Reference Guide

Microcom®

Access Integrator

Microcom Part Number 24-0000883-004

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Microcom Part Number 24-0000883-004

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Chapter 1

System Overview

Your Microcom Access Integrator is an extremely powerful and sophisticated central-site communications system. In a single chassis, you can integrate the functions of many key components — including modems, communications servers, Ethernet interfaces and ISDN, E1 or T1 lines. This medium to high-density, cost-effective system lets you apply these resources over LANs and WANs to inbound and outbound calls, with all the functionality of a communications server, terminal server and router.

Directly, remotely or over your network, you can:

- set up, reconfigure and manage any part of the system over Windows-based SNMP software
- route incoming or outgoing calls to any line or network node
- take advantage of the advancing state of the art with a distributed architecture that allows you to deploy new functionality without replacing the system

The system combines the best of today's telecommunications and networking technologies. The products give you the most advanced features in dial access communications. A powerful configuration wizard directs installation and configuration of this sophisticated system. The modules are interchangeable from chassis to chassis and will remain so. The chassis and components support standards based LAN, WAN and telecommunications operations, with SNMP management through *express*WATCH software.

Applications

The Microcom Access Integrator serves the varied dial-access needs of:

- telcos
- Internet Service Providers
- medium to large companies and
- international businesses

Typical customers apply the chassis to inbound and outbound calls for access to the Internet, to an intranet, to e-mail, for file transfers, to databases, and to corporate resources. All systems offer Microcom's advanced modem features, protocols and command sets in densities of 24 modems per chassis slot.

Its 7-slot and 17-slot chassis allow a wide variety of configurations to accommodate the most demanding communications requirements.

The chassis acts as its own network for the components you install, and it can communicate with your corporate subnets and networks as well. Inside the chassis, you can isolate, configure, reset and gather statistics from an individual port or entire set of devices. Combined with its hot-swappable modules, this makes expansion, fine-tuning and troubleshooting simple and precise.

Features

The Microcom Access Integrator system features:

- Distributed architecture for expansion, fault tolerance and upgradability
- 7-slot and 17-slot chassis
- A mix-and-match module system of modems, network media, Access Servers, E1, T1 and Primary Rate ISDN (PRI) interfaces and intelligent management of modules
- ADAPT*ive* Switching for automatic all routing to LAN and asynchronous applications
- Communications Services through Access Servers (Cisco 2511 compatible) or NT servers for remote access via L2F and PPTP WAN tunneling protocols
- Virtual Private Networking (VPN) support using L2F and PPTP
- Standard 19.5-inch rack mount or table mount
- Very high density Microcom 56K and 33.6K modems — up to 240 ports per channelized T1 systems and up to 300 for channelized E1 applications
- Security with TACACS^{+}, RADIUSs, PAP, CHAP, and Security Dynamics (SDI).

- Analog or digital modem modules with MNP Class 10 and full Microcom AT command set
- Control, configuration and statistics from all modems in a chassis with single MNC
- Options for redundancy for most modules
- Highly automated installation and configuration Wizard
- *express*WATCH remote SNMP management software
- Sophisticated configuration and diagnostics through ADMMs
- Intelligent power and temperature management
- In-band and out-of-band connectivity to MNCs
- Module firmware upgrades via flash memory
- Hot-swappable modules
- Log-in and password security
- User configurable module power-up and shutdown priorities
- Automatic shutdown in catastrophic heat or electrical conditions

Conventions in This Guide

Table 1-1. Conventions

When You See...	*It Means...*
Enter	...press the Enter (Return) key.
Ctrl - *n*	...while holding down the Control (Ctrl) key, press key *n*.
bold type	...the default value in a command description, or ...what you see on the screen or what you type.

Key Terms

Your chassis contains advanced networking technology. We use several terms throughout our documentation you should know. These include:

Table 1-2. System Terms

Term	*Definition*
ADAPT*ive* Switching	Advanced Dynamic Software Switching Architecture (ADAPT*ive)* Switching is software-based support for PPTP and L2F applications. It allows WAN ports in the chassis to be dynamically assigned to the Internet, LANs, databases, or corporate resources through a single rotary, based on automatic detection of information from incoming calls
ADMM	Advanced Distributed Management Module. This half-slot module provides extra configuration and management functions.
CPS	Call Processing Subsystem uses Microcom's Dynamic Switching Protocol (ADAPT*ive* Switching) to connect modules in a chassis and to determine type and destination of incoming and outgoing calls.
carrier	the module frame that holds one or two engines and provides backplane connectivity.
chassis	the hub and all of its components; the system.
device	Used within the context of *express*WATCH management software to describe the entire chassis including all engines installed in the system.
device view	The graphical representation (bitmap) in *express*WATCH for the Access Integrator chassis and related engines. A device view displays in the *express*WATCH main window for each chassis added using the **Devices→Managed Devices→Add...** menu option from the *express*WATCH main window.
engine	a printed circuit board installed on a carrier; two engines or one engine and a blank fit on a carrier card to make a module.
hub	the rack-mountable chassis frame with its power supplies, intelligent power management, fans and backplanes

Table 1-2. System Terms

L2F	Cisco's Layer 2 Forwarding protocol that allows the chassis to tunnel data between Cisco routers/network servers and the CPS.
LIU	Line Interface Unit, Microcom's T1 engine, each of which can support 48 digital modems through two T1 cable connections (24 modems per T1 span).
MMM	Managed Modem Module, which provides 24 modems (six modems on each engine and 12 per module on the analog). MMMs are available as digital or analog.
MNC MNC-II	Microcom Network Controller that can be used to configure, manage, upgrade, and gather statistics from MMM, PRI, and LIU engines. The MNC-II has two Ethernet ports on the front panel. It also monitors chassis temperature, battery voltage and power supply voltages. Both versions run on the same software.
module	functional component composed of a carrier with one or two engines on it that plug into chassis slots. These include one or two engines, for slots 2 through 17 in the 17-slot and 1 through 7 in the 7-slot chassis.
NMC	Network Monitor Card. This optional engine attaches to an Ethernet (Etherflex) module to monitor activity on an Ethernet network.
PPTP	Point-to-Point Tunneling Protocol, which an NT server can use to route communications with MMMs and other system components.
PRI/E1	Engine supporting Primary Rate ISDN (30 B channels and 1 D channel) or channelized E1 (30 calls) per span. Each engine has two spans.
PRI/T1	Primary Rate Interface, Microcom's ISDN T1 or E1 engine. Each PR/T1 engine supports 46 digital modems (23 B-channels plus 1 D-channel per PRI span).

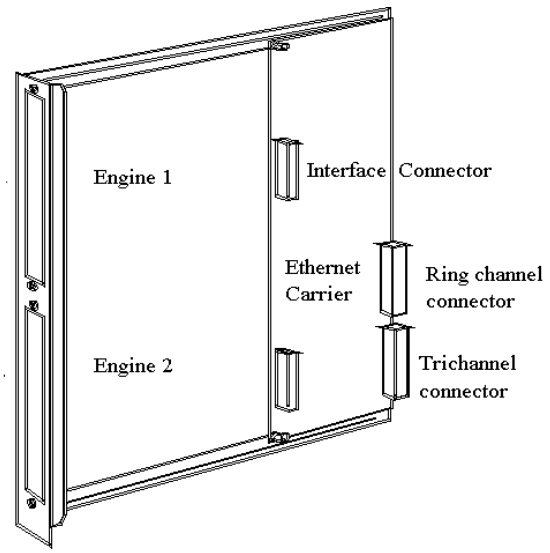


Figure 1-1. **Full-Slot Module Components**

System Components

You can choose your chassis configuration from a wide variety of networking and telecommunications components to meet your present and future needs. This open system lets you integrate the most advanced modems, comm servers, network controllers and interfaces into a single chassis. This mix-and-match approach allows extraordinary performance in a system fully compatible with standard computer systems, phone lines and Ethernet networks. Your chassis can migrate and evolve to incorporate new modules and technologies as they become available.

You can install the components you need for your specific operations. This open-system platform gives you complete access to and control of:

- High-density K56flex and V.34 Microcom Modem Modules (MMMs),
- Microcom Network Controller Modules (MNCs),
- High-speed Access Server modules for routing,
- T1 Line-Interface (LIU) Engines,
- Primary Rate Interface (PRI) Engines,
- Ethernet media modules,
- Advanced Distributed Management Modules (ADMMs), and
- Intelligent power management.

This central-site solution provides unparalleled functionality and expandabilty. In a networked hub, you can integrate the key LAN and WAN technologies, including terminal servers, Access Servers and X.25 gateways. Microcom provides a wide variety of modules — one or two cards on a hot-pluggable carrier, up to 17 per system, plus up to two power-management modules.

Each module has its own set of functions. Not only can you add them as necessary to expand a system to its fullest, but you can also swap out modules as required to maintain system performance.

You can configure and control any or all modules through the network and one of our intelligent modules.The MNCs can address, configure, control and gather statistics from each modem on a card (“engine”), each card on a carrier (“module”) and each carrier in a system. They can communicate over Microcom’s Time Division Multiplexing (TDM) backplane. Likewise, you can configure and control each other type of module in a system through an ADMM over the Ethernet backplane.

Users of Microcom’s High Density Management System (HDMS) will recognize and appreciate the similarities. The Microcom Access Integrator provides even greater density, with 24 modems per module, up to 180 modems per system. It also can integrate Access Servers directly in the hub. Its configuration functions offer the level of network management HDMS users are accustomed to having.

The Microcom Access Integrator lets you install the components that satisfy your communications needs. For minimal operations, the switching hub system itself requires:

- 1 **switching hub**,
- 1 **power supply** (at least two required for recommended redundancy in the 17-slot chassis),
- 1 **intelligent power-management module**, and
- 1 **fan** (3 are standard in the 17-slot).

The system supports many varied configurations. In addition, you can add functionality to suit your current needs and modify that as the needs change or additional modules become available.

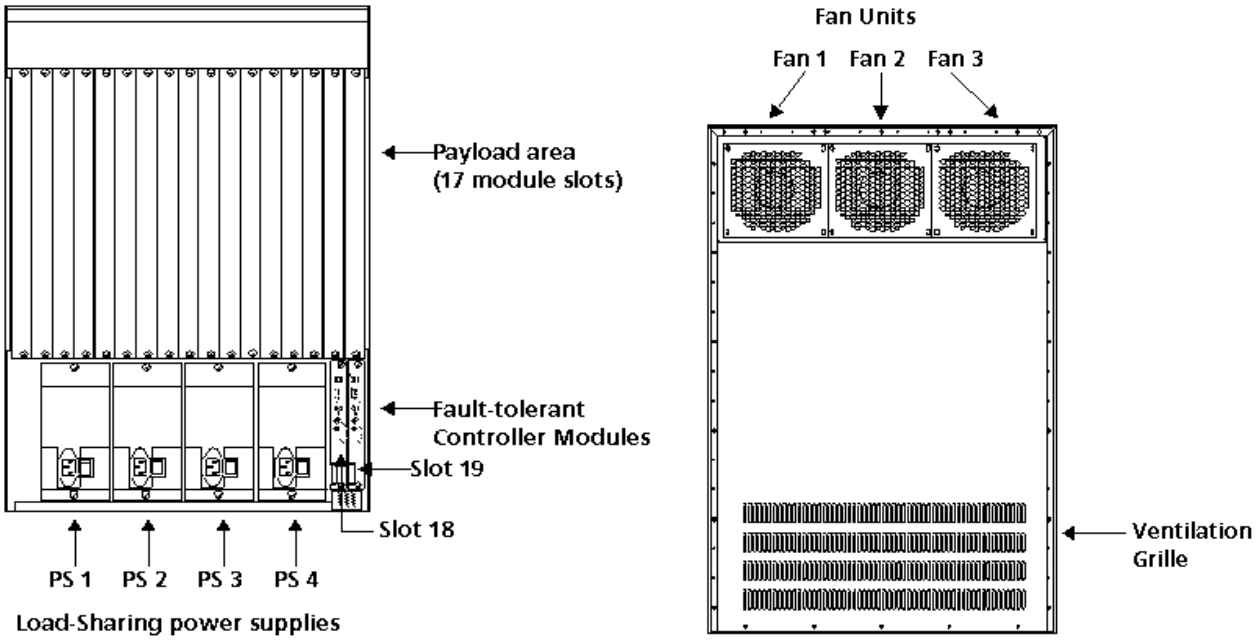


Figure 1-2. **17-Slot Chassis Front (left) and Rear (right) Views**

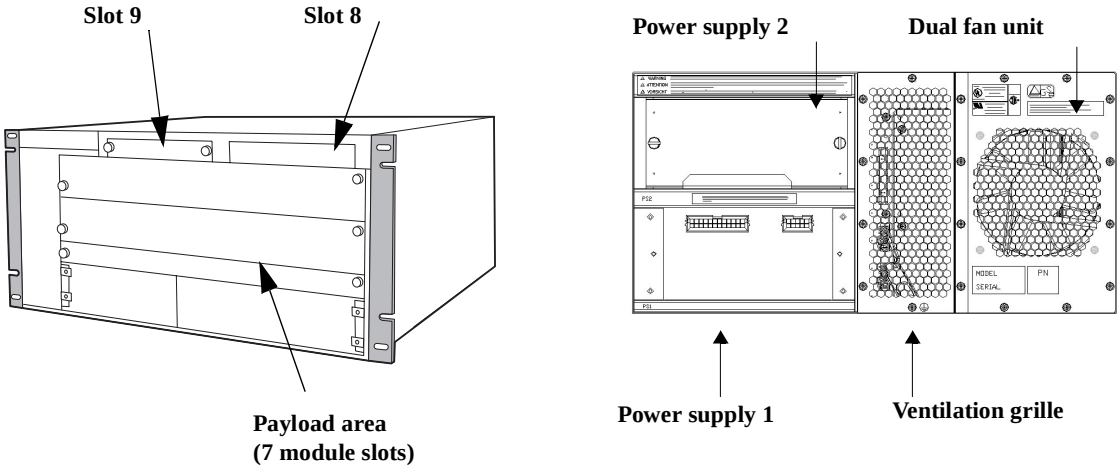


Figure 1-3. **7-Slot Chassis Front (left) and Rear (right) Views**

Power Supplies

You can use up to four power supplies in the 17-slot. Three should support all modules in a fully configured system. As a rule of thumb, you should always have one more power supply than your modules require.

These power supplies are load sharing. When they can supply more power than your system requires, all supplies share the load equally. If one begins to fail, all adjust to the increased demand.

Fans

The standard configuration for the 17-slot includes three fans at the top rear. Each is coupled with a temperature sensor, which communicates with the power-management module. The 7-slot uses a dual-fan unit.

These fans are hot swappable. We strongly recommend replacing an inoperative fan immediately and maintaining three upper fans per 17-slot hub.

In addition, each power supply includes its own fan.

Intelligent Power Management

One power controller module is essential for the hub's operation. On start, reset or insertion of a new module, it powers up each module. You can set priorities for modules for power-up and shutdown through the ADMM (see Chapter 2, *Installation*, for details). By default, all modules have the same priority. In the 7-slot chassis, they power up from slot 1 through slot 7, and shut down in the reverse order. In the 17-slot, they power up from slot 1 through slot 17, and shut down in the reverse order.

If there is not enough power for a module, this controller will not power it up. The powered up modules will operate normally.

Modules and Engines

Modules are available in a wide variety of configurations. ADMM**s** and **Ethernet media modules** use one slot each. Other modules carry one or two "engines." These include **MMMs**, **Access Servers**, **LIUs, PRIs**, and **MNCs**. Microcom will announce other modules as they become available.

User guides for the MNC and MMMs provide their command sets and physical details. One for the LIU and PRIs describes them in greater depth.

The **carriers** hold engines and interface with the chassis' backplanes. We provide fully configured carriers with one or two engines, per your order. The engines themselves are not available individually. You can replace a malfunctioning module with one of the same configuration. This will not disrupt the operations of other modules or the whole system. If you have an ADMM in the hub, it will write the configuration of the module you are replacing into the flash memory of the replacement.

Engines can have from one to four Ethernet ports. The carrier includes DIP switches to set the engines' Ethernet network. If you configure your system with an ADMM, you can set these in software.

Microcom can replace or repair modules, as needed. Contact your dealer or Microcom.

For external telecommunications, you can add digital modems in units of 24 per module.

The multi-protocol Access Servers provide a method of channeling modem communications to and from the LAN as well as in the hub itself. They function as stand-alone Access Servers. Each Access Server can support 96 modems, as well as provide one Ethernet connection, one serial port for WAN connection, and a console port.

ADMM

Your system can operate without an ADMM. However, this module provides numerous key features, including:

- Easiest configuration of backplane assignments
- Backup of module backplane assignments
- Downloads of backplane assignments to replacement modules

- Sophisticated diagnostics
- In-band management of the chassis and its network resources when used with Etherflex and MNC modules

We recommend including an ADMM in each system.

Etherflex

The MNC-II provides two Ethernet LAN ports. You can install an additional four ports with the Etherflex module. Each port allows you to connect external devices on an Ethernet 10Base-T LAN to the chassis' backplane. Etherflex modules support multiple backplane segments an individual assignment of ports.

The Ethernet media modules can connect up to four 10BASE-T networks or devices such as PCs, terminals, printers or modems to the hub. It also provides space for one or two Network Monitor Controllers (NMCs) daughter cards. One daughter card would allow network management through a workstation. Two allow a continuous workstation connection and monitoring of any of the eight backplane networks.

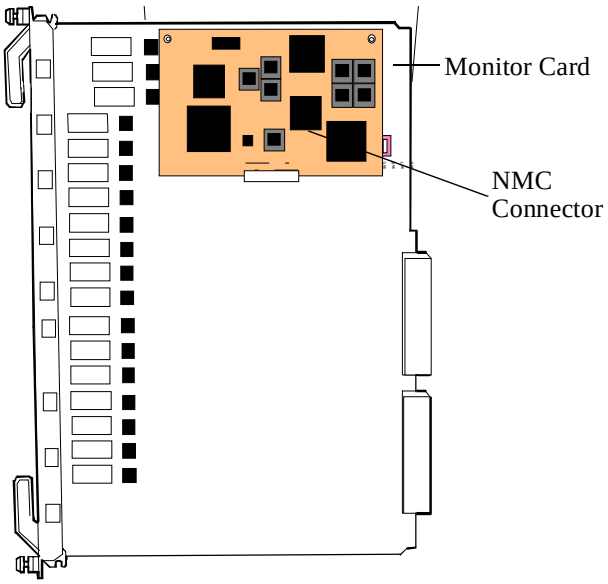


Figure 1-4. **NMC Daughter Card on Etherflex Module**

LIU

Each LIU contains two spans that support 24 ports. Thus each T1 card can provide a connection to 48 modems. A fully configured 7-slot appears in Figure 1-5 on page 1-8 including 96 modems. Two LIUs support connections to all 96 digital modems.

The line-interface unit (LIU) engine accepts up to two T1 lines for channelized service. The chassis' high-speed backplane automatically routes calls to individual digital modems.

MMM

High-density managed modem modules (MMM) are available in 24-port digital (MMM24) and 12-port analog versions. MMM24s offer up to 56 Kbps speed using K56flex technology, Microcom's sophisticated command set, and MNP 10. They default to V.34 for non-56K calls. MMM24s accept T1 or E1 calls over the chassis' high-speed backplane.

The 12-port MMMs are available as two 6-port engines per module. These V.34 analog modems also include Microcom's sophisticated command set, and MNP 10. Each engines accepts analog calls through standard RJ45 telephone cables.

Both MMM24 and 12-port MMMs support data connection rates of 33.6 Kpbs or 28.8 Kbps with throughput of 115.2 Kbps. They forward calls over the chassis' Ethernet backplane to network servers or RS-232 devices.

MNC

The Microcom Network Controller (MNC) provides SNMP management of MMM, PRI and LIU modules. The MNC allows manual configuration of these modules through *express*WATCH and its console-port interface. It stores their configurations in its 2.5Mb non-volatile RAM and automatically restores them on a module or chassis reboot. It also gathers traps and other SNMP data from the modules and forwards them to *express*WATCH for alarms and reports.A single MNC will communicate with all modems in a hub.

An MNC is necessary for the chassis to boot and operate. MNCs are hot-swappable.

It is also available as the MNC-II with two built-in Ethernet 10Base-T LAN connector ports. This is the standard module that ships with 7-slot and 17-slot chassis.

PRI

Primary Rate Interface (PRI) ISDN engines are available in T1 or E1 models. Either can accept two PRI trunk lines of their type.

Each T1 model engine supports 46 B-channel connections and each E1 model supports 60 B-channel connections. All PRI engines accept digital calls and route them over the chassis' Ethernet backplane to network servers.

7-Slot and 17-Slot Systems

Figure 1-5: 96-Port PRI/T1 7-Slot Chassis below illustrates a typical 7-slot configuration. From the top, the installed modules are:

1. On the upper right in half-slot 8, the Power Controller.
2. Slot 7 is available.
3. In slot 6, a PRI/T1 on the left and the MNC on the right.
4. In slot 5, a PRI/T1 on the left and an Access Server on the right.
5. In slots 4 through 1, MMM24s.

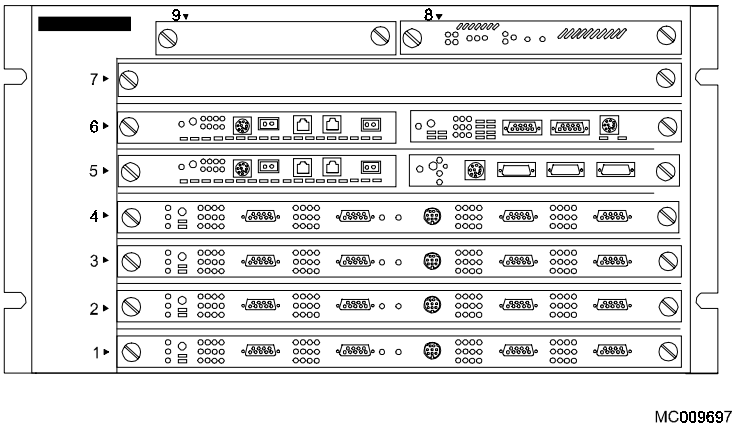


Figure 1-5. **96-Port PRI/T1 7-Slot Chassis**

The differences in a similarly configured 17-slot system would include:

1. The power supplies would appear in the front at the bottom.
2. The Power Controller module would go into half-slots 18 or 19 at the lower right.
3. An optional Etherflex module could be in slot 1.
4. MMM24s and other modules would install from slot 2 up.

Options for such a configuration would be an ADMM or power controller. Either would provide additional fault tolerance.

Communications

Backplanes

The chassis uses two separate backplanes for internal communication — tri-channel and ring channel — and a TDM "highway". Each provides different capabilities.

Note: In the 17-slot chassis, the TDM backplane does not extend to slot 1. This means that MNC, MMM, PRI and LIU engines will not operate in that slot.

The Ethernet backplane connects all modules through a carrier interface. It provides connections to Ethernet networks 1 through 8 and provides access to management services for the chassis.

Systems using an ADMM and daughter cards pass data to them over this backplane. When a chassis resets or powers up, each module looks for an ADMM over the tri-channel backplane. If they find one, the engines on them get their configuration information from it. The exceptions are the MMM, MNC and LIU engines. If the other engines do not find an ADMM, they read their non-volatile RAM or DIP switches, depending on how they are set. MMM, MNC, PRI and LIU engines get their configurations from the MNC's files.

The channel also carries the reset signal. This operates on all modules in the chassis.

The power controller (the Fault Tolerant Controller or FTC) reads the module ID for each slot. The engines' EPROMs provide their identification, which the power controller uses for inventory and power management. Its power distribution travels over this channel as well.

Communications between LIU or PRI and digital MMM engines travel over the TDM backplane. Analog modems do not use this "highway." Connectors on the digital MMM engines provide the interface to this backplane.

Figure 1-6 shows the communications among the engines and backplanes. The tri-channel is the management bus.

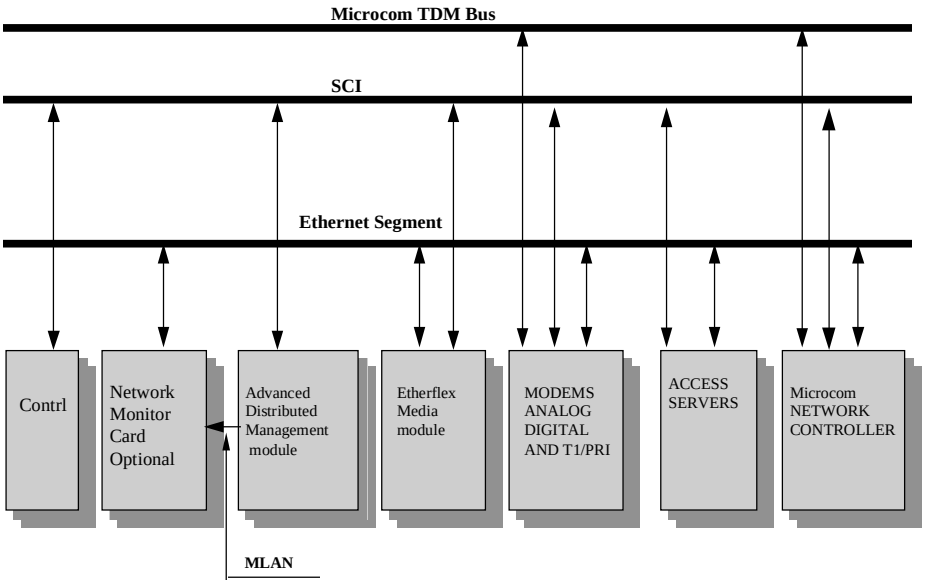


Figure 1-6. **Backplane Communications Model**

Network Servers

Access Server

The Access Server supports the Point-to-Point Protocol (PPP). With digital MMM engines, calls from an LIU, PRI in channelized T1 or analog PRI mode, or channelized E1 travel over the TDM backplane to the MMM ports and from the MMM engines to the Access Server. With analog MMM engines, calls to those ports travel by cable to the Access Server. In both cases, the Access Server processes the calls and sends them over the Ethernet segment to the router or other network resource.

You can also connect your chassis to a Windows NT server as an external network server.

IP Addresses

The Configuration Wizard prompts you to supply IP addresses as part of installation.A discussion of default IP addressing appears in Appendix J, *Standard Configurations*.

General Procedures

Setting up your chassis necessarily has multiple steps, because the chassis has many components and you will customize them to your operations. However, each step is straightforward.

Installing your Microcom Access Integrator involves preparation, physical setup and configuration. You will customize the system to your network, communications and operations. During installation, set the basic performance characteristics of each component through hardware switches or software. After startup, you can alter these settings quickly and easily through our *express*WATCH interface.

To familiarize yourself with the system's features and components, read the *Getting Started Guide*. After installation we strongly recommend using *express*WATCH for system management. Refer to its extensive on-line help.

We strongly recommend following the procedures in the *Getting Started Guide*. Briefly, they are:

- Familiarize yourself with installation steps
- Plan your installation
- Prepare your site
- Unpack your system
- Load the Wizard and follow its instructions
- Verify the chassis and components

If you have an Advanced Distributed Management Module (ADMM) as part of your system, you will also want to refer to Chapter 4, *Managing with an ADMM*. This component is necessary if you have multiple chassis on the same LAN segment or if you will segment your LAN into more than two segments. Refer to the manual provided with your ADMMs for more detail.

Chapter 2

Installation

This chapter discusses manual installation procedures. The *Getting Started Guide* and the Configuration Wizard software should lead you through installation and configuration of your system. ***We strongly recommend using the Wizard for installation***. Among the advantages of using the Wizard are:

- Automatic or assisted generation of configuration files
- On-line help
- Interactive confirmation of module insertion
- Wider range of recognized configurations
- Connectivity verification
- Automated site log configuration worksheets

If you choose to assemble your chassis manually as described in this chapter, you can still run the Wizard afterwards for verification or troubleshooting. If you do this, the Wizard may overwrite your configuration files on the PC you are using.

In this chapter, we describe common tasks, such as rack mounting in the *Getting Started Guide*. If you are unfamiliar with such procedures, see that *Guide* first.

Manual installation requires using one of the standard configurations. If you have not already selected one, you can find the one that matches your component in *Standard Configurations*. As you plan your installation and assemble the chassis, be sure to record the information in a site log. At the end of this chapter, we provide worksheets for this purpose.

Overview

Assembling the chassis is straightforward. Its components are all modular and nearly all install the same way. The basic procedure involves mounting the hub in a rack or on a load-bearing surface, installing the essential components and modules, then making the connections. Afterwards, all modules are hot-swappable for expansion, upgrade or maintenance.

You can install the following in the chassis:

- Modules, including MMMs, LIUs, PRIs, ADMMs, MNCs, Etherflex and Access Servers
- NMCs (daughter cards) Submodules,
- Load-Sharing Power Supplies
- Power Controller Modules

Note: The guide for each module contains additional information about installation, configuration, specification and operations. Refer to those if you need more detail than this guide provides.

For manual installation, we recommend the following installation procedures:

1. Prepare and plan the installation as described in the *Getting Started Guide* or this chapter and Appendix J, *Standard Configurations*.
2. Unpack your system components.
3. Mount the system in a rack or on a load-bearing surface.
4. Install the power supplies.
5. Install your MNC or MNC-II as described in the *Getting Started Guide* or the *Microcom Network Controller Guide*.
6. Install your system's other modules from slot 1 up.
7. Connect the components with cables that require them.

8. Turn on the system for basic power-up verification and diagnostics.
9. Perform final verification as described in Chapter 3, *Initial Startup*.

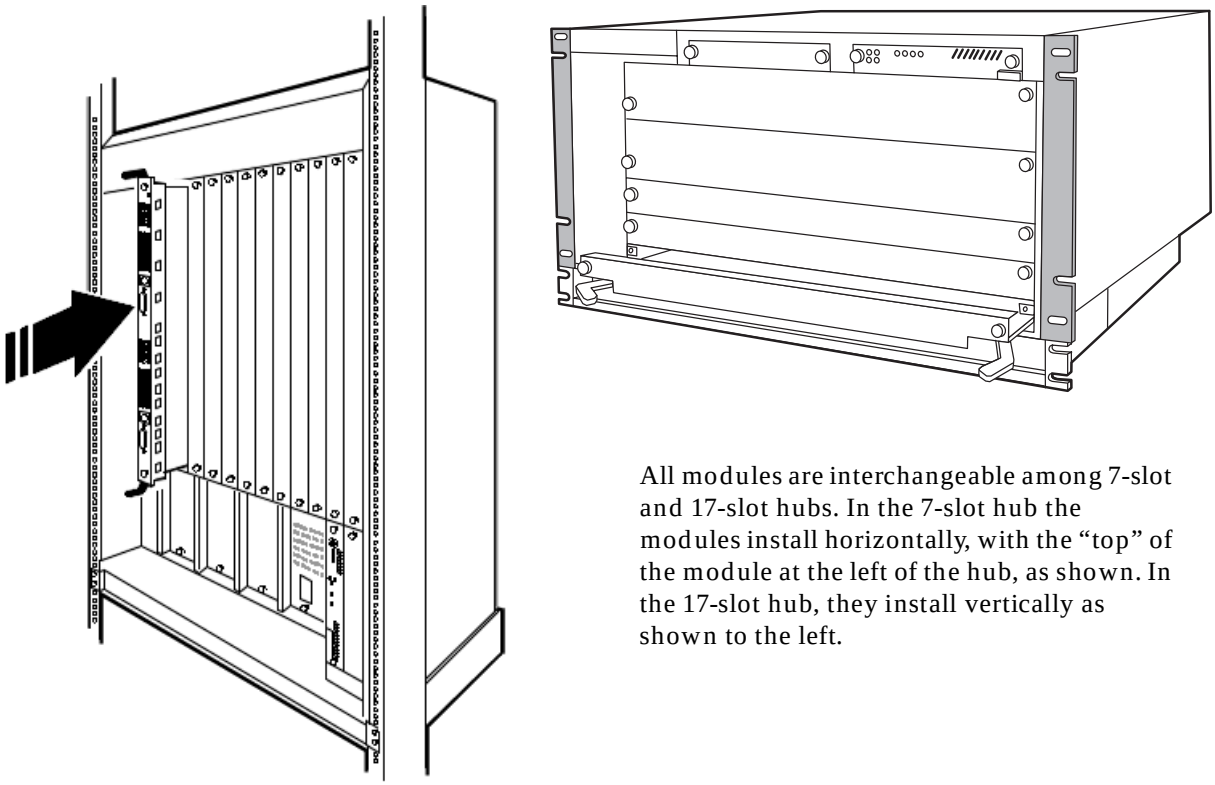
Important: While most modules fit in any open slot, if you perform manual installation, we strongly recommend using the standard configurations, as illustrated in Appendix J, *Standard Configurations*. We provide unique configuration file sets for each, with the module locations included.

Installing the Hub

The chassis design facilitates easy access, maintenance, installation, and upgrade. If you are not familiar with installing and handling modules, see the *Getting Started Guide*. Complete table and rack mounting instructions and illustrations appear in that *Guide*.

WARNING: To reduce the possibility of personal injury or serious damage to the hub, install the hub with the help of a partner. This is especially important for rack installations because you must hold the hub in place while securing the hub to the rack. We recommend rack mounting the hub ***before*** installing the modules.

Note: To maintain the hub's rigidity, do not remove blank faceplates until after you have installed the hub. If modules do not slide easily into the hub, it may be because the hub has been lifted after some or all blank faceplates have been removed.



All modules are interchangeable among 7-slot and 17-slot hubs. In the 7-slot hub the modules install horizontally, with the "top" of the module at the left of the hub, as shown. In the 17-slot hub, they install vertically as shown to the left.

Figure 2-1. Module Installation

Installing MMM, PRI and LIU Engines

Manual installation of MMM, PRI and LIU engines involves:

- Identifying your configuration
- Recording each engine's location and its MAC address (from a label on the engine) in a site log

- Inserting the modules for that configuration
- Editing and saving your configuration files in *express*WATCH
- Cabling LIUs or PRIs
- Optional cabling of MMM24s
- Rebooting the chassis to have the configurations take effect

Your system's MMM and LIU engines store their configuration information in their on-board RAM. The chassis' MNC provides these files and stores copies in its RAM disk.

Note: If you have not already installed *express*WATCH and identified your chassis configuration, do those tasks now.

Next, install all modules in your chassis, from left to right in the 17-slot and top to bottom in the 7-slot. If you are using a configuration with one or more Access Servers and digital MMMs, cable those as described in the next section, "Cabling Digital MMMs".

If your installation uses LIU or PRI engines, copy those configuration files (*xprswtch.liu* and *xprswtch.pri*) for your configuration, as described in Chapter 7 of the *Getting Started Guide* and *express*WATCH's on-line help. These LIU or PRI files assign data channels to modem ports ***if the engines are in identical positions to the files' matching configuration.***

After you install all modules, power up your chassis. Then observe the modules' LEDs to verify their basic operations. If you did not see a particular engine's LEDs during this first boot, press its reset button to do so.All LED displays appear in Appendix D, *Engine Faceplates and LEDs*.

Cabling Digital MMMs

If you are cabling MMM24s to Access Servers, the following diagrams illustrate the procedure. Each cable harness connects the four asychronous 60-pin ports of an MMM24 to three Access Server 60-pin ports. So three Access Servers can connect to four MMM24s.

7-Slot MMM24 Cabling

The MMM cables have labels from **M1** through **M4**. The Server cables have labels from **R1** through **R3**. To cable the standard configuration shown in Figure 2-2 on page 2-4:

1. Plug the **M1 Modem** cable into the 60-pin **1-6** port in the left side of slot 1.
2. Plug the **M2 Modem** cable into the 60-pin **7-12** port in the left side of slot 1.
3. Plug the **M3 Modem** cable into the 60-pin **13-18** port in the right side of slot 1.
4. Plug the **M4 Modem** cable into the 60-pin **19-14** port in the right side of slot 1.
5. Plug the **R1 Server** cable into the A1 port in the Access Server in the left side of slot 4.
6. Plug the **R2 Server** cable into the A2 port in the Access Server in the right side of slot 4.
7. Plug the **R3 Server** cable into the A1 port in the Access Server in the right side of slot 5.

