DEChub Network Modules

900-Series Concentrator Reference

Part Number: EK-CONTR-HR. A01

August 1997

This manual describes the DIGITAL DEChub 900-Series family of FDDI concentrators' functions and features.

Revision/Update Information: This is a new document.

FCC Notice — Class B Computing Device:
This equipment has been tested and found to comply with the limits for a Class B DIGITAL device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. Any modifications to this device - unless expressly approved by the manufacturer - can void the user's authority to operate this equipment under part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may cause harmful interference and (2) This device must accept any interference that may cause undesirable operation.

VCCI Notice — Class 2 Computing Device (Japan Class B):
This equipment is in the 2nd Class category (information equipment to be used in residential area or an adjacent area) and conforms to the standards set by the Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in such residential area.

When used near a radio or TV receiver, it may become the cause of radio interference. Read instructions for correct handling.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio and television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: (1) Reorient or relocate the receiving antenna. (2) Increase the separation between. (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. {3) Consult the dealer or an experienced radio/TV technician for help.

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3 FDDI Configuration Capabilities

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Preface

About This Manual

This manual describes DIGITAL's family of fiber distributed data interface (FDDI) concentrators.

Intended Audience

This manual is intended for:

- Pre-sales technical support — includes DIGITAL's technical sales force and Value Added Resellers (VARs).

- Post-sales support — includes DIGITAL's Multivendor Customer Service personnel and DIGITAL's customers.

Organization of This Manual

This manual is organized as follows:

Chapter/Appendix	Content
1	Introduces the DECconcentrators. This chapter provides an overview of concentrators and how they fit into various network topologies.
2	Lists and describes the functions, technical features and specifications of the DECconcentrator 900-series family.
3	Discusses supported FDDI configuration capabilities.
4	Describes some of the most common management tasks required by network manager; using MultiChassis Manager. Also included in the task examples are the relevant SNMP MIB object names for the convenience of non-MultiChassis Manager users.
A	Contains an overview of FDDI concepts.
B	Describes how to repair nonvolatile flash memory.
C	Describes fiber cable specifications for single-mode, multimode, and unshielded twisted-pair.

Firmware Updates

DIGITAL continuously improves the quality of its products through periodic firmware releases. To ensure the high quality and interoperability of firmware, always use the current versions of firmware.

FTP Location

You can get information about the latest firmware releases from your local DIGITAL reseller or your local DIGITAL sales office. You can also get this information by reading the README file found in

```
/pub/DEC/hub900/firmware@ftp.digital.com
```

How to Register

Firmware updates are customer-installable. To register for automatic notification of new firmware releases, return the business reply card supplied with the concentrator. Or, you can use the Internet by sending your name, title, and mailing address to:

```
dechub_notice@lkg.dec.com
```

How to Load New Firmware

Use the following tools to load new firmware:

Tool	Where to Get More Information
Flash Loader	*clearVISN User's Guide*

Conventions

This manual uses the following conventions:

Convention	Description
Note	Contains information of special importance.
Boldface type	In examples, indicates user input.
Italics	In examples, indicates a variable. In text, indicates emphasis or a book title.
`Monospaced type`	Indicates a literal example of system output.

Correspondence

Documentation Comments

If you have comments or suggestions about this document, send them to Network Products Engineering.

Attn.:   Documentation Project Manager
FAX: (508) 486-6093
E-MAIL: doc_feedback@lkg.mts.dec.com

Online Services

To locate product specific information, refer to the following online services:

BBS To read the Bulletin Board System, set your modem to 8 bits, no parity, 1 stop bit and dial 508-486-5777 (U.S.)

The DIGITAL Equipment Corporation Network Products Engineering Home Page on the World Wide Web is at the following addresses:

North America:	`http://www.networks.digital.com`
Europe:	`http://www.networks.europe.digital.com`
Australia:	`http://www.digital.com.au/networks`

Associated Documentation

The following documents provide related information.

Topic	Manual
clearVISN	*clearVISN Installation*
	clearVISN Overview
	clearVISN User's Guide
DECconcentrators	*DECconcentrator 900FH Installation and Configuration*
	DECconcentrator 900MX Installation and Configuration
	DECconcentrator 900TH Installation and Configuration
DEChubs	*DEChub Network Products Problem Solving*

Topic	Manual
DEChubs	*DEChub Network Configuration*
	DEChub Network Modules 900-Series Switch Reference
	DEChub Network Modules Repeater Reference
	DEChub 90 Owner's Manual
	DEChub 900 MultiSwitch Hub Manager Installation
	DEChub Network Modules Configuration Guide
Miscellaneous	*OPEN DECconnect Applications Guide*
	OPEN DECconnect Building Wiring Components and Application Catalog
	DECconnect System Planning and Configuration Guide
	Network Products Guide
	Bridge and Extended LAN Reference

How to Order Additional Documentation

To order additional documentation, use the following information:

To Order:	Contact:
By Telephone	USA (except Alaska, New Hampshire, and Hawaii): 1-800-DIGITAL (1-800-344-4825) Alaska, New Hampshire, and Hawaii: 1-603-884-6660 Canada: 1-800-267-6215
Electronically (USA only)	Dial 1-800-DEC-DEMO (For assistance, call 1-800-DIGITAL)
By Mail (USA and Puerto Rico)	DIGITAL EQUIPMENT CORPORATION P.O. Box CS2008 Nashua, New Hampshire 03061 (Place prepaid orders from Puerto Rico with the local DIGITAL subsidiary: 809-754-7575.)
By Mail (Canada)	DIGITAL EQUIPMENT of CANADA LTD. 940 Belfast Road Ottawa, Ontario, Canada K1G 4C2 Attn.: A&SG Business Manager
Internationally	DIGITAL EQUIPMENT CORPORATION Attn.: A&SG Business Manager c/o local DIGITAL subsidiary or approved distributor
Internally	U.S. Software Supply Business (SSB) DIGITAL EQUIPMENT CORPORATION 8 Cotton Road Nashua, New Hampshire 03063

Chapter 1

Introduction

Overview

This chapter provides an overview of the role of concentrators in an FDDI network.

In This Chapter

The following topics are described in this chapter:

Topic	Page
Concentrators	1-2
Physical Topologies	1-4
Concentrator Architecture	1-7

Concentrators

The concentrator is a device that connects stations or other concentrators to the FDDI network. It maps the logical token ring into a hierarchical physical tree. The concentrator is an active device that decodes, retimes, and modifies, if necessary, the data stream as it passes through the concentrator.

By cascading concentrators, you can create a tree topology. By connecting the root concentrator of a tree directly to the dual ring, you can create a dual ring of trees topology.

The main advantage of the concentrator is that it removes control of the ring topology from individual stations and places it in the concentrator itself. This feature increases the reliability of the network for all users. Network managers can use the concentrator to change the network topology by selectively removing or inserting attached nodes.

The concentrator plays a central role in FDDI topologies by:

- Providing the flexibility to accommodate diverse building wiring schemes

- Supporting building and campus wiring topologies through the creation of dual ring of trees topologies

- Functioning as the key component in the dual ring of trees topology

- Providing a connection point for end-stations or other concentrators in a physical tree

- Supporting small workgroup topologies when used in a standalone configuration

FDDI configuration capabilities of the DIGITAL's DEChub 900-Series concentrators are described in Chapter 3.

Concentrator Types

The FDDI standard defines two concentrator types:

- Single attachment concentrator (SAC). The SAC connects to another concentrator's M port via the S port.

- Dual attachment concentrator (DAC). The DAC has A and B ports for attaching to the dual ring or into a tree (acting as a SAC). The A port connects to the B port of a station or concentrator. The B port connects to the A port of a station or a concentrator.

DIGITAL's DEChub 900-Series concentrators are described and compared in Chapter 2.

Station Types

The FDDI standard defines two station types:

- Single Attachment Station (SAS)

  A SAS is a station with one connection to the ring. This configuration is the simplest type of connection and is made by connecting the S port of the SAS to an M port of a concentrator.

- Dual Attachment Station (DAS)

  A DAS is a station that is connected to both the primary and the secondary rings. A DAS has two types of ports: A and B. The A port connects to the another station's B port while the B port connects to another station's A port.

Network Environment

DECconcentrators can run in three network environments:

- DEChub 900 (Hub)

- DEChub ONE-MX (DEF1H)

- DEChub ONE (DEHUA)

Physical Topologies

This section shows examples of concentrator topologies. Configuration options are described in Chapter 3.

Standalone Concentrator Topology

Figure 1-1 shows an independent workgroup that requires a high speed network for intra-workgroup communication. This FDDI topology can use existing structured fiber optic or copper wiring, affording significant cost savings in prewired sites.

Figure 1-1: Concentrator in a Standalone Topology
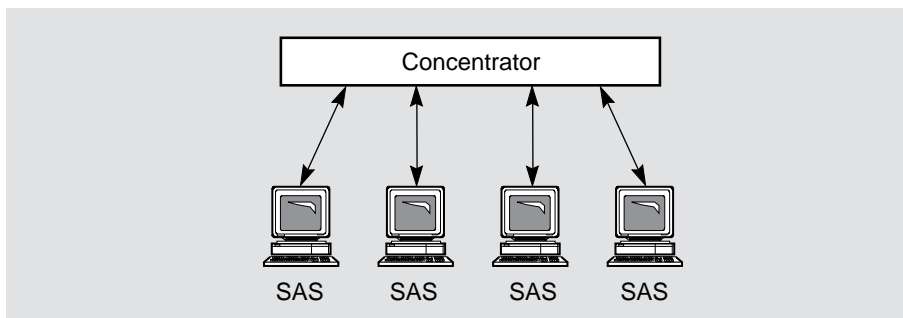
NPB-0354-95F

Tree Topology

Figure 1-2 shows a tree of concentrators. This topology provides greater flexibility for adding and removing FDDI concentrators and stations or changing their location without disrupting the FDDI LAN.

Figure 1-2: Concentrators in a Tree Topology
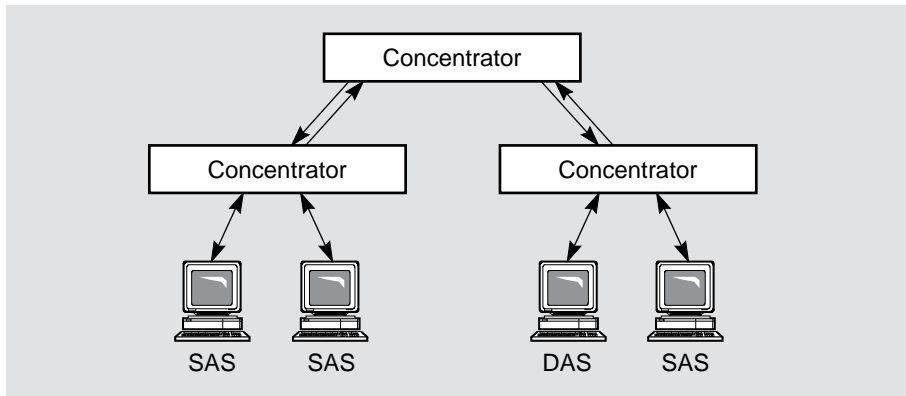
NPB-0520-96F

Dual Ring of Trees

Figure 1-3 shows concentrators cascading from other concentrators connected to a dual ring. The tree branches out by simply adding concentrators that connect to the primary ring through upper-level concentrators attached to the dual ring. Tree branches can be extended as long as the station number or ring distance limits are not exceeded.

Figure 1-3: Concentrators in a Dual Ring of Trees Topology
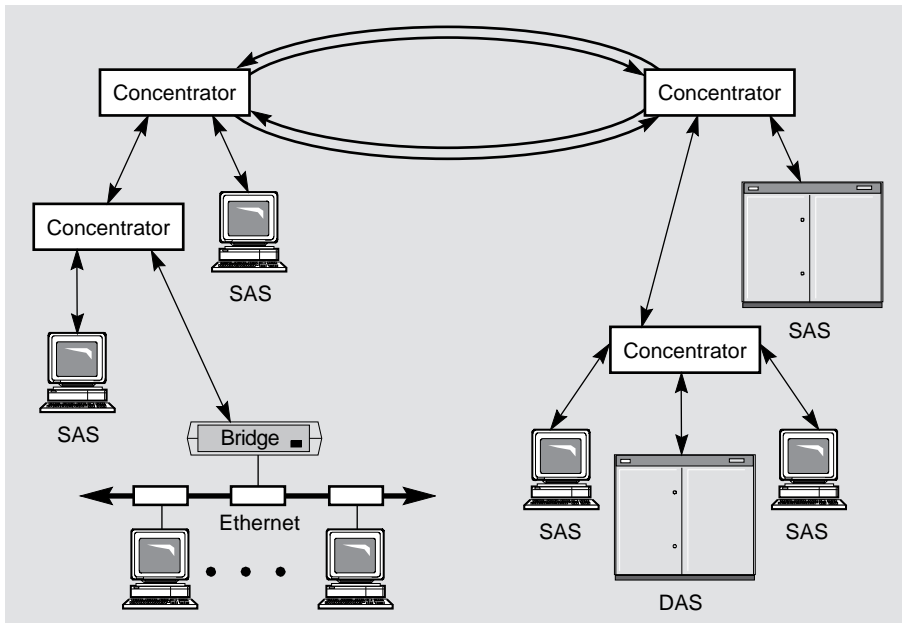
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Concentrator Architecture

The basic structure of the FDDI concentrator includes station management and an optional Media Access Control (MAC) entity. Its structure also includes several physical-layer protocol (PHY) medium-independent and physical-layer medium-dependent (PMD) entities for handling physical connections. Figure 1-4 illustrates the basic architecture of a concentrator.

Figure 1-4: Concentrator Architecture
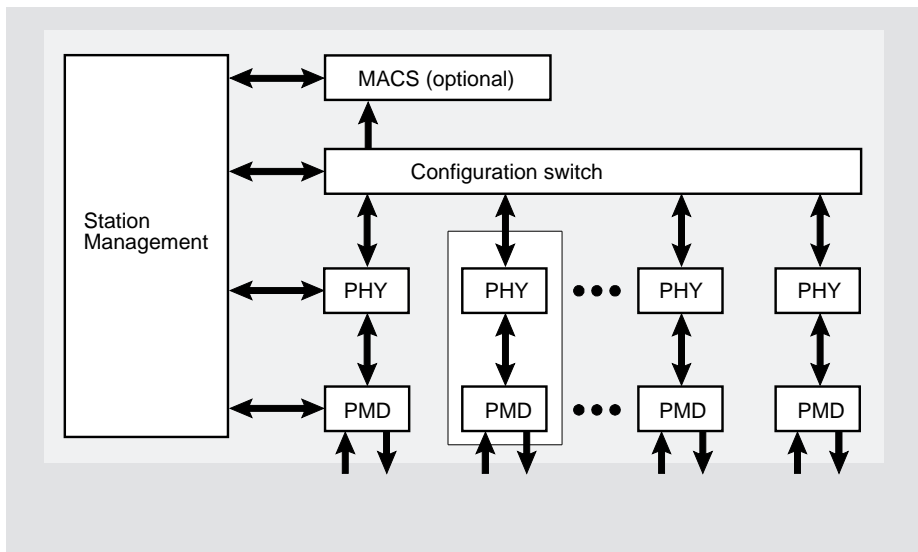
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Media Access Control (MAC)

The optional MAC entity provides MAC services to the concentrator. If the MAC entity is implemented, it is placed just in front of the outbound port. This helps to ensure that station management (SMT) station mapping can be performed accurately.

NOTE

All DECconcentrator 900 modules contain a MAC.

Configuration Switch

The configuration switch provides internal configuration capabilities to the concentrator, allowing it to disconnect any or all attached nodes from the ring. With the configuration switch, the concentrator can route the data path as required according to the number of attached devices. This switch also disconnects nonfunctional stations attached to the concentrator.

PHY Ports

Each PHY (physical layer protocol) and PMD (physical media dependent) combination makes up an FDDI PHY port. These PHY ports are full duplex with a transmit and receive function. Concentrator PHY ports can be A, B, M or S ports.

A and B ports connect the concentrator to the primary and secondary rings of the dual ring. B ports can also connect one concentrator to the M port of another concentrator in a tree configuration.

M ports connect stations or other concentrators to the FDDI network.

S ports connect single attachment concentrators to the M ports of another concentrator.

FDDI standards define the PMDs for the following media:

- Multimode fiber

- Single-mode fiber

- Unshielded twisted-pair

Station Management

Station management (SMT) provides services that monitor and control an FDDI node. The SMT allows stations to work cooperatively and ensure proper station operation. FDDI stations can have multiple instances of PMD, PHY, and MAC entities; but only one SMT entity.

MACs

Communication with the concentrator is accomplished via an optional MAC entity.

For More Information:

Topic	Information Location
Specific information on DECconcentrator configurations	Chapter 3
Managing DECconcentrators	Chapter 4
FDDI standards	Appendix A
Cable specifications	Appendix C

Chapter 2

900-Series Concentrators

Overview

This chapter lists and describes the functions, technical features and specifications of DECconcentrator 900-Series family.

In This Chapter

The following topics are covered in this chapter:

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DECconcentrator 900TH	2-10
DECconcentrator 900FH	2-16
Configuration Features	2-22
Default Configuration	2-28
Environmental Configurations	2-29
Out of Band Management	2-31

DEChub Concentrator Family

FDDI networks handle your high-speed, data-intensive networking demands and serve as a dedicated communications channel, a backbone, or a subnetwork.

Description

DIGITAL's DEChub concentrator product's include the following modules:

Product	Part Number	Description
DECconcentrator 900MX	DEF6X	8-port concentrator with 6 modular front panel ports and 2 backplane ports
DECconcentrator 900TH	DEFHU	16-port FDDI concentrator with 12 fixed UTP front-panel ports and 2 modular front panel ports plus 2 backplane ports
DECconcentrator 900FH	DEFHM	16-port FDDI concentrator with 12 fixed MMF front panel ports and 2 modular front panel ports plus 2 backplane ports

Features

The features of these concentrators are listed in Table 2-1.

Table 2-1: DEChub DECconcentrator Features

Feature	900MX	900TH	900FH
Dual homing	Yes	Yes	Yes
Dual ring connection support	Yes	Yes	Yes
FDDI ports	8 ports; 6 front panel ports and 2 backplane ports	16 ports; 14 front (12 are fixed UTP) ports and 2 backplane ports	16 ports; 14 front (12 are fixed SC optics) ports and 2 backplane ports
Modular ports	6	2	2
ModPMD options	Single-mode fiber, multimode fiber, and unshielded twisted-pair	Single-mode fiber, mulitmode fiber, and unshielded twisted-pair	Single-mode fiber, mulitmode fiber, and unshielded twisted-pair
MultiChassis Manager manageable (See Chapter 4)	Yes	Yes	Yes
Optical bypass port	Yes	Yes	Yes
Out-of band management	Yes	Yes	Yes
SNMP manageable	Yes	Yes	Yes
Software configurable A, B, M and S ports	Yes	Yes	Yes
Tree connection support	Yes	Yes	Yes

DECconcentrator 900MX

The DECconcentrator 900MX module (Figure 2-1) is an FDDI concentrator **for the DEChub 900 MultiSwitch family of modules. It has six front panel ports, two backplane ports and a six-pin MJ connector that supports optical bypass relay (OBR). It supports multiple cable media in a single product and operates in a single-slot hub configuration, or in the DEChub 900 MultiSwitch enterprise hub. You can put up to eight modules in a hub.**

Figure 2-1: DECconcentrator 900MX
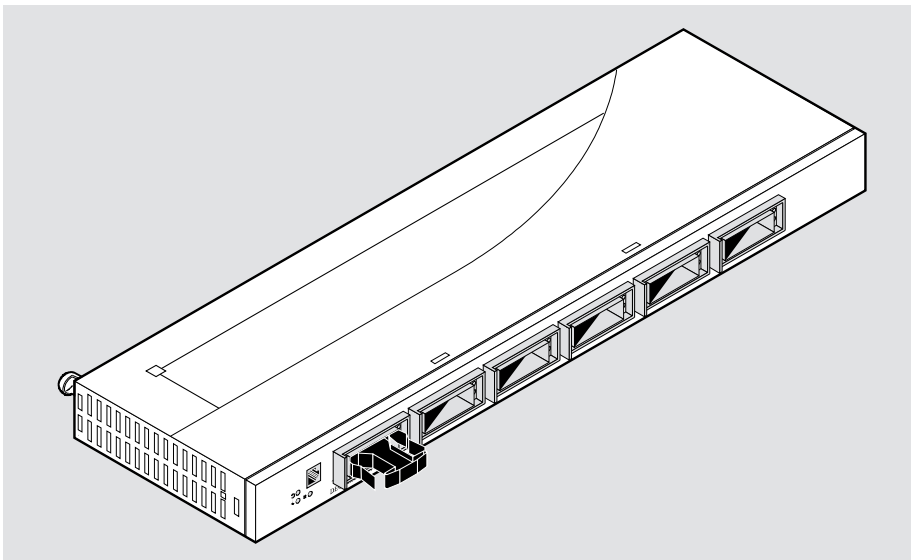
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The DECconcentrator 900MX supports six front panel FDDI station connections with any combination of multimode fiber (MMF), single-mode fiber (SMF), or unshielded twisted-pair (UTP) ModPMD ports. Two backplane ports can be used to create a dual ring connection or a treed connection across the DEChub 900 MultiSwitch backplane.

This product can be used as an entry level FDDI concentrator, or as a medium-to-high-end intelligent hub chassis-based product in the DEChub 900 MultiSwitch enterprise hub.

Port Assignments

The two ModPMD ports on the front panel and both of the back ports on the DECconcentrator 900MX are software configurable eliminating the need for two different modules and additional sparing. Depending upon your needs, you can configure one port as an FDDI A or M port, and the other port as an FDDI B, M, or S port. You can do the same with the backplane ports.

The A port connects to the incoming primary ring and the outgoing secondary ring of the FDDI dual ring. The B port connects to the outgoing primary ring and the incoming secondary ring of the FDDI dual ring. The M port connects an FDDI concentrator to a Single Attachment Station (SAS), Dual Attachment Station (DAS), or another concentrator. Table 2-2 lists DAS and SAS configurations.

Table 2-2: DECconcentrator 900MX Configurations

Station Type	Front Panel Ports	Backplane Ports	Environment
DAC	A, B, 4M	Not used	Hub, DEF1H[1], DEHUA[2]
DAC	A, 5M	B	Hub, DEF1H
DAC	B, 5M	A	Hub, DEF1H
DAC	6M	A, B	Hub, DEF1H
DAC	A, B, 4M	M	Hub, DEF1H
SAC	S, 5M	Not used	Hub, DEF1H, DEHUA
SAC	S, 5M	M	Hub, DEF1H
SAC	6M	S	Hub, DEF1H
SAC	6M	S, M	Hub, DEF1H

[1] DEChub ONE

[2] DEChub ONE MX

Port Configuration Capabilities

Figure 2-2 shows the configuration capabilities of the DECconcentrator 900MX. The left concentrator shows the configuration capabilities when the DECconcentrator 900MX is installed in a DEChub 900 MultiSwitch. The right concentrator shows the configuration capabilities when the DECconcentrator 900MX is installed in a docking station.

Port 1 can be configured as either an A or M port and Port 6 can be configured as either a B, S, or M port. Ports 2 to 5 are always M ports. The two backplane ports (ports 7 and 8) are also software configurable using MultiChassis Manager or the Setup Port menu in the DEChub ONE-MX.

Figure 2-2: DECconcentrator 900MX Port Configuration Capabilities
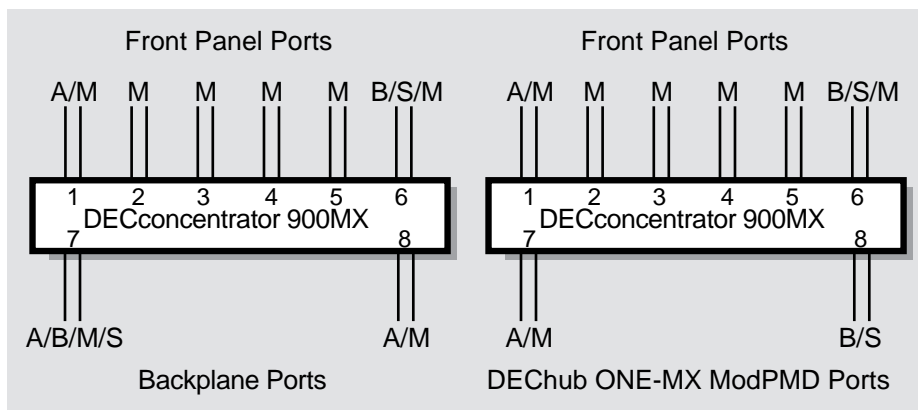
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Highlights

The DECconcentrator 900MX highlights include the following:

- Supports the following management information bases (MIBs):

    — MIB II, RFC 1213

    — FDDI MIB, RFC 1512

    — DIGITAL Extended MIB V2.9, 17-May-1994

    — PCOM MIB, June 1995

- Support for SMT 7.3 (X3.229-1994).

- Manageability using any generic SNMP management application that supports the MIBs listed above.

- IP Services support.

- Offers maximum configuration flexibility with eight total ports; four are software configurable as FDDI, A, B, M, or S ports.

- Flexible media options — the Modular Physical Medium Dependent (ModPMD) design supports Single-Mode Fiber, Multimode Fiber, and Unshielded Twisted-Pair, on a per port basis.

- Connects directly to the dual ring, eliminating downtime if the primary ring fails.

- Can be configured as either a SAC or a DAC.

- Allows for flexible network design by operating as a standalone single-slot DEChub ONE (6 ports), DEChub ONE-MX (8 ports), or in a DEChub 900 MultiSwitch enterprise hub.

- Contains a native SNMP agent for easy management in single-slot or multi-slot hub configurations.

- Provides an optical bypass port for use with an optical bypass relay (OBR).

Dimensions and Operating Specifications

Table 2-3 list the DECconcentrator 900MX dimensions and operating specifications.

Table 2-3: DECconcentrator 900MX Dimensions and Operating Specifications

Parameter	Specification
Operating Temperature[1]	5° C to 50° C (41°F to 122°F)
Power	42.5 W, total power 7.0 A, 5Vdc 0.1 A, 12Vdc[2] 0.5 A, 15Vdc
Depth	15.25 cm (6 in)[3]
Height	44.45 cm (17.5 in)
Width	4.45 cm (1.75 in)[4]
Weight	1.8 kg (4lb)
Relative Humidity	10% to 95% Non-condensing
Altitude	Sea Level to 4900 m (16,000 ft)
Connectors	6 Mod PMDs, 1 RJ12
Agency Certification	CE, CSA, FCC, TUV, UL, VCCI
Standards Compliance	ANSI X 3T9.5, X3T12, ISO9314-*, RFC 1512 and 1188

[1] For sites above 4900 m (16,000 ft), decrease the operating temperature specification by 1.8^{o}C for each 1000 m or3.2^{o}F for each 3200 ft.

[2] The 12V power in the DEChub 900 is derived from the 15V power source. Although it is listed separately in the prodict specifications, the 12V requirements are included in the 15V power total.

[3] Include an addtional 10.25 cm (4.0 in) when attached to a DEChub ONE; when attached to a DEChub ONE-MX, add 15.12 cm (5.9 in).

[4] Include an addtional 1.59 kg (3.5 lb) when attached to a DEChub ONE; when attached to a DEChub ONE-MX, add 2.10 kg (4.63 lb).

Ordering Information

Table 2-4 provides DECconcentrator 900MX ordering information.

Table 2-4: Ordering Information

Description	Order Number
DECconcentrator 900MX module with no PMDs installed	DEF6X-MA
DEChub ONE-MX single-slot chassis (required with DEF6X-MA for standalone use). Includes AUI network connector, power supply, hub setup port, and OBM port. Two slots for installing optional ModPMDs are also included.	DEF1H-##
DEChub ONE docking station	DEHUA-##
ModPMDs[1]:	
• Multimode fiber ANSI MIC connector	DEFXM-AA
• Multimode fiber SC connector	DEFXM-SC
• Single-mode fiber ST connector	DEFXS-BA
• UTP copper RJ45 connector	DEFXU-BA

country kit code. Order the following as needed: AA = United States, Canada, and Japan;
   AD = Denmark; AE = United Kingdom; AI = Italy; AK = Switzerland; AT = Israel;
   AX = Central Europe; AZ = Australia; BJ = India and South Africa.
[1] ModPMD modules must be ordered for installation in a DEF6X-MA box. Order up to six per
   DEF6X-MA box.

NOTES

The DECconcentrator 900MX module requires a DEChub 900 MultiSwitch
enterprise hub, a DEChub ONE, or a DEChub ONE MX single-slot chassis for
power. The DECconcentrator 900 software is preloaded.

