

GDC 072R118-000
Issue 2, August 1996

Installation and Operation

Universal Access System 621

Terminating Unit

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 of FCC and international rules, which are 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.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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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 state-ments 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 Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. 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. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). 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 made by an authorized Canadian maintenance facility 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. *Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.*

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 Installierung 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

Scope

This manual describes how to install and configure a General DataComm 621 Network Terminating Unit (NTU). It explains how to monitor and manage network devices. This documentation is written for operators and installers, and assumes a working knowledge of data communications equipment.

Organization

This manual has four chapters and four appendices. The information is arranged as follows:

- *Chapter 1 - System Description* introduces important concepts and features of the NTU 621.
- *Chapter 2 - Installation* tells you how to install the 621. Only typical or fundamental applications are given because of the variety of specific customer system choices.
- *Chapter 3 - Operation* describes the front panels of the 621.
- *Chapter 4 - Tests* describes performance tests.
- *Appendix A* describes the technical characteristics of the 621.
- *Appendices B, C, D, and E* cover four 621 types of cable pin-out interfacing.

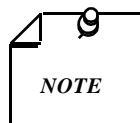
The *Index* contains the 621 subject and page number.

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.



Notes present special instructions, helpful hints or general rules.

Related Publications

The following documents have additional information that may be helpful when using this product:

- *Operating and Installation Instructions for*

	<i>DataComm 610/612 (NTU)</i>	GDC 072R114-000
•	<i>Operating and Installation Instructions for SpectraComm Manager Card</i>	GDC 048R303-000
•	<i>Operating and Installation Instructions for SpectraComm Shelf</i>	GDC 010R302-000

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. UAS)
R	denotes a technical publication
nnn	a number assigned by Technical Publications
000	identifies a hardware product and does not change
Vnnn	designates software version associated with a product, which may be updated periodically

The issue number on the title page changes only 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 always Issue 1. Other specialized publications such as Release Notes or Addenda may be available depending on the product.

Glossary of Terms

2B1Q Code

Line code for basic rate ISDN at the "U" reference point.

Address

A sequence of bits, a character, or a group of characters that identifies a network station, user, or application; used mainly for routing purposes.

BERT

Bit Error Rate Test, or tester.

A Binary Synchronous Communications protocol (BISYNC) that uses special characters to define the various fields of a message and for control functions. Typically used for transmission between a CPU and a CRT or batch-type processor. BISYNC accommodates a variety of transmission codes including ASCII, EBCDIC, and SBT (Six-Bit Transcode).

Bit

A binary digit, the representation of a signal, wave, or state, as either a binary zero or a one.

Bit Error Rate (BER)

The percentage of received bits that are in error, relative to a specific amount of bits received; usually expressed as a number referenced to a power of 10; e.g., 1 in 10^5 .

Bps

Bits per second; basic unit of measure for serial data transmission capacity; also kbps (kilobits) for thousands of bits per second; Mbps (megabits), for millions of bits per second; Gbps (gigabits) for billions of bits per second; Tbps (terabits) for trillions of bits per second.

Channel

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

Data

Digitally represented information, which includes voice, text, facsimile, and video.

Data Communications

Transmitting and receiving coded digital signals between computers or other digital devices or systems according to agreed upon specifications or standards.

Data Terminal Equipment (DTE)

Generally end-user devices, such as terminals and computers that connect to DCE, which either generate or receive the data carried by the network; in ITU-T V.24/V.28 connections, designation as either DTE or DCE determines signaling role in handshaking; in a ITU-T X.25 interface, the device or equipment that manages the interface at the user premises.

Diagnostics

Tests used to detect malfunctions in a system or component.

EPROM

Erasable Program Read-Only Memory. Memory chip for storing programs or applications software that you can erase and reload with new software.

Link

The combination of communications devices, media and software intelligence that is required to effect data communications.

Loopback

Diagnostic procedure used for transmission devices; a test message is sent to a device being tested, which is then sent back to the originator and compared with the original transmission; loopback testing may be within a locally attached device or conducted remotely over a communications circuit.

LTU

Line Terminating Unit. The equipment that terminates the access line at the network end.

MIB

Management Information Base.

Network

An interconnected group of nodes; a series of points, nodes, or stations connected by communications channels; the assembly of equipment through which connections are made between data stations.

NTU

Network Terminating Unit. The equipment that terminates the access line at the customer end.

Point-to-Point

A circuit that connects two points directly, with generally no intermediate processing nodes or computers, although there could be switching facilities; a type of connection, such as a phone-line circuit, that links two, and only two, logical entities.

RD

Receive Data.

SD

Send Data.

Self-Test

A diagnostic test mode in which the modem is disconnected from the telephone facility and its transmitter's output is connected to its receiver's input to permit the looping of test messages (originated by the modem test circuitry) through the modem to check its performance.

SNMP

Simple Network Management Protocol. The Internet standard protocol, defined in RFC 1157 developed to manage nodes on an IP network.

1 System Description

DataComm 621 NTU Features

- Supports a single channel (64 Kbps, 128 Kbps, or sub 64Kbps) of customer data on a two-wire 2B1Q loop circuit.
- Works as a Network Managed Element when used within a GDC Network Management System.
- Can be configured from on-board switches when not Network Managed.
- Supplies on-board V.35 and V.24/V.28 interfaces for the DTE port.
- Compatible with ANSI, B1, and B2 loopbacks.
- Supports both V.54 and PN127 loopbacks.
- Supports both 511 and 2047 test pattern generator and checking.

Product Description

The DataComm 621 is a single channel Network Terminating Unit (NTU), and is compatible with ANSI T1.601-1992 line coding requirements. It supports an operating range of up to 18,000 feet over a two-wire, 26 gauge line. You can chose on-board V.35 and ITU-T V.24/V.28 interfaces through berg-style jumpers. Optional 530 or X.21 interfaces card are available. You can option the 621 from the base card or by remotely from a GDC network management system (NMS). You may use the HP OPENVIEW/PC Manager when using the NTU along with a 611, 616, or the 7616.

Standalone and rackmount versions for the 621 are available. Rackmount feature GDC's unique DataComm or Universal System Shelf packaging concept. You can mount a variety of data communications products including up to 16 NTUs in the same high density shelf. Refer to *Table 1-1* at the end of this chapter for a list of part numbers for standard and optional equipment for the 621. *Appendix A* describes more technical aspects of the 621.

Applications

Figures 1-1 through *1-3* show you some NTU applications.

Figure 1-1 shows a point-to-point application. This is a non-Network Managed system and requires that the on-board option switches are used to configure the units.

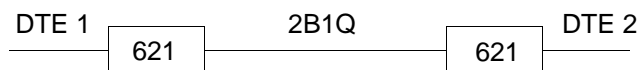


Figure 1-1 Point-to-Point Application

Figure 1-2 shows a Network Managed system. This application requires a SpectraComm Shelf, a SpectraComm Manager Card (SCM), and 621 NTUs used as remotes off of an UAS 611 or UAS 7616. In this application, the 621 NTUs are configured and controlled by the Network Manager.

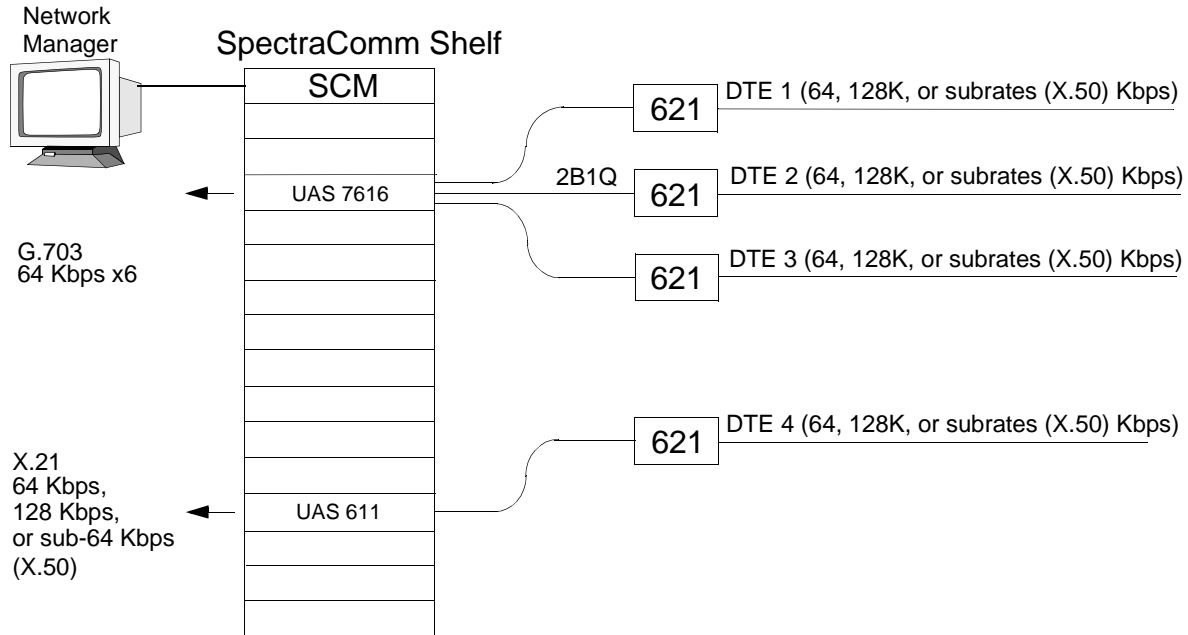


Figure 1-2 Network Managed System

Diagnostics

Built-in diagnostic circuits of the 621 NTUs allow quick and thorough performance tests: standard B1, B2, and 2B+D loopbacks, V.54 and PN127 compatible Remote Loopback (RL) and Self Test. Self-Test has a dual-patterned generator and receiver, minimizing need for external test equipment. Built-in RL allows looping of the data channel back from a remote site.

Table 1-1 Equipment List

Description	Part No.
621 Rackmount, V.35/232	048P087-001
621 Rackmount, X.21	048M087-001
621 Rackmount, V.11	048M087-002
621 Standalone, V.35, 117 Vac	048A087-001
621 Standalone, V.35, 220 Vac	048A087-002
621 Standalone, V.35, 240 Vac	048A087-004
621 Standalone, ITU-T V.24/V.28, 117 Vac	048A087-011
621 Standalone, ITU-T V.24/V.28, 220 Vac	048A087-012
621 Standalone, ITU-T V.24/V.28, 240 Vac	048A087-014
621 Standalone, V.11, 117 Vac	048A087-061
621 Standalone, V.11, 220 Vac	048A087-062
621 Standalone, V.11, 240 Vac	048A087-064
621 Standalone, X.21, 117 Vac	048A087-071
621 Standalone, X.21, 220 Vac	048A087-072

Table 1-1 Equipment List (Cont.)

