DECbridge™ 500/600 Series

digital™

Problem Solving

Order Number: EK-DEFEB-PS-002

NOTICE – Class 1 Laser Device:
The lasers in this equipment are Class 1 devices, compliant with CDRH Rules 21, CFR Subchapter J, Part 1040.10, at date of manufacture. Class 1 laser devices are not considered to be hazardous.

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.

DECbridge™ 500/600 Series

Problem Solving

July 1991

This manual describes how to troubleshoot and service the DECbridge 500/600 series. It is intended for qualified service personnel who will be repairing the bridge to the field-replaceable unit level.

Supersession/Update Information: This is a revised manual.

digital™

Order Number: EK-DEFEB-PS-002

EK–DEFEB-PS-002
JULY 1991

This manual was produced by Telecommunications and Networks Publications.

Contents

3 Removal and Replacement Procedures

4 Technical Information

Tables

Safety ⚠

Any warning or caution that appears in this manual is defined as follows:

Warning	Contains information to prevent personal injury.
Caution	Contains information to prevent damage to equipment.
Vorsicht	Enthält Informationen, die beachtet werden müssen, um den Benutzer vor Schaden zu bewahren.
Achtung	Enthält Informationen, die beachtet werden müssen, um die Geräte vor Schaden zu bewahren.
Danger	Signale les informations destinées à prévenir les accidents corporels.
Attention	Signale les informations destinées à prévenir la détérioration du matériel.
Aviso	Contiene información para evitar daños personales.
Precaución	Contiene información para evitar daños al equipo.

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

WARNING ⚠

To remove power from the unit, disconnect the power cord. Do not apply power to the unit unless the card cage assembly is fully inserted in the bridge enclosure.

VORSICHT

Schließen Sie das Gerät nicht an das Stromnetz an, solange das Kartenmagazin nicht vollständig in das Gehäuse eingeschoben ist. Ein Netzschalter ist nicht vorhanden! Um die Stromzufuhr zu unterbrechen, müssen Sie das Netzkabel aus der Steckdose ziehen.

DANGER

Avant de mettre l'appareil sous tension, assurez-vous que le panier est complètement enfoncé dans le boîtier. Pour mettre l'appareil hors tension, débranchez le cordon d'alimentation.

AVISO

No permita que llegue suministro eléctrico a la unidad, a menos que el módulo de ensamblamiento de tarjetas esté completamente insertado en la carcasa del puente. Para ello, desconecte el cable de alimentación.

WARNING ⚠

A safety earth ground wire has been incorporated into this product through the plug cap of the ac power cord. For continued protection against the risk of electrical 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 eineordnungsgemäß 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 doitêtreraccordé à une prise secteur équipée d'un contact de mise à la terre effectivement relié à la terre secteur du bâtiment.

AVISO

Este producto incorpora un cable de tierra de seguridad mediante el enchufe trifásico del cable de alimentación. Para evitar el riesgo de descargas eléctricas, este producto debe estar conectado a un receptáculotrifásico de pared que tenga su terminal de tierra debidamente conectado a la toma de tierra de seguridad del edificio.

WARNING ⚠

Lethal exposed voltages exist in the power supply. Therefore, always **disconnect the ac power cord** before removing or replacing any FRUs. Do not apply power to the bridge unless the card cage is fully inserted in the bridge enclosure. Only qualified service engineers should perform any FRU removal and replacement procedures. (Pages 3-1, 3-5, 3-11, 3-13, 3-15)

VORSICHT

Die Spannung im Netzteil ist lebensgefährlich. Ziehen Sie immer zuerst das Netzkabel aus der Wandsteckdose, wenn Sie FRUs entfernen oder austauschen müssen. Schließen Sie das Gerät nicht an das Stromnetz an, solange das Kartenmagazin nicht vollständig in das Gehäuse eingeschoben ist. FRUs dürfen nur von qualifiziertem Wartungspersonal entfernt oder ausgetauscht werden.

DANGER

Le module d'alimentation comporte des connexions non isolées soumises à des tensions dangereuses. Afin d'éviter tout risque d'électrocution, prenez soin de débrancher le cordon d'alimentation avant toute intervention sur les composants internes de l'appareil. Avant de mettre l'appareil sous tension, assurez-vous que le panier est complètement enfoncé dans le boîtier. Seuls les techniciens de maintenance qualifiés sont habilités à effectuer les opérations de dépose et de pose des unités remplaçables.

AVISO

Debido a la existencia de alta tensión en el suministro eléctrico, desconecte siempre el cable de alimentación retirando o reemplazando los FRU. Corte la alimentación eléctrica que llega al puente, a menos que el módulo de tarjetas esté completamente insertado en la carcasa del puente. Los procedimientos de retirada y sustitución de los FRU debe llevarlos a cabo únicamente personal altamente cualificado.

WARNING ⚠

Some countries require that only authorized personnel be allowed to connect and disconnect power to the unit. (Page 3–1)

VORSICHT

In einigen Ländern dürfen Elektrogeräte nur von entprechend ausgebildetem Personal, beispielsweise Elektrikern, installiert werden. Prüfen Sie, ob das in Ihrem Land zutrifft.

DANGER

Assurez-vous que la législation vous autorise bien à effectuer les branchements sur le secteur.

AVISO

Algunos países requieren que sólo sea personal autorizado quien conecte o desconecte la alimentación eléctrica que llega a la unidad.

WARNING ⚠ Some fiber optic equipment can emit laser light that can injure your eyes. Never look into an optical fiber, connector, or connector port. (Page 3-4)

VORSICHT Schauen Sie niemals direkt in ein Glasfaserkabel oder einen Glasfaseranschluß. Die Laserstrahlen in faseroptischen 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 emiten radiaciones láser que pueden dañar la vista. Nunca mire directamente a un conector o puerta de conector de fibraóptica.

CAUTION ⚠ Modules in the bridge can be damaged by electrostatic discharges (ESD). When working inside the unit, always use a grounded wrist strap (ESD strap) and a grounded work surface. A wrist strap, ground wire, and table pad are included in the field service kit (P/N 29-11762-00). (Page 3-5)

ACHTUNG Die Module können durch elektrostatische Entladungen beschädigtwerden. Benutzen Sie immer eine antistatische Gelenkmanschette und eine geerdete Arbeitsunterlage, wenn Sie am offenen Gerät arbeiten. Der Antistatikkit für das Wartungspersonal enthält eine antistatische Gelenkmanschette, Schutzleiterdraht und eine Antistatikmatte. Ein Antistatikkit ist bei DECdirekt unter der Bestellnummer 29-11762-00 erhältlich.

ATTENTION Les charges excessives d'électricité statique peuvent endommager les modules et les composants électroniques. Lors de la manipulation des modules et des composants internes, utilisez toujours le bracelet de masse et le plan de travail antistatique livrés avec le kit d'entretien (Réf. 29-11762-00).

PRECAUCIÓN Los módulos del puente pueden ser dañados por descargas electroestáticas(ESD). Cuando se trabaje dentro de la unidad, use una muñequera antiestática y una superficie de trabajo conectadas ambas a tierra. En el juego de reparación (P/N 29-11762-00) se incluye una muñequera antiestática, un cable de tierra y una tabla.

CAUTION ⚠ These logic modules have components on both sides of the board. Removing or inserting a module at a slight angle can damage it. (Page 3-6)

ACHTUNG An beiden Seiten der Karte befinden sich logische Module. Achten Sie darauf, daß Module absolut waagrecht entfernt oder eingebaut werden müssen, da sonst die Karte beschädigt werden kann.

ATTENTION Ces cartes comportent des composants sur les deux faces. Afin d'éviter tout risque de détérioration, veillez à respecter l'alignement lors des opérations de dépose et de repose.

PRECAUCIÓN Estos módulos lógicos tienen componentes en ambas partes de la placa. Si se retira o inserta un módulo en un ángulo indebido, la placa puede quedar dañada.

CAUTION ⚠ Do not leave the card cage partially withdrawn for servicing. Remove it completely from the enclosure and set it down on a horizontal surface. (Page 3-9)

ACHTUNG Wenn Sie Wartungsarbeiten durchführen, müssen Sie das Kartenmagazin entfernen und auf eine ebene Fläche stellen. Es genügt nicht, das Kartenmagazin teilweise herauszuziehen.

ATTENTION Lors des opérations d'entretien, ne laissez pas le panier à demi sorti, mais retirez-le complètement du boîtier et posez-le sur un plan de travail horizontal.

PRECAUCIÓN No deje el módulo de tarjetas sacado sólo en parte. Retírelo completamente de la carcasa y póngalo en una superficie horizontal cuando vaya a trabajar con él.

CAUTION ⚠	The card cage weighs approximately 11 kg (24 pounds). Support it well and handle it carefully during removal to avoid dropping it. (Page 3-9)
ACHTUNG	Wenn Sie das Kartenmagazin entfernen, bedenken Sie, daß es 11 kg wiegt. Stützen Sie es mit einer Hand von unten ab, und achten Sie darauf, daß es nicht auf den Boden fällt.
ATTENTION	Le panier pèse environ 11 kg. Manipulez-le avec précaution lors des opérations de dépose.
PRECAUCIÓN	El módulo de tarjetas pesa aproximadamente 11 kilos. Sujételo con firmeza y manéjelo con cuidado durante su retirada, para evitar su caída al suelo.

Preface

This manual describes how to troubleshoot and service the DECbridge 500/600 series of bridges. Information includes a product overview and list of the various models, problem-solving methods, removal and replacement procedures, and guidelines for configuring the units.

Intended Audience

This manual is intended primarily for **qualified service personnel** who will be repairing the bridge to the field-replaceable unit level. The manual also contains general information about the DECbridge 500/600 series that can be useful to Digital Equipment Corporation training, services, and manufacturing personnel, as well as system/network managers.

All procedures that deal with opening the unit for any reason are intended solely for service personnel who have been trained to perform product maintenance and repair. Knowledge of Fiber Distributed Data Interface (FDDI) and IEEE 802.3/Ethernet is a prerequisite for using this manual effectively.

Document Structure

This document has four chapters and three appendixes, as follows:

Chapter 1 Briefly introduces the various models of the DECbridge 500/600 series and compares their similarities and differences.

Chapter 2 Presents an approach to solving problems with the bridge. This includes a description of a normal power-up sequence, an overview of the self-test diagnostics, troubleshooting charts, and procedures for performing loopback tests.

Chapter 3 Describes how to remove and replace all field-replaceable units (FRUs).

Chapter 4 Contains technical information about the DECbridge 500/600 series. Includes a description of the product; a list of major assemblies, switches, and indicators; and a summary of the bridge specifications.

Appendix A Presents configuration guidelines for connecting the bridge to an FDDI and an IEEE 802.3/Ethernet network.

Appendix B Describes the FDDI connection rules and the keying of FDDI connectors.

Appendix C Contains a list of related documents that can be ordered from Digital Equipment Corporation.

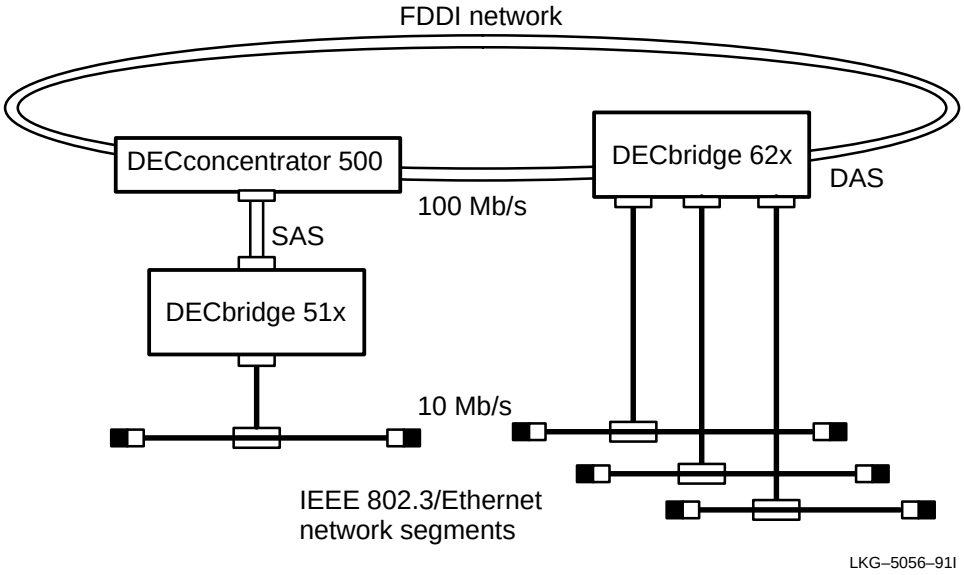
1

Introduction

1.1 General Description

The DECbridge 500/600 series units (shown in Figure 1–1) provide the interconnection between a 100-Mb/s Fiber Distributed Data Interface (FDDI) network and up to three 10-Mb/s IEEE 802.3/Ethernet network segments.

Figure 1–1: DECbridge 500/600 Series in a Sample Configuration



These bridges are store-and-forward devices. That is, they receive and store packets from the FDDI ring and IEEE 802.3/Ethernet network segments, then selectively filter (discard) the packets or forward them to the appropriate network.

As shown in Table 1–1, various network interfaces are available, depending on the particular bridge model.

Table 1–1: DECbridge 500/600 Series Units

Model	Option #	No. of NI Ports	FDDI Connection	FDDI Optics
500	DEFEB-AA/AB	1	SAS	Multimode
510	DEFEB-AC/AD	1	SAS	Multimode
518	DEFEB-AS/AT	1	SAS	Single-mode
520	DEFEB-DA/DB	1	DAS	Multimode (Port A/Port B)
524	DEFEB-DP/DQ	1	DAS	Single-mode (Port A) / Multimode (Port B)
526	DEFEB-DM/DN	1	DAS	Multimode (Port A) / Single-mode (Port B)
528	DEFEB-DS/DT	1	DAS	Single-mode (Port A/Port B)
600	DEFEB-UC/UD	3	None	Null
610	DEFEB-TA/TB	3	SAS	Multimode
618	DEFEB-TS/TT	3	SAS	Single-mode
620	DEFEB-LA/LB	3	DAS	Multimode
624	DEFEB-LP/LQ	3	DAS	Single-mode (Port A) / Multimode (Port B)
626	DEFEB-LM/LN	3	DAS	Multimode (Port A) / Single-mode (Port B)
628	DEFEB-LS/LT	3	DAS	Single-mode

FDDI Interfaces:

- A single attachment station (SAS) with one connector or a dual attachment station (DAS) with two connectors. Each connector can be either multimode or single-mode. The DAS multimode versions also have a relay driver to control an optional optical bypass relay.
- A null interface that provides no connection to the FDDI network.

IEEE 802.3/Ethernet (NI) Interfaces:

- A single AUI/ThinWire (switch-selectable) port
- Three independent AUI ports

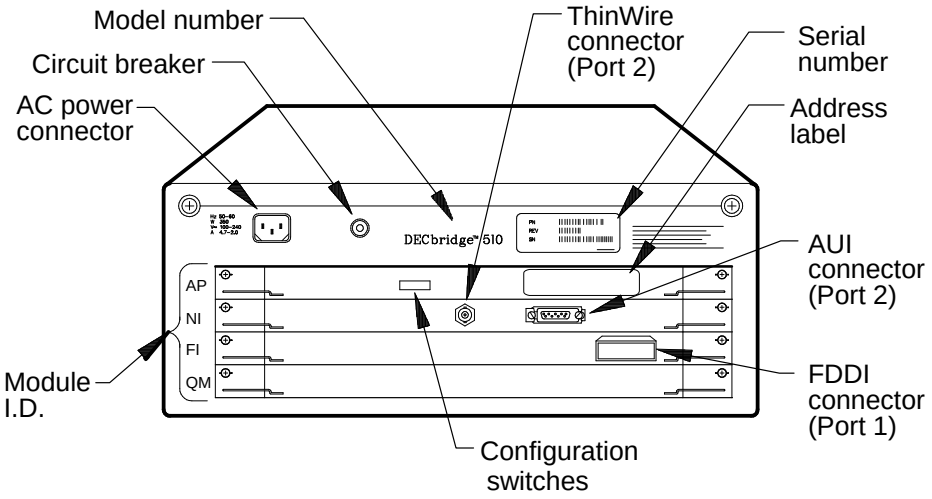
Figure 1–2 shows the major assemblies and user interfaces in a typical DECbridge 500/600 series unit. Note that the number and type of interface connectors may differ depending on the model:

- DAS bridges have two FDDI connectors, SAS bridges have one FDDI connector, and the DECbridge 600 model has no FDDI connector.
- All DECbridge 500 series models have an AUI connector and a ThinWire connector (switch-selectable) for the single IEEE 802.3/Ethernet interface. The DECbridge 600 series models all have three AUI connectors.

NOTE

The DECbridge 510 shown in Figure 1–2 is representative of the DECbridge 500/600 series. However, the number and type of interface connectors differs in the various models, as described in the previous text.

Figure 1–2: Typical DECbridge 500/600 Series Unit (I/O Panel)



All DECbridge 500/600 series units contain four logic modules:

- AP or AP2 (Application Processor) module
- NI or NI(3) (Network Interface) module
- FI (Fiber Interface) module with various types of interfaces
- QM (Queue Manager) module

Table 1–2 shows the four logic modules contained in each bridge model.

NOTE

In this manual, the terms AP and NI are used as general references to the Application Processor and Network Interface modules. The terms AP2 and NI(3) are used only when referring specifically to those two modules.

