GDC 073R122-000
Issue 1, November 1996

Installation and Operation

DataComm 731-D2

General DataComm

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.

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General DataComm

Table of Contents

Antistatic Precautions

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

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

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

Safety Guidelines

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

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

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

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

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

Preface

Scope

This manual describes how to install and configure a General DataComm 731-D2 and 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. The information is arranged as follows:

- *Chapter 1 -System Description* introduces important concepts and features of the 731-D2.
- *Chapter 2 - Installation* tells you how to install the 731-D2. 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 731-D2.
- *Chapter 4 - Tests* describes external tests.

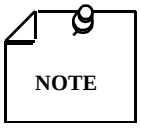
The *Index* contains the 731-D2 subject and page number.

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 DataComm Shelf — GDC 010R310-000
- Operating and Installation Instructions for Universal System Shelf — GDC 010R380-000

GDC publication numbers (e.g., *GDC 073R122-000*) 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

HDSL line code.

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.

Bipolar

The predominant signaling method used for digital transmission services, such as DDS and T1, in which the signal carrying the binary value successively alternates between positive and negative polarities. Zero and one values are represented by the signal amplitude at either polarity, while no-value “spaces” are at zero amplitude; also, polar transmission.

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 105.

CSU

Channel Service Unit.

Data

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

DDS

Dataphone digital service; private-line digital service offered intra-LATA by BOCs, inter-LATA by AT&T® Communications, with data rates typically at 2.4, 4.8, 9.6, and 56 kbps; now a part of the services listed by AT&T under the Accunet family of offerings.

Diagnostics

Tests used to detect malfunctions in a system or component.

Digital Customer Unit

Component of customer premises equipment (CPE) used to interface to a two-wire circuit. Generally combined with an OCU-DDP-601. Performs conversion and multiplexing of customer's data steam(s) to 2B1Q line coding for transmission.

Digital Loopback (DL)

Technique for testing the digital processing circuitry of a communications device; may be initiated locally or remotely via a telecommunications circuit; device being tested will echo back a received test message, after first decoding and then-re-encoding it, the results of which are compared with the original message.

DSU

Data Service Unit.

Ground

An electrical connection or common conductor that, at some point, connects to the earth.

HDSL

High-Bit Rate Digital Subscriber Line.

Interface

A shared boundary; a physical point of demarcation between two devices, where the electrical signals, connectors, timing, and handshaking are defined; the procedure, codes, and protocols that enable two entities to interact for the meaningful exchange of information.

Local Area Network

A type of high-speed data communications arrangement wherein all segments of the transmission medium (typically, coaxial cable, twisted-pair wire, or optical fiber) are under the control of the network operator.

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.

Modem

Modulator/demodulator; electronic device that enables digital data to be sent over (typically) analog transmission facilities.

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.

Node

A point where one or more functional units interconnect transmission lines (ISO); a physical device that allows for the transmission of data within a network; an end-point of a link or a junction common to two or more links in a network (IBM SNA); typically includes host processors, communications controllers, cluster controllers, and terminals.

Self-Test

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

Terminal

A point in a network at which data can either enter or leave; a device, usually equipped with a keyboard, often with a display, capable of sending and receiving data over a communications link (IBM).

Transmission

The dispatching of a signal, message, or other form of intelligence by wire, radio, telegraphy, telephony, facsimile, or other means (ISO); a series of characters, messages or blocks, including control information and user data; the signaling of data over communications channels.

1 System Description

Overview

The 731-D2 is an HDSL data unit, supporting NX64 Kbps customer digital data rates, where you choose the rates from N=1 through N=24 for a maximum data rate of 1536 Kbps.

Features

The DataComm 731-D2 is a customer premises equipment which utilizes HDSL transmission technology. You find the following features in the 731-D2:

- Can be configured unit as either a Line Terminating Unit (LTU) or Network Terminating Unit (NTU).
- Unit configuration is easily done through an ASCII terminal or by hardware on-board jumpers and switches.
- May be used as a Network Managed element within a GDC Network Management System.
- ITU-T V.35 or optional EIA 530 or X.21 customer equipment interfaces.
- Internal BERT capability.
- Convenient Local and Remote Digital Loopbacks.

Refer to Table 1-1 for standard and optional equipment part numbers.

Table 1-1 Equipment List

Description	GDC Part No.
DataComm 731-D2, V.35 (rackmount)	073P310-001
DataComm 731-D2, X.21 (rackmount)	073M310-011
DataComm 731-D2, V.11/530 (rackmount)	073M310-021
DataComm 731-D2, V.35 (standalone - 117V)	073A310-001
DataComm 731-D2, X.21 (standalone - 117V)	073A310-011
DataComm 731-D2, V.11/530 (standalone - 117V)	073A310-021
DataComm 731-D2, V.35 (standalone - 220V)	073A310-002
DataComm 731-D2, X.21 (standalone - 220V)	073A310-012
DataComm 731-D2, V.11/530 (standalone - 220V)	073A310-022
DataComm 731-D2, V.35 (standalone - 240V)	073A310-004
DataComm 731-D2, X.21 (standalone - 240V)	073A310-014
DataComm 731-D2, V.11/530 (standalone - 240V)	073A310-024
Cables	
Interface cable RJ48C plug to 9-pin female (HDSL CTRL port to terminal connection)	027H250-010
Cable assembly V.35 straight-through M/M	027H516-xxx
Adapter cable 37-pin female to 25-pin male (use with customer provided cable for RS-449 equipped. with DC 731 equipped with EIA-530 Channel Interface Card	023H501-xxx
Cable assembly DB-25M to DB-15F X.21 Adapter	027H436-001
Cable assembly DB-25M to V.35M Adapter	070H002-001
Adapter Cable 37-pin male to 25-pin male (use with customer provided cable for RS449 equipment with DataComm 731 equipped with EIA 530 (V.11) Channel Interface Card.	023H603-xxx

Table 1-1 Equipment List (Cont.)

Enclosure/Shelves	
DE Cover	010D500-003
Base Assembly, 731-D2, 117 Vac	010B038-011
Base Assembly, 731-D2, 220/240 Vac	010B134-025
Base Assembly, 731-D2, X.21/530, 117 Vac	010B038-001
Base Assembly, 731-D2, X.21/530, 220 Vac	010B134-015
Base Assembly, 731-D2, X.21/530, 240 Vac	010B134-015
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

Specifications

Local Side	
Rate	N x 64K, N = 1 to 24
Interface	V.35 [optional X.21 or V.11 (530)]
Transmission Line	
Rate	Dual duplex 392 Kbaud signaling rate, with 2B1Q line code (each loop)
Framing	HDSL framing per Belcore TA-NWT-001210
Transmit Power	13.5 dBm (± 0.5 dBm)
Meets performance specification of Belcore TA-NWT-001210	
Test Features	
Local Loopback Remote Loopback BER Test V.54 Protocol	Front panel switch or terminal screen selectable. Front panel switch or terminal screen selectable. Front panel switch or terminal screen selectable. Front panel switch or terminal screen selectable.

Dimensions	
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
Electrical	
Power	8 watts per card at card edge 100 to 129 Vac 60 Hz 198 to 242 Vac 50 Hz 216 to 254 Vac 50 Hz
Environmental	
Temperature Card Assembly Operation Card Assembly Storage/ Non-Operating	 0 to 50 degrees Celsius -40 to +85 degrees Celsius
Humidity	5 to 95% non-condensing
Altitude Operating Non-Operating	 0 to 10,000 feet 0 to 40,000 feet

Diagnostics/Network Management

Switches and jumpers, mounted on the printed circuit card, control operation and parameters. On the front panel, the 731-D2 units offer a terminal interface jack, labeled CTRL. This terminal interface lets you to access the full set of menu-driven diagnostic and configuration controls by a standard terminal interface. Available are loopback and test pattern control, access to performance monitoring, and configuration control. Instructions for using this terminal feature are in *Chapter 3, Operation.*

The 731-D2 may also be used as a standalone unit as part of the Universal Access System (UAS). The UAS is family of network managed metallic loop transmission products. A shelf mounted UAS family member interworks with a standalone unit (such as the 731-D2) located at the far end of the access loop. Full network management capabilities are achieved using the SpectraComm Manager (SCM) and its interface into an SNMP controller.

Applications

You can configure the 731-D2 for a variety of applications. *See Figures 1-1 through 1-5.*

Point-to-Point

The 731-D2 has a bandwidth of Nx64 Kbps for N=1 to N=24. You must configure both local and remote units for the same data rate.

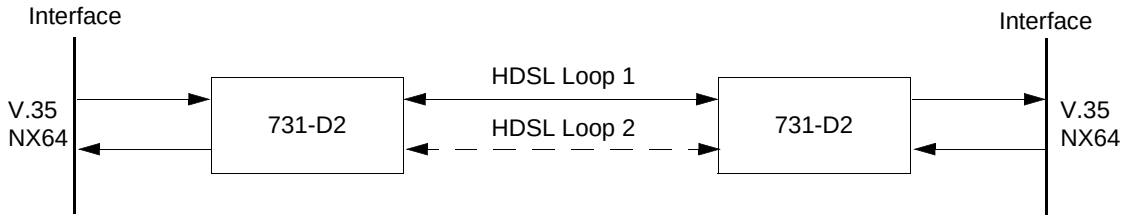


Figure 1-1 Point-to-Point

Point-to-Multipoint

You can use the 731-D2 as a remote unit in a point-to-multipoint configuration. A 701-T2 or 721-T2 master unit combines the data from two 731-D2 remote units into a single T1 interface. Data rates of Nx64 Kbps up to 768 Kbps are available at each remote site.

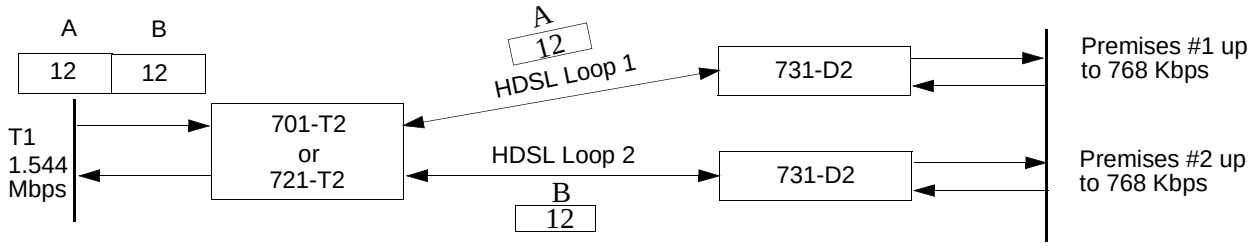
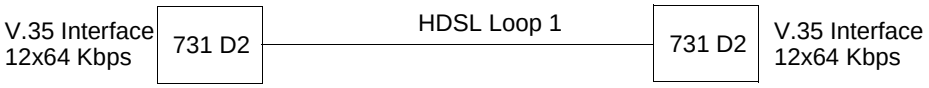


Figure 1-2 Point-to-Multipoint

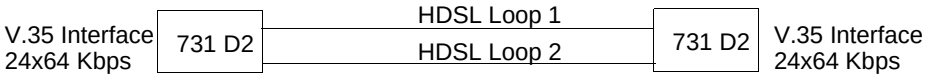
Single Loop Point-to-Point



Unit Type:	LTU	NTU
Enabled Loops:	1	1
Application:	P2P	P2P
Tx Clock Mode:	Internal	Looped
CTS Mode:	ON	ON
Data Rate:	12x64Kbps	12x64Kbps
V.54 RX Mode:	Disabled	Disabled
FP RL Mode:	EOC	EOC

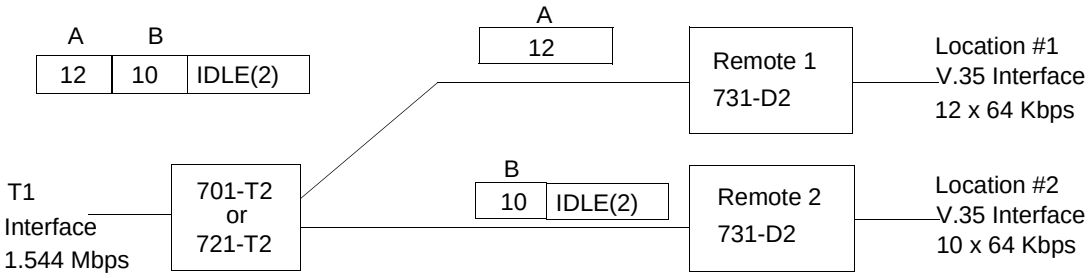
Figure 1-3 Typical Single Loop Point-to-Point Application

Two Loop Point-to-Point



Unit Type:	LTU	NTU
Enabled Loops:	2	2
Application:	P2P	P2P
Tx Clock Mode:	Internal	Looped
CTS Mode:	ON	ON
Data Rate:	24x64Kbps	24x64Kbps
V.54 RX Mode:	Disabled	Disabled
FP RL Mode:	EOC	EOC

Figure 1-4 Typical Two-Loop Point-to-Point Application



		Remote 1	Remote 2
Unit Type:	**LTU**	**NTU**	**NTU**
Enabled Loops:	2	1	1
Application:	P2MP	P2MP	P2MP
Front Panel Enable:		Enabled	Enabled
T1 Interface:	DSX-1		
Line Code:	B8ZS		
Tx Clock Mode		Looped	Looped
Frame Mode:	ESF/ANSI		
CTS Mode:		On	On
Data Rate		12 x 64 Kbps	10 x 64 Kbps
V54 Rx Mode:		Enabled	Enabled
FP RL Mode:		V54	V54
Line PreEqualization:	0-133*		
Loopback Type:	Line		
10-Minute Timeout:		Enabled	Enabled
AIS Loopdown:	Inhibit		
Timing source:	Loop		

Network Configuration	**LTU**
Application:	P2MP
Loop 1 Start DS0:	1
Loop 1 Consecutive DS0:	12
Loop 2 Start DS0:	13
Loop 2 Consecutive DS0:	10

*Set line pre-equalization according to the T1 transmit line length of the application.

Figure 1-5 Typical Point-to-Point MultiPoint

2 Installation

Overview

This chapter guides you through the process of installing and using the 731-D2 in your communications network. If this is your first experience using these units you may wish to review *Chapter 1* to make sure that you understand the key features and how to install and use the unit in your network.

Unpacking and Handling

Inspect the unit for damage.If you see any, notify the shipper right away. Save the box and packing material so that you can use it to reship the unit, if necessary.

Installation Requirements

You may install the 731-D2 basecard in a standalone DataComm Enclosure or rackmounted in a DataComm or Universal System Shelf (USS). Place the unit directly 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).

