IBM

IBM ARTIC960Rx
Frame Relay PCI Adapter
Guide to Operations

IBM

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Guide to Operations

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┌─ Important ─────────────────────────────────────────────┐
│                                                          │
│  Before using this information and the product it supports, be sure to read all the │
│  information in Appendix A, "Notices."                   │
│                                                          │
│  Before installing or removing an adapter, be sure to study the Connect/Disconnect │
│  sequence diagram for cables in "Safety Information" on page A-2. │
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First Edition (October 1998)

International Business Machines Corporation   Armonk, New York, 10504

Statement of Limited Warranty

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you originally purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. Machines are subject to these terms only if purchased in the United States or Puerto Rico, or Canada, and located in the country of purchase. If you have any questions, contact IBM or your reseller.

Machine: IBM ARTIC960Rx Frame Relay PCI Adapter

Warranty Period*: This feature assumes the Warranty period of the IBM host in which it is installed. For all other conditions, the Warranty period is three years.

*Contact your place of purchase for warranty service information.

Production Status

Each Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's warranty terms apply.

The IBM Warranty for Machines

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications. The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if authorized by IBM, will provide warranty service under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

For IBM or your reseller to provide warranty service for a feature, conversion, or upgrade, IBM or your reseller may require that the Machine on which it is installed be 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many of these transactions involve the removal of parts and their return to IBM. You represent that all removed parts are genuine and unaltered. A part that replaces a removed part will assume the warranty service status of the replaced part.

If a Machine does not function as warranted during the warranty period, IBM or your reseller will repair it or replace it with one that is at least functionally equivalent, without charge. The replacement may not be new, but will be in good working order. If IBM or your reseller is unable to repair or replace the Machine, you may return it to your place of purchase and your money will be refunded.

If you transfer a Machine to another user, warranty service is available to that user for the remainder of the warranty period. You should give your proof of purchase and this Statement to that user. However, for Machines that have a life-time warranty, this warranty is not transferable.

Warranty Service

To obtain warranty service for the Machine, you should contact your reseller or call IBM. In the United States, call IBM at **1-800-IBM-SERV (426-7378)**. In Canada, call IBM at **1-800-465-6666**. You may be required to present proof of purchase.

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When a type of service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service. You also agree to ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange.

You agree to:

1. Obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
2. Where applicable, before service is provided —
   a. Follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provide,
   b. Secure all programs, data, and funds contained in a Machine, and
   c. Inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

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IBM does not warrant uninterrupted or error-free operation of a Machine.

The warranties may be voided by misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, removal or alteration of Machine or parts identification labels, or failure caused by a product for which IBM is not responsible.

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   that is the subject of the claim.

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Contents

About This Book

This book describes the IBM ARTIC960Rx Frame Relay PCI Adapter and provides step-by-step installation instructions. After you have finished reading this book, you should be able to:

- Install the adapter
- Remove and replace the attached 2-Port Selectable PMC Adapter (PMC card)
- Troubleshoot possible problems
- Download system support programs, publications, and utility programs that support the development of adapter applications
- Obtain a list of wrap plug part numbers and run a wrap test on connectors and cable ends
- Locate optional cable connector pin numbers and assignments

Who Should Read This Book

This book is written for an experienced computer user or a person who sets up, uses, or programs the base adapter.

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Related Information

- Operating and installation documentation provided with any base adapter you are using.
- Operating and installation documentation provided with your computer.
- Reference, service, and diagnostics documentation available for your computer.
- Other related publications can be obtained from the Web at:

  `http://wwprodsoln.bocaraton.ibm.com/artic/pubs.html`

Chapter 1. Product Description

The IBM ARTIC960Rx Frame Relay PCI Adapter is a short, 32-bit,
PCI adapter. It consists of a base adapter (the IBM ARTIC960Rx
PCI Adapter) and a PMC card (the 2-Port Selectable PMC Adapter).

The Frame Relay PCI adapter provides high-function control of I/O
operations and serves to off-load input/output tasks from the system
microprocessor.
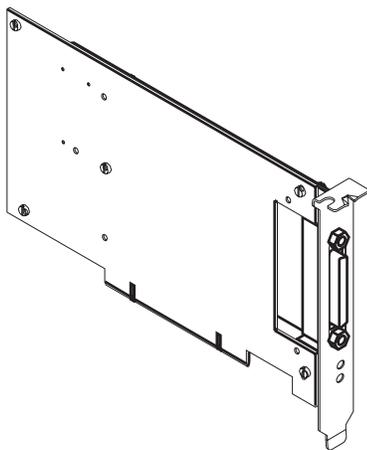
Figure   1-1. IBM ARTIC960Rx Frame Relay PCI Adapter

Part Numbers

The following table lists the part numbers for the field-replaceable
units (FRUs) associated with the Frame Relay PCI adapter.

Table 1-1. Part Numbers	
Description	**FRU Part Number**
IBM ARTIC960Rx PCI Adapter with 5-to-3.3 volt converter and 4 MB of memory	87H3545
2-Port Selectable PMC Adapter	87H3797

Features and Function

The base adapter has the following standard features:

32-bit Intel 80960RP microprocessor
> The Intel 80960RP microprocessor operates off the clock input from the system bus (supports up to 33 MHz). It includes two on-board memory subsystems:
>
> - Extended-data-output (EDO) dynamic random-access memory (DRAM), and
> - Read-only memory (ROM)
>
> These memory subsystems are used by the adapter microprocessor only. Memory on the adapter cannot be accessed from the system bus.

