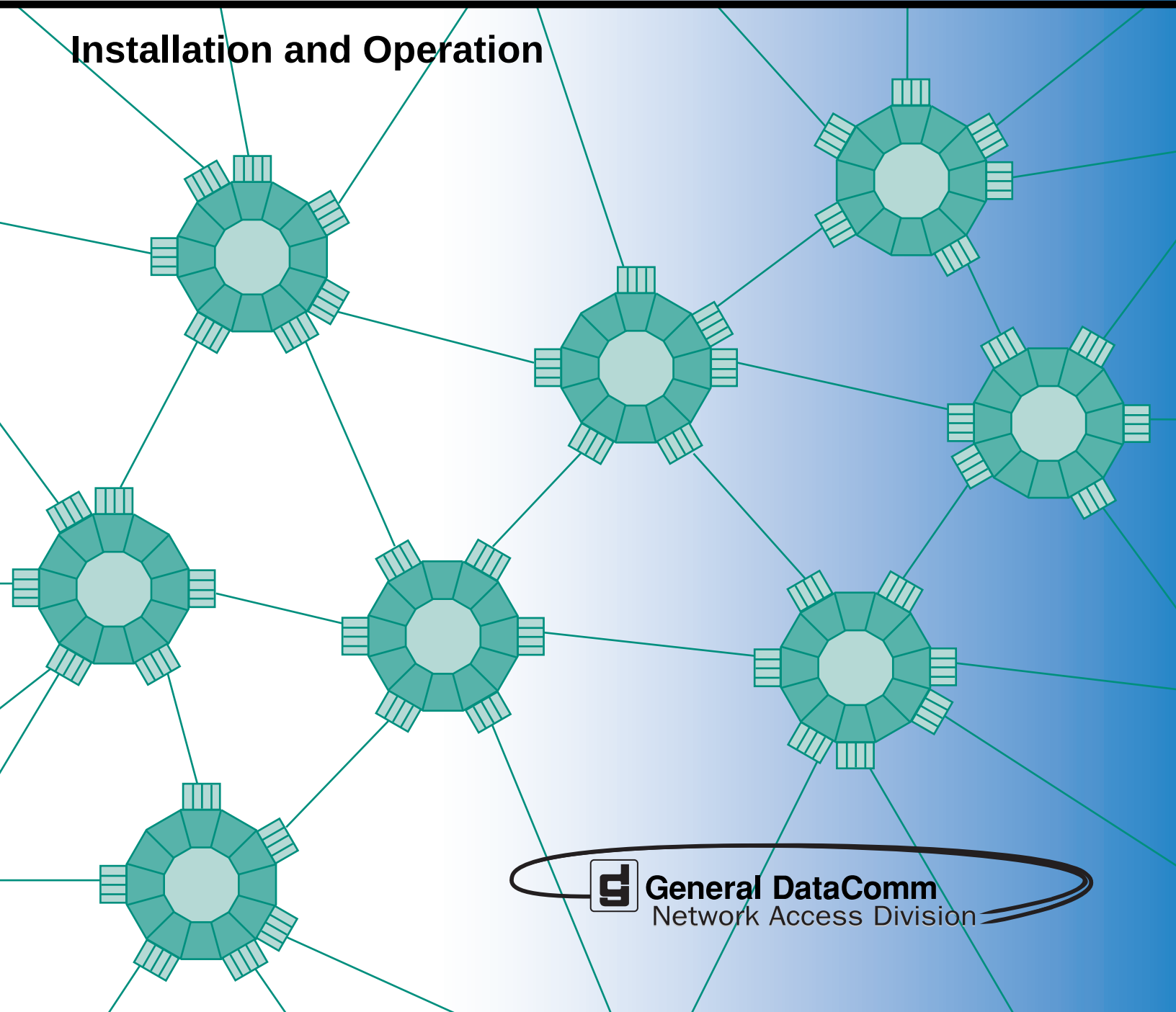
060R115-000
Issue 1

DataComm V.34 PL Modem

Installation and Operation



General DataComm
Network Access Division

060R115-000
Issue 1

DataComm V.34 PL Modem

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Trademarks

Documentation

Revision History

Issue Number	Date	Description of Change
1	June 2000	First Issue

Related Publications

A listing of related user manuals is provided below. In addition to the hardware and software manuals, always read the software System Release Notes supplied with your GDC product.

Table P-1 Related GDC Documents

Applicable Documents	
Publication Name	**Publication Number***
Instruction Manual Universal System Shelf AC and DC-to-DC Models	010R313-REV
DataComm Shelf, Model DS-1	010R310-REV
DataComm Shelf, Model DS-5	010R340-REV
DataComm Shelf, Model DS-6	010R341-REV

* For publications numbers, **REV** is the hardware manual revision (for example, -000, -001, etc.) **VREF** (if listed) is the software revision (for example, -V120 would read, Version 1.2) and corresponds to the most current revision.

Preface

Scope

This manual describes how to install and operate the DataComm V.34 PL (Private Line) modem. The information contained in this manual has been carefully checked and is believed to be entirely reliable. However, as General DataComm improves the reliability, function, and design of their products, is possible that information may not be current. Contact General DataComm if you require updated information for this or any other General DataComm product.

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Manual Organization

The online (web-based) manual uses active areas which allow you to navigate through portions of the manual by clicking on any ***blue*** text.

This manual is divided into the following chapters and appendices:

Chapter 1, Introduction

Chapter 2, Installation

Chapter 3, Operation

Chapter 4, Tests

Appendix A, Technical Specifications

Appendix B, Business Equipment Interface (TIA/EIA-232-F, ITU-T V.24/V.28/ISO 2110)

Safety Summary

The CAUTION, WARNING, and DANGER statements that appear throughout this manual are intended to provide critical information for the safety of both the service engineer and operator. These statements also enhance equipment reliability.

The definitions and symbols for CAUTION, WARNING, and DANGER comply with ANSI Z535.2, American National Standard for Environmental and Facility Safety Signs, and ANSI Z535.4, Product Safety Signs and Labels, issued by the American National Standards Institute.

The following examples show the symbols and definitions of CAUTION, WARNING, and DANGER as they are used in this manual.

CAUTION *Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury. It may also be used to alert against unsafe practices.*

WARNING *indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.*

DANGER *indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.*

VORSICHT

Potentielle Gefahr. Bei Nichtbeachtung besteht die Gefahr von leichter bis mäßiger Verletzung. Wird auch benutzt zum Schutz vor unsicherer Anwendung.

WARNUNG

Warnung vor drohender Gefahr. Folge bei Nichtbeachtung könnte Tod oder ernsthafte Verletzung sein.

GEFAHR

Bei Nichtbeachtung führt zum Tod oder ernshafter Verletzung.

Safety Guidelines

Always use the following guidelines when unsafe conditions exist or when potentially hazardous voltages are present:

- Always use caution and common sense.
- Repairs must be performed by qualified service personnel only.
- To reduce the risk of electrical shock, do not operate equipment with the cover removed.
- 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.
- Never install telephone wiring during an electrical storm.

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 Innovx 553 may contain static-sensitive devices that are easily damaged. Proper handling, grounding and precautionary ESD measures are essential when installing parts or cards. Keep parts and cards in antistatic packaging when not in use or during transport. If possible, use antistatic floorpads and workbench pads.

When handling components, 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.

Service Support and Training

VITAL Network Services, a General DataComm company, is committed to providing the service support and training needed to install, manage, and maintain your GDC equipment. VITAL Network Services provides hands-on training courses through **VITAL Network Services Global Technology Training Services**. Courses range from basic data communications, modems and multiplexers, to complex network and ATM systems. Training courses are available at our centers in the US, UK, France, Singapore and Mexico, as well as at a customer's site.

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V.34 PL Quick Reference

Mode			
FAC0	**FAC1**	**FAC2**	**FAC3**
4W Originate	4W Answer	2W Originate	2W Answer

Mode of Operation	OP	A - Asynchronous **S - Synchronous (FAC0-FAC3)**
Word Length	Ln	9 - 9 bits **10 - 10 bits (FAC0-FAC3)**
Timing	tI	**In - Internal (FAC0-FAC3)** Et - External rC - Receive
Data Rate	rt	24 - 2400 bps 48 - 4800 bps **96 - 9600 bps (FAC0-FAC3)**
Carrier	CA	**S - Simulated Control Carrier V.13 (FAC0-FAC3)** r - Real/Constant
RTS/CTS Delay	dE	0-0ms **15-15 ms (FAC0-FAC3)**
Transmit Levels	tL	0 dBm to -15 dBm **-9 dBm (FAC0-FAC3)**
* Terminal Test Control	tC	d - Disabled **E - Enabled (FAC0-FAC3)**
Front Panel Test Duration	FP	I - Infinite **10 - 10 minutes (FAC0-FAC3)**
Parity	Pr	En - Even SP - Space Od - Odd Ar - Mark **At - Auto (FAC0-FAC3)**
Notes: Defaults shown in **Bold** for FAC0 through FAC3 * If EIA pins 18 and 21 are not used, this option must be disabled (d) to prevent the modem from randomly entering the Test Mode.		

General DataComm
Network Access Division

Table of Contents

Preface

Scope iii
Manual Organization iii
Safety Summary iv
Service Support and Training vi

Table of Contents

Chapter 1: Introduction

Description 1-1
DataComm V.34 PL Modem Features 1-1
Diagnostics 1-2
Equipment List 1-2

Chapter 2: Installation

Unpacking Your Modem 2-1
Option Jumpers 2-1
DTE Interface Cards 2-3
Installation Procedure 2-3
Enclosure/Shelf Installation 2-3
Modem Installation 2-3
Electrical Connections 2-3
DTE Cables 2-7
Verifying Your Connections 2-7

Chapter 3: Operation

Operating Procedures 3-3
Status 3-3
Configuration 3-4
Private Line Operation [FAC0 - FAC3 or USr0 - USr3] 3-7
Testing the Modem 3-9
Diagnostics 3-9

Chapter 4: Tests

Analog Loopback (ANALOOP) 4-2
Analog Loopback with Self-Test 4-3
Digital Loopback 4-4
Remote Digital Loopback 4-5
Remote Digital Loopback with Self-Test 4-7
End-to-End Self-Test 4-9

Chapter 1: Introduction

Overview

This chapter describes and lists the features of the DataComm V.34 PL (Private Line) modem, and includes a brief description of the modem's diagnostics.

