

LeCroy

Getting Started Manual



WavePro® 7 Zi
SDA 7 Zi
DDA 7 Zi

LeCroy

WavePro 7Zi

Oscilloscope



Getting Started Manual

August, 2008



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The oscilloscope's firmware has been thoroughly tested and is presumed to be functional. Nevertheless, it is supplied without warranty of any kind covering detailed performance. Products not made by LeCroy are covered solely by the warranty of the original equipment manufacturer.

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WP7Zi-GSM-E-RevA

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TABLE OF CONTENTS

Welcome	5
Safety Requirements	6
Getting to Know WavePro	13
Hardware	13
Basic Controls	21
Connecting	34
Viewing Waveforms.....	40
Display	40
Zooming Waveforms	43
Persistence.....	47
WaveStream Mode.....	48
Capturing Waveforms	50
Timebase.....	50
Sampling Modes.....	51
Vertical	61
Triggering	66
Analyzing Waveforms	78
Measure	78
Math.....	88
Analysis	93
Documenting your Work.....	101
Labnotebook.....	101
Save Recall.....	105
Saving and Recalling Scope Settings	105
Saving and Recalling Waveforms	107
Disk Utilities	109
Printing	111
Print, Plot, or Copy	111
Printing	111
Managing Files	112
Utilities.....	113

WavePro 7Zi

Status	113
Remote communication	113
Hardcopy.....	115
Auxiliary Output Signals.....	118
Date & Time	120
Options.....	121
Preferences.....	121
Acquisition Status	124
Service	124
Show Windows Desktop	124
Touch Screen Calibration	125
Restoring Software	125
Reference	130
WavePro Specifications	130
Technical Support	138

Welcome

Thank you for purchasing a LeCroy product. We're certain you'll be pleased with the detailed features so unique to our instruments. This **Getting Started Manual** includes important safety and installation information for your WavePro 700Zi Series oscilloscope, along with operating procedures to get you started viewing, capturing, and analyzing your waveforms.

This WavePro 700Zi Getting Started Manual provides information in the following manner:

- **Getting to Know WavePro** acquaints you with your WavePro 700Zi Series oscilloscope hardware, basic controls, and connections.
- **Viewing Waveforms** includes instructions on setting up your display, zooming waveforms, and setting up persistence.
- **Capturing Waveforms** includes information on timebase settings, sampling modes, and vertical settings.
- **Analyzing Waveforms** includes measuring with cursors, setting up parameter measurements, an overview of math functions, and an introduction to WaveScan.
- **Documenting your Work** provides an overview of the Lab Notebook feature.
- **Save Recall** includes step-by-step procedures on saving and recalling scope settings and waveforms. It also provides information on saving screen images and disk utilities.
- **Printing** provides instructions printing waveforms and managing files.
- **Utilities** provides information on the Utilities available on the oscilloscope.

Support

When your WavePro 700Zi Series Oscilloscope is delivered, verify that all items on the packing list or invoice copy have been shipped to you. Contact your nearest LeCroy customer service center or national distributor if anything is missing or damaged. If there is something missing or damaged, and you do not contact us immediately, we cannot be responsible for replacement. If you have any problems with your product, please refer to the Technical Support contacts at the end of this **Getting Started Manual**. You can also refer to additional support materials at www.lecroy.com, or the Online Help files in your instrument.

Thank You

We truly hope these materials provide increased comprehension when using LeCroy's fine products.

Sincerely,



David C. Graef

LeCroy Corporation

Vice President and Chief Technology Officer








WavePro 7Zi

Safety Requirements

This section contains information and warnings that must be observed to keep the instrument operating in a correct and safe condition. You are required to follow generally accepted safety procedures in addition to the safety precautions specified in this section.

Safety Symbols

Where the following symbols appear on the instrument's front or rear panels, or in this manual, they alert you to important safety considerations.

	This symbol is used where caution is required. Refer to the accompanying information or documents in order to protect against personal injury or damage to the instrument.
	This symbol warns of a potential risk of shock hazard.
	This symbol is used to denote the measurement ground connection.
	This symbol is used to denote a safety ground connection.
	This symbol is used to denote a grounded frame or chassis terminal.
	This symbol shows that the switch is a Standby (power) switch. When it is pressed, the oscilloscope's state toggles between operating and Standby mode. This switch is not a disconnect device. The instrument can only be placed in a complete Power Off state by flipping the Main Power Switch on the back of the oscilloscope to the Off 'Zero' position.
	This symbol is used to denote Alternating Current.

Getting Started Manual

CAUTION	The CAUTION sign indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause damage to equipment. If a CAUTION is indicated, do not proceed until its conditions are fully understood and met.
WARNING	The WARNING sign indicates a potential hazard. It calls attention to a procedure, practice or condition which, if not followed, could possibly cause bodily injury or death. If a WARNING is indicated, do not proceed until its conditions are fully understood and met.
CAT I	Installation (Overvoltage) Category rating per EN 61010-1 safety standard and is applicable for the oscilloscope front panel measuring terminals. CAT I rated terminals must only be connected to source circuits in which measures are taken to limit transient voltages to an appropriately low level.

WavePro 7Zi

Operating Environment

The instrument is intended for indoor use and should be operated in a clean, dry environment with an ambient temperature within the range of 5 °C to 40 °C.

Note: Direct sunlight, radiators, and other heat sources should be taken into account when assessing the ambient temperature.



WARNING

The oscilloscope must not be operated in explosive, dusty, or wet atmospheres.



CAUTION

Protect the oscilloscope's display touch screen from excessive impacts with foreign objects.



CAUTION

Do not exceed the maximum specified front panel terminal (CH1, CH1, CH2, CH3, CH4, AUX IN, AUX OUT) voltage levels. Refer to Specifications for more details.

Installation (Overvoltage) Category II refers to local distribution level, which is applicable to equipment connected to the mains supply (AC power source).

Installation (Overvoltage) Category I refers to signal level, which is applicable to equipment measuring terminals that are connected to source circuits in which measures are taken to limit transient voltages to an appropriately low level.

Pollution Degree 2 refers to an operating environment where normally only dry non-conductive pollution occurs. Occasionally a temporary conductivity caused by condensation must be expected.

Protection Class 1 refers to a grounded equipment, in which protection against electric shock is achieved by Basic Insulation and by means of a connection to the protective ground conductor in the building wiring.

PLEASE NOTE THE FOLLOWING:

The design of the instrument has been verified to conform to EN 61010-1 safety standard per the following limits:

- Installation (Overvoltage) Categories II (Mains Supply Connector) & I (Measuring Terminals)
- Pollution Degree 2
- Protection Class I

Cooling

The instrument relies on forced air cooling with internal fans and ventilation openings. Care must be taken to avoid restricting the airflow around the apertures (fan holes) at the sides and rear of the oscilloscope. Ensure adequate ventilation by leaving the required 10 cm (4 inch) minimum gap around the sides and rear of the instrument.



CAUTION

Do not block the ventilation holes located on both sides and rear of the oscilloscope.

The instrument also has internal fan control circuitry that regulates the fan speed based on the ambient temperature. This is performed automatically after start-up with no manual intervention required.



CAUTION

Do not allow any foreign matter to enter the oscilloscope through the ventilation holes, etc.

AC Power Source

100 to 240 Vrms (+/-10%) AC at 50/60 Hz; 115 Vrms (+/-10%) AC at 400 Hz; Automatic AC voltage selection; Installation Category: 300V CAT II

No manual voltage selection is required because the instrument automatically adapts to line voltage.

WavePro 700Zi - \leq 800 watts (800 VA) depending on accessories installed (probes, PC port plug-ins, etc.).

Note: The instrument automatically adapts itself to the AC line input within the following ranges:

WavePro 7Zi

Voltage Range:	90 to 264 Vrms	90 to 132 Vrms
Frequency Range:	45 to 66 Hz	360 to 440 Hz

Power and Ground Connections

The instrument is provided with a grounded cord set containing a molded three-terminal polarized plug and a standard IEC320 (Type C13) connector for making line voltage and safety ground connection. The AC inlet ground terminal is connected directly to the frame of the instrument. For adequate protection against electrical shock hazard, the power cord plug must be inserted into a mating AC outlet containing a safety ground contact.



WARNING - Electrical Shock Hazard

Any interruption of the protective conductor inside or outside of the oscilloscope, or disconnection of the safety ground terminal creates a hazardous situation.

Intentional interruption is prohibited.

In Standby mode the oscilloscope is still connected to the AC supply. The instrument can only be placed in a complete Power Off state by physically disconnecting the power cord from the AC supply or by flipping the Main Power Switch on the back of the oscilloscope to the Off 'Zero' position.

The oscilloscope should be positioned to allow easy access to the socket-outlet. Disconnect the oscilloscope from the AC supply by unplugging the instrument's power cord from the AC outlet after the oscilloscope is placed in Standby state.



CAUTION

The outer shells of the front panel terminals (CH1, CH2, CH3, CH4, AUX IN, AUX OUT) are connected to the instrument's chassis and therefore to the safety ground.

Standby (Power) Switch and Oscilloscope Operational States

The front Standby (Power) switch controls the operational state of the oscilloscope. This toggle switch is activated by momentarily pressing and releasing it. The color of the LED below the switch indicates the status of the oscilloscope as follows:

- **On (LED Green)*** – oscilloscope is fully powered and operational
- **Standby (LED Off)*** – oscilloscope is powered off (except for some housekeeping circuits)
- **Standby (LED Blinking Green)** – oscilloscope's computer subsystems (hard drive, etc.) are in Standby (reduced Power mode). All other oscilloscope subsystems are fully powered.

* Factory Settings

The oscilloscope's factory settings result in only two basic oscilloscope states: On (LED Green) or Standby (LED Off). In this case of Standby (LED Off), the oscilloscope is powered off with the exception of some housekeeping circuitry (approximately 12 watts dissipation). The oscilloscope can only be placed in a complete power off state by unplugging the instrument's power cord from the primary power source (AC outlet). It is recommended that the power cord be unplugged from the AC outlet if the oscilloscope is not being used for an extended period of time.

You have the ability to change the oscilloscope's original factory settings via the **Power Options Properties** menu in Windows under **Control Panel** → **Power Options**. It is important to note that the Windows Power Option named **Standby** provides control of only the oscilloscope's computer subsystems (CPU, hard drive, etc.) and does not affect the other subsystems within the oscilloscope. In general, these other subsystems remain fully powered. For additional information on setting these Power Options, see the Windows Help menu or other related technical documentation. In terms of control buttons, this oscilloscope uses only a power button/switch and therefore references to a sleep button are not applicable.

The oscilloscope can always be placed in the Standby state (LED Off) – Power Off (except for some housekeeping circuits) by pressing and holding in the Standby toggle switch for approximately 5 seconds.

Calibration

The recommended calibration interval is one year. Calibration should be performed by qualified personnel only.

Cleaning

Clean only the exterior of the instrument, using a damp, soft cloth. Do not use chemicals or abrasive elements. Under no circumstances allow moisture to penetrate the instrument.

Avoid electrical shock hazard by unplugging the power cord from the AC outlet before cleaning.

WavePro 7Zi



WARNING - Electrical Shock Hazard

- No operator serviceable parts inside.
- Do not remove covers.
- Refer servicing to qualified personnel.

Abnormal Conditions

Operate the instrument only as intended by the manufacturer.

If you suspect the oscilloscope's protection has been impaired, disconnect the power cord and secure the instrument against any unintended operation.

The oscilloscope's protection is likely to be impaired if, for example, the instrument shows visible damage or has been subjected to severe transport stresses.

Proper use of the instrument depends on careful reading of all instructions and labels.



WARNING

Any use of the oscilloscope in a manner not specified by the manufacturer may impair the instrument's safety protection. The instrument and related accessories should not be directly connected to human subjects or used for patient monitoring.

Getting to Know WavePro

Hardware

Front Panel

Numbered labels on this graphic correspond with descriptions in the table.



Number and Description	Number and Description	Number and Description
1. Power Button	5. Volume Control and Mute Button	9. USB Ports
2. Channel Row LED Indicator	6. Ground Connector	10. Detachable Front Panel-Remote Control
3. Channel Inputs	7. Speaker	11. Release Switch for Front Panel-Remote Control
4. Auxiliary Input and Output	8. Fast Edge, Recovered Clock, and Data Outputs	

WavePro 7Zi

DETACHING AND ATTACHING THE FRONT PANEL



Detach the front panel from the oscilloscope by sliding the detachment lever to the left and pulling at the right.



Attach the front panel by inserting the lower part first, sliding the detachment lever to the left, and then pushing the top in place.

Front Panel as a Remote Control

While detached, the front panel can act as a remote control. Just plug-and-play connect it to the oscilloscope using a **USB - A to USB - Mini B** cable.



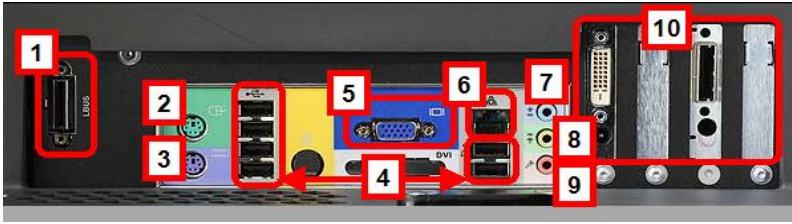
Side Panel

The WavePro Zi side panel is located on the right side (facing the front of the instrument) as follows:



WavePro 7Zi

Numbered labels on this graphic correspond with descriptions in the table.

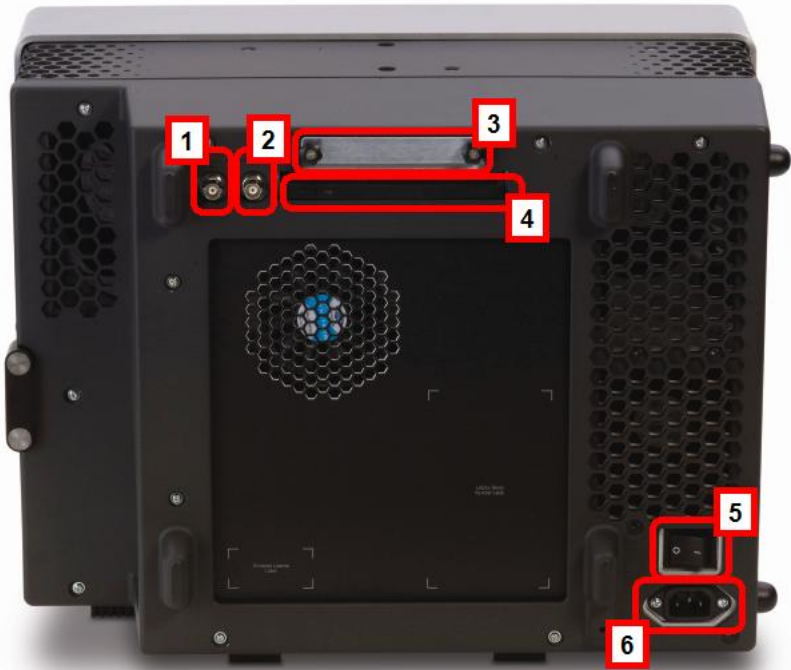


Number and Description	Number and Description	Number and Description
1. LBUS (LeCroy Bus)	5. External VGA Monitor	8. Speakers
2. Mouse	6. Ethernet Port	9. Microphone
3. Keyboard	7. Line In	10. PCI Expansion Slots for DVI (for standard display hardware), LSIB, and other options (LeCroy External Display WPZi-EXTDISP-15 option).
4. USB Ports		

Note: Consult your system administrator when connecting to an internal LAN.

Back Panel

Numbered labels on this graphic correspond with descriptions in the table.



Number and Description	Number and Description	Number and Description
1. External Clock Input (Grounded EMI Shield required when port is not in use)	3. Removable Hard Drive	5. Power Switch
2. External Clock Output	4. DVD-CD + R Drive	6. DC Power Plug

WavePro 7Zi

External Monitor

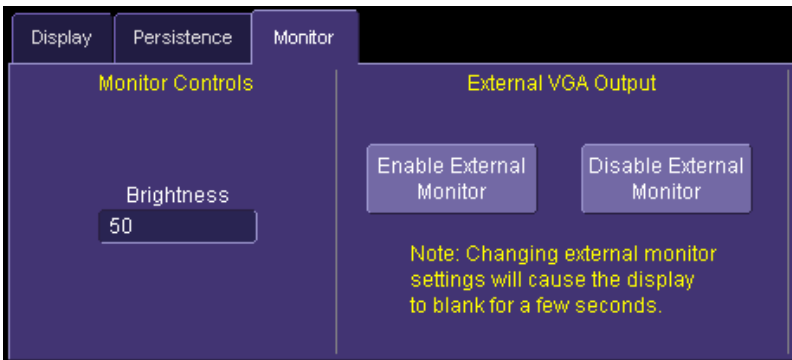
Setting up the External Monitor involves a connection and a few touch screen selections. It's a hot swap connection, so there's no need to restart the instrument once you've connected.

1. Plug your external monitor (WPZi-EXTDISP15 option) display into the **DVI** and **DC 12** connections on the PCI slot (located on the side of the oscilloscope). Connect your **USB** plug (where applicable) to an available port (also on the side of the instrument).



Note: To connect a standard VGA monitor, connect to the VGA Port.

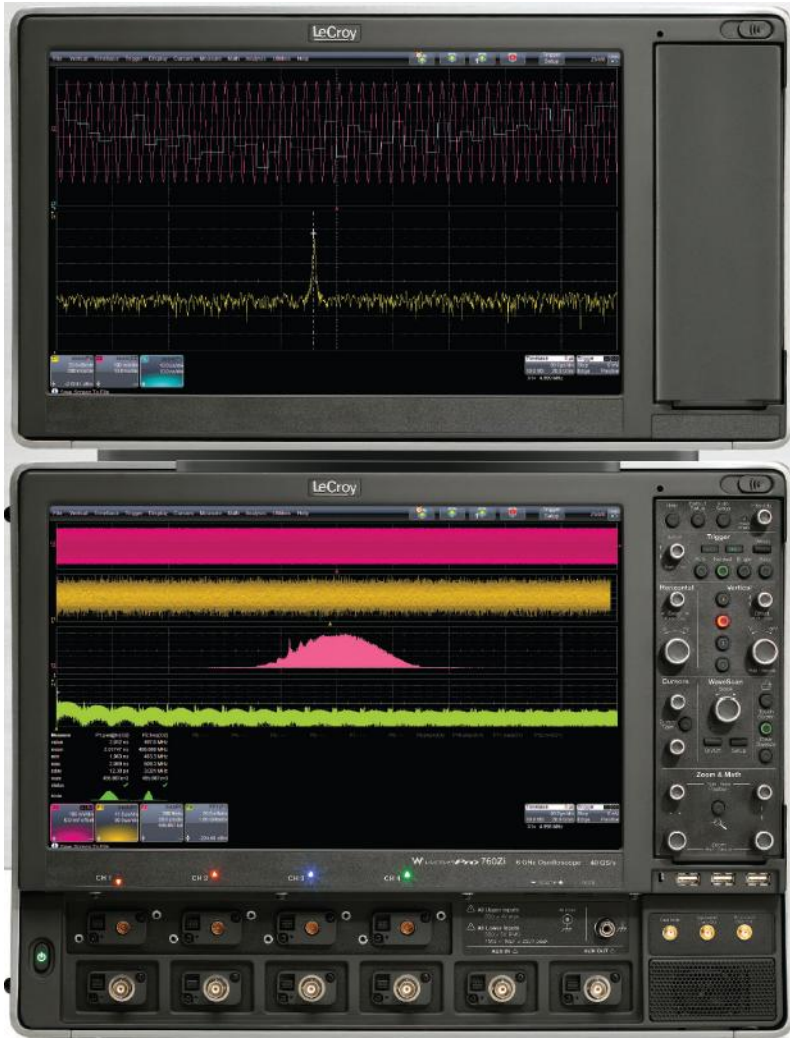
2. Turn on the oscilloscope, let the instrument boot and then touch **Display** → **Display Setup...** from the menu bar.
3. Touch the **Monitor** tab and then the **Enable External Monitor** button.



4. Touch inside the **Brightness** field and adjust brightness as necessary.

Getting Started Manual

The following picture shows a WavePro 700Zi with the LeCroy external monitor attached (optional WPZi-EXTDISP-15).



WavePro 7Zi

Dual Channel Acquisition

COMBINING CHANNELS

Channels can be combined to increase sample rate, memory, or both in order to capture and view a signal in all its detail. When you combine channels, uncombined channels like EXT BNC remain available for triggering, even though they are not displayed.

In 2-channel operation, channels 2 and 3 are made active. Channels 1 **or** 2, and 3 **or** 4 can be used in Auto operation for 20 GS/s. When channels are paired in the following combinations, the maximum sampling rate is doubled and the record length is greatly increased:

Channel Combinations Receiving 40 GS/s
Channels 1 and 3
Channels 1 and 4
Channels 2 and 3
Channels 2 and 4

Note: These sample rates apply to all WavePro Zi oscilloscopes (except the 715Zi without the WPZi 1GHz 4x20 GS option).

In short, sampling can be maximized to 40GS/s using two channel combinations except for channels 1 **and** 2, or channels 3 **and** 4 (which always yield 20 GS/s. Use best practice by choosing channel 1 or 2 for your first input, and channel 3 or 4 for the second.

Refer to [Acquisition Modes](#) in the specifications for maximum sample rates.

Combining Channels Procedure

Set up channel combinations on the interface as follows:

1. Touch **Timebase** → **Horizontal Setup** on the menu bar and the **Horizontal Setup** dialog is shown.
2. Under **Active Channels**, touch **4, 2** or **Auto**. The maximum sample rate is shown alongside each button.

Basic Controls

Hardware and Software Controls

The following Basic Control topics cover the general usage of the **hardware** buttons located on the oscilloscope's front panel and the screen control interface elements of the **software**.

Front Panel Controls

Note: Some front panel controls correspond with screen layout controls in specific ways. For example, the **Print** front panel general control button corresponds with the **Hardcopy** function at **Utilities** → **Utilities Setup** → **Hardcopy**.

WavePro 7Zi

The detachable WavePro Zi front panel.



