Modular Media Converter (MMC)

User Guide, Release 1.6.0

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MMC User's Guide
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DECLARATION OF CONFORMITY

Responsible Party Name:	RGB Networks, Inc.
Address:	390 West Java Drive Sunnyvale, CA 94089, U.S.A.
Telephone:	(877) 742-6389
Declares that product:	Modular Media Converter—MMC Complies with Part 15 of the FCC Rules.

This device complies with Part 15 of the FCC Rules. Operations are subject to the following two conditions: (1) This device must not be allowed to cause harmful interference; (2) This device must accept any interference received, including interference that may cause undesired operation.

Modifying the equipment without RGB Networks' authorization may result in the equipment no longer complying with FCC requirements for Class A or Class B digital devices. In that event, your right to use the equipment may be limited by FCC regulations, and you may be required to correct any interference to radio or television communications at your own expense.

For Class A Equipment

Note: 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.

MMC User's Guide document history

Part Number	Software Version	Doc Release Date	Changes
250-0038-01, Rev D	1.6	04/30/12	Localization and content updates.
250-0038-01, Rev C	1.6	03/08/12	Add safety messages and associated localization
250-0038-01, Rev B	1.5	04/19/2010	Logo and copyright updates
MMC-UM	1.1	09/22/2006	Initial release

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CHAPTER 1

Introducing the MMC

RGB's Modular Media Converter (MMC) delivers the industry's highest density solution for ASI to Gigabit Ethernet conversion. Based on RGB's flexible, scalable and modular platform, the MMC expedites deployments of advanced video services over IP, simplifies operation and management, and reduces operational and capital costs.

An ideal solution for environments with existing ASI interfaces, the MMC supports routing and conversion of any ASI input transport streams to any output Gigabit Ethernet port. A single MMC chassis supports up to 24 ASI ports using four ASI modules and up to 8 Gigabit Ethernet ports.

The MMC's modular and flexible architecture provides scalability designed to grow with each operator's changing environment. The MMC is fully MPEG-2-compliant and interoperable with leading cable industry equipment.

RGB's MMC is configurable through an easy-to-use, web-accessible graphical user interface or through SNMP using standard network management applications. The SNMP MIBs are readily available from the MMC start page.

Figure 1. RGB's Modular Media Converter

This guide describes the installation, configuration, use, and FRU replacement for the MMC.

Document Organization

This guide is organized as follows:

- Chapter 1, *Introducing the MMC* – (this chapter) describes the contents and conventions used in the MMC User's Guide.
- Chapter 2, *Overview* – provides a detailed description of the MMC and its features.
- Chapter 3, *Installation* – describes the tools, precautions, and steps necessary to install the system in the network.
- Chapter 4, *Configuring the MMC* – describes the initial product setup and configuration using the Java-based MMC Element Manager.
- Chapter 5, *Using The MMC* – describes how to perform input and output mapping using the MMC.
- Chapter 6, "Monitoring the MMC," discusses the methods used to monitor the health of the MMC.
- Chapter 7, *Troubleshooting* – provides information about system status, alarm messages, software upgrades, and contacting technical support.

- Chapter 8, *Field-replaceable Units* – shows you how to replace all field-replaceable units in the MMC.
- Chapter 9, *MMC Specifications* – includes information about system specifications including physical, environmental, and regulatory and compliance definitions.
- Appendix A, *Localized Cautions and Warnings* – provides translations of warnings and cautions used in this manual.

Document Audience

This guide is for system administrators and operators who are responsible for installation and maintenance of the MMC and for processing a network broadcast. You should be familiar with general video and networking terminology, and should be familiar with basic installation of hardware. Most importantly, you must be familiar with the basics and principles of broadcast network processing.

Document Conventions

Table 1 provides an easy way to recognize important information in the text.

Table 1. Document Conventions

When you see:	It means:
	**Notes** are indicated by the icon shown at left, and point out information that may not be part of the text but provide tips and other helpful advice.
	**Cautions** are indicated by the icon on the left, and let you know that an action may have undesirable consequences if the instructions are not followed correctly. Cautions also indicate that failure to follow guidelines could cause damage to equipment or loss of data. All caution statements in this manual are translated. See Appendix A, *Localized Cautions and Warnings* – to read the localized versions.
	Les symboles "**ATTENTION**", représentés par l'icône de gauche, indiquent qu'une action peut avoir des conséquences indésirables si les instructions ne sont pas suivies correctement. Les symboles " ATTENTION " indiquent également que le fait de ne pas suivre les instructions peut causer des dommages à l'équipement ou résulter en une perte de données.
	Das links abgebildete Symbol **Vorsicht** weist darauf hin, dass ein Vorgang unerwünschte Konsequenzen haben kann, falls die Anweisungen nicht korrekt befolgt werden. Das Symbol Vorsicht weist außerdem darauf hin, dass Geräte beschädigt oder Daten verloren gehen können, wenn die Anweisungen nicht befolgt werden.

Table 1. Document Conventions (Continued)

When you see:	It means:
	**Warnings** are indicated by the icon on the left, and indicate that failure to take the necessary precautions or to follow guidelines could cause harm to equipment and personnel. All warning statements in this manual are translated. See Appendix A, *Localized Cautions and Warnings* – to read the localized versions.
	Les symboles " **AVERTISSEMENT** ", représentés par l'icône de gauche, indiquent que le fait de ne pas prendre les précautions nécessaires ou de ne pas suivre les instructions peut endommager l'équipement ou provoquer des blessures.
	Das links abgebildete Symbol **Warnung** weist darauf hin, dass Geräte beschädigt oder Personen verletzt werden können, wenn die notwendigen Vorsichtsmaßnahmen nicht eingehalten oder die Anweisungen nicht befolgt werden.
Online, clicking any blue link takes you to the item to which the link refers.	

Graphics Used

In some cases, the screens shown in this manual may have been slightly modified after the manual was released, or may appear slightly different on different browsers. Every effort has been made to ensure that the latest images are used. In all cases, the functionality described is current at the time of writing.

CHAPTER 2

Overview

The MMC supports routing and conversion of any ASI input transport stream to any output Gigabit Ethernet port.

The MMC accepts any standard definition (SD) or high definition (HD) MPEG-2 transport streams carrying MPEG-2, MPEG-4/H.264 or VC-1 compressed programs. A single MMC chassis supports up to 24 ASI ports using four ASI modules and up to 8 Gigabit Ethernet ports.

The MMC supports output port redundancy where any single ASI input transport stream can be mirrored across several Gigabit Ethernet output ports. Each ASI port can only contain a single transport stream. The MMC will pass through all tables including those compliant with MPEG, DVB and ATSC standards.

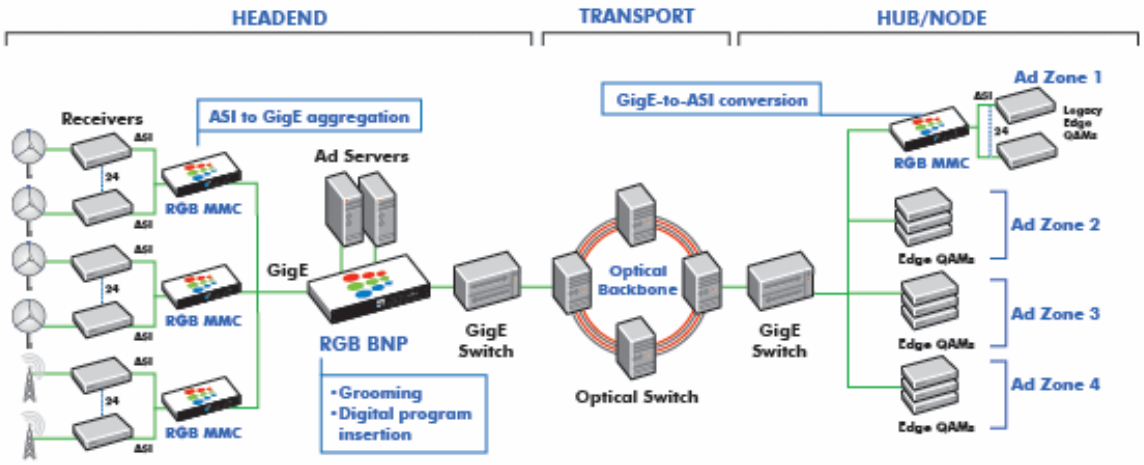
In This Chapter:

Product Features

In addition to being software-upgradeable, scalable, and highly reliable, the MMC has the following features:

- Based on RGB's flexible Video Intelligence Architecture™ (VIA).
- 1 rack unit chassis (1RU), 170 W maximum power consumption.
- Eight GigE interfaces.
- Supports up to four ASI modules, each with six ASI ports.
- Supports SPTS and MPTS transport streams input and output.
- A single MMC chassis can convert up to 24 ports of ASI to Gigabit Ethernet,.
- A graphical user interface for easy configuration and management.
- SNMP v2-based management, including SNMP traps and alerts.
- Supports transport stream input and output bit rate monitoring.

The following illustration demonstrates how an MMC in a centralized architecture can centrally serve multi-ad zones from one device.



Conversion

Table 2 summarizes the input and output rates of conversion methods provided by the MMC.

Table 2. Conversion Rates

Direction	Format	Physical Connector	Maximum Bitrate
Input	DVB-ASI	BNC	213 Mbps
Input/Output	Gigabit Ethernet	RJ-45	950 Mbps

Format Conversion and Transport Routing

The input programs can be SPTS or MPTS transports containing any supported Program Element Stream (PES) listed in Table 4. You can route any PES or program stream from the MMC's input to any output on the MMC, or duplicate a single input to multiple output ports.

The ASI ports are organized into eight groups. Figure 2 and Table 3 describe how two sets of three consecutive ports are grouped together for each ASI module.

Figure 2. ASI Port Groups (rear of MMC chassis)

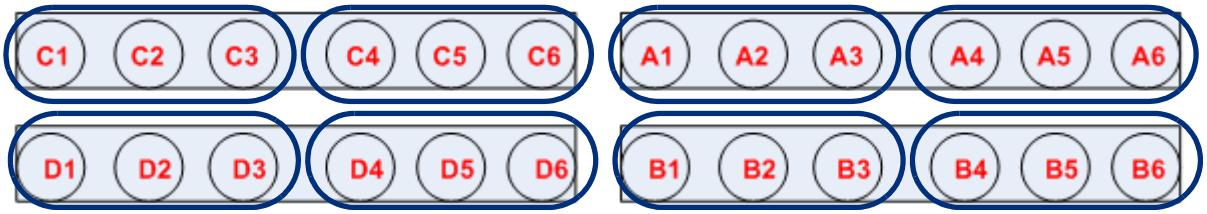


Table 3. ASI Port Groups

Group #	Ports
1	A1, A2, A3
2	A4, A5, A6
3	B1, B2, B3
4	B4, B5, B6

Group #	Ports
5	C1, C2, C3
6	C4, C5, C6
7	D1, D2, D3
8	D4, D5, D6

Transports using the IP interface (MPEG/IP) can be selected or can originate from multicast or Unicast addresses set with unique UDP ports

Class D multicast addresses range from 224.0.0.0 through 239.255.255.255 with port numbers from 0 to 65535 of the TCP/IP Networking Protocol; Unicast addresses range within class A, class B, and class C of the TCP/IP Networking Protocol.

Table 4. Routing and conversion

Formats	Specification
Video	MPEGAny standard definition (SD) or high definition (HD) MPEG-2 transport streams carrying MPEG-2, MPEG-4/H.264 or VC-1 compressed programs SD and HD resolutionsAll NTSC and PAL resolutions
Audio	All audio formats

Modular Media Converter Components

This section describes the physical characteristics of the MMC. Before installing, configuring, or replacing any component of the MMC, please be sure that you understand the chassis and its components.

Note: *This unit is intended for local (intrabuilding) connections only and is not designed or evaluated for direct connections to the public telecommunications/cable distribution system. Cable and Ethernet connections should be made in accordance to the National Electrical Code (NEC).*

Make sure that at least one of the following conditions are met[1]:

- Cable runs are located in the same building as this unit
- Any copper cables that run through air between buildings are less than 42m (140ft)

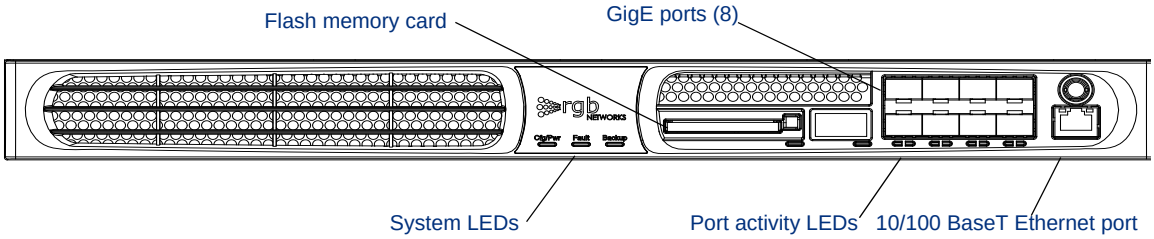
1. These options are from the US National Electrical Code, Sections 800.10, 800.12, 800.13, 800.31, 800.32, 800.33, and 800.40.

- Cable runs between buildings are directly buried
- Cable runs between buildings are in underground conduit, where a continuous metallic cable shield or a continuous metallic conduit containing the cable is bonded to each building grounding electrode system.

Front Panel

Figure 3 shows the front view of the MMC with the bezel in place. When the front bezel is removed, the RS-232 serial port is visible, as shown in Figure 4.

Figure 3. Front panel (with bezel)

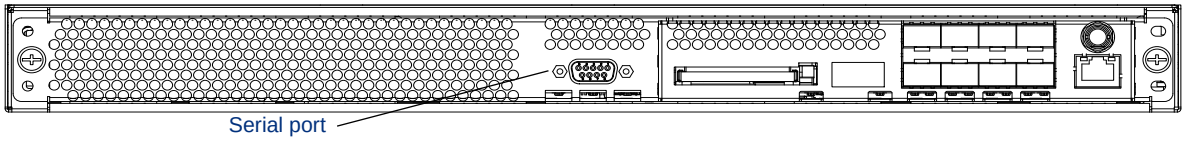


Each MMC has eight GigE ports, capable of use as input and output.

The ports, LEDs, and compact flash card are located on the Gigabit Ethernet Processor (GBP) module. For instructions on removing and replacing the GBP module, see “Replacing a Gigabit Ethernet Processor (GBP) Module” on page 59.

The RS-232 serial port (Figure 4) is used only by field service personnel. Under normal circumstances you will not need to access this port.

Figure 4. Front panel (without bezel)



LED Indicators

The primary Light Emitting Diodes (LEDs) visible on the front of the MMC chassis are shown in Figure 5. These LEDs indicate the general health of the MMC.

Figure 5. LEDs

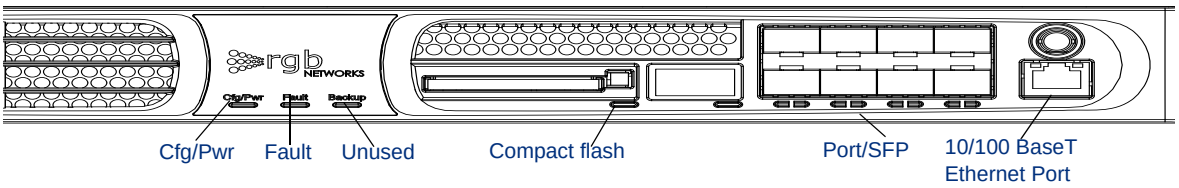


Table 5 describes the patterns used by the LED indicators.

Table 5. LED indicators

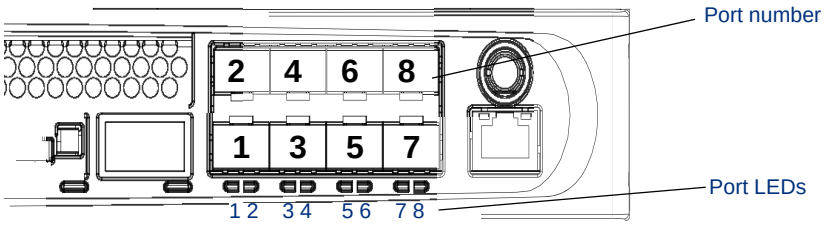
LED	Color	Indication
CFG/PWR	Off	No power to chassis
	Solid Green	The host FPGA configuration is loaded
	Solid Red	Chassis is powering up and configuration load is in progress
Fault	Blinking Green	GigE input streams detected
	Blinking Orange	No GigE input stream detected
	Blinking Red	Hardware fault (such as system fan is off)
Unused	Solid Green	Unused
Compact flash[a]	Blinking Green	Activity present
	Solid Green	Compact flash OK
	Blinking Red	Compact flash not installed
	Solid Red	Error is present
GigE	Solid Green	SFP and cable installed, link active
	Solid Red	SFP installed but no link active
10 BaseT (Ethernet control)	Solid Green	Autonegotiated link status
	Solid Yellow	Activity

a. Compact flash is necessary for loading code and saving configuration.

Port Mapping

Figure 6 shows the SFP port mapping scheme. These port numbers correspond with the port LEDs described in "LED Indicators," next.

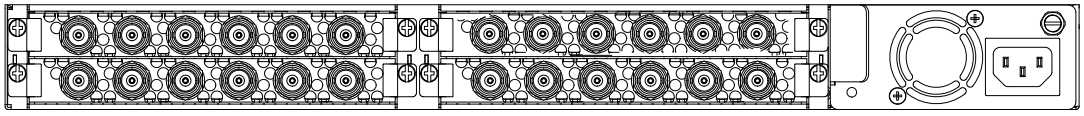
Figure 6. Port mapping and LED indicators



Rear Panel

Figure 7 shows the rear view of the MMC, fully loaded with four ASI modules.

Figure 7. Rear panel



ASI cards have six ASI ports each, which can support up to 213 Mbps configured as an input or output.

The right side of the chassis holds the power supply, including the power connector and fan. The power supply fan is not replaceable, except as part of the power supply. For details about replacing the modules and power supply, see Chapter 8, “Field-replaceable Units.”

