

DECconcentrator™ 500

digital™

Installation

NOTICE – Class A Computing Device:

This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference; in which case, measures taken to correct the interference are at the user's expense.

CAUTION

The people who install the cabling system described in this guide should be familiar with local building codes, fire codes, and any other applicable codes or regulations. The manufacturers or their distributors and agents will not be responsible for damage due to improperly installed cabling, neglect, misuse, or improper connection of devices to the cabling system.

DECconcentrator™ 500

Installation

September 1990

This manual describes how to install and check the operation of the DECconcentrator 500 wiring concentrator. Configuration examples and a description of the DECconcentrator 500 controls are included.

Supersession/Update Information:

This is a revised manual.

digital™

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

Copyright ©1990 by Digital Equipment Corporation
All Rights Reserved
Printed in U.S.A.

The following are trademarks of Digital Equipment Corporation:

BASIC
DEC
DECbridge
DECall
DECconcentrator
DECconnect
DECdirect
DECelms
DEC FDDIcontroller
DECNA
DECndu

DECnet
DECrepeater
DECserver
DECservice
DECsite
DECUS
DELNI
DELUA
DEQNA
DEMPR
DESTA

MASSBUS
METROWAVE
SERVICenter
ThinWire
TURBOchannel
UNIBUS
VAX
VAXcluster
VAXstation
VMS

digital™

Contents

Safety

Preface

1 Introduction

1.1	Product Overview	1-1
1.1.1	Port Configurations	1-2
1.1.2	Location	1-2
1.1.3	Topologies	1-2
1.2	Physical Description	1-4
1.2.1	Card Cage	1-5
1.2.2	Controller/Backplane	1-6
1.2.2.1	Logic	1-7
1.2.2.2	Data Path	1-7
1.2.3	Port Board (DEFCN-NA, DEFCN-LA)	1-7
1.2.3.1	Diagnostics and LEDs	1-8
1.2.3.2	Data Path	1-8
1.2.4	Network Management Board (DEFCN-MA)	1-8
1.2.4.1	Front Panel	1-8
1.2.4.2	Physical Layer Hardware	1-9
1.2.4.3	Data Path	1-9
1.2.4.4	Data Link Layer Hardware	1-9
1.2.5	Power Supply	1-9
1.2.6	Controls and Indicators	1-10
1.2.7	Operational Software	1-12

2 Preparing for Installation

2.1	Unpacking and Checking the Contents	2-1
-----	---	-----

2.2	Site Preparation	2-5
2.2.1	Site Preparation Checklist	2-5
2.2.2	Locating the DECconcentrator 500	2-6
2.2.2.1	Office Installation	2-7
2.2.2.2	Rack Mount Installation	2-7
2.2.2.3	Satellite Distribution Frame Installation	2-7
2.2.3	Configuration Rules	2-7
2.2.4	Available Fiber Optic Cables	2-8
2.2.5	Reconfiguring and Installing Additional Cables	2-8

3 Installation

3.1	Introduction	3-1
3.2	Identifying Option Boards	3-2
3.3	Checking the Network Management Board Switch Settings	3-4
3.4	Installing the Unit in the Rack	3-6
3.4.1	Removing the Plastic Cover	3-7
3.4.2	Installing the Rack Mount Brackets	3-8
3.4.3	Preparing the Rack	3-9
3.4.4	Mounting the Unit in the Rack	3-10

4 Checking the Wiring Concentrator

4.1	Introduction	4-1
4.2	Running the Self-Test	4-2
4.2.1	Connecting the Power Cord	4-2
4.3	Running the Loopback Test on Each Port	4-4
4.4	Attaching Fiber Optic Cables	4-6
4.4.1	Identifying Fiber Optic Cable Connectors	4-6
4.4.2	Connecting Fiber Optic Cables	4-7

5 Problem Solving

5.1	Introduction	5-1
5.2	Maintenance Strategy	5-2
5.3	Problem-Solving Sequence	5-2
5.4	Running the Self-Test	5-4
5.5	Diagnosing Problems	5-4
5.6	Loopback Testing	5-8
5.7	Down-Line Loading	5-9
5.7.1	Network Device Upgrade Utility	5-9
5.7.2	DECelms and NCP Down-Line Loading	5-9

A Configurations

A.1	Environments Served by FDDI PMD	A-1
-----	---------------------------------------	-----

A.2	Wiring	A-1
A.2.1	Crossconnect	A-1
A.2.2	FDDI Wiring Subsystems	A-2
A.2.3	Topology (Hierarchical Physical Star)	A-2
A.3	Configuring the DECconcentrator 500 in FDDI Networks	A-2
A.3.1	Standalone Configurations	A-3
A.3.2	DECconcentrator 500 Installed in Tree Configurations	A-5
A.3.3	DECconcentrator 500 Installed in Ring Configurations	A-7
A.4	FDDI Redundant Topologies	A-10
B	Option Board Installation	
B.1	Option Board Installation	B-1
B.2	Removing Cables	B-2
B.2.1	Removing the Blank Handle or Installed Option Board	B-3
B.2.2	Installing an Option Board	B-4
C	Multimode Optical System	
C.1	Overview	C-1
C.2	Option Board Optical System	C-1
C.2.1	Optical Loss	C-2
C.2.1.1	Optical Cable Attenuation	C-2
C.2.1.2	Cable Repair Strategy	C-3
C.2.2	Checking for Optical Loss	C-3
D	Specifications	
D.1	Physical Specifications	D-1
D.1.1	Fiber Optic Connector and Cable Specifications	D-2
D.1.2	Environmental Specifications	D-3
D.1.3	Electrical Specifications	D-4
D.1.4	Power Supply Specifications	D-4
E	Service Options	
E.1	Digital Service	E-1
E.1.1	On-Site Repair	E-1
E.1.1.1	DECservice Customer Support	E-1
E.1.1.2	BASIC Customer Support	E-1
E.1.1.3	On-Site Service Center	E-1
E.1.1.4	Per Call Service	E-2
E.1.1.5	DECcall Service Program	E-2
E.1.2	Off-Site Service	E-2
E.2	How to Get Service	E-2

F DECconcentrator 500 Identification List

G Related Documents

Glossary

Index

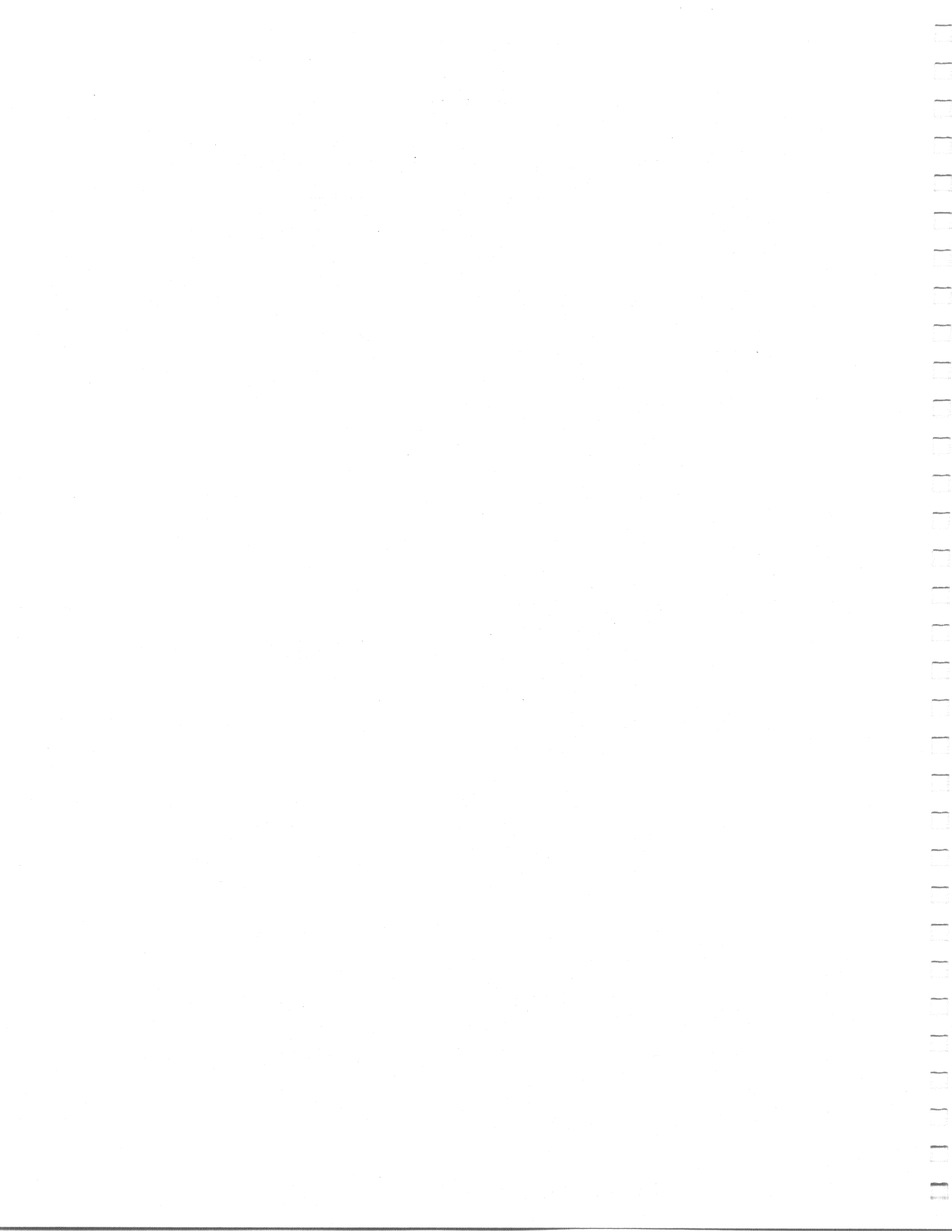
Figures

1-1	A Concentrator in a Simple Star Topology (Local Mode)	1-3
1-2	DECconcentrator 500 Installed in a Dual Counter-Rotating Ring ..	1-3
1-3	DECconcentrator 500 Installed in a Dual Ring of Trees	1-4
1-4	Fully Configured DECconcentrator 500	1-5
1-5	DECconcentrator 500 Controls and Indicators	1-11
2-1	Checking the Shipping Box Contents	2-2
2-2	U.S.A. and International Power Cords	2-3
2-3	DECconcentrator 500 Order and Serial Numbers	2-4
2-4	Sample Cable Plant Log Book Entry	2-5
3-1	Sample Option Boards	3-3
3-2	Checking the Network Management Board Switches	3-5
3-3	Removing the Plastic Cover	3-7
3-4	Preparing the Unit for Mounting	3-8
3-5	Preparing the Rack	3-9
3-6	Installing the Unit in the Rack	3-10
4-1	Connecting the Power Cord	4-2
4-2	Checking the Operational Status	4-3
4-3	Connecting a Loopback Connector to a Port	4-4
4-4	Port LED Status During Loopback Testing	4-5
4-5	Connector Types for FDDI Devices	4-7
4-6	Connecting Keyed FDDI Cables and 2.5 mm ST-type Cables	4-8
4-7	Connecting a Concentrator in a Dual Ring of Trees	4-9
4-8	LEDs: Fully Configured and Cabled DECconcentrator 500	4-10
5-1	DECconcentrator 500 FRUs	5-3
5-2	Normal LED Condition	5-5
5-3	Installing a Loopback Connector	5-8
A-1	Equipment Rooms	A-3
A-2	Standalone Workgroup Installation (No Network Management Present)	A-4
A-3	Dedicated High-Performance Network Installation (Network Management Present)	A-4

A-4	Simple Tree Topology on a Dual Ring	A-5
A-5	Logical Star, Tree Topology, FDDI Campus Backbone	A-6
A-6	DECconcentrator 500 Installed in High-Speed Dedicated Network	A-7
A-7	DECconcentrator 500 Installed in a Logical Ring with Workgroup LANs Within a Building	A-8
A-8	DECconcentrator 500 Installed in a Campus	A-9
A-9	DECconcentrator 500 Installed in Redundant Topologies	A-10
B-1	Removing Cables	B-2
B-2	Removing a Blank Handle or Installed Option Board	B-3
B-3	Installing Option Boards	B-4

Tables

1-1	Option Board Configurations	1-6
1-2	DECconcentrator 500 Controls	1-10
1-3	DECconcentrator 500 LEDs	1-11
2-1	International Power Cords	2-3
2-2	Maximum Cable Lengths	2-8
3-1	Network Management Board Switch Setting	3-4
4-1	Connection Rules	4-6
5-1	Basic Problem Solving by Symptom	5-6
5-2	Port Board Problem Solving	5-7
5-3	Network Management Board Problem Solving	5-7
5-4	Problem Solving During Loopback Testing	5-9
D-1	Rack Mount Unit Physical Specifications	D-1
D-2	Tabletop Unit Physical Specifications (Plastic Enclosure)	D-1
D-3	Cable Specifications	D-1
D-4	Fiber Optic Connector Specifications	D-2
D-5	Fiber Cable Specifications	D-2
D-6	Alternate Fiber Cable Specifications	D-2
D-7	Operating Environment Specifications	D-3
D-8	Shipping Environment	D-3
D-9	Electrical Specifications	D-4



Safety

Any warnings and cautions that appear in this manual are defined as follows:

WARNING  Contains information to prevent personal injury.

VORSICHT Enthält Informationen, die beachtet werden müssen, um den Benutzer vor Schaden zu bewahren.

DANGER Signale les informations destinées à prévenir les accidents corporels.

AVISO Contiene información para evitar daños personales.

CAUTION  Contains information to prevent damage to equipment.


ACHTUNG Enthält Informationen, die beachtet werden müssen, um die Geräte vor Schaden zu bewahren.

ATTENTION Signale les informations destinées à prévenir la détérioration du matériel.

PRECAUCIÓN Contiene información para evitar daños al equipo.

The warnings and cautions that must be observed for the hardware described in this document are listed below in English, German, French, and Spanish. The pages on which these safety messages appear are also listed.


Notes that are important to the system's installation, operation, function, and service are in English throughout this document.

WARNING  The DECconcentrator 500 contains no user-serviceable parts. During installation the unit should not be opened for any reason. If the concentrator is in need of repair, only qualified personnel familiar with safety procedures for electrical equipment and the DECconcentrator 500 should access components inside the unit.

VORSICHT Die DECconcentrator 500 enthält keinerlei Teile, die der Benutzer warten könnte. Während der Installation sollte das Gerät auf keinen Fall geöffnet werden. Reparaturen jeglicher Art an der DECconcentrator 500 dürfen nur von elektrotechnisch qualifiziertem Wartungspersonal ausgeführt werden.

DANGER Le DECconcentrator 500 ne comporte aucun élément remplaçable par l'utilisateur. Cet appareil ne doit en aucun cas être ouvert, y compris lors de l'installation. Les opérations d'entretien et de réparation doivent impérativement être effectuées par des techniciens qualifiés.


AVISO El DECconcentrator 500 contiene componentes que no pueden ser manejados por el usuario. Durante la instalación, la unidad no debe abrirse bajo ningún concepto. Si el puente necesita una reparación de alguno de los componentes internos de la unidad, sólo podrá llevarla a cabo personal especializado y familiarizado con los procedimientos de seguridad de los equipos eléctricos y del DECconcentrator 500.


WARNING  To remove power from the unit, disconnect the power cord. Do not apply power to the unit unless all covers are installed.


VORSICHT Wenn Sie die Stromzufuhr unterbrechen wollen, müssen Sie das Netzkabel aus der Wandsteckdose ziehen. Sie dürfen das Gerät nicht an das Stromnetz anschließen, bevor nicht alle Abdeckungen wieder ordnungsgemäß angebracht worden sind.

DANGER Débranchez le cordon d'alimentation pour isoler l'équipement du réseau électrique. Ne reliez au secteur qu'après l'installation complète de tous les capots.

AVISO Cortar el suministro eléctrico de la unidad, desconectar el cable de alimentación. La unidad no debe recibir suministro eléctrico a menos que estén instaladas todas las cubiertas.

-
- WARNING**  A safety earth ground wire has been incorporated into this product through the three-wire plug cap of the ac power cord. For continued protection against risk of electric shock, this product must be connected to a three-wire wall receptacle that has its grounding terminal reliably connected to the building's safety earth ground.
- VORSICHT** Das Stromkabel in diesem Gerät ist mit einem Schutzleiter versehen. Um optimale Sicherheit zu gewährleisten, dürfen Sie es nur an eine ordnungsgemäß geerdete Schuko-Steckdose anschließen.
- DANGER** Cet équipement est mis à la terre au moyen du fil de terre du cordon d'alimentation secteur. Afin d'assurer une protection efficace contre tout risque d'électrocution, cet équipement doit être raccordé à une prise secteur équipée d'un contact de mise à la terre effectivement relié à la terre secteur du bâtiment.
- AVISO** El producto consta de un cable de tierra en el enchufe trifásico del cable de alimentación. Para evitar el riesgo continuado de descargas eléctricas, este producto debe conectarse en una toma de pared trifásica que tenga un terminal de tierra con una conexión fiable a la toma de tierra del edificio.
-

- WARNING**  For continued protection against risk of electric shock, this product must be connected to a three-wire wall receptacle that has its grounding terminal reliably connected to the building's safety earth ground.
- VORSICHT** Um optimale Sicherheit zu gewährleisten, dürfen Sie es nur an eine ordnungsgemäß geerdete Schuko-Steckdose anschließen.
- DANGER** Afin d'assurer une protection efficace contre tout risque d'électrocution, cet équipement doit être raccordé à une prise secteur équipée d'un contact de mise à la terre effectivement relié à la terre secteur du bâtiment.
- AVISO** Para evitar el riesgo continuado de descargas eléctricas, este producto debe conectarse en una toma de pared trifásica que tenga un terminal de tierra con una conexión fiable a la toma de tierra del edificio.
-

- WARNING**  To avoid bodily injury or damage to the equipment, do not connect the power cord or any other cable until you are instructed to do so in these procedures.
- Do not apply power to the unit unless all covers are installed.
- VORSICHT** Schließen Sie das Netzkabel oder andere Kabel erst an, wenn Sie dazu aufgefordert werden. Andernfalls besteht **LEBENSGEFAHR!** Überdies können die Geräte Schaden nehmen.

Schließen Sie das Gerät erst an das Stromnetz an, wenn alle Abdeckungen ordnungsgemäß angebracht worden sind.


DANGER

Afin d'éviter tout risque d'accident corporel ou matériel, **NE BRANCHEZ AUCUN** cordon d'alimentation ou autre câble sans en avoir reçu l'instruction explicite dans la procédure.

Ne reliez au secteur qu'après l'installation complète de tous les capots.

AVISO

Para evitar daños internos al equipo, **NO** conectar el cable de alimentación ni ningún otro hasta que se indique en estos procedimientos.

WARNING 
(page 4-2)

To avoid bodily injury, use care when connecting the concentrator power cord. Regulations in some countries may require an authorized person to connect the power.

Make sure you connect the power cord to a grounded wall outlet.

VORSICHT

Netzspannung ist lebensgefährlich. Beachten Sie dies, wenn Sie das Netzkabel anschließen. In einigen Ländern dürfen Elektrogeräte nur von entsprechend ausgebildetem Personal, beispielsweise Elektrikern, angeschlossen werden. Prüfen Sie, ob das in Ihrem Land zutrifft.

Schließen Sie das Netzkabel nur an eine geerdete Steckdose an.

DANGER


Afin d'éviter tout risque d'accident corporel, agissez avec la plus grande précaution lors du raccordement du cordon d'alimentation du concentrateur. Assurez-vous que la législation vous autorise bien à effectuer ce branchement.

Assurez-vous que la prise sur laquelle vous raccordez le cordon d'alimentation est effectivement reliée à la terre.

AVISO


Para evitar daños generales, es importante tener cuidado a la hora de conectar el cable de alimentación del concentrador. En algunos países existen estipulaciones para que la conexión la tenga que hacer una persona autorizada.


Hay que comprobar que se conecta el cable de alimentación a una toma conectada a tierra.

WARNING 
(page 4-4)

Some fiber optic equipment can emit laser light that can injure your eyes. Never look into an optical fiber or connector port. Always assume the cable is connected to a light source.

- VORSICHT** Schauen Sie niemals direkt in ein Glasfaserkabel oder einen Glasfaseranschluß. Die Laserstrahlen in faser- optischen Geräten können Augenverletzungen verursachen.
- DANGER** Certains équipements utilisant les fibres optiques peuvent émettre des rayonnement laser dangereux pour les yeux. Ne vous avisez jamais de regarder par l'extrémité d'une fibre optique ou dans l'ouverture d'un connecteur. Considérez toujours que le câble est relié à une source lumineuse.
- AVISO** Algunos equipos de fibra óptica pueden emitir luz láser que daña los ojos. No se debe mirar en una puerta de conector o fibra óptica. Siempre se debe suponer que el cable está conectado a la luz.
-

- WARNING**  Digital recommends that only experienced service engineers should perform the replacement procedures.
(page 5-2)
- VORSICHT** Sollten Sie diese Arbeiten nur von qualifiziertem Wartungspersonal durchführen lassen.
- DANGER** Digital conseille d'avoir recours aux services d'un technicien de maintenance chevronné.
- AVISO** Digital recomienda que sólo realice esta labor una persona con experiencia.
-

- WARNING**  Always remove the power cord from the concentrator and ac source when performing any removal and replacement procedures.
(page 5-2)
- To avoid possible personal injury, let the unit cool for 5 minutes before attempting to gain access to internal parts.
- VORSICHT** Bevor Sie Teile entfernen oder ersetzen, müssen Sie immer zuerst das Netzkabel aus der Wandsteckdose und anschließend aus der Netzbuchse am Konzentrator ziehen.
- Die Teile im Inneren des Geräts sind sehr heiß. Lassen Sie das Gerät mindestens 5 Minuten abkühlen, bevor Sie es öffnen, um Verbrennungen zu vermeiden.
- DANGER** Assurez-vous toujours que le cordon d'alimentation est débranché du concentrateur et du secteur lors des procédures de dépose et pose de composants.
- Afin d'éviter tout risque d'accident, laissez l'équipement refroidir pendant 5 minutes avant d'accéder aux composants internes.
- AVISO** Desconectar siempre el cable de alimentación del concentrador y de la toma de corriente alterna al realizar cualquier procedimiento de sustitución.
- Para evitar posibles daños personales, el equipo debería enfriarse durante cinco minutos antes de tratar de acceder a su interior.

CAUTION 
(page 2-1, 3-1)

Static electricity can damage modules and electronic components. Digital recommends you use a grounded wrist strap and grounded work surface (Digital P/N 29-11762) when you handle any modules or internal parts.

ACHTUNG

Module und elektronische Komponenten können durch elektrostatische Entladungen beschädigt werden. Benutzen Sie immer eine antistatische Gelenkmanschette und eine geerdete Arbeitsunterlage, wenn Sie am offenen Gerät arbeiten. Ein Antistatik-Kit ist in der BRD bei DECdirekt unter der Bestellnummer 29-26246 erhältlich.

ATTENTION

Les charges excessives d'électricité statique peuvent endommager les modules et les composants électroniques. Digital conseille l'utilisation d'un bracelet de masse et d'un plan de travail mis à la terre (Réf. 29-11762) lors de la manipulation des modules et des composants internes.

PRECAUCIÓN

La electricidad estática puede dañar los componentes electrónicos y los módulos. Digital recomienda que se utilicen cintas de pasadores y superficies de trabajo conectadas a tierra (Digital P/N 29-11762) al trabajar con cualquier módulo o parte interna.

CAUTION 
(page 3-7)

Do not reinstall the cover screws into the wiring concentrator's metal chassis. Doing so could damage the wiring concentrator.

ACHTUNG
ben


Der Kabelkonzentrator kann beschädigt werden, wenn Sie die Gehäuseschrauben Metallgehäuse für den Kabelkonzentrator befestigen.

ATTENTION

Ne remontez pas les vis du capots sur le châssis métallique du concentrateur de câbles. Ceci pourrait endommager le concentrateur.

PRECAUCIÓN

No hay que volver a instalar los tornillos de la cubierta en el chasis de metal del concentrador del cableado, porque al hacerlo se podría dañar éste.

CAUTION 
(page 4-7)

Make sure that the bend radius of any fiber optic cable is 7.5 centimeters (3 inches) or greater.

ACHTUNG

Der Biegungsradius von faseroptischen Kabeln muß mindestens 7,5 cm betragen.

ATTENTION

Assurez-vous que le rayon de courbure des fibres optiques n'est jamais inférieur à 75 mm.

PRECAUCIÓN

Hay que comprobar que el radio de inclinación de cualquier cable óptico de fibra es de es de 7,5 centímetros (3 pulgadas) o mayor.

Preface

This guide explains how to install the DECconcentrator 500 wiring concentrator and how to check its installation and operational status. Also included is a description of the wiring concentrator controls and indicators and some examples of the DECconcentrator 500 installed in a network.

Intended Audience

This guide is intended for the hardware installer and system/network manager who is familiar with fiber optic network technologies, the Fiber Distributed Data Interface (FDDI) ANSI X3T9 standards, safety procedures, and has been trained to service this product.

WARNING

This unit contains no user-serviceable parts. During installation the unit should not be opened for any reason. If the unit is in need of repair, only qualified personnel familiar with safety procedures for electrical equipment and this unit should access components inside the unit.

WARNING

To remove power from the unit, disconnect the power cord. Do not apply power to the unit unless all covers are installed.

WARNING

A safety earth ground wire has been incorporated into this product through the three-wire plug cap of the ac power cord. For continued protection against risk of electric shock, this product must be connected to a three-wire wall receptacle that has its grounding terminal reliably connected to the building's safety earth ground.

NOTE

This product automatically adjusts to 120 Vac or 240 Vac; therefore, a voltage select switch is not provided.

How to Use This Guide

Before you install the DECconcentrator 500, Digital Equipment Corporation recommends that you read Chapters 1 and 2. These chapters describe the unit and important steps to take before you install it. If you experience a problem during the installation and checking of the unit, refer to the problem-solving procedures in Chapter 5. The appendixes contain additional information that may be useful during installation of the unit.

Document Structure

This document has five chapters and seven appendixes, as follows:

- | | |
|------------|--|
| Chapter 1 | Describes the DECconcentrator 500, option boards, and controls and indicators. |
| Chapter 2 | Describes the contents of the DECconcentrator 500 shipment and important site preparation information that must be considered before the installation. |
| Chapter 3 | Describes the installation procedures for installing any additional option boards, and installing the unit in a rack. |
| Chapter 4 | Describes powering up the unit, connecting cables, and checking the operational status of the wiring concentrator. |
| Chapter 5 | Describes the steps to take to solve problems that may occur during installation and checking the operational status of the wiring concentrator. |
| Appendix A | Describes several configurations of the wiring concentrator installed in a standalone configuration and in several network configurations. |
| Appendix B | Describes installation procedures for option boards |
| Appendix C | Briefly describes the multimode fiber optic system. |
| Appendix D | Lists the concentrator's operational, environmental, and electrical specifications. |
| Appendix E | Describes service options that are available to you from Digital Equipment Corporation. |

Appendix F Contains the DECconcentrator 500 Identification List to fill out and give to the system/network manager.

Appendix G Lists other documents that may be useful.

The postage-paid Reader's Comments form on the last page of this document requests the user's critical evaluation to assist us in preparing future documentation.

Acronyms

The following acronyms appear in this manual:

ANSI	American National Standards Institute
AVS	Auto voltage select
CON	Concentrator
DAC	Dual attachment concentrator
DAS	Dual attachment station
DECelms	Digital Extended LAN Management Software
DLL	Data link layer
DRAM	Dynamic random access memory
EEPROM	Electrically erasable read-only memory
ELM	Elasticity buffer link management encoder
FDDI	Fiber Distributed Data Interface
HDF	Horizontal distribution frame
IDF	Intermediate distribution frame
LAN	Local area network
LED	Light emitting diode
LLC	Logical link control

MAC	Media access control
MDF	Main distribution frame
MOP	Maintenance operations protocol
NCP	Network control program
ODF	Office distribution frame
PHY	Physical layer protocol (physical media independent)
PIN	P-type i-ntrinsic n-type (semiconductor)
PL	Physical layer
PMD	Physical layer medium dependent
ROM	Read only memory
SAC	Single attachment concentrator
SAS	Single attachment station
SDF	Satellite distribution frame
SMT	Station management

Introduction

1.1 Product Overview

The DECconcentrator 500 intelligent wiring concentrator is an American National Standards Institute (ANSI) X3T9 compliant physical layer device for use in a Fiber Distributed Data Interface (FDDI) network.

Digital Equipment Corporation's second generation local area networking technology is FDDI. FDDI provides a high-bandwidth (100 megabits per second), general-purpose connection between computers and peripheral equipment in a token passing, dual ring of trees configuration. FDDI establishes the connection between many stations distributed over long distances. Stations can be separated by as much as 2 kilometers (1.2 miles). An FDDI network can have up to 1000 physical connections and a total fiber path length of 200 kilometers (124 miles).

FDDI is defined by the four ANSI X3T9 standards and consists of:

- A Physical Layer (PL) that is divided into two sublayers:
 - The Physical Media Dependent (PMD) sublayer provides for the fiber, connector, and optical pulse requirements.
 - The Physical Layer Medium Independent (PHY) sublayer provides for coding, clock rate differences, and symbols. The PHY is the connection between the PMD and the Data Link Layer.
- A Data Link Layer (DLL) that is divided into two sublayers:
 - A Media Access Control (MAC) that provides for access to the medium, address recognition, and frame generation and checking.
 - A Logical Link Control (LLC) that provides a common protocol for services between the MAC and the Network Layer.

- **A Station Management (SMT) component that provides station initialization, fault isolation and recovery, configuration, and scheduling services.**

The DECconcentrator 500 can provide the attachment to a dual ring and additional attachment points for stations that are not part of the dual ring.

1.1.1 Port Configurations

The concentrator is flexible, you can start with a minimum configuration of four ports for FDDI station connections. A fully configured DECconcentrator 500 has 10 ports for FDDI station connections. You can have up to 12 ports for single attachment stations (SASs) in a standalone configuration. A dual attachment station (DAS) or concentrator can be connected to a SAS port as a single attachment device.