621 Standalone, X.21, 240 Vac	048A087-074
Enclosures/Shelves	
DE Cover	010D500-003
Base Assembly, DE27, V.35, 117 Vac	010B144-001
Base Assembly, DE27E, V.35, 220/240 Vac	010B180-005
Base Assembly, DE27, ITU-T V.24/V.28, 117 vac	010B145-001
Base Assembly, DE27E, ITU-T V.24/V.28, 220/240 Vac	010B180-006
DataComm Shelf, DS-1, 117 Vac	010B015-001
DataComm Shelf, DS-5R, -48 Vdc redundant power supplies	010M011-001
DataComm Shelf, DS-5NR, -48 Vdc non-redundant power supply	010M011-002
DataComm Shelf, DS-6R, -48 Vdc redundant power supplies, NEBS-compliant dimensions	010M047-001
DataComm Shelf, DS-6NR, -48 Vdc non-redundant power supply, NEBS-compliant dimensions	010M047-002
Universal System Shelf USS-1-D, 117 Vac, Domestic	010B080-001
Universal System Shelf USS-1-DC/NR, -48 Vdc non-redundant power supply	010M040-001
Universal System Shelf USS-1-DC/R, -48 Vdc redundant power supply	010M040-002
Optional Equipment	
25-pin Male to 34-pin Female (Shelf V.35 Business Equipment Channel 1 or standalone both channels)	070H002-001
25-Pin Male to 25-Pin Female (Shelf ITU-T V.24/V.28 business equipment Channel 1)	027H511-001
Cable with Modular Connectors	830028-807, 814, 825
Alternate Line Connection Cable	023H101-020
25-Pin female to 34-Pin female	027H566-X06
25-Pin female to 25-Pin female	027H515-X06
DB-25 to DB-15 adapter	027H430-000

2 Installation

Unpacking and Handling

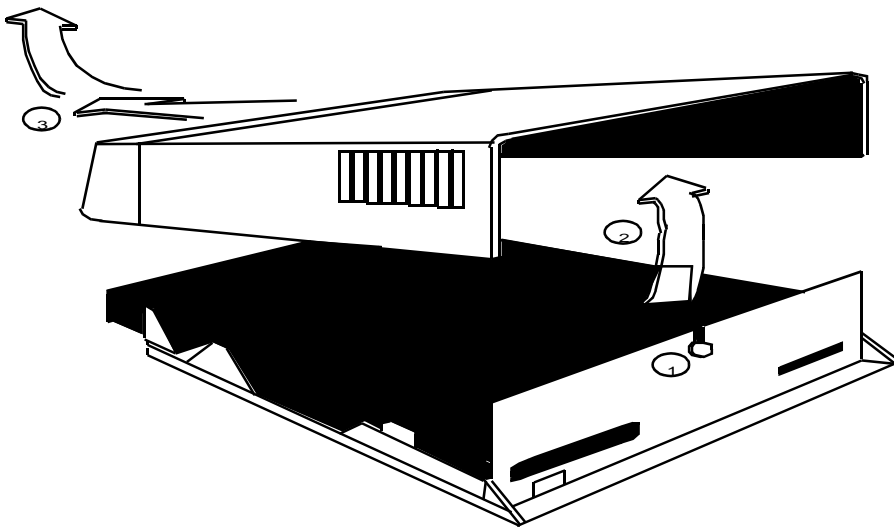
Look for damage. If you find any, notify the shipper immediately. Save the box and packing material; you can use it to reship the unit, if necessary.

Installation Procedures

You may install the 621 basecard in a standalone DataComm Enclosure or in a DataComm or Universal System Shelf (USS) rackmount. Place 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).

Standalone Installation

If you must remove the component cards from the standalone base, disconnect the power supply connector from J1 mounted at the rear center of the base card. When reinstalling the component cards to the base, reinstall the connector at J1. See *Figures 2-1* and *2-2*.



Caution: Disconnect power cable and phone connections before removing cover.

1. With front of unit facing left, turn screw to release cover.
2. Lift right end of cover upward. (For dual-card products, spread out the sides of the cover to clear the upper card.)
3. Slide cover to left with an upward motion.

When reinstalling cover, top edge of rear panel must sit between the two ridges on underside of cover.

Figure 2-1 Standalone Cover Removal Procedure

Rackmount Installation

Mounted in a DataComm Shelf (DS-1, DS-5, or DS-6), the 621 supports as many as 16 NTUs. Install the NTU in any unused slot in the shelf as follows:

1. Position the card in the top and bottom slot guides with the GDC logo on top, and carefully slide the assembly into the slot until it stops at the rear connectors.
2. Push the front panel with both hands until the assembly mates with the rear connectors.

The Universal System Shelf (USS-1) accommodates 16 NTUs. The USS-1 uses harness cards and backplanes configured to occupy one card slot in the shelf for each NTU. Backplane assembly has a keyed tab, which mates with a slot that is part of the shelf and prevents the backplane from being inserted incorrectly in the shelf.

Install the NTU in the USS-1 shelf, as follows:

1. Loosen the backplane screws and install the plug-in card from the front of the shelf by sliding it into the card guides.
2. Seat firmly into the mating connectors on the backplane using both hands.
3. Tighten the backplane screws.

This assures perfect alignment of the cards in the card guides and the mating connectors on the backplane. Allows for easy removal of the cards.

4. Plug in the four-pin cable harness on the backplane adapter to the shelf power connector located directly above the backplane adapter.

Option Selection

Dip switches and jumper straps on the NTU base card select the field options. *Figure 2-2* locates their positions and *Table 1-2 (Sheets 1 and 2)* describes each option.

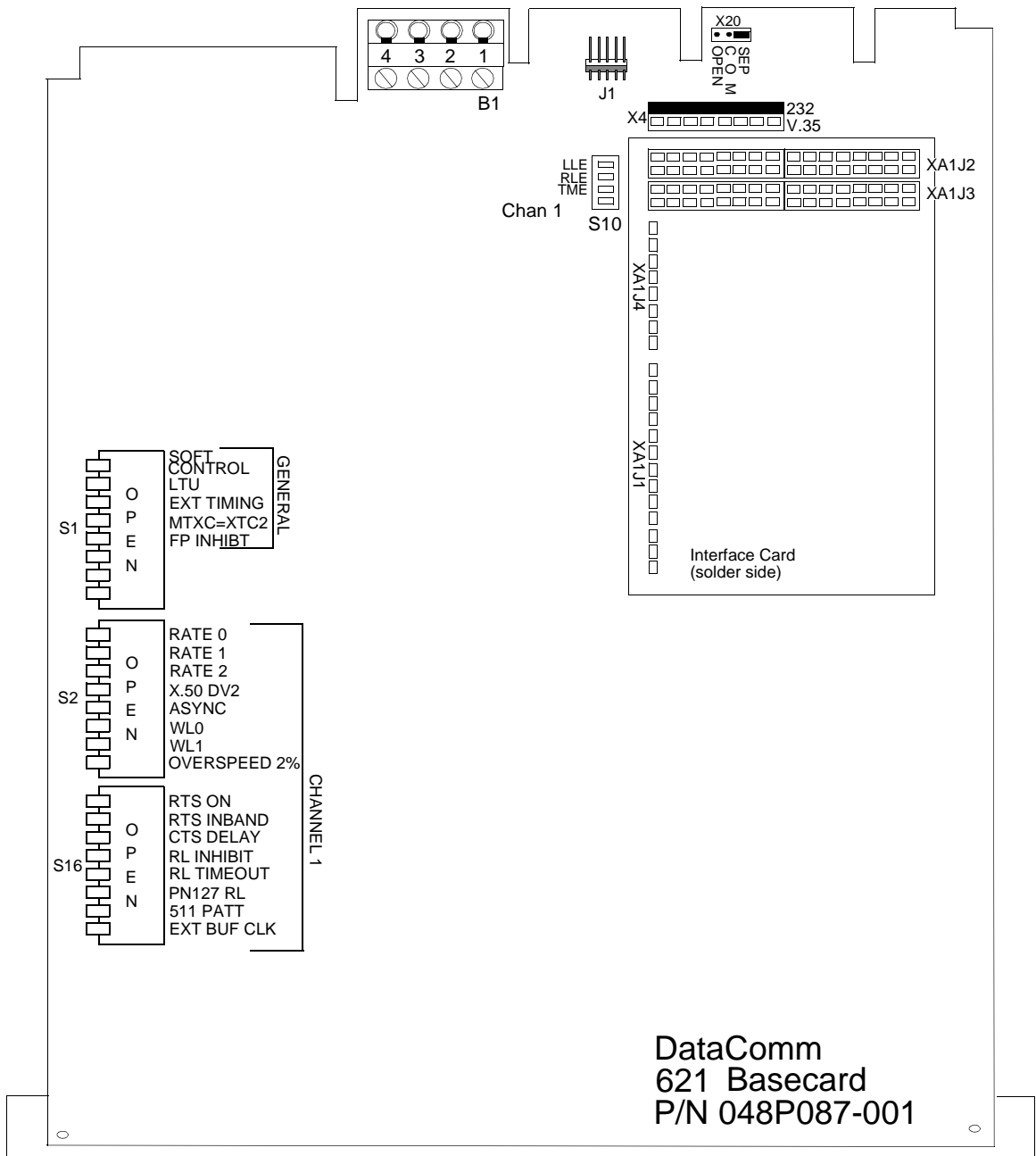


Figure 2-2 Base Card and Optional Plug-in Card Location and Switch Selection

Table 2-1 Base Card and Plug-in Card Option Location and Selection
(Sheet 1 of 2)

General Use	1	SOFT CNTRL	HARD/SOFT CONTROL: When set for hard control, the unit is configured from the hard switches. When set for soft control, the unit is configured and controlled by a network manager. Default is HARD.
	2	LTU	LTU/NTU MODE: Puts unit into Line or Network Termination handshake and operation mode. Default is NTU.
	3	EXT TIMING	INT/EXT TRANSMIT CLOCK: When optioned for LTU mode only, selects master transmit clock source as INTernal or EXTernal. When set for internal, unit generates the transmit clock timing from an on-board crystal. When set for external, the unit uses the XTC from the local DTE as the timing source. Default is INT. When optioned for NTU mode, the unit is forced to internal timing.
	4	MT XC = XTC2	Reserved for future use.
	5	FP INHIBIT	INHIBIT/ENABLE FRONT PANEL: When set for FP inhibit, the unit disables the front panel switches and no front panel diagnostics can be conducted until FP is enabled again. Default is FP enabled.
	6		Reserved for future use.
	7		
	8		