DEF6X with DEChub ONE yields a six-port concentrator. DEF6X with a
DEChub ONE-MX yields an eight-port concentrator.

DECconcentrator 900TH

The DECconcentrator 900TH (Figure 2-3) module is a high density UTP FDDI concentrator **for the DEChub 900 MultiSwitch family of modules. It has 16-ports (14 on the front panel and two on the backplane) It supports multiple cable media on two ports and operates in either a single-slot hub configuration, or in the DEChub 900 MultiSwitch enterprise hub. You can put up to eight modules in a hub.**

Figure 2-3: DECconcentrator 900TH
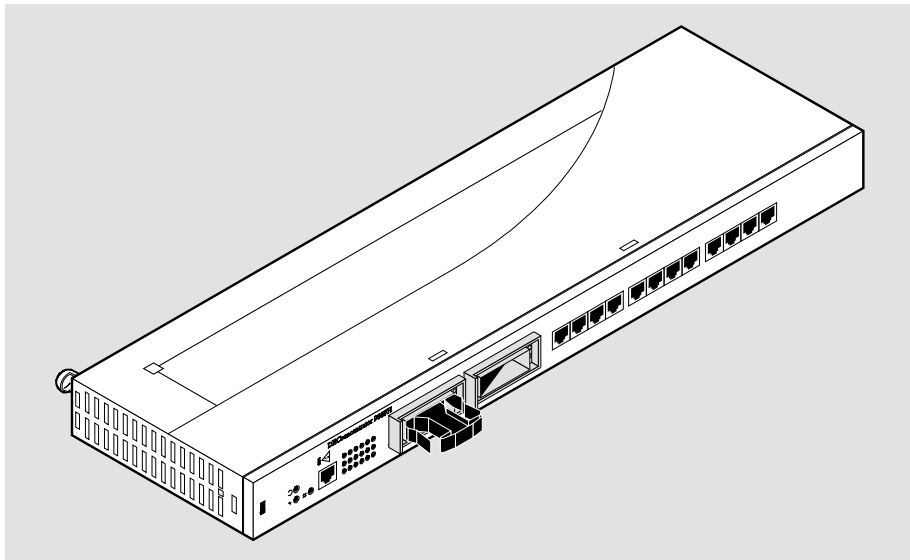
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The DECconcentrator 900TH supports 14 front panel FDDI station connections. Twelve of the front panel ports are fixed UTP connections using RJ45 connectors. You can configure the two remaining ports for either UTP, multimode fiber, or single-mode fiber by adding ModPMD modules. Two backplane ports create FDDI ring or tree connections across the DEChub 900 MultiSwitch backplane.

You can order preconfigured modules and design FDDI networks using the media types described in the previous paragraph. The ModPMD modules listed on page 2-15 can be configured in the DECconcentrator 900TH module (DEFHU-xx). This product can be used as an entry level FDDI concentrator, or as a medium-to-high-end intelligent hub chassis-based product using the DEChub 900 MultiSwitch enterprise hub.

Port Assignments

The two ModPMD ports on the front panel and both of the back ports on the DECconcentrator 900TH are software configurable, eliminating the need for two different modules and additional sparing. You can configure one front panel port as an FDDI A or M port, and the other one as an FDDI B, S, or M port. You can do the same with the backplane ports.

You can buy a pre-configured module, with the appropriate media, to connect directly to the dual ring or in an FDDI tree.

The A port connects to the incoming primary ring and the outgoing secondary ring of the FDDI dual ring. The B port connects to the outgoing primary ring and the incoming secondary ring of the FDDI dual ring. The M port connects an FDDI concentrator to a Single Attachment Station (SAS), Dual Attachment Station (DAS), or another concentrator. Table 2-5 lists all the possible configurations.

Table 2-5: DECconcentrator 900TH Configurations

Station Type	Front Panel Ports	Backplane Ports	Environment
DAC	A, B, 12M	Not used	Hub, DEF1H, DEHUA
DAC	A, 13M	B	Hub, DEF1H
DAC	B, 13M	A	Hub, DEF1H
DAC	14M	A, B	Hub, DEF1H
DAC	A, B, 12M	M	Hub, DEF1H
SAC	S, 13M	Not used	Hub, DEF1H, DEHUA
SAC	S, 13M	M	Hub, DEF1H
SAC	14M	S	Hub, DEF1H
SAC	14M	S, M	Hub, DEF1H

Port Configuration Capabilities

Figure 2-4 shows the configuration capabilities of the DECconcentrator 900TH. The left concentrator shows the configuration capabilities when the DECconcentrator 900TH is installed in a DEChub 900 MultiSwitch. The right concentrator shows the configuration capabilities when the DECconcentrator 900TH is installed in a docking station. Dual ring and tree connections are supported.

Figure 2-4: DECconcentrator 900TH Port Configuration Capabilities
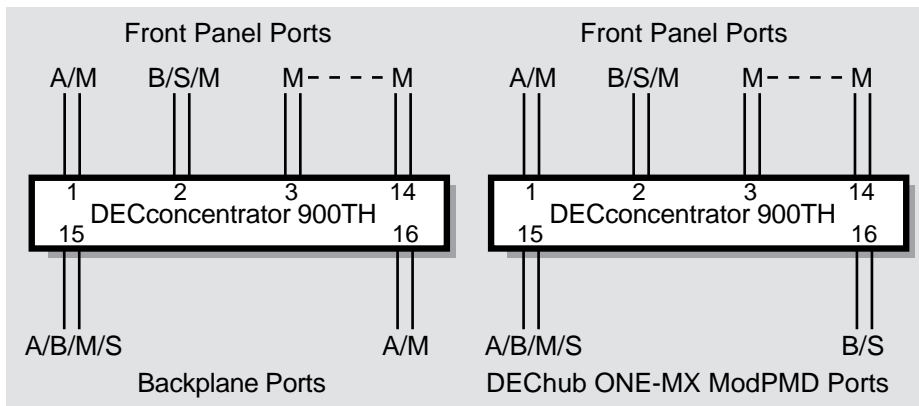
LKG-10067-96F

Highlights

The DECconcentrator 900TH highlights include the following:

- Supports the following management information bases (MIBs):

    — MIB II, RFC 1213

    — FDDI MIB, RFC 1512

    — DIGITAL Extended MIB V2.9, 17-May-1994

    — PCOM MIB, June 1995

- Support for SMT 7.3 (X3.229-1994).

- Manageability using any generic SNMP management application that supports the MIBs listed above.

- Offers maximum configuration flexibility with 16 total ports; four are software configurable as FDDI A, B, M, or S ports.

- Provides flexible media options — the modular Physical Medium Dependent (ModPMD) design supports single-mode fiber, multimode fiber, and unshielded twisted-pair (UTP).

- Can be configured as either a SAC or a DAC.

- Connects directly to the dual ring, eliminating downtime if the primary ring fails.

- Allows for flexible network design by operating as a standalone single-slot DEChub ONE-MX (16 ports), DEChub ONE (14 ports) or in a DEChub 900 MultiSwitch enterprise hub.

- Provides an optical bypass port for use with OBR relays.

- Provides IP services support.

- Contains a native SNMP agent for easy management in a single-slot or multi-slot hub configuration.

Dimensions and Operating Specifications

Table 2-6 lists the DECconcentrator 900TH dimensions and operating specifications.

Table 2-6: DECconcentrator 900TH Dimensions and Operating Specifications

Parameter	Specification
Operating Temperature[1]	5° C to 50° C (41°F to 122°F)
Power	50.5 W, total power 8.6 A, 5Vdc, 0.1 A, 12Vdc[2] 0.5 A, 15Vdc
Depth	15.25 cm (6 in)[3]
Weight	1.8 kg (4lb)[4]
Height	44.5 cm (17.5 in)
Width	4.45 cm (1.75 in)
Relative Humidity	10% to 95% Non-condensing
Altitude	Sea Level to 4800 m (16,000 ft)
Connectors	12 UTP (RJ45), 2 Mod PMDs, 1 RJ12 (OBR)
Agency Certification	CE, CSA, FCC, TUV, UL, VCCI
Standards Compliance	ANSI X 3T9.5, X3T12, ISO9314-*, RFC 1512 and 1188

[1] For sites above 4900 m (16,000 ft), decrease the operating temperature specification by 1.8°C for each 1000 m or 3.2°F for each 3200 ft.

[2] The 12V power in the DEChub 900 is derived from the 15V power source. Although it is listed separately in the prodict specifications, the 12V require,ents are included in the 15V power total.

[3] Include an addtional 10.25 cm (4.0 in) when attached to a DEChub ONE; when attached to a DEChub ONE-MX, add 15.12 cm (5.9 in).

[4] Include an addtional 1.59 kg (3.5 lb) when attached to a DEChub ONE; when attached to a DEChub ONE-MX, add 2.10 kg (4.63 lb).

Ordering Information

Table 2-7 provides DECconcentrator 900TH ordering information.

Table 2-7: Ordering Information

Description	Order Number
DECconcentrator 900TH module with no ModPMD ports	DEFHU-MX
DECconcentrator 900TH module with 2 multimode fiber ModPMD ports	DEFHU-MM
DECconcentrator 900TH module with 2 UTP ModPMD ports	DEFHU-MU
DEChub ONE-MX single-slot chassis (required for standalone use). Includes AUI network connector, power supply, hub setup port, and OBM port. Two slots for installing optional ModPMDs are also included.	DEF1H-##
DEChub ONE docking station	DEHUA-##
ModPMDs[1]:	
• Multimode fiber ANSI MIC connector	DEFXM-AA
• Multimode fiber with SC connector	DEFXM-SC
• Single-mode fiber ST connector	DEFXS-BA
• UTP copper RJ45 connector	DEFXU-BA

country kit code. Order the following as needed: AA = United States, Canada, and Japan;
  AD = Denmark; AE = United Kingdom; AI = Italy; AK = Switzerland; AT = Israel;
  AX = Central Europe; AZ = Australia; BJ = India and South Africa.
[1] Order up to two per DEFHU-*xx* box and two per DEFIH box.

NOTE

The DECconcentrator 900TH module requires a DEChub 900 MultiSwitch enterprise hub, DEChub ONE, or a DEChub ONE MX single-slot chassis for power. The DECconcentrator 900 software is preloaded.

DECconcentrator 900FH

The DECconcentrator 900FH module (Figure 2-5) is a 16-port multimode fiber (14 front panel ports and two backplane ports) FDDI concentrator for the DEChub 900 MultiSwitch family of modules. It supports two front panel modular ports for media flexibility, and can operate in either a single-slot hub configuration, or in the DEChub 900 MultiSwitch enterprise hub. You can put up to eight modules in a hub.

Figure 2-5: DECconcentrator 900FH
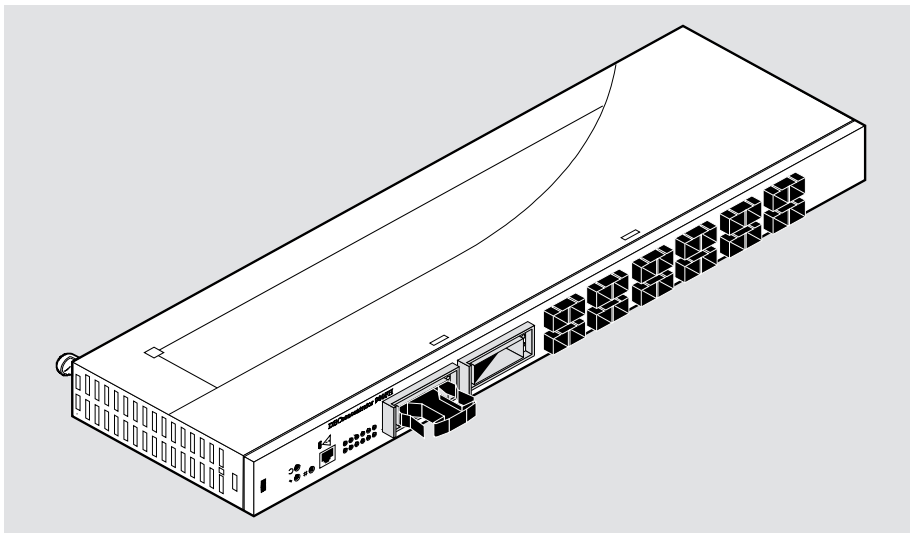
NPB-0353-95F

The DECconcentrator 900FH supports 12 front panel FDDI station connections with multimode fiber (MMF) using industry standard SC optics. You can configure the two remaining ports for either UTP, multimode fiber, or single-mode fiber by adding ModPMD modules. Two backplane ports create a dual ring or tree connection across the DEChub 900 MultiSwitch backplane. You can create up to four separate independent FDDI networks in a single hub.

You can order a preconfigured module option or custom-configure the base module to design FDDI networks using the media types described in the previous paragraph. The ModPMD modules listed on 2-21 can be configured in the DECconcentrator 900FH module (DEFHM-MX). This product can be used as an entry level FDDI concentrator, or as a medium to high-end intelligent hub chassis-based product using the DEChub 900 MultiSwitch enterprise hub.

Port Assignments

The two ModPMD ports on the front panel and both of the back ports on the DECconcentrator 900FH are software configurable, eliminating the need for two different modules and additional sparing. You can configure one front panel port as an FDDI A or M port, and the other one as an FDDI B, S, or M port. You can do the same with the backplane ports.

You can buy a pre-configured module, with the appropriate media, to connect directly to the dual ring or in an FDDI tree.

The A port connects to the incoming primary ring and the outgoing secondary ring of the FDDI dual ring. The B port connects to the outgoing primary ring and the incoming secondary ring of the FDDI dual ring. The M port connects an FDDI concentrator to a Single Attachment Station (SAS), Dual Attachment Station (DAS), or another concentrator. Table 2-8 contains all the configurations that can be used.

Table 2-8: DECconcentrator 900FH Configurations

Station Type	Front Panel Ports	Backplane Ports	Environment
DAC	A, B, 12M	Not used	Hub, DEF1H, DEHUA
DAC	A, 13M	B	Hub, DEF1H
DAC	B, 13M	A	Hub, DEF1H
DAC	14M	A, B	Hub, DEF1H
DAC	A, B, 12M	M	Hub, DEF1H
SAC	S, 13M	Not used	Hub, DEF1H, DEHUA
SAC	S, 13M	M	Hub, DEF1H
SAC	14M	S	Hub, DEF1H
SAC	14M	S, M	Hub, DEF1H

Port Configuration Capabilities

Figure 2-6 shows ModPMD Port 1 configured as either an A or M port and ModPMD Port 2 can be configured as either a B, S, or M port. The two backplane ports are also software configurable through MultiChassis Manager or the Setup Port menu. Therefore, both dual ring and tree connections can be supported.

Figure 2-6: DECconcentrator 900FH Port Configuration Capabilities
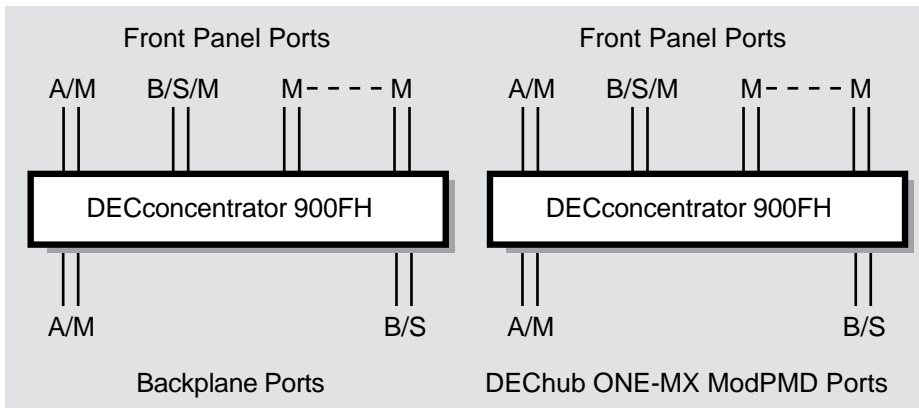
LKG-10124-96F

Highlights

The DECconcentrator 900FH highlights include the following:

- Supports the following management information bases (MIBs):

    — MIB II, RFC 1213

    — FDDI MIB, RFC 1512

    — DIGITAL Extended MIB V2.9, 17-May-1994

    — PCOM MIB, June 1995

- Support for SMT 7.3 (X3.229-1994).

- Manageability using any generic SNMP management application that supports the MIBs listed above.

- Offers maximum configuration flexibility with 16 total ports; four are software configurable as FDDI A, B, M, or S ports.

- Provides flexible media options — the modular Physical Medium Dependent (ModPMD) design supports single-mode fiber, multimode fiber, and unshielded twisted-pair (UTP).

- Can be configured as either a SAC or a DAC.

- Connects directly to the dual ring, eliminating downtime if the primary ring fails.

- Allows for flexible network design by operating as a standalone single-slot DEChub ONE-MX (16 ports), DEChub ONE (14 ports) or in a DEChub 900 MultiSwitch enterprise hub.

- Provides an optical bypass port for use with OBR relays.

- Provides IP services support.

- Contains a native SNMP agent for easy management in a single-slot or multi-slot hub configuration.

Dimensions and Operating Specifications

Table 2-9 list the DECconcentrator 900FH dimensions and operating specifications.

Table 2-9: DECconcentrator 900FH Dimensions and Operating Specifications

Parameter	Specification
Height	44.5 cm (17.5 in)
Width	4.45 cm (1.75 in)
Depth	15.25 cm (6 in)
Weight	1.8 kg (4 lb)
Temperature	5° C to 50° C (41°F to 122°F)
Relative Humidity	10% to 95% Non-condensing
Altitude	Sea Level to 4800 m (16,000 ft)
Power	10A @ 5Vdc; 0.6A @ + 15Vdc
Connectors	12 MMF SC, 2 ModPMDs, 1 RJ12 (OBR)
Agency Certification	UL, CSA, FCC, VDE, CE, VCCI
Standards Compliance	ANSI X 3T9.5, X3T12, ISO9314-*, RFC 1512 and 1188

* denotes variable

[1] For sites above 4900 m (16,000 ft), decrease the operating temperature specification by 1.8^{o}C for each 1000 m or 3.2^{o}F for each 3200 ft.

[2] The 12V power in the DEChub 900 is derived from the 15V power source. Although it is listed separately in the prodict specifications, the 12V require,ents are included in the 15V power total.

[3] Include an addtional 10.25 cm (4.0 in) when attached to a DEChub ONE; when attached to a DEChub ONE-MX, add 15.12 cm (5.9 in).

[4] Include an addtional 1.59 kg (3.5 lb) when attached to a DEChub ONE; when attached to a DEChub ONE-MX, add 2.10 kg (4.63 lb).

Ordering Information

Table 2-10: Ordering Information

Description	Order Number
DECconcentrator 900FH module with no modular PMDs installed	DEFHM-MX
DECconcentrator 900FH module preconfigured with two ANSI-MMF ModPMD ports	DEFHM-MM
DEChub ONE	DEHUA-##
DEChub ONE-MX single-slot chassis (required for standalone use). Includes AUI network connector, power supply, hub setup port, and OBM port. Two slots for installing optional ModPMDs are also included.	DEF1H-##
ModPMDs[1]:	
• Multimode fiber ANSI MIC connector	DEFXM-AA
• Multimode fiber with SC connector	DEFXM-SC
• Single-mode fiber ST connector	DEFXS-BA
• UTP copper RJ45 connector	DEFXU-BA

\# variable

\#\# country kit code. Order the following as needed: AA = United States, Canada, and Japan; AD = Denmark; AE = United Kingdom; AI = Italy; AK = Switzerland; AT = Israel; AX = Central Europe; AZ = Australia; BJ = India and South Africa.

[1] Order up to two per DEFHM-*xx* box and two per DEFIH box.

NOTES

The DECconcentrator 900FH module requires a DEChub 900 MultiSwitch enterprise hub, DEChub ONE (14 ports), or a DEChub ONE MX (16 ports) single-slot chassis for power.

The DECconcentrator 900 software is preloaded.

Configuration Features

DECconcentrator 900-Series modules support the following configuration features:

- Single Attachment Concentrator (SAC)
- Dual Attachment Concentrator (DAC)
- Dual ring and tree connection
- Dual homing
- Auto healing (this feature does not apply to standalone modules)
- Optical bypass switch
- Quick PC trace

Single Attachment Concentrator

A DECconcentrator 900 can be configured as a Single Attachment Concentrator (SAC) with one uplink connection to the backbone network. This is the simplest type of connection and is made by connecting the S port of the SAC to an M port of another concentrator.

Dual Attachment Concentrator

A Dual Attachment Concentrator (DAC) is a station that is connected to both the primary and the secondary fiber optic rings. A DAC has two ports: A and B. The A port connects to another station's B port while the B port connects to another station's A port.

Dual Ring and Tree Connections

All DIGITAL concentrators support dual ring connections (A and B ports) and tree connections (M and S ports) across the DEChub 900 backplane, or through the front panels of individual modules in a DEChub 900. DIGITAL concentrators also support dual ring connections (A and B ports) and tree connections (M and S ports) when configured stand-alone in either a DEChub ONE or a DEChub ONE-MX.

Dual Homing

Concentrators in an FDDI network provide a high degree of fault tolerance. Any number of stations attached to a single concentrator can fail, but the communications among the remaining stations continues. The concentrators are not protected in the sense that a fault in the concentrator may partition the ring such that the stations in the tree supported by the concentrator are unable to communicate with other stations in the network. A dual-homing configuration uses redundant concentrators and redundant paths (cabling). If one concentrator or its connections fail, the path to the network is kept though the dual homed connection.

Dual homing lets you connect the A and B ports of a dual attachment station to different concentrators. Only the B port is active. The A port is in the standby mode. Standby connections are not part of the ring, but if a problem occurs, the standby port can quickly be activated. This provides a high degree of fault tolerance. FDDI topology rules state that, given a choice of forming both A-M and B-M connections, a station should prefer to use B and not use A. Therefore, it is the A port that generally goes in the standby mode.

Refer to Chapter 3 for more information about dual homing.

Auto Healing

Auto healing is a feature of the DEChub 900 MultiSwitch. It does not apply to standalone modules. Auto healing is the ability to maintain (or heal) DEChub backplane FDDI connections when a module becomes non-operational. This is especially important with treed connections since they cannot restore the dual ring by wrapping.

Without the auto healing feature, the loss of a module results in the loss of all modules below that module in the tree. With auto healing enabled, for both dual ring and tree configurations, if a module is physically removed, or is determined to be unavailable, the DEChub 900 MultiSwitch heals the broken connection, thus restoring the network to operation. (Unavailable is defined as a condition in which the Hub Manager cannot communicate with the module for longer than three seconds. Such a condition is indicated by the word "Unavailable" in the lower line of the slot report in the LCD display on the DEChub 900 MultiSwitch Hub Manager.)

Auto healing is disabled by default. It can be enabled by the network manager through clearVISN MultiChassis Manager and continue to be enabled unless it is subsequently turned off by the network manager.

The auto healing features of the FDDI modules include:

• Reconfiguration around modules determined to be unavailable

• Support for cold swapping of modules

NOTE

Some outages are not detected, so healing cannot be guaranteed to always correct
the break in a tree, unless the module has been physically removed.

In high availability situations where outages longer than 500 milliseconds cannot be
tolerated, DIGITAL recommends that a dual-ring or dual homed configuration be
implemented. This ensures that the dual ring wraps and connectivity is maintained in
all cases.

With auto-healing enabled, if an FDDI module is removed from the DEChub 900 and
a module of the same type is reinstalled into the same slot, the Hub Manager
automatically restores the previous backplane configuration. This behavior occurs
whether the module is replaced with power applied to the hub (hot swapping), or when
the hub power is shut down (cold swapping). Auto-healing makes the repair of a faulty
module significantly less time consuming.

Finally, when an FDDI module is patched out of an FDDI configuration by auto-
healing, the LAN Interconnect window of MultiChassis Manager will flag that module
with a dashed line connection instead of a solid line. This is not automatically
displayed, but will appear when the window is refreshed. Modifications to the
clearVISN MultiChassis Manager LAN Interconnect window are disabled until the
patched-out condition is removed.

Optical Bypass Relay Switch

An external Optical Bypass Relay (OBR) switch, see Figure 2-7, can be used to
maintain connectivity of any DECconcentrator 900 to the FDDI network in the
absence of power or during fault conditions in a station. The OBR allows light to
bypass the optical receiver in the faulty station. In this way, the faulty station is
bypassed and the operation of the FDDI dual ring is maintained.

Figure 2-7: Optical Bypass Relay
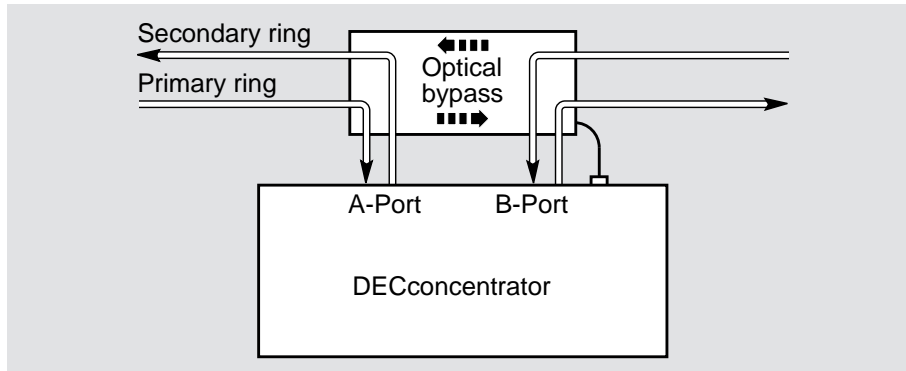
NPB-0627-96F

Quick PC Trace

A Quick PC Trace option is supported for all DEChub FDDI concentrator modules. As defined by the FDDI standard, a PC Trace is a method for recovering from a stuck beacon error condition. All stations that are in the fault domain perform some level of hardware diagnostic test before attempting to re-enter the FDDI network. Normally, concentrator modules run their full set of hardware diagnostics. This takes approximately one minute, but gives the highest level of assurance that any potential hardware failure is found. The Quick PC Trace option decreases the recovery time following a trace. When this option is enabled, only a subset of the hardware diagnostics is run whenever a PC trace occurs. The reduced set of diagnostic tests completes in approximately 10 seconds. This feature can be enabled and disabled only from the configuration screen of the module's setup port.

Reconfiguration Functions

The concentrator performs two reconfiguration functions:

- Station insertion

- Station bypass

Station insertion and station bypass are performed by the configuration switch, based on inputs from the SMT (station management). Ports can be switched into and out of the ring either by control of SMT connection management or with a management command if the concentrator has a MAC.

MAC and MAC-less Concentrators

The ANSI standards specify that concentrators can be constructed with or without a MAC entity. The addition of a MAC entity allows the concentrator to be managed by a remote management station across the FDDI network.

Depending on the requirements of a network or the desired application, the concentrator can be equipped with or without Media Access Control (MAC).

NOTE

All DECconcentrator 900 modules contain a MAC.

Concentrators normally operate without manual intervention and provide all basic services independent of MAC capability. A concentrator can be managed through a local management interface. A network manager can observe and control a concentrator directly, or remotely through a communications channel. Remote management can be provided through the same FDDI channel (referred to as in-band remote management) or through a separate management channel (referred to as out-of-band remote management).

Management adds the capabilities of remote monitoring and network configuration. In large networks, this functionality is usually required to ensure proper maintenance and control of the network.

Concentrators automatically configure the network and connect the stations to the network through the services of SMT Configuration Management (CMT) and Ring Management (RMT).

Station Bypass

Station bypass allows the concentrator to logically and physically disconnect a station from the network. The concentrator does this according to a specific set of conditions as set forth by the SMT Physical Connection Management (PCM). PCM, a service of the SMT entity, is part of the Connection Management (CMT) portion of SMT. It initializes the connection of neighboring PHYs. PCM also provides support for connection maintenance and detection of marginal connection conditions. The concentrator disconnects the station if one of the following events occurs:

- The attached station is powered off or the media is upgraded.
- The concentrator PCM detects a defective connection.
- The concentrator PCM is explicitly requested to reconfigure, by a network management entity, to remove an attached station from the network.
- The concentrator PCM detects a high error rate on the connection.

Link Error Monitor (LEM)

Independent of network management, the concentrator can remove and insert any connection. For example, the concentrator can disconnect itself from a SAS, or a DAS based on the results of the link error monitor (LEM), which is a function of CMT. The LEM monitors the connection bit error rate (BER). If a station's LEM determines that the BER is too high, the concentrator removes the connection to that station.

Physical Layer Medium Dependent (PMD) Standards

The PMD standards define the lower sublayer of the OSI physical layer. They describe the physical requirements for the nodes that attach to the FDDI network and the hardware connection between the nodes. They also provides all services necessary to transmit an FDDI-bit stream between stations. Fiber optic and copper cable are available in different sizes and types.