Front Panel Groupings

The front panel is divided into sections based on functions. The following sections explain them in a bit more detail.

MISCELLANEOUS SETUP CONTROLS



- **Help** - Press to open the LeCroy Online Assistant where you can click to open the oscilloscope online help table of contents, index, or search for a topic using a keyword. If the second monitor is installed, the online help opens on the second monitor.
- **Default Setup** - Press to reset the oscilloscope's settings to the default configuration. Corresponds with screen menu selection: **File** → **Recall Setup** → **Recall Default Setup**. For a list of default settings, see **Save/Recall** → **Saving and Recalling Scope Settings**.
- **Auto Setup** - Press once and the **Auto Setup** flyout menu opens. Press the **Auto Setup** button on the flyout menu to perform a full auto setup. Press a **Channel Find Scale** button on the flyout menu to perform a quick auto setup for that channel only. Press the **AUTO SETUP** front panel button twice to perform the last selection from the **Auto Setup** flyout menu (the default is to perform a full auto setup).
- **WaveStream** - Indicates when the acquisition mode is set to WaveStream.
- **Intensity** - Press to toggle between the most recently selected Acquisition/Sampling Mode and WaveStream mode. When you turn the knob, if WaveStream is ON, the WaveStream display intensity changes. When you turn the knob, if WaveStream is OFF, changes the Intensity setting. Corresponds with the screen menu selection: **Display** → **Display Setup**.

WavePro 7Zi

TRIGGER FRONT PANEL CONTROLS



- **Level** - Press to toggle between 50% trigger level and the previous level setting. Turn to change the trigger threshold level. This level is indicated on the Trigger label.
- **Trigger** - Indicates the trigger status as **READY** and **TRIG'D**. **READY** is lit when the trigger is armed. **TRIG'D** is lit momentarily when a trigger occurs. A fast trigger rate will cause the light to stay lit continuously.
- **Setup** - Press once to open the **Trigger Setup** dialog. Corresponds with screen menu selection: **Trigger** → **Trigger Setup**. Press the Trigger **SETUP** front panel button again to close the **Trigger Setup** dialog.
- **Auto** - Press to turn on **Auto Trigger** mode, which triggers the oscilloscope after a time-out, even if the trigger conditions are not met.
- **Normal** - Press to turn on **Normal Trigger** mode, which triggers the oscilloscope each time a signal is present that meets the conditions set for the type of trigger selected.
- **Single** - Press to turn on **Single Trigger** mode, which arms the oscilloscope to trigger once (single-shot acquisition) when the input signal meets the trigger conditions set for the type of trigger selected. If the scope is already armed, it will force a trigger.
- **Stop** - Press to prevent the scope from triggering on a signal. If you boot up the instrument with the trigger in **Stop** mode, the message "no trace available" will be displayed. Press the Trigger **AUTO** front panel button to display your trace.

HORIZONTAL FRONT PANEL CONTROLS

Note: Horizontal front panel controls correspond with screen menu selection: **Timebase** → **Horizontal Setup**.



- **Delay** - Press to toggle between a zero horizontal delay value and the previous horizontal delay value. Turn to change the horizontal delay value.
- **Time** - Turn to set the time/division of the oscilloscope timebase (acquisition system). The time scale is adjusted from the left edge of the display.

WavePro 7Zi

VERTICAL FRONT PANEL CONTROLS

Note: Vertical front panel controls correspond with screen menu selection:
Vertical → **Channel Setup**.



- **Channels** - Press a Channel 1-4 front panel button to turn the channel on or off. When a Channel 1-4 front panel button is lit, the Vertical Offset and Volts/Div knobs are "active" for that channel only.
- **Offset** - Press to toggle between a zero vertical offset value and the previous vertical offset value for the selected channel. Turn to change the vertical offset value for the selected channel.
- **Gain** - Press to toggle between fixed and variable gain adjustment. Turn to change the gain value.

CURSORS FRONT PANEL CONTROLS

Note: Cursors front panel controls correspond with screen menu selection: **Cursors** → **Cursors Setup**.



- **Absolute Cursor** - Press to set the cursor position to the default 25% position, either horizontal or vertical (depending on which cursor type you are using). Turn to adjust the position of the cursor (absolute cursor or one of the two relative cursors).
- **Cursor Type** - Press one to turn cursors ON to the last cursor type selected. Each subsequent press toggles through the cursor types (**Off**, **Abs Horizontal**, **Rel Horizontal**, **Abs Vertical**, or **Rel Vertical**).
- **Relative Cursor** - Press to set the relative cursor to the default 75% position, either horizontal or vertical (depending on which cursor type you are using) Turn to adjust relative cursors. It does not work with absolute cursor types.

WavePro 7Zi

WAVESCAN FRONT PANEL CONTROLS

Note: WaveScan front panel controls correspond with screen menu selection: **Analysis** → **WaveScan**.



- **Scroll** - If WaveScan is On, turn to scroll through the table of WaveScan-filtered events. If WaveScan is Off, turn to adjust the selected data entry field.
- **On/Off** - Press to toggle between WaveScan On and Off. This is the same as checking **Enable** in the **WaveScan** dialog. When you turn WaveScan On, it turns on the WaveScan to the last enabled mode on the last selected Channel with the last selected Filter method. It also turns on the Z1 trace with its source as the WaveScan Channel and changes whatever display grid was selected to a dual grid with channels in the top grid and the WaveScan Z1 trace in the bottom grid.
- **Setup** - Press once to open the **WaveScan** dialog. Corresponds with screen menu selection: **Analysis** → **WaveScan**. Press the WaveScan SETUP front panel button again to close the **WaveScan** dialog.

GENERAL CONTROLS FRONT PANEL CONTROLS



- **Print** - Press once and the **Print** flyout menu opens. Press the **Print Now** button on the flyout menu to print the current screen image using the Print settings on the **Utilities** → **Utilities Setup** → **Hardcopy** dialog. Press the **Print Setup** button on the flyout menu to open the **Utilities** → **Utilities Setup** → **Hardcopy**. Press the **Save Screen to file** button on the flyout menu to save the screen image as a file to storage media such as a USB drive or hard drive using the File settings on the **Utilities** → **Utilities Setup** → **Hardcopy** dialog (incrementing the filename by one each time you touch **Save Screen to File**). Press the **Save Screen to Clipboard** button on the flyout menu to save the current screen image to the clipboard. Press the **Send Screen to Email** button to send the current screen image using the email settings on the **Utilities** → **Utilities Setup** → **Hardcopy** dialog. Press the **Create Notebook Entry** button on the flyout menu to create a new lab notebook entry using the **Enter Notebook Info** window. Press the PRINT front panel button twice to perform the last selection from the **Print** flyout menu (the default is to print the screen image).
- **Touch Screen** - Press to toggle the touch screen on and off.
- **Clear Sweeps** - Press to clear data from multiple sweeps (acquisitions) including: persistence trace displays, averaged traces, parameter statistics, and Histicons. During waveform readout, cancels readout. This is the same as pressing **Clear Sweeps** on the **Measure** → **Measure Setup** or **Math** → **Math Setup** dialogs.

WavePro 7Zi

ZOOM AND MATH FRONT PANEL CONTROLS

Note: Zoom and Math front panel controls correspond with screen menu selection: **Math** → **Zoom Setup**.



- **Horizontal Position** - Press to reset the horizontal zoom position to zero. Turn to change the horizontal position of the selected math or zoom trace.
- **Horizontal Ratio** - Press to toggle between fixed and variable horizontal zoom ratio adjustment. Turn to change the horizontal zoom ratio of the selected math trace.
- **Quick Zoom** - Press to automatically display magnified views of up to four signal inputs on multiple grids. With four input signals, the signals are displayed along with four zoom traces, each on its own grid. Pressing this button also turns off all other traces.
- **Vertical Position** - Press to reset the vertical zoom position to zero. Turn to change the vertical position of the selected math or zoom trace.
- **Vertical Ratio** - Press to toggle between fixed and variable vertical zoom ratio adjustment. Turn to change the vertical zoom ratio of the selected math trace.

Screen Layout, Groupings, and Controls

The instrument's screen is divided into three main sections:

- **Menu Bar**
- **Signal Display Grid**
- **Dialog(s)**

Note: Some front panel controls correspond with screen layout controls in specific ways. For example, the **Print** front panel general control button corresponds with the **Hardcopy** function at **Utilities** → **Utilities Setup** → **Hardcopy**.

MENU BAR

The top of the screen contains a menu bar of commonly used functions. Whenever you touch one of these buttons and make a selection from its drop-down menu, the dialog area at the bottom of the screen displays the corresponding dialog.

Specific Menu Bar functions are referenced using arrow-separated path descriptions. For example, the **Save Setup** function is referenced as **File** → **Save Setup**.

The Quick Access Toolbar

The Quick Access toolbar is located on the right side of the menu bar. You can use these toolbar buttons to quickly access trigger functions.



- **Auto** - Press to turn on **Auto Trigger** mode, which triggers the oscilloscope after a time-out, even if the trigger conditions are not met.
- **Normal** - Press to turn on **Normal Trigger** mode, which triggers the oscilloscope each time a signal is present that meets the conditions set for the type of trigger selected.
- **Single** - Press to turn on **Single Trigger** mode for the selected channel, which arms the oscilloscope to trigger once (single-shot acquisition) when the input signal meets the trigger conditions set for the type of trigger selected. If the scope is already armed, it will force a trigger.
- **Stop** - Press to prevent the scope from triggering on a signal. If you boot up the instrument with the trigger in **Stop** mode, the message "no trace available" will be displayed.

WavePro 7Zi

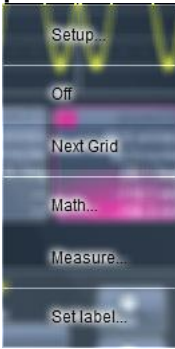
- **Trigger Setup** - Press to open the **Trigger Setup** dialog.
Corresponds with screen menu selection: **Trigger** → **Trigger Setup**.

THE SIGNAL DISPLAY GRID

You can set up the signal display area by touching **Display** → **Display Setup** from the menu bar. The **Display** dialog offers a choice of grid combinations and can also set the grid intensity.

The following Display Grid features also provide assistance when using the oscilloscope:

- **Descriptor Labels** - For more information, go to the **Trace Descriptors** topic.
- **Pop-up Menu** - You can click on a waveform to open a pop-up



menu

From this pop-up menu, you can perform the following functions:


- Open the Setup dialog for the trace
- Turn the trace descriptor label off
- Open the Math dialog for the trace
- Open the Measure dialog for the trace
- Annotate the selected trace

DIALOG AREA

The lower portion is where information is shown, selections are made, and data is input. Typically they are organized into tabular displays, subtabs, or pop-up dialogs. The dialog area is controlled by touch screen buttons and front panel buttons.

The following Dialog Area controls also provide assistance when entering data:

- **Slider Bar** - When you click in some data entry fields, a slider bar opens at the bottom of the screen.

You can use the slider bar on the left to make fine adjustments to the value. You can use the value slider on the right to make coarse adjustments to the value. You can click on the value slider to set the field to a specific value. Click the **Default** button on the slider bar to set the field to the default value. Click the keypad button  on the slider bar to set the value using the pop-up numeric keypad.
- **Flyout Menu** - The Print and Auto Setup front panel buttons open flyout menus. For more information on these menus, go to the **Front Panel Groupings** topic.

WavePro 7Zi

Connecting

Universal ProBus/ProLink Interface

LeCroy's ProBus probe system provides a complete measurement solution from probe tip to oscilloscope display. ProBus allows you to control gain and offset directly from your front panel. It is particularly useful for voltage, differential, and current active probes. It uploads gain and offset correction factors from the ProBus EPROM's and automatically compensates to achieve fully calibrated measurements.

This intelligent interconnection between your instrument and a wide range of accessories offers important advantages over standard BNC and probe ring connections. ProBus ensures correct input coupling by auto-sensing the probe type, thereby eliminating the guesswork and errors that occur when attenuation or amplification factors are set manually.

The LeCroy WavePro 700Zi series oscilloscopes with bandwidths of 4 to 6 GHz include universal ProBus/ProLink probe interfaces. As shown in the following figure, each channel has a high bandwidth ProLink connector and a 50 Ω /1 M Ω ProBus connector.

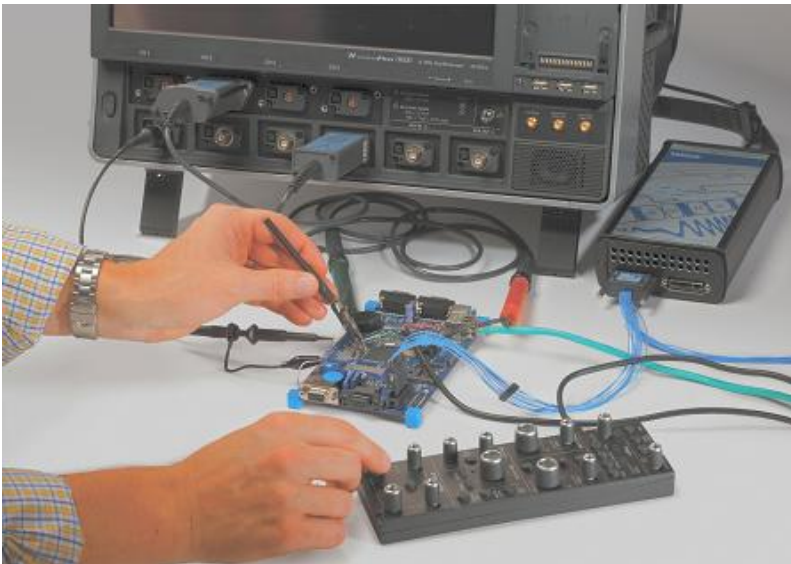


Figure 1-1. A WavePro760 Zi showing the four sets of ProBus/ProLink probe interfaces. This oscilloscope is compatible with all LeCroy probes.

Getting Started Manual

This unique interface provides the user the greatest flexibility in probe selection in any oscilloscope. The ProLink inputs provide a high integrity, high bandwidth interchangeable interface to SMA cables, LeCroy ProLink probes, and accessories. ProLink is used for higher bandwidth probes.

The ProBus interface offers both 50 Ω /1 M Ω input impedance and provides probe power and control for a wide range of probes such as high impedance passive probes, high impedance active probes, current probes, high voltage probes, differential probes. ProBus also includes sense rings for detecting passive probes. All scopes with bandwidths over 4 GHz, except the WavePro 740Zi and 760Zi, use 50 Ω inputs and provide 1 M Ω impedance by means of external adapters.

The following figure shows a typical channel setup. The input selection is on the left hand side of the dialog box. In this case the A input, the ProLink interface is selected. Each input selection has its own independent settings for Probe attenuation, bandwidth and coupling.



Figure 1-2. The channel screen layout showing Input A's ProLink interface controls setup

Note: Input A (Upper) and B (Lower) refer to the two rows of input channels specifically available on WavePro 740 and 760Zi. WavePro 715, 725, and 735Zi all have only one row of input channels on the front panel, and one corresponding selected input on the screen layout.

WavePro 7Zi

The setup for the ProBus interface is shown in the following figure. This interface also allows the selection of input impedance, 50 Ω/1 MΩ.



Figure 1-3. The channel screen layout showing Input B's ProBus interface controls setup

Another universal probe interface advantage is the ability to switch between two probe setups. This function is remotely programmable allowing the interface to operate like a switch.

The characteristics of the universal ProBus/ProLink Interface are shown in the following table. Each of the interfaces provide power to the probe. An I²C interface allows communication with the probe which permits probe recognition and interaction. This adds to the flexibility of the system as the scope can sense and control each probe.

Probe Interface	ProBus (Bandwidth)	ProLink (Bandwidth)
50 Ω	3.5 GHz	4-6 GHz
1 MΩ	500 MHz	NA

Table 1-1. Probe interface characteristics

The WavePro 740Zi and 760 Zi oscilloscopes offer the universal ProBus/ProLink probe interface which allows dual inputs in the DC to 3.5 GHz range and a dedicated high bandwidth interface in the range of 4 through 6 GHz.

The ability to select four out of eight inputs provides unheard of connection flexibility and eliminates the need for costly, easy to lose adapters.

ProLink Interface

For some instruments, LeCroy's ProLink Adapters (LPA) give you the ability to connect your signal in one of three ways:

- BMA connector (only on 4 and 6 GHz models)
- SMA using the BMA-to-SMA adapter (4 are sent standard on 4 and 6 GHz models)
- BNC using BMA-to-BNC adapter (optional)



Figure 1-4. BMA-to-SMA Adapter (1) and BMA-to-BNC Adapter (2)



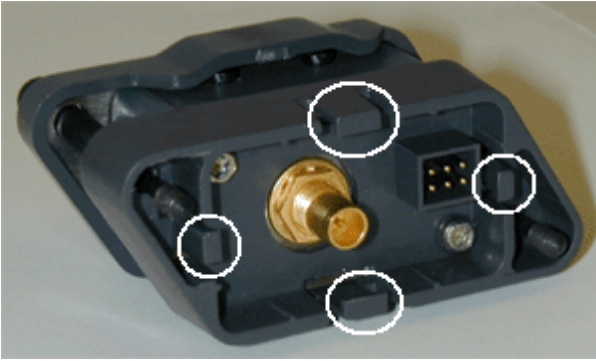
Figure 1-5. BMA Female Connector (1), ProLink BMA-to-SMA Adapter (Installed, 2), and ProLink BMA-to-BNC Adapter (Installed, 3)

Note: When connecting an active probe to the instrument, be sure to use a ProLink BMA-to-BNC adapter (item 3 in the figure). Do not plug the probe directly into the front panel connector (item 1) without an adapter.

WavePro 7Zi

CONNECTING THE ADAPTERS

The mating end of the ProLink adapter has four fastening clips as follows:









When installing an adapter on the instrument's connector panel, align the male 6-pin connector with the female connector and push the adapter straight in. There will be some resistance and you'll hear clicks as the four clips slide into place. Then tighten the captive screws.

When removing an adapter, loosen the two captive screws. Push down on the adapter to unseat the clips. This will require some force and will be initially noisy, but no damage will result to the connector, the floating female BMA connector, or the pins, which can be 15 degrees off axis when being mated or unmated.

Auxiliary Output Signals

In addition to a calibration signal, the following signals can be output through the AUX OUTPUT connector:



	Square Wave
	Trigger Out - can be used to trigger another scope
	DC level - a reference level (not available on all instruments)
	Trigger Enabled - can be used as a gating function to trigger another instrument when the scope is ready
	Pass/Fail - allows you to set a pulse duration from 1 ms to 500 ms; generates a pulse when pass/fail testing is active and conditions are met.
	Aux Output Off - turns off the auxiliary output signal

AUXILIARY OUTPUT SETUP

1. Touch **Utilities** → **Utilities Setup...** from the menu bar.
2. Touch the **Aux Output** tab.
3. If you want a 1 kHz, 1 V square wave, touch the corresponding button.
4. If you want a specialized output, touch one of the buttons under **Use Auxiliary Output For**.
5. Touch inside the **Amplitude** data entry field and enter a value, using the pop-up numeric keypad. If you want a TTL level signal, touch the **TTL Level** checkbox. The **Amplitude** field will accordingly become unavailable.
6. If you selected Square Wave, touch inside the **Frequency** data entry field and enter a value, using the pop-up keypad. You can set a value from 5.0 Hz to 5 MHz.
7. If you selected Pass/Fail, touch inside the **Pulse Duration** field and enter a value from 1 ms to 500 ms, using the pop-up numeric keypad.

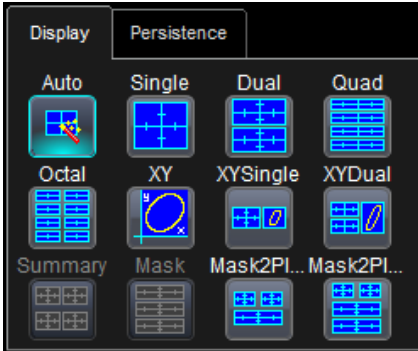
Viewing Waveforms

Display

Display Setup

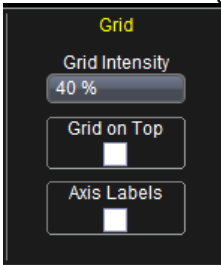
Note: Not all grid styles are available on all instruments.


1. Touch **Display** → **Display Setup** on the menu bar.
2. Touch one of the **Grid** combination buttons.



Note: Autogrid automatically adds or deletes grids as you select more or fewer waveforms to display.

3. Touch inside the grid **Intensity** data entry field and enter a value from 0 to 100 using the slider bar at the bottom of the window.





Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad.

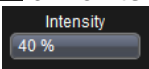

4. Touch the **Grid on top** checkbox if you want to superimpose the grid over the waveform.

Getting Started Manual

Note: Depending on the grid intensity, some of your waveform may be hidden from view when the grid is placed on top. To undo, simply uncheck **Grid on top**.

3. Touch the **Axis labels** checkbox to permanently display the values of the top and bottom grid lines (calculated from volts/div) and the extreme left and right grid lines (calculated from the timebase).

4. Choose a line style for your trace: solid **Line**  or **Points** .

5. Touch inside the trace **Intensity** data entry field  if you want to change the value and enter a value from 0 to 100 using the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad.

Note: Access the Monitor tab for external monitor display settings. Refer to the **External Monitor** topic for more details.

SEQUENCE MODE DISPLAY

To set up a Sequence Mode display, you must first have selected **Sequence** trigger mode in the **Timebase** → **Horizontal Setup** dialog. You must also have entered a **Num Segments** value. For more information on setting up Sequence Mode, see the **Sequence Sampling Mode – Working with Segments** topic.

1. Touch **Display** → **Display Setup** on the menu bar.
2. Touch inside the **Display Mode** field and select a display mode from the pop-up menu.

Moving Traces from Grid to Grid

You can move traces from grid to grid at the touch of a button.

WavePro 7Zi

Moving a Channel or Math Trace

1. Touch the descriptor label for the waveform that you want to move.



2. Touch the **Next Grid** button .

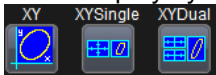
Note: If you have more than one waveform displayed on only one grid, a second grid will open automatically when you select **Next Grid**.

