DIGITAL ATM Modular PHY Cards

Installation

Order Number: EK-DAGGM-IN. D01

July 1997

This document describes how to install and verify the operation of the DIGITAL ATM modular PHY cards.

Revision/Update Information: This is a revised manual.

Contents

A Media Connection Information

B Interface Specifications

Figures

Tables

Preface

This manual explains how to install the DIGITAL ATM modular PHY (modPHY) cards and how to verify their installation and operation.

Intended Audience

This manual is for the user who has experience installing system hardware.

Document Structure

This manual is structured as follows:

- Chapter 1 provides an overview of ATM technology and a description of the modPHY cards.

- Chapter 2 describes the procedure for installing the modPHY card.

- Chapter 3 contains information about the operation of the modPHY card.

- Appendix A contains media connection information.

- Appendix B contains interface specifications.

Additional Resources

Additional information is available from DIGITAL in the *OPEN DECconnect Applications Guide*, EC-G2570-42. To order this document, refer to the directions in the How to Order Additional Documentation section.

The following documents provide information about the implemented standards:

- UNI V3.1, ATM User-Network Interface Specification

- CCITT Recommendation I.432, B-ISDN UNI-Physical Interface Specification

Online Services

Product-specific information is available from the DIGITAL Network Product Business Web Site and Bulletin Board System.

The Network Product Business Web Site can be reached from different geographic locations using the following URLs:

Americas	`http://www.networks.digital.com/`
Europe	`http://www.networks.europe.digital.com/`
Australia	`http://www.digital.com.au/networks/`
Japan	`http://www.dec-j.co.jp/ic/network/`

To connect to the Network Product Business Bulletin Board System, you need a PC and a modem. Dial 508-486-5777 (U.S.A.). Set your modem to 8 bits, no parity, 1 stop bit.

Conventions

The following conventions are used in this document:

`Special type`	Indicates a literal example of system output.
italic type	Used in command syntax or examples to indicate variables for which either the user or the system supplies a value, and indicates the complete titles of manuals.

How to Order Additional Documentation

To order additional documentation, use the following information:

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

Safety Statements

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 cautions you must observe for the hardware described in this manual appear below in English, German, French, and Spanish.

Caution	Static electricity can damage modules and electronic components. DIGITAL recommends using a grounded antistatic wrist strap and a grounded work surface when handling any modules.
Achtung	Module und elektronische Komponenten können durch elektrostatische Entladungen beschädigt werden. Benutzen Sie immer eine antistatische Gelenkmanschette und eine geerdete Arbeitsunterlage, wenn Sie am offenen Gerät arbeiten.
Attention	Les charges excessives d'électricité statique peuvent endommager les modules et les composants électroniques. DIGITAL conseille l'utilisation d'un bracelet de masse et d'un plan de travail mis à la terre lors de la manipulation des modules.
Precaución	La electricidad estática puede dañar los componentes electrónicos y los módulos. DIGITAL recomienda que se utilicen cintas de pasadores y superficies de trabajo conectadas a tierra al trabajar con cualquier módulo.

The warnings you must observe for the hardware described in this manual appear below in English, German, French, and Spanish.

Warning	Some fiber-optic equipment can emit laser light that can injure your eyes. Never look into an optical fiber or connector port. Always assume the cable is connected to a light source.
Vorsicht	Schauen Sie niemals direkt in ein Glasfaserkabel oder einen Glasfaseranschluß. Die Laserstrahlen in faser-optischen Geräten können Augenverletzungen verursachen.
Danger	Certains équipements utilisant les fibres optiques peuvent émettre des rayonnement laser dangereux pour les yeux. Ne vous avisez jamais de regarder par l'extrémité d'une fibre optique ou dans l'ouverture d'un connecteur. Considérez toujours que le câble est relié à une source lumineuse.
Aviso	Algunos equipos de fibra óptica pueden emitir luz láser que daña los ojos. No sedebe mirar en una puerta de conector o fibra óptica. Siempre se debe suponer que el cable está conectado a la luz.

1

Introduction

This chapter describes the DIGITAL ATM modular PHY (modPHY) cards.

1.1 ATM modPHY Cards

The ATM modPHY cards allow the exchange of data between different ATM systems using particular Physical Layer (PHY) types. ATM modPHY cards provide the media-specific portion of an ATM interface to support ATM connectivity across multiple platforms for different media types at speeds up to 155.52 Mb/s.

The host system provides the power, initialization, and control for the modPHY card. The modPHY card is used with an ATM segmentation and reassembly (SAR) or cell-switching function.

ATM modPHY cards are optional single-port daughter cards that:

- Provide a customer-installable, field-replaceable module

- Provide front insertion, hotswapping capabilities, and FLOWmaster flow control if supported by the host system

- Support cabling and connectors for:

    - STS-3c (155 Mb/s) multimode fiber (MMF), DAGGM-AA

    - STS-3c (155 Mb/s) single-mode fiber (SMF), DAGGS-AA

    - STS-3c (155 Mb/s) unshielded twisted-pair (UTP) or

      STS-3c (155 Mb/s) screened twisted-pair (ScTP), DAGGU-AA

    - T3 (44 Mb/s) coaxial, DAGGT-AA

    - E3 (34 Mb/s) coaxial, DAGGE-AA

    - E1 (2 Mb/s) short reach twisted-pair (TP), DAGE1-AA

    - T1 (1.54 Mb/s) short reach twisted-pair (TP), DAGT1-AA

Figure 1–1 shows ATM modPHY card components for the MMF modPHY card.

