

MMAC-Plus™ 9E312-12
Ethernet Switch Module
User's Guide

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The Complete Networking Solution™

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Read the instructions for correct handling.

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Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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Introduction

The 9E312-12 is a thirteen port switching module with twelve front panel Ethernet interfaces and one Internal Network Bus (INB) backplane interface. This module uses a Fast Packet Switch (FPS) hardware based switch design and an advanced Intel i960[®] microprocessor. This microprocessor provides a platform for all management functions within a scalable RISC-Based Architecture.

The module can operate in two modes; as a 12 port Ethernet bridge with a high speed backbone connection or as 12 Ethernet connections to a Cabletron SecureFast[™] Packet Switch (SFPS). Each port of the 9E312-12 can be configured to operate in the Full Duplex mode. This configuration allows each port to provide a full 20 Mbps of bandwidth.

Network management information is available through a variety of methods. All information based on SNMP is accessible either via an in-band (Front Panel port), Side Band (SMB-10), or via the EM's COM ports using a Network Management Server, and Serial Line Interface Protocol (SLIP) or Point-to-Point Protocol (PPP). For more information on the SMB-10, SLIP or PPP refer to the MMAC-Plus Local Management User's Guide.

The 9E312-12 also features front panel LANVIEW[™] Diagnostic LED's to offer at-a-glance status information about each front panel port as well as the operation of the overall module.

Ethernet networks are connected to the 9E312-12 module using standard Ethernet 10 Base-T RJ-45 connectors on the front panel with connectivity for UTP and STP links up to 100 meters in length.

Features

Processor

The 9E312-12 is equipped with an advanced Intel i960 microprocessor. This microprocessor provides a platform for all management functions such as Spanning Tree, RMON, and MIB support within a scalable RISC-based architecture.

Fast Packet Switching

The 9E312-12 incorporates a hardware based switch design referred to as a Fast Packet Switch (FPS), a collection of custom ASICs designed specifically for high speed switching. Because all frame translation, address lookups, and forwarding decisions are performed in hardware, the 9E312-12 can obtain a throughput performance of greater than 130K pps.

Management

The 9E312-12 features SNMP for local and remote management. Local management is provided through the RS-232 Com ports on the MMAC-Plus Environmental Module using a standard VT-220 terminal or emulator. Remote management is possible through Cabletron's SPECTRUM or any SNMP compliant management tool. Included as management features are the IETF Standard Management Information Base (MIBs) RMON (RFC1271), IETF MIB II (RFC-1213), IETF Bridge MIB (RFC-1493), and a host of other Cabletron enterprise MIBs. The 9E312-12 also offers the user a wide variety of statistical network management information to enhance network planning and troubleshooting. This module provides information for each front panel Ethernet 10Base-T port, including packet counts along with errored frame information such as collisions, CRCs, and Giants, via a variety of industry standard and private MIBs. Industry standard IEEE 802.1d bridging, including Spanning Tree Algorithm, is supported.

Connectivity

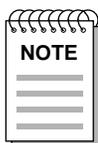
The 9E312-12 module has one interface to the INB and twelve front panel Ethernet connections. The INB interface is a fixed connection to INB-1 which allows the 9E312-12 to communicate with other MMAC-Plus modules supporting various LAN technologies including: Token Ring, FDDI, Ethernet, WAN and ATM. The front panel Ethernet connections are via standard RJ-45 connectors supporting UTP and STP cabling up to 100 meters in length.

Management Information Base (MIB) Support

The 9E312-12 provides MIB support including:

- RMON (RFC-1271)
- IETF MIB II (RFC-1213)
- IETF Bridge MIB (RFC-1493)

and a host of other Cabletron Enterprise MIBs.



For a complete list of supported MIBs, refer to the release notes provided in the 9E312-12 package.

INB

The 9E312-12 attaches to INB1 of the MMAC-Plus Backplane. The INB has a capacity of 2 Gbps to interconnect MMAC-Plus modules supporting Ethernet, FDDI, Token Ring, WAN and ATM networks. The INB transports fixed length data blocks between modules in the MMAC-Plus hub using a Time Division Multiplexing (TDM) design. Within the INB there is a 64 bit wide data bus and an eight bit control management bus. Each module that attaches to the INB has an INB Network Interface Block (NIB). The INB NIB converts canonical frames to fixed length data blocks for transmission onto the INB. For data blocks received from the INB, the INB NIB reassembles the data blocks received from the INB back into canonical frames for transmission to the Fast Packet Switch (FPS) and ultimately to the front panel port. The INB can time slice its bandwidth using one of three methods. The default method is standard TDM round-robin bandwidth arbitration, the second method is for modules to reserve a specific amount of bandwidth using MONARCH, Cabletron's INB Bandwidth Arbitrator, the third method permits the lowest slot number to use any bandwidth not used by the previous two methods.

