

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

**Artisan Technology Group**
(217) 352-9330 | sales@artisantg.com | artisantg.com

**Full-service, independent repair center**
with experienced engineers and technicians on staff.

**We buy your excess, underutilized, and idle equipment**
along with credit for buybacks and trade-ins.

**Custom engineering**
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

**Expert team | Trust guarantee | 100% satisfaction**

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *RadiSys ATCA-9100* at our website: *Click HERE*

# PROMENTUM®

## MEDIA RESOURCE MODULE REFERENCE

### ATCA-9100 WITH F-DSP FARMS



RadiSys
THE POWER OF WE

www.radisys.com

007-03097-0003• December 2010

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Revision history

| Version | Date | Description |
|---|---|---|
| -0000 | June 2008 | First edition. |
| -0001 | July 2009 | Second edition. Editorial revisions. Updated diagnostics information. Added SYS-6002 information. |
| -0002 | August 2010 | Third edition. Editorial revisions. Added information on peripheral interface module (PIM) sensors. |
| -0003 | December 2010 | Fourth edition. See *What's new in this manual on page 7* for a description of changes in this edition. |

© 2008-2010 by RadiSys Corporation. All rights reserved.

RadiSys and Promentum are registered trademarks of RadiSys Corporation. Linux is a registered trademark of Linus Torvalds. PICMG, AdvancedTCA, and ATCA are registered trademarks of the PCI Industrial Computer Manufacturers Group. Freescale, StarCore, and CodeWarrior are trademarks of Freescale Semiconductor, Inc. ispDOWNLOAD is a registered trademark of Lattice Semiconductor Corporation.All other trademarks, registered trademarks, service marks, and trade names are the property of their respective owners.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



# TABLE OF CONTENTS


Preface ..... 7
About this manual ..... 7
What's new in this manual ..... 7
Where to get more product information ..... 7
About related RadiSys products ..... 8
AdvancedTCA information ..... 8
Related documents ..... 9
Notational conventions ..... 10
Electrostatic discharge ..... 10

Chapter 1: Product Overview ..... 11
Base card features ..... 12
Modular DSP farms ..... 13
Supplied software ..... 13

Chapter 2: Base Card Components ..... 15
Detailed block diagram of the MRM ..... 15
Local management processor (LMP) ..... 16
CPLD for interrupts and resets ..... 21
Serial RapidIO (sRIO) switch array ..... 22
Ethernet switch subsystems ..... 25
Network timing subsystem (NTS) ..... 28
Hardware management subsystem ..... 30
Memory and storage devices ..... 32

Chapter 3: DSP Farms and Devices ..... 37
Interfaces to the DSP mezzanine cards ..... 37
F-DSP mezzanine card and devices ..... 40
DSP farm power-up sequence ..... 45




Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chapter 4: LEDs and External Interfaces ..... 47
Front panel ..... 47
Front panel LEDs ..... 48
Debug LEDs ..... 50
External interfaces through an RTM ..... 51
Chapter 5: Development and Debugging Features ..... 53
Removing the top cover ..... 55
Additional development and debugging hardware ..... 55
Using the consolidated debug board ..... 56
Chapter 6: Configuring DSP Devices ..... 61
Summary of available interfaces ..... 61
Summary of tasks for each interface ..... 61
DSP numbers used in each interface ..... 65
Using U-Boot to configure the DSP devices ..... 66
U-Boot command reference ..... 69
Using Linux commands to configure the DSP devices ..... 71
Using CLI commands to configure the DSP devices ..... 72
Using the API to configure the DSP devices ..... 74
Chapter 7: Diagnostic Tests and Commands ..... 77
Types of diagnostic tests and interfaces for using them ..... 77
Component functions tested by diagnostic tests ..... 78
Controlling POST diagnostic tests with U-Boot variables ..... 80
Running manufacturing diagnostic tests from U-Boot ..... 82
Running field diagnostic tests from the CLI ..... 82
Running field diagnostic tests using the diagnostics API ..... 83
Common command options ..... 84
Command to run all diagnostic tests ..... 85
POST diagnostic tests ..... 86
LMP-controlled diagnostic tests ..... 88
Serial RapidIO switch and interface diagnostic tests ..... 98
DSP device diagnostic tests ..... 103



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Chapter 8: Maintenance and Troubleshooting ..... 117
Removing the MRM ..... 117
Upgrading the software and firmware ..... 118
Troubleshooting ..... 119

Appendix A: Specifications123
Environmental specifications ..... 123
Safety specifications ..... 124
Mechanical dimensions ..... 124
Electromagnetic compatibility (EMC) ..... 124
Power consumption ..... 125
Mean time between failure (MTBF) ..... 125

Appendix B: IPMI Commands and Managed Sensors ..... 127
Supported IPMI commands ..... 127
Sensors on the MRM ..... 129
Managed sensors ..... 130
Sensor alarm troubleshooting ..... 138

Appendix C: DSP Configuration Data ..... 155
Introduction ..... 155
Example fdsp_farm.h file ..... 155



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com




# About this manual

This manual describes the Promentum® ATCA-9100 Media Resource Module (MRM), an AdvancedTCA® front module that is fully compliant with the ATCA® standard. The module is designed to be incorporated into high availability AdvancedTCA systems such as the Promentum SYS-6010 platform.

Use this manual as a reference for the operation and the maintenance of the ATCA-9100 module. It also contains software information for configuring the DSP devices as well as information on Intelligent Platform Management Interface (IPMI) commands, diagnostic tests, and troubleshooting.

The material presented here is not introductory; it is assumed that you are already familiar with the intended use of the module in your organization's ATCA platform.

The simplified names "MRM" and "module" are used in place of "ATCA-9100 Media Resource Module" for the rest of the manual.

# What's new in this manual

- Added Appendix C with example fdsp_farm.h source code.
- Made minor format and editorial corrections.

# Where to get more product information

Please visit the RadiSys Web site at www.radisys.com for product information and other resources. Downloads (manuals, release notes, software, etc.) are available at www.radisys.com/downloads.

See the following resources for information on the MRM not described in this manual:

- **Installation and initial setup instructions.** The *ATCA-9100 Media Resource Module Installation Guide* provides the steps for installing the module into a shelf and completing the initial configuration.
- **Platform hardware information.** The MRM is incorporated into platform systems such as the Promentum platforms SYS-6002, SYS-6006, SYS-6010, SYS-6014, and SYS-6016. For information about the platforms and their shelf hardware, see the appropriate *Platform Hardware Installation Guide* and the Platform *Hardware Reference*. Each *Installation Guide* provides the steps for installing and setting up the platform's shelf and each *Reference* describes the platform's features and operation.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- **Command line interface (CLI) reference information.** The *Command Line Interface Reference* describes the master CLI and its command modes and serves as a reference for command syntax and options. When referenced in this manual, the simplified name of *CLI Reference* will be used.
- **Software reference information.** The *Software Guide for Management Processors and General Computing Processors* describes the local management processor software on the MRM. This guide serves as a reference for software concepts and procedural and usage information.
- **Update information.** Firmware and software updates may be available for the MRM components from time to time. For information on updating components on the MRM and other modules, see the *Firmware and Software Update Instructions*.
- **Shelf Manager information.** The *Shelf Management Software Reference* describes the architecture and the operation of the RadiSys Shelf Manager and the HPI Server, which are software entities that control and monitor operations on the shelf. The Shelf Manager typically runs on the module installed in the hub slot—the ATCA-2210 Switch and Control Module (SCM). For certain platform configurations, such as the SYS-6002 platform configuration, the Shelf Manager may run directly on the MRM.The HPI server software can run on any RadiSys ATCA front module and provides direct access between the module and a system manager in the absence of the RadiSys Shelf Manager.

## About related RadiSys products

The MRM is part of the Promentum family of products. For information on the Promentum product family and other RadiSys products, see the RadiSys Web site at www.radisys.com.

## AdvancedTCA information

For information about the PCI Industrial Computer Manufacturers Group (PICMG®) and the AdvancedTCA standard, consult the PICMG Web site at this URL:

http://www.picmg.org



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Related documents

*Advanced Switching Core Architecture Specification Revision 1.0*, Advanced Switching Interconnect Special Interest Group, December 2003.

*BCM56500 24-Port GbE Multilayer Switch with Four10-GbE/HiGig+ Uplink Ports*, Broadcom.

*Broadcom 5650X 24-Port GbE Multilayer Switch with Four 10-GbE/HiGig+ Uplink Ports Data Sheet*, Broadcom Corporation, December 3, 2004.

*Broadcom BCM5650X Theory of Operations*, Broadcom Corporation, December 7, 2004.

*CAN/CSA C22.2 No. 60950-1-03 Safety for Information Technology Equipment, First Edition*, Canadian Standards Association (www.csa.ca), July 2006.

*Das U-Boot – Universal Bootloader* Web site, http://sourceforge.net/projects/u-boot/.

*DDR2 VLP Registered MiniDIMM MT9HVF[32|64|128]72(P)K*, Micron.

*EN 60950-1:2002 Information Technology Equipment. Safety. General Requirements, European Committee for Electrotechnical Standardization (CENELEC)* (www.cenelec.be), February 22, 2002

*EREF: A Programmer's Reference Manual for Freescale™ Book E Processors*, Freescale Semiconductor.

*The $I^2C$ Bus Specification Version 2.1*, Philips Semiconductor, (www.semiconductors.philips.com), January 2000

*IEEE Std 1149.1-2001 Test Access Port and Boundary-Scan Architecture*, IEEE Computer Society (standards.ieee.org), June 23, 2001.

*IEEE Std 802.3-2002 Telecommunications and information exchange between systems — Local and metropolitan area networks — Specific requirements, Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*, IEEE Computer Society, March 8, 2002.

*Intelligent Platform Management Interface Specification* v1.5, Revision 2.0, Intel Corporation; Hewlett Packard Company, NEC Corporation, and Dell Computer Corporation.

*MPC8548E PowerQUICC III Integrated Processor Family Reference Manual, Revision 2*, Freescale Semiconductor, February, 2007.

*MSC8144 Reference Manual: Quad Core Media Signal Processor*, Revision 3, Freescale Semiconductor, April 2008.

*PICMG 3.0 Advanced Telecommunications Computing Architecture (ATCA) Version R2.0*, PICMG (www.picmg.org).

*RapidIO™ Interconnect Specification, Part 6: 1x/4x LP-Serial Physical Layer Specification*, Revision 1.3, RapidIO Trade Association, June 2005.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

*UL 60950-1 Safety for Information Technology Equipment – Part 1: General Requirements, Edition 1*, Underwriter Laboratories (www.ul.com), July 7, 2006.

## Notational conventions

This manual uses the following conventions

| | |
|---|---|
| *ItalicText* | File, function, and utility names. |
| `MonoText` | Screen text and syntax strings. |
| **`BoldMonoText`** | A command to enter. |
| *`ItalicMonoText`* | Variable parameters. |
| Brackets [ ] | Command options. |
| Curly braces { } | A grouped list of parameters. |
| Vertical line \| | An “OR” in the syntax. Indicates a choice of parameters. |

All numbers are decimal unless otherwise stated.

## Electrostatic discharge

**WARNING! This product contains static-sensitive components and should be handled with care. Failure to employ adequate anti-static measures can cause irreparable damage to components.**

Electrostatic discharge (ESD) damage can result in partial or complete device failure, performance degradation, or reduced operating life. To avoid ESD damage, the following precautions are strongly recommended.

- Keep the module in its ESD shielding bag until you are ready to install it.
- Before touching the module, attach an ESD wrist strap to your wrist and connect its other end to a known ground.
- Handle the module only in an area that has its working surfaces, floor coverings, and chairs connected to a known ground.
- Hold the module only by its edge and mounting hardware. Avoid touching PCB components and connector pins.

For further information on ESD, visit www.esda.org.

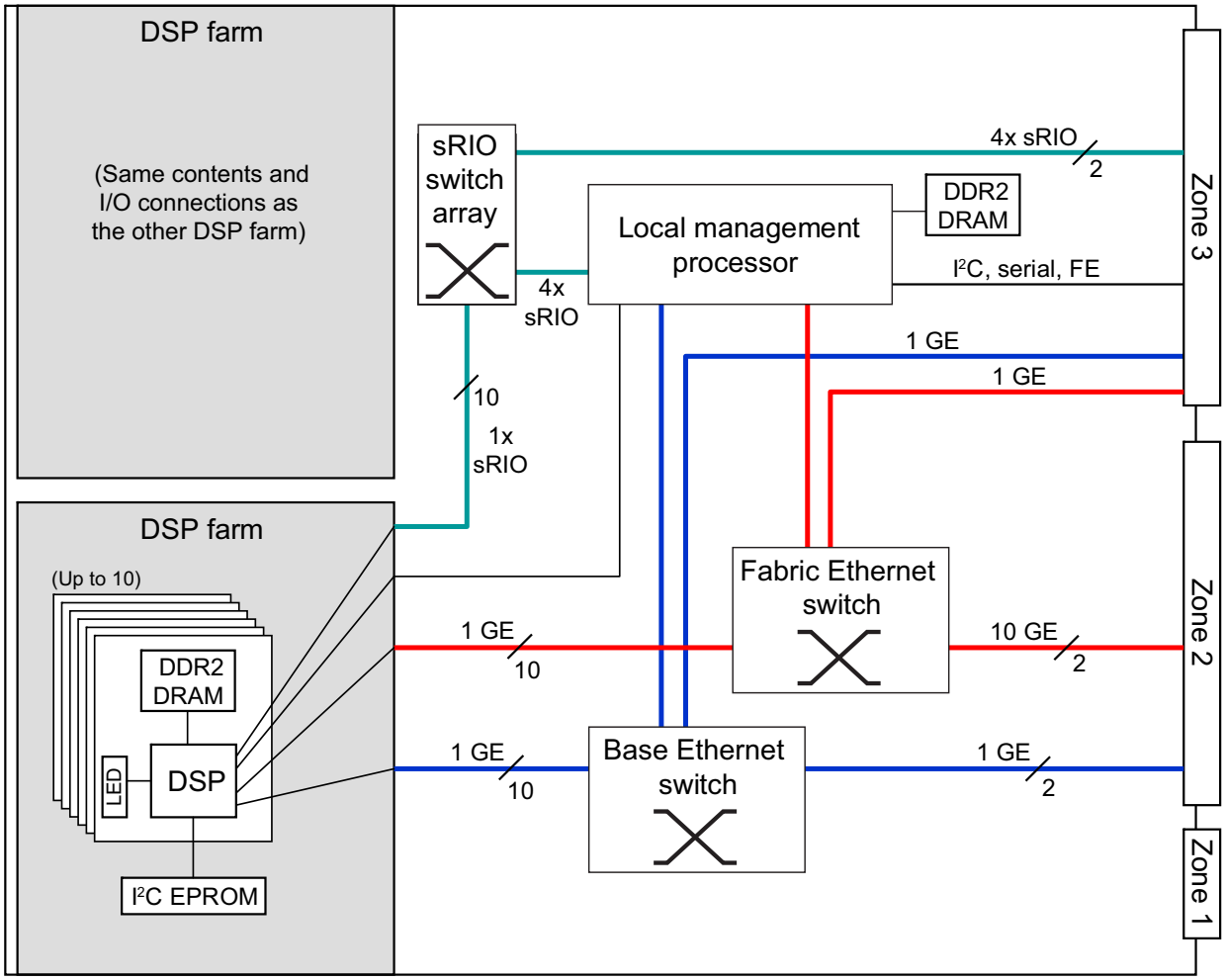


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The ATCA-9100 Media Resource Module (MRM) offers high density digital signal processing (DSP) for media processing applications that are needed on network elements such as media gateways and radio network controllers. The MRM supplies many multi-core DSP devices capable of high-speed processing of voice and video traffic. The module may be used for tasks such as:

- Transcoding
- Generating and processing in-band control signals in VoIP packets
- Recognizing and responding to touch tones
- Echo cancellation

Figure 1. MRM simplified block diagram






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Each DSP device has high bandwidth network access, with a gigabit Ethernet connection to the Base interface and another to the Fabric interface. Each device can be controlled through serial RapidIO connections to the local management processor.

The MRM is physically divided into these major parts:

- A base card that supplies the required capabilities of an ATCA front module plus advanced switching and additional management features.
- Two mezzanine cards that contain DSP devices.

# Base card features

## Local management processor (LMP)

The module incorporates a powerful on-board PowerQUICC™ III processor for its local management functions. The LMP manages the Ethernet and serial RapidIO switches, hosts the serial RapidIO switching network, and manages the DSP farms and individual DSP devices.

## Serial RapidIO (sRIO) switch array

Two sRIO switches cascade to form an sRIO switch fabric. The switch fabric supplies 1 Gbps management connectivity to each DSP device and 4 Gbps to both the LMP and an optional RTM.

## Ethernet switches

The module has two Ethernet switches:

- The Base Ethernet switch provides 1 Gbps connectivity between the backplane Base interface, the LMP, an optional RTM, and each DSP device.
- The Fabric Ethernet switch provides 10 Gbps connectivity to the backplane Fabric interface. It also supplies 1 Gbps connectivity between the LMP, an optional RTM, and each DSP device.

## Network timing subsystem (NTS)

The module's network timing subsystem receives clock signals from a centralized timing source and distributes synchronized clocks to the DSP farms and the LMP. The NTS includes a hitless switch for tracking clock source quality and associated software for specifying user-defined priorities for sources. The hitless switch transitions seamlessly to a new clock source if the source in use is lost.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Modular DSP farms

The MRM supplies the DSP devices in two farms (or collections), each on a factory-installed mezzanine card. This architecture is flexible to accommodate future mezzanine cards that supply the latest DSP technologies.

For more details, see *Chapter 3, DSP Farms and Devices, on page 37*.

# Supplied software

The module includes U-Boot, a Linux kernel, and user-space applications and utilities. It is preinstalled with Promentum software that enables management of the DSP devices, sRIO switches, and Ethernet switches, along with other MRM components. Promentum software additionally supplies API libraries and an SNMP agent to enable development of management applications.

For an introduction and details for using most of the Promentum software, see the *Software Guide*. For information about the software for configuring the DSP devices and sRIO switches, see *Chapter 6, Configuring DSP Devices, on page 61* in this manual. For information on diagnostic software for MRM components, see *Chapter 7, Diagnostic Tests and Commands, on page 77* in this manual.

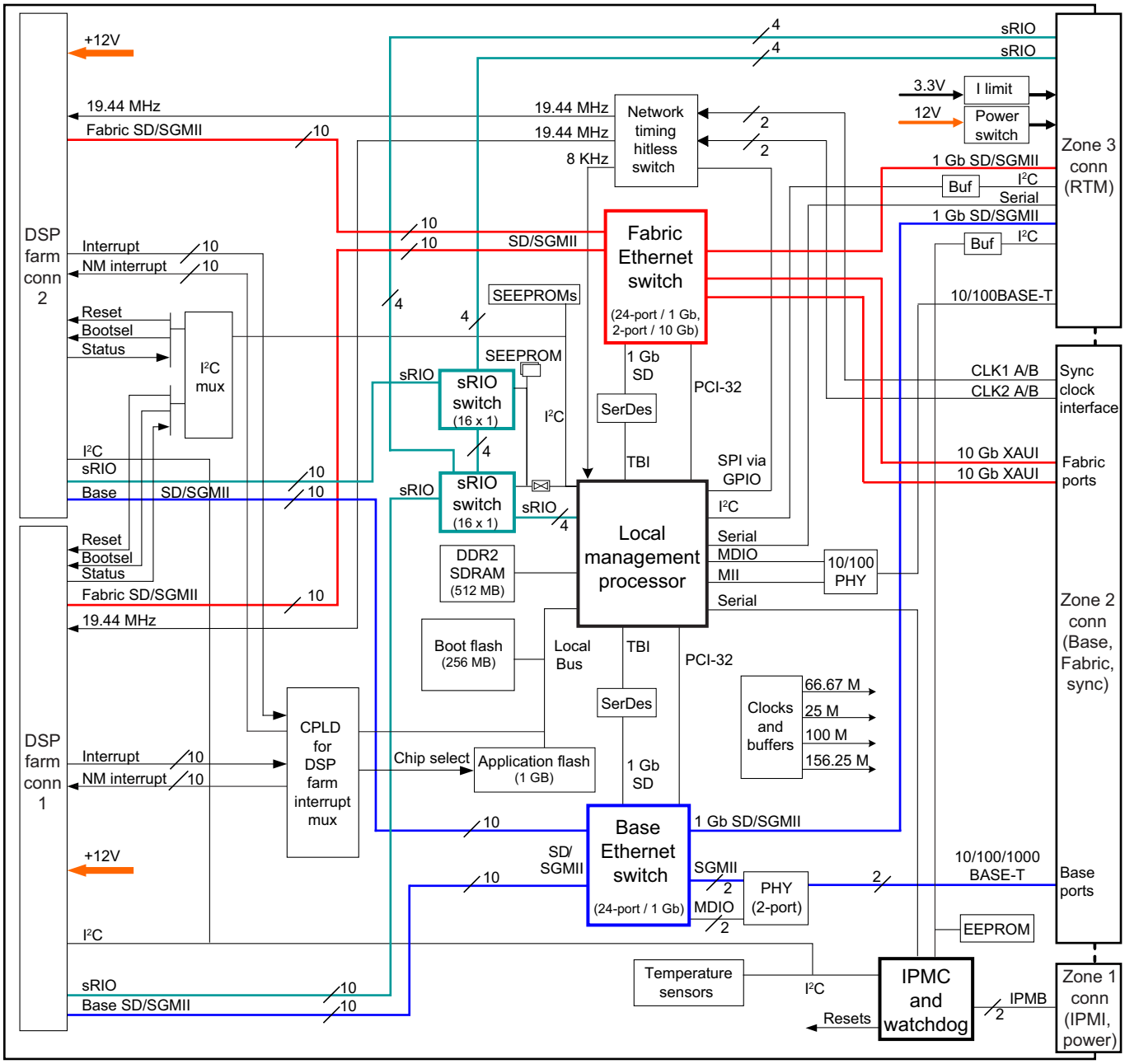


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Detailed block diagram of the MRM

Figure 2. MRM detailed block diagram






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Local management processor (LMP)

The local management processor (LMP) manages the Ethernet switches, serial RapidIO switches, and the network timing subsystem (NTS). It also provides access to the hardware management subsystem.

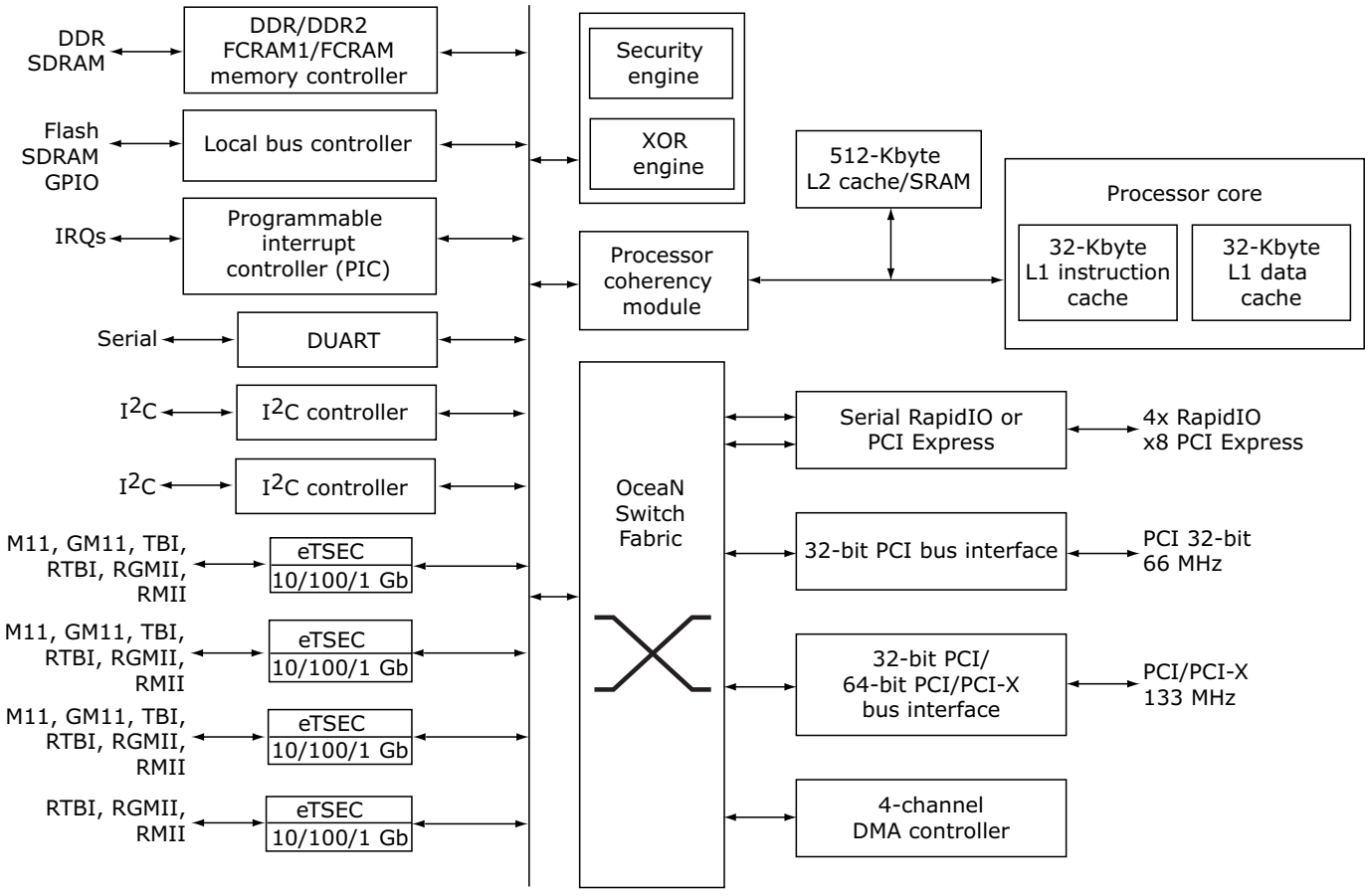
The LMP provides Ethernet ports, serial communications, an inter-integrated circuit ($I^2C$) controller, a serial peripheral interface (SPI), memory, and peripheral component interconnect (PCI) bus interfaces.

The LMP is implemented with an MPC8548 PowerQUICC III processor, which has the following characteristics:

| Processor | Core freq. (GHz) | DDR Bus freq. (MHz) | PCI bus freq. (MHz) | SYSCLK freq. (MHz) | VDD/core voltage | Instruction cache (KB) | Data cache (KB) | Processor version |
|---|---|---|---|---|---|---|---|---|
| MPC8548VTAUJ | 1.3 | 533 | 66 | 66 | 3.3V/1.1 V | 32 | 32 | 0x8031_0020 |

## LMP features

Figure 3. Block diagram of the PowerQUICC III






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The LMP's interfaces provide the following feature set on the MRM:

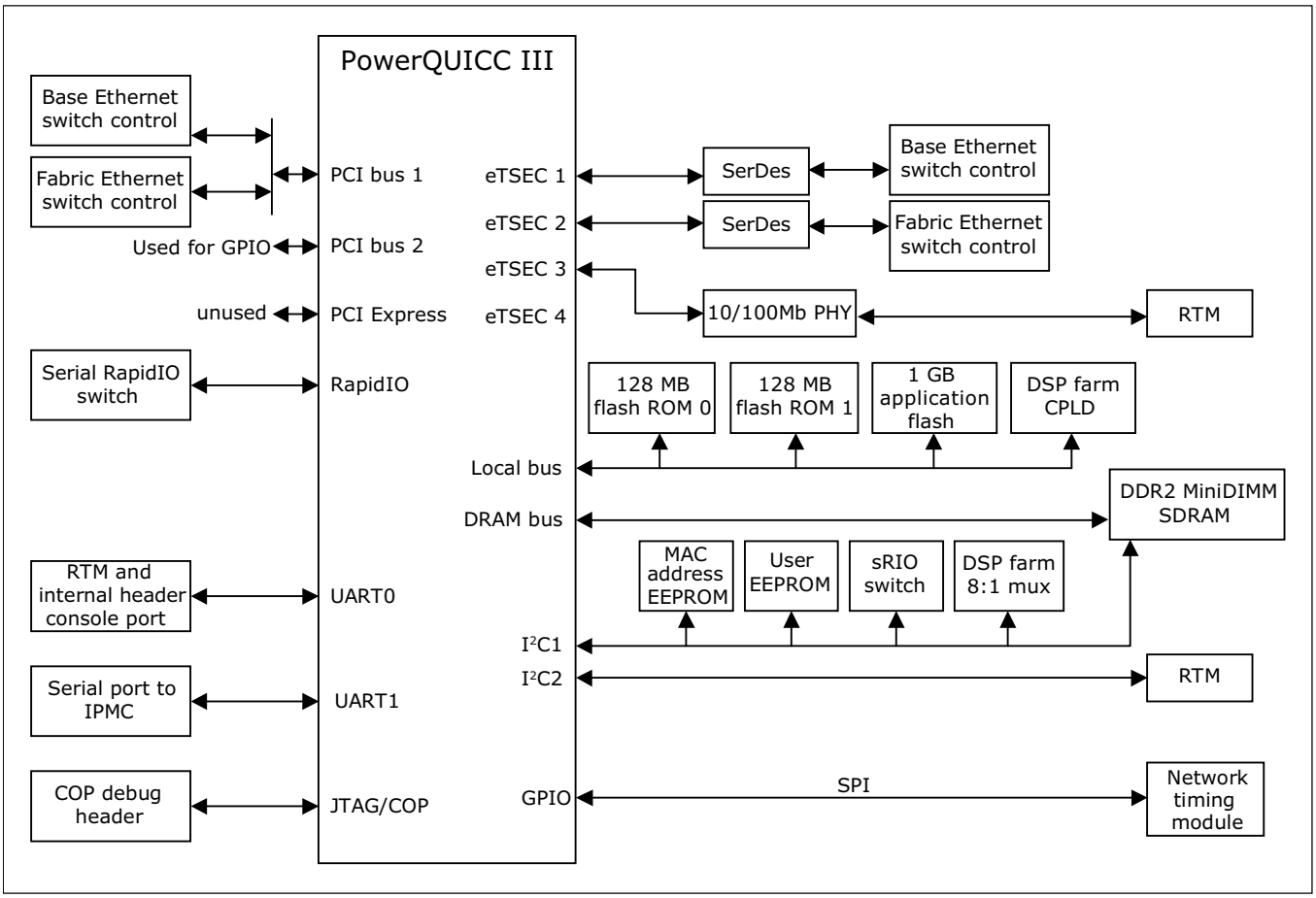
- Memory buses provide interfaces to the local synchronous dynamic random access memory (SDRAM), the boot flash memory, and the application flash memory.
- Double data rate (DDR) memory controller with 64-bit interfaces including ECC support
  - The MRM has one vertical 244-pin, 1.8 V DDR2 very low profile (VLP) MiniDIMM socket
  - The MRM supports one 512 MB or 1 GB ECC 1.8 V DDR2 VLP Registered MiniDIMM module at 533 MHz data rate
  - Supports up to 4 banks with up to 4 GB each
  - On-die termination for DDR2 interface
- Local Bus Controller:
  - Local Bus runs in 16-bit mode operating at 33 MHz
  - MRM has two redundant 128 MB flash memory devices selected by the IPMC
  - Reads configuration information on power-up for MRM version and revision history
- Two peripheral component interconnect (PCI) controllers:
  - PCI1 runs in 32-bit 66 MHz mode and provides the control interface to the Ethernet switches
  - PCI2 interface pins are configured for GPIO
- An $I^2C$ controller ($I^2C1$) that connects to internal MRM $I^2C$ devices:
  - Serial EEPROM (SEEPROM) used for storing media access control (MAC) addresses for Ethernet ports
  - SEEPROM used for storing user-defined information
  - GPIO control bits
  - DDR2 memory module
  - Clock generator
  - Serial RapidIO switches
  - $I^2C$ multiplexer that gives access to DSP farm control and status ports
- An $I^2C$ channel ($I^2C2$) routed to the RTM
- Serial RapidIO (sRIO) interface unit
  - x4 link connects to the sRIO switch
  - Supports 1 Gbps per lane
- Three-speed Ethernet Controllers (eTSECs)
  - Two eTSECs (eTSEC1 and eTSEC2) each provide a 1-Gb interface to one of the Ethernet switches
  - eTSEC3 is routed to the RTM to provide a 10/100Base-T interface for maintenance purposes
- Dual Universal Asynchronous Receiver Transmitter (DUART):
  - UART0 is routed to the RTM to provide a serial maintenance port
  - UART1 connects to the IPMC for messaging
- Power management with power saving modes: doze, nap, and sleep (management is dynamic reducing power consumption of blocks when idle)



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- Address translation and mapping unit (ATMU) with eight local address windows within 36-bit address space
- Integrated DMA controller with four channels, which supports transfers to and from local memory or I/O port
- Programmable Interrupt Controller supporting 12 external interrupts and 4 message interrupts. Includes global timer counters for generating interrupts
- System performance monitor
- Embedded e500 book-E compatible core with:
  - 32 KB Level 1 (L1) instruction cache
  - 32 KB L1 data cache
- 512 KB level 2 cache for synchronous dynamic random access memory (SDRAM)
- Supporting hardware for the PowerQUICC III, which includes:
  - Processor and system clock generation logic
  - General purpose input/output signals (GPIOs) to and from various functions on the MRM for control and status. Also provides I/O control of the NTS clocking subsystem
  - Power-good detection and reset logic

Figure 4. Block diagram of LMP relationship with MRM components






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# LMP communications controller assignments

Table 1 shows the relationship between the interfaces on the PowerQUICC III and the functions implemented on the MRM.

