Errata

Title & Document Type: N1660A Users Manual

Manual Part Number: N1660-90000

Revision Date: May 2000

HP References in this Manual

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this manual copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

About this Manual

We've added this manual to the Agilent website in an effort to help you support your product. This manual provides the best information we could find. It may be incomplete or contain dated information, and the scan quality may not be ideal. If we find a better copy in the future, we will add it to the Agilent website.

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Agilent no longer sells or supports this product. You will find any other available product information on the Agilent Test & Measurement website:

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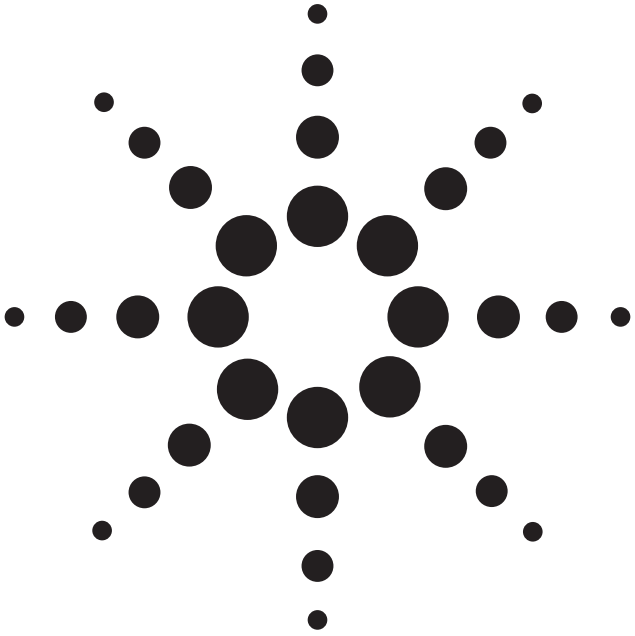
Search for the model number of this product, and the resulting product page will guide you to any available information. Our service centers may be able to perform calibration if no repair parts are needed, but no other support from Agilent is available.

Agilent Technologies

Agilent Technologies N1660A Service Advisor Dual DS1/0 Test Module

User's Manual



Agilent Technologies

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STD received ISO 9001 certification (no. 6969) from National Quality Assurance (NQA) on August 30, 1995.

Certificate No. 6969

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Safety Notices

Observe the following safety precautions whenever you operate the Dual DS1/0 Test module. Failure to comply with these and other specific warnings and cautions in this manual is a violation of Agilent Technologies' safety standards of design, manufacturing, and intended use of the test module.

Agilent Technologies assumes no liability for the operator's failure to comply with these precautions.

Product Damage

Danger! Do not use this product if it shows visible damage, fails to perform, has been stored in unfavorable conditions, or has been subject to severe transportation stresses. Make the product inoperative and secure it against any unintended operation. Contact your Agilent Technologies representative for assistance.

Explosion Hazard

Danger! Do not operate the instrument in the presence of flammable gases or fumes.

Electric Shock Hazard

Danger! To avoid the possibility of severe injury or death, observe the following precautions when using the Dual DS1/0 Test module.

Do not remove the system covers, and do not perform electrical tests if there are signs of shipping damage to the outer enclosure.

When connecting test cables to a line, do not touch the cable's metal contact points, or allow the cable leads to touch each other.

Use only the supplied power cords and connect only to a properly grounded wall outlet. Do not use extension cords that do not have a protective ground conductor.

Symbols

The following are general definitions of safety symbols used on equipment and in manuals.

Dangerous voltage.

Protective ground.

Frame or chassis ground.

Alternating current.

Direct current.

Alternating or direct current.

Caution! Read the manual.

About this Book

Using the Dual DS1/0 Test Module

Chapter 1 introduces the Dual DS1/0 Test module (N1660A), provides the installation procedure, and a brief description of the test screens and the options available from the toolbar.

Saving, Printing, and Deleting Reports

Chapter 2 explains how to save, print, and delete reports using the Reports option in the **File** menu.

T1 Analysis

Chapter 3 describes how to use the T1 Analysis screen to view the current condition of both receive T1 signals (RX1 and RX2).

Testing T1 Circuits

Chapter 4 provides step-by-step instructions for performing tests with the DS1/0 Test module.

T1 Testing Screen Reference

Chapter 5 describes all the buttons, configuration settings, and tab screens that are part of the T1 Testing option. Use this information, in conjunction with the procedures in Chapter 4, to configure and run T1 tests.

Using the Signaling Option (010)

Chapter 6 describes how to use the Signaling Option. When you purchase this option, you can enter, monitor, and display dialing information for DS0 channels.

Using the Pulse Mask Option (020)

Chapter 7 describes how to use the Pulse Mask Option. When you purchase this option, you can evaluate the shape of a received DS1 pulse and compare it to one of a set of standardized masks.

Dual DS1/0 SCPI Commands

Chapter 8 contains reference information for using SCPI commands to operate the Dual DS1/0 Test module remotely.

Specifications

Chapter 9 lists technical specifications of the Dual DS1/0 Test module, along with information about how to order accessories.

About this Version

Applicability

This version of the *Service Advisor Dual DS1/0 Test Module User Manual* applies to the N1610A Tablet, the N1700A Undercradle with an Internet Advisor, and the N1660A Dual DS1/0 Test module running operating software version **1.3** (or later) and user interface software version **1.3** (or later).

Be sure to refer to any user's manual supplements or release notes that came with the unit, or call 1-800-452-4844.

Dual DS1/0 Test Module User's Manual printing history

Version	Release date	Notes
1.0	September, 1999	
1.1	November, 1999	
2.0	March, 2000	
3.0	May, 2000	Updated to reflect software version 1.3. This version includes a Digital Data Service (DDS) tab, the Pulse Mask Option (020), and new report options.

Check the Software Version

You can check the software version number by pressing the **Help** button, or by checking the **Tablet Control** tab of the Service Advisor Manager (see the *Service Advisor Portable Test Tablet User's Manual*).

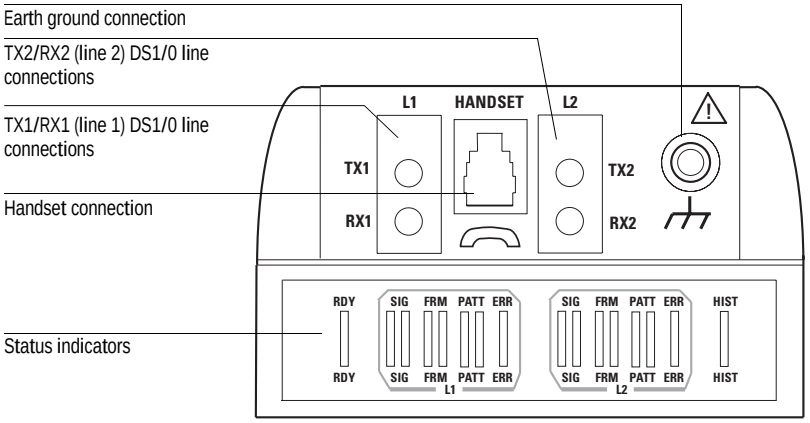
Contents

1

Using the Dual DS1/0 Test Module

The Dual DS1/0 Test Module (N1660A) at a Glance

The Dual DS1/0 Test module plugs into the Service Advisor Tablet (N1610A) or the Service Advisor Undercradle (N1700A). The module provides the capabilities to simultaneously monitor and/or test two T1 lines.



Module Status Indicators

The status indicators on the front of the module provide a visual indicator of when the module is ready for testing, and the different conditions that occur, such as signal detection and loss of signal, during a test.

The table below describes the status indicators on the Dual DS1/0 plug-in module.

Plug-in Module Status Indicators

Indicator	Description
RDY	Green LED indicates the Dual DS1/0 Test module is ready for testing.
SIG	Green LED indicates the tester has detected a signal. Red LED indicates there is a loss of signal (LOS).
FRM	Green LED indicates the tester has detected framing. Red LED indicates there is a loss of framing (LOF).
PATT	Green LED indicates the tester has detected a BERT pattern. Red LED indicates there is a loss of pattern (LOP). When you run a Tone test, the LED is off.
ERR	Red LED indicates the tester has detected an alarm or error condition.
HIST	Red LED indicates an error or alarm condition occurred in the previous test.

Connecting a Service Advisor to a T1 Circuit

Caution: Potentially dangerous voltage may be present on the line. Use extreme caution when connecting to the line. See the section "Electric Shock Hazard" in the front of this manual.

1. Insert a Dual DS1/0 Test module into a Service Advisor platform. See the appropriate manual for instructions:
   - *Service Advisor Portable Test Tablet User's Manual* (N1610-90000)
   - *Service Advisor Undercradle and SACompanion Software User's Manual* (N1700-90000)
2. Install a cable between the Dual DS1/0 Test module's L1 or L2 connection and the T1 circuit you plan to test. Install a second cable if you plan to test two circuits.
3. Install a cable between the Earth Ground connection on the Dual DS1/0 Test module and an earth ground connection on the circuit you are evaluating.
4. For speaking and listening over a DS0 channel, you can connect a handset to the module's handset connector.
5. Power ON your Service Advisor platform.
6. If you're running tests from the Service Advisor Tablet, tap the **Enable** button, in the Service Advisor Manager program, for the slot where the Dual DS1/0 Test module is installed. See "Working with the Service Advisor Manager" section in Chapter 2 of the *Service Advisor Portable Test Tablet User's Manual (*N1610-90000*)*.

   If you're remotely controlling a Service Advisor Tablet or using the Undercradle and Internet Advisor with a Dual DS1/0 Test module installed, tap the **Launch Remote** SACompanion toolbar button. Then tap the appropriate module button on the Product Remote Launch screen. See "Remotely Start and Stop a Module" section in Chapter 4 of the *Service Advisor Undercradle and SACompanion Software User's Manual* (N1700-90000).

When you see the T1 Analysis screen on your test set, you can begin running T1 tests on the circuits. See *Using the Dual DS1/0 Toolbar*, page 1–5.

Using the Dual DS1/0 Toolbar

The DS1/0 toolbar contains several buttons, each of which represents a particular function. When you tap a button, it turns yellow to indicate which test or function is active. Note that the toolbar functions are available on any DS1/0 screen.

T1 Analysis: Tap this button to monitor two T1 circuits simultaneously. See *T1 Analysis*, page 3–1 for more information.

T1 Testing: Tap this button to configure and run tests on one or two T1 circuits. See *Testing T1 Circuits*, page 4–1 for more information.

Test: Tap this button to use one of the following options:

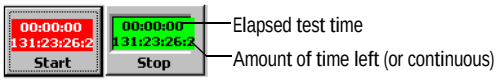
- BERT Sequences – lets you run either BTP or MTP BERT sequences, or create and run user-defined sequences. See *Configuring BERT Sequences*, page 4–14 for more information.
- Dial/Mon – (only available when you purchase Option 010) lets you enter, monitor, and display dialing information for T1 channels. See *Dial/Monitor Test Screen*, page 1–11 for more information.
- Pulse Mask – (only available when you purchase Option 020) lets you run a Pulse Mask test and view the resulting pulse mask waveform. See *Pulse Mask Screen*, page 1–12 for more information.

Event Log: Tap this button to view the event log. See *Viewing the Event Log*, page 1–13 for more information.

Auto Setup: Tap this button if you want the tester to configure its transmitter to the receiver's line configuration. See *Using the Auto Setup Feature*, page 1–14 for more information.

Start/Stop: Tap this button to start the selected test (this button turns into a Stop button). Tap **Stop** to freeze error counters, alarm indicators, and history counters, and halt a test.

This button also displays the amount of time a test has been running, and the amount of time left before the test is stopped (or indicates you have selected the continuous test time). Time is displayed using the day:hours:minutes:seconds format. Tapping the **Start** button starts a new test and resets the elapsed test time to zero.



File: Provides access to DS1/0 control and file-management functions.

File Menu Options

Option	Description
Reports	Lets you save, view, print, and delete test results or an event log (see *Saving, Printing, and Deleting Reports,* page 2–1).
Defaults	Stops any active test and resets the Dual DS1/0 Test module to the factory default settings.

File Menu Options, continued

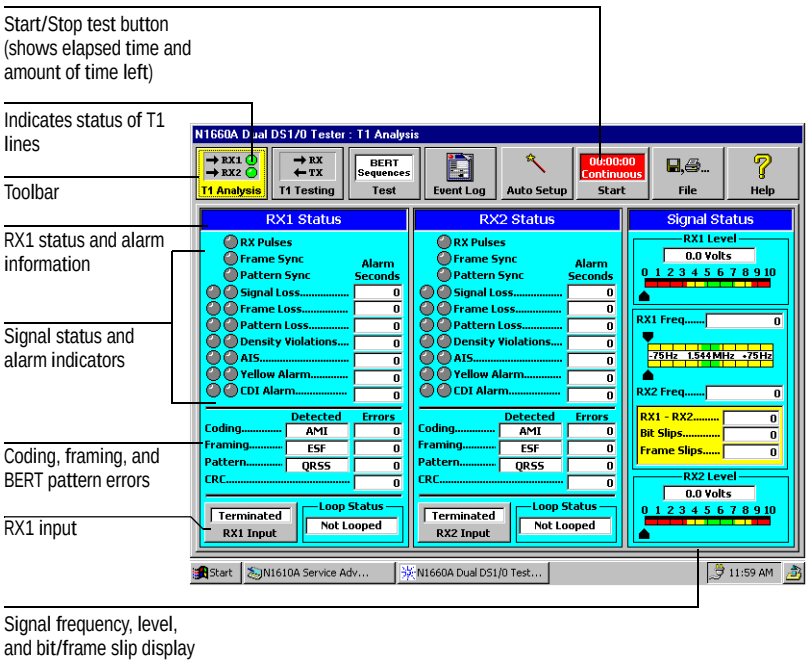
Option	Description
Test Time	Lets you set the length of time to run a test, including a continuous setting (see *Setting the Test Duration*, page 1–16).
Exit	Saves your configuration settings, closes the DS1/0 GUI, and returns control to the Service Advisor Manager (see the Service Advisor Portable Tablet User's Manual for information on the Manager).

Note: If you power off the Service Advisor without using the Exit option, your configuration settings are not saved; the settings return to the previously configured values.

Help: Displays the version of software and firmware running on the module.

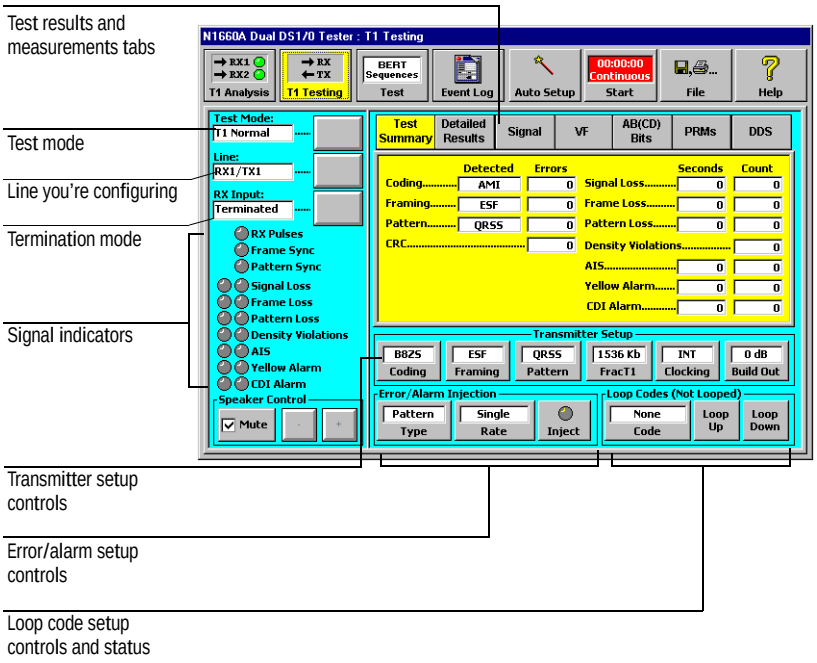
T1 Analysis Screen

Tap the **T1 Analysis** toolbar button to monitor one or two T1 circuits simultaneously. The RX1 and RX2 indicators on the button show the summary status of both lines; valid T1 signal on line and no errors, or error or alarm condition detected. See Chapter 3, *T1 Analysis*, for more information about using this screen.



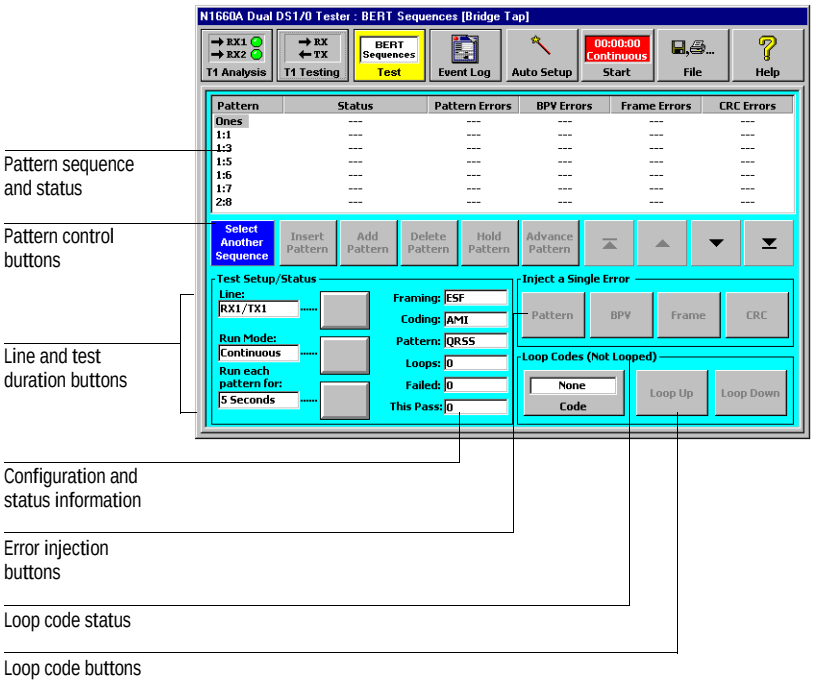
T1 Testing Screen

Tap the **T1 Testing** toolbar button to configure and run tests on one or two T1 circuits. See Chapter 4, *Testing T1 Circuits*, for more information about using this screen.



BERT Sequences Screen

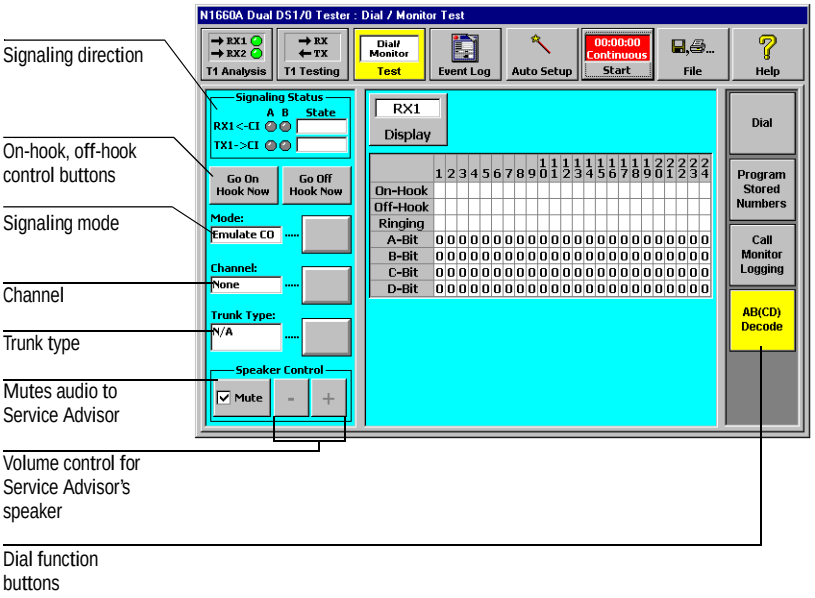
Tap the **Test** toolbar button and select the **BERT Sequences** test option. The BERT Sequences screen lets you select the BERT Bridge Tap Patterns (BTP) test sequence, the Multiple Test Patterns (MTP) test sequence, or create up to four customized BERT test sequences. See *Configuring BERT Sequences*, page 4–14, for more information about using BERT sequences.



Dial/Monitor Test Screen

Tap the **Test** toolbar button and select the **Dial/Mon.** option to access the Dial/Monitor screens. Use the Dial/Monitor option to enter, monitor, and display dialing information for T1 channels.

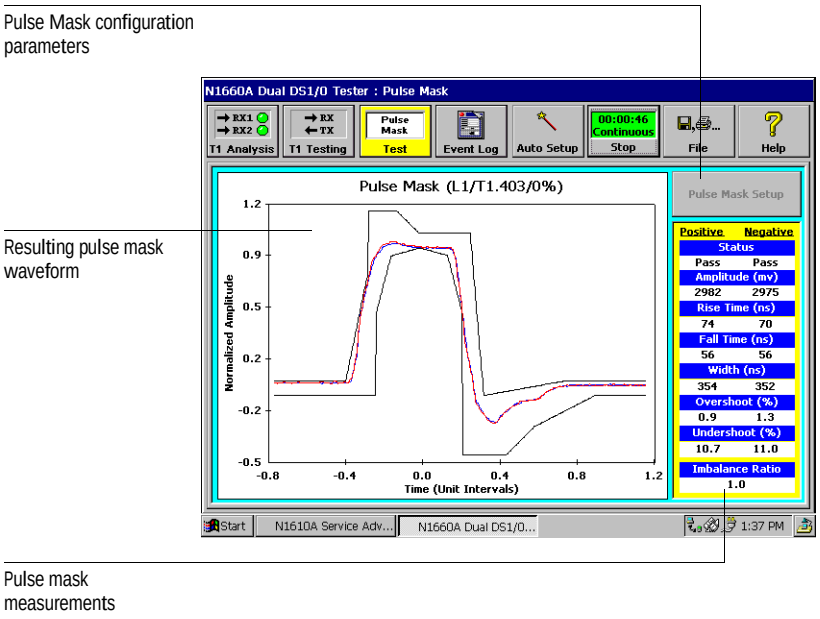
This option is available only when you purchase the Signaling Option (010). See Chapter 6, *Using the Signaling Option (010)*, for more information about using the Dial/Monitor screens.



Pulse Mask Screen

Tap the **Test** toolbar button and select the **Pulse Mask** test option. The Pulse Mask testing feature allows you to evaluate the shape of a received DS1 pulse, and compare it to one of a set of standardized masks.

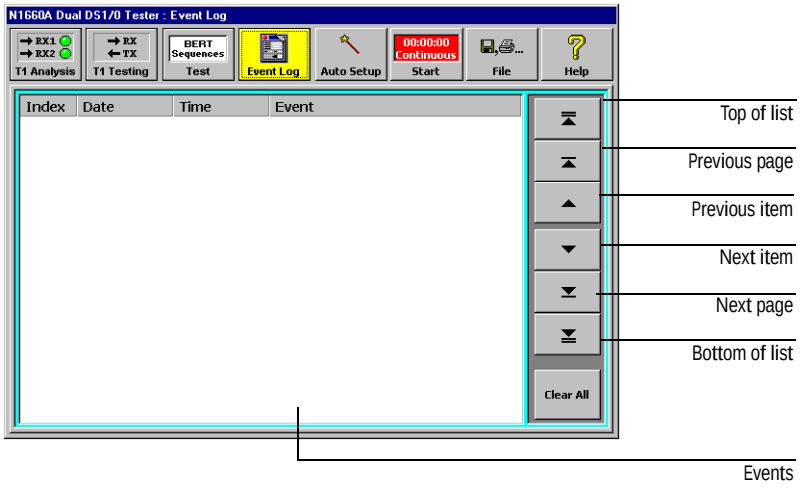
This option is available only when you purchase the Pulse Mask Option (020). See *Using the Pulse Mask Screen*, page 7–2 for more information about configuring and running a Pulse Mask test.



Viewing the Event Log

This section describes how to access the event log, which shows the stored events, errors, and alarms.

1. Tap the **Event Log** toolbar button.



2. Use the scroll buttons on the right side of the screen to move through the list of events.

   The **Clear All** button clears all displayed events.

You can save, print, and delete the event log. See *Saving, Printing, and Deleting Reports*, page 2–1 for more information.

Using the Auto Setup Feature

Use the **Auto Setup** feature when you want the tester to configure its transmitter to the receiver's line configuration. During the Auto Setup process, the tester:

- scans the receive signal to determine its characteristics – line coding, line framing, and BERT pattern
- automatically configures the Service Advisor for that type of configuration
- resets error counters, alarm indicators, and elapsed test time
- starts the selected test (shown in the Test Mode field on the T1 Testing screen)

This function is useful for configuring the Service Advisor when you're unsure of the network configuration.

Note: You cannot use the Auto Setup feature when the tester is in Internal Loop mode (see *Setting Up a T1 Test*, page 4–3).

Follow these steps to perform an Auto Setup.

1. Make sure the Service Advisor is powered ON and connected to a T1 circuit (see *Connecting a Service Advisor to a T1 Circuit*, page 1–4).
2. Tap the **Auto Setup** toolbar button.
3. Tap either the **Standard** or the **Detailed** option.

- The **Standard** option scans the receive signal and looks for the QRSS, Ones, Zeros, 1:1, 1:7, 3:24, 63, 511, 2047, 2^15-1, 2^20-1, 2^23-1, or Live BERT pattern; and the frame and coding settings.
- The **Detailed** option scans the signal and looks for all BERT patterns; and FT1, frame, and coding settings.

4. While the Auto Setup feature is working, you see the following message appear on the window:

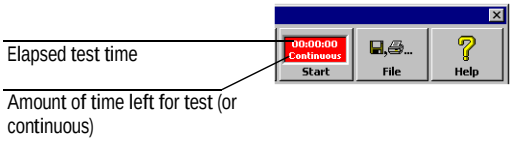
   Auto Setup is in progress, please wait.

   When the process is complete, the message disappears.

5. To exit from the Auto Setup mode while it is in progress, tap the **Stop** toolbar button. The Auto Setup process is aborted and all configuration changes are canceled.

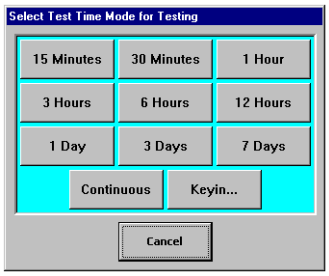
Setting the Test Duration

Before you begin a test, you can select a specific test duration. When a test duration is selected, you tap the **Start** toolbar button and the test automatically halts when the elapsed test time matches the selected test duration.

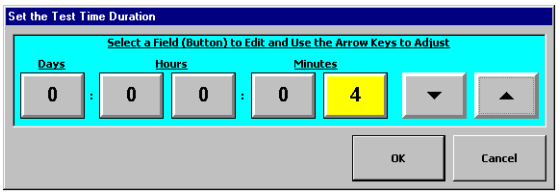


To set a test duration, follow these steps.

1. Tap the **File** toolbar button and select the **Test Time** option.
2. When the following screen appears, tap the desired test time button.



If you want to enter a specific amount of time, tap the **Keyin** button. When the following screen appears, tap the Days, Hours, or Minutes buttons, then use the up and down arrow buttons to set the desired time. Tap **OK** to save the time and return to the previously displayed screen. Tap **Cancel** to return to the previous screen without saving your entry.



2

Saving, Printing, and Deleting Reports

Printing a Report

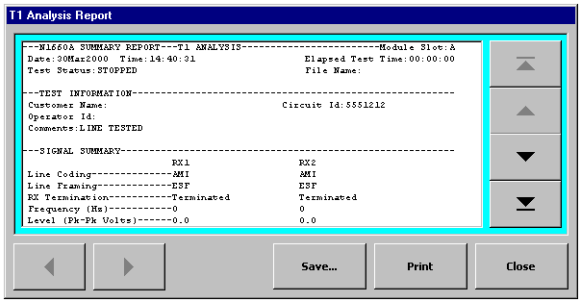
While running a test or after you tap the **Stop** toolbar button to stop a test, you can print a report that contains configuration and test results information.

Follow these steps to print a report for the test that is currently running, or a test that you just stopped. To print a saved report, see *Viewing and Printing Saved Reports*, page 2–11.

1. Tap the **File** toolbar button and select the **Reports** option.
2. Tap the **Create** button on the N1660A Reports screen.

A Report screen appears with the configuration and test results. Note that the title of the Report screen indicates which test is currently running or was previously stopped.

For example, if you are running a T1 Analysis test or just stopped it, the following report screen appears when you press the **Create** button.



3. Tap the scroll buttons the view the report data. Then tap the **Print** button to print the report. If you want to enter report header information, such as a customer name and operator ID, see *Entering Test Header Information*, page 2–4. The report header information appears in the Test Information section of the report.

   If you are remotely controlling your tester from a PC, you see the typical Windows® print screen appear when you tap the **Print** button. Select the desired printer and tap the Windows **Print** button to print the report.

Make sure you have a printer connected to the platform you are using.
See *Viewing and Printing Saved Reports*, page 2–11 for more information.

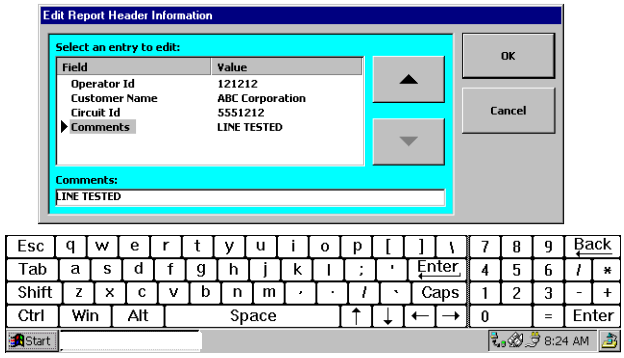
Entering Test Header Information

On each report there is a Test Information section that lists the operator name, operator ID, circuit ID, and comments. You can enter this information every time you run a test for a customer, as a way to keep track of each customer's test results.

To enter test information before saving or printing reports, complete these steps.

1. Tap the **File** toolbar button and select the **Reports** option.
2. Tap the **Header Information** button on the N1660A Reports screen.

3. When the following screen appears, tap the Up or Down arrow button to highlight each field and enter the appropriate information using the popup keypad. This information appears on the report file.

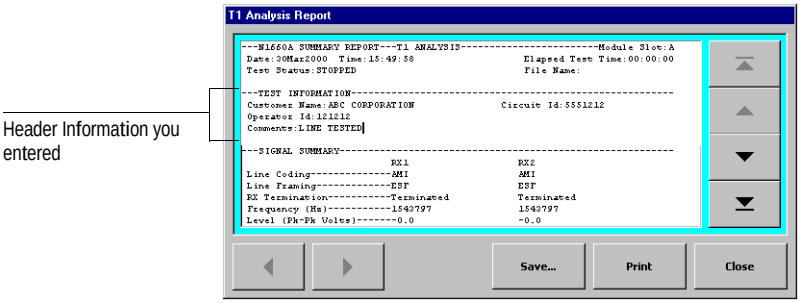


   - The *Operator ID* and *Customer Name* are saved on the Service Advisor. This allows the information to be available to use with other test modules.

- The *Circuit ID* and *Comments* are saved on the test module because they are module specific.

4. Tap **OK** to save the header information and return to the N1660A Reports screen.

5. When the N1660A Reports screen appears, tap the **Create** button to view the current report file.



You can save or print the displayed report, or tap the **Close** button to exit from this function and return to the N1660A Reports screen.

To save the displayed report, see *Saving a Report*, page 2–6.

To print the displayed report, tap the **Print** button. Then tap the **Close** button to return to the N1660A Reports screen.

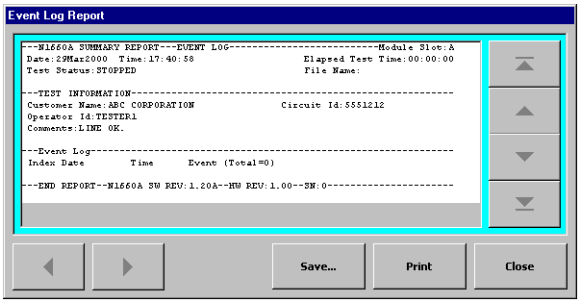
Saving a Report

You can save report information either while a test is in progress or after it has been stopped. You can select to save the information in either the Dual DS1/0 Test module or the Flash Memory card.

Follow these steps to save results in a file.

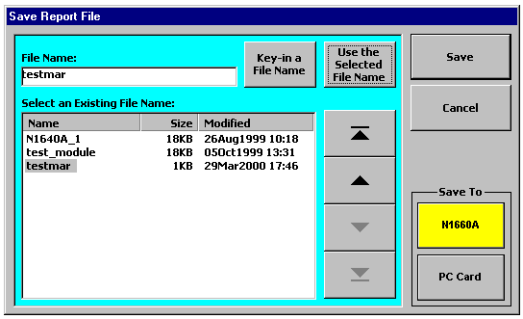
1. Tap the **File** toolbar button and select the **Reports** option.
2. Tap the **Create** button on the N1660A Reports screen.
3. The current report information appears on the Report screen. Tap the scroll arrow buttons to view the report.

   Then tap the **Save** or **Print** button. If you tap the **Close** button, the report information is not saved and you return to the N1660A Reports screen.

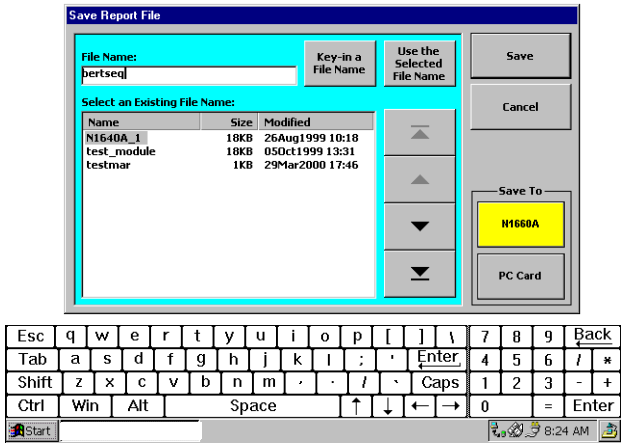


4. When the Save Report File screen appears, you can save the file using an existing filename that is listed on the screen, or enter a new one (go to step 5).

To use an existing filename, use the Up and Down arrow keys to highlight a name in the list. Then tap the **Use Selected File Name** button. You'll see the selected name appear in the File Name field. Go to step 6.



5. To enter a new filename, tap the **Key-in a File Name** button, and enter a new name using the popup keypad.



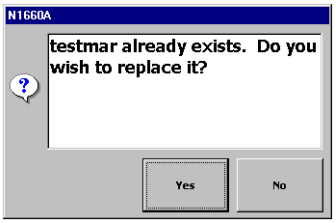
You can use any combination of characters for the file name. The system automatically adds a one at the end of the prefix name the first time you generate a report (for example, T1MON1.TXT). The module automatically increases the number each time you print another report. This ensures that each report is saved with a unique filename, and new reports do not overwrite existing reports.

6. Tap the **N1660A** button to save the file in the Dual DS1/0 Test module, or tap the **PC Card** button to save the file in the Flash Memory Card.

Note: If the PC Card button is grayed-out, there is no flash memory card installed in your tester.

7. Tap the **Save** button to save the file, or tap the **Cancel** button to avoid saving the file and return to the Report screen.

   If a file with the selected name already exists, the following screen appears. Tap **Yes** to overwrite the existing file, or **No** to enter another filename. Return to step 5 or 6 to enter a new filename.



8. Tap the **Print** or **Close** button when the Report screen appears. If you selected the Print option, make sure you have a printer connected to the platform you are using. See *Viewing and Printing Saved Reports*, page 2–11 for more information.

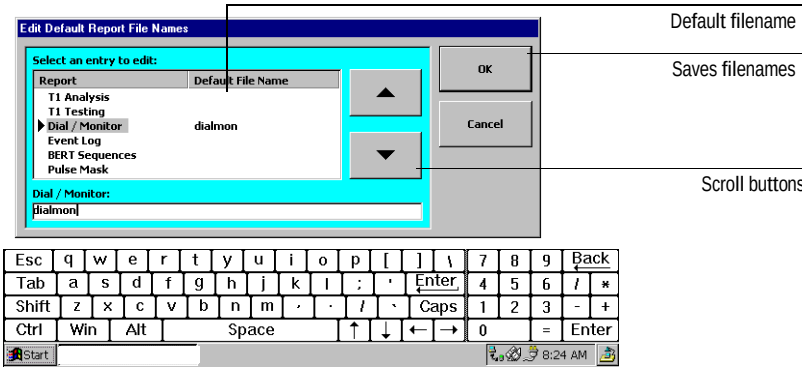
9. Tap the **Close** button on the N1660A Reports screen to return to the main Dual DS1/0 Tester screen.

Changing Default File Names

You can enter and change default names for the different types of reports you can save. To do so, follow these steps.

1. Tap the **File** toolbar button and select the **Reports** option.
2. Tap the **Default Names** button on the N1660A Reports screen.

3. When the Edit Default Report File Names screen appears, use the Up and Down arrow buttons to select the type of report information you want to save.



4. Enter the desired file name or enter default file names for one or all reports. Then tap **OK** to save the file names and return to the N1660A Reports screen.

Note: The system generates a unique default filename every time you access the Saved Reports screen. This avoids overwriting existing saved reports.