Figure 1–1 ATM modPHY Card Components
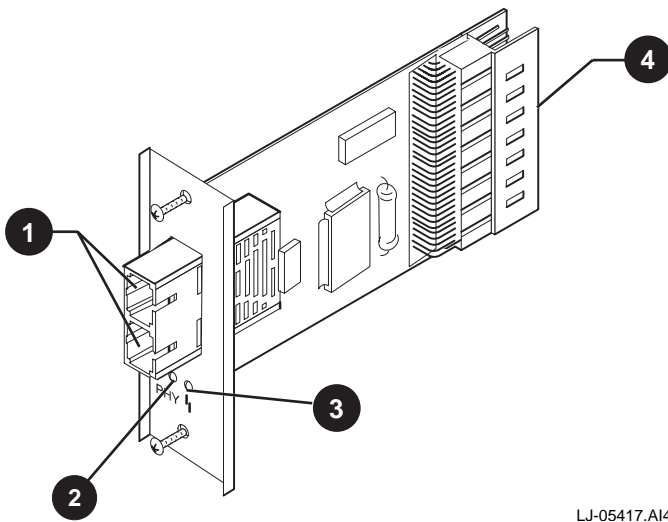
LJ-05417.AI4

Item	Control/Connector
1	SC-type transmit and receive connectors
2	PHY LED
3	FRU/Mode LED
4	96-pin host connector

1.2 Hotswap Support

The modPHY cards support hotswap. However, make sure that your host system
supports hotswap before attempting to perform this operation. Refer to the host sys-
tem's documentation for information about hotswap support.

Note

Hotswapping a modPHY card in a host system that does not support
hotswap can cause undesired behavior.

2

Installing the modPHY Card

This chapter explains how to install the DIGITAL ATM modPHY card.

2.1 Unpacking and Checking the Contents

The modPHY card is shipped in one box. Remove the contents from the box and be sure to keep all original packing materials.

Check the shipment for damage. In case of damage, contact your delivery agent and your DIGITAL sales representative.

Caution

Static electricity can damage modules and electronic components. DIGITAL recommends using a grounded antistatic wrist strap and a grounded work surface when handling any modules.

2.2 Required Tools

Installation of the ATM modPHY card requires the following tools:

- Phillips-head screwdriver
- Antistatic grounding strap

2.3 Preparing for Installation

Before you begin to install the ATM modPHY card into the system unit, you must understand whether your system supports hotswap and how that might affect your system.

Note

Hotswapping a modPHY card in a host system that does not support hotswap can cause undesired behavior.

The steps needed to initialize a modPHY card inserted into an operational system can vary. For additional information about your specific system, refer to the other documentation that shipped with your system unit.

2.4 Preparing a System

To prepare your system for the modPHY card installation, perform these steps:

1. Refer to the host system's documentation to determine what steps you need to take before installing any modPHY cards. For example, check to see whether you need to power down the system or remove any modules before attempting this operation.

2. Determine which ports to use.

3. Remove the component that is in the slot of the selected port.

   - Remove the modPHY card if there is already one in the slot. Refer to Section 2.4.1 for more information about this procedure.

   - Remove an empty option slot cover from your system unit (see Section 2.4.2).

2.4.1 Removing the Card

Refer to Figure 2–1 when removing the modPHY card.

1. Locate the captive screws that fasten the modPHY card to the host module.

2. Set up the electrostatic discharge (ESD) equipment.

3. Slip on the ESD wrist strap.

4. Use a Phillips-head screwdriver to loosen the two captive screws that hold the modPHY card in place. Loosen each screw until it is freed from the chassis (about 0.25 inch [0.63 cm]). The screws should be loose but still attached to the modPHY card.

5. Grasp the captive screws and disconnect the modPHY card from the host by pulling on the screws. Gently slide the modPHY card out of the slot after you have disconnected it from the host.

6. Place the modPHY card in a static-proof bag.

Figure 2–1 Removing the modPHY Card
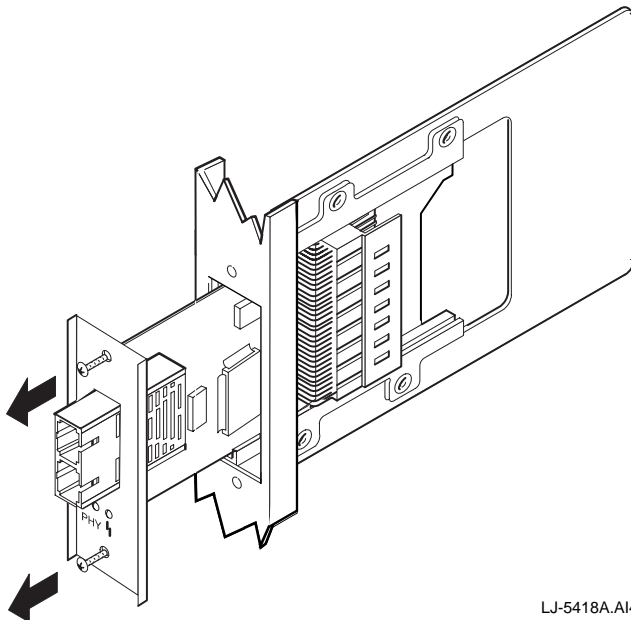
LJ-5418A.AI4

2.4.2 Removing the Slot Cover

Refer to Figure 2–2 when removing the slot cover.

1. Use a Phillips-head screwdriver to loosen the two captive screws that hold the option slot cover in place.

2. Save the option slot cover.

Figure 2–2 Removing the Slot Cover

LJ-05419.AI4
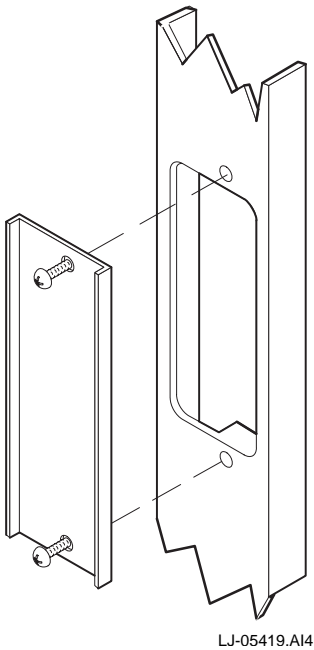
2.5 Installing the Card

Refer to Figure 2–3 when installing the ATM modPHY card into your system.

