8237 Stackable Ethernet Hub 10BASE-T

Installation and User's Guide

OPTIONS
by IBM

8237 Stackable Ethernet Hub 10BASE-T

Installation and User's Guide

OPTIONS
by IBM

Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page C-2 and "Electronic Emission Notices" on page C-3.

1st Edition (May 1997)

Contents

Figures

Tables

Safety Information

 **Danger:** Before you begin to install this product, read the safety information in Caution: Safety Information— Read This First, SD21-0030. This booklet describes safe procedures for cabling and plugging in electrical equipment.

 **Varning—livsfara:** Innan du börjar installera den här produkten bör du läsa säkerhetsinformationen i dokumentet *Varning: Säkerhetsföereskrifter—Läs detta först*, SD21-0030. Där beskrivs hur du på ett säkert sätt ansluter elektrisk utrustning.

 **Fare**: Ffr du begynner å installere dette produktet, må du lese sikkerhetsinformasjonen i *Advarsel:Sikkerhetsinformasjon—Les dette først*, SD21-0030 som beskriver sikkerhetsrutinene for kabling og tilkobling av elektrisk utstyr.

 **Fare**! Ffr du installerer dette produkt, skal du laesesikkerhedsforskrifterne i NB: *Sikkerhedsforskrifter—Laes dette først* SD21-0030. Vejledningen beskriver denfremgangsmåde, du skal bruge ved tilslutning af kabler og udstyr.

 **Gevaar**: Voordat u begint met de installatie van dit produkt, moet u eerst de veiligheidsinstructies lezen in de brochure PAS OP! *Veiligheidsinstructies—Lees dit erst*, SD21-0030. Hierin wordt beschreven hoe u electrische apparatuur op een veilige manier moet bekabelen en aansluiten.

 **Gevaar** Voordat u begint met het installeren van dit produkt, dient u eerst de veiligheidsrichtlijnen te lezen die zijn vermeld in de publikatie *Caution: Safety Information - Read This First*, SD21-0030. In dit boekje vindt u veilige procedures voor het aansluiten van elektrische appratuur.

 **Vorsicht:** Bevor mit der Installation des Produktes begonnen wird, die Sicherheitshinweise in *Achtung:Sicherheitsinformationen—Bitte zuerst lesen*, IBM Form SD21-0030. Diese Veröeffentlichung beschreibt die Sicherheitsvorkehrungen für das Verkabeln und AnschlieBen elektrischer Geräte

危険： 導入作業を開始する前に、安全に関する
小冊子SD21-0030 の「最初にお読みください」
(Read This First)の項をお読みください。
この小冊子は、電気機器の安全な配線と接続の
手順について説明しています。

 **Danger** : Avant d'installer le présent produit, consultez le livret *Attention: Informations pour la sécurité— Lisez-moi d'abord*, SD21-0030, qui décrit les procédures á respecter pour effectuer les opérations de câblage et brancher les équipements électriques en toute sécurité.

 **Danger**: Avant de procéder á l'installation de ce produit, lisez d'abord les consignes de sécurité dans la brochure *ATTENTION: Consignes de sécurité—A lire au préalable*, SD21-0030. Cette brochure décrit les procédures pour câbler et connecter les appareils électriques en toute sécurité.

 **Pericolo**: prima di iniziare l'installazione di questo prodotto, leggere le informazioni relative alla sicurezza riportate nell'opuscolo *Attenzione: Informazioni di sicurezza—Prime informazioni da leggere* in cui sono descritte le procedure per il cablaggio ed il collegamento di apparecchiature elettriche.

 **Perigo**: Antes de iniciar a instalação deste produto, leia as informações de segurança *Cuidado: Informações de Segurança—Leia Primeiro*, SD21-0030. Este documento descreve como efectuar, de um modo seguro, as ligações eléctricas dos equipamentos.

 **Peligro**: Antes de empezar a instalar este producto, lea la información de seguridad en *Atención: Información de Seguridad—Lea Esto Primero*, SD21-0030. Este documento describe los procedimientos de seguridad para cablear y enchufar equipos eléctricos.

 **Perigo**: Antes de começar a instalar este produto, leia as informações de segurança contidas em *Cuidado:Informações Sobre Segurança—Leia Isto Primeiro*, SD21-0030. Esse folheto descreve procedimentos de segurança para a instalação de cabos e conexões em equipamentos elétricos.

 **Vaara**: Ennen kuin aloitat tämän tuotteen asennuksen, lue julkaisussa *Varoitus: Turvaohjeet—Lue tämä ensin*, SD21-0030, olevat turvaohjeet. Tässä kirjasessa on ohjeet siitä, miten sähkölaitteet kaapeloidaan ja kytketään turvallisesti.

 **Vigyázat**: Mielôtt megkezdi a berendezés üezembe helyezését, olvassa el a *Caution: Safety Information— Read This First*, SD21-0030 könyvecskében leírt biztonsági információkat. Ez a könyv leírja, milyen biztonsági intézkedéseket kell megtenni az elektromos berendezés huzalozasakor illetve csatlakoztatásakor.

위험: 이 제품을 설치하기 전에 반드시
"주의: 안전 정보-시작하기 전에"
(SD21-0030) 에 있는 안전 정보를
읽으십시오.

Uwaga:
Przed rozpoczęciem instalacji produktu należy zapoznać się z instrukcją:
"Caution: Safety Information - Read This First", SD21-0030.
Zawiera ona warunki bezpieczeństwa przy podłączaniu do sieci elektrycznej
i eksploatacji.

危險：安裝本產品之前， 請先閱讀 "Caution: Safety Information--Read This First" SD21-0030 手冊中所提供的安全注意事項。 這本手冊將會說明使用電器設備的纜線及電源的安全程序。

Upozornění: než zahájíte instalaci tohoto produktu, přečtěte si nejprve bezpečnostní informace v pokynech „Bezpečnostní informace“ č. 21-0030. Tato brožurka popisuje bezpečnostní opatření pro kabeláž a zapojení elektrického zařízení.

Pozor: Preden zaènete z instalacijo tega produkta preberite poglavje: 'Opozorilo: Informacije o varnem rokovanju-preberi pred uporabo," SD21-0030. To poglavje opisuje pravilne postopke za kabliranje,

ОСТОРОЖНО: Прежде чем инсталлировать этот продукт, прочтите Инструкцию по технике безопасности в документе "Внимание: Инструкция по технике безопасности -- Прочесть в первую очередь", SD21-0030. В этой брошюре описаны безопасные способы каблирования и подключения электрического оборудования.

 Caution:
The ac power outlet must be located near the unit and easily accessible.

 Waarschuwing:
Het stopcontact moet zich in de nabijheid van de eenheid bevinden en gemakkelijk toegankelijk zijn.

 Cuidado:
A tomada de corrente alternada deve estar próxima da unidade e ser facilmente acessível.

 Pas på!
Stikkontakten skal være placeret i nærheden af enheden og være let tilgængelig.

 Waarschuwing:
Het stopcontact moet zich dichtbij de eenheid bevinden en goed toegankelijk zijn.

 Varoitus:
Yksikkö on sijoitettava lähelle pistorasiaa siten, että sen luo on esteetön pääsy.

 Attention
Le socle de prise de courant alternatif doit se trouver près de l'unité etêtre facilement accessible.

 Achtung:
Die Steckdose muss nahe beim Gerät und leicht zugänglich sein.

 Attenzione:
La presa di alimentazione ca deve essere collocata accanto all'unità e deve essere facilmente accessibile.

 Advarsel:
Stikkontakten må være nær enheten og være lett tilgjengelig.

 Cuidado:
A tomada eléctrica deve estar localizada perto da unidade e ser de fácil acesso.

 Precaución:
La toma de alimentación CA debe colocarse cerca de la unidad y ser de fácil acceso.

 VARNING:
Eluttaget måste vara lättåtkomligt och placerat nära enheten.


Električna vtičnica za izmenični tok mora biti postavljena blizu enote , dostop do nje mora biti enostaven.


Výstraha:
Zásuvka pre striedavé napätie musí byť v blízskosti zariadenia a ľahko dostupná.


Розетка переменного тока должна быть расположена рядом с устройством и легко доступна.


Uwaga: Gniazdo zasilające powinno znajdować się blisko urządzenia i być łatwo dostępne.


주의: ac 전원 콘센트가 장비 가까이에 있고 쉽게 접근할 수 있어야 합니다.

注意: 電源コンセントは、使いやすいように、装置の近くに設置する必要があります。

POZOR:
Elektrická zásuvka musí být blízko jednotky a snadno přístupná.

注意：
交流电源插座必须放置在靠近装置的地方并能很容易地使用。

VIGYÁZAT!
A váltóáramú hálózati csatlakozóaljzatnak az egységhez közel és könnyen elérhetőnek kell lennie!

Lithium Battery

The IBM 8237 Stackable Ethernet Hub 10BASE-T contains a non-replaceable lithium battery that, if disposed of improperly, can cause a fire, an explosion, or a severe burn. At the end of the life of this machine, return the IBM 8237 Stackable Ethernet Hub 10BASE-T to IBM or dispose of it according to local regulations.

About This Manual

This manual describes the features of the IBM 8237 Stackable Ethernet Hub 10BASE-T (8237) and explains how to plan for 8237s in your new or existing network, how to install 8237s, and how to administer 8237s.

Who Should Read This Manual

If you are a network planner, a hardware installer, a network administrator, or a service engineer, this manual will help you in your work with 8237s.

How This Manual is Organized

This manual contains the following sections:

- Chapter 1, "Introduction and Planning"

  Describes the features of the 8237 and provides information you will need to integrate 8237s into your new or existing network.

- Chapter 2, "Installing the 8237"

  Provides step-by-step instructions for installing the 8237 and its features.

- Chapter 3, "8237 Administration"

  Helps you determine which administrative actions are available to your 8237 installation, and then gives instructions for performing the actions.

- Chapter 4, "Troubleshooting, Installation, and Replacement Procedures"

  Gives the procedure for hot-swapping 8237s, provides step-by-step instructions on installing all customer-replaceable parts, and lists the available replacement parts. This chapter also gives steps for troubleshooting and for preparing to make a call to IBM Service.

- Appendix A, "Cable Pinout Diagrams"

  Provides pinout diagrams for the cables and connectors that the 8237 accepts.

- Appendix B, "The IBM 8237 Management Information Base"

  Lists the IBM 8237 private MIB.

- Appendix C, "Product Warranty and Notices"

  Provides emissions notices, a list of trademarks, and a statement of warranty.

- Glossary and Index

  The Glossary gives definitions of the acronyms and key terms used in this manual, and the Index helps you to find the information you are looking for.

Technical and Planning References

You may find these publications helpful in planning your network or in answering detailed technical questions.

- ISO/IEC 8802-3: 1996 ANSI/IEEE Std 802.3 1996 edition Information Technology - Local and Metropolitan Area Networks - Part 3: *Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.*
- IEEE Std. 802.3u-1995 (Supplement to ISO/IEC 8802-3: 1993). IEEE Standards for Local and Metropolitan Area Networks: (Supplement to *Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications*, ANSI/IEEE Standard 802.3, 1993 edition). Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation, Type 100BASE-T (Clauses 21-30).
- *Commercial Building Telecommunications Cabling Standard*, ANSI/TIA/EIA Standard 568-A.
- *Commercial Building Standard for Telecommunications Pathways and Spaces*, ANSI/EIA/TIA Standard 569.
- *Administration Standard for the Telecommunications Infrastructure of Commercial Buildings*, ANSI/TIA/EIA Standard 606.
- *Grounding and Bonding Requirements for Telecommunications in Commercial Buildings*, ANSI/TIA/EIA Standard 607.
- *Generic Cabling for Customer Premises Cabling*, ISO/IEC International Standard 11801.

If you intend to use STP cabling, refer to:

- *IBM Cabling System Planning and Installation Guide*, GA27-3361.

If you intend to use optical fiber cabling, refer to:

- *IBM Cabling System Optical Fiber Planning and Installation Guide*, GA27-3943.

Chapter 1. Introduction and Planning

This chapter describes the features of the IBM 8237 Stackable Ethernet Hub 10BASE-T (8237) and provides information you will need to integrate 8237s into your new or existing network.

The 8237

The 8237 is a stackable Ethernet hub that comes in three models:

- Model 001, which incorporates sixteen 10BASE-T Ethernet ports supporting the IEEE 802.3 10BASE-T specification over category 3, 4, or 5,100-ohm UTP or ScTP cabling or 150-ohm STP-A cabling. Each 8237 can accommodate an optional Media Expansion Port, or Fast Expansion Module, providing connectivity to AUI, 10BASE2, 10BASE-FL, 10BASE-T/100BASE-TX, or 100BASE-FX networks, offering maximum flexibility in system connectivity.
- Model 002, which provides all of the connectivity features of Model 001 and includes an SNMP agent that permits management of one or more Model 001s.
- Model 003, which incorporates all of the connectivity and management features of Model 002 plus a remote monitoring (RMON) agent.

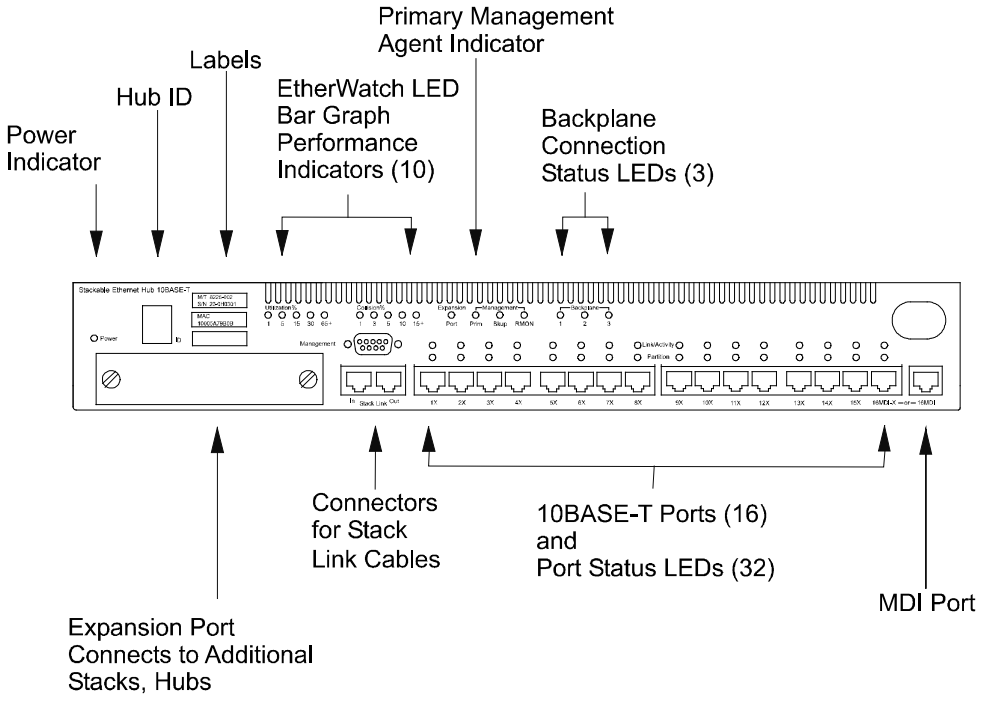

Figure 1-1. Front View of the IBM 8237 Stackable Ethernet Hub 10BASE-T

Features

All 8237 models include these features:

- Sixteen 10BASE-T ports with shielded RJ-45 connectors that support the IEEE 802.3 10BASE-T specification.
- All of the 10BASE-T ports are Medium Dependent Interface-X (MDI-X) ports. These ports perform an internal crossover function that allows easy connection to other devices using standard cables.
- The sixteenth port is also accessible without the internal crossover function, at the port marked "16-MDI," permitting connection to devices having an internal crossover function using standard straight-through cables.
- A front-panel Expansion Port slot to accommodate an optional, slide-in Media Expansion Port, or Fast Expansion Module, for connecting to AUI, 10BASE2, 10BASE-FL, FOIRL, 10BASE-T/100BASE-TX, or 100BASE-FX networks.
- Three independent 10-Mbps Ethernet backplanes.
- EtherWatch LED bars to display hub utilization and collision rates.
- Repeating of all Ethernet frame formats.
- Auto-partitioning and reconnecting of ports whose attached devices create excessive collisions.
- Jabber protection by disabling a port that receives 65 536 bits of continuous transmission and re-enabling the port when the condition clears.
- A serial management port for configuring the 8237 and upgrading microcode via Xmodem download.
- LEDs that indicate link status, activity, and partition status at the port level.
- Storage of vital configuration data in nonvolatile memory.
- Intrusion prevention: The 8237 can be configured to issue warnings or disable a port automatically when frames are received at that port from any MAC address other than the one authorized to send to that port.
- Eavesdropping protection: The 8237 can be configured so that a port will repeat packets with scrambled data if the destination address does not match the Last Source Address for that port.
- Can be mounted in an EIA standard 19-inch rack (mounting brackets included). The 8237 can also be placed on a tabletop or shelf.
- Up to ten 8237s in any combination of models can be configured in a stack.

Model 002 provides these additional features to the entire stack:

- An SNMP agent that provides support for these Management Information Bases (MIBs):
  - RFC 1213 (MIB II)
  - RFC 1516 (SNMP repeater MIB)
  - RFC 1643 (Ethernet MIB)
  - Novell Hub MIB
  - IBM private MIB (listed in Appendix B).

- A serial management port for configuring the 8237, upgrading microcode via TFTP, and out-of-band management.
- A user interface, accessible by means of VT100 terminal emulation (out-of-band) or Telnet (in-band), for issuing management commands and retrieving information and statistics concerning individual 8237s, backplanes, or the entire stack.
- SNMP manageability over IP networks using the following frame formats:

  Ethernet II
  Ethernet SNAP.
- SNMP manageability over IPX** networks using the following frame formats:

  Ethernet II
  IEEE 802.3
  IEEE 802.2
  IEEE 802.2 SNAP.
- Manageability using optional applications and platforms, such as IBM Nways Workgroup Manager for Windows NT, and Nways Campus Manager LAN for AIX.
- For IP networks:
  - SNMP manageability over a Serial Line Internet Protocol (SLIP) link to the management port
  - Support for BootP for configuring and upgrading the microcode of any 8237 Model 002 or Model 003
  - Support for TFTP for upgrading the microcode of any Model 002 or Model 003
  - Telnet support.
- For IPX networks, Novell Hub Management Interface (HMI) compliance.
- Field upgrades: Model 002 can be upgraded to Model 003.

Model 003 provides these additional features:

- All connectivity features, plus all management features of Model 002. In addition, Model 003 incorporates an RMON agent providing the functions defined in RFC 1757.
- The Model 003 RMON agent can be managed by using optional applications and platforms, such as Nways Workgroup Remote Monitor for Windows, Nways Campus Manager Remote Monitor for AIX, Nways Campus Manager Remote Monitor Advanced for AIX, Nways Campus Manager Remote Monitor for HP-UX, and Nways Campus Manager Remote Monitor Advanced for HP-UX.

Stacks

A *stack* is formed when up to ten 8237s are connected together. To create a stack, two or more 8237s must be interconnected using the Stack Link cable. For more information on interconnecting 8237s, see "Interconnecting 8237s" on page 1-5 and "Connecting Hubs with Stack Link Cables" on page 2-5.

A *managed* stack is made up of any combination of Model 001s, Model 002s, and Model 003s, as long as at least one Model 002 or Model 003 is included in the stack. In stacks with only one Model 002 or Model 003, that unit will automatically be designated the primary management agent, regardless of its physical position in the stack. For stacks having more than one Model 002 or Model 003, the following rules are observed:

- In a stack with a Model 002 and Model 003 together, the Model 003 will automatically be designated the primary management agent.
- Among the same models in a stack, the unit that is physically nearest the top of the stack will automatically be designated the primary management agent and the remainder will be designated backup management agents in order of their physical position in the stack (when connected as described in “Connecting Hubs with Stack Link Cables” on page 2-5).
- In a stack with more than one management unit, in case of the failure of the primary management agent, the management agent that is physically next lowest in position in the stack will automatically assume primary management agent responsibility.

For more information on managed stacks, see "Understanding Managed Stacks” on page 1-6.

An *unmanaged* stack is made up exclusively of Model 001s.

There are four ways to manage the 8237:

Using a local VT100 terminal emulator out-of-band
Using SNMP over SLIP out-of-band
Using Telnet over an IP network connection in-band
Using SNMP over an IP or IPX network connection in-band

Interconnecting Typical Ethernet Hubs

The best way to appreciate the benefit of stacking hubs is to examine the method of interconnection used by simpler Ethernet workgroup hubs, which interconnect by *cascading*. Cascaded hubs are in the same collision domain. Figure 1.2 on page 1-5 shows three Ethernet workgroup hubs labled A, B, and C. Hubs B and C are cascaded from Hub A.

Because data sent from the workstation to the server must pass through three hubs along the way, the server is said to be three *repeater hops* from the workstation. A repeater hop is counted whenever an Ethernet frame passes through a repeater. The IEEE 802.3 standard specifies that a frame sent from one workstation to another should not pass through more than four repeaters on the way to its destination.

If there are six ports on Hub A, you can cascade up to four more hubs from Hub A and still have a maximum of three repeater hops between any two workstations. A limitation of cascading, however, is that ports that could be used to attach workstations are being used to interconnect hubs.

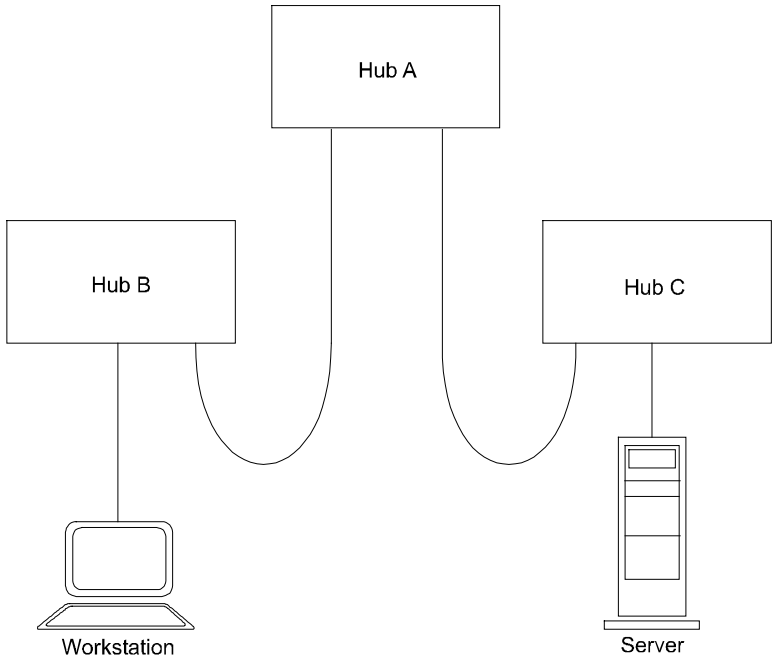

Figure 1-2. Hubs B and C are Cascaded from Hub A

Interconnecting 8237s

You can increase the number of ports available to end stations by adding 8237s to a network and interconnecting them using the Stack Link cable. Up to ten 8237s can be linked through the Stack Link port. The total hub Stack Link cable length from the first to the last 8237 can be up to 75 m (246 ft). When the Stack Link cable is used, management information can be passed between hubs, enabling management of an entire stack. If hubs in a stack are configured into different segments, they can still be managed by one Model 002 or Model 003.

There are three benefits from using the Stack Link ports to interconnect 8237s: the maximum number of hops between any two workstations directly connected to 8237s is kept at one (or one and one-half if the total Stack Link cable distance is greater than 45.7m (150 ft)), ports intended for connecting workstations are not being used for interconnecting 8237s, and an entire stack of 8237s can be managed by one Model 002 or Model 003.

Understanding Expansion Ports

There are two types of optional Expansion Ports available for the 8237, Media Expansion Ports and Fast Expansion Modules.

Media Expansion Ports (MEPs)

MEPs provide a way to connect the 8237 Hub directly to additional networks over other Ethernet media types. An MEP thus extends the collision domain of the 8237 to another network. These Expansion Ports and their connected network segments become part of the same collision domain as that of the 8237.

There are two kinds of MEPS: AUI/10BASE2 and 10BASE-FL/FOIRL. The AUI/10BASE2 MEP will accept an Ethernet transceiver or 10BASE2 coaxial cabling. The ST connectors of the 10BASE-FL/FOIRL MEP will accept standard 62.5/125-micrometer optical fiber cables. Both of these expansion ports support connection to only 10-Mbps Ethernet networks.

Fast Expansion Modules (FEMs)

The 10BASE-T/100BASE-TX and 100BASE-FX FEMs enable the 8237 to connect to another 10-Mbps Ethernet collision domain or to 100-Mbps Fast Ethernet. When installed, these Expansion Ports act as two-port Ethernet switches that provide isolation between the collision domain in the 8237 and the collision domain in the attached network, while maintaining communication between the collision domains. FEMs can be connected to a subnetwork, directly to a server, bridge, or router, or to another 8237 in the stack that has been configured to be in a different segment. Two 10BASE-T/100BASE-TX FEMs in an 8237 stack can serve as bridges, joining three segments. This approach shares network load across three 10-Mbps collision domains within the stack yet still enables communication among all workstations. The 10BASE-T/100BASE-TX FEM supports connection to either 10-Mbps or 100-Mbps networks (auto-negotiating). It supports either full-duplex or half-duplex transmission. The transmission mode selection is also auto-negotiating.

The switch interface in both types of FEMs provides:

- 160-KB port buffer.
- Automatic filtering on destination addresses.
- Source address self-learning (4000 addresses per port). Addresses age out after five minutes.
- Two selectable forwarding modes: store-and-forward and adaptive cut-through.

In store-and-forward mode, the FEM receives the entire frame before forwarding it. In adaptive cut-through mode, the FEM dynamically adjusts the forwarding mode between store-and-forward, fragment-free cut-through, and cut-through. Which mode is used depends on interface speeds and network conditions (CRC error frame rate). In fragment-free cut-through mode, the FEM stores the frame until it determines that the frame is at least 64 bytes in length and thus not a fragment. In cut-through mode, the FEM forwards the frame as soon as the destination address (8 bytes) is determined.

The trade-off between store-and-forward and adaptive cut-through forwarding modes involves latency (the transmission delay within the FEM during the forwarding process) and error propagation. Store-and-forward mode ensures that frame fragments and frames with CRC errors are not passed farther along in the

network. The penalty is increased latency caused by the delay while waiting for the entire frame (up to 1518 bytes) to be read and the CRC checked. Adaptive cut-through mode allows faster forwarding (lower latency). The penalty here is increased bandwidth consumed by fragments and some error frames. The selection between the two modes depends on network priorities.

Back-Pressure Flow Control

If an FEM receives a sustained high volume of traffic, the FEM packet memory can become full. If this happens, the FEM issues a jam pattern on the upstream link. Then, an upstream sending adapter, sensing the collision, will stop sending and wait a random period of time before re-sending a frame. If back-pressure flow control is not selected, the 8237 will discard any frames it receives during a buffer-full condition.

Generally, in this case, the sending user application will retry the transmission. In most cases, the adapter retransmission will cause less delay than an application retrying the transmission. Thus back-pressure flow control is recommended.

Transmission mode, forwarding mode, and flow control are selectable under network management control via the 8237 private MIB.

Understanding Managed Stacks

This section describes how 8237s in a stack communicate with one another, the effects of segmenting 8237s within a stack, and how to link segmented 8237s.

Inter-8237 Communications in Managed Stacks

In an 8237 stack there are three 10-Mbps backplanes and one management backplane (or bus). This management backplane is used by the management agent in Model 002 and Model 003 to retrieve management information from all units in the stack.

Regardless of the segmentation status of any 8237 or its position in the backplane, the hub retains its full management capability and the ability to be managed by a single Model 002 or Model 003.

Using any of the management methods mentioned in the previous section, you can perform any of the following actions on any 8237 in a stack while attached to the Model 002 or Model 003 that is currently the primary management hub as indicated by the Prim LED:

- Display system information
- Issue management commands to any hub in the stack
  - SNMP configuration
  - Port security control
  - Segment configuration
  - Hub configuration
  - Port configuration
  - User passwords
  - Backup ports
  - Management Port lockout
- Collect statistics at the port, hub, or segment level.

Why Segment 8237s within a Stack?

Three major uses of segmentation are to improve performance, to troubleshoot, and to isolate groups of users. This section details those uses. "Segmenting 8237s within a Stack" explains how segmenting is controlled.

Improving Performance

In an unsegmented stack, all of the 8237s remain in the factory-default segmentation status and are assigned to Backplane 1. This configuration represents a single collision domain. All devices attached anywhere in such a stack see all of the Ethernet frames generated anywhere in the stack; thus, they share a single 10-Mbps bandwidth.

As network traffic increases, excessive collisions can cause network performance to slow. You can improve performance by segmenting one or more 8237s in the stack to another backplane or by isolating them from any backplane. Each backplane or isolated 8237 is a separate collision domain, thus providing multiple 10-Mbps bandwidths.

To enable segmented 8237s to communicate with the rest of the stack, interconnect them using a FEM or a bridge, router, or switch. See "Linking Segmented 8237s" for more detail.

Troubleshooting

Segmentation can help you isolate areas of your network that are experiencing problems. You can segment 8237s one at a time while monitoring stack performance. This technique can help you localize a problem area to the devices attached to a specific 8237.

Isolating User Groups

You might have users in your network who have no need for connectivity outside their department or workgroup. By placing their workstations on a separate backplane, you can limit their network access and isolate their bandwidth demands from the remainder of the network while retaining management of the 8237s.

Segmenting 8237s within a Stack

You can use a VT100 terminal emulator or an SNMP management application to connect an 8237 to any of the three backplanes, or to isolate it from the stack. When this is done, the 8237 is said to have been *segmented*. Even though one or more hubs have been logically removed from the Ethernet bus, the management bus permits the management information, described in "Inter-8237 Communications in Managed Stacks" on page 1-6, to be passed.

Linking Segmented 8237s

When you segment an 8237, you cause it to be either connected to another backplane or to be isolated completely from the rest of the stack. Devices connected to 8237s in any backplane are able to communicate with all other devices connected to any 8237 in that backplane. Each backplane is a separate collision domain, as are any 8237s that have been isolated.

One easily implemented method of interconnecting multiple backplanes is by means of the 10BASE-T/100BASE-TX FEM. You can connect a 10BASE-T/100BASE-TX FEM in one 8237 to a port in an 8237 that is in a different backplane.

You can also interconnect 8237s in different backplanes using a bridge, router, or Ethernet switch.

In order to manage a stack of 8237s:

- The 8237 you want to manage must be a Model 002 or Model 003, or it must be connected in a stack that includes at least one Model 002 or Model 003, *and*
- There must be an Ethernet link between the 8237 to which your management workstation is attached and the Model 002 or Model 003 that is serving as the primary management unit for the stack.

Assigning Backup Port Pairs

A managed stack provides the option of making redundant connections to network-critical devices, such as servers or LAN switches. You can use the VT100 interface or any SNMP-based network management application to assign backup port pairs. These ports are called the *primary* and *secondary* ports. Any port in an 8237, including those on Expansion Ports, can be used as a backup for any other port. A stack can have up to 18 pairs of redundant ports. The primary and secondary ports can be on separate backplanes. Note that you must establish two physical connections to the desired device.

When a backup port pair has been configured and activated, the primary port will be enabled and the secondary port will be disabled to prevent looping. When a backup port pair is operating, the Link/Activity LED will indicate activity on the *primary* port and the Partition LED for the *secondary* port will be on.

If the connection to the primary port is broken, the secondary port will be enabled to keep the device connected. The Link/Activity LED will indicate activity on the *secondary* port and the Partition LED for the *primary* port will be on. When you reset the backup function, the secondary port will be disabled and the primary port will be re-enabled.

Ethernet Planning

The size of each Ethernet collision domain you create is limited by these factors:

- The cable length restrictions unique to each type of segment (that is, for 10BASE-T, 100BASE-TX, 10BASE2, 10BASE-FL, FOIRL).
- The limit of four repeaters between any two devices in one collision domain.

These factors are explained in greater detail in the following sections.

Maximum Segment Lengths

An Ethernet segment is the total length of cable between either two repeaters or between a repeater and an attached device. The different types of Ethernet supported by the 8237 place different limitations on segment lengths.

Table 1-1. Maximum Segment Lengths for the Supported Ethernet Types

Ethernet Type	Maximum Segment Length
10BASE2	185 m (607 ft)
10BASE5	500 m (1640 ft)
10BASE-T or 100BASE-TX	100 m (328 ft)
10BASE-FL	2000 m (6561 ft) Full- and half-duplex
FOIRL	1000 m (3280 ft)
100BASE-FX	412 m (1352 ft) Half-duplex 2000 m (6561 ft) Full-duplex

Four-Repeater Limit

The IEEE 802.3 Ethernet standard specifies that a maximum of four repeaters can be placed in the path between any two devices in one collision domain.

Count a stack as one repeater hop as long as the total Stack Link cable length is less than 45.7 m (150 ft). If the total Stack Link cable length is between 45.7 m (150 ft) and 75 m (246 ft), count a stack as one and one-half repeater hops.

Note: There may be more than four repeaters within a collision domain, as long as there are no more than four repeaters in the path between any two devices in the collision domain.

Cables and Connectors

Cable and connector requirements differ depending on the port to which each cable connects.

UTP and STP cable pinouts can be found in Appendix A, "Cable Pinout Diagrams."

Cabling Requirements for 10BASE-T Ports

This section describes the cables required to connect the 8237's 10BASE-T ports to network devices such as workstations and servers.

Problems with LANs are frequently due to incorrect cable selection or poor cabling practices. You should select components carefully and inspect installations for good installation practices so that your 10BASE-T network will operate as intended.

Your 10BASE-T network will operate correctly on category 3, 4, or 5, 100-ohm UTP or ScTP cable and connecting hardware, as specified in the ANSI/TIA/EIA 568-A or CSA T529 standards. Your 10BASE-T network will also operate on 150-ohm STP-A

cable and components as specified in these standards. In addition, your network will operate on IBM Cabling System types 1, 6, and 9, 150-ohm STP or STP-A cable. If you are using 150-ohm cabling systems, impedance-matching devices must be used in conjunction with the cable.

Your 10BASE-T network will also operate correctly on category 3, 4, or 5, 100- and 120-ohm, balanced, shielded or unshielded cables and components as specified in the ISO/IEC 11801 standard. It will also operate on 150-ohm, balanced, shielded cables and components as specified in the ISO/IEC 11801 standard. In addition, your network will operate on any link that meets the specifications of a Class D link as specified in the standard; this includes IBM Cabling System type 9 STP cabling. If you are using 120- or 150-ohm cabling systems, impedance-matching devices must be used in conjunction with the cable.