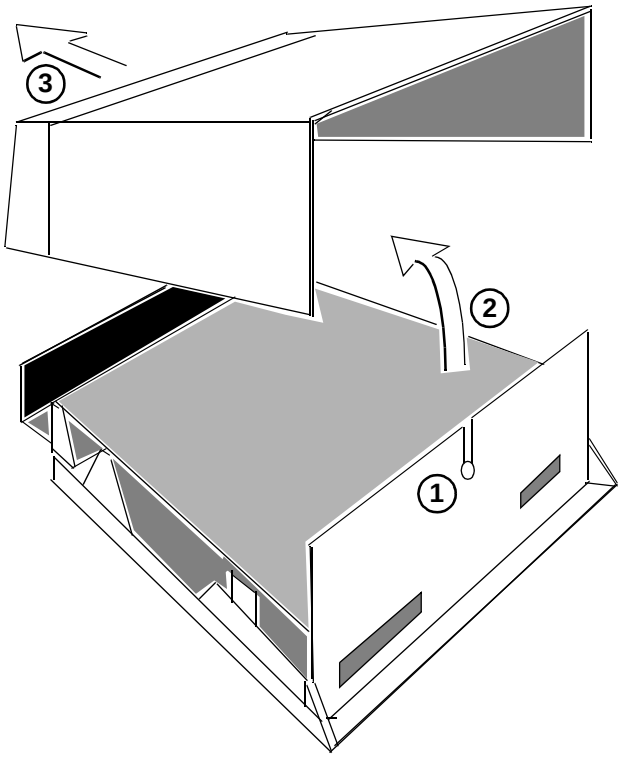
Mounting

You can have a standalone or rackmount version for either unit. You can use the 731-D2 as a standalone unit as part of the Universal Access System (UAS). The UAS is a family of network managed metallic loop transmission products. A shelf-mounted UAS family member works with a standalone unit located at the far end of the access loop. For the rackmount, GDC furnishes you the DataComm or Universal System Shelf packaging so that you can have a variety of data communications products--up to 16 units--to be mounted in the same high density shelf.

Standalone Installation

1. To remove the component cards from the standalone base, disconnect the power supply connector from J7 mounted at the rear center of the base card.

2. When you reinstall the component cards to the base, reinstall the connector at J7. *See Figure 2-1*.



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.
3. Slide cover 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

The 731-D2 mounted in a DataComm Shelf (DS-1, DS-5, or DS-6) supports as many as 16 units. You may install a unit 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 731s. The USS-1 uses harness cards and backplanes configured to occupy one card slot in the shelf for each unit. Each backplane assembly is keyed by a tab located at the bottom of the harness card. This tab mates with a slot that is part of the shelf and prevents the backplanes from being inserted incorrectly in the shelf.

Install the 731 in the USS-1 shelf:

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 and 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.

Timing - High Channel Data Rate

Consider cable length when connecting your equipment (the DTE) to the 731-D2 if you use DCE timing in a high channel data rate application. (With DCE timing, the 731-D2 issues timing to the DTE. The DCE timing options in the 731-D2 include both Looped and Internal Timing.) Cable length can cause a delay between the clock of the 731-D2 and the data arriving from the DTE. If the delay is too long (because the cable is too long or the rate is too high), you may have transmission errors.

If errors occur with DCE timing, you can use External Timing for the 731-D2 and Loop Timing for the DTE. This affords a faster data rate, regardless of cable length. (Note that the ITU-T V.35 recommends limiting cable length to about 30 meters.) *See Figure 1-2 below and refer to Chapter 3 - Operation for configuring timing options.*

NOTE

Select the appropriate timing option for the DTE: The DTE must loop timing from the Chnl Rcv Clk lead to the Chnl Ext Clk lead.

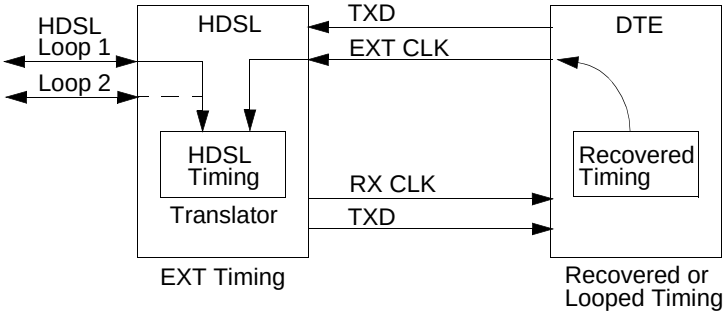


Figure 2-2 High Channel Data Rate

Setting Hard Options

Setting the hard options on the DataComm 731 basecard means adjusting configuration switches and jumpers to match your networks operation. *Table 2-1* explains the functions of the switches and jumpers and *Figure 2-3* shows their location. By switch S34-1, you choose the hard configuration option.

NOTE

The microprocessor in the DataComm 731 reads the switch settings only when you first power up. If you change the settings while the power is on, you must turn the power off and power up again for the new settings to take effect. Soft options, which are changed while power is on, do not require a power cycle. Soft options are stored in non-volatile memory and do not need to be reset after power interruption.

You need to make these adjustments only once, when first installing the unit. You don't have to repeat the procedure, unless you change your network or connect a different device to a data channel.

Table 2-1 Option Selection

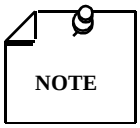
Switches	Description
S34-1 (SFT/HRD)	**Off = Soft - Allows 731-D2 configuration control through the terminal.** On = Hard - Allows the 731-D2 configuration through dip-switch settings.
S34-2 (NTU/LTU)	**Off = NTU** - The 731-D2 operates as a network termination unit, located on the user's side. On = LTU - The 731-D2 operates as a line termination unit located on the central office side. In this mode the 731-D2 serves as the master unit with respect to timing and supervision of the NTU.
S34-3 (2LP/1LP)	Allows a 731-D2 to operate over 1 HDSL loop: **Off: HDSL Loops 1 and 2 Enabled** On: HDSL Loop 1 Enabled
S34-4 (FPEN/DIS)	**Off = Enables front panel switches RL, LL, and ST.** On = Disables front panel switches RL, LL and, ST.
S34-5 (TMG0) S34-6 (TMG1)	Selects timing: TMG1 TMG0 S34-6 S34-5 **Off "don't care" Looped** The DCE transmit clock is locked to the DCE receive clock and is developed from the incoming remote end timing. On Off Internal The DCE transmit clock is derived from the internal clock oscillator of the 731-D2. On On External The DCE uses an external transmit clock provided by the customer's DTE.
S34-7 (10 MNEN/DIS)	10 minute loopback timeout. A V.54 remote loopback is terminated automatically after 10 minutes if no loopback termination command is received. **Off - Automatic timeout is enabled.** On - Automatic timeout is disabled.
S34-8 (P2P/P2MP)	Future use.
Note that factory default values are shown in **bold** type.	

Table 2-1 Option Selection (Cont.)

Switches	Description
S35-1 (V.54 EN/DIS)	**Off: Enabled - Unit will acknowledge V.54 inboard loopback code.** On: Disabled - Unit will not acknowledge V.54 loopback code
S35-2 (RL/EOC)	**Off: Front panel RL button sends V.54 code.** On: Front panel RL button sends EOC loopback command.
S35-3 (CTS ON)	**Off: CTS follows RTS.** On: CTS always ON.
S35-4 (SPARE)	Future use.
S35-5 (SPARE)	Future use.
S35-6 (SPARE)	Future use.
S35-7 (SPARE)	Future use.
S35-8 (SPARE)	Future use.
S36-1 though S36-5 (CHSEL 1 through 5)	*Refer to Table 2-1 on next page.*
S36-6 (SPARE)	Future use.
S36-7 (SPARE)	Future use.
S36-8 (SPARE)	Future use.
Jumpers	**Description**
X2	Select 0 for common signal and chassis grounds. **Select 100 for grounds isolated by 100 ohm resistor.** Select Open for isolated signal and chassis grounds.
X5, X6, X7, X8	Install to make HDSL loop connections to RJ48 C/X Connector J2.
X9	Must be installed. Removal with remote power option installed enables sealing current remote power feeding.
X10	Must be installed (731-D2 only). Removal with remote power option installed enables sealing current remote power feeding.
X11	Must be installed. Used for factory test.
X25	Selects DTE interface. V.35: Connect Pin 2 to 3, Pin 5 to 6, Pin 8 to 9, Pin 11 to 12 X.21, EIA530: Connect Pin 1 to 2, Pin 4 to 5, Pin 7 to 8, Pin 10 to 11
Note that factory default values are shown in **bold** type.	

Table 2-1 Option Selection (Cont.)

Data Rate (X64 kbps)	S36-5	S36-4	S36-3	S36-2	S36-1
24	Off	Off	On	On	On
23	Off	On	Off	Off	Off
22	Off	On	Off	Off	On
21	Off	On	Off	On	Off
20	Off	On	Off	On	On
19	Off	On	On	Off	Off
18	Off	On	On	Off	On
17	Off	On	On	On	Off
16	Off	On	On	On	On
15	On	Off	Off	Off	Off
14	On	Off	Off	Off	On
13	On	Off	Off	On	Off
12	On	Off	Off	On	On
11	On	Off	On	Off	Off
10	On	Off	On	Off	On
9	On	Off	On	On	Off
8	On	Off	On	On	On
7	On	On	Off	Off	Off
6	On	On	Off	Off	On
5	On	On	Off	On	Off
4	On	On	Off	On	On
3	On	On	On	Off	Off
2	On	On	On	Off	On
1	On	On	On	On	Off



Factory default (S36-1 through S36-5 are OFF) and invalid selections for S36-1 through S36-5 result in a default data rate of 24x64 Kbps for the 731-D2.

EIA-530 (V.11) or X.21 Interface Card

The optional EIA-530 (V.11) or X.21 Interface Card (either factory installed or available in a field upgrade kit) are interfaces for the DTE. The interfaces plug into the base card as shown in *Figure 2-3*. You must install the Jumper X25 in the correct position (*See Table 2-1*) when using the EIA-530 or X.21 interface cards. (You can also remove the card(s), shift the position of Jumper X25, and place jumpers on XA1J2 and XA1J3 to make the base card V.35 interface active.)

When you install the optional X.21 Interface Card in the active position, DTE control of Remote Terminal Test and Local Loopback is not supported. Following *Figure 2-3*, are three pages with pin breakdowns and signal exchanges of the EIA/TIA-232-E and ITU-T, EIA-530, and X.21 for business equipment. Optional transmit signal timing, X.21 Interface Card jumper position BT (Byte Timing), is not supported.

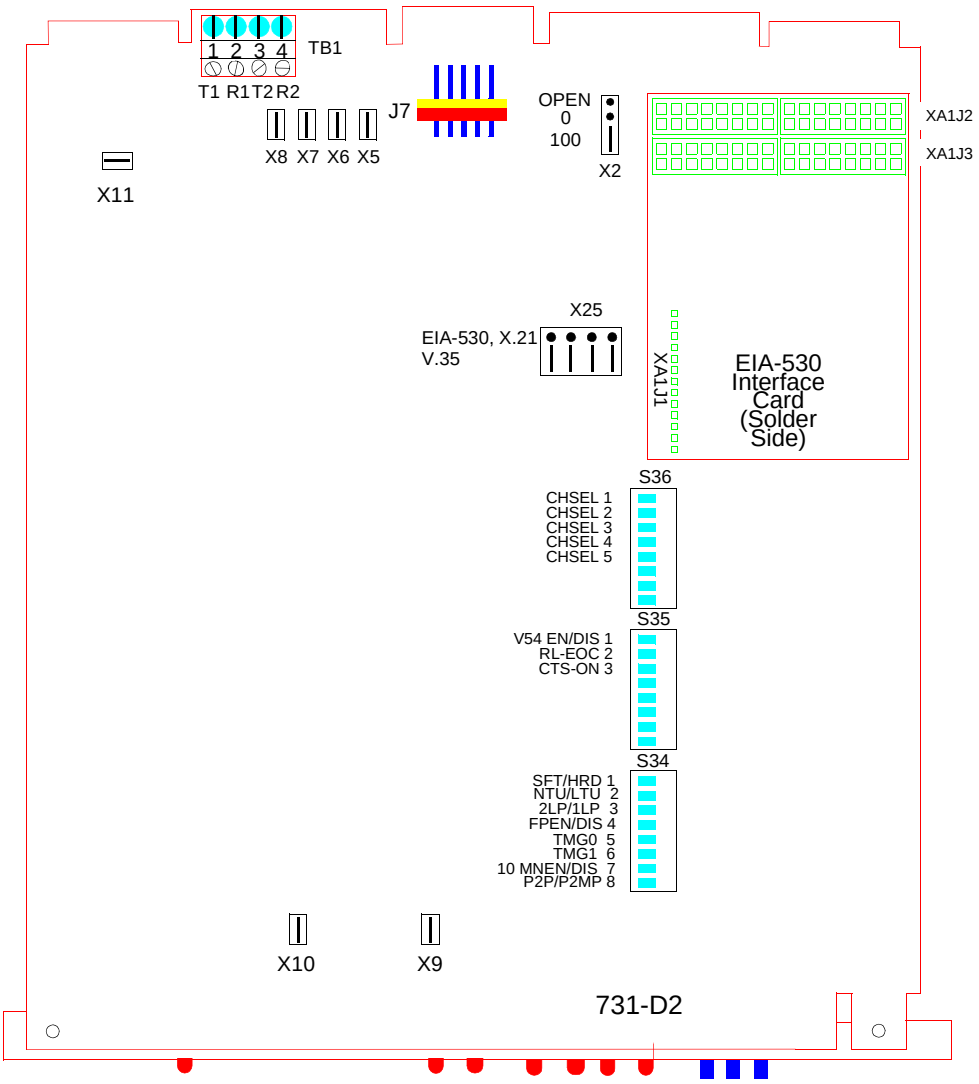


Figure 2-3 Option Switch and Jumper Locations, Basecard

Table 2-2 Pin Selections

EIA/TIA-232-E and ITU-T

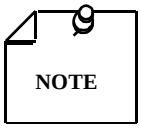
P1 Pin	V.35 Pin	ITU-T (See Note)	EIA	Signal	Description
1	A	101	AA	Protective ground	This circuit is connected to the equipment frame. Normally, it is separated from signal ground (pin B) by 100 ohms, but it may be connected to signal ground by means of an option strap.
7	B	102	AB	Signal ground	Establishes a common ground reference for all interface circuits except protective ground, pin A.
4	C	105	CA	Request-to-send	Indicates to 731 that DTE is prepared to transmit.
5	D	106	CB	Clear-to-send	Indicates to DTE that 731 is prepared to transmit.
6	E	107	CC	Data-set-ready	Indicates to DTE that 731 is operational.
8	F	109	CF	Received line signal detector	Indicates to DTE that 731 is receiving data (not idle or OOS codes).
25	K	142	TM	Test mode	Indicates to DTE that 731 in a test mode.
18	L	141	LL	Line loopback enable	Transfers signal from DTE to control Line Loopback test mode.
2 14	P S	103 103	BA(A) BA(B)	Transmitted data	Transfers data signals from DTE for modulation and transmission over communications line.
3 16	R T	104 104	BB(A) BB(B)	Received data	Transfers data signals received over communication line and demodulated by 731 to DTE.
12 24	U W	113 113	DA(A) DA(B)	Transmitter timing (DTE source)	Transfers transmitter signal timing information from DTE to 731.
13 17	V X	115 115	DD(A) DD(B)	Receiver timing	Transfers receiver signal timing information from 731 to DTE.
19 15	Y AA	114 114	DB(A) DB(B)	Transmitter timing	Transfers transmitter signal timing information from 731 to DTE.
21	BB/b	140	RL	Remote Digital Loopback test enable	Transfers signal from DTE to control Remote Digital Loop-back test mode.
20	H	108/2	CD	Data Terminal Ready	Indicates to 731 that DTE is prepared for data communication.
NOTE: ITU-T designations are shown for reference only. M, N, CC, FF, HH, JJ, KK, LL, MM, NN, Z, and pins 23, 26 are not used.					