Chan1	1	RATE 0	RATE 0-2 (3-bits): These bits set the DTE data rate. Rates below 64 Kbps automatically enable X.50 rate adaption. Default is 64 Kbps. Any unused combinations are set to 64 Kbps also.																		
	2	RATE 1																			
	3	RATE 2																			
			<table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;"><u>0-2</u></th> <th style="text-align: center;"><u>RATE</u></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Dn Dn Dn</td> <td style="text-align: center;">2.4 Kbps</td> </tr> <tr> <td style="text-align: center;">Up Dn Dn</td> <td style="text-align: center;">4.8</td> </tr> <tr> <td style="text-align: center;">Dn Up Dn</td> <td style="text-align: center;">9.6</td> </tr> <tr> <td style="text-align: center;">Up Up Dn</td> <td style="text-align: center;">19.2</td> </tr> <tr> <td style="text-align: center;">Dn Dn Up</td> <td style="text-align: center;">48.0</td> </tr> <tr> <td style="text-align: center;">Up Dn Up</td> <td style="text-align: center;">N/U</td> </tr> <tr> <td style="text-align: center;">Dn Up Up</td> <td style="text-align: center;">128.0</td> </tr> <tr> <td style="text-align: center;">Up Up Up</td> <td style="text-align: center;">64.0</td> </tr> </tbody> </table> <p>Dn = Switch is in Down (On) position. Up = Switch is in Up (Off) position.</p>	<u>0-2</u>	<u>RATE</u>	Dn Dn Dn	2.4 Kbps	Up Dn Dn	4.8	Dn Up Dn	9.6	Up Up Dn	19.2	Dn Dn Up	48.0	Up Dn Up	N/U	Dn Up Up	128.0	Up Up Up	64.0
	<u>0-2</u>	<u>RATE</u>																			
	Dn Dn Dn	2.4 Kbps																			
	Up Dn Dn	4.8																			
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Up Up Dn	19.2																				
Dn Dn Up	48.0																				
Up Dn Up	N/U																				
Dn Up Up	128.0																				
Up Up Up	64.0																				
4	X50 DV2	DIV2/DIV3 X.50: Valid when DTE rate is below 64Kbps. Selects between X.50 DIVision 2 and X.50 DIVision 3 standards. Default is DIV3.																			
5	ASYNC	ASYNC/SYNC MODE: Set to ASYNChronous for async DTE or SYNChronous for synchronous DTE. Default is SYNC.																			
6	WL0	ASYNC WORD LENGTH 0-1 (2-bits): Valid for ASYNC mode only. These bits set the word length including start and stop bits. Default is 10 bits.																			
7	WL1																				
		<table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;"><u>0-1</u></th> <th style="text-align: center;"><u>LENGTH</u></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Dn Dn</td> <td style="text-align: center;">8 bits</td> </tr> <tr> <td style="text-align: center;">Up Dn</td> <td style="text-align: center;">9</td> </tr> <tr> <td style="text-align: center;">Dn Up</td> <td style="text-align: center;">11</td> </tr> <tr> <td style="text-align: center;">Up Up</td> <td style="text-align: center;">10</td> </tr> </tbody> </table> <p>Dn = Switch is in Down (On) position. Up = Switch is in Up (Off) position.</p>	<u>0-1</u>	<u>LENGTH</u>	Dn Dn	8 bits	Up Dn	9	Dn Up	11	Up Up	10									
<u>0-1</u>	<u>LENGTH</u>																				
Dn Dn	8 bits																				
Up Dn	9																				
Dn Up	11																				
Up Up	10																				
8	OVERSPD 2%	ASYNC 1%/2.3% OVERSPEED: Valid for ASYNC mode only. Selects the amount of overspeed for 1% (1 bit in 8 characters max.) or 2.3% (1 bit in 4 characters max.). Default is 1%.																			

Table 2-1 Base Card and Plug-in Card Option Location and Selection
(Sheet 2 of 2)

S16

Chan1	1	RTS ON	NORM/FORCED RTS: When set to forced, the unit forces RTS on regardless of the state of the RTS lead from DTE. For proper operation, this option must be enabled at local and remote sites. When set to NORMAl the RTS lead from the DTE is monitored by the unit. Default is NORM.
	2	RTS INBAND	INBAND/NORM RTS: When set to inband, the unit sends the RTS signal from the local DTE to the far-end over the D-channel. When set to NORMAl, the RTS is not sent to the far-end. Default is NORM.
	3	CTS DELAY	DELAY/NODELAY CTS: When set to delay, the unit delays CTS ON to DTE by 45 ms. When no delay is set, CTS follows RTS. Default is NODELAY.
	4	RL INHIBIT	IHIBIT/ENABLE RL: When set to inhibit, the unit ignores any received RL patterns. When set to enable, the unit goes into a data loopback in response to the received RL pattern.
	5	RL TIMEOUT	TIMEOUT/NOTIMEOUT REMOTE LOOP: When set to timeout, the unit breaks the data loop after 10 minutes. When set to no timeout, the unit maintains the data loop until it is terminated by the master end. Default is NOTIMEOUT.
	6	PN 127 RL	V.54/PN127 REMOTE LOOP PATTERN: Selects between V.54 or PN127 type remote loop generation and detection patterns. Default is V.54.
	7	511 PATT	511/2047 TEST PATTERN: Selects between 511 and 2047 self-test patterns for pattern generation and detection. Default is 2047.
	8	EXT BUF CLK	Reserved for future use.

S10

Chan 1	1	LLE	When ON, a local loopback (towards the DTE) may be controlled by the DTE (Pin 18 of the ITU-T V.24/V.28 interface or Pin J of the V.35 interface). When OFF, the LL test is not under DTE control.
	2	RLE	When ON, a remote loopback may be controlled by the DTE (Pin 21 of the ITU-T V.24/V.28 interface or Pin BB of the V.35 interface). When OFF, the RL test is not under DTE control.
	3	TME	When ON, the NTU signals a test condition to the DTE (Pin 25 of the ITU-T V.24/V.28 interface or Pin K of the V.35 interface). When OFF, no test mode indication is given to the DTE.

X20

Grounds	This option provides separation or connection of protective and signal grounds. Separation of grounds (by 100 ohms or open) is selected with consideration given to power line noise, differences in ground potential, DTE manufacturer's recommendations, and safety requirements. Direct connection reduces the effects of longitudinal power line noise.
----------------	---

X4

This option provides selection between on-board V.35 and RS 232 DTE interface. V.35 selected when Berg style jumper is On V.35 Row. RS 232 selected when Berg style jumper is on RS 232 row.

Electrical Connections

The following paragraphs describe the power line, business equipment, and line connections to the 621.

Power - Standalone Enclosure

1. Attach the appropriate power cord to the rear panel IEC connector or the wall receptacle (depending on the base assembly you ordered).

The outlet should not be under switch control. You should power the unit by the same ac source as the equipment it is interfaced with. This prevents large circulating currents caused by differences in ground potential.

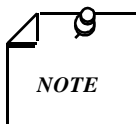
2. If you cannot tell whether or not the equipment is powered by the same ac source, check that a potential difference of less than 0.25 V rms exists between the grounding circuits of the respective power outlets.

Power - Rackmount Shelf

The NTU gets power directly from the shelf when you properly installed it as discussed in *Rackmount Installation*.

Business Equipment Connections

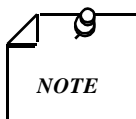
You can make business equipment connections to the standalone using a variety of connectors depending on the base assembly that you ordered. (See *Figures 2-3* and *2-4*). *Figure 2-5* shows the connections to the rackmount shelf.



You may find that single channel versions have a blank cover at the Business Equip 2 connector location.

530 or X.21 Interface Card Connections

Optional 530 or X.21 interface cards provide these interfaces for the DTE and can be factory installed, or you can get them as a field upgrade kit. They plug into the base card as illustrated in *Figure 2-2*. (You can also remove the card(s) and place jumpers on XA1J2 and XA1J3 to make the base card interface active.) When you install the optional 530 or X.21 interface card in the active position, DTE control of Remote Terminal Test and Local Loopback are not supported.



You may strap Jumper X4 on the 621 to either 232 or V.35 by removing the optional plug-in card, and return the jumpers to the base card.

Appendixes B through E describe the signals exchanged through each of the business equipment interfaces.

Line Connections

1. When the NTU is installed in the standalone enclosure, connect it to the communications line using the terminal block located on the basecard
2. When you use the TB1 terminal connections, insert the two-wire private line through the access hole in the rear panel of the enclosure and then connect it to the two center terminals (2 and 3) on the base card as shown in *Figures 2-3 and 2-4*.
3. If the NTU is rackmounted in the DataComm Shelf (DS-1, DS-5 or DS-6), connect the two-wire private line to the top two screws (T and R) of the terminal block mounted on the rear panel of the shelf.
4. If the unit is mounted in the Universal System Shelf (USS-1D or USS-1DC), first remove the plastic cover attached at the rear of the backplane to expose the terminal blocks.
These blocks accommodate wires that have no terminal lugs.
5. Remove the lugs and a portion of the insulation from the existing cable and insert the wires into the block by first unscrewing the captive screw for that portion of the terminal.
6. Connect the two wires to T/T and R/R, and replace the plastic cover. (See *Figure 2-5*).

For either case, before making the connection, verify that the terminal block corresponds to the shelf receptacle where you are installing the NTU card.