The PMD addresses the following requirements:

- Transmitter and receiver requirements, including power budget

- Transmitter and receiver waveform characteristics

- Conversion of electrical data signals to and from optical signals

- Jitter limits and permissible bit error rates

- Fiber optic cable requirements

Modular Physical Media Dependent (ModPMD) Modules

ModPMD interface modules allow flexibility so that DECconcentrators can be configured to various network cabling schemes. ModPMD modules are easily installed and are available in three basic types:

- Single-mode fiber (SMF)

- Multimode fiber (MMF)

- ANSI MIC or SC

- Unshielded twisted-pair (UTP)

Default Configurations

The default configuration for all DECconcentrator 900s, installed in a DEChub 900, is that all front panel ports are active and A and B ports are out the front. This means that no redirection to backplane ports or backplane connections is made between FDDI modules unless the network manager chooses to do so. The network manager must issue the appropriate MultiChassis Manager commands to establish FDDI networks across the backplane of the DEChub 900.

Changing Network Environments

The default configuration for all DECconcentrator 900s, installed with a DEChub ONE, is that ALL front panel ports are active and A and B ports are out the front. This is true for either the DEChub ONE, which has no direct support for FDDI ModPMD's, or the DEChub ONE-MX, which supports up to two ModPMD FDDI connections.

A network manager who wants to use the ModPMD ports of the DEChub ONE-MX, must issue the appropriate commands to enable the ModPMD ports. This can be done either via MultiChassis Manager or using the setup port of the DEChub ONE-MX.

Modules in a DEChub ONE or DEChub ONE-MX are required to perform two additional tasks. Firstly, the module must remember its configuration so that it restarts in the previously configured state following a power failure. This applies if a module is moved to the same type of DEChub ONE. Under this condition, as far as the module can tell, it is in the same environment as it was when it was powered off.

Secondly, the module must recognize a change of environment when moved between a DEChub 900, the DEChub ONE-MX, or the DEChub ONE. When the change of environment is detected, the module assumes the default condition of A and B ports out the front panel.

For example, if a DECconcentrator 900TH module, which had been configured with S and M type-ports on the back, is moved from a DEChub ONE-MX to another DEChub ONE-MX, the module will power up with the ModPMD ports of the second DEChub ONE-MX enabled as S and M ports. If the module is then moved to a DEChub ONE, it will detect an environment change, and power up with the front panel A and B type-ports enabled. If the front panel ports are reconfigured to S and M ports and then moved back to a DEChub ONE-MX, it will detect a new environment, and power up with the front panel ports enabled as A and B ports.

Also, if a module is moved from a DEChub ONE-MX to another DEChub ONE-MX with a different ModPMD configuration, the module will wake up assuming that it is still in the original DEChub ONE-MX, and will attempt to configure its ports to the remembered configuration. It does not use the change in media of the ModPMD ports to indicate a new environment.

Environmental Configurations

When the concentrator is in a DEChub ONE-MX, any one of nine different FDDI port configurations can be chosen via the setup port or MultiChassis Manager.

When the concentrator is in a DEChub ONE, only two FDDI port configurations are available via the setup port or MultiChassis Manager.

When the concentrator is in a DEChub 900, any one of nine different FDDI port configurations can be chosen. The FDDI port configurations cannot be selected via the setup port. MultiChassis Manager is used to put the module in the desired FDDI port configuration.

Table 2-11 contains all the environmental configurations that you can use. The default configuration is in bold type.

Table 2-11: Environmental Configurations

Station Type	Front Panel Ports	Backplane Port	Environment
DAC **(Default configuration)**	A, B and M	Not used	Hub, DEF1H, DEHUA
DAC	A and M	B	Hub, DEF1H
DAC	B and M	A	Hub, DEF1H
DAC	M	A and B	Hub, DEF1H
DAC	A, B and M	M	Hub, DEF1H
SAC	S, M	Not used	Hub, DEF1H, DEHUA
SAC	S, M	M	Hub, DEF1H
SAC	M	S	Hub, DEF1H
SAC	M	S and M	Hub, DEF1H

When the module is installed in a DEChub ONE or DEChub ONE-MX, the selected FDDI port configuration is stored in NVRAM. The selected configuration is maintained across a power failure and when the module is moved from a docking station to another docking station of the same type. This is true even if the numbers or types of ModPMDs in the docking stations are different.

Note that if the module is moved from one environment to a different environment, the selected configuration is deleted from NVRAM and the default configuration is used. However, all other stored information is retained (for example, in-band IP address, out-of-band address).

Table 2-12 contains the default configuration for the DECconcentrator 900TH and the DECconcentrator 900FH modules. Table 2-13 contains the default configuration for the DECconcentrator 900MX module.

Table 2-12: Default Configuration for the DECconcentrator 900TH and 900FH Modules

Port	Port Type
1	A
2	B
3-16	M
Backplane	Not used

Table 2-13: Default Configuration for the DECconcentrator 900MX Module

Port	Port Type
1	A
2 to 5	M
6	B
Backplane	Not used

Out-of-Band Management

You can use out-of-band management (OBM) facilities to manage DECconcentrator 900 modules that are installed into a DEChub ONE, DEChub ONE-MX, or a DEChub 900 MultiSwitch. These hubs have a serial OBM port that facilitates an alternative to in-band management. Thus, if the network providing the in-band connection fails, you can still use MultiChassis Manager to manage devices on the network by sending SNMP requests over Serial Line Internet Protocol (SLIP) via the OBM port.

The out-of-band management method offers the same functionality as in-band management, except that it is slower. You assign an OBM IP address and the OBM port speed via the HUB setup menu. The OBM port is a serial interface port that can be connected to a terminal server, personal computer or a modem. Supported baud rates are 1200, 2400, 4800, 9600, 19200 and 38400. If you want to switch from managing in-band to out-of-band, select the OBM IP address in MultiChassis Manager.

In-band management requires that the platform or module be assigned an in-band interface IP address as part of the configuration process. Communication with the network management station is then directed to this IP address.

The combination of the IP address and IP service module at the assigned slot location establishes the primary out-of-band management path. If you move the IP services module to another slot in the hub, you must redefine the location of the IP address.

You can also independently assign an IP address for the module that provides IP services, if you want to manage that module directly.

OBM Port and SLIP

The OBM port allows you to manage network modules with MultiChassis Manager over SLIP using a modem, or a direct connection to the OBM port. If your network management application supports a PING echo, you can use it to verify the SLIP connection. Typically, you use PING echo to verify that your network connection is operational.

You can also manage DEChubs by establishing a connection from MultiChassis Manager to an access server that supports SLIP. If you have a DECserver 900TM, DECserver 90TL, DECserver 90M, or a DECserver 900GM installed in your hub, you can establish a SLIP connection between one of the access server ports and the Hub Manager OBM port

For More Information

Topic	Where to Get More Information
Fiber cable specifications	Appendix C
	DECconcentrator 900-Series Installation and Configuration manuals
Using MultiChassis Manager windows	Chapter , Managing DIGITAL FDDI Concentrators, provides a listing of task-based examples that are often required by the network and system managers. Each task description includes the appropriate SNMP MIB object (where applicable) for non-MultiChassis Manager users.
Setting up SLIP connections	*clearVISN User's Guide*
Cable and adapter information	*DEChub 900 MultiSwitch Owner's Manual*

Chapter 3

FDDI Configuration Capabilities

Overview

This chapter describes FDDI configuration capabilities that are supported in DEChub 900 FDDI network modules. The descriptions discussed in this chapter assume that the reader is familiar with basic FDDI configuration rules and understands the differences between an A, B, M, and S port. If these terms are not familiar to you, refer to Appendix A in this manual for an overview of FDDI concepts that are discussed in this chapter.

In This Chapter

The following topics are covered in this chapter:

NOTE

Because FDDI switches (such as the DECswitch 900EF and the PEswitch 900TX) are key devices in FDDI networks, their capabilities and features are also included in this chapter.

Configuration Guidelines

This section details the configuration capabilities that are supported in the DEChub 900 family of FDDI products.

Individual FDDI Networks

Individual FDDI networks can be configured as either a dual ring or a tree. This allows compliance with FDDI configuration rules which operate at the module level and are independent of MultiChassis Manager.

Multiple FDDI Networks

In DEChubs supporting multiple FDDI networks on the backbone, some of the networks can be configured as dual rings and others can be configured as trees, but each of the individual networks can be of only one type. Dual rings of trees can be constructed by interconnecting the various networks across the front panel.

Single Attachment Concentrator (SAC)

DIGITAL's DEChub 900 family of FDDI products include Single Attach Concentrators (SACs) and Dual Attach Concentrators (DACs). A SAC has one S port and can have up to 15 M ports. A DAC has an A and B port, and can have up to 14 M ports.

Implications:

FDDI rules specify that stations with M ports are concentrators. Consequently, when a FDDI switch (such as, a DECswitch 900EF or a PEswitch 900TX) is configured with M and S ports, it reports as a concentrator in FDDI NIF (Neighbor Information Field) and SIF (Signaling Information Field) frame, and in the FDDI and SNMP MIBs.

MultiChassis Manager, FDDI monitors, and FDDI Ring Maps announce the station type of a treed DECswitch 900EF or PEswitch 900TX as a Single Attach Concentrator (SAC), rather than as a Single Attach Station (SAS).

Dual Ring and Trees

The terms, Dual Ring and Tree, are physical descriptions of the network topology. However, in all cases, the FDDI is a logical ring that enables a token to be passed from station-to-station in the ring. The physical implementation can be configured as a tree or a dual ring, but in all cases a logical ring exists.

DEChub 900 Backplane

Technically, any type of configuration (dual ring, tree, or dual ring of trees) can be created in the DEChub 900 backplane; however, for ease of use, only dual ring and tree configurations are supported.

Up to four independent FDDI networks can be created across the DEChub 900 backplane. Each of the created FDDI networks can be either a dual ring or a tree on the backplane, but not a mixture of both.

NOTE

A treed FDDI DEChub 900 backplane can connect to a dual ring that is external to the DEChub 900, and can be part of an overall dual ring of trees configuration.

Point-to-Point Connections

Note that any FDDI connection between two adjacent stations is actually two point-to-point connections, regardless of where the stations are physically located in the configuration (tree or dual ring). This is true for any FDDI product, whether the product is in a hub or operating standalone.

The backplane of the DEChub 900 MultiSwitch is used to make point-to-point connections between DEChub 900 FDDI network modules that are configured in the hub. One backplane channel is needed for each point-to-point connection.

Backplane Channels

Because two point-to-point connections are required between any two ports, two backplane channels are required for each connection between any two ports on the DEChub 900 FDDI network modules, regardless of the actual configuration.

Dual Ring Configurations

DEChub 900 FDDI network modules support front panel as well as backplane FDDI ports. When configured in a dual ring topology, ports are assigned a ring port (A port or B port) by management.

MultiChassis Manager users can assign a ring port using the Station Configuration window. Any SNMP based management software can also be used.

Because individual FDDI network modules can support a subset of these configurations, each of the FDDI network module capabilities are described in the following sections.

Dual Ring Port Configuration Examples

Figure 3-1 shows the basic dual attachment station (DAS) port configurations that can be management assigned.

Figure 3-1: Dual Ring Port Configurations
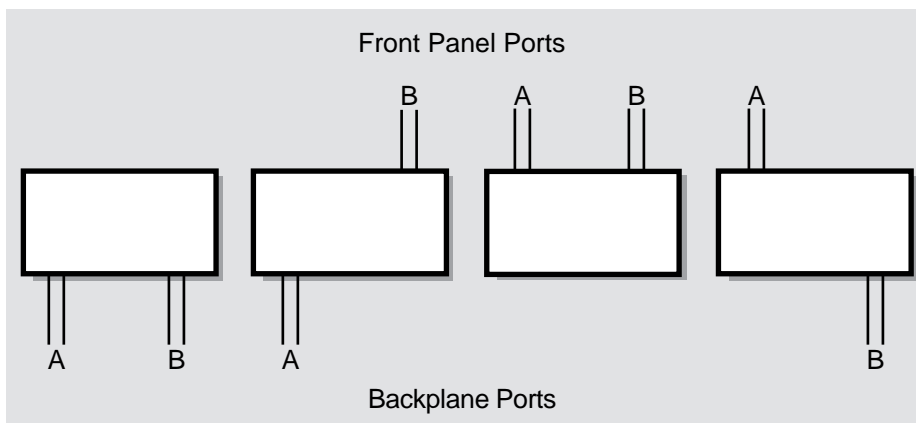
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Tree Configurations

When connected in a tree configuration, front panel ports and backplane ports are assigned a tree port (M port or S port) by management.

MultiChassis Manager users can assign a tree port using the Station Configuration window. Any SNMP based management software can be used.

Tree Port Configuration Examples

Figure 3-2 shows the tree port configurations that can be management assigned.

Figure 3-2: Tree Port Configurations

Front Panel Ports
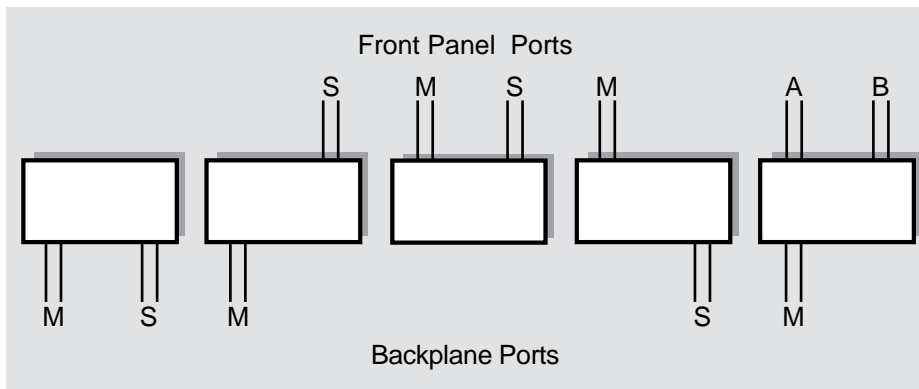
Backplane Ports

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Dual Homed Configuration

In Figure 3-2, note the fifth configuration with an M port in the backplane, and A and B ports on the front panel. This configuration is only implemented in concentrators and is used for connecting to a dual ring, or in a dual homed configuration.

Also, note that when the user-accessible FDDI ports are reconfigured as tree ports, the A port always becomes an M port and the B port always becomes an S port. This is true for either front panel ports or ModPMD ports in a DEChub ONE-MX docking station.

DECconcentrator 900MX

The DECconcentrator 900MX is an eight-port FDDI concentrator (six front panel ports and two backplane ports). The two backplane ports (Figure 3-3) attach to a DEChub 900 MultiSwitch backplane or to a DEChub ONE-MX docking station that supports ModPMDs.

Port Assignments

Port 1 can be configured as either an A or M port and Port 6 can be configured as either a B, S, or M port. Ports 2 to 5 are always M ports. The two backplane ports (ports 7 and 8) are also software configurable using MultiChassis Manager or the setup port when in a DEChub ONE-MX.

Figure 3-3: DECconcentrator 900MX Port Configuration Capabilities

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DECconcentrator 900TH

The DECconcentrator 900TH is a 16-port FDDI concentrator (fourteen front panel ports and two backplane ports). The two backplane ports, see Figure 3-4, attach to a DEChub 900 MultiSwitch backplane or to a DEChub ONE-MX docking station that supports ModPMDs.

Twelve of the front panel ports are fixed unshielded twisted pair (UTP) connections. The two remaining ports can be configured for either UTP, multimode fiber (MMF), or single mode fiber (SMF) by the addition of ModPMD modules.

Port Assignments

ModPMD Port 1 can be configured as either an A or M port and ModPMD Port 2 can be configured as either a B, S, or M port. The two backplane ports are also software configurable through MultiChassis Manager or the setup port when in a DEChub ONE-MX. Therefore, both dual ring and tree connections can be supported.

Figure 3-4: DECconcentrator 900TH Port Configuration Capabilities
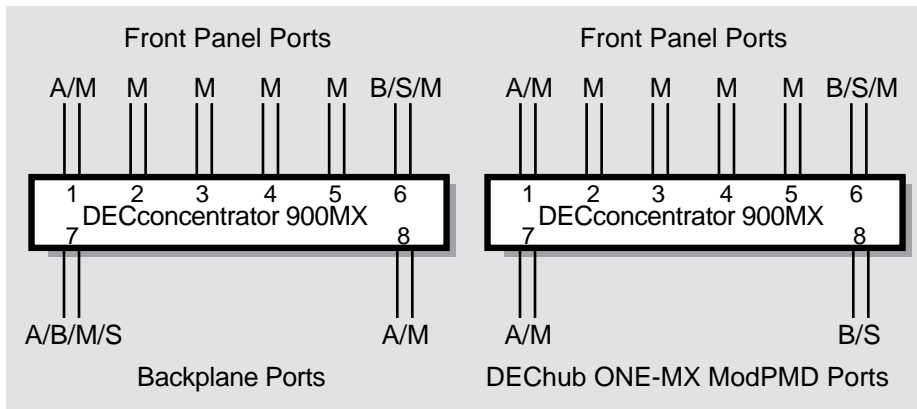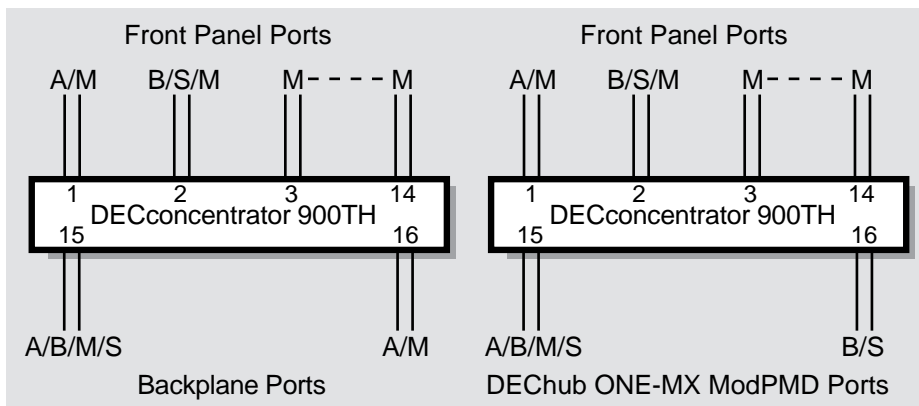

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DECconcentrator 900FH

The DECconcentrator 900FH is a 16-port FDDI concentrator (fourteen front panel ports and two backplane ports). The two backplane ports, see Figure 3-5, attach to a DEChub 900 MultiSwitch backplane or to a DEChub ONE-MX docking station that supports ModPMDs.

Twelve of the front panel ports are fixed multimode fiber (MMF), SC optics connections. The two remaining ports can be configured for either UTP, multimode fiber (MMF), or single mode fiber (SMF) by the addition of ModPMD modules.

Port Assignments

ModPMD Port 1 can be configured as either an A or M port and ModPMD Port 2 can be configured as either a B, S, or M port. The two backplane ports are also software configurable through MultiChassis Manager or the setup port when in a DEChub ONE-MX. Therefore, both dual ring and tree connections can be supported.

Figure 3-5: DECconcentrator 900FH Port Configuration Capabilities
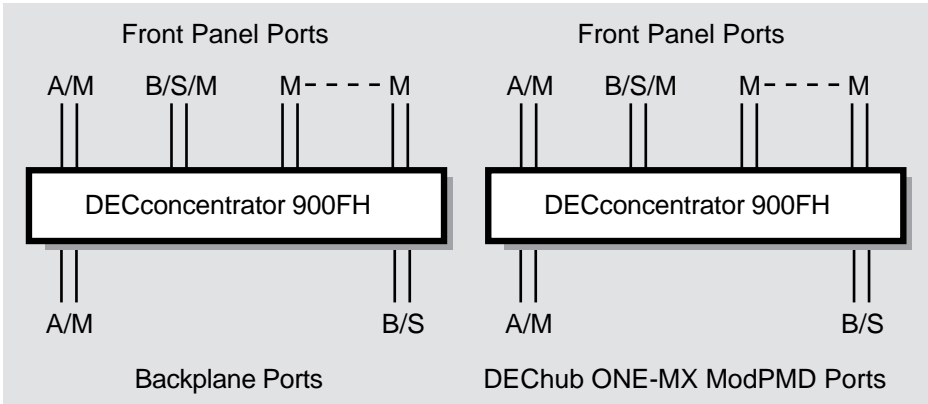
LKG-10124-96F

DECswitch 900EF

The DECswitch 900EF (previously called the DECbridge 900MX) supports two FDDI ports that can be individually assigned to either the module's front panel (Port 1A/M and Port 1B/S) or to the backplane ports for connection to a DEChub 900 MultiSwitch or to a DEChub ONE-MX docking station. Therefore, the DECswitch 900EF module can have only two FDDI ports that are active at any time (for example, two front panel ports, one front panel and one backplane port, or two backplane ports).

Port Assignments

The FDDI port assignments are software configurable via MultiChassis Manager or the setup port when in a DEChub ONE-MX. Figure 3-6 shows how two front panel ports, two backplane ports, or a front panel port and a backplane port can be configured as A and B ports or M and S ports.

Figure 3-6: DECswitch 900EF Port Configuration Capabilities
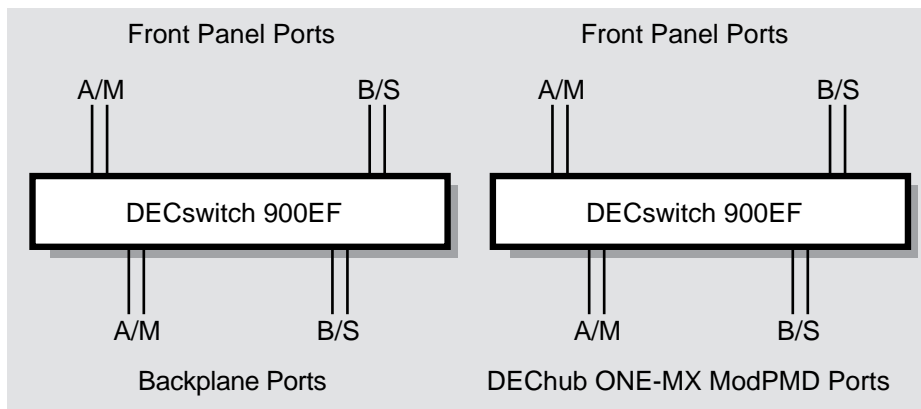
LKG-10068-96F

PEswitch 900TX

Unlike the DECswitch 900EF module, the PEswitch 900TX module supports two FDDI port connections to the DEChub 900 MultiSwitch backplane or to the DEChub ONE-MX docking station only. There are no front panel FDDI ports on the PEswitch 900TX module.

Port Assignments

The FDDI port assignments are software configurable via MultiChassis Manager or the setup port when in a DEChub ONE-MX. Figure 3-7 shows how the backplane FDDI ports can be configured as either A and B or M and S connections at any time.

Figure 3-7: PEswitch 900TX Port Configuration Capabilities
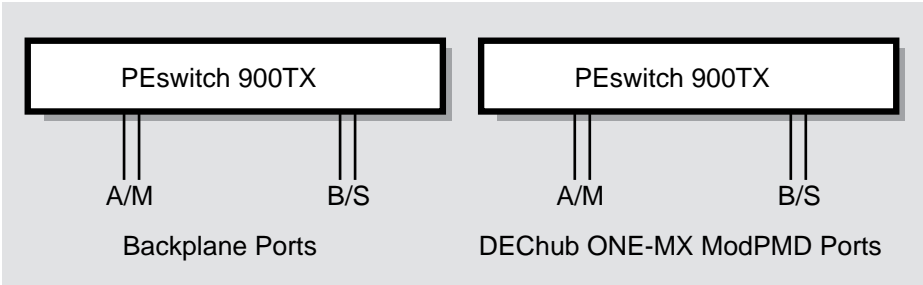
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FDDI in the Hub Backplane

The DEChub 900 MultiSwitch and the DEChub ONE-MX use a building block approach for configuring FDDI on the backplane. The network manager assigns a port type by selecting a building block.

FDDI Building Blocks

Building blocks are divided into two groups:

- Ring Building Blocks

- Tree Building Blocks

There are nine building blocks; four are used for building dual rings, and five are used for building trees.

MultiChassis Manager only allows connections to be made between building blocks of the same group (ring group or tree group), in order to avoid errors such as connections that break because of the FDDI standard's preference for trees over dual rings.

Ring Building Blocks

The four ring building blocks, see Figure 3-8, are as follows:

Name	Description
Trunk B	Port A is assigned to the FDDI network module's front panel. Port B is assigned to the DEChub 900 backplane or to the DEChub ONE-MX ModPMD.
Trunk AB	Ports A and B are assigned to the DEChub 900 backplane or to the DEChub ONE-MX ModPMD.
Trunk A	Port A is assigned to the DEChub 900 backplane or to the DEChub ONE-MX ModPMD. Port B is assigned to the FDDI network module's front panel.
Stump Primary	Ports A and B are assigned to the FDDI network module's front panel.

Figure 3-8: Ring Building Blocks
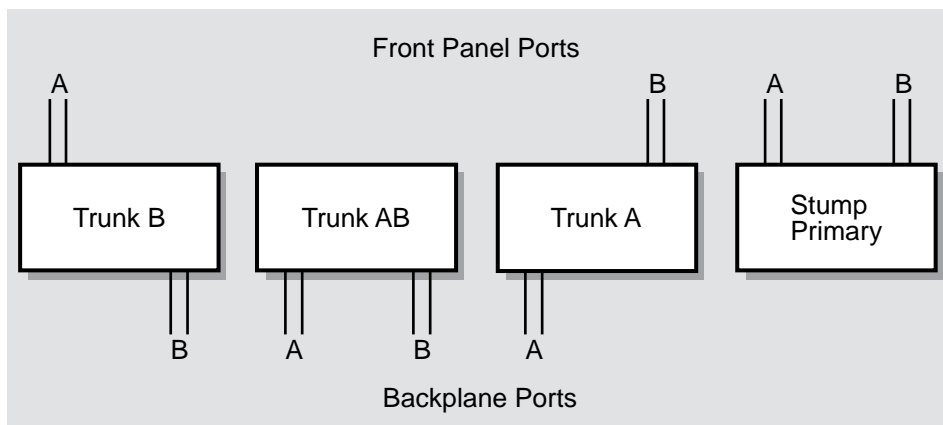
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Tree Building Blocks

The five tree building blocks, Figure 3-9, are as follows:

Name	Description
Nonroot MS	Ports M and S are assigned to the DEChub 900 backplane or to the DEChub ONE-MX ModPMDs.
Nonroot M	Port M is assigned to the DEChub 900 backplane or to the DEChub ONE-MX ModPMD. Port S is assigned to the FDDI network module front panel.
Nonroot SAC	Ports M and S are assigned to the FDDI network module's front panel.
Nonroot S	Port S is assigned to the DEChub 900 backplane or to the DEChub ONE-MX ModPMD. Port M is assigned to the FDDI network module's front panel.
Root Primary	Ports A and B are assigned to the FDDI network module's front panel. Port M is assigned to the DEChub 900 backplane or to the DEChub ONE-MX ModPMD.

Figure 3-9: Tree Building Blocks
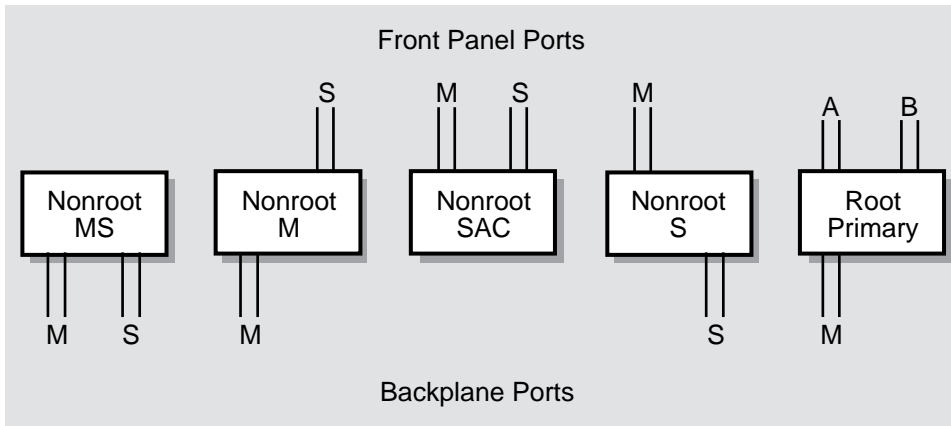
LKG-10071-96F

Default Configurations

This section describes the default (or factory set) configurations that apply to the FDDI network modules. Note that the default settings vary according to module type, and whether the module is installed into a DEChub 900 MultiSwitch, DEChub ONE or DEChub ONE-MX docking station.

