6 The Management Processor Module (MPM)

The MPM is the core of the distributed management functionality of the OmniSwitch. It provides such system services as maintenance of user configuration information, downloading of switching module software, basic bridge management functions, basic routing functions, the SNMP management agent, and access to the User Interface software.

Switching modules are dependent on the MPM for downloading software and for receiving initialization and configuration information. In addition, the Network Management System (NMS), which includes Switch Manager and AutoTracker software, depends on the MPM to send and receive SNMP messages for managing the switch.

Redundant storage of system configurations is available through the use of redundant Management Processor Modules. Each MPM in a redundant configuration stores information for the switch. If one MPM fails, the other MPM automatically assumes all management responsibilities. After initialization, the new MPM will read the configuration information from the existing MPM as long as you set automatic configuration synchronization to active.

There are five (5) versions of the MPM: the original MPM, the MPM-II, the MPM-1G, the MPM-III, and the MPM-C. The MPM-1G is also available in a wide version, the MPM-1GW, that fits in the new wide chassis. The MPM-III and MPM-C are available in wide format only. The following sections describe the five types (see also *MPM Types Matrix* on page 6-3).

Original MPM

The original MPM has been discontinued, but it is still supported. Some previous versions of the original MPM came standard with 2 MB of flash memory and 4 MB of DRAM. Flash memory on these older versions can be upgraded to 4 MB and DRAM can be upgraded to 8 MB. The DRAM upgrade is required to run OmniSwitch software release 2.0 and 2.1. The flash memory upgrade is recommended but not required unless the OmniSwitch contains all types of Switching Modules. The original MPM supports version 3.0 and later of OmniSwitch software as long as 16 MB of DRAM has been installed.

MPM-II

The MPM-II has been discontinued, but it is still supported. The MPM-II contains additional hardware logic to support Advanced Routing features and clocking for ATM cell switch configurations. The MPM-II comes standard with 4 MB of flash memory and 8 MB of DRAM. This standard configuration is normally adequate for most configurations even those with ATM modules employing Switched Virtual Circuits (SVCs). ATM cell switching and Advanced Routing configurations require 16 MB of DRAM. *Version 3.0 of OmniSwitch software and later requires 16 MB of DRAM and 4 MB of flash memory.*

MPM-1G

The original MPM and the MPM-II support a backplane switching capacity of 640 Mbps. The MPM-1G expands this capacity to 960 Mbps. The MPM-1G supports either 640 or 960 backplanes so it is backward compatible with the original MPM and the MPM-II. The MPM-1G also supports Advanced Routing and ATM cell switching configurations.

The MPM-1G is also available in a wide version, the MPM-1GW, that fits in the new wide chassis (Omni-5wx and Omni-9wx). Both versions of the MPM-1G come standard with 4 MB of flash memory and 16 MB of DRAM. They each also contain a socket for the Hardware Routing Engine (HRE), which is described in *MPM-II and MPM-1G HRE and HRE-Plus* on page 6-15.

MPM-III

The MPM-III can be used in wide chassis versions of the OmniSwitch. It contains a high-speed CPU and it supports 640 and 960 Mbps backplane speeds. The MPM-III supports Advanced Routing and ATM cell switching configurations.

The MPM-III also has an Ethernet management port that provides high-speed software transfers and user access to switch management functions. (See *MPM-III Ethernet Management Port* on page 6-9 for more information on the Ethernet management port.) The MPM-III also has a connector for the HRE-VX hardware routing engine, which is described in *MPM-III HRE-VX* on page 6-16.

MPM-C

The MPM-C can be used in wide-chassis versions of the OmniSwitch for ATM cell switching only. It combines the management functions of an MPM with cell switching matrix of a Frame to Cell Switching Module (FCSM). It comes standard with 8 MB of flash memory and 32 MB of DRAM. And it supports a cell switching fabric up to 13.2 Gbps.

Since the MPM-C is designed for ATM cell switching only; it does not support any frame switching modules (e.g., ESMs, FSMs, TSMs, etc.) and it does not support Advanced Routing software. See Chapter 41, “Cell Switching Modules (CSMs),” for more information on the MPM-C.

MPM Types Matrix

There are five (5) different versions of the Management Processor Module (MPM). The following table summarizes the five types.