LANVIEW LEDs

The 9E312-12 uses LANVIEW – the Cabletron Systems built-in visual diagnostic and status monitoring system. With LANVIEW LEDs, you can quickly identify, at a glance, system status as well as the device, port, and physical layer status. Two LEDs indicate the transmission and reception of data from the INB MMAC-Plus Backplane connection. Each of the 12 Ethernet front panel ports features two LEDs per port to indicate the ports Administrative status (enabled/disabled), LINK status (Link/Nolink), and Data Activity (receiving and transmitting data).

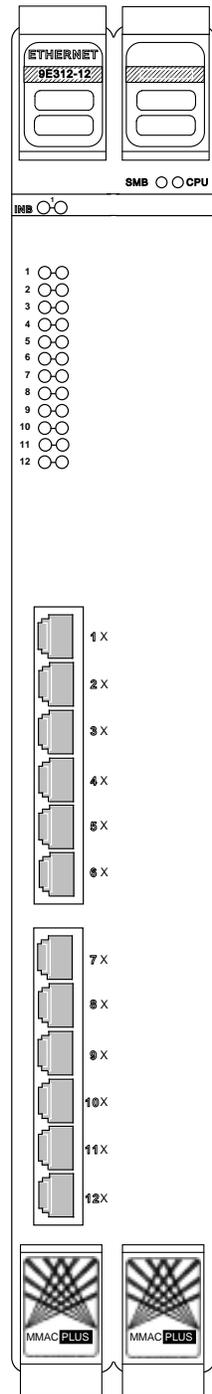


Figure 1-1. The 9E312-12 Module

Related Manuals

The manuals listed below should be used to supplement the procedures and technical data contained in this manual.

MMAC-Plus Installation Guide

MMAC-Plus Operations Guide

MMAC-Plus 9C300-1 Environmental Module User's Guide

MMAC-Plus 9C214-1 AC Power Supply User's Guide

MMAC-Plus Local Management User's Guide

INB Terminator Modules Installation Guide

Getting Help

If you need additional support with the MMAC-Plus, or if you have any questions, comments or suggestions concerning this manual, feel free to contact Cabletron Systems Technical Support:

By phone: (603) 332-9400

By CompuServe®: GO CTRON from any ! prompt

By Internet mail: support@ctrn.com

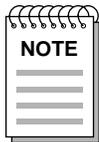
By Fax: (603) 337-3075

By BBS: (603) 335-3358

By mail: Cabletron Systems, Inc.
P.O. Box 5005
Rochester, NH 03867-0505

Installing the 9E312-12 Module

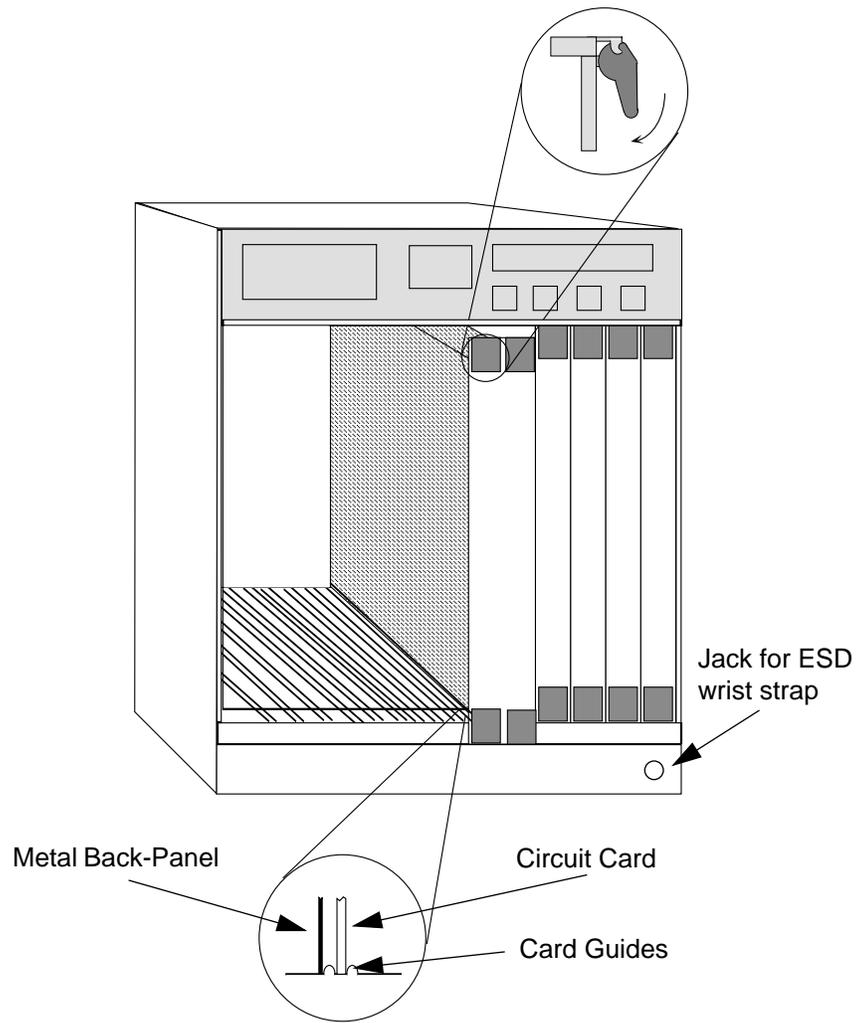
The 9E312-12 module occupies two slots in the MMAC-Plus chassis. The module must be installed with the left side (as viewed from the front) in an odd numbered slot, and the right side in an even numbered slot.



*The INB Terminator Modules must be installed on the rear of the chassis before powering up this module. Refer to the **INB Terminator Modules Installation Guide** for information and installation procedure.*

To install the 9E312-12 module, follow the steps below:

1. Remove the blank panels, covering the slots in which the module will be mounted. All other slots must be covered to ensure proper airflow and cooling.
2. Carefully remove the module from the shipping box. (Save the box and packing materials in the event the module must be reshipped.)
3. Attach one end of the ESD wrist strap packaged with the MMAC-Plus chassis to your wrist. Plug the other end into the jack for the ESD Wrist Strap in the lower right corner of the MMAC-Plus Chassis shown in Figure 2-1.
4. Remove the module from the plastic bag. Observe all precautions to prevent damage from Electrostatic Discharge (ESD).
5. Carefully examine the module, checking for damage. If any damage exists, **DO NOT** install the module. Contact Cabletron Systems Technical Support immediately.
6. Install the module into the chassis by sliding it into slots and locking down both the top and bottom plastic tabs, as shown in Figure 2-1. Take care that the module slides in straight and engages the backplane connectors properly. When installing the module, ensure that both circuit cards are between the card guides, as shown in Figure 2-1. Check both the upper and lower tracks of both cards.



Warning:
Ensure that the circuit card is between the card guides.
Lock down the top and bottom plastic tabs at the same time, applying even pressure.

Figure 2-1. Installing the 9E312-12 Module

Pinouts

The 9E312-12 front panel has twelve RJ-45 Ethernet connections, each of which is internally crossed over. Figure 2-2 illustrates a single RJ-45 Ethernet Connector.

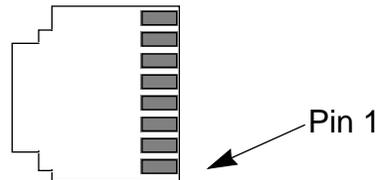


Figure 2-2. RJ-45 Ethernet Connector

Table 2-1 details the pinout connections for an RJ-45 Ethernet connector.

Table 2-1. Pinout Connections RJ-45 Ethernet connector

Pin	Description
8	No Connection
7	No Connection
6	TX-
5	No Connection
4	No Connection
3	TX+
2	RX-
1	RX+

The Reset Switch

The reset switch is located on the front panel, under the top plastic tab as shown in Figure 2-3. It serves two functions: resetting the i960 processor and shutting down the module.

- To reset the processor, press the reset switch twice within three seconds.
- To shut down the module, press and hold the switch down for three or more seconds. To restart the module, press and hold the switch down for three or more seconds.

SNMP management may be used to disable the functions of this switch.