Description

The DataComm V.34 PL modem is a universal, full-duplex, multi-speed modem that provides 9600, 4800, and 2400 bps async or sync (and 1200 bps async - refer to Note) operation over 2-wire private line, or a 4-wire private line and supports the ITU-T V.34 protocol.

Note *For 1200 bps async operation, select 9600 bps sync mode (factory default). In this mode, 1200 bps async is transmitted and received without additional settings.*

The modem includes front panel push buttons for configuration and testing.

You can install the DataComm V.34 PL in a standalone DataComm Enclosure, or you can rackmount up to 16 units in a DataComm Shelf or Universal System Shelf.

The DataComm V.34 PL modem is available in a variety of models. Table 1-1 lists the part numbers for the DataComm V.34 PL's standard and optional equipment.

DataComm V.34 PL Modem Features

- Integral synchronous/asynchronous operation.
- Synchronous DTE rates 2.4, 4.8, and 9.6 kbps.
- Asynchronous DTE rates 1.2 (refer to note above), 2.4, 4.8, and 9.6 kbps.
- 2- or 4-wire private line operation, with selectable transmit level.
- Front panel push buttons and LCD window for configuration and testing.
- Eleven front panel status LEDs.
- Flash memory for downloading modem firmware.
- Permanent storage of modem configuration profiles in non-volatile memory.
- External, Internal, or Receiver Recovered transmit timing.
- Maximum line rate selection.

- Asynchronous character lengths of 8, 9, 10, and 11 bits.
- Analog Loopback with and without Self-Test features.
- Digital Loopback and Remote Digital Loopback.
- End-to-End Self-Test (511 or in FSK ALT pattern).

Diagnostics

To help you restore service quickly in the event of problems, the DataComm V.34 PL offers an array of diagnostics for accurate detection of system faults. Included are Local Loop, Local Loop Self-Test, Digital Loopback, Remote Digital Loopback, Remote Digital Loopback Self-Test, and End-to-End Self-Test. Tests can be controlled by front panel switches and monitored through the front panel display and LEDs.

Equipment List

Table 1-1 Equipment List

Description	Part No.
DataComm V.34 PL Printed Circuit (pc) Cards	
DataComm V.34 PL rackmount pc card, with TIA/EIA-232-F DTE interface	060P014-021
DataComm V.34 PL standalone	060A014-021
Rackmount DataComm Shelves	
Model DS-1, 117 V ac	010B015-001
Model DS-5NR, dc, nonredundant power supply	010M011-002
Model DS-5R, dc, redundant power supply	010M011-001
Model DS-6N/R, dc, nonredundant power supply, NEBS compliant	010M047-002
Model DS-6R, dc, redundant power supply, NEBS compliant	010M047-001
Rackmount Universal System Shelves	
Model USS-1-D, 117 V ac	010B080-001
Model USS-1-DC/NR, dc, nonredundant power supply	010M040-001
Model USS-1-DC/R, dc, redundant power supply	010M040-002
Standalone DataComm Enclosure	
Base assembly, Model DE-1, 117 V ac	010B017-001
Cover	010D500-003

(Sheet 1 of 2)

Table 1-1 Equipment List (Continued)

Description	Part No.
Cables	
DTE cable, male-to-female straight through, DB25-DB25, 25 pins	028H511-0xx
DTE cable, male-to-male straight through, DB25-DB25, 25 pins	028H502-0xx
Private line cable, 8-pin modular-to-lugs	024H122-xxx
Private line cable, model D25S (cut leads)	023H101-xxx
8-pin modular to 8-pin modular S/T	830-028-807
(Sheet 2 of 2)	

Chapter 2: Installation

Overview

This section describes installation of the DataComm V.34 PL modem.

Unpacking Your Modem

The unit is shipped enclosed in a box and protected by packing material. Inspect the unit when you receive it. Notify the shipper of any damage immediately.

Keep the box and packing material to use if you ever need to reship the unit.

Option Jumpers

The DataComm V.34 PL has four factory-set option jumpers. Verify that they are set as shown in Figure 2-1 and described in Table 2-1.

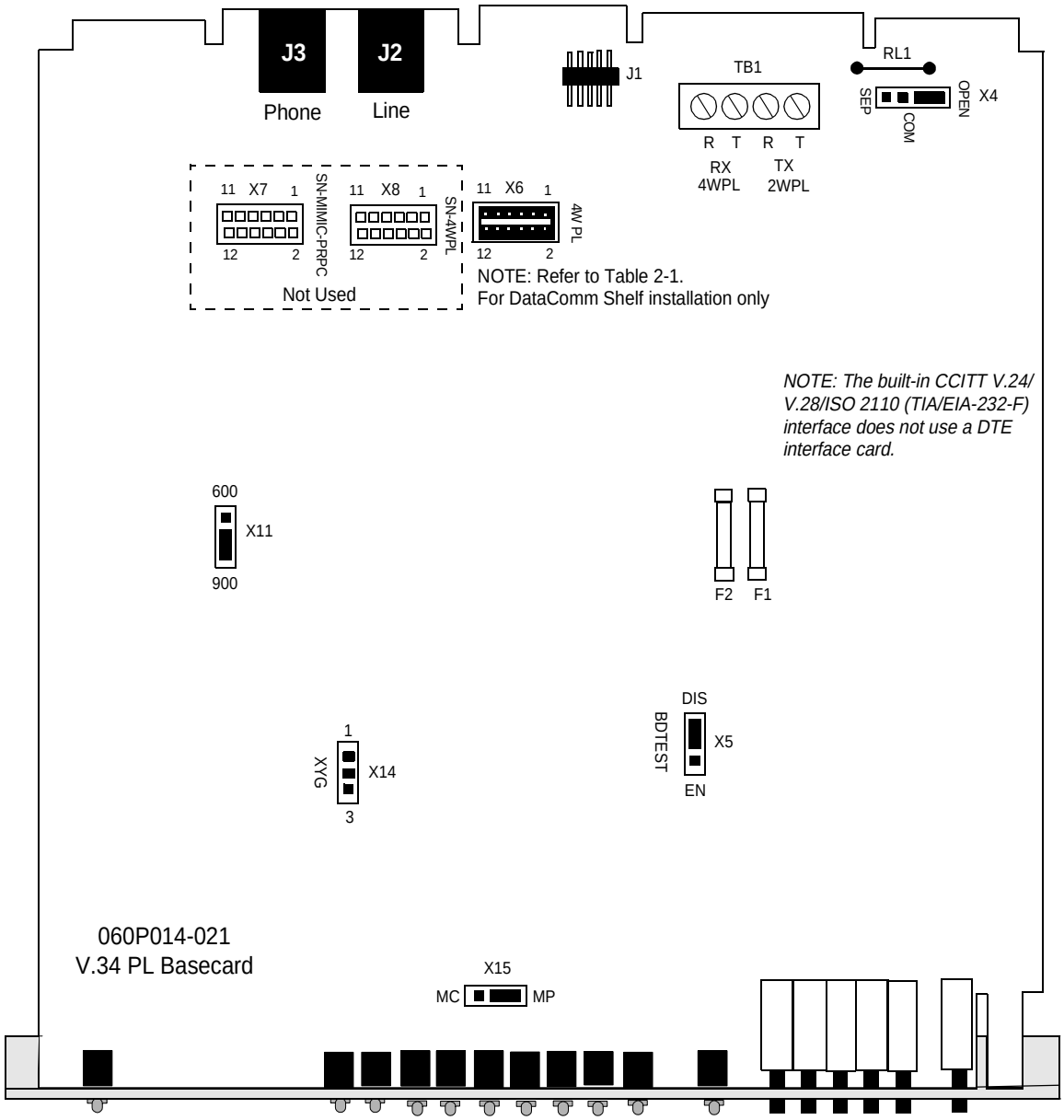


Figure 2-1 DataComm V.34 PL Card Layout

Table 2-1 Option Jumpers

Jumper	Position	Description
X4	**OPEN** (default)	Opens frame (chassis) and signal (reference) grounds.
	COM	Commons frame and signal grounds (connected through fusible link FL1).
	SEP	Separates (isolates) frame and signal grounds by 100 ohm.
X5	**DIS** (default)	MUST be in the DIS position.
X6	**Jumper installed** (default)	Selects private line (four-wire or two-wire) only operation*.
X7	-	Not Used no jumper.
X8	-	Not Used no jumper.
X11	-	Not Used leave jumper in factory position.
X14	**No Jumper** (default)	MUST have no jumper installed.
X15	**MP** (default)	MUST be in the MP position.
*Applies only when the card is installed in a Shelf.		

DTE Interface Cards

The DataComm V.34 PL has a built-in TIA/EIA-232-F (ITU-T V.24/V.28/ISO 2110) DTE interface.

Installation Procedure

The DataComm V.34 PL mounts in a variety of DataComm enclosures and shelves. Locate the unit in a ventilated area where the ambient temperature does not exceed 122°F (50°C). Do not install the unit directly above equipment that generates a large amount of heat (such as power supplies).

Enclosure/Shelf Installation

You can install the DataComm V.34 PL in a standalone DataComm Enclosure, or you can rackmount up to 16 units in a DataComm Shelf or Universal System Shelf (USS). To install a specific enclosure or shelf, refer to the appropriate manual listed in Safety Summary located in the Preface of this manual.

Modem Installation

You can install the DataComm V.34 PL in any unused slot in the enclosure or shelf. To install the DataComm V.34 PL:

1. Insert the modem into its slot with the GDC logo on top (or to the right), then slide it in until it makes contact.
2. Pull down the ejector tab (if provided) and firmly push the modem in until it seats in the rear connectors.