Note: If you are only cabling a single MMM24 in a 7-slot chassis, do not use the A2 port of the Access Server in slot 5.

For the second harness:

1. Plug the **M1 Modem** cable into the 60-pin **1-6** port in the left side of slot 2.
2. Plug the **M2 Modem** cable into the 60-pin **7-12** port in the left side of slot 2.
3. Plug the **M3 Modem** cable into the 60-pin **13-18** port in the right side of slot 2.
4. Plug the **M4 Modem** cable into the 60-pin **19-14** port in the right side of slot 2.
5. Plug the **R1 Server** cable into the A2 port in the Access Server in the right side of slot 5.
6. Plug the **R2 Server** cable into the A1 port in the Access Server in the left side of slot 6.
7. Plug the **R3 Server** cable into the A2 port in the Access Server in the right side of slot 6.

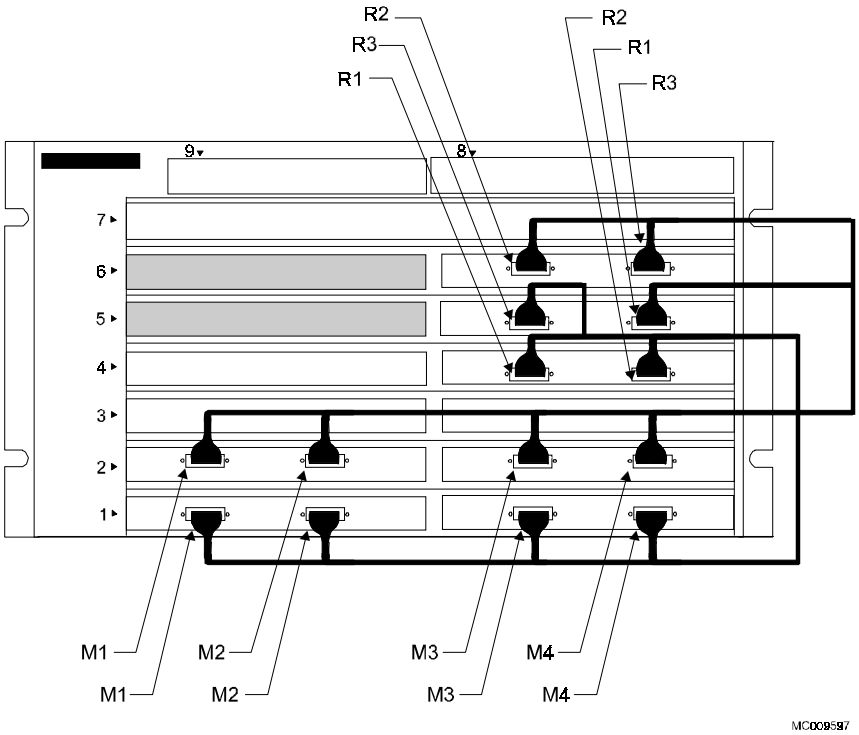


Figure 2-2. Cabling a 7-Slot Chassis with MMM24s

17-Slot MMM24 Cabling

The MMM cables have labels from **M1** through **M4**. The Server cables have labels from **R1** through **R3**. To cable the standard configuration shown in Figure 2-3 on page 2-5:

1. Plug the **M1 Modem** cable into the 60-pin **1-6** port at the top of slot 2.
2. Plug the **M2 Modem** cable into the 60-pin **7-12** port in the upper half of slot 2.
3. Plug the **M3 Modem** cable into the 60-pin **13-18** port in the lower half of slot 2.
4. Plug the **M4 Modem** cable into the 60-pin **19-24** port in the bottom of slot 2.
5. Plug the **R1 Server** cable into the A1 port on the top of the Access Server in slot 6.
6. Plug the **R2 Server** cable into the A2 port on the bottom of the Access Server in slot 6.
7. Plug the **R3 Server** cable into the A1 port on the top of the Access Server in slot 7.

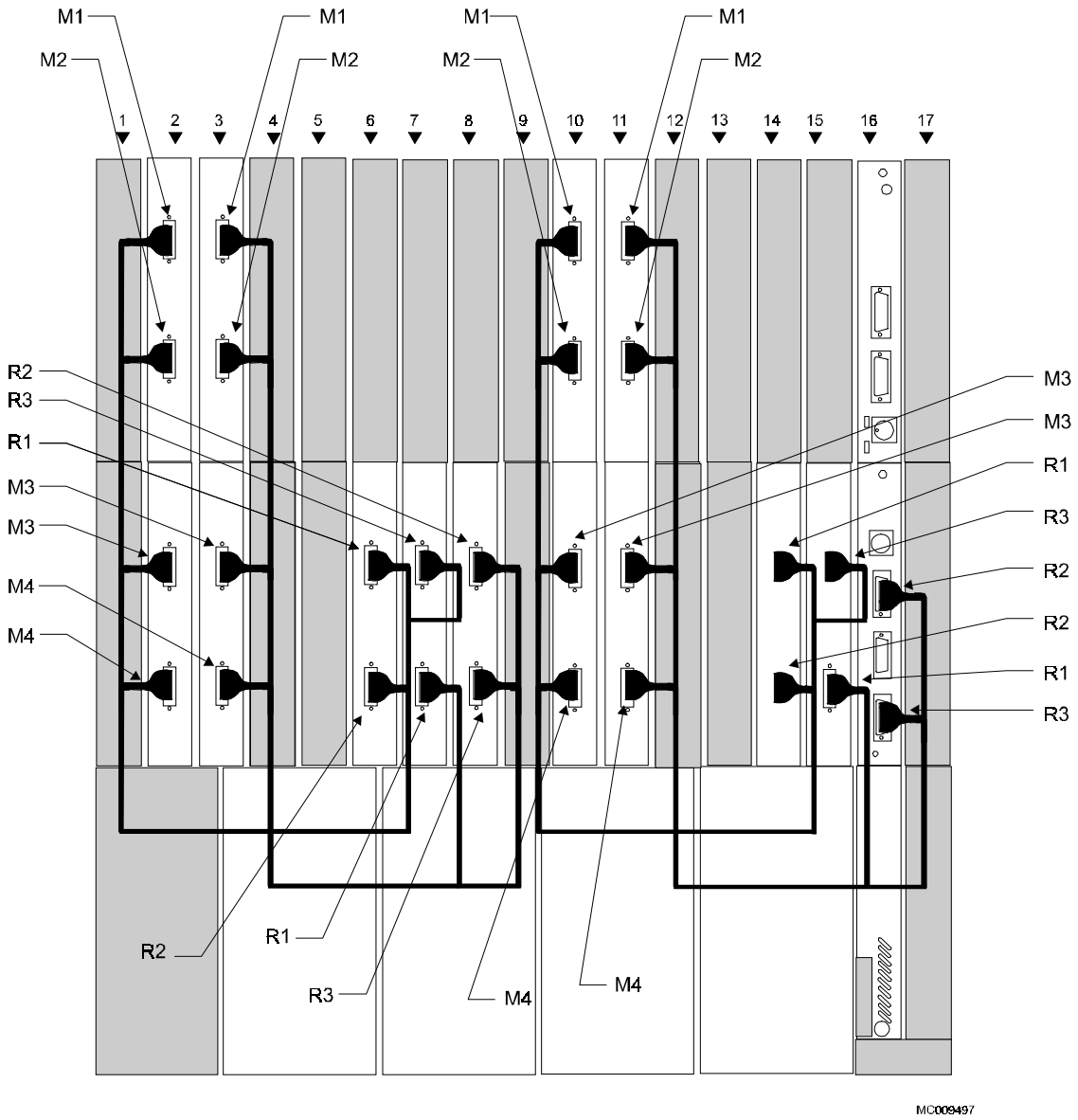


Figure 2-3. Cabling a 17-Slot Chassis with MMM24s

For harness two:

1. Plug the **M1 Modem** cable into the 60-pin **1-6** port at the top of slot 3.
2. Plug the **M2 Modem** cable into the 60-pin **7-12** port in the upper half of slot 3.
3. Plug the **M3 Modem** cable into the 60-pin **13-18** port in the lower half of slot 3.
4. Plug the **M4 Modem** cable into the 60-pin **19-24** port in the bottom of slot 3.
5. Plug the **R1 Server** cable into the A2 port on the bottom of the Access Server in slot 7.
6. Plug the **R2 Server** cable into the A1 port on the top of the Access Server in slot 8.
7. Plug the **R3 Server** cable into the A2 port on the bottom of the Access Server in slot 8.

For harness three:

1. Plug the **M1 Modem** cable into the 60-pin **1-6** port at the top of slot 10.

2. Plug the **M2 Modem** cable into the 60-pin **7-12** port in the upper half of slot 10.
3. Plug the **M3 Modem** cable into the 60-pin **13-18** port in the lower half of slot 10.
4. Plug the **M4 Modem** cable into the 60-pin **19-24** port in the bottom of slot 10.
5. Plug the **R1 Server** cable into the A1 port on the top of the Access Server in slot 14.
6. Plug the **R2 Server** cable into the A2 port on the bottom of the Access Server in slot 14.
7. Plug the **R3 Server** cable into the A1 port on the top of the Access Server in slot 15.

For harness four:

1. Plug the **M1 Modem** cable into the 60-pin **1-6** port at the top of slot 11.
2. Plug the **M2 Modem** cable into the 60-pin **7-12** port in the upper half of slot 11.
3. Plug the **M3 Modem** cable into the 60-pin **13-18** port in the lower half of slot 11.
4. Plug the **M4 Modem** cable into the 60-pin **19-24** port in the bottom of slot 11.
5. Plug the **R1 Server** cable into the A2 port on the bottom of the Access Server in slot 15.
6. Plug the **R2 Server** cable into the A1 port on the top of the Access Server in slot 16.
7. Plug the **R3 Server** cable into the A2 port on the bottom of the Access Server in slot 16.

Cabling Other Modules

The cables you need for your system depend on your configuration. This section assumes a full configuration as in our other examples.

ADMM and Media Module Connections

The ADMM and Ethernet media modules communicate over the system backplanes. You do not need to supply cables to internal components. The ADMM will diagnose, configure and control modules directly. Key ADMM commands appear in Chapter 4, *Managing with an ADMM*.

Your Etherflex module includes four RJ45 jacks for 10BASE-T network connections. You can connect up to four devices to the system through them. You can switch the ports to any of the chassis backplane channels or isolated segments.

Access Server Connections

The Access Server's Console port lets you enter commands directly to that module through its firmware.This module uses CISCO ISO for its 2511. You can see, print and order full documentation for all its commands from Cisco or at its WWW site at www.cisco.com.

The Access Server connects to MMMs, as described in the section above.

NT Server Configuration

To connect an NT 4.0 server running Remote Access Services (RAS) to your chassis, configure it for a virtual PPTP connection. This is a two-step process.

First, install RAS:

1. In the Control Panel, double click Network
2. Click the Services tab.
3. Click Add and Remote Access Services.

Second, install PPTP:

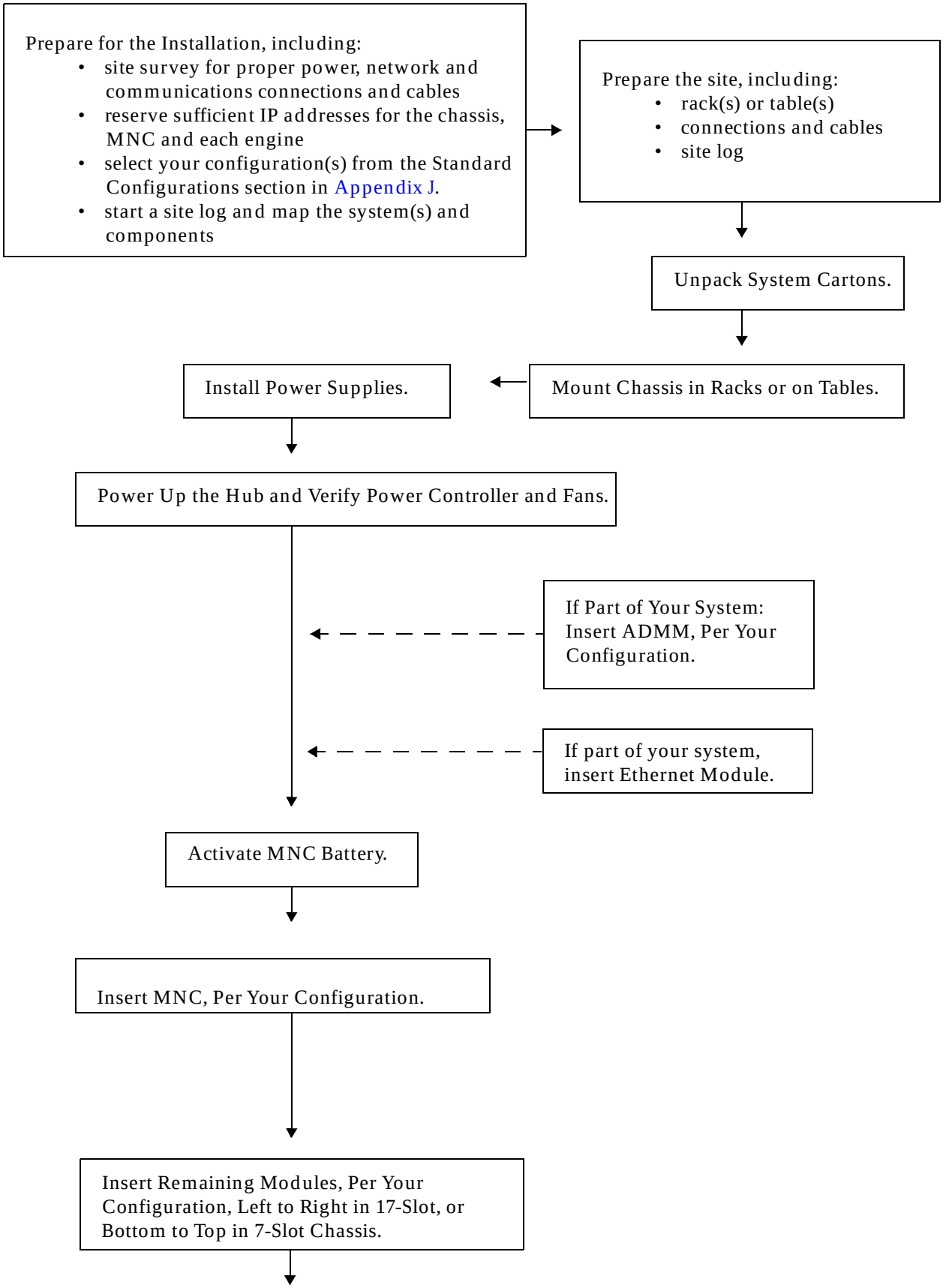
1. In the Control Panel, double click Network
2. Click the Protocols tab.
3. Add Point To Point Tunneling Protocol. After PPTP loads, RAS Setup starts.

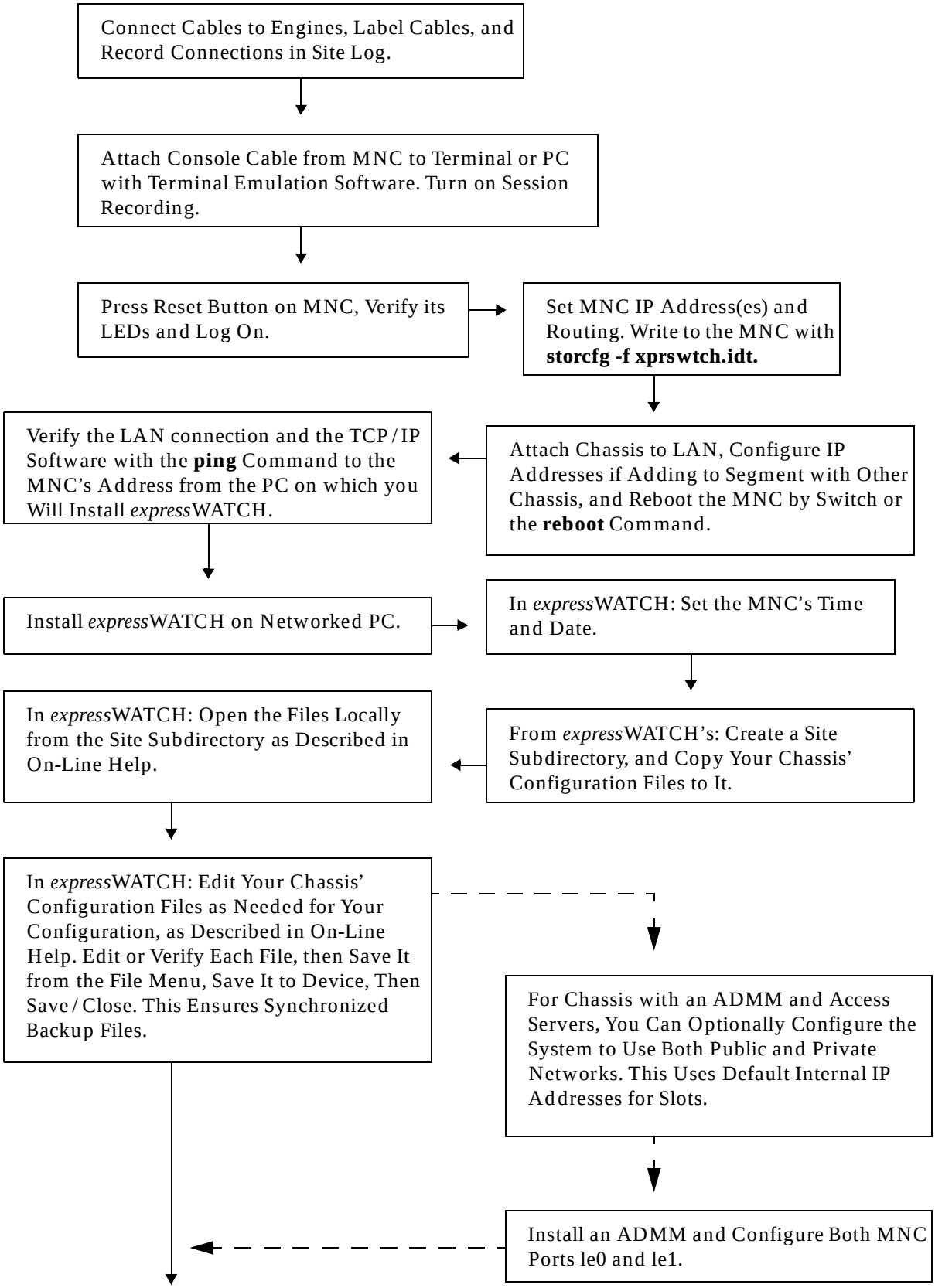
Note: You must add at least one VPN port in RAS Setup. You can install up to 256 VPN ports.

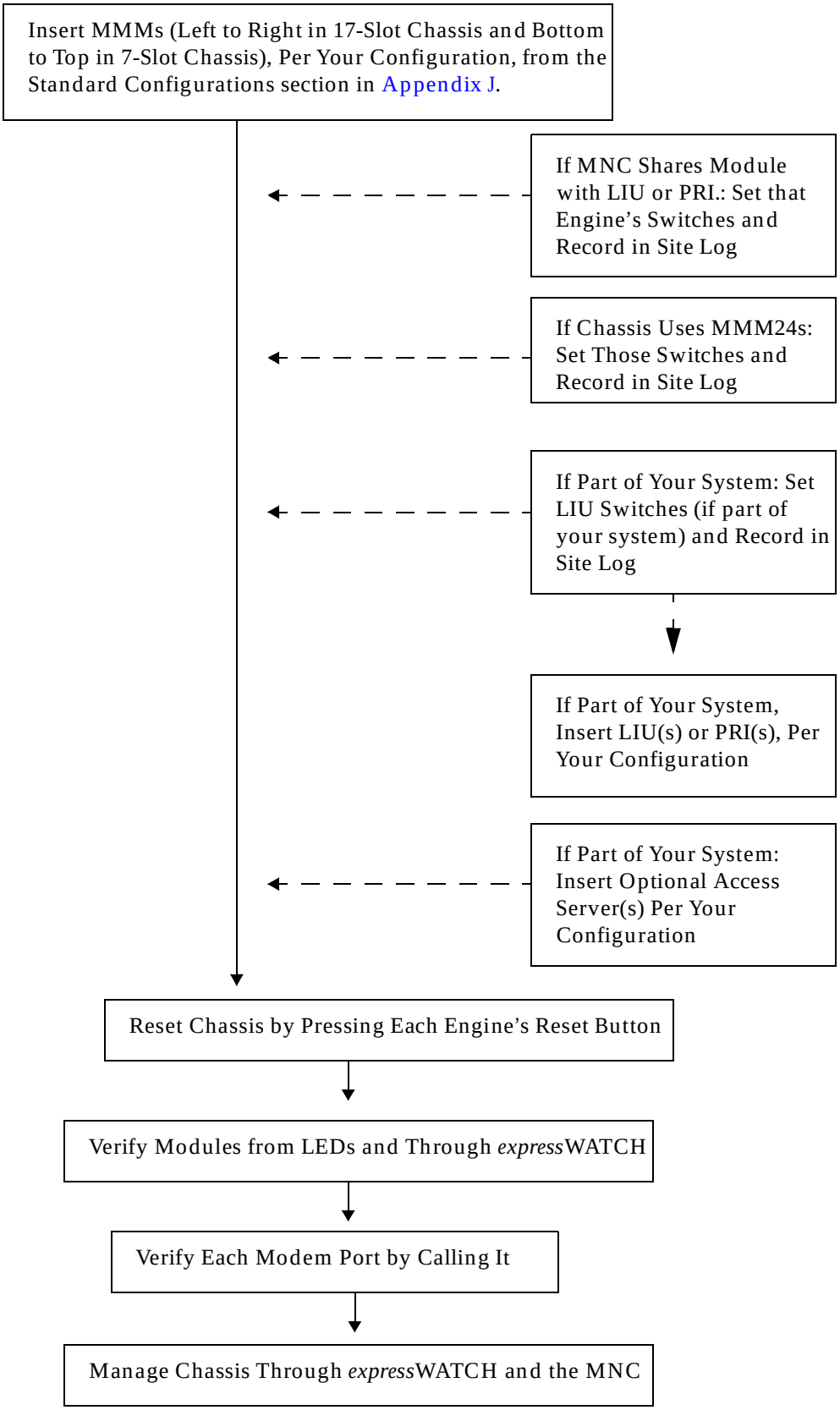
4. Specify the protocols to run for the VPN port.
5. Restart the PC.

Manual Configuration Flow

The diagram on the following pages provides an overview of the steps involved in the manual installation and configuration process. ***We strongly recommend using the Configuration Wizard instead.*** When you complete hardware installation, you can proceed to Chapter 3, *Initial Startup*.


Prepare for the Installation, including:
• site survey for proper power, network and communications connections and cables
• reserve sufficient IP addresses for the chassis, MNC and each engine
• select your configuration(s) from the Standard Configurations section in Appendix J.
• start a site log and map the system(s) and components
Prepare the site, including:
• rack(s) or table(s)
• connections and cables
• site log
Unpack System Cartons.
Mount Chassis in Racks or on Tables.
Install Power Supplies.
Power Up the Hub and Verify Power Controller and Fans.
If Part of Your System: Insert ADMM, Per Your Configuration.
If part of your system, insert Ethernet Module.
Activate MNC Battery.
Insert MNC, Per Your Configuration.
Insert Remaining Modules, Per Your Configuration, Left to Right in 17-Slot, or Bottom to Top in 7-Slot Chassis.


Connect Cables to Engines, Label Cables, and Record Connections in Site Log.
Attach Console Cable from MNC to Terminal or PC with Terminal Emulation Software. Turn on Session Recording.
Press Reset Button on MNC, Verify its LEDs and Log On.
Set MNC IP Address(es) and Routing. Write to the MNC with **storcfg -f xprswtch.idt.**
Attach Chassis to LAN, Configure IP Addresses if Adding to Segment with Other Chassis, and Reboot the MNC by Switch or the **reboot** Command.
Verify the LAN connection and the TCP/IP Software with the **ping** Command to the MNC's Address from the PC on which you Will Install *express*WATCH.
Install *express*WATCH on Networked PC.
In *express*WATCH: Set the MNC's Time and Date.
From *express*WATCH's: Create a Site Subdirectory, and Copy Your Chassis' Configuration Files to It.
In *express*WATCH: Open the Files Locally from the Site Subdirectory as Described in On-Line Help.
In *express*WATCH: Edit Your Chassis' Configuration Files as Needed for Your Configuration, as Described in On-Line Help. Edit or Verify Each File, then Save It from the File Menu, Save It to Device, Then Save/Close. This Ensures Synchronized Backup Files.
For Chassis with an ADMM and Access Servers, You Can Optionally Configure the System to Use Both Public and Private Networks. This Uses Default Internal IP Addresses for Slots.
Install an ADMM and Configure Both MNC Ports le0 and le1.


Insert MMMs (Left to Right in 17-Slot Chassis and Bottom to Top in 7-Slot Chassis), Per Your Configuration, from the Standard Configurations section in Appendix J.
If MNC Shares Module with LIU or PRI.: Set that Engine's Switches and Record in Site Log
If Chassis Uses MMM24s: Set Those Switches and Record in Site Log
If Part of Your System: Set LIU Switches (if part of your system) and Record in Site Log
If Part of Your System, Insert LIU(s) or PRI(s), Per Your Configuration
If Part of Your System: Insert Optional Access Server(s) Per Your Configuration
Reset Chassis by Pressing Each Engine's Reset Button
Verify Modules from LEDs and Through *express*WATCH
Verify Each Modem Port by Calling It
Manage Chassis Through *express*WATCH and the MNC

Chapter 3

Initial Startup

After installing all components, you are ready to verify their operation, ensure connectivity, and load configuration files. For this process, you will need a console connection to the MNC. We recommend performing other configuration through a network-connected PC with *express*WATCH.

The startup process involves:

1. Powering up the chassis and ensuring that hub components — fans, power controllers, and power supplies operate correctly.
2. Connecting a PC or terminal to the MNC and preparing it to communicate with the other components and the network.
3. Loading *express*WATCH on a network-connected PC and using it to edit and load the configuration files for your system.
4. Rebooting the system so all changes can take effect and you can test its functions.

Note: If you use the Configuration Wizard. It will direct you through the above steps.

Component Verification

Once you have completed installation as described in Chapter 4 of the *Getting Started Guide*, verify that the hub and its components (fans, power supplies, and modules) are operating normally. Then configure individual modules as described in this chapter or the modules' manuals.

If you encounter operational errors, refer to "Troubleshooting" on page F-1.

Verifying Fans

To verify that all fans and power supply fans operate normally:

- Check to be sure that each of the three fan LEDs on the Active Controller Module is lit.
- Visually inspect all fans, making sure that each is turning without interruption.

  Make sure the Temp LED is not blinking.

Enabling Automatic Power-Down by DMM

If you have a DMM in your hub, you can enable automatic module power-down in response to overheating. **OVERHEAT_AUTO_POWER_DOWN_DISABLE is the default**. We recommend enabling this option. If you are unfamiliar with ADMM commands, refer to Chapter 4, *Managing with an ADMM*.

To enable automatic module power-down, type:

SET POWER OVERHEAT_AUTO_POWER_DOWN_ENABLE Enter.

To disable automatic module power-down, type:

SET POWER OVERHEAT_AUTO_POWER_DOWN_DISABLE Enter.

Note: Modules cannot be automatically powered down by installed Power Controllers or (manually) by DMM commands entered at the prompt.

Verifying Power Supply Operation

To verify normal operation of an installed power supply or supplies, confirm that the Active Controller Module Power Supply LEDs appear as defined below.

Table 3-1. Power Supply LEDs

LED	*Normal Condition of LED at Power-Up*
Power Supply 1	On (lighted)
Power Supply 2	On (lighted) if installed; OFF if not installed
Power Supply 3	On (lighted) if installed; OFF if not installed
Power Supply 4	On (lighted) if installed; OFF if not installed

Verifying Controller Module Operation

To verify Controller Module operation:

1. Check Power Supply, Fan, and Temp LEDS:
   a. Ensure that the appropriate Power Supply LEDs are On (lighted) as in the table above.
   b. On the Active Controller Module, confirm that all three Fan LEDs are On.
   c. On the Active Controller Module, verify that the Temp LED is Off.
2. Check STBY and Active LEDs.
   a. If your system has one Power Controller:
      – Ensure that its STBY LED is Off.
      – Verify that its Active LED is On.
   b. If the system uses two Power Controllers:
      – Ensure the Active LED on the Active Controller Module is On.
      – Verify that the STBY LED on the Active Controller Module is Off.
      – On the Standby Controller Module, ensure the Active LED is Off.
      – On the Standby Controller Module, confirm that the STBY LED is On.

Note: To ensure that a broken Controller Module LED is not providing a false indication of conditions, use the AMM to enter the SHOW HUB command to verify hub operating conditions.

Verifying Network Connectivity

To verify that you have installed the hub and all modules correctly:

1. Confirm that communication can be established on all network segments you have enabled.
2. Confirm that the Network Activity LED on each installed module correctly indicates network traffic status, as shown in the table below.

Note: Not all modules have Network Activity LEDs.

Table 3-2. Network Activity LEDs

Level of Network Traffic	*Network Activity LED Status*
Normal traffic	Blinking
Constant traffic	On
No traffic	Off

See Appendix D, *Engine Faceplates and LEDs* for guides for each component's LED status.

Activating the MNC

Before you communicate with the MNC, you should have installed it as described in Chapter 2 of the *Microcom Network Controller User's Guide*.

You need a console cable that fits your PC or terminal and the MNC's Console Port. Your PC or terminal must use VT-100 compatible software set to 9600 bps. The connection displays the MNC's initial log-on request the first time. Afterwards, it displays a prompt in *slot.engine* location form, for example, **06.02 - MNC ->**.

The MNC contains UNIX-like commands enhanced by additional Microcom-specific ones. If you are familiar with UNIX, be aware that this subset does not contain many common commands and features. *Commands and most of their variables are lower case and are case sensitive.* The *Microcom Network Controller User's Guide* describes all the MNC's commands in detail. This section mention only a few key commands.

➥ **Important:** You must log into the MNC and set its IP address the first time to communicate with the chassis over the network. Before you put the system live on the network, be sure to set your passwords at the MNC. See the **password** command on page 3-5.

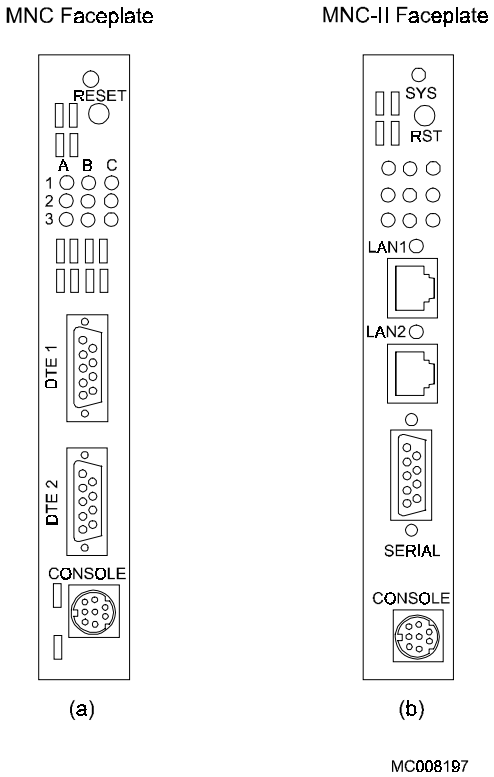


Figure 3-1. MNC (a) and MNC-II (b) Faceplates

Initial Start-up Procedure

When you have installed all components as described in Chapter 2 of the *Getting Started Guide*, you are ready to verify their operation and ensure connectivity.

For alternate manual installation, you also need to load configuration files. For this process you will need a console connection to the MNC. Microcom recommends performing other configuration tasks through a network-connected PC with *express*WATCH.

The start-up process involves:

1. Powering up the chassis and ensuring that hub components (fans, power controllers, and power supplies) operate correctly.
2. Connecting a PC or terminal to the MNC and preparing it to communicate with the other components and the network.
3. Loading *express*WATCH on a network-connected PC and using it to edit and load the configuration files for your system. Refer to Chapter 7 in the *Getting Started Guide* and *express*WATCH's on-line help for procedures.
4. Rebooting the system so all changes can take effect and you can test each function.

The following section describes the few MNC shell commands needed to start and configure your MNC for network operations. See Chapter 3 in the *Microcom Network Controller User's Guide* for a complete list of commands if you will use a terminal to control modules after initial start-up.

Initial Log-On

Starting up by terminal or PC gives you direct access to the MNC's Command Line Interface and maintains the connection when the MNC reboots during start-up. To set up the MNC the first time:

1. Connect a PC or terminal set to 9600 bps to the MNC's console port. Turn the chassis' power switch on if necessary (or, press the RESET button on the front of the MNC). You can also simply press Enter a few times until you see the login prompt.

Note: At this time *express*WATCH file error messages may appear. Files with default values are created for the missing files.

2. You are prompted for **login:** and **password:**. The initial login name is **system** and the initial password is **mai**. Press Enter after each response, for example:

   login: system Enter

   password: mai Enter

Notes: If you want to change the system password, refer to the "Passwords" section below.

After you log in, the MNC prompt displays in *slot.engine* location form, for example, **06.02 - MNC ->**. You can now enter MNC commands. (See Chapter 3 in the *Microcom Network Controller User's Guide* for command syntax descriptions, or use the **help** command to see a list of all commands.)

Shell commands are case sensitive. Type them exactly as shown in this manual. Abbreviated commands, such as **ip** for **ipconfig** are supported.

3. Next, check the MNC's IP address. Type: **ipconfig -d** Enter.

4. If the console displays all zeroes (0.0.0.0) instead of a unique IP address, the MNC will repeatedly send a BOOTP request to get an IP address. If there is no BOOTP server, you must enter an IP address manually. *Ask your system administrator to assign an address.*

   - To enter the assigned address, type: **ipconfig le0** ip# and press Enter (where ip# is the address in the form xxx.xxx.xxx.xxx). For example: **ipconfig le0 192.77.183.12**.
   - To add a non-standard subnet mask, you can combine this in the same command. For example: **ipconfig -a le0 192.77.183.12 net 255.255.255.192**. The subnet mask take effect after you store this new configuration and reboot.
   - If you need to add a route or default gateway, you can use the **ipconfig route** command with a modifier, where **-a** = add, **-d** = delete, **-n** = network, and **-h** = host.

   For example:
   ipconfig route 192.77.183.12 -h 192.28.234.12 (Routes traffic for 192.77.183.12 to 192.28.234.12)
   ipconfig dgw 192.168.0.254 (Sets 192.168.0.254 as the default router)

5. Next, verify the MNC's IP address. Type: **ipconfig -d** Enter.

6. Store the new configuration to the MNC's RAM disk. Type **storcfg followed by the appropriate option, -a (for all files) or -f <*xprswtch.idt*>** (for a specific file) **and press** Enter.
   The MNC stores its configuration files and is ready to use in your network. You can now load and use *express*WATCH to edit configuration files, and control your chassis and its modems from a network connected workstation.

7. To restart the MNC, type: **reboot** Enter, or press the Reset button on the MNC's front panel.

8. After you reboot the MNC, you can switch over from the terminal attached to the console port and use your workstation to edit and verify your configuration files through *express*WATCH. Refer to Chapter 7 in the *Getting Started Guide* and *express*WATCH's on-line help for procedures.

Passwords

The **password** command lets you change the single password for logging into the MNC, and using ftp or telnet. This password applies only to the MNC. You can have the same password or different ones for all the MNCs on your networks.

Note: This password is different from *express*WATCH security. Set those passwords in *express*WATCH.

You must know the old password to change it. The new one may be any combination of letters, numbers or symbols up to 16 characters long. The password is case sensitive.The default log in is **system** and the default password is **mai**.

When you type a password, asterisks display. Follow each entry by pressing the Enter key. You must type the old password correctly to receive the new password prompts. Then you must type the new password identically both times.

