ADTRAN

DSU 5600
Data Service Unit

USER MANUAL

ADTRAN

FCC regulations require that the following information be provided in this manual:

1. This equipment complies with Part 68 of the FCC rules. On the bottom of the equipment housing is a label that shows the FCC registration number and Ringer Equivalence Number (REN) for this equipment. If requested, provide this information to the telephone company.

2. If this equipment causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, advance notification is given, otherwise, notification is given as soon as possible. The telephone company will advise the customer of the right to file a complaint with the FCC.

3. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment; advance notification and the opportunity to maintain uninterrupted service is given.

4. If experiencing difficulty with this equipment, please contact ADTRAN for repair and warranty information. The telephone company may require this equipment to be disconnected from the network until the problem is corrected, or it is certain the equipment is not malfunctioning.

5. This unit contains no user serviceable parts.

6. An FCC compliant telephone cord with a modular plug is provided with this equipment. In addition, an FCC compliant cable appropriate for the dial backup option ordered is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using an FCC compatible modular jack, which is Part 68 compliant.

7. The following information may be required when applying to the local telephone company for leased line facilities.

Service Type	Digital Facility Interface Code	Service Order Code	Network Jacks
56 kbps Digital Interface	04DU5-56	6.0F	RJ-48S

CANADIAN EQUIPMENT LIMITATIONS

Notice: The Canadian Industry and Science Canada 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.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or an electrician, as appropriate.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all devices does not exceed 100.

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Chapter 1
Introduction

GENERAL DESCRIPTION

The ADTRAN DSU 5600 is a technologically advanced, high performance Data Service/Channel Service Unit (DSU/CSU) that provides the interface between telco provided Digital Data Service (DDS) and the customer's Data Terminal Equipment (DTE).

The DSU 5600 supports both 56 kbps and 64 kbps loop service rates and provides either synchronous or asynchronous modes of operation for the DTE interface. When the DTE interface is configured for synchronous operation, the DSU 5600 matches the selected loop rate. When the DTE interface is configured for asynchronous operation, it supports asynchronous data communications over either a 56 kbps or 64 kbps DDS service. In asynchronous mode, the DTE can be configured to operate at any of the standard asynchronous communication rates from 1.2 kbps to 57.6 kbps. All setup or configuration is accomplished with a single eight position DIP switch that is accessible from the back panel of the unit.

The DSU 5600 has an industry standard EIA-232 interface provided on a 25 pin connector.

PHYSICAL DESCRIPTION

The DSU 5600 is a stand alone unit designed to be used either on a desktop or mounted on a wall. The physical measurements of the DSU 5600 are:

Length = 8.32 inches
Width = 6.50 inches
Height = 1.56 inches
Weight = 1.50 pounds

Front Panel

As shown in Figure 1-1, the front panel of the DSU 5600 contains eleven LED indicators that display DTE interface, network, and test status. These indicators are defined in the following section *LED Identification*.

LED Identification

DTE Status (Green)

INDICATOR	DEFINITION	SOURCE
RS	Request To Send	DTE
CS	Clear To Send	DSU
TD	Transmit Data	DTE
RD	Receive Data	DSU
CD	Carrier Detect	DSU

The active state for the status indicators (RS, CS, and CD) is On; the On state for the data indicators (TD and RD) represents a SPACE condition.

NOTE

Network Status (Red)

ALM   *On* indicates a problem on the local loop or within the DDS network.
Off indicates a normal loop and network conditions.

Test Status/Error (Yellow/Red)

DTE   *On* indicates DTE interface test in progress.
Flashing indicates loop interface test (CSU Loopback) has been initiated by the telco.

Loop   *On* solid indicates loop interface test has been initiated from local DSU.
Flashing indicates loop interface test (CSU or DSU Loopback) has been initiated by the telco.

RDL   *On* solid indicates remote digital loopback test has been initiated from the local DSU.
Flashing indicates remote digital loopback test has been initiated from the remote DSU.

PTRN   *On* indicates integral pattern generator is being utilized for testing.

Error   *On* solid indicates remote digital loopback test has been initiated from the local DSU.
Flashing indicates remote digital loopback test has been initiated from the remote DSU.

For more information on the tests indicated by the indicators described previously see the chapter *Test Modes*.

Select and Test Buttons

The front panel also contains two push-button switches for selecting and controlling the various test modes for the DSU 5600.