	Original MPM	MPM-II	MPM-1G	MPM-III	MPM-C
VBUS Speed (Mbps)	640	640	640 or 960	640 or 960	N/A
Cell Bus Capacity (Gbps)	N/A	N/A	N/A	N/A	Up to 13.2
Standard Flash Memory	2 MB (upgrades to 4 MB)	4 MB (upgrades to 12 MB)	4 MB (upgrades to 12 MB)	8 MB (upgrades to 32 MB)	8 MB (upgrades to 32 MB)
Standard DRAM	4 MB (upgrades to 16 MB)	8 MB (upgrades to 16 MB)	16 MB (upgrades to 64 MB)	32 MB (upgrades to 128 MB)	32 MB (upgrades to 128 MB)
Standard SDRAM	N/A	N/A	N/A	64 MB	64 MB
Original HRE Supported?	No	Yes (with 16 MB DRAM)	Yes	No	No
HRE-Plus Supported?	No	No	Yes	No	No
HRE-VX Supported?	No	No	No	Yes	No
Ethernet Management Port?	No	No	No	Yes	Yes
Frame Switching Supported?	Yes	Yes	Yes	Yes	No
ATM Cell Switching Supported?	No	Yes (with 16 MB DRAM)	Yes	Yes	Yes
FCSM Required for ATM Cell Switching?	N/A	Yes	Yes	Yes	No
Advanced Routing Supported?	Yes (with 16 MB DRAM)	Yes (with 16 MB DRAM)	Yes	Yes	No
3.0-3.2 Software Supported?	Yes (with 16 MB DRAM)	Yes (with 16 MB DRAM)	Yes	No	No
4.1 and above Software Supported?	Yes (with 16 MB DRAM)	Yes (with 16 MB DRAM)	Yes	Yes	Yes
Narrow Version Available?	Yes	Yes	Yes	No	No
Wide Version Available?	No	No	Yes	Yes	Yes

OK1 (Hardware Status). This dual-state LED is on Green when the MPM has passed power-on hardware diagnostics successfully. On Amber when the hardware has failed diagnostic tests. If the **OK1** LED is alternating Green and Amber, then file system compaction is in progress.

Caution

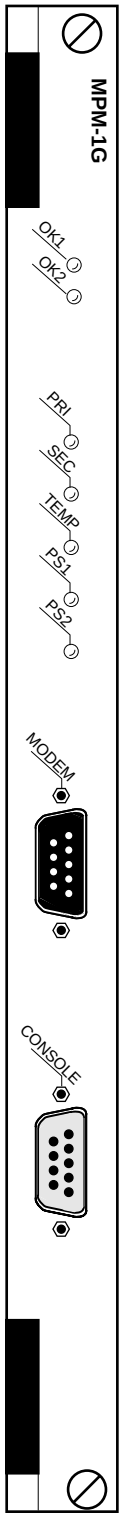
Do not power down the switch or insert any modules while the **OK1** LED is alternating Green and Amber. If you do, file corruption may result and you will not be able to restart the switch.

OK2 (Software Status). Blinking Green when the MPM has successfully loaded software to the Switching Modules. Blinking Amber when the MPM is in a transitional state, such as when it first boots up. If the **OK2** LED blinks Amber for an extended period of time (i.e., more than a minute), then you should reboot the switch.

Caution

Do not insert or remove any modules while the MPM **OK2** LED is blinking amber. If you do, file corruption may result and you will not be able to restart the switch.

Module Status LEDs



Label. This label will indicate the MPM version. It will read either **MPM** (original MPM), **MPM-II**, or **MPM-1G**.

Module Status LEDs

PRI (Primary MPM). On Green when this MPM is the active, or controlling, MPM. It is also on Green when this is the only MPM installed in the switch.

