

GDC 036R342-000
Issue 2, November 1996

Installation and Operation

OCM Packet Processor

(OPP)

Warning

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to CISPR 22, which is designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference. The user is cautioned that any changes or modifications not expressly approved by General DataComm void the user's authority to operate the equipment.

This digital apparatus does not exceed Class A limits for radio noise emissions from digital apparatus described in the Radio Interference Regulations of the Canadian Department of Communications.

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Antistatic Precautions

Electrostatic discharge (ESD) results from the buildup of static electricity and can cause computer components to fail. Electrostatic discharge occurs when a person whose body contains a static buildup touches a computer component.

The equipment may contain static-sensitive devices that are easily damaged and proper handling and grounding is essential. Use ESD precautionary measures when installing parts or cards and keep the parts and cards in antistatic packaging when not in use. If possible, use antistatic floorpads and workbench pads.

When handling components, or when setting switch options, always use an antistatic wrist strap connected to a grounded equipment frame or chassis. *If a wrist strap is not available, periodically touch an unpainted metal surface on the equipment.* Never use a conductive tool, like a screwdriver or a paper clip, to set switches.

Safety Guidelines

The following symbols are used when unsafe conditions exist or when potentially hazardous voltages are present:



Caution statements identify conditions or practices that can cause damage to the equipment or loss of data



Warning statements identify conditions or practices that can result in personal injury or loss of life.

Always use caution and common sense. *To reduce the risk of electrical shock, do not operate equipment with the cover removed.* Repairs must be performed by qualified service personnel only.

- Never install telephone jacks in a wet location unless the jack is designed for that location.
- Never touch uninsulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- Use caution when installing telephone lines and never install telephone wiring during an electrical storm.

FCC Part 68 Compliance

Connection of data communications equipment to the public telephone network is regulated by FCC Rules and Regulations. This equipment complies with Part 68 of these regulations which require all of the following.

All connections to the telephone network must be made using standard plugs and telephone company provided jacks or equivalent.

Connection of this equipment to party lines and coin telephones is prohibited. A label on the back of the front panel of data communications equipment and on the underside or rear panel of other equipment provides the FCC Registration number and the Ringer Equivalence Number (REN) for the unit. If requested, give this information to the telephone company.

If the unit causes harm to the telephone network, the telephone company may discontinue your service temporarily and if possible,

you will be notified in advance. If advance notice is not practical, you will be notified as soon as possible and will be advised of your right to file a complaint with the FCC. The telephone company may change its communication facilities, equipment, operations and procedures where reasonably required for operation. If so, the telephone company will notify you in writing. You must notify the telephone company before disconnecting equipment from 1.544 Mbps digital service. All repairs or modifications to the equipment must be performed by General DataComm. Any other repair or modification by a user voids the FCC registration and the warranty.

Canada DOC Notification

The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operation 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 may 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.

NOTICE: The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

Deutschland

Installations Anweisungen: Installieren Sie die Telefonleitungen nicht während eines Gewitters. Installieren Sie die Telefonleitungen nicht in einem feuchten Raum, außer die Dose entspricht den Vorschriften für Feuchträume. Berühren Sie unisolierte Telefonleitungen oder Einrichtungen nicht, außer diese sind vom Telefonnetz getrennt. Vorsicht bei der Installation oder Änderung von Telefonleitungen. *Achtung:* Es gibt keine durch den Benutzer zu wartende Teile im Gerät. Wartung darf nur durch qualifiziertes Personal erfolgen.

Registration Status	Port ID	SOC	FIC	USOC

Preface

Overview

The *OPP Installation and Operation Instructions* describe how to install and operate the General DataComm OCM Packet Processor (OPP). Also, this manual provides troubleshooting information for the OPP and the supported interfaces.

Note: This manual is for technical personnel with training or experience installing network devices.

Organization

This manual includes the following:

- *Chapter 1 - Introduction* provides an overview of the OPP features and identifies the supported OPP Module configurations.
- *Chapter 2 - Installation* describes how to install and power-on the OPP.
- *Chapter 3 - OPP Ethernet Module* identifies the components, describes normal operation, and provides connection information for the Ethernet Module.
- *Chapter 4 - OPP Token Ring Module* identifies the components, describes normal operation, and provides connection information for the Token Ring Module.
- *Chapter 5 - Troubleshooting* describes how to identify and solve problems that might occur while installing or operating the OPP.
- *Appendix A - Specifications* lists the physical, environmental, electrical, and interface standards for the OPP. However, note that cable specifications are in *Chapter 1*.
- *Appendix B - Typical OPP Console Port Display*
- *Appendix C - Cable Drawings*
- *Glossary*
- *Index*

Document Conventions

Level 1 paragraph headers introduce major topics.

Level 2 paragraph headers introduce subsections of major topics.

Level 3 paragraph headers introduce subsections of secondary topics.

This typewriter font shows output that is displayed on the screen.

This bold font shows specific input that you type at the keyboard.

Numbers are in decimal notation unless specified as hexadecimal.

Note: This may contain special instructions, helpful hints, or any requirements that you should know to use the product or product feature.

Publication Numbers

GDC publication numbers (e.g., *GDC 032R163-000*) are used to track and order technical manuals. Publication numbers use the following format: GDC NNNRnnn-000 or GDC NNNRnnn-Vnnn.

- *NNN* - identifies the product family (e.g. TMS).
- *R* - denotes a technical publication.
- *nnn* - a number assigned by Technical Publications.
- *000* - identifies a hardware product and does not change.
- *Vnnn* - is the software version associated with a product and may be updated periodically.

The issue number on the cover only changes when a hardware manual is revised or when a manual is reprinted for some other reason; it does not automatically change when the software is updated. A new Software Version is usually Issue 1. Other specialized publications such as *Release Notes* or *Addenda* may be available depending on the product.

Related Documentation

The following documents provide more information about using this product.

- *Internetworking Management System (IMS) User Guide* (GDC S-078R001-nnn) contains a complete discussion of the capabilities and features of the IMS.
- *OCM*TMS Installation and Operation Instructions* (GDC 036R340-000) documents the installation procedures for installing the OCM*TMS Shelf and Enclosure and describes the rear panel options.
- *Operation Manual for TMS-3000 Controller* (GDC 036R603-Vnnn) describes how to operate a TMS Controller to monitor and configure a TMS network.

1 Introduction

Overview

This chapter provides an overview of the OPP product features and capabilities.

Product Description

The OPP is a high-performance packet processor, LAN bridge router, and Frame Relay access device for LAN/WAN networks. OPP Modules are designed to operate in the GDC OCM*TMS 16-slot Shelf or the GDC OCM*TMS 10-slot Enclosure. GDC's unique Address Processor and Directory provides fast packet forwarding and storage of end-station (PC, workstation, host, etc.) information. OPP Modules use an Intel i960 RISC based processor.

The OPP Module provides a FSN (Frame Switching Network) within the OCM/TMS-3000 environment. This FSN permits LAN interconnection and Frame Relay support within the existing office communications system and provides high speed interconnection between multiple compatible modules in a node via the OCM*TMS Packet Bus.

OPP Modules can be one of the following:

- Ethernet
- Token Ring

The Ethernet Module provides one Ethernet IEEE 802.3 10BaseT LAN interface and one Frame Relay DTE (Data Terminal Equipment)/HDLC interface. The Token Ring Module provides one Token Ring IEEE 805.2 LAN interface (UTP or STP) and one Frame Relay DTE/HDLC interface.

Each card is equipped with the following:

- LAN interconnect
- two WAN interconnects
- Packet Bus interconnect or Inter Router Link (IRL)

The Packet Bus/IRL provides connections to other OPPs within the OCM and has a maximum bandwidth of 36 Mbps. The primary WAN interconnect is via the OCM's link (LIM) to a TMS or to another OCM. The LAN data is allocated bandwidth (a circuit) on the link along with other circuits for other cards in the OCM. The maximum bandwidth for OPP is one selection slower than the line rate.

The secondary WAN interface provides a Frame Relay DTE/HDLC interface to public network services and switching interfaces for private networks at data rates up to 2.048 Mbps. It uses the DB-25 connector associated with the OPP slot to provide connectivity.

Since OPP Modules are double-slot cards, the OCM*TMS Shelf or Enclosure may contain up to four Ethernet Modules, four Token Ring Modules, or a mix of both if Heterogeneous Bridging software is used.

The LAN internetworking features of the OPP are managed from the GDC Internetworking Management System (IMS). The IMS is mandatory and may be placed anywhere in a LAN segment that is logically attached to the network. Only version V7.1.4 or later can be used to manage the network. The IMS is also the vehicle to load OPP software and software upgrades.

The OCM cards, including the OPP, receive low level configuration and management information from the TMS-3000 Controller. This level of configuration must be completed before the IMS (Internetworking Management Software) can access OPP cards.

Note: The IMS is unnecessary to set up pure Bridging applications in an OCM-1000 environment (no TMS). You can enter the few set up commands on an ASCII console.

This chapter includes the following tables:

- *Table 1-1* lists the Ethernet Module features
- *Table 1-2* lists the Token Ring Module features
- *Table 1-3* lists the Interface Specifications
- *Table 1-4* lists the OPP product line equipment
- *Table 1-5* lists available cables and HUB products
- *Table 1-6* lists the pinouts of the OPP connectors

Table 1-1 Ethernet Module Features

Feature	Description
Processor	The Ethernet Module uses an i960 RISC processor with the following characteristics: <ul style="list-style-type: none"> • 2 MB expandable flash memory • 8 MB expandable system memory • 128 KB of non-volatile configuration memory
High Performance Address Processor and Directory (AP&D)	GDC's unique AP&D automatically builds and maintains address information for each network device. It enables the module to make switching decisions very quickly.
Interfaces	The Ethernet Module supports the following interfaces: <ul style="list-style-type: none"> • one Ethernet interface (10BaseT) • one Frame Relay/HDLC
Console Support	A front panel jack provides console support for the Ethernet Module.
Network Management	The Ethernet Module can be configured and monitored using the IMS and the TMS-3000 Transport Management System. The LAN is configured from the IMS and the OCM is configured from the TMS-3000. For more information about IMS operation, see the <i>IMS User Guide</i> and the <i>Operation Manual for TMS-3000 Controller</i> .

Table 1-2 Token Ring Module Features

Feature	Description
Processor	The Token Ring Module uses an i960 RISC processor with the following characteristics: <ul style="list-style-type: none"> • 2 MB expandable flash memory • 8 MB expandable system memory • 128 KB of non-volatile configuration memory
High Performance Address Processor and Directory (AP&D)	GDC's unique AP&D automatically builds and maintains address information for each network device. It enables the module to make switching decisions very quickly.
Interfaces	The Token Ring Module supports the following interfaces: <ul style="list-style-type: none"> • one Token Ring IEEE 802.5 LAN (UTP and STP, 4 or 16 MB) • one Frame Relay/HDLC
Console Support	Front panel jack provides console support for the Token Ring Module.
Network Management	The Token Ring Module can be configured and monitored using the IMS and the TMS-3000. The LAN is configured from the IMS and the OCM is configured from the TMS-3000. For more information about IMS operation, see the <i>IMS User Guide</i> and the <i>Operation Manual for TMS-3000 Controller</i> .

Table 1-3 Supported Interface Specifications

Interface	Type Supported
Ethernet	10BaseT
Token Ring	Type 1 (STP) or Type 3 (UTP)
WAN	RS-232, RS-422, and V.35

Table 1-4 OPP Equipment List

Description	GDC Part Number
OPP Ethernet Card Assembly	036M450-xxx
OPP Token Ring Token Ring Card Assembly	036M451-xxx
OCM Interface Plug In	036P455-001
8M DRAM SIMM	036P374-002
2M Flash SIMM	036P375-001
Interface Options	
Universal I/O Plug In	S-078P404-001
V.35 I/O Plug In	S-078P404-002
RS232 I/O Plug In	S-078P404-003
RS422 I/O Plug In	S-078P404-004

Note: xxx represents an assembly version number.

Table 1-5 Available Cables and HUB Products

Description	GDC Part No.
Cables	
OPP-OPP (Serial Ports) Back-to-Back	027H434-xxx
OPP Serial Port to V.35 DCE	027H589-xxx
OPP RJ-45 to DB9 (Type 1 Cable Adapter)	027H254-001
OPP Serial Port to RS-422 DCE	027H588-xxx
OPP Serial Port TO RS-232 DCE	028H345-xxx
Console to Female DB-25 (ASCII terminal)	024H139-006
Console to Male DB-25 (ASCII terminal)	024H140-006
Console to DB-9 Female (PC)	024H141-006
Ethernet 10BaseT (RJ-45s)	021H101-xxx
Ethernet 10BaseT (RJ-45s) crossover	021H102-xxx
Token Ring UTP (RJ-45s)	021H103-xxx
Token Ring STP (DB-9 IBM)	S-078H005-xxx
HUB Products	
Token Ring Unmanaged HUB UTP (rack mount)	S-078A023-002
Token Ring Unmanaged HUB STP (rack mount)	S-078A023-001
Ethernet Unmanaged HUB (desktop)	S-078A022-001

Note: xxx represents optional cable lengths. See Appendix C for cable drawings.

Table 1-6 OPP Connector Pinouts

OPP DB-25 Connector Pinouts	
Pin Number	Function
1	Shield
2	TXD A
3	RXD A
4	RTS A
5	CTS A
6	DSR A
7	Gnd
8	DCD A or Cable type (UIO)
9	R CLK B
10	DCD B
11	Ext Clk B
12	T CLK B
13	CTS B
14	TXD B
15	T CLK A
16	RXD B
17	R CLK A
18	LL
19	RTS B
20	DTR A
21	RL or Cable type (UIO)
22	DSR B (422), RI (232) or Cable type (UIO)
23	DTR B
24	EXT CLK A
25	RI (422) or TM (V.35 & 232)
OPP 10BaseT Connector Pinouts RJ-45	
1	TD+
2	TD-
3	RD+
6	RD-
OPP UTP/STP Connector Pinouts RJ-45	
3	TU+
4	RU+
5	RU-
6	TU-

Note: Due to differences in I/O SIP type, pins may vary in function.

Summary

This chapter provided an overview of the OPP features and identified the supported OPP Module configurations.

What's Next?

The next chapter describes how to install and power-on the OPP.

2 Installation

Overview

This chapter provides the steps necessary to install an OPP. Follow the steps carefully. Specifically, this chapter covers the following topics:

Installation Requirements

- Selecting a Location

- Making OPP Connections

- Powering-On the OPP

- Verifying Operation

- Configuring the OPP

- OPP MAC Address

Configuration Options

- Setting the Real Time Clock

- Setting the IP Address and Associated Parameters

- Setting the Bridge Name

- Port Numbering Scheme

- Source Routing Specific Configuration

- Status

Redundancy

Boot Up Sequence

Installation Requirements

Note: For the first OCM*TMS Shelf, install OPPs in slots 2 through 15 (maximum of four per node). For an OCM*TMS Standalone Enclosure, install OPPs (four maximum) in slots 2 through 9. Slot 1 of the Shelf and of the Enclosure is for the Common Control Module (CCM). Due to cooling limitations, the OPPs should be installed within slots 2 through 11 of the EP-5 cabinet.

To install your OPP, you must have the following:

- network cable for each LAN interface
 - *Release Notes*
Read the *Release Notes* before you install the OPP. *Installation* in the *Release Notes* lists Console Commands necessary to configure the cards.
 - Frame Relay/HDLC cables to mate with the DB-25 port (depends on configuration)
- If any ordered items are missing, contact your sales representative.

Selecting a Location

OPP Modules are mounted in either an OCM*TMS Shelf or Enclosure. When you select a location, you must meet the following requirements:

- Operating temperature must be 32° to 113° F (0° C to 45° C).
- Relative humidity during operation must be 5% to 95% non-condensing.
- Power supplied to the OCM*TMS Shelf must be 47-63 Hz and 90-264 Vac or 48 Vdc, depending on the model.
- You must be able to access the networks that will be connected to the OPP.
- You must be able to access the back panel.

See *OCM*TMS Installation and Operation Instructions* for air intake and ventilation requirements for the OCM*TMS Shelf and Enclosure.

Making OPP Connections

Interface location depends on which OPP Module is installed in your OCM*TMS. *Chapters 3 and 4* provide detailed instructions for making connections to the Ethernet and the Token Ring Modules. Generally, you should complete all connections before powering-on the OPP.

Maintenance Console Connection

To set up a Maintenance Console, use the cables listed in *Table 1-5* to connect an ASCII terminal or PC to the MAINT port on the front of the OPP.

Powering-On the OPP

To power-on the OPP, do the following steps:

1. Connect the power cord to the OCM*TMS Shelf or Enclosure.
2. Connect the power cord to the electrical outlet.
3. Insert the OPP into the slot.
4. Set the power switch to ON.
5. Verify operation by checking the items discussed in the following section, *Verifying Operation*.