Select   Each time this switch is pressed the current test mode is displayed by turning *On* one or more LEDs to indicate the specific test.

Test   Once the desired test mode is displayed on the test status indicators, the test is initiated by activating this switch. This switch is also activated to terminate any test in progress.

1. DTE Status LEDs
2. Network Status Indicator
3. Test Status/Error Indicators
4. **Select** Push Button Switch
5. **Test** (Start/Stop) Push Button Switch (Alternate Action)
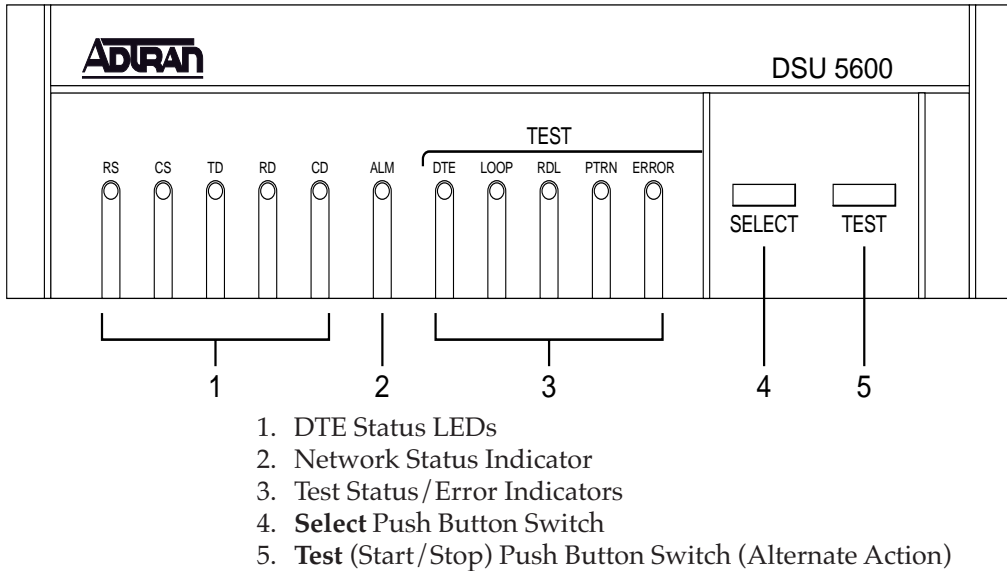
Figure 1-1
DSU 5600 Front Panel

Rear Panel

A drawing of the rear panel of the DSU 5600 is shown in Figure 1-2. The 25-pin connector labeled **PRIMARY EIA-232** provides the synchronous/asynchronous DTE interface. Connection to the DDS network is made using the 8-pin modular jack (RJ-48S) labeled **TELCO**. The pin assignments for these connectors are listed in the sections *Network Connections* and *DTE Connections.*

All setup or configuration parameters for the DSU 5600 are selected with an eight position DIP switch that is accessible from the rear panel. This switch is labeled **OPTIONS**, and reference is made to the options chart on the bottom of the unit. The individual options are explained in detail in the section *Powering*.

A power cord is also shown on the rear panel of the DSU 5600. The captive power cord on the back panel provides connection to the AC/DC power supply.
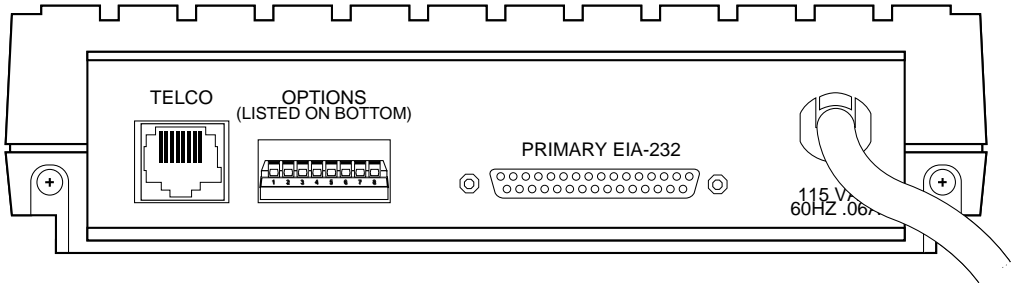
Figure 1-2
DSU 5600 Rear Panel

Chapter 2
Installation

UNPACKING

After unpacking the DSU 5600, carefully inspect it for shipping damages. If damage is suspected, file a claim immediately with the carrier and then contact ADTRAN Technical Support. If possible, keep the original shipping container for use in returning the unit to ADTRAN for repair or verification of shipping damage.

