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Issue 1 – March 1997

Installation and Operation

DeskTop 554S

SNMP Managed
Fractional T1
Data Service Unit

General DataComm

Trademarks and Patents

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P.O. Box 1299, Middlebury, Connecticut 06762-1299 U.S.A.

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Preface

Scope

This manual describes how to install and configure a General DataComm Desktop 554S Data Service Unit. It is written for installers, service technicians, and users. It assumes a working knowledge of data interfaces, T1 and Fractional T1 data transmission services, and the Simple Network Management Protocol (SNMP).

Revision History

This is the initial issue of the manual.

Organization

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

- *Chapter 1 - Technical Overview* describes the DSU, its features, and its options. This chapter contains the Equipment List table.
- *Chapter 2 - Installation* provides directions for installing the DSU.
- *Chapter 3 - Operation* describes the use of the DSU front panel controls and indicators, and of the terminal interface that can be accessed through the DSU Console port.
- *Chapter 4 - Diagnostics* describes tests that can be performed on the DSU.
- *Appendix A - Technical Characteristics*
- *Appendix B - DTE Interface Signals* lists pin/signal assignments for the two DTE interfaces that the DSU can support: ITU-T V.35 and EIA-530.
- *Appendix C - Timing Options* illustrates the arrangements that can be used to provide transmit timing for the DSU.

- *Appendix D - Alarm Definitions* identifies the conditions that can cause the DSU to generate an alarm.
- *Appendix E - MIB Tables* details the Management Information Base (MIB) tables that enable SNMP control of the DSU.

Document Conventions

Level 1 paragraph headers introduce major topics.

Level 2 paragraph headers introduce subsections of major topics.