1.1.2 Location

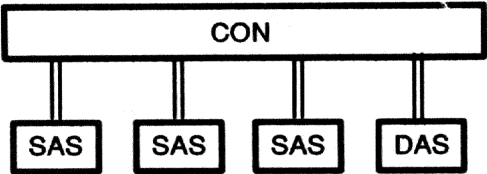
You can install the DECconcentrator in a standalone configuration or in an extended local area network (LAN). You can place and use the DECconcentrator 500 in a main distribution frame (MDF), intermediate distribution frame (IDF), horizontal distribution frame (HDF), office distribution frame (ODF), satellite distribution frame (SDF), open office environment, and computer room. A concentrator enclosed in plastic skins can be placed on a desk in an open office; a concentrator without plastic skins can be installed in a standard 48-centimeter (19-inch) wide rack.

1.1.3 Topologies

The wiring concentrator provides the connection to FDDI stations in physical star or dual ring topologies (Figure 1-1 and Figure 1-2). The DECconcentrator 500 can also be installed in a dual ring of trees configuration (Figure 1-3). See Appendix A for additional configuration examples.

For maximum flexibility and manageability of the network structure, Digital recommends a dual ring of trees topology with the dual ring contained within the main distribution frame of the cable plant.

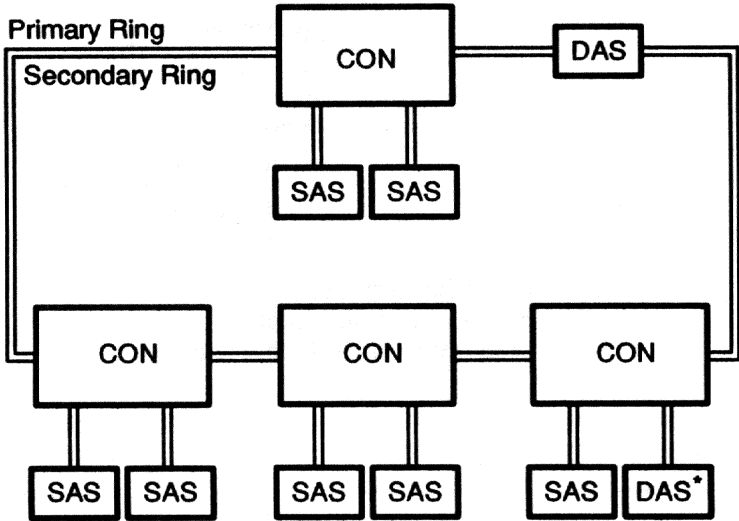
Figure 1-1: A Concentrator in a Simple Star Topology (Local Mode)



CON = DECconcentrator 500
SAS = Single Attachment Station
DAS = Dual Attachment Station used as an SAS

LKG-3791-901

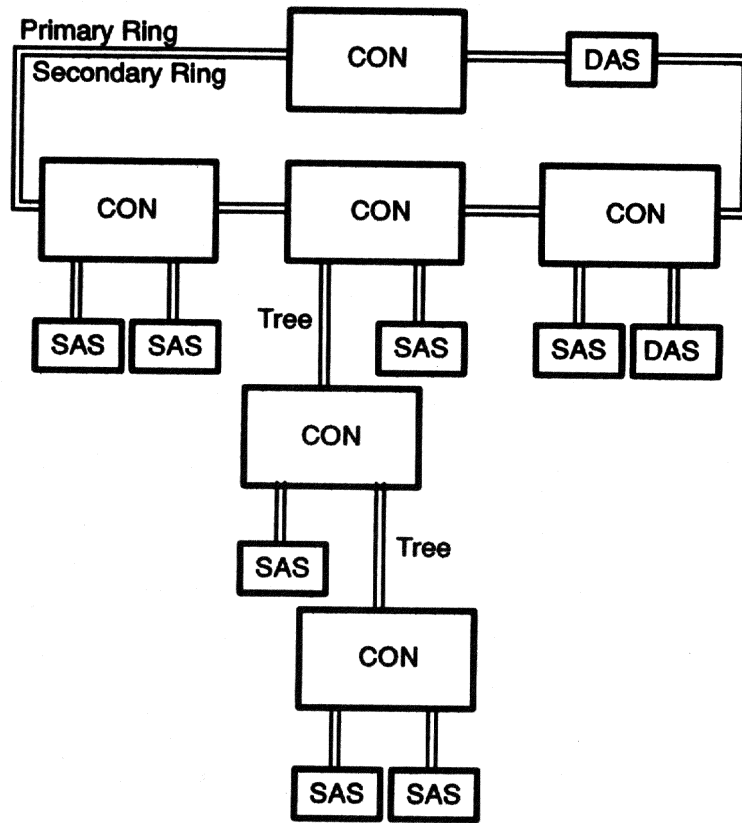
Figure 1-2: DECconcentrator 500 Installed in a Dual Counter-Rotating Ring



CON = DECconcentrator 500
SAS = Single Attachment Station
* DAS = Dual Attachment Station used as an SAS

LKG-3792-901

Figure 1-3: DECconcentrator 500 Installed in a Dual Ring of Trees



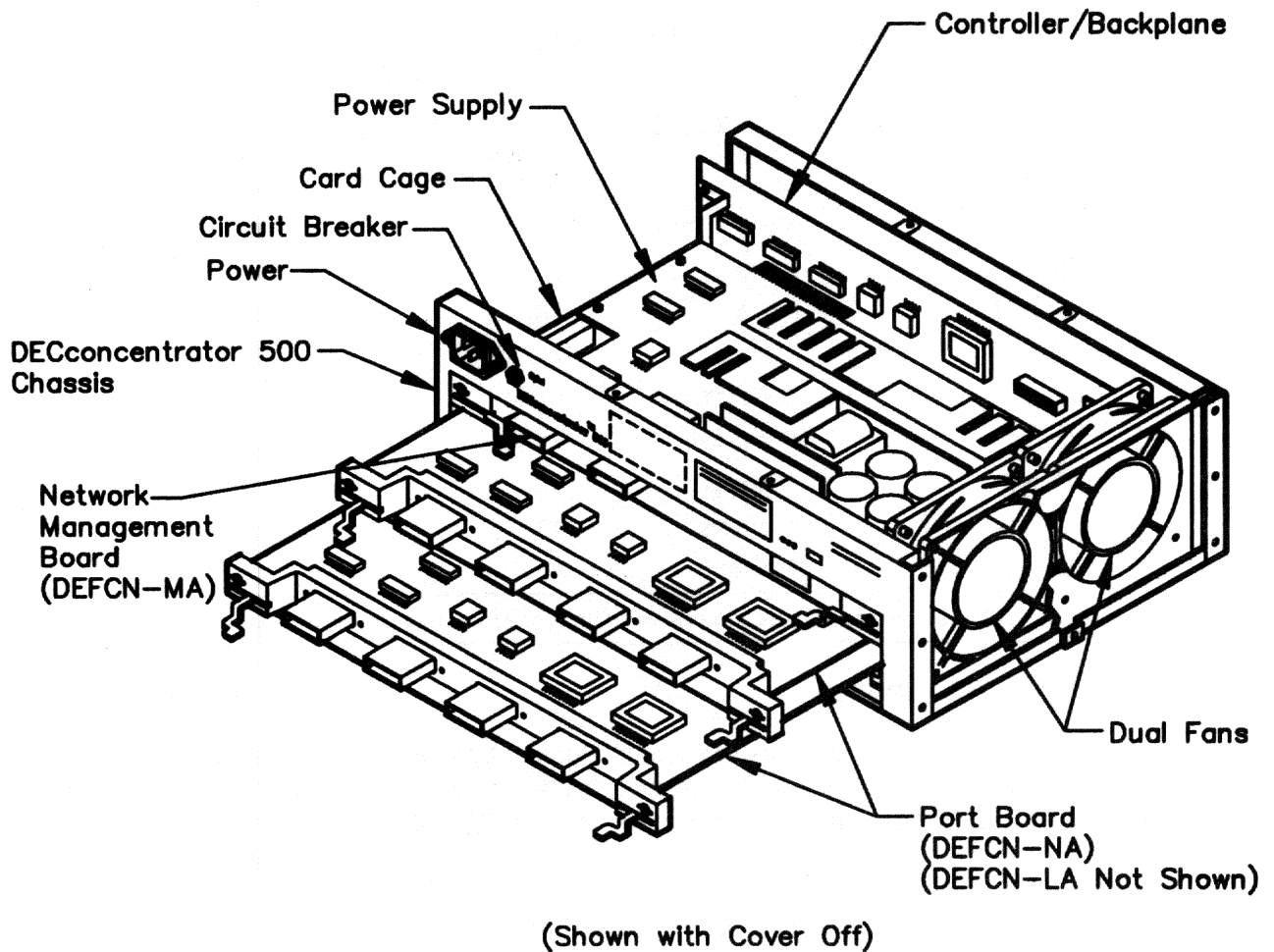
CON = DECconcentrator 500
SAS = Single Attachment Station
DAS = Dual Attachment Station used as an SAS

LKG-3793-001

1.2 Physical Description

A fully configured DECconcentrator 500 consists of the cover, chassis, card cage, intelligent Controller/Backplane, two Port boards, one Network Management board (or alternatively, three Port boards), power supply, and fan. Light emitting diodes (LEDs) provide board, power supply, and fan fault status and port operational status. Figure 1-4 shows the unit components and options for a fully configured unit.

Figure 1-4: Fully Configured DECconcentrator 500



LKG-4364-90A

1.2.1 Card Cage

The card cage contains three slots for option boards. The DECconcentrator 500 can be configured with up to three Port boards, or one Network Management board and up to two Port boards. Installed option boards inserted in the card cage connect to the Controller/Backplane through 120-pin connectors. A Port board can be installed in any slot. A Network Management board, if used, must be installed in the top slot. If a Network Management board is installed in slot two or three, the board does not operate and the fault LED blinks.

A Port board is the same as DEFCN-NA or DEFCN-LA. A Network Management board is the same as DEFCN-MA. For additional option boards, see any option board installation documentation shipped with the concentrator.

Table 1-1 lists the option configurations in the DECconcentrator 500 and the number of possible station connections.

Table 1-1: Option Board Configurations

Port Board (4 ports)	Network Management Board (2 ports)	Number of Possible FDDI Stations	Connection to Dual Ring
1 board	None	4	No
2 boards	None	8	No
3 boards	None	12	No
None	1 board	2	No
None	1 board	None	Yes
1 board	1 board	6	No
1 board	1 board	4	Yes
2 boards	1 board	10	No
2 boards	1 board	8	Yes

Note: A DAS or concentrator can be connected to a port as a single attachment device.

1.2.2 Controller/Backplane

All option boards plug into the Controller/Backplane. The Controller/Backplane has three 120-pin connectors for option boards and a 60-pin connector for the power supply. A 20-pin connector provides a test connector for Digital field level testing. The Controller/Backplane:

- Distributes power from the power supply to the option boards.
- Provides the data path interconnect between the option boards.
- Distributes clock and processor control signals from the Controller/Backplane to the option boards.
- Contains a microprocessor that executes all diagnostic and operational firmware.

All diagnostic and operational firmware can be upgraded through the FDDI network. Self-test diagnostics reside in firmware on the Controller/Backplane and test the fan, power supply, Controller/Backplane, Port board(s), and Network Management board.

1.2.2.1 Logic

The Controller/Backplane active logic includes:

- EEPROM (2 K by 8) for error logging and storing nonvolatile parameters.
- Clock source and distribution.
- 68000 microprocessor running at 6.25 MHz with RAM (32 K by 16), boot ROM (32 K by 16), and flash EEPROM (256 K by 16) for program memory. A portion of the flash EEPROM is used for remote down-line upgrade of code.
- Microprocessor support logic for interrupts, programmable timers, watchdog timer, and bus time-out.
- Refresh timer to support DRAM in packet memory. Packet memory is resident on the Network Management board.

1.2.2.2 Data Path

Transmit and receive data paths leave the option boards and pass through the 120-pin connectors to the Controller/Backplane. The Controller/Backplane processor connects the transmit and receive data paths from each option board. To maintain the token ring data path, the data path connecting option boards can internally bypass empty slots or slots with faulty modules. The data path has a ring scrubbing function and parity to permit detection of connector-related faults.

1.2.3 Port Board (DEFCN-NA, DEFCN-LA)

The Port board contains all the hardware for four ports of the FDDI physical connection type M. Single attachment stations and dual attachment stations used as single attachment stations connect to the Port board. Looking at the Port board from the connector side, the ports are labeled 1–4 from left to right. The Controller/Backplane processor controls the Port board.

Digital Equipment Corporation offers several types of Port boards, for example: the FDDI PMD standard-compliant Port board and the Low Power Port board. The Port board (DEFCN-NA) has four ports for FDDI PMD connectors and is ANSI X3T9 compliant. The Low Power Port board (DEFCN-LA) has four 2.5 mm ST-type connectors. This board is ANSI X3T9 compliant except for the connector type and maximum cable attenuation.

1.2.3.1 Diagnostics and LEDs

The front panel on each type of Port board has five light emitting diodes. One LED provides board fault status. The other four LEDs provide port status information. If system diagnostics detect a broken port, that port is bypassed and the remaining ports continue to operate in the FDDI token ring. In this case, the port status LED turns off and the Port board fault LED turns on. If the system diagnostics find that all the ports are faulty, the entire board is bypassed on the backplane and the Port board fault LED turns on.

1.2.3.2 Data Path

Data received by a port passes to the next port for transmission. Data received by Port 4 passes to the backplane and from there to Port 1 on the next Port board. The Port board also performs data encoding/decoding and clock recovery functions.

1.2.4 Network Management Board (DEFCN-MA)

The Network Management board provides the DECconcentrator 500 with A- and B-type ports, a null port, the FDDI MAC function, a unique hardware address, and packet memory for the concentrator. The Network Management board contains all the hardware to support the connection through the A and B ports to a dual ring. Or, you can connect the B port to an M port of another concentrator in a tree. The Controller/Backplane controls this board.

1.2.4.1 Front Panel

The front panel has two ports, a red board fault status LED, a red/green port status LED for each of the ports (labeled A and B), and a green LED to indicate ring operational status. The ring operational LED is a MAC layer status indicator.

A label on the handle of the board lists the unique hardware address that is resident in ROM on the board. The hardware address lets the concentrator participate as an addressable station on an extended LAN. This means the DECconcentrator 500 can receive management information from other stations on the network.

The two dual-position switches are located on the front panel. The left-hand switch (switch 1) is a software-readable switch used to *reset to default* control parameters that can be changed by remote management. The right-hand switch (switch 2) is a software-readable switch used to *enable/disable* remote management write access functions and firmware upgrade.

1.2.4.2 Physical Layer Hardware

The Network Management board physical layer hardware includes the null port, and Ports A and B. The internal null port provides a mechanism for bypassing the concentrator MAC function. The A, B, and null ports may be bypassed for fault isolation just as ports on the Port board can be isolated. The null port is internal and is not visible.

1.2.4.3 Data Path

The data path entering the Network Management board from the backplane goes to the null port, to Port B, to Port A, and then returns to the backplane. Looking at the Network Management board from the connector side, the ports are labeled A and B from left to right. Connector keying and a software-controlled state parameter distinguishes A and B ports from the type M ports of the Port board.

1.2.4.4 Data Link Layer Hardware

The Network Management board Data Link Layer hardware provides the FDDI MAC function, unique hardware address ROM, and packet memory. The implementation of the MAC function includes the ability of the concentrator to recognize multiple 48-bit addresses. The unique hardware address is in ROM, other destination addresses are held in RAM and can be changed through software.

The packet memory is used for queueing transmit and receive frames. Parity generation and checking protect packet memory. Packet memory is accessible to the processor and to the memory controller that interfaces the MAC to packet memory.

1.2.5 Power Supply

The 154 watt power supply drives two fans and delivers power to the Controller/Backplane and option boards. See Section D.1.4 for the power supply specifications. The power supply also supports:

- One green LED (power supply OK) and two red LEDs — the green LED goes on when power is applied to the wiring concentrator. The first red LED goes on if there is a problem with the fan. The second red LED goes on during power up and remains on if there is a problem with the Controller/Backplane.
- Thermal protection — provides auto shutdown of the unit if the operating temperature exceeds 50°C (122°F).
- Auto voltage select (AVS) — permits use of the wiring concentrator at 110–120 volts and 220–240 volts without setting a voltage select switch.

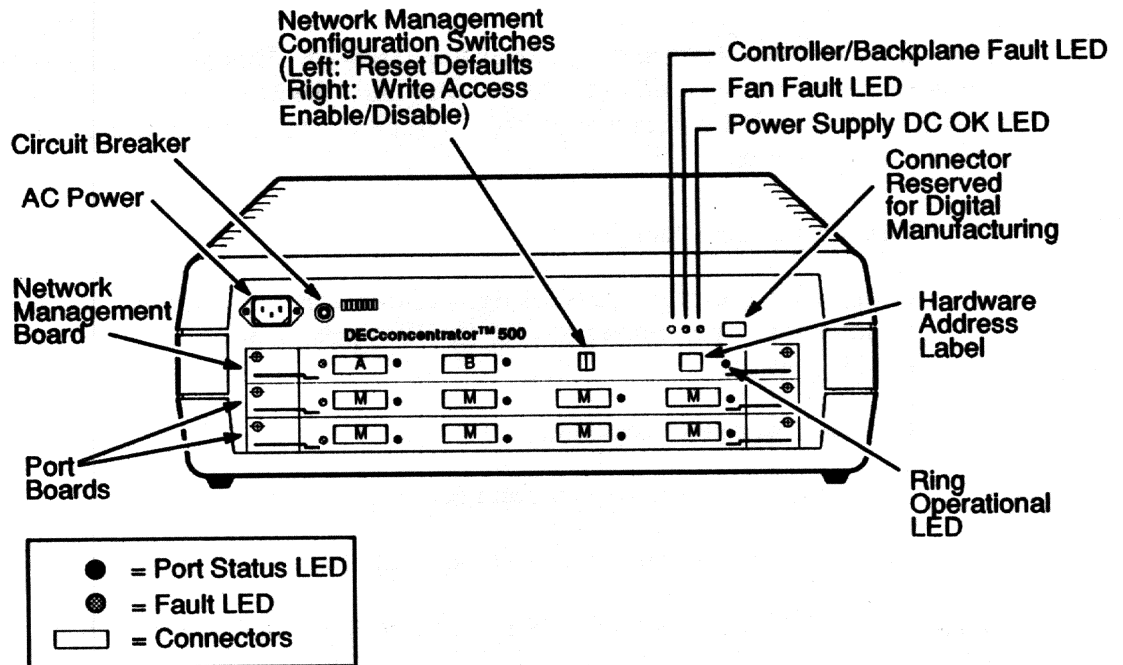
1.2.6 Controls and Indicators

Table 1–2 describes the DECconcentrator 500 controls. Figure 1–5 shows a concentrator's controls, indicators, and connectors for a fully configured unit. Table 1–3 describes the function of each LED.

Table 1–2: DECconcentrator 500 Controls






Control	Description
ac power socket	Provides connection to ac power source.
Circuit breaker	Provides overcurrent protection for the wiring concentrator. The white center of the circuit breaker pops out if the circuit breaker trips. The ac power is cut off to the wiring concentrator when the circuit breaker trips. Pressing the white center resets the circuit breaker. The circuit breaker trips at 4 amps.
Network Management Reset to Default switch (shipped with switch OFF)	When ON during power up, enables reset of system parameters that have been changed through remote management (DECelms). See Chapter 3 for more information about these switches. To reset to the default setting: <ol style="list-style-type: none">1. Set the switch to ON.2. Cycle power and wait for the self-test to complete.3. Set the switch to OFF.
Network Management Write Access Enable switch (shipped with switch OFF)	Use this software-readable switch to enable or disable remote management write access to the system control parameters and firmware upgrade. When ON write access is enabled.

Figure 1-5: DECconcentrator 500 Controls and Indicators



LKG-3786-901

Table 1-3: DECconcentrator 500 LEDs

Icon	LED	Color	Normal State	Description
	Controller/Backplane fault	Red	OFF	Indicates the operational state of the Controller/Backplane. If ON, then there is a fault with the Controller/Backplane. In this case the concentrator will not go on-line in the network.
	Power supply DC OK	Green	ON	Indicates the operational state of the power supply. If OFF, then there is a problem with the power supply.
	Fan fault	Red	OFF	Indicates the operational state of the fan. If ON, then there is a problem with the fans.
Ring OK	Ring operation	Green	ON	Indicates the operational status of the ring. If ON, then the ring is operating.
	Network Management board fault	Red	OFF	Indicates the operational state of the Network Management board. If ON, then there is a problem with the Network Management board.
PHY	Network Management port status	Green /Red	Green ON	Indicates the operational state of the Network Management board port(s).
	Port board fault	Red	OFF	Indicates the operational state of the board. If ON, then there is a problem with the Port board.
PHY	Port board port status	Green /Red	Green ON	Indicates the operational state of the Port board port(s).

1.2.7 Operational Software

Following power up or a software initiated reset of the wiring concentrator, system initialization software tests and initializes the hardware. This includes configuring around or isolating any faulty hardware. After initializing the hardware, the functional software starts executing. Following a successful initialization, operational software controls the hardware to provide:

- FDDI token ring function
- Support for reception, processing, and transmission of remote management, maintenance operations protocol (MOP) packets, and station management (SMT) packets
- On-line diagnostic functions
- Volatile and nonvolatile error and data logs
- Ring management and ring fault handling (FDDI Station Management)

Refer to the DECelms documentation for network management functions and capabilities.

Preparing for Installation

2.1 Unpacking and Checking the Contents

A single DECconcentrator 500 shipment consists of one or more boxes depending on the additional optional equipment ordered (Figure 2-1).

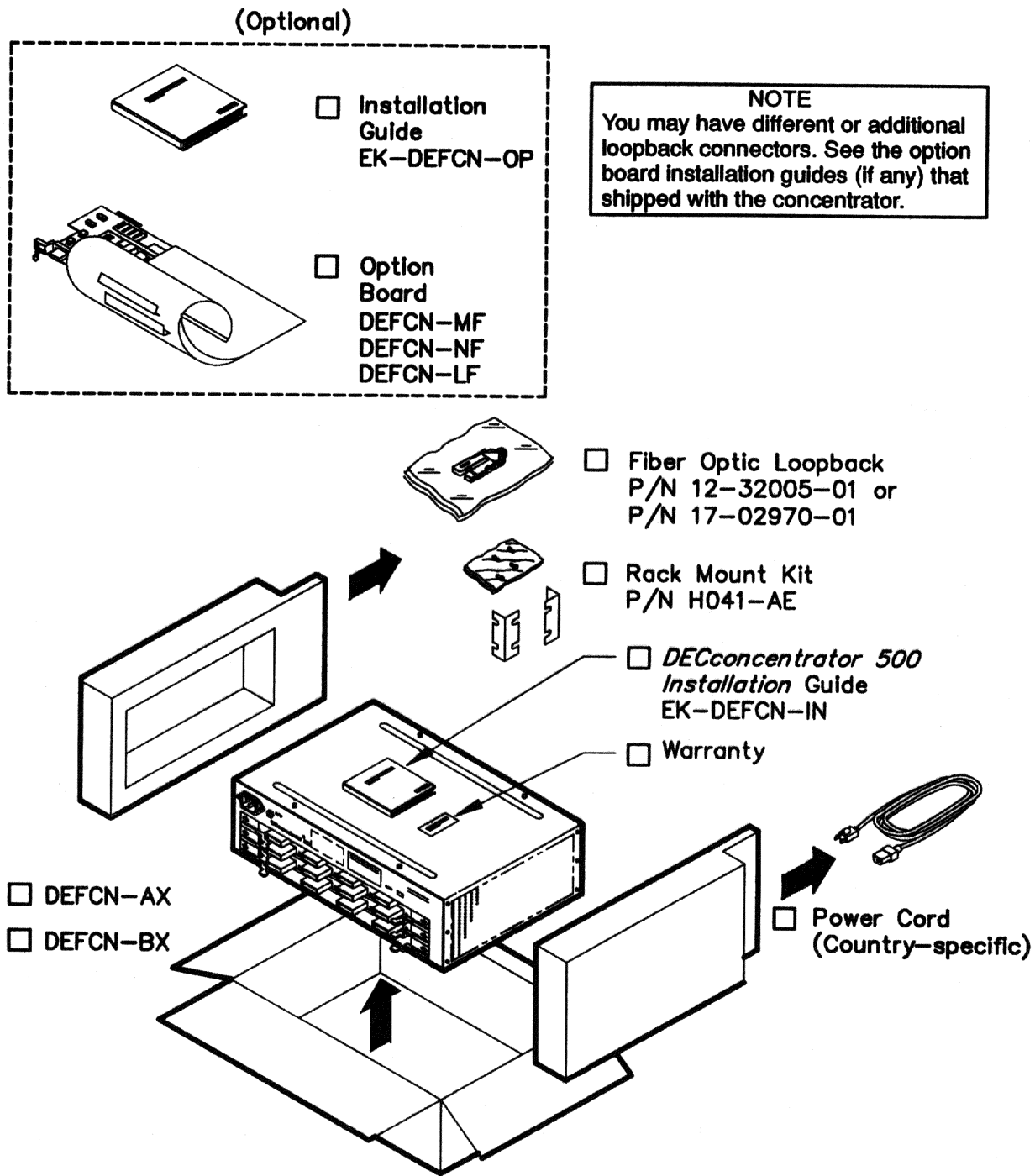
CAUTION

Static electricity can damage modules and electronic components. Digital recommends you use a grounded wrist strap and grounded work surface (Digital P/N 29-11762) when you handle any modules or internal parts.

Do not remove any additional option boards you may have from their anti-static bags until instructed to do so in the installation procedure.

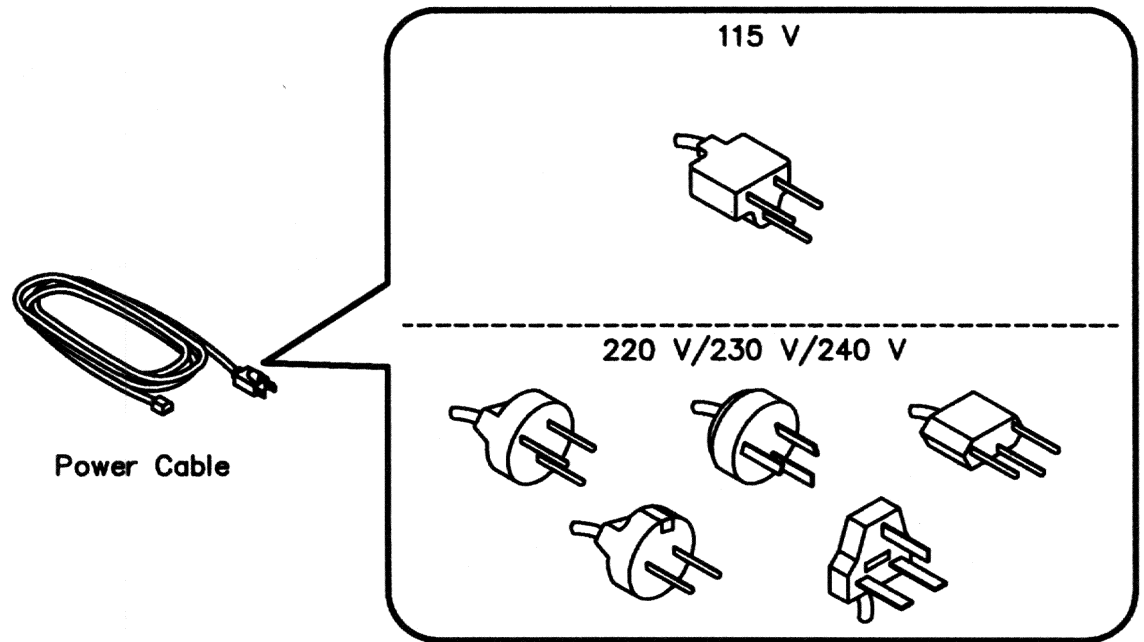
1. Unpack and check the shipment for damage and missing parts.
 - Make sure the power cord matches your wall outlet (Figure 2-2).
 - In case of damage, contact your delivery agent and your Digital sales representative.
 - In case of missing parts, contact your Digital sales representative.
2. Check the model and serial number of the wiring concentrator (Figure 2-3) and record the numbers in the DECconcentrator Identification List found in Appendix F.
3. Save all packaging material. To prevent damage, repack the unit or parts in the original packing material when transporting or shipping the unit.