FDDI Network Modules in a DEChub 900

When FDDI network modules (DECconcentrator 900MX, DECconcentrator 900FH, DECconcentrator 900TH, and DECswitch 900EF) are installed into a DEChub 900 MultiSwitch, the default configuration is as follows:

- All front panel ports are active.

- The A and B ports connect to the module's front panel ports.

This means that no redirection to backplane ports or backplane connections is made between FDDI network modules unless the network manager chooses to do so.

The network manager can issue the appropriate MultiChassis Manager commands to establish FDDI networks across the backplane of the DEChub 900 MultiSwitch.

While the default for the PEswitch 900TX is to the backplane ports, no FDDI LAN connections across the DEChub 900 backplane are made by default. The network manager must issue the appropriate MultiChassis Manager commands to connect a PEswitch 900TX to a FDDI backplane LAN.

FDDI Network Modules in a DEChub ONE or DEChub ONE-MX

When FDDI network modules (DECconcentrator 900MX, DECconcentrator 900TH, DECconcentrator 900TH, and DECswitch 900EF) are installed into a DEChub ONE or into a DEChub ONE-MX, the default configuration is as follows:

- All front panel ports are active.

- The A and B ports connect to the module's front panel ports.

PEswitch 900TX

The default configuration for the PEswitch 900TX is as follows:

- The A port and B port connect to the DEChub ONE-MX ModPMD ports.

No FDDI connections are available when the PEswitch 900TX is installed to a DEChub ONE.

NOTE

The DEChub ONE (DEHUA) supports one Ethernet connection, and the DEChub
ONE-MX (DEF1H) supports one Ethernet connection and up to two ModPMD
FDDI connections.

Enabling ModPMD Ports

To use the ModPMD ports of the DEChub ONE-MX a network manager issues the
appropriate MultiChassis Manager commands to enable the ModPMD ports, using the
building blocks previously described. This task is accomplished through the setup port
of the DEChub ONE-MX docking station.

Power Failure Recovery

Modules in a DEChub ONE or DEChub ONE-MX retain their configuration so that,
in the event of a power failure, the module returns to the previously configured state.
This previous configuration recall ability applies if a module is removed (powered off)
and then moved to another DEChub ONE docking station that is of the same model
type.

Change of Environment

FDDI network modules recognize a change of environment when moved between a
DEChub 900 MultiSwitch, or a DEChub ONE-MX, or a DEChub ONE docking
station.

When a change of environment is detected, with the exception of the PEswitch 900TX,
the FDDI network modules assume the following default configuration: A port and B
port connect to the network module's front panel.

The PEswitch 900TX module assumes the following default configuration: A port and
B port connect to the module's backplane ports only (and not to any DEChub 900
backplane FDDI LAN) or to the DEChub ONE-MX ModPMD ports.

Example of Module Reacting to Change of Environment

If a DECswitch 900EF module, that is configured with an S port and M port on the
ModPMDs, is moved from a DEChub ONE-MX docking station to another, the
module powers up with the ModPMDs of the second DEChub ONE-MX enabled as S
and M ports (previous configuration recall ability).

If the same module is then moved (from the DEChub ONE-MX docking station) to a DEChub ONE docking station, the module detects an environment change, and powers up with the front panel ports enabled as A and B ports (the module's default configuration).

If the module is again moved back to a DEChub ONE-MX docking station (from the DEChub ONE docking station), the module again detects a new environment, and powers up with the front panel ports enabled as A and B ports (default configuration).

Also, if a module is moved from a DEChub ONE-MX to another that has a different ModPMD configuration, the module powers up and, sensing that it is still in a DEChub ONE-MX, configures the ports per the previous configuration recall process. The FDDI network configuration recall process does not consider a change in the media type of the ModPMDs in the DEChub ONE-MX as a change in the environment.

FDDI Tree Configuration Examples

The DEChub 900 backplane supports many types of FDDI tree configurations. FDDI trees can be contained within the hub backplane and can connect an individual tree in the hub backplane to a higher level of a tree, or can be used to interconnect other hubs.

This section provides five examples of FDDI tree configurations that are supported in the DEChub 900 backplane:

- Example 1 — Self-contained Tree of Concentrators in Hub Backplane

- Example 2 — Self-contained Tree of Switches and Concentrators in Hub Backplane

- Example 3 — Tree Connections to an External Concentrator

- Example 4 — Dual Homing and Connection to an External Ring

- Example 5 — FDDI Tree Extensions

Example 1 — Self-contained Tree of Concentrators in Hub Backplane

In this example (Figure 5-10), an FDDI tree is constructed entirely within the Hub backplane. The backplane ports of the concentrator modules are enabled as M ports and S ports. The front panel ports become M ports.

The module that is installed in the highest slot number of the Hub (Concentrator 3) is designated as the top of the tree, and its M port connects to the S port of the module with the second highest slot number (Concentrator 2). This results in the order of low slot to high slot.

Two hub backplane flex-channels are required for each connection. In Figure 3-10, a total of four backplane channels are in use.

Figure 3-10: DECconcentrator Tree Connections in Hub Backplane

Front Panel Ports

M M M M M M   M M M M M M   M M M M M M

Concentrator 1   Concentrator 2   Concentrator 3

M   S   M   S   M   S

Backplane Ports

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Figure 3-11 shows the building block representation of the configuration example described in Figure 3-10.

Figure 3-11: Building Block Representation of Example 1
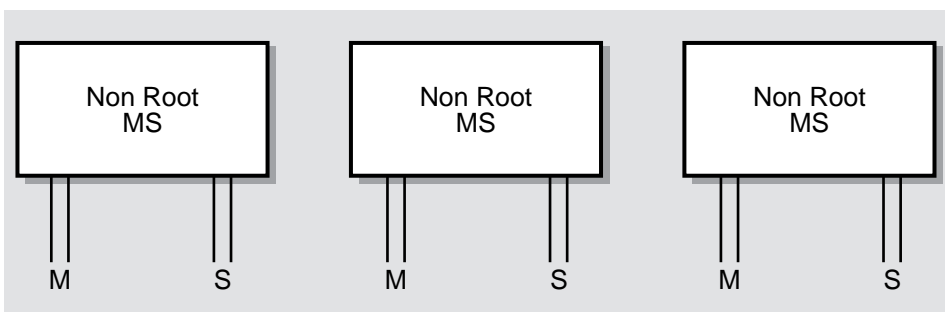
Non Root MS   Non Root MS   Non Root MS

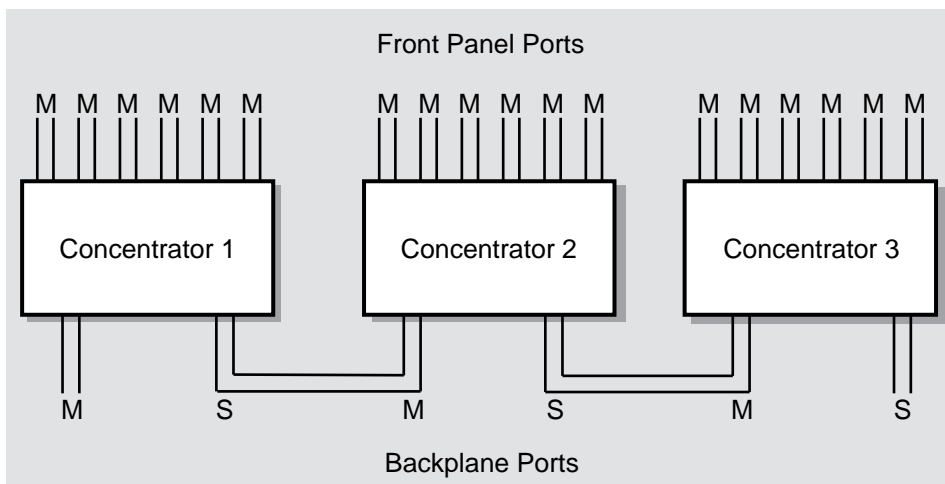M   S   M   S   M   S

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Example 2 — Self-contained Tree of Switches and Concentrators in Hub Backplane

In this example (Figure 3-12), an FDDI tree is constructed entirely within the hub backplane; however, a mixture of FDDI network module types (switches and concentrators) is used. The backplane ports of the FDDI network modules are enabled as M ports and S ports. The front panel ports of the concentrators become M ports, and the front panel FDDI ports of the switches become unusable.

The module that is installed in the highest slot number of the hub (DECswitch 900EF) is designated as the top of the tree, and its M port connects to the S port of the module with the second highest slot number (PEswitch 900TX). This results in the order of low slot to high slot.

Two hub backplane flex-channels are required for each connection. In Figure 3-12, a total of four backplane channels are in use.

Figure 3-12: Tree Connections with Switches and Concentrators

Front Panel Ports

M M M M M M

DECcconcentrator 900TH   PEswitch 900TX   DECswitch 900EF

M   S   M   S   M   S

Backplane Ports
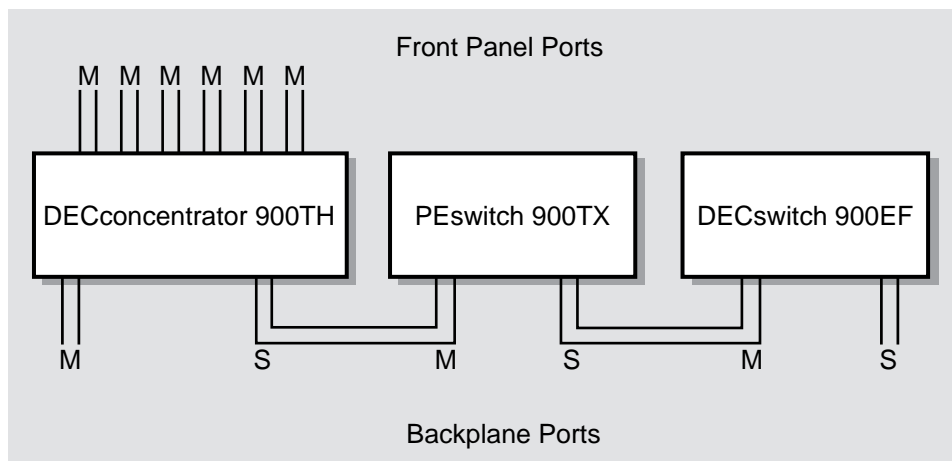
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Figure 3-13 shows the building block representation of the configuration example described in Figure 3-12.

Figure 3-13: Building Block Representation of Example 2

Non Root
MS

Non Root
MS

Non Root
MS

M   S   M   S   M   S

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Example 3 — Tree Connections to an External Concentrator

FDDI trees that are constructed within the hub backplane can connect to an external higher level concentrator by configuring one of the FDDI network modules with a front panel S port, and configuring all other FDDI network modules with backplane M and S ports.

As shown in Figure 3-14, a tree of PEswitch 900TX modules can be connected to an external FDDI ring using either a DECswitch 900EF network module (or a concentrator) to make the external connection.
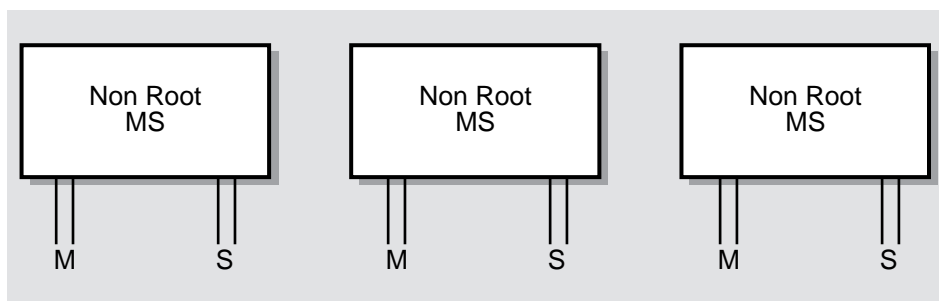
Figure 3-14: Tree Connections to an External FDDI Network
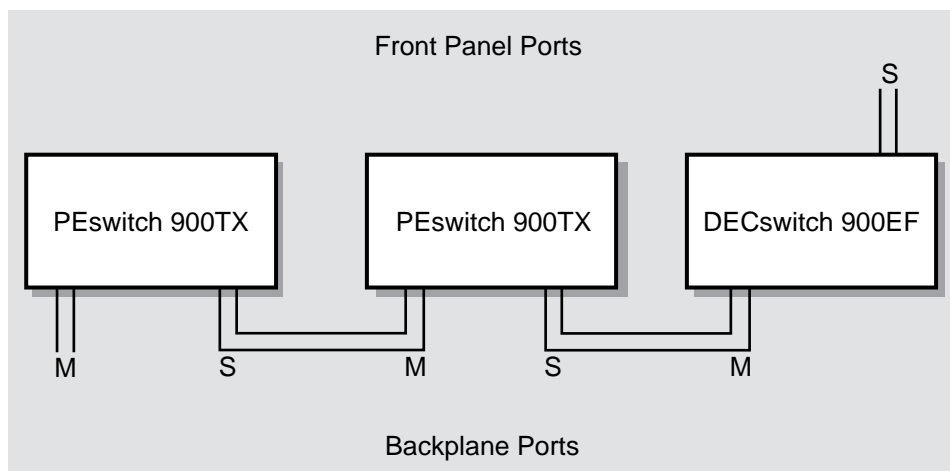
LKG-10078-96F

Figure 3-15 shows the building block representation of the configuration example described in Figure 3-14.

Figure 3-15: Building Block Representation of Example 3
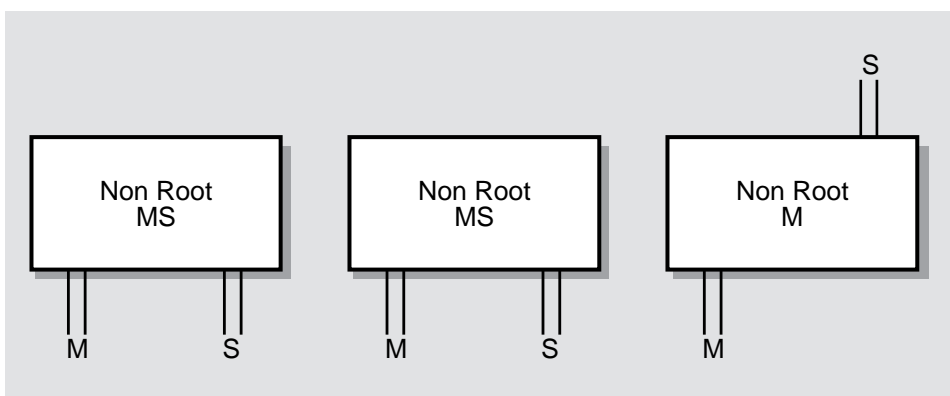
LKG-10079-96F

Example 4 — Dual Homing and Connection to an External Dual Ring

In some cases it is desirable to connect the hub to an external dual ring, and configure the network modules as FDDI trees within the hub backplane. In other cases, it is also desirable to have a redundant connection from the hub to higher level concentrators.

This second case (Figure 3-16) is commonly referred to as dual homing. Either of these configurations requires the use of a concentrator at the top level of the FDDI tree configuration.

NOTE

The network modules that are connected through the hub backplane are single attachment station (SAS) modules. The term dual homing, in this case, refers to the connection between the hub based tree and the external concentrators.

Figure 3-16: External Dual Homed Connections to an FDDI Network
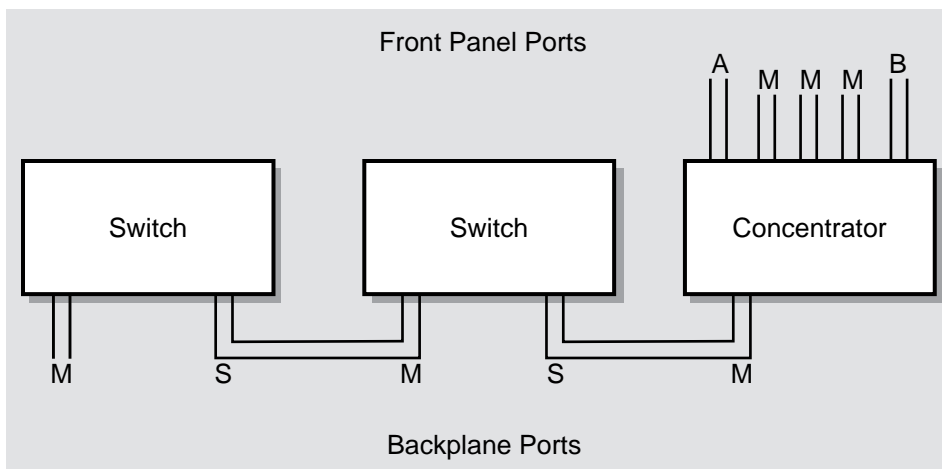
LKG-10080-96F

Figure 3-17 shows the building block representation of the configuration example described in Figure 3-16.

Figure 3-17: Building Block Representation of Example 4
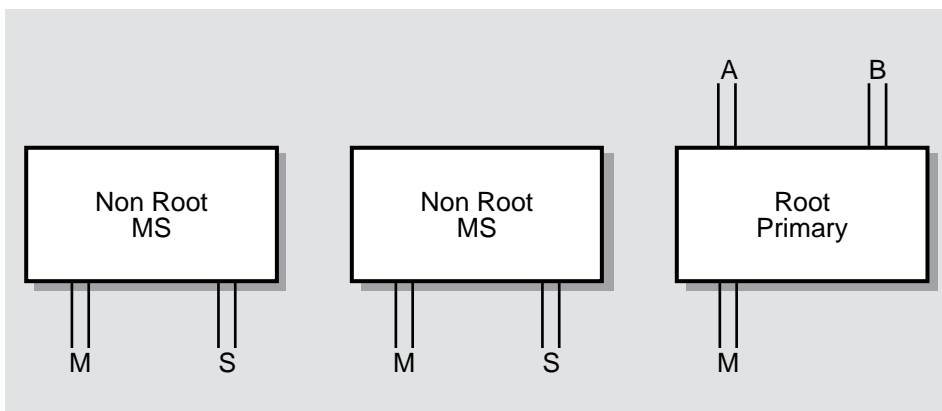
LKG-10081-96F

Example 5 — FDDI Tree Extensions

You can configure an FDDI network module, that is at the end of a branch of an FDDI tree, with front panel M ports. The M port can then be used to connect to an external FDDI network module or to an additional hub (Figure 3-18).

This configuration is used in situations where it is necessary to configure multiple hubs or hub network modules into trees (for example, when more than eight modules are required in the same closet).

Figure 3-18: Hub-Based Tree Connections to an External FDDI Network

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Figure 3-19 shows the building block representation of the configuration example described in Figure 3-18.

Figure 3-19: Building Block Representation of Example 5
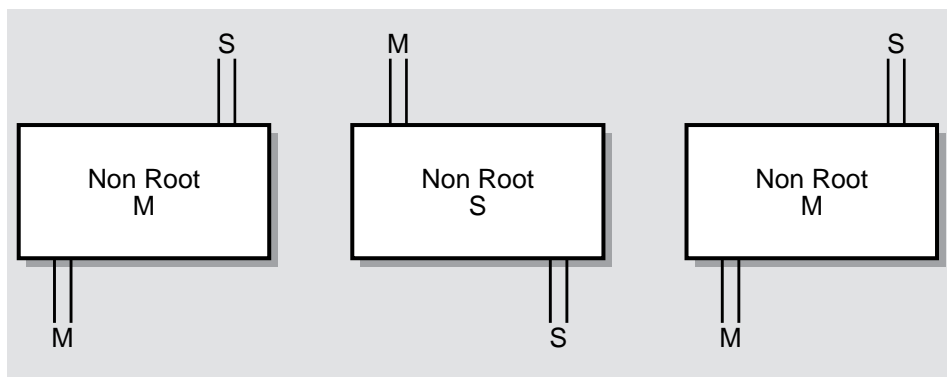
LKG-10083-96F

Dual Ring Configuration Examples

Both dual rings and trees are supported across the DEChub 900 MultiSwitch backplane. However, because it has more robust and quicker fault tolerance capabilities than tree configurations, the dual ring configuration is more effective to use across the backplane.

This section provides four examples of FDDI dual ring configurations that are supported in the DEChub 900 backplane:

- Example 1 — Dual Ring Concentrators Connected to an External Dual Ring

- Example 2 — Dual Ring Switches Connected to an External Dual Ring

- Example 3 — PEswitch 900TX Connections to an External Dual Ring

- Example 4 — Self Contained Dual Ring in the Backplane

Example 1 — Dual Ring Concentrators Connected to an External Dual Ring

As shown in Figure 3-20, all of the concentrators connect directly to the dual ring for this dual ring configuration.

Concentrator 3 has one of its front panel ports configured as the external B port connection to the dual ring and one of its backplane ports configured as the A port.

Concentrator 2 uses both backplane ports as the A port and B port connections to the dual ring.

Concentrator 1 uses the backplane B port connection to the dual ring allowing the dual ring to exit through a front panel A port.

Figure 3-20: DECconcentrator Dual Ring Connected to an FDDI Network
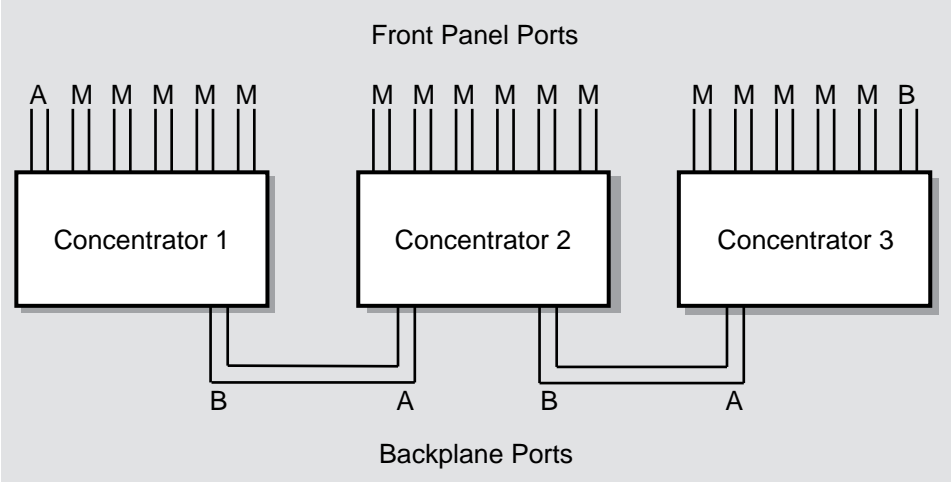
LKG-10084-96F

Figure 3-21 shows the building block representation of the configuration example described in Figure 3-20.

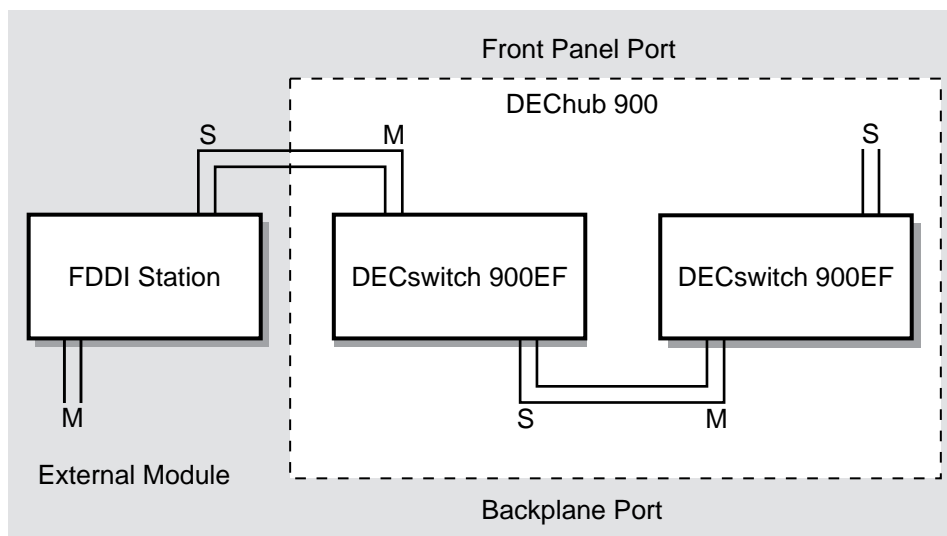**Figure 3-21: Building Block Representation of Example 1**
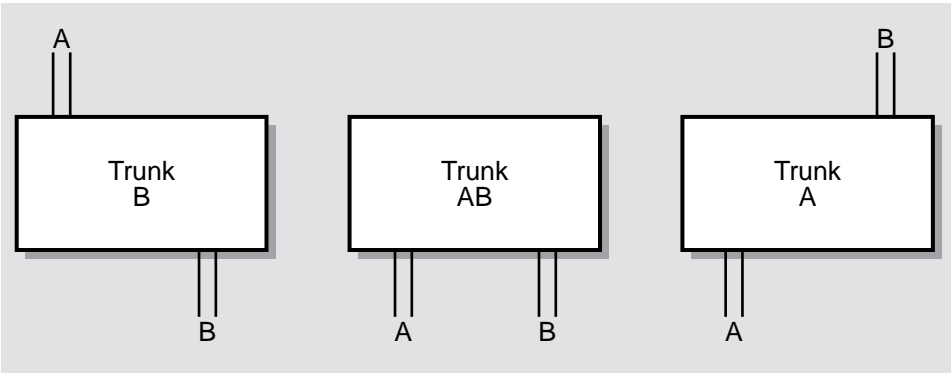
LKG-10085-96F

Example 2 — Dual Ring Switches Connected to an External Dual Ring

As shown in Figure 3-22, all of the DECswitch 900EF modules (Switches 1 through 3) can connect directly to the dual ring for this dual ring configuration (similar to the concentrators shown in Example 1).

Switch 3 has its B port assigned to the front panel port connection and the A port assigned to the backplane port connection.

Switch 2 has its A and B ports assigned to the backplane ports only (the module's front panel ports are not active, nor usable).

Switch 1 has its B port assigned to a backplane port and its A port is assigned to the front panel port.

You can also assign both A and B ports to the front panel ports (the Stump Primary building block, Figure 3-8), which allows a single DECswitch 900EF or DECconcentrator in a DEChub 900 to connect to an external FDDI backbone network.

Figure 3-22: Dual Ring Connections for DECswitch 900EF

Front Panel Ports

A   B

| Switch 1 | Switch 2 | Switch 3 |

B   A   B   A

Backplane Ports
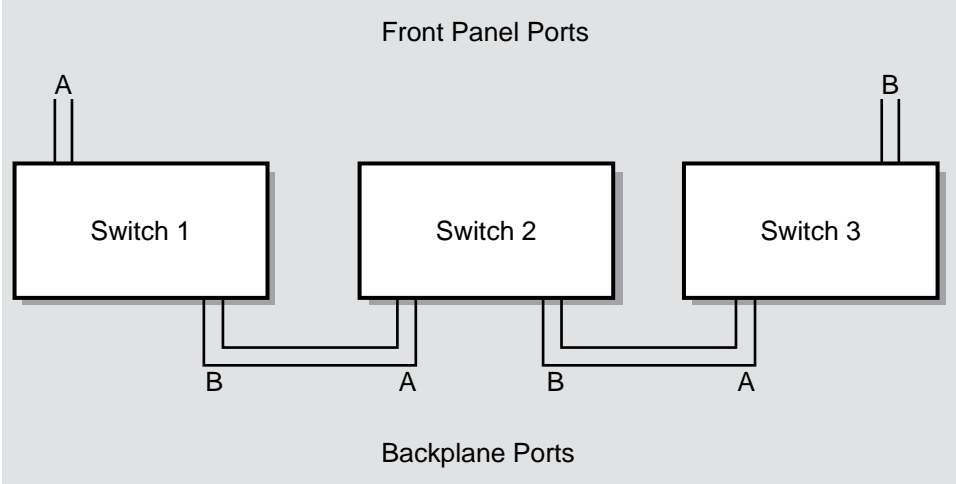
LKG-10086-96F

Figure 3-23 shows the Building block representation of the configuration example described in Figure 3-22.