5. Tap the **Close** button on the N1660A Reports screen to return to the main Dual DS1/0 Tester screen. Or tap the **Create** button to save a report (see *Saving a Report*, page 2–6).

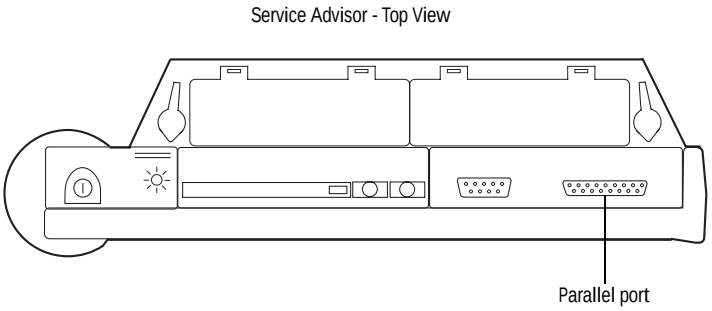
Viewing and Printing Saved Reports

You can view and print reports saved in the Dual DS1/0 Test module or Flash Card. To print reports, you must have an HP LaserJet™ printer connected to your Service Advisor platform.

Connecting a Printer to a Service Advisor Tablet (N1610A)

To connect a printer to the Service Advisor Tablet, follow these steps:

1. On top of the Service Advisor, open the panel that protects the serial and parallel ports.

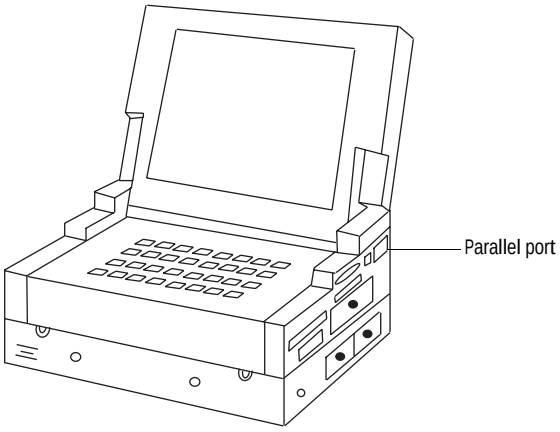


2. Install a DB-25 cable between the parallel port on the Service Advisor and your printer.

Connecting a Printer to an Internet Advisor (J2300C/D)

To connect a printer to an Internet Advisor, follow these steps:

1. Locate the parallel port on the side of the Internet Advisor.



2. Install a DB-25 cable between the parallel port on the Internet Advisor and your printer.

Printing Reports

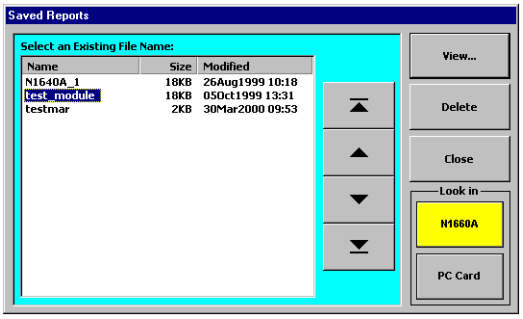
You can print saved reports when you connect a printer to your Service Advisor Tablet or Internet Advisor. If you are controlling your tester remotely from a PC, you can print reports on the printer connected to your PC or a network printer.

To print saved reports, follow these steps.

1. Tap the **File** toolbar button and select the **Reports** option.

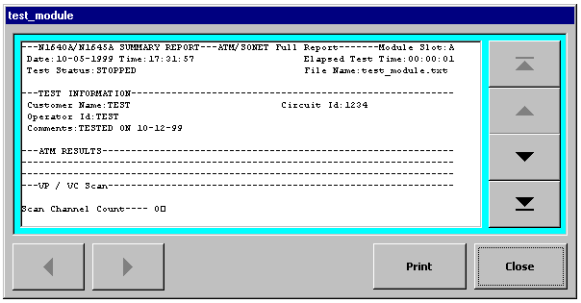
2. Tap the **View/Print/Delete** button on the N1660A Reports screen.

3. Tap the **N1660A** or the **PC Card** button, depending on where you saved the desired report file.



4. Use the Up and Down arrow buttons to highlight the name of the report you want to print.
5. Tap the **View** button.

6. When the report screen appears, you can view the content of the file using the Up and Down arrows, and then tap the **Print** button.

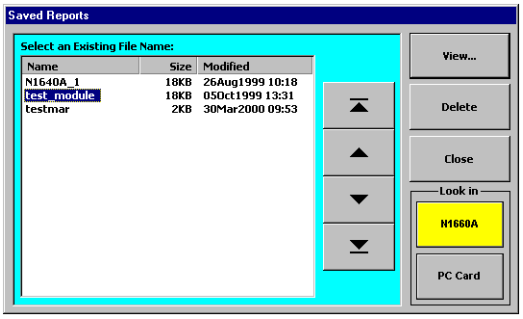


7. Tap the **Close** button on the displayed screens until you return to the main Dual DS1/0 Tester screen.

Deleting Saved Files

1. Tap the **File** toolbar button and select the **Reports** option.
2. Tap the **View/Print/Delete** button on the N1660A Reports screen.

3. Tap the **N1660A** or the **PC Card** button, depending on where you saved the file you want to delete.



4. Use the Up and Down arrow buttons to highlight the name of the report you want to delete.
5. Tap the **Delete** button.
6. When the confirmation screen appears, tap **Yes** to delete the file or **No** to cancel.
7. Tap the **Close** button on the displayed screens until you return to the main Dual DS1/0 Tester screen.

Dual DS1/0 Sample Reports

This section shows you some sample reports that you can print from the **Reports** option on the **File** menu. To create a report, you should start a test, and then select the **Reports** option from the **File** menu (see *Printing a Report*, page 2–2). You can print the following reports:

- T1 Analysis Report
- T1 Testing Report
- BERT Sequences Report
- Dial/Monitor Report
- Pulse Mask Report
- Event Log Data Report

Sample T1 Analysis Report

The T1 Analysis Report contains information about the current condition of the receive T1 signals (RX1 and RX2).

```
---N1660A SUMMARY REPORT---T1 ANALYSIS--------------------Module Slot:A
 Date:30Mar2000  Time:13:59:33              Elapsed Test Time:00:00:00
 Test Status:RUNNING                        File Name:

---TEST INFORMATION-------------------------------------------------------
 Customer Name:ABC COMPANY                  Circuit Id:5551212
 Operator Id:MATT
 Comments:LINE TESTED

---SIGNAL SUMMARY---------------------------------------------------------
                          RX1                  RX2
 Line Coding-------------AMI                  AMI
 Line Framing------------ESF                  ESF
 RX Termination----------Terminated           Terminated
 Frequency (Hz)----------N/A                  N/A
 Level (Pk-Pk Volts)-----N/A                  N/A

---SLIPS ANALYSIS---------------------------------------------------------
 RX1-RX2=N/A
 Bit Slips:N/A   Frame Slips:N/A

---ALARM SECONDS----------------------------------------------------------
                          RX1                  RX2
 Signal Loss Seconds-----2608                 2608
 Frame Loss Seconds------2608                 2608
 Pattern Loss Seconds----N/A                  N/A
 Bipolar Violations(BPV)--0                   0
 AIS Seconds-------------2608                 2608
 Yellow Alarm Seconds----2608                 2608
 CDI Alarm Seconds-------0                    0

---ERROR COUNTS-----------------------------------------------------------
                          RX1                  RX2
 Line Coding Errors------85746686             85528451
 Frame Errors------------85590326             85818510
 Pattern Errors----------N/A                  N/A
 CRC Errors--------------84762338             85623058
 Density Violations------0                    0

---END REPORT--N1660A SW REV:1.30A--HW REV:1.00--SN:0-----------------
```

Sample T1 Testing Report

The T1 Testing Report contains the T1 Test configuration settings, the transmit and receive signal settings, the signaling bits set on the receive signal, and error, alarm, VF, and DDS test results.

```
---N1660A SUMMARY REPORT---T1 TESTING --------------------Module Slot:A
 Date:30Mar2000  Time:13:59:33               Elapsed Test Time:00:00:00
 Test Status:STOPPED                         File Name:

---TEST INFORMATION-------------------------------------------------------
 Customer Name:ABC COMPANY                   Circuit Id:5551212
 Operator Id:MATT
 Comments:LINE TESTED

---TEST CONFIGURATION-----------------------------------------------------
TEST CONFIGURATION
 Mode:T1 Normal          Line:RX1/TX1            RX Input:Terminated
 Error/Alarm Injection:  Injection Type:Pattern  Injection Rate:Single
 Loop Code:None          Looped Status:Not Looped

---TX/RX SIGNALS----------------------------------------------------------
TRANSMITTED SIGNAL:TX1
 Line Coding:AMI         Line Framing:ESF        BERT Pattern:NONE
 Clocking:INT            Line Build Out:0 dB     Non-BERT Channels:Idle
 FT1 Mode:NX64           1536
 FT1 Chans:1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24

RECEIVED SIGNAL:RX1
 Line Coding:AMI         Line Framing:ESF        BERT Pattern:NONE
 0.0                     -1.#J                   0
 1543843Hz               1500000Hz               1600000Hz

SIGNALING BITS:RX1---------        RX1/TX1 RESULTS----------------------
 A: 000000 000000 000000 000000         TX1 Freq:0Hz TX1-RX1:0Hz
 B: 000000 000000 000000 000000         Bit Slips0   Frame Slips0
 C: 000000 000000 000000 000000         Round Trip Delay(usec):0
 D: 000000 000000 000000 000000

---ERROR RESULTS----------------------------------------------------------
                 Error      Errored   Severely  Consecutive  Error-Free
 ERROR COUNTS    Count      Secs(ES)  ES(SES)   SES(CSES)    Secs(EFS)
  Pattern-------374796874  0         0         22788        0
  BPV-----------374904778  0         0         0            0
  CRC-----------370817337  0         0         0            0
  Frame---------372988355  0         0         0            0

 ERROR RATES     Rate       ES%       SES%      CSES%        EFS%
  Pattern-------0.0        0.0       0.0       2278800.0    0.0
  BPV-----------0.0        0.0       0.0       0.0          0.0
  CRC-----------0.0        0.0       0.0       0.0          0.0
  Frame---------0.0        0.0       0.0       0.0          0.0
```

Sample T1 Testing Report (continued)

```
---ALARM RESULTS-----------------------------------------------------------
 ALARM                Seconds
  Signal Loss---------11394
  Frame Loss----------11394
  Pattern Loss--------11394
  AIS-----------------11394
  Yellow Alarm--------11394
  AIS-----------------11394
  CDI Alarm-----------0
  Density Violations--11394

---VF RESULTS-------------------------------------------------------------
 RX1 Dropped  Chan:N/A Freq(Hz):0      Level(dBm):0.0   Chan Data:0000
0000
 TX1 Inserted Chan:N/A Freq(Hz):404    Level(dBm):-25.0 Signaling
Bits:0000

---DDS RESULS-------------------------------------------------------------
 Format:OFF     Rate:N/A     Channel:N/A     User:N/A

 Code    Description                        Data           Count  Duration
-------------------------------------------------------------------------
                                            00000000           0         0
 MJUH    MJU Hub ID                         10000000           0         0
 UMCV    Unassigned MUX Channel Data/Voice  01000000           0         0
 UMCV    Unassigned MUX Channel Data/Voice  11000000           0         0
 UMCV    Unassigned MUX Channel Data/Voice  00100000           0         0
 DSODP   DS0 DP Latching Loopback           10100000           0         0
 DSODP   DS0 DP Latching Loopback           01100000           0         0
 DSODP   DS0 DP Latching Loopback           11100000           0         0
 DSODP   DS0 DP Latching Loopback           00010000           0         0
 DSODP   DS0 DP Latching Loopback           10010000           0         0
 MJU     Multi-Junction Unit                01010000           0         0
 MJU     Multi-Junction Unit                11010000           0         0
 MJU     Multi-Junction Unit                00110000           0         0
 MJU     Multi-Junction Unit                10110000           0         0
 MJU     Multi-Junction Unit                01110000           0         0
 MJU     Multi-Junction Unit                11110000           0         0
 MJU     Multi-Junction Unit                00001000           0         0
 MJU     Multi-Junction Unit                10001000           0         0
 MJU     Multi-Junction Unit                01001000           0         0
 MJU     Multi-Junction Unit                11001000           0         0
 MJU     Multi-Junction Unit                00101000           0         0
 MJU     Multi-Junction Unit                10101000           0         0
 MJU     Multi-Junction Unit                01101000           0         0
 MJU     Multi-Junction Unit                11101000           0         0
 UMC     Unassigned MUX Channel Data        00011000           0         0
 UMC     Unassigned MUX Channel Data        10011000           0         0
 MOS     MUX Out Of Sync                    01011000           0         0
 MOS     MUX Out Of Sync                    11011000           0         0
 TST     Test                               00111000           0         0
 TST     Test                               10111000           0         0
 ASC     Abnormal Station Condition         01111000           0         0
 ASC     Abnormal Station Condition         11111000           0         0

---END REPORT--N1660A SW REV:1.30A--HW REV:1.00--SN:0-------------------
```

Sample BERT Sequences Report

The BERT Sequences Report shows you the BERT sequences configuration settings and any BERT pattern, BPV, frame, or CRC errors detected during the test.

```
---N1660A SUMMARY REPORT---BERT SEQUENCES ----------------Module Slot:A
 Date:30Mar2000  Time:13:59:33              Elapsed Test Time:00:00:00
 Test Status:STOPPED                        File Name:

---TEST INFORMATION-------------------------------------------------
 Customer Name:ABC CORPORATION              Circuit Id:5551212
 Operator Id:121212
 Comments:LINE TESTED

---TEST CONFIGURATION-----------------------------------------------
 Mode:T1 Normal          Line:RX1/TX1
 RX1: Input:Terminated   Line Coding:AMI     Line Framing:ESF

---BERT SEQUENCE SUMMARY--------------------------------------------
 Name:User BERT3
 Run Mode:Continuous     Pattern Duration:5 Seconds
 Loops:0                 Failures:0

                      Pattern  BPV      Frame    CRC
 Pattern  Status      Errors   Errors   Errors   Errors
 ------------------------------------------------------------
 Ones     ---         ---      ---      ---      ---
 1:1      ---         ---      ---      ---      ---
 1:3      ---         ---      ---      ---      ---
 1:5      ---         ---      ---      ---      ---
 1:6      ---         ---      ---      ---      ---
 1:7      ---         ---      ---      ---      ---
 2:8      ---         ---      ---      ---      ---
 2:9      ---         ---      ---      ---      ---
 2:10     ---         ---      ---      ---      ---
 2:11     ---         ---      ---      ---      ---
 2:12     ---         ---      ---      ---      ---
 2:13     ---         ---      ---      ---      ---
 2:14     ---         ---      ---      ---      ---
 3:18     ---         ---      ---      ---      ---
 3:19     ---         ---      ---      ---      ---
 3:20     ---         ---      ---      ---      ---
 3:21     ---         ---      ---      ---      ---
 3:22     ---         ---      ---      ---      ---
 3:23     ---         ---      ---      ---      ---
 3:24     ---         ---      ---      ---      ---
 QRSS     ---         ---      ---      ---      ---

---END REPORT--N1660A SW REV:1.30A--HW REV:1.00--SN:0-----------------
```

Sample Dial/Monitor Report

The Dial/Monitor Report shows you the configured dial monitor settings, and the call monitor log events.

```
---N1660A SUMMARY REPORT---DIAL/MONITOR ------------------Module Slot:A
 Date:30Mar2000  Time:13:59:33              Elapsed Test Time:00:00:00
 Test Status:STOPPED                        File Name:

---TEST INFORMATION-------------------------------------------------------
 Customer Name:ABC CORPORATION              Circuit Id:5551212
 Operator Id:121212
 Comments:LINE TESTED

---TEST CONFIGURATION-----------------------------------------------------
TEST CONFIGURATION
 Mode:T1 Normal          Line:RX1/TX1            Channel:0
 TX1: Line Coding:AMI    Line Framing:ESF        Clocking:INT
 RX1: Input:Terminated

---DIAL-------------------------------------------------------------------
 Trunk:N/A               Signaling Direction:N/A
 Dial String:

---STORED NUMBERS---------------------------------------------------------
 SN1: NONE
 SN2: NONE
 SN3: NONE
 SN4: NONE
 SN5: NONE
 SN6: NONE
 SN7: NONE
 SN8: NONE
 SN9: NONE

---CHANNEL STATUS---------------------------------------------------------
                    111 111111 122222              111 111111 122222
        L1 123456 789012 345678 901234  L2 123456 789012 345678 901234
 On Hook
 Off Hook
 Ringing
 A-Bit     0000000 000000 000000 00000     0000000 000000 000000 00000
 B-Bit     0000000 000000 000000 00000     0000000 000000 000000 00000
 C-Bit     0000000 000000 000000 00000     0000000 000000 000000 00000
 D-Bit     0000000 000000 000000 00000     0000000 000000 000000 00000

----CALL MONITOR LOG-----------------------------------------------------
 Capture Mode:Selected Line and Channel   Timeout:5 Sec

 Index  Time      Channel  RX1:From CI            TX1:To CI
     1  16:30:40  20       Tip-Gnd
     2  16:30:40  21                              Tip-Gnd
     3  16:30:40  22       Ring-Gnd


---END REPORT--N1660A SW REV:1.30A--HW REV:1.00--SN:0-----------------
```

Sample Pulse Mask Report

The Pulse Mask Test shows you the configured pulse mask settings and test results.

```
---N1660A SUMMARY REPORT---PULSE MASK --------------------Module Slot:A
 Date:30Mar2000  Time:13:59:33               Elapsed Test Time:00:00:00
 Test Status:STOPPED                         File Name:

---TEST INFORMATION-------------------------------------------------------
 Customer Name:ABC CORPORATION               Circuit Id:5551212
 Operator Id:121212
 Comments:LINE TESTED

---PULSE MASK SUMMARY-----------------------------------------------------
 Line:1     Template:T1_102     Tolerance:0

 Polarity            Positive     Negative
 ----------------------------------------
 Status              Pass         ---
 Amplitude (mv)      2989         ---
 Rise Time (ns)      72           ---
 Fall Time (ns)      62           ---
 Width (ns)          342          ---
 Overshoot (%)       1.0          ---
 Undershoot (%)      10.8         ---

 Imbalance Ratio:0.0

         Time      Upper Mask   Lower Mask    Positive     Negative

------------------------------------------------------------------------
--
No Pulse Mask data.

---END REPORT--N1660A SW REV:1.20A--HW REV:1.00--SN:0------------------
```

Sample Event Log Data Report

The Event Log Report contains the events, errors, and alarms detected,

```
---N1660A SUMMARY REPORT--- EVENT LOG --------------------Module Slot:A
 Date:30Mar2000  Time:13:59:33              Elapsed Test Time:00:00:00
 Test Status:STOPPED                        File Name:T1EVLOG1.txt

---TEST INFORMATION-------------------------------------------------
 Customer Name:ABC CORPORATION              Circuit Id:5551212
 Operator Id:121212
 Comments:LINE TESTED

---EVENT LOG-------------------------------------------------------------
 Index Date        Time      Event (Total=10)
 1     9-8-1999    8:17:00   RX1 - 4 BPV Errors
 2     9-8-1999    8:17:00   RX2 - PRM Set
 3     9-8-1999    8:17:01   RX1 - Line Termination Set
 4     9-8-1999    8:17:02   RX1 - BPV Errors Injected
 5     9-8-1999    8:17:03   RX2 - AIS Injected
 6     9-8-1999    8:17:04   RX2 - Test State Changed
 7     9-8-1999    8:17:05   RX2 - Pattern Sync Acquired
 8     9-8-1999    8:17:06   RX2 - 6 Framing Errors
 9     9-8-1999    8:17:07   RX1 - CDI Detected
 9     9-8-1999    8:17:07   RX1 - CDI Detected

---END REPORT---N1660A SW REV:1.30 --HW REV:1.0--SN:1234
```

3

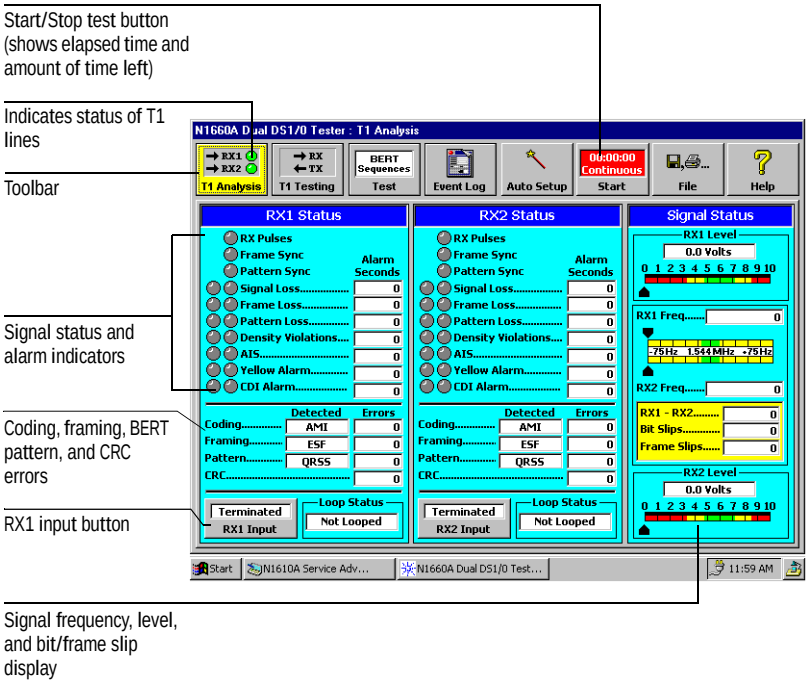
T1 Analysis

The T1 Analysis Screen

This section describes how to use the T1 Analysis screen. This screen shows the current condition of both receive T1 signals (RX1 and RX2).

The RX1 and RX2 indicators on the **T1 Analysis** toolbar button indicate the summary status of both T1 lines.

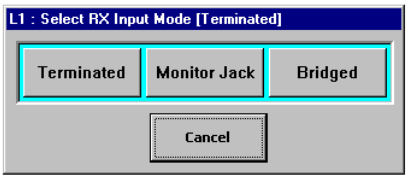
- **Green** indicates the module detects a valid T1 signal on the line and no errors or alarms have been detected.
- **Red** indicates an error or alarm is occurring now.
- **Yellow** indicates an error or alarm has previously occurred.



The T1 Analysis Screen

To monitor one or two T1 circuits, follow these steps:

1. Tap the **T1 Analysis** toolbar button to display the T1 Analysis screen.
2. Tap an **RX1 Input** button in either the RX1 Status or RX2 Status section of the screen, and select the mode from the popup menu. If you are monitoring two signals simultaneously, set the termination mode for both RX1 and RX2.



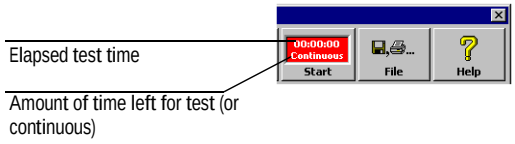
   - **Terminated:** The receive signal is terminated to 100 ohms, and a full-span automatic equalizer (ALBO) is provided to compensate for cable loss. This selection is typically used for out-of-service testing.
   - **Monitor Jack:** The receive signal is a DSX-1 monitor-level signal. This selection is typically used to monitor a signal through a DSX monitor jack that is resistor-isolated from the span. Normally, the DSX-1 monitor jack signal is 20 dB below the signal into the DSX-1.
   - **Bridged:** The receive signal is bridged to one side of the span. The Service Advisor is set to a high-impedance state (greater than 1000 ohms). This selection is typically used to monitor in-service spans that do not have a DSX monitor jack.

3. Select a test duration, if desired. See *Setting the Test Duration*, page 1–16.

4. Tap the **Start** toolbar button to begin monitoring the T1 circuit. The Service Advisor monitors the receive signal(s), and updates the results screen display.

Note: Monitoring begins on both lines at the same time.

If you set a test duration, notice the time display in the **Start/Stop** button. See *Setting the Test Duration*, page 1–16.



The elapsed test time counts forward, while the test duration time counts backwards towards zero.

5. If you selected the *continuous* test duration, tap the **Stop** toolbar button to stop the test. Monitoring stops on both lines at the same time.

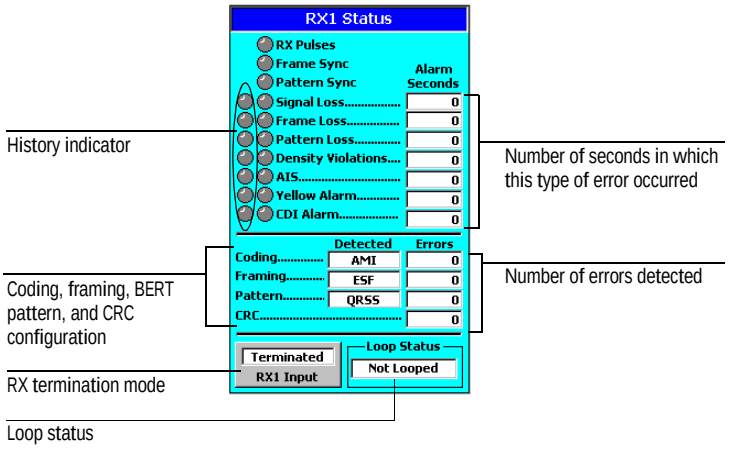
   Notice the elapsed time display on the Start/Stop button. This indicates the length of time you ran the test.

Viewing T1 Signal Test Results

T1 signal test results are shown in the RX1, RX2, and Signal Status sections of the T1 Analysis screen. While the test is running, you can monitor the level and frequency of each receive T1 signal by looking at all the signal level indicators.

RX1 and RX2 Status Results

The *RX1/RX2 Status* sections of the T1 Analysis screen contain signal indicators that show the status of the input signals on the T1 line(s) being tested with the Dual DS1/0 test module. The lower half of these sections show the coding, framing, and BERT pattern detected on the receive T1 signal, as well as the number of coding, framing, BERT pattern, and CRC errors detected while the lines were being monitored.



The signal indicators in the left column are “history” indicators that light to show a previous occurrence of the error condition. The following table shows the conditions that cause an indicator in this section to turn ON, and describes the counts that appear in the Alarm/Errored seconds column.

The following table describes each indicator and what the Alarm Seconds number means.

Signal Status Indicators

Indicator	Description
RX Pulses	Turns green to indicate the presence of a T1 signal at the RX jack.
Frame Sync	Turns green to indicate that the Service Advisor has synchronized to the framing format of the received signal.
Pattern Sync	Turns green to indicate the unit is synchronized with a known input data pattern.
Signal Loss	Turns red to indicate a loss-of-signal (LOS) condition at the RX jack lasting more than 150 milliseconds. An LOS occurs when the Service Advisor cannot detect a valid receive T1 signal at the RX jack. The associated history indicator turns yellow after this condition is detected. Alarm Seconds: The number of seconds during which at least one LOS event occurred.
Frame Loss	Turns red to indicate loss of framing (LOF) on the receive signal. An LOF event occurs when the Service Advisor cannot detect framing on the receive T1 signal. With D4 (SF) framing, an LOF occurs when 2 out of 5 F_t bits are errored. With ESF framing, an LOF occurs when 2 out of 5 frame bits are errored. The associated history indicator turns yellow after this condition is detected. Alarm Seconds: The number of seconds during which at least one loss of frame (LOF) event occurred.
Pattern Loss	Turns red to indicate loss of BERT pattern (LOP) on the receive signal. An LOP event occurs when the Service Advisor cannot detect a pattern on the receive T1 signal. LOP is declared when 100 out of 1,000 pattern bits are errored. Alarm Seconds: The number of seconds during which at least one loss of pattern (LOP) event occurred

Signal Status Indicators, continued

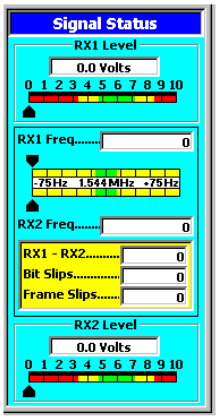
Indicator	Description
Density Violations	Turns red to indicate an excess-zeros condition, or a ones-density violation. An excess-zeros condition occurs when the receive signal contains more than 15 consecutive zeros. A ones-density violation occurs when the signal's ones-density falls below 12.5%. (Every 8 × (N + 1) bits must contain at least N ones, where N is 1 through 23.) The associated history indicator turns yellow after either condition is detected. Alarm Seconds: The number of ones-density violations that have occurred since the test began.
AIS Signal	Turns red to indicate the presence of an Alarm Indication Signal (unframed, all-ones). The associated history indicator turns yellow after this condition is detected. Alarm Seconds: The number of seconds during which at least one Alarm Indication Signal (AIS) was detected.
Yellow Alarm	Turns red to indicate the presence of a Yellow alarm (for D4, bit 2 of each DS0 set to 0 for at least 255 consecutive channels; for ESF, an alternating 00FF hex pattern in the FDL). The associated history indicator turns yellow after this condition is detected. Alarm Seconds: The number of seconds during which at least one Yellow alarm was detected.
CDI Alarm	Customer Disconnect Indicator turns red when a NIU (network interface unit) at a customer site detects that it is not receiving a signal from a previously connected piece of T1 equipment. The associated history indicator turns yellow after this condition is detected. Alarm Seconds: The number of seconds the NIU was unable to detect a signal from a previously connected piece of T1 equipment.
Coding	The type of line coding detected on the receive T1 signal. Errors: The number of line code errors that have occurred.
Framing	The type of framing detected on the receive T1 signal. Errors: The number of framing errors that have occurred.
Pattern	The BERT pattern detected on the receive T1 signal. Errors: The number of pattern errors that have occurred.

Signal Status Indicators, continued

Indicator	Description
CRC	The number of CRC-6 errors detected (ESF format only).

Signal Status Indicators

The Signal Status section of the T1 Analysis screen shows the level and frequency of the receive T1 signal, and the number of bit and frame slips that have occurred during the test period. The slips measurements are based on comparing the timing relationship between the two DS1 receivers.



Note: If you have connected the tester to only one T1 circuit, you see the messages "N/A" and "No-Signal" displayed.

RX1/RX2 Level: Shows the level of each receive (RX1 and RX2) T1 signal, in Volts. The dynamic pointers below the display fields move to graphically show the level of the receive signals. Color coding indicates whether the signal is acceptable: green (good), yellow (acceptable), and red (unacceptable). If no signal is detected, you see 0 (zero) Volts in this field. The nominal level is 6.0 Volts.

RX1/RX2 Freq: Shows the frequency of each receive (RX1 and RX2) T1 signal in Hertz. The dynamic pointers in the middle of the display fields move to graphically show the frequency of the receive signals. Color coding indicates whether the signal is acceptable: green (good), yellow (acceptable), and red (unacceptable). If no signal is detected, you see *No Signal* appear in this field.

RX1-RX2: If two T1 signals are detected, this field shows the frequency difference between both receivers (RX1 minus RX2). A positive number indicates RX1 is running faster than RX2; a negative number indicates RX1 is running slower than RX2. If only one T1 signal is detected, you see *N/A* in this field.

Bit Slips: If two T1 signals are detected, this field shows the number of individual time slot differences between the two DS1 receivers. A positive value indicates that the receive frequency is greater than the reference frequency. A negative value indicates the receive frequency is less than the reference. If the reference is lost, the bit slip count is restarted from zero when the reference is restored. If only one T1 signal is detected, you see *N/A* in this field.

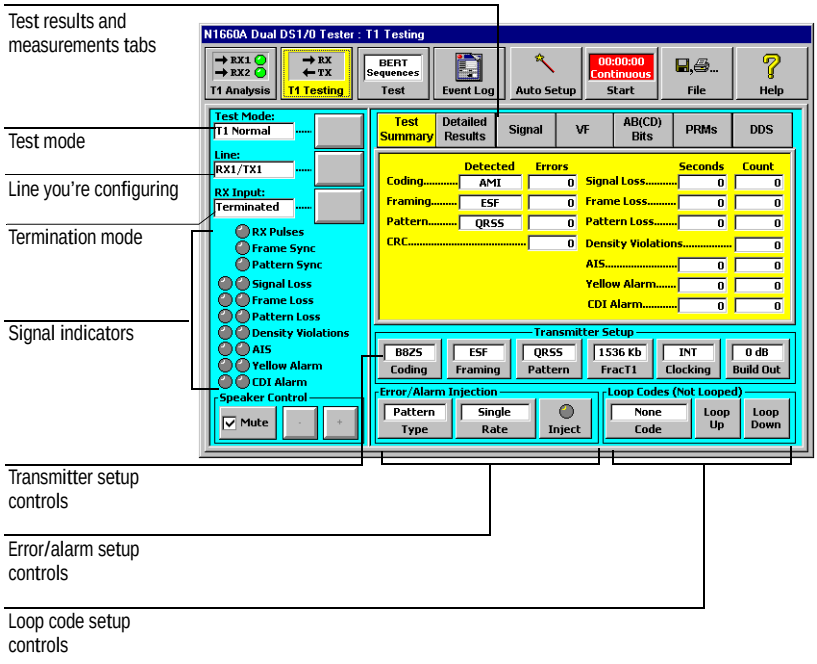
Frame Slips: Indicates the number of frame slips that may have occurred. A frame slip is declared when a difference of 193 time slots (bits) is detected between the receive and reference signals (usually a network device). Multiple frame slips within 0.25 seconds are counted as a single frame slip. If only one T1 signal is detected, you see *N/A* in this field.

4

Testing T1 Circuits

The T1 Testing Screen

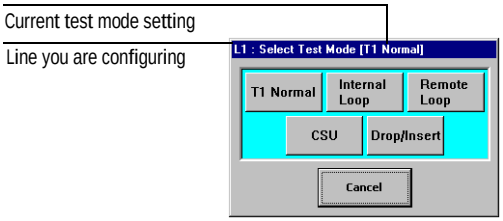
This chapter explains how to run tests on one or two T1 lines.



Setting Up a T1 Test

This section describes how to set up the basic T1 test configuration.

1. Tap the **T1 Testing** toolbar button to display the T1 Testing screen.
2. Tap the **Test Mode** button and select the type of test you want to run from the popup menu. See *Selecting the Test Mode*, page 5–3 for a description of each test mode.



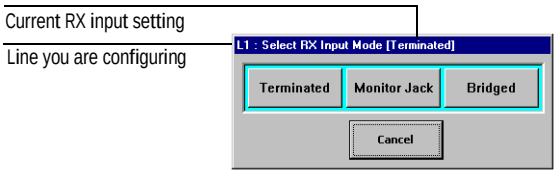
3. Tap the **Line** button until the displayed option indicates where you plugged in the bantam cables on the test module (see *The Dual DS1/0 Test Module (N1660A) at a Glance*, page 1–2).

   RX1/TX1: Indicates you have plugged the bantam cables into the L1 connections on the module.

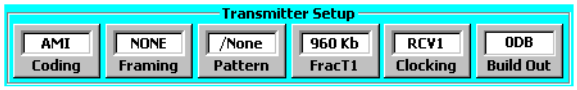
   RX2/TX2: Indicates you have plugged the bantam cables into the L2 connections on the module.

4. Tap the **RX Input** button and select the termination mode for the currently selected input (RX/TX) line. See *Selecting the RX Input*, page 5–4.

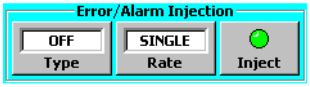
   Tap the **Cancel** button if you don't want to change the mode.



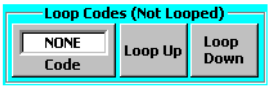
5. Tap the **Coding**, **Framing**, **Pattern**, **FracT1**, **Clocking**, or **Build Out** buttons to configure the transmitter settings. See *Transmitter Setup Controls*, page 5–7 for a description of the Transmitter Setup buttons.



6. Tap the **Type** and **Rate** buttons to configure the rate and frequency of injecting errors or alarms into the BERT payload pattern. See *Error/Alarm Injection*, page 5–24 for a description of the Error/Alarm Injection buttons.



7. Tap the **Code** button to select a loop code. You can inject loop codes when you set the *Test Mode* to T1 Normal, CSU (Channel Service Unit), or Drop/Insert mode. See *Loop Code Controls*, page 5–26 for a description of the loop code buttons.



8. To test the second T1 line, press the **Line** button and select RX2/TX2.
   - Tap the **Test Mode** button and select the test you want to run on line 2 (L2) from the popup menu.
   - Repeat steps 4 through 7 to configure the second line.

Now that you have configured the test you want to run on a T1 line, continue to the next section for instructions on running a test, injecting errors or alarms into a BERT payload pattern, or turning loop codes ON and off.

Configuring BERT Settings

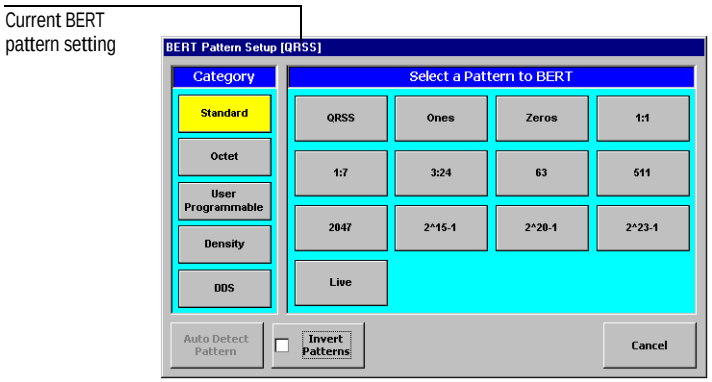
This section describes how to perform an out-of-service bit error rate test (BERT) on a T1 span. During a BERT, a test pattern is transmitted over the span and then evaluated. Any differences between the transmit and receive patterns are considered errors.