Level 3 paragraph headers introduce subsections of secondary topics.

```
This typewriter font shows output that
is displayed on the screen.
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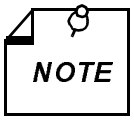
This bold font shows specific input that you type at the keyboard.

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



Notes present special instructions, helpful hints or general rules.

Service and Support

General DataComm is committed to providing the service and support needed to install, manage, and maintain your equipment. For information about service programs or for assistance with your support requirements, contact your local Sales Representative or call General DataComm Service at the 24-hour, toll-free number listed below.

- in the U.S. dial 1-800-243-1030
- outside the U.S. dial 1-203-598-7526

Be ready with the site name and phone number, and a description of the problem. The next available support representative will promptly return your call.

Hands-on training courses are provided by GDC Educational Services. Courses range from basic data communications, modems and multiplexers, to complex network and ATM systems and are taught in Connecticut or at a customer location. To discuss educational services or receive a course schedule, call 1-800-243-1030 and follow the menu instructions.

Safety Instructions

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, so proper handling and grounding are 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 floor pads and workbench pads.

When handling components or 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, such as a screwdriver or a paper clip, to set switches.

Safety Guidelines

This manual uses the Caution and Warning symbols, shown on the next page, to draw your attention to potential hazards. A Caution indicates a hazard to equipment or data. A Warning indicates a hazard to personnel.

Caution statements identify conditions or practices that can result in damage to the equipment or in 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 any equipment with the cover removed.* Repairs must be performed by qualified service personnel only.

Regulatory Notices

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 bottom of the DT 554S enclosure provides the FCC Registration number for the unit. If requested, give this information to the telephone company.

To connect the DeskTop 554S DSU to the Public Telephone Network you are required to give the following information to the Telephone Company:

FCC Registration Number: AG6USA-24144-DE-N

FIC (Facility Interface Code): 04DU9-DN, 04DU9-BN, 04DU9-1KN, 04DU9-1SN

SOC (Service Order Code): 6.0Y

Telephone Company jack type:RJ48C

The telephone company may discontinue your service temporarily if the unit causes harm to the telephone network. If possible, you will be notified of such an action 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. 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.*

1 Technical Overview

Overview

This manual contains instructions for installing the DT 554S DSU and placing it into service.

DT 554S DSU Features

The General DataComm DT 554S SNMP Managed Data Service Unit (DSU) is a highly efficient means of transmitting and receiving digital data over a T1 line supplied by a telephone company (Telco) or other service provider. The DT 554S DSU:

- Provides interface to Fractional T1 (FT1) services, giving you the flexibility to utilize only the bandwidth you need, from 56 Kbps up to the full T1 rate of 1.536 Mbps
- Allows the linking of FT1 services with traditional Dataphone Digital Service (DDS) and generic digital services, including support for ANSI T1.403 PN 127 loop up/loop down codes.
- Supports one high-speed serial data port for customer equipment.

  ITU-T V.35-compatible interface is standard

  EIA-530-compatible channel interface is available as an option
- Is fully compatible with Simple Network Management Protocol (SNMP), which can provide software control for centralized configuration and diagnostic capabilities
- Generates SNMP traps for automatic alarm reporting
- Provides out-of-band communication link to an SNMP controller via back panel Console port, which can be configured with IP address and subnet mask to support Point to Point Protocol (PPP) communications
- Supports a VT100-compatible terminal interface for configuration, diagnostic, and monitoring functions through the back panel Console port; this interface can also be accessed using the Telnet protocol

- Permits configuration of network transmitter timing from a variety of sources:

  Timing recovered from network data

  External timing

  Internal clock

- Supports Extended Superframe (ESF) and D4 framing formats; also supports unformatted (unframed) operation, for use with proprietary formats
- Provides configurable Auto Framing option that automatically adapts the DSU to ESF or D4 format
- With ESF framing selected, supports both TABS Maintenance Messages (Technical Reference 54016) and ANSI Performance Report Messages (Bellcore TR-TSY-000194) procedures for collection and monitoring of network performance information provided by the Central Office
- Provides independent user and network register sets for TABS performance data
- Supports both Alternate Mark Inversion (AMI) and Bipolar with 8 Zero Substitution (B8ZS) line codes, and allows a variety of options for ones density in the data stream
- Provides T1- and channel-level diagnostics for extensive diagnostic capabilities

Description

The DT 554S DSU provides interface between the customer's equipment and a Fractional T1 (FT1) digital carrier facility provided by the Telco or other carrier. It performs both the Data Service Unit (DSU) function of converting the customer’s data stream to bipolar format, and the Channel Service Unit (CSU) functions of network interfacing and protection. The DT 554S DSU is ideal for medium-sized, low-channel-density networks.

The DT 554S DSU may be equipped with an optional EIA-530 interface in place of the standard ITU-T V.35 interface.

Fractional T1 Capabilities

A T1 line's DS1 signal consists of 24 DS0 channels. The DT 554S DSU can be configured to map user data into either consecutive or alternate DS0s to provide rates from 56 Kbps (1 DS0) to 1.536 Mbps (24 DS0s at 64 Kbps each). Rates that use less than the full 1.536 Mbps are referred to as Fractional T1 (FT1).

The output rates available from the DSU are multiples of 56 and 64 Kbps because each of the T1 line's 24 DS0s provides a data rate of 56 or 64 Kbps depending on the form of line coding being used. The DSU can be configured to start a group of DS0s on any DS0 in the T1 line.

The full T1 bandwidth is available when consecutive DS0s are used, but restrictions on ones density may limit the actual usable bandwidth. Use of consecutive DS0s for N x 64 Kbps requires either B8ZS coding on the network line or provisioning in the DTE to guarantee mark density requirements.

Using alternate DS0s reduces the T1 bandwidth available for user data by one-half, but it eliminates restrictions on the content of user data. When the DSU is configured to use alternate DS0s it maintains minimum ones density at 50% by filling the unused DS0s with ones.

DTE Interface

The DT 554S DSU's standard DTE interface is an ITU-T V.35-compatible port for connection to synchronous serial customer equipment. Examples of customer equipment are Front End Processors (FEPs), Local Area Network (LAN) bridges, video codecs, CAD/CAM workstations, and Group 4 facsimile equipment.

An optional EIA-530 compatible interface is available to replace the standard V.35 channel interface.

Table 1-1 Equipment List

Description	GDC Part No.
GDC DT 554S DSU, 117 V ac, V.35 channel interface	048A102-003
Optional Assembly	
EIA-530 channel interface daughter card	048P042-001
Power Supply	
Power supply, 19 Vac, 0.6A, 60 Hz wall mount transformer	700-053-002
Cables	
Interface cable, ITU-T V.35 34-pin male-to-male (DSU channel port to customer equipment) (5- to 50-foot lengths)	027H570-XXX
Adapter cable, 34-pin male to DB25 female (combines with cable terminated in DB25 male to support EIA-530 interface)	027H901-001
Interface cable, EIA-530 DB25 male-to-male (connects adapter cable 027H901-001 to customer equipment with a female connector) (6-, 26- and 43-inch, and 2- to 100-foot lengths)	028H502-XXX
Interface cable, EIA-530 DB25 male-to-female (connects adapter cable 027H901-001 to customer equipment with a male connector) (26- and 43-inch, and 2- to 100-foot lengths)	028H511-XXX
Interface cable, EIA-449 37-pin male-to-male (combines with adapter cable 027H501-001, which in turn connects to adapter cable 027H901-001) (1- to 50-foot lengths)	027H603-XXX
Adapter cable, EIA-449 37-pin female to DB25 male (connects interface cable 027H603-XXX to adapter cable 027H901-001)	027H501-001

(Continued on next page)

Table 1-1 Equipment List (Continued)

Description	GDC Part No.
Interface cable, EIA-449 37-pin male to DB25 male (connects adapter cable 027H901-001 to customer equipment with a 37-pin female connector) (1- to 50-foot lengths)	023H603-XXX
Interface cable, EIA-530 DB25 male-to-male (connects adapter cable 027H901-001 to EIA-422 multiplexer aggregate with a female connector) (10- to 50-foot lengths)	027H531-XXX
DCE-to-DCE crossover interface cable, V.35 34-pin male to 34-pin male	027H521-XXX
DCE-to-DCE crossover interface cable, EIA-530 DB25 male-to-male (combines with adapter cable 027H901-001) (10- to 50-foot lengths)	027H527-XXX
Interface cable, RJ48C plug-to-plug (DSU network port to the T1 line) (10- to 50-foot lengths; 10-foot length included with standalone enclosure models)	022H024-XXX
Interface cable, RJ48C plug-to-15-pin male (DSU network port to the T1 line, Canadian installation only) (10- to 50-foot lengths)	022H022-XXX
Interface cable, RJ48C plug to 15-pin female (DSU network port to the T1 line, for Canadian installation only) (10- to 125-foot lengths)	022H020-XXX
Adapter, RS-232 DB25 male to RS-561 8-pin modular jack (connects to VT100-compatible terminal to support connection of interface cable 830-028-XXX)	029H210-001
Interface cable, RS-561 8-pin modular plug to plug (connects DSU Console port to adapter 029H210-001)	830-028-8XX
Adapter, DB25 female to 8-pin modular jack (connects Console port to DTE equipment for PPP link)	209-036-023
Adapter, DB25 male to 8-pin modular jack (connects Console port to DTE equipment for PPP link)	209-036-021
Adapter, DB25 male to 8-pin modular jack (connects Console port to DCE equipment for PPP link)	209-036-022

2 Installation

Overview

This chapter describes the installation of the DT 554S DSU.

The DT 554S DSU is shipped pre-assembled, tested, and ready to use. The normal procedure after unpacking the unit is to connect it to ac power and perfom the Preoperational Check described in this chapter. When the test is successfully completed you may proceed to make cable connections to the DSU.

The DT 554S DSU should be installed in a ventilated area where the ambient temperature does not exceed 122°F (50°C). Do not install the DSU above other equipment that generates large amounts of heat (e.g., power supplies).

This chapter includes information on setting configuration options for the DSU by means of the hardware switchbanks located on the pc board.

Unpacking and Handling

The DT 554S DSU is shipped in packing material that is enclosed in a corrugated box. Inspect the DT 554S DSU when you receive it. If you observe any damage, notify the shipper immediately.

Do not discard the box and packing material. Save them for use if it is ever necessary to reship the DT 554S DSU.

Preoperational Check

You should give the DT 554S DSU a preoperational check before you connect it to the network or customer equipment, and *before you change any factory-set options.* The factory default setting for all options is all switches set to Off. Perform a Local Test with Self-Test to verify normal operation. Refer to *Chapter 4* for instructions on performing the test. Perform the test on the DT 554S DSU before you connect it to anything other than ac power.

If the DT 554S DSU does not check out properly, replace it with a spare, if available, and repeat the test. Do not attempt to repair the DT 554S DSU. For assistance, contact General DataComm Service as described in the *Preface*.

If the DT 554S DSU passes the test but subsequently fails to perform in data communications operation, it may not be at fault; some error may have been made in the installation or option selection, or there may be other faulty devices or connections. Recheck the connections and option selections, and if necessary perform the Fault Isolation Procedure in *Chapter 4* to isolate the fault. Also verify that the customer equipment and remote DSU are compatible (that is, operating at the same rate).

Option Selection

The DT 554S DSU provides a number of field-selectable options by which you can adapt it to a variety of configurations. The most convenient way to set options is to use the VT100-compatible terminal interface. Directions for connecting to the back panel Console port appear in this chapter; directions for using the terminal interface appear in *Chapter 3, Operation*.

a. If the Auto Framing option is to be used, enable it at only one of the two DSUs that make up a link.

b. If you connect two DSUs back-to-back (direct cable connection) and automatic Line Build-Out is to be used, enable it in only one of the DSUs.

Timing Options

Timing options determine the clock source for the data the DT 554S DSU transmits to the network and receives from the customer channel equipment. The default timing option for the DSU is Receive timing, in which the network provides the timing source.

Although the network clock is the preferred timing source, the DT 554S DSU provides other timing options for use in applications where a network clock is either not available or not applicable. The flexibility and complexity of the DSU's timing options require detailed

explanations. Refer to *Appendix C* for details and applications of the DT 554S DSU timing options.

Connections

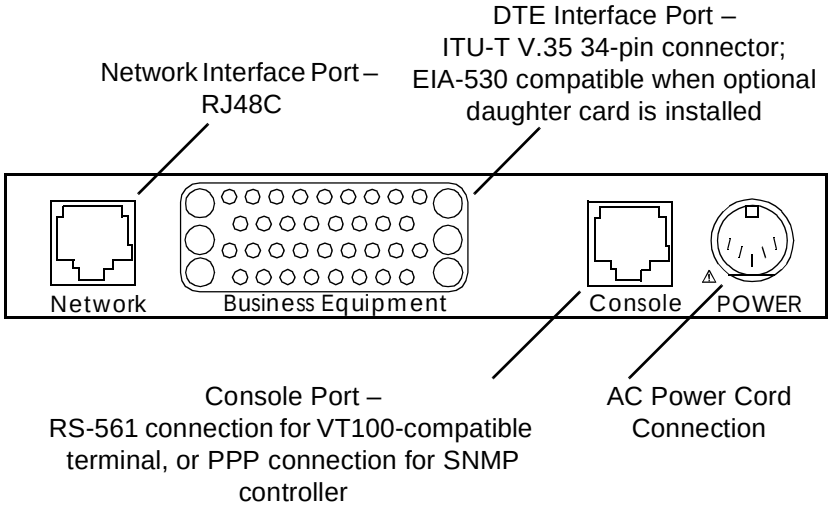
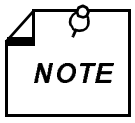


Figure 2-1 Back Panel Connectors

DTE Interface Port Connection

The DT 554S DSU provides one DTE interface port. In its standard configuration it is compatible with ITU-T V.35. It can also be ordered with the daughter card that makes the port EIA-530 compatible.



The optional EIA-530 interface card attaches to connectors XA3P1, XA3P2, and XA3P3 on the main pc card. Figure 2-2 *illustrates enable and disable positions for the daughter card. When it is not present, shorting jumpers (P/N 208-011-716) must be installed on the connectors as described in the figure.*

The DTE interface port is a 34-pin female (V.35) connector located on the rear panel. Refer to *Table 1-1* for the appropriate interface cable. Refer to *Appendix B* for interface pin/signal assignments.

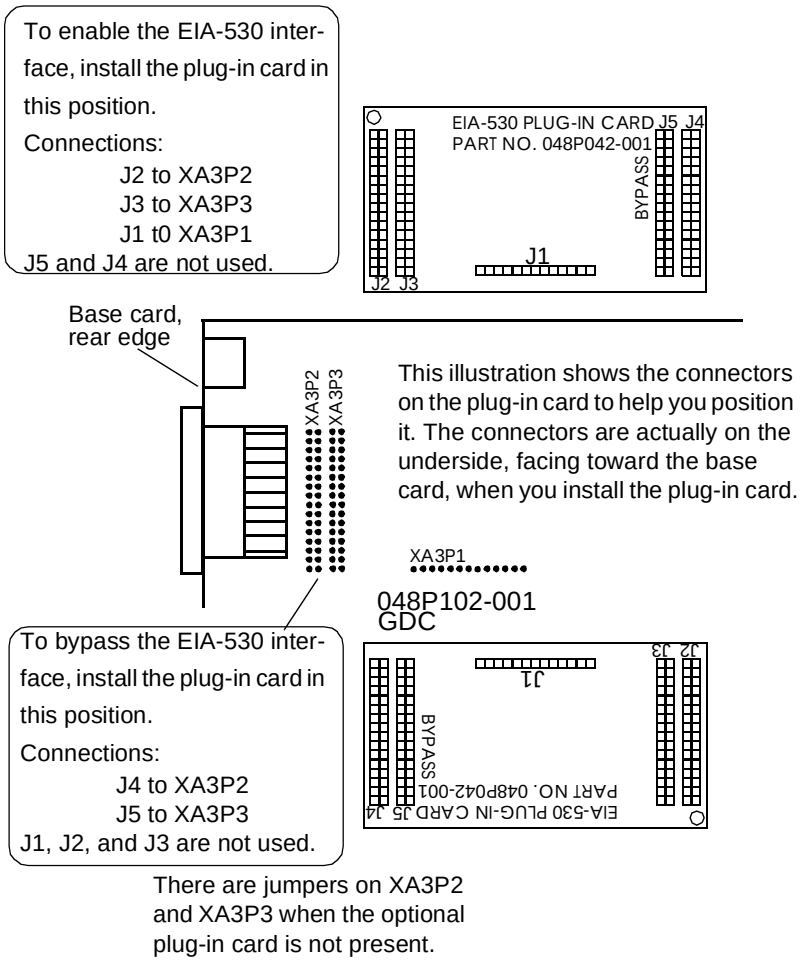
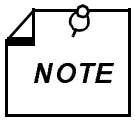


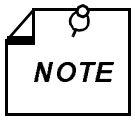
Figure 2-2 EIA-530 Interface Daughter Card Installation

Network Connection

Connect the network (T1 line) to the DT 554S DSU as described below.



The Telco continuously monitors the T1 link and the equipment connected to it. Notify the Telco before connecting the DT 554S DSU to the network. The DT 554S DSU must remain continuously powered on and connected to the T1 service. FCC Part 68 rules require the user to notify the service provider if the DSU is removed from service or turned off.



For Canadian installations only, a special cable is required for the network connection. Use GDC cable P/N 022H020 (RJ48C to DB15F) to connect the network port to the T1 line.

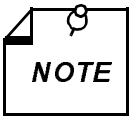
The network port interface is an RJ48C jack located on the rear panel. You must use either GDC cable P/N 022H024-XXX (RJ48C plug-to-plug) or 022H021-XXX (RJ48C plug-to-terminal lugs) to connect the T1 line to the DSU. The plug-to-plug cable is labeled NETWORK and CSU to indicate where each end is used.

Pinouts for the network end of the network interface cables are listed below:

Function	Direction	027H242-X04 022H024-XXX Pin No.	022H025-XXX 022H021-XXX Wire color
Receive Data (Ring)	To DSU	1	ORN/WHT
Receive Data (Tip)	To DSU	2	WHT/ORN
Send Data (Ring)	From DSU	4	BLU/WHT
Send Data (Tip)	From DSU	5	WHT/BLU
Shield (Frame Gnd.)	n/a	7	DRAIN

Note: The remaining leads are not used.

*If you connect two DSUs back-to-back (a direct cable connection), automatic Line Build-Out must not be enabled for both. It may be enabled in **one** of the units, if so desired.*



a. This installation procedure must be followed for compliance with FCC Part 15, Subpart J, Class A requirements.

b. For Canadian installations only, a special cable is required for the network port connection. Use GDC cable P/N 022H020-XXX (RJ48C plug to 15-pin female) to connect the network port to the T1 line.

Primary Power Connection

After the DT 554S DSU has been installed and the above connections have been made, connect primary power to the system. The DSU is provided with an external power transformer that plugs into a three-prong electrical outlet.

Connect the power cord from the transformer to the back panel of the DSU and insert the plug-in transformer into a polarized outlet that provides the required ac power.

Use only GDC Part No. 700-053-002 plug-in transformer to power the DSU. This unit is a Class 2 power source, rated 19 Vac, 0.6A, at 60 Hz.

The outlet that provides ac power should not be under switch control. The DT 554S DSU should be powered by the same ac source as the customer equipment connected to it. Use of the same ac source will prevent large circulating currents caused by differences in ground potential. If you cannot be sure that the customer equipment is powered by the same ac source as the DSU, verify that the potential difference between the grounding circuits of their respective outlets is less than 0.25 V rms.

Console Port Connection

The Console port, located on the back panel and identified in *Figure 2-1*, is the interface for both SNMP and terminal interface control of the DSU. It is an RS-561 compatible RJ45 jack that supports 9600 bps asynchronous data.

For connection of a computer running an SNMP manager, it is compatible with both Point to Point Protocol (PPP) and Serial Line Internet Protocol (SLIP).

You can use the Console port for terminal interface control either by directly connecting a VT100-compatible ASCII terminal or by establishing a telnet connection from a computer running a terminal emulator.

Connection to the Console port requires an RJ45-to-RJ45 cable and one of four adapters. The following table identifies and describes these components.

Description	Purpose	Part Number
Cable, 8-pin modular plug to 8-pin modular plug	For all Console port connections: connect one modular plug to the port, second plug to one of the following three adapters	830-028-XXX
Adapter, 8-pin modular jack to DB-25F connector	For terminal or computer that has a male DB-25 connector configured as a DTE interface	209-036-023
Adapter, 8-pin modular jack to DB-25M connector	For terminal or computer that has a female DB-25 connector configured as a DTE interface	209-036-021
Adapter, 8-pin modular jack to DB-25F connector	For terminal or computer that has a male DB-25 connector configured as a DCE interface	209-036-022
Adapter, 8-pin modular jack to DB-25M connector	For terminal or computer that has a female DB-25 connector configured as a VT100-compatible interface	029H210-001

3 Operation

Overview

This chapter provides front panel and terminal interface operating instructions for the DT 554S DSU. It deals with controlling and monitoring DSU functions by means of the front panel switches and LED indicators, and by means of a VT100-compatible terminal connected to the back panel Console port.

The front panel provides a group of monitoring functions through its indicators and enables you to invoke a subset of the DSU test functions through its four switches.

The terminal interface provided by the Console port supports a broader range of functions than does the front panel. Through the terminal interface you can alter the configuration of the DSU, invoke the full range of its diagnostic test functions, view the current status of DTE interface signals and unit alarm conditions, and display information on the unit.

This chapter describes the use of front panel switches and the terminal interface for accessing the DSU diagnostic functions. *Chapter 4, Test*s, describes in detail the actual test procedures that you can perform by those means.

The DSU is also subject to control from a Simple Network Management Protocol (SNMP) network manager or MIB browser. *Appendix E, MIB Tables*, lists the Management Information Base (MIB) tables that the DSU supports for SNMP functions. The specific network manager or MIB browser that you employ determines how you access MIB objects to control and monitor the DSU.

In addition to operating instructions, this chapter contains a brief description of how to copy revised operating firmware into the DSU by means of the Trivial File Transfer Protocol (TFTP).

Controls and Indicators

Figure 3-1 illustrates the DT 554S DSU front panel and explains the function of each control and indicator.

The four switches on the front panel are momentary action pushbuttons. One push on switch initiates its function, a second push terminates the function.

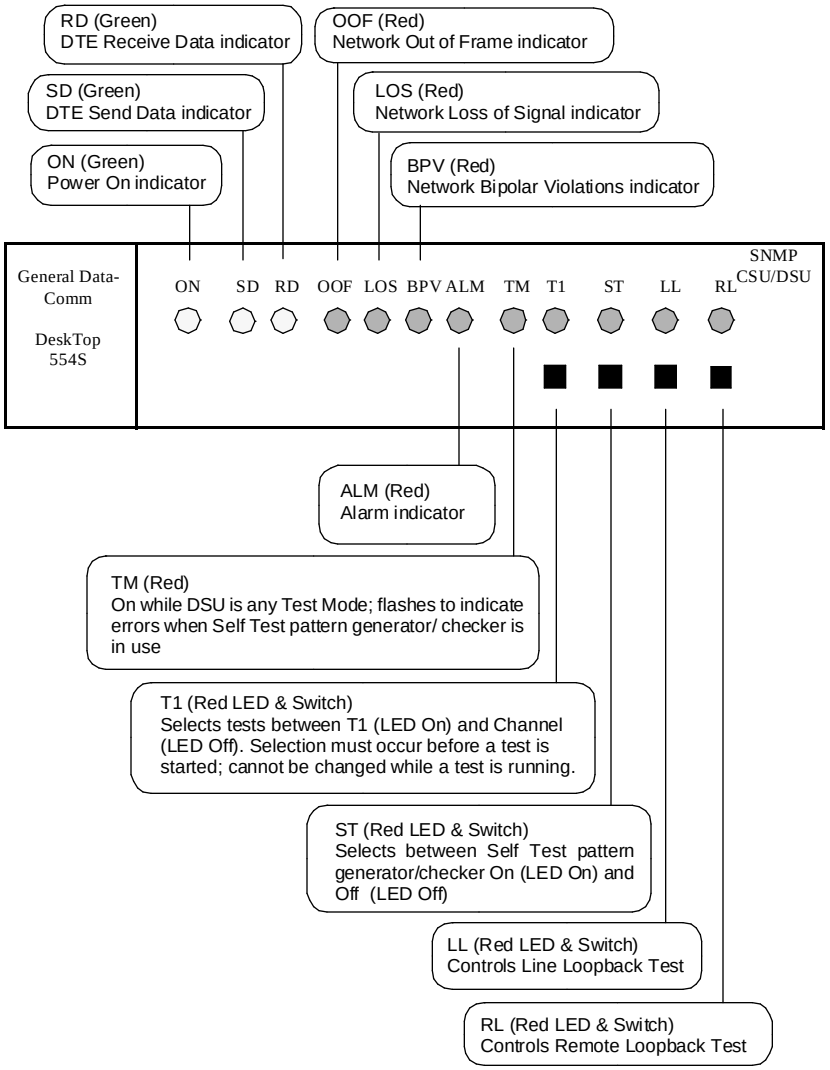


Figure 3-1 DT 554S Front Panel Controls and Indicators

GDC 048R152-000

Terminal Interface

The DT 554S DSU provides an on-screen terminal interface for configuration, diagnostic, monitor, and maintenance functions. *Figure 3-2* illustrates how the screens are arranged.

The Console Port on the DSU back panel is the connection point for the terminal interface. It supports two types of connection:

- direct cable connection of a VT100-compatible ASCII terminal
- Point to Point Protocol (PPP) link for Telnet connection with a computer running a terminal emulator.

The PPP link requires an IP address and mask configured in the DSU, as does SNMP control. PPP and SNMP use the same IP addressing. You have to use an ASCII terminal to configure the IP addressing. The IP address configuration is read-only when you use a Telnet connection.

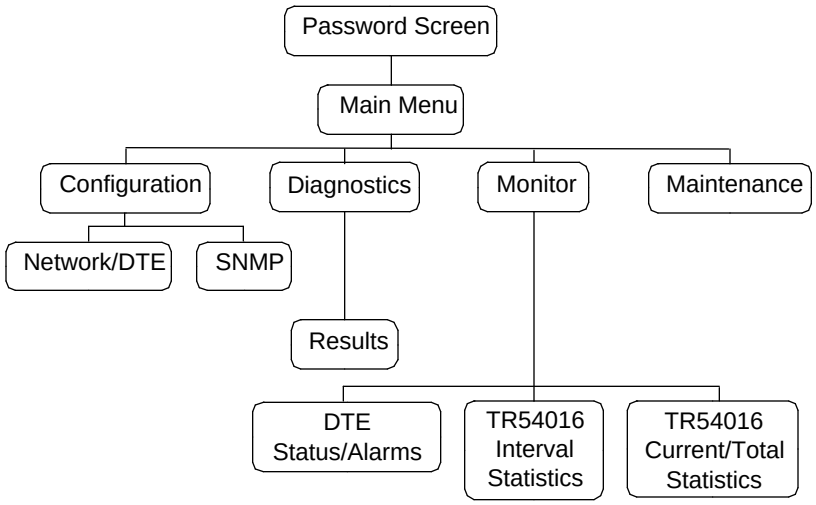


Figure 3-2 DT 554S Terminal Interface Screens

Password Screen

The Password screen shown in *Figure 3-3* is always the first to appear when you initiate a Telnet connection to the DSU. It can appear when you connect a terminal, depending on the setting of a configuration option. That option is described below in connection with the Configuration screens.

The password for the terminal interface is also the SNMP Super-User Community Name for the DSU. The default community name/ password is GDCGDC. You can use an ASCII terminal to change it in the SNMP Configuration screen. That screen is not accessible by means of a Telnet connection.

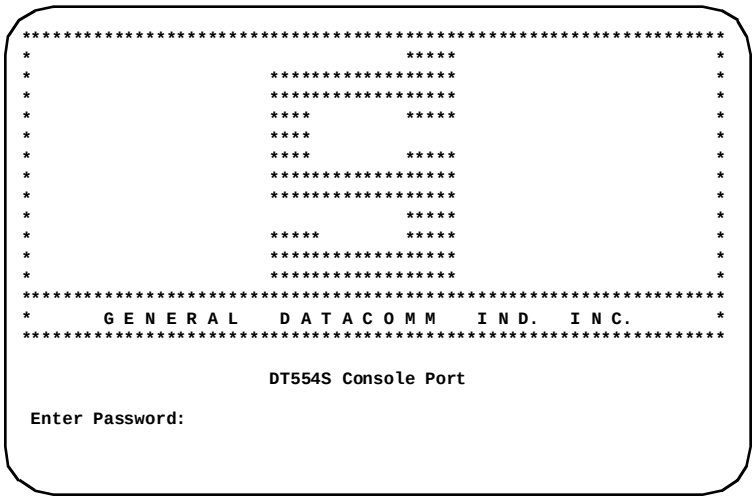


Figure 3-3 Password Screen

Main Menu

The Main Menu screen, shown in *Figure 3-4*, is the access point to the four individual terminal interface functions:

[1] Configuration
[2] Diagnostics
[3] Monitor
[4] Maintenance

The selection [0] Exit Telnet, shown in the figure, appears only when you access the terminal interface through a Telnet connection. It does not appear when you use an ASCII terminal.

Simply type the number that corresponds to the function you need to use. The selection occurs immediately when you press the key. You do not need to press the Enter key.

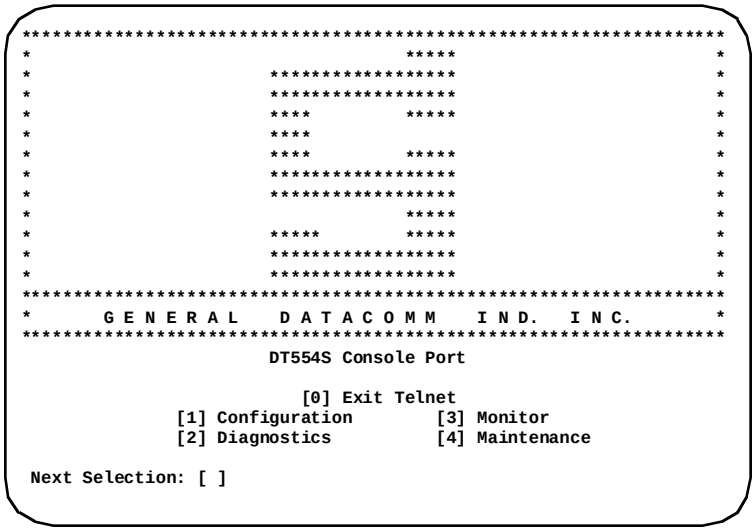


Figure 3-4 Main Menu Screen

Configuration

The Configuration screen shown in *Figure 3-5* appears when you type 1 to invoke the Configuration function from the Main Menu. From this screen you can access either of the two configuration option screens or return to the Main Menu screen:

- Type 1 to reach the Network/DTE Configuration screen
- Type 2 to reach the SNMP Configuration screen
- Type 0 to return to the Main Menu screen

Typing 3 toggles between enabling and disabling use of the Password

screen for ASCII terminal connection. The option displays the result of entering the selection at the present time (that is, if selection 3 reads "Disable VT100 Password Check" the password function is currently *enabled*). The password function cannot be disabled for Telnet connections.

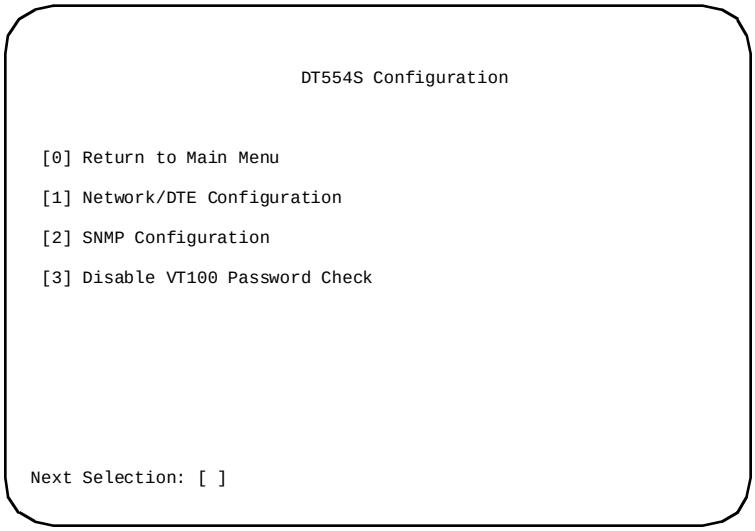


Figure 3-5 Configuration Screen

Network/DTE Configuration Screen

The Network/DTE Configuration screen shown in *Figure 3-6* presents a screen of configuration options that determine operating parameters for the network and DTE interfaces of the DSU. Each option is identified by a selection number or letter, and displays its current setting. The procedure for changing option settings follows the figure, as does a table of the settings available for each option. The settings shown in the illustration are the factory default values for the DSU. The terminal interface Maintenance screen includes a command for resetting all options to their default values.

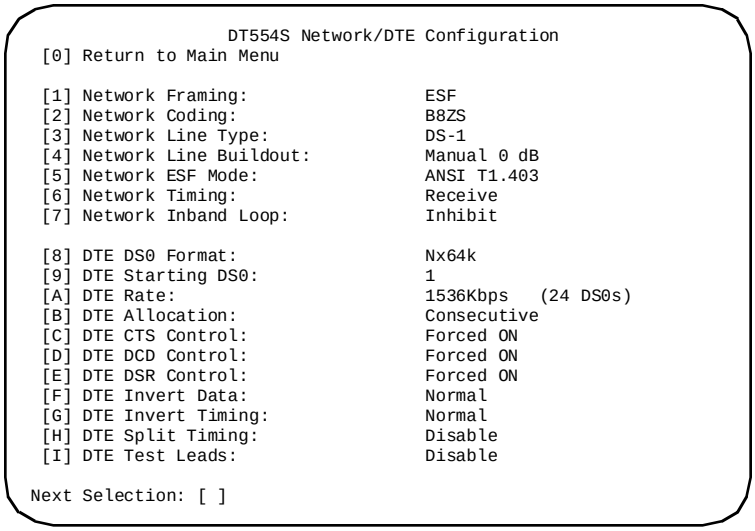


Figure 3-6 Network/DTE Configuration Screen, with Default Settings

The procedure for changing configuration option settings involves the following steps:

1. Type the selection number or letter of the option you intend to change. Highlighting appears on the current setting field for the corresponding option.
2. Use the left and right arrow keys to toggle the highlighted field through its potential settings.
3. When the desired setting is displayed, press Enter. The changed setting goes into effect immediately.
4. Repeat steps 1 through 3 for each option you need to change.
5. After you've made all required changes, type selection 0, `Return to Main Menu`.

Table 3-1, which starts on the next page, lists the configuration options that appear on the terminal interface display and all the settings available for each.

Table 3-1 DT 554S DTE/Network Configuration Option Settings

Option	Potential Settings
[0] Return to Previous Menu	Returns display to the DT 554S Configuration screen
[1] Network Framing:	ESF
	D4
	Unframed
	Auto – DSU adapts to either ESF or D4 framing based on the signal it receives. *Caution:* *Do not enable Auto Framing for both DSUs on a lin*
[2] Network Coding:	B8ZS – Bipolar with 8 Zero Substitution encoding for the network side
	AMI – Alternate Mark Inversion encoding for the network side. DSU enforces an 8 x (N+1) ones density requirement when AMI is selected in combination with framed N x 64k operation and consecutive DS0s, or with unframed operation.
[3] Network Line Type:	DS-1 – for connection to a T1 line
	DSX-1 – for connection to the cascade port of another DSU or to a CSU
[4] Network Line Buildout: [4] is Line Buildout when Line Type is DS-1	Manual 0 dB
	Manual -7.5 dB
	Manual -15 dB
	Manual -22.5 dB
	Auto *Caution:* *Do not enable automatic LBO for both DSUs in a pair connected back-to-back. Do not enable automatic LBO when the DSU is connected to a DS1 Interface Connector (Smart Jack): use manual LBO with 0 dB attenuation.*

(Continued on next page)

Table 3-1 DT 554S DTE/Network Configuration Option Settings (Continued)

Option	Potential Settings
[4] Network Pre-Equalization: [4] is Pre-Equalization when Line Type is DSX-1	0-133 ft
	133-266 ft
	266-399 ft
	399-533 ft
	533-655 ft
[5] Network ESF Mode:	ANSI T1.403 – compliance with ANSI network performance messages (per Bellcore TR-TSY-000194), available only with ESF framin
	TR 54016 – compliance with network maintenance messages per PUB 54016, available only with ESF framing
[6] Network Timing:	Internal – DSU provides the send timing source for T1 data output to the network.
	Receive – DSU recovers receive T1 clock from the network receive T1 data and uses it as the send timing source for T1 data output to the network
	DTE – DSU translates the clock taken from the Ext Clk signal provided by the DTE and uses it as the send timing source for T1 data output to the network.
[7] Network Inband Loop:	Inhibit – DSU does not respond to in-band T1 loop codes
	Payload Loop – DSU starts or stops a Payload Loop test when it detects the appropriate inband loopback code
	Line Loop – DSU starts or stops a Line Loop test when it detects the appropriate inband loopback code
[8] DTE DS0 Format:	N x 56 Kbps
	N x 64 Kbps
[9] DTE Starting DS0:	1 through 24, or None

(Continued on next page)

Table 3-1 DT 554S DTE/Network Configuration Option Settings (Continued)

Option	Potential Settings
[A] DTE Rate:	56Kbps (1 DS0) through 1344 Kbps (24 DS0s) *or* 64Kbps (1 DS0) through 1536 Kbps (24 DS0s)
[B] DTE Allocation:	Consecutive – selects consecutive DS0s for payload
	Alternate – selects alternate DS0s for payload; unused DS0s are forced to marks
[C] DTE CTS Control:	Forced ON
	Follow RTS
[D] DTE DCD Control:	Forced ON
	Follow OOF
[E] DTE DSR Control:	Forced ON
	Follow LOS
[F] DTE Invert Data	Normal
	Invert SD
	Invert RD
	Invert SD & RD
[G] DTE Invert Timing	Normal
	Invert SC
	Invert RC
	Invert SC & RC
	Auto – DSU monitors for data/clock misalignments in DTE data, and automatically toggles between Normal and Invert conditions to compensate for detected misalignment conditions

(Continued on next page)

Table 3-1 DT 554S DTE/Network Configuration Option Settings (Continued)

Option	Potential Settings
[H] DTE Split Timing	Disable – DSU uses selected Network TX Timing to clock T1 transmit data and channel send data
	Enable – DSU uses selected Network TX Timing to clock T1 transmit data, and uses the Ext Clk signal provided by DTE to clock channel send data
[I] DTE Test Leads	Disable – DTE Test Leads LL and RL disabled.
	Enable – DTE Test Leads LL and RL enabled.

SNMP Configuration Screen

The SNMP Configuration screen shown in *Figure 3-7* is fully functional when accessed by means of a VT100-compatible ASCII terminal. When the screen is accessed by means of a Telnet connection selections 1, 2, and 3 are not numbered. That is to graphically indicate that during a Telnet session those selections are read-only and cannot be changed.

This screen enables you to configure the parameters involved in SNMP control: IP address and mask, and SNMP community names and trap destinations. IP addressing is also used for Telnet connection to the DSU terminal interface.

The configuration process for this screen differs sharply from that for the DTE/Network configuration screen. The SNMP Configuration screen has four fields in which you type input rather than selecting from a range of values, and two selections that give you access to tables of configuration information rather than to individual options. Procedures for changing option settings in this screen follow the figure.

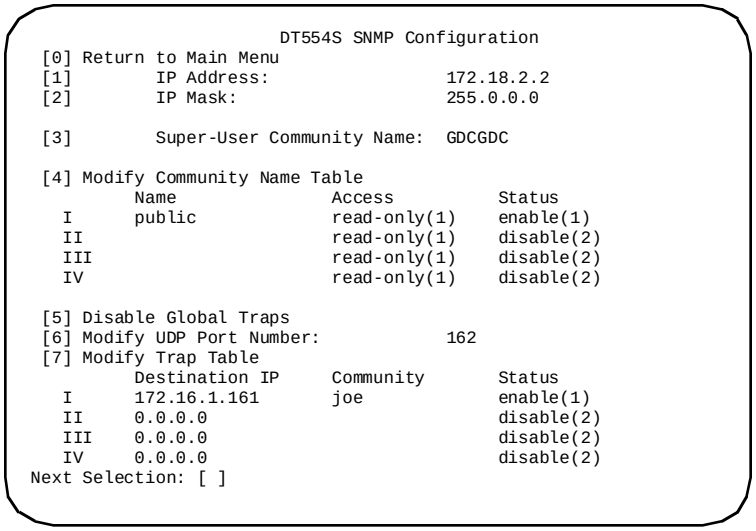


Figure 3-7 SNMP Configuration Screen

The four input fields on the screen that you modify by selecting and then typing input, are [1] Enter IP Address, [2] Enter IP Mask, [3] Modify Super-User Community Name, and [6] Modify UDP Port Number.

The DSU uses its IP Address and IP Mask to recognize SNMP or Telnet communications directed to it.

The Super-User Community Name, in addition to being an SNMP community name that can receive alarm traps and be used to access the MIBs, is also the password for making a Telnet connection to the DSU. It does not have to be entered in the Community Name table (selection [4]). The default Super-User Community Name is GDCGDC.

The UDP Port Number identifies the logical port to which the DSU directs SNMP Traps. Consult the documentation for the SNMP manager or MIB browser you are using, to determine the number you need to specify here.

The procedure for changing the contents of any of these four fields involves the following steps:

1. Type the selection number. Highlighting appears on the entry field you've selected.
2. Type the new entry for the field and press the Enter key.

   If what you type in the IP Address or IP Mask field is not in the correct format and range, the field returns to its previous value when you press the Enter key.

In the Community Name Table you specify the SNMP community names that have read and read/write privileges for the MIB tables that govern SNMP control of the DSU. The procedure for changing the contents of the table involves the following steps:

1. Type 4 in the Next Selection field. Highlighting appears on the Name field of the the first line in the Community Name Table.
2. You can move the highlight to any field in the table by using the up, down, left, and right arrow keys.
3. While a Name or a blank space in the Name column is highlighted you can type in a community name. You can use the backspace key to make corrections. Remember that community names are case sensitive.
4. When you are done typing an entry in the Name column, press the Enter key to update the field. If you use an arrow key to move to another field before you update, the previous contents return to the Name field.
5. While the highlight is in the Access column, you assign the access privilege for the community name by typing either 1 to make it read-only or 2 to make it read-write.
6. The Status column permits you to disable a community name without removing it from the table. Position the highlight in the Status column and type 2 to make disable the status for the community name. Type 1 to make enable the status for the community name.

7. When you have finished making changes in the Community Name Table, press the Enter key.

The DSU transmits alarm notifications, called traps, to the community names configured in its Trap Table. The Enable/Disable Global Traps option, selection 5, permits you to turn this function on and off. Selection 7, Modify Trap Table, enables you to specify up to four destination devices that are to receive traps and to individually enable or disable trap transmission to them.

To enable or disable the Global Traps function, type 5 in the Next Selection field. The designator displayed for selection 5 changes each time the selection is entered, from Enable to Disable or from Disable to Enable. Remember that the designator on display indicates what is to happen the next time the selection is entered, so that it reads Disable while the function is enabled.

In the Trap Table you specify the IP addresses and SNMP community names that are to receive traps from the DSU. The procedure for changing the contents of the table involves the following steps:

1. Type 7 in the Next Selection field. Highlighting appears on the Destination IP field of the the first line in the Trap Table.

2. You can move the highlight to any field in the table by using the up, down, left, and right arrow keys.

3. While an IP address or a blank space in the Destination IP column is highlighted you can type in an IP address. The DSU will reject input in this column that is not in the valid format and range for an IP address. You can use the backspace key to make corrections.

4. When you are done typing an address in the Destination IP column, press the Enter key to update the field. If you use an arrow key to move to another field before you update, the previous contents return to the field.

5. While a name or a blank space in the Community column is highlighted you can type in a community name. You can use the backspace key to make corrections. Remember that community names are case sensitive.

6. When you are done typing an entry in the Community column, press the Enter key to update the field. If you use an arrow key to move to another field before you update, the previous contents return to the field.

7. The Status column permits you to disable an individual community name so that traps are not transmitted to it without removing it from the table. Position the highlight in the Status column and type `2` to make `disable` the status for the community name. Type `1` to make `enable` the status for the community name.

8. When you have finished making changes in the Trap Table, press the Enter key.

Diagnostics

The terminal interface Diagnostics function for the DT 554S DSU supports two screens: one by which you select and initiate tests on the DSU, and one that displays test results. The results screen also contains the control function for ending a test.

You can perform a wider variety of tests from the terminal than are available by means of the DSU front panel switches. When you perform a test that employs the DSU Self Test pattern generator and checker, the results displayed on-screen are more detailed than the error indication provided by the front panel TM LED.

Figure 3-8 illustrates the Diagnostics selection screen, and *Figure 3-9* illustrates the Diagnostics results screen. Detailed instructions for using these screens appear in *Chapter 4, Tests*, together with descriptions of the diagnostic functions.