Table 1. LMP interfaces

| PowerQUICC III interfaces | Function on MRM |
|---|---|
| PCI1 | Ethernet switch control |
| PCI2/GPIO | GPIO |
| PCI Express | not used |
| RapidIO | Serial RapidIO interface to switch |
| TSEC1 | Gb link to Ethernet Base switch |
| TSEC2 | Gb link to Ethernet Fabric switch |
| TSEC3 | 10/100 Mb link to RTM |
| TSEC4 | not used |
| Local bus | Interface to boot flash, application flash, and DSP interrupt CPLD |
| DRAM bus | Interface to DDR2 MiniDIMM SDRAM |
| UART0 | RS-232 console port on RTM |
| UART1 | IPMC Interface |
| I²C1 | I²C to SDRAM, SEEPROMs, sRIO switches, DSP farm 8:1 multiplexer |
| I²C2 | I²C to RTM |
| SPI implemented via GPIO pins | Network timing subsystem |
| JTAG | Debug connector |

# Ethernet maintenance port

One of the three-speed Ethernet controllers (TSECs) on the LMP connects through a PHY to the Zone 3 connector. An RTM with an appropriate Ethernet connection can supply 10/100 Mbps Ethernet access to the LMP through an Ethernet maintenance port.

You can access the MRM from an external computer that is connected to the Ethernet maintenance port of the RTM or rear debug card. Alternatively, you can use Telnet to access the MRM through the backplane Ethernet interfaces. See the *ATCA-9100 Media Resource Module Installation Guide* for instructions on how to install the RTM and set up these connections.



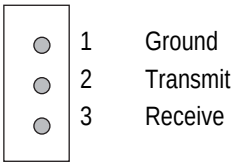
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## LMP serial console access

A full-duplex serial interface on the LMP connects to the Zone 3 connector. An RTM with an appropriate serial connection or the rear debug card can supply console access to the LMP through a serial port. See the *ATCA-9100 Media Resource Module Installation Guide* for instructions on how to install the RTM and set up a connection.

A serial debug header on the MRM provides another access point to the LMP serial console. The male, unshrouded header is accessible only when the MRM cover has been removed and is functional only when no RTM is installed. For the header location, see *Chapter 5, Development and Debugging Features, on page 53*.

The signals are compatible with the RS-232 standard. The header pinout is shown here.

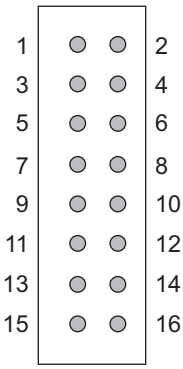



## LMP JTAG header

A JTAG header gives access to the LMP for debugging purposes. The JTAG header is accessible through an opening in the MRM sheet metal cover. For the header location, see *Chapter 5, Development and Debugging Features, on page 53*. The JTAG header pinout is shown here.

| Pin | Name | Description |
|---|---|---|
| 1 | JTAG_TDO | Development serial data out |
| 3 | JTAG_TDI | Development serial data in |
| 5 | QREQ* | Not used, pulled up to +3.3 V |
| 7 | JTAG_TCK | Development serial clock |
| 9 | JTAG_TMS | Test mode select input |
| 11 | COP_SRESET* | Soft reset of LMP |
| 13 | COP_HRESET* | Hard reset of LMP |
| 15 | CKSTP_OUT* | Check stop output |

* Active low




| Pin | Name | Description |
|---|---|---|
| 2 | N/C | No connect |
| 4 | JTAG_TRST* | Test (soft) reset |
| 6 | PULL-UP | +3.3 V supply |
| 8 | CKSTP_IN* | Check stop input |
| 10 | N/C | No connect |
| 12 | N/C | No connect |
| 14 | N/C | No connect |
| 16 | GND | Ground |

* Active low

The CKSTP_OUT signal indicates that the core has entered a stop condition and requires a reset. The CKSTP_IN signal allows a JTAG device to force the core into a stop condition. The JTAG device may use the 3.3 V power supply.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# CPLD for interrupts and resets

The MRM base card uses a CPLD to perform the following functions:

- Multiplex interrupt signals between the LMP and DSP devices
- Reset payload devices
- Switch power to the DSP farms on and off
- Facilitate access to application flash by decoding bank address bits
- Receive DSP farm presence and power status
- Receive an indication of the DSP farm type

The CPLD is a Lattice LCMXO640C Mach-XO device that uses RAM-based technology and has embedded flash to store configurations.

For information on controlling the DSP farms and devices, which relies upon the CPLD implicitly, see *Chapter 6, Configuring DSP Devices, on page 61*.

## Interrupts between the LMP and DSP devices

Each DSP device on the DSP farms can interrupt the LMP. The CPLD acts as an interrupt multiplexer to map the large number of potential interrupts to the physical interrupt resources of the LMP. The CPLD performs a logical AND of the active-low interrupt signals from all DSP devices on a single farm, so it can generate a single interrupt request to the LMP from each farm.

In addition, the CPLD gives the LMP access to address registers that can signal a non-maskable interrupt (NMI) event to each DSP device.

## Payload device resets

The MRM performs resets of payload devices when it receives reset signals from the IPMC or LMP. The payload devices are the DSP farms, the Ethernet switches, the sRIO switches, and the PHY for the Base interface.

When the CPLD itself is reset, all of the payload devices are also reset. The IPMC can reset the CPLD (and all payload devices) using a Payload Reset or a Payload Power Cycle command.

The LMP can reset individual payload devices by writing to CPLD registers that control the resets and the power switches to the DSP farms. The LMP cannot reset the CPLD, and a reset of the LMP does not change the states of the CPLD registers.

## Application flash chip selection

The CPLD facilitates communication with the application flash memory array by routing each request to the appropriate flash bank and logical address.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Serial RapidIO (sRIO) switch array

Two serial RapidIO switches work in combination to connect each DSP device to the LMP, to the RTM, and to the other DSP devices. The sRIO connections allow the LMP and other entities on the network to:

- Exchange control packets with the DSPs
- Load and manage individual DSP devices
- Directly access all DSP memory and register resources

The sRIO switches are implemented by Tundra Semiconductor Tsi578 devices. Together the switches supply 20 single-lane ports and 5 quad-lane ports. Each single lane operates at 1.25 Gbps. Taking into account the overhead of 8b/10b encoding, each single lane provides an effective user data rate of 1 Gbps. Each quad lane operates at 5 Gbps and provides an effective user date rate of 4 Gbps.

Communication between ports on the same switch uses single-lane ports at 1 Gbps, and communication between the two switches uses quad-lane ports at 4 Gbps.

The Tsi578 features include:

- Compliant with the RapidIO Interconnect Specification, revision 1.3)
- 1 Gbps user bandwidth per port, 10 Gbps inter-port bandwidth (full duplex)
- Per-port loopback support
- Per-port power-down mode support
- Per-port destination ID lookup table
- Hierarchical or flat lookup process for up to 512 destination IDs/port
- Hierarchical destination lookup for all possible (64K) destination IDs
- Full-duplex, line rate, non-blocking switching fabric (320 Gbps simplex bandwidth)
- Programmable serial transmit current with pre-emphasis equalization
- Multicast support for up to eight multicast groups
- Error management
- Performance monitoring
- Reset-system interrupt support
- Supports one outstanding maintenance transaction per interface
- IEEE 1149.1 and 1149.6 boundary scan, with register access (JTAG)
- Debug packet generation in debug mode
- $I^2C$ control interface
- Register access via $I^2C$ or sRIO



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Serial RapidIO switch port usage

The switch ports are allocated as follows:

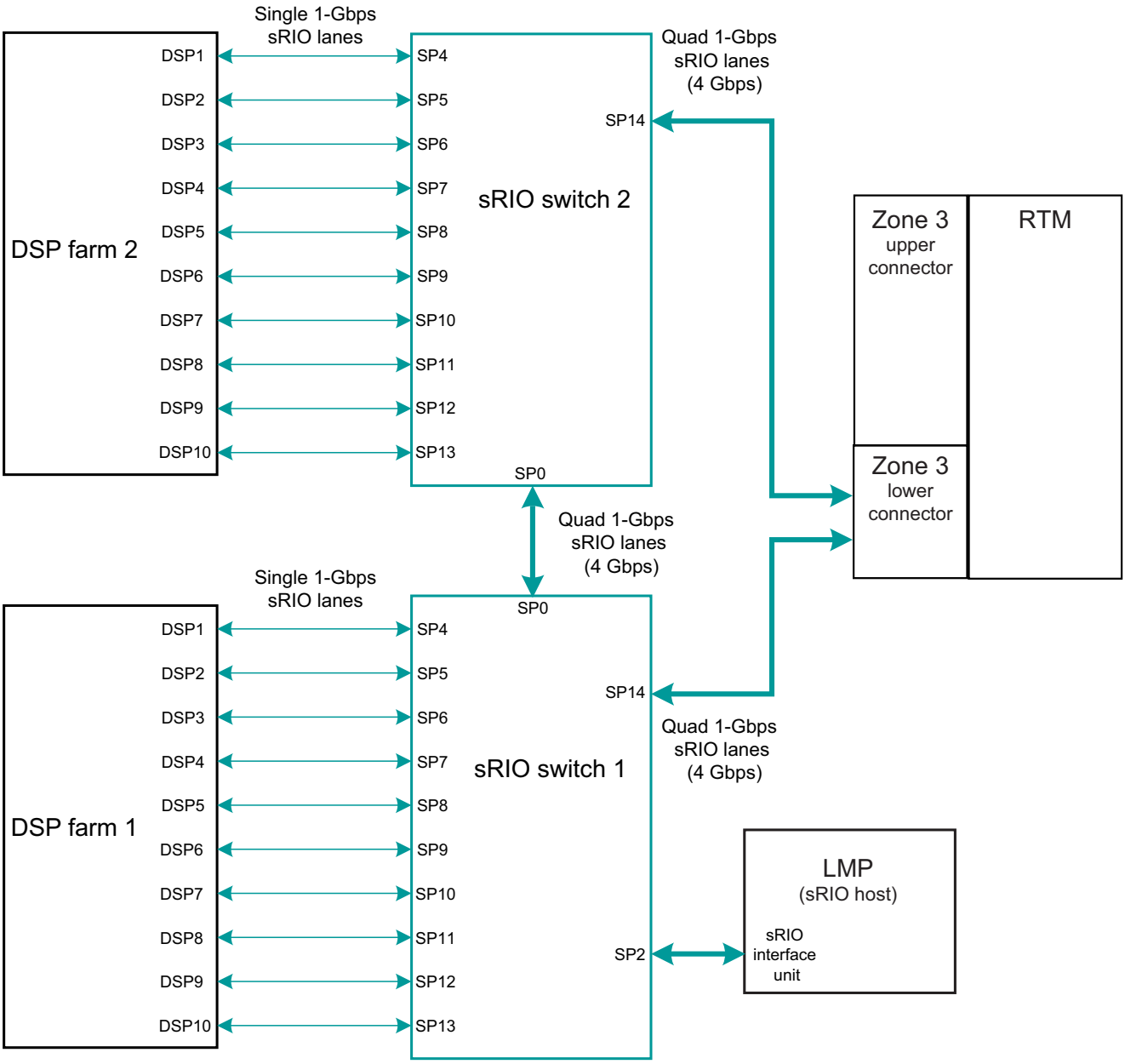
- Ten single-lane 1-Gbps ports to DSP farm 1.
- Ten single-lane 1-Gbps ports to DSP farm 2.
- One quad-lane 4-Gbps port from switch 1 to the LMP.
- One quad-lane 4-Gbps port from switch 1 to the RTM.
- One quad-lane 4-Gbps port from switch 2 to the RTM.
- Two quad-lane 4-Gbps ports (one from each switch) to communicate between switches.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Serial RapidIO switch array block diagram

Figure 5. Serial RapidIO switch array block diagram




A connection between the sRIO switches allows routing of packets from one switch to the other, so that all DSP devices are accessible over sRIO. All packets destined for the LMP must go through switch 1, as shown in the block diagram. Each switch port has its own lookup table.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

For example, for DSP5 on DSP farm 2 to communicate with the LMP, the message travels to switch port 8 on sRIO switch 2. Switch port 8 sends the message to switch port 0, which sends it over the quad-lane link to switch port 0 on switch 1. Switch port 0 on sRIO switch 1 sends the message to switch port 2, which sends it over the quad-lane link to the LMP.

For information on the management interfaces available to monitor and control the sRIO switches, see *Configuring DSP Devices on page 61*.

## Ethernet switch subsystems

The MRM has a Base Ethernet switch and a Fabric Ethernet switch. Both switches connect traffic between the DSP farms, the LMP, an optional RTM, and the backplane.

The MRM provides Ethernet switching software that runs on the LMP and manages both the Base and Fabric switches. The switches support many Layer 2 switching protocols such as virtual LANs and Class of Service queuing. For information about the Layer 2 protocols supported and the software interfaces that control them, see the *Software Guide*.

The MRM provides SNMP MIB support, CLI commands, and an API to manage the switch. For information about the SNMP MIB support and the API, see the *Software Guide*. For information about the CLI commands, see the *CLI Reference*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Base Ethernet switch subsystem

The Base Ethernet switch subsystem connects Ethernet traffic between the DSP farms, the LMP, an optional RTM, and the Base interface on the backplane. The heart of this subsystem is a Broadcom (BCM56500), 24-port, Gigabit Ethernet switch.

The Base Ethernet switch includes the following features:

- Twenty-four 1-Gb ports
- Ethernet switch/router with integrated MACs, packet buffer engine, and switching engine
- Supports wire-speed L2 switching and L3 routing
- Supports multiple (256) spanning trees (IEEE 802.1Q)
- Supports flow control (IEEE 802.x)
- Supports link aggregation (up to 8 ports) (IEEE 802.3ad)
- Supports VLANs based on MAC, port, subnet, and protocol (IEEE 802.1Q)
- IPSec engine supports DES, 3DES, HMAC-SHA-1, and HMAC-MD5 and is compatible with IPSec, SSL, TLS, 802.1x, and 802.1 li.
- Head-of-line blocking prevention
- Supports L2, L3, and L4 packet classification
- Up to 2048 packets in queue for each port and packet-forwarding rate of 42 million packets per second
- Eight layer quality of Service (QoS) on a per-port basis
- Per-port packet rate (storm) control
- Provides many port mirroring functions
- PCI interfaces to local management processor
- SGMII interface support to external 1000 Mb PHYs
- Integrated serializer/deserializer (SerDes)
- Thermally enhanced 1156-pin FCBGA package
- 3.3 volt I/O (except 1-Gb port signals)

## Base Ethernet switch port usage

The twenty-four 1-Gb ports are allocated as follows:

- Two ports connect to the backplane Base interface channels. The ports are configured as SGMII and are converted by a PHY to 1000BASE-T.
- Twenty ports connect to DSP devices on the DSP farms using SGMII 1 Gbps.
- One port connects to the LMP at 1 Gbps.
- One port connects to the optional RTM at 1 Gbps.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Fabric Ethernet switch subsystem

The Fabric Ethernet switch subsystem connects Ethernet traffic between the DSP farms, the LMP, an optional RTM, and the Fabric interface on the backplane. The heart of this subsystem is a Broadcom (BCM56502), 26-port, Gigabit Ethernet switch. Of the 26 ports, 24 are 1 Gb and 2 are 10 Gb.

The Fabric Ethernet switch includes the following features:

- Twenty-four 1-Gb ports
- Two 10-Gb ports
- Ethernet switch/router with integrated MACs, packet buffer engine, and switching engine
- Supports wire-speed L2 switching and L3 routing
- Supports multiple (256) spanning trees (IEEE 802.1Q)
- Supports flow control (IEEE 802.x)
- Supports link aggregation (up to 8 ports) (IEEE 802.3ad)
- Supports VLANs based on MAC, port, subnet, and protocol (IEEE 802.1Q)
- IPSec engine supports DES, 3DES, HMAC-SHA-1, and HMAC-MD5 and is compatible with IPSec, SSL, TLS, 802.1x, and 802.1 li.
- Head-of-line blocking prevention
- Supports L2, L3, and L4 packet classification
- Up to 2048 packets in queue for each port and packet-forwarding rate of 42 million packets per second
- Eight layer quality of Service (QoS) on a per-port basis
- Per-port packet rate (storm) control
- Provides many port mirroring functions
- PCI interfaces to local management processor
- SGMII interface support to external 1000 Mb PHYs
- Integrated serializer/deserializer (SerDes)
- Thermally enhanced 1156-pin FCBGA package
- 3.3 volt I/O (except 1-Gb and 10-Gb port signals)

## Fabric Ethernet switch port usage

Two of the 1-Gb ports on the switch are unused. The remaining 24 ports are configured as SGMII ports and are allocated as follows:

- Two ports connect to the XAUI backplane Fabric interface channels at 10 Gbps.
- Twenty ports connect to DSP devices on the DSP farms at 1 Gbps.
- One port connects to the LMP at 1 Gbps.
- One port connects to the optional RTM at 1 Gbps.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Network timing subsystem (NTS)

The network timing subsystem (NTS) receives clocks on the synchronization clock interface and distributes synchronized clocks throughout the MRM.

The MRM accepts timing references from CLK1 A/B and CLK2 A/B bussed signals on the backplane. The NTS can select from these reference timing sources and be configured with priority levels for each. By monitoring each input, the NTS can automatically switch between valid sources based on those priorities. It uses a hitless switch to provide a seamless transition to a new clock source when necessary. For more description of its operation, see the *Software Guide*.

The NTS uses the clock inputs to supply a network-synchronized,19.44-MHz clock signal to each DSP farm and the LMP. The DSP farms buffer the clock signals with multipoint low voltage differential signaling (M-LVDS) clock buffers. Each farm generates clock signals that are synchronized with the NTS clock input to meet the frequency requirements of the DSP farm components.

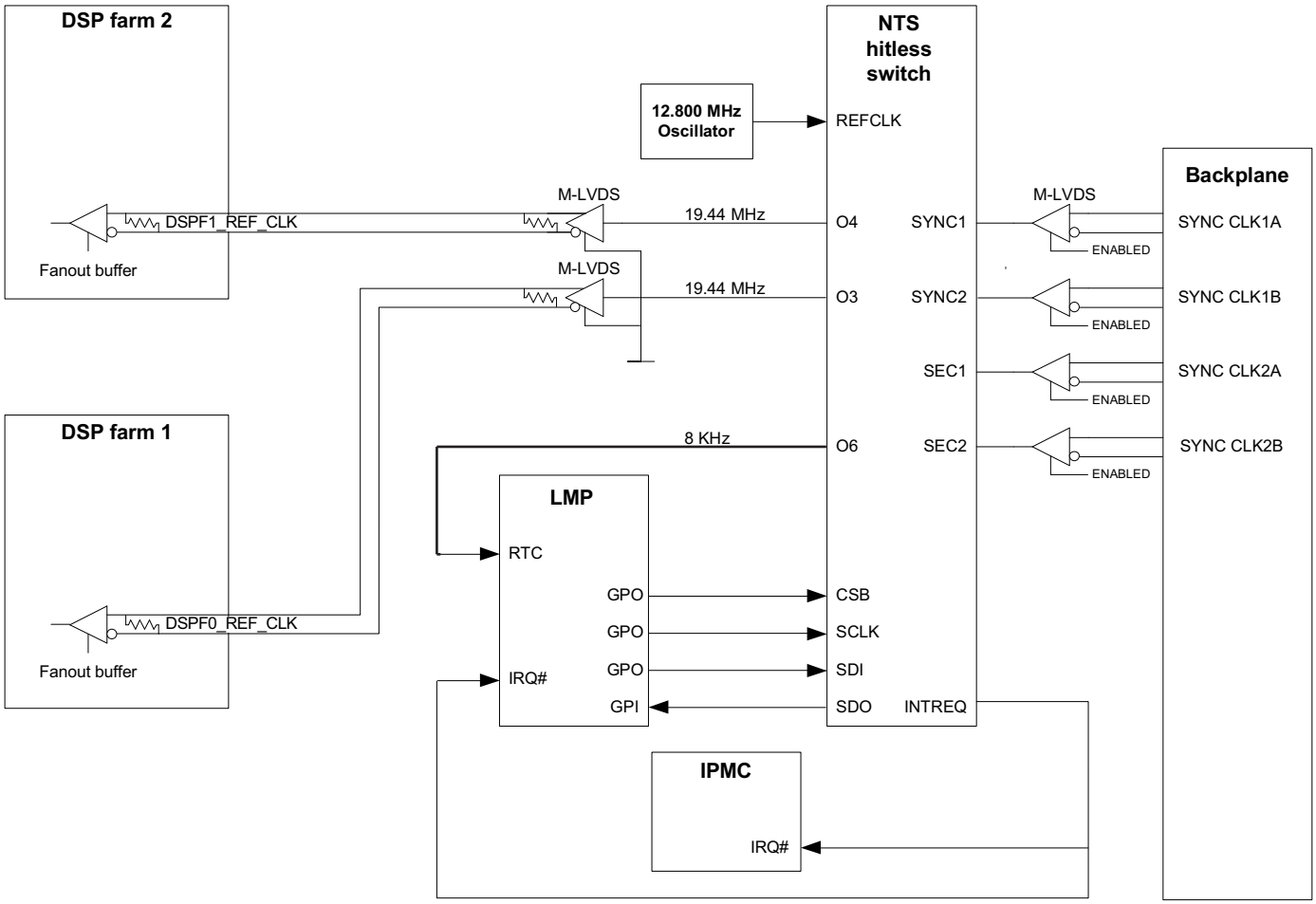
The MRM does not supply any network clock inputs to the CLK3 A/B busses on the backplane.

Figure 6 shows the NTS block diagram.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 6. NTS simplified block diagram






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Hardware management subsystem

The hardware management subsystem monitors and controls basic functions of the MRM hardware, such as power and resets. The hardware management subsystem has these main components:

- The Intelligent Platform Management Controller (IPMC)
- Sensors on the MRM base card and the DSP farms
- Interfaces for communication to external entities such as the Shelf Manager

The IPMC provides most of the hardware management functions. The hardware management subsystem has these features:

- 32 KB non-volatile random access memory
- Dual intelligent platform management bus (IPMB) signals from the IPMC to the backplane
- Field-programmable gate array (FPGA) for GPIO and watchdog function
- I²C bus interfaces to sensors on the:
  - MRM base card
  - DSP farms
  - IPMC FPGA
  - I²C multiplexer
  - Power sequencer
  - Rear transition module (RTM)
- Serial interfaces to LMP
- Analog voltage monitoring
- Monitoring of power input status
- Monitoring of reset sources
- System event log (SEL) capabilities
- External interrupts
- Auxiliary function and I/O FPGA payload power enable
- Redundant images stored in flash memory
- Auxiliary function and I/O FPGA reset control
- Auxiliary function and I/O FPGA GPIOs
- Electronic key (E-Key) control of:
  - Fabric channels connected to Zone 2 of the backplane
  - Update channels
  - Synchronization clocks
- E-Key link descriptor (but not control) for the Zone 2 Base interface channels
- Renesas H8S/2166 microcontroller GPIOs
- LMP messaging support
- LMP watchdog with pre-timeout notification, and options for software, hardware, and payload reset recovery

For information on the IPMC's role in resetting the payload devices, see *Payload device resets on page 21*. For its role in controlling the LED states, see *Front panel LEDs on page 48*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# IPMI and FPGA firmware upgrade

The Promentum software distribution includes a firmware image that you can use to upgrade the IPMI boot firmware, both copies of the IPMI application firmware, and the FPGA firmware. For upgrade instructions, see the documentation included with the image.

# IPMC serial debug and programming header

A programming header gives serial access to the IPMC debug console. This 2x5, 0.05-inch header is accessible when the MRM sheet metal cover is removed. For the header location, see *Chapter 5, Development and Debugging Features, on page 53*.

The mini-header must be expanded to a standard 0.1-inch header using a RadiSys paddle board. Contact your RadiSys sales representative to obtain a paddle board. Table 2 is the signal list for the IPMC mini-header.

Table 2. IPMC mini-header pinout

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | +3.3 V | 2 | TxD |
| 3 | Serial disable | 4 | Program IPMC |
| 5 | Reset IPMC | 6 | N/C (keying pin) |
| 7 | Ground | 8 | RxD |
| 9 | IPMB-0 bus 0 SDA | 10 | IPMB-0 bus 0 SCL |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Memory and storage devices

This section describes the storage devices provided on the MRM base card. The memory available to the DSP devices is described in *F-DSP mezzanine card and devices on page 40*.

The application flash and user serial EEPROM on the MRM base card are available for your application-specific use. In addition, you can update the image in the boot flash to include your customized software to run on the LMP.

## DDR2 SDRAM for the LMP

The LMP has access to 512 MB of DDR2 SDRAM. The 64-bit DDR2 SDRAM interface supports a 533 MHz data transfer rate with error checking and correcting (ECC) behavior.

## Boot flash for LMP software

At MRM bootup, the IPMC selects one of the two redundant boot flash devices from which to boot the LMP. The software is loaded from a boot flash device into RAM, where the file system is also created. Each boot flash device holds 128 MB and allows 16-bit wide data access.

If you need to force the MRM to boot from a particular flash device, you can use the boot flash select header shown in Figure 14 on page 54. With the MRM oriented as shown, place a jumper on the left two pins of the flash select header to select flash 0 (primary). Place a jumper over the right two pins to select flash 1 (secondary).

For information about loading software into the boot flash, see the upgrade instructions included in the Promentum software distribution.

## Application flash

The application flash is a large flash array provided to store tones, voice announcements, and other playback patterns. The application flash may also be useful for storing traces and other debug information regarding DSP and LMP activity. A portion of the application flash may be used as a file system that is accessible directly through Linux. While the Promentum driver software supports usage as a file system, the remaining file system setup must be done by the user.

The application flash consists of a 1-GB flash array arranged as 256 MB x 32 bits. The application flash is constructed using a 4 x 2 array of 1-Gbit flash devices that are each 64 Mbit x 16 bits.

Since the array is 32 bits in width and the flash devices are 16 bits in width, device configuration and programming commands must be duplicated on the high and low 16 bits of the local data bus. The 32-bit width maximizes the flash bandwidth and reduces the loading on the lower order data bus. The CPLD has the logic necessary to decode the addresses. See *CPLD for interrupts and resets on page 21*.

For information about loading software into application flash, see the *Software Guide*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

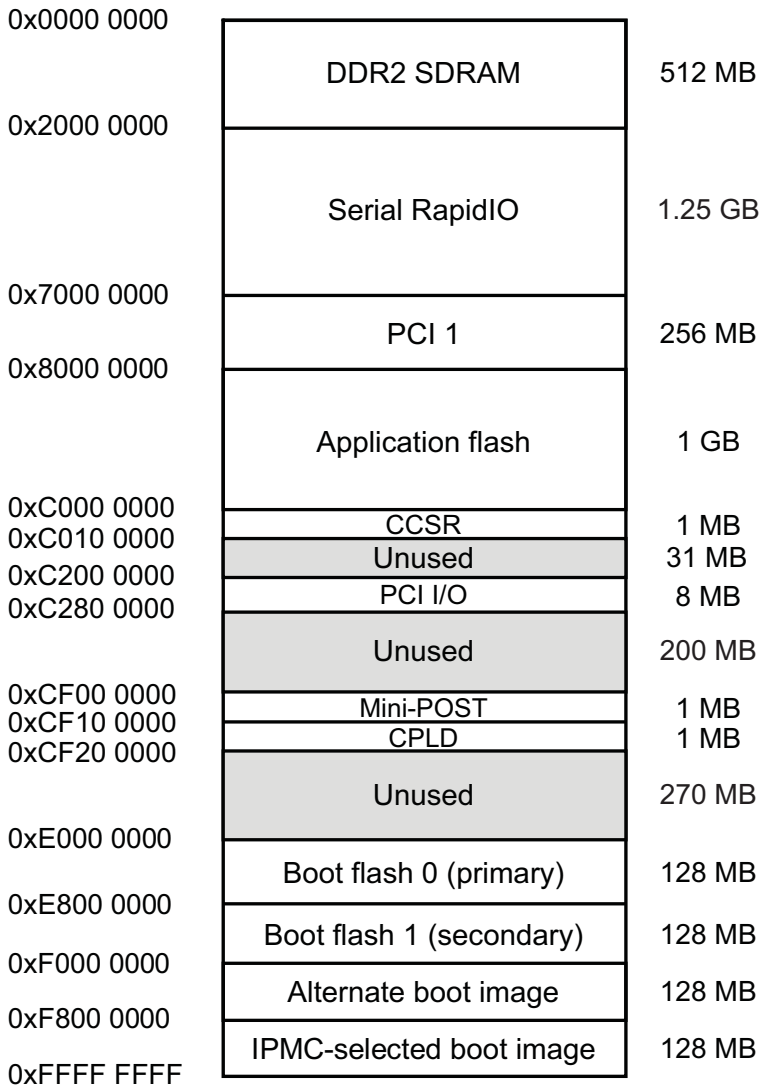
# Memory maps for the MRM base card

This section shows the memory maps for the MRM base card.

## Overall memory map

Figure 7 shows the overall memory map on the MRM base card, including the SDRAM and flash devices.

Figure 7. MRM base card overall memory map




## Boot flash device usage and maps

Figure 8 focuses on a subset of Figure 7 and shows the usage of the redundant boot flash devices and the IPMC boot image area.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The IPMC selects a flash device to use to boot up, and indicates its choice with a chip selection. The selected flash device appears at starting address 0xF8000000, where the MRM accesses the image to boot up. The alternate flash device appears at starting address 0xF0000000, but is not used.