You can perform a round-trip BERT test with a single Service Advisor with a Dual DS1/0 Test Module by looping back the far end of the T1 circuit. Loopback testing enables you to analyze a T1 span from a single location. The Service Advisor can transmit loopback control codes to a far-end loopback device, such as a network interface unit (NIU) or channel service unit (CSU); therefore, hardware looping at the far end is not necessary. (See *Configuring a Loop Code*, page 4–24.)

You can perform an end-to-end BER test of the T1 circuit using a Service Advisor and a T1 signal source (or another Service Advisor), each connected to an opposite end of the circuit.

The following procedure explains how to use the **Pattern** button on the T1 Testing screen to configure the BERT payload pattern you want to send over specified T1 lines.

1. Tap the **Pattern** button in the Transmitter Setup section of the T1 Testing screen.



2. To select a specific pattern, press the **Standard, Octet, User Programmable, Density**, or **DDS** button on the BERT Pattern Setup screen. Tapping one of these buttons displays the settings assigned to each category. See *BERT Patterns*, page 5–8 for more information about the screens displayed with each category button.

3. Tap a pattern button.

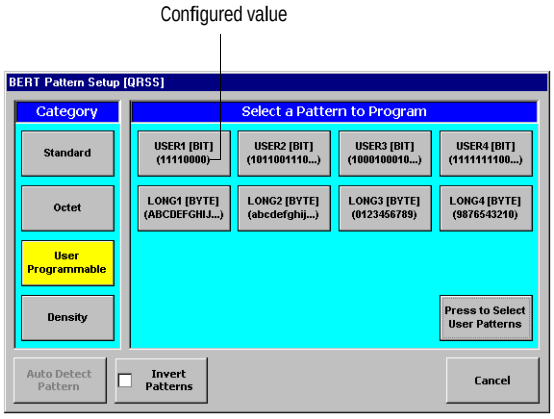
   - If you selected the User Programmable category button, press one of the **USER*n*** or **LONG*n*** buttons to select one of the pre-programmed BERT patterns. See *User Programmable Settings*, page 5–14 for a list of the default settings.
   - Tap the **Invert Patterns** button, if you want to invert the BERT pattern.
   - To change a default pattern, see *Entering a New BERT Pattern*, page 4–7.
   - If you press the **Cancel** button, no BERT pattern is selected and you return to the T1 Testing screen.

Continue to *Running a T1 Test* on page 4–35 to start your test.

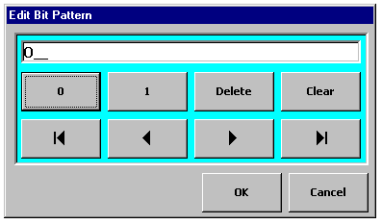
Entering a New BERT Pattern

You can enter a new BERT pattern by overwriting one of the user-programmable settings. To change a default pattern, complete these steps.

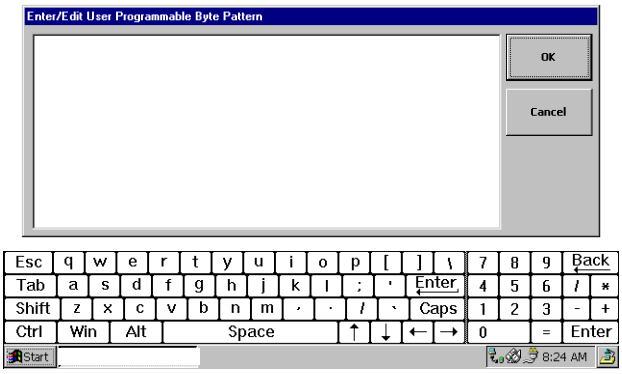
1. Tap the **Pattern** button in the Transmitter Setup section of the T1 Testing screen.
2. Tap the **User Programmable** button.
3. Tap the **Press to Program User Patterns** button. This puts you in edit mode. In this mode, you can edit one or all eight user-programmable BERT patterns.



4. Tap one of the **USER*n*** or **LONG*n*** buttons to select the default pattern you want to change.
5. Enter a 3 to 24 bit pattern using the displayed popup screen.
   - If you pressed a **USER*n*** button, use the 1 and 0 buttons on the popup screen to enter a new code.



- If you pressed a **LONG*n*** button, use the popup keypad to enter a new code.



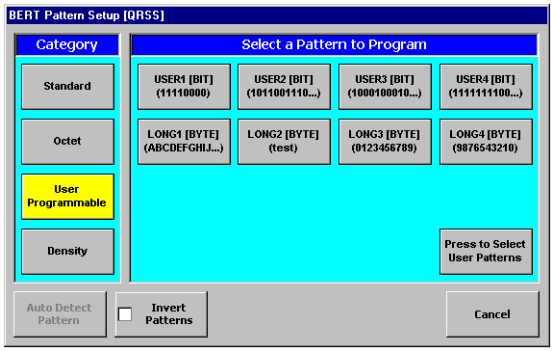
If you press the **Cancel** button, the selected code is not changed and you return to the Select a Pattern to Program screen.

6. Tap **OK** to save the pattern and return to the Select a Pattern to Program screen.

   You can see the value you configured on the **USER*n*** or **LONG*n*** button. For example:

/USER1 [BIT] (1111 0100)

7. You can continue to edit patterns, as described in steps 4 through 6. When you are finished editing, press the **Press to Select User Patterns** button. Then press the pattern you want to use for your test.



   You return to the T1 Testing screen. You'll notice the pattern you selected appears in the **Pattern** button's display area.

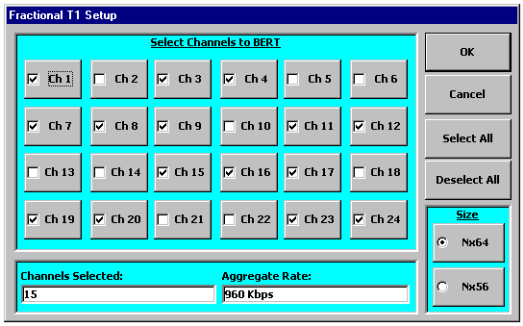
Continue to *Running a T1 Test* on page 4–35 to start your test.

Configuring a Fractional T1 (FT1) Test

The following procedure explains how to use the **FracT1** button on the T1 Testing screen to generate a FT1 signal to send over specified T1 lines.

1. Tap the **T1 Testing** toolbar button to access the T1 Testing screen.
2. Tap the **Line** button on the T1 Testing screen to select the line on the module you want to use to transmit the signal.

3. Tap the **FracT1** button on the T1 Testing screen.



4. Select the channels on which you want to generate a FT1 signal.
   - **Select All** button – selects all 24 channels.
   - **Ch 1** through **Ch 24** buttons – selects individual channels.
   - **Deselect All** button – lets you start your selection again.
5. When all the channels are selected, press either the **Nx64** or **Nx56** button to indicate the base rate for the FT1 signal. The base rate is the rate of a single DS1 channel.
   - **Channels Selected** shows the number of channels you selected.
   - **Aggregate Rate** shows the aggregate bandwidth (in Kbps) of the selected channel.
6. Tap **OK** when you are finished selecting the channels.

   If you press the **Cancel** button, no channels are selected and you return to the T1 Testing screen.

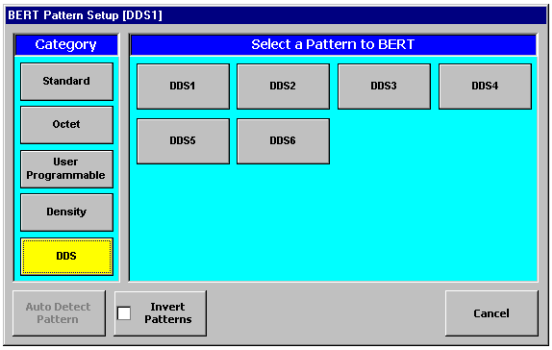
Continue to *Running a T1 Test* on page 4–35 to start your test.

Configuring a Digital Data Service (DDS) BER Test

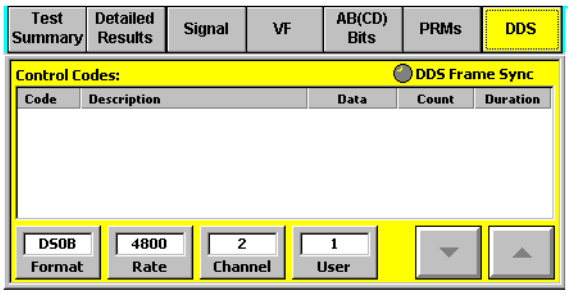
Use the DDS T1 Testing tab to access a DDS channel within a T1 signal. The DDS signal is transmitted on the selected T1 channel, and an idle signal is generated on all other channels.

To set up and run a DDS BERT test, follow these steps.

1. Tap the **T1 Testing** toolbar button to access the T1 Testing screen.
2. Tap the **Line** button on the T1 Testing screen to select the line on the module you want to use to transmit the signal.
3. Tap the **Pattern** button in the Transmitter Setup section.
4. When the BERT Pattern Setup screen appears, tap the **DDS** button in the category column, and then one of the DDS (DDS1 through DDS6) pattern buttons. See *Digital Data Service (DDS) Settings*, page 5–16 for more information about the DDS patterns.



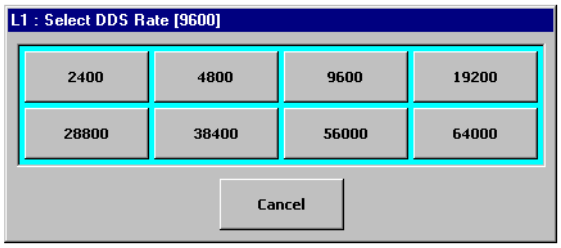
5. Tap the **DDS** tab on the T1 Testing screen.



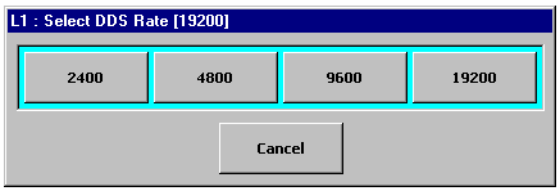
6. Tap the **Format** button and select either the DS0A or DS0B format of the DS0 signal on the DDS channel. Off turns off the DDS function.

   Notice the **FracT1** button's display panel (in the Transmitter Setup scetion of the screen) shows the DDS setting.

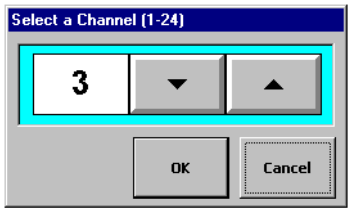
7. Tap the **Rate** button and select the desired DDS channel transmission rate (in Kb/s). If the format is DS0A, you see the follwoing rates:



   If the format is DS0B, you see the following rates:

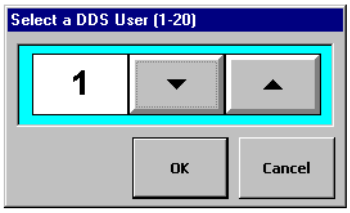


8. Tap the **Channel** button and select the T1 timeslot (1 through 24) carrying the DDS channel. Use the Up and Down arrow buttons to display a channel, and tap **OK** to select it and return to the previous screen.



   Tap the **Cancel** button to cancel out of the channel option and return to the previous screen.

9. Tap the **User** button (active only with DS0B format) and select the signal of an individual user (1 through 20, depending on the selected Rate) on the DDS channel. Use the Up and Down arrow buttons to display a user, and tap **OK** to select it and return to the previous screen.



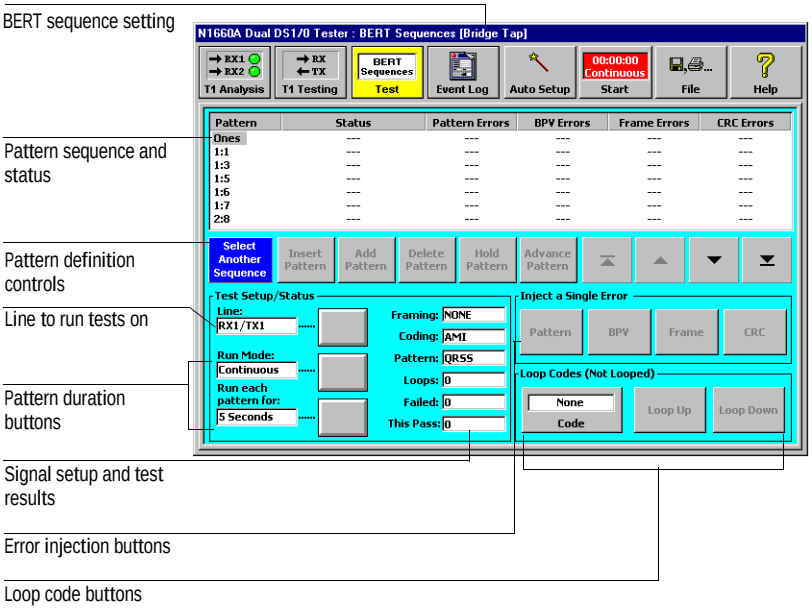
   Tap the **Cancel** button to cancel out of the user option and return to the previous screen.

Continue to *Running a T1 Test* on page 4–35 to start your test.

Configuring BERT Sequences

After selecting or creating user-programmable BERT patterns, you can configure a sequence of BERT patterns you want to transmit during a test. Use the BERT Sequences option to run Bridge Tap Pattern (BTP) or Multiple Test Pattern (MTP) sequences (see page 4–15), or create up to four different customized sequences of BERT patterns (see page 4–20).

To access the BERT Sequences screen, tap the **Test** toolbar button and select the **BERT Sequences** option from the drop-down menu.



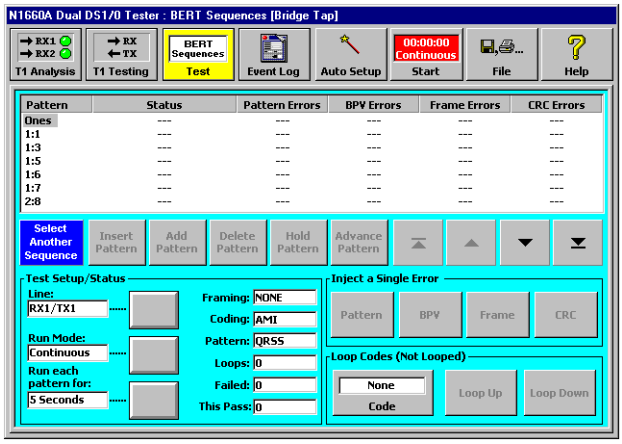
Running Bridge Tap Pattern (BTP) and Multiple Test Pattern (MTP) Tests

The Bridge Tap Patterns (BTP) and Multiple Test Patterns (MTP) are predefined test-pattern sequences that the Dual DS1/0 Test module provides for BER testing. The *Bridge Tap Patterns (BTP)* sequence is useful for detecting bridge taps and other impairments on a T1 span. The *Multiple Test Patterns (MTP)* sequence aids in acceptance testing and automatic testing of span lines.

Follow these steps to run a BTP/MTP test.

1. Access the BERT Sequences screen by tapping the **Test** toolbar button and selecting the **BERT Sequences** option from the drop-down menu.

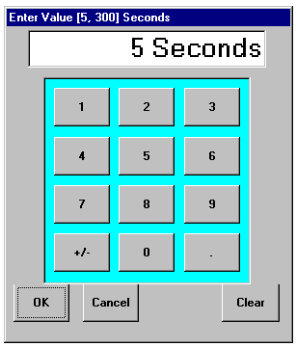
2. Tap the **Line** button and select the T1 line (RX1/TX1 or RX2/TX2) you want to run the BER test on.



3. To set the pattern duration:

   - Tap the **Run Mode** button to select either *continuous* or *once*. *Continuous* runs the selected sequence continuously until the test is stopped. *Once* transmits the selected sequence once.

- Tap the **Run each pattern for:** button and enter the length of time (5 to 300 seconds) to transmit each pattern in the sequence on the popup keypad.



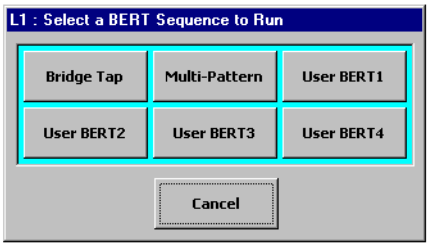
  The **Clear** button clears the displayed duration.

  Tap **OK** to save the duration you entered, and return to the BERT Sequences screen.

  The **Cancel** button returns you to the BERT Sequences screen and does not change the duration setting.

4. Check the Framing, Coding, and Pattern settings. If you need to modify a setting, press the **T1 Testing** toolbar. See *Setting Up a T1 Test*, page 4–3 for more information.

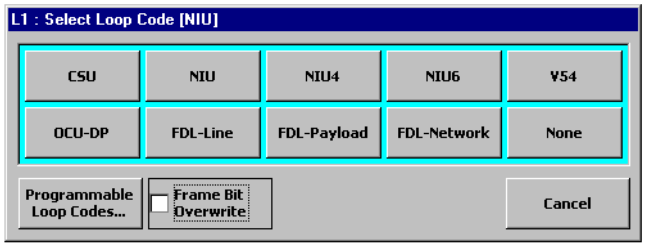
5. Tap the **Select Another Sequence** button.



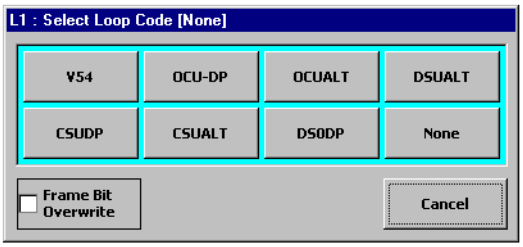
6. Tap either the **Bridge Tap** or the **Multi-Pattern** sequence button. See *BTP Patterns*, page 5–22, and *MTP Patterns*, page 5–23.

   The **Cancel** button returns you to the BERT Sequences screen.

7. Tap the **Code** button and select a loop code on the displayed screen.



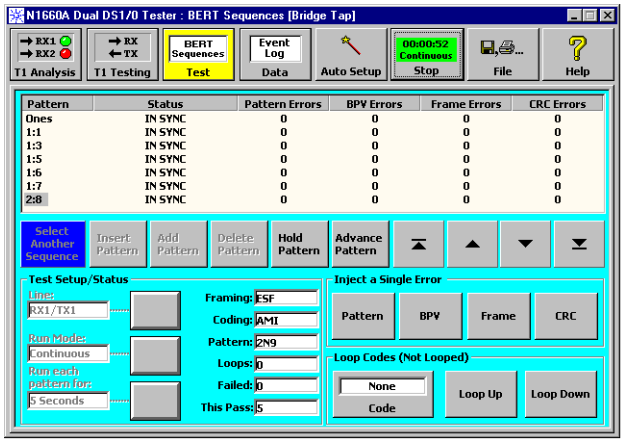
   If you configured a DDS BERT pattern (see *Configuring a Digital Data Service (DDS) BER Test*, page 4–11), you see the following loop codes.



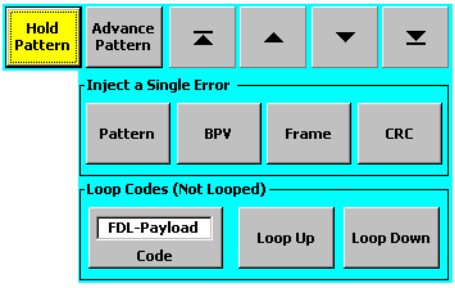
   You'll see the loop-code you selected in the **Code** button's display area. See *Default Loop-up and Loop-down Settings*, page 5–26 for a definition of the loop codes.

8. Tap the **Start** toolbar button to start a test.

9. Observe the pattern status information.



10. When the test is running, you can use the following buttons:



- **Hold Pattern** button pauses the current pattern. Use this button when you want to observe specific problems.
- **Advance Pattern** button skips to a particular pattern in the sequence.
- **Up** and **Down arrow** buttons let you move through the list of BERT patterns.
- **Pattern** button injects logic errors into the BERT payload pattern.
- **BPV** button injects bipolar violations into the BERT payload pattern. A BPV is a pulse that breaks the alternating polarity rule.

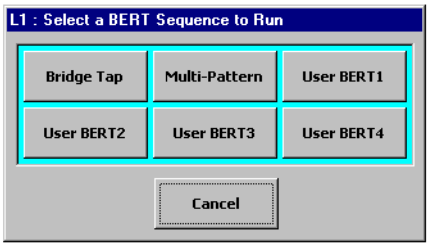
- **Frame** button injects framing bit errors into the BERT payload pattern. Note that this error is inserted only into those F-bits that are used for framing.
- **CRC** button injects CRC (cyclic redundancy checksum) errors into the BERT payload pattern.
- **Loop Up** button transmits the selected type of loop-up codes to activate loopback.
- **Loop Down** button transmits the selected type of loop-down codes to deactivate loopback.

11. Tap the **Stop** toolbar button to stop a test.

Running a Customized BERT Sequence

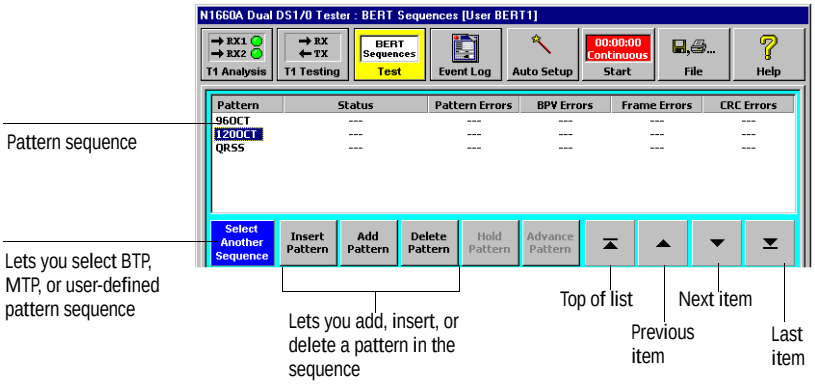
This section explains how to run a BER test using a customized sequence of BERT patterns.

1. Access the BERT Sequences screen by tapping the **Test** toolbar button and selecting the **BERT Sequences** option from the drop-down menu
2. Tap the **Select Another Sequence** button.



3. Tap one of the **User BERT** buttons. These buttons let you configure up to four different BERT pattern sequences.

   The **Cancel** button returns you to the BERT Sequences screen.



4. Tap the **Add Pattern** button.

5. When the BERT Pattern Setup screen appears, select a BERT pattern. See *Configuring BERT Settings*, page 4–5, for information about selecting a BERT pattern.

   You'll see the selected BERT patterns appear in the pattern sequence list.

6. Continue to add BERT patterns until you have all the patterns you want in your sequence.

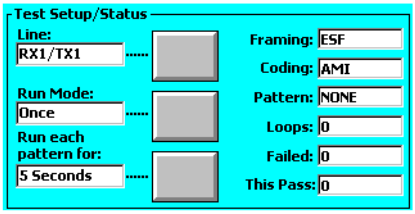
   Use the **Insert Pattern** button to insert a pattern above the entry where the cursor is positioned.

   Use the **Delete Pattern** to delete the pattern where the cursor is positioned.

   Use the cursor movement keys to move the cursor up and down through the list.

7. Configure the other **User BERT** sequences by repeating steps 3 through 6.

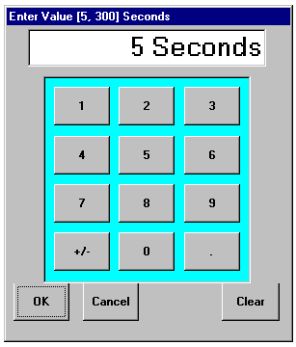
8. Tap the **Line** button and select the T1 line (RX1/TX1 or RX2/TX2) you want to run the BER test on.



9. To set the pattern duration:

   - Tap the **Run Mode** button to select either *continuous* or *once*. *Continuous* runs the selected sequence continuously until the test is stopped. *Once* transmits the selected sequence once.

- Tap the **Run each pattern for:** button and enter the length of time (5 to 300 seconds) to transmit each pattern in the sequence on the popup keypad.



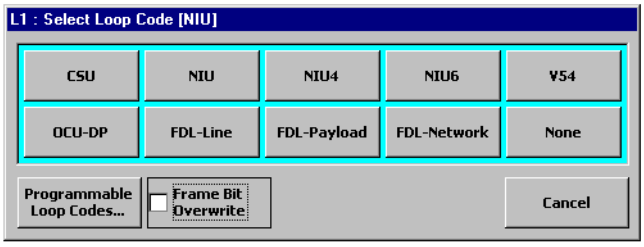
  The **Clear** button clears the displayed duration.

  Tap **OK** to save the duration you entered, and return to the BERT Sequences screen.

  The **Cancel** button returns you to the BERT Sequences screen and does not change the duration setting.

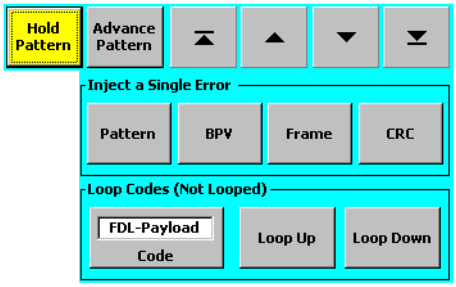
10. Check the Framing, Coding, and Pattern settings. If you need to modify a setting, press the **T1 Testing** toolbar. See *Setting Up a T1 Test*, page 4–3 for more information.

11. Tap the **Code** button and select a loop code on the displayed screen.



  You'll see the loop-code you selected in the **Code** button's display area. See *Default Loop-up and Loop-down Settings*, page 5–26 for a definition of the loop codes.

12. Tap the **Start** toolbar button to start a test.
13. Observe the pattern status information.
14. When the test is running, you can use the following buttons:

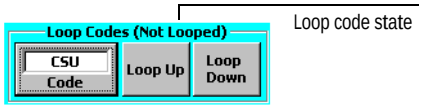


- **Hold Pattern** button pauses the current pattern. Use this button when you want to observe specific problems.
- **Advance Pattern** button skips to a particular pattern in the sequence.
- **Up** and **Down arrow** buttons let you move through the list of BERT patterns.
- **Pattern** button injects logic errors into the BERT payload pattern.
- **BPV** button injects bipolar violations into the BERT payload pattern. A BPV is a pulse that breaks the alternating polarity rule.
- **Frame** button injects framing bit errors into the BERT payload pattern. Note that this error is inserted only into those F-bits that are used for framing.
- **CRC** button injects CRC (cyclic redundancy checksum) errors into the BERT payload pattern.
- **Loop Up** button transmits the selected type of loop-up codes to activate loopback.
- **Loop Down** button transmits the selected type of loop-down codes to deactivate loopback.

15. Tap the **Stop** toolbar button to stop a test.

Configuring a Loop Code

This section explains how to use the **Code** button on the T1 Testing screen to set the loop-back code. In loopback mode, the transmit signal is reversed back as the receive signal, typically by a remote far-end network element.



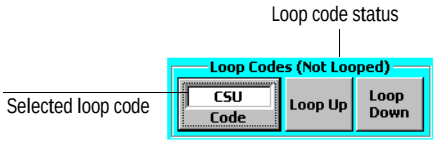
You'll notice that the loop code state of the Dual DS1/0 test module is displayed in the section title. The loop state can be:

- **CSU:Not Looped** indicates that an external device is not looped-up (CSU test mode only).
- **CSU:Looped** indicates that an external device is looped-up (CSU test mode only).
- **RMT:Looping** indicates the Dual DS1/0 test module is attempting to loop-up a remote device.
- **RMT:Unlooping** indicates the Dual DS1/0 test module is attempting to loop-down a remote device.
- **RMT:Looped** indicates the Dual DS1/0 test module has successfully looped-up a remote device.
- **RMT:Not Looped** indicates the Dual DS1/0 test module has not looped-up a remote device.

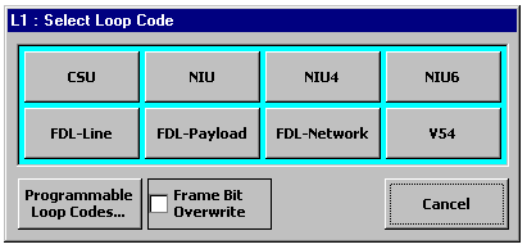
Selecting a Loop-code Setting

Follow these procedures to select a loop-code setting used to activate and deactivate loopback at the far-end equipment.

1. Tap the **Code** button on the T1 Testing screen.



2. Tap a code button on the displayed Select Loop Code screen. You'll see the loop-code you selected in the **Code** button's display area.



See *Default Loop-up and Loop-down Settings*, page 5–26 for a definition of the loop codes.

Note: When you are doing out-of-band testing, make sure the Framing setting is configured as ESF (see *Framing Format*, page 5–7 for a listing of the different framing settings).

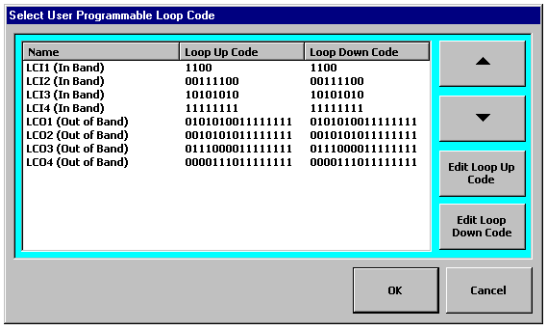
3. Tap the **Frame Bit Overwrite** button if you want to overwrite the framing bits with the selected loop code.

Continue to the next procedure for information about creating a user-programmable loop code.

Creating a User-Programmable Loop Code

You can create four additional inband and four out-of-band loop codes by following these steps.

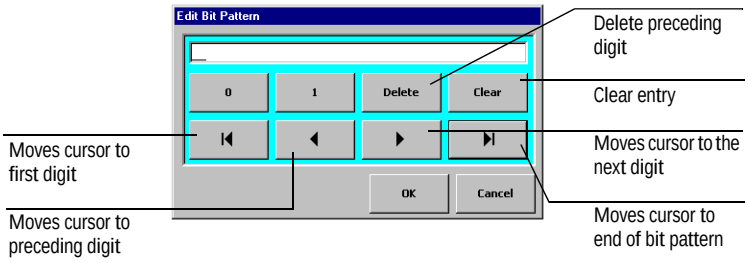
1. Tap the **Code** button on the T1 Testing screen.
2. Tap the **Frame Bit Overwrite** button if you want to overwrite the framing bits with the selected loop code.
3. Tap the **Programmable Loop Codes** button on the Select Loop Code screen.
4. Use the ▲ and ▼ buttons to highlight one of the loop codes.



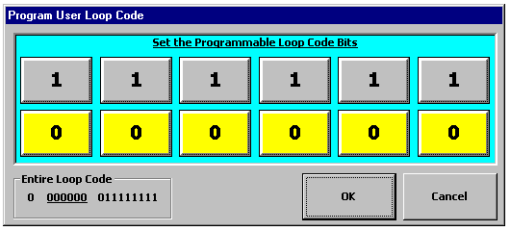
LCI1 to LCI4 are inband codes and LCO1 to LCO4 are out-of-band codes. The code you enter changes six bits *0xxx xxx0 1111 1111*, shown as *x*.

5. Tap the **Edit Loop Up Code** or the **Edit Loop Down Code** button, depending on which type of loop code you want to enter. See *Default Loop-up and Loop-down Settings*, page 5–26 for a listing of the default settings.

   - If you are entering an inband loop code (LCI1 – LCI4 code), use the **0** and **1** buttons to enter the new loop code on the Edit Bit Pattern screen.



   - If you are entering an out-of-band loop code (LCO1 through LCO4), use the **0** and **1** buttons to enter the new loop code on the Program User Loop Code screen.



6. Tap **OK** on either screen to save your entry. If you press the **Cancel** button, the programmed bit pattern is not changed and you return to the Select User Programmable Loop Code screen.

7. When you are finished editing loop codes, press the **OK** button on the Select User Programmable Loop Code screen to save your changes and return to the T1 Testing screen.

   If you press the **Cancel** button, the programmed bit patterns are not saved.

Setting the Voice Frequency Audio Controls

This section explains how to use the VF (Voice Frequency) tab on the T1 Testing screen to configure dropped VF channels to the Service Advisor's speaker for monitoring audio, and insert tones on a channel in the T1 circuit.

Drop Channel Audio (RX1, RX2)

Use this portion of the screen to:

- Select the channel from which you want audio dropped to the handset, the headset on the Service Advisor platform, and the Service Advisor's platform speaker.
- View the detected frequency and audio level, and channel data (dynamic readout in bit format) of the dropped channel.
- Mute or adjust the volume for the audio sent to the Service Advisor's platform speaker, or the headset connected to the Service Advisor platform.

Insert Channel Audio (TX1, TX2)

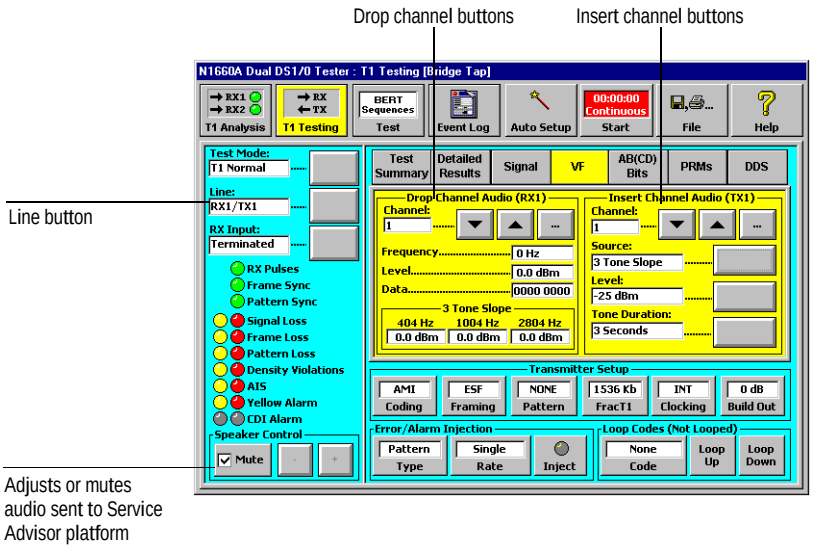
Use this portion of the screen to:

- Select the channel to insert tone or audio into.
- Select the transmit audio source and the level of the tone you want to send over the selected channel.
- Enter the amount of time you want the tone sent over the line for the Three Tone Slope test.
- Select the AB(CD) signaling bits you want to insert into the selected channel.

Configuring the Drop and Insert Channel Settings

To configure the drop and insert channel settings, follow these steps:

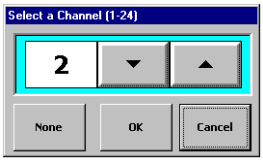
1. Tap the **VF** tab on the T1 Testing screen.



2. Tap the **Line** button on the main screen to display the line (RX1/TX1 or RX2/TX2) you want to mute or drop audio into.

3. In the *Drop Channel Audio* section, select a channel to drop to the Service Advisor's speaker:

   - Tap the ▲ and ▼ buttons to increase or decrease the displayed channel by one.
   - Tap the ··· button to select a channel number or None using the following popup screen. Use the ▲ and ▼ buttons, or press the **None** button. Tap **OK** to return to the previous screen.



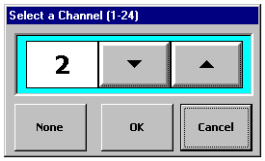
4. Tap the Speaker Control **-** or **+** button to decrease or increase the volume of the audio speaker on the Service Advisor, or press the **Mute** button to mute the sound on the Service Advisor.

   Notes: You cannot control the volume of the audio sent or received to or from a handset connected to the test module.

   When you select tones and tap the Start toolbar button to begin transmitting them, you cannot turn off the tones. Tap the Mute button in the Speaker Control section of the screen, to mute the tones.

5. In the *Insert Channel Audio* section, select the channel (1 through 24) into which you want to insert a tone:

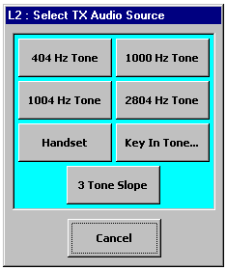
   - Tap the ▲ and ▼ buttons to increase or decrease the displayed channel by one.
   - Tap the ··· button to select a channel number or None using the following popup screen. Use the ▲ and ▼ buttons or press the **None** button. Tap **OK** to return to the previous screen.



Note: To use the insert feature on live traffic, set the Test Mode to **Drop/Insert** (see *Selecting the Test Mode*, page 5–3), and use appropriate cabling.

6. Tap the **Source** button to select the frequency of the tone you want to insert into the selected channel.

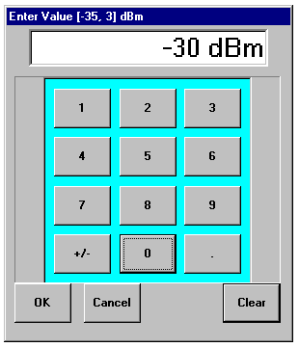
   - The **Handset** button inserts audio from the handset into the selected channel.



