GDC 073R119-000
Issue 2, May 1997

Installation and Operation

Universal Access System 710-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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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.

FCC Part 68 Compliance

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

All connections to the telephone network must be made using standard plugs and telephone company provided jacks or equivalent. Connection of this equipment to party lines and coin telephones is prohibited. A label on the back of the front panel of data communications equipment and on the underside or rear panel of other equipment provides the FCC Registration number and the Ringer Equivalence Number (REN) for the unit. If requested, give this information to the telephone company.

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

Canada DOC Notification

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas. *Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.*

Deutschland

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

Registration Status	Port ID	SOC	FIC	USOC

Preface

Scope

This manual describes how to install and configure a UAS (Universal Access System) 710-D2 and explains how to monitor and manage this device. This documentation is written for operators and installers, and assumes a working knowledge of data communications equipment.

Organization

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

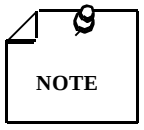
- *Chapter 1 - System Description* introduces important concepts and features of the SpectraComm 710-D2.
- *Chapter 2 - Installation* tells you how to install the UAS 710-D2. Only typical or fundamental applications are given because of the variety of specific customer system choices.
- *Chapter 3 - Operation* describes the front panels of the UAS 710-D2.
- *Chapter 4 - Tests* describes external tests.
- Chapter 5 - *Application Guide* describes timing options and sample applications.
- Appendices - *Appendices A*, *B*, and *C* cover technical characteristics, HDSL connector pin assignments, and interface signals.

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.

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

Related Publications

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

- *Operating and Installation Instructions for SpectraComm Shelf,* GDC 010R302-000
- *Operating and Installation Instructions for Universal Access System, SCM/HDSL Devices,* GDC 058R699-V100
- *Operating and Installation Instructions for SpectraComm Manager Card,* GDC 048R303-000

GDC publication numbers (e.g., *GDC 073R116-000*) 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

Line code for basic rate ISDN at the U reference point. 2B1Q (2 Binary 1 Quaternary) is a line encoding format that is supported on 2-wire interfaces.

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. (See Bit Error Rate.)

Bit Error Rate (BER)

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

Data Set Ready (DSR)

The data set is ready to accept data.

Diagnostics

Tests used to detect malfunctions in a system or component.

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 echoes back a received test message, after first decoding and then reencoding it, the results of which are compared with the original message.

DTE

Data Termination Equipment

E1

European telecommunications standard defined by CCITT standards G.703, G.704, and G.732.

HDSL

High-Bit-Rate Digital Subscriber Line.

Loopback

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

LTU

Line Terminating Unit

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

Any addressable location within a network capable of carrying a circuit.

NTU

Network Terminating Unit

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.

Simple Network Management Protocol (SNMP)

A request-response type of protocol that gathers management information from network devices. A de facto standard protocol for network management.

SpectraComm Manager (SCM)

A printed circuit card that is an SNMP proxy agent for network elements colocated with it in a SpectraComm Shelf and for remote network elements that communicate with them.

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.

Universal Access System (UAS)

The UAS is a family of network managed metallic loop transmission products. UAS is also used to represent **Unavailable Seconds**.

1 System Description

Overview

Designed to give you a connection between a **DTE** (Data Termination Equipment) interface and **HDSL** (High-Bit-Rate-Digital Subscriber Lines), the **UAS** (Universal Access System) **710-D2** operates as either an **LTU** (Line terminating Unit) or an **NTU** (Network Terminating Unit). As a Universal Access System rackmount, it is managed through a front panel supervisory terminal, hard switches, a shelf-resident **SCM** (SpectraComm Manager), and an associated **SNMP** (Simple Network Management Protocol) manager. The 710-D2 is offered as a two-HDSL loop device with a bandwidth of Nx64 Kbps for N = 1 to 32 and has a maximum data rate of 2048 Kbps.

Part numbers for standard and optional equipment for the 710-D2 are listed in Table 1-1. Technical Characteristics are listed in Appendix A.

Features

The UAS 710-D2 interfaces with your HDSL system and provides the following features:

- Configurable as either a Line Terminating Unit or Network Terminating Unit.
- Software configurable through front panel supervisory terminal. Hardware configurable via on board jumpers and switches.
- Full Network Management by means of the shelf resident SpectraComm Manager (SCM) and an associated SNMP manager.
- Operates on one or two HDSL loops. Supports Nx64 Kbps customer digital data rates selectable from N = 1 through 18 over one loop, N = 1 through 32 over two loops.
- V.35 DTE interface, EIA 530 (V.11) or X.21 optionally.
- Tx Clock modes for DTE interface include Looped, External, and Internal.
- Internal **BERT** [Bit Error Rate Test (or Tester)] capability. The **BER** (Bit Error Rate) is a percentage of received bits that are in error relative to a specific amount of received bits.
- Local **Loopback** and Remote **Digital Loopback** capabilities. A Loopback is a test message sent to a device being tested, which is then sent back to the originator and compared with the original transmission. A Digital Loopback tests the digital processing circuitry of a communications device; it may be initiated locally or remotely via a telecommunications circuit
- Supports V.54 inband loopback control.
- Reports major and minor BER alarms when HDSL loop BERs exceed predetermined thresholds.

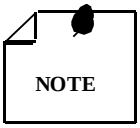
Applications

Point-to-Point

The 710-D2 has two point-to-point configurations (*See Figure 1-1)*: one with a bandwidth of Nx64 Kbps for N=1 to N=18 (one loop is enabled) and one with a bandwidth of Nx64 Kbps for N=1 to N=32 (two loops are enabled).

Fractional G.704 Service

This application provides for Fractional G.704 service. Bandwidth is 64 Kbps up to 2048 Kbps for the 710-D2. G.704 time slot allocation on the 700-G2 or 720-G2 is left justified for rates up to N=31 (1984 Kbps). If N=32 (2048 Kbps) is desired, the 700-G2 or 720-G2 must be configured in unframed mode.



Other applications may be found in Chapter 5 of this manual.

Diagnostics/Network Management

Diagnostics are used to detect malfunctions in a system or component. Operation and parameters are controlled by switches and jumpers mounted on the printed circuit card. A front panel **terminal** (point in a network at which data can enter or leave) interface jack labeled `CTRL` is also offered on the 710. This terminal interface enables 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 2, Installation*.

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. Full network management capabilities are achieved using the SCM and its interface to a UNIX-based workstation or a PC-based SNMP controller.

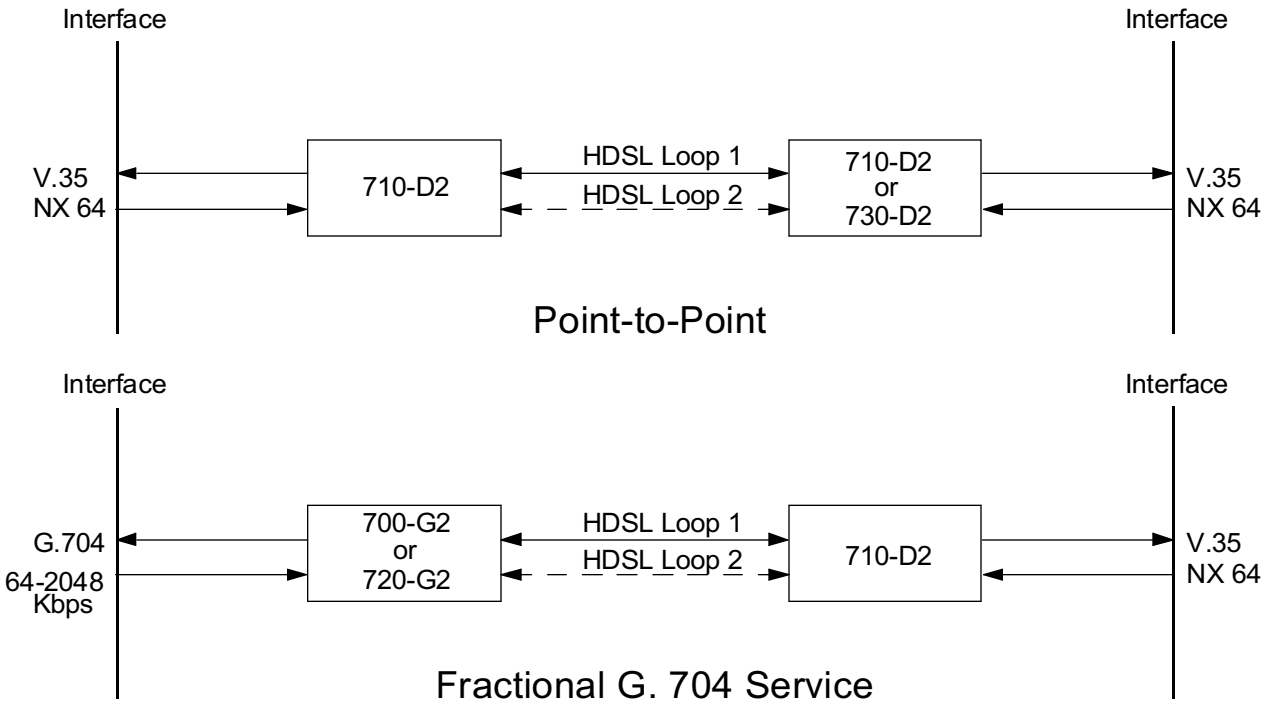


Figure 1-1 Typical UAS 710-D2 Applications

Table 1-1 Equipment List

Description	Part No.
UAS 710-D2 (rackmount)	073P215-001
UAS 710-D2 (rackmount - X.21)	073M215-011
UAS 710-D2 (rackmount - 530)	073M215-021
Cables	
Interface cable RJ48C plug to 9-pin female (HDSL CTRL port to terminal connection)	027H250-010
Interface cable, 50-pin Amp connector to six 8-position modular jacks (Each cable can support up to six cards.)	024H608-002
Cable assembly, DB-25M to V.35F	027H572-001
Cable assembly, V.35 straight-through M/F	027H553-xxx
Cable assembly V.35 straight-through M/M	027H570-xxx
Adapter cable 37-pin female to 25-pin male (use with customer provided cable for RS-449 equipment and SC 710 equipped with EIA-530 Channel Interface Card.)	027H501-001
Cable assembly DB-25M to DB-15F X.21 Adapter	027H436-001
Adapter Cable 37-pin male to 25-pin male (use with customer provided cable for RS449 equipment and SC 710 equipped with EIA 530 Channel Interface Card.)	023H603-xxx

Table 1-1 Equipment List (Cont.)

Enclosure/Shelves	Part No.
SpectraComm Shelf MS-2 Model 2 (-48 Vdc) (Includes two 8-slot, dual RJ45 Zone 1 connector panels)	010M055-001
SpectraComm Shelf MS-2 Model 1 (100/120 Vac) (Includes two 8-slot, dual RJ45 Zone 1 connector panels)	010M054-001
SpectraComm Shelf MS-2 Model 3 (220/240 Vac, International) (Includes two 8-slot, dual RJ45 Zone 1 connector panels)	010M056-001

Summary

The UAS 710-D2 is designed to give you a connection between a DTE interface and High-Bit-Rate-Digital Subscriber Lines (HDSL), operating as either an LTU or an NTU. As a Universal Access System rackmount, it is managed through a front panel supervisory terminal, hard switches, a shelf-resident SCM, and an associated SNMP manager. The 710-D2 is offered as a two-HDSL loop device with a bandwidth of Nx64 Kbps for N = 1 to 32 and has a maximum data rate of 2048 Kbps.

What's Next?