Verifying Operation

After powering-on the OPP, verify operation. To verify OPP operation, check that the following occurs when you turn on the power switch:

- The Processor on each OPP Module tests the module. The Test LED remains on until the tests are complete. The Init LED remains on throughout the test and code loading portions. The In Service LED comes on after the OPP is configured.

Note: Depending on your configuration, the power-up diagnostics, image load, and configuration download may take up to 1½ minutes to complete.

- If you have a Maintenance Console connected to the OPP MAINT port, the following key messages display on the console:

```
OPP DIAGNOSTICS COMPLETE (HARDWARE OK)
OPP OPERATIONAL FIRMWARE (IMAGE LOAD OK)
CCM REQUESTED CONFIGURE (CONFIGURATION STARTED)
OPP>EVENT: SYSTEM INITIALIZATION COMPLETED
```

See *Appendix B* for typical console display.

If the Maintenance Console does not display these messages, call General DataComm Service at 1-800-243-1030. If you have no Maintenance Console attached to the OPP, the LEDs on the OPP Module front panel indicate whether the module is operating properly. See *Chapters 3* and *4* for the module specific indicators. See *Appendix B* for typical console display at start up.

If your OPP does not power-on properly, see *Chapter 5*.

Configuring OPP

Either the OCM-1000 or the TMS-3000 with GTS 2.1 software or higher is used to configure the OCM*TMS aspect of your OPP. This configuration level must be complete before the IMS can access the OPPs.

Note: The GTS or OCM-1000 systems must configure the node before you initialize the OPP. (At least one circuit other than the OPP circuit must be configured and operational to an OCM node for an OPP to function.)

See the *OCM-1000 User Guide* (GDC 036R612-Vnnn) for more information about this system.

Usually, you do not require the IMS for pure Bridging applications. The Ethernet Bridging is self-learning and you can complete Token Ring setup on the console.

The IMS configures the advanced LAN aspects of your OPP. See *TPP/OPP Release Notes* for details and conventions. The IMS can manage the OPP either by using MAC Addresses or IP Addresses. With MAC Addresses, all forms of configuration and statistical information can be exchanged. However, downloads of code cannot be accomplished without using IP Addressing. IP Addressing lets the IMS Manager access the full set of management features.

Note: For the IMS to fully manage the OPP, the IMS and the OPP must have proper IP Addresses.

If IMS is installed on your network, see the *IMS User Guide* for information on how to configure the OPP. After installing the hardware, use the information in *Table 2-1* to configure the OPP.

OPP MAC Address Information

The MAC address is fixed based upon the OCM node and slot; it is in the following form:

0A-C0-64-ST-NN-N0 where,

S is the OCM Slot Number minus one (0 -15)

T is the TMS Network Number assigned by the TMS Software Controller (0 -15)

NNN is the TMS/OCM Node Number (1-4095)

Note: All values are displayed in hexadecimal.

Table 2-1 Network Configuration Requirements

If you are using...	you must know the following:
<i>Network Management Agent</i> SNMP	<ul style="list-style-type: none"> • IP Address • subnet mask (optional) • default gateway (optional) • read/write community names
<i>Bridging</i> Transparent Spanning Tree (Ethernet only) Source Routing (Token Ring only)	<ul style="list-style-type: none"> • Bridge number • Ring numbers
<i>Protocol Dependent Routing</i> IPX (NetWare) IP	<ul style="list-style-type: none"> • IPX network numbers • IP Address • subnet mask
Frame Relay/HDLC	<p>All WAN parameters, including the following:</p> <ul style="list-style-type: none"> • interface type (RS-232, RS-422, and V.35) • clock source and speed • enabling of HDLC Pass Through • type of line encoding (NRZ or NRZI) • enabling of line idling with flags or marks • station number (HDLC Pass Through only) <p>Configure the information on the IMS WAN Parameters screen.</p>

Configuration Options

After you connect the OPP to the LAN and to the WAN, certain configuration parameters must be loaded into non-volatile memory. You can configure these parameters with the IMS or with the Maintenance Console.

To set up the Maintenance Console for configuration parameters, do the following steps:

1. Connect an ASCII terminal (or PC with terminal emulator software) to the OPP MAINT port on the OPP front panel.

Note: GDC 024H139-006 is a cable for mini-phone jack to DB-25 female connector.

GDC 024H140-006 is a cable for mini-phone jack to a DB-25 male connector.

GDC 024H141-006 is a mini-phone jack to DB-9 (PC/AT serial port).

2. Set terminal for 2400 baud, 8 bits, 1 stop, no parity. (If the Board is booting up, wait until after the Initialization Complete prompt appears.)
3. Press the Return key until the OPP> prompt appears.
4. Type the appropriate console commands.

Setting the Real Time Clock

OPP has a Real Time Clock which is used to time and date-stamp event entries in the OPP Event Log. Use the **set clock** command to set the Real Time Clock to local time.

The syntax is

```
OPP> SET CLOCK
```

1. Enter the new date and time information in the form: **mm/dd/yy hh:mm:ss [A|P]**.
2. Enter day of the week (**1-7**, Sunday = **1**).
3. Select 12 or 24 hour clock display mode (**12** or **24**).

The battery powered Real Time Clock maintains the time of day.

Setting the IP Address and Associated Parameters

Before the IMS can download OPP software, the IP Address must be defined for the new OPP card. (You can set several other configuration parameters at this time with the Maintenance Console or with the IMS.) Define an IP Address for the card in one of the following ways:

- IP Address Setup from the Maint Port
- IP Address Setup from the BootP Server
- IP Address Setup from the IMS Global IP Settings screen

IP Address Setup from the Maint Port

To setup the IP Address directly from the Maint port, set the desired IP Address:

```
OPP> SET BRIDGE IPAD x.x.x.x(e.g., 192.9.200.101 )
```

Optional setting: IP Subnet Mask:

```
OPP> SET BRIDGE MASK x.x.x.x(e.g., 255.255.255.0)
```

Gateway:

```
OPP>S ET BRIDGE GTWY x.x.x.x(e.g., 0.0.0.0)
```

IP Address Setup from the BootP Server

Use the BootP Server on the IMS to inform the new OPP card of its IP Address at boot time. To use the IMS BootP Server, see the *IMS User Guide*.

IP Address Setup from the IMS Global IP Settings Screen

Use the IMS to enter an IP Address from the Global IP Settings screen.

Setting the Bridge Name

To set up the Bridge name (alphanumeric, if required), enter the following:

```
OPP> SET BRIDGE NAME X (alphanumeric).
```

Note: Bridge name is retained in non-volatile memory until you change it by repeating the above command (even if you move the card).

Port Numbering Scheme

Table 2-2 describes the OPP Port Numbering scheme.

Table 2-2 OPP Port IDs

Network (Port) Number	Default Name	Function
0	LAN 0	LAN
1	WAN 1-0	Secondary WAN (DB-25)
2	WAN 1-1	Primary WAN (LIM)
255	pb	Packet Bus

Source Routing Specific Configuration

For Token Ring Source Routing, additional parameters may be entered such as Bridge Number, and LAN Segment numbers for each interface.

```
OPP> SET BRIDGE NUMBER X
```

```
OPP> SET PORT X NUMBER Y
```

(Port X is number from Table 2-2, Number Y is LAN Segment number.)

Example:

```
SET PORT 2 NUMBER 6
```

Configure the primary WAN to LAN Segment Number 6 (for Source Routing). The status is displayed on the Maintenance Console as WAN 1-1 .

Status

You can display several status screens. The following lists the status screens you can display and the corresponding console commands.

To display Bridge parameters:

```
OPP> SHB
```

To display the status of an OPP port, look up the Network Number in *Table 2-2*. Use the Network Number in the command line (X = network number from *Table 2-2*):

```
OPP> SHL X (SHL = show line)
```

To display configuration information and status on an OPP port:

```
OPP> SHN X (SHN = show network)
```

To display additional details (counts):

```
OPP> SHL X (SHL = show line)
```

To display the MAC Addresses that an OPP can see

```
OPP> SHA
```

Note: The Bridge/OPP addresses in *Table 2-2* may take several forms (each form will be displayed).

When you type status commands, the screen displays several messages. The following lists and describes status messages:

- &SHC - show configuration
- ACTIVE - the line is up and working
- LOCAL DISC - OPP is unable to bring the link up
- REMOTE DISC - device at the opposite end of the WAN is not responding
- NOT CONFIG - OPP received no configuration from the TMS system

Redundancy

All the OCM common cards do not support redundancy (only CCM and LIM cards are available in redundant pairs). However, you can add a second OPP and create an additional TMS circuit for that OPP back to a major node.

With one connection from each OPP to the LAN, the software can make decisions that will provide redundancy as follows:

- *Ethernet Spanning Tree* - The algorithm lets one OPP pass data (forward data) and keeps the other OPP in the learning state such that it does not pass data (unless some element in the primary OPP data path fails).
- *Token Ring Source Routing* - The individual end stations on the ring learn the path to the destination station. Thus, both OPPs could be in use; if one went down, the end stations would relearn the necessary paths through the remaining OPP.

Boot Up Sequence

The OPP boots up in the following sequence:

1. Perform Self Test.
2. Load operating code from flash memory.
3. Test operating code.
4. Get configuration information from CCM.
5. Interfaces started.
6. WAN lines go “Active” once several successful messages are passed between the OPP and another device.

See *Appendix B* for a typical console boot up display.

Summary

This chapter described how to install and power-up the OPP.

What's Next?

The next chapter identifies the components, describes normal operation, and provides connection information for the Ethernet Module.

3 OPP Ethernet Module

Overview

This chapter provides a detailed discussion of the OPP Ethernet Module. Specifically, this chapter covers the following topics:

- Ethernet Front Panel Status Display

- Ethernet Module Daughter Cards

- Connect to the Networks

 - Connecting Ethernet Interfaces

 - Connecting Primary WAN Interfaces

 - Connecting Secondary WAN Interfaces

 - Connecting a GDC WAN Interface Back-to-Back

Ethernet Front Panel Display

Figure 3-1 shows the Ethernet Module front panel LED indicators which indicates system status.

Ethernet Module Daughter Cards

Figures 3-2 and *3-3* illustrate how to install the Ethernet Module daughter cards.

Connect to the Networks

The Ethernet Module supports one Ethernet and two WAN interfaces. The following sections provide the steps necessary to install each of these connections.

Connecting Ethernet Interfaces

To connect an Ethernet interface to the network, complete the following steps:

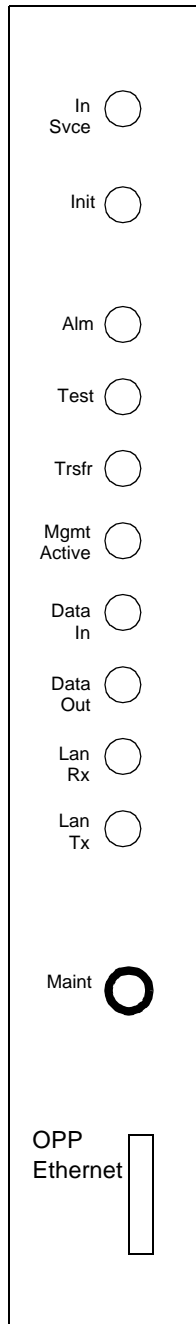
1. An Ethernet Module can be installed in slots 2 through 15 in the OCM*TMS Shelf or in slots 2 through 9 in the OCM*TMS Standalone Enclosure.

Note: Since the OPP is a two-slot module, it occupies the next higher slot as well, but connections are made only to the lower numbered slot connectors.

Using a 10BaseT (UTP) Ethernet cable, connect the Ethernet cable to the appropriate RJ-45 jack in Zone 1 (connect cable to the lower numbered slot) on the rear panel of the OCM*TMS Shelf or Enclosure. *Figure 3-4* shows where to connect an Ethernet 10BaseT cable.

2. Connect the other end of the cable to a 10BaseT HUB, repeater, or MAU (Multistation Access Unit).

Note: See the listing in *Table 1-5* of available cables and products. Since the Ethernet HUB product has eight 10BaseT and one 10Base2 ports, it is an expensive cable type conversion product.



In Service (In Svce)

Green LED lights to indicate that the module is in the currently active configuration (indicates that the module is operating).

Initialization (Init)

Yellow LED lights to indicate that module is running boot firmware (also flashes during software download).

Alarm (Alm)

Red LED lights when any major alarm condition exists.

Test (Test)

Yellow LED lights when module is performing power-up, self-test, or other diagnostic tests.

Transfer (Trsfr)

Green LED lights when packets are being processed and addresses found are forwarded.

Management Active (Mgmt Active)

Green LED flashes to indicate CPU is running management code.

Data In (Data In)

Green LED lights indicate data being received on primary WAN (LIM).

Data Out (Data Out)

Green LED lights indicate data on primary WAN (LIM) being transmitted.

LAN Receive (Lan Rx)

Green LED lights to indicate packet of LAN data being received.

LAN Transmit (Lan Tx)

Green LED lights to indicate packet of LAN data being transmitted.

Maintenance (Maint)

Miniature 3-conductor phone jack/port for connecting an ASCII terminal.

Figure 3-1 OPP Ethernet Module Front Panel

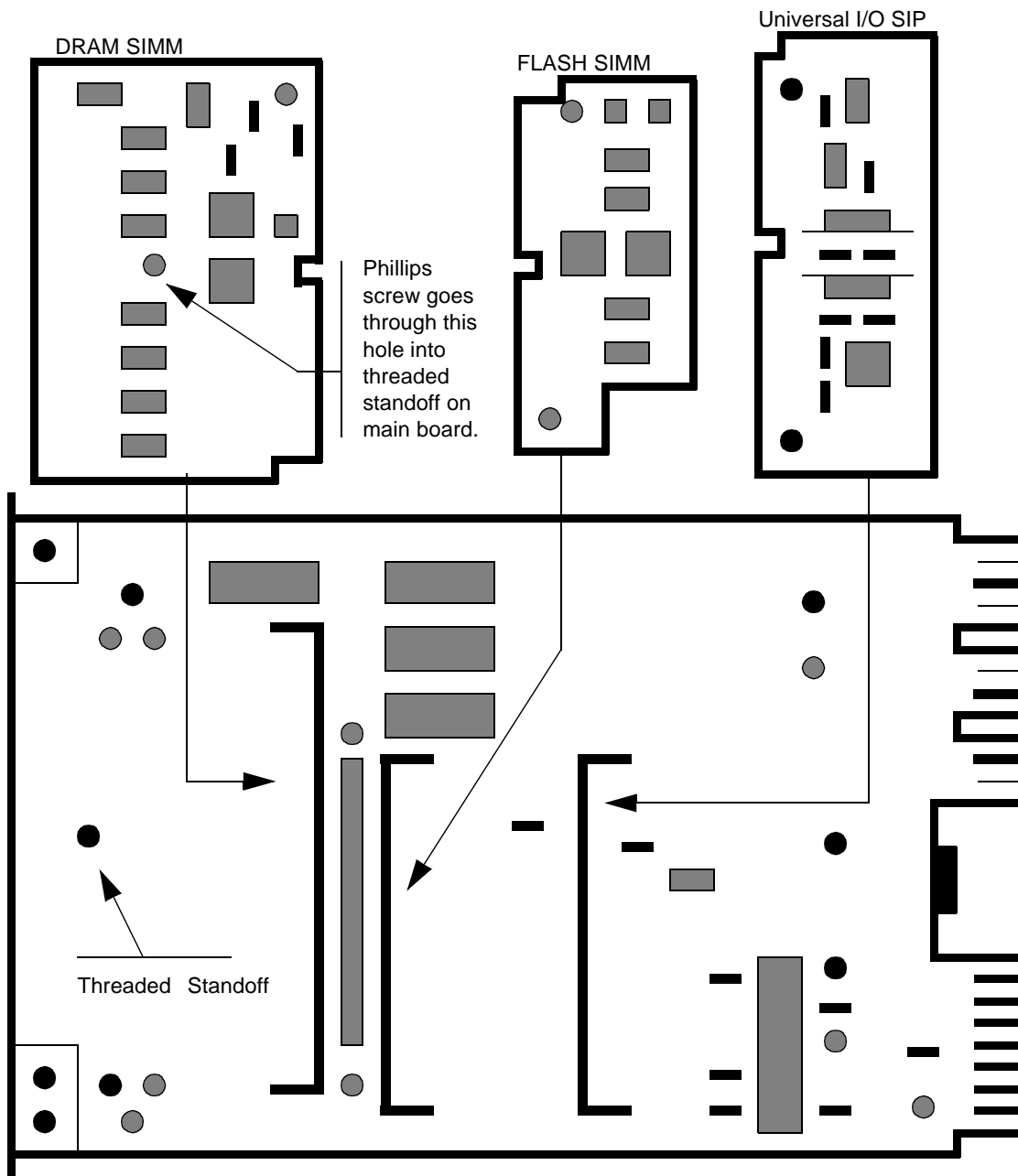


Figure 3-2 OPP Ethernet Module Daughter Cards (Bottom Row)

Note: The left side of the DRAM SIMM has a Phillips head screw. Remove the screw before you remove the card.