XY Display

Use XY displays to measure the phase shift between otherwise identical signals. You can display either voltage on both axes or frequency on both axes. The traces must have the same X-axis. The shape of the resulting pattern reveals information about phase difference and frequency ratio.

SETTING UP XY DISPLAYS

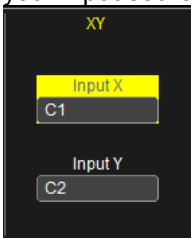
1. Touch **Display** → **Display Setup** on the menu bar.
2. Choose an XY display by touching one of the XY display mode



buttons.

You can show the two waveforms on the XY grid only, or you can show the input waveforms on a single or dual grid.

3. Touch inside the **Input X** and **Input Y** data entry fields and select your input sources from the pop-up windows.



Note: The inputs can be any combination of channels, math functions, and memory locations.

Custom Grids

Some instruments and software packages offer the option to display side-by-side grids, instead of vertically stacked grids. These side-by-side grids are labeled **Custom** in the **Display** dialog. Included in the choices are a 3-grid display, single, dual, and quad displays.

Custom grids offer views of your waveform that are contracted horizontally and less vertically.

Zooming Waveforms


You can magnify a selected region of a waveform using the Zoom function. You can display up to four Zoom (Z1 - Z4) and eight Math Zoom traces (F1 - F8). You can zoom:

- a single channel (refer to **Zooming a Single Channel**)
- a math or memory trace (refer to **Zooming Memory or Math Function Traces**)
- multiple waveforms at once (refer to **Quickly Zooming Multiple Waveforms**)
- segments in a sequence (refer to **Sampling Modes→Sequence Sampling Mode – Working with Segments**)

You can also use the Multi-Zoom Math function to create time-locked zoom traces for selected waveforms. For more information, refer to **Math→Multi-Zoom**).

At any time, you can zoom a portion of a channel waveform or Memory/Math function trace by touching and dragging a rectangle around any part of the input waveform, see the **Touch-and-Drag Zooming** topic. The zoom trace will size itself to fit the full width of the grid. The degree of magnification, will depend on the size of the rectangle that you draw.

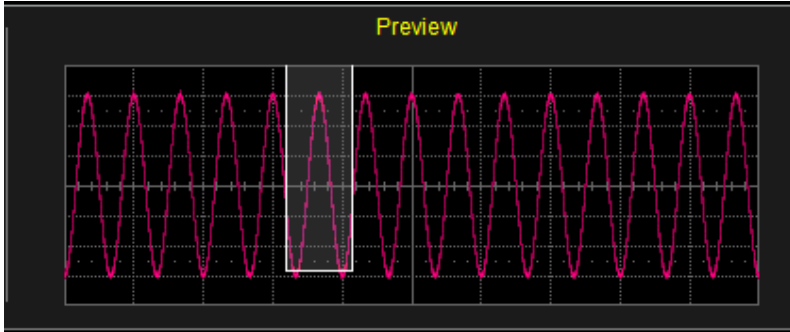


You can also use the front panel **QUICKZOOM** button  to create multiple zooms, one for each displayed input channel. For more information, see the **Quickly Zooming Multiple Waveforms** topic.

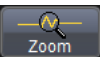
WavePro 7Zi

PREVIEWING ZOOMED WAVEFORMS

When you zoom a waveform, a preview of the zoomed area will appear in the **Preview** section of the **Zx** dialog.



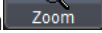
Zooming a Single Channel


The **Zoom** button  appears as a standard button at the bottom of the channel **Cx Vertical Adjust** setup dialog for you to create a zoom trace of your input waveform.

1. On the menu bar, touch **Vertical** → **Channelx Setup**.

OR

Touch the channel trace label  for a displayed channel.

2. Touch the **Zoom** button  at the bottom of the **Cx Vertical Adjust** dialog. A zoom trace (one of Z1 to Z4) will be created of the selected channel.
3. To vary the degree of zoom, touch the newly created **Zx** trace label. The setup dialog for the zoom (Z1 to Z4) opens. It shows the current horizontal and vertical zoom factors.
4. If you want to increase or decrease your horizontal or vertical zoom in small increments, touch the **Var.** checkbox to enable variable

zooming. Now with each touch of the zoom control buttons , the degree of magnification will change by a small increment.

OR

If you want to zoom in or out in large standard increments with each touch of the zoom control buttons, leave the **Var.** checkbox unchecked.

OR

If you want to set exact horizontal or vertical zoom factors, touch inside the Horizontal **Scale/div** data entry field and enter a time-per-div value, using the pop-up numeric keypad. Then touch inside the Vertical **Scale/div** field and enter a voltage value.

PLEASE NOTE THE FOLLOWING:


- To reset the zoom to x1 magnification, touch **Reset Zoom** in the dialog.
- You can also use the Zoom and Math front panel knobs to adjust the horizontal and vertical zoom.
 - **Horizontal Position** - Press to reset the horizontal zoom position to zero. Turn to change the horizontal position of the selected math or zoom trace.
 - **Horizontal Ratio** - Press to toggle between fixed and variable horizontal zoom ratio adjustment. Turn to change the horizontal zoom ratio of the selected math trace.
 - **Quick Zoom** - Press to automatically display magnified views of up to four signal inputs on multiple grids. With four input signals, the signals are displayed along with four zoom traces, each on its own grid. Pressing this button also turns off all other traces.
 - **Vertical Position** - Press to reset the vertical zoom position to zero. Turn to change the vertical position of the selected math or zoom trace.
 - **Vertical Ratio** - Press to toggle between fixed and variable vertical zoom ratio adjustment. Turn to change the vertical zoom ratio of the selected math trace.

WavePro 7Zi

Touch-and-Drag Zooming

1. Touch and drag a rectangle around any part of an input channel waveform, math trace, or memory trace. The **Zoom** (Z1 to Z4) dialog opens.

Note: If you have enclosed a combination of channel and math or memory traces in the rectangle, a pop-up **Rectangle Zoom Wizard** will appear. Touch a **Zoom** button (Z1 to Z4)

2. To turn off the zoom traces, touch the **Undo** button  at the top-right corner of the screen.

OR

Uncheck the **Trace On** checkbox in the dialog for each zoom trace.

Quickly Zooming Multiple Waveforms



Press the **QuickZoom** button  on the front panel.

Turning Off Zoom

1. Touch the math function trace label (or **Zx** trace label) for the zoom you want to turn off.
2. Touch the **Trace On** checkbox to remove the check mark and disable the zoom trace.

Persistence

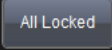


Persistence Setup

The Persistence feature helps you display your waveform and reveal its idiosyncrasies or anomalies for a repetitive signal. Use Persistence to accumulate on-screen points from many acquisitions to see your signal change over time. The instrument persistence modes show the most frequent signal path "three-dimensionally" in intensities of the same color, or graded in a spectrum of colors.

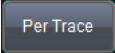



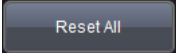
You can show persistence for up to eight inputs for any channel, math function, or memory location (M1 to M4).

SETTING UP PERSISTENCE

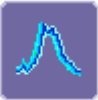
1. Touch **Display** → **Persistence Setup** on the menu bar.
2. Touch the **Persistence On** checkbox.

If you want to set up persistence for:	Follow these steps:
all input channels at once	<ol style="list-style-type: none"> 1. Touch the All Locked button . 2. Touch one of the mode buttons . 3. Touch the Show last trace checkbox if you want the last trace displayed. 4. Touch inside the Saturation data entry field and enter a whole number integer, using the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad. For more information on saturation, see the Saturation Level topic. 5. Touch inside the Persistence time data entry field and make a selection from the pop-up menu.

WavePro 7Zi

each input channel individually	<ol style="list-style-type: none">1. Touch the Per Trace button .2. Touch one of the persistence mode buttons  next to an input channel. To turn off persistence for an individual channel, touch the left-most persistence mode button next to the channel. OR For each input channel, touch its tab to set up persistence for that channel.3. Touch one of the mode buttons .4. Touch the Show last trace checkbox if you want the last trace displayed.5. Touch inside the Saturation data entry field and enter a whole number integer, using the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad. For more information on saturation, see the Saturation Level topic.6. Touch inside the Persistence time data entry field and make a selection from the pop-up menu.7. If you want to return all input channel setups to their default settings, touch the Reset All button .
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WaveStream Mode

	<p>This fast viewing mode provides brightness-graded intensity with a decay time similar to the action of phosphor on an analog screen. WaveStream mode operates at up to 40 GS/s with an update rate up to 8000 waveforms/second for better capture of higher frequency abnormal events.</p>
--	---

Adjusting Trace Intensity

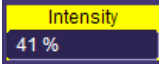


The **INTENSITY** knob adjusts the brightness of your trace, with the intensity value displayed in the bottom right-hand corner of the screen:



Pushing the knob toggles between WaveStream fast-viewing mode and real-time mode.

Note: The **INTENSITY** knob controls trace intensity only for WaveStream traces. Turning the knob when the sampling mode is Real Time will also show a change at the bottom of the screen, but the trace intensity of the real-time trace will not change; i.e., the value displayed is for the WaveStream trace. To change the trace intensity of a real-time trace, touch inside the **Intensity**



field **41 %** of the [Display](#) dialog and use the pop-up keypad or turn the front panel **ADJUST** knob.



Capturing Waveforms

Timebase

Timebase Setup and Control

Set up the timebase by using the front panel **Horizontal** controls.

SETTING UP ADDITIONAL TIMEBASE SETUP AND CONTROLS

1. Touch **Timebase** → **Horizontal Setup**. The **Timebase** dialog opens.
2. Touch inside the **Time/Division** data entry field and enter a value using the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad, or use the up/down arrows to adjust the value.
3. Touch inside the **Delay** data entry field and type in a value, or use the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up keypad. Touch the **Set To Zero** button to set the delay to zero.

Autosetup

When channels are turned on, you can run Autosetup on those channels. If no channels are turned on, all channels are affected. When more than one channel is turned on, the first channel in numerical order with a signal applied to it is automatically set up for edge triggering.




You can perform an autosetup of all these functions together by simply


pressing **Auto Setup**  on the front panel, or by touching **Auto Setup**

 in the **Vertical**, **Timebase**, or **Trigger** drop-down menu.

Sampling Modes

Depending on your timebase, you can choose either [Single-shot](#) (Real

Time) , [Sequence](#) , or [RIS](#)  mode sampling.

Some instruments also offer [Roll](#)  mode.

SELECTING A SAMPLING MODE

1. Touch **Timebase** → **Horizontal Setup** from the menu bar.
2. In the **Timebase** dialog, touch a **Sample Mode** button.

Single-shot Sampling Mode

BASIC CAPTURE TECHNIQUE

A single-shot acquisition is a series of digitized voltage values sampled on the input signal at a uniform rate. It is also a series of measured data values associated with a single trigger event. The acquisition is typically stopped a defined number of samples after this event occurs: a number determined by the selected trigger delay and measured by the timebase. The waveform's horizontal position (and waveform display in general) is determined using the trigger event as the definition of time zero.

You can choose either a pre- or post-trigger delay. Pre-trigger delay is the time from the left-hand edge of the display grid forward to the trigger event, while post-trigger delay is the time back to the event. You can sample the waveform in a range starting well before the trigger event up to the moment the event occurs. This is 100% pre-trigger, and it allows you to see the waveform leading up to the point at which the trigger condition was met and the trigger occurred. (The instrument offers up to the maximum record length of points of pre-trigger information.) Post-trigger delay, on the other hand, allows you to sample the waveform starting at the equivalent of 10,000 divisions after the event occurred.

Because each instrument input channel has a dedicated ADC (Analog-to-Digital Converter), the voltage on each is sampled and measured at the same instant. This allows very reliable time measurements between the channels.

WavePro 7Zi

On fast timebase settings, the maximum single-shot sampling rate is used. But for slower timebases, the sampling rate is decreased and the number of data samples maintained.

The relationship between sample rate, memory, and time can be simply defined as:

$$\text{Capture Interval} = \frac{1}{\text{Sample Rate}} \times \text{Memory}$$

and

$$\frac{\text{Capture Interval}}{10} = \text{Time Per Division}$$

Sequence Sampling Mode – Working with Segments

Using Sequence Mode, you can store up to 15,000 triggered events as "segments" into the oscilloscope's memory. This is ideal when capturing many fast pulses in quick succession or when capturing few events separated by long time periods. The instrument can capture in fine detail complicated sequences of events over large time intervals, while ignoring the uninteresting periods between the events. You can also make time measurements between events on selected segments using the full precision of the acquisition timebase.

Sequence mode offers a number of unique capabilities:

- You can acquire up to four channels simultaneously.
- You can minimize dead time between trigger events for consecutive segments.
- You can view time stamps for acquisitions.
- You can zoom segments or used them as input to math functions.
- You can combine sequence mode with an advanced trigger to isolate a rare event, capture all instances over hours or days, and view/analyze each afterwards.
- You can use Sequence mode in remote operation to take full advantage of the instrument's high data-transfer capability.

In Sequence mode, the complete waveform consists of a number of fixed-size segments acquired in single-shot mode (see the instrument specifications for the limits). The oscilloscope uses the sequence timebase setting to determine the capture duration of each segment: 10 x time/div. Along with this setting, the oscilloscope uses the desired number of segments, maximum segment length, and total available memory to determine the actual number of samples or segments, and time or points.

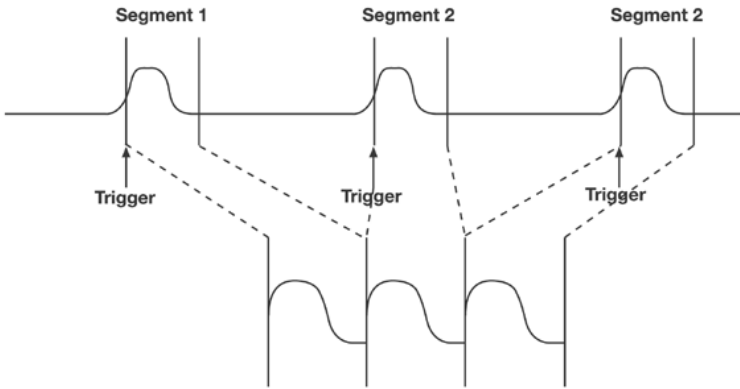


Figure 3-1. How the instrument captures segments

WavePro 7Zi

SETTING UP SEQUENCE MODE


When setting up Sequence Mode, you define the number of fixed-size segments acquired in single-shot mode (see the instrument specifications for the limits). The oscilloscope uses the sequence timebase setting to determine the capture duration of each segment. Along with this setting, the oscilloscope uses the number of segments, maximum segment length, and total available memory to determine the actual number of samples or segments, and time or points.




Figure 3-2. Setting up Sequence Mode (Adjacent)

1. Touch **Timebase** → **Horizontal Setup** on the menu bar.



2. Under **Sampling Mode**, touch the **Sequence** mode button.
3. Click the **Sequence** tab.
4. Under **Acquisition Settings**, touch inside the **Num Segments** data entry field and enter the number of segments you want to display, using the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad.

Note: The number of segments you choose to display (80 maximum) can be less than the total number of segments in the waveform. For example, in the pop-up images above, the number of display segments is 10, but the total number of segments entered in the timebase dialog's **Num Segments** field is 100.

5. Touch the **Enable Timeout** checkbox.
6. Touch inside the **Timeout** data entry field and enter a timeout value, using the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad.

Note: Use the sequence mode timeout to automatically interrupt the sequence acquisition if the timeout value is exceeded without a valid trigger. The timeout period accounts for instances when a **Num Segments** miscount occurs for some reason and the scope waits indefinitely for an unforthcoming segment. During that time, no oscilloscope functions are accessible. By means of a timeout value, however, the acquisition will be completed, the waveform displayed, and control of the oscilloscope returned to the user after the timeout has elapsed.

5. Under **Display Settings**, touch inside the **Display mode** field, and select a sequence mode display from the pop-up menu.
6. Touch the **SINGLE** trigger front panel button.

Note: Once a single acquisition has started, you can interrupt the acquisition at any time by pressing the **SINGLE** front panel button a second time or by pressing the **STOP** front panel button. In this case, the segments already acquired will be retained in memory.


WavePro 7Zi


ZOOMING SEGMENTS IN SEQUENCE MODE

You can zoom individual segments easily using the QUICKZOOM front panel button. When you zoom, the zoom traces default to Segment 1. Channel descriptors indicate the total number of segments acquired. Zoom descriptors indicate [Seg #] and #Segments in the Zoom. You can scroll through the segments using ZOOM front panel position knob.



Figure 3-3. Sample Zoom of Segments in Sequence Mode

1. Touch the front panel **Quickzoom** button .
2. Turn the ZOOM front panel position knob to scroll through the segments.
3. To vary the degree of zoom, touch the newly created **Zx** trace label. The setup dialog for the zoom (Z1 to Z4) opens. It shows the current horizontal and vertical zoom factors.
4. If you want to increase or decrease your horizontal or vertical zoom in small increments, touch the **Var.** checkbox to enable variable

zooming. Now with each touch of the zoom control buttons , the degree of magnification will change by a small increment.

OR

If you want to zoom in or out in large standard increments with each touch of the zoom control buttons, leave the **Var.** checkbox unchecked.

OR


If you want to set exact horizontal or vertical zoom factors, touch inside the Horizontal **Scale/div** data entry field and enter a time-per-div value, using the pop-up numeric keypad. Then touch inside the Vertical **Scale/div** field and enter a voltage value.

DISPLAYING AN INDIVIDUAL SEGMENT

1. Touch **Math** → **Math Setup** on the menu bar.
2. Touch a function tab (**F1** to **Fx** - The number of available math traces depends on the software options loaded on the oscilloscope. Refer to the specifications for details).
3. Touch inside the **Operator1** field and select the **Segment** button



from the pop-up menu.

4. In the dialog on the right, touch the **Select** tab.
5. Touch inside the **First Selected** data entry field and use the slider bat at the bottom of the window to select the first segment you want to display. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad.

Note: In Persistence mode, the segments are automatically overlaid one on top of the other in the display. In non-Persistence mode, they appear separately on the grid.

WavePro 7Zi

VIEWING TIME STAMPS

You can view time stamps for each segment.

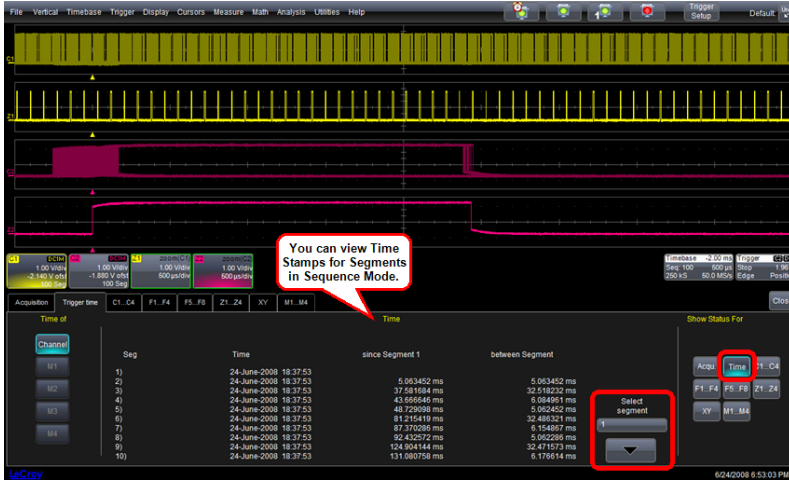


Figure 3-4. View Segment Time Stamps

1. Touch **Timebase** → **Acquisition Status** on the menu bar.

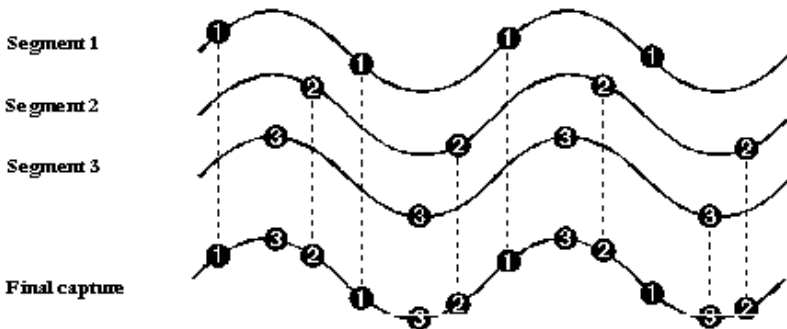
OR

2. Touch **Vertical** → **Channel Status** on the menu bar.
3. Touch the **Trigger Time** tab.
4. Under **Show Status For**, touch the **Time** button.
5. Touch inside the **Select Segment** field and enter a segment number, using the pop-up keypad or touch the arrow buttons to scroll through segment times.

RIS Sampling Mode -- For Higher Sampling Rates

RIS (Random Interleaved Sampling) is an acquisition technique that allows effective sampling rates higher than the maximum single-shot sampling rate. It is used on repetitive waveforms with a stable trigger. The maximum effective sampling rate of 50 GS/s can be achieved with RIS by making 100 single-shot acquisitions at 500 MS/s. The bins thus acquired are positioned approximately 20 ps apart. The process of acquiring these bins and satisfying the time constraint is a random one. The relative time between ADC sampling instants and the event trigger provides the necessary variation, measured by the timebase to 5 ps resolution.

The instrument requires multiple triggers to complete an acquisition. The number depends on the sample rate: the higher the sample rate, the more triggers are required. It then interleaves these segments (see [figure](#)) to provide a waveform covering a time interval that is a multiple of the maximum single-shot sampling rate. However, the real-time interval over which the instrument collects the waveform data is much longer, and depends on the trigger rate and the amount of interleaving required. The oscilloscope is capable of acquiring approximately 40,000 RIS segments per second.



Note: RIS mode is not available when the scope is operating in [Fixed Sample Rate](#) mode.

WavePro 7Zi

Roll Mode

If available on your instrument, Roll mode is invoked automatically when the time per division is 500 ms/div or greater. However, you can cancel Roll Mode and return to Real Time mode at any time.