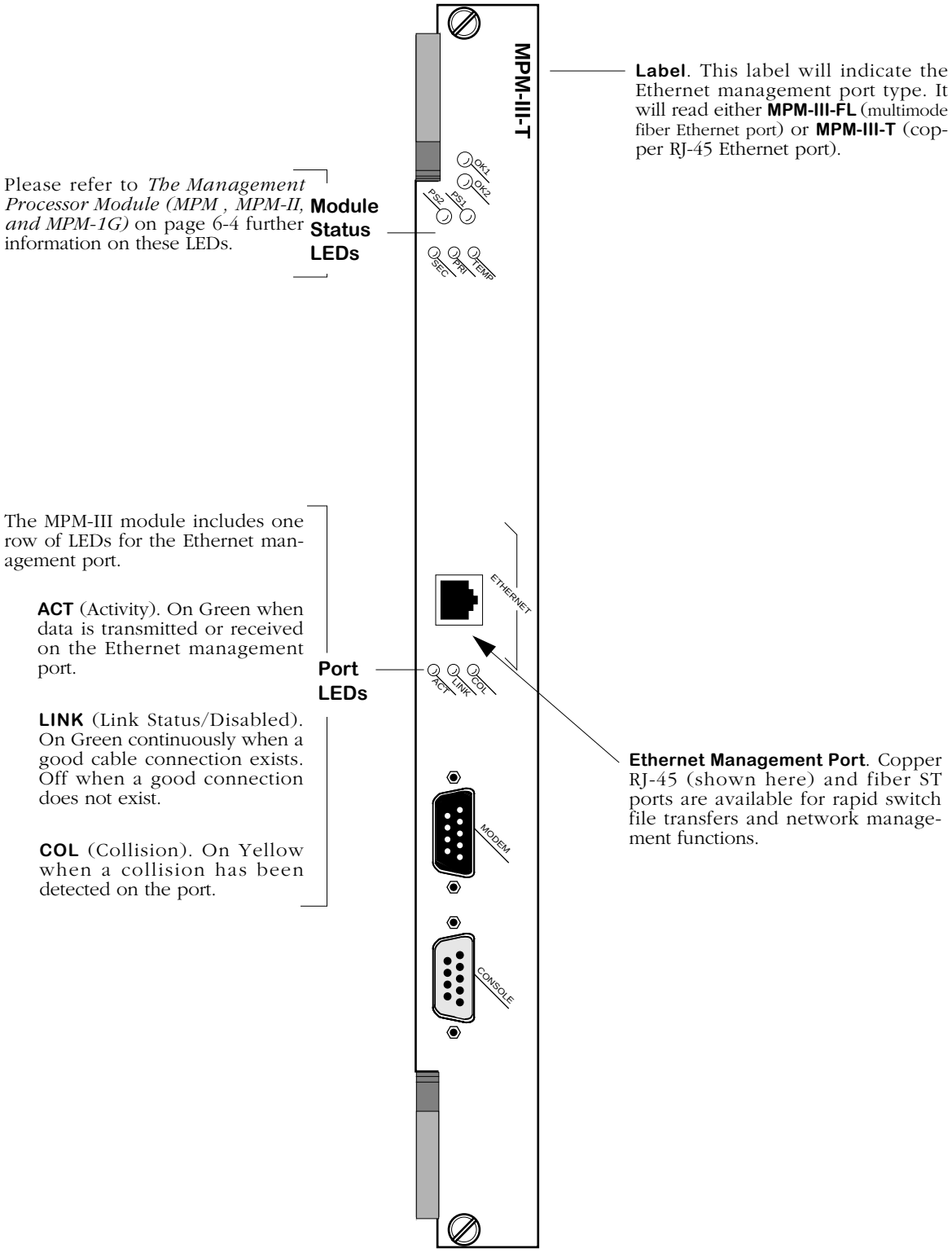
SEC (Secondary MPM). On Green when this MPM is the secondary MPM in a redundant MPM configuration. As the secondary MPM, this module is in hot standby mode.

TEMP (Temperature). On Amber to warn that the internal switch temperature is approaching operating limits. Note that this LED comes on *before* the temperature limit is reached.

PS1 (Power Supply 1 Status). This dual-state LED is on Green when the switch is receiving the proper voltage from Power Supply 1. It is On amber when Power Supply 1 is on, but not supplying the correct amount of voltage to power the switch. The **PS1** LED is Off when the Power Supply 1 is not present.

PS2 (Power Supply 2 Status). This dual-state LED is on Green when the switch is receiving the proper voltage from Power Supply 2. It is On amber when Power Supply 2 is on, but not supplying the correct amount of voltage to power the switch. The **PS2** LED is Off when Power Supply 2 is not present.