Table 1–2: Logic Modules used in the DECbridge 500/600 Series

Model	AP Module	NI Module	QM Module	FI Module
500	AP	NI	QM	FI (SAS, MM)
510	AP2	NI	QM	FI (SAS, MM)
518	AP2	NI	QM	FI (SAS, SM)
520	AP2	NI	QM	FI (DAS, MM)
524	AP2	NI	QM	FI (DAS, SM-A, MM-B)
526	AP2	NI	QM	FI (DAS, MM-A, SM-B)
528	AP2	NI	QM	FI (DAS, SM)
600	AP2	NI(3)	QM	FI (Null)
610	AP2	NI(3)	QM	FI (SAS, MM)
618	AP2	NI(3)	QM	FI (SAS, SM)
620	AP2	NI(3)	QM	FI (DAS, MM)
624	AP2	NI(3)	QM	FI (DAS, SM-A, MM-B)
626	AP2	NI(3)	QM	FI (DAS, MM-A, SM-B)
628	AP2	NI(3)	QM	FI (DAS, SM)

Legend: SAS – Single attachment station
DAS – Dual attachment station
MM – Multimode
SM – Single-mode
A and B – DAS interface connectors

2

Problem Solving

2.1 Introduction

This chapter describes several problem-solving procedures that can help diagnose failures and isolate faulty field-replaceable units (FRUs) in the DECbridge 500/600 series. To aid you in this task, the DECbridge 500/600 series contains the following problem-solving features:

- A comprehensive self-test program that executes automatically on power up, and can also be invoked remotely by the network management software.
- Local LED indicators that provide information on FRU status, LAN activity, port states, network interface selection (AUI or ThinWire), IEEE 802.3/Ethernet transceiver power, and FDDI physical connection state. Note that LED information can be read remotely using the network management software.
- A DIP switch that can restore bridge parameters to their factory settings.

Section 2.2 describes how the bridge reacts to a normal power-up operation when no faults are detected by the self-test diagnostics. The remaining sections in this chapter describe how to interpret the results of the diagnostics when faults are detected.

2.2 Normal Power Up

When power is first applied to the bridge, a series of self-test diagnostics, resident on the AP/AP2 module, is performed. These tests verify the operation of the bridge hardware before calling the operating system firmware and connecting the bridge to the network.

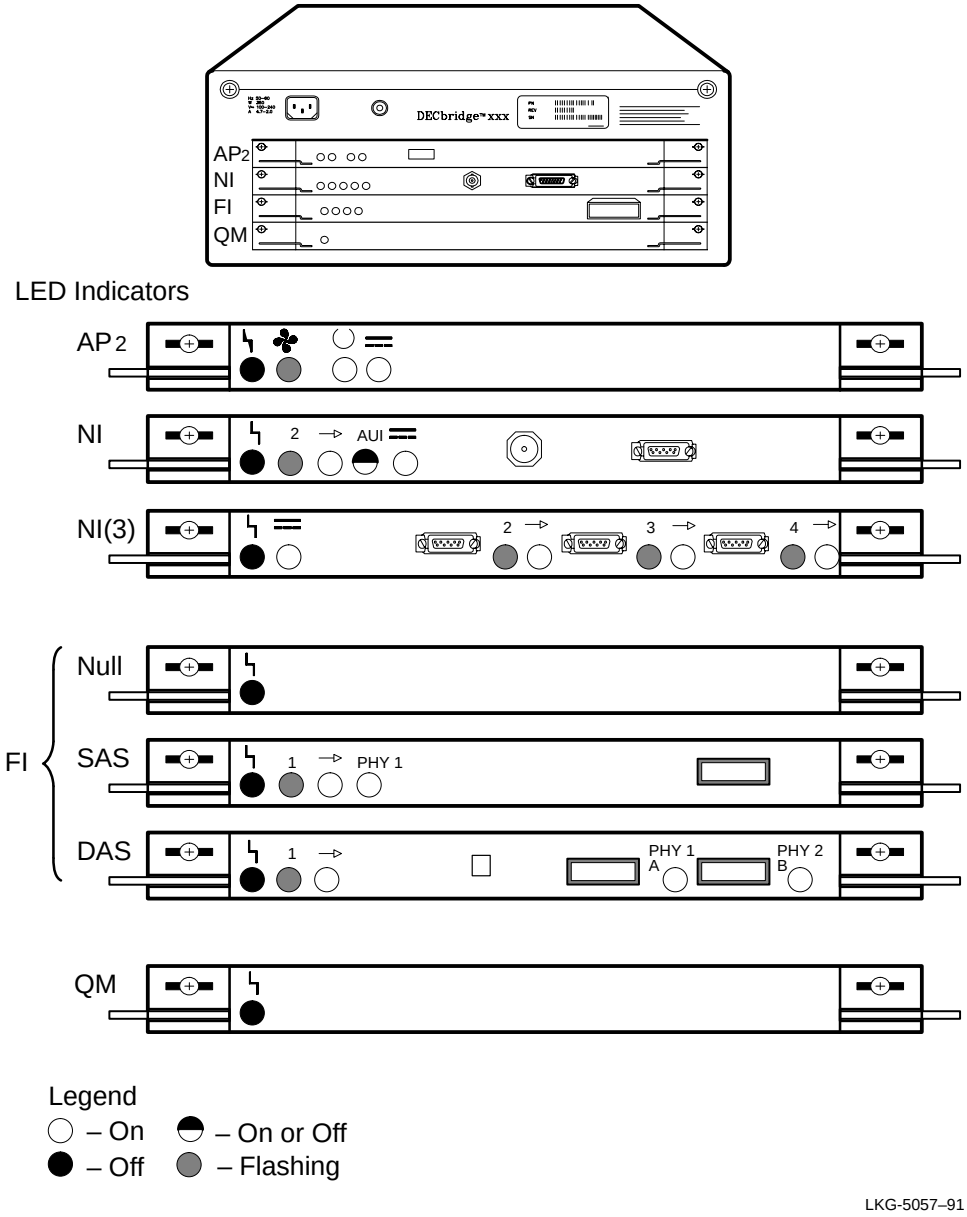
When self-test begins, all LED indicators on the bridge I/O panel are momentarily turned on for a lamp check. During this time a core test is performed to check the core hardware on the AP/AP2 module (microprocessor, bus, and some of the memory).

Upon successful completion of the core test, the indicators are turned off and the AP module tests each of the four logic modules, in sequence. (Note: If all indicators remain on after the lamp check, the core test could have failed and is unable to turn off the LEDs.) The self-test diagnostic takes up to 1 minute to complete, during which time the indicators will turn on and off according to the testing sequence.

If the tests detect a failure in an FRU, that FRU_BAD indicator turns on and the remaining modules are tested. This ensures that the fault indicators on each module will accurately reflect the state of that module, when self-test is complete. If the tests detect an incompatibility between any of the firmware and the hardware, the FRU_BAD indicator for that logic module will blink.

If no faults were detected during self-test, the MODE indicator turns on. The bridge then enters a preforwarding state for approximately 30 seconds, during which time spanning tree computations are performed and the bridge database is established. After the preforwarding delay and after the FI connection is established, the state of the indicators should be as shown in Figure 2–1. (Refer to Chapter 4 for a description of the indicators.)

Figure 2–1: LED Indicators After Power Up



- The five FRU_BAD indicators will be off (one for each logic module and one for the fan assembly), indicating that no FRU failures were detected.
- The following indicators will be on (solid green):
  - MODE indicates that self-test is complete.
  - DC_OK indicates that the power supply is OK.
  - EXT_PWR indicates that the AUI transceiver power is OK.
  - After approximately 30 seconds, the FWD indicator will turn on for each port ready to forward packets. (If a port is in BACKUP state, that port's FWD indicator remains off.)
- The PHY_1 indicator (and PHY_2 on DAS models) will blink (green) until the fiber interface connection is complete, then turn on (solid green). (This assumes that the bridge is properly connected to the FDDI network.)
- On any DECbridge 500 series unit, the AUI_SELECT indicator will be on (solid green) if the bridge uses the AUI connection to the network, and off if the bridge uses the ThinWire connection. (Configuration switch 8 in the ON position selects the AUI interface, and in the OFF position selects the Thin-Wire interface.)
- All ACT indicators can be on (yellow), off, or flashing as packets are transmitted and received over each network segment.

If the bridge is not operational, the MODE indicator will remain off and one or more of the FRU fault indicators (AP_BAD, QM_BAD, and so on.) will be on.

2.3 Self-Test Diagnostics (Overview)

The ROM-based self-test diagnostics used by the DECbridge 500/600 series consist of a core test followed by a series of more extensive tests to check each of the four logic modules in the bridge.

The core test verifies that the hardware needed to run the diagnostics is functioning properly. This core test checks the microprocessor and associated address decode and bus control, the AP bus, and some of the AP or AP2 module memory, including a CRC test of the code in the EPROM and EEPROM.

Once the core test establishes that the hardware can perform basic operations, more extensive tests for the logic modules are executed. When the entire self-test is complete (approximately 1 minute), FRU pass/fail indications are given by the state of the indicators on the I/O panel. If the diagnostics detect no fatal errors, the operational firmware is called to begin normal bridge operation.

The self-test diagnostics can be initiated in any of three ways:

- Locally by turning the ac power off for greater than 15 seconds, then back on
- Remotely through the network management software
- Internally by the operational firmware

The self-test diagnostics have two modes of operation: *normal* mode and *manufacturing* mode. These modes are selectable by configuration switch 1 on the I/O panel (see Chapter 4). **Only normal mode should be used in the field**. Manufacturing mode is designed for use in a manufacturing environment or repair station.

2.4 Recommended Approach to Problem Solving

Once you determine that a fault exists in the bridge hardware, you can approach the problem-solving task as follows:

1. Rerun the self-test diagnostics to verify the failure.
2. Visually inspect the bridge.
3. Check the state of the LEDs on the bridge for fault indications.
4. Perform port testing, if necessary.

NOTE

The system/network manager should always keep a record of current bridge management parameters. This makes it possible to recover parameters that may be lost if an NVRAM reset occurs during problem solving. Recording bridge parameters requires access to a network node that contains network management software.

2.4.1 Problem-Solving Tools and Components

The following equipment is used to test the DECbridge 500/600 series:

- Unattenuated FDDI loopback connector (P/N 12-32005-01) for FDDI multi-mode port
- Single mode attenuated loopback connector (P/N 12-34830-01)
- AUI loopback connector(s) (P/N 12-32005-01)
- T-connector (P/N 12-25869-01) and terminators (P/N 12-26318-01) for loop-back on the ThinWire port (not needed for DECbridge 600 series)
- SDU optical power meter kit (P/N 29-28384-01)

2.4.2 Running the Self-Test Diagnostics

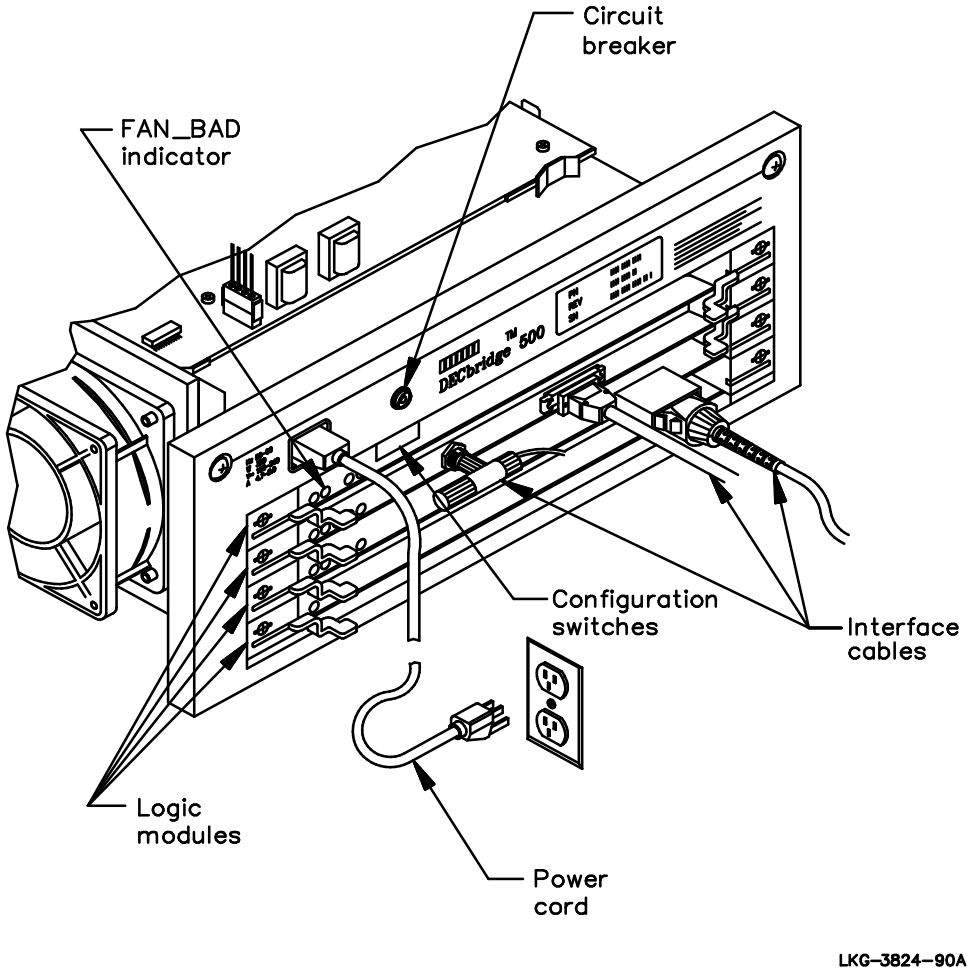
When the self-test diagnostics detect a failure in the bridge (or you suspect a failure), rerun self-test to verify that the failure can be repeated. You can run self-test locally by turning ac power to the bridge off for at least 15 seconds, then turning it back on.

2.4.3 Visually Inspecting the Bridge

Before performing in-depth problem-solving procedures such as replacing assemblies or removing cables, use the following checklist (and refer to Figure 2–2) to ensure that an easily overlooked problem is not causing the faulty operation of the bridge:

- Ensure that the power cord is properly connected both at the bridge and at the ac outlet.
- Ensure that the appropriate power is available at the ac outlet.
- Ensure that the circuit breaker (located on the bridge I/O panel) has not tripped. If it has, press the white button to reset the breaker. If it trips again, power problems may exist.
- Ensure that the fans are running (the FAN_BAD indicator should be off). If they are not, an overtemperature condition may have induced a logic module failure or a power supply problem.

Figure 2–2: Visually Inspecting the Bridge



- Check that the bridge's configuration switches are set correctly (see Chapter 4). In particular, make sure that:
  - The Manufacturing Mode switch (switch 1) is in the OFF (up) position.
  - The Enable External Loopback switch (switch 7) is in the OFF (up) position if you are not performing external loopback tests.
  - The AUI/ThinWire switch (switch 8) in a DECbridge 500 series unit is in the ON (down) position if the AUI interface is used, or in the OFF (up) position if the ThinWire interface is used.
- Ensure that the interface cable connections are secure. The FDDI cable connector(s) must be pushed securely into place in the bridge connector(s). The AUI cable connector locks in place with a slide latch. Push the slide latch to the left to make sure it snaps in the locking position. Make sure the BNC connectors used by the ThinWire interface cable are twisted securely in place. Also, make sure the proper termination is used.
- For single-mode connections, ensure that the transmit and receive cables are not reversed.
- Ensure that the FDDI connections follow the rules specified in Appendix B.
- Ensure that all the logic modules are seated firmly in their backplane connectors and that the ejector levers for each module are pushed inward (locking position).
- Consider possible environmental problems such as power fluctuations or high ambient temperature.

2.4.4 Interpreting the LED Indicators

Pass/fail results from the diagnostics are displayed on the LED indicators. Table 2–1 lists typical LED displays for various error conditions, along with probable causes and suggested corrective actions. The flow chart in Figure 2–3 indicates steps you can take to determine why a bridge is in the powered-down state. The flowchart in Figure 2–4 describes how to troubleshoot the FDDI interface. For more information on loopback testing, refer to Section 2.4.6. For replacement procedures of field-replaceable units (FRUs), refer to Chapter 3.

Table 2–1: Problem Solving Via the LEDs

NOTE

Always turn off power before removing and replacing any of the FRUs.

Symptom	Probable Cause	Corrective Actions
General:		
One or more LEDs do not light during lamp test.	Module(s) are not properly seated	Remove and reseat the logic modules (Section 3.3.2).
	Bad module(s)	Replace the logic module(s) containing the unlit LED(s) (Section 3.3.2).
All LEDs are off.	Power cord disconnected	Ensure that the power cord is connected to the bridge and to the ac outlet.
	Circuit breaker tripped	Reset the breaker. If it continues to trip, a more serious problem is indicated.
	Faulty power cord	Check the cord continuity and replace if necessary.
	Power at wall outlet.	Check the ac outlet circuit breaker. Verify that correct power is available at the outlet. Move the power cord to another outlet.
	Blown power connector fuse	In some countries, the connector to the ac outlet contains a fuse. Replace if necessary. If the fuse continues to blow, it indicates a more serious problem.

Table 2–1 (Cont.): Problem Solving Via the LEDs

Symptom	Probable Cause	Corrective Actions
All LEDs are off (cont.).	Bad fan or overtemperature condition	Remove ac power for at least 15 seconds, then reapply. If LEDs work properly for a few minutes, then all turn off again, replace the fan assembly.
	Defective module	Remove NI, FI, and QM modules. Rerun self-test and check LEDs on the AP module. If AP LEDs are OK, replace other modules (one at a time) and retest each time until the defective module is identified. Replace the defective module. If the AP LEDs remain off when only the AP module is in the unit, replace the AP module and retest.
	Defective power supply	If the LEDs still remain off after all previous actions have been taken, replace the power supply (Section 3.3.4).
All LEDs remain on.	Core test failure	Replace the AP module (Section 3.3.2).
AP_BAD, NI_BAD, FI_BAD, QM_BAD all remain on.	Module connections	Reseat all the logic modules in their connectors.
	AP module failed	Replace the AP module (Section 3.3.2).
	Bad backplane	Replace the backplane (Section 3.3.6).
AP_BAD, NI_BAD, FI_BAD, QM_BAD all blinking.	Improper upgrade	Return the unit to its original configuration.
AP/AP2 Module LEDs:		
AP_BAD remains on.	AP module failed self-test diagnostic	Replace the AP module (Section 3.3.2).
	NVRAM error	Reset module to factory defaults (switch 2).
AP_BAD blinking.	Incompatible firmware loaded	Replace the AP module with one containing a compatible firmware revision (Section 3.3.2).

