

MERLIN  
MAGIX™

# **Integrated Network Access (INA) Module Installation and Configuration Guide**

Lucent Technologies

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## *Notice*

Every effort has been made to ensure that the information in this guide is complete and accurate at the time of printing. Information, however, is subject to change.

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## *Federal Communications Commission Statement*

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense. For further FCC information, see Appendix A, "Customer Support Information," in *System Programming*.

## *Canadian Department of Communications (DOC) Interference Information*

This digital apparatus does not exceed the Class A limits for radio noise emissions set out in the radio interference regulations of the Canadian Department of Communications.

Le Présent Appareil Numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

## *Year 2000 Compliance*

The MERLIN MAGIX Integrated System is certified to be Year 2000 compliant. Additional information on this certification, and other issues regarding Year 2000 compliance, is available online at <http://www.lucent.com/enterprise/sig/yr2000>.

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# *Safety Instructions*

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## ***Important Safety Instructions* —SAVE THESE INSTRUCTIONS**

To reduce the risk of fire, electrical shock, and injury to persons, follow these basic safety precautions when installing telephone equipment:

- Read and understand all instructions.
- Follow all warnings and instructions marked on or packed with the product.
- Never install telephone wiring during a lightning storm.
- Never install a telephone jack in a wet location unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone wiring has been disconnected at the network interface.
- Use only Lucent Technologies-manufactured MERLIN MAGIX™ Integrated System circuit modules, carrier assemblies, and power units in the MERLIN MAGIX Integrated System control unit.
- Use only Lucent Technologies-recommended or approved MERLIN MAGIX Integrated System accessories.
- Do not install this product near water—for example, in a wet basement location.
- Do not overload wall outlets, as this can result in the risk of fire or electrical shock.
- The MERLIN MAGIX Integrated System requires a supplementary ground.
- Slots and openings in the module housings are provided for ventilation. To protect this equipment from overheating, do not block these openings.
- Never push objects of any kind into this product through module openings or expansion slots, as they may touch dangerous voltage points or short out parts, which could result in a risk of fire or electrical shock. Never spill liquid of any kind on this product.
- Unplug the product from the wall outlet before cleaning. Use a damp cloth for cleaning. Do not use cleaners or aerosol cleaners.
- Do not operate telephones if chemical gas leakage is suspected in the area. Use telephones located in some other safe area to report the trouble.



# About This Guide

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The *MERLIN MAGIX Integrated Network Access (INA) Installation and Configuration Guide* provides installation and configuration instructions for the MERLIN MAGIX Integrated System (IS) Integrated Network Access (INA) module. The routing functions of the module are based on Lucent Technology's PortMaster® series of products. The operating software for the module is the PortMaster ComOS® operating system.

The operating software for the router is the PortMaster ComOS release 4.1.5 and later releases.

## Audience

This guide is designed to be used by qualified system administrators, network managers and qualified MERLIN MAGIX vendors and installers. Knowledge of basic networking concepts is required to successfully install the INA module.

## Related Documentation

The following MERLIN MAGIX and PortMaster documentation provides additional information about those products.

### *MERLIN MAGIX Documentation*

The documents listed in the following table are part of the MERLIN MAGIX documentation set. To order, contact the Lucent Technologies BCS Publications Center by calling 1 800 457-1235 within the continental United States..

Document No.	Title
555-710-100	<i>Customer Documentation Package:</i> Consists of paper versions of the <i>System Manager's Quick Reference</i> , the <i>Feature Reference</i> , and <i>System Programming</i>
555-710-110	<i>Feature Reference</i>
555-710-111	<i>System Programming</i>
555-670-112	MERLIN LEGEND® Communications System, Release 7.0, System Planning
555-710-112	System Planning Supplement
555-710-113	<i>System Planning Forms</i>
555-710-119	<i>System Manager's Quick Reference</i>

<b>Document No.</b>	<b>Title</b>
555-610-150	<i>MERLIN LEGEND<sup>&lt;Superscript&gt;®</sup> Communications System, Release 6.1, Network Reference</i>
555-710-800	<i>Customer Reference CD-ROM:</i>  <i>Consists of the System Manager's Quick Reference, the Feature Reference, System Programming, and the Network Reference</i>
555-710-123 (U.S. English)	<i>4400/4400D Telephone User's Guide</i>
555-710-123FRC (Canadian French)	<i>4400/4400D Telephone User's Guide</i>
555-710-127 (U.S. English)	<i>4406D+, 4412D+, 4424D+, and 4424LD+ Telephone User's Guide</i>
555-710-127FRC (Canadian French)	<i>4406D+, 4412D+, 4424D+, and 4424LD+ Telephone User's Guide</i>
555-660-122	<i>MLX Display Telephone User's Guide</i>
555-630-150	<i>MLX- 5D<sup>®</sup>, MLX-10D<sup>®</sup> and MLX-10DP<sup>®</sup> Display Telephone Tray Cards (5 cards)</i>
555-630-152	<i>MLX-28D<sup>®</sup> and MLX-20L<sup>®</sup> Telephone Tray Cards (5 cards)</i>
555-660-124	<i>MLX-5 and MLX-10<sup>®</sup> Nondisplay Telephone User's Guide</i>
555-630-151	<i>MLX-5 and MLX-10 Nondisplay Telephone Tray Cards (6 cards)</i>
555-630-155	<i>MLX-16DP<sup>®</sup> Display Telephone Tray Cards (5 cards)</i>
555-670-151	<i>MLS and ETR Telephone Tray Cards</i>
555-670-152	<i>MLS and ETR Telephone Tray Cards (16 cards)</i>
555-660-126	<i>Single-Line Telephones User's Guide</i>
555-660-138	<i>MDC and MDW Telephones User's Guide</i>
555-710-134	<i>Digital Direct Line Console Operator's Guide</i>
555-710-136	<i>Digital Queued Call Console Operator's Guide</i>
555-661-130	<i>Calling Group Supervisor and Service Observer User Guide</i>
555-650-105	<i>Data and Video Reference</i>
555-661-140	<i>MERLIN LEGEND Communications System, Release 6.1, Installation, SPM, Maintenance and Troubleshooting</i>

Document No.	Title
555-710-142	<i>Installation, SPM, Maintenance and Troubleshooting Supplement</i>
555-710-116	<i>Pocket Reference</i>
555-025-600	<i>BCS Products Security Handbook</i>

## *PortMaster Documentation*

The following manuals are available from Lucent. Paper copies of these manuals can be ordered directly from Lucent.

The manuals are also provided as PDF and PostScript files on the *INA Module Software CD* shipped with your module.

In addition, you can download PortMaster information and documentation from **<http://www.livingston.com>**.

- *PMVision User's Guide*

This guide provides complete instructions for installing, configuring, and using the PMVision™ graphical user's interface (GUI) to ComOS.

- *PortMaster Command Line Reference*

This reference provides the complete description and syntax of each command in the ComOS command set.

- *PortMaster Configuration Guide*

This guide provides a comprehensive overview of networking and configuration for PortMaster products.

- *PortMaster Routing Guide*

This guide describes routing protocols supported by PortMaster products, and how to use them for a wide range of routing applications.

- *PortMaster Troubleshooting Guide*

This guide can be used to identify and solve software and hardware problems in the PortMaster family of products.

## *Additional References*

Additional references to Internet Requests for Comments (RFCs) and a list of useful reference books can be found in the *PortMaster Configuration Guide*. A copy of the guide is included on the *INA Module Software CDROM*.

## Document Conventions

The following conventions are used in this guide:

Convention	Use	Examples
<b>Bold font</b>	Indicates a user entry—a command, menu option, button, or key—or the name of a file, directory, or utility, except in code samples.	<ul style="list-style-type: none"> <li>Enter <b>version</b> to display the version number.</li> <li>Press <b>Enter</b>.</li> <li>Open the <b>permit_list</b> file.</li> </ul>
<i>Italic font</i>	Identifies a command-line placeholder. Replace with a real name or value.	<ul style="list-style-type: none"> <li><b>set</b> <i>Ether0</i> <b>address</b> <i>Ipaddress</i></li> <li>Replace <i>Area</i> with the name of the OSPF area.</li> </ul>
Square brackets ([ ])	Enclose optional keywords and values in command syntax.	<ul style="list-style-type: none"> <li><b>set</b> <b>nameserver</b> [2] <i>Ipaddress</i></li> <li><b>set</b> <i>S0</i> <b>destination</b> <i>Ipaddress</i> [<i>Ipmask</i>]</li> </ul>
Curly braces ({ })	Enclose a required choice between keywords and/or values in command syntax.	<b>set</b> <b>syslog</b> <i>Logtype</i> {[ <b>disabled</b> ] [ <i>Facility</i> . <i>Priority</i> ]}
Vertical bar ( )	Separates two or more possible options in command syntax.	<ul style="list-style-type: none"> <li><b>set</b> <i>S0 W1</i> <b>ospf</b> <b>on off</b></li> <li><b>set</b> <i>S0</i> <b>host default prompt</b> <i>Ipaddress</i></li> </ul>

## Document Advisories



**Note** – means take note. Notes contain information of importance or special interest.



**Caution** – means be careful. You might do something—or fail to do something—that results in equipment failure or loss of data.



**Warning** – means danger. You might do something—or fail to do something—that results in personal injury or equipment damage.

## ***Limited Warranty***

Lucent Technologies provides a limited warranty on the INA module. Refer to “Limited Warranty and Limitation of Liability” in Appendix A, “Customer Support Information,” of *System Programming* manual (555-710-111).

## ***Technical Support***

**In the USA Only.** Lucent Technologies provides a toll-free customer Helpline (1-800-628-2888) 24 hours a day. If you need assistance when installing, programming, or using your system, call the Helpline or your Lucent Technologies representative. Consultation charges may apply. Lucent recommends that customers first contact their dealer for support.

**USA Dealers and Value-Added Resellers (VARs).** Call 877-295-0099.

**Outside the USA.** If you need assistance when installing, programming, or using your system, contact your Lucent Technologies representative.

## ***INA Module Training Courses***

Lucent Global Learning Solutions (GLS) offers training specifically for the INA module. For course information, schedules, and pricing visit the Lucent GLS site at <http://training.gbcsset.lucent.com>.

Information on training for Business Partners can be found at <http://ddm.lucenttraining.com/>.

## ***PortMaster Training Courses***

The INA module is based on Lucent’s PortMaster series of products. Users planning advanced network applications of their INA module can take advantage of hands-on, technical training courses on PortMaster products and their applications from Lucent INS. For course information, schedules, and pricing, visit the Lucent website at <http://www.livingston.com/tech/training/>.