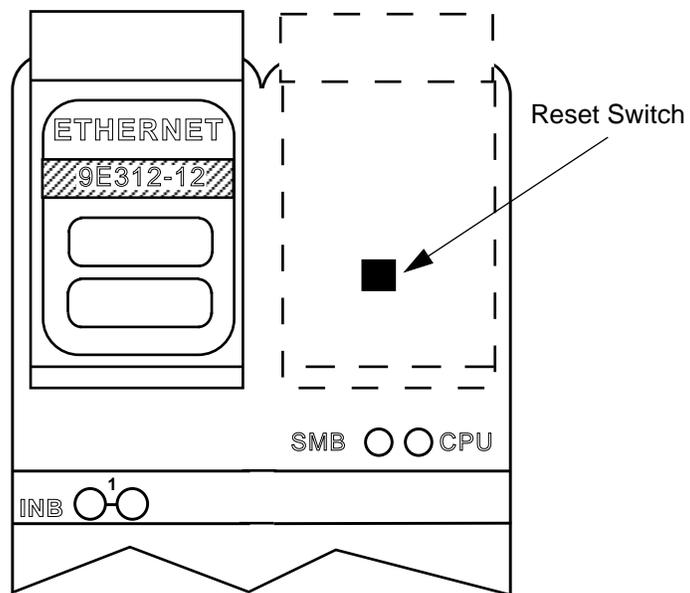


Figure 2-3. The Reset Switch

User Accessible Components

Figure 2-4 shows the various components that can be accessed by users. These consist of an eight position dip switch (explained in the next section), replaceable PROMs, and sockets for memory and flash upgrades. These will be used for future upgrades. Instructions for installing the components will be supplied with the upgrade kit.

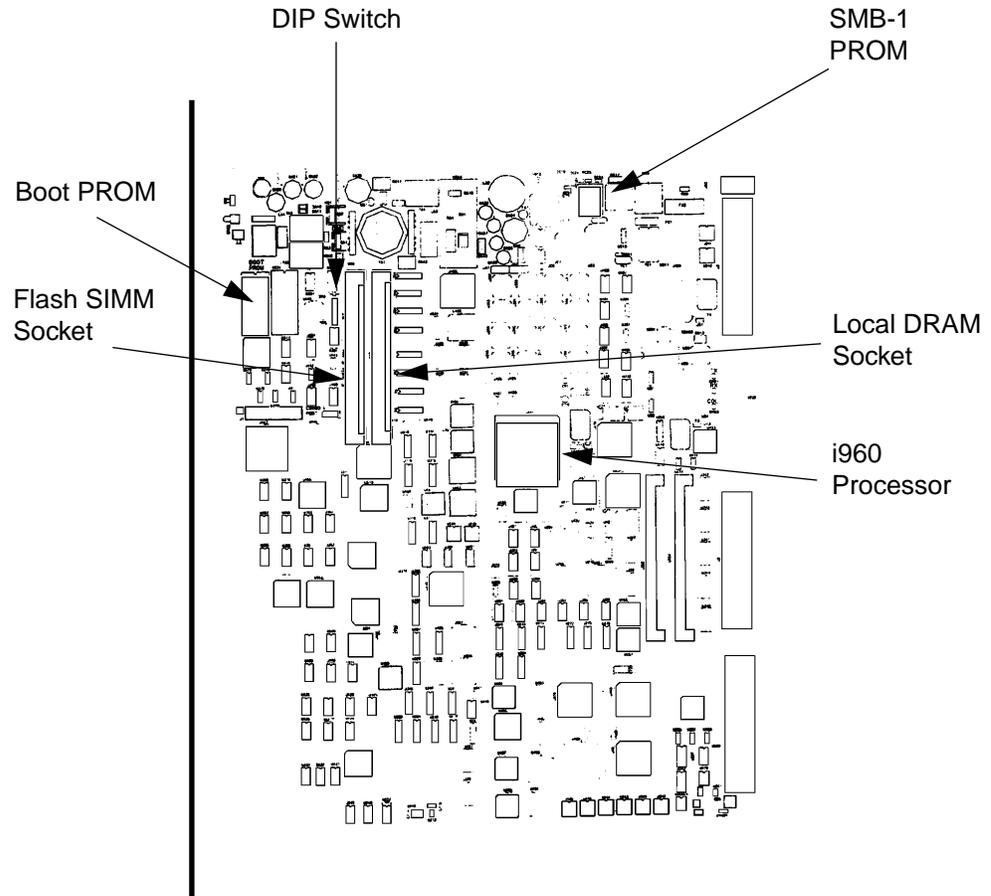


Figure 2-4. User Accessible Components

Setting the 9E312-12 Module DIP Switch

The DIP switch on the 9E312-12 Module (Figure 2-4 and Figure 2-4), is an eight switch DIP located on the top left corner of the module. Each switch is set according to the functions described in Table 2-2.