Figure 3-23: Building Block Representation of Example 2

A   B

| Trunk B | Trunk AB | Trunk A |

B   A   B   A
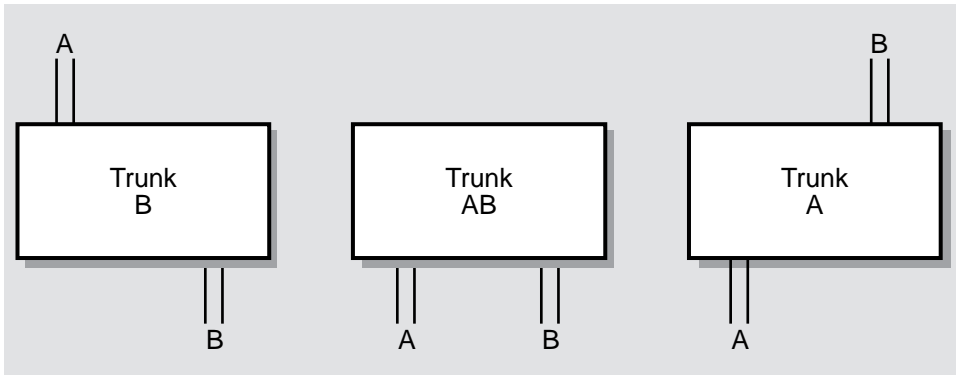
LKG-10087-96F

Example 3 — PEswitch 900TX Connections to External Dual Ring

The PEswitch 900TX module can be configured into a dual ring, however, because the module does not have front panel FDDI port connectors, two DECswitch 900EF modules or two DECconcentrator modules (in any combination) are required to complete the connection to an external FDDI network.

As shown in Figure 3-24, the FDDI dual ring connections to a PEswitch 900TX are made by means of the DEChub 900 backplane: (1) the dual ring enters through the DECconcentrator 900TH; (2) it then passes through the DEChub 900 backplane to a PEswitch 900TX; (3) from the PEswitch 900TX it again passes through the DEChub 900 backplane to exit through a DECswitch 900EF.

Figure 3-24: Dual Ring Connections for PEswitch 900TX
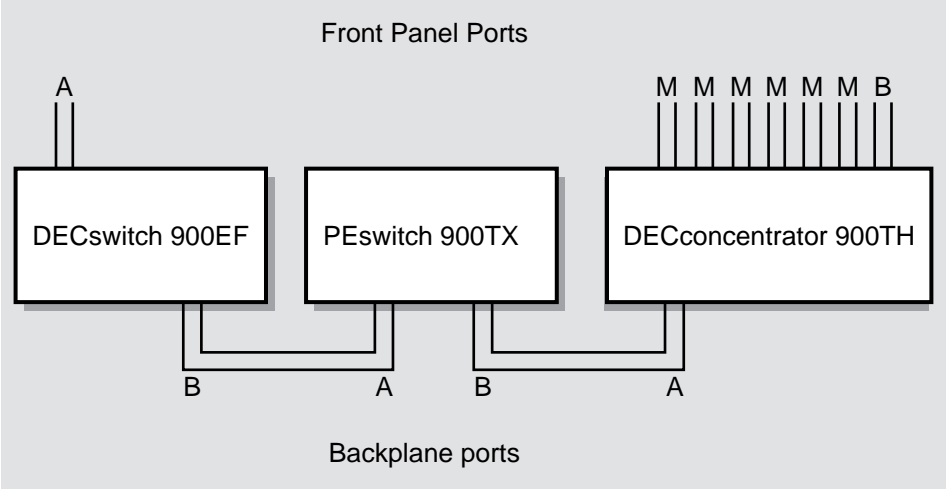
LKG-10088-96F

Figure 3-25 shows the building block representation of the configuration example described in Figure 3-24.

Figure 3-25: Building Block Representation of Example 3
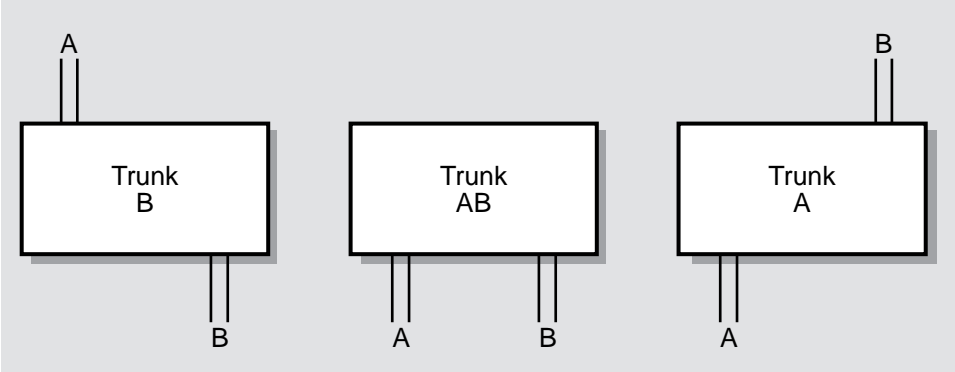
LKG-10091-96F

Example 4 — Self Contained Dual Ring in the Backplane

You can create a dual ring, that is completely contained in the DEChub 900 backplane, by connecting all the backplane ports of the FDDI network modules together (Figure 3-26).

Note that the DECconcentrator in Figure 3-26 is providing M port tree connections to externally treed FDDI stations (such as, bridges, concentrators or end user stations that use S, A, or B ports). The Concentrator is not connected to an external M port such as an external concentrator's M port.

Figure 3-26: Self-Contained Dual Ring in the Backplane
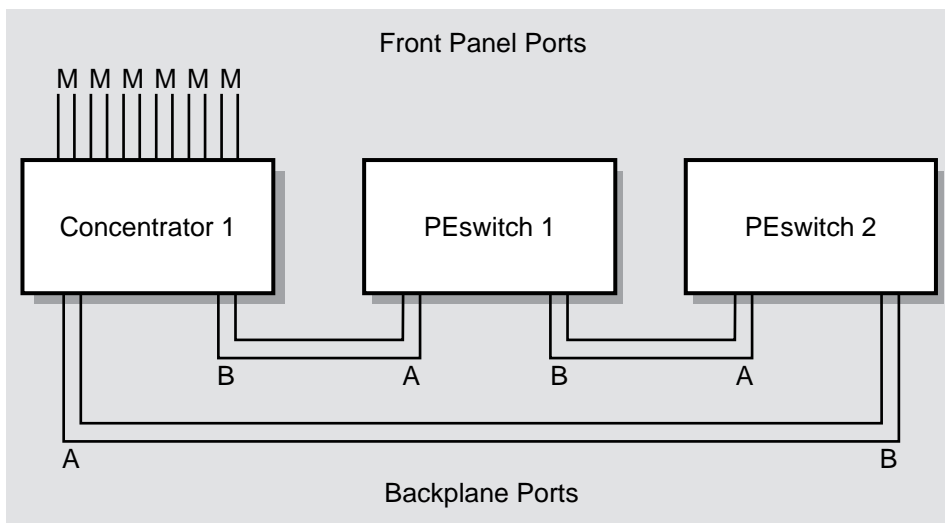
LKG-10092-96F

Figure 3-27: Building Block Representation of Example 4
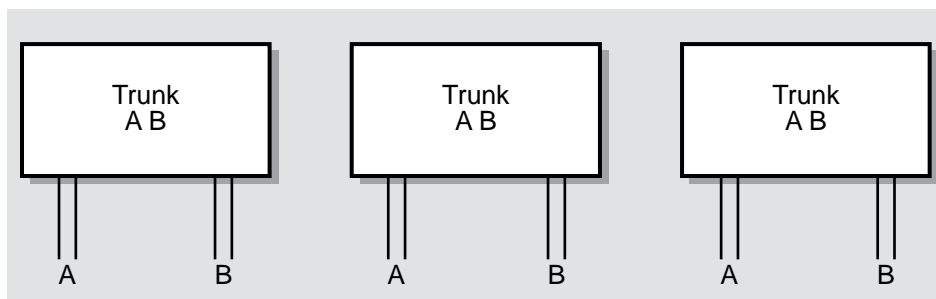
NPB-0839-97F

Fault Tolerance in Dual Rings

This section describes the fault tolerant safeguards that are built into DEChub 900 network modules.

Maintaining Network Connectivity

When a concentrator or switch in a dual ring is removed (hot swapped), the FDDI ring wraps according to FDDI standards. If the removed module has both A and B ports that are connected to the DEChub 900 backplane, the Hub Manager detects the removal and reconnects the two neighboring (upstream and downstream) FDDI stations.

If a network module is detected as being unavailable, the Hub Manager will also patch-out the module (as long as Auto Healing has been enabled).

This is a distinct advantage that FDDI modules, which are configured into a dual ring in a DEChub, have over individual nonhub-based FDDI network modules.

NOTE

Because ring wrap occurs much faster than backplane auto healing, it always occurs first. Thereafter, the Hub Manager firmware automatically reconnects the disconnected DAS stations through the DEChub 900 backplane, allowing the dual ring to unwrap. Fault recovery (unwrapping of the dual ring in the DEChub 900 backplane) is supported in all DEChub 900 FDDI network modules.

Example of Dual Ring Backplane Auto Healing

As shown in Figure 3-28, if Concentrator 1 is removed, Concentrator 2 and Switch 1 continue communications with each other and with all other FDDI stations on the DAS backbone. This is so, because Concentrator 2 (sensing the change) wraps the FDDI dual ring.

If Concentrator 2 fails, Concentrator 1 and Switch 1 wrap the dual ring and communications can continue. Within seconds of this particular ring wrap, where Concentrator 2 has become unavailable, the Hub Manager automatically reconnects Switch 1 to Concentrator 1 and the dual ring unwraps.

If, at a later time, a replacement concentrator of the same type is installed into the same slot that held Concentrator 2, the replacement concentrator will be reinserted into the ring through the Auto Healing feature.

Figure 3-28: Ring Configuration
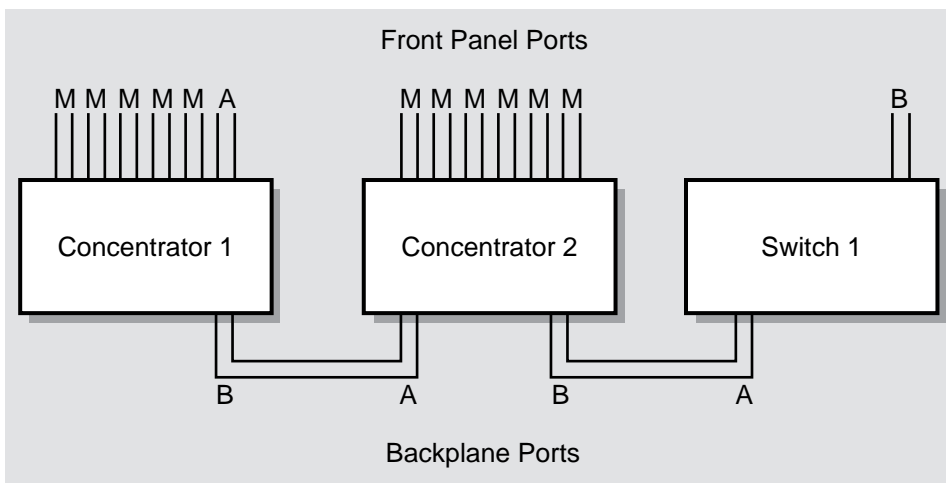
LKG-10093-96F

Fault Tolerance in Trees

This section describes the fault tolerant safeguards (for trees) that are built into DEChub 900 network modules.

Maintaining Network Connectivity

When a concentrator or switch in a tree is removed (hot swapped), the FDDI tree splits into two independent networks, per the FDDI standard.

If the removed module has both M and S ports that are connected to the DEChub 900 backplane, the Hub Manager detects the removal and reconnects the two neighboring (upstream and downstream) FDDI stations.

If a network module is detected as being unavailable, the Hub Manager will also patch-out the module (as long as Auto Healing has been enabled). This is a distinct advantage that FDDI modules, which are configured into a tree in a DEChub, have over individual nonhub-based FDDI network modules.

NOTE

If the auto-healing function is enabled and a module is patched-out, MultiChassis Manager prevents the user from adding or deleting FDDI connections, Ethernet connections, Ethernet LANs or FDDI LANs via the LAN Interconnect screen. This is designed to preserve the existing configuration until someone can physically replace any failed modules. An error message is displayed informing the user that the requested action cannot be taken, and offers a list of alternatives. If the change is still desired, the user must first disable Auto Healing by selecting "Disable" from the Auto Healing buttons on the LAN Interconnect window. This deletes the patched-out connections. Following the reconfiguration, Auto Healing can be re-enabled. This new configuration is shown on the screen.


Example of Tree Backplane Auto Healing

As shown in Figure 3-29, if Concentrator 1 is removed, Concentrator 2 and Switch 1 continue communications with each other and with all other FDDI stations in the tree.

If Concentrator 2 fails, Concentrator 1 and Switch 1 can no longer communicate with each other. Within seconds of when Concentrator 2 becomes unavailable, the Hub Manager automatically reconnects Switch 1 to Concentrator 1 and the tree is reestablished.

If, at a later time, a replacement concentrator of the same type is installed into the same slot that held Concentrator 2, the replacement concentrator is reinserted into the tree through the Auto Healing feature.

Figure 3-29: Tree Configuration
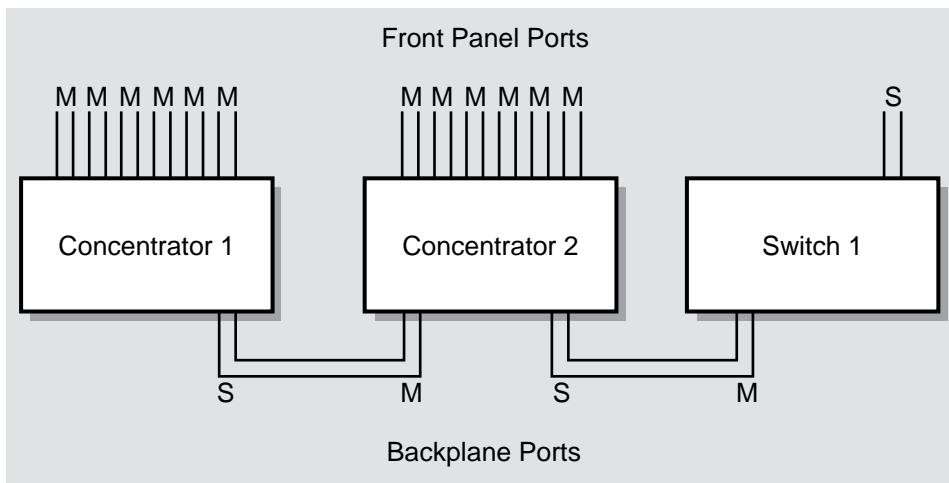
LKG-10125-96F

Token Ordering of Trees or Dual Rings

The DEChub 900 backplane uses a defined token order algorithm for FDDI dual rings or trees that are created in the hub. This section describes how the algorithm controls the token flow in the DEChub 900 backplane.

Description

The token flow is defined as the order in which the token flows to the MAC addressed slots in the DEChub 900 backplane. The token flow is from slot 1 towards slot 8, whether the backplane network is a dual ring or a tree. If there are multiple FDDI networks, each of the networks independently orders the token flow, from the lowest slot to highest slot, as closely as is allowed by the FDDI rules.

The token flow algorithm ensures that repaired modules return to the same token order that had been assigned prior to the occurrence of a module fault.

NOTE

The token flow algorithm also matches the power shedding algorithm (which sheds modules from slot 1 towards slot 8).

The following examples illustrate the concept of the token flow algorithm:

Example 1 — Token Flow Through Dual Ring Network Modules

Figure 3-30 shows a hub that is configured as a dual ring with FDDI network modules in slots 1, 2, 3, 4, 6, and slot 8.

Figure 3-30: Token Flow through Dual Ringed DEChub 900 Modules

Token order on ring map = 4>1>2>3>6>8

● = Location of MAC

LKG-10072-96F
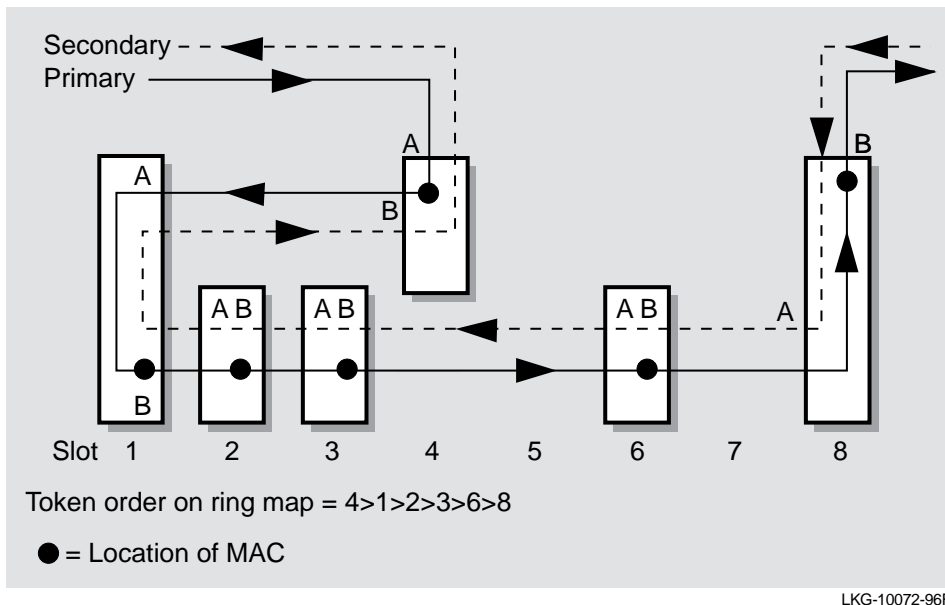
Note that the front panel A port is shown on the module in slot 4, and the B port is shown on the module in slot 8. Therefore, the token, which is flowing on the primary ring, enters the hub at slot 4 and exits from slot 8.

A ring map, showing the order of token flow, is based on the ordering of the MACs in the ring. In this example, MultiChassis Manager configures the backplane so that the token enters the A port of slot 4, encounters the MAC for slot 4, and the next MAC it sees is in slot 1. The token then flows, in order, through the MACs in slots 1,2,3, 6, and finally slot 8. Therefore, a ring map records the token order as: 4>1>2>3>6>8.

To accomplish this ordering, the Hub Manager automatically connects the B port of Slot 4 to the A port of Slot 1. The process is repeated for the other modules, so that the token always flows in the correct order.

Example 2 — Token Flow through Treed Network Modules

Figure 3-31 shows the same hub that is now configured into a tree configuration with FDDI network modules in slots 1, 2, 3, 4, 6, and 8.

Figure 3-31: Token Flow through Treed DEChub 900 Modules

LKG-10073-96F
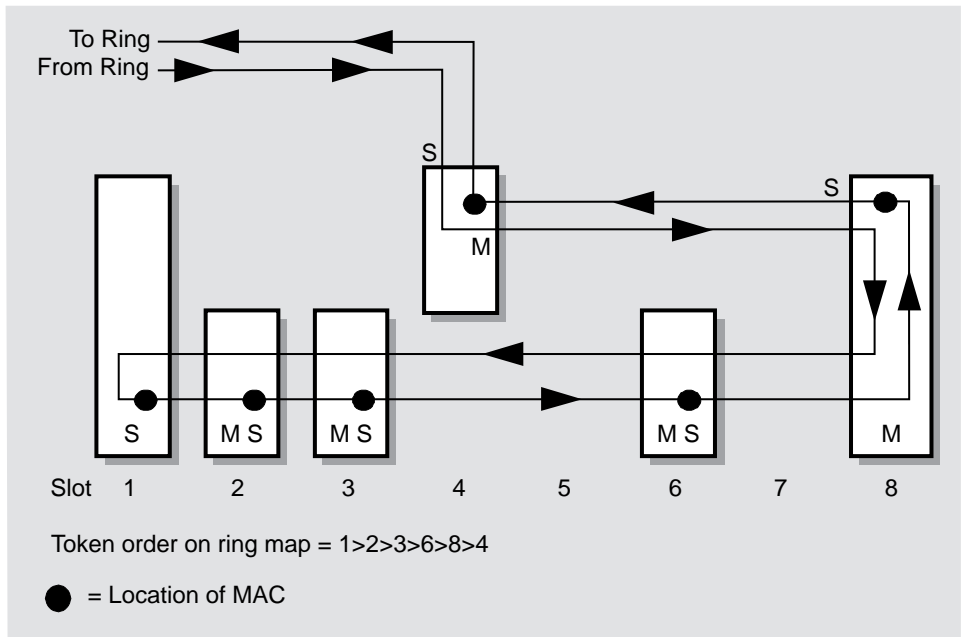
Note that the front panel S port is shown on the module in slot 4; therefore, the token enters and exits the hub at slot 4.

A ring map, showing the order of token flow, is based on the ordering of the MACs in the ring. FDDI rules require that a station's MAC be located immediately prior to the port where the token exits the station. The token enters the S port of slot 4 and flows, in order, through the MACs in slots 1, 2, 3, 6, 8 and finally slot 4. To do this, the S port of slot 8 must connect to the M port of slot 4.

In this example a ring map records the token order as: 1>2>3>6>8>4.

Quick PC Trace Option for Concentrators

A Quick PC Trace option is supported for all DEChub FDDI concentrator modules.

PC Trace Description

As defined by the FDDI standard, PC Trace is a method for recovering from a stuck beacon condition. All stations that are in the fault domain perform some level of hardware diagnostic test before attempting to reenter the FDDI network.

Normally, concentrator modules run their full set of hardware diagnostics. This takes approximately one minute, but gives the highest level of assurance that any hardware failure would be found.

Quick PC Trace Description

To decrease the recovery time following a trace, the quick PC Trace option has been added. When this option is enabled, only a subset of the hardware diagnostics is run whenever a PC Trace occurs. The reduced set of diagnostic tests completes in approximately 10 seconds. This feature can be enabled and disabled only from the configuration screen of the module's setup port.

NOTE

The DECswitch 900EF and the PEswitch 900TX do not have this optional feature because they normally recover from PC Traces very rapidly (less than 10 seconds). This is because they are FDDI end stations and have a much smaller set of FDDI-specific diagnostics to run than an FDDI concentrator.

Summary of Important Configuration Features

This section reviews the FDDI configuration features for the DEChub 900 FDDI network modules.

Support for Dual Ring and Tree Connections

All DEChub FDDI modules support dual ring connections (A and B ports) and tree connections (M and S ports) across the DEChub 900 MultiSwitch backplane, or out of the front panel of individual FDDI network modules that are configured into a DEChub 900 MultiSwitch.

ALL DEChub FDDI network modules support dual ring connections (A and B ports) and tree connections (M and S ports) when configured standalone into a DEChub ONE or DEChub ONE-MX docking station.

NOTE

The PEswitch 900TX module does not have front panel ports and requires a DEChub ONE-MX docking station, with appropriate ModPMDs, for standalone FDDI connections.

Support for Multiple Independent FDDI Networks

Multiple independent FDDI networks (trees and/or dual rings) are supported across the backplane of the DEChub 900.

Support for Automatic Healing Patch-Around for Failed Modules

An automatic healing capability to patch around failed modules is supported for both trees and dual rings across the backplane of the DEChub 900.

Support for Quick PC Trace Capability

A Quick PC Trace capability has been added to concentrators, to minimize the time it takes to return to operation following a PC Trace. This option is selectable from the module setup screens, whether the module is installed in a DEChub 900, a DEChub ONE, or a DEChub ONE-MX.

Dual Ring of Trees Topology

DEChub 900s can participate in a dual ring of trees topology as either part of the dual ring or as part of the tree. For example, a dual ring of trees can be constructed by first buiding a dual ring, then a tree, and connecting them together with a cable on the front panel (Figure 3-32).

Figure 3-32: Legal Dual Ring of Trees Topology
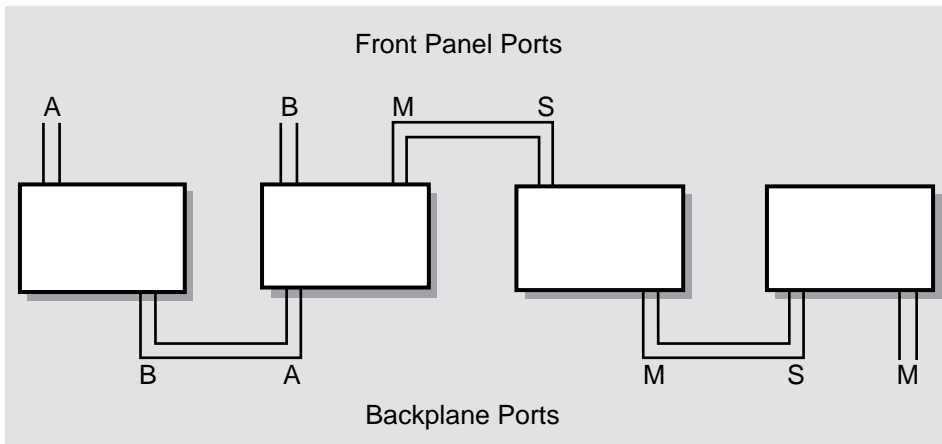
LKG-10090-96F

A dual ring of trees is not supported across the backplane. Figure 3-33 illustrates an illegal or unsupported dual ring of trees topology. The A- M- connection is honored over the B- A- connection per FDDI standards.

Note that while the connections are all in one network, MultiChassis Manager manages the connections as though they are in unconnected LANs.

Figure 3-33: Illegal Dual Ring of Trees Topology
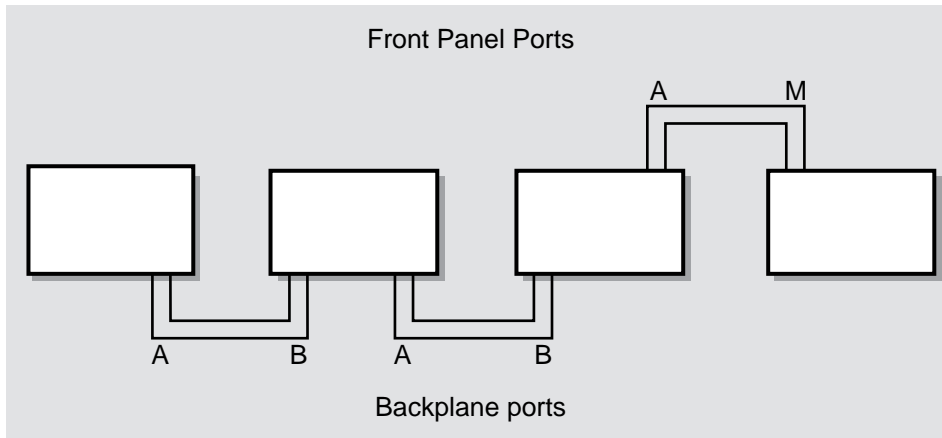
LKG-10089-96F

Dual Homing

Dual-homing to multiple FDDI modules in a DEChub 900 can be supported in two ways:

- Each module can be individually dual-homed via its front panel ports (assuming the module has front panel ports)

- One concentrator module can be dual-homed and the other FDDI modules can be treed off that concentrator

Chaining

Additional DEChubs or standalone FDDI network modules can be chained off any DEChub FDDI network module (including switches) that is configured as a tree building block.

Self-Contained Dual Ring Restriction

Attempting to build a self-contained dual ring configuration in the DEChub with eight FDDI modules will not work. This is because there are 14 backplane channels that can be used for FDDI connections and 16 channels would be required to interconnect 8 modules in a hub-contained dual ring. Note that this configuration can be accomplished with 14 backplane channels and one DAS cable between two devices front panel ports.

Self-Contained Tree Configuration

You can build a self-contained tree configuration in the DEChub 900 with eight FDDI modules. This configuration can be built because it requires only 14 backplane channels.

Network Module Front Panel Default

The FDDI default on the following modules is to use the A and B ports on the front panel ports:

- DECswitch 900EF

- DECconcentrator 900FH

- DECconcentrator 900MX

- DECconcentrator 900TH

The FDDI default for the PEswitch 900TX is to the backplane FDDI port. This is because there are no front panel FDDI ports on the PEswitch 900TX module. This fact is sometimes overlooked when considering default configurations.

Port Configuration in DEChub ONE-MX

FDDI network modules that are installed in a DEChub ONE-MX can configure their FDDI ports either with MultiChassis Manager, or via an FDDI port configuration menu on the DEChub ONE-MX setup port.

Valid FDDI Configurations

Figure 3-34 shows a mixture of DEChub types with various DEChub FDDI network modules to demonstrate the flexibility of the DEChub network products.