Table 2–1 (Cont.): Problem Solving Via the LEDs

Symptom	Probable Cause	Corrective Actions
FAN FAULT on.	Fan connections	Check fan cable connections at the power supply.
	Fan failure	Replace fan assembly (Section 3.3.5).
	Fan power failure	Replace power supply module (Section 3.3.4).
DC_OK off.	Power supply fault.	Replace power supply module (Section 3.3.4).
NI Module LEDs:		
NI_BAD remains on (and AP_BAD is off).	External Loopback switch	Check the Enable External Loopback switch. The switch must be in the OFF (up) position for normal bridge operation.
	Defective NI module	Replace the NI module (Section 3.3.2).
	FI module is causing NI module to fail	Replace the FI module (Section 3.3.2).
NI_BAD blinking.	Incompatible firmware loaded	Load compatible firmware.
FWDn blinking.	Port n in broken state	Check the external connection to the NI port.
		Perform external loopback tests.
		Check the transceiver or DELNI (if AUI is selected).
FWDn off.	Port n in preforwarding or backup state	Wait 1 minute and verify that the bridge goes into forwarding state, indicating proper bridge operation. Check line costs and enabling state using management software.
		Check the spanning tree topology using network management software.
EXT_PWR_OK off.	AUI cable	Check the AUI cable(s) for a short by temporarily removing each cable and observing if the LED turns on. If it does, check the cable and the transceiver at the other end of the cable.
EXT_PWR_OK off (and DC_OK off).	Defective NI module	Replace the NI module (Section 3.3.2).
	12 V power supply	Replace the power supply module.

Table 2–1 (Cont.): Problem Solving Via the LEDs

Symptom	Probable Cause	Corrective Actions
FI Module LEDs:		
FI_BAD remains on (and AP_BAD is off).	External Loopback switch	Check the Enable External Loopback switch. The switch must be in the OFF (up) position for normal bridge operation.
(and PHY_1 or 2 red).	Port broken	Perform loopback test, as described in Section 2.4.6. If port is OK during loopback test, check transmit and receive power, as described in Section 2.4.7.
	Bad FI module	Replace the FI module (Section 3.3.2).
FI_BAD blinking.	Incompatible firmware loaded	Load compatible firmware or replace the AP module with one containing a compatible firmware revision (Section 3.3.2).
FWD1 blinking green.	FI port in broken state	Perform loopback test, as described in Section 2.4.6.
FWD1 off.	FI Port in pre-forwarding or backup state	Wait 1 minute and verify that the bridge goes into forwarding state, indicating proper bridge operation. Check line costs and enable state using network management software. Check the spanning tree topology using network management software.
PHY_1 or 2 remains off.	Bad LED	Replace FI module.
PHY_1 blinking red (SAS bridges).	Bad module or cable	Install the FI loopback connector. If this corrects the problem, check the interface cable. If this does not correct the problem, replace the FI module (and the AP module, if necessary).
PHY_1 or PHY_2 blinking red (DAS bridges).	Illegal topology	Notify the system manager. Reconfigure the cable connections or ring topology.

Table 2–1 (Cont.): Problem Solving Via the LEDs

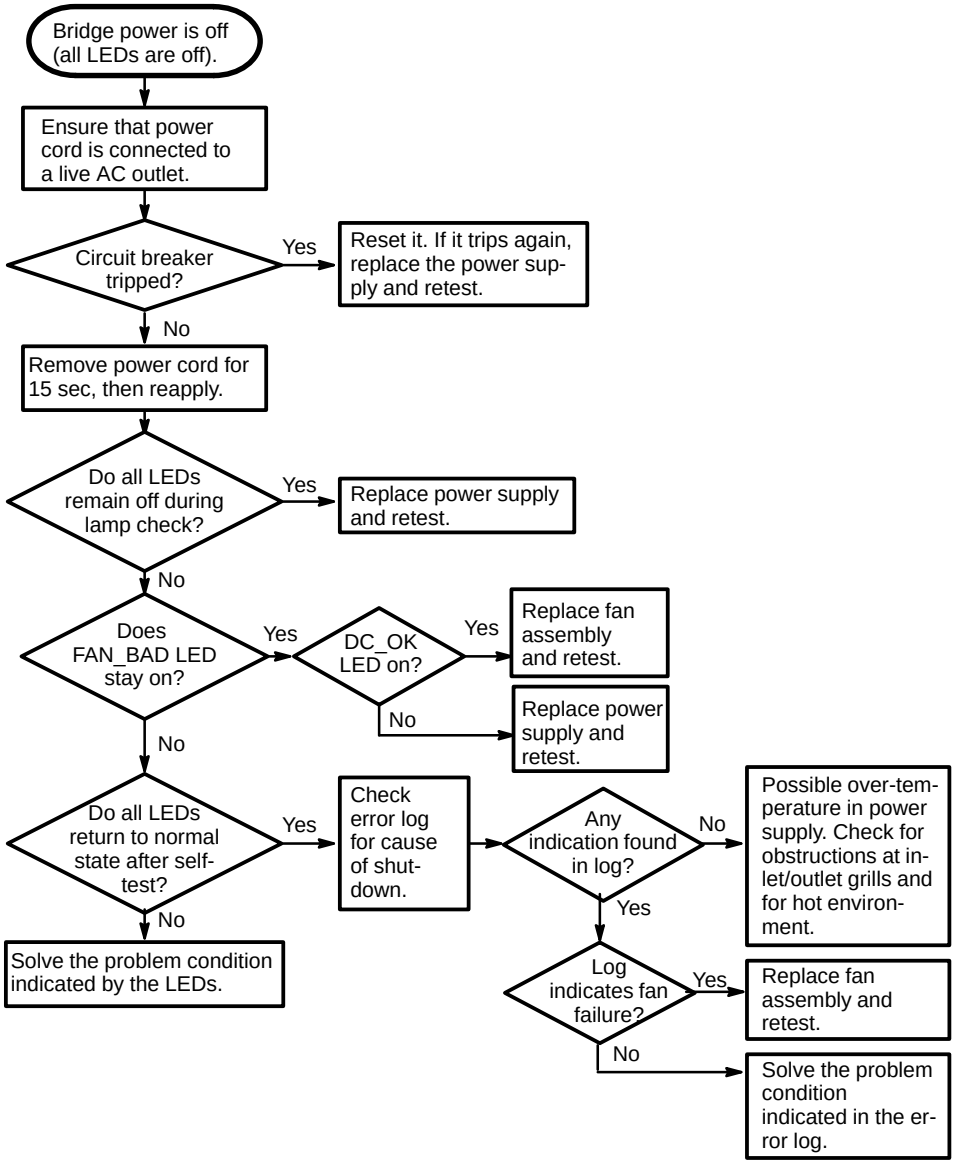
Symptom	Probable Cause	Corrective Actions
PHY_1 or 2 solid red (and FI_BAD off).	Port failed Line Confidence Test (LCT)	Test is continuously repeated at 0.5, 5, and 50 second intervals until it passes. If error condition persists, perform loopback test, as described in Section 2.4.6. Also check optical power.
PHY_1 or 2 blinking green.	Connection in progress	Connection may take up to 1 minute to achieve. PHY_1 or 2 remaining in this state may be caused by very poor signal quality. Make sure the cable is fully connected and the connecting unit on the far end is powered up. If PHY_1 or 2 is still blinking green, perform the loopback test, as described in Section 2.4.6.
QM Module LEDs:		
QM_BAD remains on (and AP_BAD is off).	QM module failed self-test diagnostic	Replace the QM module (Section 3.3.2).
	FI module is causing QM module to fail	Replace the FI module (Section 3.3.2).
QM_BAD blinking.	Incompatible firmware loaded	Load compatible firmware or replace the AP module with one containing a compatible firmware revision (Section 3.3.2).

2.4.5 If the Problem Still Exists

If none of the corrective actions shown in Table 2–1 solves the problem, try the following additional steps:

1. Reset the NVRAM by placing switch 2 to the ON (down) position and cycling the ac power off, then back on. This will clear the memory and restore default parameters for the bridge.
2. Replace all four logic modules in the unit with known good modules. If the failure disappears, reinsert the modules you've just removed, one at a time, until the problem returns. Then, replace that module with a good module.

Figure 2–3: Problem Solving a Power-Off Condition



LKG–5058–91I

Figure 2–4: Problem Solving the FDDI Interface

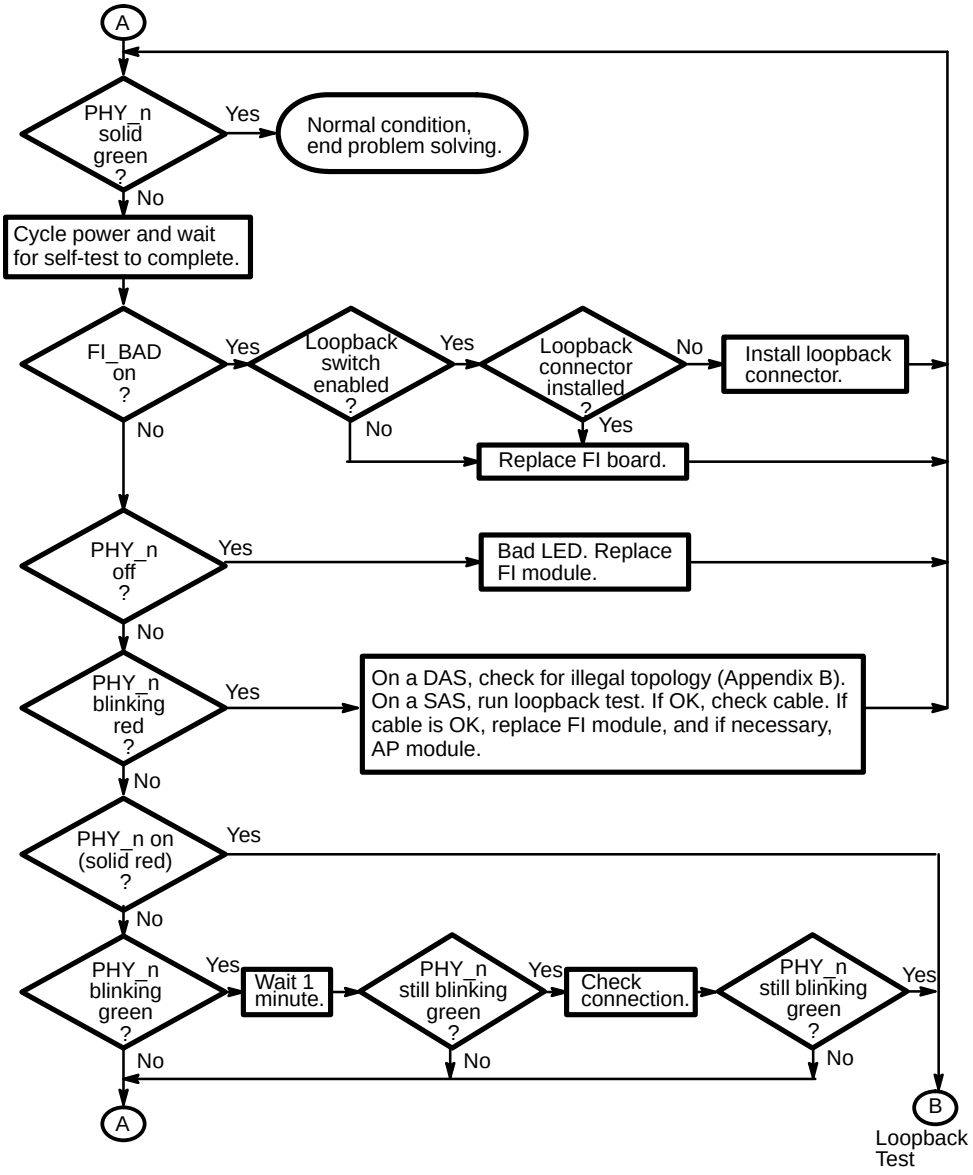


Figure 2–4 (Cont.): Problem Solving the FDDI Interface

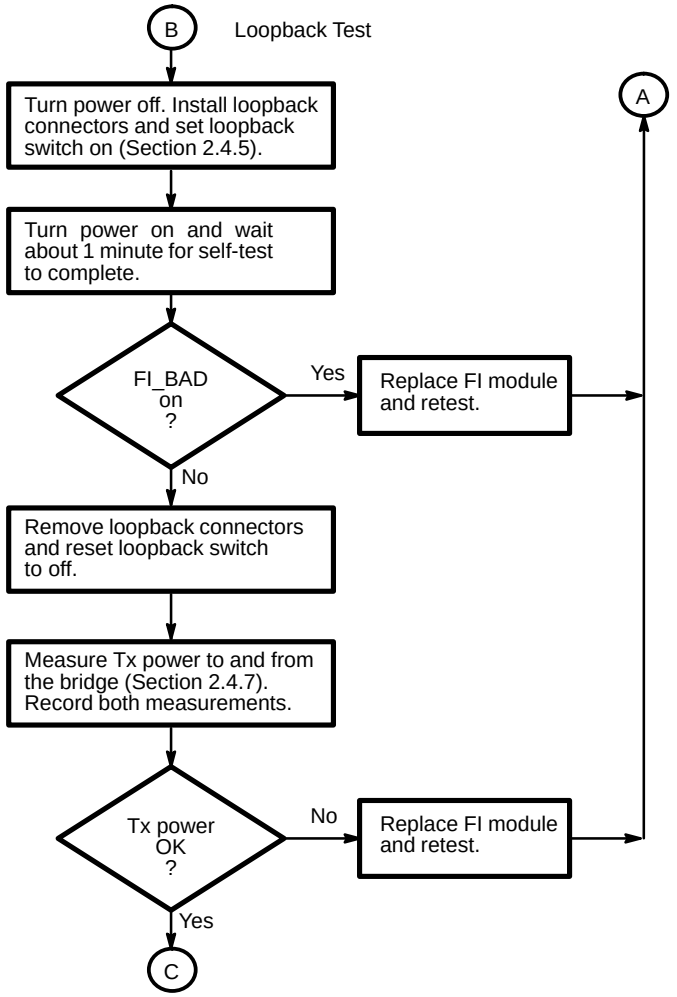
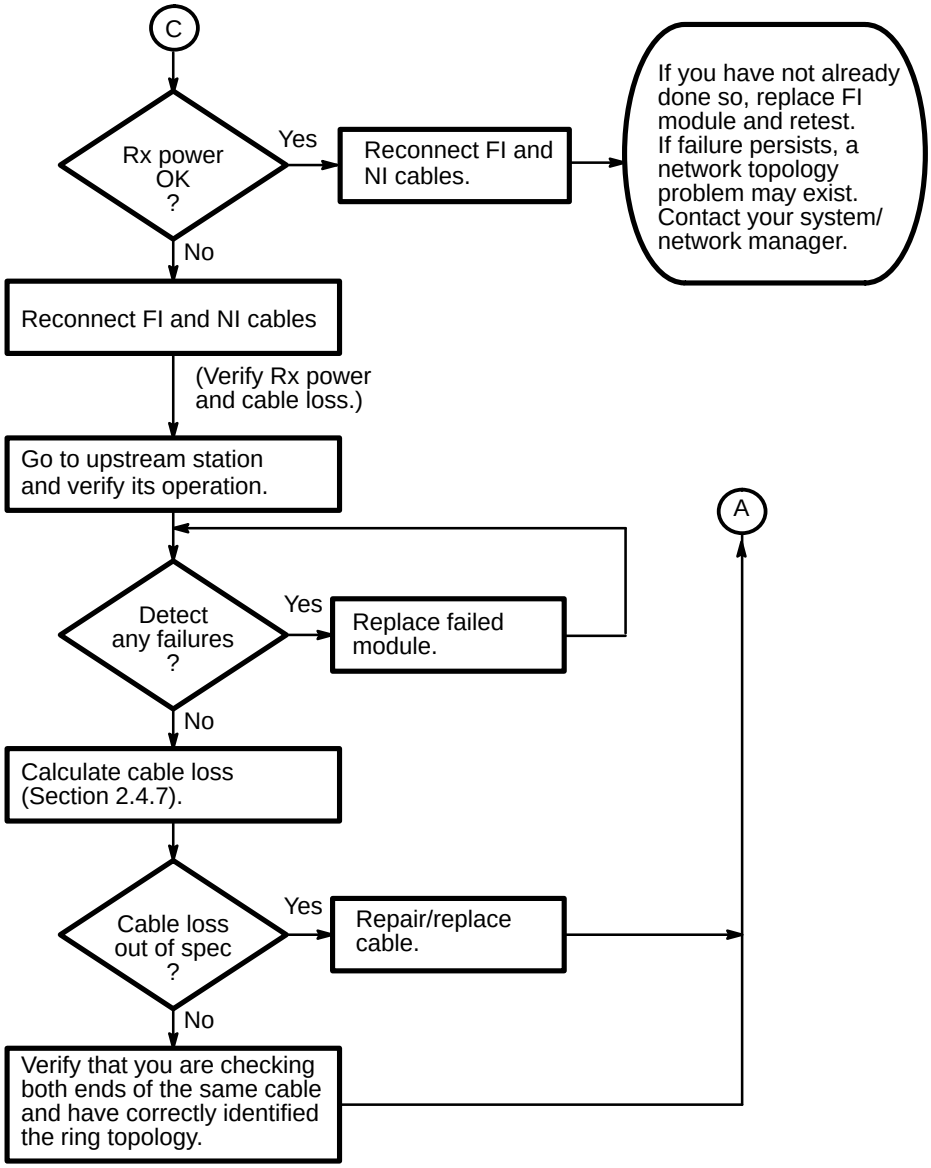


Figure 2–4 (Cont.): Problem Solving the FDDI Interface



2.4.6 Performing Loopback Testing

If diagnostic results indicate a port interface problem, you can perform a loopback test on that interface to help determine if the fault is in the bridge itself, in the interface cable, or in the device connected to the bridge. Special loopback connectors supplied with the bridge must be installed on each port. Each connector routes the transmitter output of that port back to the receiver input.