4 MB EDO DRAM
> The microprocessor on the base adapter uses this area for its instructions and data.

Sector-erasable ROM
> The ROM subsystem uses sector-erasable, read-only flash memory. It contains the power-on self-test (POST) and bootstrap-loader code for the on-board microprocessor.

PMC Connector
> The PMC connector provides a 32-bit PCI interface for attaching the PMC card. The PMC card has the protocol chips and electrical-interface drivers, receivers, terminators, and connectors that apply to that specific interface.

Specifications

The following describes the physical attributes, environmental conditions, and electrical requirements for the adapter.

Dimensions (with I/O bracket)

> Length: 185.4 millimeters (7.3 inches)
> Height: 124.5 millimeters (4.9 inches)
> Depth: 21.6 millimeters (0.8 inches)

Environment

- Air Temperature:

  > Operating: 1°C through 52°C (33.8°F through 125.6°F)
  > Non-Operating: −40°C through 60°C (−40.°F through 140°F)

- Humidity:

  > Operating: 5% through 95%.
  > Wet Bulb Temperature: 29°C (84.2°F)

Electrical

- Power Requirements

  > +3.3 V dc, 0 A
  > +5 V dc, 1.45 A (maximum)
  > +12 V dc, 43 mA (maximum)
  > −12 V dc, 0 A

Operating System Support Programs and Publications

To help programmers develop applications for the Frame Relay PCI adapter, a set of operating system packages containing the drivers and utilities to support a particular operating system is available on the World Wide Web (Web). To download from the Web, see "Downloading the Diagnostics and Operating System Support Programs" on page 2-5.

Other related publications can be obtained from the Web at:

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http://wwprodsoln.bocaraton.ibm.com/artic/pubs.html
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Obtaining Publications when Web Support Is Unavailable

If you do not have access to the Web, you can obtain these publications from the no-fee Developer's Assistance Program (DAP).

By telephone, call **1-800-426-3333** and ask for **ARTIC 160**.

By E-mail, send to **artic@us.ibm.com**.

Chapter 2. Installation Requirements and Instructions

Each IBM ARTIC960Rx Frame Relay PCI Adapter package includes:

- The IBM ARTIC960Rx PCI Adapter and 2-Port Selectable PMC Adapter pair
- This book (with the Warranty Statement)

Note: The Frame Relay PCI adapter is a Class A device.

The Federal Communications Commission (FCC) classification for this product might differ from the FCC classification for your system unit. Use the classification that is highest. For example, if the FCC classification for your system unit is Class B and a card that you install is Class A, the classification of your system unit would change to Class A. For more information, see "Required Electronic Emission and Connectivity Notices" on page A-5.

Hardware Requirements

The Frame Relay PCI adapter requires a 32-bit, PCI slot. It can be installed in any PCI-compliant computer with a fixed-frequency bus clock.

Attention:
This adapter is not supported in PCI slots using a spread-spectrum clock, such as the following IBM RISC System/6000® models: E20, E30, F30, and F3L.

## Handling Static-Sensitive Devices

Components for your adapter can be damaged by static discharges. To prevent this damage, your adapter is wrapped in an anti-static bag. Observe the following precautions when handling the adapter.

- Keep the adapter in its anti-static bag until you are ready to install it.

- Make the least possible movement of your body to minimize the electrostatic charges created by contact with clothing fibers, carpet, and furniture.

- If possible, keep one hand on the computer chassis when you are inserting or removing the adapter. Always turn the computer off before removing an adapter from the system unit.

- *Do not touch the printed circuit.* Where possible, hold the adapter by its plastic end pieces or by its edges, but do *not* touch the metal edge connectors.

- Do not place the adapter on the machine cover or on a metal table. Machine covers and metal tables increase the risk of damage because they make a discharge path from your body through the adapter.

Component Locations

The following shows some component locations on the Frame Relay PCI adapter. This adapter is a single unit consisting of the base adapter and a PMC card.
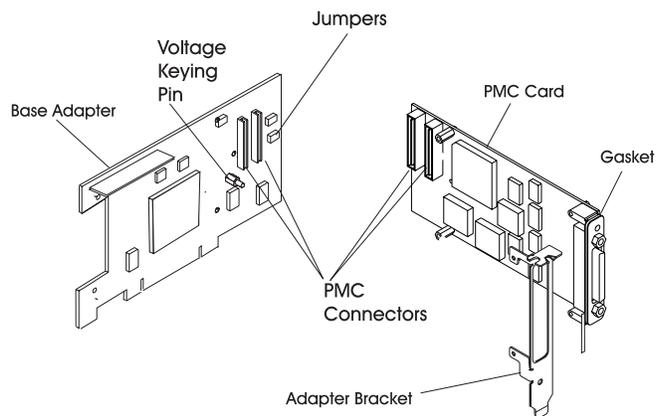
Installation

The following instructions assume that you have the Frame Relay
PCI adapter out of the system unit and are ready to put it into the
system unit. Use these steps, as appropriate for your computer, to
install the adapter.

