

LattisHub 2800 Series 10BASE-T Workgroup Concentrator User's Guide



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For more information regarding a specific product, refer to the appropriate product reference sheet.

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Consequently, when this equipment is used in a residential area or in an adjacent area thereto, radio interference may be caused to equipment such as radios and TV receivers.

Compliance with the applicable regulations is dependent upon the use of shielded cables. The user is responsible for procuring the appropriate cables. Read instructions for correct handling.

For more information regarding a specific product, refer to the appropriate product reference sheet.



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Meets requirements of:

FCC Part 15, Subparts A and B, Class A

EN 55 022 (CISPR 22:1985), Class A <and Class B>

General License VDE 0871, Class B (AmtsbIVfg No. 243/1991 and Vfg 46/1992)

VCCI Class 1 ITE

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Preface

This guide describes the physical installation of the LattisHub Model 2803, 2804, 2813, and 2814 10BASE-T Workgroup Concentrators. It also provides configuration rules for connecting Ethernet stations and making network interconnections.

Configuration procedures for IP/IPX networks are described for the Model 2813 and 2814. Instructions on how to prepare the concentrator for configuration are followed by an explanation of how to use configuration menus and descriptions of specific configuration menus and commands. Appendices provide indicator and switch descriptions; connector pin assignments; technical specifications for the concentrators; descriptions of the link integrity test and autopolarity detection and correction features; an overview of IP addressing; and a sample configuration file with instructions for modifying the file.

Before installing the LattisHub concentrator, read Chapter 3, “Network Configurations and Cable Connections,” to plan the placement and connection of concentrators and Ethernet stations.

Throughout this guide, *2800 Series* or *Model 28xx* is used to refer to the Model 2803, 2804, 2813, and 2814. Where a reference is specific to one of the models, the specific model number is used. The two-digit suffix (-04 or -05) is appended to the model number when descriptions refer to a specific option of the Model 2813 or 2814. References to the Model 281x without the option suffix apply to both options.

Intended Audience

This guide is intended for network installers or administrators who are responsible for configuring, installing, or maintaining a 10BASE-T network with LattisHub 10BASE-T Workgroup Concentrators. An understanding of 10BASE-T, IP/IPX, and network management concepts and terminology will be helpful in using this manual.

How This Guide Is Organized

This guide contains the following chapters and appendices:

Chapter 1, “Overview,” summarizes the features of the LattisHub concentrators.

Chapter 2, “Installation,” provides instructions for physical installation of LattisHub concentrators.

Chapter 3, “Network Configurations and Cable Connections,” describes network configurations for single-concentrator, multiple-concentrator, and cluster configuration networks.

Chapter 4, “Local Hub Management,” describes the Local Hub Management feature of the Model 2803 and 2804.

Chapter 5, “Configuring the Model 281x Concentrator for IP/IPX Networks,” tells how to configure the Model 281x network management for IP or IPX networks.

Appendix A lists the Model 28xx indicators and switches and describes their functions.

Appendix B provides the Model 28xx technical specifications.

Appendix C provides pin assignments for the Model 28xx connectors.

Appendix D describes the link integrity test function.

Appendix E describes autopolarity detection and correction.

Appendix F describes IP addressing.

Appendix G provides the text of a sample Model 281x configuration file and definitions of the file parameters.

Related Publications

For more information about LattisNet Ethernet networks and network management, refer to the following publications:

- 893-211-B *LattisNet System 3000 Ethernet Connectivity Guide*
- 893-568-A *Optivity User’s Guide (UNIX)*
- 893-567-A *Optivity Expanded View User’s Guide (UNIX)*
- 893-216-B *LattisNet Manager 4.1 Network Manager User’s Guide (DOS)*

Related Publications

- 893-217-B *LattisNet Manager 4.1 Concept Guide (DOS)*
- 893-222-B *LattisNet Manager 4.1 OV Windows User's Guide (DOS)*
- 893-328-A *LattisNet Manager 4.1 Installation Guide (DOS)*
- Various Current release memos for LattisNet Manager for DOS and Optivity products

Chapter 1 Overview

The LattisHub 2800 Series 10BASE-T Workgroup Concentrators are standards-based 10BASE-T hubs that provide networking solutions for low- and medium-density 10BASE-T Ethernet segments. Precon-figured for plug-and-play operation, these hubs support 10BASE-T Ethernet in a manageable, physical star configuration using a building's existing cabling system. The LattisHub 2800 Series con-centrators offer a cost-effective solution for low-density 10BASE-T departmental segments, as well as the flexibility and expandability to support medium-density 10BASE-T workgroups operating within a large enterprise network.

The LattisHub 2800 Series concentrators offer a unique, scalable architecture that allows small networks to grow easily to accommo-date additional users. Single hubs can serve as stand-alone units to support entry-level departmental 10BASE-T LANs. As network requirements grow, the initial investment is maintained by the LattisHub's unique expansion connection capability. Hubs can be connected through special expansion ports that extend management control to all ports in the network cluster while the cluster remains as one logical IEEE 802.3 Ethernet repeater. The expansion connec-tions allow a more "modular" architecture to extend per-port SNMP management functionality at a low incremental cost.

Since the IEEE limits the number of Ethernet repeaters between any two stations to four, traditional workgroup concentrators cascaded together to form larger segments typically run into this configura-tion limitation. With the new LattisHub 2800 Series concentrators, all of the expansion-connected hubs within the cluster support distributed retiming, allowing the whole cluster to remain as one logical repeater. The LattisHub 2800 Series concentrators support up to 80 users in an expansion cluster.

Two product sets of the LattisHub 2800 Series are available: the Model 2803 and Model 2804 host concentrators; and the Model 2813 and Model 2814 managed concentrators. All 2800 Series concentrators provide 16 shielded RJ-45 connectors for 10BASE-T connections, and either an AUI (Model 28x3) or 10BASE-FL fiber (Model 28x4) interconnection port.

Table 1-1 summarizes the differences among the 2800 Series concentrators.

Table 1-1. 2800-Series Concentrator Features

Model Number	Interconnect Port	Local Hub Management	SNMP Network Management
2803	AUI	yes	capable in cluster
2813	AUI	no	yes
2804	10BASE-FL	yes	capable in cluster
2814	10BASE-FL	no	yes

The Model 280x host concentrators (see Figures 1-1 and 1-2) incorporate RS-232 management via an ASCII terminal attached to the 280x Local Hub Management terminal port. Local Hub Management provides local configuration control and status for a stand-alone Model 280x concentrator. Full per-port SNMP management is extended to attached Model 280x host concentrators attached to an expansion port of a Model 281x. Up to four Model 280x host units can be connected to one Model 281x managed unit, yielding up to 80 SNMP-manageable ports in a LattisHub cluster.

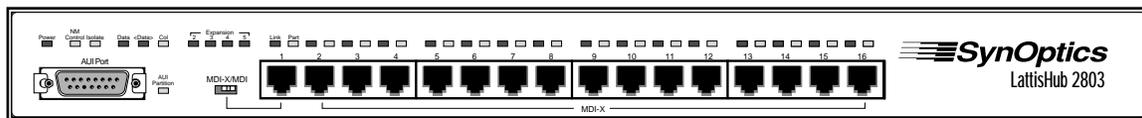


Figure 1-1. Model 2803 10BASE-T Workgroup Concentrator



Figure 1-2. Model 2804 10BASE-T Workgroup Concentrator

The Model 2813 and Model 2814 concentrators (see Figures 1-3 and 1-4) include fully integrated SNMP-based network management capabilities compatible with SynOptics LattisNet Manager for DOS, Optivity, Lattis EZ-View, or any third-party SNMP-compatible network management software. The Model 281x concentrators store the run-time management agent software in on-board flash memory. This allows software upgrades to be handled over the network from a central management station and eliminates the physical swapping of ROMs. In addition, Model 281x-05 concentrators now support both IP and IPX network management. IPX support enables network managers to install and manage Model 281x-05 concentrators in Novell Netware® environments without needing to learn and administer IP networking principles.

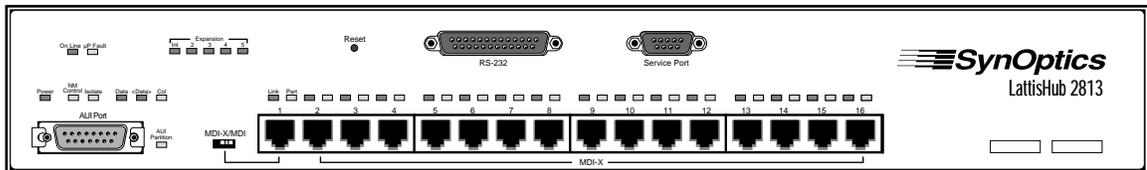


Figure 1-3. Model 2813 10BASE-T Workgroup Concentrator

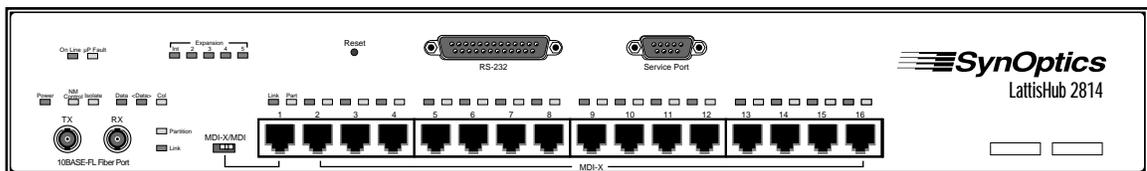


Figure 1-4. Model 2814 10BASE-T Workgroup Concentrator

Overview

Chapter 2 Installation

Installation of the Model 28xx concentrator consists of preparing the installation site, unpacking equipment, and physically installing the concentrator(s).



NOTE: *Only qualified technicians should install and maintain this equipment.*

Site Preparation

Before you start installing the Model 28xx, make sure the installation site is ready. Check the following conditions:

- **Adequate space and support**

You need a space approximately 10" by 18" on a tabletop or shelf for table installation of the Model 28xx. Make sure the table or shelf you plan to use is level and will support at least 10 pounds.

In a standard 19-inch EIA equipment rack, allow one-and-one-half rack spaces for the Model 281x and one rack space for the Model 280x.

For wall installation of the Model 28xx, you need a piece of half-inch plywood secured to the wall in the location where you plan to attach the Model 28xx. The recommended mini-mum size of the plywood is 6" by 20".

Make sure there is adequate space for cables and for wiring hardware such as punch-down blocks.

For a wall-mounted concentrator, allow adequate space at the front and rear of the concentrator to perform network main-tenance such as checking LEDs or changing cable connections.

- **Temperature**

Make sure the operating environment temperature is between 5° C and 40° C. Do not place the Model 28xx in direct sunlight or near warm air exhausts or heaters.

Installation

- **Ventilation**

For proper cooling of the Model 28xx, make sure there is adequate airflow around the concentrator. Air enters through both sides and flows out the back. Leave at least two inches of space on all sides of the Model 28xx for proper airflow and cooling.

- **Humidity**

Do not allow humidity in the area to be higher than 85% relative humidity, noncondensing.

- **Lack of dust**

Avoid installing the Model 28xx in extremely dusty locations.

- **Electromagnetic “noise”**

Avoid installing the Model 28xx within six feet of equipment such as photocopy machines, arc welders, or other equipment that creates electromagnetic “noise.”

- **Wiring hardware**

Have wiring hardware, such as punch-down blocks or patch panels, in place before you install the Model 28xx.

- **Power source**

Have a power outlet within six feet of the intended installation site.

Package Contents

When you unpack the equipment, check to see that you have the following items (see Figure 2-1):

- Model 28xx Concentrator
- Two rack-mounting brackets
- Two wall-mounting brackets
- Installation hardware:
 - Five #4-40 x 5/16" flat-head Phillips screws for attaching mounting brackets (one extra)

- Four #10-32 x 3/4" panhead Phillips screws and nylon washers for rack-mounting
- Power cord
- Model 988 10BASE-T Expansion Cable (Models 2803 and 2804 only)
- Four rubber feet
- This user's guide
- Warranty card

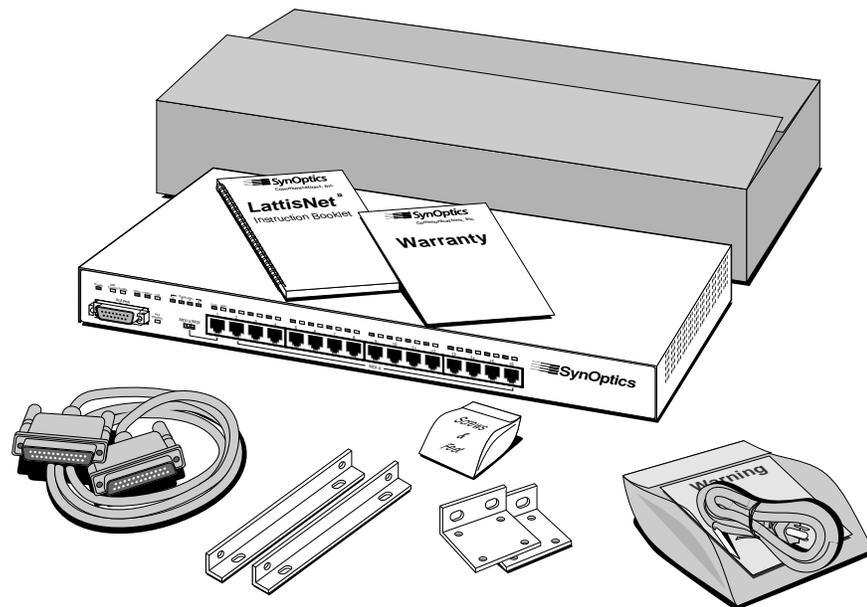


Figure 2-1. Unpacking the Model 28xx Concentrator



MODEL 281X CONCENTRATOR OPTION: Verify that you have received the correct concentrator option. The option label is on the front panel of the Model 281x, in the lower right corner (see Figure 2-2).

Installation



Figure 2-2. Model 281x Option Label

If any listed items are missing or damaged, contact the sales or customer service representative from whom you purchased your Model 28xx concentrator.

Required Tools and Materials

To install the Model 28xx, you need the following tools and materials:

- #1 Phillips screwdriver for attaching mounting brackets
- #2 Phillips screwdriver for tightening rack mounting screws
- For wall installation:
 - Piece of plywood approximately 6" by 20" (minimum 1/2 inch thick)
 - Drill
 - Four #12 x 5/8" panhead Phillips sheet metal screws

Table or Shelf Installation

To install the Model 28xx on a table or shelf, follow these steps:

1. **Peel off the protective backing from the rubber feet and apply one at each marked location on the bottom of the Model 28xx (see Figure 2-3).**

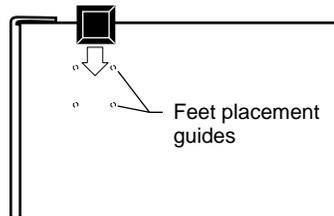


Figure 2-3. Attaching Feet

2. Set the concentrator on a table or shelf so that it has at least two inches of space on all sides.
3. Connect the power cord, first to the power entry receptacle on the back of the concentrator (see Figure 2-4), and then to the wall.

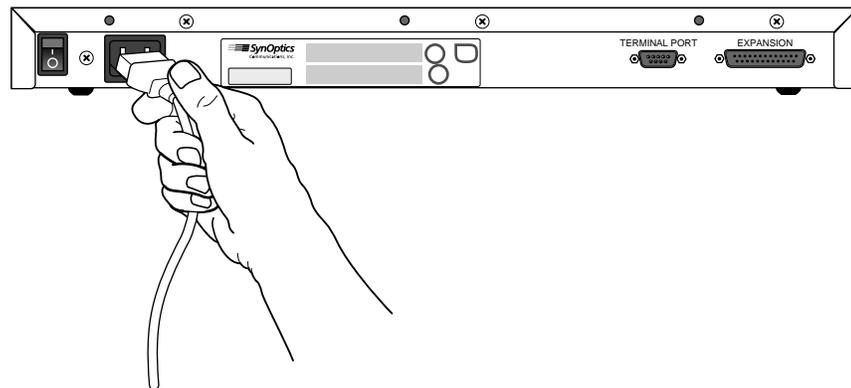


Figure 2-4. Connecting Power Cord

4. Turn on the power switch.
5. Check the Power LED on the front panel (see Figure 2-5). If it does not light, contact the customer support department of the organization from which you purchased your Model 28xx.

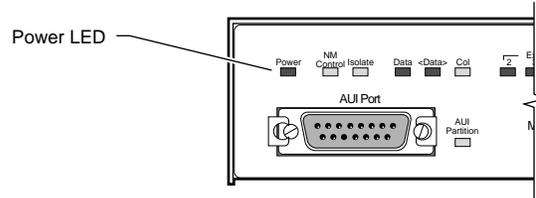


Figure 2-5. Power LED

At this point the concentrator is ready to have the network cables connected. See Chapter 3 for information on network configurations and connecting cables.

Rack Installation

To install the Model 28xx in an equipment rack, follow these steps:

1. Attach mounting brackets:

- a. On each side of the concentrator, use a #1 Phillips screwdriver to remove the screws at the front corner (see [Figure 2-6](#) and [Figure 2-7](#)).

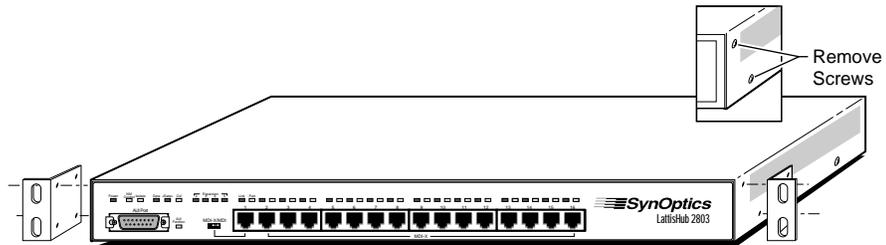


Figure 2-6. Attaching Brackets for Rack Installation—Model 280x

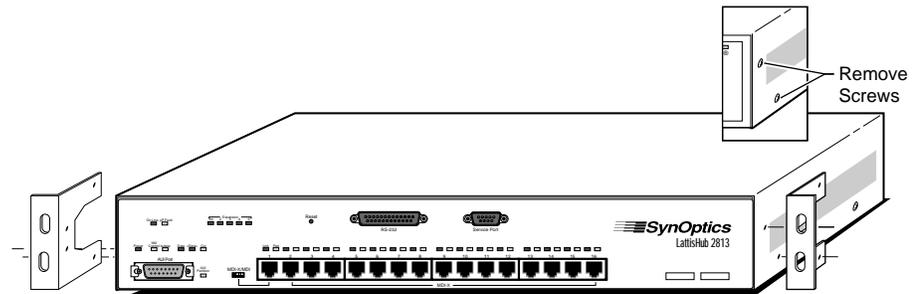


Figure 2-7. Attaching Brackets for Rack Installation—Model 281x

- b. Hold a mounting bracket against each side of the concentrator, as shown in [Figure 2-6](#) and [Figure 2-7](#), and align the countersunk screw holes in the bracket with the bracket mounting holes in the concentrator. (The bracket on the Model 281x covers a few of the chassis ventilation holes. This does not compromise the cooling of the concentrator.)
 - c. Insert two #4-40 x 5/16" flat-head screws through each bracket and into the bracket mounting holes in the concentrator cabinet. Using a #1 Phillips screwdriver, tighten the screws to secure each bracket.
- 2. Install the concentrator in the rack:**
- a. Hold the concentrator with the mounting holes in the brackets aligned with holes in the rack (see [Figure 2-8](#)).

Installation

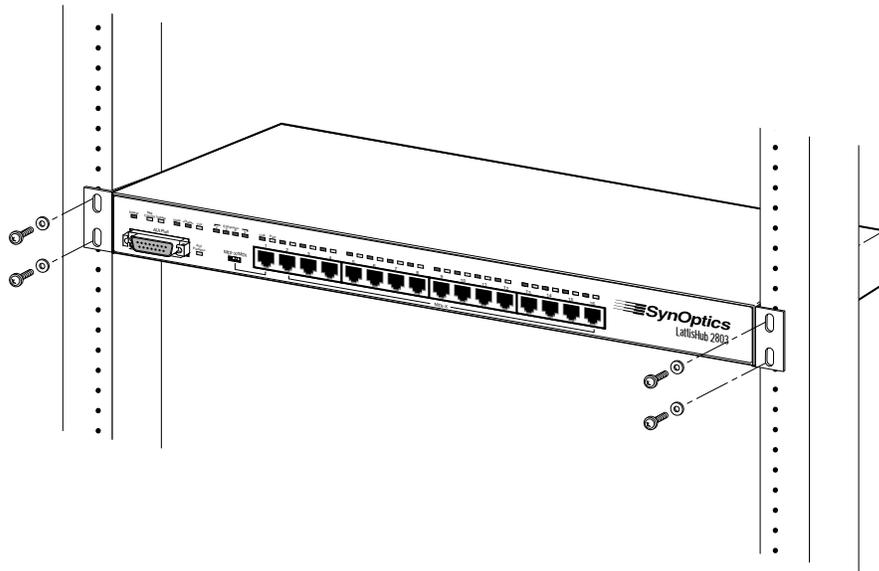


Figure 2-8. Installing Concentrator in Equipment Rack

- b. Insert two #10-32 x 3/4" screws with nylon washers through each bracket and into the rack. Using a # 2 Phillips screwdriver, tighten the screws to secure the concentrator to the rack.
- 3. Connect the power cord, first to the power entry receptacle on the back of the concentrator (see [Figure 2-9](#)) and then to the power outlet.**
- 4. Turn on the power switch.**

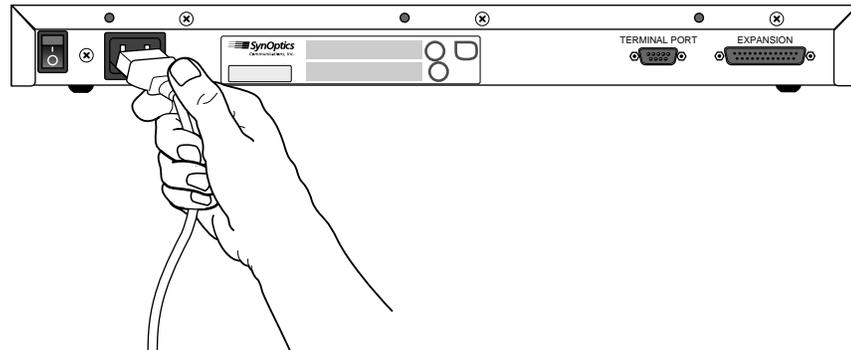


Figure 2-9. Connecting Power Cord

5. Check the Power LED on the front panel (see [Figure 2-10](#)). If it does not light, contact the customer support department of the organization from which you purchased your Model 28xx.

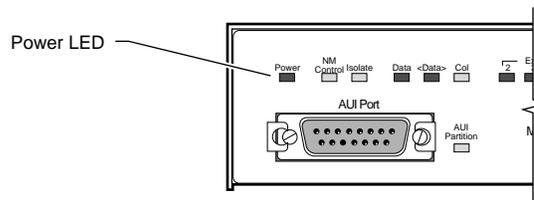


Figure 2-10. Power LED

At this point the concentrator is ready to have the network cables connected. See Chapter 3 for information on network configurations and connecting cables.

Wall Installation



SCREWS FOR WALL INSTALLATION: You must supply four #12 x 5/8" panhead Phillips sheet metal screws for wall mounting the Model 28xx.

In a wall installation, the Model 28xx must be mounted on a wooden surface. Make sure half-inch plywood is securely attached to the wall where you intend to install the Model 28xx. To install the Model 28xx, follow these steps:

1. Attach mounting brackets:

- a. Using a #1 Phillips screwdriver, remove the two bottom screws on each side (see [Figure 2-11](#)).

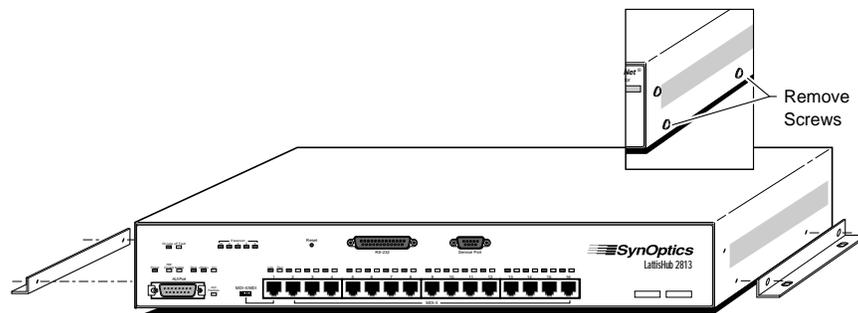


Figure 2-11. Attaching Brackets for Wall Mounting

- b. Hold a mounting bracket against each side of the con-centrator where you removed the screws, as shown in [Figure 2-11](#), and align the countersunk screw holes in the bracket with the bracket mounting holes in the concentrator.
- c. Insert two #4-40 x 5/16" flat-head screws through each bracket and into the bracket mounting holes in the con-centrator cabinet (see [Figure 2-11](#)). Using a #1 Phillips screwdriver, tighten the screws to secure each bracket.