## ***Subscribing to PortMaster Mailing Lists***

Advanced INA module users can subscribe to the following Internet mailing lists for PortMaster users:

- **portmaster-users**—a discussion of general and specific PortMaster issues, including configuration and troubleshooting suggestions. To subscribe, send email to [majordomo@livingston.com](mailto:majordomo@livingston.com) with **subscribe portmaster-users** in the body of the message.

The mailing list is also available in a daily digest format. To receive the digest, send email to [majordomo@livingston.com](mailto:majordomo@livingston.com) with **subscribe portmaster-users-digest** in the body of the message.

- **portmaster-radius**—a discussion of general and specific RADIUS issues, including configuration and troubleshooting suggestions. To subscribe, send email to **majordomo@livingston.com** with **subscribe portmaster-radius** in the body of the message.

The mailing list is also available in a daily digest format. To receive the digest, send email to **majordomo@livingston.com** with **subscribe portmaster-radius-digest** in the body of the message.

- **portmaster-announce**—announcements of new PortMaster products and software releases. To subscribe, send email to **majordomo@livingston.com** with **subscribe portmaster-announce** in the body of the message. All announcements to this list also go to the **portmaster-users** list. You do not need to subscribe to both lists.
- **tech-bulletin@livingston.com**—a moderated push list featuring technical notes, web links, and information about the latest code and beta releases sent on a weekly basis, as well as periodic technical updates. To subscribe, complete the form at **<http://www.livingston.com/tech/bulletin/index.html>**



This chapter introduces the MERLIN Integrated Network Access (INA) module and provides an overview of its installation and configuration. The following topics are discussed:

- “INA Module Description” on page 1-1
- “INA Administration” on page 1-1
- “INA Front Panel” on page 1-2
- “Installation and Configuration Steps” on page 1-4

## ***INA Module Description***

The MERLIN Integrated Network Access (INA) module (board code 100R) combines the voice functions of the MERLIN 100D module with data routing and a channel service unit (CSU)/data service unit (DSU). Using a T1 interface or an ISDN Primary Rate Interface (PRI), the INA module gives the MERLIN MAGIX™ Integrated System fast access to the Internet or a remote network without having to use an external CSU.

Data to and from the Internet or remote network is carried over a T1/PRI that is shared for both voice and data services. The DSU functionality of the INA module supports static allocation of the T1/PRI bandwidth to either voice channels or data channels:

- **Voice.** Channels allocated by the switch for voice services are available to the MERLIN MAGIX and can be used on a channel-by-channel basis to support incoming or outgoing calls.
- **Data.** Channels allocated by the switch to the router provide a high-speed data pipe for dedicated Internet or remote network access.

Routing functions are handled by an additional CPU that provides 32MB of dedicated RAM and special nonvolatile (Flash) RAM. The nonvolatile RAM contains router configuration data and operating firmware called ComOS. The module includes a 10BaseT Ethernet port to connect to the customer's network.

## ***INA Administration***

To manage the INA module, you perform administrative tasks using both MERLIN MAGIX administration and router administration. Several tools for router administration are explained later in this guide. **WinSPM** can be used for both MERLIN MAGIX administration and router administration through the ComOS command line interface.

## ***On the MERLIN MAGIX***

For a typical application, you do the following:

1. **Arrange with your telecommunications service provider (telco) for a T1/PRI line.**
2. **Have the telco provision the line so that some channels are assigned to switched voice calls and the rest are assigned to one or more point-to-point data connections.**
3. **Use the system administration console to assign the voice channels to the MERLIN MAGIX switch and the data channels to the INA module router.**

## *On the INA Module*

Use any of the following tools to access ComOS and set up and administer the INA module's routing and data functions:

- **INAWizard.** The INAWizard performs the initial configuration of the module. The program provides a step-by-step series of simple forms that allow easy entry of the basic configuration settings. The INAWizard operates on most platforms running Microsoft Windows 95/98, or Windows NT 4.0 and later. The wizard accesses the INA module through a network connection to the module's Ethernet interface. See Chapter 4, "Using the INAWizard," for more information.
- **Command Line Interface.** The command line interface provides full access and control of all ComOS functions through a direct connection to the C0 port on the front of the INA module, from a terminal or a PC or workstation used as a terminal. Once an IP address has been assigned to the module's Ethernet port, you can access the command line interface via Telnet through a network connection to the port. See Chapter 5, "Using the Command Line Interface," for more information.
- **PMVision™.** This GUI based program can be used instead of the CLI to control and configure the INA module. It can also be used to backup and restore the entire INA configuration. PMVision operates on the same platforms as the INAWizard from any workstation on the network. See Chapter 6, "Using PMVision," for more information.

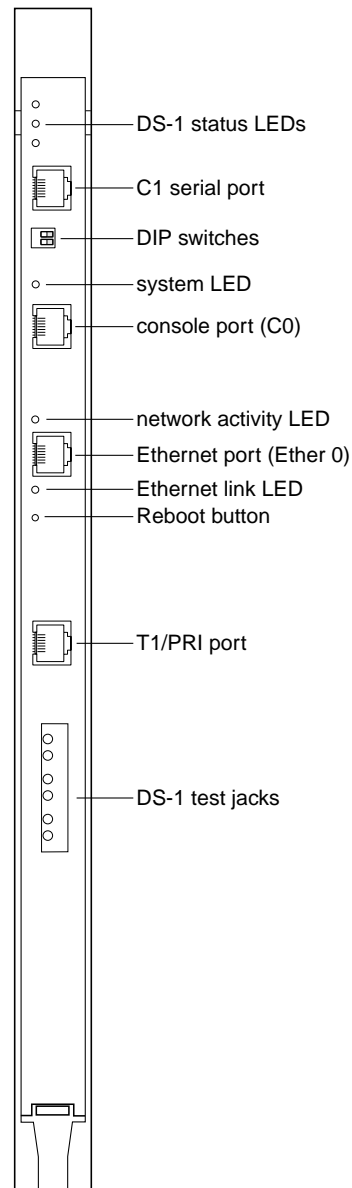
## *INA Front Panel*

The INA module (Figure 1-1) provides the following ports and LED indicators.

**DS-1 Status LEDs.** The red, green, and yellow LEDs indicate the status of the T1/PRI line connected to the module. See "T1/PRI LEDs" on page 3-4.

**C1 Serial Port.** This RJ-45 connector is used to connect the INA module to the MERLIN MAGIX system control unit and allows an up to 2400-baud dial-up connection to the INA module's command line interface. See "Connect a Serial Passthrough Cable" on page 3-1.

Figure 1-1 INA Module Front Panel



1210-001

**DIP Switches.** DIP switch 1 controls the configuration of serial port C0. DIP switch 2 controls ComOS boot behavior. See “Set DIP Switches” on page 3-2.

**System LED.** This LED indicates the status of the routing hardware and the ComOS. One blink every 5 seconds indicates normal operation. See “System LED” on page 3-5.

**C0 Serial Port.** This RJ-45 connector is used to connect a PC or terminal to act as a console. The console is used to access the ComOS command line interface. See “Connect a Console (Optional)” on page 3-3.

**Network Activity LED.** This amber LED blinks to indicate network traffic. See “Ethernet LEDs” on page 3-6.

**Ethernet Port.** This RJ-45 connector provides a 10BaseT Ethernet connection. See “Connect an Ethernet Cable” on page 3-4.

**Ethernet Link LED.** This green LED indicates link integrity to a 10BaseT hub. See “Ethernet LEDs” on page 3-6.

**Reboot Button.** This button resets the router hardware and reboots ComOS. It has no effect on MERLIN MAGIX voice operation. You will need a thin object such as a straightened paper clip to activate this recessed switch.

**T1/PRI Connection.** This RJ-45 connector connects the T1/PRI line. See “Connect a T1/PRI Cable” on page 3-3.

**DS-1 Test Jacks.** There are three pairs of jacks for DS-1 troubleshooting. See “Using the DS-1 Test Jacks” on page A-5.

## ***Installation and Configuration Steps***

### **1. Collect information about your T1 or PRI line.**

See “T1/PRI Provisioning” on page 2-1 for a preview of the values you need.

### **2. Collect information about the network and routing configuration.**

See “Network Settings” on page 2-2 for a preview of the values you need.

### **3. Install the INA module in the MERLIN MAGIX system.**

See “Install the INA Module in a Carrier” on page 3-1.

### **4. Configure the T1 or PRI line using the MERLIN MAGIX console.**

See “Set Up T1/PRI on the MERLIN MAGIX” on page 2-1.

### **5. Assign data channels to the router using the MERLIN MAGIX console.**

See “Assign T1/PRI Channels” on page 2-2.

### **6. Connect the INA module front panel cables.**

See “Connect Cables” on page 3-1.

### **7. Configure the INA module.**

See one of the following:

- “Using the INAWizard” on page 4-1.
- “Using the Command Line Interface” on page 5-1.
- “Using PMVision” on page 6-1.

To properly configure your INA module, you must gather all the technical information needed. You must also assign T1/PRI channels using the MERLIN MAGIX administration console before using the INA module.

Before starting the installation of your module, be sure that you have all needed information from the following categories:

- “T1/PRI Provisioning” on page 2-1
- “Network Settings” on page 2-2

## T1/PRI Provisioning

Table 2-1 illustrates the T1/PRI information needed to set up the data networking capabilities of the INA module. Make sure that you have obtained this information from your telco provider before beginning the configuration process. See Appendix C, “MERLIN MAGIX Administration” for more information.

Table 2-1 Basic T1/PRI Provisioning Information.

Setting	Notes	Example
DSU channel selection	DSU Channel Selection is used to assign data channels to the INA module. The number of channels can range from 1 to 24.	<i>Channel 20, 21, 22, 23</i>
Suppression	Bipolar 8-zero substitution (B8ZS) zero code suppression <b>must</b> be used in all applications of the INA module. For PRI configurations, <b>only B8ZS zero code</b> suppression is supported.	<i>B8ZS</i>
Activate or Deactivate the CSU	The INA module supports an internal CSU.	<i>Activate</i>

## Set Up T1/PRI on the MERLIN MAGIX

Table 2-1 lists only the T1/PRI settings that are related to the data networking capabilities of the INA module. Additional settings are required to fully configure the INA module to support voice services. Examples include B channel group assignments

for PRI configurations and channel signaling types for T1 configurations. You plan for and implement these additional settings as you do for a 100D module. See the *System Programming* manual (555-710-111).

## Assign T1/PRI Channels

The INA module can accommodate up to 23 PRI channels or 24 T1 channels. When the module is first installed, **no** channels are assigned to the router.

For PRI configurations, you can assign a channel to the router only if the channel is not used in a B channel group or a line pool on the switch. For T1 configurations, you can assign a channel to the router only if the channel is set to **Unequipped** from a switch perspective. You determine these channel settings as you do for a 100D module. See the *System Programming* manual (555-710-111) for more information.