The LED behaviors on ASI ports are described in Table 6. For each ASI port:

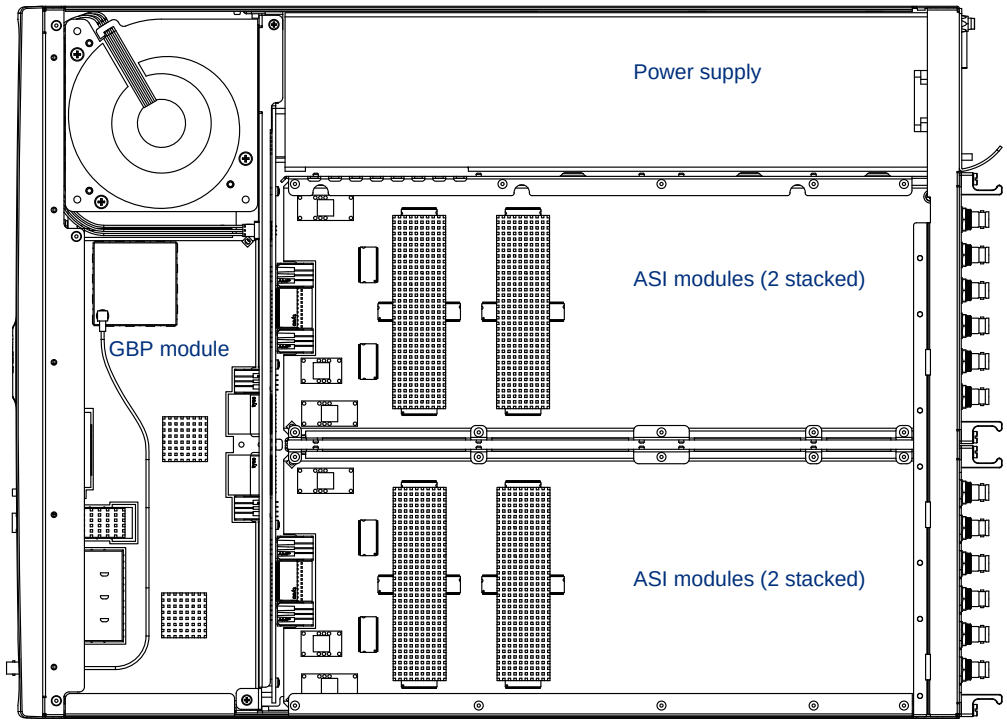
Table 6. LED Activity for ASI ports

Color and Activity	Description
solid red	ASI port is not configured
black	received mode but no incoming traffic
solid green	received mode with valid transport stream and sync lock achieved
solid orange	received mode with valid transport stream but a link fault
quickly-blinking green	transmit mode with valid input transport stream
short bursts of green	transmit mode with no incoming traffic
blinking orange	transmit mode with overflow (tx error)

MMC Component Layout

The MMC consists of three main sections: a network interface module—called the Gigabit Ethernet Processor (GBP) module, four ASI card modules, and the power supply assembly.

Figure 8. MMC chassis, components visible



CHAPTER 3

Installation

This chapter provides the information necessary to install the MMC into a rack. Read this entire chapter before beginning, and perform the installation in the order described. Chapter 4, "Configuring the MMC," describes the configuration procedure.

In This Chapter:

Before You Begin

Required Equipment

Be sure that you have the required items listed below before you begin the installation of the MMC. You will need:

- Populated MMC chassis, included:
  - AC or DC power supply
  - ASI modules
- Compact flash card (ships separately)
- AC power cord, included if AC power supply is used
- DC connector cables, if DC power supply is used
- Front and rear rack mount brackets, included
- Rack mount bracket screws, 22 included
- 1 M4 grounding nut, included
- 8 rack mount screws
- Phillips and slotted screwdrivers (not included)
- 1 ring lug for grounding
- Crossover cable long enough to connect the MMC and the management workstation (not included)

Electrostatic Precautions

Warning! *Whenever computer components are handled (especially during installation), the equipment can be damaged by the buildup of static electricity. Take precautions before touching any internal components or boards by wearing an ESD wrist strap or working on an antistatic mat. Always hold system modules by the edges and avoid touching any electronic circuitry on the cards.*

Caution:

See also "Handling Computer Components" on page 64 and "Electrostatic Advisory" on page 64 for the localized version of the above advisories.

Rack Mounting the MMC

The MMC is mounted into a standard 19-inch rack using rack mount brackets for both the front and rear of the system.

When choosing the location for the MMC within a rack, make sure that the MMC will be placed within the rack evenly, and that the installation will not cause uneven mechanical loading and weight distribution.

Do not mount the MMC into any rack that obstructs clean air flow either in the front or the rear. Generally, an aisle of at least 15 inches is the minimum distance to ensure proper air flow.

Caution: *Be sure that the MMC is mounted in a location that meets the environmental conditions shown in Table 7.*

See also "Operations Environment" on page 65 for the localized version of the above caution.

Table 7. Environmental Requirements

Condition	Limits
Storage Temperature	-40° to 70° C (-40° to 158° F)
Operating Temperature	0° to 40° C (32° to 104° F)
Humidity	5% to 95% (non-condensing)

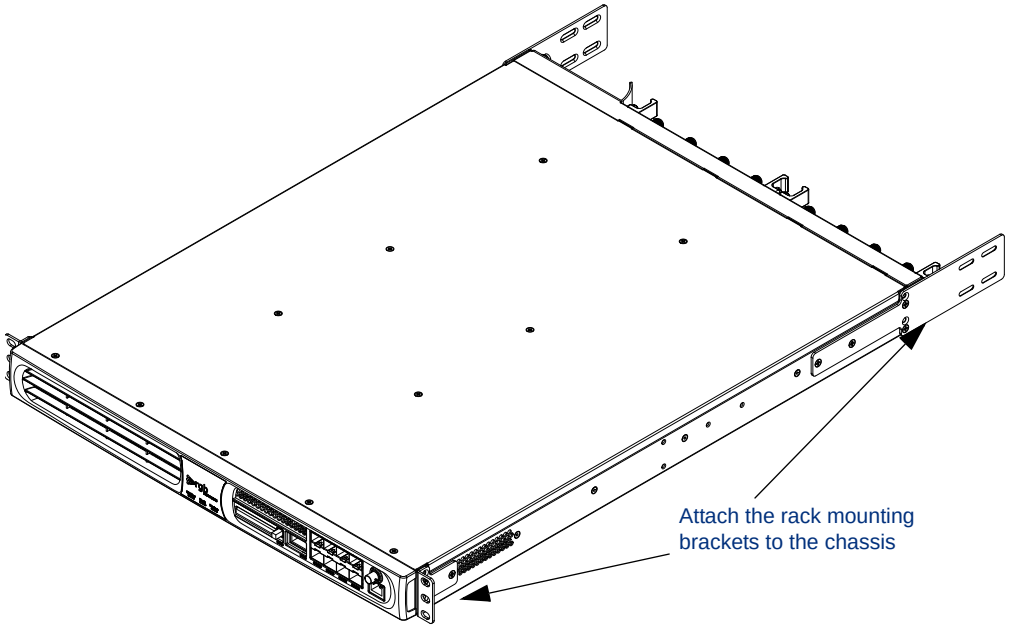
Caution: *Please install the MMC so as to be easily accessible and as close to a power socket outlet as possible.*

See also "Power Socket Proximity" on page 65 for the localized version of the above caution.

To install the MMC into a rack:

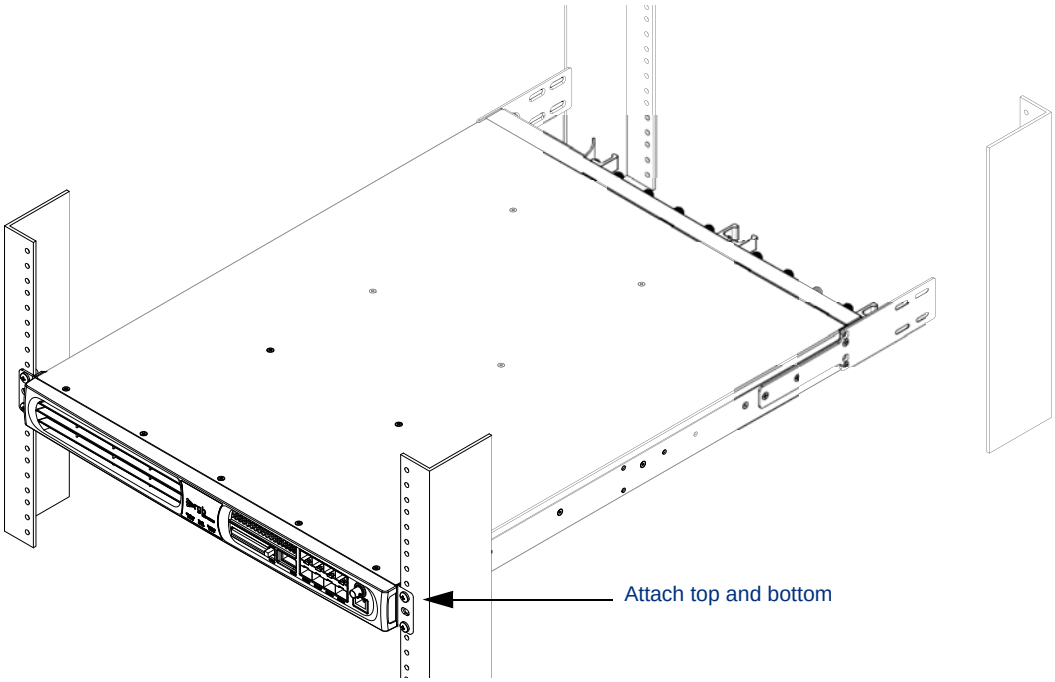
1. Using the provided screws, attach the front rack mount bracket to one side of the chassis, as shown in Figure 9.
2. Using the provided screws, attach the rear rack mount bracket to the chassis.
3. Repeat steps 1 and 2 on the other side of the chassis.

Figure 9. Attaching the rack mount brackets



4. Secure the front of the chassis to the rack using two screws on each side, as shown in Figure 10.

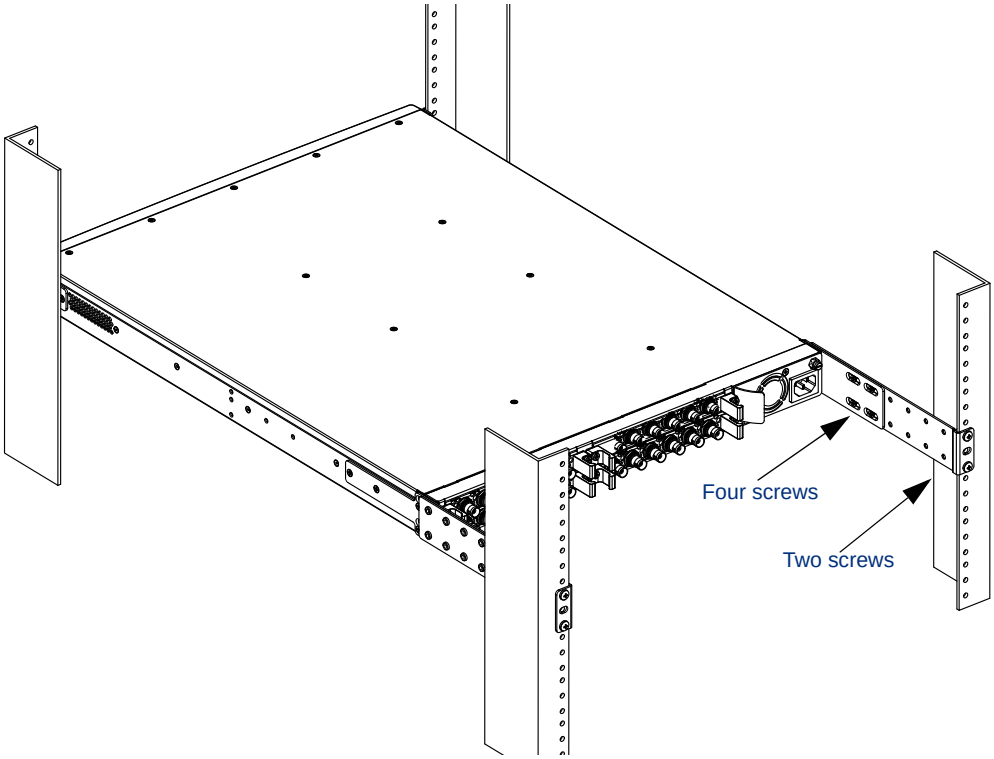
Figure 10. Securing the chassis to the rack



5. Connect the rear rack mount extensions between the rear rack mount brackets and the rack, as shown in Figure 11.

   Slide the mounting brackets to the correct distance and secure them. The rack mount bracket requires four screws, and the rack requires two screws per side.

   Figure 11. Connecting the rear rack mount brackets

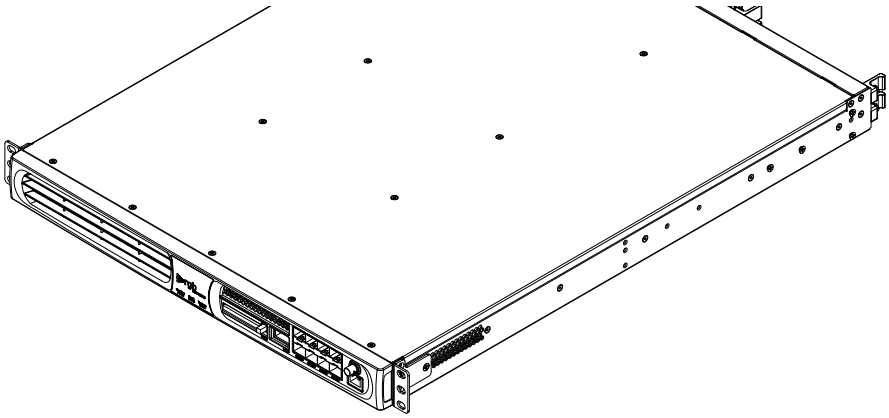


Alternate Rack Mount Procedure

This method works best for reduced-depth racks.

1. Using the provided screws, attach the front rack mount bracket to one side of the chassis as shown in Figure 12.

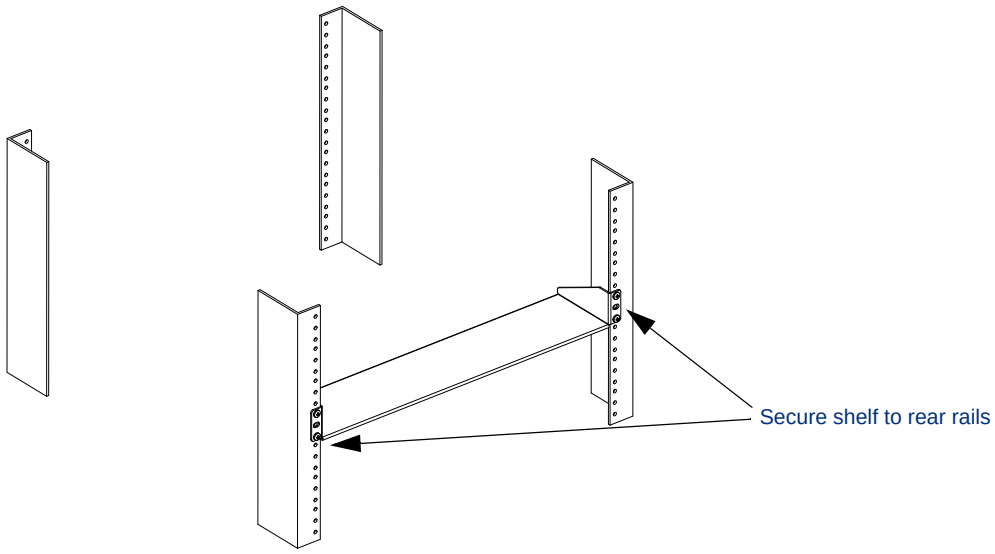
   Figure 12. Front brackets attached



2. Repeat step 1 on the other side of the chassis.

3. Install the chassis rear rack shelf to the rear mounting rails of the rack using two screws on each side as shown in Figure 13.

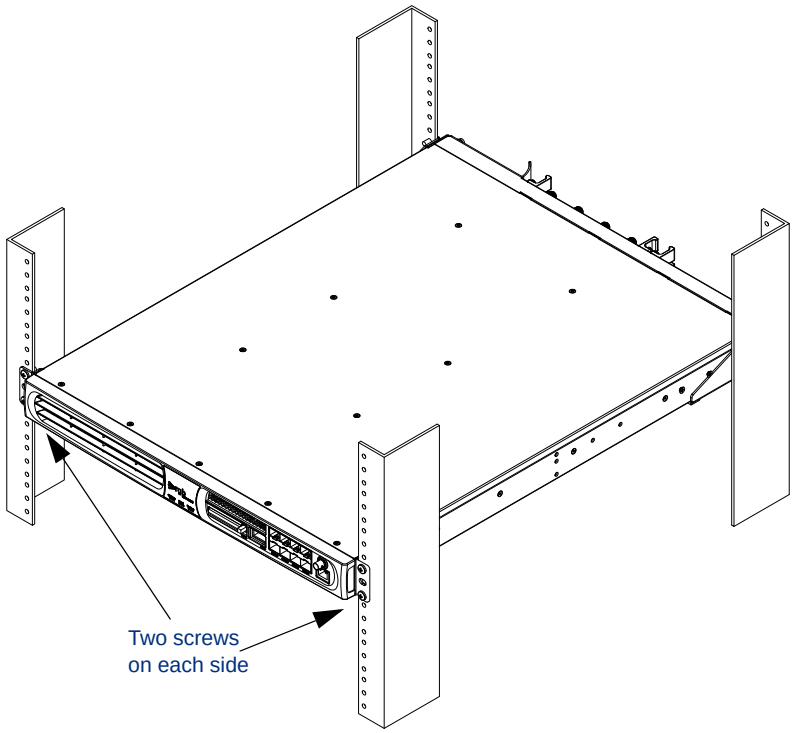
Figure 13. Rack shelf



4. Install the MMC chassis in the rack.

The rear edge of the chassis will rest on the rear rack shelf. Secure the front of the chassis to the rack using two screws on each side, as shown in Figure 14.

Figure 14. Mounted MMC



Grounding the MMC

Warning! *The MMC must be properly grounded to ensure safe operation. Before you connect power or turn on the MMC, ground the chassis. This section provides one method of grounding. There may be others: check your network configuration for details.*

See also "Grounding Equipment" on page 65 for the localized version of the above warning.