Roll mode displays, in real time, incoming points in single-shot acquisitions that have a sufficiently low data rate. The oscilloscope rolls the incoming data continuously across the screen until a trigger event is detected and the acquisition is complete. The parameters or math functions connected to each channel are updated every time the roll mode buffer is updated, as if new data is available. This resets statistics on every step of Roll mode that is valid because of new data.

Note: If the processing time is greater than the acquire time, the data in memory gets overwritten. In this case, the instrument issues the warning: **Channel data is not continuous in ROLL mode!!!** and rolling will start over again.

Vertical


Adjusting Sensitivity and Position

ADJUSTING SENSITIVITY

1. Press the appropriate channel push button, for example  to turn on channel 1.

OR

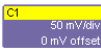
Touch **Vertical** → **Channel 1** from the menu bar.

2. Touch inside the **Trace On** checkbox  to display the trace.
3. Turn the VERTICAL GAIN front panel knob for the selected channel.

OR

Touch inside the **Volts/Div** field and enter a value using slider bar. Click the **keypad** button to enter a value using the pop-up keypad, or use the up/down arrows.

The voltage that you set is displayed in the trace descriptor

label  and in the **Volts/Div** field.

ADJUSTING THE WAVEFORM'S POSITION

Turn the VERTICAL OFFSET adjust front panel knob directly above the channel button whose waveform you want to move vertically. Or you can touch inside the **Offset** field and type in a value on the pop-up keypad. To set the vertical offset to zero, touch the **Zero Offset** button directly below the **Offset** field.

Coupling

The choices of coupling are as follows:

- DC 50 Ω (all instruments)
- GROUND (all instruments)
- DC 1 M Ω (some instruments)
- AC 1 M Ω (some instruments)

WavePro 7Zi

OVERLOAD PROTECTION

The maximum input voltage is 4 V peak. Whenever the voltage exceeds this limit, the coupling mode automatically switches from DC 50 Ω to GROUND. You will then have to manually reset the coupling to DC 50 Ω , as described next.


SETTING COUPLING

1. Touch **Vertical** → **Channel X Setup** from the menu bar.
2. Touch inside the **Coupling** field and select a coupling mode from the pop-up menu.

Probe Attenuation

SETTING UP PROBE ATTENUATION

LeCroy's ProBus system automatically senses probes and sets their attenuation for you. If you want to set the attenuation manually,

1. In the menu bar, touch **Vertical**, then select a channel from the drop-down menu.
2. Touch inside the **Probe Atten.data** entry field . Touch a divide-by menu selection or touch **Var** (variable). If you choose **Var**, type in a value using the slider bar or the pop-up numeric keypad.

Bandwidth Limits

Reducing the bandwidth also reduces the signal and system noise, and prevents high frequency aliasing.

SETTING BANDWIDTH LIMITS


Set bandwidth limits as follows:

1. In the menu bar, touch **Vertical**, then select a channel from the drop-down menu.
2. Touch inside the **Bandwidth** field and select a bandwidth limit value from the pop-up menu. The options are
 - Full (all X-Stream scopes)
 - 4 GHz
 - 3 GHz
 - 1 GHz
 - 200 MHz (all X-Stream scopes)
 - 20 MHz (all X-Stream scopes)

Linear and (SinX)/X Interpolation

Linear interpolation, which inserts a straight line between sample points, is best used to reconstruct straight-edged signals such as square waves. (Sinx)/x interpolation, on the other hand, is suitable for reconstructing curved or irregular wave shapes, especially when the sample rate is 3 to 5 times the system bandwidth.

INTERPOLATION SETUP

1. Touch the button for the channel you want to set up,  for example.
2. In the dialog area, touch inside the **Interpolation** data entry field under **Pre-Processing**. Pre-Processing is meant as before Math processing.
3. Touch inside the **Interpolation** data entry field. A pop-up menu appears offering **Linear** or **Sinx/x** interpolation.
4. Touch the button for the type of interpolation you want.


INVERTING WAVEFORMS

If available on your instrument, touch the **Invert** checkbox to invert the waveform for the selected channel.

Finding Scale

You can access the **Find Scale** button from the channel setup dialog. This feature automatically calculates peak-to-peak voltage, and chooses an appropriate Volts/Div scale to fully display the waveform.

USING FIND SCALE

1. Touch the trace label for the waveform you desire.
2. Touch the **Find Scale** icon .

WavePro 7Zi

Variable Gain

Variable Gain lets you change the granularity with which the gain is incremented. For example, when **Variable Gain** is disabled, the gain will increase or decrease in preset increments of 10 or 100 mV each time you touch the **Up/Down** buttons.

However, when **Variable Gain** is enabled, you can increase or decrease the gain in increments as small as 1 mV, depending on the scale of the waveform.

ENABLING VARIABLE GAIN

1. Touch the descriptor label for the waveform whose gain you want to vary.
2. Touch the **Variable Gain** check box.

Channel Deskew

Unlike the Deskew math function, channel Deskew does no resampling, but instead adjusts the horizontal offset by the amount that you enter. The valid range is dependent on the current timebase +/- 9 divisions.

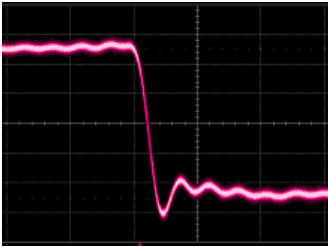
CHANNEL DESKEW SETUP

1. In the menu bar, touch **Vertical**; from the drop-down menu, select a channel to set up.
2. Touch inside the **Deskew** data entry field and enter a value using the pop-up numeric keypad.

Group Delay Compensation

Group delay is defined as the rate of change of the total phase shift with respect to angular frequency through a device or transmission medium. An unavoidable consequence of correcting for group delay is that preshoot and overshoot will be added to the signal.

- **Pulse Response** - A delay compensation that minimizes preshoot. This selection is preferred in physics applications where there's no prediction of the future event.



- **Eye Diagram** - Delay compensation with less overshoot. This selection improves the accuracy of serial eye diagrams.



- **Flatness** - A delay compensation similar to eye diagram, this selection provides a flat frequency response.



WavePro 7Zi

Triggering

Trigger Types

The triggers available to you are defined as follows:

Edge



A simple trigger, Edge trigger is activated by basic waveform features or conditions such as positive or negative slope, and holdoff.

Width



Width trigger allows you to define a positive- or negative-going pulse width bounded by a voltage level, above or below which a trigger will occur. Or you can specify a pulse width and voltage range, within or outside of which a trigger will occur.

Glitch



Glitch trigger is a simpler form of Width trigger. Use Glitch trigger when you want to define a fixed pulse-width time or time range only. Glitch trigger makes no provision for voltage levels or ranges.

Interval



While Glitch trigger performs over the width of a pulse, **Interval** trigger performs over the width of an interval — the signal duration (the period) separating two consecutive edges of the same polarity: positive to positive or negative to negative. Use interval trigger to capture intervals that fall short of, or exceed, a given time limit. In addition, you can define a width range to capture any interval that is itself inside or outside the specified range - an Exclusion trigger by interval.

Qualify First



In Sequence acquisition mode, triggers repeat on event B only if a defined pattern, state, or edge (event A) is satisfied in the first segment of the acquisition. Delay between sources is selectable by time or events.

Qualify



The **Qualify** trigger is an edge-qualified trigger that allows you to use one signal's positive or negative transition to qualify a second signal, which is the trigger source. For Qualify trigger, you specify the time or number of events after the transition when you want the trigger to occur.

State



The **State** trigger is a level-qualified trigger which requires that the qualifying signal remain above or below a specified voltage level for a trigger to occur. For State trigger, you specify the time or number of events after the signal has gone above or below the voltage level when you want the trigger to occur.

Dropout



Used primarily in single-shot applications, and usually with a pre-trigger delay, **Dropout** trigger can detect lost signals. The trigger is generated at the end of the timeout period following the last trigger source transition.

Logic



Logic trigger enables triggering on a logical combination (pattern) of five inputs: CH1, CH2, CH3, CH4, EXT. You have a choice of four Boolean operators (AND, NAND, OR, NOR), and you can stipulate the high or low voltage logic level for each input independently.

WavePro 7Zi

TV



Not available on all instruments, **TV** triggers provide stable triggering on standard or custom composite video signals. Use them on PAL, SECAM, or NTSC systems.

Slew Rate



SlewRate trigger activates a trigger when the rising or falling edge of a pulse crosses two threshold levels: an upper level and a lower level. The pulse edge must cross the thresholds faster or slower than a selected period of time. You can select both thresholds within a range of 2 ns to 20 s. Slew rate trigger is not available on all instruments.

Runt



The **Runt** trigger occurs when a pulse crosses a first threshold line, but fails to cross a second threshold line before recrossing the first. You can select both voltage thresholds within a time range of 100 ps to 20 s. Other defining conditions for this trigger are the edge (triggers on the slope opposite to that selected) and runt width.

Serial Trigger and Decode



Serial trigger allows a serial trigger condition to be set from within the oscilloscope, using an easy-to-understand interface.

Serial



80-bit Serial Trigger without decode capability is available on SDA model scopes only.

Window



Trigger when signal or exits a window defined by adjustable thresholds.

Simple Triggers



EDGE TRIGGER ON SIMPLE SIGNALS

The instrument uses many waveform capture techniques that trigger on features and conditions that you define. These triggers fall into two major categories:

- **Simple Triggers** – activated by basic waveform features or conditions such as a positive or negative slope, and hold-off
- **SMART Triggers** – sophisticated triggers that enable you to use basic or complex conditions for triggering. Use SMART Triggers for signals with rare features, like glitches.

Trigger Settings

Horizontal and Vertical adjustments are typically made for all trigger types using either the **Delay** or **Level** knobs on the front panel of the instrument or their respective fields on the **Timebase** setup dialog.

- **Horizontal:** Turn the **DELAY** knob in the **HORIZONTAL** control group to adjust the trigger's horizontal position. Or, touch inside the **Delay** field in the timebase setup dialog and enter a value, using the pop-up keypad.



The trigger location is shown by a marker under the grid.



Post-trigger delay is indicated by a left-pointing arrow at the lower-left of the grid. The time value is given in the title line of the

TimeBase label at the lower-right of the grid.

Timebase	-107.2 µs
	20.0 µs/div
	2.00 MS
	10 GS/s

- **Vertical:** Turn the **LEVEL** knob in the **TRIGGER** control group to adjust the trigger's vertical threshold.

Turn this knob to adjust the level of the trigger source or the highlighted trace. Level defines the source voltage at which the trigger will generate an event: a change in the input signal that satisfies the trigger conditions.

WavePro 7Zi

Alternatively, in the Trigger dialog, you can touch inside the **Level** field and type in a value using the pop-up numeric keypad. Quickly set a level of zero volts by touching the **Zero Level** button.

An arrow on the right side of the grid shows the threshold position. This arrow is only visible if the trigger source is displayed.

Edge Trigger Setup

Channel Setup


1. Touch the **Trigger** descriptor label.





2. Touch the **Edge** trigger button. 
3. Touch inside the trigger **Source** field and select an input from the






pop-up menu.

4. Select a coupling mode.
5. Touch inside the **Level** data entry field.  Using the pop-up numeric keypad, enter a value in millivolts or use the up/down

buttons   to increase or decrease the value in increments



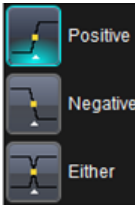
of 1 mV. Or, touch one of the preset value buttons.

6. Select the holdoff by touching the **Time** or **Events** buttons.  Use the slider bar (at the bottom of the window) to enter values via the keypad button  to enter a value using the pop-up keypad or the Default button  to use preset values. Specify the unit of



time, or use the **up/down** buttons (mentioned in the previous step) to increase or decrease the time value in increments of 200 ps. Or, touch one of the **preset value** buttons (also mentioned in the previous step).

7. Choose **Positive**, **Negative**, or **Either** from the slope choices.



Note: Use the **TriggerScan** tab to run the **Trainer** (a wizard-like tool to configure triggers), **Save**, and **Load** trigger setups for reuse.

Trigger Setup

TRIGGER SETUP CONSIDERATIONS

Trigger Modes

1. **Auto** mode causes the scope to sweep even without a trigger. An internal timer triggers the sweep so that the display remains, even when the signal does not cause a trigger.
2. In **NORMAL** mode, the scope sweeps only if the input signal reaches the set trigger point. Otherwise it continues to display the last acquired waveform.
3. In **SINGLE** mode, only one sweep occurs each time you press the button.
4. **STOP** mode inhibits all sweeps until you select one of the other three modes.

WavePro 7Zi

Determining Trigger Level, Slope, Source, and Coupling

Level defines the source voltage at which the trigger circuit generates an event (a change in the input signal that satisfies the trigger conditions). The selected trigger level is associated with the chosen trigger source. Note that the trigger level is specified in volts and normally remains unchanged when the vertical gain or offset is modified.

The Amplitude and Range of the trigger level are limited as follows:

- ± 5 screen divisions with a channel as the trigger source
- ± 400 mV with EXT as the trigger source
- ± 4 V with EXT/10 as the trigger source
- ± 40 mV with EXT*10 as the trigger source
- none with LINE as the trigger source (zero crossing is used)

Note: Once specified, Trigger Level and Coupling are the only parameters that pass unchanged from trigger mode to trigger mode for each trigger source.

Coupling refers to the type of signal coupling at the input of the trigger circuit. Choices of trigger coupling vary by scope model.

With DC coupling, all of the signal's frequency components are coupled to the trigger circuit for high-frequency bursts.

Slope determines the direction of the trigger voltage transition used for generating a particular trigger event. Choose **Positive**, **Negative**, or **Either** from the slope choices.



Like coupling, the selected slope is associated with the chosen trigger source.

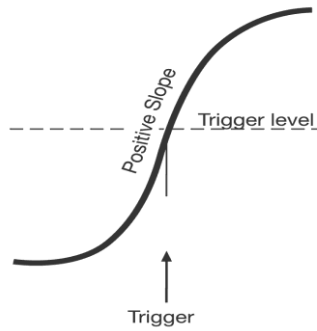
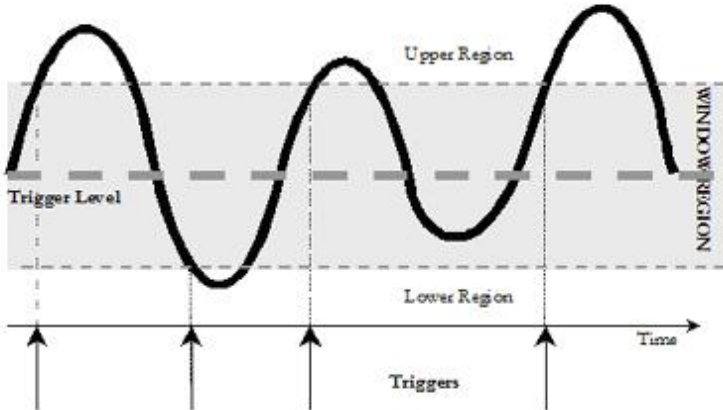


Figure 3-5. Edge trigger works on the selected edge at the chosen level. The slope (positive or negative) is specified in the Trigger label permanently displayed below-right of the grid.



Some instruments include the choice of **Window** slope, which sets a threshold above and below the trigger level beyond which the signal must pass to generate a trigger. The slope can be either positive or negative.



Trigger Source

The trigger **Source** may be one of the following:

- The acquisition channel signal (CH 1, CH 2, CH 3 or CH 4) conditioned for the overall voltage gain, coupling, and bandwidth.
- The line voltage that powers the oscilloscope (LINE). This can be used to provide a stable display of signals synchronous with the power line. Coupling and level are not relevant for this selection.
- The signal applied to the EXT BNC connector (EXT). This can be used to trigger the oscilloscope within a range of ± 400 mV on EXT, ± 4 V with EXT/10 as the trigger source, or ± 40 mV with EXT*10 as the trigger source.
- A logic pattern.

TriggerScan

TriggerScan is a debugging tool that helps you quickly find rare waveform glitches and anomalies. With TriggerScan, you can build a list of trigger setups to look for rare events and automatically sequence through each one. TriggerScan can use any type of trigger setup available including edge, width, and qualify as well as Smart Triggers (such as, glitch and runt triggers). TriggerScan automates two key processes in triggering rare events:

1. Trains the system by looking at normal acquired waveforms. During the training, the oscilloscope analyzes the waveforms to determine what waveforms normally look like. Using this information, it generates a list of smart trigger setups to trigger on abnormal situations.
2. Loads the smart trigger setups from the Trainer and cycles through these. As triggers occur, they are overlaid on the screen. All acquisition settings are preserved and you can use all the functions of the oscilloscope to find the root cause of these anomalies including, WaveScan, Histograms, and advanced analysis.

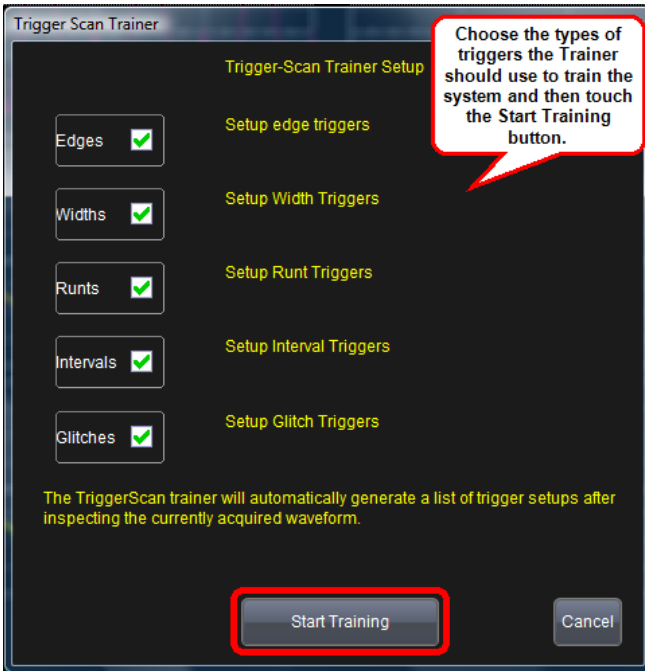


TRAINING TRIGGERSCAN

The TriggerScan Trainer inspects a currently acquired waveform and automatically builds a list of common trigger setups used to find rare events.

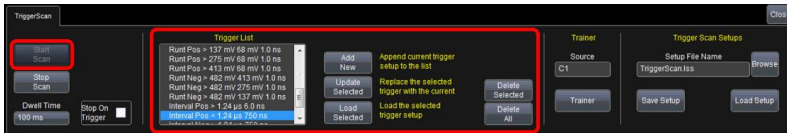
PLEASE NOTE THE FOLLOWING:

- You must acquire and display at least 3 cycles of a signal before running the Trainer.
 - You should run the Trainer if you want to change the trigger types or if you change the channel or signal.
1. Touch **Trigger** → **Trigger Setup** from the menu bar.
 2. On the **Trigger** dialog, click the **TriggerScan** tab.
 3. Touch inside the **Source** data entry field and select a channel as the source for the training.
 4. Touch the **Trainer** button.
 5. On the **TriggerScan Trainer Setup** window, choose the types of triggers the Trainer should use to train the system and then touch the **Start Training** button. The training begins. When it is complete, a list of smart trigger setups is displayed in the Trigger List.



STARTING TRIGGERSCAN

After you have run the Trainer, the Trigger List displays a list of smart trigger setups. You can add or remove trigger setups. You can also update the selected smart trigger setup. Once you have made any changes to the Trigger List, you are ready to start scanning.



1. Touch **Trigger** → **Trigger Setup** from the menu bar.
2. On the **Trigger** dialog, click the **TriggerScan** tab.
3. If you want to add a new trigger setup, touch the **Trigger** tab and set the new trigger. Then, touch the **Add New** button to add the new trigger to the Trigger List.
4. If you want to delete a trigger setup, highlight the setup in the Trigger List and touch the **Delete Selected** button.

Note: If you want to delete all trigger setups in the Trigger List, touch the **Delete All** button.

5. If you want to replace the selected trigger setup with the current trigger setup, highlight the setup in the Trigger List and touch the **Update Selected** button.
6. Once you have made any changes to the Trigger List, touch Start Scan. The oscilloscope automatically sequences through all the trigger setups.

PLEASE NOTE THE FOLLOWING:

- You can tune the dwell time that the scope will wait before loading the next trigger setup using the **Dwell Time** data entry field.
- If you have Persistence display mode enabled, all trigger events are recorded on the display. Refer to the **Persistence Setup** topic for instructions on enabling Persistence display mode.
- If you want TriggerScan to stop when the scope triggers next, check the **Stop On Trigger** checkbox. You can use this to isolate specific trigger setups.

SAVING TRIGGERSCAN SETUPS

You should save TriggerScan setups once you have made any modifications to the Trigger List. The current Trigger List will not be preserved after exiting the application unless you save it.

1. On the **TriggerScan** dialog, touch inside the **Setup File Name** data entry field and enter a file name using the pop-up keyboard.

OR

- Touch the **Browse** button and select a location and file name.
2. Touch the **Save Setup** button.

Note: You can load previously saved TriggerScan setups by touching the **Browse** button, locating the file and then clicking **Load Setup**.

Analyzing Waveforms

Measure

Measuring with Cursors





Cursors are important tools that aid you in measuring signal values. Cursors are markers — lines, cross-hairs, or arrows — that you can move around the grid or the waveform itself. Use cursors to make fast, accurate measurements and to eliminate guesswork. There are two basic types:

- **Horiz(ontal)** (generally Time or Frequency) cursors are markers that you move horizontally along the waveform. Place them at a desired location along the time axis to read the signal's amplitude at the selected time.
- **Vert(ical)** (Voltage) cursors are lines that you move vertically on the grid to measure the amplitude of a signal.

CURSOR MEASUREMENT ICONS

Note: Not all of these measure modes are available on all scope models.

Each cursor locates a point on the waveform. The cursor values can be read in the descriptor label for the trace. Use the **Position** data entry fields at the right side of the dialog to place the cursors precisely. The **Readout** icons depict what is being measured for each measurement mode.

Icon:	Description:
	Displays the absolute Y position.
	Displays the difference in Y values. The value can be read in the descriptor label for the trace.
	Displays absolute and delta cursors together.
	Displays the slope between cursors.