2. Prepare the wall for installing the mounting screws:

- a. Using [Figure 2-12](#) as a guide, mark the mounting screw locations on the plywood where you plan to install the Model 28xx.
- b. Drill pilot holes at the marked locations.

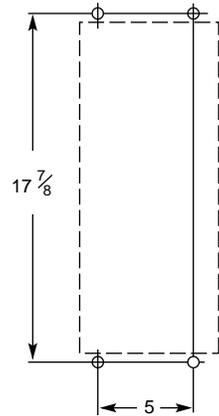


Figure 2-12. Template for Wall Mounting

- 3. Holding the concentrator against the wood, align the bracket holes with the pilot holes in the plywood (see [Figure 2-13](#)). Insert and tighten the sheet metal screws.**

Installation

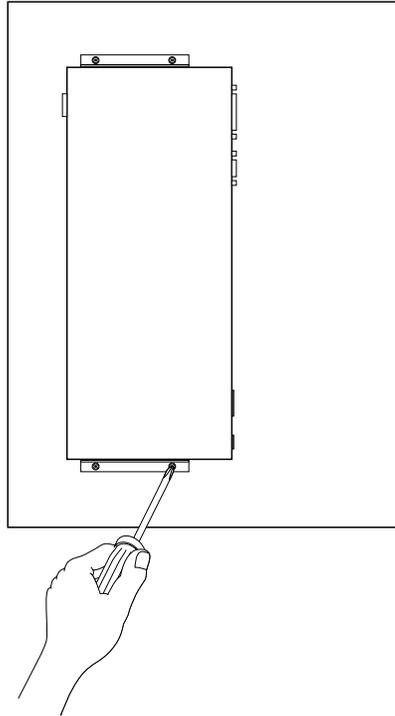


Figure 2-13. Securing Model 28xx to the Wall

- 4. Connect the power cord, first to the power entry receptacle and then to the wall outlet (see [Figure 2-14](#)).**

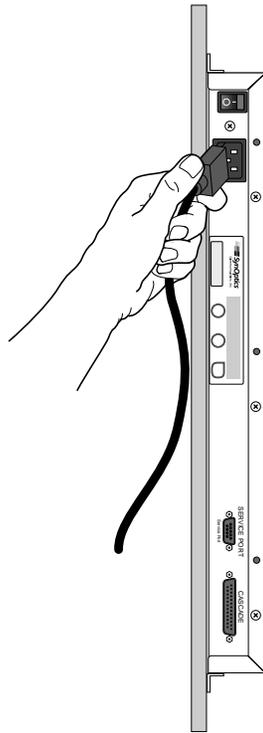


Figure 2-14. Connecting Power Cord

5. Turn on the power switch.
6. Check the Power LED on the front panel (see [Figure 2-15](#)). If it does not light, contact the customer support department of the organization from which you purchased your Model 28xx.

Installation

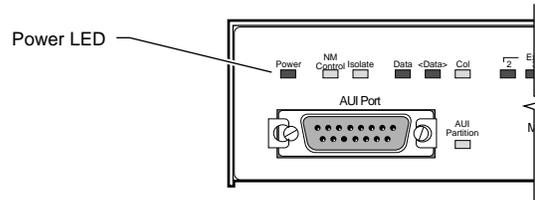


Figure 2-15. Power LED

At this point the concentrator is ready to have the network cables connected. See Chapter 3 for information on network configurations and connecting cables.

Chapter 3 Network Configurations and Cable Connections

This chapter provides general requirements and recommendations for proper network configurations using LattisHub 2800 Series 10BASE-T Workgroup Concentrators. It summarizes the possible expansion of a network from a single-concentrator network to one that encompasses several clusters and System 3000 equipment. Single-concentrator, cluster, and multiple-concentrator networks are described, as well as configuration rules for each type. Each network configuration description is followed by instructions for making the cable connections necessary for that configuration.

The installation procedures in this chapter assume that UTP horizontal distribution cables are already installed, providing connection from the work area wall outlet to the wiring closet punch-down blocks, and that cables are properly identified. Normal cabling system practices are assumed; your installation procedure may vary slightly, depending on your particular cabling system.

Building Network Configurations

The simplest type of 2800 Series network is a small stand-alone network that does not require SNMP-based network management. Starting with a single Model 280x, you can connect a maximum of 16 10BASE-T stations to a local Ethernet segment. Local Hub Management provides monitoring and control functions through an easy-to-use ASCII terminal interface. As the number of users on the segment grows to greater than 16, multiple Model 280x concentrators can be interconnected via the MDI-X/MDI switchable Port 1, or through the AUI or fiber backbone interconnect ports. However, as the network grows, so does the need for management. Local Hub Management helps some, but as you add to the station count, the ability to add SNMP management support becomes increasingly important.

At this point, you can add a single Model 281x and connect up to four Model 280xs through expansion ports, creating a Model 281x/280x cluster. This provides SNMP management for all stations connected to the cluster. It also increases the number of available ports, both by adding the 16 ports on the Model 281x and by making available the MDI-X/MDI ports (if you were formerly using the MDI-X/MDI ports for interconnection). Perhaps the most

important feature of this cluster, in terms of future expansion capabilities, is that by using the expansion ports to cluster the concentrators, you have reduced the number of repeaters to one. The retiming function is distributed among all units in the cluster, and the cluster operates in the network as a single logical IEEE 802.3 repeater.

To increase the network size beyond 80 ports, you can begin interconnecting the cluster to other concentrators. Because LattisHub 2800 Series concentrators are compatible with other System 2000 and System 3000 products, they can be used to connect a 10BASE-T workgroup into a larger enterprise network. Clusters can serve as a local workgroup in a very large network using larger concentrators, or clusters themselves can be interconnected. Clusters are treated like single concentrators in these configurations.

Single-Concentrator Network

The simplest 2800 Series network is a single-concentrator network, using either a Model 280x or a Model 281x, and its attached Ethernet stations. The maximum length of the UTP cable to an Ethernet station is 100 meters.

Stand-Alone Model 280x

Figure 3-1 shows a typical single-concentrator network configuration using a Model 2803 concentrator. In the work area, the Ethernet stations are attached to the UTP horizontal distribution cables through the AUI network interface card (NIC) and 10BASE-T transceiver. You can omit the 10BASE-T transceiver if the Ethernet station has an installed 10BASE-T network interface card.

An ASCII terminal connected to the Terminal Port via an RS-232 serial cable provides Local Hub Management functions for port monitoring and control.

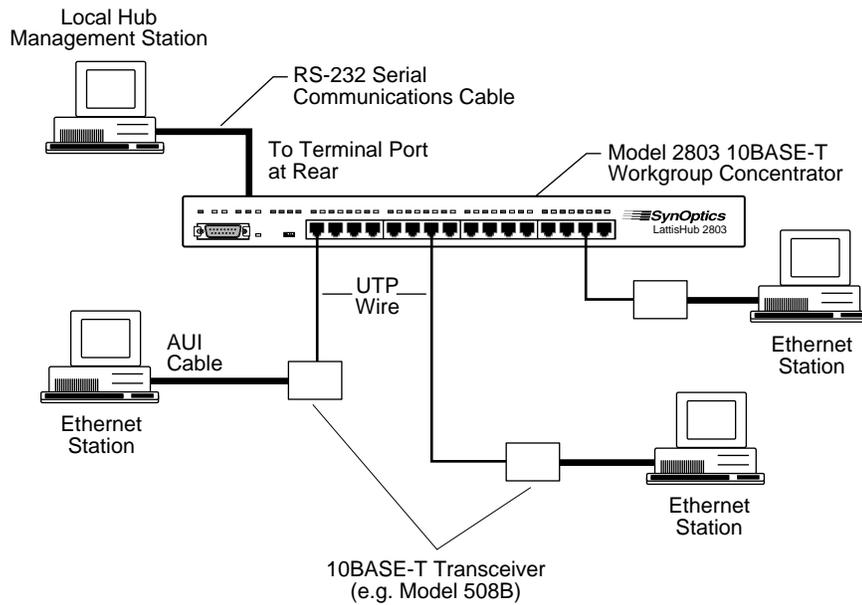


Figure 3-1. Typical Single-Concentrator Configuration—Model 280x

Stand-Alone Model 281x

A single-concentrator network using a Model 281x provides full SNMP management for up to 16 10BASE-T Ethernet stations. Figure 3-2 shows such a network configuration using the Model 281x. In the work area, the Ethernet stations are attached to the UTP horizontal distribution cables through the AUI network interface card (NIC) and 10BASE-T transceiver. A network management station is connected to a host port.

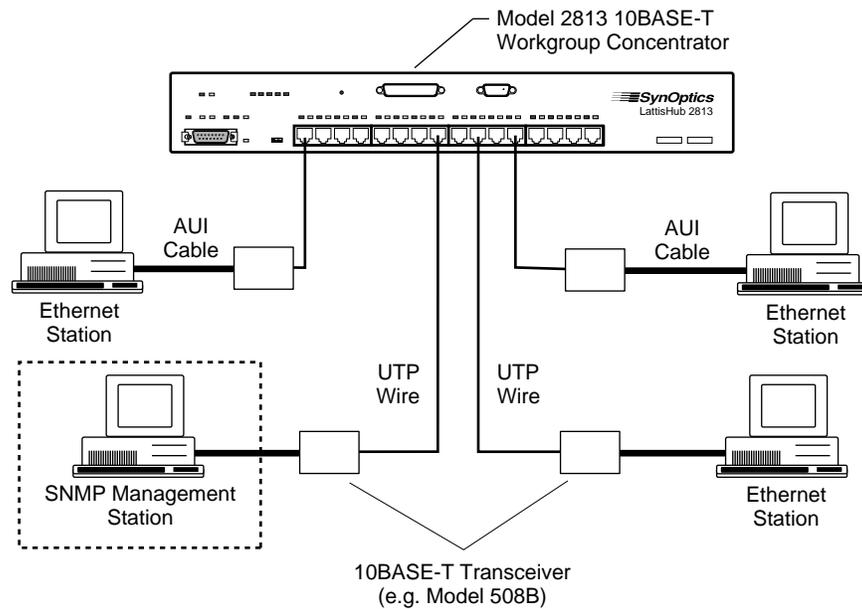


Figure 3-2. Typical Single-Concentrator Configuration—Model 281x

Ethernet Station Connections

For a single-concentrator network, the only cable connections are those between the Ethernet stations and the concentrator. Ethernet station connections are standard for all network configurations, irrespective of the number of concentrators used, and are typically made in two locations: in the work area and in the wiring closet.

Cable Connections in the Work Area

The Ethernet station can have one of two types of network inter-face card installed:

- An AUJ network interface card
- A 10BASE-T network interface card

If you are connecting an Ethernet station with an **AUI network interface card**, you must use an external 10BASE-T transceiver, such as the SynOptics Model 508B or Model 928. To connect the station to the premises cabling, follow these steps:

1. **Attach an AUI cable (e.g. Model 903A) from the interface card to the AUI port of an external 10BASE-T transceiver (e.g. Model 508B), as shown in Figure 3-3, or attach a SynOptics Model 928 Integrated Transceiver directly to the interface card (see Figure 3-4).**

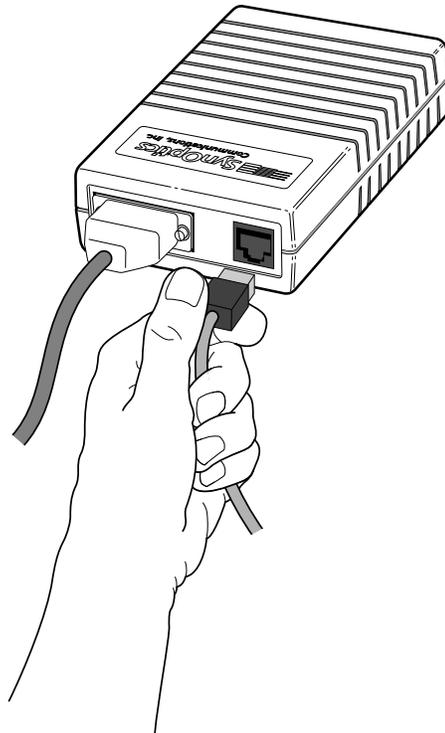


Figure 3-3. Connecting a Model 508B 10BASE-T Transceiver

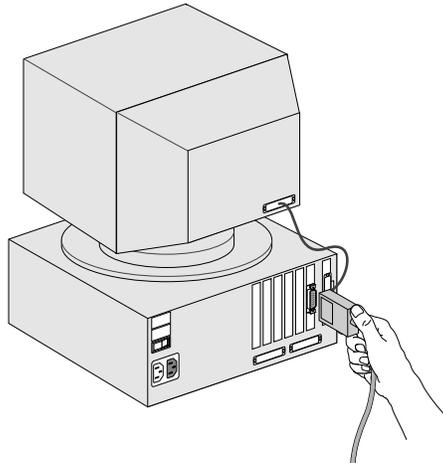


Figure 3-4. Connecting a Model 928 Integrated 10BASE-T Transceiver

2. **Connect a UTP patch cable (e.g. Model 910) from the RJ-45 port of the 10BASE-T transceiver to the RJ-45 connector of the wall outlet, or attach the captive cable on the Model 928 to the wall outlet (see Figures 3-3 and 3-4).**

If a **10BASE-T network interface card** is installed in the Ether-net station, you do not need the external 10BASE-T transceiver and AUI cable. To connect an Ethernet station with a 10BASE-T network interface card, follow these steps:

1. **Connect one end of a UTP patch cable (e.g. Model 910) to the RJ-45 port of the 10BASE-T interface card (see Figure 3-5).**
2. **Connect the other end to the RJ-45 connector of the wall outlet (see Figure 3-5).**

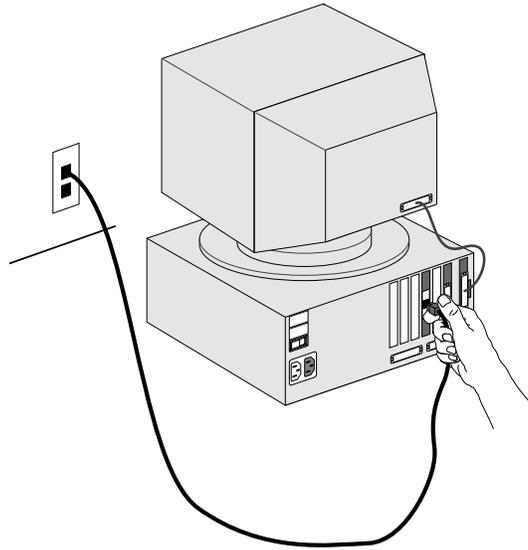


Figure 3-5. Connecting a 10BASE-T Interface Card

Repeat steps 1 and 2 for each type of station until all Ethernet stations are connected to the UTP horizontal distribution cabling through the RJ-45 connectors of wall outlets.



CONNECTING STP CABLE: To connect Ethernet stations to IBM Type 1 STP cable, use the Model 822 10BASE-T-to-Type 1 Adapter. See the Model 822 10BASE-T-to-Type 1 Adapter Reference Sheet for installation details.

Cable Connections in the Wiring Closet

To complete the connection of each Ethernet station to a Model 28xx 10BASE-T host port, follow these steps:

- 1. Verify that the total UTP segment length (including building wires and all patch cables used on any run between the station and the concentrator) does not exceed 100 meters.**
- 2. Make sure the MDI-X/MDI Switch on the Model 28xx is set to MDI-X (see Figure 3-6).**

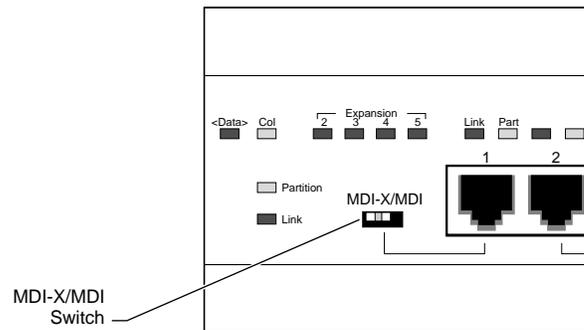


Figure 3-6. MDI-X/MDI Switch Set to MDI-X

The MDI-X/MDI Switch is used to swap the pin assignments of the transmit and receive data wire-pairs for Port 1. MDI-X configuration is used when the remote end of the wire is connected to a network station or to an MDI port on another concentrator. Ports 2 through 16 are internally configured as MDI-X ports. See Appendix A for a more complete description of the MDI-X/MDI Switch operation.

- 3. Connect a 25-pair UTP cable from the punch-down block to a UTP patch panel (see Figure 3-7).**

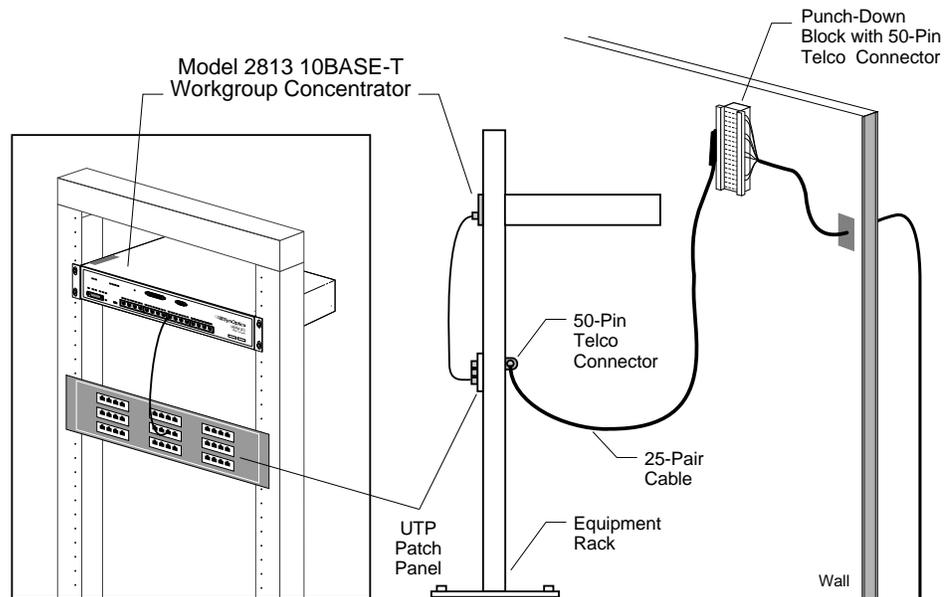


Figure 3-7. Connecting 25-Pair Cable

4. Connect one end of a UTP patch cable (e.g. Model 910) to the UTP patch panel (see Figure 3-7). Connect the other end to a 10BASE-T port on the Model 28xx (see Figure 3-8).

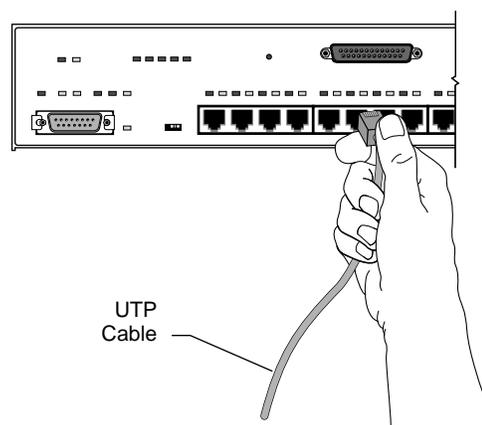


Figure 3-8. Model 28xx 10BASE-T Port Connection

5. Verify that the port's Link LED is ON.

The 2800 Series 10BASE-T Workgroup Concentrators support the 10BASE-T specified Link Integrity Test function. See Appendix D for a complete description of this feature.

Repeat steps 1 through 5 until all Ethernet stations are connected to Model 28xx 10BASE-T ports.

See Appendix C for the pin assignments of the RJ-45 connector on the Model 28xx.

The 2800 Series concentrators support automatic polarity detection and correction, which detects and automatically corrects for signal inversions on the UTP receive data wire-pair. If any receive data wire-pair was mistakenly reversed in the punch-down block during cable installation, the Model 28xx concentrator internally corrects for the miswiring, and the data path operates correctly. For more information about this feature, see Appendix E.

Cluster Configurations

To add ports to a network using a single Model 281x, or to add network management to a network using a single Model 280x, you can create a Model 280x/281x cluster configuration. A cluster configuration (see Figure 3-9) consists of one Model 281x concentrator and one or more attached Model 280x concentrators, up to a maximum of four Model 280x concentrators. A cluster lets you build the network from a starting point of 16 or fewer stations to a maximum of 80 stations, and extend network management to all 80 stations.

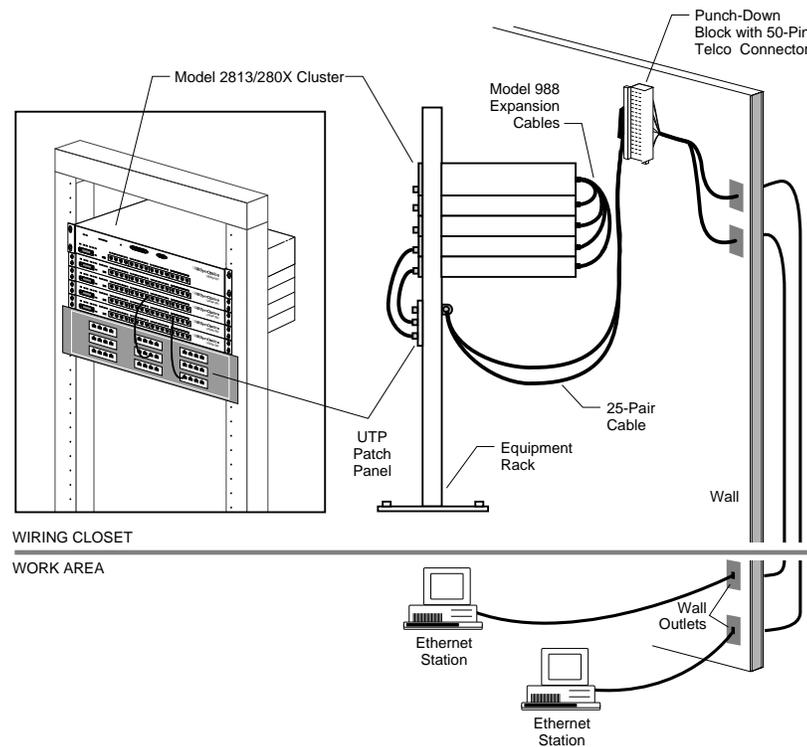


Figure 3-9. Typical Model 2813/2803 Cluster Configuration

Connection in a Model 280x/281x cluster is via Model 988 10BASE-T Workgroup Expansion Cables and the expansion ports on the con-centrators. The Model 281x extends full SNMP functionality to the Model 280x ports, providing up to 80 managed ports. Figure 3-9 shows a typical cluster configuration network with four Model 2803s connected to the Model 2813.



MINIMUM CLUSTER REQUIREMENTS: A cluster configuration requires one (and only one) Model 281x concentrator, which supplies four expansion ports. These ports can be used to connect any combination of Model 2803 and 2804 concentrators to the Model 281x. You cannot connect Model 280x concentrators into a cluster without a Model 281x.

Cluster Operation

A Model 281x/280x cluster configuration operates like a single-concentrator network, with these two additional conditions:

- Local Hub Management is disabled for any Model 280x connected to a Model 281x through the expansion port.
- Because of the nature of the expansion port connection, repeater functionality is distributed among all the units in the cluster, and the cluster becomes a single logical IEEE 802.3 Ethernet repeater.

If the Model 281x in a cluster loses power, the cluster configuration stops operating as a cluster. It loses the SNMP management, and the Model 280x units become isolated 16-port segments. If any one of the Model 280x units in a cluster loses power, the remaining units maintain the cluster configuration.

Connecting a Cluster Configuration

In the work area, connections to the network station are the same as those already described under “Cable Connections in the Work Area.” Follow the appropriate steps for either STP or UTP cable.