The Management Processor Module (MPM , MPM-II, and MPM-1G)



Label. This label will indicate the Ethernet management port type. It will read either **MPM-III-FL** (multimode fiber Ethernet port) or **MPM-III-T** (copper RJ-45 Ethernet port).

Please refer to *The Management Processor Module (MPM , MPM-II, and MPM-1G)* on page 6-4 further information on these LEDs.

Module Status LEDs

The MPM-III module includes one row of LEDs for the Ethernet management port.

ACT (Activity). On Green when data is transmitted or received on the Ethernet management port.

Port LEDs

LINK (Link Status/Disabled). On Green continuously when a good cable connection exists. Off when a good connection does not exist.

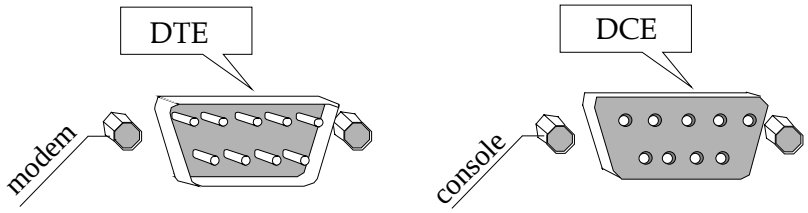
COL (Collision). On Yellow when a collision has been detected on the port.

Ethernet Management Port. Copper RJ-45 (shown here) and fiber ST ports are available for rapid switch file transfers and network management functions.

The Management Processor Module (MPM-III)

Serial and Ethernet Management Ports

You can gain access to switch management software through one of the two serial (RS-232C) ports on the MPM. The two console ports are configured with 9-pin "D" connectors (DB-9) per the IBM AT serial port specification. One port is male and the other is female.

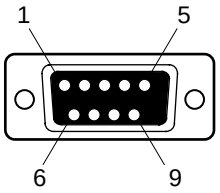


MPM Serial Ports

The male connector is a Data Terminal Equipment (DTE), which is typically connected to a modem. You can also connect directly from this port to a PC or terminal with a standard null-modem cable available in most computer equipment stores.

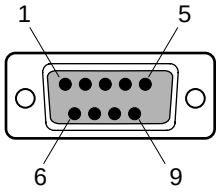
The female connector is a Data Communication Equipment (DCE), which is directly connected to a PC, terminal, or printer.

If the connecting device does not conform to the IBM AT serial port specification, then you may need to use a special cable or adapter. The pinouts for the console and modem ports are shown below and on the following page.



MPM Console Port Specifications		
Pin Number	**Standard Signal Name**	**Direction**
1	Not Used	
2	RD	From MPM
3	TD	To MPM
4,	Not Used	
5	GND	
6	Not Used	
7	Not Used	
8	Not Used	
9	Not Used	
Shell	Shield GND	

MPM Console Port



MPM Modem Port Specifications		
Pin Number	**Standard Signal Name**	**Direction**
1	Not Used	
2	RD	To MPM
3	TD	From MPM
4,	DTR	From MPM
5	GND	
6	DSR	To MPM
7	RTS	From MPM
8	CTS	To MPM
9	Not used	
Shell	Shield GND	

MPM Modem Port

Each Console port supports serial data rates of 1200, 9600, 19200, and 38400 bps. By default, each is set to 9600 bps. You can change this setting using the **ser** command that is described in Chapter 10, "Configuring Management Processor Modules." You can connect or disconnect a serial cable to this port at any time without disrupting the switch.