If switch settings are changed, the processor on the module must be reset by using the reset switch or repowering the module for the changes to take effect.

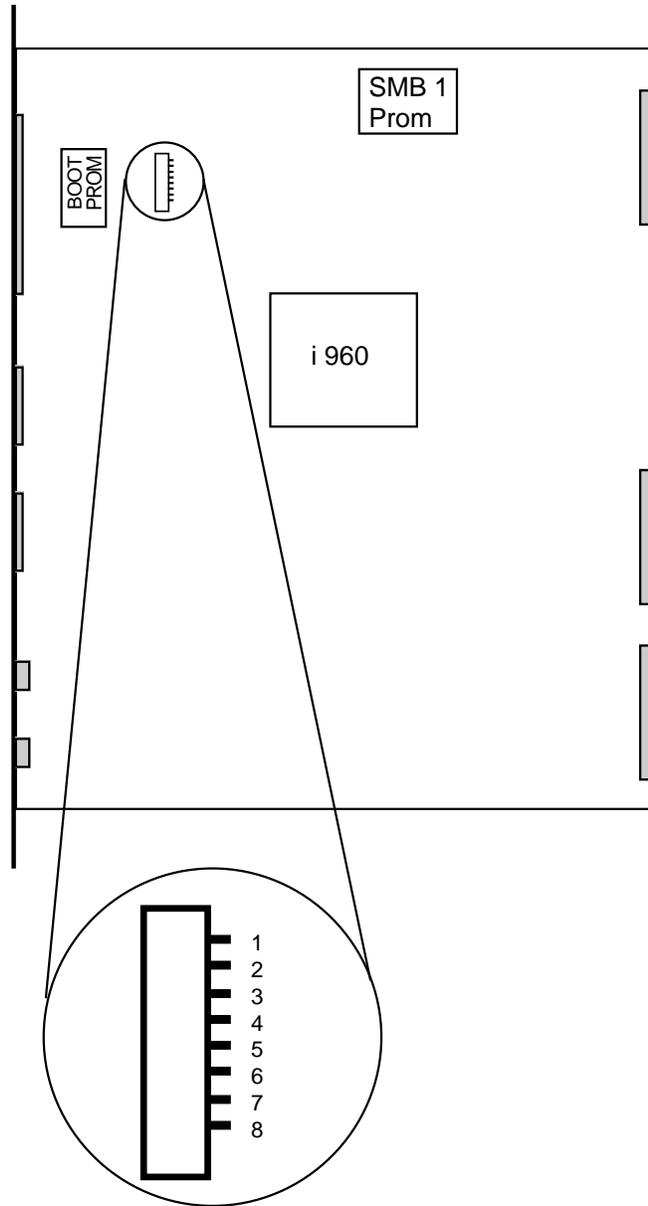


Figure 2-5. 9E312-12 Module DIP Switch location

See the **Cautions** at the end of this table.

Table 2-2. Function of DIP Switch

Switch	Function	Description
8	Clear Password¹	This module stores user entered passwords in NVRAM (Nonvolatile random access memory). To clear these passwords, toggle this switch and then reset the module's processor. Once the module resets, factory default passwords are placed in NVRAM. You can use these default passwords or, if desired, enter new passwords. To enter new passwords, refer to the Module Local Management User's Guide.
7	Clear NVRAM²	This module stores user entered parameters such as IP addresses, subnet masks, default gateway, default interface, SNMP traps, bridge configurations and module specific configurations in NVRAM. To clear these parameters toggle this switch and then reset the module's processor. Once the module resets, factory default parameters are placed in NVRAM. You can use the default parameters or, if desired, enter new parameters. To enter new parameters, refer to the Module Local Management User's Guide.
6	Force BOOTP Download	This module uses BOOTP (Boot Strap Protocol) to download new versions of the image file into Flash Memory. This procedure forces image files to be downloaded from the PC or Workstation, configured to act as the BOOTP server, connected to the EPIM port in the Environmental Module.
5	Reserved	For Factory Use Only
4	Reserved	For Factory Use Only
3	Reserved	For Factory Use Only
2	Reserved	For Factory Use Only
1	Reserved	For Factory Use Only



1. **Caution:** Do not toggle Switch 8 unless you intend to reset the user configured passwords to the factory default settings.
2. **Caution:** Do not toggle Switch 7 unless you intend to reset the user parameters to the factory default settings.