To connect the cluster together, follow these steps:

1. **Connect the station cables to the concentrator host ports, as described under “Ethernet Station Connections.”**
2. **Connect the Model 280x concentrators to the Model 281x, using the Model 988 Expansion Cable that was shipped with each Model 280x (see Figure 3-10):**
 - a. Connect the DB-25 connector on one end of the expansion cable to the expansion port on the Model 280x.
 - b. Connect the other end of the expansion cable to an available expansion port on the Model 281x. At this point, if the concentrator power is on, the **Expansion Status** LED on the Model 281x and the associated **Expansion** LED on the Model 280x light.

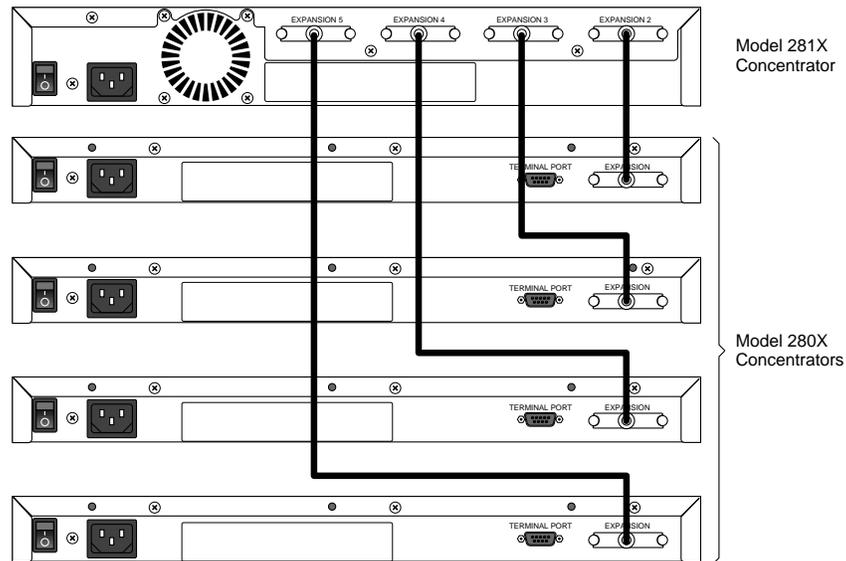


Figure 3-10. Connecting Cluster Configurations

Multiple-Concentrator Networks—2800 Series Only

Individual 2800 Series concentrators or Model 280x/281x cluster configurations can be interconnected through a backbone interconnection, or through the MDI-X/MDI ports. Backbone connections are made through the interconnect port, either the AUI port (Model 28x3) or the 10BASE-FL port (Model 28x4).

Configuration Rules

When you install a network with more than one concentrator, you must follow these configuration rules:

- Make sure all UTP segments are no longer than 100 meters.
- You must disable the SQE Test Function on the transceiver connected to the AUI port of the Model 28x3.

- You can have a maximum of four concentrators (repeaters) in the data path between any two Ethernet stations. (Remember that a cluster counts as only a single repeater.) To extend the network further, use a bridge or router.
- To use Port 1 as an interconnect port to an MDI-X port on another concentrator, you must configure it as an MDI port, using the MDI-X/MDI switch.

Interconnecting Model 28x3 Concentrators Using the AUI Port

You can connect the AUI port on the Model 28x3 to any medium-specific IEEE 802.3 MAU. For example, you can use an IEEE 802.3 10BASE-FL fiber optic medium attachment unit (FOMAU), such as the SynOptics Model 504A Transceiver, to connect the Model 28x3 to a fiber optic port on another concentrator. You can also connect the Model 28x3 AUI port to a coaxial backbone through an IEEE 802.3 MAU.

Although the example that follows shows connection between Model 28x3s and fiber cable through transceivers, the simpler way to connect to a fiber backbone is by using Model 28x4 concentrators, with their integral 10BASE-FL ports.

Connecting the AUI Port to a Fiber Backbone

Connecting an IEEE 802.3 10BASE-FL transceiver to the AUI port on the Model 28x3 allows you to connect the Model 28x3 to a fiber backbone. Figure 3-11 shows a typical network with two Model 28x3 concentrators connected to a fiber backbone. An AUI patch cable connects each Model 28x3 to a SynOptics Model 504A Transceiver that has the SQE test disabled. (The Model 504A Transceivers could also be connected directly to the AUI ports on the concentrators.) A fiber cable is connected between the two transceivers.

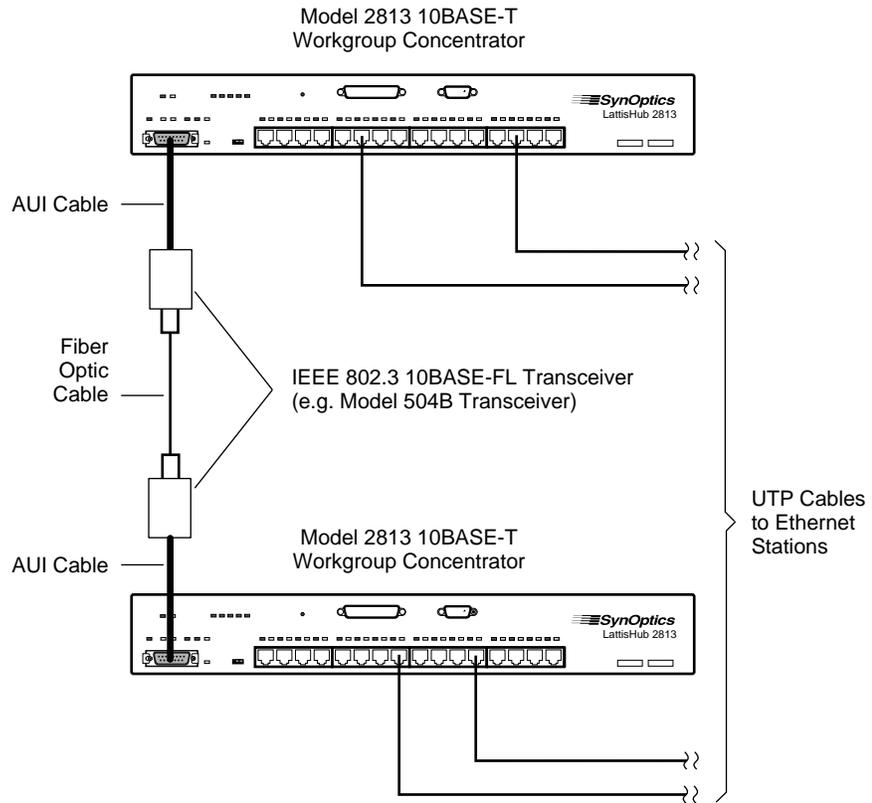


Figure 3-11. Interconnecting Model 28xxs Using an IEEE 802.3 10BASE-FL Transceiver

To use an IEEE 802.3 10BASE-FL transceiver to interconnect the Model 28x3 and other concentrators, follow these steps:

- 1. Disable the SQE (Signal Quality Error) test on an IEEE 802.3 10BASE-FL transceiver (for example, a Model 504A Transceiver).**



SQE TEST: IEEE 802.3 rules require you to disable the SQE (Signal Quality Error) test function on the IEEE 802.3 10BASE-FL transceiver connected to the AUI Port of the Model 28x3.

2. **Connect an AUI cable between the AUI port on the Model 28x3 and the AUI port on the transceiver, or attach the 10BASE-FL transceiver directly to the AUI port on the Model 28x3.**
3. **Connect a fiber optic cable between the transceiver and another optical port (for example, a port on a Model 3304 Host Module in a Model 3000 Concentrator) at the next higher level in the network hierarchy.**

Repeat steps 1 through 3 for each Model 28x3 that is to be inter-connected through an IEEE 802.3 transceiver.

Connecting the AUI Port to Coaxial Backbone

You can use the AUI port to connect a Model 28x3 to a coaxial back-bone through an IEEE 802.3 MAU. Figure 3-12 shows a Model 2813 and Model 2803/2813 cluster connected to a coaxial backbone through IEEE 802.3 MAUs. An AUI cable is connected between the AUI port on each Model 28x3 and the MAU. The SQE test is disabled on each MAU connected to the AUI port on a Model 28x3.



SQE TEST: IEEE 802.3 rules require you to disable the SQE (Signal Quality Error) test function on an IEEE 802.3 MAU connected to the AUI Port of the Model 28x3.

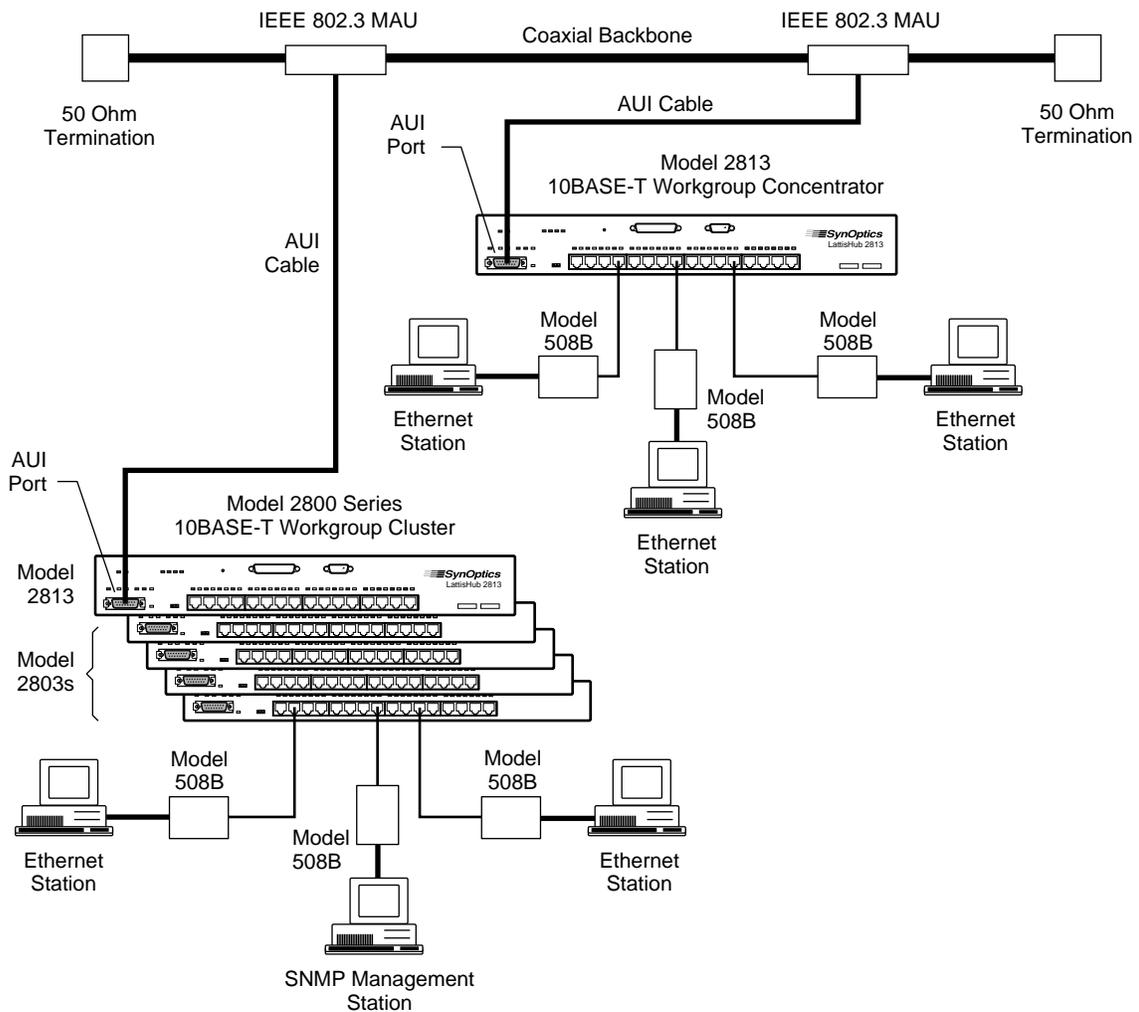


Figure 3-12. Interconnecting Model 28xxs Using Coaxial Backbone

To connect a Model 28x3 to a coaxial backbone, follow these steps:

1. **Disable the SQE (Signal Quality Error) test on the MAU.**
2. **Connect the IEEE 802.3 MAU to the coaxial backbone.**
3. **Connect an AUI cable between the IEEE 802.3 MAU and the AUI port on the Model 28x3.**

Repeat steps 1 through 3 for each Model 28x3 concentrator that is to be connected to the coaxial backbone.

Interconnecting Model 28x4 Concentrators Using the 10BASE-FL Port

Figure 3-13 shows two Model 28x4 concentrators connected via their 10BASE-FL fiber ports. A fiber cable is connected directly between the ports on the two concentrators; TX on each concentrator is connected to RX at the other end.

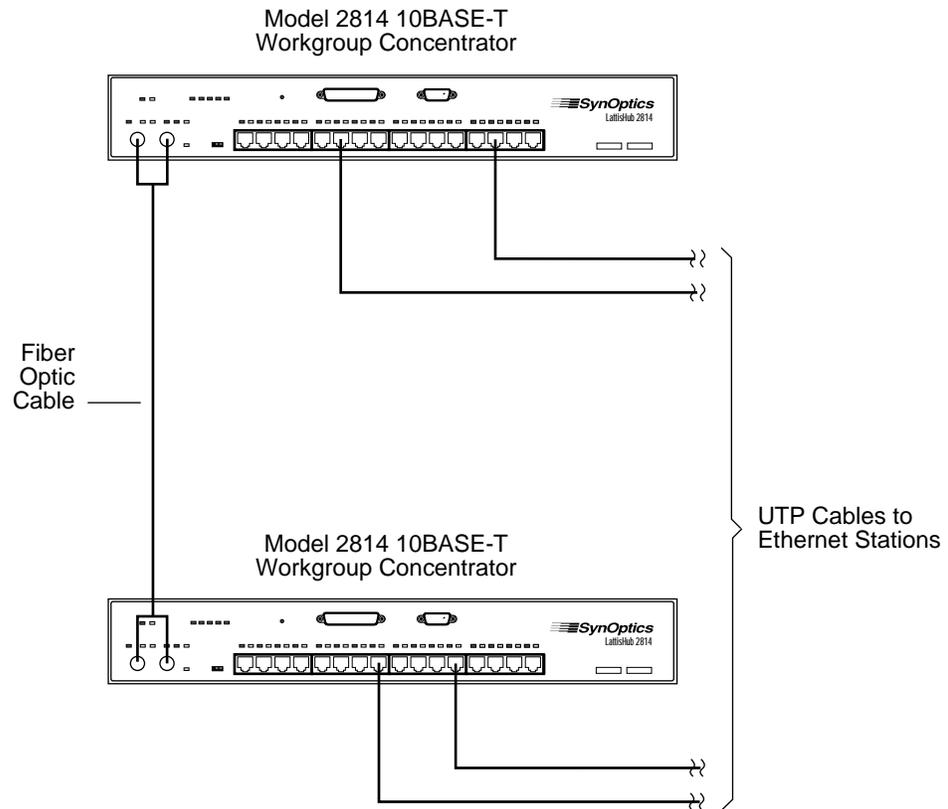


Figure 3-13. Connecting 2800 Series Concentrators Using the 10BASE-FL Port

The fiber interface of the Model 28x4 concentrator is compatible with the latest IEEE 802.3 10BASE-FL draft standard, as well as fully compatible with the IEEE fiber optic inter-repeater link (FOIRL) standard. The Model 28x4 fiber interconnect ports support up to 2-kilometer distances using 62.5/125 μm core/cladding multimode optical fiber.

To connect two Model 28x4 10BASE-FL ports, follow these steps:

1. **Make sure the power is on for both concentrators.**
2. **Connect one end of a fiber cable to the ST connectors on one Model 28x4 10BASE-FL port.**
3. **Connect the other end of the fiber cable to the other Model 28x4 10BASE-FL port.**
4. **Check the Link LED for each port. If it is not lit, reverse the TX and RX connectors on one end of the cable.**

Interconnecting Concentrators Using the MDI Port 1

You can interconnect Model 28xx concentrators by connecting an MDI Port 1 on one Model 28xx to any MDI-X 10BASE-T port on another concentrator. Figure 3-14 shows such a configuration, in which two Model 280x/2813 clusters are connected to a Model 2813. Ports 1 on the clusters' Model 2813 concentrators are set to MDI, and a UTP patch cable is used to connect each of these ports to an MDI-X port on the higher Model 2813 concentrator.



MDI-X/MDI SETTINGS: *Interconnections through the MDI-X/MDI ports must always be from MDI to MDI-X. Ports 2 through 16 are internally configured as MDI-X ports, and the switchable Port 1 is factory-set to be an MDI-X port. If you interconnect two Model 28xxs through Port 1 on both concentrators, you must change one port (but only one) to the MDI setting.*

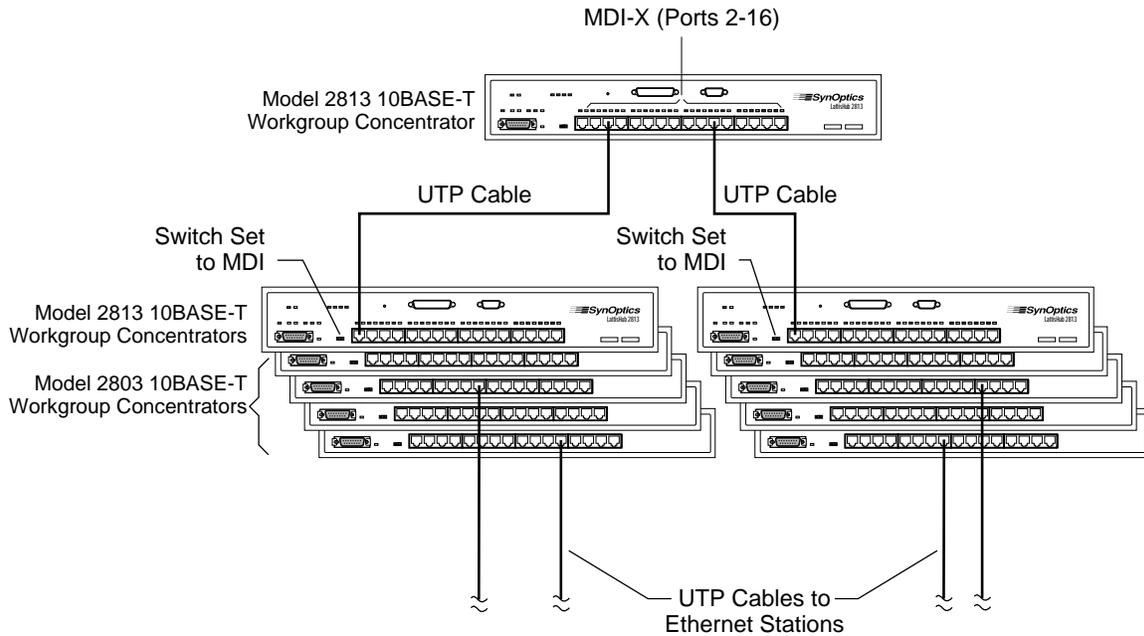


Figure 3-14. Interconnecting Concentrators via the MDI Port

To use the MDI Port 1 for interconnecting concentrators, follow these steps:

1. Use a small flat-blade screwdriver to set the MDI-X/MDI switch on a Model 28xx to the MDI position (see Figure 3-15). This sets Port 1 as an MDI port.

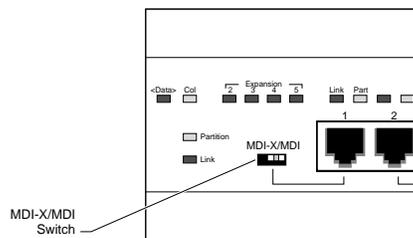


Figure 3-15. MDI-X/MDI Switch Set to MDI

- 2. Connect the MDI Port 1 of the Model 28xx to any MDI-X 10BASE-T port on a concentrator at the next higher level in the network hierarchy.**

Repeat steps 1 and 2 for each Model 28xx concentrator that is to be interconnected through an MDI Port 1 to another concentrator.

Multiple-Concentrator Networks—Including System 3000

The LattisHub 2800 Series 10BASE-T Workgroup Concentrators readily interconnect with LattisNet System 3000 products, using the same cabling procedures already described. You can connect a Model 28x3 AUI port through a MAU or FOMAU to a host port on a System 3000 concentrator, or you can connect a Model 28x4 10BASE-FL port directly to an optical port located in a System 3000 concentrator. For detailed information about networks using LattisNet System 3000 equipment, see the *LattisNet System 3000 Ethernet Connectivity Guide*.

Figure 3-16 shows a typical network that combines a Model 3000 Concentrator with a Model 281x concentrator and a Model 281x/280x cluster. Both the single concentrator and the cluster are connected to host ports on a Model 3304-ST Host Module in the Model 3000 Concentrator.

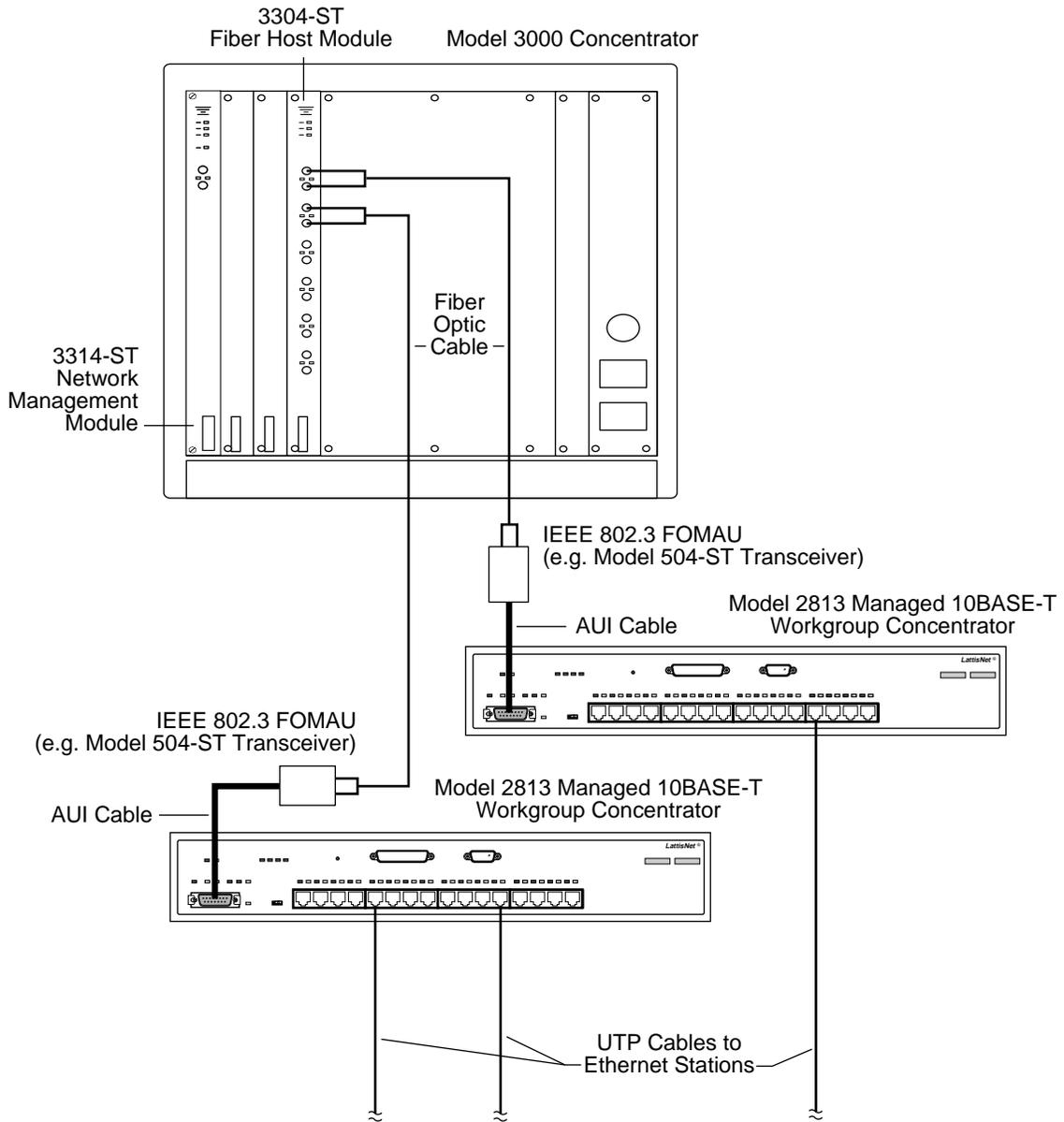


Figure 3-16. Network Including Model 3000 Concentrator

Multiple-Concentrator Networks—Including System

You can also substitute a Model 281x/280x cluster for the Model 3000 concentrator shown in Figure 3-16. Figure 3-17 shows such a network, in which a Model 2814/2804 cluster serves as the central point for the star-wired configuration. Clusters are interconnected through the fiber interconnect ports.