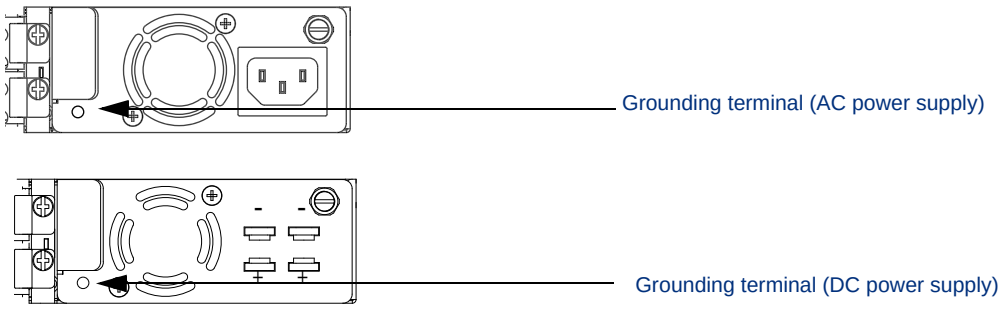
To connect the chassis ground:

1. Using a length of wire, terminate one end with a ring lug.

   For use with a DC power supply, the grounding wire must be a minimum of 12 AWG.
2. Using the provided M4 nut, install the ring lug on the grounding terminal.

   The grounding terminal is located at the rear of the MMC chassis (Figure 15), located at the lower left of the power supply, just beneath the power supply handle.

   Figure 15. Grounding terminal, rear of chassis: AC power supply top, DC power supply bottom



3. Using wire strippers, strip off 3/8 inch of insulation from the other end of the wire.
4. Attach the stripped wire into a grounding hole on the equipment rack.

Installing SFP modules

For optical output, a Small Form Factor Pluggable (SFP) optical or electrical interface module is required. The SFP modules come in a variety of ITU Grid 100GHz spacing wavelengths for connection to short haul (1000Base SX) or long haul (1000Base LX) optical networks.

- GigE interfaces that meet 1000Base SX specifications support 850 nm wavelengths for distances up to 550 meters.
- GigE interfaces that meet 1000Base LX specifications support 1310 nm and 1550 nm wavelengths for distances up to 70 kilometers.

SFPs approved for use with the MMC are based on the Multi-Source Agreement (MSA) and listed in Table 8:

Table 8. Supported SFPs

Manufacturer	Model
Tyco	1382392-3: Multi mode 850 nm, 1 GigE, LC Optical transceiver
	1511094-3: Single mode 1310 nm, 1 GigE, LC Optical transceiver
Finisar	FCMJ-8521-3: Active copper SFP
	FTRJ1319P1BTL: Single mode 1310 nm, 1GbE, LC optical transceiver
	FTRJ8519P1BTL: Multi mode 850 nm, 1GbE, LC optical transceiver

To install an SFP, follow the manufacturer's instructions. General guidelines to SFP installation include:

1. Consider your network and cabling requirements and verify that the SFP you are installing is an approved model as described in Table 8.
2. Insert the SFP into the port.

   SFPs are keyed so they can only be installed one way.
3. Slide the SFP into the port until it clicks into place and the LED is activated.

Applying Power to the MMC (AC Power Supply)

Caution: *Make sure that the safety screw is in the locked position (turned counterclockwise) after the power supply is installed, but before connecting power. Note that the locked position may be different than that of similar units. This ensures that the power supply cannot be accidentally disconnected, causing possible damage.*

See also "Safety Screw Lock Advisory" on page 66 for the localized version of the above caution.

Once installed in a rack, apply power to the chassis.

Before you apply power to the chassis, make sure that the circuit, wiring, and connections that you are using to supply the power will not become overloaded by the MMC(s). For power consumption details, see "MMC Specifications" on page 62.

Caution: *The power cord is the disconnect device for the MMC. There is no power switch: once connected to the power outlet, the unit powers up immediately.*

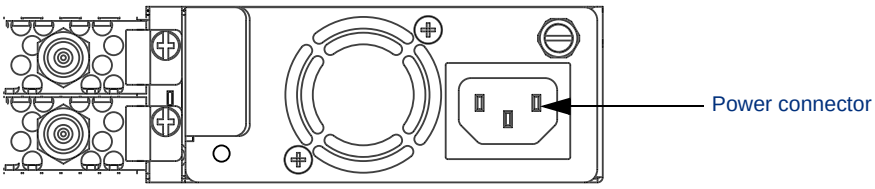
See also "Equipment On and Off" on page 66 for the localized version of the above caution.

Connect all ports before applying power.

To connect AC power to a MMC:

1. Locate the AC power cable included with the MMC chassis.
2. Plug one end of the power cable into the MMC power connector.
3. The AC power connector is located on the power supply.

Figure 16. Connect power



4. Plug the other end of the power cable into the input power source.

   The unit should now have power. Check the LEDs to verify that power has been applied. See "LED Indicators" on page 15 for details.

When the MMC is installed and powered on, verify that the **Cfg/Pwr** LED is solid green. See "LED Indicators" on page 15.

Disconnecting Power from the MMC (AC Power Supply)

Caution: *Make sure that the safely screw is in the locked position (turned counterclockwise) after the power supply is installed, but before connecting power. Note that the locked position may be different than that of similar units. This ensures that the power supply cannot be accidentally disconnected, causing possible damage.*

See also "Safety Screw Lock Advisory" on page 66 for the localized version of the above caution.

To remove power from the MMC, disconnect the power cable from the power source, that is, pull the plug from the power connector. This is the only way to ensure that the unit is not receiving power.

Applying Power to the MMC (DC Power Supply)

Before Applying Power

Caution: *Only trained personnel should install or replace this equipment.*

See also "Qualified Personnel" on page 66 for the localized version of the above caution.

- Remove all jewelry, including rings, necklaces, and watches. Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.
- The protective earth connection should be connected before proceeding with the power connection.
- Confirm that the DC power source is powered off during installation.
- For a centralized DC power connection, the unit must be installed in a restricted access location in accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA 70.
- Damage may occur if the power is connected improperly.

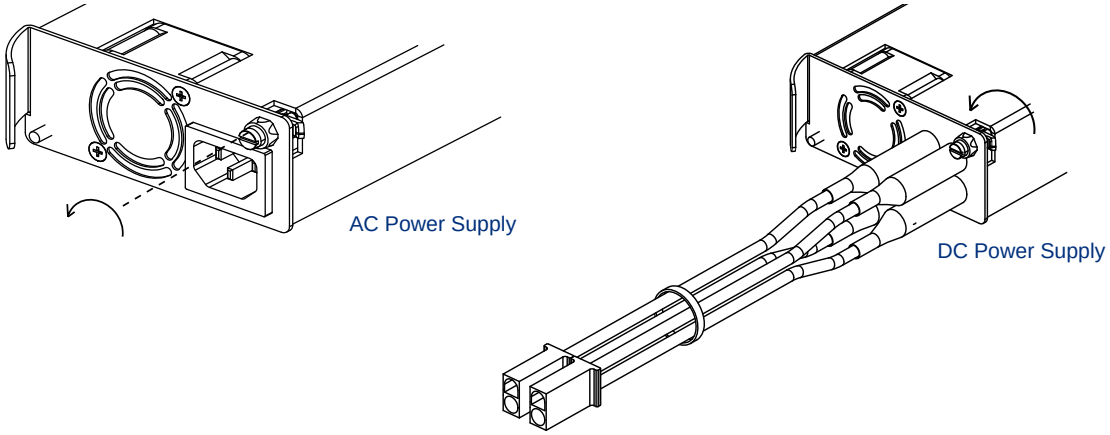
Applying Power

Once installed in a rack, apply power to the chassis.

Caution: *Make sure that the safety screw is in the locked position (turned counterclockwise) after the power supply is installed, but before connecting power. Note that the locked position may be different than that of similar units. This ensures that the power supply cannot be accidentally disconnected, causing possible damage.*

See also "Safety Screw Lock Advisory" on page 66 for the localized version of the above caution.

Figure 17. AC and DC Power Supplies



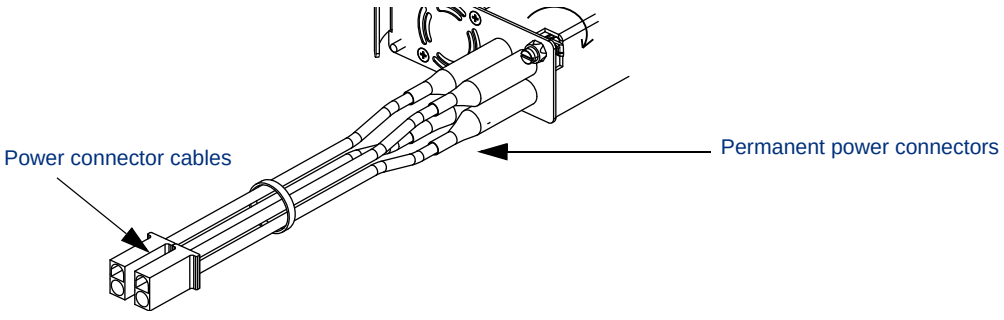
Before you apply power to the chassis, make sure that the circuit, wiring, and connections that you are using to supply the power will not become overloaded by the MMC(s). See Chapter 9, "MMC Specifications" for power consumption details.

Connect all ports before applying power.

To connect DC power to a MMC:

1. Cut the provided DC connector cables to the correct length to reach the MMC from the power source.
2. The DC power connectors are permanently attached to the power supply. Attach the connector cables from the power source to the MMC power connectors.

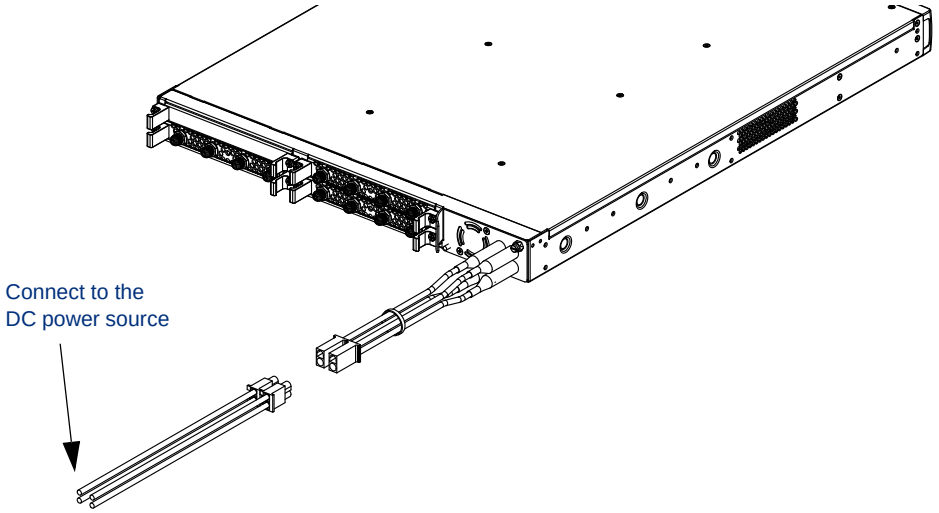
Figure 18. Connecting DC Power Cables to the MMC



3. Attach the other end of the power connector cables into the input power source.

   The power cables should be attached to a UL Listed 20 amp circuit breaker.

Figure 19. DC Power Cables Connected to MMC



4. To power the unit on, toggle the external circuit breaker to the ON position. There is no circuit breaker on the MMC.

- The unit should now have power. Check the LEDs to verify that power has been applied. See "LED Indicators" on page 15 for details.
- When the MMC is installed and powered on, verify that the **Cfg/Pwr** LED is solid green. See "LED Indicators" on page 15.

Disconnecting Power from the MMC (DC Power Supply)

To remove power from the MMC, toggle the circuit breaker to the OFF position. This is the only way to ensure that the unit is not receiving power.

Connecting External Ports

The MMC chassis has three discrete types of ports. When connecting ports, be sure to use the correct cabling. This section describes the port types and basic cabling, but the actual cabling requirements will depend on your specific network configuration and needs.

Fast Ethernet Management Port

The 10BaseT Ethernet port is used to communicate with an external console for SNMP configuration control, maintenance diagnostics, status monitoring, and fault notification. The external console can be a workstation on the IP network.

GiGE Port

The Gigabit Ethernet port must be fitted with small-form-factor pluggables (SFPs). See Table 8 for a list of tested and approved SFPs that can be used with the MMC.

ASI Port

The number of ASI ports in your MMC chassis depends on the number of ASI cards that are installed. Up to four ASI cards can be installed, each with six ports.

Installing the Compact Flash Card

The MMC uses a compact flash card to load software and save configuration information. You cannot use your MMC without it.

Caution: *Your license is attached to the compact flash (CF); do not discard it. Even if a CF card fails, keep the device and contact RGB technical support for instructions on repair or obtaining a working replacement.*

See also "Compact Flash Advisory" on page 67 for the localized version of the above caution.

If it was not shipped with your MMC, you must install it. Remove the compact flash from the shipping container and install it into the compact flash slot, located on the front of the MMC chassis.

If your compact flash card fails, contact technical support for details about replacement. See page 53 for details on contacting technical support.

CHAPTER 4

Configuring the MMC

The MMC is configurable through a Java-based graphical user interface available through a standard Web browser, or through SNMP using standard network management applications. The easy-to-use interface offers a variety of features that simplify the setup and operation of the MMC, including drag and drop mapping; alarms and logs window; and full configurability of ASI and Gigabit Ethernet (GigE) ports.

This chapter describes how to configure the MMC using the Element Manager. You also use the Element Manager to monitor MMC as described in Chapter 6, "Monitoring the MMC."

In This Chapter:

Obtaining the Java Runtime Environment

The Element Manager requires that the management workstation on which it is running has Java™ Runtime Environment (JRE) v1.5 or higher. If your management workstation does not have the correct JRE installed, it is available free on your RGB CD-ROM, from Sun Microsystems' web site, and from the RGB CustomerCare Support web site at http://support.rgbnetworks.com.

To receive a user name and other information for use with the RGB CustomerCare Support site, ask your RGB salesperson or call 877-RGB-NETW. Additional technical notes and useful software are available from the CustomerCare site, as well.

To download the JRE from Sun:

1. Open a browser with an internet connection and point to:

   http://java.sun.com

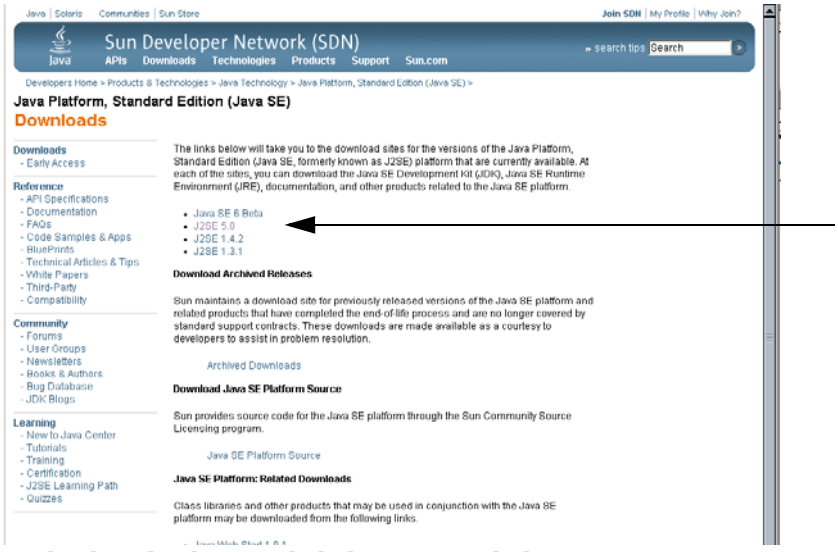
Note: *The screens shown in this section are from the java.sun.com site at the time the manual was written and may be updated without notice. The instructions provided here are for general information only.*

2. Select **Java SE** from the Popular Downloads page (Figure 20).

Figure 20. Java Popular Downloads

3. Select **J2SE 5.0.x** from the platform selection page.

Figure 21. Java Platform Selectiion



4. On the download page, click the **JDK 5.0** link (Figure 22).

Figure 22. JDK 5.0 Download Link

5. Accept the licensing agreement and click **Continue**.
6. Choose the appropriate platform for your system.

   For Windows installations, do ***not*** choose the Offline option.
7. Click **Open**.
8. Follow the installation instructions provided by Sun Microsystems.

Launching the MMC Element Manager

You do not need to install the MMC Element Manager software. It is installed on the MMC at the factory, and you connect via the IP address of the MMC.

To launch the MMC Element Manager:

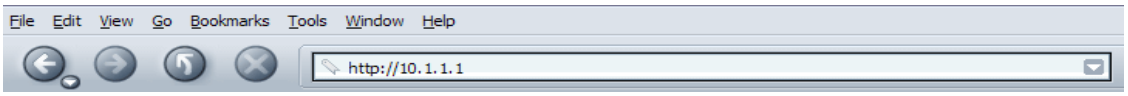
1. Open a browser session on the management workstation or on any computer that has access to the MMC.

   The IP address of the workstation being used to access the MMC must be changed to an address on the same subnet as the MMC chassis.

2. Enter the IP address of the MMC into the browser's address field. The default IP address is 10.1.1.1.

   For easier access, bookmark the URL or set it as the home page.

   Figure 23. Entering the URL for Access to the MMC Element Manager



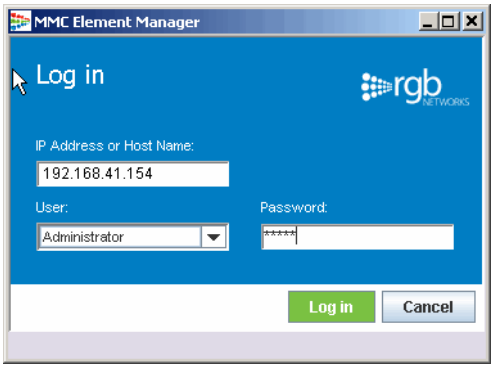
3. At the MMC Element Manager Home page (Figure 24), click the **Launch** MMC **Element Manager** link.