Chapter 2 guides you through the process of installing and using the 710-D2 in your communications network.

2 Installation

Overview

This chapter guides you through the process of installing and using the 710-D2 in your communications network. If this is your first experience using this unit, review *Chapter 1* to ensure that you understand the key features and the process of installing and using the unit in your network.

Unpacking and Handling

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

Installation

1. Install the 710-D2 in the SpectraComm shelf. All electrical connections are made through the backplane interface.
2. Place the unit in a ventilated area where the ambient temperature does not exceed 122°F (50°C).
3. Do not install the unit directly above equipment that generates a large amount of heat (such as power supplies).

Shelf

To install the SpectraComm Shelf, refer to *Operating and Installation Instructions for SpectraComm Shelf, GDC 010R302-000*.

Install shelves and power supplies as described in the SpectraComm Shelf manual. Failure to do so may result in overheating and subsequent power supply shutdown.

Module

You can install the modules in any unused slot in the shelf that has the Zone 1 connectors required for the network. To install:

1. With the GDC logo on top, insert the module into its slot and slide it in until it makes contact.
2. Pull down the ejector tab and firmly push the module in until it seats in the rear connectors.

Setting Hard Options

Setting the hard options on the SpectraComm 710 basecard means adjusting configuration switches and jumpers to match your network operation. *Table 2-1* explains the functions of the switches and jumpers and *Figure 2-1* shows their location. The hard configuration option is selected by switch S34-1.

NOTE

The microprocessor in the SpectraComm 710 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 that 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.

Make these adjustments only once, when first installing the unit. Do not 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 (SOFT)	Off = Soft - Allows 710-D2 configuration control through the terminal or a GDC SNMP managed UAS.
	On = Hard - Allows 710-D2 configuration through dip-switch settings.
S34-2 (NLP0) S34-3 (NLP1)	Allows a 710-D2 to operate over 1 or 2 HDSL loops: **NLP0** **NLP1** S34-2 S34-3 On Off HDSL Loops 1 and 2 Enabled Off On HDSL Loop 1 Enabled Off Off HDSL Loops 1 and 2 Enabled On On HDSL Loop 1 and 2 Enabled
S34-4 (NTU)	Off = NTU - The 710-D2 operates as a network termination unit, located on the user side. On = LTU - The 710-D2 operates as a line termination unit located on the central office side. In this mode the 710-D2 serves as the master unit with respect to timing and supervision of the NTU.
S34-5, 6 (Spare)	Future use.
S34-7 (CCK0) S34-8 (CCK1)	Selects timing: **CCK1** **CCK20** S34-8 S34-7 Off "don't care" Looped: The DCE transmit clock is locked to the DCE receive clock and is developed from the incoming HDSL timing. On Off Internal: The DCE transmit clock is derived from the internal clock oscillator of the 710-D2. On On External: The DCE uses an external transmit clock provided by the customer's DTE. When external timing is selected on the LTU 710, the appropriate timing option needs to be set for the DTE. The DTE must provide timing to the Chnl Ext Clk lead.

Table 2-1 Option Selection (Cont.)

Switches	Description
S35-1 — 4 (Spare)	Future use.
S35-5 (V.54)	Off - Unit acknowledges V.54 inband loopback code. On - Unit does not acknowledge V.54 loopback code.
S35-6 (RLTM)	On - No RL timeout. Off -10-minute RL timeout.
S35-7 (CTS0) S35-8 (CTS1)	**CTS0** **CTS1** S35-7 S35-8 Off On CTS on if HDSL is operating normally On Off CTS tracks RTS Off Off CTS on if HDSL is operating normally On On CTS on if HDSL is operating normally
S36-1 — S36-6 (CKS, 1— 6)	See *Table 2-1* on next page.
S36-7, 8 (Spare)	Future use.
Jumpers	**Description**
X2, X3	Must be installed.
X5	Must be installed.
X6	Must be installed in the 2-3 position for the 073P215 (V.35 I/F). For the 073M215-011 (X.21 I/F) and 073M215-021 (530 I/F) units, X700 must be installed in the 1-2 position.

Table 2-1 Option Selection (Cont.)

Data Rate (X64 Kbps)	S36-6	S36-5	S36-4	S36-3	S36-2	S36-1
32	Off	Off	Off	Off	Off	Off
32	Off	On	On	On	On	On
31	On	Off	Off	Off	Off	Off
30	On	Off	Off	Off	Off	On
29	On	Off	Off	Off	On	Off
28	On	Off	Off	Off	On	On
27	On	Off	Off	On	Off	Off
26	On	Off	Off	On	Off	On
25	On	Off	Off	On	On	Off
24	On	Off	Off	On	On	On
23	On	Off	On	Off	Off	Off
22	On	Off	On	Off	Off	On
21	On	Off	On	Off	On	Off
20	On	Off	On	Off	On	On
19	On	Off	On	On	Off	Off
18	On	Off	On	On	Off	On
17	On	Off	On	On	On	Off
16	On	Off	On	On	On	On
15	On	On	Off	Off	Off	Off
14	On	On	Off	Off	Off	On
13	On	On	Off	Off	On	Off
12	On	On	Off	Off	On	On
11	On	On	Off	On	Off	Off
10	On	On	Off	On	Off	On
9	On	On	Off	On	On	Off
8	On	On	Off	On	On	On
7	On	On	On	Off	Off	Off
6	On	On	On	Off	Off	On
5	On	On	On	Off	On	Off
4	On	On	On	Off	On	On
3	On	On	On	On	Off	Off
2	On	On	On	On	Off	On
1	On	On	On	On	On	Off
0	On	On	On	On	On	On

EIA-530 or X.21 Interface Card

The optional EIA-530 or X.21 Interface Card provides these interfaces for the DTE. They are available factory installed, or as a field upgrade kit. They plug into the base card illustrated in *Figure 2-1*. (You can also remove the card (s), place jumpers on XA1J2 and XA1J3, and move jumper X6 to make the base card 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. *Appendix C* describes the signals exchanged through the business equipment interface. Optional transmit signal timing, X.21 Interface Card jumper position BT, (Byte Timing) is not supported.

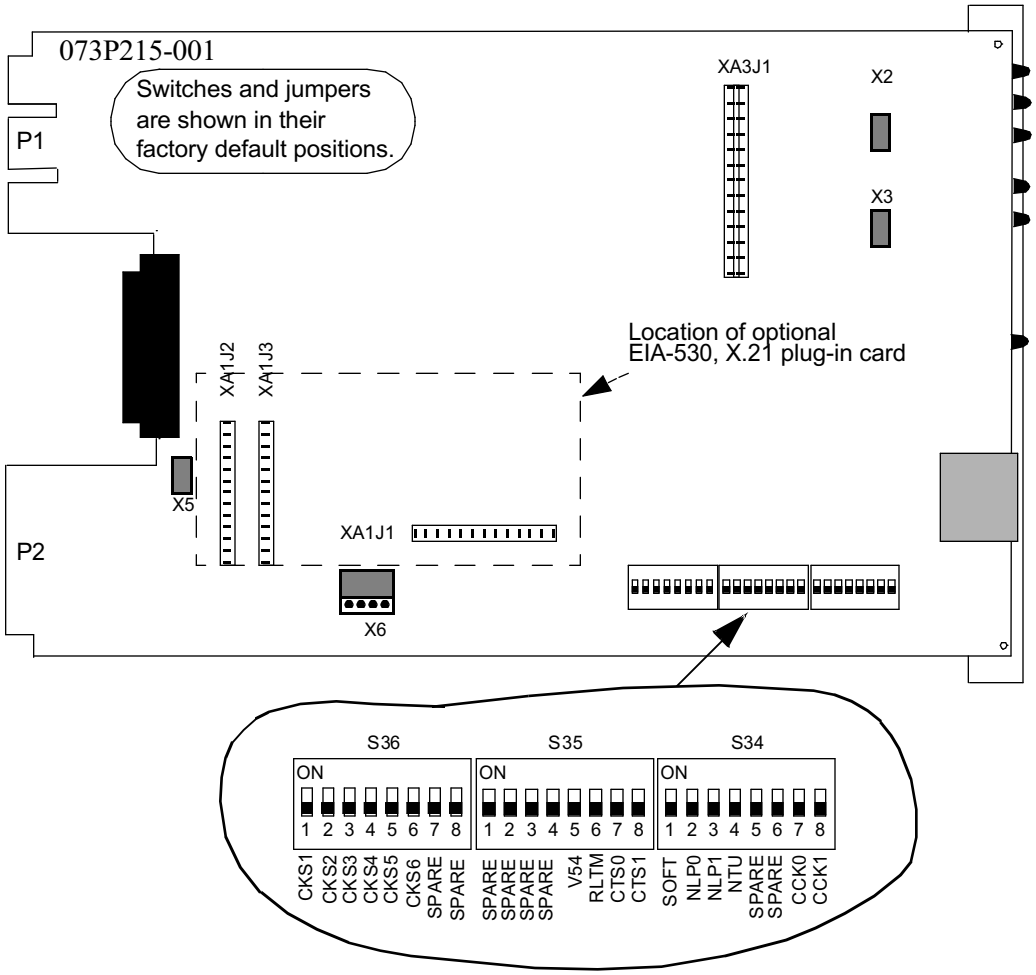


Figure 2-1 Option Switch and Jumper Locations

Electrical Lines

The following paragraphs describe the power and line connections to the 710-D2.

NOTE

Before you power the unit up, check that the edge connectors on the rear panel of the card are inserted firmly in their receptacles, which are mounted on the rear panel of the SpectraComm shelf, shown in Figure 2-2.

Power

The 710-D2 gets it power directly from the SpectraComm shelf.

Communications

See Figure 2-2 for instructions.

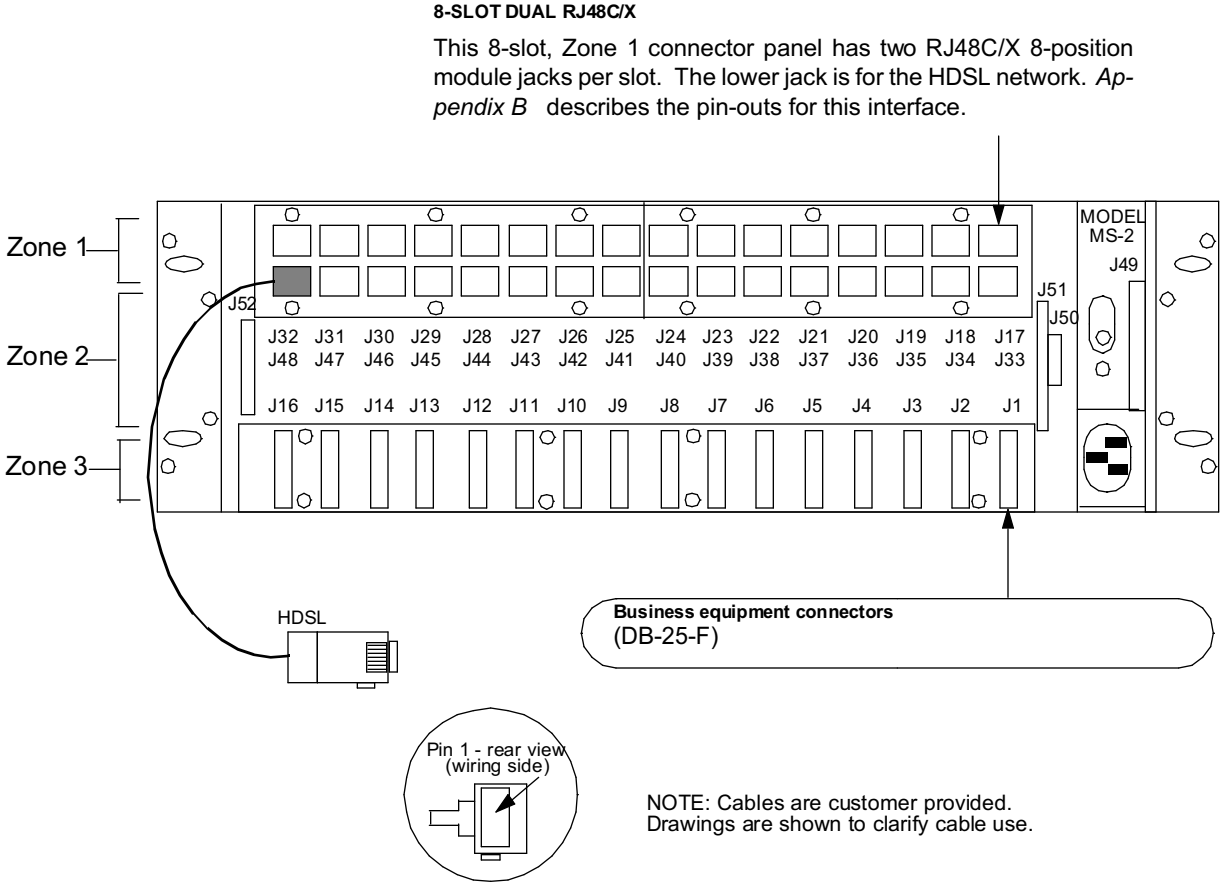


Figure 2-2 Rear Panel SpectraComm Shelf

Preoperational Configuration Setup

Hard

Configure the unit as follows:

1. On the basecard, verify that jumpers X2, X3, and X5 are installed.
2. Check that X6 is installed in the proper position, based on *Table 2-1*.
3. Check that the card is configured as an LTU or NTU based upon *Table 2-1*.
4. Set the remaining switches and jumpers according to *Table 2-1* and *Figure 2-1*. 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 Preoperational Configuration Setup Soft*.
5. Connect the DTE interface and HDSL loops to the network connectors on the rear panel of the shelf.
6. Insert the card (NTU or LTU) into a previously powered-up SpectraComm shelf. The card automatically performs internal self-tests.
7. Follow *Step 4* under Setup (Soft).

Soft

1. Follow Steps 1 through 6 above.
2. Connect a terminal to the CTRL connector on the front panel.
3. To view the test results on the terminal, go to the View H/S Config Screen on the terminal. Refer to *Chapter 3*, *Soft Option Selection* for details in configuring the unit using the supervisory terminal.
4. After performing the self-tests, the HDSL loops (LTU and NTU) initiate start-up, and the HDSL green LEDs should blink. The start-up should last less than 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 blinks until all HDSL status indicators clear.
5. 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*.

Summary

In this chapter we covered the installation and optioning of the 710-D2. We also went through the use of the 710-D2 in your communications network.

What's Next?

Chapter 3 covers the operation of the 710-D2.

3 Operation

Overview

Figure 3-1 illustrates the 710-D2 front panel and explains the function of each control and indicator. Check the operation of the unit by monitoring the front panel indicators and using the test procedures provided in *Chapter 4*. Unit configurations for typical applications are in *Chapter 5*. Once the options are set and the communication line properly connected, the units need no additional operator commands. The units are transparent to your network and communicate automatically with each other and with your connected network devices.

Front Panel

Red LEDs indicate critical or major failure, or error; green LEDs indicate a satisfactory or complete operation. From these data path indicators, you can monitor three data streams:

- HDSL Loop 1 input
- HDSL Loop 2 input
- DTE Interface

Two indicators are used for each HDSL data stream such that a green LED means `NORM` and denotes system status; a red LED means `ES` and indicates data transport status. Each LED can be in one of three states: On, blinking, or Off, (Blinking is at a 2-Hz rate). *Table 3-1* summarizes the operation of the `ES` and `NORM` indicators.

Table 3-1 Front Panel Indicators

HDSL Indicators		
ES	**NORM**	**Indication**
Off	On	Normal operation
On	Off	LOS/LOSW
On (for .5 sec.)	On	ES - Errored second
On	Blink	Start-up in progress. No response received from mating unit.
Off	Blink	Start-up in progress. Signal from mating unit has been received.

Four LEDs are available to indicate transmit and receive data at the customer DTE interface, and the state of the request-to-send and carrier-detect control lines. You have three more indicators on the front panel:

- `On` - Illuminated when +5V is applied to the card.
- `ALM` - Indicates if a Major Alarm is present. 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.

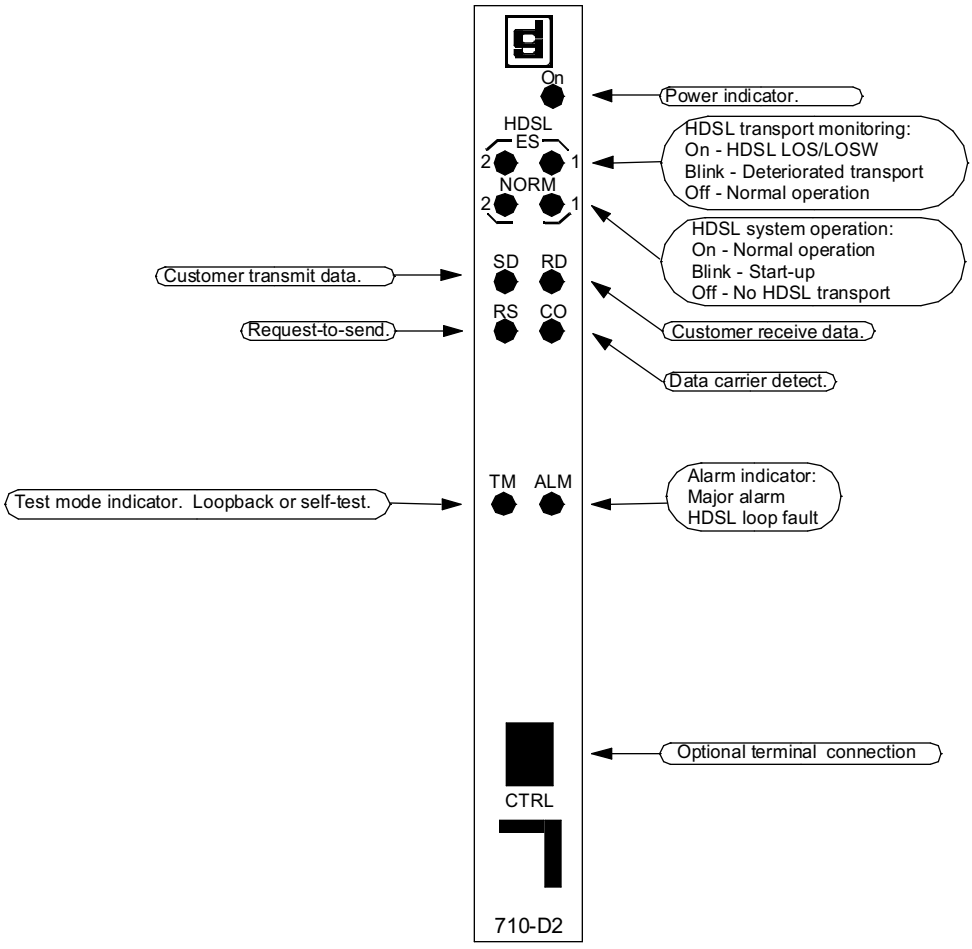


Figure 3-1 Front Panel

Soft Option Selection

You can use an optional terminal (a standard ASCII terminal equipped with an EIA/TIA-232-E communication interface) connected to the Control (CTRL) jack on the front panel for configuration and control of the 710.

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 710 operation. The following screens were derived by plugging the COMM port of a PC (using Microsoft Windows™ terminal emulator program) into the 710 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, 1 stop bit, handshake = none
- The software necessary to run the 710 supervision program is contained in the 710.

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 below:

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

A GDC cable is available for use with this control port (*Refer to Table 1-1*.).

Startup Procedure

A management session automatically starts as soon as the terminal cable is connected to the CTRL port of an operating 710. To end an ongoing management session, disconnect the terminal from the 710. Upon power-up, the 710 sends the opening screen, showed in *Figure 3-2*, followed by the main menu.

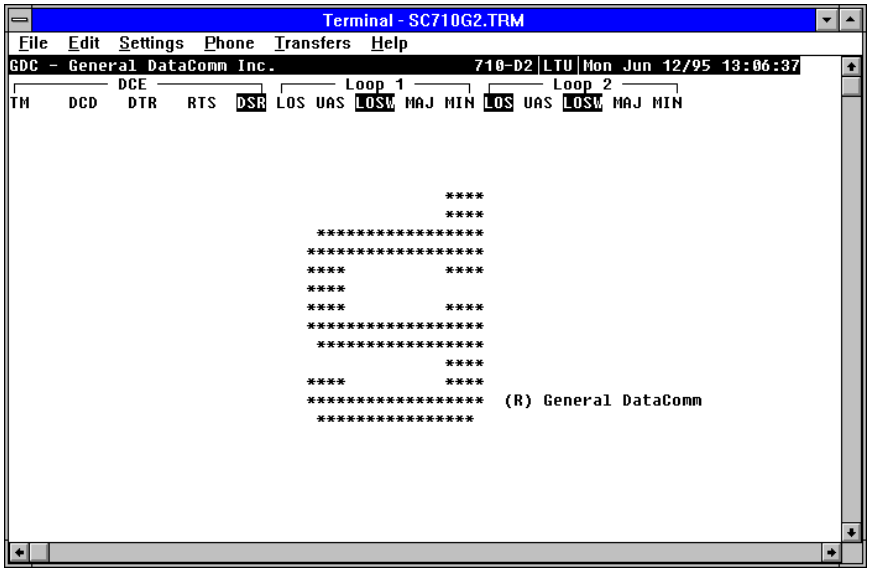


Figure 3-2 Opening Screen

Screen Organization

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

Table 3-2 Terminal Screen Organization

Field	Description
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 710.
Status Line	Located below the header, the status line includes two main fields, which display the status of the various 710 alarms and status signals. Active alarm and status indicators are displayed in reverse video.
DCE Field	Includes the following indications: TM, DCD, DTR, RTS, DSR
Loop 1, 2 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 - Selected major alarm bit error rate threshold has been exceeded. Used to estimate the BER of an individual 1168 Kbps HDSL loop. MIN - Selected minor alarm bit error rate threshold has been exceeded. Used to estimate the BER of an individual 1168 Kbps HDSL loop.
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 Procedures

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

Menu Selection

You can select a menu item in two ways:

1. Move the selected block to the desired item by means of the keyboard arrows, then press the `Enter` key.
2. Type the number appearing to the side of the menu item.

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

Field Navigation

To move forward among the fields of a dialog box, press the Down arrow key (↓). 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; press `Enter` to display an option menu with the available values.
2. Highlight the desired value; press `Enter` to select the new value and close the option menu.
3. For free-text fields, bring the cursor to the desired field and type in the desired value.

   You can use the `Backspace` and `Delete` keys to make changes or correct errors. When done, press `Enter`.

Restoring Default Values

When the 710 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 three options, described in the following paragraphs.