NOTE

When performing port loopback testing, always place loopback connectors on all the interface ports.

During loopback testing, if the FI port fails self-test, the FI_BAD indicator will turn on. If any of the NI or NI(3) ports fail self-test, the NI_BAD indicator will turn on. (Note that on a DECbridge 500 series unit, both the AUI and ThinWire interfaces are tested but only the selected interface has any effect on the NI_BAD indicator.). If an optional optical bypass switch is installed, the self-test diagnostics also check the relay driver on the FI module.

NOTE

If you have an optional optical bypass relay installed, this test will switch the relay. This could adversely affect the bypassed network.

2.4.6.1 Preparing the Unit for Loopback Testing

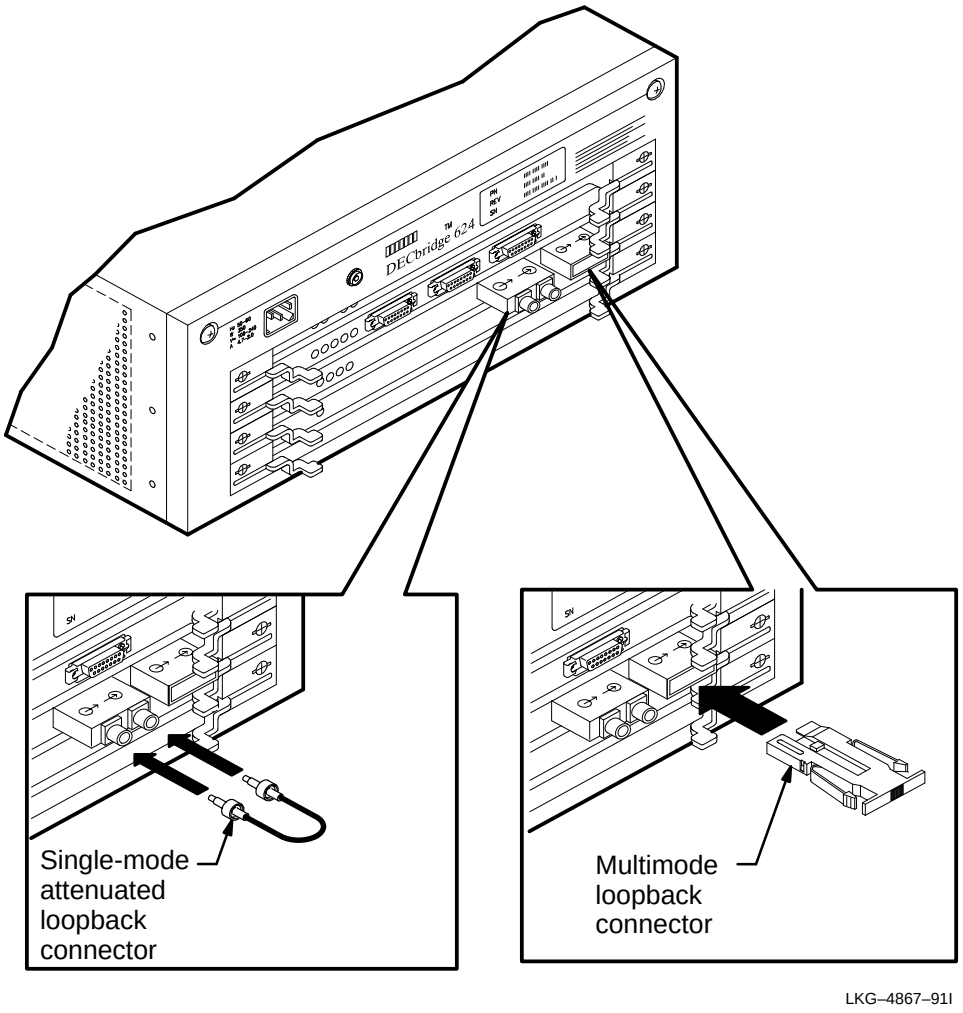
Prior to installing the loopback connectors:

1. Disconnect the bridge power cord from the ac outlet.
2. Set the Enable External Loopback switch (switch 7) to the ON (down) position.

2.4.6.2 Installing the FDDI Loopback Connector(s)

SAS units have one FDDI connector; DAS units have two. Depending on the model, these connectors may be multimode or single-mode. Be sure to install the proper loopback connectors for your particular unit, as shown in Figure 2–5.

Figure 2–5: Installing the FDDI Loopback Connectors



To install the FDDI loopback connector(s):

1. Disconnect the FDDI cable(s) from the FI module.
2. Install the appropriate loopback connector(s) for that model:
   - For multimode interfaces, install the multimode loopback connector(s) (P/N 12–32005–01).
   - For single-mode interfaces, install the single-mode loopback connector(s) (P/N 12–34830–01).

NOTE

If a loopback connector is not installed and the Enable External Loopback switch is ON, self-test will fail.

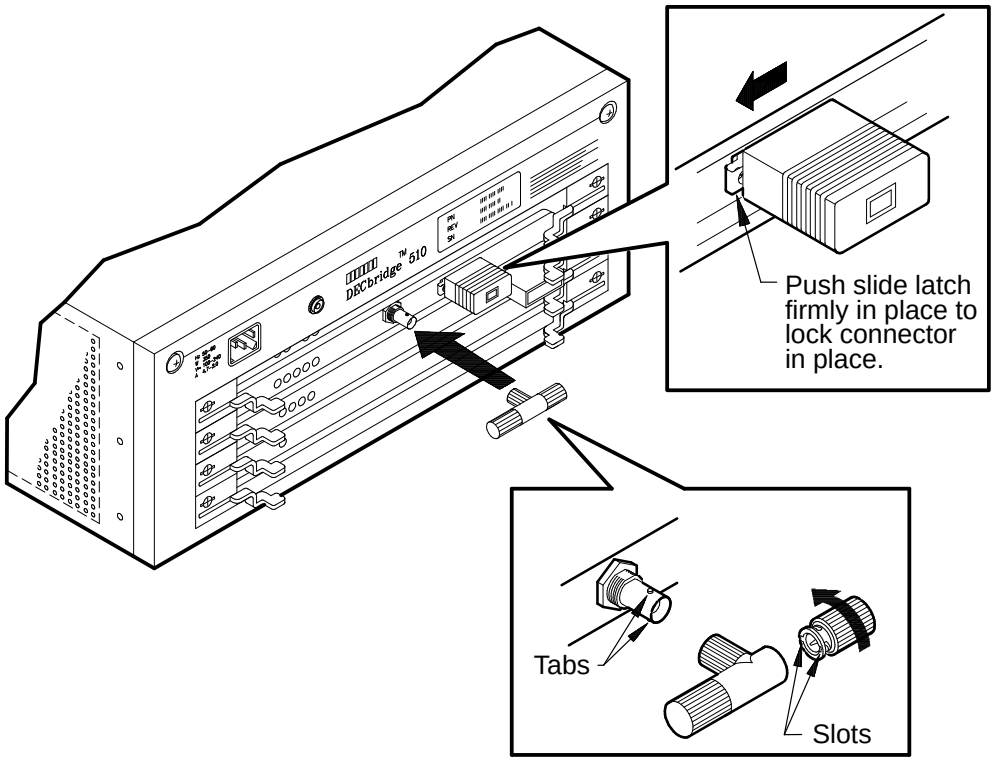
2.4.6.3 Installing the NI Loopback Connector(s)

DECbridge 500 series units have a single switch-selectable AUI/ThinWire interface. DECbridge 600 series units have three separate AUI interfaces.

To install the NI loopback connector(s):

1. Disconnect the interface cable(s) from the NI or NI(3) module.
2. Install the appropriate loopback connector(s) for that model, as shown in Figure 2–6:
   - For AUI interfaces, install the AUI loopback connector (P/N 12–22196–01).
   - For a ThinWire interface, install the T-connector (P/N 12-25869-01) and terminator (P/N 12-26318-01).
3. On DECbridge 500 series units, verify that the AUI/ThinWire switch (configuration switch 8) is in the correct position: ON (down) for testing the AUI interface and OFF (up) for testing the ThinWire interface.

Figure 2–6: Installing the NI Loopback Connectors



LKG-4868-91I

2.4.6.4 Running the Loopback Test and Observing the Results

1. Reconnect the power cord to the ac outlet.
2. Observe the state of the LED indicators on the FI module after the self-test diagnostic is complete.
   - If the FI port fault disappears (that is, if the FI_BAD indicator turns off, measure the transmit power and receive power at the bridge using the SDU power meter (Section 2.4.7). If the power levels are within specification, reconnect the interface cables and rerun the bridge self-test.
   - If the FI port fault indication persists, the problem is in the bridge. Make sure the FI module is fully seated. Replace it if necessary.
3. Observe the state of the NI_BAD indicator on the NI module.
   - If the NI_BAD indicator turns off, the problem is external to the bridge. Check the interface cable and the device connected to the other end of the cable. The LED on the loopback connector should be on.
   - If the NI_BAD indicator remains on, the problem is in the bridge. Make sure the NI module is fully seated. Replace it if necessary.

2.4.6.5 Returning to Normal Operation

When you have completed loopback testing of the ports, follow these steps to return the bridge to normal operation:

1. Disconnect the power cord from the ac outlet.
2. Set the Enable External Loopback switch (switch 7) to the OFF (up) position.
3. Remove the FI loopback connector and reconnect the FI interface cable(s).
4. Remove the NI loopback connector from the NI interface selected by the AUI/ThinWire switch, and reconnect the NI interface cable to that port.
5. Reconnect the power cord to the ac outlet.

2.4.7 Measuring the FI Power

If a failure in the FI port disappears when an FI loopback test is performed, check the optical signals into and out of the port to determine if they are within specifications. To measure the power levels of the transmit and receive optical signals at the bridge, use the SDU optical power meter kit (P/N 29-28384-01). This kit contains an optical power meter, a receive cable, and cleaning pads. To make the measurements, perform the following six steps:

NOTE

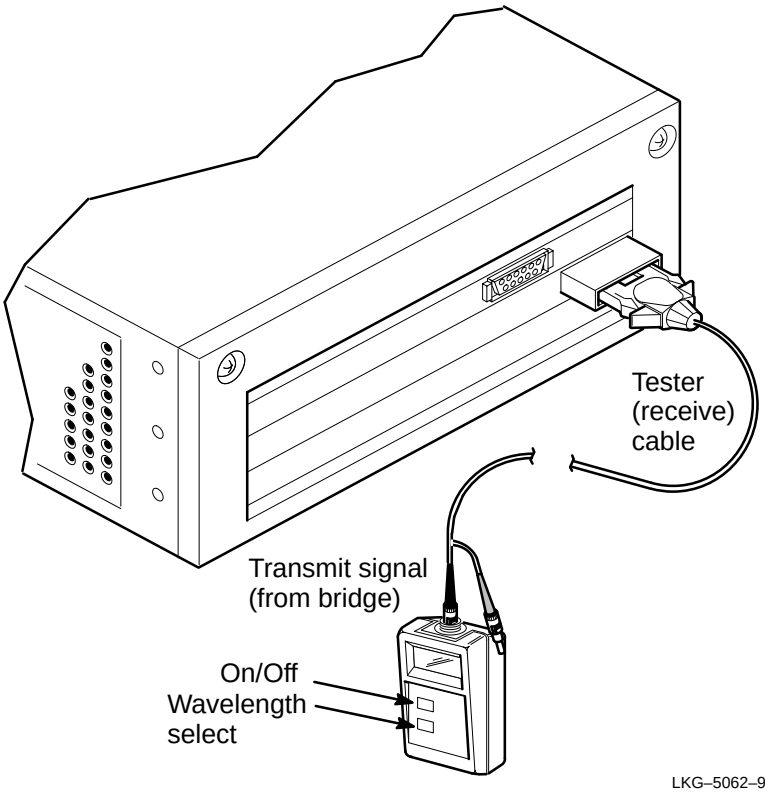
If measuring power at a simplex connector (ST), both the transmit and receive cables must be disconnected in order to get a proper light-signal pattern and observe correct power readings.

1. Make sure the bridge is in normal operating mode by placing the External Loopback switch (switch 7) to the OFF (up) position and removing the loopback connector from the FI port (if one is installed).
2. Set up the optical power meter as follows:
   a. Remove the protective cap from the input test head.
   b. Turn on the meter by pressing the ON/OFF switch.
   c. Use the λ select switch to select the 1300-nm wavelength range. The wavelength value will appear on the LCD display.
3. To ensure a clean test connection, remove the protective caps from the test cable connectors and use a cleaning pad to wipe the connector faces.
4. To measure the power of the fiber optic signal transmitted by the bridge, refer to Figure 2–7 and follow these steps:
   a. Connect the FDDI connector end of the receive cable to the FI port receptacle on the bridge.
   b. The other end of the receive cable has two leads (and fiber optic connectors). The lead with the arrow pointing towards the connector carries the transmit signal from the bridge. Plug this lead into the test head of the meter.

c. The power level of the transmit signal will be displayed on the meter. Record the value in Table 2–2.

d. Disconnect the receive cable from the bridge and from the meter.

Figure 2–7: Measuring the FI Transmit Power (Multimode)

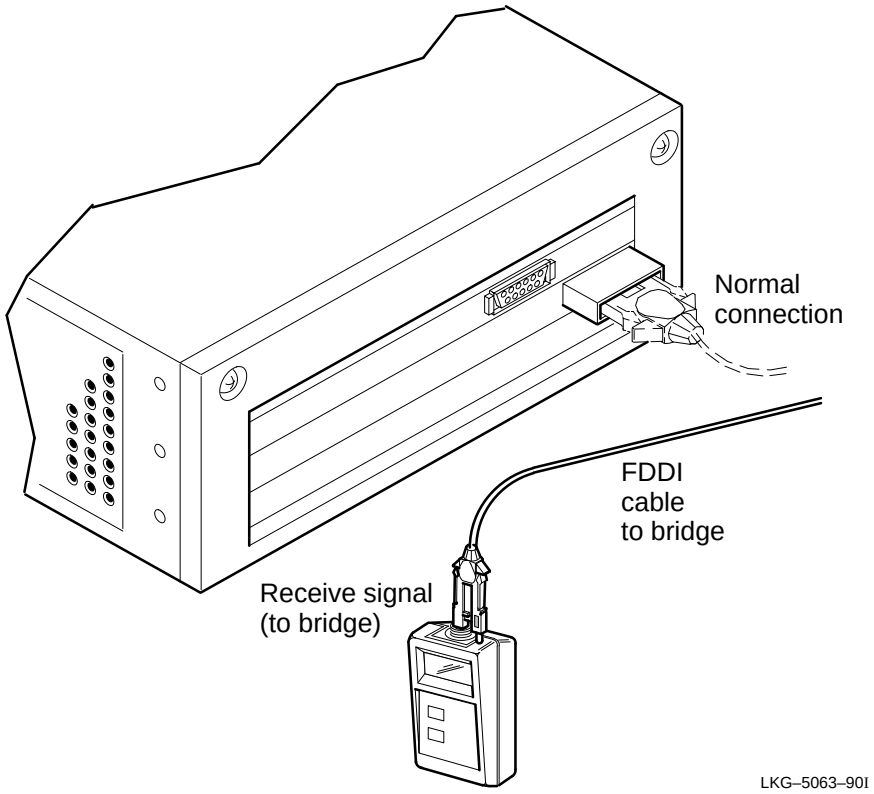


5. To measure the power of the fiber optic signal received by the bridge, refer to Figure 2–8 and follow these steps:

   a. Move the power meter close to the FDDI cable that normally plugs into the FI port of the bridge.

b. Plug the output connector on that cable into the test head of the meter. (Note: The output connector is the smaller of the two connectors on the cable.)

Figure 2–8: Measuring the FI Receive Power (Multimode)



c. The power level of the receive signal will be displayed on the meter. Record the value in Table 2–2.

NOTE

If there is no reading when you perform step 5-c, you could be checking the wrong connector (that is, the input connector rather than the output). If this occurs, measure power at the other connector.

Table 2–2 shows a sample table that you can use to record the receive and transmit power for the bridge (station A) and for the upstream device (station B). You can also use the table to record the cable loss between the two stations (the transmit power at one station minus the receive power at its downstream station).

6. Check the recorded values against the specifications given below. If either measurement falls outside the given range, that optical signal is not within specifications. Refer to the flow chart in Figure 2–4 for recommended corrective actions.

   Multimode:

   – Power level of the transmit signal must be between –14.5 and –19.5 dBm.

   – Power level of the receive signal must be between –14.5 and –30.5 dBm.

   Single-mode:

   – Power level of the transmit signal must be between –2.5 and –7.5 dBm.

   – Power level of the receive signal must be between –14.5 and –29.5 dBm.

Table 2–2: FDDI Transmit and Receive Power Calculation

Tx Power	**STA**	_____ **dBm**	**STB**	_____ **dBm**
Rx Power	**STB**	_____ **dBm**	**STA**	_____ **dBm**
Loss		_____ **dBm**		_____ **dBm**

3

Removal and Replacement Procedures

3.1 Introduction

This chapter contains removal and replacement procedures for the field-replaceable units (FRUs) in the DECbridge 500/600 series units. The modular design of these bridges allows quick removal and replacement of defective components. The replaceable components are shown in Figure 3–1.

The maintenance strategy is to replace defective components to the field-replaceable unit (FRU) level. Table 3–1 lists the FRUs in the DECbridge 500/600 series and their Digital part numbers.