   Figure 24. MMC Element Manager Home Page

The system detects whether or not the latest version of the MMC Element Manager software is installed, and performs an update if needed.

Once launched, the window displays the Login Window. Log in as described in “Logging In” on page 30.

Figure 25. Login dialog



You can also use the links provided in the MMC Home page (Figure 24), to get the latest Java version, view the system log as described in“The System Log” on page 51, version information, and use the SNMP functions.

Using the Element Manager

Use the MMC Element Manager to configure your system, map input/output conversions, monitor system status, and upgrade software as needed.

Logging In

1. Once you have launched the MMC Element Manager and clicked the login link at the top of the page, the login screen appears.
2. Enter the IP address of the MMC that you want to manage or configure.

   By default, the IP address for the MMC is 10.1.1.1.
3. Select your user account and enter the corresponding password in the Password field. *Passwords are case sensitive*. To change the password, see “MMC Element Manager Overview” on page 31.

   Three levels of user, each with specific access to the system, have permission to use the Element Manager.

If you log in as a user with limited privileges, any option not available to you is grayed out and cannot be selected. User levels include:

Table 9. User levels

User name	Default Password	Permission
User	**User**	Logging in as *User* provides read-only access. You cannot make any changes to the configuration.
Operator	**Operator**	Logging in as *Operator* provides both read and write access. Operators can make changes to the configuration. This is the normal login level.
Administrator	**Admin**	The *Administrator* user is typically only used by Field Application Engineers and Technical Support personnel, however access can be granted to key headend personnel. The Admin has the highest rights and can change the password.

4. Click **Apply**.

By default, the MMC Element Manager now opens to display the Grooming screen.

MMC Element Manager Overview

The MMC Element Manager provides an easy way to configure your MMC system. The MMC Element Manager contains the following menus and tabs, which are used to access specific screens:

Table 10. Element Manager Menus

Menu	Use
File	Exit the MMC Element Manager
View	Refreshes the currently active window
Maintenance	Upgrade software and reboot system
Help	Display online help and application information

Some primary tabs have subtabs to further refine the view, others use selections that increase the granularity of the information shown and provide access to further activities. The primary tabs include:

Table 11. Element Manager Primary Tabs

Tab	Use
Configuration	MMC configuration is performed through the subtabs of the Configuration tab. These tabs include Mapping, Ethernet Control Ports, GigE Ports, SNMP Trap, and Change Password
Alarms and Events	Specified events and alarms can be tracked on this tab. Configure the alarms and events to display only the items you are interested in
Chassis	The Chassis tab has no subtabs, but provides a quick overview of the state of the MMC. Clicking a port opens port information and configuration dialogs

Status Information

The lowest portion of the MMC Element Manager window provides status information. The information displayed depends on the current selection and status of the MMC.

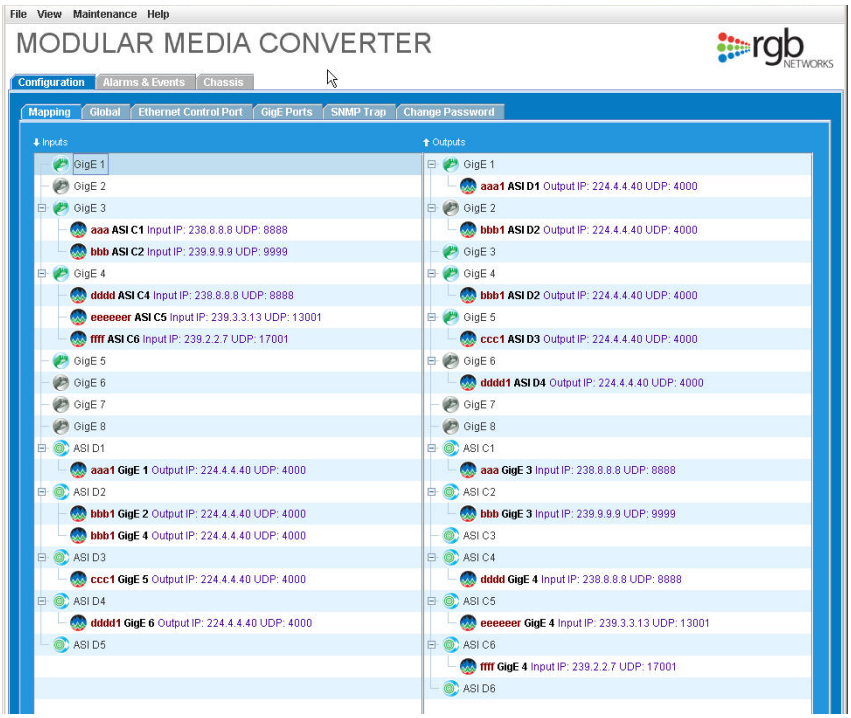
The left section displays the IP address of the MMC to which the MMC Element Manager is connected. The right portion of the status bar shows the most recent, highest priority alert triggered, if one exists. Alerts are color-coded for fast identification.

Mapping

Mapping is used to configure ASI to GigE media conversion. Use the following steps to perform port mapping:

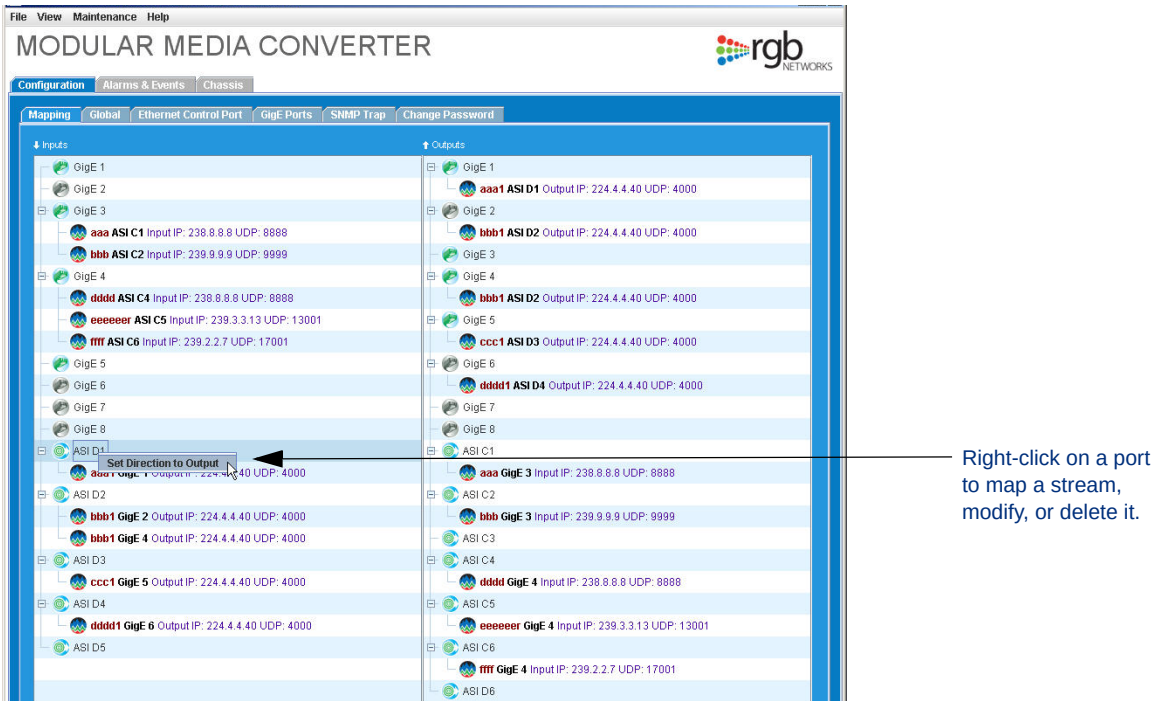
1. Select the tab and subtab **Configuration > Mapping**.
2. To map a conversion from ASI to GigE, drag and drop the stream from the ASI port to the desired GigE port.

Figure 26. MMC Mapping screen



You can also select a port or stream and right-click to see the pop-up menu. From the pop-up menu, you can map a port.

Figure 27. Right-click for Popup Menu



For more information about mapping and working with streams and ports, see Chapter 5, “Using The MMC”.

Global Configuration

Use the **Global Configuration** tab (Figure 28) to set the system time.

Figure 28. Global Configuration

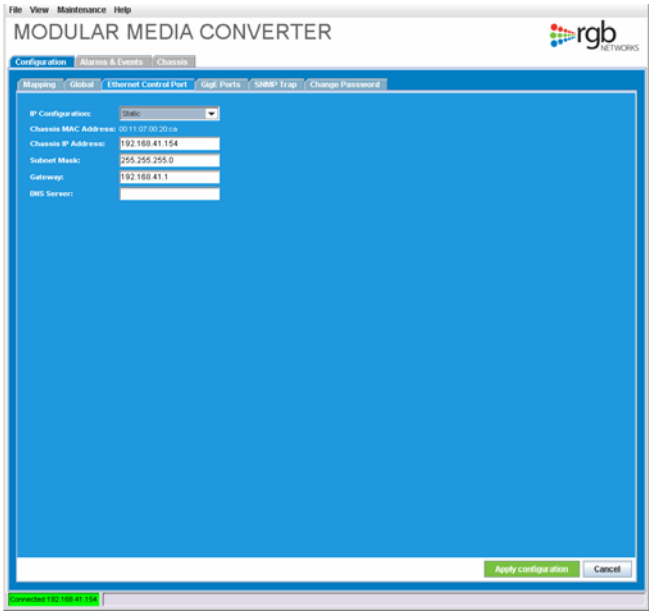
1. Enter the IP address of the NTP server that the MMC should connect to.
2. Select your local time zone from the list.
3. Click **Apply configuration** to complete the setting.

Ethernet Control Port Configuration

There is one 10/100T Ethernet port for each MMC. Go to the Ethernet Control Port screen (Figure 29) to view and configure the Ethernet Control port:

1. Select the tab and subtab **Configuration > Ethernet Control Ports**.

Figure 29. Ethernet Control Port screen



2. Table 12 describes the variables that can be changed. Depending on whether you choose a static configuration or a DHCP configuration, the variables may be different. By default, a static IP address is used.

Table 12. Ethernet Control Port Configuration Fields

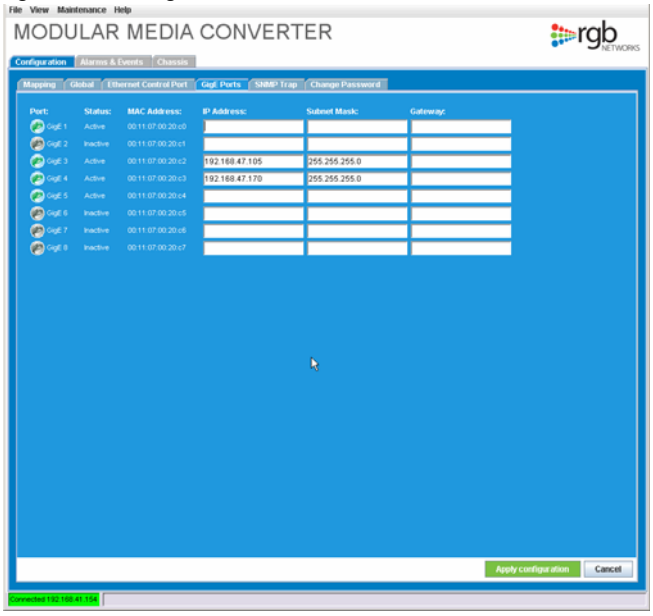
Field	Description
IP Configuration	Select the source of the MMC boot configuration file from the pull-down menu: choices include BOOTP/ DHCP or static
Chassis MAC Address	A read-only field that displays the MAC address of the MMC
Chassis IP Address	If static is selected, enter the IP address of the MMC
Subnet Mask	If static is selected, enter the subnet mask of the MMC; you cannot leave this field blank
Default Gateway	If static is selected, enter the IP address where packets are routed out of the local network
(Optional) DNS Server	Enter the IP address of the DNS server, if one is being used. If none is used, leave this blank

3. Click **Apply Configuration** to save and load the changes.

GigE Port Configuration

All GigE ports can be configured from the MMC *Element Manager*, using the **GigE Ports** screen (Figure 30). The GigE ports support full duplex processing of transport streams; this means that the same GigE port can be used for input and output.

Figure 30. GigE Ports screen



To modify a GigE port:

1. Tab to **Configuration** > **GigE Ports**.

   All GigE ports are shown in a list. For easy identification, the ports appear with a color-coded icon to recognize active and inactive ports. Active ports are shown in green.

2. Make any necessary changes to the GigE port configuration. Type the changes directly into the appropriate field for the GigE port being modified.

   GigE port parameters are listed and described in Table 13.

Table 13. GigE Port Configuration Fields

Field	Description
Port	The GigE port number, listed sequentially
Status	Read-only; the current status of the port
MAC Address	Read-only; the MAC address of the port
IP Address	The IP address for the interface; if no IP address is used, leave the field empty
Subnet Mask	The subnet mask address
Default Gateway	The default gateway to use, if applicable

3. Click **Apply Configuration** to apply the changes to your configuration.

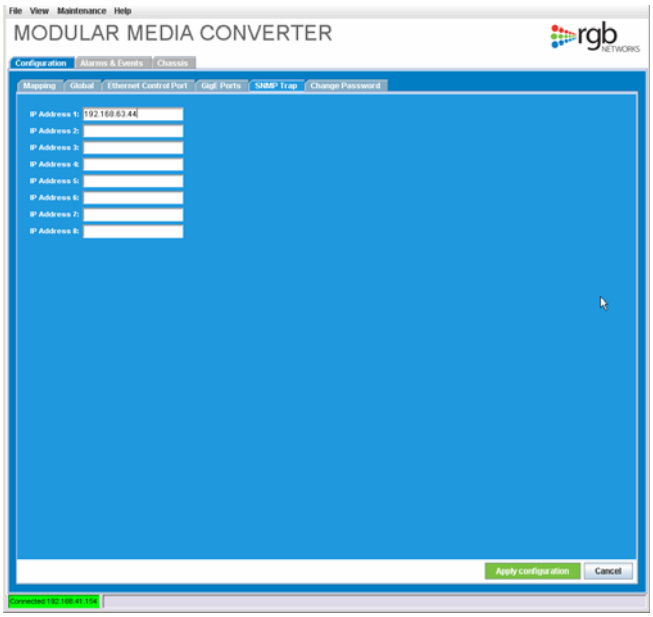
SNMP Configuration

The SNMP (Simple Network Management Protocol) tab lets you set the IP addresses for the SNMP traps. These traps then issue event notifications to the network management station. SNMP is the network management protocol used in TCP/IP networks. You can use SNMP to monitor and control network devices as well as manage configurations and collect statistics. You can change the SNMP information at any time.

Configure an SNMP agent to send traps to an SNMP manager to report significant events. Use either an in-band or an out-of-band IP interface to manage the system with SNMP. To configure SNMP for system management with SNMP, assign an IP address to an in-band Ethernet port, then set the destination IP address to which the traps are forwarded by the system agent.

1. Tab to **Configuration** > **SNMP Trap**. The SNMP Configuration window appears.

Figure 31. SNMP Trap screen



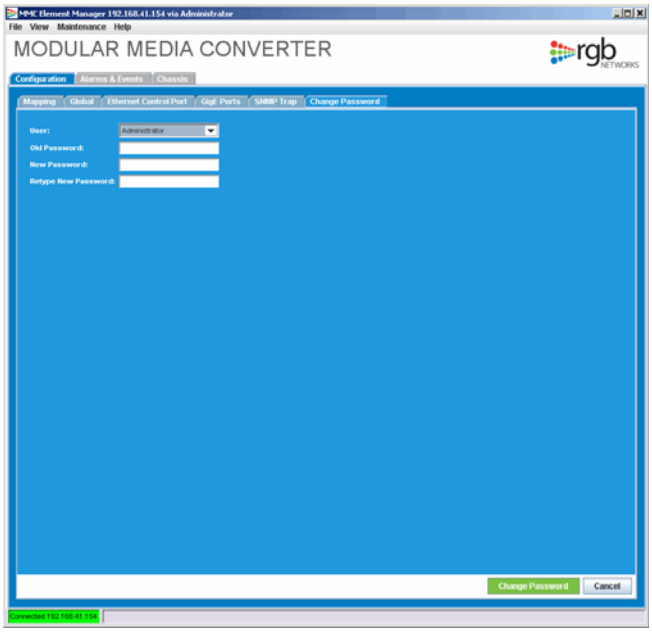
2. Enter the IP address for each SNMP trap desired: up to eight addresses can be specified. This indicates up to eight ports.
3. Click **Apply configuration** to save your configuration.

Changing the User Password

Only the Administrator user can change passwords. To change the password for a user:

1. Tab to Change Password. The Change Password window appears (Figure 32).

Figure 32. Change Password screen



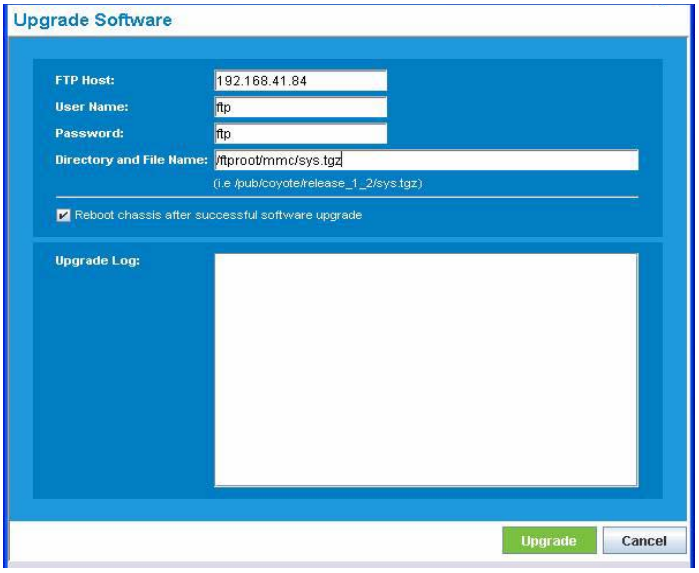
2. Select the user whose password is to be changed.
3. Type the old (current) password for this use in the Old Password field.
4. Type the new password in the New Password field. Passwords should be something not easily guessed.
5. Type the same password in the Retype Password field. Passwords are case sensitive, so make sure that you type it exactly as you entered it above.
6. Click **Change Password** to change the password.