All devices connected to the cables must be grounded.

Do not use telephone extension cables in 10BASE-T networks. The wire pairs in those cables are not twisted and the cable does not meet other requirements for use in a 10BASE-T network.

Applicable Cabling Standards

In the United States, the *ANSI/TIA/EIA 568-A Commercial Building Telecommunications Standard* has been widely adopted. The Canadian Standards Association has also participated in the development of this standard and issues a parallel document known as T529; the most current version of this document is dated 1995. Many other countries use *ISO/IEC 11801 Information technology - Generic cabling for customer premises*.

It is good practice to use only those components that have been certified by an independent testing laboratory as meeting one or more of the standards. In the case of IBM Cabling System types 1, 6, and 9 cable, certification should be either to the IBM specification or to the applicable standard.

Cabling Requirements for the Expansion Ports

Cable and connector requirements differ depending on the Expansion Port you use.

AUI/10BASE2 Media Expansion Port

This Media Expansion Port incorporates a BNC connector plus an AUI port. Only one port can be used at a time, and the port type selection is made with the push button on the Expansion Port front panel. For connection to 10BASE2 networks, you should use RG-58 A/U coaxial cables meeting the specifications in TIA/EIA 568A or ISO/IEC 11801. The maximum length of coaxial cable in one segment should not exceed 185 m (607 ft) and the number of attached nodes should not exceed 30. Connection to other networks, such as 10BASE5, can be made via the appropriate transceiver attached to the AUI port.

10BASE-FL/FOIRL Media Expansion Port

This Media Expansion Port incorporates two ST connectors. Use 62.5/125-micron multimode optical fiber that meets the specifications in TIA/EIA 568A or ISO/IEC 11801. The maximum length of optical fiber cable between devices should not exceed 2000 m (6561 ft). This device also supports FOIRL. The maximum distance for FOIRL interconnection is 1000 m (3280 ft).

10BASE-T/100BASE-TX Fast Expansion Module

This Fast Expansion Module incorporates two RJ-45 connectors, one MDI-X and one MDI. The MDI-X port performs an internal crossover function that allows easy connection to other devices using standard straight-through cables. The MDI port is without the internal crossover function, permitting connection to devices having an internal crossover function using standard straight-through cables. For connection to 10BASE-T networks, you should use category 3, 4, or 5 cables meeting the specifications outlined in "Cabling Requirements for 10BASE-T Ports" on page 1-9. For connection to 100BASE-TX networks, you can use only category 5 cables.

100BASE-FX Fast Expansion Module

This Fast Expansion Module incorporates two ST connectors. Use 62.5/125-micron multimode optical fiber that meets the specifications in TIA/EIA 568A or ISO/IEC 11801. The maximum length of optical fiber cable between devices should not exceed 2000 m (6561 ft) if the link is being operated in full-duplex mode. If operated in half-duplex mode, the length should not exceed 412 m (1352 ft).

Cabling Requirements for the Management Port

The management port is a standard DB-9 male connector that provides an EIA/TIA 232-E (was RS 232-C) serial interface. You can connect locally, with a null-modem cable, or remotely, over telephone lines, using serial cables and modems at each end. Once connected, you can manage the 8237 and upgrade microcode. This is sometimes called *out-of-band* management.

You can make a null-modem cable by connecting a null-modem adapter to a standard serial cable.

Cabling Requirements for Stack Link

The 8237 Stack Link ports provide an RJ-45 connection for the Stack Link cable. A 0.5 m (1.6 ft) length cable is provided with each unit. If a longer cable is needed use only straight-through 100-ohm category 5 STP cable with RJ-45 plugs on both ends. Note that the total length of the Stack Link cable must not exceed 75 m (246 ft).

Protected Vital Configuration Data

The following configuration information is stored in nonvolatile memory and will survive a power outage:

- System name and location
- Segment to which the hub is connected
- ID number assigned to the hub
- Password assigned to the hub

The above are retained for all models. In addition, the following information, arranged by function, is retained for Model 002 and Model 003:

- SYS group

  MIB II system contact group
  MIB II system name
  MIB II system location

- SNMP group

  SNMP group authentication traps flag

- RPTR group

  Hub MIB port administration status

- Community group

  Community name of IBM 8237 MIB
  Community access mode
  Community status

- IP trap manager group

  IP trap manager community
  IP address of the IP trap manager
  IP trap manager status

- IPX trap manager group

  IPX trap manager community
  IPX address of the IPX trap manager
  IPX trap manager status

- Download group

  IP address of TFTP download server
  File name to download
  Execution mode of downloaded code
  Protocol to be enabled

- Segment group

  Segment IP address
  Segment netmask
  Segment gateway IP address
  Segment SLIP address
  Preferred IPX frame type for the segment
  Internal IPX network of the segment
  SAP broadcast interval for the segment
  Segment name

- Hub group

  Management agent MAC address
  Agent segment number
  Agent bootup option

- Port group

  Port names

- FEM group

  Fast Expansion Module port status
  Fast Expansion Module port duplex mode
  Fast Expansion Module port back pressure mode
  Fast Expansion Module port forwarding mode
  Fast Expansion Module port name

- Backup group

  Primary port hub number
  Primary port port number
  Secondary port hub number
  Secondary port port number
  Primary and secondary port pair status

- Security group

  Hub number of port
  Port number of port
  MAC address authorized to send to port
  Action to be taken when port is intruded
  Auto-learn setting for port
  Eavesdrop protection setting for port

- User table group

  Logon IDs
  Passwords for logon IDs

- Console lock group

  Console lock status
  Console lockout delay

Power Requirements and Characteristics

The connector for the power cord is on the rear panel of the 8237.

Note: For safety reasons, it is recommended that the connection be made first to the 8237, and then to the ac outlet.

The 8237's internal, auto-ranging power supply adapts to voltages between 100 and 240 V ac at frequencies of 50 to 60 Hz, ±3 Hz.

Following are characteristics of the 8237's power supply:

Power usage (maximum)	25 watts @ 82 BTU per hour (Model 001) 29 watts @ 97 BTU per hour (Model 002) 40 watts @ 134 BTU per hour (Model 003) 12 watts @ 40 BTU per hour (Media Expansion Port) 17 watts @ 58 BTU per hour (Fast Expansion Module)
Line current (maximum)	0.9 A @ 120 V ac; 0.45 A @ 240 V ac
kVA (worst case)	0.13 kVA

Physical Characteristics

This section gives the dimensions and weight of an 8237.

Width	440 mm (17.3 in.)
Depth	290 mm (11.4 in.)
Height	65 mm (2.5 in.)
Weight	2.8 kg (6.2 lb) Model 001 2.8 kg (6.2 lb) Model 002 3.1 kg (6.8 lb) Model 003 0.17 kg (0.4 lb) Media Expansion Port 0.19 kg (0.4 lb) Fast Expansion Module

Operating Environment

This section specifies the physical environment required by 8237s.

Space Requirements

If you will connect multiple 8237s in a stack, be sure that you have enough space available in your rack or shelf for the number of hubs that will be stacked together.

Allow at least 76 mm (3 in.) at the back and 50 mm (2 in.) at the sides of the 8237 to ensure proper cooling. Leave 200 mm (8 in.) in front for viewing the LEDs, installing Expansion Ports, connecting cables, and for air circulation.

Environmental Requirements

Power-on temperature	10° to 40°C (50° to 104°F)
Relative humidity	85% maximum
Storage temperature	-25° to 70°C (-13° to 158°F)

Acoustic Characteristics

Table 1-2 is a declaration of the 8237's noise emission characteristics.

Table 1-2. Noise Emission Characteristics of the 8237

Type	Description	L_{WAd}		L_{pAm}		$<L_{pA}>_m$	
		Operating (bels)	Idling (bels)	Operating (dB)	Idling (dB)	Operating (dB)	Idling (dB)
8237	Stackable Ethernet Hub	5.1	5.1	N/A	N/A	37	37

Notes:

L_{WAd} is the declared sound power emission level for a production series of machines.

L_{pAm} is the mean value of the sound pressure emission levels at the operator position (if any) for a production series of machines.

$<L_{pA}>_m$ is the mean value of the space-averaged sound pressure emission levels at the one-meter position for a production series of machines.

N/A not applicable (no operator position).

All measurements were made in accordance with ISO 7779 and reported in conformance with ISO 9296. These are preliminary values and are subject to change. The final values will be available from IBM Manufacturing for production machines.

Documenting Your Installation

It is always a good idea to maintain charts or other documentation that pinpoint key aspects of your installation. By doing this, you will make your tasks in such areas as system expansion, reconfiguration, or troubleshooting easier to perform.

Rack Document

You should document all components installed in each rack in your establishment. The larger the organization, the more useful this can be.

Create a rack inventory document for each of the racks where you will be installing devices. Indicate the location of each device in this document. Include the unit ID and model number of each device.

Stack Document

You should document each 8237 stack. Retain this document as a record of which IP address has been assigned to each stack or individual 8237, each 8237's unit ID, and the location of each 8237.

Setup and Cabling Document

A setup and cabling diagram can be used to indicate to the installer how and where to mount the 8237 and how to connect the appropriate cables to it.

Include enough building and location information to enable the installer to find where to install the 8237. Include the 8237's backplane location, unit ID, and IP or IPX address.

Indicate whether an Expansion Port should be installed and, if so, the type (that is, AUI/10BASE2, 10BASE-FL/FOIRL, 10BASE-T/100BASE-TX, or 100BASE-FX).

For each port, record an identifier for the device at the other end of the cable. Include information such as the device's MAC address and physical location. Record the identifier for the port to which the installer should connect the cable from the 8237's port. If the 8237 is to be installed in a wiring closet, indicate that the installer should connect a patch cable from a port in the 8237 to a port in a patch panel.

Locator Document

You should maintain information that enables you to relate adapter addresses to their physical location and device. This information is useful for problem determination and should be kept current, especially in larger installations.

Each device that attaches to an 8237 is known to the network by its adapter address. This address can be one of two types: universally administered or locally administered. See the adapter's documentation to learn how to determine the address of a particular adapter.

Record adapter and hub addresses of all devices in the network in numerical order. Record the physical locations of all devices by building and room number.

In addition to recording the device identification, you should also indicate such functions as hubs, bridges, print servers, file servers, gateways, and switches.

Chapter 2. Installing the 8237

Before installing the IBM 8237 Stackable Ethernet Hub 10BASE-T, be sure to read "Safety Information" on page ix, the information in "Notices" on page C-2, and "Electronic Emission Notices" on page C-3.

This chapter provides step-by-step instructions for installing the 8237. It also explains how to install the optional Expansion Ports.

Before You Begin

1 Examine the contents of the package.

Along with this manual, the 8237 package should contain:

- The 8237 with mounting brackets attached
- A cable management bracket
- A power cord
- A safety manual
- A Stack Link cable

If any item is missing or damaged, contact your place of purchase.

2 Gather the other materials you will need:

- Network documentation identifying devices and specifying port connections
- And, if you will be rack-mounting the 8237
  - Four rack-mounting screws that are appropriate for your rack
  - A screwdriver that is appropriate for your rack-mounting screws

Setup

Refer to your network documentation for instructions about whether to rack-mount or surface-mount the 8237.

Rack-Mounting the 8237

1 Using a screwdriver, remove the four screws (two on each side) that attach the mounting brackets to the sides of the 8237, as shown in Figure 2-1 on page 2-2.

2 Rotate the brackets and reattach them as shown in Figure 2-1 on page 2-2.

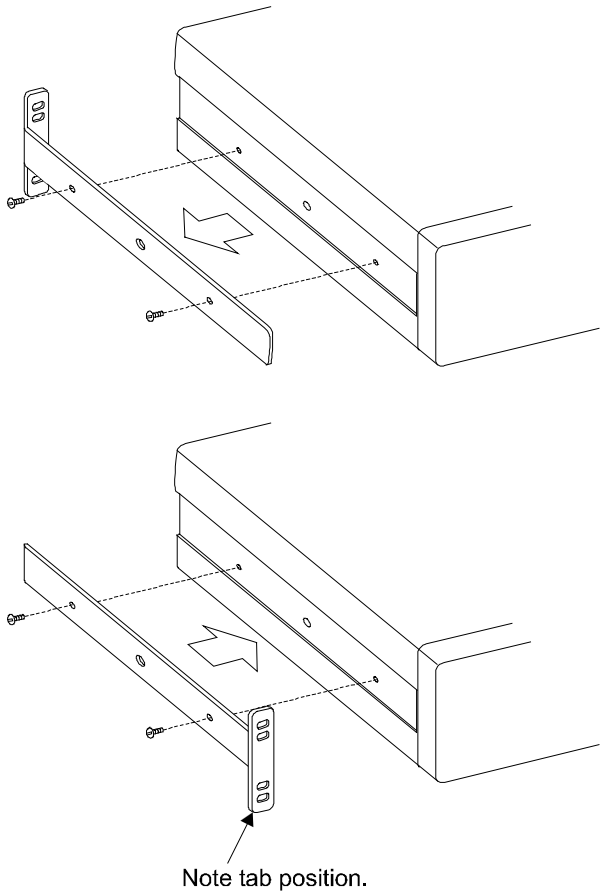

Figure 2-1. Rotating the Rack-Mounting Brackets

3 Refer to your network documentation to determine where in the rack to mount the 8237.

4 Gather the rack-mounting screws (not provided) and the cable management bracket and place them within reach.

5 Hold the 8237 in position in the rack and start the lower of the two screws that will secure the left bracket.

6 On the right side, align the lower screw holes in the mounting bracket and the cable management bracket with the correct hole of the rack and then start the screw as shown in Figure 2-2 on page 2-3.

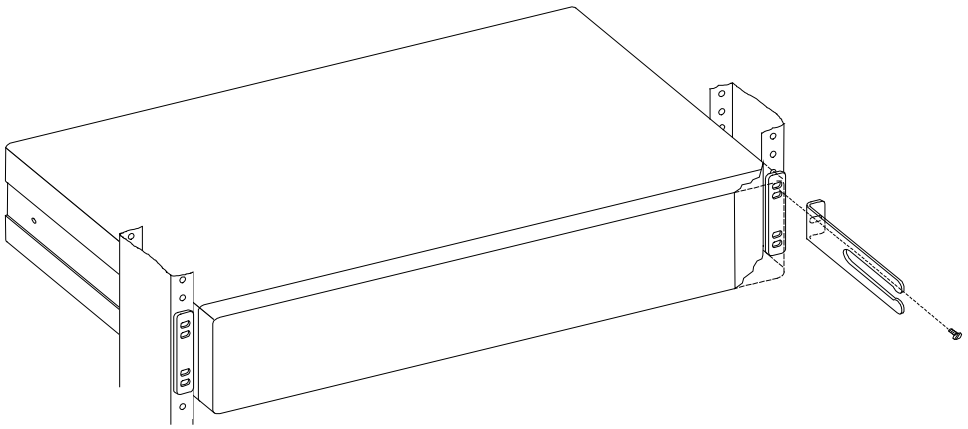

Figure 2-2. Attaching the Cable Management Bracket

7 Tighten the screws on each side.

8 If you are connecting multiple 8237s in a stack, go to "Interconnecting 8237s" on page 1-4.

9 If you are installing an Expansion Port, continue with the instructions under "Installing an Expansion Port" on page 2-4. If you are not installing this feature, continue with the instructions under "Installing and Routing Cables" on page 2-4.

Surface-Mounting the 8237

1 Place the 8237 on a flat, horizontal surface where it is to be used. The 8237 is not designed for vertical mounting.

2 If you are connecting multiple 8237s in a stack, go to "Interconnecting 8237s" on page 1-5.

3 If you are installing an Expansion Port, continue with the instructions under "Installing an Expansion Port" on page 2-4. If not, continue with the instructions under "Installing and Routing Cables" on page 2-4.

Installing an Expansion Port

The types of Expansion Port are illustrated in Figure 4-5 on page 4-8. If you are installing an optional Expansion Port, use the instructions that follow. If you are not installing this feature, continue with "Installing and Routing Cables."

Note: The Expansion Port is not hot-pluggable.

The Expansion Port slot is located at the lower left of the front of the 8237. See Figure 1-1 on page 1-1 for its location.

1. Remove the Expansion Port slot cover-plate by turning the two knurled knobs on the front counterclockwise. Retain the cover-plate so that you can locate it in the future, should you need to replace it in the 8237. If an Expansion Port is removed from the 8237, you should always replace the cover-plate to ensure proper cooling.

2. Insert the Expansion Port, ensuring that the edges slide through the guides, until the connector end is firmly seated.

3. Push and turn the two knurled knobs clockwise until they are securely attached to the 8237 frame.

Installing and Routing Cables

Remember these tips when connecting cables:

Avoid stretching or bending cables.

Avoid routing cables near potential sources of electromagnetic interference, such as motorized devices or fluorescent lights.

Route cables away from aisles and walkways to avoid creating trip hazards. Use floor cable covers to secure cables if such routes cannot be avoided.

Connecting Cables to 10BASE-T Ports and Expansion Ports

1. Refer to your network documentation to determine each cable's port or Expansion Port assignment.

2. Using appropriate connectors, connect the cables to the ports or Expansion Ports.

3. Label the cables so that it will be easy to identify the device at the other end of the cable if you have to troubleshoot a network problem. At the end of the cable nearest the 8237, place a label containing a unique identifier for the cable, the location and MAC address of the device at the other end of the cable, and the number of the port to which the device is attached.

4. If required, at the attached device's end of each cable, connect a cable from the device to any faceplate or other intermediate connection point, as appropriate.

5 Label the cables so that it will be easy to identify the 8237 port at the other end of the cable if you have to troubleshoot a network problem. At the end of the cable nearest the attached device, place a label containing a unique identifier for the cable, the location and MAC address of the 8237 at the other end of the cable, and the number of the 8237 port to which the device is connected.

Connecting Hubs with Stack Link Cables

If you will be configuring multiple 8237s into one or more stacks, you will need the Stack Link cable provided. One cable is required for every two hubs that will be interconnected. This cable is illustrated in Figure 2-3.

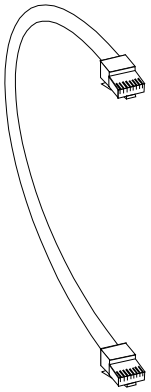

Figure 2-3. 8237 Stack Link Cable (P/N 86H0021)

If you will be connecting multiple 8237s using the Stack Link cable, follow the steps below. If not, go to "Powering On the 8237" on page 2-7.

1 Connect one end of the cable to the Stack Link In port of the 8237 that is physically nearest the top of the stack. Be sure that the cable is firmly seated and that the latches are engaged.

2 Connect the other end of this cable to the Stack Link Out port of the 8237 that is physically next lowest in the stack. Be sure that the cable is firmly seated and that the latches are engaged.

3 Repeat the above steps for each hub in the stack, progressing downward.

Note: Never allow a Stack Link cable to remain partially attached. If a Stack Link cable is disconnected from one 8237 but is left connected to the other 8237, Ethernet traffic to all backplane buses will be disrupted.

In Figure 2-4 on page 2-6, the topmost 8237 is a Model 002 and the two lower units are Model 001s. Note the Stack Link cable connections. In this example, the Model 002 would be identified as occupying position 1, the Model 001 in the middle would occupy position 2, and the Model 001 on the bottom would occupy position 3.

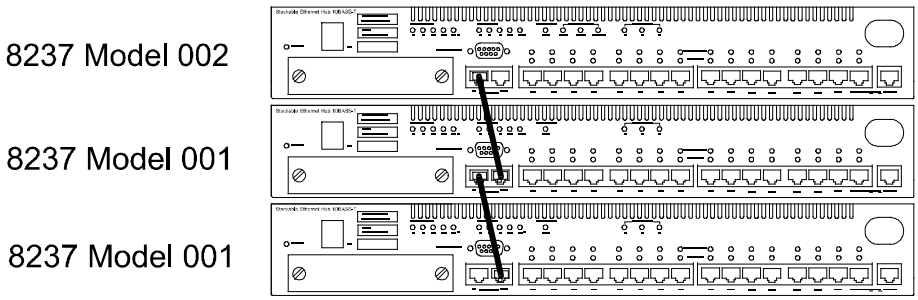

Figure 2-4. Example 8237 Stack

Connecting a Modem or a Null-Modem Cable to the Management Port

If you have a modem or a null-modem cable to install, follow the steps given here. If not, go to "Powering On the 8237" on page 2-7.

1 If you are installing a modem, unpack it and install it according to the manufacturer's instructions.
An installed modem should be set to force Data Set Ready (DSR) signals. Typically, this is done by setting a switch on the modem. Refer to the documentation that came with your modem for specific instructions.

2 Connect one end of the serial cable (modem connection) or one end of the null-modem cable (direct connection) to the 8237 port labeled *Management*.

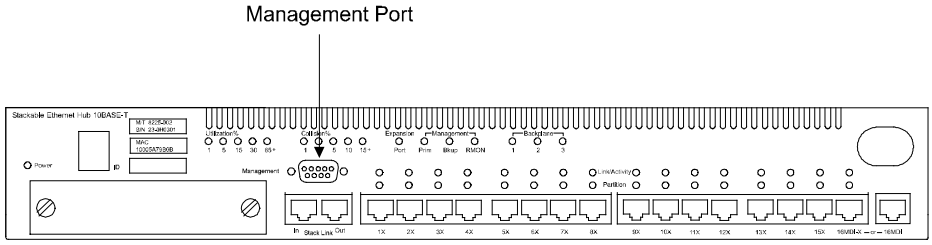

Figure 2-5. Location of the Management Port

- If you have a managed stack, this will be the Model 002 or Model 003 whose Prim LED is on, indicating that it is the primary management agent.
- If you have an unmanaged stack of Model 001s, this will be any of the units.

3 If you are installing a modem, connect the other end of the cable to the modem and connect the modem to the telephone system. If you are installing a null-modem cable, connect the other end of the cable to the communications port on your computer.

4 Continue with "Powering On the 8237" on page 2-7.

Powering On the 8237

This section describes how you should expect the LEDs to function when you power the 8237 ON.

1 Connect the power cord to the connector at the rear of the 8237, as shown in Figure 2-6.

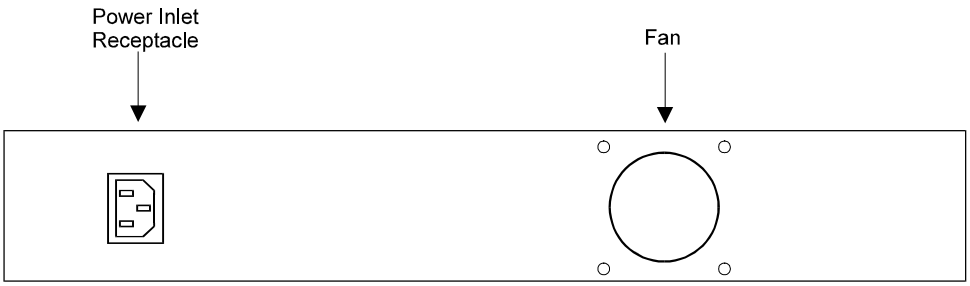

Figure 2-6. Connecting the Power Cord

2 Insert the other end of the power cord into the electric outlet.
Note: There is no power switch on the 8237.

3 Look for the following LED blink sequence:

- First, all the Link, Partition, and Utilization LEDs on the front panel should blink for approximately 4 seconds. All other LEDs remain on during this time.
- Then, the five Collision LEDs will turn on, then off, in sequence from left to right as each diagnostic test is performed. During this time, the Hub ID display will show the letter “P” to indicate that tests are in progress and the Backplane LEDs will continuously blink ON/OFF in sequence.

  Note: Because the power-on self-test (POST) diagnostics are of a brief duration, it may appear that one or more of the LEDs did not turn on and off. The important thing to note is whether any of the collision LEDs remain on, indicating a failed component. If this occurs, go to Chapter 4, "Troubleshooting, Installation, and Replacement Procedures."
- Finally, all LEDs that are appropriate for the particular 8237 stack configuration you have installed (such as the Expansion Port, management, and backplane LEDs) should reach their normal states. See Table 3-1 on page 3-44 and Table 3-2 on page 3-45 for more information concerning the LEDs.

Chapter 3. 8237 Administration

This chapter explains how to manage your 8237 installation. Its primary emphasis will be on using the built-in user interface. You can also use SNMP to manage your 8237 installation. See "Preparing for SNMP Management" on page 3-48 for details.

The 8237 User Interface Program

The 8237 incorporates a powerful user interface that can be used to manage individual 8237s or a complete stack using a terminal emulation program that supports VT100 emulation (out-of-band), or using Telnet over an IP connection (in-band).

Note: Telnet is a component of most TCP/IP applications. You will need to install TCP/IP before you can take advantage of this option.

For more information on using Telnet over an IP connection, see "Management Using Telnet" on page 3-47.

Management Using Terminal Emulation Software

You can manage your 8237 installation in one of two ways using terminal emulation software:

- By means of a direct, null-modem cable connection
- By means of the public telephone network, using modems

Obtain and install a terminal emulation software application that is compatible with your workstation's operating system and that supports VT100 emulation.

Communicating Using a Null-Modem Cable

The 8237's management port can communicate at speeds of 9600, 19 200, or 38 400 bits per second; this port speed can be selected by in-band or out-of-band commands. The default is 9600 bits per second, which is the only speed at which the Model 001 can communicate. The Model 002 and Model 003 can communicate at all three speeds. To communicate with the 8237 for the first time, configure the terminal emulation application as follows:

- Default speed of 9600 bps
- No parity
- 8 data bits
- 1 stop bit
- No flow control
- VT100 emulation
- The communications port of the workstation that you have configured in the emulation software

Note: Some emulation applications (such as many Windows-based programs) use the workstation keyboard's cursor movement keys: for example, to switch between windows. Because the 8237's user interface program uses the cursor movement keys, it is necessary when using such terminal emulators to turn off this feature. In Windows 3.1, for example, perform the following steps:

1. From the Program Manager window, double-click the **Accessories** group icon.

2 Inside the Accessories window, double-click the **Terminal** icon. This will open a blank terminal emulation session.

3 From within the Terminal window, click **Settings** on the menu bar.

4 Select **Terminal Preferences**.

5 De-select the check box **Use Function, Arrow, and Control Keys for Windows**.

6 Select **OK**.

7 You can save your current session settings by selecting File from the menu bar and selecting Save As.... Give a file name and open this file the next time you start your emulation session.

For information on connecting an 8237 to a null-modem cable, see "Connecting a Modem or a Null-Modem Cable to the Management Port" on page 2-6.

***Special Considerations*:** Because most communications software assumes that you will be using a modem, if you will be connecting using a null-modem cable, you need to be certain that your emulation software supports communication with a device that is directly attached to your workstation. Follow any special instructions from the application manufacturer concerning configuration steps that may be required to support communication with a directly attached device.

Communicating Using a Modem

If you will be communicating with the 8237 by means of a modem connection, you will need to install a second modem and connect it to your computer.

Configure the terminal emulation application as follows:

- Maximum speed of your modem
- No parity
- 8 data bits
- 1 stop bit
- No flow control
- VT100 emulation
- The workstation's communications port that will be used

Establishing a Session with the 8237

To initiate a session using the 8237's user interface program, perform the following steps:

1 Either

- Invoke your emulation software to establish a direct connection by means of the null-modem cable; or
- Invoke your emulation software and dial the number of the modem that is attached to the 8237.

2 After you have established a connection with the 8237, you will be presented with one of two situations:

- If the 8237 was already powered on, you will see a blank screen.
- If you power on the 8237 after establishing the connection, you will see a series of diagnostic messages.

  Note: If any of these messages indicates a failure, see Chapter 4, "Troubleshooting, Installation, and Replacement Procedures."

3 In either case, press **Enter** two or three times. You will be prompted for a password (Model 001) or user name and password (Model 002 or Model 003). Passwords and user names are not case-sensitive.

- All Model 001s are shipped with a password of admin. Persons accessing the Model 001 using this password will have both read and write capability and will be able to alter the configuration of the 8237.
- All Model 002s and Model 003s are shipped with a user name of admin and no preset password. A password can be assigned (see "User Passwords" on page 3-32). Persons accessing the 8237 using this combination will have both read and write capability and will be able to alter the configuration of the 8237 installation, as well as collect hub, segment, and stack statistics.
- In addition, all Model 002s and Model 003s are shipped with a user name of guest. Persons accessing the 8237 using this user name will have read capability only and will be able to read, but not change, the installation's configuration and collect statistics.

If you are connecting to a Model 002 or Model 003, you must press **Enter** after entering the user name and before entering the password. Press **Enter** again after entering the password.

4 You are now presented with the 8237's main menu. The remainder of this chapter will treat each of the management options available to you from these menus.

Model 001 Management Options

Once you have entered a valid user password, the menu illustrated in Figure 3-1 is displayed when you are connected to an unmanaged Model 001.

```
*************************************************
*IBM 8237 Stackable Ethernet Hub 10BASE-T Model 001*
*************************************************
                Bootup code : v1.00
                     Status
                     ------
              Hub ID  :  1
              Segment :  1
          ==============================

                     Command
                     -------
          h = Set hub ID
          s = Set segment
          f = Set FEM status
          c = Change password
          w = Write values into EEPROM
          x = Xmodem download
          q = Exit

          Enter command:
```

Figure 3-1. Model 001 Main Menu Panel

Note: If you attempt to communicate with a Model 001 that is configured in a managed stack, the only available commands will be Xmodem Download and Quit. All other commands can be performed only through the management agent.

Set hub ID

Type **h** and press **Enter** to display a window in which you can enter a hub identification number (between 1 and 10) for this 8237. In a managed stack, the hub ID is assigned automatically by the primary management agent. Also, if you are relocating a Model 001 from a managed stack to another stack, either managed or unmanaged, or if you are configuring an unmanaged stack of Model 001s, you do not have to reset the existing hub ID.

Set segment

Type **s** and press **Enter** to display a window in which you can enter the backplane segment to which you want the 8237 to be assigned. Possible segment values are 1, 2, or 3. You can isolate the hub from the rest of the stack by entering 0.

Set FEM status

If a Fast Expansion Module (FEM) is installed, type **f** and press **Enter** to cause a second menu to be displayed. See "Set FEM Status" on page 3-5 for details.

Change password

Type **c** and press **Enter** to display a window in which you can change the Model 001's password. The maximum length of the password is 5 characters and it is not case-sensitive. You will be prompted to reenter the password for verification.

Note: Unlike the Model 002, the Model 001 does not have a guest password status that provides read-only access.

Write values into EEPROM

Type **w** and press **Enter** to cause all changes you have made to the Model 001's configuration to be written to nonvolatile memory. If you do not do this, changes will be lost the next time the 8237 is restarted.

Xmodem Download

Type **x** and press **Enter** to initiate an Xmodem download of new microcode. After starting this process, follow your emulation software's file transfer procedure. Remember that since you will be transferring a file from your workstation, you will use the software's upload function. Following a successful Xmodem file transfer, the 8237 will restart and you will see the diagnostic messages that are displayed after a normal powering on of the system.

Exit

Type **q** and press **Enter** to exit the Model 001 interface program and return to the password prompt. If you have made changes, but have not written them to memory, you will be prompted to do this before exiting the user interface.

Set FEM Status

If your Model 001 has an FEM installed, entering f on the Main Menu causes the panel illustrated in Figure 3-2 to be displayed.

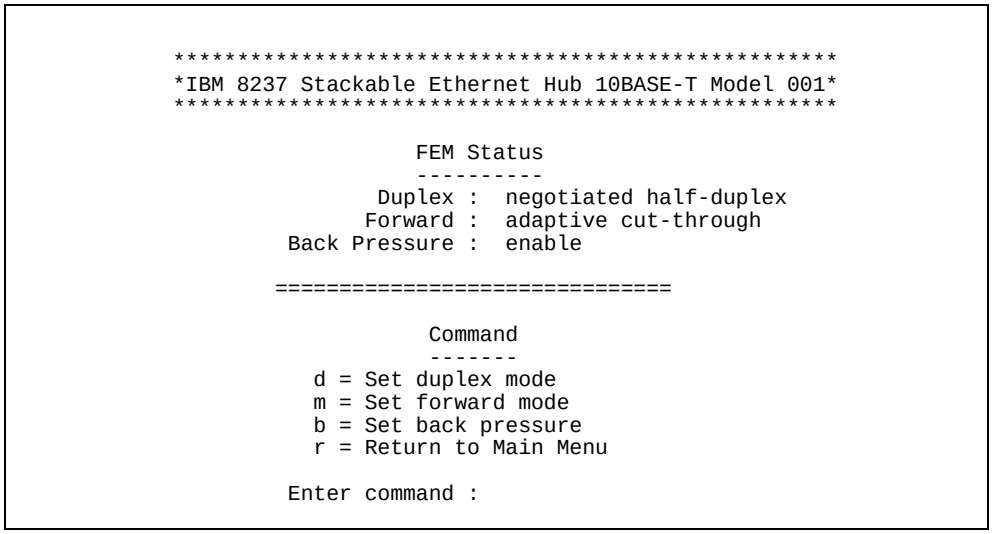

Figure 3-2. Model 001 Set FEM Status Panel

Set duplex mode

Type **d** and press **Enter** to display a window in which you can enter 1 to set the FEM to half-duplex mode, 2 to set it to full-duplex mode, or 3 to set it to auto-negotiation mode. Use half-duplex mode when connecting to a shared collision domain, such as another hub. Full-duplex mode can be used when making a dedicated connection to another device, such as a workstation, server, or switch. Auto-negotiation mode will automatically select half-duplex or full-duplex to match the attached device, providing it also supports auto-negotiation.

Set forward mode

Type **m** and press **Enter** to display a window in which you can enter 1 to set forward mode to adaptive cut-through or 2 to set the mode to store-and-forward. Use adaptive cut-through mode for normal network conditions. Use store-and-forward mode when there is a heavy network load or high error rates.

Set back pressure

Type **b** and press **Enter** to display a window in which you can enter 1 to disable back-pressure flow control or 2 to enable it. Back-pressure flow control should be enabled for heavy network load conditions to prevent frame loss.

Return to Main Menu

Type **r** and press **Enter** to return to the Main Menu.

Model 002 and Model 003 Management Options

Once you have entered a valid user ID and password, the menu illustrated in Figure 3-3 is displayed when you are connected to a Model 002 or Model 003.

```
                          Main Menu
                          =========
Exit
Restart System                          System Information ...

                     Configuration Panels:

SNMP Configuration ...                  Port Security Control ...
Segment Configuration ...               TFTP Download ...
Hub Configuration ...                   XMODEM Download ...
Port Configuration ...                  User Passwords ...
Port Backups ...                        Management Port Config ...

                      Statistics Panels:

Segment Statistics ...                  Port Statistics ...
Hub Statistics ...


            Use arrow keys to move. <Enter> to confirm
                  <Ctrl+E> to exit this program
```

Figure 3-3. Model 002 and Model 003 Main Menu Panel

To navigate any 8237 user interface panel, use the four cursor movement keys. The Up and Down arrow keys cause selections to be highlighted while moving vertically. The Right and Left arrow keys cause items to the right or left of the currently highlighted item to be highlighted. To select a highlighted item, press **Enter**.