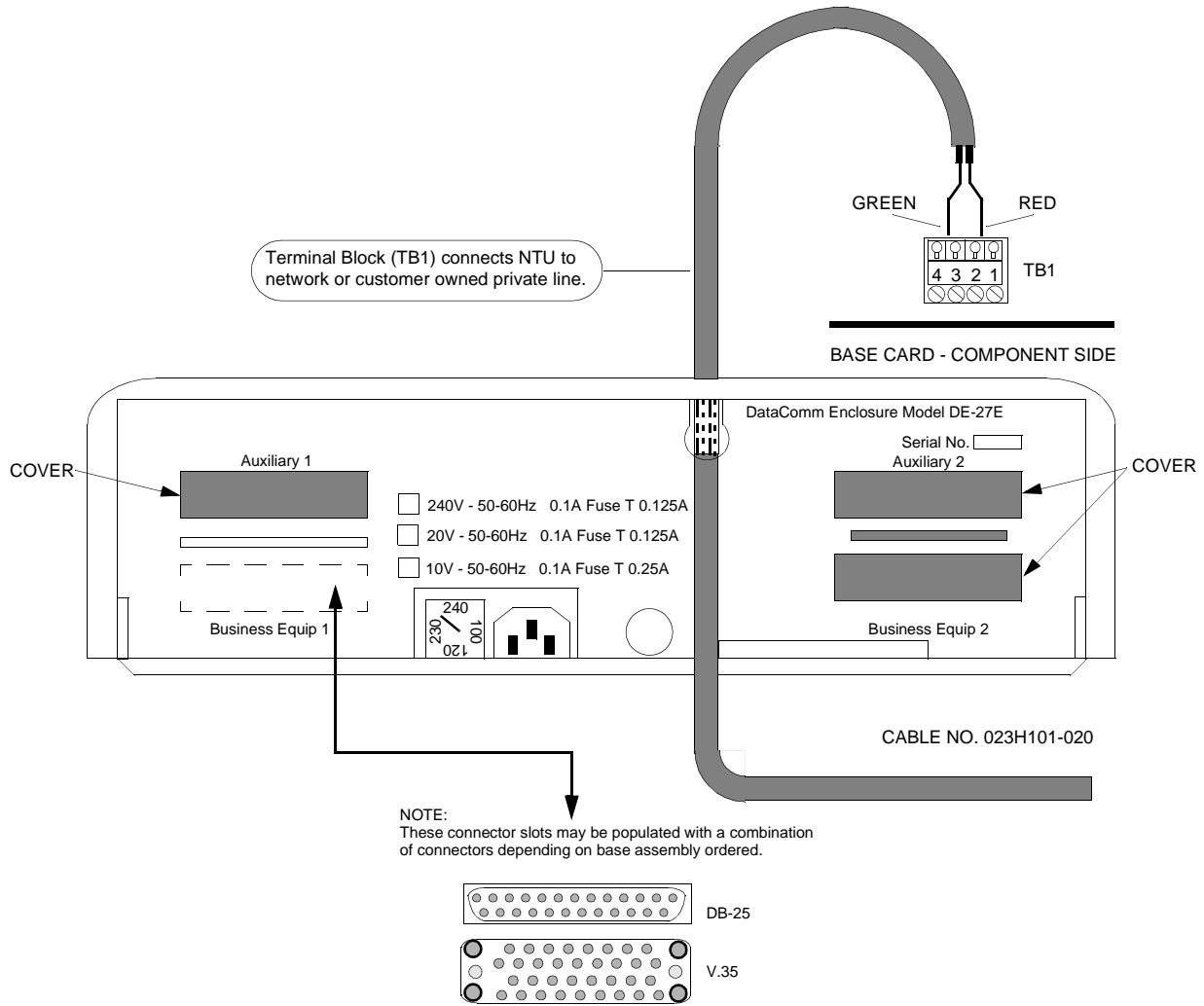


Figure 2-3 DE-27E Standalone Enclosure Rear Panel

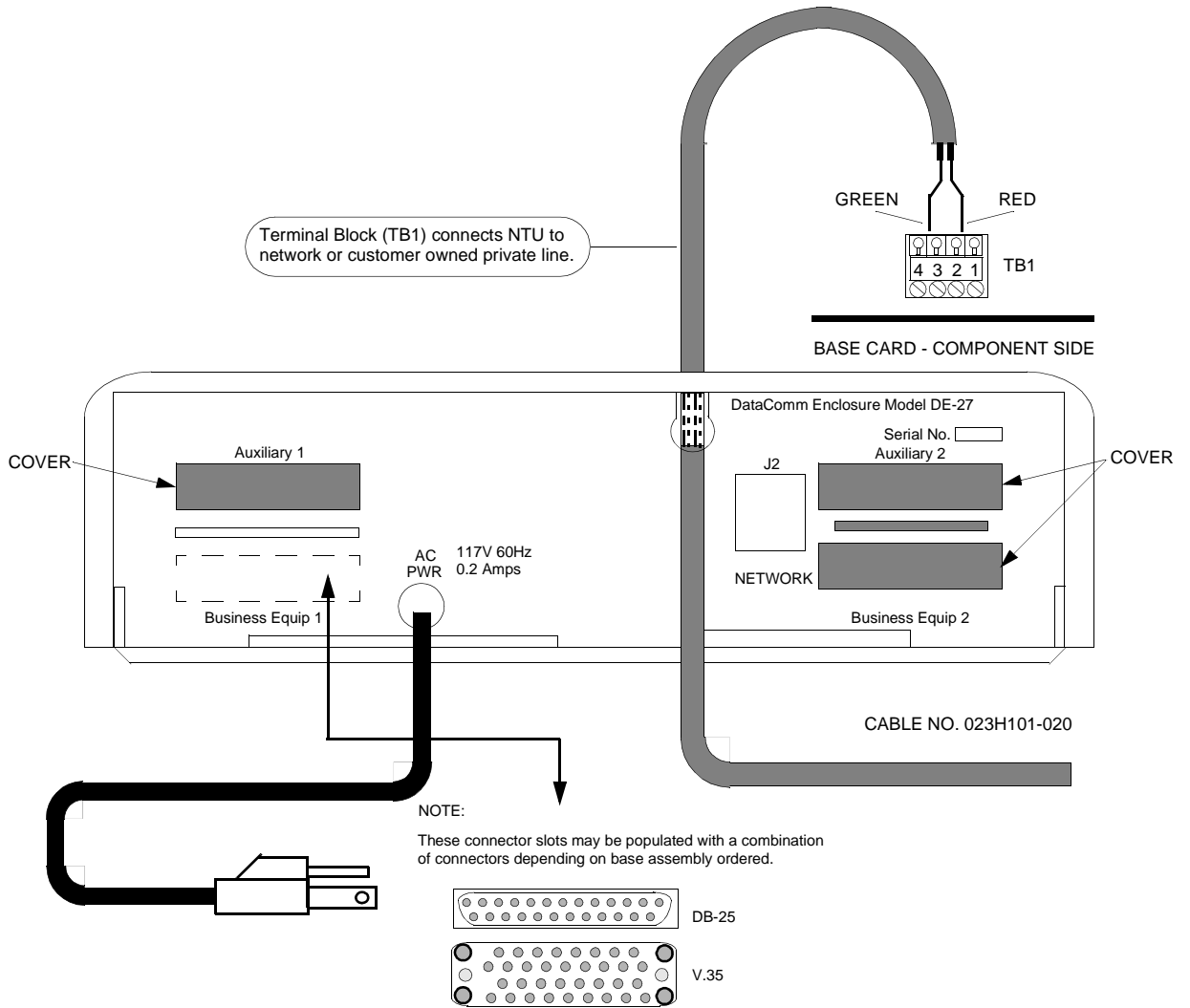
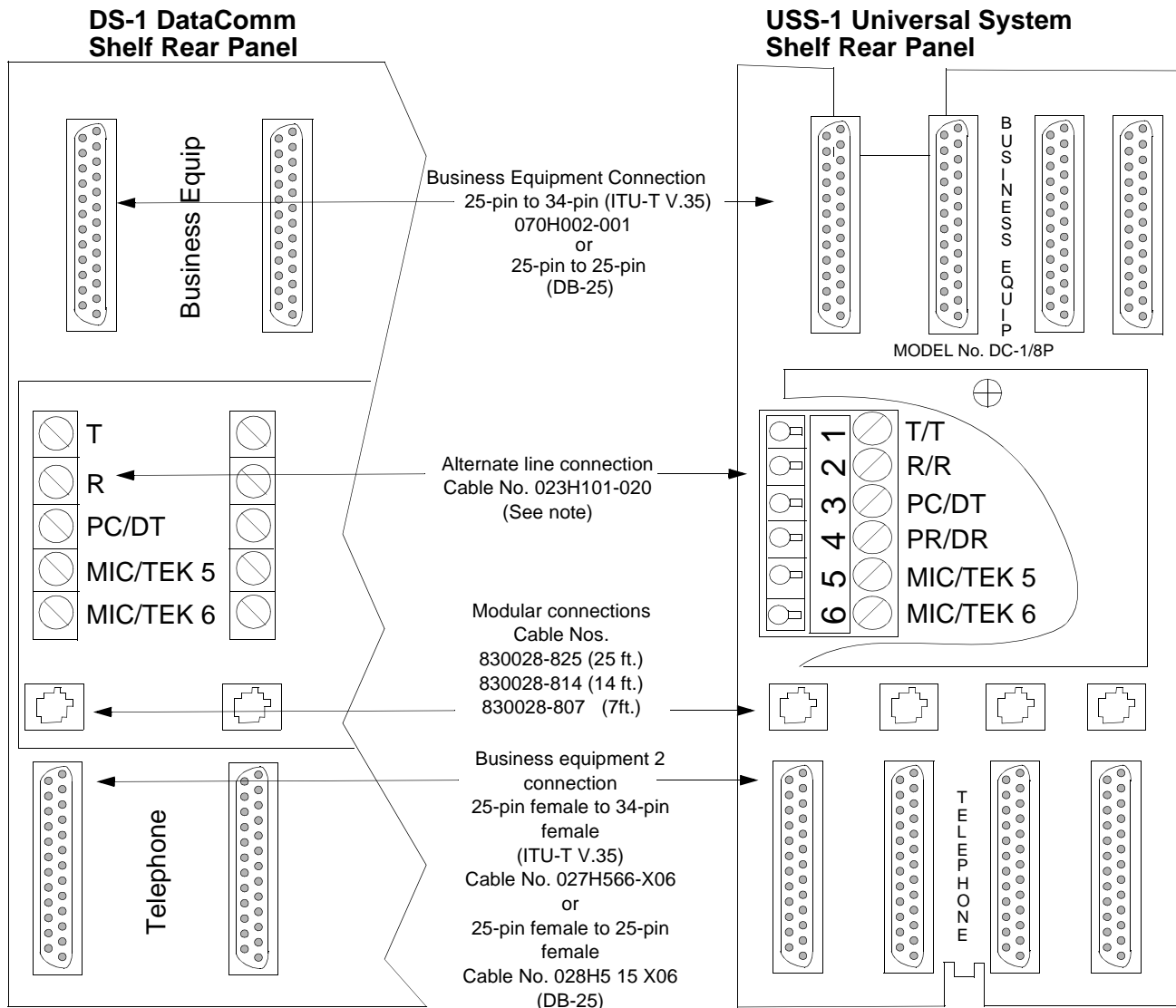


Figure 2-4 DE 27 Standalone Enclosure Rear Panel



NOTE: Connect red and green, or black and yellow wires to terminals T and R. Tie back the two unused wires.

Figure 2-5 DataComm and Universal System Shelf Rear Panel Connections

Preoperational Check

You can give the 621 a preoperational check by performing a Line Loopback (Refer to *Chapter 4, Tests*).

1. Verify the factory option strapping is in the OFF position (See *Figure 2-2*).
2. With power connected, do the test on a standalone NTU.
3. Do the test on a DataComm Shelf after you install of each card.

If the NTU passes the test, but then fails to carry out data communications, the NTU is probably not at fault. An error exists in the installation or your choice of options, or there is a faulty communications line or a problem at a remote installation. So:

1. Recheck the cable and line connections and, if necessary, run through the tests in *Chapter 4* to isolate the problem.
2. Verify that the remote NTU is compatible, such as a NTU is operating at the correct data rate.
3. If the NTU does not check out properly, replace it with a spare NTU, and repeat the test. Do not attempt to repair the NTU.

3 Operation

Overview

When you install the 621 NTU properly, control is automatic; there are no operating instructions except for testing found in *Chapter 4, Tests*). This chapter describes the controls and indicators of the unit so that the operator may use them to check out the operation of the NTU.

Controls, Indicators, and Connectors

Figures 3-1 illustrate the front panel the of the NTU and point out what each control and indicator does. You can find illustrations of the shelf and standalone rear panel connectors in *Chapter 2*.

Rackmount Shelf

You can find a description of the rackmount shelf front panel controls, indicators, and fuses in the manual supplied with the shelf. Refer to that manual if you have a rackmount shelf. In *Chapter 2, Figure 2-5* shows the rear panel and connectors of the shelf.