To assign the desired data channels to the router:

1. **Use the following sequence on your MERLIN MAGIX system programming console:**

**Menu:**

**SysProg→Start→LinesTrunks→Mbre→Mbre→CSU/DSU→Slot#→Enter→ChannelSel→Channel#→Enter**

2. **Repeat the sequence until all your T1/PRI data channels are assigned.**
3. **Reboot the router so that it recognizes the change in channel assignments.**

You can enter the **reboot** command at the command line interface, or press the reboot button on the INA module.

## Network Settings

Table 2-2 lists the basic network settings needed to configure the INA module. These are listed in the order requested by the INAWizard. See the following for more information:

- For INAWizard configuration, see the INAWizard online help.
- For command line interface configuration, see Chapter 5, “Using the Command Line Interface,” and the *PortMaster Command Line Reference*.
- For PMVision configuration, see Chapter 6, “Using PMVision.”

**WAN Port.** After the T1/PRI data channels are assigned to the router, **all** data channels are configured as **one** wide area network (WAN) port by ComOS. If your data channels are used to form multiple WAN ports, you must set up additional WAN ports.

**Additional WAN Ports.** You can set up these ports after completing the initial configuration. Use the command line interface or PMVision to set them up. The INAWizard **cannot be used** to set up these additional ports. See one of the following sections for additional configuration instructions:

- See “Set Up Additional WAN Ports” on page 5-6.

- See “Set Up Additional WAN Ports” on page 6-7.

Table 2-2 Basic Network Configuration Settings for the INA Module

Settings	Notes	Example
Ether0 address	IP address of the Ether0 port on the INA module.	<i>192.198.32.2</i>
Ether0 netmask		<i>255.255.255.0</i>
System name	Optional.	<i>Mysystem</i>
First data channel number assigned to the router	The data channel number determines the WAN port number, which is 1 (one) less than the data channel number. For example, if the first data channel number is 16, all subsequent channels are assigned to port W15.	<i>16</i>
Default gateway		<i>192.198.32.1</i>
Name service type	Optional. Select the Domain Name System (DNS) or Network Information Service (NIS).	<i>DNS</i>
Name server address	Optional.	<i>192.12.35.1</i>
WAN port address		<i>192.198.32.40</i>
Remote router address		<i>172.12.32.2</i>
Remote router netmask		<i>255.255.255.240</i>
Channel rate	This value is not handled by the INAWizard. Use the command line interface or PMVision to set this value. The default speed is 64Kbps. Almost all installations use this default value.	<i>56k or 64k</i>
Protocol	Point-to-Point Protocol (PPP) or Frame Relay.	<i>Frame</i>
Data link connection identifier (DLCI) list source	For Frame Relay connections only. Select Local Management Interface (LMI) or Annex-D, and/or manually enter a DLCI list.	<i>LMI</i>
DLCI keepalive value	For Frame Relay connections only. Change the 10-second default, if necessary, to match the value on the Frame Relay switch. Contact your telco for more information.	<i>20</i>

Table 2-2 Basic Network Configuration Settings for the INA Module (Continued)

Settings	Notes	Example
DLCI list	For Frame Relay connections for which you manually enter a list. Enter each DLCI number (1 to 1023), a colon (:), and the IP address of the router represented by the DLCI.	<i>16:172.26.131.37</i>
Dynamic Host Connection Protocol (DHCP) server address	If you use DHCP. Defaults to Ether0.	<i>192.198.32.17</i>
DHCP lease time	For DHCP dynamically assigned IP addresses. Enter hours and/or minutes. A 0 (zero) indicates an infinite time.	<i>8 hours</i>
DHCP static binding IP address(es) and corresponding media access control (MAC) address(es)	For DHCP statically assigned IP addresses. Enter each IP address and the 12-digit hexadecimal MAC address of the host to which it is assigned.	<i>192.198.32.33</i> <i>00:c0:d5:d4:da:2c</i>
DHCP address pool start address	For DHCP dynamically assigned IP addresses. Enter one address or the first in each address range.	<i>192.198.32.65</i>
DHCP address pool end address	Enter the last address in the range.	<i>192.198.32.127</i>
Network address translator (NAT) secure address and corresponding nonsecure address	If you use NAT static maps. Enter each secure internal (private) IP address and the nonsecure external (global) IP address to which you want it mapped.	<i>192.198.32.22</i> <i>172.18.1.1</i>
NAT base IP address	For a NAT dynamic address pool. Enter one nonsecure external (global) IP address or the first address in a range.	<i>192.198.32.2</i>
NAT pool size	For a NAT address pool range. Enter a number of IP addresses up to 64.	<i>64</i>



This chapter describes the steps needed to physically install and power up the INA MERLIN MAGIX system. The following topics are discussed.

- “Install the INA Module in a Carrier” on page 3-1
- “Connect Cables” on page 3-1
- “Observe LED Behavior” on page 3-4

### ***Install the INA Module in a Carrier***

Install the module in the MERLIN MAGIX carrier according to the directions found in Chapter 2 of the *MERLIN MAGIX Integrated System, Installation, SPM, and Maintenance and Troubleshooting Supplement* (555-661-140).

Turn on the MERLIN MAGIX system. Ensure that the system LED on the module’s front panel blinks off once every 5 seconds. (See “System LED” on page 3-5.) This behavior indicates that the module is properly operating and that ComOS has fully booted up. It may take up to 2 minutes for the INA module to reach this state after the power is turned on.

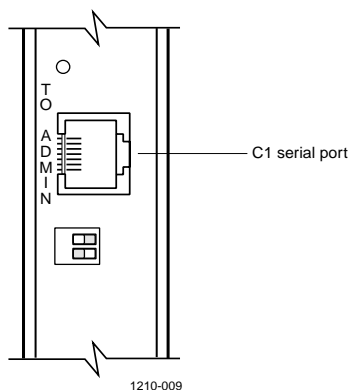
### ***Connect Cables***

The necessary cables must be connected to the INA module before you can proceed with the rest of the installation and configuration.

#### ***Connect a Serial Passthrough Cable***

Connect the supplied straight-through RJ-45 cable between the C1 port (Figure 3-1) on the INA module and the administration port (labeled ADMIN) on the MERLIN MAGIX processor module. This cable allows the user to connect to the INA command line interface by dialing in to the internal modem in the MERLIN MAGIX processor module.

Figure 3-1 C1 Serial Passthrough Port

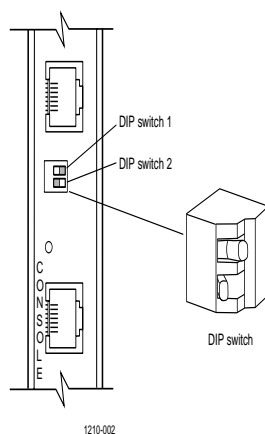


## Set DIP Switches

The DIP switches (Figure 3-2) must be set to the correct positions for the INA module to operate properly.

### 1. Set DIP switch 1 to the right.

Figure 3-2 DIP Switches



When DIP switch 1 is set to the right and the INA module is turned on, the console port is set to 9600bps, 8 data bits, 1 stop bit, no parity, and no flow control. This is the default setting and is used for connecting the C0 port to a console.

When DIP switch 1 is set to the left, the port settings can be controlled by ComOS. Use this setting for an external modem that is set up to provide access to the command line interface, for example.



**Note** – When you change the position of a DIP switch, you must restart the INA module for the change to take effect. To reboot, press the recessed reboot button on the front panel of the module. Pushing this button reboots the router software only and does not affect voice services.

### 2. Set DIP switch 2 to the left.

When DIP switch 2 is set to the left (Figure 3-2), and the INA module is turned on, the INA module boots (loads the ComOS software) from the internal nonvolatile RAM. This is the default setting for the module.

When DIP switch 2 is set to the right, and the INA module is turned on, the module boots from an external BOOTP and TFTP server. Use this setting only when serious hardware or software problems have occurred. You should only use this DIP switch setting under the direction of Lucent technical support personnel.

## *Connect a Console (Optional)*

You can connect a PC or terminal to the INA module's console port (Figure 3-3) to access the command line interface of ComOS.

*Figure 3-3* Console Port Connection

Follow these instructions to connect a PC or terminal:

- 1. If necessary, ensure that your PC or terminal has the same settings as the console port on the INA module.**

The settings are 9600 baud, 8 data bits, 1 stop bit, no parity, and no flow control.

- 2. Connect a console cable to the C0 port of your INA module and PC or terminal (Figure 3-3).**

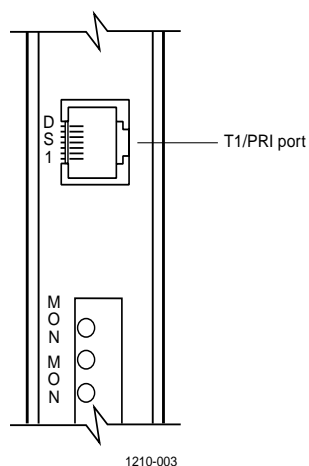
See "Console Cable" on page B-1.

- 3. Reboot the INA module by pressing the recessed reboot button. Verify that the login prompt appears.**

## *Connect a T1/PRI Cable*

Use a category 5 twisted pair cable, as specified by the EIA/TIA-568-B wiring standard, with an RJ-48C connector to connect to the T1/PRI line (Figure 3-4). See "T1/PRI Cable" on page B-2 for more information.

Figure 3-4 T1/PRI Connection

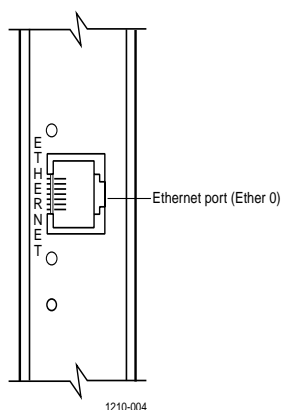


1210-003

## Connect an Ethernet Cable

Use a category 5 twisted pair cable, as specified by the EIA/TIA-568-B wiring standard, with an RJ-48C connector to connect the INA Ethernet connector (Figure 3-5) to the nearest network hub. See “Ethernet Interface” on page B-2 for more information.

Figure 3-5 Ether0 Connection



1210-004

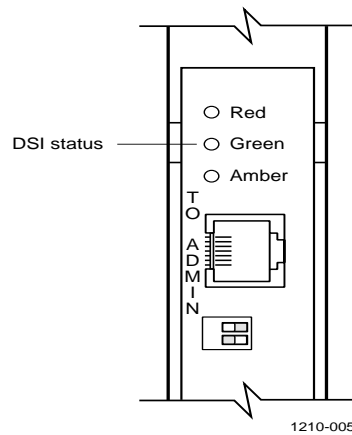
## Observe LED Behavior

Check the T1/PRI, system, and Ethernet LEDs to verify that the installed INA module is operating properly.