Figure 2-1: Checking the Shipping Box Contents



LKG-4385-90A

Figure 2-2: U.S.A. and International Power Cords



LKG-3798-90A

WARNING ⚠

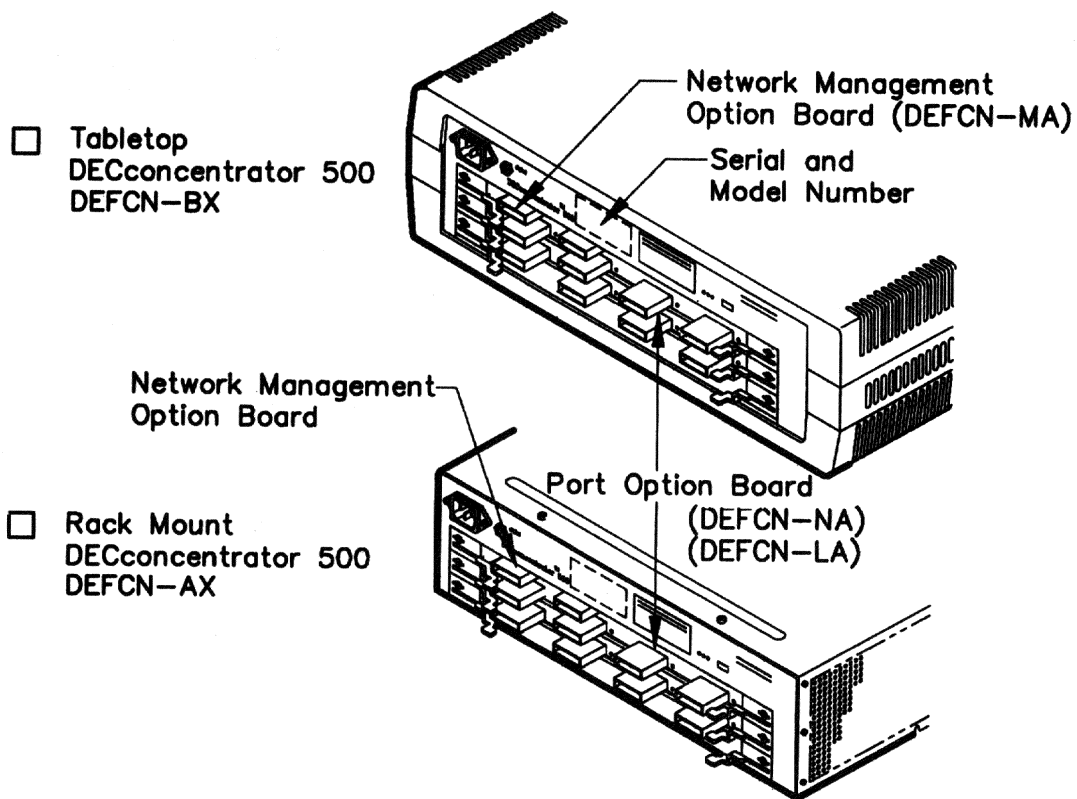
For continued protection against risk of electric shock, only connect this product to a three-wire wall receptacle that is connected to the building's safety earth ground.

The DECconcentrator 500 switches automatically to 110/120 Vac and 200/240 Vac. No user action is required to set the voltage. Table 2-1 lists the order number for the international power cords.

Table 2-1: International Power Cords

Order Number	Country	Order Number	Country
BN20A-2E	U.S.A., Canada	BN20F-2E	Switzerland
BN20B-2E	Japan	BN20H-2E	Denmark
BN20C-2E	Australia, New Zealand	BN20J-2E	Italy
BN20D-2E	Belgium, Finland, France, West Germany, Holland, Norway, Spain, Sweden	BN20K-2E	India, South Africa
BN20E-2E	Ireland, United Kingdom	BN20L-2E	Israel

Figure 2-3: DECconcentrator 500 Order and Serial Numbers



LKG-4366-90A

NOTE

Record the model and serial numbers on the DECconcentrator Identification List found in Appendix F.

The DECconcentrator 500 unit is available as DEFCN-AA, DEFCN-AB, DEFCN-BA, DEFCN-BB. The option boards are available as DEFCN-MA, DEFCN-NA and DEFCN-LA. You may have different options boards installed in the concentrator. In this case, see the option board installation guides shipped with the concentrator for information. See your sales representative for additional variations.

- DEFCN-Ax is for use in a rack. Ax models do not have plastic covers.
- DEFCN-Bx is for use on a tabletop. Bx models have plastic covers.
- The -xA models contain a U.S. power cord. The -xB models are for applications outside of the United States and Canada and have no power cord. The required power cord must be ordered separately.
- The -xA option boards are factory installed, -xF option boards are field installed.

2.2 Site Preparation

You need to make sure that the installation site meets the physical, environmental, power, and cabling requirements for the DECconcentrator 500.

Refer to Section 2.2.1 and Section 2.2.2 to make sure the site is ready to install the concentrator. See Section 2.2.3 through Section 2.2.5 for configuration information. See Appendix D for operating, environmental, and power requirements for the unit.

Note that each cable in a fiber optic cable plant should have a unique identification number recorded on a tag attached to the cable. Testing and certification information about the cable should have been recorded in the cable plant log book. Figure 2-4 shows a sample cable plant log book entry.

Figure 2-4: Sample Cable Plant Log Book Entry

Fiber Label	Fiber Size and Color	Fiber Length	OTDR 850/1300	Corrected Loss 850/1300	Certification Date	Operator	Test Equipment
B02H02/01	62.5/125	500M	1.8/1.3	1.7/1.2	8/14/89	J.R.P	OTDR/11

LKG-3815-891

2.2.1 Site Preparation Checklist

Use the following checklist to make sure the site preparation is complete.

Hardware

The DECconcentrator 500 is usually the first FDDI device to be installed.

- Make sure that the fiber optic cables are installed, tested, tagged, and certified. In the log book, note the fiber length and corrected loss (refer to Figure 2-4).
- If the DECconcentrator 500 is to be connected to a bridge, make sure the appropriate bridge is installed and the required bridge-to-DECconcentrator 500 cabling is in place.
- If the DECconcentrator 500 is to be connected to an end station (such as a workstation or server), make sure the device is installed and the required device-to-DECconcentrator 500 cabling is in place.

Suitable Environment

- Make sure that the power outlet matches the power requirements of the DECconcentrator 500 and:
 - The outlet is within 1.8 meters (6 feet) of the installation site.
 - The circuit is a 15 or 20 amperes dedicated single phase (three-wire) circuit; U.S.A. and other countries.

For 120 Vac operation, the typical input current for wiring concentrator is 1.6 ARMS at 88 VRMS line.

For 240 Vac operation, the typical input current for the wiring concentrator is 0.92 ARMS at 176 VRMS line.

The circuit breaker trips at 4 amperes. See Appendix D for additional power requirements.

- Make sure the temperature, altitude, and humidity ranges are correct.

NOTE

The DECconcentrator 500 runs cooler without a plastic cover. If the temperature is normally above 35°C (95°F) and the unit has a plastic cover, remove the cover.

- Make sure there is adequate ventilation and space for maintenance.

Service

- Make sure the (optional) service contracts are in place. Call your Digital sales representative for information on available hardware and software services to support the DECconcentrator 500. See also Appendix E for a brief description of available service options for the wiring concentrator.

2.2.2 Locating the DECconcentrator 500

As long as the environmental and power requirements are met, you can place the DECconcentrator 500 on a desktop, in a rack or distribution frame, or in a computer room. The desktop version comes with a plastic cover; the rack mount version has a metal chassis and mounting brackets.

Digital recommends a dual ring of trees topology with the dual ring contained within the main distribution frame (MDF) of the cable plant.

2.2.2.1 Office Installation

- Make sure the location is at least 45 centimeters (18 inches) above the floor surface.
- Allow at least 10 centimeters (4 inches) of airspace around the DECconcentrator 500.
- Place the DECconcentrator 500 away from direct sunlight, and heaters, as well as photocopiers and other magnetic devices.

2.2.2.2 Rack Mount Installation

You can install the DECconcentrator 500 in a standard 48-centimeter (19-inch) rack or RETMA rack cabinet. Digital Equipment Corporation and other major manufacturers of electronic equipment use standard-sized racks. The rack and cabinet rails, mounting hole patterns, and spacing conform to international standards that allow compatibility with products manufactured by Digital and others in the industry.

2.2.2.3 Satellite Distribution Frame Installation

If you are installing the DECconcentrator 500 in a standalone satellite distribution frame (SDF) or as part of a DECconnect System installation, refer to the *DECconnect System Fiber Optic Installation* guide.

The SDF is a component of the Digital DECconnect System. The SDF provides a central location for communication devices that connect fiber optic networks, ThinWire Ethernet, and twisted-pair cable to a standard Ethernet network. The SDF can also be configured as the center of a standalone network.

2.2.3 Configuration Rules

Observe the following cable configuration rules when you install any FDDI device into an FDDI network:

- The maximum cable length between any two stations varies depending on the type of installed option board. Refer to Table 2-2 for correct distances. For maximum cable distance for other types of option boards, refer to the appropriate option installation guide shipped with the concentrator.
- You can install up to a total of 500 stations on an FDDI network. However, Digital recommends 100 stations on an FDDI network.
- You can have a total maximum cable length of 100 kilometers (62 miles) using dual-fiber cable. You can have a total maximum cable length of 200 kilometers (124 miles) using single-fiber cable.

If you have an installed DECconnect System fiber optic cable plant, then color-keyed fiber optic cable connectors and FDDI device connectors aid in the proper installation of cables. See the *DECconnect System Fiber Optic Planning and Configuration* and *DECconnect System Fiber Optic Installation* guides for more information.

Table 2-2: Maximum Cable Lengths

From	To	Maximum Cable Length
Bridge	Concentrator	2 km (1.2 mi) to an installed Port board
		1 km (.62 mi) to an installed Low Power Port board
Concentrator	Concentrator	2 km (1.2 mi) to any installed Network Management board and Port board
		1 km (.62 mi) to an installed Low Power Port board
Concentrator	Station	2 km (1.2 mi) from an installed Port board or Low Power Port board
		1 km (.62 mi) to an installed Low Power Port board
ac outlet	Concentrator	1.83 m (6 ft) country-specific

2.2.4 Available Fiber Optic Cables

Digital recommends that new installations be wired with 62.5/125 Graded Index Multimode Optical Fiber (dual window) that conforms to Digital's General Specification 171002-XX. Your cable installer should provide proof of compliance.

Digital sells two fiber optic cables for indoor wiring use: BN25J-XX general purpose and BN25K-XX plenum cable.

Both these dual-fiber cables use 62.5/125 graded index multimode optical fiber and use 1300 nm wavelengths. Both cables terminate with either FDDI PMD connectors or 2.5 mm ST-type connectors. Use FDDI PMD connectors with a Port board and Network Management board. Use 2.5 mm ST-type connectors with a Low Power Port board and to connect the cable to the patch panel.

There are four types of keyed FDDI PMD connectors. Keyed slots on one face prevent accidental inversion of the connector. This ensures that transmit and receive lines are properly aligned and that devices are connected correctly to the FDDI network.

2.2.5 Reconfiguring and Installing Additional Cables

If you are reconfiguring or installing additional cables, see the *DECconnect System Fiber Optic Planning and Configuration* guide before you begin. See the *DECconnect System Fiber Optic Installation* guide for information to install fiber optic cable runs. Appendix C briefly describes the wiring concentrator optical system and some basic guidelines regarding the fiber optic link.

Installation

3.1 Introduction

This chapter describes how to install the DECconcentrator 500. Chapter 4 describes how to make sure the unit is operating correctly.

WARNING

To avoid bodily injury or damage to the equipment, do not connect the power cord or any other cable until you are instructed to do so in the following procedures.

Do not apply power to the unit unless all covers are installed.

CAUTION

Static electricity can damage modules and electronic components. Digital recommends you use a grounded wrist strap and grounded work surface (Digital P/N 29-11762) when you handle any modules or internal parts.

3.2 Identifying Option Boards

Begin by identifying the option board in the concentrator and any option board you may have to install. Figure 3-1 shows a Network Management board, Port board, and Low Power Port board. Note that:

- A Network Management board has two ports and two switches.
Always install a Network Management board in the top slot. If any type of Port board is installed in the top slot, reinstall the Port board in another slot.
If a Network Management board is installed in slot two or three, the board does not operate and the board fault LED blinks red.
- A Port board has four ports and no switches.
- A Low Power Port board has four pairs of 2.5 mm ST-type fiber optic connectors and no switches. Transmit and receive icons are located on the handle by each pair of connectors.

A Port board can be installed in any option slot.

A generic option board installation procedure is included in Appendix B.

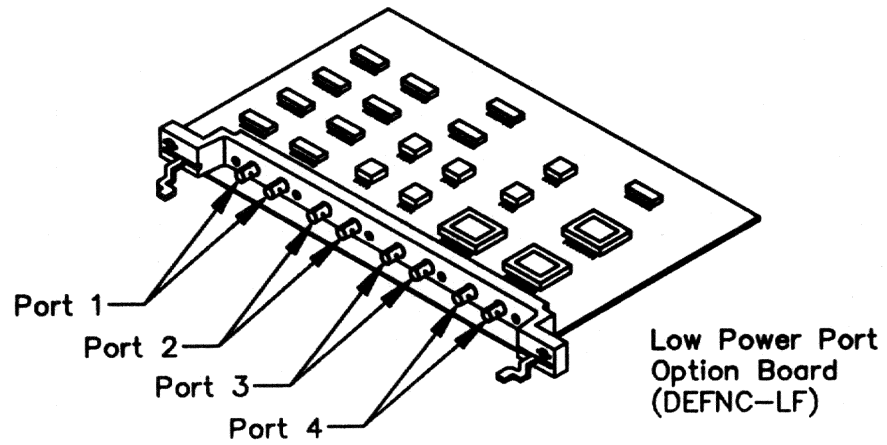
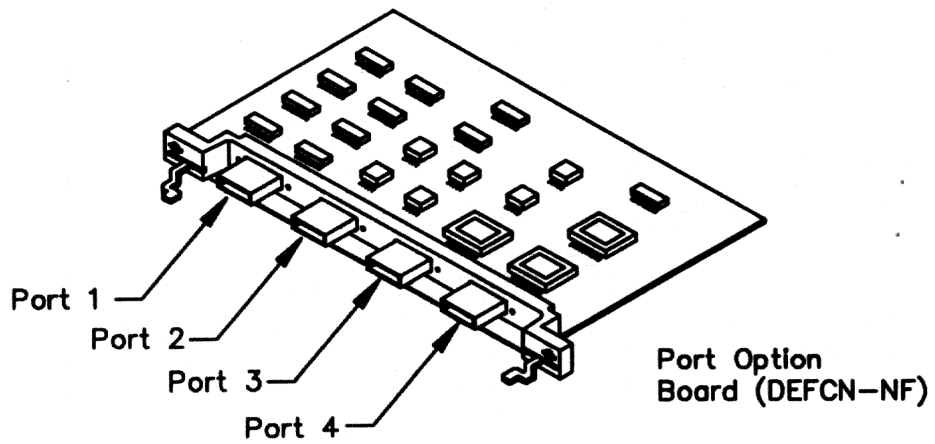
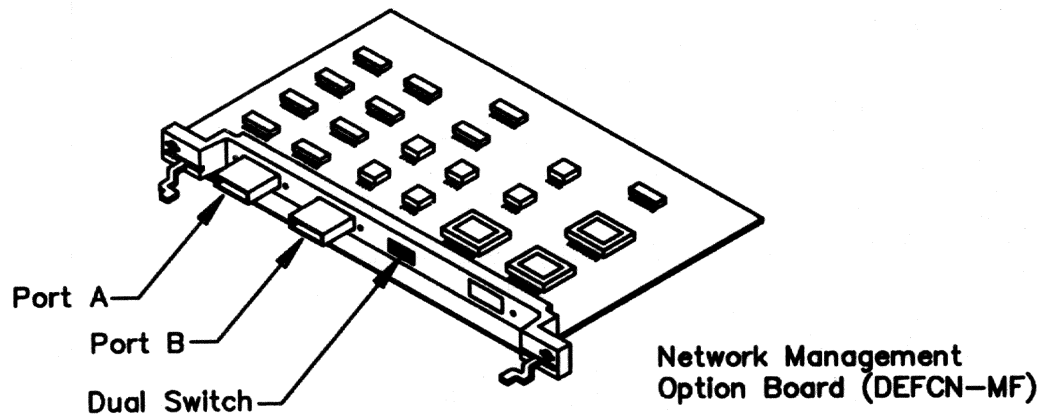
The DECconcentrator ships from the factory with the board configuration you ordered already installed. You will receive additional option boards only if you ordered them separately. You may have another type of Network Management board or Port board. To identify these boards, see the option installation guide shipped with the concentrator.

If you have	And	Then go to
No options to install	A tabletop unit (plastic cover)	Chapter 4
No options to install	A rack mount unit	Section 3.4
A Network Management board option to install		Appendix B or the option installation guide shipped with the concentrator.
A Port board or Low Power Port board option to install		Appendix B or the option installation guide shipped with the concentrator.

NOTE

The DECconcentrator 500 runs cooler without a plastic cover. If the temperature is normally above 35°C (95°F) and the unit has a plastic cover, remove the cover. See Section 3.4.1.

Figure 3-1: Sample Option Boards



LKG-4367-90A

3.3 Checking the Network Management Board Switch Settings

To check the Network Management board switch settings, do the following:

1. Make sure the switch settings match the factory settings shown in Figure 3-2 and described in Table 3-1. Three types of switches are shown. The switches on the Network Management board could be any one of the three types.

NOTE

Use a pointed tool to change switch settings. Never use a pencil; graphite can damage switches.

2. Record the switch settings and the hardware network address (located on the handle of the board) in the DECconcentrator Identification List (Appendix F).

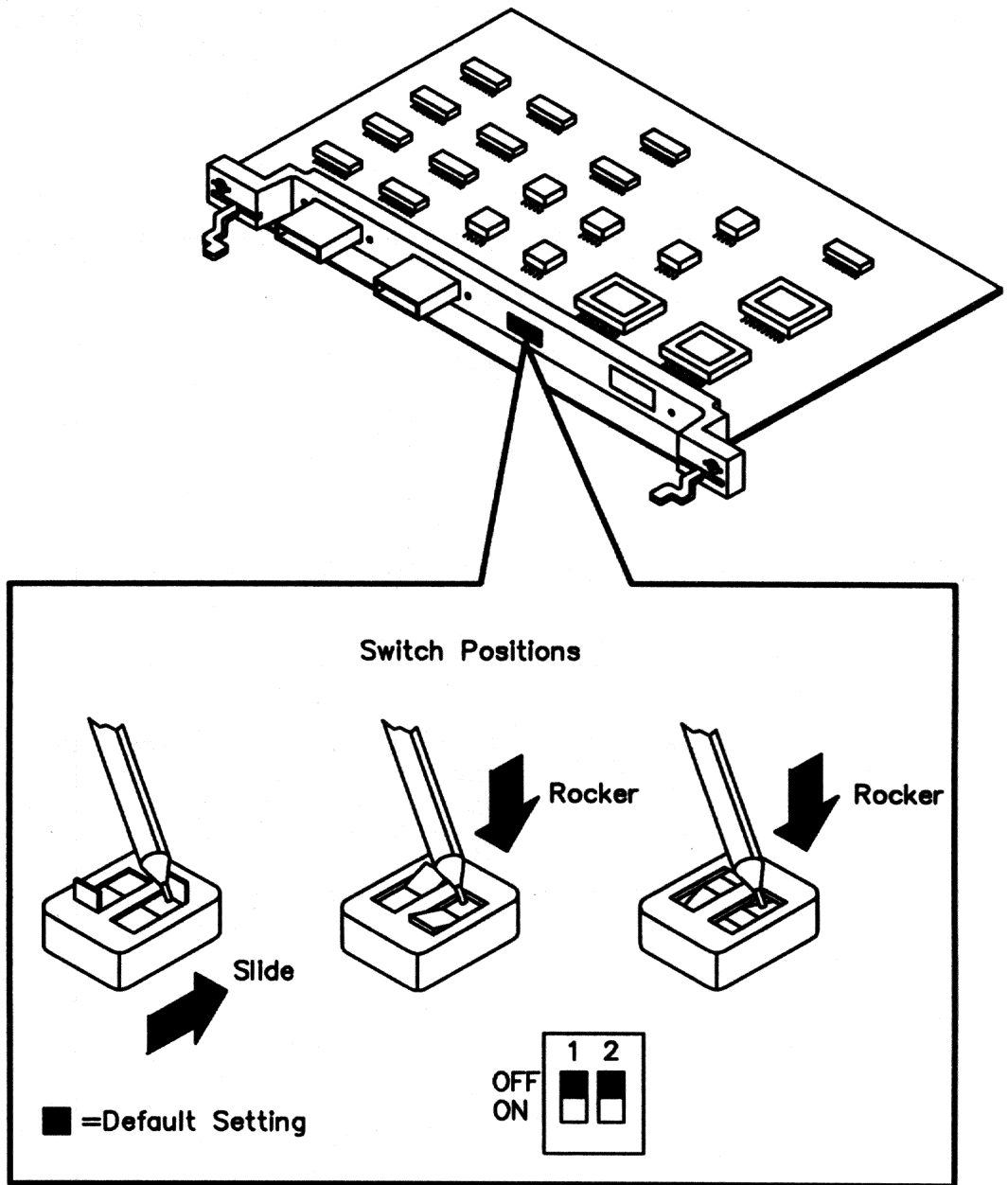
NOTE

The concentrator must be set to the default parameters in order to test all the ports. If you are reinstalling the unit, make sure to reset switch 1 (reset to default setting).

Table 3-1: Network Management Board Switch Setting

Switch	Default Setting	Function
1 (reset to default parameters)	OFF	<p>When OFF at power up, no action occurs.</p> <p>When ON during power up, enables reset of system parameters that have been changed through remote management (DECelms). For example, if remote management has disabled a port, that port is no longer disabled when you reset to the default parameters.</p> <p>To reset to the default parameters after the concentrator is installed and operational, or after being reinstalled, do the following:</p> <ol style="list-style-type: none">1. Set switch 1 to ON.2. Cycle the power and wait for self-test to complete.3. Set switch 1 to OFF.
2 (write enable/disable)	OFF	When set to ON, enables write access for system control parameters such as the password and firmware upgrade parameters.

Figure 3-2: Checking the Network Management Board Switches



LKG-3801-90A

3.4 Installing the Unit in the Rack

The DECconcentrator 500 can be mounted in a standard 48-centimeter (19-inch) RETMA rack cabinet using the rack mount kit provided with the wiring concentrator.

Rack mounting the concentrator requires:

1. Removing the concentrator's plastic cover if present.
2. Attaching the rack mount brackets to the concentrator.
3. Installing the u-nuts on the cabinet rails.
4. Installing the concentrator in the rack.

Install the concentrator in the rack so that the back of the unit (with the cable connections) is visible to the operator for monitoring the status LEDs.

NOTE

Although one person can install the concentrator in a rack, two people supporting the concentrator makes the task easier.

NOTE

The air inside an enclosed rack can be hotter than the ambient room temperature. Make sure that the air entering the DECconcentrator 500 does not exceed the maximum intake temperature of 50°C (122°F).

3.4.1 Removing the Plastic Cover

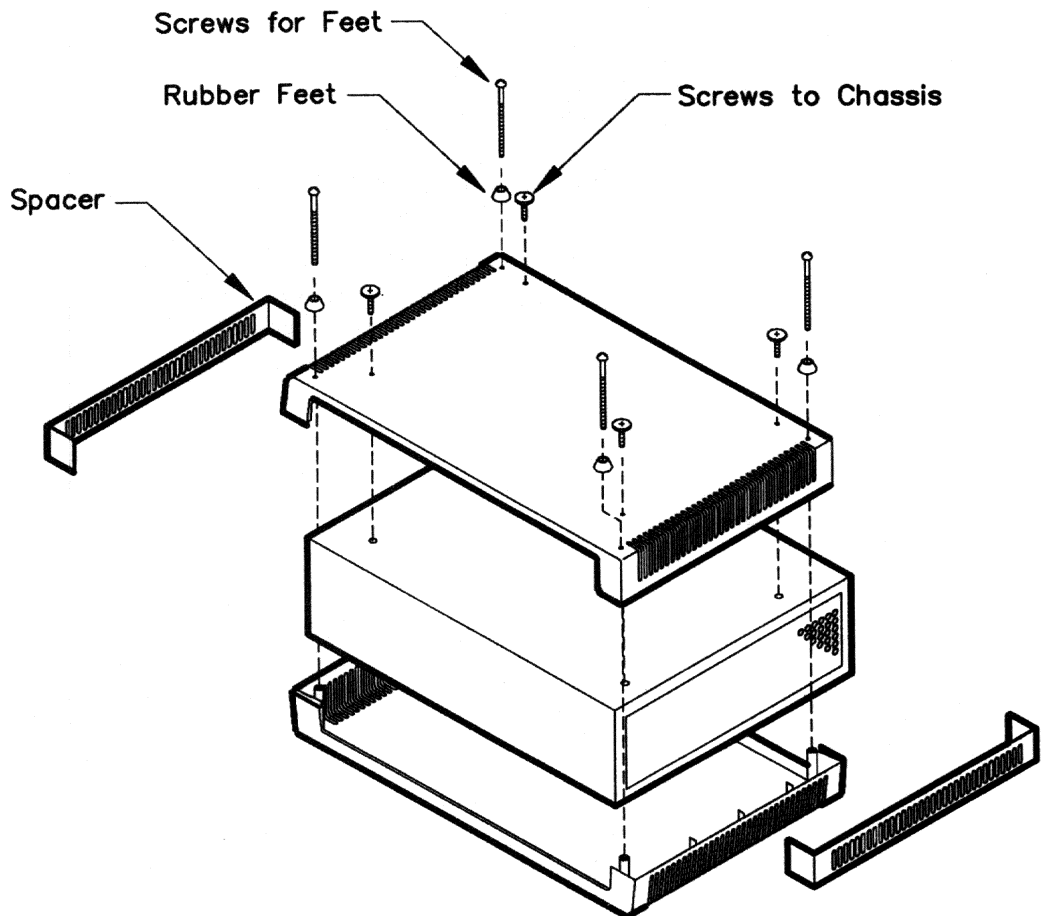
If the unit has a plastic cover, remove it from the unit as follows:

1. Place the concentrator upside down on a sturdy surface or the floor.
2. Remove the eight screws from the bottom of the unit, then, remove the plastic cover (Figure 3-3). Store the cover and associated hardware for possible future use or reconfiguration.

CAUTION

Do not reinstall the cover screws into the wiring concentrator's metal chassis. Doing so could damage the wiring concentrator.

Figure 3-3: Removing the Plastic Cover



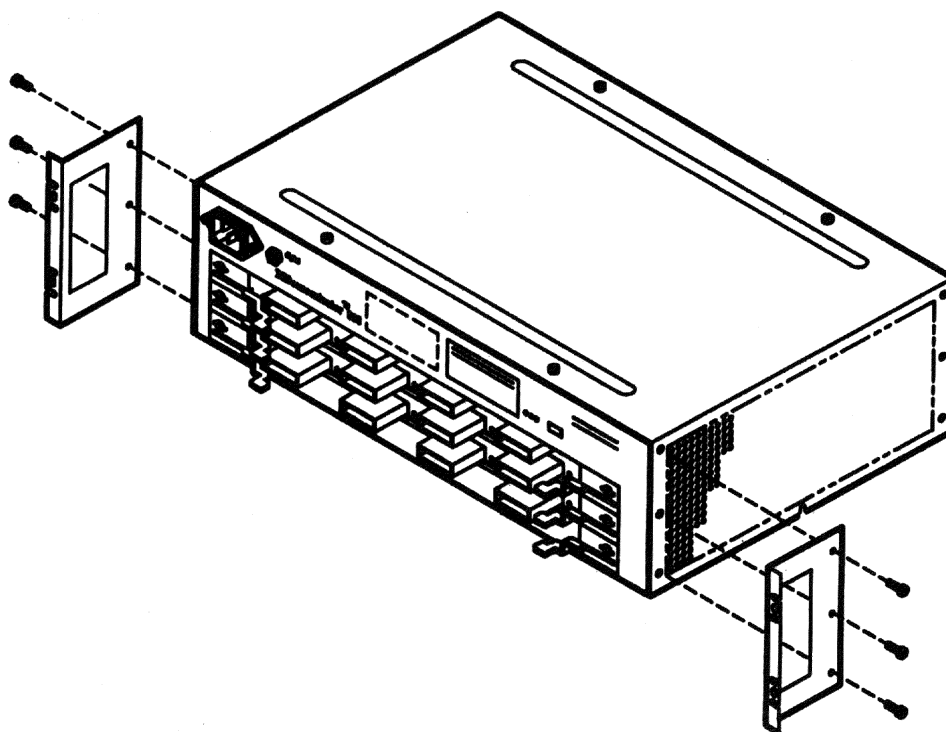
LKG-3804-90A

3.4.2 Installing the Rack Mount Brackets

Install the rack mount brackets as follows:

1. Remove the six screws from the sides of the chassis adjacent to the back of the wiring concentrator. Save the screws for future use.
2. Install the rack mount brackets. Use the six 8-32 Phillips-head screws with lock washers provided in the rack mount kit (Figure 3-4).

Figure 3-4: Preparing the Unit for Mounting



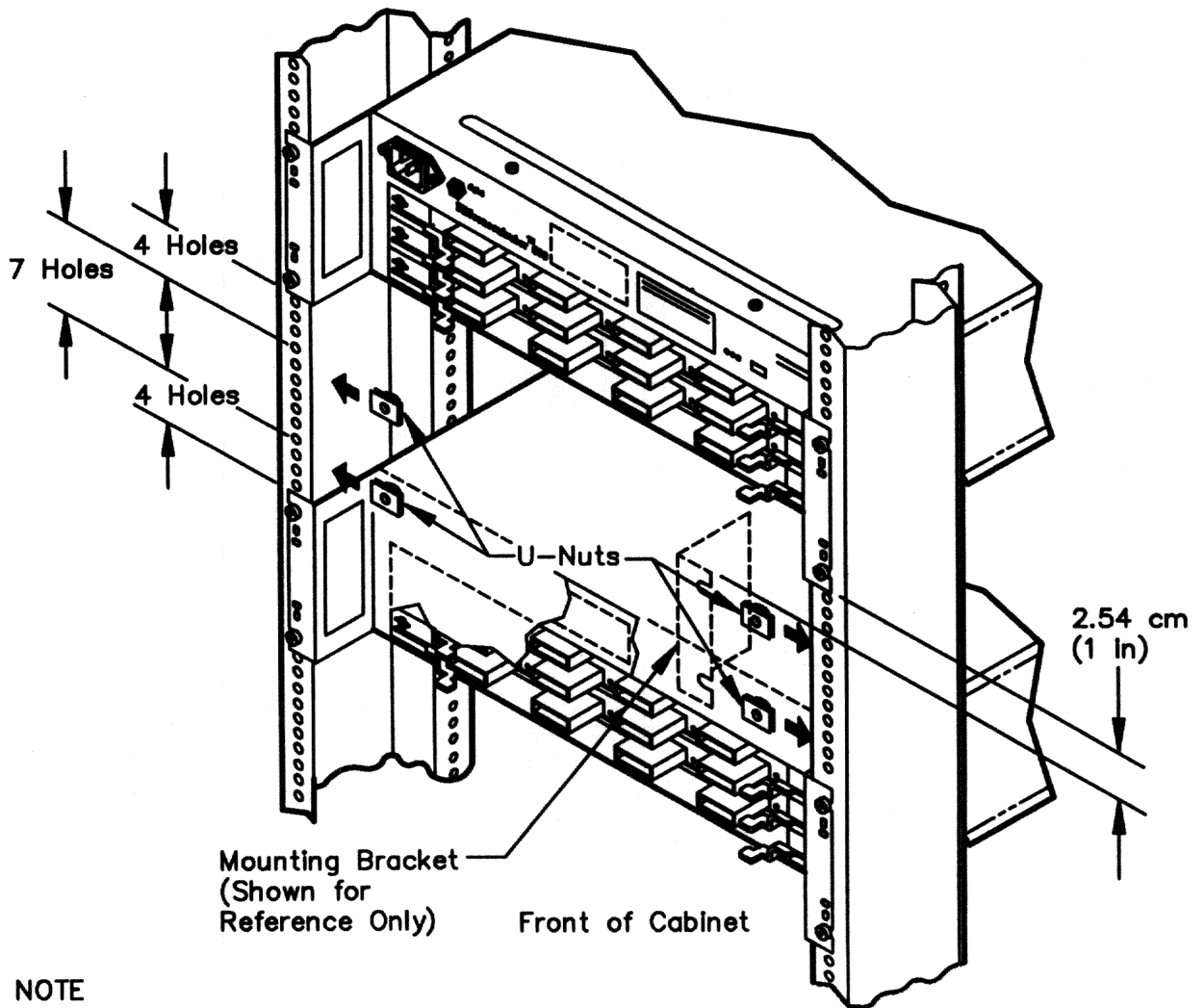
LKG-3905-80A

3.4.3 Preparing the Rack

To prepare the rack, do the following:

1. Determine where you want to mount the wiring concentrator in the rack. Allow 2.54 centimeters (1 inch) spacing between mounted devices.
2. Attach the four u-nuts to both rails at the front of the cabinet (Figure 3-5).