```
                        DT554S Diagnostics

 [0] Return to Main Menu

 [1] Select LL Mode:                            Bilateral

 [2] Start Network QRSS Self Test
 [3] Start Network Payload Loopback
 [4] Start Network Line Loopback
 [5] Start Network Local Test
 [6] Start Network Local Test with QRSS Self Test
 [7] Start Network Remote Test
 [8] Start Network Remote Test with QRSS Self Test

 [9] Select DTE Self Test Pattern:              2047 Pattern

 [A] Start DTE Self Test
 [B] Start DTE Local Loopback
 [C] Start DTE Digital Loopback
 [D] Start DTE Remote Digital Loopback
 [E] Start DTE Remote Digital Loopback with Self Test

Next Selection: [ ]
```

Figure 3-8 Diagnostics Selection Screen

```
                        DT554S Diagnostics


 [0] Return to Main Menu

 [1] Stop Test[1]
 [2] Inject Single Bit Error (ST only)
 [3] Reset Counters


 Current Test:          DTE Digital Loopback[2]
 Test Status:           Running[3]
 Test Duration:         12 seconds

 Bit Errors:            00e0000[3]


Next Selection: [ ]
```

[1] displays "Restart Test" when Test Status is "Stopped"
[2] displays name of test selected from Diagnostic Selection screen; identifies Network Line Loopback and DTE Local Loopback tests as either Unilateral or Bilateral
[3] *or* "Stopped"
[4] *or* "NO SYNC"; displays only while a Self Test is selected

Figure 3-9 Diagnostics Results Screen

Monitor

The terminal interface DT 554S Monitor function supports three display screens:

- DTE Status/Alarms
- TR54016 Current/Total Statistics
- TR54016 Interval Statistics

When you select Monitor from the Main Menu, the Monitor screen, shown in *Figure 3-10*, presents a menu with those three screens and a selection for resetting the TR54016 statistics.

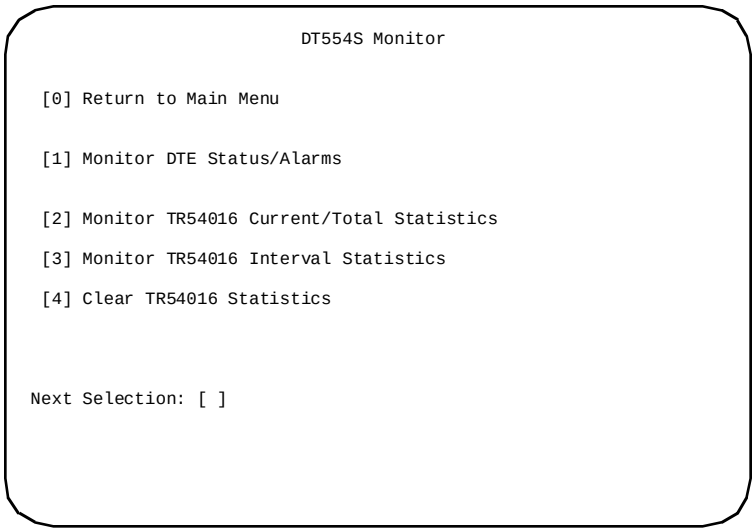


Figure 3-10 Monitor Screen

DTE Status/Alarms Screen

The DTE Status/Alarms screen, shown in *Figure 3-11*, presents current status information concerning DTE interface signals and alarm conditions.

The DTE Status portion of the screen displays the current status of

nine DTE interface signals as OFF, ON, or TRANS. TRANS indicates that the signal is transitioning, as opposed to being in a prolonged On or Off condition.

The Alarm Status portion of the screen displays the current status, INACTIVE or ACTIVE, of the nine alarm conditions that the DSU can report. Definitions of the alarm conditions appear in *Appendix D, Alarm Definitions*.

When you are done viewing the screen, type 0 to return to the Monitor menu.

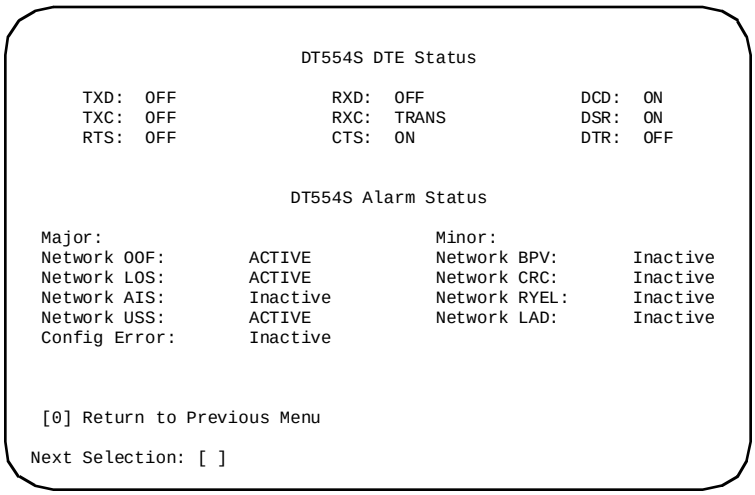


Figure 3-11 DTE Status/Alarm Screen

TR54016 Current/Total Statistics Screen

The TR54016 Current/Total Statistics screen, shown in *Figure 3-12*, presents information concerning five error conditions on which the DSU maintains counts:

Errored Seconds (ES)

Severely Errored Seconds (SES)

Bursty Errored Seconds (BES)

Unavailable Seconds (UAS)

Loss of Frame Count (LOFC)

The Current Interval portion of the screen displays how many of each type of error event have occurred during the current 15-minute interval. The DSU tracks intervals starting when the system is powered up, so they do not necessarily align with the quarter-hour boundaries (5:00, 5:15, 5:30, etc.).

The Total Statistics portion of the screen displays the accumulated counts of each type of error event for up to 24 hours (96 intervals). If the Reset Statistics selection on the main Monitor screen was used within the past 24 hours, the Total Statistics screen represents only the data accumulated since the reset occurred.

When you are done viewing the screen, type 0 to return to the Monitor menu.

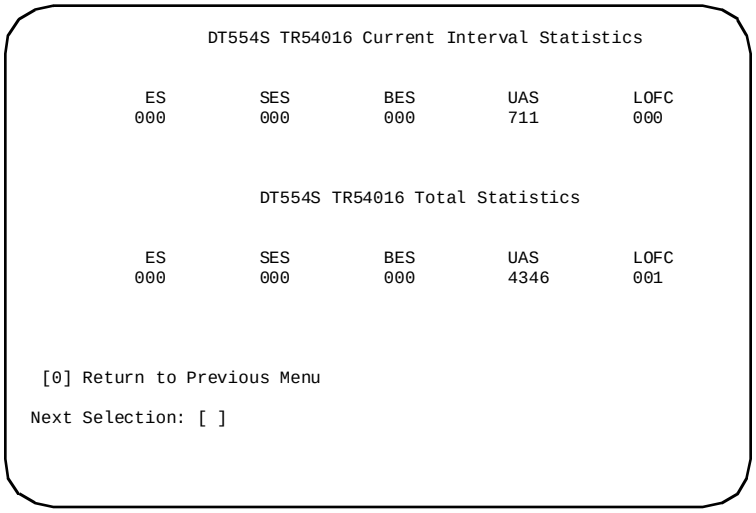


Figure 3-12 TR54016 Current/Total Statistics Screen

TR54016 Interval Statistics Screen

The TR54016 Interval Statistics screen, shown in *Figure 3-13*, presents detailed information on a selected error condition.

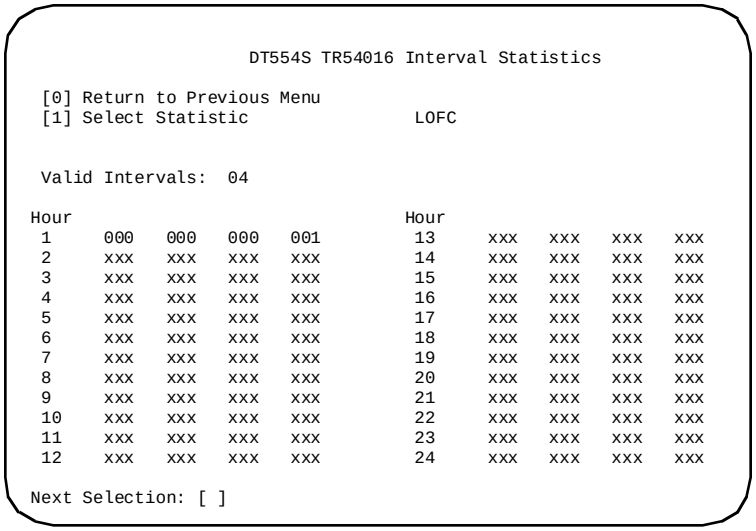
To select the condition you want displayed –

1. Type 1 to highlight the Select Statistic field.
2. Use the right and left arrow keys to toggle the field through the five available selections (ES, SES, BES, UAS, LOFC) until it displays the one you want to view.
3. Press the Enter key. The screen then displays 24 hours of data on the selected error condition. Each hour is displayed in four columns, representing 15-minute intervals. The DSU tracks intervals and hours starting when the system is powered up, so the display does not necessarily align with the quarter-hour boundaries (5:00, 5:15, 5:30, etc.).

The Valid Intervals field displays how many 15-minute intervals are represented on-screen by data. A full 24 hours of data is 96 intervals.

If the Reset Statistics selection on the main Monitor screen was used within the past 24 hours, the Interval Statistics screen shows only the data accumulated since the reset occurred. Intervals for which no data has been collected are shown as xxx.

When you are done viewing the screen, type 0 to return to the Monitor menu.



```
                    DT554S TR54016 Interval Statistics

 [0] Return to Previous Menu
 [1] Select Statistic                LOFC


 Valid Intervals:  04

Hour                                      Hour
 1     000   000   000   001             13     xxx   xxx   xxx   xxx
 2     xxx   xxx   xxx   xxx             14     xxx   xxx   xxx   xxx
 3     xxx   xxx   xxx   xxx             15     xxx   xxx   xxx   xxx
 4     xxx   xxx   xxx   xxx             16     xxx   xxx   xxx   xxx
 5     xxx   xxx   xxx   xxx             17     xxx   xxx   xxx   xxx
 6     xxx   xxx   xxx   xxx             18     xxx   xxx   xxx   xxx
 7     xxx   xxx   xxx   xxx             19     xxx   xxx   xxx   xxx
 8     xxx   xxx   xxx   xxx             20     xxx   xxx   xxx   xxx
 9     xxx   xxx   xxx   xxx             21     xxx   xxx   xxx   xxx
 10    xxx   xxx   xxx   xxx             22     xxx   xxx   xxx   xxx
 11    xxx   xxx   xxx   xxx             23     xxx   xxx   xxx   xxx
 12    xxx   xxx   xxx   xxx             24     xxx   xxx   xxx   xxx