The Flash and Universal I/O cards physically interchange, but they work only when they are in their proper locations.

To remove these cards from the connectors, push the metal retaining clips outward and lift the outer edge of the card away from the basecard. To replace these cards, insert card into the connector so the plastic alignment pins are centered in the holes near the edge of the PC board. Press card down until the metal retaining springs snap over the card.

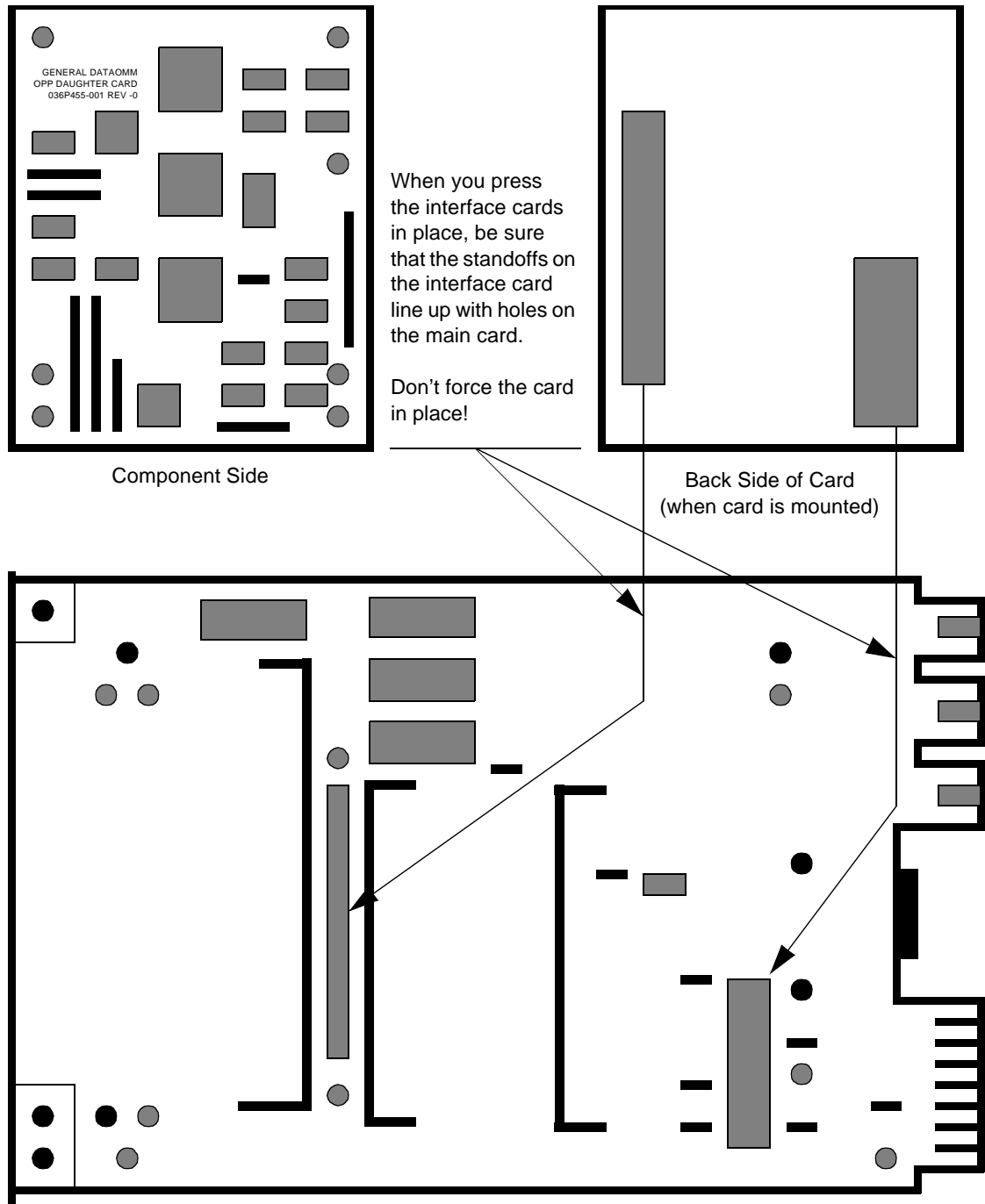
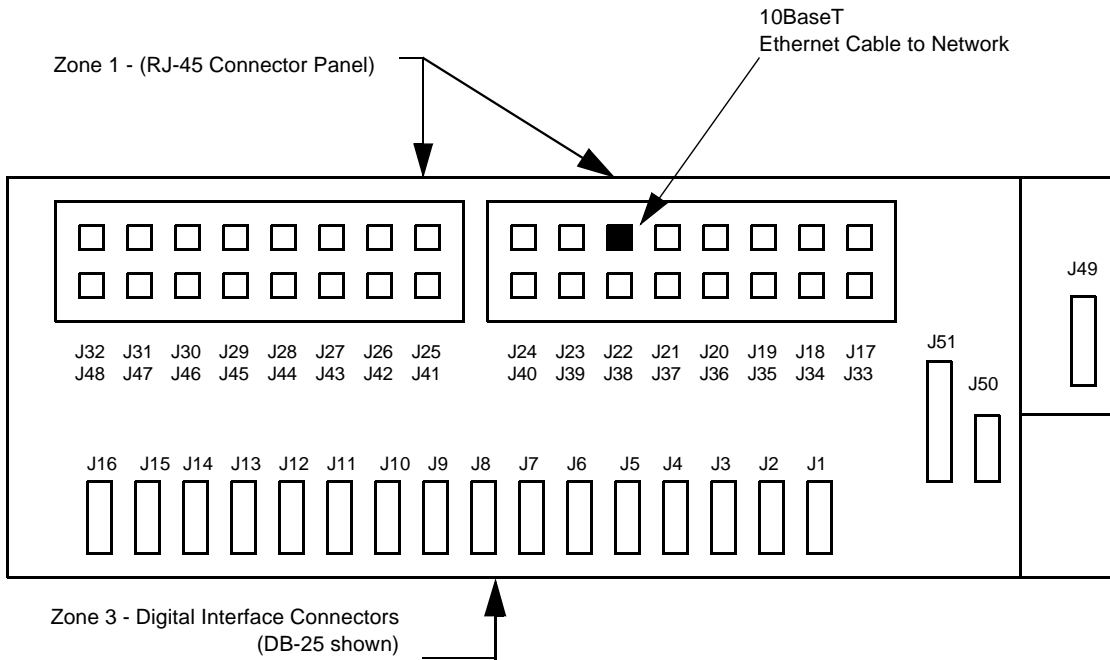


Figure 3-3 OPP Ethernet Module Interface Card Installation (Second Tier)

Note: SIMM daughter cards must be installed before you install the interface card.

OCM*TMS Shelf



OCM*TMS Enclosure

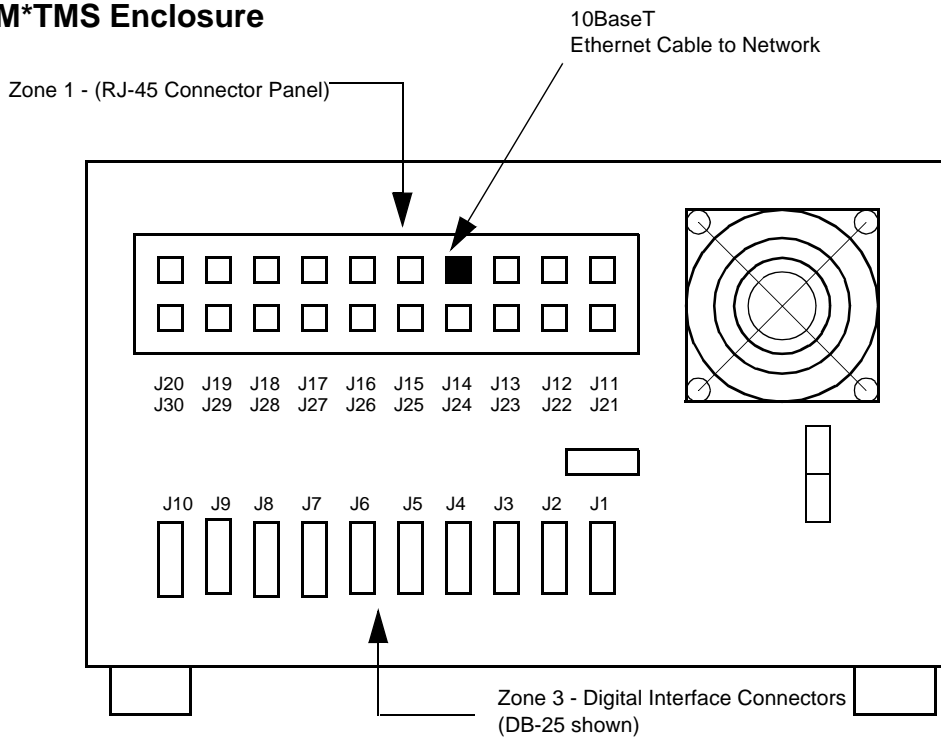


Figure 3-4 Connecting Ethernet 10BaseT Cable to an OPP Ethernet Installed in Slots 6 and 7

Note: Connect the cable to the lower numbered slot or connector of the pair.

Connecting Primary WAN Interfaces

The primary WAN interface is the connection (TMS circuit) from the local OCM to either the TMS node or another OCM node. The connection is established by setting the TMS circuit type to TPP with a sub-type of NODAL or FR-OPP on the TMS-3000 Controller. See the *TMS-3000* or *OCM*TMS* manuals for more information.

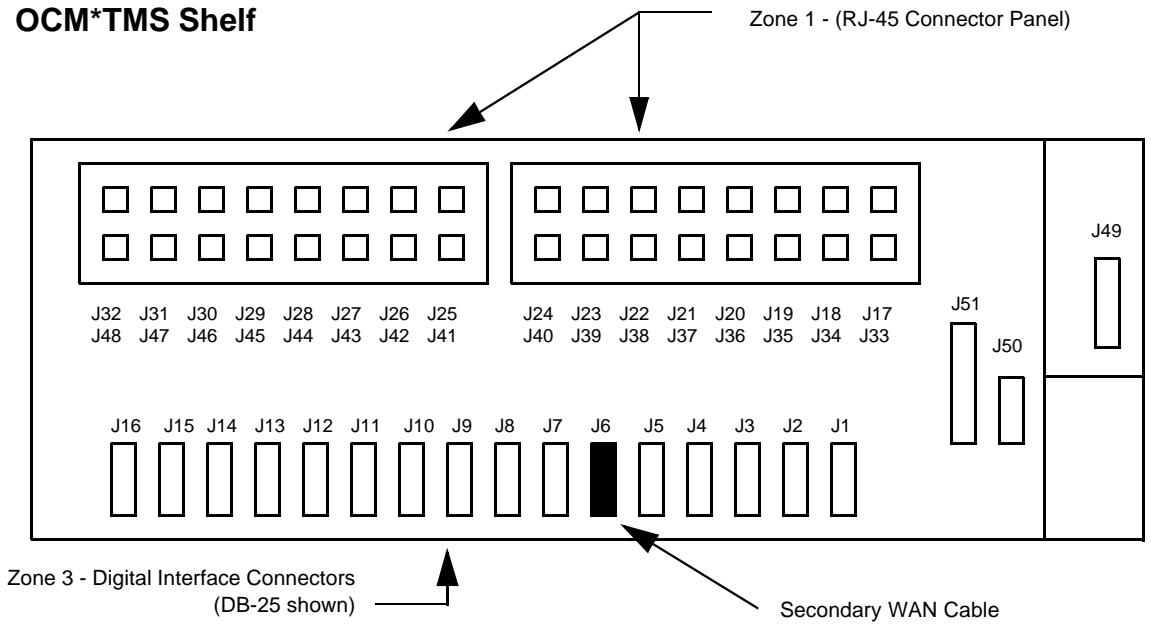
Connecting Secondary WAN Interfaces

You can connect your secondary WAN interface to a device, network, or back-to-back to another GDC secondary WAN interface.

Serial Interface

If you ordered an interface specific module (V.35, RS-232, or RS-422), you must use the cable designed for that module. Interface specific modules function with one type of cable.

1. Using the cable that was shipped with your product, connect the cable to the appropriate DB-25 connector in Zone 3 of the Shelf or Enclosure. *Figure 3-5* shows where to connect the cable.
2. Connect the other end of the cable to the DCE interface (e.g., a DSU/CSU, modem, Multiplexer, or Frame Relay device).



OCM*TMS Enclosure

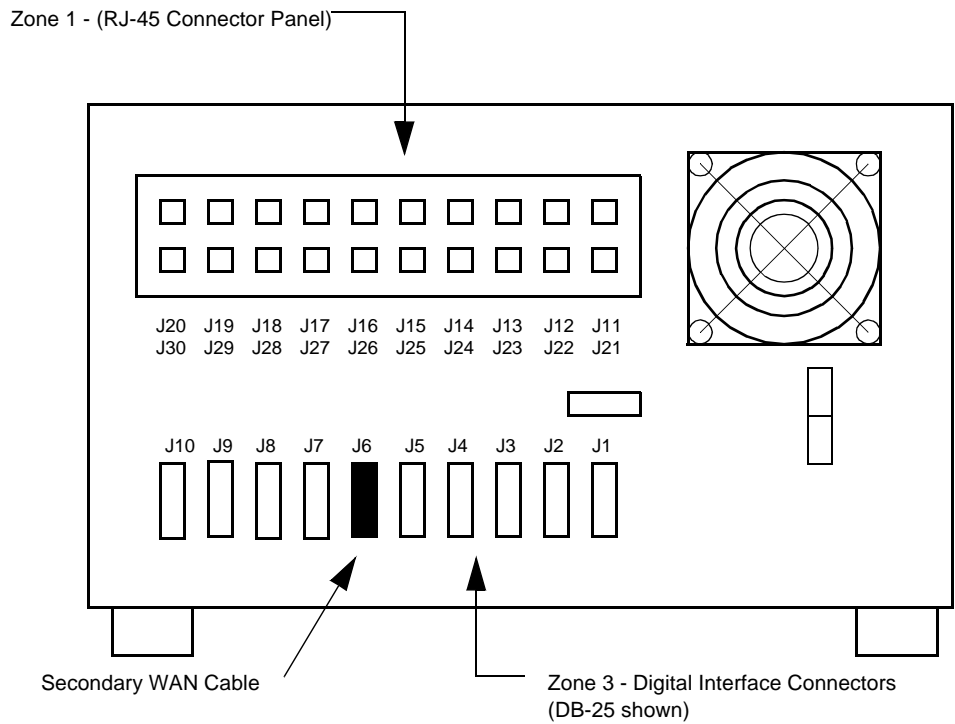


Figure 3-5 Connecting a Cable to the Secondary WAN Connector on an OPP Ethernet Installed in Slots 6 and 7

Note: Connect the cable to the lower numbered slot or connector of the pair.

Connecting a GDC WAN Interface Back-to-Back

To connect a WAN interface to another GDC WAN interface, complete the following steps:

1. Using the WAN back-to-back cable, connect the cable to the appropriate DB-25 connector in Zone 3 on the rear of the OCM* TMS Shelf or Enclosure.
2. Connect the other end of the cable to another WAN interface on another GDC device.

Back-to-Back Communications and Clock Source

When connecting two WAN interfaces back-to-back, set one to generate clock and set the other to recover clock. You can verify or change the clock source using the IMS or a console command. For more information see the *IMS User Guide*.

Summary

This chapter identified the components, described normal operation, and provided connection information for the Ethernet Module.

What's Next?

The next chapter identifies the components, describes normal operation, and provides connection information for the Token Ring Module.

4 OPP Token Ring Module

Overview

This chapter provides a detailed discussion of the Token Ring Module. Specifically, this chapter covers the following topics:

- Token Ring Front Panel Status Display
- Connect to the Networks
 - Connecting Token Ring Interfaces
 - Connecting Primary WAN Interfaces
 - Connecting Secondary WAN Interfaces
- Configuring Your Module

Token Ring Front Panel Display

Figure 4-1 shows the Token Ring Module front panel LED indicators which provide an indication of system status.

Connect to the Networks

The Token Ring Module supports Token Ring and WAN interfaces. The following sections provide the steps necessary to install each of these connections.