Figure 3-5: Preparing the Rack



NOTE

Always leave at least 2.54 cm (1 in) of space between mounted devices for passing cables to the back of rack.

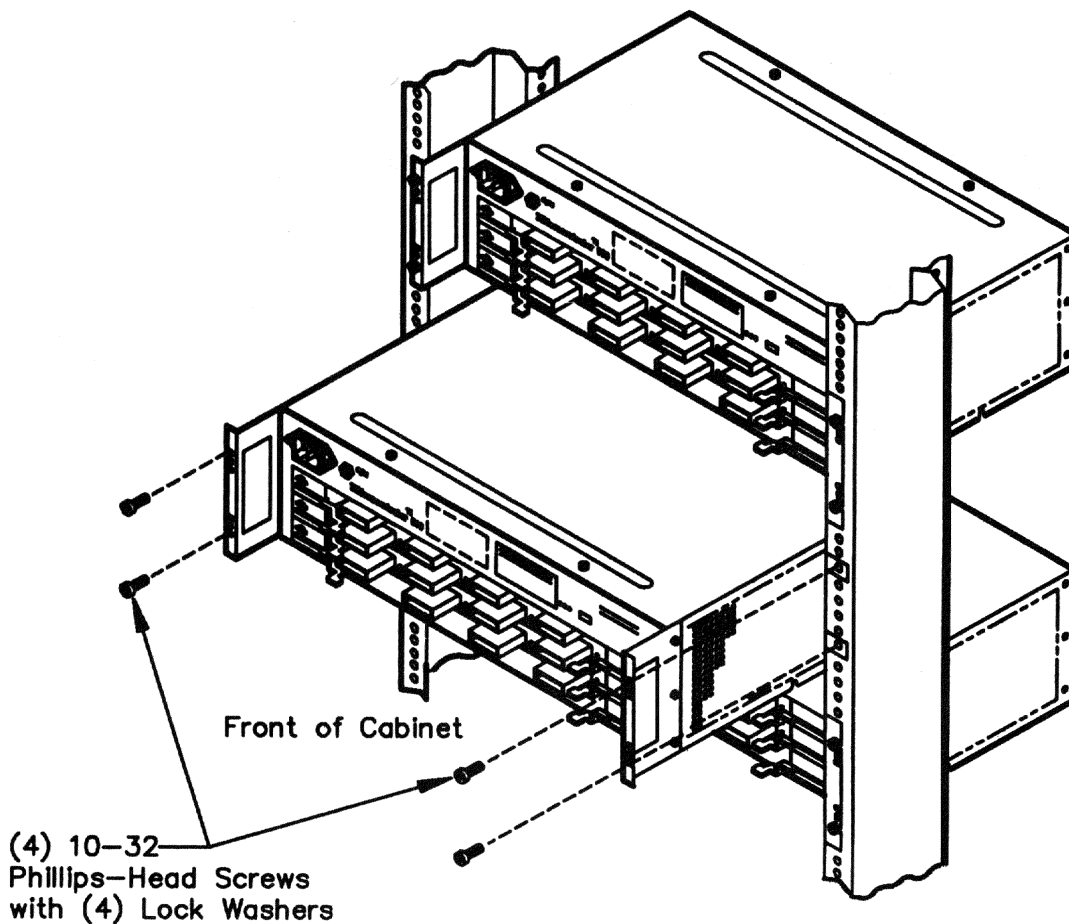
LKG-3808-90A

3.4.4 Mounting the Unit in the Rack

To mount the unit in the rack, do the following:

1. With one person supporting the front of the unit, slide the unit into the rack from the front of the cabinet. Make sure the back of the unit with the cable connections is visible to the operator for monitoring the LEDs (Figure 3-6).
2. Fasten the rack mount brackets to the u-nuts on the cabinet rails. Use the four 10-32 Phillips-head screws with lock washers provided in the rack mount kit.
3. Go to Chapter 4. DO NOT connect any cables until instructed to do so. You are now ready to test the wiring concentrator and connect the cables.

Figure 3-6: Installing the Unit in the Rack



NOTE

Always leave at least 2.54 cm (1 in) of space between mounted devices for passing cables to the back of the rack.

LKG-3807-90A

Checking the Wiring Concentrator

4.1 Introduction

This chapter describes checking the operational status of the DECconcentrator 500, all ports, and connecting the power and fiber optic cables to the wiring concentrator.

You can add a DECconcentrator 500 to an existing FDDI network at any time, although adding a wiring concentrator disrupts network traffic. Therefore, Digital recommends that you add the concentrator when you know that there will be little or no use of the network. Also, make sure you notify the appropriate personnel of this disruption.

To check the DECconcentrator 500 installation do the following:

1. Run the self-test. Applying power to the DECconcentrator 500 starts the self-test (Section 4.2). This procedure checks the internal circuitry and operational status of the DECconcentrator 500 and any installed option boards.
2. Run the loopback test. After the self-test is completed, installing a loopback connector on a port starts the loopback test. Test each port and observe the condition of the port LED. This procedure checks the ability of the individual port to transmit and receive optical pulses (Section 4.3).
3. Connect the fiber optic cables to the ports and test the connections (Section 4.4.1).
4. Fill in the DECconcentrator 500 Identification List in Appendix D and give a copy to the system/network manager to keep with the network records.

Procedures here describe using FDDI PMD and 2.5 mm ST-type loopbacks and connectors. See the instructions included with the option installation guide(s) shipped with the concentrator for installing other types of loopbacks and connectors.

4.2 Running the Self-Test

The DECconcentrator 500 unit does not have a power on/off switch. Plugging in the power cord applies power directly to the concentrator and initiates the self-test. The DECconcentrator 500 switches automatically to 100/120 Vac or 200/240 Vac. No user action is required to set the voltage.

4.2.1 Connecting the Power Cord

To connect the power cord, do the following:

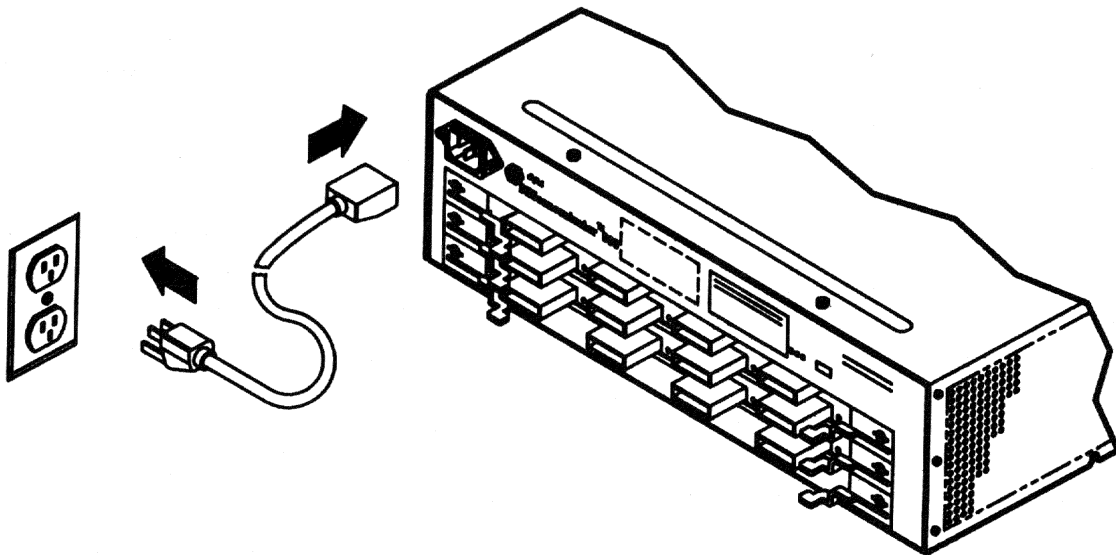
WARNING

To avoid bodily injury, use care when connecting the concentrator power cord. Regulations in some countries may require an authorized person to connect the power.

Make sure you connect the power cord to a grounded wall outlet.

1. Make sure the power cord plug matches the wall outlet.
2. Plug the power cord into the concentrator first and then into the wall outlet or appropriate power source receptacle (Figure 4-1).

Figure 4-1: Connecting the Power Cord

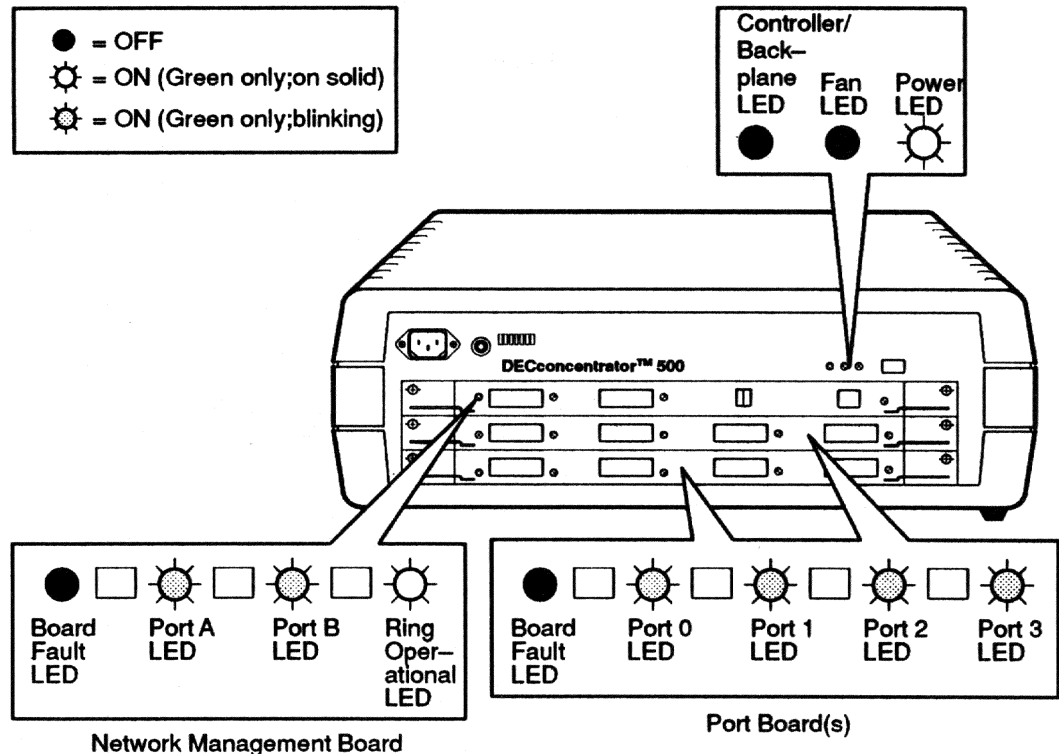


LKG-3816-90A

3. Observe the power, fan, and Controller/Backplane LEDs and the option board LEDs to make sure the unit is operational.
4. After power up, allow 15 seconds for the self-test to complete. Then, compare the state of the LEDs on the concentrator with those shown in Figure 4-2. Figure 4-2 shows the normal state of the LEDs after a successful self-test.

All LEDs normally go ON for the first 2 seconds of the self-test. The Controller/Backplane LED goes ON and remains ON during the self-test.

Figure 4-2: Checking the Operational Status



IF:
The LEDs match those shown here.

Then:
The DECconcentrator 500 wiring concentrator is operational; go to Section 4.3.

IF:
The LEDs do not match those shown here.

Then:
Go to Chapter 5.

LKG-3787-901

4.3 Running the Loopback Test on Each Port

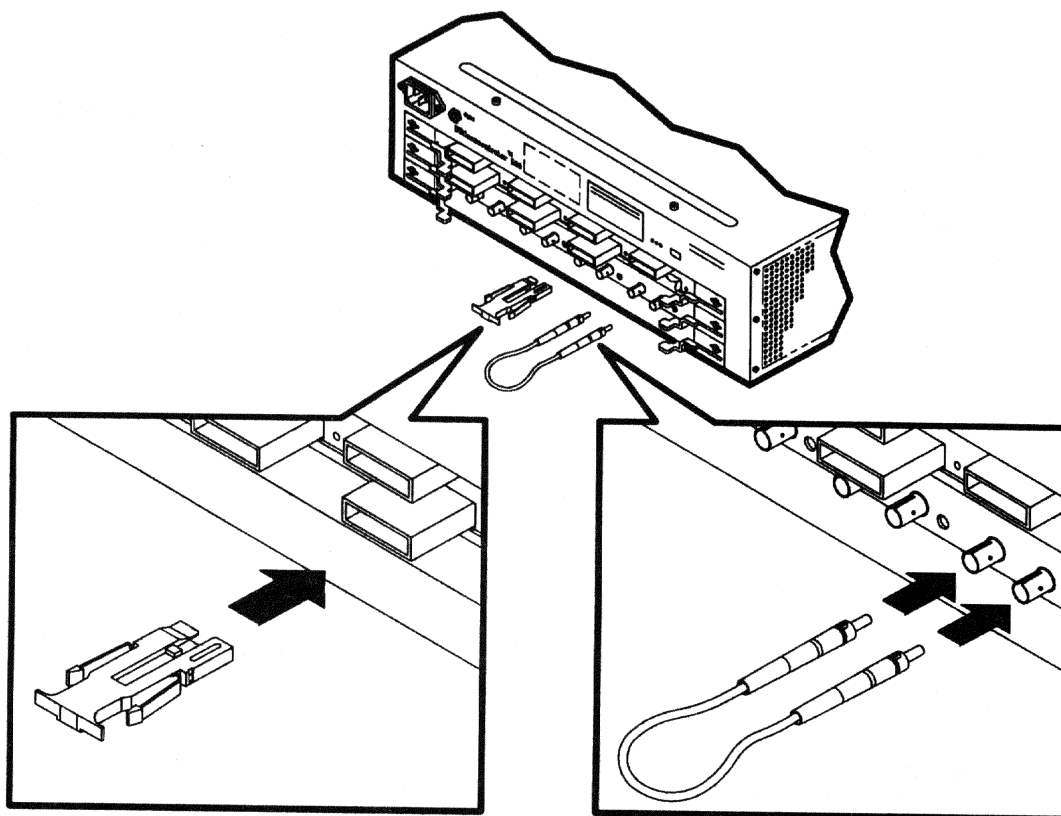
Run the loopback test after successful completion of the self-test to check the transmitters and receivers. The port status LED should be blinking green before you start the loopback test. Run this test on each port using the following procedure:

WARNING

Some fiber optic equipment emits laser light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that the cable is connected to a light source.

1. Remove the protective cap or rubber boot from the port and loopback connector. Do not touch the fiber; doing so can damage the fiber.
2. Connect the loopback connector to the port that you are testing. Use the appropriate loopback connector for the port you are testing (Figure 4-3). The 2.5 mm ST-type loopback connectors are keyed. Insert each end so that the key is up. Push firmly in place.

Figure 4-3: Connecting a Loopback Connector to a Port

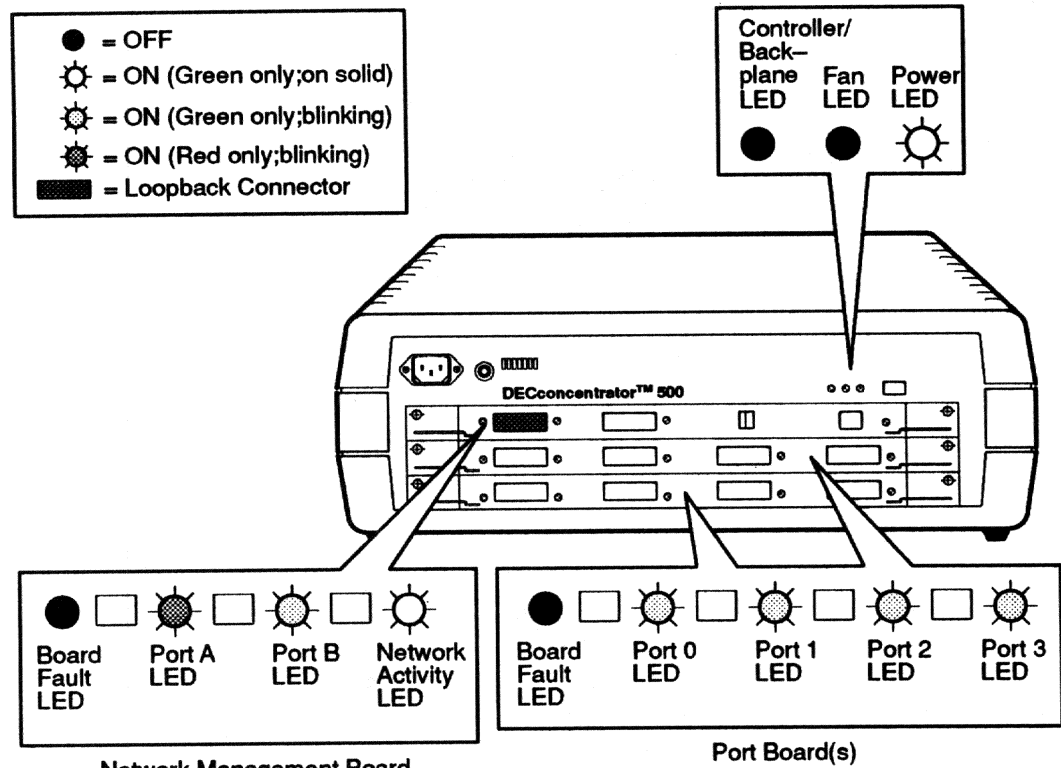


LKG-4368-90A

- Observe the port LED. The LED should blink red. This means that the port can transmit and receive optical signals. When you remove the loopback connector, the LED blinks green.

Figure 4-4 shows Port A being tested with the loopback connector.

Figure 4-4: Port LED Status During Loopback Testing



IF:
The LEDs match those shown here.

IF:
The LEDs do not match those shown here.

THEN:
The wiring concentrator port is operational. Test the next. When all ports are tested, go to Section 4.4.

THEN:
Go to Chapter 5.

LKG-3788-901

4.4 Attaching Fiber Optic Cables

To attach fiber optic cables, you need to:

1. Identify the connector and port type
2. Connect the cable to the appropriate port
3. Observe the port status LED

4.4.1 Identifying Fiber Optic Cable Connectors

Use keyed FDDI connectors with FDDI PMD ports (Figure 4-5). Use 2.5 mm ST-type connectors with low power ports. The concentrator has M-type ports on the Port boards, and A- and B-type ports on the Network Management board. Use the connection rules in Table 4-1 when you connect the cables.

NOTE

The ferrule on the transmit end of the 2.5 mm ST-type fiber optic cable connector should measure 7.89 mm \pm .025 mm (.310 \pm .001 in) in length. Shorter ferrules can cause less power to be launched into the fiber.

Table 4-1: Connection Rules

Connecting Nodes		This Node	This Node	This Node	This Node
Port Type		A	B	M	S
Other Node	A	No	Yes, rule 1 ¹	Yes	Yes
Other Node	B	Yes, rule 2 ²	No	Yes	Yes
Other Node	M	Yes, rule 3 ³	Yes, rule 4 ⁴	No	Yes
Other Node	S	Yes	Yes	Yes	Yes

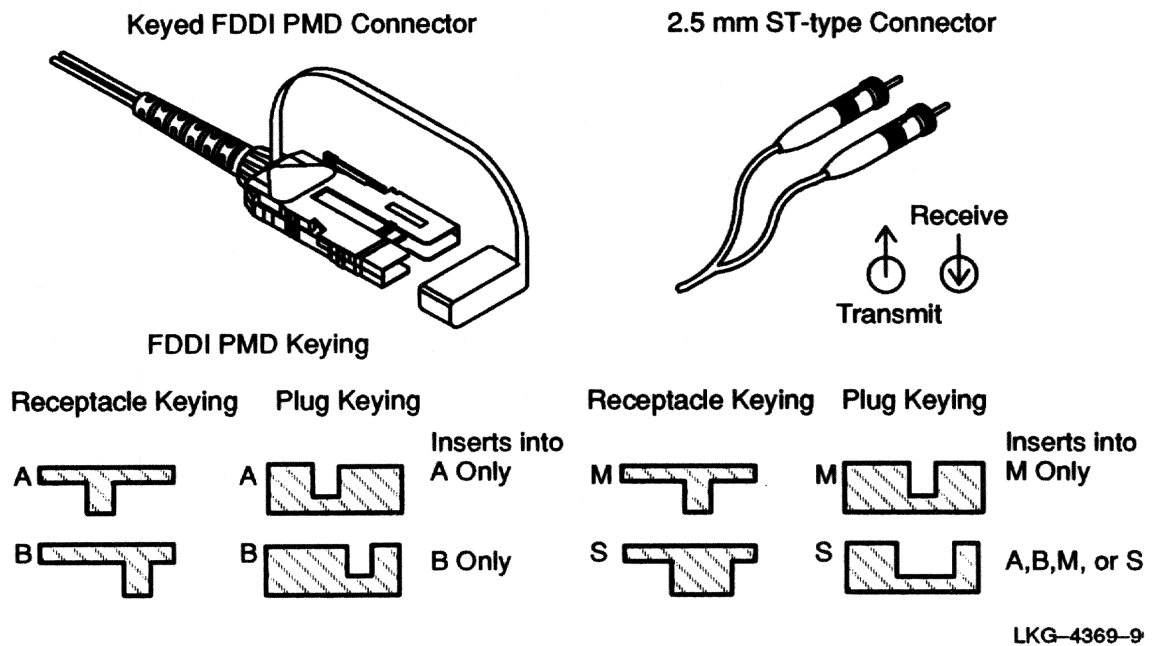
¹ Connection Rule 1: **This Node** Port B can connect to Port A of **Other Node** if, and only if, **This Node** Port A is connected to Port B or Port S of another station, or is unconnected.

² Connection Rule 2: **This Node** Port A can connect to Port B of **Other Node** if, and only if, **This Node** Port B is connected to Port A or Port S of another station, or is unconnected.

³ Connection Rule 3: **This Node** Port A can connect to Port M of **Other Node** if, and only if, **This Node** Port B is connected to Port A or Port S of another station, or is unconnected. If **This Node** Port B is connected to Port A of another station, it immediately disconnects when **This Node** Port A connects to Port M of **Other Node**.

⁴ Connection Rule 4: **This Node** Port B can accept connection to Port M of **Other Node**. If **This Node** Port A is connected to Port B or Port M of another station, it immediately disconnects when **This Node** Port B connects to Port M of **Other Node**.

Figure 4-5: Connector Types for FDDI Devices



4.4.2 Connecting Fiber Optic Cables

Digital recommends you use Digital's FDDI-to-FDDI patch cables (BN24B-XX), FDDI-to-2.5 mm ST-type patch cables (BN24D-XX), or 2.5 mm ST-type-to-2.5 mm ST-type patch cables. Use the following procedure to connect fiber optic cables.

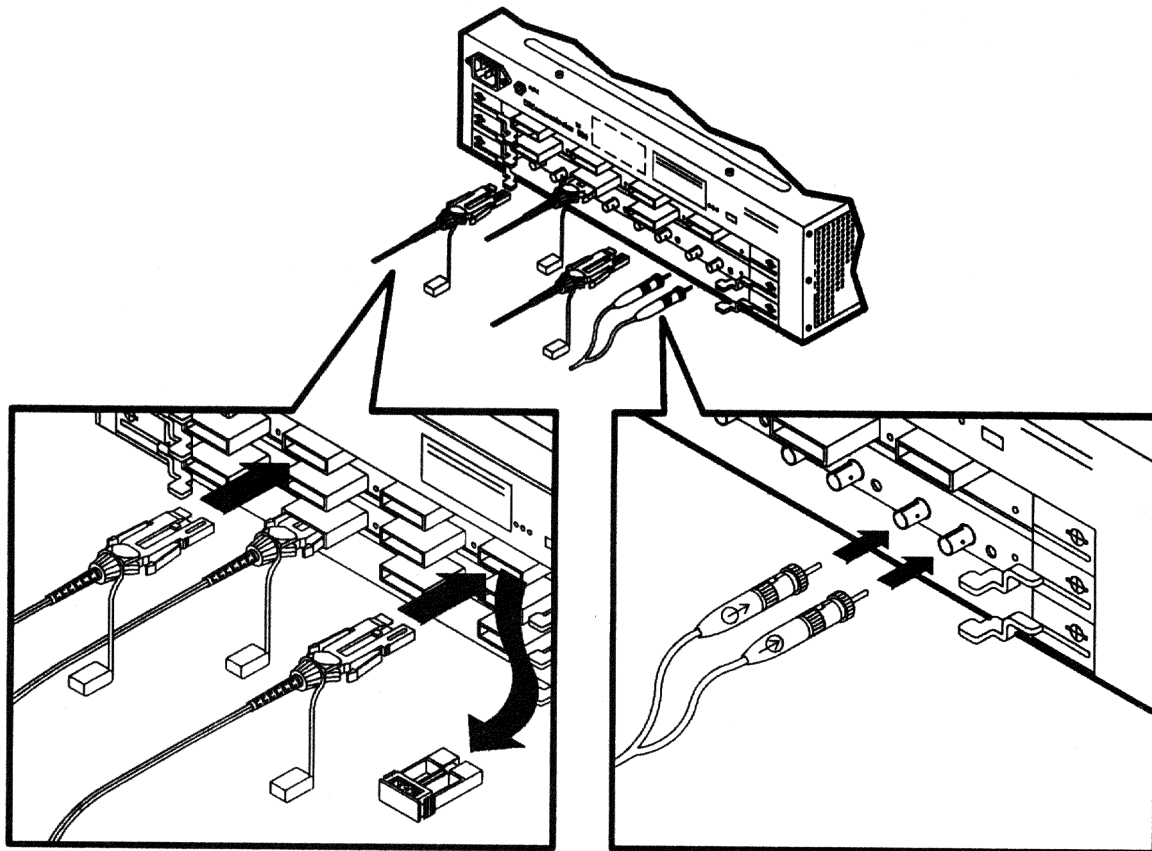
CAUTION

Make sure that the bend radius of any fiber optic cable is 7.5 centimeters (3 inches) or greater.

1. Pull the protective caps or rubber boot from the port and fiber optic cable plug. Do not touch the fiber; doing so can damage the fiber.
2. Refer to Table 4-1 to connect the fiber optic cable to the appropriate connector. Figure 4-6 shows how to connect FDDI-keyed and 2.5 mm ST-type connectors respectively. Use the following guidelines:
 - Bridges, workstations, and other single attachment stations connect to the M ports on Port boards.

- A concentrator or dual attachment station participating in a dual ring connects to the dual ring through Ports A and B on the Network Management board. Cabling goes from Port B of the upstream concentrator or DAS to port A.
 - In a dual ring of trees, a concentrator or DAS B port connects to a concentrator M port.
3. Connect the fiber optic cable to the appropriate connector. Note that:
- Digital cables BN24B-XX and BN24D-XX have colored key markers on the top of the plug; use red for A-type ports, blue for B-type ports, and green for M-type ports.
 - To prevent connecting 2.5 mm ST-type cables incorrectly, make sure to match the icons on the cable with the icons on the option board.

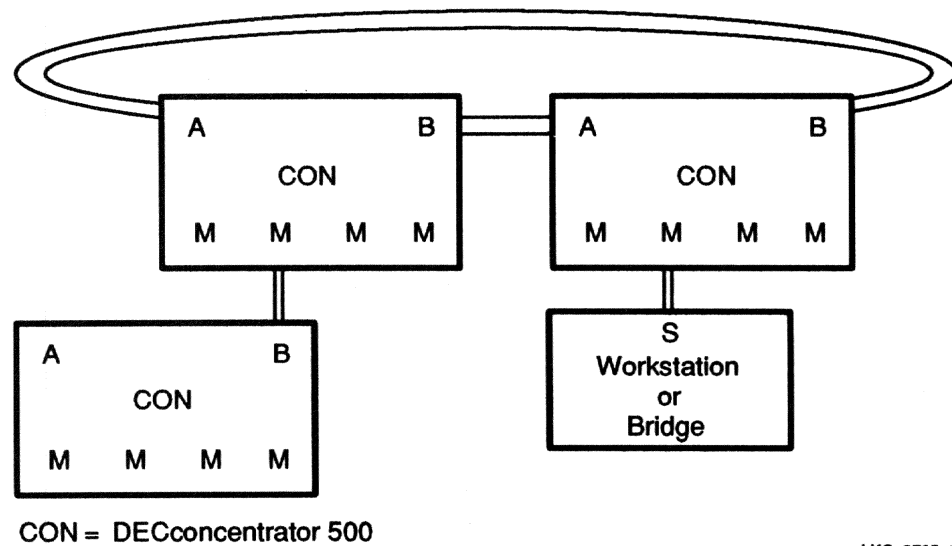
Figure 4-6: Connecting Keyed FDDI Cables and 2.5 mm ST-type Cables



LKG-4370-90A

Figure 4-7 shows connecting a concentrator in a dual ring of trees.