ADTRAN Shipments Include

The following items are included in ADTRAN shipments of the DSU 5600:

- The DSU 5600 unit
- Network interface cable (an 8-position modular to 8-position modular)
- The user manual

Customer Provides

The customer must provide an EIA-232 interface cable with standard 25-pin male D-type connectors (Cannon or Cinch DB-19604-432).

WARRANTY AND CUSTOMER SERVICE

For information regarding warranty and customer service see the inside cover of this manual.

POWERING

The DSU 5600 is equipped with a captive six-foot power cord that is terminated with a three-prong plug for connecting to a grounded power receptacle.

Ensure that a grounded, 115 VAC, 60 Hz receptacle is used for powering the DSU 5600.

NOTE

When the DSU 5600 is plugged into an AC power source, it performs a SELF TEST that tests all LED indicators plus various circuit blocks within the unit. Proper operation plus failures are indicated via the LED indicators.

CONFIGURATION

The DSU 5600 has eight options for controlling the operation of both the network and DTE interfaces. These options are selected by setting individual switches on the eight position DIP switch that is accessible from the rear panel. A label of the switch settings and their respective options is attached to the bottom of the unit for convenience.

DTE Rate and Scrambler - SW 1, SW 2, SW 3

These three switches select the data rate for the DTE interface and enable or disable the scrambler. As shown in Table 2-A, combinations of up and down settings for these switches select specific data rates and enable or disable the scrambler.

When operating at 64 kbps synchronously in Frame Relay networks the scrambler must be disabled. When operating synchronously on a 64 kbps DDS loop not supporting Frame Relay the scrambler should be enabled.

NOTE

DTE Rate	SW 1	SW 2	SW 3
1.2 and 2.4 kbps Async	Down	Down	Down
Sync, Scrambler Disabled	Up	Down	Down
4.8 kbps Async	Down	Up	Down
9.6 kbps Async	Up	Up	Down
19.2 kbps Async	Down	Down	Up
38.4 kbps Async	Up	Down	Up
57.6 kbps Async	Down	Up	Up
Sync, Scrambler Enabled	Up	Up	Up

Loop Rate - SW 4

When the SW4 switch is in the down (56 kbps) position, the network interface of the DSU 5600 is configured for operation at 56 kbps, and when this switch is in the up (64 kbps) position, the network interface is configured for 64 kbps operation.

For 64 kbps clear channel operation, there is a possibility that the DTE data sequences might mimic network loop maintenance functions and erroneously cause other network elements to activate loopbacks. To prevent this, a data scrambler is enabled when the 64 kbps option is selected.

Clear To Send (CS) - SW 5

When this switch is in the down (normal) position Clear To Send (CS) follows the Request To Send (RS) lead with 250 μ ± 125 μ of delay. The only exceptions to this occur when network or test conditions prevent data from being transferred over the DTE interface. During these conditions CS is turned *Off*.

For the up (*On*) position CS is forced *On* all the time.

Carrier Detect (CD) - SW 6

When this switch is in the down (normal) position, Carrier Detect (CD) is *On* any time customer data is being received and *Off* when the receive circuit is idle, (not carrying customer data).

When this switch is in the up (*On*) position, CD is forced *On* all the time.

Data Set Ready (SR) - SW 7

When this switch is in the down (*On*) position, Data Set Ready (SR) is forced *On* all the time. For the up (normal) position, SR is turned *Off* when the network is out of service or a test is in progress.

Remote Digital Loopback (RDL) - SW 8

When this switch is in the down (enable) position, the DSU 5600 accepts the industry standard V.54 Remote Digital Loopback (RDL) command from the far end of the circuit.

When this switch is in the up (disable) position, the DSU 5600 does not respond to a V.54 loopback command from the far end of the circuit.

NETWORK CONNECTIONS

This interface consists of four leads paired to provide separate transmit and receive circuits. The four leads are provided on the eight position modular jack (RJ-48S) labeled **TELCO** on the rear panel of the DSU 5600. The pin assignments for this connector are shown in Table 2-B.