Items that are followed by three dots (...) will, when selected, go to a second panel where additional selections can be made.

From the Main Menu panel, press **Ctrl+E** to cause an immediate exit from the user interface program. On subsequent panels, press **Ctrl+T** to return to the Main Menu.

Note that on all panels, the third line from the bottom contains a brief description of the highlighted item. On configuration panels, this line will indicate whether the field can be updated and how this is done.

- The field may be a read-only field.

- The field may be a data entry field. If this is the case, press **Enter**, enter the required data, and then press **Enter** again.
- The field may be a selection field. If this is the case, press **Enter** to begin the selection process, and then press **Ctrl+L** or the space bar to cycle through the available choices. When the choice you want is displayed, press **Enter**.

Exit

Selecting this item causes you to exit from the user interface program. Note that this has the same effect as pressing Ctrl+E.

Restart System

Selecting this item results in the 8237 management agent being restarted. You are prompted before this action takes place.

System Information

Selecting System Information on the Main Menu causes the panel illustrated in Figure 3-4 to be displayed.

```
                        System Information

     Return to Previous Panel

     System Description : IBM 8237 Stackable Ethernet Hub 10BASE-T

     System Object ID   : 1.3.6.1.4.1.2.3.22

     System Up Time     : 47584 (0 day 0 hr 7 min 55 sec)

     System Name        :

     Contact            :

     Location           :



               Use arrow keys to move. <Enter> to confirm.
                    <Ctrl+T> to return to Main Menu.
```

Figure 3-4. System Information Panel

You can enter data in the System Name, Contact, and Location fields to provide useful information to all users concerning your 8237 installation. The information contained on this panel should be kept current so that persons requiring assistance know whom to contact.

SNMP Configuration

Note: If you will be using an SNMP-based network management program to manage your 8237 installation, you need to provide the appropriate information on this panel and its lower level panels. If you will not be using an SNMP-based network management application, you can ignore this section.

Selecting SNMP Configuration on the Main Menu causes the panel illustrated in Figure 3-5 to be displayed.

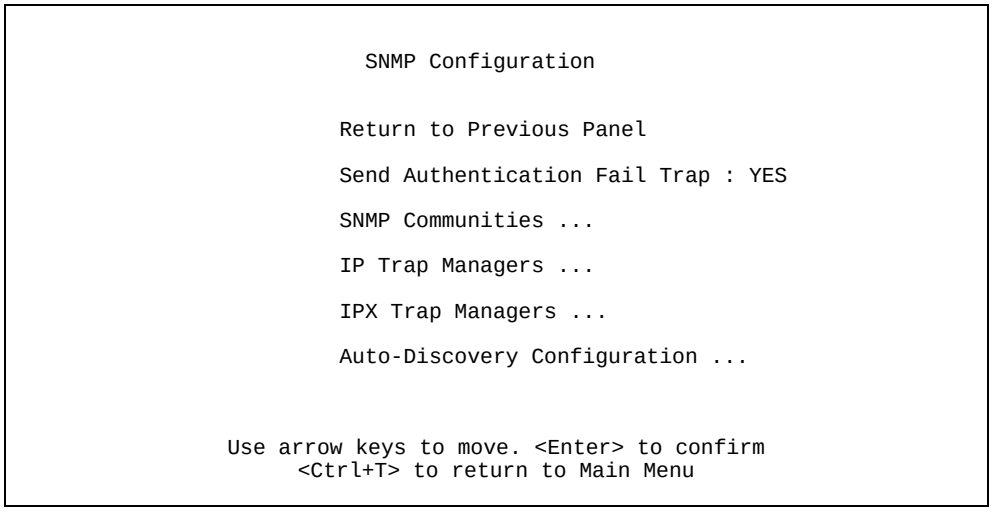

Figure 3-5. SNMP Configuration Panel

Return to Previous Panel

Return to the Main Menu.

Send Authentication Fail Trap

This is a selection field. Possible values are YES (send a trap message when SNMP authentication fails) or NO (do not send authentication failure trap messages).

SNMP Communities

Selecting SNMP Communities on the SNMP Configuration panel causes the panel illustrated in Figure 3-6 to be displayed.

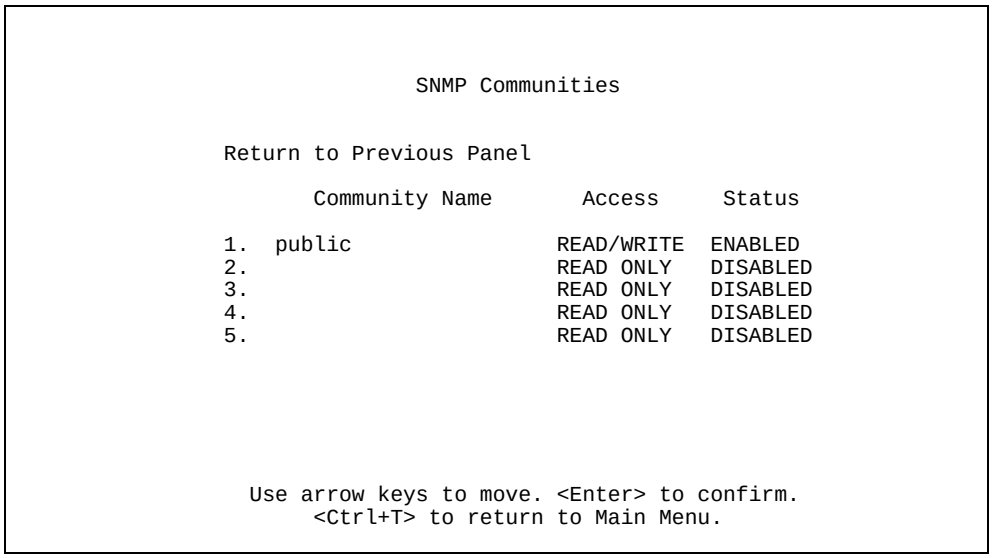

Figure 3-6. SNMP Communities Panel

Return to Previous Panel

Return to the SNMP Configuration panel.

Community Name

This field is where you enter the name that identifies each SNMP community.

Access

This is a selection field. Possible values are READ/WRITE (the community can read and update system information) and READ ONLY (the community can only read system information).

Status

This is a selection field. Possible values are ENABLED and DISABLED.

IP Trap Managers

Selecting IP Trap Managers on the SNMP Configuration panel causes the panel illustrated in Figure 3-7 to be displayed.

```
                        IP Trap Managers


     Return to Previous Panel

            IP Address          Community Name       Status

      1.  203.70.236.134      public               ENABLED
      2.  0.0.0.0             public               DISABLED
      3.  0.0.0.0             public               DISABLED
      4.  0.0.0.0             public               DISABLED
      5.  0.0.0.0             public               DISABLED
      6.  0.0.0.0             public               DISABLED
      7.  0.0.0.0             public               DISABLED
      8.  0.0.0.0             public               DISABLED
      9.  0.0.0.0             public               DISABLED
     10.  0.0.0.0             public               DISABLED




             Use arrow keys to move. <Enter> to confirm.
                  <Ctrl+T> to return to Main Menu.
```

Figure 3-7. IP Trap Managers Panel

Return to Previous Panel

Return to the SNMP Configuration panel.

IP Address

This field is where you enter the dotted-decimal IP address to which trap messages are to be sent.

Community Name

This field is where you enter the community name of the IP trap manager.

Status

This is a selection field. Possible values are ENABLED and DISABLED.

IPX Trap Managers

Selecting IPX Trap Managers on the SNMP Configuration panel causes the panel illustrated in Figure 3-8 to be displayed.

```
                          IPX Trap Managers

    Return to Previous Panel

                IPX Address                 Community Name       Status

     1.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
     2.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
     3.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
     4.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
     5.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
     6.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
     7.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
     8.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
     9.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED
    10.  00-00-00-00:00-00-00-00-00-00   public                 DISABLED



                 Use arrow keys to move. <Enter> to confirm.
                      <Ctrl+T> to return to Main Menu.
```

Figure 3-8. IPX Trap Managers Panel

Return to Previous Panel

Return to the SNMP Configuration panel.

IPX Address

This field is where you enter the dotted-decimal IPX address to which trap messages are to be sent.

Community Name

This field is where you enter the community name of the IPX trap manager.

Status

This is a selection field. Possible values are ENABLED and DISABLED.

Auto-Discovery Configuration

Selecting Auto-Discovery Configuration on the SNMP Configuration panel causes the panel illustrated in Figure 3-9 to be displayed.

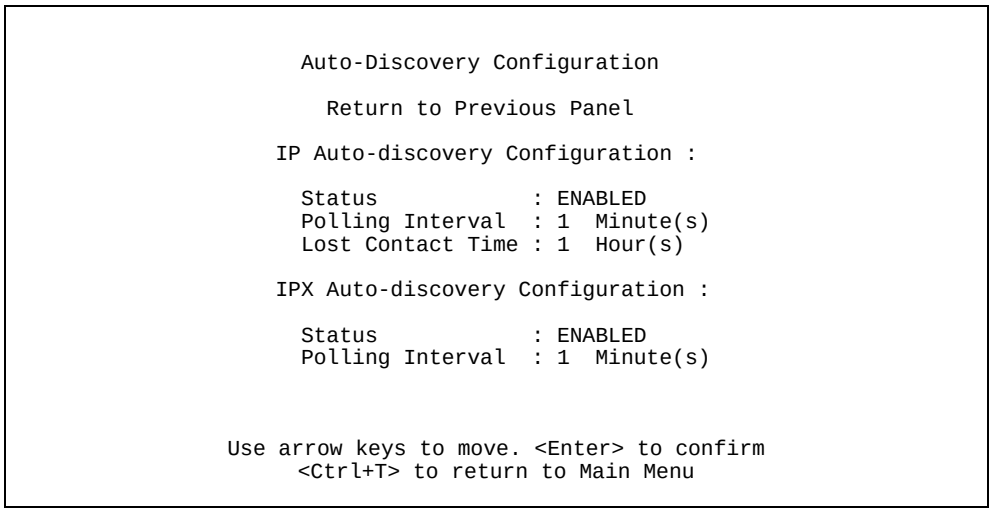

Figure 3-9. Auto-Discovery Configuration Panel

Return to Previous Panel

Return to the SNMP Configuration panel.

Status

These are selection fields to set the status of the IP and IPX auto-discovery configurations. Possible values are ENABLED and DISABLED.

Polling Interval

These fields allow you to enter the polling interval for the IP and IPX auto-discovery traps. The maximum value that can be entered is 99 minutes.

Lost Contact Time

This field allows you to enter a time limit for monitoring loss of contact with the management station. The maximum value that can be entered is 99 hours. When this time limit has expired the SNMP agent will start re-sending auto-discovery traps.

Segment Configuration

Selecting Segment Configuration on the Main Menu causes the panel illustrated in Figure 3-10 to be displayed.

```
                          Segment Configuration

Return to Previous Panel
                              Segment 1        Segment 2        Segment 3
Segment Name          :

IP Configuration :
   IP Address         : 0.0.0.0          0.0.0.0          0.0.0.0
   Subnet Mask        : 0.0.0.0          0.0.0.0          0.0.0.0
   Gateway IP         : 0.0.0.0          0.0.0.0          0.0.0.0
   Serial IP          : 0.0.0.0          0.0.0.0          0.0.0.0
                        Save to EEPROM   Save to EEPROM   Save to EEPROM

IPX Frame Type        : IEEE 802.2       IEEE 802.2       IEEE 802.2
Internal IPX Network  : 00-00-00-00      00-00-00-00      00-00-00-00


IP Protocol           : DISABLED         DISABLED         DISABLED
IPX Protocol          : DISABLED         DISABLED         DISABLED
SNMP Over Ethernet    : DISABLED         DISABLED         DISABLED


                Use arrow keys to move. <Enter> to confirm.
                     <Ctrl+T> to return to Main Menu.
```

Figure 3-10. Segment Configuration Panel

Return to Previous Panel

Return to the Main Menu panel.

Segment Name

This field is where you enter a name to identify each segment.

IP Address

This field is where you enter the dotted-decimal IP address assigned to the segment.

Subnet Mask

This field is where you enter the dotted-decimal subnet mask assigned to the segment.

Gateway IP

This field is where you enter the dotted-decimal address assigned to the segment gateway.

Serial IP

This field is where you enter the dotted-decimal address assigned to the Management Port.

Save to EEPROM

This field saves the IP addresses to nonvolatile memory and immediately enables them. Press **Enter** when this field is highlighted, and then respond **Y** (Yes) or **N** (No) to the prompt that is displayed on the message line near the bottom of the panel.

IPX Frame Type

This is a selection field. Press **Ctrl+L** to cycle through all of the supported IPX frame types. The following frame types are supported.

IEEE 802.2
IEEE 802.2 SNAP
IEEE 802.3
Ethernet II

This field also has an AUTO LEARNED selection. When this option is selected the IPX frame type in use will be automatically recognized and configured.

Internal IPX Network

This field is where you enter the internal IPX network address.

IP Protocol

This is a selection field. Possible values are ENABLED and DISABLED.

IPX Protocol

This is a selection field. Possible values are ENABLED and DISABLED.

SNMP over Ethernet

This is a selection field. Possible values are ENABLED and DISABLED. When enabled, this allows SNMP to run directly on an Ethernet network using Ethernet MAC frames (RFC 1098).

Hub Configuration

Selecting Hub Configuration on the Main Menu causes the panel illustrated in Figure 3-11 to be displayed.

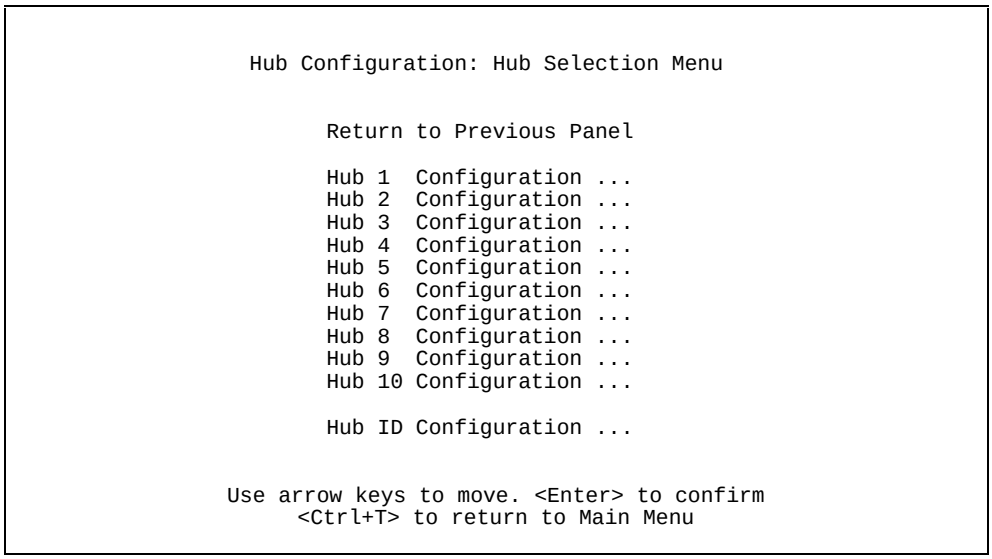

Figure 3-11. Hub Configuration: Hub Selection Menu Panel

Return to Previous Panel
Return to the Main Menu panel.

Hub ID Configuration
Change the Hub ID setting of 8237s.

When you select the hub you want to configure, the panel illustrated in Figure 3-12 on page 3-16 is displayed.

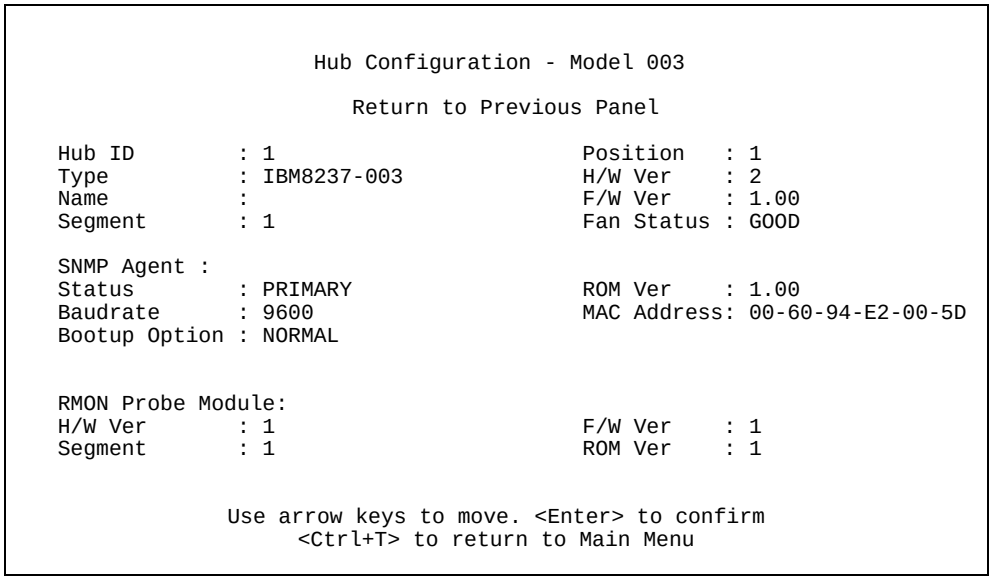

Figure 3-12. Hub Configuration Panel

Return to Previous Panel
Return to the Hub Configuration: Hub Selection panel.

Hub ID
This field displays the hub ID number.

Position
This field displays the 8237's position in the stack in top-down order.

Type
This field displays the hub model (for example, IBM8237-003).

H/W Ver
This field displays the hardware level of this 8237.

Name
This field is where you can enter a name by which this hub is to be identified.

F/W Ver
This field displays the level of the downloadable flash code in this 8237.

Segment
This field allows you to enter values that assign the 8237 to a backplane segment (1, 2, or 3) or to isolate it from the stack (0).

Fan Status
This field displays the status of the cooling fan, either GOOD or FAIL.

If the unit is a Model 001, the SNMP and RMON management agent information is replaced by `NOT PRESENT`. If the unit is a Model 002, the SNMP information is displayed and the RMON information is replaced by `NOT PRESENT`.

The next five fields pertain to the SNMP agent.

Status

This field displays the status of the SNMP management agent. Possible values are PRIMARY and BACKUP.

ROM Ver

This field displays the level of the bootup microcode of the SNMP management agent.

Baudrate

This is a selection field that enables you to set the baud rate of the management port. The possible values are 9600, 19 200, and 38 400. The default baud rate is 9600.

MAC Address

This field displays the physical address of the SNMP management agent.

Bootup Option

This is a selection field that controls how microcode is started in the system. Possible values are:

- NORMAL (boot the 8237 normally using the resident microcode).
- TFTP DOWNLOAD (download microcode using TFTP before bootup).
- BOOTP GET IP, (obtain the 8237's IP information from the BootP server and then start the microcode in flash ROM).
- BOOTP DOWNLOAD (obtain the 8237's IP information from the BootP server and then load microcode from the TFTP server).
- BOOTP UPGRADE FIRMWARE (get the IP information from the TFTP server, download the microcode file, perform a permanent upgrade, and reset the option to NORMAL).

Note: Unlike other options that result in a download, the BOOTP UPGRADE FIRMWARE option can be used on 8237s that are either primary or backup management units. Other download options can be used with only primary management units.

If the selected hub is a Model 003, information regarding both the SNMP and RMON management agents will be displayed.

The next four fields pertain to the RMON agent.

Segment

This field is a selection field. Possible values are 1, 2, and 3. The segment number indicates that the RMON management agent is monitoring that segment.

H/W Ver

This field displays the hardware level of this RMON management agent.

F/W Ver

This field displays the level of the downloadable flash code in the RMON management agent.

ROM Ver

This field displays the level of the bootup microcode in the RMON management agent.

Hub ID Configuration

When you select Hub ID Configuration from the Hub Selection panel, the panel shown in Figure 3-13 is an example of what is displayed.

```
                        Hub ID Configuration

                     Return to Previous Panel

                       Position    Hub ID

                         1.           1
                         2.           2
                         3.           3
                         4.           4
                         5.       NOT PRESENT
                         6.       NOT PRESENT
                         7.       NOT PRESENT
                         8.       NOT PRESENT
                         9.       NOT PRESENT
                        10.       NOT PRESENT

                        Enable Above Settings

              Use arrow keys to move. <Enter> to confirm.
                   <Ctrl+T> to return to Main Menu.
```

Figure 3-13. Hub ID Configuration Panel

Return to Previous Panel

Return to the Hub Configuration: Hub Selection panel.

Position

The position in the stack, in top-down order, of the 8237 whose ID is to be set.

Hub ID

This is a selection field. Possible values range from 1 through 10.

Enable above Settings

Put into effect any hub ID settings that you have changed.

Port Configuration

Selecting Port Configuration on the Main Menu causes the panel illustrated in Figure 3-14 to be displayed.

```
                Port Configuration: Port Selection Menu


                      Return to Previous Panel

                   Select port to get configuration

                 Hub ID |          Port ID
                --------+-----------------------------
                   1    |  1 thru 8   9 thru 16   EP
                   2    |  1 thru 8   9 thru 16   EP
                   3    |  1 thru 8   9 thru 16   EP
                   4    |  1 thru 8   9 thru 16   EP
                   5    |  1 thru 8   9 thru 16   EP
                   6    |  1 thru 8   9 thru 16   EP
                   7    |  1 thru 8   9 thru 16   EP
                   8    |  1 thru 8   9 thru 16   EP
                   9    |  1 thru 8   9 thru 16   EP
                  10    |  1 thru 8   9 thru 16   EP


               Use arrow keys to move. <Enter> to confirm
                    <Ctrl+T> to return to Main Menu
```

Figure 3-14. Port Configuration: Port Selection Menu Panel

Return to Previous Panel

Return to the Main Menu panel.

When you have moved the highlighting to the line containing the hub ID of the hub whose ports you want to configure, use the **Right** and **Left** arrow keys to toggle between selection of ports 1 through 8, 9 through 16, or the Expansion Port (if installed) for configuration.

Configuring Ports 1–16

Selecting 1-8 on the Port Configuration: Port Selection panel causes the panel illustrated in Figure 3-15 on page 3-20 to be displayed. Selecting 9-16 causes the panel illustrated in Figure 3-16 on page 3-20 to be displayed.

```
                    Port Configuration (1 - 8)


                     Return to Previous Panel

Hub ID   :  1
Position :  1

Port     Name         Type     Admin State  Oper State   Link   Auto Part

 1.               10BASE-T     ENABLED     YES          DOWN   NOT PART
 2.               10BASE-T     ENABLED     YES          DOWN   NOT PART
 3.               10BASE-T     ENABLED     YES          DOWN   NOT PART
 4.               10BASE-T     ENABLED     YES          DOWN   NOT PART
 5.               10BASE-T     ENABLED     YES          DOWN   NOT PART
 6.               10BASE-T     ENABLED     YES          DOWN   NOT PART
 7.               10BASE-T     ENABLED     YES          DOWN   NOT PART
 8.               10BASE-T     ENABLED     YES          DOWN   NOT PART


               Use arrow keys to move. <Enter> to confirm.
                    <Ctrl+T> to return to Main Menu.
```

Figure 3-15. Port Configuration (1-8) Panel

```
                    Port Configuration (9 - 16)


                     Return to Previous Panel

Hub ID   :  1
Position :  1

Port     Name         Type     Admin State  Oper State   Link   Auto Part

  9.              10BASE-T     ENABLED     YES          DOWN   NOT PART
 10.              10BASE-T     ENABLED     YES          DOWN   NOT PART
 11.              10BASE-T     ENABLED     YES          DOWN   NOT PART
 12.              10BASE-T     ENABLED     YES          DOWN   NOT PART
 13.              10BASE-T     ENABLED     YES          DOWN   NOT PART
 14.              10BASE-T     ENABLED     YES          DOWN   NOT PART
 15.              10BASE-T     ENABLED     YES          DOWN   NOT PART
 16.              10BASE-T     ENABLED     YES          DOWN   NOT PART


               Use arrow keys to move. <Enter> to confirm.
                    <Ctrl+T> to return to Main Menu.
```

Figure 3-16. Port Configuration (9-16) Panel

Return to Previous Panel

Return to the Port Configuration: Port Selection panel.

Hub ID

This field displays the hub ID number.

Position

This field displays the 8237's position in the stack in top-down order.

Port ID

This field displays the port number.

Port Name

This field is where you can assign a meaningful name to each port on the 8237.

Type

This field displays the type of port. The value will be 10BASE-T.

Admin State

This is a selection field. Possible values are ENABLED and DISABLED.

Oper State

This field displays the port's current operating state. The two values are YES and NO. YES indicates that the port is operating. NO indicates that either the port has been disabled, or the port has been configured as one of a backup pair and is currently not operating.

Link

This field displays the port's current status. The two values are UP and DOWN.

Auto Part

This field displays the auto-partition status of the port. The two values are PART and NOT PART.

Configuring the Expansion Port

Selecting EP on the Port Configuration: Port Selection panel causes one of two panels to be displayed, depending on the type of port installed, either a Media Expansion Port (MEP) or a Fast Expansion Module (FEM).

If an MEP is installed, the panel illustrated in Figure 3-17 will be displayed.

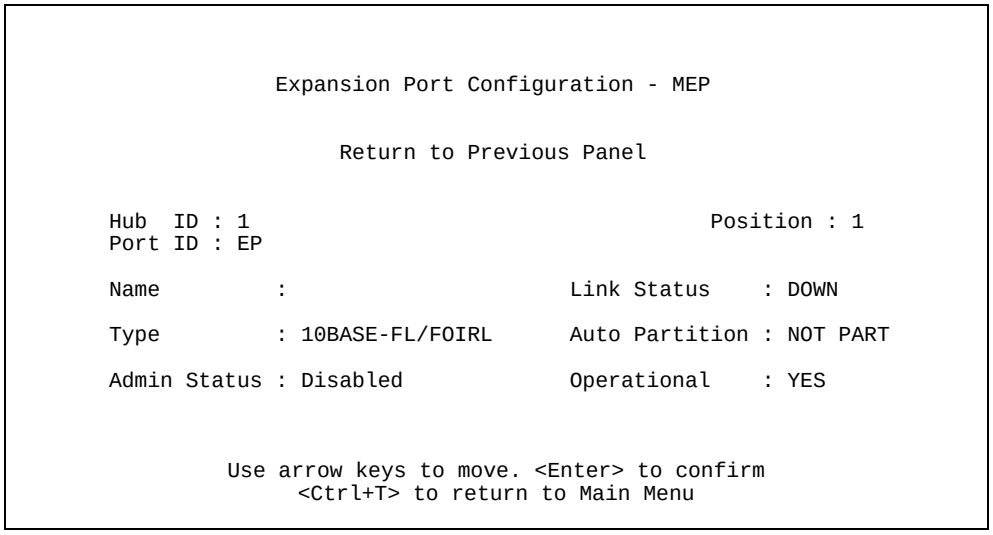

Figure 3-17. Expansion Port Configuration - MEP Panel

Return to Previous Panel

Return to the Port Configuration: Port Selection panel.

Hub ID

This field displays the hub ID number.

Position

This field displays the 8237's position in the stack in top-down order.

Port ID

This field displays the type of port. This value is always EP for the Expansion Port.

Name

This field is where you can assign a meaningful name to the MEP.

Link Status

This field displays the MEP's current status. Possible values are UP and DOWN.

Type

This field displays the type of MEP. Possible values are 10BASE-FL/FOIRL and AUI/10BASE2.

Auto-Partition

This field displays the partition status of the MEP. Possible values are PART or NOT PART.

Admin Status

This is a selection field. Possible values are ENABLED and DISABLED.

Operational

This field displays the operating status of the MEP. Possible values are YES and NO. YES indicates that the MEP is operating. NO indicates that either the MEP has been disabled, or the MEP has been configured as part of a backup pair and is currently not operating.

If an FEM is installed, the panel illustrated in Figure 3-18 will be displayed.

```
                  Expansion Port Configuration - FEM

                       Return to Previous Panel
Hub  ID :  1                                          Position :  1
Port ID : EP

Name          :                          Type        : 10BASET/100BASETX

Admin Status  : ENABLED                  Speed       : 10M

Duplex Mode   : AUTO NEGOTIATION         Link State  : DOWN

Duplex In Use : NEGOTIATED HALF-DUPLEX   Operational : YES

Back Pressure : ENABLED

Forwarding Mode   : ADAPTIVE CUT-THROUGH

Forwarding In Use : ADAPTIVE CUT-THROUGH


               Use arrow keys to move. <Enter> to confirm.
                    <Ctrl+T> to return to Main Menu.
```

Figure 3-18. Expansion Port Configuration - FEM Panel

Return to Previous Panel

Return to the Port Configuration: Port Selection panel.

Hub ID

This field displays the hub ID number.

Position

This field displays the 8237's position in the stack in top-down order.

Port ID

This field displays the type of port. This value is always EP for the Expansion Port.

Name

This field is where you can assign a meaningful name to the FEM port.

Type

This field displays the type of FEM. Possible values are 10BASE-T/ 100BASE-TX, and 100BASE-FX.

Speed

This field displays the FEM's speed. Possible values are 10M and 100M.

Link Status

This field displays the FEM's current status. Possible values are UP and DOWN.

Admin Status

This is a selection field. Possible values are ENABLED and DISABLED.

Operational

This field displays the operating status of the FEM's port. Possible values are YES and NO. YES indicates that the FEM is operating. NO indicates that either the FEM has been disabled, or the FEM has been configured as part of a backup pair and is currently not operating.

Duplex Mode

This is a selection field. Possible values are HALF-DUPLEX, FULL-DUPLEX, and AUTO NEGOTIATION.

Duplex In Use

This field displays the duplex mode status. Possible values are HALF-DUPLEX, FULL-DUPLEX, AUTO-NEGOTIATION, NEGOTIATED HALF-DUPLEX, and NEGOTIATED FULL-DUPLEX.

Back Pressure

This is a selection field. Possible values are ENABLED and DISABLED. Back-pressure flow control should be enabled for heavy network load conditions to prevent frame loss.

Forwarding Mode

This is a selection field. Possible values are STORE AND FORWARD and ADAPTIVE CUT-THROUGH.

Forwarding In Use

This field displays the forwarding mode status. Possible values are STORE AND FORWARD and ADAPTIVE CUT-THROUGH.

Port Backups

Selecting Port Backups on the Main Menu causes the panel illustrated in Figure 3-19 to be displayed.

```
                          Port Backups
                    Return to Previous Panel
Set      Primary Port          Secondary Port        Action     Status
 1.   Hub:  1  Port:  3     Hub:  2  Port:  5     INACTIVE
 2.   Hub:  1  Port:  5     Hub:  2  Port:  6     INACTIVE
 3.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
 4.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
 5.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
 6.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
 7.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
 8.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
 9.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
10.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
11.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
12.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
13.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
14.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
15.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
16.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
17.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE
18.   Hub:  2  Port:  1     Hub:  2  Port:  2     INACTIVE

              Use arrow keys to move. <Enter> to confirm.
                   <Ctrl+T> to return to Main Menu.
```

Figure 3-19. Port Backups Panel

Return to Previous Panel
Return to the Main Menu panel.

Set
The identifier of the backup pair. A maximum of 18 backup pairs can be configured.

Primary Port Hub
The hub ID of the hub whose port is to be backed up. This is a selection field. Press **Ctrl+L** to cycle from hub 1 through hub 10.

Primary Port Port
The port number that is to be backed up. This is a selection field. Press **Ctrl+L** to cycle through the port numbers. Possible values are 1 through 16 and EP.

Secondary Port Hub
The hub ID of the hub whose port will be used as the backup. This is a selection field. Press **Ctrl+L** to cycle from hub 1 through hub 10.

Secondary Port Port
The port number on the secondary hub that will serve as the backup. This is a selection field. Press **Ctrl+L** to cycle through the port numbers. Possible values are 1 through 16 and EP.

Action
This is a selection field. Possible values are ACTIVE and INACTIVE.

Status
This field displays the status of the backup port pair. Possible values are STAND-BY and BACKUP.

When you set the Action field of the backup port pair to ACTIVE, the status field will then change from being blank to either STAND-BY or BACKUP. STAND-BY indicates that the primary port is functioning and enabled. BACKUP means that the primary port has failed and the secondary port has taken over. To reset a backup pair so that the primary port is again handling network traffic, reset the Action field to ACTIVE.

Note: If a port has been configured for intrusion protection, that function has priority. This means that a port configured as the secondary that has been disabled as the result of an intrusion violation will not be available should the primary port with which it is paired fail.

Port Security Control

Selecting Port Security Control on the Main Menu causes the panel illustrated in Figure 3-20 to be displayed. This panel defines the operational modes for both port intrusion and eavesdropping.

```
              Port Security Control: Hub Selection Menu

                      Return to Previous Panel

              Select the port group to get configuration
                  or change address assignment mode

               Hub ID |          Port ID       |  Mode
              ----------------------------------------
                 1    |  1 thru 8   9 thru 16  | MANUAL
                 2    |  1 thru 8   9 thru 16  | MANUAL
                 3    |  1 thru 8   9 thru 16  | MANUAL
                 4    |  1 thru 8   9 thru 16  | MANUAL
                 5    |  1 thru 8   9 thru 16  | MANUAL
                 6    |  1 thru 8   9 thru 16  | MANUAL
                 7    |  1 thru 8   9 thru 16  | MANUAL
                 8    |  1 thru 8   9 thru 16  | MANUAL
                 8    |  1 thru 8   9 thru 16  | MANUAL
                10    |  1 thru 8   9 thru 16  | MANUAL


            Use arrow keys to move. <Enter> to confirm
                 <Ctrl+T> to return to Main Menu
```

Figure 3-20. Port Security Control: Hub Selection Menu Panel

Return to Previous Panel

Return to the Main Menu panel.

Mode

This is a selection field. Possible values are MANUAL and AUTO. The default setting is MANUAL configuration.

Selecting AUTO in the Mode field will cause the authorized address for each port of the hub to be automatically learned. That is, the source address of the most recently received frame (the Last Source Address) will automatically become the authorized address. Selecting MANUAL requires the authorized address for each port of a hub to be manually configured. The authorized address is used for Intrusion Security protection. Eavesdropping prevention uses only the Last Source Address. Note that if AUTO is selected for a hub and some of its ports have had an authorized address manually entered, the Mode field will display MIXED.