WARNING ⚠

Lethal exposed voltages exist in the power supply. Therefore, always **disconnect the ac power cord** before removing or replacing any FRUs. Do not apply power to the bridge unless the card cage is fully inserted in the bridge enclosure. Only qualified service engineers should perform any FRU removal and replacement procedures.

Some countries require that only authorized personnel be allowed to connect and disconnect power to the unit.

Figure 3–1: DECbridge 500/600 Series Field-Replaceable Units

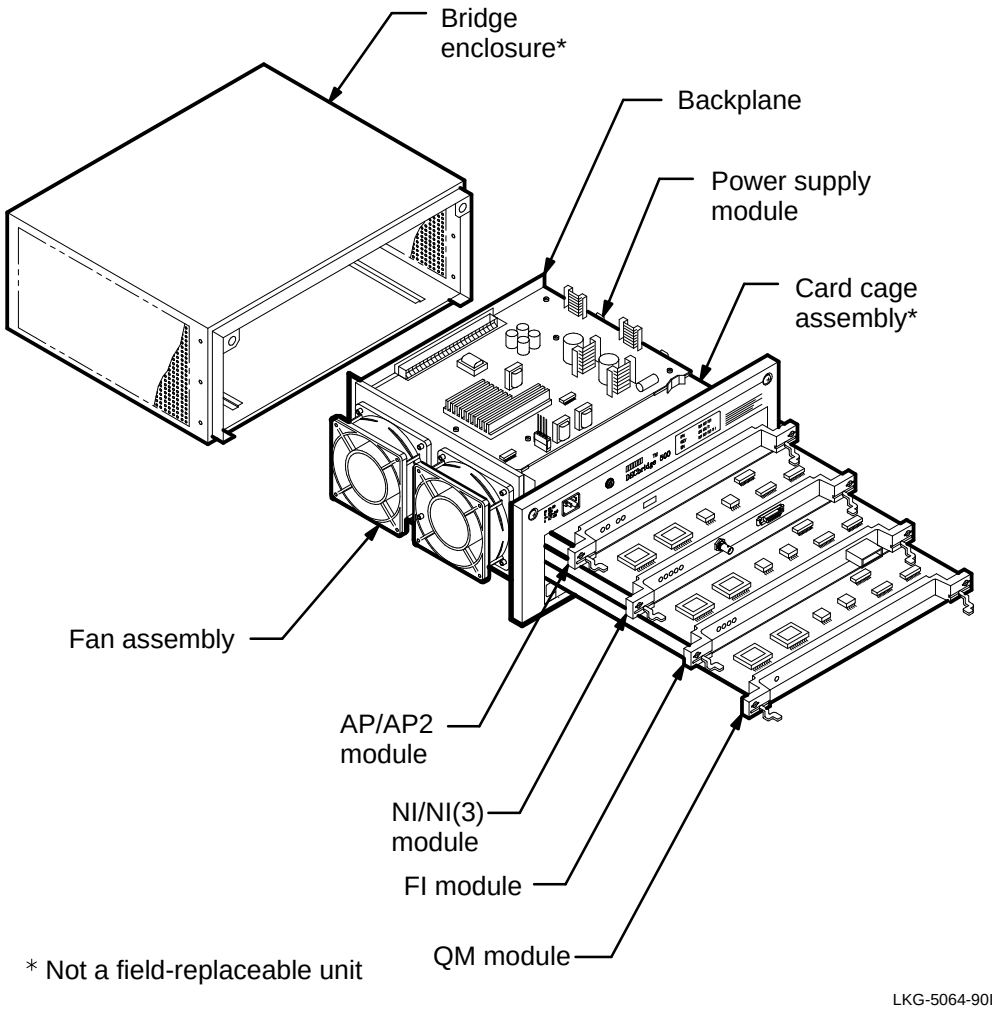


Table 3–1: Field-Replaceable Units

FRU	Digital Part Number	Models Used On
AP module	54-19375-01	DECbridge 500 only
AP2 module	54-19375-02	All models except DECbridge 500
NI module	54-19373-01	All DECbridge 500 series
NI(3) module	54-19409-01	All DECbridge 600 series
FI modules		
-SAS multimode	54-19369-01	DECbridge 500, 510, 610
-DAS multimode (A and B)	54-19369-02	DECbridge 520, 620
-SAS single-mode	54-19369-03	DECbridge 518, 618
-DAS single-mode (A) multimode (B)	54-19369-05	DECbridge 524, 624
-DAS multimode (A) single-mode (B)	54-19369-04	DECbridge 526, 626
-DAS single-mode (A and B)	54-19369-06	DECbridge 528, 628
-Null	54-19369-09	DECbridge 600
QM module	54-19371-01	All models
Backplane	54-19377-01	All models
Power supply	30-32524-01	All models
Fan assembly	70-27394-01	All models

3.2 Preparing the Bridge for Servicing

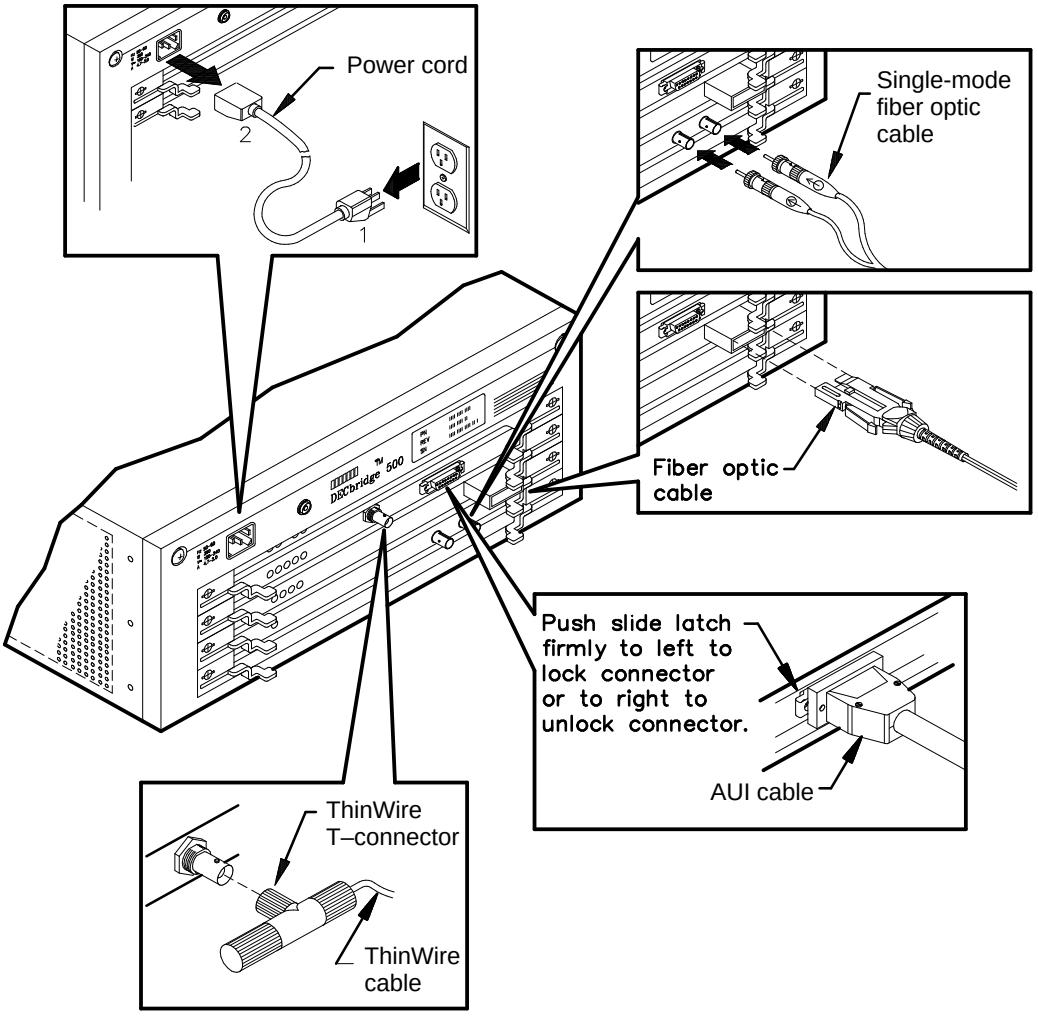
Follow these steps before performing any servicing procedures on the bridge.

1. Remove power to the bridge by unplugging the power cord from the ac outlet and then from the bridge, as shown in Figure 3–2.
2. Disconnect the interface cable(s) from the NI module. Note that the AUI cable connector locks into place with a slide latch (see Figure 3–2). To remove the AUI cable, push the slide latch to the right to unlock the connector. To remove the ThinWire cable, push in and rotate the connector a quarter turn.
3. Remove the fiber optic cable(s) from the FI module. If you have a protective cover available, place it on the fiber optic connector to protect it against dust.

WARNING ⚠

Some fiber optic equipment can emit laser light that can injure your eyes. Never look into an optical fiber, connector, or connector port.

Figure 3–2: Power Cord and Interface Cable Removal



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3.3 Removing and Replacing the FRUs

Logic modules are removed directly from the bridge and do not require the prior removal of any other assembly. The removal of the other FRUs requires first removing the card cage assembly from the bridge enclosure for access.

WARNING ⚠

Lethal exposed voltages exist in the power supply. Therefore, always **disconnect the ac power cord** before removing or replacing any FRUs. Do not apply power to the bridge unless the card cage is fully inserted in the bridge enclosure. Only qualified service engineers should perform any FRU removal and replacement procedures.

CAUTION ⚠

Modules in the bridge can be damaged by electrostatic discharges (ESD). When working inside the unit, always use a grounded wrist strap (ESD strap) and a grounded work surface. A wrist strap, ground wire, and table pad are included in the field service kit (P/N 29-11762-00).

3.3.1 Tools Required

The only equipment required to remove and replace FRUs is a #2 Phillips-head screwdriver and the ESD strap mentioned in the CAUTION note above.

3.3.2 Removing and Replacing Logic Modules

This section describes how to remove and replace any of the four logic modules in the bridge.

3.3.2.1 Removing Logic Modules

To remove any of the four logic modules, refer to Figure 3–3 and follow these steps:

NOTE

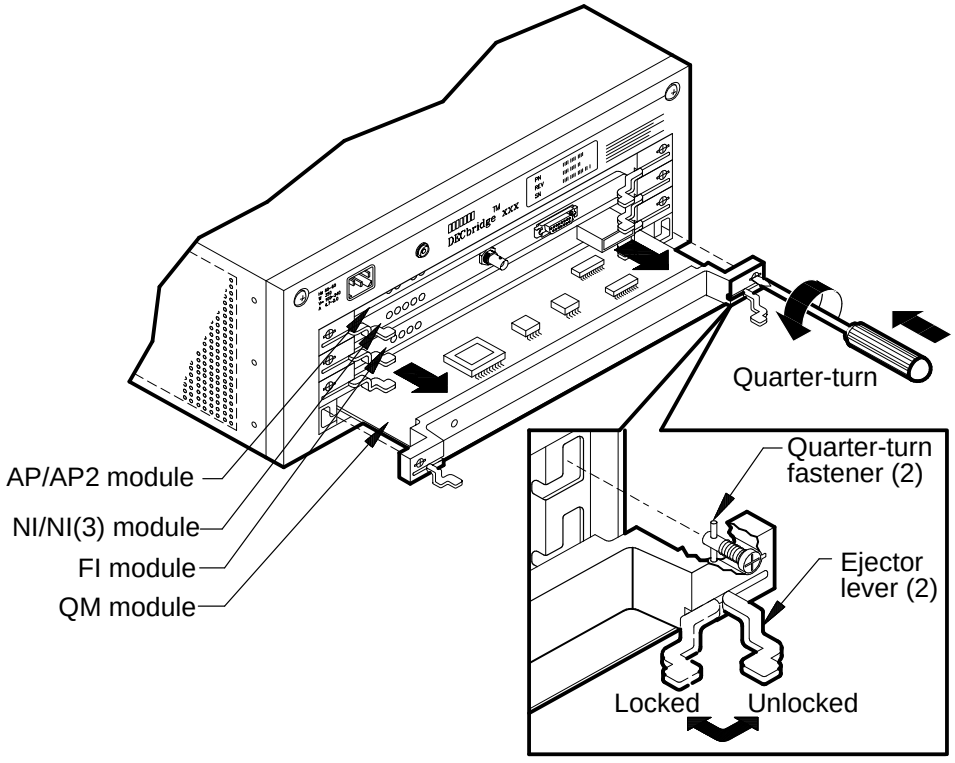
Before removing the AP/AP2 module, record the existing switch settings on that module so that you can set the switches on the replacement module to the appropriate positions. Also, use the network management software to record bridge parameter settings and the firmware version prior to replacing the AP/AP2 module.

CAUTION ⚠

The logic modules have components on both sides of the module. Removing or inserting a module at a slight angle can damage it.

1. Remove ac power to the bridge and disconnect all interface cables (Section 3.2).
2. Attach the ESD ground strap to your wrist and to the unit.
3. Using a #2 Phillips-head screwdriver, loosen the quarter-turn fastener on each side of the module. Push in and turn the screwdriver one-quarter turn counterclockwise. The fastener will pop out when unlocked.
4. Swing the two ejector levers on the module outward to the unlocked position.
5. Carefully slide the module straight out of the card cage. Be careful not to let the components on the bottom of the module scrape against the ejector levers of the module below it.

Figure 3–3: Logic Module Removal and Replacement



3.3.2.2 Replacing Logic Modules

To make sure you have the correct replacement module, check the name of that module on the left side of the module handle. (The revision level is shown on the right side of the handle.) The card-cage slots are also labeled, as shown in Figure 3–3. Each module is keyed so that it can be locked in place only if it is in the proper slot. Trying to force a module into the wrong slot may damage the keys.

To replace a logic module, refer to Figure 3–3 and follow these steps:

1. Verify that the replacement module is at the same revision or a higher revision than the failed module.
2. If an AP/AP2 module is being replaced:
   - Make sure the switches on the replacement AP module are set to the same positions as the switches on the removed AP module.
   - Since the AP module contains the address ROM(s) for the bridge, the physical address of the bridge changes when the AP module is replaced. An address label on the module lists the new address.
3. Remove ac power to the bridge, disconnect all interface cables, and attach the ESD ground strap to your wrist and to the bridge (Section 3.2).
4. Check that the logic module ejector levers are in the unlock position (swung outward). Hold the replacement module component-side up and carefully slide it into the appropriate card cage slot until it makes contact with the backplane connector. Do not let the components on the bottom of the module scrape against the ejector levers of the module below it.
5. Firmly push the ejector levers inward until the module is fully seated into the connector. (Note: When all modules are properly inserted, all the ejector levers should be aligned.)
6. Using the Phillips-head screwdriver, tighten the two quarter-turn fasteners that attach the module to the card cage (by pushing in and turning the screwdriver clockwise).
7. Connect the interface cables, then the power cord (Section 3.2).
8. Wait for self-test to complete and check the state of the LEDs to ensure that the unit is operational (Section 2.2).

3.3.3 Removing and Replacing the Card Cage

To gain access to the fan assembly, power supply, or backplane, you must first remove the card-cage assembly from the bridge enclosure.

3.3.3.1 Removing the Card Cage

CAUTION ⚠

Do not leave the card cage partially withdrawn for servicing. Remove it completely from the enclosure and set it down on a horizontal surface.

To remove the card cage from the bridge enclosure, refer to Figure 3–4 and follow these steps:

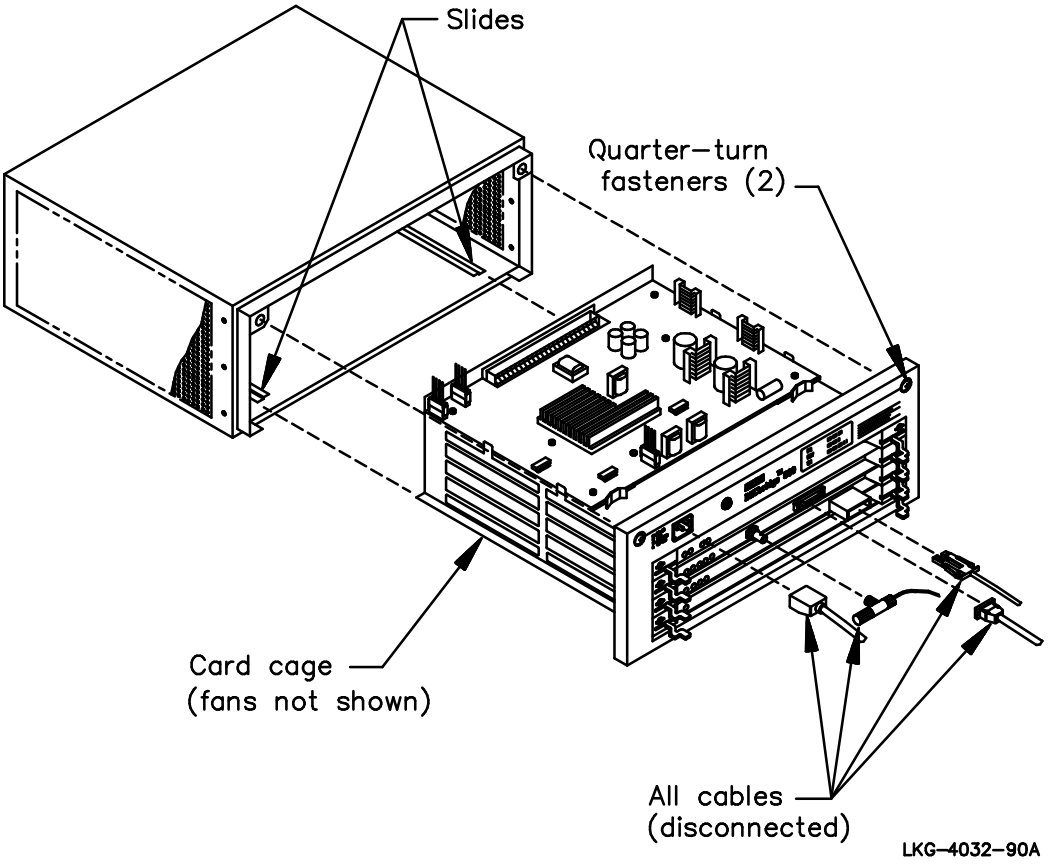
1. Remove power to the bridge and disconnect the interface cables (Section 3.2).
2. Attach the ESD ground strap.
3. Using a Phillips-head screwdriver, loosen the two quarter-turn fasteners at the upper corners of the bridge enclosure.