Upgrading Software

To upgrade to the latest MMC software, download the software from an FTP server and use the MMC Element Manager upgrade feature to perform the upgrade. You will receive the specific information about the upgrade software when you purchase an upgrade, or when you are notified that an upgrade is available. Upgrade support software includes upgrades for both active and standby units in a redundant system.

1. From the main Element Manager menu, select **Maintenance > Upgrade**. The Upgrade Software dialog appears (Figure 33).

   Figure 33. Upgrade Software dialog



2. Enter the information required to perform the upgrade.

   You will need to know the IP address of the FTP server on which the upgrade software package resides, and if one is required, the user name and password for that server. The correct syntax to enter appears directly in the window.

   Reboot chassis after success lets you reboot the chassis automatically, enable this feature; otherwise, you must reboot the chassis manually

3. Click **Upgrade** to begin the upgrade procedure.

   As the software is upgraded, you will see information appear in the Upgrade Log portion of the dialog. This helps you follow the upgrade progression.

4. After the upgrade is complete and the status shows 100%, the upgrade is installed.

5. If this is a downgrade, clear the Java Web Start cache as described in “Clearing the Web Start Cache” on page 40.

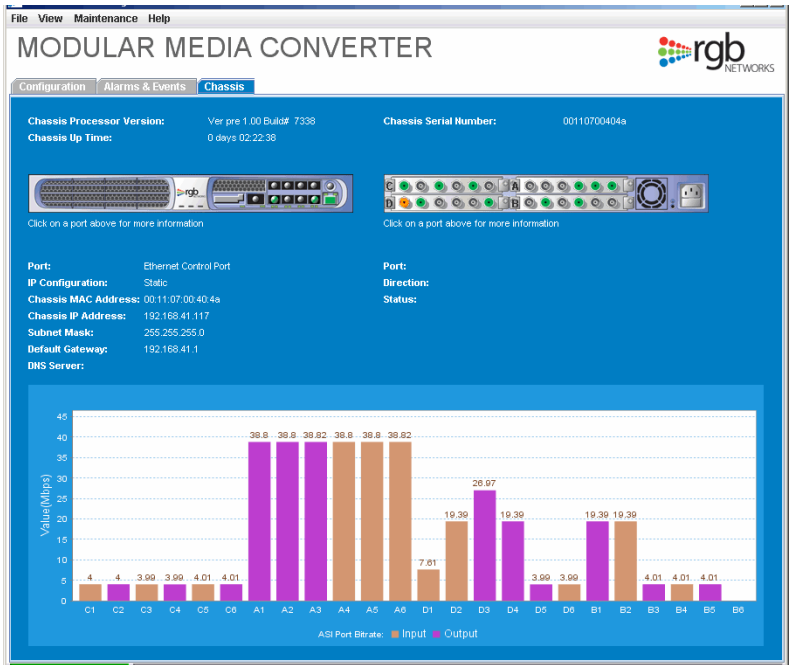
6. If you chose not to autoreboot, manually reboot the system as described in “Rebooting the System” on page 41.

Chassis View

The MMC Element Manager automatically detects the chassis hardware and provides a graphical display of the product components and their state, as shown in Figure 34.

By default, the first active port is selected. All active ports appear green on the screen. For easy identification, whenever another port is selected, that port's icon is shown.

Figure 34. Chassis tab



The information on this screen cannot be changed and is displayed for informational purposes only. When you move the cursor over a port on the screen, the cursor changes to a hand, indicating a link. Depending on which port is selected, you can see the information about the 10 Base-T port (Ethernet control), the GigE ports, or the ASI ports. If the selected port is active, it appears green on the screen. Active ports with current activity are shown blinking. The information displayed in the main Chassis tab screen is described in Table 14.

Table 14. Chassis information window

Field	Description
Chassis processor Version	Version of the software currently installed
Chassis serial number	Serial number for the chassis; useful when troubleshooting or contacting technical support—the serial number is the same as the 100-BaseT port MAC address
Chassis up time	Amount of time that the chassis has been continuously accessible
Internal chassis temperature	For each processor card, the internal temperature is displayed, allowing easy determination that the temperature is within acceptable limits (80°—90° is normal; if the chassis temperature exceeds 90°, an alarm is generated)
Graphical view of physical configuration	A graphical representation of the front and rear of the chassis configuration: move the cursor over the port and click to modify configuration

Table 14. Chassis information window (Continued)

Field	Description
GigE port information	Configuration and addresses of the GigE ports; select the port on the graphical representation to view the information
ASI port information	Port, direction, and status; select a port on the representation to see details about the port

You can see easily which ASI ports are active, and how the relative activity levels. For each port, solid grey indicates that the port is not active. Solid green indicates that the port is configured but no activity is current. A blinking green/gray port indicates that activity is present. The faster the blinking, the more activity is present.

Click on the image of any active port to view more information about that port.

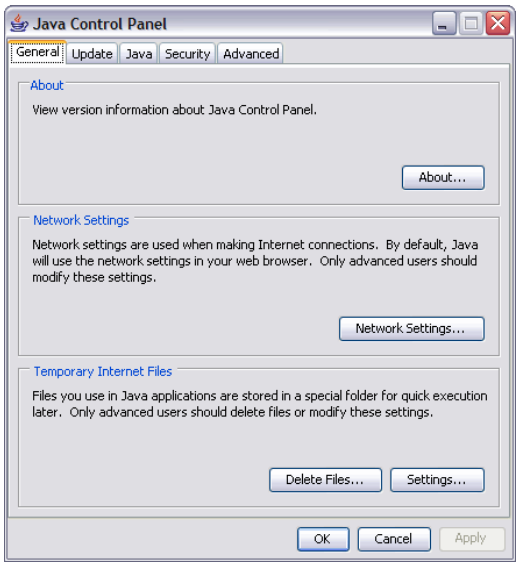
Clearing the Web Start Cache

Any time that you downgrade software, you must clear the cache from the Java Web Start. Older versions of the Element Manager use Web Start when the MMC Element Manager is started. This is only needed when you change to a software version lower than the current one.

To clear the Java Web Start cache (on a Windows system):

1. From the Start Menu, select **Settings** > **Control Panel** > **Java**.

   The Java Control Panel is launched.



2. From the **File** menu, select **Preferences**. The Java Start Preferences screen appears.
3. In the **Temporary Internet Files** section, click **Clear Folder**.
4. Click **OK** to clear the cache and close the screen.

Rebooting the System

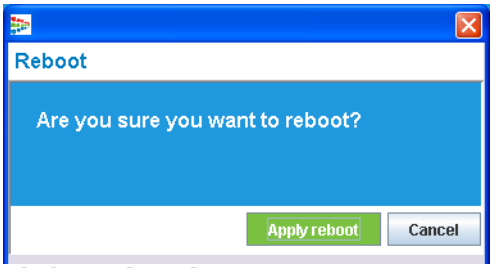
Any time you load a new software image, you must reboot the system. When a power cycle or reboot is performed, the MMC will retain previously-saved configuration settings. Only the parameters of newly-introduced features need to be set when the system is upgraded and rebooted.

The MMC is rebooted using a power cycle or using the MMC Element Manager.

The MMC does not have a power switch. To power the unit down, disconnect the power cable from the connector as described in "Replacing a Power Supply" on page 55. To reboot the switch from the MMC Element Manager:

1. From the main menu, select **Maintenance** > **Reboot**. The **Reboot** screen appears (Figure 35).

   Figure 35. Reboot dialog



2. Click **Apply Reboot**.
3. To reboot other units, select the unit and repeat the procedure.

Checking for the MMC Element Manager Version

To determine the currently installed version of the MMC Element Manager, from the main menu select **Help** > **About**. The MMC Element Manager displays the **About** MMC screen.

Figure 36. MMC Version Information

CHAPTER 5

Using The MMC

This chapter describes how to perform port and stream-related tasks on the MMX, using the Element Manager.

In This Chapter:

Before You Begin

Before you begin performing any mapping task, complete the general configuration described in Chapter 4, "Configuring the MMC".

Format Conversion and Mapping

At the MMC Element Manager, you will use the Configuration --> Mapping screen (Figure 37) to perform mapping tasks and to view bit rates. There are two ways to perform format conversion tasks: drag-and-drop, and right-click menu options.

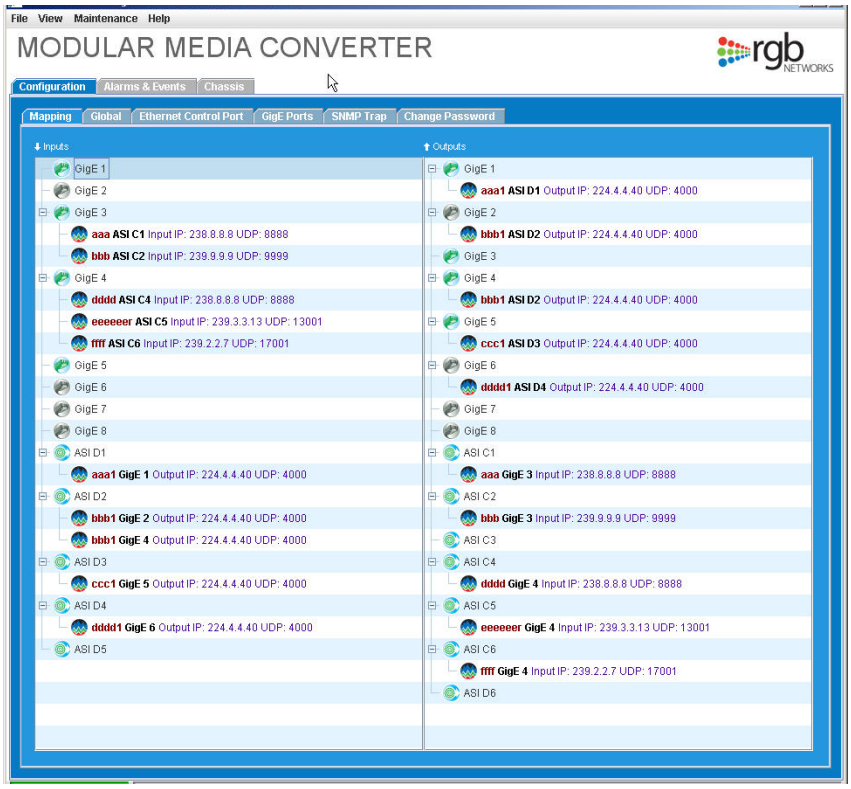
All of the GigE and ASI ports are shown on both the input and output side of the window. The left portion of the window is where input is displayed. Output is on the right.

On each side, you can see any current input or output on each port. Output appears only after there is output content. Until there is content, the ports are shown, but no content is below them.

All GigE and ASI ports are shown in the Input (left) portion of the window, and on the Output (right) portion of the window. Active ports are shown in green, and inactive ports are shown in grey. Transport streams are shown under the port in which they are active.

You cannot add format conversion and mapping to an inactive port.

Figure 37. Configuration --> Mapping screen



Drag and Drop

Drag and drop means that you select the item from the list, and while still holding the left mouse button, drag the content to the desired location.

Format Conversion and Port Mirroring

The MMC can take any ASI input transport stream and output that over any GigE port.

You can use drag and drop to create multiple outputs, or to change direction. By dragging a transport stream from one input port to multiple output ports, you can create mirrored outputs.

- You can route a single ASI input to up to 8 Gigabit Ethernet output ports. When you create mirrored outputs, the IP address and the UDP of the mirrored outputs have to all be the same.
- When mapping an ASI transport stream to multiple GigE ports (port mirroring), the duplicated output GigE transport streams will all have the same source IP address. They will all have the address of the GigE port with the lowest port number.

Drag the transport stream from Input to Output, under the port desired. You cannot drag a transport stream from a GigE port to a GigE port, or from an ASI port to an ASI port.

GigE ports may contain either single program transport stream (SPTS) or multiple program transport stream (MPTS). ASI ports can only contain one single program transport stream (SPTS).

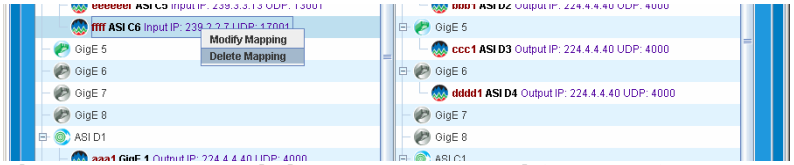
Right-click Menus

To access any of the right-click menus, select the port or stream and click the right mouse button.

Create a Mapping

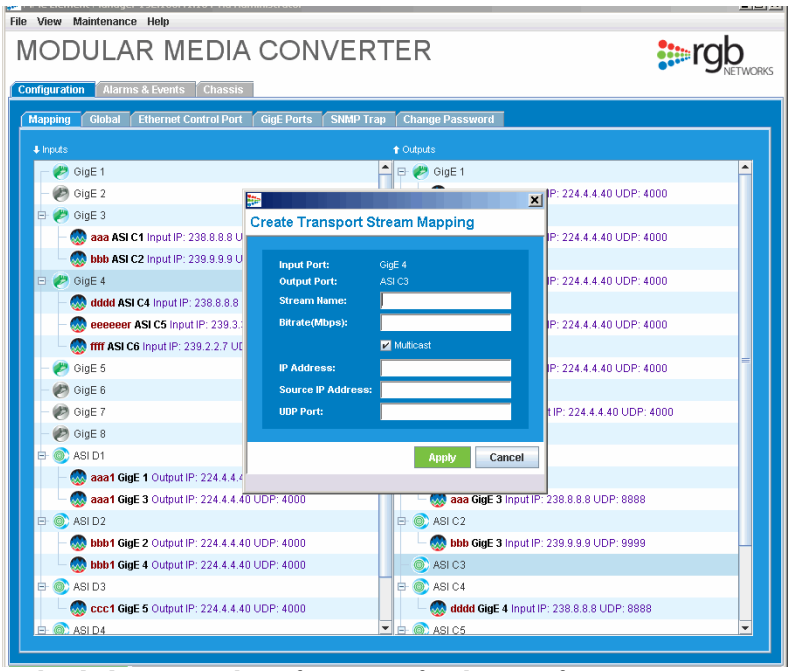
1. Select the GigE that you want to add a format conversion and mapping.
2. Right-click and select **Add Mapping** from the popup menu (Figure 38).

Figure 38. Select Add Mapping



The Create Mapping dialog is now presented (Figure 39).

Figure 39. Create Mapping dialog

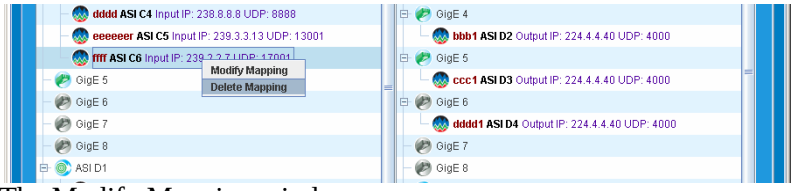


3. At the dialog, enter the information for the new format conversion and mapping, then click **Apply**.

Modify a Mapping

1. Select the transport stream that you want to convert.
2. Right-click and select **Modify Mapping**.

Figure 40. Modify Mapping, popup menu



The Modify Mapping window appears.

3. The only option that is changeable is the program name. Type the new name into the window and click **Apply**.

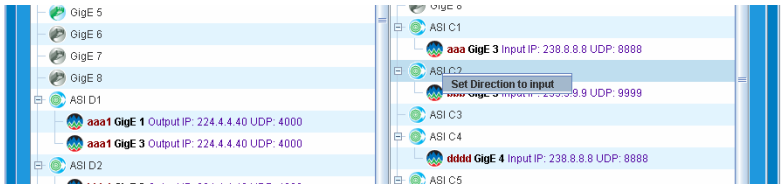
Change the Direction of a Mapping

You can change the direction of any format conversion, whether it is on the Input or Output side of the window.

To change the direction:

1. Select the transport stream or program which you want to change.
2. Right-click and select **Set Direction.**

Figure 41. Set Direction, popup menu



If this is an input, you can select **Set direction to Output**. If it is an output, you can select **Set direction to Input**.

Delete a Mapping

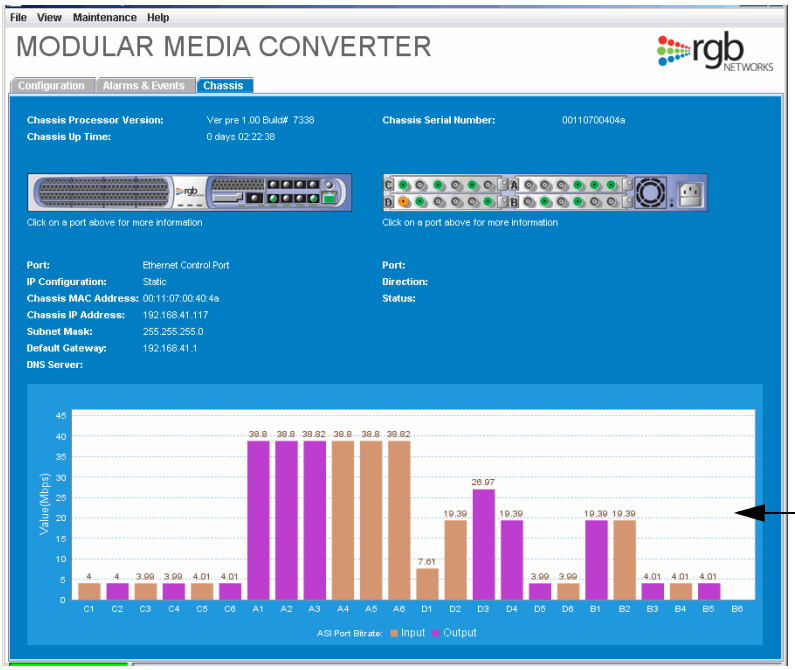
To delete a mapping:

1. Select the item to be deleted and right-click.
2. Choose **Delete Mapping** from the popup menu.

Monitoring Bitrates

The lower portion of the Chassis View window is used to monitor ASI input and output bit rates in real time. Input and output bit rates are shown in a bar graph. The bit rate for each program is shown in Mbps.

Figure 42. Bit Rate Monitor view



Monitor bit rates

CHAPTER 6

Monitoring the MMC

This chapter describes information about the system that you can monitor to ensure that the system is always healthy. The **Alerts & Events** tab provides system information and health status. To view other information about the MMC, use the other MMC Element Manager windows.