Figure 3-34: Valid FDDI Configurations for DEChub FDDI Modules
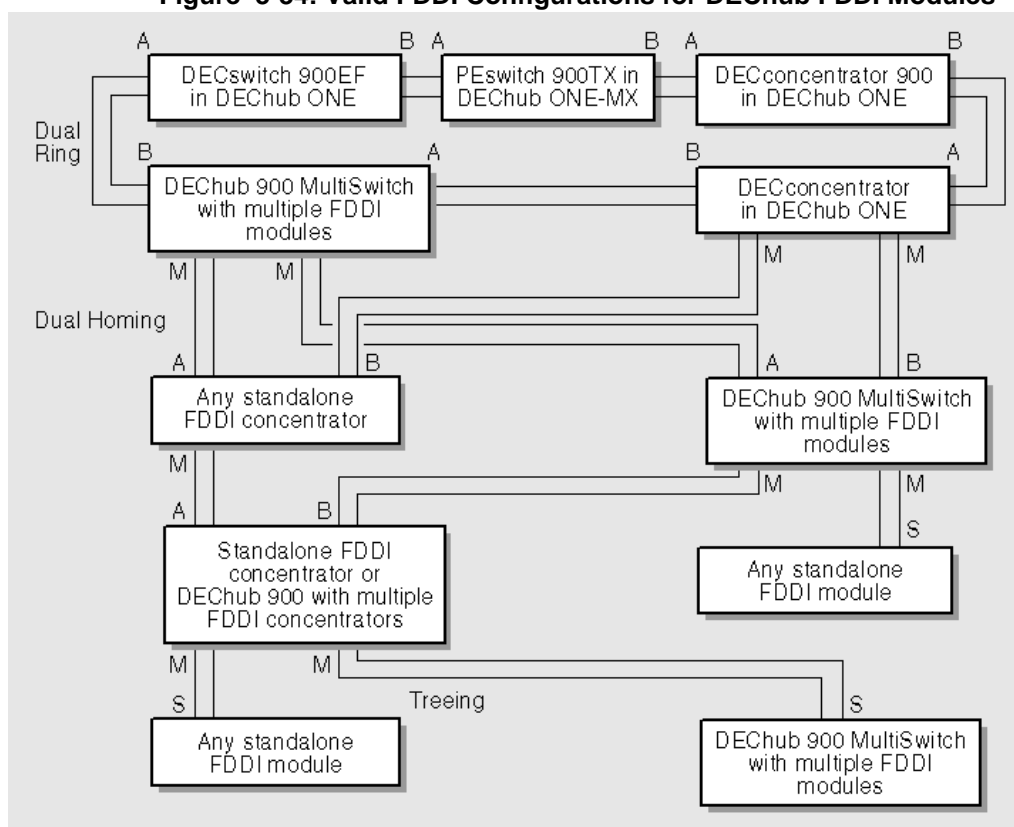
LKG-10094-96F

For More Information

Topic.	Where to Get More Information...
Features, topologies, and components of the FDDI local area network standard.	*A Primer on FDDI: Fiber Distributed Data Interface.*
Features and functions of DIGITAL's 900-Series switching products.	*DEChub Network Modules 900-Series Switch Reference* manual
Digital Equipment Corporation's DECconcentrator 900 FDDI network modules.	*DECconcentrator Installation and Configuration* manuals.

Chapter 4

Managing FDDI Concentrators

Overview

This chapter explains how to use concentrator-specific clearVISN MultiChassis Manager windows to perform management tasks. It also provides an overview of the windows and the associated tasks. Each task description includes the appropriate SNMP MIB object (where applicable) for non-MultiChassis Manager users.

In This Chapter

The following topics are described in this chapter:

Topic	Page
Displaying Station Information	4-7
Displaying MAC Status	4-24
Setting Connection Policy	4-26
Setting the Connection Management Timers	4-28
Configuring the Token Timers	4-30
Enabling and Disabling the Ring Purger	4-32
Setting Link Error Rate Alarm and Cutoff Thresholds	4-33
Enabling and Disabling Quick PC Trace	4-34

Using clearVISN MultiChassis Manager

clearVISN MultiChassis Manager is a flexible, network configuration and management application that provides a graphical user interface (GUI). MultiChassis Manager manages network modules installed in a hub as well as the hub itself. MultiChassis Manager can also manage devices in a DEChub ONE-MX or a DEChub ONE-MX, if the device has an IP address.

To communicate management and configuration commands to the network modules, MultiChassis Manager sends Simple Network Management Protocol (SNMP) commands to SNMP agents in the network modules or in the hub itself.

Although it is possible to use SNMP commands with any vendor's management station, MultiChassis Manager makes it easy to manage the concentrators by the use of customized window displays.

What You Can Do With MultiChassis Manager

You can use MultiChassis Manager to:

- View the status and activity of network modules and ports

- Configure LANs on the hub backplane

- Monitor the flow and accuracy of network data

- Configure network modules

Concentrator-Specific MultiChassis Manager Windows

This section describes the concentrator-specific MultiChassis Manager windows and explains how to open them.

Table 4-1 lists the windows that you can use to manage the 900-series concentrators. The table describes the windows and their associated tasks.

Table 4-1: MultiChassis Manager Windows and Tasks

Use This Window	To...
Hub Front Panel	Observe and interpret LEDs.
FDDI Summary	• Display or assign the concentrator description.
	• Display management information, concentrator status, station information, MAC information, concentrator configuration information, and port information.
	• Disconnect and reset the concentrator.
	• Reset the concentrator to the factory defaults
FDDI MAC Summary	• Display neighbor information, traffic information, timer information, path utilization, and network utilization.
	• Enable/disable the ring purger.
FDDI Port Details	• Display port status, counters and path information.
	• Set the link error rate alarm/cutoff.

Opening a Concentrator Window

Table 4-2 describes how to open MultiChassis Manager concentrator windows.

Table 4-2: Concentrator Windows

To open this window...	Do this...
FDDI Summary	From the Hub Front Panel window, double-click on a chassis slot that contains a concentrator. Use the buttons on the FDDI Summary window to reach other windows.
FDDI MAC Summary	From the FDDI Summary window, click on the **Summary** button in the MAC Information box.
FDDI Port Details	From the Hub Front Panel physical view, double-click on any port connector.
	or
	From the Hub Front Panel logical view, click on any port button.
	or
	From the FDDI Summary window, click on any port connector.

FDDI Summary Window

The FDDI Summary window (Figure 4-1) displays station information described in Table 4-3. Buttons on the FDDI Summary window provide access to other windows used in managing concentrators.Table 4-4 contains a description of the buttons.
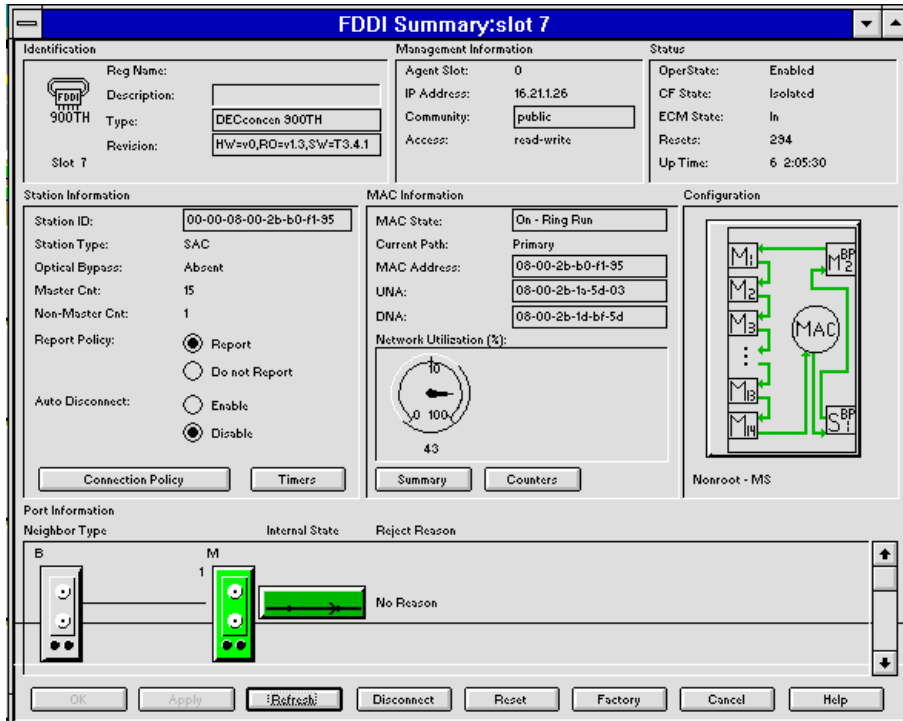
Figure 4-1: FDDI Summary Window

Table 4-3: Station Information

Name	Description
Station Identification	A unique eight-byte identifier for an FDDI station. The first two bytes are zeros and the last six bytes specify the module's hardware address.
Station Type	• Single attachment station (SAS) • Dual attachment concentrator (DAC) • Single attachment concentrator (SAC) • Dual attachment station (DAS)
Optical Bypass	An external optical bypass relay (OBR) can be used to maintain connectivity of the FDDI ring in the absence of power or during fault conditions in a station. The bypass relay allows the light to bypass the optical receiver in the faulty station. This bypass maintains the operation of the FDDI ring. The OBR port on the concentrator is a communication line to the external OBR.
Master Count	The number of master ports (M) in a node. The number is zero if the node is not a concentrator.
Non-Master Count	The number of non-master ports in a node (A, B, and S).
Report Policies	If you enable Report Policies, the station generates status reporting frames for its implemented events and conditions. This variable determines the value of the SR_Enable flag. This flag indicates that the Status Report Protocol is enabled for this station. The default (initial) value is enabled. To change the report policy setting simply click on Report or Do Not Report in the Station Information box within the FDDI Summary window.

Name	Description
Auto Disconnect	This option provides increased reliability in configurations having multiple levels of dual-homed concentrators. For example, if a concentrator on the dual ring becomes isolated (i.e., a backhoe slices the cables going into ports A and B), all lower-level concentrators that are dual-homed to this concentrator are isolated from the rest of the network.
	If you enable Auto Disconnect, a concentrator disables all of its M ports when it detects that both ports A and B (S port for a SAC) are no longer active. This forces the lower-level dual-homed concentrators to switch to their standby links. This prevents the lower-level concentrators and stations from remaining isolated.
	When either ports A or B (S port for a SAC) becomes active, the concentrator then enables the M ports.
	The default setting is disabled. To change the Auto Disconnect setting, click on Enable or Disable in the Station Information box within the FDDI Summary window.
Connection Policy	This option defines which port type connection combinations are allowed for in the concentrator's ports.
	When you click on **Connection Policy**, the Connection Policy dialog box appears. You use this box to set the connection policy for the module. When you set a connection policy, it affects only the physical connections attempted after the set. Previous connections are not affected. If a connection is not allowed and you attach a physical medium that tries to make a connection, the port shows a "Remote Reject" reject reason. If MultiChassis Manager polling is not enabled, you need to do a refresh to see this status.
	Note: If two stations are attempting to make a connection, the connection policy must be agreed to by both stations. For example, if you set a reject A-B on one concentrator, set the neighbor with reject B-A; otherwise, the connection will be allowed.

Name	Description
Timer Information	You click on **Timers** in the FDDI Summary window to set the expiration values for the Connection Management timers. When you click on Timers, the Timers dialog box appears.
	The Connection Management timers are as follows:
	• Notification Time — The interval between successive iterations of the Neighbor Notification protocol. The range is 2 to 30 seconds (default: 30 seconds)
	• Max Trace Expiration — The maximum propagation time for a trace on an FDDI topology. The range is 6 to 30 seconds (default: 7 seconds).
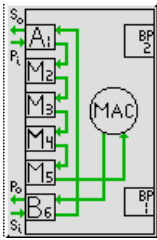
Relevant SNMP Object

MIB Object...	Where to get more information...
fddimibSMTTable	RFC 1512

Table 4-4 contains a description of the buttons on the FDDI Summary window.

Table 4-4: FDDI Summary Window Buttons

Button	Description
Connection Policy	Click on this button to open the Station Connection Policy window.
Timers	Click on this button to open the Station Timers window.
Summary	Click on this button to open the MAC Summary window.
Counters	Click on this button to open the MAC Counters window.
	Click on this button to open the Configuration window.

On-line Help

Click on the Help button in any MultiChassis Manager window to open a help topic. Help topics provide details about the current window and provide help for performing management tasks.

Disabling and Enabling the Concentrator

You can disable the concentrator through the FDDI Summary window. When you disable the concentrator, the concentrator's physical links are disconnected. To access a concentrator installed in a DEChub ONE or DEChub ONE-MX, use the concentrator's out-of-band management (OBM) port. To access a concentrator installed in a DEChub 900 MultiSwitch, use the DEChub 900 MultiSwitch's OBM port. Or, if the concentrator is not set up as the IP server, you can use in-band management to reach the concentrator through IP services on the hub.

To enable the concentrator after you have disabled it, you must reset it.

How to Disable (and Enable) the Concentrator

To disable (and enable) the concentrator, perform the following steps:

Step	Action
1)	Open the FDDI Summary window.
2)	Click on the **Disconnect** button in the FDDI Summary window to disable the concentrator.
3)	When you disable a concentrator, a confirmation window is displayed. Click on **Yes** in the confirmation window to complete the action.
4)	Click on the **Reset** button in the FDDI Summary window to enable the concentrator. Note: The Reset button puts the concentrator back to its state prior to being disabled.

Relevant SNMP Object

MIB Object...	Where to get more information...
fddimibSMTStationAction	RFC 1512

Displaying Configuration Information

The Station Configuration window, shown in Figure 4-2, displays the current configuration of the concentrator's internal data path.

Figure 4-2: Station Configuration Window
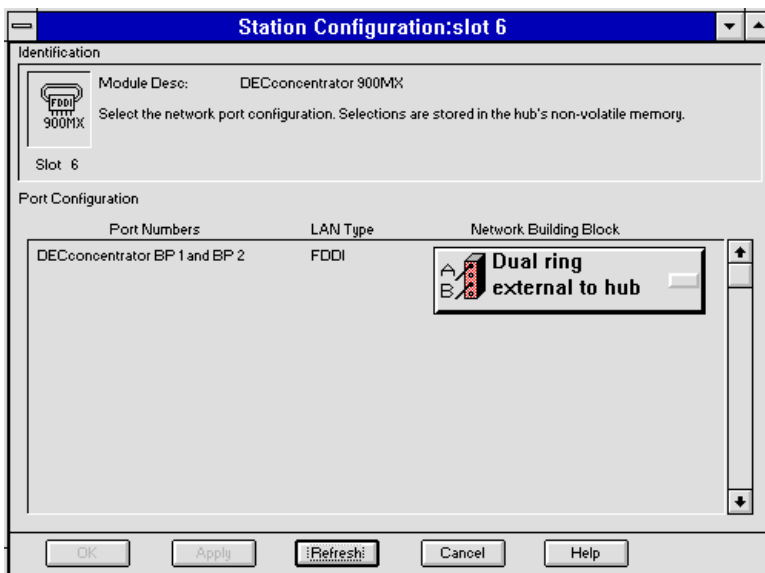
How to Display Configuration Information

To display the current configuration information perform the following steps:

Step	Action
1)	Open the FDDI Summary window.
2)	Click on the **Configuration** icon.
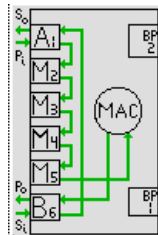
The Station Configuration window appears and displays identification and port configuration information.

When this module is installed in a DEChub 900 MultiSwitch and you invoke MultiChassis Manager using the module's own IP address, or using the hub's address with a community name of public-*n* (where *n* is the module's slot number), this push-button is grayed out. You cannot access the Station Configuration window to reconfigure the module's ports. To reconfigure the module's ports when modules are installed in the DEChub 900 MultiSwitch, you must invoke MultiChassis Manager using the hub's IP address.

Relevant SNMP Object

MIB Object...	Where to get more information...
pcomLigo	PCOM MIB, June 1995 or later

Displaying Network Utilization

The current FDDI utilization information is displayed in the Network Utilization box in the FDDI Summary window (Figure 4-1) and in the FDDI MAC Summary window (Figure 4-3.) This information includes the percentage of network utilization. The meter indicates average utilization since the last time the window was refreshed.

Figure 4-3: FDDI MAC Summary Window
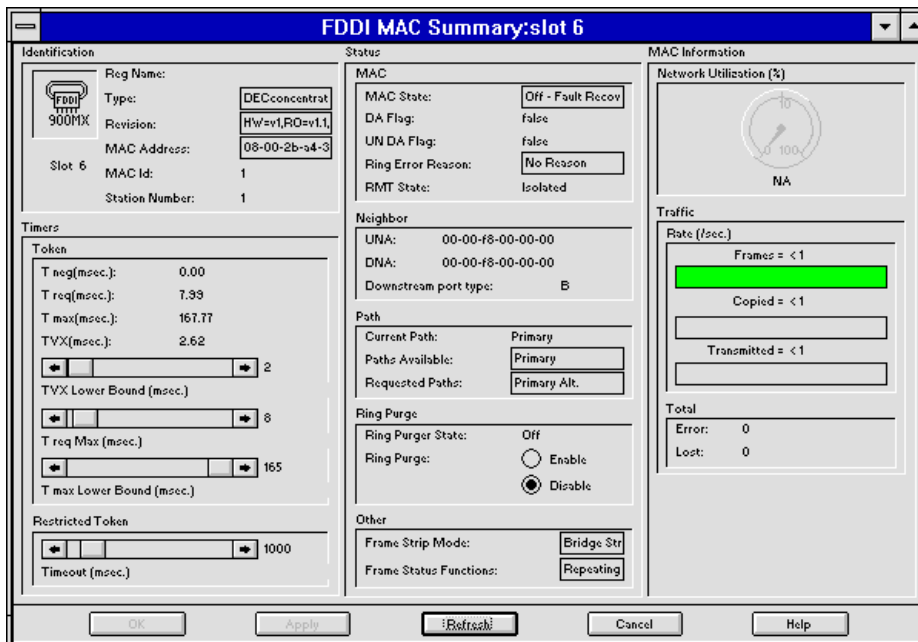
How to Display Network Utilization

To display current Network Utilization:

Step	Action
1)	Open the FDDI Summary window.
2)	Click on the **Summary** button under the Network Utilization gauge. The Network Utilization gauge is located in the upper right corner.
	The FDDI MAC Summary window appears.

NOTE

To get the most accurate recording of Logical Link Control (LLC) traffic utilization, disable the ring purger on all devices on the ring. The reading is a snapshot of information at the moment the reading is taken and may vary from window to window. See the section titled Enabling and Disabling the Ring Purger.

The utilization is computed using the following algorithm:

$$U = 1 - \frac{MD}{T}$$

where T is the sample time (time since last screen refresh), D is the measured ring latency and M is the number of times the token was seen in the time period. The ring latency is measured by timing how long it takes a void frame to traverse the ring.

Relevant SNMP Object

MIB Object...	Where to get more information...
eMACRingLatency	Vendor MIB
fddimibMACTokenCts	RFC 1512

Configuring the Concentrator Ports

You can configure two front panel ports and two backplane ports on any DECconcentrator.

Network Building Block Options

There are two categories of building blocks icons:

- FDDI dual-ring

- FDDI tree

NOTE

When modules are installed in a DEChub 900 MultiSwitch, the module port configurations are stored in the DEChub 900 MultiSwitch's Hub Manager. Therefore, when you remove a module from a hub and install it in a different hub or a different slot in the same hub, the port configurations are lost and must be reconfigured. You can switch the FDDI ports A and B to the concentrator backplane only when the concentrator is installed in a DEChub 900 MultiSwitch or DEChub ONE-MX.

Table 4-5 describes the dual-ring building blocks and Table 4-6 describes the FDDI tree building blocks.
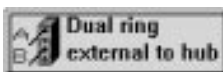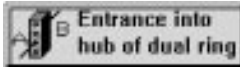
Table 4-5: FDDI Dual-Ring Building Blocks

Icon	Description
Dual ring external to hub	Switches the FDDI A and B ports to the module's front panel. Select this port configuration when connecting the module to a dual ring that is external to the hub.
Exit from hub of dual ring	Switches the B port to the module's front panel and the A port to the backplane. Select this port configuration to exit the dual ring from the hub's backplane.
Entrance into hub of dual ring	Switches the A port to the module's front panel and the B port to the backplane. Select this port configuration to bring the dual ring into the hub's backplane.
Dual ring internal to hub	Switches the FDDI A and B ports to the module's backplane. Select this port configuration to connect the module to the dual ring on the hub's backplane.

Table 4-6: FDDI Tree Building Blocks

Icon	Description
Root of dual homed tree	Switches the A and B ports to the module's front panel and the M port to the module's backplane. Select this configuration to connect the hub module to a ring that is external to the hub or a dual-homed tree configuration. The DECconcentrator modules are the only modules that support this configuration.
Tree on hub backplane	Switches the S and M ports to the module's backplane. Select this configuration to connect the module in a tree on the hub backplane.
Entrance to hub of tree	Switches the S port to the module's front panel and the M port to the module's backplane. Select this port configuration to enter a tree into the hub backplane.

Icon	Description
	Switches the M port to the module's front panel and the S port to the module's backplane. Select this port configuration to exit a tree from the hub backplane.
	Switches the M and S ports to the module's front panel. Select this port configuration to connect the module to a tree external to the hub.

How to Configure the Concentrator Ports

To configure the concentrator ports:

Step	Action
1)	Open the FDDI Summary window.
2)	Click on the **Configuration** icon in the FDDI Summary window. The Station Configuration window for the concentrator appears.
3)	Click on the **Network Building Block** icon and select the desired configuration.
4)	Click on **Apply** to apply the new configuration.
5)	Click on **Ok** to close the Station Configuration window.

Relevant SNMP Object

MIB Object...	Where to get more information...
pcomLigo	PCOM MIB, June 1995 or later
chasLigoTable	Chassis MIB, V2.0 or higher

Displaying Port Information

The FDDI Summary window and the FDDI Port Details window display port information.

You can access port information from the Hub Front Panel window or the FDDI Summary window.

From the Hub Front Panel Window

From the Hub Front Panel window, double-click on a Station Port icon. The FDDI Port Details window (Figure 4-4) appears.

Figure 4-4: FDDI Port Details Window
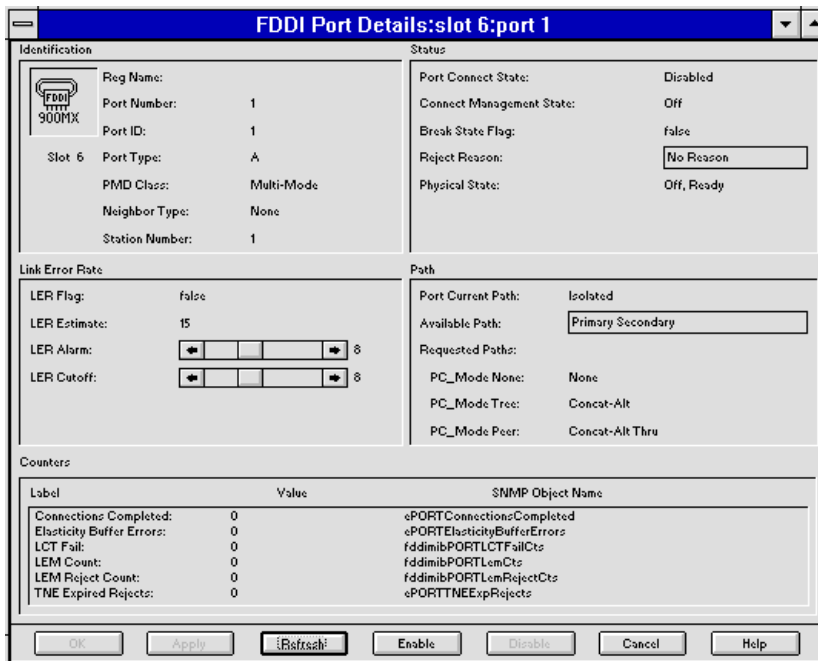
From the FDDI Summary Window

From the FDDI Summary window, perform the following steps:

Step	Action
1)	Double-click on a port connector button in the Port Information box.
	The FDDI Port Details window appears and provides detailed port information. Refer to Figure 4-4.
2)	Refer to Table 4-7 for a description of the FDDI Port Details window fields.

Table 4-7: FDDI Port Details Window Field Description

Field	Description
Identification	Indicates Registered Name, Port Number, ID, Type, PMD Class, Neighbor Type, and Station Number.
Status	Indicates Port Connection State, Connect Management State, Break State Flag, Reject Reason, and Physical State.
Link Error Rate	Indicates the state of the Link Error Rate (LER) flag, the number of estimated link errors, and the settings for LER Alarm and LER Cutoff.
Path	Indicates Port Current Path, Available Path, and Requested Paths.
Counters	Indicates Label, Value, and related SNMP Object Names.

To modify a field, follow the instructions in the MultiChassis Manager online help.

Relevant SNMP Object

MIB Object...	Where to get more information...
fddimibPORTTable	RFC 1512

Enabling and Disabling Concentrator Ports

You can enable or disable a port from the FDDI Summary window (see Figure 4-1) or the FDDI Port Details window (see Figure 4-4).

From the FDDI Summary Window, perform the following steps:

Step	Action
1)	Open the FDDI Summary window.
2)	Click on the port's Internal State Enable/Disable button in the Port Information box.

Internal State   Internal State
Enable button   Disable button

Step	Action
3)	Use the scroll bar on the right side to select other ports.
4)	Click on the **Apply** button to apply the change. Or, click on the **OK** button to apply the change and close the window.

From the FDDI Port Details Window, perform the following steps:

Step	Action
1)	From the FDDI Summary window, double-click on the port connector button.

The FDDI Port Details window appears.

Step	Action
2)	Click the **Enable** button (to enable the port) or the **Disable** button (to disable the port).

Relevant SNMP Object

MIB Object...	Where to get more information...
fddimibPORTAction	RFC 1512

Displaying MAC Status

The FDDI Summary window, shown in Figure 4-1, displays limited status information. To see more detailed status information, open the FDDI MAC Summary window (Figure 4-5).

Figure 4-5: FDDI MAC Summary Window
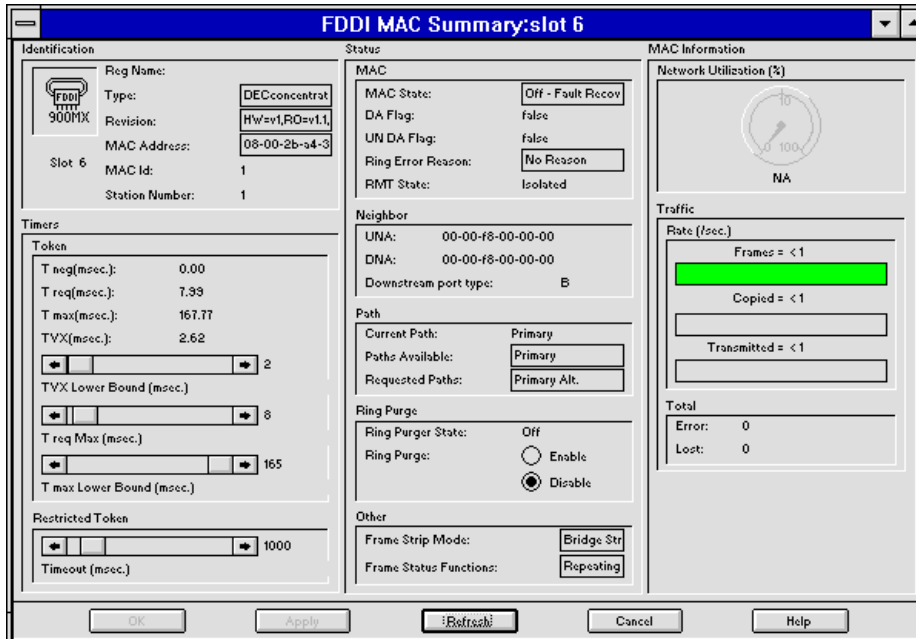
How to Display MAC Status

Step	Action
1)	Open the FDDI Summary window.
2)	Click the **Summary** button in the MAC Information box.
	Result: The FDDI MAC Summary window appears and displays the information described in Table 4-8.

Table 4-8: MAC Status Information

Name	Description
MAC Identification	The Identification box displays information about the concentrator.
Status	Displays the MAC states, neighbor MAC addresses and downstream port type, path information, ring purge information, and frame information.
MAC Information	Displays network utilization details, traffic information, and error and lost counters information.
Timers	Displays token and restricted token timers.

Relevant SNMP Object

MIB Object...	Where to get more information...
fddimibMACTable	RFC 1512

Setting Connection Policy

The connection policy determines whether a connection can be made to individual concentrator ports.

How to Set Connection Policy

To set the connection policy:

Step	Action
1	Open the FDDI Summary window.
2	Click the **Connection Policy** button in the Station Information box.
	The Connection Policy dialog box appears. A red box at the intersection of a neighbor port and a local port indicates that connections between these two types of ports are not allowed.
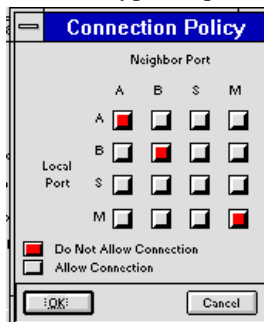
Step	Action
3	To allow or disallow a connection between a concentrator port type and a neighbor port type, click on the box that intersects the two ports.
	The box changes to red or gray.
4	Click the **OK** button to confirm the connection policy and close the dialog box.
5	Click the **Apply** button on the Summary window to apply the change. Or, click the **OK** button on the Summary window to apply the change and close the window.