EIA-530

Pin	Circuit	Direction	Description
1			Frame Ground
2	BA	To 731	Send Data (A)
14	BA	To 731	Send Data (B)
3	BB	From 731	RCV Data (A)
16	BB	From 731	RCV Data (B)
4	CA	To 731	RTS (A)
19	CA	To 731	RTS (B)
5	CB	From 731	CTS (A)
13	CB	From 731	CTS (B)
6	CC	From 731	DSR (A)
22	CC	From 731	DSR (B)
7	AB		Signal Ground
8	CF	From 731	DCD (A)
10	CF	From 731	DCD (B)
17	DD	From 731	RCV CLK (A)
9	DD	From 731	RCV CLK (B)
24	DA	To 731	EXT CLK (A)
11	DA	To 731	EXT CLK (B)
15	DB	From 731	TX CLK (A)
12	DB	From 731	TX CLK (B)
20	CD	To 731	DTR (A)
23	CD	To 731	DTR (B)
21	RL	To 731	Remote Digital Loopback Enable
18	LL	To 731	Line Loopback Enable
25	TM	From 731	Test Mode

X.21

P1/P2 Pin	*15-Pin X.21 Connector	ITU-T Circuit	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 731 that DTE is prepared to transmit.
8 10	5 12	I(A) I(B)	Indication	Indicates to DTE that 731 is receiving data.
17 9	6 13	S(A) S(B)	Signal Element Timing	Transmit and receive signal timing information from 731 to DTE.
24 12	7 14	X(A) X(B)	* DTE Signal Element Timing (X)	Optional transmit signal timing information from DTE to 731 if X.21 adapter module is configured for XT.
7	8	G	Signal Ground	Common ground reference.
* Optional transmit signal timing, X.21 Interface Card jumper position BT, (Byte Timing) is not supported.				



Before you power the unit up, refer to the preoperational Hard/Soft paragraphs that follow the Electrical Connections Information.

Power

Standalone

1. Attach the appropriate power cord to the rear panel IEC connector or the wall receptacle (depending on the base assembly you ordered).
2. Be sure that the unit is powered by the same ac source as the equipment that you are interfacing with the unit. This prevents large circulating currents caused by differences in ground potential.
3. If you cannot determine whether the equipment is powered by the same ac source, then verify that a potential difference of less than 0.25 V rms exists between the grounding circuits of the respective power outlets.

Rackmount Shelf

The unit get its power directly from the shelf when you install it properly (*Refer to Rackmount Installation.*)

Business Equipment Connections

You may make the Business Equipment connections to the 731-D2 standalone enclosure rear panels using a variety of connectors depending on the base assembly you ordered. *See Figures 2-4 (DE-23E) and 2-5 (DE-7) for these connections.*

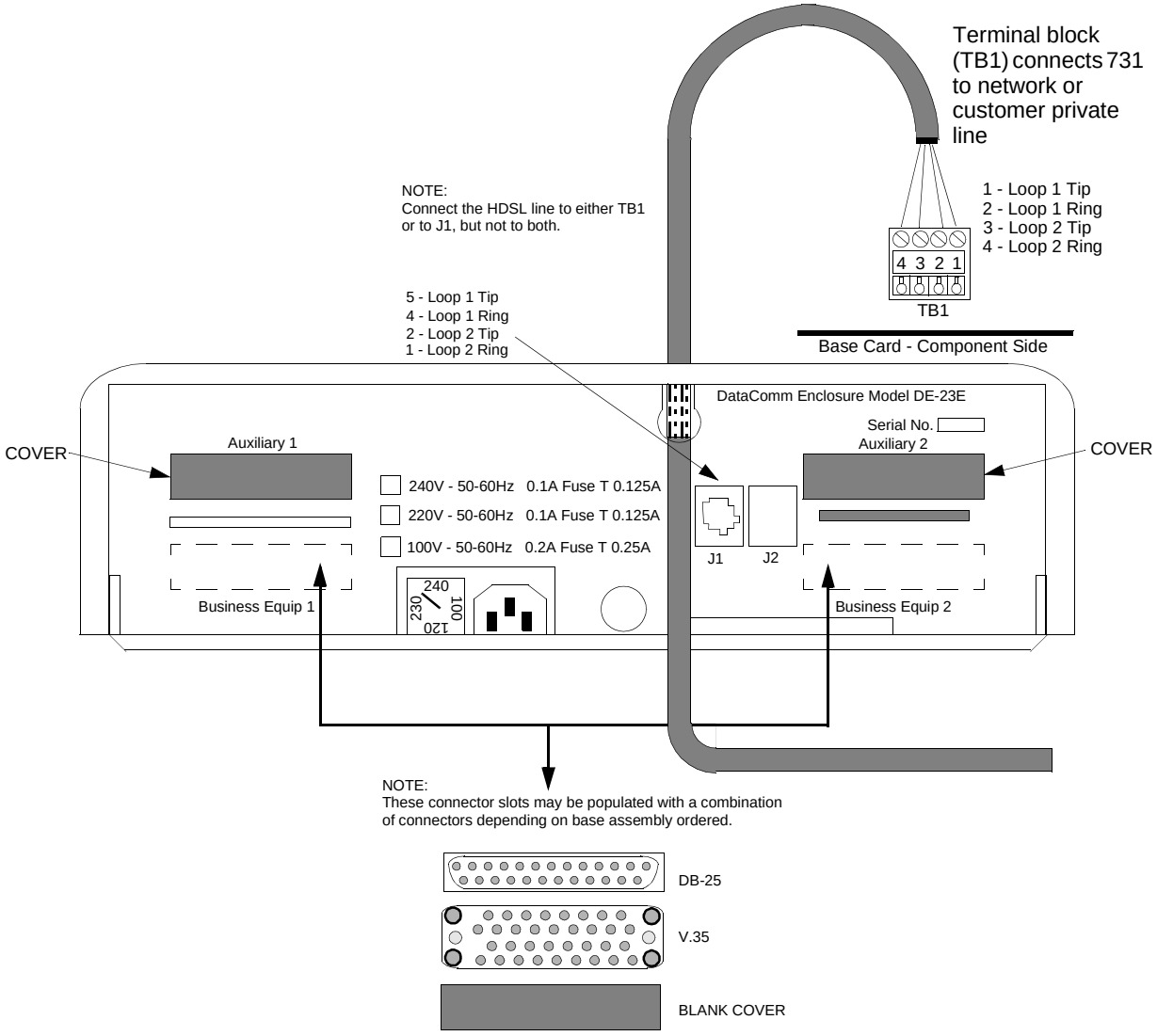


Figure 2-4 DE-23E Standalone Enclosure Rear Panel

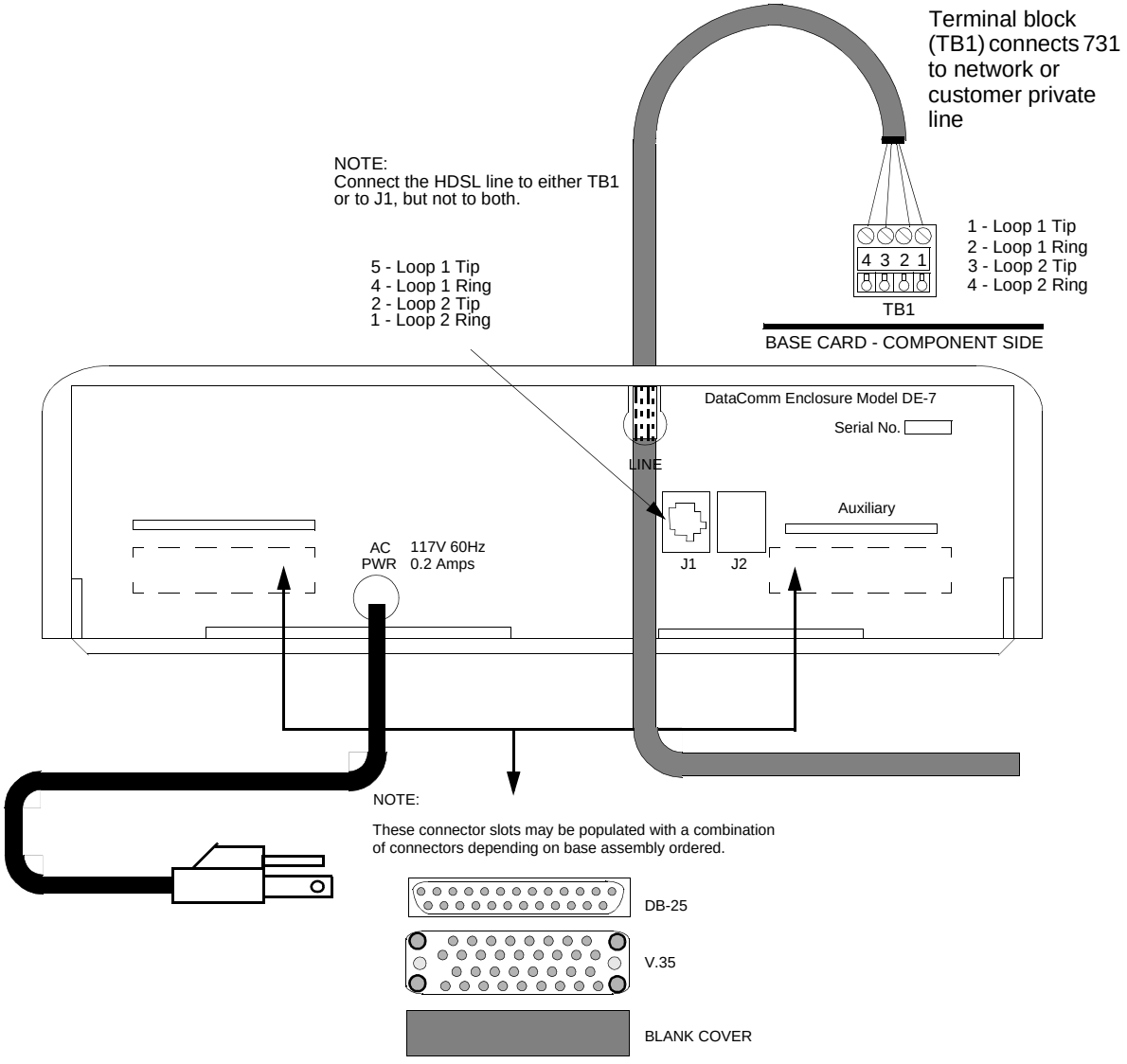


Figure 2-5 DE-7 Standalone Enclosure Rear Panel

HDSL Line Connections

You may make HDSL line connections to the 731-D2 standalone using TB1 which is located on the basecard or to the RJ48 connector labelled J1 on the rear panel. *See Figures 2-4* and *2-5*.

For shelf enclosures, follow these steps:

1. If the unit is rackmounted in the DataComm or USS-1 shelf, you connect the two-wire lines according to *Figure 2-6*.

2. If you mount the unit 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 VF terminal blocks, which are for wires with no terminal lugs.

3. Remove the lugs and some insulation from the existing cable and insert the wires into the block by first unscrewing the captive screw for that portion of the terminal.

4. Connect the wires as shown in *Figure 2-6*, and replace the plastic cover.
5. For either the DataComm or Universal System Shelf, before making the connection, verify that the terminal block corresponds to the shelf receptacle where you install the 731.

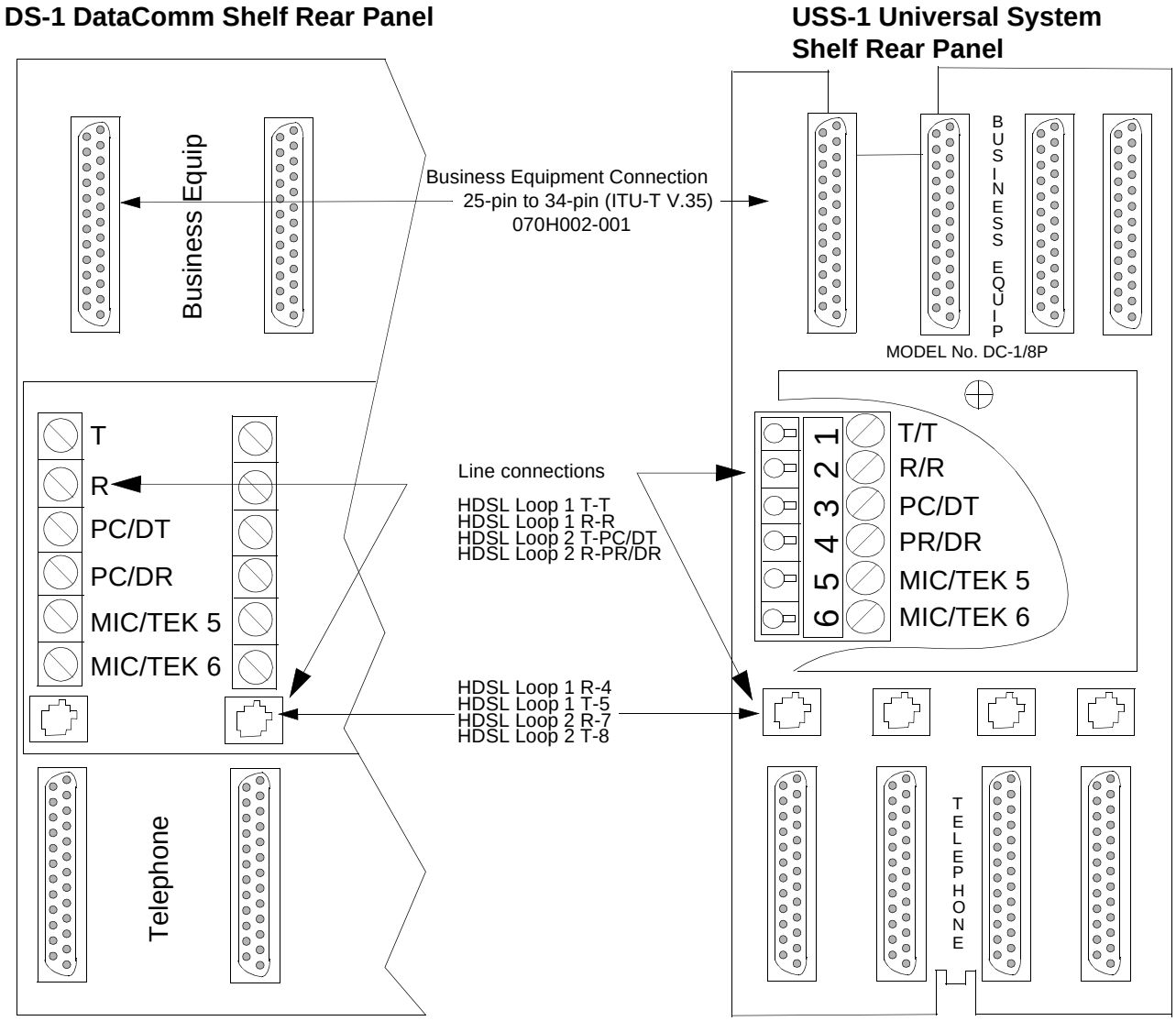


Figure 2-6 DataComm and Universal System Shelf Rear Panel Connections

Preoperational Configuration Setup

Hard

Configure the unit as follows:

1. Verify that the card is configured as an LTU or NTU based upon *Table 2-1*.
2. Set the remaining switches and jumpers according to *Table 2-1* and *Figure 2-3*. If S34-1 is

placed in the SOFT configuration position, all other switch settings are ignored, and the unit must be configured via the optional terminal screen. Refer to Setup (Soft).