### T1/PRI LEDs

These LEDs (Figure 3-6) indicate the status of the T1/PRI line and operate in the same way as on a 100D module. Make sure they indicate that the T1/PRI line is operating properly.

Figure 3-6 T1/PRI (DS-1) LEDs

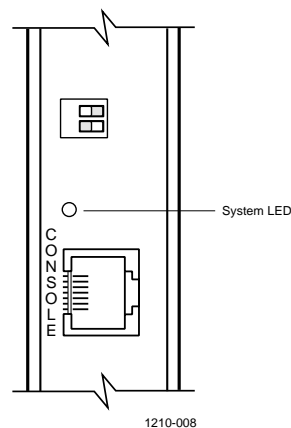


- Red illuminated indicates that there is an error condition on the line or that the INA module is in the standby mode. When in standby mode, the module is not operational for T1/PRI services. This LED stays illuminated for approximately 15 to 30 seconds when an active line is first connected.
- Green illuminated indicates that the INA module is in test mode.
- Amber illuminated indicates that one or more voice calls are currently active on the T1/PRI interface.

## System LED

This LED (Figure 3-7) operates as follows:

Figure 3-7 System LED



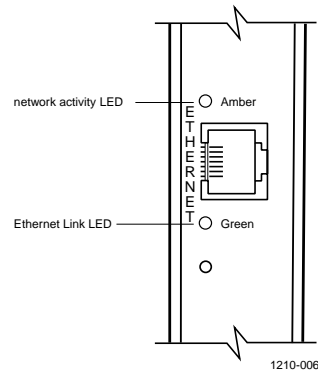
- During the initial hardware self-test the LED stays unlit.
- When the ComOS starts to boot up, the LED lights and remains on.
- When the system is fully operational, the LED remains on, blinking off once every 5 seconds.

After the module has been powered up and loading is complete, make sure that the LED is blinking off once every 5 seconds. The INA module takes about 20 seconds to reach this state.

## Ethernet LEDs

These LEDs (Figure 3-8) show the status of the Ethernet connection to the INA module.

Figure 3-8 Ethernet LEDs



- The green link LED is on when the module has link integrity to a 10BaseT hub, switch, or router. Make sure that this LED lights when a cable has been connected between the module and an Ethernet hub. If the LED does not light, check the cable itself and the network connections.
- The amber network activity led blinks to indicate Ethernet traffic. During heavy traffic, this LED might appear solid due to its rapid blinking. Depending on your network, you might not necessarily see much traffic.

The INAWizard program provides basic configuration settings for the INA module. The wizard uses a graphical user interface (GUI) to guide you step by step through the configuration process.

The program runs on platforms that use Microsoft Windows 95, Windows 98, or Windows NT 4.0 and later. A platform with a 486/DX-or-faster processor with 32 MB of RAM minimum is required. A processor with 48 megabytes RAM is recommended.

The INAWizard performs the initial configuration for new modules, including setting the IP address for the module's Ethernet port. The wizard can also be used to reconfigure modules that have already been set up.

This chapter discusses the following topics:

- “Install the Wizard” on page 4-1
- “Connect the Workstation to the INA Module” on page 4-1
- “Run the Wizard” on page 4-2

## ***Install the Wizard***

Install the INAWizard by running the program **inawizard\_install.exe**. The installation program can be found on the CD-ROM included with this guide. Follow the instructions in the resulting dialog boxes to complete the installation. Lucent recommends using the Java runtime engine that comes with the installation package, rather than any existing copy.

## ***Connect the Workstation to the INA Module***

For the wizard to work, an Ethernet connection between the workstation running the wizard and the module must exist. You can usually make the connection through your network, but you can use a free standing workstation and a crossover Ethernet cable instead.

### ***Over a LAN***

If the module is being configured for the first time and does not have an Ethernet address configured, the workstation running the INAWizard and the INA module itself must be on the same subnet. The wizard automatically identifies the INA module and sets the Ether0 address.

If the workstation is not on the same subnet, then the initial Ethernet configuration for the module must be set through a console connection and the command line interface. See “Connect a Console (Optional)” on page 3-3 and “Set the Ether0 Network Address” on page 5-3.





The ComOS commands can be used to configure the INA module directly through the ComOS command line interface. You access the command line interface through the console port C0 using a terminal or PC running a terminal emulator. Once the module has been connected to a network, the best way to access the command line interface is through a Telnet session from a network workstation.

This chapter shows the basic ComOS commands that are used to configure the INA module. Further details can be found in the *PortMaster Command Line Reference* and the *PortMaster Configuration Guide*.

The following configuration steps are discussed:

- “Connect a Console” on page 5-1
- “Log In” on page 5-2
- “Set the Administrative Password” on page 5-2
- “Set the Ether0 Network Address” on page 5-3
- “Set the System Name” on page 5-4
- “Set the Default Route Gateway” on page 5-4
- “Use Name Resolution (Optional)” on page 5-4
- “Configure the WAN Port” on page 5-5

Before configuring the INA module with the command line interface, make sure you have done the following:

- Assigned T1/PRI channels to the INA module. (See “Assign T1/PRI Channels” on page 2-2.)
- Collected all the information needed for your network. (See “Network Settings” on page 2-2.)

## ***Connect a Console***

There are three ways to establish a console session. You can use the console port, a Telnet session or use the MERLIN MAGIX internal modem and the **WinSPM** passthrough option.

### ***Using the C0 Console Port***

You can connect to the console port with a terminal or a PC workstation running a terminal emulation program. See “Connect a Console (Optional)” on page 3-3 for more details.

## *Using a Telnet Session*

Once the INA module has been connected to a network and an Ethernet address has been assigned, Telnet is the best way to establish a console session.

1. **Run a Telnet application from a network connected workstation.**
2. **Select the connect function, and enter the IP address assigned to the INA module's Ethernet port.**
3. **Press Enter if needed.**

A login prompt appears.

## *Using the Passthrough Serial Connection*

1. **Make sure that the serial passthrough cable has been connected to the INA module and the MERLN MAGIX processor module.**

See "Connect a Serial Passthrough Cable" on page 3-1.

2. **Use the MERLIN MAGIX WinSPM application on a PC workstation with a modem to dial up a connection to the MERLN MAGIX processor module.**

Connect to \*10 to access the modem.

3. **Enter your MERLIN MAGIX system administration password and select the WinSPM Passthrough option.**
4. **Press Enter to receive a login prompt to the command line interface of the router.**

## *Log In*

Follow these steps to log in to the INA module:

1. **At the login prompt, type !root and press Enter.**
2. **At the password prompt, press Enter—no password is needed for a first-time installation.**

login: !root

Password:

Command>

## *Set the Administrative Password*

The password is an ASCII-printable string of up to 16 characters used to access the INA module administrative features. Only a person with administrative access can change this password.

Enter the following commands to set the password:

```
Command> set password [Password]
```

```
Command> save all
```



**Caution** – Change the administrative password each time you give it to someone outside the organization for servicing.

## ***Set the Ether0 Network Address***

You can set an IP and IPX address on the INA module. Both IP and IPX routing protocols are enabled by default. Information on IPX settings can be found in the *PortMaster Configuration Guide* and the *PortMaster Command Line Reference*.

### ***Set the IP Address and Netmask***

The IP address identifies the port for IP Ethernet traffic. The default netmask (subnet mask) is 255.255.255.0. If your network is divided into subnets, enter the netmask that identifies how your network addresses are divided between the network portion and the host portion.

Use the following commands to set the IP address and netmask:

```
Command> set ether0 address Ipaddress
```

```
Command> set ether0 netmask Ipmask
```

```
Command> save all
```

### ***Set the Broadcast Address***

The broadcast address, constructed from the IP address and netmask of a specified Ethernet interface, is used by RIP to send information to other hosts on a local Ethernet network.

When you set a broadcast address for the Ethernet port on the INA module, all other hosts on the local Ethernet network, must be set to the same broadcast address.

Use these commands to set the broadcast address:

```
Command> set ether0 broadcast high|low
```

```
Command> save all
```

**high**—Use when the host part of the binary address is all 1s (ones)—such as 192.168.1.255. This is the most often used setting.

**low**—Use when the host part of the binary address is all 0s (zeros)—such as 192.168.1.0. This is the default setting.

## ***Set the System Name***

The system name identifies the INA module for Simple Network Management Protocol (SNMP) queries, IPX protocol routing, and Challenge Handshake Authentication Protocol (CHAP) authentication.

Use these commands to set the system name:

```
Command> set sysname String
```

```
Command> save all
```

The system name can have up to 16 characters. When the system name is set, it replaces the word **Command** in the prompt.

## ***Set the Default Route Gateway***

The default gateway address is the destination address to which the INA module sends the packet when its Te( )e11-6(ol)61 Tfys4.1(l)4.2(e s)-3.8( Defigur T) Nafa NaultawafiguryTf1.8073 -2.0

## Set the Name Service

The INA module supports either the NIS or the DNS. See the *PortMaster Configuration Guide* for more information on name services.

Use these commands to set the name service:

```
Command> set namesvc dns|nis
```

```
Command> save all
```

Once the name service is set, you must set the address of your NIS or DNS name server and enter the domain name of your network.

## Set the Name Server

The INA module supports RFC 1877, which allows remote hosts also supporting RFC 1877 to learn the name of a server through PPP negotiation. You must provide the IP address of the name server if you use a name service.

Use the following command to set the name server:

```
Command> set nameserver Ipaddress
```

```
Command> save all
```



**Note** – You can disable the use of a name service by setting the name server's IP address to 0.0.0.0.

## Set the Domain Name

The domain name is used for hostname resolution. If you are using DNS or NIS, you must set a domain name for your network.

```
Command> set domain String
```

# Configure the WAN Port

ComOS automatically creates a WAN port that makes the high-speed dedicated connection to the INA module. For example, if four PRI channels numbered 5, 6, 7, 8 have been assigned to the INA module, ComOS creates WAN port W4. With a data capacity of 4 x 64Kbps or 256Kbps.

The WAN port number assigned by ComOS is based on the lowest channel number used by the channel group minus one. For example, if T1/PRI channels 12, 13, 14, and 15 are assigned to the INA module, port W11 is assigned to the group.

All data channels assigned to the INA module are initially placed in channel group 1. If necessary you can configure the channel rate for this channel group.

More than one WAN port can be configured if different groups of T1/PRI channels serve more than one destination. Additional WAN ports must be separately configured with IP address, netmask, protocol, channel speed, and any other desired parameters. See "Set Up Additional WAN Ports" on page 5-6.



**Note** – Be sure to reset the WAN port or reboot the router after making changes to the WAN port configuration. To reboot, enter the **reboot** command or press the reboot button on the INA module.

## *Set the Channel Rate*

Almost all data channels have a channel rate of 64Kbs, the default value assigned by ComOS. However, if the channel rate is 56kbs, you must set the channel rate to that value.