NOTE

Changes to connection policy do not affect connections made prior to the new policy taking effect.
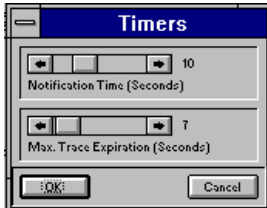
Relevant SNMP Object

MIB Object...	Where to get more information...
fddimibSMTConnectionPolicy	RFC 1512

Setting the Connection Management Timers

To set the connection management timers:

Step	Action
1	Open the FDDI Summary window.
2	Click the **Timers** button in the Station Information box.

The Timers dialog box appears.

3	Click on each scale slider (Notification Time and Max Trace Expiration) and drag it to set the desired time interval in seconds in the Timers box.
4	Click the **OK** button to confirm the changes and close the dialog box.
5	Click the **Apply** button on the Summary window to apply the changes. Or, click the **OK** button on the Summary window to apply the changes and close the window.

Connection Management Timer Values

Table 4-9 describes the connection management timer values.

Table 4-9: Connection Management Timer Values.

Name	Description
Notification Time	The interval between successive iterations of the Neighbor Notification protocol. The range is 2 to 30 seconds (default: 30 seconds).
Max Trace Expiration	The maximum propagation time for a trace on an FDDI topology. The range is 6 to 30 seconds (default: 7 seconds).

Relevant SNMP Object

MIB Object...	Where to get more information...
fddimibMACTable	RFC 1512

Configuring the Token Timers

You can modify the station token timers to improve the performance of the ring. The following example is a range of values for the objects TVX Lower Bound, T Req Max, and T Max Lower Bound.

```
0 < TVX Lower Bound < T Req Max < = T Max Lower Bound
```

How to Configure the Token Timers

To configure the token timer:

Step	Action
1	Open the FDDI Summary window.
2	Click on the **Summary** button in the MAC Information box.
	The FDDI MAC Summary window appears.
3	In the Timers box, click on the **scale slider** for each of the following timers and set the desired time interval. See Table 4-10.
	`TVX Lower Bound (msec.)` `T req Max (msec.)` `T max Lower Bound (msec.)`
4	Click on the **Apply** button to execute the change. Or, click on the **OK** button to execute the change and close the window.

Token Timer Fields

Table 4-10 describes the Token Timer fields.

Table 4-10: Token Timer Fields

Field	Description
T neg	The negotiated target token rotation time for the ring.
T req	The requested target token rotation time by this station.
T max	The maximum target token rotation time for this station.
TVX	The maximum time allowed between valid transmissions on the ring.
TVX Lower Bound	The minimum allowed value of T max, which is also the maximum allowed value of T req Max.
T req Max	The maximum supported value for T req in the absence of a duplicate address condition.
T Max Lower Bound	The minimum value of TVX used by this path.

NOTE

The default values for the Token Timer fields in Table 4-10 are displayed in the FDDI Summary window.

Relevant SNMP Object

MIB Object...	Where to get more information...
fddiMACTable	RFC 1512

Enabling and Disabling the Ring Purger

You can enable or disable the ring purger. The purpose of the ring purger is to rid the ring of No Owner Frames (NOFs) and fragments.

When you enable the ring purger on any DIGITAL FDDI device on the network, the Frames Per Second (frames/sec) Traffic counter increases because the Void frames that the MAC transmits are counted by the MAC Frame counter. When the Void frames increase, the Token counter increases significantly and causes the Network Utilization to increase. To prevent Void frames from being seen as traffic on the FDDI ring, you must disable the ring purger on all DIGITAL FDDI devices.

NOTE

To get the most accurate recording of Logical Link Control (LLC) traffic utilization, you should disable the ring purger on all devices on the ring. Also, note that the reading is a snapshot taken at the moment the reading is taken. Because it is a snapshot, it may vary from window to window.

How to Enable or Disable the Ring Purger

To enable or disable the ring purger:

Step	Action
1	Open the FDDI Summary window.
2	Click on the **Summary** button in the MAC Information box. The FDDI MAC Summary window appears.
3	Click either the **Enable** or **Disable** button in the Ring Purge box.
4	Click the **Apply** button to apply the change. Or, click the **OK** button to apply the change and close the window.

Relevant SNMP Object

MIB Object...	Where to get more information...
eMACRingPurgerState	DIGITAL Extended MIB, V3.0 or higher

Setting Link Error Rate Alarm and Cutoff Thresholds

The Link Error Rate Alarm and Cutoff Thresholds are set from the FDDI Ports Details window.

The Link Error Rate box displays the following information about the link errors on this port:

- Link Error Rate Flag—the default value is False; however, if the error rate exceeds the cutoff threshold, this box is True.

- Link Error Rate Estimate—the default value is 15; this value decreases as link errors increase.

- Link Error Rate Alarm—the default value is 8, except for UTP, which is 5.

- Link Error Rate Cutoff—the default value is 8, except for UTP, which is 5.

How to Set the Link Error Rate, Alarm, and Cutoff Values

To set the Link Error Rate (LER) Alarm and Cutoff thresholds:

Step	Action
1	Open the FDDI Port Details window by clicking on a port icon either in the MultiChassis Manager Front Panel window or in the FDDI Summary window (Figure 4-1). The FDDI Port Details window (Figure 4-4) appears.
2	Click on the **LER Alarm** scale slider in the Link Error Rate box and set the threshold to the desired level.
3	Click on the **LER Cutoff** scale slider in the Link Error Rate box and set the threshold to the desired level.
4	Click the **Apply** button to apply the change. Or click the **OK** button to apply the change and close the window.

Relevant SNMP Object

MIB Object...	Where to get more information...
fddimibPORTTable	RFC 1512

Enabling and Disabling Quick PC Trace

You enable Quick PC Trace only from the configuration screen of the concentrator's setup port.

How to Enable and Disable Quick PC Trace

To enable and disable Quick PC Trace, perform the following steps:

Step	Action
1	Ensure that the baud rate of the device (terminal or PC) you will connect to the setup port is set to 9600.
2	Connect your device to the setup-port connector on either the DEChub 900 MultiSwitch, DEChub ONE or DEChub ONE-MX, depending on where the concentrator is installed.
3	Press **Return** until the setup menu appears. On the DEChub ONE or DEChub ONE-MX, the DECconcentrator Installation Menu appears. Go to step 5. On the DEChub 900 MultiSwitch, the DEChub 900 MultiSwitch Installation Menu appears. Enter the number of the menu option titled **Start Redirect Mode** and press **Return**. A prompt appears requesting the slot number of the concentrator in the DEChub 900 MultiSwitch. Go to step 4.
4	Enter the slot number of the concentrator and press **Return**. The DECconcentrator Installation Menu appears.
5	Enter the number of the menu option titled **Module-Specific Options** and press **Return**. The DECconcentrator Configuration Menu appears.
6	Enter the number of the option titled **Enable/Disable Quick PC-trace Recovery** and press **Return**. A prompt appears informing you whether Quick PC Trace is currently enabled or disabled and giving you the option of changing the current state.
7	Enter **Y** to change the enabled/disabled state of Quick PC Trace to the opposite of its current state. Enter **N** to leave the current state unchanged and press **Return**.
8	Press **Return** to go back to the previous menu.

Appendix A

FDDI

Overview

Fiber Distributed Data Interface (FDDI) is a set of ANSI/ISO standards for a 100 Mbps token passing ring which uses Multimode fiber, Single mode fiber, Unshielded Twisted Pair, Screened/Shielded Twisted Pair or any combination of the four as the transmission medium. This appendix provides an overview of the applicable FDDI standards that govern the use of FDDI network modules.
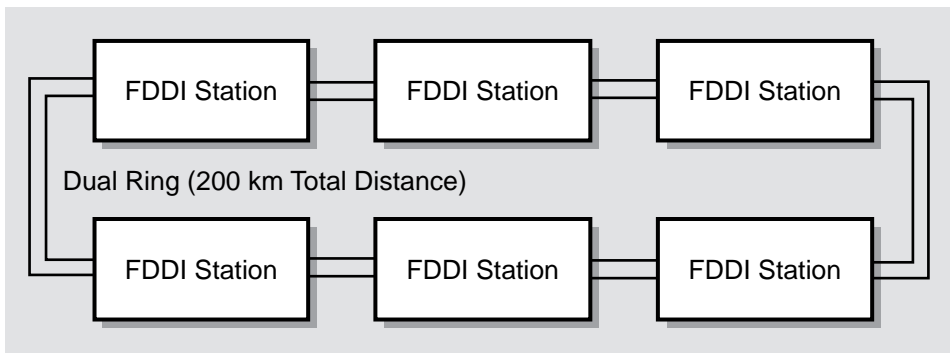
In This Appendix

The following topics are covered in this appendix:

The Dual Ring

The basic FDDI network is constructed of two independent rings and is commonly referred to as a dual ring (Figure A-1). A dual ring connects to each FDDI station in the network. Each ring can span a total distance of up to 100 km, which allows for a distance of up to 200 km (2 x 100 km/ring) of cabling. As many as 500 stations can be attached to the dual ring — typical configurations usually have no more than 200 stations.

Figure A-1: FDDI Dual Ring


```
┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ FDDI Station │   │ FDDI Station │   │ FDDI Station │
└──────────────┘   └──────────────┘   └──────────────┘

Dual Ring (200 km Total Distance)

┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ FDDI Station │   │ FDDI Station │   │ FDDI Station │
└──────────────┘   └──────────────┘   └──────────────┘
```

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All FDDI networks operate as logical token rings, where the right to transmit is granted by the possession of a token. There is one token per ring, and it is passed from station to station, according to a set of rules known as the timed token protocol. A station wishing to transmit on the ring first captures the token. It then transmits frames for a period of time determined by the timed token rules, and then releases the token immediately after completing its transmission.

A transmitting station is also responsible for removing the frames it transmitted from the ring, once they have circled the ring and returned to the station. This process is called frame stripping.

Station Types

As shown in Figure A-2, FDDI networks are constructed using the following two types of devices:

- Stations — there are two types of stations: Dual Attachment Stations (DAS) and Single Attachment Stations (SAS).

- Concentrators — there are two types of concentrators: Dual Attachment Concentrators (DAC) and Single Attachment Concentrators (SAC).

Figure A-2: FDDI Station Types
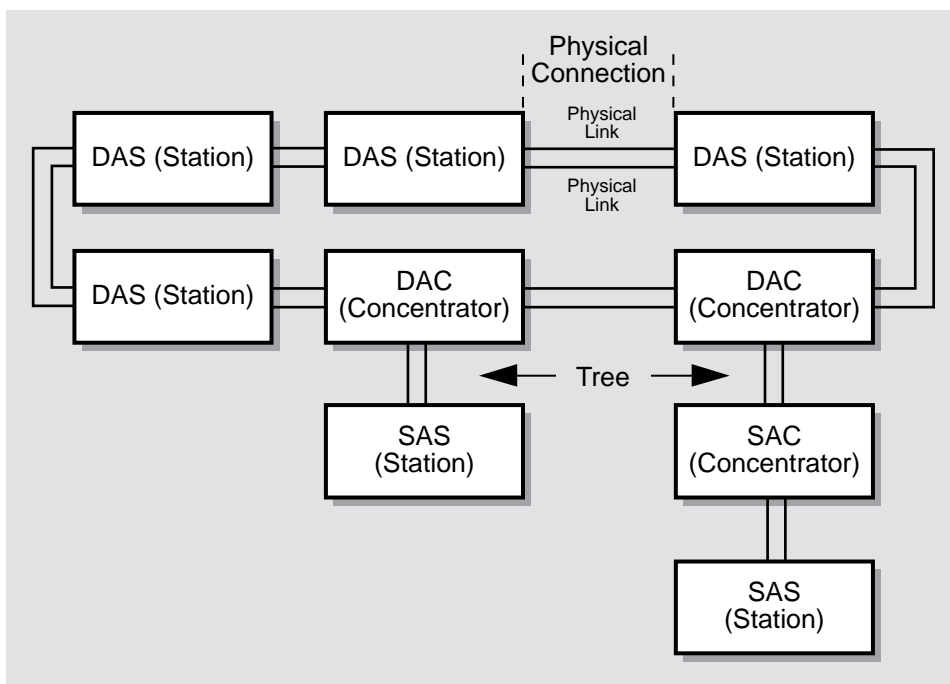
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Dual Attachment Stations

Dual Attachment Stations (DAS) attach directly to the dual ring.

Single Attachment Stations

Single Attachment Stations (SAS) connect to the ring via a concentrator, that can be of two types:

- Dual Attachment Concentrator (DAC) — attaches directly to the dual ring.

- Single Attachment Concentrator (SAC) — attaches to the ring through other concentrators.

Physical Connection

As shown in Figure A-2, all devices, whether they are single attachment stations or dual attachment stations, connect to each other via a full-duplex connection, called a physical connection.

Each physical connection comprises two physical links (a single fiber-optic cable per each physical link):

- Single Attachment Stations and Single Attachment Concentrators connect to a concentrator, or to another station, via one physical connection.

- Dual Attachment Stations and Dual Attachment Concentrators connect to each other via two physical connections.

Media Types and Maximum Distances

FDDI allows links to be built from the following media types:

Fiber Media	Fiber Type (Microns)	Power Budget (Decibels)	Maximum Link Distance (Kilometers)
Multimode Fiber (MMF)	62.5/125	11	2.0
Single-mode Fiber (SMF)	8-to-10	22	60

Copper Media	Copper Type	Maximum Link Distance
Unshielded Twisted Pair (UTP)	100 ohm Category 5 Twisted Pair	100 meters
Screened Twisted Pair	100 ohm Category 5 Twisted Pair	100 meters
Shielded Twisted Pair	150 ohm Category 5 Twisted Pair (equivalent to IBM Type 1 cable.)	100 meters

Station Configurations

Stations and concentrators (Figure A-3) can be identified by the types of ports that they use to attach to other stations:

- A and B Ports — Dual Attachment Stations have A and B ports for attachment to other stations in the dual ring, or to concentrator M ports.

- M Port — All concentrators, (SAC or DAC), are identifiable by the presence of M ports. The M port allows the attachment of other stations or concentrators.

- S Port — If the concentrator also has an S port, it is a SAC; if it has A and B ports it is a DAC. A Single Attachment Station has an S port for connection to a concentrator M port.

Figure A-3: FDDI Port Types
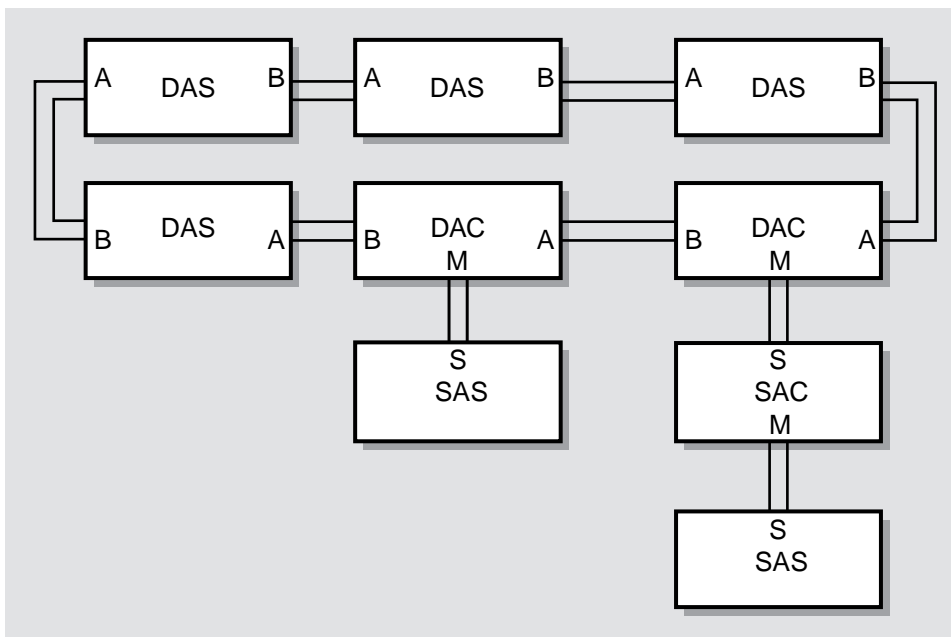
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MAC Location

FDDI rules require that a station's Media Access Control (MAC) be physically located immediately prior to the port where the token exits the station. For Dual Attachment devices this means that the MAC is immediately ahead of the B port; for Single Attachment devices it is immediately ahead of the S port.

Physical Topologies

Although all FDDI networks are logical rings, the following physical topology types can be created:

- Dual rings

- Trees

- Dual ring of trees

Dual Ring Topologies

Dual ring topologies (as shown in Figure A-1) are created by connecting only Dual Attachment Stations. The A port of one DAS station connects to the B port of the next DAS station, forming a physical connection between the two stations. The connections can continue until up to 500 stations are included in the dual ring.

- Independent Rings

    Because there are two physical links per physical connection (see Figure A-2), two operating links are created between each DAS station when the ring is formed. This design allows for two independent rings, the primary ring and the secondary ring, to be formed.

    The Primary ring enters the DAS station at the A port, and exits the DAS station at the B port. The Secondary ring enters the DAS station at the B port and exits the DAS station at the A port.

- Backup Benefit

    In general, all data traffic between stations is carried on the primary ring and the secondary ring is idle during this time. FDDI standards actually allow both rings to be used for carrying data traffic, but in practice this is rarely done. The common practice is to use the secondary ring as a backup for the primary ring.

    A benefit of having dual rings is that, in case of a failure, the secondary ring can be used to patch a failure affecting the primary ring. If a station detects that one of its A or B ports has failed, it wraps the primary and secondary rings together, thus restoring operation to the other stations in the ring. Wrapping occurs very quickly, usually in well under a half a second.

Tree Topologies

FDDI also allows for the creation of tree topologies. Tree topologies start with a stand-alone concentrator at the top of the tree. Stations (DAS or SAS) or other concentrators (DACs) connect to this concentrator, and branch out from the top of the tree.

- How to Identify Trees

  The distinguishing feature of a tree topology is the connection to an M port. Single Attachment Stations (S ports) typically connect to a concentrator, but Dual Attachment Stations (A and B ports) can also connect to the M ports.

- Benefit

  A major advantage of the use of trees built with concentrators is the ability of the concentrator to electronically disconnect stations from the ring in case of failure, or, by management control.

Dual Ring of Trees Topology

The third, and most common, FDDI configuration (Figure A-4) is referred to as the dual ring of trees. This configuration type is a very robust topology and is a hybrid of the dual ring and tree topologies.

Dual Attachment Concentrators (DACs) and Dual Attachment Stations (DASs) attach together in a dual ring, with treed stations connected to the concentrators' M ports. The concentrator connects stations attached to these M ports into the flow of the primary ring.

Figure A-4: FDDI Topologies
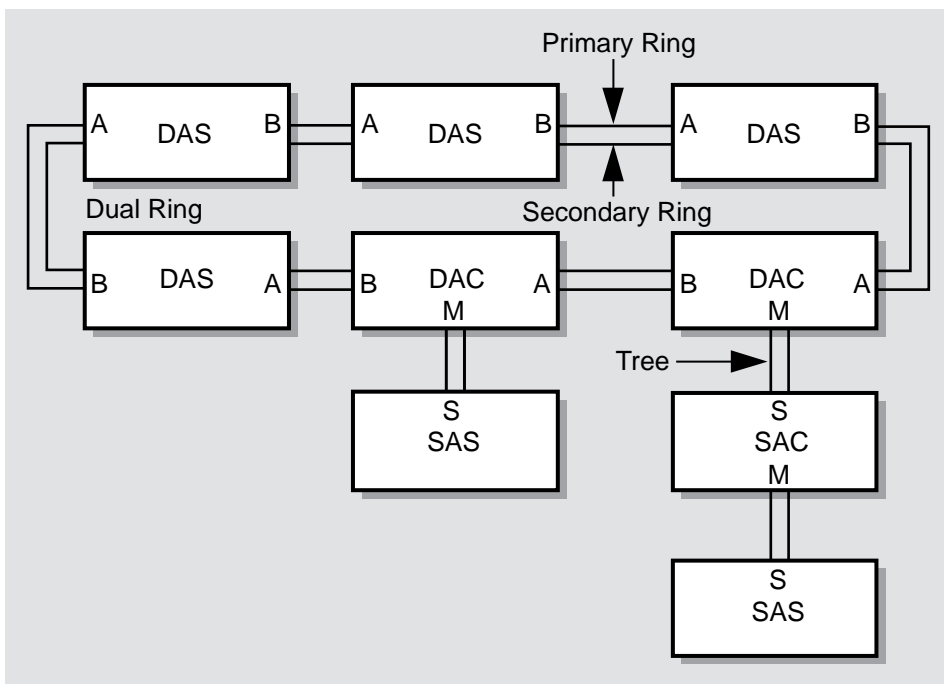
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Station States

The station state is defined by FDDI standards as the internal configuration of the paths within the station. Stations can be in one of two states: the Through State or the Wrap State (Figure A-5).

For example, DAS or DAC stations that are in an (unwrapped) dual ring are in the Through State. If a station detects a failure, causing it to wrap the rings together, that station transitions to the Wrap State.

Figure A-5: Wrapped FDDI Ring

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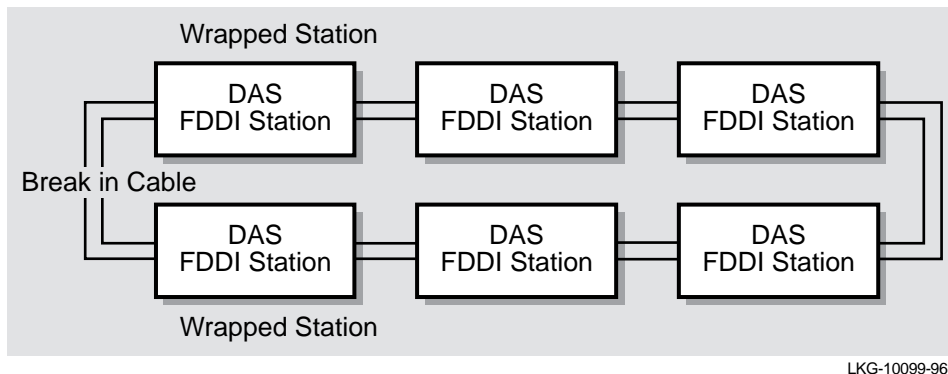
FDDI Naming Convention

When transitioning to the Wrap State, the station can adjust its internal configuration in a number of ways that are specified by FDDI standards. FDDI standards require that each station configuration type has a specific naming format, and that the station is required to use that specific naming format when reporting internal configuration status to management.

- All DIGITAL SAS and SAC devices report: wrap_S

- All DIGITAL DAS and DAC devices in the wrapped state report: c_wrap_A (concatenated wrap A) or c_wrap_B (concatenated wrap B)

  To explain further, c_wrap_A means that the B port is not active, the station has wrapped the ring, and the A port is the active port.

FDDI Connection Rules

FDDI connection rules can seem complex and sometimes confusing; however, once clarified and understood, one can easily see how the applied rules prevent the formation of non-useful topologies that can disrupt communications among stations in the ring. FDDI connection rules also ensure that the ring always converges to a pre-defined topology.

For example, as shown in Figure A-6, if Port A (DAC 1) is connected to Port B (DAC 2), and then Port B (DAC 1) is connected to an M-port of (DAC 3), Port A (DAC 1) breaks its connection to Port B (DAC 2).

This behavior is referred to as taking the tree connection over the ring connection. This particular rule ensures that the same tree topology is always formed, independent of the order in which the physical connections are made.

Figure A-6: FDDI Connection Rules
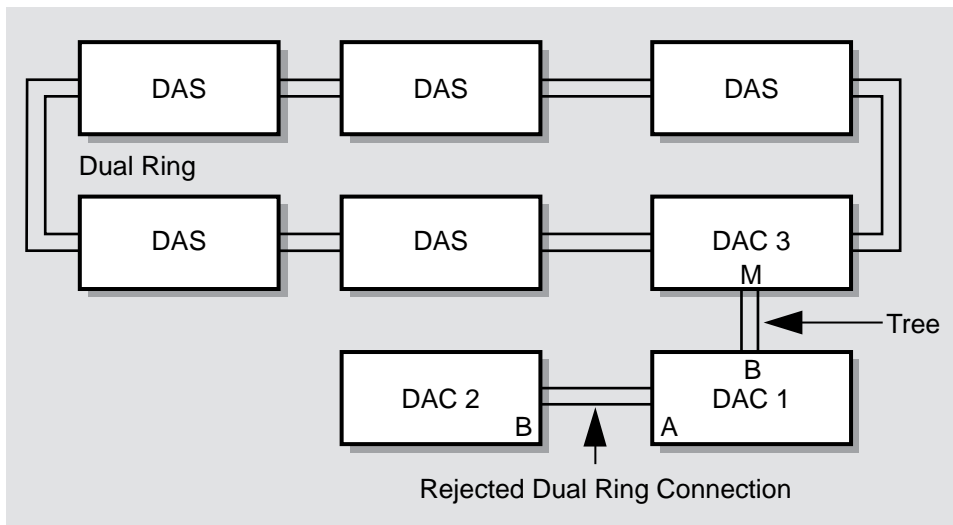
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How Rings Are Formed

FDDI rings are formed by the completion of physical connections between pairs of ports. The ports signal various parameters that are necessary for the successful completion of the connections.

When a port attempts to form a connection with another port, it indicates both its own port type, and whether it wishes to form a connection with the port type that it senses at the other end of the link.

Undesirable Connections

One type of connection, the M Port-to-M Port connection, is always rejected. Other types of connections, such as A port to A port and B port to B port connections are undesirable, but can be formed if the connection rules of one of the stations allows the connection.

Example

For example, if a DIGITAL FDDI product attempts to form an A-port to A-port connection with another DIGITAL FDDI product, the connection is rejected.

The connection is rejected because DIGITAL products are designed to avoid connection to similar ports; (both ports signal that they do not wish to connect to a remote A port).

If the DIGITAL FDDI product attempts to form an A-port to A-port connection to a non-DIGITAL station, and the non-DIGITAL station's A port signals that it wants to accept the connection to the DIGITAL A port, the DIGITAL station honors the request (per the ANSI standard's rules for connection of ports).

The result of this type of connection is graphically shown in the following subsection.

Result

The resulting configuration (Figure A-7) is that, although the stations are connected, one station's MAC address is in the primary ring, and the other station's MAC address is in the secondary ring.

Because the rings are isolated when in the Through State (refer to Station States on page A-9), the stations are unable to communicate, even though their ports have formed a valid physical connection.

Figure A-7: Connecting to Similar Ports
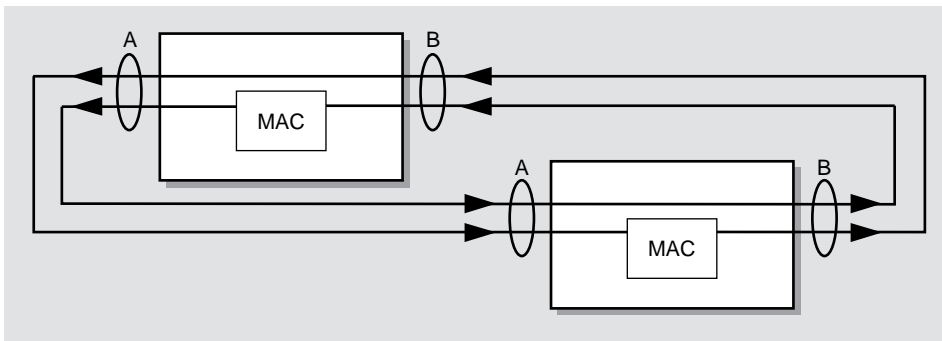
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Summary of FDDI DECconcentrator Connection Rules

Table A-1 summarizes the FDDI connection rules.

Table A-1: FDDI Connection Rules and Station States

Port A	Port B	Topology	Station State
M	—	Tree	c_wrap_A
—	M	Tree	c_wrap_B
M	M	Tree	c_wrap_B (Dual Homed)
B	—	Peer[1]	c_wrap_A
—	A	Peer[1]	c_wrap_B
B	A	Peer[1]	Through
A	—	Peer[1]	c_wrap_A
—	B	Peer[1]	c_wrap_B
S	—	Peer[1]	c_wrap_A
—	S	Peer[1]	c_wrap_B
S	S	Peer[1]	Through
S	M	Tree	c_wrap_B (Tree Preference)[2]
M	S	Tree	c_wrap_A (Tree Preference) [2]
S	A	Peer[1]	Through
B	S	Peer[1]	Through
B	M	Tree	c_wrap_B (Tree Preference) [2]
M	A	Tree	c_wrap_A (Tree Preference) [2]

[1] Indicates dual ring connection.