1. Attach one end of the antistatic wrist strap to your wrist and the other end to the system.

Caution

Static electricity can damage modules and electronic components. DIGITAL recommends using a grounded antistatic wrist strap and a grounded work surface when handling any modules.

---

2. Hold the modPHY card by the edges and position it so that it is parallel with the slot opening.

3. Insert the modPHY card through the opening in the system unit by aligning the sides of the modPHY card with the card guide.

4. Push the modPHY card into the slot until the 96-pin connector is firmly seated on the motherboard.

5. Fasten the modPHY card to the system unit with the two captive screws. Torque to 5 in-lb (0.56 N-m).

Figure 2–3 Installing the modPHY Card

LJ-5424A.AI4

3
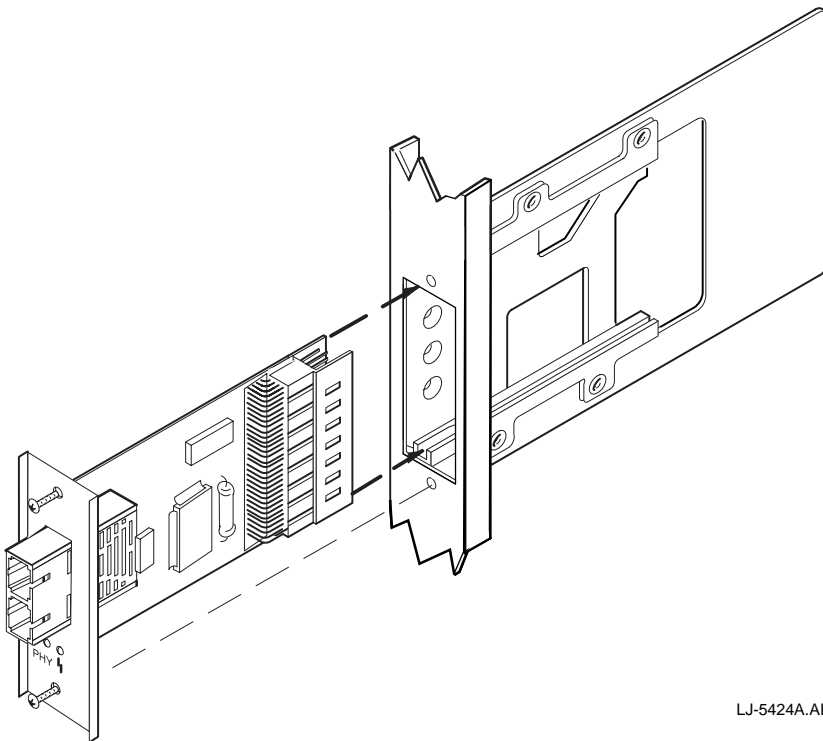
Using the modPHY Card

This chapter explains the operation of the DIGITAL ATM modPHY cards. After
you install the card, it must be initialized.

3.1 Initializing the modPHY Card

The modPHY card must be initialized upon insertion into your system. Systems that
support hotswap perform this procedure automatically. Refer to your system docu-
mentation for information about module initialization and hotswap support.

After initialization, the two LEDs on the modPHY card provide information about its
operation. The Physical Layer (PHY) LED is labeled PHY and indicates the state of
the Physical Layer interface. The field-replaceable unit/mode (FRU/Mode) status
LED is labeled with a broken line and indicates the port's fault or diagnostic status.

If your system supports hotswap, the PHY and FRU/Mode LEDs flash green three
times after the modPHY card is inserted to indicate the recognition and initialization
of the modPHY card. Table 3–1 describes other LED indications that occur after this
point.

If your system was powered up before the insertion of the modPHY card and it does
not support hotswap, the LEDs should remain unlit.

If none of the LEDs light within 10 seconds after the card is inserted, either your sys-
tem does not support hotswap or the card has a fault.

- If your system does not support hotswap, you have to reinitialize the host mod-
  ule. Refer to your system documentation for more information.

- If your system supports hotswap, replace your card or contact your DIGITAL
  sales representative.

3.2 Verifying Operability

A modPHY card might be operational but inactive because it is not connected to a remote system. In this situation, both the PHY and FRU/Mode LEDs are unlit.

Once the card is connected to another system, verify that the connection is active by checking the LEDs.

If your system supports hotswap and:

- Neither LED lights, you should perform a loopback test.

- The LEDs do light, refer to Table 3–1 to determine whether you must take any action.

Table 3–1 LED Conditions

Indication	Action
FRU/Mode LED is amber.	The diagnostics have detected a fault. If possible, try the modPHY card in another slot to determine whether the modPHY card or the host module contains the fault. If the modPHY card contains the fault, replace your card or contact your DIGITAL sales representative.
FRU/Mode LED is blinking green.	The port has been redirected elsewhere. See the host system's documentation for more information about a redirected port.
PHY LED is green.	No action is necessary. The card is working properly and a link is established.
PHY LED is amber.	The port is inactive due to excessive media errors. Perform loopback testing to isolate the problem.
PHY LED is blinking green.	The card has been disabled by management.
PHY LED is off.	Refer to Section 3.3 for information about checking your connections. There might be a connection problem because the port is unable to receive from the neighboring switch or station.

3.3 Checking the Connections

If you cannot establish a link to an attached system, make sure that you have the correct cable for your particular type of port. For example, SMF cables are not interchangeable with MMF cables even though they look similar.

3.3.1 Using Loopback Connectors

If the correct cables are being used, test the port connections with loopback connectors. Loopback connectors help to isolate your connection problems. Refer to Appendix A for more information about the appropriate loopback connectors used for testing different types of ports.

3.3.2 Performing Loopback Testing

Loopback testing verifies the ability of a port to transmit and receive, and isolates a problem to a particular element of a connection; that is, one of the ports or the media connecting them. Tests on the individual ports allow independent verification of each port as operational. If neither port is identified as faulty, the media is suspected. If replacement cables cannot be used, then continuity tests or cable loss measurements are needed to identify the media problems for repair purposes.