Table 2-B
Network Connections

Pin Number	Function	Signal Direction
1	Transmit Data (R)	From Customer to Network Interface
2	Transmit Data (T)	From Customer to Network Interface
3-6	Not Used	
7	Receive Data (T-1)	From Network Interface to Customer
8	Receive Data (R-1)	From Network Interface to Customer

DTE CONNECTIONS

The Data Terminal Equipment is attached to the connector labeled **PRIMARY EIA-232** at the rear of the DSU 5600. The pin assignments for all pins used on this connector are shown in Table 2-C.

Table 2-C

Pin Assignments for Primary EIA-232 Connector

Pin Number	Function	Signal Direction
1	AA	Protective Ground (PG)
2	BA	Send Data (SD)
3	BB	Receive Data (RD)
4	CA	Request to Send (RS)
5	CB	Clear to Send (CS)
6	C C	Data Set Ready (SR)
7	AB	Signal Ground (SG)
8	CF	Receive Line Signal Detector (CD)
9	-	Not Used
10	-	Not Used
11-14	-	Not Used
15	DB	Transmit Clock (SCT)
16	-	Not Used
17	DD	Receive Clock (SCR)
19-24	-	Not Used

CAUTION

A shielded EIA-232 cable is required to prevent possible radio frequency interference emissions.

Chapter 3
Test Modes

In addition to a self test mode, other DSU 5600 test modes allow the user to isolate problems to specific components of the communications circuit. These various test modes for the DSU 5600 are initiated and terminated from the front panel using **Select** and **Test**.

SELF TEST

When the DSU 5600 is powered on, all LEDs on the front panel turn *On* simultaneously for approximately two seconds then turn *Off* briefly. The LEDs then cycle *On* in pairs with a fan-out pattern away from the **ALM** indicator. Next, the LEDs cycle *Off* in pairs with a fan-in pattern back towards the **ALM** indicator. These patterns are repeated four times to determine that all LEDs are functioning properly.

At completion of the LED test patterns the **PTRN** LED is *On*, indicating the DTE with TP test is being performed. This test is successful if the **Error** indicator does not turn *On*. If the DTE with TP test fails, the **RS**, **ALM**, **DTE**, **PTRN**, and **Error** indicators all *Flash*.

If an EPROM CHECKSUM failure is detected during self test, **CS**, **ALM**, **PTRN**, and **Error** indicators *Flash* at the end of the self test.

NEAR END TEST

The local DSU 5600 is capable of performing the following near end tests:

- DTE Only
- DTE with Test Pattern
- DTE and Loop (LL)
- Loop Only (RT)

DTE Only Test

The DTE Only test provides a method for testing both the DTE interface of the local DSU 5600 plus its loop transmitter and receiver. For this test, the loop transmit data is connected to the loop receive data at a point close to the physical network interface. A block diagram illustrating the loopback point and the signal paths for this test is shown in Figure 3-1.

To initiate the DTE Only test, perform the following steps:

1. Press **Select** once to turn *On* the DTE test indicator.
2. Press **Test** while the test indicator is *On*.

To terminate this test, press **Test**.

Test data from the terminal or test equipment is routed through the DTE section of the DSU 5600 and then to the output of the loop transmitter section where the signal is encoded for transmission. The output of the loop transmitter is coupled back to the loop receiver input. This receive test signal is then decoded and returned to the terminal or test equipment where it is checked for bit errors.
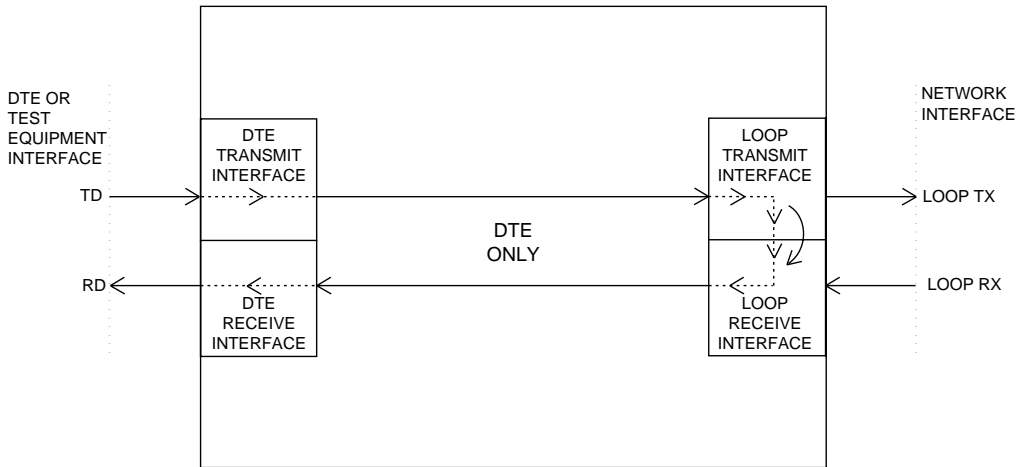
Figure 3-1
DTE Only Test Diagram