[2] Tree topology always takes precedence over ring topology when simultaneous or conflicting connections are made.

Ring Operation

FDDI rings operate according to the rules of the Timed Token Protocol.

The operation of the ring can be divided into two states:

- Ring Initialization State

- Steady State Operation

Ring Initialization State

The FDDI ring is initialized by a process known as the claim token process, that is invoked whenever a station enters or exits the ring, or if a failure of the normal ring operation is detected. The purpose of the claim token process is to set the operational timers for the ring, and to choose a station that is responsible for creating the token.

The Claim Token Process

All stations send a special frame, known as a claim frame, containing a bid for the length of time that the station is willing to wait between receipt of tokens. The station that wins the bidding is the station whose bid indicates that it needs the token the most often. If the outcome of the bidding indicates a tie, the station with the highest MAC address wins.

The outcome of the claim process is that all stations agree to abide by this time period, which is known as T_Negotiated (T_Neg). Typical values for T_Neg are in the range of 5-10 ms, with 8 ms being a common choice.

Varying the value of T_Neg can dramatically change the utilization and latency of a very busy FDDI ring, but it has minimal affect on the utilization or latency of a lightly loaded ring. DIGITAL recommends not changing the value of T_Neg from the device manufacturer's default setting.

The Beacon Process

If a ring fails to complete the claim process within a certain time, the ring enters the beacon process. The beacon process causes special frames known as beacon frames to traverse the ring in an attempt to isolate the location of the fault.

Understandably, when beacon frames are detected traversing the ring, it usually indicates a serious problem with the operation of the ring.

Steady State

In the steady state, the token circulates around the ring. The time for a token to circle once around the ring without being used by anyone is known as the token latency. Stations that wish to transmit must capture the token, and can transmit as long as allowed by the token holding rules.

All stations keep a timer called the valid transmission timer (TVX) which they use for timing valid activity on the ring. If, for any reason, a token gets lost, the TVX timer expires and all stations enter the claim process to elect a new token.

During the Steady State, all stations in the ring exchange frames that report their adjacent stations. This information is communicated via Station Management (SMT) frames, that are sent at a rate of approximately 1 every 10 to 30 seconds.

Using these frames, all stations on the ring determine their upstream and downstream neighbors. For example, Station 2 is said to be downstream of Station 1 if Station 2 receives the token after it was received by Station 1.

For More Information

Topic	Where to Get More Information...
Features, topologies, and components of the FDDI local area network standard.	*Fiber Distributed Data Interface, An Introduction* (DIGITAL Press)
	Fiber Distributed Data Interface
	FDDI Handbook, Raj Jain

Appendix B

Repairing Nonvolatile Flash Memory

Overview

This appendix describes how to repair a nonvolatile flash memory that has been corrupted by an interrupt during an upgrade to the module.

In This Appendix

The following topics are covered in this appendix:

Power Interrupts During Upgrades

Upgrading your module is a process that is fully described in the specific module's Installation manual and also in the *DEChub 900 MultiSwitch Owner's Manual*. This feature allows you to keep your module up to date with the latest firmware release from DIGITAL.

The upgrade process is a quick and simple procedure (typical time for completion is about 5 minutes). However, during the time that the old firmware image is erased and replaced by the new firmware image, the power must not be interrupted. An interrupt during this stage of the process can corrupt the firmware image load.

Although this is unlikely to happen, this section explains how to recover in the event of an untimely power interrupt during the upgrade.

Symptoms of Corrupted Nonvolatile Flash Memory

This section describes some symptoms that indicate nonvolatile flash memory is corrupted.

When the Module Is in a DEChub ONE or DEChub ONE-MX

The symptoms of corrupted nonvolatile flash memory when a concentrator is in a DEChub ONE or DEChub ONE-MX are as follows:

- All LEDs are off except for the power LED.

- There is no response when you connect a terminal to the setup port and press Return several times.

When the Module Is in a DEChub 900 MultiSwitch

The symptoms of corrupted nonvolatile flash memory when a concentrator is in a DEChub 900 MultiSwitch areas follows:

- All LEDs are off except for the power and network OK LEDs.

- The hub's LCD display shows the module as being present in its slot but of an unknown type.

- Selecting Redirect Mode from the hub's setup port to the concentrator does not work.

The Recovery Process

The recovery process requires that you install the concentrator in a DEChub 900 MultiSwitch and use the Hub Manager to perform a firmware upgrade of the module.

You can upgrade the firmware in one of two ways:

- Using the DEChub 900 MultiSwitch's setup port menu

- Using the clearVISN Flash Loader application

Using the DEChub 900 MultiSwitch's Setup Port Menu

Perform the following steps to load the new firmware:

Step	Action
1	Ensure that the baud rate of the device (terminal or PC) you will connect to the setup port is set to 9600.
2	Connect your device to the setup-port connector on the DEChub 900 MultiSwitch.
3	Press Return a few times until the Setup menu appears. The DEChub 900 MultiSwitch Installation Menu appears.
4	Enter the number of the menu option titled Downline Upgrade and press **Return**. A prompt appears requesting the slot number of the concentrator in the DEChub 900MultiSwitch.
5	Enter the slot number of the concentrator and press **Return**. A prompt for the load file name appears.
6	Enter the name of the file containing the firmware you want to load and press **Return**. You obtain the name of the file from the DEChub Consolidated Firmware Kit. A prompt for the IP address of the host system where the load file resides appears.

7   Enter the IP address of the load host system and press **Return**.

If there is only one network interface (IP address) for the Hub Manager to choose from, a prompt appears informing you that the device will be nonfunctional for up to 10 minutes during the load. Go to step 9.

If both in-band and out-of band addresses are assigned, or if more than one in-band address is assigned, a prompt appears requesting that you select one from a list of available network interfaces.

8   Enter the number of the network interface you want to use and press **Return**. The numbers are listed on the screen.

A prompt appears informing you that the device will be nonfunctional for up to 10 minutes during the load.

9   Press **Return** to start the load.

A series of dots and messages appears until the load is complete.

The message `File transfer completed` appears twice before the load is complete. After that message appears the second time, you must wait approximately two minutes for the concentrator to become operational before proceeding. Do not proceed until the DEChub 900 MultiSwitch's LCD display states that the concentrator in the specified slot is up.

The `File transfer completed` message appears once, when the image is loaded in the hub's memory, and again, when the image is loaded in the concentrator's memory. After the image is in the concentrator's memory, the concentrator stores the image in non-volatile flash memory, resets itself, and runs self-tests. Flash memory can become corrupted anytime before the concentrator resets itself.

10   When the DEChub 900 MultiSwitch's LCD display states that the concentrator is up, verify the upgrade by selecting the setup menu option titled **Start Redirect Mode** and press **Return**.

A prompt appears requesting the slot number of the concentrator in the DEChub 900 MultiSwitch.

11   Enter the concentrator's slot number and press **Return**.

The concentrator's installation menu appears.

12   Select **Show Current Settings** and press **Return**.

The settings for the concentrator appear.

13   Verify the upgrade by checking the concentrator's version number, system uptime, and the status of the last downline upgrade.

Using clearVISN Flash Loader

Perform the following steps to load the new firmware:

Step	Action
1	Ensure that the TFTP Server that performs the load is running. Click on the clearVISN Router icon in the clearVISN Windows group.

Note: Security is turned on for the software. The default user name and password are **Admin**. This login must be changed to secure the workstation for the Administrator. This initial security login is at an Administrator level. All security words are case sensitive. Only the Administrator can add and modify users and passwords to tailor security requirements for individual networks.
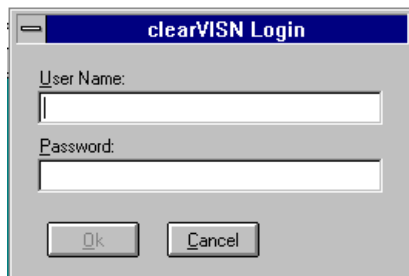
This login screen appears each time that the clearVISN Router is opened.

Note: For more information, refer to the *clearVISN Overview* manual, Router Manager, for detailed security information.

Step	Action
2	Enter the user name and password and click **OK**.

The TFTP Server icon appears.

Step	Action
3	Proceed to Step 4 to start Flash Loader from the Applications menu within MultiChassis Manager or Stack Manager. Otherwise, double-click on the Flash Loader icon in the clearVISN Windows group.

The Flash Loader main window appears.
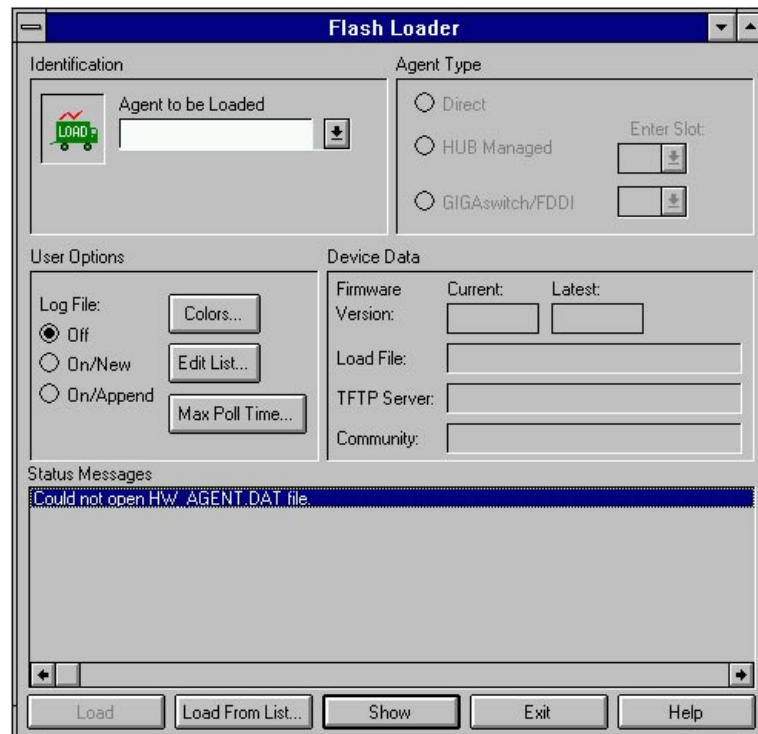
Step	Action
4	To start Flash Loader from MultiChassis Manager, double-click on the MultiChassis Manager icon.

MultiChassis
Manager

To start Flash Loader from Stack Manager, double-click on the Stack Manager icon.

Stack
Manager

The MultiChassis Manager or the Stack Manager Hub Front Panel window appears.

a Select **Applications** from the menu bar.

b Select **Flash Loader** from the pull-down list menu.

c Click **Help** at the bottom of the screen for additional information and management tasks.

Step	Action
5	In the User Options box, select **On/New** under Log File.
	The messages that subsequently appear in the Status Message box are written to the file HUBLOAD.LOG.
6	Enter the IP address or name of the DEChub 900 MultiSwitch IP Services module in the Agent to Be Loaded field of the Identification box.
7	Click on **Show** to update the Agent Type box and the Device Data box.
	In the Agent Type Box, both Direct and Hub Managed are enabled. The Data box displays data for the DEChub 900 MultiSwitch.
8	Click on **Hub Managed**.
	The Enter Slot selection box is enabled.
9	In the Enter Slot selection box, enter the slot number of the concentrator.
	The Device Data box displays data for the concentrator.
10	Enter a new value in any of the Device Data parameter fields that you want to change. The information in the Device Data fields comes from the DEChub Consolidated Firmware kit on your system. To load a file from another system, you must enter the full path of the file on that system in the Load File field and the IP address of that system in the TFTP Server field.
	When you click on the Load button, the load uses whatever values are specified for the Device Data parameters.
11	Click on the **Load** button to initiate the load.
	The load begins. A popup message appears informing you that polling is in progress and giving you the option to stop the polling, but not the loading. Flash Loader polls the device every 15 seconds to determine if the device has the new firmware. The polling stops when the load is complete or when the max poll time is reached.

Appendix C

Fiber Cable Specifications

Overview

This appendix describes the fiber cable specifications for single-mode, multimode, and unshielded twisted-pair.

In This Appendix

The following topics are covered in this appendix:

Single-Mode Fiber (SMF)

Single-mode fiber allows the longest communication link. The distance between two FDDI stations can be up to 60 km. SMF fibers have lower loss (attenuation) than other fibers. SMF fibers are thinner than other fibers. The typical core diameter is 8 to 10 µm compared to 50 to 100 µm for MMF fibers.

The FDDI single-mode PMD standard describes the traits of single-mode fiber for long-distance links. Table C-1 lists the single-mode fiber optic cable specifications.

Table C-1: Single-Mode Fiber Cable Specifications

Recommended Cable	Parameters
Mode field diameter	8.2 µm to 10.5 µm
Cladding diameter	125 µm +/- 2µm
Fiber cladding noncircularity	2% maximum
Core to cladding concentricity error	1 µm maximum
Normal operating wavelength	1300 nm
Fiber cutoff wavelength	1260 nm maximum
Zero dispersion wavelength	1300 to 1324 nm
Zero dispersion slope	0.093 ps/ (nm2km) maximum
Optical power attenuation	< 0.40 dB per km @ 1310 nm
Minimum power budget	22 dB @ 1300 nm
Minimum required loss	12 dB @ 1300 nm
Maximum distance	60 km (37.2 miles)

Multimode Fiber (MMF)

The FDDI standard specifies the use of 62.5/125 µm multimode, graded index, fiber optic cable. This permits the use of lower cost LEDs in the place of more expensive laser devices required for single-mode fiber. An appendix to the PMD standard lists cable alternatives. Table C-2 lists DIGITAL's recommended fiber cable specifications in both the 1300 (for FDDI) and 850 (for Ethernet) nm window.

Table C-2: Multimode Fiber Cable Specifications

Recommended Cable	Parameters
Nominal core diameter	62.5 +/- 3.0 µm
Cladding diameter	125.0 +/- 2.0µm
Numerical aperture	0.275 +/- 0.015
Modal bandwidth minimum	500 MHz * km @ 1300nm, 160 MHz * km @ 850 nm
Maximum attenuation rate	1.5 dB/km @ 1300 nm, 3.5 dB/km @ 850 nm
Power budget	11.0 dB @1300 nm (for FDDI)

Table C-3 lists the alternate multimode fiber cable specifications for FDDI only in the 1300 nm window.

Table C-3: Alternative Multimode Fiber Cable Specifications for FDDI

Alternative Cable	100/140	50/125
Nominal core diameter	100 µm* +/- 4.0 µm	50 µm* +/- 3.0 µm
Cladding diameter	140 µm* +/- 6.0 µm	125 µm* +/- 2.0 µm
Optical wavelength	1300 nm	1300 nm
Numerical aperture	0.290 +/- 0.015	0.200 +/- 0.015
Modal bandwidth minimum	500 MHz per km @ 1300 nm	500 MHz per km @ 1300 nm
Power budget for FDDI	9.0-13.0 dB	6.0-7.0 dB
Maximum distance	1.6 km (.96mi)	2 km (1.2 mi.)

*Power budget contingent on core and cladding tolerances.

Unshielded Twisted-Pair(UTP)

Use 100 ohm Category 5 Unshielded Twisted Pair or 100 ohm Category Screened Twisted Pair (STP). Maximum length is 100 meters.

Glossary

This glossary is a comprehensive source of definitions used in this manual.

American National Standards Institute

An organization that coordinates and publishes standards for use in the United States.

ANSI

See American National Standards Institute.

attenuation

The amount of optical power (or light) that is lost as the light travels from the transmitter through the medium to the receiver. The difference between transmitted and received power, expressed in decibels (dB).

backbone

A network configuration that connects various LANs together into an integrated network, as for example, in a campus environment.

bandwidth

A measure of the amount of traffic the media can handle at one time. In digital communications, bandwidth describes the amount of data, in bits per second, that can be transmitted over the line.

ber

The ratio between the total number of bits transmitted in a given message and the number of bits in that message received in error.

BootP

A protocol that is used by a network node to determine the Internet Protocol (IP) address of its Ethernet interfaces used for network booting.

bypass

The function that allows a station to be optically or electronically isolated from the network while maintaining the integrity of the ring.

campus backbone substation

The cabling and cross-connects between clusters of buildings within a site. One building contains the main cross-connect.

CMT

Connection management.

community

A set of attributes that are managed as a group. Community names are used to control access. Each software request contains a community name that the agent uses as a password to verify that the requester is authorized to access the agent's management information base (MIB) or a subset of that MIB.

community strings

A text string, also referred to as a community name, that is used as a password by an SNMP agent to authenticate or verify that the network management station (NMS) making the request is allowed access to the contents of the agent's Management Information Base (MIB).

concentrator

The FDDI concentrator is a physical layer repeater that allows the attachment of multiple single attachment stations, dual attachment stations, or other concentrators to the FDDI network.

connection management

The portion of the station management function that controls insertion, removal, and connection of the PHY and MAC entities within a station. It includes the physical connection management, configuration management, and entity coordination management components.

configuration management

The portion of connection management that provides for configuration of PHY and MAC entities within a station.

cross-connect

Patch cable and passive hardware that is used to administer the connection of cables at a central or remote location.

DAC

See dual attachment concentrator.

DAS

See dual attachment station.

downstream

A term that refers to the relative position of two stations in a ring. A station is downstream of its neighbor if it receives the token after its neighbor receives the token.

downstream neighbor address (DNA)

The MAC address that identifies the most recently known downstream neighbor. Stations determine the downstream neighbor by exchanging neighborhood information frames (NIFs) as part of the neighbor notification protocol. Stations also use the protocol to determine the existence of duplicate address conditions.

dual attachment concentrator (DAC)

A concentrator that offers two connections to the FDDI network capable of accommodating the FDDI dual (counter-rotating) ring, and additional ports for the connection of other concentrators or FDDI stations.

dual attachment station (DAS)

An FDDI station that offers two connections to the FDDI dual counter-rotating ring.

dual homing

A method of cabling concentrators and stations in a tree configuration that permits an alternate or backup path to the FDDI network in case the primary connection path fails. Can be used in a tree or in a dual ring of trees configuration.

dual ring of trees

A topology of concentrators and stations that cascade from concentrators on a dual ring.

EIA

See Electronic Industries Association.

Electronic Industries Association

A standards organization specializing in the electrical and functional characteristics of interface equipment.

encoding

The act of changing data into a series of electrical or optical signals that can travel efficiently over a medium.

entity

An active element within an Open Systems Interconnection layer or subpolar.

entity coordination management (ECM) state

The ECM controls the optical bypass switch of the physical media dependent (PMD) layer and signals the physical control management (PCM) when the media is available. The ECM starts the PCMs for the A and B ports in the station when the optical bypass is complete. In concentrators, ECM also starts the PCMs associated with M ports.

FDDI

See Fiber Distributed Data Interface.

FDDI connector type

A variable that specifies the type of port being managed. The four different types of ports are as follows:

- A — The port in a dual attachment station or concentrator that attaches to the primary in and the secondary out when attaching to the dual ring.

- B — The port in a dual attachment station or concentrator that attaches to the secondary in and the primary out when attaching to the dual ring.

- S — Either the port in a single attachment station, or one port in a single attachment concentrator.

- M — A port in a concentrator that serves as a master to a connected station or concentrator.

Fiber Distributed Data Interface (FDDI)

A set of ANSI/ISO standards that define a high-bandwidth (100-Mb/s), general-purpose, local area network (LAN) connection between computers and peripheral equipment in a timed-passing, dual ring-of-trees configuration.

Fiber Distributed Data Interface (FDDI) station

A node on an FDDI ring capable of transmitting, receiving, and repeating data. A station has one instance of SMT, at least one instance of PHY and PMD, and an optional MAC entity.

fiber optics

A transmission medium used to transmit signals in the form of optical signals.

frame

A group of digits transmitted as a unit, over which a coding procedure is applied for synchronization.

hot swap

To "hot swap" a component means to remove and replace it while the system is in operation.

hub

A central device, usually in a star topology local area network (LAN), to which each network module is attached.

Hub Manager

A microprocessor-based controller used to monitor, configure, and control the hub. Either under remote management control or default local control, the Hub Manager provides a central point for allocation of hub resources to the hub-mounted network modules.

IEEE

Institute of Electrical and Electronics Engineers (US).

in-band management

Managing a device over a network.

interconnect

A panel-mounted fiber optic coupler or wallbox-mounted fiber-optic coupler used to join two cables with a single pair of connectors.

Internet Protocol (IP)

The network protocol offering a connection-less-mode network service in the Internet suite of protocols.

Internet Protocol (IP) address

The IP address is a series of numbers that identifies a device's location on the Internet.

Internet Protocol (IP) name

A unique alphanumeric string that identifies a device on the Internet.

interoperability

The ability of all system elements to exchange information between single vendor and multimedia equipment. Also called open communications.

IP

See Internet Protocol.

ISO

International Organization for Standardization.

isochronous transmission

A data communications service required when time-dependent data is to be transmitted. It is characterized by its ability to deliver bandwidth at specific, regular intervals.

LAN

See Local Area Network.

LAT

See local area transport.

LEM

Link Error Monitor. Monitors the connection bit error rate (ber). If a stations LEM determines that the ber is too high, the concentrator moves the connection to that station.

LER

Link Error Rate.

link-loss budget

The total amount of attenuation that can be introduced before an optical system will fail to work.

Local Area Network (LAN)

A data communications network that spans a limited geographical area. The network provides high-bandwidth communication over coaxial cable, twisted-pair, fiber, or microwave media and is usually owned by the user.

local area transport (LAT)

A communications protocol used in a local area network.

logical ring

The path a token follows in an FDDI network made up of all the connected MAC sublayers. The accompanying physical topology can be a dual ring of trees, a tree, or a ring.

local topology

See logical ring.

MAC

Media Access Control. The lower portion of the datalink layer.

MAC address

A unique 48-bit binary number (usually represented as a 12-digit hexadecimal number) encoded in a device's circuitry to identify it on a local area network.

management agent

See Simple Network Management Protocol (SNMP) agent.

management information base (MIB)

A dynamic, virtual collection of data about a managed object. The managed object provides this data to the network management station (NMS) which gathers the values from the managed object and loads them into the MIB representing the object.

MAU

See multistation access unit (Token Ring) or medium attachment unit (Ethernet).

Also see low light for another definition. When used in the context of network modules such as switches, this acronym stands for media access unit.

Media Access Control (MAC) layer

The lower portion of the datalink layer. In FDDI (and other types of shared-medium LANs) the Data Link layer sublayer responsible for scheduling, transmitting, and receiving data. The MAC differs for various physical media.

media interface connector

An optical fiber connector pair that links the fiber media to the FDDI station or another cable. The MIC consists of two halves. The MIC plug terminates an optical fiber cable. The MIC receptacle is attached to an FDDI station.

MIB

See Management Information Base.

MIC

See media interface connector.

module

An interchangeable unit that provides functionality and interconnection to a local area network (LAN) through the hub.

See also network modules.

ModPMD

Module Physical Media Dependent.

multimode

A type of fiber optic cable in which more than one transmission mode is supported.

network

A collection of computers, terminals, and other devices together with the hardware and software that enables them to exchange data and share resources over either short or long distances.

network modules

Any modular devices that provide network connectivity or services that can be installed in a DEChub backplane or used standalone. These include, but are not limited to, repeaters, concentrators, bridges, brouters, terminal servers, switches, and SNMP agents.

node

Any intelligent device that communicates with other devices in the network.

out-of-band management (OBM)

Management of a network module or the DEChub 900 MultiSwitch backplane over a telephone line or direct line to a console port rather than over the network.

optical bypass relay (OBR)

Used to maintain connectivity in the absence of power or during fault conditions in a station. OBR allows light to bypass the optical receiver in the faulty station.

PCM

Physical Connection Management.

PHY

See Physical Layer Protocol.

physical layer medium dependent

FDDI standards that define the media and protocols to transfer symbols between adjacent PHYs.

physical layer protocol

A Fiber Distributed Data Interface (FDDI) standard that defines symbols, line states, clocking requirements, and the encoding of data for transmission.

physical topology

The arrangement of cables and hardware that make up the network.

PMD

See Physical Layer Medium Dependent.

PMD class

The type of physical media associated with a port.

port connector type

A variable that specifies the type of port being managed. The four different types of ports are as follows:

- A—The port is a dual attachment station or concentrator that attaches to the primary in and the secondary out when attaching to the dual ring.

- B—The port is a dual attachment station or concentrator that attaches to the secondary in and the primary out when attaching to the dual ring.

- S—Either the port in a single attachment station, or one port in a single attachment concentrator.

- M—A port in a concentrator that serves as a master to a connected station or concentrator.

power budget

The difference between transmit power and receiver sensitivity, including any tolerances.

protocol

A formal set of rules governing the format, timing, sequencing, and error control of exchanged messages on a data network.

A protocol can also include facilities for managing a communications link or contention resolution.

A protocol can relate to data transfer over an interface, between two logical units directly connected, or on an end-to-end basis between two end users over a large and complex network. There are hardware protocols and software protocols.

repeat

A station receives a frame or token from an upstream station, retimes it, and places it onto the ring for its downstream neighbor. The repeating station can examine, copy to a buffer, or modify control bits in the frame, as appropriate.

ring

Connection of two or more stations in a circular logical topology. Information is passed sequentially between active stations, where each one, in turn, examines or copies the data, and returns it to the originating station, which removes the data from the network.

ring purger

A token ring packet that clears data from the network.

SAC

See single attachment concentrator.

SAS

See single attachment station.

shielded twisted-pair

A twisted pair cable whose resistance to electromagnetic interference is improved by use of a flexible metallic sheath surrounding the pairs.

single attachment station (SAS)

An FDDI station that offers one S port for attachment to the FDDI ring.

single attachment concentrator

A concentrator that offers one S port for attachment to the FDDI network, and M ports for the attachment of stations or other concentrators.

single mode

A type of fiber optic cable in which only one transmission mode is supported.

Serial Line Internet Protocol (SLIP)

Used for transmitting Internet Protocol (IP) packets across serial lines.

Simple Network Management Protocol (SNMP)

A high-level, standards-based protocol for network management, usually used in TCP/IP networks.

Simple Network Management Protocol (SNMP) agent

An entity in a hardware device that executes SNMP requests.

SLIP

Serial Line Internet Protocol.

SMT

See station management.

SNMP

See Simple Network Management Protocol.

SNMP MIB-II

The Management Information Base (MIB-II) for use with network management protocols in TCP/IP-based Internets.

standalone

A network module in a single configuration.

standby port

A redundant port that is configured as a backup port to an active port. A standby port is disabled and is held in readiness in case the active port fails.

station

A node on an FDDI ring capable of transmitting, receiving, and repeating data. A station has one SMT, at least one instance of PHY and PMD, and an optional MAC entity.

station management

The entity within a station on the FDDI ring that monitors and exercises overall control of station activity.

STP

See shielded twisted-pair.

synchronous transmission

An FDDI service class which guarantees a certain bandwidth to each requesting station, within a time bounded by the timed-token protocol.

TCP

See Transmission Control Protocol.

Transmission Control Protocol (TCP)

The transport protocol offering a connection-oriented transport service in the Internet suite of protocols.

token ring

A network with a ring topology that passes data-bearing tokens from one attached station to the next.

topology

The logical or physical arrangement of nodes on a network.

trap

Messages generated by firmware in Simple Network Management Protocol (SNMP) agent hardware. The firmware monitors the hardware for faults and sends messages to monitoring software.

For the MultiChassis Manager application, the Alarms Poller software communicates with the SNMP agents in a hub or a community and arranges for specific traps to be sent to the network management station running the HUBwatch application.

The trap table in the Alarms Definition file determines which traps to monitor. Cold start, warm start, and authentication failure are examples of traps monitored by the alarms software.

The Alarms Poller software uses Internet Protocol (IP) addresses and community names to communicate with specific SNMP agents, such as the DECagent 90, the Hub Manager, and modules with built-in SNMP agents.

twisted pair

A communications cable constructed of two helically wrapped conductors.

User Datagram Protocol (UDP)

The transport protocol offering a connection-less-mode transport service in the Internet suite of protocols.

unshielded twisted-pair

A cable constructed of two helically wrapped conductors that are called a pair. In the context of FDDI, it usually refers to 100-Ohm cables in a 4-pair bundle.

upstream neighbor address (UNA)

The MAC address that identifies the most recently known upstream neighbor. Stations determine the upstream neighbor by exchanging neighborhood information frames (NIFs) as part of the neighbor notification protocol. Stations also use the protocol to determine the existence of duplicate address conditions.

wide area network

A network spanning a large geographical area that provides communications among devices on a regional, national, or international basis.

workgroup

A network configuration characterized by a small number of attached devices spread over a limited geographical area.

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