Connecting Token Ring Interfaces

You can connect your Token Ring interfaces to an STP (Type 1) or UTP (Type 3) Token Ring network. The lower RJ-45 jack interface is 16 Mbps and requires the use of a shielded DB-9 adapter on the rear panels of the OCM*TMS Shelf and Enclosure. The upper RJ-45 interface is 4 Mbps. Both connectors are in Zone 1 of the OCM*TMS Shelf and Enclosure rear panel.

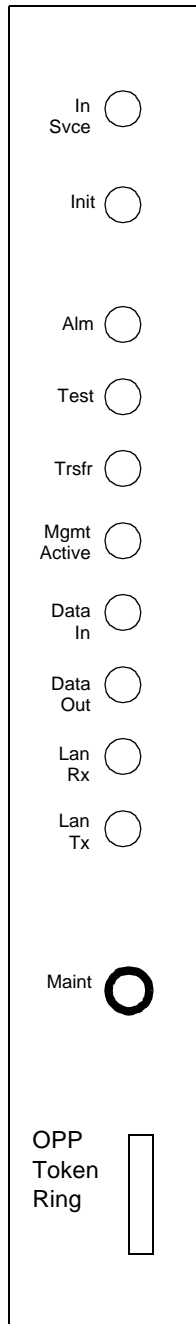
Note: See the listings in Table 1-5 of available cables and products.

STP (Type 1) or UTP (Type 3)

Before being shipped, your module was configured for the interface type you specified in your product order. If the interface is incorrect, you can change it with the Maintenance Console or with the IMS. See the *IMS User Guide* or *TMS-3000 User Guide* for more information on the commands to change the interface type.



Before you power-on your OPP, verify that all line speeds for connected Token Ring interfaces are set correctly (see the configuration sheet for interface settings). If the line speed is not set properly for your network, you must change it with the Maintenance Console or with the IMS before connecting to the network.



In Service (In Svce)

Green LED lights to indicate that the module is in the currently active configuration (indicates that the module is operating).

Initialization (Init)

Yellow LED lights to indicate that module is running boot firmware (also flashes during software download).

Alarm (Alm)

Red LED lights when any major alarm condition exists.

Test (Test)

Yellow LED lights when module is performing power-up, self-test, or other diagnostic tests.

Transfer (Trsfr)

Green LED lights when packets are being processed and addresses found are forwarded.

Management Active (Mgmt Active)

Green LED flashes to indicate CPU is running management code.

Data In (Data In)

Green LED lights indicate data being received on primary WAN (LIM).

Data Out (Data Out)

Green LED lights indicate data on primary WAN (LIM) being transmitted.

LAN Receive (Lan Rx)

Green LED lights to indicate packet of LAN data being received.

LAN Transmit (Lan Tx)

Green LED lights to indicate packet of LAN data being transmitted.

Maintenance (Maint)

Miniature 3-conductor phone jack/port for connecting an ASCII terminal.

Figure 4-1 OPP Token Ring Module Front Panel

Line Type and Speed Configuration

On the OPP Maintenance Console, type

```
OPP> STOP 0
OPP> SET LINE 0 SPEED=4(or 16)
OPP> SET LINE 0 UTP(or STP)
OPP> START 0
```

Note: Since the OPP is a two-card module, it occupies the next higher slot; but be sure to connect cables to the lower numbered slots.

Using STP (Type 1) Token Ring Cable

To connect a token ring interface to the network using an 16 Mbps STP (Type 1) cable, complete the following steps:

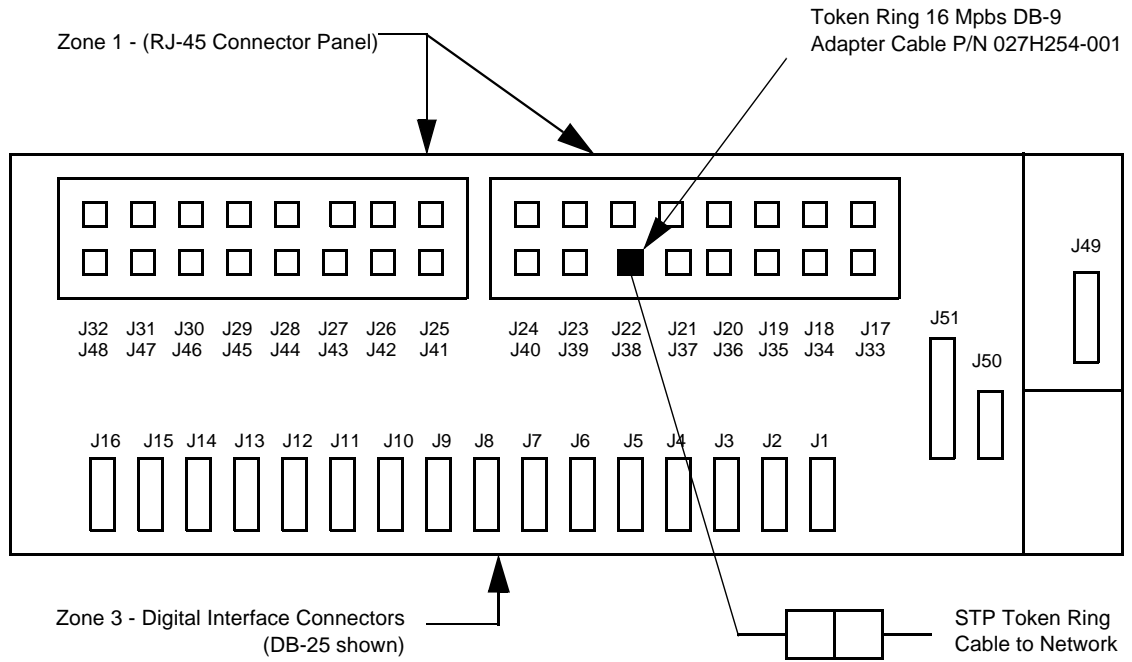
1. Confirm that the OCM product has a double row of RJ-45 connectors in Zone 1 of the half of the chassis that will contain the OPP. If not, install a double row RJ-45 panel in Zone 1 on the OCM*TMS rear panel (see *Table 4-1*).
2. Install the RJ-45 ground clip (supplied with OPP) on the lower RJ-45 connector for the slot that the OPP will be used in (if one does not already exist).
3. Using an 027H254-001 STP cable with a DB-9 connector, connect the RJ-45 end to the appropriate lower RJ-45 connector in Zone 1 on the rear of the OCM*TMS Shelf or Enclosure. *Figure 4-3* shows how to connect an STP (Type 1) cable.
4. Connect the other end of the adapter cable to a Token Ring cable leading to a HUB or MAU.

Note: Using the ground clip on the lower RJ-45 connector is necessary to meet FCC rules and regulations.

Table 4-1 OCM Zone 1 Connector Panels (Dual Row RJ-45)

Shelf Type	Shielding	GDC Part Number
8-Slot Enclosure	No shield	010B178-001
	Shielded	N/A
16-Slot Shelf	No shield	010C342-001
	Shielded	010C342-002

OCM*TMS Shelf



OCM*TMS Enclosure

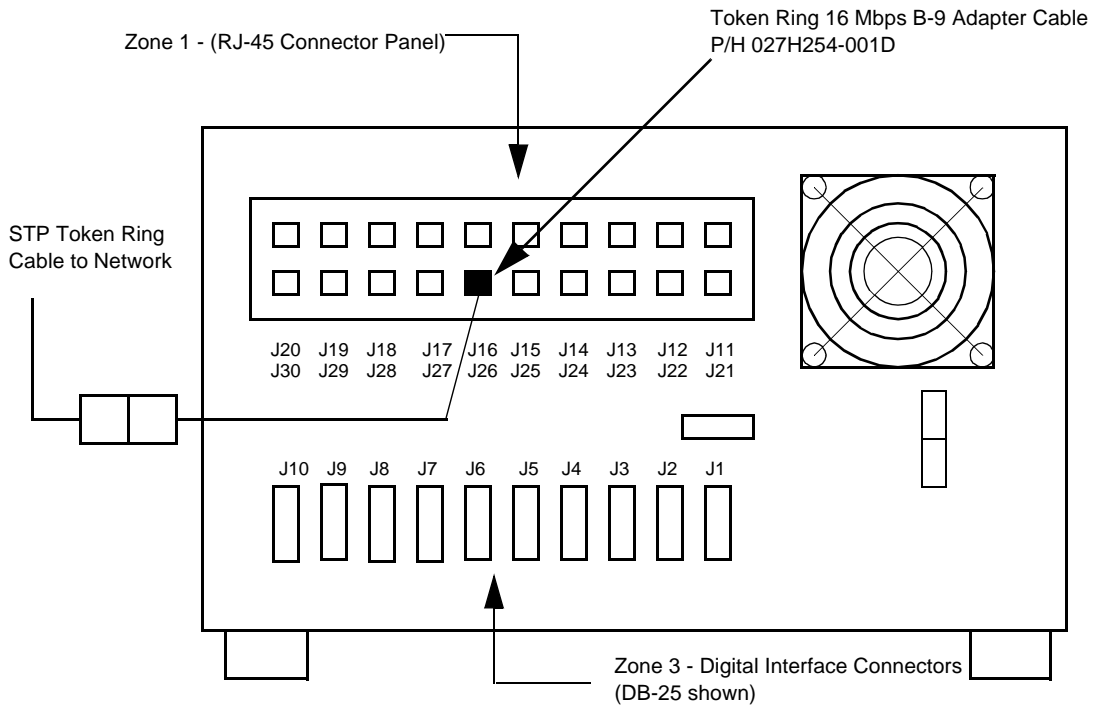


Figure 4-2 Connecting STP Token Ring Cable to Token Ring STP Adapter Cable Installed in Slots 6 and 7

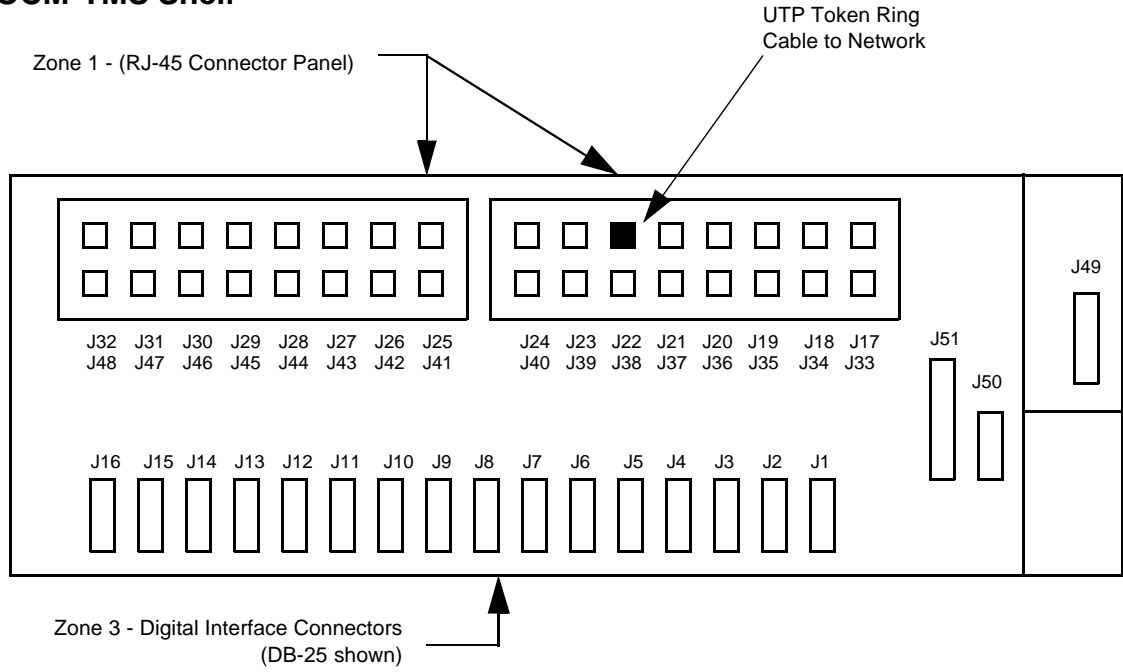
Note: Connect the cable to the lower numbered slot or connector of the pair.

Using UTP (Type 3) Token Ring Cable

To connect a Token Ring interface to the network using a UTP (Type 3) cable, complete the following steps:

1. Using a UTP cable, connect the cable to the appropriate upper RJ-45 jack in Zone 1 on the OCM*TMS Shelf or Enclosure. *Figure 4-3* shows where to connect a UTP cable to the module.
2. Connect the other end of the cable to a Token Ring HUB or MAU.

OCM*TMS Shelf



OCM*TMS Enclosure

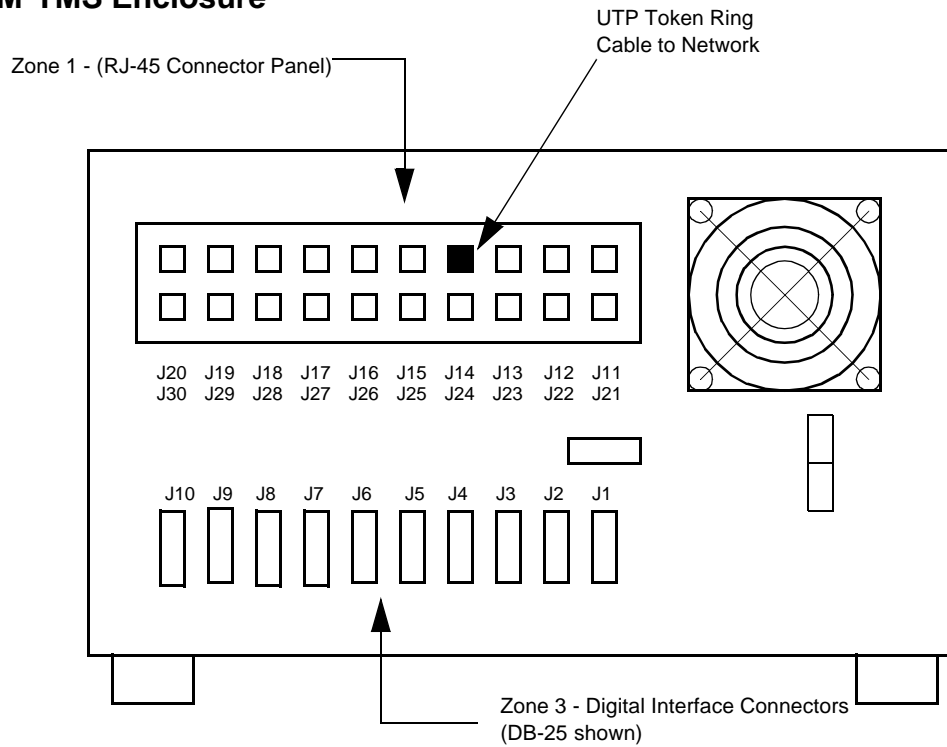


Figure 4-3 Connecting UTP Token Ring Cable to OPP Token Ring Module Installed in Slots 6 and 7

Note: Connect the cable to the lower numbered slot or connector of the pair.

Connecting Primary WAN Interfaces

The primary WAN interface is the connection from the local OCM to either the TMS node or another OCM node. The connection is established by setting the TMS circuit type to TPP with a subtype NODAL or FR-OPP on the TMS-3000 Controller. See the *TMS-3000* or *OCM*TMS* manuals for more information.

Connecting Secondary WAN Interfaces

You can connect your secondary WAN interface to a device or network or back-to-back to another GDC secondary WAN interface.

Serial Interface

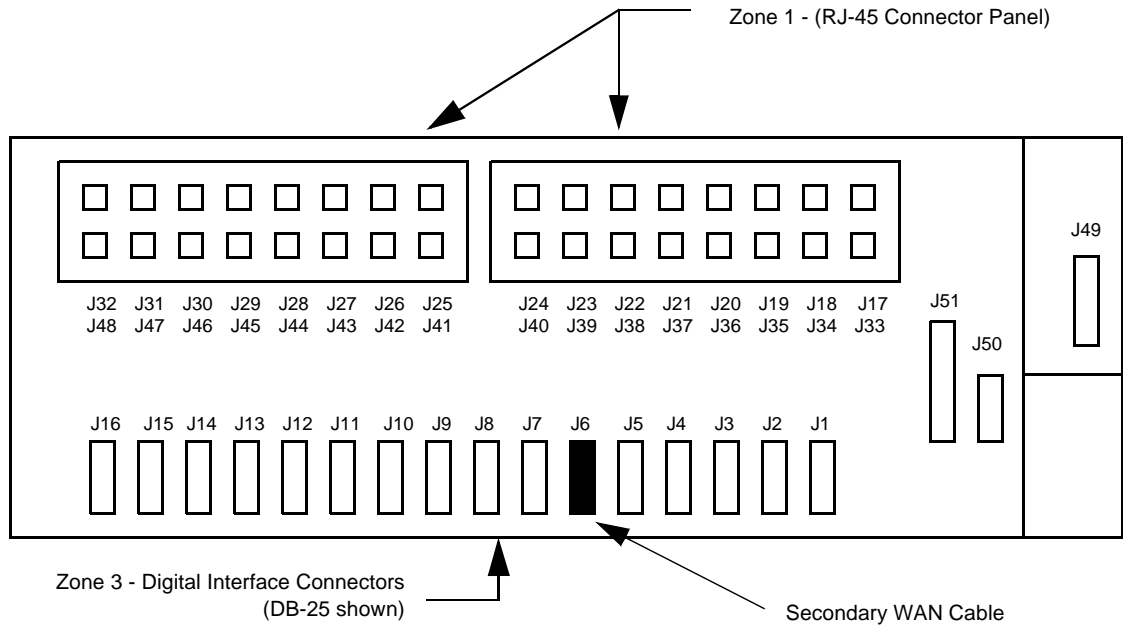
If you ordered an interface specific module (RS-232, RS-422, or V.35), you must use the cable that the module was designed for. Interface specific modules will only function with one type of cable.