*Cgroup* is the defined channel group number. ComOS initially assigns all INA module data channels to group 1. If you set up additional WAN ports, you must issue this command for each of the channel groups you have set up.

Use the following commands to set the channel rate:

```
Command> set line0 group Cgroup 56K|64k
```

```
Command> save all
```

## *Set Up Additional WAN Ports*

To set up additional WAN ports use the following commands:

```
Command> set line0 group Cgroup channels Channel-list
```

```
Command> save all
```

For example, suppose you had a PRI line with channels 1, 2, 3, and 4 assigned to your ISP and channels 9 and 10 assigned to a connection to a branch office. Initially, channels 1, 2, 3, 4, 9, and 10 are all assigned to W0 by ComOS. To create a new WAN port, you must enter the following commands:

```
Command> set line0 group 2 channels 9 10
```

```
Command> save all
```

```
Command> reboot
```

As a result, WAN port W0 is assigned to channels 1, 2, 3, and 4 and WAN port W8 is assigned to channels 9 and 10.

You must then configure W8 with the desired protocol, IP address, netmask, and related settings. Be sure to set the correct channel rate for the new group, if necessary, with the **set line0** command.

## *Set the Port IP Address (Optional)*

You can set the local IP address of the W0 port to create an interface with a IP address.

You can use any IP address. If you set the local address of the WAN port to 0.0.0.0 for PPP, the INA module uses the Ether0 address for the end of the serial link. If you set the WAN port address to 0.0.0.0 for a Frame Relay connection, the port is disabled.

Use the following commands to set the IP address:

```
Command> set W address Ipaddress
```

```
Command> save all
```

## *Set the Destination IP Address*

The destination IP address is the IP address or hostname of the machine on the other end of the connection. The destination IP address can also be set to 255.255.255.255 for PPP users. This setting allows the INA module to learn the IP address of the system on the other end of the connection using PPP IPCP address negotiation.

Do not set a destination IP address for Frame Relay connections. Instead, use a data link connection identifier (DLCI) list to link IP addresses to DLCIs, or use the Local Management Interface (LMI) or Annex-D status updates and Inverse ARP to discover Frame Relay addresses dynamically. See the *PortMaster Configuration Guide* for more information.

Use the following commands to set the destination IP address:

```
Command> set W destination Ipaddress [Ipmask]
```

```
Command> save all
```

## *Set the Netmask*

The default netmask is 255.255.255.0. If the remote network has been divided into subnets, enter the netmask that identifies how the remote network addresses are divided between the network portion and the host portion. The value of *Ipmask* is dependent upon the size of the IP subnet of which the IP address is a member.

Use the following commands to set the netmask:

```
Command> set W netmask Ipmask
```

```
Command> save all
```

## *Set the Transport Protocol*

The transport protocol can be set to either PPP or Frame Relay. If Frame Relay is used, additional Frame Relay settings must be configured. See the *PortMaster Configuration Guide* for more information.

Use these commands to set the transport protocol:

```
Command> set W protocol ppp|frame
```

```
Command> save all
```

```
Command> reboot
```

## *Apply Filters to the WAN Port (Optional)*

Filters can be used to provide elementary firewall protection for your WAN port. For information on input and output filters, see the *PortMaster Configuration Guide*.





PMVision is a Java-based program with a graphical user interface (GUI) that can be used to monitor and configure the INA module. Information about using PMVision on other platforms can be found in the *PMVision User's Guide*, which describes the capabilities of PMVision in more detail.

PMVision runs on platforms that use Microsoft Windows 95, Windows 98, or NT 4.0 and later. A platform with a 486/DX or faster processor with 32 MB RAM minimum is required. A processor with 48 megabytes RAM is recommended.

This chapter briefly describes how to use PMVision to configure a INA module. Consult the *PMVision User's Guide* for information on using other PMVision functions. Topics covered include:

- “Install PMVision” on page 6-1
- “Connect the Workstation to the INA Module” on page 6-1
- “Run PMVision” on page 6-2
- “Communicate with the INA Module” on page 6-3
- “Selecting PMVision Functions” on page 6-4

## ***Install PMVision***

To install PMVision on a Windows 95, Windows 98 or NT 4.0 platform, run the **pmvision\_install.exe** program found on the INA software CD. Follow the instructions provided by the program.

## ***Connect the Workstation to the INA Module***

For PMVision to communicate to the module, an Ethernet connection between the workstation and the module must exist. You can usually make the connection through your network. A free standing workstation and a crossover Ethernet cable can be used instead.

### ***Over a LAN***

The Ethernet address for the INA module must be set before you can use PMVision. If the INAWizard has been already been used to configure the module, then the Ether0 address is set. The Ether0 address can also be set through a console connection and the command line interface. See “Connect a Console (Optional)” on page 3-3 and “Set the Ether0 Network Address” on page 5-3.

## *Using a Crossover Cable*

An independent laptop or desktop workstation equipped with a network interface card can be used to run PMVision. Connect an Ethernet crossover cable between the Ethernet connection on the workstation and the Ethernet port on the INA module. (See “Crossover Cable” on page B-3.)

Before proceeding, determine the Ethernet address that the INA module has been set to. Set the workstation's IP address to an address on the same subnet as the module's Ether0 address. An easy way to do so is to choose an address one number above or below the module's address.

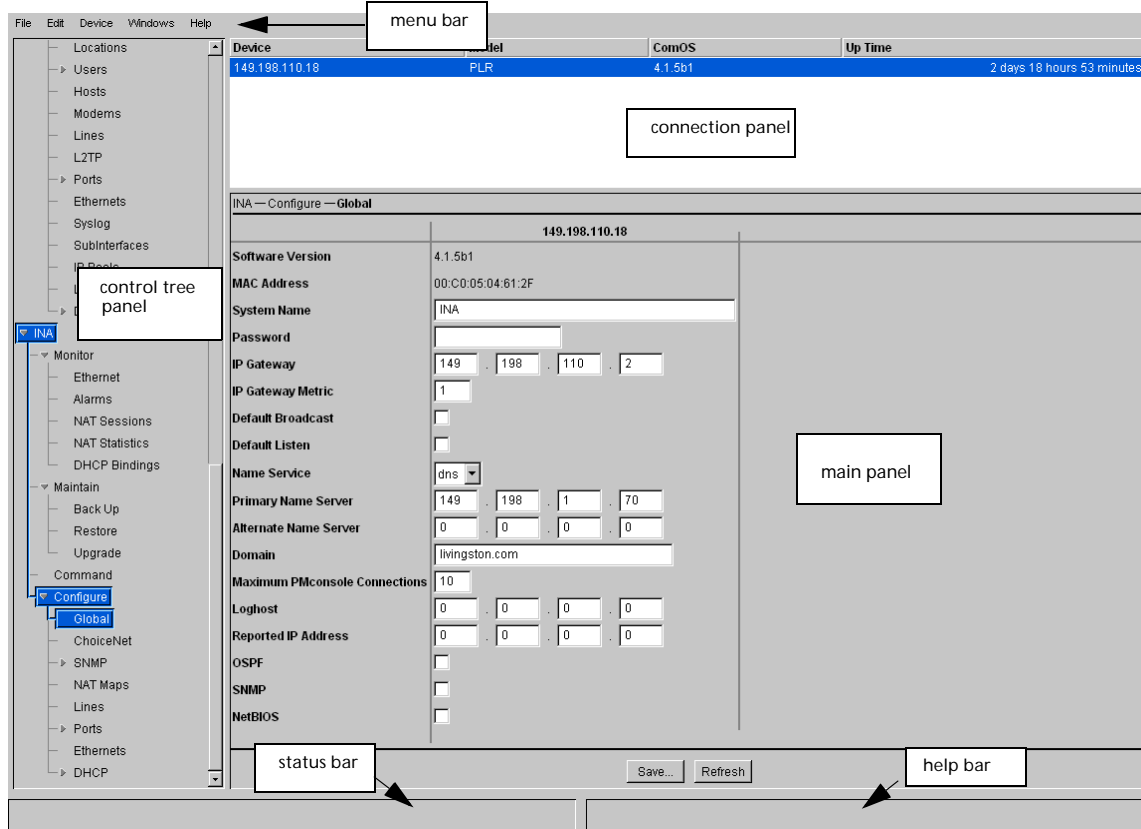
## ***Run PMVision***

Before configuring the INA module with PMVISION, make sure you have done the following:

- Assign T1/PRI channels to the INA module. See “Assign T1/PRI Channels” on page 2-2.)
- Collect all the information needed for your network. (See “Network Settings” on page 2-2.)

To start PMVision, select the PMVision icon from the Lucent folder in your **Start** → **Programs** menu. The main PMVision screen appears (Figure 6-1).

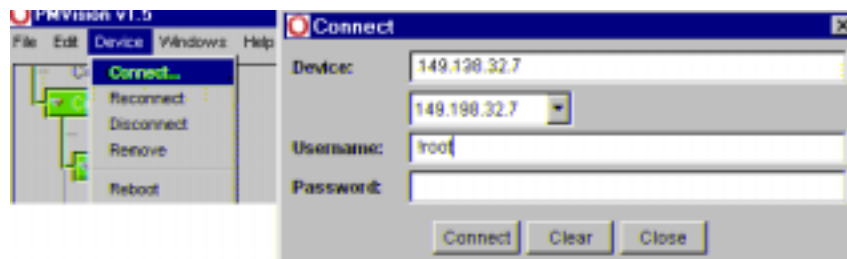
Figure 6-1 PMVision Main Screen



## Communicate with the INA Module

Select **Device** from the menu bar, and click **Connect** to establish communications between PMVision and your INA module. The connection dialog box appears (Figure 6-2). Enter the IP address or Domain Name System (DNS) name of the INA module into the device text box. If you have connected to this INA module before, you can also select the address from the drop-down list box. Complete the dialog by completing the Username and Password text boxes and clicking **Connect**.

Figure 6-2 Connection Dialog

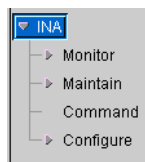


When the connection has been made, information about the INA module appears in the connection panel. The INA module information line is highlighted, indicating that the INA module is active and can be controlled by PMVision. PMVision is now ready to interact with the INA module.

## Selecting PMVision Functions

The control tree panel has a section for controlling the INA module. When using PMVision for the first time, double-click on **INA** to expand the tree. You **must** use the INA section of the tree for proper operation of all functions. Figure 6-3 shows the control tree.

Figure 6-3 INA Control Tree



## Using Configuration Functions

Double-click **Configure** to display all of the available configuration functions. Select a configure function by clicking the desired function name in the control tree. When a function is selected, the main panel shows either a configuration *panel* or a configuration *display*.