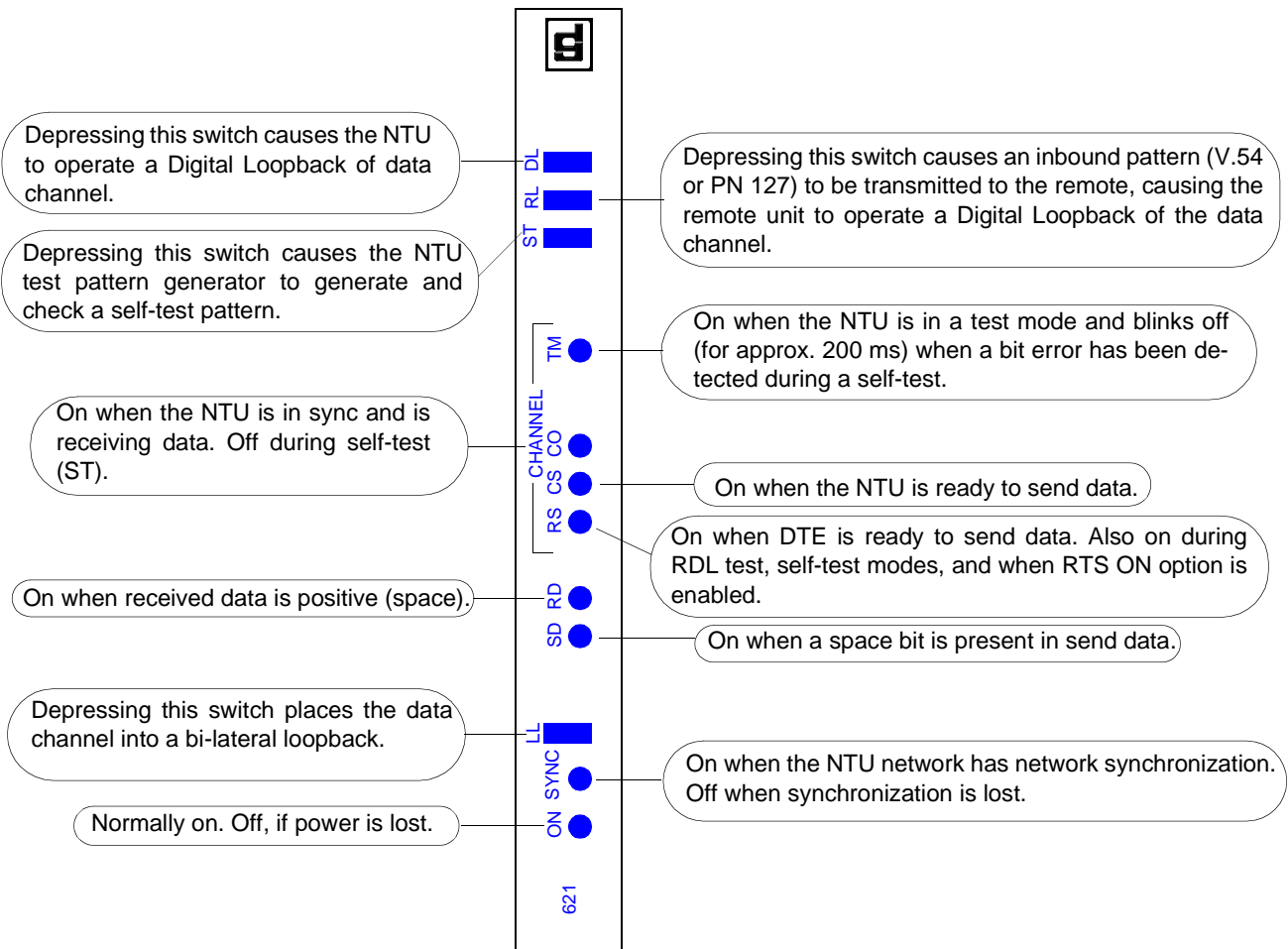


Figure 3-1 Front Panel Indicators and Controls

4 Tests

Overview

This chapter describes tests you can do from the front panel. *Figures 4-2 through 4-7* show you the 621 front panel. *Table 4-1* displays the diagnostic test priorities. You can use the tests furnished in this chapter to isolate problems in the data communications system (See fault-isolation sequence in *Figure 4-1*).

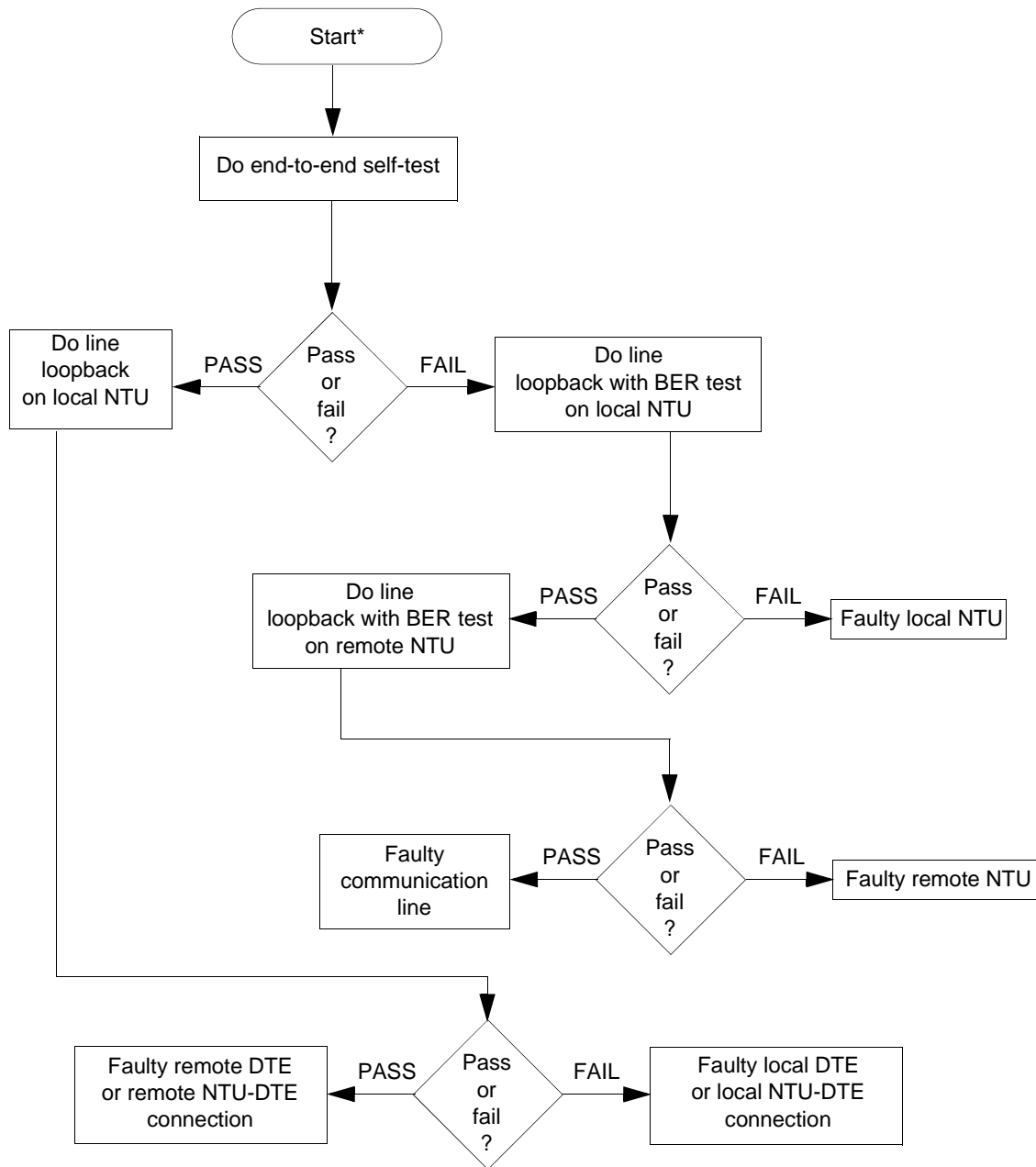
Table 4-1 Diagnostic Test Priorities

Channel 1 or Channel 2		
Priority	Test	Means of Activation
1	2B+D B1, B2 Loops	Network Control Code
2	LL	Front Panel (FP) switch
3	DL	Front Panel (FP) switch
4	RL	Front Panel (FP) switch
5	LL	DTE
6	RL	DTE
7	ST	Front Panel (FP) Switch
8	RL (Remote)	from Remote RL

- V.54 and PN127 RL test are continuously attempted (causing data disruptions) until the loop is achieved or the test is aborted.
- Front panel ST test cannot be combined with any other test except FP RL.
- You may initiate Diagnostics from the front panel switches, the DTE interface, or the Network.
- SD and RD test indicators referred to in the tests, which are described in this section, may flicker (blink) or appear to be solidly ON. This depends on the data rate at which the unit is being tested. These indicators may not appear as bright as other LED indicators.

Point-to-Point Testing

Next paragraphs present test information for point-to-point installations. You may set up the NTU to permit the DTE to control Local Loopback and Remote Loopback (Refer to *Chapter 2, Installation*).



*Assuming a problem exists.

Figure 4-1 Fault Isolation Sequence

Line Loopback Test

Line Loopback (LL) checks out the performance of the 621 and its associated DTE. Initiating this test, the NTU transmitter output and receiver input disconnects from the communications line and then reconnects, creating a circuit similar to an analog loopback circuit that loops signals from the transmitter through the receiver. Also, the disconnected transmitter and receiver communications lines connect, creating a circuit (the Line Loopback circuit) that loops received signals back over the communications line to the originating station. *Figure 4-2* illustrates LL using the front panel LL pushbutton.

While Line Loopback is carried out locally, you may send a Self-Test pattern from the remote site to the local NTU, which loops the test pattern back to the remote site to be verified. This test checks the performance of the NTU at the remote site and the communications line. To begin this test, arrange with the remote site personnel before initiating Line Loopback locally.