The loopback test configuration involves connecting a particular port's transmitter to its own receiver. (Special connectors or cables might be required.) In this configuration, the PHY LED should be solid green. Other LED indications are associated with module faults or uninitialized cards.

Refer to Appendix A for more information about attaching and removing connectors.

3.4 Configuring the Physical Layer

The modPHY cards support the following modes of operation:

- Diagnostic mode
- Normal mode with local clock and loop timing
- Synchronous clock domains

The user can configure these operation modes by using host-specific commands. The commands to invoke these modes can be found in the host system documentation that describes the host's management facilities.

3.4.1 Diagnostic Mode

In addition to the external loopback configuration described in Section 3.3, modPHY cards also support a diagnostic mode called line loopback. In line-loopback mode, the port's received data stream becomes the transmitted data stream instead of normal host-supplied data. This mode is commonly used to determine the bit-error rate

performance of the receiver or to allow links to be tested from the far end of a connection. A host cannot communicate using a port that is in this special diagnostic mode. All modPHY cards support this mode of operation.

3.4.2 Clock Modes During Normal Operation

During normal operation, the received data is passed from the modPHY card to the host and outgoing host data is transmitted by the modPHY card. Each modPHY card supports two modes of transmitter operation as defined by the source of the clock used for transmission.

- Local clock source operation:

  Transmission is based on a local clock source. All modPHY cards support this mode which is the default configuration.

  Some modPHY cards accept a local clock reference from the host system and can transmit synchronously to other ports as described in Section 3.4.3.

- Loop-timing operation:

  Host data is transmitted based on the external clock recovered by the same port's receiver. All modPHY cards have this capability although it must be selected by management.

  This mode of operation is often required for connections to a public service provider. If loop-timing operation is selected but the received clock is absent, the port will transmit based on a local reference until a received clock is again recovered by the port.

3.4.3 Synchronous Clock Domains

Some ATM applications require timing information derived from a clock recovered from the network data connection and require the exact recovered clock frequency. A synchronous clock domain includes the set of nodes that transmit signals based on a single reference clock and the nodes that receive and use this timing information.

The modPHY cards that can be part of a synchronous clock domain are the DAGGM-AA, DAGGS-AA, and DAGGU-AA cards. These modPHY cards can transmit with a signal synchronized to other ports on the same host. The size of this clock domain depends heavily on the capability of the ATM switch that is the modPHY host. If an ATM switch has the capability to accept an external clock, then this common clock domain can span multiple switches.

The DAGGM-AA, DAGGS-AA, and DAGGU-AA modPHY cards can be chosen by the host to provide the external reference clock signal. All other DIGITAL ATM modPHY cards cannot be synchronized to other ports nor provide an external reference clock signal to the host.

3.5 Configuration Guidelines for Physical Layer Parameters

This section describes the configuration options for Physical layer (PHY) parameters that you should be aware of when trying to manage connections to your DIGITAL ATM modPHY cards. In particular, you must manually configure the following PHY parameters if the default values for your ATM modPHY card connections do not agree with those of an attached node:

- Framing

- Cell mapping

- Clock source

- Line buildout

All these parameters have default values during normal operation. If you use these default values, loopback testing should be successful and indicate any faults.

You can set the values of some parameters to support interoperability with other equipment using the ATM console commands or SNMP for your system modules. However, if you change the default values for the clock source or line buildout parameters, loopback testing might fail. Check your host system documentation for information about other PHY types that might not be listed.

3.5.1 Framing

The framing parameters must be the same at both ends of a connection or it might result in an inoperational connection. The values of the framing parameters for different PHY types are shown in Table 3–2.

Table 3–2 Framing Parameter Values

PHY Type	Values	Default Value
155 Mb/s MMF	SONET, SDH	SONET
155 Mb/s SMF	SONET, SDH	SONET
155 Mb/s UTP	SONET, SDH	SONET
T1 TP	ITU G.804	ITU G.804
T3 coaxial	C-bit, M23	C-bit
E1 TP	ITU G.704	ITU G.704
E3 coaxial	ITU G.832, ITU G.751	ITU G.832

Notes

1. SONET STS-3c as defined by Bellcore and ANSI.

2. SDH STM-1 as defined by ITU.

3. C-bit as defined in Bellcore TR-NWT-000499 Issue 5, *Transport Systems Generic Requirements (TSGR): Common Requirements*.

4. M23 as defined in ANSI T1.102.

3.5.2 Cell Mapping

The cell mapping parameters must be the same at both ends of a connection or it will result in an inoperational connection. The values of the cell mapping parameters for different PHY types are shown in Table 3–3.

Table 3–3 Cell Mapping Parameter Values

PHY Type	Values	Default Value
155 Mb/s MMF	ADM	ADM
155 Mb/s SMF	ADM	ADM
155 Mb/s UTP	ADM	ADM
T1 TP	ADM	ADM
T3 coaxial	ADM, PLCP	PLCP
E1 TP	ADM, PLCP	ADM
E3 coaxial	ADM	ADM

Notes

1. PLCP supports the option of transmitting cells with the Physical Layer Convergence Protocol (PLCP).

2. ADM supports the option of transmitting cells with ATM Direct Mapping (ADM) as defined by ATM Forum UNI 3.1 specification.

3.5.3 Clock Source

The clock source parameter is configured to meet the needs of the application. In LAN applications, the clock source is usually a local reference. In some WAN applications, the port must be manually configured to operate in loop timing. Each PHY type supports two modes of transmitter operation, either local clock source operation or loop-timing operation (see Section 3.4.2), as defined by the source of the clock used for transmission.

The values of the clock source parameters for different PHY types are shown in Table 3–4.

Table 3–4 Clock Source Parameter Values

PHY Type	Values	Default Value
155 Mb/s MMF	local, loop timing	local
155 Mb/s SMF	local, loop timing	local
155 Mb/s UTP	local, loop timing	local
T1 TP	local, loop timing	local
T3 coaxial	local, loop timing	local
E1 TP	local, loop timing	local
E3 coaxial	local, loop timing	local

When the system module is rebooted, the nonvolatile configuration records for each populated port are examined. When a modPHY is initialized, the default setting is used unless another value has already been configured.