   - The **Key In Tone** button lets you enter a frequency tone on a popup keypad. The frequency can be between 200 and 3950 Hertz.

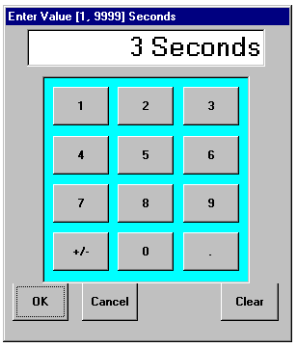
   - The **3 Tone Slope** button measures the attenuation on the T1 line at three specific frequencies; 404, 1004, and 2804 Hertz.
   - The **Clear** button clears the displayed frequency.
   - Tap **OK** to save the frequency you entered, and return to the T1 Testing screen.
   - The **Cancel** button returns you to the VF Tab display and does not change the frequency setting.

7. In the *Insert Channel Audio* section, press the **Level** button and enter the level of the tone (-35 to 3 dBm) you want to transmit over the T1 line on the popup keypad.



   - The **Clear** button clears the displayed level.
   - Tap **OK** to save your entry and return to the T1 Testing screen.
   - The **Cancel** button returns you to VF Tab display and does not save any level changes.

8. If you selected 3 tone slope, press the **Tone Duration** button to set the amount of time you want the tone sent over the line for the Three Tone Slope test.

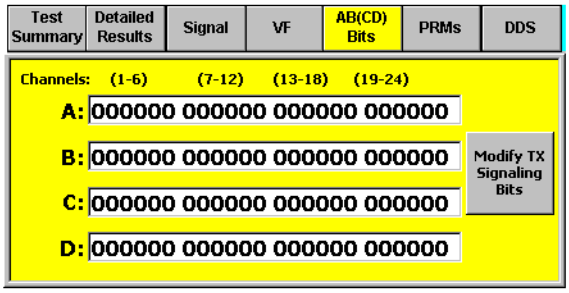


   - The **Clear** button clears the displayed level.
   - Tap **OK** to save your entry and return to the T1 Testing screen.
   - The **Cancel** button returns you to VF Tab display and does not save any level changes.

Setting the Transmit Signaling Bits

You can set the signaling bits you want to transmit over the circuit to busy-out the other channels while you're testing.

1. On the T1 Testing screen, press the **AB(CD) Bits** tab to view the signaling bits set for all 24 channels on a T1 line.

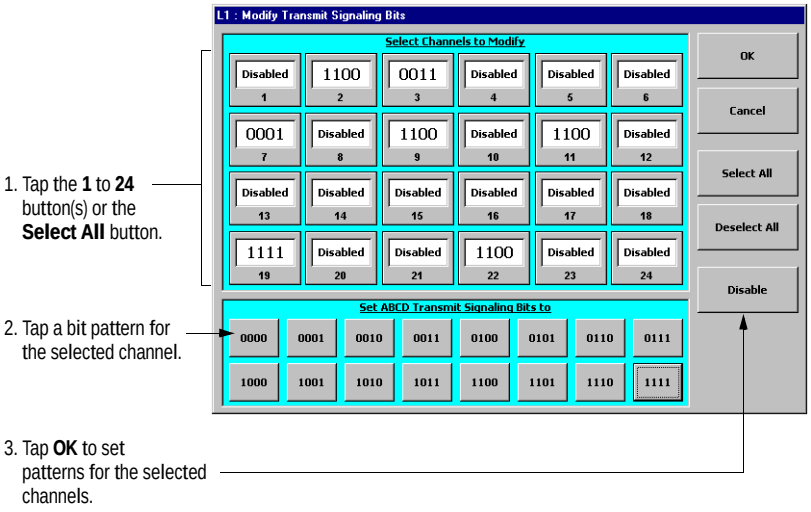


The Framing type determines the bits displayed on this screen. Use the following chart as a reference.

AB(CD) Bits Displayed for Each Frame Type

Frame Type Setting	Bits Displayed
None	No bits displayed (cannot insert signaling bits on a channel with this frame type).
D4	A and B bits
ESF	A, B, C, and D bits
SLC-96	A and B bits

2. Tap the **Modify TX Signaling Bits** button if you want to modify the displayed bit patterns.



3. Select the channel and the signaling bits you want to transmit over a circuit. You'll notice when you press a channel button, it turns yellow to indicate that it is selected. You can select multiple channels and apply the same bit pattern to these selected channels.

   - **Select All** button – selects all 24 channels.
   - **1** through **24** buttons – selects individual channels.
   - **Deselect All** button – lets you start your selection again.
   - **Disable** button – indicates that you do not want to transmit signaling bits over the selected channel(s).

4. Select a bit pattern button on the lower part of the screen. The bit pattern is set for all selected (yellow) channels.

5. Tap **OK** to save the bit pattern settings. The **Cancel** button returns you to the T1 Testing screen and does not save any bit pattern changes.

The configured signaling bits are sent out on the appropriate channels while a test is running.

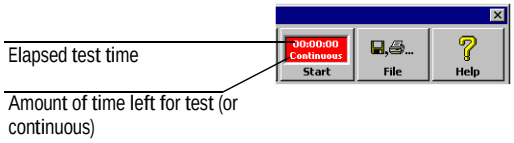
Running a T1 Test

This section describes how to run a T1 test on one or two lines. When you run tests on two lines, the tests run simultaneously. This means when you press the **Start** button to run a test, if you have configured both lines, the tests begin and end at the same time.

1. Tap the **Start** toolbar button to begin testing a T1 line. The Service Advisor starts the test and begins to detect the status of the receive signal, and updates the displayed screen.

Note: If you have set up two tests, the configured tests run simultaneously on both lines.

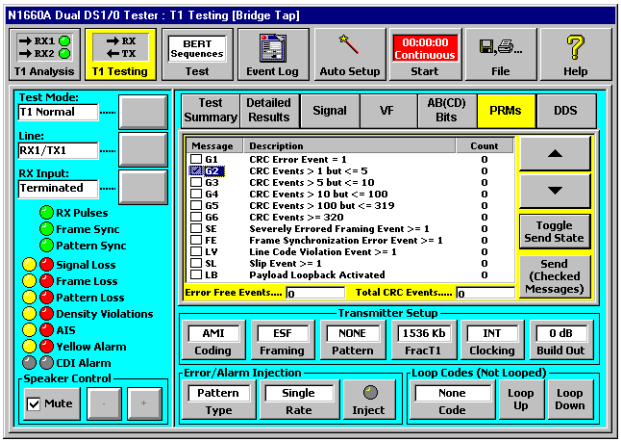
   If you set a test duration, notice the time display in the **Start/Stop** button. See *Setting the Test Duration*, page 1–16.



   The elapsed test time counts forward, while the test duration time counts backwards towards zero.

2. Tap the **Inject** button if you want to inject a configured error or alarm into the BERT payload pattern. The alarm or error is injected into the line selected on the left side of the screen.

3. Tap the **T1 Testing** toolbar button.
4. Tap the **PRMs** tab if you want to transmit one or multiple Performance Report Messages (PRMs) during a test (see *Injecting PRMs*, page 4–37).



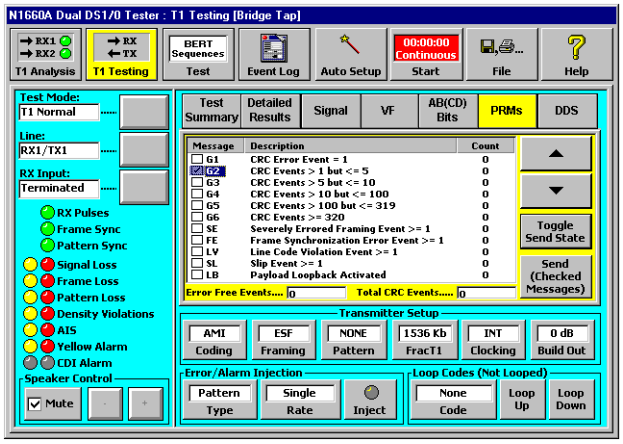
5. Tap the **Loop Up** button if you want to transmit the configured active code to activate loopback.
6. Tap the **Loop Down** button if you want to transmit the configured active code to deactivate loopback.
7. Tap the **Stop** toolbar button to stop the test. Monitoring stops on both lines at the same time.

   Notice the elapsed time display on the Start/Stop button. This indicates the length of time you ran the test.

Injecting PRMs

While a test is running, you can transmit PRMs. To do so, follow these steps:

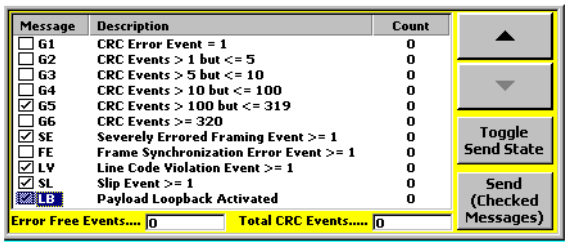
1. Tap the **T1 Testing** toolbar button and then the **PRMs** tab.



2. Tap the **Line** button (left side of screen) and select the line (RX1/TX1 or RX2/TX2) you want to transmit the PRMs on.

3. Use the ▲ and ▼ buttons to move the cursor to the messages in the list.

4. Tap the **Toggle Send State** button to select a message to transmit during the test. When you select messages, you can select one of the G*x* messages, either the SE or the FE message, the LV message, the SL message, and/or the LB message.



To deselect a message, move the cursor to that message and press the **Toggle Send State** button. You will see the check disappear from the check box.

5. Tap the **Send (Checked Messages)** button to transmit the selected message.
6. Watch the Count column, the Error Free Events counter, and the Total CRC Events counter.

   Count for each message: indicates that type of message was detected.

   Error Free Events: shows the number of events during which no errors occurred.

   Total CRC Events: shows the total number of CRC errors received during a test.

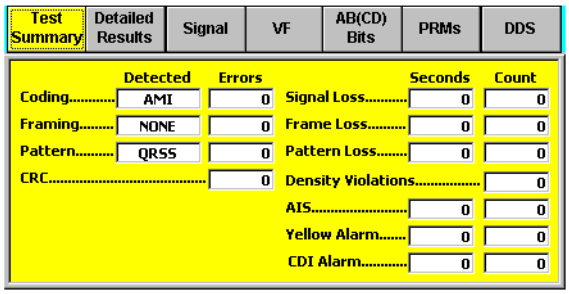
Viewing Test Results

When you run a T1 test, results are divided among four different tabs:

- **Test Summary:** shows the configured framing, BERT pattern, and coding settings; the current results message; and frame, bit, and BPV error counts.
- **Detailed Results:** shows statistics for BERT pattern, BPV, CRC, and frame errors; and synchronization errors.
- **Signal:** shows the physical characteristics of the RX and TX signals for the selected line.
- **Voice Frequency:** lets you set up and run tests, monitor, and control both audio drop and audio insert on a specific channel for the selected line.
- **AB(CD) Bits:** shows signaling bits for all 24 channels of the selected line and lets you modify the transmit signaling bits for all 24 channels.
- **PRMs**: shows the counts for performance report messages, error-free events, and total CRC events.
- **DDS:** shows information about the RX DDS control codes on the selected DDS channel.

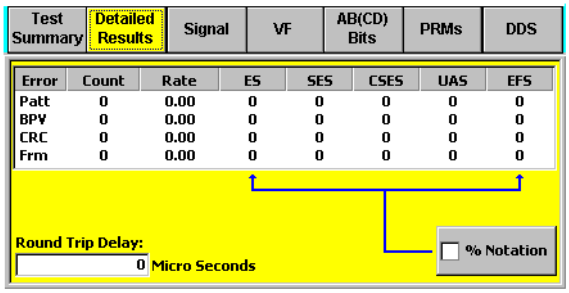
To view T1 test results, complete these steps:

1. Tap the **Test Summary** tab to view configuration information about the currently selected T1 line, and error counts. See *Test Summary Tab*, page 5–29 for a description of results displayed on this tab.

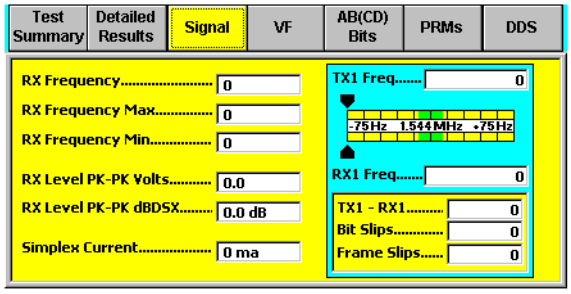


2. Tap the **Detailed Results** tab to view error rates, errored seconds, pattern sync losses, and CRC errors. See *Detailed Results Tab*, page 5–31 for a description of results displayed on this tab.

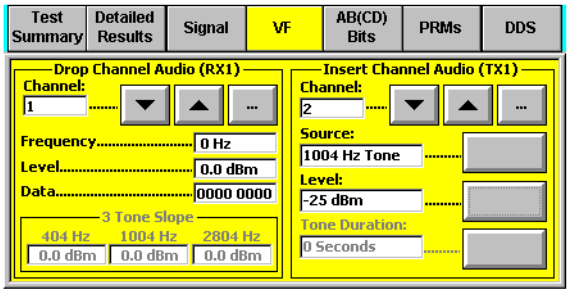
   If you tap the **% Notation** button, the errored seconds (ES), severely errored seconds (SES), consecutive severely errored seconds (CSES), unavailable seconds (UAS), and error-free seconds (EFS) values are shown as a percentage.



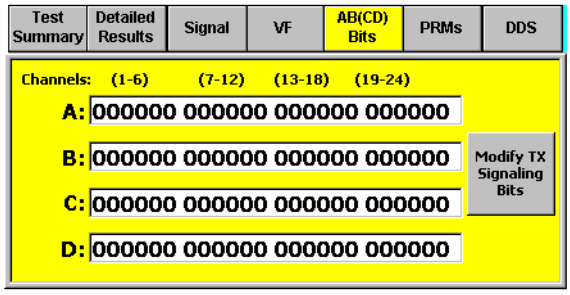
3. Tap the **Signal** tab to display the physical characteristics of the signal (such as frequency, signal level, bit slips, and frame slips). See *Signal Tab*, page 5–34 for a description of results displayed on this tab.



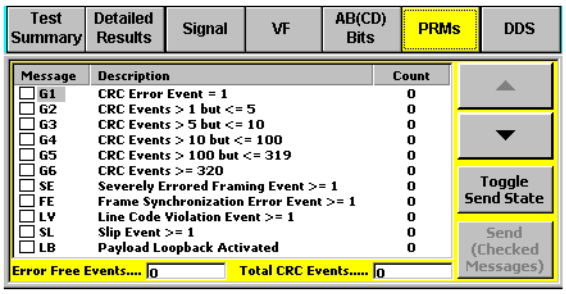
4. Tap the **VF** tab to select a channel to drop to the Service Advisor's speaker, adjust the speaker's volume, insert a tone into a selected channel, and run a Three Tone Slope test. See *Setting the Voice Frequency Audio Controls*, page 4–28 for instructions on using this tab, and see *VF Tab*, page 5–36 for a description of results displayed on this tab.



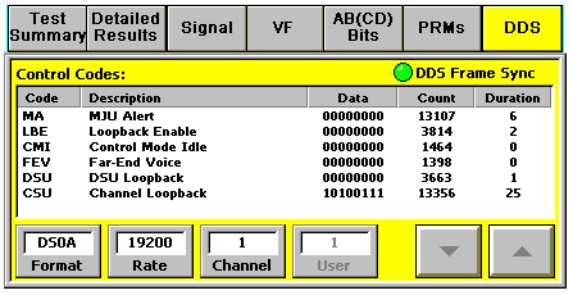
5. Tap the **AB(CD) Bits** tab to view the signaling bits set for all 24 channels on a T1 line. See *AB(CD) Bits Tab*, page 5–38 for a description of results displayed on this tab, or page 4–33 for information about setting TX signaling bits.



6. Tap the **PRMs** tab to look at the counts for performance report messages.



7. Tap the **DDS** tab to look at the RX DDS control codes on the selected DS1 channel.



Saving Configuration Settings

When you shut down your tester, all your configuration settings are saved in memory. To shut down the tester properly, press the **File** toolbar button, and select the Exit menu option.

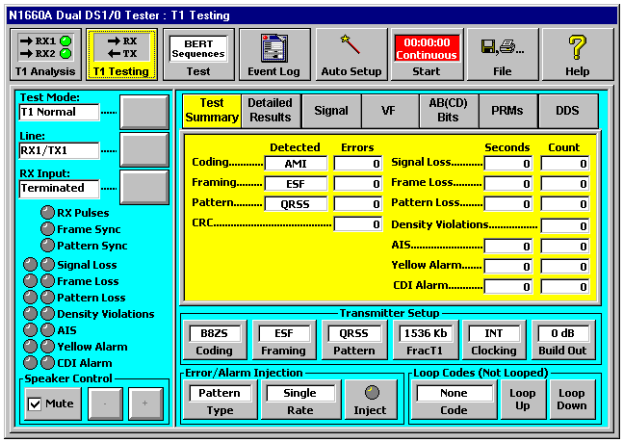
Note: If you power off your tester without using the File toolbar button and the Exit option, all your configuration settings are reset to their default settings.

5

T1 Testing Screen Reference

T1 Testing Screen

This chapter defines all the configuration settings that appear on the T1 Testing screen and the associated tab screens. Use this chapter in conjunction with the procedures in Chapter 4, *Testing T1 Circuits* to configure and run a T1 test.

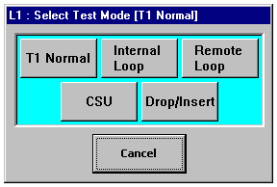


Line Configuration and Status

This section defines the settings used to configure the T1 test mode, the line you're testing, and the termination mode (RX Input). The settings are grouped by button names.

Selecting the Test Mode

When you tap the **Test Mode** button the following popup appears.



T1 Normal: The T1 transmit signal is generated internally according to the selected framing, payload, line code, and so on. The receiver is configured for the same settings, allowing for BER testing (the received pattern is compared to the transmitted pattern). During T1 Normal test mode, channels can be tested for BERT, tone or dialing.

Internal Loop: The Service Advisor internally loops the T1 transmit (TX) signal back to the T1 receive (RX) signal, at the digital level. This is comparable to connecting a patch cord between the TX1/RX1 or TX2/RX2 ports on the Service Advisor. In this mode, **Rx Input** is forced to **Terminated**, and **Clocking** is forced to **Internal**. Use this mode if you want to verify the test set's configuration and that it is working properly.

Remote Loop: The receive T1 signal is looped back to the transmitter. The receive data is regenerated and transmitted to the span. Full T1 monitor testing can be performed in this mode.

CSU: Channel Service Unit mode. The Service Advisor performs as a CSU on the span, responding to all valid loop-up and loop-down codes. When the unit is not looped back, it transmits all-ones with the selected framing and line code.

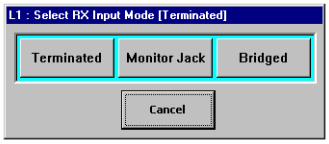
Drop/Insert: In this mode, single or multiple timeslots are dropped and inserted internally, the TX clock is slaved to the RX clock, channels that are not being used for testing are passed through uninterrupted, and TX and RX paths are crossed over (RX2 to TX1 and RX1 to TX2).

Notes: When using this mode, the "back side" of the selected channel is busied-out to prevent the CO switch or CI PBX from making a call on the dropped channel to the "front side."

If the Signaling Direction is set to Signaling to CI (Emulate Exchange) in the Dial/Monitor function, the channel transmitting back to the CO is busied-out to prevent the CO switch from trying to route a call to the out-of-service channel. The same applies to the other direction. See *Monitoring Channel Status*, page 6–3.

Selecting the RX Input

When you tap the **RX Input** button, the following popup appears.



Terminated: The receive signal is terminated to 100 ohms, and a full-span automatic equalizer (ALBO) is provided to compensate for cable loss. This selection is typically used for out-of-service testing.

Monitor Jack: The receive signal is a DSX-1 monitor-level signal. This selection is typically used to monitor a signal through a DSX monitor jack that is resistor-isolated from the span.

Bridged: The receive signal is bridged to one side of the span. The Service Advisor is set to a high-impedance state (greater than 1000 ohms). This selection is typically used to monitor in-service spans that do not have a DSX monitor jack.

Signal Indicators

The signal indicators show whether certain conditions are present on the currently selected T1 input signal (see *T1 Measurements*, page 9–8).

The indicators in the left column are "history" indicators that light to show a previous occurrence of the error condition. The **Clear History** button resets these indicators.

T1 Indicators

Indicator	Description
RX Pulses	Turns green to indicate the presence of a T1 signal at the RX jack.
Frame Sync	Turns green to indicate the T1 Service Advisor has synchronized to the receive signal framing.
Pattern Sync	Turns green to indicate the unit is synchronized with a known input data pattern.
Signal Loss	Turns red to indicate a loss of signal condition at the RX jack lasting for more than 150 milliseconds.
Frame Loss	Turns red to indicate a loss of framing (LOF) condition. For D4 (SF), LOF is declared when 2 out of 5 F_t bits are errored. For ESF, LOF is declared when 2 out of 5 frame bits are errored.
Pattern Loss	Turns red to indicate a loss of pattern condition. Loss of pattern is declared when 100 out of 1000 pattern bits are errored.
Density Violations	Turns red to indicate an excess zeros condition or a ones-density violation. Excess zeros are declared when more than 15 consecutive zeros are detected. A ones-density violation is declared when the ones-density falls below 12.5%.
AIS Signal	Turns red to indicate the presence of an alarm indication signal (unframed, all-ones) on the receive signal.

T1 Indicators, continued

Indicator	Description
Yellow Alarm	Turns red to indicate the presence of a Yellow alarm condition on the receive signal (bit 2 of each DS0 set to 0 for at least 255 consecutive channels for SF; alternating $00FF_h$ in the FDL for ESF).
CDI Alarm	Customer Disconnect Indicator turns red to indicate that the NIU (network interface unit) at the customer's site is not receiving a signal from a previously connected piece of T1 equipment.

Speaker Control Buttons

The Speaker Control section of the T1 Testing screen lets you adjust the volume the audio speaker on the Service Advisor.

Mute: mutes the sound on the Service Advisor. Tap this button to mute transmitting tones.

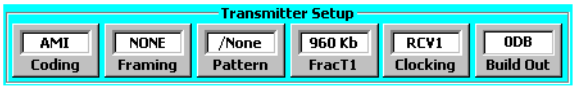
–: decrease the volume of the audio speaker.

+: increase the volume of the audio speaker

Note: You cannot control the volume of the audio sent or received to or from a handset connected to the test module.

Transmitter Setup Controls

The follow sections describe the configuration settings that appear when you tap a Transmitter Setup control button.



Line Coding

The **Coding** button lets you select the line coding for the currently selected T1 circuit. The line code can be set to **AMI** (alternate mark inversion), or **B8ZS** (bipolar with eight-zero substitution).

Framing Format

The **Framing** button lets you set the framing format of the selected T1 circuit. It configures the Service Advisor to use this framing format for transmitting and receiving data, and for testing circuits where this framing is used.

NONE: Unframed T1 signals.

D4: D4 framing format, also called SuperFrame (SF).

ESF: Extended SuperFrame framing format.

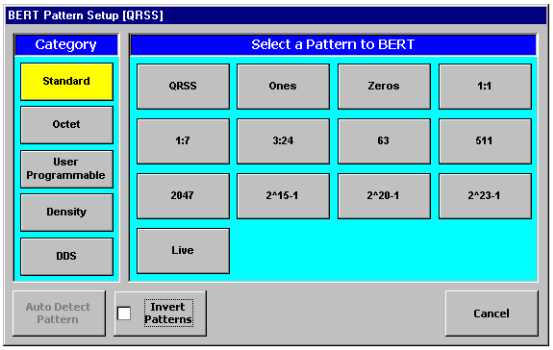
SLC-96: SLC-96 framing format (also called TR8).

BERT Patterns

The **Pattern** button lets you select a data pattern to transmit on the output T1 signal. This pattern is compared to the receive input signal. There are four different pattern categories: Standard, Octet, User-Programmable, and Density. Within these categories are:

- **1s-density patterns**: 1:1, 1:3, 1:5, 1:6, 1:7, 2:8 through 2:14, and 3:18 through 3:24.
- **Circuit-stress patterns**: ONES, ZEROS, LIVE, and QRSS
- **PRBS patterns**: 63, 511, 2047, 2^15-1, 2^20-1, and 2^23-1
- **Octet patterns**: Oct 52, Oct 53, Oct 54, Oct 55, Oct 72, Oct 96, Oct 120, Daly 55, and Net 55
- **DDS patterns**: DDS1 through DDS6

Standard BERT Patterns



The following table describes the standard BERT patterns.

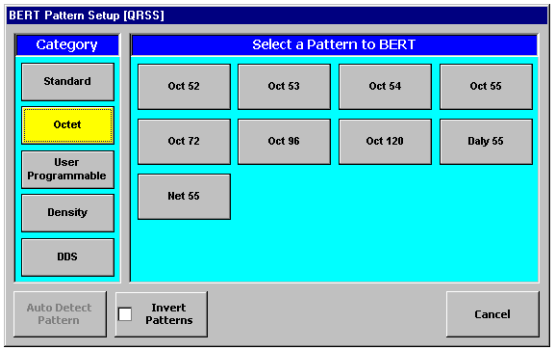
Standard BERT Patterns

Pattern	Description
QRSS	Quasirandom signal source, useful for stressing 1.54 Mb/s lines. A 2^{20}–1 pattern with a 14-zero constraint. This pattern simulates live traffic.
ONES	All-ones. 1111... This pattern consists of pulses only and is useful for stressing the repeater power consumption level when the maximum number of pulses is present. This pattern is also used when measuring the signal power level at a DSX bay.
ZEROS	All-zeros (0000...), which may help locate bridge taps.
1:1	Alternating ones and zeros (1010...) pattern.
1:7	A one-and-seven pattern (a single binary 1 and seven 0s). Also called 1:8 or one-in-eight.
3:24	3-in-24. A 12.5% ones-density pattern.
63	A 63-bit PRBS used for DS0 testing on DDS channels.
511	A 511-bit PRBS used for DS0 testing on DDS channels.

Standard BERT Patterns, continued

Pattern	Description
2047	A 2047-bit PRBS used for DSO testing on DDS channels.
2^15-1	Pseudorandom bit sequence (PRBS). For example, 2^15-1 is a 2^{15}–1 PRBS. This pattern is used to stress clock recovery circuits with a maximum of 14 consecutive zeros.
2^20-1	This pattern stresses AMI-coded, 1.54 Mb/s circuits beyond the standard-specified limits.
2^23-1	This pattern stresses AMI-coded, 1.54 Mb/s circuits beyond the standard-specified limits. It is commonly used for testing HDB3-encoded circuits.
Live	No pattern. The receiver does not try to synchronize to a pattern. The transmitter sends the QRSS pattern.

Octet Settings



The following table defines the selectable density test patterns.

Octet BERT Patterns

Pattern	Description
Oct 52	A 52 octet pattern whose byte values (hex) are as follows: `80018001 80018001 80018001 80018001 80018001 80018001 80018001 8001AFAA AF010101 01FFFFFF FF010101 01FFFFFF FFFFFFCD`
Oct 53	A 53 octet pattern whose byte values (hex) are as follows: `ffffd301 80018001 80018001 80018001 80018001 80018001 80018001 80018001 8001f555 f5808080 80ffffff ff808080 80ffffff`
Oct 54	A 54 octet pattern whose byte values (hex) are as follows: `01010101 01010001 01010101 01030101 01010701 01015555 5555AAAA AAAA0101 01010101 FFFFFFFF FFFF8001 80018001 80018001 80`

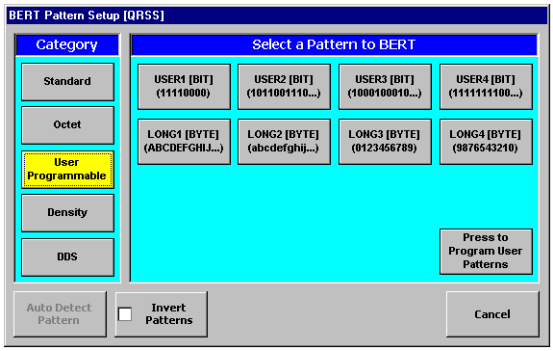
Octet BERT Patterns, continued

Pattern	Description
Oct 55	A 55 octet pattern whose byte values (hex) are as follows: 10000000 10000000 10000000 10000000 10000000 10000000 00000001 10000000 10000000 10000000 10000000 10000000 10000000 11000000 10000000 10000000 10000000 10000000 11100000 10000000 10000000 10000000 10000000 10101010 10101010 10101010 10101010 10101010 10101010 10101010 10101010 10000000 10000000 11000000 10000000 10000000 10000000 11111111 11111111 11111111 11111111 11111111 11111111 00000001 10000000 00000001 10000000 00000001 10000000 00000001 10000000 00000001 10000000 00000001 10000000 This is also known as the Daly pattern.
Oct 72	A 72 octet pattern whose byte values (hex) are as follows: 80808080 01000101 01038001 80010180 01220020 220020AA AAAAAAAA 55555555 AAAAAAAA 55AAAA55 55558080 FFFFFFFF FFFFFFFE FFFF2449 92888888 10420821 84200882 40201080
Oct 96	A 96 octet pattern whose byte values (hex) are as follows: FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF AAAAAAAA 80018001 80018001 80018001 80018001 80018001 AAAAAAAA 80018001 80018001 80018001 80018001 80018001
Oct 120	A 120 octet pattern. The byte values (hex) are as follows: FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF FFFFFFFF AAAAAAAA 10101010 10101010 10101010 10101010 10101010 AAAAAAAA 10101010 10101010 10101010 10101010 10101010

Octet BERT Patterns, continued

Pattern	Description
Daly 55	The 55 octet pattern from T1M1.3. The byte values (hex) are as follows: `01010101 01018001 01010101 01030101 01010701 01010155 555555AA AAAAAA01 01010101 01FFFFFF FFFFFF80 01800180 01800180 018001`
Net 55	A 55 octet pattern. Similar to the Daly pattern, but byte 3 is 03_h and byte 7 is 00_h.

User Programmable Settings

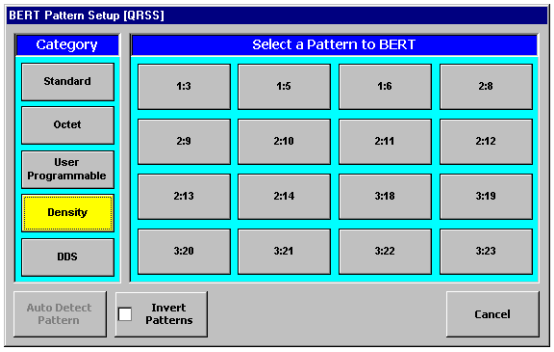


The following table defines the default user-programmable patterns. To change a default pattern, tap the **Press to Program User Patterns** button and enter a 3 to 24 bit pattern.

User-Programmable BERT Patterns

Pattern	Default Setting
USER1 [BIT] ()	1111 0000
USER2 [BIT] ()	1011 0011 1000 1111 0000
USER3 [BIT] ()	1000 1000 1000 1000 1
USER4 [BIT] ()	1111 1111 0000 0000 1111 1111
LONG1 [BYTE] ()	ABCDEFGHIJKLMNOPQRSTUVWXYZ
LONG2 [BYTE] ()	abcdefghijklmnopqrstuvwxyz
LONG3 [BYTE] ()	0123456789
LONG4 [BYTE] ()	9876543210

Density Settings

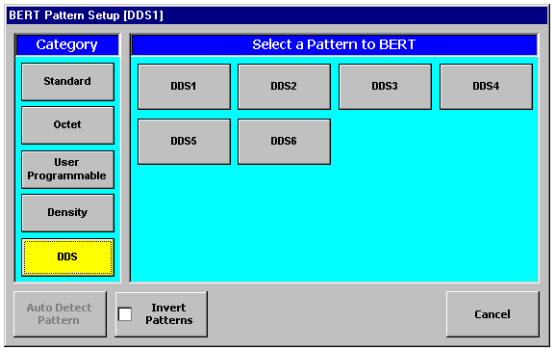


The following table defines the selectable density test patterns.

Density Test Pattern Descriptions

Pattern	Description
1:3	A one-and-three pattern (a single binary 1 and three Os).
1:5	A one-and-five pattern (a single binary 1 and five Os).
1:6	A one-and-six pattern (a single binary 1 and six Os).
2:8–2:14	A two-and-eight pattern (two binary 1s and six Os), and so on.
3:18–3:23	A three-and-eighteen pattern (three binary 1s and fifteen Os), and so on.

Digital Data Service (DDS) Settings



The following table defines the selectable DDS test patterns.

DDS Test Pattern Descriptions

Pattern	Description
DDS1	A repeating pattern of FF 00 hex: 100 octets of 1111 1111 (FF_h), followed by 100 octets of 0000 0000 (00_h). This pattern switches rapidly between maximum and minimum ones density, creating extreme stress on power supplies, timing-recovery circuits, ALBO circuits, and repeater-equalization circuits. DDS1 contains 100 bytes of hex 00 (1,000 binary zeros in a row). Using this pattern on a T1 or DS0 circuit running over AMI line-coded facilities will cause a traffic-affecting failure of that facility.

DDS Test Pattern Descriptions, continued

Pattern	Description
DDS2	A repeating pattern of 7E 00 hex: 100 octets of 0111 1110 ($7E_h$), followed by 100 octets of 0000 0000 (00_h). This pattern switches rapidly between HDLC/SLDC protocol '7E' flags or idles and all zeros, which detects some pattern-sensitivity problems. The 00 portion of the pattern creates extreme stress on timing-recovery, ALBO, and repeater-equalization circuits. DDS2 contains 100 bytes of hex 00 (1,000 binary zeros in a row). Using this pattern on a T1 or DS0 circuit running over AMI line-coded facilities will cause a traffic-affecting failure of that facility. **Note:** Most HDLC/SDLC pattern-sensitivity problems occur when the '7E' flag follows a long string of ones, as in the OCT-55 (T1-6) pattern. To use the OCT-55 pattern on a T1-DDS channel, run a T1 BER test using **Frac T1** or **Drop/Insert** test mode to select the DDS channel.
DDS3	A repeating pattern of 32 hex (0011 0010). This pattern, which runs safely on all DS1 facilities, is a traffic simulator that stresses power supplies and regenerator-switching circuitry with rapid transitions between ones and zeros. It also stresses timing recovery for IBM and bisync protocols. This pattern will not invoke B8ZS on B8ZS-configured facilities.
DDS4	A repeating pattern of 40 hex (0100 0000). This pattern, which runs safely on all DS1 facilities, provides the minimum ones density for a DS0 DDS circuit, and stresses clock-recovery and repeater-equalization circuits. DDS4 is actually a one-and-seven (1:7) or one-in-eight (1:8) pattern—a single binary 1 and seven 0s. However, when DDS patterns are run at DS1 speeds, most test sets do not frame align the pattern, and frame bits may end up in the middle of an octet. To ensure that frame bits fall only on octet boundaries, run a T1 BER test with the 1:7 pattern. Use Frac T1 or Drop/Insert test mode to select the DDS channel, and be sure to observe proper precautions on live T1 circuits. **Note:** When running DDS long patterns, such as DDS5, at low-speed subrates (for example, 2.4 or 4.8 Kb/s), it takes a while for the test set to sync on the pattern

DDS Test Pattern Descriptions, continued

Pattern	Description
DDS5	A combination of DDS stress patterns 1 through 4. This pattern, which runs safely on all DS1 facilities, simulates the transition from IDLE to DATA mode on DDS circuits. It can be used as a work-around for the DS1 two-minute limit on an "all ones" pattern. It is useful for detecting marginal equipment in multipoint applications, and stressing power supplies and ABLO circuits. The pattern is: • 800 bytes DDS1 (100 bytes FF_h and 100 bytes 00_h — four times) • 800 bytes DDS2 (100 bytes $7E_h$ and 100 bytes 00_h — four times) • 200 bytes DDS3 (repeating 32_h pattern) • 200 bytes DDS4 (repeating 40_h pattern) **Note:** DDS5 contains 100 bytes of hex 00 (1,000 binary zeros in a row). Using this pattern on a T1 or DS0 circuit running over AMI line-coded facilities will cause a traffic-affecting failure of that facility.
DDS6	(DS0 6) A repeating pattern of seven bytes of 0111 1111 (7Fh), followed by a single byte of 1111 1111 (FFh). This pattern, which runs safely on all DS1 facilities, simulates the transition from IDLE to DATA mode on DDS circuits. It can be used as a work-around for the DS1 two-minute limit on an "all ones" pattern. It is useful for detecting marginal equipment in multipoint applications and for stressing power supplies and ALBO circuits.

Clocking Source

The **Clocking** button lets you select the type of clocking you want to use.

RCV1: Timing is derived from the RX1 signal.

RCV2: Timing is derived from the RX2 signal.

Internal Clock: Timing is based on the Service Advisor's internal 1.544 MHz oscillator.

Line Build Out (LBO)

The **Build Out** button lets you select the type of line build out you want to use.