When you have moved the highlighting to the line containing the hub ID of the hub whose ports you want to configure, use the **Right** and **Left** arrow keys to toggle between selection of ports 1 through 8, or 9 through 16, for configuration.

Selecting 1-8 on the Port Security Control: Hub Selection panel causes the panel illustrated in Figure 3-21 on page 3-28 to be displayed. Selecting 9-16 causes the panel illustrated in Figure 3-22 on page 3-28 to be displayed.

```
                    Port Security Control (1 - 8)

                       Return to Previous Panel

     Hub ID :  1                                  Position :  1

              Authorized     Last Source
Port   Mode      Address        Address     Intrusion Action   Eavesdrop

  1.  MANUAL  080000-123456  FFFFFF-FFFFFF  INACTIVE           INACTIVE
  2.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
  3.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
  4.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
  5.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
  6.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
  7.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
  8.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE


                Use arrow keys to move. <Enter> to confirm.
                     <Ctrl+T> to return to Main Menu.
```

Figure 3-21. Port Security Control (1 - 8) Panel

```
                    Port Security Control (9 - 16)

                       Return to Previous Panel

     Hub ID :  1                                  Position :  1

              Authorized     Last Source
Port   Mode      Address        Address     Intrusion Action   Eavesdrop

  9.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
 10.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
 11.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
 12.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
 13.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
 14.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
 15.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE
 16.  MANUAL  000000-000000  FFFFFF-FFFFFF  INACTIVE           INACTIVE


                Use arrow keys to move. <Enter> to confirm.
                     <Ctrl+T> to return to Main Menu.
```

Figure 3-22. Port Security Control (9 - 16) Panel

Return to Previous Panel

Return to the Port Security Control: Hub Selection panel.

Hub ID

This field displays the hub ID number.

Position

This field displays the 8237's position in the stack in top-down order.

Port

The port number on the selected hub for which intrusion control is to be configured.

Mode

This is a selection field. The possible values are MANUAL and AUTO. Selecting AUTO causes the authorized address for the port to be automatically learned. Selecting MANUAL requires the authorized address for the port to be manually entered. Note that if an address is manually entered this field will change to MANUAL even if it were configured as AUTO.

Authorized Address

This field enables you to enter the MAC address of the device that is authorized to communicate with this port. Note that this address is used for intrusion prevention.

Intrusion Action

This is a selection field where you can choose the action to be taken when an unauthorized MAC address attempts to communicate with the port. Possible values are INACTIVE, NOTIFY, and NOTIFY AND DISABLE.

Notifications are issued in the form of trap messages. If the port is set to DISABLE following receipt of an unauthorized communication, it must be re-enabled from the Admin Status field of the Port Configuration panel (see Figure 3-15 on page 3-20).

Eavesdrop

This is a selection field. The two possible values are INACTIVE and ACTIVE. Eavesdropping protection ensures that only designated workstations will receive confidential data packets from the network. If a port has Eavesdrop set to ACTIVE, a check is performed on incoming packets to see if the destination address matches the last source address for that port. If a match is made the packet is repeated to the port unchanged; otherwise, it is repeated with scrambled data (a pattern of alternating ones and zeroes). Broadcast packets are always repeated on all ports unchanged.

Last Source Address

This field displays the source address of the last incoming frame on the port.

TFTP Download

For more information on obtaining the most current version of the 8237 microcode, see "Getting New Microcode" on page 3-46.

When connected to a primary management unit, selecting TFTP Download on the Main Menu causes the panel illustrated in Figure 3-23 to be displayed.

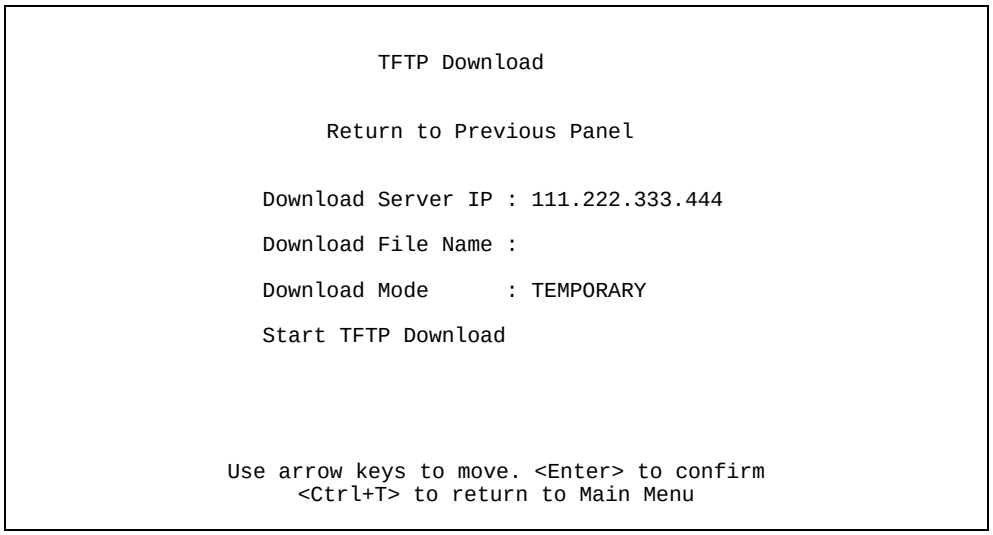

Figure 3-23. TFTP Download Panel

Return to Previous Panel
Return to the Main Menu panel.

Download Server IP
This field is where you enter the IP address of the server where the microcode file is stored.

Download File Name
This field is where you enter the name of the microcode file that is to be downloaded.

Download Mode
This is a selection field. Possible values are TEMPORARY (the microcode is not written to nonvolatile memory and will be lost if the system is restarted or powered off) and PERMANENT (the microcode is written to nonvolatile memory and is retained across system restarts and power interruptions).

Start TFTP Download
After the above Server IP, File Name, and Mode fields are updated, select this field to start a TFTP download.

Xmodem Download

For more information on obtaining the most current version of the 8237 microcode, see "Getting New Microcode" on page 3-46.

Selecting Xmodem Download on the Main Menu causes the panel illustrated in Figure 3-24 to be displayed.

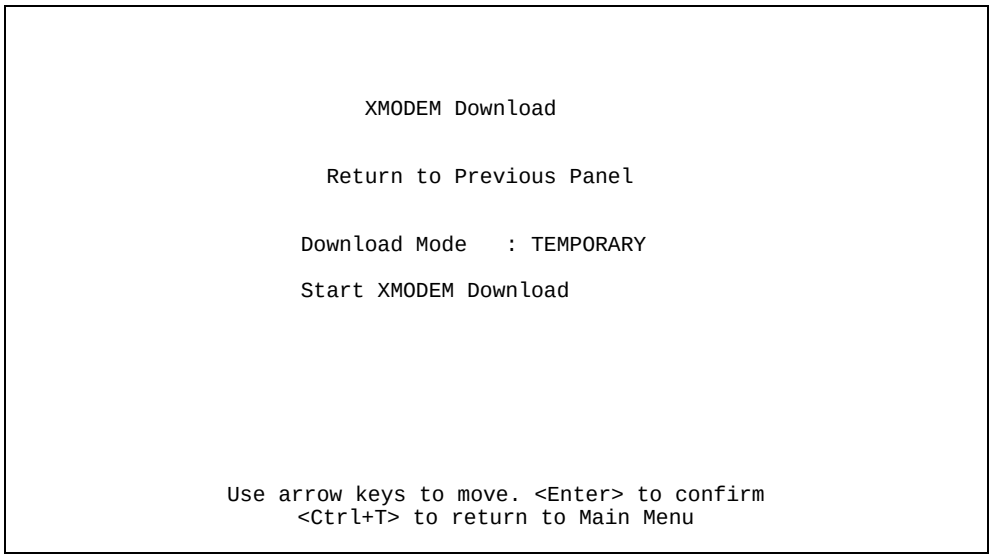

Figure 3-24. Xmodem Download Panel

Return to Previous Panel

Return to the Main Menu panel.

Download Mode

This is a selection field. Possible values are TEMPORARY (the microcode is not written to nonvolatile memory and will be lost if the system is restarted or powered off) and PERMANENT (the microcode is written to nonvolatile memory and is retained across system restarts and power interruptions).

Start XMODEM Download

Selecting this field begins the Xmodem download process. After you have highlighted this item and pressed Enter, follow your emulation software's file transfer procedures. Remember that since you will be transferring a file *from* your workstation, you will use the software's upload function.

Following a successful Xmodem file transfer, the 8237 will restart. You will see the diagnostic messages that are displayed following a normal powering on of the system.

User Passwords

All Model 002s and Model 003s are shipped without a preset password.

Selecting User Passwords on the Main Menu causes the panel illustrated in Figure 3-25 to be displayed.

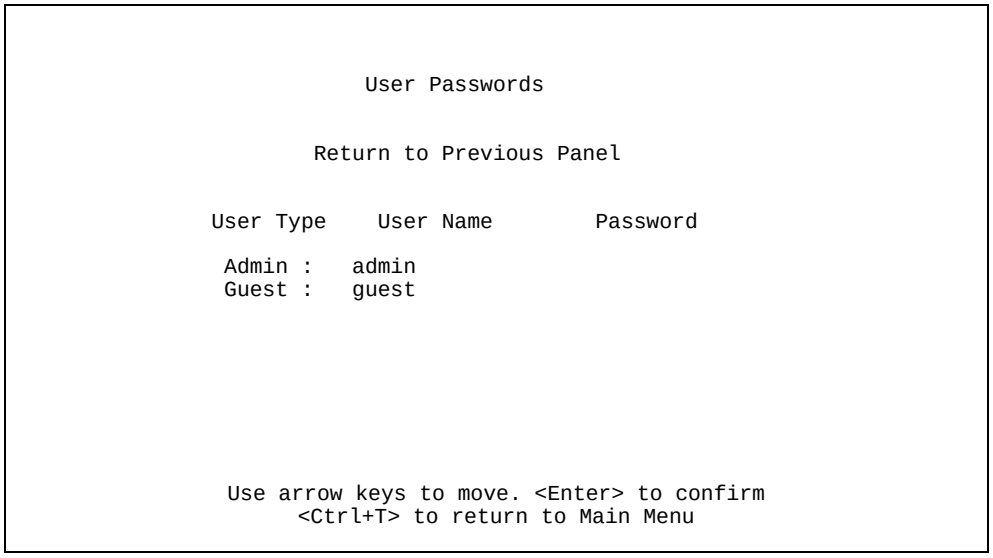

Figure 3-25. User Passwords Panel

Return to Previous Panel
Return to the Main Menu panel.

User Type
The type of access for which the user name and password are being set. The Admin user type has read and write authority, and persons accessing the system using the user name and password assigned to this user type will be able to modify the system configuration. The Guest user type has only read authority and cannot modify the system configuration.

User Name
The user name that is to be entered when connecting to the 8237. The default user name for Admin is admin, and the default for Guest is guest.

Password
The password that is to be entered when connecting to the 8237. There is no default password for Admin.

Management Port Configuration

Selecting Management Port Configuration on the Main Menu causes the panel illustrated in Figure 3-26 to be displayed.

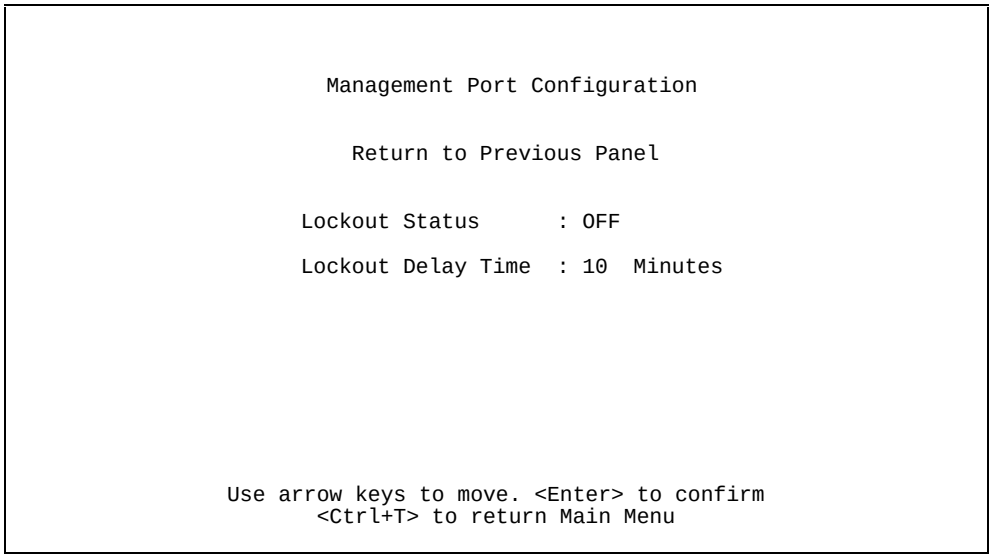

Figure 3-26. Management Port Configuration Panel

Return to Previous Panel

Return to the Main Menu panel.

Lockout Status

This is a selection field that enables the Management Port lockout function. Possible values are ON and OFF. Setting to ON will cause the Management Port to be disabled after no user input is received for the time set in Lockout Delay Time.

Lockout Delay Time

The length of time, in minutes, that the 8237's user interface will remain active without user input following a login. The maximum value that can be entered is 99 minutes.

Segment Statistics

Selecting Segment Statistics on the Main Menu causes the panel illustrated in Figure 3-27 to be displayed.

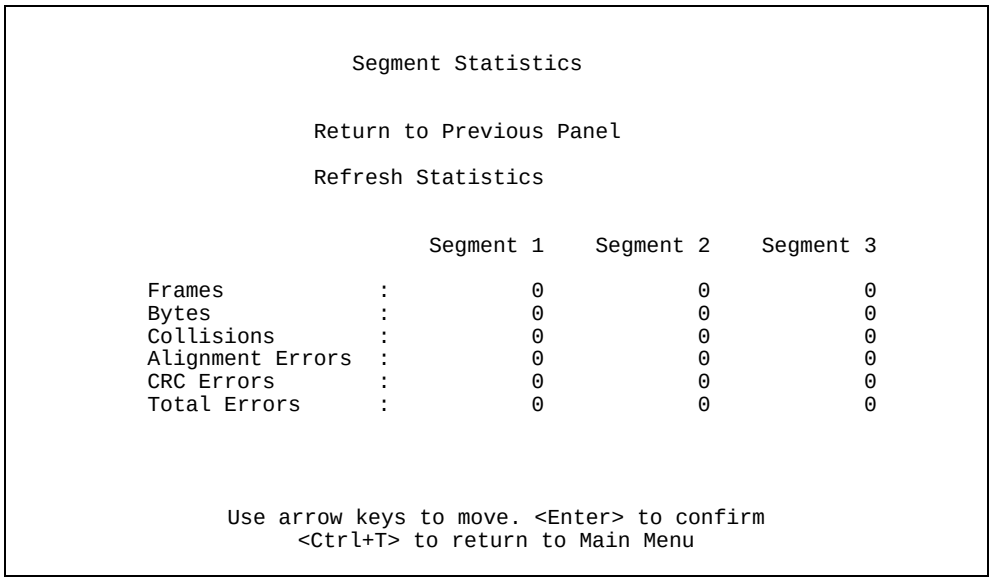

Figure 3-27. Segment Statistics Panel

Return to Previous Panel
Return to the Main Menu panel.

Refresh Statistics
Selecting this item causes all fields to be updated.

Frames
The total number of frames received on the segment during the current operation cycle (since the last reset or power on).

Bytes
The total number of bytes received on the segment during the current operation cycle.

Collisions
The total number of collisions detected on the segment during the current operation cycle.

Alignment Errors
The total number of alignment error frames detected on the segment during the current operation cycle.

CRC Errors
The total number of CRC error frames detected on the segment during the current operation cycle.

Total Errors
The total number of errors detected on the segment during the current operation cycle.

Hub Statistics

Selecting Hub Statistics on the Main Menu causes the panel illustrated in Figure 3-28 to be displayed.

```
                Hub Statistics: Hub Selection Menu


                    Return to Previous Panel

                      Hub  1 Statistics ...
                      Hub  2 Statistics ...
                      Hub  3 Statistics ...
                      Hub  4 Statistics ...
                      Hub  5 Statistics ...
                      Hub  6 Statistics ...
                      Hub  7 Statistics ...
                      Hub  8 Statistics ...
                      Hub  9 Statistics ...
                      Hub  10 Statistics ...



            Use arrow keys to move. <Enter> to confirm
                 <Ctrl+T> to return to Main Menu
```

Figure 3-28. Hub Statistics: Hub Selection Menu Panel

Return to Previous Panel
Return to the Main Menu panel.

When you select the hub whose statistics you want to display, the panel illustrated in Figure 3-29 on page 3-36 is displayed.

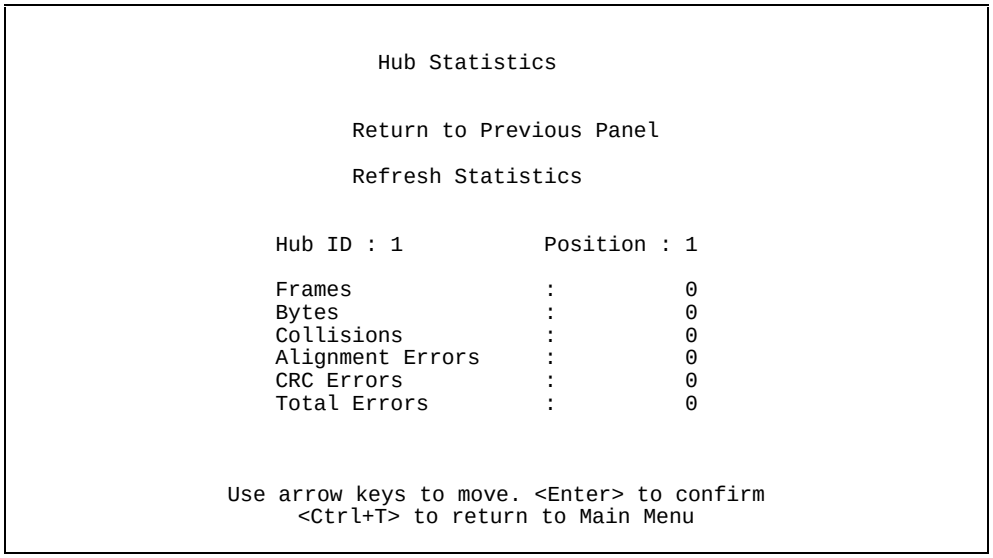

Figure 3-29. Hub Statistics Panel

Return to Previous Panel
Return to the Hub Statistics: Hub Selection panel.

Refresh Statistics
Selecting this item causes all fields to be updated.

Hub ID
This field displays the hub ID number.

Position
This field displays the 8237's position in the stack in top-down order.

Frames
The total number of frames received by the hub during the current operation cycle.

Bytes
The total number of bytes received by the hub during the current operation cycle.

Collisions
The total number of collisions detected by the hub during the current operation cycle.

Alignment Errors
The total number of alignment error frames detected by the hub during the current operation cycle.

CRC Errors
The total number of CRC error frames detected by the hub during the current operation cycle.

Total Errors
The total number of errors detected by the hub during the current operation cycle.

Port Statistics

Selecting Port Statistics on the Main Menu causes the panel illustrated in Figure 3-30 to be displayed.

```
                Port Statistics: Port Selection Menu


                     Return to Previous Panel

                   Select Port to get Statistics

 Hub ID |                         Port ID
--------|-------------------------------------------------------------
   1    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
   2    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
   3    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
   4    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
   5    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
   6    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
   7    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
   8    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
   9    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP
  10    |   1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  EP


             Use arrow keys to move. <Enter> to confirm
                  <Ctrl+T> to return to Main Menu
```

Figure 3-30. Port Statistics: Port Selection Menu Panel

Return to Previous Panel

Return to the Main Menu panel.

Use the cursor movement keys to highlight the port on the hub whose statistics you want to view.

Port Statistics

When you select one of the standard 10BASE-T ports (numbered 1 through 16) on the Port Statistics: Port Selection panel, the panel illustrated in Figure 3-31 on page 3-38 is displayed. When EP is selected the statistics panel for MEP or FEM is displayed, depending on which Expansion Port is installed.

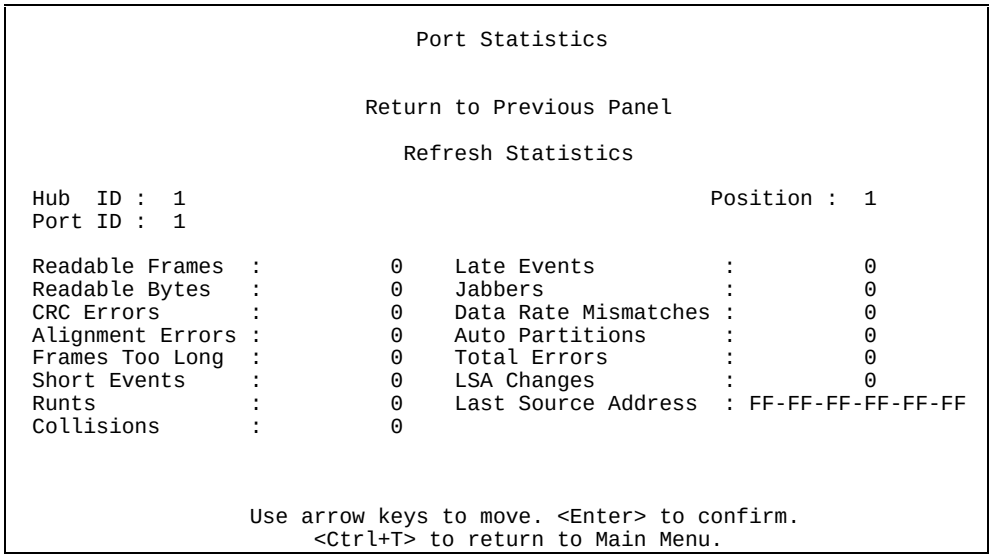

Figure 3-31. Port Statistics Panel

Return to Previous Panel
Return to the Port Statistics: Port Selection panel.

Refresh Statistics
Selecting this item causes all fields to be updated.

Hub ID
This field displays the hub ID number.

Port ID
This field displays the port ID number.

Position
This field displays the 8237's position in the stack in top-down order.

Readable Frames
Total number of readable frames received by the port during the current operation cycle.

Readable Bytes
Total number of readable bytes received by the port during the current operation cycle.

CRC Errors
Total number of CRC error frames detected by the port during the current operation cycle.

Alignment Errors
Total number of alignment error frames received by the port during the current operation cycle.

Frames Too Long
Total number of frames received by the port during the current operation cycle that were too long.

Short Events
Total number of short events detected by the port during the current operation cycle.

Runts
Total number of runts detected by the port during the current operation cycle.

Collisions
Total number of collisions detected by the port during the current operation cycle.

Late Events
Total number of late events detected by the port during the current operation cycle.

Jabbers
Total number of jabber events detected by the port during the current operation cycle.

Data Rate Mismatches
Total number of data rate mismatches detected by the port during the current operation cycle.

Auto Partitions
Total number of times this port has been auto-partitioned during this operation cycle.

Total Errors
Total errors detected by the port during the current operation cycle.

LSA Changes
Total number of last source address (LSA) changes detected by the port during the current operation cycle.

Last Source Address
Source address of the last frame received by the port.

Expansion Port Statistics

When you select EP on the Port Statistics: Port Selection panel, one of two panels will be displayed, depending on the Expansion Port installed.

For an MEP, the panel illustrated in Figure 3-32 is displayed.

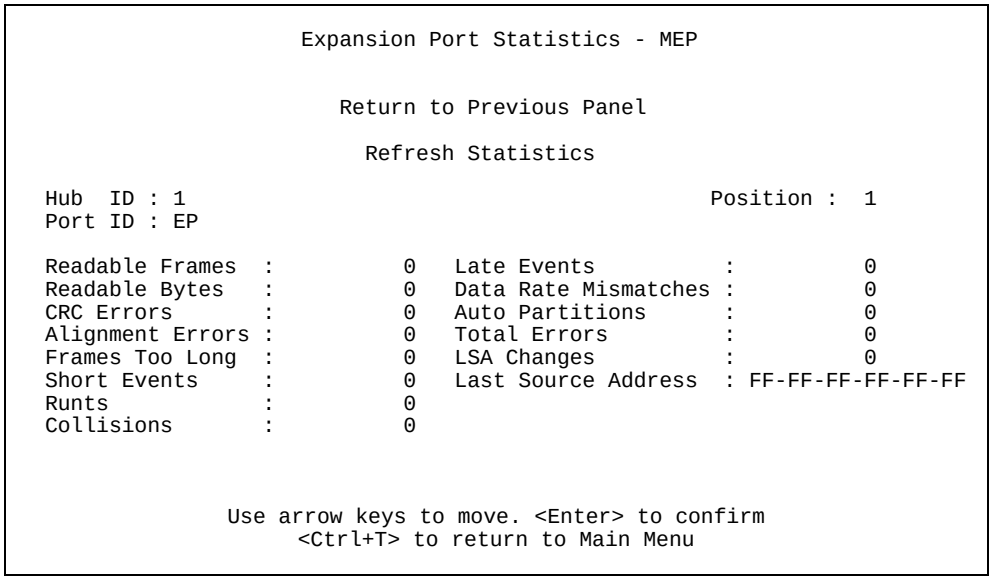

Figure 3-32. Expansion Port Statistics - MEP Panel

Return to Previous Panel

Return to the Port Statistics: Port Selection panel.

Refresh Statistics

Selecting this item causes all fields to be updated.

Hub ID

This field displays the hub ID number.

Port ID

This field displays the port ID number. This will always be EP for an Expansion Port.

Position

This field displays the 8237's position in the stack in top-down order.

Readable Frames

Total number of readable frames received by the port during the current operation cycle.

Readable Bytes

Total number of readable bytes received by the port during the current operation cycle.

CRC Errors

Total number of CRC error frames received by the port during the current operation cycle.

Alignment Errors

Total number of alignment error frames received by the port during the current operation cycle.

Frames Too Long
Total number of frames received by the port during the current operation cycle that were too long.

Short Events
Total number of short events detected by the port during the current operation cycle.

Runts
Total number of runts detected by the port during the current operation cycle.

Collisions
Total number of collisions detected by the port during the current operation cycle.

Late Events
Total number of late events detected by the port during the current operation cycle.

Data Rate Mismatches
Total number of data rate mismatches detected by the port during the current operation cycle.

Auto Partitions
Total number of times this port has been auto-partitioned during this operation cycle.

Total Errors
Total errors detected by the port during the current operation cycle.

LSA Changes
Total number of last source address (LSA) changes detected by the port during the current operation cycle.

Last Source Address
Source address of the last frame received by the port.

For an FEM, the panel illustrated in Figure 3-33 is displayed.

```
                  Expansion Port Statistics - FEM


                     Return to Previous Panel

                       Refresh Statistics

Hub  ID : 1                                        Position :  1
Port ID : EP

In Frames        :          0   CRC Errors          :          0
In Bytes         :          0   Frames Too Long      :          0
In Discards      :          0   Runts               :          0
Out Frames       :          0   Collisions          :          0
Out Bytes        :          0
Out Discards     :          0




             Use arrow keys to move. <Enter> to confirm
                  <Ctrl+T> to return to Main Menu
```

Figure 3-33. Expansion Port Statistics - FEM Panel

Return to Previous Panel
Return to the Port Statistics: Port Selection panel.

Refresh Statistics
Selecting this item causes all fields to be updated.

Hub ID
This field displays the hub ID number.

Port ID
This field displays the port ID number. This will always be EP for an Expansion Port.

Position
This field displays the 8237's position in the stack in top-down order.

In Frames
Number of frames received by the FEM during the current operation cycle.

In Discards
Number of frames received and filtered by the FEM during the current operation cycle.

In Bytes
Number of bytes received by the FEM during the current operation cycle.

Out Frames
Number of frames transmitted by the FEM during the current operation cycle.

Out Discards
Number of frames transmitted and filtered by the FEM during the current operation cycle.

Out Bytes
Number of bytes transmitted by the FEM during the current operation cycle.

CRC Errors
Total number of CRC error frames received by the FEM during the current operation cycle.

Frames Too Long
Total number of frames received by the FEM during the current operation cycle that were too long.

Runts
Total number of runts detected by the FEM during the current operation cycle.

Collisions
Total number of collisions detected by the port during the current operation cycle.

Understanding the LEDs

Table 3-1 on page 3-44 and Table 3-2 on page 3-45 give the meanings associated with the 8237 status and port LEDs.

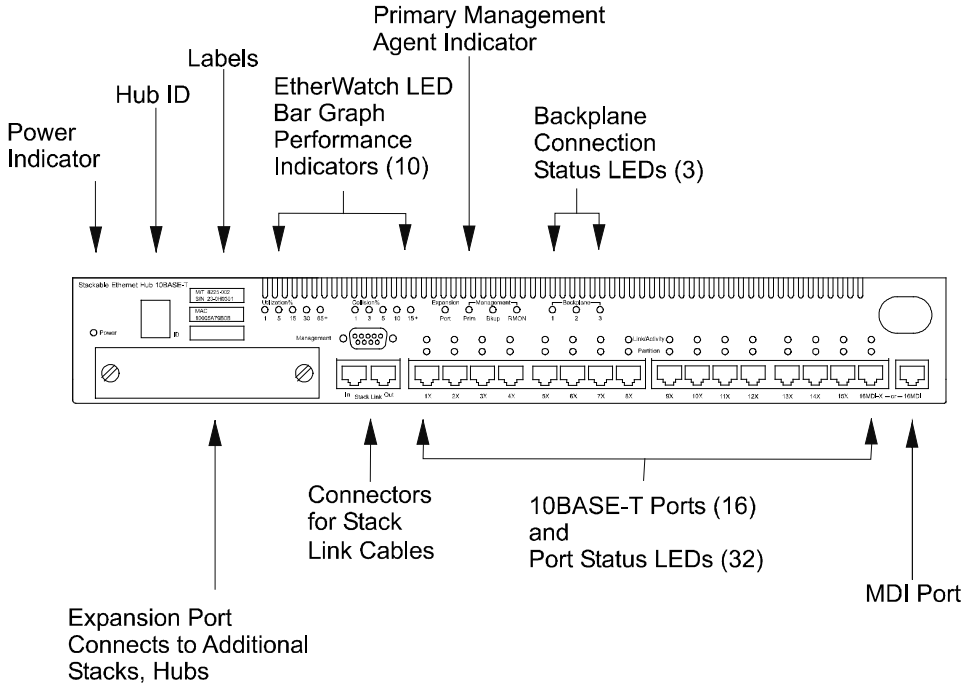

Figure 3-34. Front View of the 8237 Model 002 or Model 003 Showing the LEDs

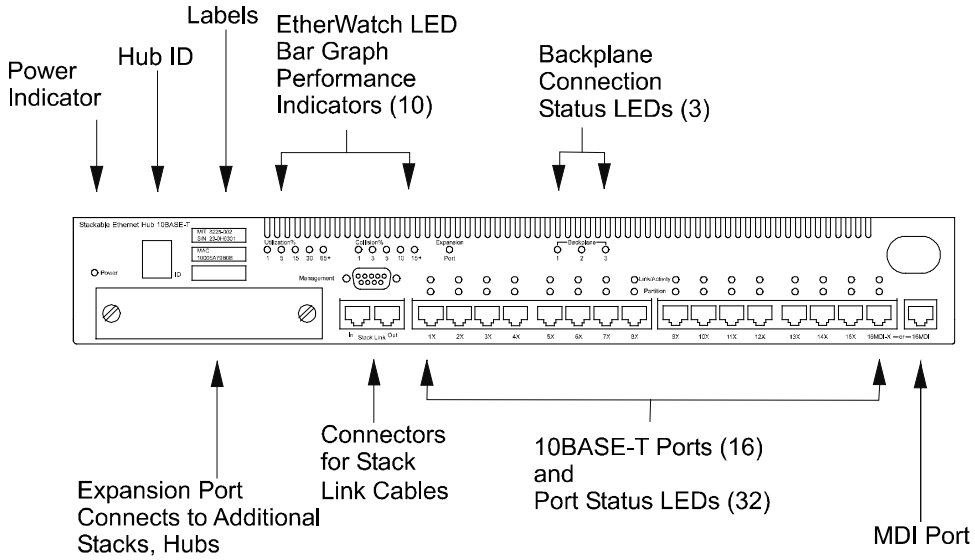

Figure 3-35. Front View of the 8237 Model 001 Showing the LEDs

Table 3-1. (Page 1 of 2). Status LED Explanations

LED	State	Explanation
EtherWatch utilization bar (Green) or (Yellow)	On	The percentage of network bandwidth being used is indicated by the five LEDs as follows: **1** 1% utilization (green) **2** 4% utilization (green) **3** 16% utilization (green) **4** 32% utilization (yellow) **5** 64% utilization (yellow) These LEDs turn on in a manner similar to a bar graph. For example, if LEDs 1, 2, and 3 are on and LEDs 4 and 5 are off, network utilization is somewhere between 16% and 32%.
	Off	The hub is experiencing less than 1% utilization.
EtherWatch collision bar (Green) or (Yellow)	On	The hub has detected collisions on one or more of its ports. The five LEDs indicate the following collision rates: **1** 1% collisions (green) **2** 3% collisions (green) **3** 5% collisions (green) **4** 10% collisions (yellow) **5** 15% or more collisions (yellow) These LEDs turn on in a manner similar to a bar graph. For example, if LEDs 1, 2, and 3 are on and LEDs 4 and 5 are off, the collision rate is somewhere between 5% and 10%.
	Off	No collisions are occurring.
Prim (Green)	On	The unit has the SMNP management agent installed and is functioning as the primary management unit in its backplane.
	Off	There is no management agent installed, or an installed management agent has failed.
Bkup (Green)	On	The unit has the SMNP management agent installed and is functioning as a backup management unit in its backplane.
	Off	There is no management agent installed, or an installed management agent has failed.
RMON (Green)	On	The unit has the RMON management agent installed and the agent is functioning normally.
	Off	There is no RMON management agent installed, or an installed RMON agent has failed.

Table 3-1 (Page 2 of 2). Status LED Explanations

LED	State	Explanation
Backplane 1	On	The 8237 is attached to the indicated backplane.
Backplane 2 Backplane 3 (Green)	Off	If all three LEDs are off, the 8237 has been isolated from all backplanes.
ID (Green)	On	In a stack, each repeater has a unique ID. The 8237 automatically sets the hub ID, freeing you from this task. In normal operation, the indicator displays a number in 7-segment format. NOTE: This indicator is used only if the 8237 is being managed by a Model 002 or Model 003.
Power (Green)	On	A power module is installed and functioning correctly.
	Off	There is no power module installed, or the power module is not connected.
Expansion Port (Green)	On	An Expansion Port is installed and is functioning correctly.
	Off	There is no Expansion Port installed.
	Blinking	The Expansion Port has failed.