1. Turn off the computer.

2. Unplug the power cords from the electrical outlets.

3. Disconnect all cables from the rear of the system unit.

4. Remove the system unit cover.

5. Locate an available 32-bit PCI expansion slot in your system unit
   that supports the appropriate length of the adapter.

6. Remove the expansion-slot screw, and then remove the
   expansion-slot cover.

7. Grasping the adapter by the top edge, firmly press the adapter
   into the connector at the rear panel of the system unit. Then,
   secure the adapter bracket to the slot using the screw provided.

Rear
panel
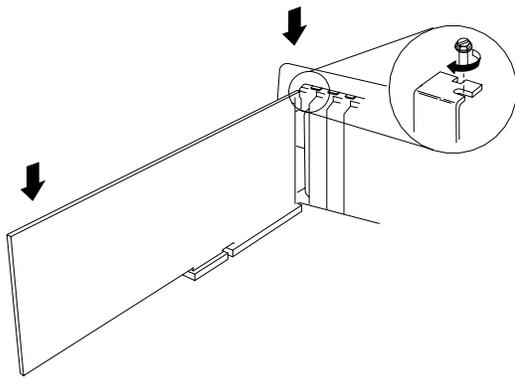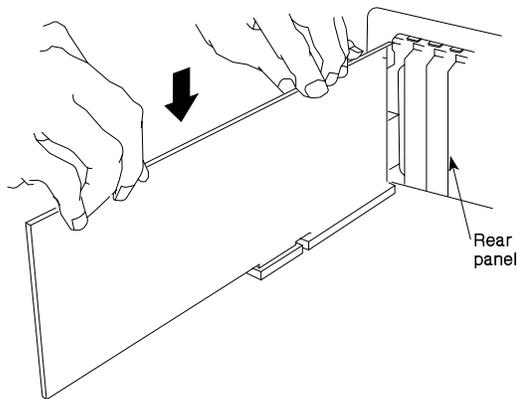
8. Before tightening the expansion-slot screw, make sure adjacent expansion-slot screws do not interfere with the adapter bracket. Then tighten the expansion-slot screw to lock the adapter in place.

9. If you have other adapters (or options) to install, do so now. Refer to the installation instructions provided with your computer for more information.

10. Reinstall the system unit cover and reconnect all cables to their appropriate connectors (refer to the documentation that came with your computer).

11. Plug all power cords into electrical outlets.

Downloading the Diagnostics and Operating System Support Programs

IBM provides adapter support for some operating system environments. The adapter diagnostic program and the support programs for your specific operating system can be obtained through the World Wide Web or a Bulletin Board System (BBS).

Downloading from the Web

Do the following.

1. Using a Web browser of your choice, type:

   `http://wwprodsoln.bocaraton.ibm.com/artic/file_rep.html`

2. Select the operating-system support you want.

3. Download the **Program** file.

4. Download the **Installation/file creation instructions** file, and follow the steps for installing and configuring the product support.

Downloading from the BBS

Do the following.

1. Check that your modem settings are as follows:

   Data Bit   8
   Parity Bit   N
   Stop Bit   1

2. Dial the U.S.A. number **561-443-0134**.

3. Select the operating system support you want.

4. Select a **Transfer Protocol** supported by your communications software.

5. View on-line or download the **Readme/Instruction** file.

6. Follow the instructions in the Readme file for downloading and installing the program support that comes with the diagnostics.

Obtaining Operating System Software when Web/BBS Support Is Unavailable

For those who are unable to retrieve the files from either the Web or BBS, support is provided by telephone or E-mail.
For telephone assistance (U.S.A. ONLY), call:
1-800-426-3333 and ask for ARTIC 160.

For E-mail assistance, send to:
artic@us.ibm.com

Chapter 3. Removing and Installing the 2-Port Selectable PMC Adapter

This chapter contains information on removing and reinstalling the 2-Port Selectable PMC Adapter on a base adapter. In this section, the IBM ARTIC960Rx PCI Adapter is referred to as the base adapter, and the 2-Port Selectable PMC Adapter is referred to as the PMC card.

To remove the PMC card from the Frame Relay PCI adapter:

1. Turn off the computer.

2. Unplug the power cords from the electrical outlets.

3. Disconnect all cables from the rear of the system unit.

4. Remove the system unit cover.

5. Locate the Frame Relay PCI adapter containing the PMC card and record its slot number.

6. Remove the adapter-bracket retaining screw.

7. Remove the Frame Relay PCI adapter from the system unit by grasping the top edge of the card and the connector bracket, and pulling upward.

   Note: Be sure to hold the Frame Relay PCI adapter by the edges only; do not touch the component pins or solder joints.

8. The PMC card has a rubber gasket around the connector at the rear of the card; take care not to damage it when removing the adapter bracket.

   Remove the mounting screws on the base adapter. Then remove the adapter bracket. (The two cards are still held together by the PMC connector.)
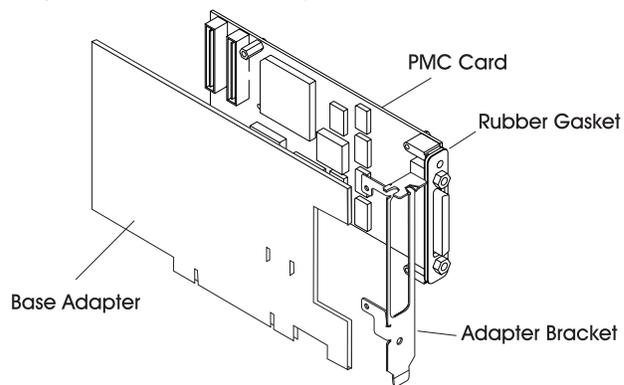
9. Carefully separate the connector on the PMC card from the connector on the base adapter using a gentle rocking motion.