The same sequence of actions occur if a port is unpopulated at module powerup, but is populated later.

When a PHY type change occurs during modPHY hotswap, the new port is reinitialized with the default setting (local timing). When modPHY hotswap does *not* result in PHY type change, the port is reinitialized with its last known setting (if it is not overridden by a loss of signal or loss of frame condition).

Note that hotswap does not trigger a nonvolatile record update. So, a subsequent module reboot might change the timing setting because the last known setting might be different from the nonvolatile record.

3.5.4 Line Buildout

The line buildout parameter is configured to meet the needs of the application. In LAN applications, the line buildout is usually not important and not configurable. The default value of the line buildout parameter should allow the entire range of media options in most LAN applications.

In WAN applications for North America, manual control of the line buildout parameter is sometimes necessary for T1 and T3 media. For T1 and T3 media, the default values shown are sufficient for all supported lengths for connections between DIGITAL equipment and their recommended cables.

The values of the line buildout parameters for different PHY types are shown in Table 3–5.

Table 3–5 Line Buildout Parameter Values

PHY Type	Values	Default Value	Supported Length
155 Mb/s MMF	0 to 2 km	Not applicable	0 to 2 km*
155 Mb/s SMF	0 to 40 km	Not applicable	0 to 40 km*
155 Mb/s UTP	0 to 100 m	Not applicable	0 to 100 m
T1 TP	0 to 110 ft 110 to 220 ft 220 to 330 ft 330 to 440 ft 440 to 550 ft 550 to 600 ft > 600 ft	0 to 110 ft	0 to 655 ft
T3 coaxial	0 to 225 ft 225 to 450 ft	0 to 225 ft	0 to 450 ft
E1 TP	0 to 200 m	Not applicable	0 to 200 m
E3 coaxial	0 to 200 m	Not applicable	0 to 200 m

*Longer distances are supported under certain conditions (see Section A.1.3).

A

Media Connection Information

This appendix describes the attachment and removal of connectors for each type of physical media interface used in a DIGITAL ATM modPHY card. It also contains cable information for each media type.

A.1 Connecting MMF and SMF Media

This section describes the media connection information for multimode fiber (MMF) and single-mode fiber (SMF) connections.

A.1.1 Attaching Cables and Connectors

Perform these steps to attach the cables and loopback connectors to the ATM mod-PHY card.

1. Remove the dust caps from the PHY port and cable.

2. Line up the transmit cable connector with the transmit port and the receive cable connector with the receive port. Insert the connectors, ensuring that the key is correctly positioned (see Figure A–1).

Note

Make sure that the bend radius of any fiber-optic cable is 1 inch (2.5 cm) or greater. To avoid optical power loss, do not touch the fiber ends.

Figure A–1 Attaching and Removing MMF and SMF Cables and Connectors
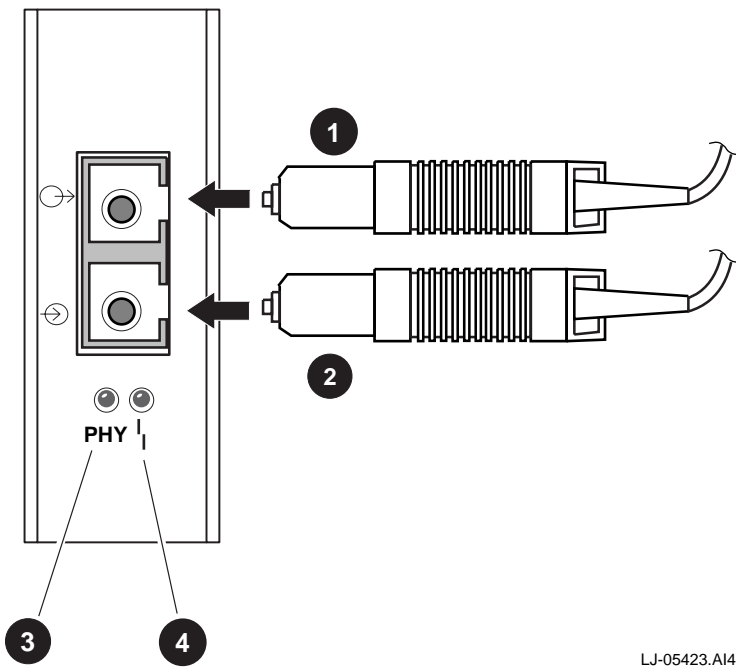
LJ-05423.AI4

Item	Control/Connector
1	SC-type transmit connector
2	SC-type receive connector
3	PHY LED
4	FRU/Mode LED

A.1.2 Removing Cables and Connectors

Perform these steps to remove the cables and loopback connectors.

1. Pull the connector from the PHY port.

2. Replace the dust caps on the connector and the PHY port.

A.1.3 Cables

Information about MMF and SMF cables is provided in this section.

A.1.3.1 MMF Cable Specifications

The MMF cables should adhere to these specifications:

- EIA/TIA 492-AAAA

- 62.5/125 μm

- SC connector

- 0 through 2 km (standard cable plant)

- 0 through 9 dB loss at 1300 nm (UNI V3.1, ATM User-Network Interface Specification)

  or

  0 through 11 dB loss at 1300 nm (ANSI X3.166-1990, FDDI PMD)

Connection distances for OC-3 above 2 km using 62.5/125 μm fiber can be operated correctly as long as the following conditions are met:

- $L \leq 4$ km

- $8 \text{ dB} > (A \times L + CL + SM)$

where

A	Is attenuation for each km of fiber in dB/km. This value is typically 1 to 2 dB/km.
L	Is the length of the link in km.
CL	Are the connector losses in dB (includes all connectors except those on the modPHY card).
SM	Is the splice margin reserved for future repairs of fiber link in dB. This value is typically 0.5 dB.