If there are non-time-domain waveforms displayed, there will also be a menu offering choices of x-axis units: **s** or **Hz**, for example.

Cursors Setup

Note: Setup procedures will vary depending on the measure modes available in your scope model.

QUICK DISPLAY

At any time, you can change the display of cursor types (or turn them off) without invoking the **Cursors Setup** dialog as follows:

1. On the menu bar, touch **Cursors**, then **Off**, **Abs Horizontal**, **Rel Horizontal**, **Abs Vertical**, or **Rel Vertical**.


OR

Press the CURSOR TYPE button on the front panel repeatedly to scroll through each cursor type. Turn the CURSORS knobs to adjust the position of the cursor.

Note: The bottom cursor knob adjusts relative cursors. It does not work with absolute cursor types.

2. The cursors displayed will assume the positions previously set up. If you want to change their position or measurement mode, in the menu bar touch **Cursors**, then **Cursors Setup** in the drop-down menu.

SETTING UP ABSOLUTE CURSORS


1. Touch **Cursors** → **Cursors Setup** on the menu bar. The **Standard Cursors** dialog opens.
2. In the dialog area, touch the **Cursors On** check box to display them.
3. Touch the **Horizontal Abs** or **Vertical Abs** mode button.
4. Touch inside the **Position 1** data entry field and type in a value for the cursor or use the slider bar at the bottom of the window to adjust the cursor position. Click the keypad button  on the slider bar to enter a value using the pop-up keypad.

OR

Use the CURSORS knobs on the front panel to place the cursor.

WavePro 7Zi

SETTING UP RELATIVE CURSORS

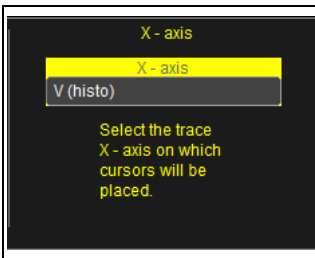
1. Touch **Cursors** → **Cursors Setup** on the menu bar. The **Standard Cursors** dialog opens.
2. In the dialog area, touch the **Cursors On** check box to display them.
3. Touch the **Horizontal Rel** or **Vertical Rel** mode button.
4. Touch a readout parameter button: **Absolute**, **Delta**, **Abs+Delta**, or **Slope**.
5. Touch inside the **Position 1** and **Position 2** data entry fields and type in a value for each cursor or use the slider bar at the bottom of the window to adjust the cursor positions. Click the keypad button  on the slider bar to enter a value using the pop-up keypad.

OR

Use the **CURSOR**s knobs on the front panel to place the cursors.

6. If you want both cursors to move in unison as you adjust the position, touch the **Track** check box to enable tracking.

CURSORS ON MATH FUNCTIONS



You can place cursors on a math function whose X-axis has a dimension other than time (FFT, for example). On the **Cursors Setup** dialog, an **X-Axis** menu will become available from which to choose the units. For example, if you are placing cursors on a histogram, select **V (histo)**.

Overview of Parameters

Parameters are measurement tools that determine a wide range of waveform properties. Use them to automatically calculate many attributes of your waveform, like rise-time, rms voltage, and peak-to-peak voltage, for example.

There are parameter modes for the amplitude and time domains, custom parameter groups, and parameters for pass and fail testing. You can make common measurements on one or more waveforms.

TURNING ON PARAMETERS

1. Touch **Measure** → **Measure Setup** on the menu bar.
2. Touch the **On** checkbox for each parameter you want to enable.

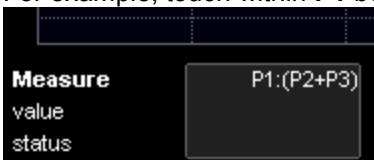
Note: Some instruments do not have this option and will display all parameters together.

3. Touch the **Show Table** checkbox to display the parameters below the grid.

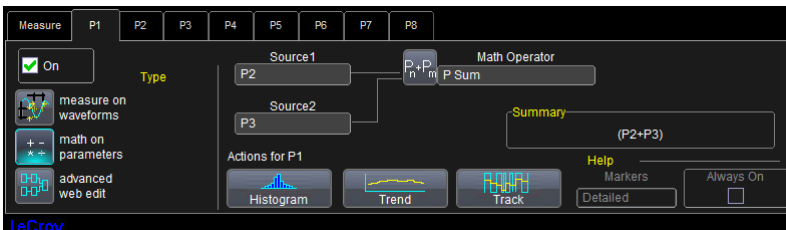
QUICK ACCESS TO PARAMETER SETUP DIALOGS

You can quickly gain access to a parameter setup dialog by touching the parameter list box below the grid.

For example, touch within **P1** below the grid



to display the setup dialog for P1.

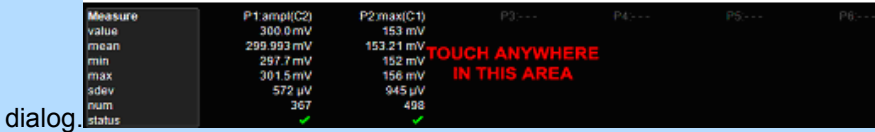


WavePro 7Zi



Touch the row titles **Measure** dialog.

Note: Some instruments have only one **Measure** dialog. In this case, touching anywhere in the parameter results area displays the **Measure**



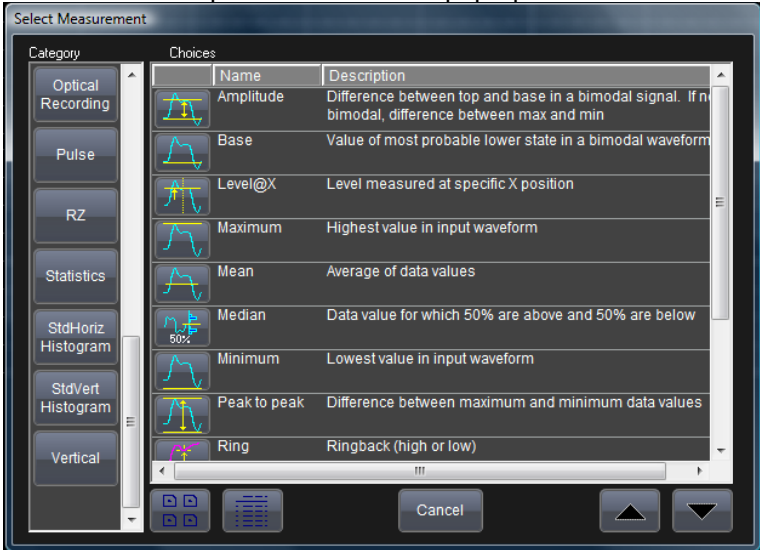
Parameter Setup

1. Touch the parameter tab (**Px**) of an unused location or one that you want to change.
2. Under **Type**, select a measurement type:

	<p>Measure On Waveforms - Applies measurements directly on the waveform denoted in the Source1 field.</p>
	<p>Math On Parameters - Performs math (addition, subtraction, multiplication, division) on parameters denoted in the Source1 and Source2 fields. This feature is available with some optional math packages.</p>
	<p>Advanced Web Edit - Uses LeCroy's Processing Web to set up the measurement. This feature, which is available with the XWEB option, allows you to chain practically unlimited math functions together to operate on your waveform measurements.</p>

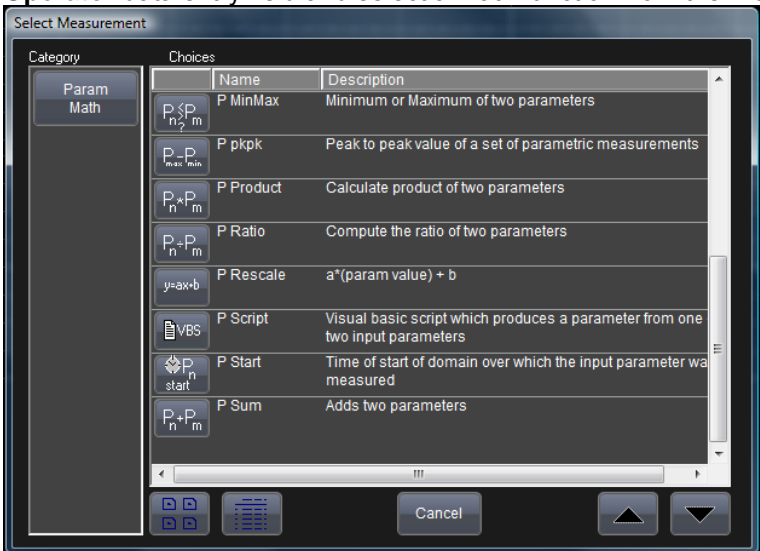
3. Touch inside the **Source1** field and select a channel, math trace, memory trace, or other waveform to be measured.

- If you selected **Measure On Waveforms**, touch inside the **Measure** field and select a parameter from the pop-up menu



OR

- If you selected **Math On Parameters**, touch inside the **Math Operator** data entry field and select a math function from the menu



WavePro 7Zi

5. In the mini-dialog to the right of the main setup dialog, touch the [Gate](#) tab to narrow the span of measurement.
6. Touch the [Accept](#) tab to define parameter values to be used in the measurement.

Measure Modes

The selections for Measure Mode allow you to quickly apply parameters for [standard vertical](#) and [standard horizontal](#) setups, and [custom](#) setups.

STANDARD VERTICAL PARAMETERS

These are the default Standard Vertical Parameters:

Vertical
mean
sdev
max.
min.
ampl
pkpk
top
base

STANDARD HORIZONTAL PARAMETERS

These are the default Standard Horizontal Parameters:

Horizontal
freq
period
width
rise
fall
delay
duty
num points

SELECTING MEASURE MODES

1. Touch **Measure** → **Measure Setup** on the menu bar.
2. Under **Measure Mode**, select the **Std Vertical** or **Std Horizontal** buttons.

Note: You can choose to [customize](#) up to 12 parameters by touching **My Measure**.

3. Touch inside the **Source** data entry field and choose a source for which the measurements should apply.

WavePro 7Zi

Help Markers

Help Markers clarify parameter measurements by displaying movable cursors and a visual representation of what is being measured. For the "at level" parameters, Help Markers make it easier to see where your waveform intersects the chosen level. This feature also displays the hysteresis band that you have set about that level.

You also have the option, by means of an **Always On** checkbox, to leave the Help Markers displayed after you have closed the Help Markers setup dialog.

You have a choice of **Simple** or **Detailed** views of the markers:

- The **Simple** selection produces cursors and Measure Gate gate posts. The gate posts are independently placeable for each parameter.
- The **Detailed** selection produces cursors, Measure Gate gate posts, a label identifying the parameter being measured, and a level indicator and hysteresis band for "at level" parameters (not part of Standard Horizontal or Standard Vertical parameters).

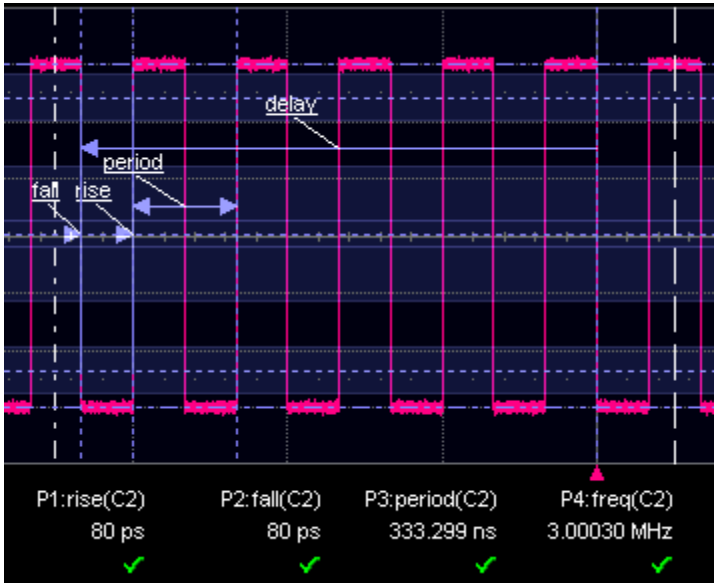


Figure 4-1. Standard Horizontal Parameter Help Markers

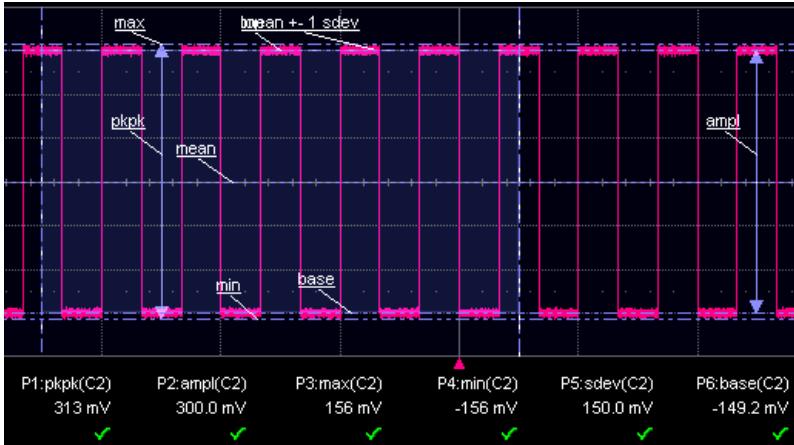
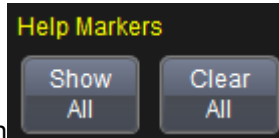


Figure 4-2. Standard Vertical Parameter Help Markers

Setting Up Help Markers

1. Touch **Measure** → **Measure Setup** on the menu bar.
2. Select a Measure Mode: **Std Vertical**, **Std Horizontal**, or **My Measure**.



3. Touch the **Show All** button to display Help Markers for every parameter being measured on the displayed waveform (C2 in the examples above).
4. Touch a **P1** to **Px** tab for any parameter listed; it doesn't matter which. Touch inside the **Help Markers** field and select **Simple**. The **Simple** selection produces cursors and Measure Gate gate posts. The gate posts are independently placeable for each parameter. or **Detailed**. The **Detailed** selection produces cursors, Measure Gate gate posts, a label identifying the parameter being measured, and a level indicator and hysteresis band for "at level" parameters. .

Note: The choice of **Simple** or **Detailed** is applied to all parameters at the same time. That is, if you choose Simple markers for one parameter, all parameters will be displayed in this mode.

5. Touch the **Always On** checkbox if you want to continuously display Help Markers for this parameter.

WavePro 7Zi

Math

Introduction to Math Traces and Functions

With the instrument's math tools you can perform mathematical functions on a waveform displayed on any channel, or recalled from any of the four reference memories M1 to M4. You can also set up traces F1 to Fx [The number of math functions that can be performed at the same time depends on the software options loaded on your scope.] to do math on parameter measurements P1 to Px [The number of parameters that can be measured at the same time depends on the software options loaded on your scope.] .

Instruments that offer more than one math trace provide enhanced capabilities. For example: you could set up Trace F1 as the difference between Channels 1 and 2, Trace F2 as the average of F1, and Trace F3 as the integral of F2. You could then display the integral of the averaged difference between Channels 1 and 2.

Any trace and function can be chained to another trace and function. For example, you could make Trace F1 an average of Channel 1, Trace F2 an FFT of F1, and Trace F3 a zoom of F2.

Math Made Easy

With the instrument's math tools you can perform mathematical functions on a waveform displayed on any channel C1 to C4, or recalled from any of the four reference memories M1 to M4. To do computations in sequence, you can also use math functions F1 to Fx as a source input waveform. Or you can use Parameters P1 through Px

For example: you could set up F1 as the difference between Channels 1 and 2, F2 as the average of F1, and F3 as the integral of F2. You could then display the integral of the averaged difference between Channels 1 and 2. Any trace and function can be chained to another trace and function. For example, you could make F1 an average of Channel 1, F2 an FFT of F1, and F3 a zoom of F2.

Refer to the Specifications to find out which math tools are available in each optional package.

SETTING UP A MATH FUNCTION

Math Setup

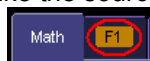
This setup mode allows you to quickly apply frequently used math functions.

1. Touch **Math** → **Math Setup** on the menu bar.
2. If there are math functions already assigned to **F1** through **Fx**[The number of math traces available depends on the software options loaded on your scope. See Specifications.], touch the checkbox for the function you want to enable.
3. To assign a new math function to a trace, touch the Fx button for that








trace, for example . The math function menu appears.

4. Touch a menu selection; your new function is automatically assigned, with the same setups as were in place for the last function in that Fx position.
5. If you want to change other setup items, like the source waveform,





touch the appropriate Fx tab, for example . The setup dialog for that Fx position appears.

6. Touch the **Single** function button  if you want to perform just one math function on the trace, or touch the **Dual** function button  to perform math on math.
7. Touch the **Graph** button, then touch inside the **Graph with** field to select a graph mode. The Graph modes are as follows:

Mode:	Description:
	Histogram of the values of a parameter
	Track of each value of a parameter
	Trend of the values of a parameter over time

WavePro 7Zi

Both Track and Trend are tools that can be used to plot measurement data and observe variations with respect to time. Differences between Track and Trend are summarized in the table below:






Characteristic	Trend 	Track 
Representation	Parameter value vs. event	Parameter value vs. time
Behavior	Cumulative over several acquisitions up to 1 million events	Non-cumulative (resets after every acquisition). Unlimited number of events
Time Correlation to Other Data	No	Yes
Monitors an Evolution in the Frequency Domain	No. Trend points are not evenly spaced in time and therefore cannot be used for an FFT.	Yes
Monitors the Evolution of a Measurement Parameter over Several Acquisitions	Yes	No. Track resets after every acquisition.
Ensures No Lost Measurement Data	No. Since data can be accumulated over many acquisitions, and since the oscilloscope takes time to calculate measurement values and to display data before the trigger is re-armed, data can be missed.	Yes. Maximum time period that can be captured is limited by acquisition memory and sampling rate.

In general, Track will be the tool to use if you want to capture a continuous stream of data that is spaced closely together. Trend can be used if your data is spaced widely apart and longer than the “dead-time” of the oscilloscope between acquisitions.

FFT

FFT SETUP

Setting Up an FFT

1. Touch **Math** → **Math Setup** on the menu bar.
2. Touch a Math function trace button: **F1** through **Fx**[The number of math traces available depends on the software options loaded on your scope. See Specifications.] a pop-up menu appears. Select **FFT** from the menu. 
3. Touch the **Single**  or **Dual** (function of a function)  button if the FFT is to be of the result of another math operation.
4. Touch inside the **Source1** field and select a channel, memory, or math trace on which to perform the FFT.
5. Touch inside the **Operator1** field:
Select **FFT** from the pop-up menu if you selected **Single** function. Select another math function if you selected **Dual** function. Then touch inside the **Operator2** field and select **FFT** from the pop-up menu.
6. In the right-hand dialog, touch the **FFT** tab.
7. Choose whether to Truncate[When the FFT transform size does not match the record length, you can truncate the record and perform an FFT on the shorter record. This will increase the resolution bandwidth.]  or Zero-fill[Zero-fill is useful when the source data for the FFT comes from a math operation that shortens the record. This is commonly encountered in filtering operations like enhanced resolution. The missing data points are replaced by data values, whose amplitudes are interpolated to fit between the last data point and the first data point in the record. This guarantees that there is not a first-order discontinuity in the filled data. Since the data at the end of the record is "filled" data, it is advisable to select a weighting window other than rectangular to minimize the effect of the fill on the resulting spectrum.]  the trace display.
8. Touch the **Suppress DC** checkbox if you want to make the DC bin go to zero. Otherwise, leave it unchecked.

WavePro 7Zi

9. Touch inside the **Output** type field, and make a selection from the pop-up menu.
10. Touch inside the **Window** field, select a window type.
11. Touch inside the **Algorithm** field and select either Least Prime[The default algorithm is a least primes algorithm that computes FFTs on transform sizes having lengths that can be expressed as factors of $2^N \cdot 5^K$. This is very compatible with the record lengths encountered in the oscilloscope, which are often multiples of 1, 2, 4, 5, or 10.] or Power of 2[The other choice is a power of two algorithm where the record lengths are in the form of 2^N . The power of 2 algorithm generally runs faster than the least primes algorithm. The price that is paid is a record length that is not the same as the acquired signal. The power-of-two FFT will truncate to the nearest power-of-two less than record length if truncate is chosen or fill data to nearest power-of-two greater than the record length if zero fill is selected.] from the pop-up menu.

Analysis

WaveScan

INTRODUCTION TO WAVESCAN

WaveScan enables you to search for unusual events in a single capture, or to scan for an event in many acquisitions over a long period of time. You can select from more than 20 search modes (frequency, rise time, runt, duty cycle, etc.), apply a search condition (slope, level, threshold, hysteresis), and begin scanning in a post-acquisition environment. Since the scanning modes are not simply copies of the hardware triggers, but "software triggers," the capability is much greater.

For instance, there is no "frequency" trigger in any oscilloscope, yet WaveScan allows frequency to be quickly scanned for. You can accumulate a data set of unusual events that are separated by hours or days, enabling faster debugging. The events are time stamped and indexed in a table from which you can select them for viewing individually.

You can also set actions to occur automatically when unusual events are found: stop the acquisition, emit an audible beep, [output a pulse](#), [print the screen](#), [save the waveform](#), or create a [LabNotebook™](#) entry.

The screenshot shows the WaveScan control panel with the following settings:

- Enable:
- Mode: Edge
- Source1: C1
- Filter Method: No Filter
- Filter Wizard: [Button]
- Table:
- Overlay:
- Histogram:
- Zoom:
- Action on Features Found: Trigger Action (highlighted in yellow)
- None: [Button]

Two red arrows point from the 'Table' and 'Action on Features Found' sections to their respective outputs below.

Idx	Edge Time
1	-749.101 ns
2	-415.846 ns
3	-82.201 ns
4	250.898 ns
5	584.399 ns
6	918.099 ns

The Action on Features Found menu is shown with the following options:


- None (highlighted in cyan)
- Pulse AUX Output
- Stop Acquisition
- Print Screen
- Save Waveform(s)
- Beep
- Save to LabNotebook

Signal Views

WaveScan provides distinct views of your signal:

WavePro 7Zi

- [Source](#) view highlights all occurrences of edges that meet your criteria.
- [Scan Overlay](#) (not available in WaveSurfer Xs scopes) places all captured edges one on top of the other in a separate grid. You can apply monochromatic persistence in this view.
- [Scan Histogram](#) (not available in WaveSurfer Xs scopes) provides a statistical view of edges that meet your search criteria.
- [Zoom](#) view allows you to expand a waveform feature vertically and

horizontally; to apply further processing ; to store  it, or to apply a descriptive label  to the feature.