3. Connect the DTE interface and HDSL loops to the network connectors on the rear panel.
4. Apply power to the unit.
5. After automatically performing internal self-tests, the HDSL loops initiate start-up, and the HDSL green LEDs should blink. The start-up generally lasts less than 30 seconds, but may last up to 3 minutes. When complete, the HDSL NORM LEDs should be On and the HDSL ES LEDs should be Off. If not, the start-up failed. The two cards automatically initiate a new start-up procedure. During this time, the ALM LED will blink until all HDSL and E1 status indicators clear.
6. Data transfer should occur, DTE indicators RD and SD should be On. The NORM LED should be On, and the ES LED should be Off. If not, refer to the troubleshooting procedure in *Chapter 4*.

Soft

1. Verify that Switch S34-1 is in the SOFT position. When the unit is powered up in the SOFT position, configuration parameters are obtained from non-volatile memory which stored the last settings when the unit was previously powered on. (If the unit is new, factory defaults are used.)
2. Connect the DTE interface and HDSL loops to the network connectors on the rear panel.
3. Apply power to the unit.
4. Connect a terminal to the CTRL connector on the front panel.
5. *Refer to Chapter 3, Paragraph Setting Soft Options for configuration procedures*.
6. After automatically performing internal self-tests, the HDSL loops initiate start-up, and the HDSL green LEDs should blink. The start-up generally lasts less than 30 seconds, but may last up to 3 minutes. When complete, the HDSL NORM LEDs should be On and the HDSL ES LEDs should be Off. If not, the start-up failed. The two cards automatically initiate a new start-up procedure. During this time, the ALM LED will blink until all HDSL and E1 status indicators clear.
7. Data transfer should occur, DTE indicators RD and SD should be On. The NORM LED should be On, and the ES LED should be Off. If not, refer to the troubleshooting procedure in *Chapter 4*.

3 Operation

Overview

Figure 3-1 illustrates the DataComm 731-D2 front panel and explains the function of each control and indicator. You may check the operation of the unit by monitoring the front panel indicators and using the test procedures provided in *Chapter 4*. You can find some unit configurations for typical applications in *Chapter 1*. Once you set the options and you connect the communication line properly, the units need no additional operator commands. The units are transparent to your network and communicate automatically with each other and your connected network devices.

Front Panel

The front-panel red and green indicators (LEDs) are described below, such that the red LED indicates critical or major failure or error and the green LED indicates satisfactory operation or completion of a process.

Data Path Indicators - Three data streams are visually monitored:

1. HDSL Loop 1 input
2. HDSL Loop 2 input
3. DTE Interface

Two indicators are used for each data stream, where the green LED designated as NORM indicates the status of the system and, the red LED referred to as ES, indicates the data transport status. Each LED can be in one of three states: On, blinking, or Off (blinking is at 2 Hz). *Table 3-1* summarizes:

Table 3-1 Front Panel Indicators

HDSL Indicators		
ES	**NORM**	**Indication**
Off	On	Normal operation
On	Off	LOS/LOSW
On (for 0.5 sec.)	On	ES - Errored second
On	Blink	Start-up tests, No response from mating unit
Off	Blink	Start-up in progress

Two more LEDs, SD and RD, indicate transmit and receive data at the customer DTE interface. Three additional indicators are used on the front panel:

ON - Lit when +5V is applied to the card.

ALM - Indicates if a Major Alarm is present. If a failure was detected during self-test, this LED blinks. Additionally, it blinks upon the detection of LOS, LOSW, or UAS on any HDSL loop.

TM - This LED is on during one of the following conditions:

Loopback is activated at the local unit.

Loopback is activated by the remote unit.

The BER meter has been activated, or any self-test is in progress.

The TM LED blinks when a BER test is in progress and bit errors are present.

ST push button - Pushing the ST button activates a 2^{15} pseudo-random test pattern while enabling the simultaneous detection of an incoming 2^{15} pattern.

LL push button - Pushing this button initiates the same loopback as the Local Line Loopback described in *Chapter 4*. The unit must be configured for external timing for this loopback to be functional.

RL push button - Pushing this button initiates the same loopback as the Remote Line Loopback described in *Chapter 4*. The RL push button is functional when the unit is configured as a LTU, or whenever V.54 inband signaling has been enabled.

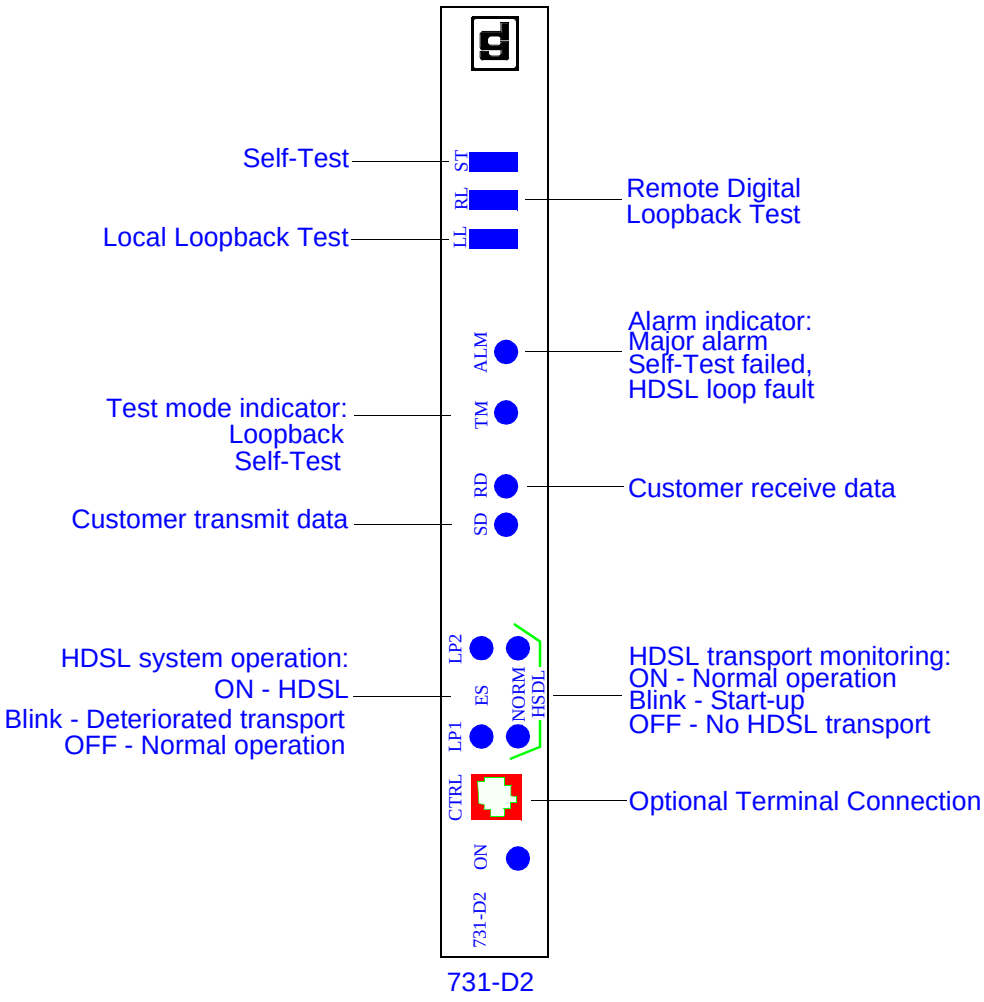


Figure 3-1 Front Panel

Soft Option Selection

You can use a terminal connected to the Control (CTRL) jack on the front panel to configure and control the 731.

Terminal Requirements

You can use any standard ASCII terminal (VT100 or ANSI terminal or personal computer emulating an ASCII terminal) equipped with an EIA/TIA-232-E communication interface to control the 731 operation. The following screens were derived by plugging the COMM port of a PC (using a terminal emulator program) into the 731 front panel CTRL jack. Set the terminal communications parameters as follows:

- Data Rate = 9600 bps, Character Format = 1 start bit, 8 data bits, no parity, one 1 stop bit
- The software necessary to run the 731 supervision program is contained in the 731 itself.

Control Port Characteristics

The control port has an EIA/TIA-232-E asynchronous DCE interface, terminated in an RJ-45 connector designated CTRL on the front panel. The connector is wired as shown here:

Pin	Function
1, 2, 3	Not connected
4	Ground
5	Transmit output (RXD of terminal)
6	Receive input (TXD of terminal)
7, 8	Shorted internally

Start-up Procedure

A management session is automatically started as soon as the terminal cable is connected to the CTRL port of an operating 731. To end an ongoing management session, disconnect the terminal from the 731. Upon power-up, the 731 sends the opening screen, shown in *Figure 3-2*, then followed by the main menu.

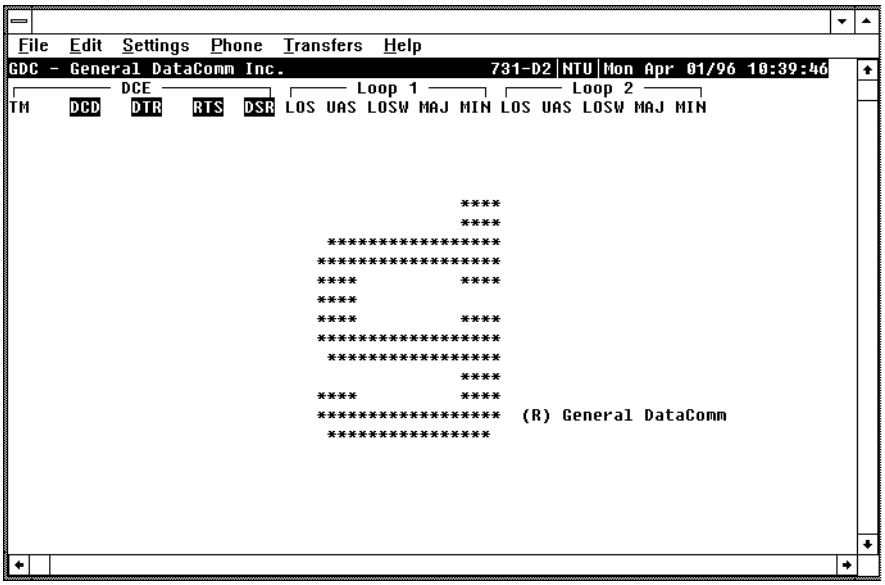


Figure 3-2 Opening Screen

Screen Organization

The screen includes the areas described in *Table 3-2*.

Table 3-2 Terminal Screen Organization

Header	Located at the top of the screen, the header displays GDC name and equipment model, followed by the current operating mode (LTU or NTU), and the date and time sent by the 731.
Status Line	Located below the header, the status line includes two main fields, which display the status of the various 731 alarms and status signals. An active alarm and status indicators are displayed in reverse video.
DTE Field	Includes the following indications: TM, DCD, DTR, RTS, DSR
Loop Alarms Field	Loop alarms field is divided into several sub fields, one for each loop and includes the following indications: LOS - Loss of input signal on the corresponding loop. UAS - Unavailable seconds threshold for the corresponding loop is being exceeded. LOSW - Loss of synchronization word on the corresponding loop. MAJ - Incoming HDSL bit error rate exceeds selected major alarm threshold. MIN - Incoming HDSL bit error rate exceeds selected minor alarm threshold.
Work Area	Displays the menu and dialog boxes.
Active Keys Area	The active keys are constantly updated to show the keys and key combinations you can use on the current screen.

Operating Steps

The following procedures apply to all the operations that you perform on the ASCII terminal.

Menu Selection

Select a Menu item in two ways:

1. Move the selected block to the desired item by means of the arrows, then press the Enter key.

   Or,

2. Type the number appearing to the side of the menu item.

Either action opens the submenu or dialog box used to perform the selected operation.

Field Navigation

1. To move forward among the fields of a dialog box, press the Down arrow key.
2. To move backward, press the Up arrow key.

Field Editing

You can modify the values displayed in the screen fields as follows:

1. Bring the cursor to the desired field, and then press Enter to display an option menu with the available values.
2. Highlight the desired value then press Enter to select the new value and close the option menu.
3. For free-text fields, bring the cursor to the desired field, then type in the desired value.
4. You can use the Backspace and Delete keys to make changes or correct errors. When done, press Enter.

Restoring Default Values

When the 731 stores default values for parameters displayed in a dialog box, you can replace the current values with the default values by pressing Ctrl-D (Ctrl-D means hold down the Ctrl (control) key and press D).

Saving Values

To save new parameter values entered in dialog boxes, press Ctrl-W. These parameters are stored in non-volatile memory for use upon the next unit power-up in SOFT Config mode (S34-1 switch is set to SOFT).

Quitting without Saving

To quit without saving the new parameter values entered in a dialog box, press Esc. You can also press Esc as necessary to close any open submenus and to return to the main menu.

Refresh

You may refresh the screen at any time by typing Ctrl-R.

Main Menu

The Main Menu is displayed in *Figure 3-3*. The menu includes four options, described in the following paragraphs.

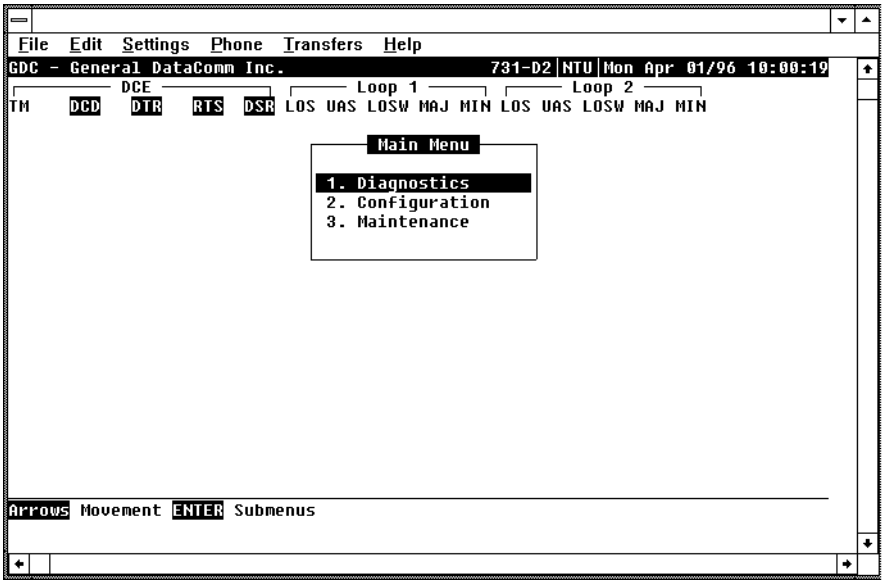


Figure 3-3 Main Menu Screen

Diagnostics Option

Use this option to display diagnostic information and to activate or control diagnostic functions, as follows:

- Display of performance statistics collected on each of the HDSL loops.
- Display HDSL loop status information, technical data on loop performance, HDSL loop noise margins, and pulse attenuation.
- Cancel the start-up process.