DTE with Test Pattern (TP)

The DTE with Test Pattern (TP) test is similar to the DTE Only test described previously. The DTE with TP test is initiated at the local DSU 5600 and is used to independently test the operation of the DSU 5600.

To initiate the DTE with TP test, perform the following steps:

1. Press **Select** twice to turn *On* both the **DTE** and **PTRN** test indicators.
2. Press **Test** while these test indicators are *On*.

To terminate this test, press **Test.**

Instead of using data from the terminal or test equipment, this test utilizes an internal test pattern generator and detector built into the DSU 5600. The loopback point and the data paths for this test are illustrated in Figure 3-2.

The internal test pattern generator and detector of the DSU 5600 operate with a 2047 data pattern. When this test is initiated, the test pattern detector examines the receive data stream until synchronization to the 2047 pattern is achieved. Once synchronized, the detector continues to check the receive data and reports any bit errors detected by turning *On* the **Error** LED.

Once a test is initialized with the internal test pattern generator and detector, errors can be injected into the transmit data stream by pressing **Select** and observed by watching the **Error** LED turn *On* for a brief period of time.

As previously mentioned, the DTE with TP test is automatically performed during the self test sequence for the DSU 5600.
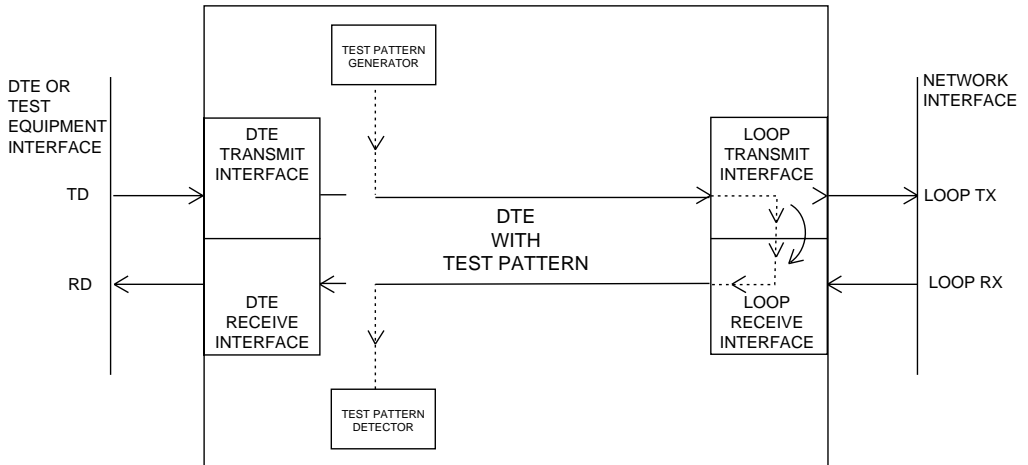
Figure 3-2
DTE with Test Pattern Test Diagram

DTE and Loop Test (LL)

The DTE and Loop test is initiated at the local DSU 5600 and allows independent testing of the separate sections of the DSU 5600. First, it allows the local DTE interface to be tested with data from the terminal or test equipment. Second, it allows the loop interface section of the local DSU 5600 to be tested from the remote site over the actual communications circuit. Testing from the remote end of the circuit is done with test data generated by the remote DSU or terminal type test equipment.

The DTE and Loop test splits the DSU 5600 into separate DTE and Loop interface sections and then loops the transmit data of each interface back to its respective receive data. A block diagram illustrating the loopback points and the signal paths for this test is shown in Figure 3-3.