### Working with Configuration Panels

Configuration panels (Figure 6-4) have **Save** and **Refresh** control buttons at the bottom. Enter or edit the desired data, and click the **Save** button. A dialog appears to confirm the data to be changed. If you must reboot the PortMaster to update the data, a dialog box allows the choice between rebooting now or later.

Figure 6-4 Configuration Panel Example

INA — Configure — DHCP

149.198.110.18

DHCP Server ☒

Relay Server 0 0 0 0

Gateway 0 0 0 0

Netmask 0 0 0 0

Lease 0 hours 0 minutes Infinity

Save... Refresh

## Working with Configuration Displays

Displays (Figure 6-5) have two or more control buttons at the bottom. Click the **Add** button to add a new entry and display a configuration panel. Enter the data and click **Save**.

You can edit or delete a setting by first selecting the setting to be changed. Clicking **Edit** displays a configuration panel. Modify the displayed data and click **Save**. Clicking **Delete** erases the selected settings. Use the **Refresh** button to refresh the displayed data and confirm that settings have been updated.

Figure 6-5 Configuration Display Example

INA — Configure — NAT Maps

Device	NAT Map	Rule Count
149.198.110.18	plrmap	0

Add... Edit... Delete Refresh

## Enter Basic Settings

Enter configuration settings by selecting the appropriate functions.

Table 6-1 shows the PMVision functions you would use to enter basic configuration information. Consult the *PMVision User's Guide* or use PMVision online help if more information is needed.

Table 6-1 Basic INA Module Configuration Using PMVision

Setting	Select PMVision Function:	Entry
Ether0 address	INA→Configure→Ethernets, Edit	IP address

Table 6-1 Basic INA Module Configuration Using PMVision (Continued)

Setting	Select PMVision Function:	Entry
Ether0 netmask	<b>INA→Configure→Ethernets, Edit</b>	<i>IP netmask</i>
System name	<b>INA→Configure→SNMP</b>	<i>System name</i>
Default gateway	<b>INA→Configure→Global</b>	<i>IP gateway</i>
Name service type	<b>INA→Configure→Global</b>	<i>Name service</i>
Name server address	<b>INA→Configure→Global</b>	<i>Primary name server</i>
WAN port address	<b>INA→Configure→Ports, Sync ports, Edit</b>	<i>Local IP address</i>
Remote router address	<b>INA→Configure→Ports, Sync ports, Edit</b>	<i>Destination IP address</i>
Remote router netmask	<b>INA→Configure→Ports, Sync ports, Edit</b>	<i>Netmask</i>
Channel rate	<b>INA→Configure→Lines, line0, →Edit→Groups→Edit</b>	<i>Rate, Save</i>
Protocol	<b>INA→Configure→Ports, Sync ports, Edit</b>	<i>PPP or Frame</i>
DLCI list source (Frame Relay only)	<b>INA→Configure→Ports, Sync ports, Edit</b>	<i>Keep Alive LM, Annex-D or manual</i>
DLCI Keepalive Value (Frame Relay only)	<b>INA→Configure→Ports, Sync ports, Edit</b>	<i>Keepalive interval</i>
DLCI list (Frame Relay only)		<i>DLCI number, IP address</i>
DHCP server address	<b>INA→Configure→DHCP</b>	<i>Select the checkbox to enable</i>
DHCP lease time	<b>INA→Configure→DHCP</b>	<i>Lease</i>
DHCP static binding IP addresses and corresponding MAC addresses	<b>INA→Configure→DHCP→Bindings→Add</b>	<i>IP address, MAC address</i>
DHCP address pool start address and end address	<b>INA→Configure→DHCP</b>	<i>IP pool addresses</i>

## *Set Up Additional WAN Ports*

If the data channels assigned to the INA module support multiple WAN ports, you must set up additional WAN ports as follows:

1. **Select the INA→Configure→Lines function from the control tree.**
2. **Select the *line0* entry in the main panel, and click the Edit button.**
3. **Click the Groups button on the line0 panel.**
4. **Click the Add button.**
5. **Enter the group number, the list of channels separated by spaces, and the channel rate, and click OK**
6. **Reboot the INA module.**
7. **Select the INA→Configure→Ports function.**
8. **Click the Sync Ports button.**
9. **Select the new WAN port, and click the Edit button.**
10. **Enter the desired network settings.**

The new WAN port will not operate properly unless these settings are correct.

## *Using the Backup and Restore Functions*

Backup and restore functions for the INA module are found under the **INA→Maintain** section of the control tree. These functions can backup or restore all or a portion of the network settings for the INA module.

Lucent strongly recommends that a separate backup be performed before and after any changes to the INA module routing configuration.

### *Back Up the INA Module Settings*

To create a backup file for the INA module, select **INA→Maintain→Back Up**. You can backup the entire configuration or check specific items to backup (See Figure 6-6). After selecting the backup options, enter or browse to the backup file name and click **Backup** to begin the process.

The administrative (!root) password is **not** backed up or restored by the **Maintain** functions.

Figure 6-6 PMVision Backup Dialog

## Restore the INA Module Settings

To restore the INA module settings captured in a backup file, select **INA→Maintain→Restore**. Enter or browse to the backup filename on the Restore panel (Figure 6-7) and click **Restore**. The restored values overwrite any values existing in the INA module. A backup file created with a selective backup overwrites only the selected configuration values and leaves the others unchanged.

Figure 6-7 PMVision Restore Dialog



This appendix provides the following troubleshooting procedures for the INA module:

- “Observing LED Behavior” on page A-1
- “Observing Boot Messages” on page A-2
- “Using the DS-1 Test Jacks” on page A-5

Additional troubleshooting and maintenance information can also be found in Appendix C, “MERLIN MAGIX Administration.”

## ***Observing LED Behavior***

Table A-1 identifies LED behavior, possible causes of the behavior, and potential solutions.

For information on contacting Lucent technical support, see “Technical Support” on page -xv.

*Table A-1* Hardware Problems and Solution

<b>LED Behavior</b>	<b>Possible Cause</b>	<b>Solution</b>
System LED does not light.	Power is not present.	Check that the module is correctly seated in the carrier. Check that the MERLIN MAGIX system is properly turned on.
T1/PRI line is connected to the T1/PRI port and the red DS-1 status LED stays lit for more than 30 seconds.	The INA module does not recognize service from the telephone company.	Check the T1 cable and modular jack. If the problem is not resolved, contact the telephone company.
During startup, the system LED fails to light or stays continuously lit.	A hardware problem has occurred.	Contact Lucent technical support.
Twenty seconds after booting, the system LED stays solidly lit or does not light.	A component might have loosened during shipping, or the module is defective.	Contact Lucent technical support.
During operation, the system LED stays solidly lit for more than 20 seconds or does not light.	A hardware problem might have been caused by an external device.	If the LED stays solidly lit for more than 20 seconds or does not light after you have checked all external cables, contact Lucent technical support.

Table A-1 Hardware Problems and Solution (Continued)

LED Behavior	Possible Cause	Solution
No console login prompt is displayed.	Terminal settings are incorrect or a connection or cable is inoperable.	<ul style="list-style-type: none"> <li>• Verify terminal settings of 9600 baud, 8 data bits, 1 stop bit, a parity of none, and software control (XON/XOFF).</li> <li>• Verify that DIP switch 1 is set to the right.</li> <li>• Verify that you have a working null modem cable and that it is properly connected at both ends. For cable information see “Console Cable” on page B-1.</li> </ul>
Ethernet link LED is not lit when connected to a 10BaseT Ethernet hub.	There is no link integrity.	Verify that you have a working 10BaseT cable properly connected to the INA module and to the hub.
Network activity LED is solidly lit.	<p>Heavy traffic can cause the network LED to blink so rapidly that it appears to be solidly lit.</p> <p>However, if packets cannot be passed, you might have an incorrectly cabled network.</p>	Verify that the network cables are correctly installed.
Network activity LED is not lit.	If the INA module is not receiving or sending traffic, the network LED is not lit.	Verify that the network cables are correctly installed.
An undefined difficulty occurred at startup, but the cause cannot be determined from LED behavior.	Refer to the solution column.	Try booting in console mode, and observe the boot messages. See “Observing Boot Messages” on page A-2. If the boot messages do not suggest a solution, record the information and contact Lucent technical support.

## Observing Boot Messages

If you are having difficulty booting the INA module and are unable to isolate the problem by observing LED behavior, boot the INA module in console mode and check the boot messages.

Follow these instructions to check boot messages:

### 1. Attach a console.

See “Connect a Console (Optional)” on page 3-3.

**2. Press the reboot button.****3. Observe the boot messages displayed on the console screen.**

**Note** – Boot messages vary slightly, depending on the version of the PROM and ComOS.

The following example is from an INA module:

```

INA  PROM 2.33, 8/19/99
Testing System Clock...OK
Sizing System Memory...4MB FPM
CPU 486DX5-133 +Flash
Starting FLASH Boot...
Flash Memory ... Am29F016 4096K
16384 Verifying Checksum .OK
Starting Loader in flash
Testing High Memory ... . 4096K
INA.
Setting up ACC 2188 PCI Controller
Found 15360K PCI Memory at 0x20000000
Testing PCI Memory block 0x20000000-0x20efffff ...Passed
Total of 15360K PCI Memory Ready
block alloc 425 870400
block_alloc: cpu<0> control 0026ddf0 free_count<425>
Flash Memory 0... Am29F016 4096K
Flash type Am29F016 with 4096K of memory in 64 cells and 4032
nodes
Initializing MT8986 TDM Chip ...Ok
INA ComOS V4.1.5b2.
100R HV=01 FBV=00 FAV=11 FAS=01.
Initializing Rockwell Bt8472 HDLC
Found 3 ports...
e_loopback_test: packet buffer at 200d2080
ether0 active ... PCI-Master
stac_hw_init: Initializing STAC hardware, addr = 0x0ffff800
Hardware compression (9711)
Hardware Compression Enabled
Running ComOS...

```

PortMaster Console login

Use Table A-2 to interpret possible diagnostic boot messages.

Table A-2 Interpreting Diagnostic Boot Messages

Field	Possible Message	Explanation
INA PROM	<i>N</i>	Version number of the installed boot PROM.
Testing System Clock	ERROR	This error indicates a boot failure. Record all information to this point and contact Lucent technical support.
Sizing System Memory	ERROR at <i>failed memory address</i> .	This error indicates a boot failure. Record all information to this point and contact Lucent technical support.
CPU Type	486DX5-133	The type of CPU installed.
Starting FLASH Boot	N/A	N/A
Flash Memory	Am29F016 4096K	Nonvolatile RAM brand name and size in kilobytes.
16384	16384	Counter for system memory dynamic RAM (DRAM) size. If the size counter freezes, record all information to this point and contact Lucent technical support.
Verifying Load Module Checksum	Invalid Length for Flash at <i>RAM address</i> .	This error indicates a boot failure. Record all information to this point and contact Lucent technical support.
Starting Loader	N/A	N/A
Testing High Memory	ERROR at <i>failed memory address</i>	This error indicates a boot failure. Record all information to this point and contact Lucent technical support.

