

HYPERLABS XTDR™

User Manual and Technical Guide

Applies to Model Numbers

HL22xx and HL52xx Series

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Introduction

These consolidated reference materials apply to the XTDR™ software included with all HL22xx and HL52xx Signal Path Analyzer (SPA) instruments from HYPERLABS. The same software package is compatible with all instruments in these series.

Please note that some features referenced below, such as TDT, XT, and S21 measurement, require a certain minimum number of instrument ports/channels. Where this is the case, it will be noted in the text.

XTDR™ is compatible with all HL22xx and HL52xx Signal Path Analyzer instruments built in 2014 or later (serial numbers beginning with the letter “E”, “F”, or “G” e.g. EF01, FG03, GA02). For older instruments, please contact HYPERLABS to determine the software that should be used.

For further technical support, please visit our website: www.hyperlabsinc.com/support.aspx

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Section 1: Instrument Operation

HYPERLABS instruments are controlled and powered via USB. The included XTDR™ software and drivers are compatible with all versions of Windows XP, Windows Vista, Windows 7, Windows 8, and Windows 10. At this time, there are no plans for OS X, Linux, or other operating system support.

The instrument must be plugged into the PC prior to running the XTDR™ software. A green LED on the back panel of the instrument will indicate that it is plugged into a working USB port.

Section 2: Static Sensitivity and Protection

The level of static protection required depends on the instrument model. **Please read this section carefully.**

High-speed instruments (model numbers HL22xx) are sensitive to electrostatic discharge (ESD), so appropriate protection should always be used. An antistatic wrist strap is included with these models.

Instruments in the HL52xx series are compliant with Class 2 of ESDS Component Sensitivity Classification (ESD STM5.1-1998). Additional static protection is not required to use these instruments in most applications.

NOTE: ESD damage is expressly excluded from the HYPERLABS standard warranty. See our website for details.

Section 3: Driver and Software Installation

HYPERLABS instruments utilize third-party drivers from FTDI. On internet-connected computers, the latest signed drivers will be automatically downloaded and installed as soon the instrument is plugged in to a working USB port.

If the computer is not connected to the internet or not configured for automatic driver installation, the FTDI drivers must be manually installed. Please visit the following page to download the latest version of the FTDI drivers:
<http://www.ftdichip.com/Drivers/D2XX.htm>

If the program states it cannot find “FTD2xx.dll”, download the driver package at the address above, extract the .ZIP file, and copy the FTD2xx.dll file into the installation directory listed below.

Once the FTDI driver is installed, the XTDR™ software can be installed by running “setup.exe” in the included install package. If the package is in compressed (.zip) format, all files must be extracted prior to installation.

By default, the software will install to the following directory: “C:\HYPERLABS\XTDR\”

We recommend installing to the default directory in most situations. However, the user may elect to install to a different directory during setup. No other user options are available during the installation process.

Section 4: Running the XTDR™ Software

The instrument is initialized and calibrated at startup, a process that takes up to 10 seconds. The software will not be responsive to user input during that time, and the user interface may flicker. When this initialization process is complete, the operator will see the user interface shown on the following page. A message box on the right XTDR™ software panel will say: **Initializing... DONE!**

NOTE: For optimal results, the instrument should be plugged in for a 5 minute “warm up” period prior to use. After warmup, the operator should enable auto calibration or periodically recalibrate manually (see *Section 16* below).

If any error messages are shown, please make sure that the instrument is plugged in and the drivers installed (see *Sections 1-3* above) before contacting HYPERLABS for additional support.

Section 5: Overview of XTDR™ Software and Display Controls

When the XTDR™ software is running, the user will see a screen similar to *Figure 1* below.



Figure 1: XTDR™ startup screen after initialization and calibration (units in meters, mV)

This User Manual is organized according to XTDR™ control functionality. Please see the Table of Contents above for a list of the controls covered in the sections below.

NOTE: Not all software features are available on all instrument models. The interface and options will vary slightly based on the number of ports and channels available on each instrument.

Section 6: Waveform Display

As of Version 2.0, XTDR™ displays data in both the Time Domain and Frequency Domain.

In the time domain, waveforms are shown as a function of time or distance. In **TDR** or Near End Crosstalk (**NEXT**) modes, time and distance are **ROUNDTRIP**. In **TDT** or Far End Crosstalk (**FEXT**) modes, time and distance are one-way. See *Section 11 below* for information on the available measurement modes. Horizontal and vertical units in the time domain can be changed using the X Units and Y Units menus (see *Sections 9-10 below*).

In the frequency domain, data are always shown in **DB** as a function of frequency in **GHz**.

The acquisition window START and END points and the DIELECTRIC K can be changed on demand (see *Sections 11.2-11.5 below*). The vertical scaling behavior can also be customized (see *Section 12.2 below*).

The operator can also position the cursors on the waveform using drag-and-drop (see *Section 7 below*). No other actions can be performed directly on the Waveform Display.

For help reading actual waveform output, please review the Application Guides on our website, or contact HYPERLABS for assistance.

Section 7: Cursor Readings

XTDR™ has two cursors which can be used to take spot measurements on the Waveform Display. **C1** is blue, and **C2** is red. These cursors can be positioned by dragging and dropping them on the waveform.

Cursor readings are found in the right-hand panel of the XTDR™ software, as shown in *Figure 2* at right. The grey +/- box displays the horizontal and vertical difference between the two cursors, in the selected units of measure.

NOTE: The cursors always snap to the closest point on the waveform. If the software is in **Auto Acquire** mode (see *Section 12* below), the cursors will jump slightly as each waveform is acquired. For the most accurate cursor readings, HYPERLABS recommends switching to manual acquisition before positioning the cursors or logging the results.

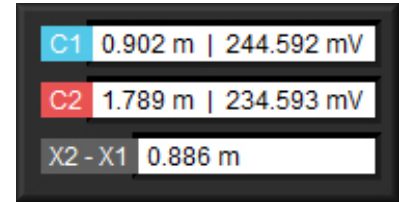


Figure 2: Example Cursor readings in m, mV

The cursors can also be used to zoom in on a section of the waveform. See *Section 11.4* below for more information on this feature.

Section 8: Display Options

In the **Display** menu found at the top of the XTDR™ interface, the operator can control the look of the Waveform Display. These options are aesthetic, and do not impact the way in which the waveform is acquired.

When the **Dark Background** option is selected, a bright green waveform is displayed on a dark grid, similar to most test and measurement instruments. An alternative **Light Background** can be selected to show a darker waveform on a white background.

NOTE: The **Display** options affect only the active waveform. For ease of reading, recalled waveforms (see *Section 14.4* below) are always displayed as a magenta line.

Section 9: Time and Frequency Domains

As of XTDR™ Version 2.0, measurements can be taken in the **Frequency Domain** as well as the **Time Domain**. These modes can be toggled using the **Domain** menu. Note that measurements can only be displayed in one mode at a time.

For a list of current measurement types available in each domain and with each instrument model, please see *Section 10* below.

All HYPERLABS Signal Path Analyzers are “native” time domain instruments. That is, waveform data are acquired in the time domain and converted to the frequency domain using Fast Fourier Transform (FFT). Due to the mathematics inherent to FFT, data resolution will be better in the time domain than the frequency domain.

For more detailed information about the metrology used in either the time or frequency domain, please contact HYPERLABS.

Section 10: Mode and Channel Selection

HYPERLABS Instruments compatible with XTDR™ have either 1 or 2 Ports and between 2 and 20 Channels, configured in differential pairs. A higher number of available channels allows for more available test modes.

At startup, the software will automatically enable the available measurement modes and channel selection menus based on the number of instrument channels detected.

All of the mode and channel selection controls are found above the Waveform Display Area, shown in greater detail in *Figure 6* below.

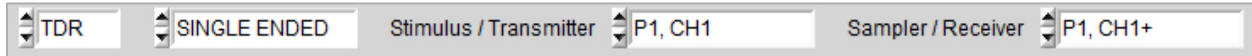


Figure 3: Measurement mode and channel selection controls

Section 10.1: Time Domain Measurement Modes

Each measurement mode supported by XTDR™ requires a minimum number of channels. *Figure 4* below shows the **Time Domain** modes available with each channel configuration. If a mode is not selectable from the menu, it means that the instrument doesn't have enough channels to perform that type of measurement.

Measurement Mode	Required Channels	Description and Available Sampler Options
TDR (time domain reflectometry)	2+ channels	Default setting; both stimulus and sampler on the selected channel pair; measures either single-ended (+ or - channel) or differential (Ohms only) Example: STIMULUS on P1, CH1; SAMPLER on P1, CH1+
TDT (time domain transmission)	4+ channels	Stimulus on the selected channel, sampler on the corresponding channel pair on the opposite port Example: STIMULUS on P1, CH1; SAMPLER on P2, CH1+
NEXT (near-end crosstalk)	8+ channels	Stimulus on the selected channel, sampler on any other channel on the same port as the stimulus Example: STIMULUS on P1, CH1; SAMPLER on P1, CH2+
FEXT (far-end crosstalk)	8+ channels	Stimulus on the selected channel, sampler on any other channel on the opposite port from the stimulus Example: STIMULUS on P1, CH1; SAMPLER on P2, CH2+

Figure 4: Available time domain measurement modes and their required channel configurations

Section 10.2: Frequency Domain Measurement Modes

As of XTDR™ Version 2.0, measurements shown in *Figure 5* below are available in the **Frequency Domain**. If a mode is not selectable from the menu, it means that the instrument doesn't have enough channels to perform that type of measurement.

Measurement Mode	Required Channels	Description and Available Sampler Options
S11 (return loss)	2+ channels	Default setting; both stimulus and sampler on the selected channel pair; measures either single-ended (+ or - channel) or differential (Ohms only) Example: STIMULUS on P1, CH1; SAMPLER on P1, CH1+
S21 (insertion loss, amplitude)	4+ channels	Stimulus on the selected channel, sampler on the corresponding channel pair on the opposite port Example: STIMULUS on P1, CH1; SAMPLER on P2, CH1+

Figure 5: Available frequency domain measurement modes and their required channel configurations

Section 10.3: Channel Selection

XTDR™ always has one active **Stimulus/Transmitter** channel, and one active **Sampler/Receiver** channel. As the names imply, the signal originates from the **Stimulus** channel, and is measured by the **Sampler** channel.

The operator can select a **Stimulus** channel at any time. The options available in the menu will depend on the number of channels in the instrument (see *Sections 10.1-10.2* above).

Based on the active **Stimulus** and **Mode**, XTDR™ populates the available **Sampler** channels automatically. The operator can choose from the available sampler channels at any time.

NOTE: Not every channel can be the **Sampler** in every **Mode** or with every **Stimulus**. See *Figures 4-5* above for information on valid channel configurations for each **Mode**. Please contact HYPERLABS or visit our website for additional information on this topic.

Section 10.4: Single-ended and Differential Modes

By default, XTDR™ performs **SINGLE ENDED** measurements of the device under test. **SINGLE ENDED** measurements can be taken on any **Channel** and in every **Mode**.

DIFFERENTIAL measurements are available only in **TDR** mode, with **IMPEDANCE (Ohm)** selected as the vertical unit. In other modes or units, this option will not be available to the operator.

Section 11: Horizontal Unit Controls

Horizontal Controls impact the way in which the waveform is displayed by the XTDR™ software. Combined with the Vertical Axis Controls (see *Section 12* below), these allow the operator to customize the test environment.

Section 11.1: Horizontal Units

In the **Time Domain**, the horizontal axis is displayed in **DISTANCE (m)**, **DISTANCE (ft)**, or **TIME (ns)**. The unit of measure can be changed using the **X Units** menu bar. When a unit is chosen, a new waveform will be acquired and displayed in the selected horizontal units.

Any of these units of time or distance can be used to locate faults, measure impedance, or otherwise analyze the device under test. Accurate distance readings are dependent on having set the proper **Dielectric K** (see *Section 11.5* below).

In the **Frequency Domain**, data are always displayed as a function of **FREQUENCY (GHz)**.

Section 11.2: Window Start and End

The **START** and **END** points of the waveform acquisition window can be set by either entering a numerical value or adjusting the appropriate slider. These controls use the active horizontal unit (see *Section 11.1* above).

A minimum window width is required for data acquisition. If **END** is set too close to **START** (within 0.1 m, 0.3 ft, 0.5 ns, or 0.5 GHz), the software will automatically adjust **END** to satisfy the minimum width.

NOTE: Time domain waveforms consist of 1024 equidistant data points. XTDR™ automatically sizes the acquisition window as closely as possible to the desired width. A slightly smaller acquisition window may result from this rounding. In the frequency domain, changing the frequency range truncates the number of data points.

Section 11.3: Set Zero Reference

By default, XTDR™ sets the zero reference point (i.e. where $x = 0$) to an absolute time or distance of zero. This feature only applies to measurements taken in the **Time Domain**.

As of Version 1.3.1, the user can set a zero reference point to the beginning of the Device Under Test (DUT) instead. This allows a time or distance measurement of the DUT itself, without having to account for the internal reference cable of the TDR instrument.

To use this feature, select the **Set Zero** option from the **Calibration** menu. To reset the zero point to an absolute value, choose **Reset Zero** from the same menu.

NOTE: The instrument or DUT must be in open to find the correct zero reference point, and the zero reference is set to the position of this open.

To set the zero reference immediately after the TDR, disconnect everything from the instrument before using this feature. To set the zero reference after an adapter or fixture, leave the fixture or adapter in place but disconnect the DUT before running **Set Zero**.

Section 11.4: Cursor-based Zoom

The cursors can also be used to zoom in on any portion of the waveform. To do this, place Cursor 1 (blue) on the left edge of the area to be magnified, and Cursor 2 (red) to the right. Then click the **ZOOM** button found below the waveform. To reset the horizontal scale to its default values, simply click the **RESET** button.

NOTE: Due to the data quantization used in the XTDR™ software, the right edge of the zoom area may not correspond exactly to the position of Cursor 2.

Section 11.5: Dielectric Constant (K) and Velocity of Propagation (V/C)

Because electrical signals propagate at different speeds through different materials, XTDR™ gives the operator the ability to change the **DIELECTRIC K**. Below this control, the **V/C** box shows the velocity of propagation as a ratio of the speed of light. **V/C** is derived from **DIELECTRIC K** and cannot be changed manually.

NOTE: Dielectric K affects only distance measurements in the **Time Domain**. It is not relevant to measurements taken in time (ns).

Some common materials and their K values are listed in *Figure 6* below.

Material	K	V/C
Coaxial cable with polyethylene insulation	2.23	0.6696
Coaxial cable with Teflon insulation	2.06	0.6967
Printed Circuit Board (PCB)	4.0	0.5000
Aluminum Oxide	9.8	0.3194

Figure 6: Table of Dielectric Constants for Common Materials

Section 11.6: Rise Time Filtering

As of XTDR™ Version 1.2.0, the user may apply a software-level rise time filter to the waveform. Some applications, especially manufactured products such as cable assemblies, specify a rise time that should be used for certain tests. This feature allows the user to comply with the recommended test procedures

To change the size of the filter, enter a value in the **Filter Rise Time (ps)** dialog box. A larger filter value renders a cleaner waveform because more aberrations are filtered out. The filter, which is disabled by default, can also be manually disabled by unchecking the box.

NOTE: the rise time filter value is applied **in addition to** the rise time of the instrument itself. It does not represent the total width of the filter.

Section 12: Vertical Axis Controls

The vertical scale and unit controls in XTDR™ are similar to the horizontal controls (see *Section 11* above).

Section 12.1: Vertical Units

The **Y Units** menu changes the units displayed on the vertical axis of the Waveform Display Area. Options include: **Volts (mV)**, **Normalized**, **Impedance (Ohm)**, and **Reflection Coefficient (Rho)** in the **Time Domain**, and **Amplitude (DB)** in the **Frequency Domain**.

All of the vertical units in the **Time Domain** provide different types of information about the device under test, but the fundamental shape of the waveform is similar in **mV**, **Norm**, and **Rho** modes. Due to the nature of impedance calculations, the shape of the waveform looks slightly different in **Ohm**.

For recommendations on which units to use in specific test environments, please reference *Figure 8* in the next subsection or contact HYPERLABS. Proper values for the upper and lower limits depend on the selected vertical unit, and can also be found in *Figure 8*.

Section 12.2: Vertical Limits and Scaling

The Waveform Display can be set to **AUTOSCALE Y-AXIS**, or to manual scaling. The user can toggle the mode using the controls in the right-side panel, shown in *Figure 7* at right in greater detail.

If the software is set to manual scaling, the user can adjust the limits of the vertical axis using the controls shown in *Figure 4*. When **AUTOSCALE Y-AXIS** is enabled, the limits controls are disabled.

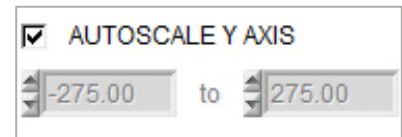


Figure 7: Y axis scaling controls

Figure 8 below shows the default limits of each unit type in manual scaling.

UNITS	Lower Limit	Upper Limit	Description
mV (millivolts)	-500	500	Default setting, measures the voltage of the 250 mV pulse sent by the instrument On positive going channels, unity (50 Ω) is now 250 mV, 500 mV shows an open, and 0 mV is short. For negative going channels, -250 mV is unity, -500 mV represents open, and 0 mV is a short.
Normalized Voltage	0	2.0	Reflected voltage represented as a fractional value, where 0 indicates the initial value, 1.0 indicates the normalized incident step (250 mV), and 2.0 indicates an open (full reflection)
Impedance (Ω)	0	500	Impedance, in Ohms (Ω), of the device under test
Reflection Coefficient (Rho)	-1.0	1.0	Coefficient used to calculate impedance, where 0.0 represents 50 Ω; Impedance (Z) = 50 * (1 + Rho) / (1 - Rho)

Figure 8: Recommended Vertical Scale for Each Unit Type

Section 13: Waveform Acquisition and Averaging

Section 13.1: Automatic Acquisition

The operator can control the number of waveforms to acquire and toggle between automatic and manual acquisition. This is done using the controls in the right-hand panel and shown at right in *Figure 9*.



Figure 9: Waveform acquisition controls

By default, XTDR™ operates in **Auto Acquire** mode. In this mode, waveforms are acquired and displayed at regular intervals.

By unchecking the box, the software can be set to manual mode. In manual mode, the software acquires and displays a single waveform whenever the operator clicks the green **ACQUIRE** button.

Section 13.2: Waveform Averaging

Multiple waveforms can be combined and averaged using the **Waveform Averaging** control, found above the message box in the right-hand panel and shown in *Figure 10* at right. Up to 32 waveforms may be averaged at once.

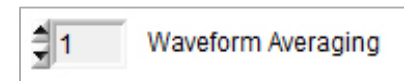


Figure 10: Waveform averaging control

On each acquisition, the software acquires the desired number of waveform and displays the average values as a single waveform. The default value of this control is 1, which indicates that a single waveform is acquired.

NOTE: As of XTDR™ 2.5, software multithreading has improved acquisition speed and user interface responsiveness. It is no longer necessary to disable automatic acquisition when using waveform averaging.

Section 13.3: Instrument Activity Status Light

A green indicator light, shown in *Figure 11* at right, was added in Version 2.5 to inform the user when the Signal Path Analyzer is actively acquiring data or being recalibrated. This light is located in the top panel of the software, next to the **Sampler / Receiver** control.



Figure 11: Status light indicating current instrument activity on Port 1, CH1+

When the light is bright green, an acquisition or calibration is in progress. A dark green light indicates that the most recent action was completed.

Section 14: Message Log and Timestamp

XTDR™ displays messages and status updates to the user in a box in the right-hand panel of the software, shown in *Figure 12* at right.

As of XTDR™ v2.0, messages related to calibration and data logging are shown, along with any errors encountered by the software during operation. Logging functionality and documentation will be expanded in future versions.

The software also displays a timestamp for each waveform acquisition. This is displayed in green text immediately below the message pane.

A timestamp of the acquisition can be found in the bottom-right corner of the waveform plot area.

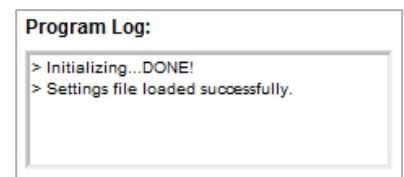


Figure 12: Typical XTDR™ message log

Section 15: Data Logging and Storage

XTDR™ has a variety of logging features to simplify the storage of data obtained during testing. These controls are all found in the **File** menu in the main program menu bar.

Section 15.1: Printing

When the user selects the **Print** menu option, XTDR™ formats the waveform acquisition for printing. To save ink, the color scheme is automatically switched to Light Background, and switched back once printing is complete.

Section 15.2: CSV Logging

The **Save CSV** menu item in XTDR™ saves the waveform data to a comma-separated values (.csv) file. This raw data can be used for data storage or post-processing in other software.

The structure of the CSV file is simple. The first column contains the horizontal values, and the second contains the vertical values. The header row shows the horizontal (m, ft, ns, or GHz) and vertical units (mV, norm, Ohm, Rho, or DB) used to acquire the waveform.

For simplicity of post-processing, the CSV file does not include a timestamp or serial number. We recommend that the user store this data in the filename for later reference.

Section 15.3: Saving to PNG

Using **Save PNG** feature, the operator can save the waveform and XTDR™ window to a PNG image file. The user can select the directory to save the file, but no other options are available.

Section 15.4: Storing and Retrieving Waveforms

In XTDR™, waveforms can be stored and retrieved later as an on-screen reference for subsequent tests.

The **Store Waveform** menu item captures the waveform on the screen and saves it to a waveform file (.xtdr). The **Recall Waveform** option is used to load old waveforms into the Waveform Display as a magenta plot. The **Clear Waveform** menu option removes the stored waveform from the screen.

NOTE: When a waveform is loaded, the horizontal and vertical scale and unit controls are set to the parameters used for the original measurement, and cannot be changed until the stored waveform is cleared.

Section 15.5: Serialization and Notes

In the **Serial** field, found in the right panel below the **Acquire** button, the user can enter a serial number of the device under test. This data is shown on all stored screenshots. By default, the serial number is also added to the filename when the operator saves a CSV, PNG, or full waveform (.xtdr).

Note: the **Serial** field can only contain alphanumeric characters, spaces, and dashes. Entering other characters may prevent data from saving correctly.

In Version 2.5, a **Notes** field was added below the **Serial** field. Anything entered as a note will be saved when logging the data to a CSV file. It is not stored as part of PNG or full waveform (.xtdr) files.

Section 16: Instrument Calibration

All HYPERLABS TDRs have an internal amplitude calibration feature, and the instrument automatically calibrates at software startup. Amplitude calibration can also be performed on demand or automatically during data collection. To use these features, use the **Calibration** menu located in the main program menu bar.

Section 16.1: Automatic and Manual Amplitude Calibration

In XTDR™ Version 2.5, the software performs an automatic amplitude recalibration every 30 seconds while the instrument is in **Auto Acquire** mode (see *Section 13* above). When manual acquisition is used, the software automatically ensures that a recent good calibration is available on the selected channel.

In both cases, the amplitude of the active channel is re-calibrated either internally or externally, depending on the mode selected (see *Section 16.2* below).

While operating in the **Frequency Domain**, XTDR™ requires additional SOLT calibration in order to take accurate S11 and S21 measurements. See *Section 16.3* below for more information on SOLT calibration.

NOTE: Prior to Version 2.5, auto-calibration was performed every 2.5 seconds, and it was possible to toggle this feature. Due to performance improvements in Version 2.5, there is no longer any need to disable auto-calibration, so the option to do so has been removed.

Section 16.2: Internal and External Amplitude Calibration

Internal Calibration is the default amplitude calibration method in XTDR™. In this mode, the instrument is calibrated to a high-quality 50 Ω reference cable inside the instrument housing. **Internal calibration** is sufficient for the majority of applications, and we generally recommend using this mode.

For applications requiring an external reference cable, **External Calibration** may provide more accurate calibration and measurements. For this mode to be effective, the instrument must be connected to at least 1 ft (30 cm) of external high-quality 50 Ω cabling.

To switch between **Internal Calibration** and **External Calibration**, choose the appropriate option in the **Calibration** menu. As of Version 2.0, the calibration mode can be changed without restarting the software.

Section 16.3: SOLT Calibration in the Frequency Domain

In XTDR™, additional SOLT (Short, Open, Load, Through) calibration is required to display accurate data in the **Frequency Domain**. Accurate SOLT reference is used by the software FFT to convert time domain acquisition data into S11 and S21.

SOLT calibration will be initiated automatically when the operator selects the **Frequency Domain** menu option for the first time during a test session. A dialog box, shown in detail in *Figure 13* at right, initiates the SOLT process.

The **Load File** option allows the operator to load previously saved SOLT calibration settings. As long as the instrument was properly warmed up and calibrated when the SOLT file was saved, it will maintain good calibration every time it is used.

If no saved SOLT file is available, clicking the **New Calibration** button initiates a new calibration session. Carefully follow the on-screen instructions to calibrate each channel to Short, Open, and Load (S11 mode only) or Through (S21 mode).

NOTE: Separate calibrations and files are maintained for Return Loss (S11) and Insertion Loss (S21) modes.

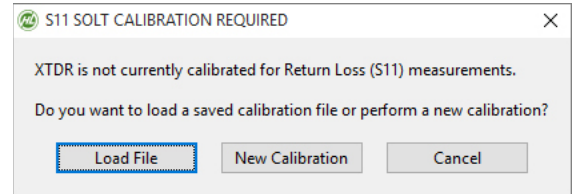


Figure 13: Prompt to initiate SOLT calibration in S11 (return loss) mode

Section 16.4: NIST Certification

Each instrument, including the internal reference cable, is calibrated by HYPERLABS using NIST-traceable equipment at the time of initial shipment.

If regular NIST recertification is required, the instrument can be sent to HYPERLABS periodically for calibration and certification. At the time of service, HYPERLABS will verify the unit using NIST-traceable instruments and provide a certificate of calibration. Please see our website for current pricing and RMA procedures.

Section 17: Save, Load, and Reset Settings

As of Version 1.2.0, XTDR™ will automatically remember test environment settings (e.g. selected units, time window, dielectric constant) between program sessions.

Also as of XTDR™ Version 1.2.0, users can manually save settings for later use. To store the settings, select the **File** menu and then **Save Settings**. To retrieve the settings later, simply choose **Load Settings**.

To reset to the default test environment settings, select **Reset Defaults** from the **File** menu. Note that this does not delete any saved settings; it merely reverts the active environment to the default.

The default folder for saved settings is: **C:\HYPERLABS\XTDR\settings**

Section 18: Additional Resources

This manual for HYPERLABS XTDR™ is primarily intended to cover instrument setup and familiarize the user with the major features of the hardware and software. The applications for Signal Path Analyzers are too many and varied to cover fully in this User Manual.

Accordingly, we have made a wide variety of Application Guides and other reference materials on our website. A full listing of Application Guides can be found at: <http://www.hyperlabsinc.com/application-guides.aspx>

If help for your application isn't shown in our Application Guides, HYPERLABS is always happy to provide unlimited technical support to our customers. For up-to-date telephone or email support options, please see our webpage: <http://www.hyperlabsinc.com/contact-us.aspx>

Section 19: Copyright Information

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