Network Configurations and Cable Connections

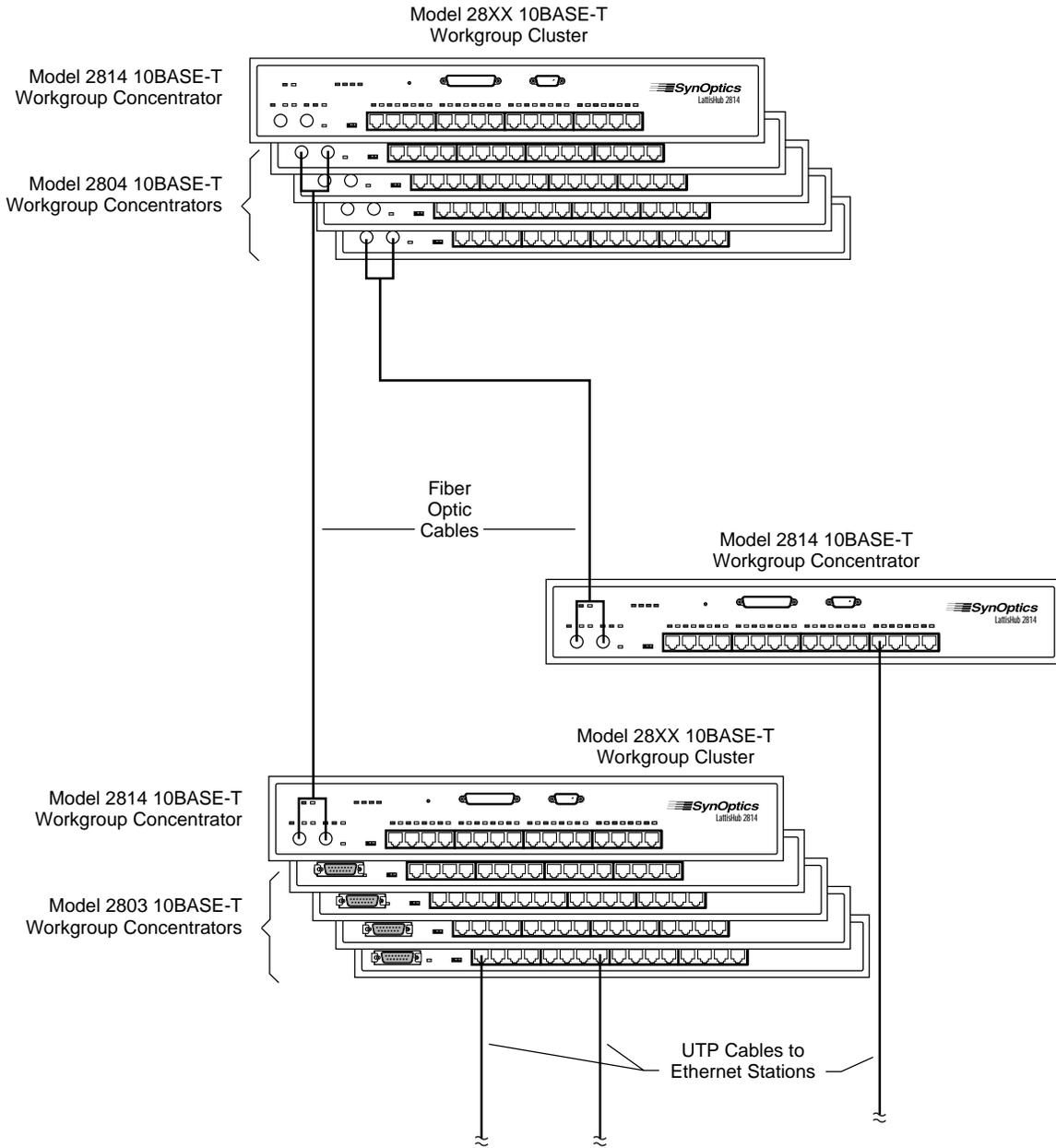


Figure 3-17. Network Composed Entirely of LattisHub Clusters and Single

Concentrator

Network Configurations and Cable Connections

Chapter 4 Local Hub Management

LattisHub Model 280x concentrators feature a limited set of management functions that are accessible through the Local Hub Management port. From an ASCII terminal attached to this port, you can view current conditions for all ports, enable or partition ports, and enable or disable certain functions.

Connecting a Management Terminal

To use the Local Hub Management feature, you need the following equipment:

- ASCII terminal or a portable computer that has a serial port and can emulate an ASCII terminal (for instance, with communications software).
- A standard RS-232 serial communications cable with suitable connectors, also referred to as a modem or straight-through cable. This cable is *not* a null modem cable or a crossover cable.

The RS-232 cable must have a female DB-9 connector at one end to connect to the Model 280x. The other end should have the appropriate connector for your computer or terminal's serial port. (The serial port is usually a male DB-9 or DB-25 connector.)

Table 4-1 lists the pin assignments to use when connecting this type of cable.

Table 4-1. Service Port Pin Assignments

Terminal Pin DB-9	DB-25	Function	To Model 2705 DB-9 Pin	Function
2	3	Receive data	2	Transmit data
3	2	Transmit data	3	Receive data
5	7	Signal ground	5	Signal ground



OTHER PINS: RS-232 Signals on other pins, such as DTR, CTS, and CD, are not recognized.

Connect the cable between the DB-9 connector on the Local Hub Management port of the Model 280x and the serial port on the terminal.

Local Hub Management

Set the terminal's protocol as follows:

- 9600 b/s
- 1 stop bit
- 8 data bits
- No handshaking
- No parity

The Local Hub Management Display

When the management terminal is connected to the concentrator and both are powered on, the terminal screen shows the display shown in Figure 4-1.

```
--- SynOptics MODEL 280X LOCAL HUB MANAGEMENT version 1.0 ---  
  
PORT | 1| 2| 3| 4| 5| 6| 7| 8| 9| 10| 11| 12| 13| 14| 15| 16| 17 (AUI)  
LINK STATUS | | X| | | | | X| | | | | | | | | | N \ A  
INV POLARITY STAT | | | | | | | | | | | | | | | | | N \ A  
PARTITION STATUS | X| | | | | | | | | | | | | | | | |  
COLLISION FLAG | | X| | | | | X| | | | | | | | | | |  
LATE COL FLAG | | | | | | | | | | | | | | | | | |  
JABBER FLAG | | | | | | | | | | | | | | | | | |  
AUTO PART FLAG | | | | | | | | | | | | | | | | | |  
MDI\MDIX SW SET MDI  
BOARD REVISION A  
  
X = event occurred  
d = function disabled  
  
CONTROL OPTIONS:  
  
E ENABLE PORT  
P PARTITION PORT  
A ENABLE TP RCV AUTO POLARITY DETECTION FUNCTION  
D DISABLE TP RCV AUTO POLARITY DETECTION FUNCTION  
L ENABLE TP RCV LINK TEST FUNCTION  
T DISABLE TP RCV LINK TEST FUNCTION (forces link good)  
R RESET  
<RETURN> UPDATE SCREEN  
  
ENTER OPTION: _
```

Figure 4-1. Local Hub Management Menu

The top portion of the display provides monitoring of the host and interconnect ports. It lists events and conditions for the ports and indicates whether or not the specified event or condition has occurred at each port. Just below the port monitoring area is a line showing the setting of the MDI-X/MDI switch for Port 1. The display also shows the board revision.

The bottom part of the display lists the following control options:

- E Enable port (default)
- P Partition port
- A Enable twisted pair receive autopolarity detection (default)
- D Disable twisted pair receive autopolarity detection
- L Enable twisted pair receive link test (default)
- T Disable twisted pair receive link test
- R Reset concentrator

When you enter a port control option, the screen displays the message

```
Enter port number for a specific port  
or enter 'A' for all ports, and press <RETURN>:_
```

By default, all ports are enabled (i.e., not partitioned). Enabling a port clears the partition status of the port. If a port is enabled, the LINK STATUS field will be updated with an **x** when good 10BASE-T link status occurs. If you partition a port, the LINK STATUS **x** disappears, and an **x** appears in the corresponding PARTITION STATUS field.

Because autopolarity detection is enabled as the default condition, the INV POLARITY STAT field is empty unless the autopolarity detection is disabled using control option D (a **d** appears in the INV POLARITY STAT field) or a receive data wire pair polarity inversion has been detected (an **x** appears in the INV POLARITY STAT field). Similarly, the default condition for the receive link test function is **enabled**. If you disable the twisted pair receive link test function, this forces the port to a “link status good” state and displays an **x** in the LINK STATUS field.

Local Hub Management

If you press **R** to reset the concentrator, a display message asks for confirmation (Y/N). If you respond **Y**, the concentrator is returned to its original power-up state, and all ports are set to the default condition.

Chapter 5 **Configuring the LattisHub Model 281x for IP/IPX Networks**

This chapter provides instructions for configuring the LattisHub Model 2813 and 2814 10BASE-T Workgroup Concentrators for networks that use IP, IPX, or a combination of the two.

The configuration process for the Model 281x varies depending on the network management operating system and the hardware components in your network.

If your network is IP-based, and you don't have a BOOTP server, you must configure the Model 281x through a connection to the male DB-9 service port. For instructions on configuring through the service port, see "Setting the Boot Configuration Without a BOOTP Server," later in this chapter.

If your network is IP-based and has a BOOTP server, configuration of the Model 281x via a connection to the service port is unnecessary. However, you must modify the load server configuration file (BOOTPTAB.TXT) and the Model 281x configuration file, as specified in the publications that came with your LattisNet load server or network management software. The text of the Model 281x configuration file and descriptions of the file parameters are in Appendix G of this guide.

If your network is IPX-based, service port configuration is unnecessary. The 281x will automatically learn from the network all required IPX network information.

If your network uses both IP and IPX, you may need to configure the Model 281x for IP operation through the service port, depending on whether or not there is a BOOTP server. For the IPX portion of the network, service port configuration is not necessary.



HARDWARE ADDRESS: Whether you're setting up for IP or IPX, you will need the hardware address of the Model 281x to set up the load server configuration file. The hardware address consists of 000081 followed by the number on the label below the SynOptics logo at the lower right of the front panel (see Figure 5-1). For instructions on setting up the configuration file, see the publications that came with the load server.

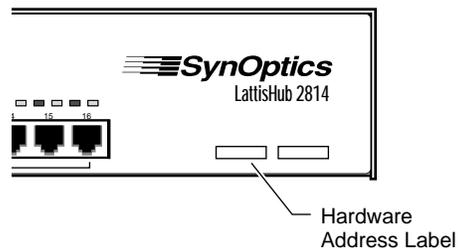


Figure 5-1. Hardware Address Label

Summary of Boot Sequence with a BOOTP Server

This section summarizes the Model 281x boot sequence if a BOOTP server is present and the load server configuration file and Model 281x configuration file are correctly set up. If these conditions are true, you do not need to configure the Model 281x via the DB-9 service port; it will automatically obtain its IP configuration parameters via the BOOTP server, and its IPX parameters via the IPX file server.

The Model 281x factory default settings are

- Boot Mode = **Network**
- Boot Protocol = **Auto**
- Image Load Mode = **Remote w/Local**

The first time the Model 281x is powered on, it uses these settings to perform the following boot sequence:

1. **The Model 281x performs a diagnostic self-test and displays the results on the terminal screen connected to the service port (if one is connected).**

2. **The screen (if connected) says**

Trying BOOTP...

while the Model 281x sends a broadcast message looking for its booting parameters.

3. **The BOOTP server sends the booting parameters to the Model 281x.**

4. **The Model 281x issues IPX “Find Nearest Server” SAP frames to learn the IPX network number. The screen (if connected) says**

Trying SAP...

5. **If a Novell server or IPX router is present, it responds to the SAP request. If the SAP request is not answered, the Model 281x configures itself as IP-only.**
6. **Via ASCII mode TFTP, the server transfers the configuration file (as specified by the boot parameters) to the Model 281x.**
7. **Via binary mode TFTP, the server transfers the run-time image file (as specified by the configuration file) to the Model 281x. The terminal screen (if connected to the service port) displays the SynOptics banner.**
8. **If the transferred code is different from that already in the Flash EPROM, the new run-time code is saved into Flash EPROM.**
9. **The Model 281x run-time image file begins execution. The green On Line LED of the Model 281x is now ON (and the yellow uP Fault LED is OFF).**



EPROM UPDATES AND IMAGE LOAD MODE: If the downloaded image is different from what is already saved in Flash EPROM, Flash EPROM is updated after that remote download. Once the remote load process succeeds, the Image Load Mode automatically switches to Remote w/Local.

Setting the Boot Configuration Without a BOOTP Server

If a BOOTP server is *not* present, you must configure the Model 281x through the service port. This section describes the Model 281x configuration and boot sequence. It includes hardware requirements for connecting the Model 281x to a configuration terminal, initial steps to prepare the Model 281x for configuration, and the configuration command menus.

To set the boot configuration, follow these steps:

1. **Connect a terminal to the service port, as described under “Initial Steps,” later in this chapter.**

2. **Press <Ctrl-C> during the boot process to access the primary boot configuration menu. This menu and its commands are described in detail in the section “Boot Configuration Menus.”**
3. **Set the Model 281x IP address, boot server’s IP address, router’s IP address, and boot file name.**
4. **Set the Model 281x IPX network number.**
5. **Enter command w [Write boot configuration to EEPROM] to save the booting parameters to EEPROM.**
6. **Enter command l [Load boot file and go]. The following messages appear on the terminal’s screen (see Figure 5-2 and Figure 5-3):**

```
TFTP NETASCII loading c:\tftpboot\281x50.cfg from XXX.XXX.XX.XXX
TFTP trying... open
file loaded
TFTP loaded config file ok
TFTP IMAGE loading c:\tftpboot\281x50.img from XXX.XXX.XX.XXX
TFTP trying...open
Start address:2000:0
file loaded
Loaded image
Updating eeprom... done

* * * * *
* Copyright(c) 1992 *
* SynOptics Communications, Inc. *
* All Rights Reserved *
* Date: Nov 04, 1992, Time: 18:32:02 *
* Model 281x version 5.0.0 *
* * * * *

Model type/revision: 2813/0

Press Ctrl-Y to begin
```

Figure 5-2. Boot Messages (Remote Image File Load)

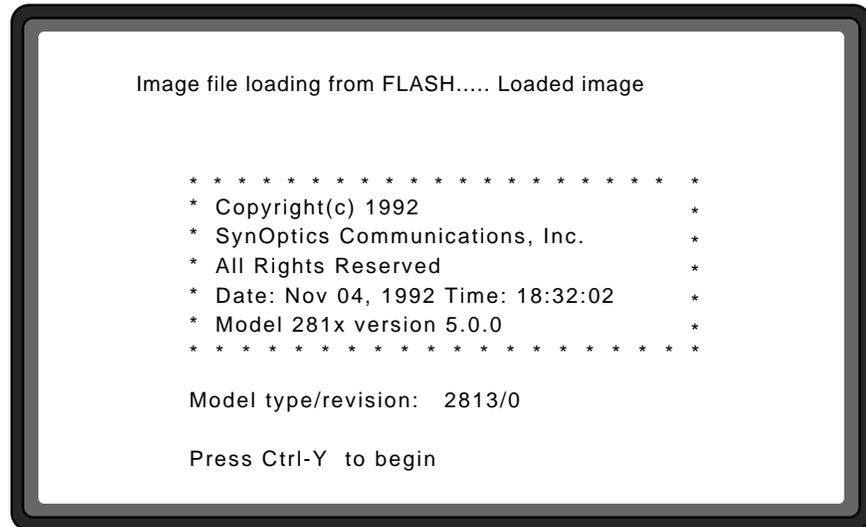


Figure 5-3. Boot Messages (Local Image File Load)

At this point the Model 281x is completely operational and requires no user intervention. If you want to change any run-time parameters, press <Ctrl-Y> to display the run-time parameters menu. This menu and associated submenus are described in later sections of this chapter.



NOTE: *If you plan to manage your network only with IPX network management stations, BOOTP server or service port configuration is unnecessary. The Model 281x will automatically learn from the network the required IPX network information.*

Requirements

To configure the Model 281x via the DB-9 service port, you need the following hardware components:

- A terminal that has a serial port, or a portable computer that has a serial port and can emulate an ASCII terminal (for instance, with communications software).

- A standard RS-232 serial communications cable with suitable connectors, also referred to as a modem or straight-through cable. This cable is *not* a null modem cable or a crossover cable.

The RS-232 cable must have a female DB-9 connector at one end to connect to the Model 281x. The other end should have the appropriate connector for your computer or terminal's serial port. (The serial port is usually a male DB-9 or DB-25 connector.) Table 5-1 lists the pin assignments to use when connecting this type of cable.

Table 5-1. Service Port Pin Assignments

Terminal Pin DB-9	DB-25	Function	To Model 2705 DB-9 Pin	Function
2	3	Receive data	2	Transmit data
3	2	Transmit data	3	Receive data
5	7	Signal ground	5	Signal ground



OTHER PINS: RS-232 Signals on other pins, such as DTR, CTS, and CD, are not recognized.

Initial Steps

To prepare the Model 281x for configuration, follow these steps:

1. **Connect the terminal (or a computer in terminal emulation mode) to the service port on the Model 281x, using the RS-232 cable described under “Requirements.” Set the terminal's protocol as follows:**
 - 9600 b/s
 - 8 data bits
 - No parity
 - 1 stop bit
 - No handshaking
 - Standard ASCII code

2. **Apply power to the Model 281x. The Model 281x performs a diagnostic self test that validates all testable hardware components, and the following diagnostic messages appear on the terminal's screen (see Figure 5-4):**

```
Model 281X IP/IPX BOOT PROM Rev: A Date: Nov 17, 1992
Power-On Self Test
Test #1 Boot ROM Checksum Test . . . Boot ROM Checksum Test Passed
Test #2 LCA Test . . . LCA Test Passed
Test #3 Memory Test
. . . . .
Memory Test Passed
Test #4 FLASH Checksum Test . . . FLASH Checksum Test Passed
Test #5 EEPROM Checksum Test . . . EEPROM Checksum Test Passed
On board: Local Image version 5.0.0
Test #6 CNMI Test . . . CNMI Test Passed
Test #7 NIC Test . . . NIC test Passed
Power-On Self Test Passed
```

Figure 5-4. Diagnostic Messages for Model 281x

If an error occurs, the self test loops to the point of the error. If the error persists, the Model 281x resets itself and restarts. If the same error message repeatedly displays on the monitor, or if the **µP Fault** LED remains lit, contact your supplier's customer service department.

If the error clears, the diagnostics continue with the remaining tests.

After the self tests run, the following download messages appear (see Figure 5-5):

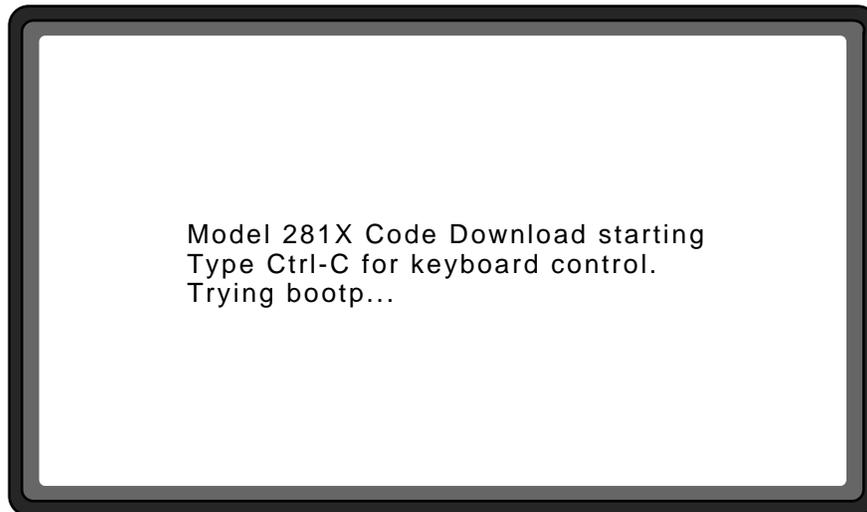


Figure 5-5. Download Messages

3. Verify the Model 281x LED status:

- **Power LED** *on*
- **On Line LED** *flashing*
- **NM Cntrl LED** *off*
- **μP Fault LED** *off*

The factory default Boot Mode setting for the Model 281x is **Network**.

Therefore, if this is the first time the Model 281x has been powered up, it looks for a BOOTP server. The screen says

Trying BOOTP...

while the Model 281x sends a broadcast message looking for its booting parameters.

- 4. Since a BOOTP server is not set up, type <Ctrl-C> to enter the Model 281x boot configuration menu. See “Setting the Boot Configuration” for a description of the configuration menus.**

Using Configuration Menus

To configure the Model 281x through the service port, you use configuration menus on the display of the terminal connected to the service port. There are two series of configuration menus (see Figure 5-6 and Figure 5-7):

- One menu sets the primary boot configuration; that is, it tells the concentrator how to identify itself to the network management software. You can access this menu only before the image code is loaded. To access this menu, press <Ctrl-C>.
- The other menu series modifies the run-time parameters; use the menus to change operating parameters as the concentrator is running. You can access these menus only after the image code is loaded. To access these menus, press <Ctrl-Y>.

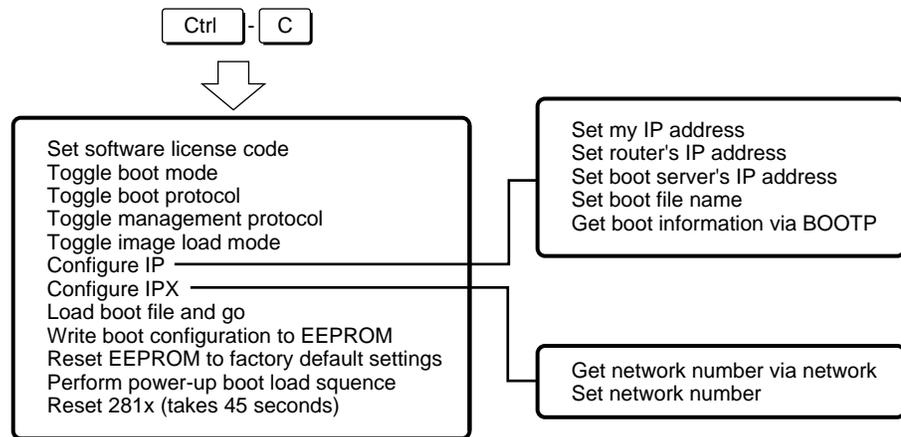


Figure 5-6. Primary Boot Configuration Menu

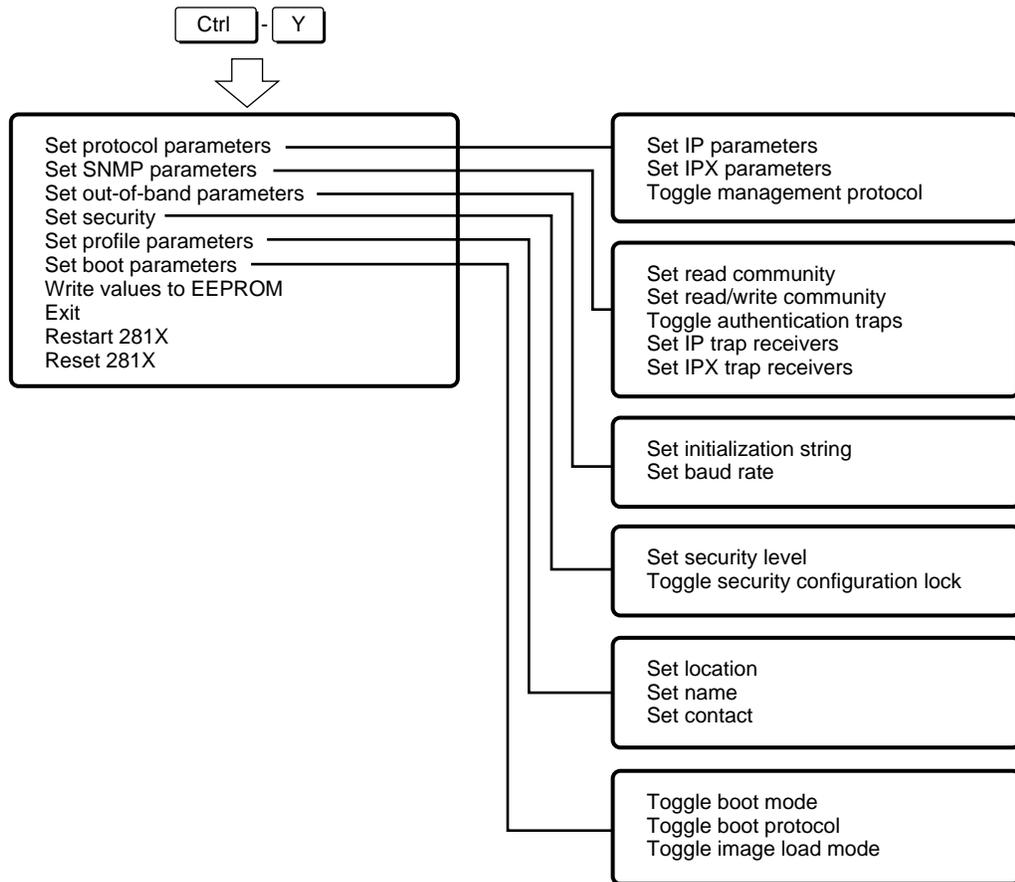


Figure 5-7. Run-Time Parameters Menus

Menus for configuring the Model 281x have similar formats. Each menu shows the current settings for a group of parameters, followed by a list of commands for changing the parameters (see Figure 5-8 for an abridged example).

```
281X IP/IPX Boot Menu

MAC Address: 00:00:81:XX:XX:XX
Local Agent Version: 5.0.0
Software License Code: XXXXXXXX
Boot Mode: Network (EEPROM)
Boot Protocol: Auto (IP, IPX, IP_IPX)
Management Protocol: IP_IPX (IP, IPX)
Image Load Mode: Remote w/local (Remote, Local)

-c Set software license code
-m Toggle boot mode
-p Toggle boot protocol
. .
. .
-g Perform power-up boot load sequence
-r Reset 281X (takes 45 seconds)
```

Figure 5-8. Sample Configuration Menu (abridged)

Toggle and Parameter Commands

Some commands switch between two or three possible settings; these commands toggle a condition. Other commands allow you to enter information; these commands *set*, *add*, or *delete* a parameter value. Specific commands on the main menu also have submenus from which you can select additional commands.