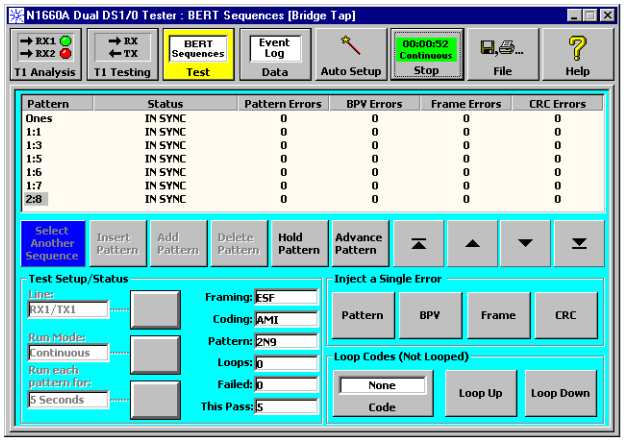
0, -7.5, -15, -22.5 dB: Indicates the attenuation level (in decibels) from a DSX-1 level signal.

0, 266, 399, 533, 655 ft: Indicates the number of feet from the DSX1.

BERT Pattern Sequences Controls

Pattern Sequence and Test Status

The pattern sequence and test status area contains controls for creating user-defined BER test-pattern sequences (see *Running a Customized BERT Sequence*, page 4–20). During a BER test, this area displays the current status of each pattern in the sequence.



Pattern: The name of the current pattern.

Status: The pattern's current or most recent status.

Pattern Errors: The number of bit errors detected during this pattern.

BPV Errors: The number of BPVs detected during this pattern.

Frame Errors: The number of frame errors detected during this pattern.

CRC Errors: The number of CRC (cyclic redundancy checksum) errors detected during this pattern.

Pattern Definition

The pattern definition area contains controls for selecting and defining BERT pattern sequences.

Select Another Sequence: Lets you select BTP, MTP, or create one to four user-defined BERT pattern sequences. See *Configuring BERT Sequences*, page 4–14.

Add Pattern: Lets you add a pattern to the sequence.

Insert Pattern: Lets you select a pattern to insert into the sequence. Inserts the selected pattern above the entry where the cursor is positioned.

Delete Pattern : Deletes the selected test-pattern sequence.

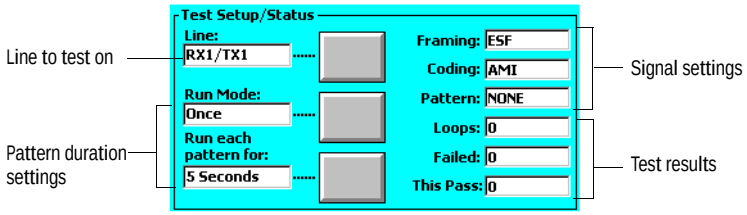
Hold Pattern: Pauses the test on the current test pattern. Click the button again to release the hold and continue with the next pattern in the sequence.

Advance Pattern: Skips immediately to the next test pattern in the sequence.

Cursor movement keys: Moves the cursor up and down through the list.

Test Setup/Status Section

The Test Setup/Status section lets you select the line to run the test on, the test mode and duration, displays the signal settings, and displays test results.



Line: Lets you select the line you want to run the test on.

Run Mode: Lets you select either *continuous* or *once*. *Continuous* runs the selected sequence continuously until the test is stopped. *Once* transmits the selected sequence once

Run each pattern for: Lets you specify the length of time to transmit each pattern in the sequence. You can select between 5 and 300 seconds.

Framing: The framing setting configured on the T1 Testing screen.

Coding: The coding setting configured on the T1 Testing screen.

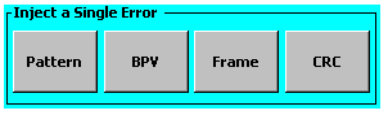
Pattern: The pattern setting configured on the T1 Testing screen.

Loops: The number of times the test-pattern sequence has been run.

Failed: The number of patterns that had at least one error (of any type).

This Pass: The length of time the current test pattern has been running.

Inject Error Buttons



Pattern: Injects logic errors into the BERT payload pattern.

BPV: Injects bipolar violations into the BERT payload pattern. A BPV is a pulse that breaks the alternating polarity rule.

Frame: Injects framing bit errors into the BERT payload pattern. Note that this error is inserted only into those F bits that are used for framing.

CRC: Injects CRC (cyclic redundancy checksum) errors into the BERT payload pattern.

Loop Codes Buttons

See *Loop Code Controls*, page 5–26.

BTP Patterns

A BTP BER test transmits the following patterns, which are useful for detecting bridge taps and other impairments on the T1 circuit.

Patterns Transmitted During the BTP

Transmit Order	Pattern	Transmitted Bits (F=frame bit)
1	All Ones	F1111
2	1:1	F0101
3	1:3	F0100
4	1:5	F0100 00
5	1:6	F0100 000
6	1:7	F0100 0000
7	2:8	F1100 0000 00
8	2:9	F1100 0000 000
9	2:10	F1100 0000 0000
10	2:11	F1100 0000 0000 0
11	2:12	F1100 0000 0000 00
12	2:13	F1100 0000 0000 000
13	2:14	F1100 0000 0000 0000
14	3 in 18	F1101 0000 0000 0000 00

Patterns Transmitted During the BTP, continued

Transmit Order	Pattern	Transmitted Bits (F=frame bit)
15	3 in 19	F1100 1000 0000 0000 000
16	3 in 20	F1100 1000 0000 0000 0000
17	3 in 21	F0100 0100 0000 0000 0000 1
18	3 in 22	F0100 0100 0000 0000 0000 10
19	3 in 23	F0100 0100 0000 0000 0000 100
20	3 in 24	F0100 0100 0000 0000 0000 0100
21	QRSS	2^{20}–1 Pseudorandom with 15 zeros suppression

Note: An Interpattern Advance Byte code (F1111 1010) is transmitted between each pattern in the BTP test, allowing two test sets to sync on the transmitted pattern.

MTP Patterns

An MTP BER test transmits the following patterns, which are useful for qualifying T1 circuits and performing acceptance testing.

Patterns Transmitted during the MTP

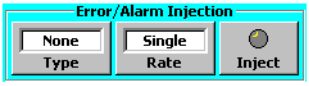
Transmit Order	Pattern	Pattern Makeup
1	All ones	F1111
2	1:8	F0100 0000
3	2:8	F1100 0000 00
4	3 in 24	F0100 0100 0000 0000 0000 0100
5	QRSS	2^{20}– 1 pseudorandom bit sequence with 15 zeros suppression

Note: An Interpattern Advance Byte code (F1110 1110) is transmitted between each pattern in the MTP test, allowing two test sets to sync on the transmitted pattern.

Error/Alarm Injection

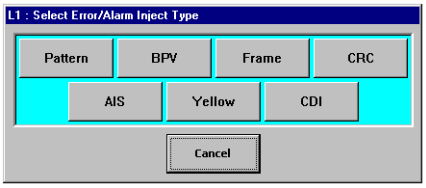
This section describes the types of alarms/errors and the rate at which you want to inject errors into the BERT payload pattern. The settings are grouped by button names.

To inject errors, select the type of error and the rate at which you want to inject an error, and then tap the **Inject** button. The inject indicator (on the Inject button) lights while the Service Advisor injects an error into the BERT payload pattern.



Error/Alarm Types

The **Type** button, on the T1 Testing screen lets you select the type of error you want to inject into the T1 transmit signal.



Pattern: Injects logic errors into the BERT payload pattern.

BPV: Injects bipolar violations into the BERT payload pattern. A BPV is a pulse that breaks the alternating polarity rule.

Frame: Injects framing bit errors into the BERT payload pattern. Note that this error is inserted only into those F bits that are used for framing.

CRC: Injects CRC (cyclic redundancy checksum) errors into the BERT payload pattern.

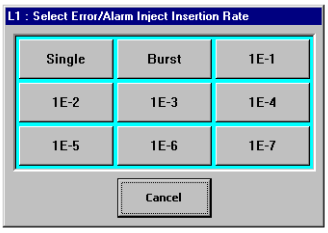
AIS: Injects an Alarm Indication Signal (an unframed all-ones pattern) in the T1 transmit signal.

Yellow: Injects a Yellow alarm in the T1 transmit signal. For D4 (SF), the alarm is transmitted in bit 2 of the DS0; for ESF, the alarm is an alternating $00FF_h$ pattern transmitted in the facility datalink (FDL).

CDI: Injects a Customer Disconnect Indicator alarm in the T1 transmit signal to indicate that the NIU (network interface unit) at the customer's site is not receiving a signal from a previously connected piece of T1 equipment.

Error Injection Rate

The **Rate** button lets you specify how often to generate the error.



Single: Injects a single error into the BERT payload pattern when you tap the **Inject** button.

Burst: Injects between 1 and 9,999 errors when you tap the **Inject** button on the T1 Testing screen.

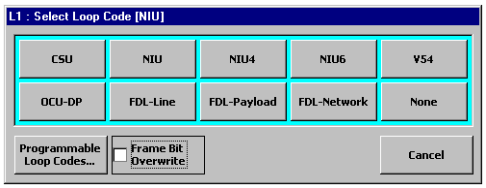
When you tap the **Burst** button, a popup screen appears. Enter the number of errors (1 through 9,999) you want to inject as a burst of errors.

1E-1 through 1E-7: Injects errors into the BERT payload pattern at the selected rate. For example, 1.E–3 is 1×10^{-3}, or 1 bit error every 1,000 bits.

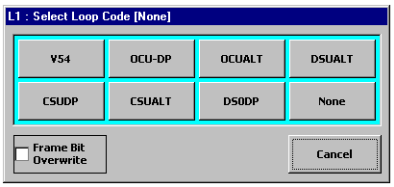
Loop Code Controls

The Loop Codes area controls T1 loopback capabilities. The Service Advisor can transmit several types of codes to activate and deactivate loopback at the far-end equipment.

The **Code** button lets you select the type of loopback code you want to use. Note that the following screen appears when you tap the **Codes** button on the Bert Sequences screen. The **Codes** screen displayed from the T1 Testing screen does not have the OCU-DP and None options.



The following **Codes** screen appears when you have configured DDS BERT settings.



Default Loop-up and Loop-down Settings

The following table lists the default bit sequence for each loop code type.

Loop Code Definitions

Loop Code Type	Default Loop-Up Code	Default Loop-Down Code
CSU (DS1 in-band)	1000 0	100
NIU (DS1 in-band)	1100 0	1110 0

Loop Code Definitions, continued

Loop Code Type	Default Loop-Up Code	Default Loop-Down Code
NIU4 (DS1 in-band)	1100	1110
NIU6 (DS1 in-band)	1000 00	1100 00
V54 (DS0 in-band) Note that these loop-codes operate on selected FT1 channels.	Standard ITU-T V.54 loopback. This selection uses in-band signaling to activate/deactivate CSU/DSU loopback, as specified in ANSI T1.403, Annex B.	
OCU-DP (DS0 in-band)	When you choose this setting, if the OCU-DP (office channel unit dataport) receives a CSU loop code, it reverses the sealing current of the line, causing a loopback of the CSU at the customer premises.	
OCUALT	Alternating loopback of the office channel unit (OCU), which is useful for isolating the central office from the local loop.	
DSUALT	Alternating loopback of the digital service unit (DSU).	
CSUDP	Latching loopback of the CSU.	
CSUALT	Alternating loopback of the channel service unit (CSU)	
DSODP	Loopback of the DS0 dataport. This type of loopback is useful for isolating a hub office from an end office.	
FDL-Line (out-of-band)	0000 1110 1111 1111	0011 1000 1111 1111
FDL-Payload (out-of-band)	0001 0100 1111 1111	0011 0010 1111 1111
FDL-Network (out-of-band)	0001 0010 1111 1111	0010 0100 1111 1111
LCI1 (user-programmable in-band)	1100	1100
LCI2 (user-programmable in-band)	00111100	00111100
LCI3 (user-programmable in-band)	1010 010 1010 1010	1010 010 1010 1010
LCI4 (user-programmable in-band)	1111 1111 0000 0000	1111 1111 0000 0000
LCO1 (user-programmable out-of-band)	0101 0100 1111 1111	0101 0100 1111 1111
LCO2 (user-programmable out-of-band)	0010 1010 1111 1111	0010 1010 1111 1111

Loop Code Definitions, continued

Loop Code Type	Default Loop-Up Code	Default Loop-Down Code
LCO3 (user-programmable out-of-band)	0111 0000 1111 1111	0111 0000 1111 1111
LCO4 (user-programmable out-of-band)	0000 1110 1111 1111	0000 1110 1111 1111
OCUALT	Alternating loopback of the office channel unit (OCU), which is useful for isolating the central office from the local loop.	

Frame Bit Overwrite

Tap the **Frame Bit Overwrite** button if you want to overwrite framing bits with the selected loop code.

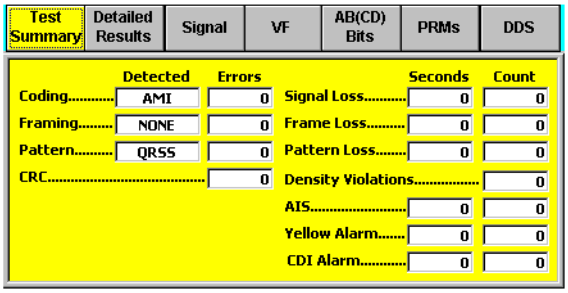
Loop Up/Down Buttons

Loop Up: Transmits the selected type of loop-up codes to activate loopback.

Loop Dn: Transmits the selected type of loop-down codes to deactivate loopback.

Test Summary Tab

The Test Summary tab displays configuration information about the currently selected T1 line, as well as a summary of test results.



Coding: The current line code setting, and the number of coding errors detected.

Framing: The current framing format, and the number of framing errors detected

Pattern: The current payload pattern setting, and the number of BERT pattern errors detected.

CRC: The number of CRC errors detected (ESF format only).

Signal Loss: The number of one-second intervals during which at least one loss of signal (LOS) event occurred, and the number of LOS detected during the test.

Frame Loss: The number of seconds when at least one frame sync loss event occurred, and the number of frame synchronization loss events detected. A frame loss event is declared when two out of five frame bits are errored.

Pattern Loss: The number of seconds (since start of test) the Service Advisor was not synchronized on the receive signal pattern, and the number of times the Service Advisor lost synchronization with the receive signal pattern.

Density Violations: The number of ones-density violations. A ones-density violation is declared when more than 15 consecutive zeros are received, or when the ones-density drops below 12.5%. (Every 8×(N+1) bits must contain at least N ones, where N can be 1 through 23.)

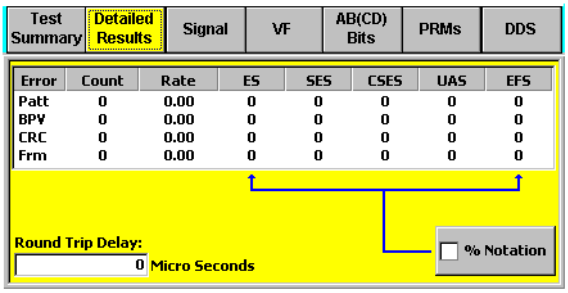
AIS: The number of one-second intervals during which at least one AIS event occurred, and the number of AIS errors detected during a test.

Yellow Alarm: The number of one-second intervals during which at least one Yellow alarm event occurred, and the number of Yellow alarms detected during a test. With D4 (SF), a Yellow alarm is indicated when bit 2 of each DS0 has been zero for 255 consecutive channels. With ESF, a Yellow alarm is indicated when the FDL contains an alternating 00FF hex pattern.

CDI Alarm: The number of one-second intervals during which at least one Customer Disconnect Indicator event occurred, and the number of CDIs detected during a test.

Detailed Results Tab

The Detailed Results tab displays BERT error counts for the currently selected T1, as described in the following table.



BERT Error Count Descriptions

Type of Error	Result	Description
Pattern (BERT)	Count	The number of receive pattern bits that did not match the selected pattern.
	Rate	The ratio of errored pattern bits to total number of pattern bits received, since the beginning of the test.
	Errored Seconds (ES)	The number of seconds during which at least one pattern bit error occurred.
	Severely Errored Seconds (SES)	The number of seconds during which the error rate was 10^{-3} or greater.
	Consecutive Severely Errored Seconds (CSES)	The number of SESs for which the previous two seconds were also SESs.
	Unavailable Seconds (UAS)	Number of seconds the circuit was unavailable while errors were being monitored.
	Error-free Seconds (EFS)	The total number of seconds during which no pattern error occurred.

BERT Error Count Descriptions, continued

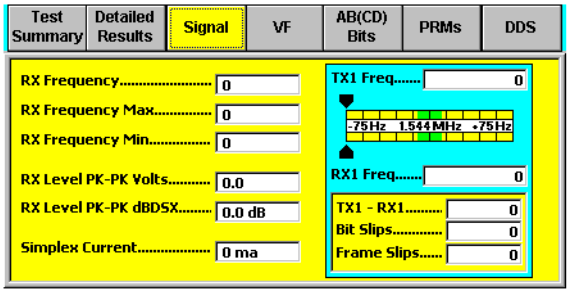
Type of Error	Result	Description
BPV (bi-polar violation)	Count	The number of BPVs detected.
	Rate	The ratio of BPVs to the number of bits received.
	ES	The number of seconds during which at least one BPV occurred.
	SES	BPV severe errored seconds.
	CSES	The number of SESs for which the previous two seconds were also SESs.
	UAS	Number of seconds the circuit was unavailable while errors were being monitored.
	EFS	The number of seconds during which no BPVs occurred.
CRC (cyclic redundancy checksum)	Count	The number of CRC-6 errors detected (ESF format only).
	Rate	The ratio CRC-6 errors over the total number of ESF frames received.
	ES	The number of seconds during which at least one CRC error occurred.
	SES	CRC severe errored seconds
	CSES	The number of SESs for which the previous two seconds were also SESs.
	UAS	Number of seconds the circuit was unavailable while errors were being monitored.
	EFS	The number of seconds during which no CRC errors occurred.

BERT Error Count Descriptions, continued

Type of Error	Result	Description
Frame	Count	The number of frame bit errors detected.
	Rate	The ratio of errored framing bits to the total number of framing bits received.
	ES	The number of seconds during which at least one frame bit error occurred.
	SES	Frame severe errored seconds
	CSES	The number of SESs for which the previous two seconds were also SESs.
	UAS	Number of seconds the circuit was unavailable while errors were being monitored.
	EFS	The number of seconds during which no frame errors occurred.
Round Trip Delay		The round-trip delay of a looped-back transmit signal. Round-trip delay is the amount of time it takes the transmit signal to reach the far end and return. This measurement is available only when you have configured the 2^15, 2^20, 2^23 or QRSS pattern.

Signal Tab

The Signal tab displays detailed signal measurements for the currently selected receive T1 signal.



Signal Measurement Descriptions

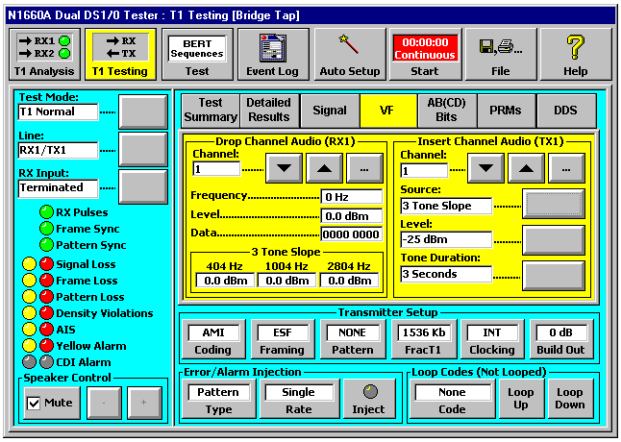
Result	Description
Rx Frequency	The current receive frequency, in Hertz.
Rx Frequency Max	The highest received frequency (Hertz) since the start of the test.
Rx Frequency Min	The lowest received frequency (Hertz) since the start of the test.
Rx Level PK-PK Volts	The current signal level, in Volts peak-to-peak.
Rx Level PK-PK dBDSX	The current signal level in decibels referenced to DSX-1 level.
Simplex Current	The receiver current (in mA), which results from a DS1 signal voltage on the selected line.
TX1/RX1 Frequency	Shows the frequency of the transmit and receive T1 signal (in MHz) on the line. The dynamic pointers in the middle of the display fields move to graphically show the frequency of the signals. Color coding indicates whether the signal is acceptable: green (good), yellow (acceptable), and red (unacceptable).
TX1 - RX1	The frequency difference between both transmit lines (TX1 minus TX2). A positive number indicates TX1 is running faster than TX2; a negative number indicates TX1 is running slower than TX2.

Signal Measurement Descriptions, continued

Result	Description
Bit Slips	The number of individual timeslot differences between the receive signal and the reference signal. A positive value indicates the receive frequency is greater than the reference frequency; a negative value indicates the receive frequency is less than the reference frequency.
Frame Slips	The number of times a difference of 193 timeslots (bits) occurred between the receive signal and the reference signal. The (+) count indicates frame slips when the receive signal was faster than the reference signal; the (–) count indicates when the receive signal was slower than the reference.

VF Tab

The VF (Voice Frequency) tab enables you to drop voice frequency (VF) channels to the Service Advisor's speaker for audio monitoring, and to insert tones on a channel in the T1 circuit. See *Setting the Voice Frequency Audio Controls*, page 4–28.



The three display fields in the *Drop Channel Audio* section of the VF tab are described below. To display values for the different channels, tap the ▲ and ▼ buttons and the ··· button to select a channel number. To select a line, tap the **Line** button (on the left side of the screen) until the desired line appears in the display (see page 4–4).

Frequency display: Shows the receive frequency (in Hertz) for the selected channel.

Level display: Shows the receive level (in dBm) for the selected channel.

Data display: Shows the data on a selected channel (1-24) on the selected Line (RX1/TX1 or RX2/TX2). The data is shown eight bits at a time, and is continuously updated.

3 Tone Slope display: Shows the receive level (in dBm) for the selected channel detected at the 404, 1004, and 2804 Hertz levels.

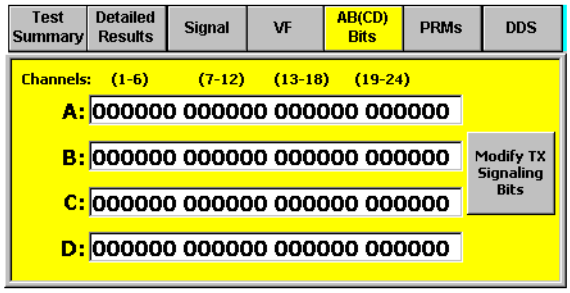
Source button: Lets you set the frequency of the tone you want to insert into a channel.

Level button: Lets you enter the level of the tone (-35 to 3 dBm) you want to transmit over the T1 line.

Tone Duration button: Lets you set the amount of time (1 to 9,999 seconds) you want to send the configured tone over the T1 line. The tone duration is only used for the three tone slope test.

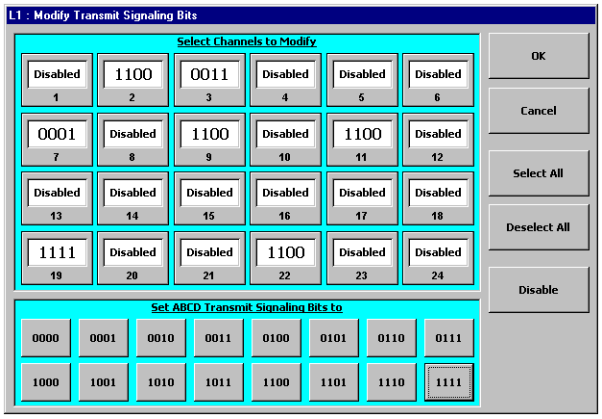
AB(CD) Bits Tab

The AB(CD) Bits tab lets you view the signaling bits set for all 24 channels on a T1 line. To display values for the different lines, tap the **Line** button (on the left side of the screen) until the desired line appears. You'll see the values appear for the selected line.



Modify Transmit Signaling Bits Screen

The Modify Transmit Signaling Bits screen lets you modify the displayed bit patterns. This screen appears when you tap the **Modify TX Signaling Bits** button on the AB(CD) Tab screen.



Channel buttons: Tap the channel buttons for the channels you want to transmit signaling bits over. You can select multiple channels and apply the same bit pattern to these selected channels.

Bit pattern button : Sets the bit pattern for all selected (yellow) channels.

OK button: Saves the bit pattern settings.

Cancel button: Returns you to the T1 Testing screen and does not save any bit pattern changes.

Select All button: Selects all 24 channels.

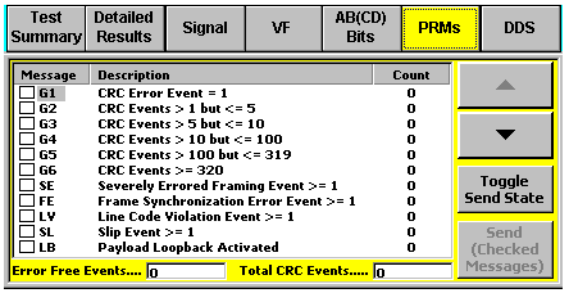
Deselect All button: Lets you start your selection again.

Disable button: Indicates that you do not want to transmit signaling bits over the selected channel(s).

The configured signaling bits are sent out on the appropriate channels while a test is running.

PRMs Tab

The PRMs tab displays counts for various error events, and lets you select and transmit a PRM message while a test is running.



Message and Descriptions column: Lists the PRMs you can transmit.

Count: Shows the number of times the message was detected during a test.

Error Free Events: shows the number of events during which no errors occurred.

Total CRC Events: shows the total number of CRC errors received during a test.

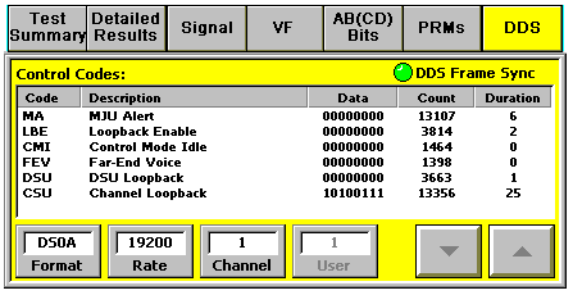
Up and Down cursor movement buttons: Moves the cursor up and down through the list of messages.

Toggle Send State: Selects or deselects a message in the list.

Send (Checked Messages) button: Transmits the selected messages over the selected T1 line.

DDS Tab

The DDS tab displays information about the RX DDS control codes on the selected DDS channel.



DDS Frame Sync: (DS0-B format only) Lights to indicate the tester has synchronized to the framing format on the DDS channel.

Code: The name of the control code.

Description: A description of the control code.

Data: The control code, in binary format.

Count: The number of time this control code has been detected.

Duration: The number of seconds this control code has been present on the channel.

For information about running a DDS BERT test, including a description of the **Format**, **Rate**, **Channel**, and **User** buttons, see *Configuring a Digital Data Service (DDS) BER Test*, page 4–11.

6

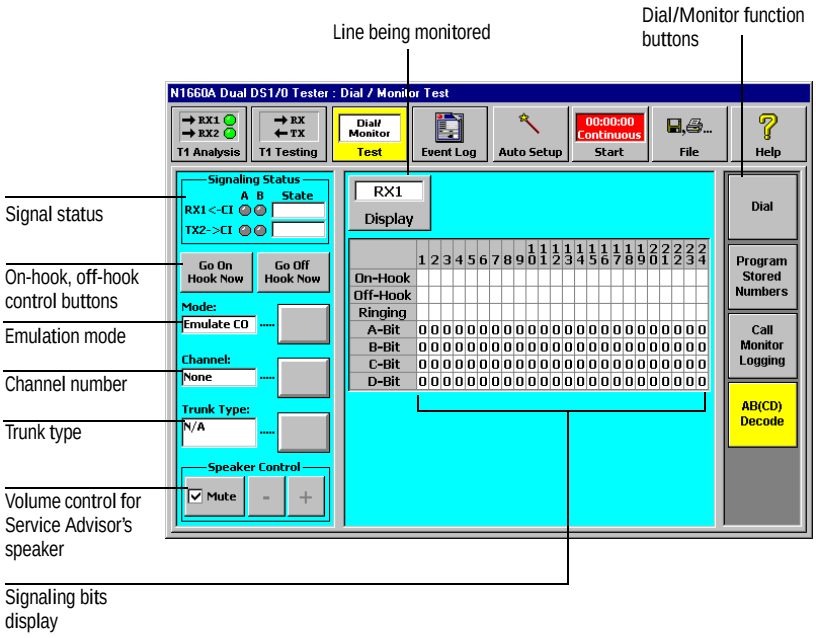
Using the Signaling Option (010)

Activating the Signaling Option

If you purchased the Signaling Option 010 for your tester, follow the procedure described in the user's manual supplement (N1660-90001) shipped with your module. This option lets you use the Dial/Monitor option to enter, monitor, and display dialing information for T1 channels.

Monitoring Channel Status

To access the main Dial/Monitor screen, tap the **Test** toolbar button and select the **Dial/Mon** option. The following screen appears.

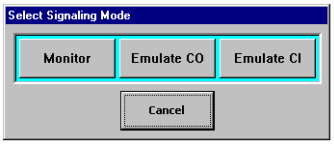


The AB(CD) Decode option lets you view the signaling bits of the 24 channels on the selected receive T1 line, in both directions. You use the monitor channel status option to:

- observe on-hook and off-hook status
- observe ringing detection
- observe ABCD signaling bit status

Follow these steps to use the monitor channel status feature.

1. Tap the **AB(CD) Decode** button on the main Dial/Monitor Test screen.
2. Tap the **Display** button and select the line you want to monitor (see screen on previous page). In Drop/Insert test mode, the lines are defined as follows:
   - RX1–from the CI, RX2–from the CO
   - RX1– from the CO, RX2–from the CI
3. Tap the **Mode** button to select the signaling mode.

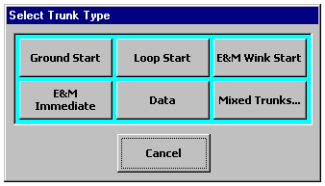


Monitor: indicates you want to monitor the signaling bits on all 24 channels on the selected receive T1 line (see **Display** button), in both directions. In this mode, you cannot use the **Dial**, **On Hook**, or **Off Hook** buttons.

Emulate CO: indicates you want to monitor the signal being transmitted from the CO to the CI and the signal being sent from the CI to the CO.

Emulate CI: indicates you want to monitor the signal being transmitted from the CI to the CO and the signal being sent from the CO to the CI.

4. Tap the **Trunk** button, and select the desired trunk type. Each trunk type has its own signaling bit scheme to represent on-hook, off-hook, and ringing signals.



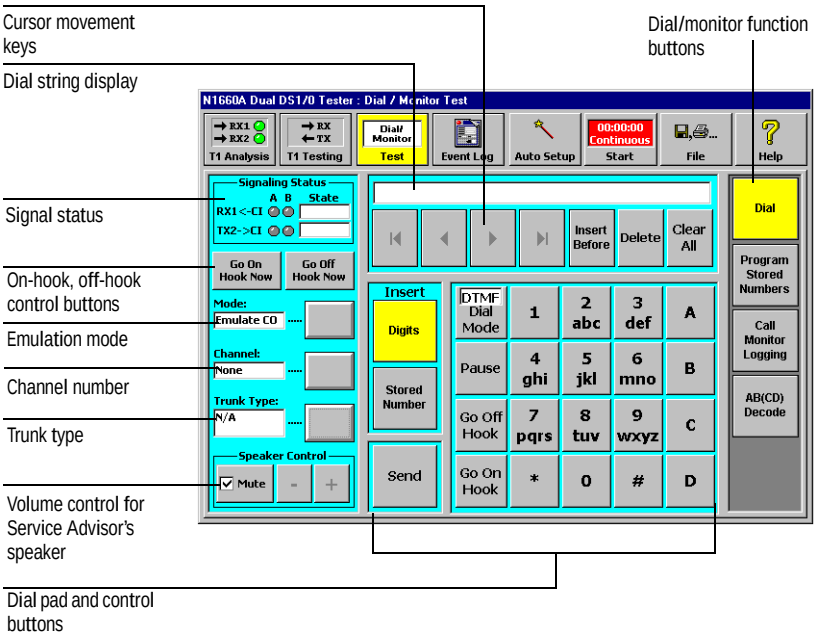
5. View the signaling bits display area.

   - *On-Hook, Off-Hook, and Ringing* rows display a telephone icon that shows the current status of each channel, as determined by the signaling bits for the selected trunk type.
   - *ABCD Signaling Bit* rows show the binary state (1 or 0) of that channel's signaling bits. C and D bits are applicable for ESF framing format only.

Entering a Dial String

The **Dial** button lets you enter a dial string that you can listen to on a handset connected to the test module, a headset connected to the Service Advisor platform, or through the Service Advisor's audio speaker.

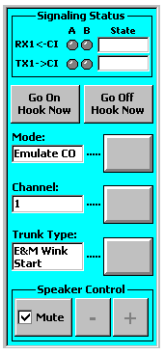
This section explains how to configure the signal transmission settings, the dial string, and the line and channel to monitor. When you tap the **Dial** button on the Dial/Monitor Test screen, the following screen appears:



Configuring Trunk Type and Signaling Direction

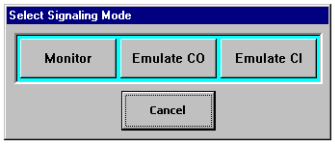
Follow these steps to configure the channel on RX1/TX1 (line 1) to transmit the dial string over, the type of trunk the Service Advisor is connected to, and the circuit side on which to transmit the signal generated by the Service Advisor.

The Dual DS1/0 Test module is designed to always send the entered dial string on RX1/TX1 (line 1). If you are in Drop and Insert test mode, line 1 is RX1/TX2.



1. Connect one of the following to a Service Advisor platform:
   - a handset to L1 (RX1/TX1) on a Dual DS1/0 Test module (see *The Dual DS1/0 Test Module (N1660A) at a Glance*, page 1–2)
   - a headset to the Service Advisor platform (see the manual shipped with the Service Advisor platform)
   - a headset to the Service Advisor Undercradle (see the manual shipped with the Undercradle)
2. Tap the **Mode** button on the main Dial/Monitor Test screen to select the signaling direction. The signaling mode indicates the circuit side on which to transmit the signal generated by the Service Advisor. To enter a dial string, you must select either **Emulate CO** or **Emulate CI**.

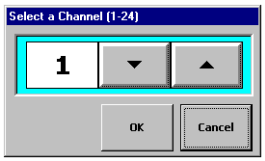
If you tap the **Monitor** button, the **Dial** button becomes inactive (grayed-out).



Emulate CO – indicates that you want to emulate the central office and transmit the dial string to the customer's site.

Emulate CI – indicates that you want to emulate the customer's site and transmit the dial string to the central office.

3. Tap the **Dial** function button on the right side of the screen.
4. Tap the **Channel** button, and select the DS0 channel you want to dial on from the popup screen.

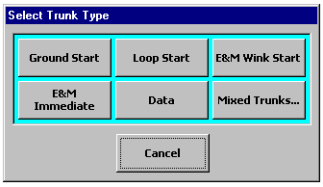


- Tap the ▲ and ▼ buttons to increase or decrease the displayed channel by one.
- Tap **OK** to save your channel selection and return to the previous window. Tap **Cancel** to return to the previous screen without changing the channel.

5. Tap the **Trunk Type** button.

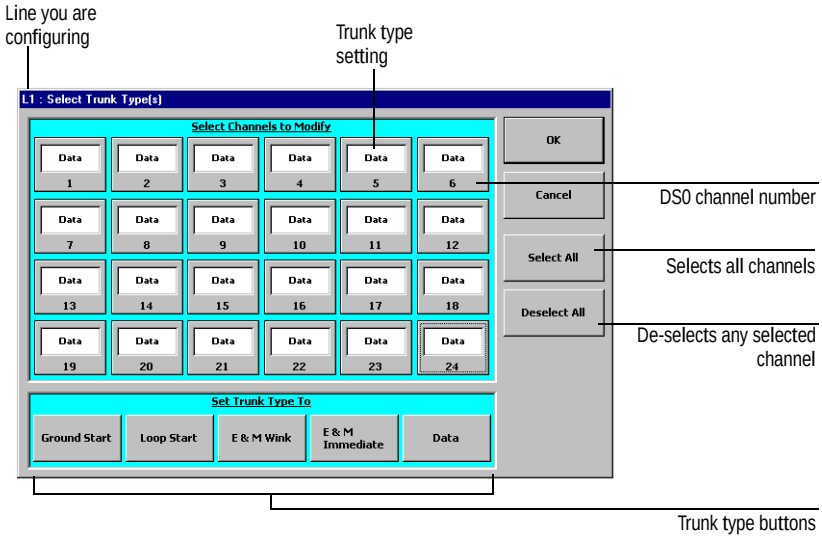
   The Service Advisor uses the trunk type setting to make sure that it inserts the signaling bits properly. Each trunk type has its own signaling bit scheme to represent on-hook, off-hook, and ringing signals.

6. Tap one of the trunk type buttons. This sets the trunk type for all 24 channels to the same value. Tap the **Mixed Trunks** button to set the trunk type for each channel individually.



Note: When you shut down the tester using the File toolbar button and the Exit option, the trunk type settings are saved in the module's flash memory.