Configuration Option

Use this option to configure the data interface and HDSL loop parameters, as follows:

- Modify the HDSL loop operating mode (NTU or LTU), number of loops enabled, and application type (point-to-point, point-to-multipoint), and front panel enable.
- Display and modify the interface configuration, TX Clock mode, CTS mode, V.54 and RL pushbutton options, and Data Rate.
- Display system hardware and software data and 731 self-test results.

Maintenance Option

Use this option to perform maintenance activities, as follows:

- Enable both local and remote system loopbacks.
- Test system performance using the internal 731 BER meter.
- Set the real-time clock.

- Reset the statistics counters.
- Initiate manually the start-up process.
- Reset the 731. (Simulate power-up.)

These screens are described in *Chapter 4* under *Maintenance Menu*.

Diagnostic Menu

You can use the diagnostic menu to display diagnostic information, and to activate diagnostic functions. See *Figure 3-4*. To open the diagnostics menu, select Item 1 on the main menu.

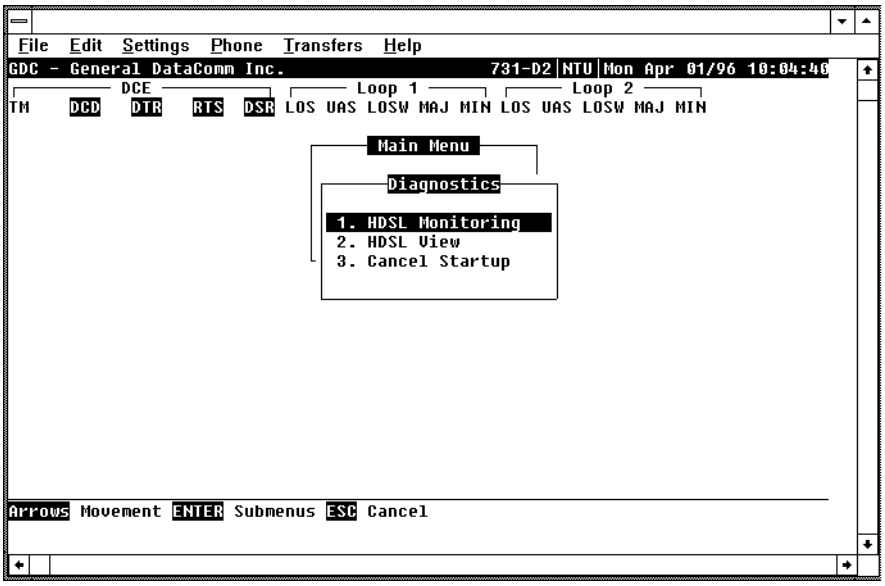


Figure 3-4 Diagnostic Menu Screen

The functions available from the diagnostic menu are as follows:

- HDSL Monitoring
- HDSL View
- Cancel Startup

HDSL Monitoring

The HDSL Monitoring screen, *Figure 3-5*, displays 24-hour performance statistics on the HDSL loops. To display the HDSL monitoring screen, select Item 2 on the diagnostic menu.

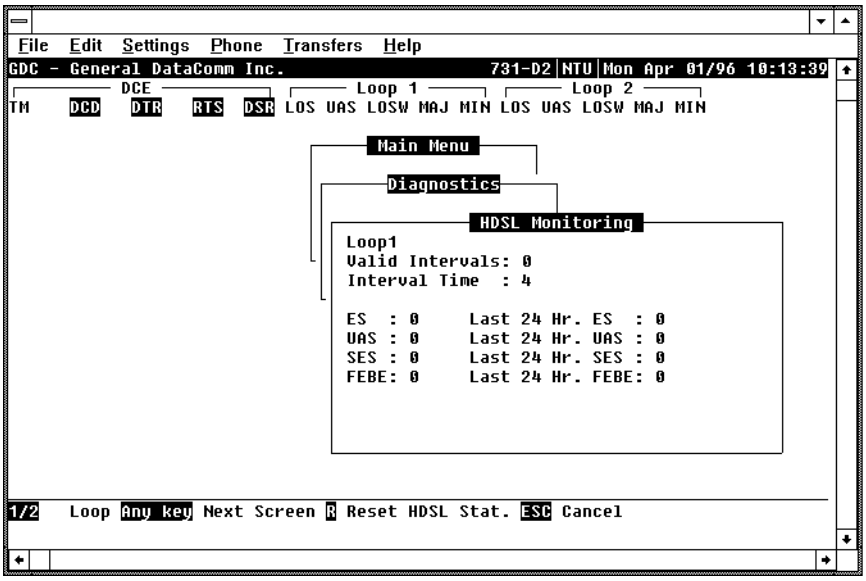


Figure 3-5 HDSL Monitoring Screen

The screen includes the fields described in *Table 3-3*.

Table 3-3 HDSL Monitoring Screen

Valid Intervals	Displays the number of valid 15-minute intervals within the current 24-hour interval. The range is 0 to 96. HDSL error statistics ES, UAS, and SES are reported consistent with ITU G.821.
Interval Time	Displays the elapsed time in seconds from the beginning of the current 15-minute interval. The range is 0 to 900.
ES	Displays the number of errored seconds in the current 15-minute interval.
Last 24 Hr ES	Displays the number of errored seconds in the last 24-hour interval.
UAS -	Displays the number of unavailable seconds in the current 15-minute interval.
Last 24 Hr UAS	Displays the number of unavailable seconds in the last 24-hour interval.
SES	Displays the number of severely errored seconds in the current 15-minute interval.
Last 24 Hr SES	Displays the number of severely errored seconds in the last 24-hour interval.
FEBE	Displays the number of Far-End-Block-Errors reported by the remote equipment in the current 15-minute interval.
Last 24 Hr FEBE	Displays the number of Far-End-Block-Errors reported in the last 24-hour interval.

To select another loop, type its number: 1 or 2.

NOTE

Powering up the 731-D2 resets the 24 hour performance statistics on the HDSL loops.

After viewing the data collected for the selected loop in the current 15-minute interval, you can display the other 95 intervals within the current 24-hour interval by pressing any key, except 1, 2, R, and Esc keys. The display is cyclic, that is, the current interval is displayed again after the 95th interval.

To reset the HDSL statistics counters, type R. All the displayed values are reset to 0.

To exit and return to the Diagnostics menu, press the Esc.

HDSL View

This option displays the HDSL Status screen, which shows you diagnostic information and technical data on HDSL loop performance. A typical screen is shown in *Figure 3-6*.

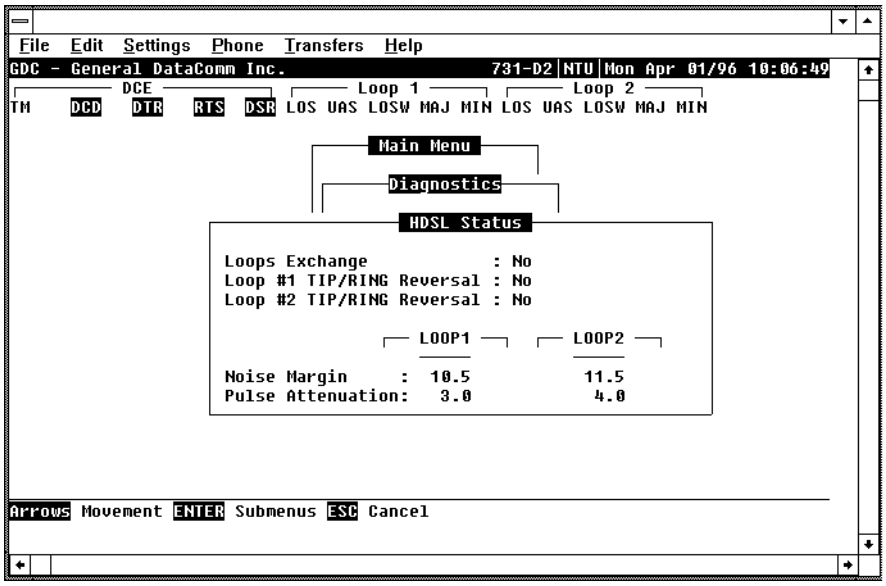


Figure 3-6 HDSL View Screen

Table 3-4 describes the fields on the HDSL Status screen.

Table 3-4 HDSL Status Screen Fields

Loops Exchange	Indicates whether the HDSL loops carrying the data traffic are correctly connected or have been interchanged by error. This information is available only when the unit connected in a link can exchange information and is not applicable if unit is configured as an LTU. If the loops exchange indicates YES, then the swapped wires must be corrected.
Loop 1 TIP/RING Reversal	Indicates whether the two conductors of HDSL Loop 1 are correctly connected or have been interchanged by error. This information is available only when the unit connected in a link can exchange information with the remote unit. Not applicable if unit is configured as an LTU. If the TIP/RING reversal indicates YES, then the 731 automatically recovers from this condition.
Loop 2 TIP/RING Reversal	Indicates whether the two conductors of HDSL Loop 2 are correctly connected or have been interchanged by error. This information is available only when the unit connected in a link can exchange information with the remote unit. Not applicable if unit is configured as an LTU. If the TIP/RING reversal indicates YES, then the 731 automatically recovers from this condition.
Noise Margin	Displays amount of additional noise in dB which can be tolerated before exceeding $5X10^{-8}$ bit error ratio. Separate values are provided for each HDSL loop.
Pulse Attenuation	Displays the pulse attenuation, in dB, measured by the signal processing circuits of the 731. Separate values are provided for each HDSL loop for the local unit.

Operation

To display the HDSL Status screen, select Item 2 on the Diagnostics menu. After viewing the data, press Esc to exit and return to the Diagnostic menu.

Cancel Start-Up

The Cancel Startup option is used to cancel the start-up process performed by the 731 upon link initialization and whenever the synchronization between two GDC HDSL units connected in a link is lost. This function enables partial operation under fault conditions.

Operation

To instruct the 731 to stop performing the start-up process, select Item 3 from the Diagnostics menu.

Configuration Menu

Use the Configuration menu to configure the data interface and the HDSL loop parameters. To open the Configuration menu, select Item 2 on the Main Menu. *Figure 3-7* depicts the Configuration menu.

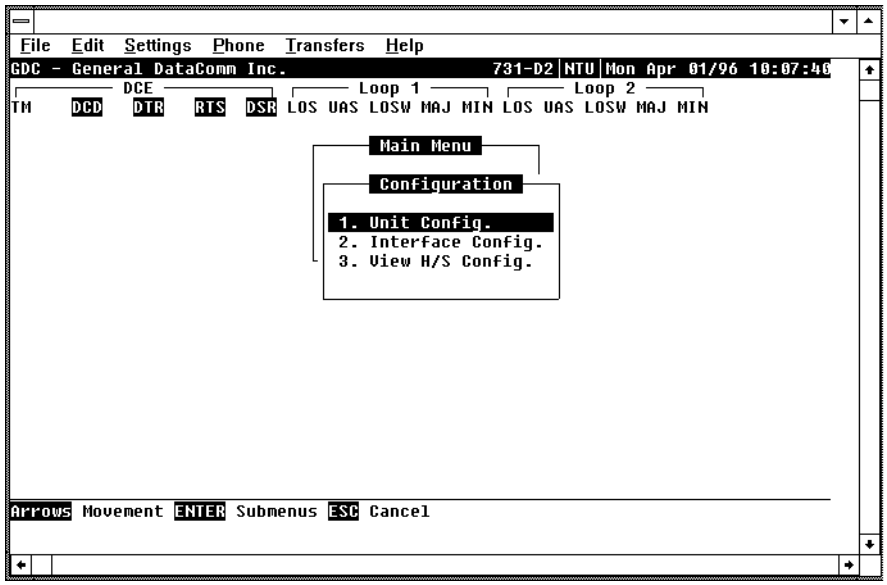


Figure 3-7 Configuration Menu Screen

The functions available from the Configuration menu are as follows:

- Unit Config.
- Interface Config.
- View H/S Config.

Unit Configuration Screen

The Unit Configuration option displays the Unit Configuration screen, showing the HDSL configuration parameters of the 731. A typical screen is shown in *Figure 3-8.*

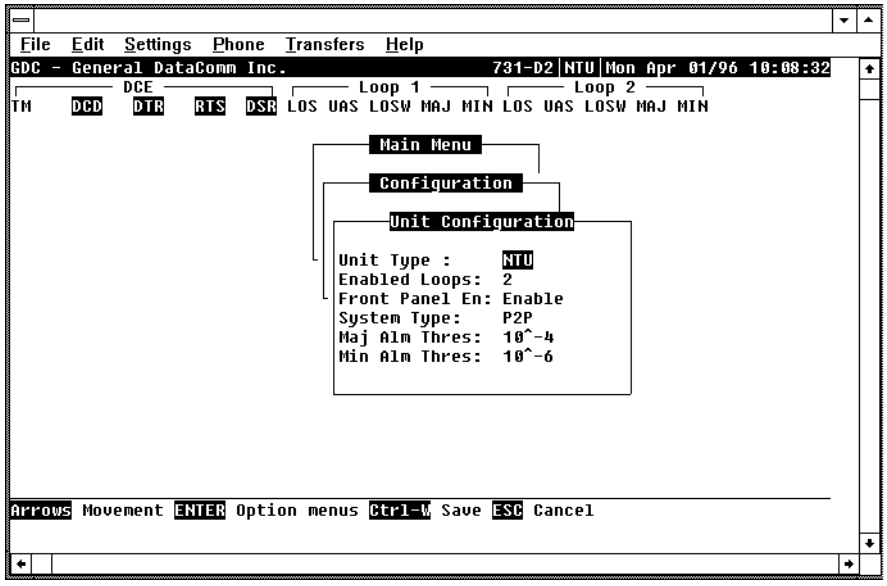


Figure 3-8 Unit Configuration Screen

The screen includes six fields, which are used to select the operating mode of the 731 on the HDSL loops side:

- Unit Type
- Enabled Loops
- Front Panel Enable
- System Type
- Major Alarm Threshold
- Minor Alarm Threshold

Table 3-5 Unit Configuration Screen Fields

UNIT TYPE	LTU - Line Terminating Unit **NTU** - Network Terminating Unit
ENABLED LOOPS	1 or **2** loops available with the DC731-D2.
SYSTEM TYPE	Select point-to-point (**P2P**) or point-to-multipoint (P2MP) application.
MAJ ALM THRES	Programmable threshold from **10^{-4}** to 10^{-8} for determining incoming line bit error rate. Set to a higher threshold than MIN ALM THRES to indicate conditions of major line problems.
MIN ALM THRES	Programmable threshold from 10^{-4} to 10^{-8} for determining incoming line bit error rate. Set to a lower threshold than MAJ ALM THRES to indicate conditions of minor line problems. **10^{-6}** is the default value.
FRONT PANEL EN	**Enabled**: allows RL, LL, and ST diagnostics from the front panel. Disabled: prohibits RL, LL, and ST diagnostics from the front panel.
Default values are shown in **bold** type.	

Operation

To display the interface configuration screen, select Item 2 on the configuration menu.