CAUTION ⚠

The card cage weighs approximately 11 kg (24 pounds). Support it well and handle it carefully during removal to avoid dropping it.

4. Firmly grasping each side of the card cage, slide it completely out of the bridge enclosure and set it down on a sturdy horizontal surface.

Figure 3–4: Card Cage Removal and Replacement



3.3.3.2 Replacing the Card Cage

To replace the card cage assembly in the bridge enclosure, refer to Figure 3–4 and follow these steps:

1. Make sure that power is removed from the bridge and the interface cables are disconnected (Section 3.2).
2. Make sure the ESD ground strap is attached (Section 3.3).

3. Firmly grasping each side of the card cage, align the runners on the card cage bottom with the guides in the bridge enclosure. Then, carefully push the card-cage into the enclosure.
4. Tighten the two quarter-turn fasteners to lock the card cage in place.
5. Connect the interface cables, then the power cord (Section 3.2).
6. Wait for self-test to complete and check the state of the LEDs to ensure that the unit is working properly (Section 2.2).

3.3.4 Removing and Replacing the Power Supply

The power supply module is located at the top of the card cage. Before removing the power supply module, first remove power from the bridge, disconnect the interface cables (Section 3.2), and attach the ESD ground strap. Then, remove the card cage from the bridge enclosure (Section 3.3.3.1).

WARNING ⚠

Lethal exposed voltages exist in the power supply. Therefore, always **disconnect the ac power cord** before removing or replacing any FRUs. Do not apply power to the bridge unless the card cage is fully inserted in the bridge enclosure. Only qualified service engineers should perform any FRU removal and replacement procedures.

3.3.4.1 Removing the Power Supply

To remove the power supply module, refer to Figure 3–5 and follow these steps:

1. Remove the card cage from the bridge enclosure (Section 3.3.3.1).
2. Disconnect the ac input connector that plugs into P3 on the power supply module.
3. Disconnect the fan assembly connectors that plug into J1 and J2 on the power supply module.
4. Remove the seven screws that secure the power supply module to the card cage. Place the screws nearby for use when replacing the power supply.

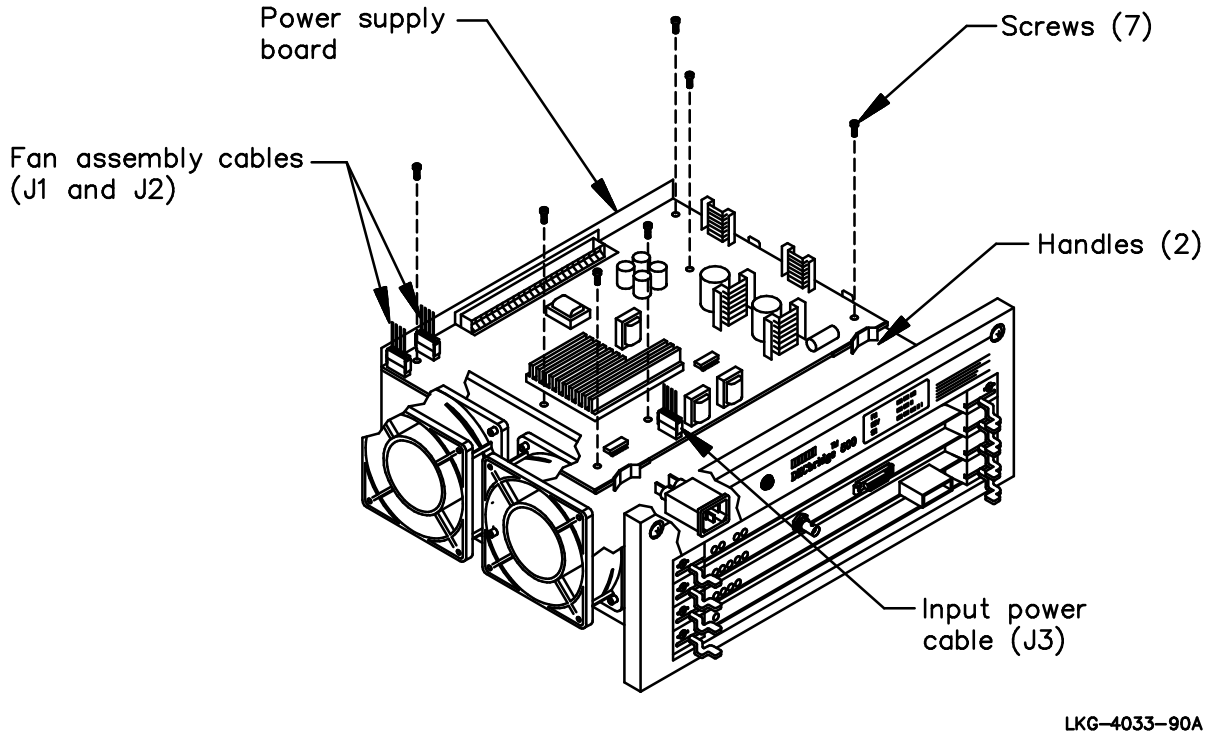
5. Use the small plastic handles on the power supply module to pull it forward out of its backplane connector, then lift the power supply module to remove it.

3.3.4.2 Replacing the Power Supply

To replace the power supply module, refer to Figure 3–5 and follow these steps:

1. Make sure that power is removed from the bridge and the interface cables are disconnected (Section 3.2).
2. Make sure the ESD ground strap is attached.
3. Make sure the insulator is in place between the power supply and card cage. Then, place the power supply module on top of the card cage, aligning its connector with the backplane connector.

Figure 3–5: Power Supply Removal and Replacement



4. Use the plastic handles on each side of the power supply module to push (or pull) the module into the backplane connector. You may find it easier to orient the unit so that the backplane is towards you, and then pull the power supply module into the backplane connector, rather than push it in.
5. Line up the screw holes in the power supply module with the corresponding tapped holes in the card cage, and replace the seven screws that secure the module in place.
6. Plug the two fan assembly connectors, P1 and P2, into power supply connectors J1 and J2.
7. Plug the ac input connector P3 from the line filter and circuit breaker into J3 on the power supply module.
8. Replace the card cage back into the bridge enclosure and tighten both quarter-turn fasteners (Section 3.3.3.2).
9. Connect the interface cables, then the power cord (Section 3.2).
10. Wait for self-test to complete and check the state of the LEDs to ensure that the unit is operational (Section 2.2).

3.3.5 Removing and Replacing the Fan Assembly

The fan assembly is located on the left side of the card cage. In case of a fan failure, replace the entire fan assembly (which includes both fans). To gain access to the fan assembly, you must first remove the card cage from the bridge enclosure. Before beginning this procedure, remove power from the bridge and disconnect the interface cables (Section 3.2) and attach the ESD ground strap.

WARNING ⚠

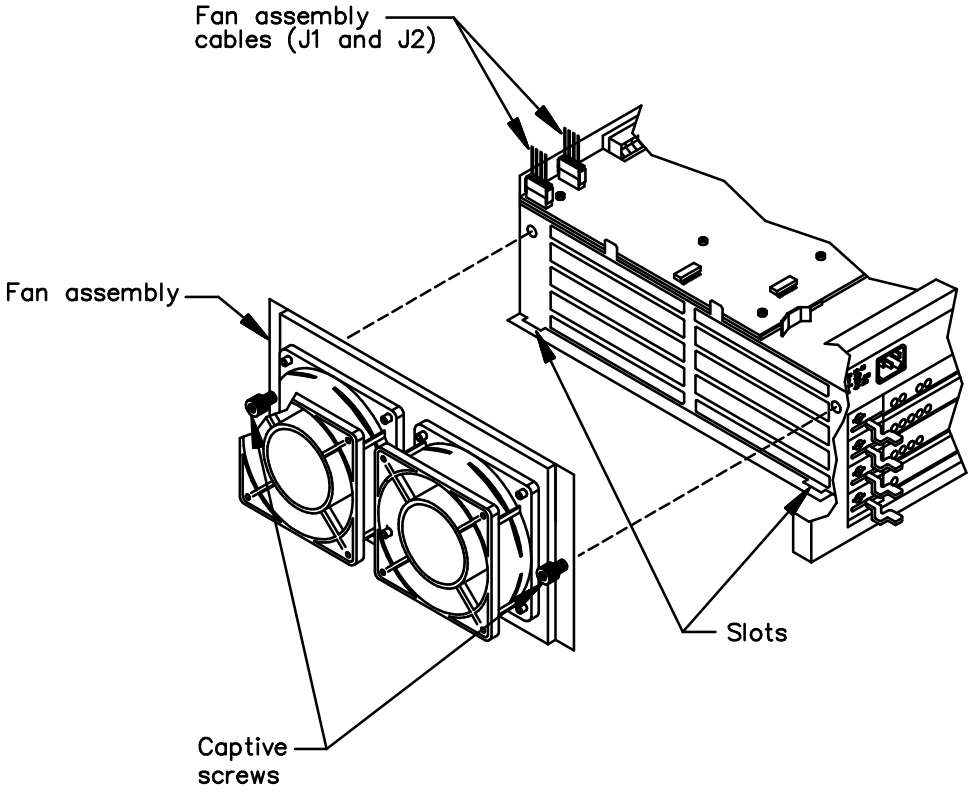
Lethal exposed voltages exist in the power supply. Therefore, always **disconnect the ac power cord** before removing or replacing any FRUs. Do not apply power to the bridge unless the card cage is fully inserted in the bridge enclosure. Only qualified service engineers should perform any FRU removal and replacement procedures.

3.3.5.1 Removing the Fan Assembly

To remove the fan assembly, refer to Figure 3–6 and follow these steps:

1. Remove the card cage from the bridge enclosure (Section 3.3.3.1).
2. Unplug the two fan assembly connectors, P1 and P2, from the power supply module.
3. Using a #2 Phillips-head screwdriver, unscrew the two captive screws on each side of the fan assembly.
4. Lift the fan assembly out of the card cage.

Figure 3–6: Fan Assembly Removal and Replacement



3.3.5.2 Replacing the Fan Assembly

To replace the fan assembly, refer to Figure 3–6 and follow these steps:

1. Make sure that power is removed from the bridge and the interface cables are disconnected (Section 3.2).
2. Make sure the ESD ground strap is attached.
3. Place the fan assembly in the side of the card cage, and align it so that the tabs in the bottom of the fan assembly fit into corresponding slots in the bottom of the card cage.
4. Tighten the two captive screws that hold the fan assembly in place.
5. Plug the fan assembly connectors, P1 and P2, into power supply connectors J1 and J2.
6. Place the card cage back into the bridge enclosure and tighten the two quarter-turn fasteners (Section 3.3.3.2).
7. Connect the interface cables, then the power cord (Section 3.2).
8. Wait for self-test to complete and check the state of the LEDs to ensure that the unit is operational (Section 2.2).

3.3.6 Removing and Replacing the Backplane

To gain access to the backplane, you must first remove the card cage from the bridge enclosure. Before beginning this procedure, remove power from the bridge and disconnect the interface cables (Section 3.2) and attach the ESD ground strap.

WARNING ⚠

Lethal exposed voltages exist in the power supply. Therefore, always **disconnect the ac power cord** before removing or replacing any FRUs. Do not apply power to the bridge unless the card cage is fully inserted in the bridge enclosure. Only qualified service engineers should perform any FRU removal and replacement procedures.

3.3.6.1 Removing the Backplane

To remove the backplane, refer to Figure 3–7 and follow these steps:

1. Remove the card cage from the bridge enclosure (Section 3.3.3.1).
2. Disengage the four modules from the backplane connector (Section 3.3.2.1).
3. Disengage the backplane connector from the power supply fingers and remove the backplane. (It is not necessary to unscrew and remove the power supply.)
4. Remove the 10 screws that secure the backplane to the card cage. Place the screws and backplane stiffeners nearby for use when replacing the backplane.

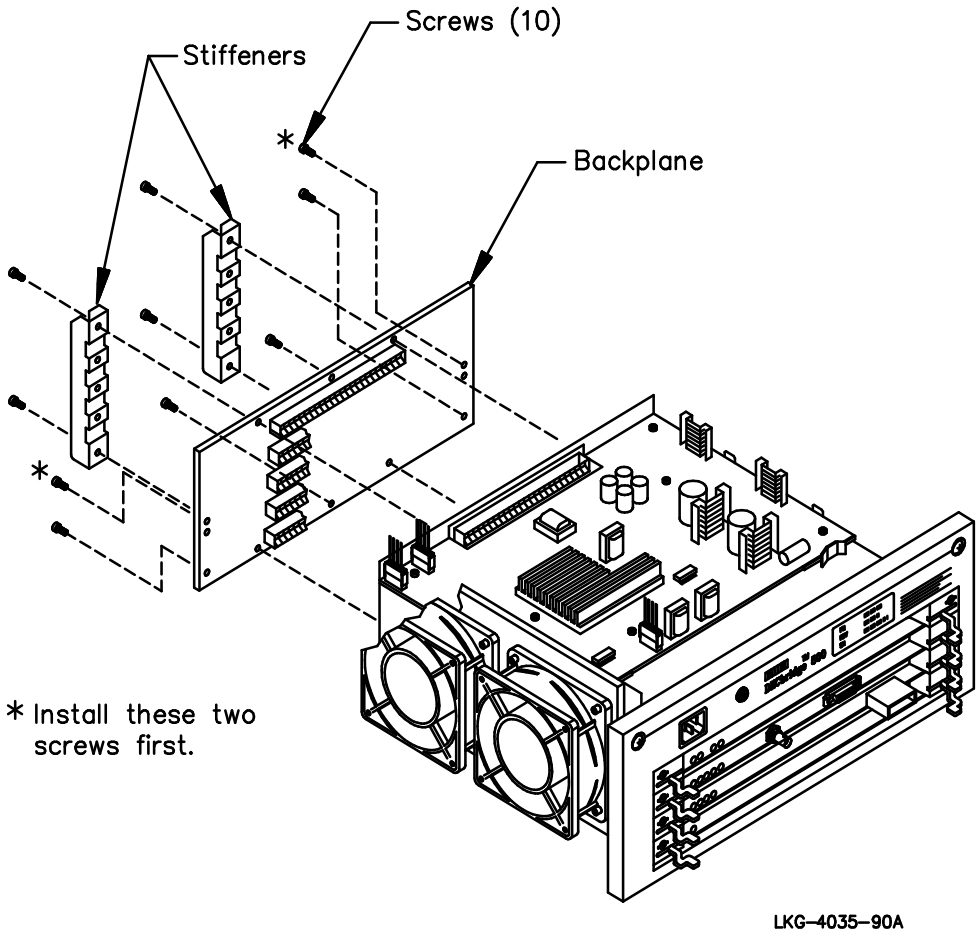
3.3.6.2 Replacing the Backplane

To replace the backplane, refer to Figure 3–7 and follow these steps:

1. Make sure that power is removed from the bridge and the interface cables are disconnected (Section 3.2).
2. Make sure the ESD ground strap is attached.
3. Make sure the power supply is properly screwed in place. Then, engage the backplane connector with the power supply fingers and snap it into place.
4. Align the screw holes in the replacement backplane with the corresponding tapped holes in the card cage. Then, use the 10 screws and backplane stiffeners saved from the removal procedure to attach the backplane in place. Insert (but do not tighten) the two screws at the upper corners of the backplane first, to align it. Then, insert the remaining eight screws. After inserting all 10 screws, tighten them all.
5. Reseat the four logic modules into the backplane connector by pushing the locking levers of each module inward and tightening the quarter-turn fasteners (Section 3.3.2.2).
6. Replace the card cage in the bridge enclosure and tighten the two quarter-turn fasteners (Section 3.3.3.2).
7. Connect the interface cables (Figure 3–2 for proper installation locations).

8. Connect the power cord (Figure 3–2). The bridge automatically powers up and runs self-test when the power cord is plugged in. Wait for self-test to complete and check the state of the LEDs to ensure that the unit is working properly (Section 2.2).

Figure 3–7: Backplane Removal and Replacement



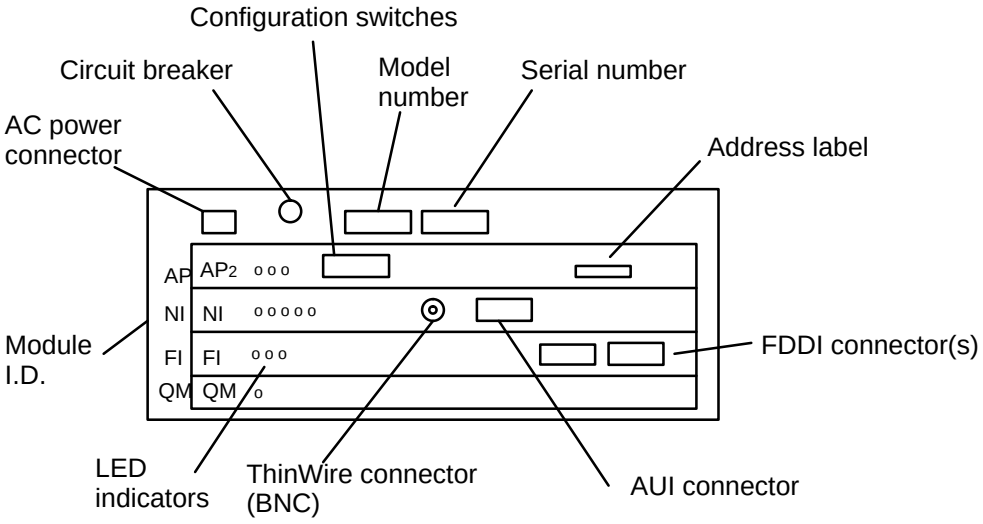
4

Technical Information

4.1 Physical Description

Figure 4–1 shows the I/O panel of a typical DECbridge 500/600 series unit (the DECbridge 520).