To initiate the DTE and Loop test, perform the following steps:

1. Press **Select** three times to turn *On* both the DTE and Loop test indicators.
2. Press **Test** while these test indicators are *On*. The DTE and Loop LEDs *Flash* during initialization of the test and turn *On* solid once the test is in progress.
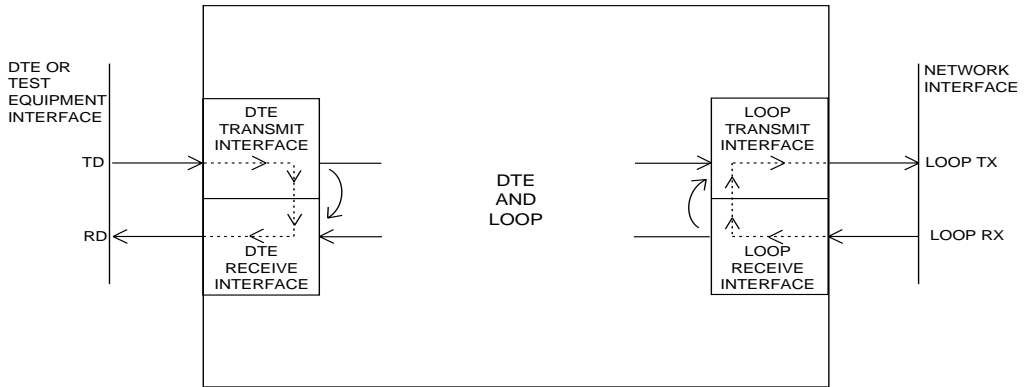
To terminate this test, press **Test**.

Figure 3-3
DTE and Loop Test Diagram

Loop Only Test

The Loop Only test allows the loop interface and a major portion of the DTE interface of the local DSU 5600 to be tested from a remote site over the actual digital data circuit.

During the Loop Only test, the network receive data is looped to the network transmit data inside the DTE interface section of the DSU 5600. The physical DTE interface is ignored for this test. A block diagram illustrating the loopback point and the signal paths for this test is shown in Figure 3-4.

To initiate the Loop Only test, perform the following steps:

1. Press **Select** four times to turn *On* the loop test indicator.
2. Press **Test** while this test indicator is *On*. The Loop LED *Flashes* during initialization of the test and turns *On* solid once the test is in progress.
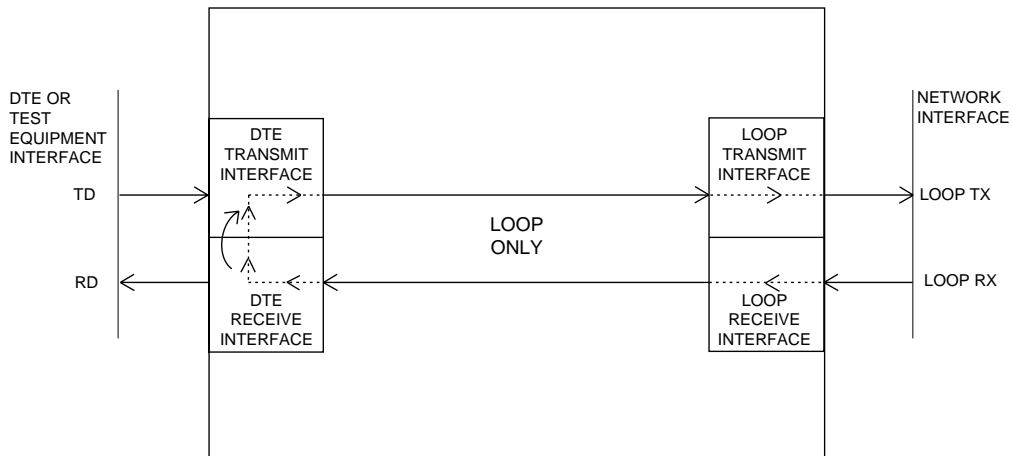
To terminate this test, press **Test**.

Figure 3-4
Loop Only Test Diagram

FAR END TESTS

Remote Digital Loopback (RDL)

When the remote digital loopback (RDL) test is initiated at the local DSU 5600, it commands the remote DSU into loopback with the industry standard V.54 loopback pattern. The loopback point and the signal paths for the remote DSU are the same as the Loop Only test for a local DSU (Figure 3-4). This loopback test is performed with data from the terminal or test equipment.

To initiate the RDL test, perform the following steps:

1. Press the **Select** switch five times to turn *On* the RDL test indicator.
2. Press **Test** while the test indicator is *On*. The RDL LED *Flashes* during initialization of the test and turns *On* solid once the test is in progress.

To terminate this test, press **Test**.