Reinstalling the PMC Card

> **Before you begin**
>
> On the base adapter, verify that the jumpers are set as follows:
>
>   Jumper P04 is connected across pins 2,3
>   Jumper P05 is connected across pins 1,2
>
> See "Component Locations" on page 2-2 for jumper, voltage
> keying pin, and connector locations.

1. If the mounting screws are in place, remove them as shown.
   The screws might come in a separate hardware kit with some
   PMC cards.

4 Screws
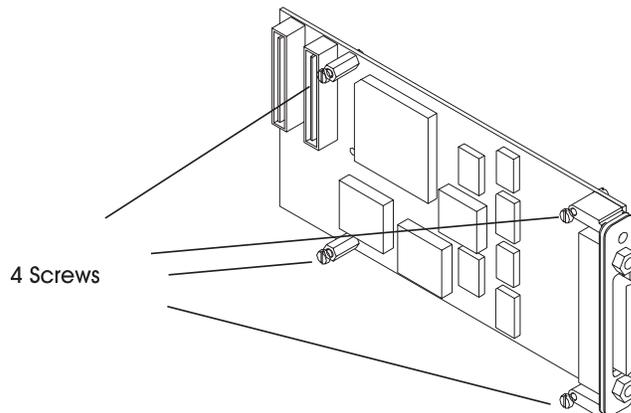
2. Align the connector on the PMC card with the connector on the base adapter.

   Attention:
   When the base adapter and the PMC card are properly aligned, the top of the voltage keying pin on the base adapter will fit into the voltage key opening on the PMC card.

3. Firmly press the PMC card and the base adapter connectors together.

4. Attach the cards through the standoffs using two of the screws. The PMC card has a rubber gasket around the connector at the rear of the card; take care not to damage it. Attach the adapter bracket using the remaining two screws.
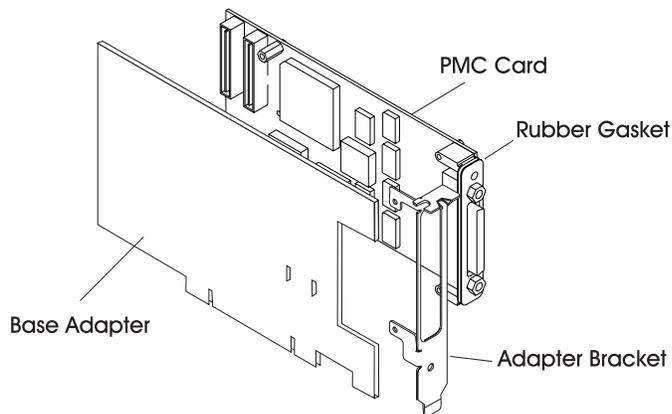
Chapter 4. Troubleshooting

This chapter discusses how to troubleshoot possible problems with the Frame Relay PCI adapter. This chapter also describes how to:

- Run a wrap test on connectors and cable ends
- Obtain a list of wrap plug part numbers

Problem Determination Procedures

For system testing information, refer to the documentation that came with your computer.

If you performed the diagnostic tests because of a suspected communications problem and have successfully completed the tests without an error message, additional testing may be required on the following:

- Host computer or device with which you are trying to communicate (such as a printer)
- An attached communications device, such as a modem
- Communications cable

To test the base adapter, or the PMC card attached to the base adapter, refer to the operating system support programs you downloaded from the Web or BBS (see "Downloading the Diagnostics and Operating System Support Programs" on page 2-5).

If you cannot isolate the problem, have the system unit serviced.

Diagnostic Wrap Plugs

Diagnostic wrap tests can be performed at the PMC connector or at a selected port of the optional cable. Use the menu prompts to select either location for wrap testing. Table 4-1 lists the wrap plug part numbers to use during wrap testing. (The part number is printed on the wrap plug.)

Table 4-1. Diagnostic Wrap Plugs	
Description	**FRU Part Number**
120-pin connector	87H3311
25-pin wrap plug—EIA-232 (ISO 2110) or EIA-530 (ISO 2110)	87H3439
34-pin female wrap plug—V.35 DTE (ISO 2593)	87H3442
34-pin male wrap plug—V.35 DCE (ISO 2593)	87H3458
37-pin wrap plug—RS-449 (ISO 4902)	87H3440
15-pin wrap plug—X.21 (ISO 4903)	53G0638

Chapter 5. Cables and Connectors

Optional cable assemblies are available for the Frame Relay PCI
adapter. Each assembly consists of a 120-pin connector and two
lengths of cable that provide one of the following electrical interfaces:

- EIA-232 cable (ISO 2110)
- V.35 (V.36 compatible) DTE (ISO 2593) cable
- A mixed-interface cable that provides one V.35 DTE (ISO 2593)
  interface and one EIA-232 (ISO 2110) interface.
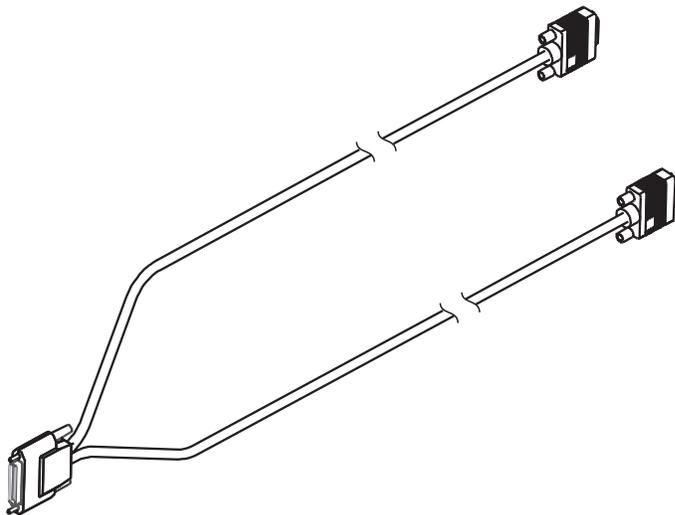

Figure   5-1. Optional Cables

Each cable has a single 120-pin, male, D-shell connector that
branches into two individual cables, each of which provides access
to one of two independent ports.

Cables for the IBM ARTIC960 4-Port Selectable PMC Adapter can
be used with the 2-Port Selectable PMC Adapter. Use ports 0 and 1
of the 4-port cable; the other two ports (2 and 3) are not used.

The following tables list the electrical interface and part numbers associated with each of the optional cables.

Each cable assembly has two part numbers associated with it: a field-replaceable unit (FRU) number and an assembly number. Use the FRU part number to order a replacement cable. Use the assembly part number to identify the cable type (the assembly part number is printed on the cable assembly).

Table   5-1. Part Numbers for the 2-Port Cables

Electrical Interface	Connector Type	Part Number	
		FRU	Assembly
EIA-232 (ISO 2110)	25-pin male D-shell	87H3780	87H3779
V.35 DTE (ISO 2593)	34-pin male block	87H3783	87H3782
V.35 DTE (ISO 2593) and EIA-232 (ISO 2110)	34-pin male block and 25-pin male D-shell	87H3786	87H3785

Table   5-2. Part Numbers for Optional 4-Port Cables

Electrical Interface	Connector Type	Part Number	
		FRU	Assembly
EIA-232 (ISO 2110)	25-pin male D-shell	87H3405	87H3404
EIA-530 (ISO 2110)	25-pin male D-shell	87H3402	87H3401
V.35 DTE (ISO 2593)	34-pin male block	87H3399	87H3498
V.35 DCE (ISO 2593)	34-pin female block	87H3456	87H3455
RS-449 (ISO 4902)	37-pin male D-shell	87H3396	87H3395
X.21 (ISO 4903)	15-pin male D-shell	87H3408	87H3407

Port Speeds

When clocks are supplied by an external device (all interfaces except EIA-232), the PMC card supports two ports running simultaneously at a maximum data rate of 2 048 000 bits per second (bps), duplex, and synchronous. The following table shows the maximum speed supported for each electrical interface.

| Electrical Interface	Maximum Speed (per port)
EIA-232 (ISO 2110)	38 400 bps (U.S. only) 19 200 bps (EMEA only)
EIA-530 (ISO 2110)	2 048 000 bps
V.35 DTE (ISO 2593)	2 048 000 bps (US only) 64 000 bps (EMEA only)
V.35 DCE (ISO 2593)	2 048 000 bps (US only) 64 000 bps (EMEA only)
RS 449 (ISO 4902)	2 048 000 bps
X.21 (ISO 4903)	2 048 000 bps

Clocks supplied by a Dual Universal Serial Communications
Controller (DUSCC) on the PMC card provide synchronous data
rates up to 64 000 bps, duplex. In addition, an on-card clock
generator can provide data rates of either 1 544 000 bps or 2 048 000
bps for each port. Selection of the clock frequency is programmable.

Connector Pin Numbers and Assignments

This section provides pin numbering and signal assignments for each
of the optional cables. For each cable, a table shows the pin
assignments for the 120-pin connector and the correlation to the two
port connectors. Each signal is identified as input (I) or output (O),
as viewed from the PMC card.

120-Pin Connector

The individual signals for all ports connect to the PMC card through
the 120-pin connector at the rear of the card. The following shows a
120-pin connector.

Pin 1   **Pin 30**

Pin 91   **Pin 120**
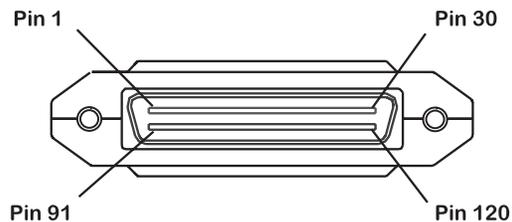
EIA-232 Connector

The following illustration shows a 25-pin, male, D-shell connector. Table 5-3 lists the pin assignments for the EIA-232 (ISO 2110) electrical interface. The "x" in the signal name is the number of the port.

```
 1  /•••••••••••••\ 1 3
14  \•••••••••••••/ 2 5
```
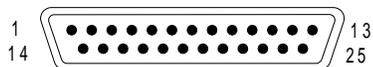
Table 5-3. EIA-232 (ISO 2110) Connector Pin Assignments				
		120-Pin Connector		**25-Pin**
Signal Name	**I/O**	**0**	**1**	**Connector**
TXDx	O	105	45	02
RXDx	I	104	44	03
RTSx	O	114	54	04
CTSx	I	120	60	05
CDx	I	094	34	08
DTRx	O	112	52	20
DSRx	I	098	38	06
TXCLKOx	O	111	51	24
TXCLKIx	I	091	31	15
RXCLKx	I	106	46	17
GND	---	110	50	07
Shield	---	Housing		01/Housing