To use the menus, follow these steps:

1. **Type the lower-case letter for the command you want to issue; do not type the dash that displays in front of the command.**
2. **If you select a *toggle* command, the specified parameter changes its setting in the upper part of the menu. The current setting for a toggle command appears first, followed by the alternate setting(s) in parentheses. For example, if you select command m [Toggle boot mode], the message**

Boot Mode: Network (EEPROM)

changes to

Boot Mode: EEPROM (Network)

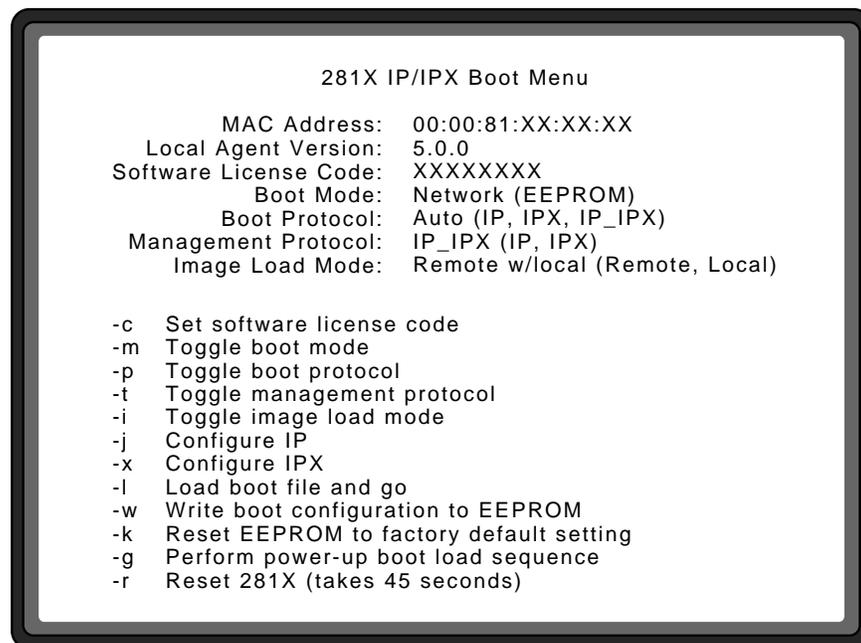
and vice versa.

If you select a *set*, *add*, or *delete* command, either you shift to a submenu, or the command you selected displays at the bottom of the menu, followed by a type-in field. When a command selection displays a type-in field, enter the requested information and press <Enter>.

3. **Repeat steps 1 and 2 if you want to change other parameters.**
4. **If you are working from a submenu, press <ESC> when you are finished. If you are working from the main menu, choose an appropriate command from the bottom of the menu.**

Boot Configuration Menus

To set the primary boot configuration without a BOOTP server, press <Ctrl-C> during the boot process. The menu shown in Figure 5-9 appears.



```
281X IP/IPX Boot Menu

MAC Address: 00:00:81:XX:XX:XX
Local Agent Version: 5.0.0
Software License Code: XXXXXXXX
  Boot Mode: Network (EEPROM)
  Boot Protocol: Auto (IP, IPX, IP_IPX)
Management Protocol: IP_IPX (IP, IPX)
Image Load Mode: Remote w/local (Remote, Local)

-c Set software license code
-m Toggle boot mode
-p Toggle boot protocol
-t Toggle management protocol
-i Toggle image load mode
-j Configure IP
-x Configure IPX
-l Load boot file and go
-w Write boot configuration to EEPROM
-k Reset EEPROM to factory default setting
-g Perform power-up boot load sequence
-r Reset 281X (takes 45 seconds)
```

Figure 5-9. Boot Configuration Menu

The commands in this menu are of three types: the first five commands (**c**, **m**, **p**, **t**, and **i**) set values for the parameters at the top of the menu; the next two commands (**j** and **x**) open submenus that configure the IP and IPX operating parameters; and the last five commands (**l**, **w**, **k**, **g**, and **r**) initiate an action by the Model 281x.

To change a parameter value in the top section of the menu, type the letter that corresponds to the parameter you want to change. Then type the new entry for that item. To initiate one of the actions, simply type the letter of the desired command.

See the next section, “Boot Configuration Commands,” for a complete description of all the boot configuration commands.

Boot Configuration Commands

The boot configuration menu includes the following commands:

- c** **[Set software license code]** Eight ASCII hexadecimal characters that represent a software licensing code. You can type uppercase or lowercase letters; the Model 281x displays lower-case characters on the display menu. Spaces are ignored.



SOFTWARE LICENSE CODE: The code must be correctly input to run with advanced agent software functionality on the Model 281x. Without the correct license code, the concentrator defaults to Basic agent functionality. If the code is incorrect or misplaced, contact your Customer Support representative.

Model 281x-04 concentrators are pre-configured at the factory with the software key.

- m** **[Toggle boot mode]** Shifts the boot mode between **Network** and **EEPROM**. The factory default setting is **Network**.

When **Network** is selected, the Model 281x tries to learn its configuration over the network, using the protocol specified by command **t** [**Toggle boot protocol**].

When **EEPROM** is selected, the Model 281x configures itself during power-on or reset using the parameter values obtained from the EEPROM (if they exist).



NOTE: When **EEPROM** is selected as the boot mode, you must use the menu selections to set or change the required parameters.

p **[Toggle boot protocol]** Shifts the boot protocol among **Auto**, **IP**, **IPX**, and **IP_IPX**. The factory default setting is **Auto**.



NOTE: If *m* [**Toggle boot mode**] is set to **EEPROM**, this parameter is ignored.

When **Auto** is selected, the Model 281x tries to find its IP or IPX configuration parameters over the network. It starts by seeking the IP parameters and configuration file from a BOOTP server, transferring the configuration file, and writing the values (if it finds them) into EEPROM. If it can't find IP parameters, it looks for them in EEPROM. If there are no IP parameters in EEPROM, this Model 281x cannot be managed by IP.

Then the Model 281x seeks the IPX values and writes them into EEPROM.

As long as it can find either IP or IPX parameters, the Model 281x will write the values into EEPROM. If the Model 281x fails to locate either an IP BOOTP server or a Novel (IPX) server or router, it resets and starts over.

When **IP** is selected, the Model 281x tries to locate a BOOTP server and load the IP parameter values. It also writes these values into EEPROM. If it cannot find a BOOTP server or transfer the configuration file, it looks for default values in EEPROM and, failing that, resets itself. If IP is selected, the Model 281x does not look for IPX parameters.

When **IPX** is selected, the Model 281x looks for a Novell server or router from which it can obtain the IPX network number. If no server or router responds, the Model 281x uses the network number in EEPROM (if it exists). If there is no network number in EEPROM, the Model 281x will not boot. When IPX is selected, the Model 281x does not look for a BOOTP server.

When **IP_IPX** is selected, the Model 281x looks for *both* a BOOTP server *and* a Novell server or router. If it finds them, it transfers the configuration file, obtains the IPX network number, and writes the parameter values into EEPROM. If it does not find them, it looks for default values in the EEPROM. If it fails to find IP parameters, the Model 281x resets itself and starts the booting process over.

- t** **[Toggle management protocol]** Shifts the management protocol among **IP_IPX**, **IP**, and **IPX**. The factory default setting is **IP_IPX**. The management protocol is independent of the boot protocol.

When **IP_IPX** is selected, the Model 281x can be managed by either IP or IPX network management stations.

When **IP** is selected, the Model 281x can be managed only by IP network management stations.

When **IPX** is selected, the Model 281x can be managed only by IPX network management stations.



NOTE: *The Model 281x must have a valid configuration in EEPROM for the protocol the network management station is using. That is, the Model 281x must know its IP address and proper subnet mask if an IP network management station will be used to manage it. Likewise, the Model 281x must know its IPX network number if an IPX network management station will be used.*

- i** **[Toggle image load mode]** Shifts the image load mode among **Remote**, **Remote w/Local**, and **Local**. The factory default setting is **Remote w/Local**.

When **Remote** is selected, the Model 281x tries to download the image file according to the boot mode specified by command **m** [**Toggle boot mode**]. The image file will never be loaded from local Flash EPROM, even if downloading fails and the local image file exists.

When **Remote w/Local** is selected, the Model 281x tries to download the image file according to the boot mode setting. The local image is used as a backup in case the remote download fails. If the download fails, instead of resetting itself and starting the process over, the Model 281x loads the image file from local Flash EPROM.

When **Local** is selected, the Model 281x loads the image file from on-board local Flash EPROM. When you set the image load mode to Local, the boot mode setting is no longer important (i.e., the 281x will perform only a local load of the image file).



LOCAL IMAGE FILE: If the local image file is corrupted, you will not be allowed to set the image load mode to **Local**.



NOTE: *en the image load mode is set to LOCAL, you must use the menu selections to set the required parameters. Local loading of the image file will not be performed if the Model 281x IP address has not yet been entered (My IP address: [none]).*

- j** **[Configure IP]** Shifts display to another menu (see next section) that allows you to set or modify the Model 281x's IP address, boot server's address, default boot router's address, and boot file name of the configuration file.

- x** **[Configure IPX]** Shifts display to another menu (see later section) that allows you to set or modify the Model 281x's IPX network number.

l **[Load bootfile and go]** Directs the Model 281x to try to load the configuration specified by the parameter values shown on the menu and begin operation.

If the image load mode is set to **Remote** or **Remote w/Local**, this command can be used to interactively test the operation of your TFTP server. If the parameters are set correctly, a series of boot messages display as shown in Figure 5-5a. If the image load mode is set to **Local**, this command loads the local EPROM image file and begins execution. A series of boot messages displays, as shown in Figure 5-5b.

w **[Write boot configuration to EEPROM]** Takes all the parameters that you have set using the configuration menus and stores them in EEPROM.

k **[Reset EEPROM to factory default settings]** Resets the EEPROM contents to the factory default settings.

g **[Perform power-up boot load sequence]** Depending on how the boot mode and image load are set, the Model 281x either

- Sends a BOOTP or SAP request or uses the values in Flash EPROM, then tries to load the bootfile and begin operation

or

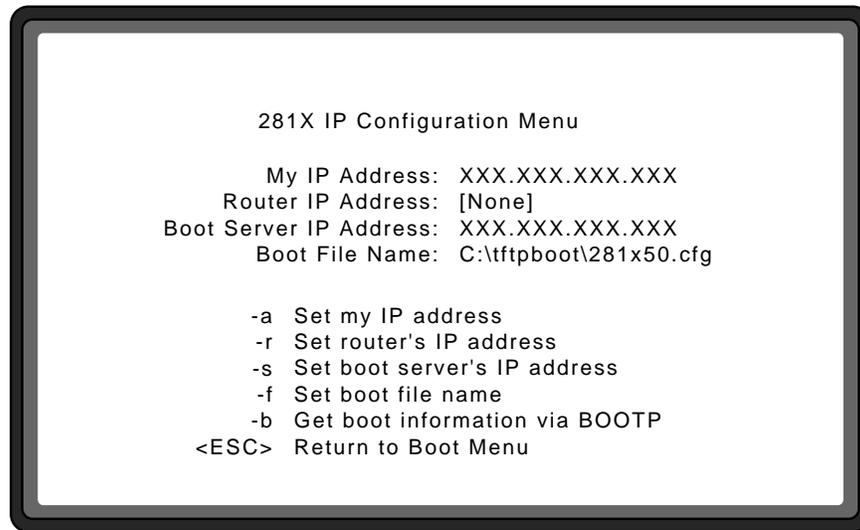
- Loads the image file from local Flash EPROM and begins operation

This command can be used to interactively test the operation of your BOOTP and TFTP servers and to test the local image loading from flash memory operation.

r **[Reset 281x]** This command causes the Model 281x to go through the self-test and image loading process. Before the command takes effect, a confirmation message appears on the screen.

IP Configuration Menu

When you select command **j** [**Configure IP**] from the start-up menu, the menu in [Figure 5-10](#) appears.



```
281X IP Configuration Menu

My IP Address: XXX.XXX.XXX.XXX
Router IP Address: [None]
Boot Server IP Address: XXX.XXX.XXX.XXX
Boot File Name: C:\tftpboot\281x50.cfg

-a Set my IP address
-r Set router's IP address
-s Set boot server's IP address
-f Set boot file name
-b Get boot information via BOOTP
<ESC> Return to Boot Menu
```

Figure 5-10. IP Configuration Menu

The new settings must be written to EEPROM (command **w** [**Write boot configuration to EEPROM**]) on the main menu) before they will take effect.

This menu includes the following commands:

- a** **[Set my IP address]** Up to twelve numeric characters, written in dotted decimal notation (N.N.N.N, with N being a value from 0 to 255, inclusive). These characters identify the network IP address of the Model 281x. This is the Internet address the Model 281x uses during operation. To set this address to **none**, enter 0.0.0.0, or type <none>. See Appendix F, “IP Addressing,” for a description of what each part of the address means.

- r** **[Set router’s IP address]** Up to twelve numeric characters, written in dotted decimal notation. This is the IP address of the default router used when the boot server is located on a different IP subnet. To set this address to **none**, enter 0.0.0.0, or type <none>.



NOTE: *This parameter is used only for booting, not for normal operation. The “default router” parameter in the configuration file described in the LattisNet SNMP Load Server Installation and Configuration Guide is used for normal operation. Set this parameter only if the boot server is on a different IP subnet from the Model 281x. Otherwise, leave it as [none].*

s **[Set boot server’s IP address]** Up to twelve numeric characters, written in dotted decimal notation. This is the IP address of the host that provides the files for boot loading the Model 281x. To set this address to **none**, enter 0.0.0.0, or type <none>.

f **[Set boot file name]** Up to 64 ASCII characters. Identifies the path and filename specifying the Model 281x configuration file to be loaded. The string format is specific to the operating system used by the TFTP server. For example, if the TFTP server is an MS-DOS-based implementation, a sample string can be

`c:\tftpboot\281x50.cfg`

If the TFTP server is UNIX-based, a sample string can be

`/tftpboot/281x50.cfg`

b **[Get boot information via bootp]** Causes the Model 281x to send a BOOTP request. If a BOOTP server exists, the parameters at the top of the menu will be filled in using the values obtained from the BOOTP server. This command can be used to interactively test the operation of your BOOTP server.

ESC **[Return to Boot menu]** Returns display to boot menu.

IPX Configuration Menu

When you select command **x** **[Configure IPX]** from the start-up menu, the menu in Figure 5-11 appears.

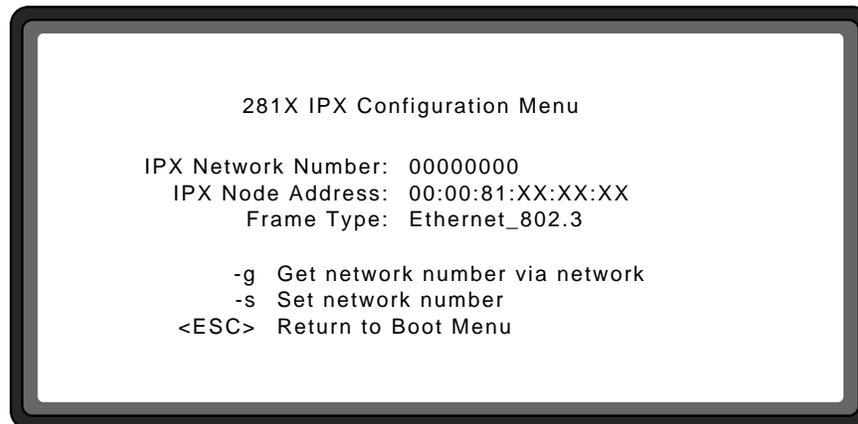


Figure 5-11. IPX Configuration Menu

The new settings must be written to EEPROM (command **w** [**Write boot configuration to EEPROM**] on the main menu) before they will take effect.

This menu includes the following commands:

- g** **[Get network number via network]** Causes the Model 281x to issue up to eight IPX “Find Nearest Server” SAP broadcasts to learn the local network number.

- s** **[Set network number]** Eight numeric characters, identifying the IPX network number the Model 281x is attached to. This is the network number the Model 281x uses during operation. To set this number to **none**, enter 00000000 or type <none>.

- ESC** **[Return to Boot Menu]** Returns display to start-up menu.

Setting Run-Time Parameters

When the boot sequence is complete and the image code is running, the Model 281x requires no further user intervention. However, if you want to modify run-time parameters, the menu shown in Figure 5-11 allows you to do so. Using this menu, you can

- Update IP and IPX configuration parameters or boot parameters
- Set the Model 281x for out-of-band operation
- Set SNMP parameters
- Set the location string for the Model 281x

If you change any of these settings, you must store the new settings in EEPROM (command **w**) and either restart or reset the Model 281x (command **r** or **z**) before the new settings will take effect.

To modify run-time parameters, type <Ctrl-Y>; the menu in Figure 5-12 appears. If you are running Basic agent functionality, command **c** [**Set security parameters**] is not supported. To change any of the run-time parameters, select the appropriate command from the menu.

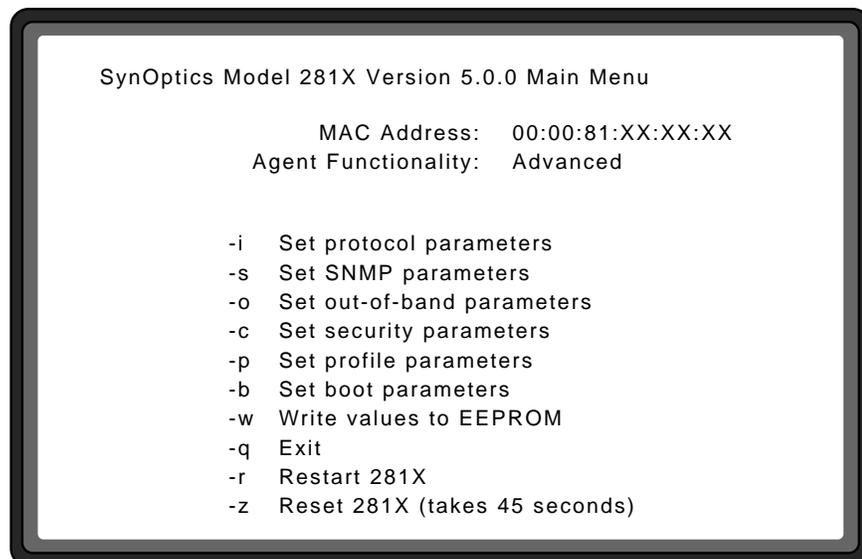


Figure 5-12. Run-Time Parameters Menu (Advanced Agent)

The first six commands (**i**, **s**, **o**, **c**, **p**, and **b**) take you to submenus with specific commands for each set of parameters. The submenus for these commands are described in the next six sections. The other commands produce results without shifting to other menus.

This menu includes the following commands:

- i** **[Set protocol parameters]** Shifts display to another menu that allows you to set or modify the IP or IPX configuration parameters and set the management protocol.

- s** **[Set SNMP parameters]** Shifts display to another menu that allows you to set or modify the SNMP read community and read/write community, to enable or disable the authentication traps, and to set IP and IPX trap receivers.

- o** **[Set out-of-band parameters]** Shifts display to another menu that allows you to set or modify the initialization string and baud rate.

- c** **[Set security parameters]** Shifts display to another menu that allows you to enable or disable security features and to toggle the security configuration lock. Security features are available only with the Advanced agent software.

- p** **[Set profile parameters]** Shifts display to another menu that allows you to set or modify the location, name, and administrator contact strings.

- b** **[Set Boot parameters]** Shifts display to another menu that allows you to set or modify the boot mode, boot protocol, and image load mode.

- w** **[Write values to EEPROM]** Saves the current parameter values (including any you have just changed) to the EEPROM. When the Model 281x is restarted, it will use these values during booting.

- q** **[Exit]** Takes you out of the configuration process without saving any changed values.

- r** **[Restart 281x]** Re-executes the code that is already down-loaded. When you issue this command, a screen message asks for confirmation. Upon confirmation, the screen immediately scrolls to the SynOptics banner and displays the message “Press CTRL-Y to begin.”

- z** **[Reset 281x]** Resets the unit. This command causes the Model 281x to go through self tests and image loading process again.

Protocol Parameters

When you select command **i** [**Set protocol parameters**] from the main menu, the submenu in Figure 5-12 appears.

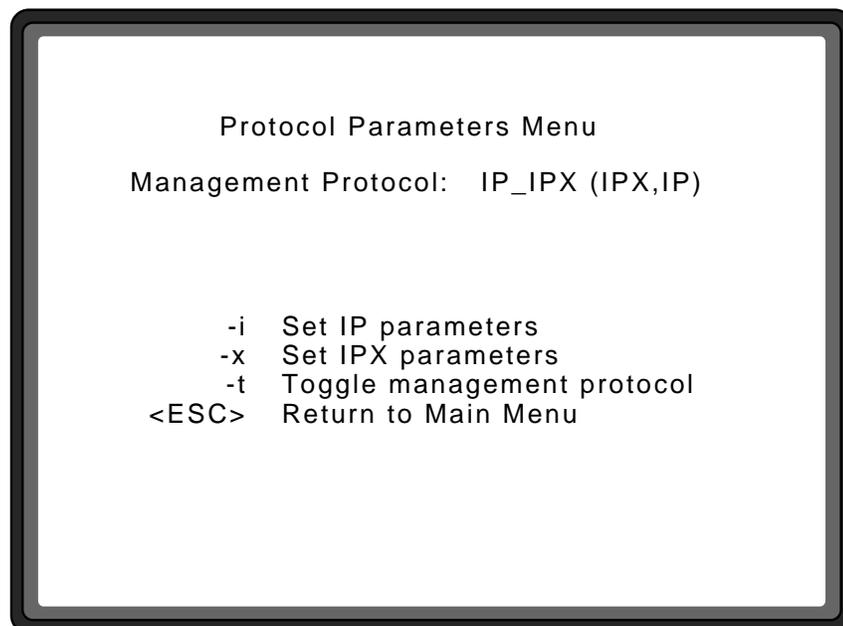


Figure 5-13. Protocol Parameters Menu

This menu includes the following commands:

- i** **[Set IP parameters]** Shifts display to another menu that allows you to set or modify the concentrator IP address, subnet mask, default router IP address, boot server IP address, and boot file name.
- x** **[Set IPX parameters]** Shifts display to another menu that allows you to set or modify the IPX network number.