RDL with Test Pattern (TP)

When the RDL with TP test is initiated at the local DSU 5600, it commands the remote DSU into loopback with the industry standard V. 54 loopback pattern. The loopback point and the signal paths for the remote DSU are the same as the Loop Only test for a local DSU (Figure 3-4). This loopback test is performed with data from the internal test pattern generator and error detector.

To initiate the RDL with TP test, perform the following steps:

1. Press **Select** six times to turn *On* both the RDL and PTRN test indicators.
2. Press **Test** while these test indicators are *On*. The RDL and PTRN LEDs *Flash* during initialization of the test and turn *On* solid once the test is in progress.

To terminate this test, press **Test**.

Test Pattern (PTRN)

When the PTRN test is initiated, the local DSU 5600 uses the integral test pattern generator to transmit a standard 2047 test pattern to the DSU On the far end of the circuit. The local DSU 5600 then examines the received data for the standard 2047 pattern. Once this pattern is detected the, **Error** indicator is turned *Off*. The **Error** indicator turns *On* when errors in the receive data pattern are detected. While this test is active, errors can be injected into the transmit data stream by pressing the **Select** push button.

To initiate the PTRN test, use the following steps:

1. Press the **Select** switch seven times to turn *On* the PTRN test indicator.
2. Press the **Test** switch while this test indicator is *On*. The PTRN LED *Flashes* during initialization of the test and turns *On* solid once the test is in progress.

To terminate this test, press the **Test** switch.

REMOTE TESTS

The DSU 5600 responds to three remote activated tests:

• Remote Digital Loopback (RDL)
• CSU Loopback (LL)
• DSU Loopback (RT)

The RDL test is initiated by a remote DSU and causes the local DSU 5600 to loopback. The loopback point is the same as the Loop Only point shown in Figure 3-4. This test is run to test the end-to-end performance of the circuit.

Both the CSU Loopback and the DSU Loopback tests are activated from the telephone company diagnostic test equipment and are used to isolate trouble on a circuit.

The CSU Loopback, commonly called the LL test, has the same loopback points as the DTE and Loop test. It is used by the telephone company to test the integrity of the local loop.

The DSU Loopback, commonly called the RT test, has the same loopback point as the Loop Only test and is used by the telephone company to test the operation of both the local loop and DTE interface sections.

Chapter 4
Specifications Summary

SPECIFICATIONS AND FEATURES

This section describes the standard specifications and features incorporated in the DSU 5600.

Loop Interface
4-wire, full duplex

Line Requirements
Local loop specifications per AT&T Pub 62310

Loop Rates
56 kbps or 64 kbps

Receiver Sensitivity
-45 dB

DTE Interfaces
EIA-232 synchronous or asynchronous

DTE Data Rates
• 1.2 kbps, 2.4 kbps, 4.8 kbps, 9.6 kbps, 19.2 kbps, 38.4 kbps, or 57.6 kbps asynchronous
• 56 kbps or 64 kbps synchronous

DTE Operating Modes
Full or half duplex

Diagnostics
- Network test center activated
  - CSU loopback on sealing current reversal in local loop
  - DSU loopback

- User activated
  - Self test
  - Local loopback
  - V.54 activated remote loopback with:
     2047 test pattern
     DTE data/data from external test set

Power
115 VAC
4 Watts (maximum)

Environment
- Temperature
  - Operating   0°C to 50°C (32°F to 122°F)
  - Storage   -20°C to 70°C (-4°F to 158°F)

- Relative Humidity up to 95%, non-condensing

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Product Support Information

Presales Inquiries and Applications Support
Please contact your local distributor, ADTRAN Applications
Engineering, or ADTRAN Sales:

Applications Engineering   (800) 615-1176
Sales   (800) 827-0807

Post-Sale Support
Please contact your local distributor first. If your local distribu-
tor cannot help, please contact ADTRAN Technical Support and
have the unit serial number available.

Technical Support   (888) 4ADTRAN

Repair and Return
If ADTRAN Technical Support determines that a repair is
needed, Technical Support will coordinate with the Return
Material Authorization (RMA) department to issue an RMA
number. For information regarding equipment currently in
house or possible fees associated with repair, contact RMA
directly at the following number:

RMA Department   (205) 963-8722

Identify the RMA number clearly on the package (below ad-
dress), and return to the following address:

ADTRAN, Inc.
RMA Department
901 Explorer Boulevard
Huntsville, Alabama 35806

RMA # _____