Next Selection: [ ]
```

Figure 3-13 TR54016 Interval Statistics Screen

Maintenance

The terminal interface DT 554S Maintenance screen, shown in *Figure 3-14*, displays information that identifies the unit, its firmware revision level(s), and the type of DTE interface installed in it. The screen also provides a group of control functions.

The DT 554S DSU can store two revisions of its operating firmware simultaneously. The Maintenance screen identifies the firmware revision in use as "Current Firmware Revision" and the other revision as "Alternate Firmware Revision".

Selection 1 "Run Alternate Firmware Revision" causes the DSU to switch between the two sets of firmware each time you invoke it. The command also performs a reset on the DSU and causes the two sets of firmware to exchange their designations.

Selection 2 "Perform Soft Reset" commands the DSU to perform a reset while continuing to operate with the current revision firmware.

Selection 3 "Reset Factory Defaults," invoked from a VT100-

compatible terminal, restores all Network/DTE Configuration and SNMP Configuration options in the DSU to their default settings and performs a reset.

When invoked by means of a Telnet connection "Reset Factory Defaults functions somewhat differently: the IP Address and IP Mask on the SNMP Configuration screen retain their user-configured values. The Telnet connection would be lost if the IP address and mask were reset to defaults.

When you are done with the Maintenance screen, type 0 to return to the Main Menu.

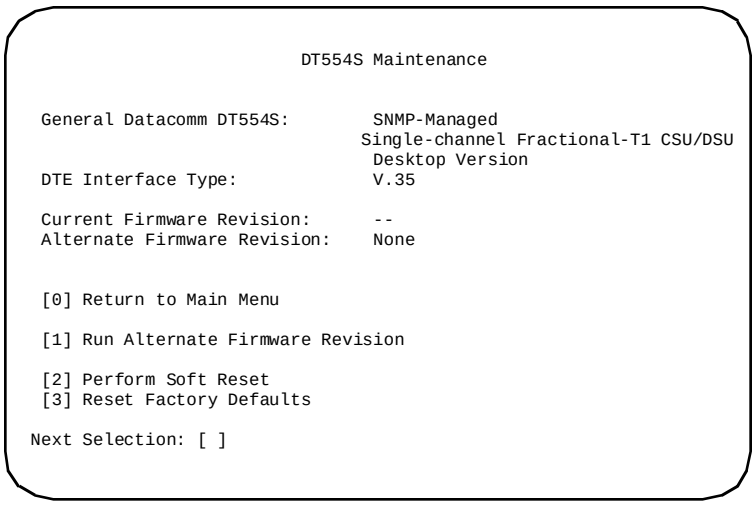


Figure 3-14 Maintenance Screen

Firmware Download

The DT 554S DSU can store two versions of operating firmware, as described above, so that new firmware can be loaded without interupting normal operation. New firmware, when it is downloaded, always begins as the Alternate Firmware Revision while the DSU continues to operate with its previous firmware. GDC may provide revised firmware to correct problems or to implement enhancements.

Trivial File Transfer Protocol (TFTP) is used to perform the actual firmware download, using the following procedure:

1. Connect the computer that is to be used for the download to the DSU Console port.
2. Initiate a Point to Point Protocol (PPP) link or a Serial Line Interface Protocol (SLIP) link, and ping the DSU to verify communication.
3. Initiate a TFTP session to the DSU IP address.
4. At the TFTP prompt type

   `bin`

   and press the Enter key so that the transfer takes place in binary mode.
5. Type

   `trace`

   and press the Enter key so that activity is displayed during the transfer.
6. Type

   `put "DT554S.V" "DT554S.V"`

   and press the Enter key to initiate the actual transfer. This command writes the file named DT554S.V on the computer over the file named DT554S.V in the DSU. The filenames must be entered in all uppercase letters.
7. When the download is complete, access the DSU terminal interface and select Maintenance.
8. At the Maintenance screen, type 1 and press the Enter key to switch over to using the new firmware, which becomes the "Current Firmware Revision". The earlier firmware revision is retained as the "Alternate Firmware Revision", and the DSU can be switched back to using it if there is any need to do so. Designators in the Firmware Revision displays take the form of "--" for the earliest released version, "-A" for the next, "-B" and so on.

4 Diagnostics

Overview

This chapter describes the test functions of the DT 554S DSU and provides instructions for their use. There are three ways to control tests locally:

- Terminal Interface Diagnostics Selection screen enables you to command all DSU tests
- Front panel switches enable you to command all but three of the DSU tests
- DTE interface signals can command two tests – DTE Local and Remote Loopbacks.

The DSU can also be commanded remotely into tests that involve looping the networks signal back to be checked for errors at the remote site. The remote site DSU transmits inband loop codes to command remote loopbacks at the local unit. This chapter identifies the tests that can be commanded remotely.

The structure of the chapter is based on the terminal interface Diagnostic Selection screen since it includes all the the test functions. The other two means of diagnostic control are limited to subsets.

The table on the following page lists the available tests and how each can be commanded.

Test:	Can be commanded by –
Network QRSS Self Test	Terminal Interface, Front Panel Switch ST (T1 indicator, controlled by T1 switch, must be On)
Network Payload Loopback	Terminal Interface
Network Line Loopback	Terminal Interface, Front Panel Switch LL (T1 indicator, controlled by T1 switch, must be On)
Network Local Test	Terminal Interface
Network Local Test with QRSS Self Test	Terminal Interface
Network Remote Test	Terminal Interface, Front Panel Switch RL (T1 indicator, controlled by T1 switch, must be On)
Network Remote Test with QRSS Self Test	Terminal Interface, Front Panel Switches RL and ST (T1 indicator, controlled by T1 switch, must be On)
DTE Self Test	Terminal Interface, Front Panel Switch ST
DTE Local Loopback	Terminal Interface, Front Panel Switch LL, DTE Interface pin L
DTE Digital Loopback	Terminal Interface
DTE Remote Digital Loopback	Terminal Interface, Front Panel Switch RL, DTE Interface pin BB
DTE Remote Digital Loopback with Self Test	Terminal Interface, Front Panel Switches RL and ST

The local diagnostic functions work on a "first come, first served" basis: only one of the three means of control can be in effect at a time, and a test that has begun cannot be overridden by either of the other two types of control. While the terminal interface Diagnostic screens are open the DSU ignores the front panel switches and the DTE interface test leads.

Inband loop codes received from the remote site DSU take precedence over local diagnostic functions. If a locally initiated test is running when a loop code is received, the DT 554S DSU terminates the test and performs the remote loopback.

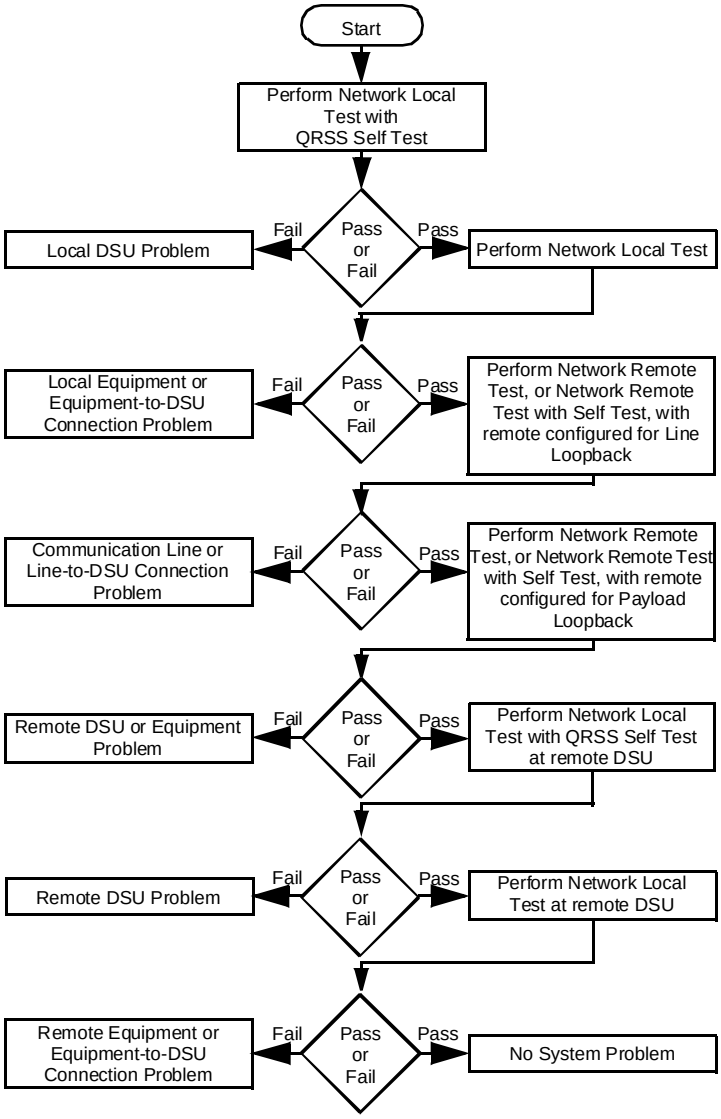


Figure 4-1 Fault Isolation Procedure

Tests can be used at the time of installation or whenever operation of the DSU must be checked. You can also use these tests as an aid in isolating problems in the data communications system (refer to *Figure 4-1, Fault-Isolation Procedure*).

Terminal Interface Test Procedure

All tests that you perform by means of the terminal interface involve the same basic procedure, which is described below. Descriptions of the individual tests appear on the following pages.

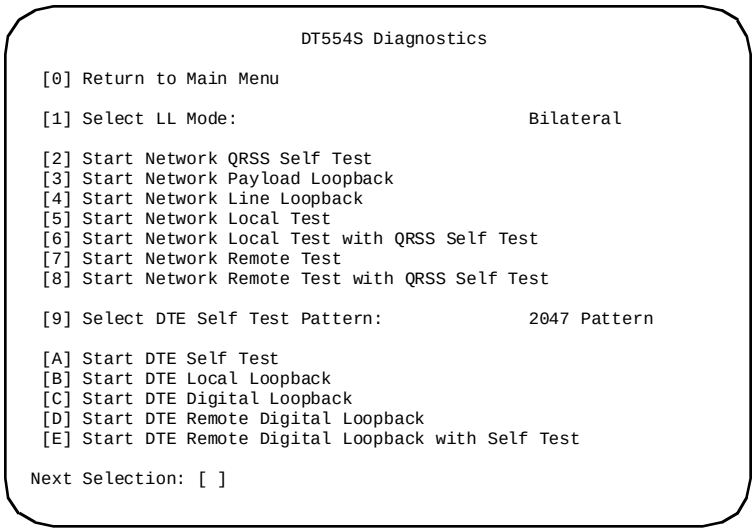


Figure 4-2 Diagnostics Selection Screen

Employ the following procedure to initiate tests using the terminal interface:

1. If the test is one that involves cooperation with an operator at a remote site, contact that person and make arrangements to perform the test. Tests that must be initiated (and later terminated) at both sites include end-to-end self tests, Line Loopbacks, and Payload Loopbacks.

2. Select `[2] DIAGNOSTICS` from the terminal interface Main Menu. The DSU responds by displaying the DT554S Diagnostics Selection screen, as shown in *Figure 4-2*.

3. Make any preliminary setups required for the test you intend to perform. Two selections fall into this category:

   `[1] Select LL Mode` must be set correctly if you are doing a Network Line Loopback or a DTE Local Loopback. When Unilateral is selected the function creates only one loopback: incoming data back onto the T1 line in the case of the network test, or transmit data back as receive data in the case of the DTE test. When Bilateral is selected each test function loops data in both directions.

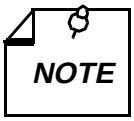
   `[9] Select DTE Self Test Pattern` can be set to `2047 Pattern` or `511 Pattern` as needed for either of the two functions that involve DTE Self Test. This is particularly important when doing an end-to-end self test.

   To change the setting of either of these

   A. Type the selection number or letter of the option you intend to change. Highlighting appears on the current setting field for the corresponding option.

   B. Use the left and right arrow keys to toggle the highlighted field through its potential settings.

   C. When the desired setting is displayed, press Enter.



Changes you make to the LL Mode or DTE Self Test Pattern selection from the Diagnostics Selection screen also apply to how those functions operate in response to the front panel switches.

4. Type the selection number of the test you intend to perform. The DSU responds by initiating the test and displaying the DT554S Diagnostics results screen, as shown in *Figure 4-3*.

The Diagnostics Results screen displays four lines of information about the current test and a menu with four selections:

`Current Test:` identifies the test that is running, including Unilateral/Bilateral specification for Network Line Loopback or DTE Local Loopback.

`Test Status:` displays `Running` when the screen first appears; it displays `Stopped` when you select `[1] Stop Test` from the Results screen menu. The menu selection changes to `[1] Restart Test` when `Stopped` is displayed here.

`Test Duration:` displays how long the test has run.

`Bit Errors:` is displayed only when the Self Test function is in use; it normally displays the number of detected errors; it displays `NO SYNC` if no test pattern is being received during an end-to-end test.

In addition to `[1] Stop/Restart Test`, described together with `Test Status` above, and `[0] Return to Main Menu` the menu contains two selections:

`[2] Inject Single Bit Error` enables you to insert an intentional error as check on the error detector when running a self test.

`[3] Reset Counters` clears both the `Bit Errors` count and the `Test Duration`.

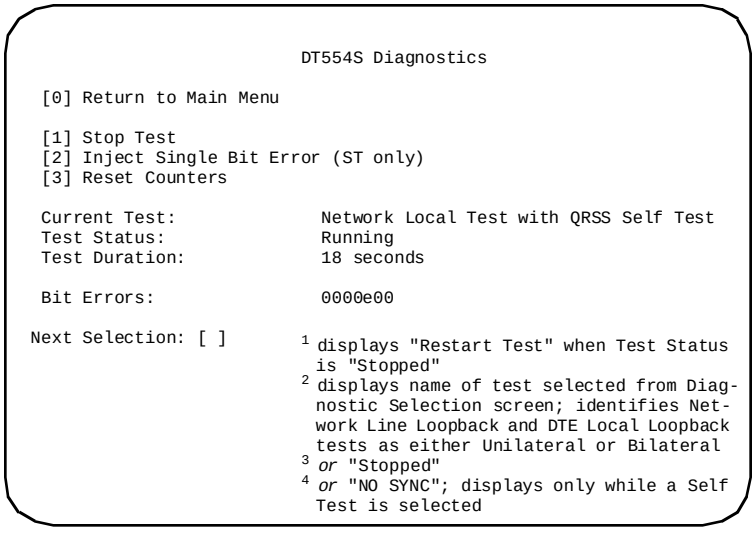


Figure 4-3 Diagnostics Results Screen

Network QRSS Self Test

The Network QRSS Self Test function provides test pattern generation and checking that involves the network interface while excluding the DTE interface. The pattern it provides is a quasi-random signal (QRSS).

The Network QRSS Self Test function appears three times in the terminal interface Diagnostics Selection menu: once by itself and twice in combination with loopback tests. The loopback-with-self test functions are discussed on later pages under their own headings.

You can use the Network QRSS Self Test function by itself to perform an End-to-End Self Test as illustrated in *Figure 4-4*. You can command the test by means of either the terminal interface screen or the front panel switches. Use of the terminal interface provides greater detail in the test results. The test requires the cooperation of an operator at the remote site to initiate the function in the remote DSU, observe the results, and terminate the function.

In the Network End-to-End Self Test, two DSUs transmit internally generated test patterns to each other for verification. Bipolar violations are corrected during this test. Within each DSU, a Test Pattern Generator creates the test pattern, and a Test Pattern checker determines if the data it receives matches that which was transmitted. The test checks both DSUs and the T1 link.

To initiate the test from the terminal interface Diagnostics Selection screen, select `[2] Start Network QRSS Self Test`.

Figure 4-5 shows the switches and indicators that are involved when you command a Network End-to-End Self Test from the front panel. Remember that when you initiate the test from the front panel the only display of results is the TM indicator flashing in response to detected errors. The terminal interface Diagnostics Results screen does not display the results of tests initiated from the front panel.

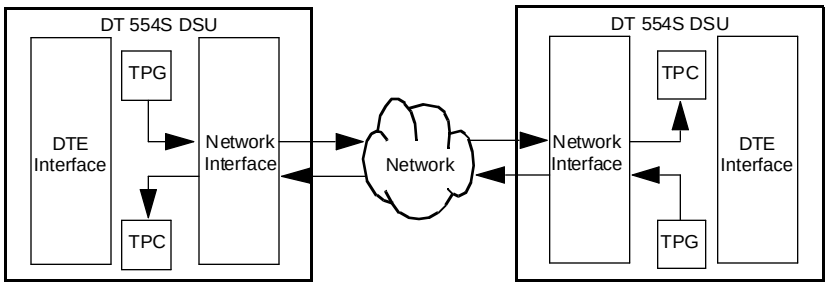


Figure 4-4 Data Path for Network End-to-End Self Test

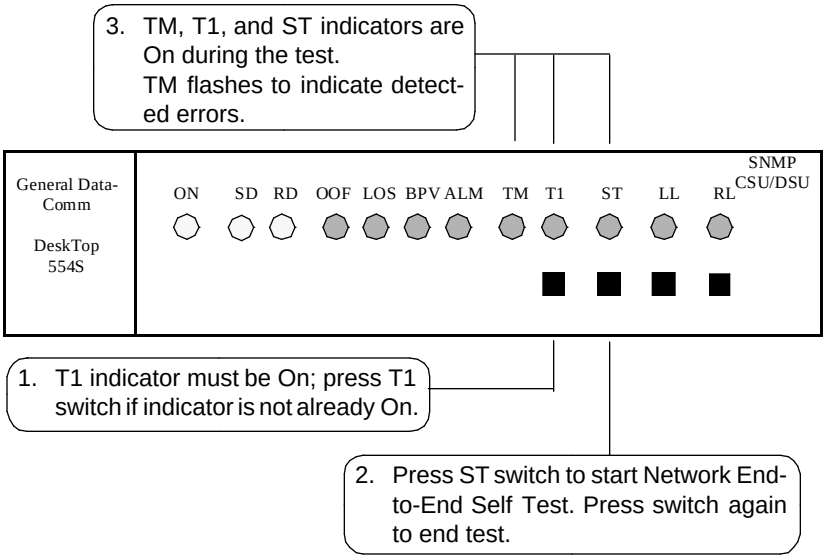


Figure 4-5 Network End-to-End Self Test, Front Panel Control

Network Payload Loopback

The Network Payload Loopback function provides a data path for a test signal that is originated and checked at the remote site. The Payload Loopback, illustrated in *Figure 4-6*, loops back onto the T1 line only the receive DS0s that carry DTE channel data. The loopback occurs at a point within the DSU at which the data has already passed through most of the network interface circuitry.

You can command the loopback by means of either the terminal interface screen or the front panel switches:

- On the terminal interface Diagnostic Selection screen this function is selection `[3] Start Network Payload Loopback`.
- The Network Payload Loopback function is performed as part of the DTE Local Loopback when LL Mode is set to Bilateral. The DTE Local Loopback function is described later in this chapter.

The Network Payload Loopback can also be initiated by a loop code transmitted to the local DSU from the remote site. Local DSU configuration optioning determines whether it can be commanded into the loopback by the remote.

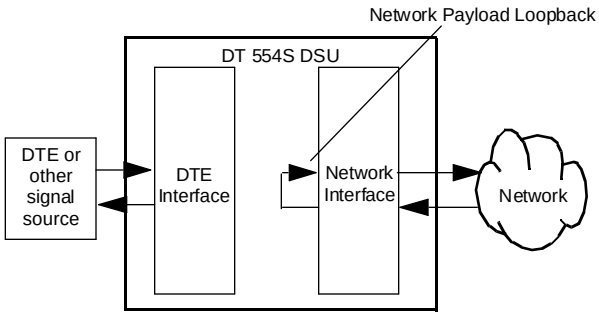


Figure 4-6 Data Path for Network Payload Loopback

Network Line Loopback

The Network Line Loopback function provides a data path for a test signal that is originated and checked at the remote site. The Line Loopback, illustrated in *Figure 4-7*, loops back the entire T1 line. The loopback occurs at a point within the DSU at which the data has passed through only a minimum of the network interface circuitry.

You can command the loopback by means of either the terminal interface screen or the front panel switches:

- On the terminal interface Diagnostic Selection screen this function is selection `[4] Start Network Line Loopback`.
- *Figure 4-8* shows the switches and indicators that are involved when you command a Network Line Loopback from the front panel. The DSU also establishes a DTE Local Loopback when LL Mode is set to Bilateral.

The Network Line Loopback can also be initiated by a loop code transmitted to the local DSU from the remote site. Local DSU optioning determines whether it can be commanded into the loopback by the remote. For the DSU to accept the remote line loop code, option 7, Network Inband Loop, in the Network/DTE Configuration screen must be set to Line Loop.

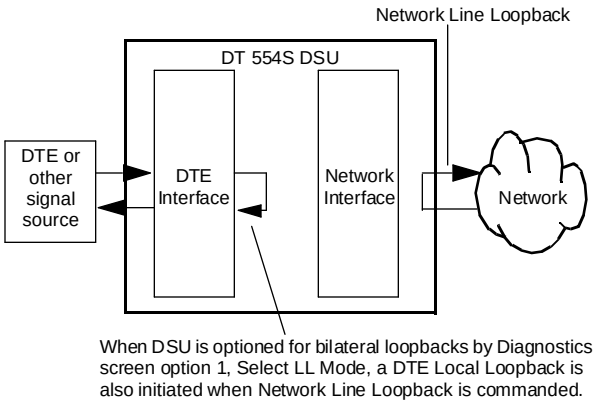


Figure 4-7 Data Path for Network Line Loopback

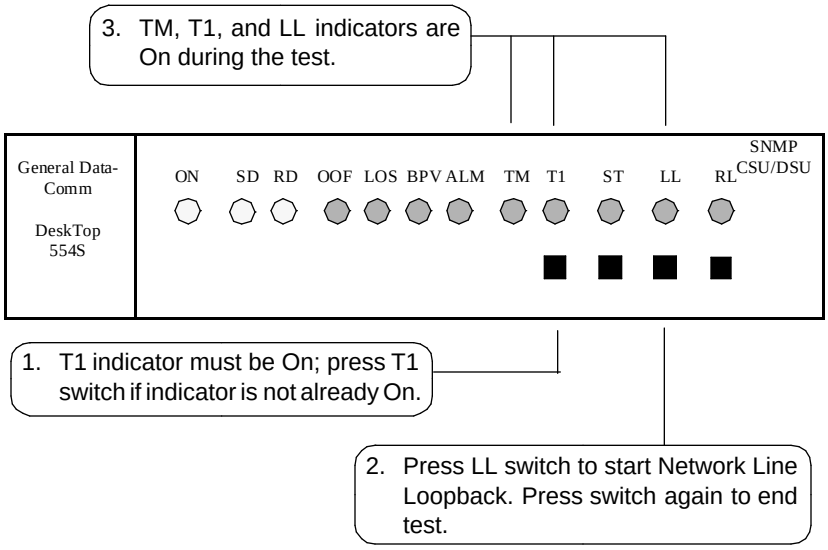


Figure 4-8 Network Line Loopback, Front Panel Control

Network Local Test

The data path for the Network Local Test is illustrated in *Figure 4-9*. This test can only be commanded from the terminal interface Diagnostics Selection screen.

The DSU loops the transmit signal back to the receive path at the network interface. While the loop is in effect the DSU transmits an Alarm Indication Signal (all ones) on the T1 line. The DTE interface remains active so that a test signal can be generated and checked by an external device.

Local Test checks the local DSU, including the channel interface, isolated from the T1 line. Error detection and reporting is entirely the responsibility of the external device that supplies the test signal.

To initiate the loopback from the Diagnostics Selection screen, select `[5] Start Network Local Test`.

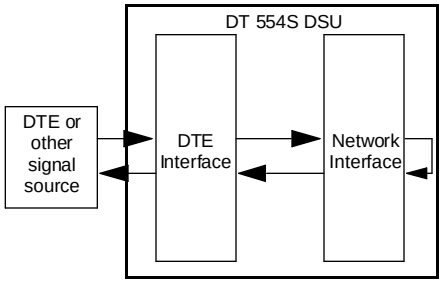


Figure 4-9 Data Path for Network Local Test

Network Local Test with QRSS Self Test

The data path for the Network Local Test with QRSS Self Test is illustrated in *Figure 4-10*. This test can only be commanded from the terminal interface Diagnostics Selection screen.

The DSU generates a QRSS test pattern, loops the transmit signal back to the receive path at the network interface, and checks the returned test pattern for errors. While the loop is in effect the DSU transmits an Alarm Indication Signal (all ones) on the T1 line. The DSU is electronically disconnected from its DTE during the test.

Local Test with Self-Test checks the internal circuits of local DSU isolated from both the T1 line and the DTE. It does not check the channel interface to the DTE.

To initiate the test from the Diagnostics Selection screen, select `[6] Start Network Local Test with QRSS Self Test`.

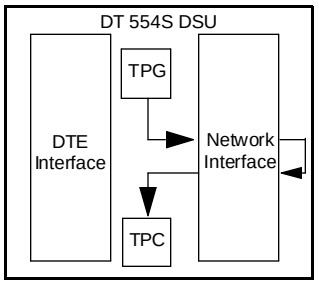


Figure 4-10 Data Path for Network Local Test with Self Test

Network Remote Test

The data path for the Network Remote Test is illustrated in *Figure 4-11*. You can command the loopback by means of either the terminal interface screen or the front panel switches.

When you initiate a Network Remote Test the DSU transmits a loop-up code to the remote unit for approximately five seconds. The remote unit responds by engaging either a Line or a Payload loopback (determined by its optioning).

After the loop is established, connect test equipment to the local DSU DTE interface. Generate a test message. The test equipment should receive back the same message it transmits. A problem exists if it does not.

Network Remote Test with a Line loopback tests the line and the network interface at the remote DSU. Network Remote Test with a Payload loopback extends the test to include network interface circuitry at the remote DSU.

To initiate the test from the terminal interface Diagnostics Selection screen, select `[7] Start Network Remote Test`.

Figure 4-12 shows the switches and indicators that are involved when you command a Network Remote Test from the front panel.

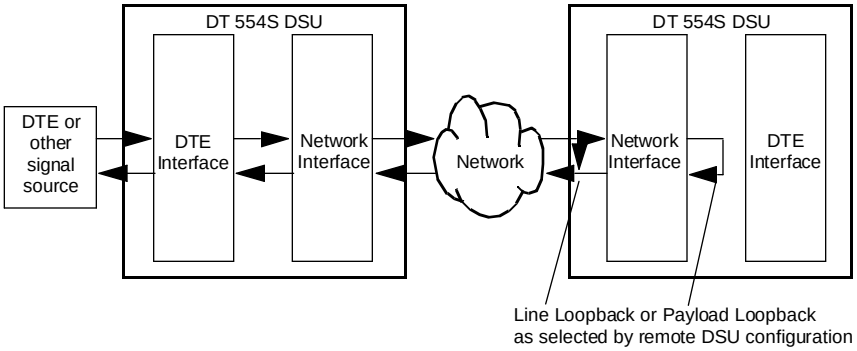


Figure 4-11 Data Path for Network Remote Test

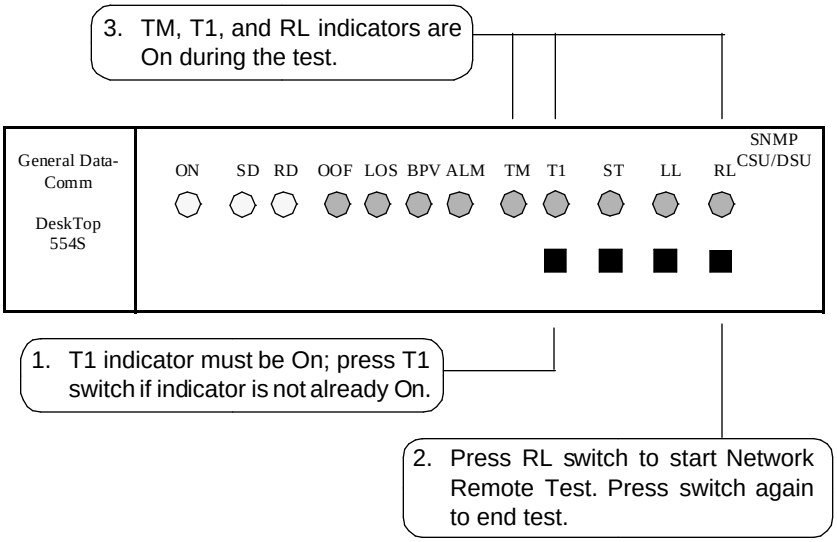


Figure 4-12 Network Remote Test, Front Panel Control

Network Remote Test with QRSS Self Test

The data path for the Network Remote Test with QRSS Self Test is illustrated in *Figure 4-13*. You can command the loopback by means of either the terminal interface screen or the front panel switches.

When you initiate a Network Remote Test the DSU transmits a loop-up code to the remote unit for approximately five seconds. The remote unit responds by engaging either a Line or a Payload loopback (determined by its optioning).

When the loop is established the DSU generates a QRSS test pattern and transmits it to the remote DSU which loops it back to be checked for errors at the local DSU. The DSUs are electronically disconnected from their DTEs during the test.

Network Remote Test with a Line loopback tests the line and the network interface at the remote DSU. Network Remote Test with a Payload loopback extends the test to include network interface circuitry at the remote DSU.

To initiate the test from the terminal interface Diagnostics Selection screen, select `[8] Start Network Remote Test with QRSS Self Test`.

Figure 4-14 shows the switches and indicators that are involved when you command a Network Remote Test with QRSS Self Test from the front panel.

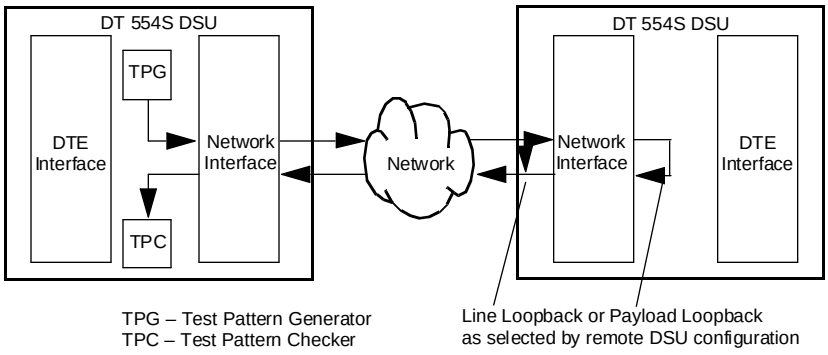


Figure 4-13 Data Path for Network Remote Test with Self Test

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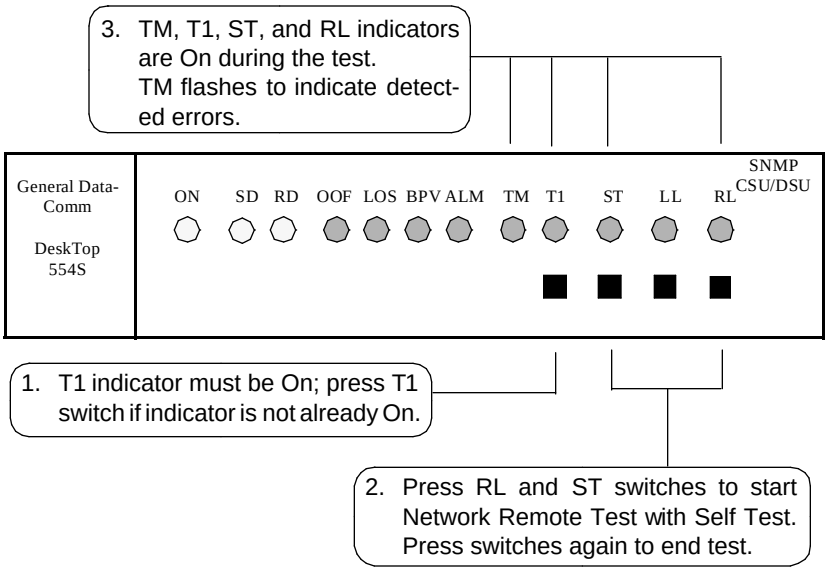


Figure 4-14 Network Remote Test with Self Test, Front Panel Control

DTE Self Test

The DTE Self Test function provides test pattern generation and checking that involves the DTE interface. The test pattern is selectable to be either a 2047-bit or a 511-bit pattern. You can select the pattern by means of the terminal interface DT554S Diagnostics Selection screen, [9] `Select DTE Self Test Pattern.`

The DTE Self Test function can be initiated from two selections in the terminal interface Diagnostics Selection menu: once by itself and once in combination with a loopback test. The Remote Digital Loopback with Self Test is discussed on a later page under its own heading.

You can use the DTE Self Test function by itself to perform an End-to-End Self Test as illustrated in *Figure 4-15*. You can command the test by means of either the terminal interface screen or the front panel

switches. Use of the terminal interface provides greater detail in the test results. The test requires the cooperation of an operator at the remote site to initiate the function in the remote DSU, observe the results, and terminate the function.

In the DTE End-to-End Self Test, two DSUs transmit internally generated test patterns to each other for verification. Bipolar violations are corrected during this test. Within each DSU, a Test Pattern Generator creates the test pattern, and a Test Pattern checker determines if the data it receives matches that which was transmitted. The test checks both DSUs and the T1 link.

To initiate the test from the terminal interface Diagnostics Selection screen, select `[A] Start DTE Self Test`.

Figure 4-16 shows the switches and indicators that are involved when you command a DTE End-to-End Self Test from the front panel. Remember that when you initiate the test from the front panel the only display of results is the TM indicator flashing in response to detected errors. The terminal interface Diagnostics Results screen does not display the results of tests initiated from the front panel.

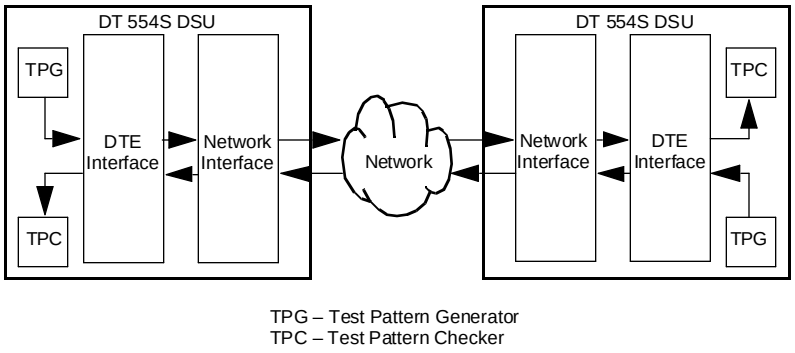


Figure 4-15 Data Path for DTE End-to-End Self Test

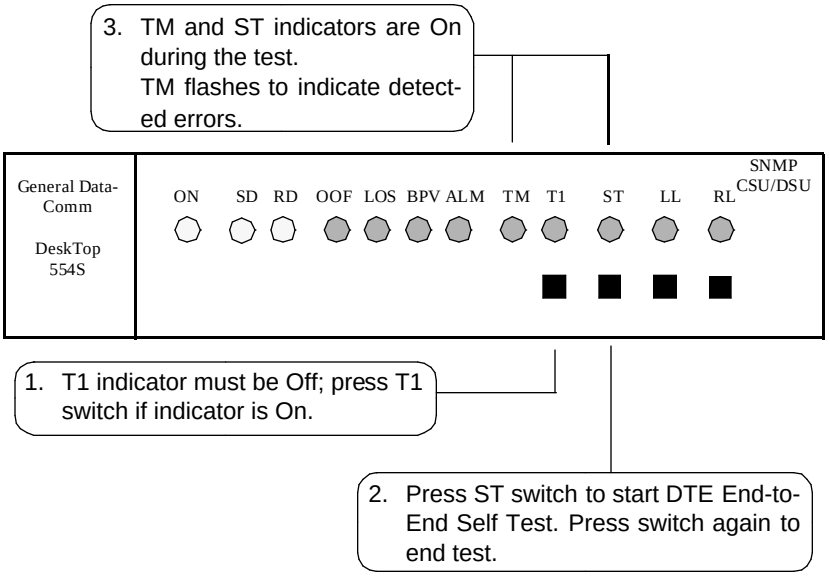


Figure 4-16 DTE End-to-End Self Test, Front Panel Control

DTE Local Loopback

The data path for the DTE Local Loopback is illustrated in *Figure 4-17*. The DSU loops the transmit signal back to the receive path just beyond the DTE interface, which remains active so that a test signal can be generated and checked by an external device.

DTE Local Loopback checks the DTE interface and the DTE-to-DSU connection. Error detection and reporting is entirely the responsibility of the external device that supplies the test signal.

To initiate the loopback from the Diagnostics Selection screen, select `[B] Start DTE Local Loopback`.

Figure 4-18 shows the switches and indicators that are involved when you command a DTE Local Loopback from the front panel. You can also command the test by means of DTE interface pin L when the DTE Test Leads configuration option is enabled.

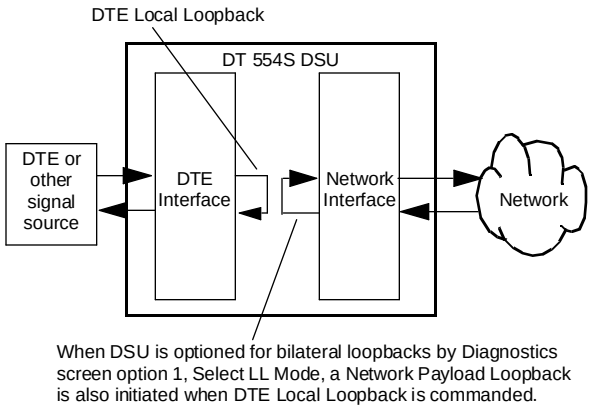


Figure 4-17 Data Path for DTE Local Loopback

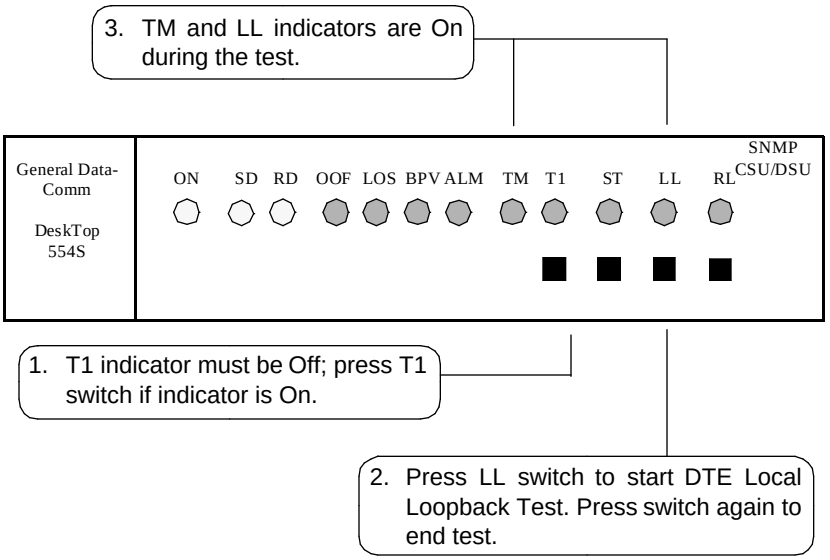


Figure 4-18 DTE Local Loopback, Front Panel Control

DTE Digital Loopback