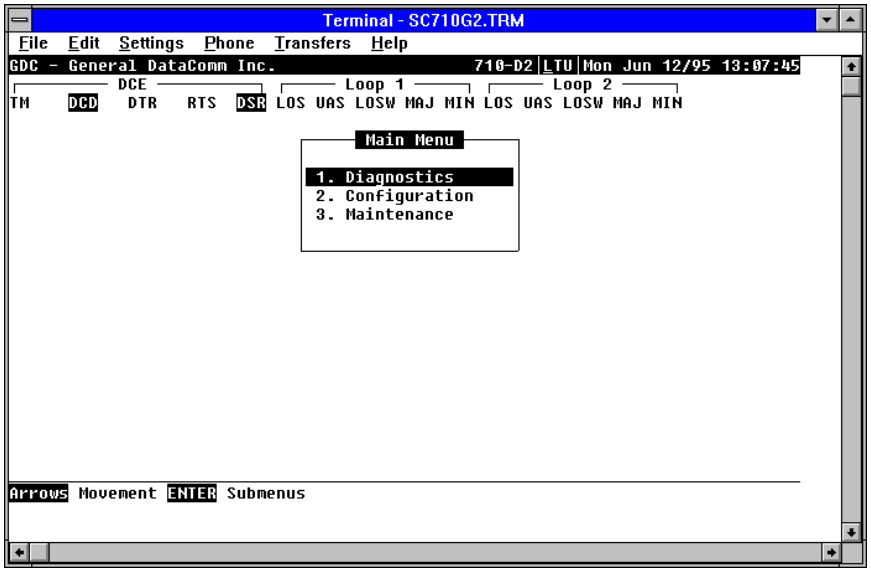


Figure 3-3 Main Menu

Diagnostics

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, etc.
- Cancel the start-up process.

Configuration

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 major and minor alarm thresholds.
- Display and modify the interface configuration, TX Clock mode, CTS mode, V.54 options, Remote Loopback time-out options, and Data Rate.
- Display system hardware and software data and 710 self-test results.

Maintenance

Use this option to perform maintenance activities, as follows:

- Enable both local and remote system loopbacks.
- Test system performance using the internal 710 BER meter.
- Set the real-time clock.
- Reset the statistics counters.
- Manually initiate the start-up process.
- Reset the 710. (Simulate a power-up.)

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

Diagnostic Menu

Use the diagnostic menu to display diagnostic information, and to activate diagnostic functions. See *Figure 3-4*. To open `Diagnostics`, select Item `1` on the `Main Menu`.

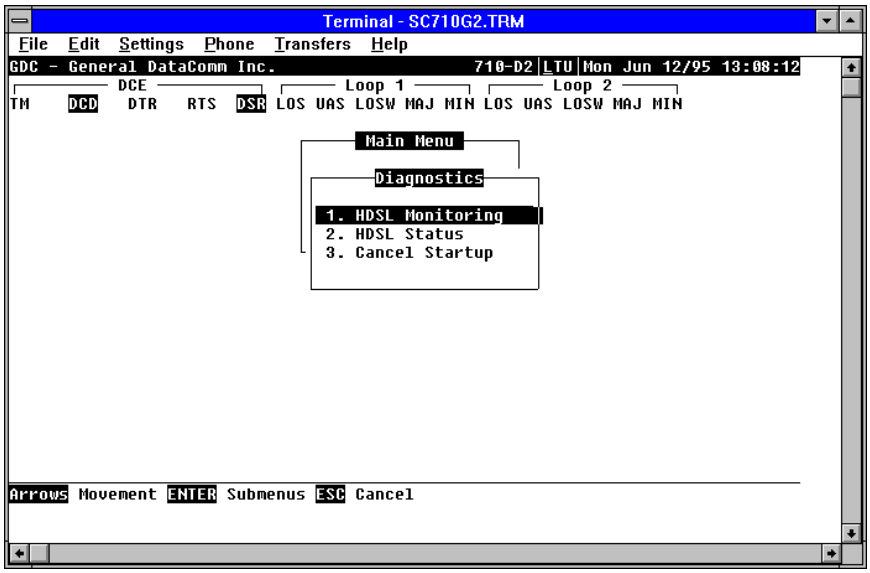


Figure 3-4 Diagnostic Menu

The functions available from the diagnostic menu are:

- `HDSL Monitoring`
- `HDSL Status`
- `Cancel Startup`

HDSL Monitoring

The HDSL Monitoring screen, *Figure 3-5*, displays 24-hour performance statistics on the HDSL loops. To display `HDSL Monitoring`, select Item `1` on the `Diagnostic` menu.

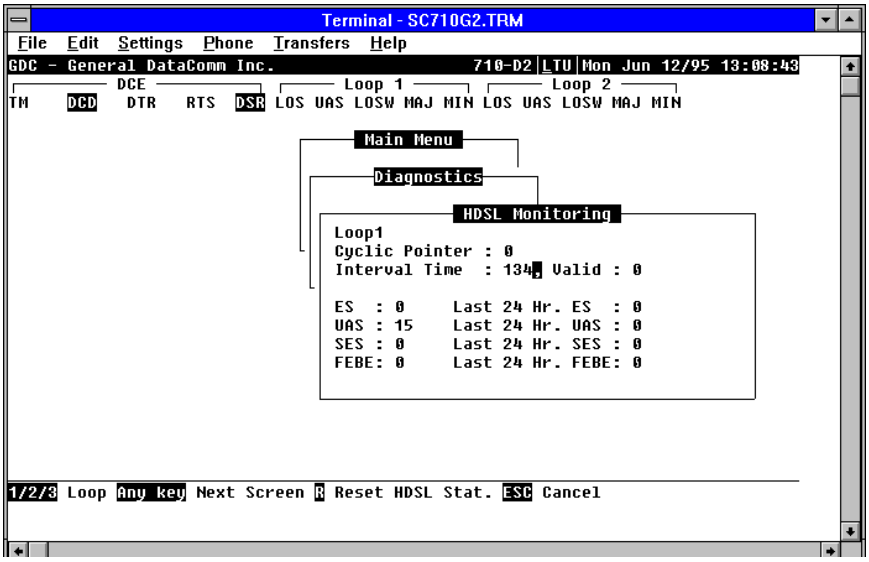


Figure 3-5 HDSL Monitoring Screen

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

Table 3-3 HDSL Monitoring Screen

Field	Description
`Cyclic Pointer`	Displays the number sequence of the current 15-minute interval within the current 24-hour interval. The range is 0 to 95. 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 710-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`, `3`, `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 `Esc`.

HDSL Status

The 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*.

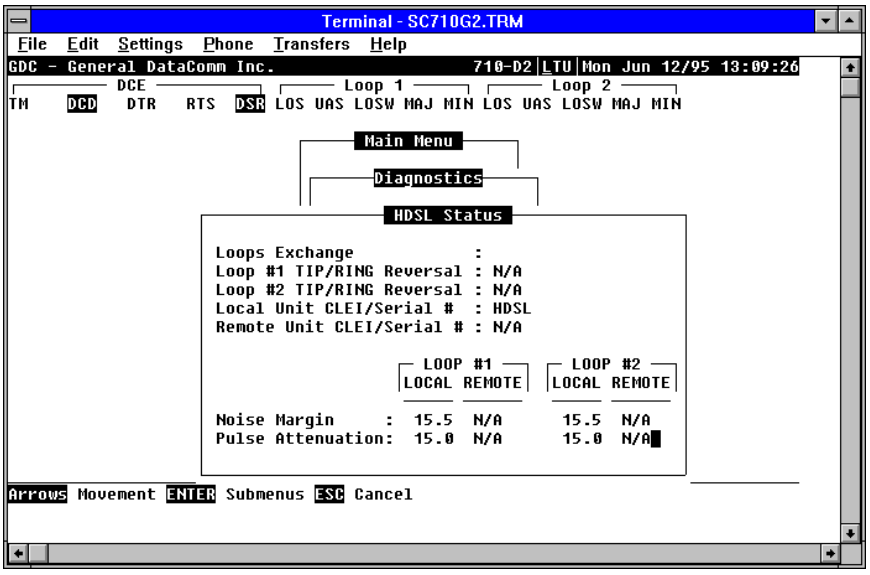


Figure 3-6 HDSL View Screen

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

Table 3-4 HDSL Status Screen Fields

Field	Description
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 with the remote unit. Not applicable if unit is configured as an LTU.
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.
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.
Local Unit CLEI/Serial #	For future use.
Remote Unit CLEI/Serial #	For future use.
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 710. Separate values are provided for each HDSL loop for the local unit.

Operation

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

Cancel Startup

`Cancel Startup` is used to cancel the start-up process performed by the 710 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 select `Cancel Startup`, 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.

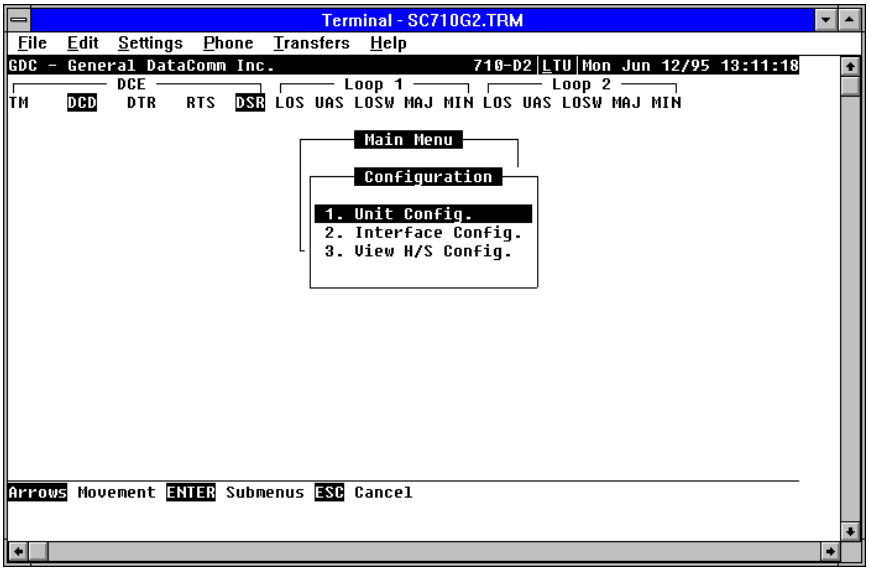


Figure 3-7 Configuration Menu

The functions available from the Configuration menu are as follows:

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

Unit Configuration Screen

Select `1. Unit Config.` to display the Unit Configuration screen and show the HDSL configuration parameters of the 710. A typical screen is shown in *Figure 3-8*.