Figure 8. Boot flash device usage

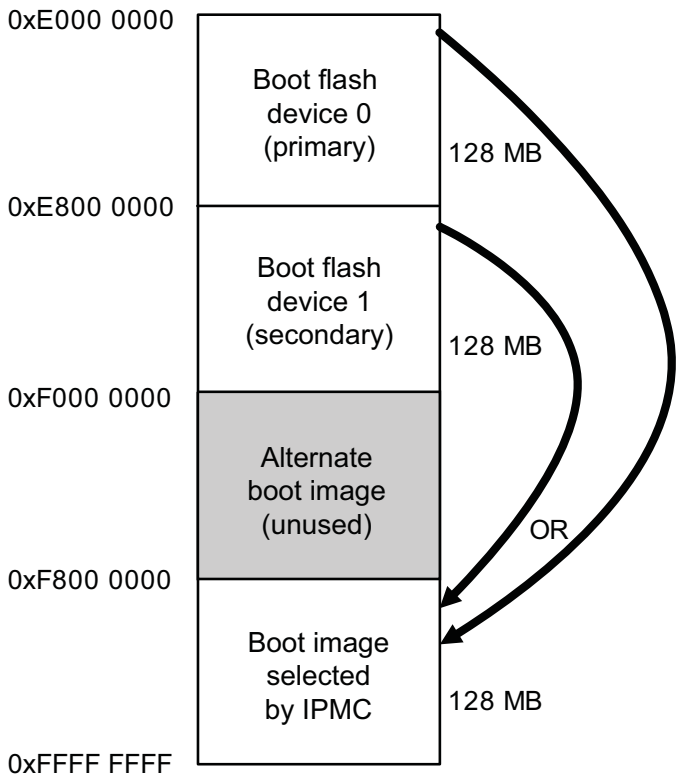



Figure 9 shows the layout of contents in each of the boot images shown in Figure 8.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 9. Boot image contents

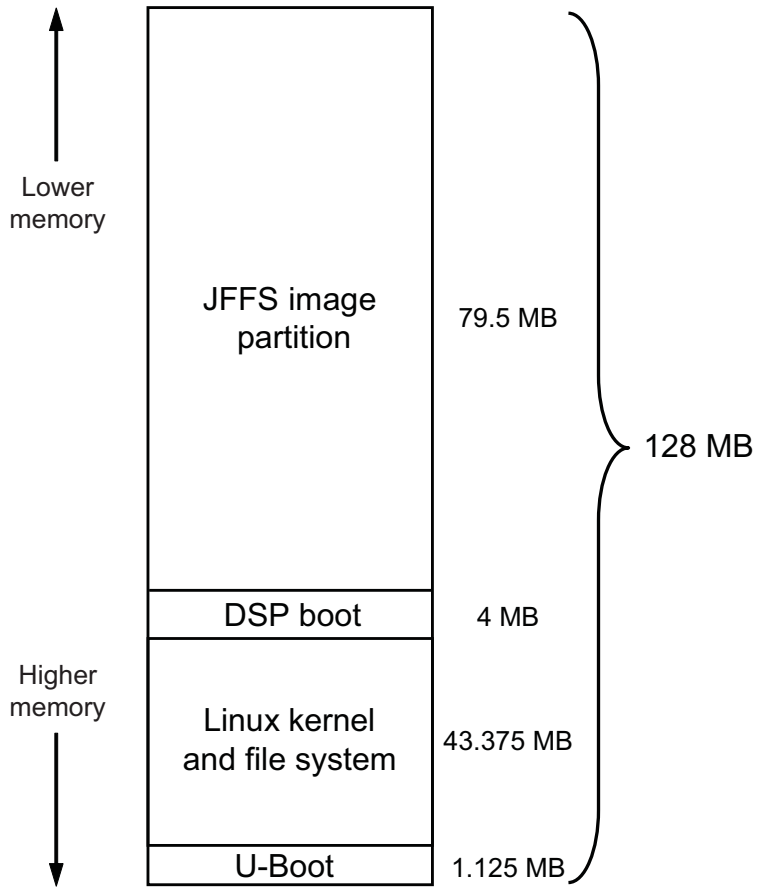
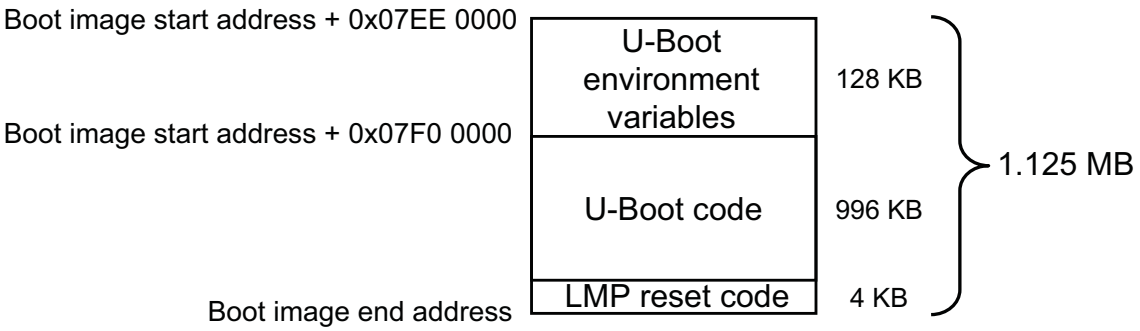



Figure 10 shows the layout of the U-Boot partition within each boot image. The U-Boot environment variables are stored in a separate flash block to protect against corruption when updating the other elements within the U-Boot partition.

Figure 10. U-Boot partition contents






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## User serial EEPROM

A 64-KB serial EEPROM (SEEPROM) is available to contain user-defined data. The user SEEPROM can be used for any type of data, and is especially useful for providing DSP boot information. The user SEEPROM is accessible to the LMP over an $I^2C$ bus.

The user SEEPROM is available for your use and is initially empty. To access the user EEPROM, you must write a Linux-based $I^2C$ application that uses the following device node: */dev/i2c/0*

## MAC serial EEPROM

A 2-Kbit SEEPROM stores MAC addresses for the Ethernet interfaces. This includes the interfaces on the Ethernet switches, on the LMP, and on the DSP devices. The components retrieve MAC addresses for their interfaces before they first access the network.

The first nine bytes of the MAC address SEEPROM are currently reserved for RadiSys' use (and the reserved bytes may increase in future implementations). The remaining bytes are available for user-defined information.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The two DSP farms supply independently controlled, high-speed DSP devices. Each farm has ten DSP devices. Each device connects to the Serial RapidIO switch Fabric and Ethernet interfaces to send and receive management traffic and media content.

RadiSys defined the mezzanine card form factor, its connections to the MRM base card, and the mezzanine card contents. Table 3 lists the DSP farm summary.

Table 3. F-DSP farm summary

| | |
|---|---|
| Farm name: | F-DSP |
| DSP manufacturer: | Freescale Semiconductor |
| Number of DSPs: | 10 |
| Cores per DSP: | 4 |
| Speed of each core: | 800 MHz |
| MRM order code with two of these farms preinstalled: | A9100-F |

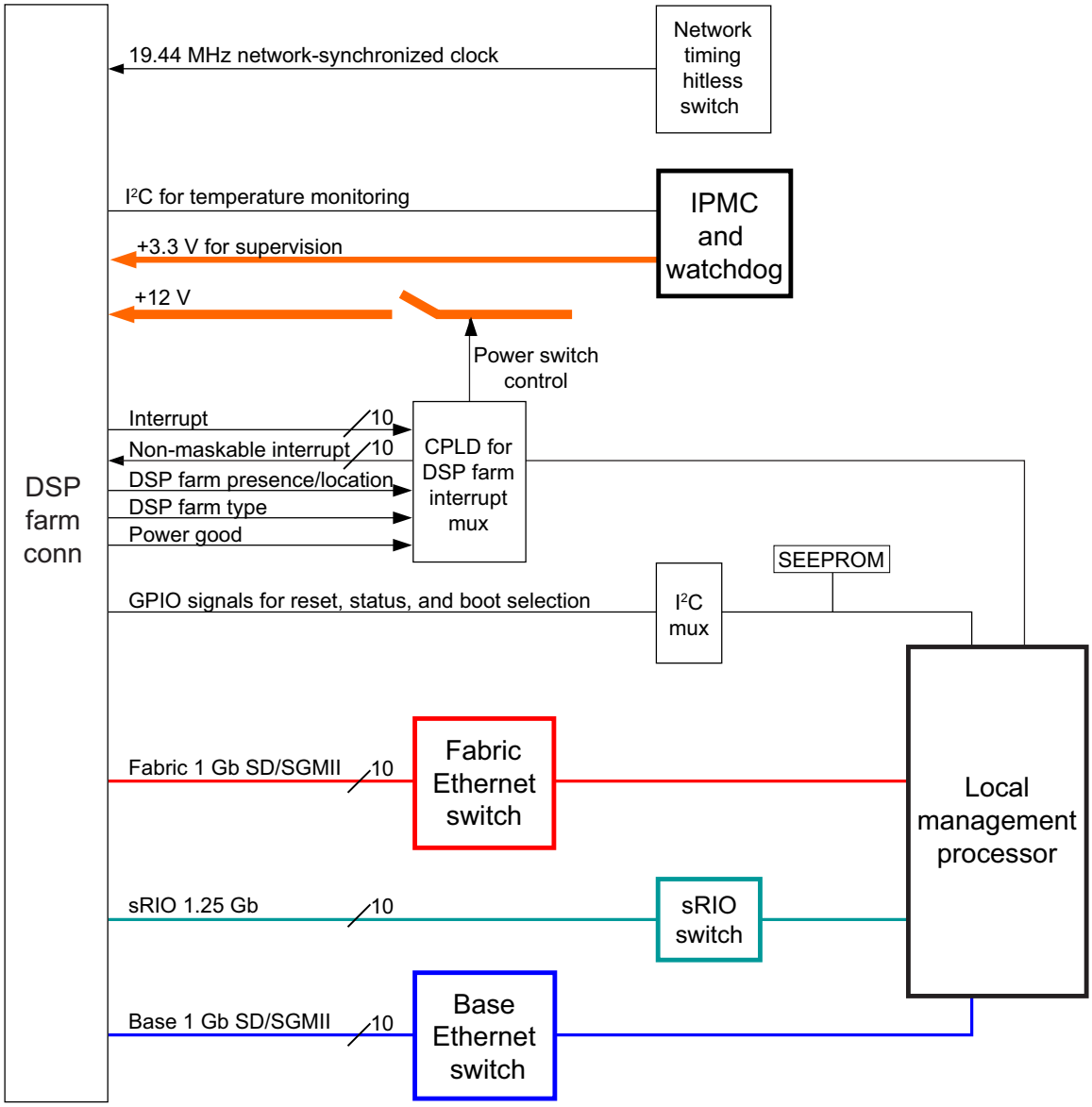
## Interfaces to the DSP mezzanine cards

The MRM base card has two mezzanine card connectors, which supply connections for up to 10 DSP devices per mezzanine. The signal pins support 18 Gbps differential or 9 Gbps single-ended signaling, and are impedance-matched. The power pins are each rated at 2.7 A.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 11. Connections to each mezzanine card






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The mezzanine card connectors supply these signals to each DSP farm:

- SerDes/SGMII interfaces
  - 10 SerDes/SGMII interfaces to and from the Base Ethernet switch
  - 10 SerDes/SGMII interfaces to and from the Fabric Ethernet switch
- 10 sRIO interfaces to and from the sRIO switch array at 1.25 Gb each
- Interrupt signals going through the interrupt multiplexer CPLD to and from the LMP
  - 10 interrupt outputs to the LMP
  - 10 non-maskable interrupt (NMI) inputs from the LMP
- I²C interfaces
  - GPIO signals addressed to and from individual DSPs for:
    - DSP status
    - DSP boot select control
    - DSP hard reset control
    - DSP soft reset control
    - In-system programming (ISP) interface
  - DSP farm temperature sensor interface to the IPMC
- 19.44 MHz clock input from the base card Network Timing Subsystem (NTS). See Figure 6 on page 29 for more information.
  - The 19.44 MHz O3 output from the NTS Hitless Switch supplies DSP farm 1.
  - The 19.44 MHz O4 output from the NTS Hitless Switch supplies DSP farm 2.
  - This clock input is connected to each DSP's TIMI0 and TIMI1 timer inputs to support network clock synchronization.
- Identification and presence interfaces to the CPLD
  - Module type interface identifies the type of mezzanine installed
  - Location interface identifies the mezzanine location
- Power supply and status
  - +12 V power supply to power the mezzanine
  - +3.3 V power supply to allow the IPMC to supervise the mezzanine when the mezzanine is not powered
  - Power good signal to the CPLD to indicate that all mezzanine power rails are within tolerance



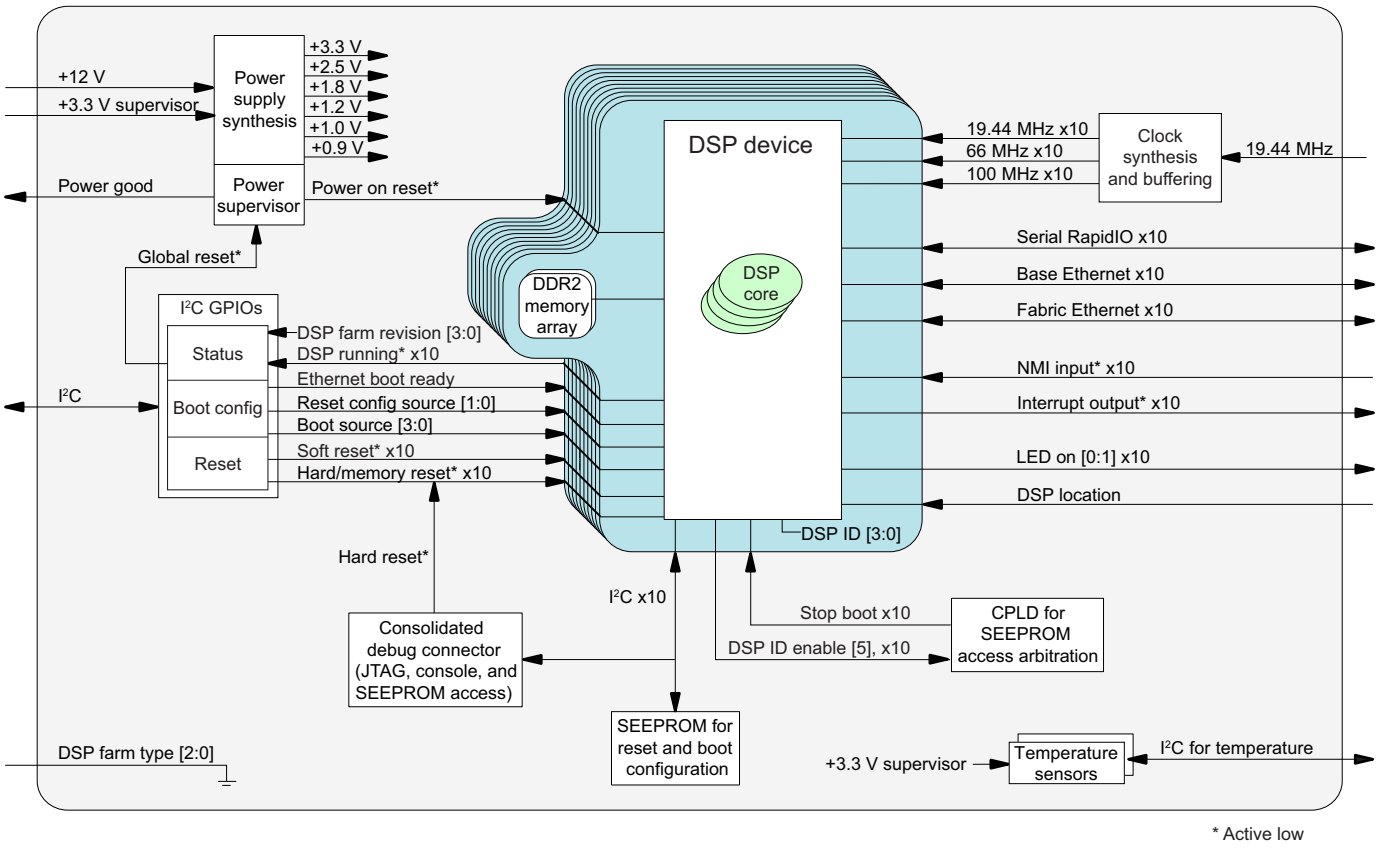
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# F-DSP mezzanine card and devices

## F-DSP mezzanine card block diagram

The lines in the block diagram that cross the outer mezzanine card boundary go to the connector that mates with the MRM base card.

Figure 12. F-DSP mezzanine card block diagram






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# F-DSP farm features

This section identifies the features supplied by the F-DSP mezzanine card. Each farm supplies:

- 10 DSP devices from Freescale Semiconductor, Inc.
- A serial EEPROM to store configuration data, boot parameters, and DSP image
- A consolidated debug header supporting DSP JTAG access, CPLD and SEEPROM programming, and a serial port
- A system for power supply synthesis that:
  - Converts the +12 V input to the levels needed by the mezzanine card components
  - Responds to and initiates power resets
  - Provides an indication to the MRM IPMC that power conditions are normal
- Temperature sensors that are powered by the +3.3 V supervisor supply
- Clock circuitry that buffers the network-synchronized clock supplied by the base card and generates the frequencies needed for the mezzanine card components

For each DSP device, the F-DSP farm supplies:

- Two gigabit Ethernet interfaces
- A 1x serial RapidIO interface
- An $I^2C$ interface that provides access to configuration data, boot parameters, and DSP image stored in a serial EEPROM
- A 256-MB DDR2 memory array accessible at 400 MHz
- A 10-MB pool of M3 memory that is 128 bits wide and accessible at up to 400 MHz
- A 128-KB L2 shared instruction cache
- 512-KB, 128-bit wide M2 low-latency shared memory for temporary and critical data buffering
- 32 unidirectional DMA channels that provide up to 16 memory-to-memory channels
- A chip-level arbitration and switching system that arbitrates access to the shared memory and peripheral devices
- 32 GPIO ports
- An interrupt concentrator that consolidates and routes all maskable and non-maskable interrupts
- On-chip emulation for both basic and complex debugging and profiling
- PLLs that support three clock inputs



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

For each DSP device core, the F-DSP farm supplies:

- A 16-KB L1 instruction cache
- A 32-KB L1 data cache
- An extended programmable interrupt controller (EPIC) that supports 256 interrupts with 32 priorities
- A software watchdog timer

## MSC8144 DSP device features

The F-DSP mezzanine card contains 10 Freescale MSC8144 DSP devices. Each device has:

- Four Starcore™ SC3400 DSP cores operating at up to 1 GHz
- A QUICC engine
- A DDR2 controller
- Two gigabit Ethernet interfaces
- A 1x serial RapidIO interface
- A 128-KB L2 instruction cache
- 512 KB of synchronous static RAM (SSRAM) (M2)
- 10 MB of pseudo-SSRAM (M3) implemented as DDR2 chip-on-chip memory

## DDR2 memory for the MSC8144 device

Each MSC8144 includes a DDR2 controller and has access to an external DDR2-SDRAM array of 256 MB. The array is constructed with two DDR2-SDRAM devices of 8 Mb x 16 bits x 8 banks (1024 Mb) each. The SDRAM devices are accessible at 400MHz (200MHz externally). Page-based interleaving is employed where the bank address bits are positioned between the row and column address bits. The DDR2 controller performs row, column, and bank address multiplexing. The controller supplies up to 16 bits of multiplexed addressing, of which the MRM uses 15.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Power resets on the F-DSP farm

The F-DSP card and individual DSP devices (with the associated M3 memory) can each be reset. Table 4 lists the reset types.

Table 4. F-DSP power reset types

| Reset type | Components affected | Initiating events | Effects |
|---|---|---|---|
| Power-on reset | Entire mezzanine card (except components powered by the +3.3 V supervisor supply) | • Power is applied to the mezzanine<br>• The LMP asserts a global reset, using the I²C reset port | Reconfigures all DSP devices |
| Hardware reset | Individual DSP device<br>or | • The LMP asserts a hardware reset on the GPIO<br>• A hardware reset command is received through sRIO<br>• A DSP executes a hardware reset command to reset itself | Resets the designated DSP devices and the associated M3 memory logic.<br>Does not force a reset configuration cycle or affect timing subsystems. |
| | Entire mezzanine card | • A JTAG reset is received, which resets the entire mezzanine card<br>• A header reset is received from the SEEPROM programming header | |
| Software reset | Individual DSP device | • The LMP asserts a software reset on the GPIO<br>• A DSP core's watchdog timer expires<br>• A software reset command is received through sRIO<br>• A DSP executes a software reset command to reset itself | Resets all cores of the designated DSP devices.<br>Does not affect M3 memory or timing subsystems. |

## F-DSP boot configuration process

The DSP boot sequence begins after the DSP farm's global reset is released (using the LMP I²C GPIO). As part of the boot sequence, a boot configuration process identifies the source for reset configuration data, retrieves the reset configuration data, and retrieves the boot image. It may also initialize the Ethernet interfaces.

During the boot configuration process, the sources for the reset configuration data and for the boot image are identified. The reset configuration data source can be:

- The I²C interface to the boot SEEPROM, which is located on the DSP farm.
- Pins on the DSP device itself.

The boot image source can be:

- The I²C interface to the boot SEEPROM.
- The sRIO interface.
- The Base Ethernet interfaces.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

When the boot image source is the I²C interface, DSP device 1 and the CPLD coordinate DSP access to the SEEPROM to retrieve both reset configuration data and the boot image. When the global reset is released, DSP 1 reads its configuration information from the SEEPROM and completes its own configuration. Then DSP 1 retrieves the configuration information for each of remaining 9 DSPs from the SEEPROM and loads the information into the DSP 1 local memory. Using the DSP farm CPLD for arbitration control, DSP1 initiates the configuration sequence for the remaining 9 DSPs by individually enabling the stop boot control line for each DSP. When enabled, each DSP reads its configuration information directly from DSP 1. The process completes when DSP 10 finishes reading its reset configuration data from DSP 1.

When the boot image source is the sRIO interface, the DSP devices use ROM code to initialize their sRIO interfaces. They derive the required sRIO 16-bit endpoint ID at reset configuration time from either the I²C SEEPROM or from a default value of 0xFFFF.

When the boot image source is the Ethernet interfaces, each DSP device uses ROM code to initialize its Ethernet interface 1, and then waits for the LMP to indicate that a server for Ethernet booting is ready. When signalled, the DSP attempts to retrieve the boot image using BOOTP.

When getting a boot image using the Ethernet interfaces, each DSP uses the method determined at reset configuration to obtain a MAC address—either reading it from the MAC address SEEPROM or deriving it from the DSP ID. The address is assigned during interface initialization. For more information, see *MAC serial EEPROM on page 36*.

***Important:*** A MAC address derived from a DSP ID is not unique or IEEE-assigned, so plan your network carefully. In most cases, MAC addresses must be reassigned after the DSPs boot.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# DSP farm power-up sequence

When you issue the command to power up a DSP farm, the LMP initiates the power-up sequence. The LMP:

1. Turns on the DSP farm power using the DSP farm control register.
2. Polls the DSP farm status register for the farm's power good (PGx) bit until it receives a PWGOOD indication.
3. Sets the farm’s configuration source and boot source using the boot select GPIO port.
4. Removes the resets from the reset port GPIO.
5. Polls the status $I^2C$ GPIO port until all ten lines are inactive.

   Power up is complete.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

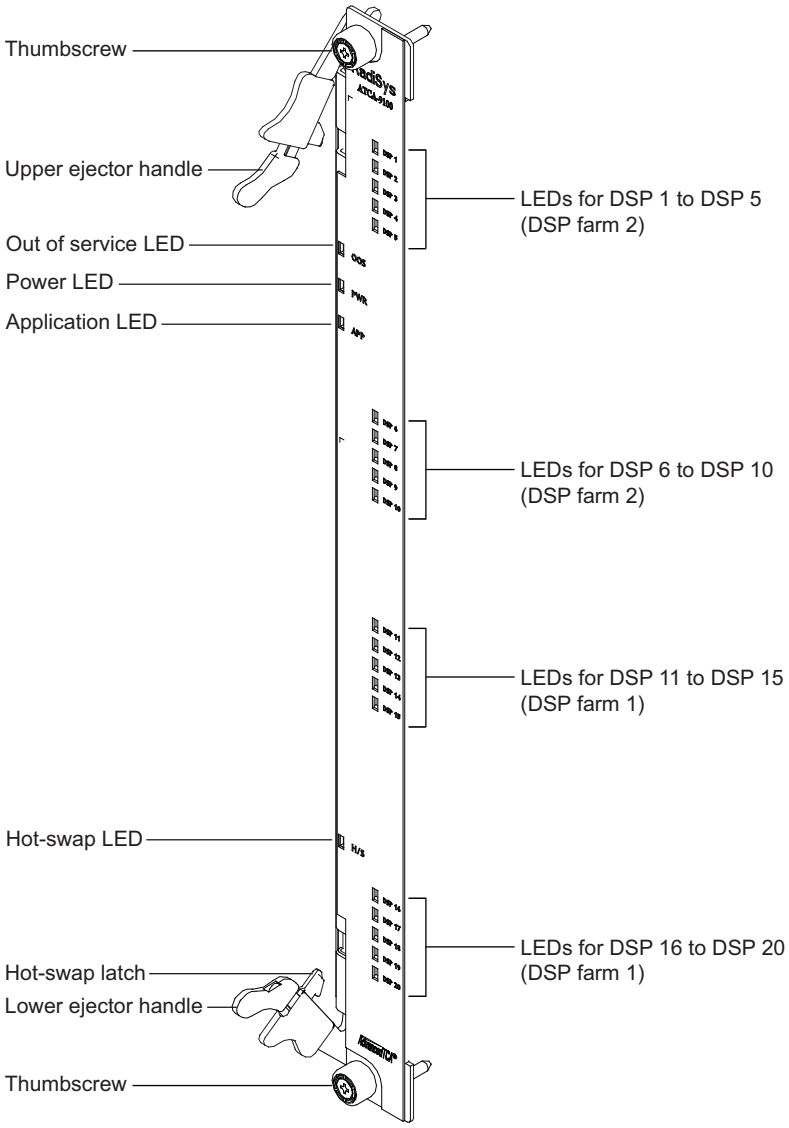
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

This chapter provides basic information about the MRM's externally available indicators, mechanical parts, and connectors.

# Front panel

Figure 13 shows the elements of the MRM front panel.

Figure 13. MRM front panel






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Front panel LEDs

Table 5 describes the front panel LEDs.

Table 5. Front panel LEDs

| Label | LED ID | Definition | Color | LED states |
|---|---|---|---|---|
| OOS | LED 1 | Out of service | Amber or red[a] | Application-defined[b] |
| PWR | LED 2 | Power | Green or amber | Green: All power supplies were initially good, and power has not been removed<br>Off: The MRM is not powered on<br>Amber: Application-defined[a, b] |
| APP | LED 3 | Application-defined | Green or amber[c] | Application-defined[c] |
| H/S | H/S | Hot-swap status | Blue | Long blink: Activating the MRM after insertion<br>Short blink: Preparing for hot-swap<br>Solid: Ready for hot-swap<br>Off: No hot-swap activity in progress |
| DSP 1 to DSP 20 | | DSP device status | Green or red | Red when power is applied to the DSP farm, until configuration changes are made. See *Controlling the DSP LEDs on page 49*. |

[a] The user application can select the LED color using the Set FRU LED State IPMI command.

[b] The user application can control LED illumination using the Set FRU LED State IPMI command.

[c] The user application can control the LED color and illumination using functions from the DSP control and status API. For details, see the *ATCA-9100 MRM API Reference* in the Promentum software distribution.

The IPMC uses GPIO pins to control the hot-swap and power LEDs. The IPMC supplies default states for the LEDs and responds to sensor readings, GPIO inputs, and IPMI commands from other entities to change LED states.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Controlling the DSP LEDs

After a DSP device has been initialized and configured, a custom application running on the DSP or the LMP can control the LED color and illumination. The applications write to the DSP registers that control the DSP GPIO pin states. Table 6 shows the register values for the F-DSP LEDs.

Table 6. F-DSP registers for controlling DSP LED states

| GPIO port | Name | I/O direction | Register value | | Resulting LED state |
|---|---|---|---|---|---|
| | | | Bit 5 | Bit 4 | |
| 4 and 5 | DSPn_LEDEN0 and DSPn_LEDEN1 | I/O. Set to output to control the LEDs. | 0 | 0 | Off (default) |
| | | | 0 | 1 | Green |
| | | | 1 | 0 | Red |
| | | | 1 | 1 | N/A |

Before the DSP application can control the LEDs, it must set the direction of the GPIO pins to output in the DSP configuration registers. When the pin direction changes to output, the LED state changes to the state configured in the registers or to the default state specified in the table.

A custom LMP application can access the registers for each DSP over sRIO. The LMP's DSP status and control API supplies a function to set the GPIO pin direction. For more information, see *Using the API to configure the DSP devices on page 74*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Debug LEDs

The MRM contains debug LEDs that show you the LMP state and the status of power supplies and Ethernet links. You can view the power indicator debug LEDs when the adjacent chassis slot is empty, and you can see the LMP and Ethernet debug LEDs through the RTM slot when the slot cover is removed.

Figure 14 on page 54 shows the location of the debug LEDs. You can view the debug LEDs most easily when the MRM's top cover is removed, as in the figure. For instructions, see *Removing the top cover on page 55*.

Table 7 lists the debug LED states and their meanings.

Table 7. Debug LEDs

| Status type | LED label | Description | LED states | Controlled by |
|---|---|---|---|---|
| Power | D12 | +12 V power monitor | Red: Error<br>Green: OK | Power supervisor |
| | D14 | +3.3 V power monitor | Red: Error<br>Green: OK | Power supervisor |
| | D15 | +2.5 V power monitor | Red: Error<br>Green: OK | Power supervisor |
| | D16 | +1.8 V power monitor | Red: Error<br>Green: OK | Power supervisor |
| | D17 | +1.25 V power monitor | Red: Error<br>Green: OK | Power supervisor |
| | D18 | +1.1 V power monitor | Red: Error<br>Green: OK | Power supervisor |
| | D20 | +1.2 V power monitor | Red: Error<br>Green: OK | Power supervisor |
| | D4 | +0.9 V power monitor | Red: Error<br>Green: OK | 0.9 V current sense line |
| LMP state | D5 | Reset configuration complete | Red: Failed<br>Green: Success | MPC8548 |
| Ethernet maintenance port (10/100BASE-T) | D51 | Link activity | Green: Activity<br>Off: Idle | LXT971A |
| | D52 | Link status | Green: Link<br>Off: No link | LXT971A |
| Base Ethernet rear port | D1 | Link activity | Green: Activity<br>Off: Idle | BCM5482 |
| | D2 | Link status | Green: Link<br>Off: No link | BCM5482 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# External interfaces through an RTM

You can gain additional I/O access to the MRM through an RTM. The RTM must be designed for compatibility with the MRM. RadiSys does not currently supply an RTM for use with the MRM.