Connections for OC-3 using 50/125 or 100/140 μm fiber can be operated correctly as long as the cable plant meets or exceeds the requirements given in the ANSI X3.166-1990, FDDI PMD standard.

A.1.3.2 MMF Cables

The following MMF cables are available from DIGITAL:

Cable Description	Order Number
ST-SC, MM, Dual Fiber-Optic Cables	BN34A-xx
SC-SC, MM, Dual Fiber-Optic Cables	BN34B-xx

where *xx* represents the cable length. The available cable lengths are described in the *OPEN DECconnect Applications Guide*.

A.1.3.3 SMF Cable Specifications

The SMF cables must be dispersion-unshifted and should adhere to these specifications:

- EIA/TIA 492-CAAA

- 9/125 μm

- 0 through 15 km (Bellcore TR-NWT-000253, Intermediate Reach-1, OC3)

- 0 through 15 dB loss at 1300 nm

Connection distances for OC-3 above 15 km are beyond the requirements of Bellcore TR-NWT-000253, but can be operated correctly as long as either of the following conditions are met:

- For links up to 40 km in length,

  $15 \text{ dB} \geq (A \times L + CL + SM)$

- For links up to 60 km in length,

  $14 \text{ dB} \geq (A \times L + CL + SM)$

where

A	Is attenuation for each km of fiber in dB/km. This value is typically 0.2 to 0.4 dB/km.
L	Is the length of the link in km.
CL	Are the connector losses in dB (includes all connectors except those on the modPHY card).
SM	Is the splice margin reserved for future repairs of fiber link in dB. This value is typically 0.5 dB.

A.1.3.4 SMF Cables

Patch cables should have SC connectors on one end for connection to the modPHY card and the other end should have connectors that meet the needs of the fiber plant or the attaching device.

The following vendors supply single-mode patch cables:

3M/Fiber Optics Products	Cooper Industries
3M Telecom Markets Division	Belden Division
6801 River Place Boulevard	Richmond, IN
Austin, TX 78726	(317) 983-5200
AMP Incorporated	Siecor Corporation
Harrisburg, PA	Hickory, NC
(800) 522-6752	(704) 327-5000
Anixter Brothers	Sumitomo Electric
4711 Golf Road	Research Triangle Park, NC
Skokie, IL 60076	(800) 358-7378
(708) 677-2600	
Boston Office (508) 682-8870	
Computer Crafts, Inc.	
Hawthorne, NJ	
(201) 423-0405	

A.1.4 Loopback Connectors

For MMF, the H4085-AA loopback connector is an optional product available from
DIGITAL.

For SMF, use the patch cables that are available from the vendors listed in Section
A.1.3.4. An attenuator is not needed.

A.2 Connecting T3 and E3 Media

This section describes the media connection information for T3 or E3 connections.

When necessary, an external Channel Service Unit (CSU) or Line Isolation Unit
(LIU) is used with the DAGGE-AA or the DAGGT-AA modPHY card to meet local
safety requirements. The CSU is required when connecting to cables that might
originate outside the building and is often provided by the public network provider.

Note

Digital Equipment Corporation is in the process of obtaining PTT approval
to connect the DAGGE-AA (E3) modPHY card to public networks. Contact
your local DIGITAL office to verify that PTT approval has been granted
before connecting the E3 modPHY card to the public network.

A.2.1 Attaching Cables

Perform these steps to attach the cables:

1. Align the transmit cable connector with the transmit port and the receive cable
   connector with the receive port.

2. Push one connector into the PHY port and rotate clockwise 1/4 turn (see Figure
   A–2) to lock it in place.

3. Repeat step 2 for the second cable.

Figure A–2 Attaching and Removing T3 or E3 Cables
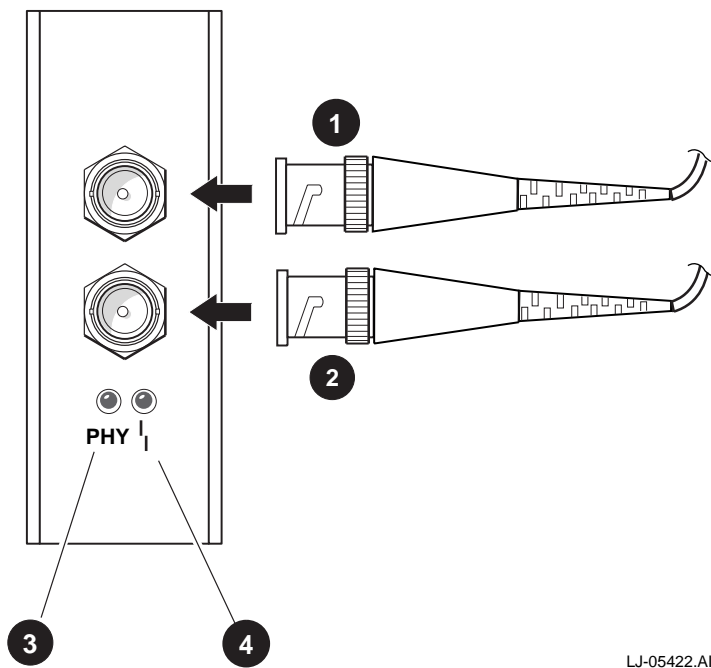
LJ-05422.AI4

Item	Control/Connector
1	BNC-type receive connector
2	BNC-type transmit connector
3	PHY LED
4	FRU/Mode LED

A.2.2 Removing Cables

Perform these steps to remove the cables:

1. Rotate the connector counterclockwise 1/4 turn to unlock it.

2. Pull the connector from the PHY port.

A.2.3 Cables

The T3 or E3 cables should adhere to these specifications:

- 75 coaxial (RG-59B or equivalent) terminated with 75-ohm BNC connectors

- Maximum of 450 ft (137 m) of cable

The following vendors supply T3 and E3 cables:

Alpha Wire Corporation	Cooper Industries
Elizabeth, NJ	Belden Division
(908) 925-8000	Richmond, IN
	(317) 983-5200

A.3 Connecting ATM UTP and ScTP Media

This section describes the media connection information for unshielded twisted-pair (UTP) and screened twisted-pair (ScTP) connections.