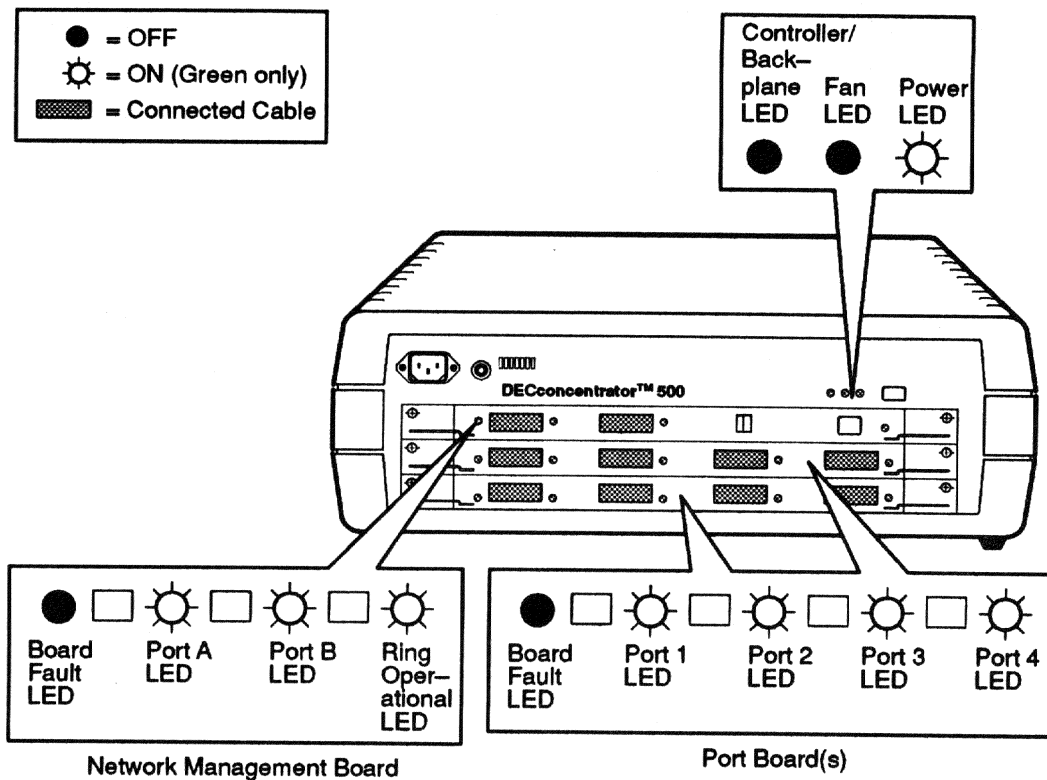
Figure 4-7: Connecting a Concentrator in a Dual Ring of Trees



-
4. Observe the LEDs as you connect the fiber optic cables (Figure 4-8).
 5. For each cable that is connected to the concentrator, add the cable identification number to the DECconcentrator 500 Identification List in Appendix D.

Figure 4-8 assumes a fully configured DECconcentrator 500 with a device connected at the other end of each cable. If no cable is connected to a port, the port LED blinks green.

Figure 4-8: LEDs: Fully Configured and Cabled DECconcentrator 500



IF:
The LEDs match those shown here.

Then:
The DECconcentrator 500 wiring concentrator is operational and correctly cabled; installation is complete.

IF:
The LEDs do not match those shown here.

Then:
Go to Chapter 5.

LKG-4168-901

Problem Solving

5.1 Introduction

This chapter helps you identify and correct problems that might occur during installation of the DECconcentrator 500 unit. The procedures described here are for diagnosing and correcting hardware-related problems only.

As you go through these problem-solving steps, write down the symptoms, LED state, and what you did to correct the problem. If the problem continues after you complete these procedures:

- Notify your system/network manager or authorized service representative about the problem and the field-replaceable unit (FRU) that may be faulty.
- Give a copy of your problem-solving record to your system/network manager or service representative.

Additional problem-solving information is available in the *DECconcentrator 500 Problem Solving* guide. Also, refer to the following items for service information.

- Your warranty for information about repairs. If you do not have a service contract you may need to have a service engineer remove and return the faulty FRU. Otherwise, see the *DECconcentrator 500 Problem Solving* guide for directions.
- Your service contract for information about getting service and the type of service you have.
- Appendix E for a brief description of the different types of service that are available to you.

5.2 Maintenance Strategy

The following procedures assume that the problem has been isolated to the concentrator. Identify and then replace any faulty FRU. (See the *DECconcentrator 500 Problem Solving* guide for procedures to remove and replace FRUs.)

WARNING

Digital Equipment Corporation recommends that only trained service engineers perform the replacement procedures.

The FRU may be the:

- Port board
- Network Management board
- Controller/Backplane
- Fan assembly
- Power supply
- Circuit breaker

5.3 Problem-Solving Sequence

Use the following procedures to identify a faulty FRU:

1. Visually check all cable connections to make sure they are properly connected.
2. Run the self-test.
3. Observe and record the condition of the concentrator LEDs.
4. Take the appropriate corrective action (see Table 5-1 through Table 5-4).
5. After diagnosing and correcting the problem, return to Chapter 4 to confirm the correct operation of the concentrator.

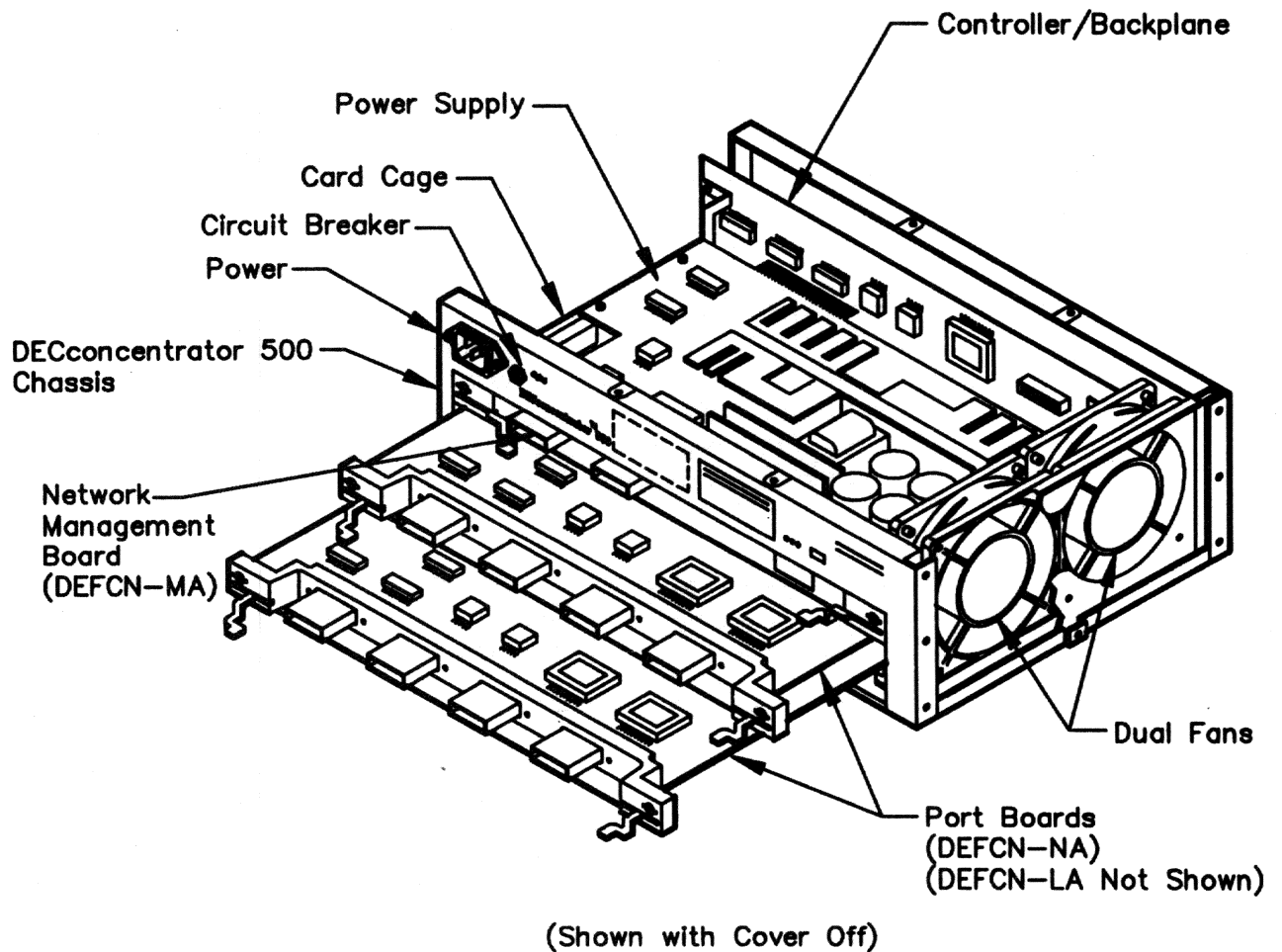
WARNING

Always remove the power cord from the unit and ac source when performing any removal and replacement procedures.

To avoid possible personal injury, let the unit cool for 5 minutes before opening the concentrator.

Figure 5-1 shows the DECconcentrator 500 FRUs.

Figure 5-1: DECconcentrator 500 FRUs



LKG-4371-90A

Digital Equipment Corporation also recommends that you remove any port cable that could be in the way when you service the unit.

NOTE

Reinstall all cables back in their original position; an incorrectly installed cable can cause the network to fail.

5.4 Running the Self-Test

To run the self-test:

1. Disconnect the power from the DECconcentrator 500.
2. Reconnect the power to start the self-test.

The concentrator's LEDs indicate the operational status of the DECconcentrator 500. Figure 5-2 shows the normal condition of the LEDs on completion of the self-test; a fully configured DECconcentrator 500 is shown.

NOTE

If any ports have been disabled by remote management (DECelms), the LEDs may not light as indicated in these procedures. The concentrator must be set to the default parameters in order to test all ports. If you are reinstalling the unit, make sure you reset switch 1 (the *reset to default parameters* switch). See Table 3-1 for directions.

The DECconcentrator 500 self-test runs for approximately 15 seconds. When the self-test starts, *all* the LEDs go on for 2 seconds while the self-test checks the LEDs, EPROMS, EEPROMS, and the processor. The test then continues to check the rest of the internal circuitry.

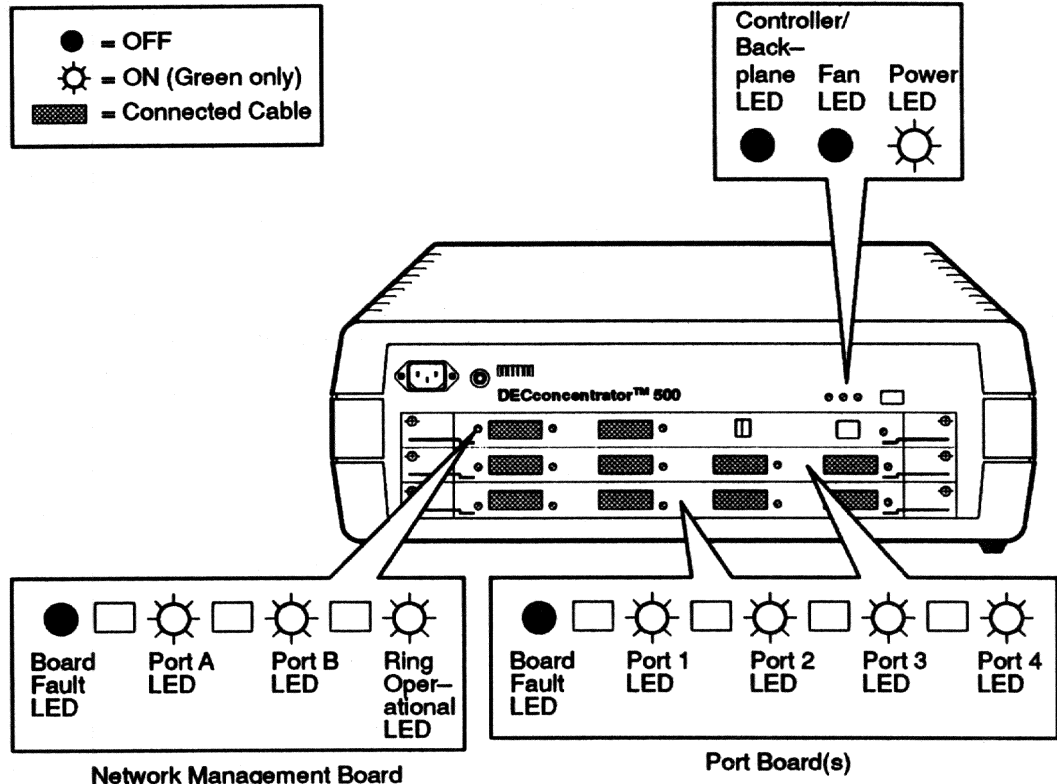
If no fatal faults occur, operational firmware takes control of initializing the concentrator. If there is a nonfatal fault, the operational firmware decides to continue or to abort the initialization of the concentrator. The decision to abort or continue depends on the type of fault detected.

Section 5.5 describes what you can do if the LED display is not normal.

5.5 Diagnosing Problems

Table 5-1, Table 5-2, and Table 5-3 describe basic problem-solving procedures you can follow when you encounter a problem during installation or during operation of the concentrator. The symptoms described here are presented in the order that they might occur during the power-up self-test.

Figure 5-2: Normal LED Condition



IF:
 The LEDs match those shown here.

Then:
 The DECconcentrator 500 wiring concentrator is operational and correctly cabled.

IF:
 The LEDs do not match those shown here.

Then:
 Go to Table 5-1.

LKG-3790-901

Table 5-1: Basic Problem Solving by Symptom

Symptom	Probable Cause	Corrective Action
All LEDs off	Power cord connection.	Make sure the power cord is firmly connected at both ends.
	Incorrect or no power at wall outlet.	Make sure the correct power is available at the wall outlet. If no power is available, check the circuit breaker for the outlet. If necessary, connect the unit to a different outlet.
	Blown fuse at wall outlet.	In some countries the power connector at the wall outlet has a fuse. Replace the blown fuse. If the problem persists, try connecting to a different wall outlet. If the problem continues there may be a faulty power cable or incorrect wiring. Notify your system/network manager.
	Faulty power cord.	Use a meter to measure the continuity of the power cord. Replace the cord if defective.
	The circuit breaker has tripped.	Check the circuit breaker. If the circuit breaker has tripped, reset it by pressing on the white center button. If the problem persists, the power supply or circuit breaker needs to be replaced. Notify your system/network manager.
DC OK LED is off, any other LED on	Problem with the power supply.	The power supply needs to be replaced or repaired. Notify your system/network manager.
Fan LED is on (red)	Problem with the fan or fan connection.	Notify your system/network manager.
Controller/Backplane LED is on (red) and all option board fault LEDs are on (red)	Problem with the Controller/Backplane, LED, or connection to the power supply.	Notify your system/network manager.

Table 5–2: Port Board Problem Solving

Symptom	Probable Cause	Corrective Action
Board Fault LED is on (red), other Port board LEDs off, unit LEDs normal	Problem with the Port board.	The board needs to be replaced or repaired. Notify your system/network manager.
Port LED off	Port disabled by management, LED broken or board at fault.	Set port state on through DECElms software, otherwise, use the reset to default parameter switch. However, always make sure to notify your system/network manager that you are resetting the parameters.
Port LED blinking red	Unsupported configuration or ring topology.	Verify and reconfigure the cable connections or ring topology. Before you reconfigure, see your system/network manager for confirmation.
Port LED red	Link Confidence Test failure, possible cable or cable connection problem.	Check cable connections. Run the loopback test described in Section 5.6 to test the port. See Table 5–4 for problem solving during loopback testing.

Table 5–3: Network Management Board Problem Solving

Symptom	Probable Cause	Corrective Action
Board Fault LED is on (red), other Port board LEDs off, unit LEDs normal	Problem with the Network Management board.	The board needs to be replaced or repaired. Notify your system/network manager.
Ring Operational LED off	No network activity, no token being passed.	Indicates a network configuration problem or problem on the network. See your system/network manager if the problem persists.
Port LED off	Port disabled by management, LED broken or board at fault.	Set port state on through DECElms software, otherwise, use the reset to default parameter switch. However, always make sure to notify your system/network manager that you are resetting the parameters.
Port LED blinking red	Unsupported configuration or ring topology.	Verify and reconfigure the cable connections or ring topology. Before you reconfigure, see your system/network manager for confirmation.
Port LED red	Link Confidence Test failure, possible cable or cable connection problem.	Check cable connections. Run the loopback test described in Section 5.6 to test the port. See Table 5–4 for problem solving during loopback testing.

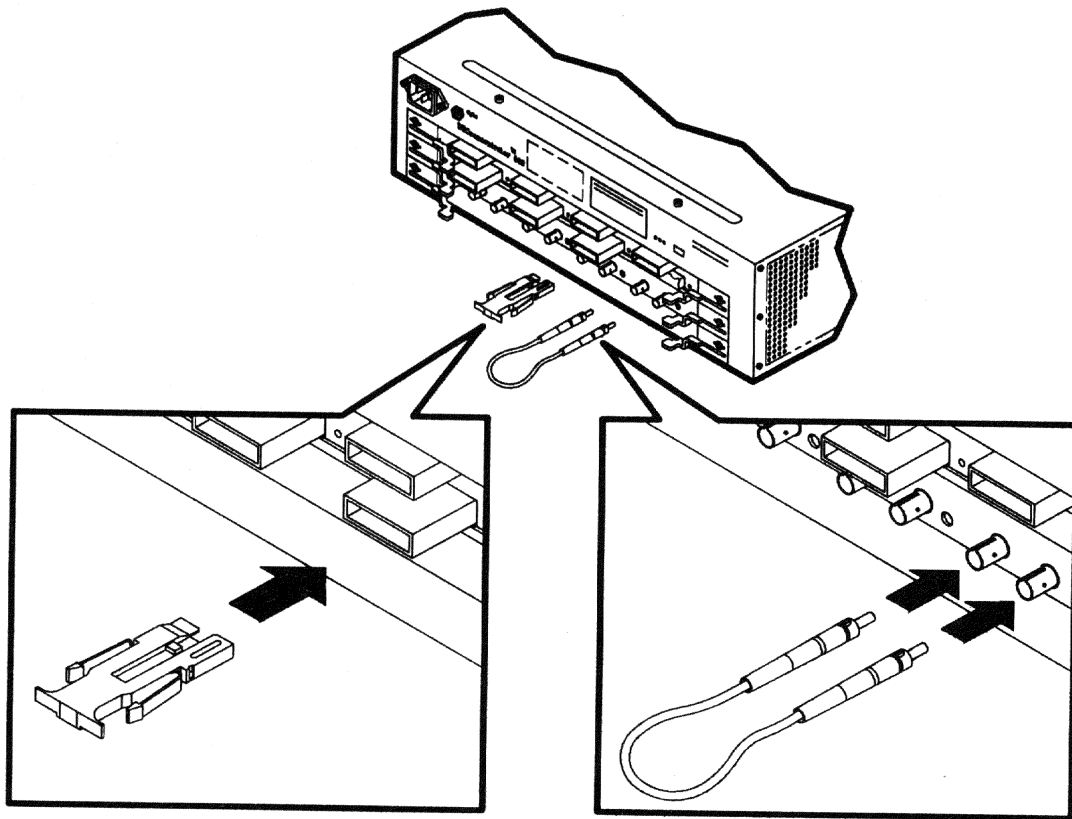
5.6 Loopback Testing

Use the loopback test to determine if the DECconcentrator 500 Port board or Network Management board is faulty, or if the problem is with the cable or the device at the other end of the cable. This test verifies the basic ability to transmit and receive. The loopback test does not verify the ability to receive minimum level signals. The test does not verify that the transmitter's output level is within specification. Use the following procedure:

1. Install the loopback connector (Figure 5-3).
2. Observe and record the port LED status on that port. The port status LED should blink red.
3. Refer to Table 5-4 for corrective action.

If you have a port or board fault, see your system/network manager or authorized service representative for help. See also the *DECconcentrator 500 Problem Solving* guide for more information.

Figure 5-3: Installing a Loopback Connector



LKG-4368-90A

Table 5-4: Problem Solving During Loopback Testing

Symptom	Probable Cause	Corrective Action
Port LED red on, green on, or blinking green	Port failure.	The board needs to be replaced or repaired. See your system/network manager or service representative for help.
Port LED blinking red	Normal during loopback testing. Original problem may be with the cable or device at the other end of the cable. The transmit power may be out of specifications.	Check the operational status of the device at the other end of the link. If the problem persists, see your system/network manager or service representative for help.

5.7 Down-Line Loading

Down-line loading of software to upgrade firmware can be done through the Network Device Upgrade utility or through DECelms and NCP.

5.7.1 Network Device Upgrade Utility

The Digital Network Device Upgrade (DECndu) utility lets you upgrade software from either a VMS-based or ULTRIX-based host system. The DECndu is supplied with the upgrade software. Before you upgrade the software using this utility, you need to be familiar with the following:

- Physical address of the device to be upgraded
- Type of controller available on the host node
- Load file in the form: <DEVICE-NAME><SOFTWARE-VERSION>.XXX

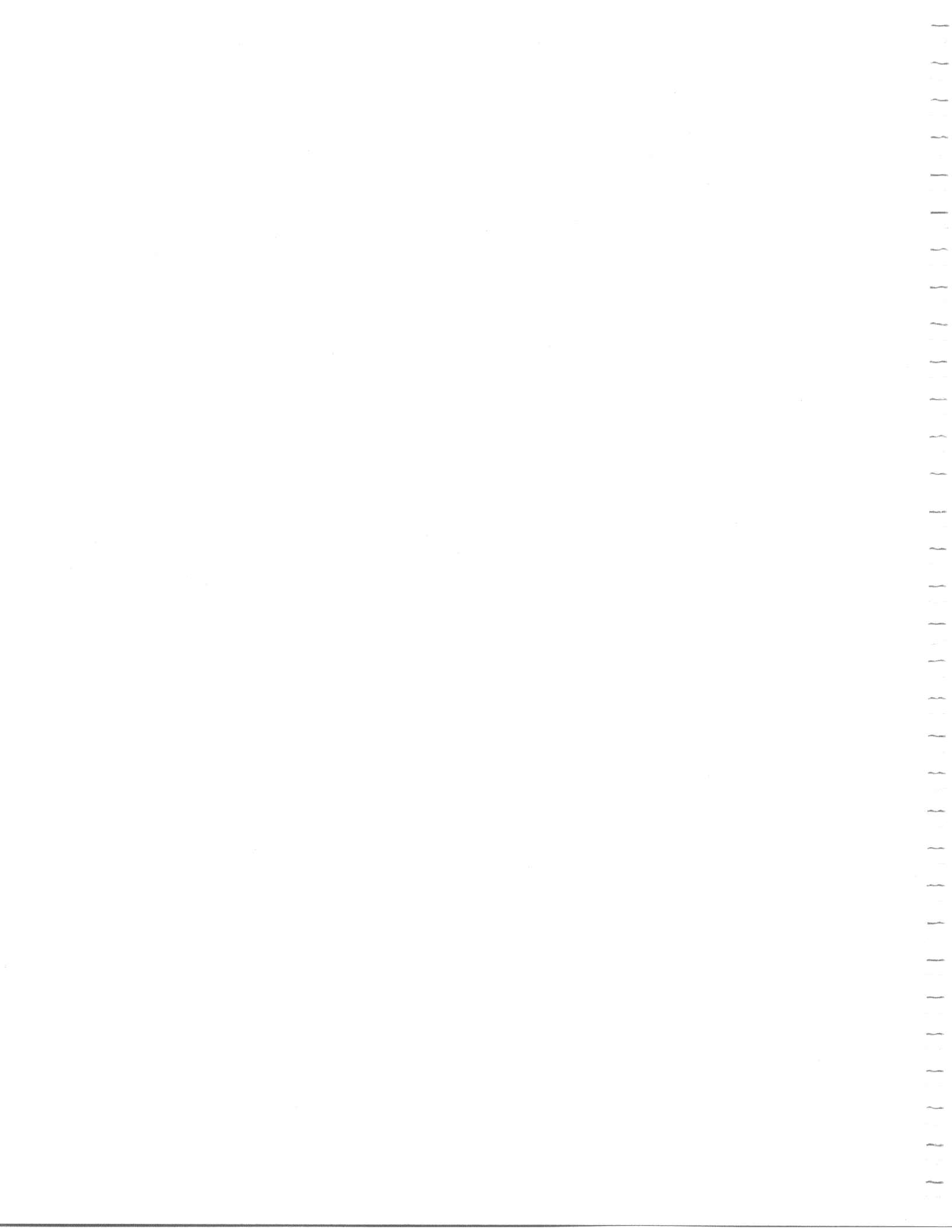
NOTE

Make sure you follow the directions supplied with the software upgrade kit. The utility prompts you for information. Each query must be answered.

5.7.2 DECelms and NCP Down-Line Loading

The sequence of DECelms and NCP commands cause the unit to send a request to the host machine to start the process. The procedure loads the new code into packet memory on the unit. While in packet memory, the image is verified. The unit then goes off line for 1 to 5 minutes while the operational code is erased and rewritten with the new code in packet memory. The unit reboots and is operational with the new code.

If you choose to use NCP and DECelms to perform a down-line upgrade, make sure you refer to your NCP and DECelms documentation for detailed directions.



Configurations

A.1 Environments Served by FDDI PMD

The FDDI Physical Layer Medium Dependent (PMD) standard describes three major application environments:

1. Office/building — consists of a relatively large number of nodes (smaller computers, communications controllers, and workstations). The nodes may be frequently powered down. Supported by a radial (star) wiring scheme, this environment can experience frequent moves, add-ons, and changes.
2. Campus — consists of multiple buildings with links of up to 2 kilometers (1.2 miles). The campus environment is a superset of the office/building environment.
3. Data Center — consists of a small number of nodes (typically mainframe computers) restricted to a limited geographical area. The data center, a subset of the office/building environment, allows the use of casual wiring such as raised floors.

A.2 Wiring

Commercial building wiring standards, such as EIA/TR 48.1 and EIA/TIA-568, address all communication needs: voice, data, and video distribution for single or multiple buildings. EIA/TR 41.8.1 and EIA/TIA-568 define a wiring system that supports a multi-vendor, multiproduct environment. The core of the wiring system is a hierarchy of equipment rooms that provide crossconnects.

A.2.1 Crossconnect

Crossconnects allow cables terminated on “one side” to be connected with cables terminated on the other side by means of a patch cord. Crossconnects mean that:

- Wiring subsystems can be linked together and circuits can be routed or rerouted to various locations within the system.
- Various logical topologies can be supported over the same physical network.

A.2.2 FDDI Wiring Subsystems

The FDDI wiring subsystems consist of the:

- Campus backbone subsystem that goes from the main distribution frame (MDF) to the intermediate distribution frame (IDF) in a building. There is only one MDF. All buildings on a campus have an IDF (Figure A-1).
- Building backbone subsystem that goes from the IDF to the horizontal distribution frame (HDF) on each floor. The building backbone subsystem is sometimes referred to as the riser subsystem.
- Horizontal wiring (distribution subsystem) that goes from the HDF to transition points such as the satellite distribution frame (SDF) and then to the office wallbox, or directly from the HDF to the office wallbox.

A.2.3 Topology (Hierarchical Physical Star)

A hierarchical physical star topology provides a central point for administration, management, and remedial maintenance. A physical star topology allows flexibility for configuring any logical topology.