1. Using the cable that was shipped with your OPP, connect the cable to the appropriate DB-25 connector in Zone 3 of the OCM*TMS Shelf or Enclosure. *Figure 4-4* shows where to connect a cable.
2. Connect the other end of the cable to the DCE interface (e.g., a DSU/CSU, modem, Multiplexer, or Frame Relay device).

Configuring Your Token Ring OPP

See *Chapter 2*.

OCM*TMS Shelf



OCM*TMS Enclosure

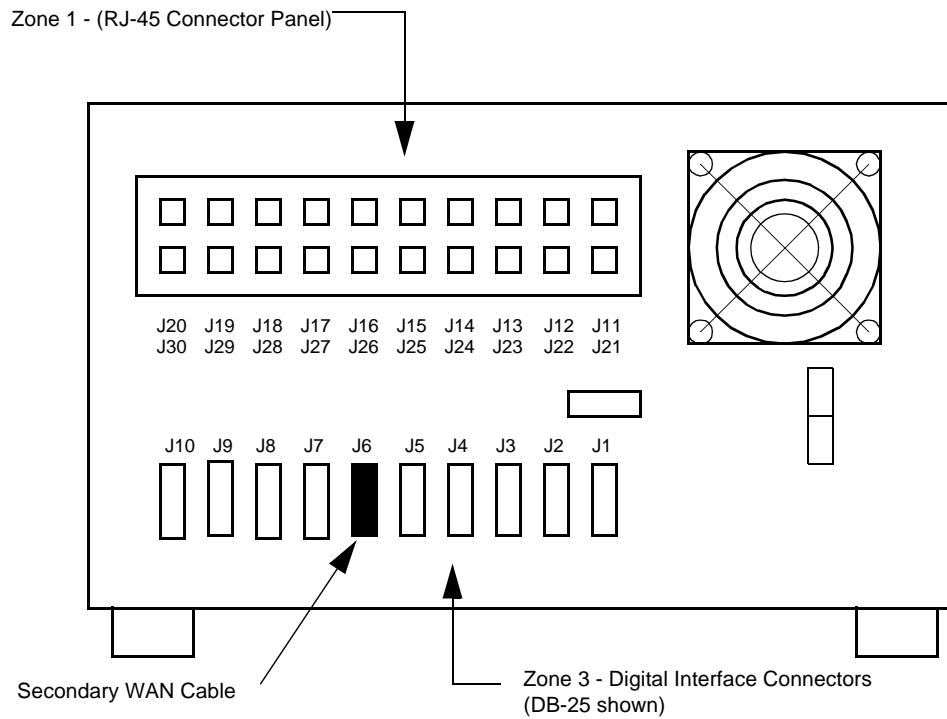


Figure 4-4 Connecting a Cable to an OPP Token Ring with OPP Card in Slots 6 and 7

Note: Connect the cable to the lower numbered slot or connector of the pair.

Summary

This chapter identified the components, described normal operation, and provided connection information for the Token Ring Module.

What's Next?

The next chapter describes how to identify and solve problems that might occur while installing or operating the OPP.

5 Troubleshooting

Overview

This chapter describes how to identify and solve problems that might occur while installing or operating your OPP. Specifically, this chapter covers the following topics:

Troubleshooting OPP Power-On Failures

Troubleshooting an Ethernet Module

No Traffic between Ethernet LAN and the WAN

No Activity on a Secondary WAN Port

Inability to see an OPP on the IMS

Loss of Accurate Data and Time or Loss of “NAME” with Loss of Power

Troubleshooting a Token Ring Module

No Traffic Between the Token Ring LAN and the WAN

Troubleshooting OPP Power-On Failures

If the OPP Module(s) does not power on when the OCM*TMS power switch is turned on, do the following steps:

1. Be sure the OPP Module is seated firmly in the OCM*TMS slot.
2. Be sure the power cable is securely connected to the OCM*TMS and that the PWR ON lights are lit.
3. Be sure the power supplied to the unit meets the requirements in *Appendix A*.

If the problem persists, contact General DataComm Service at 1-800-243-1030.

Troubleshooting an Ethernet Module

The following sections describe troubleshooting steps for the following problems:

- No traffic between Ethernet LAN and the WAN
- No activity on a secondary WAN port
- Inability to see an OPP on the IMS
- Loss of accurate date and time or loss of “NAME” with loss of power

No Traffic Between Ethernet LAN and the WAN

If packets are not being forwarded to and from the Ethernet, the Ethernet Module requires troubleshooting. The following sections describe troubleshooting steps you should follow when you have Ethernet Module problems with one of the following:

- Basic Interface
- OPP Card Initialization
- Primary WAN Port Communications
- Network Design

The Ethernet Module has interface status LEDs which provide basic troubleshooting information. See *Chapter 3* for a description of the LEDs.

Basic Interface Problems

When the Ethernet Module experiences basic interface problems, do the following troubleshooting steps:

1. Be sure that the cable is properly connected to the appropriate OPP (the upper RJ-45 connector in Zone 1 on the OCM*TMS rear panel). Confirm that the ON LED is corresponding to the OPP port on the connected HUB or MAU.
2. Be sure that the cable meets the specifications in *Table 1-5*.
3. Confirm that the OPP can see traffic by observing the Lan Rx LED on the front panel. This LED lights for each packet the OPP sees.
4. Use an Ethernet LAN Protocol Analyzer to confirm the OPP is visible on the Ethernet. The MAC Address of the OPP should be recognizable if the card is connected properly. The OPP MAC Address is of the form OA C0 64 XX XX XX
5. Type **SHL 0** on the Maintenance Console to display LAN related statistics. Type **SHN 0** to display LAN port confirmation. (Each port on the OPP must in FORWARDING to pass user data.)

OPP Card Initialization Problems

When the Ethernet Module experiences OPP card initialization problems, do the following troubleshooting steps:

If a Maintenance Console is accessible (ASCII terminal or PC in terminal emulation):

1. Connect the terminal to the MAINT jack on the front of the OPP using the cable specified in *Chapter 1*.
2. Reinsert the card into the OCM*TMS Shelf or Enclosure.
3. Observe the display and confirm that the OPP is doing the following:
 - passing its diagnostics
 - successfully loading its image
 - receiving configure commands from CCM
 - initialization complete
 - interfaces changing to forwarding state

See *Appendix B* for a typical console display.

4. Once the LAN port is forwarding, type **SHA** on the Maintenance Console to display a list of all MAC Addresses that the OPP can communicate with.
5. If the IMS is not accessible and you do not have a console available, call General DataComm Service at 1-800-243-1030.

Primary WAN Port Communications Problems

When the Ethernet Module experiences primary WAN port communications problems, do the following troubleshooting steps:

1. Confirm connectivity between the OCM LIM and its TMS node. See *OCM*TMS Installation and Operation Instructions*.
2. On the Maintenance Console type **SHN 2** and **SHL 2** to display statistics. (The port must be in FORWARDING to pass user data).

Network Design Problems

When the Ethernet Module experiences network design problems, contact General DataComm Service at 1-800-243-1030.

No Activity on a Secondary WAN Port

If packets are not being forwarded to and from the secondary WAN (DB-25), check the following:

1. Be sure you are using the proper WAN cable for your WAN interface.
2. Be sure the cable is properly connected to the interface and the modem or DSU/CSU (on both the local and remote ends of the link).
3. Be sure the modem or DSU/CSU is powered on (on the local and remote ends of the link).
4. Be sure the following WAN parameters are set properly:
 - interface type (RS-232, RS-422, or V.35)
 - clock source (most should be set to recover clock)
 - interface speed (line speeds must be identical on both sides of the line)
 - data invert option is the same on both sides of the WAN connection

*If the IMS is available...*display the above parameters using the WAN Parameters screen. For more information on how to access the WAN Parameters screen in the IMS, see *Configuring GDC Devices* chapter, *Serial or WAN Interface Parameters*, in the *IMS User Guide*.

*If the IMS is unavailable...*connect a console and execute the **SHC 2** console command to check line speeds, clock generation/recover settings, and data inversion states.

Inability to See an OPP on the IMS

The IMS station must have a connection path to the OPP:

1. Confirm all TMS circuits are up in the path.
2. Confirm all LANs are functional in the path.
3. Confirm that the IMS is displaying the MAC address of the OPP on the IMS Display Active Devices screen. If not, no complete path exists between the IMS and the OPP.

The IMS can manage the OPP either by using MAC Addresses or IP Addresses. With MAC Addresses, all forms of configuration and statistical information can be exchanged. However, downloads of code cannot be accomplished without using IP Addressing. IP Addressing lets the IMS Manager access the full set of management features.

Note: For the IMS to fully manage the OPP, the IMS and the OPP must have proper IP Addresses.

Loss of Accurate Date and Time or Loss of "NAME" with Loss of Power

See *TPP/OPP Release Notes* on installing new OPP cards.

Return OPP card to General DataComm Service for battery replacement.

Troubleshooting a Token Ring Module

The Token Ring Module has interface status LEDs which can provide additional troubleshooting information. See *Chapter 4* for a description of the LEDs.

No Traffic Between the Token Ring LAN and the WAN

If packets are not being forwarded to and from the Token Ring network, the Token Ring Module requires troubleshooting. The following sections describe troubleshooting steps you should follow when you have Token Ring Module problems with one of the following:

- Basic Ring Interface
- OPP Card Initialization
- Primary WAN Port Communications
- Network Design

Basic Ring Interface Problems

When the Token Ring Module experiences basic ring interface problems, do the following troubleshooting steps:

1. Be sure that the cable is properly connected (UTP in the upper RJ-45 connector and STP in the lower RJ-45 connector with the correct adapter cable). Confirm that the ON LED is corresponding to the OPP port on the connected HUB or MAU.
2. Be sure that the cable meets the specifications in *Table 1-5*.
3. Confirm that the OPP is set to the correct ring speed (4 or 16 Mhz) and cable type (UTP or STP).
4. Confirm that the OPP can see traffic off of the ring by observing the Lan Rx LED on the front panel. This LED lights for each packet the OPP sees.
5. Use a Token Ring LAN Protocol Analyzer to confirm the OPP is trying to enter the ring. The MAC address of the OPP card should be recognizable if the card is connected properly. The OPP ring address is of the form 0A C0 64 XX XX XX (50 03 26 XX XX XX will be displayed on the console).
5. Type **SHL 0** on the Maintenance Console to display the LAN related statistics.
6. Type **SHN 0** to display LAN port configuration information.

OPP Card Initialization Problems

When the Token Ring Module experiences OPP card initialization problems, do the following troubleshooting steps:

If a Maintenance Console is accessible (ASCII terminal or PC in terminal emulation):

1. Connect the terminal to the MAINT jack on the front of the OPP using the cable specified in *Table 1-5*.
2. Reinsert the card into the OCM*TMS Shelf or Enclosure.
3. Observe the display and confirm that the OPP is doing the following:
 - passing its diagnostics
 - successfully loading its image
 - receiving configure commands from CCM
 - initialization complete
 - interfaces changing to forwarding state

See *Appendix B* for a typical console display.

4. Once the LAN port is forwarding, type **SHA** on the Maintenance Console to display a list of all MAC Addressees that the OPP can communicate with.

Primary WAN Port Communications Problems

When the Token Ring Module experiences primary WAN port communications problems, do the following steps:

1. Confirm connectivity between OCM LIM and its TMS node. See *OCM*TMS Installation and Operation Instructions*.
2. Confirm that the TMS sub-type is correct for each circuit end (either NODAL or TPP-FR).
3. On the Maintenance Console, type **SHN 2** to display primary WAN port configuration and **SHL 2** to display statistics. (Each port must be in FORWARDING to pass user data.)

Network Design Problems

Token Ring networks requires a non-repetitive node and segment number for each OPP, LAN, and WAN in the network. When the Token Ring Module experiences network design problems, confirm that each number has been entered in the OPP configuration.

Summary

This chapter described how to identify and solve problems that might occur while installing or operating the OPP.

A Specifications

This appendix contains OPP product specifications. Tables in this appendix are the following:

Table A-1 Environmental Specifications

Table A-2 Electrical Specifications

Table A-3 OPP Capabilities

Table A-4 Interface Standards and Specifications

Table A-5 OPP Network Compatibility

Table A-6 Software Feature Sets

Table A-1 Environmental Specifications

Temperature	32° F to 113° F	0° C to 45° C
Relative Humidity 1	5% to 95%	non-condensing

Note: The maximum ambient room temperature for any OCM product containing an OPP card is 45° C.

Table A-2 Electrical Specifications

Voltage	+5 Vdc, -5 Vdc, +12 Vdc, -12 Vdc
Power consumption	15 watts

Table A-3 OPP Capabilities

Interface	Standard
LAN	<ul style="list-style-type: none"> • one Ethernet or Token Ring interface • 10 Mbps IEEE 802.310 Base T via RJ-45 connectors • 4 Mbps UTP or 16 Mbps STP via RJ-45 connectors and adapter cable (to DB-9)
Frame Relay or HDLC interface	<ul style="list-style-type: none"> • one Frame Relay or HDLC interface • standard synchronous speeds to E1 (2.048 Mbps) • DB-25 interface • RS-422/V.11, RS-232, or V.35,
Internodal Link	standard rates up to E1 (2.048 Mbps)

Table A-4 Interface Standards and Specifications

Interface	Standard	Max Speed
Token-Ring	802.5 UTP or STP	4/16 Mbps
Serial Interfaces	<ul style="list-style-type: none"> • RS-422/V.11 and X.21 • V.35 • RS-232 	<ul style="list-style-type: none"> • 2.048 Mbps • 2.048 Kbps • 19.2 Kbps
Ethernet/IEEE 802.3	10BaseT 802.3	10 Mbps

Table A-5 OPP Network Compatibility

Interface	Standard
Frame Relay	Compatible with AT&T, Sprint, MCI, DEC, Northern Telecom, StrataCom, ANTI T1.606, T1.617, T1.618, Frame Relay Forum Agreements <ul style="list-style-type: none"> • Ethernet to/from Frame Relay Encapsulation • Token Ring to/from Frame Relay Encapsulation • HDLC to/from Frame Relay Encapsulation

Table A-6 Software Feature Sets

Feature	Standard
Bridging Operation	<ul style="list-style-type: none"> • Transparent • Source Routing/Transparent • Source Routing
Routing Operation	<ul style="list-style-type: none"> • TCP/IP • Novell IPX/SPX
Heterogeneous Bridging	<ul style="list-style-type: none"> • Ethernet to Token Ring • Token Ring to Ethernet

B Typical OPP Console Display

CONSOLE SETUP = 2400 BAUD, 8 BITS, 1 STOP, NO PARITY

NOTE: IT SHOULD NOT BE ASSUMED THAT THIS DISPLAY WILL BE THE SAME FOR ALL CONFIGURATIONS

Copyright (c) 1992, CrossComm Corporation

Portions Copyright (c) 1989 - 1991, Intel Corporation

** OPP Diagnostics Version 1.00.05.v **

Diagnostic Start - Wednesday, 07/06/94 10:48:07 AM

Checksum PROM Test	(02)	—	PASSED
Upper DRAM Test	(06)	—	PASSED
Shared Buffer Memory Test	(03)	—	PASSED
Led Test.....	(03)	—	PASSED
Configuration Register Test	(03)	—	PASSED
AM79C960 Register Test.....	(02)	—	PASSED
AM79C960 Setup Test.....	(02)	—	PASSED
AM79C960 Init Test.....	(02)	—	PASSED
AM79C960, Internal Lpbk Test	(02)	—	PASSED
AM79C960 Setup Test.....	(02)	—	PASSED
AM79C960 Colsn Test.....	(02)	—	PASSED
AM79C960, ILACC Setup Test..	(02)	—	PASSED
Initialize CRC Table Test..	(02)	—	PASSED
AM79C960 CRC Test.....	(02)	—	PASSED
Ethernet Stop Test.....	(02)	—	PASSED
SCA 0 Access Test.....	(02)	—	PASSED
SCA0 P1 Intern Lpbck Test..	(02)	—	PASSED

Pkt Bus - Int. Lpbck Test.. (02) — STARTED
(1) Module PB Local Loopback Test...
(2) Module Config is : 00000000
(3) Module Config is : 00000018
(4) Receive Status is : 000000a0
(5) Transmit Status is : 00000000
(6) Receive Status is : 00000000
(7) Transmit Status is : 00000000
(T1) Remaining Timeout is 1000; Transmit Status Peek is 00000001
(R0) Receive Status Peek is 00000031
(R1) Remaining Timeout is 1000; Receive Status Peek is 00000031
(R2) Receive DMA is 23023
(8) Sync Rx Complete with RCV_LEARN_SEQ: 0x31
(R0) Receive Status Peek is 00000020
(R1) Remaining Timeout is 1000; Receive Status Peek is 00000001
(R2) Receive DMA is 23023
PASSED

Diag Configuration Test (01) — STARTED
OPP PROM Revision is 1.0.5.b; Serial # = Part # =
DRAM size is 8 Megabytes
Diagnostic Configuration Test PASSED

OPP Diagnostics complete
Received Unknown Operation from CCM: 0

Secondary loader uncompressing image...
Completed uncompressing image.
Jumping to operational software at address 0x90008000

CROSSCOMM ILAN OPP Internetworking System
OPP Operational Firmware
icp - Linked: Fri Jun 24 19:00:08 EDT 1994
libcp 1.0, Sun Mar 13 02:25:15 EST 1994
libc 1.3, Tue Apr 14 00:53:59 EDT 1992
libopp 0.0, Thu Jun 2 16:09:21 EDT 1994

Watchdog Timer Enabled
 Watchdog RESET Enabled
 Slot 6 waiting for CCM CONFIGURE Command....CCM Requested Deconfigure.
 CCM Requested Configure.
 MAC Addr: Oa-cO-64-03-06-60
 bootp: Requesting IP address
 System Mac Address :Oa-cO-64-63-06-60
 Board Mac Address :Oa-cO-64-63-06-60

Note: See Chapter 2 for the form of the MAC Address.