Note: The number of grids displayed varies from one to three grids depending on which views are enabled. WaveScan handles this function automatically, and there is no option to move traces from one grid to another, as would be the case under normal (non-WaveScan) operation.

Search Modes

Search modes are used to locate anomalies during acquisition.

- [Edge](#) - for detecting the occurrence of edges; selectable slope and level
- [Non-monotonic](#) - for detecting threshold re-crosses; selectable slope, hysteresis, and level
- [Runt](#) - for detecting pulses that fail to cross a threshold; selectable polarity and thresholds
- [Measurement](#) - for filtering and performing parameter measurements

Parameter Measurements

Besides parameter measurements made during acquisition, post-acquisition measurements can also be made. The number of parameters available depends on the options loaded on your instrument. Measurements are made only on the events defined by your filter (search criteria). A [Filter Wizard](#) is provided to quickly establish statistical criteria such as ± 1 , 3, or 5 sigma.

Sampling Mode

Whenever WaveScan is enabled, the instrument reverts to Real-time sampling mode.

Pass/Fail Testing



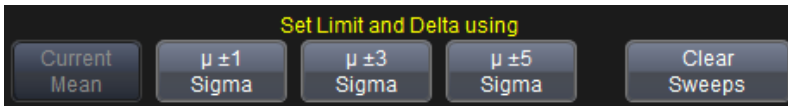
COMPARING PARAMETERS

Each Pass/Fail input (**Qx**) can compare a different parameter result to a user-defined limit (or statistical range) under a different condition.

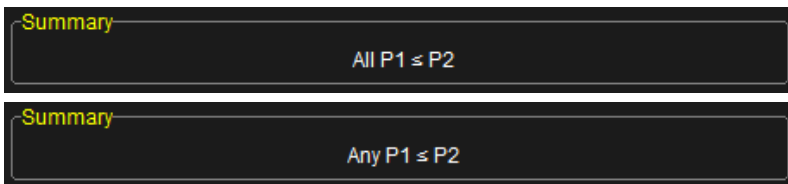
The conditions are represented by these comparison operators:



At the touch of a button, test results can also be compared to these standard statistical limits:



In Dual Parameter Compare mode, your X-Stream oscilloscope can take parameter results measured on two different waveforms and compare them to each other. If desired, set your test to be true if **Any** or **All** waveforms fit the criteria set by the comparison condition. Setups are conveniently shown in the Summary box of the **Qx** dialog as follows:



WavePro 7Zi



MASK TESTS

Mask testing can be done using an existing mask, or by using a mask created from your actual waveform, with vertical and horizontal tolerances that you define. Existing masks can be loaded from a floppy disk or from a network.

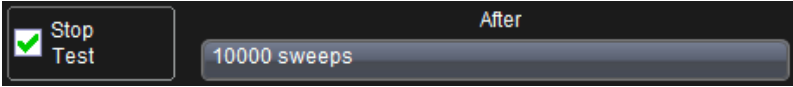
You can set your mask test to be True for waveforms All In, All Out, Any In, or Any Out. For example, if you select All In, the test will be False if even a single waveform falls outside the mask.

Masks that you create from your waveform can be confined to just a portion of the trace by use of a measure gate. Refer to the **Measure Gate** topic for more information on how this feature works.

ACTIONS

By touching the **Stop Test**




checkbox  in the

Actions dialog, you can set up the test to end after a predetermined number of sweeps that you decide.

You can also decide the actions to occur upon your waveforms' passing or failing, by selecting one or all of the following:

- stop
- audible alarm
- print image of display
- emit pulse (if available)
- save waveform

The selection Pulse  causes a pulse to be output through the Aux Out connector at the front of the oscilloscope. This pulse can be used to trigger another oscilloscope. You can set the amplitude and width of the pulse as described in Auxiliary Output Signals.

Getting Started Manual


Depending on your scope model, you can configure up to 8 pass/fail conditions. The boolean conditions to determine if your waveform passes are as follows:

All True	All False
Any True	Any False
All Q1 to Q4 Or All Q5 to Q8	Any Q1 to Q4 And Any Q5 to Q8



PASS/FAIL TESTING SETUP

Initial Setup

1. Touch **Analysis** → **Pass/Fail Setup...** from the menu bar.
2. Touch the **Actions** tab.
3. Touch the **Enable Actions** checkbox. This causes selected actions to occur on your waveform's passing or failing a test.
4. Touch the **Summary View** checkbox to enable a line of text

Last = True Passed 1 Of 1 sweeps 

showing a concise status of the last waveform and keeping a running count of how many sweeps have passed.

5. Touch inside the **Pass If** field, and select a boolean condition from the choices shown.
6. If you want to set up the test to end after a finite number of sweeps, touch the **Stop Test** checkbox. Then touch inside the **After** data entry field and enter a value, using the pop-up numeric keypad.
7. Use either the **Pass**  or **Fail**  button on the **If** section of the dialog to set actions taking place when your waveform passes or fails the test.
8. The **Then** section of the dialog provides **stop test**, **sound alarm**, **print result**, **emit pulse**, or **save** (the waveform) actions. If you want to have the results printed and your scope is not equipped with a printer, be sure that the it is connected to a local or network printer. Refer to the **Printing** topics for more information.
9. If you want to save your waveform automatically, touch the **Save Setup** checkbox. This will take you out of the current dialog and will open the **Save Waveform** dialog. Refer to the **Save Recall** → **Saving and Recalling Waveforms** topic for more information.
10. Test Pass/Fail conditions by touching the **Force Actions Once** button. Press the **Clear All** button to quickly uncheck all checkboxes and make new selections.

WavePro 7Zi

Comparing a Single Parameter

1. Touch **Analysis** → **Pass/Fail Setup...** from the menu bar.
2. Touch one of the **Qx** tabs and a setup dialog for the position is shown.
3. Touch inside the **Source1** field and select a source from the pop-up menu.
4. Touch inside the **Condition** field in the main dialog and select

ParamCompare

5. Touch inside the **Compare Values** field and select **All** or **Any** from



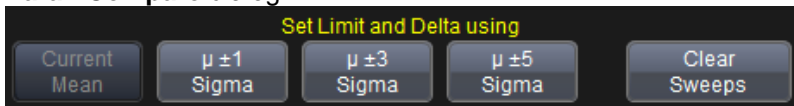
the pop-up menu. By selecting **All**, the test will be true only if every waveform falls within the limit that you will set. By selecting **Any**, the test will be true if just one waveform falls within the limit.

6. Touch inside the **Condition** field on the **ParamCompare** part of the dialog and select a math operator from the pop-up menu.



7. Touch inside the **Limit** field and enter a value using the pop-up numeric keypad. The value entered acquires the dimensions corresponding to the parameters being tested. For example, if you are testing a time parameter, the unit is seconds.

If you chose either **WithinDeltaPct** or **WithinDeltaAbs** from the **Condition** menu, you also have the choice of setting the limit by means of the statistical buttons at the bottom of the **ParamCompare** dialog:



Comparing Dual Parameters

1. Touch **Analysis** → **Pass/Fail Setup...** from the menu bar.
2. Touch one of the **Qx** tabs and a setup dialog for the position is shown.
3. Touch inside the **Condition** field in the main dialog and select



DualParamCompare

4. Touch inside the **Source1** and **Source2** fields and select a source from the pop-up menu.
5. Touch inside the **ParamCompare** mini-dialog field and select a source from the pop-up menu.
6. Touch inside the **Compare Values** field and select **All** or **Any** from





the pop-up menu. By selecting **All**, the test will be true only if every waveform falls within the limit that you will set. By selecting **Any**, the test will be true if just one waveform falls within the limit.

7. Touch inside the **Condition** field in the **ParamCompare** mini-dialog and select a math operator from the pop-up menu.



8. Touch inside the **Limit** field and enter a value, using the pop-up numeric keypad. This value takes the dimension of the parameter that you are testing. For example, if you are testing a time parameter, the unit is seconds.

9. If you chose either **WithinDeltaPct**  or **WithinDeltaAbs**  from the **Condition** menu, touch inside the **Delta** field and enter a value.

WavePro 7Zi

Mask Testing

1. Touch **Analysis** → **Pass/Fail Setup...** from the menu bar.
2. Touch one of the **Qx** tabs and a setup dialog for the position is shown.
3. Touch inside the **Source1** field and select a source from the pop-up menu.
4. Touch inside the **Condition** field in the main dialog and select **Mask**



Test.

5. From the **Test** portion of the dialog, make a selection in the **Test is**



True when group of buttons. This selection means, for example, that if you select **All In** the test is False when a single waveform falls outside the mask.

6. From the **Show Markers** section of the dialog, choose whether or not to have mask violations displayed.
7. If you are loading a pre-existing mask, touch the **Load Mask** tab, and then the **File** button. You can then enter the file name or browse to its location.
8. If you want to make a mask from your waveform, touch the **Make Mask** tab.
9. Touch inside the **Ver Delta** and **Hor Delta** fields and enter boundary values, using the pop-up numeric keypad.
10. Touch the **Browse** button to create a file name and location for the mask if you want to save it.
11. Touch the **Gate** tab, then enter values in the **Start** and **Stop** fields to constrain the mask to a portion of the waveform. Or, you can simply touch and drag the Gate posts, which initially are placed at the extreme left and right ends of the grid.

Documenting your Work

Labnotebook

Introduction to LabNotebook

LeCroy's LabNotebook feature extends the documentation capabilities of your scope. It allows you to create an annotated notebook entry containing all displayed waveforms, the setup of the DSO, and user-supplied annotation. The notebook entry can then be converted to hardcopy format -- pdf, rtf, or html -- and printed or e-mailed. You can also use the default report layout or configure your own, and even substitute your own company logo in the header.

Notebook entries are stored in an internal database and are available for recall at any time. Besides storing the waveform data, LabNotebook also stores your panel setups and parameter measurements. You have the capability to back up the database to external media.

The Flashback feature allows you to recall the state of the DSO at a later date, including the saved waveforms and the DSO setup, so that you can make additional measurements. A keyword filter makes it easy to find the correct notebook entry to recall.

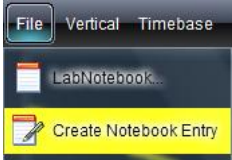
You can choose which notebook to use for your entries, and label the notebook by project or user. If the scope is shared among several users, for example, or used for different projects, the data can be kept separately. Similarly, hardcopy reports can be stored in different folders.

Note: If your external monitor is connected, the LabNotebook automatically opens on the external monitor.

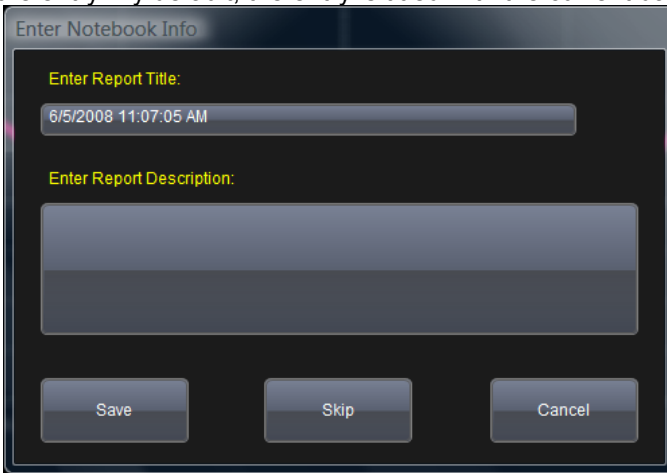
WavePro 7Zi

Creating a Notebook Entry

1. Touch **File** → **Create Notebook Entry** on the menu bar





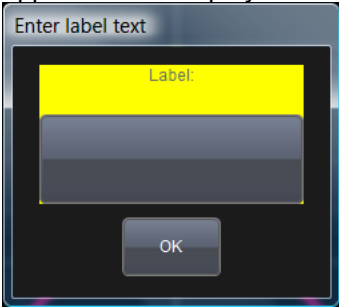
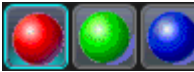



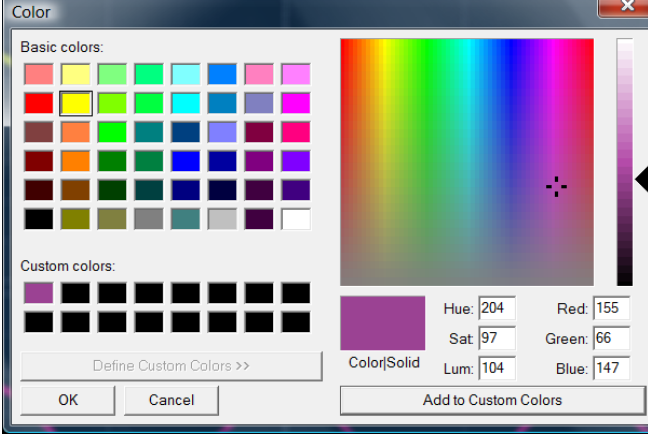
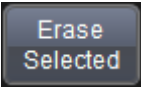
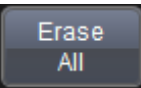
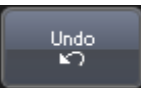

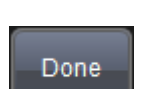
A dialog box is displayed in which to enter a title and comments for the entry. By default, the entry is titled with the current date and time.



2. Touch inside the **Title** field and enter a title, using the pop-up keyboard. Then touch inside the **Description** field and enter a description, if desired, and touch **Close**.
3. The notebook entry will display your waveforms in "print colors," that is, on a white background to save printer ink, if you selected that option in notebook [Preferences](#). Otherwise, the waveforms will appear on a black background.

A drawing toolbar appears at top:

Icon:	Description:
	<p>The pen tool enables you to write or draw in freehand. You can use a mouse, or a stylus to do this using the touch screen. Once you click off, you can drag your note anywhere on your waveform.</p>
	<p>The circle tool enables you to create a circle around a waveform feature that you want to point out. Once you click off, the circle is drawn and you can drag it anywhere on the screen.</p>
	<p>The arrow tool enables you to draw lines with arrowheads for callouts. You can rotate these lines through 360 degrees and drag them to any location on the screen.</p>
	<p>The text tool enables you to enter text callouts on your report. When you touch this tool, a dialog box opens in which to enter text by means of a pop-up keyboard. After you touch Close, your text will appear on the display as a draggable object.</p> 
	<p>These are the three default colors that you can select for shapes, lines, and text. To use additional colors, touch More.</p>
	<p>When you touch More, a Custom box opens with the default color yellow displayed. Touch the yellow button to open the full color palette</p>

Icon:	Description:
	 <p>When you have chosen a custom color, touch Add to Custom Colors; the color will appear in the Custom Colors palette. Then touch the color to enable it, and touch OK. The next object that you create will be in that color.</p>
	<p>If you want to erase a drawing object, touch it to select it, then touch Erase Selected.</p>
	<p>Touch Erase All to erase all drawn objects and text.</p>
	<p>Touch Undo to discard the last object drawn.</p>
	<p>The Move Toolbar button enables you to place the toolbar anywhere on the screen. Touch the button a second time to return it to its original fixed location.</p>
	<p>Touch Done when you are finished annotating the notebook entry. The name of the entry will appear in the list in the LabNotebook dialog. You can now create a hardcopy report of it, and email or print it.</p>

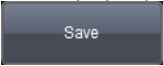
Save Recall

Saving and Recalling Scope Settings

You can quickly save and recall up to six scope panel settings internally. These internally saved settings are easy to recall later. You can also save and recall your scope panel settings as a file (.lss) on the hard disk, a network location, USB drive, or another location.

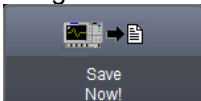
Saving Scope Settings

1. Touch **File** → **Save Setup** on the menu bar.
2. To save the scope settings internally, under **Save to Internal Setup**, touch inside a **SetupX** data entry field and use the pop-up keyboard

to enter a file name. Touch the Save button  next to the **SetupX** data entry field. The file is saved in **D:\Internal Setups**, and the current date/time is displayed above the field.

OR

To save the scope settings to a file, under **Save To File**, touch inside the **Save panel to file** data entry field and use the pop-up keyboard to enter the path for the destination folder. Or touch **Browse** to navigate to the destination folder. Then, touch the Save Now button.



Recalling Scope Settings

1. Touch **File** → **Recall Setup** on the menu bar.
2. To recall internally saved scope settings, under **Recall from Internal Setup**, touch the **Recall** button next to the file you want to recall.

OR

To recall scope settings from a saved file, under **Recall From File**, touch inside the **Recall panel from file** data entry field and use the pop-up keyboard to enter the path to the source folder. Or touch **Browse** to navigate to the source folder. Then touch the Recall Now button.

WavePro 7Zi

Recalling Default Settings

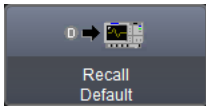
Some of the default settings for your WavePro 700Zi oscilloscope include the following configurations:

- Channels 1 and 2 are turned on at 50 mV/div, 0V offset, linear interpolation
- All other measurements are cleared for Math, Reference Waveforms, and Channels
- Trigger is set to Channel 1 with an Auto positive edge, DC coupled, and with a 0V level
- The Timebase set to 50 ns/div, 10ks, 20 GS/s, and with zero delay
- Smart memory is set to Set max memory with 100ks selected
- The Cursors are turned off
- The Grids are set to AutoGrid

If you want to reset the settings to the default configuration, press the **DEFAULT SETUP** front panel button.

OR

Touch **File** → **Recall Setup** on the menu bar. Touch the Recall Default button under **Recall Default Setup**.



Saving and Recalling Waveforms

Saving Waveforms

1. Touch **File** → **Save Waveform** on the menu bar.
2. In the **Save Waveform** dialog, touch the **Save To** Memory button



3. Touch inside the **Source** field and select a source from the **Select Source** pop-up window. The source can be any trace; for example, a channel (C1–C4), math function (F1–F4), or a waveform stored in non-volatile RAM (M1–M4).
4. Touch inside the **Trace Title** data entry field if you want to change the default name of your waveforms. Use the pop-up keyboard to type the new name.

Note: You can change the name but not the sequence number.



CAUTION

If you use a name that ends in a number instead of a letter, the instrument may truncate the number. This is because, by design, the first waveform is automatically numbered 0, the second 1, etc. For example, if you want to use waveform name "XYZ32" but it is not preceded by waveforms XYZ0 through XYZ31, the waveform will be renumbered with the next available number in the sequence.

If you need to use a number in your waveform's name, it is recommended that you append an alpha character at the end of the number : "XYZ32a" for example.

5. If you are saving to file, touch the **Data Format** field and select a format type from the pop-up menu.

Depending on your selection, you may need to touch the **SubFormat** field and select a subformat. If you select **ASCII**, touch the **Delimiter** field and select a delimiter character from the pop-up menu: comma, space, semicolon, or tab.

Note: The **WaveML** format, which enables XML output, is used for persistence traces.

WavePro 7Zi

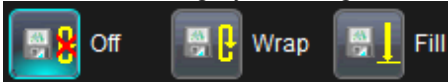
6. Touch the **Browse** button next to the **Save file in directory** field and browse to the location where you want the file saved. The file name is assigned automatically and is shown below the field.



7. Touch the Save Now button

Auto Save

You can use the Auto Save feature to automatically save a waveform to disk after each new trigger. You can enable Auto Save from **Save Waveform** dialog by touching one of the Auto Save buttons



Select **Wrap** (old files overwritten) or **Fill** (no files overwritten).



CAUTION

If you select **Fill**, you can quickly use up all disk space on your hard disk.

Recalling Waveforms

Only .trc files that were saved in binary format can be recalled into the oscilloscope.

1. Touch **File** → **Recall Waveform** on the menu bar.
2. To recall a waveform from memory, in the **Recall Waveform** dialog,



touch the **Recall From Memory** button. Touch inside the **Source** field and select a memory location in which to store the file: M1 to M4.

OR

To recall a waveform from a file, in the **Recall Waveform** dialog,



touch the **Recall From File** button. Touch inside the **Destination** field and select a memory location in which to store the file: M1 to M4. Touch inside the **Show only files** field and select an area to limit the search to: channels, math functions, or memory. Touch inside the **Recall files from directory** data entry field and

enter the path using the pop-up keyboard. Or, touch the **Browse** button to navigate to the file. Touch inside the **Next file will be recalled from data entry** field and enter the path using the pop-up keyboard. Or, touch the **Browse** button to navigate to the file.




3. Touch the Recall Now button.

Disk Utilities

Use the Disk Utilities dialog to delete files or create folders.

Note: All of the Disk Utilities can also be accomplished using the standard file management tools in Microsoft Windows®.

Deleting a Single File

1. Touch **File** → **Disk Utilities** on the menu bar.
2. Touch the Delete button  in the **Disk Utilities** dialog.
3. Touch inside the **Current folder** data entry field and use the pop-up keyboard to enter the path to the folder that contains the file you want to delete.

OR


4. Touch the **Browse** button and navigate to the folder.
4. Touch inside the **File to be deleted** data entry field and use the pop-up keyboard to enter the name of the file.

OR

5. Touch the **Browse** button and navigate to the file.
5. Once you have located the file, touch the **Delete File** button.

WavePro 7Zi


Deleting All Files in a Folder

1. Touch **File** → **Disk Utilities** on the menu bar.
2. Touch the Delete button  in the **Disk Utilities** dialog.
3. Touch inside the **Current folder** data entry field and use the pop-up keyboard to enter the path to the folder that contains the file you want to delete.

OR

4. Touch the **Browse** button and navigate to the folder.
4. Once you have located the folder, touch the **Empty Folder** button.