♦ Note ♦

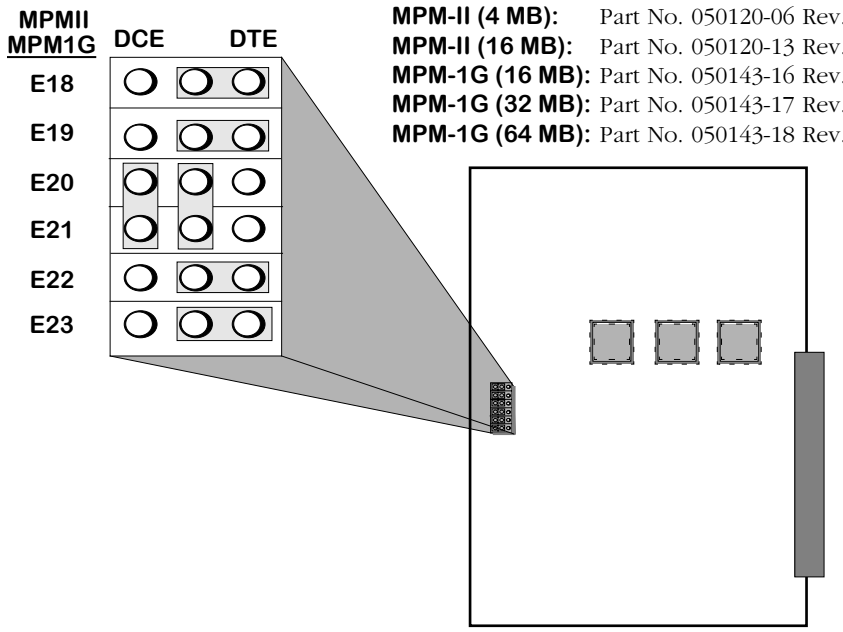
On the MPM-C and MPM-III, you must remove the default baud rate shunt (E1), which fixes the baud rate at 9600 bps, before you can change the baud rate. This shunt is located near the Ethernet management port.

Modem Port Jumpers

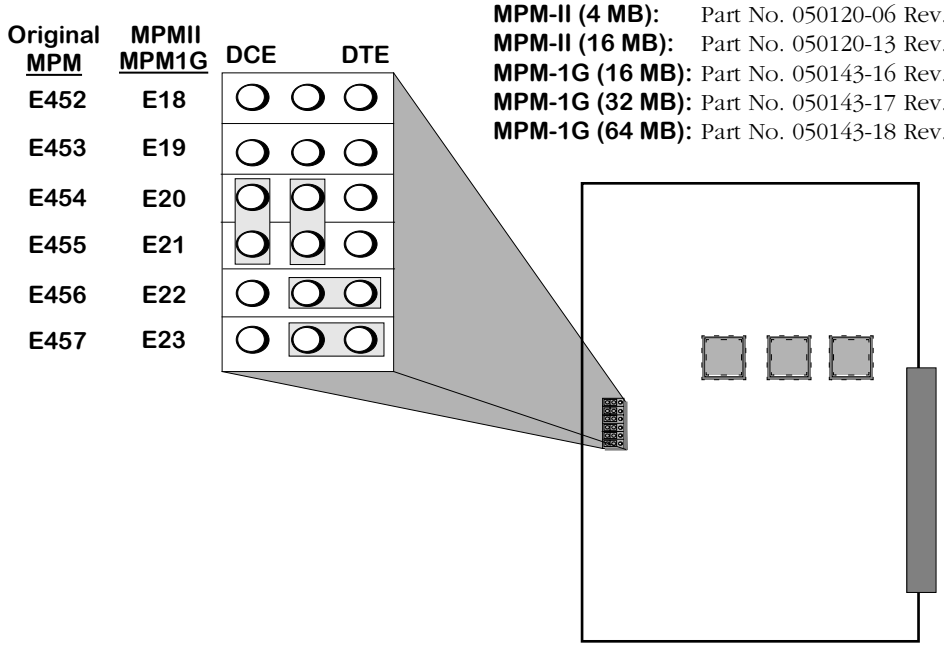
When using the modem port, jumpers must be set correctly. The MPM has one user-configurable jumper block. For the original MPM this block is labelled E452-457. For the MPM-II and MPM-1G this block is labelled E18-23. All remaining jumpers on the board are for internal use only. Do not alter any other jumper settings. By default, jumpers for the modem port are configured as shown in one of the figures below. Newer boards use the configuration in the top illustration and older boards use the configuration in the bottom illustration; refer to revision levels in the drawings for the correct configuration.

♦ Note ♦

The MPM-C and MPM-III are hard wired for DTE communications. You do not set jumpers on these modules.