To change the current value of a parameter, use the following procedure:

1. Move the selection block to the desired line and press Enter

An option menu appears with the available options.

2. Highlight the desired option, and press Enter. The option menu closes, and the new selection appears in the corresponding line.
3. To reset the selected parameters to the default values, press Ctrl-D.
4. To save changes, press Ctrl-W.
5. To quit and cancel the changes made in this screen, press Esc.
6. To exit and return to the Configuration menu, press the Esc.

Point-to-Point Options

When the 731-D2 is used in a point-to-point configuration, any of the three TX Clock Mode DTE timing options (EXTERNAL, INTERNAL, LOOPED) found in the Interface Config. screen are available. Usually, when the 731-D2 is configured as a NTU, either the EXTERNAL or LOOPED configuration is used. In this case, the LTU typically is either a 701-T2 or 721-T2 with its T1 Interface Frame Mode set up for ESF or SF. The LTUs T1 DS0s are recombined into a user selectable aggregate data rate (V.35, EIA-530, X.21) by the 731-D2. For increasing 731-D2 aggregate rates, the 731-D2 data is sourced from the T1 DS0s in an increasing order, i.e., 1x64 Kbps is sourced from T1 DS0 1, 2x64 Kbps is sourced from T1 DS0s 1 and 2, 3x64 Kbps is sourced from T1 DS0s 1, 2, and 3, etc. Time slot routing over the HDSL loops follows that shown in *Table 3-6*. A maximum aggregate rate of 24x64 Kbps is available from the 731-D2 NTU in this case.

Routed T1 time slots over HDSL loops when used with 701-T2 or 721-T2.

Table 3-6 T1 Point-to-Point Data Routing

Loop 1	1	2	3	4	4	6	7	8	9	10	11	12
Loop 2	13	14	15	16	17	18	19	20	21	22	23	24

With two loops enabled and a 731-D2 used with a 701-T2 or 721-T2 LTU, an aggregate signal of 1536 Kbps may be provisioned. Here, the 731-D2 remote (V.35, EIA-530, or X.21) will have its Tx Clock Mode set for EXTERNAL or LOOPED timing. Additionally, with 731-D2 units as both LTU and NTU, an aggregate Nx64 Kbps signal up to 1536 Kbps may be provisioned. In this case, the Tx Clock Mode of the 731-D2 LTU is set for INTERNAL timing, and the Tx Clock Mode of the 731-D2 NTU is set for EXTERNAL or LOOPED timing.

Point-to-Multipoint Options

731-D2 units may be used as remotes (NTU) in a point-to-multipoint application with a 701-T2 or 721-T2 LTU. Each 731-D2 may be independently configured for data rates of Nx64 Kbps, up to 12x64 Kbps. The data stream from both 731-D2s are combined by the 701-T2 or 721-T2 into a single T1 interface. A typical configuration is shown in Figure 1-5.

Interface Configuration Screen

The Interface Configuration option displays the DCE Interface Configuration parameters of the 731. A typical screen is shown in *Figure 3-9*.

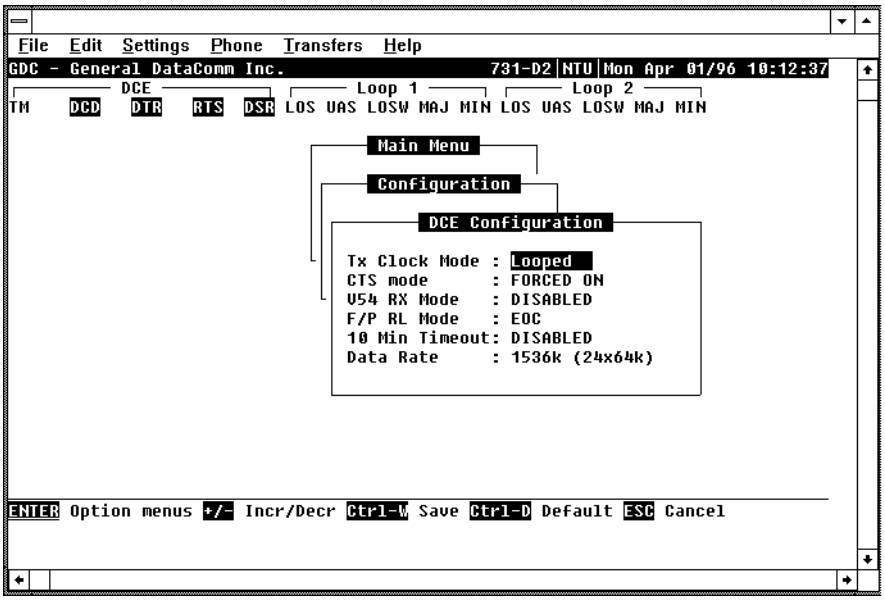


Figure 3-9 Interface Configuration Screen

The screen includes the following fields described in *Table 3-7*.

Table 3-7 Interface Configuration Screen

TX Clock Mode	Displays the DCE interface transmit timing selection: **Looped** - The transmit clock is locked to the receive clock and is developed from the incoming remote end timing. External - The DCE interface uses an external clock provided by the customer's DTE. Internal - The transmit clock is derived from the internal clock oscillator of the HDSL module.
CTS Mode	Forced On: CTS is on as long as the HDSL module is powered and operating normally. **Normal**: The CTS line tracks the state of the RTS line.
V54 Rx Mode	**Enabled**: The 731 detects and responds to inband V54 protocol. Disabled: The 731 does not respond to inband V54 protocol.
F/P RL Mode	**V54**: Pressing the front panel RL button initiates the V54 protocol toward the HDSL side of the 731. EOC: Pressing the front panel RL button causes the 731 to send a loopback command to the remote HDSL unit.
Data Rate	Press the plus (+) key or space bar to increment the data rate, press the minus (-) key to decrement the data rate. Select from N=1 to N=**24**.
10 Min Timeout	Displays the Loopback Timeout Enable. If **enabled**, V.54 loopbacks are automatically terminated after 10 minutes.
Defaults are shown in **bold** type.	

View H/S Configuration

The View H/S Configuration option displays the Configuration and Selftest Results screen, showing hardware and software configuration data and the results of the last power-up self-test. The information displayed on this screen is intended for maintenance and technical support groups. A typical screen is shown in *Figure 3-10*.

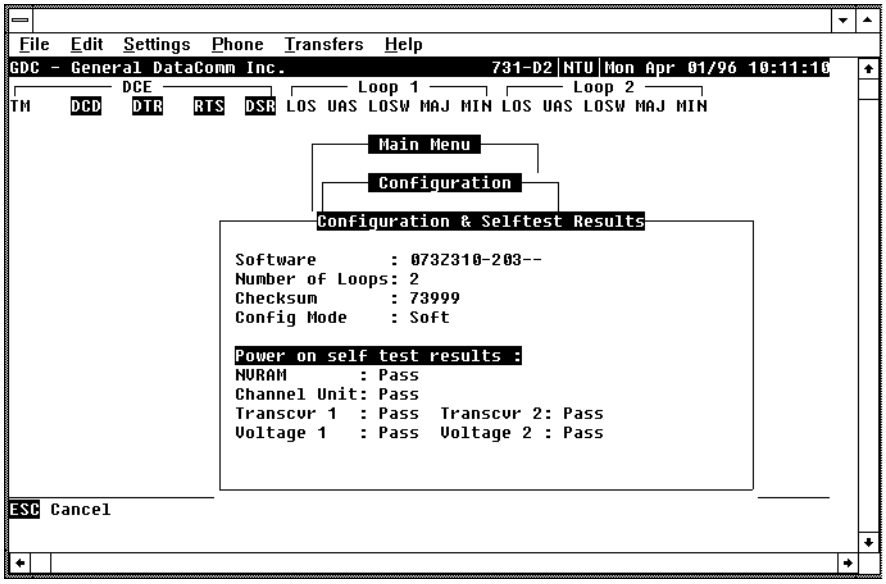


Figure 3-10 View H/S Configuration Screen

The upper area of the screen presents configuration data. The lower area presents the results of the last power-on self-test. *Table 3-8* describes the fields in the screen.

Table 3-8 Configuration and Selftest Results Screen Fields

Software Version	Displays the software version of the 731.
Number of Loops	Displays the number of HDSL loops of the 731.
Checksum	Firmware checksum.
Config Mode	Displays the current configuration mode of the 731: Soft - The 731 is configured under software control. Hard - The 731 is configured by means of the basecard dip switches and jumpers.

The last power-on self-test results area lists each 731 subsystem tested during the self-test, and the self-test result is Pass or Fail. These tested subsystems are non-volatile RAM, HDSL Channel Unit, HDSL Loop 1 and Loop 2 transceivers; and +12V (Voltage 1) and -12V (Voltage 2) power supplies.

Maintenance Menu

You may refer to *Chapter 4* to for maintenance and troubleshooting.

Network Management

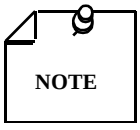
A remote DataComm 731-D2 can be used as a Network Managed element when used within a GDC Network Management System. The 731-D2 works together with a GDC SpectraComm Manager, a 701-T2, and GDC management software to form a complete network management system. The management software conforms to the MIB (Management Information Base) II standards set out for SNMP Version 1.0. Refer to the *Operating and Installation Instructions for SpectraComm Manager Card, Publication GDC 048R303-000.*

MIB Tables

This section consists of tables that list and describe the MIB objects by which a SNMP network manager can configure, control, and monitor the DataComm 731-D2. Each table is arranged in five columns:

- MIB Object - name
- Syntax - MIB variable type
- Access - read-write, read-only, or write-only
- Enumeration - interpretation of specific possible values or range of possible values
- Description - function of the MIB object

How MIB objects appear on the screen and are manipulated varies with the network manager or MIB browser being used. Purpose of information in these tables is for supplementing the operating instructions for the manager or browser.



Many SNMP network managers and MIB browsers automatically perform a Get operation immediately following a Set to an object that permits read-write access. In that way the success of the write operation is confirmed. If your manager or browser does not perform this function automatically, it is highly advisable that you command a Get for each object you Set.

Table 3-9 Version Group Table

MIB Object	Syntax	Access	Enumeration	Description
System MIB Version	Display String	Read-only		Identifies the version of the MIB. The format of the version is x = yzT, where x identifies the major revision number, y identifies the typographical revision, and T identifies the test revision (not on formal release). Acceptable values for the individual revision components are: x: 1 - 9 y: 0 - 9 z: 0 - 9 T: A - Z
Version Index	SC instance	Read-only		Identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and sub-identifier. The table describes the maintenance objects for the unit and references the unit interface.
Firmware Level	Display String	Read-only		The version number of the firmware. This identifies the installed revision. The released version number is sequenced from A,...AA,...ZZ. Test versions are numerical from 01 to 99.
Model Number	Display String	Read-only		This variable is used to determine the type of card family installed.

Table 3-10 Maintenance

MIB Object	Syntax	Access	Enumeration	Description
Maintenance Line Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and sub-identifier. The table describes the maintenance objects for the unit and references the unit interface.
Soft Reset	SC instance	Read-write	Reset (1) Norm (2)	Supports the action of soft resetting the unit. When this object is set to reset, the unit performs a soft reset to the managed unit. Norm cannot be set by management.
Config Mode	Integer	Read-only	Software (1) Hardware (2)	The configuration mode of the unit. A unit may be hardware or software configured.
System Up Time	Time Ticks	Read-only		This variable is used to report the elapsed system time since power on.
Unit Type	Integer	Read-write	LTU (1) NTU (2)	This variable is used to define HDSL type. LTU selects line terminating unit, NTU selects network terminating unit.
Default Initiate	Integer	Read-write	Default (1) Normal (2)	Used to allow the non-volatile configuration to be set to a factory default reset. Normal cannot be set by management.
Loop Provision	Integer	Read-write	Point-to-point (1) Point-to-MultiPoint (2)	This variable is used to define the HDSL loop provision. When P-P is selected, the unit is connected to the other HDSL unit. When P-MP is selected, the unit is connected to more than one HDSL units for data grooming.
Number of Loops	Integer	Read-write	One Loop (1) Two Loops (2)	Defines number of active HDSL loops. Can be set for one or two loops.
Front Panel	Integer	Read-write	Inhibit (1) Enable (2)	Enables or inhibits the front panel operation.

Private Storage 1	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.
Private Storage 2	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.
Private Storage 3	Display String	Read-write	(Size (16))	This variable is used for general purpose storage.
LED Status	Display String	Read-only	Octet 1 Bit 7 - not used Bit 6 - not used Bit 5 - not used Bit 4 - not used Bit 3 - not used Bit 2 - not used Bit 1 - ALM Bit 0 - TM Octet 2 Bit 7 - not used Bit 6 - not used Bit 5 - not used Bit 4 - not used Bit 3 - NORM L2 Bit 2 - ES L2 Bit 1 - NORM L1 Bit 0 - ES L1	Returns a bit wise snapshot of the front panel LED status.
V54 Config	Integer	Read-write	Inhibit (1) Enabled (2)	Enables the unit to recognize a V.54 pattern
FP RDL Config	Integer	Read-write	EOC (1) V54 (2)	Determines the means for initiating an RDL test when the front panel RL switch is engaged.
RL Timeout	Integer	Read-write	None (1) 10 mins (20)	Determines whether a V.54 initiated loopback is automatically terminated after 10 minutes. When set to None (1), loopback stays engaged until deactivated.

Table 3-11 DTE Configuration

MIB Object	Syntax	Access	Enumeration	Description
DTE Configuration Index	SC instance	Read-only		Identifies the interface where this entry is applicable. SC instance defines the slot, line, drop, and interface.
DTE CTS Mode	Integer	Read-write	Forced ON (1) ON with RTS (2)	Controls the function of CTS.
DTE Data Rate	Integer	Read-write	(1..24)	This variable represents the DTE data rate in 64K increments.
DTE TX Clock Source	Integer	Read-write	External Timing (1) Internal Timing (2) Loop Timing (3)	Determines the source of the transmit clock. External timing indicates timing sourced from an external DTE clock. Internal timing indicates that an on-board clock source is used. Loop timing indicates that timing is recovered from the receive data stream.

Table 3-12 HDSL Diagnostics

MIB Object	Syntax	Access	Enumeration	Description
Diagnostic Index	SC instance	Read-only		Identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop. and sub-identifier, which is in this case, a network interface.
Loopback	Integer	Read-write	No Loopback (1) Line Loop (2)	Supports the action of a diagnostic loop at the point indicated.
BER Test	Integer	Read-write	Inhibit (1) Enable (2) Reset (3)	Supports the action of bit error rate test. When set to inhibit, no BERT test is in progress. When set to enable, BERT is in progress. When set to reset, diagnostic result error counts and intervals are set to zero.