For example:

MNC> password Enter

Enter Old Password:******** Enter

Enter New Password: ******** Enter

Reenter New Password: ******** Enter

Important: The new password takes effect immediately. ***Be sure to record any changes.***

*express*WATCH

Nearly all system management for all Microcom Access Integrators on your networks will be through our *express*WATCH Windows GUI. There is an overlap in functions between the MNC's command line, the Wizard, and *express*WATCH. The following chart lists which tasks you can perform with each interface. *express*WATCH has a much richer set of functions. It also includes a terminal emulation utility, which displays the MNC's command line interface within *express*WATCH. You can use *express*WATCH for all management, except the initial log on, when a problem with the IP address disrupts communication over the network, or for troubleshooting.

Table 3-3. Management Interfaces

Function	*Task*	*MNC*	*express WATCH*	*Configuration Wizard*
Installation	Setup	✔		✔
	Log-on	✔		
	Configuration File Transfer	✔	✔	
	Setting Date and Time	✔	✔	
Help	Brief	✔		
	Extensive		✔	✔
Viewing Status	Hub Configuration	✔		
	System / Hub Status	✔	✔	
	MMM Status (port)	✔	✔	
	MMM EIA Signals	✔		
	LIU Status (span)	✔	✔	
	PRI Status (span)	✔	✔	
	Events / Traps		✔	
	Event Threshold Setup	✔	✔	

Table 3-3. Management Interfaces (Continued)

Function	*Task*	*MNC*	*express WATCH*	*Configuration Wizard*
Configuration	Network Configuration File Editors:			
	• Identity: Identification information about the MNC engine.		✔	✔
	• Host: Maintains a record of each engine's type and addressing data.		✔	✔
	• Route: Contains specific IP routing information for network devices.		✔	
	• System: Contains MNC operating parameter settings and basic system characteristics.		✔	✔
	• LIU Engine: Contains location and operating parameters for each Channelized T1 Engine.		✔	✔
	• PRI Engine: Contains location and operating parameters for each PRI card.		✔	✔
	• MMM Engine: Contains location and operating parameters for each MMM card. Also used to assign modem groups.		✔	✔
	• Call Processing: Allows you to specify to which communications server calls are routed. Also contains modem pooling assignments.		✔	✔
	• Clocked Execution: Specifies specific time / day to send canned modem command sequences.		✔	
	• Events / Alarms: Used to customize how the system processes event conditions.		✔	
	• Trap: Contains settings for SNMP trap and event log file processing.		✔	
	• Automatic data forwarding: Specifies destination and user information. Allows automatic delivery of statistics, events, or both, via the network.		✔	
	Activating configuration files	✔		
	Modem Groups		✔	
Controlling	Password	✔	✔	
	Port / Span Operations	✔	✔	
	Reboot (Chassis)	✔		
	Reset (Engines)	✔		
	Defining Modem Groups		✔	
	Sending Individual Canned Modem Command Sequence Files	✔		
Statistics	Historical (MMM only)	✔		
	Real-time	✔		
File Management	Managing MNC RAM Disk (check free memory size)	✔		
	File Transfer	✔	✔	
	Deleting Files	✔	✔	
	Firmware Upgrades	✔		
Troubleshooting	Start-up Diagnostics (ROMs)	✔		
	Port / Span Operations	✔		
	Ping Host	✔		
	Start Network Interface Servers	✔		
	Replace MNC	✔		

Configuration Files

The MNC's 2.5Mb RAM disk stores configuration files for each MMM, LIU, PRI, and MNC in a chassis. In addition, it stores a variety of system files that control the chassis operations and statistical functions. The Wizard leads you through proper setup of these files. We strongly recommend installing with the Wizard.

For the alternate manual installation, we provide custom configuration-file sets for each of our standard configurations. These minimize your effort in initial configuration and fine-tuning. You can use *express*WATCH to edit all of these file. Most editing is done in the GUI through dialog boxes. A few use an ASCII editor (refer to the *express*WATCH on-line help for details).

Table 3-4. Configuration Files

File Type	*File Name*	*Editor Type*
Automatic Data Forwarding	xprswtch.fwd	GUI
Call Processing	xprswtch.cps	ASCII
Clocked Execution	xprswtch.clk	ASCII
Events	xprswtch.evt	ASCII
Host	xprswtch.hst	GUI
LIU	xprswtch.liu	GUI
MMM	xprswtch.mmm	ASCII
PRI	xprswtch.pri	ASCII
Routing	xprswtch.rte	GUI
System	xprswtch.mis	GUI
Trap	xprswtch.trp	ASCII
Identity	xprswtch.idt	GUI

When it reboots individually or as part of the chassis, each LIU, MMM and MNC engine identifies itself to the MNC with a BOOTP request. It loads its stored file from the MNC.

As part of initial configuration, you transfer configuration files to the MNC. Afterwards on a system reboot, it updates the LIUs, MMMs and itself to reflect the contents of these files.

Note: The MNC loads all its files on a reboot. If it encounters a file with no corresponding engines (LIUs for example), it skips that file.

The additional RAM disk memory is available for holding boot and main code files for these modules. The MNC can burn this code into them (including itself) when you want to upgrade the firmware. See Appendix C of the MNC guide for complete procedures on these operations.

After burning firmware, you should erase the code files from the MNC's RAM disk. This ensures you have memory available for the next upgrade. ***You should always keep the xprswtch files in the MNC's RAM disk. DO NOT erase them.***

Table 3-5. Configuration File Procedures

Configuration File	*Type of Editor*	*Reboot/Reset Required When File Edited?*	*Description*
System Configuration **xprswtch.mis**	GUI	No- system level changes take effect when the save operation completes	The **xprswtch.mis** configuration file contains miscellaneous system configuration parameters. Included in this file are the settings for the MNC's DTE/console port and basic system characteristics.
Identity Configuration **xprswtch.idt**	GUI	No- system level changes take effect when the save operation completes	The **xprswtch.idt** configuration file contains identification information about the MNC, including the LAN/WAN interface and IP and subnet mask for the MNC to use during a SLIP connection.
Host Configuration **xprswtch.hst**	GUI	No- system level changes take effect when the save operation completes	The engines issue a BOOTP request when they are rebooted. The MNC uses the information in the **xprswtch.hst** configuration file to respond with a BOOTP reply message indicating the IP address assigned to each engine. A record is maintained for each engine including: ID number, card type, and unique addressing data.
LIU Engine Configuration **xprswtch.liu**	GUI	Yes-reset each affected LIU engine	The Line Interface Unit (LIU) Configuration file **(xprswtch.liu)** supports the LIU (T1) engines. Use the LIU Configuration editor to identify the location of each LIU engine and set parameters affecting the operation of each engine and span in the system. You can also add, delete, or move LIU engines; define parameters for each LIU engine individually; or create custom configurations.
Primary Rate Interface Configuration **xprswtch.pri**	ASCII	Yes-reset each affected PRI engine	The Primary Rate Interface (PRI) Configuration file **(xprswtch.pri)** supports the PRI (ISDN, channelized T1 or channelized E1) engines. Use the PRI Configuration editor to identify the location of each PRI engine and set parameters affecting the operation of each engine and span in the system.
MMM Engine Configuration **xprswtch.mmm**	ASCII	Yes-reset each affected MMM engine	The Managed Modem Module (MMM) Configuration file **(xprswtch.mmm)** is used for configuring the MMM engines. Use the MMM Configuration editor to identify the location of each MMM engine and set parameters affecting the operation of each modem and all ports in the system. You can also add, delete, or move MMM engines; define parameters for each MMM engine individually; or create custom configurations.
Call Processing Configuration **xprswtch.cps**	ASCII	Yes-reset MMM and PRI engines	The Call Processing Configuration file (**xprswtch.cps**) allows you to specify how incoming calls are connected to network services in Microcom's Access Integrator chassis. The call processing parameters allow you to specify to which communication servers or services calls are routed.

Table 3-5. Configuration File Procedures (Continued)

Configuration File	*Type of Editor*	*Reboot/Reset Required When File Edited?*	*Description*
Clocked Execution Configuration **xprswtch.clk**	ASCII	No- system level changes take effect when the save operation completes	The Clocked Execution Configuration file (**xprswtch.clk**) allows you to configure the system to automatically send modem command sequence files to one or more modems in the chassis instructing them to change their configuration or operation.
Routing Configuration **xprswtch.rte**	GUI	No- system level changes take effect when the save operation completes	The **xprswtch.rte** configuration file specifies the IP routing information that is required when the MNC needs to communicate with a device that is not connected to the same physical LAN segment as the MNC. The routing configuration file contains three route definitions: • **Route:** Defines the desired destination IP address. • **Gateway:** Defines the gateway IP address for the MNC to reach the destination. • **Type:** Refers to the entry type, either host or route.
Automatic Data Forwarding Configuration **xprswtch.fwd**	GUI	No- system level changes take effect when the save operation completes	The **xprswtch.fwd** configuration file specifies the destination IP address, user name, password, and report type for up to three destinations; it allows you to automatically deliver statistics, events, or both, via the network.
Events Configuration **xprswtch.evt**	NA	Yes-reboot the MNC	The **xprswtch.evt** configuration file can be used to customize how the system processes event conditions. This file maintains the event definition for all events in the system. Each entry has an ID number and a sequence of parameters that define the severity of the event and possible actions to take based on the count of occurrences. **Note:** Due to file size limitations, the xprswtch.evt configuration file ***can not*** currently be edited from within *express*WATCH. Use any stand-alone ASCII editor, such as Microsoft's Windows 95 WordPad editor if you need to change settings in this file.
Trap Destination Configuration **xprswtch.trp**	ASCII	No- system level changes take effect when the save operation completes	The **xprswtch.trp** configuration file contains the settings for SNMP trap processing and event logfile processing, allowing you to customize where the system sends SNMP traps.

Essential File Configuration

This manual ***does not*** describe the options for each configuration file in detail. To continue your configuration, use *express*WATCH and its on-line help. It provides illustrated step-by-step procedures for each type of module you have in your chassis, as well as for the shared files.

Because each installation is unique, be sure to take the time to check each configuration editor. You should have your site survey and related information at hand. That will let you verify your line types and other settings as you edit.

The *express*WATCH on-line help presents all file editors. Also check the release notes included with your chassis for any last-minute configuration improvements.

Standard Configuration Files

When you install *express*WATCH, it copies empty configuration files, as well as a set for each of the standard configurations we describe in Appendix J, *Standard Configurations*. The Wizard helps you build these files. ***For manual installation only***, use the files that match or most closely match your configuration.

The procedure for the files is:

1. Locate the appropriate files on the *express*WATCH PC's hard drive. The path appears under your configuration's diagram in Appendix J, *Standard Configurations*.
2. Create a mnemonic subdirectory for the chassis on the PC's drive. We recommend using the \siteCfg directory. Add a subdirectory there reflecting the chassis' location or other identifier, such as \siteCfg\detroit2.
3. Copy all the files for your configuration to the new subdirectory.
4. Start *express*WATCH and edit each of the files in your new subdirectory as required for your system, as described in 5 through 8.
5. Open each file in turn in the order they appear in Figure 3-4, using the **Configuration→Edit Local File...** menu. When the Select File To Edit dialog displays, ***for each file,*** locate the file in the new subdirectory you created from the Look in: list box. Click on the file you want to edit. Then click on **Open**. Be sure to open *xprswtch.idt* last as you edit these files.
6. Edit or verify each file. If you are unsure of settings, refer to the *Getting Started Guide*, Chapter 7 in or *express*WATCH's on-line help.
7. When you finish editing a file, click on the **Save** button. This updates the local copy of the file on the *express*WATCH PC. To transfer this to the MNC's RAM disk, select **Configuration→Transfer File to Device...→<*filetype*>**, where *filetype* is the configuration file you edited.

Notes: These two steps save identical files on the MNC and on the *express*WATCH PC, and make your changes active on the MNC. If you need to restore the files or duplicate them for a similar installation, they will be available.

If you edit configuration files requiring individual engines to be reset before the changes take effect, *express*WATCH notifies you of which engines to reboot.

8. Finally, click on the **Close** button to stop editing that file.

Repeat the opening and saving procedures whenever you edit a chassis configuration file. This ensures you will have identical files as backup.

Each *express*WATCH procedure appears in its on-line help. General procedures appear in Chapter 7 of the *Getting Started Guide*. Also, the Configuration Wizard brings up the appropriate module editor during its configuration process.

Editing Configuration Files

Opening Files

To edit a file on the *express*WATCH PC, click on the device's view in the main *express*WATCH window. Next, select the **Configuration→Edit Local File...** menu. In the Select File To Edit dialog box**,** locate the file from the Look in: list box. Click on the file you want to edit. Then click on **Open**. The file's GUI dialog or ASCII editor will display.

To edit a file on the MNC, click on the device's view in the main *express*WATCH window. Next, select the **Configuration→Edit File From Device→<*filetype*>**, where *filetype* is the configuration file you want to edit. When *express*WATCH prompts for the control session password, type it and click on **OK.** (Until you change it, the password is **mai**.) Then the GUI or ASCII editor for that file displays.

Saving Files

After you edit or verify the file, save it twice, once locally to the site subdirectory you created for that chassis and once on the MNC. The easiest way to do this is to save it to the backup directory when you have finished editing, then to the MNC.

To save to the backup directory when you have a local file open, click on the **Save** button. This updates the local copy of the file on the *express*WATCH PC. To transfer this to the MNC's RAM disk, select **Configuration→Transfer File to Device...→<*filetype*>**, where *filetype* is the configuration file you edited.

Finally, click on **Close**. When you save a system file to the MNC, the changes take effect immediately. However, if you edit configuration files requiring individual engines to be reset before the changes take effect, *express*WATCH notifies you of which engines to reboot.

Entering Reset/Reboot Commands

Within *express*WATCH, if you are not near the chassis, you can establish a Telnet session with the MNC's command line interface to send reset or reboot commands to each affected engine. Choose **Tools→Terminal Emulator** from the *express*WATCH main window.

Note: You must have a Telnet application installed and properly configured before you can use *express*WATCH's terminal emulator. Refer to *express*WATCH's on-line help for details.

For a full description of the reset/reboot commands and required syntax, refer to the *Microcom Network Controller User's Guide*, Chapter 3, *Using the MNC Command Line Interface*.

Completing Start-up

When you have edited all of the configuration files to reflect your system and saved them, reboot all engines by pressing their reset buttons. Start by resetting the MNC.

Watch the modules to see that each powers up properly and that their LEDs do not show errors. If all engines of a particular type, such as MMMs, display errors, check your configuration file for that type.

When your system boots without errors, verify your network and telco operations.

Chapter 4

Managing with an ADMM

Once you have completed installation as described in Chapter 2 and Chapter 4 of the *Getting Started Guide*, verify that the hub and its components (fans, power supplies, and modules) are operating normally. Then if you are using a configuration with an Access Server and connections to both public and private networks, configure individual modules as described in this chapter or the modules' manuals.

Managing the Hub

The hub can contain more than one ADMM, but only one ADMM (the Master Management Module) is responsible for managing hub conditions (for example, configuring installed modules). Master ADMM management tasks include, but are not limited to, the following:

- Identifying and configuring modules
- Storing configurations for all installed modules in on-board non-volatile memory
- Providing complete status reporting for modules
- Identifying and communicating with installed Network Monitor Cards
- Monitoring hub temperature and power levels
- Monitoring Active and Standby Controller Modules
- Configuring a module so that it can be installed in another hub (called "hot staging")

Entering Management Commands

Here we describe basic hub management commands. Refer to the 2511 IOS documentation for all commands and details on management.

Note: By default, the ADMM reads an engine's DIP switches and not its configuration from file. To enable software configuration by ADMM, use the **set device dip_configuration disable** command.

Using Management Commands

ADMMs are controlled by entering commands at the management prompt on the terminal screen. ADMM commands are not case-sensitive (they can be entered in uppercase, lowercase, or a mixture of uppercase and lowercase).

- You must log in to the system (to an installed ADMM) before you enter commands. When directly connecting a PC to the console port, use a null modem cable.
- To log in to the system, enter your password (the user password or administrator password you have chosen) at the `Login:` and `Password:` prompts. The default log-in is **system** and the default password is null (just press the **Enter** key).

Subslot Command Arguments

The ADMM also lets you issue subslot command arguments for Show, Set, and Reset to modify NMC settings.

Changing Management Commands

You may change the ADMM factory-set default values. To change factory defaults, you must be logged in under the administrator password. For a discussion of how to change default values, and set user and administrator passwords, refer to 2511 IOS documentation.

Command Help

To display help information for any ADMM command, enter "?" at the `Microcom>` prompt. When you enter "show ?" at the prompt, the following information displays:

```
Microcom> show ?

Possible completions:
        alert
        backplane_paths
        clock
        counter
        device
        event_log
        host
        hub
        interface
        inventory
        ip
        login
        module
        network
        port
        power
        ring_map
        terminal
        tftp
        trunk

Microcom> show
```

Completing a Command

To complete any ADMM command without entering the full command:

1. Enter the command (for example, the SHOW command).
2. Enter the first several letters of the selected command *parameter*.
3. Press the space bar to complete the command.
4. Press **Enter** to process the completed command.

Command Completion Example

`Microcom>`show
`Microcom>`show inv
`Microcom>`show inv [Press the space bar]
`Microcom>`show inventory
`Microcom>`show inventory **Enter**

Changing the Prompt

The first command you may want to enter is one that changes the prompt. We recommend using a prompt that reflects the location or other identifier of the system. This will be useful when you access the system remotely.

Use the **set terminal prompt** command to do this. To change the prompt for a system in Boston for example, you might type:

`Microcom>`set terminal prompt Boston01

Terminal parameter changed

Boston01>

Sample ADMM Commands

Command syntax and an example of screen output follow for each command.

Set Power

Enter the SET POWER command to change the power mode, or to change the power class setting for a specified module. The following SET POWER commands are available:

- SET POWER MODE
- SET POWER OVERHEAT_AUTO_POWER_DOWN
- SET POWER SLOT CLASS

Set Power Mode

The Microcom Switching Hub uses load-sharing power supplies that support two power modes:

- **Power fault-tolerant mode**.
  Power fault-tolerant mode can be established only if there is at least one power supply's worth of power more than what is needed to meet the current power requirements of all installed modules. When the hub is running in power fault-tolerant mode, one power supply's worth of power is always kept in reserve. If a power supply fails, reserve power becomes available and the hub continues to operate.
- **Power non-fault tolerant mode (default)**.
  When the hub is running in power non-fault-tolerant mode, the full power output of all installed power supplies is available to run the hub and installed modules.

Note: Modules are automatically power-managed by installed Controller Modules.

To set the power mode to fault-tolerant mode or power non-fault-tolerant mode, use the following command syntax:

SET POWER MODE {fault_tolerant}

SET POWER MODE {non_fault_tolerant}

In the following example, the power mode is set to power fault-tolerant mode:

```
Microcom> set power mode fault_tolerant Enter

Power mode set to FAULT_TOLERANT.

Microcom>
```

Set Power Overheat_Auto_Power_Down

The two overheat auto power down modes are:

- Overheat auto power down enabled
- Overheat auto power down disabled (default)

To enable or disable overheat auto power down mode, use the following command syntax:

```
SET POWER OVERHEAT_AUTO_POWER_DOWN {enable}
SET POWER OVERHEAT_AUTO_POWER_DOWN {disable}
```

In the following example, SET POWER OVERHEAT_AUTO_POWER_DOWN is used to enable overheat auto power down mode:

```
Microcom> set power overheat_auto_power_down enable Enter

overheat-power-down mode set to ENABLE.

Microcom>
```

Set Power Slot Class

To assign a power class to any installed module except installed Controller Modules, enter SET POWER SLOT CLASS at the <Microcom> prompt.

The Active Controller Module uses module power class settings to decide:

- which modules should be powered down following a power supply failure.

- which modules should be powered down because of an overheat condition.

Power class settings range from 10 (highest) to 1 (lowest). The default power class setting for all modules is 3.

Note: You cannot change the default power class setting for installed Controller Modules.

To set the power class for a module, use the following command syntax:

```
SET POWER SLOT {slot} CLASS
```

In the following example, SET POWER SLOT CLASS sets the power class for a module installed in slot 1 to power class 7:

```
<Microcom> set power slot 1 class Enter
Enter class: 7 Enter

Slot 01 power class is set to 07.

<Microcom>
```

Reset

Enter the RESET command to reset installed modules, submodules, and the hub.

The following RESET commands are available:

- Reset Module
- Reset Hub

Reset Module

Enter the RESET MODULE command to perform a hardware reset of any installed module other than installed Controller Modules.

To reset any installed module or submodule (except Controller Modules), use the following command syntax:

```
RESET MODULE {slot.subslot}
```

In the following example, RESET MODULE initiates a hardware reset of the module installed in slot 16:

```
<Microcom> reset module 16. Enter
Enter subslot: 1 Enter

Resetting this module will reset all of the modules in this slot.
Do you wish to continue ? (y/n) : [Y]
Resetting module 16.1.

<Microcom>
```

Reset Hub

Enter the RESET HUB command to reboot all installed modules and the hub itself, including the Active Controller Module. RESET HUB performs a hardware reset of the hub and all installed modules. Diagnostic routines execute (if enabled) and traffic forwarding may be briefly interrupted. Once the hub reset is complete, you must log back in to the Master ADMM before you can enter any other commands.

Note: You must save or revert unsaved changes before RESET HUB executes.

To reboot the hub and all installed modules, use the following command syntax:

```
RESET HUB
```

In the following example, RESET HUB reboots the hub and all installed modules:

```
<Microcom> reset hub Enter
<Microcom>
Distributed Management Module (vx.xx)
Copyright (c) 199x 3Com Corporation.
```

Show

Enter the SHOW command to display hub, module, and submodule operating conditions, and to identify installed hub components.

Show Hub

Enter the SHOW HUB command to display basic information about hub operating conditions, including temperature and power supply conditions.

The following information is provided by the SHOW HUB command:

- Hub information
- Hub type
- Operating status of each installed power supply
- Operating status of each installed fan
- Temperature information for the hub

To display hub information and operating conditions, use the following command syntax:

SHOW HUB

In the following example, the SHOW HUB command identifies the switching hub:

```
<Microcom> show hub Enter

Hub Information:

Hub Type: 6017C
Power Supply Information:

     Power Supply   Status
     ------------   ------
      1             NORMAL
      2             NORMAL
      3             NORMAL
      4             NORMAL

Temperature Information:

     Probe          Location        Temperature
     -----          --------        -----------
      1             FAN_1           27 Degrees Celsius
      2             FAN_2           25 Degrees Celsius
      3             FAN_3           25 Degrees Celsius

Fan Information:

     Fan            Status
     ---            ------
      1             OKAY
      2             OKAY
      3             OKAY

<Microcom>
```

Show Module

Enter the SHOW MODULE command to display information for a module and submodule installed in a specified slot, or to display information for *all* modules and submodules installed in the hub.

The following SHOW MODULE commands are available:

- SHOW MODULE
- SHOW MODULE ALL
- SHOW MODULE VERBOSE

To display basic information for a module installed in a specified slot, use the following command syntax:

SHOW MODULE {*slot.subslot*}

In the following example, SHOW MODULE is used to display basic information for Controller Modules installed in slots 18 and 19, respectively.

```
<Microcom> show module 18.1 Enter

Slot Module          Version    Network       General Information
----- --------------- -------    ------------- -------------------
18.01 6000M-RCTL       1.xx       N/A           Active Controller Module

<Microcom> show module 19.1 Enter

Slot Module          Version    Network       General Information
----- --------------- -------    ------------- -------------------
19.01 6000M-RCTL       1.xx       N/A           Standby Controller Module

<Microcom>
```

To display basic information for all modules and submodules installed in a specified slot, use the following command syntax:

SHOW MODULE {*slot*.all}

In the following example, SHOW MODULE ALL is used to identify the module and submodules installed in slot 1.

```
<Microcom> show module 1.all Enter

Slot  Module          Version   Network       General Information
----- --------------- -------   ------------- -------------------
01.01 6106M-CAR        1.xx      N/A
01.06 6100D-MGT        1.xx      ETHERNET_7
01.08 6000M-MGT        1.xx      N/A          Master Management Module

<Microcom>
```

To display basic information for all installed modules, use the following command syntax:

SHOW MODULE {all}

Note: When entered from a terminal prompt (using a DNN), SHOW MODULE ALL displays information for installed modules only.

In the following example, SHOW MODULE ALL is used to display the following information for all installed modules:

- Slot location
- Module name
- Module version number
- Network assignment
- General information

```
<Microcom> show module all Enter

Slot  Module            Version   Network        General Information
----- ---------------   -------   -------------  -------------------
01.01 6106M-CAR         1.xx      N/A
01.08 6000M-MGT         1.xx      N/A            Master Management Module

03.01 6124M-TPL6        1.xx      PER_PORT       Port(s) are down
03.02 6100D-MGT         1.xx      ETHERNET_1

05.01 6124M-TPL6        1.xx      PER_PORT       Port(s) are down

06.01 6124M-TPL6        1.xx      PER_PORT

09.01 5124M-TPCL        v1.00     PER_CONNECTOR  Port(s) are down

10.01 5102M-AUIF        004       PER_PORT       Port(s) are down

11.01 5106M-BNC         001       ETHERNET_1     Port(s) are down
```

```
12.01 5112M-TPPL        004       PER_PORT       Port(s) are down


14.01 5302M-MGT1        2.00      FDDI_ONLINE_3  Slave Management Module

15.01 5104M-FIB         002       ETHERNET_1     Port(s) are down

16.01 5108M-TP          003       ETHERNET_1     Port(s) are down

18.01 6000M-RCTL        1.xx      N/A            Active Controller Module

19.01 6000M-RCTL        1.xx      N/A            Standby Controller Module

<Microcom>
```

To display detailed information about a module installed in a specified slot or subslot and additional information about module software and DIP switch settings, use the following command syntax:

SHOW MODULE {*slot.subslot*}{verbose}

In the following example, SHOW MODULE VERBOSE is entered to display detailed information for an Ethernet 24-Port module installed in slot 1:

```
<Microcom> show module 1.1 verbose Enter

Slot  Module              Version   Network            General Information
----- ---------------     -------   -------------      -------------------
01.01 6124M-TPL6          1.xx      PER_PORT

6124M-TPL6: Microcom Ethernet 24-PORT 10BASE-T Module

Non-Volatile DIP Setting:           DISABLED


<Microcom>
```

Show Power

Enter the commands in Table 4-1. to display current power conditions in the hub:

Table 4-1. Show Power Commands

Command	*Description*
SHOW POWER BUDGET	Lets you see how power output is distributed among all installed load-sharing power supplies. This information helps you to determine if hub power is sufficient to permit the addition of modules, and to avoid an unintentional loss of power fault-tolerance (if currently in effect).
SHOW POWER MODE	Tells you which of two power modes is currently in effect (power fault-tolerant mode or power non-fault-tolerant mode).
SHOW POWER SLOT	Displays the slot number, power class setting, administrative status (slot power enabled or disabled), and module operating status of a module installed in a specified slot.
SHOW POWER ALL	Displays power mode, slot power information, and power budget information for all installed modules.

Show Power Budget

To display power budget information, use the following command syntax:

SHOW POWER BUDGET

The following information displays:

```
Power Management Information
                        ----------------------------
Hub Power Budget :
```

```
Voltage Type  Voltage Level  Watts Capacity   Watts Available   Watts Consumed
------------  -------------  --------------   ---------------   --------------
    +5V          5.094          367.00           226.00             141.00

    -5V         -5.058           27.00            23.75               3.25

   +12V         11.803           81.50            28.00              53.50

   -12V        -11.993           30.50            30.25               0.25

    +2V          2.125           14.30            10.20               4.10

<Microcom>
```

Show Power Mode

To display the current power modes, use the following command syntax:

SHOW POWER MODE

When you enter SHOW POWER MODE at the `Microcom>` prompt while the hub is running in power non-fault-tolerant mode, the following information displays:

```
<Microcom> show power mode Enter

                Power Management Information
                ----------------------------
Hub Power Modes:

        Fault-Tolerant Mode:         NON_FAULT_TOLERANT
        Overheat Power Down Mode:    DISABLE

<Microcom>
```

When you enter SHOW POWER MODE at the `Microcom>` prompt while the hub is running in power fault-tolerant mode, the following information displays:

```
<Microcom> show power mode Enter

                Power Management Information
                ----------------------------
Hub Power Modes:

        Fault-Tolerant Mode:         FAULT_TOLERANT
        Fault-Tolerant Status:       FAULT_TOLERANT
        Overheat Power Down Mode:    DISABLE

<Microcom>
```

Show Power Slot

To display the slot number, power class setting, administrative status (slot power enabled or disabled), and module operating status of a module installed in a specified slot, use the following command syntax:

SHOW POWER SLOT {*slot*}

When you enter SHOW POWER SLOT at the `Microcom>` prompt, the following information displays for a Master ADMM installed in slot 1:

```
<Microcom> show power slot 1 Enter

                Power Management Information
                ----------------------------
Slot Power Information:

Slot     Class          Admin Status        Operating Status
----     -----          ------------        ----------------
1        9              ENABLE              ENABLED
```

```
<Microcom>
Show Power All
```

To display detailed power information for the hub and installed modules, use the following command syntax:

SHOW POWER ALL

When you enter SHOW POWER ALL at the `Microcom>` prompt, the following information displays:

```
<Microcom> show power all Enter

                Power Management Information
                ----------------------------
Hub Power Modes:

        Fault-Tolerant Mode:         NON_FAULT_TOLERANT
        Fault-Tolerant Status:       NON_FAULT_TOLERANT
        Overheat Power Down Mode:    DISABLE

Slot Power Information:

Slot     Class          Admin Status        Operating Status
----     -----          ------------        ----------------
1        9              ENABLE              ENABLED
3        4              ENABLE              ENABLED
5        4              ENABLE              ENABLED
6        5              ENABLE              ENABLED
9        N/A            ENABLE              ENABLED
10       N/A            ENABLE              ENABLED
11       N/A            ENABLE              ENABLED
12       N/A            ENABLE              ENABLED


Slot     Class          Admin Status        Operating Status
----     -----          ------------        ----------------
13       N/A            ENABLE              ENABLED
14       N/A            ENABLE              ENABLED
15       N/A            ENABLE              ENABLED
16       N/A            ENABLE              ENABLED


Hub Power Budget:

Voltage Type  Voltage Level  Watts Capacity   Watts Available   Watts Consumed
------------  -------------  --------------   ---------------   --------------
    +5V          5.128          367.00           226.00             141.00

    -5V         -5.058           27.00            23.75               3.25

   +12V         11.803           81.50            28.00              53.50

   -12V        -11.993           30.50            30.25               0.25

    +2V          2.125           14.30            10.20               4.10

<Microcom>
```

In this example:

- Modules are installed in slots 1, 3, 5, and 6.
- Modules in slots 9 through 16 with no power class settings.
- Power is enabled to all occupied slots.
- All modules are recognized as “manageable” by the Master Management Module.
- Power mode and power budget information displays.

Show Inventory

Enter the following SHOW INVENTORY commands:

- SHOW INVENTORY NO_VERBOSE
- SHOW INVENTORY VERBOSE

When you enter SHOW INVENTORY NO_VERBOSE, the following information displays for installed modules:

- Hub identification information:
  - Hardware version number of the hub
  - Serial number of the hub
  - Vendor name
  - Date of manufacture
- Slot numbers and slot contents per slot (slots 1 through 19, inclusive)
- Model number for each installed module
- Hardware version number for each installed module
- Serial number for each installed module
- Vendor name for each installed module
- Date of manufacture for each installed module

When you enter SHOW INVENTORY VERBOSE, the following additional information is shown for installed modules:

- Operational software version number
- Boot software version number

Show Inventory No_Verbose

To display basic inventory information for the hub, use the following command syntax:

SHOW INVENTORY NO_VERBOSE

When you enter SHOW INVENTORY NO_VERBOSE at the `<Microcom>` prompt, the following information displays:

```
<Microcom> show inventory no_verbose Enter

HUB/                        Hardware
Slot  Module                Version    Serial #         Vendor              Date
----- ----------------      --------   ---------------- ----------------    ------
HUB   6017C                 1.xx       12345            Chipcom             931021

01.01 6106M-MGT             2.01       1.xx             Chipcom             931130

03.01 6124M-TPL6            1.xx       1234             Chipcom             931021

03.02 6100D-MAC             2.01       1.xx             Chipcom             931130

05.01 6124M-TPL6            1.xx       32154            Chipcom             931021

06.01 5112M-TPPL            1.xx       54321            Chipcom             931021

09.01 5124M-TPCL            N/A        N/A              N/A                 N/A

10.01 5102M-AUIF            N/A        N/A              N/A                 N/A

11.01 5106M-BNC             N/A        N/A              N/A                 N/A
```

```
HUB/                        Hardware
Slot  Module                Version    Serial #          Vendor              Date
----- ----------------      --------   ---------------- ----------------     ------
12.01 5112M-TPPL            N/A        N/A               N/A                 N/A

13.01 5106M-BNC             N/A        N/A               N/A                 N/A

14.01 5302M-MGT1            N/A        N/A               N/A                 N/A

15.01 5104M-FIB             N/A        N/A               N/A                 N/A

16.01 5108M-TP              N/A        N/A               N/A                 N/A

18.01 6000M-RCTL            2          76543             Chipcom             931025

19.01 6000M-RCTL            2          76543             Chipcom             931025

Microcom>
```

Show Inventory Verbose

To display more detailed inventory information for the hub, use the following command syntax:

SHOW INVENTORY VERBOSE

When you enter SHOW INVENTORY VERBOSE at the `<Microcom>` prompt, the following information displays (see next page):

Note: In the following screen output display, information for slots 11 through 15 is not shown (a vertical row of dots below the information given for slot 10 indicates a break in output display continuity).

```
<Microcom> show inventory verbose Enter

HUB/                        Hardware
Slot  Module                Version    Serial #              Vendor              Date
-- ----------------      --------  ----------------      ----------------   ------
HUB   6017C                 1.xx       12345                 Chipcom             931021

01.01 6106M-MGT             2.01       1.xx                  Chipcom             931130

      Operational Version: 1.xx       Boot Version: 1.xx

DMM:  Operational Version: 1.xx       Boot Version: 1.xx

03.01 6124M-TPL6            1.xx       1234                  Chipcom             931021

      Operational Version: 1.xx       Boot Version: 1.xx

03.02 6100D-MAC             2.01       1.xx                  Chipcom             931130

      Operational Version: 1.xx       Boot Version: 1.xx

05.01 6124M-TPL6            1.xx       32154                 Chipcom             931021

      Operational Version: 1.xx       Boot Version: 1.xx

06.01 6124M-TPL6            1.xx       54321                 Chipcom             931021

      Operational Version: 1.xx       Boot Version: 1.xx

09.01 5124M-TPCL            N/A        N/A                   N/A                 N/A

      Operational Version: v1.00      Boot Version: N/A

10.01 6124M-TPL6            1.xx       54321                 Chipcom             931021

      Operational Version: 1.xx       Boot Version: 1.xx
```

```
 .
 .
 .

16.01 5108M-TP             N/A       N/A                  N/A                N/A

      Operational Version: 003       Boot Version: N/A

18.01 6000M-RCTL           2         76543                Chipcom            931025

      Operational Version: 1.xx      Boot Version: 1.xx

19.01 6000M-RCTL           2         76543                Chipcom            931025

      Operational Version: 1.xx      Boot Version: 1.xx

<Microcom>
```

Appendix A

Switching Hub Specifications

The Microcom Intelligent Switching Hub is a modular chassis that supports all components of the Microcom Access Integrator Switching System and modules. The hub is available in a 17-slot and a 7-slot version.

Figure A-1 shows two Microcom 17-Slot Switching Hubs and one 17-Slot concentrator.