A.3.1 Attaching Cables and Connectors

Refer to Figure A–3 when performing these steps to attach the cables and loopback connectors to the ATM modPHY card:

1. Align the key of the modular jack (MJ) plug with the locking key of the MJ receptacle.

2. Push the MJ plug into the receptacle until the plug mates fully with the locking key. You will hear a snapping sound when the locking key engages.

Figure A–3 Attaching and Removing ATM UTP and ScTP Cables and Connectors
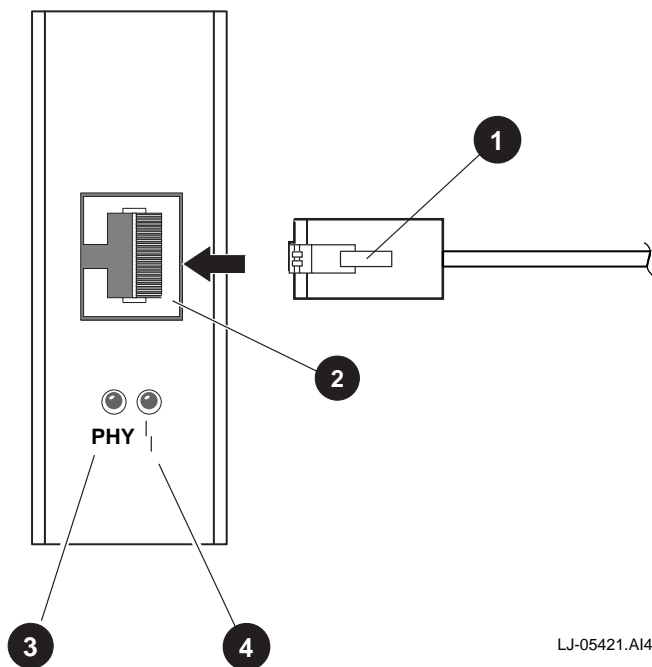
LJ-05421.AI4

Item	Control/Connector
1	MJ locking key
2	MJ receptacle
3	PHY LED
4	FRU/Mode LED

A.3.2 Removing Cables and Connectors

Perform these steps to remove the cables and loopback connectors:

1. Squeeze the locking key against the main body of the MJ plug.

2. Remove the MJ plug from the receptacle.

A.3.3 Cables

Information about UTP and ScTP cables is provided in this section.

A.3.3.1 Cable Specifications

The UTP and ScTP cable plant must meet the requirements of EIA/TIA 568B for a Category 5 twisted-pair installation. See the *OPEN DECconnect Applications Guide* for more information.

Note

EIA/TIA 568B requirements are typically met with:

- 295 ft (90 m) of Category 5 building cable

- 33 ft (10 m) of Category 5 patch cords

- 1 punchdown block (Category 5)

A.3.3.2 UTP Cables

The following UTP cables are available from DIGITAL:

Cable Description	Order Number
UTP High-Performance Data Grade Building Cables (TIA/EIA Category 5)	H8245-C and H8246-C series
UTP Category 5 Patch Cord	BN25H-*xx*

where *xx* represents the cable length. The available cable lengths are described in the *OPEN DECconnect Applications Guide*.

BN25H contains a cross-over and can be used to directly connect two ATM devices in close proximity. Refer to the *OPEN DECconnect Applications Guide* for information about installed wiring and other configurations.

A.3.3.3 ScTP Cables

The following ScTP cables are available from DIGITAL:

Cable Description	Order Number
Screened Twisted-Pair High-Performance Data Grade Building Cables (TIA/EIA Category 5)	H8245-D and H8246-D series
ScTP Category 5 Patch Cord	BN26S-*xx*

where *xx* represents the cable length. The available cable lengths are described in the *OPEN DECconnect Applications Guide*.

A.3.4 Loopback Connectors

For UTP and ScTP, the H4082-AC loopback connector is an optional product available from DIGITAL.

A.4 Connecting T1 and E1 Media

This section describes the media connection information for T1 or E1 connections.

When necessary, an external Channel Service Unit (CSU) or Line Isolation Unit (LIU) is used with the DAGE1-AA or the DAGT1-AA modPHY card to meet local safety requirements. The CSU is required when connecting to cables that might originate outside the building and is often provided by the public network provider.

Approved CSUs are available from:

Digital Link Corporation
217 Humboldt Court
Sunnyvale, CA 94089-1300
(408) 745-6200

Sync Research
10C Commerce Way
Newton, MA 02766
(508) 285-0033

Note

Digital Equipment Corporation is in the process of obtaining PTT approval to connect the DAGE1-AA (E1) modPHY card to public networks. Contact your local DIGITAL office to verify that PTT approval has been granted before connecting the E1 modPHY card to the public network.

A.4.1 Attaching Cables

Refer to Figure A–4 when attaching the cables to the ATM modPHY card.

1. Align the key of the modular jack (MJ) plug with the locking key of the MJ receptacle.

2. Push the MJ plug into the receptacle until the plug mates fully with the locking key. You will hear a snapping sound when the locking key engages.