Table 3-2. Port LED Explanations

LED	State	Explanation
Link/Activity (Green)	On	A cable is connected to the 10BASE-T port, the port detects that a device is connected to the other end of the cable, and the port can receive a signal from the device.
	Blinking	The 10BASE-T port is currently receiving a frame through that port.
	Off	A cable is not connected to the 10BASE-T port, or there is a problem with the cable, the port, or the device at the other end of the cable.
Partition (Yellow)	On	The hub has partitioned the port because of excessive collisions by the device connected to the port, or the port has been disabled.
	Off	The port is enabled (the normal state) and no excessive collisions are occurring.

Getting New Microcode

The latest version of 8237 microcode is made available on the IBM PC Company Bulletin Board System (BBS), as well as the IBM Networking Environment Support WWW and anonymous FTP sites on the Internet. The latest IBM 8237 private MIB is also available from these sites under the file name *8237MIB.EXE*.

To get the microcode from the Internet:

FTP Site

1 Access the IBM Networking Environment Support anonymous ftp site:

Lansupport.raleigh.ibm.com

2 Login as anonymous. Enter your entire e-mail address as your password.

3 The files are in the pub/products/lanprods/hub directory.

4 Find the file containing the microcode and download it to your computer.

The name of the microcode file will be in the format *8237xddd.EXE*, where:

x is a number indicating the target product type: 1 for Model 001, 2 for Model 002, and 3 for Model 003.

ddd is a 3-digit number that indicates the microcode version.

Transfer the microcode file to your computer. If your communications software offers the option, download the file in *binary* form.

Note: For convenience and to avoid overwriting existing files, you might want to place the file in a temporary subdirectory that you create for the purpose.

5 Decompress the microcode file.

At a DOS or OS/2 command prompt, enter **8237xddd**, where *x* is the target product and *ddd* is the appropriate version number, and the compressed file will decompress into two files:

- The microcode file, *IBMxddd.IMG*
- A README file, *README.TXT*

WWW Site

1 Access the IBM Networking Environment Support Internet World Wide Web site:

http://www.networking.ibm.com/nes/neshard.htm

2 Repeat step 4 above.

3 Repeat step 5 above.

To get the microcode from the BBS:

1 Prepare your computer to call the IBM Bulletin Board System.

You need a computer with a modem and communications software in order to make the call. Make sure that your communications software is set to use 8 data bits, no parity, 1 stop bit, and no flow control.

2 Dial one of the following numbers:

United States	(919) 517-0001
Toronto	(905) 316-4255, (416) 956-7877
Vancouver	(604) 664-6464
Montreal	(514) 938-3022

If you are a first-time user, you will be prompted for your first and last names, and then you will be asked to enter a password. You might want to write your password in the following space.

Your Password

IBM Personal Computer Company BBS password: _____

3 Repeat step 4 on page 3-46.

4 Repeat step 5 on page 3-46.

Management Using Telnet

You can access your 8237 using Telnet, either in-band, over an Ethernet connection or out-of-band, using SLIP.

When you connect using Telnet, you will see the user interface that has already been documented in this chapter.

Configuring for SLIP

The 8237 management unit supports two IP addresses, one for Ethernet and one for the serial line. When configuring your 8237, these addresses are entered on the Segment Configuration panel (see Figure 3-10 on page 3-13) in the IP Address and Serial IP fields, respectively. Both of these addresses share a common subnet mask. In order for SLIP to function, both IP addresses must be on the same network. If the subnet mask is `255.255.255.0`, you might configure the two addresses `9.123.1.9` (Ethernet IP address) and `9.123.1.10` (serial line IP address). If the addresses are on the same network, the first three portions of the IP address must be identical.

Another requirement is that the SLIP client/host (the PC or device that is connected to the 8237 by a serial link) must use the same IP address and subnet mask as the 8237 Serial Line IP. Using the above example, the address and subnet mask for the SLIP client/host must be `9.123.1.10` and `255.255.255.0`, respectively.

Preparing for SNMP Management

SNMP management requires that you have a managed stack: that is, that your stack contain at least one 8237 Model 002 or Model 003. Model 002 incorporates an SNMP agent and Model 003 incorporates an RMON agent that implements the SNMP protocol.

Model 002 supports the following MIBs:

- MIB II (RFC1213)
- Repeater MIB (RFC1516)
- Ethernet MIB (RFC1643)
- Novell Hub MIB
- IBM 8237 Private MIB

Model 003 supports all of the above, as well as the RMON MIB (RFC 1757).

These MIBs can be managed by most network management applications, including IBM Nways Manager for Windows, Nways Campus Manager LAN for AIX, and Nways Campus LAN for HP-UX. The 8237 supports SNMP/IPX and Novell HMI specifications, enabling this system to be integrated seamlessly into the NetWare environment.

Before you can use an SNMP-based network management application, you must configure your primary 8237 management agent using either the user interface program or BootP. For information on the user interface program, see "The 8237 User Interface Program" on page 3-1.

Setting an IP Address Using BootP

If you have selected one of the BootP options on the Hub Configuration panel (Figure 3-12 on page 3-16), the 8237 automatically sends out BootP requests every 6 seconds for up to 2 minutes after a power-up. The BootP request contains the MAC address of the 8237.

The requests seek a BootP server, which you must have previously configured with an address resolution table containing MAC addresses and corresponding IP addresses. When the BootP server receives the request, it sends an IP address to the requesting 8237's MAC address.

NOTE: BootP requests will not pass through routers.

BootP servers vary from manufacturer to manufacturer, so use the following example for reference only. Refer to your BootP server's documentation for specific instructions.

```
ibvdddmmmmmmmmmmmm:\
HT=ethernet:\
HA=mmmmmmmmmmmm:\
IP=ddd.ddd.ddd.ddd:\
SM=ddd.ddd.ddd.ddd:\
GW=ddd.ddd.ddd.ddd
```

Figure 3-36. A Sample BootP Configuration File

In the example in Figure 3-35, the first line is the locally administered name of the device that will receive the IP address, "HT" is its hardware type, "HA" is its MAC

address, "IP" is its IP address, "SM" is its IP subnet mask, and "GW" is its default gateway, or default router, address.

Chapter 4. Troubleshooting, Installation, and Replacement Procedures

This chapter provides diagnostic techniques and replacement procedures for the IBM 8237 Stackable Ethernet Hub 10BASE-T, including a parts catalog.

Problem Determination

There are three methods of problem determination for the 8237:

1. Observe the LEDs. See "LED Symptom and Fix Listing" for a list of symptoms and fixes.
2. Swap hubs within the stack. See "Hot-Swapping 8237s" on page 4-3 for a description of how to hot-swap an 8237 in the stack.
3. Observe the results of the diagnostic power-on self-test (POST) by connecting a terminal to the management port. See "Problem Determination through the Management Port" on page 4-3 for more information.

LED Symptom and Fix Listing

Table 4-1 (Page 1 of 2). LED Symptom/Fix Table

SYMPTOM	FIX
During POST, one or more LEDs remain ON during the test. If a failure is detected, the LEDs remain ON and the Hub ID display shows “F.”	The normal power-on activity is for the Link/Activity, Partition, and Utilization LEDs to blink ON/OFF for 4 seconds; all other LEDs remain ON during this time and the Hub ID display will show “18.” Then as each test is performed, the five Collision LEDs will turn ON in sequence, from the first to the last, and the Hub ID display will show “P.” While these tests are in progress the Backplane LEDs continuously blink ON/OFF in sequence. After the tests, if any of the Collision LEDs remain ON and the Hub ID display shows “F,” replace the 8237.
Two hubs in a managed stack display the same ID number.	The physical stack is logically divided into more than one stack, with each having one or more management hubs. Check for loose or disconnected Stack Link cables. Note: In an unmanaged stack, the ID numbers of the hubs in the stack are not significant.
A hub displays no ID number, or the hub displays no meaningful ID number.	Meaningful numbers are 1–10. Verify that the hub has power. The Power LED should be ON. If no problem is found, replace the failing hub. If there is no change, replace the primary management hub in the stack. The primary management hub displays the Prim LED ON.

Table 4-1 (Page 2 of 2). LED Symptom/Fix Table

SYMPTOM	FIX
Two or more hubs that are in the same backplane of a stack have the Prim LED ON.	The physical stack is segmented into more than one logical stack, with each having one or more management hubs. Check for loose or disconnected Stack Link cables. Replace the hub with the Prim LED ON that is logically lowest in the stack. To determine which is logically lowest, you can look at the hub interconnect cables to see how they are attached.
The Expansion Port LED is OFF, although power is ON and an Expansion Port is installed.	• Replace the Expansion Port. • Replace the 8237.
The Power LED is OFF.	Verify ac power. Replace the power supply.
An 8237 Model 002 or Model 003 does not have either the Prim or the Bkup LED ON.	Verify that the hub is correctly connected to the other hubs in the stack and that it has power. If no problem is found, replace the 8237.
An 8237 Model 003, or Model 002 with the RMON upgrade feature, does not have the RMON LED ON.	• Replace the RMON Daughter Board. • Replace the 8237.

Hot-Swapping 8237s

You can disconnect the Stack Link cable from an 8237 and plug it into a replacement 8237 without powering off the other 8237s in the stack (that is, you can hot-swap 8237s).

If you hot-swap an 8237, the ports will take 1 or 2 minutes to re-synchronize; however, each 8237 performs repeater functions normally while re-synchronizing. All Ethernet traffic will be disrupted during the time that the Stack Link cable is not fully connected.

To hot-swap an 8237:

1. Disconnect the power cord from the ac outlet and then from the 8237 that is to be replaced.
2. Unplug all the cables connected to the hub that is being replaced, making sure to label the cables so that you will know where to reconnect them.
3. If the 8237 you are removing from the stack has an Expansion Port, and the replacement does not, remove the Expansion Port from its slot and install it in the replacement 8237.

   Attention: Make sure that the power to an 8237 is disconnected before you remove or install its Expansion Port.
4. Connect the cables to the ports of the replacement 8237.
5. Connect the power cord to the 8237 and then connect the other end to the ac outlet.

Problem Determination through the Management Port

When power is applied to an 8237, a set of self-tests is performed. To review the results of these tests, you can connect a computer that has a terminal emulation program to the management port, remove power from the 8237 to be tested, and then reconnect power. The result of the self-test is displayed on the terminal. For details about terminal emulation programs, see Chapter 3, "8237 Administration."

Note that the power-on self-test (POST) first checks the validity of the microcode before continuing with other tests. If the microcode is found to be invalid, the system will halt and prompt for new microcode to be downloaded. For a Model 001, an Xmodem download is requested (see Figure 4-2 on page 4-4). For a Model 002 or Model 003, the system enters a Download menu (see Figure 4-5 on page 4-7).

Sample 1

The following example is typical of the display when you power ON a Model 001 hub. You can scroll up and down in this display.

```
IBM 8237 Stackable Ethernet Hub 10BASE-T Model 001
Power-up System Self-Diagnostic Process
V1.00 6-30-1997 Copyright(C) IBM Corp.


SYSTEM TESTS :
---------------------------------
Boot FLASHROM checksum test ... Pass
EEPROM test ... Pass
System SRAM test ... Pass
HIMIB test ... Pass
eIMR+ test ... Pass
FEM test ... Not Detected
---------------------------------
SYSTEM TESTS COMPLETED


Press any key to continue ...
```

Figure 4-1. Example of Self-Test Results for a Model 001

If any of the tests indicates FAIL, replace the field-replaceable unit (FRU) indicated in the following list. Replacement procedures are detailed in “Installation, Removal, and Replacement Procedures” on page 4-8.

Boot FLASHROM test — Replace 8237 microcode. Next, replace the 8237.

EEPROM test — Replace the 8237.

System SRAM test — Replace the 8237.

HIMIB test — Replace the 8237.

EIMR+ test — Replace the 8237.

FEM test — Replace the Fast Expansion Module.

```
IBM 8237 Stackable Ethernet Hub 10BASE-T Model 001
Power-up System Self-Diagnostic Process
V1.00 6-30-97 Copyright(C) IBM Corp.


SYSTEM TESTS :
----------------------------------------
Boot FLASHROM checksum test ... Failed
Press <ENTER> to start Xmodem download:
```

Figure 4-2. Example of Microcode Failure for a Model 001

Sample 2

The following example is typical of the display when you power ON a Model 002 management hub. You can scroll up and down in this display.

```
IBM 8237 Agent EPROM V1.00 1997/06/30
Copyright(C) 1997, IBM Corp.

Current hub segment is 1
Console speed is 9600
Performing self-test, please wait....
<Press Ctrl+L to enter Download menu>


DRAM test.................PASS.
EPROM test................PASS.
NIC test..................PASS.
REPEATER test.............PASS.
FLASHROM test.............PASS.
FEM test..................Not Detected.
RMON Daughter Board test...Not Detected.
System recognized as Model 002.
POST flag is 1000.
MAC Address is 00-60-94-E2-00-5D
End of POST.
Entering the system:


Boot option : normal
```

Figure 4-3. Example Self-Test Results for Model 002

If any of the tests indicates FAIL, replace the field-replaceable unit (FRU) indicated in the following list. Replacement procedures are detailed in “Installation, Removal, and Replacement Procedures” on page 4-8.

DRAM test — Replace the 8237.

EPROM test — Replace the 8237.

NIC test — Replace the 8237.

REPEATER test — Replace the 8237.

FLASHROM test — Replace 8237 microcode. Next, replace the 8237.

FEM test — Replace the Fast Expansion Module.

Sample 3

The following example is typical of the display when you power ON a Model 003 advanced management hub. You can scroll up and down in this display.

```
IBM 8237 Agent EPROM V1.00 1997/06/30
Copyright(C) 1997, IBM Corp.

Current hub segment is 1
Console speed is 9600
Performing self-test, please wait....
<Press Ctrl+L to enter Download menu>


DRAM test.................PASS.
EPROM test.................PASS.
NIC test...................PASS.
REPEATER test..............PASS.
FLASHROM test..............PASS.
FEM test...................Not Detected.
RMON Daughter Board test...PASS.

     RMON Daughter Board information:
         POST flag     : 0000
         EPROM         : PASS.
         FLASHROM      : PASS.
         NIC           : PASS.
         DRAM size     : 8192KB
         ROM version   : 1.00
         ROM date      : 1997/06/30
         FW version    : 1.00
         FW date       : 1997/06/30
         HW version    : 0

System recognized as Model 003.
POST flag is 1000.
MAC Address is 00-60-94-E2-00-5E
End of POST.
Entering the system:

Boot option : normal
```

Figure 4-4. Example Self-Test Results for Model 003

The replacement actions for failures of **DRAM test**, **EPROM test, REPEATER test**, **FLASHROM test**, and **FEM test** are the same as those indicated for the Model 002. If any of the RMON Daughter Board **EPROM test**, **FLASHROM test**, or **NIC test** indicates FAIL, replace the RMON Daughter Board. Replacement procedures are detailed in “Installation, Removal, and Replacement Procedures” on page 4-8.

If there is no SIMM installed and **DRAM size** shows less than 4096 KB, the on-board DRAM is defective and the RMON Daughter Board should be replaced. If there is a SIMM installed and **DRAM size** shows less than the sum of 4096 KB plus the size of the SIMM capacity, remove the SIMM and retest by repowering ON the hub. If the results of the retest show **DRAM size** is 4096 KB, replace the SIMM. If **DRAM size** now shows less than 4096 KB, replace the RMON Daughter Board.

```
IBM 8237 Agent EPROM V1.00 1997/06/30
Copyright(C) 1997, IBM Corp.

Current hub segment is 1
Console speed is 9600
Performing self-test, please wait....
<Press Ctrl+L to enter Download menu>

DRAM test..................PASS.
EPROM test.................PASS.
NIC test...................PASS.
REPEATER test..............PASS.
FLASHROM test..............FAIL.
FEM test...................Not Detected.
RMON Daughter Board test...Not Detected.
System recognized as Model 002.
Agent or RMON board's FLASHROM failed,
entering Download menu....

Download Menu:
        0. Quit
        1. Set the bootup filename
        2. Display the bootup filename
        3. Perform the TFTP Download
        4. Display bootup IP addresses
        5. Clear bootup IP addresses
        6. Set the bootup IP addresses
        7. Set hub segment
Enter your choice?
```

Figure 4-5. Example of Microcode Failure for Model 002 and Model 003

The Download Menu is accessible after any restart by pressing Ctrl+L. From this menu you can perform the following operations.

Quit
Exit the Download Menu and start the system.

Set the bootup filename
Enter the microcode filename on the TFTP server.

Display the bootup filename
Display the current microcode filename.

Perform the TFTP Download
Download new microcode from the TFTP server.

Display bootup IP addresses
Display the current local IP, subnet mask, TFTP server IP, and default gateway IP.

Clear bootup IP addresses
Clear the current local IP, subnet mask, TFTP server IP, and gateway IP.

Set the bootup IP addresses
Set the local IP, subnet mask, TFTP server IP, and gateway IP.

Set the hub segment
Set the hub's Backplane segment.

Installation, Removal, and Replacement Procedures

Following is the list of replaceable parts in the 8237. If any other part of the 8237 is damaged or defective, then the 8237 must be replaced.

- AC power cable
- Cable management bracket
- Mounting-bracket hardware
- Stack Link cable
- Expansion Ports
- RMON Daughter Board
- SIMM memory
- Fan (base machine)
- Power supply

Notes:

1. Power cords and Expansion Ports do not come with replacement 8237s. When you replace an 8237, you must transfer these from the old 8237 to the new one.
2. Replacement RMON Daughter Boards do not include a new memory SIMM. You must transfer any installed SIMM to the new RMON Daughter Board. See “SIMM Memory Installation and Replacement” on page 4-13 for instructions.
3. Power supply replacement should be performed only by trained service personnel.

8237 Hub Replacement

To replace an 8237, perform the steps under "Hot-Swapping 8237s" on page 4-3.

Expansion Port Installation and Replacement

Note: Expansion Ports are NOT hot-swappable. You must remove power from the 8237 before replacing the Expansion Port.

1 Remove power from the 8237 by disconnecting the power cable from the ac outlet and then from the rear of the 8237.

2 Remove the installed Expansion Port, or blank cover, by turning the two knurled knobs on the front counterclockwise. Slide the port out of the 8237.

3 Insert the new Expansion Port, ensuring that the edges slide through the guides, until the connector end is firmly seated.

4 Turn the two knurled knobs on the new Expansion Port clockwise until they are securely attached to the 8237 frame.

5 Reconnect the communications cable to the new Expansion Port.

6 Reconnect the ac power cable to the wall outlet and then to the 8237.

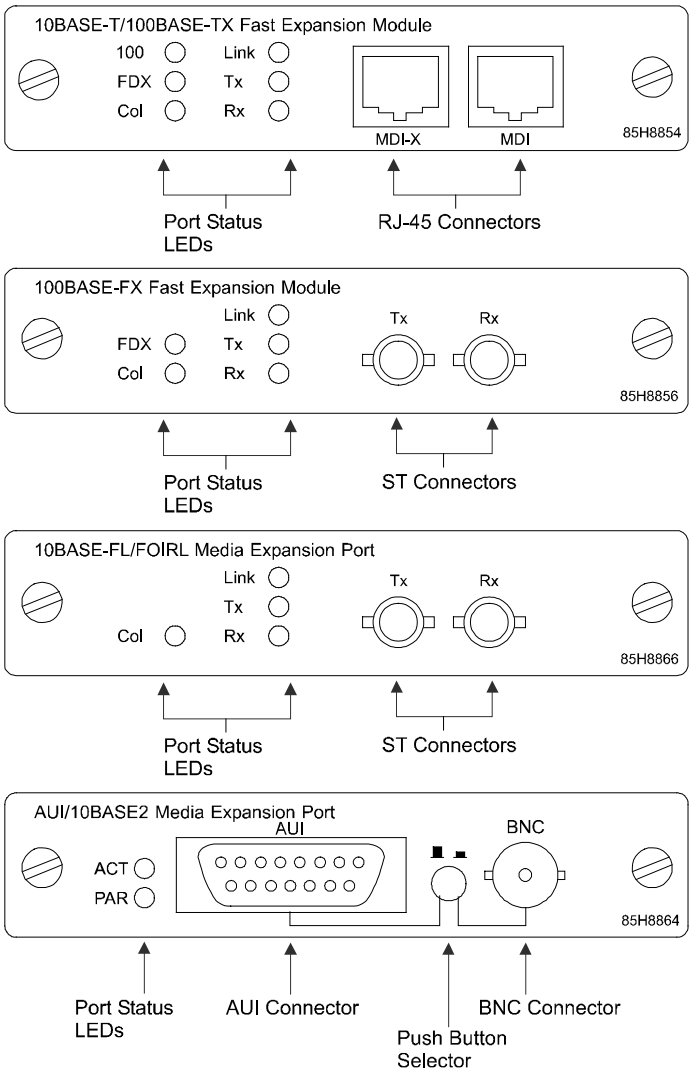

Figure 4-6. Four Expansion Port Types

Verify Expansion Port operation as follows:

- Observe the indicators on the front panel of the 8237.

  The Expansion Port LED should be ON.
  The Power LED should be ON.

- Observe the LEDs on the Expansion Port. The port's LEDs should display the current activity. Depending on which Expansion Port you have installed, and your network configuration, some of the following conditions might be indicated:

  ACT Blinking of this LED indicates that data is being transmitted or received through the 10BASE2 Media Expansion Port.

  PAR When this LED is on, the 10BASE2 Media Expansion Port has been partitioned.

  FDX When this LED is on, communication through the Expansion Port is in full-duplex mode.

Col Blinking of this LED indicates that collisions are occurring in this collision domain.

Tx Blinking of this LED indicates that data is being transmitted by the 8237, through the Expansion Port.

Rx Blinking of this LED indicates that data is being received by the 8237, through the Expansion Port.

Link This LED indicates that a link is complete from another device to the Expansion Port.

100 This LED indicates that 100BASE-TX communication is occurring. This LED is present on the 10BASE-T/100BASE-TX Fast Expansion Module only.

Attention: If you remove an Expansion Port without replacing it with another, then you must replace the blank cover over the empty slot for proper cooling of the 8237.

RMON Daughter Board Installation and Replacement

This procedure is applicable to 8237 Models 002 and 003 only.

The part number of the RMON Daughter Board is printed on the top surface, near the front of the 8237.

1 Remove power to the 8237 by disconnecting the ac cable from the outlet and then from the back of the 8237.

2 Remove the 8237's top cover by following these steps.

a. Remove the three top-cover screws and mounting bracket on each side of the 8237 as shown in Figure 4-7.

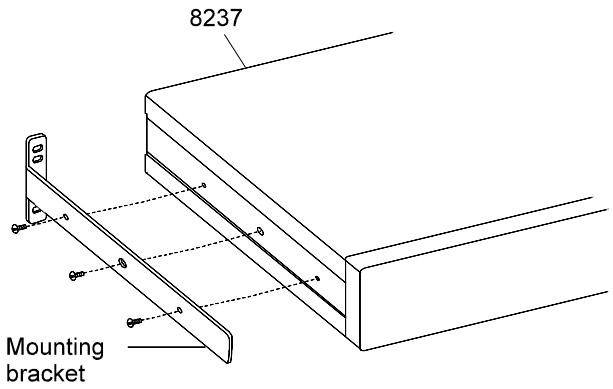

Figure 4-7. Removing the Top-Cover Screws

b. Remove the two top fan-guard screws on the rear of the unit, as shown in Figure 4-8 on page 4-11.

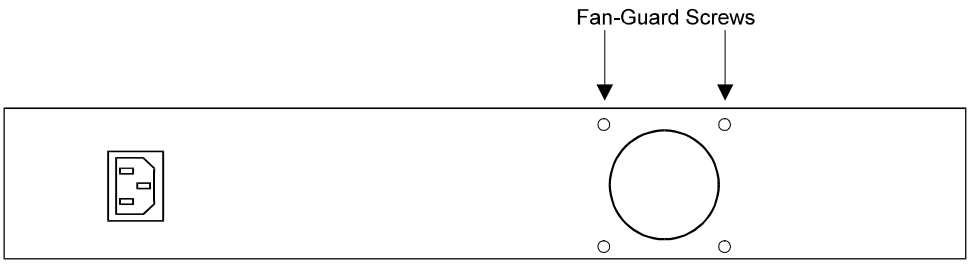

Figure 4-8. Back View: Removing the Fan-Guard Screws

c. Grasp the top cover of the 8237 at the rear of the machine and lift it approximately 25 mm (1 in.) at the back. Then, slide the cover up and to the rear to remove it.

Remove the top cover and set it aside.

3 If an RMON Daughter Board is present, remove the four screws that hold the board in place.

When the screws have been removed, lift the board firmly from the sides to disconnect the RMON Daughter Board from the 8237.

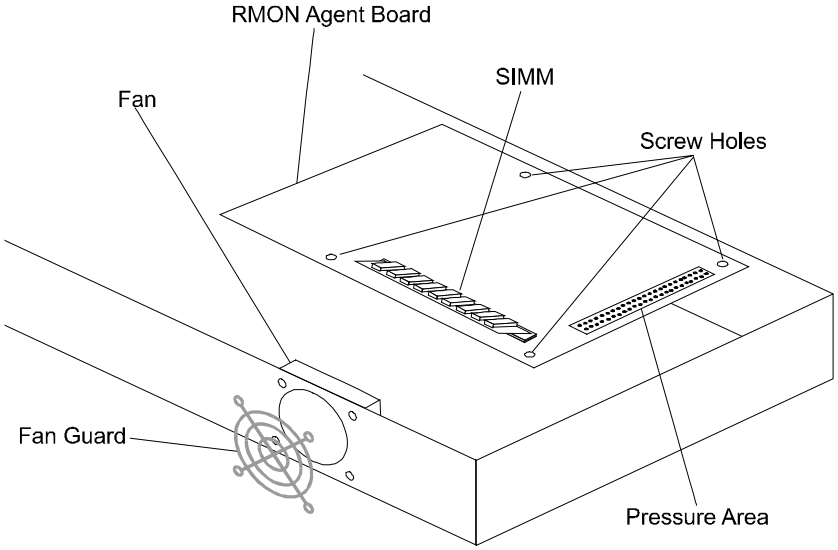

Figure 4-9. Remove the RMON Daughter Board

4 To install the new RMON Daughter Board, remove it from its packaging and place it carefully in position, making sure that the screw holes are aligned.

5 Firmly press the pressure area of the new RMON Daughter Board, shown in Figure 4-9, to fully seat the connector.

6 Start the screws in their respective holes and then tighten the screws.

7 New or replacement RMON Daughter Boards do not include a memory SIMM. To transfer any installed SIMM to the new RMON Daughter Board:

- Disconnect the old SIMM from the RMON Daughter Board by compressing the clip on each side of the SIMM, moving the top of the SIMM to a vertical position and then lifting the SIMM up and out of its slot, as shown. See Figure 4-10.

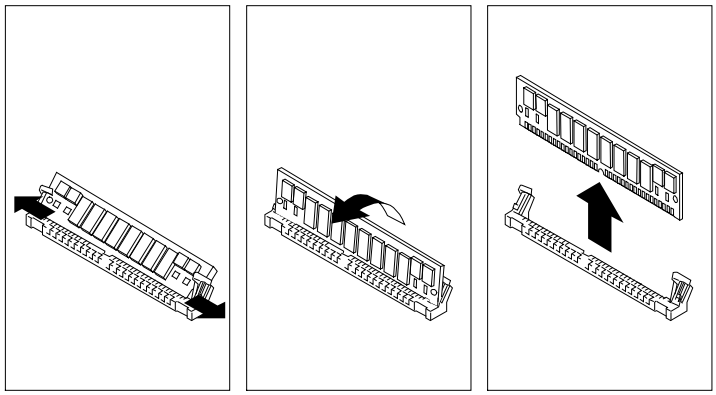

Figure 4-10. SIMM Removal

- Install the new SIMM by sliding it into the slot and rotating the top to the back, as shown. See Figure 4-11. Make sure that the clips snap into place.

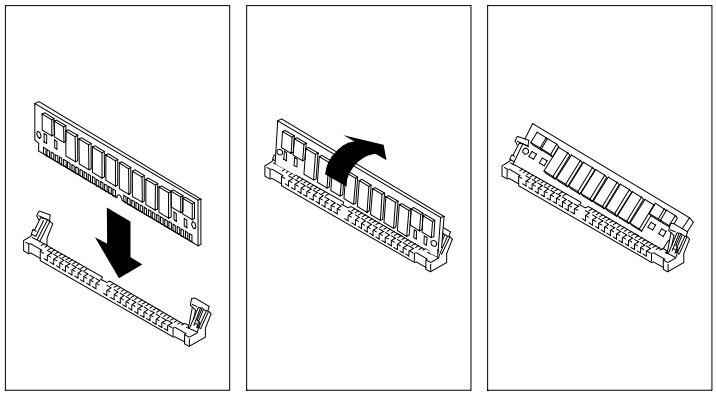

Figure 4-11. SIMM Replacement

8 Replace the cover by reversing the actions in step 2. Note that both sides of the top cover fit inside the edges of the bottom cover.

9 Connect ac power by attaching the power cord to the 8237 and then to the ac outlet.

SIMM Memory Installation and Replacement

1 Remove power to the 8237 by disconnecting the ac cable from the outlet and then from the rear of the 8237.

2 Remove the 8237's top cover by following these steps.

a. Remove the three top-cover screws and mounting bracket on each side of the 8237, as shown in Figure 4-12.

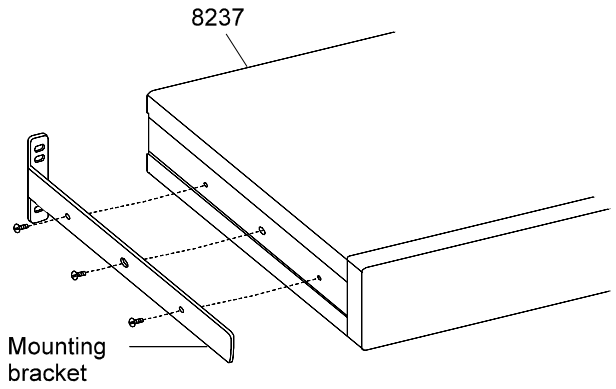

Figure 4-12. Removing the Top-Cover Screws

b. Remove the two top fan-guard screws on the rear of the unit, as shown in Figure 4-13.

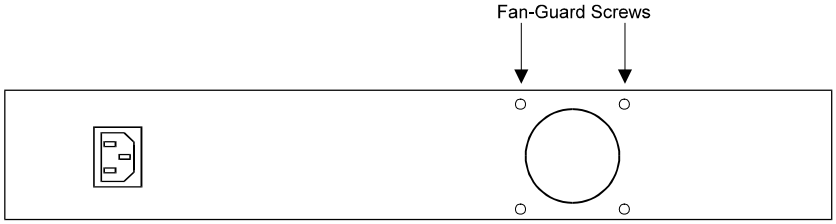

Figure 4-13. Back View: Removing the Fan-Guard Screws

c. Grasp the top cover of the 8237 at the rear of the machine and lift it approximately 25 mm (1 in.) at the back. Then, slide the cover up and to the rear to remove it.

Set the top cover aside.

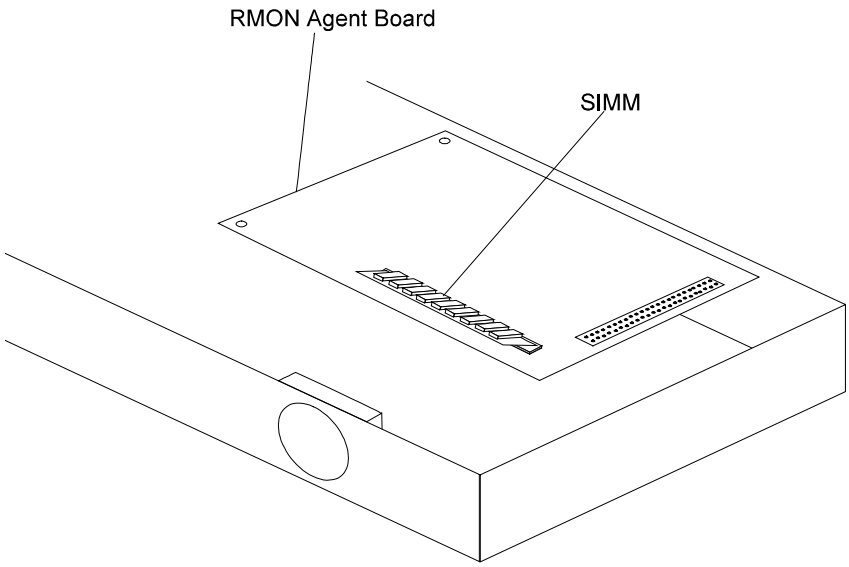

Figure 4-14. View of RMON Daughter Board and SIMM

4 If a SIMM is installed, disconnect the old SIMM from the RMON Daughter Board by compressing the clip on each side of the SIMM, rotating the top of the SIMM to a vertical position and then lifting the SIMM up and out of its slot, as shown in Figure 4-15.

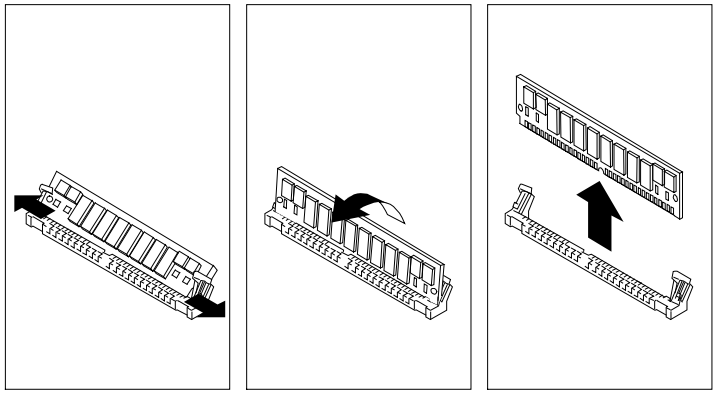

Figure 4-15. SIMM Removal

5 Install the new SIMM by sliding it into the slot, and rotating the top to the back, as shown in Figure 4-16. Make sure the clips snap into place.