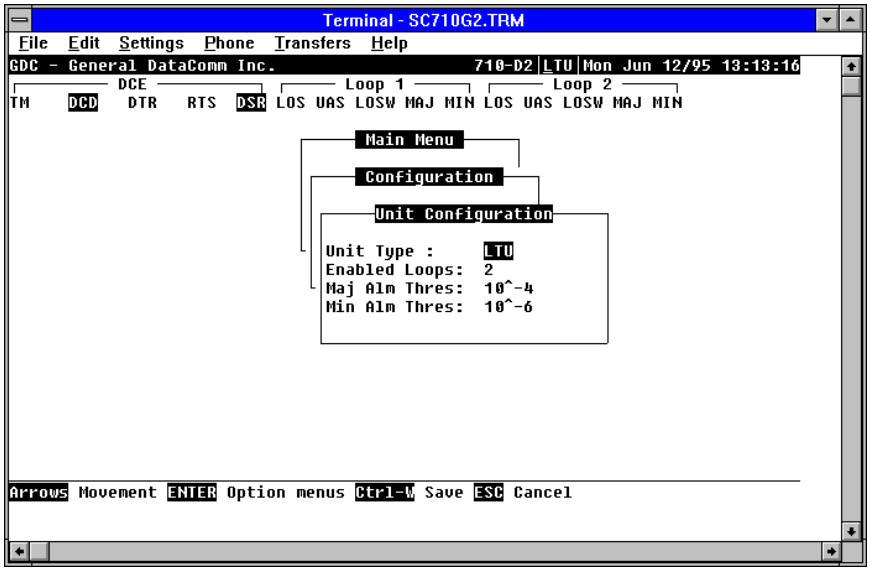


Figure 3-8 Unit Configuration Screen

The screen includes four fields, which are used to select the operating mode of the 710 on the HDSL loops side, and the network application:

- `Unit Type`
- `Enabled Loops`
- `Maj Alm Thres` (Major Alarm Threshold)
- `Min Alm Thres` (Minor Alarm Threshold)

Operation

1. To display the `Unit Configuration` screen, select Item `1` on the `Configuration` menu.
2. To change the current selection for `Unit Type`, press `Enter`. This displays an option menu with the available options:
   - LTU
   - NTU
3. Highlight the desired option and press `Enter`. The option menu closes and the new selection appears in the screen.
4. To change the current value of the `Enabled Loops field`, select Item `2` on the unit configuration menu. A menu displays the number of loops with options of 1 and 2.
5. Highlight the desired number and press `Enter` to select it.
6. To change the current major alarm, bit-error rate threshold, select Item `3` on the `Unit Configuration` menu. This value is changed in the same way as other unit configuration items. Available selections are 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7}, and 10^{-8}.

7. To change the current minor alarm, bit-error rate threshold, select Item `4` on the `Unit Configuration` menu. This value is changed the same way as other unit configuration items. Available selections are 10^{-4}, 10^{-5}, 10^{-6}, 10^{-7}, and 10^{-8}.

8. After making the desired changes, press `Ctrl-W` to save the changes in the 710. To quit and cancel changes made in this screen, press the `Esc` key without pressing `Ctrl-W`.

9. To exit and return to the configuration menu, press `Esc`.

Interface Configuration Screen

Selecting `Interface Config.` displays DCE Interface Configuration parameters of the 710. A typical screen is shown in *Figure 3-9*. The screen includes the fields described in *Table 3-5*.

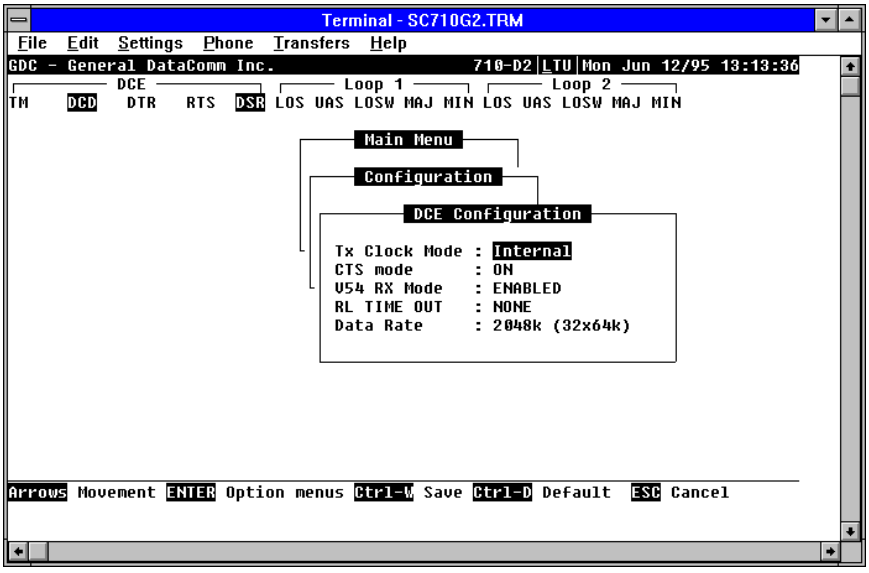


Figure 3-9 Interface Configuration Screen

Table 3-5 Interface Configuration Screen

Field	Description
TX Clock Mode	Displays the DCE interface transmit timing selection: Looped - The DCE transmit clock is locked to the DCE receive clock and is developed from the incoming HDSL timing. External - The DCE interface uses an external clock provided by your DTE. When external timing is selected on the LTU 710, the appropriate timing option needs to be set for the DTE. The DTE must loop timing from the Chnl Rcv Clk lead to the Chnl Ext Clk lead. Internal - The DCE transmit clock is derived from the internal clock oscillator of the 710-D2.
CTS Mode	On: CTS is on as long as the HDSL module is powered and operating normally. On with RTS: The CTS line tracks the state of the RTS line.
V54 Rx Mode	Enabled: The 710 detects and responds to inband V.54 protocol. Disabled: The 710 does not respond to inband V.54 protocol.
RL Timeout	None: Remote loopback remains on indefinitely. 10 Min: Remote loopback is disabled after 10 minutes.
Data Rate	Press the space bar to increment the data rate, press the minus key to decrement the data rate. Select from N=1 to N=18 when one loop is enabled or N=1 to N=32 when both loops are enabled.

Operation

To select Interface Config., 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 Esc.

E1 (G.704) Service Provisioning Options

When the 710-D2 is used in point-to-point **E1** (European telecommunications standard defined by ITU-T standards G.703, G.704, and G.732) provisioning configuration, any of the three DTE timing options (EXTERNAL, INTERNAL, LOOPED) found in the Interface Config. Screen under TX Clock Mode are available. When the 710-D2 is configured as a NTU, either the EXTERNAL or LOOPED configuration is used. In this case, the LTU typically is either a 700-G2 or 720-G2 with its E1 Interface Conf. Frame Mode set up for FRAMED. The LTUs E1 DS0s are recombined into a selectable aggregate data rate (V.35, EIA-530, X.21) by the 710-D2. For

increasing 710-D2 aggregate rates, the 710-D2 data is sourced from the E1 DS0s in an increasing order, i.e., 1x64 Kbps is sourced from E1 DS0 1, 2x64 Kbps is sourced from E1 DS0s 1 and 2, 3x64 Kbps is sourced from E1 DS0s 1, 2, and 3, etc. Time slot routing over the HDSL loops follows that shown below. In this case, a maximum aggregate rate of 31x64 Kbps is available from the 710-D2 NTU.

Routed E1 timeslots over HDSL loops with 700-G2 Interface Config. TS16 set for DATA.

Loop 1	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31
Loop 2	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	f

f = all ones filled

With two loops enabled and a 700-G2 or 720-G2 with its E1 Interface Config. Frame Mode set for UNFRAMED, an aggregate signal of 2048 Kbps may be provisioned. Here, the 710-D2 remote (V.35, EIA-530, or X.21) has its Tx Clock Mode set for EXTERNAL or LOOPED timing.

With only one loop enabled and a 700-G2 or 720-G2 LTU with its E1 Interface Config. Frame Mode set for FRAMED, a fractional E1 service may be provided to the remote site via a 710-D2 NTU. The E1 DS0s are routed over the HDSL loops in a contiguous block and are recombined by the 710-D2 into an aggregate Nx64 Kbps signal. Up to 18x64 Kbps may be provisioned via the 710-D2 in this case.

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*.

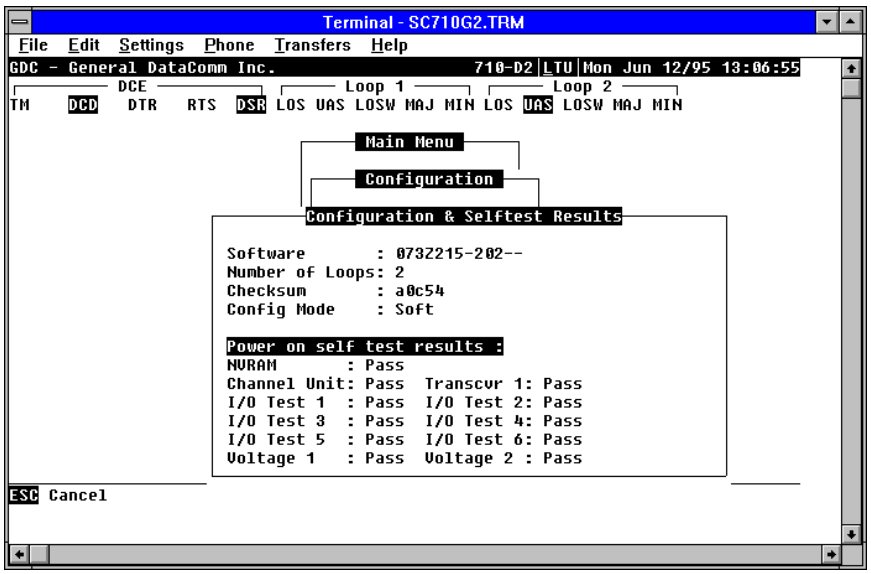


Figure 3-10 View H/S Configuration Screen

The upper area of the screen presents configuration data. The lower area presents the results of the last power-on self-test. *Table 3-6* describes the fields in the screen.

Table 3-6 Configuration and Selftest Results Screen Fields

`Software Version`	Displays the software version of the 710.
`Number of Loops`	Displays the number of HDSL loops of the 710.
`Checksum`	Firmware checksum.
`Config Mode`	Displays the current configuration mode of the 710: `Soft` - The 710 is configured under software control. `Hard` - The 710 is configured by means of the internal dip switches and jumpers.

The last power-on self-test results area lists each 710 subsystem tested during the self-test, and the self-test result: `Pass` or `Fail`.

Maintenance Menu

Refer to *Chapter 4* to perform maintenance and troubleshooting.

Network Management

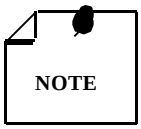
The UAS 710-D2 can be used as a Network Managed element when used within a GDC Network Management System. The UAS 710-D2 management software conforms to the MIB (Management Information Base) II standards set out for SNMP Version 1.0. Refer to the related SCM Manager Card publication listed in the Preface.

MIB Tables

Tables 3-7 through 3-16 list and describe the MIB objects by which an SNMP network manager can configure, control, and monitor the UAS 710-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

The way MIB objects appear on the screen and how they are manipulated varies depending on the network manager or MIB browser being used. The information in these tables is therefore intended for use in conjunction with 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 you confirm the success of the write operation. If your manager or browser does not perform this function automatically, we advise that you command a Get for each object you Set.

Table 3-17 is a list of HDSL alarms.

Table 3-7 Version Group

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		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.
Firmware Level	Display String	Read-only		The version number of the firmware. This allows the products to know which revision is installed. 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 3-8 Maintenance

MIB Object	Syntax	Access	Enumeration	Description
Maintenance Line Index	SC instance	Read-only		Index value 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)	Hardware 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 tick time.
Unit Type	Integer	Read-write	LTU (1) NTU (2)	Used to define HDSL type. LTU selects line terminating unit, NTU selects network terminating unit. For 700-G2/G3, this variable can only be a LTU.
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.
Data Type	Integer	Read-write	Data (2) Voice (1)	Defines the HDSL data type as Data for the 710-D2.
Number of Loops Enabled	Integer	Read-write	One Loop (1) Two Loops (2)	Used to define the HDSL loop configuration. It can be set for one to two loops.
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.

Table 3-8 Maintenance (Cont.)

MIB Object	Syntax	Access	Enumeration	Description
LED Status	Octet String	Read-only	Octet 1 Bit 7 - not used Bit 6 - EIA RD Bit 5 - EIA CO Bit 4 - EIA RS Bit 3 - NORM E1 Bit 2 - ES E1 Bit 1 - AL Bit 0 - TM Octet 2 Bit 7 - not used Bit 6 - EIA SD 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.