Operation

The 9E312-12 module is a thirteen port device; twelve front panel ports, each represents a separate Ethernet collision domain and one port connected to INB1.

As shown in Figure 3-1, Ethernet Network Interface Blocks (ENIBs) convert data packets received from any front panel port into a canonical frame format before forwarding to the Fast Packet Switch (FPS), while the Internal Network Bus Network Interface Block (INB NIB) converts data packets received from the INB into a canonical format before forwarding to the (FPS). All data packets destined for a front panel port, the INB, or i960 are converted into the canonical format before forwarding to the FPS. Network Interface Blocks (NIBs) check for valid data packets entering the system. If an errored data packet is found, the FPS flags the error and does not forward the errored data packet to any outbound ports. Once in this common format, the FPS decides from header information the port destination of data packets. Data packets are then converted from the canonical format to the proper format for the interface destination whether it is a front panel port, or connection to the INB.

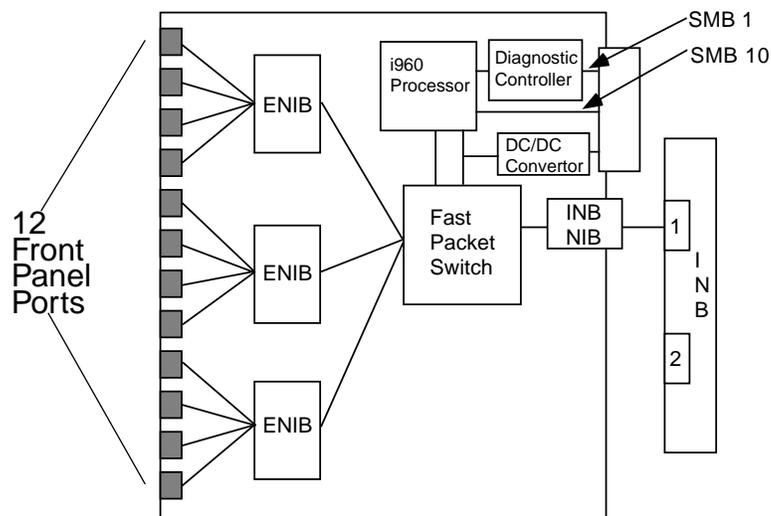


Figure 3-1. Packet Flow

ENIB

The Ethernet Network Interface Block (ENIB) converts Ethernet data packets received through front panel ports into a common canonical format that allows the Fast Packet Switching Engine to determine the proper destination port. The ENIB also converts data packets from the common canonical format back to Ethernet data packets for transmission out front panel ports.

Fast Packet Switch

The Fast Packet Switch (FPS) is a hardware based switch design that is the key building block of the MMAC-Plus. All filtering/forwarding decisions are made in hardware as opposed to software as in traditional bridges. This custom hardware allows the FPS to process over 150K frames per second. The FPS is designed to support up to 64 ports that are shared between the host processor, the INB backplane, and LAN/WAN interfaces on the front panel of MMAC-Plus modules. The FPS can operate in two modes; as a traditional bridge or as a SecureFast Packet Switch (SFPS). When operating in bridge mode, it makes filtering/forwarding decisions based on Destination Address (DA), with standard IEEE 802.1d learning. When operating in SFPS mode, all filtering/forwarding decisions are made based on a DA-SA pair and its receive port. These DA-SA pairs with the associated receive port are programmed into the switch using Cabletron's Automated Connection Management System (ACMS). This provides the network administrator with the ultimate network security without the performance degradation found when using routers or bridges with special filtering capabilities. The MMAC-Plus hub supports modules operating in bridge mode and SFPS mode simultaneously providing security when/where needed and ease of configuration where security is not required.

i960 Host

The i960 host provides the SNMP protocol stacks, to support industry standard MIBs. Additionally, Cabletron enterprise extension MIBs are supported for each media type. Advanced management services, such as the Distributed LAN Monitor, telnet and network address to MAC address mapping, are also provided by the i960 host.