The DTE Digital Loopback function provides a data path for a test signal that is originated and checked at the remote site. The Digital Loopback, illustrated in *Figure 4-19*, loops receive data back through the transmit portion of the DTE interface.

You can command the loopback only by means of the terminal interface DT554S Diagnostics Selection screen.

To initiate the loopback from the terminal interface DT554S Diagnostics Selection screen, select `[C] Start DTE Digital Loopback`.

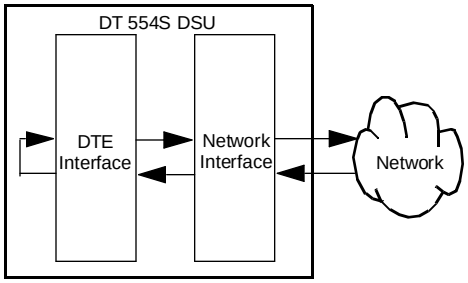


Figure 4-19 Data Path for DTE Digital Loopback

DTE Remote Digital Loopback

The data path for the DTE Remote Digital Loopback is illustrated in *Figure 4-20*. You can command the loopback by means of the terminal interface screen, the front panel switches, or a signal on the DTE interface.

When you initiate a DTE Remote Digital Loopback the DSU transmits a PN127 code to the remote unit. The remote unit responds by establishing a digital loopback toward the local DSU. After the loop is established, connect test equipment to the local DSU DTE interface. Generate a test message. The test equipment should receive back the same message it transmits. A problem exists if it does not. DTE Remote Digital Loopback tests the local DSU, the line, and most of the the remote DSU.

To initiate the test from the terminal interface Diagnostics Selection screen, select `[D] Start DTE Remote Digital Loopback`.

Figure 4-21 shows the switches and indicators that are involved when you command a DTE Remote Digital Loopback from the front panel.

You can also command the test by means of DTE interface pin BB when the DTE Test Leads configuration option is enabled.

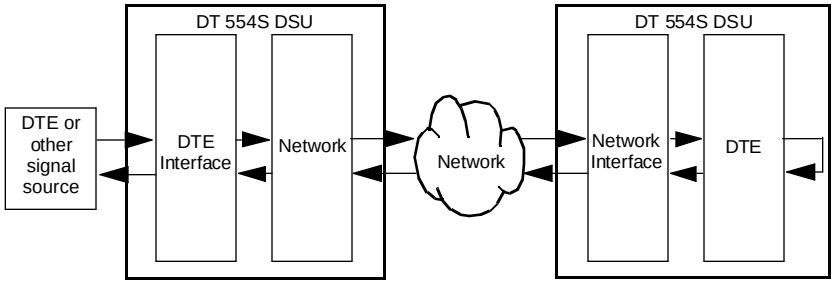


Figure 4-20 Data Path for DTE Remote Digital Loopback

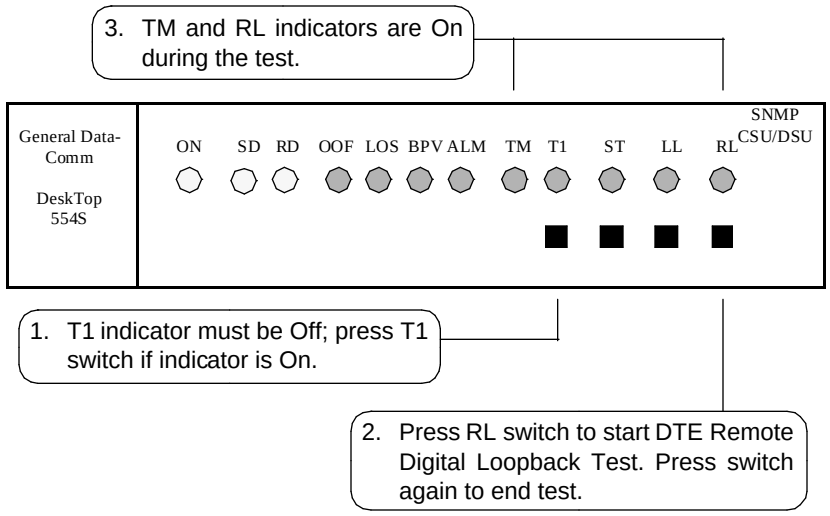


Figure 4-21 DTE Remote Digital Loopback, Front Panel Control

DTE Remote Digital Loopback with Self Test

The data path for the DTE Remote Digital Loopback with Self Test is illustrated in *Figure 4-22*. You can command the loopback by means of the terminal interface screen or the front panel switches.

When you initiate a DTE Remote Digital Loopback with Self Test the DSU transmits a PN127 code to the remote unit. The remote unit responds by establishing a digital loopback toward the local DSU.

When the loop is established the DSU generates the selected test pattern and transmits it to the remote DSU which loops it back to be checked for errors at the local DSU. The DSUs are electronically disconnected from their DTEs during the test.

To initiate the test from the terminal interface Diagnostics Selection screen, select `[E] Start DTE Remote Digital Loopback with Self Test`.

Figure 4-23 shows the switches and indicators that are involved when you command a DTE Remote Digital Loopback with Self Test from the front panel.

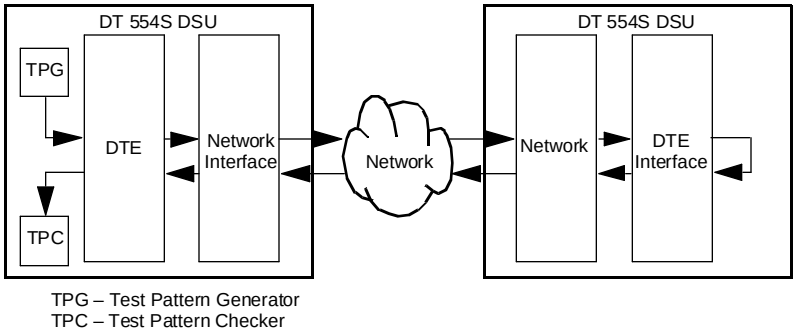


Figure 4-22 Data Path for DTE Remote Digital Loopback with Self Test

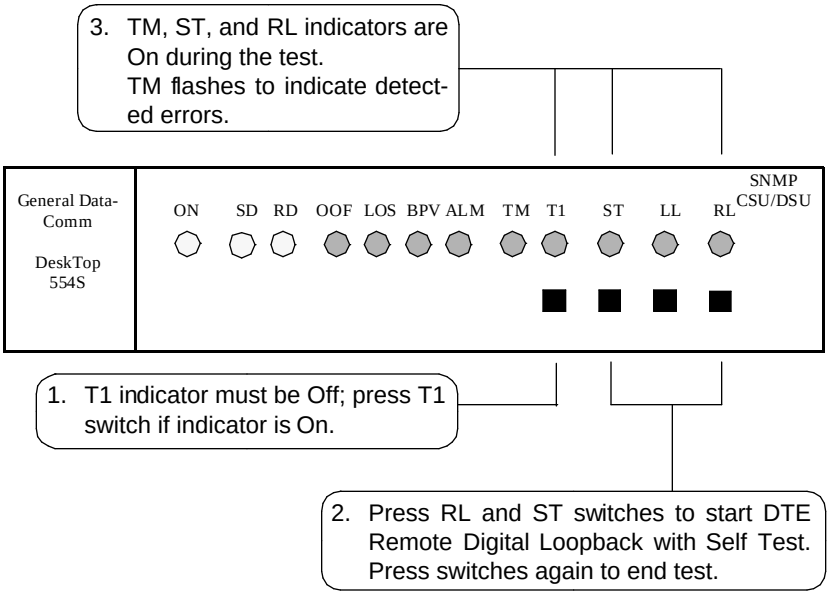


Figure 4-23 DTE Remote Digital Loopback with Self Test, Front Panel Control

A Technical Characteristics

Item	Characteristic
Physical	
PC card assembly in enclosure	
Height	1.4 in. (36 mm)
Width	7.4 in. (188 mm)
Depth	11.0 in. (279 mm)
Weight	1 lb. (0.45 kg)
Shipping weight	2 lb. (0.9 kg)
Environmental	
Temperature	
Operating	32° to 122°F (0° to 50°C) (derate by 1°C/1000 ft above sea level)
Non-operating	–40° to 185°F (–40° to 85°C)
Humidity, operating	5% to 95%, without condensation
Altitude	
Operating	0 to 10,000 ft (0 to 3,048 m)
Non-operating	0 to 40,000 ft (0 to 12,192 m)
Electrical	
Power requirements	
Voltage	99 to 129 V ac
Frequency	60 Hz
Power dissipation	20 W maximum
Fusing (pc card)	Two 1.0 A, 250 V, 3AG (GDC Part No. 215300-100)

(Continued on next page)

Item	Characteristic
Electrical (Continued)	
Data rates	N x 64 kbps or N x 56 kbps (N = 1 to 24); maximum aggregate (payload) rate of 1,536,000 bps (1,544,000 bps in unframed mode)
Communication line	T1 digital carrier (non-loaded, staggered-twist ABAM, PIC, or pulp-insulated exchange-type cable, 19 to 26 gauge)
Line impedance	100Ω
Network port physical interface	RJ48C modular jack
Network port physical interface	RJ48C modular jack
Network transmitter	
Frequency	1,544,000 bps ± 50 bps
Pulse amplitude — with surge protection	2.40 to 3.60 V at 60°F — may vary over a cycle of 60 Hz current.
Unbalance in height of adjacent negative and positive pulses	200 mV (maximum)
Width of output pulse (half amplitude)	324 nsec ± 45 nsec
Unbalance in width of positive and negative pulses	20 nsec (maximum)
Time between two consecutive pulses of opposite polarity	648 nsec ± 15 nsec (measured at half amplitude point of leading edges)
Maximum rise or falling time	100 nsec
Overshoot at trailing edge of pulse	10% to 30% of pulse amplitude
Line Build-Out	0, 7.5, 15, or 22.5 dB (selectable or automatic) at 772 kHz

(Continued on next page)

Item	Characteristic
Electrical (Cont.)	
Timing source	Internal clock, external clock, slave (received timing loopback)
Network receiver	
Operating range	0 to 30 dB of cable loss at 772 kHz (relative to 3.0V launch pulse)
Input impedance	100 Ohm
Jitter tolerance	Conforms to specifications defined in AT&T PUB 62411, December 1988
Longitudinal balance	35 dB from 50 to 1500 kHz
Transmitter	
Pre-equalization	0 to 655 feet of line length
Impedance	100Ω
Channel port (customer equipment) interface	
Standard	One ITU-T V.35-compatible synchronous serial data port
Optional	EIA-530 compatible synchronous serial data port
Physical interface	ITU-T V.35 (34-pin female connector)
T1 compatibility	
Data encoding	AMI with no bipolar violations, and B8ZS
Clear Channel Capability	B8ZS
Network interface	1.544 Mbps channelized DS1 in consecutive or alternate DS0s (complies with AT&T 54019A specifications for FT1 transmission) Can be optioned for unchannelized operation.

(Continued on next page)

Item	Characteristic
Electrical (Cont.)	
Consecutive zeros enforcement	8 x (N+1) when configured for AMI, consecutive, N x 64, framed; or AMI, unframed
Keep Alive signal	Type 1 (consecutive, framed ones filling the unused bandwidth)
Framing format	D4 Superframe, AT&T 54016 Extended Superframe (ESF), ANSI T1.403 ESF with automatic frame format, unframed option
Alarms and status conditions	Out of Frame (OOF), Alarm Indication Signal (AIS or Blue alarm), Loss of Signal (LOS)
Diagnostics	Network Self-Test; Network Line Loop; Network Payload Loop; Network Local Test, with Self-Test; Network Remote Test, with Self-Test; DTE Self-Test; DTE Local Loop; DTE Digital Loop; DTE Remote Digital Loop, with Self-Test. Front panel test switch EIA test leads for LL, RL

B Interface Signals

Table B-1 ITU-T V.35 (Standard Interface)

34-Pin Pin No.	Function	Direction
A	Frame Ground, AA	n/a
P	Send Data (a), BA	To DSU
S	Send Data (b), BA	To DSU
R	Rcv Data (a), BB	From DSU
T	Rcv Data (b), BB	From DSU
C	RTS, CA	To DSU
D	CTS, CB	From DSU
E	DSR, CC	From DSU
B	Sig Gnd, AB	n/a
F	DCD, CF	From DSU
L	LL	To DSU
U	Ext Clk (a), DA	To DSU
W	Ext Clk (b), DA	To DSU
V	Rcv Clk (a), DD	From DSU
X	Rcv Clk (b), DD	From DSU
Y	Tx Clk (a), DB	From DSU
AA	Tx Clk (b), DB	From DSU
H	DTR, CD	To DSU
BB	RDL, RL	To DSU
K	Test Mode, TM	From DSU

Table B-2 EIA-530 (Optional Interface)*

34-Pin Pin No.	DB25 Pin No.	Function	Direction
A	1	Frame Ground, AA	n/a
P	2	Send Data (a), BA	To DSU
S	14	Send Data (b), BA	To DSU
R	3	Rcv Data (a), BB	From DSU
T	16	Rcv Data (b), BB	From DSU
C	4	RTS (a), CA	To DSU
Y	19	RTS (b), CA	To DSU
D	5	CTS (a), CB	From DSU
V	13	CTS (b), CB	From DSU
E	6	DSR (a), CC	From DSU
J	22	DSR (b), CC	From DSU
B	7	Sig Gnd, AB	n/a DSU
F	8	DCD (a), CF	From DSU
HH	10	DCD (b), CF	From DSU
X	17	Rcv Clk (a), DD	From DSU
MM	9	Rcv Clk (b), DD	From DSU
W	24	Ext Clk (a), DA	To DSU
CC	11	Ext Clk (b), DA	To DSU
AA	15	Tx Clk (a), DB	From DSU
U	12	Tx Clk (b), DB	From DSU
H	20	DTR (a), CD	To DSU
Z	23	DTR (b), CD	To DSU
BB	21	RDL, RL	To DSU
K	25	Test Mode, TM	From DSU
L	18	LL	To DSU

* The optional EIA-530 interface for a DT 554S DSU is implemented through the 34-pin female business equipment connector on the back panel. Conversion from that connector to a standard DB25 female connector for EIA-530 requires Adapter Cable GDC Part No. 027H901-001. This table lists pinouts for both types of connector.

C Timing Options

Overview

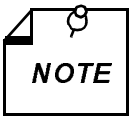
The flexibility and complexity of the timing options for the DT 554S DSU require explanations that are more detailed than those normally provided. This appendix therefore describes details and applications of the DT 554S DSU timing options:

- Receive Timing
- Internal Timing
- DTE Timing
- DTE Split Timing

Each description is accompanied by an illustration that shows how the timing clock is distributed throughout the network. The timing option descriptions are followed by some representative network applications that show how to apply the timing options in a variety of network configurations.

Timing Option Descriptions

In synchronous networks, all device transmitters and receivers are usually referenced to a single master timing source. This timing source, or clock, is frequently provided by the network and is highly accurate and stable. The DSU recovers the embedded clock from the data stream and uses it to synchronize its own internal timing reference to the master clock. This allows the DSU to extract the data reliably and further to distribute timing to other devices connected to it. (Timing is embedded in the data stream on the network port, but is provided on a separate lead in the DTE interface.) The network clock is the preferred timing source, but the DT 554S DSU supports other timing options as well, for use in applications where timing from the network clock is either not available or not applicable.



Several techniques exist for providing timing to the customer equipment: smooth clock and variations of gapped clock. With a smooth or continuous clock, the type employed by the DT 554S DSU, every clock pulse is the same length and occurs at the same interval. With a gapped clock, however, pulses are intentionally omitted. Customer equipment that is expecting a smooth clock may not function properly with a gapped clock. It may interpret the missing pulses as loss of timing. A gapped clock, moreover, may never be used as a timing reference or to convey network timing. On the other hand, equipment that can tolerate a gapped clock will probably work well with a smooth clock, making the smooth clock technique more universally acceptable.

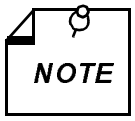
The default timing option for the DT 554S DSU is Receive Timing, used when the network provides the timing source. When the network does not provide the timing source, one DT 554S DSU must use Internal Timing (or DTE Timing when customer equipment connected to it provides timing) and the others must use Receive Timing. When the network and the customer equipment both provide timing, you may need to use DTE Split Timing, a combination of Receive Timing and DTE Timing.

One thing is common to all DT 554S DSU timing options: the DSU uses the clock it recovers from network receive data to clock data into the receive buffer and to provide the channel *receive* clock signal for the channel. What differs is the source of the master clock reference and the source of the channel *transmit* clock signals, as shown in *Table C*-1:

- With Receive Timing, the master clock comes from the network, and channel transmit clock signals are derived from the clock recovered from the network receive data.
- With Internal Timing, the DSU provides the master clock, but channel transmit clock signals are still derived from the recovered clock.
- With DTE Timing, the customer equipment connected to the DSU provides its own transmit clock signal, from which the DT 554S

DSU derives a master clock. For this method, the DTE must be the master source of timing.

- With DTE Split Timing, the customer equipment connected to the DSU provides its own transmit clock signal (like DTE Timing), but the network provides the master clock for the rest of the network (like Receive Timing).



All timing options that include split timing require each timing source to be traceable to the same Stratum 1 clock.

The data rate on the network port is 1.544 Mbps. On the DTE port, however, the data rate may be from 56 Kbps to 1.536 Mbps (1.544 Mbps when using unframed mode). The DT 554S DSU compensates for the difference in data rates by translating the clock frequency when passing it from one port to another.

Table C-1 Timing Option Reference

Timing Option	Master Clock Source			Ch. Trans. Clock Source	
	Net.	554	DTE	Net.	DTE
Receive Timing	✓			✓	
Internal Timing		✓		✓	
DTE Timing			✓		✓
DTE Split Timing	✓				✓

Receive Timing

With Receive Timing, illustrated in *Figure C-1*, the network (or a device at the remote end) provides the timing source (1). The DT 554S DSU recovers the receive T1 clock from the network receive T1 data and uses it both to clock T1 data into the receive buffer (2) and to provide the send timing source for T1 data output from the transmit buffer (3) to the network. The DSU also translates (4) the receive T1

clock to provide the channel transmit and receive clock signals on the appropriate channel interface leads.

Select Receive Timing when using the DT 554S DSU in a network (or with a device at the remote end) that supplies the clock, as in a DACS (Digital Access and Cross-connect System) network.

NOTE

Select the appropriate timing option for the customer equipment. The DT 554S DSU provides transmit timing on the DTE interface Tx Clk lead.

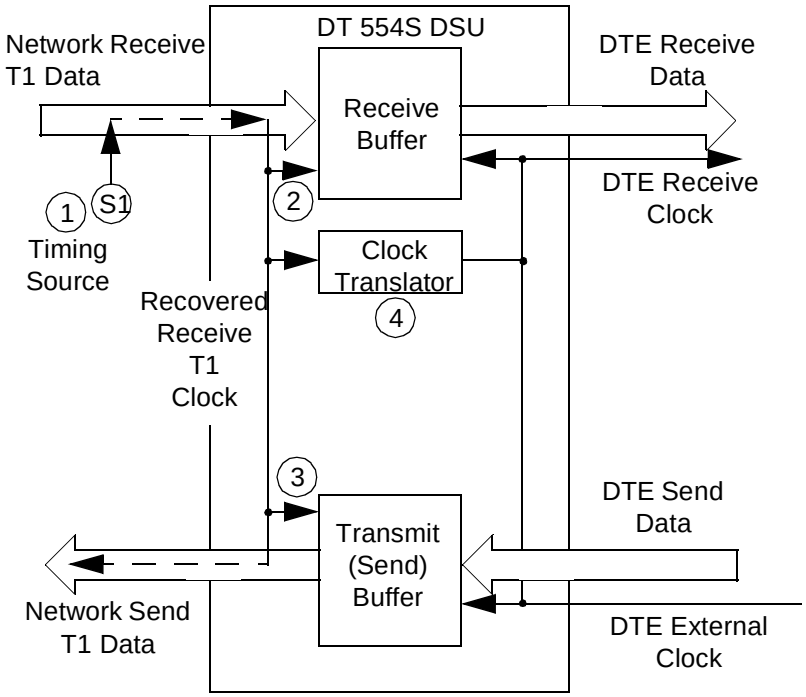
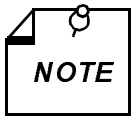


Figure C-1 Receive Timing

Internal Timing

With Internal Timing, illustrated in *Figure C-2*, the DT 554S DSU provides the send timing source (1) for T1 data output from the transmit buffer (2) to the network. (This clock satisfies the requirements of a Stratum 4, Level II clock, as defined in AT&T Technical Reference 62411.) The remote DSU uses this as its timing reference (3) and loops it back to the DT 554S DSU (4). The DT 554S DSU recovers the receive T1 clock from the network receive T1 data and uses it to clock T1 data into the receive buffer (5). The DT 554S DSU also translates (6) the receive T1 clock to provide the channel transmit and receive clock signals on the appropriate channel interface leads.

Select Internal Timing when using the DT 554S DSU in a private network that does not provide timing (e.g., a non-DACS based service).



a. *Configure only one DT 554S DSU in your network for Internal Timing, and configure the others for Receive Timing.*

b. *Select the appropriate timing option for the customer equipment: The DT 554S DSU provides transmit timing on the DTE interface Tx Clk lead.*

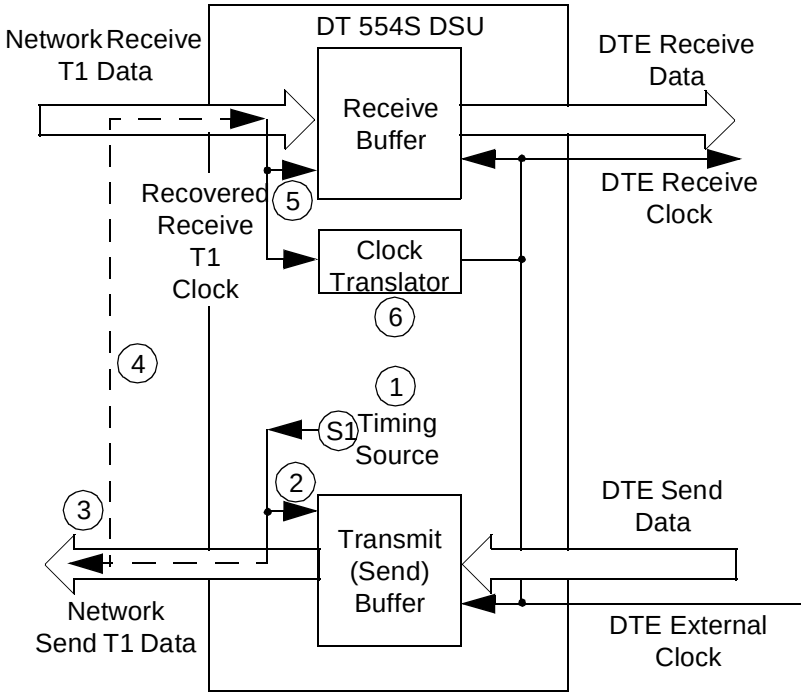


Figure C-2 Internal Timing

DTE Timing

With DTE Timing, illustrated in *Figure C-3*, the customer equipment connected to the DSU DTEl interface provides its own channel transmit clock signal (1) on the appropriate interface lead. The DT 554S DSU translates (2) this clock to provide the send timing source for T1 data output from the transmit buffer (3) to the network. The remote DSU uses this as its timing reference (4) and loops it back to the DT 554S DSU (5). The DT 554S DSU recovers the receive T1 clock from the network receive T1 data and uses it to clock T1 data into the receive buffer (6). The DT 554S DSU also translates (7) the receive T1 clock to provide the receive clock signals for the channel on the appropriate interface leads.

In order for this application to work, the DTE device that acts as timing source S1 must be the network source of timing. The DTE must not be passing along timing that is derived from another source or from a rate conversion.

Select DTE Timing when using the DT 554S DSU in a private network with the customer equipment supplying the clock.

NOTE

Select the appropriate timing option for the customer equipment: The DT 554S DSU expects external timing on the DTE interface Ext Clk lead.

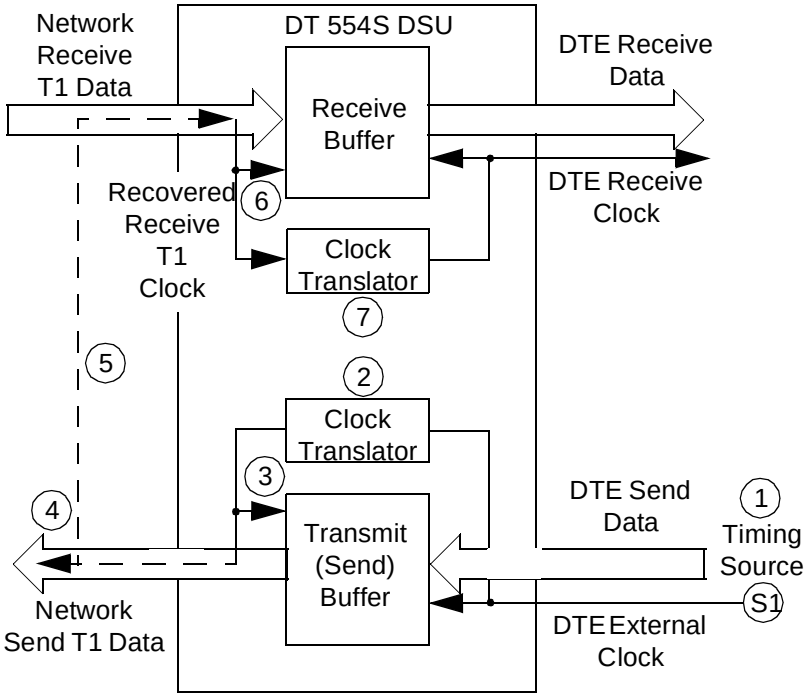
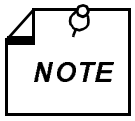


Figure C-3 DTE Timing

DTE Split Timing

DTE Split Timing, illustrated in *Figure C-4*, is a combination of Receive Timing and DTE Timing that utilizes two clock sources. As in Receive Timing, the network (or a device at the remote end) provides one timing source (1). The DT 554S DSU recovers the receive T1 clock from the network receive T1 data and uses it to clock T1 data into the receive buffer (2) and to provide the send timing source for T1 data output from the transmit buffer (3) to the network. The DT 554S DSU also translates (4) the receive T1 clock to provide the receive clock signal, on the appropriate interface lead. As in DTE Timing, the customer equipment on the channel interface provides the other timing source, its own channel transmit clock signal (5) on the appropriate interface lead, but the DT 554S DSU uses it for nothing else.

Select DTE Split Timing when there are timing sources provided by both the network and the customer equipment.



a. Select the appropriate timing option for the customer equipment: The DT 554S DSU expects external timing on the DTE interface Ext Clk lead.

b. All timing options that include split timing require every timing source to be traceable to the same Stratum 1 clock.

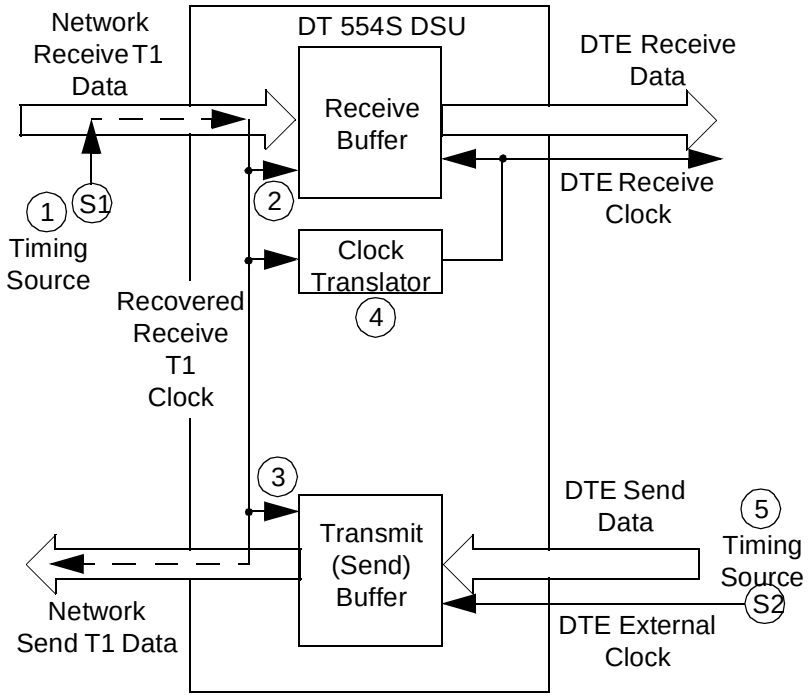


Figure C-4 DTE Split Timing

Typical Network Applications

Although you can use the DT 554S DSU in various network configurations with different types of equipment, the following simple applications illustrate the fundamental reasoning you use to select the appropriate timing option.

Back-to-Back Application

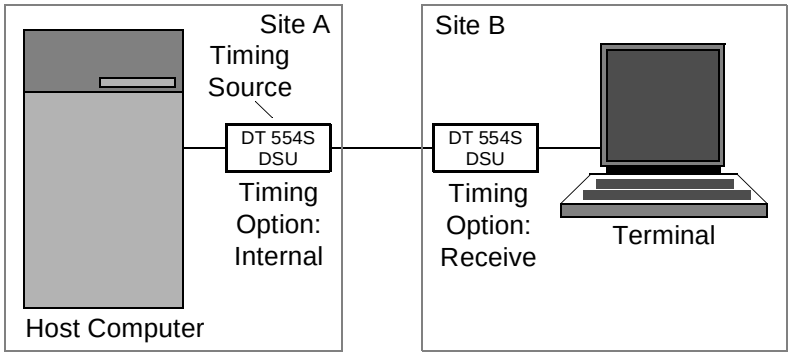
In an in-house data communications network, two DT 554S DSUs are connected back-to-back. The only component connecting them is cable, so there is no network to provide the timing source.

If the customer equipment connected to the channel cannot provide

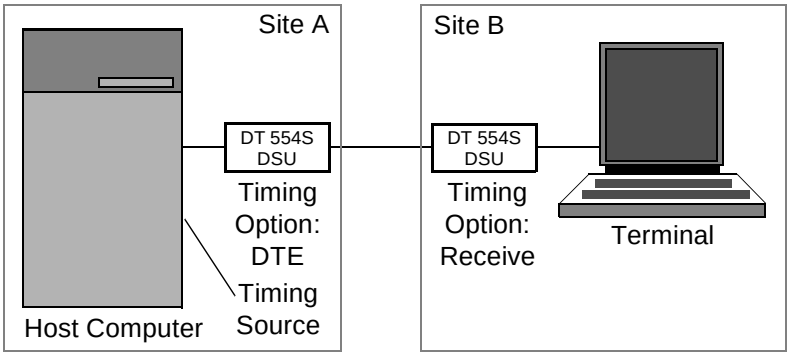
timing, select Internal Timing for the master or host end, and select Receive Timing for the other, as shown in *Figure C-5 A*. In this example, the DT 554S DSU at Site A is configured for Internal Timing, making it the timing source.

If the customer equipment is to provide an external timing source, select Channel Timing for the DT 554S DSU connected to that equipment and select Receive Timing for the other, as shown in *Figure C-5 B*. In this example, the host computer at Site A is providing timing, so its DT 554S DSU is configured for Channel Timing.

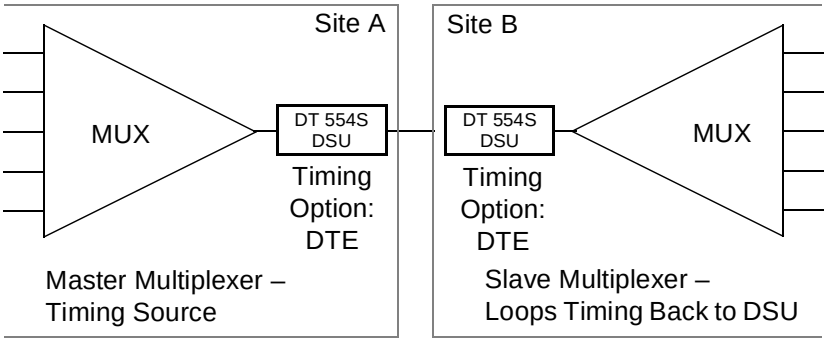
In the master/slave multiplexer application illustrated in *Figure C-5 C*, the multiplexer at Site A is configured as the master (i.e., the timing source) and the multiplexer at Site B is configured as a slave. With Channel Timing selected for both DT 554S DSUs, the master multiplexer provides timing and the slave multiplexer loops back timing so timing is dependent on the customer equipment.



A. DT 554S DSU at Site A Supplies Timing



B. Customer Equipment at Site A Supplies Timing



C. Master/Slave Multiplexer Timing

Figure C-5 Typical Back-to-Back Applications

D Alarm Definitions

Overview

This appendix describes the DT 554S DSU alarms that can appear on the terminal interface Monitor screen Alarm Status display:

Network OOF	(Network Out of Frame)
Network LOS	(Network Loss of Signal)
Network USS	(Network Unavailable Signal State)
Network AIS	(Network Alarm Indication Signal)
Network BPVS	(Network Bipolar Violations)
Network CRCS	(Network Cyclic Redundancy Checksum)
Network RYEL	(Network Received Yellow Alarm)
Network LAD	(Network Low Average Density)
Config Error	(Configuration Error)

Those alarms also generate Traps that the DSU sends to the SNMP Community Names configured to receive them. There are three additional conditions that generate Traps but which do not appear on the Alarm Status display:

Power Up

TFTP Download Fail

Firmware Load Fail

Alarm Status Display Conditions

Network Out Of Frame

A Network Out Of Frame (NETWORK OOF) alarm event occurs when the DSU misses two out of four framing bits in the signal coming from the network. The front panel OOF indicator reflects the current status of DSU-to-network synchronization.

Network Loss Of Signal

A Network Loss of Signal (NETWORK LOS) alarm event occurs when the DSU senses an absence of network signal. The absence of signal for a time equivalent to 175 bits (± 75) is considered no signal. The front panel LOS indicator reflects the current status of the network signal condition.

Network Unavailable Signal State

A Network Unavailable Signal State (NETWORK USS) alarm event occurs when 10 consecutive severely errored seconds occur. It ends when the DSU has processed 10 consecutive seconds of data without the occurrence of a severely errored second.

Network Alarm Indication Signal

A Network Alarm Indication Signal (NETWORK AIS) alarm event occurs when the DSU receives an AIS from the network.

Network Bipolar Violations

A Network Bipolar Violation (NETWORK BPV) alarm event occurs when the signal the DSU receives from the network does not alternate between signal levels as required for Alternate Mark Inversion (AMI) or Bipolar with 8 Zero Substitution (B8ZS) data encoding.

The front panel BPV indicator reflects the current status of BPV error events.

Network Cyclic Redundancy Checksum

A Network Cyclic Redundancy Checksum (NETWORK CRCS) error alarm event occurs when ESF framing is in use and the CRC-6 code calculated at the receiving DSU does not match the CRC-6 code calculated by the DSU that transmitted the signal. The DSU performs the CRC check on each ESF frame to detect errors in the DS1 signal.

Network Received Yellow

A Network Received Yellow (NETWORK RYEL) alarm event occurs when the DSU receives a Yellow alarm from the network.

Network Low Average Density

A Network Low Average Density (NETWORK LAD) alarm event occurs when the 8(N+1) Ones Density Requirement is being enforced

(DSU operating mode either Unframed/AMI or Framed/AMI/Nx64k/ Consecutive) and the DSU has to insert ones in the signal it transmits toward the network. The DSU inserts ones and declares a NETWORK LAD alarm when the signal from the DTE at its DTE interface port contains fewer ones than the Ones Density option requires.