Table 3-9 DTE Configuration

MIB Object	Syntax	Access	Enumeration	Description
DTE Config 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.
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..32)	This variable represents the DTE data rate in 64 K increments.
DTE TX Clock Source	Integer	Read-write	External Timing (1) Internal Timing (2) Loop Timing (3)	External timing indicates that recovered receive clock from another interface is used as the transmit clock. Internal indicates that a local clock source is used. Loop Timing indicates that the recovered receive clock is used as the transmit clock.

Table 3-10 HDSL Diagnostics

MIB Object	Syntax	Access	Enumeration	Description
Diagnostic 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.
Loopback	Integer	Read-write	No Loopback (1) Line Loop (2) Local Loop (3) Line and Local Loop (4)	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, the BERT result is reset.

Table 3-11 Alarm Threshold Configuration

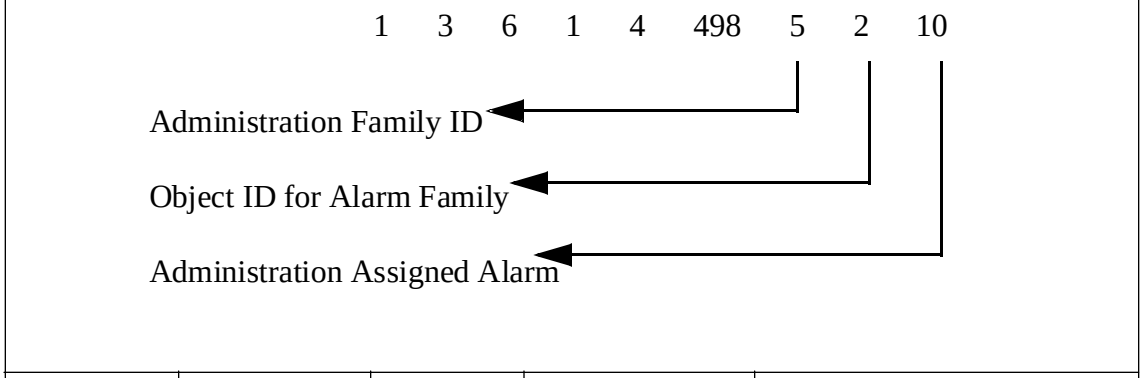
MIB Object	Syntax	Access	Enumeration	Description
Alarm Configuration Index	SC instance	Read-only		The index value that uniquely identifies the interface to which this entry is applicable. SC instance defines the slot, line, drop. and sub-identifier, which is in this case, a network interface, including 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) thres1E09 (6)	Sets the Major or Minor alarm threshold criteria.

Table 3-12 HDSL Diagnostic Results

MIB Object	Syntax	Access	Enumeration	Description
Diagnostic Results 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.
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 to Not In Sync, BERT test is not in sync, and BER rate is not valid.
	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.

Table 3-13 HDSL Performance

Current Performance Table				
MIB Object	**Syntax**	**Access**	**Enumeration**	**Description**
HDSL Current 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 an E1 or loop interface.
HDSL Current ESs	Gauge	Read-only		The number of errored seconds encountered by an E1 or loop interface in the current 15 minute interval.
HDSL Current SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop or E1 interface in the current 15 minute interval.
HDSL Current UASs	Gauge	Read-only		The number of degraded seconds encountered by a loop or E1 interface in the current 15 minute interval.
HDSL Current DMs	Gauge	Read-only		The number of degraded minutes encountered by a E1 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.
Internal Performance Table				
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 in this case, can be an E1 or loop interface.
HDSL Interval Number	Integer	Read-only	(1..96)	A number between 1 and 96, where 1 is the most recently completed 15 minute interval and 96 is the least recently completed 15 minute interval (assuming that all 96 intervals are valid).
HDSL Interval LESs	Gauge	Read-only		The number of errored seconds encountered by a loop or E1 interface in one of the previous 97 individual 15 minute intervals.
HDSL Interval SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop or E1 interface in one of the previous 96 individual 15 minute intervals.
HDSL Interval UASs	Gauge	Read-only		The number of unavailable seconds encountered by a E1 interface in one of the previous 96 individual 15 minute intervals.
HDSL Interval DMs	Gauge	Read-only		The number of degraded minutes encountered by a loop or E1 interface in one of the previous 96 individual 15 minute intervals.
HDSL Interval FEBEs	Gauge	Read-only		This variable represents the HDSL loops Far End Block Errors.

Table 3-13 HDSL Performance (Cont.)

Total Performance Table				
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 is in this case, can be an E1 or loop interface.
HDSL Total ESs	Gauge	Read-only		The number of errored seconds encountered by an E1 or loop interface in the previous 24 hour interval.
HDSL Total SESs	Gauge	Read-only		The number of severely errored seconds encountered by a loop or E1 interface in the previous 24 hour interval.
HDSL Total UASs	Gauge	Read-only		The number of unavailable seconds encountered by a loop or E1 interface in the previous 24 hour interval.
HDSL Total DMs	Gauge	Read-only		The number of degraded minutes encountered by a E1 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 3-14 Loop/E1 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 an E1 or loop interface.
HDSL Reset Intervals	Integer	Read-write	Normal (1) Reset (2)	This variable is used to reset loop/E1 performance intervals. When it is set to reset, the loop/E1 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.

Table 3-15 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 reinitializes 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.

Table 3-15 HDSL Status (Cont.)

MIB Object	Syntax	Access	Enumeration	Description
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 3-16 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, 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 indicator.

Table 3-17 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
HDSL Major Alarm	Yes	L1, L2
HDSL Minor Alarm	Yes	L1,L2

Summary

In this chapter we covered the operation of the 710-D2. We covered the 710-D2 front panel and explained the function of each control and indicator. We explained soft option selection, screen organization, operating procedures, network management, and the various menus.

What's Next?

Chapter 4 covers loopback testing, troubleshooting procedures, and the Maintenance Menu screens and descriptions.

4 Tests

Overview

This chapter describes troubleshooting procedures, loopback testing, and the Maintenance Menu screens and descriptions.

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

The 710 displays the status of these tests through the indicators on the front panel. You may also use the optional terminal connected to the control port (`CTRL`) on the front panel which provides a comprehensive set of features for testing operation and identifying trouble areas. This chapter provides instructions for managing the 710 system with this terminal and tells you how to enable and disable various loopbacks.

If you cannot resolve problems with the 710-D2 using the following procedures, please contact General DataComm Service.

Troubleshooting

- LEDs are OFF:

  If the terminal is working, check the status of voltage 1 and voltage 2 on the terminal View H/S Config screen.

- 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. Check the loop connections between the two cards (LTU and NTU).
  2. Verify 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 used to perform maintenance and troubleshooting activities. To open the `Maintenance` menu, select Item `3` on the `Main Menu`. *Figure 4-1* illustrates the Maintenance menu.

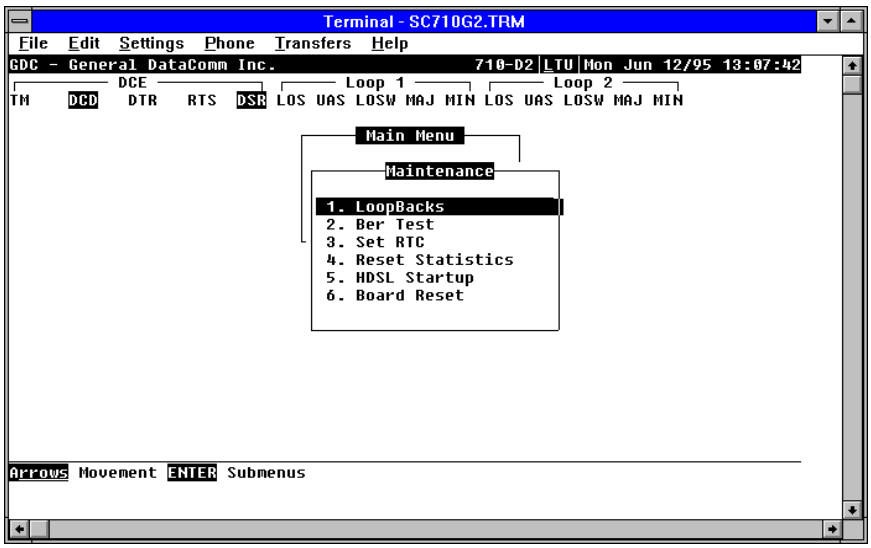


Figure 4-1 Maintenance Menu

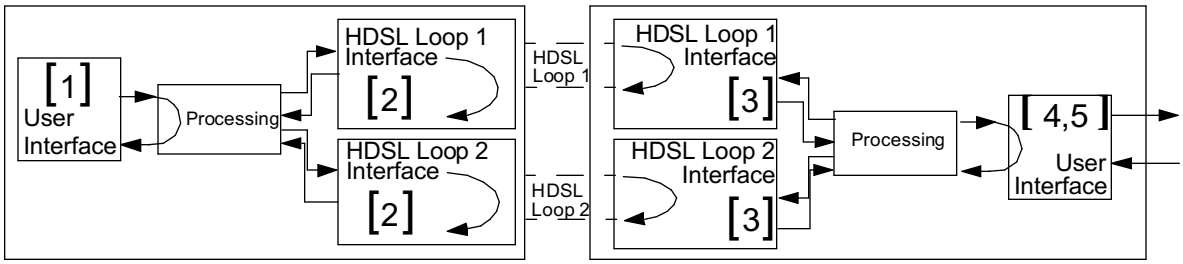
The functions available from the Maintenance menu are as follows:

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

Loopback Testing

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

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



Local line Loopback	[1]
Local HDSL Loopback	[2]
Remote HDSL Local Loopback	[3] not available
Remote Digital Loopback	[4]
V.54 Remote Digital Loopback	[5]

Figure 4-2 Loopback Signal Paths

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

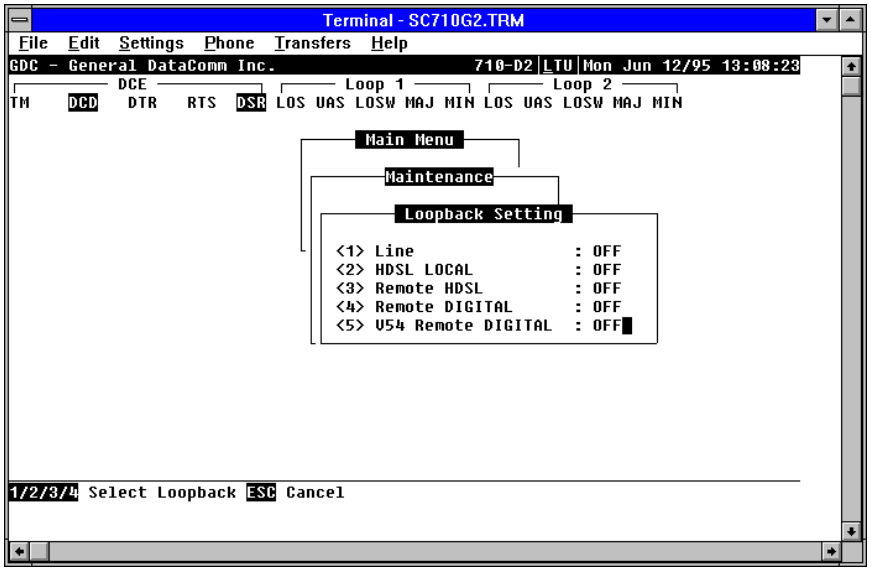


Figure 4-3 Loopback Screen

Operation

To access the Loopback function, select item `1` on the `Maintenance` menu.