A.3 Configuring the DECconcentrator 500 in FDDI Networks

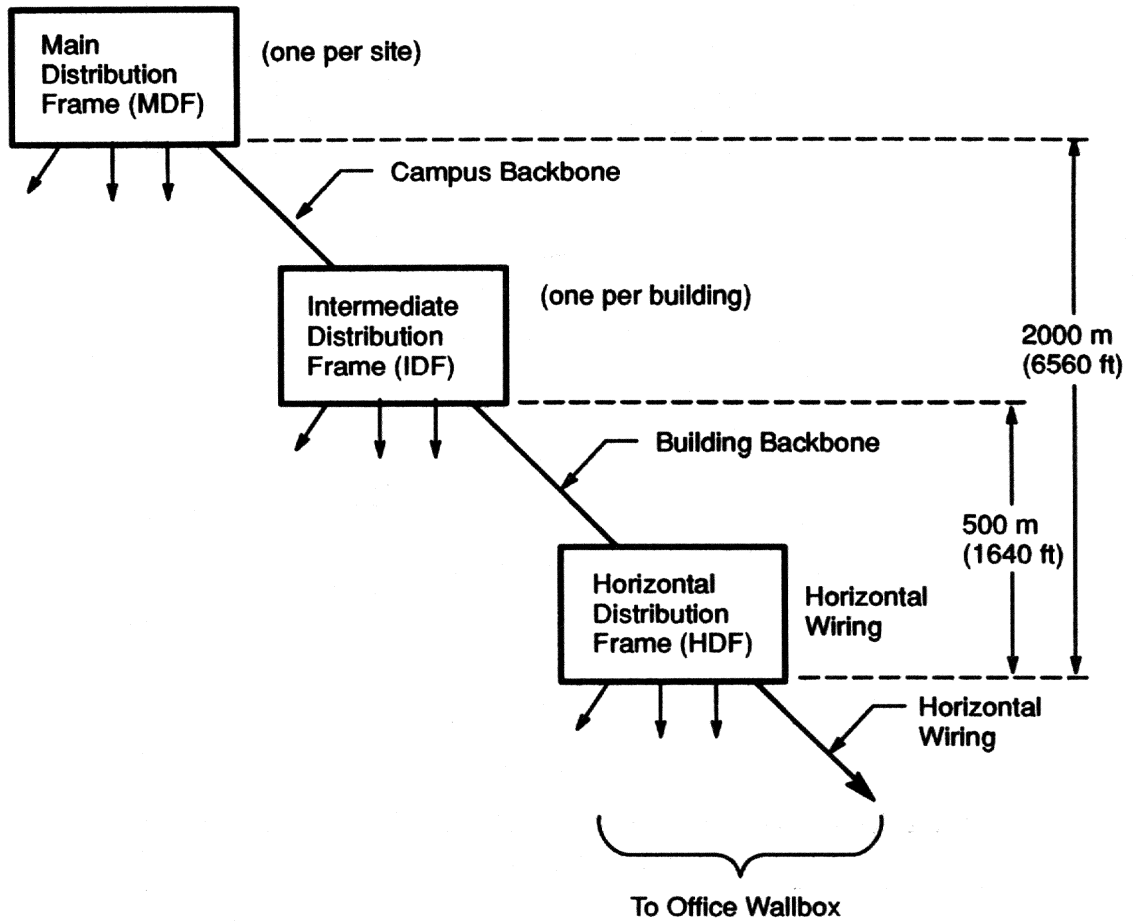
The DECconcentrator 500 wiring concentrator can be used:

- As an FDDI backbone providing high-speed interconnection of FDDI and 802.3/Ethernet networks.
- In a dedicated high-speed network for specialized environments, such as workgroup LANs connecting high-performance workstations and servers.
- In a standalone high-speed workgroup.

The actual installation can be a standalone wiring concentrator with direct SAS workstation interconnections, concentrators installed on a dual ring, concentrators installed in a ring of trees configuration, or as a backbone.

Digital recommends a dual ring of trees topology with the dual ring contained within the MDF of the cable plant.

Figure A-1: Equipment Rooms



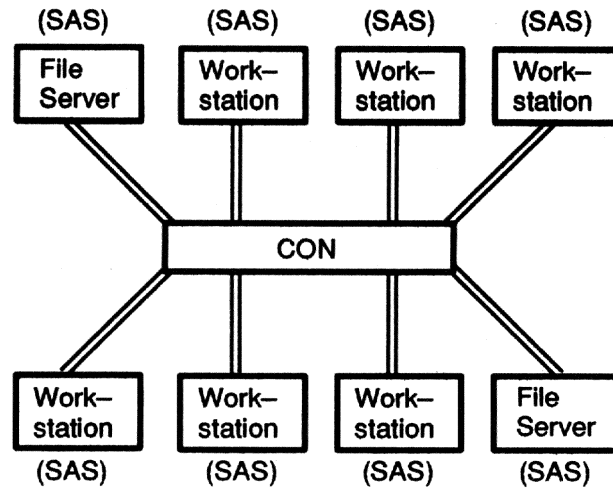
*These are recommendations set forth in EIA/TIA 568 for structured wiring schemes.

LKG-3796-901

A.3.1 Standalone Configurations

Figure A-2 shows the concentrator installed in a standalone workgroup. Figure A-3 shows a dedicated high-performance network with network management capabilities.

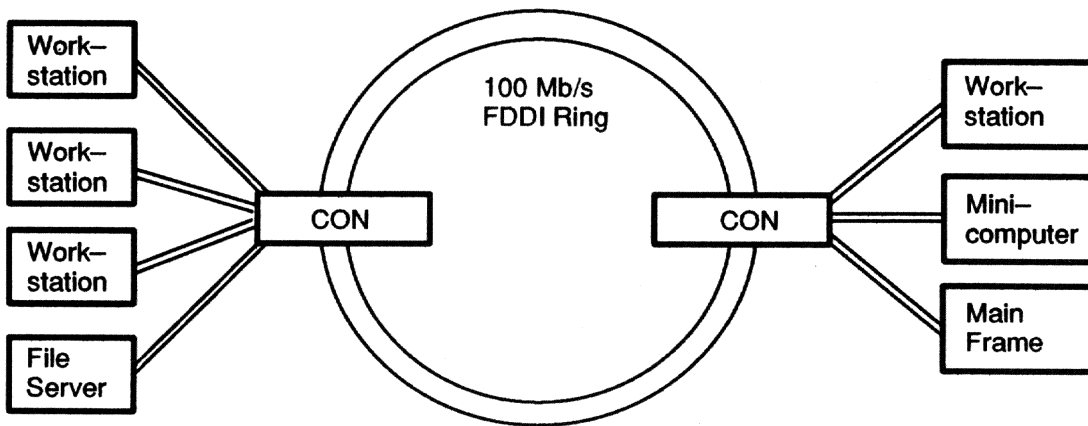
Figure A-2: Standalone Workgroup Installation (No Network Management Present)



CON = DECconcentrator 500
SAS = Single Attachment Station

LKG-3797-891

Figure A-3: Dedicated High-Performance Network Installation (Network Management Present)

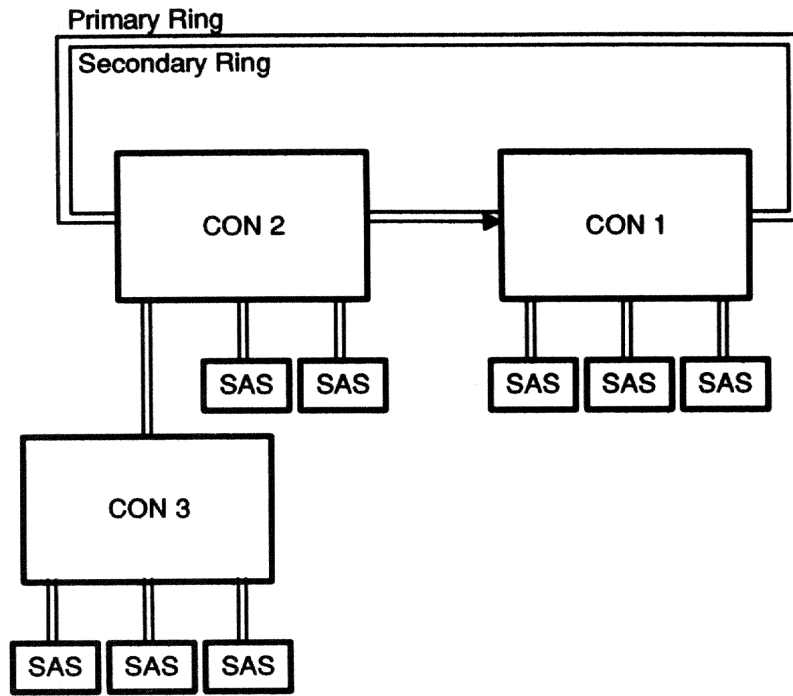


LKG-4456-891

A.3.2 DECconcentrator 500 Installed in Tree Configurations

Figure A-4 and Figure A-5 show the wiring concentrator in tree configurations.

Figure A-4: Simple Tree Topology on a Dual Ring



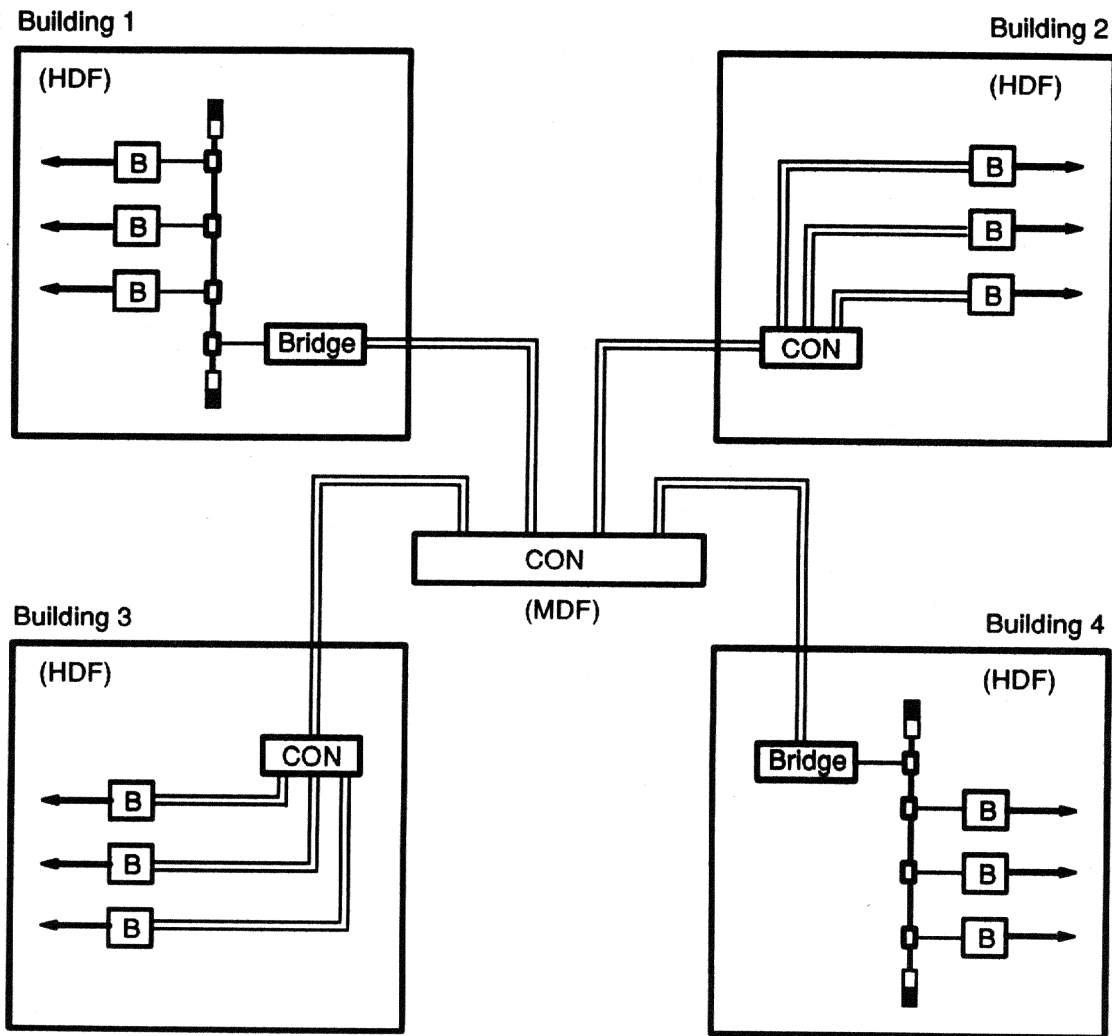
CON = DECconcentrator 500
SAS = Single Attachment Station
▶ = Token

Note:

CON 1 and CON 2 connected through ports A and B on the Network Management board. CON 3 connected to CON 2 through a port on the Port board.

LKG-3808-901

Figure A-5: Logical Star, Tree Topology, FDDI Campus Backbone



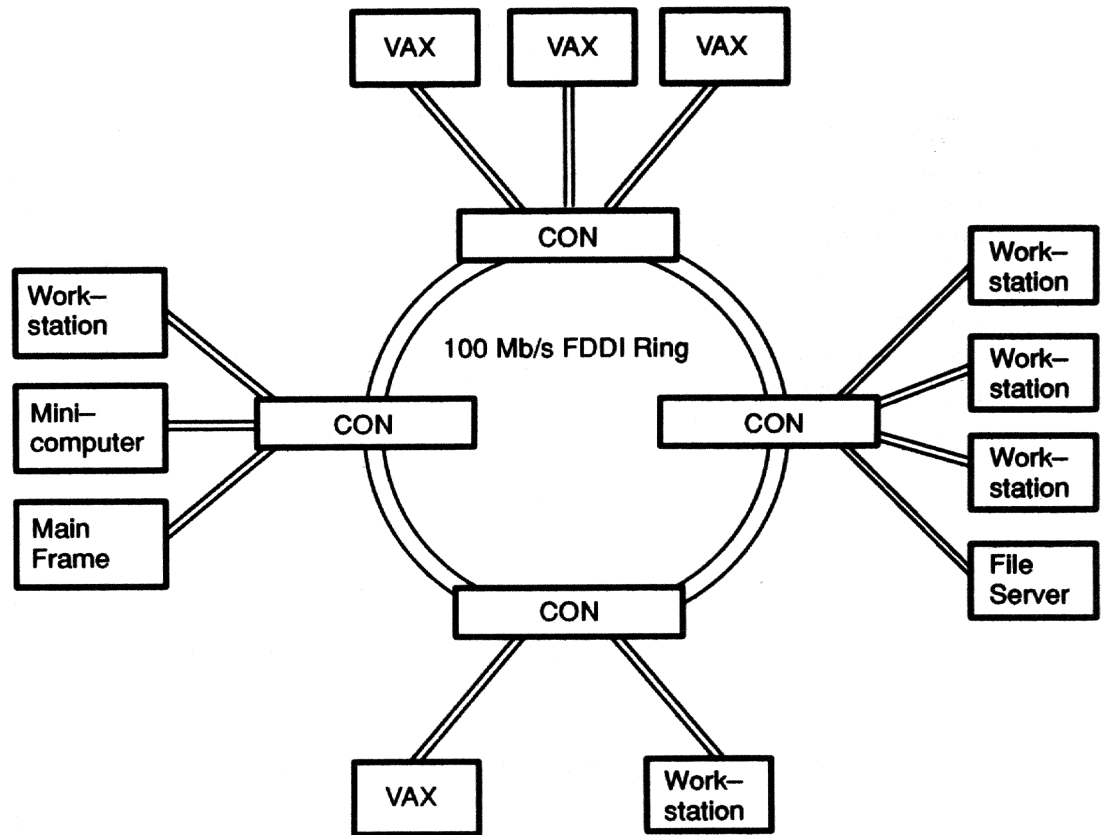
CON = DECconcentrator 500
 HDF = Horizontal Distribution Frame
 MDF = Main Distribution Frame
 B = Bridge

LKG-3809-901

A.3.3 DECconcentrator 500 Installed in Ring Configurations

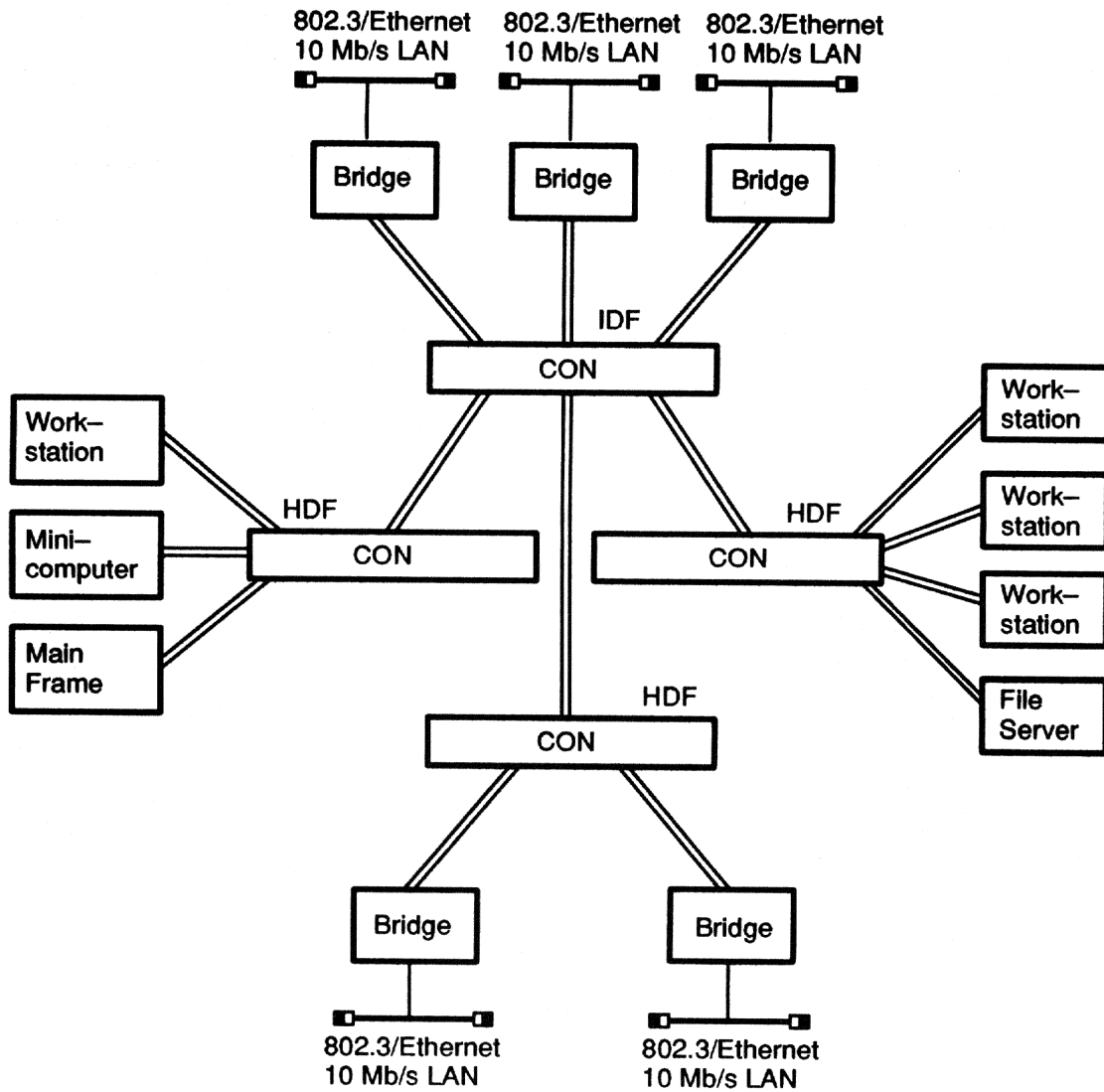
Figure A-6 shows a wiring concentrator installed in a high-speed dedicated network supporting specialized, network-intensive applications. Figure A-7 shows an FDDI dedicated high-speed network for specialized environments such as a workgroup LAN connecting high-performance workstations and servers. Figure A-8 shows a campus configuration.

Figure A-6: DECconcentrator 500 Installed in High-Speed Dedicated Network



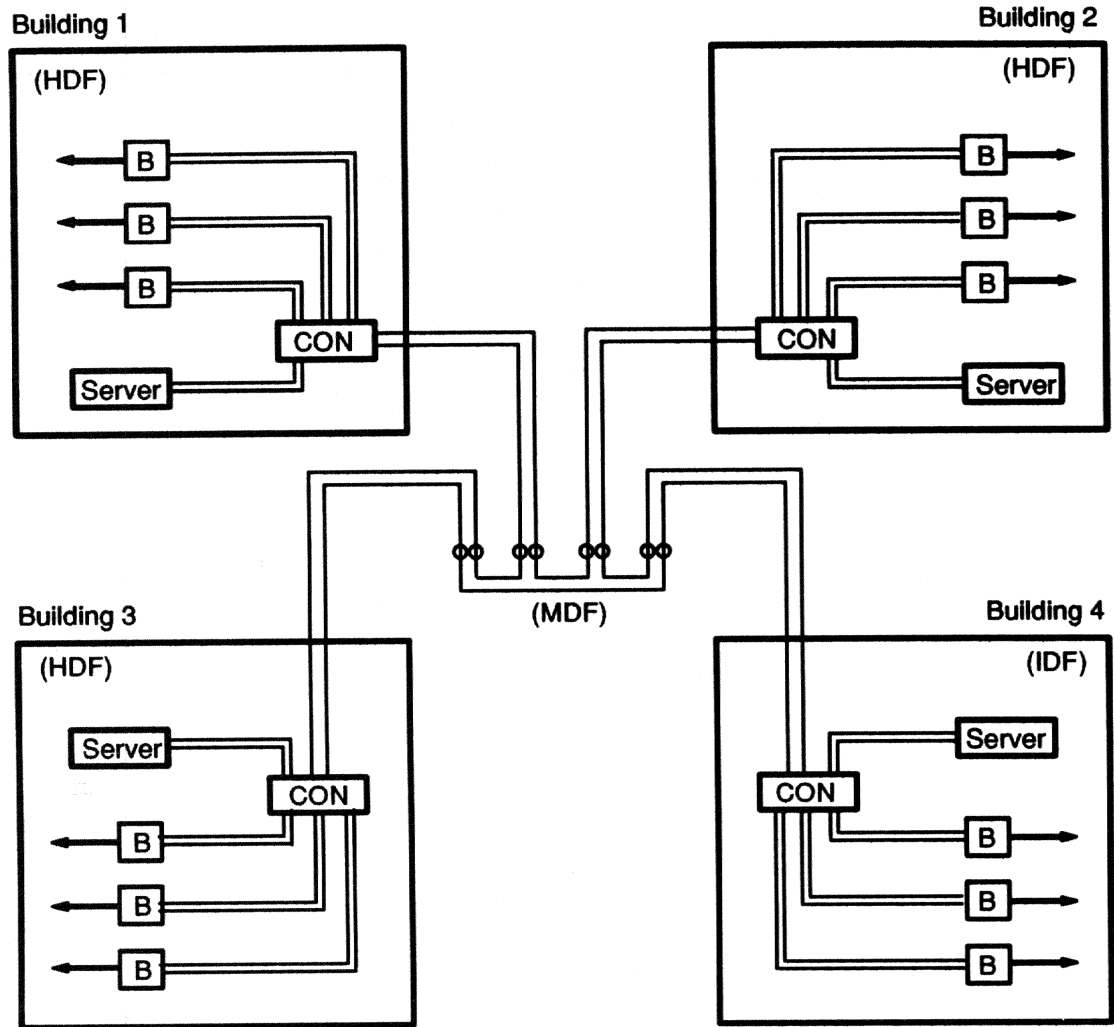
LKG-3812-891

Figure A-7: DECconcentrator 500 Installed in a Logical Ring with Workgroup LANs Within a Building



LKG-3813-891

Figure A-8: DECconcentrator 500 Installed in a Campus



CON = DECconcentrator 500
 HDF = Horizontal Distribution Frame
 MDF = Main Distribution Frame

IDF = Intermediate Distribution Frame
 B = Bridge

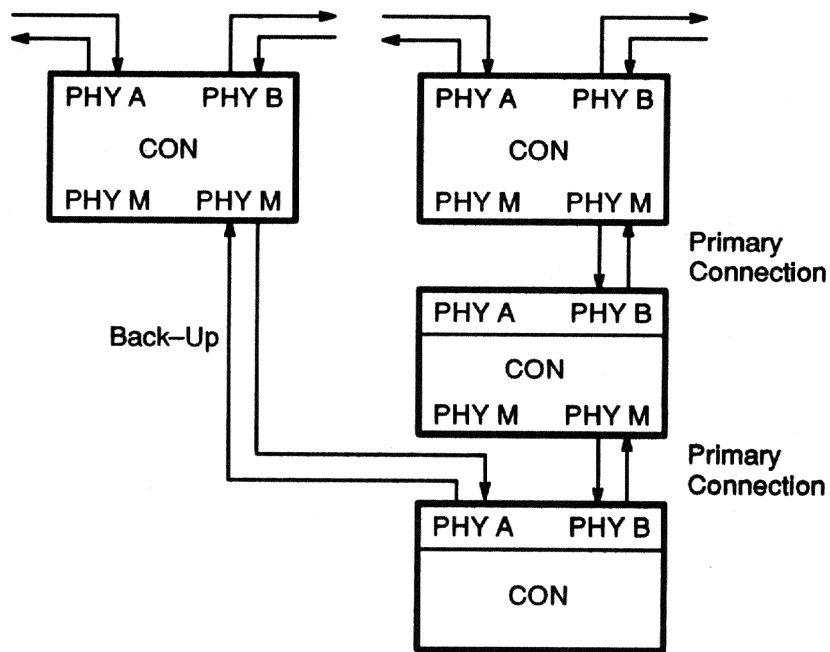
LKG-3814-901

A.4 FDDI Redundant Topologies

The FDDI connection rules allow for several redundant topologies. A redundant topology provides several logical paths from the trunk ring. This is useful when there is a node or cable failure and the trunk ring goes into the wrap state. Redundant topologies can be used in installations where system up-time is very critical.

Figure A-9 shows a simple redundant connection.

Figure A-9: DECconcentrator 500 Installed in Redundant Topologies



LKG-4373-901

Option Board Installation

B.1 Option Board Installation

You can use the following procedures to install any option board. Always observe anti-static precautions when you handle electronic equipment.

Option board installation includes the following steps:

- Removing power and cables from the unit
- Removing the blank handle or existing option board
- Installing the new option board in the concentrator

Refer to the option board installation guide(s) for specific details for each board you install.

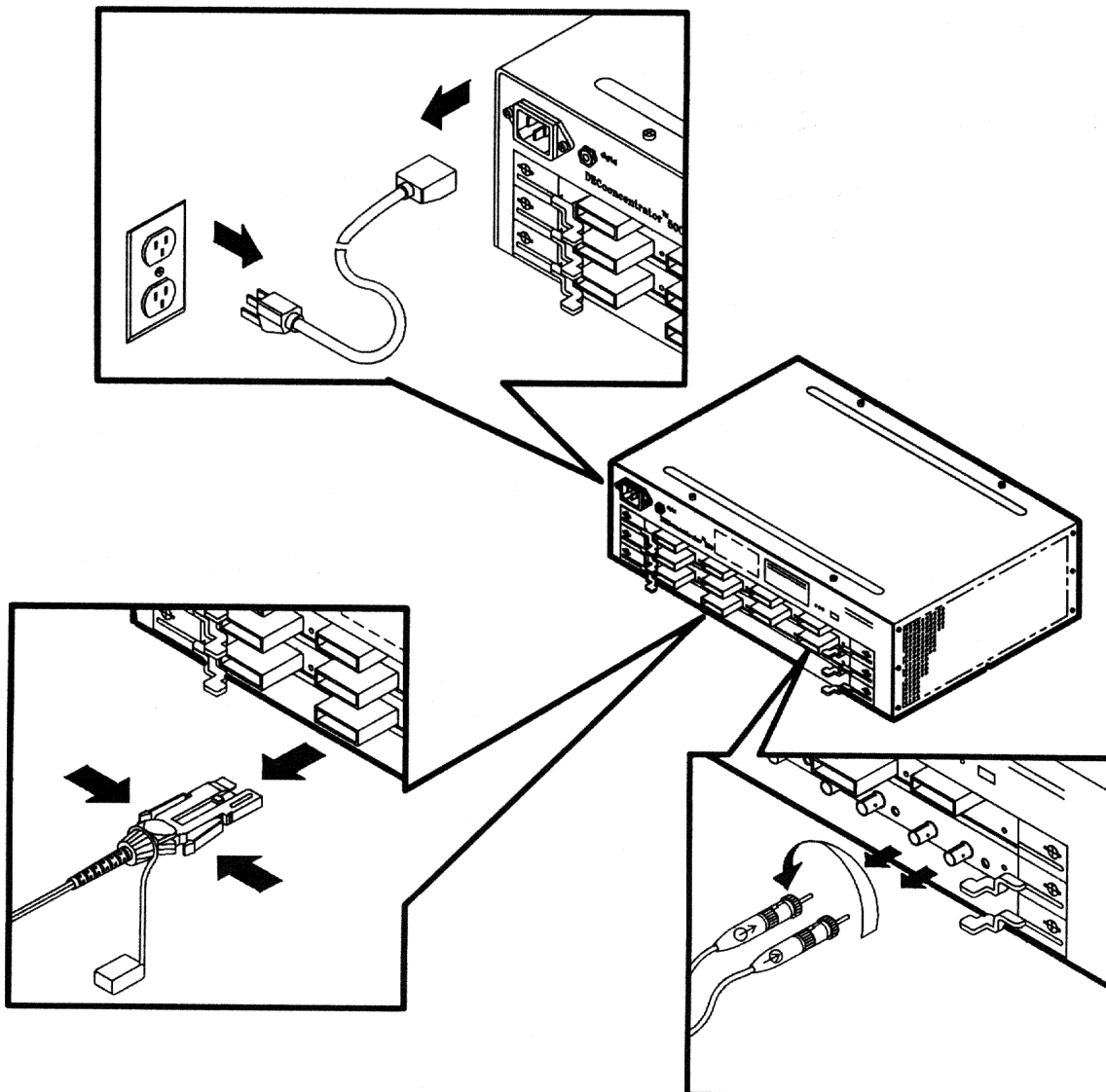
Always install a Network Management board in the top slot of the concentrator. If a Port board is already installed in the top slot, reinstall it in another slot.

B.2 Removing Cables

To remove the cables, do the following:

1. Disconnect the power cord from the wall and then from the wiring concentrator (Figure B-1).
2. Disconnect any fiber optic cable from the unit that prevents easy access to the slot where the option board is to be installed. Make careful note of the cable orientation and port location for each cable you remove.