The Host engine sends and receives packets via the CPU FPS Interface. This allows the bridge to perform spanning tree protocol and other bridging functions. The SMB Interfaces provide communication to the Host Engine for management functions.

INB NIB

Each module that attaches to the Internal Network Bus (INB) has an INB Network Interface Block (NIB). The INB NIB converts canonical frames to fixed length data blocks for transmission onto the INB. For data blocks received from the INB, the INB NIB reassembles the data blocks received from the INB back into canonical frames for transmission to the Fast Packet Switch (FPS) then from the FPS to the front panel ports.

System Management Buses

There are two management channels within the MMAC-Plus system: the SMB-1 and the SMB-10. These buses provide out-of-band management and inter-module management communication.

SMB-1 Bus

The SMB-1 is a 1Mbs management bus located within the MMAC-Plus. This bus is utilized by all diagnostic controllers in the system including connectivity modules, power supply modules and the environmental module. The SMB-1 transports inter-chassis information between system components, such as power and environmental information, as well as diagnostic messages. Periodic loop-back tests are performed by all modules which share this bus to ensure the validity of SMB-1. In the event a failure is detected on SMB-1, the SMB-10 may be used as an alternate communication channel.

SMB-10 Bus

The SMB-10 is a 10Mbs management bus located within the MMAC-Plus. This bus is used for inter-chassis communication of modules as well as serving as an out-of-band management channel into the MMAC-Plus. The SMB-10 is externalized from the chassis via an optional Ethernet Port Interface Module (EPIM) located on the front of the Environmental Module. Through an EPIM connection, full SNMP management of the MMAC-Plus is available out-of-band from user data. Modules which share the SMB-10 bus periodically send out loop-back packets to ensure the validity of SMB-10. If a fault is detected on the SMB-10, the SMB-1 is used by the modules as an alternate communication channel.

System Diagnostic Controller

This diagnostic controller is composed of a Z-80 microprocessor and its supporting logic. The diagnostic controller is designed to control the power-up sequencing of modules, monitor the 9E312-12 input and output power parameters, keep watch over the main host processor, monitor the temperature,

and control the SMB LANVIEW diagnostic LEDs. Although the system diagnostic controller and the main host processor can operate independently of each other if needed, they exchange information about each others status and overall module condition. The information gathered by the diagnostic controller is available to the network manager via local/remote management and the LCD located on the environment module. The 9E312-12 is designed to continue functioning in the event of a diagnostic controller fault.

DC/DC Converter

The DC/DC converter converts the 48 VDC on the system power bus to the necessary operating voltages for its host network services module. The diagnostic controller monitors and controls the operation of the DC/DC converter.

INB Interface

The INB Backplane is designed to transport fixed length data blocks between modules in the MMAC-Plus using a Time Division Multiplexing (TDM) design. The MMAC-Plus INB bus delivers 2.0 Gbs of true data bandwidth with all control and management communication being serviced on the 8 bit out-of-band bus. The INB can time slice its bandwidth using one of three methods. The default method is standard TDM round-robin bandwidth arbitration, the second method is for modules to reserve a specific amount of bandwidth using MONARCH, Cabletron's INB Bandwidth Arbitrator, the third method permits the lowest slot number to use any bandwidth not used by the previous two methods.

LANVIEW LEDs

The front panel LANVIEW LEDs indicate the status of the module and may be used as an aid in trouble shooting. Shown in Figure 4-1 are the LANVIEW LEDs of the 9E312-12 module.