To change the state of a loopback, use the following procedure:

1. Type the number of the line of the desired loopback. This toggles the selected loopback ON and OFF.
2. To exit and return to the `Maintenance` menu, press the `Esc` key.

Line Loopback

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

When the local line loopback is connected (ON) (loopback **`[1]`**), the data signal received from the local user via the transmit line of the user equipment interface is returned by the HDSL system module on the receive line of that interface. Therefore, during normal operation the local user equipment should receive its own signal without errors.

The local user transmit signal is transparent and therefore is sent to the remote HDSL system; however, the signal received from the remote HDSL system is lost.

For this loopback to be functional, the unit must be configured for external timing.

HDSL Local Loopback

The local HDSL loopback is generally used to test the proper operation of the local HDSL system, and therefore should be used after "normal operation" is obtained (i.e., the HDSL loops must be trained and capable of transparently passing user data).

When the local HDSL loopback is connected (ON) (loopback **[2]**), the transmit signal of each HDSL loop is returned by the HDSL loop interface (s) of this HDSL system module on the receive path of the same loop. Therefore during normal operation the local user equipment should receive its own signal without errors. Both loops must be in normal operation for this loopback to function properly.

The local user transmit signal is transparent and therefore sent to the remote HDSL system, however the signal received from the remote HDSL system is lost.

Remote HDSL Local Loopback- Not Currently Available.

Remote Digital Loopback

The remote digital loopback is generally used to test end-to-end the proper operation of the HDSL link, and therefore should be initiated by the LTU only and used after normal operation is obtained.

When the remote digital loopback is connected (ON) (Loopback **[4]**), the data received by the remote module from the local user is returned by the HDSL system module on the transmit path, back to the local unit. Therefore, during normal operation the local user equipment should receive its own signal without errors.

The local user transmit signal is also passed to the remote user equipment connected to the HDSL system, however the signal transmitted by the remote user is lost.

V.54 Remote Loopback

The V.54 remote loopback is generally used to test the proper operation of one remote to another. You should use it after normal operation is obtained. When the V.54 loopback is selected (loopback 5), the initiating unit sends the V.54 inband code to the other remote unit. Upon receiving an acknowledgment the initiating unit turns its TM LED ON indicating the far-end unit is in the loopback mode.

When the loopback is engaged, you see error -free data returning. The other remote unit data are blocked.

In the case when the other unit doesn't acknowledge the V.54 inband loopback code, or fails to transmit the acknowledgment, the initiating unit continues sending V.54 inband code and blocks data until there is a correct acknowledgment, or the loopback command is terminated.

Test Loopbacks - Considerations

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). In most situations, initiate the loopbacks from the side serving as the LTU, because this allows you to follow the signal path starting from the central office and continue toward the end user in addition to maintaining system timing. All of the test loopbacks are transparent.

Recommended order of test activation is as follows:

1. Line loopback.
2. HDSL local loopback.
3. Remote digital loopback
4. V.54 remote digital loopback.

This is also the order in which the loopbacks are listed on the LOOPBACKS screen.

BER Test

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

Testing Method

BER testing is performed by repeatedly transmitting a pseudo test sequence having a length of 2^{-15} -1 bits, and comparing by means of an error detector the received sequence. Any difference is assumed to be an error and is counted. To perform a meaningful comparison, the error counting is inhibited until the error detector becomes synchronized to the incoming sequence. During this synchronization, it is possible to see a burst of 255 errors.

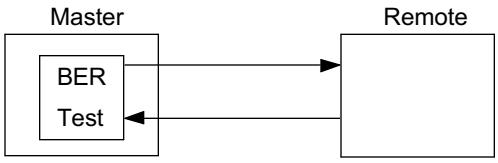
During this testing, your traffic is disconnected. BER tests may be performed in an end-to-end mode that requires both LTU and NTU BER testers to be on. If testing is initiated at one end, a loopback along the signal path needs to be connected. The loopback can be a physical connection made somewhere along the signal path or a test loopback activated at the desired location as described in the loopback descriptions in this chapter. Alternatively, an external BERT may be connected 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^{24} bits). The number of errors that are displayed in each interval can be up to 255. If the actual number of errors in a given interval is higher, this maximum count is considered in the calculation of the BER. The calculated BER is updated at the end of each interval.

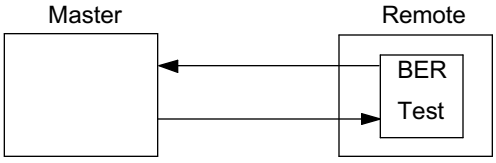
The bit error rate test must be done over all active individual HDSL loops simultaneously.

BER testing can be performed through the GDC UAS Controller or supervisory terminal port. The front panel LED TM is on when the BER test is initiated. When the error detection is in sync and detects no errors, the TM LED is on. But when the error detector is not in sync or detects errors, the TM blinks.

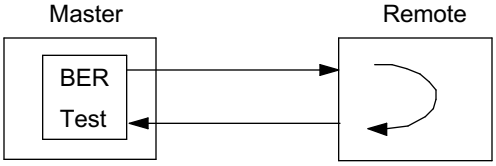
Test Configuration Notes



Master Self-Test:
Enable master BER test. Be sure you have an external loopback or test equipment at the remote unit to facilitate this test.

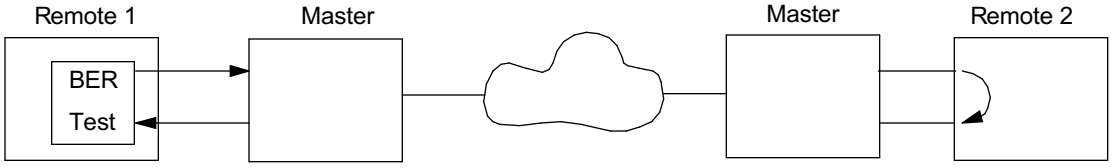


Remote Self-Test:
Enable remote BER test. Be sure you have an external loopback or test equipment at the master unit to facilitate this test.



Self-Test with Remote Loopback:
From master unit, assert Remote Loopback (RL) and enable BER test.

Master to Remote Self-Test:
Enable BER test on both master and remote units.



Remote Self-Test with V.54 RDL:
Place far-end remote 2 into Remote Loopback by sending V.54 code and turn on the self-test on that remote 1. This test can be initiated only from the front panel or supervisory terminal. Both remote units must be 710 or 730 type units.

BER Screen Description

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

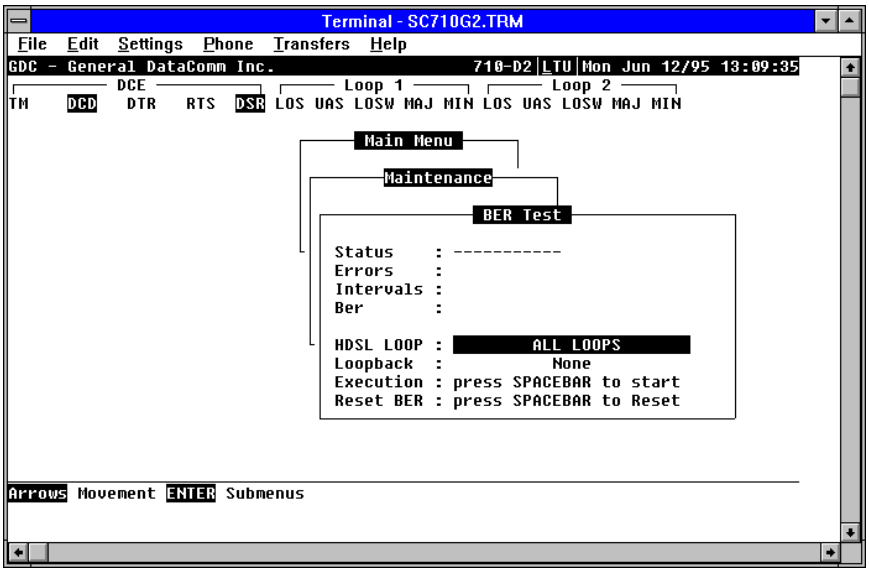


Figure 4-4 BER Test Screen

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

- The top area displays BER results.
- The bottom area is used to select the desired HDSL loop you want to perform the test on, and to start and stop BER measurement.

The fields of the BER Test dialog box are described in *Table 4-1*.

Table 4-1 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 - The error detector is not synchronized, and BER measurement is inhibited.
Intervals	Displays the number of measurement intervals up to this point.
BER	Displays the BER calculated up to this point.
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 Local - Remote Digital Loopback is activated for the BER test. HDSL line loopback can also be initiated with a BER test.
Execution	Displays the next state of BER measurement: Press the SPACEBAR to start - BER measurement disabled. Press the SPACEBAR to stop - BER measurement enabled.
Reset BER	Press the spacebar to reset the BER counter.

Operation

1. To display the BER TEST screen, select item `2` on the `Maintenance` menu.
2. 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 spacebar.

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 spacebar. 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 press **ESC**.

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) see 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 enables you to set the real-time clock of the 710. A typical screen is shown in *Figure 4-5.*

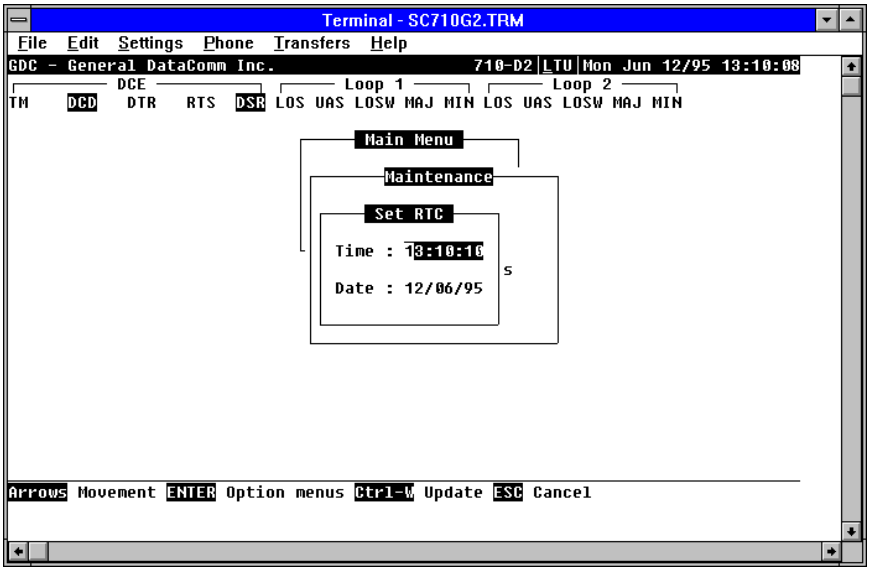


Figure 4-5 Set RTC Screen

The screen includes two fields described in *Table 4-2.*

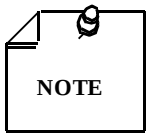
Table 4-2 Set RTC Screen Fields

Time	Displays the time in 24-hr military format showing hours:minutes:seconds retrieved from the 710 at the time the screen is opened.
Date	Displays the date (day/month/year) retrieved from the 710 at the time the screen is opened.

Operation

To change the current time or date, use the following procedure:

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 `Esc`.



The 710 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 710.

Operation

To instruct the 710 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 initiate the 710 HDSL loops start-up process. Normally this process is automatically performed upon link initialization and whenever the synchronization between two linked 710 units is lost.

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

To instruct the 710 to perform the start-up process, select item `5` on the `Maintenance` menu.