Electrical Connections

Connections to the DataComm V.34 PL are dependent on the enclosure or shelf in which it is installed. See Figure 2-2 and Figure 2-3 for connection details. Refer to Table 2-2 for the pinout of the 50-pin Telco VF connector which is available on the DataComm DS-6 shelf.

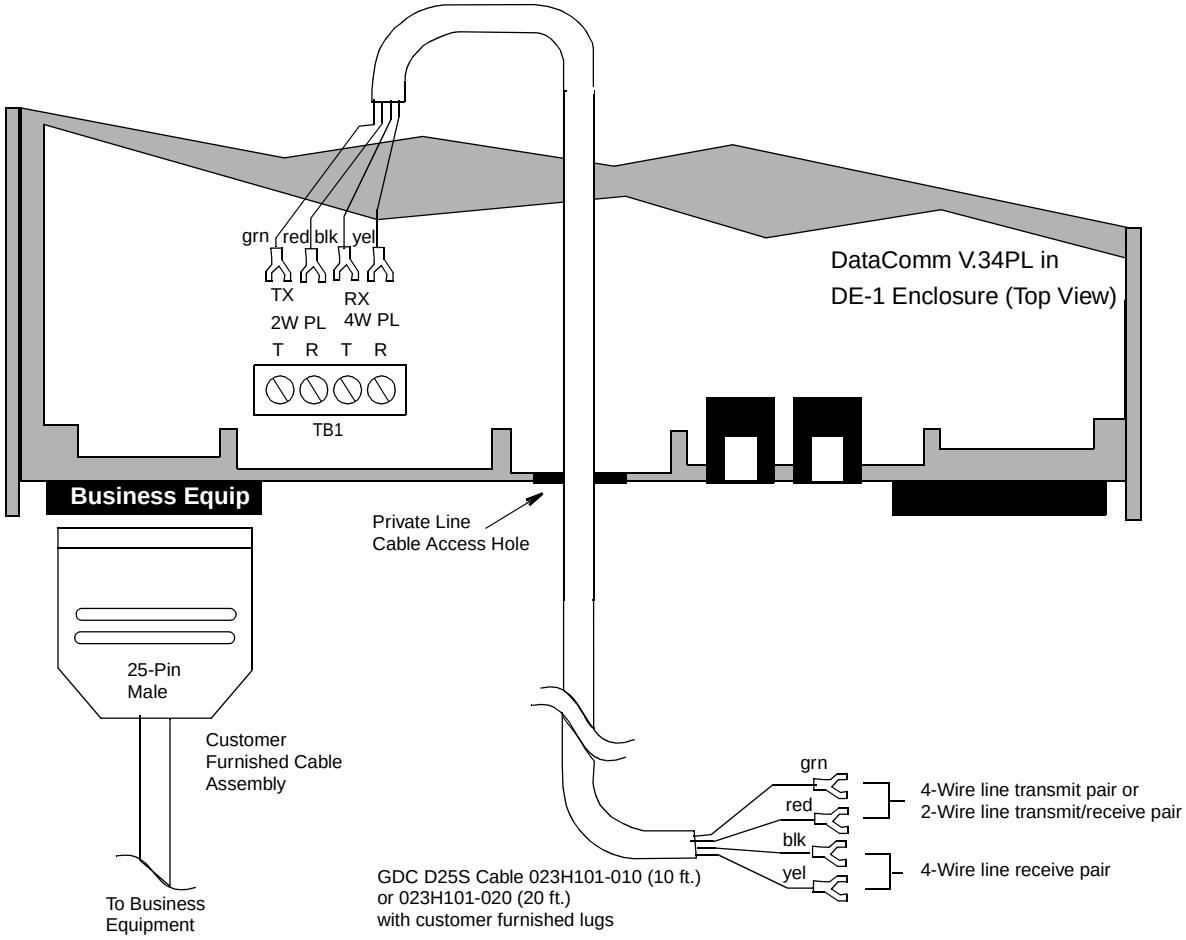


Figure 2-2 V.34 PL in Standalone Enclosure

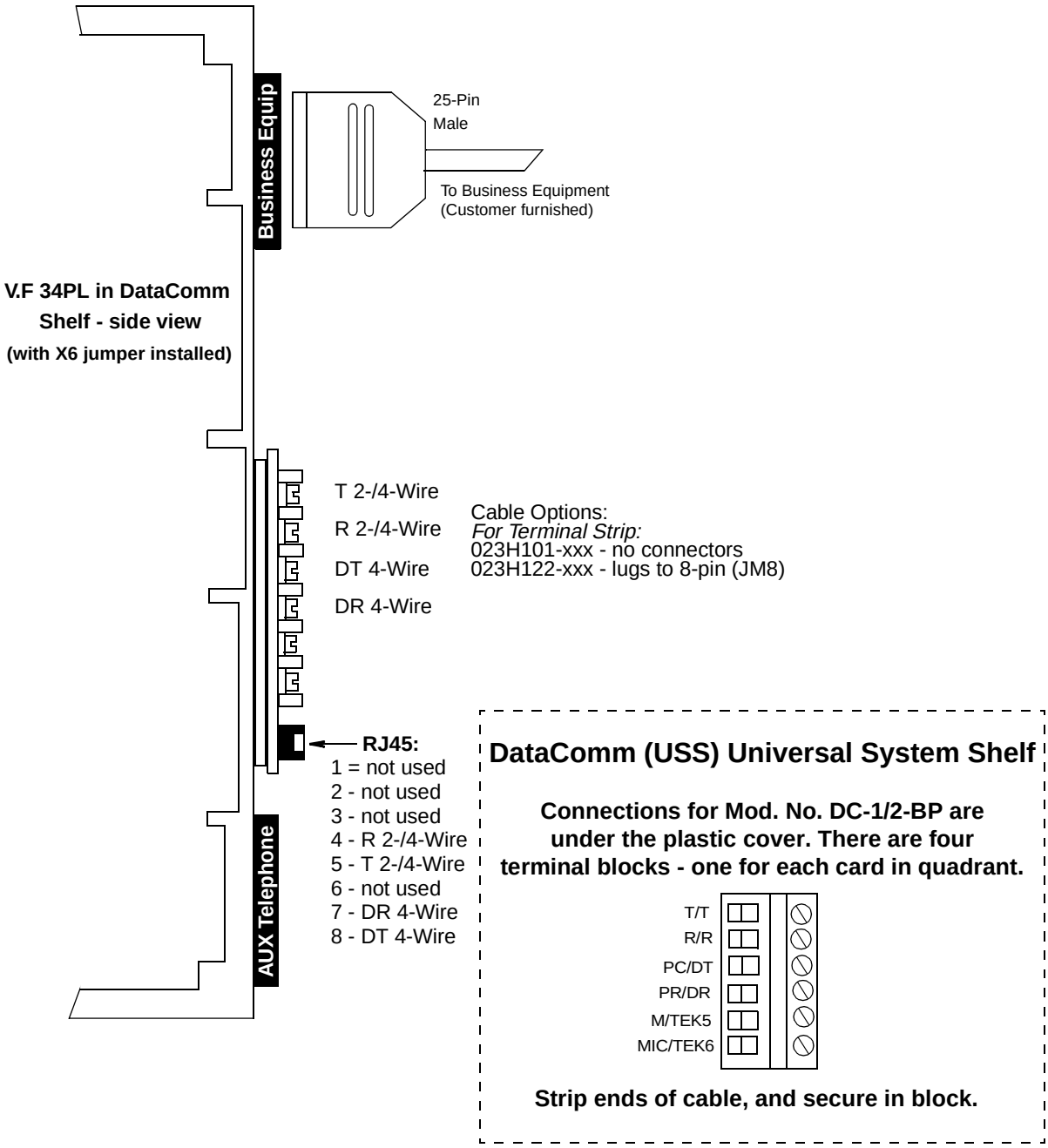


Figure 2-3 V.34 PL Connections in DataComm and DataComm USS Shelf

Table 2-2 50-Pin VF Connector Pinout (Telco 50-Pin Backplane)

50-Pin Connector	Private Line (Option X6)	Line
26	T	1/9
1	R	
27	T1	
2	R1	
28	not used	
3	not used	
29	T	2/10
4	R	
30	T1	
5	R1	
31	not used	
6	not used	
32	T	3/11
7	R	
33	T1	
8	R1	
34	not used	
9	not used	3/11
35	T	4/12
10	R	
36	T1	
11	R1	
37	not used	
12	not used	
38	T	5/13
13	R	
39	T1	
14	R1	
40	not used	
15	not used	
41	T	6/14
16	R	
42	T1	
17	R1	
43	not used	
18	not used	
44	T	7/15

(Sheet 1 of 2)

Table 2-2 50-Pin VF Connector Pinout (Telco 50-Pin Backplane)

50-Pin Connector	Private Line (Option X6)	Line
19	R	
45	T1	
20	R1	
46	not used	
21	not used	
47	T	8/16
22	R	
48	T1	
23	R1	
49	not used	
24	not used	
50	UNASSIGNED	-
25	UNASSIGNED	

(Sheet 2 of 2)

DTE Cables

With the TIA/EIA-232-F (ITU-T V.24/V.28/ISO 2110) DTE interface, use standard TIA/EIA-232-F cables.

Verifying Your Connections

Your modem should now be connected. To verify that the power supply is connected properly, see if the display on the front panel is flashing decimal point four (refer to *Chapter 3, Operation* for front panel operation). If not, reset the modem. If decimal point four still does not flash, then either the power supply is not connected properly, or the modem is not functioning.

Chapter 3: Operation

Overview

This Chapter describes how to operate and configure the DataComm V.34 PL modem by means of the modem's front panel push buttons (displayed in Red throughout this chapter) and display.

The DataComm V.34 PL front panel, illustrated in Table 3-1, includes 6 push buttons for controlling the modem, 11 status LEDs and a 4-character display screen. Table 3-1 describes the front panel controls and Table 3-2 describes the front panel indicators (the LEDs). The screen displays the status of the modem and, with the push buttons, allows you to perform configuration and testing.