Table 3-13 HDSL Diagnostic Results

MIB Object	Syntax	Access	Enumeration	Description
Diagnostic Results Index	SC instance	Read-only		Identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop. and sub-identifier, which is in this case, a network interface.
Test Execution Status	Integer	Read-only	In Sync (1) Not In Sync (2)	The current execution status of the diagnostic test. When set to In Sync, BERT test is in sync and BER rate is valid. When set in NOT IN Sync, BERT test is not in sync, and BER rate is not valid.
Diagnostic Result Error Counts	Integer	Read-only	(0..65535)	The results of the last diagnostic test. This can be the current test running or the last completed test. Note that the interpretation of these test results may be affected by the value of the Test Execution Status object.
Diagnostic Result Interval	Integer	Read-only	(0..65535)	This variable represents the BER test intervals. A time interval is defined as the time required for transmission of a block of bits.
V54 RDL Test	Integer	Read-only	Not in V54 Test (1) TX V54 Test (2)	Indicates whether the front panel RL button is selected and transmitting a V54 pattern.

Table 3-14 HDSL Performance

Current Performance				
MIB Object	**Syntax**	**Access**	**Enumeration**	**Description**
HDSL Current Index	SC instance	Read-only		Identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and interface, which in this case, can be a loop interface.
HDSL Current ESs	Gauge	Read-only		The number of errored seconds encountered by a loop interface in the current 15-minute interval.
HDSL Current SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop interface in the current 15-minute interval.
HDSL Current UASs	Gauge	Read-only		The number of unavailable seconds encountered by a loop interface in the current 15-minute interval.
HDSL Current FEBEs	Gauge	Read-only		The number of far end block errors encountered by a loop interface in the current 15-minute interval.
Interval Performance				
HDSL Interval Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop. and interface, which is in this case, a loop interface.
HDSL Interval Number	Integer	Read-only	(1..96)	A number between 1 and 96, where 1 is the most recently completed 15 minutes interval and 96 is the least recently completed 15 minutes interval (assuming that all 96 intervals are valid).
HDSL Interval ESs	Gauge	Read-only		The number of errored seconds encountered by a loop interface for the 15-minute interval.
HDSL Interval SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop interface for the 15-minute interval.
HDSL Interval UASs	Gauge	Read-only		The number of unavailable seconds encountered by a loop interface for the 15-minute interval.
HDSL Interval FEBEs	Gauge	Read-only		This variable represents the HDSL loops far end block errors for the 15-minute interval.

Total Performance				
MIB Object	**Syntax**	**Access**	**Enumeration**	**Description**
HDSL Total Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and interface, which in this case, can be a loop interface.
HDSL Total ESs	Gauge	Read-only		The number of errored seconds encountered by a loop interface in the previous 24-hour interval.
HDSL Total SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop interface in the previous 24-hour interval.
HDSL Total UASs	Gauge	Read-only		The number of unavailable seconds encountered by a loop interface in the previous 24-hour interval.
HDSL Total FEBEs	Gauge	Read-only		The number of far end block errors encountered by a loop interface in the previous 24-hour interval.

Table 3-15 Loop Performance Interval Maintenance

MIB Object	Syntax	Access	Enumeration	Description
HDSL Interval Maintenance Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and interface, which in this case, can be a loop interface.
HDSL Reset Intervals	Integer	Read-write	Normal (1) Reset (2)	This variable is used to reset loop performance intervals. When it is set to reset, the loop performance tables are set to zero.
HDSL Number of Valid Intervals	Integer	Read-only	(1..96)	This variable is used to read the number of intervals collected. Each interval is an increment of 15-minutes.
Reset Major Alarm	Integer	Read-write	Clear alarm(1) Normal alarm(2)	Resets the Major Alarm Threshold exceeded alarm. Normal Alarm value is read-only.
Reset Minor Alarm	Integer	Read-write	Clear alarm(1) Normal alarm(2)	Resets the Minor Alarm Threshold exceeded alarm. Normal Alarm value is read-only.

Table 3-16 HDSL Status

MIB Object	Syntax	Access	Enumeration	Description
HDSL Loop Status Line Index	SC instance	Read-only		This object identifies status parameters associated with the managed object.
HDSL Loop Startup	Integer	Read-write	Normal (1) Start (2) Cancel (3)	Supports the action of initializing HDSL loop startup sequence. When set to start, HDSL unit reinitialize the startup sequence. Set to cancel, the unit aborts the startup sequence. Normal, the unit operates normally.
HDSL Loop Tip and Ring Reversal Mode	Integer	Read-only	Normal (1) Reversed (2)	Signals the loop Tip and Ring status. When normal, the loop operates normally. When reversed, loop Tip and Ring have been reversed.
HDSL Loop Signal to Noise Margin	Integer	Read-only	(0..127)	Represents the loop signal to noise margin in dB units.
HDSL Loop SN Frac	Integer	Read-only	(0..5)	Used with the HDSL loops signal to noise margin variable in the following manner: 1. Only the values 0 and 5 are allowed. 2. The value of zero means HDSL loops signal to noise margin is a whole number. 3. The value of five means HDSL loop signal to noise margin is a real number and that 0.5 must be added to it.
HDSL Loop SN Atten Sense	Integer	Read-only	Positive (1) Negative (2)	Identifies the sense of the HDSL loop signal to noise margin variable.
HDSL Loop Pulse Atten	Integer	Read-only	(0..100)	Represents twice the HDSL loop pulse attenuation level in dB units.
HDSL Loop Pulse Atten Frac	Integer	Read-only	(0..5)	This variable is used with the HDSL loop pulse attenuation variable under the following conditions: 1. Only the values 0 and 5 are allowed. 2. The value of zero means HDSL loop pulse atten is a whole number. 3. The value of five means HDSL loop pulse atten is a real number and that 0.5 must be added to it.
HDSL Loop Gain	Integer	Read-only	Low (1) High (2) OK (3)	Represents the HDSL loop gain setting.
HDSL Loop Exchange	Integer	Read-only	Normal (1) Exchange (2)	This variable is used to represent the HDSL loop status. When set to normal, HDSL loops are correctly connected. Set to exchange, the HDSL loop has been interchanged.

Table 3-17 DTE Status (DTE Interface Only)

MIB Object	Syntax	Access	Enumeration	Description
DTE Status Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, and drop.
DTE DTR Status	Integer	Read-only	Off (1) On (2)	DTR EIA status indicator.
DTE DCD Status	Integer	Read-only	Off (1) On (2)	DCD EIA status indicator.
DTE RTS Status	Integer	Read-only	Off (1) On (2)	RTS EIA status indicator.

Table 3-18 Alarm Threshold Configuration

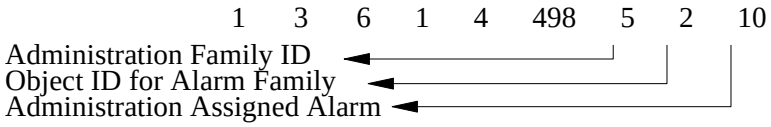
MIB Object	Syntax	Access	Enumeration	Description
Alarm Configuration Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop, and sub-identifier, which is in this case, a network interface, including Loop 1 and Loop 2.
Alarm Configuration Identifier	Object Identifier	Read-only		The unique alarm identifier assigned to this alarm type. The format of this identifier is an Object Identifier that has the following format: {iso (1) org (3) dod (6) internet (1) private (4) enterprises (1) gdc (498) xxx (x) alarm (z) yyy (y) where xxx (x) is the administratively assigned family object identifier, (z) is the object identifier for alarms in the family defined MIB, and yyy (y) is the administratively assigned alarm type identifier for this alarm. See example below.
				
Alarm Threshold	Integer	Read-write	thres1E04 (1) thres1E05 (2) thres1E06 (3) thres1E07 (4) thres1E08 (5) thres 1E09 (6)	Sets the Major or Minor alarm threshold criteria.

Table 3-19 HDSL Alarm Object Identifier Definitions

Alarm Name	Maskable ?	Applies To
HDSL No Response Alarm	No	Unit
HDSL Diagnostic Rx Error Alarm	No	Unit
HDSL Power Up Alarm	No	Unit
HDSL Unit Failure	No	Unit
HDSL Check Sum Corrupt	No	Unit
HDSL Loss of Signal	Yes	L1, L2
HDSL Unavailable Second	Yes	L1, L2
HDSL Errored Second	Yes	L1, L2
HDSL Loss of Sync Word	Yes	L1, L2

4 Tests

Overview

The activation of any loopback disrupts the flow of user's traffic.

The 731 displays the status of these tests through the indicators on the front panel. You may also use an ASCII terminal connected to the control port (CTRL) on the front panel, giving you many features for testing operation and pointing out potential problems. This chapter tells you how to manage the 731 system with this terminal and explains how to enable and disable the loopbacks.

Troubleshooting

- LEDs are Off:
  1. If all the LEDs are Off, verify that the fuse on the rear panel is good.
  2. If the terminal is working, check the status of Voltage 1, Voltage 2 on the View H/S Config screen of the terminal. If there is a problem, get repairs.
- Start Up Continuously Fails:
  1. If an HDSL red ES LED is continuously On during start-up, the card is not receiving a signal from the far end of its channel. If so, check the loop connections between the two cards (LTU and NTU).
  2. Make sure that one card is configured as LTU and the other as NTU.
  3. Check the status of the card in the View H/S Config screen.

Maintenance Menu

The Maintenance Menu is for maintenance and troubleshooting. To open the maintenance menu, select Item 3 on the main menu. *Figure 4-1 illustrates the Maintenance Menu.*

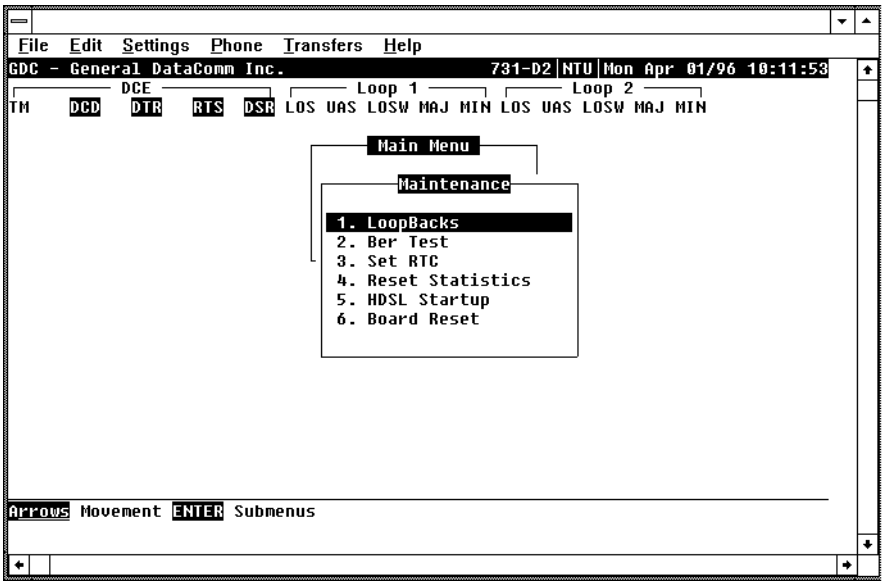


Figure 4-1 Maintenance Menu Screen

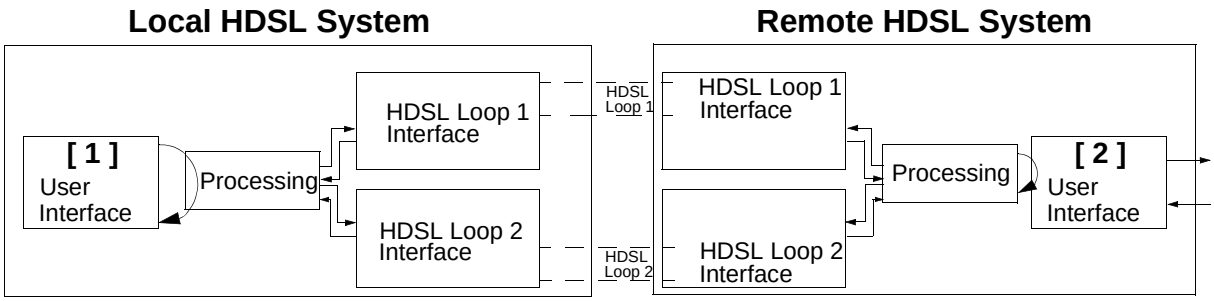
The functions available from the maintenance menu are as follows:

- Loopbacks
- BER Test
- Set RTC
- Reset Statistics
- HDSL Startup
- Board Reset

Loopback Test

The activation of any loopback disrupts the flow of user's traffic.

This function is used to enable/disable loopbacks on the your equipment interface and on the HDSL loops for doing maintenance. The HDSL systems offered by GDC provide three types of test loopbacks. *Figure 4-2* shows the simplified signal paths when the loopbacks are connected.



Local line loopback	**[1]**
Remote loopback	**[2]**

Figure 4-2 Loopbacks Signal Paths

Figure 4-3 shows a typical loopback setting screen for a HDSL system using a DTE interface.

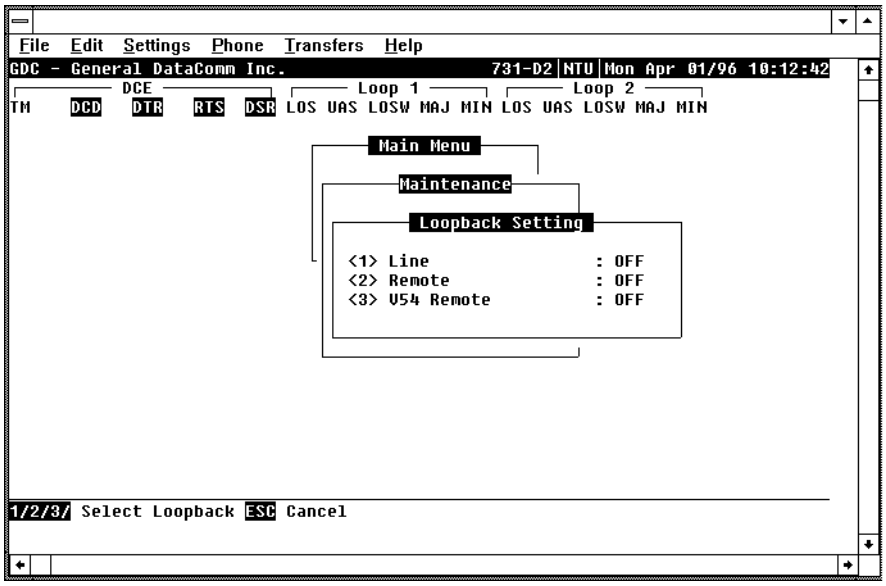


Figure 4-3 Loopback Screen

Operate Loopbacks

To access the Loopbacks function, select Item 1 on the Maintenance Menu. To change the loopback state:

1. Type the number of the line of the desired loopback. This toggles the selected loopback On and Off.
2. Highlight the desired option, and press Enter to send the command to the HDSL system. The option menu closes, and the new selection appears in the corresponding line.
3. To exit and return to the Maintenance Menu, press the Esc.

Loopback Testing via Front Panel

The 731 supports two types of loopbacks at the front panel:

LL - Local Loopback loops the data back towards the your equipment interface. Configure the unit for external timing. This activates the loopback.

RL - Remote Loopback signals the remote unit to loopback the data at your equipment interface. There are two types of remote loopbacks depending on the RL configuration (*See Configuration screen*). One is EOC remote loopback, which sends loopback information over the EOC channel, whereas the other is V.54 remote loopback, which sends an inband V.54 loopback code. This puts the remote circuit into loopback. If the EOC option is selected, the RL switch is functional, but only if the 731 is configured as a LTU. The forward signal for both of these loopbacks is transparent.