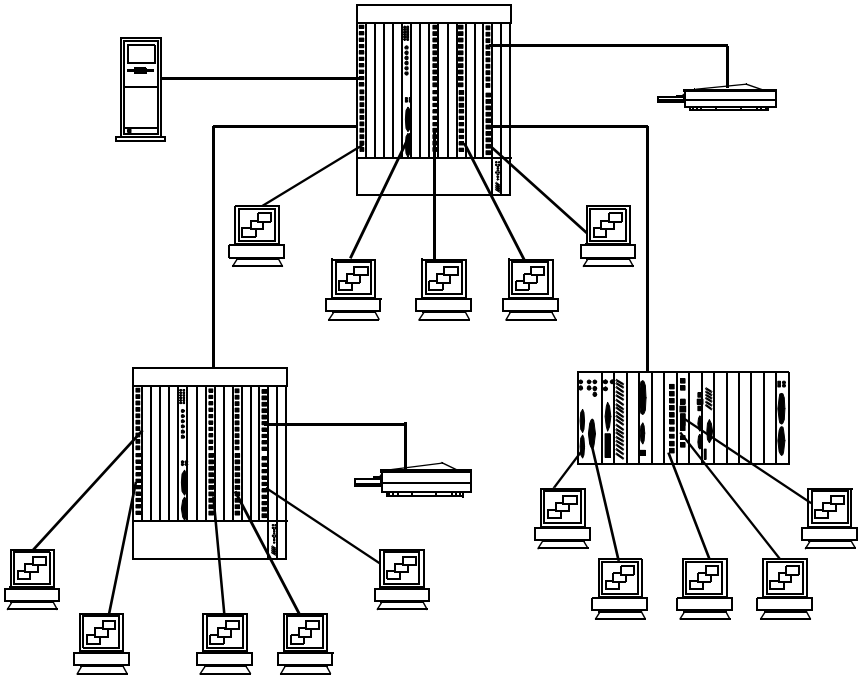


Figure A-1. Microcom Access Integrator Switching System

The Switching System features include the following:

- Hub Backplane Architecture
- Microcom Access Integrator Module Support
- Microcom Intelligent Power Subsystem
- Intelligent Cooling Subsystem
- Distributed Hub Management Architecture

Hub Backplane Architecture

Hubs equipped with the **Enhanced TriChannel Backplane s**upport all system modules, including Ethernet modules and the ADMM.

Determining the Model Number of Your Hub

To determine the Model Number of your hub, check the sticker affixed to the immediate left of the left-most power supply slot.

After hub installation, if your hub is managed by an ADMM, determine the model number:

1. Enter the SHOW HUB command or the SHOW INVENTORY command.
2. Press **Enter**.

Features and Functionality

The hub supports up to eight Ethernets that can run concurrently on hubs equipped with the enhanced TriChannel Backplane.

Note: The number of networking services that can run concurrently in any version of the hub varies according to the backplane types and protocol types installed.

The hub offers the following features and functionality:

- Up to eight Ethernets:
  - Hub Ethernet Modules can use the first three Ethernet networks. Hub Ethernet Modules and can communicate with each other on these three shared networks).
  - Hub Ethernet Modules can use all eight Ethernet networks.

Backplane Capabilities

The following table summarizes the capabilities of the hub Enhanced TriChannel Backplane and the hub SwitchChannel Backplane.

Networks listed in the table are available to each port and module in the hub, regardless of slot location. The maximum number of supported networks is shown in each column. The “maximum number of networks” is the maximum number of networks available per protocol (not the number of networks that can exist concurrently).

Note: The maximum number of networks applies only to a hub in which one protocol is used.

Table A-1. Backplane Capabilities

Enhanced TriChannel Backplane	***SwitchChannel Backplane***
Supports up to 6 Ethernets [1] 3 Ethernets using TriChannel architecture [2] 3 additional Ethernets using enhanced TriChannel architecture	Supports up to 16 Gigabits of cell switching capacity
Note: Enhanced TriChannel Backplane Ethernets 4, 5, and 6 can be used by hub modules only. RingChannel Backplane Ethernets 7 and 8 can be used by hub modules only.	
Note: Enhanced TriChannel Backplane Ethernets 1, 2, and 3 can be used by hub modules. Hub Ethernet modules connected to these three Ethernet networks can communicate with each other across the backplane.	

Microcom Intelligent Power Subsystem

The Microcom Intelligent Power Subsystem supports load-sharing power supplies, high power availability, and Controller-based power verification features designed to ensure optimal performance (see the table below).

Table A-2. Power Subsystem

Feature	*Description*
Load-sharing power supplies	Provides evenly distributed power consumption among all installed power supplies. Hub activity is not disrupted if a power supply fails because there is no changeover (and hence, no changeover interval).
High power capacity	Four power supplies (17-Slot hub) deliver more than 1000 watts to installed modules. In a 10-Slot hub running under power fault-tolerant mode, three power supplies deliver up to 500 watts of power to installed modules. In a 17-Slot hub running under power fault-tolerant mode, four power supplies deliver up to 750 watts of power to installed modules. If a power supply fails while the hub is running in power fault-tolerant mode, still-functioning supplies provide all the power necessary to keep installed modules and the hub running. This is because the power reserved for power fault-tolerance is made available to modules already powered. Hence, the failure of a power supply has no impact to the system. The power mode and the amount of power available determine the current power limit.
Front-load accessibility	Provides easy access for upgrades. As your power needs increase over time, it is easy to upgrade by adding a power supply into the front of the hub. Because power supply connectors are keyed to the power distribution board, replacing a faulty power supply is a short procedure.
Dedicated power supply bay cooling	Vent holes on the back of the hub cool the power supply bay. These vent holes reduce the possibility that an overheat condition in the power supply bay will cause or contribute to hub or module failure. This feature works with other hub features to maintain normal hub internal operating temperature.
Controller Module-based software-driven power management	The hub Fault-Tolerant Controller Module polls each new system module installed in the hub to confirm enough power is available. If available power is adequate, the new hub module powers up. If available power is inadequate, the new hub module does not power up. System overload is thereby avoided. Software-driven power management (Intelligent Power Management) also provides protection against the possibility of a catastrophic power failure. If the hub is operating in power non-fault-tolerant mode and a power supply fails, installed Controller Modules power down selected (low power class) hub modules until the power deficit is corrected. Intelligent Power Management ensures that key components and resources continue to operate, even under extreme failure conditions.

Intelligent Cooling Subsystem

The default temperature threshold is the maximum internal hub temperature for normal hub operation.

- Overheating occurs when the internal hub temperature exceeds the default threshold.
- The default internal operating temperature threshold for the hub is 60 degrees Celsius (140 degrees Fahrenheit).

The Intelligent Cooling Subsystem in the hub helps prevent:

- Damage to the hub and all installed modules
- Loss of configuration information

This section describes:

- Active Controller Module FAN LEDs
- Automatic Hub Module Power-Down
- Enabling and Disabling Hub Module Power-Down
- Active Controller Module TEMP LEDs (Operating Temperature)

Active Controller Module FAN LEDs

Active Controller Module FAN LEDs indicate that an installed fan has failed. The hub can run normally with either two or three functioning fans.

Note: Operate the hub with all three fans running.

Because the hub can run on just two fans, a warning provided by Active Controller Module FAN LEDs allows time to replace a faulty fan at your convenience. For more information, refer to Appendix F, *Troubleshooting*.

Automatic Module Power-Down

The Intelligent Cooling Subsystem operates as follows:

- Active and Standby Controller Modules continually monitor the temperature sensor located behind each fan unit, providing an accurate measurement of internal hub temperature.
- If the DMM management command SET POWER OVERHEAT_AUTO_POWER_DOWN ENABLE is in effect, an overheat condition may cause installed Controller Modules to begin powering down selected modules until the cause of the overheat condition is corrected and normal hub internal operating temperature is restored.
- The order in which modules power down is determined by:
  - Individual module power class settings
  - Relative slot location of each installed module.

For more information, refer to "Managing Power in the Hub" on page A-13.

Enabling and Disabling Module Power-Down

To enable or disable automatic power-down of modules caused by a hub overheat condition, issue the SET POWER OVERHEAT_AUTO_POWER_DOWN ENABLE (or DISABLE) command.

The default state is SET POWER OVERHEAT_AUTO_POWER_DOWN DISABLE, meaning that installed modules do not power down automatically during an overheat condition. Refer to Chapter 3, *Fan Verification*, for more information on overheat conditions.

Note: This command is available only if you are using a Master DMM (“RDY” shows on the LCD display of a DMM that has Mastership status).

Active Controller Module TEMP LEDs

The TEMP LED on the Active Controller Module indicates:

- A normal hub internal operating temperature
- An excessive hub internal operating temperature.

When hub internal operating temperature rises above the temperature threshold, the following occurs:

- A built-in temperature sensor detects the rise in hub internal operating temperature
- The TEMP LED blinks
- The Active Controller Module sends an alert to the system administrator using the Master Distributed Management Module (if installed)

The TEMP LED stops blinking when hub internal operating temperature falls below the temperature threshold for at least 15 minutes. Correct the overheat condition promptly to avoid possible hardware damage.

The table below describes Controller Module LEDs associated with hub internal operating temperature.

Note: Only Active Controller Module LEDs report hub operating conditions.

Table A-3. Temp LEDs

LED	*Description*
TEMP	Indicates normal hub internal operating temperature, or a hub overheat condition resulting from a number of possible causes. Refer to Chapter 3, the section "Component Verification" and Appendix F, *Troubleshooting*, for more information.
FAN (1 through 3)	Indicates normal fan operation, fan failure, and related conditions that may cause the hub to overheat.
POWER SUPPLY (1 through 4)	Indicates normal power supply operation, a power supply failure, and related conditions that may cause the hub to overheat.

Distributed Management Architecture

Distributed hub management is a whole-system approach in which software and hardware management functions are shared among functionally-related components. This design assures optimal fault-tolerance for the hub and all of the modules within it.

hub network management architecture enables you to manage multiple LAN segments from a single module. This capability is delivered by:

- an ADMM (DMM)
- Network Monitor Cards (NMCs)

Microcom DMM and DMM-EC Comparison

The difference between the DMM and the DMM-EC is that Ethernet Network Monitor Cards cannot be installed on the DMM (the DMM is the stand-alone Distributed Management Module).

Both the DMM and the DMM-EC communicate with installed Ethernet Network Monitor Cards. Only ENMCs can be physically attached to a DMM-EC.

You can install a backup DMM for extra fault-tolerance. If a primary (Master) DMM fails, the backup (Standby) DMM becomes the Master DMM and learns the existing hub configuration.

Note: The rapid changeover from a failed Master DMM to a Standby DMM (which becomes Master when the current Master DMM fails) occurs without causing any loss of data. Nodes can still communicate with each other, but the DMM interface is briefly unavailable to the user during the changeover.

Network Monitor Card

A Network Monitor Card is a circuit board that includes the following features:

- Can be physically attached to a Media Module, or to an ADMM with Ethernet Carrier (DMM-EC) installed in the hub.
- Does not occupy a slot of its own. Rather, an NMC is a submodule that shares a slot or slots with the Media Module or DMM-EC to which it is attached.
- Monitors all activity on a network, gathering statistics and reporting them to a protocol-independent Microcom Distributed Management Module.
- Communicates with an installed DMM using a high-speed management path on the backplane, irrespective of the physical location of the NMC in the hub.
- Network Monitor Cards are optional. Install them only if you need to gather network statistics and have them reported to an installed Microcom DMM.

- Provides full fault-tolerance capability. If an NMC fails, you can switch a second NMC of the same protocol to the network previously monitored by the failed NMC.

Note: Supported Network Monitor Cards are described in the table below.

Table A-4. Supported NMCs

Network Monitor Card	*Description*
Ethernet Network Monitor Card (ENMC)	Designed to reside on an Ethernet Media Module or on a DMM-EC. An ENMC monitors the system or Ethernet network to which it is assigned, and reports statistics for that network to a Master DMM.

Reporting Statistics

To report network statistics to a Master DMM:

1. Select Ethernet segments to monitor.
2. Install *one* Network Monitor Card to gather statistics for *each* Ethernet segment you wish to monitor.

Statistics Reporting Example

To gather statistics on two Ethernet networks, install:

- 1 DMM to fully manage *all* networks. This DMM is the Master DMM.
- 2 ENMCs to gather statistics for the 2 Ethernet segments. Install one ENMC per segment.

Refer to Table A-2 for a description of backplane network allocation in the hub.

Management Capabilities

Module Configuration and Monitoring

Master Management modules installed in the hub perform the following two primary functions:

- **Configuration** - Configure and provide status reporting for modules and the hub
- **Monitoring** - Gather network statistics

Mastership in the Hub

If two or more DMMs are installed in the same Microcom hub, only one DMM is elected Master. All other DMMs in that hub are standby DMMs.

Refer to Table A-5 for an overview of system management capabilities in the hub.

Master Management Module

A Master Management Module is the management module that manages and controls the hub. The Master Management Module can be either an ADMM or a standby system Management Module.

Master DMM

A Microcom Master Distributed Management Module manages and controls the hub. It has the ability to fully manage hub conditions (for example, power management, enabling power to slots, and setting hub operating temperature parameters).

Install at least one DMM per hub so you can take advantage of advanced DMM monitoring and configuration features.

A Microcom Master DMM configures and provides status reporting for:

- Hub Ethernet Modules.

  - If the Ethernet Network Monitor Card (ENMC) assigned to a hub Ethernet network (networks 1, 2, or 3) is installed on a Distributed Management Module with Ethernet Carrier (DMM-EC), you can gather full statistics for that hub Ethernet network.
  - If the ENMC is installed on a Hub Ethernet Module, you can gather limited system Ethernet statistics.

A Master Distributed Management Module (DMM):

- Monitors Microcom Access Integrator networks.
- Requires a protocol-specific Network Monitor Card to monitor any network. You can install Ethernet Network Monitor Cards on any hub Ethernet Media Module or on any DMM-EC.
- Incorporates an LCD display that says “RDY” to indicate this is the Master DMM.

Standby DMM

A Standby DMM:

- Is any installed DMM that does not have “mastership.” The LCD display on a Standby DMM says “STBY”.
- Is inactive until the Master DMM fails.
- Cannot monitor any network. A Standby DMM does not communicate with installed Network Monitor Cards.

Elected Hub Master Module

When you install a DMM in a powered-up hub for the first time, and if that DMM is then elected Master:

- The DMM automatically learns the configurations of all installed hub modules.
- The DMM saves the configuration information it has learned in on-board non-volatile RAM storage (NVRM).

Note: You can configure any hub module using a Master DMM, then install that hot-staged system module into another hub. This is possible because a hub module stores configuration information in on-board non-volatile RAM (NVRAM).

Hub Module DIP Configuration

When a system module powers up in a hub that is not managed:

- The system module configures to DIPs if the hub is already operating when you install the system module.
- The system module configures to DIPs if the hub is not operating when you install the system module (that is, if the hub powers up *after* you install the system module).

When a system module powers up in a managed hub:

- If a saved configuration is not available for *this type* of system module installed in *this slot*, the new system module configures to defaults (isolated, with all ports disabled).
  - For example, if you replace a faulty system BNC Module in slot 5 with a functional BNC Module installed in the *same* slot, and the Master Management Module does not have a saved configuration for the replacement BNC Module, the replacement BNC Module configures to defaults.
  - The system module configures to defaults if the hub is already operating when you install the system module, *or* if the hub is not operating when you install the system module (that is, if the hub powers up *after* you install the system module).
- If an installed Master DMM or Master Management Module has a saved configuration for *this type* of system module newly installed in *this slot*, the Master DMM or Master Management Module provides the saved configuration to the newly installed system module.

- For example, if you replace a faulty system BNC Module in slot 5 with a functional BNC Module installed in the *same* slot, the Master Management Module provides a saved system BNC Module configuration (if available) to the replacement module.
- The new system module configures to the saved configuration if the hub is already operating when you install the system module, *or* if the hub is not operating when you install the system module (that is, if the hub powers up after you install the system module).

Notes: The newly installed system module can be either a replacement module that has been configured in another hub, *or* a new module that has never been configured. If a usable saved configuration is not available, the new module stays in the default state.

Both DMMs and systemS Management Modules have a "configure to DIPs" option which allows system media modules to configure to DIP switch settings automatically, regardless of the saved configuration that management might have for them.

Hub Module Configuration

Hub modules can save their own configurations. Once installed, hub modules first attempt to configure:

- From on-board DIP switch settings, or
- From a saved configuration stored in on-board non-volatile memory (NVRAM)

For each hub module, the switch setting (to DIPs, or to NVRAM) determines which configuration (DIP or NVRAM) is attempted.

If a Master DMM is present, the hub module submits its configuration (DIP or stored in NVRAM) to a Master DMM for approval.

- If the Master DMM has a saved configuration for the system module, it provides that configuration to the system module, overriding the system module's requested configuration.
- If the Master DMM does not have a saved configuration for the system module, it allows the system module to configure to its requested configuration, provided the requested configuration is valid.
- If the configuration requested by the system module has some invalid settings, the system module reverts to defaults (isolated with all ports disabled).
- If a Master DMM is not present and the:
  - system module is set to DIPs, then the system uses the DIP configuration.
  - system module is set to NVRAM and the system module has a stored configuration, the system module configures to that stored configuration.
  - system module is set to NVRAM and no configuration is stored there, the system module configures to defaults (isolated with all ports disabled).
  - system module is set to NVRAM and the stored configuration is invalid, the system module configures to defaults (isolated with all ports disabled).

Notes: Network Monitor Cards do not store a configuration in NVRAM. During a system reset in which all modules reboot, Network Monitor Cards set to defaults and wait to be configured by a Master DMM.

A DMM elected to mastership learns all configuration information for all installed modules, and automatically restores that information to all modules (or their replacements) following a hub or module failure.

Network Monitoring and Module Configuration Summary

This section is a summary of Management Module capabilities in the hub.

Only a Management Module elected to mastership has the ability to configure modules. For a list of Master DMM capabilities, see Table A-5. A Management Module not elected to mastership can only monitor the network to which it is assigned.

Table A-5. Management Module Capabilities

Capability	*DMM*[1]
Provide interface to Controller Module functionality	Yes
Configure Ethernet Modules	Yes
Monitor Ethernet networks	Yes w/ENMC
[1]Must be a Master Management Module.	

System Media Modules have limited on-board network configuration capabilities. You can set on-board DIP switches to select the network (or networks) to which ports will be assigned.

Using Backup Management Modules

You can provide extra protection for your system by installing backup management modules (two or more DMMs) in the hub. The Master DMM provides configurations to all modules. One or more additional DMMs back up the Master DMM if it fails.

- Install more than one DMM-EC in your system to ensure that Ethernet Network Monitor Cards (ENMCs) installed on multiple DMM-ECs provide *full* monitoring for a greater number of hub Ethernet networks (each DMM-EC can support up to 6 ENMCs).
- Assign an ENMC as a standby ENMC in order to establish fault-tolerance for an active ENMC.
- Install additional Ethernet Network Monitor Cards on hub Ethernet Media Modules.
- Install all Ethernet Network Monitor Cards on 2 DMM-ECs (6 ENMCs per DMM-EC) to monitor all of the hub's 12 Ethernet segments. This installation approach centralizes the physical location of ENMCs in your hub and simplifies maintenance.

Backup Management Module Example

If you need to remove a host DMM-EC to replace a defective Ethernet Network Monitor Card, you can replace the faulty ENMC without disrupting port connections (port connections are disrupted when a faulty ENMC is removed from an installed system Ethernet Media Module).

Note: Ethernet Network Monitor Cards installed on a DMM-EC in standby mode are configured by the Master DMM to monitor Ethernet networks. When a DMM-EC is in standby mode, only the DMM (management) component of the DMM-EC is in standby mode. The Carrier component of the DMM-EC (the component that supports the attachment of ENMCs) remains active.

Hub Fault-Tolerant Controller Module Description

Active and Standby Controller Module Functionality

Installed Active and Standby Controller Modules provide power management for all installed system modules and maintain an accurate power budget for the hub.

The *first* Controller Module you install assumes the role of Active Controller Module.

The *second* Controller Module you install assumes the role of Standby Controller Module.

Active Controller Module

The Active Controller Module:

- Monitors hub conditions
- Provides clocking and timing to the backplane
- Synchronizes the operation of all installed modules

In a managed hub, the Active Controller Module reports:

- All hub operating conditions to the Master DMM
- Failures to the Master DMM

Standby Controller Module

The Standby Controller Module monitors hub conditions.

Note: In a hub managed by a Master DMM, you can use management commands to define power management parameters. Refer to section, "Managing Power in the Hub," on page A-13, for information on Controller-based power management functionality.

The hub Controller Module bay accommodates up to two system Fault-Tolerant Controller Modules. Install at least one Controller Module for normal hub operation. Install a second Controller Module to achieve Controller Module fault-tolerance. Refer to section, "Controller Module Fault-Tolerance," on page A-11, for more information.

Identifying Controller Module Slots

The hub identifies Controller Modules as shown in Table A-6.

Table A-6. Identifying Controller Module Slots (DMM)

In a...	*The Master DMM identifies the slot numbers for a pair of AI Controller Modules installed in...*
17-Slot hub managed by an Microcom Master DMM Slots 18 and 19 as slot 18 (left) and slot 19 (right)	SlotS 18 and 19 as slot 18 (left) 18 and 19 as slot 18 (left)

Downloading Software to the Controller Module

Future enhancements to Controller Module functionality may make it necessary to download a new revision of the software. This section describes:

- Downloading to a Hub Containing Two Installed Controller Modules
- Downloading to a Hub Containing One Installed Controller Module

Downloading to a Hub Containing Two Installed Controller Modules

A download to the Standby Controller Module *first* causes only *one* disruption to hub operation, and is therefore the recommended method for downloading software to installed Controller Modules.

Note: The DMM may display irrelevant traps about an installed Controller Module after you download new Controller Module code.

In a hub containing two installed Controller Modules, *always*:

1. First, perform a download to the Standby Controller Module
2. Second, perform a download to the Active Controller Module

When you download to the Standby Controller Module first:

– The Standby Controller Module remains in Standby mode and causes no disruption to hub operation.

– The Active Controller Module reboots, and then loses Active Controller Module status to the Standby Controller Module. The Active Controller Module reboots and briefly disrupts hub operation.

A download to the Active Controller Module first would cause *two* disruptions to hub operation. Because it causes two disruptions (one more than necessary), this approach to download is feasible but not recommended.

When you download to the Active Controller Module first:

– The Active Controller Module reboots and loses Active Controller Module status (the Standby Controller Module becomes the "new" Active Controller Module, and the "old" Active Controller Module becomes the Standby Controller Module).

This is the first disruption to hub operation.

– A *second* disruption to hub operation occurs when you download to the "new" Active Controller Module that was previously the Standby Controller Module (a *second* reboot and swap of Active Controller Module status takes place).

Note: As a Controller Module is being downloaded, the TEMP LED on the Controller Module lights and remains illuminated for the duration of the download. When a download attempt is unsuccessful, the STBY and ACTIVE LEDs on the Controller Module to which you are downloading light and remain illuminated until you re-initiate the download procedure.

Downloading to a Hub Containing One Installed Controller Module

In a hub containing only one installed Controller Module, the system recognizes the single installed Controller Module as the Active Controller Module.

You can perform a Controller Module software download when there is just one installed Controller Module, keeping in mind the following:

- Power management functionality is inactive while a download is in progress, and until the download completes.
- *If a power failure occurs* while download is in progress, the system may not be able to recover and the Controller Module to which you are downloading may fail.
  - – Upon power recovery, replace the failed Controller Module and re-initiate the download to the replacement Controller Module.
  - – Next (optionally), re-insert the original Controller Module (the one that failed during the first download) and re-initiate download to the original Controller Module while the Active Controller Module is present and functioning.

  The original Controller Module powers up as the Standby Controller Module.

Controller Module Fault-Tolerance

Both the Active Controller Module and the Standby Controller Module monitor and modify hub operating conditions (such as power and temperature).

Redundant monitoring and control capability enables the Standby Controller Module to be ready to instantly take over for the Active Controller Module should the need arise. This capability is called *fault-tolerance. Controller-based fault-tolerance is highly recommended.*

Installing Two Controller Modules into a Powered-Up Hub

If two Controller Modules are installed in a hub that is already powered up:

- The first Controller Module installed becomes the Active Controller Module.
- The second Controller Module installed becomes the Standby Controller Module.

Under these circumstances, the number of the slot in which a Controller Module is installed does *not* determine whether the module becomes the Active or Standby Controller Module.

Installing Two Controller Modules into a Powered-Down Hub

If two Controller Modules are installed in a hub that is not yet powered up:

- The Controller Module installed in slot 18 or in slot 11 always becomes the Active Controller Module when the hub is subsequently powered on.
- If the hub is reset by a power outage or through DMM commands:
  - The Controller Module in slot 18 (17-Slot hub) becomes the Active Controller Module.
  - The Controller Module in slot 19 (17-Slot hub) becomes the Standby Controller Module.

Only One Active Controller Module Per Hub

Only one Controller Module can be the Active Controller Module at any given time. When only one Controller Module is installed, that Controller Module is the Active Controller Module.

When Standby Controller Module Becomes Active Controller Module

When the Standby Controller Module takes over for the Active Controller Module, all installed modules reboot (this type of reset is called “fast reset”). To facilitate immediate resumption of hub activity following a reboot, system modules equipped with on-board non-volatile memory (NVRAM) automatically load the configuration stored in NVRAM. This occurs *regardless* of current DIP switch settings.

Note: In contrast to a fast reset, when a hub module is cold booted (becomes power enabled by installed Controller Modules, or following a hub reset) the system module configures from either DIP switches or from NVRAM storage. The DIP switch setting on each hub module (to DIPs or to NVRAM) determines how each hub module configures. Refer to section, “Hub Module Configuration,” on page A-8, for more information.

Load-Sharing Power Supplies

This section describes available power modes and power supply failure in each power mode.

The hub is shipped with one modular load-sharing power supply. The 17-Slot hub can accommodate up to four supplies.

Power Modes

The hub runs in either of two power modes:

- Power Non-Fault Tolerant Mode
- Power Fault-Tolerant Mode

Note: For optimal power redundancy in either power mode, run the hub with at least one power supply more than the minimum number required to operate all installed modules and all modules you plan to install.

Power Non-Fault-Tolerant Mode

Power non-fault-tolerant mode is a user-selectable mode in which 100% of the power that can be allocated to modules is available to them (no power is held in reserve).

Power non-fault-tolerant mode is the default mode for power supplies as shipped.

While the hub is running in power non-fault-tolerant mode, the amount of power available to modules is determined by the number of installed power supplies.

If a power supply fails while the hub is running in power non-fault-tolerant mode:

- Installed Controller modules may shut down selected system modules in an attempt to bring installed module power consumption under the now-reduced power budget.

- Installed modules continue to operate without interruption if the output of at least one installed power supply is *not* required by installed modules when a power supply fails.

Refer to section, "Hub Module Power-Down Response," on page A-18, for more information.

Avoiding Power Supply Overload at Startup

Important: When switching on power supplies in a hub containing modules, we strongly recommend that you switch all installed power supplies on *simultaneously* in order to avoid the possible shutdown of one or more power supplies. This is necessary only when the power required by installed modules is greater than the capacity of the first power supply/supplies you switch on. For example, if you switch on one power supply at a time, the first power supply you switch on may get overloaded and shut down before a second power supply can power up and share the load. Also, if a power supply shuts down due to an overload, be aware that you must wait at least ten seconds before attempting to switch that power supply on again.

Power Fault-Tolerant Mode

Power fault-tolerant mode is a user-selectable mode in which one power supply's worth of power is held in reserve. This reserve power is not available to installed modules until a power supply fails, or until the user switches the power mode from power fault-tolerant mode to power non-fault-tolerant mode.

While the hub is running in power fault-tolerant mode:

- All installed power supplies are functioning and contributing power to the hub. No single power supply is a dedicated standby power supply. Rather, a factory-defined power limit (based on the number of installed power supplies) ensures that at least one power supply's worth of power is available to replace power lost when a power supply fails.
- The amount of power required by installed modules must not be greater than the number of installed power supplies minus one (N-1). When you reserve one power supply's worth of power in power fault-tolerant mode, the failure of a single power supply has no impact on installed modules already powered up.

If a power supply fails while the hub is running in power fault-tolerant mode:

- Active and Standby Controller Modules respond by automatically disabling power fault-tolerant mode.
- Power formerly reserved (unavailable to installed modules) is made available to power enabled system modules to prevent them from powering down by power class and slot location (as an attempt to bring power consumption under the now-reduced power budget).
- All modules that had power before the power supply failure continue to receive power without interruption.
- Upon power supply recovery, power fault-tolerant mode is automatically re-enabled.

Note: To *prevent* Active and Standby Controller Modules from automatically disabling power fault-tolerant mode in response to a power supply failure, ensure that the number of installed power supplies is equal to or greater than N-2 (two extra power supplies). In a hub with at least two extra installed power supplies, N-1 power supplies continue to be available to run the hub in power fault-tolerant mode, even after a single power supply fails.

Managing Power in the Hub

The system Fault-Tolerant Controller Module provides comprehensive power management for the hub and all installed hub modules.

Establishing Power Fault-Tolerance

Operate the hub in power fault-tolerant mode to ensure that at least one supply's worth of power is available to replace power lost when and if a single power supply fails.

To set the hub to power fault-tolerant mode or power non-fault-tolerant mode enter the SET POWER MODE command at the DMM prompt.

When you attempt to set the hub to power fault-tolerant mode, Active and Standby Controller Modules determine if there is sufficient unallocated power budget available to place one power supply's worth of power in reserve.

- If there is sufficient unallocated power budget, the hub sets to power fault-tolerant mode.
- If there is insufficient unallocated power budget, the hub remains in power non-fault-tolerant mode.

To ensure optimal power fault tolerance, determine the current power budget for the hub as follows:

1. If you have installed an ADMM in your hub, enter the SHOW POWER BUDGET command at the terminal prompt.

   The SHOW POWER BUDGET command shows the amount of power currently available for modules:

   – Total power installed

   – Amount of power consumed

   – Amount of power available

   Compare this information with the power requirements for each module installed in the hub.

   Refer to the documentation supplied with each module to determine your module power requirements. Take into account any modules you plan to install, as well as those already installed.

Note: Power supply output values displayed by the SHOW POWER BUDGET command have been rounded down. Therefore, these values may not precisely match those provided in the documentation shipped with each module.

2. Examine the output of the SHOW POWER BUDGET command. If necessary, add another power supply to your hub.

Table A-7 shows the power available in power non-fault-tolerant mode (by voltage type). Values are rounded values that do *not* include system overhead (fans, TriChannel signalling, and two installed Controller Modules).

Table A-7. Power Available to Modules in Power Non-Fault-Tolerant Mode

Output Voltage Type (Volts)	***One Power Supply (Watts)***	***Two Power Supplies (Watts)***	***Three Power Supplies (Watts)***	***Four Power Supplies (Watts)***
+5	204.00	367.00	551.00	735.00
-5	15.00	27.00	38.25	51.00
+12	48.00	81.50	122.50	163.00
-12	18.00	30.50	46.00	61.25
+2	8.40	14.30	21.40	28.60
TOTAL WATTS	293.40	520.30	779.15	1038.85

Table A-8 shows the power available in power fault-tolerant mode (by voltage type). Values are rounded values that do *not* include system overhead (fans, TriChannel signalling, or installed Controller Modules).

Table A-8. Power Available to Modules in Power Fault-Tolerant Mode

Output Voltage Type (Volts)	*One Power Supply (Watts)*[1]	*Two Power Supplies (Watts)*	*Three Power Supplies (Watts)*	*Four Power Supplies (Watts)*
+5	N / A	204.00	367.00	551.00
-5	N / A	15.00	27.00	38.25
+12	N / A	48.00	81.50	122.50
-12	N / A	18.00	30.50	46.00
+2	N / A	8.40	14.30	21.40
TOTAL WATTS	N / A	293.40	520.30	779.15

[1] Power fault-tolerance can only be established if at least one power supply's worth of unallocated power budget is available to be held in reserve.

In summary, you can only establish power fault-tolerant mode if:

- Power budget consumed is less than or equal to the power delivery capability provided by N-1 power supplies (see Table A-8), and
- The hub is managed by an installed ADMM.

Enabling and Disabling Power to Slots

If you have an installed Distributed Management Module, you can use Microcom power management commands to enable or disable power to any selected slot containing a system module. Installed Controller Modules allow you to enable power to a slot, but only if there is sufficient unallocated power budget to power up the module installed in the slot.

Power Enabled State

To enable power to a specified slot:

1. Enter the SET POWER SLOT <slot> MODE ENABLE command.
2. Press **Enter**. If there is:
   - Sufficient power available to meet the requirements of the system module, installed Controller Modules enable power to the specified slot and reduce the power budget by the amount of power the system module installed in that slot consumes.
   - Insufficient power to meet the requirements of the system module, the system module remains in power pending state until sufficient power becomes available.

An system module that was powered down due to a lack of sufficient available power is in *power pending state*. The module can be automatically powered up again by installed Controller Modules when sufficient power becomes available.

Power Disabled State

A system module in *power disabled state* is a system module that was powered down. A system module in power disabled state is *not* eligible to be automatically powered up again when sufficient power becomes available.

To disable power to a system module in a specified slot:

1. Enter the SET POWER SLOT <slot> MODE DISABLE command.
2. Press **Enter**.

Upon disabling power to a slot containing a system module, the power previously consumed by the system module is returned to the unallocated power budget (that is, to the power available budget).

Note: Hub Management Modules do not provide a user interface to Controller Module power management functionality.

Hub Module Power Class Settings

A *power class setting* is a user-definable value ranging from 1 through 10 (10 is the highest possible power class setting). You can define the power class setting for any installed system module to make one system module more important or less important than another.

Installed Controller Modules use default and user-defined power class settings to make power management decisions. For example, installed Controller Modules use system module power class settings to determine the order in which installed system modules power up and power down under certain power deficit and overheat conditions.

Using the Default Power Class Setting

Each system module is shipped with a default power class setting of 3.

- Assign higher power class settings to all installed DMMs, and assign the highest power class setting of any installed system module to the Master DMM. This assures that the Master DMM powers down last (after all other installed system modules).
- Assign a higher power class setting to any system module connected to critical network resources.

Setting Power Class Manually

To set the power class for a system module in a specified slot:

1. Enter the SET POWER SLOT <slot> CLASS <class> command.
2. Press **Enter**

Note: Even though it has a power class setting, a Controller Module cannot be power managed. A Controller Module always draws power when inserted in the hub, and a Controller Module cannot be powered down using a DMM command.

Power Class 10 Warnings

A system module assigned a power class setting of 10 cannot be automatically powered down by installed Controller modules.

- If a power supply failure causes a power deficit (or if a hub overheat condition develops while OVERHEAT_AUTO_POWER_DOWN is enabled), a system module assigned a power class setting of 10 continues to run until you order it to shut down. Under some conditions (such as an extended overheat condition), hub or module hardware damage may result.
- To ensure that installed Controller Modules are able to *automatically* make all power management decisions without waiting for user intervention, do not assign a power class setting of 10 to any system module unless absolutely necessary.

Budgeting Power

Allocating Power for Installed Modules

Before you install a new system module in the hub, and if your hub contains a DMM, enter the SHOW POWER BUDGET command to confirm there is sufficient power for installed modules. The SHOW POWER BUDGET command displays current hub power conditions that help you decide if there is sufficient power available to power up and operate the new module.

Table A-9 shows selected DMM power management commands and their functions.

Table A-9. Selected DMM Power Management Commands

Command Name	*Displays...*
SHOW POWER BUDGET	Power budget information on a per-voltage basis. Displays actual voltages measured on the hub backplane.
SHOW POWER SLOT	Power class, power state, and power status for the module in a specified slot, or in all slots.
SHOW POWER MODE	Whether power fault-tolerant or power non-fault-tolerant mode is currently in effect for the hub. Also indicates whether OVERHEAT_AUTO_POWER_DOWN is enabled or disabled.
SHOW POWER ALL	The information displayed by all of the preceding commands.

Once powered up, a Master DMM provides initial system module power consumption values from the system power consumption table it maintains to installed Controller Modules.

When an installed Controller Module powers up a system module:

- The Controller Module adjusts the available power budget to reflect the power consumption of the newly powered-up system module.
- Controller Modules then power up remaining system modules (by power class and slot location) to the limit of the unallocated power budget.

By maintaining an accurate power budget, installed Controller Modules can determine:

- Which installed system modules to power up
- Which installed system modules (if any) to power down to bring module power consumption under budget
- Which installed system modules to place in power pending state due to a lack of sufficient unallocated power budget to power them up

Increasing the Unallocated Power Budget

This section describes actions you can take to increase unallocated power budget whenever you need more power for installed system modules, or to power up newly installed modules.