7. If you tapped the **Mixed Trunks** button, the following screen appears.



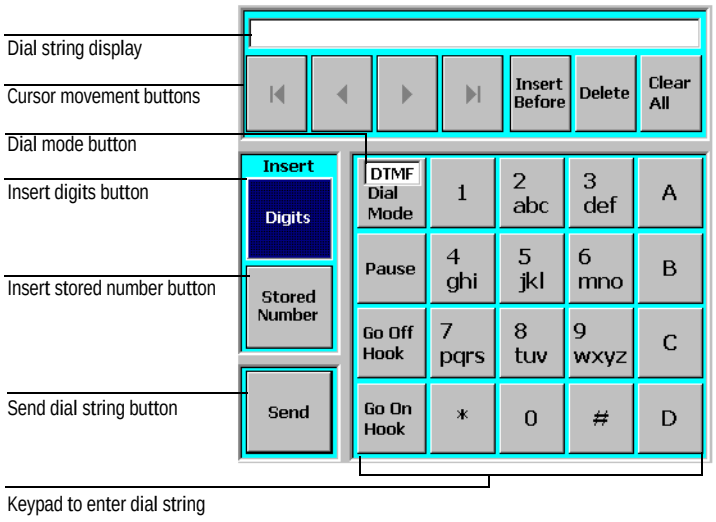
- Tap a channel button (1 - 24). The selected channel button turns yellow.
- Tap one of the trunk type buttons. You'll see the selected trunk type appear in the selected channel's display.

- Tap the **Select All** button if you want to set all or most of the channels to the same trunk type. Tap the **Deselect All** button to de-select the selected (yellow) channel buttons.
- Tap **OK** to save the trunk types set for each channel.
- Tap the **Cancel** button to cancel your selections and return to the main Dial/Monitor Test screen.

Entering and Sending a Dial String

After you set the signaling mode, the channel, and trunk type on the left side of the main Dial/Monitor Test screen (see *Configuring Trunk Type and Signaling Direction*, page 6–6), you enter the dial string you want to send on the configured line and channel.

Follow these steps to enter the dial string you want to send on the displayed channel.



1. Tap the **Digits** button on the main Dial/Monitor Test screen.
2. Tap the **Dial Mode** button until the desired mode appears. *Modes are:* DTMF, MF, and DP.

3. Enter the desired dial string using the displayed keypad. A dial string can be 1 to 32 digits in length.

   DTMF Dial Mode Keys: 0 to 9, A to D, asterisk (*), and pound sign (#)

   MF Dial Mode Keys: 0 to 9, KP, ST, STP, ST2P, and ST3P

   DP Dial Mode Keys: 0 to 9

   Use the cursor movement buttons to modify your entry.

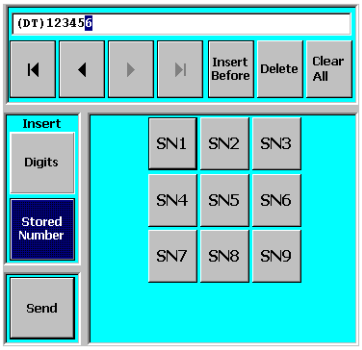
Dial Mode Cursor Movement Keys

Button	Description
	Moves the cursor to the first digit or code in the dial string.
	Moves the cursor one digit or code to the left.
	Moves the cursor one digit or code to the right.
	Moves the cursor to the end of the dial string.
	Inserts the key you tapped before the cursor.
	Deletes the preceding digit or code.
	Clears the entry from the display.

4. Tap the **Pause** button to insert a pause code in the dial string.
5. Tap the **Go Off Hook** button to insert a [GoOffHook] code in the dial string.

6. Tap the **Go On Hook** button to insert a [GoOnHook] code in the dial string.

7. Tap the **Stored Number** button to select a stored dial string.



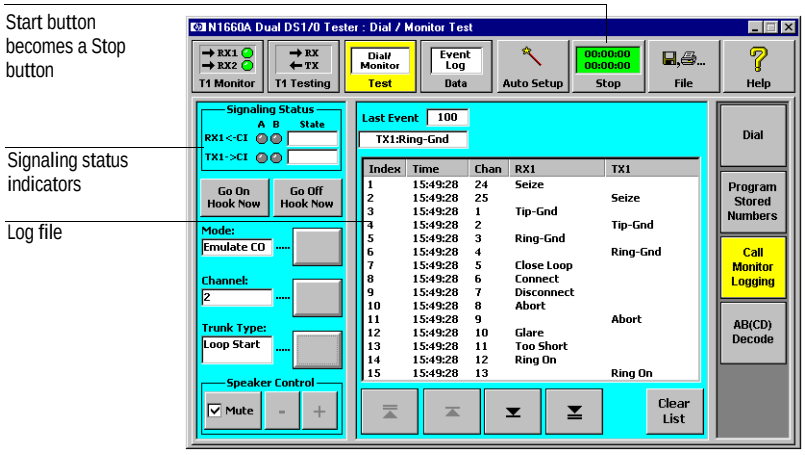
Tap one of the stored number (SN1 – SN9) buttons and the stored dial string appears in the display. If no dial string appears, there is no dial string associated with the button. For more information about saving dial strings, see *Programming and Sending Stored Numbers*, page 6–13.

8. Tap the Speaker Control **-** or **+** button to decrease or increase the volume of the audio speaker on the Service Advisor. To mute the sound for a T1 line (RX1/TX1 or RX2/TX2) tap the **Mute** button; you'll see a check-mark appear in the button.

9. Tap the **Send** button to send the displayed dial string over the T1 circuit.

   When the dial string is sent over the T1 circuit,

   - the Signaling Status indicators light when the CI or CO ends of the circuit go on-hook or off-hook
   - the Call Monitor Logging file automatically appears (see *Viewing a Call Monitor Log File*, page 6–15)
   - the **Start** toolbar button become a **Stop** button

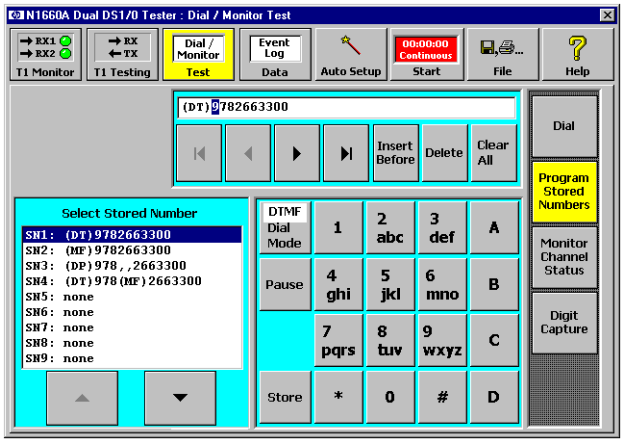


10. To stop sending a dial string, tap the **Stop** toolbar button.

Programming and Sending Stored Numbers

Follow these steps to enter, save, and send dial strings. You can define and save up to nine dial strings.

1. Tap the **Program Stored Numbers** button on the main Dial/Monitor Test screen.
2. Highlight a selection (**SN1** through **SN9**) in the Select Stored Number section of the screen. Use the ▲ or ▼ arrow to scroll through the list.



3. Tap the **Dial Mode** button until the desired mode appears. *Modes are:* DTMF, MF, and DP.
4. Enter the desired dial string using the displayed keypad. The dial string can be 1 to 32 digits in length.

   DTMF Dial Mode Keys: 0 to 9, A to D, asterisk (*), and pound sign (#)

   MF Dial Mode Keys: 0 to 9, KP, ST, STP, ST2P, and ST3P

   DP Dial Mode Keys: 0 to 9

   Use the cursor movement buttons to modify your entry (see *Dial Mode Cursor Movement Keys*, page 6–10 for a description of each key).
5. Tap the **Pause** button to insert a pause code in the dial string.
6. Tap the **Store** button to save the displayed dial string.

7. To send a stored dial string, tap the **Dial** function button. The selected stored dial string appears in the display.
8. Tap the **Send** button to send the displayed dial string over the T1 circuit.

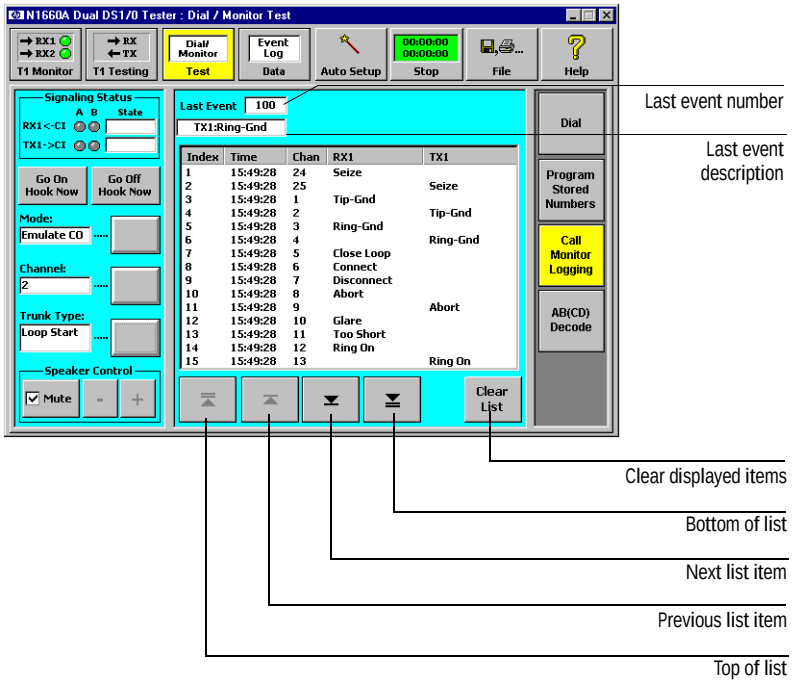
   When the dial string is sent over the T1 circuit,

   - the Signaling Status indicators light when the CI or CO ends of the circuit go on-hook or off-hook
   - the Call Monitor Logging file automatically appears (see *Viewing a Call Monitor Log File*, page 6–15)
   - the **Start** toolbar button become a **Stop** button
9. To stop sending a dial string, tap the **Stop** toolbar button.

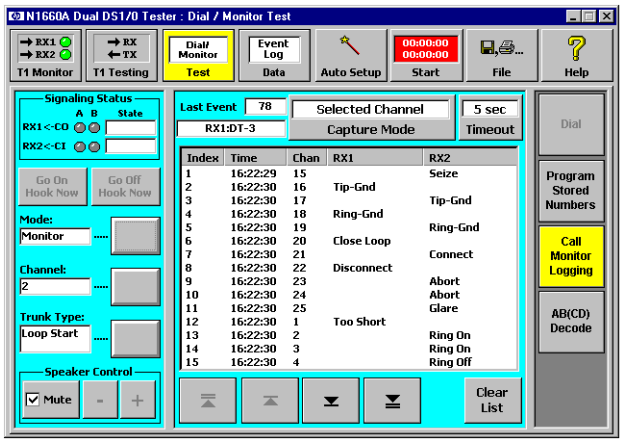
Viewing a Call Monitor Log File

This section explains how to use the log feature to view the dialing information the test set is inserting into a DS0 channel. You can also use this feature to monitor a single channel in both directions, or to scan the T1 for DS0s going off-hook.

1. Tap the **Call Monitor Logging** button on the main Dial/Monitor Test screen. If the signaling mode is set to Emulate CO or CI, the following screen appears.



If the signaling mode is set to Monitor, the following screen appears.

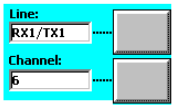


- Tap the **Capture Mode** button to select the desired mode.

  Selected Line and Channel: captures dialing information for the displayed Line and Channel. When you select this capture mode, configure the Line and Channel you want to scan and monitor. In Drop/Insert test mode, the lines are defined as follows:

  RX1–from the CI, RX2–from the CO

  RX1– from the CO, RX2–from the CI



  Scan, Monitor until hangup: scans and captures information for all 24 channels on the selected line, until a hangup is detected. RX1/TX1 line selection indicates from CI to CO, and RX2/TX2 indicates from CO to CI.

  Scan, Monitor until timeout: scans and captures information for all 24 channels on the selected line, until the timeout has expired. See the next step.

- Tap the **Timeout** button to select the amount of time you want the Service Advisor to "hang" online after the call setup digits are received. *Options are*: 5 sec, 10 sec, 15 sec, 30 sec, and 60 sec.

2. Tap the **Clear List** button if information appears in the captured dialing information display area.
3. Tap the **Start** toolbar button to begin monitoring the configured line and channels.

Note: The Start button becomes a Stop button. After you start monitoring, tap the Stop button to stop monitoring the line.

4. Use the arrow buttons to move through the list (refer to the screen on the previous page). The display area lists all the events that occur on the specified line and channel(s).

   Index: A sequential number assigned to each event.

   Time: The time of day for each event. The time stamp is based on the Service Advisor's internal time-of-day clock.

   Chan: The channel on which the event occurred.

   RX1/RX2: A description of the event that occurred on the line.

   TX1/TX2: A description of the event that occurred on the line.

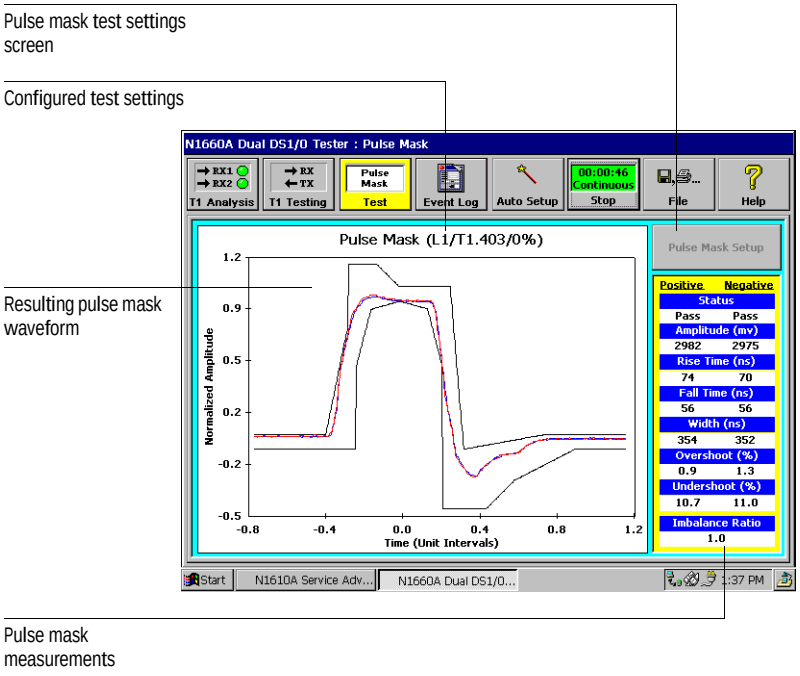
7

Using the Pulse Mask Option (020)

Using the Pulse Mask Screen

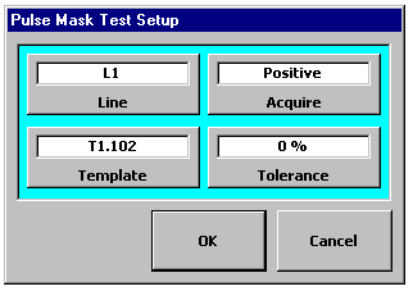
If you purchased the Pulse Mask Option (020) for your tester, you will see a Pulse Mask option when you tap the **Test** toolbar button. The Pulse Mask testing feature lets you evaluate the shape of a received DS1 pulse (a positive or negative pulse represents a binary 1) and compare it to one of a set of standardized *masks*.

A *pulse mask* is a standardized range defining the boundaries of an ideal waveform shape.



To use the Pulse Mask screen, follow these steps.

1. For more reliable test results, tap the **T1 Testing** toolbar button. Tap the **Framing** button and select *None*. Then tap the **Pattern** button and select the *Standard 1:7* pattern (see *Chapter 4* for more information).
2. Tap the **Test** toolbar button and select the **Pulse Mask** option.
3. Tap the **Pulse Mask Setup** button on the Pulse Mask screen.



4. Tap the **Line** button to select *L1* or *L2* to indicate which line you want to run the pulse mask test on.
5. Tap the **Acquire** button to select the *Positive, Negative,* or *Positive & Negative* voltage pulse. The value you select (shown in the button's display field), determines whether the test set evaluates a received positive voltage pulse (**Positive**), negative voltage pulse (**Negative**), or both (**Positive & Negative**).
6. Tap the **Template** button to select the pulse mask to be used for the pulse mask test. The available choices are:

   None: No mask is used. Mask fit and imbalance results are not applicable, but other results are still valid.

   T1.102: Pulse mask as defined by ANSI specification T1.102.

   T1.403: Pulse mask as defined by ANSI specification T1.403.

   G.703: Pulse mask as defined by the proposed update to ITU-T recommendation G.703 (DS3 Electrical Interface Spec. T1X1.4/95-013).

   PUB 62411: Pulse mask as defined by the Bellcore specification *62411*.

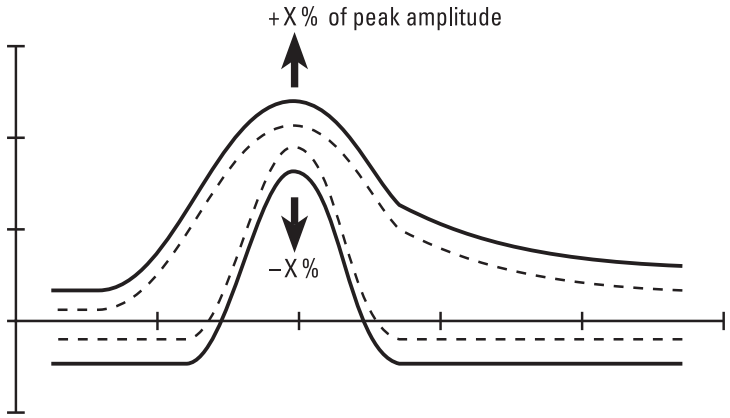
7. Tap the **Tolerance** button to select a *0%*, *3%*, or *6%* adjustment to the selected pulse mask specification.

   0%: The selected mask specification is not adjusted.

   3%: The selected mask specification is offset ±3 percent of the peak amplitude (see figure).

   6%: The selected mask specification is offset ±6 percent of the peak amplitude (see figure).

Pulse Mask Tolerance Adjustment



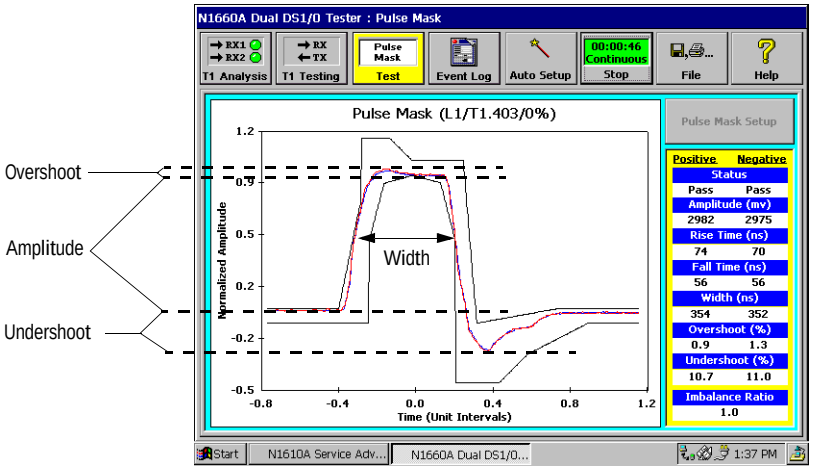
8. Tap **OK** to save the settings and return to the previous screen.

   If you tap the **Cancel** button, no settings are changed and you return to the Pulse Mask screen.

9. Tap the **Start** toolbar button to start a pulse mask test.

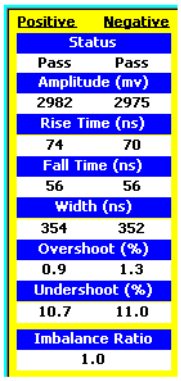
Pulse Mask Waveform

The following sample screen shows the shape of a received DS1 pulse in comparison with the selected T1.403 pulse mask, with 0% tolerance adjustment. The receive pulse fits within the selected mask, which is indicated by the *Pass* status.



Pulse Mask Measurements

The pulse mask measurement section of the screen shows the DS1 pulse mask measurements, based on the shape of a received DS1 pulse (binary 1).



Status: Indicates whether the receive signal falls within the selected mask.

Amplitude (mv): Indicates the peak of the pulse.

Rise Time (ns): Indicates the calculated rise time of the received pulse, in nanoseconds.

Fall Time (ns): Indicates the calculated fall time of the received pulse, in nanoseconds.

Width (ns): Indicates the width of the received pulse, in nanoseconds.

Overshoot (%): Indicates the percent that the pulse measured out-of-range.

Undershoot (%): The base to negative peak value divided by pulse amplitude.

Imbalance Ratio: Indicates the ratio of the amplitude of the positive received pulse and the amplitude of the negative received pulse meets the specifications of the selected pulse mask.

Note: Acquire on the Pulse Mask Test Setup screen must be set to Positive & Negative to receive an imbalance ratio value (see page 7–3).

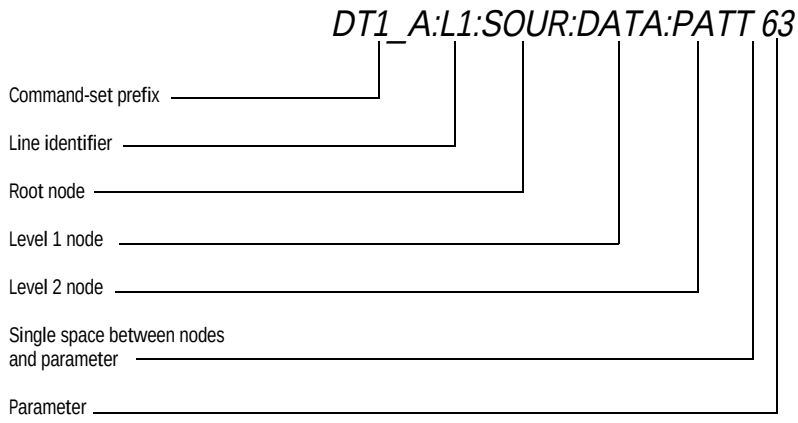
8

Dual DS1/0 SCPI Commands

SCPI Command Syntax

Standard Commands for Programmable Instruments (SCPI) is a command language used to control electronic test and measurement plug-in modules. SCPI commands are sent from a PC to a Service Advisor's test module to configure and perform tests, and gather data.

Each SCPI command consists of a command-set prefix (such as DT1), a line identifier (either L1 or L2), a root node (SOUR in the following example), one or more lower level nodes (DATA:PATT in the following example), followed by an applicable parameter (63 in the following example). (There is a space between the last level node and the parameter.)



The test module uses this structure to interpret the SCPI command. Generally, each line identifier, root, and lower level node is preceded by a colon (:), but the command-set prefix is not. This helps the instrument correctly parse the command's component parts.

Command-Set Prefix

The Service Advisor (Tablet or Undercradle) with a Dual DS1/0 Test module installed) uses the command-set prefix (DT1) to determine which plug-in module to access to initiate a SCPI command. The sample SCPI commands assume that you have only one module installed in your Service Advisor.

If you have **two** Dual DS1/0 Test modules installed in a Service Advisor, you must start each SCPI command with one of the following prefixes to indicate which module you want to communicate with.

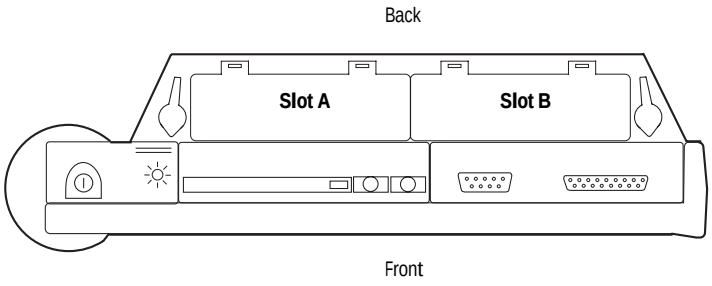
Command-Set Prefix Used When Two Modules are Installed

Prefix	Description
DT1_A	Indicates that you want to send a SCPI command to the module in slot A.
DT1_B	Indicates that you want to send a SCPI command to the module in slot B.

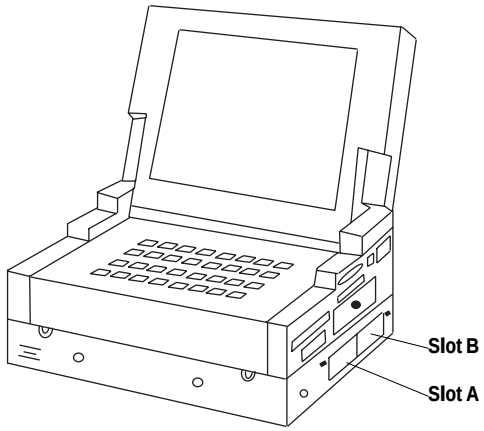
For example, if you want to issue a command to the DS1/0 Test module installed in slot A, your command would look like:

```
DT1_A:L1:SOUR:DATA:PATT ONES
```

The following illustration marks slot A and B in a Service Advisor Tablet.



The following illustration marks slot A and B in a Service Advisor Undercradle, which is attached to an Internet Advisor (J2300C/D).



Root Nodes

The following root nodes are supported by the Dual DS1/0 Test module.

Root Node	Description
:ROUTe	Lets you select the channels you want to use for drop and insert mode and BER testing.
:SOURce	Lets you set the transmitter functions for the test module.
:SENSe	Lets you configure the audio source you want to output to.
:INITiate	Starts running a test.
:FETCh	Lets you retrieve test results and configured settings from the Dual DS1/0 Test module output queue.
:ABORt	Stops a test and freezes the test results.

Long Form and Short Form

SCPI commands have both a long and short version; for example :SOURCE and :SOUR. The Tablet responds to either version, but will not respond to variations of either version, such as :SOURC.

The SCPI interface does not differentiate between upper-case and lower-case letters, but only the long *or* short form of a command is valid. Notice the examples in the following table.

SCPI Command Syntax

Correct Entry	Incorrect Entry
:SOURCE	:SOURC
:SourCe	:sou
:sour	:Sourc

Using Parameters

Parameters provide a setting for the command (for example, ON or OFF). They follow the nodes of commands and are listed in angle brackets (< >).

Multiple command parameters are separated by a vertical bar (|). Specify only one parameter when you issue the command.

Separating Commands and Parameters

The following table lists the different separators you can use between commands and parameter.

SCPI Command Separators

To Separate...	Use...	Example
A command-set prefix from a root node	Colon (:)	DT1:L1
A root node from a lower level node	Colon (:)	DT1:L1:SOUR
A parameter from a command	Space	DT1:L1:ROUT:DMUX:DROP 2
Multiple commands entered in a command string	Semicolon (;)	DT1:SOUR:TEST:STAT ON;DT1:INIT

Sending Multiple Commands in a Command String

You can send multiple SCPI commands in the same command string. The commands execute one at a time, in the order in which you have entered them. To separate the commands, use a semicolon (;). See example in table above.

Note: You must always enter the DT1:*RST command by itself on a command-line.

Programming a DS1/0 Test

This section explains how to a test module before running a test, provides a guideline for entering commands in the proper sequence, and contains some sample tests you can enter to become familiar with programming tests.

Resetting Your Test Set

Before you program a DS1/0 test, you should always enter the DT1:*RST command to reset the test module. When you issue this command, the DS1/0 test module:

- sets all DS1/0 test results and configuration values to their defined default setting. Default settings are listed in the individual command descriptions.
- clears the SCPI control registers in the test module
- stops a DS1/0 test if one is currently running

When you become familiar with the SCPI default settings you will notice that, in many cases, you can enter just a few commands to run a test or make a measurement.

Command Sequence

When programming a DS1/0 test with SCPI commands, you always:

- reset the test module to default settings
- select a test
- configure the receiver and transmitter functions
- initiate the test
- retrieve test results
- abort the test

SCPI Return Codes

To determine if the command you just entered used the proper format, or if an error occurred while processing the command, type:

```
DT1:L[1|2]:SYSTem:ERRor ?
```

Refer to the following table to see if the command executed successfully, or if an error occurred.

SCPI Return Codes

Code	Meaning
0	Command executed successfully.
–100	Command error.
–109	Required parameter missing.
–112	Command keyword too long.
–120	Parameter value out-of-range.
–221	Invalid mode setting for command.
–223	Command line longer than 80 characters.
–350	Error lost due to overflow in error queue.

Basic Test Commands

This section describes the SCPI commands you use with most tests. See *Command Sequence*, page 8–7 for more information about the sequencing of the DT1 SCPI commands.

Basic TIMS Test Commands

Root	Level 1	Level 2
DT1:SOURce	:TEST	:STATe < ON | OFF >
DT1:INITiate		
DT1:ABORt		

:SOURce:TEST:STATe <ON | OFF>

This command starts and stops a test.

Default: OFF

:INITiate

This command starts the selected test, resets results counters on the test module to zero, and enables results processing.

:ABORt

This command stops the current test and retains the current processed results.

Signal Routing Commands

This section describes the :ROUTe commands, which are used to indicate which channels you want to use for drop and insert mode and BER testing.

DT1:L[1 | 2]:ROUTe Command Structure

Root	Level 1	Level 2
DT1:L[1 | 2]:ROUTe	:DMUX	:DROP < channel 1-24 >
	:MUX	:INSert < channel 1-24 >
	:SELect	:FT1 < channel mask >

:L[1|2]:ROUTe:DMUX:DROP <*channel 0, 1–24*>

This command lets you indicate which channel you want to drop from the DS0 demultiplexer.

Parameter Range: 1 through 24
0 = none

Default: 0

:L[1|2]:ROUTe:MUX:INSert <*channel 0, 1–24*>

This command lets you indicate which channel you want to insert on a DS0 multiplexer.

Parameter Range: 1 through 24
0 = none

Default: 1

:L[1|2]:ROUTe:SELect:FT1 <*channel mask*>

This command lets you enable or disable BERT on the selected channel(s). To enable BERT, enter this command with the channel number(s) (in decimal format) you want to use BER testing. Each bit in the channel mask represents channel selections. For example, 0x0000 0003 represents channel 1 and 2 (bit 0,1). The channel mask must be a decimal value.

Default: 1677215 (0x00ff ffff) for all 24 channels

Receiver Configuration Commands

This section describes the :SENSe commands used to enable and disable the audio speaker on the Service Advisor platform and the handset connected to the module.

DT1:L[1|2]:SENSe Command Structure

Root	Level 1	Level 2	Level 3
DT1:L[1 | 2]:SENSe	:AUDio	:SPEAKer	:STATe < ON | OFF >
			:VOLume < setting >
		:HANDset	:STATe < ON | OFF >
	:VF	:STATe < ON | OFF >	
	:BYTEPattern	:COUNt < value >	
		:STORe < PROG1 | PROG2 | PROG3 | PROG4 >	
		:TRIGger	:MASK < data pattern >
			:ACTion < OFF | IMMediate | APPly >

:L[1|2]:SENSe:AUDio:SPEAKer:STATe <ON | OFF>

This command sets the Service Advisor platform's audio feature ON or off. When you use this command to turn the platform's audio ON, you hear tones from various tests through the Service Advisor's speaker.

When you use this command to turn the Service Advisor's audio off, you still hear Service Advisor sounds, such as key clicks.

Note: To mute all sounds picked up by the Service Advisor's audio feature, use the Mute option on the Service Advisor Utilities window. See Adjusting Tablet Properties in Chapter 2 of the HP Service Advisor Portable Test Tablet User's Manual.

Default: OFF

:L[1|2]:SENSe:AUDio:SPEAKer:VOLume <*setting*>

This command sets the Service Advisor platform's audio speaker volume, in percentage format.

Parameter Range: 0 to 100

Default: 0

:L[1|2]:SENSe:AUDio:HANDset:STATe <ON | OFF>

Use this command to set the handset's audio feature ON or off, if you have connected a handset to the Dual DS1/0 test module.

Default: OFF

:L[1|2]:SENSe:VF:STATe <ON | OFF>

Use this command to enable or disable VF frequency and level measurements. Set this parameter to off if you want to use the Call Monitor Logging function (see *Viewing a Call Monitor Log File*, page 6–15).

Default: ON

:L[1|2]:SENSe:BYTEPattern:COUNt <*value*>

This command lets you configure the number of bytes to capture during a test.

Parameter Range: 0 to 1024 bytes

Default: 1024

:L[1|2]:SENSe:BYTEPattern:STORe <PROG1 | PROG2 | PROG3 | PROG4>

This command lets you configure four buffers to store captured bytes.

Default: PROG1

:L[1|2]:SENSe:BYTEPattern:TRIGger:MASK <*data pattern*>

This command indicates to the tester to capture data when the selected data pattern mask is received.

Parameter Range: 0 to 0xff

Default: 0xff

:L[1|2]:SENSe:BYTEPattern:TRIGger:ACTion <OFF | IMMediate | APPly>

This command indicates whether you want to use the data capture feature.

DT1:L[1 | 2]:SENSe:BYTEPattern:TRIGger:ACTion <*capture mode*> Parameters

Capture Mode	Description
OFF	Stop BERT pattern capture
IMMediate	Start BERT pattern capture immediately. When you enter this parameter, it overrides any setting you have entered in the *:L[1 | 2]:SENSe:BYTEPattern:TRIGger:MASK <data pattern>* command (see page 8–14).
APPly	Start BERT pattern capture when the mask, defined in the *:L[1 | 2]:SENSe:BYTEPattern:TRIGger:MASK <data pattern>* command is detected (see page 8–14).

Default: OFF

Pulse Mask Test Commands

This section describes the commands used to run a pule mask test.

Pulse Mask Command Structure

Root	Level 1	Level 2
DT1:L[1 | 2]:SENSe	:PMASk	:SELect < template >
		:POLarity < acquired polarity >
		:TOLerance < 0 | 3 | 6 >
		:ACTion < ON | OFF >

:L[1|2]:SENSe:PMASk:SELect <*template*>

Use this command to select the pulse template you want to use for your test.

DT1:L[1 | 2]:SENSe:PMASk:SELect <*template*> Parameters

Templates	Description
NONE	No template selected.
T1_102	Pulse mask as defined by ANSI specification T1.102
T1_403	Pulse mask as defined by ANSI specification T1.403
G703	Pulse mask as defined by the proposed update to ITU-T recommendation G.703 (DS3 Electrical Interface Spec. T1X1.4/95-013)
PUB62411	Pulse mask as defined by the Bellcore specification 62411.

Default: T1_403

:L[1|2]:SENSe:PMASk:POLarity <*acquired polarity*>

Use this command to select the pulse polarity to be acquired.

DT1:L[1 | 2]:SENSe:PMASk:POLarity <*acquired polarity*> Parameters

Acquired Polarity	Description
POSitive	Indicates the test set will evaluate a received positive voltage pulse.
NEGative	Indicates the test set will evaluate a received negative voltage pulse.
POSNEG	Indicates the test set will evaluate a received positive and negative voltage pulse.

Default: POSitive

:L[1|2]:SENSe:PMASk:TOLerance <*0* | *3* | *6*>

Use this command to select a *0%*, *3%*, or *6%* adjustment to the selected pulse mask specification.

DT1:L[1|2]:SENSe:PMASk:TOLerance <*0* | *3* | *6*> Parameters

Tolerance	Description
0	The selected mask specification is not adjusted.
3	The selected mask specification is offset ±3 percent of the peak amplitude.
6	The selected mask specification is offset ±6 percent of the peak amplitude.

Default: 0

:L[1|2]:SENSe:PMASk:ACTion <*ON* | *OFF*>

Use this command to turn the pulse mask test ON and off.

Default: OFF

Transmitter Line Configuration Commands

This section describes the :SOURce commands, which configure the transmitter parameters for each T1 line.

DT1:L[1 | 2]:SOURce Command Structure

Root	Level 1
DT1:L[1 | 2]:SOURce	:MODE < test mode >
	:FRAMe < framing format >
	:CODE < line coding >
	:CLOCk < clock source >
	:TERMination < type of termination >
	:MULTiplier < NX56 | NX64 >
	:LBO < line build out >
DT1:SOURce	:TIMEtest < duration >

:L[1|2]:SOURce:MODE <*test mode*>

This command lets you configure the test mode (see *Setting Up a T1 Test*, page 4–3).

DT1:L[1 | 2]:SOURce:MODE <*test mode*> Parameters

Test Mode	Description
NORMal	T1 Normal mode: The T1 transmit signal is generated internally according to the selected framing, payload, line code, and so on. The receiver is configured for the same settings, allowing for BER testing (the received pattern is compared to the transmitted pattern).
CSU	Channel Service Unit mode: The Service Advisor performs as a CSU on the span, responding to all valid loop-up and loop-down codes.
DI	Drop & Insert mode: In this mode, single or multiple timeslots are dropped and inserted internally, the TX clock is slaved to the RX clock, channels that are not being used for testing are passed through uninterrupted, and TX and RX paths are crossed over (RX2 to TX1 and RX1 to TX2).
INTLoop	Internal Loop mode: The Service Advisor internally loops the T1 transmit (TX) signal back to the T1 receive (RX) signal, at the digital level
EXTLoop	External Loop mode: The receive T1 signal is looped back to the transmitter. The receive data is regenerated and transmitted to the span. Full T1 monitor testing can be performed in this mode.

Default: NORMal

:L[1|2]:SOURce:FRAMe <*framing format*>

This command lets you configure the framing format.