V.35 DTE Connector

The following shows a 34-pin male connector. Table 5-4 lists pin
assignments for the V.35 DTE (ISO 2593) electrical interface. The
"x" in the signal name is the number of the port.
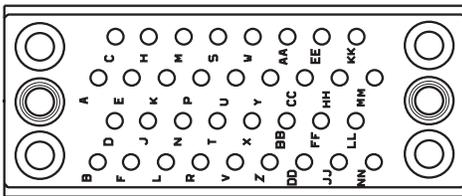
Table 5-4. V.35 DTE (ISO 2593) Connector Pin Assignments				
		120-Pin Connector		**34-Pin**
Signal Name	**I/O**	**0**	**1**	**Connector**
TXDxA	O	118	58	P
TXDxB	O	119	59	S
RTSx	O	114	54	C
RXDxA	I	096	36	R
RXDxB	I	097	37	T
CTSx	I	120	60	D
DSRx	I	098	38	E
DTRx	O	112	52	H
CDx	I	094	34	F
RCLKIxA	I	108	48	V
RCLKIxB	I	109	49	X
TCLKOxA	O	116	56	U
TCLKOxB	O	117	57	W
TCLKIxA	I	102	42	Y
TCLKIxB	I	103	43	AA
GND	---	110	50	B
Shield	---			A

Mixed-Interface Connector (V.35 DTE/EIA-232)

This section lists pin assignments for the mixed-interface cable.

V.35 DTE Connector—Port 0

The following shows a 34-pin male connector. Table 5-5 lists pin
assignments for the V.35 DTE (ISO 2593) electrical interface at port
0. The "x" in the signal name is the number of the port.

Table 5-5. V.35 DTE Pin Assignments—Port 0			
		120-Pin Connector	**34-Pin**
Signal Name	**I/O**	**0**	**Connector**
TXDxA	O	118	P
TXDxB	O	119	S
RTSx	O	114	C
RXDxA	I	096	R
RXDxB	I	097	T
CTSx	I	120	D
DSRx	I	098	E
DTRx	O	112	H
CDx	I	094	F
RCLKIxA	I	108	V
RCLKIxB	I	109	X
TCLKOxA	O	116	U
TCLKOxB	O	117	W
TCLKIxA	I	102	Y
TCLKIxB	I	103	AA
GND	---	110	B
Shield	---	A	

EIA-232 Connector—Port 1

The following shows a 25-pin, male, D-shell connector. Table 5-6
lists the pin assignments for the EIA-232 (ISO 2110) electrical
interface at port 1. The "x" in the signal name is the number of the
port.
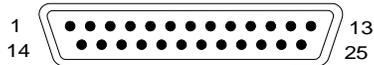
Table 5-6. EIA-232 Pin Assignments—Port 1			
Signal Name	**I/O**	**120-Pin Connector** **1**	**25-Pin Connector**
TXDx	O	45	02
RXDx	I	44	03
RTSx	O	54	04
CTSx	I	60	05
CDx	I	34	08
DTRx	O	52	20
DSRx	I	38	06
TXCLKOx	O	51	24
TXCLKIx	I	31	15
RXCLKx	I	46	17
GND	---	50	07
Shield	---	Housing	01/Housing

Connectors for Optional 4-Port Cables

The following sections provide pin numbering and signal assignments
for the optional 4-port cables when used with the Frame Relay PCI
adapter.

EIA-530 Connector

The following illustration shows a 25-pin, male, D-shell connector. Table 5-7 lists the pin assignments for the EIA-530 (ISO 2110) electrical interface. The "x" in the signal name is the number of the port.


Table 5-7. EIA-530 (ISO 2110) Connector Pin Assignments				
		120-Pin Connector		**25-Pin**
Signal Name	**I/O**	**0**	**1**	**Connector**
TXDxA	O	118	58	02
TXDxB	O	119	59	14
RTSxA	O	114	54	04
RTSxB	O	115	55	19
RXDxA	I	096	36	03
RXDxB	I	097	37	16
CTSxA	I	100	40	05
CTSxB	I	101	41	13
CDxA	I	094	34	08
CDxB	I	095	35	10
RCLKIxA	I	108	48	17
RCLKIxB	I	109	49	09
TCLKOxA	O	116	56	24
TCLKOxB	O	117	57	11
TCLKIxA	I	102	42	15
TCLKIxB	I	103	43	12
DSRxA	I	098	38	06
DSRxB	I	099	39	22
DTRxA	O	112	52	20
DTRxB	O	113	53	23
GND	---	110	50	07
Shield	---	Housing		01/Housing

V.35 DCE Connector

The following illustration shows a 34-pin female connector.
Table 5-8 lists the pin assignments for the V.35 DCE (ISO 2593)
electrical interface. The "x" in the signal name is the number of the
port.

