Reference

CSA8000B Communications Signal Analyzer
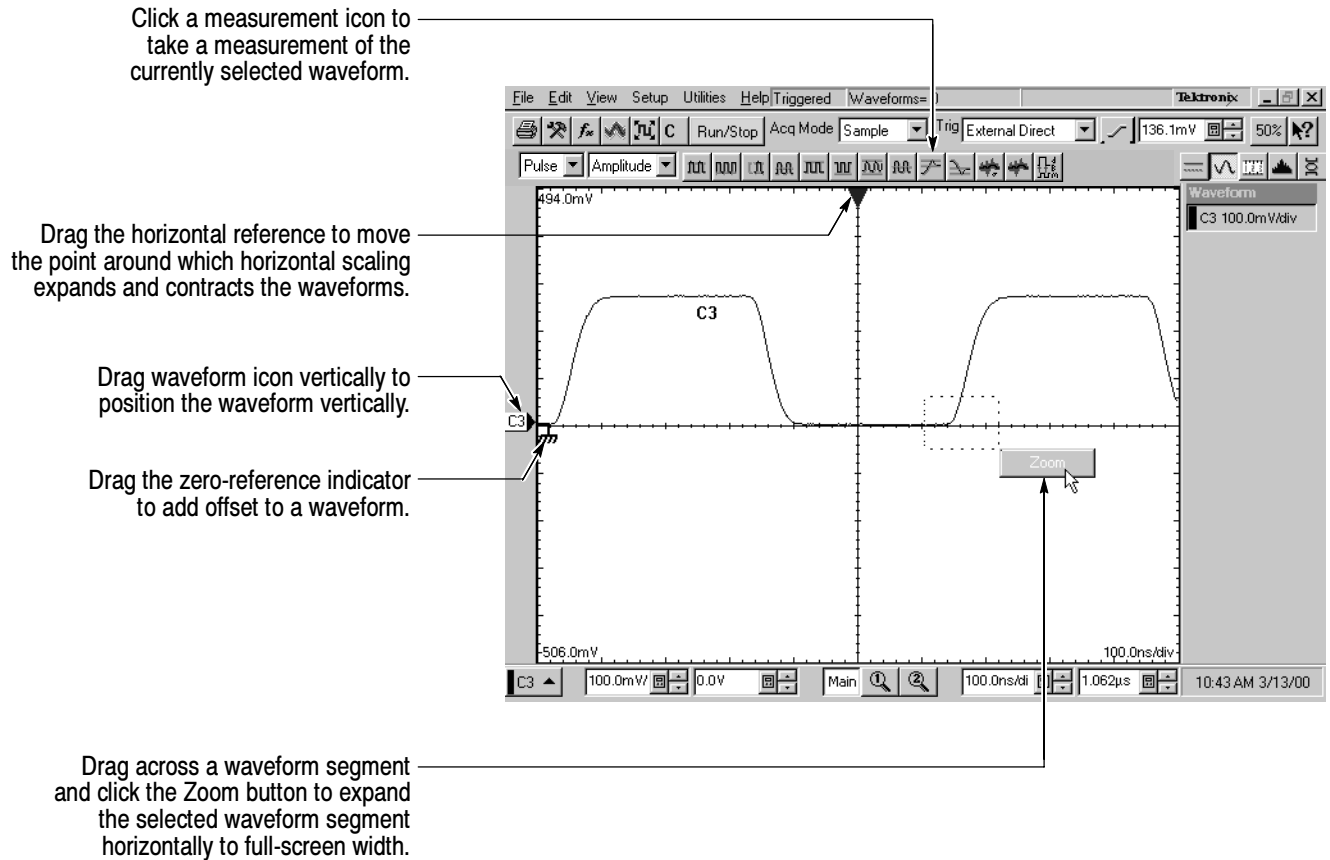
TDS8000B Digital Sampling Oscilloscope

071-1096-00

To Use the Screen Controls

Use the mouse to select waveforms, menus, and buttons. You can also drag with the mouse where indicated below.

Click a measurement icon to take a measurement of the currently selected waveform.

Drag the horizontal reference to move the point around which horizontal scaling expands and contracts the waveforms.