Figure 3-1 Front Panel

Table 3-1 Front Panel Controls

Key	Function
AL	Starts/stops CCITT V.54 Loop 3 (Local Loop or ANALOOP). Can be used before ST for CCITT V.54 Loop 3 with Self-Test (Local Loop Self-Test or ANALOOP Self-Test).
ST	Starts End-to-End Self-Test. (Use AL, RDL or DL to stop the test.) Can be used after AL for CCITT V.54 Loop 3 with Self-Test. Can be used after RDL for CCITT V.54 Loop 2 with Self-Test.
ADV	Advances the display to the next configuration selection. See “Front Panel Configuration Procedure Summary” on page 4.
RDL	Starts/stops CCITT V.54 Loop 2 (Remote Digital Loopback). Can be used before ST for CCITT V.54 Loop 2 with Self-Test (Remote Digital Loopback Self-Test).
DL	Starts/stops CCITT V.54 Loop 2 (Digital Loopback).
SEL	Displays current configuration. Sets the current configuration then advances to the next selection. See “Front Panel Configuration Procedure Summary” on page 4.
RST	Saves the changed options to the previously selected User Profile, and provides the Idle/On-Line function.

Table 3-2 Front Panel Indicators

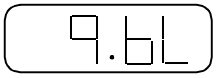
LED	Definition	LED State	Description
TR	Data Terminal Ready	On	The DTE has turned On DTE interface pin 20 (or DTR is On), indicating it is ready for data communications.
		Off	The DTE has turned Off pin 20, indicating it is not ready for data communications.
SD	Send Data	On	Indicates a SPACE condition in the transmitted data.
	(Transmitted Data)	Off	Indicates a MARK condition.
RD	Received Data	On	Indicates a SPACE condition in the received data.
		Off	Indicates a MARK condition.
MR	Modem Ready	On	The DCE has turned On DTE interface pin 6 (or DSR is On), indicating it is ready for data communications.
		Off	The DCE has turned Off pin 6, indicating it is not ready for data communications.
		Flashing	The modems are handshaking.
RS	Request to Send	On	The DTE has turned On DTE interface pin 4 (or RTS is On), indicating that the DTE is requesting the modem for data transmission.
		Off	Pin 4 is Off.
CS	Clear to Send	On	The modem has turned On DTE interface pin 5 (or CTS is On), indicating it is ready to transmit data.
		Off	The modem has turned Off pin 5, indicating it is not ready to transmit data.
CO	Carrier On (Data Carrier Detect)	On	The modem has turned On DTE interface pin 8 (or DCD is On), indicating it is receiving data.
		Off	The modem has turned Off pin 8, indicating it is not receiving data.
GD	Good Data	On	The modem is receiving an acceptable carrier level and is equalized.
		Off	The modem is not receiving an acceptable carrier level or is not equalized.
TM	Test Mode	On	The modem is in a test mode.
		Off	The modem is not in a test mode.
ALM	Alarm		Not used.
OH	Off-Hook	On	The modem is in the off-hook state.
		Off	The modem is in the on-hook state.

Operating Procedures

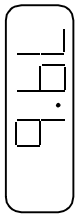
The DataComm V.34 PL allows you to perform a number of operations from the front panel. It displays status information and allows you to configure some aspects of the modem, as well as perform diagnostics.

Note *The screen illustrations below are for a modem mounted in a DataComm Enclosure. When the modem is rackmounted, the screen is turned on end.*

DataComm Encl.



Rackmount



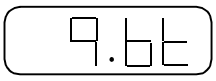
Status

When the modem is first powered up, the display test shows **8.8.8.8.** then momentarily **gdc** followed by a flashing decimal point. This is followed by the leased-line handshake mode. When modem is in handshake mode, the MR LED flashes along with a flashing decimal point. The GD LED is off.

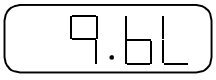
Note When the modem is in data mode. The MR and GD LED are ON along with a flashing decimal point (at the right side of the screen).

When the modem is in idle mode, the MR and GD LED is OFF along with a flashing decimal point (at the right side of the screen).

While the modem is in idle mode, press SEL to display the DTE (terminal) speed for two seconds. The example illustrates the display for the last data rate saved (the t indicates that the modem is displaying the terminal speed).



While the modem is in data mode, press SEL to display the DCE speed (the line or VF speed) for two seconds. The example illustrates the display for 9.6 kbps (the L indicates that the modem is displaying the line speed).



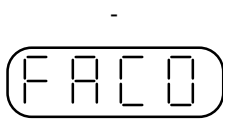
If the DCE speed changes while the modem is in data mode, the modem displays the new speed for two seconds.

Configuration

The DataComm V.34 PL leased-line only modem allows you to select a configuration profile. As soon as it is powered up, it performs a display test then displays "**gdc**" momentarily, then continuously enters the leased line handshake mode.

To configure the modem you must first place the modem in the idle mode. (the modem is in the idle mode if the decimal point at the far right of the display is flashing and the front panel MR and GD LEDS are OFF. Press the front panel RST button to enter the idle mode. This may take four to five seconds after the button is pressed.

To enter configuration mode press SEL, then press ADV (within two seconds). The modem briefly displays the last profile saved or selected from the front panel. The example illustrates the display for **FAC**tory (fixed) profile 0.
Once in configuration mode, there is a slight delay between the switch entry and the next LED update. Do not press the switch until the LED display updates, you may inadvertently select the next entry.



To scroll though the profile configurations, press ADV. Profiles include **FAC0** through **FAC3** and **USr0** through **USr3**.

Front Panel Configuration Procedure Summary

Before attempting to configure the DataComm V.34 PL you must identify whether you require 4 Wire (4W) or 2 Wire (2W) Private Line operation and whether you want the answer or originate function. Then chose the appropriate factory fixed default followed by the appropriate options. The Main Profile Menu is shown below:

FAC0 (4W Orig.)	Recalls factory default 0 profile (when saved, resets USr0 to FAC0 defaults)
FAC1 (4W Ans.)	Recalls factory default 1 profile (when saved, resets USr1 to FAC1 defaults)
FAC2 (2W Orig.)	Recalls factory default 2 profile (when saved, resets USr2 to FAC2 defaults)
FAC3 (2W Ans.)	Recalls factory default 3 profile (when saved, resets USr3 to FAC3 defaults)
USr0	4-wire, Originate
USr1	4-wire, Answer
USr2	2-wire, Originate
USr3	2-wire, Answer
rEL	Displays firmware version

Note *You must start with a factory fixed default of **FAC0**, **FAC1**, **FAC2** or **FAC3** for first time configuration setup. For subsequent configuration changes you would choose USr1 through USr3 depending on which USr profile the options were stored in.*

1. Press SEL to verify the selection and again to enter the configuration mode. **COnf** is displayed. While in the configuration mode, the SEL button displays the current configuration option selection then advances to the next option. The display eventually wraps back to the mode of operation **OP** display.
2.
3. The ADV button displays the current option's selections one at a time. Pressing the SEL button at this point will set that option to the currently displayed selection and change the currently running configuration to this selection then advance to the next configuration option.
4. To save the changed options, press the RST button. This saves the options into the previously selected Usr or FAC Profile and sets this profile to the modem's power up profile. If a factory default (for example, **FAC1**) was selected, it's corresponding user profile (**USr1**) would store the changed options and **USr1** would become the power up profile.

To abort option configuration mode, press AL. If any options were changed, they remain in effect. This action does not save to a user profile or power up profile.

Table 3-3 summarizes the front panel options.

Table 3-3 Front Panel Configuration Options

Mode of Operation	OP	A - Asynchronous **S - Synchronous (FAC0-FAC3)**
Word Length	Ln	9 - 9 bits **10 - 10 bits (FAC0-FAC3)**
Timing	tI	**In - Internal (FAC0-FAC3)** Et - External rC - Receive
Data Rate	rt	24 - 2400 bps 48 - 4800 bps **96 - 9600 bps (FAC0-FAC3)**
Carrier	CA	**S - Simulated Control Carrier V.13 (FAC0-FAC3)** r - Real/Constant
RTS/CTS Delay	dE	0-0ms **15-15 ms (FAC0-FAC3)**
Transmit Levels	tL	0 dBm to -15 dBm **-9 dBm (FAC0-FAC3)**
* Terminal Test Control	tC	d - Disabled **E - Enabled (FAC0-FAC3)**
Front Panel Test Duration	FP	I - Infinite **10 - 10 minutes (FAC0-FAC3)**
Parity	Pr	En - Even SP - Space Od - Odd Ar - Mark **At - Auto (FAC0-FAC3)**
Notes: Defaults shown in **Bold** for FAC0 through FAC3 * If EIA pins 18 and 21 are not used, this option must be disabled (d) to prevent the modem from randomly entering the Test Mode.		

Private Line Operation [FAC0 - FAC3 or USr0 - USr3]

The DataComm V.34 PL modem is configured to operate over a point-to-point, unconditioned, voice grade private line (speech band leased line).

Point-to-point private lines rented from the telephone company are dedicated, direct, semi-permanent phone line connections between two locations. In applications that require a continuous data transfer between fixed points, it may be more economical to rent a private line at a fixed rate, than to pay monthly long distance charges for dial up calls. The communication link between two multiplexers will generally involve a modem operating over private lines.

Two-wire or Four-wire Selection

The DataComm V.34 PL modem is capable of operation on private line networks, using either 4-wire or 2-wire circuits.

In any private line connection, first designate one modem as the originate modem **FAC0** (4W)/ **FAC2** (2W) and the other as the answer modem **FAC1** (4W)/**FAC3** (2W). Next, configure both modems for the type of communication they are intended to perform: these include synchronous or asynchronous modes, DTE data rate, etc.

Data Mode

The DataComm V.34 PL modem is in data mode while it has a telephone line connection to another modem or is in the process of establishing a connection. In Data Mode the modem transmits all the data it receives from the DTE over the phone line.

In data mode the modem can operate either asynchronously or synchronously.

Each telephone line connection (private line) between two modems in data mode begins with a handshaking sequence. During that sequence the modems determine the VF (telephone line) speed, and related parameters for the data link. Configuration determines the range of choices available to the modem in the negotiation process.