To increase unallocated power budget:

- Add one or more power supplies.
- If the hub is running in power fault-tolerant mode, change the power mode to power non-fault-tolerant to make reserve power available to all installed modules.
- As a last resort, manually power down selected low power class system modules until you have enough power.

For more information about using DMM commands to manually power down system modules, refer to "Enabling and Disabling Module Power-Down" on page A-4.

Hub Module Power-Up Strategy

Default Hub Module Power-Up Strategy

The hub Fault-Tolerant Controller Module determines how much power a system module requires before it permits the module to power up.

Controller Modules employ the following power-up strategy:

- Current unallocated power budget must be sufficient to power up this system module.
- During hub power-up, installed Controller Modules power up the DMM that has the highest power class setting of all installed DMMs before powering up all other installed system modules. This DMM is thereby elected Master.
- System modules set to SLOT POWER ENABLED power up, in order, from slot 1 to slot 17 (17-Slot hub).
- System modules set to SLOT POWER ENABLED that have the highest power class setting power up first.
- System modules set to SLOT POWER ENABLED continue to power up based on power class settings (from highest to lowest). This process continues until the limit of the power budget is reached.
- If two or more system modules set to SLOT POWER ENABLED have the *same* power class setting, they power up, in order, from slot 1 to slot 17 (17-Slot hub).
- System modules set to SLOT POWER DISABLED are not permitted to power up.

Notes: Power-up occurs in this manner only if installed system modules do not configure from saved power management configuration data stored in their NVRAM. Refer to "Saved Power Management Configurations" for more details.

Hub module power-down in response to an overheat condition occurs only within affected overheat management areas. Refer to section, "Overheat Condition," on page A-19, for information on overheat power-up and power-down.

Specifying Hub Module Power-Up Order

To specify the order in which system modules power up, change their power class settings.

To change the power class setting for any hub module:

1. Enter the SET POWER SLOT <slot> CLASS <class> command.
2. Press **Enter**.

Note: Assign a high power class setting (for example, 9) to modules that provide network interfaces for a DMM (host system modules to which a Network Monitor Card is attached) to ensure that they receive power first and power down last. This approach also ensures that the DMM does not lose network connectivity (and hence, SNMP management of the hub) during a power-down sequence.

Hub Module Power-Down Response

This section describes how Intelligent Power Management responds to power deficits and overheat caused by selected abnormal operating conditions.

Correcting a Power Deficit

To correct a power deficit, installed Controller Modules must reduce the power consumption of all installed modules. Controller Modules can only reduce power consumption by:

- Disabling power fault-tolerant mode (if in effect) to make reserve power available to installed modules.
- Selectively powering down system modules to return power to the budget.

Installed Controller Modules power down system modules the same way in:

- An unmanaged hub
- A hub managed by a Master DMM

If installed Controller Modules are unable to respond to a power deficit (for example, due to a power failure), the hub resets. Under these conditions, power-up (recovery) occurs when the hub reboots.

Refer to section, "Power Supply Failure," on page A-19, for more information.

Powering Up With Insufficient Power

If there is insufficient power to power up a system module, installed Controller Modules automatically place the system module in power pending state until there is enough power to enable it.

Power Supply Failure

Intelligent Power Management response to a power supply failure is determined by the current power mode:

- If a power supply fails while the hub is running in power fault-tolerant mode:
  - Installed Controller Modules respond by disabling power fault-tolerant mode. If the power budget deficit remains in effect after power fault-tolerant mode has been disabled, system modules selectively power down based on power class settings and relative slot locations until the power budget deficit is corrected.
  - Once the power budget deficit is corrected and there is again enough power to re-establish power fault-tolerant mode, power fault-tolerant mode is automatically re-enabled.

Note: When a power deficit occurs while the hub is running in power fault-tolerant mode, Controller Modules do not shut down system modules to reduce the power budget.

- If a power supply fails while the hub is running in power non-fault-tolerant mode (the default mode), installed Controller Modules may selectively shut down system modules in an attempt to bring module power consumption under budget.

The system module power-down sequence is as follows:

- System modules power down, in order, from slot 17 to slot 1, starting with system modules having the lowest power class setting.
- If two or more system modules have the same power class, they power down from slot 17 to slot 1 (17-Slot hub).
- System modules continue to power down until total power consumption is at or below budget.

You can specify the order in which system modules power down when a power supply failure occurs by changing ACMS module power class settings (SET POWER <slot>.class command).

For information on system module power down due to an overheat condition, see the section, “Overheat Condition,” that follows.

Note: Even during a power deficit, a system module having a power class setting of 10 does not power down unless the user explicitly orders it to do so. To order a system module (except the Active Controller Module) to shut down, enter SET POWER SLOT <slot> MODE DISABLE at the prompt.

Overheat Condition

An overheat condition exists when one of the hub temperature sensors detects a hub internal operating temperature that exceeds a pre-defined threshold. The default threshold setting is fixed at an upper limit of 60°C (140° F) to prevent module damage.

An overheat condition may be caused by cooling loss or excessively high ambient (room) air temperature.

The following occurs during an overheat condition:

1. If an SNMP agent is present in the hub, power management informs the SNMP agent of the overheat condition.
2. A 1-minute delay is provided, during which the Master DMM and external management entities are notified of the overheat condition.
3. Approximately 1 minute later, Controller Modules apply a power-down strategy to installed system modules in the overheat management areas where the overheat condition was detected.

Controller Modules do *not* power down system modules occupying slots outside affected overheat management areas. This overheat power-down strategy is based on the power class setting and slot location of each installed system module.

Refer to "Overheat Management Areas," "Overheat Power-Down Strategy," and "Overheat Recovery Strategy" (following) for a discussion of overheat management areas and overheat power-down and power-up strategies.

Enabling and Disabling Automatic Hub Module Power-Down (Overheat Condition)

To enable automatic hub module power-down in response to an overheat condition:

1. Enter the SET POWER OVERHEAT_AUTO_POWER_DOWN_ENABLE command.
2. Press **Enter**.

To disable automatic hub module power down in response to an overheat condition:

1. Enter the SET POWER OVERHEAT_AUTO_POWER_DOWN_DISABLE command.
2. Press **Enter**.

Recall that modules can never be automatically powered down by installed Controller Modules or (manually) by DMM commands entered at the prompt.

Overheat Management Areas in 7-Slot Chassis

The overheat power-down strategy is based on three temperature sensors in the hub, one per installed fan unit, that effectively divides the module payload area of the hub into three overlapping "overheat management areas."

Each overheat management area comprises 8 payload slots. The overlap reflects the overlapping cooling effects of adjacent fan units (the hub can run with a minimum of two installed and functioning fan units, but three are recommended).

The overheat management areas divide the payload slots as follows:

- Slots 1 through 8 (overheat management area 1)
- Slots 6 through 13 (overheat management area 2)
- Slots 10 through 17 (overheat management area 3)

Overheat Power-Down Process

The hub module overheat power-down strategy is as follows:

- When any hub temperature sensor detects an internal hub operating temperature of 45°C or higher, power management issues warning traps that tell the user an overheat condition may soon exist. The system generates warning traps every 30 seconds (approximate) at this point.
- When internal hub operating temperature reaches 60°C (140° F), power management power-disables *selected* system modules installed within each affected overheat management area to reduce the 5 Volt power consumption by at least 50 watts.
- Selected system modules in affected overheat management areas power-down, in order, starting with system modules having the lowest power class setting.
- This reduction of power consumption should provide a 2°C drop in temperature at the temperature sensor for that overheat management area. A single temperature sensor is located at the back of each exhaust fan. The system generates overheat traps every 10 seconds (approximately).
- If two or more system modules in an affected overheat management area have the *same* power class, they power down from highest slot to lowest slot.
- System modules continue to power down until all system modules in the affected overheat management area have powered down. System modules with a power class setting of 10 continue to run.

- Hub temperature is allowed to stabilize for 15 minutes before further action is taken.
- If hub temperature is not at or below the established overheat threshold after 15 minutes have elapsed, *all* system modules in the affected overheat management area (or areas) are powered down. System modules in affected overheat management areas do not power up again until you correct the overheat condition.

Overheat Recovery Strategy

Overheat recovery occurs when the temperature sensor that detected an overheat condition reports that internal hub temperature is at or below the overheat threshold.

Once overheat recovery is initiated, system modules that were powered down to alleviate the overheat condition power up to the limit of the current power budget.

Controller Modules perform overheat recovery power-up as follows:

- System modules power up, in order, from the lowest slot in the affected overheat management area to the highest slot in the affected overheat management area.
- System modules with the highest power class setting power up first. If two or more system modules have the *same* power class setting, they power up from the lowest slot in the affected overheat management area to the highest slot in the affected overheat management area.

➥ **Important**: If SET POWER OVERHEAT_AUTO_POWER_DOWN_DISABLE is in effect when an overheat condition occurs, the hub and all installed modules continue to run. Under these circumstances, an extended overheat condition may cause heat-related hardware damage. Run the hub with OVERHEAT_AUTO_POWER_DOWN_ ENABLE in effect.

Saved Power Management Configurations

The hub Fault-Tolerant Controller Module stores:

- Saved power management configuration data for all installed system modules in on-board Controller Module NVRAM
- Unmanaged power allocation data describing the type (per voltage) and the amount of power (watts) available to installed system modules

When the hub powers up following a hub reset:

- Controller Modules use saved power management configuration data to verify that power configurations for installed system modules precisely match those in effect prior to the hub reset.
- If necessary, Controller Modules then use the saved data to restore lost system module power configurations.

Installed Controller Modules save the power management configuration data shown in Table A-10:

Table A-10. Saved Power Management Configuration Data

Data Type	*Description*
Slot profile	Identifies the module installed in a given slot as a system module. In addition, empty slots are identified.
Slot power state	Power state for each installed system module (enabled, disabled, or pending).
Slot power class	Power class setting for each installed system module.
Power mode	Power mode for the hub prior to a hub reset (power fault-tolerant mode or power non-fault-tolerant mode).
Overheat auto power down mode	Auto power down mode of the hub prior to a hub reset (enabled or disabled).

As the hub powers up following a hub reset, installed Controller Modules compare saved slot profile data for the system module in each successive slot with current slot profile data.

- If saved slot profile data for all slots containing system modules matches current slot profile data, all installed system modules then configure to saved power management configuration data.
- If a current slot profile does not match the saved profile for a given slot and the hub contains only system modules, the following applies:
  - The DMM with the highest power class setting powers up first.
  - System modules power up based on power class setting and relative slot location.

See the section, "Hub Module Power Class Settings" on page A-16 for more information.

Note: If a power supply fails while the hub is rebooting, saved power management configuration data (for example, the number of installed and functioning power supplies) does *not* accurately describe hub conditions following the reboot. Under these circumstances, total power required by hub modules may be more power than the power available *after* the reboot.

Appendix B

Switching Hub Specifications

Supported Network Protocols

Network Protocols Supported: Ethernet/IEEE 802.3 over various media

Environmental Specifications

Table B-1. Environmental Specifications

Specification	*Operating Requirement*
Hub Operating Temperature[1]	0° to 40° C Ambient[2] (32° to 122° F)
Storage Temperature	-10° to 66° C (22° to 150° F)
Operating Humidity	Less than 95%, non-condensing

[1]Hub operating temperature is temperature of the environment in which it is installed.

[2]Ambient air is room air (the air drawn into the hub by installed fans to cool hub components). Hub temperature sensors *do not* measure ambient air temperature.

Mechanical Specifications

Table B-2. 17-Slot Chassis Mechanical Specifications

Specification	*Description*
Dimensions	17.36 inches W x 15.06 inches D x 26.52 inches H (44.0 cm W x 38.5 cm D x 67.3 cm H)
Weight	
Unloaded, with blank cover plates, 3 fan units, and no power supplies	48.4 lbs. (21.9 kg)
Unloaded, with blank cover plates, 3 fan units, and1 power supply	53.8 lbs. (24.4 kg)
Loaded, with 17 installed modules, 3 fan units and4 power supplies	120.0 lbs. (54.4 kg)

Table B-3. 7-Slot Chassis Mechanical Specifications

Specification	*Description*
Dimensions	17.36 inches W x 20,1 inches D x 8.7inches H (44.0 cm W x 51.1 cm D x 21.6 cm H)
Weight	
Unloaded, with blank cover plates, fan unit, and1 power supply	46.9 lbs. (21.2 kg)
Loaded, with 7 installed modules, fan unit and1 power supply	57.3 lbs. (25.9 kg)

Power Requirements

Each 295-Watt load sharing power supply has the following specifications:

- 295 Watt Power Supply: 85 to 132 VAC, 6 Amps maximum
- 180 to 264 VAC, 2.8 Amps maximum
- 47 to 63 Hz
- 1007 BTU / hour

Regulatory Compliance

Table B-4. Regulatory Certifications

Certification	*Description*
Safety	UL 1950 CSA-950 TUV Rheinland (EN 60950)
Emissions	FCC Part 15 Class A VDE / B VCCI Class 1 CISPR 22 Level A

Microcom Switching Hub Accessories

Table B-5. Hub Accessories

Accessory	*Description*
17-Slot Switching Hub Chassis	45 lbs. (20 kg)
Fault-Tolerant Controller Module	.7 lbs. (.3 kg)
Power Supply Module	5.45 lbs. (2.5 kg)
17-Slot System Fan Assembly	1.2 lbs. (.4 kg)
Hub System Rack Mount Kit	Flanges attach to the hub to permit rack mounting.

Appendix C

Engine Switches

The MNC, MMM, PRI and LIU engines have a series of switch banks. We describe these in this appendix. ***However, you can set all their functions in software and we strongly recommend doing so using* express*WATCH and the configuration files to change an engine's operations.***

The configuration files stored in the MNC's RAM disk reset each engine on a chassis reboot. They also let you make changes over the network or through a remote connection and force the engine to read and load its new configuration. If you use switches instead of files, any changes must be performed on-site by removing the modules to access the switches.

You will find the switches useful during maintenance and troubleshooting. You can temporarily set engines to specific states to perform tests and return them to the configuration file settings when you have finished.

Switch Operations

To set engine switches, first remove the module from the chassis. Refer to the illustrations in this appendix for switch locations. The tables that accompany each illustration will list the settings.

The switch banks will indicate the "ON" position. Some tables in some engine manuals that show entire bank settings will use "u" for an ON setting and "d" for an OFF setting, in the form "d u d u d d d d". That indicates that switches 2 and 4 should be ON and the others in that bank off.

MMM Switches

Analog MMM and MMM24 engines use the configuration files exclusively. Older hex digital MMM engines have switches as shown in this section. If you need to set an analog MMM or MMM24 to boot mode for diagnostics, locate its jumper JP7 and move the shunt to cover both wires. Be sure to return JP7 to its default when you have finished.

See the following figure to orient you to the digital MMM switch bank location and layout.

MMM Switch Bank 2 is on the middle lower edge of each MMM engine. Switches 1 through 8 are numbered from left to right. The ON position is up and the OFF position is down.

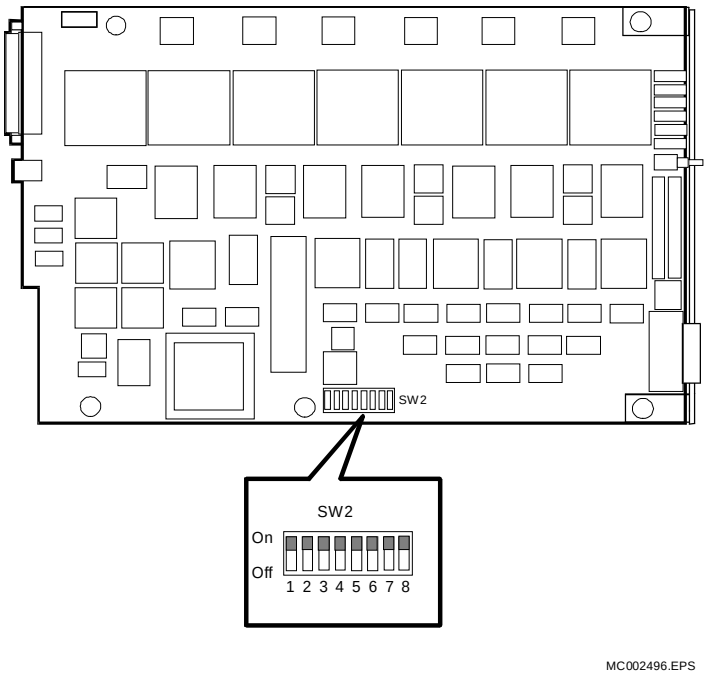


Figure C-1. **MMM Engine Switch Location**

Table C-1. MMM Switches

Switch	*Function*	*Switches and Setting*	*Effect*
1 and 2	T1 DS0 time slot assignment	1 2 off off on off off on on on	 DS0 1 - 6 DS0 7 - 12 DS0 13 - 18 DS0 19 - 24
1 and 2	E1 DS0 time slot assignment	1 2 off off on off off on on on	 DS0 1 - 6 DS0 7 - 12 DS0 13 - 15 and 17 - 19 DS0 20 - 25
3	Line type	off on	T1 E1
4	TDM Span	off on	Span 1 Span 2
5	Configuration Control	off on	read *xprswtch.mmm* configuration from switches
6	Startup Control	off on	Start Main Mode Stay in Boot Mode
7 and 8	Reserved	7 8 off off	**Note:** These switches must stay in the off position.

LIU Switches

By default, all LIU switches are down. This lets you set all its parameters through *express*WATCH. We recommend leaving Switch Bank 3, Switch 8 in the ON position and using the *express*WATCH files to control this engine.

LIUs require setting for the type of T1 line your telco provides. In most installations you only have one type of T1 service and all T1 switch settings are identical.

The switch banks are numbered 1 through 8 left to right; ON is down and OFF is up as you look at the switch lettering. Switch Bank 1 is visible between the circuit boards at the top of the engine. Switch Bank 3 is in the upper right of the engine.

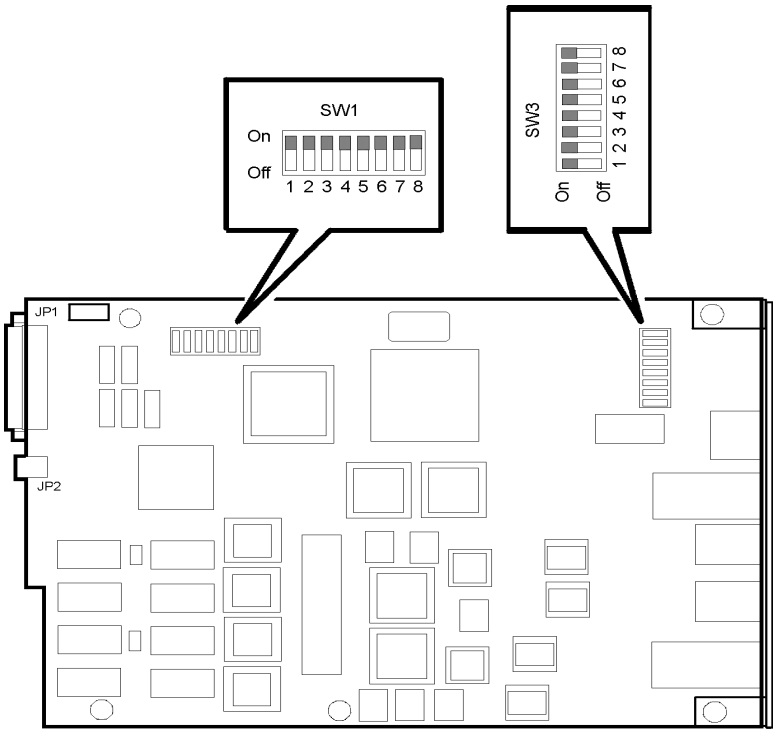


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Figure C-2. **LIU Engine Switch Locations**

Table C-2. LIU Switch Bank 1

Switch	*Function*	*Switches and Setting*	*Effect*
1 and 2	Transmit Line Build Out	1 2 on on	0dB (default)
		off on	7.5dB
		on off	15dB
		off off	22.5dB
3, 4 and 5	Loopback	3 4 5 on on on	Normal (default)
		off on on	LIU Span 1 Local Loopback
		on off on	CSU Span 1 Local Loopback
		off off on	LIU Span 2 Local Loopback
		on on off	CSU Span 1 Remote Loopback
		off on off	CSU Span 2 Local Loopback
		on off off	CSU Span 2 Remote Loopback
		off off off	Transmit All Ones Span 1 (TAOS)
6	Equalizer Gain	on	36dB (default)
		off	[Reserved]

Table C-2. LIU Switch Bank 1 (Continued)

Switch	***Function***	***Switches and Setting***	***Effect***
7	Line Code	on	B8ZS
		off	AMI (default)
8	Startup Mode	on	Main (default)
		off	Boot

Table C-3. LIU Switch Bank 3

Switch	***Function***	***Switches and Setting***	***Effect***
1 and 2	Signaling Mode	1 2 on on	T1 Bit Robbing (default)
		off on	[Reserved]
		on off	[Reserved]
		off off	[Reserved]
3 and 4	Frame Format	3 4 on on	D4 (default)
		off on	ESF
		on off	[Reserved]
		off off	[Reserved]
5	Clock Source	on	Slave (default)
		off	Master
6	Span 1 or 2	on	Span 1 (default)
		off	Span 2
7	Hardware Diagnostics	on	Normal (default)
		off	Continuous diagnostics
8	Configuration Source	on	Read *xprswtch.liu* (default)
		off	Configure from switches

PRI Switches

By default, all PRI switches are down. This lets you set all its parameters through *express*WATCH. We recommend leaving Switch Bank 3, Switch 8 in the ON position and using the *express*WATCH files to control this engine.

PRI engines require setting for the type of ISDN line your telco provides. In most installations you only have one type of ISDN service and all PRI switch settings will be identical.

The switch bank layouts are 1 through 8 left to right; ON is down and OFF is up as you look at the switch lettering. Switch Bank 2 is visible between the circuit boards at the top of the engine. Switch Bank 1 is in the upper right of the engine.

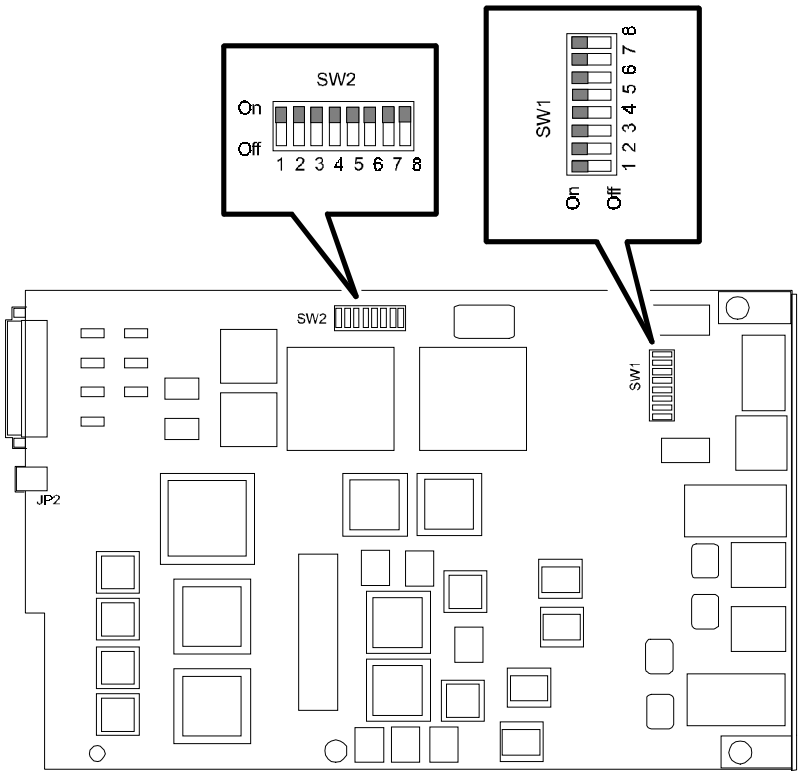

Figure C-3. **PRI Engine Switch**

Table C-4. PRI Switch 1

Switch	***Function***	***Switches and Setting***	***Effect***
1 and 2	Transmit Line Build Out	1 2 on on	0dB (default)
		off on	7.5dB
		on off	15dB
		off off	22.5dB
3, 4 and 5	Loopback	3 4 5 on on on	Normal (default)
		off on on	LIU Span 1 Local Loopback
		on off on	CSU Span 1 Local Loopback
		off off on	LIU Span 2 Local Loopback
		on on off	CSU Span 1 Remote Loopback
		off on off	CSU Span 2 Local Loopback
		on off off	CSU Span 2 Remote Loopback
		off off off	Transmit All Ones Span 1 (TAOS)

Table C-4. PRI Switch 1

Switch	*Function*	*Switches and Setting*	*Effect*
6	Equalizer Gain	on	36dB (default)
		off	[Reserved]
7	Line Code	on	B8ZS default for T1, or HDB3 default for E1
		off	AMI
8	Startup Mode	on	Main (default)
		off	Boot

Table C-5. PRI Switch 2

Switch	*Function*	*Switches and Setting*	*Effect*
1, 2, 3	T1/E1 Mode	1 2 3 on on on	T1 Bit Robbing
		off on on	T1/PRI default for T1
		on off on	E1/PRI with CRC4 (default)
		off off on	E1/PRI with CRC4 disabled
		on on off	[Reserved]
		off on off	[Reserved]
		on off off	[Reserved]
		off off off	[Reserved]
4, 5, 6	Frame Format (T1 only)	3 4 5 on on on	D4
		off on on	ESF (default)
		on off on	[Reserved]
		off off on	[Reserved]
		on on off	[Reserved]
		off on off	[Reserved]
		on off off	[Reserved]
		off off off	[Reserved]
7	Hardware Diagnostics	on	Normal (default)
		off	Interactive diagnostics
8	Configuration Source	on	Read *xprswtch.pri* (default)
		off	Configure from switches

MNC Switches

The MNC contains three banks of configuration switches. Their functions are set in software through *express*WATCH or the MNC command line.

These switch banks are inaccessible. ***SW2 and SW3 must remain in the OFF position***.

When you use the **hubc** command, settings for SW2 appear in the "Bank1" column. SW3 settings appear in the "Bank2" column, and SW4 settings appear in the "Bank3" column.

The illustration shows the location of the switch banks, and the table explains the function of each configuration switch setting. Factory default settings are in **bold**.

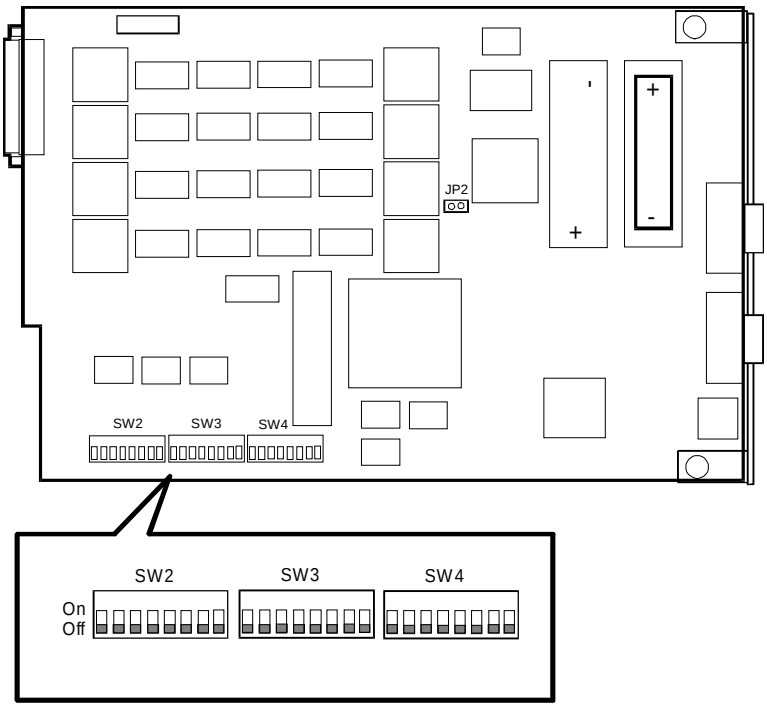

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Figure C-4. **MNC Switch Locations**

Table C-6. MNC Switch Bank 4

Switch Number	*Setting*	*Function*
1	ON OFF	**Reserved** ---- Default
2	ON OFF	**Start-up Control** Start Main mode (default) Stay in Boot mode
3	ON OFF	**Reserved** ---- Default
4	ON OFF	**Chassis Type*** 7-slot chassis 17-slot chassis (default)
5	ON OFF	**Reserved** ---- Default
6	ON OFF	**Reserved** ---- Default
7	ON OFF	**Reserved** ---- Default

Table C-6. MNC Switch Bank 4

8	ON OFF	**Reserved** ---- Default

Note: You may leave switch 4 in the default 1700 chassis position. By default, the MNC reads this setting from the *xprswtch.mis* file and will set it accordingly. When you configure and reboot a new chassis, *express*WATCH will display the appropriate 7-slot or 17-slot icon for management.

Appendix D

Engine Faceplates and LEDs

Modem LEDs

The faceplates of Hex MMM engines have 19 LEDs that give a visual indication of the operating mode of the engine and each of its modems. The LEDs are shown in the left side of Figure D-1.

The faceplates of MMM24s have four sets of modem LEDs, one set each for modems 1-6, 7-12, 13-17, and 18-24. Each set is arranged the same. The LEDs for the top set appear on the right side of Figure D-1.

Figure D-1. Modem LEDs (Hex MMM left; MMM24 right)

Hex MMM LEDs

The green LED above the RESET button is the engine's status indicator. It lights when you power up the engine. It goes out during initiation procedures. Then it remains on as long as the engine receives power.

The bank of 18 amber LEDs below the RESET button have row labels 1 through 6 for the engine's six modems. The columns A, B, and C show the status of each modem.

- LEDs in column A are Ring Indicators. An LED blinks when its modem is receiving an incoming Ring. After it establishes a connection, it indicates speed in the following ranges:
  - 2400 bps and below — LED is off
  - 4800 bps through 12,000 bps — LED is on
  - 14,400 bps through 33,600 bps — LED blinks off and on
- LEDs in column B are Off-Hook Indicators. An LED remains lit when its modem is off hook. It blinks when the modem is busied out.
- LEDs in Column C are DTR Indicators. An LED is on when its modem's DTR is high and off when it is low.

MMM24 LEDs

The three STATUS LEDs at the top of the MMM24 faceplate indicate three different module states. The right one is a green power indicator and should remain lit when the chassis is on. The middle flashes in response to LAN traffic. The left one flashes when the module receives MNC communications.

The four sets of modem LEDs display each modem's status and speed. Next to the modem's number, the upper LED indicates DTR and speed. The lower LED displays DTR status.

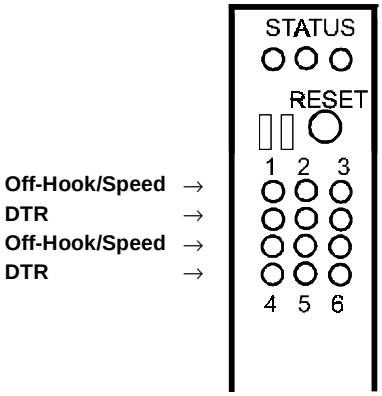


Figure D-2. MMM24 Modem LEDs

Table D-1.MMM24 Modem LED States

	Upper (Off-Hook/Speed)	***Lower (DTR)***
On Solid	Off-hook	Data Terminal Ready
Off	On-hook	Data Terminal Not Ready
Flash	Ring detected	—
Blinking	Connection (see speeds below)	Busied out
2/10-second blink	50Kbps or above connection	—
4/10-second blink	40Kbps to 48Kbps connection	—
6/10-second blink	30Kbps to 38Kbps connection	—
8/10-second	21.6Kbps to 28.8Kbps connection	—
1-second	19.2Kbps or below connection	—

The analog MMM faceplates show 19 LEDs on each top and bottom engines. These give a visual indication of the operating mode of the engine and each modem.

The top light above the RESET button is the engine's power indicator. It is on steadily as long as the engine receives power.

The bank of 18 LEDs below the RESET button have row labels **1** through **6** for the engine's six modems. The columns **A**, **B**, and **C** show the status of each modem.

Column A is the Ring Indicator. It blinks when the modem is receiving an incoming Ring. After it establishes a connection, it is a Speed Indicator. The ranges it shows are:
2400 bps and below — off
4800 bps through 12,000 bps — on
14,400 bps through 33,600 bps — blink

Column B is the Off-Hook Indicator. It remains lit when the modem is off hook. It blinks when the modem is busied out.

Column C is the DTR Indicator. It is on when DTR is high and off when DTR is low.

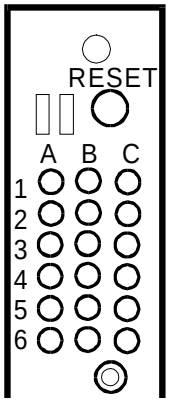
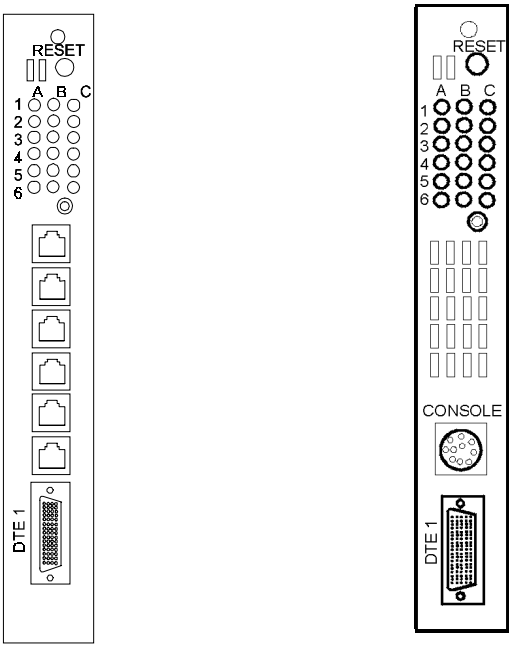


Figure D-3. MMM LEDs

Analog and digital MMMs, T1 LIUs, PRIs, and any network servers are part of a high-density communication system that provides extreme port density in a small space. The faceplates of both an analog and a digital MMM engine appear below in Figure D-4

Analog MMM Faceplate



Digital Hex MMM Faceplate

Figure D-4. Analog and Digital 6-Port MMM Engine Faceplates

LIUs and PRIs communicate with digital MMMs over the chassis backplane. Access Servers let you communicate with all six modems in a digital MMM over a single cable. Each Access Server can direct the communications of up to 16 ports, so that three can be used to direct the 48 ports provided by eight MMMs (two T1 lines).

Analog MMMs do not interface with T1 LIUs or PRIs, but rather connect directly to analog telephone lines through RJ11 connectors on their face plates. A single Access Server can direct the communications of up to 16 analog modem ports.

For cableless operation, the MMM can communicate with AccessBuilders over the chassis backplane.

Note: The CONSOLE port on the digital MMM faceplate is for Microcom diagnostics use only.

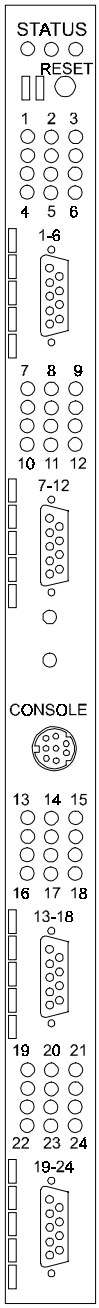


Figure D-5. MMM24 Faceplate

LIU Connections and LEDs

The faceplate of each PRI engine includes two RJ-48 jacks for T1 / E1 lines. Each engine can accept two T1 or E1 lines. Each T1 span bundles 23 DS0 time slots to carry data and one 64Kbps time slot to carry signaling information. Each E1 span bundles 30 DS0) time slots to carry data and one 64Kbps time slot to carry signaling control information. Channelized T1 spans carry 24 robbed-bit channels. Channelized E1 spans carry 30 bit-oriented channels.