The MRM supports the following connections to an RTM:

- SerDes/SGMII lane from Base interface Ethernet switch
- SerDes/SGMII lane from Fabric interface Ethernet switch
- 4x 1.25 Gbps serial RapidIO lane from serial RapidIO switch 1
- 4x 1.25 Gbps serial RapidIO lane from serial RapidIO switch 2
- RS-232 serial port from LMP
- 10/100BASE-T maintenance interface to LMP
- $I^2C$ interface to IPMC
- $I^2C$ interface to the LMP
- Switched +12 V from payload supply
- RTM hot-swap switch closure signal

Note that the RTM must include a transformer for the Ethernet maintenance port.

The MRM uses a Zone 3 double connector that is supplied by Tyco Electronics as part number 6469001-1. This MRM female connector mates to a connector on an RTM.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 8 lists the pinout signals for the J30 RTM connector and Table 9 on page 52 lists the pinout signals for the J31 lower RTM connector. Note that each differential pair has an individual L-shaped ground contact.

Table 8. Upper RTM Connector Signals

| Row | AB | | CD | | EF | | GH | |
|---|---|---|---|---|---|---|---|---|
| 1 | +12V_RTM | +12V_RTM | +12V_RTM | +3.3V_IPMC | RTM_EJECT | RTM_PRSNT# | RTM_HS_LED | RTM_EN* |
| 2 | +12V_RTM | +12V_RTM | +12V_RTM | IPMC_INT* | IPMC_I2C_CLK | IPMC_I2C_DAT | | |
| 3 | SERIAL_0_TX (PQ3_TX) | SERIAL_0_RX (PQ3_RX) | | | | | | |
| 4 | | | | | | | | RESET (LMP_ RESET*) |
| 5 | | | | | | | | |
| 6 | | | | | | | CPU0_SCL (PQ3_SCL) | CPU0_SDA (PQ3_SDA) |
| 7 | DEBUG_0 (IRQ_IN*) | | | | RESET_0 (RTM_RESET*) | | | |
| 8 | FE_TXD+ | FE_TXD- | FE_RXD+ | FE_TXD- | FE_LINK_LED | | | |
| 9 | | | | | | | | |
| 10 | GE1_TX+ | GE1_TX- | GE1_RX+ | GE1_RX- | GE2_TX+ | GE2_TX- | GE2_RX+ | GE2_RX- |

= 100Base_TX
= 1000BASE-BX Base Interface switch port
= 1000BASE-BX Fabric Interface switch port
= Not used

The lower RTM J31connector is dedicated to serial RapidIO lanes. Two 4x serial RapidIO lanes are available from the MRM serial RapidIO switch fabric. Table 9 lists the pinout signals for the RTM J31 connector. Note that each differential pair has an individual L-shaped ground contact.

Table 9. Lower RTM Connector Signals

| Row | AB | | CD | | EF | | GH | |
|---|---|---|---|---|---|---|---|---|
| 1 | RTMsRIO_00_ RX+ | RTMsRIO_00_ RX- | RTMsRIO_00_ TX+ | RTMsRIO_00_ TX- | RTMsRIO_01_ RX+ | RTMsRIO_01_ RX- | RTMsRIO_01_ TX+ | RTMsRIO_01_ TX- |
| 2 | RTMsRIO_02_ RX+ | RTMsRIO_02_ RX- | RTMsRIO_02_ TX+ | RTMsRIO_02_ TX- | RTMsRIO_03_ RX+ | RTMsRIO_03_ RX- | RTMsRIO_03_ TX+ | RTMsRIO_03_ TX- |
| 3 | RTMsRIO_10_ RX+ | RTMsRIO_10_ RX- | RTMsRIO_10_ TX+ | RTMsRIO_10_ TX- | RTMsRIO_11_ RX+ | RTMsRIO_11_ RX- | RTMsRIO_11_ TX+ | RTMsRIO_11_ TX- |
| 4 | RTMsRIO_12_ RX+ | RTMsRIO_12_ RX- | RTMsRIO_12_ TX+ | RTMsRIO_12_ TX- | RTMsRIO_13_ RX+ | RTMsRIO_13_ RX- | RTMsRIO_13_ TX+ | RTMsRIO_13_ TX- |
| 5–10 | Not used | | | | | | | |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



# DEVELOPMENT AND DEBUGGING FEATURES 5

The MRM supplies a number of features that are useful in a lab environment for developing and loading applications and for debugging hardware and software problems. Certain features are accessible only under special circumstances, such as with the MRM's top cover removed, or with the adjacent chassis slot empty to allow extra space.

***Important:*** The development and debug features are for lab use only. Compliance testing for the product did not include these features or methods, and they are not intended for use in a production network.

Table 10 lists the development and debugging features and describes how to access them. Figure 14 shows the MRM with its top cover removed to expose all of the features.

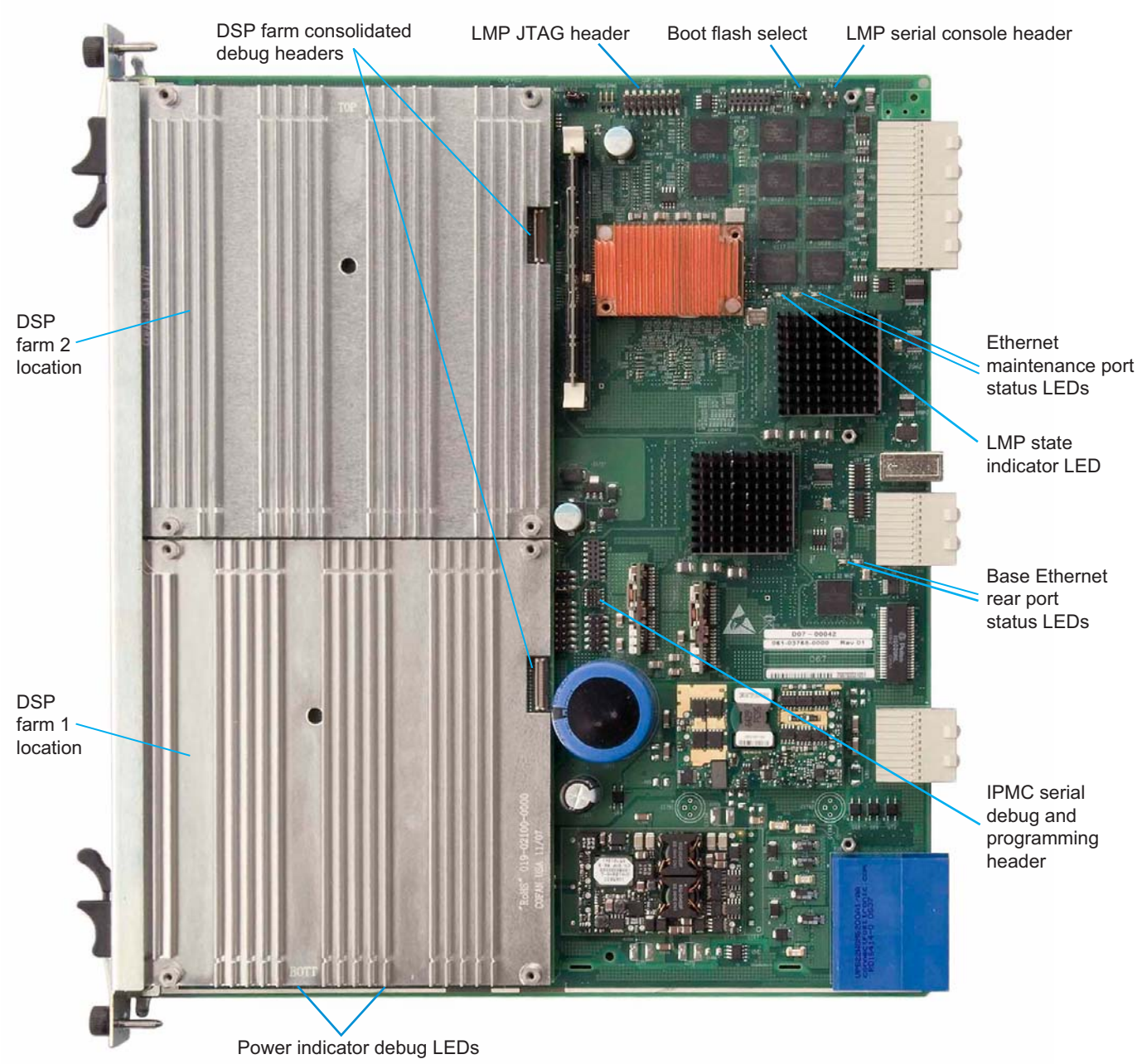
Table 10. MRM development and debugging features

| Debugging feature | Label | Accessible when: | See also |
|---|---|---|---|
| LMP JTAG header | P1 | Adjacent slot empty | *LMP JTAG header on page 20* |
| LMP serial console header | P6 | Any time | *LMP serial console access on page 20* |
| IPMC serial debug and programming header | J5 | Cover removed and adjacent slot empty | *IPMC serial debug and programming header on page 31* |
| Boot flash select | P8 | Any time | |
| Debug LEDs (power) | N/A | Adjacent slot empty | *Debug LEDs on page 50* |
| Debug LEDs (Ethernet maintenance port) | N/A | Rear slot cover removed and rear debug card installed | |
| Debug LEDs (Base interface) | N/A | Rear slot cover removed | |
| DSP farm consolidated debug header (both farms) | N/A | Cover removed and adjacent slot empty | *Additional development and debugging hardware on page 55* |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 14. MRM development and debugging features with the top cover removed






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Removing the top cover

If you need access to features that require removing the MRM cover:

1. Obey ESD guidelines. See *Electrostatic discharge on page 10*.
2. Remove the MRM from the shelf as described in *Removing the MRM on page 117*.
3. Place the MRM on its bottom side. The bottom side is on the left when you view the MRM vertically as shown in Figure 13 on page 47.
4. Unscrew the 11 retaining screws on the top.
5. Lift the cover off the MRM.

To make use of the development and debugging hardware:

1. Connect cables and other development hardware to the MRM as needed.
2. If necessary, make space in the chassis for cables and other hardware by removing the front module or air management filler panel from the adjacent slot.
3. Carefully install the MRM in the chassis. See the installation guide for detailed instructions.

**WARNING! Do not operate the MRM with its cover off and the adjacent slot empty for a long time, because it changes the airflow within the chassis. In the absence of a Shelf Manager, the MRM can become too hot and be damaged by the heat. If a Shelf Manager is present, it may power down the MRM if it becomes too warm. After you replace the MRM cover and install it in the chassis again, you must replace the adjacent module or air management filler panel to return chassis airflow to normal.**

# Additional development and debugging hardware

Table 11 lists the hardware available to help you perform development and debugging in a lab environment:

Table 11. Development and debug hardware

| Development hardware | Purpose | RadiSys order code |
|---|---|---|
| Rear debug card | Enables connections to the MRM without an RTM. | TH-1620-00 |
| Consolidated debug board and cable | Supplies connectors to allow programming and debugging of the DSP farms and their components. Includes a cable to connect the debug board to a DSP farm. | TH-1397-00 |
| Lattice ispDOWNLOAD® USB port download cable | Enables updates to the DSP farm CPLD image from an external computer by connecting the computer to the consolidated debug board. Power must be enabled to the DSP farm. | N/A, contact Lattice Semiconductor Corp. |

Contact a sales representative from the appropriate vendor for ordering information.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Using the consolidated debug board

By connecting the consolidated debug board to a DSP farm, you gain JTAG access to the DSP devices and the CPLD as well as programming access to the DSP farm SEEPROM.

To connect the consolidated debug board:

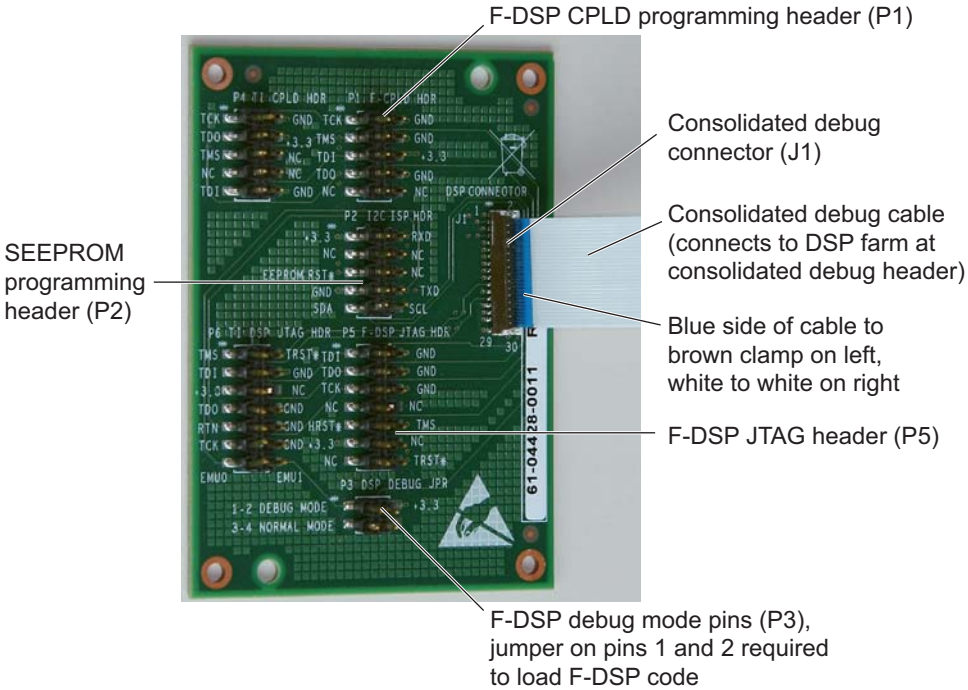
1. Remove the MRM top cover to access the consolidated debug headers, as described in *Removing the top cover on page 55*.
2. Insert one end of the consolidated debug cable into the consolidated debug header on a DSP farm. To locate the DSP farm headers, see Figure 14 on page 54.

   The blue side of the cable faces the brown clamp on the header.
3. Insert the other end of the debug cable into the J1 connector on the debug board.

   The blue side of the cable faces the brown clamp on the connector.
4. To load an image from the Freescale CodeWarrior™ JTAG emulator, first place a jumper over pins 1 and 2 of the P3 debug connector.

   ***Important:*** A jumper on these pins prevents the DSP from executing its boot image. No initialization takes place while the jumper remains on these pins unless it is configured manually from the emulator.
5. Connect equipment to the debug board using other cables as needed. To locate the appropriate connectors, see Figure 15.

Figure 15. Consolidated debug board connectors






Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6. Re-install the blade in the shelf. For instructions, start from Step 2 of the procedure for making use of debugging and development hardware on page 55.

***Important:*** Before you connect an emulator to a DSP device, power up the farm and remove the reset signal from the specific DSP device. For instructions on powering up the farm and removing the reset signal, see *Chapter 6, Configuring DSP Devices, on page 61*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Development and debugging software tools

The MRM DSP farms are likely to be compatible with a variety of development tools. RadiSys has verified compatibility with these tools:

- Freescale CodeWarrior StarCore Compiler for Windows
- Freescale CodeWarrior Development Studio for SC3X00 Architectures
- Freescale CodeWarrior USB TAP emulator

## JTAG chain order

The DSP farm JTAG chains are arranged in this order:

DSP7, DSP6, DSP4, DSP2, DSP0, DSP1, DSP3, DSP5, DSP9, DSP8.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Consolidated debug header pinout

The DSP farms each have a 30-pin connector that consolidates development and debugging signals from several interfaces. Table 12 describes the pin functions of the header for F-DSP farms.

Table 12. F-DSP consolidated debug header pinout

| Pin | Function | I/O | Description |
|---|---|---|---|
| Debugger signal set[a] | | | |
| 1 | DSP_HDR_TDI | I | JTAG TDI for DSP loop |
| 2 | GND | -- | Circuit ground |
| 3 | DSP_HDR_TDO | O | JTAG TDO for DSP loop |
| 4 | GND | -- | Circuit ground |
| 5 | DSP_HDR_TCK | I | JTAG TCK for DSP loop |
| 6 | GND | -- | Circuit ground |
| 7 | DSP_JTAG_HRESET* | I | DSP farm reset from Freescale emulator hardware |
| 8 | DSP_HDR_TMS | I | JTAG TMS for DSP loop |
| 9 | +3.3V | -- | Power for debug interface |
| 10 | +3.3V | -- | Power for debug interface |
| 11 | DSP_EE0 | I | Forces debug mode when low |
| 12 | DSP_HDR_TRST* | I | JTAG TRST* for DSP loop |
| 13 | GND | -- | Circuit ground |
| 14 | GND | -- | Circuit ground |
| CPLD programming signal set | | | |
| 15 | CPLD_TCK | I | JTAG TCK for CPLD loop |
| 16 | GND | -- | Circuit ground |
| 17 | CPLD_TDO | O | JTAG TCK for CPLD loop |
| 18 | GND | -- | Circuit ground |
| 19 | CPLD_TDI | I | JTAG TDI for CPLD loop |
| 20 | GND | -- | Circuit ground |
| 21 | CPLD_TMS | I | JTAG TMS for CPLD loop |
| 22 | GND | -- | Circuit ground |
| SEEPROM programming signal set | | | |
| 23 | DSP_I2C_SCL | I/O | $I^2C$ clock for DSP / SEEPROM |
| 24 | GND | -- | Circuit ground |
| 25 | DSP_I2C_SDA | I/O | $I^2C$ data for DSP / SEEPROM |
| 26 | I2C_EEPROM_RESET | I | DSP farm reset from $I^2C$ SEEPROM programming hardware |
| DSP0 serial debug terminal signal set | | | |
| 27 | GND | -- | Circuit ground |
| 28 | DSP0_DBGRXD | I | Receive serial port data to DSP0 |
| 29 | GND | -- | Circuit ground |
| 30 | DSP0_DBGTXD | O | Transmit serial port data from DSP0 |

[a] The F-DSP debugger signal set has been tested with the Freescale CodeWarrior USB TAP emulator.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



# CONFIGURING DSP DEVICES 6

This chapter summarizes the interfaces available for configuring the DSP devices and sRIO switches as well as how to perform the configuration from each interface.

## Summary of available interfaces

This chapter gives instructions for the initialization and management tasks using multiple interfaces. The interfaces are best used for these purposes:

- **U-Boot** - to run manufacturing diagnostic tests and perform low-level development and debugging. U-Boot commands can be entered individually or combined together into environment variables to execute multiple commands at once. For details, see *Using U-Boot to configure the DSP devices on page 66*.
- **Linux utility/commands** - to interactively perform tasks that are not supported by the CLI. This interface consists of the *sriotool* utility and standard Linux commands. See *Using Linux commands to configure the DSP devices on page 71*.
- **CLI** - to interactively manage the DSPs in an environment that gives helpful prompts. The DSPs and sRIO switches are controlled by blade-management CLI commands. See *Using CLI commands to configure the DSP devices on page 72*.
- **API** - to programmatically manage the DSPs and exercise the greatest amount of control. The low-level C-language functions allow you to maximize your application's control over the DSPs and sRIO switches. See *Using the API to configure the DSP devices on page 74*.

For a list of the DSP numbering used in each interface, see *DSP numbers used in each interface on page 65*.

## Summary of tasks for each interface

This section summarizes the significant tasks needed to configure the DSPs and sRIO switches. The tables that follow indicate how to perform the tasks in each interface. An empty cell indicates the task is not supported in that interface.

For a summary of each type of task, see:

- *Summary of initialization steps on page 62*
- *Summary of preparation tasks for running diagnostic tests on page 63*
- *Summary of additional configuration tasks on page 64*



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Summary of initialization steps

Before using the DSP devices, you must initialize the sRIO switches as well as the DSP devices. The two serial RapidIO switches work in combination to allow the LMP and other entities on the network to load and manage each DSP device. The sRIO switch array gives access to DSP memory and registers, which may be helpful during application development.

Table 13 lists the individual steps for initializing the sRIO switches and DSP devices for each interface. For alternative approaches to the complete DSP initialization procedure, see the information starting from page 63 about preparing for diagnostic tests by loading the DSPs.

Table 13. Steps for initializing the sRIO switches and DSP devices in each interface

| Task | U-Boot | Linux utility/commands | CLI | API |
|---|---|---|---|---|
| 1. Load the sRIO switch library | Not necessary in U-Boot | `insmod <path>/riodev.ko` | | |
| 2. Initialize the sRIO switch | `SRIOinit` | `sriotool init` | | sRIO API function (initialization) |
| 3. Power up the DSP farms | `DSPPowerOn 0 1` and `DSPPowerOn 1 1` | `sriotool fpon 0` and `sriotool fpon 1` | `DSP power` | DSP API function (power set) |
| 4. Set the GPIO pin direction | `DSPPowerOnPinConfiguration 0` and `DSPPowerOnPinConfiguration 1` | | `DSP reset-dsp` | DSP API function (GPIO power on pin direction) |
| 5. Set the DSP boot source | `DSPWrBootSelect 0 1` and `DSPWrBootSelect 1 1` | | `DSP boot-src` | DSP API function (boot source set) |
| 6. Remove the reset signal from the DSPs | `DSPResetSet 0 a 0` and `DSPResetSet 1 a 0` | | `DSP reset-dsp` | DSP API function (reset set) |
| 7. Initialize the sRIO switch ports to the DSP devices | `SRIOcfgport 0 ff` and `SRIOcfgport 1 ff` | `sriotool idin 20` | | sRIO API function (DSP initialization) |
| 8. Configure the DDR memory for the DSP devices (optional) | | `sriotool idcm 20` | | sRIO API function (DSP memory read and write) |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 13. Steps for initializing the sRIO switches and DSP devices in each interface (continued)

| Task | U-Boot | Linux utility/commands | CLI | API |
|---|---|---|---|---|
| 9. Load an image to the DSP devices | `tftp 0x1000000 <path/filename>` and `SRIOdsploa d 0 ff 1000000` and `SRIOdsploa d 1 ff 1000000` | `sriotool idpl 20 <path/filename>` | | sRIO API function (DSP memory write) |
| 10.Set the DSP execution address | | | | sRIO API function (DSP set execution address) |
| 11.Execute the DSP image | | | | sRIO API function (DSP execute) |
| Find more information on these tasks | See *Using U-Boot to configure the DSP devices on page 66*. | See *Using Linux commands to configure the DSP devices on page 71*. | See *Using CLI commands to configure the DSP devices on page 72* and the *CLI Reference*. | See *Using the API to configure the DSP devices on page 74* and the API reference and usage guide. |

## Summary of preparation tasks for running diagnostic tests

Table 14 lists the tasks needed to prepare to run diagnostic tests for each interface.

Table 14. Preparing to run diagnostic tests on each interface

| Task | U-Boot | CLI | API |
|---|---|---|---|
| Reset the sRIO switches to default register values | `SRIOswreset` and `SRIOinit` | Not necessary in Linux | Not necessary in Linux |
| Initialize the sRIO interfaces to the DSPs | Set environment variables and execute commands, including `SRIOcfgport` | Execute *sriotool* commands if preparation is necessary | Use an example application function or an sRIO API function (DSP initialization) if preparation is necessary |
| Initialize and load the diagnostic tests image to the DSPs | Set environment variables and execute commands | Execute *sriotool* commands if preparation is necessary | Use an example application function |
| Find more information on these tasks | See *Preparing to run diagnostic tests in U-Boot on page 66*. | See *Preparing to run diagnostic tests in the CLI on page 72*. | See *Preparing to run diagnostic tests using the API on page 75*. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Summary of additional configuration tasks

Table 15 lists configuration tasks that go beyond basic initialization for each interface.

Table 15. Additional tasks in each interface

| Task | U-Boot | CLI | API |
|---|---|---|---|
| Get the starting MAC address for the DSPs | | `show DSP start-enet-addr` | DSP API function (Ethernet MAC get) |
| Get and set the DSP Ethernet interface status | | `DSP enet-status` | DSP API function (Base Ethernet get and set) |
| Program the DSP SEEPROM | `DSPeepromprog` (See the procedure on page 68.) | | DSP API function (EEPROM write) |
| Select the DSP reset configuration source and type (soft/hard) | | `DSP reset-config` | DSP API function (DSP reset configuration set) |
| Query the DSP farm type | `DSPfarmtypetest` (See the description of this diagnostic test on page 112.) | `show DSP farm-type` | DSP API function (DSP farm type get) |
| Check DSP farm power status | | `show DSP power` | DSP API function (DSP power get) |
| Check if a DSP is running an image | | | DSP API function (DSP status get) |
| Check the NMI status of a DSP | | show NMI-status | DSP API function (DSP NMI get) |
| Initiate an NMI to a DSP | `DSPnmitest` (The image of DSP diagnostic tests must be loaded for this test to run. See page 108.) | `DSP NMI` | DSP API function (DSP NMI set) |
| View the mask preventing interrupts from a DSP | | show DSP interrupt-mask | DSP API function (DSP interrupt mask get) |
| Prevent interrupts from a DSP | | DSP interrupt-mask | DSP API function (DSP interrupt mask set) |
| Identify the DSPs asserting an interrupt state | | show DSP interrupt-state | DSP API function (DSP interrupt state get) |
| Clear the DSP interrupt after processing it or unmasking the DSP | | DSP interrupt-state | DSP API function (DSP interrupt state set) |
| Get and set the application LED color | | | DSP API function (DSP application LED get and set) |
| Find more information on these tasks | See *Using U-Boot to configure the DSP devices on page 66*. | See *Using CLI commands to configure the DSP devices on page 72* and the *CLI Reference*. | See *Using the API to configure the DSP devices on page 74* and the API reference and usage guide. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# DSP numbers used in each interface

The numbers that identify the DSP farms and devices vary between the software interfaces. Table 16 lists the DSPs as shown by LEDs on the MRM front panel and matches them with the numbers that identify them in various interfaces.

Table 16. Numbers identifying the DSP devices in each software interface

| Number on MRM front panel | Numbers for U-Boot commands | Numbers in sriotool utility, CLI commands, and API functions |
|---|---|---|
| DSPs 11-20 | Farm 0 | Farm 0 |
| DSPs 1-10 | Farm 1 | Farm 1 |
| DSP 1 | Farm 1, DSP 0 | DSP 10 |
| DSP 2 | Farm 1, DSP 1 | DSP 11 |
| DSP 3 | Farm 1, DSP 2 | DSP 12 |
| DSP 4 | Farm 1, DSP 3 | DSP 13 |
| DSP 5 | Farm 1, DSP 4 | DSP 14 |
| DSP 6 | Farm 1, DSP 5 | DSP 15 |
| DSP 7 | Farm 1, DSP 6 | DSP 16 |
| DSP 8 | Farm 1, DSP 7 | DSP 17 |
| DSP 9 | Farm 1, DSP 8 | DSP 18 |
| DSP 10 | Farm 1, DSP 9 | DSP 19 |
| DSP 11 | Farm 0, DSP 0 | DSP 0 |
| DSP 12 | Farm 0, DSP 1 | DSP 1 |
| DSP 13 | Farm 0, DSP 2 | DSP 2 |
| DSP 14 | Farm 0, DSP 3 | DSP 3 |
| DSP 15 | Farm 0, DSP 4 | DSP 4 |
| DSP 16 | Farm 0, DSP 5 | DSP 5 |
| DSP 17 | Farm 0, DSP 6 | DSP 6 |
| DSP 18 | Farm 0, DSP 7 | DSP 7 |
| DSP 19 | Farm 0, DSP 8 | DSP 8 |
| DSP 20 | Farm 0, DSP 9 | DSP 9 |
| All DSPs | N/A | DSP 20 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Using U-Boot to configure the DSP devices

This section gives procedures and reference material for performing DSP configuration from U-Boot. For instructions on setting U-Boot environment variables and copying them to both flash partitions, see the *Software Guide*.

## Accessing U-Boot

To access U-Boot:

1. Establish a serial connection to the module.
2. Access the Linux prompt.

   ***Tip:*** After the next step, you must enter a key combination within two seconds to break into U-Boot. Read the next steps carefully before performing them. If you do not enter the keystrokes in time, repeat the following steps until you are successful.
3. Reboot the module by entering:

   **`reboot`**
4. Look for this prompt:

   `Autobooting in 2 seconds, press Ctrl-x followed by Ctrl-w to stop...`
5. At the prompt, enter these key combinations within 2 seconds:

   **`Ctrl-x Ctrl-w`**

## Preparing to run diagnostic tests in U-Boot

### Preparing the DSP farm sRIO interfaces in U-Boot

Certain sRIO tests require the sRIO interfaces to the DSP farms to be initialized before executing the diagnostic. To initialize and configure the interfaces:

1. Perform these one-time environment variable setup steps:
   a. Set these U-Boot environment variables. The values are listed in the release notes text file that is included with the MRM software distribution. Search for “DSP initialization scripts” to locate the information.

      | | |
      |---|---|
      | `ffarm0initsrio` | For DSP farm 1 (bottom farm containing DSP devices 11-20). |
      | `ffarm1initsrio` | For DSP farm 2 (top farm containing DSP devices 1-10). |

      ***Tip:*** The environment variables needed for sRIO initialization are a subset of those needed to run DSP diagnostic tests. If you plan to run the DSP diagnostic tests too, you can save time by setting the additional variables listed in the release notes file now.
   b. Save the U-Boot environment settings:

      **`saveenv`**



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

After verifying that the DSP diagnostic tests run as expected, set the same U-Boot environment variables on the other boot flash device and save your settings.

2. Execute one or both of these U-Boot commands to initialize the interfaces:

| | |
|---|---|
| **`run ffarm0initsrio`** | For DSP farm 1 and all its DSP devices. |
| **`run ffarm1initsrio`** | For DSP farm 2 and all its DSP devices. |

3. Configure the sRIO interfaces by executing one or both of these commands:

| | |
|---|---|
| **`SRIOcfgport 0 0xff`** | For DSP farm 1 and all its DSP devices. |
| **`SRIOcfgport 1 0xff`** | For DSP farm 2 and all its DSP devices. |

## Resetting the sRIO switches to default register values in U-Boot

Certain sRIO tests require the sRIO switch register values to be set to default values. To reset the register values to defaults from U-Boot:

1. Reset the sRIO switches:
   **`SRIOswreset`**
2. Re-initialize the sRIO switches and the LMP's sRIO interface:
   **`SRIOinit`**

## Initializing and loading the DSP devices for diagnostic tests in U-Boot

Before executing most of the DSP diagnostic tests, you must initialize the sRIO switch, power up the DSP farm and devices, and load an image provided by RadiSys to the DSP devices.

To initialize, power-up, and load the image:

1. Place the supplied image for DSP diagnostic tests in the */tftpboot* directory of an accessible TFTP server.
2. Perform these one-time environment variable setup steps:
   a. Set the U-Boot environment variables listed in the release notes text file that is included with the MRM software distribution. Search the file for "DSP initialization scripts" to locate the information. For instructions on setting U-Boot environment variables, see the *Software Guide*.
   b. Save the U-Boot environment settings:
      **`saveenv`**



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3. Before running a DSP test, execute one of these U-Boot commands to initialize, power-up, and load the diagnostic tests image:

| | |
|---|---|
| **`run ldfdspf0`** | For DSP farm 1 and all its DSP devices (bottom farm containing DSP devices 11-20). |
| **`run ldfdspf1`** | For DSP farm 2 and all its DSP devices (top farm containing DSP devices 1-10). |
| **`run ldfdspf01`** | For both DSP farms and all their DSP devices. |

   After verifying that the DSP diagnostic tests run as expected, set the same U-Boot environment variables on the other boot flash device and save your settings. For information on selecting the boot flash device, see the *Software Guide*.

## Programming the DSP farm SEEPROM from U-Boot

This procedure writes a binary image to the DSP farm SEEPROM. The image size can be up to 64 KB.