- t **[Toggle management protocol]** Shifts the management protocol among **IP_IPX**, **IP**, and **IPX**. The factory default setting is **IP_IPX**.

When **IP_IPX** is selected, the Model 281x can be managed by either IP or IPX network management stations.

When **IP** is selected, the Model 281x can be managed only by IP network management stations.

When **IPX** is selected, the Model 281x can be managed only by IPX network management stations.



NOTE: *The Model 281x must have a valid configuration in EEPROM for the protocol the network management station is using. That is, the Model 281x must know its IP address and proper subnet mask if an IP network management station will be used to manage it. Likewise, the Model 281x must know its IPX network number if an IPX network management station will be used.*

ESC [Return] Returns the display to the main menu.

IP Parameters

When you select command **i** [**Set IP parameters**] from the Protocol parameters menu, the submenu in Figure 5-14 appears:

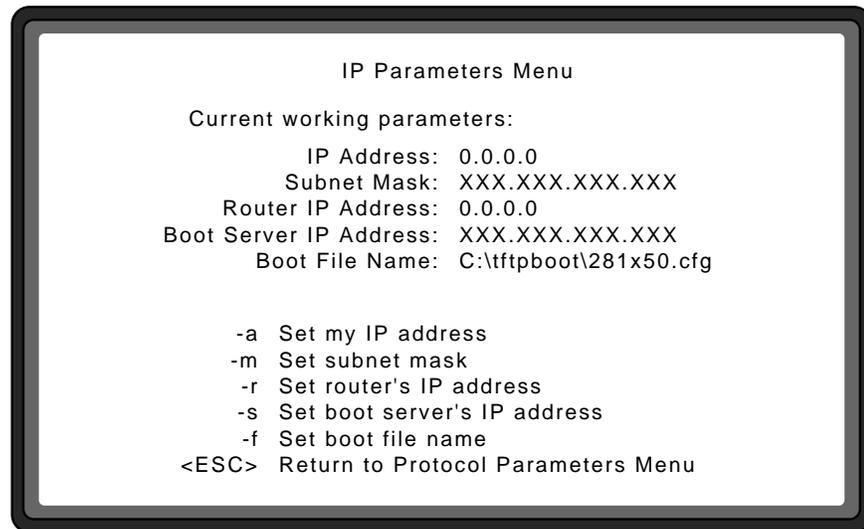


Figure 5-14. IP Parameters Menu

When you modify run-time parameters on this menu, the screen changes to show both the original settings and the new ones (see Figure 5-15). The new settings will take effect only after you exit the configuration program and save them to EEPROM (command **w** on the main menu), then restart or reset the Model 281x.

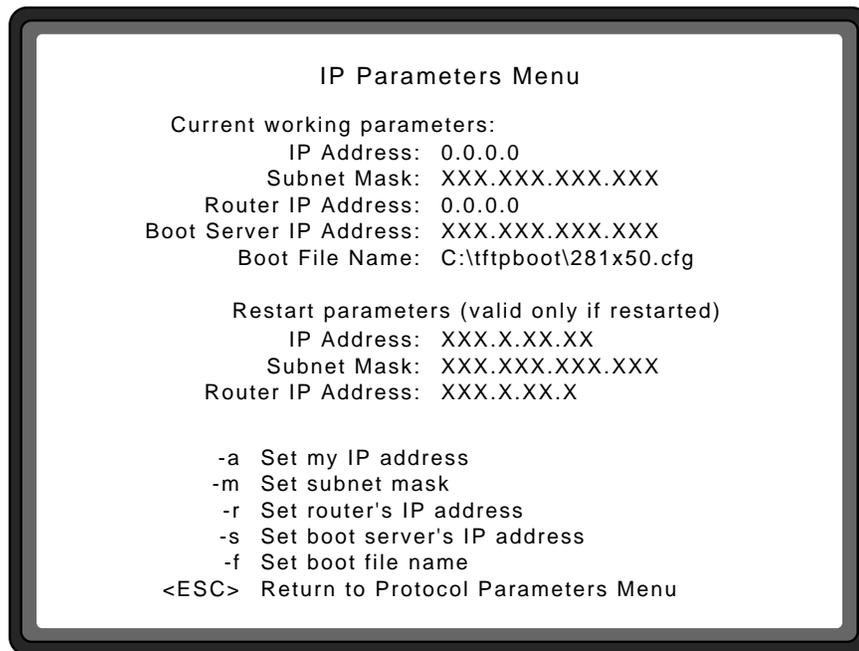


Figure 5-15. Changing IP Parameters

Each time you change one of the run-time parameters on this menu, the screen scrolls to show the new setting on the “Restart parameters” part of the menu. This menu includes the following commands:

- a** **[Set my IP address]** Up to twelve numeric characters, written in dotted decimal notation (N.N.N.N, with N being a value from 0 to 255, inclusive). These characters identify the network address of the Model 281x. To set this address to **none**, enter 0.0.0.0. If the address is none, that parameter entry remains blank at the top of the menu.

- m** **[Set subnet mask]** Up to twelve numeric characters, written in dotted decimal notation. To set this address to **none**, enter 0.0.0.0. See the section “Subnetting” in Appendix G for a description of subnet addresses.

- r** **[Set router's IP address]** Up to twelve numeric characters, written in dotted decimal notation. To set this address to **none**, enter 0.0.0.0.

- s** **[Set boot server's IP address]** Up to twelve numeric characters, written in dotted decimal notation. This is the IP address of the host that provides the files for boot loading the Model 281x. To set this address to **none**, enter 0.0.0.0.

- f** **[Set boot file name]** Up to 64 ASCII characters. Identifies the path and filename specifying the Model 281x configuration file to be loaded. The string format is specific to the operating system used by the TFTP server. For example, if the TFTP server is an MS-DOS-based implementation, a sample string can be

`c:\tftpboot\281x50.cfg`

If the TFTP server is UNIX-based, a sample string can be

`/tftpboot/281x50.cfg`

- ESC** **[Return to Protocol Parameters Menu]** Returns the display to the Protocol Parameters menu.

IPX Parameters

When you select command **x** **[Set IPX parameters]** from the Protocol Parameters menu, the submenu in Figure 5-16 appears:

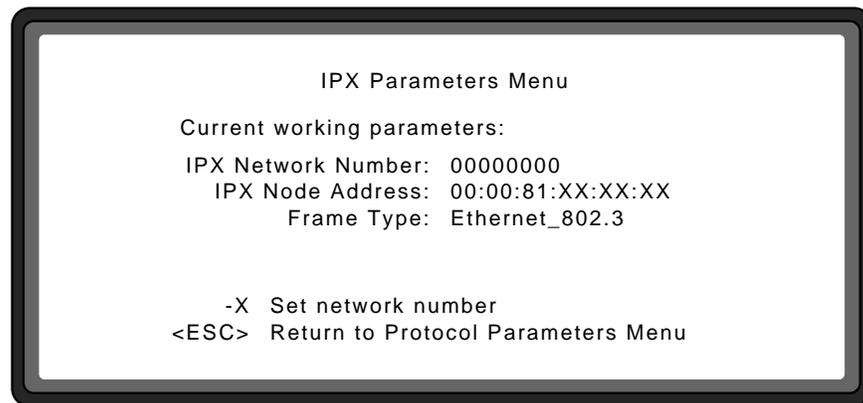


Figure 5-16. IPX Parameters Menu

This menu includes the following commands:

- x** **[Set network number]** Eight numeric characters, identifying the IPX network number the Model 281x is attached to. This is the network address the Model 281x uses during operation. To set this address to **none**, enter 00000000.

- ESC** **[Return to Protocol Parameters Menu]** Returns the display to the Protocol Parameters menu.

SNMP Parameters

When you select command **s** **[Set SNMP parameters]** from the main menu, the menu shown in Figure 5-16 appears.

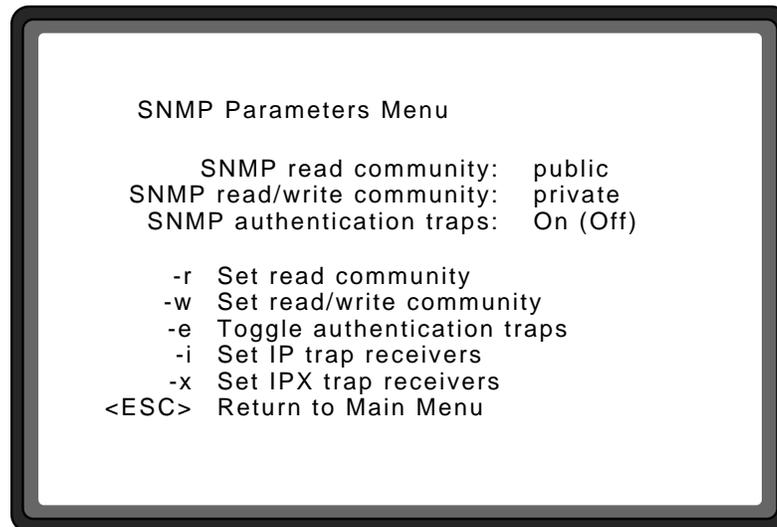


Figure 5-17. SNMP Parameters Menu

This menu includes the following commands:

- r** **[Set read community]** Up to 20 alphanumeric characters that specify the SNMP community string used for read-only SNMP operations. To set this value to **[none]**, press <Enter> without typing any other characters. This will disable access to the read-only objects.

- w** **[Set read/write community]** Up to 20 alphanumeric characters that specify the SNMP community string used for read and write SNMP operations. To set this value to **[none]**, press <Enter> without typing any other characters. This will disable access to the read/write SNMP operations.

- e** **[Toggle authentication traps]** Switches the SNMP authentication traps between **ON** and **OFF**.

- i** **[Set IP trap receivers]** Takes you to a submenu (see next section) that allows you to list ten IP addresses to send SNMP trap messages.

- x** **[Set IPX trap receivers]** Takes you to a submenu (see later section) that allows you to list ten IPX addresses to send SNMP trap messages.

- ESC** **[Return to Main Menu]** Returns the display to the main menu.

SNMP Trap Receivers for IP

When you select command **i** **[Set IP trap receivers]** from the SNMP Parameters menu, the menu shown in Figure 5-18 appears.

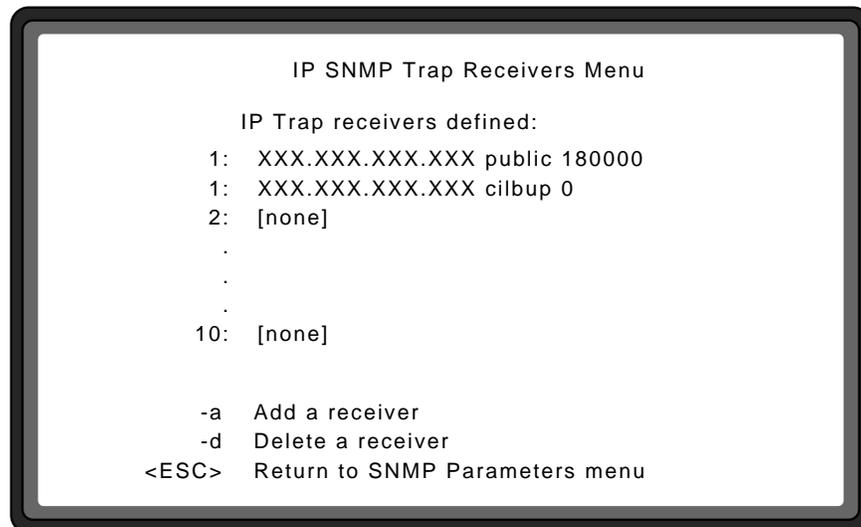


Figure 5-18. SNMP IP Trap Receivers Menu

This menu includes the following commands:

- a** **[Add a receiver]** When you enter this command, the screen displays the message

Enter new trap receiver's IP address:

Type the address of the trap receiver you are adding. It can be up to twelve numeric characters, written in dotted decimal notation (N.N.N.N, with N being a value from 0 to 255, inclusive). When you press <Enter> the screen displays the message

Enter new trap receiver's community string:

Identify the new trap receiver's community string, and press <Enter>. When you press <Enter>, the screen displays the message

Enter new trap receiver's age-out time
(in unit of 10 msec):

Identify the new trap receiver's age-out time, and press <Enter>. The screen scrolls and adds a new entry to the displayed list of defined trap receivers.



AGE-OUT TIME: The age-out time specifies the length of time in milliseconds an entry may stay in the trap receiver's table. Once an entry ages out it is removed from the table. When a network management station learns about a Model 281x on the network it automatically registers its IP address in the trap receivers table and sets the age-out timer to 180000 milliseconds (30 minutes). Every 10 minutes it re-registers. If a network management station is removed from the network or does not re-register, the Model 281x will age out the IP address.

d **[Delete a receiver]** When you issue this command, the screen displays the message

Enter the number of the entry to delete:

Type the number (1 through 10) of the entry you are deleting, and press <Enter>. The screen scrolls and changes the deleted entry to read **[none]** on the displayed list of defined trap receivers.

ESC [Return] Returns the display to the SNMP Parameters menu.

SNMP Trap Receivers for IPX

When you select command **x** **[Set IPX SNMP trap receivers]** from the **SNMP Parameters menu**, the menu shown in **Figure 5-19** appears.

```
IPX SNMP Trap Receivers Menu

IPX Trap Receivers defined:
1: 12345678:123456789012 public 180000
1: 87654321:210987654321 cilbup 0
2: [none]
.
.
.
10: [none]

-a Add a receiver
-d Delete a receiver
<ESC> Return to SNMP Parameters menu
```

Figure 5-19. SNMP IPX Trap Receivers Menu

This menu includes the following commands:

- a** **[Add a receiver]** When you enter this command, the screen displays the message

Enter new trap receiver's IPX network number (in hexadecimal):

Identify the IPX network number of the trap receiver you are adding. It must be eight hexadecimal characters. To set this address to **none**, enter 00000000. When you press <Enter> the screen displays the message

Enter new trap receiver's IPX node address (in hexadecimal):

Identify the IPX node address of the trap receiver you are adding. It must be twelve hexadecimal characters. When you press <Enter> the screen displays the message

Enter new trap receiver's community string:

Identify the new trap receiver's community string, and press <Enter>. When you press <Enter>, the screen displays the message

Enter new trap receiver's age-out time
(in unit of 10 msec):

Identify the new trap receiver's age-out time, and press <Enter>. The screen scrolls and adds a new entry to the displayed list of defined trap receivers.



AGE-OUT TIME: The age-out time specifies the length of time in milliseconds an entry may stay in the trap receiver's table. Once an entry ages out it is removed from the table. When a network management station learns about a Model 281x on the network it automatically registers its IPX address in the trap receivers table and sets the age-out timer to 180000 milliseconds (30 minutes). Every 10 minutes it re-registers. If a network management station is removed from the network or does not re-register, the Model 281x will age out the IPX address.

d **[Delete a receiver]** When you issue this command, the screen displays the message

Enter the number of the entry to delete:

Type the number (1 through 10) of the entry you are deleting, and press <Enter>. The screen scrolls and changes the deleted entry to read **[none]** on the displayed list of defined trap receivers.

ESC **[Return to SNMP Parameters Menu]** Returns the display to the SNMP Parameters menu.

Out-of-Band Parameters

When you select command **o** **[Set Out-Of-Band parameters]** from the main menu, the menu in Figure 5-20 appears.

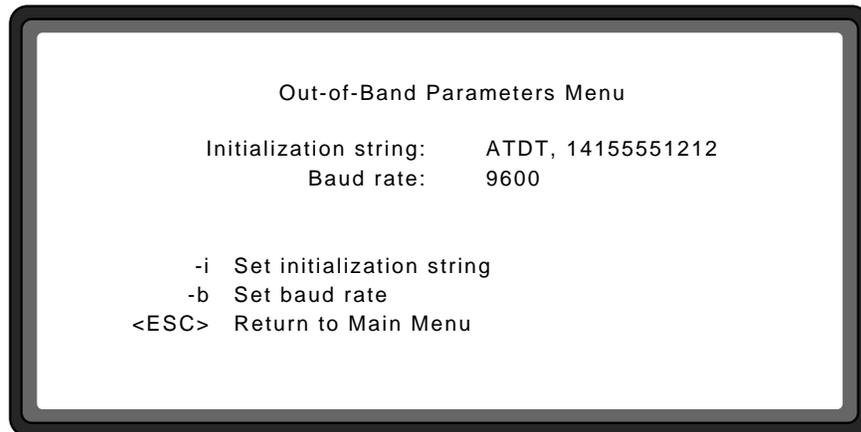


Figure 5-20. Out-of-Band Parameters Menu

This menu includes the following commands:

i **[Set initialization string]** Up to 64 characters for the Model 281x's initialization string. This is the string of characters that a network management station will dial to establish out-of-band contact with the Model 281x in case of network problems.

b **[Set baud rate]** Shifts display to another submenu with selections for possible baud rate settings for the external modem. Possible choices for the baud rate are:

- 1** 300
- 2** 1200
- 3** 2400
- 4** 4800
- 5** 9600

After selecting one of the baud rate settings, press <ESC> to return to the Out-of-Band Parameters menu.

ESC [Return to Main Menu] Returns the display to the main menu.

Security Parameters

When you select command **c** [**Set security parameters**] from the main menu, the menu in Figure 5-21 appears.

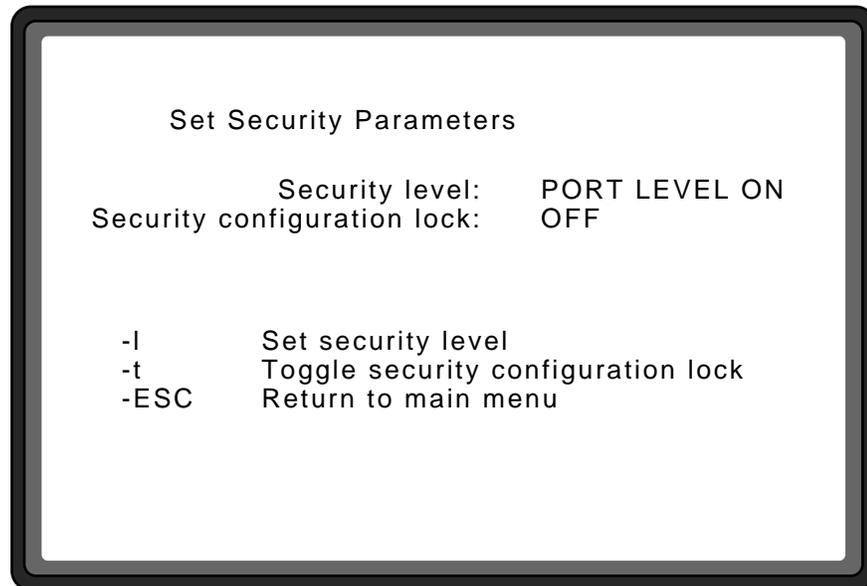


Figure 5-21. Security Parameters Menu

This menu includes the following commands:

- l** [**Set security level**] Shifts display to another submenu from which you can disable security altogether or enable security at the concentrator, slot, or port level.
- t** [**Toggle security configuration lock**] Shifts the security configuration lock between ON and OFF.

ESC [Return to Main Menu] Returns the display to the main menu.

The service port on the Model 281x features a security lock soft-ware switch for protection of the node security configuration. This switch lets you prevent unauthorized changes to the security settings without physical access to the concentrator. When the security configuration lock is set to the ON position, Allowed Nodes settings cannot be modified from network management stations. Authorized changes to the configuration will require changing the lock setting at the service port.

Profile Parameters

When you select command **p** [Set profile parameters] from the main menu, the menu in Figure 5-21 appears.

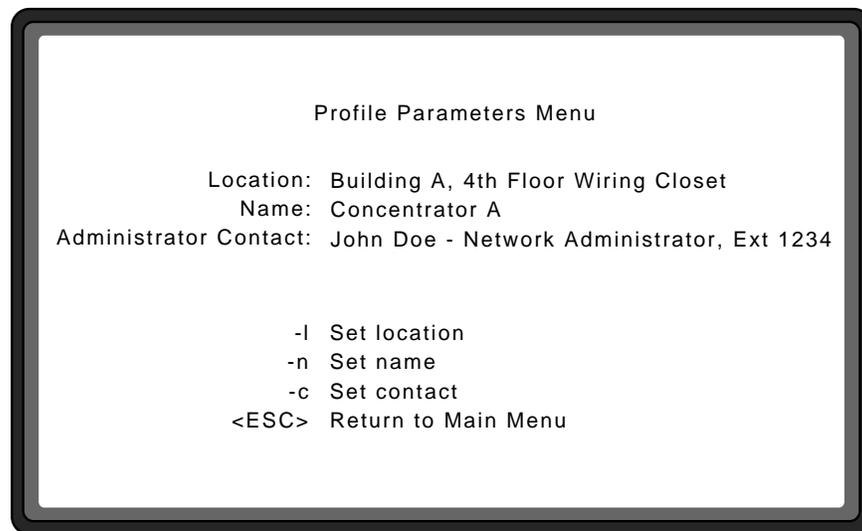


Figure 5-22. Profile Parameters Menu

This menu includes the following commands:

- l** [Set location] Up to 64 alphanumeric characters that represent the location of the Model 281x. This entry is useful for determining the physical location of a concentrator.
- n** [Set name] Specifies a name for the Model 281x concentrator.

- c** **[Set contact]** Specifies the person who should be contacted about matters pertaining to the Model 281x.

- ESC** **[Return to Main Menu]** Returns the display to the main menu.

Boot Parameters

When you select command **b** **[Set Boot parameters]** from the main menu, the menu in Figure 5-23 appears.

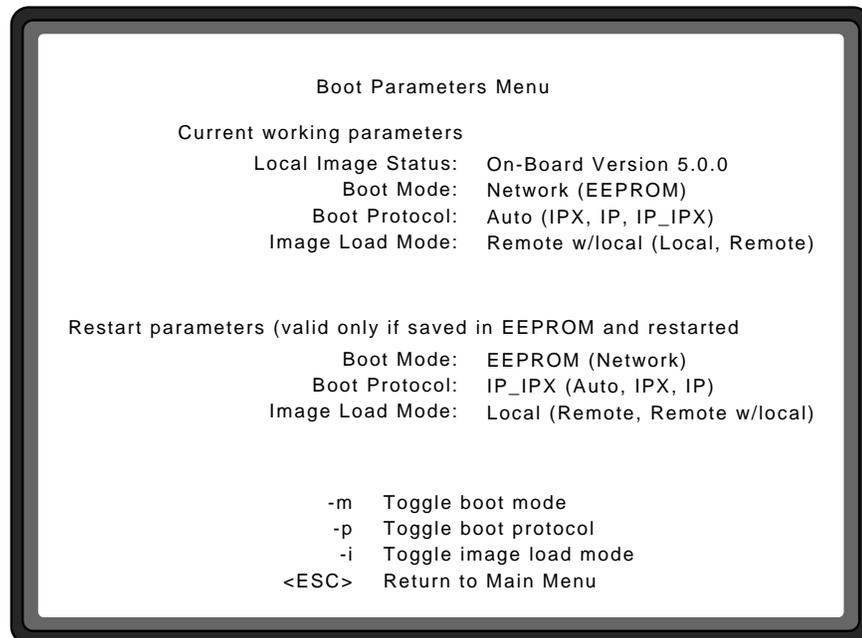


Figure 5-23. Boot Parameters Menu

This menu includes the following commands:

- m** **[Toggle boot mode]** Shifts the boot mode between **Network** and **EEPROM**. The factory default setting is **Network**.

When **Network** is selected, the Model 281x tries to learn its configuration over the network, using the protocol specified by command **t** **[Toggle boot protocol]**.

When **EEPROM** is selected, the Model 281x configures itself during power-on or reset using the parameter values obtained from the EEPROM (if they exist).



NOTE: When **EEPROM** is selected as the boot mode, you must use the menu selections to set or change the required parameters.

p [Toggle boot protocol] Shifts the boot protocol among **Auto**, **IP**, **IPX**, and **IP_IPX**. The factory default setting is **Auto**.



NOTE: If *m* [Toggle boot mode] is set to **EEPROM**, this parameter is ignored.

When **Auto** is selected, the Model 281x tries to find its IP or IPX configuration parameters over the network. It starts by seeking the IP parameters and configuration file from a BOOTP server, transferring the configuration file, and writing the values (if it finds them) into EEPROM. If it can't find IP parameters, it looks for them in EEPROM. If there are no IP parameters in EEPROM, this Model 281x cannot be managed by IP.