Loopback Testing via Maintenance Menu

You may also use an ASCII terminal connected to the Control Port (CTRL) on the front panel for testing operation and identifying trouble areas. You may use loopbacks to enable/disable loopbacks on the your equipment interface and on the HDSL loops for doing maintenance

The HDSL systems offered by GDC furnish you test loopbacks available from the optional terminal. *Figure 4-2* shows the simplified signal paths when the loopbacks are connected.

Line Loopback

The line loopback is generally used to test the connections between your local equipment and the HDSL system module.

When the line loopback is connected (On) (Loopback **[1]**, *Figure 4-2)*, the data signal received from the local user through the transmit line of the user equipment interface is returned on the receive line of that interface. Therefore, during normal operation the user equipment receives its own signal without errors. The user equipment transmit signal is transparent and thus is sent to the remote HDSL system, but the signal received from the remote HDSL system is blocked from the user equipment interface.

EOC Remote Loopback

The remote loopback is generally used to test the proper operation of one remote to another. Use it when in normal operation.

When you choose EOC remote loopback (Loopback **[2]**), *Figure 4-2)*, the initiating unit sends a loopback command via the HDSL EOC channel and turns on its TM LED. The far end unit responds by taking data received by the line and sending it back towards the line. When the loopback is engaged, you observe the return of error-free data. Transmit data, originating at the far end user equipment, is blocked.

V.54 Remote Loopback

The remote loopback is generally used to test the proper operation of one remote to another. Use it when in normal operation.

When you choose remote V.54 loopback (Loopback **[2]**), *Figure 4-2)*, the initiating unit sends V.54 inband code to the other remote unit. As soon as it gets an acknowledgment, the initiating unit turns its TM LED On to tell you that the far-end unit is in the loopback mode. When the loopback is engaged, you observe the return of error-free data. Transmit data, originating at the far end user equipment, is blocked.

If the other unit doesn't acknowledge the V.54 inband loopback code, or there is an error in sending the acknowledgment, the initiating unit continues sending V.54 inband code and blocks data until you get a correct acknowledgment, or until the loopback command is terminated.

Considerations in Test Loopbacks

Test loopbacks are designed to allow systematic testing of the signal paths along the link, starting from one end of the link (the local HDSL module). Most of the time, it is better to initiate the loopbacks from the side serving as the LTU, since this permits you to follow the signal path starting from the office and continue toward the end user. In addition, this maintains system timing. All test loopbacks are transparent.

Best testing order is to do Line loopback first, then the Remote.

BER Test

This screen is used to perform bit error measurements on an HDSL system module.

Method

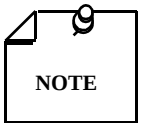
You do BER testing by repeatedly transmitting a pseudo test sequence having a length of 2^{-15}-1 bits, and then compare, with an error detector, the received sequence. Assume any difference is an error and is counted. For a good comparison, error counting is inhibited until the error detector becomes synchronized with the incoming sequence. During this synchronization, it is possible to see a burst of 255 errors.

During this testing, your traffic is disconnected. You may do BER tests in an end-to-end mode which requires both LTU and NTU BER testers to be on. If testing is initiated at one end, you must connect a loopback along the signal path. The loopback can be a physical connection made somewhere along the signal path, or a test loopback activated at the desired location as described under *Loopbacks*. Or, you can connect an external BERT to the remote unit to facilitate testing.

The measurement is carried out over discrete intervals (an interval corresponds to the time required for a transmission block of 2^{21} bits). Errors counted in each interval can be up to 255. If the actual number of errors in a given interval is higher, this maximum count is part of the BER calculation. The calculated BER is updated at the end of each interval.

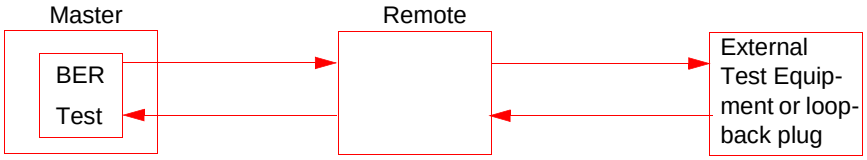
The bit error rate test is done over individual HDSL loops or over the entire HDSL bandwidth. (Only one BERT test can be active at a time). For the point-to-point mode of operation, the BER test is done only over all loops; for point-to-multipoint, you can do the BERT test on individual loops.

BER testing is handled through the GDC UAS Controller, supervisory terminal port or front panel switch. The front panel LED TM is on when you start the BER test. When the error detection is in sync and detects no errors, the TM LED is on and not blinking. But when the error detector is not in sync or detects some errors, the TM LED blinks. The TM LED does not blink if the data detected is all 1s or all 0s.

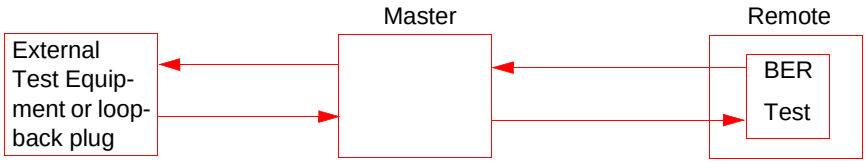


The internal BER test pattern generates data which is inverted relative to test equipment connected at the remote user-equipment interface.

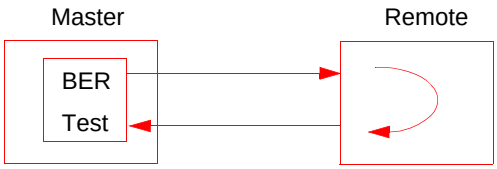
Test Configuration Notes



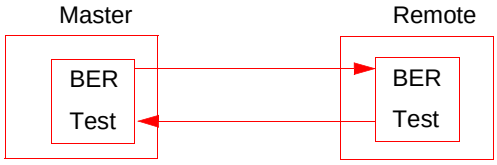
Master Self-Test:
(1) At the remote unit, attach external test equipment configured with test pattern 2^{15} and with data inverted. (A loopback plug may be used in place of test equipment.) (2) Enable Master BER test for all loops. (3) Proper operation is indicated by SYNC status and no errors.



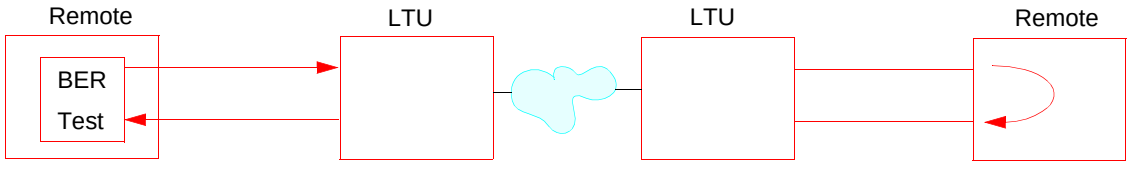
Remote Self-Test:
(1) At the Master unit, attach external test equipment configured with test pattern 2^{15} and with data inverted. (A loopback plug may be used in place of test equipment.) (2) Enable Remote BER test for all loops. (3) Proper operation is indicated by SYNC status and no errors.



Self-Test with Remote Loopback:
(1) Enable Master BER test for all loops and with Remote Loopback. (2) Proper operation is indicated by SYNC status and no errors.



End-to-End Self-Test:
(1) Enable BER test for all loops on both Master and Remote units. (2) Proper operation is indicated by SYNC status and no errors.



Remote Self-Test with V.54 RDL:
This test can be initiated only from the front panel or supervisory terminal. Both remote units must be 731 units. The LTU units must have V.54 detection disabled, if supported. (1) Enable BER test on one end for all loops and with V.54 Remote Loopback. (2) Proper operation is indicated by SYNC status and no errors.

BER Screen Description

A typical screen for BER testing is shown in *Figure 4-4.*

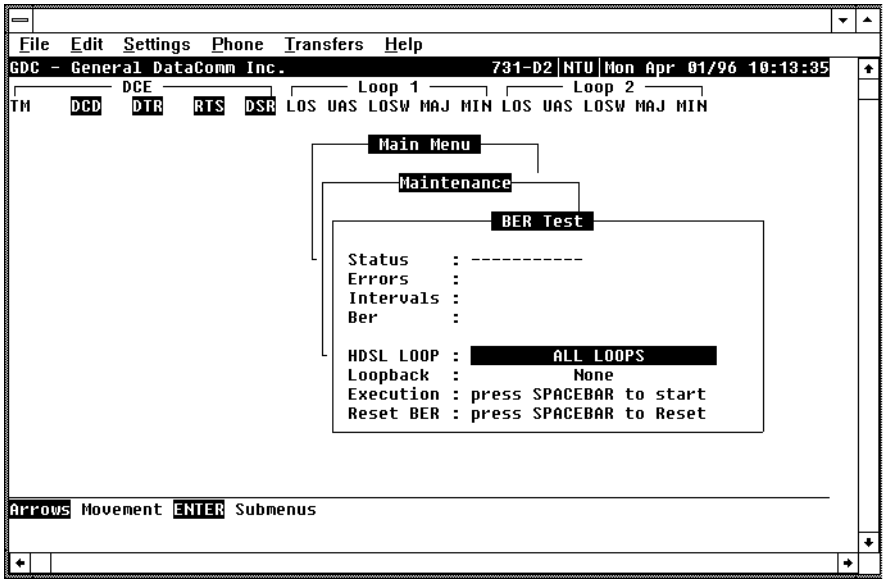


Figure 4-4 BER Test Screen

The dialog box used to control BER testing has two areas:

- Top is for displaying BER results.
- Bottom is to select the desired HDSL loop you want to perform the test on and to start/stop BER measurement.

The fields of the BER Test dialog box are described in *Table 4-2.*

Table 4-2 BER Test Screen Fields

Status	Displays the current status of the error detector: Sync - The error detector is synchronized, and the BER measurement is possible. Out-of-Sync: Error detector is not synchronized and BER measurement is inhibited.
Errors	Displays the number of accumulated errors.
Intervals	Displays the number of measurement intervals up to this point.
BER	Displays the BER calculated up to this point.
HDSL Loop	Displays the HDSl loop to be tested. Each individual loop or all loops as an aggregate may be selected.
Loopback	Displays the current state of the loopback activated for the purpose of the BER test: None - No loopback has been activated. In this case, an external loopback, e.g., a physical loopback connection, must be connected before starting the BER test. Remote - Remote loopback is activated for the BER test.
Execution	Displays the next state of BER measurement: `Press SPACEBAR to start` while BER measurement is disabled. `Press SPACEBAR to stop` while BER measurement is enabled.
Reset BER	Displays the command to Reset Errors, Intervals, and BER.

Operation

1. To display the BER TEST screen, select Item 2 on the Maintenance Menu.
2. Select desired HDSL loop you want to perform test on, by moving the selection block to HDSL loop field. Press the space bar to choose the desired HDSL loop.
3. Make sure a loopback is activated. If the Loopback field displays None and no external loopback is currently connected, change the state of the loopback used for BER measurement. Move the selection block to the Loopback line and press the space bar.

To enable/disable BER testing:

1. To start the BER measurement, move the selection block to the Execution field and press the space bar. The Execution field now shows `Stop`.
2. To stop the BER measurement, move the selection block to the Execution line and press the space bar. The Execution field now shows `press spacebar` to start

To exit and return to the maintenance menu, make sure that BER testing has been disabled, and then press the `ESC` key.

NOTE

You cannot exit the BER TEST screen while a BER test is running.

When you start or stop the BER test on one of the HDSL loops, the other loop(s) sees bursted errors on its data.

The BER test detector synchronizes and shows error-free for all 1s and all 0s pattern.

Set RTC

The Set RTC option lets you set the real-time clock of the 731. A typical screen is shown in *Figure 4-5*.

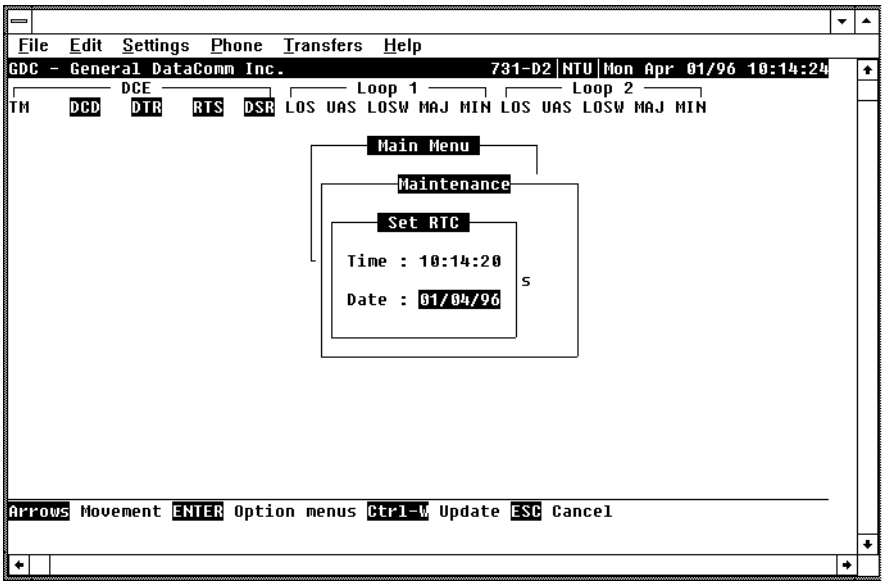


Figure 4-5 Set RTC Screen

The screen includes two fields described in *Table 4-3*.

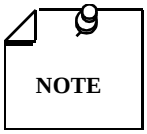
Table 4-3 Set RTC Screen Fields

`Time`	Displays the time in 24-hr military format showing hours:minutes:seconds retrieved from the 731 at the time the screen is opened.
`Date`	Displays the date (day/month/year) retrieved from the 731 at the time the screen is opened.

Operation

To change the current time or date:

1. Move the selection block to the desired line and press `Enter`.
2. Type the new time or date in the format seen on the screen, then press `Enter`. The option menu closes, and the new time and/or date appears in the corresponding line.
3. To save changes, press `Ctrl-W`.
4. To quit and cancel the changes made in this screen, press `Esc` without pressing `Ctrl-W`.
5. To exit and return to the maintenance menu, press the `Esc`.



The 731 internal time is updated at the instant you press CTRL-W.

Reset Statistic

The `Reset Statistics` option resets all the performance statistics entries of the 731.

Operation

To instruct the 731 to reset all the performance statistics counters:

1. Select Item 4 on the Maintenance Menu. You see a dialog box with two options: `Yes` and `No`.
2. To reset the statistics, move the selection block to `Yes`, and press `Enter`.
3. To exit without resetting press `Esc`, or move the selection block to `No` and press `Enter`.

HDSL Start-Up

This option is used to manually activate the 731 HDSL loops start-up. Normally this process is automatically performed upon link initialization and whenever the synchronization between two linked 731 units is lost.

The activation of this function disrupts the transfer of data through the link for a short time.

To instruct the 731 to go through start-up, select Item 5 on the Maintenance Menu.

731 Board Reset

To reset the 731, select Item 6 on the Maintenance Menu. After a few seconds, the opening screen appears. The unit goes through its start-up routine and displays the Main Menu screen.

The activation of this function disrupts the transfer of data through the link for a short time.

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General DataComm