In This Chapter:

Selecting the Elements to View

The upper portion of the **Alerts & Events** tab lets you define the information you want to see on the screen. You can select as many options as you choose; the information is cumulative. To sort alerts and events, click the table header. The MMC Element Manager re-sorts the information according to your selection.

Once you have selected the events to display, click **Apply Filter** to accept the changes and refresh the window.

Types of alerts and events that can be displayed include:

- **All** shows all alerts and events, regardless of severity
- **Raised** shows all alerts that have been raised, but not cleared
- **Cleared** shows all alerts that have been raised and cleared
- **Critical** shows only critical severity alerts; these are alerts that must be dealt with immediately
- **Major** shows major alerts; these are alerts that may not require immediate intervention but cannot be allowed to continue indefinitely
- **Minor** shows minor alerts that will not disrupt the system

Viewing Alarms and Events

After you have set the types of alerts to display, you can tab to **Alarms & Events** at any time to see the current state of the system.

For each alarm, you see a description, status, severity, source, cleared time (if the alarm has been cleared), any comment, and the user who cleared the alarm. Cleared events remain in the list for historical purposes.

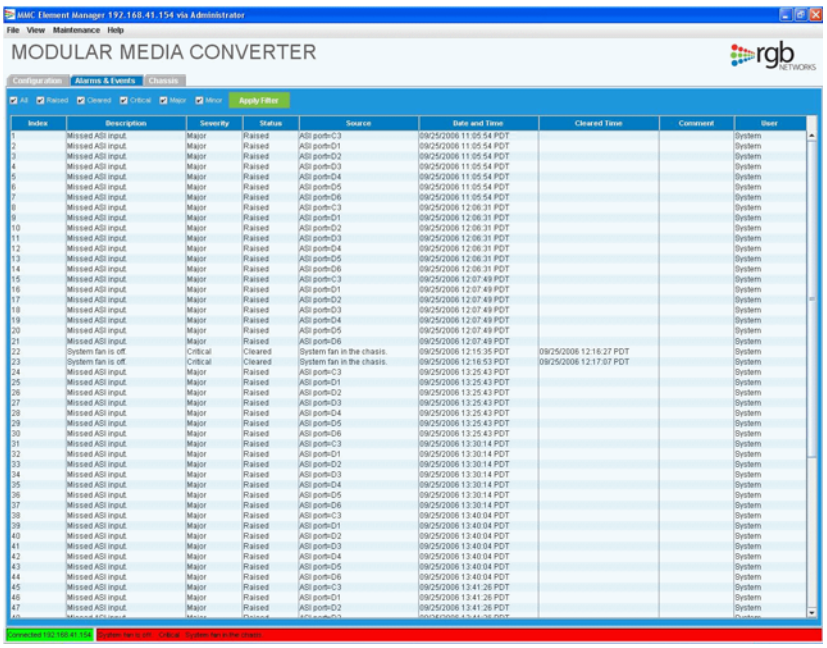
Alarms and Events

The following alarms are available:

- Input GigE not operational
- Output GigE not operational
- Input ASI not operational
- Output ASI not operational
- Cooling system failure

The four severity levels include **info**, **minor**, **major**, and **critical**.

Figure 43. Alarms window



The Status Bar

The status bar is visible regardless of the tab selected. This ensures that you can see if there are any critical alerts that need attention. The bottom portion of the window displays the IP address to which the MMC Element Manager is connected and the highest-priority current alert. The information is color-coded. A green IP address section indicates that the connection is active.

For alerts, the color-coding is one of the following:

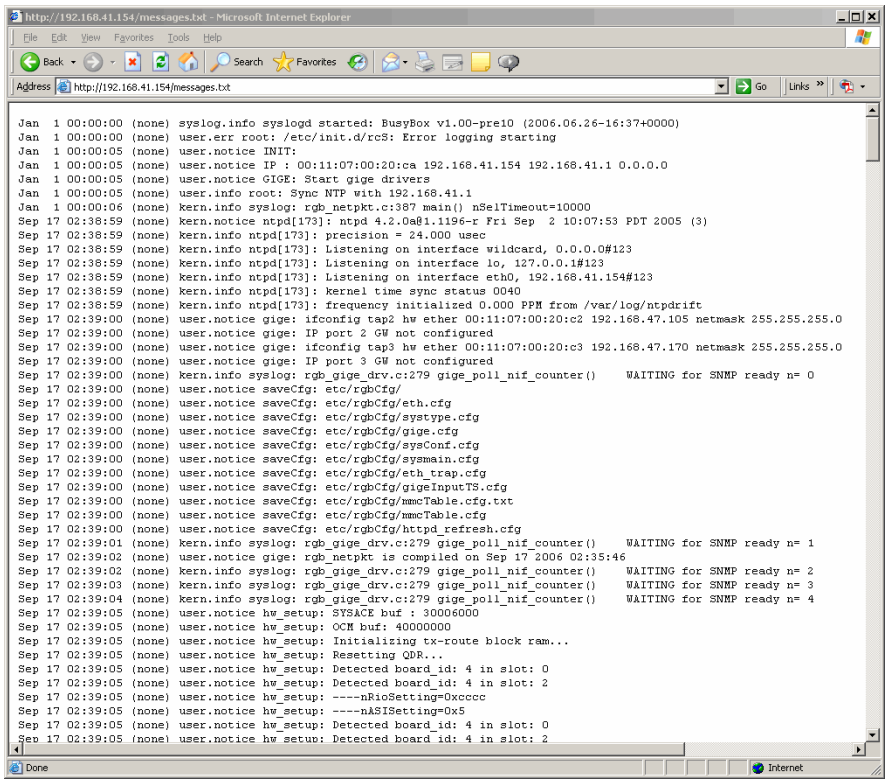
- **Green** indicates that the alert or event displayed is informational

- **Yellow** indicates a situation that may need operator action
- **Red** indicates that an important or critical error has occurred and operator intervention is needed.

The System Log

You can view the system log at any time by clicking **Show System Log** from the initial Element Manager window (Figure 44).

Figure 44. System Log



You can see all of the events that the system has logged, and the details about them.

CHAPTER 7

Troubleshooting

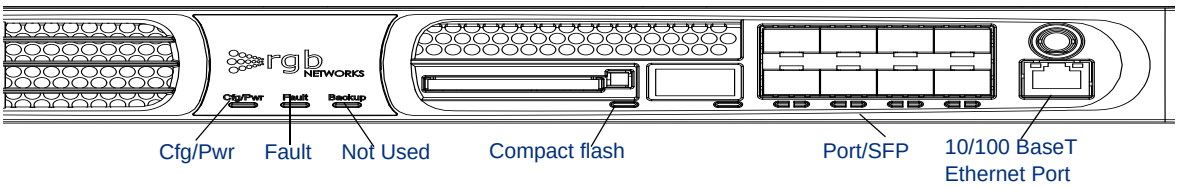
Use information in this chapter to perform basic troubleshooting tasks for the MMC.

In This Chapter:

LED Indicators

The LED indicators are fully described in "LED Indicators" on page 15. These should be your first line of inquiry if any MMX component is not performing correctly.

Figure 45. LED locations



Indicator: An LED indicator for one of the GigE ports is red.
Possible solution: Verify that the module is installed correctly and has power.

Indicator: The LED indicator for the 10/100 BaseT port is off or red.
Possible solution: Verify that the module is installed correctly and the 10/100 BaseT port cable is connected correctly.

Indicator: The system power LED indicator is off.
Possible solution: Verify that the power cord is correctly installed and that the power is turned on.

Indicator: The LED indicator for the compact flash is blinking red.
Possible solution: Install a compact flash card.

Indicator: The LED indicator for the compact flash is solid red.
Possible solution: A flash error has occurred or the flash module is corrupted and needs to be reformatted or replaced.

Error Log Analysis

If asked to do so by technical support, access the error log. You will be instructed on this procedure by the technical support engineer.

Software Upgrade

Use the Element Manager to upgrade any software image of the MMX. See “Upgrading Software” on page 38 for details about upgrading software.

Contacting Technical Support

Before you contact technical support, have the following information handy:

- Chassis model and serial number
- A clear description of the problem
- Steps to reproduce the problem, if applicable

Customers who purchased their MMX product directly from **RGB Networks** should contact **877-RGB-NETW** (877-742- 6389).

CHAPTER 8

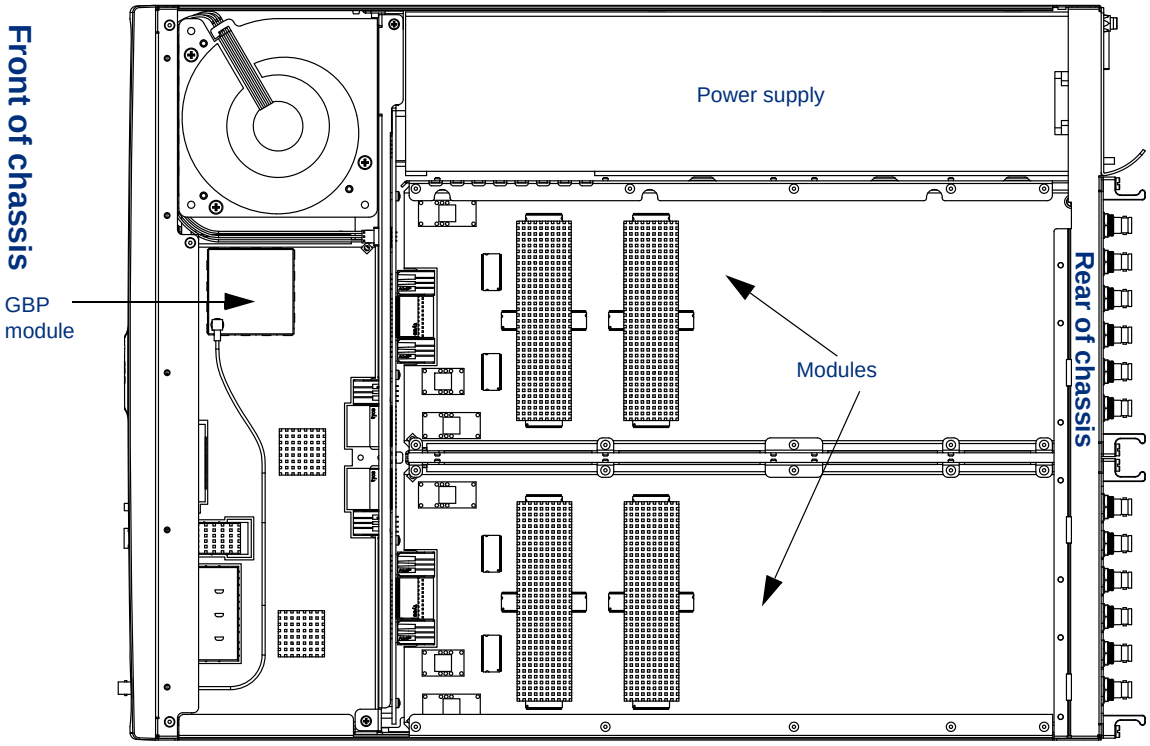
Field-replaceable Units

This chapter provides instructions on replacing the Field-replaceable Units (FRUs). There are three replaceable units on the MMC (Figure 46). The removal and replacement procedure is provided for each.

Warning! *Do not replace any component (such as fuses) not specifically described here. For replacement beyond the FRU level, contact your technical support representative for instructions on returning the component. (See "Contacting Technical Support" on page 53.)*

See also "FRU Replacement Advisory" on page 68 for the localized version of the above warning.

Figure 46. Top view of chassis, with FRUs visible



Always wear an ESD wristband or use an electrostatic mat when working with electronic components.

The chassis does not need to be removed from the rack to replace a FRU, but the system **must** be powered down before beginning any replacement process.

Warning! *Never replace any FRU while the chassis is still connected to the power source.*

See also "Power Source Safety Advisory" on page 68 for the localized version of the above warning.

In This Chapter:

Replacing a Power Supply

The power supply is located on the rear of the MMC chassis. Any time that the chassis is not receiving adequate power, as indicated by the system LEDs and performance, verify that power is reaching the chassis. If power is reaching the power supply but not getting to the system, you might need to replace the power supply.

Removing a Power Supply

The basic procedure for removing a power supply is similar regardless of whether the power supply is for AC or DC power.

To remove a failed power supply:

1. Ensure that you have a replacement power supply ready to reinsert.
2. Ensure that there is no power to the unit:
   - AC power supply units
     Shut down the unit by removing the power cable from the power supply connector.
   - DC power supply units
     Toggle the circuit breaker to the OFF position. Disconnect the cables from the power connector.
3. Loosen the power supply unit by turning the safety screw *clockwise*. Turning the screw counterclockwise tightens the screw.

   Use a slotted screwdriver to tighten or loosen the screw, then use your fingers to further turn the screw, if necessary.
4. Firmly grasp the power supply by the handle (Figure 47, for AC; Figure 48, for DC)

Figure 47. AC Power supply handle—Unlock

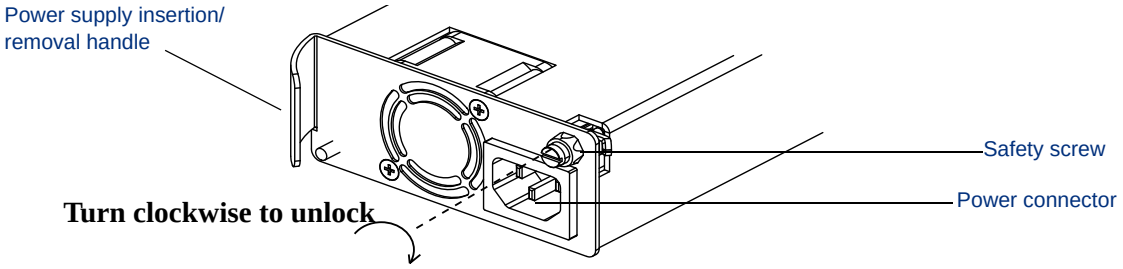
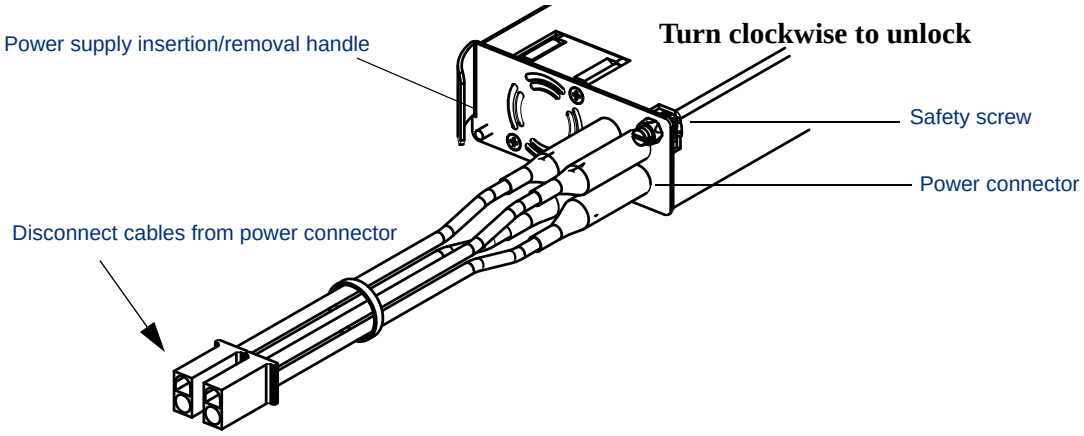
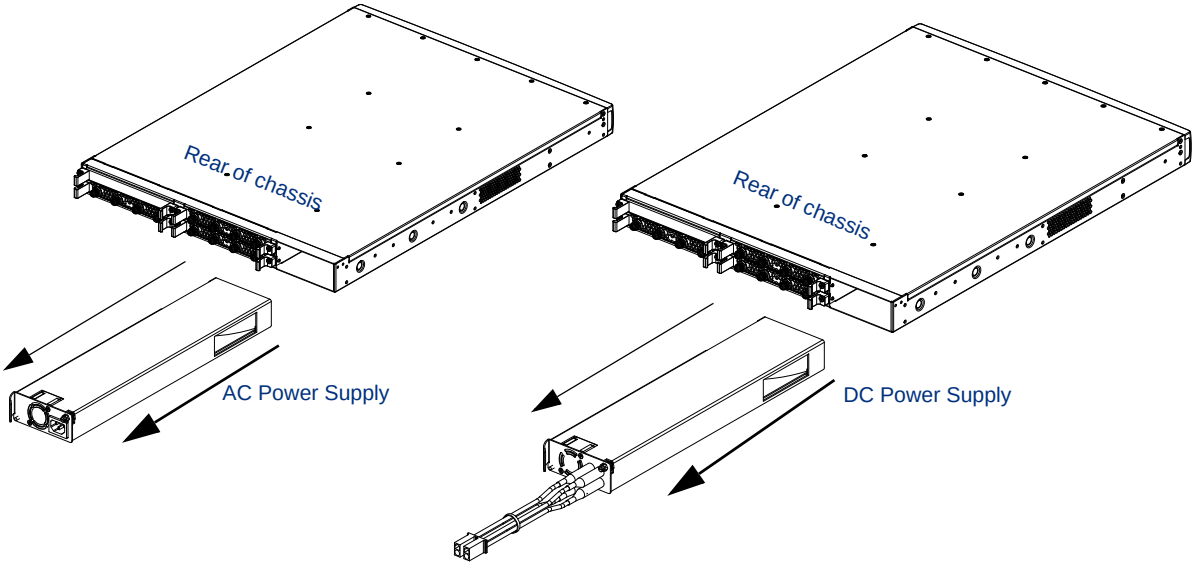


Figure 48. DC Power supply handle—Unlock



5. Pull gently but firmly, sliding the power supply out of the bay (Figure 49).

Figure 49. Removing power supply



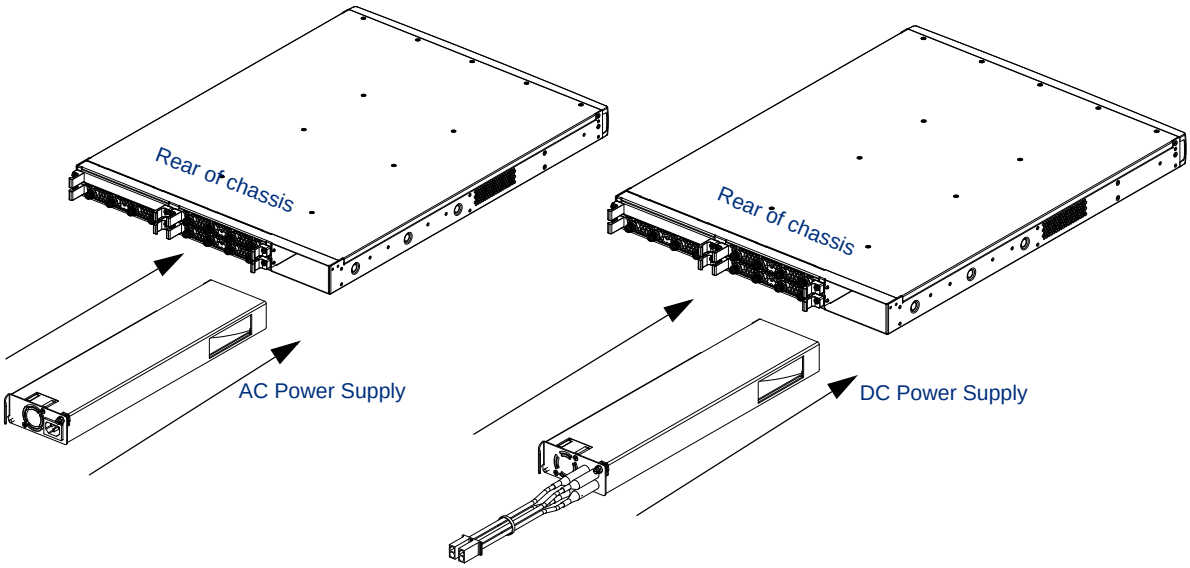
Inserting a Power Supply

Once you have removed the failed power supply, install a replacement:

1. Remove the replacement power supply from its packing and carefully inspect it for damage.

   Do not install a visibly damaged power supply.
2. Slide the replacement power supply into the slot (Figure 50).