Table 5-8. V.35 DCE (ISO 2593) Connector Pin Assignments				
		120-Pin Connector		**34-Pin**
Signal Name	**I/O**	**0**	**1**	**Connectors**
TXDxA	I	096	36	P
TXDxB	I	097	37	S
RXDxA	O	118	58	R
RXDxB	O	119	59	T
TCKxA	O	116	56	Y
TCKxB	O	117	57	AA
TTExA	I	108	48	U
TTExB	I	109	49	W
RCKxA	O	116	56	V
RCKxB	O	117	57	X
RTSx	I	120	60	C
CTSx	O	114	54	D
DCDx	O	112	52	F
DSRx	O	112	52	E
DTRx	I	098	38	H
	I	94	34	H
Ground	---	110	50	B
Shield	---			A
Note:				
1. TXCLKO is source for TCK and RCK.				
2. DTR is source for DSR and DCD.				

RS-449 Connector

The following illustration shows a 37-pin, D-shell connector.
Table 5-9 lists pin assignments for the RS-449 (ISO 4902) electrical
interface. The "x" in the signal name is the number of the port.
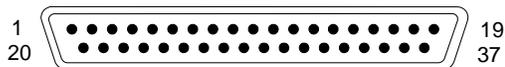
Table 5-9. RS-449 (ISO 4902) Connector Pin Assignments				
		120-Pin Connector		37-Pin
Signal Name	I/O	0	1	Connectors
TXDxA	O	118	58	04
TXDxB	O	119	59	22
RXDxA	I	096	36	6
RXDxB	I	097	37	24
RTSxA	O	114	54	07
RTSxB	O	115	55	25
CTSxA	I	100	40	09
CTSxB	I	101	41	27
DSRxA	I	098	38	11
DSRxB	I	099	39	29
DTRxA	O	112	52	12
DTRxB	O	113	53	30
CDxA	I	094	34	13
CDxB	I	095	35	31
RCLKIxA	I	108	48	08
RCLKIxB	I	109	49	26
TCLKOxA	O	116	56	17
TCLKOxB	O	117	57	35
TCLKIxA	I	102	42	05
TCLKIxB	I	103	43	23
GND	---	100	50	19,20,37

X.21 Connector

The following illustration shows a 15-pin, male, D-shell connector. Table 5-10 lists the pin assignments for the X.21 (ISO 4903) electrical interface. The "x" in the signal name is the number of the port.

```
1  ⟨• • • • • • • •⟩  8
 9  ⟨ • • • • • • • ⟩  15
```
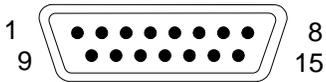
Table 5-10. X.21 (ISO 4903) Connector Pin Assignments				
		120-Pin Connector		**15-Pin**
Signal Name	**I/O**	**0**	**1**	**Connector**
TXDxA	O	118	58	02
TXDxB	O	119	59	09
RTSxA	O	114	54	03
RTSxB	O	115	55	10
RXDxA	I	096	36	04
RXDxB	I	097	37	11
CTSxA	I	100	40	05
CTSxB	I	101	41	12
RCLKIxA	I	108	48	06
RCLKIxB	I	109	49	13
TCLKOxA	O	116	56	07
TCLKOxB	O	117	57	14
GND	---	110	50	08
Shield	---	Housing		01/Housing

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⚠ **DANGER:** Electrical current from power, telephone, and communications cables is hazardous. To avoid shock hazard, connect and disconnect cables as shown below when installing, moving, or opening the covers of this product or attached devices.

To Connect	To Disconnect
Turn Everything OFF.	Turn Everything OFF.
First, attach all cables to devices.	First, remove power cord from outlet.
Attach signal cables to receptacles.	Remove signal cables from receptacles.
Attach power cord to outlet.	Remove all cables from devices.
Turn device ON.	
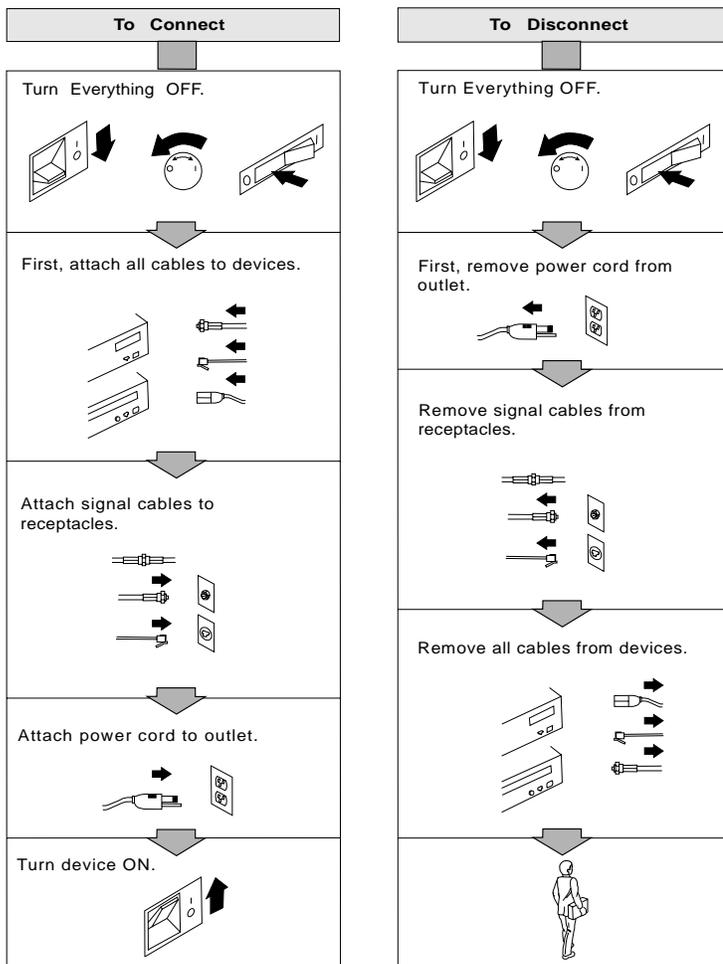
Note: In the UK, by law, the telephone cable must be connected after the power cord.