The presence of a carrier from a remote modem causes the DataComm V.34 PL modem to enter data mode and assert a Data Carrier Detect (DCD) signal to it’s DTE.

Asynchronous Operation [OP.A]

When you select asynchronous operating mode (**OP.A** from the front panel), the DataComm V.34 PL modem operates asynchronously while on-line (data mode - connected to the telephone line).

Synchronous Operation [OP.S]

Selecting **OP.S** from the front panel selects synchronous operation.

V.13 Simulated Carrier Mode [CA.S]

V.13 mode is a simulated controlled carrier mode designed for polling applications. It uses the ITU-T V.13 RTS/DCD signaling method to control the remote modem's DCD lead via the local modem's RTS lead. It can be used for both synchronous and asynchronous data. To select this mode from the front panel, select **CA.S**.

The following DTE data rates are available when the modem operates in V.13 synchronous or asynchronous mode:

9600 bps (enter 96)
4800 bps (enter 48)
2400 bps (enter 24)

Real/Constant Carrier Mode [CA.r]

In Real/Constant Carrier mode - (select **CA.r** from the front panel) With constant (continuous) carrier, the modem's transmitter is always ready to transmit signals at the data input lead. Carrier stays on independent of RTS from the terminal. It can be used for both synchronous and asynchronous data.

The following DTE data rates are available when the modem operates in Real/Constant synchronous or asynchronous mode:

9600 bps (enter 96)
4800 bps (enter 48)
2400 bps (enter 24)

Clock Selection

The synchronous format relies on transmit and receive clocks to maintain character timing. It therefore does not need start and stop bits for each character as does the asynchronous format. The DataComm V.34 PL modem can be configured to use one of the following three clock sources to transmit synchronous data:

- Internal - transmit clock generated by the DataComm V.34 PL modem.
- External - transmit clock signal generated by the DTE is passed to the modem along with data.
- Receiver - transmit clock derived by the local modem from the data it is receiving from the remote modem (also called wrap timing).

The preferred clock source varies for different computer systems. Consult your computer's manual for its particular specifications.

Regardless of which transmit clock source it is using, the DataComm V.34 PL modem always outputs its transmit clock signal to the DTE on pin 15 of the EIA interface. Pin 17 always provides the receive clock signal derived from the incoming data. When the DTE provides external transmit clock it does so on Pin 24.

Note *The receive clock is always controlled by the remote modem that sends the data being received. It is not recommended to have the local and remote modems both configured to derive transmit clock from received data.*

Transmit Level

It is possible in private line operation for the transmit levels of the modems to be either too low or too high. When that is the case the connection usually will not be dependable and will be filled with errors. To correct such situations, the transmit level of the DataComm V.34 PL for private line operation can be configured in 1 dBm increments between 0 dBm and -15 dBm. This selection can be done from the front panel by entering **tL** then 0 to 15. -9dBm is the default.

Note *It is recommended that you permanently store the above settings by pressing the RST front panel button. The modems are now ready for private line communications.*

Automatic and Manual Handshaking

The modems can be put into private line idle via the front panel RST button. From idle, the RST button can be used to initiate a new connection. Once told to handshake, the modems will continuously try to complete a handshake.

Note *When the modem is in synchronous mode, you must press the front panel RST button to enter idle.*

When communicating with a different modem in private line operations, the following steps outline how to configure the modems:

1. Configure both modems for the type of communications they are intended to perform.
2. Configure the DataComm V.34 PL modem as the Originate modem, selecting **FAC0, FAC2**.
3. Again, use the RST button to permanently store the current configurations for both modems.

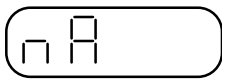
Testing the Modem

Chapter 6 describes basic diagnostics.

Note *You can perform private line "back-to-back" testing with the supplied 8-pin cable, but only in two-wire mode with the transmit level set to -15 dBm. For back-to-back testing in four-wire mode, use GDC cable P/N 024H207-XXX.*

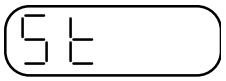
Diagnostics

The DataComm V.34 PL allows you to perform the diagnostics described below. If you attempt to start a test which cannot be run (e.g., End-to-End Self-Test when the local modem is not connected to another modem), the modem displays nA (not applicable).

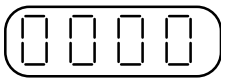


End-to-End Self-Test

To start the test, press ST. The modem flashes the TM LED and displays the test name while it is setting up the test, then lights the TM LED and displays four digits of the error count (0000 to 9999). It indicates larger numbers by lighting decimal point one and displaying the four least significant digits of the actual count (for example, the actual error count is 12345, but the modem displays 2.345). To stop the test, press AL, RDL or DL.



Setup

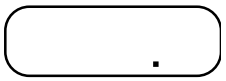


Running

CCITT V.54 Loop 3 Local Loop)

To start the test, press AL. The modem flashes the TM LED and displays the test name while it is setting up the test, then lights the TM LED and lights decimal point three while the test is running. To stop the test, press AL, RDL or DL.

Setup

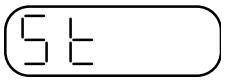


Running

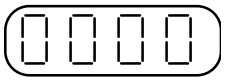
CCITT V.54 Loop 3 with Self-Test (Local Loop Self-Test)

To start the test, press AL then press ST. The modem flashes the TM LED and displays the test names while it is setting up the test, then lights the TM LED and displays four digits of the error count (0000 to 9999). It indicates larger numbers by lighting decimal point one and displaying the four least significant digits of the actual count (for example, the actual error count is 12345, but the modem displays 2.345). To stop the test, press AL, RDL, or DL.

Setup AL



Setup ST

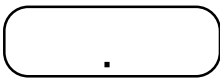


Running

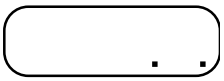
CCITT V.54 Loop 2 (Remote Digital Loopback)

To start the test, press RDL. The modem flashes the TM LED and displays the test name while it is setting up the test, then lights the TM LED and lights decimal point two while the test is running. To stop the test, press AL, RDL or DL. If the remote modem initiated the test, the local modem lights decimal points three and four while the test is running.

Setup



Running (Local)



Running Remote

Chapter 4: Tests

Overview

This chapter describes tests that you can perform to isolate a trouble condition. The tests can isolate a problem to the data connection, modem operation, or the DTE interface level. Refer to Figure 4-1 for a sequence of tests for fault isolation.

Note

a. *On-line tests, which involve data transmitted from one modem to another, can be performed with the modems operating in synchronous mode.*

b. *Once a modem is in Slave RDL, it will ignore all requests other than AL.*

c. *If an MRDL request does not get a response from the Slave modem at 2400 bps, the Master will drop the line.*

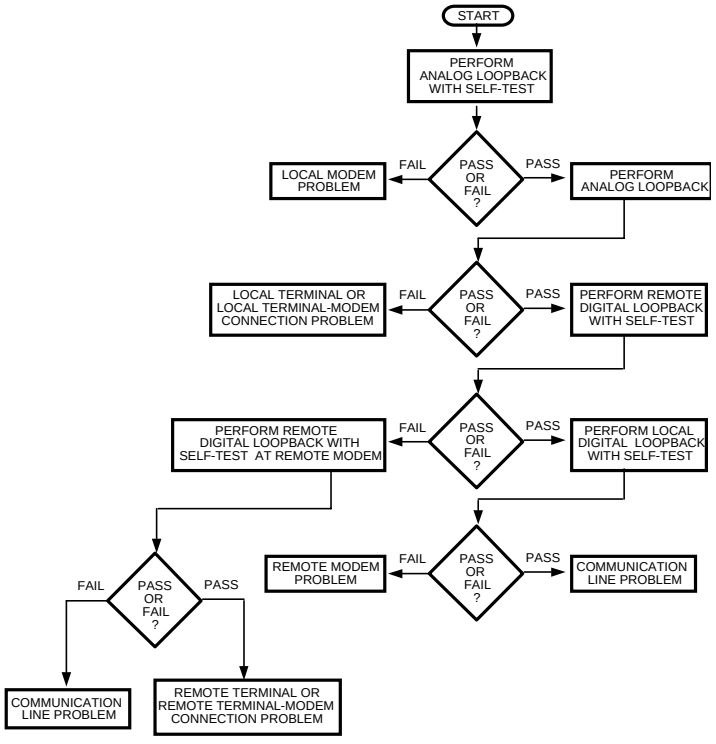
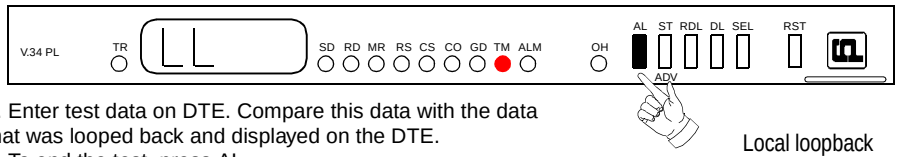


Figure 4-1 Fault Isolation Sequence

Analog Loopback (ANALOOP)

The Analog Loopback (AL) test mode, illustrated below, is provided to isolate problems in the modem operation and the DTE interface. Specifically, AL tests modem modulator/demodulator operation, DTE receive/transmit operation, and DTE interface operation.

1. To start the test, press AL.
2. TM flashes and the test name (LL) appears on the LCD while it is setting up the test, then TM lights and decimal point three appears while the test is running.



3. Enter test data on DTE. Compare this data with the data that was looped back and displayed on the DTE.
4. To end the test, press AL.