EMA Operational Firmware
 ema 01.01.01, Wed Apr 27 23:22:01 EDT 1994
 OPP InterModuleInit - Card reports it is in slot 6.
 Clock status Wednesday July 6, 1994 10:49:02 AM

Note: Present time and date stored in non-volatile RAM on OPP.

System Mac Address :Oa-cO-64-63-06-60
 Board Mac Address :Oa-cO-64-63-06-60

...Initing 64 PerPrio Counters (need 34) using 1 SBM buffers.
 Configuring WAN Ports from CCM Info...
 PassThru mode disabled..Done.
 Registered 6 On-Line Diagnostics.

CrossComm Corporation - ILAN/XL Console

OPP(0)> Event : System Initialization Completed

Timeout waiting for Sync Rx Complete.

No other modules on Bus.

Configuring Ilacc Device (0)

Starting LA-0-0 ...

Event : LA0-0 - Interface state changed to Active

Line 0 stopped

LAN

Line 1 stopped

DB-25 Port (secondary WAN, FRAME RELAY/HDLC)

Line 2 stopped

Primary WAN (via LIM)

Line 255 stopped

Packet BUS

CCM Requested Deconfigure.

Event : LA0-0 - Interface state changed to Stopped

CCM Requested Configure.

MAC Addr: Oa-cO-64-03-06-60

Line 0 started

Line 1 started

Line 2 started

Line 255 started

Timeout waiting for Sync Rx Complete.

No other modules on Bus.

Configuring Ilacc Device (0)

Starting LA-0-0 ...

Event . LA0-0 -Interface state changed to Active

LAN inteface turned on

Event: WN1-1 -Interface state changed to Active

primary WAN (via LIM) turned on

Event: Port LA0-0 -Port State Change to Learn

LAN learning addresses

Event: Port WN1-1 -Port State Change to Learn

primary WAN learning addresses

Event: Port LA0-0 -Port State Change to Forward

LAN able to access WAN

Event: Port WN1-1-Port State Change to Forward

primary WAN able to access LAN.

C Cable Drawings

Overview

The following pages are drawings of cables that are needed for OPP connections.

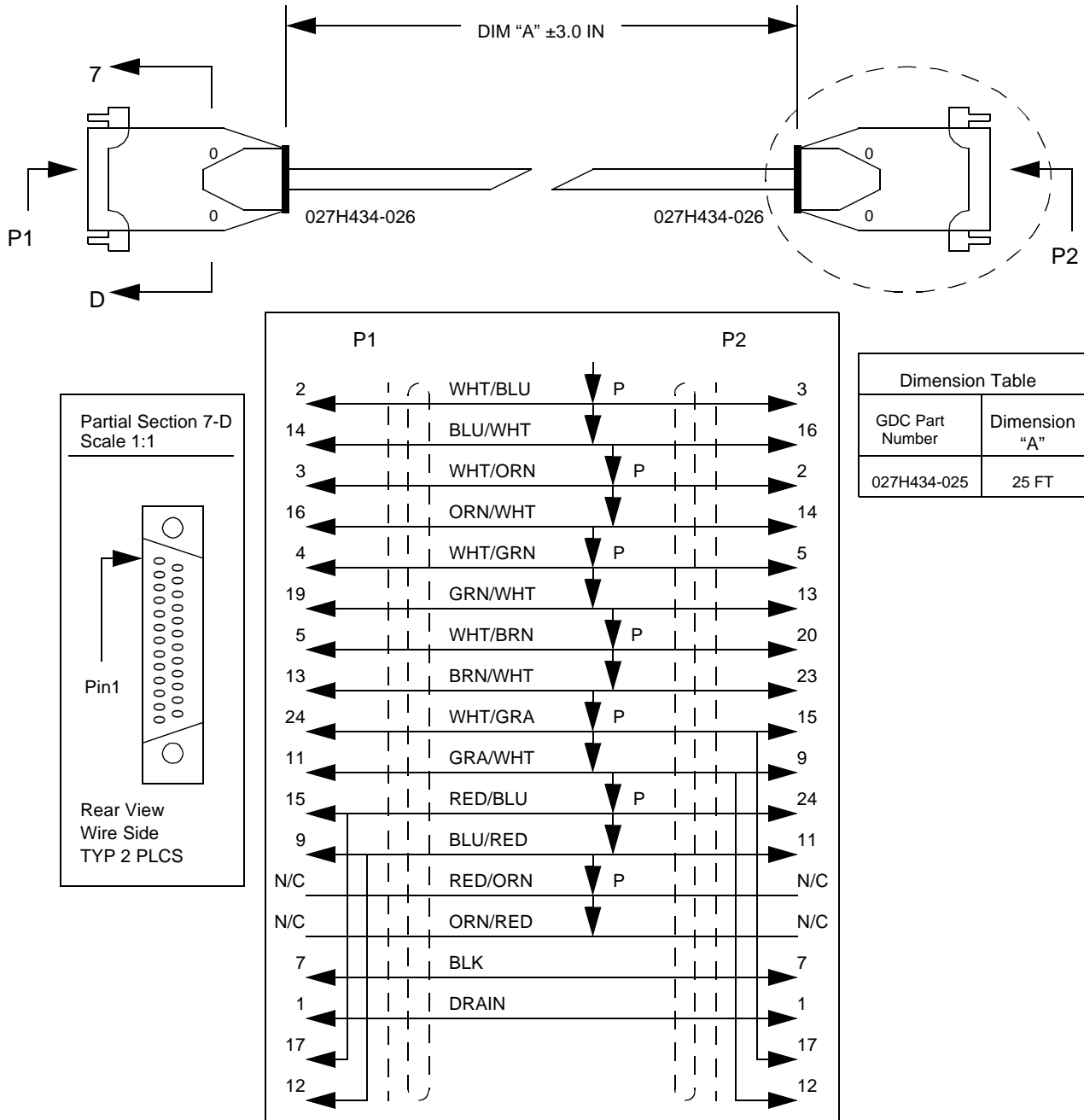


Figure C-1 Cable Assembly, OPP-OPP XOVER M/M DB-25 (GDC Part No. 027H434-025)

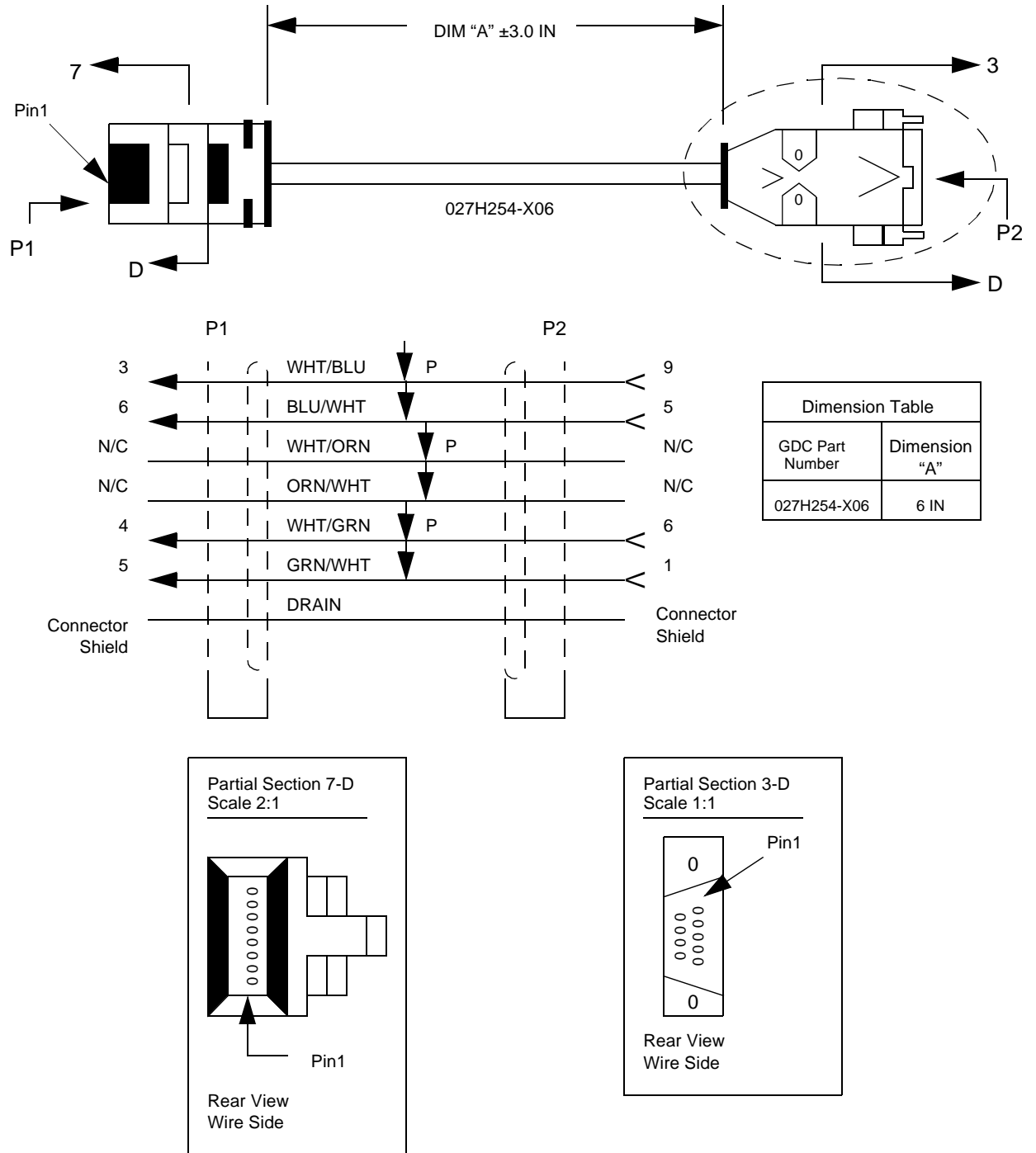


Figure C-2 Cable Assembly, OPP TKN/RNG DB-9/RJ-45 (GDC Part No. 027H254-X06)

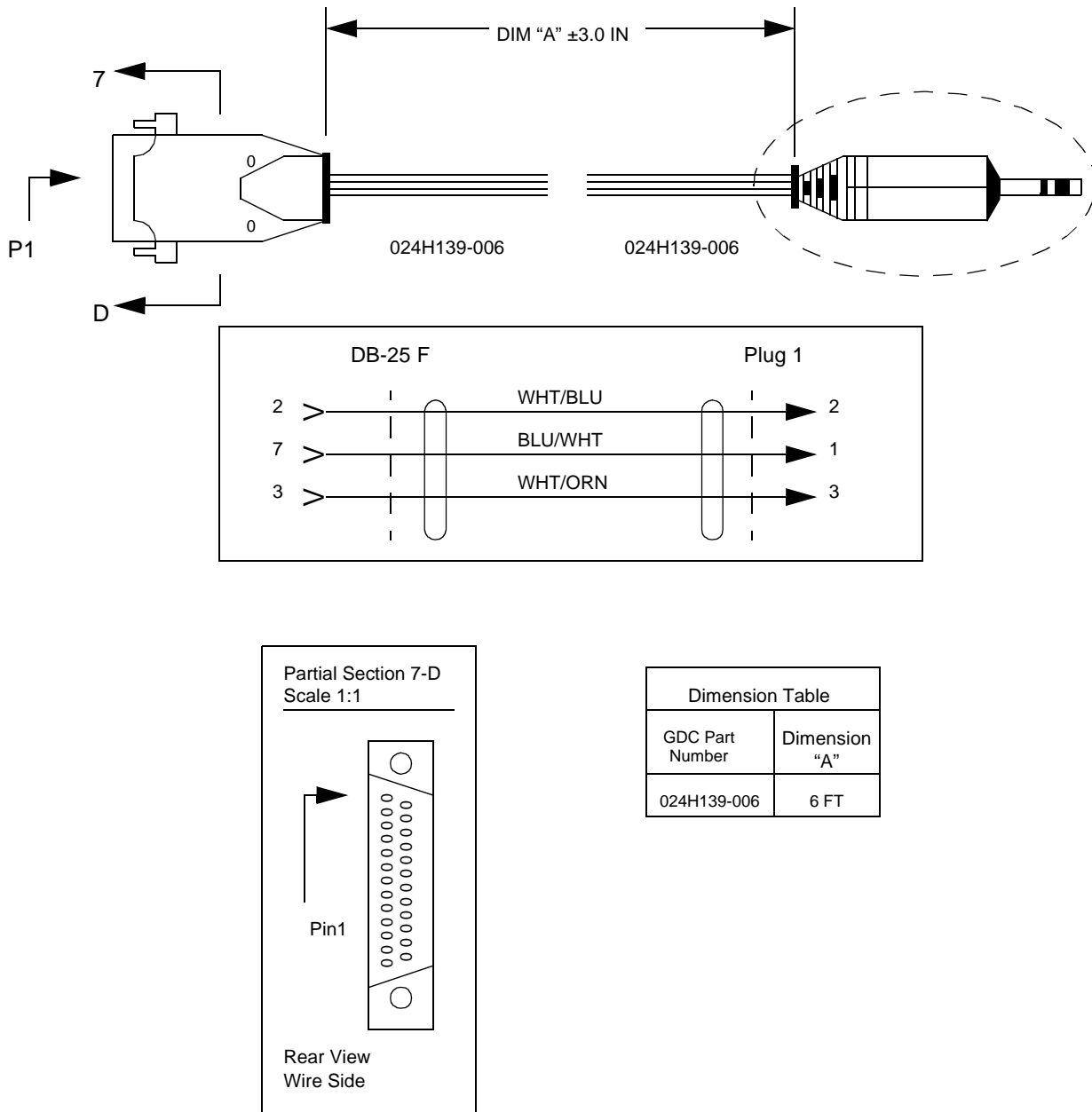


Figure C-3 Cable Assembly, DMA-200 Front Panel to VT 100 Terminal (GDC Part No. 024H139-006)