Figure 4–1: Typical DECbridge 500/600 Series Unit (I/O Panel)



The I/O panel of the DECbridge 500/600 series units contains the following components:

- Fiber optic connector(s) for the FDDI interface – DAS models have one FDDI type A and one type B connector; SAS models have one type S connector; the DECbridge 600 has no FDDI connector. Depending on the model, the connectors may be multimode or single-mode.
- Connector(s) for the IEEE 802.3/Ethernet AUI interfaces(s). The DECbridge 500 series models have a BNC connector for the ThinWire interface and a "D" connector for the AUI interface. The DECbridge 600 series models have three "D" connectors for three separate AUI interfaces.
- A standard IEC connector for the ac input.
- Circuit breaker (ac input).
- LED indicators (located on each of the four logic modules).
- Configuration switches (located on the AP/AP2 module).
- An address label showing the 48-bit physical addresses of the ports.

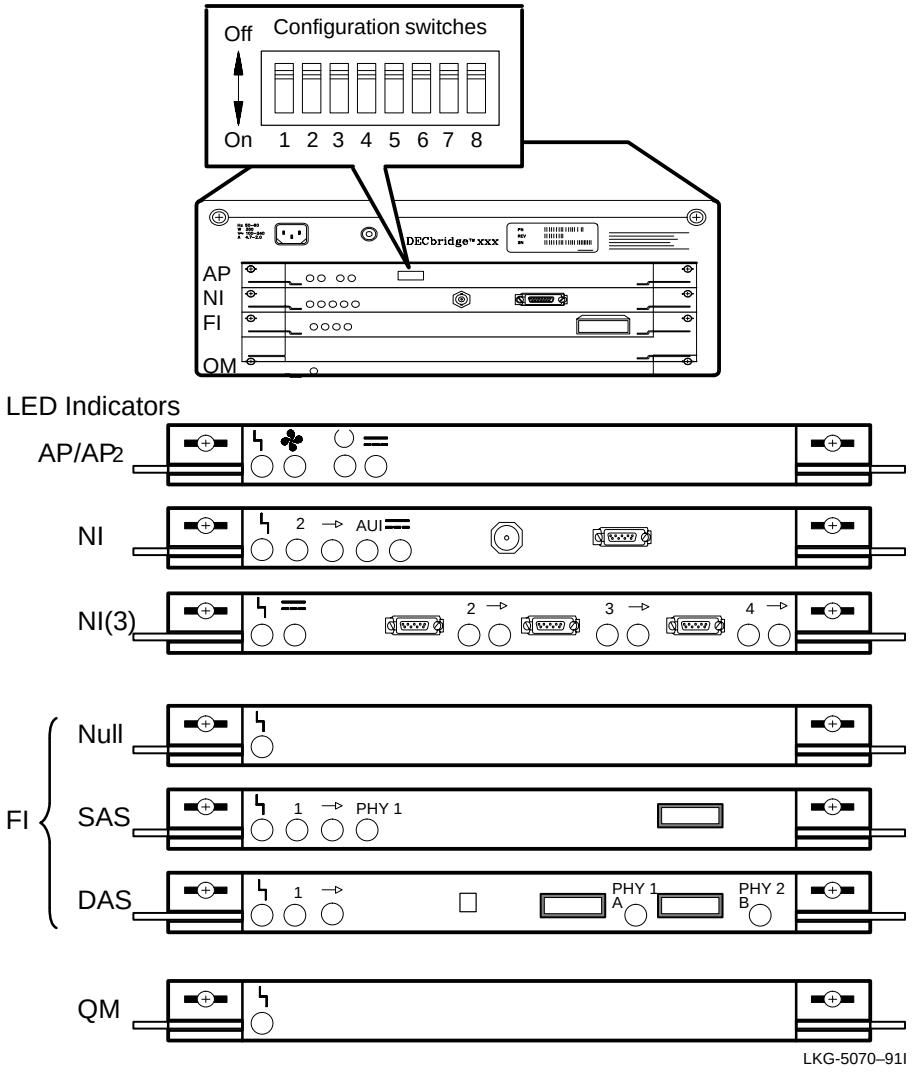
NOTE

The bridge does not have a power ON/OFF switch. Power is applied to the bridge when the ac power cord is plugged in. Neither does the bridge have a voltage select switch because the bridge automatically adjusts to a voltage range of 88 – 264 Vac.

4.2 DECbridge 500/600 Series Switches and Indicators

Figure 4–2 shows the location of the switches and indicators on all DECbridge 500/600 series units.

Figure 4–2: Switches and Indicators



4.2.1 Circuit Breaker

The circuit breaker provides overcurrent protection for the bridge. If an overcurrent condition causes the circuit breaker to trip, the white center portion of the breaker pops out and ac power is removed from the bridge. To reset the circuit breaker, push in the white center portion of the breaker.

4.2.2 Configuration Switches

The eight configuration switches located on the AP/AP2 module are listed in Table 4–1. A description of each switch follows the table.

Table 4–1: Configuration Switches

Switch	Name	Factory Setting	ON (Down)	OFF (Up)
1	Manufacturing mode	OFF	Select manufacturing mode	Select normal operating mode
2	Restore default parameters	OFF	Restore default parameters on power up	Use current parameters
3	Write access (FDDI - Port 1) [1]	OFF	Allow management write access on Port 1	No management write access on Port 1
4	Write access (Port 2) [1]	OFF	Allow management write access on Port 2	No management write access on Port 2
5	Write access (Port 3) [2]	OFF	Allow management write access on Port 3	No management write access on Port 3
6	Write access (Port 4) [2]	OFF	Allow management write access on Port 4	No management write access on Port 4
7	External loopback	OFF	Enable external loopback test	Normal operation
8	AUI/ThinWire[3]	OFF	Select AUI connection for Port 2	Select ThinWire connection for Port 2

[1] On the AP module (DECbridge 500 model only), switch 3 controls write access to Port 2 and switch 4 controls write access to Port 1. The DECbridge 600 has no Port 1.

[2] Only applicable when 3-port NI(3) module is installed.

[3] Only applicable when 1-port NI module is installed.

- **Switch 1 – Manufacturing mode** – Should always be in the OFF (up) position for normal operating mode. Manufacturing mode is only for use in a manufacturing environment or repair station. Always recycle ac power to the bridge after changing this switch setting.

- **Switch 2 – Restore default parameters** – Normally in the OFF (up) position. Turning it ON resets all parameters defined by bridge management and replaces them with the default factory settings. Always recycle ac power to the bridge after changing this switch setting.

- **Switch 3 – Write access Port 1*** – When this switch is ON, network stations with management capabilities can read and write (modify) bridge management parameters through the specified port. When this switch is OFF, those stations can read but cannot write bridge management parameters. The firmware checks the state of this switch whenever a write access to the bridge is attempted through the port.

- **Switch 4 – Write access Port 2* (or 1)** – Performs the write access function (described above) for Port 2.

- **Switch 5 – Write access Port 3** – Performs the write access function for Port 3. It is applicable only with a 3-port NI(3) module.

- **Switch 6 – Write access Port 4** – Performs the write access function for Port 4. It is applicable only with a 3-port NI(3) module.

- **Switch 7 – External loopback enable** – Should be in the OFF position during normal bridge operation. Turning it ON allows the self-test diagnostics to perform external loopback tests (providing external loopback connectors are in place). It also tests the optical bypass relay driver on DAS multimode units. Always recycle ac power to the bridge after changing this switch setting.

- **Switch 8 – AUI/ThinWire** – Applicable only with a 1-port NI module to select the interface connector. Placing the switch in the ON (down) position connects Port 2 to an AUI interface; placing the switch in the OFF (up) position connects Port 2 to a ThinWire interface. Changing this switch setting does not require recycling power to the bridge.

---

* In the DECbridge 500, switch 3 controls write access to Port 2 and switch 4 controls write access to Port 1.

4.2.3 Indicators

The LED indicators are located on the four logic modules and are visible from outside the unit. In general, green LEDs indicate the presence of power and show the state of each port; red LEDs indicate a fault; and yellow LEDs indicate the presence of activity on a communications link.

When the bridge is first powered on (ac power cord plugged in), all LEDs light momentarily to check the indicators. Once this lamp check is complete, the self-test diagnostics turn the LEDs off or leave them on according to the testing sequence. The functions of all LEDs in the DECbridge 500/600 series are described in Table 4–2.

Table 4–2: LED Indicators

LED	Symbol	Color	Normal	Description
AP2 or AP Module:				
AP BAD	↳	Red	Off	On -- Self-test failed Off -- Self-test passed Blink -- Incompatible firmware loaded
FAN BAD	✤	Red	Off	On -- Fan failure Off -- Fan OK
MODE	○	Green	On	On -- Bridge operational Off -- Self-test in progress Blink -- Down-line load in progress
DC OK	⎓	Green	On	On -- DC power OK Off -- DC power failure
QM Module:				
QM BAD	↳	Red	Off	On -- Self-test failed Off -- Self-test passed Blink -- Incompatible firmware loaded

Table 4–2 (Cont): LED Indicators

LED	Symbol	Color	Normal	Description
NI or NI(3) Module:				
NI BAD	↳	Red	Off	On -- Self-test failed Off -- Self-test passed Blink -- Incompatible firmware loaded
ACTn (n= 2, 3, or 4)	n	Yellow	On/Off	On -- NI port(n) carrier present Off -- NI port(n) carrier not present
FWDn	—▷	Green	On	On -- NI port(n) in forwarding state Blink -- NI port(n) in broken state Off -- NI port(n) not forwarding, not broken (in pre-forwarding or backup state)
AUI SELECT (**Series 500 only**)	AUI	Green	On/Off	On -- NI port AUI interface selected Off -- NI port ThinWire interface selected
EXT PWR OK	⎓	Green	On	On -- AUI transceiver power OK (In Series 500, not affected by AUI/ThinWire switch) Off -- AUI transceiver power failure
FI Module: (Note: FI Null Module has only the FI BAD indicator)				
FI BAD	↳	Red	Off	On -- Self-test failed Off -- Self-test passed Blink -- Incompatible firmware loaded
ACT1	1	Yellow	On/Off	On -- Valid traffic present Off -- Not transmitting/receiving valid packets
FWD1	—▷	Green	On	On -- FDDI port in forwarding state Blink -- FDDI port in broken state Off -- FDDI port not forwarding, not broken (in pre-forwarding or backup state)

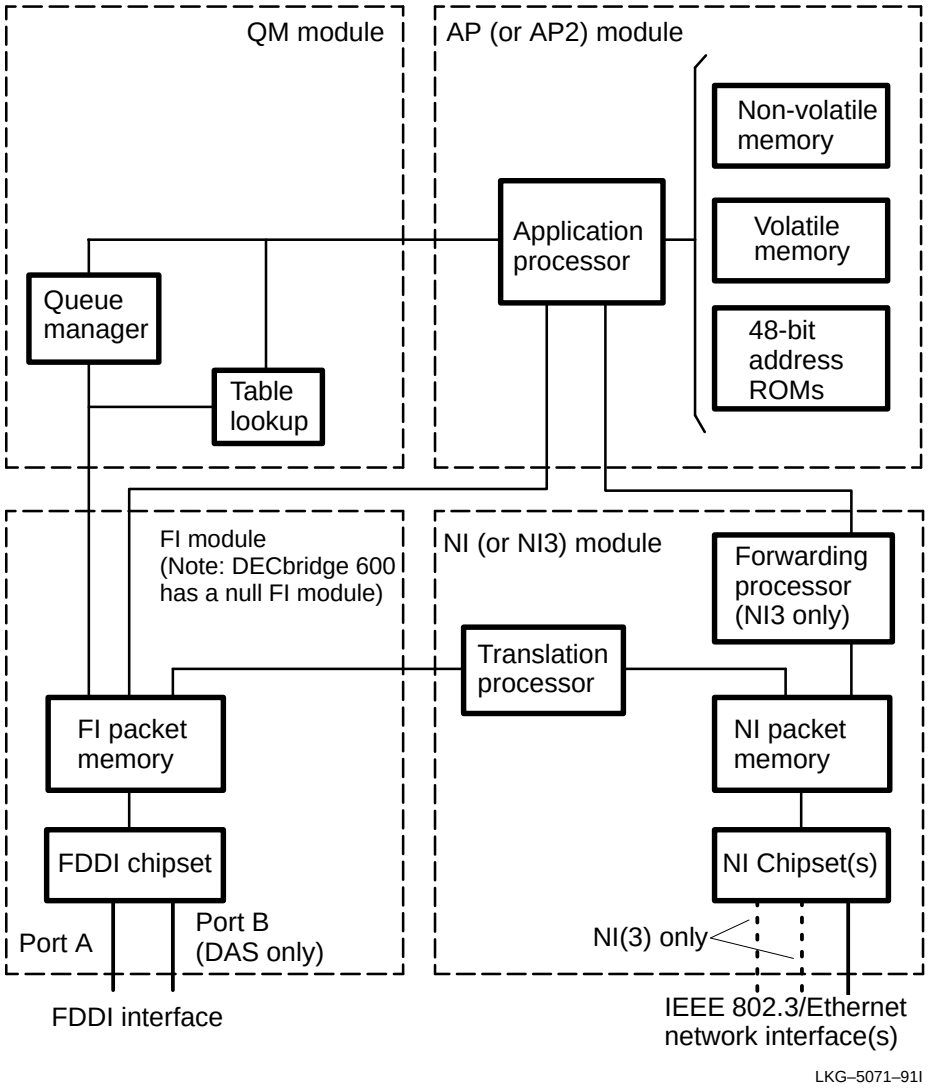
Table 4–2 (Cont): LED Indicators

LED	Symbol	Color	Normal	Description
PHY 1 (A)	PHY 1	Green	On	On -- PHY connection complete
		Green		Blink -- PHY connection in progress
		Red		On -- Broken port or Link Confidence Test (LCT) failure retry loop
		Red		Blink -- Illegal topology
				Off -- Port disabled via management
		Red/green		Blink -- Standby mode for this port when connected to concentrator.
PHY 2 (B) (**Only on DAS models)**	PHY 2	Green	On	On -- PHY connection complete
		Green		Blink -- PHY connection in progress
		Red		On -- Broken port or Link Confidence Test (LCT) failure retry loop
		Red		Blink -- Illegal topology
				Off -- Port disabled via management

4.3 Block Diagram Description

Figure 4–3 shows a simplified block diagram of the four logic modules in the DECbridge 500/600 series.

Figure 4–3: Simplified Block Diagram



4.3.1 AP2 (or AP) Module Description

The Application Processor (AP or AP2) module contains the main processing unit in the bridge. It makes most of the packet filtering/forwarding decisions, coordinates various bridge management tasks, and handles the spanning tree operation.

The module contains several blocks of memory. Volatile memory is used for storing program code and status information. Nonvolatile (read-only) memory is used for storing program code; nonvolatile (read/write) memory is used for storing downline loaded programs, bridge parameters and error logs.

The DECbridge 500 series has one address ROM to store the 48-bit physical address of the bridge. The DECbridge 600 series has two address ROMs: one stores the address of Port 1, and the other stores the address of Port 3. Addresses for Ports 2 and 4 are derived from these two stored addresses.

4.3.2 QM Module Description

The main function of the Queue Manager module is to service packets received from the FDDI link. The queue manager is supported by a table lookup (TLU) unit, which compares addresses of received packets with addresses stored in the bridge's address table. The results are used to implement address filtering of packets.

4.3.3 FI Module Description

The Fiber Interface (FI) module provides either a single attachment station (SAS) or dual attachment station (DAS) connection to the FDDI media. (In the DECbridge 600, a null FI module is used that has no FDDI interface.) The major functional blocks in the FI module are the FDDI chipset and the FI packet memory.

The FDDI chipset provides the FDDI interface and handles the protocol and memory access control for the FDDI port. In a DAS model, the FDDI chipset contains two PHY and PMD sections to provide the DAS connection. Each PMD section can handle either a standard ANSI or a single-mode interface.

The FI packet memory stores the frames received from the FDDI ring and the frames to be transmitted to the FDDI ring.

The DAS multimode version also provides control for an optional optical-bypass relay. This bypass relay helps maintain FDDI ring integrity if the bridge becomes broken or is powered down.

4.3.4 NI Module Description

The Network Interface (NI) module provides the interface to the IEEE 802.3/Ethernet network(s). Major components on this module are the NI packet memory, the NI chipset, and the translation processor. In addition, the NI3 module contains a forwarding processor.

The NI packet memory stores packets received from and destined to the IEEE 802.3/Ethernet network(s). It also provides a means of communication between the application processor and the translation processor.

The NI chipset provides the interface between NI packet memory and the physical interface circuitry. The NI chips perform all IEEE 802.3/Ethernet MAC-level functions, and also provide a direct memory access (DMA) to packet memory.

Because the FDDI and IEEE 802.3/Ethernet networks use different frame formats, the translation processor modifies the format of packets being forwarded from one network to the other.

The forwarding processor (in an NI3 module) handles the transfer of packets through the various queues in NI packet memory. Once the AP determines on what outbound port(s) a packet will be forwarded, the FP ensures that the packet is placed on the appropriate queue(s) to accomplish this.