Table A-2 Interpreting Diagnostic Boot Messages (Continued)

Field	Possible Message	Explanation
Setting up ACC 2188 PCI Controller Found 16384K PCI Memory at 0x1ffff000 Testing PCI Memory block 0x20000000- 0x20ffffff ...Passed Total of 16384K PCI Memory Ready block alloc 425 870400 block_alloc: cpu<0> control 0028bdb0 free_count<425>		PCI memory has been correctly set up.
PM3VT/Legend ComOS V4.15.a4.		ComOS version string.
100R HV=01 FBV=00 FAV=11 FAS=01		MERLIN firmware identification.
Found x ports	3	Number of ports found, including C0 and C1.
Ether0 active	PCI-Master	Ethernet interface found.
Running ComOS	N/A	If the system becomes suspended at this point and does not print the next message, the configuration nonvolatile RAM (NVRAM) has been corrupted. Refer to the <i>PortMaster Troubleshooting Guide</i> for instructions on nonvolatile RAM recovery.
PortMaster Console login:	N/A	System is up and running.

## Using the DS-1 Test Jacks

The six test jacks provide the means to connect external test equipment to the T1/PRI line. Table A-3 describes the functions of the individual jacks. Figure A-1 illustrates the test jack locations. Figure A-2 shows the test jack configuration.

Table A-3 DS-1 Test Jacks Description

Test Jack Label	Description and Usage
MON In	Monitor In. This jack allows external test equipment to passively monitor the T1/PRI signal coming from the network to the INA module. The use of this jack does not disrupt the T1/PRI signal received by the INA module from the network.
MON Out	Monitor Out. This jack allows external test equipment to passively monitor the T1/PRI signal going to the network from the INA module. The use of this jack does not disrupt the T1/PRI signal transmitted by the INA module to the network.
NET In	Network In. An intrusive, break-in jack that allows external test equipment to inject a T1/PRI signal to the network. The use of this jack disrupts the T1/PRI signal transmitted by the INA module to the network.
EQPT Out	Equipment Out. An intrusive, break-in jack that allows external test equipment to intercept and terminate the T1/PRI signal coming from the INA module. The use of this jack disrupts the T1/PRI signal transmitted by the INA module to the network.
NET Out	Network Out. An intrusive, break-in jack that allows external test equipment to intercept and terminate the T1/PRI signal coming from the network. The use of this jack disrupts the T1/PRI signal received by the INA module from the network.
EQPT In	Equipment In. An intrusive, break-in jack that allows external test equipment to inject a T1/PRI signal to the INA module. The use of this jack disrupts the T1/PRI signal received by the INA module from the network.

Figure A-1 DS-1 Test Jack Locations

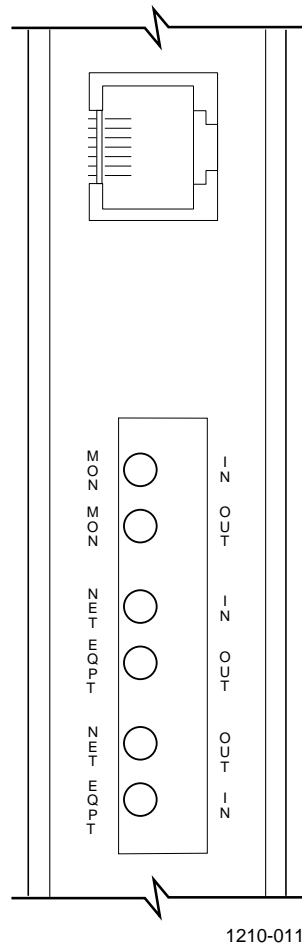
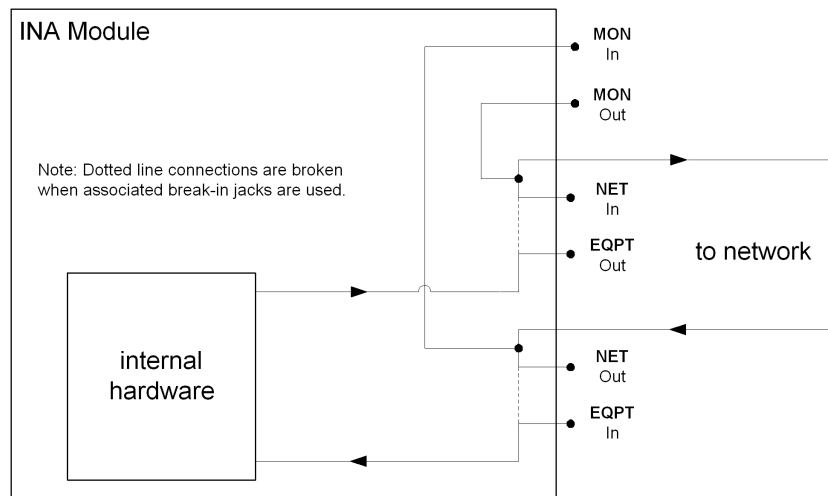


Figure A-2 DS-1 Test Jack Configuration







This appendix provides cable and pinout specifications.

### Cables Specified

- **Console Cable.** This null modem cable is used to connect a terminal or PC to the console port of the INA module.
- **T1/PRI Cable.** This cable is used to connect a T1/PRI line to the INA module.
- **Ethernet Interface Cable.** This cable is used to connect the Ethernet connector on the INA module to an Ethernet hub.
- **Crossover Cable.** This cable is used to make a simulated network connection between the INA module's Ethernet port and a free-standing computer workstation.

### Console Cable

Table B-1 shows the cable pinouts for a RJ-45-to-DB-25 null modem cable. The INA module does not use Data Set Ready (DSR).

Table B-1 Console Cable Pinout

INA Module Serial Port (C0)				PC or terminal Serial Port	
RJ-45	Name	Definition	Direction	DB-25 (DTE)	Signal
1	RTS	Request to Send	Output	5	CTS
2	DTR	Data Terminal Ready	Output	8 <sup>1</sup>	DCD
3	TXD	Transmit Data	Output	3	RXD
4	GND	Signal Ground		NC <sup>2</sup>	
5	GND	Signal Ground		7	GND
6	RXD	Receive Data	Input	2	TXD
7	DCD	Data Carrier Detect	Input	20	DTR
8	CTS	Clear to Send	Input	4	RTS
NC <sup>2</sup>		Data Set Ready		6 <sup>1</sup>	DSR

1. Pins 8 and 6 in the DB-25 connectors are connected internally.

2. Not connected.

## ***T1/PRI Cable***

Table B-2 shows the pinouts for a category 5 unshielded, ungrounded, twisted pair cable, as specified by the EIA/TIA-568-B wiring standard, with an RJ-48C connection

*Table B-2* T1/E1 RJ-48C Connector Pinout

<b>T1 Port</b>			
<b>RJ-48C</b>	<b>Signal</b>	<b>Definition</b>	<b>Direction to or from the INA Module</b>
1	RXD (Ring)	Receive Data	Input
2	RXD (Tip)		
4	TXD (Ring)	Transmit Data	Output
5	TXD (Tip)		

## ***Ethernet Interface***

Table B-3 provides specifications for the 10Mbps baseband IEEE 802.3-compatible Ethernet interface.

*Table B-3* Ethernet Interface

<b>Ethernet Type</b>	<b>Connector Type</b>	<b>Cable Type</b>	<b>Transmission Distance</b>
RJ-48C	RJ-48C for 10BaseT	Category 5 unshielded twisted pair	Hub distance—328ft (100m) maximum Repeaters—four maximum

## ***Crossover Cable***

This RJ-45 crossover cable is used to connect two (and only two) machines using 10baseT Ethernet without the use of a hub. The cable must be fabricated from category 5 unshielded twisted pair. Table B-4 shows the wiring for this cable.

*Table B-4* Crossover Cable Wiring

<b>RJ-45 Connector</b>	<b>RJ-45 Connector</b>
pin 1	pin 3
pin 2	pin 6
pin 3	pin 1
pin 6	pin 2



This appendix describes the MERLIN MAGIX system programming options for the INA module. The INA module is identified as a 100R module in MERLIN MAGIX programming and console displays.

The following topics are covered:

- “INA Module System Programming Summary” on page C-1
- “INA Module Administration Options” on page C-1
- “INA Module Maintenance Options” on page C-3
- “INA Module System Interactions” on page C-7

## ***INA Module System Programming Summary***

In general, the INA/100R module supports the same system programming options as the 100D module. Specific exceptions and additions are noted in this appendix. Additions include the ability to configure and maintain the internal CSU/DSU supported by the 100R module. Exceptions include that only bipolar 8-zero substitution (B8ZS) encoding is supported when the module is used in PRI mode. For more information on 100D module programming, see the *System Programming Manual* (555-710-111).



**Note** – To avoid corruption of data sent and received by the integrated data router, Lucent recommends that all T1/PRI lines used with the INA module be provisioned for B8ZS encoding.

Each 100R module accommodates up to 23 PRI channels or 24 T1 channels. Each channel can be either used by the MERLIN MAGIX or assigned to the data router. Channels assigned to the router can be used for Internet access, remote network connections, and other WAN applications.

Channels on the 100R module provide the same features and capabilities as channels on a 100D module. For example, the channels on the 100R module can be configured as robbed-bit channels for T1 applications or can be used in B-channel groups for PRI applications. Channels on the 100R module count towards system capacities just as channels on the 100D module do. Channels that are assigned to the router are included in the count. Therefore, the combined total of 100R and 100D modules in a system cannot exceed three.

In addition to MERLIN MAGIX system programming, the INA module requires programming specifically for the router subsystem. (See “Network Settings” on page 2-2.)

## ***INA Module Administration Options***

The INA module introduces two additional administration options: to activate or deactivate the onboard CSU and DSU channel selection.

The rest of the administration options are essentially the same as for the 100D module. For more information on configuring the 100D module, see *System Programming* manual (555-710-111).

## Activate or Deactivate the Onboard CSU

The internal CSU on the INA module is activated by default. You can view and change this setting by using the following sequence on your system programming console:

**Menu:** SysProg→Start→LinesTrunks→Mbre→Mbre→CSU/DSU→Slot#→Enter→  
ActivateCSU



**Caution** – The MERLIN MAGIX is forced into an idle state if the CSU settings are changed during active voice calls. In this case, the change in CSU status occurs after all active voice calls have been terminated.