Figure B-1: Removing Cables



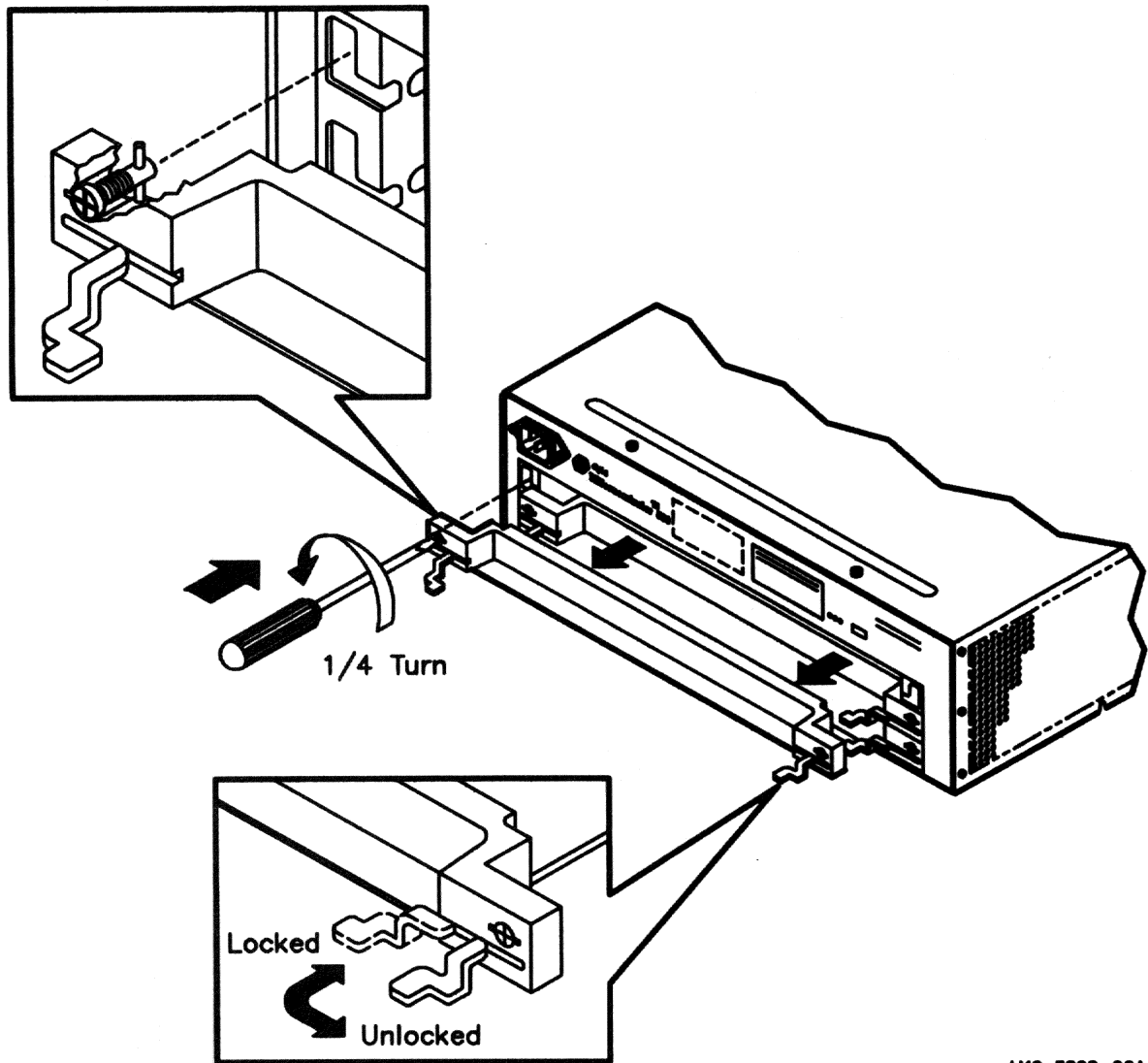
LKG-3979-90A

B.2.1 Removing the Blank Handle or Installed Option Board

To remove the blank handle or installed option board, do the following:

1. Using a Phillips-head screwdriver, push in and turn the two captive screws counterclockwise 1/4 turn.
2. Unlock the blank handle locking levers (Figure B-2). Remove the blank handle.

Figure B-2: Removing a Blank Handle or Installed Option Board



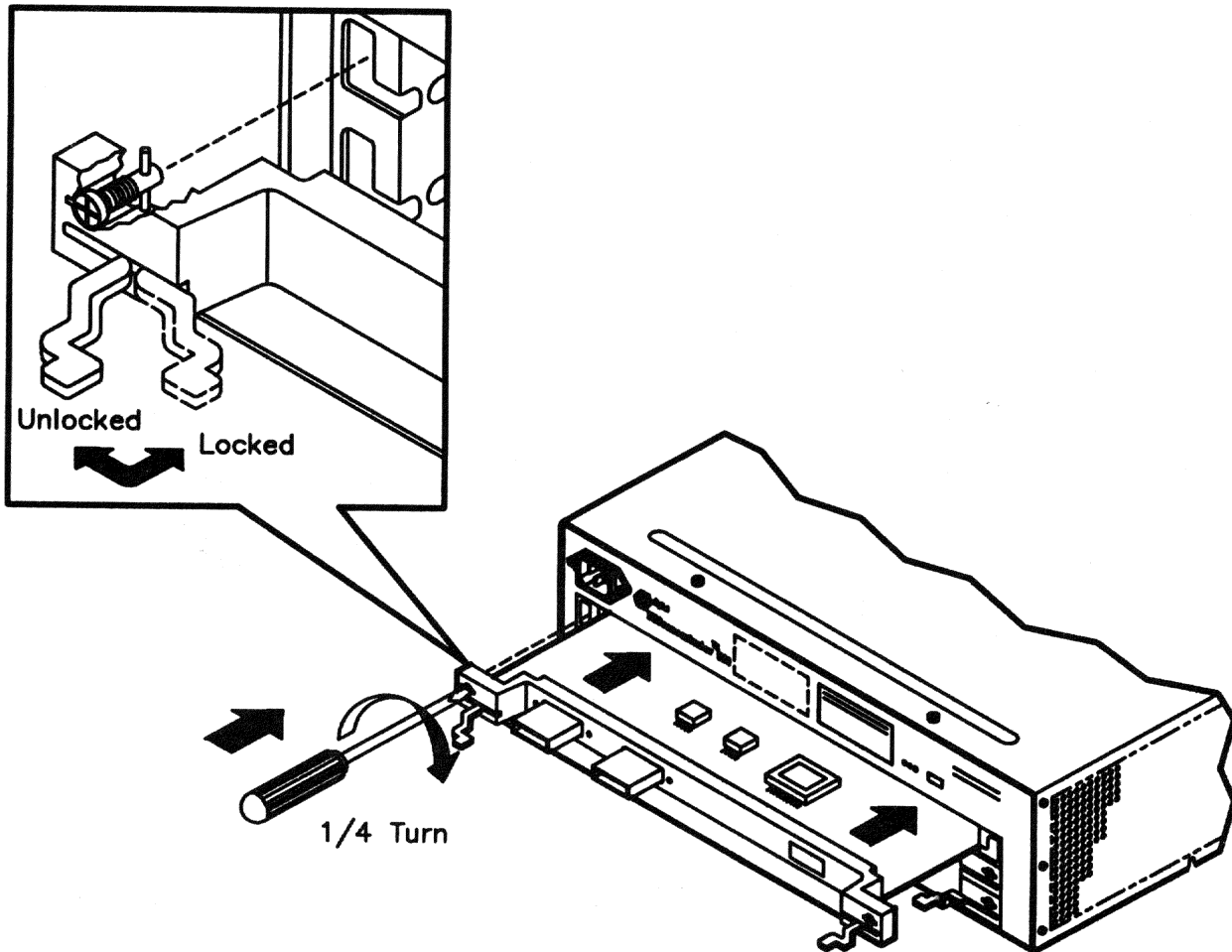
LKG-3802-90A

B.2.2 Installing an Option Board

If a Network Management board is to be installed, always install it in the top slot. Any type of Port board can be installed in any option slot. To install an option board, do the following:

1. Carefully remove the option board from its anti-static bag. Make sure the locking levers on the option board are unlocked (Figure B-3).
2. Slide the option board into the selected slot. Push firmly in place.
3. Lock the board in place and turn the two captive screws clockwise 1/4 turn.
4. If you have a tabletop unit, go to Chapter 4, otherwise, go to Chapter 3, Section 3.4. Do not connect any cable until instructed to do so.

Figure B-3: Installing Option Boards



LKG-3803-90A

Multimode Optical System

C.1 Overview

The DECconcentrator 500 fiber optic system consists of a transmitter, optical cable, and a receiver for each port on the Port board and on the Network Management board. FDDI-type connectors or 2.5 mm ST-type connectors connect the cable to the transmitter and receiver on the option boards. There are actually two such optical systems in a link to provide bidirectional transmission. The cable plant can have a number of connectors and splices in it.

The transmitter converts an electrical data signal into an optical pulse train and transmits the light pulse into the core of the optical fiber in the cable. The cable guides the light to the optical receiver at the other end. The optical receiver converts the light pulse into an electrical data signal.

For the receiver to function correctly there must be sufficient optical power. Cables and connectors cause incremental loss of optical signal. The primary measure of the DECconcentrator 500 optical system is its optical loss. The end-to-end optical loss of the optical channel must be controlled to ensure proper operation of the unit.

C.2 Option Board Optical System

The DECconcentrator 500 can span a distance up to 2 kilometers (1.2 miles) from station-to-station using the specified fiber optic cable. The Network Management board, Port board, and Low Power Port board all use 1300 nanometer wavelength LED transmitters and PIN photodiode receivers. When used with the design fiber, the link provides the user with:

- Network Management or Port board with 11 decibels (dB) of loss to achieve the required transmission distance.

- 62.5 micron core fiber provides an 11 dB optical power budget
- 50 micron core fiber provides a 6 dB optical power budget
- 100 micron core fiber provides an 11 dB optical power budget
- Low Power Port board with reduced optical power budget to achieve the required transmission distance.
 - 62.5 micron core fiber provides an 7 dB optical power budget
 - 50 micron core fiber provides a 3–5 dB optical power budget. The exact power budget will vary depending on the 50 micron cable attributes. The worst case is 3 dB.

C.2.1 Optical Loss

The optical loss in the optical channel is contributed by:

- The optical loss of the cable itself.
- The losses contributed by each connector and splice in the cable plant.

Careful attention must be paid to the total optical loss of the cable plant when the devices span long distances or when extensions to existing links are planned. The optical loss of high-quality cables depends on the cable type, but can range from 0.5 to 1.5 dB/km. Splice losses can vary from 0.2 to 0.5 dB each. Connector losses can range from 0.3 to 1.0 dB each. The total loss in the system must be less than the power budget.

NOTE

Use of 100 micron core fiber may result in higher power launched into the fiber. Users employing 100 micron fiber should confirm that their cable has at least 3 dB of attenuation.

C.2.1.1 Optical Cable Attenuation

The attenuation of optical cables varies with wavelength, therefore, it is important to measure the optical loss of the cable at 1300 nanometers for all option boards. High-quality cables have lower optical loss per kilometer values than low-quality cables. Connector losses are generally not wavelength-dependent.

Any cable plant should be similar with respect to fiber type. Mixing fiber types usually results in very high losses and is not recommended.

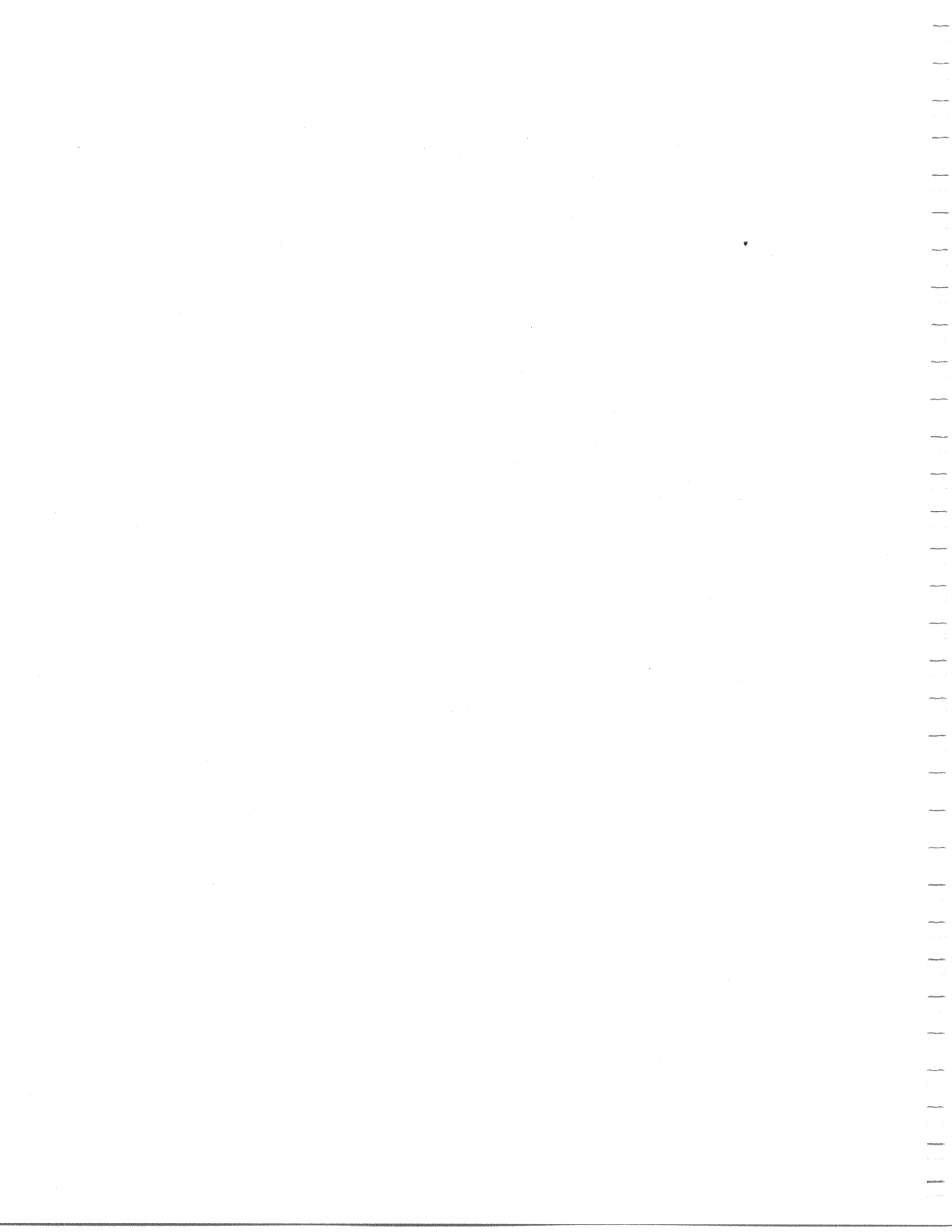
C.2.1.2 Cable Repair Strategy

The cable repair strategy also affects the optical loss budget. Although damaged cable can be repaired, it is usually at the cost of additional losses due to the splices or connectors that must be used to replace the damaged section. A good wiring strategy includes loss budget explicitly set aside for future repairs.

C.2.2 Checking for Optical Loss

The optical loss of the optical channel can be checked at the receive end of the fiber by measuring the optical power exiting the fiber. The transmitting station must be powered up and transmitting an optical idle signal. Use the procedure and equipment specified in the *DECconnect System Fiber Optic Installation* guide. It is advisable to check the optical loss on both sides of a patch panel.

The DECconcentrator 500 option boards have a margin built-in to allow for gradual transmitter and receiver degradation over the life of the product. However, the margin can result in too much power for very short transmission lengths. Optical power exiting the fiber in excess of -14 dBm is an indication that the cable plant does not have enough optical loss. The receiver will not function properly unless optical loss is introduced to limit the optical power to -14 dBm or less.



Specifications

D.1 Physical Specifications

Table D-1 through Table D-3 list the DECconcentrator 500 physical and power cord specifications.

Table D-1: Rack Mount Unit Physical Specifications

Parameter	Dimension
Height	13.33 cm (5.25 in)
Depth	29.85 cm (11.75 in)
Width	43.59 cm (17.16 in)
Weight	7.95 kg (17.5 lbs)

Table D-2: Tabletop Unit Physical Specifications (Plastic Enclosure)

Parameter	Dimension
Height	16.10 cm (6.34 in)
Depth	31.31 cm (12.33 in)
Width	49.30 cm (19.41 in)
Weight	9.97 kg (22 lbs)

Table D-3: Cable Specifications

Parameter	Dimension
ac power cord length	U.S.A. 1.83 m (6 ft) Others 2.5 m (8.2 ft)

D.1.1 Fiber Optic Connector and Cable Specifications

Digital recommends 62.5/125 Graded Index Multimode Optical Fiber. The fiber optic cable should conform to Digital's general specification 1710002-GS. Contact your sales representative for information about ordering this specification. Table D-4 through Table D-6 list fiber optic connector and cable specifications. Note that the minimum power budget requirements are included in these tables even though they are not specifications. The power budget is contingent on core and cladding tolerances.

Table D-4: Fiber Optic Connector Specifications

Connector Type	Attenuation
FDDI ANSI	Maximum attenuation not directly specified by ANSI X3T9
ST 2.5 mm (0.10 in)	Maximum attenuation less than 0.7 dB

Table D-5: Fiber Cable Specifications

Recommended Cable	Parameters
Core diameter	62.5 μm \pm 3.0 μm
Cladding diameter	125 \pm 2.0 μm
Nominal operating wavelength	1300 nm
Numerical aperture	0.275 \pm 0.015
Optical power attenuation	\leq 1.5 dB per km at 1300 nm
Minimum bandwidth	500 MHz \cdot km
Minimum power budget	11.0 dB at 1300 nm
Maximum distance	2 km (1.2 miles)

Table D-6: Alternate Fiber Cable Specifications

Alternate Cable	100/140	50/125
Nominal core diameter	100 μm \pm 4.0 μm	50 μm \pm 3.0 μm
Nominal cladding diameter	140 μm \pm 6.0 μm	125 μm \pm 2.0 μm
Nominal operating wavelength	1300 nm	1300 nm
Nominal numerical aperture	0.29 \pm 0.015	0.20 \pm 0.015
Minimum bandwidth	500 MHz \cdot km	500 MHz \cdot km
Minimum power budget	11 dB	6.0 dB
Maximum distance	1.6 km (.96 miles)	2 km (1.2 miles)

NOTE

Lengths less than 1 kilometer (3280 feet) of 100 micron (μm) fiber do not have sufficient optical loss; malfunction of the receiver can occur. Use 62.5/125 patch cords to induce loss.

D.1.2 Environmental Specifications

The DECconcentrator 500 is designed to operate in an open office or in an exposed area of an industrial site. The concentrator is not designed to operate in an air plenum.

NOTE

To prevent damage to electronic components, do not exceed 50°C (122°F) ambient temperature at the air intake of the DECconcentrator 500.

Table D-7 and Table D-8 list the environmental specifications.

Table D-7: Operating Environment Specifications

Parameter	Value
Operational temperature	5°C (41°F) to 50°C (122°F) at sea level *
Non-operational temperature	-40°C (-40°F) to 66°C (151°F)
Relative humidity	10% or less to 95% (noncondensing)
Wet bulb	32°C (90°F) maximum
Dew point	2°C (36°F) minimum
Altitude	Sea level to 2.4 km (8,000 ft)
Air flow	200 LFM (minimum), for adequate air flow, provide about 10 to 15 cm (4 to 6 in) of space at both ends
Inlet/outlet air temperature	Inlet: 50°C (122°F) maximum Outlet: 60°C (140°F) maximum

*Reduce the maximum operating ambient temperature by 1.8°C/100 m (1° F/1000 ft) for operation at high altitude sites.

Table D-8: Shipping Environment

Parameter	Value
Temperature	-40°C (-40°F) to 66° C (151°F)
Relative humidity	10% or less to 95% (noncondensing)
Altitude	Sea level to 9.1 km (30,000 ft)

NOTE

Your service contract may require more specific limits for temperature and humidity.

D.1.3 Electrical Specifications

The DECconcentrator 500 power supply has power cord options for all major Digital markets. Table D-9 lists the DECconcentrator 500 electrical specifications for a fully configured concentrator. Section D.1.4 lists the power supply specifications.

Table D-9: Electrical Specifications

Parameter	120 Vac Operation	240 Vac Operation
Nominal line voltage	110 V	220 V
Voltage tolerance	88 Vac to 132 Vac	176 Vac to 264 Vac
Power source phasing	Single	Single
Frequency	50/ 60 Hz	50/60 Hz
Line frequency tolerance	47 Hz to 63 Hz	47 Hz to 63 Hz
Input current (maximum)	2.3 ARMS at 88 VRMS line	1.2 ARMS at 176 VRMS line
Input current (typical)	1.6 ARMS at 88 VRMS line	0.92 ARMS at 176 VRMS line
Input power (maximum)	120 W (input VA 200 maximum)	120 W (input VA 200 maximum)
Input power (typical)	105 W (input VA 155)	105 W (input VA 177)
Over voltage condition	150 VRMS for 1 second maximum	300 VRMS for 1 second maximum
Cold start inrush current	Low range: 35 A peak High range: 35 A peak	Low range: 35 A peak High range: 35 A peak
Heat dissipation (maximum)	120 W	120 W
Heat dissipation (typical)	105 W	105 W
Circuit breaker rating	4 A	4 A

D.1.4 Power Supply Specifications

The 154 watt universal power supply has the following specifications:

- + 5.0 Vdc at 18 A and -5.0 Vdc at 10 A
- +12.0 Vdc at 2 A
- Overvoltage protection
- Thermal shutdown
- Auto adjust for input voltage to 120 Vac operation and 240 Vac operation

Service Options

E.1 Digital Service

The Digital Service program provides a wide range of maintenance plans. These include on-site, carry-in, and mail-in maintenance services.

E.1.1 On-Site Repair

Digital offers fast, low-cost, quality maintenance performed at your site by Digital-trained Service Specialists. There are several on-site services available.

E.1.1.1 DECservice Customer Support

DECservice customer support provides preferred on-site service, with a guaranteed response time when equipment is located within a specified distance from the service facility. DECservice guarantees a continuous repair effort until service is restored. You can choose the hours of coverage, as much as 24 hours a day, 7 days a week.

E.1.1.2 BASIC Customer Support

BASIC customer support service provides on-site service during regular business hours, Monday through Friday.

E.1.1.3 On-Site Service Center

If you have at least 50 terminals or small systems and can provide work space at your site, Digital will provide an on-site technician for a predetermined, period of time. This repair service is provided for a variety of models.

E.1.1.4 Per Call Service

This noncontractual service provides on-site repair based on time and materials. Per Call service is available during regular business hours, Monday through Friday.

E.1.1.5 DECall Service Program

DECall service program is similar to Per Call service. You pay a fixed fee per call with an annual retainer fee.

E.1.2 Off-Site Service

Digital also provides several options for off-site service. Contact your local Digital Field Service office for information.

E.2 How to Get Service

Digital has a central SERVICenter in your area to help you keep your system running at peak efficiency. To find out more about Digital hardware and software service offerings, call one of the following telephone numbers.

In the United States: 1-800-554-3333

Worldwide: Contact your local Digital Field Service office.

DECconcentrator 500 Identification List

Fill in the DECconcentrator 500 Identification List and give a copy to the system/network manager.

<input type="checkbox"/>	DECconcentrator 500 model number	_____
<input type="checkbox"/>	DECconcentrator 500 serial number	_____
<input type="checkbox"/>	Network Management board: network address	_____
<input type="checkbox"/>	Network Management board: switch 1 setting	_____
<input type="checkbox"/>	Network Management board: switch 2 setting	_____
<input type="checkbox"/>	Network Management board: ports used	_____
	Port A cable i.d. number	_____
	Port B cable i.d. number	_____
<input type="checkbox"/>	First port module: number of ports used	_____
	Port 1 cable i.d. number	_____
	Port 2 cable i.d. number	_____
	Port 3 cable i.d. number	_____
	Port 4 cable i.d. number	_____
<input type="checkbox"/>	Second port module: number of ports used	_____
	Port 1 cable i.d. number	_____
	Port 2 cable i.d. number	_____
	Port 3 cable i.d. number	_____
	Port 4 cable i.d. number	_____
<input type="checkbox"/>	Third port module: number of ports used	_____
	Port 1 cable i.d. number	_____
	Port 2 cable i.d. number	_____
	Port 3 cable i.d. number	_____
	Port 4 cable i.d. number	_____



Related Documents

Additional information can be found in the following documents. Ordering information is provided at the back of this guide.

- *DECconcentrator 500 Option Board Installation* (Order No. EK-DEFCN-OP)
This guide describes the procedures to install additional or replacement option boards in the DECconcentrator 500.
- *DECconcentrator 500 Problem Solving* (Order No. EK-DEFCN-PS)
This guide describes isolating DECconcentrator 500 faults to the field-replaceable unit (FRU) and removing and replacing each FRU. This is a field problem-solving guide.
- *FDDI System Level Description* (Order No. EK-DFSLD-SD)
This guide describes the FDDI system, how it works, and the role of the individual components.
- *DECbridge 500 Installation* (Order No. EK-DEFEB-IN)
This guide describes installation procedures for the DECbridge 500.
- *DECbridge 500 Problem Solving* (Order No. EK-DEFEB-PS)
This guide describes isolating DECbridge 500 faults to the field-replaceable unit (FRU) and removing and replacing each FRU. This is a field problem-solving guide.
- *DECconnect System Fiber Optic Planning and Configuration* (Order No. EK-DECSY-FP)
This guide describes the planning requirements, product information, and guidelines for configuring DECconnect System Fiber Optic Networks that use the DECconnect System fiber optic products.

- *DECconnect System Fiber Optic Installation* (Order No. EK-DECSY-FI)
This guide describes how to install a DECconnect System fiber optic cable plant.
- *DECelms Installation* (AA-PAK1A-TE)
This guide describes how to install and verify DECelms (DEC Extended LAN Management Software) on a VMS system.
- *DECelms Reference* (AA-PBWBA-TE)
This manual is a reference guide to the DECelms (DEC Extended LAN Management Software) commands.
- *DECelms Use* (AA-PAK2A-TE)
This guide describes how to use DECelms (DEC Extended LAN Management Software) to configure, manage, and monitor the LAN Bridge 100, LAN Bridge 150, LAN Bridge 200, DECbridge 500, and DECconcentrator 500.

Additional Networking Documentation

Additional information about networking products can be found in the following documents. Ordering information is provided at the back of this guide.

- *Networks and Communications Product Documentation* (Order No. EK-NACPD-RE)
This guide lists the title and order number for each publication associated with Digital Equipment Corporation's Networks and Communications products.
- *Telecommunications and Network Buyer's Guide*. Customers can receive a catalog by contacting their local sales office.
This catalog contains a complete list of the available networking products.

Glossary

attenuation

Level of optical power loss expressed in units of decibels (dB).

average power

Optical power measured using an average reading power meter when the FDDI station is transmitting a stream of halt (00100) symbols.

bypass

The ability of a station to be optically isolated from the network while maintaining the integrity of the ring.

claim token process

A process to determine the timed token rotation time (TTRT), initiate the token, and initialize the ring. The station with the lowest TTRT or address initializes the ring if the T-bid is the same.

concentrator (CON)

An FDDI node that provides additional attachment points for stations that are not part of the dual ring, or for other concentrators in a tree structure. A concentrator has two Physical Layer entities and may have one or more Data Link Layer entities. The concentrator is the focal point of Digital's dual ring of trees topology.

configuration switch

On the wiring concentrator, one of two hardware switches located on the network management board handle. Switch 1 is used to reset the system parameters to the default status, switch 2 is used to enable/disable remote write access.

A software switch residing in firmware that gives the station management component the ability to switch out a group of PHYs that are contained on a module. The connection management component provides signaling-based services to the token ring stations.

connector plug

A device used to terminate an optical conductor cable.

connector receptacle

The fixed or stationary half of a connection that is mounted on a panel/bulkhead. Receptacles mate with plugs.

counter-rotating ring

An arrangement whereby two signal paths, whose direction is opposite to each other, exist in a ring topology.

Data Link Layer (DLL)

An FDDI protocol sublayer that provides for Media Access Control (MAC) and Logical Link Control (LLC).

Dual Attachment Concentrator (DAC)

A concentrator that offers two connections to the FDDI network capable of accommodating the FDDI dual (counter-rotating) ring.

Dual Attachment Station (DAS)

An FDDI device that offers two connections to the FDDI network capable of accommodating the FDDI dual (counter-rotating) ring.

fatal fault

A condition that causes a specific LED display on the wiring concentrator or a message on a remote management system and stops operation of the wiring concentrator or component until you find and correct the problem.

Fiber Distributed Data Interface (FDDI)

A set of ANSI/ISO standards that, when taken together, define a 100 Mb/s, timed-token protocol. Local area network that uses fiber optic cable as the transmission medium. The standards define physical layer medium dependent (PMD), physical layer protocol (PHY), media access control (MAC), and station management (SMT) entities.

FDDI connector

A category of connectors that meet the ANSI PMD standard and are used to connect single attachment stations, dual attachments stations, and wiring concentrators to an FDDI network. Type A and B connectors are used to connect a wiring concentrator or dual attachment station to the dual ring. Type M and S connectors are used to connect wiring concentrators and single attachment stations.

FDDI network

A fiber optic network that meets the ANSI X3T9 standard. A dual rotating token ring network operating at a bandwidth of 100 Mb/s.

fiber

Dielectric that guides light; waveguide.

fiber optic cable

A jacketed fiber or fibers.

fiber optics

A technology whereby signals are transmitted over an optical waveguide medium through the use of light-generating transmitters and light-detecting receivers.

LASER

Light Amplification by Stimulated Emission of Radiation. Used for transmission over single-mode cable systems.

logical ring

An FDDI network comprised of all the connected MACs, viewed from the perspective of the topology of the connected MACs. In contrast to a physical ring, which views an FDDI network from the perspective of the topology of all physically connected nodes.

Maintenance Operation Protocol (MOP)

A formal set of networking rules and messages used to load and dump computer memory. MOP is also used to test a communications link between two adjacent network nodes.

Media Access Control (MAC)

A component of FDDI that:

- Provides for timed token access to stations on the ring
- Allows communication through frames
- Initializes the ring and controls the claim process
- Controls the beacon process and locates the fault when the ring is broken.

Network Management board

An option board for the wiring concentrator that provides for the connection to the dual ring and the hardware/firmware to allow remote management and up-line dump and down-line upgrade. A network management board has two FDDI connectors: one type A and one type B.

node

A generic term applying to any FDDI network attachment (station, concentrator, or repeater).

null port

An internal port on the wiring concentrator network management board that provides a mechanism for bypassing the concentrator's MAC function.

optical receiver

An optoelectronic circuit that converts an incoming optical signal to an electronic logic signal.

optical transmitter

An optoelectronic circuit that converts an outgoing electronic logic signal to an optical signal.

parity

A method of checking for the correct data that involves counting the 1 bits in each character's data pattern, and then making the sum either even or odd.

physical connection

The full-duplex physical layer association between adjacent PHYs in an FDDI ring; a pair of Physical Links.

physical link

The path, through PMD and attached cabling, from the transmit logic of one PHY to the receive logic of an adjacent PHY in an FDDI ring.