Creating a Folder

1. Touch **File** → **Disk Utilities** on the menu bar.
2. Touch the Create button  in the **Disk Utilities** dialog.
3. Touch inside the **Current folder** data entry field and use the pop-up keyboard to enter the path to the directory where you want to create the folder, and then name of the folder.
4. Touch the **Create Folder** button.

Printing

Print, Plot, or Copy

The instrument gives you the ability to output files to a printer or plotter, to print to file, or to e-mail your files. Any Microsoft Windows® supported printer is supported by your instrument.

Printing

Setting Up the Printer

1. Touch **File** → **Print Setup** on the menu bar. The Utilities **Hardcopy** dialog opens.

OR

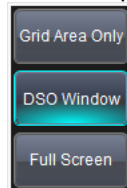
Press the PRINT front panel button. Then, touch the **Print Setup** button on the **Print** flyout menu.



2. On the Hardcopy dialog, touch the **Printer** icon.
3. Under **Colors**, touch the **Use Print Colors** checkbox if you want the traces printed on a white background.

Note: A white background saves printer toner. (You can change the printer colors in the **Utilities** → **Preference Setup** → **Color** dialog.)

4. Touch inside the **Select Printer** field. Choose a printer from the pop-up menu.
5. Touch the **Properties** button to see your printer setup.
4. Touch the icon for the layout **Orientation** you want: portrait or landscape.
5. Touch the **Hardcopy Area** field to choose which part of the screen





you want to print from the pop-up menu. Choose **Grid Area Only** if you do not need to print the dialog area and you only want to show the waveforms and grids. Choose **DSO window** if you want to print the dialogs with the waveforms and grids. Choose **Full Screen** if you want to print the entire screen.

WavePro 7Zi

Printing a Screen Image

You can print in one of three ways:

- Press the PRINT button  on the front panel. Then, touch the **Print Now** button on the **Print** flyout menu.
- Touch **File** → **Print** on the menu bar.
- Touch the **Print Now** button  in the **Utilities** → **Hardcopy** dialog

Note: The instrument uses the Print settings on the **Utilities** → **Hardcopy** dialog to print the screen image.


Adding Printers and Drivers

Note: If you want to add a printer driver, the driver must first be loaded on the scope.

1. Touch **File** → **Print Setup** on the menu bar.

OR

Press the PRINT front panel button. Then, touch the **Print Setup** button on the **Print** flyout menu.

2. On the Utilities **Hardcopy** dialog, touch the **Printer** icon .
3. Touch the **Add Printer** button. A Microsoft Windows® Printer window opens where you can add a printer.

Managing Files

Use the instrument's **Utilities** menu to save the screen image as a file to storage media, such as a USB drive or hard drive. You can give your files custom names and create directories for them.

Hard Disk Partitions

The instrument's hard disk is partitioned into drive **C:** and drive **D:**. Drive **C:** contains the Windows operating system and the instrument application software. Drive **D:** is intended for data files.

Utilities

Status

From **Status** tab on the **Utilities** dialog, you can view system status. The **System Status** read-only dialog displays system information including model number, serial number, firmware version, and installed software and hardware options.

Accessing the System Status Dialog

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch **System Status** on the **Utilities** dialog.

OR

Touch the **Status** tab.

Remote communication

From the **Remote** tab on the **Utilities** dialog, you can set up remote communication. You can select a network communication protocol, establish network connections, and configure the Remote Control Assistant log from the **Remote** dialog. The choice of communication protocols is limited to TCPIP and GPIB.

PLEASE NOTE THE FOLLOWING:

- GPIB is an option and requires a GPIB card to be installed in a card slot at the rear of the scope.
- The instrument uses Dynamic Host Configuration Protocol (DHCP) as its addressing protocol. Therefore, it is not necessary to set up an IP address if your network supports DHCP. If it does not, you can assign a static address in the standard Windows 2000 network setup menu.

The Remote Control Assistant monitors communication between your PC and oscilloscope when you are operating the instrument remotely. You can log all events, or errors only. This log can be invaluable when you are creating and debugging remote control applications.

Setting Up Remote Communication.

If you are connecting the scope to a network, first contact your Information Systems administrator. If you are connecting the scope directly to your PC, connect a GPIB or Ethernet cable between them.

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch the **Remote** tab.

WavePro 7Zi

3. Make a **Port** selection: **TCPIP** (transmission control protocol/Internet protocol) or **GPIB** (general purpose interface bus). If you do not have a GPIB card installed, the GPIB selection will not be accessible.
4. If you are using GPIB, set a GPIB address by touching inside the **GPIB Address** data entry field and enter an address.

OR

If you are using TCPIP, press the **Net Connections** button; the Windows **Network Connections** window opens. You can reconfigure the oscilloscope's connection if it is already connected to the network or make a new connection.

Note: Your instrument allows you to restrict remote control access to certain clients. To restrict access, under **Security**, touch the **Yes** button and enter the IP addresses or domain name server names you want to restrict separated by a comma.

Configuring the Remote Control Assistant Event Log

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch the **Remote** tab.
3. Under **Remote Control Assistant**, touch inside the **Log Mode** data entry field. Select **Off**, **Errors Only**, or **Full Dialog** from the pop-up menu.
4. To export the contents of the event log to an ASCII text file, touch the **Show Remote Control Log** button. The **Event Logs** pop-up window opens. Touch inside the **DestFilename** data entry field and enter a file name, using the pop-up keyboard. Then, touch the **Export to Text File** button.

Hardcopy

From the **Hardcopy** tab on the **Utilities** dialog, you can print screen images. On the **Hardcopy** dialog, you can print the screen image to a printer, to the clipboard, or to a file. You can choose to print the waveform and grids only, the waveform and grids with the dialog, or the entire screen. You can also e-mail your screen images.



Printing

For instructions on printing and printer setup, refer to the **Printing** topic.



Clipboard

The **Clipboard** selection on the **Hardcopy** tab saves the screen image on the clipboard so you can paste a file into another application (like MS Word, for example).

Saving a Screen Image to the Clipboard

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch the **Hardcopy** tab, then the **Clipboard** icon.
3. Touch the **Colors** field and choose **Standard** to print the screen as it appears, **Print** to print the waveforms on a white background, or **Black & White** to print the waveforms in black & white.

Note: Choosing **Print** colors saves printer toner/ink.

4. Touch the **Hardcopy Area** field to choose which part of the screen you want to print. Choose **Grid Area Only** if you do not need to print the dialog area and you only want to show the waveforms and grids. Choose **DSO window** if you want to print the dialogs with the waveforms and grids. Choose **Full Screen** if you want to print the entire screen.



5. Touch the **Print Now** button

Note: Once you have configured your **Clipboard** settings on the **Hardcopy** dialog, you can touch the **PRINT** front panel button and touch **Save Screen to Clipboard** on the **Print** flyout menu. The instrument uses the **Clipboard** settings to save the screen image to the clipboard.

WavePro 7Zi



File

The **File** selection on the **Hardcopy** tab saves the screen image as a file to storage media such as a USB drive or hard drive.

Saving a Screen Image to a File

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch the **Hardcopy** tab, then the **File** icon.
3. Touch inside the **File Format** data entry field and select a graphic file format from the pop-up menu.
4. Touch the **Colors** field and choose **Standard** to print the screen as it appears, **Print** to print the waveforms on a white background, or **Black & White** to print the waveforms in black & white.

Note: Choosing **Print** colors saves printer toner/ink.

5. Touch inside the **File Name** data entry field and enter a name for the display image, using the pop-up keyboard.
6. Touch inside the **Directory** data entry field and type the path to the folder you want to print to, using the pop-up keyboard. Or touch the **Browse** button and navigate to the folder.
7. Touch the **Hardcopy Area** field to choose which part of the screen you want to print. Choose **Grid Area Only** if you do not need to print the dialog area and you only want to show the waveforms and grids. Choose **DSO window** if you want to print the dialogs with the waveforms and grids. Choose **Full Screen** if you want to print the entire screen.



8. Touch the **Print Now** button.

Note: Once you have configured your **File** settings on the **Hardcopy** dialog, you can touch the **PRINT** front panel button and touch **Save Screen to File** on the **Print** flyout menu. The instrument uses the **File** settings to save the screen image to a file (incrementing the filename by one each time you touch **Save Screen to File**).



E-Mail

The **E-mail** selection on the **Hardcopy** tab gives you the option to e-mail your screen images, using either the MAPI or SMTP protocols. Before you output to e-mail from the **Utilities** dialog, you first have to set up the e-mail server and recipient address in **Preference Setup**.

E-Mailing a Screen Image

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch the **Hardcopy** tab, then the **E-mail** icon.
3. Touch inside the **File Format** data entry field and select a graphic file format from the pop-up menu.
4. Touch the **Colors** field and choose **Standard** to print the screen as it appears, **Print** to print the waveforms on a white background, or **Black & White** to print the waveforms in black & white.

Note: Choosing **Print** colors saves printer toner/ink.

5. Touch the **Prompt for message to send with mail** checkbox if you want to include remarks with the image.
6. Touch the **Hardcopy Area** field to choose which part of the screen you want to print. Choose **Grid Area Only** if you do not need to print the dialog area and you only want to show the waveforms and grids. Choose **DSO window** if you want to print the dialogs with the waveforms and grids. Choose **Full Screen** if you want to print the entire screen.



7. Touch the **Print Now** button







Note: Once you have configured your **Email** settings on the **Hardcopy** dialog, you can touch the **PRINT** front panel button and touch **Send Screen to Email** on the **Print** flyout menu. The instrument uses the **Email** settings to send the screen image.

WavePro 7Zi

Auxiliary Output Signals

From **Aux Output** tab on the **Utilities** dialog, you can output auxiliary signals. In addition to a calibration signal, the following signals can be output through the AUX OUTPUT connector:

Note: Not all of these options are available on some oscilloscope models.

Button:	Description:
	Square Wave You can set a Frequency value from 5.0 Hz to 5 MHz.
	Trigger Out — can be used to trigger another scope.
	DC level — a reference level
	Trigger Enabled — can be used as a gating function to trigger another instrument when the scope is ready
	Pass/Fail — allows you to set a pulse duration from 1 ms to 500 ms; generates a pulse when pass/fail testing is active and conditions are met.
	Aux Output Off — turns off the auxiliary output signal



Setting Up Auxiliary Output

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch the **Aux Output** tab.
3. If you want a 1 kHz, 1 V Square Wave, touch the **Set to 1 kHz, 1 V Square Wave** button.

OR

If you want a specialized output, touch one of the following buttons under **Use Auxiliary Output For: Square Wave, Trigger Enabled, Trigger Out, Pass/Fail, or Off**.

Note: If you choose **Pass/Fail**, touch inside the **Pulse Duration** field (if applicable) and enter a value from 1 ms to 500 ms, using the pop-up numeric keypad.

4. If applicable, touch inside the **Amplitude** data entry field and enter a value, using the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad.
5. Touch inside the **Frequency** data entry field and enter a value, using the slider bar at the bottom of the window. Click the keypad button  on the slider bar to enter a value using the pop-up numeric keypad.

WavePro 7Zi

Date & Time

From the **Date & Time** tab on the **Utilities** dialog, you can manually set the time and date or get it from the Internet. If you elect to get the date and time from the Internet, you need to have the oscilloscope connected to the Internet through the LAN connector on the side panel. You can also set time zones and daylight savings time.

Setting the Date and Time Manually

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch the **Date/Time** tab.
3. Touch inside each of the **Hour**, **Minute**, **Second**, **Day**, **Month**, and **Year** data entry fields and enter a value, using the pop-up numeric keypad.
4. Touch the **Validate Changes** button.

Setting the Date and Time from the Internet

Note: The Simple Network Time Protocol (SNTP) is used.

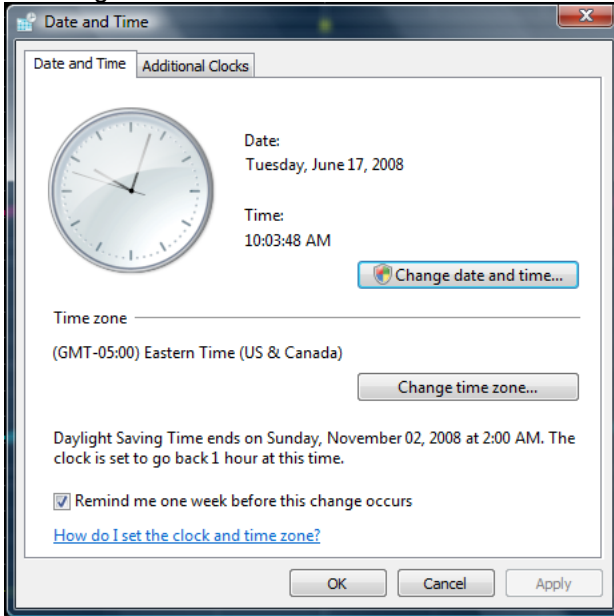
1. Ensure that the scope is connected to the Internet through the LAN connector at the side of the scope.
2. Touch **Utilities** → **Utilities Setup** on the menu bar.
3. Touch the **Date/Time** tab.
4. Touch the **Set from Internet** button.

Setting the Date and Time from Windows

1. Touch **Utilities** → **Utilities Setup** on the menu bar.
2. Touch the **Date/Time** tab.
3. Touch the **Windows Date/Time** button



4. Use the **Time & Date Properties** window to configure the time, including time zone.



Options

From the **Options** tab on the **Utilities** dialog, you can add or remove software options. For information about software options, contact your local LeCroy Sales and Service office, or visit our Web site at <http://www.lecroy.com/options>.

Options that you purchase add performance to your instrument. This added performance is seen in the new math functions or parameters that you can choose from when doing Measure or Math setups.

Preferences

Enabling Audible Feedback

You can choose to have audible confirmation each time you touch a screen or front panel control. When Audible Feedback is enabled, the oscilloscope beeps each time you touch the screen or front panel control.

1. Touch **Utilities** → **Preferences** on the menu bar.
2. Touch the **Audible Feedback Enable** checkbox so that the oscilloscope beeps with each touch of the screen or front panel control.

WavePro 7Zi

Enabling Auto-calibration

You can choose to have your instrument automatically recalibrate itself whenever there is a significant change in ambient temperature. If you do not enable this option, the oscilloscope recalibrates only at startup and whenever you make a change to certain operating conditions.

1. Touch **Utilities** → **Preferences** on the menu bar.
2. Touch the **Automatic Calibration Enable** checkbox.

Optimizing Performance

If this option is available on your oscilloscope, you can set up the oscilloscope to optimize either calculating speed or display speed. If the display update rate is of primary concern to you, optimize for Display. If acquisition and analysis are more important, optimize for analysis. Optimizing for analysis can be useful when persistence or averaging is used, giving higher priority to waveform acquisition at the expense of display update rate.

The choices are presented as a spectrum with highest values at the extremes:



1. Touch **Utilities** → **Preferences** on the menu bar.
2. Touch one of the optimization icons.

Setting an Offset Control

As you change the gain, this control allows you to either keep the vertical offset level indicator stationary (when **Div** is selected) or to have it move with the actual voltage level (when **Volts** is selected). The advantage of selecting **Div** is that the waveform will remain on the grid as you increase the gain; whereas, if **Volts** is selected, the waveform may move off the grid.

Note: Regardless of whether you select **Volts** or **Div**, the **Offset** shown in the channel setup dialog always indicates volts. However, when **Div** is selected for the Offset Control, the offset in volts is scaled proportional to the change in gain, thereby keeping the division on the grid constant.

1. Touch **Utilities** → **Preferences** on the menu bar.
2. Touch the **Acquisition** tab.
3. Under **Offset Setting constant in:**, touch either the **Div** or **Volts** button.

Setting a Delay Control

As you change the timebase, this control allows you to either keep the horizontal offset indicator stationary (when **Div** is selected) or to have it move with the trigger point (when **Time** is selected). The advantage of selecting **Div** is that the trigger point will remain on the grid as you increase the timebase; whereas, if **Time** is selected, the trigger point could move off the grid.

Note: Regardless of whether you select **Time** or **Div**, the **Delay** shown in the timebase setup dialog always indicates time. However, when **Div** is selected for Delay In, the delay in time is scaled proportional to the change in timebase, thereby keeping the division on the grid constant.

1. Touch **Utilities** → **Preferences** on the menu bar.
2. Touch the **Acquisition** tab.
3. Under **Delay Setting constant in:**, touch either the **Div** or **Volts** button.

Configuring E-mail Settings

Before you can send e-mail from the oscilloscope, it must first be configured.

1. Touch **Utilities** → **Preferences** on the menu bar.
2. Touch the **E-mail** tab.
3. Choose an e-mail server protocol:

MAPI (Messaging Application Programming Interface) is the Microsoft interface specification that allows different messaging and workgroup applications (including e-mail, voice mail, and fax) to work through a single client, such as the Exchange client. MAPI uses the default Windows e-mail application (usually Outlook Express).

SMTP (Simple Mail Transfer Protocol) is a TCP/IP protocol for sending messages from one computer to another through a network. This protocol is used on the Internet to route e-mail. In many cases no account is needed.

4. If you chose MAPI, touch inside the **Originator Address (From:)** data entry field and use the pop-up keyboard to type in the instrument's e-mail address. Then touch inside the **Default Recipient Address (To:)** data entry field and use the pop-up keyboard to enter the recipient's e-mail address.

OR

WavePro 7Zi

If you chose SMTP, touch inside the **SMTP Server** data entry field and use the pop-up keyboard to enter the name of your server. Touch inside the **Originator Address (From:)** data entry field and use the pop-up keyboard to type in the instrument's e-mail address. Then touch inside the **Default Recipient Address (To:)** data entry field and use the pop-up keyboard to enter the recipient's e-mail address.

5. To send a test e-mail text message, touch the **Send Test Mail** button. The test message reads "Test mail from [name of scope's email address]."

Acquisition Status

For each general category of oscilloscope operation, you can view a summary of your setups. To access these status dialogs, choose the following:

- **Vertical** → **Channels Status** on the menu bar
- **Timebase** → **Acquisition Status** on the menu bar
- **Trigger** → **Acquisition Status** on the menu bar
- **Math** → **Math Status**, **Zoom Status**, or **Memory Status** on the menu bar

In addition to these dialogs, summaries are also provided for XY setups, memory (M1-M4) setups, and time stamps for sequence mode sampling.


Service



This button on the **Utilities Setup** dialog provides access to service dialogs, which are for the sole use of LeCroy service personnel. A security code is required to gain access.

Show Windows Desktop



Touch the **Show Windows Desktop** button  on the **Utilities Setup** dialog to minimize the instrument application. To maximize the application, touch the appropriate shortcut icon



Touch Screen Calibration

To start the calibration procedure, touch the **Touch-Screen Calibration** button.



During the calibration, you will be prompted to touch the center of a small cross in five key locations on the touch screen.

PLEASE NOTE THE FOLLOWING:

- Because sufficient accuracy cannot be achieved using your finger, use a stylus instead for this procedure.
- The calibration has a ten-second timeout in case no cross is touched.
- To avoid parallax errors, be sure to place your line of sight directly in front of each cross before touching it.

Restoring Software

System Recovery for Oscilloscopes Running Windows XP and Vista

Your oscilloscope is designed to operate reliably for many years. However, the application software operating the instrument runs on a Windows platform. The loading or incomplete removal of additional Windows applications may eventually cause problems in the stability of the operating system. Severe cases may require a reloading of the base operating system and oscilloscope application. This is done using a recovery routine that restores a clean copy of the image originally installed on the C: drive.

Note: Any user and calibration data located on the D: partition is not affected by the recovery process.

LeCroy provides you with a recovery application and a backup image in an extra partition on the instrument's hard drive. The recovery process is easy to perform, using the following instructions. After the recovery procedure is done, you must activate Windows, either by Internet connection to Microsoft's Web site or by telephone. Have your Windows Product Key number (located on the rear of the oscilloscope) handy during Windows reactivation.

WavePro 7Zi

Note: The recovery process produces a replica of the operating system and oscilloscope application software at the current revision levels when the oscilloscope was manufactured. Any further revisions of the application software, Windows operating system, and virus scan definition files are not automatically upgraded. Therefore, after completion of the disk image recovery, it is highly recommended to search vendor Web sites and upgrade the individual components to current revision levels. The current oscilloscope application software can be downloaded directly from the LeCroy website at www.lecroy.com. Since the calibration data for the oscilloscope is stored in the D: drive, current calibration constants are not overwritten during the recovery process.

Recovery Procedure

1. Connect a network cable to the LAN port on the rear of the oscilloscope if you intend to activate windows through the Internet.
2. Connect a keyboard and a mouse to the oscilloscope.
3. Apply power to the oscilloscope.
4. As soon as the LeCroy logo appears on the screen, press and hold down the F4 key until the recovery software logo appears momentarily:



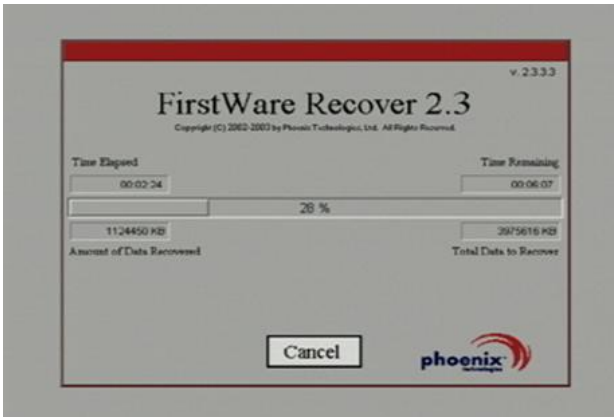
5. Then the cME console End User License Agreement is displayed. Read the agreement, and click **Accept**:

WavePro 7Zi

7. The FirstWare Recover splash screen is displayed momentarily:

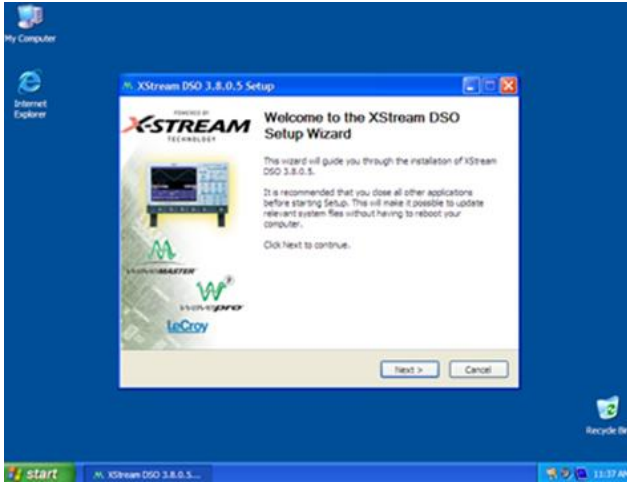


8. The recovery starts, and the FirstWare Progress screen is displayed. No further selections are required. The recovery takes about 10 minutes.