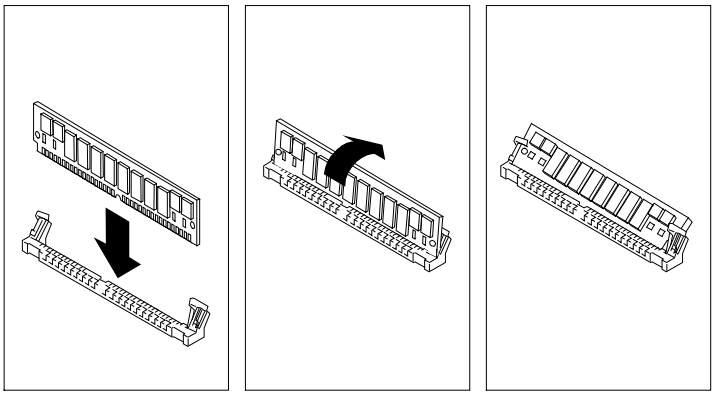

Figure 4-16. SIMM Replacement

6 Replace the cover by reversing the steps in step 2 on page 4-9. Note that both sides of the top cover fit inside the edges of the bottom cover.

7 Connect ac power by attaching the power cord to the 8237 and then to the ac outlet.

Fan Replacement

1 Remove power to the 8237 by disconnecting the ac cable from the ac outlet and then from the rear of the 8237.

2 Remove the 8237's top cover by following these steps.

a. Remove the three mounting-bracket screws on each side of the 8237, as shown in Figure 4-17.

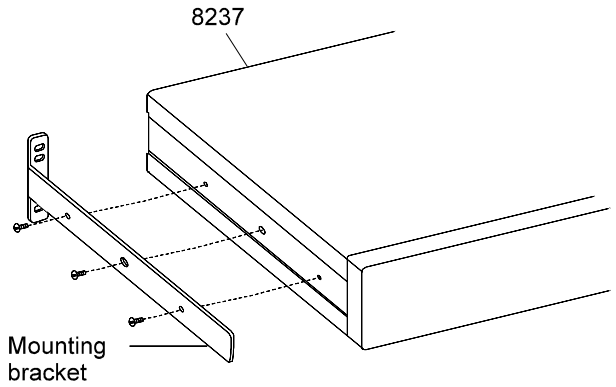

Figure 4-17. Removing the Mounting-Bracket Screws

b. Remove the two top fan-guard screws on the rear of the unit, as shown in Figure 4-18.

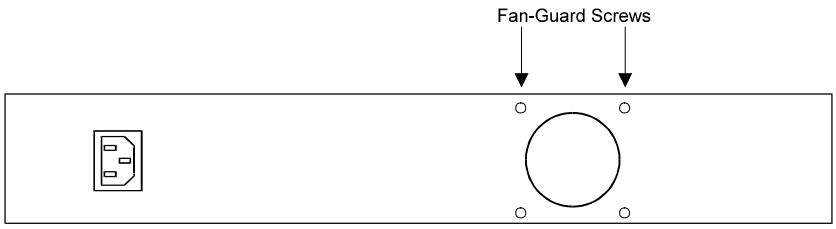

Figure 4-18. 8237 Back View

c. Grasp the top cover of the 8237 at the rear of the machine and lift it approximately 25 mm (1 in.) at the back. Then, slide the cover up and to the rear to remove it.

Remove the top cover and set it aside.

3 Disconnect the three-wire fan power cable from its position on the main board.

4 Remove the two bottom screws that hold the fan and the fan guard to the 8237. These are indicated in Figure 4-19. Retain the fan guard.

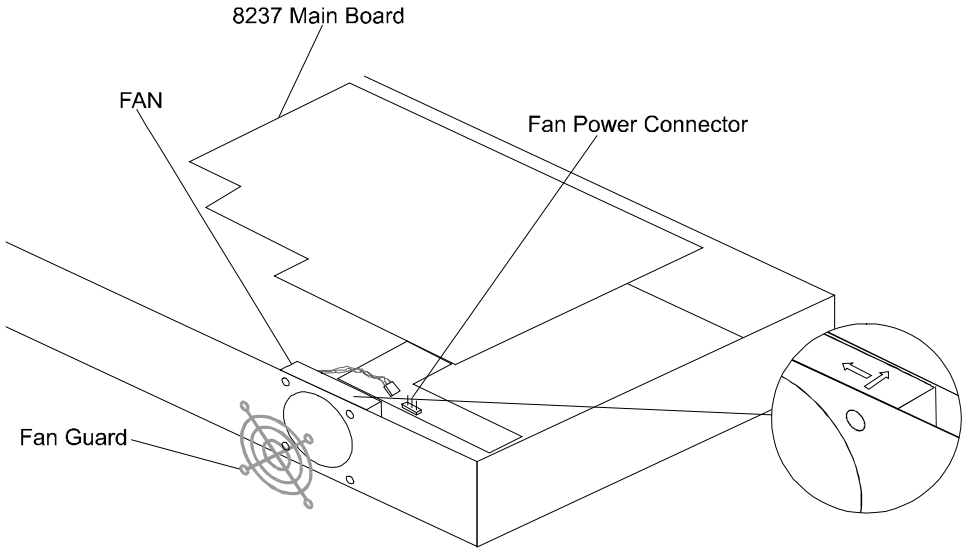

Figure 4-19. Fan Replacement

5 Set the new fan in the 8237. The arrows on the fan go as shown in Figure 4-19.

6 Replace the fan guard and the two fan-mounting screws removed in step 4.

7 Connect the new fan's power cable to the connector pins from which the old fan's power cable was removed. Note that the cable connector will snap back into place in one direction only.

8 Replace the cover by reversing the actions in step 2. Note that both sides of the top cover fit inside the edges of the bottom cover.

9 Connect ac power by attaching the power cable to the 8237 and then to the ac outlet.

10 Verify that the fan is operational. The fan's direction of airflow should be into the unit.

8237 Parts Catalog

The following table gives the part numbers for replacement and optional parts.

Table 4-2. Field-Replaceable Parts List

Item Name	Part Name	Replacement Part Number
1a	8237 Model 001	85H8842
1b	8237 Model 002	85H8852
1c	8237 Model 003	85H8862
2a	Media Expansion Port (AUI/10BASE2)	85H8875
2b	Media Expansion Port (10BASE-FL/FOIRL)	85H8876
2c	Fast Expansion Module (10BASE-T/100BASE-TX)	85H8872
2d	Fast Expansion Module (100BASE-FX)	85H8873
3	Rack-Mounting Hardware (includes two brackets and four screws)	85H8978
4	Stack Link Cable	86H0021
5	Cable Management Bracket	13H8966
6	RMON Daughter Board	85H8869
7	Fan Assembly	85H8870
8	Power Supply	85H8877

Note: A label on the left front of the 8237 indicates the model number.

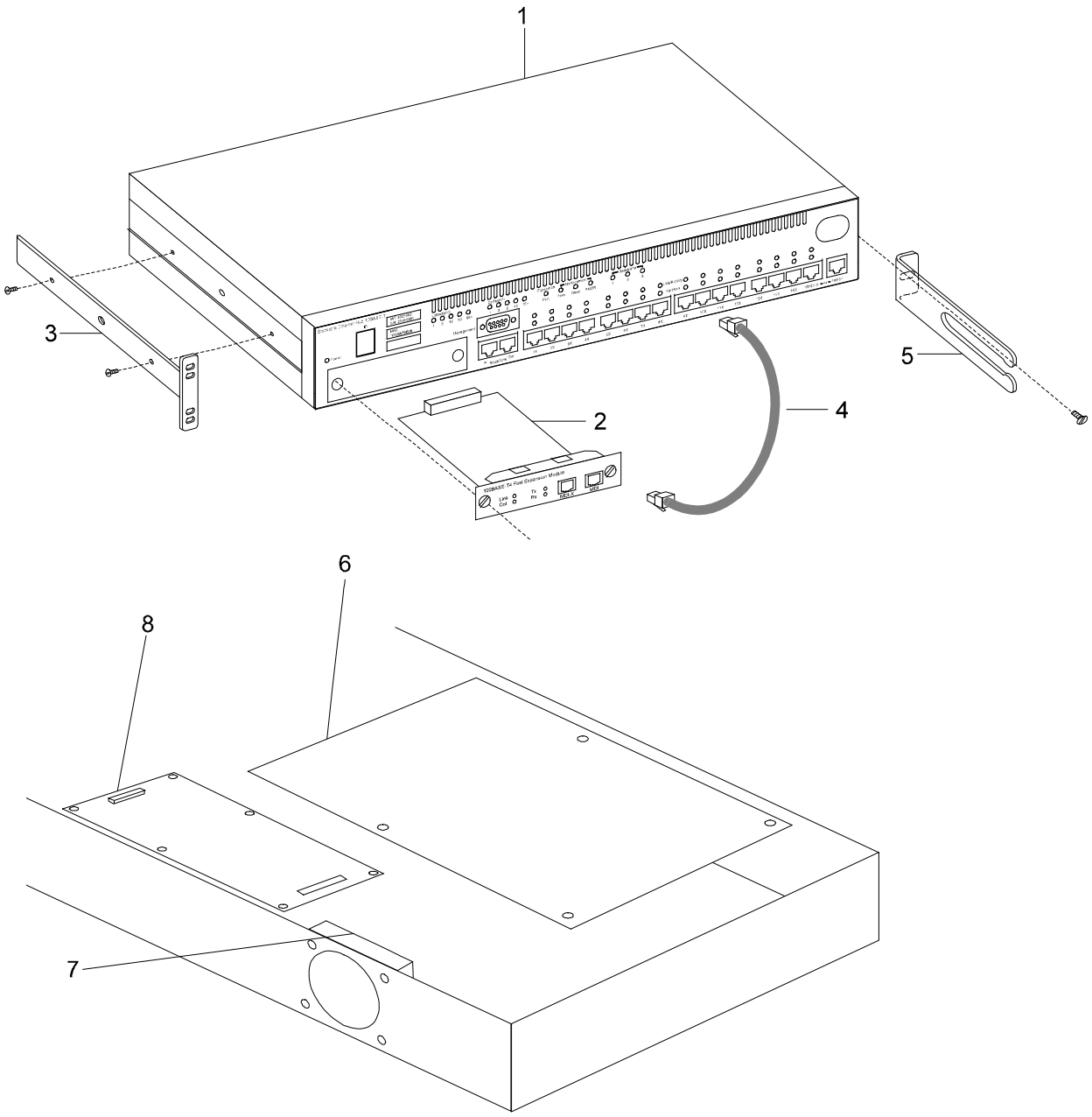

Figure 4-20. 8237 Field-Replaceable Parts

Available Features for Your 8237

You can purchase upgrades for your 8237s, using the following features list.

Table 4-3. Features That Can Be Purchased

Feature Name	Feature Code	Feature Part Number
RMON Agent Upgrade, Model 002 to Model 003	8969	85H8969
Media Expansion Port Module Kit, AUI/10BASE2	8864	85H8864
Media Expansion Port Module Kit, 10BASE-FL/FOIRL	8866	85H8866
Fast Expansion Module Kit, 10BASE-T/100BASE-TX	8854	85H8854
Fast Expansion Module Kit, 100BASE-FX	8856	85H8856

8237 Power Cords Table

Table 4-4. 8237 Power Cords by Country

Country	Part Number
U.S., Brazil, Canada, Latin America, Asia/Pacific, Mexico	6952301
Japan	34G0232
Angola, Austria, Belgium, Bulgaria, Egypt, Finland, France, Germany, Greece, Hungary, Iceland, Iran, Lebanon, Luxembourg, Mozambique, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sudan, Sweden, Syria, Turkey, Zaire	13F9978
Bahrain, Cyprus, Ghana, Iraq, Ireland, Jordan, Kenya, Kuwait, Libya, Malawi, Malta, Nigeria, Oman, Qatar, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, United Kingdom, Yemen, Zambia	14F0032
Denmark	13F9996
Ethiopia, Italy	14F0068
Switzerland	14F0050
Israel	14F0086
Namibia, Pakistan, South Africa, Swaziland, Zimbabwe	14F0014
Liberia, Saudi Arabia	6952301
China	14F0033

RMON Memory SIMM

The 8237 RMON Daughter Board supports the following types of industry-standard SIMM.

- 4, 8, 16, or 32 MB
- 72 pin
- 60 nanosecond
- No parity
- Tin-lead contacts

Help and Warranty Service Information

During the warranty period, you can get toll-free technical support 24 hours a day, 7 days a week, to answer any questions about your new 8237. If you need warranty service, you are entitled to on-site service for one year from the date of purchase.

Before calling, please prepare for your call by following these steps.

Step 1: Troubleshooting

You might be able to solve the problem yourself. Before calling IBM, try the following troubleshooting procedures.

1. Test the power outlet to be sure power is present.
2. Determine whether or not the fan is running.
3. Remove and reattach all cables, checking the cables, connectors, and ports for damage.
4. Remove and reseat any Expansion Ports, if applicable.
5. Verify that all configuration settings are correct.
6. Review all portions of this manual that pertain to the installation or replacement of features and be sure that you have followed all procedures.
7. After completing these steps, reassemble the 8237 and reconnect the power cord to the 8237 and then to the ac outlet.

Step 2: Preparing for the Call

To assist the technical support representative, have as much of the following information as possible available:

1. Product name, description, and serial number (if any)
2. Proof of purchase
3. Status of the LEDs
4. Description of the problem
5. Exact wording of SNMP traps (if any)
6. Hardware and software configuration information for your system

If possible, be at your 8237. Your technical support representative might want to walk you through a procedure during the call.

Step 3: Placing the Call to IBM

Use one of the following numbers:

☎ In the United States, call the IBM PC HelpCenter at 1-800-772-2227.

If you want a copy of the latest 8237 microcode or an updated IBM MIB, see “Getting New Microcode” on page 3-46.

☎ In Canada, call HelpPC at 1-800-565-3344.

☎ Outside the United States and Canada, contact your place of purchase or your local IBM branch office.

Appendix A. Cable Pinout Diagrams

Straight-Through 10BASE-T/100BASE-TX Cables

10BASE-T/100BASE-TX connections to devices such as workstations and servers require straight-through cables, as shown schematically in Figure A-1 and Figure A-2 for UTP and Figure A-3 on page A-2 for STP.

Two standards are shown for wiring UTP connectors, T568-A and T568-B. The only difference between them is in the color of the insulation around the wires.

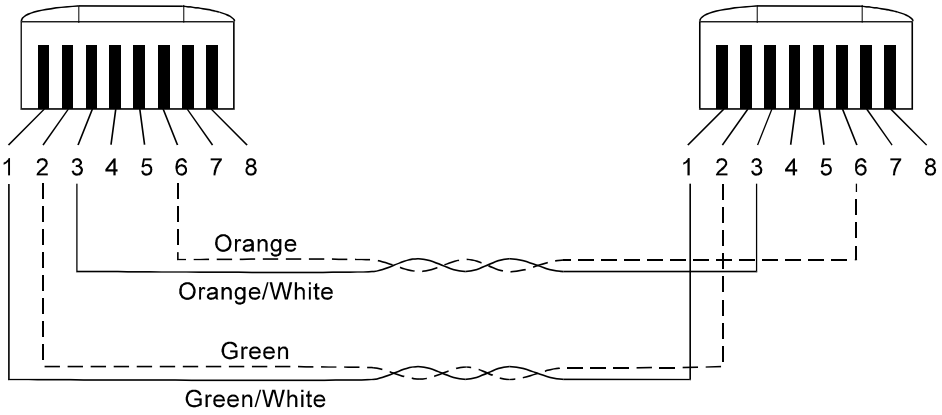

Figure A-1. Straight-Through UTP Cable (RJ-45 to RJ-45), T568-A

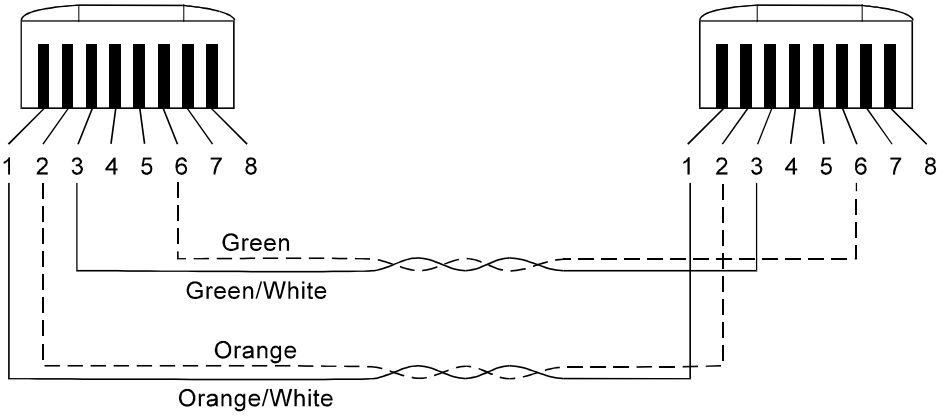

Figure A-2. Straight-Through UTP Cable (RJ-45 to RJ-45), T568-B

Straight-Through 10BASE-T/100BASE-TX Cables for STP

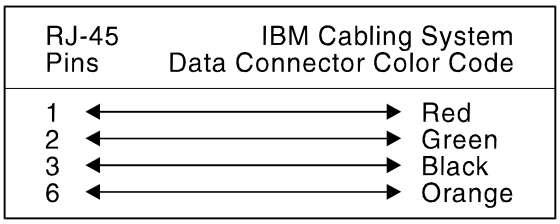

Figure A-3. Straight-Through STP Cable (RJ-45 to IBM Data Connector)

Crossover 10BASE-T/100BASE-TX Cables

Crossover cables are typically required when making 10BASE-T/100BASE-TX connections to other hubs. The 8237 does not *require* crossover cables, but if you need them, Figure A-4 and Figure A-5 show you how to wire the connectors.

Two standards are shown for wiring UTP connectors, T568-A and T568-B. The only difference between them is in the color of the insulation around the wires.

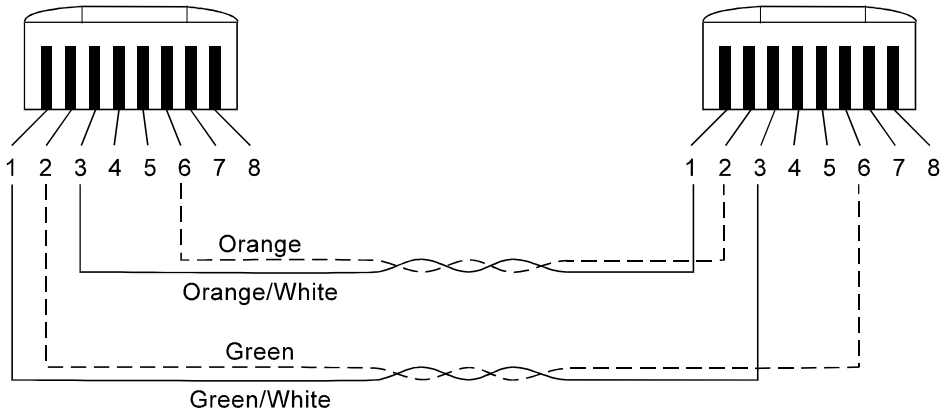

Figure A-4. Crossover UTP Cable (RJ-45 to RJ-45), T568-A

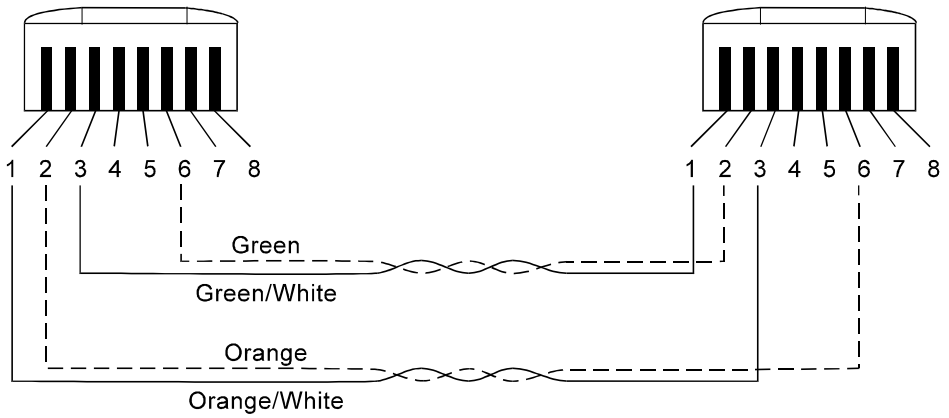

Figure A-5. Crossover UTP Cable (RJ-45 to RJ-45), T568-B

Crossover 10BASE-T/100BASE-TX Cables for STP

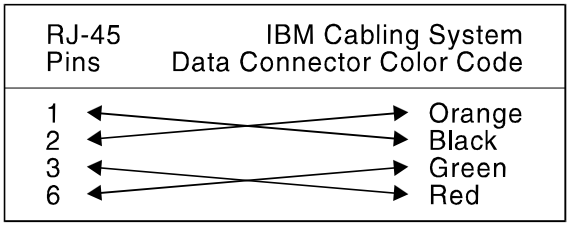

Figure A-6. Crossover STP Cable (RJ-45 to IBM Data Connector)

Null-Modem Cable

A null-modem cable should be used for a direct connection from a PC serial port to the 8237 Management Port.

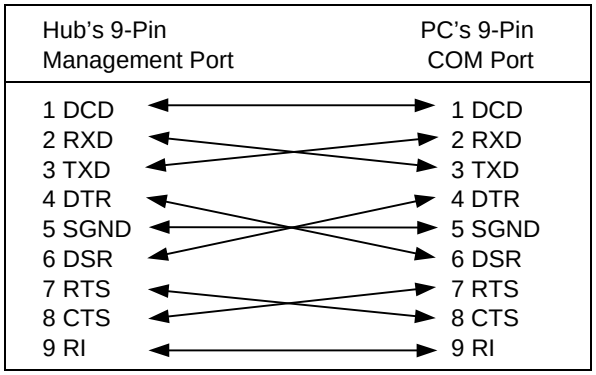

Figure A-7. Null-Modem Cable Connection

Appendix B. The IBM 8237 Management Information Base

Note: A copy of the latest IBM 8237 MIB can be obtained through the IBM Personal Computer Company BBS. Follow the steps in "Getting New Microcode" on page 3-46.

The IBM 8237 product supports the following standard MIBs:

1. RFC 1213 (MIB II)
    - **a.** System Group
    - **b.** Interfaces Group
    - **c.** Address Translation Group
    - **d.** IP Group
    - **e.** ICMP Group
    - **f.** UDP Group
    - **g.** SNMP Group
1. RFC 1516 - Definitions of Managed Objects for IEEE 802.3 Repeater Devices
2. RFC 1643 - Definitions of Ethernet Like Objects