Physical Media Dependent (PMD)

A media-dependent FDDI protocol layer that provides for the fiber, connector, and optical pulse requirements.

Physical Media Independent (PHY)

A sublayer of FDDI that provides for coding, clock rate differences, and symbols. The PHY is the connection between the PMD layer and the Data Link Layer.

PIN

P-type I intrinsic N-type (semiconductor). A type of photodiode used as a detector to make sure received and transmitted light can convert to electrical signals.

Port board

An option board for the wiring concentrator that provides for the connection of up to four single attachment stations to the wiring concentrator. A Port board conforms to the ANSI X3T9 standard and supports 1300 nanometer wavelength fiber optics and has four FDDI type M fiber optic connectors.

A Low Power Port board does not conform to the ANSI X3T9 standard. However, the Low Power Port board is designed to operate with FDDI devices and supports 1300 nanometer wavelength fiber optics and has eight 2.5 mm ST-type fiber optic connectors for connection of up to four devices

processor

The functional part of the wiring concentrator Controller/Backplane that uses instructions to perform computation or manipulate data.

receive

The act of a station accepting a frame, token, or control sequence from the ring.

repeat

The act of a station in receiving a code-bit stream (frame or token) from an upstream station and placing it onto the ring to its downstream neighbor. The repeating station may examine, copy to a buffer, or modify control bits in the code-bit stream before placing the data onto the ring.

repeater

An FDDI node that minimally comprises the functionality of two PMDs and provides only a repeat function. A repeater does not have any MACs or concentrator functionality. For example, a DEC concentrator 500 configured with port boards only and installed in a standalone configuration acts like a repeater.

ring

Two or more stations wherein information is passed sequentially between active stations, each station in turn examining or copying the information, finally returning it to the originating station.

Single Attachment Concentrator (SAC)

A concentrator that offers one attachment to the FDDI network.

Single Attachment Station (SAS)

An FDDI station that offers one attachment to the FDDI network.

station

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

token

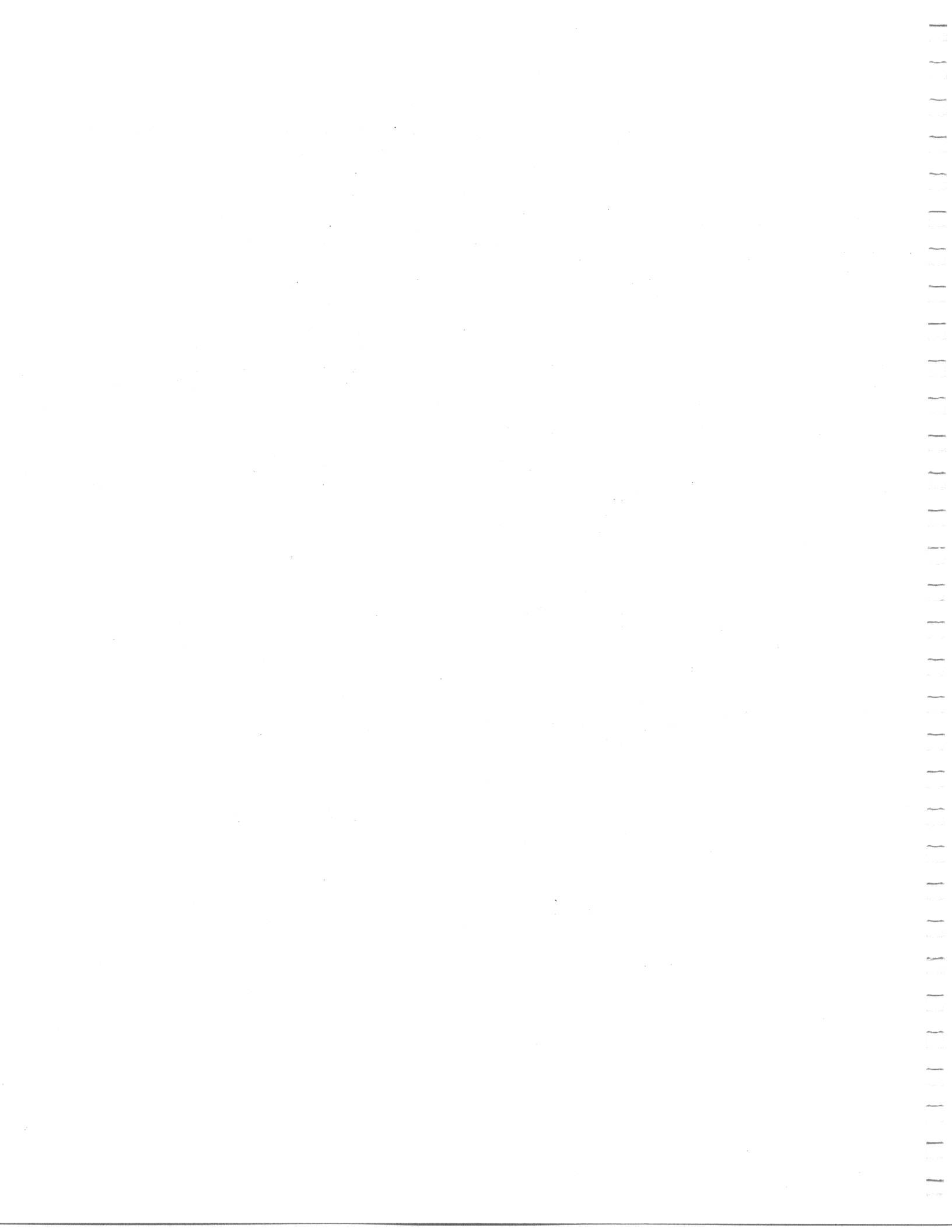
A special frame that is transmitted around a ring. Whichever node has the token has the right to transmit data over the ring. Each node has a timer that controls how long the node can hold the token.

transmit

The act of a station that consists of generating a frame, token, or control sequence, and placing it on the ring for receipt by the next (downstream) station.

trunk ring

The dual ring used for FDDI.



Index

A

- A-type port
 - connection guidelines, 1–8
 - labeling, 1–8
- Address
 - destination, 1–9
 - unique hardware, 1–9
- All LEDs off, 5–6
- Altitude, D–3
- ANSI standard, 1–1
- Attenuation, C–2
- Auto voltage select, 1–9

B

- B-type port
 - connection guidelines, 1–8
 - labeling, 1–8
- Backplane
 - function, 1–6
 - number of connectors, 1–6
 - size of connectors, 1–6
- Bandwidth, 1–1
- Board fault LED on, 5–7

C

- Cable. *See also* Fiber optic cable; Power cord; Certification

connectors

- colored, 2–8
 - keyed, 2–8
 - identification number, 4–9
 - maximum lengths, table, 2–8
 - optical loss, value, C–2
 - repair strategy, C–3
- Cable connection, problem with, 5–7
 - Cable plant
 - corrected loss, 2–5
 - log book, 2–5
 - sample log entry, 2–5
 - Card cage
 - description, 1–5
 - distribution of option boards, 1–5
 - Network Management board location, 1–5
 - Port board location, 1–5
 - Caution
 - fiber optic cable bend radius, 4–7
 - field replaceable units, 5–2
 - plastic cover screws, 3–7
 - power cord, 4–2
 - static electricity, 2–1, 3–1
 - temperature, 3–6
 - Certification, cable installation, 2–5
 - Circuit breaker
 - amps, 1–10
 - function, 1–10
 - operation, 1–10
 - problem with, 5–6
 - resetting, 5–6
 - wall outlet, 5–6

- Clock recovery, 1–8
- Clock signal, 1–6
- Computer room, 1–2
- Configuration
 - cable length
 - between stations, 2–7
 - concentrator to device, table, 2–8
 - maximum on network, 2–7
 - campus backbone, A–6
 - dedicated network, A–7
 - dual ring, A–5
 - high-performance network, A–4
 - logical star, A–6
 - number of stations, 2–7
 - reconfigure cable runs, 2–8
 - rules, 2–7
 - standalone, A–3
 - working group LANs, A–8
- Configure, adding cable runs, 2–8
- Connector
 - examples, 4–7
 - fault detection, 1–7
 - FDDI PMD, 2–8
 - keyed, 1–9, 2–8
 - optical loss, C–2
 - optical loss, value, C–2
- Connector type
 - Network Management board, 1–9
 - Port board, 1–7
- Controller/backplane
 - active logic, 1–7
 - connectors, 1–6
 - firmware upgrade, 1–7, 5–9
 - function, 1–6
 - LED, 1–9, 5–6
 - parity, 1–7
 - problem with, 5–6
 - RAM, 1–7
 - ring scrubbing, 1–7
 - ROM, 1–7
 - token ring maintenance, 1–7
- Controls and Indicators
 - circuit breaker, amps at trip, 1–10
 - LEDs, 1–11
 - reset to default switch, 1–10
 - write access enable switch, 1–10

- CPU. *See* Controller/backplane
- Crossconnect
 - intermediate, A–2
 - main, A–2

D

- Damaged parts, 2–1
- Data Link Layer, 1–1
- Data Link Layer hardware
 - address ROM, 1–9
 - MAC function, 1–9
 - packet memory, 1–9
- Data path
 - bypassing, 1–7
 - parity, 1–7
 - ring scrubbing, 1–7
 - through
 - backplane, 1–7
 - option board, 1–7, 1–8, 1–9
 - token ring, 1–7
- DC OK LED off, 5–6
- DECconcentrator 500
 - connecting to
 - bridge, 2–5, 4–7
 - dual attachment station, 4–8
 - dual ring, guidelines, 4–8
 - end station, 2–5
 - network, 4–1
 - single attachment station, 4–7
 - physical location, 2–6
 - position in rack, 3–6, 3–10
 - rack mount version, 2–6
 - table top version, 2–6
 - use in FDDI network, A–2
 - voltage select, 4–2
- Distribution subsystem, A–2
- Down-line load
 - description, 5–9
 - EEPROM, 1–7
 - new software, 5–9
 - process, 5–9
- DRAM, 1–7
- Dual ring, topology, 1–2
- Dual ring of trees, guideline, 1–8

E

EEPROM

- Controller/backplane, 1-7
- error log, 1-7
- function, 1-7

Environment

- altitude, 2-6, D-3
- FDDI, A-1
- humidity, 2-6, D-3
- power, 2-6
- temperature, 2-6, D-3
- ventilation, 2-6

Error log, 1-12

F

Fan LED, 1-9, 5-6

FDDI. *See* Fiber Distributed Data Interface

FDDI wiring subsystem

- campus, A-2
- distribution subsystem, A-2
- intermediate cross connect, A-2
- main cross connect, A-2
- riser subsystem, A-2

Fiber Distributed Data Interface

- ANSI standard, 1-1
- bandwidth, 1-1
- connectors, 4-6, 4-7
- description, 1-1
- network size, 1-1

Fiber optic cable

- bend radius, 4-7
- cable caps, 4-7
- connecting
 - 2.5 mm ST-Type connector, 4-7, 4-8
 - bridge, 4-7
 - dual attachment station, 4-8
 - dual ring, 4-8
 - keyed FDDI connectors, 4-7, 4-8
 - guidelines, 4-7
 - procedure, 4-7
- recommended type
 - compliance, 2-8
 - Digital standard, 2-8
 - general purpose, 2-8

- plenum, 2-8
- terminator, 2-8
- wavelength, 2-8

Field-replaceable unit

- caution, 5-2
- isolation to, 5-2
- list of, 5-2
- maintenance strategy, 5-2

Firmware. *See also* Down-line load

- enable/disable write access, 1-8
- error log, 1-7
- upgrade, 1-7
 - description, 5-9
 - new software, note, 5-9
 - process, 5-9

Frequency, D-4

FRU. *See* Field-replaceable unit, 5-2

Fuse, 5-6

G

Getting service, E-2

H

Hardware address

- function, 1-8
- location, 1-8

Horizontal wiring, A-2

Humidity, D-3

Hz

- 120 Vac operation, D-4
- 240 Vac operation, D-4
- microprocessor, 1-7

I

Identification, cable

- certification, 2-5
- id number, 2-5

Indicator. *See* Light emitting diode

Initialization, during self-test, 5-4

Input current

120 Vac operation, 2-6, D-4

240 Vac operation, 2-6, D-4

Installation. *See also* Network Management

board; Port board

blank handle removal, B-3

bridge, 2-5

end station, 2-5

FDDI device in network, 2-5

loopback connector, 4-4

Network Management board

guideline, 1-5, 3-2, B-4

procedure, B-4

office

air flow, 2-7

magnetic devices, 2-7

plastic cover, removal, 3-7

Port board

guideline, 1-5, 3-2, B-4

procedure, B-4

rack mount

process, 3-6

rack mount brackets, 3-8

standard cabinet, 2-7

satellite equipment room, 2-7

L

LED. *See* Light emitting diode

Light emitting diode

at power up, 4-3

at connection of cables, 4-9, 4-10

function, 1-4 - 1-9

normal state, 1-11

power supply, 1-9

problem solving

all off, 5-6

DCOK off, 5-6

Port board fault led, 5-7

port LED blinking green, 5-7

port LED blinking red, 5-7

port LED off, 5-7

ring operational LED, 5-7

ring operation status, 1-8

Line voltage, D-4

Locking levers, B-3

Logical link control, 1-1

Loopback test

loopback installation, 4-4

normal display, 4-5

procedure, 4-4, 5-8

reading, 5-8

when to run, 4-4, 5-7, 5-8

Low Power Port board

ANSI specifications, 1-7

connector type, 1-7

identification, 3-2

optical loss, C-2

M

M-type connector, Port board, 1-7

MAC. *See* Media access control, 1-8

Media Access Control

bypassing, 1-9

frame generation, 1-1

function, 1-1

packet memory access, 1-9

Memory controller, 1-9

Microprocessor, 1-7

Missing parts, 2-1

N

Network management board, switches, location,
1-8

Network Management board

connection

dual ring, 1-8

dual ring of trees, 1-8

rules, 4-6

connector type, 4-6

Data Link Layer hardware, 1-9

data path, 1-9

fault isolation, 1-9

handle, description, 1-8

identification, 3-2

installation, B-1

LEDs, 1-8

- location in card cage, 1-5, 3-2, B-4
- loopback test
 - board fault LED, 5-9
 - port fault LED, 5-9
- media access control, 1-9
- optical loss, C-1
- packet memory, 1-7, 1-9
- parity, 1-9
- physical layer hardware, 1-9
- port labeling and types, 1-8
- problem with ring operation, 5-7
- processor control, 1-8
- switch, function, 1-8
- switch setting
 - procedure, 3-4
 - reset software parameters, 3-4
 - write enable, 3-4
- Nonfatal fault
 - initialization, 5-4
 - operational software, 5-4
- Null port
 - function, 1-9
 - Network Management board, 1-8
- Number of stations
 - different configurations, 1-6
 - Network Management board, 1-6
 - Port board, 1-6

O

- On-site repair, E-1
- Operational software
 - nonfatal fault, 5-4
 - on-line diagnostics, 1-12
 - ring fault handling, 1-12
 - ring management, 1-12
 - self-test, 1-12
 - station management, 1-12
- Operational status
 - at power up, 4-3
 - fiber optic connection, 4-9, 4-10
 - loopback test, 4-4, 4-5
- Optic system,
- Optical loss, C-1
 - checking for, C-3

- control, C-2
- optical loss, C-1, C-3
- option boards, C-1
- Optical pulse train, 1-1, C-1
- Option board
 - data path through, 1-7
 - location in card cage, 1-5
 - number of stations, 1-6
- Order number
 - identification list, 2-1
 - location on unit, 2-4

P

- Packaging materials, 2-1
- Packet memory
 - function, 1-9
 - location, 1-7, 1-9
 - motherboard support, 1-7
 - parity, 1-9
 - protection, 1-9
- Patch cord, A-1
- PHY. *See* Physical Media Independent, 1-1
- Physical description, wiring concentrator, 1-4
- Physical layer, 1-1
- Physical Media Dependent
 - application environment, A-1
 - function, 1-1
 - optical pulse, 1-1
 - port type, 1-7
- Physical Media Independent
 - coding, 1-1
 - function, 1-1
- Physical star, topology, 1-2
- Plastic cover
 - caution, 3-7
 - removal, 3-7
- PMD. *See* Physical Media Dependent, 1-7
- Port board
 - ANSI X3T9 compliant, 1-7
 - bypassing, 1-8
 - clock recovery, 1-8
 - connection rules, 4-6
 - connectors, 1-7, 4-6
 - data, encoding/decoding, 1-8

- failures, 1-8
- function, 1-8
- identification, 1-7, 3-2
- installation, B-1
- location in card cage, 1-5, 3-2, B-4
- loopback test, 5-9
- low power optics, 1-7
- optical loss, C-1
- problem with
 - board, 5-7
 - cable connection, 5-7
 - connection, cable, 5-7
 - port, 5-7
 - ring topology, 5-7
- processor control, 1-7
- Port LED
 - blinking, 5-7, 5-9
 - off, 5-7
 - red, 5-7, 5-9
- Power cord
 - connecting
 - caution, 4-2
 - procedure, 4-2
 - problem with, 5-6
 - unpacking, 2-1
 - warning, 3-1
- Power supply
 - auto voltage select, 1-9, D-4
 - function, 1-9
 - LEDs, 1-9
 - problem with, 5-6
- Problem solving. *See also* Self-test
 - boards, 5-7
 - by symptom, 5-6, 5-7
 - circuit breaker, 5-6
 - procedure, 5-1
 - receive power, 5-9
 - record, 5-1
 - ring operational LED, 5-7
 - sequence, 5-2
 - transmit power, 5-9
 - who to notify, 5-1
- Processor
 - access to packet memory, 1-9
 - control signal, 1-6
 - Controller/backplane, 1-7

- microprocessor, 68000, 1-7
- speed, 1-7

R

- Rack mount, 3-6 - , 3-10
- RAM, Controller/backplane, 1-7
- Receive, data path. *See* Data path
- Receiver, C-1
- Refresh timer, 1-7
- Remote management
 - enable/disable write access, 1-8
 - MOP, 1-12
 - operational software, 1-12
 - resetting control parameters, 1-8
- Repair, E-1
- Reset to default
 - switch function, 1-10
 - switch operation, 1-10
- Ring fault handling, 1-12
- Ring management, 1-12
- Ring of trees, topology, 1-2
- Ring operation status, 1-8
- Ring scrubbing, 1-7
- Ring topology, problem with, 5-7
- Riser subsystem, A-2
- ROM, Controller/backplane, 1-7

S

- Self-test
 - broken port, Port board, 1-8
 - function, 1-6, 5-4
 - LEDs, table, 1-11
 - procedure, 5-4
 - symptom of a problem, 5-4
 - time to complete, 4-3
- Serial number, 2-1, 2-4
- Service
 - contract, 2-6, 5-1
 - how to get, 2-6, E-2
 - telephone number, E-2
 - types of, 5-1, E-1
- Software. *See* Operational software, 1-12

Specifications

- cable, table, D-1, D-2
- electrical, table, D-4
- environmental, D-3
- physical, table, D-1

Splice optical loss, C-2

Static electricity, 3-1

Switch setting

- procedure, 3-4
- reset software parameters, 3-4
- write enable, 3-4

System diagnostic. *See* Self-test

System parameters, storing, 1-7

T

Temperature, 3-6, D-3

Thermal protection, 1-9

Token ring, 1-7, 1-8

Topology

- backbone, A-2
- dual ring, 1-2, 1-3, A-2
- physical star, 1-2, 1-3, A-2
- ring of trees, 1-2, 1-4, A-2
- tree configuration

Transmit data path. *See* Data path

Transmit power, problem solving, 5-9

Transmitter

- function, C-1
- type, C-1
- wavelength, C-1

V

Voltage switch, 4-2

W

Warning

- fiber optic equipment, 4-4
- hot unit, 5-2
- power cord, 3-1, 4-2

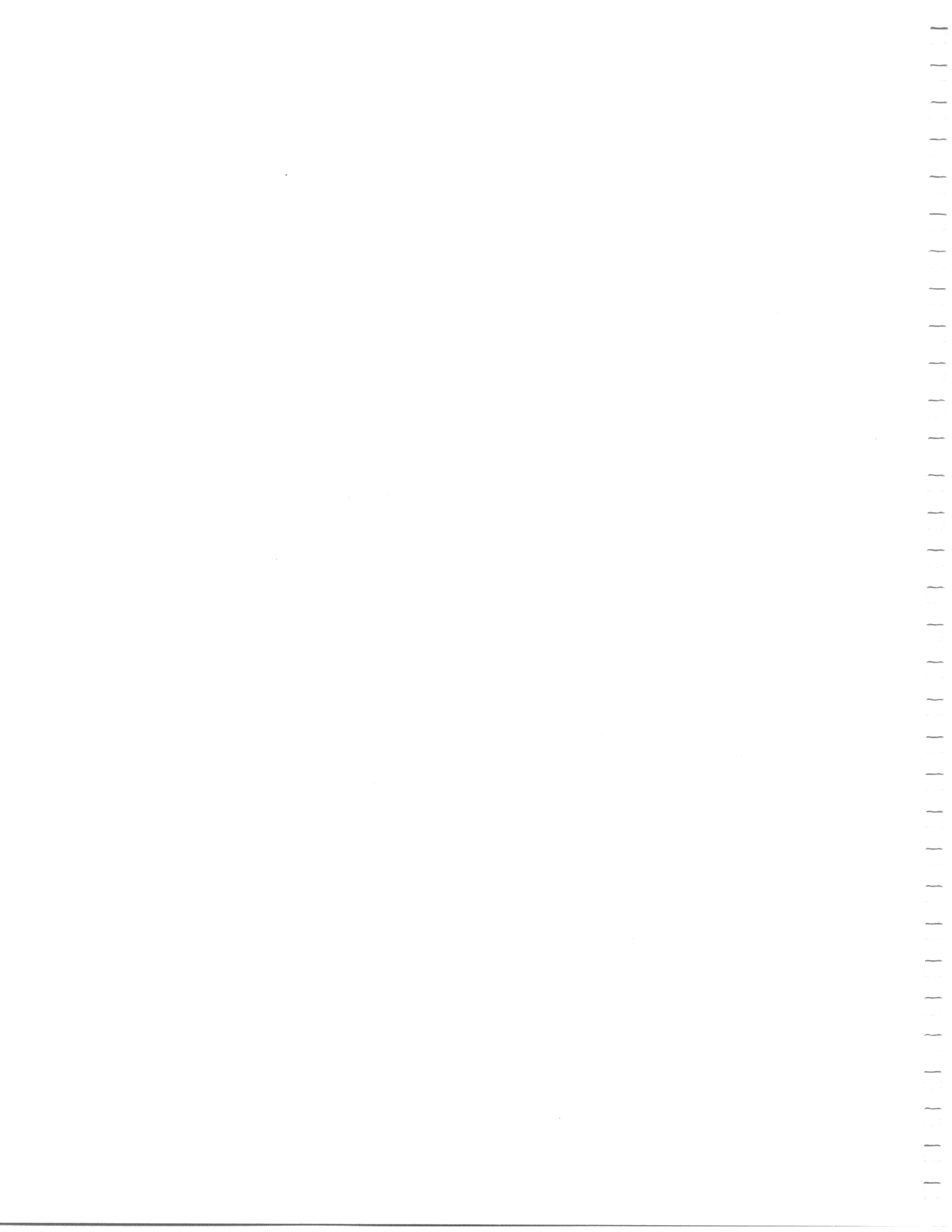
Warranty, 5-1

Wiring

- circuit rerouting, A-2
- commercial, A-1
- FDDI subsystem, A-2
- multi-vendor environment, A-1
- standard, A-1

Write access enable switch

- default setting, 1-10
- functions, 1-10



HOW TO ORDER ADDITIONAL DOCUMENTATION

DIRECT TELEPHONE ORDERS

In Continental USA
and Puerto Rico
call 800-344-4825

In Canada
call 800-267-6215

In New Hampshire
Alaska or Hawaii
call 603-884-6660

DIRECT MAIL ORDERS (U.S. and Puerto Rico*)

DIGITAL EQUIPMENT CORPORATION
P.O. Box CS2008
Nashua, New Hampshire 03061

DIRECT MAIL ORDERS (Canada)

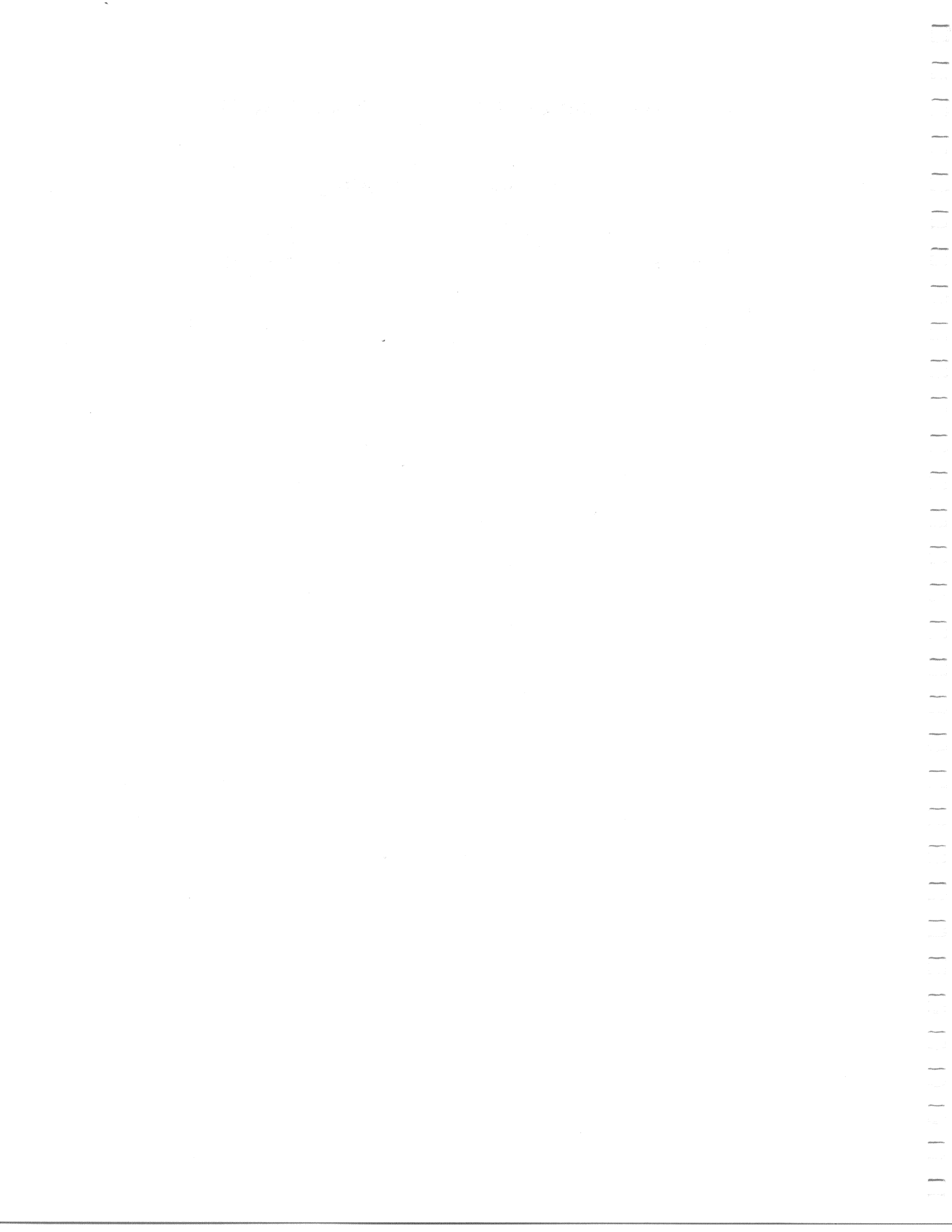
DIGITAL EQUIPMENT OF CANADA LTD.
940 Belfast Road
Ottawa, Ontario, Canada K1G 4C2
Attn: A&SG Business Manager

INTERNATIONAL

DIGITAL
EQUIPMENT CORPORATION
A&SG Business Manager
c/o Digital's local subsidiary
or approved distributor

Internal orders should be placed through Publishing and Circulation Services (P&CS),
Digital Equipment Corporation, 10 Forbes Road, Northboro, Massachusetts 01532-2597

*Any prepaid order from Puerto Rico must be placed
with the Local Digital Subsidiary:
809-754-7575



READER'S COMMENTS

What do you think of this manual? Your comments and suggestions will help us to improve the quality and usefulness of our publications.

Please rate this manual:

	Poor			Excellent	
Accuracy	1	2	3	4	5
Readability	1	2	3	4	5
Examples	1	2	3	4	5
Organization	1	2	3	4	5
Completeness	1	2	3	4	5

Did you find errors in this manual? If so, please specify the error(s) and page number(s).

General comments:

Suggestions for improvement:

Name _____ Date _____
Title _____ Department _____
Company _____ Street _____
City _____ State/Country _____ Zip _____

DO NOT CUT - FOLD HERE AND TAPE



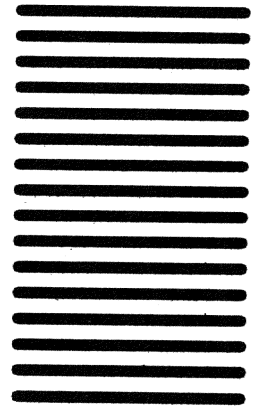
NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY LABEL
FIRST CLASS PERMIT NO. 33 MAYNARD MASS.

POSTAGE WILL BE PAID BY ADDRESSEE

digital™

**Telecommunications and
Networks Publications**
550 King Street
Littleton, MA 01460-1289



DO NOT CUT - FOLD HERE

CUT ON THIS LINE

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

digital™

Printed in U.S.A.