**Prerequisites:**

- The DSP farm is prepared for DSP diagnostic tests, with the image of the diagnostic tests loaded to the DSPs. See *Initializing and loading the DSP devices for diagnostic tests in U-Boot on page 67*.
- The image to program is placed in the */tftpboot* directory of an accessible TFTP server.
- The IP address and gateway for reaching the TFTP server are already set as U-Boot environment variables. For an example, see the U-Boot information in the *Software Guide*.

To program the SEEPROM:

1. Set the SRIO memory window to DSP 0, M3 memory by invoking the following command:

   **`SRIOmsel`** *`<dsp>`* **`0`**

   The *`<dsp>`* should be `10` (for the bottom farm containing DSP devices 11-20) or `20` (for the top farm containing DSP devices 1-10).

2. Transfer the image to M3 memory on DSP 0, starting at address 0xD07F0000.

   **`tftp 0x207F0000`** *`<image_name>`*

3. (Optional) Verify that the memory was written correctly:

   **`SRIOdspmdw`** *`<dsp>`* **`d07f0000`**

4. Write the image from memory to the SEEPROM:

   **`DSPeepromprog`** *`<farm-id>`*

   The *`<farm-id>`* is `0` for the bottom farm or `1` for the top farm.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# U-Boot command reference

This section supplies the syntax for using several U-Boot commands.

## Powering up the DSP farms from U-Boot

The `DSPPowerOn` command turns power on and off to the DSP farms.

**Syntax:** **`DSPPowerOn`** *`<farm-id> <power-state>`*

**Command options:**

| | |
|---|---|
| *`<farm-id>`* | The DSP farm to power up or down. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *`<power-state>`* | The power state to apply. Possible values are 0 to power off or 1 to power on. |

### Example

To power on DSP farm 0 (which corresponds to DSPs 11-20):

```
DSPPowerOn 0 1
```

## Resetting the DSP devices from U-Boot

The `DSPResetSet` command resets a DSP device, which stops any image that is running on the DSP. This is important, for example, before executing a diagnostic test that would conflict with any running image.

**Syntax:** **`DSPResetSet`** *`<farm-id> <DSP-id> <reset-type> <core-or-PHY> <NMI-state>`*

**Command options:**

| | |
|---|---|
| *`<farm-id>`* | The DSP farm with the DSP devices to reset. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *`<DSP-id>`* | The DSP to reset. Possible values range from 0 to 9, for DSPs 0 through 9, or a for all DSP devices. The only *`Reset-Type`* available with the a (all DSP) option is a hard reset. |
| *`<reset-type>`* | 0 = Performs a hard reset of the DSP device<br>1 = Performs a soft reset of the DSP device |
| *`<core-or-PHY>`* | The DSP core or PHY to reset. Possible values range from 0 to 5. This parameter has no effect for F-DSP farms. This parameter is always required. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

*<NMI-state>* Whether to assert an NMI while resetting. Always set the value to 1 to indicate no NMI.

**Example:**

To perform a hard reset of DSP device 14 (farm 0, DSP 3):

```
DSPResetSet 0 3 0 0 1
```

## Enabling the sRIO links to the DSPs from U-Boot

The `SRIOcfgport` command brings up the links between the sRIO switch and the DSPs.

**Syntax:** **SRIOcfgport** *<switch> <port>*

**Command options:**

*<switch>* The sRIO switch, which connects to a DSP farm of the same number. Possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10).

*<port>* The sRIO switch port to enable, which corresponds to a specific DSP device. Possible values are 4 to d, or ff for all ports. To identify a port corresponding to a specific DSP device, see *Serial RapidIO switch array block diagram on page 24*.

**Example:**

To bring up the sRIO link to DSP device 4 (farm and switch 1, DSP 3 and switch port 8):

```
SRIOcfgport 1 8
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Using Linux commands to configure the DSP devices

From Linux, you can initialize the DSP devices and sRIO switches and load images to the DSPs using a combination of standard Linux commands and a special MRM utility. The */usr/bin/sriotool* utility uses the sRIO and DSP APIs to manage the sRIO switch and the DSP devices. The source code for the utility acts as an example application and is delivered in an Linux RPM package within the software distribution.

To view *sriotool* usage details, enter:

```
sriotool -?
```

## Initializing the DSPs using Linux commands and the sriotool utility

By default the DSP farms are powered off and no image is loaded on the DSP devices. This procedure initializes the serial RapidIO (sRIO) switch in order to access the DSP devices. It also powers on and initializes the DSP farms and loads a DSP image onto the DSPs.

To power up the DSP farms and devices and load an image to them:

1. Connect to the MRM and access the Linux shell.
2. Identify the kernel version in the directory path:

   ```
   ls -d /lib/modules/*mrm1
   ```

   The output should look similar to this and will be used for *<base_path>* in the next step:

   ```
   /lib/modules/2.6.14.7-105mrm1
   ```

3. Load the library for the sRIO switch, using the base path from the previous step:

   **insmod** *<base_path>***/kernel/drivers/rapidio/riodev.ko**

   For example:

   ```
   insmod /lib/modules/2.6.14.7-105mrm1/kernel/drivers/rapidio/riodev.ko
   ```

4. Initialize the sRIO switch:

   ```
   sriotool init
   ```

5. Power up the DSP farms:

   ```
   sriotool fpon 0
   sriotool fpon 1
   ```

   The DSP LEDs become red when the power-on pin direction is set.

6. Configure the sRIO interfaces on the DSP devices:

   ```
   sriotool idin 20
   ```

   The value 20 represents all DSP devices.

7. Configure the DDR memory for the DSP devices:

   ```
   sriotool idcm 20
   ```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

8. Use the following syntax to load a custom image on all the DSP devices:

   **sriotool idpl 20** *<your_image_location>*

   To load the RadiSys image of DSP diagnostic tests on all the DSP devices, enter:

   **sriotool idpl 20 /usr/share/fdspdiags.srec**

   When the image loads successfully, this message displays:

   ```
   DSP Program Load/Execute Success
   ```

   The DSP LEDs show the LED state defined by your application. When the diagnostic tests image is loaded, the DSP LEDs become green.

# Using CLI commands to configure the DSP devices

The Promentum CLI includes commands for configuring the DSPs. You can find the commands in the blade-management mode of the CLI. Use the commands that begin with “show” from the main blade-management mode, and use the other CLI commands in this chapter from the blade-management configuration mode. For details on accessing the CLI and using the commands and command modes, see the *CLI Reference*.

## Preparing to run diagnostic tests in the CLI

Some of the required actions to prepare the components for diagnostic tests are not supported in the CLI. RadiSys recommends that you use the *sriotool* utility to prepare the components before running the diagnostic tests from the CLI. For an overview of the preparation steps, see the sections that follow.

### Preparing the DSP farm sRIO interfaces for CLI diagnostic tests

To prepare to run the sRIO diagnostic tests, you have these options:

- **If the DSPs are not powered on or initialized**, use the procedure *Initializing the DSPs using Linux commands and the sriotool utility on page 71*. You can skip the step that loads an image onto the DSPs.
- **If the DSPs are powered on and initialized** (the DSP reset signal is removed), but the sRIO interfaces to the DSPs have not been initialized, initialize the sRIO interfaces with this command:

  **sriotool idin 20**
- **If the DSPs and their sRIO interfaces are fully initialized**, you can run the sRIO diagnostic tests with no further preparation, including in situations where another type of image is running on the DSPs.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Initializing the DSPs for CLI diagnostic tests

The CLI commands for the diagnostic tests will automatically load the diagnostic tests image to the DSP devices if the DSPs do not already have the image loaded on them.

To prepare to run the DSP diagnostic tests, you have these options:

- **If the DSPs are not powered on or initialized**, use the procedure *Initializing the DSPs using Linux commands and the sriotool utility on page 71*. You can skip the step that loads an image onto the DSPs, and then run the DSP diagnostic tests from the CLI.
- **If the DSPs are powered on and initialized**, but no image or the image of the diagnostic tests has been loaded to them, you can run the DSP diagnostic tests without further preparation.
- **If the DSPs have a non-diagnostic type of image running on them**, you can reset the DSPs to remove the image from them. Reset and reconfigure the DSPs as follows:

  a. Perform a power reset and reconfiguration of the DSP farms:

  ```
  sriotool fpon 0
  sriotool fpon 1
  ```

  b. Initialize the sRIO switch ports to the DSP devices:

  ```
  sriotool idin 20
  ```

  The DSPs are ready for diagnostic tests.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Using the API to configure the DSP devices

You can develop applications to control the MRM's sRIO switches and individual DSP devices. The DSP control and status API provides control functions that enable your application to initialize the serial RapidIO switches, power up and reset the DSPs, select a boot source for the DSPs, and load a DSP image. The application you create runs on the MRM's LMP and communicates with the DSPs through the CPLD. The API's status functions let your application get the type of DSP farm installed as well as the power status and running status of the DSPs.

The API's function name prefix, shared library, and header file name are listed below:

| | |
|---|---|
| Function name prefix: | RSYS_DSP, RSYS_ADSP, and RSYS_SRIO |
| Shared library: | libRsysAdspApi.so.0 |
| Header file to include: | rsys_adsp1.h |

Reference information for the DSP control and status API is located in the *ATCA-9100 MRM API Reference*, provided as part of the module's software distribution.

Two example applications, *sriotool* and *mrmexample*, show how to do common functions and simplify certain tasks for you. The executable versions are located in the */usr/bin* directory on the MRM.

## Initializing the DSPs using the API

You can use the *dspFarmBringUp()* function in the *mrmexample* application to initialize the DSPs and load an image to them. Alternatively, you can use the individual API functions to create a custom application for initializing the DSPs and loading an image.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Preparing to run diagnostic tests using the API

You can use the DSP control and status API to prepare the sRIO switches and DSP devices for diagnostic tests, as described in the sections below. For information on using the diagnostic APIs, see *Running field diagnostic tests using the diagnostics API on page 83*.

## Preparing the DSP farm sRIO interfaces using the API

When preparing to run the sRIO diagnostic tests, you have these options:

- **If the DSPs are not powered on or initialized**, you can use the *dspFarmBringUp()* function in the *mrmexample* application to initialize the DSPs and their sRIO interfaces. The function requires you to load an image to the DSPs, although the image is not necessary to prepare the sRIO interfaces for diagnostic tests. It may be convenient to load the image, which is located in the */usr/share* directory. Alternatively, you can use the individual API functions to create a custom application for initializing the DSPs and sRIO interfaces.
- **If the DSPs are powered on and initialized** (the DSP reset signal is removed), but the sRIO interfaces to the DSPs have not been initialized, you can initialize the sRIO interfaces using the *RSYS_SRIO_DSPInit()* function.
- **If the DSPs and their sRIO interfaces are fully initialized**, you can run the sRIO diagnostic tests with no further preparation. Even if a non-diagnostic image is running on the DSPs, the sRIO diagnostic tests can be run.

## Preparing to run DSP diagnostic tests using the API

When preparing to run the DSP diagnostic tests, you have these options:

- **If the DSPs are not powered on or initialized**, you can use the *dspFarmBringUp()* function in the *mrmexample* application to initialize the DSPs and their sRIO interfaces and specify the image of the diagnostic tests to load. The supplied image is located in */usr/share* directory. Alternatively, you can use the individual API functions to create a custom application for initializing the DSPs and loading the image of the diagnostic tests.
- **If the DSPs are powered on with their sRIO interfaces initialized**, you can use the *dspProgramLoad()* function in the *mrmexample* application to load the image of the diagnostic tests to the DSPs. The function, which replaces any image already running, requires the image's file name. The supplied image is located in the */usr/share* directory. Alternatively, you can use the individual API functions to create a custom application for loading the image of the diagnostic tests.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The MRM software includes diagnostic tests that verify the state of MRM components and hardware interfaces on the MRM base card and the DSP farms. The diagnostic tests include automatic self-tests, interactive tests, and tests that can be run programmatically.

Disruptive tests stop the normal functioning of the MRM while they run. Non-disruptive tests allow normal MRM functions to continue. The diagnostic tests for the base card include both disruptive and non-disruptive tests; however, the diagnostic tests for the DSP farms are all disruptive.

For a list of all the diagnostic tests, see Table 22 on page 86.

## Types of diagnostic tests and interfaces for using them

Table 17 describes the types of diagnostic tests available for the MRM and the interfaces you use to access them.

Table 17. Types of diagnostic tests

| Test type | Description | Interface for running tests | For details, see... |
|---|---|---|---|
| POST diagnostic tests | Power-on self-tests that run automatically in U-Boot when the MRM powers up. These tests are designed to run very quickly. | None—tests are run automatically. You can change which tests are run by redefining certain U-Boot environment variables. | *Controlling POST diagnostic tests with U-Boot variables on page 80*. |
| Manufacturing diagnostic tests | Tests that can be useful prior to deployment of the MRM in a network. These tests are disruptive. The results are logged to the console. | U-Boot commands. | *Running manufacturing diagnostic tests from U-Boot on page 82*. |
| Field diagnostic tests | Tests that can be useful when the MRM is deployed in a network. Some of these tests are disruptive. | CLI. | *Running field diagnostic tests from the CLI on page 82*. |
| | | API. | *Running field diagnostic tests using the diagnostics API on page 83*. |

Descriptions and command syntax for each test are provided later in the chapter:

- For POST diagnostic tests, see *POST diagnostic tests on page 86*.
- For manufacturing and field diagnostic tests, see:
  - *LMP-controlled diagnostic tests on page 88*.
  - *Serial RapidIO switch and interface diagnostic tests on page 98*.
  - *DSP device diagnostic tests on page 103*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Component functions tested by diagnostic tests

Table 22 lists the component functions tested bydiagnostic tests available for the MRM components.

Table 18. Summary of MRM component functions tested by diagnostic tests

| | Component tested | POST diagnostic tests (non-disruptive) | Manufacturing diagnostic tests (disruptive) | Field diagnostic tests | | | | See... |
|---|---|---|---|---|---|---|---|---|
| | | | | Disruptive | | Non-disruptive | | |
| | Interface | Automatic | U-Boot | CLI | API | CLI | API | |
| All | All components listed below | | X | X | X | | | page 85 |
| LMP (components tested from the LMP) | LMP internal memory | X | X | | | | X | page 86, page 88 |
| | DDR2 SDRAM | X | X | | | X | X | page 86, page 89 |
| | Direct memory access (DMA) | | X | | X | | X | page 90 |
| | Flash | X | X | | | X | X | page 86, page 90 |
| | MAC serial EEPROM | X | X | | | X | X | page 87, page 92 |
| | User serial EEPROM | X | X | | | X | X | page 87, page 92 |
| | $I^2C$ bus | X | X | | | | X | page 87, page 93 |
| | $I^2C$ multiplexer registers | | X | X | X | | | page 93 |
| | $I^2C$ multiplexer function | | X | X | X | | | page 93 |
| | CPLD registers | X | X | X | X | X | X | page 86, page 94 |
| | DSP memory through sRIO | | X | | | | | page 94 |
| | IPMC UART port access | | X | | | X | X | page 95 |
| | IPMC watchdog | | | X | X | | | page 95 |
| | Application LED | | X | X | X | | | page 96 |
| | NTS hitless switch | X | X | | | X | X | page 87, page 96 |
| | LMP eTSECs | X | X | | | | X | page 87, page 97 |
| | Ethernet switch internal operation | X | X | | X | | | page 87, page 98 |
| sRIO switch | sRIO serial EEPROM | | X | | | X | X | page 98 |
| | sRIO switch $I^2C$ interface | X | X | X | X | | | page 88, page 99 |
| | sRIO switch registers | | X | X | X | | | page 100 |
| | sRIO switch mailbox | | X | X | X | | | page 100 |
| | sRIO switch loopback | | X | X | X | | | page 101 |
| | sRIO switch multicast address | | X | | | | | page 102 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 18. Summary of MRM component functions tested by diagnostic tests (continued)

| | Component tested | POST diagnostic tests (non-disruptive) | Manufacturing diagnostic tests (disruptive) | Field diagnostic tests | | | | See... |
|---|---|---|---|---|---|---|---|---|
| | | | | Disruptive | | Non-disruptive | | |
| | Interface | Automatic | U-Boot | CLI | API | CLI | API | |
| DSP devices | DSP alive status | | X | | | X | X | page 103 |
| | DSP power enable | | X | | X | | | page 104 |
| | DSP boot control | | X | X | X | | | page 104 |
| | DSP boot source | | X | X | X | | | page 105 |
| | DSP LED | | X | X | X | | | page 106 |
| | DSP interrupt generation | | X | X | X | | | page 107 |
| | DSP NMI processing | | X | X | X | | | page 108 |
| | DSP memory | | X | X | X | | | page 109 |
| | DSP EEPROM | | X | X | X | | | page 110 |
| | DSP EEPROM MAC address | | X | X | X | | | page 111 |
| | DSP software version | | X | X | X | | | page 112 |
| | DSP soft reset register | | X | | X | | | page 113 |
| | DSP soft reset function | | X | | | | | page 114 |
| | DSP hard reset register | | X | | X | | | page 114 |
| | DSP hard reset function | | X | | X | | | page 115 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Controlling POST diagnostic tests with U-Boot variables

The tests designed to be run as POST diagnostic tests include “post” in their names. These tests are optimized for speed to minimize the MRM’s boot up time and are enabled by default. Each POST diagnostic is minimal in scope compared to the manufacturing diagnostic for the same component, often verifying only that the component responds or its identification register can be read.

The diagnostic tests are controlled by U-Boot environment variables, which are described in Table 19. For information on the individual tests defined in the environment variables, see *POST diagnostic tests on page 86*.

Table 19. U-Boot environment variables for controlling POST diagnostic tests

| Environment variable | Description and default value |
|---|---|
| `BOARD_INIT_RAM_TEST` | Runs very early in the boot-up process and tests the memory used by U-Boot. This is the only safe time to test the U-Boot memory. This is the only memory test run by default during the POST diagnostic tests.<br>Default value: `LMPpostmtest 0x0 0x1000;LMPpostmtest 0x1fe00000 0x1fffffff`<br>**WARNING! Do not add the BOARD_INIT_RAM_TEST variable or its definition into the postdiags variables. The memory ranges that this variable uses are reserved for U-Boot. Testing these ranges at the wrong time can cause a conflict and keep the MRM from booting.** |
| `postdiagscold` | Runs during a cold start (power up or reboot) of the MRM. By default it verifies the flash, the CPLD, a response from all expected $I^2C$ devices, the NTS, the Ethernet switches on the PCI bus, the Ethernet controllers, and the SRIO switches.<br>Default value: `LMPpostftest;LMPpostcpldtest; LMPposti2ctest;LMPpostntstest;LMPpostpcitest 0; LMPpostethtest;SRIOPostSwitchTest 0` |
| `postdiagswarm` | Runs during a warm start (LMP reset) of the MRM. By default it verifies the same components that are included in the `postdiagscold` variable. The flag with value 1 causes certain tests to run only the portions that do not disrupt the Ethernet and sRIO switch configurations.<br>Default value: `LMPpostftest;LMPpostcpldtest; LMPposti2ctest;LMPpostntstest;LMPpostpcitest 1; LMPpostethtest;SRIOPostSwitchTest 1` |

## Management of tests

You can selectively enable, disable, and control diagnostic tests run during boot up by editing the U-Boot environment variables listed in Table 19 on page 80. Be aware that adding tests will likely increase the MRM’s boot up time, since the system runs through all prerequisite steps before executing the tests.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The examples and instructions in this section assume you are already familiar with editing the U-Boot environment variables in U-Boot or through a Linux utility. If this is not the case, please refer to the *Software Guide* for instructions on how to edit environment variables before trying out these examples.

## Adding tests

You can add any of the manufacturing diagnostic tests that start with LMP to the `postdiagscold` and `postdiagswarm` variables. However, carefully consider which tests you add, since adding tests to environment variables can delay the MRM's boot up time.

An example of when you might add a test to an environment variable is if you want to test the full range of SDRAM (by default, only U-Boot memory is tested). This can be done by adding the manufacturing diagnostic `LMPmtest`, which is a comprehensive memory test, and the RAM addresses to the `postdiagscold` and `postdiagswarm` environment variables.

`LMPmtest` and the RAM addresses can be added either directly in U-Boot by issuing commands or through a Linux utility. The following describes how to issue the commands in U-Boot.

1. To add `LMPmtest` and the RAM addresses to the `postdiagscold` environment variable, enter:

   **`setenv postdiagscold “$postdiagscold;LMPmtest 0x1000 0x1fdffff0 0”`**

2. To add `LMPmtest` and the RAM addresses to the `postdiagswarm` environment variable, enter:

   **`setenv postdiagswarm “$postdiagswarm;LMPmtest 0x1000 0x1fdffff0 0”`**

For details about `LMPmtest` and its available options see page 89.

## Disabling tests

POST diagnostic can be disabled so they do not run when the MRM boots up. The tests can be disabled either directly in U-Boot by issuing commands or through a Linux utility. This example describes how to disable tests by issuing commands in U-Boot.

1. Enter blank values for the environment variables, which deletes them from U-Boot:

   ```
   setenv BOARD_INIT_RAM_TEST
   setenv postdiagscold
   setenv postdiagswarm
   ```

2. Verify that the variables are deleted by entering:

   **`printenv`**

   The variables should no longer appear in the list.

3. Make the changes permanent by entering:

   **`saveenv`**

4. Use the above procedures to make the same changes on the other boot flash. For instructions on accessing the other flash device, see the *Software Guide*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Viewing the results

Checkpoint events are logged in the MRM's local system event log (SEL) to indicate the start and the completion of POST diagnostic tests. Any checkpoint events logged between the start and the completion event represents a POST failure. These failure events are then forwarded to the Shelf Manager, which logs the event in the SEL for the shelf.

If no events are logged between the start and the completion events, the diagnostic tests ran successfully.

For a complete list of the checkpoint events for the MRM and other modules, see the *Software Guide*.

## Running manufacturing diagnostic tests from U-Boot

You can execute manufacturing diagnostic tests from U-Boot. In the test descriptions in this chapter, the U-Boot command syntax is listed in this chapter as shown below:

**U-Boot:** **ubootcommand** *<required-parameter>* [*<optional-parameter>*] [*<iteration-count>*] [*<stop-on-error>*]

You cannot cancel tests that are invoked from U-Boot, but you can cancel subsequent iterations by pressing Ctrl-c. For details on running multiple iterations and stopping tests when errors occur, see the description of the *Common command options on page 84*.

To see a short description of the parameters for any U-Boot command, enter:

**help** *CommandName*

## Running field diagnostic tests from the CLI

You can execute field diagnostic tests from the blade diagnostics mode of the CLI. To access this mode from the master CLI, enter:

**blade-diags**

For each diagnostic test, the CLI command syntax is listed in this chapter as shown below:

**CLI:** **component clicommand required-keyword** [optional-keyword] *<required-parameter>* [*<optional-parameter>*] [iteration-count *<count>*] [*<stop-on-error>*]

The component identifies the entity that controls the test, which may be the LMP, sRIO switch, or DSP device. For details on any of these categories of tests, see the LMP, sRIO, and DSP tests.

You can cancel tests that are invoked from the CLI while they are running by pressing Ctrl-c. For details on running multiple iterations and stopping tests when errors occur, see the description of the *Common command options on page 84*.

For general information on using the CLI, see the *CLI Reference*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Running field diagnostic tests using the diagnostics API

The diagnostics API lets you run field diagnostic tests from a user application running under Linux. Using the diagnostics API, your application can run multiple diagnostic tests simultaneously and can cancel and query the status of individual tests while they are running.

The API provides generic function calls for controlling all field diagnostic tests. The user application uses the “create” function and passes it an ID that indicates the specific diagnostic test to control.

For each diagnostic test described in the manual, the ID to pass to the create function is listed in this chapter as shown below:

The example below shows the format of the IDs passed to the create function by the user application:

**API:** `RSYS_DIAGID_COMPONENT_TEST`

The “component” portion of this ID, describes the entity that controls the test, which may be the LMP, sRIO switch, or DSP device. For details on any of these categories of tests, see the LMP, sRIO, and DSP tests.

The diagnostic API’s function name prefix, shared library, and header file name are listed below:

| | |
|---|---|
| Function name prefix: | RSYS_Diag |
| Shared library: | libRsysAdspDiag.so.0 |
| Header file to include: | rsys_adsp1_diag.h |

A sample application called *diagutil* demonstrates usage of the diagnostics API. The binary application is installed on the module as */usr/bin/diagutil*, and the source code is delivered in the Promentum software distribution.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Common command options

The command options listed here are used by most tests executed in U-Boot and the CLI.

## iteration-count

**U-Boot:**

*<iteration-count>* Specifies the number of times to run the test, from 0 to 0xFF, with a default of 1. Use a value of 0 to run the test an infinite number of times. If running multiple iterations, you can stop the test by pressing Ctrl-c.

**CLI:**

`iteration-count` *<count>*

Specifies the number of times to run the test, from 0 to 255, with a default of 1. Use a value of 0 to run the test an infinite number of times. If running multiple iterations, you can stop the test by pressing Ctrl-c.

***Note:*** Certain tests allow only one iteration. See the individual command descriptions to identify those tests.

## stop-on-error

**U-Boot:**

*<stop-on-error>* Specifies whether to stop the test immediately upon encountering an error. A value of 1 stops the test on error; 0 (default) allows the test to continue. This optional parameter must be preceded by the *iteration-count* parameter.

**CLI:**

`stop-on-error` Specifies whether to stop the test immediately upon encountering an error. Including this optional parameter stops the test on error. Omitting the parameter allows the test to continue. This optional parameter must be preceded by the *iteration-count* parameter.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Command to run all diagnostic tests

When run from the CLI or API, the `diagnose` test executes all available tests with one command.

When run from U-Boot, the `diagnose` command executes all of the test commands identified in the `diagnose` environment variable. You can control the tests executed by editing the value of the environment variable. The environment variable can specify the options to use for each test, including the number of iterations. For information on editing U-Boot environment variables in U-Boot or through a Linux utility, see the *Software Guide*. For instructions on accessing U-Boot, see *Accessing U-Boot on page 66*.

## Syntax

**API:** `RSYS_DIAGID_DIAGNOSE`

**CLI:** **`diagnose`** [`iteration-count` *<count>*] [*<stop-on-error>*]

**U-Boot:** **`diagnose`**

## Command options:

See *Common command options on page 84*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# POST diagnostic tests

These POST diagnostic tests quickly verify the operation of several components on the MRM base card. You can execute any POST diagnostic tests except the LMP memory POST at any time from U-Boot.

## LMP memory POST

Verifies the memory caches and SRAM for the LMP and the LMP processor core complex. This test validates 8 KB of memory on either side of each 1 MB boundary in the specified memory range. It writes different patterns on each side of the boundary and then reads the values.

**WARNING! Do not execute this test from the command line or add this test to the `postdiagscold` or `postdiagswarm` environment variable. Execute this test only from the `BOARD_INIT_RAM_TEST` environment variable, because testing the U-Boot memory at the wrong time can cause a conflict and keep the MRM from booting. For details, see** *Controlling POST diagnostic tests with U-Boot variables on page 80***.**

### Syntax

**U-Boot:** **`LMPpostmtest`** *`<start-addr>`* *`<stop-addr>`*

### Command options

**U-Boot:**

| | |
|---|---|
| *`<start-addr>`* | Specifies the starting address to test, from 0x0 to 0x1ffffffe. |
| *`<stop-addr>`* | Specifies the ending address to test, from 0x01 to 0x1fffffff. |

## Flash POST

Verifies the boot flash and application flash are detected by U-Boot and retrieves their sizes.

### Syntax

**U-Boot:** **`LMPpostftest`**

## CPLD POST

Verifies device read and write operations through the local bus interface to confirm that the CPLD registers can be written to and read. It also verifies that the device identifier has the correct value.

### Syntax

**U-Boot:** **`LMPpostcpldtest`**



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## I²C bus POST

Scans I²C bus 1 for all possible I²C addresses and verifies that all expected devices respond.

### Syntax

**U-Boot:** **LMPposti2ctest**

## NTS hitless switch POST

Verifies all register values in the NTS hitless switch by reading them through the SPI interface. The identification register must identify the device correctly, and all other registers must be set to power-on-reset values.

### Syntax

**U-Boot:** **LMPpostntstest**

## Ethernet switch POST

Verifies the Ethernet switches are accessible on the PCI bus and their PCI register values are correct. If the cold boot option is specified, the LMP also reads and writes to the Ethernet switch memory.

### Syntax

**U-Boot:** **LMPpostpcitest** *<warmBootFlag>*

### Command options

**U-Boot:**

*<warmBootFlag>* Specifies the type of test to perform. The possible values are:

`0` - Performs all tests (for cold boot situations)

`1` - Keeps the current Ethernet switch configuration (for warm boot situations)

## eTSEC POST

Verifies the eTSECs are accessible by reading their identification registers.

### Syntax

**U-Boot:** **LMPpostethtest**



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### sRIO switch POST

Verifies the sRIO switches are accessible on the $I^2C$ bus and their register values are correct. If the cold boot option is specified, the LMP also reads and writes to the sRIO switch memory.

#### Syntax

**U-Boot:** **SRIOPostSwitchTest** *<warmBootFlag>*

#### Command options

**U-Boot:**

*<warmBootFlag>* Specifies the type of test to perform. The possible values are:

`0` - Performs all tests (for cold boot situations)

`1` - Keeps the current sRIO switch configuration (for warm boot situations)

## LMP-controlled diagnostic tests

These manufacturing and field diagnostic tests verify the operation of several components on the MRM base card.

### LMP internal memory test

Verifies the memory caches and SRAM for the LMP and the LMP processor core complex.

#### Syntax

**API:** RSYS_DIAGID_LMP_INTMEM

**U-Boot:** **LMPintmemtest** *<pattern-type>* [<*iteration-count*>] [<*stop-on-error*>]

#### Command options

**U-Boot:**

*<pattern-type>* Specifies the type of test to perform. The possible values are:

`0` - Performs all memory tests

`1` - Writes simple patterns to memory

`2` - Tests addressability by walking 1s and 0s across address bus

`3` - Tests data bus by walking 1s and 0s across data bus



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# DDR2 SDRAM test

Verifies the DDR2 SDRAM. Only the POST diagnostic tests (using the U-Boot environment variable BOARD_INIT_RAM_TEST) can test the portion of SDRAM used by U-Boot. During manufacturing diagnostic tests, the memory test address range cannot include the memory used to hold the U-Boot code, data, and stack space. Valid addresses are 0x1000 to 0x1fdfffff.

For the field diagnostic tests you can specify the number of megabytes to test, but not a specific address range. In addition, you are not able to specify a test type for field diagnostic tests.

## Syntax

**API:** RSYS_DIAGID_LMP_MEM

**CLI:** **LMP mtest size** *<megabytes>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **LMPmtest** *<start-addr> <stop-addr> <test-type>* [*<iteration-count>*] [*<stop-on-error>*]

## Command options

**CLI:**

*<megabytes>* Specifies the amount of memory to test, from 1 to 300 megabytes.

**U-Boot:**

*<start-addr>* Specifies the starting address to test, from 0x1000 to 0x1fdfffff.

*<stop-addr>* Specifies the ending address to test, from 0x1000 to 0x1fdfffff.

*<test-type>* Specifies the type of test to perform. The possible values are:

0 - Performs all memory tests

1 - Writes simple patterns to memory

2 - Tests addressability by walking 1s and 0s across address bus

3 - Tests data bus by walking 1s and 0s across data bus

4 - Generates ECC errors and verifies detection



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Direct memory access (DMA) test

Verifies simple memory-to-memory transfers, PCI-bus DMA transfers to the register space of each Ethernet switch, and parallel transfers using all of the DMA channels.

### Syntax

**API:** RSYS_DIAGID_LMP_DMA

**U-Boot:** **LMPdmatest** *<dma-type>* [<*iteration-count*>] [<*stop-on-error*>]

### Command options

**U-Boot:**

*<dma-type>* Specifies which DMAs to test. The possible values are:

0 - Tests all types of DMAs, one at a time

1 - Tests memory-to-memory transfers

2 - Tests memory-to-PCI memory-mapped register transfers

3 - Tests all active DMA channels in parallel

## Flash test

Verifies that the boot flash and application flash can be written to and erased. For the boot flash, the test verifies that the last sector cannot be written to when write-protected. The test writes and erases one sector at a time, preserving the existing contents of the flash.

**WARNING! If invoking this test from the MRM's CLI or from the API, start the test only after ensuring that no other application will access the flash device under test at the same time.**

The flash address ranges are:

| Flash device | Start address | End address | Sector size |
|---|---|---|---|
| Application flash | 0x80000000 | 0xbfffffff | 256 KB |
| Boot flash 0 (primary) | 0xe0000000 | 0xe7ffffff | 128 KB |
| Boot flash 1 (secondary) | 0xe8000000 | 0xefffffff | 128 KB |
| IPMC-selected boot image | 0xf8000000 | 0xffffffff | 128 KB |

### Syntax

**API:** RSYS_DIAGID_LMP_FLASHTEST

**CLI:** **LMP ftest** start-addr *<start>* stop-addr *<stop>* test-type *<type>* [iteration-count *<count>*] [<*stop-on-error*>]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**U-Boot:** `LMPftest <start-addr> <stop-addr> <test-type> [<iteration-count>] [<stop-on-error>]`

## Command options

**CLI**

`<start>` Specifies the starting address to test, which must be the first byte of a sector.

`<stop>` Specifies the ending address to test, which must be the last byte of a sector.

`<type>` Specifies the type of test to perform. The possible values are:

`all` - Performs all memory tests, but only tests write-protect function if the address range includes the last sector of the boot flash device

`write-protect` - Tests write-protect function on the last sector of the boot flash identified by the address range

`erase` - Erases sectors

`read-write` - Erases sectors and rewrites with a pattern

`<count>` For this test, the default value of 1 is the only valid value. See *iteration-count on page 84*.

**U-Boot**

`<start-addr>` Specifies the starting address to test, which must be the first byte of a sector.

`<stop-addr>` Specifies the ending address to test, which must be the last byte of a sector.

`<test-type>` Specifies the type of test to perform. The possible values are:

`0` - Performs all memory tests, but only tests write-protect function if the address range includes the last sector of the boot flash device

`1` - Tests write-protect function on the last sector of the boot flash identified by the address range

`2` - Erases sectors

`3` - Erases sectors and rewrites with a pattern

`<iteration-count>` For this test, the default value of 1 is the only valid value. See *iteration-count on page 84*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## MAC serial EEPROM test

Verifies the MAC address EEPROM by making a backup copy and then overwriting the contents with an incrementing pattern. After verifying that the incrementing pattern can be read, the test restores the original contents of the EEPROM.

**WARNING! If invoking this test from the MRM's CLI or from the API, start the test only after all other access to the EEPROM has been suspended.**

### Syntax

**API:** RSYS_DIAGID_LMP_MACEEPROM

**CLI:** **LMP mactest** [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **LMPmactest** [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

*<count>* For this test, the default value of 1 is the only valid value. See *iteration-count on page 84*.

**U-Boot:**

*<iteration-count>* For this test, the default value of 1 is the only valid value. See *iteration-count on page 84*.

## User serial EEPROM test

Verifies the user EEPROM by making a backup copy and then overwriting the contents with an incrementing pattern. After verifying that the incrementing pattern can be read, the test restores the original contents of the EEPROM.

**WARNING! If invoking this test from the MRM's CLI or from the API, start the test only after all other access to the EEPROM has been suspended.**

### Syntax

**API:** RSYS_DIAGID_LMP_USEREEPROM

**CLI:** **LMP usertest** [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **LMPusertest** [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

*<count>* For this test, the default value of 1 is the only valid value. See *iteration-count on page 84*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**U-Boot**

*<iteration-count>* For this test, the default value of 1 is the only valid value. See *iteration-count on page 84*.

## I²C bus test

Scans I²C bus 1 for all possible I²C addresses and displays a list of the devices that respond. The `iprobe` command takes no parameters.

For a similar test that also checks that the expected devices respond and that no extra devices respond, use the diagnostic `LMPposti2ctest`. It can be run from U-Boot safely at any time.

### Syntax

**API:** RSYS_DIAGID_LMP_I2CPROBE

**U-Boot:** **iprobe**

## I²C multiplexer register test

Verifies read/write registers to confirm that the I²C multiplexer can be configured to enable each channel.

### Syntax

**API:** RSYS_DIAGID_LMP_I2CMUXREG

**CLI:** **LMP i2cmuxregtest** [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **LMPi2cmuxregtest** [*<iteration-count>*] [*<stop-on-error>*]

### Command options

See *Common command options on page 84*.

## I²C multiplexer functional test

Verifies I²C multiplexer functions to confirm that the I²C channels to the DSP farms are properly multiplexed. The test writes values into each GPIO device's output port 0 register and then reads the devices to verify that the correct values were written. This test requires power to both DSP farms.

### Syntax

**API:** RSYS_DIAGID_LMP_I2CMUXFUNC

**CLI:** **LMP i2cmuxfunctest** [iteration-count *<count>*] [*<stop-on-error>*]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**U-Boot:** **LMPi2cmuxfunctest** [<*iteration-count*>] [<*stop-on-error*>]

### Command options

See *Common command options on page 84*.

## CPLD register test

Verifies device read and write operations through the local bus interface to confirm that the CPLD registers can be written to and read. Read testing compares registers' defined default values to expected default values. Write testing is performed on registers that allow read/write access.

***Note:*** To perform functional testing of the CPLD, use the *DSP interrupt generation test*, *DSP NMI processing test*, and *DSP power enable test*.

### Syntax

**API:** RSYS_DIAGID_LMP_CPLD

**CLI:** **LMP cpldregtest** [iteration-count <*count*>] [<*stop-on-error*>]

**U-Boot:** **LMPcpldregtest** [<*iteration-count*>] [<*stop-on-error*>]

### Command options

See *Common command options on page 84*.

## DSP memory through sRIO test

Verifies up to three types of DSP memory through sRIO direct I/O. The test uses patterns of alternating bits and walking ones and zeros.

***Important:*** This test may corrupt the memory on the DSPs. After running the test, reload any image that was previously loaded on the DSPs.

### Prerequisites:

- Power up the DSP farm. See *Powering up the DSP farms from U-Boot on page 69*.
- Prepare the sRIO interfaces. See *Enabling the sRIO links to the DSPs from U-Boot on page 70*.
- Stop any image running on the DSP devices. See *Resetting the DSP devices from U-Boot on page 69*.

### Syntax

**U-Boot:** **LMPdspmtest** <*farm-id*> <*DSP-id*> <*type*> [<*iteration-count*>] [<*stop-on-error*>]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Command options

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, for DSPs 0 through 9. |
| *<type>* | Specifies the type of memory to test. The possible values are:<br>`0` - Tests M2 memory<br>`1` - Tests M3 memory<br>`2` - Tests DDR memory<br>`3` - Tests all memory |

## IPMC port access test

Verifies LMP access to the IPMC UART port by issuing IPMI commands to retrieve the device ID and the sensors supported by the IPMC.

### Syntax:

**API:** `RSYS_DIAGID_LMP_IPMCTEST`

**CLI:** **`LMP ipmctest`** [`iteration-count` *<count>*] [*<stop-on-error>*]

**U-Boot:** **`LMPipmctest`** [*<iteration-count>*] [*<stop-on-error>*]

### Command options

See *Common command options on page 84*.

## IPMC watchdog test

Sets the IPMC watchdog state variable, which causes the watchdog to notify the LMP to reboot the MRM. If you see the MRM reboot, the test is successful. Otherwise, the test returns a failure to indicate that the watchdog is not working.**Syntax:**

**API:** `RSYS_DIAGID_LMP_WATCHDOG`

**CLI:** **`LMP watchdog`**



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Application LED test

Verifies the operation of the bi-colored application LED, which is controlled by the LMP's GPIO pins. This is a visual test you can use to run through the green, amber, and off cycles of the LED. To confirm successful completion of the test, monitor the LED while the test is running.

### Syntax

**API:** RSYS_DIAGID_LMP_LED

**CLI:** **LMP ledtest color** *<color-type>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **LMPledtest** *<color-type>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

*<color-type>* Specifies the LED color setting to test. Possible values are:

`green` - Tests green only

`amber` - Tests amber only

`both` - Tests both colors by alternately flashing each color

1. U-Boot

*<color-type>* Specifies the LED color setting to test. Possible values are:

`0` - Tests both colors by alternately flashing each color

`1` - Tests green only

`2` - Tests amber only

## NTS hitless switch test

When run as a manufacturing diagnostic test, this verifies device read and write operations through the SPI interface. Upon completion of the test, all registers are restored to their default values. When run as a field diagnostic test, this reports the current status of the hitless switch.

### Syntax

**API:** RSYS_DIAGID_LMP_NTSREG

**CLI:** **LMP ntstest** [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **LMPntstest** [*<iteration-count>*] [*<stop-on-error>*]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Command options

See *Common command options on page 84*.

## LMP eTSEC test

When run as a manufacturing diagnostic test, this verifies each eTSEC. Maximum-sized, minimum-sized, and mid-sized Ethernet packets are generated and looped back; if the packets are received error-free and no internal Ethernet error counters increment, the test is considered successful.

When run as a field diagnostic test, packets are sent by the LMP to the Ethernet switch over the PCI interface that connects them. Conversely, the switch sends the packets out its Ethernet interface back to the LMP, which receives and verifies the packets on its own Ethernet interface. The test sends 100 packets of each size in each direction. If any of the packets are not received or if the received packet differs from the sent packet, the test is considered a failure.

### Syntax

**API:** `RSYS_DIAGID_LMP_ETHTEST`

**U-Boot:** **`LMPethtest`** *`<port>`* *`<loopback>`* [<*`iteration-count`*>] [<*`stop-on-error`*>]

### Command options

**U-Boot:**

*`<port>`* Specifies the interface to test. The possible values are:

`0` - Test all three Ethernet interfaces

`1` - Test eTSEC1 interface to Base Ethernet switch

`2` - Test eTSEC2 interface to Fabric Ethernet switch

`3` - Test eTSEC3 interface to RTM

*`<loopback>`* Specifies the type of loopback to run. The possible values are:

`0` - Test using both loopbacks (available only when *`port`* value is 0 or 3)

`1` - Test using internal MAC loopback

`2` - Test using PHY loopback (available only when *`port`* value is 0 or 3)



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Ethernet switch internal operation test

Checks the internal registers of the Base and the Fabric Ethernet switches. When run as a POST diagnostic test, all of the registers are tested. When run as a manufacturing or field diagnostic test, certain PCI configuration registers are verified and the CMIC_DEV_REV_ID register is read, but the memory-mapped registers are not read.

#### Syntax

**U-Boot:** **LMPethswregtest** *<switch>* [*<iteration-count>*] [*<stop-on-error>*]

#### Command options

**U-Boot:**

*<switch>* Specifies the switch to test. The possible values are:

`0` - Tests both the Fabric and Base switch registers

`1` - Tests the Fabric switch registers

`2` - Tests the Base switch registers

## Serial RapidIO switch and interface diagnostic tests

These manufacturing and field diagnostic tests check the sRIO switches and the interfaces.

### sRIO serial EEPROM test

Checks the sRIO serial EEPROMs by making a backup copy and then overwriting the contents with an incrementing pattern. After verifying that the incrementing pattern can be read, the test restores the original contents of each EEPROM.

***Note:*** These EEPROMs are not validated during POST. If invoking this test from the MRM's CLI or from the API, start the test only after all other access to the EEPROM has been suspended.

#### Syntax

**API:** RSYS_DIAGID_LMP_SRIOEEPROM

**CLI:** **SRIO eepromtest switch** *<switch-id>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **SRIOeepromtest** *<switch>* [*<iteration-count>*] [*<stop-on-error>*]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Command options

**CLI:**

| | |
|---|---|
| *<switch-id>* | Specifies the EEPROM to test. The possible values are 0 (for the EEPROM associated with the sRIO switch connected to DSP farm 1) or 1 (for the EEPROM associated with the sRIO switch connected to farm 2). |
| *<count>* | For this test, the default value of 1 is the only valid value. See *iteration-count on page 84*. |

**U-Boot:**

| | |
|---|---|
| *<switch>* | Specifies the EEPROM to test. The possible values are 0 (for the EEPROM associated with the sRIO switch connected to DSP farm 1) or 1 (for the EEPROM associated with the sRIO switch connected to farm 2). |
| *<iteration-count>* | For this test, the default value of 1 is the only valid value. See *iteration-count on page 84*. |

## sRIO switch I2C interface test

Verifies the sRIO registers through the I2C interface. The LMP reads the registers through the I2C interface and compares them to their default values.

### Prerequisites

Reset the sRIO switch to default register values as described in *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

| | |
|---|---|
| **API:** | `RSYS_DIAGID_SRIO_I2CREGTEST` |
| **CLI:** | **`SRIO swi2cregtest switch`** *<switch-id>* [`iteration-count` *<count>*] [*<stop-on-error>*] |
| **U-Boot:** | **`SRIOswi2cregtest`** *<switch>* [*<iteration-count>*] [*<stop-on-error>*] |

### Command options

**CLI:**

| | |
|---|---|
| *<switch-id>* | Specifies the sRIO switch to test. The possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10). |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**U-Boot:**

*<switch>* Specifies the sRIO switch to test. The possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10).

## sRIO switch register test

Verifies the registers that the LMP reads through the sRIO interface by comparing the register contents to default values. The test requires that the switch registers be set to default values.

### Prerequisites

Reset the sRIO switch to default register values as described in *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** RSYS_DIAGID_SRIO_REGTEST

**CLI:** **SRIO swregtest switch** *<switch-id>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **SRIOswregtest** *<switch>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

*<switch-id>* Specifies the sRIO switch to test. The possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10).

**U-Boot:**

*<switch>* Specifies the sRIO switch to test. The possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10).

## sRIO switch mailbox test

Verifies the registers on the sRIO switch that act as mailboxes for communicating information between an external $I^2C$ master and a host processor. The test verifies the sRIO interface, the $I^2C$ interface, and the sRIO switch interrupt to the LMP. The test is disruptive because it changes the sRIO switch register settings.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Syntax

**API:** RSYS_DIAGID_SRIO_MBOXTEST

**CLI:** **SRIO swmboxtest switch** *<switch-id>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **SRIOswmboxtest** *<switch>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

*<switch-id>* Specifies the sRIO switch to test. The possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10).

**U-Boot:**

*<switch>* Specifies the sRIO switch to test. The possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10).

## sRIO switch loopback test

Verifies continuity and the ability to send and receive packets for one or more sRIO ports. This disruptive test configures one or more sRIO ports for loopback. The LMP sends sRIO packets to the ports, which return the packets to the LMP. The LMP verifies that all packets return to it with their payload intact.

When run from U-Boot, each port is tested individually. When run from the CLI or API with the `serpentine` option, packets are sent from the LMP through all ports on both sRIO switches and then back to the LMP. If the serpentine test fails, individual ports can be tested to isolate the failure.

Prerequisites:

Initialize the sRIO interfaces. See *Summary of preparation tasks for running diagnostic tests on page 63*.

Syntax:

**API:** RSYS_DIAGID_SRIO_LPBKTEST

**CLI:** **SRIO swlpbktest type** {serpentine | {individual switch *<switch-id>* port *<port-id>*}} [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **SRIOswlpbktest** *<switch>* *<port>* [*<iteration-count>*] [*<stop-on-error>*]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Command options

**CLI:**

| | |
|---|---|
| `serpentine` | Tests all ports on both switches at once, returning the packets to the LMP when they have passed through all ports. |
| `individual` | Tests the switch and port specified by *<switchID>* and *<portID>*. |
| *<switch-id>* | Specifies the sRIO switch to test. The possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10). |
| *<port-id>* | Specifies the port to test. The values range from 4 through 13 for individual ports. |

**U-Boot:**

| | |
|---|---|
| *<switch>* | Specifies the sRIO switch to test. The possible values are 0 (for the switch connected to the bottom farm containing DSP devices 11-20) or 1 (for the switch connected to the top farm containing DSP devices 1-10). |
| *<port>* | Specifies the port to test. The values range from 4 through 0xd for individual ports. The value 0xff tests all ports on the switch. |

## sRIO switch multicast test

Configures the sRIO switch devices with a multicast address whose group members include the LMP port and all ports connected to a DSP. The LMP uses the multicast address to perform a direct I/O memory write pattern to an address range within the external memory of the DSP. The LMP then performs a memory read of the same address range for each individual DSP in order to compare values. This test is disruptive.

### Prerequisites

Initialize the sRIO interfaces. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**U-Boot:** **`SRIOswmcasttest`** [*<iteration-count>*] [*<stop-on-error>*]

### Command options

See *Common command options on page 84*.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# DSP device diagnostic tests

These manufacturing and field diagnostic tests check the DSP devices and their interfaces. In preparation, you must load the DSPs with a provided image that responds to requests from the LMP as described in *Summary of preparation tasks for running diagnostic tests on page 63*. The LMP initiates the DSP tests and retrieves the results using sRIO direct I/O.

For a list of the DSP numbering used in each interface, see *DSP numbers used in each interface on page 65*.

## DSP farm GPIO alive status test

Verifies the alive status of the specified DSP by reading the GPIO status port. This is a non-disruptive read test.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** `RSYS_DIAGID_DSP_ALIVE`

**CLI:** **`DSP alivetest DSP`** *`<DSP-id>`* [`iteration-count` *`<count>`*] [*`<stop-on-error>`*]

**U-Boot:** **`DSPaliveregtest`** *`<farm-id>`* *`<DSP-id>`* [*`<iteration-count>`*] [*`<stop-on-error>`*]

### Command options

**CLI:**

*`<DSP-id>`* Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel.

**U-Boot:***`<farm-id>`* Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10).

*`<DSP-id>`* Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## DSP power enable test

Verifies the LMP's ability to enable and disable power to the DSP through the CPLD. The test sets the power enable bits, verifies that the bits have been properly set, and validates that the voltage supplied to the DSP farm is within an acceptable range. This is the most basic test you can perform on the DSP farm.

### Syntax

**API:** RSYS_DIAGID_DSP_POWEREN

**U-Boot:** **DSPpwrentest** *<farm-id>* *<power-state>* [<*iteration-count*>] [<*stop-on-error*>]

### Command options

**U-Boot:**

*<farm-id>* Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10).

*<power-state>* Specifies whether to connect or disconnect the power to the DSP farm. A value of 1 connects the power; a value of 0 disconnects the power.

## DSP farm GPIO boot control test

Verifies access to the boot source and reset source $I^2C$ I/O chip registers on the DSP farm by writing the values you specify to them and then reading from them.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** RSYS_DIAGID_DSP_BOOTREG

**CLI:** **DSP bootregtest DSP** *<DSP-id>* **boot-src** *<source>* *<reset-src>* [iteration-count *<count>*] [<*stop-on-error*>]

**U-Boot:** **DSPbootregtest** *<farm-id>* *<boot-src>* *<reset-src>* [<*iteration-count*>] [<*stop-on-error*>]

### Command options

**CLI:**

*<DSP-id>* Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

*<source>* Specifies the interface over which the DSP device will load an image when it boots. The possible values are:

`I2C` - I²C bus

`SRIO` - sRIO interface ID

`eth0` - eth0 interface on the LMP

`SRIO-default` - SRIO interface with the default ID`eth0-default` - eth0 interface on the LMP with the default MAC address

**U-Boot:**

*<farm-id>* Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10).

*<boot-src>* Specifies the interface over which the DSP device will load an image when it boots. The possible values are:

`0` - I²C

`1` - sRIO

`2` - eth0 interface on the LMP

`3` - eth1 interface on the LMP

*<reset-src>* Specifies whether the contents of the I²C EEPROM on the DSP farm overrides the boot source selection. The possible values are:

`0` - The I²C EEPROM overrides the boot source.

`1` - The specified boot source is used.

## DSP boot source test

Retrieves and displays the boot source and reset source information directly from the specified DSP device.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** `RSYS_DIAGID_DSP_BOOT`

**CLI:** **`DSP boottest DSP`** *<DSP-id>* **`core`** *<core-id>* [`iteration-count` *<count>*] [*<stop-on-error>*]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**U-Boot:** **DSPboottest** *<farm-id> <DSP-id> <core-id>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI**

*<DSP-id>* Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel.

*<core-id>* Specifies the DSP core to test. Possible values range from 0 to 3.

**U-Boot:**

*<farm-id>* Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10).

*<DSP-id>* Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected.

*<core-id>* Specifies the DSP core to test. Possible values range from 0 to 3.

## DSP LED test

Verifies the operation of a bi-colored DSP LED, which is controlled by the DSP device through the DSP farm GPIO pins. This is a visual test you can use to run through the green, red, and off cycles of a specified LED. To confirm successful completion of the test, monitor the LED while the test is running.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** RSYS_DIAGID_DSP_LED

**CLI:** **DSP ledtest DSP** *<DSP-id>* **core** *<core-id>* **color** *<color-type>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **DSPledtest** *<farm-id> <DSP-id> <core-id> <color-type>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

*<DSP-id>* Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

| | |
|---|---|
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |
| *<color-type>* | Specifies the LED color setting to test. Possible values are:<br>`off` - Tests the off setting<br>`green` - Tests green only<br>`red` - Tests red only<br>`both` - Tests both colors by alternately flashing each color |

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |
| *<color-type>* | Specifies the LED color setting to test. Possible values are:<br>`0` - Tests the Off setting<br>`1` - Tests green only<br>`2` - Tests red only<br>`3` - Tests both colors by alternately flashing each color |

## DSP interrupt generation test

Verifies a DSP's ability to interrupt the LMP. The LMP receives interrupts from the DSP farm through the CPLD interrupt multiplexer. The test sets the interrupt mask register, verifies the proper setting of the mask, registers a callback function to handle an interrupt, and signals the DSP to assert the interrupt to the LMP. After processing the test interrupt, the LMP signals the DSP to remove the interrupt.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

| | |
|---|---|
| **API:** | `RSYS_DIAGID_DSP_INT` |
| **CLI:** | **`DSP interrupttest DSP`** *<DSP-id>* **`core`** *<core-id>* [`iteration-count` *<count>*] [*<stop-on-error>*] |
| **U-Boot:** | **`DSPinttest`** *<farm-id>* *<DSP-id>* *<core-id>* [*<iteration-count>*] [*<stop-on-error>*] |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Command options

**CLI:**

| | |
|---|---|
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |

## DSP NMI processing test

Verifies the DSP's ability to process an NMI from the LMP. The test asserts the NMI, verifies that it was properly asserted, and then clears the NMI when the DSP farm verifies that it has received the interrupt.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** `RSYS_DIAGID_DSP_NMI`

**CLI:** **DSP nmitest DSP** *<DSP-id>* **core** *<core-id>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **DSPnmitest** *<farm-id>* *<DSP-id>* *<core-id>* [*<iteration-count>*] [*<stop-on-error>*]

Command options:

**CLI**

| | |
|---|---|
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |

## DSP memory test

Verifies the memory for a particular DSP device directly. This test is similar to the *DSP memory through sRIO test on page 94*.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** `RSYS_DIAGID_DSP_MEM`

**CLI:** **DSP memorytest DSP** *<DSP-id>* **core** *<core-id>* **mem-type** *<type>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **DSPmtest** *<farm-id> <DSP-id> <core-id> <type>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

| | |
|---|---|
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |
| *<type>* | Specifies the type of memory to test. The possible values are:<br>`M2` - Tests M2 memory<br>`M3` - Tests M3 memory<br>`DDR` - Tests DDR memory<br>`all` - Tests all memory |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, for DSPs 0 through 9. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |
| *<type>* | Specifies the type of memory to test. The possible values are:<br>0 - Tests M2 memory<br>1 - Tests M3 memory<br>2 - Tests DDR memory<br>3 - Tests all memory |

## DSP EEPROM test

Verifies a DSP device's ability to read from and write to the DSP farm's serial EEPROM through the $I^2C$ interface. The test makes a backup copy before overwriting the contents and restores the original contents of the EEPROM before completing. This test is run only on DSP core 0 of each DSP device.

The EEPROM contains a MAC address, a boot image, reset configuration words, and basic boot configuration for each DSP device.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** `RSYS_DIAGID_DSP_EEPROM`

**CLI:** **`DSP eepromtest DSP`** *<DSP-id>* [`iteration-count` *<count>*] [*<stop-on-error>*]

**U-Boot:** **`DSPeepromtest`** *<farm-id>* *<DSP-id>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

| | |
|---|---|
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**U-Boot:**

*<farm-id>* Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10).

*<DSP-id>* Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected.

## DSP EEPROM MAC address test

Reads the MAC address for the specified DSP. The MAC address is read from the DSP farm's serial EEPROM.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** RSYS_DIAGID_DSP_EEPROMMAC

**CLI:** **DSP eeprommactest DSP** *<DSP-id>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **DSPmacaddrtest** *<farm-id>* *<DSP-id>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

*<DSP-id>* Specifies the DSP for which to retrieve a MAC address. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel.

**U-Boot:**

*<farm-id>* Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10).

*<DSP-id>* Specifies the DSP for which to retrieve a MAC address. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## DSP software version test

Verifies a DSP device core's ability to report the version of the image currently loaded.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** RSYS_DIAGID_DSP_SWVER

**CLI:** **DSP swvertest DSP** *<DSP-id>* **core** *<core-id>* [iteration-count *<count>*] [*<stop-on-error>*]

**U-Boot:** **DSPswvertest** *<farm-id>* *<DSP-id>* *<core-id>* [*<iteration-count>*] [*<stop-on-error>*]

### Command options

**CLI:**

*<DSP-id>* — Specifies the DSP to test. Possible values range from 0 to 19. The values 0-9 correspond to DSPs 11-20 shown on the MRM front panel, and 10-19 correspond to 1-10 on the front panel.

*<core-id>* — Specifies the DSP core to test. Possible values range from 0 to 3.

**U-Boot:***<farm-id>* — Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10).

*<DSP-id>* — Specifies the DSP to test. Possible values range from 0 to 9, for DSPs 0 through 9.

*<core-id>* — Specifies the DSP core to test. Possible values range from 0 to 3.

## DSP farm type test

Identifies the DSP farm type by reading the DSPFx_STAT register of the CPLD. This non-disruptive read test can be executed only during manufacturing diagnostic tests using U-Boot.

### Syntax

**U-Boot:** **DSPfarmtypetest** *<farm-id>* [*<iteration-count>*] [*<stop-on-error>*]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Command options

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<stop-on-error>* | Specifies whether to stop the test immediately upon encountering an error. A value of 1 stops test on error; 0 (default) allows test to continue. This optional parameter must be preceded by the *iteration-count* parameter. |

## DSP GPIO soft reset register test

Verifies the soft reset register on the specified DSP by writing to and reading from the $I^2C$ I/O chip register on the DSP farm.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** RSYS_DIAGID_DSP_SOFTRESET

**U-Boot:** **DSPsresregtest** *<farm-id> <DSP-id> <core-id>* [<*iteration-count*>] [<*stop-on-error*>]

### Command options

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## DSP GPIO soft reset functional test

Initiates a soft reset on the specified DSP. The LMP asserts a soft reset on the GPIO for the DSP, then reads the DSP's reset status register to verify that the reset was completed successfully.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** RSYS_DIAGID_DSP_SOFTRESETFUNC

**U-Boot:** **DSPsresfunctest** *<farm-id> <DSP-id> <core-id>* [<*iteration-count*>] [<*stop-on-error*>]

### Command options

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |

## DSP farm GPIO hard reset register test

Verifies the hard reset register on the specified DSP by writing to and reading from the $I^2C$ I/O chip register on the DSP farm.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** RSYS_DIAGID_DSP_HARDRESET

**U-Boot:** **DSPhresregtest** *<farm-id> <DSP-id> <core-id>* [<*iteration-count*>] [<*stop-on-error*>]



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### Command options

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |

## DSP farm GPIO hard reset functional test

Initiates a hard reset of the specified DSP. The LMP asserts a hard reset on the GPIO for the DSP, then reads the DSP's reset status register to verify that the reset was completed successfully.

### Prerequisites

Initialize and load the DSPs. See *Summary of preparation tasks for running diagnostic tests on page 63*.

### Syntax

**API:** `RSYS_DIAGID_DSP_HARDRESETFUNC`

**U-Boot:** **`DSPhresfunctest`** *<farm-id> <DSP-id> <core-id>* [<*iteration-count*>] [<*stop-on-error*>]

### Command options

**U-Boot:**

| | |
|---|---|
| *<farm-id>* | Specifies the DSP farm to test. Possible values are 0 (for the bottom farm containing DSP devices 11-20) or 1 (for the top farm containing DSP devices 1-10). |
| *<DSP-id>* | Specifies the DSP to test. Possible values range from 0 to 9, corresponding to DSPs 1-10 or 11-20, depending on the farm selected. |
| *<core-id>* | Specifies the DSP core to test. Possible values range from 0 to 3. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

This chapter supplies maintenance procedures as well as symptoms of problems and steps for diagnosing and resolving them.

## Removing the MRM

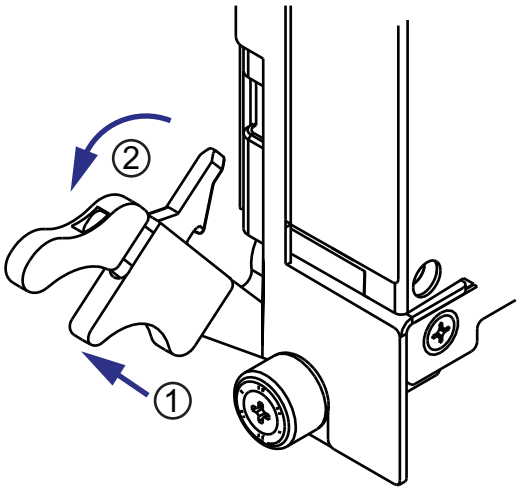
To remove the MRM from the shelf:

2. Obey ESD precautions and make sure you are adequately grounded. See *Electrostatic discharge on page 10*.
3. Disconnect all cables from the RTM that is directly behind the MRM (if installed). Power to the RTM will be lost once the MRM is removed.
4. On the MRM, loosen the thumbscrews next to the ejector handles.
5. Release only one ejector latch—either the right latch or the lower latch—and then stop.
   - If the MRM is oriented vertically, release the lower ejector latch.
   - If the MRM is oriented horizontally, release the right ejector latch.

   To release the ejector latch, use the procedures shown in Figure 16.

Figure 16. Ejector latch release

1. Slide lock toward handle.
2. Pull handle out.




6. The H/S blue light starts flashing. When the H/S blue light turns solid blue you may remove the MRM.
7. Release the second ejector latch—either the left latch or the upper latch.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Use the same procedures to release the ejector latch as were shown in the diagram for Step 5.

8. Simultaneously pull both ejector handles to remove the MRM from the slot.
9. Pull the MRM out of the slot.
10. Place the MRM on a flat, static-free surface.
11. For instructions on installing a replacement MRM in the empty slot, see the *ATCA-9100 MRM Installation Guide*.

    If you are not replacing the MRM with another module, you must install an air management filler panel in the slot to maintain proper cooling and airflow through the shelf.

# Upgrading the software and firmware

Table 20 summarizes the MRM's programmable devices and the content that can be upgraded.

Table 20. Programmable devices and upgradeable content

| Programmable device | Upgradeable content | Copies to upgrade | Upgrade interface |
|---|---|---|---|
| LMP boot flash | U-Boot | 2 | Linux, U-Boot |
| | Linux kernel and file system | 2 | Linux, U-Boot |
| IPMC | IPMI application | 2 | IPMI |
| | IPMI boot | 1 | |
| IPMC FPGA | IPMI I/O expander | 1 | IPMI |
| IPMC SEEPROM | FRU records | 1 | IPMI |
| Ethernet MAC SEEPROM | MAC addresses | 1 | Linux, U-Boot |
| Interrupt multiplexer CPLD | DSP control and status | 1 | Linux |
| sRIO switch boot SEEPROM | sRIO configuration | 2 (1 SEEPROM per switch) | U-Boot |
| DSP farm CPLD | DSP reset configuration control | 2 (1 per DSP farm) | Linux |
| DSP farm SEEPROM | DSP reset configuration data and boot data for $I^2C$ boot | 2 (1 per DSP farm) | Linux, U-Boot |

The MRM and its enabled services can remain fully operational during the upgrade of all the components. A reboot is necessary to activate the upgraded content.

All upgrades can be performed from the MRM's LMP:

- Through a serial console that is directly connected to the RTM serial port.
- By a remote login to the MRM over Ethernet. The session is lost when the MRM reboots. You cannot access U-Boot or view the bootup messages.

Upgrades of the IPMC, the FPGA, and the IPMC SEEPROM can also be performed from a remote computer by specifying the Shelf Manager IP address and the MRM's IPMB address in the upgrade commands.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

***Note:*** If the MRM is installed in slot 1 of the ATCA-6002 shelf, the Shelf Manager must be running in enhanced mode. See the *Shelf Management Software Reference* for more information about the enhanced mode of the Shelf Management software.

Instructions for upgrading all of the components are included with the upgrade image, which is available from the RadiSys Web site or from RadiSys Technical Support.

# Troubleshooting

When the MRM does not perform as you expect, look for symptoms that might clarify the cause. Performing the following actions can aid you in diagnosing the problem:

- Check the state of the LEDs on the MRM and other modules in the platform, especially the power and out of service LEDs.
- Check the events logged in the Shelf Manager's system event log (SEL). If you are using the RadiSys Shelf Manager, see the *Shelf Management Software Reference* for information on accessing the SEL. If you are using a non-RadiSys Shelf Manager, see the associated documentation.
- Check temperatures on the MRM. If you are using the RadiSys Shelf Manager, see the troubleshooting information in the *Shelf Management Software Reference* for details on how to perform these queries.
- Check the IP address and the subnet mask assignment. See the *Software Guide* for details on these assignments.
- View the Ethernet configuration using the `show` commands in the Ethernet CLI.
- Verify the Ethernet switches are communicating properly. See the *Software Guide* for information on diagnosing communication and connection issues.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

## Symptoms and recommended actions

Table 21 lists possible troubleshooting scenarios. Look through the listed symptoms to see if any apply to your situation and follow the recommended actions for the applicable symptoms. When an action reveals the cause of the problem, resolve the problem as indicated.

Table 21. Troubleshooting actions based on symptoms

| Symptom | Recommendation |
|---|---|
| The power LED on the MRM is not lit. | • Verify that other modules in the shelf are powered. If not, check the power to the shelf.<br>• Inspect the rear connectors for damage. If they show no sign of damage, you can try the following:<br>§ carefully insert the MRM into a different slot<br>§ carefully insert a different MRM in the original slot<br>Do not force the insertion of the MRM. If insertion is not easy, the pins on the backplane connector may be damaged, which could potentially damage the rear connectors on the MRM.<br>• Verify that the MRM's power indicator debug LEDs are on. For information on locating and viewing these LEDs, see *Chapter 5, Development and Debugging Features, on page 53*. If the debug LEDs are not on when there is power to the shelf, return the MRM to RadiSys for replacement.<br>• Verify the MRM is in the M4 hot-swap state (i.e., active state). (See the *Shelf Management Software Reference* for more information on hot-swap states.)<br>• Check to see if the software installed on the MRM is communicating with the platform's Shelf Manager or whether the MRM is waiting for an external Shelf Manager to enable it.<br>If the MRM is installed in slot 1 of an ATCA-6002 shelf, this state indicates the Shelf Manager software is not running. See the *Shelf Management Software Reference* for information about enabling the Shelf Management software on modules installed in slot 1 of the ATCA-6002 shelf. |
| The MRM or another module overheats. | • Verify that no cover plates are installed. Instead, empty slots must have air management filler panels designed for the shelf's slots installed to properly maintain airflow and emissions.<br>• Check temperatures at the air intake, on the overheating module, and at the platform's air exhaust. Use the information to determine whether the overheating may be caused by warm facility air, a module failure, or a failed fan module. If you are using the RadiSys Shelf Manager, see the troubleshooting information in the *Shelf Management Software Reference* for details on how to perform these queries.<br>• Try moving the module to a different slot to see if that resolves the overheating.<br>• Verify there is clearance of at least two inches between the side of the shelf and the side of the rack cabinet.<br>• Check the shelf's air filter for obstructions and dirt. |
| Sensors generate alarms or events | See the troubleshooting recommendations in *Sensor alarm troubleshooting on page 138*. |
| An MRM does not work correctly. | Check the Shelf Manager's system event log for significant events related to the MRM. In particular, verify that the MRM worked correctly when it was installed, and look for any events since then that would explain the changes. If the log information does not reveal useful events, remove the MRM and install it in a different slot. If possible, install another MRM of the same kind in the original slot to help determine whether the MRM is defective. |
| The MRM does not boot up. | If U-Boot is functioning but Linux does not boot up, the Linux software may be corrupted in both flash partitions. See the Software Guide for instructions on:<br>• Disabling the BMC watchdog to diagnose bootup issues.<br>• Restoring Linux software from U-Boot. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 21. Troubleshooting actions based on symptoms (continued)

| Symptom | Recommendation |
|---|---|
| The OOS LED blinks when the MRM attempts to power up. | Neither IPMC application image is valid. Upgrade both IPMC application images using the upgrade instructions supplied with the Promentum software distribution. |
| Intermittently, the MRM and other installed MRMs experience random data errors. | Verify that the platform's frame-ground connection is properly connected to a high-quality earth-ground connection. Check for electrical noise at the backplane power connections and at the power entry module power inputs. Consider the possibility of a malfunctioning MRM causing electrical noise on backplane connections. |
| Ethernet traffic between the DSPs and the network is dropped. | • Verify that the Ethernet switch ports to the DSPs are enabled. Use the `show port all` command within the Ethernet CLI to verify that the expected ports are enabled (EKey Mode and Admin Mode) and connected to a peer (Link Status). If the ports are disabled, enable selected ports using the `no shutdown` command. See the *CLI Reference* for further details.<br>• If Base interface traffic is dropped, use the `show port all` command in the Base Ethernet CLI to verify that port 0/1 or 0/2 is enabled. If both ports are disabled, enable the selected port using the `no shutdown` command. In a shelf where two Promentum SCMs are used as the hub modules, only one of these ports should be enabled at once. The Promentum SCMs interconnect their Base switching domains, which can lead to network loops if a module has both Base interface ports enabled. Other hub modules that interconnect their Base switching domains cause the same restriction.<br>• If Fabric interface traffic is dropped, use the `show port all` command in the Fabric Ethernet CLI to verify that port 0/1 or 0/2 is enabled. If both ports are disabled, enable the selected port using the `no shutdown` command. In a shelf where two hub modules interconnect their Fabric switching domains, only one of these ports should be enabled at once. The Promentum SCMs do not interconnect their Fabric switching domains, so this restriction does not apply where Promentum SCMs are the hub modules.<br>• Verify that an application on the LMP can ping the DSP devices through the Ethernet switch. First load the diagnostics image onto the DSP devices as described in *Initializing the DSPs using Linux commands and the sriotool utility on page 71*. Then run one or more ping scripts supplied in the */usr/share* directory to ping all the DSPs in a farm from the Base switch, the Fabric switch, or both. Run a similar script to verify access to the other DSP farm. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Environmental specifications

The module is designed to meet the environmental specifications listed in Table 22. The operating environment must provide sufficient airflow across the module to keep it within its temperature specification.

Table 22. Environmental

| Characteristic | State | Value |
|---|---|---|
| Temperature (ambient) | Operating | +5° C to +45° C<br>30° C/hr rate of change |
| | Short term operating[a] | –5°C to +55° C<br>30° C/hr rate of change |
| | Storage | –40° C to +70° C |
| Relative humidity | Operating | 5% to 85% RH non-condensing |
| | Short term operating[a] | 5% to 90% RH non-condensing at +30° C |
| | Storage | 5% to 90% RH non-condensing at +40° C |
| | Short term storage[a] | 5% to 95% RH non-condensing at +40° C |
| Altitude | Operating[b] | Up to 1800 meters (5,905 feet), +55°C<br>> 1800 meters up to 4000 meters (13,123 feet), derated linearly to +45°C |
| Shock (drop) | Unpacked<br>Free fall, corners, surfaces, and edges | 0 to < 10 kg = 100 mm drop<br>10 to < 25 kg = 75 mm drop |
| | Packaged (Unpalletized)<br>Free fall, corners and edges | < 15 kg = 1000 mm drop (one person carrying) |
| | Palletized (in shelf test) | 100 mm free fall drop |
| Vibration | Operating (in shelf test) | 0.1g, 2 to 200 Hz and back, 0.25 octave/min sine sweep[b] |
| | Transportation (packaged) | 0.5g, 5 to 50 Hz and back, 0.1 octave/min sine sweep[c]<br>3.0g, 50 to 500 Hz and back, 0.25 octave/min sine sweep[c] |
| Seismic | Operating | Per Zone 4 test method, GR-63-CORE |

[a] Short term defined as a maximum of 96 consecutive hours.
[b] For a maximum of eight consecutive hours.
[c] In each direction for each of three mutually perpendicular axes.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Safety specifications

The safety specifications are measured under laboratory ambient temperature and humidity (approximately 25°C and humidity between 30% and 50%). Testing was performed in partnership with a Nationally Recognized Testing Laboratory (NRTL) accredited to provide the required certifications. Table 23 lists the product safety specifications.

Table 23. Safety

| Characteristic | Certification | Standard and Test Criteria |
|---|---|---|
| Product Safety—US | Accessory Listing | *UL 60950-1 Safety for Information Technology Equipment – Part 1: General Requirements, Edition 1*, Underwriter Laboratories, 7/7/2006 |
| Product Safety—Canada | Approval | *CAN/CSA C22.2 No. 60950-1-03 Safety for Information Technology Equipment, First Edition*, Canadian Standards Association, 7/2006 |
| Product Safety—EU | Conformance with the Low Voltage Directive | EN 60950-1 “Safety for Information Technology Equipment” |

# Mechanical dimensions

Table 24 lists the MRM mechanical dimensions.

Table 24. Mechanical dimensions

| Characteristic | Value |
|---|---|
| MRM dimensions | 351 mm x 30.48 mm x 305 mm (13.819” x 1.20” x 12.008”) |
| MRM weight | 3.27 kg (7.2 lbs) |

# Electromagnetic compatibility (EMC)

The module has been evaluated against the following standards while installed in a representative shelf:

## Emissions standards

- FCC Part 15, Subpart B Digital Device, Class A: 2006
- EN 55022: 2006
- ICES-003
- EN 300 386 V1.4.1

## Immunity standards

- EN 55024:1998 + A1 + A2
- EN 300 386 V1.4.1



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

### FCC Part 15 statement

This equipment has been tested and found to comply with the limits for a Class A 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 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Modifications made to the product, unless expressly approved by RadiSys Corporation, could void the user's authority to operate the equipment.

### CISPR 22 statement

**WARNING! This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.**

### ICES 003 statement

This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

## Power consumption

Table 25 lists the power consumption specifications for the MRM.

Table 25. Power consumption

| Product | Typical power consumption measured at 25°C | Maximum (worst case) power consumption |
|---|---|---|
| ATCA-9100 with two F-DSP farms | 170 to 190 Watts, depending on the application | 274 Watts |

## Mean time between failure (MTBF)

**Calculation Type:** MTBF/FIT rate

**Standard:** Telcordia Standard SR-332 Issue 2

**Methods:** Method I, Case III, Quality Level II



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The calculation results were generated using the references and assumptions listed. This specification and its associated calculations supersede all other released mean time between failures (MTBF) and failure in time (FIT) calculations with earlier dates. The reported failure rates do not represent catastrophic failure. Table 26 lists the estimated MRM reliabilty data for several configurations.

Table 26. Reliability Estimate Data

| | | |
|---|---|---|
| Failure Rate (FIT) | MRM base card | 4,587 failures in $10^9$ hours |
| | Base card with two F-DSP farms | 12,658 failures in $10^9$ hours |
| MTBF | MRM base card | 218,000 hours |
| | Base card with two F-DSP farms | 79,000 hours |

## Environmental assumptions

- Failure rates are based on a 35°C ambient temperature.
- Applied component stress levels are 50% (voltage, current, and/or power).
- Ground, fixed, controlled environment with an environmental adjustment factor equal to 1.0.

## General assumptions

- Component failure rates are constant.
- Board-to-system interconnects are included within estimates.
- Non-electrical components (screws, mechanical latches, labels, covers, etc.) are not included in estimates.

## General notes

- Method I, Case I = Based on parts count. Equipment failure is estimated by totaling device failures rates and quantities used.
- Quality Level II = Devices purchased to specifications, qualified devices, vendor lot-to-lot controls for acceptable quality levels (AQLs) and defects per million (DPMs).

Where available, direct component supplier predictions or actual FIT rates have been used.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Supported IPMI commands

The MRM supports the IPMI commands in Table 27.

Table 27. Standard IPMI and ATCA commands supported by the MRM (sheet 1 of 2)

| Message commands | NetFn | Command |
|---|---|---|
| Get Device ID | App (0x06) | 0x01 |
| Broadcast “Get Device ID” | App (0x06) | 0x01 |
| Cold Reset | App (0x06) | 0x02 |
| Warm Reset | App (0x06) | 0x03 |
| Get Self Test Results | App (0x06) | 0x04 |
| Set ACPI Power State | App (0x06) | 0x07 |
| Get ACPI Power State | App (0x06) | 0x08 |
| Reset Watchdog Timer | App (0x06) | 0x22 |
| Set Watchdog Timer | App (0x06) | 0x24 |
| Get Watchdog Timer | App (0x06) | 0x25 |
| Set BMC Global Enables | App (0x06) | 0x2E |
| Get BMC Global Enables | App (0x06) | 0x2F |
| Clear Message Flags | App (0x06) | 0x30 |
| Get Message Flags | App (0x06) | 0x31 |
| Get Message | App (0x06) | 0x33 |
| Send Message | App (0x06) | 0x34 |
| Set Event Receiver | S/E (0x04) | 0x00 |
| Get Event Receiver | S/E (0x04) | 0x01 |
| Platform Event (a.k.a “Event Message”) | S/E (0x04) | 0x02 |
| Get Device SDR Info | S/E (0x04) | 0x20 |
| Get Device SDR | S/E (0x04) | 0x21 |
| Reserve Device SDR Repository | S/E (0x04) | 0x22 |
| Set Sensor Hysteresis | S/E (0x04) | 0x24 |
| Get Sensor Hysteresis | S/E (0x04) | 0x25 |
| Set Sensor Threshold | S/E (0x04) | 0x26 |
| Get Sensor Threshold | S/E (0x04) | 0x27 |
| Set Sensor Event Enable | S/E (0x04) | 0x28 |
| Get Sensor Event Enable | S/E (0x04) | 0x29 |
| Get Sensor Reading | S/E (0x04) | 0x2D |
| Get FRU Inventory Area Info | Storage (0x0A) | 0x10 |
| Read FRU Data | Storage (0x0A) | 0x11 |
| Write FRU Data | Storage (0x0A) | 0x12 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 27. Standard IPMI and ATCA commands supported by the MRM (sheet 2 of 2)

| Message commands | NetFn | Command |
|---|---|---|
| Get SDR Repository Info | Storage (0x0A) | 0x20 |
| Reserve SDR Repository | Storage (0x0A) | 0x22 |
| Get SDR | Storage (0x0A) | 0x23 |
| Get SEL Info | Storage (0x0A) | 0x40 |
| Get SEL Entry | Storage (0x0A) | 0x43 |
| Add SEL Entry | Storage (0x0A) | 0x44 |
| Partial Add SEL Entry | Storage (0x0A) | 0x45 |
| Clear SEL | Storage (0x0A) | 0x47 |
| Get SEL Time | Storage (0x0A) | 0x48 |
| Set SEL Time | Storage (0x0A) | 0x49 |
| Get PICMG Properties | Group Extension: PICMG (0x2C) | 0x00 |
| Get Address Info | Group Extension: PICMG (0x2C) | 0x01 |
| FRU Control | Group Extension: PICMG (0x2C) | 0x04 |
| Get FRU LED Properties | Group Extension: PICMG (0x2C) | 0x05 |
| Get LED Color Capabilities | Group Extension: PICMG (0x2C) | 0x06 |
| Set FRU LED State | Group Extension: PICMG (0x2C) | 0x07 |
| Get FRU LED State | Group Extension: PICMG (0x2C) | 0x08 |
| Set IPMB State | Group Extension: PICMG (0x2C) | 0x09 |
| Set FRU Activation Policy | Group Extension: PICMG (0x2C) | 0x0A |
| Get FRU Activation Policy | Group Extension: PICMG (0x2C) | 0x0B |
| Set FRU Activation | Group Extension: PICMG (0x2C) | 0x0C |
| Get Device Locator Record ID | Group Extension: PICMG (0x2C) | 0x0D |
| Set Port State | Group Extension: PICMG (0x2C) | 0x0E |
| Get Port State | Group Extension: PICMG (0x2C) | 0x0F |
| Compute Power Properties | Group Extension: PICMG (0x2C) | 0x10 |
| Set Power Level | Group Extension: PICMG (0x2C) | 0x11 |
| Get Power Level | Group Extension: PICMG (0x2C) | 0x12 |
| Bused Resource | Group Extension: PICMG (0x2C) | 0x17 |
| Get Target Upgrade Capabilities | Group Extension: PICMG (0x2C) | 0x2E |
| Get Component Properties | Group Extension: PICMG (0x2C) | 0x2F |
| Abort Firmware Upgrade | Group Extension: PICMG (0x2C) | 0x30 |
| Initiate Upgrade Action | Group Extension: PICMG (0x2C) | 0x31 |
| Upload Firmware Block | Group Extension: PICMG (0x2C) | 0x32 |
| Finish Firmware Upload | Group Extension: PICMG (0x2C) | 0x33 |
| Get Upgrade Status | Group Extension: PICMG (0x2C) | 0x34 |
| Activate Firmware | Group Extension: PICMG (0x2C) | 0x35 |
| Query Self Test Results | Group Extension: PICMG (0x2C) | 0x36 |
| Query Rollback Status | Group Extension: PICMG (0x2C) | 0x37 |
| Initiate Manual Rollback | Group Extension: PICMG (0x2C) | 0x38 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Sensors on the MRM

The MRM manages sensors with sensor data record (SDR) support. The MRM implements a Type 12h (0x12) management controller device locator record for identifying the management controller and a Type 1h (0x01) full sensor record for describing the sensor.

Rather than being an actual physical component, some sensors are an accumulation of the information gathered by the measuring devices and the IPMC on the MRM. The IPMC monitors conditions and detects digital state changes or analog values crossing thresholds. When transitions occur, the IPMC sends the information on to the Shelf Manager as events. The Shelf Manager may in turn send these events on to a system manager.

## Types of sensors

The MRM implements the following types of sensors.

- **Discrete** — A discrete sensor can represent up to16 states. The sensor is coded as a 16-bit value with one bit true and the remaining bits false.
- **Digital** — A digital sensor has two possible states, only one of which can be active at any given time. For example, a digital sensor monitoring the power may indicate whether the power is good (within an acceptable range) or not.
- **OEM** — An OEM sensor is an 8-bit value with its states defined by the manufacturer. The reading types of these sensors are sometimes defined as “sensor-specific.”
- **Threshold** — A threshold sensor has a range of 256 values, which represent measurements on the MRM and its FRUs. Temperature, voltage, current, and fan speed sensors are examples of threshold sensors.

  Table 28 shows the possible thresholds.

Table 28. Threshold types

| Threshold type | Description |
|---|---|
| UNR | Upper non-recoverable thresholds generate a critical alarm on the high side. |
| UC | Upper critical thresholds generate a major alarm on the high side. |
| UNC | Upper non-critical thresholds generate a minor alarm on the high side. |
| LNC | Lower non-critical thresholds generate a minor alarm on the low side. |
| LC | Lower critical thresholds generate a major alarm on the low side. |
| LNR | Lower non-recoverable thresholds typically generate a critical alarm on the low side. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Managed sensors

Table 29 provides details about the MRM sensors that are managed by the IPMC. All sensors generate events unless noted otherwise in the table footnotes.

Table 29. MRM sensors managed by the IPMC (sheet 1 of 8)

| # | Name | Sensor type | Reading type | Normal reading | Alarms | Notes |
|---|---|---|---|---|---|---|
| 00 | ATCA FRU Hotswap | OEM | Sensor-specific | 0x00-0x07 | N/A | Module hot-swap information as defined in AdvancedTCA Base Specification. Sensor state represents the M-state of the module. |
| 01 | ATCAPhysIpmb | OEM | Sensor-specific | 0x00-0xFF | N/A | Physical IPMB0 status information as defined in AdvancedTCA Base Specification.<br>Reading value:<br>Bit [7] = IPMB B override state<br>Bit [6:4] = IPMB B local status<br>Bit [3] = IPMB A override state<br>Bit [2:0] = IPMB A local status |
| 02 | Ejector Closed | Digital | Slot or connector | N/A | N/A | state 0: Ejector latch open; fault status asserted<br>state 1: Ejector latch closed; identify status is asserted |
| 03 | -48V Absent A | Digital | Power supply | 0 | N/A | state 0: Power supply A presence detected<br>state 1: Power supply A failure detected |
| 04 | -48V Absent B | Digital | Power supply | 0 | N/A | state 0: Power supply B presence detected<br>state 1: Power supply B failure detected |
| 05 | -48V Fuse Fault | Digital | Power supply | 0 | N/A | state 0: Both A and B fuses OK; presence detected<br>state 1: Either A or B fuse blown; failure detected |
| 06 | BMC Wdog Tm0 | Discrete | Sensor-specific | N/A | N/A | Event offset: Watchdog action<br>0: Timer expired, status only; no action or interrupt<br>1: Payload cold reset<br>2: Payload power down<br>3: Payload power cycle<br>4-7: Reserved<br>8: Pre-timer interrupt |
| 07 | ZoneA Inlet Temp | Threshold | Temperature | 25 | minor, major, critical | Zone A inlet temperature in degrees C. Hysteresis: ±3<br>Default thresholds:<br>LNR: -8; LC: -3; LNC: 2; UNC: 65; UC: 72; UNR: 80 |
| 08 | ZoneB Inlet Temp | Threshold | Temperature | 25 | minor, major, critical | Zone B inlet temperature in degrees C. Hysteresis: ±3<br>Default thresholds:<br>LNR: -8; LC: -3; LNC: 2; UNC: 65; UC: 72; UNR: 80 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 29. MRM sensors managed by the IPMC (sheet 2 of 8)

| # | Name | Sensor type | Reading type | Normal reading | Alarms | Notes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 09 | ZoneC Inlet Temp | Threshold | Temperature | 25 | minor, major, critical | Zone C inlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -8 | -3 | 2 | 65 | 72 | 80 |
| 10 | ZoneD Inlet Temp | Threshold | Temperature | 25 | minor, major, critical | Zone D inlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -8 | -3 | 2 | 65 | 72 | 80 |
| 11 | ZoneA Outlet Temp | Threshold | Temperature | 25 | minor, major, critical | Zone A outlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 75 | 82 | 90 |
| 12 | ZoneB Outlet Temp | Threshold | Temperature | TBD | minor, major, critical | Zone B outlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 75 | 82 | 90 |
| 13 | ZoneC Outlet Temp | Threshold | Temperature | 25 | minor, major, critical | Zone C outlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 65 | 72 | 90 |
| 14 | ZoneD Outlet Temp | Threshold | Temperature | 25 | minor, major, critical | Zone D outlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 65 | 72 | 80 |
| 15 | Rear Inlet Temp | Threshold | Temperature | 25 | minor, major, critical | Rear inlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -8 | -3 | 2 | 65 | 72 | 80 |
| 16 | Rear Out Temp | Threshold | Temperature | 25 | minor, major, critical | Rear outlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 75 | 82 | 95 |
| 17 | MPC8548 Temp | Threshold | Temperature | 25 | minor, major, critical | LMP temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 65 | 72 | 80 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 29. MRM sensors managed by the IPMC (sheet 3 of 8)

| # | Name | Sensor type | Reading type | Normal reading | Alarms | Notes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | ESwitch Temp | Threshold | Temperature | 25 | minor, major, critical | Ethernet switch temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 65 | 72 | 80 |
| 19 | +12V | Threshold | Voltage | +12.0 V | minor, major, critical | Power in volts. Hysteresis: ±0.19 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 10.2 | 10.8 | 11.4 | 12.6 | 13.2 | 13.8 |
| 20 | +2.5V | Threshold | Voltage | +2.50 V | minor, major, critical | Power in volts. Hysteresis: ±0.05 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 2.12 | 2.25 | 2.38 | 2.63 | 2.75 | 2.88 |
| 21 | +3.3V | Threshold | Voltage | +3.30 V | minor, major, critical | Power in volts. Hysteresis: ±0.05 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 2.805 | 2.97 | 3.135 | 3.465 | 3.63 | 3.795 |
| 22 | +1.8V | Threshold | Voltage | +1.80 V | minor, major, critical | Power in volts. Hysteresis: ±0.02 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 1.53 | 1.62 | 1.71 | 1.89 | 1.98 | 2.07 |
| 23 | +0.9V | Threshold | Voltage | +0.90 V | minor, major, critical | Power in volts. Hysteresis: ±0.02 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 0.75 | 0.80 | 0.85 | 0.95 | 1.00 | 1.05 |
| 24 | +1.25V | Threshold | Voltage | +1.25 V | minor, major, critical | Power in volts. Hysteresis: ±0.02 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 1.062 | 1.125 | 1.187 | 1.312 | 1.375 | 1.437 |
| 25 | +1.1V VCORE | Threshold | Voltage | +1.10 V | minor, major, critical | Power in volts. Hysteresis: ±0.02 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 0.935 | 0.99 | 1.045 | 1.155 | 1.21 | 1.265 |
| 26 | +1.2V | Threshold | Voltage | +1.20 V | minor, major, critical | Power in volts. Hysteresis: ±0.02 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 1.02 | 1.08 | 1.14 | 1.26 | 1.32 | 1.38 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 29. MRM sensors managed by the IPMC (sheet 4 of 8)

| # | Name | Sensor type | Reading type | Normal reading | Alarms | Notes |
|---|---|---|---|---|---|---|
| 27 | +5V Standby | Threshold | Voltage | +5.00 V | minor, major, critical | Power in volts. Hysteresis: ±0.12<br>Default thresholds:<br>LNR: 4.25 LC: 4.5 LNC: 4.75 UNC: 5.25 UC: 5.5 UNR: 5.75 |
| 28 | Power Problem | Digital | Voltage | 0 | N/A | state 0: All payload power signals are good<br>state 1: One or more payload power signals has a problem |
| 29 | IPMC WD Reset | Digital | Module | 0 | N/A | Status of MRM module reset caused by IPMC watchdog.<br>state 0: Module is not in reset<br>state 1: Module is in reset |
| 30 | DSP-FS-0 Presence[a] | Digital | Sensor-specific | 0 | N/A | F-DSP farm presence in site 0.<br>state 0: Entity present<br>state 1: Entity absent<br>state 2: Entity disabled |
| 31 | DSP-TI-0 Presence[a] | Digital | Sensor-specific | 0 | N/A | T-DSP farm presence in site 0.<br>state 0: Entity present<br>state 1: Entity absent<br>state 2: Entity disabled |
| 32 | DSP-FS-1 Presence[a] | Digital | Sensor-specific | 0 | N/A | F-DSP farm presence in site 1.<br>state 0: Entity present<br>state 1: Entity absent<br>state 2: Entity disabled |
| 33 | DSP-TI-1 Presence[a] | Digital | Sensor-specific | 0 | N/A | T-DSP farm presence in site 1.<br>state 0: Entity present<br>state 1: Entity absent<br>state 2: Entity disabled |
| 34 | ATCA Physical IPMB-L | OEM | Sensor-specific | 0x00-0x0F | N/A | Bit [7:4] = Reserved<br>Bit [3] = IPMB-L override state<br>Bit [2:0] = IPMB-L local status |
| 35 | RTM Eject Closed | Digital | Slot or connector | 0 | N/A | state 0: RTM eject latch is open or not detected<br>state 1: RTM eject latch is closed |
| 36 | RTM FRU Hotswap | Digital | Sensor-specific | 0x00-0x07 | N/A | Return M0 to M7 ATCA hot swap states |
| 37 | RTM Present | Digital | Slot or connector | 0 | N/A | state 0: RTM is not installed<br>state 1: RTM is installed |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 29. MRM sensors managed by the IPMC (sheet 5 of 8)

| # | Name | Sensor type | Reading type | Normal reading | Alarms | Notes |
|---|---|---|---|---|---|---|
| 38 | OEM Active Boot Flash | OEM | Sensor-specific | 0 or 1 | N/A | Event data: Data field<br>Byte 1: Boot flash partition selected and reason.<br>Bit [1:0]:<br>00h = Flash bank 0 has been selected;<br>01h = Flash bank 1 has been selected<br>Byte 2: Not used.<br>Byte 3: The cause of reset:<br>00h = CFD timer was initialized<br>01h = CFD timeout has occurred<br>02h = Flash bank switch was externally initiated.<br>03h = No change |
| 39 | OEM Payload Reset | OEM | Sensor-specific | 0x00-0x0F | N/A | Event data: Data field<br>Byte 1: Payload reset occurrence and reason.<br>Bit [1:0]:<br>00h = No reset has occurred<br>01h = Reset occurred<br>Byte 2: The highest priority reset source<br>Byte 3: The second highest priority reset source. If only one reset occurs, this value is set to 0x00.<br>For information about OEM payload reset sensor readings, event data, and priorities, see Table 30 on page 137. |
| 40 | DSP-FS-0 Inlet [a, b] | Threshold | Temperature | 25 | minor, major, critical | F-DSP farm site 0 inlet temperature in degrees C. Hysteresis: ±3<br>Default thresholds:<br>LNR: -8; LC: -3; LNC: 2; UNC: 65; UC: 72; UNR: 82 |
| 41 | DSP-FS-0 Outlet [a, b] | Threshold | Temperature | 25 | minor, major, critical | F-DSP farm site 0 outlet temperature in degrees C. Hysteresis: ±3<br>Default thresholds:<br>LNR: -5; LC: 0; LNC: 5; UNC: 65; UC: 84; UNR: 101 |
| 42 | DSP-TI-0 Inlet [a, b] | Threshold | Temperature | 25 | minor, major, critical | T-DSP farm site 0 inlet temperature in degrees C. Hysteresis: ±2<br>Default thresholds:<br>LNR: -8; LC: -3; LNC: 2; UNC: 60; UC: 75; UNR: 85 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 29. MRM sensors managed by the IPMC (sheet 6 of 8)

| # | Name | Sensor type | Reading type | Normal reading | Alarms | Notes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | DSP-TI-0 Outlet [a, b] | Threshold | Temperature | 25 | minor, major, critical | T-DSP farm site 0 outlet temperature in degrees C. Hysteresis: ±2 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 60 | 75 | 85 |
| 44 | DSP-TI-0 +3.3V [a, b, c] | Threshold | Voltage | +3.30 V | minor, major, critical | T-DSP farm site 0 power in volts. Hysteresis: ±0.06 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 2.805 | 2.97 | 3.135 | 3.465 | 3.63 | 3.795 |
| 45 | DSP-TI-0 +1.8V [a, b, c] | Threshold | Voltage | +1.80 V | minor, major, critical | T-DSP farm site 0 power in volts. Hysteresis: ±0.01 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 1.53 | 1.62 | 1.71 | 1.89 | 1.98 | 2.07 |
| 46 | DSP-TI-0 +1.2V [a, b, c] | Threshold | Voltage | +1.20 V | minor, major, critical | T-DSP farm site 0 power in volts. Hysteresis: ±0.01 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 1.02 | 1.08 | 1.14 | 1.26 | 1.32 | 1.38 |
| 47 | DSP-TI-0 +1.1 [a, b, c] | Threshold | Voltage | +1.10 V | minor, major, critical | T-DSP farm site 0 power in volts. Hysteresis: ±0.01 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 0.935 | 0.99 | 1.045 | 1.155 | 1.21 | 1.265 |
| 48 | DSP-FS-1 Inlet [a, b] | Threshold | Temperature | 25 | minor, major, critical | F-DSP farm site 1 inlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -8 | -3 | 2 | 65 | 84 | 101 |
| 49 | DSP-FS-1 Outlet [a, b] | Threshold | Temperature | 25 | minor, major, critical | F-DSP farm site 1 outlet temperature in degrees C. Hysteresis: ±3 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 65 | 83 | 107 |
| 50 | DSP-TI-1 Inlet [a, b] | Threshold | Temperature | 25 | minor, major, critical | T-DSP farm site 1 inlet temperature in degrees C. Hysteresis: ±2 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -8 | -3 | 2 | 60 | 75 | 85 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 29. MRM sensors managed by the IPMC (sheet 7 of 8)

| # | Name | Sensor type | Reading type | Normal reading | Alarms | Notes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | DSP-TI-1 Outlet [a, b] | Threshold | Temperature | 25 | minor, major, critical | T-DSP farm site 1 outlet temperature in degrees C. Hysteresis: ±2 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | -5 | 0 | 5 | 60 | 75 | 85 |
| 52 | DSP-TI-1 +3.3V [a, b, c] | Threshold | Voltage | +3.30 V | minor, major, critical | T-DSP farm site 1 power in volts. Hysteresis: ±0.06 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 2.805 | 2.97 | 3.135 | 3.465 | 3.63 | 3.795 |
| 53 | DSP-TI-1 +1.8V [a, b, c] | Threshold | Voltage | +1.80 V | minor, major, critical | T-DSP farm site 1 power in volts. Hysteresis: ±0.01 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 1.53 | 1.62 | 1.71 | 1.89 | 1.98 | 2.07 |
| 54 | DSP-TI-1 +1.2V [a, b, c] | Threshold | Voltage | +1.20 V | minor, major, critical | T-DSP farm site 1 power in volts. Hysteresis: ±0.01 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 1.02 | 1.08 | 1.14 | 1.26 | 1.32 | 1.38 |
| 55 | DSP-TI-1 +1.1 [a, b, c] | Threshold | Voltage | +1.10 V | minor, major, critical | T-DSP farm site 1 power in volts. Hysteresis: ±0.01 | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 0.935 | 0.99 | 1.045 | 1.155 | 1.21 | 1.265 |
| 56 | PIM Enable A | Digital | Power supply | 0 | N/A | state 0 = Power supply A presence detected<br>state 1 = Power supply A failure detected | | | | | |
| 57 | PIM Enable B | Digital | Power Supply | 0 | N/A | state 0 = Power supply B presence detected<br>state 1 = Power supply B failure detected | | | | | |
| 58 | PIM -48V Current | Threshold | Current | N/A | minor, major, critical | This sensor measure current in amps. | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | N/A | N/A | N/A | 6.00 | 8.00 | 10.00 |
| 59 | PIM -48V A | Threshold | Voltage | 48.00 | minor, major, critical | This sensor measures voltage in volts. | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 36.00 | N/A | N/A | N/A | N/A | 75.00 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 29. MRM sensors managed by the IPMC (sheet 8 of 8)

| # | Name | Sensor type | Reading type | Normal reading | Alarms | Notes | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | PIM -48V B | Threshold | Voltage | 48.00 | minor, major, critical | This sensor measures voltage in volts. | | | | | |
| | | | | | | Default thresholds: | | | | | |
| | | | | | | LNR | LC | LNC | UNC | UC | UNR |
| | | | | | | 36.00 | N/A | N/A | N/A | N/A | 75.00 |
| 61-255 | | Open for dynamically added sensors from the RTM | | | | | | | | | |

[a] DSP farm site 0 indicates the bottom farm that contains DSP devices 11-20, and site 1 indicates the top farm that contains DSPs 1-10.

[b] These sensors physically reside on the DSP farms but are read and monitored by the IPMC. They are ignored if the corresponding Presence sensor indicates that this type of farm is not present at this site.

[c] These sensors do not generate alarm conditions unless the LMP software has notified the IPMC that the DSP farm is powered on.

## OEM Payload Reset Sensor details

Table 30 supplies additional details for sensor 39.

Table 30. OEM Payload Reset Sensor readings, event data, and priorities

| Priority | Reset Source | Reset type | Sensor Reading/Event Data |
|---|---|---|---|
| -- | No previous reset | N/A | 0x00 |
| 1 | Power-on reset | Cold | 0x01 |
| 2 | CFD watchdog | Cold | 0x02 |
| 3 | BMC watchdog (cold reset) | Cold | 0x03 |
| 4 | LMP HRESET_REQ# assertion | Cold | 0x04 |
| 5 | LMP CKSTP_OUT# assertion | Cold | 0x05 |
| 7 | IPMI command: FRU Control (cold reset) or Set Control State (payload reset) OEM command | Cold | 0x06 |
| 8 | HRESET* assertion | Cold | 0x07 |
| 9 | AWD_HRESET* (auxiliary watchdog) assertion | Cold | 0x08 |
| 10 | BMC watchdog (warm reset) | Warm | 0x81 |
| 11 | Front panel reset button | Warm | 0x82 |
| 12 | RTM reset button | Warm | 0x83 |
| 13 | IPMI command: FRU Control (warm reset) | Warm | 0x84 |
| 14 | AWD_SRESET* assertion | Warm | 0x85 |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Sensor alarm troubleshooting

Table 31 lists the recommended actions to take when the managed sensors generate alarms or events.

Table 31. Sensor alarms and recommended actions (sheet 1 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 00 | ATCA FRU Hotswap | Event only | M7 state | Remove module and reinsert it. If problem persists, remove module and contact customer support. |
| 01 | ATCA Physical IPMB0 | Event only | $I^2C$ data or clock lines problem | Investigate bus communication error. Possibly remove module and replace. |
| 02 | Ejector Closed | Event only | None | No action required; information only. |
| 03 | -48V Absent A | Event only | Voltage from -48V power source 'A' is not present. | Investigate power loss. |
| 04 | -48V Absent B | Event only | Voltage from -48V power source 'B' is not present. | Investigate power loss. |
| 05 | -48V Fuse Fault | Event only | A -48V fuse is not functioning. | Check the -48V fuses, and replace as necessary. |
| 06 | BMC Watchdog | Event only | Status only | No action required; information only. |
| | | | Payload cold reset | Investigate watchdog timeout. |
| | | | Payload power down | Monitor to see if the event is repeated for more than 1 day. |
| | | | Payload power cycle | |
| | | | Pre-timeout interrupt | |
| 07 | ZoneA Inlet Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 2 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 08 | ZoneB Inlet Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 09 | ZoneC Inlet Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 3 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 10 | ZoneD Inlet Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 11 | ZoneA Out Temp | Minor temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 82°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 90°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 4 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 12 | ZoneB Out Temp | Minor temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 82°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 90°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 13 | ZoneC Out Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 5 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 14 | ZoneD Out Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 15 | Rear Inlet Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 6 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 16 | Rear Out Temp | Minor temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 82°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 92°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 17 | MPC8548 Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 7 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 18 | ESwitch Temp | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 19 | +12V | Minor voltage high | Voltage over 12.6V threshold; module will not go into M4 state. [d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 13.2V threshold; module will not go into M4 state. [d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 13.8V threshold; module will not go into M4 state. [d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 11.4V threshold; module will not go into M4 state. [d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 10.8V threshold; module will not go into M4 state. [d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 0V threshold; module will not go into M4 state. [d] | Remove module and contact customer support. |
| 20 | +2.5V | Minor voltage high | Voltage over 2.63V threshold; module will not go into M4 state. [d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 2.75V threshold; module will not go into M4 state. [d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 2.88V threshold; module will not go into M4 state. [d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 2.38V threshold; module will not go into M4 state. [d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 2.25V threshold; module will not go into M4 state. [d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 2.12V threshold; module will not go into M4 state. [d] | Remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 8 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 21 | +3.3V | Minor voltage high | Voltage over 3.465V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 3.63V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 3.795V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 3.135V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 2.97V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 2.805V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 22 | +1.8V | Minor voltage high | Voltage over 1.89V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.98V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 2.07V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.71V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 1.62V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 1.53V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 23 | +0.9V | Minor voltage high | Voltage over 0.95V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.00V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 1.05V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 0.85V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 0.80V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 0.75V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 9 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 24 | +1.25V | Minor voltage high | Voltage over 1.312V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.375V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 1.437V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.187V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 1.125V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 1.062V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 25 | +1.1V VCORE | Minor voltage high | Voltage over 1.155V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.21V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 1.265V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.045V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 0.99V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 0.935V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 26 | +1.2V | Minor voltage high | Voltage over 1.26V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.32V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 1.38V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.14V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 1.08V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 1.02V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 10 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 27 | +5V Standby | Minor voltage high | Voltage over 5.25V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 5.5V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 5.75V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 4.75V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 4.5V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 4.25V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 28 | Power Problem | Event only | One or more payload power signals has a problem. | Monitor to see if the event is repeated for more than 1 day. |
| 29 | IPMC WD Reset | Event only | The H8 was reset due to a timeout of the IPMC watchdog. | Monitor to see if the event is repeated for more than 1 day. |
| 30 | DSP-FS-0 Presence | Event only | None | No action required; information only. |
| 31 | DSP-TI-0 Presence | Event only | None | No action required; information only. |
| 32 | DSP-FS-1 Presence | Event only | None | No action required; information only. |
| 33 | DSP-TI-1 Presence | Event only | None | No action required; information only. |
| 34 | ATCA Physical IPMB-L | Event only | $I^2C$ data or clock lines problem | If the IPMB-L bus does not recover on its own, hot swap the module and/or remove AMCs until the problem is resolved. |
| 35 | RTM Eject Closed | Event only | None | No action required; information only. |
| 36 | RTM Hotswap | Event only | M7 state | Remove module and reinsert it. If problem persists, remove module and contact customer support. |
| 37 | RTM Present | Event only | None | No action required; information only. |
| 38 | OEM Active Boot Flash | Event only | CFD watchdog timed out, secondary flash bank was set to active. | Investigate watchdog timeout. |
| | | | Flash bank was set externally. | Customer-specific. |
| | | | No change to flash bank | No action required; information only. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 11 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 39 | OEM Payload Reset | Event only | No previous reset | No action required; information only. |
| | | | Power-on reset | No action required; information only. |
| | | | CFD watchdog reset | Investigate cause of reset. |
| | | | BMC watchdog (cold reset) | |
| | | | LMP HRESET_REQ# assertion | |
| | | | LMP CKSTP_OUT# assertion | |
| | | | IPMI command: FRU Control (cold reset) or Set Control State (payload reset) | |
| | | | HRESET* assertion | |
| | | | AWD_HRESET* assertion | |
| | | | BMC watchdog (warm reset) | |
| | | | Front panel reset button | |
| | | | RTM reset button | |
| | | | IPMI command: FRU Control (warm reset) | |
| | | | AWD_SRESET* assertion | |
| 40 | DSP-FS-0 Inlet | Minor temperature high | Temperature over 65°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 72°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 80°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 12 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 41 | DSP-FS-0 Outlet | Minor temperature high | Temperature over 77°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 84°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 95°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 42 | DSP-TI-0 Inlet | Minor temperature high | Temperature over 60°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 85°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 13 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 43 | DSP-TI-0 Outlet | Minor temperature high | Temperature over 60°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 85°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 44 | DSP-TI-0 +3.3V | Minor voltage high | Voltage over 3.465V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 3.63V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 3.795V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 3.135V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 2.97V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 2.805V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 45 | DSP-TI-0 +1.8V | Minor voltage high | Voltage over 1.89V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.98V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 2.07V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.71V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 1.62V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 1.53V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 14 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 46 | DSP-TI-0 +1.2V | Minor voltage high | Voltage over 1.26V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.32V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 1.38V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.14V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 1.08V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 1.02V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 47 | DSP-TI-0 +1.1V | Minor voltage high | Voltage over 1.155V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.21V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 1.265V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.045V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 0.99V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 0.935V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 48 | DSP-FS-1 Inlet | Minor temperature high | Temperature over 60°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 85°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 15 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 49 | DSP-FS-1 Outlet | Minor temperature high | Temperature over 60°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 85°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 50 | DSP-TI-1 Inlet | Minor temperature high | Temperature over 60°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 85°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 2°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under -3°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -8°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 16 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 51 | DSP-TI-1 Outlet | Minor temperature high | Temperature over 60°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature high | Temperature over 75°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature high | Temperature over 85°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| | | Minor temperature low | Temperature under 5°C threshold. | Monitor to see if the alarm worsens. |
| | | Major temperature low | Temperature under 0°C threshold. | Monitor to see if the alarm worsens or is persistent for more than 1 hour. If persistent, remove and/or hot swap module. If still persistent, remove module and contact customer support. |
| | | Critical temperature low | Temperature under -5°C threshold; module will not stay in M4 state. | Remove and/or hot swap module. If problem persists, remove module and contact customer support. |
| 52 | DSP-TI-1 +3.3V | Minor voltage high | Voltage over 3.465V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 3.63V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 3.795V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 3.135V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 2.97V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 2.805V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 53 | DSP-TI-1 +1.8V | Minor voltage high | Voltage over 1.89V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.98V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 2.07V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.71V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 1.62V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 1.53V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 31. Sensor alarms and recommended actions (sheet 17 of 17)

| # | Name | Alarm or event | Possible errors or faults | Recommendation |
|---|---|---|---|---|
| 54 | DSP-TI-1 +1.2V | Minor voltage high | Voltage over 1.26V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.32V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 1.38V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.14V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 1.08V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 1.02V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 55 | DSP-TI-1 +1.1V | Minor voltage high | Voltage over 1.155V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage high | Voltage over 1.21V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage high | Voltage over 1.265V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Minor voltage low | Voltage under 1.045V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm worsens. |
| | | Major voltage low | Voltage under 0.99V threshold; module will not go into M4 state.[d] | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical voltage low | Voltage under 0.935V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 56 | PIM Enable A | Event only | None | No action required; information only. |
| 57 | PIM Enable B | Event only | None | No action required; information only. |
| 58 | PIM -48V Current | Minor current high | Current over 6.00 amps threshold. | Monitor to see if the alarm worsens. |
| | | Major current high | Current over 8.00 amps threshold. | Monitor to see if the alarm is persistent. If persistent, remove module and contact customer support. |
| | | Critical current high | Current over 10.0 amps threshold. | Remove module and contact customer support. |
| | | Minor current low | N/A | No action required; information only |
| | | Major current low | N/A | No action required; information only |
| | | Critical current low | N/A | No action required; information only |
| 59 | PIM -48V A | Critical voltage high | Voltage over 75V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Critical voltage low | Voltage under 36V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| 60 | PIM -48V B | Critical voltage high | Voltage over 75V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |
| | | Critical voltage low | Voltage under 36V threshold; module will not go into M4 state.[d] | Remove module and contact customer support. |

[d] Any voltage alarm during bootup keeps the MRM in M3 state. If the MRM has already reached M4 state when the alarm occurs, it remains in M4 state.



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

# Introduction

The following example header file is an example of test source code that supports diagnostics on F DSP farm cards .

# Example fdsp_farm.h file