In addition, the 8237 supports the objects defined in this MIB.

```
-- Version 1.10
-- May  22, 1997

IBM-8237-MIB DEFINITIONS ::= BEGIN

IMPORTS
        enterprises,
        Counter, TimeTicks, IpAddress
        FROM RFC1155-SMI;

IMPORTS
        DisplayString
        FROM RFC1213-MIB;

IMPORTS
        OBJECT-TYPE
        FROM RFC-1212;

-- New definitions

    IpxAddress ::= OCTET STRING (SIZE(10))


ibm                     OBJECT IDENTIFIER ::= { enterprises 2 }

ibmProd                 OBJECT IDENTIFIER ::= { ibm 6 }

ibm8237                 OBJECT IDENTIFIER ::= { ibmProd 134 }

products                OBJECT IDENTIFIER ::= { ibm8237 1 }
snmpMgt                 OBJECT IDENTIFIER ::= { ibm8237 2 }

ibm8237-1               OBJECT IDENTIFIER ::= { products 1 }
ibm8237-2               OBJECT IDENTIFIER ::= { products 2 }
ibm8237-3               OBJECT IDENTIFIER ::= { products 3 }

systemInfo              OBJECT IDENTIFIER ::= { snmpMgt 1 }
stackInfo               OBJECT IDENTIFIER ::= { snmpMgt 2 }


    --
```

```
-- Community Group.
--     The community group defines the community strings
--     accepted by the system.
--

communityMgt        OBJECT IDENTIFIER ::= { systemInfo 1 }

communityStringSize OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Length of the community string."
    ::= { communityMgt 1 }

communityTableSize OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Size of the community table."
    ::= { communityMgt 2}

communityTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF CommunityEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION  "Community table."
    ::= { communityMgt 3 }

communityEntry OBJECT-TYPE
    SYNTAX  CommunityEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { communityIndex }
    ::= { communityTable 1 }

CommunityEntry ::= SEQUENCE
    {
        communityIndex
            INTEGER,
        communityString
            DisplayString,
        communityAccessMode
            INTEGER,
        communityStatus
            INTEGER
     }

communityIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Index of the community table."
    ::= { communityEntry 1 }

communityString OBJECT-TYPE
    SYNTAX  DisplayString
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Community string; the length is limited by
                  communityStringSize."
    ::= { communityEntry 2 }

communityAccessMode OBJECT-TYPE
    SYNTAX  INTEGER {
                      read-only(1),
                      read-write(2)
                    }
    ACCESS  read-write
```

```
    STATUS  mandatory
    DESCRIPTION  "Access mode of the community. A read-only
                 community cannot be used to issue set
                 commands. If the SNMP access uses a community
                 which communityAccessMode is read-only to
                 access the community table, only the community
                 used is accessible. All other community
                 entries are invalid and their communityString
                 values are shown as null strings."
    ::= { communityEntry 3 }

communityStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                      invalid(1),
                      valid(2)
                    }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Administration status of this community. SNMP
                 requests will be accepted when the community
                 string matches and the community status is
                 valid."
    ::= { communityEntry 4 }

--
-- Trap manager group
--
--   The trap manager group is used to define the nodes which
--   can receive the trap messages sent by the agent.
--

trapManagerMgt      OBJECT IDENTIFIER ::= { systemInfo 2 }

ipTrapManagerMgt    OBJECT IDENTIFIER ::= { trapManagerMgt 1 }
ipxTrapManagerMgt   OBJECT IDENTIFIER ::= { trapManagerMgt 2 }


--
-- IP trap manager group
--

ipTrapManagerTableSize OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Size of the IP trap manager table."
    ::= { ipTrapManagerMgt 1 }

ipTrapManagerTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF IpTrapManagerEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION  "IP trap manager table."
     ::= { ipTrapManagerMgt 2 }

ipTrapManagerEntry OBJECT-TYPE
    SYNTAX  IpTrapManagerEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { ipTrapManagerIndex }
     ::= { ipTrapManagerTable 1 }

IpTrapManagerEntry ::= SEQUENCE
    {
         ipTrapManagerIndex
            INTEGER,
         ipTrapManagerCommunityIndex
            INTEGER,
```

```
          ipTrapManagerIpaddress
             IpAddress,
          ipTrapManagerEntryStatus
             INTEGER
    }

ipTrapManagerIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Index of the trap manager table."
    ::= { ipTrapManagerEntry 1 }

ipTrapManagerCommunityIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Selects a community string from the community
                  table for sending traps."
    ::= { ipTrapManagerEntry 2 }

 ipTrapManagerIpaddress OBJECT-TYPE
    SYNTAX IpAddress
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION  "IP address of the network manager."
    ::=  { ipTrapManagerEntry 3 }

ipTrapManagerStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                      invalid(1),
                      valid(2)
                    }
    ACCESS   read-write
    STATUS   mandatory
    DESCRIPTION  "Trap messages are sent to a trap manager
                  when its ipTrapMgrStatus is valid."
    ::= { ipTrapManagerEntry 4 }

--
-- IPX trap manager group
--

ipxTrapManagerTableSize OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Size of the IPX trap manager table."
    ::= { ipxTrapManagerMgt 1 }

ipxTrapManagerTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF IpxTrapManagerEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION  "IPX trap manager table."
     ::= { ipxTrapManagerMgt 2 }

ipxTrapManagerEntry OBJECT-TYPE
    SYNTAX  IpxTrapManagerEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { ipxTrapManagerIndex }
     ::= { ipxTrapManagerTable 1 }

IpxTrapManagerEntry ::= SEQUENCE
    {
          ipxTrapManagerIndex
             INTEGER,
```

```
        ipxTrapManagerCommunityIndex
           INTEGER,
        ipxTrapManagerIpxaddress
           IpxAddress,
        ipxTrapManagerEntryStatus
           INTEGER
    }

ipxTrapManagerIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Index of the IPX trap manager table."
    ::= { ipxTrapManagerEntry 1 }

ipxTrapManagerCommunityIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Selects a community string from the community
                  table for sending traps."
    ::= { ipxTrapManagerEntry 2 }

ipxTrapManagerIpxaddress OBJECT-TYPE
    SYNTAX IpxAddress
    ACCESS read-write
    STATUS mandatory
    DESCRIPTION  "IPX address of the IPX network manager. "
    ::=  { ipxTrapManagerEntry 3 }

ipxTrapMgrStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                     invalid(1),
                     valid(2)
                    }
    ACCESS   read-write
    STATUS   mandatory
    DESCRIPTION  "Trap messages are sent to a trap manager
                  when its ipxTrapMgrStatus is valid."
    ::= { ipxTrapManagerEntry 4 }


--
--  Download Group
--
--   The download group is used to trigger download operation of
--   the agent device to get a new version of software with TFTP
--   protocol from a server computer. The manager can select to
--   upgrade software temporarily or permanently, and to run new
--   software immediately or at the next power-up.
--
--

downloadMgt         OBJECT IDENTIFIER ::= { systemInfo 3 }

downloadServerIP OBJECT-TYPE
    SYNTAX  IpAddress
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "IP address of the file server of the download
                  file."
    ::= { downloadMgt 1 }


downloadFilename OBJECT-TYPE
    SYNTAX  OCTET STRING (SIZE (0..127))
    ACCESS  read-write
    STATUS  mandatory
```

```
    DESCRIPTION  "File name to download."
    ::= { downloadMgt 2 }

downloadMode OBJECT-TYPE
    SYNTAX  INTEGER {
                    permanent(1),
                    temporary(2)
                   }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "A permanent upgrade stores download software
                  into the permanent storage of the agent
                  device. A temporary upgrade puts download
                  software in RAM only, often for a test only."
    ::= { downloadMgt 3 }

 downloadAction OBJECT-TYPE
    SYNTAX  INTEGER {
                    notDownloading(1),
                    downloading (2)
                   }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Setting this object to downloading(2)
                  initiates a TFTP download of the agent.  The
                  agent will download the new image from the
                  server specified by downloadServerIP. The
                  download file name is specified by
                  downloadFilename."
    ::= { downloadMgt 4}

--
-- IP auto-discovery Group.
--     The IP auto-discovery group defines the IP auto-discovery
--     feature of the SNMP-managed device.  The feature operates
--     as follows:
--
--     (1) The SNMP-managed device sends the auto-discovery
--         trap at a time interval selected by the user.
--     (2) Traps are sent until an SNMP Get, Get Next or Set
--         request frame is received. The reception of an SNMP
--         request frame indicates that the device has been
--         discovered by the network management station.
--     (3) Once an SNMP get request frame is received, a
--         'watchdog timer' selected by the user is started.
--         When an SNMP request frame has not been received from
--         the management station during the watchdog time
--         interval.  The management station has lost contact,
--         then the managed device sends the auto-discovery trap
--         again.
--

autodiscovery       OBJECT IDENTIFIER ::= { systemInfo 4 }

ipAutoDiscovery     OBJECT IDENTIFIER ::= { autodiscovery 1 }
ipxAutoDiscovery    OBJECT IDENTIFIER ::= { autodiscovery 2 }

ipAutoDiscoveryStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                      enabled(1),
                      disabled(2)
                    }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION "Setting this object to enabled(1) enables the
                 IP auto-discovery feature."
    ::= { ipAutoDiscovery 1 }
```

```
    ipAutoDiscoveryInterval OBJECT-TYPE
        SYNTAX  INTEGER (1..60)
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION "The time interval in minutes for the SNMP-
                     managed device to send the auto-discovery
                     trap."
        ::= { ipAutoDiscovery 2 }

    ipAutoDiscoveryWatchDogInterval OBJECT-TYPE
        SYNTAX  INTEGER (1..24)
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION "The time interval in hours for the SNMP-managed
                     device to monitor for loss of contact with the
                     management station."
        ::= { ipAutoDiscovery 3 }


    --
    -- IPX auto-discovery Group.
    --     The IPX auto-discovery group is accomplished by the IPX
    --     SAP broadcasting.  The following objects define the IPX
    --     SAP broadcasting parameters.
    --

    ipxAutoDiscoveryStatus OBJECT-TYPE
        SYNTAX  INTEGER {
                          enabled(1),
                          disabled(2)
                        }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION "Setting this object to enabled(1) enables the
                     IPX SAP broadcasting."
        ::= { ipxAutoDiscovery 1 }

    ipxAutoDiscoveryInterval OBJECT-TYPE
        SYNTAX  INTEGER (1..60)
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION "The time interval in minutes for the SNMP-
                     managed device to broadcast the IPX SAP
                     response frame."
        ::= { ipxAutoDiscovery 2 }


--
-- Stack information group; this group is classified into four
-- groups:the basic group, the monitor group, the backup group, and
-- the security group.
--

    basicInfo               OBJECT IDENTIFIER ::= { stackInfo 1 }
    monitorInfo             OBJECT IDENTIFIER ::= { stackInfo 2 }
    backupPortInfo          OBJECT IDENTIFIER ::= { stackInfo 3 }
    securityInfo            OBJECT IDENTIFIER ::= { stackInfo 4 }


    --
    -- Basic Stack Object
    --
    --
    --


    basicStack              OBJECT IDENTIFIER ::= { basicInfo 1 }
```

```
--

    basicStackHealth OBJECT-TYPE
        SYNTAX  OCTET STRING ( SIZE (240) )
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "

           < FOR IBM 8237 DEFINITION : >
           Total of 10 hubs can be stacked in a single 8237 system,
           each uses 24 bytes to indicate its status.

           240 bytes = 10 hub * (17 + 7) bytes
               |
           byte240 byte239.....................byte2 byte1
                                                    |
                                        bit7 bit6 ... bit1 bit0

           (6 bit + 2 bit) * 17 port = 17 bytes

           BYTE 1 - 17 : port status for port 1 - 17

                   *BYTE 1 : port status for port 1

                      bit 0-5 : LED status
                          bit 0 : link status
                                0 - no link; 1 - link
                          bit 1 : partition status
                                0 - partitioned; 1 - not partitioned
                          bit 2 : port operation status
                                0 - disabled; 1 - enabled
                          bit 3-5 : traffic status
                                000 - no traffic
                                001 - 1% traffic
                                010 - 4% traffic
                                011 - 16% traffic
                                100 - 32% traffic
                                101 - >= 64% traffic

                      bit 6 : port admin status
                                0 - disabled; 1 - enabled

                      bit 7 : reserved


           BYTE 18 : Expansion Port (EP) status1

                      bit 0-2: EP Type
                              000 - AUI/BNC MEP, AUI in used
                              100 - AUI/BNC MEP, BNC in used
                              010 - 10BASE-FL MEP
                              110 - not present
                              001 - 100BASE-TX FEM
                              101 - 100BASE-FX FEM
                              011 - reserved
                              111 - reserved

                      bit 3-4 : FEM forwarding mode status
                                Applicable only to FEM module
                             00 - adaptive cut through
                             01 - reserved
                             10 - reserved
                             11 - store and forward

                      bit 5: FEM back pressure status
                              0 - disabled; 1 - enabled

                      bit 6-7 : reserved
```

```
BYTE 19 : Expansion Port (EP) status2

          bit 0-2 : LED status
                  bit 0 : FEM link status
                        0 - no link; 1 - link
                  bit 1 : FEM half/full duplex status
                        0 - full duplex; 1 - half duplex
                  bit 2 : FEM port speed
                        0 - 10 Mbps; 1 - 100 Mbps

          bit 3: EP collision led status
                  0 - off; 1 - on

          bit 4-5 :
                  bit 4 : tx LED status
                          0 - off; 1 - tx on
                  bit 5 : rx LED status
                          0 - off; 1 - rx on

          bit 6-7 : reserved

BYTE 20 : SNMP agent & RMON probe status

          bit 0 - 1: reserved
             00 - SNMP Agent not present (8237-001)
             01 - SNMP Agent only (8237-002)
             10 - SNMP agent with RMON 1 probe (8237-003)
             11 - SNMP agent with RMON 2 probe (8237-003)
          bit 2 : master status
                  0 - subordinate; 1 - master
          bit 3 - 4 : reserved
          bit 5 - 7 : RMON probe segment
                  000 - disabled
                  001 - segment 1
                  010 - segment 2
                  100 - segment 3

BYTE 21 : Hub Segment/Bus Termination

          bit 0 - 1 : Segment
                   00 - isolated
                   01 - segment 1
                   10 - segment 2
                   11 - segment 3
          bit 2: termination status
                  0 - not end hub
                  1 - end hub in the stack
          bit 3 - 7 : reserved


BYTE 22 : Hub ID/Hub Position

          bit 0 - 3 : hub ID status
                  0000 - invalid
                  0001 - 1
                  0010 - 2
                  0011 - 3
                  0100 - 4
                  0101 - 5
                  0110 - 6
                  0111 - 7
                  1000 - 8
                  1001 - 9
                  1011 - 10
                  1100 to 1111 - reserved
```

```
                    bit 4 - 7 : hub position
                             0000 - invalid
                             0001 - 1
                             0010 - 2
                             0011 - 3
                             0100 - 4
                             0101 - 5
                             0110 - 6
                             0111 - 7
                             1000 - 8
                             1001 - 9
                             1011 - 10
                             1100 to 1111 - reserved

           BYTE 23 : utilization and collision rate

                    bit 0 - 3 : utilization LED status
                             0000 - none
                             0001 - 1 %
                             0010 - 4  %
                             0011 - 16 %
                             0100 - 32 %
                             0101 - >= 64 %
                    bit 4 - 7 : collision LED status
                             0000 - none
                             0001 - 1 %
                             0010 - 3 %
                             0011 - 5 %
                             0100 - 10 %
                             0101 - >= 15 %


           BYTE 24 : fan status

                    bit 0 : fan status
                            0 - bad; 1 - good

                    bit 1-7 : reserved

       ::= { basicStack 1 }


--
-- Basic Segment Object
--


basicSegmentTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF BasicSegmentEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION  "Segment table. Each entry contains attributes
                  assigned to a backplane segment."
    ::= { basicInfo 2 }

basicSegmentEntry OBJECT-TYPE
    SYNTAX  BasicSegmentEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { basicSegmentIndex }
    ::= { basicSegmentTable 1 }

BasicSegmentEntry ::= SEQUENCE
    {
        basicSegmentIndex
            INTEGER,
        basicSegmentProtocol
            INTEGER,
```

```
        basicSegmentIpAddr
            IpAddress,
        basicSegmentNetMask
            IpAddress,
        basicSegmentGateway
            IpAddress,
        basicSegmentSlipAddr
            IpAddress,
        basicSegmentReset
            INTEGER,
        basicSegmentIpxFrame
            INTEGER,
        basicSegmentIntIpxNet
            OCTET STRING,
        basicSegmentName
            DisplayString
    }

basicSegmentIndex OBJECT-TYPE
    SYNTAX  INTEGER (1..3)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Backplane segment number."
    ::= { basicSegmentEntry 1 }

basicSegmentProtocol OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION "For protocol stack definition :

                 bit 0: IP protocol stack
                        0: disabled;  1: enabled
                 bit 1: IPX protocol stack
                        0: disabled;  1: enabled
                 bit 2: SNMP over Ethernet
                        0: disabled;  1: enabled"
    ::= { basicSegmentEntry 2 }

basicSegmentIpAddr OBJECT-TYPE
    SYNTAX  IpAddress
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "IP address of this segment.
                  The corresponding definition in each segment
                  of the 8237 system.  Because the IBM 8237 is a
                  multi-home host (A device has multiple
                  interfaces without routing capability), each
                  segment of the 8237 system has its own
                  interface parameters, such as the IP address.
                  When the agent switches to another segment,
                  the interface parameters are changed.  The
                  interface parameters are defined in the
                  following variables."
    ::= { basicSegmentEntry 3 }

basicSegmentNetMask OBJECT-TYPE
    SYNTAX  IpAddress
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "IP netmask of this segment."
    ::= { basicSegmentEntry 4 }

basicSegmentGateway OBJECT-TYPE
    SYNTAX  IpAddress
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Preferred gateway of this segment."
```

```
        ::= { basicSegmentEntry 5 }

    basicSegmentSlipAddr OBJECT-TYPE
        SYNTAX  IpAddress
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION  "SLIP address of this segment. The SLIP must
                      reside in the same subnet as the
basicSegmentIpAddress."
        ::= { basicSegmentEntry 6 }

    basicSegmentReset  OBJECT-TYPE
        SYNTAX  INTEGER {
                         notreset(1),
                         reset(2)
                        }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION  "Setting the basicSegmentIpAddr,
                      basicSegmentNetMask, basicSegmentGateway, and
                      basicSegmentSlipAddr will not make these
                      parameters take effect immediately. They will
                      take effect when basicSegmentReset is set to
                      reset(2)."
        ::= { basicSegmentEntry 7 }

    basicSegmentIpxFrame OBJECT-TYPE
        SYNTAX  INTEGER {
                         ethernet8023-frame(1),
                         ethernetii-frame(2),
                         ethernet8022-frame(3),
                         ethernetsnap-frame(4),
                         auto-learn(5),
                         auto-learn-ipx8023-frame(6),
                         auto-learn-ipx8137-frame(7),
                         auto-learn-ipx8022-frame(8),
                         auto-learn-ipxsnap-frame(9)
                        }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION  "Default IPX frame type of the system. Four
                      types of IPX frame support.  You can
                      set this object within the values from
                      ethernet8023-frame(1) to auto-learn(5) only.
                      Setting this object to auto-learn(5) lets the
                      system find the IPX frame type automatically.
                      The result of auto-learn is reflected as
                      follows:
                         auto-learn-ipx8023-frame(6),
                         auto-learn-ipx8137-frame(7),
                         auto-learn-ipx8022-frame(8), and
                         auto-learn-ipxsnap-frame(9).

                      Setting to any of these four values is not
                      acceptable; 'snmpBadValue' will be returned.
                      Note that if the frame type cannot be
                      determined, then the system will remain in
                      auto-learn."
        ::= { basicSegmentEntry 8 }

    basicSegmentIntIpxNet OBJECT-TYPE
        SYNTAX  OCTET STRING (SIZE (4))
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION  "Internal IPX network number of the segment.
                      Internal network number identifies a server in
                      IPX network. It must be unique within an IPX
                      network."
```

```
        ::= { basicSegmentEntry 9 }

    basicSegmentName OBJECT-TYPE
        SYNTAX  DisplayString (SIZE (0..12))
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION  "Mnemonic name of the segment."
        ::= { basicSegmentEntry 10 }


    --
    -- Basic Group Object - Hub control information
    --

    basicGroup              OBJECT IDENTIFIER ::= { basicInfo 3 }

--
--
--

    basicHubTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF BasicHubEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION  "A group means a single hub."
        ::= { basicGroup 1 }

    basicHubEntry OBJECT-TYPE
        SYNTAX  BasicHubEntry
        ACCESS  not-accessible
        STATUS  mandatory
        INDEX   { basicHubIndex }
        ::= { basicHubTable 1 }

    BasicHubEntry ::= SEQUENCE
        {
            basicHubIndex
                INTEGER,
            basicHubType
                INTEGER,
            basicHubPosition
                INTEGER,
            basicHubSegment
                INTEGER,
            basicHubName
                DisplayString,
            basicHubHwVer
                INTEGER,
            basicHubFwMajorVer
                INTEGER,
            basicHubFwMinorVer
                INTEGER,
            basicHubFanStatus
                INTEGER,
            basicHubBootupCodeMajorVer
                INTEGER,
            basicHubBootupCodeMinorVer
                INTEGER,
            basicHubAgentStatus
                INTEGER,
            basicHubAgentPhysAddr
                PhysAddress,
            basicHubAgentBootupOption
                INTEGER,
            basicHubAgentBaudrate
                INTEGER
        }
```

```
basicHubIndex OBJECT-TYPE
    SYNTAX  INTEGER (1..10)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "ID number of a hub, used to select it."
    ::= { basicHubEntry 1 }

basicHubType OBJECT-TYPE
    SYNTAX  INTEGER {
                     ibm8237-1(1),
                     ibm8237-2(2),
                     ibm8237-3(3),
                     not-present(1000)
                    }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Type of hub."
    ::= { basicHubEntry 2 }

basicHubPosition OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Physical position of a hub in top-down order."
    ::= { basicHubEntry 3 }

basicHubSegment OBJECT-TYPE
    SYNTAX  INTEGER (0..3)
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Segment number of the backplane to which the
                  hub is connected. Value 0 means that the hub
                  is isolated, not attached to any segment."
    ::= { basicHubEntry 4 }

basicHubName OBJECT-TYPE
    SYNTAX  DisplayString (SIZE (0..12))
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Mnemonic name of a hub."
    ::= { basicHubEntry 5 }

basicHubHwVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Hardware version of the hub."
    ::= { basicHubEntry 6 }

basicHubFwMajorVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Microcode major version of this hub."
    ::= { basicHubEntry 7 }

basicHubFwMinorVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Microcode minor version of this hub."
    ::= { basicHubEntry 8 }

basicHubFanStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                     good(1),
                     fail(2)
                    }
```

```
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Status of the fan."
    ::= { basicHubEntry 9 }

basicHubBootupCodeMajorVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Bootup microcode major version of this hub."
    ::= { basicHubEntry 10 }

basicHubBootupCodeMinorVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Bootup microcode minor version of this hub."
    ::= { basicHubEntry 11 }


basicHubAgentStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                     not-present(1),
                     primary(2),
                     backup(3)
                    }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Status of this hub agent.  Each segment allows
                  an SNMP primary agent. primary(2): The agent
                  in this segment is a primary agent. backup(3):
                  The agent in this segment is a backup agent."
    ::= { basicHubEntry 12 }

basicHubAgentPhysAddr OBJECT-TYPE
    SYNTAX  PhysAddress
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "MAC address of this hub agent"
    ::= { basicHubEntry 13 }

basicHubAgentBootupOption OBJECT-TYPE
    SYNTAX  INTEGER {
                      normal(1),
                      tftp-download(2),
                      bootp-get-ip(3),
                      bootp-download(4),
                      bootp-upgrade(5)
                     }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "This variable defines how to start the
                  microcode in the segment.
                  normal(1):
                              Use NVRAM information and flash
                              ROM microcode to start up the
                              system.
                  tftp-Download(2):
                              Always download the new version of
                              microcode into RAM and start it.
                  bootp-get-ip(3):
                              Get the IP information from the
                              BootP server, and then start up
                              the microcode in flash ROM.
                  bootp-download(4):
                              Get the IP information from the
                              BootP server, and then download
```

```
                                the microcode from the TFTP
                                server.
                        bootp-upgrade(5):
                                Get the IP information from the
                                BootP server, and then download
                                the microcode from the TFTP
                                server.  After the download has
                                been completed, upgrade the
                                microcode in system flash ROM."
        ::= { basicHubEntry 14 }

    basicHubAgentBaudrate OBJECT-TYPE
        SYNTAX  INTEGER {
                         9600-baud(9600),
                         19200-baud(19200),
                         38400-baud(38400)
                        }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION  "Baud rate of the console port"
        ::= { basicHubEntry 15 }




    --
    --  Basic FEM object
    --


    basicFemTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF BasicFemEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION  "Basic information about FEM ports in a system.
                      Each port belongs to a group.  The group index
                      is the same as the group index of the
                      basicPortTable: that is, basicPortGroupIndex."
        ::= { basicGroup 2 }

    basicFemEntry OBJECT-TYPE
        SYNTAX  BasicFemEntry
        ACCESS  not-accessible
        STATUS  mandatory
        INDEX   { basicFemHubIndex }
        ::= { basicFemTable 1 }

    BasicFemEntry ::= SEQUENCE
        {
            basicFemHubIndex
                INTEGER,
            basicFemType
                INTEGER,
            basicFemLinkStatus
                INTEGER,
            basicFemDuplexStatus
                INTEGER,
            basicFemBackPressureStatus
                INTEGER,
            basicFemForwardingMode
                INTEGER,
            basicFemSpeed
                INTEGER,
            basicFemName
                DisplayString
        }

    basicFemHubIndex OBJECT-TYPE
```

```
    SYNTAX  INTEGER (1..10)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "ID number of a hub unit, used to select it."
    ::= { basicFemEntry 1 }

basicFemType OBJECT-TYPE
    SYNTAX  INTEGER {
                     not-present(1),
                     100base-tx(2),
                     100base-fx(3)
                    }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Port type of the FEM port."
    ::= { basicFemEntry 2 }

basicFemLinkStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                     goodlink(1),
                     badlink(2)
                    }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Link status of the FEM port."
    ::= { basicFemEntry 3 }

basicFemDuplexStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                     half-duplex(1),
                     full-duplex(2),
                     auto-negotiation(3),
                     negotiated-half-duplex(4),
                     negotiated-full-duplex(5)
                    }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION "Setting this object to full-duplex(2) enables
                 the FEM port for full-duplex mode, so that the
                 port can send and receive frames at the same
                 time. Setting this object to auto-
                 negotiation(3) lets the transceiver decide the
                 duplex status of the port. The result of the
                 auto-negotiation is reflected as negotiated-
                 half-duplex(4) or negotiated-full-duplex(5).
                 Setting to these two values is not valid;
                 'snmpBadValue' will be returned."
    ::= { basicFemEntry 4 }

basicFemBackPressureStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                     enabled(1),
                     disabled(2)
                    }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION "Setting this object to enabled(1) enables the FEM
                 backpressure feature.  When the output queue is
                 full, the FEM port will generate collisions
                 back to the source network everytime a frame is
                 received.

                 Setting this object to disabled(1) lets the FEM
                 port discard the input frames of the source
                 network when the output queue is full."
    ::= { basicFemEntry 5 }

basicFemForwardingMode OBJECT-TYPE
```

```
        SYNTAX  INTEGER {
                         store-and-forward(1),
                         adaptive-cut-through(2),
                         adaptive-store-and-forward(5)
                        }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION "Setting this object to store-and-forward(1)
                     makes the FEM port receive the entire packet
                     before forwarding them.
                     Setting this object to adaptive-cut-through
                     makes the system forward the packets with cut-
                     through mode when the transmission quality of
                     the destination network allows. If the
                     transmission quality is bad, the FEM will use
                     store and forward mode to process the packets.
                     In this case, the object returns adaptive-
                     store-and-forward(5) as value. Setting the
                     object to adaptive-store-and-forward(5) is not
                     valid; 'snmpBadValue will be returned."
        ::= { basicFemEntry 6 }

    basicFemSpeed OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "Reflecting the speed of the FEM port.  The line
                     speed is determined by the auto-negotiation
                     mechanism of the transceiver of the FEM port.
                     Currently, there are two values - 10000000
                     (10M) and 100000000(100M)."
        ::= { basicFemEntry 9 }

    basicFemName OBJECT-TYPE
        SYNTAX  DisplayString (SIZE (0..12))
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION  "Mnemonic name of the FEM port."
        ::= { basicFemEntry 7 }


    ---
    ---   Basic Probe table
    ---


    basicProbeTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF BasicProbeEntry
        ACCESS  not-accessible
        STATUS  mandatory
        DESCRIPTION  "RMON probe table information; the index is the
                      same as the index of basicGroupTable."
        ::= { basicGroup 3 }

    basicProbeEntry OBJECT-TYPE
        SYNTAX  BasicProbeEntry
        ACCESS  not-accessible
        STATUS  mandatory
        INDEX   { basicProbeHubIndex }
        ::= { basicProbeTable 1 }

    BasicProbeEntry ::= SEQUENCE
        {
            basicProbeHubIndex
                INTEGER,
            basicProbeType
                INTEGER,
            basicProbeHwVer
```

```
            INTEGER,
        basicProbeRomMajorVer
            INTEGER,
        basicProbeRomMinorVer
            INTEGER,
        basicProbeFwMajorVer
            INTEGER,
        basicProbeFwMinorVer
            INTEGER,
        basicProbeSegment
            INTEGER,
        basicProbeStatus
            INTEGER
    }


basicProbeHubIndex OBJECT-TYPE
    SYNTAX  INTEGER (1..10)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "ID number of a hub unit, used to select it."
    ::= { basicProbeEntry 1 }

basicProbeType OBJECT-TYPE
    SYNTAX  INTEGER {
                    not-present(1),
                    i386ex-probe-rmon(2),
                    i386ex-probe-rmon2(3)
                   }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "RMON probe board model number. If the value
                  is not-present(1), the variables in
                  this branch are meaningless."
    ::= { basicProbeEntry 2 }

basicProbeHwVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Hardware version of the RMON probe."
    ::= { basicProbeEntry 3 }

basicProbeRomMajorVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Boot ROM microcode major version of the RMON
                  probe."
    ::= { basicProbeEntry 4 }

basicProbeRomMinorVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Boot ROM microcode minor version of the RMON
                  probe."
    ::= { basicProbeEntry 5 }


basicProbeFwMajorVer OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Microcode major version of the RMON probe."
    ::= { basicProbeEntry 6 }

basicProbeFwMinorVer OBJECT-TYPE
```

```
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Microcode minor version of the RMON probe."
    ::= { basicProbeEntry 7 }

basicProbeSegment OBJECT-TYPE
    SYNTAX  INTEGER {
                      segment-1(1),
                      segment-2(2),
                      segment-3(4)
                    }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "The value represents the segment the probe is
                  monitoring."

    ::= { basicProbeEntry 8 }

 basicProbeStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                     not-present(1),
                     disabled(2),
                     monitoring(3)
                    }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Status of this RMON probe entry."
    ::= { basicProbeEntry 9 }


--
--  Basic Port Object
--

basicPort               OBJECT IDENTIFIER ::= { basicInfo 4 }


basicPortTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF BasicPortEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION  "Basic information about ports in a system.
                  Each port belongs to a group."
    ::= { basicPort 1 }

basicPortEntry OBJECT-TYPE
    SYNTAX  BasicPortEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { basicPortHubIndex, basicPortIndex }
    ::= { basicPortTable 1 }

BasicPortEntry ::= SEQUENCE
    {
        basicPortHubIndex
            INTEGER,
        basicPortIndex
            INTEGER,
        basicPortType
            INTEGER,
        basicPortLinkStatus
            INTEGER,
        basicPortName
            DisplayString
    }
```

```
basicPortHubIndex OBJECT-TYPE
    SYNTAX  INTEGER ( 1..10 )
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Index of the hub."
    ::= { basicPortEntry 1 }

basicPortIndex OBJECT-TYPE
    SYNTAX  INTEGER ( 1..17 )
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Port number."
    ::= { basicPortEntry 2 }

basicPortType OBJECT-TYPE
    SYNTAX  INTEGER {
                     10base-T(1),
                     AUI-in-used(2),
                     BNC-in-used(3),
                     10BASE-FL(4),
                     100BASE-TX(5),
                     100BASE-FX(6),
                     not-present(8)
                    }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Port type of a port."
    ::= { basicPortEntry 3 }

basicPortLinkStatus OBJECT-TYPE
    SYNTAX  INTEGER {
                     goodlink(1),
                     badlink(2),
                     other(3)
                    }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Link status of a port."
    ::= { basicPortEntry 4 }

basicPortName OBJECT-TYPE
    SYNTAX  DisplayString (SIZE (0..12))
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Mnemonic name of a port."
    ::= { basicPortEntry 5 }




--
-- Performance Monitor Segment Table
--
monitorSegmentTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF MonitorSegmentEntry
    ACCESS  not-accessible
    STATUS  mandatory
    ::= { monitorInfo 1 }

monitorSegmentEntry OBJECT-TYPE
    SYNTAX  MonitorSegmentEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { monitorSegmentIndex }
    ::= { monitorSegmentTable 1 }

MonitorSegmentEntry ::= SEQUENCE
```

```
    {
        monitorSegmentIndex
            INTEGER,
        monitorSegmentTotalFrames
            Counter,
        monitorSegmentTotalBytes
            Counter,
        monitorSegmentCollisions
            Counter,
        monitorSegmentCRCErrors
            Counter,
        monitorSegmentAlignmentErrors
            Counter,
        monitorSegmentTotalErrors
            Counter
    }

monitorSegmentIndex OBJECT-TYPE
    SYNTAX  INTEGER ( 1..3 )
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "ID used to select a segment."
    ::= { monitorSegmentEntry 1 }

monitorSegmentTotalFrames OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total frames received by a segment."
    ::= { monitorSegmentEntry 2 }

monitorSegmentTotalBytes OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total bytes received by a segment."
    ::= { monitorSegmentEntry 3 }

monitorSegmentCollisions OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total collisions on a segment."
    ::= { monitorSegmentEntry 4 }

monitorSegmentCRCErrors OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total CRC errors received by a segment."
    ::= { monitorSegmentEntry 5 }

monitorSegmentAlignmentErrors OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total frame-alignment errors received by a
                  segment."
    ::= { monitorSegmentEntry 6 }

monitorSegmentTotalErrors OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total errors received by a segment."
    ::= { monitorSegmentEntry 7 }
```

```
--
-- Performance Monitor Group Table
--

monitorHubTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF MonitorHubEntry
    ACCESS  not-accessible
    STATUS  mandatory
    ::= { monitorInfo 2 }

monitorHubEntry OBJECT-TYPE
    SYNTAX  MonitorHubEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { monitorHubIndex }
    ::= { monitorHubTable 1 }

MonitorHubEntry ::= SEQUENCE
    {
        monitorHubIndex
            INTEGER,
        monitorHubCollisions
            Counter,
        monitorHubCRCErrors
            Counter,
        monitorHubAlignmentErrors
            Counter
    }

monitorHubIndex OBJECT-TYPE
    SYNTAX  INTEGER ( 1..10 )
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "ID used to select a hub."
    ::= { monitorHubEntry 1 }

monitorHubCollisions OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total collisions experienced by a hub."
    ::= { monitorHubEntry 2 }

monitorHubCRCErrors OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total CRC errors received by a hub."
    ::= { monitorHubEntry 3 }

monitorHubAlignmentErrors OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Total frame-alignment errors received by a hub."
    ::= { monitorHubEntry 4 }




--
-- FEM port statistics
--


monitorFemTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF MonitorFemEntry
```

```
    ACCESS  not-accessible
    STATUS  mandatory
    ::= { monitorInfo 3 }

monitorFemEntry OBJECT-TYPE
    SYNTAX  MonitorFemEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { monitorFemHubIndex}
    ::= { monitorFemTable 1 }

MonitorFemPortEntry ::= SEQUENCE
    {
        monitorFemHubIndex
            INTEGER,
        monitorFemInFrames
            Counter,
        monitorFemInDiscards
            Counter,
        monitorFemInOctets
            Counter,
        monitorFemOutFrames
            Counter,
        monitorFemOutDiscards
            Counter,
        monitorFemOutOctets
            Counter,
        monitorFemFCSErrors
            Counter,
        monitorFemFrameTooLongs
            Counter,
        monitorFemRunts
            Counter,
        monitorFemCollisions
            Counter
    }


monitorFemHubIndex OBJECT-TYPE
    SYNTAX  INTEGER ( 1..10 )
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "ID used to select a hub."
    ::= { monitorFemEntry 1 }

monitorFemInFrames OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION "Number of frames received by the FEM port."
    ::= { monitorFemEntry 2 }

monitorFemInDiscards OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION "Number of frames received and filtered by the
                 FEM port."
    ::= { monitorFemEntry 3 }

monitorFemInOctets OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION "Number of octets received by the FEM port."
    ::= { monitorFemEntry 4 }

monitorFemOutFrames OBJECT-TYPE
```

```
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "Number of frames transmitted by the FEM port."
        ::= { monitorFemEntry 5 }

    monitorFemOutDiscards OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "Number of frames transmitted to but filtered by
                     the FEM port."
        ::= { monitorFemEntry 6 }

    monitorFemOutOctets OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "Number of octets transmitted by the FEM port."
        ::= { monitorFemEntry 7 }

    monitorFemFCSErrors OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "Number of CRC errors received by the FEM port."
        ::= { monitorFemEntry 8 }

    monitorFemFrameTooLongs OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "Number of frames longer than 1518 bytes
                     received by the FEM port."
        ::= { monitorFemEntry 9 }

    monitorFemRunts OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "Number of frames shorter than 64 bytes received
                     by the FEM port."
        ::= { monitorFemEntry 10 }

    monitorFemCollisions OBJECT-TYPE
        SYNTAX  Counter
        ACCESS  read-only
        STATUS  mandatory
        DESCRIPTION "Number of collisions in the FEM port."
        ::= { monitorFemEntry 11 }


    --
    -- MEP port statistics
    --
    -- There is no need to implement MEP statistics. The MEP port
    -- can be accessed as repeater port 17.
    --



--
-- backup port group
--

    backupPortTableSize OBJECT-TYPE
        SYNTAX  INTEGER
        ACCESS  read-only
```

```
    STATUS  mandatory
    DESCRIPTION  "Table size of backup port pairs."
    ::= { backupPortInfo 1 }

backupPortTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF BackupPortEntry
    ACCESS  not-accessible
    STATUS  mandatory
    ::=  { backupPortInfo 2 }

backupPortEntry OBJECT-TYPE
    SYNTAX  BackupPortEntry
    ACCESS  not-accessible
    STATUS  mandatory
    INDEX   { backupIndex }
    ::=  { backupPortTable 1 }

BackupPortEntry ::= SEQUENCE
    {
        backupIndex
            INTEGER,
        backupPriPortGroup
            INTEGER,
        backupPriPortPort
            INTEGER,
        backupSecPortGroup
            INTEGER,
        backupSecPortPort
            INTEGER,
        backupPortAction
            INTEGER
    }

backupIndex OBJECT-TYPE
    SYNTAX  INTEGER (1..18)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Backup table index."
    ::= { backupPortEntry 1 }

backupPriPortGroup OBJECT-TYPE
    SYNTAX  INTEGER (1..10)
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Hub ID of the primary port."
    ::= { backupPortEntry 2 }

backupPriPortPort OBJECT-TYPE
    SYNTAX  INTEGER (1..17)
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Port number of the primary port."
    ::= { backupPortEntry 3 }

backupSecPortGroup OBJECT-TYPE
    SYNTAX  INTEGER (1..10)
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Hub ID of the secondary port."
    ::= { backupPortEntry 4 }

backupSecPortPort OBJECT-TYPE
    SYNTAX  INTEGER (1..17)
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Port number of the secondary port."
    ::= { backupPortEntry 5 }
```

```
    backupPortAction OBJECT-TYPE
        SYNTAX  INTEGER {
                         inactive(1),
                         active(2),
                         stand-by(3),
                         backup(4)
                        }
        ACCESS  read-write
        STATUS  mandatory
        DESCRIPTION "Setting this object to inactive(1) disables the
                     backup port function for this backup port pair.
                     Setting this object to active(2) will disable
                     the secondary port and enable the primary port.

                     When the backup port pair is activated, the
                     backup status of this port pair is reflected as
                     stand-by(3) or backup(4). Value stand-by(3)
                     indicates that the primary port is okay and
                     enabled.  Value backup(4) means that the
                     primary port has failed and the secondary port
                     has taken over.  After the secondary port has
                     taken over, setting this object to active(2)
                     will attempt to recover the primary port and
                     disable the secondary port.  Success here
                     depends on the ability to establish a good link
                     on the primary port.

                     The values stand-by(3) and backup(4) are read-
                     only. Attempting to set this object to either
                     of these two values is not valid.  The result
                     'snmpBadValue' will be returned."
        ::= { backupPortEntry 6 }

--
-- security port group
--

    securityPortTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF SecurityPortEntry
        ACCESS  not-accessible
        STATUS  mandatory
        ::=  { securityInfo 1 }

    securityPortEntry OBJECT-TYPE
        SYNTAX  SecurityPortEntry
        ACCESS  not-accessible
        STATUS  mandatory
        INDEX   { securityPortGroupIndex, securityPortIndex }
        ::=  { securityPortTable  1 }

    SecurityPortEntry ::= SEQUENCE
        {
            securityPortGroupIndex
                INTEGER,
            securityPortIndex
                INTEGER,
            securityAuthorizedAddr
                PhysAddress,
            securityAutoLearnAction
                INTEGER,
            securityIntrusionAction
                INTEGER,
            securityEavesdroppingAction
                INTEGER
        }

    securityPortGroupIndex OBJECT-TYPE
        SYNTAX  INTEGER
```

```
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "ID of a hub."
    ::= { securityPortEntry 1 }

securityPortIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION  "Port number in a hub."
    ::= { securityPortEntry 2 }

securityAuthorizedAddr OBJECT-TYPE
    SYNTAX  PhysAddress
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "Authorized source MAC address assigned to the
                  port."
    ::= { securityPortEntry 3 }

securityAutoLearnAction OBJECT-TYPE
    SYNTAX  INTEGER {
                    inactive(1),
                    active(2),
                    learned(3)
                   }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION "Setting this object to inactive(1) disables the
                 auto-learn function for the authorized physical
                 address of this port.  Once this object is set
                 to active(2), the agent will set the authorized
                 address to 0 first and then start the auto-
                 learn process and the hub will begin to read
                 the source address of the first incoming error-
                 free frame.  The source address obtained will
                 become the authorized address and the object
                 securityAuthorizedAddr will be changed
                 accordingly. When the authorized address has
                 been learned successfully, the status of this
                 port will be reflected as learned(3).
                 Otherwise the status will remain as active(2).
                 Setting to the last value, learned(3), is not
                 acceptable; 'snmpBadValue' will be returned."
    ::= { securityPortEntry 4 }

securityIntrusionAction OBJECT-TYPE
    SYNTAX  INTEGER {
                    inactive(1),
                    notify(2),
                    notify-and-disable(3)
                   }
    ACCESS  read-write
    STATUS  mandatory
    DESCRIPTION  "The object sets the action mode when the
                  source address of the port is different from
                  the securityAuthorizedAddr.

                  When set to inactive(1), disables the
                  intrusion protection of this port.

                  When set to notify(2), enables the intrusion
                  protection of the port. If the port receives a
                  frame with a source address different from the
                  securityAuthiruzedAddr, the agent sends a trap
                  message to the trap managers.
```

```
                        When set to notify-and-disable(3), also
                        enables the intrusion protection function.  If
                        the port receives a frame with a source
                        address different from the
                        securityAuthorizedAddr, the agent sends a trap
                        message port."
            ::= { securityPortEntry 5 }

        securityEavesdroppingAction OBJECT-TYPE
            SYNTAX  INTEGER {
                             inactive(1),
                             active(2)
                            }
            ACCESS  read-write
            STATUS  mandatory
            DESCRIPTION  "This object determines whether the
                          eavesdropping protection is in active state."
            ::= { securityPortEntry 6 }
--
--
--   IBM 8237 Traps
--
--
        intrusionHappen TRAP-TYPE
            ENTERPRISE  ibm8237
            VARIABLES   { securityPortGroupIndex, securityPortIndex }
            DESCRIPTION "An intrusion has occurred at the specified
                         port."
            ::= 1

        masterLinkFailEvent TRAP-TYPE
            ENTERPRISE  ibm8237
            VARIABLES   { backupPriPortGroup, backupPriPortPort,
                          backupSecPortGroup, backupSecPortPort }
            DESCRIPTION "The primary port has failed, and the secondary
                         port has been activated."
            ::= 2

        backupAgentRelay TRAP-TYPE
            ENTERPRISE  ibm8237
            VARIABLES   { basicHubIndex, basicSegmentIndex }
            DESCRIPTION "The primary agent has failed, and the backup
                         agent is now monitoring the system."
            ::= 3

        hubFanFailTrap TRAP-TYPE
            ENTERPRISE  ibm8237
            VARIABLES   { basicHubIndex }
            DESCRIPTION "A hub fan has failed."
            ::= 4

        ipAutoDiscoveryTrap TRAP-TYPE
            ENTERPRISE  ibm8237
            DESCRIPTION "The trap announces the presence of an SNMP-
                         managed device."
            ::= 5

    END
```

Appendix C. Product Warranty and Notices

International Business Machines Corporation Armonk, New York, 10504

Statement of Limited Warranty

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you originally purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. If you have any questions, contact IBM or your reseller.

Machine: IBM 8237 Stackable Ethernet Hub 10BASE-T

Warranty Period*: 1 year

**Contact your place of purchase for warranty service information.*

Production Status

Each Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's warranty terms apply.

The IBM Warranty for Machines

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications. The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if authorized by IBM, will provide warranty service under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

For IBM or your reseller to provide warranty service for a feature, conversion, or upgrade, IBM or your reseller may require that the Machine on which it is installed be 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many of these transactions involve the removal of parts and their return to IBM. You represent that all removed parts are genuine and unaltered. A part that replaces a removed part will assume the warranty service status of the replaced part.

If a Machine does not function as warranted during the warranty period, IBM or your reseller will repair it or replace it with one that is at least functionally equivalent, without charge. The replacement may not be new, but will be in good working order. If IBM or your reseller is unable to repair or replace the Machine, you may return it to your place of purchase and your money will be refunded.

If you transfer a Machine to another user, warranty service is available to that user for the remainder of the warranty period. You should give your proof of purchase and this Statement to that user. However, for Machines which have a life-time warranty, this warranty is not transferable.