Then the Model 281x seeks the IPX values and writes them into EEPROM. If it can't find a Novell server, it resets and starts the boot process over.

As long as it can find either IP or IPX parameters, the Model 281x will write the values into EEPROM. If the Model 281x fails to locate either an IP BOOTP server or a Novel (IPX) server or router, it resets and starts over.

When **IP** is selected, the Model 281x tries to locate a BOOTP server and load the IP parameter values. It also writes these values into EEPROM. If it cannot find a BOOTP server or transfer the configuration file, it looks for default values in EEPROM and, failing that, resets itself. If IP is selected, the Model 281x does not look for IPX parameters.

When **IPX** is selected, the Model 281x looks for a Novell server or router from which it can obtain the IPX network number. If no server or router responds, the Model 281x uses the network number in EEPROM (if it exists). If there is no network number in EEPROM, the Model 281x defaults to a network number of all zeroes. When IPX is selected, the Model 281x does not look for a BOOTP server.

When **IP_IPX** is selected, the Model 281x looks for *both* a BOOTP server *and* a Novell server or router. If it finds them, it transfers the configuration file, obtains the IPX network number, and writes the parameter values into EEPROM. If it does not find them, it looks for default values in the EEPROM, and defaults to 00000000 as the IPX network number if there are no other values in EEPROM. If it fails to find IP parameters, the Model 281x resets itself and starts the booting process over.

- i** **[Toggle image load mode]** Shifts the image load mode among **Remote**, **Remote w/Local**, and **Local**. The factory default setting is **Remote w/Local**.

When **Remote** is selected, the Model 281x tries to download the image file according to the boot mode specified by command **m** **[Toggle boot mode]**. The image file will never be loaded from local Flash EPROM, even if downloading fails and the local image file exists.

When **Remote w/Local** is selected, the Model 281x tries to download the image file according to the boot mode setting. The local image is used as a backup in case the remote download fails. If the download fails, instead of resetting itself and starting the process over, the Model 281x loads the image file from local Flash EPROM.

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When **Local** is selected, the Model 281x loads the image file from on-board local Flash EPROM. When you set the image load mode to **Local**, the boot mode setting is no longer important (i.e., the 281x will perform only a local load of the image file).



LOCAL IMAGE FILE: *If the local image file is corrupted, you will not be allowed to set the image load mode to **Local**.*

ESC [Return to main menu] Returns the display to the main menu.

Appendix A Indicators and Switches

This appendix describes the indicators and switches on the LattisHub 2800 Series 10BASE-T Workgroup Concentrators. Tables A-1 and A-2 describe the functions of the indicators and switches. Table A-3 describes the meanings of combinations of the **µP Fault** and **On-Line** LEDs. Figures A-1 through A-4 show the concentrator front panels.

Table A-1. Model 2803/2804 LEDs

Type	Label	Color	Meaning
Power LED	Power	green	DC power is accurately delivered to the concentrator's internal circuitry.
Concentrator LEDs	Data	green	Lights while data is present in the concentrator.
	<Data>	green	Stretched LED lights for 34 ms after each data transmission. This allows the eye to perceive very short transmissions.
	Col	yellow	Stretched LED lights for 140 ms indicating a collision in the concentrator.
	NM Control	yellow	For a stand-alone Model 280x concentrator, indicates that one or more ports have been partitioned by Local Hub Management. For a Model 280x/281x cluster, indicates that the Model 280x concentrator has been isolated (partitioned) from the cluster "backplane" or that one or more ports have been partitioned by SNMP network management.
	Isolate	yellow	Lights to indicate the Model 280x has been partitioned (isolated) by network management from the extended Model 281x "backplane." The Model 280x will then function as its own 16-port Ethernet segment.
AUI Port LED (Model 2803)	AUI Partition	yellow	Lights to indicate that the AUI port has been autopartitioned because of an excessive number of consecutive collisions, an excessively long single collision signal, or jabber input; or it has been partitioned by SNMP network management (cluster configurations only) or by Local Hub Management (stand-alone Model 280x only).

Table A-1. Model 2803/2804 LEDs (continued)

Type	Label	Color	Meaning
10BASE-FL Port LEDs (Model 2804)	Partition	yellow	The 10BASE-FL port has been autopartitioned because of an excessive number of consecutive collisions, an excessively long single collision signal, or jabber input; or has been partitioned by SNMP network management (cluster configurations only) or by Local Hub Management (stand-alone Model 280x only).
	Link	green	Lights when the port is connected to another 10BASE-FL or FOIRL port on a powered concentrator or transceiver.
Expansion Port LEDs	Expansion 2, 3, 4, 5	green	Lights to indicate which Model 281x expansion port is used to connect to this Model 280x.
10BASE-T Port LEDs	Link	green	The port is connected to another powered 10BASE-T port whose signaling meets the requirements for an IEEE 802.3i 10BASE-T device. This LED turns OFF if a port has been partitioned by network management or local hub management.
(16 Pairs)	Part	yellow	The port has been autopartitioned because of an excessive number of consecutive collisions or an excessively long single collision signal; or has been partitioned by SNMP network management (cluster configurations only) or by Local Hub Management (stand-alone Model 280x only).



Figure A-1. Model 2803 10BASE-T Workgroup Concentrator Front Panel



Figure A-2. Model 2804 10BASE-T Workgroup Concentrator Front Panel

Table A-2. Model 2813/2814 LEDs

Type	Label	Color	Meaning
Power LED	Power	green	DC power is accurately delivered to the concentrator's internal circuitry.
Concentrator LEDs	Data	green	Lights while data is present in the concentrator.
	<Data>	green	Stretched LED lights for 34 ms after each data transmission. This allows the eye to perceive very short transmissions.
	Col	yellow	Stretched LED lights for 140 ms indicating a collision in the concentrator.
AUI Port LED (Model 2813)	Isolate	yellow	Lights to indicate the host portion of the Model 281x has been partitioned (isolated) by SNMP network management from the extended Model 281x "backplane." These 16 ports of the Model 281x will continue to function as their own 16-port Ethernet segment.
	Partition	yellow	Lights to indicate that the AUI port has been autopartitioned because of an excessive number of consecutive collisions, an excessively long single collision signal, or jabber input; or it has been partitioned by SNMP network management.
10BASE-FL Port LEDs (Model 2814)	Partition	yellow	10BASE-FL port has been autopartitioned because of an excessive number of consecutive collisions, an excessively long single collision signal, or jabber input; or has been partitioned by SNMP network management.
	Link	green	Lights to indicate the port is connected to another 10BASE-FL or FOIRL port on a powered concentrator or transceiver.

Table A-2. Model 2813/2814 LEDs (continued)

Type	Label	Color	Meaning
Expansion Port LEDs	Expansion Status	green	Lights to indicate that the specified expansion port connection to a Model 280x has been physically completed and the Model 280x microcontroller has passed diagnostics. Expansion unit #1 (Int) is the internal host portion of the Model 281x, and units 2 through 5 are the external Model 280x host units.
	Int, 2, 3, 4, 5		
Host Port LEDs (16 pairs)	Part	yellow	Port has been autopartitioned because of an excessive number of consecutive collisions or an excessively long single collision signal; or has been partitioned by SNMP network management. or local hub management.
	Link	green	Port is connected to another powered 10BASE-T port whose signaling meets the requirements for an IEEE 802.3i 10BASE-T device. This LED turns OFF if a port has been partitioned by network management.
Operation LEDs	On Line	green	Flashes to indicate that the Model 281x has not yet started to execute the run-time image software code. This LED lights to indicate that the download (or local load) has succeeded and has begun to execute the run-time image. If the μ P Fault LED is on, the On Line LED lights to indicate that the concentrator is running its self-test or that the download has failed eight times.
	NM Control	yellow	Lights to indicate that the concentrator has been isolated (partitioned) from the cluster "backplane" or that one or more ports have been partitioned by SNMP network management.
	μ P Fault	yellow	Lights to indicate that a microprocessor fault has occurred in the concentrator. This LED lights during power-on self-test and reset, then turns off if the tests are successful.

Reset Switch (Model 281x only)

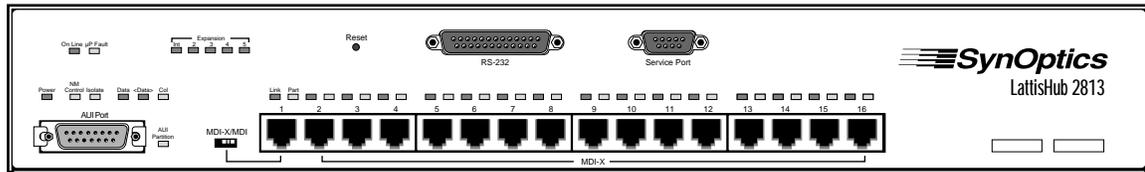


Figure A-3. Model 2813 10BASE-T Workgroup Concentrator Front Panel

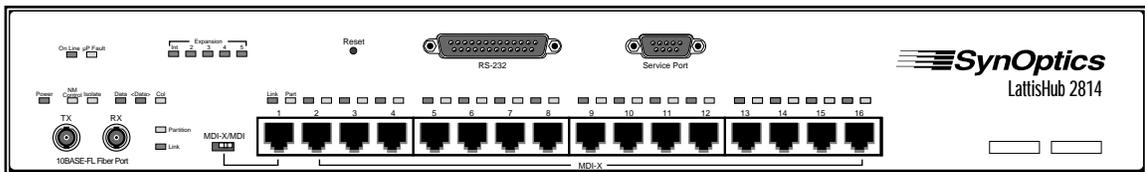


Figure A-4. Model 2814 10BASE-T Workgroup Concentrator Front Panel

Table A-3. Model 281x μP Fault and On Line LED Combination

μP Fault	On Line	μP Fault
ON	ON	Running self tests, or download failed after eight attempts.
OFF	Flashing	Waiting for download, or download in progress.
OFF	ON	In operation.

Reset Switch (Model 281x only)

A recessed pushbutton reset switch on the front panel of the Model 281x is accessible using a jeweler’s screwdriver or similar pointed implement (see Figure A-5). This switch can be used to reset the Model 281x. Resetting the Model 281x causes it to go through the complete download/local load process. The reset is similar to turning the Model 281x power off and then back on, except that data integrity is not interrupted during a reset and is interrupted during a power recycle.

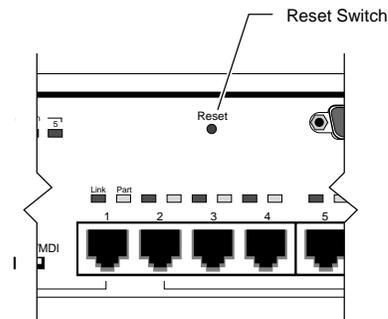


Figure A-5. Reset Switch

MDI-X/MDI Switch

LattisHub 2800 Series 10BASE-T Workgroup Concentrators allow you to configure Port 1 as an MDI or MDI-X port. The abbreviation MDI stands for Media Dependent Interface, and is specified by the IEEE 802.3i 10BASE-T Standard to be the electrical and mechanical interface to the UTP wire. An MDI port transmits out to the UTP wire on pins 1 and 2 (pair 2 of the 4-pair UTP cable), and receives from the UTP wire on RJ-45 pins 3 and 6 (pair 3 of the 4-pair UTP cable).

For two 10BASE-T devices to communicate, the transmitter of each device must connect to the receiver of the other device. The reversal of the transmit and receive assignments is called a crossover function. Every 10BASE-T link segment requires a crossover function, and it can be implemented in one of two ways:

- Internally, designed as part of the circuitry in the 10BASE-T device (see Figure A-6)

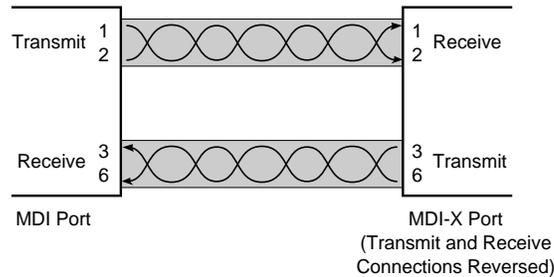


Figure A-6. Internal Crossover Function

- Externally, with a crossover UTP cable that reverses the transmit and receive wire-pairs at the RJ-45 connector on one end of the UTP cable (see Figure A-7)

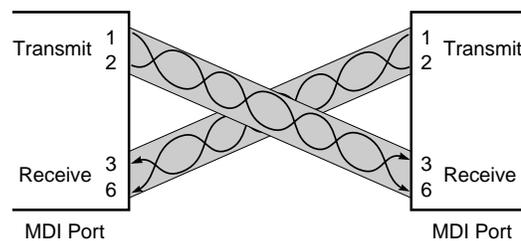


Figure A-7. External Crossover Function

Implementing the crossover function externally has several disadvantages. You may have to special-order or make your own crossover UTP cable, since this is a nonstandard cable. Having a mixture of straight-through and crossover cables in a network increases the probability of mistaken identification of patch cables. In general, it is more convenient to have the crossover function implemented internally, and this is the recommended way of implementing the crossover.

If the crossover function is implemented internally, that port is designated an MDI-X port (X for crossover function). Internal crossover functions allow the use of standard straight-through UTP cable to connect MDI ports to MDI-X ports. 10BASE-T transceivers are implemented as MDI ports, and 10BASE-T repeaters (e.g. ports 2 through 16 of the 2800 Series concentrators) have MDI-X ports.

Indicators and Switches

The Model 28xx configures Ports 2 through 16 as MDI-X ports, while Port 1 can be configured as either MDI or MDI-X through the MDI-X/MDI switch on the front panel (see Figure A-8).

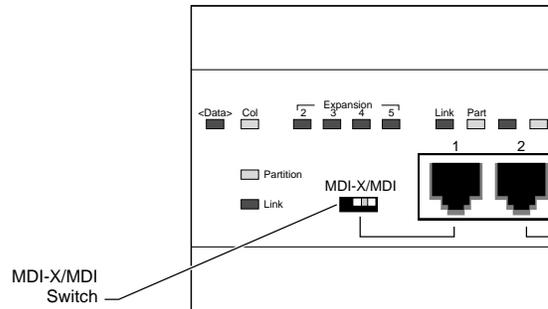


Figure A-8. MDI-X/MDI switch

This feature is very convenient when you interconnect 2800 Series concentrators through their 10BASE-T ports. It allows you to use a straight-through UTP cable between Port 1 (configured as an MDI port) and any of the interconnected concentrator's MDI-X 10BASE-T ports. Without the MDI-X/MDI switch, a crossover cable would be required to interconnect the concentrators directly through UTP wire.

Appendix B Technical Specifications

Network Protocol

10 Mb/s Manchester encoded (IEEE 802.3 CSMA/CD)

Standards Support

IEEE 802.3i Type 10BASE-T
IEEE 802.3 10BASE-FL draft standard

Electrical Specifications

Input Power:

14W (Model 2803, 2804)
40W (Model 2813, 2814)

Thermal Rating:

47.6 BTU/hr maximum (Model 2803, 2804)
136 BTU/hr maximum (Model 2813, 2814)

AC Line Frequency:

50–60 Hz

Input Voltage:

100–240 VAC

Volt Amperes Rating:

1.0A at 100 VAC
0.5A at 240 VAC

Fuses:

Internal

Fuse Rating:

2A at 240 VAC

Technical Specifications

Optical Specifications (Model 28x4)

Optical Transmit Range:

-12 dBm to -18 dBm

Optical Receive Average Power Range

-12 dBm to -32.3 dBm

Physical Specifications

Weight:

(Model 280x) 6.7 lb (3.0 kg)

(Model 281x) 8.2 lb (3.7 kg)

Dimensions:

(Model 280x)(W) 17.3 in x (D) 7.2 in x (H) 1.6 in

(W) 43.9 cm x (D) 18.2 cm x (H) 4.0 cm

(Model 281x)(W) 17.3 in x (D) 7.2 in x (H) 2.5 in

(W) 43.9 cm x (D) 18.2 cm x (H) 6.3 cm

Rack Space:

(Model 280x) 1 rack-mount space

(Model 281x) 1.5 rack-mount spaces

Environmental Specifications

Operating Temperature:

5° C to 40° C

Storage Temperature:

-25° C to +70° C

Operating Humidity:

85% max. relative humidity, noncondensing

Storage Humidity:

95% max. relative humidity, noncondensing

Operating Altitude:

10,000 ft (3,000m) maximum

Electromagnetic Emissions

Meets requirements of:

FCC Part 15, Subparts A and B, Class A

EN 55 022 (CISPR 22:1985), Class B

General License VDE 0871, Class B (AmtsblVfg No. 243/1991 and Vfg 46/1992)

VCCI Class 1 ITE

Safety Agency Approvals

UL-listed, CSA-certified, TUV-licensed

Microprocessors

Model 281x:

10 MHz NEC V35 Plus (80186 class), with National Semiconductor

DP8390 Network Controller

80C52 microcontroller

Model 280x:

80C52 microcontroller

Memory (Model 281x)

512 KB dynamic RAM, plus additional static RAM for specialized functions

512 KB Flash EPROM

8 KB EEPROM

64 KB Boot EPROM

Technical Specifications

Appendix C Pin Assignments

This appendix lists the pin assignments for the connectors on LattisHub 2800 Series 10BASE-T Workgroup Concentrators, and describes how to use the RS-232 port for making out-of-band connections.

AUI Port

Table C-1 shows the pin assignments for the female DB-15 connector on the AUI port on Model 28x3 concentrators. Figure C-1 shows the pin locations.

Table C-1. AUI Connector Pin Assignments (female DB-15)

Pin #	Signal	Pin #	Signal
1	GND	8	GND
2	CI-A	9	CI-B
3	DO-A	10	DO-B
4	GND	11	GND
5	DI-A	12	DI-B
6	GND	13	+12V
7	(NC)	14	GND
		15	GND



NOTE: Do not connect the AUI port on a Model 28x3 directly to the AUI port on an Ethernet station.

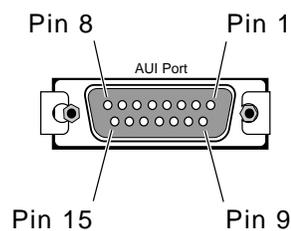


Figure C-1. DB-15 Connector Pin Locations

10BASE-T Ports

Table C-2 shows the RJ-45 pin assignments for the 10BASE-T ports on the Model 28xx. Figure C-2 shows the pin locations.

Table C-2.

Pin#	MDI Signal (Function)	MDI-X Signal (Function)
1	TD + (Transmit to UTP wire)	RD + (Receive from UTP wire)
2	TD - (Transmit to UTP wire)	RD - (Receive from UTP wire)
3	RD + (Receive from UTP wire)	TD + (Transmit to UTP wire)
4	Not used by 10BASE-T	Not used by 10BASE-T
5	Not used by 10BASE-T	Not used by 10BASE-T
6	RD - (Receive from UTP wire)	TD - (Transmit to UTP wire)
7	Not used by 10BASE-T	Not used by 10BASE-T
8	Not used by 10BASE-T	Not used by 10BASE-T

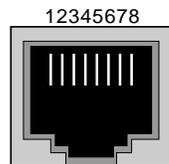


Figure C-2. RJ-45 Connector Pin Locations

RS-232 Port

Table C-3 shows the pin assignments for the RS-232 port on the Model 281x, and Figure C-3 shows the connector.

Table C-3. RS-232 Port Interface Pin Assignments (Male DB-25 Connector)

Pin #	Function	Direction
2	Transmit data	from Model 281x
3	Receive data	to Model 281x
4	Request to send	from Model 281x
5	Clear to send	to Model 281x

Table C-3. RS-232 Port Interface Pin Assignments (Male DB-25 Connector) (continued)

Pin #	Function	Direction
6	Data set ready	to Model 281x
7	Signal ground	
8	Carrier detect	to Model 281x
20	Data terminal ready	from Model 281x
22	Ring indicator	to Model 281x

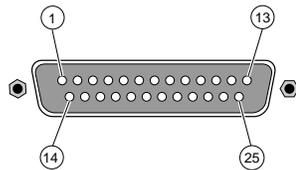


Figure C-3. RS-232 Connector

Using the RS-232 Serial Port for an Out-of-Band Connection

The Model 281x RS-232 serial communications port can be used for out-of-band connection to the telephone voice network through an external modem. You must provide the cable between the Model 281x and the modem.

To connect a Model 281x to an out-of-band voice network, follow these steps:

- 1. Set up the modem, following instructions in the user's guide for the modem:**
 - a. Power up the modem.
 - b. Configure the modem. Be sure to set auto-answering ON.
 - c. Connect the modem to telephone line through an RJ-11 jack.
- 2. Connect the modem to the Model 281x:**
 - a. Connect the male connector on the RS-232 serial communications cable to the female connector on the modem.

Pin Assignments

- b. Connect the female connector on the RS-232 serial communications cable to the male DB-25 connector on the Model 281x.

3. Power up the Model 281x or push the reset switch.



NOTE: Be sure the modem is powered up before you power up or reset the Model 281x.

Service Port (Model 281x)

Table C-4 shows the pin assignments for the service port on the Model 281x, and Figure C-4 shows the connector.

Table C-4. Model 281x Service Port Pin Assignments (Male DB-9 connector)

Pin #	Function	Direction
2	Transmit data	from Model 281x
3	Receive data	to Model 281x
5	Signal ground	—

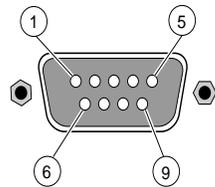


Figure C-4. Service Port Connector

Local Hub Management Port (Model 280x)

Table C-5 shows the pin assignments for the Local Hub Management port on the Model 280x, and Figure C-5 shows the connector.

Table C-5. Model 281x Local Hub Management Port Pin Assignments (Male DB-9 connector)

Pin #	Function	Direction
2	Transmit data	from Model 280x
3	Receive data	to Model 280x
5	Signal ground	–

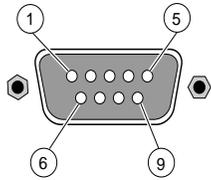


Figure C-5. Local Hub Management Port Connector

Pin Assignments

Appendix D Link Integrity Test Function

LattisHub 2800 Series 10BASE-T Workgroup Concentrators support the IEEE 802.3i 10BASE-T Link Integrity Test function on all their 10BASE-T ports. This function monitors the UTP receive data wire-pair and determines the integrity of the UTP link segment. The 10BASE-T transceiver located at the other end of the link segment also monitors its UTP receive data wire-pair for link integrity. Thus both data wire-pairs of the UTP link segment are tested for link integrity.

At all times the Model 28xx transmits either data or an idle signal, which is called TP_IDL (twisted-pair idle signal). TP_IDL is transmitted in the absence of data, and consists of a repetitive sequence of 100-nano-second pulses occurring every 16 milliseconds. The 100-nanosecond pulses are called Link Test Pulses (LTPs).

All Model 28xx ports monitor their receive wire-pair for data and LTP activity. If neither data nor LTPs are detected within 100 milliseconds, the port's Link Status LED goes OFF to indicate no link status. While there is no link integrity, the Model 28xx port does not send data to the UTP wire, and the port receiver does not forward data from the UTP wire to the concentrator until link integrity is restored.

Link Integrity Test Function

Appendix E Autopolarity Detection and Correction

All Model 28xx 10BASE-T ports support the automatic polarity detection and correction function, which detects and automatically corrects for UTP receive data wire-pair signal inversions. If any receive data wire-pair is mistakenly reversed in the punch-down block during cable installation, the Model 28xx port internally corrects for the miswiring and the data path operates correctly.

The Model 28xx ports monitor the polarity of the receive data wire-pair only upon power-up or while the Model 28xx port has no link status (**Link LED OFF**). While a port is being monitored, two conditions may occur:

- If the port receives one normal data packet (no inversion), wire polarity is considered good and the monitoring for that port stops until either power-up or no link status occurs.
- If the port receives either two consecutive inverted data packets or six consecutive inverted link test pulses, the automatic polarity correction function is enabled to internally correct for the receive data wire-pair inversion. Monitoring stops until either power-up or no link status occurs.

Since the algorithm monitors both data packets and link test pulses, the automatic polarity correction is enabled even if no data is present on the link segment. There is no indication on the Model 28xx that the wires are reversed, since no user intervention is required to correct this wiring error.

Autopolarity Detection and Correction

Appendix F IP Addressing

The official description of Internet addresses is RFC 1166, *Internet Numbers*. The DDN Network Information Center (NIC) at SRI International in Menlo Park, California, maintains and distributes the RFC documents. The NIC also assigns Internet addresses and network numbers. When an organization applies to the NIC, the NIC assigns a network number or range of addresses that is appropriate to the number of host devices on the network.