Note: The screen goes blank on occasion for prolonged periods. This is normal and is not an indication of any malfunctioning of the recovery process.

9. After the recovery is completed, the X-Stream software installer screen appears. Click Next to continue:



10. When the X-Stream installation is completed, reboot the oscilloscope (as follows).

Now you must activate Windows by Internet connection to Microsoft's Web site or by telephone. When activating, have the Windows Product Key number handy (it is affixed to the rear of the oscilloscope).

Restarting the Application

Upon initial power-up, the oscilloscope automatically loads the instrument application software. If you exit the application and want to reload it, touch the shortcut icon on the desktop:



If you minimize the application, touch the appropriate task bar or desktop icon to maximize it:



Restarting the Operating System

If you need to restart the Windows® operating system, reboot the oscilloscope by pressing and holding in the power switch for 10 seconds, then turning the power on again.

WavePro 7Zi

Reference

WavePro Specifications

Note: Specifications are subject to change without notice.

Vertical System	WavePro 715Zi	SDA, WavePro 725Zi	SDA, DDA, WavePro 735Zi	SDA, WavePro 740Zi	SDA, DDA, WavePro 760Zi
Analog (ProLink Input) Bandwidth @ 50Ω (-3dB) (≥ 10 mV/div)	NA	NA	NA	4 GHz (≥ 10mV/div)	6 GHz (≥ 10mV/div)
Analog (ProBus Input) Bandwidth @ 50Ω (-3dB)	1.5 GHz (≥ 10mV/div)	2.5 GHz (≥ 10mV/div)	3.5 GHz (≥ 10mV/div)	3.5 GHz (≥ 10mV/div)	3.5 GHz (≥ 10mV/div)
Analog (ProBus Input) Bandwidth @ 1 MΩ (-3dB)	500 MHz (typical)	500 MHz (typical)	500 MHz (typical)	500 MHz (typical)	500 MHz (typical)
Rise Time (Typical)	235 ps	150 ps	120 ps	105 ps	70 ps
Input Channels	4				
Bandwidth Limiters	20 MHz, 200 MHz, 1 GHz		20 MHz, 200 MHz, 1 GHz, 3 GHz		20 MHz, 200 MHz, 1 GHz, 3 GHz, 4 GHz
Input Impedance	50 Ω ±2% or 1 MΩ 16 pF, 10 MΩ 11 pF with supplied probe				
Input Cooling	1 MΩ: AC, DC, GND; 50 Ω: DC, GND				
Maximum Input Voltage	50 Ω: ±5 V _{rms} 1 MΩ: 250 V max, (peak AC: ≤ 10 kHz + DC)			50 Ω (ProBus): ±5 V _{rms} 50 Ω (ProLink): ±4 V _{peak} 1 MΩ (ProBus): 250 V max (peak AC: ≤ 10 kHz + DC)	
Vertical Resolution	8 bits; up to 11 bits with enhanced resolution (ERES)				
Sensitivity	50 Ω: 2 mV-1 V/div, fully variable (2-9.99 mV/div via zoom); 1 MΩ: 2 mV-10 V/div, fully variable				
DC Gain Accuracy	±1.5% of full scale				
Offset Range	50 Ω (ProBus Input): ±750 mV @ 10–170 mV/div ±4 V @ 172 mV/div–1 V/div 1 MΩ: (ProBus Input): ±1 V @ 2–128 mV/div ±10 V @ 130 mV–1.28 V/div ±100 V @ 1.3 V–10 V/div			50 Ω (ProLink Input): ±750 mV @ 10–118 mV/div ±4 V @ 120 mV/div–1 V/div 50 Ω (ProBus Input): ±750 mV @ 10–170 mV/div ±4 V @ 172 mV/div–1 V/div 1 MΩ: (ProBus Input): ±1 V @ 2–128 mV/div	

Getting Started Manual

Vertical System	WavePro 715Zi	SDA, WavePro 725Zi	SDA, DDA, WavePro 735Zi	SDA, WavePro 740Zi	SDA, DDA, WavePro 760Zi
				±10 V @ 130 mV–1.28 V/div ±100 V @ 1.3 V–10 V/div	
Offset Accuracy	±(1.5% of full scale +1.0% of offset value +1 mV)				

Horizontal System	WavePro 715Zi	SDA, WavePro 725Zi	SDA, DDA, WavePro 735Zi	SDA, WavePro 740Zi	SDA, DDA, WavePro 760Zi
Timebases	Internal timebase common to 4 input channels; an external clock may be applied at the auxiliary input				
Time/Division Range	Real time: 20 ps/div-1000 s/div (RIS mode: 20 ps/div-10 ns/div; Roll mode: up to 1000 s/div)				
Clock Accuracy	≤ 1 ppm+ (aging of 0.5 ppm/yr from last calibration)				
Time Interval Accuracy	< 0.06 / SR + (clock accuracy* Reading) (rms)				
Jitter Noise Floor	1.5 ps (Typical)	1 ps (Typical)	800 fs (Typical)	750 fs (Typical)	560 fs (Typical)
Trigger and Interpolator Jitter	3 ps _{rms} (Typical)	2 ps _{rms} (Typical)		1 ps _{rms} (Typical)	
Channel-Channel Deskew Range	±9 x time/div. setting, 100 ms max., each channel				
External Timebase Reference (Input)	10 MHz; 50 Ω impedance, applied at the rear input				
External Timebase Reference (Output)	10 MHz; 50 Ω impedance, applied at the rear output				
External Clock	0.1 Hz-100 MHz, 50 Ω or 1 MΩ impedance, applied at the auxiliary input				

Acquisition System	WP715Zi	WP725Zi	WP735Zi	WP740Zi	WP760Zi
Single-Shot Sample Rate/Ch	20 GS/s on 2 Ch 10 GS/s on 4 Ch (Option WPZi-1.5GHz-4X20GS doubles the sample rate)			40 GS/s on 2 Ch 20 GS/s on 4 Ch	
Random Interleaved Sampling (RIS)	200 GS/s for repetitive signals (20 ps/div, to 10 ns/div)				
Maximum Trigger Rate	1,00,000 waveforms/second (in Sequence Mode, up to 4 channels)				
Intersegment Time	800 μs				
Maximum Acquisition Memory Points/Ch	(4 Ch / 2 Ch)		Number of Segments		
Standard Memory	10 M / 20 M (Standard memory for SDA and DDA Oscilloscopes are 20 M / 40 M)		5000		
S-32 - Memory Option	32 M / 64 M		15,000		

WavePro 7Zi

Acquisition System	WP715Zi	WP725Zi WP735Zi WP740Zi WP760Zi
M-64 - Memory Option	64 M / 128 M	15,000
L-128 - Memory Option	128 M / 256 M	15,000

Acquisition Processing	
Averaging	Summed averaging to 1 million sweeps; continuous averaging to 1 million sweeps
Enhanced Resolution (ERES)	From 8.5 to 11 bits vertical resolution
Envelope (Extrema)	Envelope, floor, or roof for up to 1 million sweeps
Interpolation	Linear or Sin x/x

Triggering System	WavePro 715Zi	SDA, WavePro 725Zi	SDA, DDA, WavePro 735Zi	SDA, WavePro 740Zi	SDA, DDA, WavePro 760Zi
Modes	Normal, Auto, Single, and Stop				
Sources	Any input channel, Aux, Aux/10, or line; slope and level unique to each source (except line trigger)				
Coupling Mode	DC, AC, HFRej, LFRej				
Pre-Trigger Delay	0-100% of memory size (adjustable in 1% increments of 100 ns)				
Post-Trigger Delay	0-10,000 divisions in real time mode, limited at slower time/div settings or in roll mode				
Hold-off by Time or Events	From 2 ns up to 20 s or from 1 to 99, 999,999 events				
Internal Trigger Range	±4.1 div from center				
Trigger Sensitivity with Edge Trigger (Ch 1-4) ProBus Inputs	2 div @ < 1 GHz 1.5 div @ < 500 MHz 1.0 div @ < 200 MHz (for DC, AC, LFRej coupling, ≥ 10 mV/div, 50 Ω)	2 div @ < 2.5 GHz 1.5 div @ < 1.25 GHz 1.0 div @ < 200 MHz (for DC, AC, LFRej coupling, ≥ 10 mV/div, 50 Ω)	2 div @ < 3.5 GHz 1.5 div @ < 1.75 GHz 1.0 div @ < 200 MHz (for DC, AC, LFRej coupling, ≥ 10 mV/div, 50 Ω)		
Trigger Sensitivity with Edge Trigger (Ch 1-4) ProLink Inputs	Not Applicable			2 div @ < 4 GHz 1.5 div @ 2 GHz 1.0 div @ 200 MHz (for DC, AC, LFRej coupling, ≥ 10 mV/div, 50 Ω)	2 div @ < 6 GHz 1.5 div @ 3 GHz 1.0 div @ 200 MHz (for DC, AC, LFRej coupling, ≥ 10 mV/div, 50 Ω)
External Trigger Sensitivity, (Edge Trigger)	2 div @ < 1 GHz 1.5 div @ < 500 MHz 1.0 div @ < 200 MHz				

Getting Started Manual

Triggering System	WavePro 715Zi	SDA, WavePro 725Zi	SDA, DDA, WavePro 735Zi	SDA, WavePro 740Zi	SDA, DDA, WavePro 760Zi
(for DC, AC, LFRaj coupling)					
Max, Trigger Frequency, SMART Trigger™	1.0 GHz @ ≥ 10 mV/div (minimum triggerable width 500 ps)	2.0 GHz @ ≥ 10 mV/div (minimum triggerable width 500 ps)	2.0 GHz @ ≥ 10 mV/div (minimum triggerable width 500 ps)	2.0 GHz @ ≥ 10 mV/div (minimum triggerable width 500 ps)	
External Trigger Input Range	Aux (± 0.4 V); Aux/10 (± 4 V)				

Basic Triggers	
Edge	Triggers when signal meets slope (positive, negative, or either) and level condition.
TV-Composite Video	Triggers NTSC or PAL with selectable line and field; HDTV (720p, 1080i, 1080p) with selectable frame rate (50 or 60 Hz) and Line; or CUSTOM with selectable Fields (1-8), Lines (up to 2000), Frame Rates (25, 30, 50, or 60 Hz), Interlacing (1:1, 2:1, 4:1, 8:1), or Synch Pulse Slope (Positive or Negative).
Window	Trigger when signal or exits a window defined by adjustable thresholds.

SMART Triggers	
State or Edge Qualified	Triggers on any input source only if a defined state or edge occurred on another input source. Delay between source is selectable by time or events.
Qualified First	In Sequence acquisition mode, triggers repeatably on event B only if a defined pattern, state, or edge (event A) is satisfied in the first segment of the acquisition. Delay between sources is selectable by time or events.
Dropout	Triggers if signal drops out for longer than selected time between 1 ns and 20 s.
Pattern	Logic combination (AND, NAND, OR, NOR) of 5 inputs (4 channels and external trigger input). Each source can be high, low, or don't care. The High and Low level can be selected independently. Triggers at start or end of the pattern.

SMART Triggers with Exclusion Technology	
Glitch	Triggers on positive or negative glitches with widths selectable as low as 200 ps (depending on oscilloscope bandwidth) to 20 s, or on intermittent faults.
Width (Signal or Pattern)	Triggers on positive, negative, or both widths with widths selectable as low as 200 ps (depending on oscilloscope

WavePro 7Zi

SMART Triggers with Exclusion Technology	
	bandwidth) to 20 s, or on intermittent faults.
Interval (Signal or Pattern)	Triggers on intervals selectable between 1 ns and 20 s.
Timeout (State/Edge Qualified)	Triggers on any source if a given state (or transition edge) has occurred on another source. Delay between sources is 1 ns, to 20 s, or 1 to 99,999,999 events.
Runt	Trigger on positive or negative runts defined by two voltage limits and two time limits. Select between 1 ns and 20 ns.
Slew Rate	Trigger on edge rates. Select limits for dV, dt, and slope. Select edge limits between 1 ns and 20 ns.
Exclusion Triggering	Trigger on intermittent faults by specifying the expected behavior and triggering when that condition is not met.

High-Speed Serial Protocol Triggering	WavePro715Zi	WavePro 725Zi	WavePro 735Zi	WavePro 740Zi	WavePro 760Zi
Data Rates	Not available	(Option WPZi-MSPT Standard with SDA) 50 Mb/s-1.25 Gb/s		(Option WPZi-HSPT Standard with SDA) 50 Mb/s-2.7 Gb/s	
Pattern Length	-	80 bits, NRZ or 8b10b			
Clock and Data Outputs	-	400 mV _{p-p} (typical), AC coupled			
Clock Recovery Jitter	-	1 ps _{rms} + 0.3% Unit Interval rms for PRBS data patterns with 50% transition density			
Hardware Clock Recovery Loop BW	-	PLL Loop BW = Fbaud/5500, 50 Mb/s to 1.25 Gb/s (Typical)			

Low-Speed Serial Protocol Triggering (Optional)	
Available	I ² C, SPI, (SPI, SSPI, SIOP), UART-RS232, CAN, LIN, FlexRay Reference individual datasheets for complete specifications.

Color Waveform Display	
Type	Color 15.3" flat panel TFT-Active Matrix LCD with high resolution touch screen
Resolution	WXGA; 1280 X 768 pixels
Number of Traces	Display a maximum of 8 traces. Simultaneously display channel zoom, memory, and math traces.
Grid Styles	Auto, Single, Dual, Quad, Octal, X-Y, Single+X-Y, Dual +X-Y
Waveform Representation	Sample dots joined, or sample dots only

Integrated Second Display (optional)	
Type	Color 15.3" flat panel TFT-Active Matrix LCD with high resolution touch screen
Resolution	WXGA; 1280 x 768 pixels

Getting Started Manual

LeCroy WaveStream Fast Viewing Mode	
Intensity	256 Intensity Levels, 1-100% adjustable via front panel control
Number of Channels	Up to 4 simultaneously
Type	Select analog or color graded
Max. Sampling Rate	40 GS/s (20 GS/s for WavePro 715Zi without WPZi-1GHZ-4X20GS option)
Persistence Aging	Select from 500 ms to Infinite
Waveforms/Second (continuous)	Up to 2500 Waveforms/second

Analog Persistence Display	
Analog and Color-Graded Persistence	Variable saturation levels; stores each trace's persistence data in memory
Persistence Types	Select analog, color, or three-dimensional
Trace Selection	Active persistence on all or any combination of traces
Persistence Aging	Select from 500 ms to infinity
Sweep Display Modes	All accumulated, or all accumulated with last trace highlighted

High-Speed Digitizer Output (Option)	
Type	LeCroy LSIB
Transfer Rate	Up to 250 Mpts/s (Maximum)
Output Protocol	PCI Express, Gen1 (4 lanes utilized for data transfer)
Control Protocol	TCP/IP
Command Set	Via Windows Automation or LeCroy Remote Command Set

Zoom Expansion Traces	
	Display up to 4 Zoom and 8 Math/Zoom traces

Processor/CPU	
Type	Intel® Core™ 2 Quad, 2.5 GHz (or better)
Processor Memory	2 GB standard, up to 8 GB optional (4 GB standard with S-32 memory, 8 GB standard with M-64 or L-128 memory)
Operating System	Microsoft Windows® Vista® Business Edition (64-bit) with SP1
Real Time Clock	Date and time displayed with waveform and in hardcopy files. SNTP support to synchronize to precision internal clocks.

Internal Waveform Memory	
	4 active waveform memory traces (M1-M4) store 16-bit/point full length waveforms. Waveforms can be stored to any number of files limited only by the data storage media capacity.

WavePro 7Zi

Setup Storage

Front Panel and Instrument Status	Store to the internal hard drive or to a USB-connected peripheral device.
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Interface	WavePro Z10Zi	WavePro Z25Zi	WavePro Z35Zi	WavePro Z40Zi	WavePro Z60Zi
Remote Control	Via Windows Automation, or LeCroy Remote Command Set				
Network Communication Standard	LXI Class C, VXI-11, VICP, DCOM				
GPIB Port (optional)	Supports IEEE - 488.2				
LSIB Port (optional)	Supports PCI Express Gen1 x4 protocol with LeCroy supplied API				
USB Device Port (optional)	Type-B				
Ethernet Port	Supports 10/100/1000BaseT Ethernet interface (RJ45 port)				
USB Ports	Minimum 6 total (including 3 front panel) USB 2.0 ports support Windows compatible devices				
External Monitor Port	15-pin D-Type WXGA compatible to support customer-supplied external monitor. DVI and power connector to support LeCroy WPZi-EXTDISP-15 additional touch screen display accessory. Includes support for extended desktop operation with optional LeCroy or other second monitor.				
Peripheral Bus	LeCroy LBUS standard				

Auxiliary Input

Signal Types	Select External Trigger or External Clock Input on the front panel
Coupling	50 Ω : DC; 1 M Ω : AC, DC, GND
Max. Input Voltage	50 Ω : 5 V_{rms} ; 1 M Ω : 250 V (Peak AC < 10 kHz + DC)

Auxiliary Output

Signal Types	Select from calibrator, control signals, or Off
Calibrator Signal	500 Hz-5 MHz square wave or DC level; 0.0 to 500 mV into 50 Ω (0-1 V into 1 M Ω)
Control Signals	Trigger enabled, trigger out, pass/fail status

Automatic Setup

Auto Setup	Automatically sets timebase, trigger, and sensitivity to display a wide range of repetitive signals
Find Vertical Scale	Automatically sets the vertical sensitivity and offset for the selected channel to display a waveform with the maximum dynamic range

Getting Started Manual

General	
Auto Calibration	Ensures specified DC and timing accuracy is maintained for 1 year minimum.

Probes	
Probes	Qty. (4) + 10 Passive Probes
Probe System	ProBus (and ProLink on 4 and 6 GHz models). Automatically detects and supports a variety of compatible probes
Scale Factors	Automatically or manually selected depending on probe used
Calibration Output	1 kHz square wave, 1 V _{p-p} (typical), output to probe hook

Power Requirements	
Voltage	100-240 VAC ±10% at 50/60 Hz; 100-120 VAC ±10% at 400 Hz; Automatic AC Voltage Selection
Max. Power Consumption	800 W/800 VA

Environmental	
Temperature (Operating)	+5 °C to +40 °C including CD-RW/DVD-ROM drive
Temperature (Non-Operating)	-20 °C to +60 °C
Humidity (Operating)	5% to 80% relative humidity (non-condensing) up to +31 °C. Upper limit derates to 50% relative humidity (non-condensing) at +40 °C.
Humidity (Non-Operating)	5% to 95% relative humidity (non-condensing) as tested per MIL-PRF-28800F
Altitude (Operating)	Up to 10,000 ft. (3048 m) at or below +25 °C
Altitude (Non-Operating)	Up to 40,000 ft. (12,192 m)
Random Vibration (Operating)	0.5 g _{rms} 5 Hz to 500 Hz, 15 minutes in each of three orthogonal axes
Random Vibration (Non-Operating)	2.4 g _{rms} 5 Hz to 500 Hz, 15 minutes in each of three orthogonal axes as tested per MIL-PRF-28800F
Functional Shock	20 g peak, half sine, 11 ms pulse, 3 shocks (positive and negative) in each of three orthogonal axes, 18 shocks total as tested per MIL-PRF-28800F

Physical Dimensions	
Dimensions (HWD)	355 mm x 467 mm x 289 mm; 14" x 18.4" x 11.4" (height excludes feet)
Weight	18.4 kg; 40 lbs.
Shipping Weight	26.6 kg; 58 lbs.

Certifications	
	CE Compliant, UL and cUL listed; conforms to EN 61326, EN 61010-1, UL 61010-1 2nd edition, and CSA C22.2 No. 61010-1-04

Warranty and Service	
	Three-year warranty; calibration recommended annually. Optional service programs include extended warranty, upgrades, and calibration services.

WavePro 7Zi

Technical Support

For assistance with installation, calibration, and a full range of software applications contact the customer service center nearest you. You can also find contact information for the following offices on the LeCroy Web site at <http://www.lecroy.com/tm/ServiceSupport>.

Contact Your Local LeCroy Technical Support Office for Help	
<p>United States and Canada Phone Sales: 800-553-2769 or 845-425-2000 Fax (Sales&Service): 845-578-5985 Email Sales: contact.corp@lecroy.com Web Site: http://www.lecroy.com/</p>	<p>Europe Phone Sales: + 41 22 719 2228 Fax Sales: + 41 22 719 2230 Email Sales: contact.sa@lecroy.com Web Site: http://www.lecroy.com/europe</p>
<p>China Phone Sales: ++86 28- 86527180 / 7181 / 7182 Fax Sales: +86 28-8652 7183 Email Sales: george.ni@lecroy.com</p>	<p>Singapore Phone Sales: ++ (65) 64424880 Fax Sales: ++ (65) 64427811 Email Sales: jimmy.ong@lecroy.com</p>
<p>TaiwanPhone Sales: (886) 2 8226 1366 Fax Sales: (886) 2 8226 1368 Email Sales: sales_twn@lecoln.com.tw Web Site: http://www.lecoln.com.tw</p>	<p>Tokyo Phone Sales: ++ 81 3 3376 9400 Fax Sales: ++ 81 3 3376 9587 Web Site: http://www.lecroy.com/japan</p>
<p>Korea - Seoul Phone Sales: ++ 82 2 3452 0400 Fax Sales: ++ 82 2 3452 0490 Web Site: http://www.lecroy.co.kr</p>	

Thank you for purchasing a
WavePro, SDA, or DDA 7 Zi
Oscilloscope

LeCroy

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