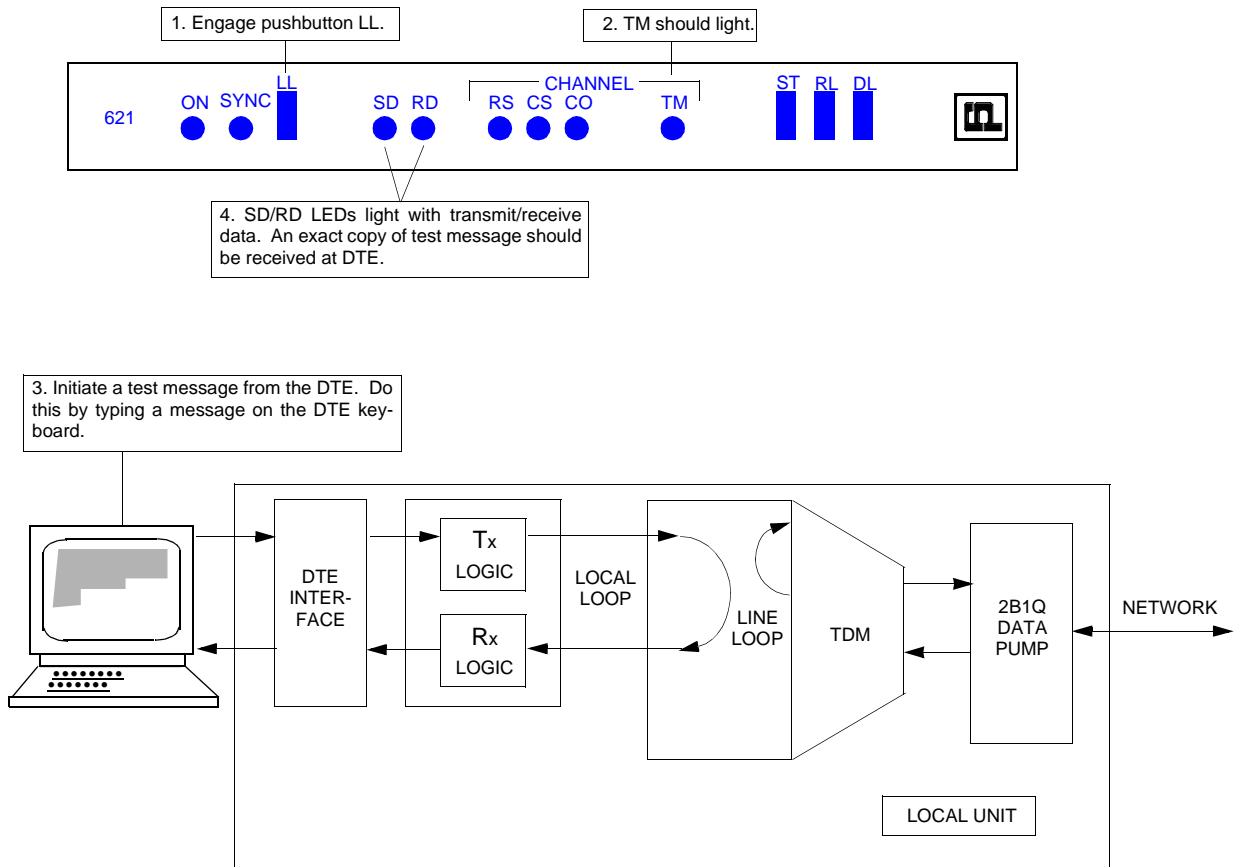


Figure 4-2 Line Loopback (LL) Test

Digital Loopback Test

This Digital Loopback (DL) test checks the performance of the local and remote NTUs, the DTE of the local unit and the communications line. When you start the test, the receiver output and the transmitters input of the unit are disconnected from the DTE and then connected together, creating a circuit that loops back the remote transmit of the data unit. *Figure 4-3* shows the DL test.

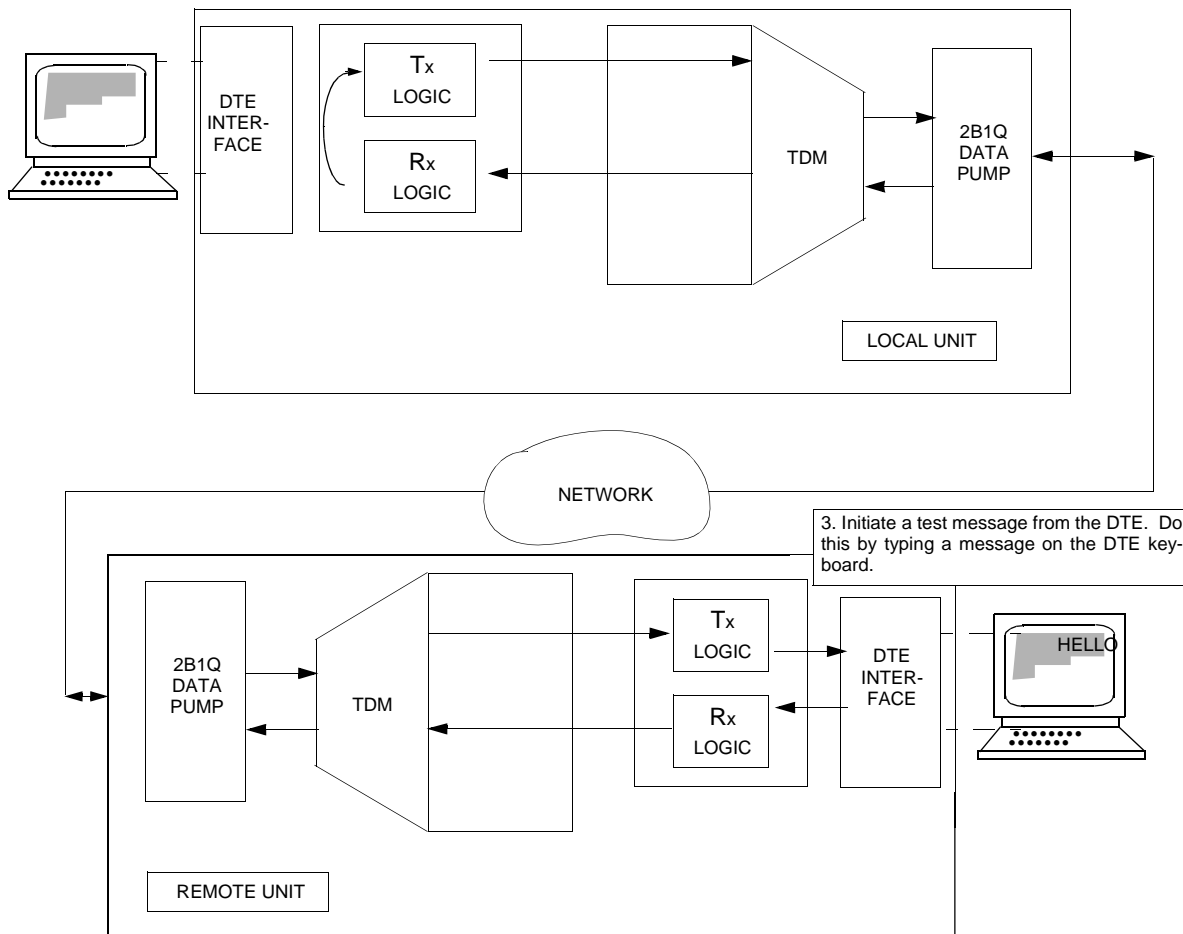
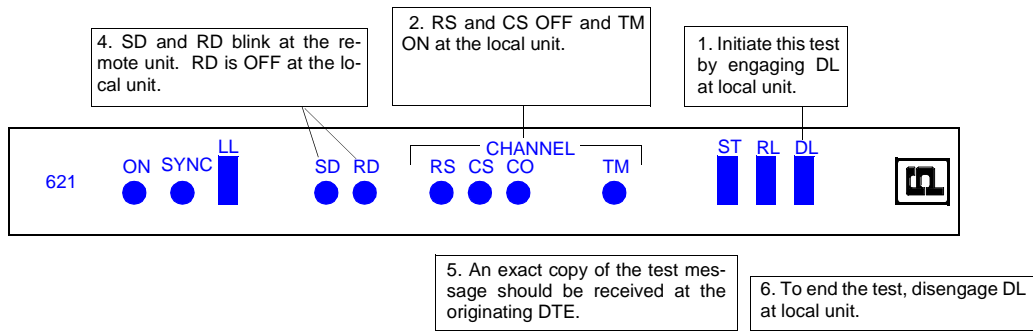


Figure 4-3 Digital Loopback Test

Remote Loopback

Remote Loopback (RL) checks the performance of the local and remote unit's, the local DTE, and the communications line. When you initiate this test, the remote unit goes into a Digital Loopback (DL) condition. The remote unit transmitter and receiver are disconnected from the DTE interface and connected together, creating a circuit that loops the digital output signals of the receiver to the input of the transmitter. *Figure 4-4* illustrates RL.