MPM-II (4 MB): Part No. 050120-06 Rev. C17 and later
MPM-II (16 MB): Part No. 050120-13 Rev. C17 and later
MPM-1G (16 MB): Part No. 050143-16 Rev. B07 and later
MPM-1G (32 MB): Part No. 050143-17 Rev. B06 and later
MPM-1G (64 MB): Part No. 050143-18 Rev. B06 and later



Original MPM: All versions
MPM-II (4 MB): Part No. 050120-06 Rev. C16 and earlier
MPM-II (16 MB): Part No. 050120-13 Rev. A10 and earlier
MPM-1G (16 MB): Part No. 050143-16 Rev. B06 and earlier
MPM-1G (32 MB): Part No. 050143-17 Rev. B05 and earlier
MPM-1G (64 MB): Part No. 050143-18 Rev. B05 and earlier

Jumper settings on this block determine whether the modem port is configured for DCE or DTE operation. By default, they are configured for DTE operation, which is standard for a modem port. These jumpers also accommodate various loopback and null modem configurations.

Make sure the jumper block is set as shown in the figure on the following page before using the modem port. This default configuration allows you to connect the modem port to a modem using a straight-through cable, or to connect to a terminal, such as a PC, using a cross-over cable.

MPM-III Ethernet Management Port

The MPM-III also supports an out-of-band Ethernet port for high-speed uploads and switch management functions. With this port, you can access the OmniSwitch over a network via Telnet or FTP.

Before you can access an OmniSwitch through the Ethernet management port, you must assign an IP address to it first. You can use the Boot prompt to configure an IP address for the Ethernet management port or you can use the **ethernetc** command, which is described in Chapter 10, "Configuring Management Processor Modules." After you have assigned an IP address to the Ethernet management port, you can use it to Telnet into the UI.

See Appendix A, "The Boot Line Prompt," for documentation on configuring the Ethernet management port with the boot prompt.

See the table below for available Ethernet management port types.

MPM-III Model	Ethernet Management Port Type (Cable Type)	Max. Cable Distance
MPM-III-T	RJ-45 (UTP)	100 meters
MPM-III-FL	ST (Multimode fiber)	2 kilometers

♦ Note ♦

The Ethernet management port has a default IP address of 192.168.11.1.

Flash Memory and Switch Software

Flash memory on the MPM holds the OmniSwitch's executable images and configuration data for each image file. When a Switching Module comes online, the MPM downloads the appropriate image file for that module to that module's SIMM memory. Image files (those with the .img extension) contain executable code for different switching modules and software features. In addition, Programmable Gate Array (PGA) files (those with the .pga extension) are currently used with the Token Ring fiber module (TSM-F-6) for specialized configurations.

The following table lists all the files that may be present in MPM flash memory along with the module(s) or feature with which the file is used.

File Name	Modules/Function Used With
mpm.img	MPM, MPM-II, MPM-1G
mpm3.img	MPM-III
mpmc860.img	MPM-C
mpm.cmd	MPM, MPM-II, and MPM-1G command file
mpm3.cmd	MPM-III command file
mpmc860.cmd	MPM-C command file
mpm.cfg mpm.cnf	MPM, MPM-II, MPM-1G, MPM-III, MPM-C configuration files
asm.img	All ASM modules, all ASM2 modules, FCSM I (ASM functions), FCSM II (ASM functions)
asmc.img	MPM-C ("FCSM" functions)
asm_mpg.img	Multi-peer group PNNI operation for FCSM I and FCSM II
asmc_mpg.img	Multi-peer group PNNI operation for MPM-C
asmce.img	Circuit emulation (ASM-CE, CSM-AB-CE)
asmcedrv.img	Circuit emulation (ASM-CE, CSM-AB-CE)
cell.img	CSM-155, CSM-622, CSM-A25, FCSM, FCSM-II, MPM-C
cell_mpg.img	CSM-155, CSM-622, CSM-A25, FCSM, FCSM-II, MPM-C used with multi-peer group PNNI operation

continued on next page...

File Name	Modules/Function Used With (Cont.)
diag.img	Diagnostics software (MPM, MPM-II, MPM-1G)
diag3.img	Diagnostics software (MPM-III)
diagc.img	Diagnostics software (MPM-C)
dmesm.img	Ethernet (Mammoth) port stress test software
dni.img	Diagnostics software for non Mammoth switching modules
ds3e3drv.img	ASM-DS3, ASM-E3, CSM-AB-DS3, CSM-AB-E3
e12.img	ESM-C-12, ESM-T-12, ESM-F-8
esm.img	ESM-C-8, ESM-U
fesm.img	ESM-100-C, ESM-100-C-FD, ESM-100-Fx-FD, ESM-100C-5, ESM-100CFx-5 (on HSM)
fesm2.img	ESM-100-C, ESM-100-C-FD, ESM-100-Fx-FD, ESM-100C-5, ESM-100CFx-5 (on HSM2)
fsm.img	FSM-M, FSM-S, FSM-C, FSM-M-C, FSM-SH
fwd.img	IP Firewall software
gated.img	Advanced Routing software
ima.img	Inverse Multiplexing over ATM (IMA) software
ipcntrl.img	IP control software
ipms.img	IPMS software
isdn.img	WSM-BRI-SC
lsm.img	LES/BUS software
lsm_mpg.img	LES/BUS software used with multi peer group PNNI operation
m013m.img	WSM-M013
mesm.img	ESM-C-100-12, ESM-C-16, ESM-C-32, ESM-100FM-8, ESM-FM-16W, ESM-100C-32W, ESM-T-24W, GSM-FM/FS-2W
mpc.img	Multi-Protocol Over ATM (MPOA) software
mrd.img	Advanced Routing software
mtsm.img	TSM-CD-16W

continued on next page...

File Name	Modules/Function Used With (Cont.)
ntp.img	Network Time protocol (NTP) software
qos.img	Quality of Service (QOS) software
rav.img	RADIUS authentication software
sec.img	SONET error collection software
t1e1drv.img	WSM-FT1/E1, ASM-CE, CSM-AB-T1, CSM-AB-E1
text_cfg.img	Text-based configuration software
tsm.img	TSM-C-6, TSM-F-6, TSM-CD-6
tsm.pga	TSM-F-6
vrrp.img	VRRP software
wsm.img	WSM-S (Frame Relay and PPP software)

Flash Memory Guidelines

The switch alters flash memory contents when a software command requests a configuration change, when a remote administrator downloads a new executable image, or when the switch fails and a record of the failure is written to flash memory. These operations require available space in flash memory.

In general the flash memory on the switch should always have at least 75000 bytes available at all times. In a switch with 4 MB of flash memory, for example, the images in flash should never exceed 3.45 MB. (You can view how much flash memory is available through the **ls** command.) This will allow enough room in flash for booting and configuration file expansions. If your flash memory exceeds this amount, then you need to delete some images from flash.

In addition, the flash file system has a limit of 32 files, including configuration, logging, and other files. When this 32-file limit is reached, configuration file expansions will cease and new files will not be able to be loaded. This file limit applies even if there is enough memory available in flash.

Not all image files in flash memory are required—only those that must be used with the switching modules in your OmniSwitch. You can remove any files that are not required for your OmniSwitch configuration by using the **rm** command. For example, if you did not have a Token Ring fiber module (TSM-F-6), then you could remove all PGA files (about 56K). If you do not have any Token Ring modules, you could remove the **tsm.img** file.

MPM Redundancy

In order to provide greater reliability, the OmniSwitch supports two MPMs in a primary/secondary redundant configuration. If the primary MPM fails, the secondary MPM takes over without any operator intervention.

When you have two MPMs in one chassis, they must be installed in slots 1 and 2, and only one can be active. MPMs will assume one of the following roles.

- Primary - The MPM that is currently active and processing commands. It is also the MPM that is communicating via Telnet, FTP, etc.
- Secondary - An MPM that is currently not the primary. It has sufficient software to communicate with the primary MPM. (For full redundancy, the secondary MPM should also have the same software version as the primary and its configuration should be in sync with the primary.) In this state, it is capable at any time of assuming the primary role.

The LEDs on each MPM reflect the same status with the exception that the primary's **PRI** LED is on whereas the secondary's **SEC** LED is on. Also, the secondary MPM's **OK2** LED will not flash amber during board transitions.