DT1:L[1 | 2]:SOURce:FRAMe <*framing format*> Parameters

Framing Format	Description
NONE	Unframed T1 signals.
D4	D4 framing format, also called SuperFrame (SF).
ESF	Extended SuperFrame framing format.
SLC96	SLC-96 framing format (also called TR8).

Default: ESF

:L[1|2]:SOURce:CODE <*line coding*>

This command lets you configure the line coding for the currently selected T1 circuit. The line code can be set to **AMI** (alternate mark inversion), or **B8ZS** (bipolar with eight-zero substitution).

Default: B8ZS

:L[1|2]:SOURce:CLOCk <*clock source*>

This command lets you configure the type of clocking you want to use.

DT1:L[1 | 2]:SOURce:CLOCk <*clock source*> Parameters

Clock Source	Description
RCV1	Timing is derived from the RX1 signal.
RCV2	Timing is derived from the RX2 signal.
INTernal	Timing is based on the Service Advisor's internal 1.544 MHz oscillator.

Default: INTernal

:L[1|2]:SOURce:TERMination <*type*>

This command lets you configure the termination mode for the T1 input (RX/TX) lines.

DT1:L[1 | 2]:SOURce:TERMination <*type*> Parameters

Type of Termination	Description
TERMinal	The receive signal is terminated to 100 ohms, and a full-span automatic equalizer (ALBO) is provided to compensate for cable loss. This selection is typically used for out-of-service testing.
MONitor	The receive signal is a DSX-1 monitor-level signal. This selection is typically used to monitor a signal through a DSX monitor jack that is resistor-isolated from the span.
BRIDge	The receive signal is bridged to one side of the span. The Service Advisor is set to a high-impedance state (greater than 1000 ohms). This selection is typically used to monitor in-service spans that do not have a DSX monitor jack.

Default: TERMinal

:L[1|2]:SOURce:MULTiplier <NX56 | NX64>

This command lets you configure the base rate for the FT1 signal.

DT1:L[1 | 2]:SOURce:MULTiplier <*DS0 multiplier*> Parameters

DS0 Multiplier	Description
NX56	Selects 56 Kb/s channels.
NX64	Selects 64 Kb/s channels.

Default: NX64

:L[1|2]:SOURce:LBO <*line build out*>

This command lets you configure the type of line build out you want to use.

Parameter Range: 0DB, -7.5DB, -15DB, -22.5DB, 0FT, 266FT, 399FT, 533FT, 655FT

Default: 0DB

:SOURce:TIMEtest <*duration*>

This command lets you configure the amount of time (in seconds) to run a test (see *Setting the Test Duration*, page 1–16). To set the test time to continuous, enter a 0 (zero) duration time.

Default: 0

Transmitter Bit Error Rate Test (BERT) Configuration Commands

This section describes the :SOURce commands used to configure the BER test patterns you want to use.

DT1:L[1 | 2]:SOURce Command Structure

Root	Level 1	Level 2
DT1:SOURce	:BITPattern	:PROG1 < BERT bit string >
		:PROG2 < BERT bit string >
		:PROG3 < BERT bit string >
		:PROG4 < BERT bit string >
	:BYTEPattern	:PROG1 < BERT byte string >
		:PROG2 < BERT byte string >
		:PROG3 < BERT byte string >
		:PROG4 < BERT byte string >
DT1:L[1	2]:SOURce	:DATA	:PATTern < BERT pattern >
		:INVert < ON	OFF >

:SOURce:BITPattern:PROG1 <*BERT bit pattern*>

This command lets you enter a user-defined receive BER test bit pattern. This pattern can contain up to 32 bits. For example, you can enter 10110000000000000000000000000001.

Default: 11110000

:SOURce:BITPattern:PROG2 <*BERT bit pattern*>

This command lets you enter a user-defined receive BER test bit pattern. This pattern can contain up to 32 bits. For example, you can enter 10110000000000000000000000000001.

Default: 101100111000111110000

:SOURce:BITPattern:PROG3 <*BERT bit pattern*>

This command lets you enter a user-defined receive BER test bit pattern. This pattern can contain up to 32 bits. For example, you can enter 10110000000000000000000000000001.

Default: 1000100010001000

:SOURce:BITPattern:PROG4 <*BERT bit pattern*>

This command lets you enter a user-defined receive BER test bit pattern. This pattern can contain up to 32 bits. For example, you can enter 10110000000000000000000000000001.

Default: 11111111000000011111111

:SOURce:BYTEPattern:PROG1 <*BERT byte pattern*>

This command lets you enter a user-defined receive BER test byte pattern. This pattern can contain up to 1024 bytes. For example, you can enter ABCD.

Default: ABCDEFGHIJKLMNOPQRSTUVWXYZ

:SOURce:BYTEPattern:PROG2 <*BERT byte pattern*>

This command lets you enter a user-defined receive BER test byte pattern. This pattern can contain up to 1024 bytes. For example, you can enter ABCD.

Default: abcdefghijklmnopqrstuvwxyz

:SOURce:BYTEPattern:PROG3 <*BERT byte pattern*>

This command lets you enter a user-defined receive BER test byte pattern. This pattern can contain up to 1024 bytes. For example, you can enter ABCD.

Default: 0123456789

:SOURce:BYTEPattern:PROG4 <*BERT byte pattern*>

This command lets you enter a user-defined receive BER test byte pattern. This pattern can contain up to 1024 bytes. For example, you can enter ABCD.

Default: 9876543210

:L[1|2]:SOURce:DATA:PATTern <*BERT data pattern*>

Use this command to set the transmit BER test data pattern.

DT1:L[1 | 2]:SOURce:DATA:PATTern < *BERT pattern* > Parameters

Pattern	Description
NONE	No BER test data pattern set.
ONES	All ones.
QRSS	Quasi-random signal.
63	A 63-bit PRBS used for DS0 testing on DDS channels.
215	Pseudorandom bit sequence (PRBS). For example, 2^15-1 is a 2^{15}–1 PRBS. This pattern is used to stress clock recovery circuits with a maximum of 14 consecutive zeros.
220	This pattern stresses AMI-coded, 1.54 Mb/s circuits beyond the standard-specified limits.
223	This pattern stresses AMI-coded, 1.54 Mb/s circuits beyond the standard-specified limits. It is commonly used for testing HDB3-encoded circuits.
511	A 511-bit PRBS used for DS0 testing on DDS channels.
2047	A 2047-bit PRBS used for DS0 testing on DDS channels.

DT1:L[1 | 2]:SOURce:DATA:PATTern < *BERT pattern* > Parameters, continued

Pattern	Description
SPACe	All zeros.
ALT	Alternating ones and zeros.
USER	User-programmable pattern.
DALY	55-octet pattern.
NET55	A 55 octet pattern. Similar to the Daly pattern, but byte 3 is 03_h and byte 7 is 00_h.
1N3, 1N5, 1N6, 1N8	One-in-three pattern, and so forth.
2N8, 2N9, 2N10, 2N11, 2N12, 2N13, 2N14	Two-in-eight pattern, and so forth
3N18, 3N19, 3N20, 3N21, 3N22, 3N23, 3N24	Three-in-eighteen pattern, and so forth
52OCT, 53OCT, 54OCT, 55OCT, 72OCT, 96OCT, 120OCT	Fifty-two octet pattern, and so forth.
DDS1	A repeating pattern of FF 00 hex: 100 octets of 1111 1111 (FF_h), followed by 100 octets of 0000 0000 (00_h). This pattern switches rapidly between maximum and minimum ones density, creating extreme stress on power supplies, timing-recovery circuits, ALBO circuits, and repeater-equalization circuits. DDS1 contains 100 bytes of hex 00 (1,000 binary zeros in a row). Using this pattern on a T1 or DS0 circuit running over AMI line-coded facilities will cause a traffic-affecting failure of that facility.

DT1:L[1 | 2]:SOURce:DATA:PATTern < *BERT pattern* > Parameters, continued

Pattern	Description
DDS2	A repeating pattern of 7E 00 hex: 100 octets of 0111 1110 ($7E_h$), followed by 100 octets of 0000 0000 (00_h). This pattern switches rapidly between HDLC/SLDC protocol '7E' flags or idles and all zeros, which detects some pattern-sensitivity problems. The 00 portion of the pattern creates extreme stress on timing-recovery, ALBO, and repeater-equalization circuits. DDS2 contains 100 bytes of hex 00 (1,000 binary zeros in a row). Using this pattern on a T1 or DS0 circuit running over AMI line-coded facilities will cause a traffic-affecting failure of that facility. **Note:** Most HDLC/SDLC pattern-sensitivity problems occur when the '7E' flag follows a long string of ones, as in the OCT-55 (T1-6) pattern. To use the OCT-55 pattern on a T1-DDS channel, run a T1 BER test using **Frac T1** or **Drop/Insert** test mode to select the DDS channel.
DDS3	A repeating pattern of 32 hex (0011 0010). This pattern, which runs safely on all DS1 facilities, is a traffic simulator that stresses power supplies and regenerator-switching circuitry with rapid transitions between ones and zeros. It also stresses timing recovery for IBM and bisync protocols. This pattern will not invoke B8ZS on B8ZS-configured facilities.

DT1:L[1 | 2]:SOURce:DATA:PATTern < *BERT pattern* > Parameters, continued

Pattern	Description
DDS4	A repeating pattern of 40 hex (0100 0000). This pattern, which runs safely on all DS1 facilities, provides the minimum ones density for a DS0 DDS circuit, and stresses clock-recovery and repeater-equalization circuits. DDS4 is actually a one-and-seven (1:7) or one-in-eight (1:8) pattern—a single binary 1 and seven 0s. However, when DDS patterns are run at DS1 speeds, most test sets do not frame align the pattern, and frame bits may end up in the middle of an octet. To ensure that frame bits fall only on octet boundaries, run a T1 BER test with the 1:7 pattern. Use Frac T1 or Drop/Insert test mode to select the DDS channel, and be sure to observe proper precautions on live T1 circuits. **Note:** When running DDS long patterns, such as DDS5, at low-speed subrates (for example, 2.4 or 4.8 Kb/s), it takes a while for the test set to sync on the pattern
DDS5	A combination of DDS stress patterns 1 through 4. This pattern, which runs safely on all DS1 facilities, simulates the transition from IDLE to DATA mode on DDS circuits. It can be used as a work-around for the DS1 two-minute limit on an "all ones" pattern. It is useful for detecting marginal equipment in multipoint applications, and stressing power supplies and ABLO circuits. The pattern is: • *800 bytes DDS1 (100 bytes FF_h and 100 bytes 00_h — four times)* • *800 bytes DDS2 (100 bytes $7E_h$ and 100 bytes 00_h — four times)* • *200 bytes DDS3 (repeating 32_h pattern)* • *200 bytes DDS4 (repeating 40_h pattern)* **Note:** DDS5 contains 100 bytes of hex 00 (1,000 binary zeros in a row). Using this pattern on a T1 or DS0 circuit running over AMI line-coded facilities will cause a traffic-affecting failure of that facility.

DT1:L[1 | 2]:SOURce:DATA:PATTern <*BERT pattern*> Parameters, continued

Pattern	Description
DDS6	(DSO 6) A repeating pattern of seven bytes of 0111 1111 (7Fh), followed by a single byte of 1111 1111 (FFh). This pattern, which runs safely on all DS1 facilities, simulates the transition from IDLE to DATA mode on DDS circuits. It can be used as a work-around for the DS1 two-minute limit on an "all ones" pattern. It is useful for detecting marginal equipment in multipoint applications and for stressing power supplies and ALBO circuits.
BITPROG1...4	Sets the BERT pattern to the value configured in the :SOUR:BITP:PROG1...4 commands (see page 8–27).
BYTEPROG1...4	Sets the BERT pattern to the value configured in the :SOUR:BYTEP:PROG1...4 commands (see page 8–28).

Default: QRSS

:L[1|2]:SOURce:DATA:INVert <ON | OFF>

Use this command to invert the transmit BER test pattern you entered with the DT1:L[1|2]:SOURce:DATA:PATT command (see page 8–29).

Default: OFF

BERT Sequences Configuration Commands

This section describes the commands used to configure the sequence of BERT patterns you want to use during a test.

BERT Sequences Command Structure

Root	Level 1	Level 2	Level 3
MEMory	:SEQUence	:PAT1...4 < BERT sequence >	
DT1:L[1 | 2]:SOURce	:SEQUence	:PATTern < pattern option >	
		:PATTern	:DURation < seconds >
			:MODE < ONCE | CONTinuous >
			:CTRL < HOLD | RESume | ADVance >

MEMory:SEQUence:PAT1...4 <*BERT sequence*>

Use this command to create up to four different BERT sequences. Within each sequence, you can have up to 24 data patterns for a Multiple Test Pattern (MTP). See *:L[1|2]:SOURce:DATA:PATTern <BERT data pattern>*, page 8–29 for a listing of BERT patterns.

A backslash (/) in front of the pattern indicates that you want to use the invert function (see previous command description). Separate each pattern in the list with a comma (,).

Example: MEM:SEQU:PAT1 QRSS,1N8,/3N24
MEM:SEQU:PAT2 ALT,/511,ONES,NET55

Default: not applicable

:L[1|2]:SOURce:SEQUence:PATTern <*pattern option*>

Use this command to specify the BERT sequence you want to run.

DT1:L[1 | 2]:SOURce:SEQUence:PATTern <*option*> Parameters

Option	Description
1 through 4	BERT sequence defined with the MEM:SEQU:PAT1...4 command (see page 8–35).
BTP	Indicates that you want to run a Bridge Tap pattern. See *BERT Pattern Sequences Controls*, page 5–19, for more information.
MTP	Indicates that you want to run a Multiple Test pattern. See *BERT Pattern Sequences Controls*, page 5–19, for more information.

Default: BTP

:L[1|2]:SOURce:SEQUence:PATTern:DURation <*seconds*>

Use this command to specify the amount of time between patterns while you are running a MTP or BTP test.

Parameter Range: 5 and 300 seconds

Default: 5

:L[1|2]:SOURce:SEQUence:PATTern:MODE <ONCE | CONTinuous>

Use this command to specify how often to run the selected BERT pattern sequence.

DT1:L[1 | 2]:SOURce:SEQUence:PATTern:MODE <*option*> Parameters

Option	Description
ONCE	Transmits the selected sequence once.
CONTinuous	Runs the selected sequence continuously until the test is stopped.

Default: CONTinuous

:L[1|2]:SOURce:SEQUence:PATTern:CTRL <HOLD | RESume | ADVance>

Use this command to control the pattern sequence during a test.

DT1:L[1 | 2]:SOURce:SEQUence:PATTern:MODE <*option*> Parameters

Option	Description
HOLD	Pauses transmitting at the current pattern in the sequence. Use this button when you want to observe a specific problem or to correct a problem and continue during a sequence.
RESume	Resumes running through the selected BERT pattern sequence.
ADVance	Advances the transmit pattern to skip a particular pattern

Default: not applicable

Performance Report Messages (PRMs) Commands

This section describes the commands used to create and generate PRMs during a test.

PRM Command Structure

Root	Level 1	Level 2
DT1:L[1 | 2]:SOURce	:PRM	:TYPE < 32-bit map >
		:CTRL < OFF | ONCE | CONTinuous >

:L[1|2]:SOURce:PRM:TYPE *<32-bit maps>*

Use this command to indicate the PRMs you want to transmit during a test. See *Injecting PRMs*, page 4–37 for more information about injecting PRMs.

DT1:L[1 | 2]:SOURce:PRM:TYPE *< 32-bit maps >* Parameters

Bits	Description
0 to 15	Number of CRCs to transmit.
16	SL - Slip event message
17	SE - Severely errored framing event
18	FE - Frame synchronization bit error
19	LB - Payload loopback
20	LV - Line coding violation (BPV)
21 to 31	not used

Example: :DT1:L1:SOUR:PRM:TYPE 0x0302
This command indicates that you want to transmit two CRCs, an SL, and an SE message.

Default: 0

:L[1|2]:SOURce:PRM:CTRL <OFF | ONCE | CONTinuous>

Use this command to show often you want the tester to transmit PRMs during a test.

DT1:L[1 | 2]:SOURce:PRM:CTRL <*options*> Parameters

Options	Description
OFF	Indicates that you do not want to generate a PRM during a test.
ONCE	Indicates that you want to send the selected PRM once during a test. The PRM transmitted is determined by the :DT1:L[1 | 2]SOUR:PRM:TYPE command (see page 8–40).
CONTinuous	Indicates that you want to send the selected PRM continuously during a test. The tester automatically transmits the selected PRM at one second intervals. The PRM transmitted is determined by the :DT1:L[1 | 2]SOUR:PRM:TYPE command (see next command).

Default: ONCE

Three Tone Slope Test Commands

This section describes the commands used to run a three tone slope test.

PRM Command Structure

Root	Level 1	Level 2
DT1:L[1 | 2]:SOURce	:TONE	:FREQ1...8 < frequency >
		:LEVel < value >
		:DURation < time >

:L[1|2]:SOURce:TONE:FREQ1...8 <*frequency*>

Use this command to configure up to eight frequencies that you can use during a Three Tone Slope test. The following example configures three different frequencies; 404, 1004, and 2804 Hertz. Use this command to configure the frequencies, and the *:L[1|2]:SOURce:TONE:FREQ1...8 <frequency>* command (see next command) to select the frequencies you want to use during the three tone slope test.

Example: :DT1:L1:SOUR:TONE:FREQ1 404
:DT1:L1:SOUR:TONE:FREQ2 1004
:DT1:L1:SOUR:TONE:FREQ3 2804

Parameter Range: 200 to 3950 (measurement in Hertz)

Default: 0 (indicates you don't want to run a three tone slope test)

:L[1|2]:SOURce:TONE:LEVel <*value*>

Use this command to select the frequencies you want to use for the Three Tone Slope test.

Parameter Range: -35 to 3 (measurement in dBm)

Default: 0 (indicates you don't want to run a three tone slope test)

:L[1|2]:SOURce:TONE:DURation <*time*>

Use this command to set the amount of time you want each tone sent over the line for the Three Tone Slope test.

Parameter Range: 1 to 9999 (measurement in seconds)

Default: 0 (indicates you want to send each tone continuously)

DDS Control Commands

This section describes the commands used to run a DDS BER test.

DDS Control Command Structure

Root	Level 1	Level 2	Level 3
DT1:L[1 | 2]:SOURce	:DDS	:FORMat < OFF | DSOA | DSOB >	
		:RATE < transmission rate >	
		:CHANnel < 1...24 >	
		:USER < 1...20 >	
DT1:L[1 | 2]:SENSe	:DDS	:CTRLcode	:INDEX < value >

:L[1|2]:SOURce:DDS:FORMat <OFF | DS0A | DS0B>

Use this command to specify either the DS0A or DS0B format of the DS0 signal on the DDS channel.

DT1:L[1 | 2]:SOURce:DDS:FORMat <*options*> Parameters

Options	Description
DS0A	Indicates the access point for performing test and monitoring capabilities are from the module.
DS0B	Indicates the access point for performing test and monitoring capabilities are from a DS0-B cross connect.
OFF	Turns off the DDS control function.

Default: OFF

:L[1|2]:SOURce:DDS:RATE <*transmission rate*>

Use this command to select the DDS channel transmission rate (in Kb/s).

Parameter Values: 2400, 4800, 9600, 19200, 28800, 38400, 56000, 64000

Default: 2400

:L[1|2]:SOURce:DDS:CHANnel <1...24>

Use this command to select the T1 timeslot carrying the DDS channel.

Parameter Values: 1 through 24

Default: 1

:L[1|2]:SOURce:DDS:USER <1...20>

Use this command to select the signal of an individual user on the DDS channel. This command is valid only when the format is set to DS0B (see *:L[1|2]:SOURce:DDS:FORMat <OFF | DS0A | DS0B>*, page 8–44).

The value you use with this command depends on the transmission rate you set (see *:L[1|2]:SOURce:DDS:RATE <transmission rate>*, page 8–44). Use the following table to determine the maximum number of channels available for each rate.

Maximum Number of Channels for Each Transmission Rate

Transmission Rate	Maximum Number of User Channels
2400	20
4800	10
9600	5
19200	2
28800	0
34400	0
56000	0
64000	0

Default: 1

:L[1|2]:SENSe:DDS:CTRLcode:INDEX <*value*>

Use this command to read a single DDS control code.
(See *:L[1|2]:FETCh:DDS:CTRLcode:COUNt ?*, page 8–92 for more information about querying the total DDS control code count.)

Parameter Values: any number

Default: 0

Transmitter Loop Code Commands

This section describes the :SOURce commands used to configure the loop codes the transmitter sends over the T1 line.

DT1:L[1|2]:SOURce Command Structure

Root	Level 1	Level 2	Level 3
DT1:L[1|2]:SOURce	:LOOPcode	:TYPE <type>	
		:ACTion <LPUP | LPDN>	
	:FOVWrite <ON | OFF>		
DT1:SOURce	:INBANd	:LPUP	:PROG1...4 <string>
		:LPDN	:PROG1...4 <string>
	:OUTBANd	:LPUP	:PROG1...4 <string>
		:LPDN	:PROG1...4 <string>

:L[1|2]:SOURce:LOOPcode:TYPE <*type*>

This command lets you configure the type of loop code you want to use.

DT1:L[1 | 2]:SOURce:LOOPcode:TYPE <*type*> Parameters

Type	Description
NONE	No loop code
CSU	Customer Service Unit loopback
NIU, NIU4, NIU6	Network Interface Unit loopback
LINE	Line loopback
PAYLoad	Payload loopback
NETWork	Network loopback
V54	Standard ITU-T V.54 loopback
OCUDP	Office Channel Unit DS0 dataport loopback
INBAND_PROG1...4	User-defined inband loopback code
OUTBAND_PROG1...4	User-defined out-of-band loopback code
OCUALT	Alternating loopback of the office channel unit (OCU), which is useful for isolating the central office from the local loop.
DSUDP	Latching loopback of the digital service unit (DSU).
DSUALT	Alternating loopback of the DSU.
CSUDP	Latching loopback of the channel service unit (CSU).
CSUALT	Alternating loopback of the CSU.
DS0DP	Loopback of the DS0 dataport. This type of loopback is useful for isolating a hub office from an end office.

Default: NONE

:L[1|2]:SOURce:LOOPcode:ACTion <LPUP | LPDN>

This command lets you specify whether you want to activate or deactivate loopback.

DT1:L[1 | 2]:SOURce:LOOPcode:ACTion <*operation*> Parameters

Operation	Description
LPUP	Activates the configured loop-code type (see page 8–48).
LPDN	Deactivates loopback codes.

Default: LPUP

:L[1|2]:SOURce:FOVWrite <ON | OFF>

This command lets you specify whether you want to use the frame bit overwrite feature to overwrite framing bits with the configured loop code.

Default: OFF

:SOURce:INBANd:LPUP:PROG1...4 <*string*>

This command lets you specify four user-defined inband loop-up codes. Each code can be up to 8 bits, for example 1111 0000. You use this command in conjunction with the loop-code type command (see page 8–48).

Example:

```
DT1:L1:SOUR:INBAN:LPUP:PROG1 11110000
```

Default: 00000000

:SOURce:INBANd:LPDN:PROG1...4 <*string*>

This command lets you specify four user-defined inband loop-down codes. Each code can be up to 8 bits, for example 1011 0000. You use this command in conjunction with the loop-code type command (see page 8–48).

Example:

```
DT1:L1:SOUR:INBAN:LPDN:PROG1 10110000
```

Default: 00000000

:SOURce:OUTBANd:LPUP:PROG1...4 <*string*>

This command lets you specify four user-defined out-of-band loop-up codes. Each code can be up to 8 bits, for example 1010 1010. You use this command in conjunction with the loop-code type command (see page 8–48).

Example:

```
DT1:L1:SOUR:OUTBAN:LPUP:PROG1 10101010
```

Default: PROG1 = 10101010
PROG2 = 01010101
PROG3 = 11110000
PROG4 = 00001111

:SOURce:OUTBANd:LPDN:PROG1...4 <*string*>

This command lets you specify four user-defined out-of-band loop-down codes. Each code can be up to 8 bits, for example 0101 0101. You use this command in conjunction with the loop-code type command (see page 8–48).

Example:

```
DT1:L1:SOUR:OUTBAN:LPDN:PROG1 10101010
```

Default: PROG1 = 10101010
PROG2 = 01010101
PROG3 = 11110000
PROG4 = 00001111

Transmitter Alarm and Error Injection Commands

This section describes the :SOURce commands that let you configure the type of error or alarm and the rate at which it is injected into the T1 line.

DT1:L[1 | 2]:SOURce Command Structure

Root	Level 1	Level 2
DT1:L[1 | 2]:SOURce	:INJect	:TYPE < type >
		:RATE < rate >
		:BURSt < rate >
		:STATe < ON | OFF >

:L[1|2]:SOURce:INJect:TYPE <*type*>

This command lets you configure the type of error you want to inject into a T1 line.

DT1:L[1 | 2]:SOURce:INJect:TYPE <*type*> Parameters

Type	Description
OFF	No alarm or errors injected.
LOGIC	Injects logic errors into the BERT payload pattern.
BPV	Injects bipolar violations into the BERT payload pattern. A BPV is a pulse that breaks the alternating polarity rule.
FBE	Injects framing bit errors into the BERT payload pattern. Note that this error is inserted only into those F bits that are used for framing.
CRC	Injects CRC (cyclic redundancy checksum) errors into the BERT payload pattern.
AIS	Injects an Alarm Indication Signal (an unframed, all-ones pattern) in the T1 transmit signal.
YELlow	Injects a Yellow alarm in the T1 transmit signal. For D4 (SF), the alarm is transmitted in bit 2 of the DS0; for ESF, the alarm is an alternating $00FF_h$ pattern transmitted in the facility datalink (FDL).
CDI	Injects a Customer Disconnect Indicator alarm to indicate that the NIU (network interface unit) at the customer's site is not receiving a signal from the T1 tester; usually because the T1 tester has been disconnected.

Default: OFF

:L[1|2]:SOURce:INJect:RATE <*rate*>

This command lets you configure the rate at which the configured errors are injected into the T1 line.

DT1:L[1 | 2]:SOURce:INJect:RATE <*rate*> Parameters

Rate	Description
SINGle	Injects a single error into the BERT payload pattern.
BURST	Injects a burst of errors. See next command to configure the burst rate.
1E-1 through 1E-7	Injects errors into the BERT payload pattern at the selected rate. For example, 1.E–3 is 1×10^{-3}, or 1 bit error every 1,000 bits.

Default: SINGle

:L[1|2]:SOURce:INJect:BURSt <*rate*>

This command lets you configure the burst error injection rate.

The following example indicates that you want to inject 30 CRC errors in each burst.

Example:
```
DT1:L1:SOUR:INJ:TYPE CRC
DT1:L1:SOUR:INJ:RATE BURST
DT1:L1:SOUR:INJ:BURS 30
DT1:L1:SOUR:INJ:STAT ON
```

Parameter Range: 1 to 9,999 errors

Default: 25 errors

:L[1|2]:SOURce:INJect:STATe <ON | OFF>

This command lets you turn ON and off the error and alarm injection state.

Default: OFF

Transmitter Voice Frequency Signaling Commands

This section describes the :SOURce commands, which configure the transmitter parameters that voice frequency signaling option.

DT1:L[1 | 2]:SOURce Command Structure

Root	Level 1	Level 2
DT1:L[1 | 2]:SOURce	:AUDio	:SOURce < NONE | MICrophone >
	:TONE	:FREQ1...8 < frequency >
		:LEVel < level >
	:SIGNal	:ABIT < 0 | 1 >
		:BBIT < 0 | 1 >
		:CBIT < 0 | 1 >
		:DBIT < 0 | 1 >
		:STATe < ON | OFF >

:L[1|2]:SOURce:AUDio:SOURce <MICrophone | NONE>

This command lets you select a transmit audio source.

DT1:L[1 | 2]:SOURce:AUDio:SOURce <*source*> Parameters

Source	Description
NONE	Sends configured tones over the line.
MICrophone	Transmits audio to handset.

Default: NONE

:L[1|2]:SOURce:TONE:FREQ[1...8] <*frequency*>

This command lets you enter up to eight different tone frequencies to transmit over the T1 line when you are running a multi-tone test. You can enter a tone between 200 and 3950 Hertz.

Example: :L1:SOUR:TONE:FREQ1 404

Parameter Range: 200 to 3950

Default: 0

:L[1|2]:SOURce:TONE:LEVel <*level*>

This command lets you generate a tone at a specific level with a selected frequency, when running a multi-tone test. You can enter a value between -35 and 3 dBm.

Example: DT1:L1:SOUR:TONE:LEV -30

Parameter Range: -35 to 3

Default: 0

:L[1|2]:SOURce:SIGNal:ABIT <0 | 1>

This command lets you write the signaling A bit of the selected insert channel. See *:L[1|2]:ROUTe:MUX:INSert <channel 0, 1–24>*, page 8–11.

Default: 0

:L[1|2]:SOURce:SIGNal:BBIT <0 | 1>

This command lets you write the signaling B bit of the selected insert channel. See *:L[1|2]:ROUTe:MUX:INSert <channel 0, 1–24>*, page 8–11.

Default: 0

:L[1|2]:SOURce:SIGNal:CBIT <0 | 1>

This command lets you write the signaling C bit of the selected insert channel. See *:L[1|2]:ROUTe:MUX:INSert <channel 0, 1–24>*, page 8–11.

Default: 0

:L[1|2]:SOURce:SIGNal:DBIT <0 | 1>

This command lets you write the signaling D bit of the selected insert channel. See *:L[1|2]:ROUTe:MUX:INSert <channel 0, 1–24>*, page 8–11.

Default: 0

:L[1|2]:SOURce:SIGNal:STATe <ON | OFF>

This command enables or disables the signaling bit set with one of the :SOUR:SIGN:*n*BIT commands.

Default: OFF

Data Capture Commands

This section describes the commands used to create and generate bit-oriented code to a Facility Data Link (FDL).

PRM Command Structure

Root	Level 1	Level 2
DT1:L[1 | 2]:SOURce	:BOC	:DATA < sync status message >
		:DURation < time >

:L[1|2]:SOURce:BOC:DATA <*sync status code*>

Use this command to send a sync status message to FDL.

DT1:L[1 | 2]:SOURce:BOC:DATA <*sync status code*> Parameters

Sync Status Code	Description
00110000 11111111	Do not use for synchronization
00000100 11111111	Strat 1 traceable
00001100 11111111	Strat 2 traceable
00100000 11111111	Strat 3 traceable
00101000 11111111	Strat 4 traceable
00100010 11111111	+/- 20 ppm traceable
00001000 11111111	Sync trace unknown
01111110 01111110	Data link idle
11111111 11111111	All ones

Example: :DT1:L1:SOUR:BOC:DATA 0111111001111110
(Indicates that you want to send a “data link idle” message to FDL.)

Default: 0000110011111111 (Strat 2 traceable message)

:L[1|2]:SOURce:BOC:DURation <*time*>

This command lets you configure the amount of time (in milliseconds) to transmit a bit-orient code to FDL.

DT1:L[1 | 2]:SOURce:BOC:DURation <*time*> Parameters

Time	Description
0xffff ffff	No message sent
0x0000 0000	Stop
nxnnnn nnnn	Number of milliseconds

Default: 0xffff ffff

Signaling Option (010) Commands

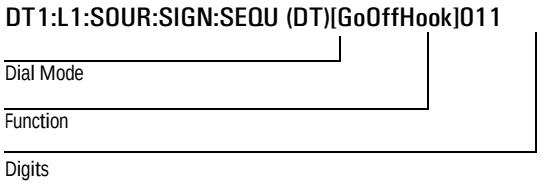
This section describes the commands used to configure the signaling option (010).

Signaling Option Commands

Root	Level 1	Level 2	Level 3
DT1:L[1 | 2]:SOURce	:SIGNal	:DIAL	:SEQUence < dial string >
DT1:MEMory	:SIGNal	:STORe	:NUM1...9 < dial string >
DT1:L[1 | 2]:ROUTe	:SIGNal	:TRUNk	:CH1...24 < trunk type >
			:APPLy
DT1:L[1 | 2]:SENSe	:SIGNal	:MODE < EMUL_CO | EMUL_CI | MONitor >	
		:SCAN	:TYPE < mode >
			:TIMEout < value >

:L[1|2]:SOURce:SIGNal:SEQUence <*dial string*>

Use this command to enter a dial string (see *Entering a Dial String*, page 6–5). The components of a dial string are described below. You must begin each *dial string* with dial code (see below).



Components:

Dial Mode: (DT), (MF)

Digit qualifier, applies to all digits following, until changed. Always enclosed in parentheses. You can enter a dial mode more than once in a single dial sequence. If you enter only a dial mode with this command, no action occurs; you must enter digits with the dial mode.

Digits: 0:9, *, #

* and # are undefined in (MF) dial mode. You must enter a dial mode before you enter a digit.

Pause Code: , (comma)

Function codes: Always enclose a function code in square brackets.

Function Codes Description

Code	Description
[GoOnHook]	Go on-hook.
[GoOffHook]	Go off-hook.

Function Codes Description, continued

Code	Description
[A]:[D]	DTMF keys A to D.
[ST]	MF key ST.
[STP]	MF key STP.
[ST2P]	MF key ST2P.
[ST3P]	MF key ST3P.

Default: not applicable

:MEMory:SIGNal:STORe:NUM1...9 <*dial string*>

This command lets you save a dial string on the module see *Programming and Sending Stored Numbers*, page 6–13.

Example: DT1:L1:MEM:SIGN:STOR:NUM2 (DT)[GoOffHook]1234

Default: not applicable

:L[1|2]:ROUTe:SIGNal:TRUNk:CH1...24 <*trunk type*>

This command lets you select a trunk type (see *Configuring Trunk Type and Signaling Direction*, page 6–6. You must enter the :L[1|2]:ROUT:SIGN:TRUN:APPL command to make this command active.

Example: DT1:L1:ROUT:SIGN:TRUN:CH2 LOOP
DT1:L1:SIGN:TRUN:APPL (*see below*)

Trunk types: LOOP_start, GND_start, EM_Immediate, EM_Wink, DATA

Default: DATA

:L[1|2]:ROUTe:SIGNal:TRUNk:APPLy

This command activates all the trunk types you entered for channels using the previous command.

Default: not applicable

:L[1|2]:SENSe:SIGNal:MODE <EMUL_CO | EMUL_CI | MONitor>

This command lets you select a signaling sequence mode (see *Entering a Dial String*, page 6–5).

Default: not applicable

:L[1|2]:SENSe:SIGNal:SCAN:TYPE <*mode*>

This command lets you set a timeout mode for the call monitoring log feature.

Modes: OFF, NOSCAN, UNTIL_HANGUP, UNTIL_INTERDIGIT

Default: OFF

:L[1|2]:SENSe:SIGNal:SCAN:TIMEout <*value*>

This command lets you set a timeout value in seconds for the UNTIL_INTERDIGIT scan mode set with the previous command.

Example: DT1:L1:SENS:SIGN:SCAN:TYPE UNTIL_INTERDIGIT
DT1:L1:SENS:SIGN:SCAN:TIME 60

Default: 0

Signaling Fetch Commands

The following table lists the FETCh commands used to retrieve information about the Signaling Option 010 settings. When you enter any of the commands listed below, make sure to begin with the following:

DT1:L[1|2]:FETCh

Signaling Fetch Commands

Command	Description
:SIGNal:ABIT ?	Reads the A bit of the received signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11).
:SIGNal:BBIT ?	Reads the B bit of the received signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11).
:SIGNal:CBIT ?	Reads the C bit of the received signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11).
:SIGNal:DBIT ?	Reads the D bit of the received signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11).
:SIGNal:RING ?	Reads the ring state of the received signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11). The return value is also dependent on the trunk type specified in the :L[1 | 2]:ROUT:SIGN:TRUN:CH1...24 < trunk type > (see page 8–66).
:SIGNal:ONHOOK ?	Reads the on-hook state of the received signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11). The return value is also dependent on the trunk type specified in the :L[1 | 2]:ROUT:SIGN:TRUN:CH1...24 < trunk type > (see page 8–66).

Signaling Fetch Commands, continued

Command	Description
:SIGNal:OFFHOOK ?	Reads the off-hook state of the received signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11). The return value is also dependent on the trunk type specified in the :L[1 | 2]:ROUT:SIGN:TRUN:CH1...24 < trunk type > (see page 8–66).
:TXSIGNal:ABIT ?	Reads the A bit of the transmitted signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11).
:TXSIGNal:BBIT ?	Reads the B bit of the transmitted signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11).
:TXSIGNal:CBIT ?	Reads the C bit of the transmitted signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11).
:TXSIGNal:DBIT ?	Reads the D bit of the transmitted signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11).
:TXSIGNal:RING ?	Reads the ring state of the transmitted signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11). The return value is also dependent on the trunk type specified in the :L[1 | 2]:ROUT:SIGN:TRUN:CH1...24 < trunk type > (see page 8–66).
:TXSIGNal:ONHOOK ?	Reads the on-hook state of the transmitted signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11). The return value is also dependent on the trunk type specified in the :L[1 | 2]:ROUT:SIGN:TRUN:CH1...24 < trunk type > (see page 8–66).

Signaling Fetch Commands, continued

Command	Description
:TXSIGNal:OFFHOOK ?	Reads the off-hook state of the transmitted signal, on the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < channel number > (see page 8–11). The return value is also dependent on the trunk type specified in the :L[1 | 2]:ROUT:SIGN:TRUN:CH1...24 < trunk type > (see page 8–66).