Classes of Internet Addresses

As described in RFC 1166, Internet addresses are 32-bit quantities, divided into five classes. Classes differ in the number of bits allocated to the network and host portions of the address. For this discussion, consider a network to be a collection of computers (hosts) that have the same network field value in their Internet addresses.

The **Class A** Internet address format (see Figure F-1) uses the highest eight bits as the network field and sets the highest priority bit to 0 (zero). The remaining 24 bits form the host field. Only 128 Class A networks can exist, but each Class A network can have almost 17 million hosts.

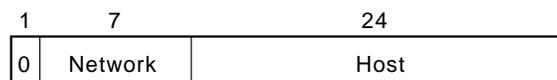


Figure F-1. Class A Internet Address

The **Class B** Internet address format (see Figure F-2) uses the highest 16 bits as the network field and sets the two highest-order bits to 1,0. The remaining 16 bits form the host field. Over 16,000 Class B networks can exist, and each Class B network can have up to 65,000 hosts.

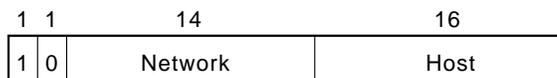


Figure F-2. Class B Internet Address

The **Class C** Internet address format (see Figure F-3) uses the highest 24 bits as the network field and sets the three highest-order bits to 1,1,0. The remaining eight bits form the host field. Over two million Class C networks can exist, and each Class C network can have up to 255 hosts.

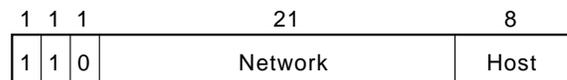


Figure F-3. Class C Internet Address

The **Class D** Internet address format is reserved for multicast groups, as discussed in RFC 1112. In Class D addresses, the four highest-order bits are set to 1,1,1,0.

The **Class E** Internet address is reserved for future use. In Class E addresses, the four highest-order bits are set to 1,1,1,1. The router currently ignores Class D and Class E Internet addresses, except for the global broadcast address 255.255.255.255.

Internet Address Notation

Internet addresses are written as four decimal numbers, for example, 255.255.255.255. Each decimal number represents an 8-bit octet. When strung together, the four octets form the 32-bit Internet address. This notation is called *dotted decimal*.

These examples show 32-bit values expressed as Internet addresses:

192.31.7.19
10.7.0.11
255.255.255.255
0.0.0.0

The largest possible value of a field in a dotted-decimal number is 255, which represents an octet of all ones.

Allowable Internet Addresses

Some Internet addresses are reserved for special uses and cannot be used for host, subnet, or network addresses. Table F-1 lists ranges of Internet addresses and shows which addresses are reserved and which are currently available.

Table F-1. Reserved and Available Internet Addresses

Class	Address or Range	Status
A	0.0.0.0	Reserved
	1.0.0.0 through 126.0.0.0	Available
	127.0.0.0	Reserved
B	128.0.0.0	Reserved
	128.1.0.0 through 191.254.0.0	Available
	191.255.0.0	Reserved
C	192.0.0.0	Reserved
	192.0.1.0 through 223.255.254	Available
	223.255.255.0	Reserved
D,E	224.0.0.0 through 255.255.255.254	Reserved
	255.255.255.255	Broadcast

Internet Address Conventions

If the bits in the host portion of an address are all 0, that address refers to the network specified in the network portion of the address. For example, the Class C address 192.31.7.0 refers to a particular network.

Conversely, if the bits in the network portion of an address are all 0, that address refers to the host specified in the host portion of the address. For example, the Class C address 0.0.0.234 refers to a particular host.

If the bits in the host portion of an address are all 1, that address refers to all hosts on the network specified in the network portion of the address. For example, the Class B address 128.1.255.255 refers to all hosts on the 128.1.0.0 network. (Remember that an octet of ones becomes the decimal number 255.)

Because of these conventions, do not use an Internet address with all zeros or all ones in the host portion for your router address.

Addresses and Routing

Addresses make it possible to route and deliver data packets. Consider a host sending an Internet data packet. If the destination host and sending host are on the same network, the packet goes directly to the destination host. If the destination host and sending host are on different networks, the packet goes to a router.

To determine whether the destination host is on the same network, the sending host compares the network portions of the destination address and its own address. If these network numbers are the same, the destination host is on the same network. If the network numbers are different, the destination host is on another network, and the data packet must go to a router.

A router has two or more network interfaces onto different networks. The router's primary function is to direct packets between these networks, delivering them to their final destination or to another router. (A router-to-router transmission is called a hop.)

To begin the routing process, the router examines the network number of the destination address. Using this number as a key, the router locates applicable routing information in its routing table. The router uses this routing information to send the packet to its final or to an intermediate destination.

Subnetting

Subnetting is a scheme for imposing a simple hierarchy on hosts on a single physical network. The usual practice is to use the first few bits in the host portion of the network addresses for a subnet field. For example, Figure F-4 shows a Class B address with five bits of the host portion used as the subnet field. The official description of subnetting is RFC 950, *Internet Standard Subnetting Procedure*.

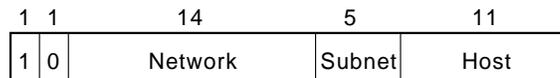


Figure F-4. Subnet Field in a Class B Address

As with the host portion of an address, do not use all zeros or all ones in the subnet field.

Subnetting and Routing

Routers and hosts can use the subnet field for routing. The rules for routing on subnets are the same as on networks. However, correct routing requires all subnets of a network to be physically contiguous. In other words, the network must be set up so that it does not require traffic between any two subnets to cross another network. Also, RFC 950 implicitly requires that all subnets of a network have the same number of bits in the subnet field.

Subnet Masks

A subnet mask identifies the subnet field of a network address. This mask is a 32-bit Internet address written in dotted-decimal notation with all ones in the network and subnet portions of the address. For the example in Figure F-4, the subnet mask is 255.255.248.0.

Table F-2 shows the subnet masks you can use to divide an octet into subnet and host fields. The subnet field can consist of any number of the host field bits; you do not need to use multiples of eight. However, you should use three or more bits for the subnet field—a subnet field of two bits yields only four subnets, two of which are reserved (the 1,1 and 0,0 values).

Table F-2. Subnet Masks

Subnet Bits	Host Bits	Hex Mask	Decimal Mask
0	8	0	0
1	7	0x80	128
2	6	0xC0	192
3	5	0xE0	224
4	4	0xF0	240
5	3	0xF8	248
6	2	0xFC	252
7	1	0xFE	254
8	0	0xFF	255

IP Addressing

Appendix G Setting Up the Model 281x Configuration File

The SETUP program with your SynOptics network management software installs a sample Model 281x concentrator configuration file, called *281x50.cfg*. In order to use a BOOTP server, you must modify this sample configuration file or create one of your own.



NOTE: *Each managed concentrator on your network requires a unique configuration file.*

You can edit the configuration file with any ASCII text editor, such as the Windows Notepad. Lines beginning with the # character are considered comments. You can modify the sample file for your own use by uncommenting the appropriate keyword lines and specifying the parameter values.



CAUTION: *Before you edit a Model 281x configuration file, make a backup copy of the file for reference.*

Sample Configuration File

This section provides an example of a complete Model 281x configuration file. The meanings of the data fields are described in the next section, “Configuration Parameters.”

The IP addresses for default router and trap receivers have been left as dummies (xxx.xxx.xxx.xxx) in the sample files, so as not to accidentally use a real IP address. You must replace the dummy sequences with real addresses appropriate to your network.

You must specify a path and file name for the network management image file; there is no default for this parameter.



NOTE: *The **Parameter** must begin in the first column; otherwise, that line will be ignored by the Model 281x.*

The sample configuration file *281x50.cfg* looks like this:

Setting Up the Model 281x Configuration File

```
# Specify file name for the Model 281x image file. NOTE this
# has to be the first un-commented line in this file for the
# Model 281x to load properly.
281x50.img
#
# Specify the software license key, which is an 8-digit
# hexadecimal number to download advanced features of the
# agent software. Tab or space may be inserted after first
# four digits in this number. The default feature of the agent
# software is Basic.
# For example:
#agent-key 1234abcd      or
#agent-key 1234 abcd
#
# Assign local subnet mask for this Model 281x.
# For example:
#netmask 255.255.255.0
#
# Specify the default router for this Model 281x.
# For example:
#default-router xxx.xxx.xxx.xxx
#
# Specify the Novell network number for this Model 281x.
# Must be exactly eight hexadecimal digits.
#network-number 00000000
#
# Indicate baud rate used for the RS-232 out-of-band port.
# Valid entries are 300, 1200, 2400, 4800 and 9600 baud.
# Default is:
#baud-rate 9600
#
# Enter the concentrator's initialization string used for
# out-of-band communication. Refer to the modem vendor's
# User's Guide for the initialization string format.
# For example:
#initialization-string ATDT,9,1,415-555-1212
#
# Specify the Model 281x's location (64 characters max.).
# For example:
#location Building A
#
# Specify the Model 281x's name (64 characters max.).
# For example:
#sysname concA.abcCompany.com
#
# Specify the name & phone number of the Model 281x's
# administrator or contact person (64 characters max.).
# For example:
```

Sample Configuration File

```
#syscontact John Smith -Network Administrator -ext 5555
#
# Specify the community string used for read only operations.
# Specifying no community string will allow no access to the
# read only objects.
# For example:
#read-community public
#
# Specify the community string used for read and write
# operations. Specifying no community string will allow
# no access to the read and writeable objects.
# For example:
#write-community private
#
# Enter the list of IP trap receivers along with their
# community strings and age-out times. Specify only one
# entry pair per line, up to a maximum of 10 entries.
# For example:
#ip-trap-receiver 134.177.10.11 trap-community public 0
#
# Enter the list of IPX trap receivers along with their
# community strings and age-out times. Specify only one
# entry pair per line, up to a maximum of 10 entries.
# For example:
#ipx-trap-receiver 00000000:000000000000 trap-community public 0
#
# Enable or disable the use of authentication traps. Valid entries
# are on and off. Default is off.
# For example:
#authentication-traps off
#
# Specify the load mode for this concentrator. Valid choices are
# remote-only, local-only or remote-with-local-backup.
# Default is remote-with local-backup.
# For example:
#load-mode remote-with-local-backup
#
# Specify the boot mode for this concentrator. Network configures
# the concentrator to use the network for remote loading of the
# concentrator's configuration information. EEPROM configures the
# concentrator to use data stored in EEPROM for local loading.
# Valid choices are network or eeprom.
# Default is network.
# For example:
#boot-mode network
#
# Specify the boot protocol for this concentrator. Valid choices
# are AUTO, IP, IPX, and IPX_IP. Default is AUTO.
```

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```
# For example:
#boot-protocol AUTO
#
# Specify the management-protocol for this concentrator. Valid
# choices are IP_IPX, IP, and IPX. Default is IP_IPX.
# For example:
#management-protocol IP_IPX
#
# Save configuration data to EEPROM.
#save-to-eprom

#=====Advanced Section=====
# ALL below this comment line apply only to Advanced
# Ethernet Agents
#
# Specify the lifetime of a node list entry in seconds.
# Maximum number is 42,949,672 seconds (approximately 497 days).
# Default is 60 seconds.
# For example:
#portlife 60
#
# Specify how many nodes are allowed to associate with a
# particular port. Maximum is 12.
# Default is 12.
#max-nodes-per-port 12
#
# Specify allowed nodes for this concentrator. Specify only one
# entry per line. The maximum number of nodes that can be
# specified is 512.
# The format is:
#       node AABBCCDDEEFF slot# port#
# Where AABBCCDDEEFF is the hexadecimal MAC address with 12 hex
# digits. Slot# is a decimal number from 1 to 5 inclusive and
# port# is a decimal number from 1 to 16 inclusive.
# For example:
# node 013489ABCDEF 1 6
# node abcdef987654 2 5
# node 000081111111 2 6
# node 000082222222 2 7
# node 000083333333 2 8
#
# "Wild card" notation:
# If slot# or port# is either 0 or blank, that entry will be
# treated as a wild card.
# For example, this wild card entry specifies all ports
# associated with the concentrator:
# node 1234567890ab
# This wild card entry also specifies all ports associated
```

Sample Configuration File

```
# with the concentrator.
# node 1234567890ab 0 0
# This wild card entry specifies all ports associated
# with slot 5 in this concentrator:
# node 234567890abc 5 0
#
# Enable allowed nodes and set the security level to be used
# when the system is up. Security can be set at either
# concentrator, slot, or port level. System default is OFF for
# allowed nodes features; to enable allowed nodes, uncomment the
# appropriate line.
# For example:
# allow-on conc
# allow-on slot
# allow-on port
#
# Specify the action to be taken when a node security violation
# occurs. Actions can be specified for violations at the port,
# slot, or concentrator level. Formats are
#      port slot# port# action#
#      slot slot# action#
#      conc action#
# Where slot#, port#, action# are all decimal numbers.
# For action#, valid choices are 2, 3, 4, or 5.
# 2 = no-action;
# 3 = send-trap-only;
# 4 = partition-port-only;
# 5 = send-trap-and-partition-port;
#
# This port-level example is used to check slot 5, port 11.
# If address violation occurs, send trap only.
# port 5 11 3
# This port-level example is used to check slot 4, port 12.
# If address violation occurs, do nothing.
# port 4 12 2
# This port-level example is used to check slot 2, port 3.
# If address violation occurs, send trap and partition the port 3.
# port 2 3 5
#
# This slot-level example is used to check slot 5 and
# partition that port if address violation occurs.
# slot 5 4
# This slot-level example is used to check slot 3 and
# send trap and partition that slot if address violation occurs.
# slot 3 5
#
# This concentrator-level example is used to check
# entire concentrator. If address violation occurs,
```

Setting Up the Model 281x Configuration File

```
# send a trap and partition the port to which the concentrator
# is connected.
# conc 5
#
# Add an entry to the threshold table. Maximum number of table
# entries is 12.
# Format of the command:
# threshold IN OB SL PO TY CN SV AC DU
# IN = index, from 1 to 12 inclusive
# OB = object, which is one of the following:
#   conc      Threshold is set for a concentrator
#   slot      Threshold is set for a slot
#   port      Threshold is set for a port
# SL = slot number, from 1 to 5, inclusive
# PO = port number, from 1 to 16, inclusive
# TY = type, which is one of the following:
#   good-bytes
#   good-packets
#   bad-packets
#   crc-error-packets
#   misaligned-packets
#   runt-packets
#   fragments
#   too-long-packets
#   collisions
#   late-collisions
#   link-status
#   multicast-packets
#   broadcast-packets
# CN = condition, which is one of the following, depending on TY:
#   cross      Trigger alarm when actual-value crosses set-value
#   over       Trigger alarm when actual-value is greater than
#               set-value
#   over-rate  Trigger alarm when actual-value/second is greater
#               than set-value/second
#   link-on    Trigger alarm when port link status is on
#   link-off   Trigger alarm when port link status is off
# SV = set value, which can be an absolute number or a
#       rate per second
# AC = action, which is one of the following:
#   trap-only      Send trap only
#   partition-slot Partition a slot, specified by SL
#   partition-port Partition a port, specified by SL and PO
#   trap-partition-slot Send trap and partition a slot,
#                       specified by SL
#   trap-partition-port Send trap and partition a port,
#                       specified by SL and PO
# DU = Duration in seconds of period during which threshold
```

```
#      is monitored
# Sample threshold table entries:
# This sample threshold table entry is number 6 in the table.
# It counts CRC error packets for a concentrator in every one
# second. When the number of CRC errors goes over 1000 in every
# 1 second , it sends a trap.
# threshold 6 conc 0 0 crc-error-packets over 1000 trap-only 1
#
# This sample threshold entry is number 2 in the table.
# It checks slot 3 for 200 good bytes in every 3 seconds. When
# the counter crosses 200 in every 3 seconds, it sends a trap
# and partitions the slot.
# threshold 2 slot 3 0 good-bytes cross 200 trap-partition-slot 3
#
# Enable or disable automatic network topology build-up.
# Valid entries are on and off. Default is on.
# For example:
# hello-message on
#
# Lock/Unlock security configuration. Valid entries are on and
# off. Default is off.
# For example:
# security-config-lock off
```

Configuration Parameters

This section describes each parameter in the Model 281x configuration file *281x50.cfg*. To modify the file, use an ASCII text editor, such as the Windows Notepad, to change parameter values or to add or delete parameters.

Parameter names are shown here in **boldface**. You must replace the *parameter arguments* shown in *italics* with specific values.

If multiple arguments are shown separated by a vertical bar (|), you may enter any one of the displayed values. (Note that this use of the vertical bar is different from its use in BOOTPTAB.TXT to separate records.)



NOTE: *The **parameter** must begin in the first column; otherwise, the line will be ignored by the Model 281x.*

Dotted decimal notation, used with the IP address values, takes the form N.N.N.N, where N is a numeric value from 0 to 255 inclusive. Unlike IP addresses in BOOTPTAB.TXT, N is always interpreted as a decimal number.

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These are the configuration file parameters:

filename or *drive:\directory\filename*

The path and file name for the Model 281x image file. It must be the first line in the configuration file. You may include the drive as part of the path.



CAUTION: *This parameter is mandatory. If you do not enter a valid filename or c:\directory\filename, the Model 281x cannot boot and will fail to operate.*

agent-key *xxxx xxxx*

Software key to enable Advanced features of Release 4.0+ software—an eight-digit hexadecimal string. A tab or a space may be inserted after the first four digits. You should have obtained the software key at the time of purchase of the Model 281x with Advanced features. If you do not have the key, contact your customer support representative at the dealer from which you purchased your SynOptics equipment. If the configuration file contains no entry for this parameter, the default is Basic features.

netmask *ip address*

The local subnet mask for this Model 281x—up to twelve numeric characters, written in dotted decimal notation. For a discussion of IP addresses and subnet fields, see Appendix F, “IP Addressing.” If no entry exists in the configuration file, the default is no mask.

default-router *ip address*

The address of the default router for this Model 281x—up to twelve numeric characters, written in dotted decimal notation. To cancel this address, enter **0.0.0.0**. If no entry exists in the configuration file, the default is none.

network-number *00000000*

This concentrator’s Novell network number. The number must be an eight-digit hexadecimal number.

baud-rate *300|1200|2400|4800|9600*

The data rate used by the RS-232 out-of-band port. The five values shown are the only valid entries. If no entry exists in the configuration file, the default is 9600.

initialization-string *string*

The initialization string the concentrator uses for out-of-band communication (64 alphanumeric characters maximum). This is the string of characters that a network management station dials to establish an out-of-band connection if there is an interruption in normal network communication. If the configuration file contains no entry for this parameter, the default is none.

location *string*

The concentrator's location (64 alphanumeric characters maximum). This can be any convenient identifier that describes where the concentrator is physically situated. If the configuration file contains no entry for this parameter, the default is none.

sysname *string*

The concentrator's name (64 alphanumeric characters maximum). This can be any convenient identifier that gives the concentrator unique identification. If the configuration file contains no entry for this parameter, the default is the string "sysname is not set".

syscontact *string*

The name and phone number of the Administrator or contact person for the concentrator (64 alphanumeric characters maximum). If the configuration file contains no entry for this parameter, the default is the string "syscontact is not set".

read-community *string*

The community string used for read-only SNMP operations (20 alphanumeric characters maximum). If you do not specify a community string, access to the read-only objects is disabled. If the configuration file contains no entry for this parameter, the default is no community string.

write-community *string*

The community string used for read and write SNMP operations (20 alphanumeric characters maximum). If you do not specify a community string, access to the read-write objects is disabled. If the configuration file contains no entry for this parameter, the default is no community string.

IP-trap-receiver *ipaddress trap-community string age-out*

A list of trap receivers along with their community strings. Each entry must occupy a separate line, up to a maximum of 10 entries. The *ipaddress* can be up to twelve numeric characters, written in dotted decimal notation; *string* (20 alphanumeric characters maximum) can be any ASCII string. The *trap-community* is similar to the **read-community** string. If you enter an *ipaddress* with no trap-community, the default string is **public**. The *age-out* timer specifies the length of time in milliseconds that an entry will remain in the IP-trap-receivers table.

IPX-trap-receiver *ipaddress trap-community string age-out*

A list of trap receivers along with their community strings. Each entry must occupy a separate line, up to a maximum of 10 entries. The *ipaddress* consists of the 8-digit network number, followed by a colon and the 12 hexadecimal characters of the node address. The *trap-community* is similar to the **read-community** string. If you enter an *ipaddress* with no trap-community, the default string is **public**. The *age-out* timer specifies the length of time in milliseconds that an entry will remain in the IPX-trap-receivers table.

authentication-traps *on|off*

Enables or disables the use of authentication traps. If no entry exists in the configuration file, the default is off (disabled).

load-mode *remote-only|local-only|remote-with-local-backup*

Specifies the load mode for this concentrator. For a detailed description refer to “Image Load Mode” in the Boot Configuration Commands section of Chapter 5.

boot-mode *network|eeprom*

Specifies the boot mode for this concentrator. For a detailed description see “Boot Mode” in the Boot Configuration Commands section of Chapter 5.

boot-protocol *Auto|IP|IPX|IPX_IP*

Specifies the boot protocol for this concentrator. For a detailed description, see “Boot Protocol” in the Boot Configuration Commands section of Chapter 5.

management-protocol *IP_IPX|IP|IPX*

Specifies the network management station's protocol for this concentrator. For a detailed description see "Management Protocol" in the Boot Configuration Commands section of Chapter 5.

save-to-eprom

Instructs the Model 281x to save the current configuration data to EEPROM during the boot time. If the configuration file contains no entry for this parameter, the default is no save.

portlife xx

Specifies the lifetime of a node list entry in seconds. The maximum value is 42,949,672 seconds (approximately 497 days), and the default is 60 seconds.

max-nodes-per-port nn

Specifies the number of nodes that can be associated with one port. The maximum is 12, and the default is 12.

node xxxxxxxxxxx slot# port#

A list of nodes allowed on the network. Each entry must occupy a separate line, up to a maximum of 512 entries. Each parameter consists of the 12-digit hexadecimal MAC address of the node, followed by its slot number and port number. A slot or port number of zero, or a blank, is treated as a "wild card," indicating "any slot" or "any port." For example, the entry `node 013489ABCDEF 4 0` specifies that any port associated with slot 4 on the concentrator with MAC address 013489ABCDEF is allowed on the network.

allow-on conc|slot|port|

Enables the allowed nodes feature, and specifies the level of security. You can enable allowed nodes at the concentrator, slot, or port level. The system default for Allowed Nodes is OFF; to enable the feature and select a level, uncomment the appropriate line in the configuration file. You can select only one level at a time.

port slot# port# action#

slot slot# action#

conc action#

These three keywords specify actions to be taken when a security violation occurs, either at a specific port, identified by both slot number and port number, at a particular slot, or for the concentrator as a whole. The action to be taken is identified by one of these numbers:

- 2 = take no action
- 3 = send a trap
- 4 = partition the port
- 5 = send a trap and partition the port

threshold *IN OB SL PO TY CN SV AC DU*

Adds an entry to the threshold table. For a complete discussion of thresholds and threshold table entries, see the publications that came with your network management software. The fields for this parameter are

IN Index number, from 1 to 12, inclusive. The maximum number of table entries is 12.

OB Object of threshold; valid entries in this field are conc (concentrator), slot, or port.

SL Slot number, from 1 to 5, inclusive.

PO Port number, from 1 to 16, inclusive.

TY Type of threshold. Thresholds can be set for good bytes, good packets, bad packets, CRC error packets, misaligned packets, runt packets, fragments, too-long packets, collisions, late collisions, link status, multicast packets, and broadcast packets.

CN Threshold condition that triggers response or action specified by the *AC* field. Response can be triggered each time the actual value crosses the set value; when the actual value is greater than the set value; when the actual value per second is greater than the set value per second; or when link status changes for a port.

SV Set value for the threshold. This can be an absolute number or a rate, depending on the *TY* field entry.

AC Action triggered by the threshold. The action can be to send a trap; to partition a slot or port; or to send a trap *and* partition a slot or port.

DU Duration, in seconds, of the period during which the threshold is being monitored.

hello-message *on|off*

Enables or disables the automatic network topology buildup, by enabling or disabling the concentrator's "hello message." Valid choices are on and off. The default is on.

security-config-lock *on|off*

Locks or unlocks access to the security configuration via the network management user interface. When this keyword is set on, you cannot change Allowed Nodes settings through the network management user interface unless you change the configuration setting through a connection to the Model 281x service port. Valid choices are on and off. The default is off.

Setting Up the Model 281x Configuration File