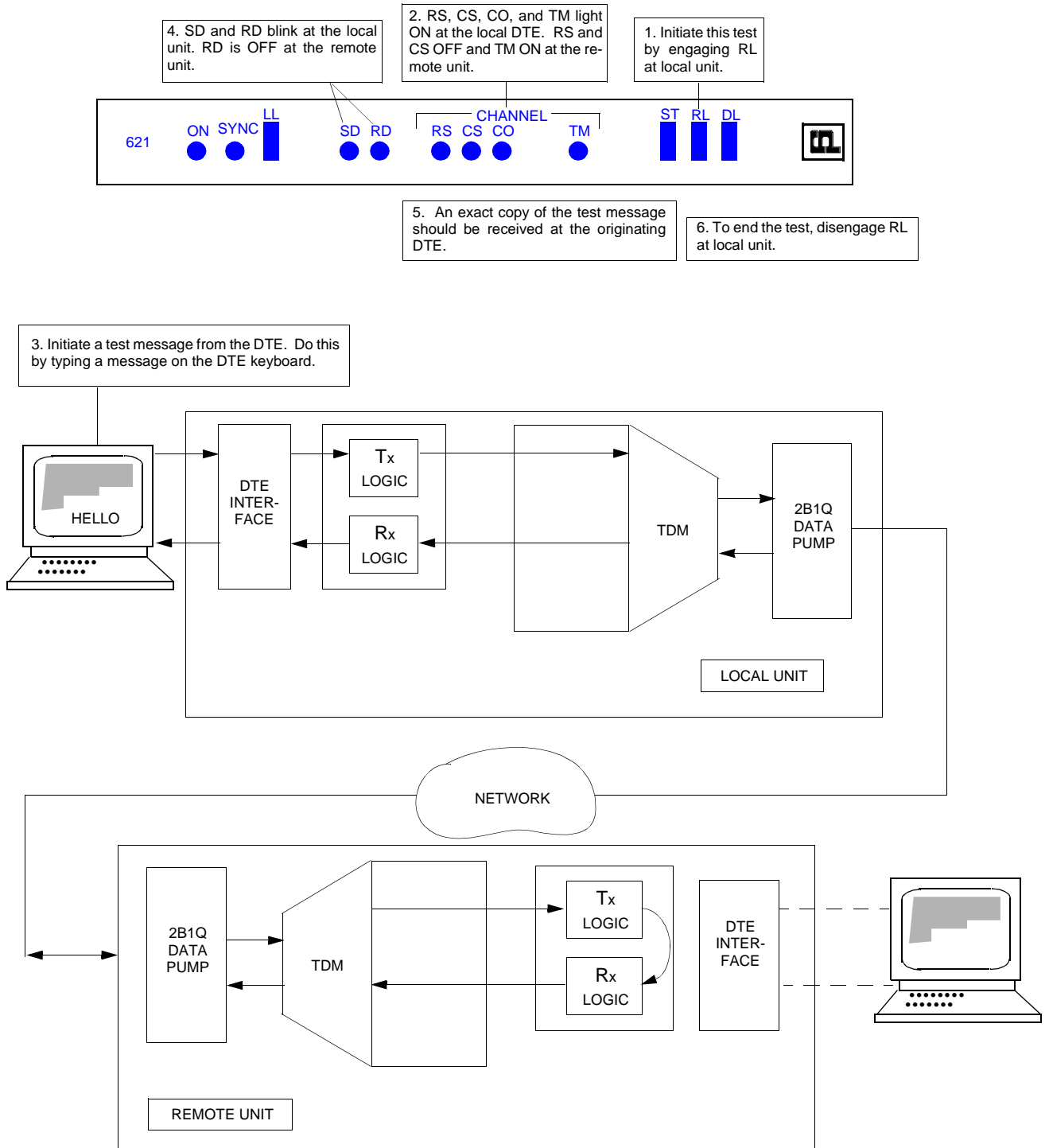
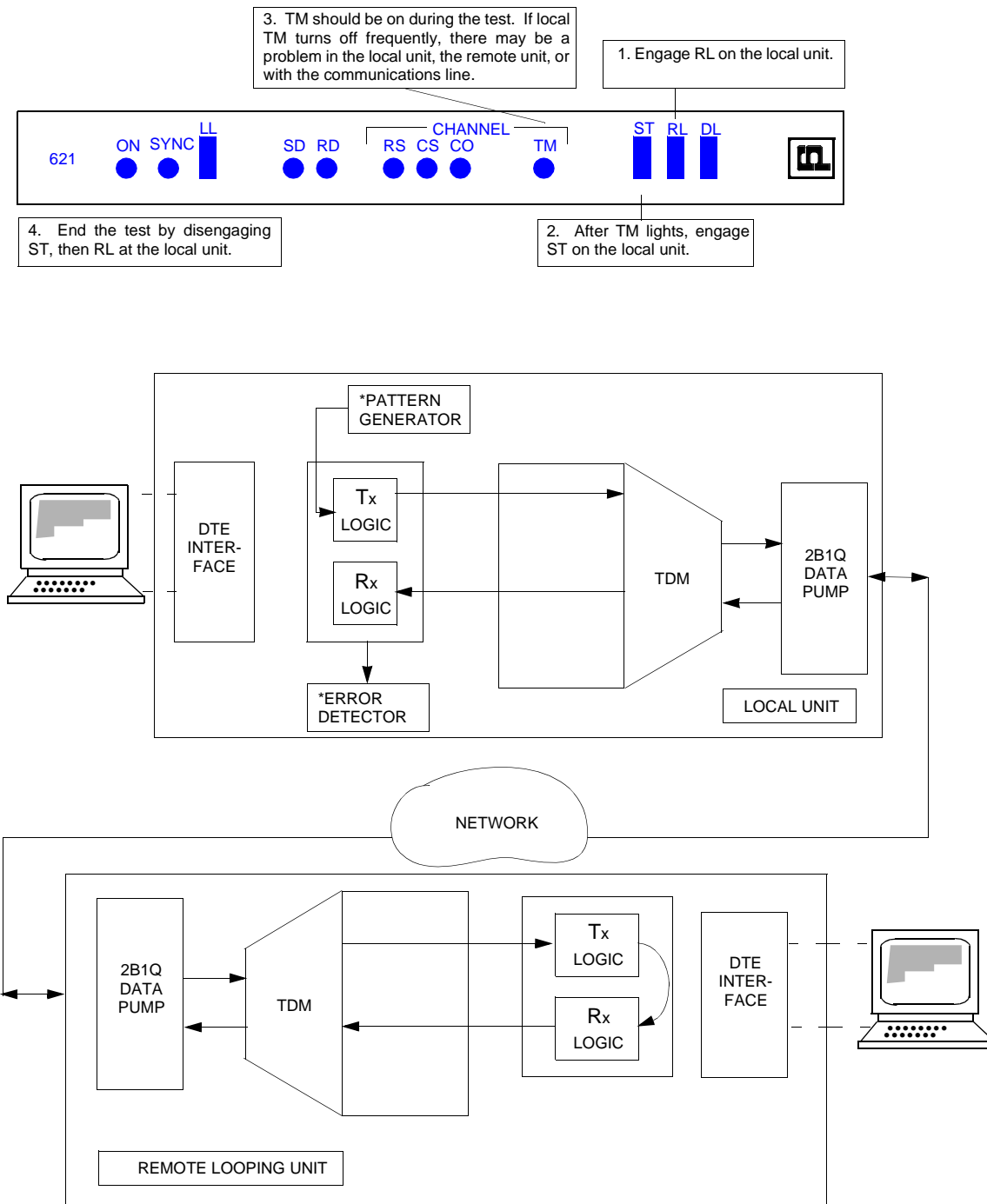


Figure 4-4 Remote Loopback Test

Figure 4-5 illustrates how the Remote Loopback Test may be combined with Self-Test to send and check Self-Test patterns, eliminating the need for external test equipment.

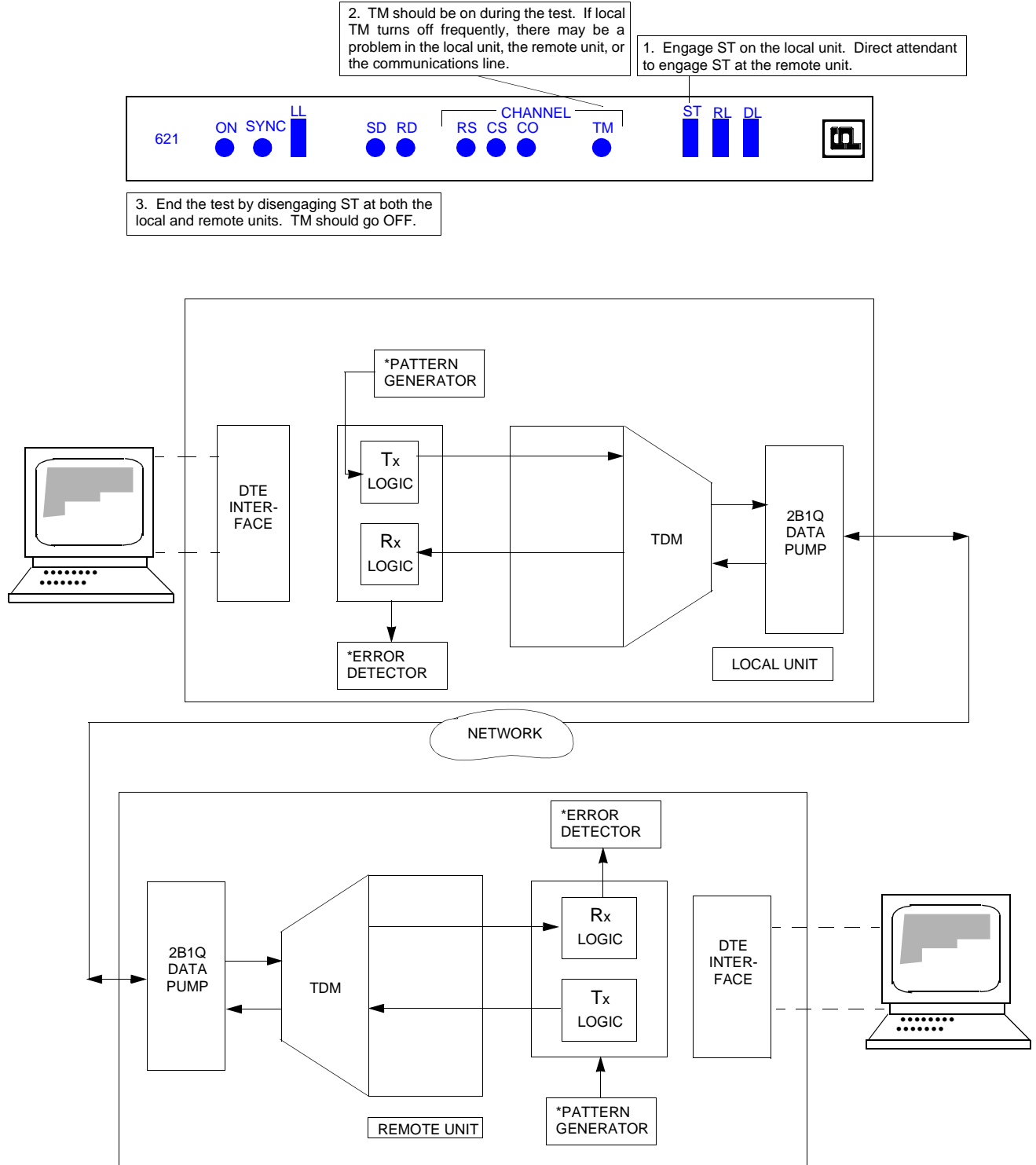


*Option Switch S16-7 selects either a 2047 or 511 test for the pattern generator and error detector.

Figure 4-5 Remote Loopback Self Test

End-to-End Self Test

Besides the Self-Test functioning with other tests, Self-Test may be used just by itself. If this test is used independently, the local and remote units exchange Self-Test patterns between their respective test circuits to check out the communications line and the local and remote units (not including the DTE interfaces). See *Figure 4-6 for End-to-End Self-Test*.



*Option Switch S16-7 selects either a 2047 or 511 test for the pattern generator and error detector. Both local and remote units must select the same pattern before test.

Figure 4-6 End-to-End Self Test

Network Loopback Tests (EOC Controlled)

The Network Loopback tests (2B+D, B1, and B2) are remotely controlled diagnostics that issue loopback codes over the Embedded Operations Channel (EOC). The unit, which detects this code, goes into loopback. The transmitter input and receiver output of the unit are disconnected from the DTE and are connected together to create a circuit that loops received signals back over the communications line to the originating station. *Figure 4-7* shows the EOC controlled Network Loopback tests.

If you have to isolate a problem, contact the remote test center operators and ask them to initiate a network test. Test results should follow the fault isolation sequence (*Figure 4-1*) to pinpoint problems. Observe that remote controlled EOC tests can loop the channel.