Figure A–4 Attaching and Removing T1 or E1 Cables
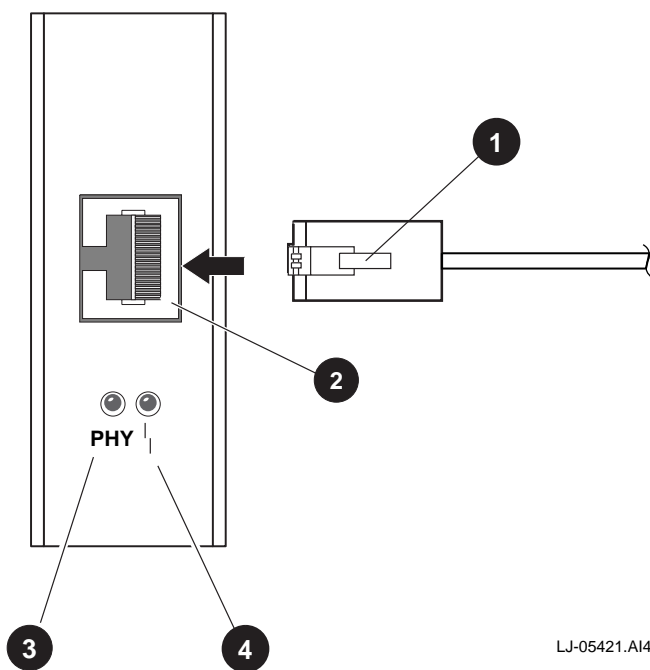
LJ-05421.AI4

Item	Control/Connector
1	MJ locking key
2	MJ receptacle
3	PHY LED
4	FRU/Mode LED

A.4.2 Removing Cables

Perform these steps to remove the cables:

1. Squeeze the locking key against the main body of the MJ plug.

2. Remove the MJ plug from the receptacle.

A.4.3 Cables

The T1 or E1 cable plant must meet the requirements of ITU-T G.703 for a symmetrical pair installation and should adhere to these specifications:

- 100 ohm symmetrical pair (for T1)

  120 ohm symmetrical pair (for E1)

- Maximum of 655 ft (200 m) of cable

- 0 through 6 dB loss at 200 m

T1 and E1 cables are available from:

Computer Crafts, Inc.   Computer Crafts (Europe) Ltd.
P.O. Box 644   Ashford, Kent UK
Hawthorne, NJ 07507   44 (0) 1233 500000
(201) 423-0405

The vendor's part number is 1000322-*xx* for the T1 cable and 1000324-*xx* for the E1 cable, where *xx* is the cable length in meters.

A.4.4 Loopback Connectors

For T1 and E1, a loopback connector is available from:

Computer Crafts, Inc.   Computer Crafts (Europe) Ltd.
P.O. Box 644   Ashford, Kent UK
Hawthorne, NJ 07507   44 (0) 1233 500000
(201) 423-0405

The vendor's part number is 3100116-01.

B

Interface Specifications

This appendix describes the interface specifications for each type of physical media interface used in a DIGITAL ATM modPHY card.

B.1 MMF Ports

The multimode fiber (MMF) ports adhere to the following optical specifications:

- Transmit power level, -20 dbm minimum

- Receive power level, -31 dbm minimum

B.2 SMF Ports

The single-mode fiber (SMF) ports adhere to the following optical specifications:

- Transmit power level, -15 dbm minimum

- Receive power level, -31 dbm minimum

- Transmitter meets IEC 825 Class I safety requirements

B.3 T3 Ports

This section describes the interface specifications for the T3 ports.

The BNC connectors on the modPHY card can provide connection of the cable shield to the chassis and to an earth reference. The modPHY card is provided in the following configuration:

- Transmit connector referenced to chassis

- Receive connector isolated from chassis (at low frequency)

The T3 receive connector can be referenced to the chassis by adding a hex nut to the receive connector. The T3 transmit connector must always be referenced to the chassis.

B.4 E3 Ports

This section describes the interface specifications for the E3 ports.

The BNC connectors on the modPHY card can provide connection of the cable shield to the chassis and to an earth reference. The modPHY card is provided in the following configuration:

- Transmit connector referenced to chassis

- Receive connector isolated from chassis (at low frequency)

The E3 modPHY card is provided with insulating and conductive washers. To isolate either connector from the chassis, place an insulating washer between the metal washer and the chassis. To reference either connector to the chassis, remove the isolation washer. The E3 receive connector is provided with two isolation washers, one of which can be used to isolate the transmit connector.

B.5 ATM UTP and ScTP Ports

This section describes the interface specifications for unshielded twisted-pair (UTP) and screened twisted-pair (ScTP) connections.

The UTP and ScTP ports adhere to the following electrical specifications:

- Transmit power level, 1.1 Vpp maximum

  Transmit power level, 0.9 Vpp minimum

- Receive sensitivity, capable of data recovery with bit error rate of less than 10^{-10} over a 100 m Category 5 certified cable plant.

Figure B–1 and the associated table provide information about the MJ pin assignments.

Figure B–1 MJ Pin Assignments for ATM UTP and ScTP
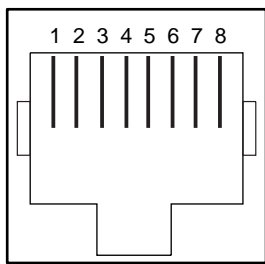
LJ-05420.AI4

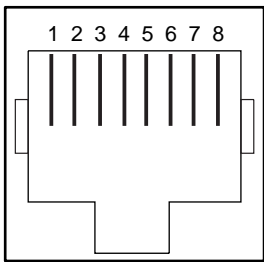| Contact	Pin Assignment
1	Receive +
2	Receive -
3	Isolated from chassis at low frequency
4	Isolated from chassis at low frequency
5	Isolated from chassis at low frequency
6	Isolated from chassis at low frequency
7	Transmit +
8	Transmit -

B.6 T1 and E1 Ports

This section describes the interface specifications for T1 and E1 ports.

B.6.1 Pin Assignments

Figure B–2 and the associated table provide information about the MJ pin assignments.

Figure B–2 MJ Pin Assignments for T1 or E1

LJ-05420.AI4

Contact	Pin Assignment
1	Receive +
2	Receive -
3	Shield reference point (optional)
4	Transmit +
5	Transmit -
6	Shield reference point
7	Unused
8	Unused

B.6.2 Connector Earth Reference for E1

The connectors on the modPHY can provide connection of the cable shield to the chassis and to an earth reference. The modPHY card is provided in the following configuration:

- Receive connector (pin 3) is isolated from chassis

- Transmit connector (pin 6) is always referenced to chassis

The E1 receive shield can be referenced to the chassis by reconfiguring a jumper named J10.