4.3.5 Power Supply

The DECbridge 500/600 series power supply supplies the following outputs:

- +5.1 V at 50 amps (maximum)
- +12.0 V at 1.7 amps (maximum)
- –12.0 V at 1.7 amps (maximum)
- A separate, isolated 12 V at 1.0 amps (maximum) per fan

The power supply also provides the following features:

4.3.5.1 Power Supply Shutdown

If an overvoltage condition occurs at any of the power-supply outputs, the entire power-supply shuts down. The power supply outputs become latched and will NOT automatically recover even if the cause of the overvoltage condition is removed. To reset the supply and resume normal operation, you must cycle power by removing ac power to the unit, waiting at least 10 seconds, then reapplying the ac power.

4.3.5.2 Thermal Protection

If the temperature inside the power supply is too high for normal operation, the power supply protects itself by shutting down. When the overtemperature condition is corrected and the unit cools off, cycle the ac power input (as described in the previous paragraph) to reset the supply and resume normal operation.

4.3.5.3 DC OK Output Signal

The DC OK signal from the power supply controls the DC OK LED on the AP module. It is asserted (and the LED is on) when all the voltages (including the fan voltage) meet predetermined minimum thresholds:

- +5 Vdc output is above +4.5 Vdc
- +12 Vdc output is above +11 Vdc
- –12 Vdc output is below –11 Vdc
- +12 Vdc fan output is above +10 Vdc

4.3.6 Fan Assembly

The fan assembly provides the air flow used to cool the bridge. The assembly contains two fans and is located on the left side of the card cage. A circuit on the AP2 module monitors the rotation of the fans and sets a fan failure bit (in the AP2 module) whenever the fan is rotating too slowly or not at all. Both the self-test diagnostics and the operational firmware periodically check the status of the fans by reading this bit.

If the diagnostics detect a fan failure:

- The FAN_BAD indicator remains on after the lamp check is complete.
- If the diagnostics detect no fatal error (note that fan failure is not a fatal error), the operational firmware is invoked after self-test is complete.
- If the diagnostics detect a fatal error, the bridge is powered down after 2 minutes.

If the operational firmware detects a fan failure:

- The FAN_BAD indicator turns on.
- A management status bit is set to indicate the fan failure.
- After 5 minutes, the bridge is powered down.

4.4 Product Specifications

This section contains the physical, electrical, environmental, and cabling specifications for the DECbridge 500/600 series.

4.4.1 Physical Specifications

The DECbridge 500/600 series can be rackmounted or used on a desktop or shelf. The physical dimensions of the unit are listed in Table 4–3.

Table 4–3: Physical Specifications

Dimension	Value
Height	17.7 cm (6.9 in)
Width	44.2 cm (17.4 in)
Depth	36.5 cm (14.4 in)
Weight	14.5 kg (32 lbs)

4.4.2 Electrical Specifications

The DECbridge 500/600 series requires an ac power input in the range of 88 to 264 Vac. The electrical specifications of the unit are listed in Table 4–4.

Table 4–4: Electrical Specifications

Parameter	Value
Voltage	88 – 264 Vac, single phase, 3 wire
Frequency	47 Hz to 63 Hz
Current	3.9 A at 100 volts 1.7 A at 240 volts
Input power	390 watts (maximum)
Heat dissipation	1330 BTU/hr (maximum)

4.4.3 Environmental Specifications

The DECbridge 500/600 series is designed to operate in an open office environment, equipment room, or in an exposed area of an industrial site. The bridge is not designed for operation in an air plenum. Table 4–5 lists the environmental specifications of the bridge.

CAUTION

The ambient air temperature at the bridge air intake must not exceed 50° C (122° F).

Table 4–5: Environmental Specifications

Parameter	Value
Operating Environment:	
Temperature (at sea level)*	5° C to 50° C (41° F to 122° F)
Relative humidity	10% to 95% (non-condensing)
Wet-bulb temperature	32° C (90° F) maximum
Altitude	Sea level to 2.4 km (8000 ft)
Inlet air temperature	50° C (122° F) maximum
Non-Operating Environment:	
Temperature	–40° C (–40° F) to 66° C (151° F)
Relative humidity	10% to 95% (non-condensing)
Altitude	Sea level to 9.1 km (30,000 ft)

*Reduce the maximum operating ambient temperature by 1.8° C per 1000 meters (1.0° F per 1000 ft) for operation at high-altitude sites.

4.4.4 Cabling Specifications

Table 4–6 lists some of the specifications for the power cable, IEEE 802.3/Ethernet cable, and FDDI cable.

Table 4–6: Cable Specifications

Item	Value
Power:	
AC power cord length	U.S. -- 1.83 m (6 ft) Others -- 2.5 m (8.2 ft)
IEEE 802.3/Ethernet AUI Interface:	
Transceiver cable length	50 m (164 ft) maximum
IEEE 802.3/Ethernet ThinWire Interface:	
ThinWire cable length	185 m (606 ft) maximum
Recommended Multimode Fiber Interface Cable:	
Cable length	2 km (6561 ft) maximum
Nominal core diameter	62.5 ± 3.0 µm
Cladding diameter	125.0 ± 2.0 µm
Numerical aperture	0.275 ± 0.015
Modal bandwidth minimum	500 MHz•km @ 1300 nm, 160 MHz•km @ 850 nm
Maximum attenuation rate	1.5 dB/km @ 1300 nm, 3.5 dB/km @ 850 nm
Power budget	11.0 dB @ 1300 nm (for FDDI), varies by product @ 850 nm
Fiber optic connector types	Approved MIC plug types A, B, and S; maximum attenuation is 1.0 dB

Table 4–6 (Cont): Cable Specifications

Item	Value
Alternate Multimode Fiber Interface Cable:	
	100/140 / **50/125**
Cable length	2 km (6561 ft) maximum / 2 km (6561 ft) maximum
Nominal core diameter	100 µm* ± 4.0 µm / 50 µm* ± 3.0 µm
Cladding diameter	140 µm* ± 6.0 µm / 125 µm* ± 2.0 µm
Optical wavelength	1300 nm / 1300 nm
Numerical aperture	0.290 ± 0.015 / 0.200 ± 0.015
Modal bandwidth minimum	500 MHz•km @ 1300 nm / 500 MHz•km @ 1300 nm
Power budget for FDDI	11.0 dB / 6.0 dB
Maximum distance	1.6 km (.96 mi) / 2 km (1.2 mi)
(*Power budget contingent on core and cladding tolerances)	
Recommended Single-mode Fiber Interface Cable:	
Cable length	40 km (24.8 miles) maximum
Mode field diameter	8.2 µm to 10.5 µm
Cladding diameter	125 µm (± 2.0 µm)
Fiber cladding noncircularity	2% maximum
Core to cladding concentricity error	1 µm maximum
Nominal operating wavelength	1300 nm
Fiber cutoff wavelength	1270 nm maximum
Zero dispersion wavelength	1300 to 1322 nm
Zero dispersion slope	0.095 ps/(nm^2km) maximum
Optical power attenuation	≤0.40 dB per km at 1310 nm
Minimum power budget	22 dB at 1300 nm
Minimum required loss	12 dB at 1300 nm
Fiber optic connector types	Approved FC/PC plug types

A

Configuration Guidelines

This section presents general guidelines for installing a DECbridge unit or for troubleshooting configuration problems.

A.1 General Guidelines

- Ensure that the extended LANs connected to the IEEE 802.3/Ethernet ports are properly configured for IEEE 802.1d and LAN Bridge 100 spanning tree loop detection modes. This is especially important in networks that contain bridges that are not manufactured by Digital Equipment Corporation. Refer to the *Bridge and Extended LAN Reference* guide for further information.
- Bridges are used to interconnect single-LAN segments into an extended LAN. Each bridge starts a new single-LAN segment. The extended LAN can have a maximum of seven levels of bridges.

A.2 Bridge-to-FDDI Guidelines

- A SAS bridge can only be connected to the FDDI dual ring network through a concentrator. Port 1 of a SAS bridge is an S port. Although an S port can be legally connected to any type of FDDI port (A, B, M, or S), it is recommended that Port 1 be connected to an M port on the DECconcentrator 500 (if one is available). The connection is made through a fiber optic cable that meets the specifications described in Chapter 4.

- Port 1 of a DAS bridge has an A and a B connector that allows the bridge to be connected directly to the FDDI network. Port 1 (A) connects to the incoming Primary ring and the outgoing Secondary ring of the FDDI dual ring. Port 1 (B) connects to the outgoing Primary ring and the incoming Secondary ring of the FDDI dual ring.

- Bridge-to-FDDI connections can be either multimode or single-mode, depending on the model. The maximum cable length for multimode connections is 2 kilometers (6561 feet). The maximum cable length for single-mode connections is 40 kilometers (24.8 miles). If the connection is made through a patch panel, the total cable length must not exceed this maximum length. Single-mode connections must have a minimum optical power loss of 12 dB.

- For additional information and guidelines on fiber optic cable plants, refer to the *DECconnect System Fiber Optic Installation* guide and *DECconnect System Fiber Optic Planning and Configuration* guide.

A.3 Bridge-to-802.3/Ethernet Guidelines

DECbridge 500 series units can be connected to an IEEE 802.3/Ethernet network through either an AUI interface or a ThinWire interface. DECbridge 600 series units can be connected to three individual IEEE 802.3/Ethernet network segments through three separate AUI interfaces.

A.3.1 AUI Interface

The following rules and guidelines are for connecting the bridge to an IEEE 802.3/Ethernet network via the AUI interface:

- If the bridge connects to an IEEE 802.3 transceiver such as the H4005 or to a DESTA, the transceiver cable must be an IEEE 802.3-compliant transceiver cable (BNE3H/K/L/M or BNE4C/D).

- If the bridge connects to a non-IEEE 802.3 transceiver such as the H4000, the transceiver cable can be either Ethernet or IEEE 802.3 compliant.

- IEEE 802.3 transceiver cables and Ethernet transceiver cables cannot be interconnected.

- Maximum length of the transceiver cable cannot exceed 50 meters (164 feet). This maximum length can be decreased due to the *internal cabling equivalency* of a device (such as a DELNI) that is connected between the bridge and the transceiver, or due to the use of an office transceiver cable. The cabling equivalency of such a device must be subtracted from the 50-meter (164-foot) maximum. Note that the DECbridge 500/600 series does not have an internal cabling equivalency.

Cabling equivalency is a measure of the internal timing delay of a device expressed in meters of transceiver cable.

For example:

  - If a device has a 5-meter (16.4-foot) cabling equivalency, then its maximum allowable transceiver cable length is 50 meters (164 feet) minus 5 meters (16.4 feet) or 45 meters (148 feet).
  - Office transceiver cable (BNE4*x*-*xx*), due to its smaller diameter, has a signal loss that is four times that of the (BNE3*x*-*xx*) transceiver cable. If office transceiver cable is used, the maximum transceiver cable distance must be divided by 4. Thus, the maximum office transceiver cable length allowed is 12.5 meters (41 feet).

    If the configuration includes a device and the device has any internal cabling equivalency, this should be subtracted from the 50-meter (164-foot) maximum before dividing by 4. For example, if a device has a 10-meter (32.8-foot) cabling equivalency and is attached to its transceiver using office transceiver cable, then the maximum allowable transceiver length is 50 meters (164 feet) minus 10 meters (32.8 feet) divided by 4. The arithmetic result yields 10 meters (32.8 feet).

    For device-specific information related to cabling equivalency, refer to the *DECconnect System Planning and Configuration* Guide.

- When connecting the bridge to a configuration that includes a DELNI, allow 5 meters (16.4 feet) cabling equivalency loss for the DELNI.

A.3.2 ThinWire Interface

The following rules and guidelines are for connecting a DECbridge 500/600 series unit to an IEEE 802.3/Ethernet network via the ThinWire interface.

- The maximum length for a continuous segment of ThinWire cable is 185 meters (606.9 feet).
- The minimum bend radius of ThinWire cable is 2 centimeters (.75 inches).
- No more than 30 stations are allowed on a segment. The DEMPR, if configured, counts as one station. In a DECconnect configuration with faceplates and satellite equipment rooms, only 28 stations are allowed.
- No more than 60 male/female connector junctions are allowed on the segment.
- The ThinWire cable must be properly terminated at both ends with 50-ohm terminators. If a DEMPR is attached to one end of the cable, the DEMPR provides the termination for that end; a terminator is still required for the other end.

B

FDDI Connection Information

B.1 FDDI Connection Rules

The FDDI connection rules are defined in Figure B–1. The table defines which port types (A, B, M, S) may be interconnected into legal topologies. In the figure, **This Node** is the reference point for all connection decisions.

Figure B–1: FDDI Connection Rules Matrix

This Node

Other Node: PHY port	A	B	M	S
A	No	Rule 1	Yes	Yes
B	Rule 2	No	Yes	Yes
M	Rule 3	Yes Note 1	No	Yes
S	Yes	Yes	Yes	Yes

Yes = Accepts this connection
No = Does not accept this connection

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Rule 1: PHY B of This Node accepts connection to PHY A of Other Node if:

- PHY A of This Node is not connected, or
- PHY A of This Node is connected to PHY B or PHY S of another node.

Rule 2: PHY A of This Node accepts connection to PHY B of Other Node if:

- PHY B of This Node is not connected, or
- PHY B of This Node is connected to PHY A or PHY S of another node.

See also Note 2.

Rule 3: PHY A of This Node accepts the connection to PHY M of Other Node if:

- PHY B of This Node is not connected, or
- PHY B of This Node is connected to PHY A or PHY S of another node.

See also Note 2.

Note 1: Backup tree connection (dual homing)

The connection of PHY B of This Node to PHY M of Other Node always takes precedence over the connection of PHY A of This Node to PHY M of another node.

When a connection between PHY A of This Node and a PHY M or PHY B of another node exists, it is disabled when PHY B of This Node connects to PHY M of Other Node.

If the connection breaks between PHY B of This Node and PHY M of Other Node, the connection is reestablished between PHY A of This Node and PHY M of another node.

Note 2: Tree connections are preferred over dual ring connections

Tree connections are preferred over dual ring connections when only one of two connections may be accepted.

The connection of PHY A or B of This Node to PHY M of Other Node always takes precedence over the connection of the remaining PHY (A or B) of This Node to PHY A or PHY B of another node.

The connection is disabled between the remaining PHY (A or B) of This Node and PHY A or PHY B of another node when PHY A or PHY B of This Node connects to PHY M of Other Node.

B.2 FDDI Connector Keying

The DECbridge 500/600 series uses the following FDDI connector types:

- Media Interface Connectors (MIC) for multimode type connections
- FC/PC for single-mode type connections

The MICs are designed to align the fiber cable properly with the transmit and receive optics — that is, they are keyed and must be aligned properly. DAS versions of the bridge use MIC A and MIC B type connectors to connect the bridge to the dual ring. SAS versions of the bridge use a single MIC S connector to connect to a concentrator (see Figure B–2).

Figure B–2: FDDI Connector Keying

Connector keying:

MIC A Primary in/secondary out–DAS A port
MIC B Primary out/secondary in–DAS B port
MIC M Concentrator M port
MIC S SAS S port

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The position of the keyway on the MIC plug determines the type of receptacle to which it connects. A MIC S plug fits all receptacles. The other MIC plugs and receptacles (type A and B) must match for proper installation.

The FC/PC single-mode connectors are not keyed but are identified by transmit ( ) and receive ( ) icons.

C

Related Documents

Additional information relating to problem-solving the DECbridge 500/600 series can be found in the following documents. Ordering information is provided at the back of this manual.

- *DECbridge 500/600 Series Installation and Upgrade* (Order No. EK-DEFEB-IN)

  Explains how to install the DECbridge 500/600 series units, how to verify their operation once installed, and how to upgrade from one model to another.

- *FDDI System Level Description* (Order No. EK-DFSLD-SD)

  Describes Digital's Fiber Distributed Data Interface (FDDI), how it works, and the role of the individual FDDI components. This guide also discusses Digital's approach to network management and the facilities provided by network management software.

- *Bridge and Extended LAN Reference* (Order No. EK-DEBAM-HR)

  Describes how bridges are used to create extended local area networks (LANs). Includes information on LAN interconnections, overall bridge operation, spanning tree, bridge management, and possible solutions to bridge-related problems in a network.

- *DECconcentrator 500 Installation* (Order No. EK-DEFCN-IN)

  Explains how to install a DECconcentrator 500 unit and how to check its installation and operational status.

- *DECconcentrator 500 Problem Solving* (Order No. EK-DEFCN-PS)

  Explains how to troubleshoot and service the DECconcentrator 500 unit. Includes a product overview, problem-solving methods, and removal and replacement procedures for field-replaceable units (FRUs).

- *DECconnect System Fiber Optic Planning and Configuration* (Order No. EK-DECSY-FP)

  Provides an overview of Digital's structured wiring network along with guidelines for planning, configuring, and designing fiber optic subsystems within the network.

- *DECconnect System Fiber Optic Installation* (Order No. EK-DECSY-FI)

  Contains guidelines for installing fiber optic cables and passive equipment in a DECconnect System fiber optic structured-wiring network, along with test procedures for certifying the installation.

- *DECconnect System Planning and Configuration* (Order No. EK-DECSY-CG)

  Contains planning requirements and guidelines for configuring DECconnect System networks and other networks that use DECconnect System products.

- *DECconnect System Facilities Cabling Installation* (Order No. EK-DECSY-FC)

  Provides procedures for properly installing Ethernet coaxial cables, twisted-pair cables, andThinWire cables within a DECconnect System site.

- *DECelms Use* (Order No. AA-PAK2A-TE)

  Describes how to use DECelms (Digital Extended LAN Management Software) to configure, manage, and monitor the DECbridge 500, DECconcentrator 500, and all Digital LAN Bridge products.

- *DECmcc Bridge Access Module Use* (Order No. AA-PD1BC-TE)

  Describes how to use the DECmcc (Digital Management Control Center) Bridge Access Module to manage bridges.

Index

E

F

I

K

L

M

N

O

P

Q

R

S

T

V

W

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