Warranty Service

To obtain warranty service for the Machine, you should contact your reseller or call IBM. In the United States, call IBM at 1-800-IBM-SERV (426-7378). In Canada, call IBM at 1-800-565-3344. You may be required to present proof of purchase.

IBM or your reseller will provide certain types of repair and exchange service, either at your location or at IBM's or your reseller's service center, to restore a Machine to good working order.

When a type of service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange.

You agree to:

1. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
2. where applicable, before service is provided --
    a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provide,
    b. secure all programs, data, and funds contained in a Machine, and
    c. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Extent of Warranty

IBM does not warrant uninterrupted or error-free operation of a Machine.

The warranties may be voided by misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, removal or alteration of Machine or parts identification labels, or failure caused by a product for which IBM is not responsible.

THESE WARRANTIES REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.

Limitation of Liability

Circumstances may arise where, because of a default on IBM's part or other liability you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable only for:

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages or loss, up to the greater of U.S. $100,000 or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR LOSSES OR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), EVEN IF IBM OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only IBM's product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any of IBM's intellectual property rights may be used instead of the IBM product, program, or service. Evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the user's responsibility.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to the IBM Director of Licensing, IBM Corporation, 500 Columbus Avenue, THORNWOOD NY 10594 USA.

Electronic Emission Notices

Federal Communications Commission (FCC) Statement

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

IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Avis de conformité aux normes d'industrie Canada

Cet appareil numérique de la classe A respecte toutes les exigences du Reglement sur le materiel brouilleur du Canada.

European Community (CE) Mark of Conformity Statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Warning: THIS IS A CLASS A PRODUCT. IN A DOMESTIC ENVIRONMENT THIS PRODUCT MAY CAUSE RADIO INTERFERENCE IN WHICH CASE THE USER MAY BE REQUIRED TO TAKE ADEQUATE MEASURES.

Dieses Geraet ist berechtigt in Uebereinstimmung mit dem deutschen EMVG vom 9.Nov.92 das EG-Konformitaetszeichen zu fuehren. Der AuBteller der Konformitaetserklaerung ist die

IBM Corporation
P.O. Box 12195
Research Triangle Park, NC 27709
USA

Dieses Geraet erfuellt die Bedingungen der EN 55022 Klasse A. Fuer diese Klasse von Geraeten gilt folgende Bestimmung nach dem EMVG: Geraete duerfen an Orten, fuer die sie nicht ausreichend entstoert sind, nur mit besonderer Genehmigung des Bundesminesters fuer Post und elekommunikation oder des Bundesamtes fuer Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Stoerungen zu erwarten sind. Auszug aus dem EMVG vom 9.Nov.92, Para.3, Abs.4)

Hinwies:

Dieses Genehmigungsverfahren ist von der Deutschen Bundespost noch nicht veroeffentlicht worden.

Japanese Voluntary Control Council for Interference (VCCI) Statement

This equipment is in the 1st Class category (information equipment to be used in commercial and/or industrial areas) and conforms to the standards set by the Voluntary Control Council for Interference by Information Technology Equipment aimed at preventing radio interference in commercial and industrial areas.

Consequently, when used in a residential area or in an adjacent area thereto, radio interference may be caused to radios and TV receivers, and so on.

Read the instructions for correct handling.

注意

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づく第一種情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Korean Communications Statement

Please note that this device has been approved for business purpose with regard to electromagnetic interference. If you find this is not suitable for your use, you may exchange it for a non-business purpose one.

Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

AIX	NetView
EtherWatch	Nways
HelpCenter	Operating System/2
IBM	OS/2

Windows and Windows NT are registered trademarks of Microsoft Corporation.

Other company, product, and service names, which may be denoted by a double asterisk (**), may be trademarks or service marks of others.

Glossary of Terms and Abbreviations

This glossary defines terms and abbreviations used in this manual. It includes terms and definitions from the IBM Dictionary of Computing (New York; McGraw-Hill, Inc., 1994).

- The symbol (A) identifies definitions from the American National Standard Dictionary for Information Systems, ANSI X3.172-1990, copyright 1990 by, the American National Standards Institute (ANSI). Copies can be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018.
- The symbol (E) identifies definitions from the ANSI/EIA Standard - 440A: Fiber Optic Terminology, copyright 1989 by the Electronics Industries Association (EIA). Copies can be purchased from the Electronic Industries Association, 2001 Pennsylvania Avenue N.W., Washington, DC 20006.
- The symbol (I) identifies definitions from the Information Technology Vocabulary, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1).
- The symbol (T) identifies definitions from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1.

The following cross-references are used in this glossary:

Contrast with. This refers to a term that has an opposed or substantively different meaning from the IBM Dictionary of Computing

See. This refers the reader to multiple-word terms in which this term appears.

See also. This refers the reader to terms that have a related, but not synonymous, meaning.

Synonym for. This indicates that the term has the same meaning as a preferred term, which is defined in the glossary.

Special Characters

μm. Micrometer. One millionth part of one meter; synonymous with micron.

μs. Microsecond. One millionth part of one second.

Numerics

10BASE2. An IEEE 802.3 standard for baseband Ethernet data transmission at 10 Mbps over coaxial cable.

10BASE-FL. An IEEE 802.3 standard for baseband Ethernet data transmission at 10 Mbps over two multimode optical fibers.

10BASE-T. An IEEE 802.3 standard for baseband Ethernet data transmission at 10 Mbps over twisted pair cabling.

100BASE-FX. An IEEE 802.3 standard for baseband Ethernet data transmission at 100 Mbps over two multimode optical fibers.

100BASE-TX. An IEEE 802.3 standard for baseband Ethernet data transmission at 100 Mbps over two pairs of category 5 unshielded balanced cable or 150-ohm shielded balanced cable.

A

A. Ampere.

ac. Alternating current.

active. (1) Able to communicate on the network. A network adapter is active if it is able to transmit and receive on the network. (2) Operational. (3) Pertaining to a node or device that is connected or is available for connection to another node or device. (4) Currently transmitting or receiving.

adapter. In a LAN, within a communicating device, a circuit card that, with its associated software and/or microcode, enables the device to communicate over the network.

address. (1) In data communication, the IEEE-assigned unique code or the unique locally administered code assigned to each device or workstation connected to a network. (2) A character, group of characters, or a value that identifies a register, a particular part of storage, a data source, or a data sink. The value is represented by one or more characters. (T) (3) To refer to a device or an item of data by its address. (A) (4) The location in the storage of a computer where data is stored. (5) In word processing, the location, identified by the address code, of a specific section of the recording medium or storage. (T)**address resolution**. (1) A method for mapping network-layer addresses to media-specific addresses. (2) See also Address Resolution Protocol (ARP).

address resolution protocol (ARP). A protocol that dynamically maps between Internet addresses, baseband adapter addresses, X.25 addresses, and token-ring adapter addresses on a local area network.

agent. See Simple Network Management Protocol (SNMP) agent.

ANSI. American National Standards Institute.**application**. A collection of software components used to perform specific types of user-oriented work on a computer.**ASCII**. American National Standard Code for Information Interchange. The standard code, using a coded character set consisting of 2-bit coded characters (8 bits including parity check), that is used for information interchange among data processing systems, data communication systems, and associated equipment. The ASCII set consists of control characters and graphic characters. (A)

Note: IBM has defined an extension to ASCII code (characters 123-255).

attach. To make a device a part of a network logically.**attaching device**. Any device that is physically connected to a network and can communicate over the network.**AUI**. Attachment unit interface.

authentication. (1) In computer security, verification of the identity of a user or the user's eligibility to access an object. (2) In computer security, verification that a message has not been altered or corrupted. (3) In computer security, a process used to verify the user of an information system or protected resources. (4) A process that checks the integrity of an entity.

authentication entity. In the Simple Network Management Protocol (SNMP), the network management agent responsible for verifying that an entity is a member of the community it claims to be in. This entity is also responsible for encoding and decoding SNMP messages according to the authentication algorithm of a given community.

authentication failure. In the Simple Network Management Protocol (SNMP), a trap that may be generated by an authentication entity when a requesting client is not a member of the SNMP community.

auto-partition. In Ethernet repeaters, to shut off traffic in and out of a port when the port detects excessive an excessive frequency or duration of collisions. Auto-partitioned ports continue to transmit and receive, and when they are successful in either in a specified amount of time, they reconnect to the network automatically.

B

back pressure. A method of preventing network packets being transmitted onto a network segment by sending a jamming signal.

bandwidth. (1) The difference, expressed in hertz, between the highest and the lowest frequencies of a range of frequencies. For example, analog transmission by recognizable voice telephone requires a bandwidth of about 3000 hertz (3 kHz). (2) The bandwidth of an optical link designates the information-carrying capacity of the link and is related to the maximum bit rate that a fiber link can support.

baud. (1) A unit of signaling speed equal to the number of discrete conditions or signal events per second; for example, one baud equals one-half dot cycle per second in Morse code, one bit per second in a train of binary signals, and one 3-bit value per second in a train of signals each of which can assume one of eight different states. (A) (2) In asynchronous transmission, the unit of modulation rate corresponding to one unit interval per second; that is, if the duration of the unit interval is 20 milliseconds, the modulation rate is 50 baud. (A)

BBS. Bulletin Board System.

binary. (1) Pertaining to a system of numbers to the base two; the binary digits are 0 and 1. (A) (2) Pertaining to a selection, choice, or condition that has two possible different values or states. (I) (A)

bit. Either of the binary digits: 0 or 1.

bit-time. (1) The time required to transmit 1 bit on the network. For example, the IBM PC Network bit-time equals 500 nanoseconds (ns) and the Fast Ethernet bit-time equals 10 ns. (2) The reciprocal of the line data rate (or network data transfer rate).

BNC. A connector used with some coaxial cables.

BootP. Bootstrap Protocol.

Bootstrap Protocol (BootP). A protocol in the TCP/IP suite that permits a station to transmit a request for an IP address to a server and permits the server to assign a station an IP address based on the station's media access control (MAC) address. Together with the Trivial File Transfer Protocol (TFTP), BootP can also be used to send files.

bps. Bits per second.

bridge. (1) An attaching device that connects two LAN segments to allow the transfer of information from one LAN segment to the other. A bridge may connect the LAN segments directly by network adapters and software in a single device, or may connect network adapters in two separate devices through software and use of a telecommunications link between the two adapters. (2) A functional unit that connects two LANs that use the same logical link control (LLC) procedures

but may use the same or different medium access control (MAC) procedures. (T) Contrast with *gateway* and *router*.

broadband. (1) A frequency band between any two non-zone frequencies. (2) A frequency band divisible into several narrower bands so that different kinds of transmissions such as voice, video, and data transmission can occur at the same time. Synonymous with *wideband*. Contrast with *baseband*, *carrierband*.

broadband local area network (LAN). A local area network (LAN) in which information is encoded, multiplexed, and transmitted through modulation of a carrier. (T)

broadcast. Simultaneous transmission of data to more than one destination.

Btu. British thermal unit.

bus. (1) In a processor, a physical facility on which data is transferred to all destinations, but from which only addressed destinations may read in accordance with appropriate conventions. (I) (2) A network configuration in which nodes are interconnected through a bidirectional transmission medium. (3) One or more conductors used for transmitting signals or power. (A)

bus network. A network configuration that provides a bidirectional transmission facility to which all nodes are attached. A sending node transmits in both directions to the ends of the bus. All nodes in the path examine and may copy the message as it passes.

byte. (1) A string that consists of a number of bits, treated as a unit, and representing a character. (T) (2) A binary character operated upon as a unit and usually shorter than a computer word. (A) (3) A string that consists of a particular number of bits, usually 8, that is treated as a unit, and that represents a character. (4) A group of 8 adjacent binary digits that represent one extended binary-coded decimal interchange code (EBCDIC) character. (5) See *n-bit byte*.

C

cascade. To connect in a series or in a succession of stages so that each stage derives from or acts upon the product of the preceding stage.

coaxial cable. A cable consisting of one conductor, usually a small copper tube or wire, within and insulated from another conductor of larger diameter, usually copper tubing or copper braid.

collision. (1) An unwanted condition that results from concurrent transmissions on a channel. (T) (2) When a frame from a transmitting adapter encounters any other signal in its path (frame, noise, or another type of signal), the adapter stops transmitting and a collision is registered.

collision domain. In IEEE 802.3 networks, one segment or multiple segments that are interconnected physically by repeaters.

command. (1) A request for performance of an operation or execution of a program. (2) A character string from a source external to a system that represents a request for system action.

communication network management (CNM). The process of designing, installing, operating, and managing distribution of information and control among users of communication systems.

Community Name. A name given to a configured group of users authorized for management access to an SNMP enabled network device.

component. (1) Any part of a network other than an attaching device, such as an IBM 8228 Multistation Access Unit. (2) Hardware or software that is part of a functional unit.

configuration. (1) The arrangement of a computer system or network as defined by the nature, number, and chief characteristics of its functional units. More specifically, the term may refer to a hardware configuration or a software configuration. (I) (A) (2) The devices and programs that make up a system, subsystem, or network. (3) See also *system configuration*.

connect. In a LAN, to physically join a cable from a station to an access unit or network connection point. Contrast with attach.

CSMA/CD. Carrier sense multiple access with collision detection. The access protocol used in Ethernet networks.

D

data. (1) A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by human or automatic means. (I) (A) (2) Any representations such as characters or analog quantities to which meaning is or might be assigned. (A)

data link. (1) Any physical link, such as a wire or a telephone circuit, that connects one or more remote terminals to a communication control unit, or connects one communication control unit with another. (2) The assembly of parts of two data terminal equipment (DTE) devices that are controlled by a link protocol, and the interconnecting data circuit, that enable data to be transferred from a data source to a data sink. (I) **Note:** A telecommunication line is only the physical medium of transmission. A data link includes the

physical medium of transmission, the protocol, and associated devices and programs; it is both physical and logical.

data set ready (DSR). Synonym for *DCE ready*.

data transfer. (1) The result of the transmission of data signals from any data source to a data receiver. (2) The movement, or copying, of data from one location and the storage of the data at another location.

DCE ready. In the EIA 232 standard, a signal that indicates to the data terminal equipment (DTE) that the local data circuit-terminating equipment (DCE) is connected to the communication channel and is ready to send data. Synonymous with *data set ready (DSR)*.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified.

delimiter. (1) A character used to indicate the beginning or end of a character string. (T) (2) A bit pattern that defines the beginning or end of a frame or token on a LAN.

destination. Any point or location, such as a node, station, or particular terminal, to which information is to be sent.

device. (1) A mechanical, electrical, or electronic contrivance with a specific purpose. (2) An input/output unit such as a terminal, display, or printer. See also *attaching device*.

diagnostics. Modules or tests used by computer users and service personnel to diagnose hardware problems.

digital. (1) Pertaining to data in the form of digits. (A) Contrast with analog. (2) Pertaining to data consisting of numerical values or discrete units.

duplex mode. The method by which data is transmitted and received on a data link. Data can be sent and received at the same time, i.e. full-duplex mode, or sent and received one at a time, i.e. half-duplex mode.

E

EIA. Electronic Industries Association.

EIA 232. In data communications, a specification of the Electronic Industries Association (EIA) that defines the interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE), using serial binary data interchange.

end delimiter. The last byte of a token or frame, consisting of a special, recognizable bit pattern.

equipment rack. A metal stand for mounting network components, such as distribution panels and IBM 8237 Stackable Ethernet Hubs. Synonymous with *rack*.

Ethernet. A 10- or 100-megabit baseband local area network that allows multiple stations to access the transmission medium at will without prior coordination, avoids contention by using carrier sense and deference, and resolves contention by using collision detection and transmission. Ethernet uses carrier sense multiple access with collision detection (CSMA/CD).

Ethernet version 2. Also called DIX Ethernet, for DEC, Intel, and Xerox. Differs from IEEE 802.3 Ethernet in frame format only. Not an approved international standard but in more widespread use than IEEE 802.3 Ethernet.

F

feature. A part of an IBM product that may be ordered separately by the customer.

field. On a data medium or a storage medium, a specified area used for a particular category of data; for example, a group of character positions used to enter or display wage rates on a panel. (T)

field-replaceable unit (FRU). An assembly that is replaced in its entirety when any one of its components fails.

file. A named set of records stored or processed as a unit. (T)

file server. A high-capacity disk storage device or a computer that each computer on a network can access to retrieve files that can be shared among the attached computers.

File Transfer Protocol (FTP). In TCP/IP, an application protocol used for transferring files to and from host computers. FTP requires a user ID and possibly a password to allow access to files on a remote host system.

flash memory. A data storage device that is programmable, erasable, and does not require continuous power to retain its storage. The chief benefit of flash memory over other programmable and erasable data storage devices is that it can be reprogrammed without being removed from the circuit board.

forward mode. Method by which incoming data frames are sent to their destination port in a switch.

frame. (1) The unit of transmission in some LANs, including the IBM Token-Ring Network and the IBM PC Network. It includes delimiters, control characters, information, and checking characters. (2) A housing for machine elements. (3) In synchronous data link control (SDLC), the vehicle for every command, every response, and all information that is transmitted using

SDLC procedures. Each frame begins and ends with a flag.

ft. (1) Foot. (2) Feet.

FTP. (1) File Transfer Protocol. (2) Foiled twisted pair.

FRU. Field replaceable unit.

fully qualified path name. In an operating system, a file name that includes all directories and the drive in the hierarchical sequence above the file.

function. (1) A specific purpose of an entity, or its characteristic action. (A) (2) In data communications, a machine action such as carriage return or line feed.

functional unit. An entity of hardware, software, or both, capable of accomplishing a specified purpose. (I) (A)

G

gateway. A device and its associated software that interconnect networks or systems of different architectures. The connection is usually made above the reference model network layer. For example, a gateway allows LANs access to System/370 host computers. Contrast with *bridge* and *router*.

group. (1) A set of related records that have the same value for a particular field in all records. (2) A collection of users who can share access authorities for protected resources. (3) A list of names that are known together by a single name.

H

hardware. Physical equipment as opposed to programs, procedures, rules, and associated documentation. (I) (A)

header. The portion of a message that contains control information for the message such as one or more destination fields, name of the originating station, input sequence number, character string indicating the type of message, and priority level for the message.

hertz (Hz). A unit of frequency equal to one cycle per second.
Note: In the United States, line frequency is 60 Hz or a change in voltage polarity 120 times per second; in Europe, line frequency is 50 Hz or a change in voltage polarity 100 times per second.

hop. See *repeater hop*.

HMI. Hub Management Interface.

hub. In a network, a point at which circuits are either connected or switched. For example, in a star network, the central node, or in a star/ring network, the location of wiring concentrators.

Hz. Hertz.

I

IEC. International Electrotechnical Commission.

IEEE. Institute of Electrical and Electronics Engineers.

in. Inch.

in-band. A communication data stream transmitted within the primary signaling channel or frequency band.

input/output (I/O). (1) Pertaining to a device whose parts can perform an input process and an output process at the same time. (I) (2) Pertaining to a functional unit or channel involved in an input process, output process, or both, concurrently or not, and to the data involved in such a process.

interface. (1) A shared boundary between two functional units, defined by functional characteristics, common physical interconnection characteristics, signal characteristics, and other characteristics as appropriate. (I) (2) A shared boundary. An interface may be a hardware component to link two devices or a portion of storage or registers accessed by two or more computer programs. (A) (3) Hardware, software, or both, that links systems, programs, or devices.

interrupt. (1) A suspension of a process, such as execution of a computer program caused by an external event, and performed in such a way that the process can be resumed. (A) (2) An instruction that directs the microprocessor to suspend what it is doing and run a specified routine. When the routine is complete, the microprocessor resumes its original work.

IP. Internet Protocol.

IPX. Internetwork Packet Exchange.

IPX socket. Within a device attached to an IPX network, the address of a process, such as file service or diagnostics.

ISO. International Organization for Standardization.

J

jabbering. A condition in which a device is transmitting a frame that is longer than the maximum allowed length.

jack. A connecting device to which a wire or wires of a circuit may be attached and which is arranged for insertion of a plug.

K

kg. Kilogram.

km. Kilometer

kVA. Kilovolt ampere. A unit of power.

L

LAN. Local area network.

LAN segment. (1) Any portion of a LAN (for example, a single bus or ring) that can operate independently but is connected to other parts of the establishment network via bridges. (2) An entire ring or bus network without bridges.

layer. (1) One of the seven levels of the Open Systems Interconnection reference model. (2) In open systems architecture, a collection of related functions that comprise one level of hierarchy of functions. Each layer specifies its own functions and assumes that lower level functions are provided. (3) In SNA, a grouping of related functions that are logically separate from the functions of other layers. Implementation of the functions in one layer can be changed without affecting functions in other layers.

lb. Pound.

LED. Light-emitting diode

link. (1) The logical connection between nodes including the end-to-end link control procedures. (2) The combination of physical media, protocols, and programming that connects devices on a network. (3) In computer programming, the part of a program, in some cases a single instruction or an address, that passes control and parameters between separate portions of the computer program. (I) (A) (4) To interconnect items of data or portions of one or more computer programs. (5) In SNA, the combination of the link connection and link stations joining network nodes.

link connection. (1) All physical components and protocol machines that lie between the communicating link stations of a link. The link connection may include a switched or leased physical data circuit, a LAN, or an X.25 virtual circuit. In SNA, the physical equipment providing two-way communication and error correction and detection between one link station and one or more other link stations.

link test. In 10BASE-T and optical fiber based Ethernet, a signal sent back and forth between a port in a repeater and a port in an attached device to verify connection.

local area network (LAN). A computer network located on a user's premises within a limited geographical area.

locally administered address. In a local area network, an adapter address that the user can assign to override the universally administered address. Contrast with universally administered address.

logical connection. In a network, devices that can communicate or work with one another because they share the same protocol. See also *physical connection*.

M

m. Meter

MAC. Medium access control.

Management Information Base (MIB). In the Simple Network Management Protocol (SNMP), a collection of objects relating to a common management area. See also *MIB object*.

Mbps. One million bits per second.

medium access control (MAC) protocol. In a local area network, the part of the protocol that governs communication on the transmission medium without concern for the physical characteristics of the medium, but taking into account the topological aspects of the network, in order to enable the exchange of data between data stations. (T)

message. (1) A logical partition of the user device's data stream to and from the adapter. (2) A group of characters and control bits transferred as an entity.

MIB. Management Information Base.

MIB browser. A software tool, often shipped with network management applications, that allows working with any SNMP MIB that is written in abstract syntax notation 1 (ASN.1).

MIB object. In the Simple Network Management Protocol (SNMP), an object contained in the Management Information Base (MIB).

microcode. (1) One or more microinstructions. (2) A code, representing the instructions of an instruction set, that is implemented in a part of storage that is not program-addressable.

mm. Millimeter.

modem (modulator/demodulator). A device that converts digital data from a computer to an analog signal that can be transmitted in a telecommunication line, and converts the analog signal received to data for the computer.

N

n-bit byte. A string that consists of n bits. (T)

name. An alphanumeric term that identifies a data set, statement, program, or cataloged procedure.

NetView. A host-based IBM licensed program that provides communication network management (CNM)

or communications and systems management (C&SM) services.

network. (1) A configuration of data processing devices and software connected for information interchange. (2) An arrangement of nodes and connecting branches. Connections are made between data stations. (T)

network layer. (1) In the Open Systems Interconnection reference model, the layer that provides for the entities in the transport layer the means for routing and switching blocks of data through the network between the open systems in which those entities reside. (T) (2) The layer that provides services to establish a path between systems with a predictable quality of service. See *Open Systems Interconnection (OSI)*.

network management. The conceptual control element of a station that interfaces with all of the architectural layers of that station and is responsible for the resetting and setting of control parameters, obtaining reports of error conditions, and determining if the station should be connected to or disconnected from the network.

network manager. A program or group of programs that is used to monitor, manage, and diagnose the problems of a network.

node. (1) Any device, attached to a network, that transmits and/or receives data. (2) An endpoint of a link, or a junction common to two or more links in a network. (3) In a network, a point where one or more functional units interconnect transmission lines.

nonvolatile random access memory (NVRAM). Random access memory that retains its contents after electrical power is shut off.

null-modem cable. An EIA 232 serial cable wired so two terminals can communicate without the use of modems.

NVRAM. Nonvolatile random access memory.

O

octet. A byte that consists of 8 bits. (T)

ohm. A unit of measure of electrical resistance.

Open Systems Interconnection (OSI). (1) The interconnection of open systems in accordance with specific ISO standards. (T) (2) The use of standardized procedures to enable the interconnection of data processing systems.
Note: OSI architecture establishes a framework for coordinating the development of current and future standards for the interconnection of computer systems. Network functions are divided into seven layers. Each layer represents a group of related data processing and communication functions that can be carried out in a standard way to support different applications.

Open Systems Interconnection (OSI) architecture. Network architecture that adheres to a particular set of ISO standards that relates to Open Systems Interconnection. (T)

Open Systems Interconnection (OSI) reference model. A model that represents the hierarchical arrangement of the seven layers described by the Open Systems Interconnection architecture.

operation. (1) A defined action, namely, the act of obtaining a result from one or more operands in accordance with a rule that completely specifies the result for any permissible combination of operands. (A) (2) A program step undertaken or executed by a computer. (3) An action performed on one or more data items, such as adding, multiplying, comparing, or moving.

option. (1) A specification in a statement, a selection from a menu, or a setting of a switch, that may be used to influence the execution of a program. (2) A hardware or software function that may be selected or enabled as part of a configuration process. (3) A piece of hardware (such as a network adapter) that can be installed in a device to modify or enhance device function.

out-of-band. A communication data stream transmitted outside the primary signaling channel or frequency band.

output device. A device in a data processing system by which data can be received from the system. (I) (A) Synonymous with *output unit*.

output unit. Synonym for *output device*.

P

parallel port. A port that transmits the bits of a byte in parallel along the lines of the bus, 1 byte at a time, to an I/O device. On a personal computer, it is used to connect a device that uses a parallel interface, such as a dot matrix printer, to the computer. Contrast with *serial port*.

path. (1) In a network, any route between any two nodes. (T) (2) The route traversed by the information exchanged between two attaching devices in a network. (3) A command in IBM Personal Computer Disk Operating System (PC DOS) and IBM Operating System/2 (OS/2) that specifies directories to be searched for commands or batch files that are not found by a search of the current directory.

personal computer (PC). A desk-top, free-standing, or portable microcomputer that usually consists of a system unit, a display, a monitor, a keyboard, one or

more diskette drives, internal fixed-disk storage, and an optional printer. PCs are designed primarily to give independent computing power to a single user and are inexpensively priced for purchase by individuals or small businesses.

physical connection. The ability of two connectors to mate and make electrical contact. In a network, devices that are physically connected can communicate only if they share the same protocol. See also logical connection.

platform. (1) The operating system environment in which a program runs. (2) In computer technology, the principles on which an operating system is based.

plug. (1) A connector designed to insert into a receptacle or socket. (2) To insert a connector into a receptacle or socket.

port. (1) An access point for data entry or exit. (2) A connector on a device to which cables for other devices such as display stations and printers are attached.

POST. Power-on self-test.

power-on self-test (POST). A series of diagnostic tests that are run automatically each time the computer's power is turned on.

procedure. A set of instructions that gives a service representative a step-by-step procedure for tracing a symptom to the cause of failure.

protocol. (1) A set of semantic and syntactic rules that determines the behavior of functional units in achieving communication. (I) (2) A specification for the format and relative timing of information exchanged between communicating parties.

R

rack. Synonym for equipment rack.

random access memory (RAM). A computer's or adapter's volatile storage area into which data may be entered and retrieved in a nonsequential manner.

receive. To obtain and store information transmitted from a device.

repeater. In a network, a device that amplifies or regenerates data signals in order to extend the distance between attaching devices.

repeater hop. Counted when a frame passes through a repeater or its equivalent.

Reverse Address Resolution Protocol (RARP). A protocol that maintains a database of mappings between physical hardware addresses and IP addresses.

RFC. Request for comments.

router. An attaching device that connects two LAN segments, which use similar or different architectures, at the reference model network layer. Contrast with *bridge and gateway.*

Routing Information Protocol (RIP). In the Internet suite of protocols, an interior gateway protocol used to exchange intradomain routing information and to determine optimum routes between internet hosts. RIP determines optimum routes on the basis of route metrics, not link transmission speed.

S

SAP. (1) Service access point. (2) Service Advertising Protocol.

ScTP. Screened twisted pair.

segment. See *cable segment, LAN segment*.

serial. (1) Pertaining to a process in which all events occur one after the other; for example, serial transmission of the bits of a character according to V24 CCITT protocol. (T) (2) Pertaining to the sequential or consecutive occurrence of two or more related activities in a single device or channel. (A) (3) Pertaining to the sequential processing of the individual parts of a whole, such as the bits of a character or the characters of a word, using the same facilities for successive parts. (A)

Serial Line Internet Protocol (SLIP). A simple form of encapsulation for IP frames that enables them to travel over serial lines.

serial port. On personal computers, a port used to attach devices such as display devices, letter-quality printers, modems, plotters, and pointing devices such as light pens and mice; it transmits data 1 bit at a time. Contrast with parallel port.

server. (1) A device, program, or code module on a network dedicated to providing a specific service to a network. (2) On a LAN, a data station that provides facilities to other data stations. Examples are a file server, print server, and mail server.

Service Advertising Protocol (SAP). In Internetwork Packet Exchange (IPX), a protocol that provides the following:

- A mechanism that allows IPX servers on an internet to advertise their services by name and type. Servers using this protocol have their name, service type, and internet address recorded in all file servers running NetWare.
- A mechanism that allows a workstation to broadcast a query to discover the identities of all servers of all types, all servers of a specific type, or the nearest server of a specific type.

- A mechanism that allows a workstation to query any file server running NetWare to discover the names and addresses of all servers of a specific type.

shielded twisted pair (STP). An electrically conductive cable made up of one or more pairs of individually shielded wires with a shield over all the pairs.

SIGNAL. (1) A time-dependent value attached to a physical phenomenon for conveying data. (2) A variation of a physical quantity, used to convey data.

Simple Network Management Protocol (SNMP) agent. Software stored in the device being managed that exchanges Simple Network Management Protocol information with a network management station.

Simple Network Management Protocol (SNMP). In the internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices manages is defined and stored in the application's Management Information Base (MIB).

SLIP. Serial Line Internet Protocol.

SNMP. Simple Network Management Protocol.

SNMP Community. A configured group of users authorized for management access to an SNMP enabled network device.

socket. See *IPX socket*.

source address. A field in the medium access control (MAC) frame that identifies the location from which information is sent. Contrast with *destination address*.

start delimiter. The first byte of a token or frame, consisting of a special, recognizable bit pattern.

station. (1) A communication device attached to a network. The term used most often in LANs is an attaching device or workstation. (2) An input or output point of a system that uses telecommunication facilities; for example, one or more systems, computers, terminals, devices, and associated programs at a particular location that can send or receive data over a telecommunication line. See also *attaching device, workstation*.

STP. Shielded twisted pair.

subsystem. A secondary or subordinate system, or programming support, usually capable of operating independently of or asynchronously with a controlling system.

switch. On an adapter, a mechanism used to select a value for, enable, or disable a configurable option or feature.

synchronous. (1) Pertaining to two or more processes that depend on the occurrences of a specific event such as common timing signal. (I) (A) (2) Occurring with a regular or predictable timing relationship.

system. In data processing, a collection of people, machines, and methods organized to accomplish a set of specific functions. (I) (A)

system configuration. A process that specifies the devices and programs that form a particular data processing system.

system unit. (1) A part of a computer that contains the processing unit, and may contain devices such as disk and diskette drives. (2) In an IBM personal computer, the unit that contains the processor circuitry, ROM, RAM, and the I/O channel. It may have one or more disk or diskette drives.

T

telecommunication line. Any physical medium, such as a wire, that is used to transmit data.

telephone twisted pair. See *unshielded twisted pair (UTP)*.

Telnet. In TCP/IP, an application protocol that allows a user at one site to access a remote system as if the user's display station were locally attached. Telnet uses the Transmission Control Protocol as the underlying protocol.

terminal. In data communication, a device, usually equipped with a keyboard and display device, capable of sending and receiving information.

terminal emulator. A program that allows a device such as a microcomputer or personal computer to enter and receive data from a computer system as if it were a particular type of attached terminal.

TFTP. Trivial File Transfer Protocol.

throughput. (1) A measure of the amount of work performed by a computer system over a given period of time, for example, number of jobs per day. (I) (A) (2) A measure of the amount of information transmitted over a network in a given period of time. For example, a network's data transfer rate is usually measured in bits per second.

TIA. Telecommunications Industry Association.

topology. The physical or logical arrangement of nodes in a computer network. Examples include ring topology and bus topology.

transceiver. Any device that can transmit and receive traffic.

transmission medium. (1) A physical carrier of electrical energy or electromagnetic radiation. (2) The

physical medium that conveys data between data stations; for example, twisted-pair wire, optical fiber, coaxial cable. (T)

trap. In the Simple Network Management Protocol (SNMP), a message sent by a managed node (agent function) to a management station to report an exception condition.

Trivial File Transfer Protocol (TFTP). In TCP/IP, a protocol used for transferring files to and from host computers. It is a simpler form of the File Transfer Protocol, requiring no authentication and using less memory for storage.

twisted pair. A transmission medium that consists of two insulated conductors twisted together to reduce noise. (T)

U

universally administered address. The address permanently encoded in an adapter at the time of manufacture. All universally administered addresses are unique. Contrast with *locally administered address*.

unshielded twisted pair (UTP). One or more twisted pairs of copper wire in the unshielded voice-grade cable commonly used to connect a telephone to its wall jack.

UTP. Unshielded twisted pair.

V

V. Volt.

VT100. A character-mode workstation. Characters are sent immediately to the host system when a key is pressed.

variable. (1) In computer programming, a character or group of characters that refers to a value and, in the execution of a computer program, corresponds to an address. (2) A quantity that can assume any of a given set of values. (A)

version. A separate IBM-licensed program, based on an existing IBM-licensed program, that usually has significant new code or new function.

W

watt. Measurement of electrical power.

workstation. (1) An I/O device that allows either transmission of data or the reception of data (or both) from a host system, as needed to perform a job: for example, a display station or printer. (2) A configuration of I/O equipment at which an operator works. (T) (3) A terminal or microcomputer, usually one connected to a mainframe or network, at which a user can perform tasks.

write community. In SNMP, one or more network management stations that are known to a given agent and that are authorized to write to the MIB.

write community name. A text name that defines the write community: a password.

X

XMODEM. A protocol for file transfer between devices that specifies the sending of data in 123-byte blocks and is error-correcting.

Index

Numerics

A

B

C

D

E

F

H

I

J

L

M

N

P

R

S

T

U

V

W

X

Part Number: 85H8847

Printed in Taiwan