```
/*
 * fdsp_farm.h
 *
 * Test code to perform diagnostics on Freescale DSP farm cards
 *
 * Author: RadiSys Corp.
 *
 * Copyright 2006 RadiSys Corp.
 *
 *  This program is free software; you can redistribute it and/or modify it
 *  under the terms of the GNU General Public License as published by the
 *  Free Software Foundation; either version 2 of the License, or (at your
 *  option) any later version.
 *
 *
 *  THIS SOFTWARE IS PROVIDED ``AS IS'' AND ANY EXPRESS OR IMPLIED
 *  WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
 *  MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED.
 *  IN NO EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT,
 *  INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING,
 *  BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS
 *  OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND
 *  ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR
 *  TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE
 *  USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
 *
 *  You should have received a copy of the GNU General Public License along
 *  with this program; if not, write to the Free Software Foundation, Inc.,
 *  675 Mass Ave, Cambridge, MA 02139, USA.
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
 */

#ifndef __cmddspfarm_h_guard_
#define __cmddspfarm_h_guard_

#define MAX_DSPS_PER_FARM 10


/* CCSR GPIO address */
#define FDSP_CCSR_ADDRESS           0xFFF10000
#define MSC8144_CCSR_GPIO           0xFFF27200
#define FDSP_GPIO_PDAT_REG          0xFFF27208
#define FDSP_GPIO_PDIR_REG          0xFFF27210
#define FDSP_GPIO_INPUT_ENABLE_REG  0xFFF78024
#define FDSP_GIER_INPUTS            0x0FC45F80



/***** GPIO Function Summary
N-unused not tied (should be outputs)
O-outputs
T-unused & tied to ground (must be inputs)
S-special funtion input (input enable must be on)
Q-special function output
X-not GPIO function by mode


FUNC   TTTT   SSTT   TTON   NSXO   QSOT   TTTT   IOOO   NNNN

GPIO   3322   2222   2222   1111   1111   1100   0000   0000
BIT    1098   7654   3210   9876   5432   1098   7654   3210

GIER   =  0x0FC45F80

******/

/* GPIO-Special Function  : I2C & TIMER2 */
#define FDSP_PSOR_USE_GPIO_I2C_AND_TMR20x0C040000

/* FDSP CFG_DSP GPIO[3:0] for DSP 0 only */
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
#define FDSP_CFGDSP_GPIO_PDIR       0x00000000

/* FDSP LED GPIO[5:4] */
#define FDSP_LED_GPIO_PDIR          0x00000030
#define FDSP_LED_GPIO_PDAT_MASK     0xFFFFFFCF
#define FDSP_LED_GPIO_LED_OFF       0x00000000
#define FDSP_LED_GPIO_LED_GREEN_ON  0x00000010
#define FDSP_LED_GPIO_LED_RED_ON    0x00000020

/* FDSP Alive test defines */
/* ALIVE bit GPIO[6] */
#define FDSP_ALIVE_GPIO_PDIR        0x00000040
#define FDSP_ALIVE_GPIO_MASK        0x00000040
#define FDSP_ALIVE                  0
#define FDSP_NOT_ALIVE              1

// farm location is GPIO 7 (input)
#define FDSP_GPIO_PDIR_P7IN_MASK    0xFFFFFF7F  // set pin 7 to input
#define FDSP_GPIO_PDAT_P7OUT_MASK   0x00000080

#define FDSP_GPIO_OUTPUTS (FDSP_LED_GPIO_PDIR | FDSP_ALIVE_GPIO_PDIR)

/* RCW defines */
#define RCWHR_ADDR                  0xFFF24804
#define DEVICE_ID_MASK              0x000003F0


/* use DDR */
#define FDSP_MAC_CFG_ADDR           0x40000000


/* INT_OUT is asserted when VIRQ_16 is asserted, sect. 13.2.2, sect. 13.4 */
#define INT_OUT_VIGR_ASSERT         0x00000200
#define INT_OUT_VIGR_DEASSERT       0xFFFFFDFF
#define FDSP_VIGR_ADDRESS        0xFFF27000 /* ver. 8 of reference manual */
#define FDSP_VISR_ADDRESS        0xFFF27008 /* ver. 8 of reference manual */
#define FDSP_VISR_INTOUT_MSK        0x00010000

/* NMI related test definitions */
#define FDSP_NMI_IRQ_IDX242 /* table 13.4 */
#define FDSP_EPIC_IPL60_ADDR        0xFFF004F0
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
#define FDSP_EPIC_ELR7_ADDR         0xFFF0051C
#define FDSP_EPIC_IPR7_ADDR         0xFFF0053C
#define FDSP_EPIC_ENDIS7_ADDR       0xFFF0055C

#define FDSP_EPIC_IPL60_MSK      0x009F0000 /* OR this to set NMI priority */
#define FDSP_EPIC_ELR7_MSK       0x00040000 /* OR to set as edge triggered */
#define FDSP_EPIC_ENDIS7_MSK     0xFFFBFFFF /* AND to disable the NMI */
#define FDSP_NMI_IPR7_MSK      0x00040000 /* AND to see if NMI is pending */

/* RCW Addresses */
#define FDSP_RCWLR_ADDR             0xFFF24800
#define FDSP_RCWHR_ADDR             0xFFF24804

/* Boot port values in RCWHR (after shift right 23 and mask applied) */
#define BPRT_MASK                   0x3F
#define BPRT_PCI_NO_DDR             0x00
#define BPRT_PCI_DDR_32MB           0x01
#define BPRT_PCI_DDR_256MB          0x02
#define BPRT_PCI_DDR_64MB           0x03
#define BPRT_PCI_DDR_128MB          0x04
#define BPRT_PCI_DDR_512MB          0x05
#define BPRT_PCI_I2C                0x08
#define BPRT_PCI_RIO_NO_I2C         0x09
#define BPRT_PCI_RIO_I2C            0x0A
#define BPRT_PCI_ENET_NO_I2C_SMII   0x0F
#define BPRT_PCI_ENET_NO_I2C_RMII   0x10
#define BPRT_PCI_ENET_NO_I2C_RGMII  0x11
#define BPRT_PCI_ENET_NO_I2C_MII    0x12
#define BPRT_PCI_ENET_NO_I2C_SGMII  0x13
#define BPRT_PCI_ENET_I2C_SMII      0x14
#define BPRT_PCI_ENET_I2C_RMII      0x15
#define BPRT_PCI_ENET_I2C_RGMII     0x16
#define BPRT_PCI_ENET_I2C_MII       0x17
#define BPRT_PCI_ENET_I2C_SGMII     0x18

/* RSR Address */
#define FDSP_RSR_ADDR               0xFFF24810



#if 0
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
/*************************************************************************
* PURPOSE: Initialise the DDR2 Memory
*
* NOTES:
*
* ENTRY:
*
* EXIT:
*************************************************************************/

void InitMSC8144_DDR2(void)
{
#define DDR_CFG                     0xFFF78010


   long *pliAddress;      /* The address being read */


//-------------------------------------------------------------------------
//DDR registers memory layout
//-------------------------------------------------------------------------
typedef struct {
    unsigned int cs0_bnds;
    unsigned int reserved1;
    unsigned int cs1_bnds;
    unsigned int reserved2;
} ddr_cs_bnds_t;

typedef struct {
    unsigned int cs0_config;
    unsigned int cs1_config;
} ddr_cs_config_t;

typedef struct {
    unsigned int ext_refrec;
    unsigned int timing_cfgs0;
    unsigned int timing_cfgs1;
    unsigned int timing_cfgs2;
    unsigned int ddr_sdram_cfg1;
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
    unsigned int ddr_sdram_cfg2;
    unsigned int ddr_sdram_mode1;
    unsigned int ddr_sdram_mode2;
    unsigned int ddr_sdram_md_cntl;
    unsigned int ddr_sdram_interval;
    unsigned int ddr_data_init;
    unsigned int reserved3;
    unsigned int reserved4;
    unsigned int ddr_sdram_clk_cnt;
} ddr_cfg_t;

// Base address for ddr_cs_bnds_t
static volatile ddr_cs_bnds_t* volatile ddr_cs_bnds =
(ddr_cs_bnds_t*)0xFFF20000;

// Base address for ddr_cs_config_t
static volatile ddr_cs_config_t* volatile ddr_cs_config =
(ddr_cs_config_t*)0xFFF20080;

// Base address for ddr_cs_config_t
static volatile ddr_cfg_t* volatile ddr_cfg = (ddr_cfg_t*)0xFFF20100;


   //Voltage select a^EUR" 0x1 a^EUR" select 1.8V
   //writemem32 0xFFF78010 0x00000001
   pliAddress = (long*) DDR_CFG;
   *pliAddress=0x00000001;

   // CS0_BNDS
   //Chip select 0 memory bounds [256MB]
   //Start address = 0x4000_0000
   //End address = 0x4fff_ffff
   //******* writemem32 0xFFF20000 0x0080009F
   ddr_cs_bnds->cs0_bnds = 0x0080009F;

   // CS0_CONFIG
   //CS0 configuration
   //Chip Select x Enable (CSxEN) = 0x1
   //Chip Select x Auto-Precharge Enable (APxEN) = 0x1
   //ODT for Reads (ODTR) = 0x0 no odt for reads
   //ODT for Writes (ODRW) = 0x0 no odt for writes
   //Number of Bank Bits (NBCS) = 0x1 a^EUR" 3 banks
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
//Number of Row Bits (NRBCS) = 0x1 a^EUR" 13 bits
//Number of Column Bits (NCBCS) = 0x2 a^EUR" 10 bits
//writemem32 0xFFF20080 0x80804102
ddr_cs_config->cs0_config = 0x80804102;

// TIMING_CFG_0
//Timing configuration 0
//Read-to-Write Turn-Around (RWT) = 0x0 - default
//Write-to-Read Turn-Around (WRT) = 0x0 - default
//Read-to-Read Turn-Around (RRT) = 0x0 - default
//Write-to-Write Turn-Around (WWT) = 0x0 - default
//Active Power-Down Exit Timing (APDE) = 0x2 - 2 clocks
//Precharge Power-Down Exit Timing (PPDE) = 0x2 - 2 clocks
//ODT Power-Down Exit Timing (ODTPDE) = 0x1 - 1 default
//Mode Register Set Cycle Time (MRSC) = 0x2 - 2 clocks
//writemem32 0xFFF20104 0x00220102
ddr_cfg-> timing_cfgs0 = 0x00220102;


// TIMING_CFG_1
//Timing configuration 1
//Precharge-to-Activate Interval (PRETOACT) = 0x3 - 3 clocks
//Activate-to-Precharge Interval (ACTTOPRE) = 0x9 - 9 clocks
//Activate to Read/Write Interval for SDRAM (ACTTORW) = 0x4 - 4 clocks
//MCAS Latency from Read Command (CASLAT) = 0x5 - 3 clocks
//Refresh Recovery Time (REFREC) = 0xD - 21 clocks
//Last Data to Precharge Minimum Interval (WRREC) = 0x3 - 3clocks
//Activate-to-Activate Interval (ACTTOACT) = 0x2 - 2 clocks
//Last Write Data Pair to Read Interval (WRTORD) = 0x2 - 2 clocks
//writemem32 0xFFF20108 0x3945D322
ddr_cfg-> timing_cfgs1 = 0x39452322;

// TIMING_CFG_2
//Timing configuration 2
//Additive Latency (AL) = 0x0
//MCAS-to-Preamble Override (CPO) = 0x1F - automatic
//Write Latency (WRL) = 0x2 - 2 clocks
//Read-to-Precharge (RDPRE) = 0x2 - 2 clocks
//Write Data Delay (WRTORD) = 0x1 - 1/4 clock
//Minimum CKE Pulse Width (CKEP) = 0x3 - 3 clocks
//Window for Four Activates (FOURA) = 0x01
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
//writemem32 0xFFF2010C 0x0F9044C1
ddr_cfg-> timing_cfgs2 = 0x021048c1;

//TIMING_CFG_3
//Timing configuration 3
//Set the extended refresh recovery time
//writemem32 0xFFF20100 0x0
ddr_cfg-> ext_refrec = 0x00010000;

// DDR_SDRAM_CFG_2
//Control configuration 2
//Force Self Refresh (FSR) = 0x0
//DLL Reset Disable (DLLRD) = 0x0
//DQS Configuration (DQS) = 0x1 a^EUR" differential DQS
//ODT Configuration (ODT) = 0x0 a^EUR" ODT not asserted
//Number of Posted Refreshes (NPR) = 0x1 refresh on time
//DRAM Data Initialization (DINIT) = 0x0 a^EUR" no data init
//writemem32 0xFFF20114 0x04001000
ddr_cfg-> ddr_sdram_cfg2 = 0x04001000;


// DDR_SDRAM_MODE_1
//Mode configuration 1
//EMR1 = 0x4004
//EMR = 0x0232
//writemem32 0xFFF20118 0x40040232
ddr_cfg-> ddr_sdram_mode1 = 0x40040232;

// DDR_SDRAM_MODE_2
//Mode configuration 2
//EMR2 = 0x0
//EMR3 = 0x0
//writemem32 0xFFF2011C 0x00000000
ddr_cfg-> ddr_sdram_mode1 = 0x0;

// DDR_SDRAM_INTRERVAL
//Interval configuration
//Refresh Interval (REFINT) = 0x0600 a^EUR" 7.5 usec between refreshes
//Precharge Interval (BSTOPRE) 0x0200 a^EUR" banks will remain open
//for 512 clocks.
//writemem32 0xFFF20124 0x06000200
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
    ddr_cfg-> ddr_sdram_interval = 0x030c0000;

    // DDR_SDRAM_CLK_CNTL
    //Clock control configuration
    //Clock launched A^1/2 cycle after address/command
    //writemem32 0xFFF20130 0x02000000
    ddr_cfg-> ddr_sdram_clk_cnt = 0x02000000;

    // DDR_SDRAM_CFG_1
    //Control configuration 1
    //Memory controller enable = 0x1 - enabled
    //Self Refresh Enable (SREN) = 0x0 - disabled
    //ECC Enable (ECCE) = 0x0 - disabled
    //SDRAM Type (STYPE) =0x3 a^EUR" DDR2
    //Dynamic Power Management Mode (DYNPWR) =0x0 - disabled
    //32-Bit Bus Enable (32BE) = 0x0 a^EUR" 32bit interface
    //Non-concurrent Auto Precharge (NCAP) a^EUR" 0x0 a^EUR"
    //concurrent AP allowed
    //2T Timing Enable (2TEN) = 0x0 - @T Disabled
    //Half-Strength Drive Enable (HSE) = 0x0 a^EUR" full strength
    //Bypass Initialization (BI) = 0x0 a^EUR" Bypass disabled
    //writemem32 0xFFF20110 0x83000000
    ddr_cfg-> ddr_sdram_cfg1 = 0x83000000;

}
#endif

#endif // guard
```



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

**Artisan Technology Group** is an independent supplier of quality pre-owned equipment

## Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

## We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

## Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP