Agilent Technologies N1626A Service Advisor xDSL TIMS Test Module (ITU-T)

User's Manual

Agilent Technologies

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Warranty

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

Certificate No. 6969

Agilent Technologies
Service Test Division
2 Robbins Road
Westford, Massachusetts 01886 USA

Safety Notices

Observe the following safety precautions whenever you operate the TIMS xDSL 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 a Service Advisor tester 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 Service Advisor Tablet.

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.

Declaration of Conformity

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Agilent Technologies Company

Manufacturer's Address: Service Test Division
2 Robbins Road
Westford, MA 01886-4113

Declares that the product

Product Name: xDSL TIMS Module

Model Numbers: N1626A

Product Options: This declaration covers all options of the above product.

Conforms to the following Product Specifications:

EMC:	EN 55011:1991 / CISPR 11:1990 (Group 1, Class A)	
	EN 50082-1:1992	
	IEC 801-2:1984	8 kV AD
	IEC 801-3:1984	3 V/m
	IEC 801-4:1988	0.5 kV signal lines
		1 kV AC power lines

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.

The product was tested in a full configuration.

Denis E. Viel
Quality Manager

September 14, 1999
Westford, MA, USA

European Contact: Your local Agilent Technologies Sales and Service Office or Agilent Technologies GmbH, Department ZQ/Standards Europe, Herrenberger Strass 130, D-71034 Boeblingen, Germany (FAX +49-7031-14-3143).

About this Book

Getting Started

Chapter 1 *Getting Started* introduces the ITU-T version of the Service Advisor xDSL TIMS Module (N1626A), illustrating its connectors and controls. The chapter also describes basic functions of the Service Advisor Tablet, such as connecting power and starting and stopping the user interface.

Testing

Chapters 2 through 7 provide instructions for performing tests with the TIMS Module.

TIMS Reference

Chapters 8 through 13 contain reference information for the TIMS and Signaling module test functions. The signaling test screens in Chapter 13 are available when you purchase the Signaling Option 010.

Printing and Reports

Chapter 14 *Printing and Reports* Describes how to print display screns and reports, and how to save and delete reports.

Specifications

Chapter 15 *Specifications* lists technical specifications of the Tablet and information on ordering accessories.

Manual Conventions

Note: Contains important information.

Caution: Contains information about situations that could damage equipment or lose data.

Warning! Contains information about conditions that might cause personal injury.

About this Version

Applicability

This version of the *Agilent Technologies N1626A Service Advisor xDSL TIMS Test Module User's Manual (ITU-T Version)* applies to the N1610A or N1610B Tablet running operating system software version **1.4** (or later) and a N1626A TIMS Module running software version **1.5** (or later).

Note that some systems running earlier software may not provide all of the features described in this manual, and that systems running later versions of software may operate differently than described in this manual. Be sure to refer to any user's manual supplements or release notes that came with the unit, or call Agilent Customer Care at 1-877-878-8018.

Service Advisor xDSL TIMS Test Module User's Manual printing history

Version	Release date	Notes
1.0	March, 1999	Initial Release
2.0	September, 1999	
3.0	February, 2001	
4.0	May, 2001	Updated to reflect software version 1.50

Check the Software Version

You can check the software version number by tapping the Help button on the control screens, or the Tablet Control tab of the Service Advisor Manager.

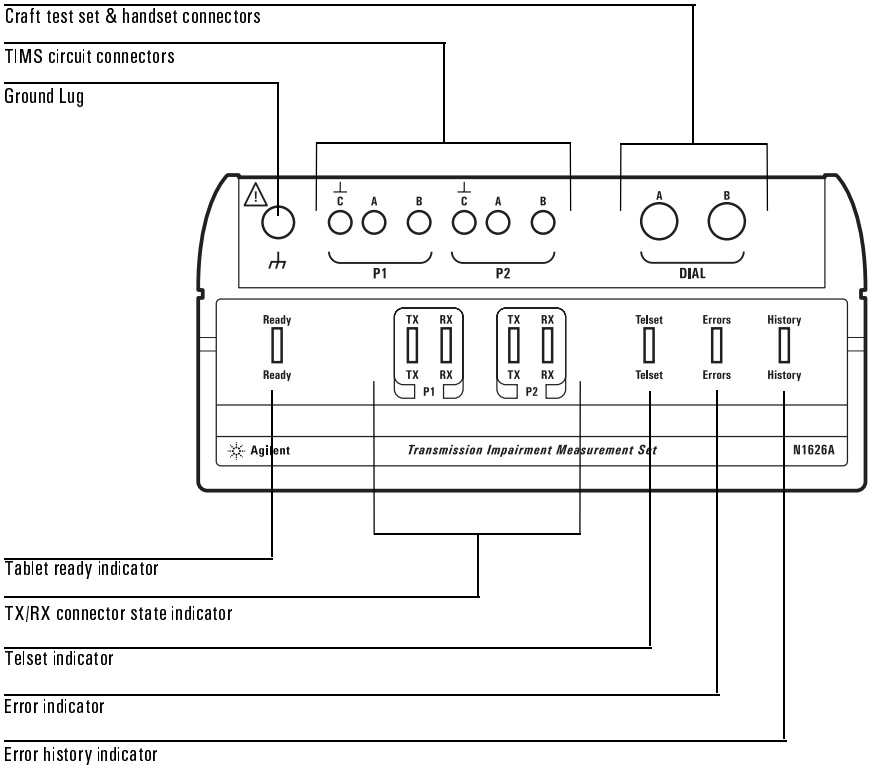
Contents

1

Getting Started

The N1626A xDSL TIMS Module at a Glance

The xDSL TIMS module plugs into the Service Advisor tablet to provide Transmission Impairment Measurement Set (TIMS) testing and power spectrum measurements. The figure below identifies connectors and indicators on the TIMS module.



TIMS Module Connectors

The TIMS module has the following connectors.

Craft test and handset connectors: Use these jacks to connect a portable telephone or butt-set (craft test set) to the TIMS module for dialing or speaking over the line

TIMS line connectors: The P1 and P2 connectors each accept a test cable for connecting the TIMS module to a line.

- Use P1 *or* P2 to connect to a single line.
- Use P1 *and* P2 to connect to two lines, or for loopback tests.

Note: The TIMS module has a frequency range up to 2 MHz for qualifying and troubleshooting lines for applications such as HDSL and ADSL.

Ground lug: Use this lug to attach a ground cable to connect the TIMS module to earth ground.

TIMS Module Indicators

TIMS module indicators provide status and configuration information.

Tablet ready indicator: Lights to indicate the module is under power and ready for operation.

TX and RX indicators: Show whether the module's P1 and P2 connectors are configured to transmit (TX) or receive (RX).

Telset indicator: Lights when the module is being used for dialing operations, such as dialing or speaking over a line.

Error indicator: Lights when an error occurs (when the test's pass/fail limits are exceeded; see page 2–3).

Error history indicator: Lights and remains lit when an error occurs during a test. Selecting a new test or restarting a test turns the indicator off.

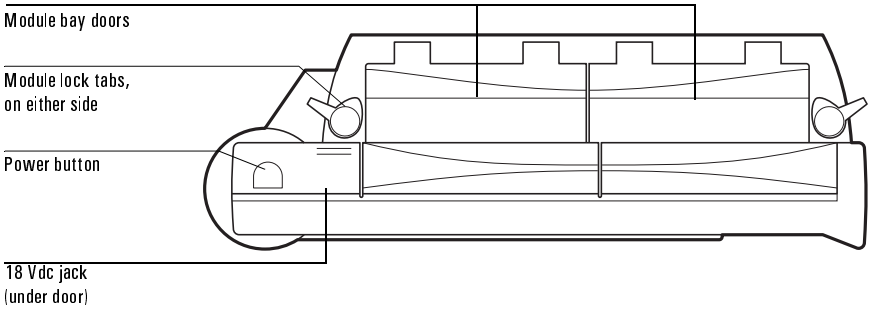
Using the Agilent Service Advisor Tablet

This section provides information about using the Service Advisor tablet with the TIMS module.

Installing Modules

Follow these steps to install the TIMS module in the tablet.

1. Open both module bay doors on top of the tablet and align the TIMS module with the bays.
2. Slide the module all the way into both bays until it seats firmly, and turn the locking tabs to lock the module in place.



Switching the Tablet and User Interface On

To turn on the tablet and start the user interface:

1. To use external power, connect the tablet's **18 Vdc jack** to an N1612A ac adapter or an N1614A 12 Vdc vehicle power adapter.

   If no external power source is connected, the tablet's battery provides power.

2. Tap the power switch on top of the tablet.

   The power indicator on the front panel lights. After a short startup routine, the tablet launches the Service Advisor Utilities Manager.

When operating using battery power, if the battery charge is too low to run the tablet and TIMS module, a warning message displays.

For more information on using the tablet, refer to the *Service Advisor Portable Test Tablet User's Manual*.

The TIMS User Interface

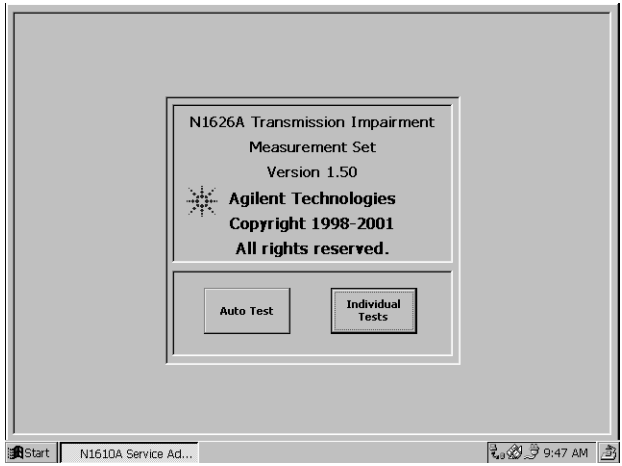
Opening the TIMS User Interface

When a Service Advisor detects a TIMS module in its bays, it either launches the TIMS software automatically (if AutoStart is enabled in the Service Advisor Manager's Setup screen), or displays the Service Advisor Manager screen.

If the TIMS interface does not open automatically:

1. On the Service Advisor Manager screen, tap the **Enable** button.

   The TIMS startup screen displays.



2. To run Auto Test sequences, tap **Auto Test**.

   See *Running Auto Test Sequences*, page 2–17.

3. To configure tests, modify Auto Test sequences, or run an individual test, tap **Individual Tests**.

   See *Setting Up a TIMS Test*, page 2–3 for information on configuring individual TIMS tests.

   See *Auto Test Sequences*, page 8–15 for information on creating and modifying Auto Test sequences.

   See *TIMS Tests and Measurements*, page 2–14 for descriptions of the TIMS tests.

Navigating the User Interface

To navigating the tablet's interface:

- Select options and activate buttons by tapping the item on the screen. Use your finger or the stylus that came with the tablet. (The stylus is stored in the back of the module bay.)
- Select **OK** to activate a selection. **Cancel** closes the current window without implementing any changes.
- When you select an option that requires a numeric value, the software opens a keypad containing touch selectable digits and options.

  Tap the appropriate buttons to specify a field value. The **Clear** button erases the values displayed. Tap **OK** to enter the value displayed, or **Cancel** to close the keypad window without specifying a new value. Keypad windows close when **Cancel** or **OK** are tapped.
- Close the program by selecting Exit from the File menu. See *File*, page 8–3

Stopping TIMS Module Software

To stop the TIMS software and close the TIMS interface:

1. In the File menu, tap **Exit**.

   A window opens, asking if you're sure you want to shut down TIMS.

2. Tap **YES** to shut down TIMS.

   The TIMS interface closes, and the Service Advisor Manager displays.

Shutting down the Tablet

To shut down the Service Advisor tablet:

1. Tap **ShutDown** at the top right of the Service Advisor Manager screen.

   A window opens, asking if you want to shut down the Service Advisor.

2. Tap **YES** to shut down the tablet.

   The tablet stops any active tests, closes the interface, and shuts down the Service Advisor Manager.

   By default, power is also switched off. You can configure the Tablet to leave power on when you shut down. Refer to the *Service Advisor Portable Test Tablet User's Manual* for information on changing the shut down options.

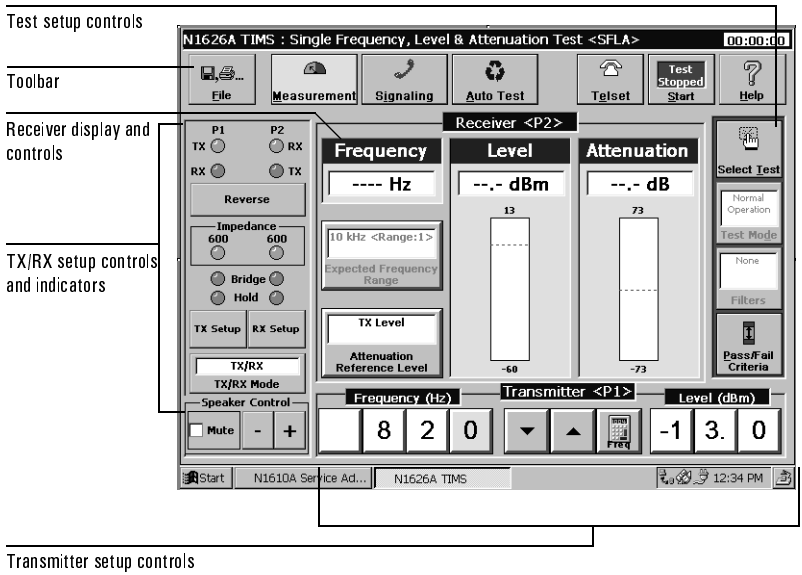
Note: You can also shut down the interface and Service Advisor Manager software by pressing the power switch, but Agilent recommends you use the shutdown option to avoid losing unsaved test data.

The TIMS Screen at a Glance

All of the TIMS test screens contain similar features. The Single FLA Test screen below is typical. The Receiver section in the middle of the screen changes, in response to which test is selected, and other selections.

Controls that are grayed out are not available for the test selected.

See *TIMS Screen Components*, page 8–2 for more detailed explanation of the test screens.



Changing Fuses on the TIMS Module

Two fuses protect the TIMS module from excessive line voltage.

To change a fuse:

Warning! Before performing this procedure, turn off the Service Advisor and disconnect its power source.

1. Slide the TIMS module out of the tablet and find the fuse holders on the bottom of the module faceplate.
2. Use a small screwdriver to unscrew the fuse holder until it pops out.
3. Gently pull out the fuse and examine it.

   The filament should be intact. If the filament is broken, the fuse is bad.
4. If the fuse is bad, replace it only with a similar rated fuse (250 V, 750 mA) If the fuse is good, reinsert the fuse in the holder.
5. Insert the fuse holder in the TIMS module, and use a screwdriver to push in and tighten the fuse holder.

Upgrading and Reloading the TIMS Software

The N1626A TIMS module's operating software is loaded using a PC with a CD-ROM drive.

To reload or upgrade the TIMS software:

1. Connect the Service Advisor tablet to a PC that has a CD-ROM drive, using a null modem, 9-pin serial cable.
2. Close all applications on the tablet, except the Service Advisor Manager.
3. On the Service Advisor Manager screen, tap the Upgrade tab.

   The Upgrade screen opens.
4. Tap the **Upgrade** button at the right side of the screen.
5. Insert the CD-ROM in the CD drive of the PC.

   The Download program launches.
6. In the Download window, select **N1626A**.
7. Tap **Download**.
8. Follow the instructions presented by the Download program.

2

Using the TIMS Module

Connecting to a Subscriber Line

Warning! Potentially dangerous voltage may be present on the line. Use extreme caution when connecting to the line. See *Electric Shock Hazard* in the front of this manual.

Caution: For battery operation, connect the ground lug on the TIMS module chassis to earth ground.

Connecting the TIMS Module to the Subscriber Line

To connect the TIMS module to a subscriber line, install a test cable between the TIMS module P1 or P2 connector and the appropriate conductors of the line you plan to test. Install a second cable if you plan a loopback test using two lines.

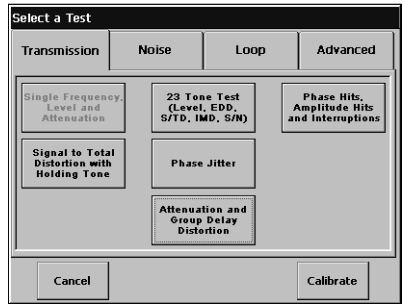
To perform the Noise Balance or Longitudinal Balance tests, connect a 3-conductor test cable with a grounded shield to the TIMS module's P1 or P2 connectors and the subscriber line.

Setting Up a TIMS Test

This section describes how to set up the TIMS tester for running any of the tests. For detailed information on the test screens and controls, refer to Chapter 8, *TIMS Reference*.

Selecting a Test

When the Individual Test option is selected from the Service Advisor Utilities Manager screen, the TIMS tester defaults to the Single Frequency Level and Attenuation test. The **Select Test** button on the right side of the display opens the Select a Test menu. The test options are arranged under four tabs as shown below. The currently selected test and any unavailable tests are grayed out.



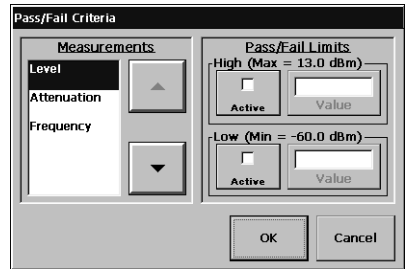
Setting Pass and Fail Limits

Most TIMS tests have a default range of pass/fail values defined for each test measurement. For example, in most tests the default range for received signal level is –60 dBm to +13 dBm. You can use the Pass/Fail Criteria window to change the limits of acceptable results for a test.

To change the high and low limits for a test:

1. Tap **Pass/Fail Criteria** on the right side of the screen.

   The Pass/Fail Criteria window opens.



2. In the Pass/Fail Criteria window, select the limit you want to change.

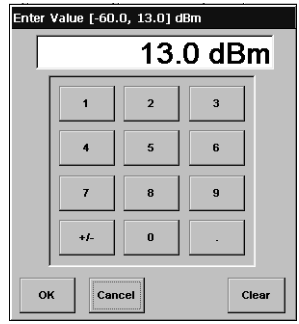
   (In the example, you could set limits for Level, Attenuation, and Frequency.)

   Select the limit by tapping it, or by tapping the up or down arrow.

3. Tap the **Active** button for the limit (high or low) you want to change.

4. Tap the corresponding **Value** button.

   The Enter Value keypad opens. The range of usable limits is displayed in the title bar of the keypad.



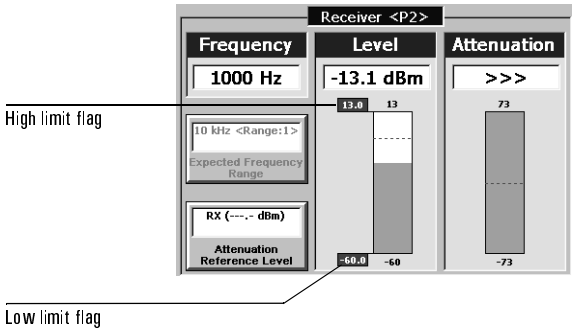
5. Enter a new limit, and tap **OK** to set the new value.

   If the values entered are outside the range of usable limits, a Value Error message box displays, showing the usable range. If the values entered are within the usable range, the Enter Value keypad closes, and the values entered are set as limits.

6. To change the other limit values, repeat steps 2, 3, 4, and 5 for that limit.

7. When you are done specifying new limit values, tap **OK** in the Pass/Fail Criteria window to activate the new limits.

   Flags are added to the display to show the new user-defined pass/fail limits.



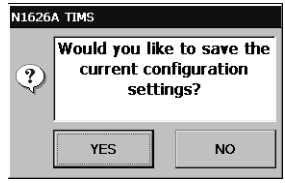
Changing the Default Pass and Fail Limits

The File Save feature allows you to save the current set of pass and fail limits, then use them as default values in future tests.

To save the current limit settings as the default limits:

1. In the File menu, tap **Save**.

   A window opens, asking if you want to save the current settings.



2. Tap **YES** to save the current settings as defaults.

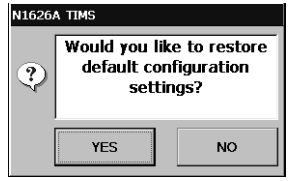
Restoring the Factory Default Limits

Note: When the tester starts, the last set of limits that was saved is used as defaults. To restore the factory settings as defaults, complete the procedure below.

To restore the factory set default pass and fail settings:

1. In the File menu, tap **Open.**

   A window opens, asking if you want to restore the default settings..

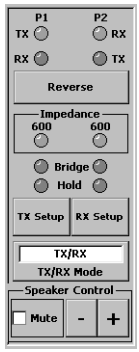


2. Tap **YES** to restore the factory set default limits.

Setting Up the Transmitter and Receiver (TX/RX Setup)

Use the TX/RX setup controls on the left side of the screen to set the basic configuration of the TIMS module's P1 and P2 ports.

Indicators show the current configuration as follows:

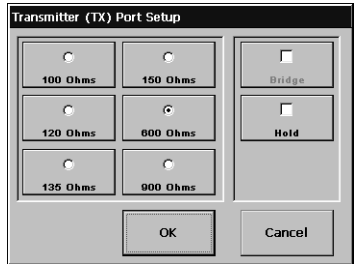


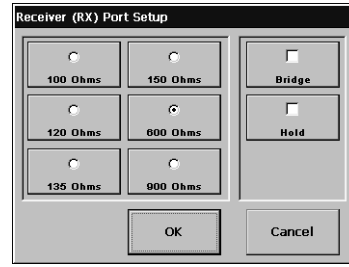
Green indicates that an item is selected.

Yellow (used only in bridge mode) indicates that the selected line-impedance value is not the actual impedance setting, but is used only for computing measurements. See *Bridge Termination*, below.

Reverse: Tap this button to reverse the transmit (TX) and receive (RX) functions of the TIMS module's P1 and P2 ports.

TX Setup and RX Setup: Tapping the TX Setup or RX Setup button opens one of the menus shown below. The buttons in the menu select the termination mode and line impedance.





- **Bridge termination:** This mode sets the receiver to a high-impedance state (40 kOhms) for nonintrusive testing on a live line. The selected RX impedance is used for computing measurement results. When Bridge mode is selected, the impedance indicator turns yellow.
- **Hold termination:** This mode holds the line for testing (see *Dial-and-Hold Functions Using a Butt-Set*, page 2–12).

TX/RX Mode: Opens the Select a TX/RX Mode menu. The menu choices are: Transmit/Receive, Receive only, and Transmit only.

Be sure to set the correct interface impedance for the application you are testing. For example, use Bridge mode and a 100-Ohm impedance to test live ADSL circuits.

The table below lists typical line impedances; however, your test may require different settings.

Interface Impedance Settings for Service Testing

Service	Impedance Setting
ADSL	100 Ohms
HDSL	135 Ohms
ISDN	135 Ohms
POTS	600, 900 Ohms

Speaker Controls

Plus and Minus: The speaker plus (**+**) and minus (**-**) buttons increase or decrease the Tablet's speaker volume.

Mute: Turns the speaker off. A checkmark appears in the Mute button when the speaker is off.

Configuring Special Test Modes and Options

Use the test feature controls on the right side of the screen to select tests and special configuration options.

Select Test: Opens the Select a Test menu to select a new test (see page 2–3).

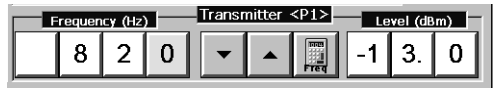
Test Modes: Opens the Select a Test Mode menu to configure the TIMS tester for specialized modes like loopback and quiet termination.

Filters: Opens the Select Filters menu to select a weighting filter for the test.

Pass/Fail Criteria: Opens the Pass/Fail Criteria menu to change the pass and fail limits for the test (see *Setting Pass and Fail Limits*, page 2–3).

Setting Up the Transmit Signal for Individual Tests

Use the Transmitter controls at the bottom of the screen to configure the TIMS transmitter output signal for the test, if necessary. (See *TX/RX Setup Controls and Indicators*, page 8–6 and *Transmitter Level Controls*, page 8–14.).



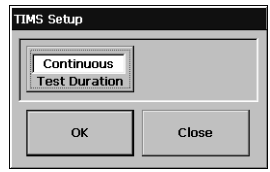
Note: In some tests the test signal frequency and signal level are set automatically by the test software. The control buttons are grayed out.

Setting Test Duration

Most tests normally run continuously until the **Stop** button is tapped, but you can set a length of time for those test to run. After the **Start** button is tapped, the test runs for the specified time, then stops. Tapping **Stop** ends the test even if a specified time has not elapsed.

To set a duration for the test:

1. In the File menu, select **Setup**. The TIMS Setup window opens.



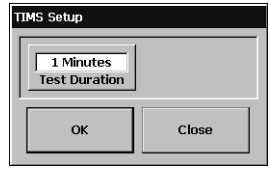
2. In the TIMS Setup window, tap **Test Duration** to open the Enter Value Keypad.

3. Tap the **Clear** button to clear the current setting, and the number buttons to enter the desired time in minutes.

   The value can be 1 to 9998 minutes. Entering 9999 resets to continuous testing. Entries consisting only of zeros trigger an eror message.

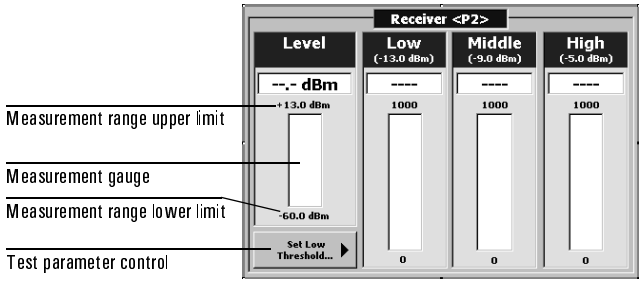
4. Tap **OK** to set the test duration to the entered number of minutes.

   The **Test Duration** button displays the new time setting.

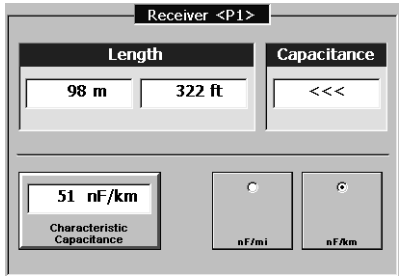


Viewing Test Results

The Receiver area displays test results and user-defined receiver settings, such as pass and fail limits and measurement ranges.



Some test results display as bar gauges or graphs; others display as arrays of values like the window below.



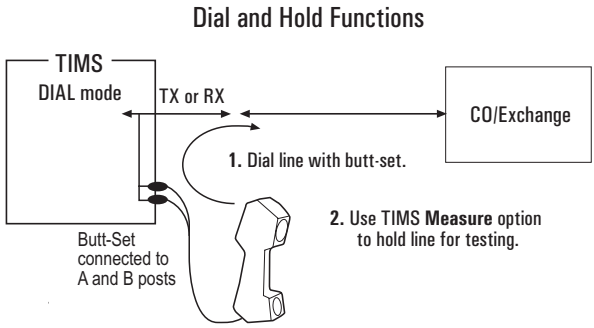
When the receiver displays **>>>**, the signal characteristic is greater than the test parameters.

When the receiver displays **<<<**, the signal characteristic is smaller than the test parameters.

Dial-and-Hold Functions Using a Butt-Set

This section describes how to perform dial-and-hold functions with the TIMS tester using a butt-set (for example, dialing the exchange to request a tone on the line, then holding the line for testing). See *Telset Option*, page 8–19.

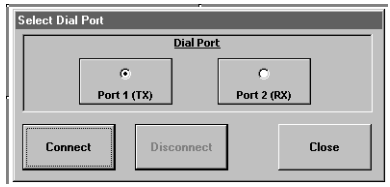
The TIMS tester can also perform dial and hold functions without a butt-set; see Chapter 7, *Using Signaling with the Tims Module*.



To perform dial-and-hold:

1. Connect your butt-set to the A and B binding posts on the TIMS module.
2. Connect the tester to the twisted-pair line.
3. In the Select a Test window, tap the desired test.
4. Tap **Telset**.

   The Select Dial Port window opens.

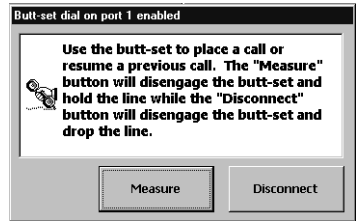


5. Tap the dial port your butt-set (craft test set) or a portable telephone will connect to.

Note: The current state of the port is shown on the port selection button as either TX or RX.

6. Tap **Connect**.

   The window shown below opens.



7. Use the butt-set to place a call or dial the exchange for services.

   If you plan to hold the line for testing, continue with step 8; otherwise, tap the Disconnect button to release the line.

8. Tap **Measure** to hold the line for testing, then tap **Start** to run the selected test.

9. When you've finished testing, release the line by either:

   - Using the TX/RX setup controls (on the left of the screen) to uncheck Hold for the port.
     (The Hold function was invoked automatically by the Telset option.)

   Or

   - Tapping **Telset** again, and selecting the port you want to release, then tapping Disconnect.

TIMS Tests and Measurements

Below are descriptions of the various tests and measurements you can perform with the TIMS module. To run one of the tests, see the page referred to in the description.

The default TX tone frequency is 1020 Hz. Loopback configurations are not generally used. The TIMS tester can be configured for receive-only, and the received tone can be 990 Hz to 1030 Hz.

Transmission Tests

Single Frequency, Level, and Attenuation (Single FLA) Test: This test checks signal strength and line attenuation. See page 3–2 for more information.

Cross Talk (NEXT/FEXT) Tests: Cross-talk tests measure the amount of signal that leaks from one twisted pair to another twisted pair in the same binder group. The TIMS tester provides two cross-talk tests: near-end cross talk (NEXT) and far-end cross talk (FEXT). See page 3–5 for more information.

Signal to Total Distortion (S/TD) Test: The S/TD test measures the quality of a voice service line, and can be used to minimize the error rate on data lines. See page 3–7 for more information.

23-Tone Test: The 23-Tone test measures attenuation distortion and envelope delay distortion (EDD) for the voice band. See page 3–9 for more information.

Phase Jitter Test: In this test, the TIMS module transmits a 1020 Hz tone at –13d Bm. The signal is looped back to the module's P2 port and the phase jitter is measured. See page 3–14 for more information.

Attenuation and Group Delay Distortion: This test measures flatness in the reception attenuation and delay of 23 tones in a test signal. See page 3–17 for more information.

Phase and Amplitude Hits & Interruptions Test: This test monitors phase hits, gain hits, and interruptions. See page 3–19 for more information.

Noise Tests

Noise Test: Noise measurements determine the level of background noise and interference on the line. See page 4–2 for more information.

Noise with Holding Tone: This test transmits a holding tone over the line to turn on any voice-activated devices in the circuit. At the measurement end, a notch filter removes the tone, so only the noise and distortion are measured.See page 4–5 for more information.

Impulse Noise (Voice Band): This test measures impulse noise on voice band lines. See page 4–8 for more information.

Impulse Noise with Holding Tone: This test measures impulse noise on a line when a holding tone is present. See page 4–10 for more information.

Impulse Noise (Wide Band): This test measures impulse noise on lines carrying wide-band services like ISDN, HDSL, and ADSL. See page 4–12 for more information.

Noise Balance Test: This test measures the metallic noise level, power influence, and noise balance in a twisted-pair line. See page 4–13 for more information.

Loop Tests

Complex Impedance Return Loss Test: This test generates a test signal, then measures the magnitude and phase angle of the line impedance. See page 5–2 for more information.

SRL/ERL Test: This test performs automated return loss measurements to determine singing return loss (SRL) and echo return loss (ERL) in the tested line. See page 5–4 for more information.

Longitudinal Balance Test: This test uses a signal to find the longitudinal balance of a twisted- pair line. See page 5–6 for more information.

Capacitance and Loop Length Calculation: This test can be used to determine the distance to an open. See page 5–8 for more information.

Digital Multimeter Test: This test measures dc voltage on the line. See page 5–10 for more information.

Load Coil Detection: Load coils must be removed before DSL service can be deployed. The TIMS tester can detect up to four load coils from a single access point at either end of the line. See page 5–12 for more information.

Test Loop (430-Ohm) Measurement: This test measures the current flow in the local loop with a 430-Ohm load applied (to simulate a telephone off-hook condition). See page 5–14 for more information.

Advanced Tests

Power Spectral Density (PSD) and Power Spectrum Test: The TIMS tester provides two options for measuring signal spectrum: power spectral density (PSD) and power spectrum. See page 6–2 for more information.

- The *PSD* option measures wide-band random noise levels across the selected frequency band on signals with random data stream input.
- The *power spectrum* option measures narrow-band signals.

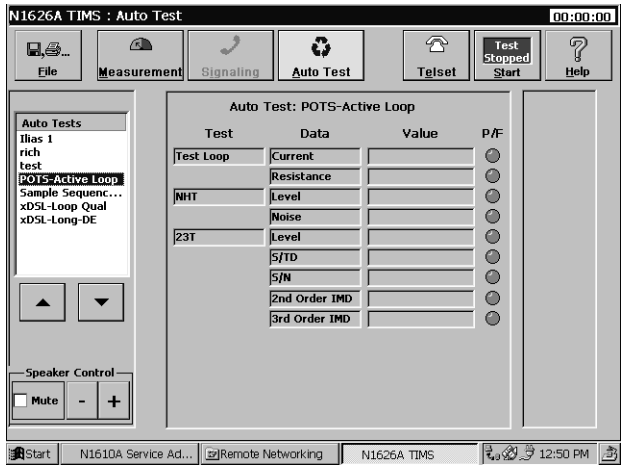
Swept FLA Test: In the Swept FLA test, two TIMS units are connected at opposite ends of a line for a stepped frequency sweep. See *Swept FLA Test*, page 6–5 for more information.

Running Auto Test Sequences

The Auto Test function lets you run a series of tests with one tap on the **Start** button. Example auto test sequences are included; you are encouraged to set up your own. See *Auto Test Sequences*, page 8–15 for more information.

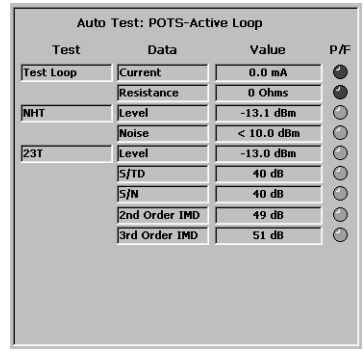
To run one of the test sets in the menu:

1. Tap **Auto Test**. The Auto Test screen displays.



2. Use the arrow buttons to highlight a test set in the menu at the left of the screen. The middle of the Auto Test screen displays the tests that make up the set, with fields for results and pass and fail indicators.

3. Tap **Start**. The tests run, and the results display in the appropriate fields.



3

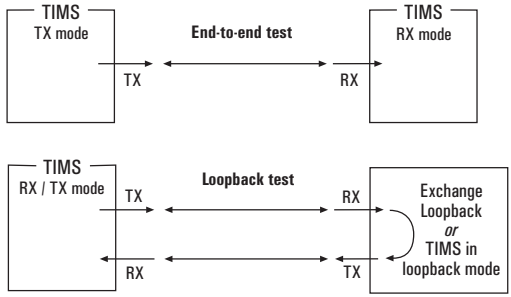
Performing TIMS Transmission Tests

Single Frequency, Level, and Attenuation (Single FLA) Test

This test checks signal strength and line attenuation. A Single FLA test can be performed using a TIMS at each end of the line, or one TIMS and a loopback at the far end of the line. For more information about the Single FLA screen, see page 9–2.

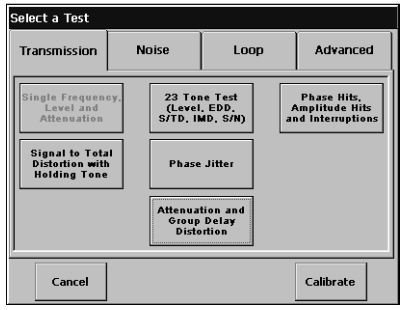
Note: For FLA tests to work properly, noise interference must be at least 20 dB lower than the signal being measured; otherwise, the readings may be invalid.

SFLA Test Configurations



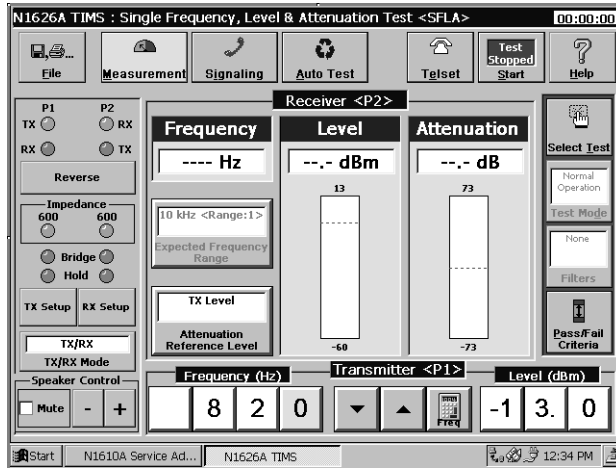
1. Connect the testers to the line or lines being tested.
2. Tap **Select Test**.

   The Select Test window opens.



3. Under the Transmission tab, tap **Single Frequency, Level, and Attenuation**.

   The Single FLA Test screen opens.



4. Configure each tester using the TX and RX setup controls on the left side of the screen (see *Setting Up the Transmitter and Receiver (TX/RX Setup)*, page 2–7).

5. Use the Transmitter Frequency and Level buttons to configure the transmit signal (see page 8–13 and page 8–14).

   If the line carries tones for signaling information, use SF Skip to block those tones from being sent, or the test may cause unintentional reactions. SF Skip is an option in the Enter TX Frequency window displayed when you tap the **Freq** button at the bottom of the Single FLA Test screen.

6. Use the **Attenuation Reference Level** button to select the reference level for the test.

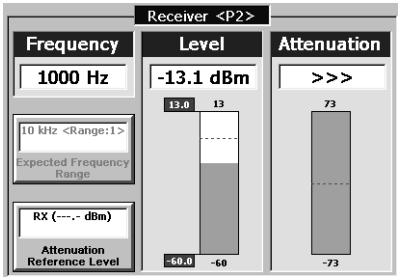
7. For an end-to-end test, tap **User Specified** in the RX tester's Reference Level menu to set the reference level to the signal source's transmit level.

8. For an end-to-end test when RX Only mode is selected, use the RX tester's Expected Frequency Range to set the receive frequency range.

   If the received signal frequency is not within the expected frequency range, frequency readings may not be accurate. See page 8–23 for descriptions of frequency ranges.

Note: If you don't know the signal frequency, run a power spectrum measurement on the received signal, then use the cursor option to find its approximate frequency. When you know the frequency, select the correct range for the test.

9. Tap **Start** at the top of the screen to start the test, and observe the Receiver display for test results.

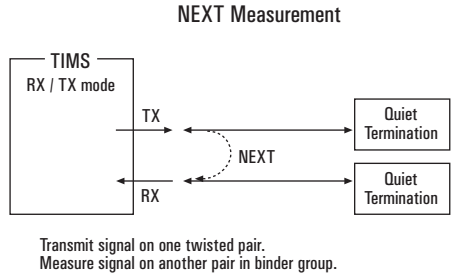


Cross Talk (NEXT/FEXT) Tests

Cross-talk tests measure the amount of signal that leaks from one twisted pair to another twisted pair in the same binder group. The TIMS tester provides two cross-talk tests: near-end cross talk (NEXT) and far-end cross talk (FEXT).

Near-End Cross-Talk (NEXT)

One TIMS tester is needed for NEXT tests. P1 is connected to one twisted pair, and P2 is connected to another. The tester transmits a signal on one pair and receives it on the other.



To perform a NEXT test:

1. Connect the tester's RX port to a line you want to test, and the TX port to another twisted pair in the same binder group (see the preceding figure).
2. Tap **Select Test.**

   The Select a Test window opens.
3. Under the Transmission tab, tap **Single Frequency, Level, and Attenuation**.

   The Single FLA Test screen opens.
4. Use the TX/RX setup controls on the left side of the screen to configure the tester.

   Configure either the P1 or P2 connector for TX. Configure the other connector for RX.

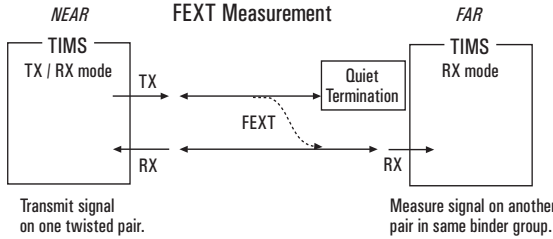
   Use TX/RX mode (see *Setting Up the Transmitter and Receiver (TX/RX Setup)*, page 2–7).

5. Use the Transmitter Frequency and Level buttons to configure the signal.
6. Tap **Start** at the top of the screen to start the test, and observe the Receiver display for test results.

You can use the **Attenuation Reference Level** button to change the reference level for the test.

Far-End Cross-Talk (FEXT)

The far-end cross-talk (FEXT) test requires two TIMS testers, one at each end of the twisted-pair lines. One tester transmits a signal on a twisted pair, and the other tester receives at the far end of another twisted pair.



1. Connect two testers to the lines (see the preceding figure).
2. Tap **Select Test**.
3. Under the Transmission tab, tap **Single Frequency, Level, and Attenuation**.
4. Configure each tester using the TX/RX setup controls on the left side of the screen (see *Setting Up the Transmitter and Receiver (TX/RX Setup)*, page 2–7).
5. Use the Transmitter Frequency and Level buttons to configure the transmit signal of the near-end tester.
6. On the receiving tester, select **Unknown** for Attenuation Reference Level.
7. Tap **Start** at the top of the screen on both testers.
8. Observe the Receiver display for test results.

Signal to Total Distortion (S/TD) Test

The S/TD test measures the quality of a voice service line, and can help minimize the error rate on data lines. For more information about the S/TD screen, see page 9–5.

Signal-to-Total Distortion with Holding Tone

To run a S/TD test, complete these steps:

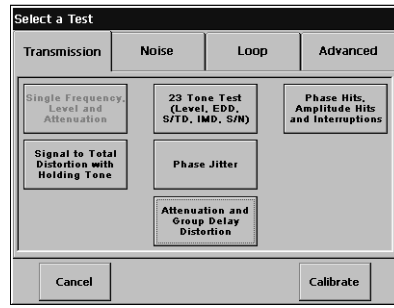
1. Connect a TIMS tester to the receiving end of the line.
2. Connect a signal source (from the exchange or another TIMS tester) to the other end.

   See the figure above.

Note: In cases where 4-wire access is available, a single TIMS tester can be used in TX/RX mode in a loopback configuration.This is not a common practice for S/TD testing.

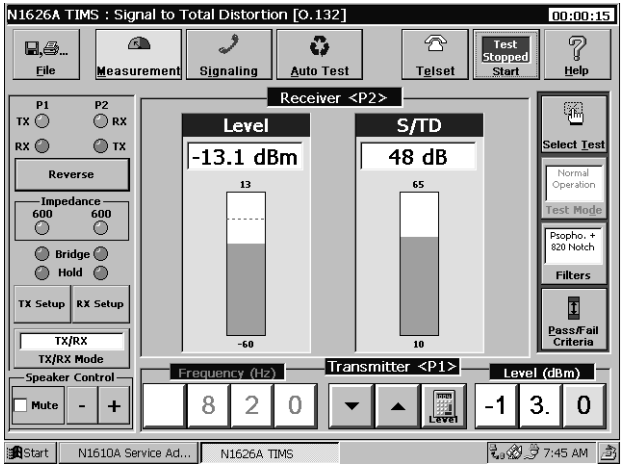
3. Insert a holding tone (820 Hz at –13 dBm) into the transmit end of the line.
4. At the receiving end of the line, tap **Select Test.**

   The Select a Test window opens.



5. Under the Transmission tab, tap **Signal to Total Distortion with Holding Tone**.

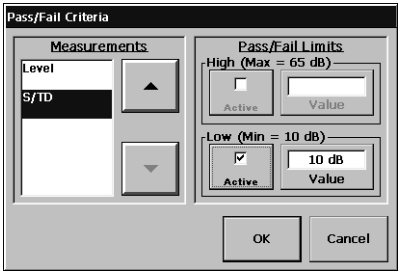
   The Signal to Total Distortion screen opens.



6. Set the TX/RX Mode to RX Only.

7. Use the psophometric or channel filter.

8. Set Pass and Fail limits for this test using the **Pass/Fail Criteria** button and window.



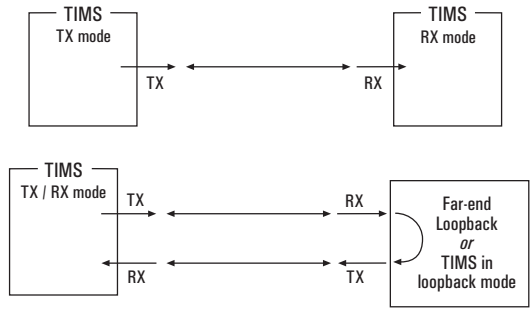
9. Observe the Receiver display for test results.

23-Tone Test

The 23-tone test measures attenuation distortion and envelope delay distortion (EDD) for the voice band. The test transmits 23 different frequencies (203.125 Hz to 3640.625 Hz, as specified in IEEE Standard 743-1995). For more information about the 23-Tone Test screen, see page 9–6.

This test typically uses two TIMS testers, one at each end of the line. You can also use a single tester to run a loopback test over two twisted pairs. The test results are then divided by two. Both twisted pairs must have identical characteristics for test results to be accurate.

23-Tone Test Configuration



To perform a 23-Tone test, complete these steps:

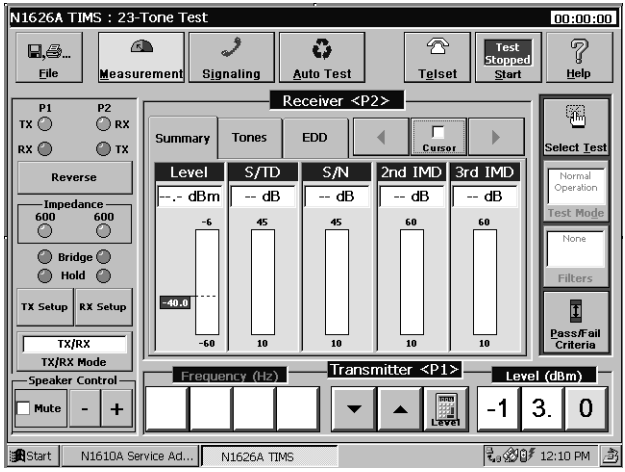
1. Connect the TIMS testers to the line**.**

   See the figure above.

2. On each tester, tap **Select Test**.

3. On each tester, under the Transmission tab, tap **23-Tone Test**.

   The 23-Tone Test screen opens.



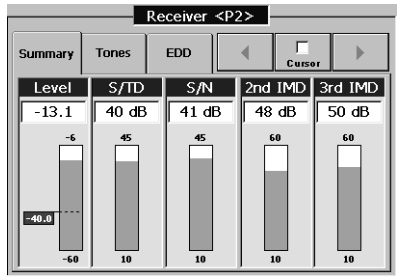
4. Configure each tester using the TX and RX setup controls on the left side of the display.

   See *Setting Up the Transmitter and Receiver (TX/RX Setup)*, page 2–7.

5. On the TX tester, use the Transmitter Level controls to set the level of the transmit signal.

6. Set Pass and Fail limits for this test using the **Pass/Fail Criteria** button and window.

7. Tap **Start** at the top of the screen on both testers. On the RX tester, observe the Receiver display for a summary of the test results.



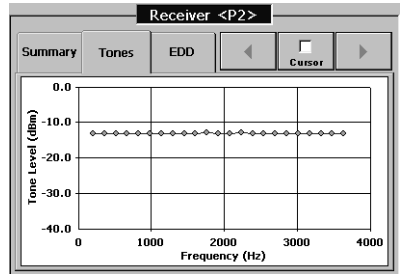
Displaying a Graph of the 23-Tone Test Results

Use the Tones or EDD tabs in the 23-Tone Test screen to display graphs of test results. (See see page 3–12 for information about EDD.)

To display a graph of the tone levels in the received signal:

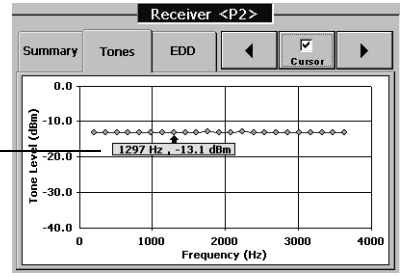
1. In the Receiver window of the RX tester, tap the Tones tab to view a graph of the line's signal response to each of the 23 tones.

   The Tone Level to Frequency graph displays.



2. Tap the **Cursor** button to display a signal marker and information tag.

   These show details for the test result data points. Use the arrow buttons or touch a data point to move the marker.



Cursor tag shows information about the signal at this measurement point.

Envelope Delay (EDD) Measurement

An EDD measurement determines the degree of phase non-linearity on a line. The TIMS tester calculates EDD by measuring the phase difference between each adjacent pair of tones in the received 23-tone signal. It compares the measured values to reference values for the phase differences (see Table 18 in IEEE Standard 743-1995). The resulting differences in values represent the delay.

Complete these steps to display the line's EDD:

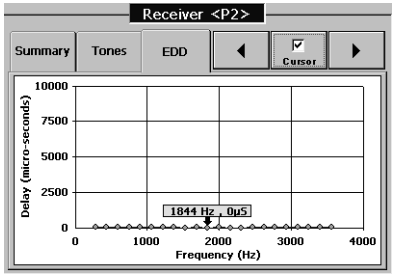
1. Tap **Select Test**.

   The Select a Test window opens.

2. Under the Transmission tab, tap **23-Tone Test.**

3. Tap **Start** at the top of the screen to begin the measurement.

4. On the RX tester, tap the EDD tab to view a graph of the line's envelope delay to frequency.



5. Tap the **Cursor** button to display a signal marker and information tag.

   These show details for the test result data points. Use the arrow buttons or touch a data point to move the marker.

Intermodulation Distortion (IMD) Measurement

The 23-tone test measures intermodulation distortion (IMD), which is caused when a signal with multiple tones passes through a non-linear gain device and generates sum and difference tones that are not in the original signal.

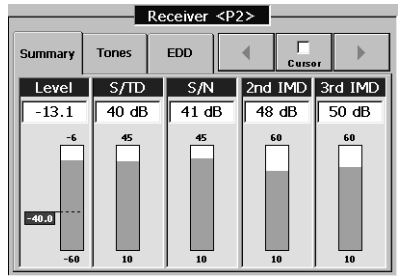
You can assess non-linearities in the transmission path by measuring 2nd-order and 3rd-order IMD products. 23-Tone Summary test results display the ratios of the received 23-tone signal to the 2nd and 3rd order IMD products.

The tester calculates 2nd- and 3rd-order results based on IEEE Standard 743-1995, Section 8.6.5.

Complete these steps to measure the line's IMD:

1. Run the 23-Tone Test described on page 3–9.
2. Tap the Summary tab.

   The 2nd and 3rd IMD measurements are the two right-hand columns in the Summary screen.

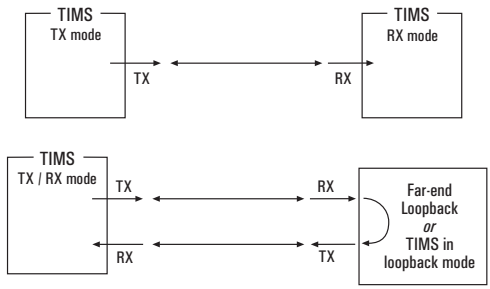


Phase Jitter Test

In this test, the TIMS Module transmits a 1020 Hz tone at –13 dBm. The signal is looped back to the TIMS P2 port and the phase jitter is measured. The test conforms to ITU Recommendation ITU-T 0.91. For more information about the Phase Jitter test screen, see page 9–9.

The test can be run using one tester transmitting on P1 and receiving on P2, or with two testers, one transmitting to the other. When using a loopback test configuration, use a known good line for the loopback to avoid misleading results.

Amplitude Jitter, Phase Jitter, Test Configuration



To perform a phase jitter test, complete these steps:.

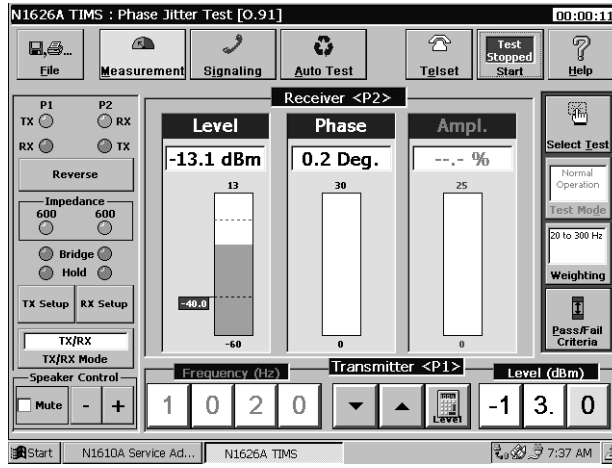
1. Connect the TIMS tester or testers to the line under test.

   See the figure above.

2. Tap **Select Test.**

3. Under the Transmission tab, tap **Phase Jitter**.

The Phase Jitter window opens.



4. Configure the TX or TX/RX tester or testers.

   Use the TX/RX setup controls on the left side of the display to set up the tester's test configuration (see *Setting Up the Transmitter and Receiver (TX/RX Setup)*, page 2–7).

   The tester's transmit frequency and level default settings are 1020 Hz and –13.0 dBm for the jitter test. The transmit level can be changed, if necessary.

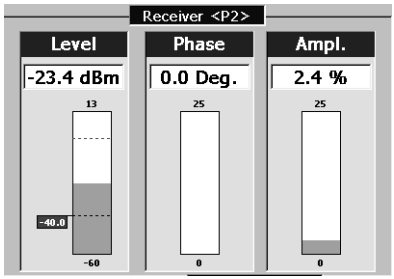
5. On the TX tester, tap **Start** at the top of the screen to begin the test.

6. On the RX tester, tap the **Weighting** button to choose a weighting filter. The available bandpass filter options are:

   - Standard filter from 20 to 300 Hz
   - Low frequency filter from 4 to 20 Hz
   - Combined bandpass filter from 4 to 300 Hz

7. On the RX tester, set the pass and fail limits using the **Pass/Fail Criteria** button and controls (See *Pass and Fail Limits*, page 8–11).

8. On the RX tester, tap **Start** at the top of the screen, and observe the Receiver display for test results.



Attenuation and Group Delay Distortion Test

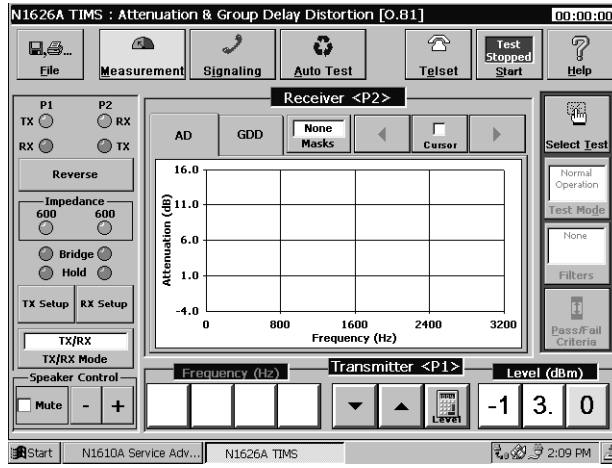
This test can be run with one TIMS tester in loopback mode, but using two TIMS is preferred. When using two TIMS testers, one transmits a test signal, and the other TIMS receives and analyzes it. When using one TIMS tester, the tester transmits the test signal into one line, receives it from another, then analyzes the received signal. Refer to page 9–11 for more information on the Attenuation and Group Delay Distortion Test screen.

To aid in qualifying the line, tolerance masks can be applied to the analyzed signal. See *Masks Button*, page 9–12.

To run an Attenuation and Group Delay Distortion test:

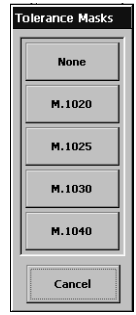
1. Connect the TIMS tester or testers to the line under test.
2. Tap **Select Test** on both testers.
3. Under the Transmission tab, tap **Attenuation and Group Delay Distortion** on both testers.

   The Attenuation and Group Delay Distortion test screen opens.



4. Tap the **Masks** button at the top of the Receiver window of the receiving TIMS tester.

   The Tolerance Masks menu opens. See *Masks Button*, page 9–12 for more information.

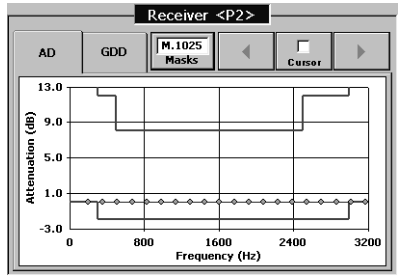


5. Tap the appropriate mask.

   The Tolerance Masks menu closes.

6. Tap **Start** at the top of the screen and observe the Receiver window for test results.

   Tap the AD tab to view attenuation distortion results; tap the GDD tab to view group delay distortion results.



7. Tap the **Cursor** button to display a signal marker and information tag.

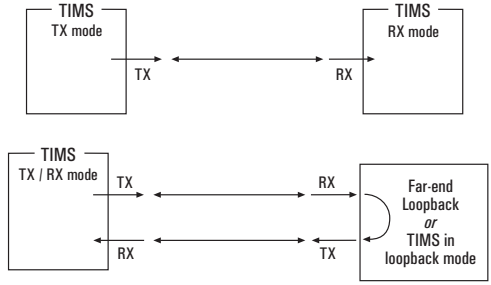
   These show details for the test result data points. See *Cursor Button*, page 9–13 for more information.

Phase and Amplitude Hits & Interruptions Test

This test monitors signal phase and amplitude hits, and dropouts. The test conforms to ITU Recommendation ITU-T 0.95. For more information about the Phase and Amplitude Hits & Interruptions Test screen, see page 9–14.

The test can be run using one tester transmitting on P1 and receiving on P2, or with two testers, one transmitting to the other. When using a loopback test configuration, use a known good line for the loopback to avoid misleading results.

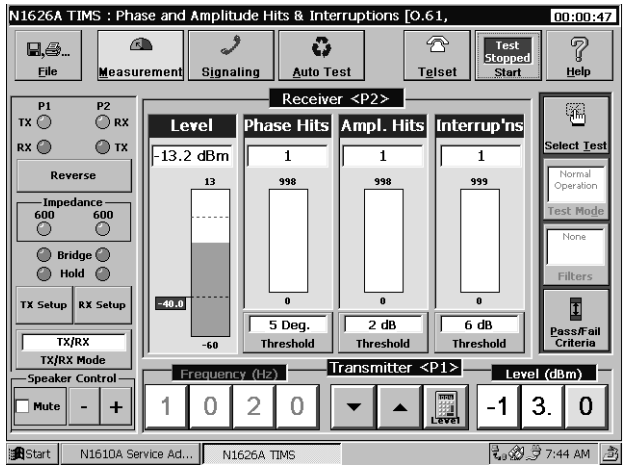
Phase Hit, Gain Hit, or Dropout Test Configuration



To test the signal for phase and amplitude hits and interruptions, complete the following procedure:

1. Connect the TIMS tester to the line (see the preceding figure).
2. Tap **Select Test.**
3. Under the Transmission tab, tap **Phase Hits, Amplitude Hits, and Interruptions**.

The Phase and Amplitude Hits & Interruptions screen opens.



4. Configure each tester using the TX/RX setup controls on the left side of the display.

   See *Setting Up the Transmitter and Receiver (TX/RX Setup)*, page 2–7

5. On the TX tester, use the Transmitter **Level** controls to set the level of the transmit signal.

6. On the TX tester, tap **Start** at the top of the screen to begin the test.

7. On the RX tester, tap **Start** at the top of the screen, and observe the Level indicator for the signal level at the RX tester input.

8. Tap the **Weighting** button to choose a weighting filter.

9. Set the threshold levels for the type of hit or dropout being measured.

   Pass and fail limits can be set for the test results using the **Pass/Fail Criteria** button and controls (See *Pass and Fail Limits*, page 8–11).

4

Performing TIMS Noise Tests

Noise Measurements

Noise measurements determine the level of background noise and interference on the line. Noise tests usually use a filter appropriate to the type of service. The TIMS tester measures noise after filtering by the selected input filter. The table below lists noise weighting filters and typical applications.

There are six noise tests:

- Noise (Page 4–3)
- Noise with Holding Tone (Page 4–5)
- Impulse Noise (Voice Band) (Page 4–8)
- Impulse Noise with Holding Tone (Page 4–10)
- Impulse Noise (Wide Band) (Page 4–12)
- Noise Balance (Page 4–13)

TIMS Filters and Applications

TIMS Filter	3-dB Frequency Range	Application
Psophometric†	700 Hz – 3400 Hz	Voice
Channel†	300 Hz – 3400 Hz	Modem
275–3250 Hz flat‡	275 Hz – 3250 Hz	Impulse noise
750–2300 Hz flat‡	750 – 2300 Hz	Impulse noise
E	1 kHz – 50 kHz	ISDN
F	5 kHz – 245 kHz	HDSL
G	20 kHz – 1100 kHz	ADSL

† *Conforms to ITU Recommendation ITU-T 0.41*

‡ *Conforms to ITU Recommendation ITU-T 0.71*

Noise Test

Complete these steps to run a Noise test:

1. Connect the tester to the line.

   You can connect to the line at the customer premises or the exchange. See *Connecting to a Subscriber Line*, page 2–2.

2. Tap the **Select Test** button.

3. Under the Noise tab, tap the noise test you want to run.

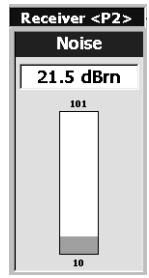
4. Use the tester's TX and RX setup controls on the left side of the screen to select an input impedance.

   See *Setting Up the Transmitter and Receiver (TX/RX Setup)*, page 2–7.

5. Tap the **Filters** button and select an appropriate filter in the Select Filters window.

6. Set Pass and Fail limits for the test using the **Pass/Fail Criteria** button and window.

7. Tap **Start** at the top of the screen, and observe the Receiver display for test results.



Note: The Power Spectrum Density test can be run to help identify the sources of noise interference.

Loop Noise

Noise between the tip and ring conductors is known as loop noise, metallic noise, tip-to-ring noise, or differential noise.

To measure loop noise:

1. Connect the tester to one end of the line.
2. Apply quiet termination to the other end of the line.
3. Complete the noise test procedure on page 4–3.

Note: The acceptable noise level on a voice line is typically 20 to 30 dBm.

Steady-State Noise in POTS Band

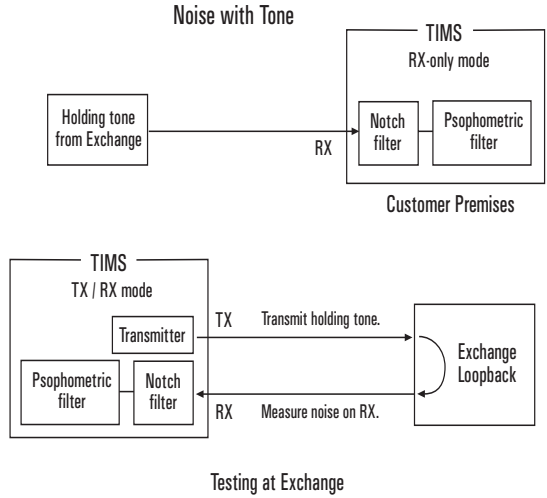
To measure steady-state noise on ADSL lines that also carry POTS, complete the noise test procedure on page 4–3, using the psophometric or channel filter.

The acceptable limit for idle channel noise is 18 dBrn.

Noise with Holding Tone Test

This test generates a holding tone while measuring noise on the line. The holding tone turns on any voice-activated devices in the circuit (for example, the codec on a line card). At the measurement end, a notch filter removes the tone, so only noise and distortion are measured. The test conforms to ITU Recommendation ITU-T 0.132.

For more information on the Noise with Holding Tone Test screen, see page 10–4.

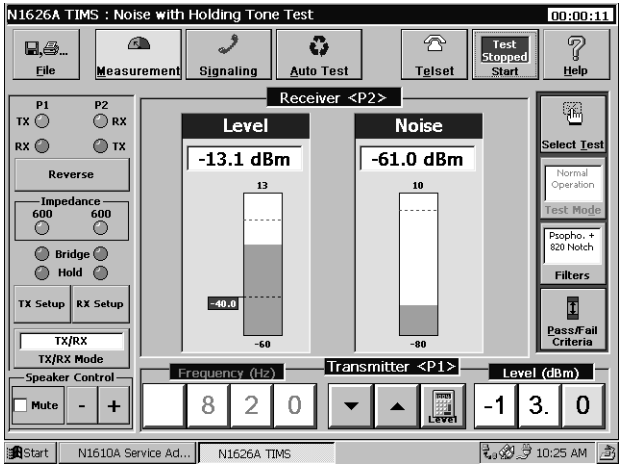


Note: When the noise with holding tone test is selected, the TIMS tester automatically activates a notch filter.

To run a noise with holding tone test:

1. Tap **Select Test**.
2. Under the Noise tab, tap **Noise with Holding Tone.**

3. Complete the noise test procedure on page 4–3.



Note: The Pass/Fail Level on the sample screen is set to -40 dBm. The holding tone must be above -40 dBm to get an accurate noise measurement.

4. Generate a tone on the line, either from the CO or from a TIMS tester at the other end of the line.

5. Tap the **Filters** button and select the appropriate filters.

   To generate a tone using the TIMS tester, select the notch filter with the same center frequency as the holding tone you want to send. For example, to send an 820 Hz tone, select the 820 Hz notch filter; the tester automatically matches the transmitter frequency to the notch filter.

Impulse Noise Measurements

Impulse noise is a spike in the noise signal that is higher in level than background noise. It can cause clicks and pops on voice lines, and errors on ADSL lines. Impulse noise measurements count the number of times spikes in the signal level exceed a predefined threshold level.

The TIMS tester can test for three types of impulse noise:

- Impulse Noise (Voice Band) — See page 4–8
- Impulse Noise with Holding Tone — See page 4–10
- Impulse Noise (Wide Band) — See page 4–12

In impulse noise tests, the TIMS records measurements at low, middle, and high impulse noise thresholds. The low-level threshold is set with the keypad and the middle and high-level thresholds are automatically set to 4 dB and 8 dB above the low-level threshold.

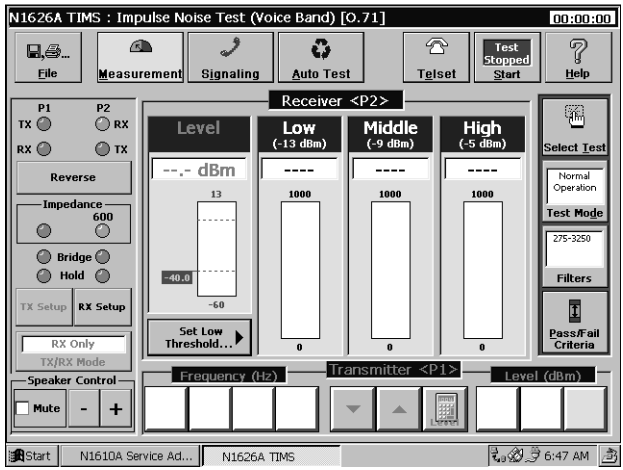
Impulse Noise Test (Voice Band)

This test measures impulse noise on ADSL lines that also carry POTS (for example, noise from ADSL modems). The test conforms to ITU Recommendation ITU-T 0.71.

To measure impulse noise for POTS:

1. Tap **Select Test.**
2. Under the Noise tab, tap **Impulse Noise (Voice Freq. Band)**.

   The Impulse Noise Test (Voice Band) screen opens.



3. Tap the **Filters** button and select the 275–3250 Hz or 750–2300 Hz filter.
4. Tap the **Set Low Threshold** button to open the keypad and specify the low-level threshold.
5. If you want the test to run for a specific length of time, complete the *Setting Test Duration* procedure on page 2–10.
6. Tap **Start** at the top of the screen to start the test, and observe the Receiver window for test results.

Impulse Noise at the Exchange

To measure impulse noise at the exchange:

1. Connect the tester to the exchange end of the line, using the 275–3250 Hz or 750–2300 Hz filter.
2. Complete the procedure beginning on page 4–8.

Impulse Noise with Holding Tone Test

This test measures impulse noise on a line when a holding tone is present. The test can be useful in measuring noise spikes generated by voice-activated devices.

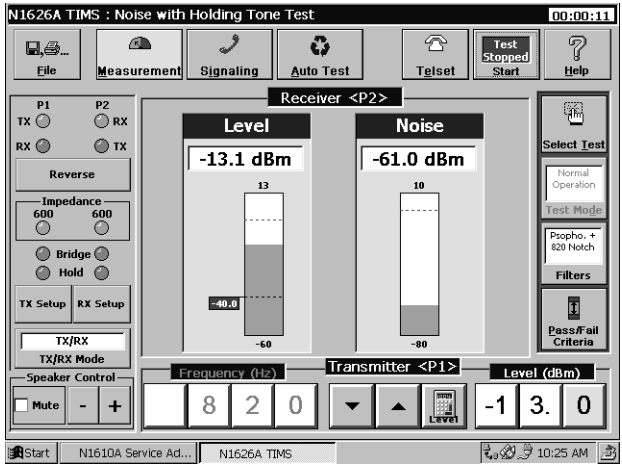
The Impulse Noise with Holding Tone test requires a TIMS tester at the receiving end of the line and a signal source (such as another TIMS tester) at the other end. For more information on the Impulse Noise with Holding Tone Test screen, see page 10–6.

To measure impulse noise with a holding tone:

1. Transmit a holding tone (820 or 1020 Hz at –12 dBm) to turn on any voice-activated devices in the line.
2. At the receiving end of the line, tap the **Select Test** button.

   The Select a Test window opens.
3. Under the Noise tab, tap **Impulse Noise with Holding Tone (Voice Freq. Band).**

   The Impulse Noise with Holding Tone Test screen opens.



4. Tap the **Filters** button, and select the 275–3250 Hz or 750–2300 Hz filter and 820 Hz or 1020 Hz notch filter.

   Use the notch filter that matches the holding tone; it removes the tone at the receiver, so only impulse noise is measured.

5. Tap the **Set Low Threshold** button to open the keypad and set the low-level threshold.

   The middle and high level thresholds are automatically set to 4 and 8 dBm above the low level threshold.

Note: The holding tone must be above -40 dBm to get an accurate noise measurement.

6. If you want the test to run for a specific length of time, see *Setting Test Duration*, page 2–10.

7. Tap **Start** at the top of the screen to start the test, and observe the Receiver window for test results.

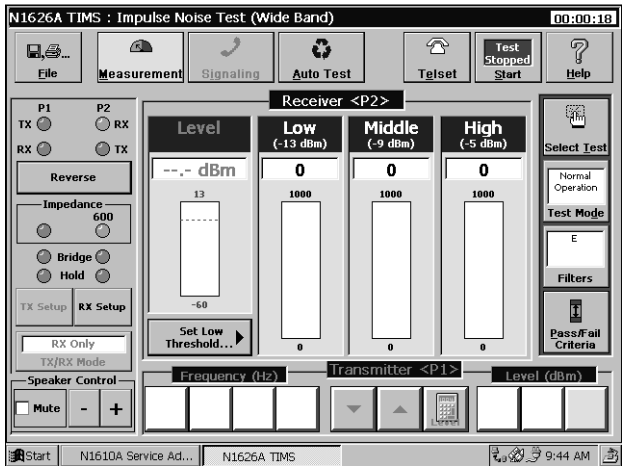
Impulse Noise Test (Wide Band)

This test measures impulse noise on lines carrying wide-band services like ISDN, HDSL, and ADSL. For more information on the Impulse Noise (Wide Band) Test screen, see page 10–8.

To measure impulse noise on a wide band line:

1. At the receiving end of the line, tap the **Select Test** button.
2. Under the Noise tab, tap **Impulse Noise (Wide Band).**

   The Impulse Noise Test (Wide Band) screen opens.



3. Tap the **Filters** button, and select the E, F, or G filter.
4. Tap the **Set Low Threshold** button to open the keypad and specify the low-level threshold.

   The middle and high level thresholds are automatically set to 4 and 8 dBm above the low level threshold.

Note: The holding tone must be above -40 dBm to get an accurate noise measurement.

5. If you want the test to run for a specific length of time, see *Setting Test Duration*, page 2–10.
6. Tap **Start** at the top of the screen to start the test, and observe the Receiver window for test results.

Noise Balance Test

This test measures the metallic noise level, power influence, and noise balance in a twisted-pair line.

The test's metallic (or tip-to-ring) noise measurement measures the total amount of noise on the line. This noise includes power line noise, background noise, and tones weighted by the selected filter.

Power influence is 50 or 60 Hz ac interference that is induced in an unbalanced line by nearby power lines.

The noise balance measurement is the power influence minus metallic noise, in dBrn. Use this measurement to identify interference from sources other than power lines.

For more information on the Noise Balance Test screen, see page 10–9.

Note: To obtain valid readings, you must be testing a standard polyethylene cable ("PIC" or "PE" cable) that is between 3,000 and 20,000 feet long.

To run a Noise Balance Test:

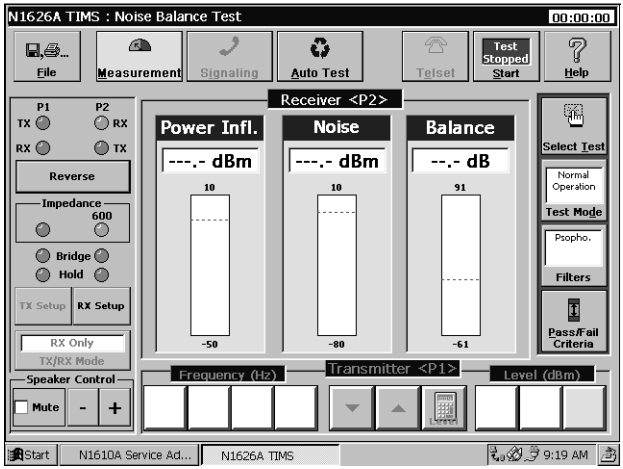
1. Ground the sleeve or shield of the test cable to an earth ground point.

Note: The tester's ground lug is a safety ground only. It is isolated from the test cable's shield by a 10 MΩ resistor. If the sleeve or shield of the test cable is not earth ground, this measurement will be inaccurate.

2. Tap **Select Test** at the right side of the screen.

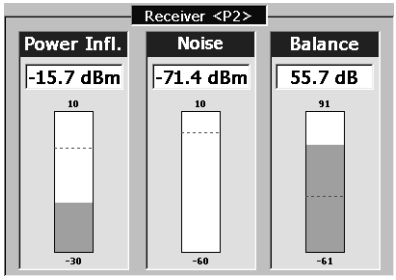
3. Under the Noise tab, tap **Noise Balance Test**.

   The Noise Balance Test window opens.



4. Tap the **Filters** button, and select the appropriate filter.

5. Tap **Start** at the top of the screen, and observe the Receiver window for test results.



5

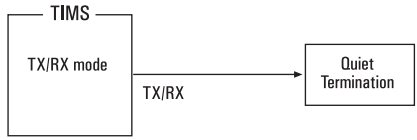
Performing TIMS Loop Tests

Complex Impedance and Return Loss Test

This test generates a test signal, then measures the magnitude and phase angle of the line impedance. To make meaningful measurements, there must be no ac or dc voltage on the line, and the line should be passively terminated.

For more information on the Complex Impedance and Return Loss Test screen, see page 11–2.

Complex Impedance Measurement



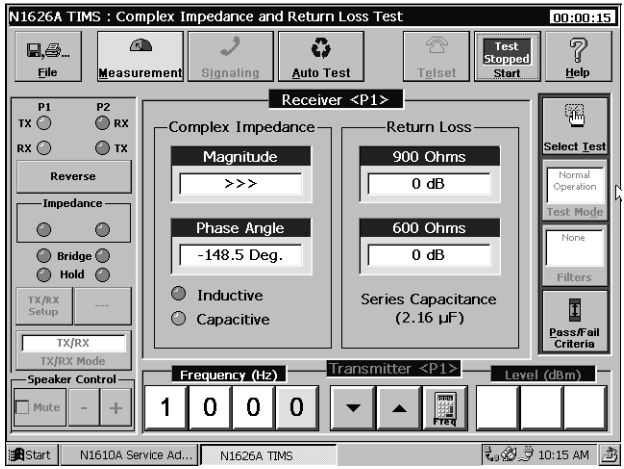
1. Connect the twisted pair being tested to the tester.

   Quiet termination is required at the far end of the twisted pair.

2. Tap the **Select Test** button.

3. Under the Loop tab, tap **Complex Impedance and Return Loss**

   The Complex Impedance and Return Loss Test window opens.



4. Set the tester's Transmitter Frequency to the desired test frequency (between 100 Hz and 9900 Hz).

5. Tap **Start** at the top of the screen and observe the Receiver window for test results

   The Magnitude value can range from 0 to 9999 Ohms.

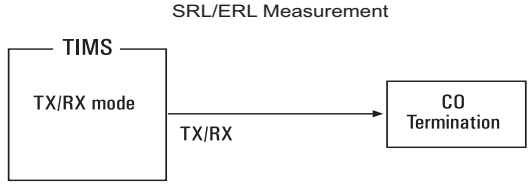
   >>> in the Magnitude value field means that the result was too high to measure.

   <<< in the Magnitude value field means that the result was too low to measure.

   The sign of the Phase Angle indicates the inductive or capacitive nature of the impedance.

SRL/ERL Test

This test performs automated return loss measurements to determine singing return loss (SRL) and echo return loss (ERL) in the tested line.



For more information on the SRL and ERL Test screen, see page 11–4.

To run an SRL/ERL test:

1. Connect the twisted pair being tested to the tester.

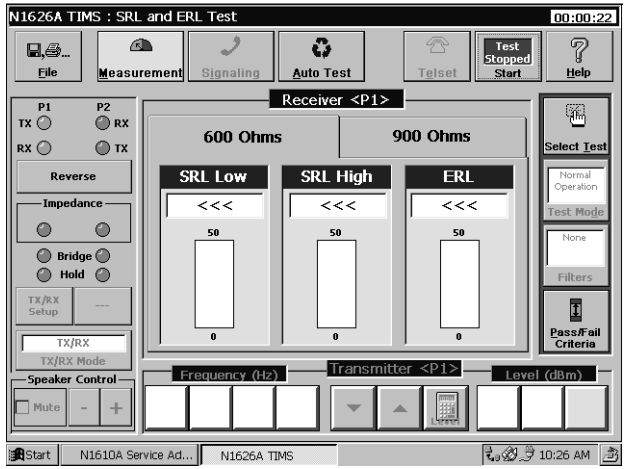
   Quiet termination is required at the other end.

2. Tap the **Select Test** button.

   The Select a Test window opens.

3. Under the Loop tab, tap **SRL & ERL**.

   The SRL and ERL Test window opens.



4. Select the receiver reference impedance.

   The impedance is either 600 Ohms (with a series 2.16 µF capacitor) or 900 Ohms (with a series 2.16 µF capacitor).

5. Use the **Pass/Fail Criteria** button and window to set pass and fail limits for the test.

6. Tap **Start** at the top of the screen, and observe the values in the SRL Low, SRL High and ERL displays.

   >>> in an SRL or ERL display means that the result was too high to measure.

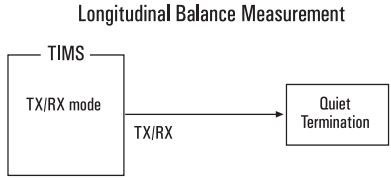
   <<< in an SRL or ERL display means that the result was too low to measure.

Longitudinal Balance Test

This test uses a test signal to find the longitudinal balance of a twisted pair line. Longitudinal balance is the ratio of the longitudinal voltage (measured to ground) to the metallic voltage (between conductors) expressed in dB. The test signal frequency can range from voice to 200 KHz,

If signal couplings, the twisted pair, and the CO termination are not all perfectly balanced, slightly unequal currents will flow in the two conductors of the twisted pair. This can result in the conversion of part of the longitudinal signal into a metallic signal.

For more information on the Longitudinal Balance Test screen, see page 11–5.



To run a longitudinal balance test:

1. Connect the twisted pair being tested to the TX port of the tester.

   Quiet termination is required at the far end of the twisted pair.

2. Ground the sleeve or shield of the test cable to an earth ground point.

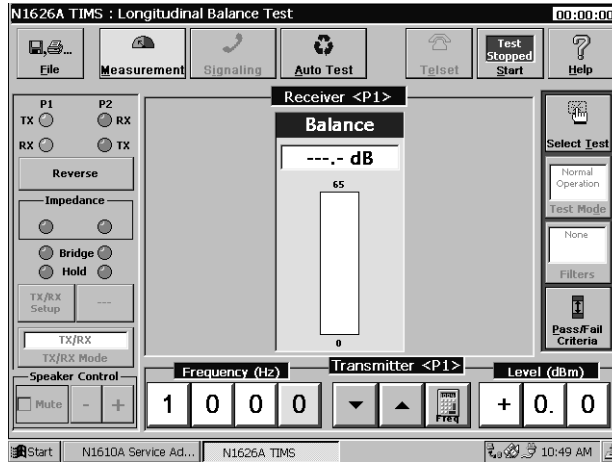
Note: The tester's ground lug is a safety ground only. It is isolated from the test cable's shield by a 10 MOhm resistor. If the sleeve or shield of the test cable is not earth ground, this measurement will be inaccurate.

3. Tap the **Select Test** button.

   The Select a Test window opens.

4. Under the Loop tab, tap **Longitudinal Balance**.

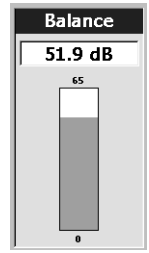
   The Longitudinal Balance Test window opens.



5. Set the tester's Transmitter Frequency to the desired frequency (50 Hz to 200 kHz).

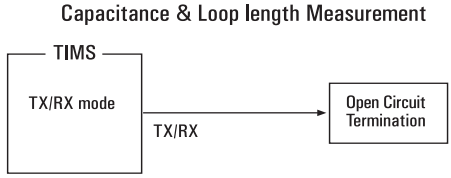
6. Set the transmitter level to the desired signal level (from -10 to +10 dBm).

7. Tap **Start** at the top of the screen and observe the longitudinal balance measurement in the Balance display.



Capacitance and Loop Length Calculation Test

The Loop Length Calculation test measures the capacitance of a twisted pair. It then uses the characteristic capacitance value of the twisted pair wire to calculate the length of the tested loop. This test can be used to determine the distance to an open by measuring the capacitance between tip and ring, then converting the measured capacitance value into a distance.



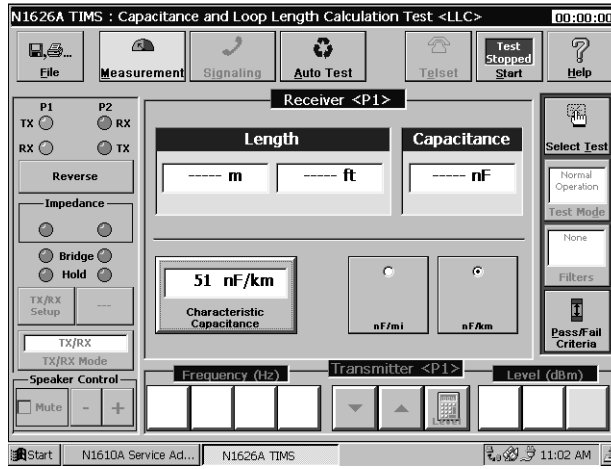
For more information on the Capacitance and Loop Length Calculation Test screen, see page 11–6.

To run a Capacitance and Loop Length Calculation test:

1. Verify that the twisted pair under test is open-circuited at the far end.
2. Connect the twisted pair being tested to the tester.
3. Tap **Select Test**.

   The Select a Test window opens.
4. Under the Loop tab, tap **Capacitance and Loop Length Calculation**

The Capacitance and Loop Length Calculation Test window opens.

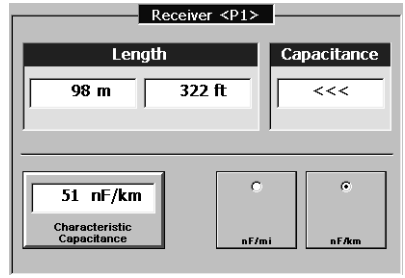


5. Select either miles or kilometers as the unit for the distance measurement, using the **nF/mi** or **nF/km** button.

6. Tap the **Characteristic Capacitance** button and enter the characteristic capacitance for the twisted pair, using the keypad.

   The characteristic capacitance can be obtained from the cable manufacturer

7. Tap **Start** at the top of the screen and observe the Receiver window for test results.



>>> in the Capacitance display means that the result was too high to measure.

<<< in the Capacitance display means that the result was too low to measure.

Digital Multimeter Test

The Digital Multimeter test measures dc voltage (as much as ± 204 Vdc) between A and B of the twisted pair. (Polarity is indicated as the voltage of A relative to B.)

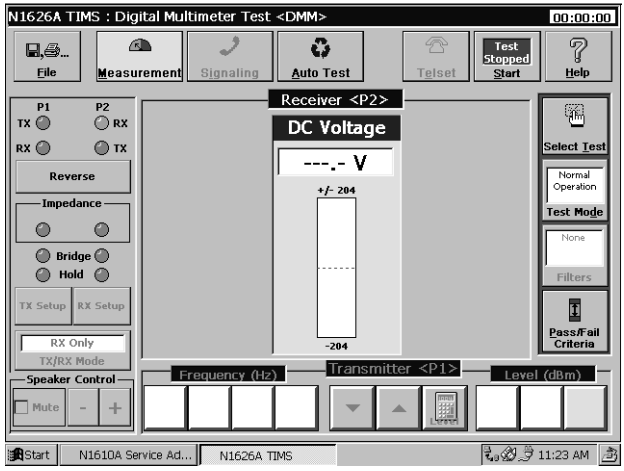
For more information on the DC Voltage Test screen, see page 11–7.

To run a Digital Multimeter test:

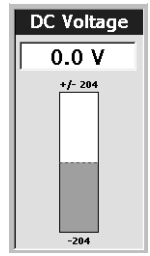
1. Connect the tester to the line.
2. Tap **Select Test**.

   The Select a Test window opens.
3. Under the Loop tab, tap **Digital Multimeter**.

   The Digital Multimeter Test window opens.



4. Tap **Start** at the top of the screen to begin the test, and observe the Receiver display for test results.

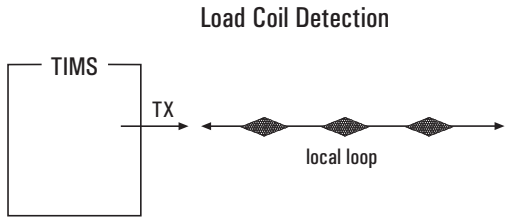


   If dc voltage reads 0, there is no dc voltage on the line. Make sure the line is connected to the battery at the exchange, and that there are no opens in the line.

Note: For ADSL testing, take dc voltage measurements on both sides of POTS splitters (that is, at the exchange and subscriber).

Load Coil Detection Test

Load coils are installed on long loops to improve the quality of voice transmission. These coils must be removed before DSL service (such as HDSL or ADSL) can be deployed. To aid in locating coils, the TIMS tester can detect up to four load coils from a single access point at either end of the line.



For more information on the Load Coil Detection Test screen, see page 11–8.

To run a Load Coil Detection test:

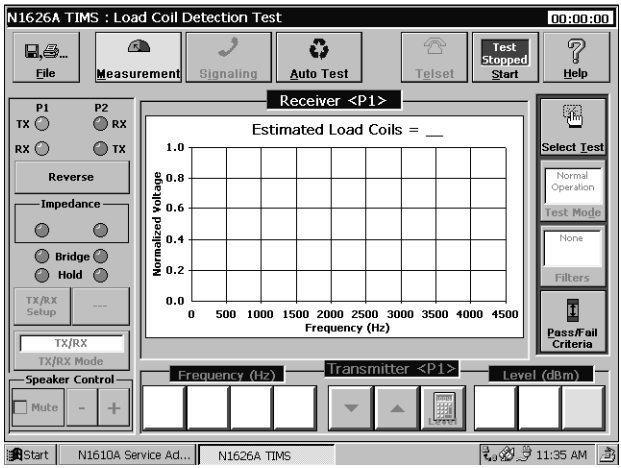
1. Connect the tester to the twisted pair line.

   For best results the far end should be shorted, but this is not necessary.

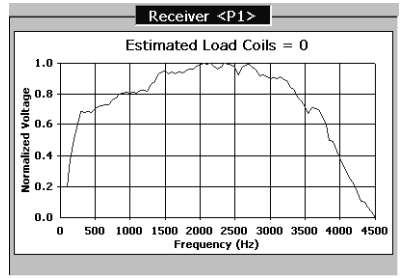
2. Tap **Select Test**.

3. Under the Loop tab, tap **Load Coil Detection**.

   The Load Coil Detection Test window opens.



4. Tap **Start** at the top of the screen to begin the test.
5. Allow 11 seconds for the test to run, then observe the Receiver display for test results.



Test Loop (430-Ohm) Test

This test measures the current flow in the local loop with a 430-Ohm load applied. It is useful for determining whether there is sufficient loop current for various types of service.

For more information on the Test Loop (430-Ohm) Test screen, see page 11–9.

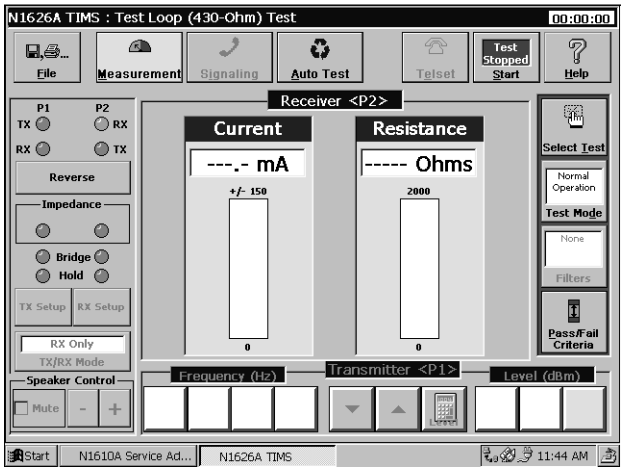
Note: This test requires live battery voltage from the exchange. If no dc voltage is present, the loop current is 0.

To run a 430-Ohm Loop test:

1. Connect the tester to the line.
2. Tap **Select Test**.

   The Select a Test window opens.
3. Under the Loop tab, tap **Test Loop (430-Ohm)**.

   The Test Loop (430-Ohm) Test window opens.



4. Tap **Start** at the top of the screen and observe the Receiver display for test results.

6

Performing TIMS Advanced Tests

Power Spectral Density (PSD) and Power Spectrum Tests

The TIMS tester provides two options for measuring signal spectrum:

- PSD measures wide-band random noise levels across the selected frequency band. Use it on signals with random data stream input, such as E1, ISDN, HDSL, or ADSL.
- Power spectrum measures narrow-band signals, like tones and AM radio interference.

If the PSD measurement shows large spikes, there are tones in the signal; the power spectrum option can measure the level of these tones. Power spectrum displays the power levels of the tones in a standard spectrum analyzer format.

For more information on the Power Spectral Density Test screen, see page 12–2.

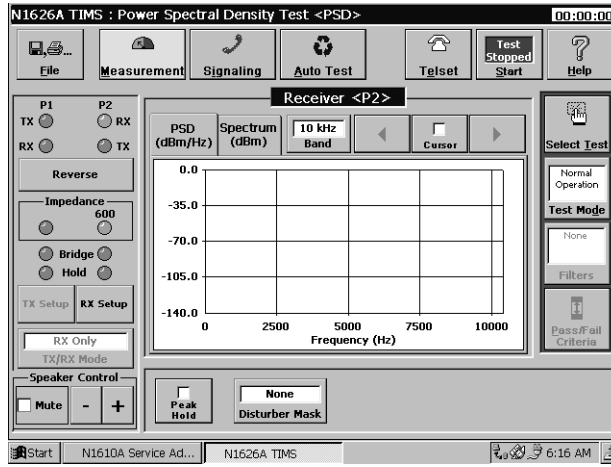
PSD Test

To run a PSD test:

1. Connect the tester to the twisted-pair line.
2. Tap the **Select Test** button.

   The Select a Test window opens.
3. Under the Advanced tab, tap **Power Spectral Density**.

The power Spectral Density Test screen opens.

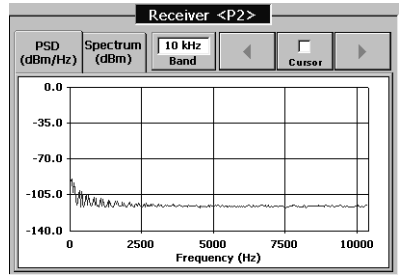


4. Use the TX and RX setup controls on the left side of the display to configure the tester (See *Setting Up the Transmitter and Receiver (TX/RX Setup)*, page 2–7.)

5. Tap the **Band** button in the Receiver window and select a frequency range for the test.

6. Tap the PSD tab in the Receiver window.

7. Tap **Start** at the top of the screen, and observe the Receiver window for test results.



Power Spectrum Test

To run a power spectrum test:

1. Complete steps 1 through 5 in the PSD test above.

   To determine whether a line can support ADSL service, use the 2 MHz band.

2. Tap the Spectrum tab in the Receiver window.

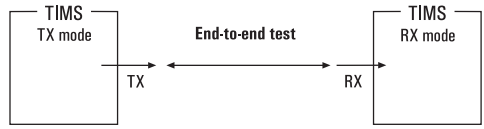
3. Tap **Start** at the top of the screen, and observe the **Receiver** window for test results.

To determine the nature of interference, compare the results to spectrum masks.

Swept FLA Test

This test requires two testers; one must be configured in transmit mode, and the other in receive mode. Loopback testing is not supported.

Swept FLA Test Configurations



In the Swept FLA test, a TIMS transmits a test signal at one end of a line. Another TIMS at the other end of the line receives the signal. Both testers are programmed with the same start and stop frequencies that serve as limits for the stepped frequency sweep. As the transmitting tester performs its stepped frequency sweep, the receiving tester monitors the incoming test signals and plots the signal levels versus frequency on the tester's display.

For more information on the Swept FLA Test screen, see page 12–4.

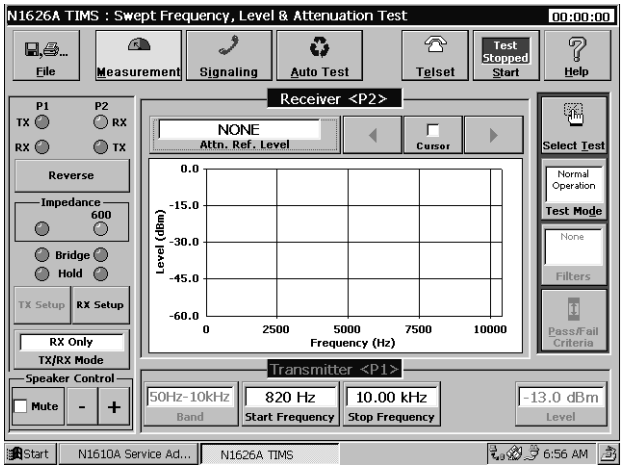
Setting Up a Swept FLA Test

Transmitting TIMS Setup:

1. Connect the transmitter port of the tester to the twisted-pair being tested.
2. Tap **Select Test**.

   The Select a Test window opens.
3. Under the Advanced tab, tap **Swept FLA**.

The Swept Frequency, Level & Attenuation Test screen opens.



4. Set the tester's TX/RX Mode to TX Only.
5. Set the tester's Transmitter Start Frequency and Stop Frequency values (see page 8–13).

   The Swept FLA test supports only voice band frequencies.
6. Set the Transmitter Level to the desired signal level (typically –13 dBm see page 8–14).

Receiving TIMS Setup:

1. Connect the receive port of the tester to the twisted-pair being tested.
2. Tap **Select Test**.

   The Select a Test window opens.
3. Under the Advanced tab, tap **Swept FLA**.
4. Set the tester's TX/RX Mode to RX Only.
5. Set the tester's Transmitter Start Frequency and Stop Frequency to the same values set for the test signal transmitter.
6. Set the Attenuation Reference Level to a reference value (normally the transmitted signal level).

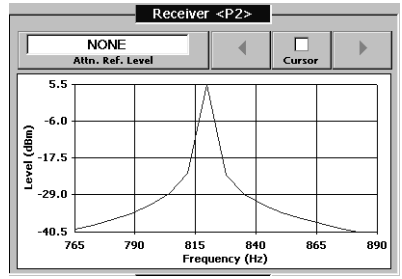
Running a Swept FLA Test

To run a Swept FLA test:

1. Complete the transmitting and receiving TIMS setup procedures that begin on page 6–5.
2. Tap **Start** at the top of the screen on the TX tester to transmit the test frequencies.
3. Tap **Start** at the top of the screen on the RX tester to initiate test signal analysis.

Note: The transmitting tester must be started before the receiving tester for the test to execute properly.

4. Observe the Receiver window of the receiving tester for test results.



The Cursor button toggles a marker on the receiver display on and off. The marker identifies a unique sample point in the receiver's signal plot, with the frequency and power level of the sample point displayed below the marker. You can advance the marker through successive sample points using the cursor's arrow keys, or move it directly to a selected sample point in the plot by tapping the point.

7

Using Signaling with the Tims Module

Entering and Sending a Dial String

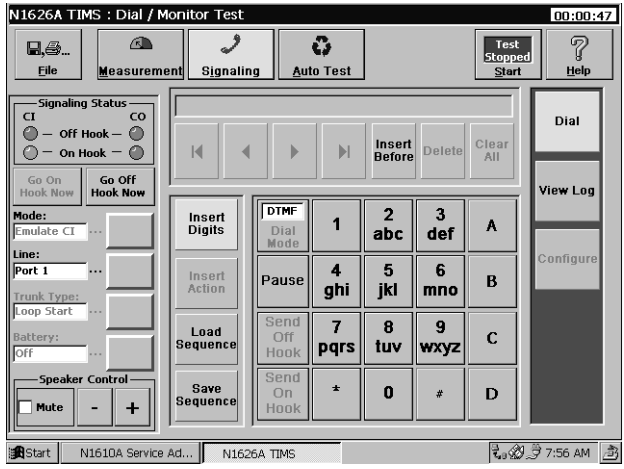
The TIMS Module's dial functions let you enter a series of action codes and numbers using the Dial/Monitor Test screen's keypad. The assembled action codes and numbers can be output as a DTMF dial string over the subscriber line. Dial strings can be from 1 to 128 characters in length, including action codes.

For more information of the Dial / Monitor Test screen, see page 13–2.

To enter and send a dial string:

1. Connect the TIMS Module to the circuit under test.
2. Tap **Signaling** at the top of the screen.

   The Dial / Monitor Test screen opens.



Note: Buttons that are grayed out are not available.

3. Use the display keypad to enter digits and special characters in the dial string.

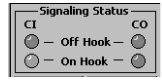
   The dial string displays in the entry field above the arrow buttons. Use the arrow buttons to move left and right in the dial string.

4. Add pauses to the dial string using the **Pause** button.

5. To recall a previously stored dial string or segment use the **Load Sequence** button. (See *Recalling and Sending a Stored Dial String*, page 7–5 for details on using stored dial strings.

6. When the string is done, tap **Start** at the top of the screen to begin a signaling sequence.

7. Observe the Signaling Status indicators to verify that the **CI** and **CO** indicators change state at the beginning and end of the signaling sequence.



8. At the other end of the line, verify that the dial string is received correctly.

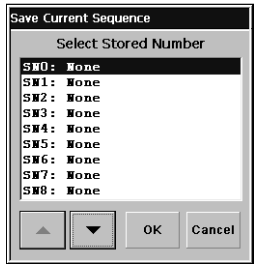
Note: When the line is placed off hook in Signaling, it remains that way until released, even when the TIMS goes to Measurement mode. To place the line on hook, either release the hold in the Measurement Transmitter (TX) Port Setup window, or tap **Go Off Hook Now** on the Signaling screen.

Storing a Dial String

Follow these steps to save a dial string. You can save up to nine dial strings or segments. Each dial string can be from 1 to 128 characters long, including action code characters.

1. Enter a dial string in the dial string display as described on page 7–2.
2. Tap the **Save Sequence** button on the Dial/Monitor Test screen.

   The Save Current Sequence window opens.



3. Use the ▲ and ▼ arrows to scroll through the list and highlight a memory location.

   Locations are numbered SN1 through SN9. Empty locations show “None”.
4. After you select a dial string memory location, tap **OK** to store the current dial string and close the Save Current Sequence window.

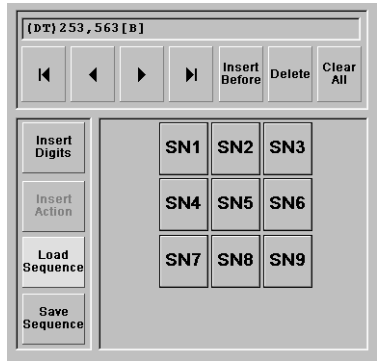
   The Cancel button closes the Save Current Sequence window without making changes.

Note: Saving the current dial string to a memory location that contains a previous dial string overwrites the older string. Previously stored dial strings or dial string segments can be modified this way.

Recalling and Sending a Stored Dial String

Follow these steps to recall stored dial string.

1. Tap the **Load Sequence** button to call the memory location selector.



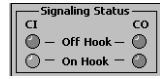
2. Tap a memory location button.

   The stored dial string displays in the dial string field.

Note: If a dial string is already in the display, be sure to tap the Clear All button before you tap a stored number button. Otherwise, the stored dial string is added to the end of the current string. For more information about saving dial strings, see *Storing a Dial String*, page 7–4.

3. Tap the **Go Off Hook Now** button to go off hook.

   The Signaling Status Off Hook indicators light when the CI and CO interface circuits go off-hook.



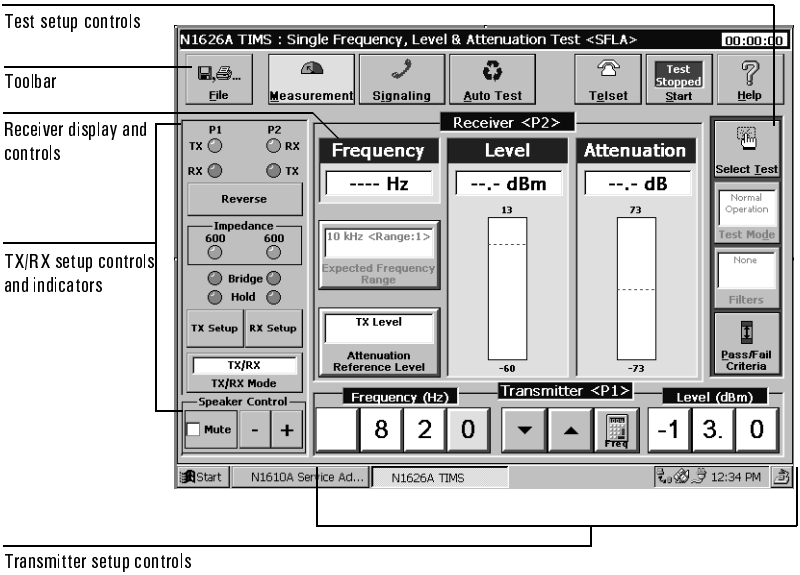
4. When both ends of the trunk are off-hook, tap **Start** at the top of the screen to send the dial string.

8

TIMS Reference

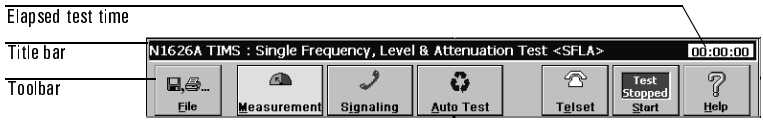
TIMS Screen Components

This section describes the major components of TIMS screens. The following figure shows the major components of a typical TIMS screen. Not all screens contain all components.



Toolbar

The title bar and toolbar shown below appear at the top of every TIMS screen, and contain test and measurement functions and controls.



Elapsed Test Time: Shows the length of time the current test has been running. Tapping the **Start** button resets the elapsed test time to 0.

File: Opens the File menu of TIMS control and file-management functions.

Open: Restores factory-default settings.

Save: Sets the current pass/fail settings as defaults (see *Changing the Default Pass and Fail Limits*, page 2–6).

Reports: Prints reports on a printer connected to the Agilent Advisor's parallel port (see *Printing a Report*, page 14–5).

Print Screen: Prints the displayed screen on a printer connected to the Agilent Advisor's parallel port (see *Printing a Screen*, page 14–4.

Setup: Sets test duration (see *Setting Test Duration*, page 2–10).

Exit: Closes the TIMS interface and displays the Service Advisor Manager.

Measurement: Provides access to TIMS tests such as noise, FLA, load coil detection, and power spectrum.

Signaling: Opens screens for configuring the TIMS signal output. See Chapter 13, *Signaling Screen Reference*.

Auto Test: Opens the Auto Test screen for setting up and running preset groups of tests. See *Auto Test Sequences*, page 8–15.

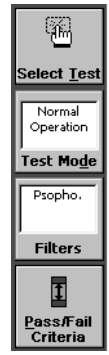
Telset: Provides access to controls for performing dialing functions over the line (see *Telset Option*, page 8–19).

Start: Starts the selected test. The **Start** button displays "Test Stopped" in red in its center. Tapping **Start** changes the button to a **Stop** button that displays "Test Running" in green in its center. Tapping **Stop** halts the test.

Help: Displays the version of the TIMS software.

Test Setup Controls

The test setup control buttons on the right side of the screen are used to select tests and special test configuration options.



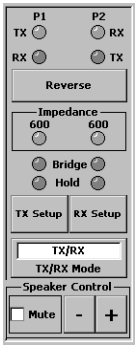
Select Test: Opens a menu containing major test functions (see *Select a Test Menu*, page 8–20).

Test Mode: Provides access to specialized functions like loopback and quiet-termination (see *Test Modes*, page 8–8).

Filters: Opens a window with filter selections for the current test (see *Filters*, page 8–10).

Pass/Fail Criteria: opens a window with controls for changing the pass and fail parameters for measurement. See *Setting Pass and Fail Limits*, page 2–3, and *Changing the Default Pass and Fail Limits*, page 2–6.

TX/RX Setup Controls and Indicators



The TX/RX setup controls on the left side of the screen configure the TIMS line connector ports (P1 and P2).

TX and RX Indicators

Two columns of indicators show the status of the TIMS tester's P1 and P2 ports. P1 indicators are in the left column, and P2 indicators in the right.

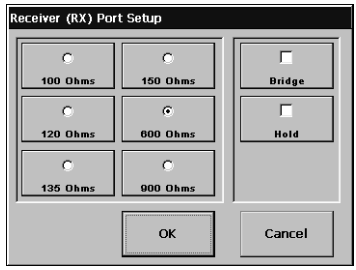
Green: Indicates that an item is selected.

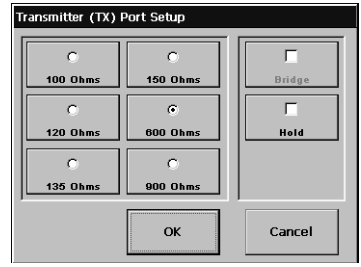
Yellow: (Used only in bridge mode) indicates that the selected line-impedance value is not the actual impedance setting, but is used only for computing measurements (see *Bridge* on page 8–7).

TX and RX Controls

Reverse: This button reverses the transmit (TX) and receive (RX) modes of the module's P1/P2 connectors.

RX Setup and TX Setup: These buttons open the RX Setup and TX Setup windows, to select the termination mode (Bridge or Hold), and impedance (100, 135, 150, 600, 900, or 1200 Ohms).





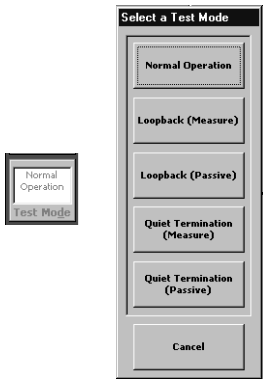
- **Bridge** sets the receiver to a high-impedance state (40 kOhms) for non-intrusive testing on a live circuit. The selected RX input impedance (its indicator turns yellow) is used for computing measurements.
- **Hold** holds the line for dial-and-hold functions (see *Auto Test Sequences*, page 8–15). Toggling this control off (so it is not checkmarked) releases a hold on the line.

TX/RX Mode: This button allows you to select an operating mode: Transmit and Receive, Receive Only, or Transmit Only.

Note: The Speaker Control buttons are the only enabled buttons during a test.

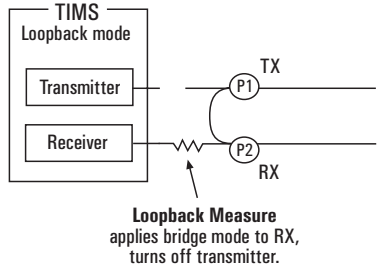
Test Modes

The **Test Mode** button opens the Select a Test Mode window, where you can configure the TIMS Module for specialized functions.



Normal Operation: The default, places the module in test mode.

Loopback (Measure): Activates loopback mode (P1 A & B connected to P2 A & B, see the illustration below), turns off the transmitter, and places the RX port in bridge mode so RX measurements can be made.



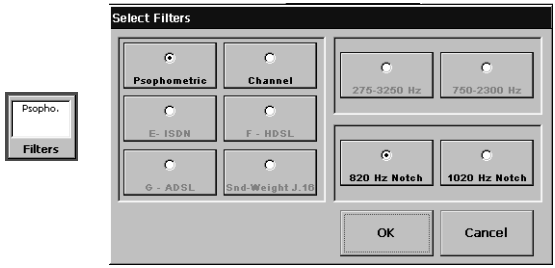
Loopback (Passive): Activates loopback mode (see the illustration above) and turns off both transmitter and receiver.

Quiet Termination (Measure): Places the module's TX port in quiet-termination mode with the selected TX impedance and the transmitter off, and allows measurements at the RX port.

Quiet Termination (Passive): Places the module's TX port in quiet-termination mode using the selected TX impedance. The module's transmitter and receiver are both off.

Filters

The **Filters** button opens the Select Filters window, which shows the filters available for the current test. Tap a button to select a filter, then tap **OK**. **Cancel** closes the window without changing filter selection.



The **Filters** button is grayed out when no filters are available. The following table describes TIMS filters.

N1626A TIMS Filters

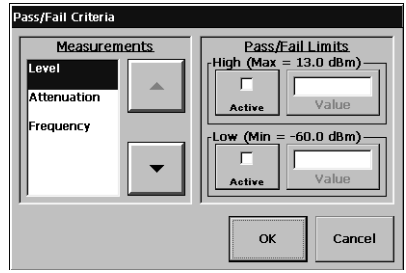
Filter	Description
Psophometric†	700 Hz to 3400 Hz bandpass filter used in evaluating how annoying background noise is to the listener.
Channel†	300 Hz to 3400 Hz bandpass filter used when measuring noise, impulse noise, or the strength of a data modem signal.
2300 Hz flat‡	750 to 2300 Hz bandpass filter used to measure impulse noise.
3250 Hz flat‡	275 Hz to 3250 Hz bandpass filter used to measure impulse noise.
820 Hz notch	Notch filter removes 820 Hz holding tone from the signal.
1020 Hz notch	Notch filter removes 1020 Hz holding tone from signal.
E	1kHz to 50 kHz bandpass filter for ISDN measurements.
F	5 kHz to 245 kHz bandpass filter for HDSL measurements.
G	20 kHz to 1100 kHz bandpass filter for ADSL measurements.

† *Conforms to ITU Recommendation ITU-T 0.41*

‡ *Conforms to ITU Recommendation ITU-T 0.71*

Pass and Fail Limits

The **Pass/Fail Criteria** button opens the Pass/Fail Criteria screen, for setting pass and fail limits for the current test. This is used to define the range of acceptable test results. (See page 2–3 for information about how to change pass and fail limits.)



Measurements: Lists the measurement values for which limits can be set. Use the up/down arrow buttons to select an item, or tap the item.

Active: Tap the corresponding button to enable the high or low limit for the selected measurement.

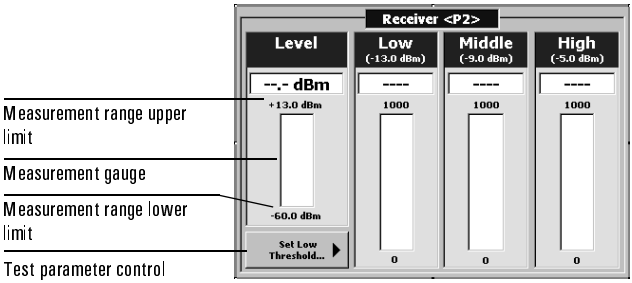
Value: Opens the Enter Value keypad to enter a new value.

OK: Applies the new pass and fail limits.

Cancel: Closes the Pass/Fail Criteria window without changing the pass and fail limits.

The Receiver Display

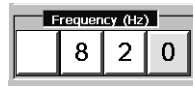
The Receiver display in the middle of a test screen shows test results and measurements. See the descriptions of individual test screens for information about that test's Receiver display.



- **Measurement gauges** show test results and provide information about the receive signal. The gauges show the default values and the measurement range, and any user-defined settings (see page 2–3).
- **Test parameter controls** are used for some tests to configure test parameters, such as the "low threshold" for impulse noise tests.

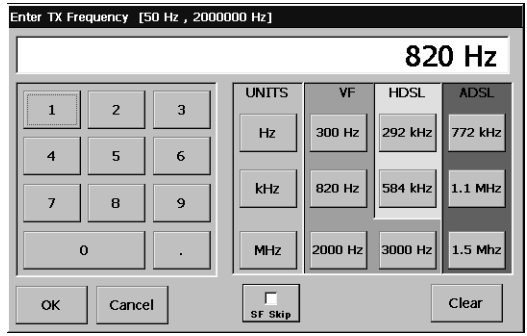
Transmitter Frequency Controls

The TX Frequency controls set a transmitter signal frequency for the current test. Tap a digit on the screen to select it, then use the arrow keys to change the value.



The up and down arrow buttons increase or decrease a selected digit.

The **Freq** button opens the Enter TX Frequency keypad. Use this keypad to enter specific frequency values and units. Tap **OK** when the new transmit frequency is selected, or **Cancel** to return to the test.



Keypad buttons : Use these buttons to enter a frequency value and select the unit of measure. Buttons at the right side of the keypad set the transmit frequency to preset values for different applications.

SF Skip: (Signaling frequencies skip) This option filters out signaling frequencies in the 2130 Hz to 2430 Hz range. These frequencies carry signaling information between central offices.

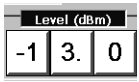
OK: Sets the test frequency to the value displayed on the keypad.

Cancel: Closes the keypad without changing the frequency setting.

Clear: Deletes the current value and leaves the keypad open so you can specify a new value.

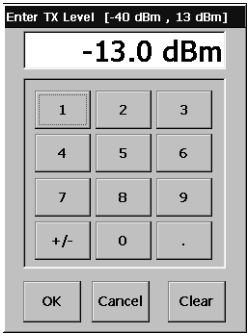
Transmitter Level Controls

The Transmitter Level controls set the transmit signal level for the current test.



Up and down arrows: The arrow buttons increase or decrease the value of a selected digit in the TX Level display.

Level button : If any of the TX Level indicator buttons are tapped, the **Freq** button changes to a **Level** button, which opens the Enter TX Level keypad.



Keypad number buttons: Use these buttons to enter a level value.

OK: Sets the test level to the value displayed on the keypad.

Cancel: Closes the keypad without changing the level setting.

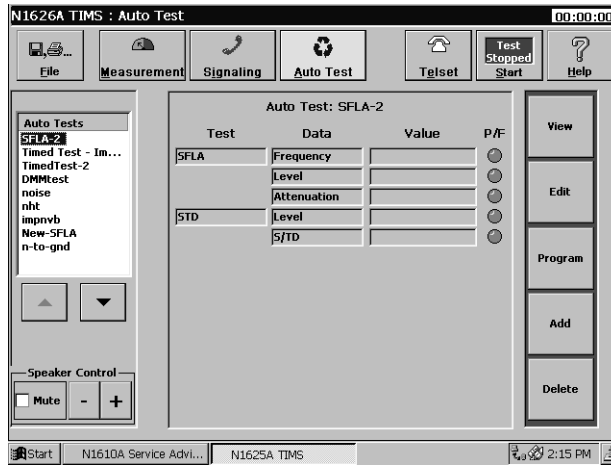
Clear: Deletes the current value and leaves the keypad open so you can specify a new value.

Auto Test Sequences

The Auto Test screen contains controls for editing, creating, and running sequences of tests. Selecting a test sequence in the Auto Tests menu, then tapping **Start**, runs the tests in the sequence, in order. When the tests finish, the screen's title bar changes from "N1626A TIMS: Auto Test" to "N1626A TIMS: (*name of test sequence*)," and results of the tests display in the fields at the center of the screen.

The TIMS comes with a library of test sequences installed. These are examples; users are encouraged to create their own sequences to meet their needs. The TIMS tester can be programmed with as many as ten test sequences

Note: The editing buttons appear at the right of the screen only if the Individual Tests option is chosen when the TIMS is started. If Auto Test is chosen at startup, the Auto Test screen does not have the editing buttons, and sequences cannot be changed.



Auto Tests Menu

The Auto Tests menu is at the left side of the screen whenever Auto Test is enabled. The menu lists all available sequences of tests. The arrow buttons at the bottom of the menu control which sequence is selected (and highlighted).

Detail and Results Window

The area at the middle of the screen displays information about the selected test sequence:

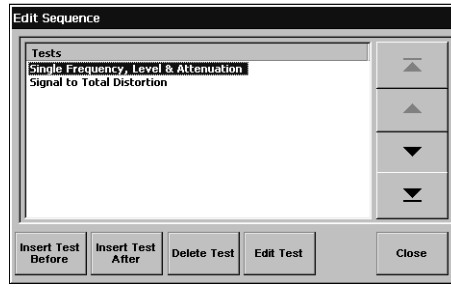
- Name of the sequence
- Tests included in the sequence, in the order they run
- The types of results yielded by each test
- Fields for results values, which display at the end of each test in the sequence
- P/F indicators that indicate whether the results are within the pass and fail limits (see *Pass and Fail Limits*, page 8–11). The indicators light if the results are within pass and fail limits.

View Test Sequence

The **View** button opens the View Sequence window, which lists the operations performed when the auto test sequence runs.

Edit Test Sequence

The **Edit** button opens the Edit Sequence window, for modifying test sequences.



Arrow buttons: Control which test in the sequence is selected and highlighted.

Insert Test Before: Opens the Select a Test window. Tapping a test in the window opens the control screen for that test so you can configure it, and changes the **Tel<u>s</u>et** and **<u>S</u>tart** buttons at the top of the screen.

The **Tel<u>s</u>et** button changes to a green **Message** button. Tapping it opens the Supply Message Text window and a keyboard for creating a message that displays before the test sequence runs. Use the message function to create a confirmation or other message box.

The **<u>S</u>tart** button changes to a green **End Sequence** button. Tapping it opens a confirmation message box that asks if you want to save the sequence.

- **Yes** adds the new test to the auto test sequence, before the highlighted test.
- **Cancel** closes the message box and returns to the test control screen.
- **No** closes the message box and returns to the Edit Sequence window, without changing the test sequence.

The **Select <u>T</u>est** button also turns green when a test is selected in the Select a Test window. To add more tests, tap **Select <u>T</u>est** again.

Insert Test After: Opens the Select a Test window. As with the **Insert Test Before** button, tapping a test in the window opens the control screen for that test so you can configure it, and changes the **Telset** and **Start** buttons at the top of the screen. The **Message** and **End Sequence** buttons function as with **Insert Test Before**, above. Any test added will be after the highlighted test.

Delete Test: Removes the selected test from the sequence. Tapping **Delete Test** opens a message box, asking you to confirm whether the test should be deleted.

Edit Test: Opens the control screen for the selected test so you can configure it, and changes the **Telset** and **Start** buttons at the top of the screen. The **Message** and **End Sequence** buttons function as with **Insert Test Before**, above.

Close: Closes the Edit Sequence window without changing the test sequence.

Replace a Sequence

The **Program** button opens the Select a Test window. Tapping a test in the window opens the control screen for that test so you can configure it, and changes the **Telset** and **Start** buttons at the top of the screen. The **Message** and **End Sequence** buttons function as with **Insert Test Before**, above.

Tapping **End Sequence**, then **Yes** in the confirmation box, replaces the tests in the selected sequence with the newly added ones.

Create New Sequences

The **Add** button opens the Select a Test window. Tapping a test in the window opens the control screen for that test so you can configure it, and changes the **Telset** and **Start** buttons at the top of the screen.

- The **Message** button functions as with **Insert Test Before**, above.
- The **End Sequence** button opens the same confirmation message box as in **Insert Test Before**, but tapping **Yes** in the confirmation opens the Supply Sequence Name window and keyboard, for naming the new test sequence.

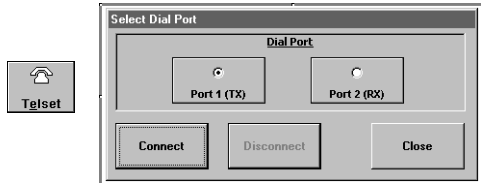
Note: The only way to close the Supply Sequence Name window is by typing a name and tapping **OK**. Tapping **OK** without entering any characters opens an error message box.

Note: If the TIMS tester is programmed with ten test sequences, the **Add** button is disabled. One of the existing sequences must be deleted before a new sequence can be created.

Telset Option

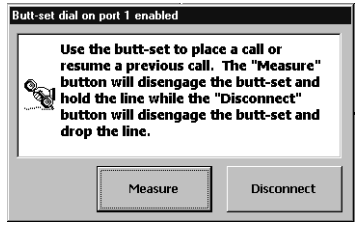
The **Telset** option lets you dial over the line, or hold the line for testing using a butt-set. See *Dial-and-Hold Functions Using a Butt-Set*, page 2–12 for instructions on using the Telset option.

The **Telset** button opens the Select Dial Port window.



Port 1 and Port 2: Select P1 or P2 to perform dial-and-hold functions.

Connect: Activates your choice, and opens the window shown below.



- **Measure:** Holds the selected line (P1 or P2) for testing.
- **Disconnect**: Releases the selected line (P1 or P2).

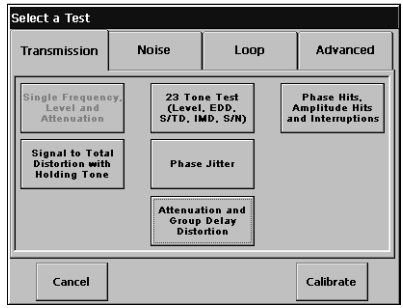
Close: returns you to the previous screen without implementing any selections.

Disconnect: Releases the selected line (P1 or P2).

Close: Returns you to the previous screen without implementing any selections.

Select a Test Menu

The **Select Test** button opens the Select a Test menu containing test and measurement functions.



Note: If a test is running, the Select Test button is disabled. Stop the test to select a different test.

The test selection buttons are organized under four test group tabs. Select the appropriate tab and test selection button as follows.

Transmission Tab

Single Frequency, Level, & Attenuation: Calls a control screen for measuring frequency, level, and attenuation (see *Single Frequency, Level, and Attenuation (Single FLA) Screen*, page 9–2).

Signal to Total Distortion with Holding Tone: Generates a holding tone and opens a display that compares the RX signal power to total signal distortion from all sources (see *Signal to Total Distortion (S/TD) Test Screen*, page 9–5).

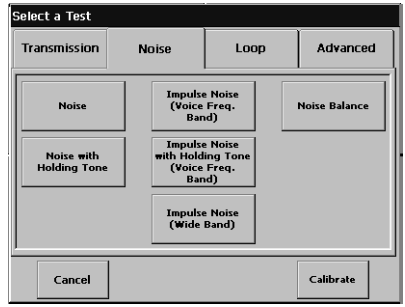
23 Tone Test (Level, EDD, S/TD, IMD, S/N): Calls a control screen that initiates a 23-Tone Test and displays the test results (see *23 Tone Test Screen*, page 9–6).

Phase Jitter: Calls a control screen used to monitor an incoming test signal's power level, and the magnitude of the signal phase and amplitude distortion (see *Phase Jitter Screen*, page 9–9).

Attenuation & Group Delay Distortion: Calls a screen that tests (see *Attenuation & Group Delay Distortion Screen*, page 9–11).

Phase Hits, Amplitude Hits, and Interruptions: Calls a control screen used to monitor an incoming signal's power level, and the number of phase hits, amplitude hits, and signal interruptions (see *Attenuation & Group Delay Distortion Screen*, page 9–11).

Noise Tab



Noise: Calls a control screen for running a metallic noise test (see *Noise Test Screen*, page 10–2).

Noise with Holding Tone: Calls a screen for running a noise with holding tone test (see *Noise with Holding Tone Test Screen*, page 10–4).

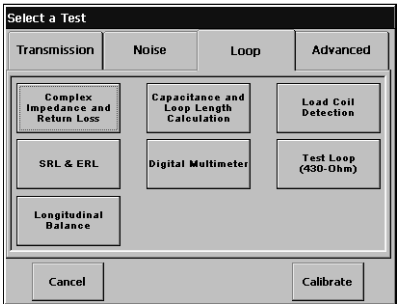
Impulse Noise (Voice Freq. Band): Calls a control screen for measuring impulse noise in the voice frequency band (see *Impulse Noise Test (Voice Band) Screen*, page 10–5).

Impulse Noise with Holding Tone: Calls a control screen for measuring impulse noise in the voice frequency band (see *Impulse Noise with Holding Tone Test Screen*, page 10–6).

Impulse Noise (Wide Band): Calls a control screen for measuring wide-band impulse noise (see *Impulse Noise Test (Wide Band) Screen*, page 10–8).

Noise Balance: Calls a control screen used for measuring metallic noise, power influence, and noise balance - noise contributed by sources other than power lines. (see *Noise Balance Test Screen*, page 10–9).

Loop Tab



Complex Impedance and Return Loss: Calls a control screen used to measure complex impedance and return loss (see *Complex Impedance and Return Loss Test Screen*, page 11–2).

SRL & ERL: Calls a control screen used for measuring singing return loss (SRL) and echo return loss (ERL) in a line (see *SRL/ERL Screen*, page 11–4).

Longitudinal Balance: Calls a control screen used for measuring the longitudinal balance of a line. Longitudinal balance is a ratio of the longitudinal voltage (measured to ground) to the metallic voltage expressed in dB (see *Longitudinal Balance Screen*, page 11–5).

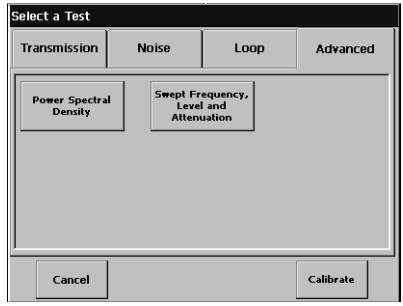
Capacitance and Loop Length Calculation: Calls a control screen used to measure the capacitance of a twisted-pair line. The test software then uses the characteristic capacitance value of the twisted-pair wire to calculate the length of the tested loop (see *Capacitance and Loop Length Calculation Screen*, page 11–6).

Digital Multimeter: This button lets you make dc voltage measurements (see *Digital Multimeter Screen*, page 11–7).

Load Coil Detection: Calls a screen for testing for load coils on the line (see *Load Coil Detection Screen*, page 11–8).

Test Loop (430 Ohm): Calls a control screen for measuring loop current (see *Test Loop (430-Ohm) Screen*, page 11–9).

Advanced Tab



Power Spectral Density: Calls a control screen for viewing power spectral density (PSD) and power spectrum measurements (see *Power Spectral Density (PSD) Screen*, page 12–2).

Swept Frequency Level and Attenuation: Calls up a control screen used to perform a Swept Frequency Level and Attenuation (Swept FLA test. In this test, a test signal is swept (actually stepped) across a user-defined frequency band. The user must specify the start and end frequencies of the test signal's frequency sweep (see *Swept FLA Screen*, page 12–4).

Calibration

The **Calibrate** button on the Select a Test screen invokes the unit calibration function. This function is used by Agilent Technologies personnel, and is password protected.

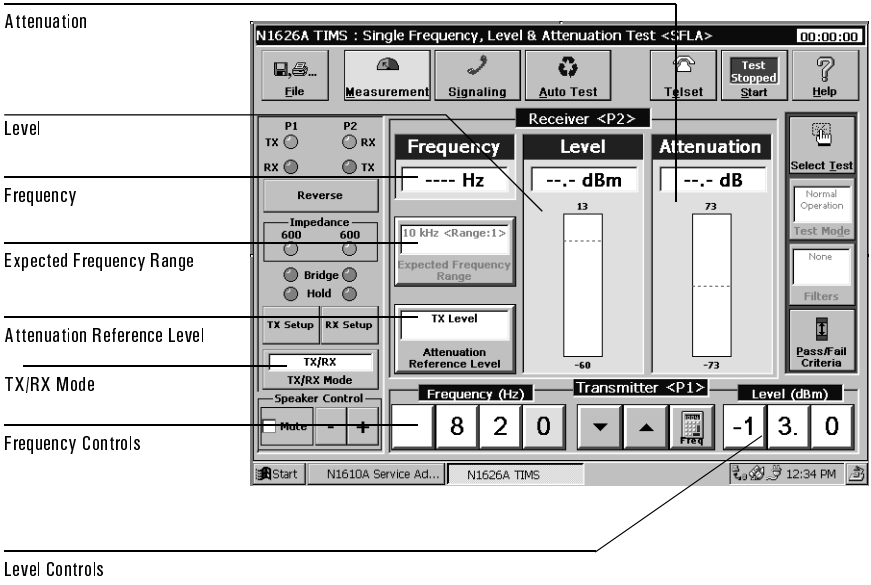
9

TIMS Transmission Test Screens Reference

Single Frequency, Level, and Attenuation (Single FLA) Screen

This screen controls the Single FLA test, which generates a test signal and measures signal frequency, level, and attenuation at the receiving end of a line.

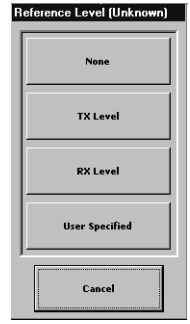
See *Single Frequency, Level, and Attenuation (Single FLA) Test*, page 3–2.



Transmitter Controls

For TX/RX and TX-only modes, the Transmitter Frequency and Level controls define the transmit signal frequency and level.

Attenuation Reference Level: The Attenuation Reference Level button opens the Reference Level menu shown below. The buttons in the Reference Level menu set a reference level, to which the receive signal is compared. The difference between the reference level and the receive signal level is displayed in the Attenuation display of the Receiver window.



None: In Swept FLA tests, turns off the attenuation reference level.

TX Level: When running a loopback Single FLA test in TX/RX mode, sets the tester's TX signal level as the reference level.

RX Level: In TX/RX or RX-only modes, stores the current level of the RX signal as the reference level for later measurements.

User Specified: Opens a keypad where you can define a reference level for the test. The range for this level is from –60dBm to +13dBm.

Note: The RX Level option can be used to capture a generated signal level for use as a reference in future tests.

Receiver Controls and Indicators

Attenuation Reference Level: This is usually the power level of the test signal at its source. In loopback tests (TX/RX mode) using one TIMS tester, this level is automatically set to the TX signal level (see page 9–3). The Attenuation Reference Level button opens a window with controls to set either a TX or a RX reference signal level for the test.

Expected Frequency Range: In RX-only mode, this control sets the range of frequencies that the receiver measures, as described in the table below.

Frequency Ranges

Band	Range	Tolerance
10 kHz	50 Hz to 9999 Hz	± 1 Hz
100 kHz	10 kHz to 99.99 kHz	± 10 Hz
2 MHz	100 kHz to 999.9 kHz	± 100 Hz
	1.000 MHz to 2.000 MHz	± 1000 Hz

Note: If the receive signal frequency is outside the selected range, frequency readings may not be accurate. Level readings, however, are accurate as long as the receive frequency is lower than the high end of the selected range.

Note: To determine the signal frequency, run a power spectral density test (see page 6–2) on the receive signal, and use the cursor option to determine its approximate frequency.

Frequency: The frequency of the receive signal, in hertz (Hz).

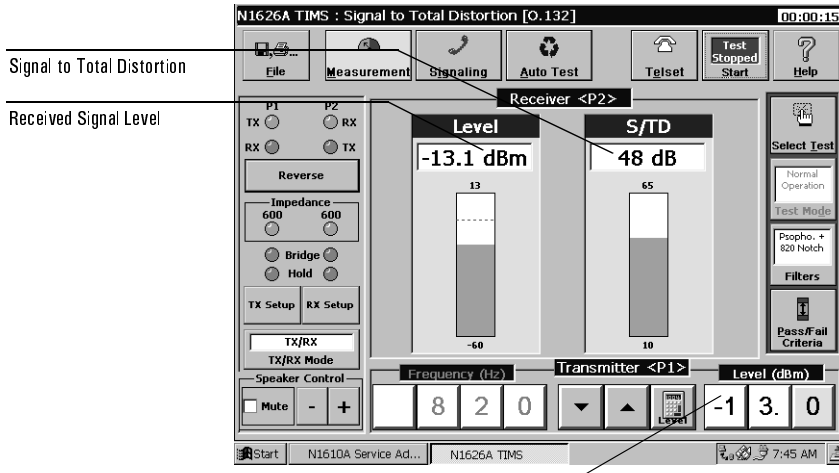
Level: The receive signal strength, in dBm (from –40 dBm to +13 dBm).

Attenuation: The difference between the receive signal level (in dB), and the attenuation reference level. For example, if the reference level is –11 dBm and the receive signal level is –13 dBm, attenuation is 2 dB.

Note: If the received signal level is less than the reference, the attenuation display is a positive number; if greater than the reference, the attenuation display is negative.

Signal to Total Distortion (S/TD) Test Screen

This screen controls a test that compares the power of the receive signal to the weighted power of all other signals and noise on the line (the total signal distortion). The test is useful for determining the quality of a line for voice service, and for evaluating excessive error rates on data lines. The test conforms to ITU Recommendation ITU-T 0.132. See *Signal to Total Distortion (S/TD) Test*, page 3–7.



Transmitter Controls

Frequency: Selecting the S/TD test automatically sets the signal frequency to the holding tone and notch filter frequency. See *Filters*, page 8–10.

Level: Sets the transmit signal level (from –40 dBm to +13 dBm; the default is –13 dBm). See *Transmitter Level Controls*, page 8–14.

Receiver Indicators and Controls

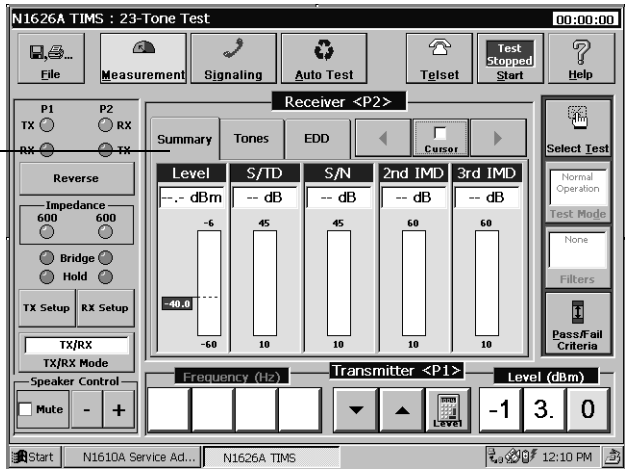
Level: The strength (in dBm) of the received signal.

S/TD: The ratio of received signal power to signal distortion power, expressed in dB. The reading is weighted by the filter in use. (The notch filter is automatically selected.)

23 Tone Test Screen

This screen controls a 23-tone test that measures attenuation distortion, envelope delay distortion (EDD), and intermodulation distortion (IMD) in the voice band.

See *23-Tone Test*, page 3–9.



Summary Tab

Transmitter Controls

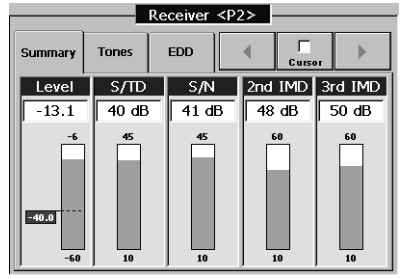
Frequency: Selecting the 23 Tone test automatically configures the test frequencies; the Frequency controls are disabled.

Level: In TX/RX and TX-only mode, this control sets the transmit signal level (from –40 to –6 dBm; –13 dBm is the default).

Receiver Controls

Summary Tab

The Summary tab opens a window that summarizes 23-Tone test results.



Level: The strength (in dBm) of the receive signal.

S/TD: The ratio (in dB) of signal power to signal-distortion power (the combined power of all other signals and background noise on the line).

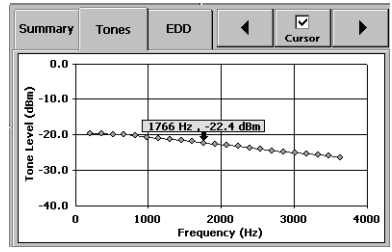
S/N: The ratio (in dB) of signal power to noise power (that is, the power of the background noise on the line).

2nd IMD: The ratio of the signal power (in dB) of the combined tones in the test signal to the second-order IMD products.

3rd IMD: The ratio of the signal power (in dB) of the combined tones in the test signal to the third-order IMD products.

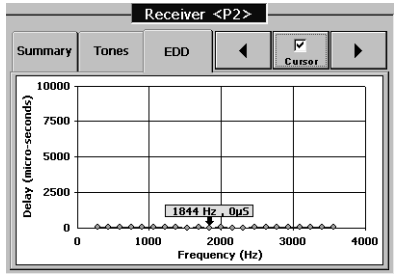
Tones Tab

The Tones tab presents a graph showing the levels of the 23 tones (y-axis) as a function of frequency (x-axis).

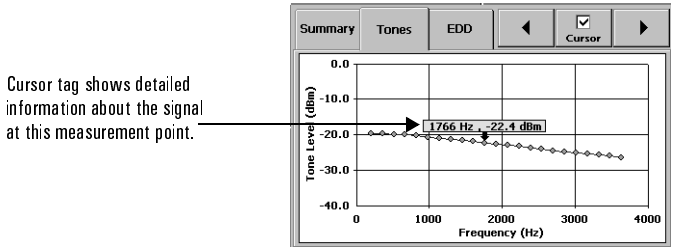


EDD Tab

The Envelope Delay Distortion (EDD) tab presents a graph showing envelope delay (y-axis) as a function of frequency (x-axis).



Cursor Button : Tapping the Cursor button displays a signal marker and tag containing information about the signal at each of the 23 data points in the test results.



You can move the marker and tag to another data point. Either:

- Use the left and right arrow buttons to move the marker to another data point. Double-clicking the left or right arrow button moves the marker to that end of the display.

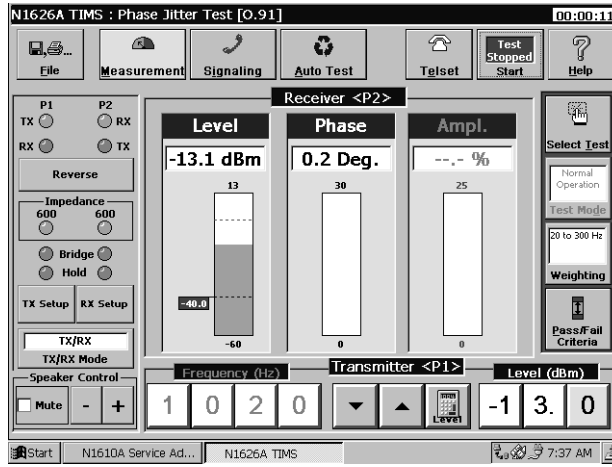
Or

- Touch a data point on the display.

Phase Jitter Screen

This screen controls a test that generates a 1004 Hz, –13 dBm0 holding tone signal, and measures phase jitter in the signal after it is passed through a twisted-pair line. The test conforms to ITU Recommendation ITU-T 0.91.

See *Phase Jitter Test*, page 3–14.



Transmitter Controls and Indicators

Selecting the Phase Jitter test on a transmitting TIMS tester automatically sets the transmitter Frequency and Level controls to 1020 Hz and –13 dBm0, respectively. The Level controls can be used to adjust the transmit signal level in the range of –40 to 0 dBm0.

Receiver Controls

Weighting: The **Weighting** button selects the proper weighting filter for the phase and amplitude jitter tests. The available bandpass filters are:

- Standard filter from 20 to 300 Hz
- Low frequency filter from 4 to 20 Hz
- Combined bandpass filter (from 4 to 300 Hz)

Repeatedly pressing the **Weighting** button cycles through the filter options.

Pass Fail Criteria: The **Pass/Fail Criteria** button functions when the tester is in TX/RX or RX-only mode, to define the range of acceptable input signals. When pressed, the **Pass/Fail Criteria** button opens the Pass/Fail Criteria window. (See *Pass and Fail Limits*, page 8–11.)

Receiver Indicators

Level: Indicates the average signal power level of the holding tone at the module's receiver input. This level is the reference level from which the amplitude jitter is calculated. The level meter's range is from –60 to +13 dBm.

Phase Jitter: displays the current phase jitter level. Phase jitter is defined as a deviation in the zero crossings of a tone, relative to their nominal crossings. The term describes a signal with zero crossing points that jitters in time, because of an ac component in the signal. Phase jitter has little effect on voice transmission, because the human ear is relatively insensitive to phase distortions. However, this form of jitter can affect voice-band modems that use phase modulation.

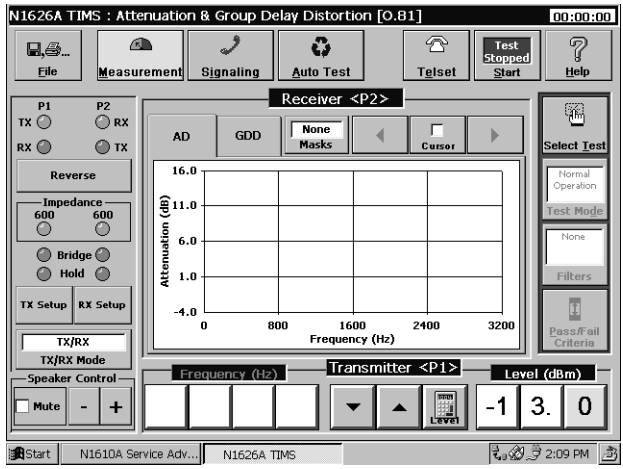
In the phase jitter test, a TIMS Module transmits a 1020 Hz tone at –13 dBm. At the receiving end of the line, a TIMS Module passes the incoming signal through a bandpass filter that limits the module's signal response. The resulting signal is passed to the input of a phase detector. The phase detector compares the instantaneous phase and average phase of the signal, and generates an error signal representing their difference. The components of the error signal between 20 and 300 Hz are measured, digitized, and displayed as the phase jitter reading. The measurement range is from 0 to 30° as specified in ITU Recommendation ITU-T 0.91.

Attenuation & Group Delay Distortion Screen

This screen controls a test that measures the differences in the reception attenuation and delay of 23 tones in a test signal. The test can be run with one TIMS tester in loopback mode, but using two TIMS is preferred. When using two TIMS testers, one transmits a test signal, and the other TIMS receives and analyzes it. When using one TIMS tester, the tester transmits the test signal into one line, receives it from another, then analyzes the received signal. The test signal is an automatically configured 23-tone signal. When the TIMS tester analyzes the received signal, it compares the differences in attenuation and transmission delay of the 23 tones. The test conforms to ITU Recommendations M.1020, M.1025, M.1030, and M.1040.

To aid in qualifying the line, a tolerance mask can be applied to the analyzed signal. See *Masks Button*, page 9–12.

See *Attenuation and Group Delay Distortion Test*, page 3–17.



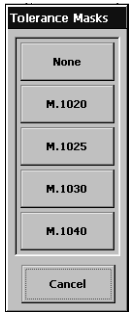
Transmitter Controls and Indicators

Selecting the Attenuation and Group Delay Distortion test automatically configures the test signal.

Receiver Controls

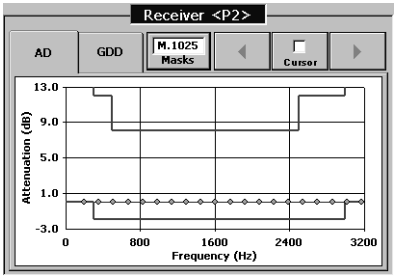
Masks Button

This button opens the Tolerance Masks menu, which offers a choice of four tolerance masks, or None. The masks (sometimes called “disturber masks”) are defined by ITU-T Recommendations. For example, mask M.1020 is defined by ITU-T Recommendation M.1020. The masks are used to check whether special leased circuits are conditioned to provide specified attenuation and group delay distortion. .



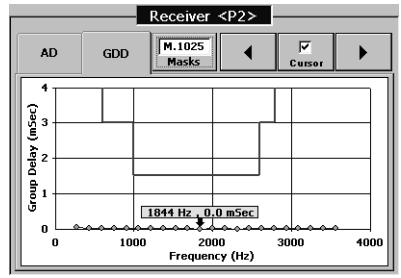
AD Tab

The AD tab presents a graph showing difference between send and receive levels of the 23 tones (y-axis) as a function of frequency (x-axis).



GDD Tab

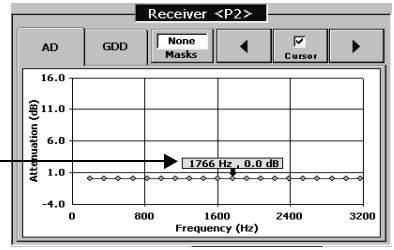
The Group Delay Distortion (GDD) tab presents a graph showing group delay (y-axis) as a function of frequency (x-axis).



Cursor Button

Tapping the Cursor button displays a signal marker and tag containing information about the signal at each of the 23 data points in the test results.

Cursor tag shows detailed information about the signal at this measurement point.



You can move the marker and tag to another data point. Either:

- Use the left and right arrow buttons to move the marker to another data point. Double-clicking the left or right arrow button moves the marker to that end of the display.

Or

- Touch a data point on the display.

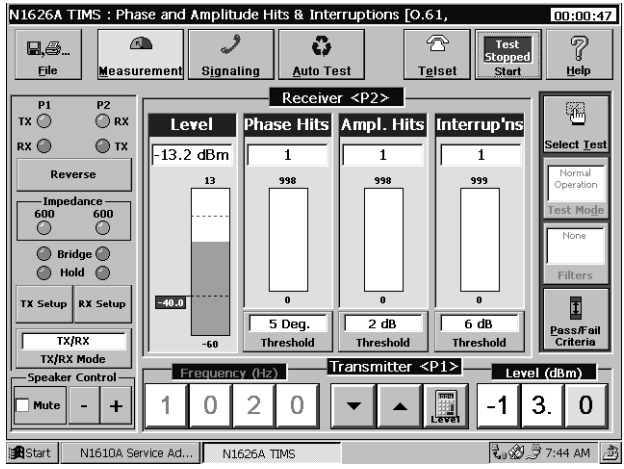
Phase and Amplitude Hits & Interruptions Screen

This screen controls a test that monitors signal phase hits, amplitude hits, and interruptions in the incoming holding tone. The test conforms to ITU-T 0.95 and 0.61. See *Phase and Amplitude Hits & Interruptions Test*, page 3–19.

A phase hit is a sudden change in the phase of a received test tone, often caused by automatic switching to standby facilities. To qualify as a phase hit, the change in phase must exceed the Phase Hit Threshold for more than 4 ms.

An amplitude hit is a sudden change in the level of a signal. Following the hit, the level may return to its original value or may stay an a new value indefinitely.

Interruptions are reductions in signal level of 12 dB or more. Interruptions may last for a short time (just over 4 ms) or they may last indefinitely. Conditions, such as equipment malfunctions, high impedances, or weather related attenuation can cause an interruption.



Transmitter Controls and Indicators

In the TX or TX/RX modes, selecting this test automatically sets the transmitter frequency to 1020 Hz and the level to –13 dB. The level can be adjusted in the range of –40 to 0 dBm0. RX-only mode disables these controls.

Receiver Controls

Weighting: The **Weighting** button selects the proper weighting filter for the phase and amplitude jitter tests. The available bandpass filters are:

- Standard filter with a 20 to 300 Hz bandpass
- Low frequency filter with a 4 to 20 Hz bandpass
- Combined bandpass filter with 4 to 300 Hz bandpass

Repeatedly pressing the **Weighting** button cycles through the filter options.

Pass and Fail Limits: In TX/RX or RX-only mode, the **Pass/Fail Criteria** button opens a display for defining pass and fail limits. (See *Pass and Fail Limits*, page 8–11.)

Threshold Functions

The TIMS module tracks the phase of the incoming holding tone, providing an average phase reference to which the instantaneous phase can be compared. The TIMS module also tracks the holding tone power level, and produces a reference signal representing the average input signal level. The reference signal defines a level from which signal transients (amplitude hits and interruptions) can be measured.

Phase Hit Threshold: This setting determines the permissible amount of phase deviation before the deviation is counted as a phase hit. The **Threshold** button opens a menu of threshold settings from 5 to 45° in 5° increments.

Gain Hit Threshold: This setting determines how far the signal gain can deviate from the gain reference level before a gain hit is counted. The **Threshold** button opens a menu of gain deviation threshold settings of 2 dB, 3 dB, and 6 dB.

Interruptions Threshold: The received level is measured and stored at the start of the measurement interval. The stored value becomes the reference level, to which the instantaneous level is compared. The TIMS Module software sets the interruptions threshold at 6 dB or10 dB below the reference level.

Receiver Indicators

The Phase and Amplitude Hits and Interruptions Test screen receiver functions include a signal power indicator and three event counters. Their functions are as follows:

Level: Indicates the average signal level of the holding tone at the module's receiver input. This level serves as the reference level from which the gain hit and dropout thresholds can be calculated.

Phase Hits: A phase hit is a sudden change in the phase of a received test tone, often caused by automatic switching to standby facilities. To qualify as a phase hit, the absolute difference between the nominal phase and the instantaneous phase must exceed the Phase Hit Threshold for more than 4 ms. The phase hit logic inhibits the phase hit function for 1 second following the detection of a dropout. The module can record a maximum of 998 phase hits during the test.

Amplitude Hits: A gain hit is a sudden increase or decrease in the level of a received test tone, often caused by automatic switching to standby facilities. To qualify as a gain hit, a signal fluctuation must exceed the Gain Hit Threshold for more than 4 ms. The gain hit logic is also inhibited for 1 second following the detection of a dropout. The hit counter can record a maximum of 998 gain hits during the test.

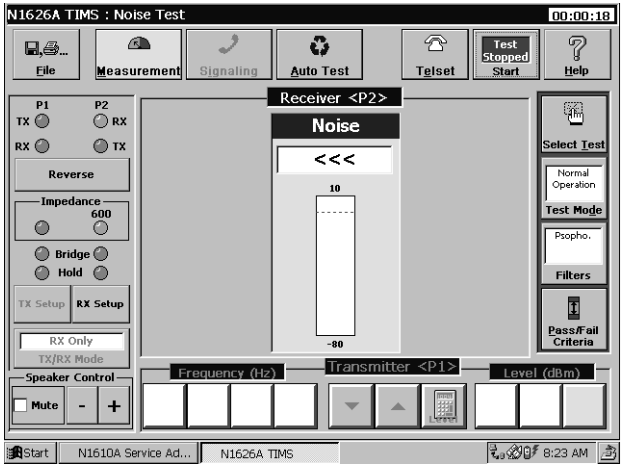
Interruptions: An interruption is a gain hit with a drop in level of more than 6 dB or 10 dB. Such a signal drop is large enough to be deemed a loss of signal, and is large enough to cause a modem to retrain. The counting of phase hit and gain hits is inhibited for 1 second following each dropout. The interruption counter can record a maximum of 998 interruptions during the test.

10

TIMS Noise Test Screens Reference

Noise Test Screen

This screen controls a test that measures the amount of noise on a line, including background noise and tones, as weighted by the selected filter.



Note: The Transmitter **Frequency** and **Level** controls are not available since the Noise test is conducted in RX-only mode.

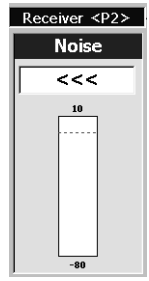
Receiver Controls and Indicators

Filters: Used to select the appropriate filter for the class of service being carried on the twisted-pair**.**

Supported Frequency Range and Application for TIMS Filters

TIMS Filter	3-dB Frequency Range	Application
Psophometric	700 Hz – 3400 Hz	Voice
Channel	300 Hz – 3400 Hz	Modem
275–3250 Hz flat	275 Hz – 3250 Hz	Impulse noise
750–2300 Hz flat	750 – 2300 Hz	Impulse noise
E	1 kHz – 50 kHz	ISDN
F	5 kHz – 245 kHz	HDSL
G	20 kHz – 1100 kHz	ADSL

Noise Indicator: The indicator displays the noise level in dBm, and a bar graph showing the noise level in a –80 to +10 dBm range.

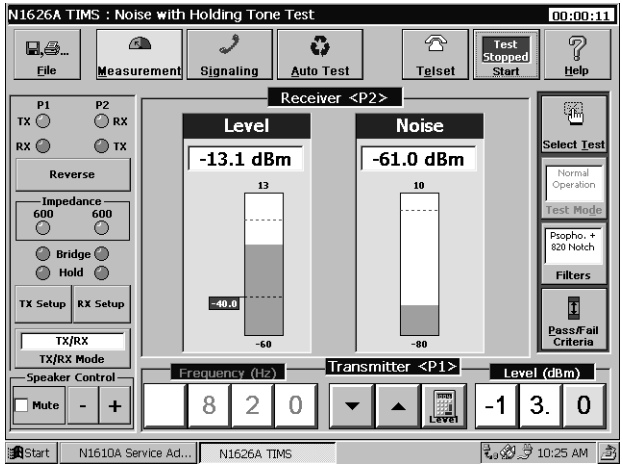


When the receiver displays **>>>**, the noise level is greater than 10 dBm.

When the receiver displays **<<<**, the noise level is less than –80 dBm.

Noise with Holding Tone Test Screen

This screen controls a test that measures noise and distortion on the line, including quantizing distortion from voice-activated devices switched on by a holding tone on the line. The receiver's notch filter removes the holding tone from the signal, so only noise and distortion are measured.



Transmitter Controls

Frequency: Selecting a notch filter automatically sets the TX signal frequency to the holding tone signal frequency of 820 or 1020 Hz. The TX Frequency controls are disabled and grayed out.

Level: Sets the transmit signal level. The range can be set from –40 dBm to 0 dBm. The default setting is –13 dBm.

Receiver Indicators

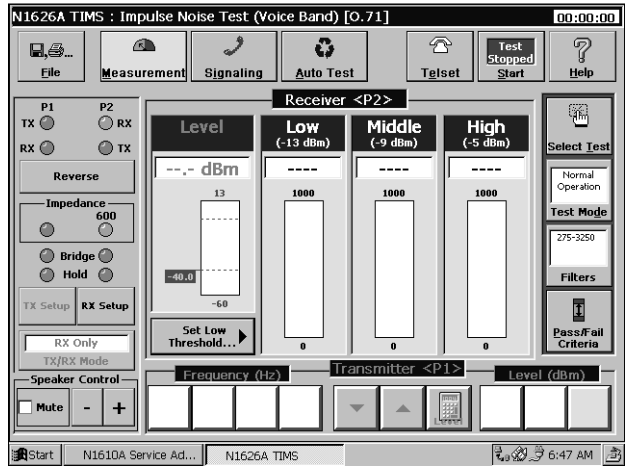
Level: The strength of the received signal, in dBm.

Note: The holding tone must be above –40 dBm to get an accurate noise measurement.

Noise: The noise on the received signal, including quantizing noise from voice-activated devices, in dBm.

Impulse Noise Test (Voice Band) Screen

This screen controls a test that measures impulse noise using voice-frequency weighting filters (275–3250 Hz, 750–2300 Hz). The impulse noise counters register the number of times the noise signal level exceeds defined thresholds. The test conforms to ITU-T 0.71.



Note: The counting rate of the impulse-noise counters is limited to seven counts per second.

Receiver Controls and Indicators

The Receiver indicators show impulse-noise counts and visual displays of the number of impulse-noise spikes detected at each threshold level.

Low: The number of times the noise level exceeded the low-level impulse-noise threshold. (See *Set Low Threshold*, page 10–5.)

Middle: The number of times the noise level exceeded the middle-level impulse-noise threshold, which is 4 dB above the low-level threshold.

High: The number of times the noise level exceeded the high-level impulse-noise threshold, which is 8 dB above the low-level threshold.

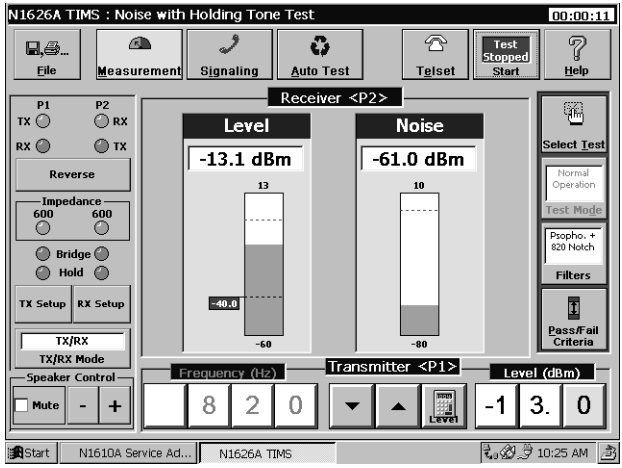
Set Low Threshold : Opens a keypad to set the low-level impulse-noise threshold, between 30 and 95 dBrn. The default value is 77 dBrn. The middle- and high-level thresholds are automatically set 4 dB and 8 dB above the low-level threshold.

Impulse Noise with Holding Tone Test Screen

This screen controls a test that measures impulse noise using voice-frequency weighting filters (275–3250 Hz, 750–2300 Hz). The impulse noise counters register the number of times a peak in the signal level exceeds defined thresholds.

A holding tone switches on voice-activated devices on the line. A notch filter in the receiver removes the holding tone so only impulse noise is measured.

Note: The counting rate of the impulse-noise counters used in this test is limited to seven counts per second.



Transmitter Controls

Frequency: Selecting a notch filter automatically sets the TX signal frequency to the holding tone signal frequency 820 or 1020 Hz. The TX Frequency controls are disabled and grayed out.

Level: Sets the transmit signal level. The range can be set from –40 dBm to 0 dBm. The default setting is –13 dBm.

Receiver Controls and Indicators

The receiver indicators show impulse-noise counts and visual displays of the number of impulse-noise spikes detected at each threshold level (between 0 and 1,000). The level of the noise spike determines in which group or groups the spike is counted.

Low: The number of times the noise level exceeded the low-level impulse-noise threshold (see Set Low Threshold).

Middle: The number of times the noise level exceeded the middle-level impulse-noise threshold, which is 4 dB above the low-level threshold.

High: The number of times the noise level exceeded the high-level impulse-noise threshold, which is 8 dB above the low-level threshold.

Level: The strength (in dBm) of the received signal.

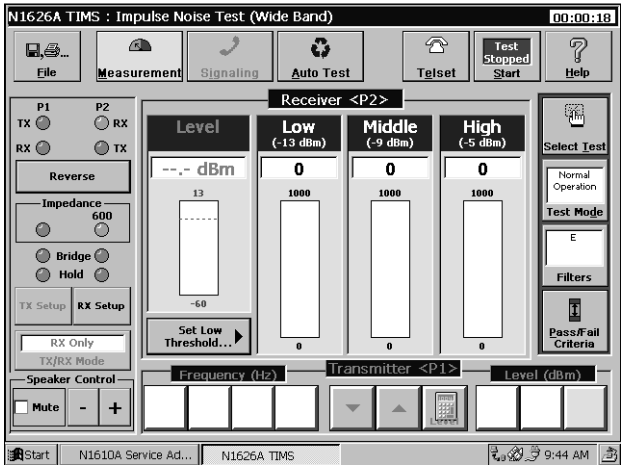
Note: Notice that the Pass/Fail Level on the sample screen is set to –40 dBm. The holding tone must be above –40 dBm to get an accurate noise measurement.

Set Low Threshold: Opens a keypad used to define the threshold level for measuring impulse noise. Any noise spikes above this level are counted as impulse noise. The threshold range is from 30 to 95 dBrn with a default value of 77 dBrn.

Impulse Noise Test (Wide Band) Screen

This screen controls a test that measures impulse noise, as weighted by the selected E, F, or G wide-band filter.

Note: The counting rate of the impulse-noise counters used in this test is limited to a maximum of seven counts per second.



Receiver Controls and Indicators

The Receiver indicators display impulse-noise counts and visual displays of the number of impulse-noise spikes detected at each threshold level (between 0 and 1,000). The level of the noise spike determines in which group or groups the noise spike is counted.

Low: The number of times the noise level exceeded the low-level impulse-noise threshold (see Set Low Threshold).

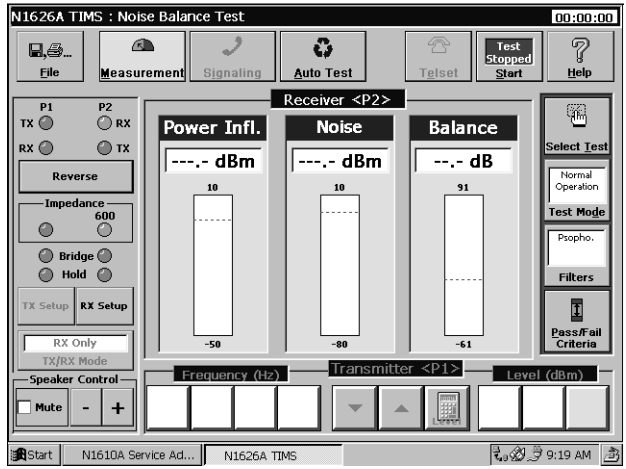
Middle: The number of times the noise level exceeded the middle-level impulse-noise threshold, which is 4 dB above the low-level threshold.

High: The number of times the noise level exceeded the high-level impulse-noise threshold, which is 8 dB above the low-level threshold.

Set Low Threshold : Opens a keypad to set the low-level threshold, between 30 and 95 dBrn. The default value is 77 dBrn. The middle- and high-level thresholds are automatically set 4 dB and 8 dB above the low-level threshold.

Noise Balance Test Screen

This screen controls a test that measures the metallic noise level, power influence, and noise balance in a twisted-pair line. The metallic noise measurement represents a weighted noise value, and includes background noise and tones. Power influence is a measurement of ac noise from power lines. The balance measurement is equal to power influence minus noise.



Note: The tester's ground lug is a safety ground only. It is isolated from the test cable's shield by a 10 MΩ resistor. If the sleeve or shield of the test cable is not earth ground, this measurement will be inaccurate.

Note: To obtain valid readings, you must be testing a standard polyethylene cable ("PIC" or "PE" cable) that is between 3,000 and 20,000 feet long.

Receiver Controls and Indicators

Filters: Selects a filter for the class of service carried on the twisted-pair (see page 10–2).

Noise: The metallic noise on the line after weighting by a receiver input filter.

Power Influence: A measurement of ac noise from nearby power lines.

Balance: A measurement of the power influence minus line noise.

11

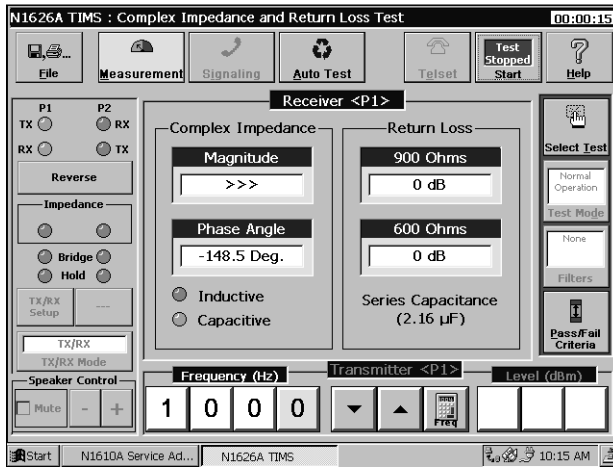
Loop Test Screens Reference

Complex Impedance and Return Loss Test Screen

This screen controls a test that measures the impedance and return loss of a signal at any multiple of 100 Hz in a range of 100 Hz to 2 MHz. The Receiver window displays magnitude and phase angle of the line impedance. Return loss is calculated for reference impedances of 600 and 900 Ohms in series with a 2.16 µF capacitor.

Use this test on twisted pair lines having these characteristics:

- Impedance magnitude between 50 and 300 Ohms
- Angle magnitude less than 50 degrees



Transmitter Controls

Transmitter Frequency: Sets the test transmit frequency within a range of 100 Hz to 2 MHz. The frequency increments in 100 Hz steps. For example, if you set the frequency to 1530 Hz, the tester rounds this value to 1500 Hz.

Receiver Indicators

Complex Impedance Indicators

Magnitude: Displays the magnitude and phase of the line impedance. The magnitude value can range from 0 to 9,999 Ohms.

Phase Angle: The sign of the phase angle is an indication of the inductive or capacitive nature of the impedance (0 to 90 degrees).

Return Loss Indicators

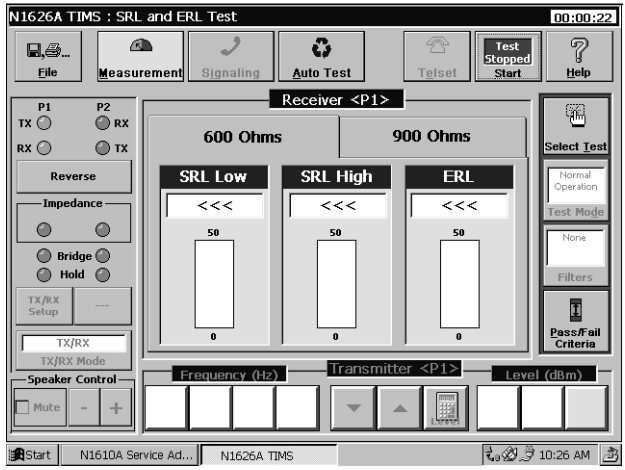
900 Ohms: The return loss with a receiver reference impedance of 900 Ohms in series with a 2.16 µF capacitor.

600 Ohms: The return loss with a receiver reference impedance of 600 Ohms in series with a 2.16 µF capacitor.

SRL/ERL Screen

This screen controls three automated frequency sweeps to measure singing return loss (SRL) and echo return loss (ERL) in upstream lines. SRL is the weighted return loss measured in two frequency bands:

The screen displays 600 Ohm and 900 Ohm impedance results that permit return loss measurements for either line impedance.



600 Ohms tab: Displays test results for a 600 Ohm receiver input impedance (with a series 2.16 µF capacitor).

900 Ohms tab: Displays test results for a 900 Ohm receiver input impedance (with a series 2.16 µF capacitor).

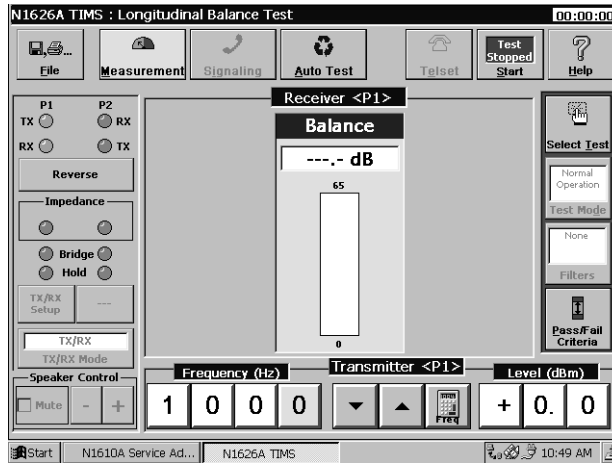
SRL Low: The singing return loss (SRL) of the upstream line at the extreme low end of the voice band (from 260 Hz to 500 Hz).

SRL High: The singing return loss (SRL) in the upstream line at the extreme high end of the voice band (from 2200 Hz to 3400 Hz).

ERL: The echo return loss (ERL) in the upstream line. This is the weighted return loss in the middle of the voice frequency band (from 560 Hz to 1965 Hz).

Longitudinal Balance Screen

This screen controls a test that measures the longitudinal balance of a twisted pair. This balance is defined as a ratio of the longitudinal voltage (measured to ground) to the metallic voltage and is expressed in dB.



Transmitter Controls

Frequency: Sets the tester's transmitter to a frequency between 50 Hz and 200 kHz. A a voice frequency test signal (usually around 1 kHz) is generally used to determine the longitudinal balance.

Level: Sets the transmitter signal level between –10 and +10 dBm.

Receiver Indicators

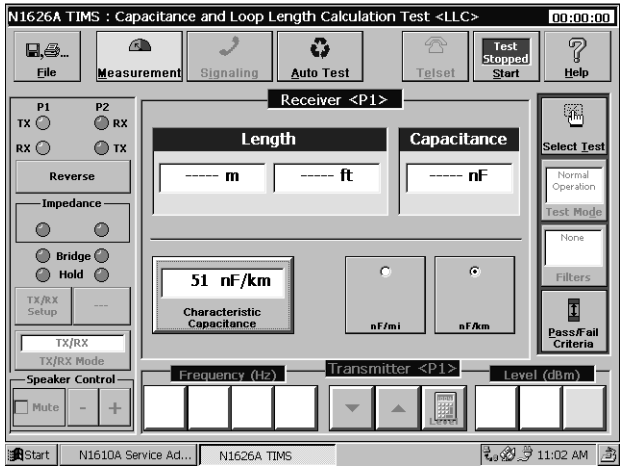
Balance: Displays the line's longitudinal balance in dB.

Capacitance and Loop Length Calculation Screen

This screen controls a test that measures loop capacitance. The measured capacitance and the characteristic impedance of the twisted-pair wire are used to calculate the length of the loop under test

Use this test on twisted pair lines having these characteristics:

- Length between 1 km and 7.5 km
- Capacitance between 50 nF and 400 nF.



Receiver Controls and Indicators

nF/mi: Sets nanofarad per mile as the unit for the characteristic capacitance.

nF/km: Sets nanofarad per kilometer as the unit for the characteristic capacitance.

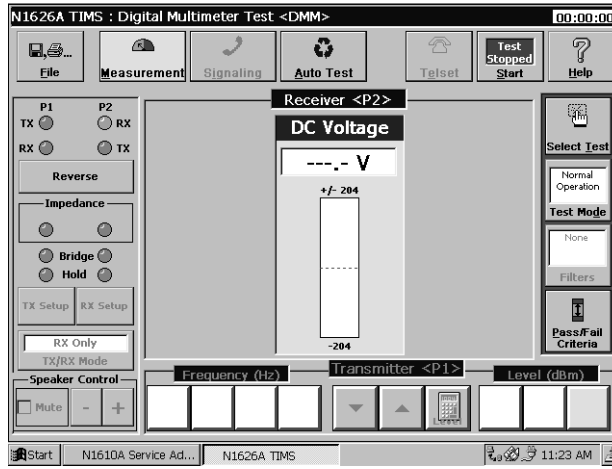
Characteristic Capacitance: opens a keypad that sets the characteristic capacitance of the wire under test. This value can be obtained from the cable manufacturer. The 51 nF/km default is for 26 ga twisted PVC.

Capacitance: Displays the line capacitance measurement.

Length: Displays the calculated line length.

Digital Multimeter Screen

This screen displays the dc voltage (up to ±204 Vdc) between A and B on the twisted pair.



Receiver Indicators

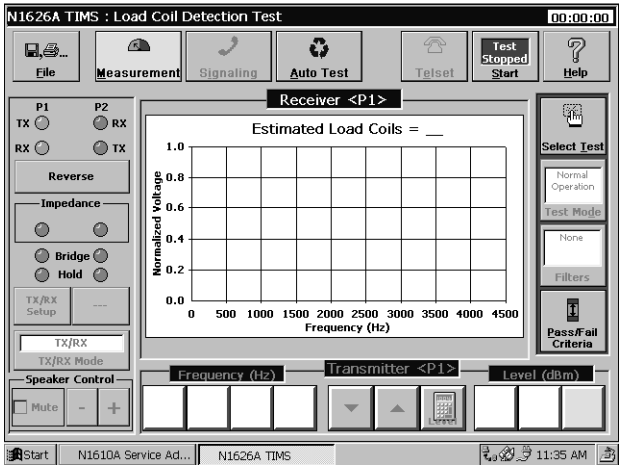
DC Voltage: The dc voltage (up to ±204 Vdc) on the line. Polarity is indicated as the voltage of A relative to B.

- If A is greater than B, polarity is positive.
- If B is greater than A, polarity is negative.

Warning! Use extreme caution when measuring high voltage.

Load Coil Detection Screen

This screen displays the results of a test that checks for load coils on the line. Up to four coils can be detected.



Receiver Indicators

Estimated Load Coils: The number of load coils estimated to be on the line, based on a frequency sweep of the line. The display graph shows normalized loop impedance relative to frequency.

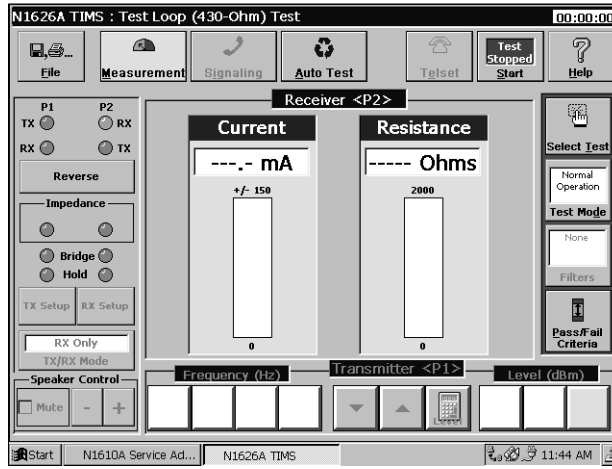
The Y-axis shows the normalized voltage drop across the line when the line is in series with the TIMS tester. Results are corrected so voltages are all between 0 and 1.

The X-axis shows the signal frequency, in Hz.

Load coils ususally appear as dips in the graph.

Test Loop (430-Ohm) Screen

This screen displays the current in the local loop with a 430-Ohm load applied (a simulated telephone off-hook condition).



Note: This test requires –48 V supplied by the CO.

Receiver Indicators

Current: The current (in mA) on the line with a 430-Ohm load applied.

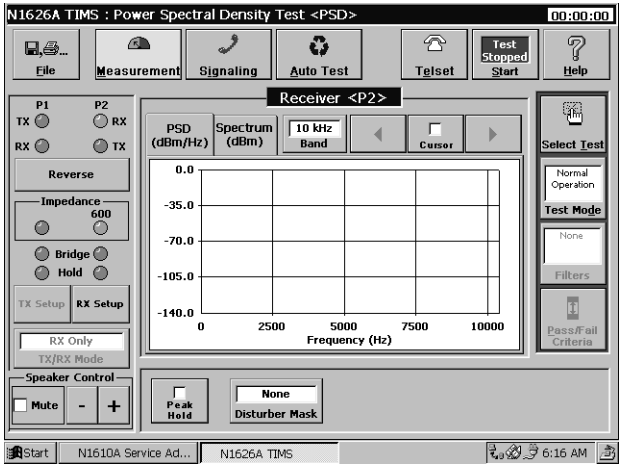
Resistance: Displays the measured line resistance.

12

Advanced Test Screens Reference

Power Spectral Density (PSD) Screen

This screen displays PSD and power spectrum information for the received signal.



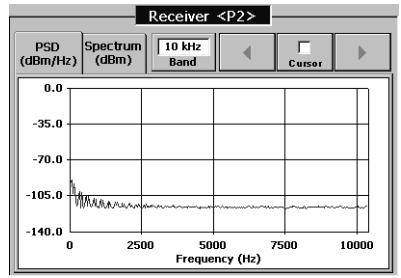
Receiver Controls and Indicators

Band: Opens a menu of settings for the frequency range of the PSD or power spectrum measurements.

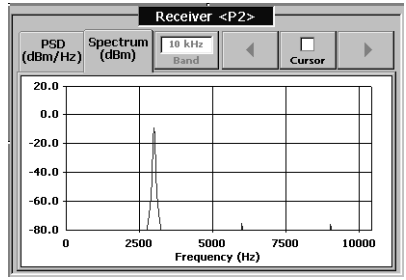
PSD Frequency Ranges

Band	Frequency Range
10 kHz	31 Hz to 10.4 kHz
100 kHz	305 Hz to 104 kHz
2 MHz	11 kHz to 2 MHz

PSD Tab: Shows the level of wide-band random noise (**y-axis**) as a function of frequency (**x-axis**).



Power Spectrum Tab: Shows the level of narrow-band signals, like tones and AM radio interference. The graph shows signal level (**y-axis**) as a function of frequency (**x-axis**).



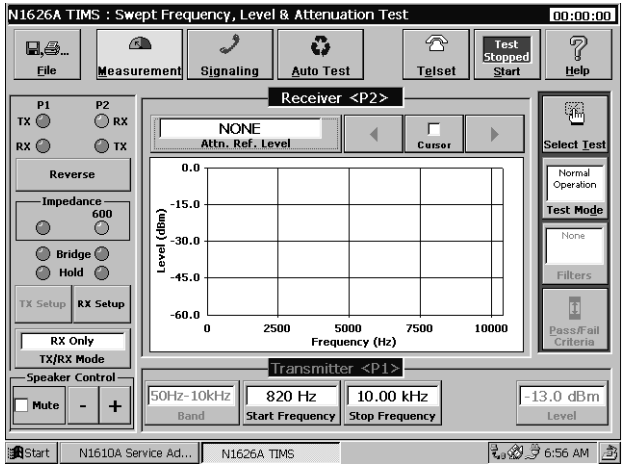
You can use the **Cursor** button to display detailed information about individual data points in the test results.

Swept FLA Screen

When the TIMS tester is used in transmit mode, you can use this control screen to define the start and stop frequencies of the tester's stepped frequency sweep. You can adjust the test signal level in a range from –40 to +13 dBm.

At the receiving end of the line, a TIMS tester is placed in receive mode and is programmed with the same start and stop frequency range used in the transmitter. An attenuation reference level (usually the transmit signal level) should also be entered.

Both testers are then started and the transmitter begins its stepped frequency sweep. At the other end of the line, TIMS tester in receive mode monitors the incoming test signals and plots the signal levels versus frequency on the tester's display. In the 10 KHz band up to 400 sample points are plotted. In the 100 kHz and 2 MHz bands, the test plots up to 100 points.



Transmitter Controls

TX/RX Mode: During end-to end tests one TIMS tester is set to TX mode, and the tester at the far end of the line is set to RX Mode.

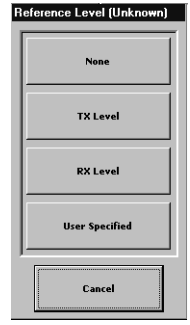
Start Frequency: Opens a keypad that sets the start frequency of the test signal's frequency sweep.

Stop Frequency: Opens a keypad that sets the end frequency of the test signal's frequency sweep.

Level: Opens a keypad that sets the transmitter signal level (from -40dBm to +0 dBm, –13 dBm is the default).

Receiver Controls and Indicators

The **Attn. Ref. Level** button opens the Reference Level menu. The buttons in the menu set a reference level, to which the receive signal is compared. The difference between the reference level and the receive signal level is displayed in the Attenuation display of the Receiver window.



None: In Swept FLA tests, turns off the attenuation reference level.

TX Level: When running a loopback Single FLA test in TX/RX mode, sets the tester's TX signal level as the reference level.

RX Level: In TX/RX or RX-only modes, stores the current level of the RX signal as the reference level for later measurements.

User Specified: Opens a keypad where you can define a reference level for the test. The range for this level is from –60dBm to +13dBm.

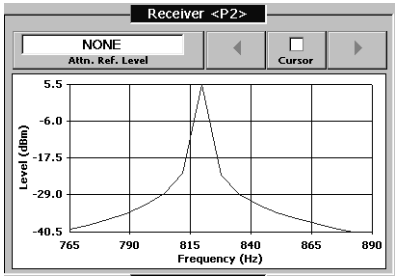
Note: The RX Level option can be used to capture a generated signal level for use as a reference in future tests.

Cursor: Tapping the **Cursor** button displays a signal marker and tag containing information about the signal at each of the data points in the test results.

You can move the cursor and tag to another data point, as follows:

- Use the left and right arrow buttons to move to the next data point. Double-tapping the left or right arrow button moves the cursor to that end of the display.
- Touch a data point on the display.

Receiver Display: Displays a frequency response curve for the signal being received by the tester's receiver.

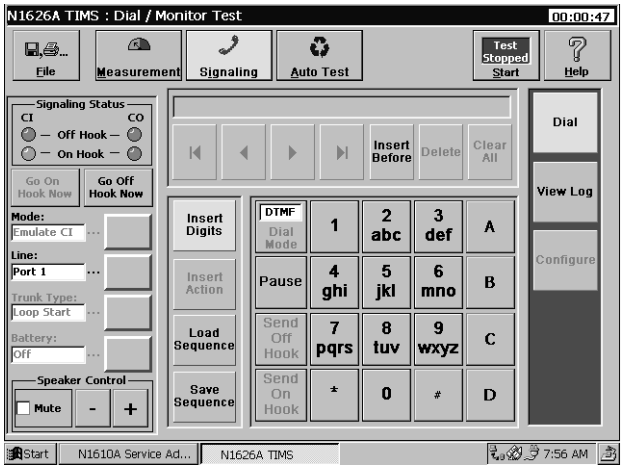


13

Signaling Screen Reference

Dial/Monitor Test Screen

The **Signaling** button opens the Dial/Monitor Test screen. This screen configures a dial string for output over a subscriber line. Tapping the **Start** button transmits the dial string on the selected port.



Before entering a dial string, you must select an output port. When this is done, enter the individual codes that make up a dial string in the entry field of the screen. A dial string can be from 1 to 32 characters in length including action codes. The action codes often consist of several ASCII characters. However each is counted as a single character.

Dial/Monitor Controls

Go On Hook Now: Stops the dial string transmission and changes to the on-hook state.

Go Off Hook Now: Changes the line to off-hook state.

Mode: Displays Emulate CI as the emulation mode for the test.

Line: Selects the port to transmit the signal to.

Speaker Control: The three Speaker Control buttons control the audio signal (including signaling tones) from the subscriber line to the Tablet's speaker. The **Mute** button enables or disables the speaker. The **+** and **-** buttons are volume controls.

Dial String Configuration Tools

Dial Mode: Selects DTMF or Dial Pulse signaling. Dual-Tone Multifrequency (DTMF) is used for Touchtone™ signaling from a telephone set or a PBX to an exchange. After it is seized, the exchange attaches a DTMF receiver to its end of the loop, before returning a dial tone. As each button on the DTMF dial pad is tapped, the phone's talk circuit is disconnected and a tone pair is sent to the exchange. Each tone pair comprises two separate signals, each at one of seven defined audio frequencies. The tone pairs are detected at the exchange and used to supply addressing information. The tones are also coupled into the talk circuit, to provide user feedback. DTMF is also used in end-to-end signaling between subscribers.

Pause: Inserts a one second pause code in the dial string. The pause code instructs the Signaling Module to wait one second before proceeding. Consecutive pause codes can be inserted into the dial string to produce a longer wait.

***:** The asterisk is a DTMF special character

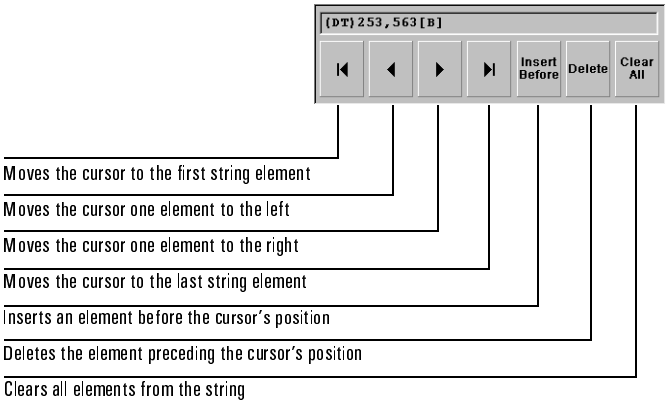
#: The pound sign is a DTMF special character

A, B, C, D: DTMF special characters

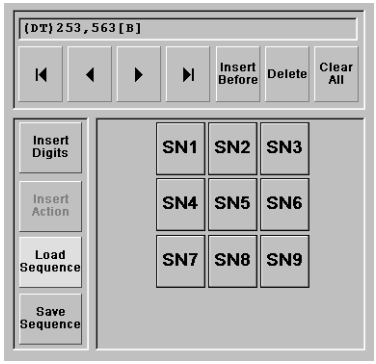
Number Buttons (1 through 0): The numbered keypad buttons enter individual digits in the dial string.

Dial String Entry Field: Displays the Dial string as it is entered. The display includes a blinking cursor that shows where editing actions occur.

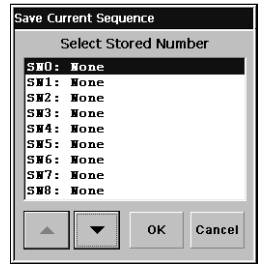
Dial String Editing Buttons: There are seven buttons located just below the dial string display field. Use these buttons to modify a dial string entry.



Load Sequence: Opens the memory location selector menu. Each of the SN buttons in the menu is linked to a dial string storage location. Tapping a SN button retrieves the string stored in that location, and displays it in the dial string entry field of the Dial / Monitor Test screen. The displayed string can be edited using the dial string editing buttons discussed above. If no string is displayed in the entry field, the selected SN location is empty.



Save Sequence: The **Save Sequence** button opens the Save Current Sequence window. This display lets you select a stored dial string to send over the line. Tapping the Start button sends the selected dial string out the selected TIMS Module port.Empty SN positions are labeled “None.” For more information about saving dial strings, see *Storing a Dial String*, page 7–4



14

Printing and Reports

Connecting Printers

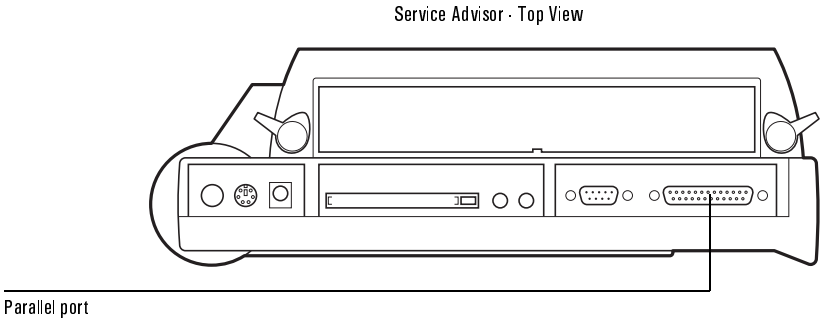
The Agilent Service Advisors are compatible with HP Deskjet™ printers.

Caution: If no printer is connected, sending the Print command freezes the Service Advisor, and requires a restart. Unsaved data will be lost.

Connecting a Printer to a Service Advisor Tablet (N1610B)

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

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

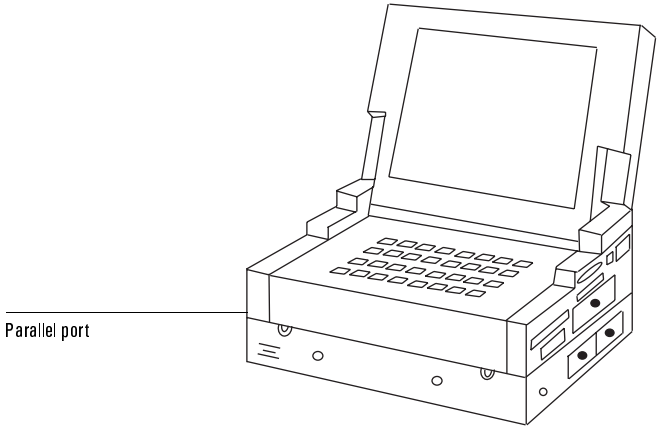


2. Install a DB-25 cable between the parallel port on the Service Advisor and your printer.

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

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

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



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

Printing a Screen

You can always print the current screen when your Tablet is connected to a HP Deskjet™ printer. The printer must be directly connected to the parallel port on your Service Advisor (see *Connecting a Printer to a Service Advisor Tablet (N1610B)*, page 14–2, or *Connecting a Printer to an Agilent Advisor (J2300C/D)*, page 14–3). The screen prints exactly as it appears on the tester's display.

To print a screen, tap **Print Screen** in the File menu. The screen prints on your printer.

Caution: Make sure you have a printer connected to the platform you are using. If no printer is connected, sending the Print command freezes the Service Advisor, and requires a restart. Unsaved data will be lost.

Printing a Report

You can print a report that contains configuration and test results during a test or after you tap the **Stop** toolbar button to stop a test.

To print a saved report, see *Viewing and Printing Saved Reports*, page 14–12.

To print a report for the test that is currently running, or a test that you just stopped:

Caution: Make sure you have a HP Deskjet™ printer connected to the platform you are using. If no printer is connected, sending the Print command freezes the Service Advisor, and requires a restart. Unsaved data will be lost.

Note: If you want a header to print on the report, the header must be applied before performing this procedure. See *Entering Test Header Information*, page 14–7.

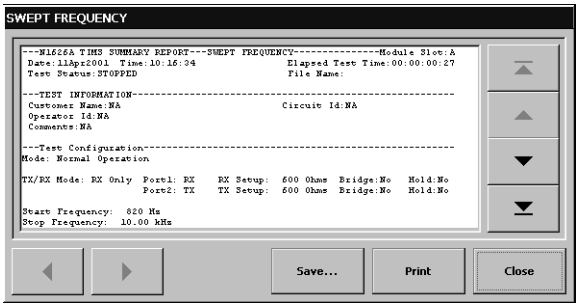
1. Open the File menu, then tap **Reports**.

   The TIMS Reports menu opens.

2. Tap the **Create** button on the TIMS Reports screen.

   A Report screen opens, with the configuration and test results. The title of the Report screen indicates the test that is currently running or was last stopped.

For example, if you are running a Swept FLA test or just stopped it, tapping the **Create** button opens the report screen below.



3. Tap the arrow buttons to 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 14–7. The report header information appears in the Test Information section of the report.

   If you are controlling your tester remotely from a PC, you see the typical Windows print screen appear when you tap the **Print** button.

4. Select the desired printer and tap the Windows **Print** button to print the report.

See *Viewing and Printing Saved Reports*, page 14–12 for more information.

Entering Test Header Information

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

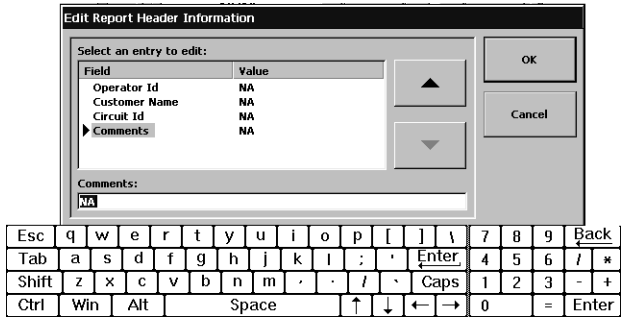
To enter test information before saving or printing reports:

1. Open the **File** menu and tap **Reports**.

   The TIMS Reports menu opens.

2. Tap **Header Information**.

   The Header Information menu opens.



3. Tap the Up or Down arrow button to highlight each field and enter the appropriate information using the keyboard display.

   This information appears on the report file.

Note: The Operator ID and Customer Name are saved on the Service Advisor. This makes the information available to 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 TIMS Reports screen.
5. On the TIMS Reports screen opens, tap **Create** to view the current report file.

   You can save or print the displayed report, or tap Close to return to the TIMS Reports screen.

   To save the displayed report, see *Saving a Report*, page 14–9.
6. To print the displayed report, tap the **Print** button. Then tap the **Close** button to return to the TIMS Reports screen.

Saving a Report

You can save report information during a test or after stopping it. You can save the information in either the TIMS Test module or the Flash Memory card.

Reports can also be saved to a pc, using SA Companion. See the *Service Advisor Portable Test Tablet User's Manual* for more information.

To save results in a file:

1. Open the **File** menu and tap **Reports**.

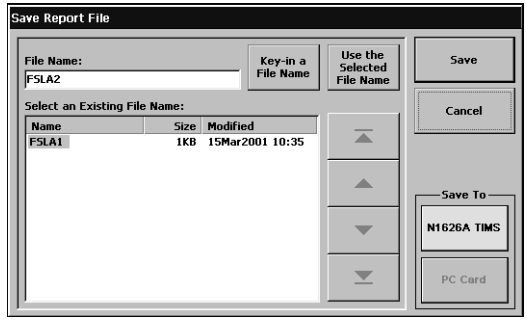
   The TIMS Reports menu opens.

2. Tap **Create**.

   The Report screen opens. Tap the arrow buttons to view the report.

3. Tap the **Save** button.

   The Save Report File window opens.



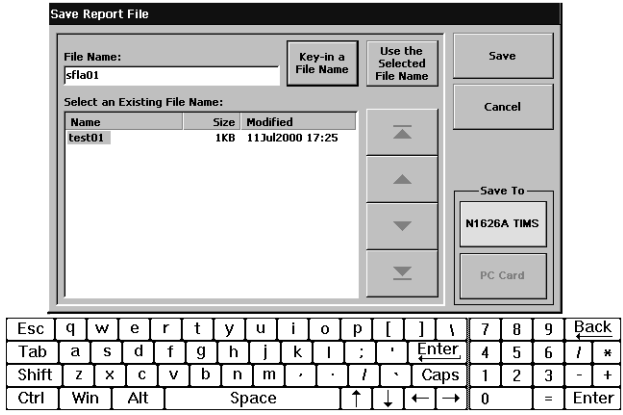
   If you tap the **Close** button, the report information is not saved and you return to the TIMS Reports menu.

4. Select a filename.

   When the Save Report File screen opens, you can save the file using one of the filenames listed on the screen, or enter a new one

   - To use an existing filename, highlight a name in the list using the arrow keys, then tap **Use Selected File Name**. You'll see the selected name appear in the File Name field. Go to step 6.
   - To enter a new filename, go to step 5.

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



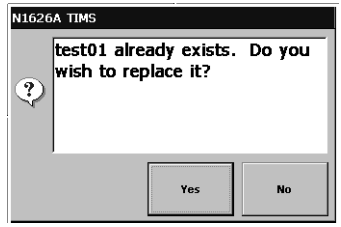
   You can use any combination of characters for the file name. The system automatically adds a **1** at the end of the prefix name the first time you generate a report (for example, TEST01.TXT). The number automatically increases each time you print a report. This ensures that each report is saved with a unique filename, and new reports do not overwrite existing reports.

6. Tap the **N1626A TIMS** button to save the file in the TIMS 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 return to the Report screen without saving the file.

If a file with the selected name already exists, the window shown below opens. 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 opens.

   Before tapping **Print**, make sure you have a printer connected to the platform you are using. See *Viewing and Printing Saved Reports*, page 14–12 for more information.

9. Tap the **Close** button on the N1626A TIMS Reports screen to return to the main TIMS tester screen.

Viewing and Printing Saved Reports

You can print saved reports when you connect a printer to your Service Advisor Tablet or 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.

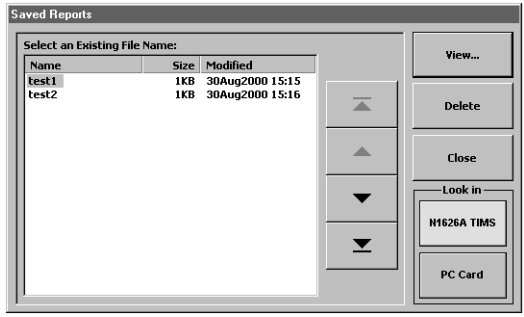
To print saved reports, follow these steps.

1. Open the **File** menu and tap **Reports**.

   The TIMS Reports menu opens..

2. Tap the **View/Print/Delete...** button.

   The Saved Reports window opens.

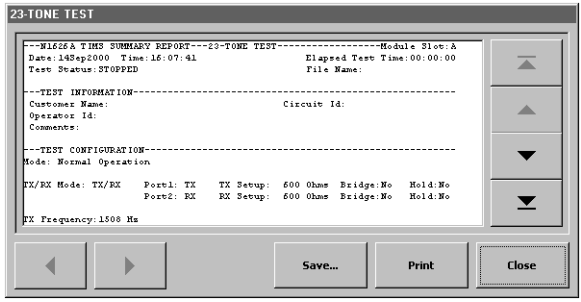


3. Tap the **N1626A** or the **PC Card** button, depending on where you saved the desired report file.

4. Use the Up and Down arrow buttons to highlight the name of the report you want to print, or tap the report name.

5. Tap the **View** button.

   The report displays.



6. View the contents of the file using the Up and Down arrows, then tap the **Print** button.

Caution: Make sure you have a HP Deskjet™ printer connected to the platform you are using. If no printer is connected, sending the Print command freezes the Service Advisor, and requires a restart. Unsaved data will be lost.

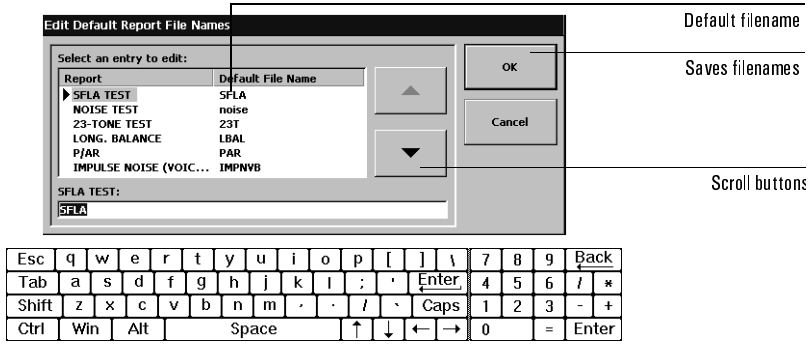
7. Tap the **Close** button on the displayed screens until you return to the main TIMS Tester screen.

Changing Default File Names

You can enter and change default names for different types of reports.

1. To open the TIMS Reports menu, tap **Reports** in the File menu..

2. Tap **Default Names** for the Edit Default Report File Names screen.



3. Use the arrow buttons to select the type of report information you want to save.

4. Enter the desired file name or default file names for one or all reports, then tap **OK** to save the file names and return to the TIMS 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. On the TIMS Reports screen, tap the **Close** button to return to the main TIMS test screen, or tap the **Create** button to save the report (see *Saving a Report*, page 14–9).

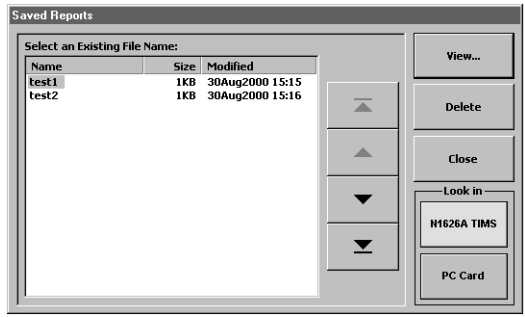
Deleting Saved Files

1. Open the File menu and tap **Reports**.

   The TIMS Reports menu opens.

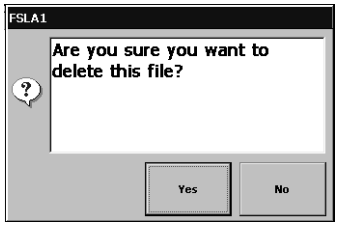
2. Tap **View/Print/Delete**.

   The Saved Reports window opens.



3. Tap the **N1626A** 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.

The Delete confirmation message window opens.



6. 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 TIMS Tester screen.

15

Specifications

N1626A TIMS Module Specifications

The following table lists the specifications of the N1626A TIMS Module.

TIMS Module Specifications

Characteristic	Specification
Physical Characteristics	
Size (W × H × D)	7.8 × 9.0 × 2.6 inches (19.8 × 22.9 × 6.6 cm)
Weight	2.7 pounds (1.2 kg) 8.1 pounds (3.65 kg) with S.A. Tablet & battery
Temperature	**Operating:** 0 to +40 °C (+32 to 104 °F) **Storage:** –20 to +60 °C (–4 to 140 °F)
General Characteristics	
Power	10.5 watts (provided by S.A. Tablet)
Vdc	**Range:** –204 to +204 Vdc range (tip-to-ring) **Max. dc blocking:** 200 Vdc
Impedance levels	100, 120, 135, 150, 600, 900 ohms (transmit and receive independently selectable)
Termination mode	Bridge, hold (transmit and receive independently selectable)

TIMS Module Specifications, continued

Characteristic	Specification		
Transmitter Characteristics			
TX frequency	**Range:**	50 Hz to 2 MHz	
	Skip Frequencies: 2130 to 2430 Hz		
	Resolution:	4 digits	
	Accuracy:	Range	Accuracy
		50 Hz to 9999 Hz	±1 Hz
		10 kHz to 400 kHz	±10 Hz
		400 kHz to 1 MHz	±100 ppm
		> 1 MHz	±1000 ppm
TX level	**Range:**	–40 to +13 dBm	
	Resolution:	0.1 dB	
	Accuracy:	Frequency	Accuracy
		1000 Hz (0 to –19 dBm)	±0.1 dB
		all other	±0.2 dB
	Distortion:	At least 40 dB below output level at –40 to +10 dBm	
	Flatness:	200 Hz to 15 kHz	±0.1 dB
		all other frequencies	±0.5 dB

TIMS Module Specifications, continued

Characteristic	Specification		
Receiver Characteristics			
RX frequency	**Range:** 50 Hz to 2 MHz		
	Resolution: 4 digits		
	Accuracy:	Freq. Range	Accuracy
		50 Hz to 9999 Hz	±1 Hz
		10 kHz to 400 kHz	±10 Hz
		400 kHz to 1 MHz	±100 ppm
		> 1 MHz	±1000 ppm
RX level	**Range:** –60 to +13 dBm		
	Resolution: ±0.1 dB		
	Detector type: Average, RMS		
	Accuracy:	Freq. Range	Accuracy
		50 Hz to 200 Hz	±0.5 dB
		200 Hz to 15 kHz	±0.2 dB
		15 kHz to 2 MHz	±0.5 dB
		1002 Hz to 1020 Hz	±0.1 dB (0 to –19 dBm)
Tone generator (TX function)	50 Hz to 2 MHz, in 1 Hz increments Preset tones: 300 Hz, 820 Hz, 2000 Hz, 3000 Hz		
Holding tones (TX function)	820 and 1020 Hz		
Holding circuits	Two, each drawing 23 mA nominal dc current		
Freq. weighting filters (RX function)	Psophometric, 275–3250 Hz, 750–2300 Hz, channel, 820 Hz notch, 1020 Hz notch, E, F, G		
Level ranges	Analog interface: -50 dBm to +10 dBm Digital Interface: -40 dBm to +3dBm		

TIMS Module Specifications, continued

Characteristic	Specification
DTMF signaling (TX function)	**Digits:** 0 – 9, A, B, C, D, *, # **Level Range:** –40 dBm to +5 dBm **TX timing range:** 50 to 499 ms (ON), 50 to 500 ms (off) Store and auto-dial up to nine phone numbers
Connectors and Jacks	
Siemens jacks	TIMS circuit connectors
Banana jacks	Butt-set connection (*A* & *B* binding posts)
RS-232 connector	Remote connection & SCPI control

TIMS Test Specifications

The following table presents the characteristics for TIMS tests and measurements.

TIMS Test and Measurement Characteristics

Characteristic	Specification	
SFLA Test		
Transmitter Characteristics	see page 15–3	
Receiver Characteristics	see page 15–4	
Swept FLA		
Transmitter Characteristics	see page 15–3 16 tones/s up to 400 tones/sweep in the 10 kHz band. 1 tone/s up to 100 tones/sweep in the 10 kHz band.	
Receiver Characteristics	see page 15–4	
Noise Test		
Accuracy	±1 dB	
Resolution	±0.1 dB	
Detector type	True RMS	
Filter ranges	**Filter**	**Noise** (dBrn)
	Psophometric	–80 to 0
	Channel	–80 to 0
	E filter	10 to 90
	F filter	20 to 90
	G filter	30 to 90

TIMS Test and Measurement Characteristics, continued

Characteristic	Specification	
Impulse Noise (3-Level Test)		
Threshold levels	low, middle, high (difference of 4 dB)	
Threshold ranges	Filter	Impulse Noise (dBm)
	Psophometric	–60 to 20
	Channel	–50 to 0
	275–3250 Hz flat	–50 to 0
	750–2300 Hz flat	–50 to 0
	E filter	–60 to 20
	F filter	–50 to 20
	G filter	–40 to 20
23-Tone Test		
Signal (TX)	23 frequencies in the range 203 Hz to 3640 Hz	
TX/RX Level	–40 dBm to –6 dBm	
EDD	10,000 microseconds	
S/TD	10 to 45 dB	
IMD	2nd and 3rd order IMD products for 20 to 60 dB below signal level	
S/N	10 to 45 dB	
Test results	Range	
PSD and Power Spectrum		
Spectrum resolution	Frequency Range	**Resolution**
	50 Hz to 10 kHz	31.25 Hz
	304 Hz to 103 kHz	304 Hz
	10.9 kHz to 1.99 MHz	3.65 kHz

TIMS Test and Measurement Characteristics, continued

Characteristic	Specification	
Display resolution	Frequency Range	**Resolution**
	50 Hz to 10 kHz	331 points
	304 Hz to 103 kHz	340 points
	10.9 kHz to 1.99 MHz	545 points
SRL/ERL Test		
TX Signal	3 frequency sweeps: 260 Hz to 500 Hz, SRL Low 2200 Hz to 3400Hz, SRL High 560 Hz to 1965 Hz, ERL compatible with IEEE 743-1995, Sect. 8.4	
TX Accuracy	± 0.5 dB	
Receiver Characteristics	see page 15–4	
RX Accuracy & Range	2-wire, ±0.5dB over range of 0dB to 40 dB 4-wire, ±0.5dB over range of 0dB to 40 dB	
Cap. & Loop Length		
Capacitance Range	50 nF to 550 nF	
Wire standards	83 nF/mi and 51 nF/km	
Accuracy	1%	
DC Voltage Measure		
Range	0 to 204 Vdc	
Accuracy	± 5%	
430 Ohm Test Loop		
Range	0 to 150ma	
Accuracy	± 5%	

TIMS Test and Measurement Characteristics, continued

Characteristic	Specification
Complex Impedance	
Magnitude	up to 990 Ohms
Angle	±90 °
Accuracy	Impedance ±2%, return loss 0.5dB
Longitudinal Balance	
Range	0 to 100 dB
Accuracy	±1 dB
Frequency Range	50 Hz - 700 Hz
Load Coil Detection	
Method	Sweep frequency
Range	Up to four load coils

TIMS Weighting Filters

The following table lists the frequency ranges of the TIMS weighting filters.

N1626A TIMS Weighting Filters

Filter Type	3-dB Frequency Range
Psophometric	700 Hz – 3400 Hz
Channel	300 Hz – 3400 Hz
275–3250 Hz flat	275 Hz – 3250 Hz
750–2300 Hz flat	750 – 2300 Hz
E	1 kHz – 50 kHz
F	5 kHz – 245 kHz
G	20 kHz – 1100 kHz

Ordering Information

Contact your Agilent Technologies representative to purchase any of the following products or accessories.

TIMS Module Ordering Information

Part Number	Product Description
N1610B	Service Advisor Portable Test Tablet, includes: NiMH battery and internal battery charger, Service Advisor Companion software, Vac power adapter (N1612A) DB-9 to DB-9 serial null-modem cable
	Option **Description** 500 Remote Services (for S.A. Tablet and modules) 910 Additional S.A. Tablet User's Manual
N1611A	Additional NiMH battery (for N1610AB
N1612A	Universal Vac power adapter and power cord (select one): ABA (North America) ABB (European HPSA) ABG (Australia) ABU (UK) ACD (Switzerland) ACF (Japan) AKJ (Israel) AKM (China)
N1613A	External battery charger (for N1610B)
N1614A	12 Vdc power adapter (for vehicle power source)
N1615A	Softsided carrying case (for N1610B and accessories)
N1616A	Hard carrying case (for N1610B and accessories)
N1617A	Service Advisor Connectivity kit, includes: Service Advisor Companion software, DB-9 to DB-9 null-modem cable

TIMS Module Ordering Information, continued

Part Number	Product Description
N1618A	56 k/V.90 Modem PC card
N1620A	10-BaseT Ethernet LAN PC card
N1621A	10 Mb Compact Flash and PCMIA adapter
N1623A	Grounded test cable equipped with two Bantum connectors and alligator ground clip.
N1624A	Grounded test cable equipped with two WECO 310 connectors and alligator ground clip.
N1626A	xDSL 2 MHz TIMS Module (ITU-T)
N1626A-910	Additional xDSL TIMS User's Manual (ITU-T)
8120-8845	DB-9 to DB-9 serial null-modem cable (standard with N1610B)

Warranty, Calibration, and Service

Agilent Technologies Limited Warranty Statement

Agilent Product: N1626A Service Advisor xDSL TIMS Test Module

Duration of Limited Warranty: Three years

1. Agilent warrants to you, the end-user customer, that Agilent hardware, accessories and supplies will be free from defects in materials and workmanship after the date of purchase, for the period specified above. If Agilent receives notice of such defects during the warranty period, Agilent will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or equivalent in performance to new.

2. Agilent warrants to you that Agilent software will not fail to execute its programming instructions after the date of purchase, for the period specified above, due to defects in material and workmanship when properly installed and used. If Agilent receives notice of such defects during the warranty period, Agilent will replace software which does not execute its programming instructions due to such defects.

3. Agilent does not warrant that the operation of Agilent products will be uninterrupted or error free. If Agilent is unable, within a reasonable time, to repair or replace any product to a condition as warranted, you will be entitled to a refund of the purchase price upon prompt return of the product.

4. Agilent products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.

5. Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by Agilent, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.

6. Agilent warrants that the Agilent Product described above will be able to accurately process date data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000, including leap year calculations, when used in accordance with the Product documentation provided by Agilent (including any instructions for installing patches or upgrades), provided that all other products (e.g. hardware, software, firmware) used in combination with such Agilent Product(s) properly exchange date data with it. If the Specifications require that specific Agilent Products must perform as a system in accordance with the foregoing

warranty, then that warranty will apply to those Agilent Products as a system, and Customer retains sole responsibility to ensure the Year 2000 readiness of its information technology and business environment. The duration of this warranty extends through January 31, 2001. To the extent permitted by local law, this warranty applies only to branded Agilent Products and not to products manufactured by others that may be sold or distributed by Agilent. The warranty in this paragraph 6) applies only to Agilent Products shipped after July 01, 1998. The remedies applicable to this paragraph 6) are those provided in paragraphs 1, 2, and 3.

7. Products purchased from Agilent outside the U.S. will receive the standard warranty in the country of purchase. If end user customer moves such Products to another country where Agilent has Support presence, then end user customer will receive the destination country standard warranty.

8. Products purchased in the U.S. based on the U.S. list prices will only receive standard warranty in the U.S., except for Products with a global warranty. A global warranty means that the Product will include the destination country's standard warranty in any country where the Product is moved provided that Agilent has Support presence in that country.

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Support

If you have a question or need help with your N1626A Service Advisor xDSL TIMS Test Module, please refer to one of the following sources of assistance.

- Read this manual to see if the information you seek is here. To help you locate information more quickly, use the Index at the back of the manual, and the Table of Contents at the front of the manual.
- Carefully check your test setup, connections, and power. Be sure that the module is installed in the Service Advisor tablet properly.
- Refer to the Agilent Technologies website at http://www.agilent.com
- Call the Agilent Call Center at 800-452-4844.

Calibration and Service

Calibration

This instrument must be calibrated only by authorized Agilent Technologies personnel. Unauthorized service or calibration will void the warranty.

- Agilent Technologies suggests that the TIMS Test Module (N1626A) be calibrated every three years.

To arrange for calibration, please contact the Agilent Instrument Support Center at 800-403-0801 to obtain an RMA (return material authorization) number and receive shipping instructions.

Service

If your xDSL TIMS Test module is not operating properly, carefully check all configuration parameters and connections. Improper selection of timing modes or drop channels, for example, can cause unexpected operation. Also check that the module is seated properly in the Tablet or Undercradle.

If you are still experiencing problems or feel that your module requires service, contact the Agilent Call Center at 800-452-4844. Trained personnel are available to help solve your problem or determine if the module must be returned for repair.

If your module must be returned, a Call Center representative will assign an RMA (return material authorization) number and give you shipping instructions. No product will be accepted for service without an RMA number.

Contact the Instrument Support Center at 800-403-0801.

Glossary

ac: Alternating current.

ADSL: Asymmetric Digital Subscriber Line.

AMI: Alternate Mark Inversion. A line coding scheme.

ANSI: American National Standards Institute.

ATU-C: ADSL termination unit–central office. The ADSL modem at the central-office end of the ADSL line.

ATU-R: ADSL termination unit–remote. The ADSL modem at the remote end of the ADSL line.

asynchronous: Not synchronized; not timed to an outside clock source.

attenuation: Signal loss.

bandwidth: A network's or channel's capacity to carry traffic.

bit: A basic unit of data. A bit can be set to either a zero or a one.

bit rate: (FTP) The speed at which bits are transferred over the network.

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.

CO: Central Office.

CPE: Customer premises equipment.

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 reference noise with C-message weighting.

dc: Direct current.

DCE: Data circuit-terminating equipment. Equipment that provides the interface between a DTE device and a transmission circuit (for example, a modem).

decimal: A base-10 numbering system in which the digits range from 0 to 9.

downlink: The ADSL circuit path used to transmit data from the central office (ATU-C) to the subscriber (ATU-R).

download: Moving information from one location to another (typically, between two network nodes).

downstream: See *downlink*.

DRS: Digital reference signal.

DS1: Digital signal level 1; 1.544 Mbps.

DTE: Data terminal equipment. Equipment that converts user information into data signals for transmission (for example, a PC).

DTMF: Dual Tone MultiFrequency. A dialing method that uses a unique two-tone combination to represent each dialing digit. Also called touch-tone or push-button dialing.

EDD: Envelope delay distortion.

envelope: A group of frequencies used to simulate a data signal.

EPD: Echo Path Delay.

EPL: Echo Path Loss.

ERL: Echo Return Loss.

ESD: Electrostatic discharge. The discharge of static electricity, which has the potential to damage electronic circuitry.

FEXT: Far-end cross talk.

FLA: Frequency, Level, and Attentuation.

FTP: File Transfer Protocol.

gateway: A device (such as a router) that serves as an entryway into a network.

GUI: Graphical user interface.

HDSL: High-bit rate Digital Subscriber Line.

hexadecimal: A base-16 numbering system in which the digits range from 0 through F. A subscript "h" is used to denote a hexadecimal value (for example, $2A0F_h$).

hop: A router in the path that data travels to reach a destination (remote) node.

Hz: Hertz. Measure of frequency, one cycle per second.

IMD: Intermodulation Distortion.

IMPN: Impulse Noise.

IMPHT: Impulse Noise with Holding Tone.

IMPNWB: Impulse Noise (Wide-Band).

ISDN: Integrated Services Digital Nework.

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 or Kbit: Kilobit. A thousand bits.

KB or Kbyte: Kilobyte. One thousand bytes.

Kbps: Kilobits per second.

kHz: Kilohertz. Measure of frequency, one thousand cycles per second.

LAN: Local area network.

LCD: Load Coil Detection or liquid crystal display.

LED: Light-emitting diode.

load coil: A device used to improve the quality of voice transmission, causes problems with digital services.

loopback: A state in which the transmit signal is reversed back as the receive signal, typically by a far-end network element.

mA: Milliampere. Measure of current, one thousandth of an ampere.

Mb or Mbit: Megabit. One million bits.

MB or Mbyte: Megabyte. One million bytes.

Mbps: Megabits per second.

MHz: Megahertz. Measure of frequency, one million cycles per second.

ms: Millisecond. One thousandth of a second.

NEXT: Near-end cross talk.

NHT: Noise with Holding Tone.

NIC: Network Interface Card. A type of PCMIA card.

NiMH: Nickel Metal Hydride. A type of smart battery.

node: Any addressable device in the network, such as a host.

notch filter: A filter that removes a certain frequency from the signal, typically a holding tone.

NTG: Noise to Ground.

NWT: Noise with Tone.

OC: Optical carrier.

octet: Eight bits. Typically refers to a group of bits that spans more that one byte. Compare *byte*.

packet: A block of serial data. identified by a header and end byte.

P/AR: Peak-to-Average Ratio.

PI: Power influence. A test used to measure the amount of noise on each wire in a twisted pair.

PING: Packet InterNet Groper.

ppm: Parts per million.

POTS: Plain old telephone service.

PSD: Power Spectral Density.

QOS: Quality-Of-Service. Measurements used to set up ATM service, and monitor performance.

RAM: Random access memory.

RMS: Root mean square. A type of detector used for TIMS measurements.

ROM: Read-only memory.

RX: (Receive) An input function.

SCPI: Standard Commands for Programmable Instruments.

SRL-lo: Singing Return Loss–low.

SRL-hi: Singing Return Loss–high.

S/TD: Signal-to-Noise and Total Distortion.

synchronous: Synchronized. Occurring at the same rate or period; sharing common timing with an outside timing source.

TCP: Transmission Control Protocol.

T1: See *DS1*.

TDR: Time Domain Reflectometer.

timing: See *clock*.

TIMS: Transmission Impairment Measurement Set.

TLP: Transmission Level Point.

TTL: Transistor-to-transistor logic. A standard transmission level with a logic low of 0 volts and a logic high of 5 volts.

TX: (Transmit) An output signal or port.

uplink: The ADSL circuit path used to transmit data from the subscriber (ATU-R) to the central office (ATU-C).

upstream: See *uplink*.

V: Volt.

Vac: Volt, alternating current.

Vdc: Volt, direct current.

VF: Voice frequency.

V pk: Volt peak.

V p-p: Volt, peak-to-peak.

xDSL: x-type digital subscriber line. Refers to a group of DSL sevices, for example, ADSL, HDSL, etc.

A

B

C

D

E

F

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X

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