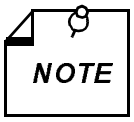
Configuration Error

A Configuration Error (CONFIG ERROR) alarm indicates that the checksum computed by the DSU for its configuration does not match the one it stored at the time the configuration was performed.

Trap Conditions

Power Up

The DSU generates a Power Up Trap each time its power is switched from Off to On.



The Power Up condition causes the front panel Alarm LED to light as soon as the Off to On transition occurs. The Trap is not sent until power has remained on for approximately 30 seconds.

TFTP Download Fail

The DSU generates a TFTP Download Fail Trap if a download of new firmware is unsuccesful for any reason.

Firmware Load Fail

The DSU generates a Firmware Load Fail Trap if you issue the Run Alternate Firmware Revision command from the Maintenance screen and the DSU is unable to perform that function.

E MIB Tables

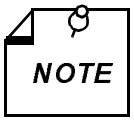
Overview

This appendix lists the Management Information Base (MIB) tables that the DT 554S DSU supports. You can use Simple Network Management Protocol (SNMP) to control and monitor the DSU by accessing the MIB tables with an SNMP network manager or a MIB browser.

The DSU employs two industry standard MIBs for the basis of its SNMP control: RFC 1213 and RFC 1406. The DSU supports the entire RFC 1213 MIB, with some restrictions or modifications to individual MIB objects. It supports the local end portion of the RFC 1406 MIB, with some restrictions or modifications to individual MIB objects.

There is also a GDC-created DT554 MIB that governs alarm trap generation.

The MIB tables that the DSU supports are defined on the following pages.



Initial configuration of the DSU should be carried out by means of the terminal interface. There are configuration options in the DSU for which there are not MIB objects.

RFC 1213

The DSU supports all the tables defined in RFC 1213, Management Information Base for Network Management of TCP/IP-based internets: MIB-II. Tables E-1 through E-12 on the following pages list the objects in those MIB tables, their access (read/write or read-only), and what they do.

The tables identify the instances where the implementation of an object in the DSU differs from the standard implementation.

System Group

Implementation of the System group is mandatory for all systems. If an agent is not configured to have a value for any of these variables, a string of length 0 is returned.

Table E-1 DS1 Configuration Table

MIB Object	Syntax	Access	Enumeration	Description
sysDescr	DisplayString (SIZE (0..255))	read-only		A textual description of the entity. This value should include the full name and version identification of the system's hardware type, software operating-system, and networking software. It is mandatory that this only contain printable ASCII characters.
sysObjectID	OBJECT IDENTIFIER	read-only		The vendor's authoritative identification of the network management subsystem contained in the entity. This value is allocated within the SMI enterprises subtree (1.3.6.1.4.1) and provides an easy and unambiguous means for determining ‘what kind of box' is being managed. For example, if vendor ‘Flintstones, Inc.' was assigned the subtree 1.3.6.1.4.1.4242, it could assign the identifier 1.3.6.1.4.1.4242.1.1 to its ‘Fred Router'.
sysUpTime	TimeTicks	read-only		The time (in hundredths of a second) since the network management portion of the system was last re-initialized.
sysContact	DisplayString (SIZE (0..255))	read-write		The textual identification of the contact person for this managed node, together with information on how to contact this person.

(Continued on next page)

Table E-1 DS1 Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
sysName	DisplayString (SIZE (0..255))	read-write		An administratively-assigned name for this managed node. By convention, this is the node's fully-qualified domain name.
sysLocation	DisplayString (SIZE (0..255))	read-write		The physical location of this node (e.g., telephone closet, 3rd floor').
sysServices	INTEGER (0..127)	read-only		A value which indicates the set of services that this entity primarily offers. The value is a sum. This sum initially takes the value zero, Then, for each layer, L, in the range 1 through 7, that this node performs transactions for, 2 raised to (L - 1) is added to the sum. For example, a node which performs primarily routing functions would have a value of 4 (2^(3-1)). In contrast, a node which is a host offering application services would have a value of 72 (2^(4-1) + 2^(7-1)). Note that in the context of the Internet suite of protocols, values should be calculated accordingly: layer functionality 1 physical (e.g., repeaters) 2 datalink/subnetwork (e.g., bridges) 3 internet (e.g., IP gateways) 4 end-to-end (e.g., IP hosts) 7 applications (e.g., mail relays) For systems including OSI protocols, layers 5 and 6 may also be counted.

Interfaces Group

Implementation of the Interfaces group is mandatory for all systems.

The Interfaces table contains information on the entity's interfaces. Each interface is thought of as being attached to a ‘subnetwork'. This term should not be confused with ‘subnet' which refers to an addressing partitioning scheme used in the Internet suite of protocols.

Table E-2 Interfaces Group Configuration Table

MIB Object	Syntax	Access	Enumeration	Description
ifNumber	INTEGER	read-only		The number of network interfaces (regardless of their current state) present on this system.
ifIndex	INTEGER	read-only		A unique value for each interface. Its value ranges between 1 and the value of ifNumber. The value for each interface must remain constant a least from one re-initialization of the entity's network management system to the next re-initialization.
ifDescr	DisplayString (SIZE (0..255))	read-only		A textual string containing information about the interface. This string should include the name of the manufacturer, the product name and the version of the hardware interface.

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Table E-2 Interfaces Group Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ifType	INTEGER		other(1), -- none of the following regular1822(2) hdh1822(3), ddn-x25(4), rfc877-x25(5), ethernet-csmacd(6), iso88023-csmacd(7), iso88024-tokenBus(8), iso88025-tokenRing(9), iso88026-man(10), starLan(11), proteon-10Mbit(12), proteon-80Mbit(13), hyperchannel(14), fddi(15), lapb(16), sdlc(17), ds1(18), -- T-1 e1(19), -- european equiv. of T-1 basicISDN(20), primaryISDN(21), -- proprietary serial propPointToPointSerial(22), ppp(23), softwareLoopback(24), eon(25), -- CLNP over IP [11] ethernet-3Mbit(26), nsip(27), -- XNS over IP slip(28), -- generic SLIP ultra(29), -- ULTRA technologies ds3(30), -- T-3 sip(31), -- SMDS frame-relay(32)	The type of interface, distinguished according to the physical/link protocol(s) immediately 'below' the network layer in the protocol stack.

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Table E-2 Interfaces Group Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ifMtu	INTEGER	read-only		The size of the largest datagram which can be sent/received on the interface, specified in octets. For interfaces that are used for transmitting network datagrams, this is the size of the largest network datagram that can be sent on the interface.
ifSpeed	Gauge	read-only		An estimate of the interface's current bandwidth in bits per second. For interfaces which do not vary in bandwidth or for those where no accurate estimation can be made, this object should contain the nominal bandwidth.
ifPhysAddress	PhysAddress	read-only		The interface's address at the protocol layer immediately 'below' the network layer in the protocol stack. For interfaces which do not have such an address (e.g., a serial line), this object should contain an octet string of zero length.
ifAdminStatus	INTEGER	read-write	up(1), -- ready to pass packets down(2), testing(3) -- in some test mode	The desired state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifOperStatus	INTEGER	read-only	up(1), -- ready to pass packets down(2), testing(3) -- in some test mode	The current operational state of the interface. The testing(3) state indicates that no operational packets can be passed.

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Table E-2 Interfaces Group Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ifLastChange	TimeTicks	read-only		The value of sysUpTime at the time the interface entered its current operational state. If the current state was entered prior to the last re- initialization of the local network management subsystem, then this object contains a zero value.
ifInOctets	Counter	read-only		The total number of octets received on the interface, including framing characters.
ifInUcastPkts	Counter	read-only		The number of subnetwork-unicast packets delivered to a higher-layer protocol.
ifInNUcast Pkts	Counter	read-only		The number of non-unicast (i.e., subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
ifInDiscards	Counter	read-only		The number of inbound packets which were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol. One possible reason for discarding such a packet could be to free up buffer space.
ifInErrors	Counter	read-only		The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
ifInUnknown Protos	Counter	read-only		The number of packets received via the interface which were discarded because of an unknown or unsupported protocol.
ifOutOctets	Counter	read-only		The total number of octets transmitted out of the interface, including framing characters.

(Continued on next page)

Table E-2 Interfaces Group Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ifOutUcast Pkts	Counter	read-only		The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.
ifOutNUcast Pkts	Counter	read-only		The total number of packets that higher-level protocols requested be transmitted to a non-unicast (i.e., a subnetwork-broadcast or subnetwork-multicast) address, including those that were discarded or not sent.
ifOutDiscards	Counter	read-only		The number of outbound packets which were chosen to be discarded even though no errors had been detected to prevent their being transmitted. One possible reason for discarding such a packet could be to free up buffer space.
ifOutErrors	Counter	read-only		The number of outbound packets that could not be transmitted because of errors.
ifOutQLen	Gauge	read-only		The length of the output packet queue (in packets).
ifSpecific	OBJECT IDENTIFIER	read-only		A reference to MIB definitions specific to the particular media being used to realize the interface. For example, if the interface is realized by an ethernet, then the value of this object refers to a document defining objects specific to ethernet. If this information is not present, its value should be set to the OBJECT IDENTIFIER { 0 0 }, which is a syntactically valid object identifier, and any conformant implementation of ASN.1 and BER must be able to generate and recognize this value.

IP Group

Implementation of the IP group is mandatory for all systems.

Table E-3 IP Group Configuration Table

MIB Object	Syntax	Access	Enumeration	Description
ipForwarding	INTEGER	read-write	forwarding(1), -- acting as a gateway not-forwarding(2) -- NOT acting as a gateway	The indication of whether this entity is acting as an IP gateway in respect to the forwarding of datagrams received by, but not addressed to, this entity. IP gateways forward datagrams. IP hosts do not (except those source-routed via the host). Note that for some managed nodes, this object may take on only a subset of the values possible. Accordingly, it is appropriate for an agent to return a 'badValue' response if a management station attempts to change this object to an inappropriate value.
ipDefaultTTL	INTEGER	read-write		The default value inserted into the Time-To-Live field of the IP header of datagrams originated at this entity, whenever a TTL value is not supplied by the transport layer protocol.
ipInReceives	Counter	read-only		The total number of input datagrams received from interfaces, including those received in error.
ipInHdrErrors	Counter	read-only		The number of input datagrams discarded due to errors in their IP headers, including bad checksums, version number mismatch, other format errors, time-to-live exceeded, errors discovered in processing their IP options, etc.

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Table E-3 IP Group Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ipInAddr Errors	Counter	read-only		The number of input datagrams discarded because the IP address in their IP header's destination field was not a valid address to be received at this entity. This count includes invalid addresses (e.g., 0.0.0.0) and addresses of unsupported Classes (e.g., Class E). For entities which are not IP Gateways and therefore do not forward datagrams, this counter includes datagrams discarded because the destination address was not a local address.
ipForw Datagrams	Counter	read-only		The number of input datagrams for which this entity was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination. In entities which do not act as IP Gateways, this counter will include only those packets which were Source-Routed via this entity, and the Source-Route option processing was successful.
ipInUnknown Protos	Counter	read-only		The number of locally-addressed datagrams received successfully but discarded because of an unknown or unsupported protocol.
ipInDiscards	Counter	read-only		The number of input IP datagrams for which no problems were encountered to prevent their continued processing, but which were discarded (e.g., for lack of buffer space). Note that this counter does not include any datagrams discarded while awaiting re-assembly.

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Table E-3 IP Group Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ipInDelivers	Counter	read-only		The total number of input datagrams successfully delivered to IP user-protocols (including ICMP).
ipOutRequests	Counter	read-only		The total number of IP datagrams which local IP user-protocols (including ICMP) supplied to IP in requests for transmission. Note that this counter does not include any datagrams counted in ipForwDatagrams.
ipOutDiscards	Counter	read-only		The number of output IP datagrams for which no problem was encountered to prevent their transmission to their destination, but which were discarded (e.g., for lack of buffer space). Note that this counter would include datagrams counted in ipForwDatagrams if any such packets met this (discretionary) discard criterion.
ipOutNo Routes	Counter	read-only		The number of IP datagrams discarded because no route could be found to transmit them to their destination. Note that this counter includes any packets counted in ipForwDatagrams which meet this 'no-route' criterion. Note that this includes any datagrams which a host cannot route because all of its default gateways are down.
ipReasm Timeout	INTEGER	read-only		The maximum number of seconds which received fragments are held while they are awaiting reassembly at this entity.

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Table E-3 IP Group Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ipReasm Reqds	Counter	read-only		The number of IP fragments received which needed to be reassembled at this entity.
ipReasmOKs	Counter	read-only		The number of IP datagrams successfully re-assembled.
ipReasmFails	Counter	read-only		The number of failures detected by the IP re- assembly algorithm (for whatever reason: timed out, errors, etc.). Note that this is not necessarily a count of discarded IP fragments since some algorithms (notably the algorithm in RFC 815) can lose track of the number of fragments by combining them as they are received.
ipFragOKs	Counter	read-only		The number of IP datagrams that have been successfully fragmented at this entity.
ipFragFails	Counter	read-only		The number of IP datagrams that have been discarded because they needed to be fragmented at this entity but could not be, e.g., because their Don't Fragment flag was set.
ipFragCreates	Counter	read-only		The number of IP datagram fragments that have been generated as a result of fragmentation at this entity.

IP Address Table

The IP address table contains this entity's IP addressing information.

Table E-4 IP Address Table

MIB Object	Syntax	Access	Enumeration	Description
ipAdEntAddr	IpAddress	read-only		The IP address to which this entry's addressing information pertains.
ipAdEntIf Index	INTEGER	read-only		The index value which uniquely identifies the interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value of ifIndex.
ipAdEntNet Mask	IpAddress	read-only		The subnet mask associated with the IP address of this entry. The value of the mask is an IP address with all the network bits set to 1 and all the hosts bits set to 0.
ipAdEnt BcastAddr	INTEGER	read-only		The value of the least-significant bit in the IP broadcast address used for sending datagrams on the (logical) interface associated with the IP address of this entry. For example, when the Internet standard all-ones broadcast address is used, the value will be 1. This value applies to both the subnet and network broadcasts addresses used by the entity on this (logical) interface.
ipAdEnt ReasmMax Size	INTEGER (0..65535)	read-only		The size of the largest IP datagram which this entity can reassemble from incoming IP fragmented datagrams received on this interface."

IP Routing Table

The IP routing table contains an entry for each route presently known to this entity.

Table E-5 IP Routing Configuration Table

MIB Object	Syntax	Access	Enumeration	Description
ipRouteDest	IpAddress	read-write		The destination IP address of this route. An entry with a value of 0.0.0.0 is considered a default route. Multiple routes to a single destination can appear in the table, but access to such multiple entries is dependent on the table-access mechanisms defined by the network management protocol in use.
ipRouteIf Index	INTEGER	read-write		The index value which uniquely identifies the local interface through which the next hop of this route should be reached. The interface identified by a particular value of this index is the same interface as identified by the same value of ifIndex.
ipRouteMetric 1	INTEGER	read-write		The primary routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipRouteProto value. If this metric is not used, its value should be set to -1.
ipRouteMetric 2	INTEGER	read-write		An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipRouteProto value. If this metric is not used, its value should be set to -1.
ipRouteMetric 3	INTEGER	read-write		An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipRouteProto value. If this metric is not used, its value should be set to -1.

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Table E-5 IP Routing Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ipRouteMetric 4	INTEGER	read-write		An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipRouteProto value. If this metric is not used, its value should be set to -1.
ipRoute NextHop	IpAddress	read-write		The IP address of the next hop of this route. In the case of a route bound to an interface which is realized via a broadcast media, the value of this field is the agent's IP address on that interface.)
ipRouteType	INTEGER	read-write	other(1), -- none of the following invalid(2), -- an invalidated route -- route to directly direct(3), -- connected (sub-)network -- route to a nonlocal indirect(4) -- host/ network/sub-network	The type of route. Note that the values direct(3) and indirect(4) refer to the notion of direct and indirect routing in the IP architecture. Setting this object to the value invalid(2) has the effect of invalidating the corresponding entry in the ipRouteTable object. That is, it effectively disassociates the destination identified with said entry from the route identified with said entry. It is an implementation-specific matter as to whether the agent removes an invalidated entry from the table. Accordingly, management stations must be prepared to receive tabular information from agents that corresponds to entries not currently in use. Proper interpretation of such entries requires examination of the relevant ipRouteType object.

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Table E-5 IP Routing Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ipRouteProto	INTEGER	read-only	other(1), -- none of the following -- non-protocol information, -- e.g., manually configured local(2), -- entries -- set via a network netmgmt(3), -- management protocol -- obtained via ICMP, icmp(4), -- e.g., Redirect the remaining values are all gateway routing protocols egp(5), ggp(6), hello(7), rip(8), is-is(9), es-is(10), ciscoIgrp(11), bbnSpfIgp(12), ospf(13), bgp(14)	The routing mechanism via which this route was learned. Inclusion of values for gateway routing protocols is not intended to imply that hosts should support those protocols.
ipRouteAge	INTEGER	read-write		The number of seconds since this route was last updated or otherwise determined to be correct. Note that no semantics of ‘too old' can be implied except through knowledge of the routing protocol by which the route was learned.

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Table E-5 IP Routing Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ipRouteMask	IpAddress	read-write		Indicate the mask to be logical-ANDed with the destination address before being compared to the value in the ipRouteDest field. For those systems that do not support arbitrary subnet masks, an agent constructs the value of the ipRouteMask by determining whether the value of the correspondent ipRouteDest field belong to a class-A, B, or C network, and then using one of: mask network 255.0.0.0class-A 255.255.0.0class-B 255.255.255.0class-C If the value of the ipRouteDest is 0.0.0.0 (a default route), then the mask value is also 0.0.0.0. It should be noted that all IP routing subsystems implicitly use this mechanism.
ipRouteMetric 5	INTEGER	read-write		An alternate routing metric for this route. The semantics of this metric are determined by the routing-protocol specified in the route's ipRouteProto value. If this metric is not used, its value should be set to -1.