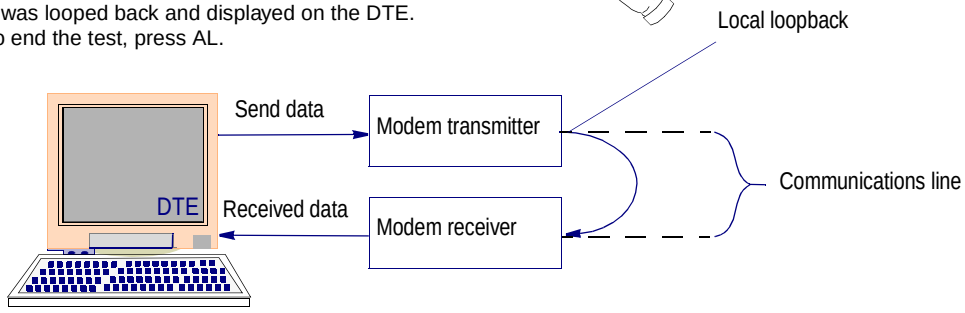


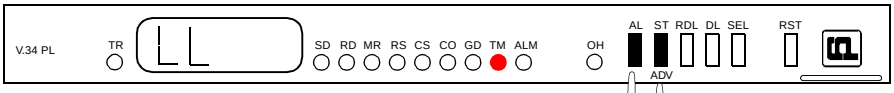
Table 4-1 Analog Loopback

Step	Front Panel
1.	To start the test, press AL.
2.	The modem flashes the TM LED and displays the test name (LL) while it is setting up the test, then lights the TM LED and decimal point three while the test is running.
3.	Enter test data at the DTE. Compare the data that was entered at the DTE with the data that is looped back and displayed by the DTE. If errors occur frequently, a problem may exist in the modem, the DTE, or the DTE-to-modem connection. Refer to Figure 4-1, Fault Isolation Sequence.
4.	To end the test, press AL, RDL or DL.

Analog Loopback with Self-Test

Analog Loopback may be combined with Self-Test, as illustrated below. Upon initiation of Self-Test, a pattern is generated by the transmitter and sent to the receiver for analysis. The pattern is made up of alternate ones and zeros for 2400 bps. For all other speeds the modem generates a 511 test pattern. The number of errors is displayed on the screen. This test provides a means for you to determine whether the problem is in the local data set.

1. To start the test press AL, then press ST.
2. TM flashes and the LCD displays the test names (LL and ST) while it is setting up the test, then TM lights and the LCD displays four digits of the error count (0000 to 9999) while the test is running.



3. When the timer (S-register 18) times out, the test ends.
4. To end the test, press AL, RDL or DL.

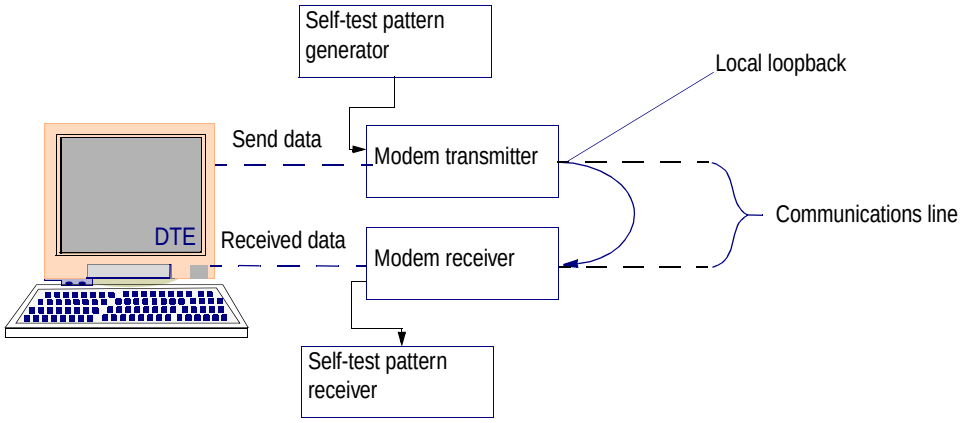


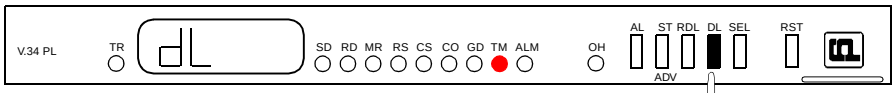
Table 4-2 Analog Loopback with Self-Test

Step	Front Panel
1.	To start the test press AL, then press ST.
2.	The modem flashes the TM LED and displays the test names (LL and ST) while it is setting up the test, then lights the TM LED and displays four digits of the error count (0000 to 9999) while the test is running. It indicates larger numbers by lighting decimal point one and displaying the four least significant digits of the actual count (for example, the actual error count is 12345, but the modem displays 2.345).
3.	To end the test, press AL, RDL or DL.

Digital Loopback

The modem can be commanded to enter digital loopback, illustrated below, by means of the front panel. This loopback is used while a call to the distant modem is established. In digital loopback, the local received data is coupled to the transmitter input, so that the remote unit can perform a loopback test without commanding remote loopback. In asynchronous mode the clocks are clamped at the EIA interface.

1. Establish data communications with the remote modem.
2. To start the test. press DL.
3. TM flashes and the LCD displays the test name (DL) while it is setting up the test, then TM lights and decimal point one is displayed while the test is running.



4. Ask the remote attendant to enter data at the remote DTE, then compare it with the data that is looped back and displayed by the DTE.
5. To end the test, press DL.

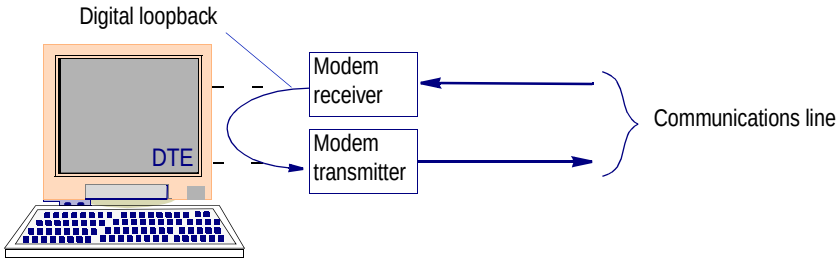


Table 4-3 Digital Loopback

Step	Front Panel
1.	Establish data communications with a remote modem.
2.	To start the test, press DL.
3.	The modem flashes the TM LED and displays the test name (DL) while it is setting up the test, then lights the TM LED and decimal point one while the test is running.
4.	Direct the remote attendant to enter data at the remote DTE, then compare it with the data that is looped back and displayed by the DTE. If errors occur frequently, a problem may exist in the local or remote modems, the remote DTE, the remote DTE-to-modem connection, or the communication line. Refer to Figure 4-1, Fault Isolation Sequence.
5.	To end the test, press AL, RDL or DL.

Remote Digital Loopback

Remote Digital Loopback, illustrated below, is controlled at the local end. It can be commanded from the front panel, or by the DTE's EIA pin 21. The loopback can be commanded only after a call is established and both ends are in data mode. In this loop, the demodulator's descrambled received data at the remote end is coupled to the remote transmitter input for transmission back to the local end.

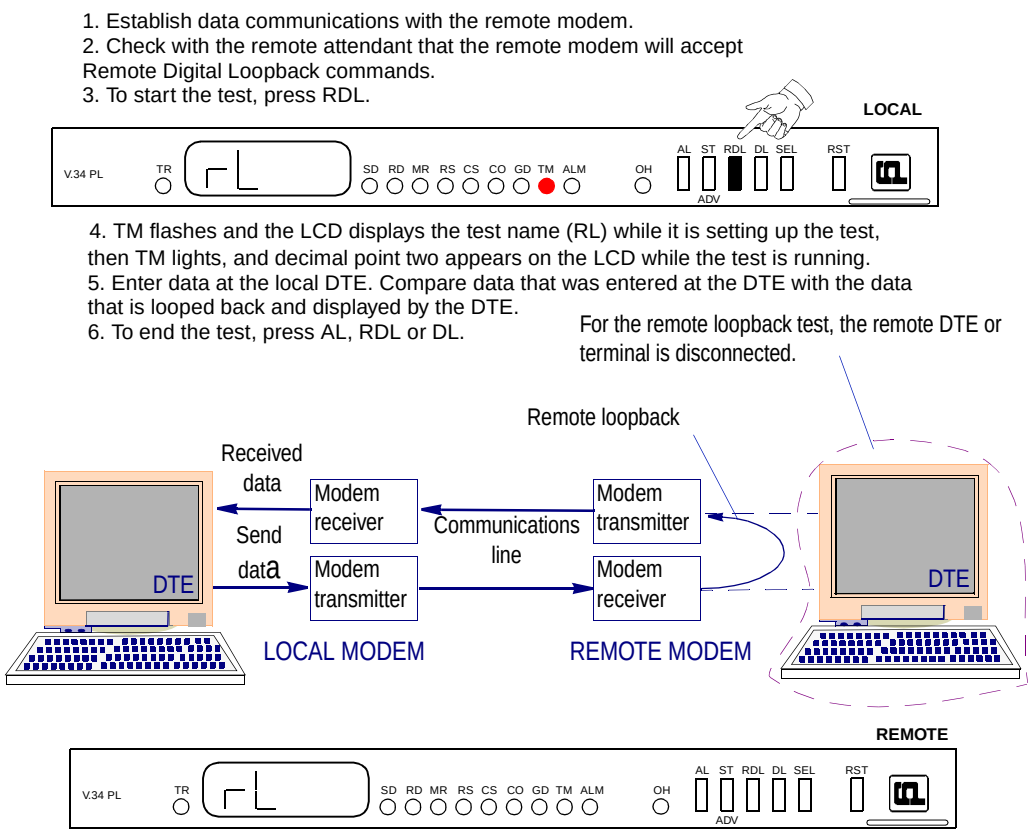


Table 4-4 Remote Digital Loopback

Step	Front Panel
1.	Establish data communications with a remote modem.
2.	Check with the remote attendant that the remote modem will accept Remote Digital Loopback commands.
3.	To start the test, press RDL.
4.	The modem flashes the TM LED and displays the test name (RL) while it is setting up the test, then lights the TM LED and decimal point two while the test is running. (If the remote modem initiated the test, the local modem lights decimal points three and four while the test is running.)