Figure 50. Power supply insertion



3. Turn the screw counterclockwise to tighten it, securing the power supply to the MMC chassis.

Caution: *Make sure that the safety screw is in the locked position (turned counterclockwise) after the power supply is installed, but before connecting power. Note that the locked position may be different than that of similar units. This ensures that the power supply cannot be accidentally disconnected, causing possible damage.*

See also "Safety Screw Lock Advisory" on page 66 for the localized version of the above caution.

It is important to lock the power supply into the chassis because if you need to disconnect the power cord, the power supply must be locked tightly into position (Figure 51, for AC; Figure 52, for DC).

Figure 51. AC Power supply handle—Lock

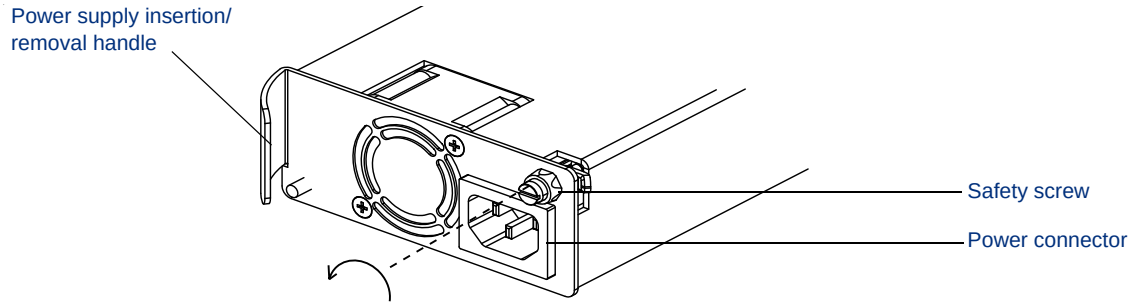
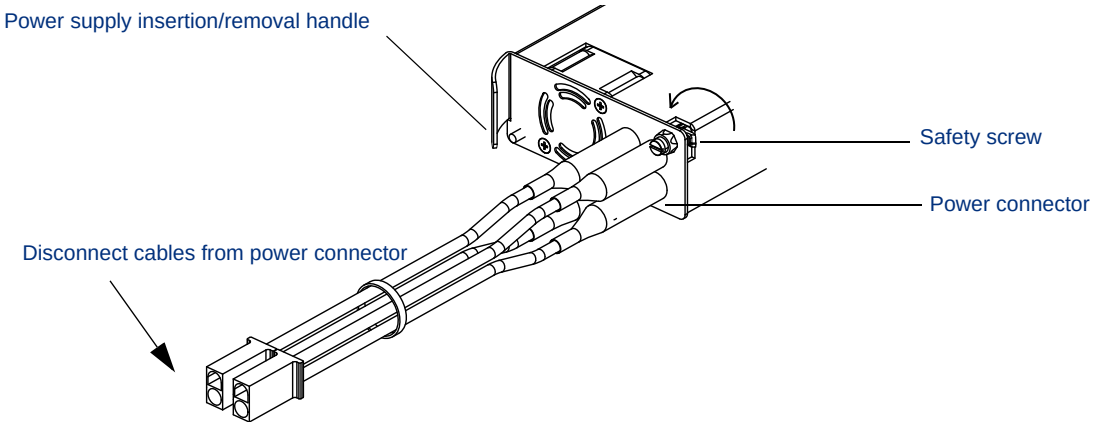


Figure 52. DC Power supply handle—Lock



4. Apply power to the power supply:
   - For AC power supplies, refer to “Applying Power to the MMC (AC Power Supply)” on page 24.
   - For DC power supplies, refer to “Applying Power to the MMC (DC Power Supply)” on page 25.

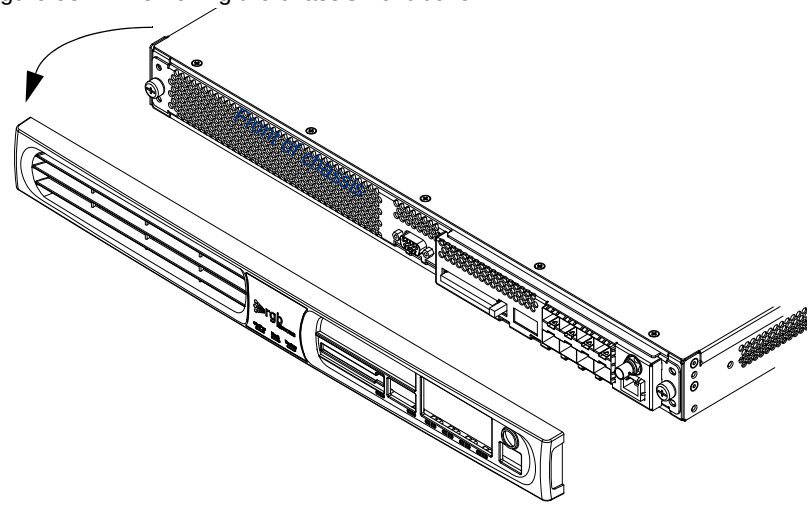
Replacing a Gigabit Ethernet Processor (GBP) Module

When you have determined that a GBP module must be replaced, follow this procedure to remove and replace the module. You do not need to remove the chassis from its rack mount to replace a module.

Removing a GBP Module

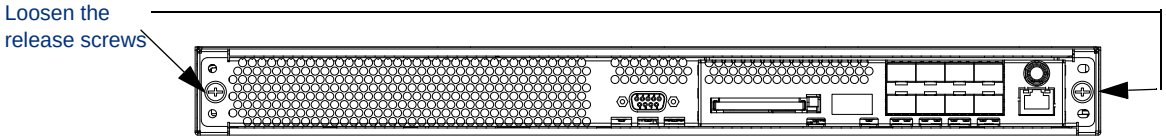
1. Ensure that you have a replacement module available.
2. Shut down the unit by removing the power cable from the power supply connector.
3. Remove all cabling from the module.
4. Grasping it firmly with your fingers, gently remove the bezel on the front of the chassis (Figure 53).

Figure 53. Removing the chassis front bezel



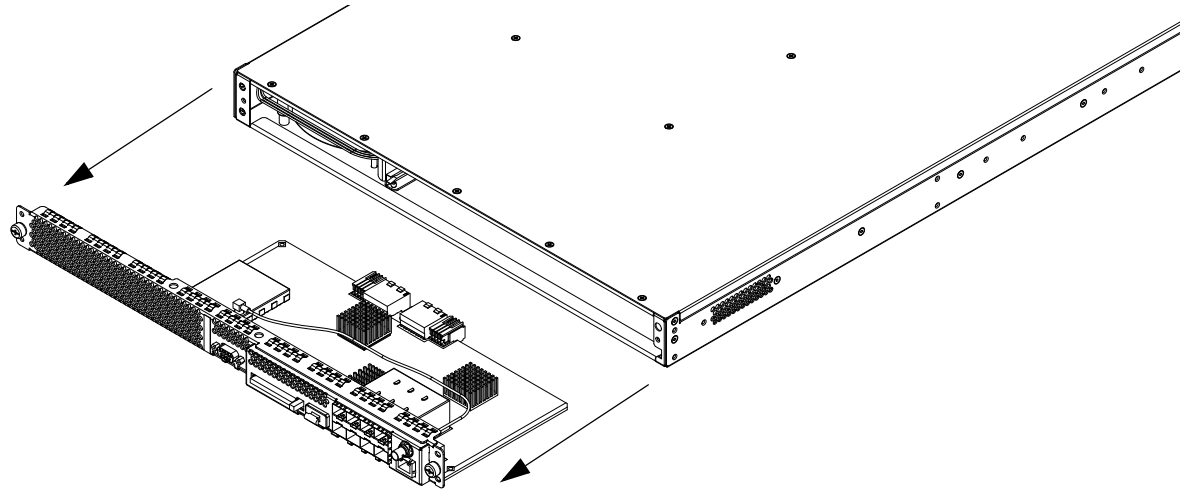
5. Using a Phillips screwdriver, loosen—but do not remove—the screws that secure both sides of the GBP module to the chassis. They act as handles to assist with the module's removal.

Figure 54. Loosening the GBP module release screws



6. Firmly grasping the screws, slide the GBP module out of the bay (Figure 55).

Figure 55. Removing the GBP module



Replacing a GBP Module

After you have removed the failed GBP module, replace it with the new one:

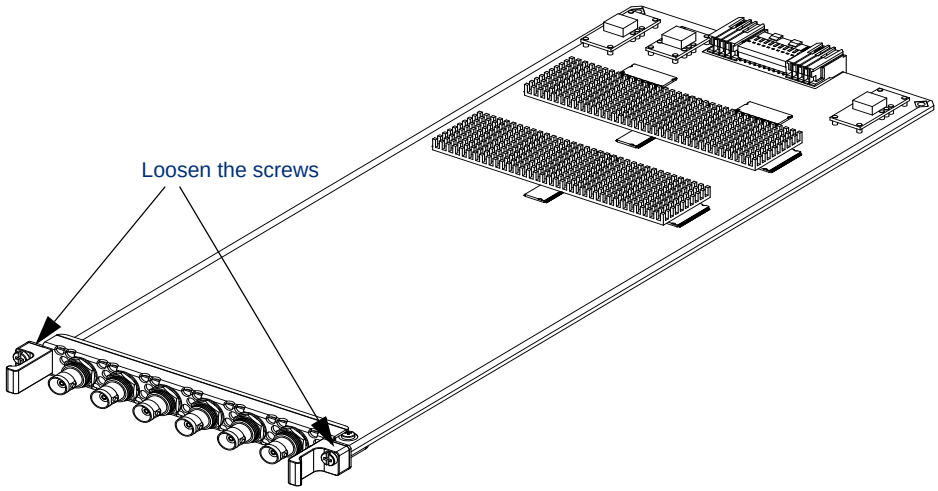
1. Grasp the module firmly by the edges only and slide it into the chassis, using the plastic guide rails to ensure proper seating.
2. Push until the module is firmly seated.
3. Using a Phillips screwdriver, tighten the insertion/removal screws to secure the GBP module to the MMC chassis.
4. Replace the front bezel by snapping it in place.
5. Restore any cabling and power up the unit.

Replacing an ASI Module

Removing an ASI Module

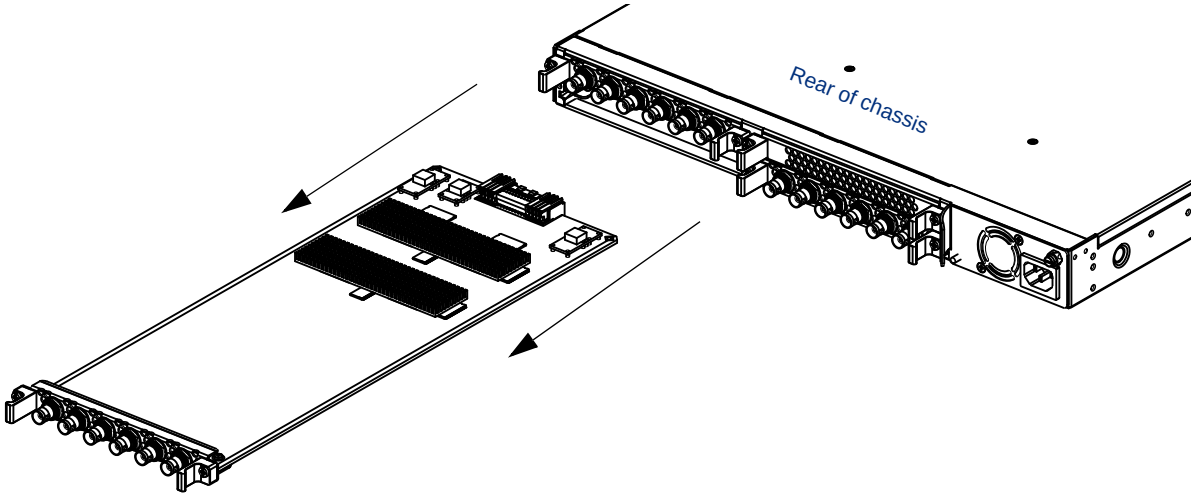
1. Shut down the unit by removing the power cable from the power supply connector.
2. Using a Phillips screwdriver, loosen—but do not remove—the insertion/removal screws (Figure 56).

Figure 56. Loosening the insertion/removal screws



3. Using the handles on either side of the module as a grip, gently but firmly slide the module out of the chassis (Figure 57).

Figure 57. Removing the ASI module



Replacing an ASI Module

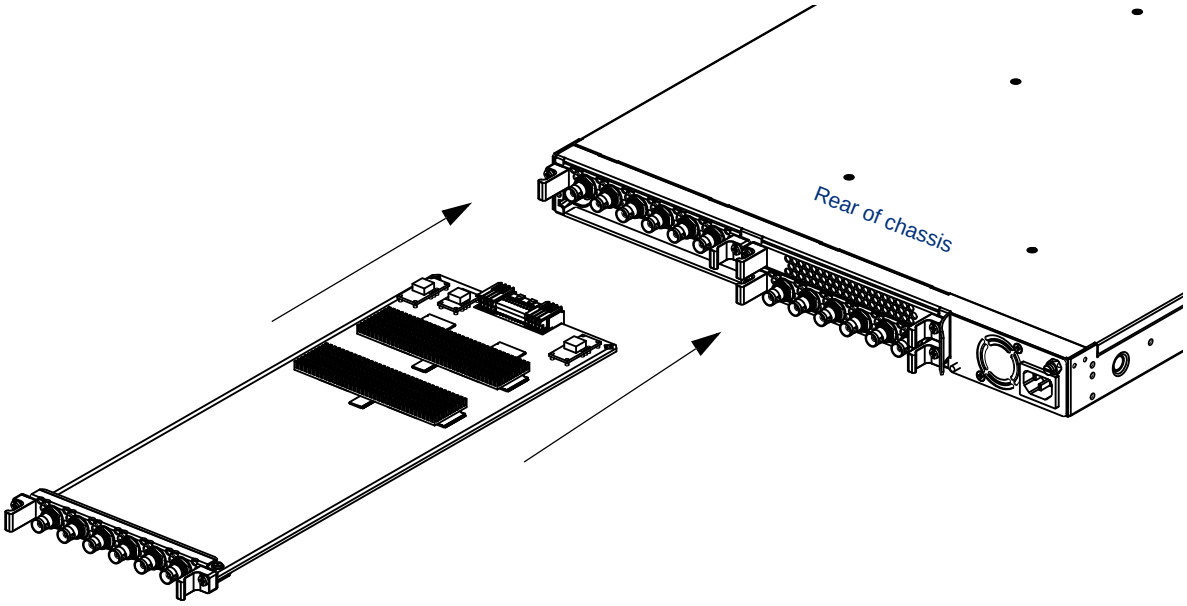
After an ASI module has been removed, replace it as soon as possible, or install a blank slot cover to ensure proper air flow.

If you are leaving an empty slot, any empty slot should be fitted with a blank cover.

To install an ASI module:

1. Firmly hold the card by the edges or the handles and slide it into the chassis (Figure 58), using the plastic guide rails to ensure proper seating.
2. Press firmly until the module seats in the chassis.

Figure 58. Installing the ASI module



3. Using a Phillips screwdriver, tighten the insertion/removal screws to attach the card to the chassis.
4. Restore any cabling and power up the unit.
5. Reboot the system as described in “Rebooting the System” on page 41.