Board Reset

This option is used to reset the 710.

To reset the 710, select item `6` on the `Maintenance` menu. After a few seconds, the opening screen appears. The unit performs the start-up process, and displays the `Main Menu`.

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

Summary

In this chapter we covered loopback testing, troubleshooting procedures, and the Maintenance Menu screens and descriptions.

What's Next?

Chapter 5 includes timing notes and typical applications to assist you in configuring your system.

5 Application Guide

Overview

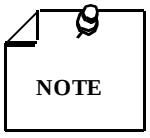
This chapter includes timing notes and typical applications to assist you in configuring your system.

Timing Options

High Channel Data Rate Application

The length of the cable connecting your equipment (the DTE) to the 710 is an important factor when using internal or looped timing in a high data rate application. (With internal or looped timing, the 710 provides timing to the DTE.) The cable creates a delay between the 710 clock and data arriving from the DTE. When this delay is too great (because the cable is too long or the rate is too high), it can cause errors.

If errors occur with DCE timing, you can use external timing for the LTU 710 and loop timing for the NTU 710. This permits operation at any data rate, regardless of cable length. (Note that the ITU-T V.35 recommendation limits cable length to about 30 m.) Refer to *Figure 5-1* and *Chapter 3 - Operation* for configuring timing options.



When external timing is selected on the LTU 710, the appropriate timing option needs to be set for the DTE. The DTE must loop timing from the Chnl Rcv Clk lead to the Chnl Ext Clk lead.

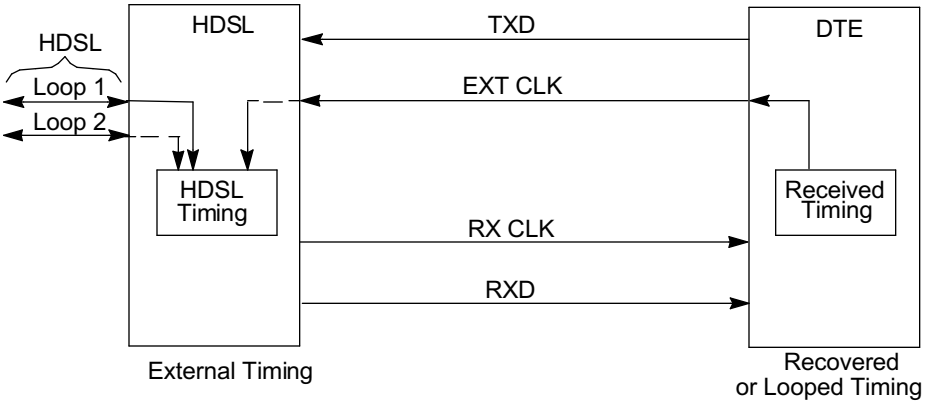


Figure 5-1 High Data Rate Application

Typical Applications

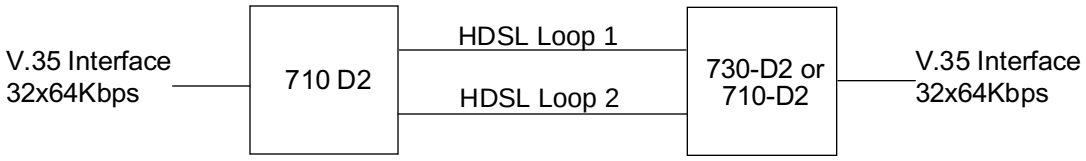
Figures 5-2 through *5-4* show typical applications and option settings for configuring your system.

Single Loop Point-to-Point

Unit Type:	LTU	NTU
Enabled Loops:	1	1
Application:	N/A	P2P
FP Enable:	N/A	Enabled
Tx Clock Mode:	External	Looped
CTS Mode:	ON	ON
Data Rate:	18x64Kbps	18x64Kbps
V.54 RX Mode:	Disabled	Disabled
FP RL Mode:	N/A	EOC

Figure 5-2 Single Loop Point-to-Point Application

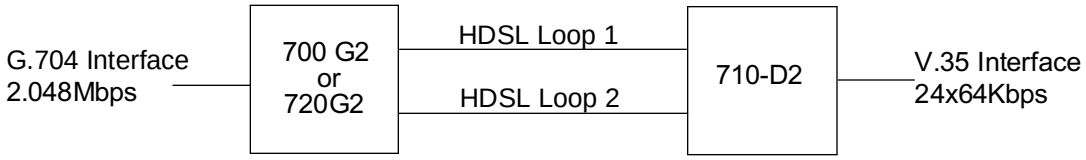
Two Loop Point-to-Point



Unit Type:	LTU	NTU
Enabled Loops:	2	2
Application:	N/A	P2P (730-D2 only)
FP Enable:	N/A	Enabled (730-D2 only)
Tx Clock Mode:	External	Looped
CTS Mode:	ON	ON
Data Rate:	32x64Kbps	32x64Kbps
V.54 RX Mode:	Disabled	Disabled
FP RL Mode:	N/A	EOC (730-D2 only)

Figure 5-3 Two Loop Point-to-Point Application

Fractional G.704 Service (2 Loop)



Unit Type:	LTU
Enabled Loops:	2
FP Enable	Enable
Line Unit:	TLU
Line Code:	HDB3
Frame Mode:	Framed
TS16	Data

Network Configuration

Application:	P2P
Loop 1 Start DS0:	Not Applicable
Loop 1 Consecutive DS0:	Not Applicable
Loop 2 Start DS0:	Not Applicable
Loop 2 Consecutive DS0:	Not Applicable

Unit Type:	NTU
Enabled Loops:	2
Application:	N/A
FP Enable:	N/A
Tx Clock Mode:	Looped
CTS Mode:	ON
Data Rate:	1x64Kbps to 31x64Kbps
V.54 Rx Mode:	Enabled
FP RL Mode:	V.54

Figure 5-4 Fractional G.704 Service (2-Loop) Application

Summary

This chapter covered timing notes and typical applications.These may be useful in configuring your system.

What's Next?

The remainder of this manual consists of three appendices which cover technical characteristics, HDSL connector pin assignments, and DTE interface signals.

A Technical Characteristics

Table A-1 Technical Characteristics

DTE Interface	
Rate	N x 64 Kbps, N = 1 to 32
Interface	V.35 [optional X.21 or V.11 (530)]
HDSL Interface	
Rate	Dual duplex 584 Kbaud signaling rate, with **2B1Q*** line code (each loop)
Framing	HDSL framing per ETSI DTR/TM 3017, including performance monitoring via HDSL CRC indication
Transmit Power	13.5 dBm (± 0.5 dB)
Transmission Line	
Two non-loaded metallic twisted-pairs (loop # 1 and loop # 2), up to 3.2 Km at 0.4 mm or up to 4.5 Km at 0.5 mm under the following conditions: No loading coils, no additional shielding. When Bridged-Taps (BTs) are present, the following rules apply: Maximum number of bridged-taps = 2 Maximum tap length = 1000 meters No loop impairments Meets performance specification of ETSI DTR/TM 3017	
Test Features	
Local Loopback	Terminal screen selectable.
Remote Loopback	Terminal screen selectable.
BER Test	Terminal screen selectable.
V.54 Protocol	Terminal screen selectable.
*2B1Q: Line code for basic rate ISDN at the U reference point. 2B1Q (2 Binary 1 Quaternary) is a line encoding format that is supported on 2-wire interfaces.	

Table A-1 Technical Characteristics (Cont.)

Dimensions	
Height	27 mm (0.8 in.)
Width	178 mm (7.0 in.)
Depth	241 mm (9.5 in.)
Weight	0.28 kg (10.0 oz.)
Shipping Weight	0.74 kg (1.0 lbs, 10 oz.)
Temperature	0° to 50°C (32° to 122°F) operating –40° to 85°C (–40° to 158°F) non-operating
Electrical	
Power	+5 Vdc 730mA +12 Vdc 74mA -12 Vdc 94mA Load Number = 0.9
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

B HDSL Connector Pin Assignments

Connector Pin Assignments HDSL Connector		
Pin No.	**RJ48C/X**	**Color**
1	HDSL2-R	Blue
2	HDSL2-T	Orange
3		Black
4	HDSL1-R	Red
5	HDSL1-T	Green
6		Yellow
7		Brown
8		Slate

Lower jacks
J33 to J48
(HDSL Connectors)

C Business Equipment (DTE) Interface Signals

Table C-1 ITU-T V.35

V.35					
Zone 3 DB-25 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 710 that DTE is prepared to transmit.
5	D	106	CB	Clear-to-send	Indicates to DTE that 710 is prepared to transmit.
6	E	107	CC	Data-set-ready	Indicates to DTE that 710 is operational.
8	F	109	CF	Received line signal detector	Indicates to DTE that 710 is receiving data (not idle or OOS codes).
25	NN	142	TM	Test mode	Indicates to DTE that 710 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 710 to DTE.
24 11	U W	113 113	DA(A) DA(B)	Transmitter timing (DTE source)	Transfers transmitter signal timing information from DTE to 710.
17 9	V X	115 115	DD(A) DD(B)	Receiver timing	Transfers receiver signal timing information from 710 to DTE.
15 12	Y AA	114 114	DB(A) DB(B)	Transmitter timing	Transfers transmitter signal timing information from 710 to DTE.

Table C-1 ITU-T V.35 (Cont.)

V.35 (Cont.)					
Zone 3 DB-25 Pin	**V.35 Pin**	**ITU-T (See Note)**	**EIA**	**Signal**	**Description**
21	BB/b	140	RL	Remote Digital Loopback test enable	Transfers signal from DTE to control Remote Digital Loopback test mode.
20	H	108/2	CD	Data Terminal Ready	Indicates to 710 that DTE is prepared for data communication.
NOTE: ITU-T designations are shown for reference only. Since Zone 3 DB-12 Pin is an external connector, Zone 3 DB-25 connector of the shelf maps to V.35 pin via cable adapter 027H572-001 (DB-25M to V.35).					

Table C-2 EIA-530

EIA-530			
Zone 3 DB-25 Pin	**Circuit**	**Direction**	**Description**
1			Frame Ground
2	BA	To 710	Send Data (A)
14	BA	To 710	Send Data (B)
3	BB	From 710	RCV Data (A)
16	BB	From 710	RCV Data (B)
4	CA	To 710	RTS (A)
19	CA	To 710	RTS (B)
5	CB	From 710	CTS (A)
13	CB	From 710	CTS (B)
6	CC	From 710	DSR (A)
22	CC	From 710	DSR (B)
7	AB		Signal Ground
8	CF	From 710	DCD (A)
10	CF	From 710	DCD (B)
17	DD	From 710	RCV CLK (A)
9	DD	From 710	RCV CLK (B)
24	DA	To 710	EXT CLK (A)
11	DA	To 710	EXT CLK (B)
15	DB	From 710	TX CLK (A)
12	DB	From 710	TX CLK (B)
20	CD	To 710	DTR (A)
23	CD	To 710	DTR (B)
21	RL	To 710	Remote Digital Loopback Enable
18	LL	To 710	Line Loopback Enable
25	TM	From 710	Test Mode

Table C-3 X.21

X.21				
Zone 3 DB-25 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 710 that DTE is prepared to transmit.
8 10	5 12	I(A) I(B)	Indication	Indicates to DTE that 710 is receiving data.
17 9	6 13	S(A) S(B)	Signal Element Timing	Transmit and receive signal timing information from 710 to DTE.
24 12	7 14	X(A) X(B)	* DTE Signal Element Timing (X)	Optional transmit signal timing information from DTE to 710 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.				

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General DataComm