Table 4-4 Remote Digital Loopback (Continued)

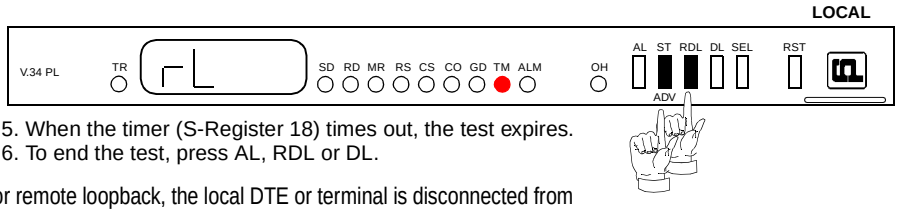
Step	Front Panel
5.	Enter data at the local DTE. Compare data that was entered at the DTE with the data that is looped back and displayed by the DTE. If errors occur frequently, a problem may exist in the local or remote modems, local DTE, local DTE-to-modem connection, or the communication line. Refer to Figure 4-1, Fault Isolation Sequence.
6.	To end the test, press AL, RDL, or DL.

Note: CTS at the remote modem will drop low during the test.

Remote Digital Loopback with Self-Test

Remote Digital Loopback with Self-Test, illustrated below, is controlled at the local end. It can be commanded from the front panel. This command can only be entered after the call is established and both ends are in the data mode. The test causes the local modem to generate a pattern that is transmitted across the telephone line to the remote modem's receiver, looped through to the remote modem's transmitter, and sent back across the telephone line to the local modem's receiver for analysis. The pattern is made up of alternate ones and zeros for 2400 bps. For all other speeds the modem generates a 511 test pattern. The number of errors is displayed on the screen. This test checks both modems and the telephone line.

1. Establish data communications with the remote modem.
2. Check with the remote attendant that the modem will accept Remote Digital Loopback commands.
3. To start the test, press RDL, then press ST.
4. TM flashes and the LCD displays the names (RL and ST) while it is setting up the test, TM lights and the LCD displays four digits of the error count (0000 to 9999) while the test is running.



5. When the timer (S-Register 18) times out, the test expires.
6. To end the test, press AL, RDL or DL.

For remote loopback, the local DTE or terminal is disconnected from

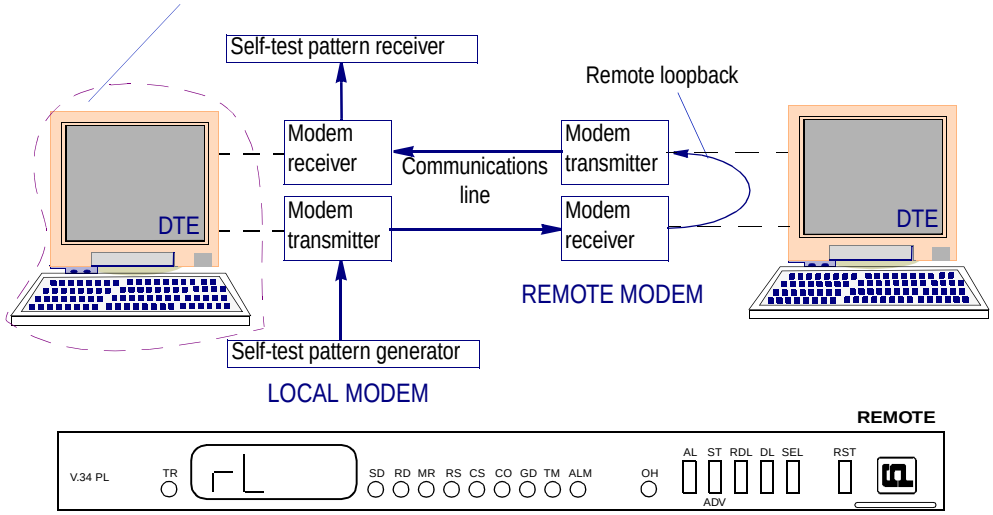


Table 4-5 Remote Digital Loopback with Self-Test

Step	Front Panel
1.	Establish data communications with a remote modem.
2.	Check with the remote attendant that the remote modem will accept Remote Digital Loopback commands.
3.	To start the test press RDL, then press ST.

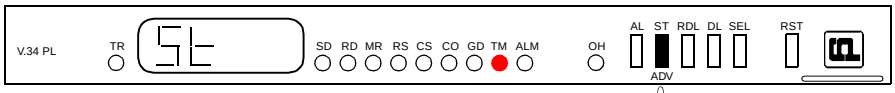
Table 4-5 Remote Digital Loopback with Self-Test

Step	Front Panel
4.	The modem flashes the TM LED and displays the test names (RL and ST) while it is setting up the test, then lights the TM LED and displays four digits of the error count (0000 to 9999) while the test is running. It indicates larger numbers by lighting decimal point one and displaying the four least significant digits of the actual count (for example, the actual error count is 12345, but the modem displays 2.345).
5.	To end the test, press AL, RDL, or DL.

End-to-End Self-Test

End-to-End Self Test, illustrated below, requires operators at both the local and remote modem. It can be commanded from the front panels. The commands can only be entered after the call is established and both ends are in the data mode. The test causes each modem to generate a pattern and to transmit it to the other modem. The modem receiving the pattern checks it for errors. The patterns are made up of alternate ones and zeros for 2400 bps. For all other speeds the modems generate a 511 test pattern. The number of errors received is displayed on the screen. This test checks the operation of both modems and the communications line.

1. To start the test, press ST.
2. TM flashes and the LCD displays the test name (ST) while it is setting up the test, then TM lights and the LCD displays four digits of the error count (0000 to 9999) while the test is running.



3. When the timer (S-Register 18) times out, the test expires.
4. To end the test, press AL, RDL or DL.

For self-test (end-to-end self-test), both the local and remote DTEs or terminals are disconnected from their modems.

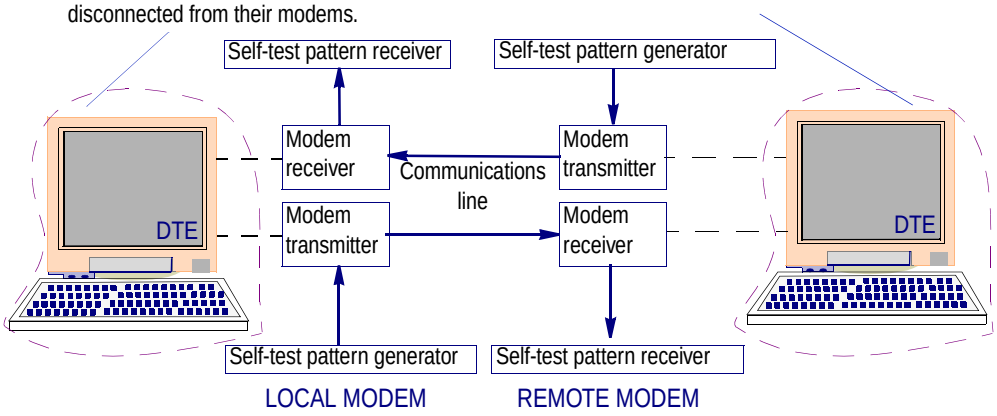


Table 4-6 End-to-Tend Self-Test

Step	Front Panel
1.	To start the test press ST.
2.	The modem flashes the TM LED and displays the test name (ST) while it is setting up the test, then lights the TM LED and displays four digits of the error count (0000 to 9999) while the test is running. It indicates larger numbers by lighting decimal point one and displaying the four least significant digits of the actual count (for example, the actual error count is 12345, but the modem displays 2.345).
3.	To end the test, press AL, RDL, or DL.

Appendix A: Technical Specifications

Item	Specification
VF Data Rates	9600 bps (ITU-T V.34) synchronous/asynchronous 4800 bps (ITU-T V.34) synchronous/asynchronous 2400 bps (ITU-T V.34) synchronous/asynchronous
Data Format	Bit synchronous - selectable 9 or 10 bits per character
Transmit Clock	Internal, External, or Receive Wrap
Compatibility	ITU-T V.34
Operating Mode	Private line - two-wire or four-wire
Answer Tone	ITU-T V.34 as specified by ITU-T
Note: *Receiver performance in ITU-T V.34, may be degraded when transmitting above -6 dBm.*	

Item	Specification
Receive Carrier	
ITU-T V.34	As specified by ITU-T
Note: ITU-T V.34 being echo canceling protocols, use signal quality as criteria for maintaining connection. They also provide for self-training detection to force disconnect.	
Receive Level	
Two-wire Private Line	-6 to -33 dBm
Four-wire Private Line	0 to -26 dBm
Hysteresis	2 dBm minimum
DTE Interface	
Standard	EIA/TIA-232-E (ITU-T V.24/V.28/ISO 2110)
Optional	EIA/TIA-530-A (ITU-T V.10/V.11/V.24/ISO 2110 Amendment 1) V.35 (ITU-T V.24/V.28/V.35/ISO 2593) V.36 (requires a special optional cable)
Line Requirements	
Private Line	Two-wire or four-wire
Line Connection	
Private Line	8-position modular jack (US RJ45)
Line Equalization	Automatic Adaptive
Connection Options	One second Line Break Holdover in four-wire private line mode only.
Power Consumption	7 card-edge watts dc maximum
DC Voltage (Typical)	
+5V	+5V ±5% at 1A
+12V	+12V ±5% at 0.2A
-12V	-12V ±5% at 0.2A
Dimensions (Printed circuit board)	
Height	22.2 mm (7/8 in)
Width	248 mm (9 3/4 in)
Depth	273 mm (10 3/4 in)

Item	Specification
Temperature	
Operating	0 to 50×C (32× to 122×F)
Non-operating	-40 to 70×C (-40× to 158×F)
Humidity, operating	Up to 95 % humidity (non-condensing)
Altitude, operating	0 m to 3,047 m (0 to 10,000 ft)

Appendix B: Business Equipment Interface (TIA/EIA-232-F, ITU-T V.24/V.28/ISO 2110)