Note: In the UK, by law, the power cord must be disconnected after the telephone line cable.

Telecommunication Notices

FCC Part 68 Compliance Information

The Frame Relay PCI adapter complies with Part 68 of the FCC rules. The label located on the back side of the adapter contains, among other information, the FCC registration number for this equipment. If requested, provide this information to your telephone company. The card has an SOC code of 6.0N and FIC codes 04DU9-BN, 04DU9-DN, 04DU9-IKN, 04DU9-ISN, and 04DU9-IZN.

The IBM ARTIC960 4-Port T1 RJ-48 Cable, which uses USOC jack RJ-48, is an FCC-compliant cable and modular jack available for the adapter. The adapter and cable are designed to be connected to the telephone network or premises wiring using a compatible modular plug that is Part 68-compliant.

If the adapter causes harm to the telephone network, the telephone company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice is not practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

If trouble is experienced with this equipment, for repair or warranty information, in the United States, call IBM at **1-800-IBM-SERV**. In Canada, call IBM at **1-800-465-6600**.

No repairs can be performed by the customer.

Canada Telecommunications Statement

NOTICE: The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution might be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

This equipment uses a CA81A telephone jack.

Australian Telecommunications Statement

Warning:

This equipment should be connected to a telecommunications network through an ACA-approved channel service unit (CSU).

Required Electronic Emission and Connectivity Notices

Federal Communications Commission (FCC) Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Compliance Statement

This Class A digital apparatus complies with the Canadian ICES-003.

Cet appareil numérique de la classe A conform à la norme NMB-003 du Canada.

United Kingdom

Notice to United Kingdom Users

This apparatus is approved under General Approval number NS/G/1234/J/100003 for indirect connection to public telecommunications systems in the United Kingdom.

European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.

IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22 / European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention
This is a Class A product. In a domestic environment, this product
may cause radio interference, in which case, the user may be
required to take adequate measures. If the Ethernet port is
connected, 100 ohm category 5 shielded twisted-pair Ethernet cable
must be used to reduce the potential for causing interference to radio
and TV communications and to other electrical or electronic
equipment. IBM cannot accept responsibility for any interference
caused by other-than-recommended cables and connectors.

Germany

**Zulassungsbescheinigung laut Gesetz über die
elektromagnetische Verträglichkeit von Geräten (EMVG)
vom 30. August 1995**

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem deutschen
EMVG das EG-Konformitätszeichen - CE - zu führen.

Der Aussteller der Konformitätserklärung ist die:

> International Business Machines
> ARTIC Hardware Development
> 1798 N.W. 40th Street
> Boca Raton FL 33431
> U.S.A.

Informationen in Hinsicht EMVG Paragraph 3, Abs. 2:

> Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und
> EN 55022 Klasse A.

EN 55022 Klasse A Geräte bedürfen folgender Hinweise:

Nach dem EMVG:
"Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind,
nur mit besonderer Genehmigung des Bundesministeriums für Post
und Telekommunikation oder des Bundesamtes für Post und
Telekommunikation betrieben werden. Die Genehmigung wird erteilt,

wenn keine elektromagnetischen Störungen zu erwarten sind."
(Auszug aus dem EMVG, Paragraph 3, Abs. 4)

Dieses Genehmigungsverfahren ist nach Paragraph 9 EMVG in
Verbindung mit der entsprechenden Kostenverordnung (Amtsblatt
14/93) kostenpflichtig.

Nach der EN 55022:
"Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im
Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom
Betreiber verlangt werden, angemessene Maβnahmen durchzuführen
und dafür aufzukommen."

Anmerkung:
Um die Einhaltung des EMVG sicherzustellen, sind die Geräte wie in
den Handbüchern angegeben zu installieren und zu betreiben.

Japanese Voluntary Control Council for Interference (VCCI) Statement

This product is a Class A Information Technology Equipment and conforms to the standards set by the Voluntary Control Council for Interference by Information Technology Equipment. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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Korea

Korean Communications Statement

Please note that this device has been approved for business purpose with regard to electromagnetic interference. If you find this is not suitable for your use, you may exchange it for a non-business one.

Taiwan

Taiwan Class A Warning Statement

This product is a Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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這是甲類ㄉ 資訊產品，在
居住的環境中使用時，可
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Part Number 87H3770

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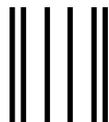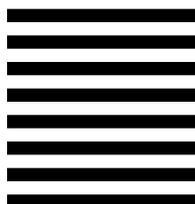
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