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Table E-5 IP Routing Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
ipRouteInfo	OBJECT IDENTIFIER	read-only		A reference to MIB definitions specific to the particular routing protocol which is responsible for this route, as determined by the value specified in the route's ipRouteProto value. If this information is not present, its value should be set to the OBJECT IDENTIFIER { 0 0 }, which is a syntactically valid object identifier, and any conformant implementation of ASN.1 and BER must be able to generate and recognize this value.

IP Address Translation Table

The IP address translation table contain the IpAddress to ‘physical' address equivalences. Some interfaces do not use translation tables for determining address equivalences (e.g., DDN-X.25 has an algorithmic method); if all interfaces are of this type, then the Address Translation table is empty, i.e., has zero entries.

Table E-6 IP Address Translation Table

MIB Object	Syntax	Access	Enumeration	Description
ipNetToMedia IfIndex	INTEGER	read-write		The interface on which this entry's equivalence is effective. The interface identified by a particular value of this index is the same interface as identified by the same value of ifIndex.
ipNetToMedia PhysAddress	PhysAddress	read-write		The media-dependent 'physical' address.
ipNetToMedia NetAddress	IpAddress	read-write		The IpAddress corresponding to the media-dependent 'physical' address.
ipNetToMedia Type	INTEGER	read-write	other(1), -- none of the following invalid(2), -- an invalidated mapping dynamic(3), static(4)	The type of mapping. Setting this object to the value invalid(2) has the effect of invalidating the corresponding entry in the ipNetToMediaTable. That is, it effectively disassociates the interface identified with said entry from the mapping identified with said entry. It is an implementation-specific matter as to whether the agent removes an invalidated entry from the table. Accordingly, management stations must be prepared to receive tabular information from agents that corresponds to entries not currently in use. Proper interpretation of such entries requires examination of the relevant ipNetToMediaType object.
ipRouting Discards	Counter	read-only		The number of routing entries which were chosen to be discarded even though they are valid. One possible reason for discarding such an entry could be to free-up buffer space for other routing entries.

ICMP Group

Implementation of the ICMP group is mandatory for all systems.

Table E-7 ICMP Group Table

MIB Object	Syntax	Access	Description
icmpInMsgs	Counter	read-only	The total number of ICMP messages which the entity received. Note that this counter includes all those counted by icmpInErrors.
icmpInErrors	Counter	read-only	The number of ICMP messages which the entity received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, etc.).
icmpInDestUnreachs	Counter	read-only	The number of ICMP Destination Unreachable messages received.
icmpInTimeExcds	Counter	read-only	The number of ICMP Time Exceeded messages received.
icmpInParmProbs	Counter	read-only	The number of ICMP Parameter Problem messages received.
icmpInSrcQuenchs	Counter	read-only	The number of ICMP Source Quench messages received.
icmpInRedirects	Counter	read-only	The number of ICMP Redirect messages received.
icmpInEchos	Counter	read-only	The number of ICMP Echo (request) messages received.
icmpInEchoReps	Counter	read-only	The number of ICMP Echo Reply messages received.
icmpInTime stamps	Counter	read-only	The number of ICMP Timestamp (request) messages received.
icmpInTime stampReps	Counter	read-only	The number of ICMP Timestamp Reply messages received.
icmpOutAddrMasks	Counter	read-only	The number of ICMP Address Mask Request messages sent.
icmpOutAddrMaskReps			The number of ICMP Address Mask Reply messages sent.

TCP Group

Implementation of the TCP group is mandatory for all systems that implement the TCP.

Note that instances of object types that represent information about a particular TCP connection are transient; they persist only as long as the connection in question.

Table E-8 TCP Group Table

MIB Object	Syntax	Access	Enumeration	Description
tcpRto Algorithm	INTEGER	read-only	other(1), -- none of the following constant(2), -- a constant rto rsre(3), -- MIL-STD-1778, Appendix B vanj(4) -- Van Jacobson's algorithm [10]	The algorithm used to determine the timeout value used for retransmitting unacknowledged octets.
tcpRtoMin	INTEGER	read-only		The minimum value permitted by a TCP implementation for the retransmission timeout, measured in milliseconds. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission timeout. In particular, when the timeout algorithm is rsre(3), an object of this type has the semantics of the LBOUND quantity described in RFC 793.

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Table E-8 TCP Group Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
tcpRtoMax	INTEGER	read-only		The maximum value permitted by a TCP implementation for the retransmission timeout, measured in milliseconds. More refined semantics for objects of this type depend upon the algorithm used to determine the retransmission timeout. In particular, when the timeout algorithm is rsre(3), an object of this type has the semantics of the UBOUND quantity described in RFC 793.
tcpMaxConn	INTEGER	read-only		The limit on the total number of TCP connections the entity can support. In entities where the maximum number of connections is dynamic, this object should contain the value -1.
tcpActive Opens	Counter	read-only		The number of times TCP connections have made a direct transition to the SYN-SENT state from the CLOSED state.
tcpPassive Opens	Counter	read-only		The number of times TCP connections have made a direct transition to the SYN-RCVD state from the LISTEN state.
tcpAttempt Fails	Counter	read-only		The number of times TCP connections have made a direct transition to the CLOSED state from either the SYN-SENT state or the SYN-RCVD state, plus the number of times TCP connections have made a direct transition to the LISTEN state from the SYN-RCVD state.

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Table E-8 TCP Group Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
tcpEstab Resets	Counter	read-only		The number of times TCP connections have made a direct transition to the CLOSED state from either the ESTABLISHED state or the CLOSE-WAIT state.
tcpCurrEstab	Gauge	read-only		The number of TCP connections for which the current state is either ESTABLISHED or CLOSE-WAIT.
tcpInSegs	Counter	read-only		The total number of segments received, including those received in error. This count includes segments received on currently established connections."
tcpOutSegs	Counter	read-only		The total number of segments sent, including those on current connections but excluding those containing only retransmitted octets.
tcpRetrans Segs	Counter	read-only		The total number of segments retransmitted - that is, the number of TCP segments transmitted containing one or more previously transmitted octets.

TCP Connection Table

The TCP connection table contains information about this entity's existing TCP connections.

Table E-9 TCP Connection Table

MIB Object	Syntax	Access	Enumeration	Description
tcpConnState	INTEGER	read-write	closed(1), listen(2), synSent(3), synReceived(4), established(5), finWait1(6), finWait2(7), loseWait(8), lastAck(9), closing(10), timeWait(11), deleteTCB(12)	The state of this TCP connection. The only value which may be set by a management station is deleteTCB(12). Accordingly, it is appropriate for an agent to return a 'badValue' response if a management station attempts to se this object to any other value. If a management station sets this object to the value deleteTCB(12), then this has the effect of deleting the TCB (as defined in RFC 793) of the corresponding connection on the managed node, resulting in immediate termination of the connection. As an implementation-specific option, a RST segment may be sent from the managed node to the other TCP endpoint (note however that RST segments are not sent reliably).
tcpConnLocal Address	IpAddress	read-only		The local IP address for this TCP connection. In the case of a connection in the listen state which is willing to accept connections for any IP interface associated with the node, the value 0.0.0.0 is used.
tcpConn LocalPort	INTEGER (0..65535)	read-only		The local port number for this TCP connection.
tcpConn RemAddress	IpAddress	read-only		The remote IP address for this TCP connection.
tcpConn RemPort	INTEGER (0..65535)	read-only		The remote port number for this TCP connection.
tcpInErrs	Counter	read-only		The total number of segments received in error (e.g., bad TCP checksums).
tcpOutRsts	Counter	read-only		The number of TCP segments sent containing the RST flag.

UDP Group

Implementation of the UDP group is mandatory for all systems which implement the UDP.

Table E-10 UDP Group Table

MIB Object	Syntax	Access	Enumeration	Description
udpIn Datagrams	Counter	read-only		The total number of UDP datagrams delivered to UDP users.
udpNoPorts	Counter	read-only		The total number of received UDP datagrams for which there was no application at the destination port.
udpInErrors	Counter	read-only		The number of received UDP datagrams that could not be delivered for reasons other than the lack of an application at the destination port.
udpOut Datagrams	Counter	read-only		The total number of UDP datagrams sent from this entity.

UDP Listener Table

The UDP listener table contains information about this entity's UDP end-points on which a local application is currently accepting datagrams.

Table E-11 UDP Listener Table

MIB Object	Syntax	Access	Enumeration	Description
udpLocal Address	IpAddress	read-only		The local IP address for this UDP listener. In the case of a UDP listener which is willing to accept datagrams for any IP interface associated with the node, the value 0.0.0.0 is used.
udpLocalPort	INTEGER (0..65535)	read-only		The local port number for this UDP listener.

EGP Group

Implementation of the EGP group is mandatory for all systems which implement the EGP.

Table E-12 EGP Group Table

MIB Object	Syntax	Access	Enumeration	Description
egpInMsgs	Counter	read-only		The number of EGP messages received without error.
egpInErrors	Counter	read-only		The number of EGP messages received that proved to be in error.
egpOutMsgs	Counter	read-only		The total number of locally generated EGP messages.
egpOutErrors	Counter	read-only		The number of locally generated EGP messages not sent due to resource limitations within an EGP entity.

EGP Neighbor Table

The EGP neighbor table contains information about this entity's EGP neighbors.

Table E-13 EGP Neighbor Table

MIB Object	Syntax	Access	Enumeration	Description
egpNeighState	INTEGER	read-only	idle(1), acquisition(2), down(3), up(4), cease(5)	The EGP state of the local system with respect to this entry's EGP neighbor. Each EGP state is represented by a value that is one greater than the numerical value associated with said state in RFC 904.
egpNeighAddr	IpAddress	read-only		The IP address of this entry's EGP neighbor.
egpNeighAs	INTEGER	read-only		The autonomous system of this EGP peer. Zero should be specified if the autonomous system number of the neighbor is not yet known.

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Table E-13 EGP Neighbor Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
egpNeighIn Msgs	Counter	read-only		The number of EGP messages received without error from this EGP peer.
egpNeighIn Errs	Counter	read-only		The number of EGP messages received from this EGP peer that proved to be in error (e.g., bad EGP checksum).
egpNeighOut Msgs	Counter	read-only		The number of locally generated EGP messages to this EGP peer.
egpNeighOut Errs	Counter	read-only		The number of locally generated EGP messages not sent to this EGP peer due to resource limitations within an EGP entity.
egpNeighIn ErrMsgs	Counter	read-only		The number of EGP-defined error messages received from this EGP peer.
egpNeigh OutErrMsgs	Counter	read-only		The number of EGP-defined error messages sent to this EGP peer.
egpNeigh StateUps	Counter	read-only		The number of EGP state transitions to the UP state with this EGP peer.
egpNeigh StateDowns	Counter	read-only		The number of EGP state transitions from the UP state to any other state with this EGP peer.
egpNeigh IntervalHello	INTEGER	read-only		The interval between EGP Hello command retransmissions (in hundredths of a second). This represents the t1 timer as defined in RFC 904.
egp-NeighInterval Poll	INTEGER	read-only		The interval between EGP poll command retransmissions (in hundredths of a second). This represents the t3 timer as defined in RFC 904.
egpNeigh Mode	INTEGER	read-only	active(1), passive(2)	The polling mode of this EGP entity, either passive or active.

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Table E-13 EGP Neighbor Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
egpNeigh EventTrigger	INTEGER	read-write	start(1), stop(2)	A control variable used to trigger operator- initiated Start and Stop events. When read, this variable always returns the most recent value that egpNeighEventTrigger was set to. If it has not been set since the last initialization of the network management subsystem on the node, it returns a value of 'stop'. When set, this variable causes a Start or Stop event on the specified neighbor, as specified on pages 8-10 of RFC 904. Briefly, a Start event causes an Idle peer to begin neighbor acquisition and a non-Idle peer to reinitiate neighbor acquisition. A stop event causes a non-Idle peer to return to the Idle state until a Start event occurs, either via egpNeighEventTrigger or otherwise.
egpAs	INTEGER	read-only		The autonomous system number of this EGP entity.

SNMP Group

Implementation of the SNMP group is mandatory for all systems which support an SNMP protocol entity. Some of the objects defined below will be zero-valued in those SNMP implementations that are optimized to support only those functions specific to either a management agent or a management station. In particular, it should be observed that the objects below refer to an SNMP entity, and there may be several SNMP entities residing on a managed node (e.g., if the node is hosting acting as a management station).

Table E-14 SNMP Group Table

MIB Object	Syntax	Access	Enumeration	Description
snmpInPkts	Counter	read-only		The total number of Messages delivered to the SNMP entity from the transport service.
snmpOutPkts	Counter	read-only		The total number of SNMP Messages which were passed from the SNMP protocol entity to the transport service.
snmpInBad Versions	Counter	read-only		The total number of SNMP Messages which were delivered to the SNMP protocol entity and were for an unsupported SNMP version.
snmpInBad Community Names	Counter	read-only		The total number of SNMP Messages delivered to the SNMP protocol entity which used a SNMP community name not known to said entity.
snmpInBad Community Uses	Counter	read-only		The total number of SNMP Messages delivered to the SNMP protocol entity which represented an SNMP operation which was not allowed by the SNMP community named in the Message.
snmpInASN ParseErrs	Counter	read-only		The total number of ASN.1 or BER errors encountered by the SNMP protocol entity when decoding received SNMP Messages.
snmpInToo Bigs	Counter	read-only		The total number of SNMP PDUs which were delivered to the SNMP protocol entity and for which the value of the error-status field is ‘tooBig'.
snmpInNo SuchNames	Counter	read-only		The total number of SNMP PDUs which were delivered to the SNMP protocol entity and for which the value of the error-status field is ‘noSuchName'.

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Table E-14 SNMP Group Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
snmpInBad Values	Counter	read-only		The total number of SNMP PDUs which were delivered to the SNMP protocol entity and for which the value of the error-status field is ‘badValue'.
snmpIn ReadOnlys	Counter	read-only		The total number valid SNMP PDUs which were delivered to the SNMP protocol entity and for which the value of the error-status field is ‘readOnly'. It should be noted that it is a protocol error to generate an SNMP PDU which contains the value ‘readOnly' in the error-status field, as such this object is provided as a means of detecting incorrect implementations of the SNMP.
snmpIn GenErrs	Counter	read-only		The total number of SNMP PDUs which were delivered to the SNMP protocol entity and for which the value of the error-status field is ‘genErr'.
snmpInTotal ReqVars	Counter	read-only		The total number of MIB objects which have been retrieved successfully by the SNMP protocol entity as the result of receiving valid SNMP Get-Request and Get-Next PDUs.
snmpInTotal SetVars	Counter	read-only		The total number of MIB objects which have been altered successfully by the SNMP protocol entity as the result of receiving valid SNMP Set-Request PDUs.
snmpInGet Requests	Counter	read-only		The total number of SNMP Get-Request PDUs which have been accepted and processed by the SNMP protocol entity.

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Table E-14 SNMP Group Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
snmpInGet Nexts	Counter	read-only		The total number of SNMP Get-Next PDUs which have been accepted and processed by the SNMP protocol entity.
snmpInSet Requests	Counter	read-only		The total number of SNMP Set-Request PDUs which have been accepted and processed by the SNMP protocol entity.
snmpInGet Responses	Counter	read-only		The total number of SNMP Get-Response PDUs which have been accepted and processed by the SNMP protocol entity.
snmpInTraps	Counter	read-only		The total number of SNMP Trap PDUs which have been accepted and processed by the SNMP protocol entity.
snmpOutToo Bigs	Counter	read-only		The total number of SNMP PDUs which were generated by the SNMP protocol entity and for which the value of the error-status field is ‘tooBig.
snmpOutNo SuchNames	Counter	read-only		The total number of SNMP PDUs which were generated by the SNMP protocol entity and for which the value of the error-status is ‘noSuchName'.
snmpOutBad Values	Counter	read-only		he total number of SNMP PDUs which were generated by the SNMP protocol entity and for which the value of the error-status field is ‘badValue'.
snmpOutGen Errs	Counter	read-only		The total number of SNMP PDUs which were generated by the SNMP protocol entity and for which the value of the error-status field is ‘genErr'.
snmpOut GetRequests	Counter	read-only		The total number of SNMP Get-Request PDUs which have been generated by the SNMP protocol entity.

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Table E-14 SNMP Group Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
snmpOutGet Nexts	Counter	read-only		The total number of SNMP Get-Next PDUs which have been generated by the SNMP protocol entity.
snmpOut SetRequests	Counter	read-only		The total number of SNMP Set-Request PDUs which have been generated by the SNMP protocol entity.
snmpOutGet Responses	Counter	read-only		The total number of SNMP Get-Response PDUs which have been generated by the SNMP protocol entity.
snmpOutTraps	Counter	read-only		The total number of SNMP Trap PDUs which have been generated by the SNMP protocol entity.
snmpEnable AuthenTraps	INTEGER	read-write	enabled(1), disabled(2)	Indicates whether the SNMP agent process is permitted to generate authentication-failure traps. The value of this object overrides any configuration information; as such, it provides a means whereby all authentication-failure traps may be disabled. Note that it is strongly recommended that this object be stored in non-volatile memory so that it remains constant between re-initializations of the network management system.

RFC 1406

The DSU supports SNMP MIB tables defined in *RFC 1406, Definitions of Managed Objects for the DS1 and E1 Interface Types*. It supports the tables that make up the Near End Group and the Fractional Group within the MIB. It does not support the Far End Group tables. Tables E-14 through E-19 on the following pages list the objects in the supported MIB tables, their access (read/write or read-only), and what they do.

The tables identify the instances where the implementation of an object in the DSU differs from the standard implementation.

DS1 Near End Group

Implementation of this group is mandatory for all systems that attach to a DS1 Interface.

The DS1 Near End Group consists of four tables:

- DS1 Configuration
- DS1 Current
- DS1 Interval
- DS1 Total

Table E-15 DS1 Configuration Table

MIB Object	Syntax	Access	Enumeration	Description
dsx1LineIndex	INTEGER (1..'7fffffff'h)	read-only		This object is the identifier of a DS1 Interface on a managed device. If there is an ifEntry that is directly associated with this and only this DS1 interface, it should have the same value as ifIndex. Otherwise, the value exceeds ifNumber, and is a unique identifier following this rule: inside interfaces (e.g., equipment side) with even numbers and outside interfaces (e.g., network side) with odd numbers. **Variation from RFC 1406:** For DT 554S DSU, the value displayed by this object is always 1.
dsx1IfIndex	INTEGER (1..'7fffffff'h)	read-only		This value for this object is equal to the value of ifIndex from the Interfaces table of MIB II (RFC 1213) **Variation from RFC 1406**: The DSU returns the message "Information not available on dt554s"
dsx1Time Elapsed	INTEGER (0..899)	read-only		The number of seconds that have elapsed since the beginning of the current error-measurement period. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"

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Table E-15 DS1 Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Valid Intervals	INTEGER (0..96)	read-only		The number of previous intervals for which valid data was collected. The value will be 96 unless the interface was brought on-line within the last 24 hours, in which case the value will be the number of complete 15 minute intervals the since interface has been on-line. **Variation from RFC 1406:** For DT 554S DSU, the highest value displayed by this object is 95. Interval 96 is assumed to be the current interval, which can be read via dsx1CurrentTable.