Deactivating the CSU has the following impact on 100R module operation:

- The 100R board does not respond to network initiated loopback requests.
- The 100R board does not send T1 performance statistics to the network.
- The line compensation value used by the 100R board corresponds to the DTE settings appropriate for a 100D module instead of a CSU. The DTE and CSU values are summarized in Table C-1

Table C-1 100R Module Line Compensations with a Deactivated CSU

Line Compensation Setting in MERLIN MAGIX System Programming	DTE Line Compensation When CSU Is DEACTIVATED	CSU Line Buildout (LBO) When CSU Is DEACTIVATED
1	0 to 133 feet	0.0db
2	133 to 266 feet	-7.5db
3	266 to 399 feet	-15db
4	399 to 533 feet	-22.5db
5	533 to 655 feet	-22.5db

## DSU Channel Selection

By default, no channels are assigned to the router. DSU channel selection is used to assign channels to the router. Use the following sequence on your system programming console to assign channels to the router:

**Menu:** SysProg→Start→LinesTrunks→Mbre→Mbre→CSU/DSU→Slot#→Enter→  
ChannelSel→Channel#→Enter

You must repeat this sequence for each channel to be assigned to the router.



**Note** – For T1 configurations, you can assign a channel to the router only if the channel is **Unequipped** from a switch perspective. For PRI configurations, you can assign a channel to the router only if the channel is not used in a B channel group or a line pool on the switch.



**Note** – For the router to recognize a change in channel assignments, you must reboot the router either from its command line interface or by pressing the reboot button on the INA module.

You can view a summary of DSU channel assignments by using the following sequence on your system programming console.

**Menu:** SysProg→Start→LinesTrunks→Mre→Mre→CSU/DSU→  
Slot#→Enter→ChannelSel→Inspect

All channels are listed and marked with one of the selections shown in Table C-2:

Table C-2 Inspect DSU Channel Assignments

Selection	Description
R	The channel is assigned to the router.
S	The channel is assigned to the switch.
U	The channel is assigned to neither the router nor the switch.

Use the following sequence on your system programming console to unassign channels from the router.

**Menu:** SysProg→Start→LinesTrunks→Mre→Mre→CSU/DSU→  
Slot#→Enter→ChannelSel→Channel#→Delete

You must repeat this sequence for each channel to be unassigned from the router.

## INA Module Maintenance Options

The 100R module has improved T1/PRI error event reporting and has an expanded set of demand tests. All 100D module maintenance options are also included.

### Error Events

The INA module provides three additional error event counts as well as the ability to manually clear these error event counts. Included are

- 24-hour event totals
- Current events
- Selected interval events
- Clearing error events



**Note** – The additional error event counts are cleared whenever the INA module is reset. Be sure to view the error events before resetting the module or busying out the module.

From your system programming console, use the following sequence to access the INA module Error Events screen. Be sure to select the corresponding INA module slot number.

**Menu:** Maintenance→Slot→Slot#→Enter→Error Events

The Current Hour and Previous Hour error event screens that are also used on the 100D module are available on the INA module. Clearing the new error event counts does not affect the Current Hour and Previous Hour error event counts. Because the Current Hour and Previous Hour statistics are computed with a different algorithm, Current Hour and Previous Hour counts do not match the newer counts.

## 24 Hour Event Totals

The 24-hour total error event screen reports cumulative error statistics spanning the past 24 hours. The current event totals are not included in this report. From your system programming console, use the following sequence to access the INA 24 Hr Total screen. Be sure to select the corresponding INA module slot number.

**Menu:** Maintenance→Slot→Slot#→Enter→Error Events→24 hr total

This screen provides statistics related to the health of the T1/PRI interface. These statistics are summarized in Table C-3.

Table C-3 24-Hour Total Error Line Items

Item	Description
24 Hour Slot <i>xx</i>	<i>xx</i> is the slot currently being reported on.
<i>nn</i> Valid Intervals	<i>nn</i> is the number of valid historical 15-minute intervals from the past 24 hours. A valid historical interval is one for which data has been captured while the system was running. During a valid interval, data has not been lost due to a clearing of error events or a board reset. A board reset can occur during a reset, busy-out, frigid start, cold start or power outage.
MIS	Misframes.
SLP	Slips.
ES	Errored Seconds.
BS	Bursty errored seconds.
SEC	Severely errored seconds.
FS	Failed seconds.
BPV	Bipolar violations.



Each error statistic represents the sum of error events from all valid intervals including the current interval. The message “9999” represents an overflow situation.

You can refresh the 24-hour total screen by pressing →**Back** and then pressing →**24 hr total** again.

## Current Events

The Current error event screen reports error statistics for the 15-minute interval that is currently active. The elapsed minutes line displays the number of minutes that have elapsed for the current interval. The elapsed minutes display ranges from 0 to 15 and is rounded to the nearest minute. From your system programming console, use the following sequence to access the Current screen. Be sure to select the corresponding INA module slot number.

**Menu: Maintenance→Slot→Slot#→Enter→Error Events→Current**

The events reported are the same as for the 24 hour event totals screen.

You can refresh the Current screen by pressing →**Back** and then pressing →**Current** again.

## Selected Interval Events

The Selected Interval Events screen reports on error statistics for a specific 15-minute interval from the past 24 hours. Ninety-six 15-minute intervals occur in a 24-hour period. Interval 1 is the most recent 15 minute interval just before the current interval, and interval 96 is the oldest interval. From your system programming console, use the following sequence to select a specific interval from the Selected Interval Events screen. Be sure to select the corresponding INA module slot number.

**Menu: Maintenance→Slot→Slot#→Enter→ErrorEvents→Interval→Interval#→Enter**



**Note** – Invalid intervals have all zeroes for error data, but no visual indication is given to show that the interval is not valid. You can, however, compute the total number of invalid intervals by subtracting the valid interval count on the 24-hour total screen from 96.

## Clearing Error Events

The Clear Error Events screen causes error events for all intervals, including the current interval, to be cleared. From your system programming console, use the following sequence to access the Clear Error Events screen. Be sure to select the corresponding INA module slot number.

**Menu: Maintenance→Slot→Slot#→Enter→Error Events→Clear**

To stop the clear event and retain all error events, press →**Back** or →**Cancel**. You will return to the Error events screen.

## *Demand Tests*

The INA module board incorporates three new demand tests:

- Line loopback
- Payload loopback
- Bit error rate test (BERT)

### *Line Loopback Test*

The line loopback test loops the T1 signal back towards the network without regenerating framing and without recalculating a cyclic redundancy test (CRC) checksum. To perform this test, you must first busy out the INA module. From your system programming console, use the following sequence to start the line loopback test:

**Menu: Maintenance→Slot→Slot#→Enter→Demand test→LineLpbk**

After the line loopback test has been started, selecting →**Back** terminates the test.

**Note** – During the line loopback test, the INA module transmit clocking is derived from the signal received by the INA module. The remote end of the T1 connection must be set up as the clock master for the T1/PRI inrfco v(o)6.5il tilcloo

Table C-4 describes the available BERT test patterns.

Table C-4 BERT Test Patterns

Test Options	Description
→ <b>QRSS</b>	Produces a quasi-random test pattern.
→ <b>3 in 24</b>	Produces a bit pattern consisting of 3 ones in 24 (1000 1000 1000 0000 0000 0000).
→ <b>All zeroes</b>	Produces a test pattern of all zeroes.
→ <b>All ones</b>	Produces a test pattern of all ones.

After starting a BERT test, press →**Monitor** to view the progress of the test. One of the following results will be displayed.

- **No Synch**—Indicates that the BERT test pattern is not being successfully received back.
- **Sync-Errors**—Indicates that the BERT test pattern is being successfully received. The console displays the number of bit error detected. For overflow situations “99999” is displayed.

To refresh the display, press →**Back**, and then select →**Monitor**. This refreshes the test results without terminating the test.



**Note** – During BERT testing, the INA module transmit clocking is derived from the backplane of the MERLIN MAGIX. The remote end of the T1 connection must be set up as either the clock slave for the T1/PRI interface, or must provide a line loopback.

## INA Module System Interactions

### Backup and Restore

Like the 100D module, any programming done on the MERLIN MAGIX for the INA module can be backed up and restored with the system Personal Computer Memory Card International Association (PCMCIA) card or by a PC running WinSPM. The new administration options for the INA module (CSU Activate/Deactivate and DSU Channel Selection) are included.



**Note** – Administration data associated with the router is not backed up and restored by the MERLIN MAGIX backup functions. Router administration data must be backed up and restored separately by using PMVision (see Chapter 6, “Using PMVision”). The INAWizard may be used to restore the basic network settings, but is not a true backup. (See Chapter 4, “Using the INAWizard”.)

### Surrogate Operation

The INA module supports surrogate mode programming. The INA module is indicated on MERLIN MAGIX system programming screens by the label *100R-U*.

## Board Renumbering

The INA module works in the same manner as the 100D module for board renumbering. Use board renumbering to replace a 100D module with a 100R module, and vice versa. After the board renumbering, T1/PRI data that had been previously administered for the replaced module is associated with the new module. The data channels assigned to the 100R are now be unassigned on the 100D module.

## Print Reports

The System Inventory Report is enhanced to include summary information about INA modules present in the system. This summary information is presented under the *100-RU* label.

## PCMCIA Flash Memory Card-Based Upgrade Operation

The INA module firmware is upgradeable using the MERLIN MAGIX PCMCIA card.



**Note** – Performing an upgrade to the INA module firmware using the MERLIN MAGIX PCMCIA card does not upgrade the INA module router software. Router software is upgraded separately with the PMVision application. Depending upon the nature of the upgrade, either a INA module firmware upgrade, or a router software upgrade, or both might be required.

## Other System Interactions

Table C-5 shows system conditions applying to the INA module.

*Table C-5* INA Module System Interactions

Condition	Explanation
<b>Idle Conditions - System Forced Idle</b>	The system might be forced into an idle state while the module is routing data traffic. When the system is in the forced idle condition, the router on the INA module continues to operate and route data traffic.
<b>Slot Busy-Out</b>	An INA module can be busied out even if the module is routing data traffic. Busying out the module disrupts both voice and router services. Voice and data services are restored when the module is restored.

Table C-5 INA Module System Interactions (Continued)

Condition	Explanation
<b>System Erase (Frigid Start)</b>	When a frigid start occurs, all MERLIN MAGIX parameters for the INA module are returned to default values. Router administration data, however, is preserved. MERLIN MAGIX parameters must be reprogrammed after the frigid start to restore voice and data services. The router must be rebooted after DSU channel selection has been performed.
<b>System Restart (Cold Start)</b>	All programming for the INA module is saved during a cold start. Voice and router services are disrupted for the duration of the cold start but are restored after the cold start.
<b>Warm Start</b>	All the programming for the INA module is saved during a warm start.
<b>Board Replacement</b>	You must turn the power off on the MERLIN MAGIX before replacing an INA module. The INA module is not hot-swappable.



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