Pin No.	Circuit		Name	Direction	Function
	232-F	V.24			
	Description				
2	BA	103	SD	To DCE	Transmitted Data
	Data signals originated by the DTE - to be transmitted to a remote data station via a data channel, or to be passed to the DCE for maintenance test purposes under control of the DTE - are transferred to the DCE on this circuit.				
3	BB	104	RD	From DCE	Received Data
	Data signals generated by the DCE - in response to data channel line signals received from a remote data station, or in response to DTE maintenance test signals - are transferred to the DTE on this circuit.				
4	CA	105	RTS	To DCE	Request to Send
	Signals on this circuit control the data transmit function of the DCE. The On condition causes the DCE to assume the data channel transmit mode. The Off condition causes the DCE to assume the data channel non-transmit mode when all data transferred on circuit 103 has been transmitted.				
5	CB	106	CTS	From DCE	Clear to Send
	Signals on this circuit indicate whether the DCE is ready to transfer data. The On condition indicates that the signal converter or similar equipment is connected to the line and that the DCE is ready to initiate transfer of data. The Off condition indicates that the DCE is not ready to transfer data.				
6	CC	107	DSR	From DCE	Data Set Ready
	Signals on this circuit indicate whether the DCE is ready to operate. The On condition indicates that the signal converter or similar equipment is connected to the line and that the DCE is ready to exchange further control signals with the DTE to initiate transfer of data. The Off condition indicates that the DCE is not ready to operate.				
7	AB	102	SIG GND		Signal Ground
	This pin is the signal ground reference for the V.24 interface circuits.				
8	CF	109	CO/DCD	From DCE	Data Channel Receive Line Signal Detect
	Signals on this circuit indicate whether the receive data channel line signal is within appropriate limits, as specified in the relevant recommendation for DCE. The On condition indicates that the received signal is within appropriate limits. The Off condition indicates that the received signal is not within the appropriate limits.				
15	DB	114	SC	From DCE	Transmit Clock DCE Source
	Signals on this circuit are used to provide the data terminal equipment with signal element timing information. The data terminal equipment shall provide a data signal on the Transmit Data line in which the transitions between signal elements nominally occur at the time of the Off-to-On transitions of the signal on the DB circuit.				
17	DD	115	RC	From DCE	Received Clock
	Signals on this circuit are used to provide the data terminal equipment with received signal element timing information. The On-to-Off transition shall nominally indicate the center of each signal element on the BB (Received Data) circuit.				

Pin No.	Circuit 232-F	Circuit V.24	Name	Direction	Function
	Description				
18	LL	141	ALE	To DCE	Local Loopback
	Signals on this circuit are used to control local loopback.				
20	CD	108/1		To DCE	Connect Data Set to Line
	Signals on this circuit control switching of the signal-conversion or other similar equipment to or from the line. The On condition causes the DCE to dial a stored phone number and connect the signal-conversion or similar equipment to the line. The On condition following Ring Indicator causes the DCE to perform automatic answer. The Off condition causes the DCE to remove the signal-conversion or similar equipment from the line.				
20	CD	108/2	DTR	To DCE	Data Terminal Ready
	Signals on this circuit control switching of the signal-conversion or similar equipment to or from the line. The On condition, indicating that the DTE is ready to operate, prepares the DCE to connect the signal conversion or similar equipment to the line and maintains this connection after it has been established by supplementary means. The DTE is permitted to present the On condition on circuit 108.2 whenever it is ready to transmit or receive data. The Off condition causes the DCE to remove the signal-conversion or similar equipment from the line.				
21	2.5	140	RLE	To DCE	Remote Digital loopback
	The On condition in this circuit will initiate a Remote Digital Loopback test.				
22	CE	125	RI	From DCE	Ring Indicator
	The On condition of this circuit indicates that a ringing signal is being received on the communication channel. The On signal shall appear approximately coincident with the On segment of the ringing cycle (during rings) on the communication channel.				
23	CI	112	TC	From DCE	Speed Indicator
	The On condition indicates that the modem is operating at the highest speed within the selected handshake mode. The Off condition indicates that a speed lower than the maximum was selected.				
24	DA	113	TC	To DCE	Transmit Clock DTE Source
	Signals on this circuit are used to provide the transmitting signal converter with signal element timing information. The On-to-Off transition shall nominally indicate the center of each signal element on the BA (Transmit Data) line.				
25	TM	142	TME	From DCE	Test Mode Indicator
	The On condition in this circuit indicates a test mode in the DCE, precluding reception or transmission of data signals from or to a remote DTE. The Off condition indicates that the DCE is not in test mode.				

Index

A

Analog Loopback 4-2
Appendices
    Technical Specifications A-1
Asynchronous Operation 3-7

B

Business Equipment Interface (TIA/EIA-232-F, ITU-T V.24/V.28/ISO 2110) 1

C

Real/Constant Mode 3-8
V.13 Simulated Carrier Mode 3-7
V.13 Synchronous Mode 3-8
Clock Selection 3-8
Configuration 3-4

D

Data Mode 3-7
Diagnostics 1-2, 3-9
    CCITT V.54 Loop 2 (Remote Digital Loopback) 3-11
    CCITT V.54 Loop 3 (Local Loop or ANALOOP) 3-11
    End-to-End Self-Test 3-10
Digital Loopback 4-3
DTE Cables 2-7
DTE Interface Jumpers 2-3

E

Electrical Connections 2-3
Enclosure/Shelf Installation 2-3
End-to-End Self-Test 4-9

F

Figures
    Analog Loopback 4-2
    Analog Loopback with Self-Test 4-4
    Fault Isolation Sequence 4-1
    Front Panel 3-1
Four-wire Selection 3-7

H

Handshaking
    Automatic 3-9
    Manual 3-9

I

Installation Procedure 2-3

L

Loopback with Self-Test 4-3

M

Modem Installation 2-3

O

Synchronous Operation 3-7
Operating Procedures 3-3
Option Jumpers 2-1

P

Private Line Operation 3-7

R

Remote Digital Loopback 4-5
Remote Digital Loopback with Self-Test 4-7

S

Service Support and Training vi
Status 3-3
Synchronous Operation 3-8

T

Tables
    Equipment List 1-2
    Front Panel Controls 3-1
    Front Panel Indicators 3-2
    Option Jumpers 2-3
Testing the Modem 3-9

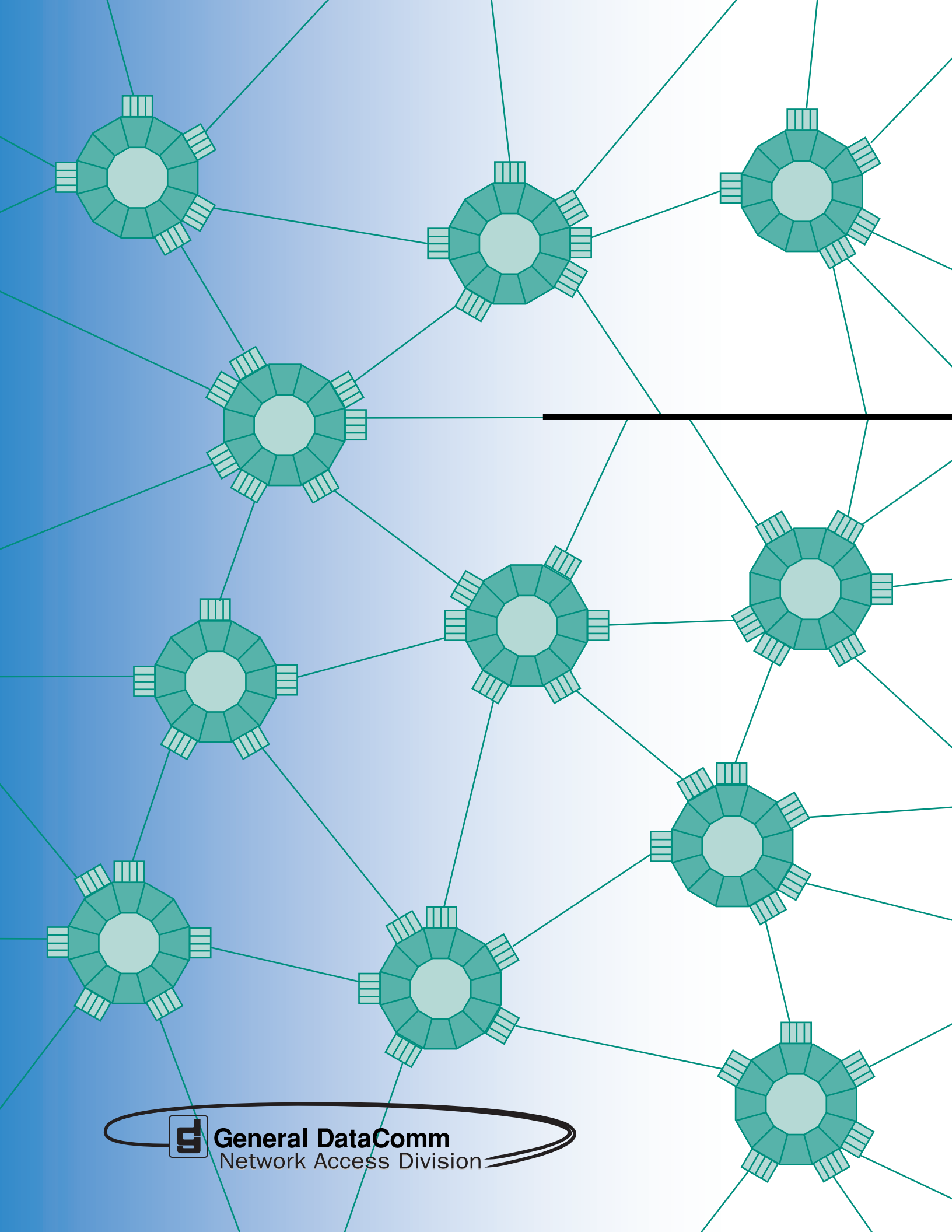
Transmit Level 3-9
Two-wire Selection 3-7

U

Unpacking Your Modem 2-1

V

V.34 PL Connections in DataComm and DataComm USS Shelf 2-5
V.34 PL in Standalone Enclosure 2-4
Verifying Your Connections 2-7


General DataComm
Network Access Division