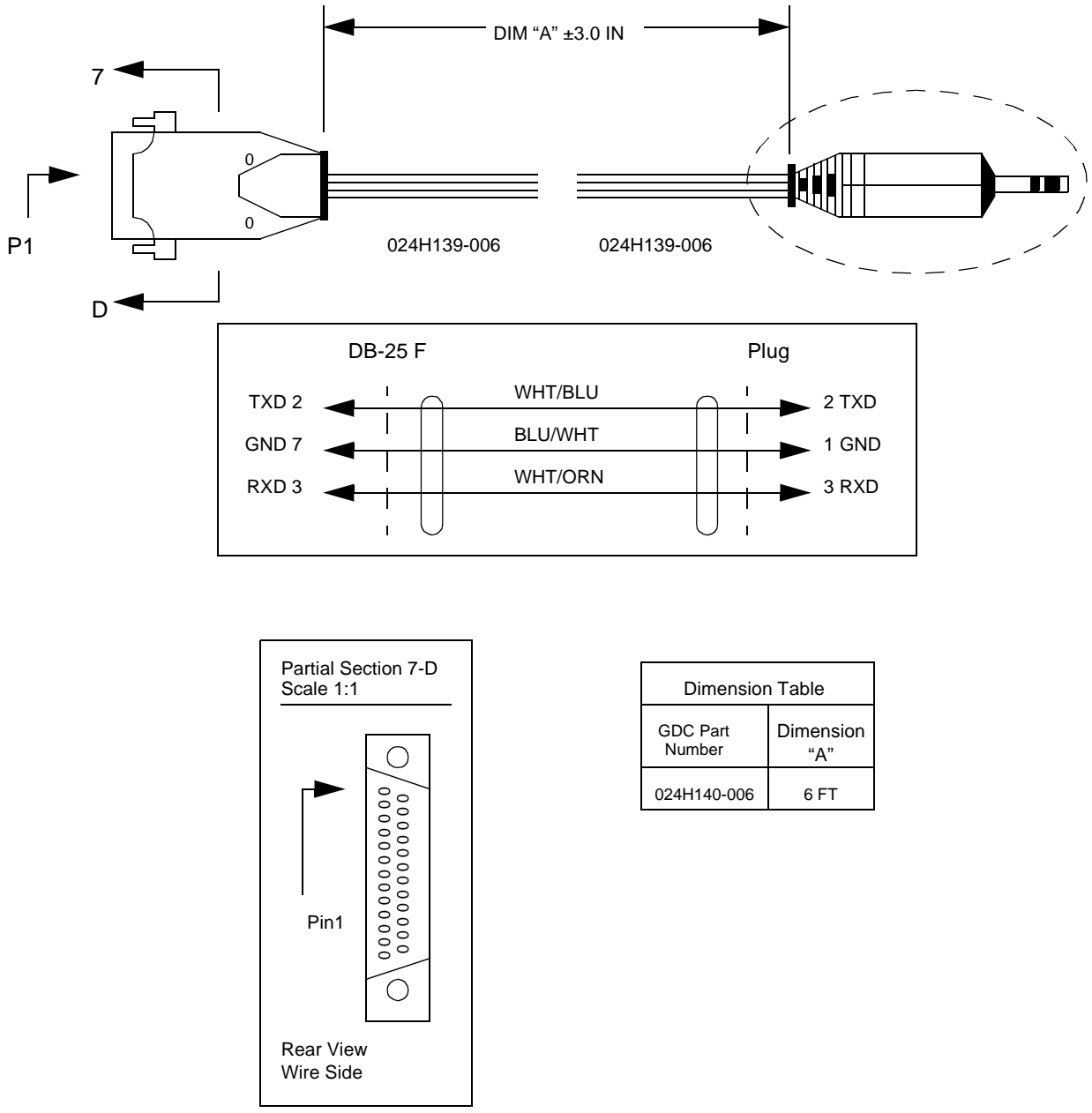


Figure C-4 Cable Assembly, Turbo CH MGT Port/DTE (GDC Part No. 024H140-006)

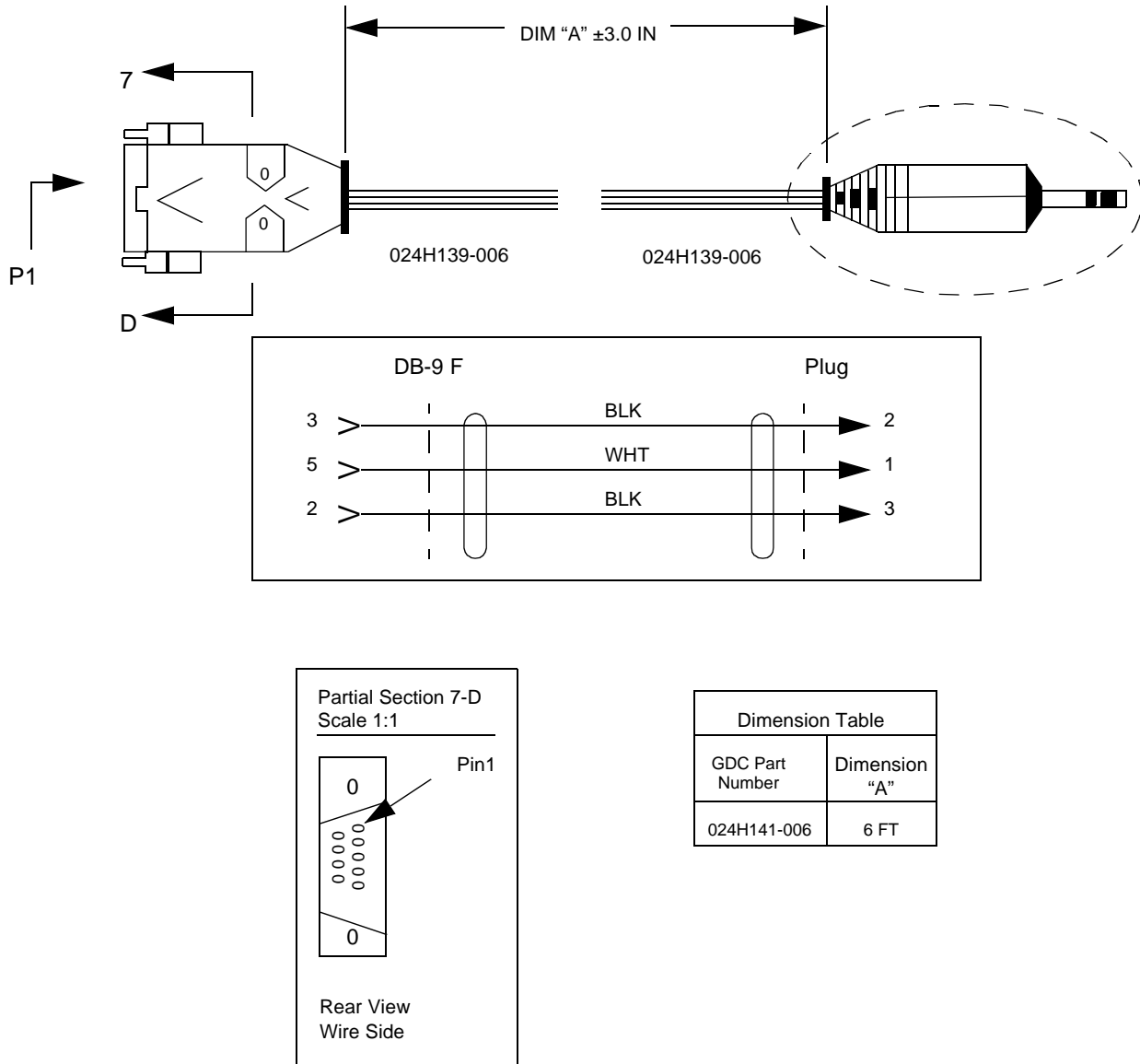


Figure C-5 Cable Assembly, TMS Front Panel/ PC DB-9 (GDC Part No. 024H141-006)

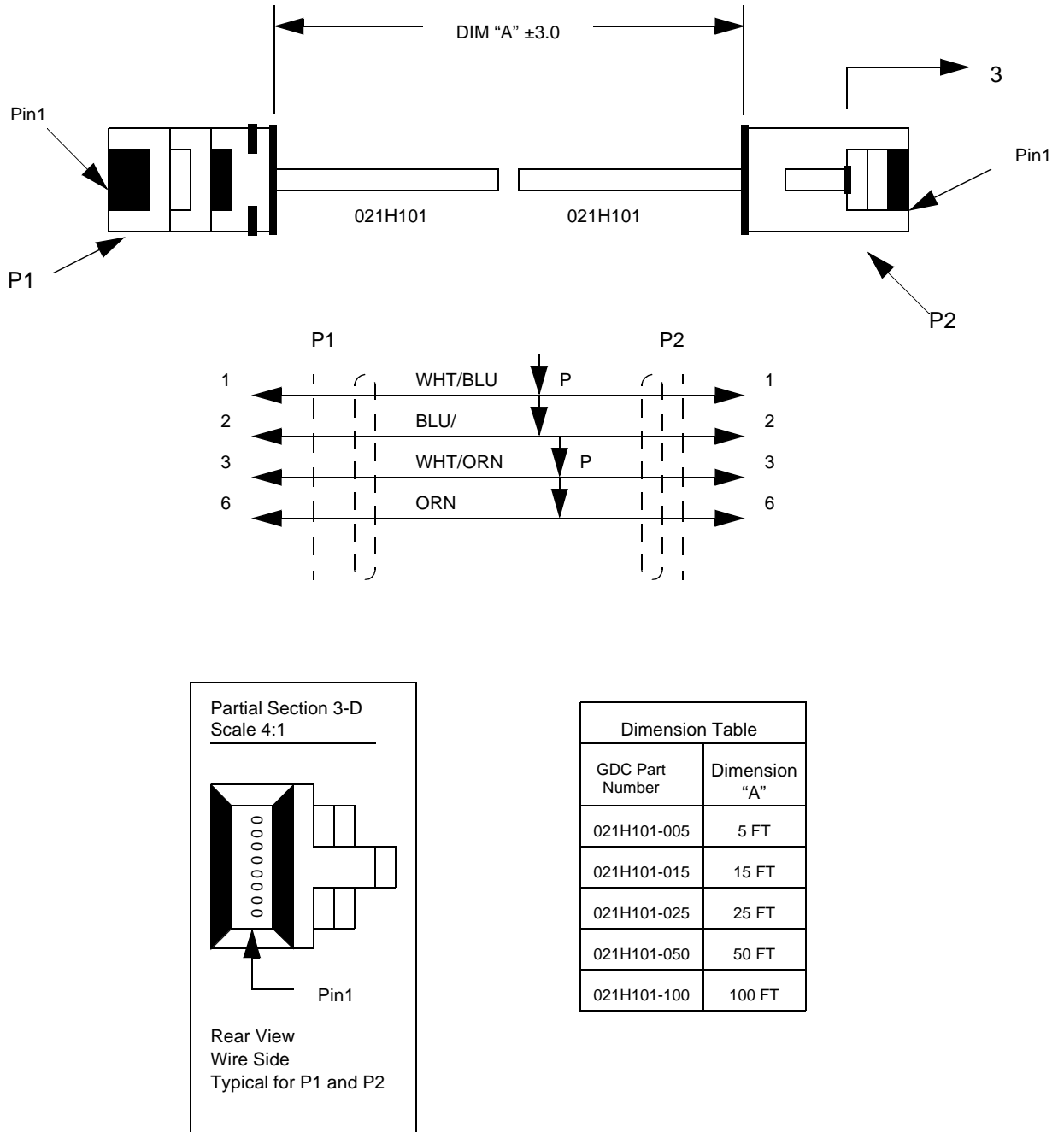
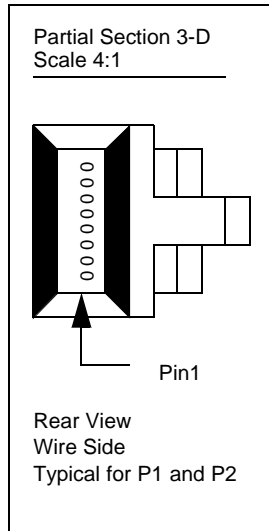
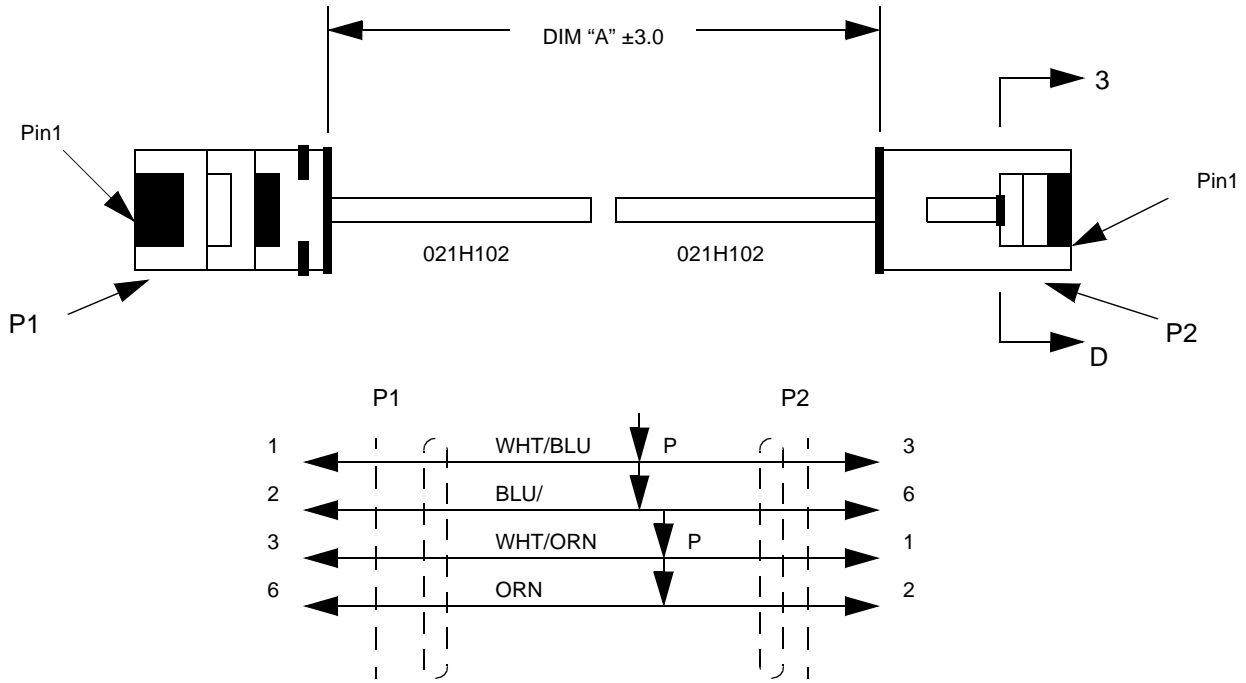
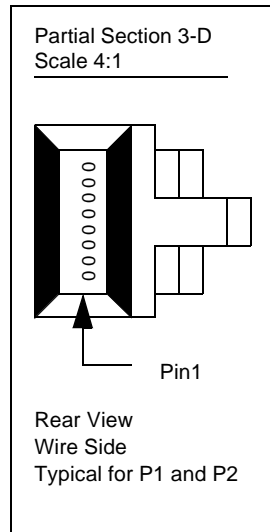
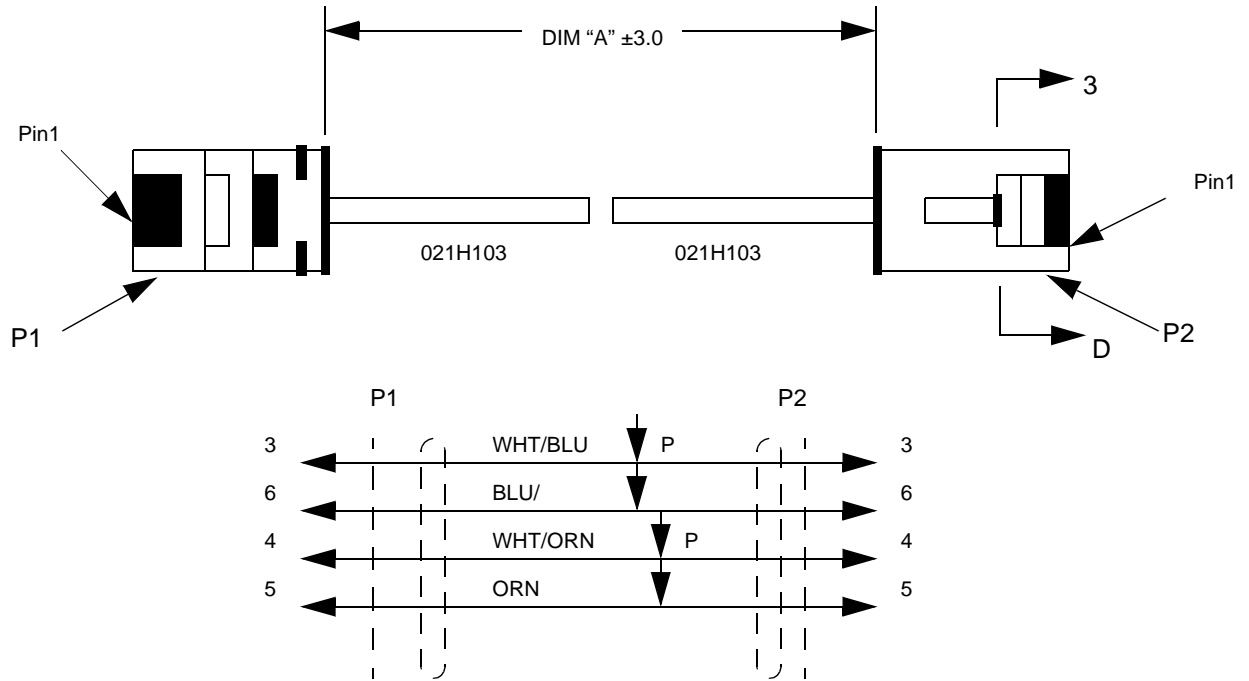