The PRI engines communicate over the Ethernet and TDM backplanes. Once you have set them for the type of line you have during installation, connect your T1 / E1 cables to the RJ-48 jacks on the front of the card.The faceplates have eight LEDs. These give a visual indication of the status of the PRI interfaces.

The cable connected to the bottom RJ-48 jack on each engine is for PRI interface 1. The one connected to the upper jack is for PRI interface 2.

The two columns of four LEDs indicate the same information. The left column is for PRI 1 and the right one is for PRI 2.

From the top, the LEDs light when:

1. Frame Synchronization detected.
3. Frame slips detected.
4. Bipolar Violations detected.
5. Yellow (remote) or Red (AIS) alarms detected.

Refer to Chapter 3 in the *Microcom Network Controller User's Guide* for more detail on LIU Static Status and alarms.

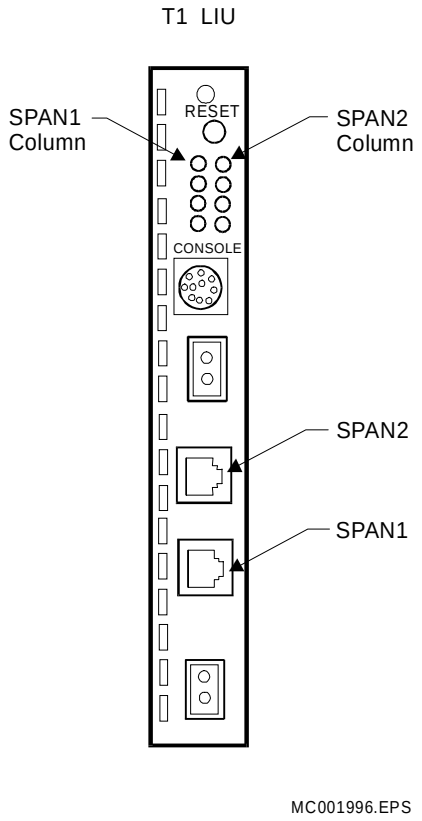


Figure D-6. LIU Faceplate

The top LED should remain solidly on when a T1 cable is plugged in and the LIU is configured properly. The other LEDs blink when the LIU detects those errors.

➥ **Important**: A configuration that uses only one T1 cable in an LIU requires using Span 1.

PRI Connections and LEDs

The faceplate of each PRI engine includes two RJ-48 jacks for T1/E1 lines. Each engine can accept two T1 or E1 lines. Each T1 engine bundles 46 DS0 time slots to carry data and two 64Kbps time slots to carry signaling information. Each E1 engine bundles 60 DS0) time slots to carry data and 2 64Kbps time slots to carry signaling control information.

The PRI engines communicate over the Ethernet and TDM backplanes. Once you have set them for the type of line you have in *express*WATCH, connect your T1/E1 cables to the RJ-48 jacks on the front of the card.The faceplates have eight LEDs. These give a visual indication of the status of the PRI interfaces.

The cable connected to the bottom RJ-48 jack on each engine is for PRI interface 1. The one connected to the upper jack is for PRI interface 2.

The two columns of four LEDs indicate the same information. The left column is for PRI 1 and the right one is for PRI 2.

From the top, the LEDs light when:

1. Frame Synchronization detected.
2. Frame slips detected.
3. Bipolar Violations detected.
4. Yellow (remote) or Red (AIS) alarms detected.

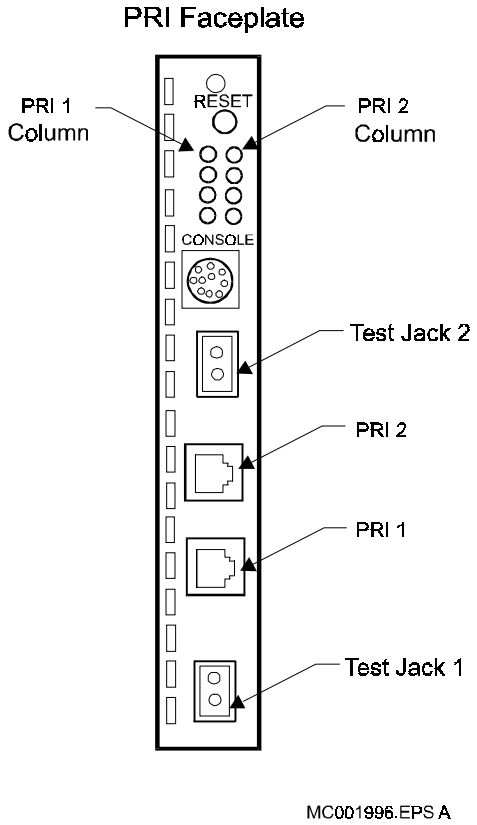


Figure D-7. PRI Engine Faceplate

The top LED should remain solidly on when a T1/E1 cable is plugged in and the engine is configured properly. The other LEDs blink when the PRI detects those errors.

Hardware Features on the MNC and MNC-II

Figure D-8 (a) shows the faceplate for the MNC and Figure D-8 (b) shows the faceplate for the MNC-II. Descriptions of each one follows.

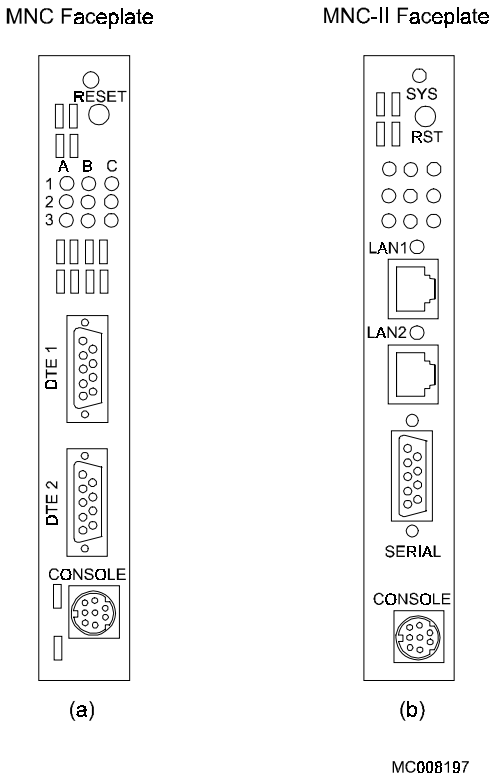


Figure D-8. **MNC Faceplate (a) MNC-II Faceplate (b)**

MNC Faceplate

RESET: Press this button to restart the MNC.

LEDs: When you start up the system, the 9 LEDs on the MNC faceplate light to form patterns that indicate the system diagnostics routine is operating. For a description of these patterns, see the section "Front Panel LEDs" that follows below.

DTE 1: Use this interface to establish SLIP connections.

DTE 2: Not used in this firmware version.

CONSOLE PORT: Once you set up your system and install your Microcom modules (MNC, MMMs, LIUs, and PRIs), you can access the built-in user interface via the Console port (8-pin DIN connector).

MNC-II Faceplate

SYS: When lit, the LED indicates the system is ON.

RST: Press this button to restart the MNC II.

LEDs: When you start up the system, the 9 LEDs on the MNC faceplate light to form patterns that indicate the system diagnostics routine is operating. For a description of these patterns, see Table D-2.

LAN 1 and LAN 2: Two RJ-45 10BASE-T ports are tied to Carrier Ports 3 and 4 respectively and provide access to the Ethernet backplane.

Note: MNC software does not control these ports. They are controlled via carrier DIP switches on the Carrier card or with an ADMM.

Serial: This male 9-pin serial port is provided to establish SLIP connections and is DTE/DCE selectable via software control.

CONSOLE PORT: Once you have set up your system and install your Microcom modules (MNC, MMMs, LIUs, and PRIs), you can access the built-in user interface via the Console port (8-pin DIN connector).

MNC and MNC-II Front Panel LEDs

When the MNC boots, the start-up diagnostics routine begins and the front panel LEDs change status. The LEDs run through a series of patterns that indicate the number of the test that is currently running. These patterns represent the numbers on a die. For example, the pattern that follows shows 4 LEDs lighted (●) to indicate Test Number 4.

Table D-2. MNC LEDs

Test Number	*Description*
1	Boot ROM test
2	RAM test
3	Tests the setting of the time-of-day clock
4	Tests time-of-day clock
5	Tests timers against time-of-day clock
6	Console port test (internal loopback)
7	Ethernet port 1 (le0) test (internal loopback)
8	Ethernet port 2 (le1) test (internal loopback)

●	❍	●
❍	❍	❍
●	❍	●

Example of Test 4

Note: When this routine is completed and the MNC is operational, all of the LEDs remain off.

If one of these tests fails, the:

- failed test code flashes a few times on the LEDs
- failure is noted in the **diag.log** file
- system proceeds with start-up

Appendix E

Cable Specifications

This appendix provides the following pinout information:

- Console Port Pinouts (8-Pin DIN), Table E1
- Asynchronous Ports (DB-60 to DB-25 DTE EIA / TIA-232) Table E-2
- EIA-530 DTE Cable Pinout (DB-60 to DB-25), Table E-3
- EIA / TIA-232 DTE Cable Pinout (DB-60 to DB-25), Table E-4
- EIA / TIA-232 DCE Cable Pinout (DB-60 to DB-25, Table E-5
- EIA / TIA-449 DTE Cable Pinout (DB-60 to DB-37), Table E-6
- EIA / TIA-449 DCE Cable Pinout (DB-60 to DB-37), Table E-7
- V.35 DTE Cable Pinout (DB-60 to 34-Pin), Table E-8
- V.35 DCE Cable Pinout (DB-60 to 34-Pin), Table E-9
- X.21 DTE Cable Pinout (DB-60 to DB-15), Table E-10
- X.21 DCE Cable Pinout (DB-60 to DB-15), Table E-11

Console Signals and Pinouts

The console port is configured as:

- a data communications equipment (DCE)
- an asynchronous serial port

Following are the pinouts for the console port:

Table E-1. Console Port Pinouts (8-Pin DIN)

Console Port (DTE)		
Pin[a]	***Signal***	***Direction***
1	DTR	OUT
2	–	–
3	TxD	OUT
4	GND	–
5	RxD	IN
6	–	–
7	DCD	IN
8	–	–

[a]Any pin not referenced is not connected.

Serial Cable Assemblies and Pinouts

The following illustrations and tables provide assembly drawings and pinouts for the EIA / TIA-232 DTE and DCE cables.

Asynchronous Cable and Pinouts

The following table lists the pinouts for the 60-pin Asynchronous cable. The direction of the signal is in reference to the router.

Table E-2. Asynchronous Cable Pinouts (DB-60 to DB-25 DTE EIA/TIA-232)

Pin #	*Signal*	*Direction*	*Pin #*	*Signal*	*Direction*	*Pin #*	*Signal*	*Direction*
1	–	–	21	M3RTS	OUT	41	M5RTS	OUT
2	M0TXD	OUT	22	M3DTR	OUT	42	M5CTS	IN
3	M0DTR	OUT	23	M3TXD	OUT	43	M5DCD	IN
4	M0RTS	OUT	24	GND	–	44	M5RXD	IN
5	M0CTS	IN	25	M2RXD	IN	45	GND	–
6	M0DCD	IN	26	M2DCD	IN	46	GND	–
7	M0RXD	IN	27	M2CTS	IN	47	M7RXD	IN
8	GND	–	28	M2RTS	OUT	48	M7DCD	IN
9	M1TXD	OUT	29	M2DTR	OUT	49	M7CTS	IN
10	M1DTR	OUT	30	M2TXD	OUT	50	M7RTS	OUT
11	M1RTS	OUT	31	–	–	51	M7DTR	OUT
12	M1CTS	IN	32	M4TXD	OUT	52	M7TXD	OUT
13	M1DCD	IN	33	M4DTR	OUT	53	GND	–
14	M1RXD	IN	34	M4RTS	OUT	54	M6RXD	IN
15	GND	–	35	M4CTS	IN	55	M6DCD	IN
16	–	–	36	M4DCD	IN	56	M6CTS	IN
17	GND	–	37	M4RXD	IN	57	M6RTS	IN
18	M3RXD	IN	38	GND	–	58	M6DTR	OUT
19	M3DCD	IN	39	M5TXD	OUT	59	M6TXD	OUT
20	M3CTS	IN	40	M5DTR	OUT	60	–	–

Notes:

1. Pin numbers are the same for Port A0 and A1 of router.
2. Eight modem / 232 channels listed as M0 – M7

EIA-530

Figure E-1 shows the EIA-530 serial cable assembly, and Table E-3 lists the pinouts. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

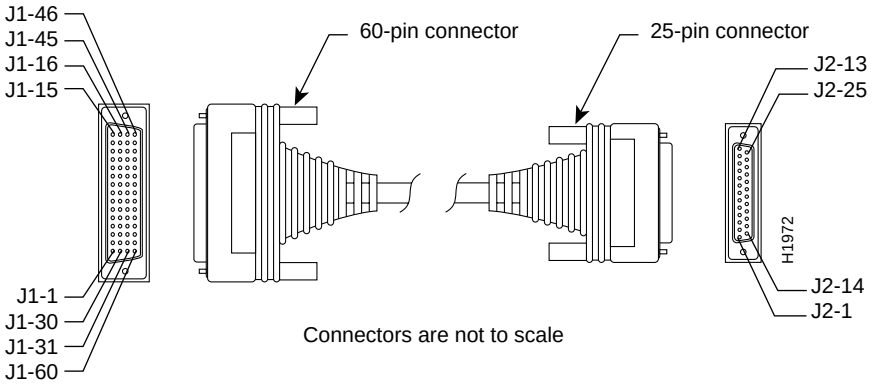


Figure E-1. EIA-530 Serial Cable Assembly

Table E-3. Console Port Pinouts (8-Pin DIN)

60 Pin[a]	*Signal*	*25 Pin*	*Signal*	*Direction* *DTE DCE*[b]
J1-11 J1-12	TxD / RxD+ TxD / RxD–	J2-2 J2-14	BA(A), TxD+ BA(B), TxD–	—> —>
J1-28 J1-27	RxD / TxD+ RxD / TxD–	J2-3 J2-16	BB(A), RxD+ BB(B), RxD–	<— < —
J1-9 J1-10	RTS / CTS+ RTS / CTS–	J2-4 J2-19	CA(A), RTS+ CA(B), RTS–	—> —>
J1-1 J1-2	CTS / RTS+ CTS / RTS–	J2-5 J2-13	CB(A), CTS+ CB(B), CTS–	<— <—
J1-3 J1-4	DSR / DTR+ DSR / DTR–	J2-6 J2-22	CC(A), DSR+ CC(B), DSR–	<— <—
J1-46 J1-47	Shield_GN D MODE_2	J2-1 –	Shield –	Shorted
J1-48 J1-49	GND MODE_1	– –	– –	Shorted
J1-5 J1-6	DCD / DCD+ DCD / DCD–	J2-8 J2-10	CF(A), DCD+ CF(B), DCD–	<— <—

Table E-3. Console Port Pinouts (8-Pin DIN) (Continued)

60 Pin[a]	*Signal*	*25 Pin*	*Signal*	*Direction* *DTE DCE*[b]
J1-24 J1-23	TxC / RxC+ TxC / RxC–	J2-15 J2-12	DB(A), TxC+ DB(B), TxC–	<— <—
J1-26 J1-25	RxC / TxCE+ RxC / TxCE–	J2-17 J2-9	DD(A), RxC+ DD(B), RxC–	<— <—
J1-44 J1-45	LL / DCD Circuit_GND	J2-18 J2-7	LL Circuit_GND	—> –
J1-7 J1-8	DTR / DSR+ DTR / DSR–	J2-20 J2-23	CD(A), DTR+ CD(B), DTR–	—> —>
J1-13 J1-14	TxCE / TxC+ TxCE / TxC–	J2-24 J2-11	DA(A), TxCE+ DA(B), TxCE–	—> —>

[a]Any pin not referenced is not connected.

[b]The EIA-530 interface cannot be operated in DCE mode. A DCE cable is not available for the EIA-530 interface.

EIA/TIA-232

Figure E-2 shows the EIA / TIA-232 cable assembly; Table 4 lists the DTE pinout; and Table E-5 lists the DCE pinout. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

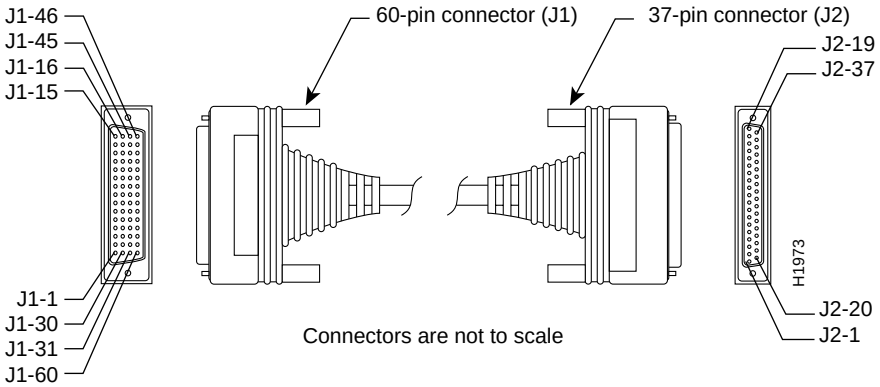


Figure E-2. EIA/TIA-232 Cable Assembly

Table E-4. EIA/TIA-232 Dable Pinout DB-60 to DB-25)

60 Pin[a]	*Signal*	*Description*	*Direction*	*25 Pin*	*Signal*
J1-50 J1-51 J1-52	MODE_0 GND MODE_DCE	Shorting group	–	–	–
J1-46	Shield GND	Single	–	J2-1	Shield GND
J1-41 Shield	TxD / RxD –	Twisted pair no. 5	—> –	J2-2 Shield	TxD –
J1-36 Shield	RxD / TxD –	Twisted pair no. 9	<— –	J2-3 Shield	RxD –
J1-42 Shield	RTS / CTS –	Twisted pair no. 4	—> –	J2-4 Shield	RTS –
J1-35 Shield	CTS / RTS –	Twisted pair no. 10	<— –	J2-5 Shield	CTS –
J1-34 Shield	DSR / DTR –	Twisted pair no. 11	<— –	J2-6 Shield	DSR –
J1-45 Shield	Circuit GND –	Twisted pair no. 1	– –	J2-7 Shield	Circuit GND –
J1-33 Shield	DCD / LL –	Twisted pair no. 12	<— –	J2-8 Shield	DCD –
J1-37 Shield	TxC / NIL –	Twisted pair no. 8	<— –	J2-15 Shield	TxC –
J1-38 Shield	RxC / TxCE –	Twisted pair no. 7	<— –	J2-17 Shield	RxC –
J1-44 Shield	LL / DCD –	Twisted pair no. 2	—> –	J2-18 Shield	LTST –
J1-43 Shield	DTR / DSR –	Twisted pair no. 3	—> –	J2-20 Shield	DTR –
J1-39 Shield	TxCE / TxC –	Twisted pair no. 6	—> –	J2-24 Shield	TxCE –

[a]Any pin not referenced is not connected.

Table E-5. EIA/TIA-232 DCE Cable Pinout (DB-60 to DB-25)

60 Pin[a]	*Signal*	*Description*	*Direction*	*25 Pin*	*Signal*
J1-50 J1-51	MODE_0 GND	Shorting group	–	–	–
J1-46	Shield GND	Single	–	J2-1	Shield GND
J1-36 Shield	RxD / TxD –	Twisted pair no. 9	<— –	J2-2 Shield	TxD –
J1-41 Shield	TxD / RxD –	Twisted pair no. 5	—> –	J2-3 Shield	RxD –

Table E-5. EIA/TIA-232 DCE Cable Pinout (DB-60 to DB-25) (Continued)

60 Pin[a]	*Signal*	*Description*	*Direction*	*25 Pin*	*Signal*
J1-35 Shield	CTS / RTS –	Twisted pair no. 10	<— –	J2-4 Shield	RTS –
J1-42 Shield	RTS / CTS –	Twisted pair no. 4	—> –	J2-5 Shield	CTS –
J1-43 Shield	DTR / DSR –	Twisted pair no. 3	—> –	J2-6 Shield	DSR –
J1-45 Shield	Circuit GND –	Twisted pair no. 1	– –	J2-7 Shield	Circuit GND
J1-44 Shield	LL / DCD –	Twisted pair no. 2	—> –	J2-8 Shield	DCD –
J1-39 Shield	TxCE / TxC –	Twisted pair no. 7	—> –	J2-15 Shield	TxC –
J1-40 Shield	NIL / RxC –	Twisted pair no. 6	—> –	J2-17 Shield	RxC –
J1-33 Shield	DCD / LL –	Twisted pair no. 12	<— –	J2-18 Shield	LTST –
J1-34 Shield	DSR / DTR –	Twisted pair no. 11	<— –	J2-20 Shield	DTR –
J1-38 Shield	RxC / TxCE –	Twisted pair no. 8	<— –	J2-24 Shield	TxCE –

[a]Any pin not referenced is not connected.

EIA/TIA-449

Figure E-3 shows the EIA / TIA-449 cable assembly; Table E-6 lists the DTE pinout; Table E-7 lists the DCE pinout. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

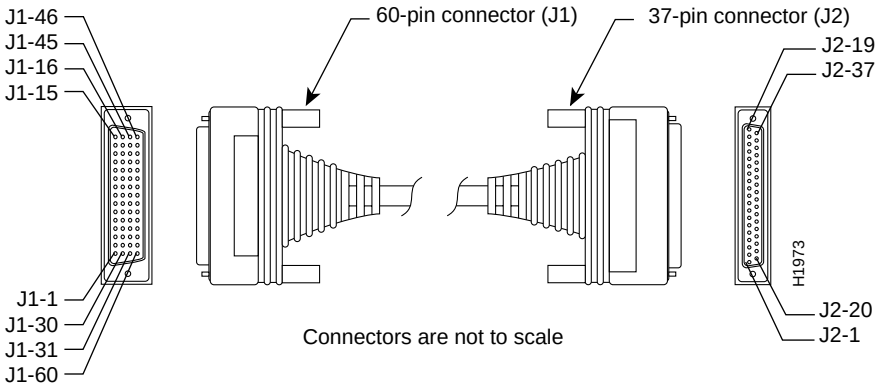


Figure E-3. EIA/TIA-449 Cable Assembly

Table E-6. EIA/TIA-449 DTE Cable Pinout (DB-60 to DB-37)

60 Pin[a]	*Signal*	*Description*	*Direction*	*37 Pin*	*Signal*
J1-49 J1-48	MODE_1 GND	Shorting group	–	–	–
J1-51 J1-52	GND MODE_DCE	Shorting group	–	–	–
J1-46	Shield_GND	Single	_	J2-1	Shield GND
J1-11 J1-12	TxD/RxD+ TxD/RxD–	Twisted pair no. 6	—> —>	J2-4 J2-22	SD+ SD–
J1-24 J1-23	TxC/RxC+ TxC/RxC–	Twisted pair no. 9	<— <—	J2-5 J2-23	ST+ ST–
J1-28 J1-27	RxD/TxD+ RxD/TxD–	Twisted pair no. 11	<— <—	J2-6 J2-24	RD+ RD–
J1-9 J1-10	RTS/CTS+ RTS/CTS–	Twisted pair no. 5	—> —>	J2-7 J2-25	RS+ RS–
J1-26 J1-25	RxC/TxCE+ RxC/TxCE–	Twisted pair no. 10	<— <—	J2-8 J2-26	RT+ RT–
J1-1 J1-2	CTS/RTS+ CTS/RTS–	Twisted pair no. 1	<— <—	J2-9 J2-27	CS+ CS–
J1-44 J1-45	LL/DCD Circuit_GND	Twisted pair no. 12	—> _	J2-10 J2-37	LL SC
J1-3 J1-4	DSR/DTR+ DSR/DTR–	Twisted pair no. 2	<— <—	J2-11 J2-29	DM+ DM–
J1-7 J1-8	DTR/DSR+ DTR/DSR–	Twisted pair no. 4	—> —>	J2-12 J2-30	TR+ TR–
J1-5 J1-6	DCD/DCD+ DCD/DCD–	Twisted pair no. 3	<— <—	J2-13 J2-31	RR+ RR–
J1-13 J1-14	TxCE/TxC+ TxCE/TxC–	Twisted pair no. 7	—> —>	J2-17 J2-35	TT+ TT–
J1-15 J1-16	Circuit_GND Circuit_GND	Twisted pair no. 9	– –	J2-19 J2-20	SG RC

[a]Any pin not referenced is not connected.

Table E-7. EIA/TIA-449 DCE Cable Pinout (DB-60 to DB-37)

60 Pin[a]	*Signal*	*Description*	*Direction*	*37 Pin*	*Signal*
J1-49 J1-48	MODE_1 GND	Shorting group	–	–	–
J1-46	Shield_GND	Single	–	J2-1	Shield GND

Table E-7. EIA/TIA-449 DCE Cable Pinout (DB-60 to DB-37) (Continued)

60 Pin[a]	*Signal*	*Description*	*Direction*	*37 Pin*	*Signal*
J1-28 J1-27	RxD / TxD+ RxD / TxD–	Twisted pair no. 11	<— <—	J2-4 J2-22	SD+ SD–
J1-13 J1-14	TxCE / TxC+ TxCE / TxC–	Twisted pair no. 7	—> —>	J2-5 J2-23	ST+ ST–
J1-11 J1-12	TxD / RxD+ TxD / RxD–	Twisted pair no. 6	—> —>	J2-6 J2-24	RD+ RD–
J1-1 J1-2	CTS / RTS+ CTS / RTS–	Twisted pair no. 1	<— <	J2-7 J2-25	RS+ RS–
J1-24 J1-23	TxC / RxC+ TxC / RxC–	Twisted pair no. 9	—> —>	J2-8 J2-26	RT+ RT–
J1-9 J1-10	RTS / CTS+ RTS / CTS–	Twisted pair no. 5	—> —>	J2-9 J2-27	CS+ CS–
J1-29 J1-30	NIL / LL Circuit_GND	Twisted pair no. 12	—> –	J2-10 J2-37	LL SC
J1-7 J1-8	DTR / DSR+ DTR / DSR–	Twisted pair no. 4	—> —>	J2-11 J2-29	DM+ DM–
J1-3 J1-4	DSR / DTR+ DSR / DTR–	Twisted pair no. 2	<— <—	J2-12 J2-30	TR+ TR–
J1-5 J1-6	DCD / DCD+ DCD / DCD–	Twisted pair no. 3	—> —>	J2-13 J2-31	RR+ RR–
J1-26 J1-25	RxC / TxCE+ RxC / TxCE–	Twisted pair no. 10	<— <—	J2-17 J2-35	TT+ TT–
J1-15 J1-16	Circuit_GND Circuit_GND	Twisted pair no. 8	_ _	J2-19 J2-20	SG RC

[a]Any pin not referenced is not connected.

V.35

Figure E-4 shows the V.35 cable assembly; Table E-8 lists the DTE pinout; Table E-9 lists the DCE pinout. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

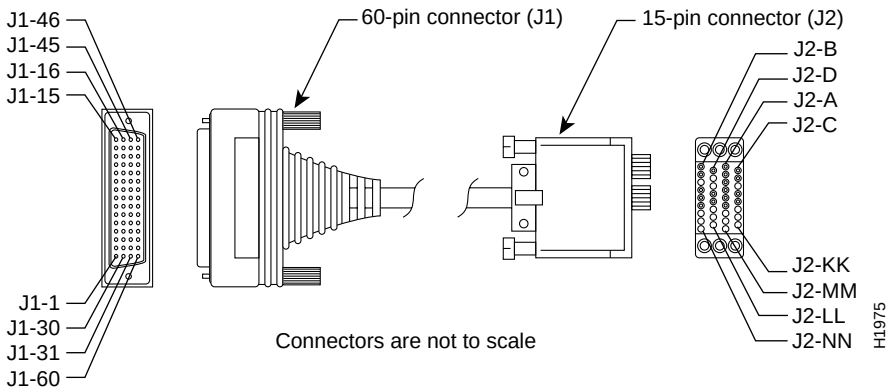


Figure E-4. V.35 Assembly

Table E-8. V.35 DTE Cable Pinout (DB-60 to 34-Pin)

60 Pin[a]	*Signal*	*Description*	*Direction*	*34 Pin*	*Signal*
J1-49 J1-48	MODE_1 GND	Shorting group	–	–	–
J1-50 J1-51 J1-52	MODE_0 GND MODE_DCE	Shorting group	–	–	–
J1-53 J1-54 J1-55 J1-56	TxC / NIL RxC_TxCE RxD / TxD GND	Shorting group	–	–	–
J1-46	Shield_GND	Single	–	J2-A	Frame GND
J1-45 Shield	Circuit_GND –	Twisted pair no. 12	– –	J2-B Shield	Circuit GND –
J1-42 Shield	RTS / CTS –	Twisted pair no. 9	—> –	J2-C Shield	RTS –
J1-35 Shield	CTS / RTS –	Twisted pair no. 8	<— –	J2-D Shield	CTS –
J1-34 Shield	DSR / DTR –	Twisted pair no. 7	<— –	J2-E Shield	DSR –
J1-33 Shield	DCD / LL –	Twisted pair no. 6	<— –	J2-F Shield	RLSD –
J1-43 Shield	DTR / DSR –	Twisted pair no. 10	—> –	J2-H Shield	DTR –
J1-44 Shield	LL / DCD –	Twisted pair no. 11	—> –	J2-K Shield	LT –
J1-18 J1-17	TxD / RxD+ TxD / RxD–	Twisted pair no. 1	—> —>	J2-P J2-S	SD+ SD–
J1-28 J1-27	RxD / TxD+ RxD / TxD–	Twisted pair no. 5	<— <—	J2-R J2-T	RD+ RD–
J1-20 J1-19	TxCE / TxC+ TxCE / TxC–	Twisted pair no. 2	—> —>	J2-U J2-W	SCTE+ SCTE–
J1-26 J1-25	RxC / TxCE+ RxC / TxCE–	Twisted pair no. 4	<— —	J2-V J2-X	SCR+ SCR–
J1-24 J1-23	TxC / RxC+ TxC / RxC–	Twisted pair no. 3	<— —	J2-Y J2-AA	SCT+ SCT–

[a]Any pin not referenced is not connected.

Table E-9. V.35 DCE Cable Pinout (DB-60 to 34-Pin)

60 Pin[a]	*Signal*	*Description*	*Direction*	*34 Pin*	*Signal*
J1-49 J1-48	MODE_1 GND	Shorting group	–	–	–
J1-50 J1-51	MODE_0 GND	Shorting group	–	–	–
J1-53 J1-54 J1-55 J1-56	TxC/NIL RxC_TxCE RxD/TxD GND	Shorting group	–	–	–
J1-46	Shield_GND	Single	–	J2-A	Frame GND
J1-45 Shield	Circuit_GND –	Twisted pair no. 12	– –	J2-B Shield	Circuit GND –
J1-35 Shield	CTS/RTS –	Twisted pair no. 8	<— –	J2-C Shield	RTS –
J1-42 Shield	RTS/CTS –	Twisted pair no. 9	—> –	J2-D Shield	CTS –
J1-43 Shield	DTR/DSR –	Twisted pair no. 10	—> –	J2-E Shield	DSR –
J1-44 Shield	LL/DCD –	Twisted pair no. 11	—> –	J2-F Shield	RLSD –
J1-34 Shield	DSR/DTR –	Twisted pair no. 7	<— –	J2-H Shield	DTR –
J1-33 Shield	DCD/LL –	Twisted pair no. 6	<— –	J2-K Shield	LT –
J1-28 J1-27	RxD/TxD+ RxD/TxD–	Twisted pair no. 5	<— <—	J2-P J2-S	SD+ SD–
J1-18 J1-17	TxD/RxD+ TxD/RxD–	Twisted pair no. 1	—> —>	J2-R J2-T	RD+ RD–
J1-26 J1-25	RxC/TxCE+ RxC/TxCE–	Twisted pair no. 4	<— <	J2-U J2-W	SCTE+ SCTE–
J1-22 J1-21	NIL/RxC+ NIL/RxC–	Twisted pair no. 3	—> —>	J2-V J2-X	SCR+ SCR–
J1-20 J1-19	TxCE/TxC+ TxCE/TxC–	Twisted pair no. 2	—> —>	J2-Y J2-AA	SCT+ SCT–

[a]Any pin not referenced is not connected.

X.21

Figure E-5 shows the X.21cable assembly; Table E-10 lists the DTE pinout; Table E-11 lists the DCE pinout. Arrows indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

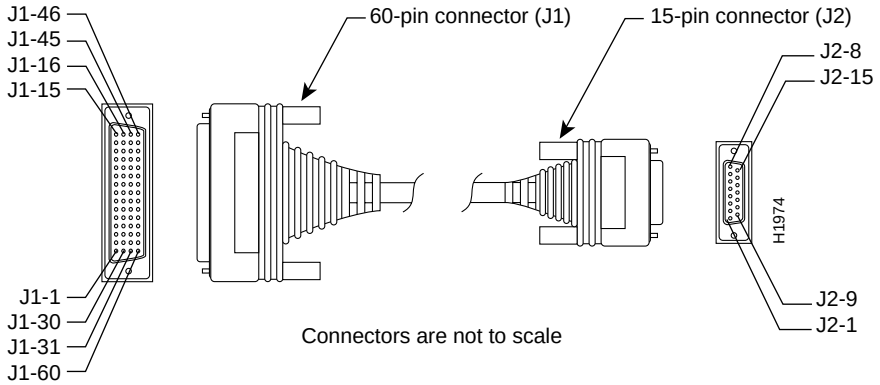


Figure E-5. X.21 Cable Assembly

Table E-10. X.21 DTE Cable Pinout (DB-60 to DB-15)

60 Pin[a]	*Signal*	*Description*	*Direction*	*15 Pin*	*Signal*
J1-48 J1-47	GND MODE_2	Shorting group	–	–	–
J1-51 J1-52	GND MODE_DCE	Shorting group	–	–	–
J1-46	Shield_GND	Single	–	J2-1	Shield GND
J1-11 J1-12	TxD / RxD+ TxD / RxD–	Twisted pair no. 3	—> —>	J2-2 J2-9	Transmit+ Transmit–
J1-9 J1-10	RTS / CTS+ RTS / CTS–	Twisted pair no. 2	—> —>	J2-3 J2-10	Control+ Control–
J1-28 J1-27	RxD / TxD+ RxD / TxD–	Twisted pair no. 6	<— <—	J2-4 J2-11	Receive+ Receive–
J1-1 J1-2	CTS / RTS+ CTS / RTS–	Twisted pair no. 1	<— <—	J2-5 J2-12	Indication+ Indication–
J1-26 J1-25	RxC / TxCE+ RxC / TxCE–	Twisted pair no. 5	<— <—	J2-6 J2-13	Timing+ Timing–
J1-15 Shield	Control_GND –	Twisted pair no. 4	– –	J2-8 Shield	Control GND –

[a]Any pin not referenced is not connected.

Table E-11. X.21 DCE Cable Pinout (DB-60 to DB-15)

60 Pin[a]	*Signal*	*Description*	*Direction*	*15 Pin*	*Signal*
J1-48 J1-47	GND MODE_2	Shorting group	–	–	–
J1-46	Shield_GND	Single	–	J2-1	Shield GND
J1-28 J1-27	RxD / TxD+ RxD / TxD–	Twisted pair no. 6	<— <—	J2-2 J2-9	Transmit+ Transmit–
J1-1 J1-2	CTS / RTS+ CTS / RTS–	Twisted pair no. 1	<— <—	J2-3 J2-10	Control+ Control–
J1-11 J1-12	TxD / RxD+ TxD / RxD–	Twisted pair no. 3	—> —>	J2-4 J2-11	Receive+ Receive–
J1-9 J1-10	RTS / CTS+ RTS / CTS–	Twisted pair no. 2	—> —>	J2-5 J2-12	Indication+ Indication–
J1-24 J1-23	TxC / RxC+ TxC / RxC–	Twisted pair no. 4	—> —>	J2-6 J2-13	Timing+ Timing–
J1-15 Shield	Control_GND –	Twisted pair no. 5	– –	J2-8 Shield	Control GND –

[a]Any pin not referenced is not connected.