dsx1LineType	INTEGER	read-write	other(1), dsx1ESF(2), dsx1D4(3), dsx1E1(4), dsx1E1-CRC(5), dsx1E1-MF(6), dsx1E1-CRC-MF(7	This variable indicates the variety of DS1 Line implementing this circuit. The type of circuit affects the number of bits per second that the circuit can reasonably carry, as well as the interpretation of the usage and error statistics. The values, in sequence, describe: TITLE: SPECIFICATION: dsx1ESF Extended SuperFrame DS1 dsx1D4 AT&T D4 format DS1 dsx1E1* CCITT Recommendation G.704 (Table 4a) dsx1E1-CRC* CCITT Recommendation G.704 (Table 4b) dsxE1-MF* G.704 (Table 4a) with TS16 multiframing enabled dsx1E1-CRC-MF* G.704 (Table 4b) with TS16 multiframing enabled ***Variation from RFC 1406:** Not a valid value for DT 554S DSU.

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Table E-15 DS1 Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Line Coding	INTEGER	read-write	dsx1JBZS (1), dsx1B8ZS (2), dsx1HDB3 (3), dsx1ZBTSI (4), dsx1AMI (5), other(6)	This variable describes the variety of Zero Code Suppression used on the link, which in turn affects a number of its characteristics. **dsx1JBZS*** refers the Jammed Bit Zero Suppression, in which the AT&T specification of at least one pulse every 8 bit periods is literally implemented by forcing a pulse in bit 8 of each channel. Thus, only seven bits per channel, or 1.344 Mbps, is available for data. **dsx1B8ZS** refers to the use of a specified pattern of normal bits and bipolar violations which are used to replace a sequence of eight zero bits. ANSI Clear Channels may use **dsx1ZBTSI***, or Zero Byte Time Slot Interchange. E1 links, with or without CRC, use **dsx1HDB3*** or dsx1AMI. **dsx1AMI** refers to a mode wherein no zero code suppression is present and the line encoding does not solve the problem directly. In this application, the higher layer must provide data which meets or exceeds the pulse density requirements, such as inverting HDLC data. ***Variation from RFC 1406:** Not a valid value for DT 554S DSU. Other(6) is also not a valid value.

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Table E-15 DS1 Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1SendCode	INTEGER	read-write	dsx1SendNoCode(1), dsx1SendLine Code(2), dsx1SendPayloadCode(3), dsx1SendResetCode(4), dsx1SendQRS(5), dsx1Send511Pattern(6), dsx1Send3in24Pattern(7), dsx1SendOtherTestPattern(8)	This variable indicates what type of code is being sent across the DS1 interface by the device. The values mean: dsx1SendNoCode – sending looped or normal data dsx1SendLineCode – sending a request for a line loopback dsx1SendPayloadCode* – sending a request for a payload loopback dsx1SendResetCode – sending a loopback termination request dsx1SendQRS – sending a Quasi-Random Signal (QRS) test-P pattern dsx1Send511Pattern* – sending a 511 bit fixed test pattern dsx1Send3in24Pattern* – sending a fixed test pattern of 3 bits set-P in 24 dsx1SendOtherTestPattern* – sending a test pattern other than those described by this object ***Variation from RFC 1406:** Not a valid value for DT 554S DSU. **Variation from RFC 1406:** For DT 554S DSU, enumeration (2) causes the DSU to transmit a generic loop up code. The remote determines, based on its configuration, whether it is to start a Line Loop or a Payload Loop. Enumeration (2) thus includes the functionality that RFC 1406 defines for enumeration (3). (4) dsx1SendReset Code stops either test at the remote. Writing 2 or 4 to this object causes the code to be transmitted briefly. The object does not provide indication of the actual loop status at the remote.

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Table E-15 DS1 Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Circuit Identifier	Display-String (SIZE (0..255))	read-write		This variable contains the transmission vendor's circuit identifier, for the purpose of facilitating troubleshooting.
dsx1Loopback Config	INTEGER	read-write	dsx1NoLoop (1) dsx1Payload Loop(2) dsx1Line Loop(3), dsx1Other Loop(4)	This variable represents the loopback configuration of the DS1 interface. Agents supporting read/write access should return badValue in response to a requested loopback state that the interface does not support. The values mean: **dsx1NoLoop** – Not in the loopback state. A device that is not capable of performing a loopback on the interface shall always return this as it's value. **dsx1PayloadLoop** – The received signal at this interface is looped through the device. Typically the received signal is looped back for re- transmission after it has passed through the device's framing function. **dsx1LineLoop** – The received signal at this interface does not go through the device (minimum penetration) but is looped back out. **dsx1OtherLoop** – Loopbacks that are not defined here. **Variation from RFC 1406:** For DT 554S DSU, enumeration (4) is defined as dsx1LocalTest. When that value is written to the object, the DSU starts the internal Local Test loop. DT 554S returns SNMP BAD VALUE error if a write to this object is attempted while there is already a test in progress.

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Table E-15 DS1 Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Line Status	INTEGER (1..8191)	read-only	This variable indicates the Line Status of the interface. It contains loopback, failure, received 'alarm' and transmitted 'alarm' information. The dsx1LineStatus is a bit map represented as a sum, therefore, it can represent multiple failures (alarms) and a LoopbackState simultaneously. dsx1NoAlarm should be set if and only if no other flag is set. If the dsx1LoopbackState bit is set, the loopback in effect can be determined from the dsx1LoopbackConfig object. The various bit positions are: 1 dsx1NoAlarm No Alarm Present 2 dsx1RcvFarEndLOF Far end LOF (a.k.a., Yellow Alarm) 4* dsx1XmtFarEndLOF Near end sending LOF Indication 8 dsx1RcvAIS Far end sending AIS 16* dsx1XmtAIS Near end sending AIS 32 dsx1LossOfFrame Near end LOF (a.k.a., Red Alarm) 64 dsx1LossOfSignal Near end Loss Of Signal 128 dsx1LoopbackState Near end is looped 256* dsx1T16AIS E1 TS16 AIS 512* dsx1RcvFarEndLOMF Far End Sending TS16 LOMF 1024* dsx1XmtFarEndLOMF Near End Sending TS16 LOMF 2048 dsx1RcvTestCode Near End detects a test code 4096 dsx1OtherFailure any line status not defined here ***Variation from RFC 1406:** Not a valid value for DT 554S DSU.	

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Table E-15 DS1 Configuration Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Signal Mode	INTEGER	read-write	none (1), robbedBit (2), bitOriented (3), messageOriented (4)	**Variation from RFC 1406:** For DT 554S DSU this object is read-only, and always returns the value 'none', indicating that no bits are reserved for signaling on this channel.
dsx1Transmit ClockSource	INTEGER	read-write	loopTiming (1), localTiming (2), throughTiming (3)	The source of Transmit Clock. 'loopTiming' indicates that the recovered receive clock is used as the transmit clock. 'localTiming' indicates that a local clock source is used. 'throughTiming' indicates that recovered receive clock from another interface is used as the transmit clock.
dsx1Fdl	INTEGER	read-write	other(1), dsx1Ansi-T1-403(2), dsx1Att-54016(4), dsx1Fdl-none(8)	This bitmap describes the use of the facilities data link, and is the sum of the capabilities: 'other' indicates that a protocol other than one following is used. 'dsx1Ansi-T1-403' refers to the FDL exchange recommended by ANSI. 'dsx1Att-54016' refers to ESF FDL exchanges. 'dsx1Fdl-none' indicates that the device does not use the FDL. **Variation from RFC 1406:** For DT 554S DSU only values (2) and (4) are valid.

DS1 Current Table

The DS1 current table contains various statistics being collected for the current 15 minute interval.

Table E-16 DS1 Current Table

MIB Object	Syntax	Access	Enumeration	Description
dsx1Current Index	INTEGER (1..'7fffffff'h)	read-only		The index value which uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value as a dsx1LineIndex object instance **Variation from RFC 1406:** For DT 554S DSU, the value displayed by this object is always 1.
dsx1Current ESs	Gauge	read-only		The number of Errored Seconds, encountered by a DS1 interface in the current 15 minute interval
dsx1Current SESs	Gauge	read-only		The number of Severely Errored Seconds encountered by a DS1 interface in the current 15 minute interval.
dsx1Current SEFSs	Gauge	read-only		The number of Severely Errored Framing Seconds encountered by a DS1 interface in the current 15 minute interval. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"
dsx1Current UASs	Gauge	read-only		The number of Unavailable Seconds encountered by a DS1 interface in the current 15 minute interval.

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Table E-16 DS1 Current Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Current CSSs	Gauge	read-only		The number of Controlled Slip Seconds encountered by a DS1 interface in the current 15 minute interval.
dsx1Current PCVs	Gauge	read-only		The number of Path Coding Violations encountered by a DS1 interface in the current 15 minute interval. **Variation from RFC 1406:** The DSU returns the message "Information not avaiVariation from RFC 1406:lable on dt554s"
dsx1Current LESs	Gauge	read-only		The number of Line Errored Seconds encountered by a DS1 interface in the current 15 minute interval. **Variation from RFC 1406**: The DSU returns the message "Information not available on dt554s"
dsx1Current BESs	Gauge	read-only		The number of Bursty Errored Seconds (BESs) encountered by a DS1 interface in the current 15 minute interval.
dsx1Current DMs	Gauge	read-only		The number of Degraded Minutes (DMs) encountered by a DS1 interface in the current 15 minute interval Variation from RFC 1406: The DSU returns the message "Information not available on dt554s"
dsx1Current LCVs	Gauge	read-only		The number of Line Code Violations (LCVs) encountered by a DS1 interface in the current 15 minute interval. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"

DS1 Interval

The DS1 Interval Table contains various statistics collected by each DS1 Interface over the previous 24 hours of operation. The past 24 hours are broken into 96 completed 15-minute intervals.

Table E-17 DS1 Interval Table

MIB Object	Syntax	Access	Enumeration	Description
dsx1Interval Index	INTEGER (1..'7fffffff'h)	read-only		The index value which uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value as a dsx1LineIndex object instance. **Variation from RFC 1406:** For DT 554S DSU, the value displayed by this object is always 1.
dsx1Interval Number	INTEGER (1..96)	read-only		A number between 1 and 96, where 1 is the most recently completed 15 minute interval and 96 is the least recently completed 15 minutes interval (assuming that all 96 intervals are valid).
dsx1Interval ESs	Gauge	read-only		The number of Errored Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.
dsx1Interval SESs	Gauge	read-only		The number of Severely Errored Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

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Table E-17 DS1 Interval Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Interval SEFSs	Gauge	read-only		The number of Severely Errored Framing Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"
dsx1Interval UASs	Gauge	read-only		The number of Unavailable Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals
dsx1Interval CSSs	Gauge	read-only		The number of Controlled Slip Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.
dsx1Interval PCVs	Gauge	read-only		The number of Path Coding Violations encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"
dsx1Interval LESs	Gauge	read-only		The number of Line Errored Seconds encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals. Variation from RFC 1406: The DSU returns the message "Information not available on dt554s"
dsx1Interval BESs	Gauge	read-only		The number of Bursty Errored Seconds (BESs) encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals.

(Continued on next page)

Table E-17 DS1 Interval Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Interval DMs	Gauge	read-only		The number of Degraded Minutes (DMs) encountered by a DS1 interface in one of the previous 96, individual 15 minute, intervals. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"
dsx1Interval LCVs	Gauge	read-only		The number of Line Code Violations (LCVs) encountered by a DS1 interface in the current 15 minute interval. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"

DS1 Total

The DS1 Total Table contains the cumulative sum of the various statistics for the 24 hour period preceding the current interval.

Table E-18 DS1 Total Table

MIB Object	Syntax	Access	Enumeration	Description
dsx1Total Index	INTEGER (1..'7fffffff'h)	read-only		The index value which uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value as a dsx1LineIndex object instance. **Variation from RFC 1406:** For DT 554S DSU, the value displayed by this object is always 1.

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Table E-18 DS1 Total Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Interval Number	INTEGER (1..96)	read-only		A number between 1 and 96, where 1 is the most recently completed 15 minute interval and 96 is the least recently completed 15 minutes interval (assuming that all 96 intervals are valid).
dsx1TotalESs	Gauge	read-only		The number of Errored Seconds encountered by a DS1 interface in the previous 24 hour interval
dsx1Total SESs	Gauge	read-only		The number of Severely Errored Seconds encountered by a DS1 interface in the previous 24 hour interval.
dsx1Total SEFSs	Gauge	read-only		The number of Severely Errored Framing Seconds encountered by a DS1 interface in the previous 24 hour interval. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"
dsx1Total UASs	Gauge	read-only		The number of Unavailable Seconds encountered by a DS1 interface in the previous 24 hour interval.
dsx1Total CSSs	Gauge	read-only		The number of Controlled Slip Seconds encountered by a DS1 interface in the previous 24 hour interval.
dsx1Total PCVs	Gauge	read-only		The number of Path Coding Violations encountered by a DS1 interface in the previous 24 hour interval. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"

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Table E-18 DS1 Total Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dsx1Total LESs	Gauge	read-only		The number of Line Errored Seconds encountered by a DS1 interface in the previous 24 hour interval. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"
dsx1Total BESs	Gauge	read-only		The number of Bursty Errored Seconds (BESs) encountered by a DS1 interface in the previous 24 hour interval
dsx1TotalDMs	Gauge	read-only		The number of Degraded Minutes (DMs) encountered by a DS1 interface in the previous 24 hour interval. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"
dsx1TotalLCVs	Gauge	read-only		The number of Line Code Violations (LCVs) encountered by a DS1 interface in the current 15 minute interval. **Variation from RFC 1406:** The DSU returns the message "Information not available on dt554s"

DS1 Fractional Group

Implementation of this group is mandatory for those systems dividing a DS1 into channels containing different data streams that are of local interest. Systems which are indifferent to data content, such as CSUs, need not implement it.

The DS1 fractional table identifies which DS1 channels associated with a CSU are being used to support a logical interface, i.e., an entry in the interfaces table from the Internet-standard MIB.

For example, consider an application managing a North American

ISDN Primary Rate link whose division is a 384 kbit/s H1 "B" Channel for Video, a second H1 for data to a primary routing peer, and 12 64 kbit/s H0 "B" Channels. Consider that some subset of the H0 channels are used for voice and the remainder are available for dynamic data calls.

We count a total of 14 interfaces multiplexed onto the DS1 interface. Six DS1 channels (for the sake of the example, channels 1..6) are used for Video, six more (7..11 and 13) are used for data, and the remaining 12 are in channels 12 and 14..24.

Let us further imagine that ifIndex 2 is of type DS1 and refers to the DS1 interface, and that the interfaces layered onto it are numbered 3..16.

We might describe the allocation of channels, in the dsx1FracTable, as follows:

dsx1FracIfIndex.2. 1 = 3	dsx1FracIfIndex.2.13 = 4
dsx1FracIfIndex.2. 2 = 3	dsx1FracIfIndex.2.14 = 6
dsx1FracIfIndex.2. 3 = 3	dsx1FracIfIndex.2.15 = 7
dsx1FracIfIndex.2. 4 = 3	dsx1FracIfIndex.2.16 = 8
dsx1FracIfIndex.2. 5 = 3	dsx1FracIfIndex.2.17 = 9
dsx1FracIfIndex.2. 6 = 3	dsx1FracIfIndex.2.18 = 10
dsx1FracIfIndex.2. 7 = 4	dsx1FracIfIndex.2.19 = 11
dsx1FracIfIndex.2. 8 = 4	dsx1FracIfIndex.2.20 = 12
dsx1FracIfIndex.2. 9 = 4	dsx1FracIfIndex.2.21 = 13
dsx1FracIfIndex.2.10 = 4	dsx1FracIfIndex.2.22 = 14
dsx1FracIfIndex.2.11 = 4	dsx1FracIfIndex.2.23 = 15
dsx1FracIfIndex.2.12 = 5	dsx1FracIfIndex.2.24 = 16

For North American (DS1) interfaces, there are 24 legal channels, numbered 1 through 24.

For G.704 interfaces, there are 31 legal channels, numbered 1 through 31. The channels (1..31) correspond directly to the equivalently numbered time-slots.

Table E-19 DS1 Fractional Table

MIB Object	Syntax	Access	Enumeration	Description
dsx1FracIndex	INTEGER (1..'7fffffff'h)	read-only		The index value which uniquely identifies the DS1 interface to which this entry is applicable. The interface identified by a particular value of this index is the same interface as identified by the same value an dsx1LineIndex object instance. **Variation from RFC 1406:** For DT 554S DSU, the value displayed by this object is always 1.
dsx1Frac Number	INTEGER (1..31)	read-only		The channel number for this entry. **Variation from RFC 1406:** For DT 554S DSU the valid values for this object are defined as follows (1..24)
dsx1FracIf Index	INTEGER (1..'7fffffff'h)	read-write		An index value that uniquely identifies an interface. The interface identified by a particular value of this index is the same interface as identified by the same value an ifIndex object instance. If no interface is currently using a channel, the value should be zero. If a single interface occupies more than one time slot, that ifIndex value will be found in multiple time slots. **Variation from RFC 1406:** For DT 554S DSU the valid values for this object are defined as follows 0 = Not allocated to DTE 2 = Allocated to DTE

DT 554 MIB

The DT 554 MIB contains the DT 554AlarmTable, which consists of entries that report the status of alarms. The status of an alarm indicates whether the alarm is currently active or inactive. This information will be determined by the network element depending on the alarm threshold configuration.

The structure of the table is such that alarm status is supported on a unit or interface basis, and then on an alarm type basis within the interface. For the sake of simplicity and to support the reporting of status of all alarms, a unit is treated as an interface in this table."

The DSU sets the DT 554 Alarm Trap to report an alarm whenever an alarm status change occurs. The variable bindings contain the description and status for each alarm that changes state.

Note that the OBJECT IDENTIFIER of the variable contains the interface, family type, and alarm type of the alarm encoded within.

More than one alarm can be sent in the trap, if the network element indicates that more than one has changed at the same time.

Table E-20 DT554S Table

MIB Object	Syntax	Access	Enumeration	Description
dt554sMIB version	DisplayString (SIZE (5))	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 minor revision number, 'z' identifies the typographical revision, and T identifies the test revision. Acceptable values for the individual revision components are as follows x: 1 - 9 y: 0 - 9 z: 0 - 9 T: A - Z Upon formal release, no designation for the test revision will be present.

(Continued on next page)

Table E-20 DT554S Table (Continued)

MIB Object	Syntax	Access	Enumeration	Description
dt554sText AlarmGlobal	INTEGER	read-write	disable(1), enable(2)	This globally enables and disables all text based TRAPs from an agent.
dt554sText AlarmNumber	INTEGER	read-only		The index value which uniquely identifies the interface to which this entry is applicable.
dt554sText Alarm Description	DisplayString (SIZE (1..32))	read-only		The Description of the alarm generated.
dt554sText AlarmStatus	DisplayString (SIZE (1..8))	read-only		The current status of the alarm. In string form, the value Inactive indicates that this alarm is currently inactive. The value Active indicates that this alarm is currently active. This variable will only return the strings Active and Inactive.
dt554sText Alarm SeverityLevel	DisplayString (SIZE (1..8))	read-only		The severity level associated with the alarm in the Alarm table. In string form, the value Critical is critical for the enterprise functioning. The values Major, Minor, Warning indicates otherwise as specified by enterprise. This variable will only return the strings Critical, Major, Minor, and Warning.

HP OpenView Trap Handling

In order for HP OpenView to recognize and store traps from the DT 554S you need to use the procedure that follows to create a file in the OpenView configuration directory and issue the command that puts it into effect as part of the configuration.

1. Create a file named `dt554events.conf` in the `/ov/conf` directory.

2. Using the text editor of your choice, enter the following in the file and save it:

```
####################
#
# enterprises
#
dt554s {.1.3.6.1.4.1.498.6.12}
#
dt554sAlarm {.1.3.6.1.4.1.498.6.12} 6 1 a "Error Events" 1
GDC: DT554S Alarm Condition $2 occurred, severity is $4,
status is $3
SDESC
The data passed with the event are:
1) Index
    Source id of the program sending the trap.
2) Description
3) Status
    OVw objectid of the event source.
4) Severity
EDESC
```

3. Issue the command

   ```
   /usr/ov/bin/xnmevents -load dt554events.conf
   ```

   to add the file to HP OpenView's list of Trap handling files.

4. Issue the command

   ```
   /usr/ov/bin/xnmevents -events
   ```

   which causes the file to begin executing.

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General DataComm