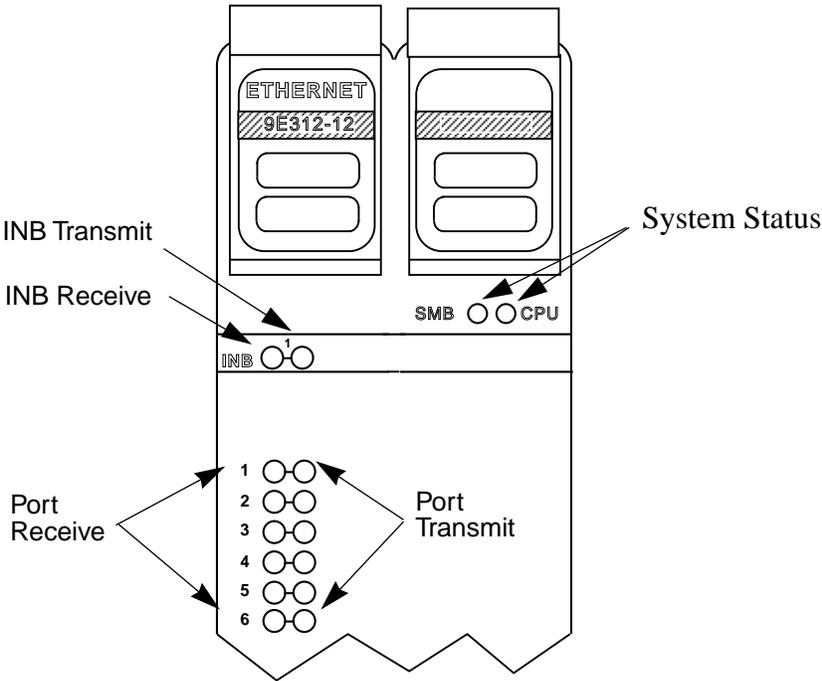


Figure 4-1. The LANVIEW LEDs

The function of the two System Status LEDs, System Management Bus (SMB) and CPU (Central Processing Unit), are listed in Table 4-1.

Table 4-1. System Status (SMB and CPU) LEDs

LED Color	State	Description
Green	Functional	Fully operational.
Yellow	Testing	Normal, internal diagnostic testing being done.
Yellow (Flashing)	Crippled	Not fully operational (i.e., one bad port).
Yellow / Green	Booting	Blinks yellow and green while booting.
Red	Reset	Normal power-up reset.
Red (Flashing)	Failed	Fatal error has occurred.
Off	Power off	Module powered off.

The function of the INB Receive LEDs are listed in Table 4-3

Table 4-2. INB Receive LEDs

LED Color	State
Green	Link, no activity, port enabled
Yellow (Flashing)	Link, activity, port enabled (Flashing to steady on indicates rate.)
Red	No link, port disabled
Red (Flashing)	Link, port disabled
Off	No link, no activity, port enabled

The function of the INB Transmit LEDs are listed in Table 4-3.

Table 4-3. INB Transmit LEDs

LED Color	State
Green (Flashing)	Activity, port enabled (Flashing to steady on indicates rate.)
Yellow (Flashing)	Port in standby state
Red	Port disabled
Red (Flashing)	FAULT or Error (Flashing to steady on indicates rate.)
Off	No activity, port enabled

The function of the Port Receive LEDs are listed in Table 4-4.

Table 4-4. Port Receive LEDs

LED Color	State
Green	Link, no activity, port enabled
Yellow (Flashing)	Link, activity, port enabled, (Flashing to steady on indicates rate.)
Off	No link, port disabled
Green (Flashing)	Link, port disabled

The function of the Port Transmit LEDs are listed in Table 4-3.

Table 4-5. Port Transmit LEDs

LED Color	State
Green (Flashing)	Activity, port enabled (Flashing to steady on indicates rate.)
Yellow (Flashing)	Port in standby state
Red (Flashing)	Error (collision) (Flashing to steady on indicates rate.)
Off	No activity, port enabled

Specifications

Technical Specifications

CPU:

Intel i960 RISC based microprocessor

Memory:

4 Meg. Local RAM (expandable to 12 Meg.)
2 Meg. Flash Memory (expandable to 16 Meg.)
2 Meg. Packet RAM

Standards:

IEEE 802.1D
IEEE 802.3i 10 Base-T

Network Interfaces:

RJ-45 Connectors

Safety



It is the responsibility of the person who sells the system to which the module will be a part to ensure that the total system meets allowed limits of conducted and radiated emissions.

This equipment meets:

The safety requirements of:

- UL 1950
- CSA C22.2 No. 950
- EN 60950
- IEC 950

The EMI requirements of:

- FCC Part 15 Class A
- EN 55022 Class A
- VCCI Class I

The EMC requirements of:

- EN 50082-1
- IEC 801-2 ESD
- IEC 801-3 Radiated susceptibility
- IEC 801-4 EFT

Service

MTBF (MHBK-217E)	>200,000 hrs.
MTTR	<0.5 hr.

Physical

Dimensions:

35.0 D x 44.0 H x 6.0 W centimeters
(13.8 D x 17.4 H x 2.4 W inches)

Weight:

Unit:	2.7kgs. (6lbs.)
Shipping:	3.6kgs. (8lbs.)

Environment:

Operating Temperature	5 to 40° C
Storage Temperature	-30 to 90° C
Relative Humidity	5% to 95% non-condensing