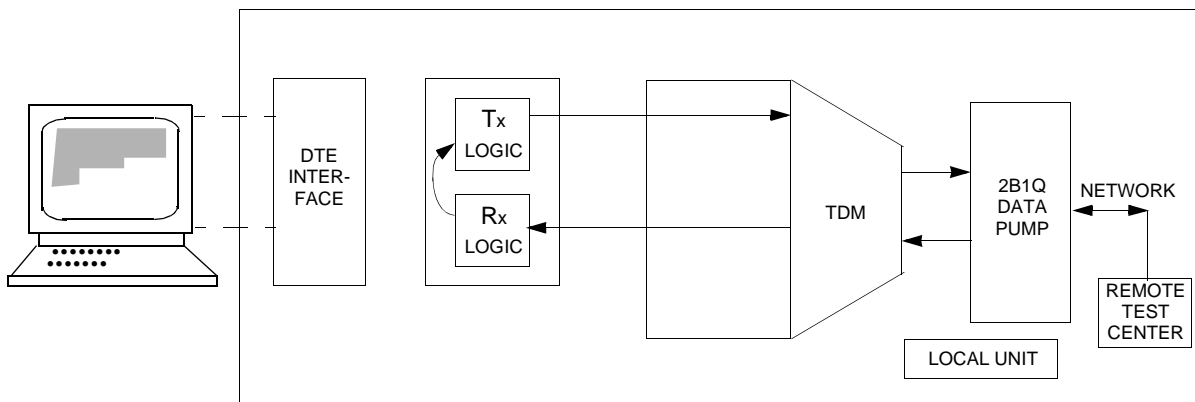
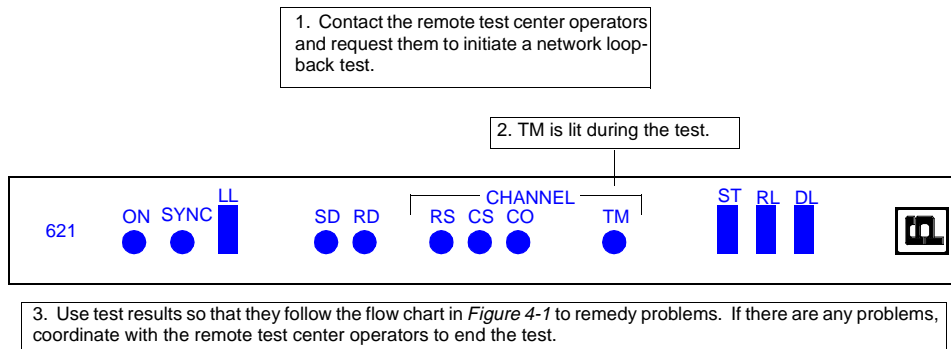


Figure 4-7 Network Loopback Test, EOC Controlled

A Technical Characteristics

CPE Interface	
Data Rates	2.4, 4.8, 9.6, 19.2, 48, 64, and 128 kbps. Rates below 64 Kbps use X.50 rate adaption, 2.4 - 19.2 Async.
Interface Types	ITU-T V.24/V.28 or V.35. Other interface types using optional plug-ins.
Network Interface	
Operating Mode	Full duplex with adaptive echo cancellation.
DTE Operation	Sync and Async
Word Length	8-bit word, 9-bit word, 10-bit word, and 11-bit word
Over Spec	1% and 2.3%
RTS/CTS Delay	None/45 milliseconds
RTS Control	Forced normal
Data Rate	160 Kbps total: 128 Kbps user data, 16 Kbps internal control, 16 Kbps for timing and synchronization.
Data Format	Synchronous, serial binary
Line Coding	2B1Q, compatible with ANSI T1.601
Line Requirements	2-wire, non-loaded metallic circuit
Operating Range	5.5 km (18,000 ft.) — with 0.4 mm (26 gauge wire)
Diagnostics	
Network	2B+D loopback, B1 loopback, B2 loopback
Customer (per channel)	V.54 and PN 127 RL method (front panel and DTE invoked) LL (front panel bilateral and DTE channel loop only) DL (front panel invoked) ST (front panel invoked)
Power Requirements	
Rackmount	10 W maximum
Humidity	Up to 95% without condensation
Physical Characteristics	
Standalone	
Height	99 mm (3.9 in.)
Width	277 mm (10.9 in.)
Depth	318 mm (12.5 in.)
Weight	3.2 kg (7.1 lbs.)
Shipping Weight	3.6 kg (8.1 lbs.)

Temperature	0° to 50°C (32° to 122°F) operating –40° to 70°C (–40° to 158°F) non-operating
Rackmount Full shelf with 16 units	
Height	267 mm (10.5 in.)
Width	484 mm (19.0 in.)
Depth	343 mm (13.5 in.) Also, 305 mm (12.0 in.) in DS-6 Enclosure.
Weight	18 kg (40.2 lbs.)
Shipping Weight	19 kg (42.5 lbs.)
Temperature	0° to 50°C (32° to 122°F) operating –40° to 85°C (–40° to 185°F) non-operating
Fusing	F1, F2: 2A, 250V, FB
Safety Protection	UL listed and CSA approved

B Business Equipment (DTE) Interface Signals (ITU-T V.24/V.28)

P1, P2, Pin	ITU-T No.	Circuit	Function
1	101	AA	Shield
2	103	BA	Transmitted Data
3	104	BB	Received Data
4	105/133	CA/CJ (Note 1)	Request to Send/Read for Receiving
5	106	CB	Ready for Receiving
6	107	CC	DCE Ready
7	102	AB	Signal Common
8	109	CF	Received Line Signal Detector
9	-	-	(Reserved for Testing) (+12V)
10	-	-	(Reserved for Testing) (-12V)
11	126	(Note 2)	Unassigned
12 *	122/112	SCF/CI (Note 3)	Secondary Received Line Signal Detector/Data Signal Rate Selector (DCE Source)
13*	121	SCB	Secondary Clear to Send
14*	118	SBA	Secondary Transmitted Data
15	114	DB	Transmitter Signal Element Timing (DCE Source)
16*	119	SBB	Secondary Received Data
17	115	DD	Receiver Signal Element Timing (DCE Source)
18	141	LL	Local Loopback
19*	120	SCA	Secondary Request to Send
20	108/1, /2	CD	DTE Ready
21	140/110	RL/CG	Remote Loopback/Signal Quality Detector (RL for 621)
22*	125	CE	Ring Detector
23*	111/112	CH/CI (Note 3)	Data Signal Rate Selector (DTE/DCE Source)
24	113	DA	Transmit Signal Element Timing (DTE Source)
25	142	TM	Test Mode

* Not supported in 621

Notes Pertaining to ITU-T V.24/V.28 Table

- 1: When hardware flow control is required, Circuit CA may take on the characteristics of Circuit CJ. (CA is used for 621).
- 2: Pin 11 is unassigned. It will not be assigned in future versions of ITU-T V.24/V.28. However, in international standard ISO 2110, this pin is assigned to ITU-T Circuit 126, Select Transmit Frequency.
- 3: ITU-T designations are shown for reference only.

C Business Equipment (DTE) Interface Signals (ITU-T V.35)

P1/P2 Pin	V.35 Pin	ITU-T (See Note)	NTU	Signal	Description
1	A	101		Protective ground	
7	B	102		Signal ground	Establishes a common ground reference for all interface circuits except protective ground, pin A.
4	C	105	RS	Request-to-send	Indicates to NTU that DTE is prepared to transmit.
5	D	106	CS	Clear-to-send	Indicates to DTE that NTU is prepared to transmit.
6	E	107	DM	Data-set-ready	Indicates to DTE that NTU is operational.
8	F	109	CO	Received line signal detector	Indicates to DTE that NTU is receiving data (not idle or OOS codes).
25	K	142	TM	Test mode	Indicates to DTE that NTU in a test mode if option switch S10-3 or S17-3 is ON.
18	J	141	LLE	Line loopback enable	Transfers signal from DTE to control Line Loopback test mode if option switch S10-1 or S17-1 is ON.
2 14	P S	103 103	SD-A SD-B	Transmitted data	Transfers data signals from DTE for modulation and transmission over communications line.
3 16	R T	104 104	RD-A RD-B	Received data	Transfers data signals received over communication line and demodulated by NTU to DTE.
12 24	U W	113 113	TT-A TT-B	Transmitter timing (DTE source)	Transfers transmitter signal timing information from DTE to NTU.
13 17	V X	115 115	RT-A RT-B	Receiver timing	Transfers receiver signal timing information from DSU to NTU.
19 15	Y AA/a	114 114	ST-A ST-B	Transmitter timing	Transfers transmitter signal timing information from NTU to DTE.
21	BB/b	140		Remote Digital Loopback test enable	Transfers signal from DTE to control Remote Loop-back test mode if option switch S10-2 or S17-2 is ON and the NTU is an RDL-version.
20	H	108/2	TR	Data Terminal Ready	Indicates to NTU that DTE is prepared for data communication.
9	H	108/2	TR	Data Terminal +12V	Provided to Interface
10				-12V	Provided to Interface

Note: ITU-T designations are shown for reference only. M, N, CC, DD, FF, HH, JJ, KK, LL, MM, NN, Z, and Pins 23, 26 are not used.

D Business Equipment (DTE) Interface Signals (530)

P1/P2 Pin	Circuit Designation	Signal	Description
1	---	Shield	Allows shield connections.
2 14	BA(A) BA(B)	Transmitted data	Transfers data signals from DTE for modulation and transmission over communications line.
3 16	BB(A) BB(B)	Received data	Transfers data signals to DTE that were received over communications line and demodulated by DSU.
4 19	CA(A) CA(B)	Request to send	Indicates to DSU that DTE is prepared to transmit.
5 13	CB(A) CB(B)	Clear to send	Indicates to DTE that DSU is prepared to transmit.
6 22	CC(A) CC(B)	Data set ready	Indicates to DTE that DSU is prepared for data communications.
20 23	CD(A) CD(B)	Data terminal ready	Indicates to DSU that DTE is prepared for data communications.
7	AB	Signal ground	Establishes a common ground reference for all interface circuits except protective ground.
8 10	CF(A) CF(B)	Received line signal detector	Indicates to DTE that DSU is receiving data (not receiving idle or OOS codes).
15 12	DB(A) DB(B)	Transmitter signal element timing	Transfers transmitter signal timing information from DSU to DTE.
17 9	DD(A) DD(B)	Receiver signal element timing	Transfers receiver signal timing information from DSU to DTE.
18	LL	Analog Loopback enable	Transfers signal from DTE to control analog loopback test.
21	RL	Remote Digital Loopback enable	Transfers signal from DTE to control Remote Digital Loopback test mode.
24 11	DA(A) DA(B)	Transmitter signal element timing (External Clock)	Transfers transmitter signal timing information from DTE to DSU.
25	TM	Test mode indicator	Indicates to DTE that DSU is in a test mode.

E Business Equipment (DTE) Interface Signals (X.21)

P1/P2 Pin	* 15-Pin X.21 Connector	ITU-T Circuit Designation	Signal	Description
2 14	2 9	T(A) T(B)	Transmitted data	Data from DTE.
3 16	4 11	R(A) R(B)	Received data	Data to DTE.
4 19	3 10	C(A) C(B)	Control	Indicates to DSU that DTE is prepared to transmit.
8 10	5 12	I(A) I(B)	Indication	Indicates to DTE that DSU is receiving data.
17 9	6 13	S(A) S(B)	Signal element timing	Transmit and receive signal timing information from DSU to DTE.
24 12	7 14	X(A) X(B) B(A) B(B)	DTE signal element timing (X) or Byte timing (B)	Optional transmit signal timing information from DTE to DSU if X.21 adapter module is configured for XT. Byte timing information from DSU to DTE if X.21 adapter module is configured for BT.
* DB25 to DB15 adapter cable, part # 027H436-001, needed for X.21 mechanical compatibility				

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