Appendix F

Troubleshooting

Troubleshooting Fault Conditions

This chapter offers suggestions for detecting and troubleshooting fault conditions in the hub and for verifying Controller Module operation.

If you cannot correct a fault condition using any of the suggestions provided in Table F-1, contact your Microcom dealer or Customer Support for assistance.

Note: For information concerning the maintenance of power supplies and fans, refer to Appendix G, *Maintenance*.

Table F-1.Troubleshooting Using the Controller Module LEDs

LED	*State*	*Possible Cause*	*Corrective Action*
POWER SUPPLY (1 through 4)	OFF	Power supply not installed.	(NONE)
		Power supply LED has failed.	Press the LED Test button on the Controller Module to verify LED operation.
	Blinking	Power supply is installed but faulty.	Verify that the outlet is supplying power.
			Verify that the power cord is plugged in at both ends and that the cord is appropriate for your country's line voltage.
			Verify that the power switch on the power supply is set to the On position.
			Verify that the power supply is fully seated in the backplane connectors.
			Verify that the power supply is not overloaded. Set the power supply switch to the Off position, wait a few moments, then set the power supply switch to the On position.
			Replace the power supply if the suggestions presented above do not correct the problem.
FAN (1 through 3)	OFF	Fan LED is faulty.	Press the LED Test button to determine if this Fan LED is functional.
	Blinking	Fan unit is faulty or not installed.	Replace the fan unit.
TEMP	OFF	Hub temperature is normal, or TEMP LED is faulty.	Press the LED Test button to determine if the TEMP LED is functional.
	Blinking	Temperature in the hub is higher than the allowable limit.	Verify that all fans are operating normally and nothing is blocking airflow through the front of the hub. Blocked airflow may cause overheating.
			Verify that the required number of fan units has been installed (never operate the hub with fewer than two installed and functioning fan units).
			Verify that there is at least 3 inches (8 cm) of space behind the hub for proper airflow. Blocked airflow may cause overheating.

Table F-1.Troubleshooting Using the Controller Module LEDs (Continued)

LED	*State*	*Possible Cause*	*Corrective Action*
			Lower the room temperature. Even if all installed fan units are functioning normally, excessively warm room air circulated by installed fans may fail to adequately cool the hub and installed modules.
ACTIVE	ON	Controller Module is in Active mode.	See section, “Verifying Controller Module Operation,” on page 3-2.
	OFF	Controller Module is in Standby mode.	Verify that the Standby LED is illuminated.
		Controller Module LED is faulty.	Press the LED Test button to determine if the Active LED is functional.
STBY	ON	Controller Module is in Standby mode.	See section, “Verifying Controller Module Operation,” on page 3-2.
	OFF	Controller Module LED is faulty.	Press the LED Test button to determine if the STBY LED is functional.
		Controller Module fuse has blown.	Replace the Standby Controller Module.
	Blinking	Controller Module is faulty.	Reset the Standby Controller Module. If a reset does not correct the problem, replace the Standby Controller Module.

Appendix G

Maintenance

This appendix describes the routine maintenance you should perform to keep your Microcom Switching Hub working at its best. This appendix also provides instructions for replacing defective power supplies and fan units.

➥ **Important:** There are no user-serviceable parts on either the load-sharing power supplies or the fan units. If these components fail, remove them as described in this appendix and return them to your supplier. Keep replacement power supply units and fan units at your site so they are available if needed.

Routine Maintenance

On a regular basis, inspect your hub to verify that:

- All blank system faceplates are securely attached to the hub.
- All system filler plates (if installed) are securely attached to the hub.
- At least two fans are running.

➥ **Important:** If only two fans are operational, system operation is not affected. However, you should schedule the defective fan for prompt replacement. If *less than two fans are operational*, power off the hub immediately. Do not attempt to power up again until at least two operational fans have been installed. You should normally run the hub with a full complement of three fans.

- Ventilation to the hub is unobstructed.
- Controller Module and Media Module LEDs are functioning normally and show normal readings.
- Power requirements for all installed modules are met by the power supplies.
- Power cords from each power supply are not frayed or damaged.
- Cables running from each installed module are in good condition.
- If rack mounted, the hub and the cable tray are securely attached to your rack.
- All modules are securely seated in the backplane and firmly attached to the hub.

Replacing a Defective Power Supply

The hub accommodates up to four modular load-sharing power supplies. Remove and install all power supplies in the same manner, using the same steps.

Note: When replacing a power supply, leave enough supplies running at all times to satisfy the requirements of installed modules. If removal of a defective, but still functioning, power supply will not cause a power deficit in the hub, you can remove the faulty supply without losing power to module(s). Before attempting to remove a power supply from the hub, evaluate hub power conditions. If you have an installed Master Distributed Management Module, enter the SHOW POWER BUDGET command to display current power conditions for the hub.

To replace a defective power supply (see Table G-1):

➥ **Important:** To avoid electric shock, — *before attempting to remove the power supply from the hub* — set the faulty power supply's ON / OFF switch (| / O) to the OFF (O) position, and disconnect the power cord from both the power supply and the wall outlet.

1. Remove the power supply bay grille (if installed).
2. Set the defective power supply's ON / OFF switch (| / O) located on the front of the supply to the OFF (O) position.
3. Remove the power cord from the wall outlet.
4. Remove the power cord from the power supply socket.

5. Loosen the spring-loaded screws that secure the power supply to the front of the hub (see Table G-1).
6. Pull the power supply straight out from the hub, making certain you do not damage the connectors on the rear of the supply or those on the power switching board.
7. Remove the replacement power supply from its shipping box and set the power supply's ON / OFF (| / O) switch to the OFF (O) position.

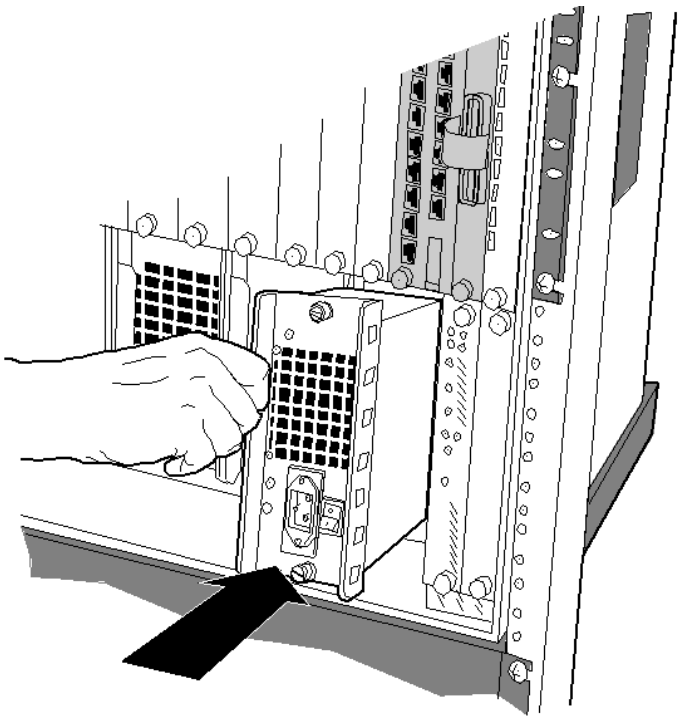


Figure G-1. Replacing a Defective Load-Sharing Power Supply

8. Carefully slide the power supply into the selected power supply slot (the same slot from which the defective supply was removed, or any other available power supply slot).
9. Hand-tighten the spring-loaded screws that secure the power supply to the front of the hub.
10. Plug the power cord into the socket on the power supply.
11. Plug the power cord into the wall outlet.
12. Set the power supply's ON / OFF switch (| / O) to the ON (|) position.
13. The replacement power supply is now fully operational.
14. Optionally, install the power supply bay grille (for installation instructions, see Chapter 4 in the *Getting Started Guide*.
15. Check the POWER SUPPLY LEDs on the Active Controller Module to verify that the replacement power supply is functioning normally. All LEDs for installed power supplies should be illuminated to indicate normal operation.

Replacing a Defective Fan Unit

The 17-Slot hub ships with three installed fan units. For normal hub operation, at least *two* of these dedicated fan units must be running at all times. Power supply fans help to ventilate the hub, but they are not designed to act as a substitute for dedicated fan units.

Important: If more than one fan unit malfunctions, power down the hub immediately and do not attempt to power up again until you have installed at least two fully functional fan units. To ensure optimal hub operation, always run the hub with three installed fan units.

To replace a defective fan unit, refer to the following steps and Figure G-2:

Note: If only one fan unit malfunctions, you do *not* need to power off the hub before removing and replacing the defective unit.

1. Remove and save the four corner screws that attach the fan unit to the rear of the hub.

2. Carefully pull the fan unit straight out from the hub fan bay and, before completely removing the fan, grasp the four-position fan connector cable and disconnect it from the hub (see the figure below).
3. Remove the replacement fan unit from its shipping box and carefully slide the fan into the slot formerly occupied by the faulty unit. Connectors on the installed fan must be firmly seated in the corresponding hub connectors.
4. Verify that the replacement fan is flush with the back of the hub.

Note: The fan begins rotating the moment the unit is plugged in.

5. Replace the four screws that secure the fan unit to the rear of the hub.
6. Visually inspect all installed fans to verify that each is turning without interruption.
7. Check the FAN LEDs on the Active Controller Module to confirm that all fan units are functioning normally. LEDs for installed fans should be illuminated to indicate normal operation.

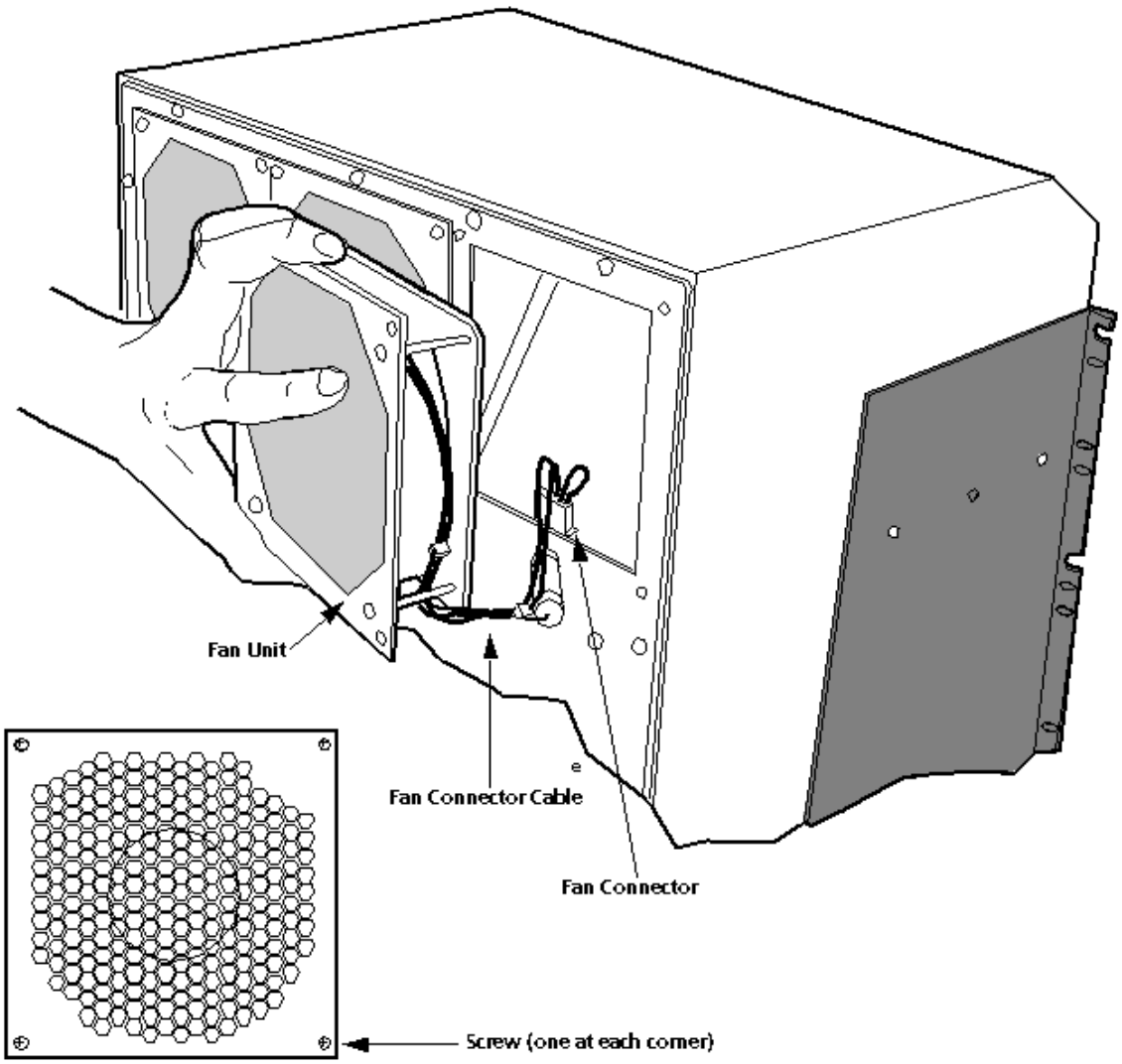


Figure G-2. Replacing a Defective Fan Unit

Maintaining Hub System Components

For maintenance other than power supply, fan, and module maintenance described in previous sections, the following applies:

Important: This unit may have one or more power supply cords. Disconnect all power supply cords before servicing to avoid electric shock.

Appendix H

Product Support

Customer Support Options

You have a variety of options in getting help with your system. Refer to the section, “Support Programs,” that appears below. Your dealer can provide more information on these support programs, or you can call Microcom at (781) 551-1313.

You can find files and other information on our Internet site, as described below.

Accessing On-line Information

Access information about Microcom’s products through the following ways:

- World Wide Web
- Faxbacks

World Wide Web: Our World Wide Web site offers up-to-date information about product features and availability, troubleshooting tips, and technical data about Compaq Microcom products, including the Compaq Microcom Series 6000 Remote Access Concentrator.

To view the Compaq Microcom Home Page, set your browser for the following Internet address:

http://www.microcom.com

Faxbacks: You can fax your questions to Compaq Microcom at (800) 285-2802. You will usually receive a response from our customer support group within 24 hours.

ftp: Download the latest technical bulletins and program files or e-mail messages to the Compaq Microcom sales group from an ftp directory at the following address:

ftp://ftp.microcom.com

Per Incident Support

Free support is not available for Compaq Microcom 6000 Series Remote Access Concentrator. If you choose not to take advantage of the SystemCare programs, technical support will be provided at a per incident charge of $300. Repair services are also available within our standard turnaround times and rates.

Support Programs

Compaq Microcom 6000 Series SystemCare

This program provides premium technical support services for one full year.

Support Availability: Support is available five days per week, during our standard hours of operation, 8 a.m. to 7 p.m. Eastern Standard Time (EST).

Direct Access to Technical Support: Customer Service Representatives will connect you with our expert Compaq Microcom 6000 Series staff or, if you prefer, we will return your call within two hours.

Toll Free Access: Access to Compaq Microcom 6000 Series Support Services is available through a toll-free 800 SystemCare number, which is provided as part of this program.

Compaq Microcom 6000 Series SystemCare Gold

Provides premium technical support and overnight exchange services for one full year.

Unlimited Technical Support: Support is available seven days per week, 24 hours per day. As with SystemCare, support is offered through our toll-free 800 number.

Overnight Repair Services: Should you need to repair your equipment, SystemCare Gold includes an overnight exchange program for 6000 Series equipment to minimize downtime. Depending on the time of your call, we will send you a replacement unit the same day or the following day. Provided that you return your defective unit to us within 10 days, the exchange unit is free of charge.

Appendix I

Event Descriptions

Severity Levels

The following table lists the *express*WATCH trap / log severity levels. All events by number appear on the following pages in Table I-2.

Table I-1. Event/Trap Severity Levels

Severity	*Description/Cause(s)*
9	**Reboot MNC —Fatal system error** File-system error; networking error; pSOS+ error; memory error.
8	**MNC reboot *may be* necessary — Fatal application error** Non-recoverable application error; cannot acquire resource.
7	**Intervention, or modem or MNC reboot *may be* necessary — Backplane protocol failure** Modem out-of-service; secondary controller error.
6	**Clear alarm and check condition — Alarm(s)** Auto forwarding failure; chassis has been rebooted; chassis busy; DTE failure; false answer; no dial tone; ring no answer; start sequence failed; start sequence file not found; rotary skip.
5	**Requires intervention — Notification** Code download error; Session Manager error; Remote Alarm Processing error; Event System error.
4	***May* require intervention — Notification** Threshold-processing message.
3	**No intervention necessary — Statistical** Modem connect or disconnect messages; modem in-service messages.
2	**No intervention necessary —Notification** Modem status; Event System informational message; Session Manager information; Remote Alarm Processing information.
1	**Debug Message** (not documented; if you receive a debug message, contact technical support)

The factory default logging event severity threshold is set at 5, while the trap severity threshold is set at 7. Any event with a severity of 7 can be logged as well as turned into a trap.

You can set event parameters in the Traps and Events dialog. Click on the Traps button to display up the window. There you can set thresholds and polling time periods.

Your system administrator can also edit the Event Configuration File to customize event descriptions. You can access this ASCII editor by choosing Controls→Configuration from the *express*WATCH main window. Then choose File→Open→Event Configuration File on Device.... This displays Event Configuration file in ASCII format, containing all the information about each event.

Important: Exercise care in editing the Event Configuration File. *Do not* change any event numbers in square brackets at the head of a section in the xprswtch.evt file. This could result in a corrupt file that may require reinstallation of *express*WATCH or the Event Configuration file containing factory defaults.

Microcom strongly recommends using the dialog boxes to change thresholds and other event values.

Events

All Microcom Access Integrator events appear in the following table by number, screen message and severity level. We recommend that system administrators and users refer to events by the description and not the event number.

Note: *Italicized* text (for example *nn*) represents a variable displayed by *express*WATCH.

Table I-2. Microcom Access Integrator Events

Event	*Screen Message*	*Action*	*Severity*
15100	Canned sequence execution failed: File=*filename* Modem=*nn* Reason=*string*	The initialization strings defined in the canned sequence file were not sent to the modem successfully. 1. Verify that the canned sequence file configured for this event contains the desired modem commands. 2. Verify that the modem is in a state that supports canned sequence execution (i.e. is not out-of-service or busied out).	5
15101	Canned sequence execution successful: File=*filename* Modem=*nn*	No action required.	3
15102	Start sequence failed: File=*filename* Modem=*nn* Reason=*string*	The initialization strings defined in the canned sequence file were not sent to the modem successfully. 1. Verify that the canned sequence file configured for this event contains the desired modem commands. 2. Verify that the modem is in a state that supports canned sequence execution (i.e. is not out-of-service or busied out).	7
15103	Start sequence file not found: File=*filename* Modem=*nn*	The start sequence file does not exist on the MNC's RAM disk. 1. Check the Event Configuration file to verify that the desired start sequence file has been configured for the "modem in service"events. 2. Verify that the specified start sequence file is missing from the MNC's RAM disk. 3. Use a text editor to create the desired start sequence file. Transfer the file to the MNC using *express*WATCH or ftp.	7
15104	Clocked execution sequence successful: File=*filename* Modem=*nn*	No action required.	3
15105	Clocked execution sequence failed: File=*filename* Modem=*nn* Reason=*string*	The initialization strings defined in the canned sequence file were not sent to the modem successfully. 1. Verify that the canned sequence file contains the desired modem commands. 2. Verify that the modem is in a state that supports canned sequence execution (i.e. is not out-of-service or busied out).	7
15106	Clocked execution sequence file not found: File=*filename* Modem=*nn*	The sequence file does not exist on the MNC's RAM disk. 1. Check the Clocked Execution Configuration file to verify that the desired sequence file has been configured. 2. Verify that the specified sequence file is missing from the MNC's RAM disk. 3. Use a text editor to create the desired sequence file. Transfer the file to the MNC using *express*WATCH or ftp.	7
15107	Canned sequence execution failed: File=*filename* EngineID=*engine-id-string* Modem=*nn* Reason=*string*	The initialization strings defined in the canned sequence file were not sent to the modem successfully. 1. Verify that the canned sequence file configured for this event contains the desired modem commands. 2. Verify that the modem is in a state that supports canned sequence execution (i.e. is not out-of-service or busied out).	5

Table I-2. Microcom Access Integrator Events (Continued)

Event	***Screen Message***	***Action***	***Severity***
15108	Canned sequence execution successful: File=*filename* EngineID= *engine-id-string* Modem=*nn*	No action required.	3
15109	Start sequence failed: File=*filename* EngineID= *engine-id-string* Modem=*nn* Reason=*string*	The initialization strings defined in the canned sequence file were not sent to the modem successfully. 1. Verify that the canned sequence file configured for this event contains the desired modem commands. 2. Verify that the modem is in a state that supports canned sequence execution (i.e. is not out-of-service or busied out).	7
15110	Start sequence file not found: File=*filename* EngineID= *engine-id-string* Modem=*nn*	The start sequence file does not exist on the MNC's RAM disk. 1. Check the Event Configuration file to verify that the desired start sequence file has been configured for the "modem in service" events. 2. Verify that the specified start sequence file is missing from the MNC's RAM disk. 3. Use a text editor to create the desired start sequence file. Transfer the file to the MNC using *express*WATCH or ftp.	7
15111	Clocked execution sequence successful: File=*filename* EngineID= *engine-id-string* Modem=*nn*	No action required.	3
15112	Clocked execution sequence failed: File=*filename* EngineID= *engine-id-string* Modem=*nn* Reason=*string*	The initialization strings defined in the canned sequence file were not sent to the modem successfully. 1. Verify that the canned sequence file contains the desired modem commands. 2. Verify that the modem is in a state that supports canned sequence execution (i.e. is not out-of-service or busied out).	7
15113	Clocked execution sequence file not found: File=*filename* EngineID= *engine-id-string* Modem=*nn*	The sequence file does not exist on the MNC's RAM disk. 1. Check the Clocked Execution Configuration file to verify that the desired sequence file has been configured. 2. Verify that the specified sequence file is missing from the MNC's RAM disk. 3. Use a text editor to create the desired sequence file. Transfer the file to the MNC using *express*WATCH or ftp.	7
15227	Group *nn* modems: *x* percent busy	The specified modem group has exceeded the configured utilization threshold. 1. Verify the "group busy" utilization threshold has been configured correctly. 2. Modify the group configuration to add more modems to the specified group.	7
15228	Group *nn* busy cleared: *x* percent busy	The group busy condition has been cleared. No action required.	7

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15229	Chassis *nn* modems: *x* percent busy	The specified chassis has exceeded the configured utilization threshold. 1. Verify the "chassis busy" utilization threshold has been configured correctly. 2. Expand the system's capacity by adding more chassis and/or modems.	7
15230	Chassis *nn* busy cleared: *x* percent busy	The chassis busy condition has been cleared. No action required.	7
15300	Controller rebooting.	No action required.	9
15301	Controller booted at *string*	No action required.	9
15302	Auto Forwarding Complete: Filename *string* Dest *string*	No action required.	9
15303	Auto Forwarding Failed: Filename *string* Dest *string* Reason *string*	Verify that the Auto Forwarding configuration is correct.	6
15304	Event Threshold Exceeded: Event *number* Modem *number*	Refer to the administrative action of the specified event number.	7
15305	Disk full - file *string* deleted	The disk is near full, please delete unnecessary files.	9
15306	Bootp daemon cannot find MNC's IP Address	1. Set an IP Address on the MNC. 2. Store the.idt file. 3. Reboot MNC.	9
15307	Bootp daemon cannot find Net Mask	1. Set a Net Mask on the MNC. 2. Store the.idt file. 3. Reboot MNC.	9
15308	Bootp Couldn't Change Directory to: *path-name*	Contact technical support for assistance.	9
15309	Unable to open Bootp Host file, *filename*	1. Download new host file to MNC. 2. Reboot MNC.	9
15310	Bootp daemon cannot Allocate Memory	Contact technical support for assistance.	9
15311	EntryCount missing from Host File *filename*	1. Download new host file to MNC. 2. Reboot MNC.	9
15312	Invalid Info read in from Host file, Section *section-name*: *entry-name value*	1. Download new host file to MNC. 2. Reboot MNC.	7
15313	Valid Info read in from Host file: *text*	No action required.	3
15314	Couldn't Open Host File, and AllowDefault Not Set	1. Download new host files to MNC, and 2. Reboot the MNC. Or 1. Set AllowDefaultHostFile in the xprswtch.mis file.	9
15315	Internal Bootp Error: *error-message, error-code*	Contact technical support for assistance.	9

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15316	Error when Processing Host File Info, *error-message*: *parameter*	1. Download new host file to MNC. 2. Reboot MNC.	7
15317	Read *nn* hosts from *filename*	No action required.	3
15318	Received Packet with Protocol Error: *parameter, info-message*	No action required.	3
15319	Got New MNC Response; Going Passive. IP Addrs are: *ip-address, ip-address*	1. Download new configuration files to MNC. 2. Issue the MNC's **goactive** shell command. 3. Reboot MNC.	7
15320	Unable to add engine: slot= *number*, engine= *number*, type= *number*	Unable to add specified engine to internal database. This problem is most likely the result of an inconsistent setting for the chassis' SlotCount configuration in the xprswtch.mis file. The MNC has automatically updated the SlotCount setting for a 17 slot chassis. 1. Verify the SlotCount setting in the xprswtch.mis file is consistent with the number of slots in your chassis. 2. No further corrective action required.	9
15321	LED Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	6
15322	Boot ROM Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	8
15323	RAM Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	8
15324	Clock Time Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	8
15325	Clock Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	8
15326	Timer Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	8
15327	DTE Port Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	8
15328	Ethernet 1 Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	8
15329	Ethernet 2 Test Failed: Engine *engine-id-string*	Maintenance suggested; contact technical support.	8
15330	No entry for host in the configuration file: host MAC address	1. Download new Host file (xprswtch.hst) to the MNC. 2. Reboot the MNC.	9
15401	Remote Alarm *alarm-name* cleared	No action required.	2
15402	Remote Alarm *alarm-name* cleared for Group *nn*	No action required.	2
15403	Remote Alarm *alarm-name* cleared for Modem *nn*	No action required.	2
15404	Remote Alarm *alarm-name* cleared for Chassis *nn*	No action required.	2
15405	Remote Alarm *alarm-name* posted	No action required.	2

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15406	Remote Alarm *alarm-name* posted for Group *nn*	No action required.	2
15407	Remote Alarm *alarm-name* posted for Modem *nn*	No action required.	2
15408	Remote Alarm *alarm-name* posted for Chassis *nn*	No action required.	2
15409	No Remote Alarm modems available	1. Verify that the number of modems configured for remote alarm processing is adequate. 2. Use *express*WATCH to update the remote alarm configuration.	7
15410	RAP session established with Modem *nn*	No action required.	2
15411	RAP session terminated with Modem *nn*	No action required.	2
15412	RAP report sent to site *nn* using Modem *nn*	No action required.	2
15500	EngineId *engine-id-string* Modem *nn* in Group 0 is in service	No action required.	7
15501	EngineId *engine-id-string* Modem *nn* in Group 1 is in service	No action required.	7
15502	EngineId *engine-id-string* Modem *nn* in Group 2 is in service	No action required.	7
15503	EngineId *engine-id-string* Modem *nn* in Group 3 is in service	No action required.	7
15504	EngineId *engine-id-string* Modem *nn* in Group 4 is in service	No action required.	7
15505	EngineId *engine-id-string* Modem *nn* in Group 5 is in service	No action required.	7
15506	EngineId *engine-id-string* Modem *nn* in Group 6 is in service	No action required.	7
15507	EngineId *engine-id-string* Modem *nn* in Group 7 is in service	No action required.	7
15508	EngineId *engine-id-string* Modem *nn* in Group 8 is in service	No action required.	7
15509	EngineId *engine-id-string* Modem *nn* is out of service	The Controller lost communications with the specified modem. 1. Verify that the modem is properly installed in the chassis. 2. Use the MNC's **port** command to reset the modem.	7

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15510	EngineId *engine-id-string* Modem *nn* has been busied out	Cableless: DTR signal not present on the Backplane. There is connection failure to Router. 1. Check CPS configuration file. 2. Check Router configuration. 3. Check Backplane signals. Cabled: DTR signal not present from Router. 1. Check Router configuration. 2. Check DTR on cable.	7
15511	EngineId *engine-id-string* Modem *nn* busyout released	No action required.	7
15512	EngineId *engine-id-string* Modem *nn* - Modem Code Load Error: Reason *string*	Unable to update the modem's flash memory. 1. Retry the update. 2. If the error occurs several times, contact technical support.	5
15513	EngineId *engine-id-string* Modem *nn* - Modem Code Load Reset	The modem's flash memory has been updated successfully. No action required.	2
15514	EngineId *engine-id-string* Modem connect on port *nn*: Mode= *call-mode* Mod Speed= *connect-speed*, Mod Type= *modulation-type*, Cmp= *compression-protocol*, Ecorr= *link-protocol*	No action required.	3
15515	EngineId *engine-id-string* Modem disconnect on port *nn*: Mode= *call-mode*, Disc= *disconnect-reason*, Mod Speed= *connect-speed* Mod Type= *modulation-type*, Cmp= *compression-protocol*, ECorr= *link-protocol*	No action required.	3
15516	EngineId *engine-id-string* Modem *nn* - Data Activity Timeout	A data connection established for the specified modem, but no data activity has been detected by the Controller for over 4 hours. 1. Determine if this is normal in your environment. 2. Use the MNC's **port** shell command to terminate the connection.	7
15517	EngineId *engine-id-string* Modem *nn* had False Answer	A modem fails to establish an answering connection with another modem. Either a device other than a modem answered, or the calling modem was unable to establish a data connection. 1. Check configurations of both modems to verify that they are compatible. 2. Verify that the cables are attached properly (cabled system only). 3. Verify that the Router is configured correctly. 4. Verify the MMM configuration file. 5. Verify the CPS configuration file.	7

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15518	EngineId *engine-id-string* Modem *nn* - No Dial Tone	No dial tone detected when attempting a dial-out call. 1. Verify that the phone line can initiate outbound calls. 2. Check the phone line connection to that modem.	7
15519	EngineId *engine-id-string* Modem *nn* - No Answer	The dialed phone number not answered. 1. Verify the number is correct. 2. Verify the called site is operational. 3. Verify the cables are attached properly (cabled system only). 4. Verify the Router is configured correctly. 5. Verify the MMM configuration file. 6. Verify the CPS configuration file.	7
15520	EngineId *engine-id-string* Modem *nn* - Dialed number busy	The dialed phone number busy. 1. Verify that the number dialed is correct. 2. Re-dial.	7
15521	EngineId *engine-id-string* Modem *nn* - No Carrier	Failed to establish a data connection with the called modem 1. Verify that the number is correct. 2. Retry the call. 3. Check configurations of both modems to verify that they are compatible. 4. Verify that the MMM card is securely installed in the Hub.	7
15522	EngineId *engine-id-string* Modem *nn* - No Link	Failed to establish a data connection with the called modem during MNP or LAPM negotiations. 1. Verify that the number is correct. 2. Retry the call. 3. Check configurations of both modems to verify that they are compatible. 4. Verify that the MMM card is securely installed in the Hub.	7
15523	EngineId *engine-id-string* Modem *nn* - Unclassified	Failed to connect with the called modem. The failure condition cannot be determined. 1. Verify that the number is correct. 2. Retry the call. 3. Check configurations of both modems to verify that they are compatible.	7
15524	EngineId *engine-id-string* Modem *nn* - Ring No Answer	The modem failed to go off-hook in response to a ring. 1. Verify that the modem is configured for auto-answer. 2. Verify that DTR is high.	7

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15525	EngineId *engine-id-string* Modem *nn* - No DTR from Host	Check the DTR signal line on the host port. Cableless: 1. Check the Backplane configuration. 2. Check Router configuration. 3. Check the MMM configuration file. 4. Check the CPS configuration file. Cabled: 1. Check the cable connection. 2. Check Router configuration. 3. Check the MMM configuration file.	7
15526	EngineId *engine-id-string* Modem *nn* - Configuration Error	Check the MMM configuration file.	7
15527	EngineId *engine-id-string* - Configuration file read Error	1. Check the MMM configuration file. 2. Check slot position of MMM engine is correct.	7
15528	EngineID *engine-id-string Modem nn has been placed in modem pool.*	No action required.	7
15529	EngineID *engine-id-string modem nn has been removed from modem pool: Reason(s) = number*	Check the MMM configuration file. The possible reason codes are: 1. The port is down. 2. A management action has taken the port out of service. 3. A service provider is not available. 4. A line interface is not available. 5. The port is configured for busyout.	7
15530	LED Test Failed: Engine *engine-id-string*	Maintenance suggested; contact techncial support.	6
15531	Boot ROM Test Failed: Engine engine-id-string	Maintenance suggested; contact techncial support.	8
15532	RAM Test Failed: Engine engine-id-string	Maintenance suggested; contact techncial support.	8
15533	DTE Port Test Failed:Engine engine-id-string	Maintenance suggested; contact techncial support.	8
15534	Ethernet Test Failed: Engine engine-id-string	Maintenance suggested; contact techncial support.	8
15535	Timer Test Failed: Engine engine-id-string	Maintenance suggested; contact techncial support.	8
15536	Shared Memory Test Failed: Engine engine-id-string	Maintenance suggested; contact techncial support.	8
15600	Engine= *engine-id-string* Span= *nn* Yellow Alarm	1. Verify LIU/PRI/MMM connections to TDM highway. 2. Verify operation of modems on this span.	7
15601	Engine= *engine-id-string* Span= *nn* Red Alarm	1. Verify Telco Interface. 2. Possible equipment failure has occurred.	7

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15602	Engine= *engine-id-string* Span= *nn* Frame Slips	1. Verify LIU / PRI configuration versus Telco Line configuration. 2. Verify that the Master system clock is not enabled on more than one span or engine.	7
15603	Engine= *engine-id-string* Span= *nn* Loss of Frame Sync	1. Verify LIU / PRI configuration versus Telco Line configuration. 2. Verify LIU / PRI Master system clock is enabled.	7
15604	Engine= *engine-id-string* Span= *nn* Loss of Signal	1. Verify Telco connection to RJ48 connector. 2. Verify Telco signal is present with test equipment. 3. Test equipment with loopback cable to verify that spans can recognize the signal.	7
15605	Engine= *engine-id-string* Span= *nn* Frame Sync Achieved: Span UP	No action required.	3
15606	Engine= *engine-id-string* Span= *nn* Loss of Master Clock	1. Verify Telco connection to RJ48 connector. 2. Verify clock switchover occurred to another Span or engine.	5
15607	Engine= *engine-id-string* Span= *nn* Yellow Alarm Cleared	No action required.	3
15608	Engine= *engine-id-string* Span= *nn* Red Alarm Cleared	No action required.	3
15609	LED Test Failed	Maintenance suggested; contact technical support.	6
15610	Boot ROM Test Failed	Maintenance suggested; contact technical support.	8
15611	RAM Test Failed	Maintenance suggested; contact technical support.	8
15612	DTE Port Test Failed	Maintenance suggested; contact technical support.	8
15613	Ethernet Test Failed	Maintenance suggested; contact technical support.	8
15614	Timer Test Failed	Maintenance suggested; contact technical support.	8
15615	ACFA 1 Test Failed	Maintenance suggested; contact technical support.	8
15616	ACFA 2 Test Failed	Maintenance suggested; contact technical support.	8
15617	CSU 1 Test Failed	Maintenance suggested; contact technical support.	8
15618	CSU 2 Test Failed	Maintenance suggested; contact technical support.	8
15619	Engine= *Engine-id-string* Span= *nn* Span configured as disabled	Event was initiated by the system administrator.	5
15620	Engine= *Engine-id-string* Span= *nn* Autodetected *Framing-string*	Resulting event from framing autodetection command. Possible *Framing-Strings* are: 1. D4 Framing 2. ESF Framing 3. E1 Multiframe CRC4 Framing 4. E1 Doubleframe No CRC4 Framing 5. Unknown Framing 6. No Signal No action required if framing detected, otherwise, verify switch configuration or RJ45 cable.	7