Figure C-6 Cable Assembly, 10BaseT, S/T (GDC Part No. 021H101-XXX)



Dimension Table	
GDC Part Number	Dimension "A"
021H102-005	5 FT
021H102-015	15 FT
021H102-025	25 FT
021H102-050	50 FT
021H102-100	100 FT

Figure C-7 Cable Assembly, 10BaseT, Crossover (GDC Part No. 021H102-XXX)



Dimension Table	
GDC Part Number	Dimension "A"
021H103-005	5 FT
021H103-015	15 FT
021H103-025	25 FT
021H103-050	50 FT
021H103-100	100 FT

Figure C-8 Cable Assembly, Token Ring Type 3 (UTP) (GDC Part No. 021H103-XXX)

D EC Declaration

EC Declaration of Conformity for Electromagnetic Compatibility and Safety

We, General DataComm Inc., declare under our sole legal responsibility that the following products conform to the following relevant harmonized standards, the reference numbers of which have been published in the Official Journal of the European Communities:

Electromagnetic Compatibility — (EMC Directive 89/336/EEC):

- The affixing of the CE mark is based on compliance with directive 89/336/EEC as amended by directive 93/68/EEC.
- EN 55022 (Based on CISPR 22), Specification for limits and methods of measurement of radio interference characteristics of information technology equipment.
- EN 55024 Limits and methods of measurement of the immunity to Electro-Magnetic interference for information technology equipment.
- EN 50081-1 (Based on IEC 801), Electromagnetic compatibility generic emissions standard Part 1: Residential, Commercial and light industry.
- EN 50082-1 Electromagnetic compatibility generic immunity standard Part 1: Residential Commercial and light industry.

Low Voltage Directive — (LVD 73/23/EEC):

- The affixing of the CE mark is based on compliance with directive 73/23/EEC as amended by directive 93/68/EEC.
- EN 60950 Safety of Information Technology Equipment including Electrical Business Equipment.
- EN 41003 Particular Safety Requirements for Equipment to be connected to Telecommunications Networks.

Equipment List

TMS Channel Cards	
036M078-001	UDC/232/V.24/V.2036M078-002
036M078-002	UDC/422/V.11
036M078-003	UDC/423/V.10
036M078-004	UDC/V.35
GS936M014-001	TDC-2 (256K0
GS936M014-002	TDC-5 (512K0
036P265-003	UVC/ADPCM
036M285-002	CELP Voice Channel w/Fax
036M285-003	CELP Voice Channel
036M285-004	CELP 9.6K Voice Channel w/Fax
036M285-005	CELP 9.6K Voice Channel
036P270-001	Echo Cancellor
036M335-001	ACM II/E1
TMS 3000 Options	
036M337-001	ESCC (Enterprise System Control Card)
036P302-001	RCC (Redundancy Control Card)
036P307-002	ECC-II (Expansion Common Card)
S-036P042-001	Sync Status Module
S-036B001-002	CP-12 Adapter (Expansion Shelf)
S-036P001-001	CP (422/423/449 Ext. Adapter)
039P002-001	DLD=M (Ext. Line Driver)
OCM*TMS 2000 Feeder	
036M486-002	2121 Standalone Enclosure w/CCM N/R
036M481-001	2220 Shelf w/CCM, N/R
036M481-002	2320 Shelf w/CCM, Redundant
036M482-001	2230 Shelf w/CCM, NR -48VDC
OCM 1000 Point-to-Point	
036M488-002	1120 Standalone Enclosure, w/CCM, N/R
036M484-001	1220 Shelf w/CCM, N/R
036M484-002	1320 Shelf w/CCM, Redundant
OCM*TMS 1000/2000 LIM Cards	
036M410-002	E-1
036P436-002	V.35 LIM
036P436-001	V.11 LIM
036P437-001	Subrate LIM (RS232/V.28)
Expansion Shelf (OCM*TMS 1000/2000)	
010M065-001	MS-1 AC Expansion Shelf 220/240V
010M066-001	MS-1 DC Expansion Shelf

Data Channel Cards	
036P413-001	DDC (RS-232)
036P410-001	HS SDC (RS-232)
036P410-002	HS SDC (V.35)
036P410-003	HS SDC (RS-422)
036P410-004	HS SDC (RS-423)
LAN/Frame Relay Cards	
036M450-003	OPP/Ethernet
036M450-004	OPP/Ethernet w/o Packet Bus
036M451-001	OPP Token Ring (-003 non-existent P/N)
036M451-004	OPP Token Ring w/o Packet Bus
Voice Signaling (2W/4W E&M)	
036M420-006	PCM/ADPCM-No Echo
036M420-003	PCM/ADPCM-w/Echo
036M420-028	CELP No Fax
036M420-025	CELP w/Fax
Voice Signaling (2W FXS)	
036M420-004	2W FXS/ADPCM/No Echo
036M420-001	2W FXS/ADPCM w/Echo
036M420-026	
036M420-023	
Spares and Options	
036M040-004	CCM-4
036M040-005	CCM-5
TMS-3000 Compact Shelf	
036M357-001	TMS Compact w/ESCC, N/R
036M357-002	TMS Compact w/ESCC, Redundant
Module Interface	
036P041-001	EIF-E (RS232/V.24)
TMS-3000 Channel Cards	
036M078-005	Hyper UDC/422
036M078-006	Hyper UDC/V.35
TMS-3000 Options	
036P365-001	Universal I/O red.
036P351-001	Sync Status Module
OCM*TMS 2000 Feeder	
036M482-001	2230 Shelf w/CCM, N/R, -48
Data Channel Module	
036P416-001	OCM G.703 Data Channel

Voice Signaling (2W FXO)	
036M420-005	2W FXO/ADPCM - No Echo
036M420-002	2W FXO/ADPCM w/ Echo
036M420-027	2W FXO/CELP No Fax
036M420-023	2W/4W FXS/CELP w/Fax
036M420-024	2W FXO/CELP w/Fax
Minimux Plus Basic Assembly	
G036B003-015	Minimux Plus Enclosure 220/240V
G036B015-002	Minimux Plus Exp. Encl.
TMS-3000 Compact	
036M358-001	TMS Compact w/ESCC, N/R
036M358-002	TMS Compact w/ESCC, Redundant
Module Interface	
036P064-001	EIF-G (64K Co-Direct)
036P066-001	EIF-C (64K Contra-Direct)
Data Channel Cards	
036P243-001	TMS G.703 Data Channel
036P414-001	X.50 Quad Data Card

Glossary

Aggregate Trunk

A full duplex communication line which transports data between two nodes.

Alarms

Alarms occur when a malfunction is detected in the system. Major alarms need immediate attention and indicate that the hardware on a Common Module is malfunctioning. Minor alarms are not immediately detrimental to the working of the system and indicate that one of the Data or Voice Channel Modules is malfunctioning.

AUI

Attachment Unit Interface. A connector for an Ethernet interface that attaches a workstation to a transceiver.

Bridge

A device for connecting similar LANs using the data link layer MAC source and destination addresses contained in the data frames of all LAN traffic.

Card

An assembly of components that can be tested, removed, and replaced as a unit. A card usually refers to a single unit without piggyback cards connected to it.

CCM

TMS-2000 (OCM*TMS) Common Control Module

Channel

Part of a circuit path through several entities in a communication system. A channel runs between two nodes.

Circuit

An end-to-end data path which can pass through several entities in a communication system. A circuit is described or referred to by the nodes/channel names which become connected by the existence of the circuit (see *TPP Pathway*).

Common Module

A generic term for any module that causes a major alarm when removed. This includes all modules housed in the main TMS Shelf plus the Expansion Modules located on each TMS Expansion Shelf.

Communications Bus

(see *MP Bus*)

Controller

A computer that is connected to the ESCC Module in a TMS-3000 node via an external connection on the Main Harness Card. It performs configuration and framing calculations for the entire network, as well as other status, diagnostics, and alarm functions. A Maintenance Console is not classified as a Controller because it has only limited control over only one node.

DACS network

Digital Access Cross-Connect System. A byte oriented (DS0) digital T1 network service.

Data Link Connection Identifier (DLCI)

The unique numeric identifier assigned to each source-destination pair defined for each frame relay access port (only significant locally).

DLC

Data Link Connection

DS0 (Digital Signal Level 0)

A single 64 kbps channel. The data stream is divided into 8-bit bytes. DS0 is a byte-oriented environment.

DS1 (Digital Signal Level 1)

A combination of 24 DS0 channels and 8000 framing bits into a 1.544 Mbps data stream. The TMS-3000 uses the DS1 method of framing.

DSU

Data Services Unit

DSX-1 Interface

An electrical interface that converts a formatted data signal into the proper signal levels for the digital T1 network (also called a cross-connect).

DTE

Data Terminal Equipment

Encapsulation

Embedding Ethernet or Token Ring information in Frame Relay packets.

ESCC

Enterprise System Control Card. The ESCC supports non-disruptive software downloads, expanded non-volatile memory, better Fast Bus select resolution, and additional features.

ESF

Extended Superframe. A modified D4 framing format. The basic D4 framing structure contains 1 frame but followed by 24 eight-bit time slots or a 193 bit frame. An EDF contain (24) 193 bit frames. ESF allows a greater amount of access to digital network services (see *D4 and Superframe*).

Ethernet

A LAN for connecting devices within the same building, operating over twisted-pair wire or coaxial cable at speeds up to 10 Mbps. It operates at the physical and Data Link layers of the OSI model, specifying CSMA/CD.

FCS

Frame Check Sequence

Filtering

The process of prohibiting the transfer of data from one LAN to another based on some characteristic of the frame, such as MAC addresses of the frame or protocol type.

Forwarding

The process of transferring a data frame from one LAN to another based on some characteristic of the frame, such a MAC addresses of the frame, or protocol type.

Frame Relay

A technique for fast transmission of LAPD frames where only three elements are utilized:

- frame delimiters (flags)
- two-octet address
- FCS

An integral number of user data bytes are contained between the address field and the FCS. This user data is passed transparently by the network. Frames with incorrect FCSs or frames which cannot be queued are discarded. It is left to the end-to-end higher level protocols to determine of a frame is missing and take appropriate action. Such techniques are optimized for reliable digital networks.

Frame Relay Mode 1

Uses PVCs (Permanent Virtual Circuit) to deliver data between end users.

FSN

Frame Switching Network. A set of core services provided to packet switching applications within the TMS-3000. Its fundamental purpose is to transfer a network frame from a source node to a destination node. The source node is the node where the frame is introduced into the network, and the destination node is specified by information contained in the frame.

HDLC

High-Level Data Link Control

IMA

Intelligent Media Adapter. A Token Ring LAN or Ethernet LAN media adapter plug-in module.

IMS

GDC's Internetworking Management Software.

IP

Internet Protocol

IPX

IntereXchange Protocol (Novell NetWare)

ISDN

Integrated Services Digital Network

ITU-T

International Telecommunication Union - Telecommunication Standardization Sector. A committee that sets international communications standards.

LAN

Local Area Network

LAN*TMS

Local Area Network Transport Management System. A network-managed system for integrating multiple local area networks (LANs) into a single communications network.

LAPD

Link Access Procedure-D

LIM

TMS-2000 Line Interface Module

LIS

Local In-Channel Signaling

LMI

Local Management Interface

MAC

Media Access Control. This is a unique six byte address which has been assigned to the LAN network interface by the manufacturer. All LAN packets contain a source address field and a destination address field in the frame header. MAC addresses are assigned in blocks by the IEEE 802 committee.

MAU

Main Access Unit

MIB

Management Information Base

Module

An assembly which has definable performance characteristics so that it can be tested, removed, and replaced as a unit. In a TMS-3000 system, each card on the Main Shelf and Expansion Shelves is a module. A module can have other cards called piggybacks plugged in it.

MP or Microprocessor Bus

Also known as the Communications Bus, it is used to convey configuration diagnostic, and alarm information between the ESCC and all other modules in the system.

Multidrop

A circuit with one polling master and multiple end points (drops).

Multipoint

A circuit with multiple terminations with the same level of priority (no master).

MVC

Permanent Multicast Virtual Circuit

Network

Refers to a group of three or more nodes connected together with aggregate trunks. Not all the nodes in a network will be TMS-3000 nodes.

Network Frame

A continuous group of octets (8-bit bytes) at the lowest sub-layer of the OSI data link layer (layer 2) bounded by HDLC flags. Unlike a TDM frame, it has no frame synchronization bit and no time slot interchange. A network frame may will be carried inside one or more TDM frames across a TMS circuit.

Node

Any addressable location within a network capable of carrying a TMS-3000 circuit.

OCM*TMS

(see *TMS-2000*)

OPP

OCM Packet Processor. A module installed in a TMS-2000 Enclosure or Shelf that interfaces externally with public frame relay network or frame relay devices such as LAN Bridges, routers, and Frame Relay PADs.

OPP Module

The physical printed circuit boards of an OPP and all of its electrical and mechanical components.

Packet

A sequence of data, with associated control elements, that is switched and transmitted as a whole; refers mainly to the field structure and format defined within the X.25 recommendation; multiple packets may be required to carry one complete document or a lengthy information block.

Packet Switching

A data transmission technique where user information is segmented and routed in discrete data envelopes called packets, each with its own appended control information for routing, sequencing, and error checking; a transmission technique that allows a communication channel to be shared by many users, each using the circuit only for the time required to transmit a single packet; a network that operates in this manner.

Piggyback Card

A card that plugs into a base card. The piggyback is a separate assembly that can be tested, removed, and replaced as a unit.

Port

Any switchable entity. A port may be a logical entity that is not necessarily realized through a physical connector. For example, a single Frame Relay interface can support many Frame Relay ports.

Route

A logical path through a network from the transmitting equipment to the receiving equipment which can go through several nodes.

SNMP

Simple Network Management Protocol. The Internet Standards Protocol, defined in RDC 1157 developed to manage nodes on an IP network. SNMP is a request-response protocol that gathers management information from networked devices. SNMP is a de facto standard protocol for network management. Two versions exist: SNMP 1 and 2. The protocol provides a means to set and monitor configuration parameters. SNMP 2 offers a manager-to-manager capability and increased security.

Superframe

A D4 frame consists of 1 frame bit followed by 24 eight-bit time slots. A D4 superframe contains 12 consecutive 193-bit frames.

TCP

Transmission Control Protocol

TDM

Time Division Multiplexer. A TDM processes two or more channels of data for transmission over a shared trunk.

TMS-2000

Office Communication Manager. A feeder multiplexer that is used as a node in a TMS-3000 network. It is system of modules installed in a TMS-2000 Enclosure or TMS-2000 Shelf. Separate from the TMS shelf, it multiplexes data from several analog and digital devices, then transfers that data to the TMS for further routing.

TMS-3000 Controller

A computer that is connected to the ESCC in a TMS-3000 node via an external connection on the Main Harness card. It performs configuration and framing calculations for the entire network, as well as other status, diagnostics and alarm functions. A Maintenance Console is not classified as a Controller because it has only limited control over only one node.

Token Ring

A LAN that uses the token passing access method and arranges the computers in a ring sequence.

TPP

TMS Packet Processor. A module installed in a TMS-3000 main shelf that interfaces externally with public frame relay networks or frame relay devices such as LAN bridges, routers and frame relay PADs. It also has internal access to the Fast Bus, allowing it to transfer frame relay, HDLC, and SDLC data to other TPP Modules in the shelf or to modules such as CIC, CDA, ACC, and IAC.

TPP Pathway

A TMS circuit between any of the following:

- synchronous data channel and a TPP Module
- two TPP Modules
- TPP Module and an OPP Module
- two OPP Modules

This circuit is unique because it is destined to a TPP/OPP Module within the TMS-3000/2000, rather than through an external interface.

WAN

Wide Area Network; a synchronous serial interface (i.e., a non-LAN interface).

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