CHAPTER 9

MMC Specifications

In This Chapter:

Input Interfaces/Output Interfaces

Table 15. Input/Output Interfaces

Interface	Type
Gigabit Ethernet	8 SFP interfaces (copper or optical) configured
Fast Ethernet	1 10/100BaseT control and management interface
ASI	Up to 24 ASI ports per chassis
	Up to 4 ASI modules with 6 ASI ports each
	Software configurable as input or output
	213 Mbps data rate/port

Video and Audio Formats

Table 16. Input/Output Interfaces

Type	Formats supported
Audio formats	All
MPEG	All transport streams carrying MPEG-2, MPEG-4/H.264, and VC-1 compression programs MPTS, SPTS, multicast and unicast support CBR and VBR support
SD and HD resolutions	All NTSC and PAL resolutions

Regulatory Compliance

Table 17. Regulatory Compliance

Regulatory Type	Compliance
Safety	UL, TUV
Electromagnetic	FCC Part 15, Class A. EN55022, EN55024

Electrical/Mechanical

Table 18. Electrical and Mechanical

Specification	Limits
Input Power	AC: 100-127 VAC @ 1.4A to 200-240 VAC @ 0.8A DC: 48 VDC @ 3.5A (range 36-75 VDC)
Line Frequency	50-60 Hz
Power consumption	170 W maximum (fully loaded)
Dimensions	1RU (1.75"H x 19"W x 23"L) (43.6H x 433W x 583L mm)
Weight	<30 lbs. (11.34 kg)
Cooling	Front to back

Environmental

Table 19. Environmental Ranges

Condition	Value Range
Storage Temperature	-40° C to 70° C
Operating Temperature	0° C to 40° C
Humidity	5% to 95% (non-condensing)

APPENDIX A

Localized Cautions and Warnings

Handling Computer Components

Page	Statement type	Statement
page 19	Warning	Whenever computer components are handled (especially during installation), the equipment can be damaged by the buildup of static electricity. Take precautions before touching any internal components or boards by wearing an ESD wrist strap or working on an antistatic mat. Always hold system modules by the edges and avoid touching any electronic circuitry on the cards.
	Avertissement	Lors de la manipulation de composants électroniques ou informatiques (en particulier pendant l'installation) l'équipement peut être endommagé par l'accumulation d'électricité statique. Prenez des précautions avant de toucher tout circuit ou toute carte interne, soit en portant un bracelet antistatique, soit en travaillant sur un tapis de sol antistatique. Tenez toujours les modules du système par leurs bords et évitez de toucher tout circuit électronique sur les cartes.
	Warnung	Bei der Handhabung von Computerbauteilen (insbesondere beim Einbau) können diese durch elektrostatische Aufladung beschädigt werden. Treffen Sie Vorsichtsmaßnahmen, indem Sie ein Erdungsarmband anlegen oder auf einer antistatischen Matte arbeiten, bevor Sie Bauteile oder Leiterplatten im Inneren des Geräts berühren. Halten Sie Systemmodule immer an den Kanten, und berühren Sie die elektronischen Bauteile auf den Leiterplatten nicht.

Electrostatic Advisory

Page	Statement type	Statement
page 19	Caution	
	Attention	EQUIPEMENT SENSIBLE A L'ELECTRICITE STATIQUE PRENEZ DES PRECAUTIONS
	Vorsicht	Elektrostatisch empfindliches Gerät Vorsichtsmaßnahmen beachten

Power Socket Proximity

Page	Statement type	Statement
page 19	Caution	Please install the MMC so as to be easily accessible and as close to a power socket outlet as possible.
	Attention	Installez le MMC dans un endroit accessible et aussi près que possible d'une prise de courant.
	Vorsicht	Der MMC muss möglichst leicht zugänglich und in der Nähe einer Netzsteckdose aufgestellt werden.

Operations Environment

Page	Statement type	Statement
page 19	Caution	Be sure that the MMC is mounted in a location that meets the environmental conditions shown in Table 7.
	Attention	Vérifiez que le MMC est installé dans un lieu qui satisfait aux conditions environnementales présentées dans le tableau 1.
	Vorsicht	Vergewissern Sie sich, dass der Aufstellort des MMC den in Tabelle 1 aufgeführten Umgebungsbedingungen entspricht.

Grounding Equipment

Page	Statement type	Statement
page 23	Warning	The MMC must be properly grounded to ensure safe operation. Before you connect power or turn on the MMC, ground the chassis. This section provides one method of grounding. There may be other: check your network configuration for details.
	Avertissement	Le MMC doit être correctement relié à la masse pour assurer un fonctionnement sécurisé. Avant de connecter le courant ou de mettre en marche le MMC, reliez le châssis à la masse. Cette section indique une méthode de mise à la masse. Il peut y en avoir d'autres : vérifiez la configuration de votre réseau pour plus de détails.
	Warnung	Für einen sicheren Betrieb muss der MMC vorschriftsmäßig geerdet sein. Erden Sie das Chassis des MMC, bevor Sie das Gerät an die Stromversorgung anschließen oder einschalten. Dieser Abschnitt erläutert eine Erdungsmethode. Eventuell gibt es auch andere Möglichkeiten. Prüfen Sie ihre Netzwerkkonfiguration, um diesbezügliche Einzelheiten festzustellen.

Equipment On and Off

Page	Statement type	Statement
page 24	Caution	The power cord is the disconnect device for the MMC. There is no power switch: once connected to the power outlet, the unit powers up immediately.
	Attention	Le cordon d'alimentation constitue le mécanisme de déconnexion du MMC. Il n'y a pas d'interrupteur : une fois connecté à la prise de courant, le système est immédiatement mis sous tension.
	Vorsicht	Der MMC wird mit dem Netzkabel ein- und ausgeschaltet. Es gibt keinen Netzschalter. Beim Einstecken des Netzkabels in die Steckdose wird das Gerät unmittelbar eingeschaltet.

Qualified Personnel

Page	Statement type	Statement
page 25	Caution	Only trained personnel should install or replace this equipment.
	Attention	Seul un personnel qualifié devrait installer ou remplacer cet équipement.
	Vorsicht	Dieses Gerät darf nur von qualifiziertem Personal aufgestellt und ausgetauscht werden.

Safety Screw Lock Advisory

Page	Statement type	Statement
page 24 page 25 page 26 page 57	Caution	Make sure that the safety screw is in the locked position (turned counterclockwise) after the power supply is installed, but before connecting power. Note that the locked position may be different than that of similar units. This ensures that the power supply cannot be accidentally disconnected, causing possible damage.
	Attention	Assurez-vous que la vis de sécurité est en position bloquée (tournée dans le sens contraire des aiguilles d'une montre) après avoir installé l'alimentation, mais avant d'avoir connecté le courant. Notez que la position bloquée peut être différente de celle d'unités similaires. Ceci constitue la preuve que l'alimentation ne peut pas être déconnectée par accident, et ainsi causer de possible dommages.
	Vorsicht	Vergewissern Sie sich, dass sich die Sicherheitsschraube in der verriegelten Position befindet (gegen den Uhrzeigersinn), nachdem das Netzteil eingebaut wurde, aber bevor das Gerät an die Stromversorgung angeschlossen wird. Beachten Sie, dass die verriegelte Position anders als bei ähnlichen Einheiten sein kann. So wird sichergestellt, dass das Netzteil nicht versehentlich getrennt wird, was zu Beschädigungen führen kann.

Compact Flash Advisory

Page	Statement type	Statement
page 28	Caution	Your license is attached to the compact flash (CF); do not discard it. Even if a CF card fails, keep the device and contact RGB technical support for instructions on repair or obtaining a working replacement.
	Attention	Votre licence se trouve sur la carte mémoire Compact Flash. Ne l'égarez pas. Au cas où la carte mémoire Compact Flash serait déficiente, conservez-la et contactez le support technique RGB pour obtenir des instructions concernant la réparation ou le remplacement.
	Vorsicht	Ihre Lizenz ist auf der Compact Flash-Karte enthalten. Entsorgen Sie diese nicht. Selbst wenn eine CF-Karte ausfällt, bewahren Sie diese auf, und wenden Sie sich an den technischen Kundendienst von RGB, um Anweisungen für die Reparatur oder den Austausch durch eine funktionsfähige Karte zu erhalten.

Power Source Safety Advisory

Page	Statement type	Statement
page 54	Warning	Never replace any FRU while the chassis is still connected to the power source.
	Avertissement	Ne remplacez jamais une unité remplaçable sur site si le châssis est toujours connecté à l'alimentation.
	Warnung	Tauschen Sie kein vor Ort austauschbares Teil aus, während das Chassis mit der Stromversorgung verbunden ist.

FRU Replacement Advisory

Page	Statement type	Statement
page 54	Warning	Do not replace any component (such as fuses) not specifically described here. For replacement beyond the FRU level, contact your technical support representative for instructions on returning the component (See “Contacting Technical Support” on page 53)
	Avertissement	Ne remplacez aucun composant (tel que les fusibles) qui ne soit pas spécifiquement décrit ici. Pour des remplacements au-delà des unités remplaçables sur site, contactez le représentant du support technique pour connaître les instructions à suivre si vous souhaitez renvoyer le composant. (Voir “Contacting Technical Support” on page 53).
	Warnung	Tauschen Sie keine Komponenten (wie Sicherungen) aus, die hier nicht ausdrücklich genannt sind. Beim Austausch von Komponenten, die keine vor Ort austauschbaren Teile sind, wenden Sie sich an den für Sie zuständigen Mitarbeiter des technischen Kundendiensts, um Anweisungen zum Zurücksenden der Komponente zu erhalten. (Siehe “Contacting Technical Support” on page 53.)

Glossary

This glossary defines the acronyms common in the video industry, and used in this guide. It is not all-inclusive but serves as a reference.

Numeric

3DES
Triple Data Encryption Standard. A mode of DES that encrypts data three times. Three 64-bit keys are used, for an overall key length of 192 bits.

A

AES
Advanced Encryption Standard. AES is a privacy transform for IPSec and Internet Key Exchange, and is replacing the Data Encryption Standard (DES). AES offers a larger key size and a variable key length.

ARP
Address Resolution Protocol. ARP broadcasts a packet containing the IP address that the sender specifies to all hosts attached to an Ethernet connection. When the target recognizes that the IP address is its own, it returns a response.

ASI
Asynchronous Serial Interface. ASI extends the functionality from strictly a video/audio-bounded device to a transport stream-based system that can store data in either a single program stream or a set of multiple program streams.

ATSC
Advanced Television Systems Committee. ATSC is working to coordinate television standards among different communications media. ATSC is also developing digital television implementation strategies.

C

CA
Conditional Access. Conditional access is an encryption/decryption management method by which a broadcaster controls a subscriber's access to services.

CAS
Conditional Access Systems. These are systems that ensure broadcast service is accessible only to those entitled to access, usually by scrambling or encrypting the service.

CBR
Constant Bit Rate. Constant bit rate encoding ensures that the rate at which a codec's output is consumed is constant. Because it is the maximum bitrate that matters, CBR is useful for streaming multimedia content on limited capacity channels. See also VBR.

CSA
Common Scrambling Algorithm.

D

DCCT
Direct Channel Change Table, part of 9 tables in the ATCS PSIP. The DCCT instructs the receiver to change channels based on viewer preferences, demographics or geographical location. This table works with a DCCSDT in the set top box.

DCCSDT
DCC Selected Code Change Table, part of 9 tables in the ATCS PSIP.

DES
Data Encryption Standard. DES specifies a FIPS approved cryptographic algorithm as required by FIPS 140-1. Encrypting data converts it to an unintelligible form called cipher. The cryptographic security of the data depends on the security provided for the key used to encipher and decipher the data. Data can be recovered from cipher only by using exactly the same key used to encipher it.

DET
Data Event Table, part of 9 tables in the ATCS PSIP. The DET announces the data portion of a video/audio/data event when the data event does not match the exact duration of an video/audio event.

DHCP
Dynamic Host Configuration Protocol. DHCP servers let individual computers on an IP network extract their configurations. DHCP servers have no specific information about the individual computers until they request the information.

DOCSIS
Data Over Cable Service Interface Specifications. Now known as CableLabs Certified Cable Modems. DOCSIS specifies modulation schemes and the protocol for exchanging bidirectional signals over cable.

DPI
Digital Program Insertion. The digital splicing of one MPEG program (typically a commercial) into another based on digital cues within the MPEG transport stream.

DVB
Digital Video Broadcast. A European set of defined transmission standards for digital broadcasting systems.

DWDM
Dense Wavelength Division Multiplexing. A fiber-optic transmission technique using light wavelengths to transmit data parallel-by-bit or serial-by-character.

E

EAS
Emergency Alert System. An operational structure for national and local emergency alerts used by broadcast, cable, and wireless cable.

ECM
Entitlement Control Messages.

ECMG
ECM Generator.

EIT
Event Information Table, part of 9 tables in the ATCS PSIP. EITs are associated with a specific virtual channel in the VCT, contain event information, and point to the location of extended text in the ETT.

EM
Element Manager. The graphical user interface for the MMX.

EMM
Entitlement Management Message. A packet containing the information necessary to decrypt the picture.

EMMG
Entitlement Management Message Generator. The component of the conditional access headend that delivers entitlements to the multiplexers.

EOD
Everything-On-Demand.

ETT
Extended Text Table, part of 9 tables in the ATCS PSIP. ETTs carry longer text messages than EITs for describing events and virtual channels.

F

FCC
Federal Communications Commission. The agency that regulates communications services, including cable television, at the Federal level.

FPGS
Field Programmable Gate Array. An array of logic gates that can be hardware-programmed to fulfill user-specified task.

FVOD
Free-Video-On-Demand.

G

GigE
Gigabit Ethernet. Ethernet which supports data transfer rates of 1 Gigabit (1,000 megabits) per second.

GBP
Gigabit Ethernet Processor module used with the MMX.

GUI
Graphical User Interface.

H

HD
High Definition. High-resolution digital television combined with Dolby Digital surround sound (AC-3).

HFC
Hybrid Fiber/Coax. A distribution system combining fiber and coax cable. An HFC system is used to distribute CATV signals into a neighborhood.

I

IGMP
Internet Group Management Protocol. IP hosts use IGMP to register dynamic multicast group membership. Connected routers discover the group members using the same protocol.

IP
Internet Protocol. The network layer for the TCP/IP Protocol Suite. It is a connectionless, best-effort packet switching protocol.

ITU
International Telecommunication Union. An international organization through which governments and the private sector coordinate global telecommunications networks and devices.

J

JRE
Java Runtime Environment. JRE is made up of the Java virtual machine, the Java platform core classes, and supporting files.

L

LED
Light Emitting Diode. A semiconductor diode that emits light when current passes through it. LEDs are used as indicators.

M

MGT
Master Guide Table, part of 9 tables in the ATCS PSIP. MGT provides program-identification (PID) locations so a receiver can find the other tables, and informs the receiver of changes or table updates.

MIB
Management Information Base. MIB defines the variables needed by the SNMP protocol to monitor and control elements in a network.

MID
Mid-plane.

MPEG
Moving Pictures Experts Group. The standards group and the standard for compression and storage of motion video.

MPTS
Multi-Program Transport Stream. A combined multiplex of video streams.

MUX
Multiplexer. A device that both combines multiple data sources into a single data stream for transmission, and demultiplexes the single data stream into its composite forms.

N

NPT
Network Time Protocol. A TCP protocol that assures accurate local time-keeping with reference to radio and atomic clocks, and can synchronize distributed clocks within milliseconds.

NTSC
National Television System Committee. Committee that defined the current standard for analog color television in North America, as well as the name for the standard. The format is 525 lines in 4MHx of video bandwidth.

O

OOB
Out-Of-Band

P

PAT
Program Association Table. A table ID that indicates the MPEG-2 SI packet type.

PCR
Program Clock Reference.

PMT
Program Map Table. A table ID that indicates the MPEG-2 SI packet type.

PSI
Program Specific Information, as part of MPEG-2.

PSIP

Program and System Information Protocol. PSIP is a collection of nine tables that allow the DTV transport stream to provide information about a station's services and programming.
These nine tables include:

- Master Guide Table (MGT)
- System Time Table (STT)
- Virtual Channel Table (VCT)
- Rating Region Table (RRT)
- Event Information Table (EIT)
- Extended Text Table (ETT)
- Data Event Table (DET)
- Directed Channel Change Table (DCCT)
- DCC Selected Code Change Table (DCCSDT)

Q

QAM

Quadrature Amplitude Modulation. This is the modulation technique used in systems carrying digital video.

QoS

Quality of Service. Guarantees network bandwidth and availability for applications.

R

RF

Radio Frequency. Television signals are modulated onto RF signals and are then demodulated by the television tuner.

RTP

Real Time Protocol. RTP provides services such as payload type identification, sequence numbering, time-stamping, and delivery monitoring to real-time applications.

RU

Rack Unit. A common increment of equipment space height. The height of 1 RU is 1.75 inches.

S

SAP

Secondary Audio Program. A way to provide a second audio channel within a TV broadcast channel. Commonly used for stereophonic sound or bilingual audio tracks.

SCTE

Society of Cable Telecommunications Engineers. An organization that develops training for cable television installers and engineers and standards for the cable industry.

SD
Standard definition.

SFP
Small Form Factor Pluggable. An optical interface that is used in network switches for Fibre Channel, Gigabit Ethernet and InfiniBand.

SNMP
Simple Network Management Protocol. A protocol used to monitor and control network devices, and to manage configurations, statistics collection, performance, and security.

SPTS
Single Program Transport Stream.

STP
Strip Processor. The STP modules (NP and ASI) is one of the units that comprise the MMX.

STT
System Table Time. Allows a broadcaster to present time indicators to the consumer, ensuring that the time is synchronized.

SVOD
Subscription-Video-on-Demand. This is a Video-on-Demand service offered by subscription, providing viewers with access to select programs from the libraries of featured cable networks.

T

TFTP
Trivial File Transfer Protocol. TFTP uses UDP and is often used by servers to boot diskless workstations, X-terminals, and routers.

U

UDP
User Datagram Protocol. A connectionless protocol that runs on top of IP networks. UDP provides a direct way to send information over an IP network. It is used primarily for broadcasting messages over a network.

V

VBI
Vertical Blanking Interval. A portion of a television signal that carries non-audio/video data, such as closed-caption text.

VBR
Variable Bit Rate. VBR streams vary in bandwidth over time.

VCT

Virtual Channel Table, part of 9 tables in the ATCS PSIP. The VCT contains a list of all the channels that are or will be online, along with their channel name and number. This table contains the set of data that enables a receiver to tune and locate the service being broadcast.

VOD

Video-on-Demand. Video-on-demand systems allow users to watch video content over a network as part of an interactive television system, either by streaming or by download.

X

XFP

10 Gigabit Small Form Factor Pluggable (SFP). The XFP is a pluggable, hot-swappable optical interface for 10 Gigabit SONET/SDH, Fibre Channel, Gigabit Ethernet, and other applications. XFP modules are optical transceivers, typically 1310nm or 1550nm. Optical XFPs include digital diagnostics.

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