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15621	Engine= *Engine-id-string* PRI Engine Operational Mode = *Mode-String*	Notification event with enigne's mode of operation. Possible *Mode-Strings* are: 1. PRI T1 2. PRI E1 3. Channelized T1 4. Channelized E1 No action required.	5
15700	Engine *engine-id-string* Control Session to *ip-address* timed out	The PPTP control session has timed out. No action required.	7
15701	Engine *engine-id-string* Control Session to *ip-address* terminated by Peer	The peer has requested to terminate the PPTP control session. No action required.	7
15702	Engine *engine-id-string* Terminated Control Session to *ip-address*	The host has requested to terminate the PPTP control session. No action required.	7
15703	Engine *engine-id-string* Control Session to *ip-address* closed	The PPTP control session has closed. No action required.	7
15704	Engine *engine-id-string* Control Session to *ip-address* not established	A PPTP control session could not be established with the specified *ip-address* on the routes list. No action required.	7
15705	Engine *engine-id-string* Control Session to *ip-address* established	The PPTP control session has been established. No action required.	3
15706	Engine *engine-id-string* Peer *ip-address* is alive	The host can ping the peer. No action required.	3
15707	Engine *engine-id-string* Peer *ip-address* not answering	The host unable to communicate with the peer. If this event keeps repeating and is not followed by event 15705, do the following: 1. Verify that the peer module is installed in the hub. 2. Check that both peer and host modules are configured to communicate on the same Ethernet segment. 3. Check that both are configured for the proper *ip-address*. If necessary, reconfigure and reboot the modules. 4. If the intended *ip-address* is not being displayed: modify the CPS configuration file for the desired *ip-address*, upload the file to the MNC, and reboot the engine specified by *engine-id-string*.	7
15708	Engine *engine-id-string* PortHandle *nn* detected *protocol-type* protocol	The CPS subsystem detected the connection protocol *protocol-type.* No action required.	2
15709	Engine *engine-id-string* PortHandle *nn* Protocol not detected	The CPS subsystem could not detect the connection protocol. No action required.	4
15710	Engine *engine-id-string* PortHandle *nn* Service Provider *ip-address* declined the call. Cause code = *nn*	The Service Provider assigned to handle the call refused to do so. The cause code may indicate the reason. Check the status of the Service Provider.	4

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15711	Engine *engine-id-string* PortHandle *nn* connection to server *ip-address* established. Client call ID= *nn*, Server call ID= *nn*, Calling Number= *phone-number*, Called Number= *phone-number*	Client user session has been established. No action required.	3
15712	Engine *engine-id-string* PortHandle *nn* connection to server *ip-address* terminated. Client call ID= *nn*, Server call ID= *nn*	Client user session has been terminated. Usually no action required but if the user session is terminating just after being established, do the following: 1. Verify that the client is submitting a proper user name and password to gain access to the service provider. 2. Verify that the server provider is configured for the desired name and password. 3. If TCP/IP operation is intended, verify that the client is properly configured for TCP/IP and PPP.	3
15713	Engine *engine-id-string* Unable to open *filename* config file	The CPS configuration file could not be found on the MNC. 1. Upload a properly configured configuration file to the MNC. 2. Reboot the engine specified by *engine-id-string*.	7
15714	Engine *engine-id-string* Invalid CPS config data *entry*: *value*	The CPS configuration file contained an entry that could not be parsed properly. 1. Modify the CPS configuration file with a valid *entry*: *value*. 2. Upload the configuration file to the MNC. 3. Reboot the engine specified by *engine-id-string*.	7
15715	Engine *engine-id-string* PPTP flow control mismatch between modules	The CPS configuration file configured with PPTP flow control disabled. 1. Re-configure the peer to disable flow control, **Or** 2. Modify the CPS configuration file to enable flow control and reboot the engine specified by *engine-id-string*.	7
15716	Engine *engine-id-string* Fatal Error - Memory allocation failed. *filename*, *line-number*	No memory resources are available in the engine and it has probably halted. 1. Reboot the engines specified by *engine-id-string*. 2. If this problem persists, contact technical support.	9
15717	Engine *engine-id-string* PortHandle *nn* Called Address lookup failedfor called number *phone-number*. Using default instead.	Ensure that the Called Address Routing table is correctly configured for the phone number(s) of the system.	3
15718	Engine *engine-id-string* Unable to assign Modem Call	The PRI engine cannot find a free modem for an analog call. Ensure that the modem pool is sufficient for the application or that all modems available.	6
15719	Engine *engine-id-string* Assigned Modem Call to *engine-id-string*	The PRI engine has asigned an analog data call to a modem for service.	3
15720	Engine *engine-id-string* Modem Pool Engine *ip-address* indicates *nn* ports available	An MMM engine is reporting the current port availability status of the engine.	3

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15721	Engine *engine-id-string* Modem Pool Exhausted	The PRI engine cannot find a free modem for an analog call. Ensure that the modem pool is sufficient for the application.	6
15722	Engine *engine-id-string* PortHandle *nn* No Service Providers Available	The engine processing an incoming call was unable to find a Service Provider to handle the connection. Ensure that the number of Service Provider ports is sufficient for the chassis' configuration.	7
15723	Engine xx tunnel established for ID nn to dest yy	An L2F tunnel has been opened from the Engine (NAS) to the gateway. No action required.	4
15724	Engine xx tunnel closed for ID nn to dest yy	An L2F tunnel has been closed from the Engine (NAS) to the gateway. No action required.	4
15725	Engine xx Porthandle nn Client L2F session established for yy on tunnel ID zz	A Client L2F session is opened for the port over a tunnel. No action required.	7
15726	Engine xx Porthandle nn Client L2F session for yy on tunnel zz disconnected	The port's Client L2F session closed over the tunnel. No action required.	4
15727	Engine xx Porthandle nn Client L2F session for yy on tunnel zz being disconnected	In the process of closing a port's Client L2F session. No action required.	1
15728	Engine xx tunnel zz opn ID yy failed to authenticate	Tunnel failed to open on authentication (password failure). Check the gateway to see if the user name and passwords are correct.	7
15729	Engine xx Porthandle nn client LCP negotiation on tunel ID zz failed to converge	Client PPP LCP parameter needs to be reconfigured.	7
15730	Engine *engine-id-string* PortHandle *nn* Asynchronous login session failed	The asynchronous login session failed due to an invalid host secret or a timeout entering data. No action required.	4
15800	ISDN connection established. Engine= *Engine-id-string* Span= *nn* Channel= *nn* Protocol= *protocol* Data Rate= *nn* Direction= *data-direction*	None	3
15801	ISDN connection disconnected. Engine= *Engine-id-string* Span= *nn* Channel= *nn* Reason Code= *Q931_cause-code*	Refer to reason code for additional information regarding disconnection.	3
15802	Analog connection established. Engine= *Engine-id-string* Span= *nn* Channel= *nn* Data Rate= *nn* Direction=*data-direction*	None	3
15803	Analog connection disconnected. Engine= *Engine-id-string* Span= *nn* Channel= *nn* Reason Code= *Q931_cause-code*	Refer to reason code for additional information regarding disconnection.	3

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15804	ISDN incoming connection rejected. Engine= *Engine-id-string* Span= *nn* Call ID= *nn* Cause Code= *Q931_cause-code*	1. Check connection to network server. 2. Check connection to modems. 3. Check for available B channel. 4. Check switchtype setting. 5. Refer to reason code for additional information regarding rejected call.	5
15806	Channel administratively placed in service. Engine= *Engine-id-string* Span= *nn* Channel= *nn*	None.	5
15807	Channel administratively placed out of service. Engine= *Engine-id-string* Span= *nn* Channel= *nn*	1. Administratively initiated. 2. Current call not affected. 3. No further calls allowed.	5
15808	Munich32 has been placed in loopback mode. Test condition. Engine= *Engine-id-string* Span= *nn*	No calls accepted by this SPAN for the duration of this test.	7
15809	Munich32 has cleared from loopback mode. Engine= *Engine-id-string* Span= *nn*	None	7
15811	Layer 2 Established. Engine= *Engine-id-string* Span= *nn*	None	5
15812	Layer 2 Down. Engine= *Engine-id-string* Span= *nn*	1. Check configuration settings. 2. Consider other accompanying events.	5
15813	Layer 3 Established. Engine= *Engine-id-string* Span= *nn*	None	5
15814	Layer 3 Down. Engine= *Engine-id-string* Span= *nn*	1. Check configuration settings. 2. Consider other accompanying events.	5
15816	Channel restarted. Engine= *Engine-id-string* Span= *nn* Channel= *nn*	Channels can be restarted by administrative action or by the network.	3
15818	LED Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15819	Boot ROM Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15820	RAM Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15821	DTE Port Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15822	Ethernet Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15823	Timer Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15824	ACFA 1 Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15825	ACFA 2 Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15826	CSU 1 Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15827	CSU 2 Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15828	HSCX Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15829	MUNICH2 Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15830	MUNICH1 Test Failed: Engine engine-id-string	Maintenance suggested; contact technical support.	8
15831	Span not active. Engine = *Engine-id-string* Span= *nn*	1. This event is possibly result of administrative action. 2. Verify control session 3. Verify administrative state of span. 4. Verify ISDN switch state.	7
15832	Span active. Engine = *Engine-id-string* Span= *nn*	Span ready to accept a call.	7
15833	Channel active. Engine = *Engine-id-string* Span= *nn* Channel = *nn*	Channel ready to accept a call.	1
15834	Channel not active. Engine = *Engine-id-string* Span= *nn* Channel = *nn*	1. This event is possibly result of administrative action. 2. Verify control session. 3. Verify administrative state of span. 4. Verify ISDN switch state.	1
15900	Engine *Engine-id-string* Porthandle *nn* : SDI User *username* Authenticated.	None - (informational) SDI user authenticated successfully	2
15901	Engine *Engine-id-string* Porthandle *nn* : SDI User *username* Denied Access.	User denied access by SDI. See the ACE Server log for reason.	7
15902	Engine *Engine-id-string* Porthandle *nn* : SDI User *username* Next Card Code Sequence Successful.	None - (informational) SDI user successfully completed next card code sequence.. user authenticated successfully.	2
15903	Engine *Engine-id-string* Porthandle *nn* : SDI User *username* Next Card Code Sequence Failed	User denied access by SDI after next card code sequence. See ACE server log for reason.	7
15904	Engine *Engine-id-string* Porthandle *nn* : SDI User *username* New Pin Sequence Successful.	None - (informational) SDI user successfully completed new pin sequence.	2
15905	Engine *Engine-id-string* Porthandle *nn* : SDI User *username* New Pin Sequence Failed.	User was unable to establish a new PIN with SDI, check the sadmin activity or exception log at the ACE server for more information.	7

Table I-2. Microcom Access Integrator Events (Continued)

Event	*Screen Message*	*Action*	*Severity*
15906	Engine *Engine-id-string* Porthandle *nn* : SDI User *username* Suspect - Excessive Authentication Failures.	Excessive SDI authentication failures have taken place. This is to warn the administrator that there have been excessive amounts of SDI authentication failures on this port. SDI has initiated suspect processing. See the SDI user quide for possible actions as a result of suspect processing.	7
15907	Engine *Engine-id-string* Porthandle *nn* : SDI Trying Backup ACE Server.	SDI could not reach the primary ACE Server and retrying to a backup server (if a slave server is not configured, it will retry primary server). Check configuration settings to make sure the correct IP address and UDP port number have been entered for the primary and slave (if you have one) ACE Server(s). If these are correct look into a potential network problem.	4
15908	Engine *Engine-id-string* Porthandle *nn* : SDI Retrying PrimaryACE Server.	SDI could not reach the primary ACE Server and retrying. Check configuration settings to make sure the correct IP address and UDP port number have been entered for the primary ACE Server. If these are correct look into a potential network problem.	4
15909	Engine *Engine-id-string* Porthandle *nn* : SDI Retry Count Exceeded.	SDI could not reach any of the ACE Servers. Check configuration settings to make sure the correct IP address and UDP port number have been entered for the primary and slave (if you have one) ACE Server(s). If these are correct look into a potential network problem.	8

Appendix J

Standard Configurations

Overview

As described in the *Getting Started Guide*, the Configuration Wizard is the quickest, easiest, most error-free method of installing and configuring your chassis. We strongly recommend using the Wizard.

We provide 10 standard configurations you can assemble manually as described in Chapter 2, *Installation*. The Wizard recognizes many other configurations and leads you through preparing the files. However, you can choose from the 10 configurations in this appendix and edit their related file templates manually.

Standard Configurations

Before you prepare your site or begin to install your chassis, you should locate your configuration from those on pages J-2 through J-6. Familiarize yourself with the module placement in your system.

If your system represents a subset of a configuration, you can build it by inserting modules from slot 1 upward. This allows for easy expansion later and for simple editing of the default configuration files during initial installation. While the system offers a great deal of flexibility, following the standard chassis layouts is the most efficient procedure. Doing this also makes logging and troubleshooting chassis quick and easy.

Diagram Conventions

Each of the configurations diagram illustrates the engine location and module placements. The text under each configuration lists the location of its configuration file templates and the number of IP addresses you should need for the assembled chassis. If you use an external router or server to isolate the chassis, you will only need one IP address and can use the default ones provided with the chassis for its modules.

The default slot IP addresses appear in Figure J-3 and Figure J-4.

Slot Numbering

The slot numbers appear on the front of chassis. In the 17-slot chassis, they start at 1 on the left and run through 17 on the right. In the bottom right corner of the chassis to the right of the power supplies, the single-engine slots are 18 on the left and 19 on the right. These two slots can also accept ADMMs.

In the 7-slot chassis, the numbers start at 1 on the bottom and run through 7 at the top. On the very top row, the single-engine slots are 8 on the right and 9 on the left.

Both styles of chassis use identical modules. These modules are interchangeable from chassis to chassis. This is true for the power controllers or ADMMs in the single-engine slots.

Configuration File Locations

Under each diagram, we list the location of its default configuration files. During *express*WATCH installation, files for these configurations load with a full directory structure. You will find it most efficient to start with the files we provide for your specific configuration. These files include the engines shown in the locations in the diagram. Using these files is a real time saver.

The procedures for locating, editing and copying files appear in *express*WATCH's on-line help. Basic *express*WATCH operations also appear in Chapter 7 of the *Getting Started Guide*.

Note: As shown below each configuration on the following pages, the number of IP addresses required varies by installation. If you assign static IP addresses through a comm server, add one for the comm server and one for each port in the system.

Table J-1. Standard Configuration Diagrams

Diagram	*Page*	*System Configuration*
Table J-2.	J-2	7-Slot 48-Port PRI-T1
Table J-3.	J-3	7-Slot 96-Port PRI-T1
Table J-4.	J-3	7-Slot 48-Port Hex MMM PRI-T1
Table J-5.	J-3	7-Slot 60-Port PRI-E1
Table J-6.	J-3	17-Slot 120-Port PRI-E1
Table J-7.	J-4	17-Slot 96-Port PRI-T1/24-Port Analog MMM
Table J-8.	J-4	17-Slot 96-Port Hex MMMs PRI-T1
Table J-9.	J-5	17-Slot 60-Port Hex MMMs PRI-E1
Table J-10.	J-5	17-Slot 120-Port Hex MMM PRI-E1
Table J-11.	J-6	17-Slot 60-Port PRI-E1/36 Analog Hex MMM

Table J-2. 7-Slot 48-Port PRI-T1

Slot	*Left Engine*	*Right Engine*
7	Etherflex	
6	PRI-T1	MNC
5	Blank	Access Server
4	Blank	Blank
3	Blank	Blank
2	MMM24	
1	MMM24	

Default Files Location: \TemplCfg\7slot\T1\48port

Number of IP Addresses Required: 6

Table J-3. 7-Slot 96-Port PRI-T1

Slot	*Left Engine*	*Right Engine*
7	Etherflex	
6	PRI-T1	MNC
5	PRI-T1	Access Server
4	MMM24	
3	MMM24	
2	MMM24	
1	MMM24	

Default Files Location: \TemplCfg\7slot\T1\96port

Number of IP Addresses Required: 9

Table J-4. 7-Slot 48-Port Hex MMM PRI-T1

Slot	*Left Engine*	*Right Engine*
7	Etherflex	
6	PRI-T1	MNC
5	Blank	PRI-T1
4	MMM	MMM
3	MMM	MMM
2	MMM	MMM
1	MMM	MMM

Default Files Location: \TemplCfg\7slot\T1\48port\MMM12

Number of IP Addresses Required: 12

Table J-5. 7-Slot 60-Port PRI-E1

Slot	*Left Engine*	*Right Engine*
7	Etherflex	
6	PRI-E1	MNC
5	Blank	Access Server
4	Blank	Blank
3	MMM24	
2	MMM24	
1	MMM24	

Default Files Location: \TemplCfg\7slot\E1\60port

Number of IP Addresses Required: 7

Table J-6. 17-Slot 120-Port PRI-E1

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Etherflex	MMM24	MMM24	MMM24	MMM24	MMM24	MMM24	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	PRI-E1	PRI-E1
							Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Access Server	MNC

Default Files Location: \TemplCfg\17slot\E1\120port

Number of IP Addresses Required: 11

Table J-7. 17-Slot 96-Port PRI-T1/24-Port Analog MMM

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Etherflex	MMM24	MMM24	MMM24	MMM24	MMM	MMM	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	PRI-T1	PRI-T1
					MMM	MMM	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Access Server	MNC

Default Files Location: \TemplCfg\17slot\T1\120port

Number of IP Addresses Required: 13

Table J-8. 17-Slot 96-Port Hex MMMs PRI-T1

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Etherflex	MMM	MMM	MMM	MMM	MMM	MMM	MMM	MMM	Blank	Blank	Blank	Blank	Blank	Blank	PRI-T1	PRI-T1
	MMM	MMM	MMM	MMM	MMM	MMM	MMM	MMM	Blank	Blank	Blank	Blank	Blank	Blank	Access Server	MNC

Default Files Location: \TemplCfg\17slot\T1\96port\MMM12

Number of IP Addresses Required: 21

Table J-9. 17-Slot 60-Port Hex MMMs PRI-E1

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Etherflex	MMM	MMM	MMM	MMM	MMM	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	PRI-E1
	MMM	MMM	MMM	MMM	MMM	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Access Server	MNC

Default Files Location: \TemplCfg\7slot\E1\60port\MMM12

Number of IP Addresses Required: 15

Table J-10. 17-Slot 120-Port Hex MMM PRI-E1

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Etherflex	MMM	MMM	MMM	MMM	MMM	Blank	Blank	Blank	MMM	MMM	MMM	MMM	MMM	Blank	PRI-E1	PRI-E1
	MMM	MMM	MMM	MMM	MMM	Blank	Blank	Blank	MMM	MMM	MMM	MMM	MMM	Blank	Access Server	MNC

Default Files Location: \TemplCfg\17slot\E1\120port\MMM12

Number of IP Addresses Required: 25

Table J-11. 17-Slot 60-Port PRI-E1/36 Analog Hex MMM

1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Etherflex	MMM24	MMM24	MMM24	MMM	MMM	MMM	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	PRI-E1
				MMM	MMM	MMM	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Blank	Access Server	MNC

Default Files Location: \TemplCfg\17slot\E1\96port

Number of IP Addresses Required: 14

IP Addressing

In this installation planning and preparation phase, you will decide how each chassis will attach to your LAN or WAN, and what IP address configuration you will use for each chassis. These decisions determine:

- whether you configure all modules on one internal LAN backplane, or segregate the internal traffic onto two internal LAN backplanes,
- whether you use default IP addresses for the MMMs, PRIs and LIUs on an internal private LAN,
- and whether you assign MMMs and LIUs IP addresses to an engine based on its slot/engine location or based on its MAC address.

The modules plug into the chassis backplane. The backplane interconnects the modules via up to eight internal LANs and up to five internal TDM highways. The TDM highways carry data and management traffic between the various modules. An Ethernet module connects one or more of the backplane LANs to external LANs and connects external devices to the backplane LANs.

The MMM, PRI and LIU engines obtain their IP addresses by sending broadcast BOOTP requests to the MNC. The BOOTP request includes the engine's slot/engine location and the engine's MAC address. The MNC that receives these requests responds to recognized engines with the engines IP address.

Addressing Options

You can assign IP addresses either by slot/engine location or by MAC address, depending upon network topology. If a chassis is the only one on a LAN, its MMM, PRI and LIU addresses may be by slot/engine location. When multiple chassis are on the same segment, you must use the MAC address. Otherwise, each chassis' MNC will receive multiple BOOTP requests from engines on all Microcom Access Integrator chassis on the segment. In these cases, it will not know which is which if the assignment is by slot/engine.

Assigning IP addresses by slot/engine has advantages. Specifically, when you replace a module, its engines will receive the same IP addresses as the previous ones in the same slot/engine locations.

When you assign by MAC address, you must update the *xprswtch.hst* configuration file with the new MAC addresses of the new engines whenever you replace a module for diagnostics, maintenance, repair or upgrade. You should do this through *express*WATCH. Refer to its on-line help for procedures. Of course, you should record the MAC addresses and serial numbers in your site log.

Note: If you use the Configuration Wizard, it generates this list as part of the process.

Single LAN Configuration

In Figure J-1, a chassis resides on a LAN segment. It uses its internal public LAN, and communicates with the external public LAN through the Ethernet module (the Media Access Card).

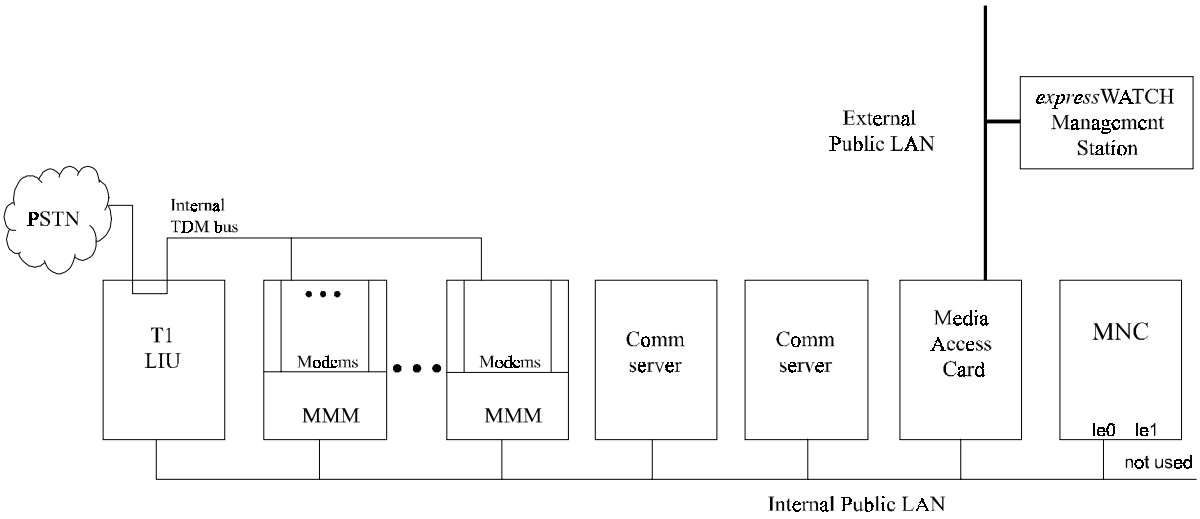


Figure J-1. Single LAN Configuration

This configuration is valid for a chassis using either an NT server or an Access Server, with or without cables to the modems. In this layout, the internal LAN segment is an extension of the external LAN. Each engine in the chassis will require a unique public LAN IP address. If you have only one Access Integrator chassis attached to the external LAN segment you may assign these IP addresses by slot/engine location. If you have more than one Access Integrator attached to the external LAN segment you will need to assign the IP addresses by MAC address.

For this configuration, MNC internal management traffic is on the public LAN network. The primary MNC network port le0 is active and the private network port le1 is inactive. ***You must assign an IP address to le0 on MNC in addition to assigning an IP address to each of the MMM and LIU engines.***

➥ **Important:** Each MNC acts as a BOOTP server for its LIU, PRI and MMM engines, as well as a BOOTP client for the network. Each time an engine restarts, it sends a BOOTP request including its slot location and MAC address. If another chassis' MNC receives a request from an MMM in slot2, engine 1, the MMM will receive multiple conflicting IP assignments in response. In these cases, configure the chassis with MAC addresses in the *xprswtch.hst* file as described in the *express*WATCH's on-line help.

Note: If you use the Configuration Wizard, it generates this list as part of the process.

Dual Internal LAN Configuration

In other network configurations, you will want to use both the chassis' internal private LAN and its internal public LAN. The figure below illustrates communications for such a system.

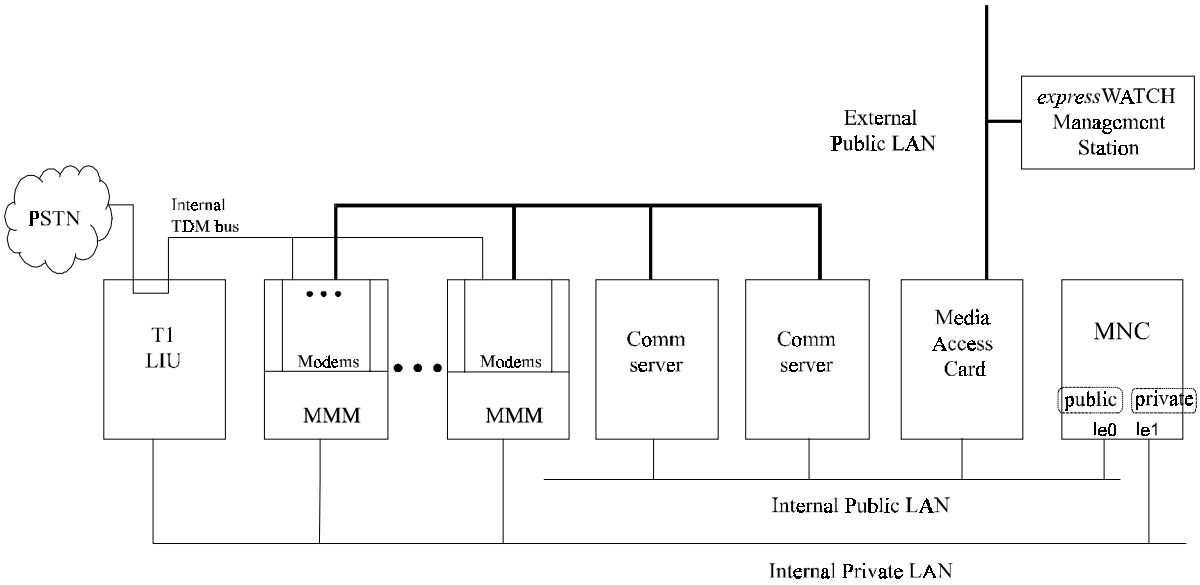


Figure J-2. Dual LAN Configuration

In the configuration above, the MMM and LIU engines have private IP addresses based on slot/engine. You would not have to update the MAC addresses through *expressWATCH* when you replace an MMM or LIU engine. However, you will need a DMM to configure the MNC by activating both of its Ethernet ports (le0 and le1).

This configuration is valid for cabled installations, both modem pool applications that do not use an integrated communications server and enterprise applications where the modems are cabled to the integrated Access Server. The only engines that require a unique public LAN IP address are the MNC and any Access Servers that communicate with the external public LAN. The MMMs and LIUs are isolated on their own internal private LAN and communicate only with the MNC.

Both LAN ports (le0 and le1) on the MNC are used in this configuration. This will require the installation and configuration using a DMM. The DMM is required to connect MNC port le0 to one backplane LAN and MNC port le1 to a different backplane LAN. While we recommend leaving the DMM in the chassis, you can move it from one chassis to another as a configuration and diagnostic tool.

The primary MNC network port le0 is for SNMP, telnet and ftp communications to the external LAN for network management. You must assign a unique IP address to MNC port le0 for the external LAN. The MNC's internal management traffic is on the private internal LAN network on port le1. You can use the default IP addresses for MNC's le1 port and the MMM and LIU engines. The default IP addresses are discussed in detail in the following section. Use *express*WATCH to configure the System Configuration file's "MNC traffic LAN" setting to private LAN and the "Use Default Host File" setting to yes.

One advantage of this configuration is that it only requires two IP addresses, one for le0 and one for le1. The LIU and MMM engines identify themselves to the MNC by their slot/engine locations. Because they do not advertise themselves to the external public network, they do not have to supply unique IP addresses and MAC addresses.

The procedures for selecting public or private networking, adding MAC addresses and updating module files appear in *express*WATCH's on-line help.

Note: You will find it convenient to record the MAC address of each engine in your site log next to the slot and engine location. The MAC address is on a white sticker on each engine under the title "Le NODE ADDRESS". The address is in the form "00009004DA2D-17," with the first 12 characters being the MAC address. Each is unique.

Internal Addresses

The chassis provides default IP addresses for each engine connected to the TDM backplane. These are the engines in slots 2 through 17, top and bottom, in the 17-slot, and engines in slots 1 through 7, left and right, in the 7-slot. The default addresses range from 192.168.0.1 through 192.168.0.32 for the 1700 (Figure J-4), and from 192.168.0.1 through 192.168.0.7 and 192.168.0.17 through 192.168.0.23 for 700 (Figure J-3).

The following two figures list the default IP addresses for the 700 and 1700 chassis.

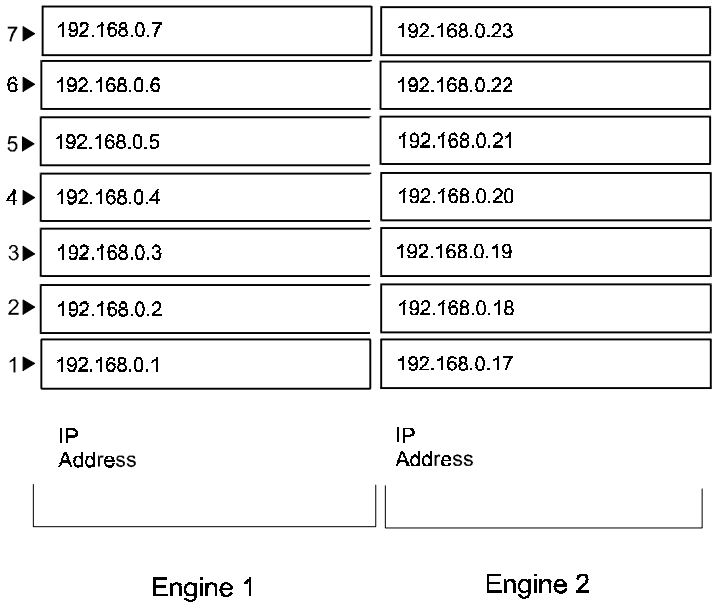


Figure J-3. 7-Slot Chassis Default IP Addresses

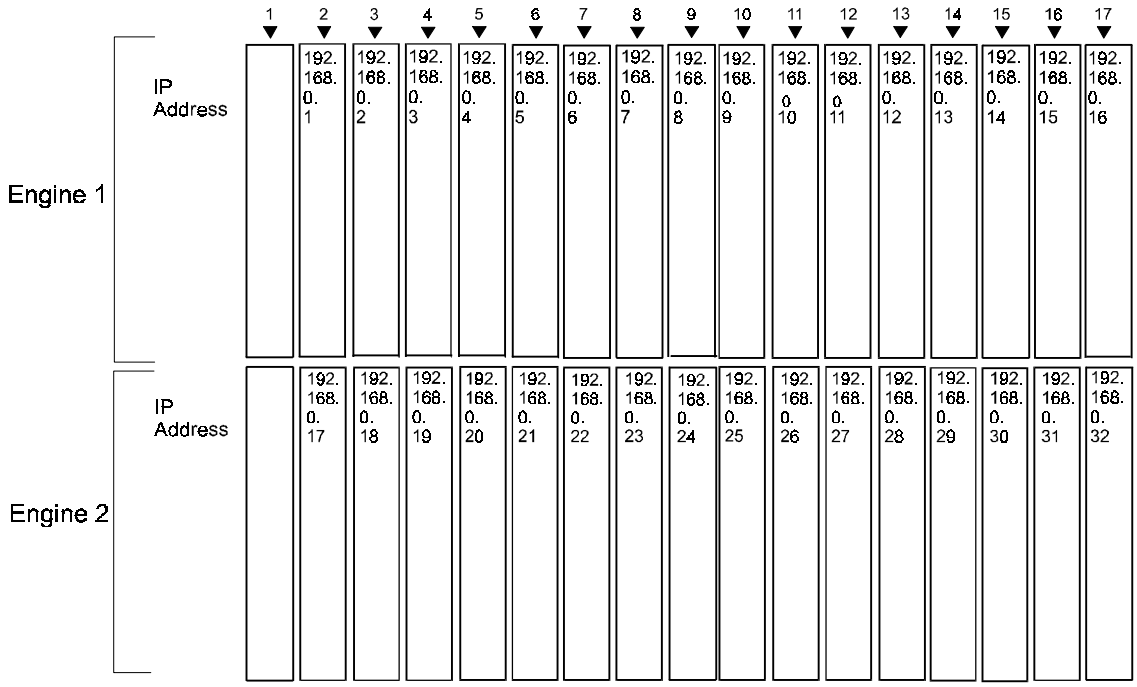


Figure J-4. 17-Slot Chassis Default IP Addresses

Managing With and Without an ADMM

We recommend configuring your hub using an ADMM. It serves several functions:

- Manages the module carrier that interfaces the engines to the LAN backplane
- Retains the settings mapping engine backplane LAN ports to 1 of the 8 backplane LANs
- Chassis inventory information
- In conjunction with an Ethernet NMC, provides monitoring of backplane LAN performance
- Power and ventilation monitoring
- Chassis diagnostic capabilities

The system can operate without a DMM installed. ***A DMM is necessary to configure multiple chassis on the same LAN segment or if you will use both MNC Ethernet addresses***. You can use a single ADMM to configure multiple chassis, moving it from one to another. You can do the same for diagnostic functions. However, an ADMM cannot serve its function of backing up and restoring module configurations unless it is in a chassis on reboot.

See Chapter 4, *Managing with an ADMM*, for basic commands and operations.

An MNC in the hub can configure and control the MMMs, PRIs and LIUs. It can also download new firmware to them as needed. You do not need an ADMM for modem and T1 control.

If you have configured a module's carrier with an AMM, the carrier switch settings determine how it will behave in a new system or a new slot in the same system. For example, if you replace a module with the same type in the same slot number, the ADMM will override the module's settings with those of the previous module. If you put a module into a slot that has not had that type before, the ADMM will attempt to read the configuration of the module and store those settings.

Without an ADMM in the system, you can configure modules using the carrier DIP switches, and through *express*WATCH and other software interfaces. If you do not configure a module, its firmware will initially contain default settings as listed in its manual.

Microcom Access Integrator System Worksheets

System ID:

Location:

*express*WATCH Configuration File Directory:

Installation Date:

Remarks:

Slot/ Engine Type	***Serial Number/ MAC Address***	***Cable ID***	***IP Address***	***DIP Settings and Other Configuration***
1 Top				
1 Bottom				
2 Top				
2 Bottom				
3 Top				
3 Bottom				
4 Top				
4 Bottom				
5 Top				
5 Bottom				
6 Top				
6 Bottom				
7 Top				
7 Bottom				
8 Top				
8 Bottom				
9 Top				
9 Bottom				
10 Top				

Slot/ Engine Type	***Serial Number/ MAC Address***	***Cable ID***	***IP Address***	***DIP Settings and Other Configuration***
10 Bottom				
11 Top				
11 Bottom				
12 Top				
12 Bottom				
13 Top				
13 Bottom				
14 Top				
14 Bottom				
15 Top				
15 Bottom				
16 Top				
16 Bottom				
17 Top				
17 Bottom				
18				
19				
Power 1				
Power 2				
Power 3				
Power 4				

System ID:

Location:

expressWATCH Configuration File Directory:

Installation Date:

Remarks:

Slot/ Engine Type	***Serial Number/ MAC Address***	***Cable ID***	***IP Address***	***DIP Settings and Other Configuration***
1 Top				
1 Bottom				
2 Top				
2 Bottom				
3 Top				
3 Bottom				
4 Top				
4 Bottom				
5 Top				
5 Bottom				
6 Top				
6 Bottom				
7 Top				
7 Bottom				
8				
9				
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