Change-Over Procedure

The secondary MPM continuously monitors the primary MPM. This monitoring serves two purposes: 1) to notify the secondary MPM that the primary is alive and processing, and 2) to update the configuration and thus keep the two MPMs in sync. If the secondary MPM detects that the primary is no longer operational, it can begin to take over as primary within a few seconds. When a secondary MPM becomes primary it resets all the other modules in the chassis and performs a primary MPM initialization.

There are four states for an MPM configuration. You can view the current MPM state through the **slot** command. These states are described in the table below. Note that for a primary/secondary configuration to be in a "redundant" state, the relationship between the two MPMs must meet the conditions shown in the table.

MPM State	Requirement for State
Redundant	Both MPMs are running the same version of software and the configurations are in sync.
Configuration Fallback	Both MPMs are running the same version of software but the configurations are different.
Software Fallback	The MPMs are running different versions of software, and their configurations may be the same or different.
None	There is only one MPM installed in the chassis.

The primary MPM has the ability to transfer files to and from the secondary MPM. In the condition where the secondary MPM has an older version of software, it is not desirable to update the configuration file of the secondary. It is therefore the default not to update the configuration file on the secondary if the secondary is running an earlier version of software. You can force the update using the appropriate command.

♦ Note ♦

Do *not* remove a primary MPM without performing a **renounce** command (described in Chapter 10, "Configuring Management Processor Modules") first.

MPM Redundancy Commands

A set of commands exists to monitor the primary and secondary MPMs. These commands are covered in detail in Chapter 10, "Configuring Management Processor Modules." Note that you can attach a terminal to both MPMs in a chassis; however, you will see a different set of commands depending on which is primary and which is secondary.

Hardware Routing Engines

Hardware Routine Engines (HREs) are submodules that plug into a socket on the MPM-III, MPM-1G, or MPM-II to significantly enhance routing performance. An MPM without an installed HRE routes packets between Groups and VLANs by sending them up the IP protocol stack for processing and then back down the protocol stack for transmission. This method can be slow and routing performance is limited by the available MPM CPU cycles.

With an installed HRE, routing is performed in hardware making it unnecessary for the MPM to process all packets and saving valuable CPU cycles. The HRE is free to perform routing at full VBUS speeds.

♦ Note ♦

If a switch contains only one HRE, then the MPM on which that HRE is a daughterboard should be installed in Slot 1 of the chassis. Slot 1 is optimized for high-performance routing.

There are three versions of the HRE:

- The original HRE for the MPM-II and MPM-1G
- The HRE-Plus for the MPM-II and MPM-1G
- The HRE-VX for the MPM-III.

Approximately 100 K 64-byte packets per second (bidirectional) can be processed by these HREs. The HRE versions are described in the subsections below.

♦ Note ♦

The MPM-C and original MPM do not support any version of the HRE.

MPM-II and MPM-1G HRE and HRE-Plus

There are two versions of the HRE for the MPM-II and MPM-1G: HRE and HRE-Plus. The HRE and HRE-Plus include a 2K CAM and 2048-entry header cache table. The HRE-Plus supports redundant configurations in which two MPMs, each with an HRE-Plus, are installed in a single chassis. The standard HRE does not support redundant configurations.

♦ Note ♦

You must have at least 16 MB of DRAM and 4 MB of flash memory on your MPM-II or MPM-1G to use an HRE or HRE-Plus.

MPM-III HRE-VX

The HRE-VX is an HRE designed specifically to run on an MPM-III. The HRE-VX includes 8 MB of SDRAM and 64 K of SRAM. The HRE-VX supports redundant configurations in which two MPM-IIIs, each with an HRE-VX are installed in a single chassis.

♦ Note ♦

Although the HRE-VX is similar in appearance to the Omni Switch/Router HRE-X, it *cannot* be used on any Omni Switch/Router module.

FDDI Trunking Ports and Large Routed Frames

The HRE will not correctly route large frames received from a FDDI port configured as a proprietary FDDI Trunking port. Data corruption will occur on frames larger than 1856 bytes, a value that includes the MAC header. Only larger frames, such as those generated by FDDI and Token Ring, are affected by this limitation. Since Ethernet frames are smaller than 1856 bytes, they are not affected by his limitation.