Using Query Commands to Retrieve Results

You can enter all the SCPI commands, except :INIT and :ABORT, as *query* commands. A query command looks like the following:

```
DT1:SOUR:TEST:STAT ?
```

The :FETC *root node* is the most commonly used query command and is followed by one or more level nodes, all separated by a colon (:). Notice the question mark after the last level node (STAT) – all query (or FETC) commands end with a question mark.

In general, query commands instruct a test module to retrieve the current result, error, or alarm information specified by the parameter, and display the result on the PC. For example, the command DT1:L1:FETC:AUTO:STAT ? returns either a 0 to indicate the auto-evaluate has completed, or a 1 to indicate the auto-evaluate is still in-progress.

Querying Line Status Information

Use the FETCh commands described in this section to query the characteristics of the T1 signal.

:L[1|2]:FETCh:STATus:<*characteristic*> ?

T1 Line Characteristics

Characteristic	Fetches status of...
RXPULSE	Pulse signal
FRMSYNC	Frame synchronization
PATSYNC	Pattern synchronization

Querying Tester Information

These commands let you query information about the Dual DS1/0 Test module. When you enter any of the commands listed below, make sure to begin with the following:

DT1:L[1|2]:FETCh

General Tester Commands

Command	Description
:RTDELAY ?	Returns the round trip delay value, in microseconds.
:CHANDATA ?	Returns the eight-bit data of the drop channel. The module determines which channel to query by looking at the channel specified in the :L[1 | 2]:ROUT:DMUX:DROP < 1...24 > command (see page 8–11).
:SERialnum ?	Returns the module's serial number.
:FIRMware ?	Returns the 860 firmware version.
:AUTOtest:STATe ? *	Returns either a 1 or 0. 1 = auto-evaluate is in-progress 0 = auto-evaluate complete
:TIMEtest:REMain ? *	Returns the amount of run time left (in seconds) for the test that is currently running.

* You do not specify a line (:L[1|2]) with the these commands.

:L[1|2]:FETCh:OPTion ?

This command returns the software option setting mask. The value is returned only when the value is masked and with the following:

- OPTION_SIGNAL_SEQUENCE – 0x00000001
- OPTION_PMASK – 0x00000004

:L[1|2]:FETCh:BOC:DATA ?

This command returns the sync status code detected if the data capture mode is enabled. See *:L[1|2]:SOURce:BOC:DATA <sync status code>*, page 8–61 for a list of codes.

:L[1|2]:FETCh:DATACapture:STATe ?

This command returns the status of the data capture process.

1 = capture process in-progress

0 = capture complete

:L[1|2]:FETCh:SIGNal:<*characteristic*> ?

T1 Signal Characteristics

Characteristic	Fetches
SIMPlex	Status of the receiver current (in mA), which results from a DS1 signal voltage on the selected line
LEVel	Level of the signal
MINimum	Minimum signal level
MAXimum	Maximum signal level
DBDSX	Level peak-to-peak dbDSX

:L[1|2]:FETCh:FREQuency:<*value*> ?

T1 Signal Frequency Characteristics

Value	Fetches
VALue	Frequency measurement
MINimum	Minimum frequency measurement
MAXimum	Maximum frequency measurement

Querying Alarm Information

Use the FETCh commands described in this section to query the status of the alarms.

:L[1|2]:FETCh:ALARm:<*type*> ?

The following chart lists all the types of alarms you can look at using this command. For example, if you enter :L1:FETC:ALAR:LOP, the module sends back the response1 if an LOP was detected on line RX1/TX1 (0 is the response if no LOP alarms are detected).

Alarm Status

Type	Fetches number of...
LOS	Times a loss of signal alarm was detected
LOS_SEC	Seconds during which a loss of signal alarm was detected
LOS_OCC	Occurrence count of LOS alarms.
OOF	Times a loss of frame alarm was detected
OOF_SEC	Seconds during which a loss of frame alarm was detected
OOF_OCC	Occurrence count of LOF alarms.
LOP	Times a loss of pattern alarm was detected
LOP_SEC	Seconds during which a loss of pattern alarm was detected
AIS	Times an AIS alarm was detected
AIS_SEC	Seconds during which an AIS alarm was detected
AIS_OCC	Occurrence count of AIS alarms.
YELlow	Times a yellow alarm was detected

Alarm Status, continued

Type	Fetches number of...
YELlow_SEC	Seconds during which a yellow alarm was detected
YELow_OCC	Occurrence count of yellow alarms.
PDV	Times a pulse density violation (PDV) alarm was detected
PDV_SEC	Seconds during which a PDV alarm was detected
CDI	Times a Customer Disconnect Indicator (CDI) alarm was detected
CDI_SEC	Seconds during which a CDI alarm was detected
CDI_OCC	Occurrence count of CDI alarms.

Querying Error Information

Use the FETCh commands described in this section to query the

:L[1|2]:FETCh:ERRor:<*type*> ?

The following chart lists all the types of errors you can look at using this command. For example, if you enter DT1:L1:FETC:ERR:BPV, the module sends back the response 1 if a loss of bi-polar violation was detected on line RX1/TX1 (0 is the response if no BPV errors are detected).

Error Information

Type	Fetches...
BIT	Bit error count
BIT_RATIO	Bit error count ratio
BIT_EFS	The number of seconds during which no bit errors occurred.
BIT_EFS_PC	The percentage of all seconds that contained no bit errors.
BIT_ES	The number of seconds during which at least one bit error occurred.
BIT_SES	The number of seconds during which the error rate was 10^{-3} or greater.
BIT_SYNC	The number of times the Service Advisor lost synchronization with the receive signal pattern.
BIT_SYNC_ES	The number of seconds (since start of test) the Service Advisor was not synchronized on the receive signal pattern.
BIT_CSES	Bit consecutive severe error seconds
BIT_CSES_RATIO	Bit consecutive severe error seconds rate.

Error Information, continued

Type	Fetches...
BPV	Bi-polar violation error count.
BPV_RATIO	The ratio of BPVs to the number of bits received.
BPV_EFS	The number of seconds during which no BPV errors occurred.
BPV_EFS_PC	The percentage of all seconds that contained no BPV errors.
BPV_ES	The number of seconds during which at least one BPV occurred.
BPV_SES	Bi-polar violation severe error second.
BPV_CSES	Bi-polar violation consecutive severe error second.
BPV_CSEC_RATIO	Bi-polar violation consecutive severe error seconds rate.
CRC	CRC-6 error count
CRC_RATIO	The ratio of CRC-6 error over the total number of ESF frames received.
CRC_EFS	The number of seconds during which no CRC errors occurred.
CRC_EFS_PC	The percentage of all seconds that contained no CRC errors.
CRC_ES	The number of seconds during which at least one CRC error occurred.
CRC_SES	CRC severe error seconds.
CRC_CSES	CRC consecutive severe error seconds.
CRC_CSES_RATIO	CRC consecutive severe error seconds rate.
FRM	Frame error count.
FRM_RATIO	Frame error current ratio.
FRM_EFS	Frame error-free seconds.
FRM_EFS_PC	Frame error free second percent.
FRM_ES	Frame error seconds.

Error Information, continued

Type	Fetches...
FRM_SES	Frame error, severe error seconds.
FRM_SYNC	Frame error synchronization count.
FRM_SYNC_ES	Frame error synchronization seconds.
FRM_CSES	Frame consecutive severe error seconds.
FRM_CSES_RATIO	Frame consecutive severe error seconds rate.

:L[1|2]:FETCh:SLIP:CLOCK ?

The number of individual timeslot differences between the receive signal and the 1.544 MHz reference signal. A positive value indicates the receive frequency is greater than the reference frequency; a negative value indicates the receive frequency is less than the reference frequency.

Default: 0

:L[1|2]:FETCh:SLIP:CLOCK_RATIO ?

The clock slip current ratio.

Default: 0

:L[1|2]:FETCh:SLIP:PFRAMe ?

This count indicates that frame slips occurred when the receive signal was faster than the reference signal.

Default: 0

:L[1|2]:FETCh:SLIP:NFRAMe ?

This count indicates that frame slips occurred when the receive signal was slower than the reference signal.

Default: 0

Querying the Loop-up and Loop-down Status

This section lists the commands that let you query the status of the tester and the remote network device.

:L[1|2]:FETCh:LOOPcode:DETect ?

This command returns one of the following values:

Return Value	Description
0	Loop code not detected.
0xfe	Receiving loop.
0xff	Receiving unloop.

:L[1|2]:FETCh:LOOPcode:REMote ?

This command returns the status of the remote device.

Return Value	Description
0	Loop code not detected.
0xfe	Receiving loop.
0xff	Receiving unloop.

:L[1|2]:FETCh:LOOPcode:LOCal ?

This command returns the ID of the active local loop.

0 = not looped

:L[1|2]:FETCh:LOOPcode:TYPE ?

If there is an active, local loop, this command returns one of the following codes. See *Loop Code Controls*, page 5–26, for more information about the listed loop codes.

Return Value	Description
0	Loop code not detected.
1	CSU loop code detected.
2	NIU loop code detected.
3	NIU4 loop code detected.
4	NIU6 loop code detected.
5	FDL_LLB loop code detected.
6	FDL_PLB loop code detected.
7	FDL_NIU loop code detected.

Querying the VF Signaling Measurements

This section lists the commands used to query the VF tone and frequency measurements.

:L[1|2]:FETCh:TONE:FREQ1 | FREQ2 ?

This command returns the measured frequency at the first highest (FREQ1) or second (FREQ2) highest level.

:L[1|2]:FETCh:TONE:LEV1 | LEV2 ?

This command returns the first (LEV1) and second (LEV2) measured signal level.

:L[1|2]:FETCh:SIGNal:<*signaling bit*> ?

The following chart lists the four variations of this command used to look at the settings for the A, B, C, and D bits. The module determines which channel to query by looking at the channel specified in the DT1:L[1|2]:ROUT:DMUX:DROP <*1...24*> command (*see page 8–11*).

For example, if you enter DT1:L1:FETC:SIGN:ABIT ?, the module sends back the signaling pattern set for the ABIT on the configured channel.

Signaling Bits Description

Signaling Bit	Description
ABIT	Displays the setting for the ABIT on the selected channel.
BBIT	Displays the setting for the BBIT on the selected channel.
CBIT	Displays the setting for the CBIT on the selected channel.
DBIT	Displays the setting for the DBIT on the selected channel.

Querying Performance Report Message Counts

This section lists the commands used to query PRM counts.

:L[1|2]:FETCh:PRM:<*type of message*> ?

This command returns the error count for each type of PRM detected during a test. When you enter any of the commands listed below, make sure to begin with the following:

DT1:L[1|2]:FETCh

For example, DT1:L1:FETC:G1 ? fetches the number of G1 messages detected during a test. See *PRMs Tab*, page 5–40 for more information about the message counts.

PRM Count Commands

Count	Description
:EFE ?	Error-free event count.
:CRC ?	Total number of CRC errors detected.
:G1 ?	Number of time only one CRC error was detected.
:G2 ?	Number of time more than one, but less than or equal to five CRC errors were detected.
:G3 ?	Number of time more than five, but less than or equal to ten CRC errors were detected.
:G3 ?	Number of time more than five, but less than or equal to ten CRC errors were detected.
:G4 ?	Number of time more than ten, but less than or equal to 100 CRC errors were detected.
:G5 ?	Number of time more than 100, but less than or equal to 319 CRC errors were detected.

PRM Count Commands, continued

Count	Description
:G6 ?	Number of time more than 320 CRC errors were detected.
:SE ?	Number of time when at least one severely errored framing event was detected.
:FE ?	Number of times at least one frame synchronization error event was detected.
:LV ?	Number of times at least one line code violation event was detected.
:SL ?	Number of times at least one slip event was detected.
:LB ?	Number of times a payload loopback was activated.

Querying Pulse Mask Information

This section describes the commands used to query the pulse mask test information.

:L[1|2]:FETCh:PMASk:IMBRatio ?

Use this command to query the ratio of the amplitude of the positive received pulse and the amplitude of the negative received pulse meets the specifications of the selected pulse mask.

You receive a ratio only when you set the :L[1|2}:FETCh:PMASk:POLarity command to positive & negative (see *:L[1|2]:SENSe:PMASk:POLarity <acquired polarity>*, page 8–18).

:L[1|2]:FETCh:PMASk:POSitive:DATA ?

Use this command to query the data points of the positive pulse.

:L[1|2]:FETCh:PMASk:POSitive:FITStatus ?

Use this command to query the result of positive pulse fitting. 0 = failed, 1 = success, 2 = no data, 0xff = unavailable.

:L[1|2]:FETCh:PMASk:POSitive:AMPLitude ?

Use this command to query the positive pulse amplitude, in millivolts.

:L[1|2]:FETCh:PMASk:POSitive:RISE ?

Use this command to query the rise time of the positive pulse, in nanoseconds.

:L[1|2]:FETCh:PMASk:POSitive:FALL ?

Use this command to query the fall time of the positive pulse, in nanoseconds.

:L[1|2]:FETCh:PMASk:POSitive:WIDTh ?

Use this command to query the width of the positive pulse, in nanoseconds.

:L[1|2]:FETCh:PMASk:POSitive:OSH ?

Use this command to query the overshoot percentage of the positive pulse.

:L[1|2]:FETCh:PMASk:POSitive:USH ?

Use this command to query the undershoot percentage of the positive pulse.

:L[1|2]:FETCh:PMASk:NEGative:DATA ?

Use this command to query the data points of the negative pulse.

:L[1|2]:FETCh:PMASk:NEGative:FITStatus ?

Use this command to query the result of negative pulse fitting. 0 = failed, 1 = success, 2 = no data, 0xff = unavailable.

:L[1|2]:FETCh:PMASk:NEGative:AMPLitude ?

Use this command to query the negative pulse amplitude, in millivolts.

:L[1|2]:FETCh:PMASk:NEGative:RISE ?

Use this command to query the rise time of the negative pulse, in nanoseconds.

:L[1|2]:FETCh:PMASk:NEGative:FALL ?

Use this command to query the fall time of the negative pulse, in nanoseconds.

:L[1|2]:FETCh:PMASk:NEGative:WIDTh ?

Use this command to query the width of the negative pulse, in nanoseconds.

:L[1|2]:FETCh:PMASk:NEGative:OSH ?

Use this command to query the overshoot percentage of the negative pulse.

:L[1|2]:FETCh:PMASk:NEGative:USH ?

Use this command to query the undershoot percentage of the negative pulse.

Querying Digital Data Service (DDS) Information

This section lists the commands used to query DDS information.

:L[1|2]:FETCh:DDS:FSYNC ?

This command indicates whether tester has synchronized to the framing format on the DDS channel. 1 = frame sync condition, 0 = not synchronized.

:L[1|2]:FETCh:DDS:CTRLcode:COUNt ?

This command queries the total DDS control code count.

:L[1|2]:FETCh:DDS:CTRLcode:INFO ?

Use this command, in conjunction with the :L[1|2]:SENSe:DDS:CTRLcode:INDEX command (see page 8–46), to display DDS control code information.

The format of the return ASCI string is:

Rcv_code, Chan_data, Count, Duration

Rcv_code: The name of the control code.

Chan_data: The control code.

Count: The number of time this control code has been detected.

Duration: The number of seconds this control code has been present on the channel.

9

Specifications

DS1/0 Features

Auto Configure: Automatic alignment to framing, line code, and test patterns; standard mode tests all patterns, normal and inverted; detailed mode tests only standard BERT patterns.

Event Log: Captures up to 4096 events from RX1 and/or RX2 with date and time stamp

- stores LOS, AIS, Yellow, Frame Loss, Pattern Loss, Density Violations, and CDI alarms
- stores Logic, BPV, Frame Errors, and CRC errors
- stores test start or stop, frame type change, pattern type change, LBO change, B8ZS change, and loopcodes detected events
- data stored with 1 second resolution

Test Period: Continuous, 15 min, 30 min, 1 hour, 3 hours, 6 hours, 12 hours, 1 day, 3 days, 7 days, or user programmable (1 minute to 7 days)

ASCII Reports: Can print or save Dual Monitor, T1 Testing, Signaling, Event Log, or BERT Sequences during a test or after you have stopped a test. Reports are 75 columns wide, and you can enter header information (Operator ID, Customer Name, Circuit ID, Comments) for report.

Data and File Management: Local: store last configuration, restore last configuration, and reset default configuration; remote: download program Flash-ROM updates.

Remote Control: SCPI command line interface and remote graphical user interface (GUI) for PC

Connectors for Module: L1 and L2: dual bantam; handset: RJ-11; ground lug

Module soft LEDs: L1 and L2: one set for each; Status: signal, frame, pattern sync, error; Other: history and ready

Error Injects: Logic, BPV, Frame, CRC

Alarm Injects: AIS, Yellow, CDI

Error and Alarm Injection Rate: Single, Burst, 1E-1, 1E-2, 1E-3, 1E-4, 1E-5, 1E-6, 1E-7

Test Periods: Continuous, user-selectable time periods

Storing and Printing Results: *Printer/Remote Control*: Control by user interface or customer- written interface. Printer control by user's PC (serial or parallel).

Results and setup storage: Limited only by user's PC hard drive capacity. Test setups and results can be saved to hard drive or floppy disk.

Physical Characteristics of Dual DS1/0 Test Module

Size (W×H×D)	3.5 × 8.5 × 1 inches
Weight	1.5 pounds (.6 kg)
Temperature	Operating: 0° to +40° C (32° to 104° F) Storage: -20° to +60° C (-4° to 140° F)
Power	7 Watts (provided by Service Advisor N1610)
EMI	FCC Class
Mechanical	HP Handheld Class 2B

T1 and Fractional T1 Transmitter Specifications

Number: Two fully-independent transmitters

Line codes: AMI, B8ZS

Framing: D4, ESF, SLC-96, None

Impedance: 100 ohms ±5%

Line Build Out: Selectable 0, –7.5, –15, –22.5 dB; 0, 266, 399, 533, 655 feet

Transmitter timing: Recovered (loop-timed), Internal

Pulse shape: T1X1.403 for cross-connects

T1 Standards: ANSI T1X1.403, TR-TSY-00008

Intrinsic jitter: ITU-T Rec 703, section 2

Idle channel: All ones or user-bit programmable byte

TX Clock sources: RX1 recovered clock, RX2 recovered clock, Internal clock source (TX clock: 1.544 Mb/sec ±10 ppm)

Transmits: Two fully-independent BERT patterns; Alarms: LOS, AIS, Yellow, Customer Disconnect Indicator (no LAPD processing)

Fractional T1 testing rates: N×56, N×64, 1 <=n, 24; contiguous or non-contiguous

Error Injection: Frame: single, 2 to 6 consecutive frames, and a burst of 25

BPV and Pattern: single, 1E-1 to 1E-7, and a burst of 1 to 9,999

CRC: single, 1E-4 to 1E-7 (which is equivalent to an error rate of 2.17E-3), and a burst of 1 to 9,999

Bit: 1E-1 to 1E-7, and a burst of 1 to 9,999

Loop codes: Standard: CSU, NIU, NIU4, NIU6, V.54, OCU-DP, FDL-Line, FDL-Payload, FDL-Network

DDS: V.54, OCU-DP, OCUALT, DSUALT, CSUDP, CSUALT, DS0DP

User-programmable: LCl1 to LCl4 in-band codes, LCO1 to LCO4 out-of-band codes

Frame Bit Overwrite: ON/off

CODEC: μLAW

Tone generation: 404, 1000, 1004, 2804 Hz, or user-programmable tone in the range of 200 Hz to 3950 Hz in 1 Hz steps with adjusted level from +3 dBm to -35 dBm in 1 dBm steps

3 Tone Slope: (404, 1004, 2804 Hz) with level adjustable from +3 dBm to -35 dBm in 1 dB steps, and duration adjustable 1 to 9,999 seconds in 1 second steps.

Audio input: from handset can be encoded onto a single user-selectable DS0 timeslot instead of a tone

Signaling bit control: AB or ABCD signaling bits are user-programmable for all 24 channels

BERT patterns: Standard: QRSS, Ones, Zeros, 1:1, 1:7, 3:24, 63, 511, 2047, 2^15-1, 2^20-1, 2^23 -1, Live

Octet: Oct 52 to Oct 55, Oct 72, Oct 96, Oct 120, Daly 55, Net 55;
User-programmable: four user-defined bit patterns (3 to 16 bits) and four user-defined byte patterns (up to 1024 bytes)

Density: 1:3, 1:5, 1:6, 2:8 – 2:14, 3:18 – 3:23; all patterns can be inverted

DDS: DDS1 through DDS6

BERT sequences: Types of patterns: Bridge tap (BTP), Multipattern (MTP), User (1 to 3)

Programmable parameters: Line (RX1/TX2, RX2/TX2, or RX1/TX2 in Drop and Insert mode), Run Mode (once or continuous), Run Pattern for 5 to 300 seconds (1 second step)

Sequence controls: hold pattern or advance pattern

Sequence Results: Per Pattern: Status (Running) In Sync, total pattern errors, total BPV errors, total frame errors, total CRC errors; Overall: number of loops, number of failed loops, current pass number

DDS Rate (User Channel): DS0A rates: 2400, 4800, 9600, 19200, 28800, 38400, 56000, 64000 Kb/s

DS0B rates (user channel): 2400 (1 - 20 user), 4800 (1 - 10 user),
9600 (1 - 5 user), 19200 (1 - 2 user) Kb/s

PRM Generation: Runs in Normal, Internal, and Drop&Insert modes. Can select the following events:

G1 - CRC error event = 1
G2 - CRC event > 1 but ≤ 5
G3 - CRC event > 5 but ≤ 10
G4 - CRC event > 10 but ≤ 100
G5 - CRC event > 100 but ≤ 319
G6 - CRC event ≥ 320
SE - Severely Errored Framing Event ≥ 1
FE- Frame Synchronization Error Event ≥ 1
LV - Line Code Violation Event ≥ 1
SL - Slip Event ≥ 1
LB - Payload Loopback Activated

T1 Receiver Specifications

Number: Two fully-independent receivers with individual BERT

T1 Standards: ANSI T1X1.403, TR-TSY-00008

Receives and detects: BERT patterns

Impedance: Bridge: 1000 ohms ±5% ohms bridged; Terminate: 100 ohms ±5%

Monitor: 100 ohms ±5%

Line codes: AMI, B8ZS (once a B8ZS code is detected, B8ZS is declared until LOS is detected or AutoSetup is used

Framing: D4, ESF, SLC-96, None

Fractional T1 testing rates: N×56, N×64, $1 \leq n < 24$; contiguous or non-contiguous

Audio output: One user-selected DS0 timeslot in a T1 signal is dropped to an internal speaker with adjustable volume or to a handset jack (on the module) with normal telephone output level. Both directions can be dropped simultaneously. Frequency and level are measured for the DS0 channel.

Jitter tolerance: Input typically tolerates a signal modulated with sinusoidal jitter having an amplitude/frequency relationship defined in ITU-T Rec 703, section 3

Signal loss criteria: No pulses for 192 bit times

Density violations criteria: Excess zeros or ones in accordance with ANSI T1.403

D4 alarm criteria: Frame loss when two out of five Ft bits are in error. *Yellow alarm* when bit two of each DS0 has been zero for 255 consecutive channels.

ESF alarm criteria: Frame loss when two out of five Ft bits are in error. *Yellow alarm* when alternating eight ones and eight zeros are detected in data link

Pattern loss criteria: Greater than 100 errors in 1000 bits

T1 Measurements

Level: Terminate: 0 to -35 dBdsx, Monitor: -17 to -30 dB (flat loss relative to 0 dBdsx1, Resolution: ±1 dB and accuracy of ±5%

Simplex current range: 1 to 200 mA (with a resolution of 1 mA and accuracy of ±5%)

Frequency: Maximum, minimum, and current during the test period. Resolution: ±1 Hz, accuracy: ±2 dB, range: 1.544 MHz ±250 ppm.

Slips: Measure modes: RX1/RX2, TX1/RX1, TX2/RX2; Results: relative frequency, total, estimated frame

Status Indicators: Green soft LEDs indicate RX pulses (presence of a T1 signal), frame sync (synchronized to receive signal framing), and pattern sync (synchronized with a known input data pattern)

Alarm Indicators: Red soft LEDs indicate Signal Loss, Frame Loss, Pattern Loss, Density Violation, AIS signal, Yellow Alarm, CDI

Alarms: Signal loss seconds and counts, loss of frame seconds and counts, density violations seconds, AIS seconds and count, yellow alarm seconds and count, CDI seconds and count (no LAPD processing), pattern loss seconds and count.

Pattern Errors: Count, rate, errored seconds (ES), severely error seconds (SES), consecutive severely error seconds (CSES), unavailable seconds (UAS), error free seconds (EFS), %ES, %SES, %CSES, %UAS, %EFS

BPV Errors: Count, rate, ES, SES, CSES, UAS, EFS, %ES, %SES, %CSES, %UAS, %EFS

CRC Errors: Count, rate, ES, SES, CSES, UAS, EFS, %ES, %SES, %CSES, %UAS, %EFS

Frame Errors: Count, rate, ES, SES, CSES, UAS, EFS, %ES, %SES, %CSES, %UAS, %EFS

Round Trip Delay: Measurement range: 2^15 pattern: 0 to 21 msec, 2^20 pattern: 0 to .68 sec, 2^23: 0 to 5.4 sec, QRSS: 0 to .68 sec with a resolution of ±.1 bit time and accuracy of ±2 bit times)

Tone: Timeslot demultiplexed and level and frequency measured

AB(CD) Bits: Simultaneously displays AB(CD) bits in all 24 channels for either receiver

Timeslot Data Displayed: 8 bit

3 Tone Slope: Shows average value of tone in dBm, ±1% frequency acceptance bandwidth for 404 Hz, 1004 Hz, and 2804 Hz tones

PRM: Shows total counts for G1, G2, G3, G4, G5, G6, SE, FE, LV, SL, and LB, error free seconds and total CRC events

DDS Measurements: DDS frame synchronization, control code capture: code, description, data, count, and duration

Signaling Option (010) Characteristics

Signaling Types: E&M immediate, E&M wink start, ground start, loop start, data, mixed trunk (signaling type can be programmed for individual timeslots)

Operating Modes: AB(CD) decode, Call Monitor Logging, Dial, Program Stored Number

Modes: Monitor both CO and Customer Interface (CI), emulate CO, emulate CI

Channel Selection: 1 to 24

Status Indicators: CO: on-hook, off-hook, ringing; CI: on-hook, off-hook, ringing

AB(CD) Decodes: Displays signaling state (on-hook, off-hook, ringing) and AB(CD) signaling bits for RX1 or RX2, depending on signaling type and mode

Call Monitor Logging: Monitor modes: selected channel, scan and monitor until hang-up, scan and monitor until timeout (can select 5, 10, 15, 30, or 60 seconds)

Decodes: DTMF, MF, and DP digits and signaling state (resolution of 1 second

Dial Modes: Channel selection: 1 to 24

DTMF digits: 0-9, *, #, A, B, C, D, pause; digit and interdigit time is typically 50 ms

MF digits: 0-9, KP, ST1-3, pause; digit time is typically 70 ms; KP time is typically 100 ms; interdigit time is typically 50 ms

DP digits: 0-9

Controls: “Go On Hook Now”, “Go Off Hook Now”

Program Stored Numbers: Program up to nine digit strings (SN1 – SN9) with MF, DTMF, and DP

Pulse Mask Option (020) Characteristics

Masks: T1.102, T1.403, G.703, Pub 62411

Capture Data: Line 1 or 2; Acquire: positive, negative, or positive and negative

Mask Tolerance: 0%, 3%, or 6%

Measurements: Pass/fail, amplitude (mv), rise time (ns), fall time (ns), width (ns), overshoot (%), undershoot (%), imbalance ration (only when acquire is set to positive and negative)

Ordering Accessories

Contact your Agilent representative to purchase any of the following items, or to find out more information.

Dual DS1/0 Test Module Accessories

Product Number	Product Description
E6361A	T1 Mini-bantam cable set
E6360A	Standard telephone handset
N1660A-910	Additional user's manual

Agilent Technologies Limited Warranty

Agilent Product:	**Duration of Limited Warranty:**
Dual DS1/0 Test Module (N1660A)	3 years

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Services and Support

If you are looking for a product manual, or related information and services, such as answers to frequently-asked questions (FAQ), access the following Web site:

www.agilent.com/comms

If your Dual DS1/0 Test module does not appear to be operating properly, carefully check all configuration parameters and connections. Also check that the module is seated properly in the Service Advisor.

Any adjustment, maintenance, or repair on this module must be performed by qualified personnel. Contact your Customer Engineer through your local Agilent Technologies Service Center. You can find a list of local service representatives on the Web at:

www.tm.agilent.com/tmo/assist/English/

Select a country, and then the link under the Local Office(s) section (found at the bottom of the screen). Selecting the local office link displays location and contact information for all the local offices.

If you do not have access to the Internet, one of these centers can direct you to your nearest representative:

Service Center Telephone Numbers

Location	Telephone Number
United States	Test and Measurement Call Center 1.800.452.4844 (toll free in the U.S.)
Canada	905.206.4725
Europe	31.20.547.9900
Japan	Measurement Assistance Center 81.426.56.7832 81.426.56.7840 (FAX)
Latin America	305.267.4245 305.267.4288 (FAX)

Service Center Telephone Numbers, continued

Location	Telephone Number
Australia	1.800.629.485
New Zealand	0800.738.378
Asia-Pacific	852.2599.7777 852.2506.9285 (FAX)

Returning a Unit for Repair

If your Dual DS1/0 Test module must be returned, a Technical Support representative will assign a Return Material Authorization (RMA) number. No product will be accepted for service without an RMA number.

Ship the instrument to:

Repair Department
Agilent Technologies, Inc.
Service Test Division
2 Robbins Road
Westford, MA 01886 USA

Be sure to mark the RMA number on the outside of the shipping container. In addition, be sure to include the following information:

- Model number (N1660A) and name (Dual DS1/0 Test module)
- Serial number
- Your name and phone number
- A written description of the problem
- Return “ship to” address
- Invoice address
- Payment information (if unit is out of warranty)

Glossary

AB/ABCD: Signaling bits for DS0 and T1 channels.

ac: Alternating current.

ACU: Alarm Control Unit.

AIS: Alarm indication signal. Originally called a "Blue" alarm.

ALBO: Automatic line build out.

all-ones: A bit pattern made up entirely of binary ones (*1111*....).

AMI: Alternate Mark Inversion. A line coding scheme.

ANSI: American National Standards Institute.

asynchronous: Not synchronized; not timed to an outside clock source.

bandwidth: A network's or channel's capacity to carry traffic.

BER: Bit error ratio. The number of errored bits over the total number of bits. This term is often used interchangeably with *bit error rate* (the number of errored bits *per second*).

BERT: Bit error ratio testing. This term is often used interchangeably with bit error *rate* testing.

B-ISDN: Broadband ISDN. See also *ISDN*.

bisync: Bisynchronous transmission.

bit: A basic unit of data. A bit can be set to either a zero or a one.

BITS: Building integrated timing supply. A stratum 1 clock source, typically in a CO.

Blue alarm: Original name for alarm indication signal.

B*n*ZS: Bipolar with *n*-zero substitution. A line coding scheme in which *n* consecutive zeros are replaced by a substitution code to maintain a high pulse density. Typical codes are B3ZS for DS3 and B8ZS for DS1.

BPV: Bipolar violation. The occurrence of a pulse that breaks the alternating polarity rule.

Bridged Tap: Unconnected cables on a reconditioned line, a common cause of problems with digital services.

BW: See *bandwidth*.

byte: Eight bits. Usually refers to a particular location in a frame.

CCITT: Consultative Committee on International Telegraph and Telephone, now the International Telecommunications Union (ITU). The standards produced by this organization are called ITU-T Recommendations.

clock: The timing of, or timing source for, digital telecom equipment.

COFA: Change of frame alignment. A shift in the alignment of a signal's framing bits.

CPE: Customer premises equipment.

CRC: Cyclic redundancy checksum. A basic error-checking technique.

CSES: Consecutively severely errored second.

CSU: Customer Service Unit.

D4: See *SF*.

DACS: Digital access and cross-connect system.

Daly pattern: A repeating 55 octet pattern.

datalink: A transmission path for data.

dB: Decibel. Standard unit for transmission loss, gain, and relative power ratios.

dBdsx: Decibels relative to the DSX level.

dBm: Decibels relative to one milliwatt.

dBrnc: Decibels relative to network carrier.

dc: Direct current.

DCC: Data communications channel.

DCE: Data circuit-terminating equipment. Equipment that provides the interface between a DTE device and a transmission circuit (for example, a modem).

DCS: Digital cross-connect system.

DDL: Derived Data Link.

DDS: Digital Data Service.

DLC: Digital loop-carrier system.

DRS: Digital reference signal.

DS0: Digital signal level 0; typically 64 or 56 Kb/s.

DS1: Digital signal level 1; 1.544 Mb/s.

DS2: Digital signal level 2; 6.312 Mb/s.

DS3: Digital signal level 3; 44.736 Mb/s.

DSU: Digital Service Unit.

DSX: A digital signal cross-connect and patch bay.

DTE: Data terminal equipment. Equipment that converts user information into data signals for transmission (for example, a PC).

"dumb" terminal: A passive, unintelligent device that serves as a remote Service Advisor emulator.

EFS: Error-free second.

error rate: The number of errors per second. Compare *error ratio*.

error ratio: The number of errors over the total number of bits. This term is often used interchangeably with *error rate*, although they are two different measurements.

ES: Errored second. A second in which at least one error occurred.

ESF: Extended Superframe framing format (DS1).

FDL: Facilities Data Link.

FDL LLB: Line loopback (sometimes called FDL loopback).

FDL PLB: Payload loopback. Only the payload (data) is looped back, not the framing or FDL bits.

FDL SJ: Smart Jack line loop (sometimes called network loopback).

frame: A group of bits, timeslots, or bytes whose unique positions can be identified relative to an alignment signal or pointer.

FT1: Fractional T1. A subrate signal on a DS1, comprising N number of DS0 channels. See also *N × 64*.

HDLC: High-level Data Link Control.

hexadecimal: A base-16 numbering system in which the digits range from 0 through F. A hexadecimal value is noted with a subscript "h," for example: "$2A0F_h$."

Hz: Hertz.

IBM: International Business Machines Corporation.

idle signal: A signal transmitted to indicate that a channel is not in use.

ISO: International Standards Organization.

ITU: International Telecommunications Union, formerly the Consultative Committee on International Telegraph and Telephone (CCITT). The standards produced by this organization are called ITU-T Recommendations.

jitter: Short-term variation in the phase of a digital signal (includes phase variation above 10 Hz).

Kb: Kilobit. A thousand bits.

Kb/s: Kilobits per second.

kHz: Kilohertz.

LBO: See *line build-out*.

LCD: Liquid crystal display.

LCVA: Line code violation alarm.

line build-out: A circuit that simulates the signal attenuation of a specified cable length.

LLB: See *FDL LLB*.

LOF: Loss of frame.

loopback: A state in which the transmit signal is reversed back as the receive signal, typically by a far-end network element.

LOS: Loss of signal.

Mb: Megabit. One million bits.

Mb/s: Megabits per second.

MHz: Megahertz.

monitor level: The signal level at a DSX Monitor point.

ms: Millisecond.

multiframe: A set of consecutive frames in which the position of each is defined in relation to a multiframe alignment signal.

N × 64/N × 56: A subrate signal on a DS1, formed by using N number of 64 Kb/s or 56 Kb/s channels.

NIU: Network Interface Unit.

octet: Eight bits. Typically refers to a group of bits that spans more that one byte. Compare *byte*.

OIU: Office Interface Unit.

OOF: Out of frame.

overhead: The bits or bytes in a frame or cell that are not the payload. Overhead provides for signal control and monitoring.

parity: An error checking method that uses extra bits to provide even or odd parity for a specific group of bits.

payload: The information bits of a frame or cell. Those bits that are not part of the *overhead*.

PLB: See *FDL PLB*.

PRBS: Pseudorandom bit sequence. A test pattern that simulates live, random traffic.

Pulse mask: A standardized range defining the boundaries of an ideal waveform shape.

QRSS: Quasirandom sequence signal.

Results (.rls) file: Contains test measurement data.

SDLC: Synchronous Data Link Control.

Setup (.stp) file: Contains test configuration information for setting up tests.

SJ: See *FDL SJ*.

SLC-96™: Subscriber loop carrier system 96. An AT&T T1 framing format. In the Service Advisor, SLD-96 refers to any system that is TR-SY-000008 compatible.

Smart Repeater: A repeater that can be controlled remotely using 16-bit codes transmitted on the T1.

synchronous: Synchronized. Occurring at the same rate or period; sharing common timing with an outside timing source.

test set: The hardware portion of the Service Advisor (the Undercradle or Standalone unit).

timeslot: A unique, cyclic time interval; typically providing a single channel.

timing: See *clock*.

TTL: Transistor-to-transistor logic. A standard transmission level with a logic low of zero volts and a logic high of 5 volts.

UAS: Unavailable seconds.

UI: Unit interval. The duration of one clock cycle, or pulse period, for a given rate.

V: Volt.

Vac: Volt, alternating current.

Vdc: Volt, direct current.

VF: Voice frequency.

V pk: Volt peak.

V p-p: Volt, peak-to-peak.

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