Drag waveform icon vertically to position the waveform vertically.

Drag the zero-reference indicator to add offset to a waveform.

Drag across a waveform segment and click the Zoom button to expand the selected waveform segment horizontally to full-screen width.
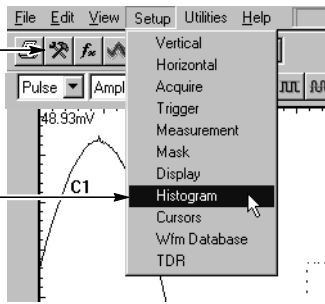
Other Navigation Tips:

- Right click on display items and readouts to find set-up shortcuts and additional options.

- Use the touch screen to make selections if a mouse is not available. Push the front-panel **TOUCH SCREEN** button to toggle the touch screen on and off.

- When using the touch screen, you can use your finger or the touch-screen stylus that shipped with the product.
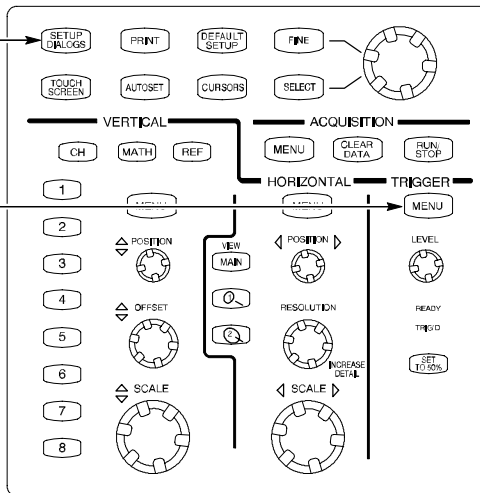
To Access the Setup Dialog Boxes

Click the Setups icon to access the setup dialog boxes with the one last active selected.

Access any setup dialog box from the Setup menu.

File	Edit	View	Setup	Utilities	Help

Setup menu:
- Vertical
- Horizontal
- Acquire
- Trigger
- Measurement
- Mask
- Display
- Histogram
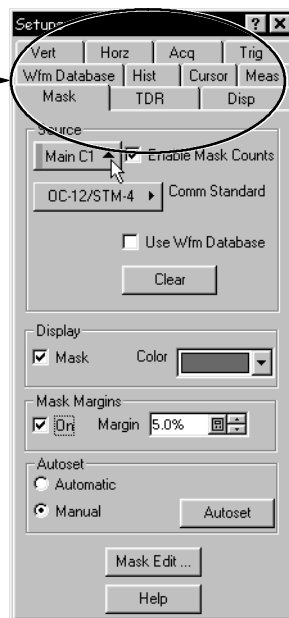- Cursors
- Wfm Database
- TDR

Pulse | Ampl

48.93mV

C1

Push the **SETUP DIALOGS** button to access the last active setup dialog box.

Push a **MENU** button to access the setup dialog box for that control group.

SETUP DIALOGS   PRINT   DEFAULT SETUP   FINE

TOUCH SCREEN   AUTOSET   CURSORS   SELECT

VERTICAL

CH   MATH   REF

1
2
3
4
5
6
7
8

MENU

△ POSITION ▽

△ OFFSET ▽

△ SCALE ▽

ACQUISITION

MENU   CLEAR DATA   RUN/STOP

HORIZONTAL — TRIGGER

VIEW
MAIN

MENU

◁ POSITION ▷

RESOLUTION

◁ SCALE ▷

INCREASE DETAIL

MENU

LEVEL

READY

TRIG'D

SET TO 50%

Click on the tabs to select among the setup dialog boxes.

Setups

Vert	Horz	Acq	Trig
Wfm Database	Hist	Cursor	Meas
Mask	TDR	Disp	

Source

Main C1   ☑ Enable Mask Counts

OC-12/STM-4 ▶   Comm Standard

☐ Use Wfm Database

Clear

Display
☑ Mask   Color [▼]

Mask Margins
☑ On   Margin 5.0% ▣▲▼

Autoset
○ Automatic
● Manual   Autoset

Mask Edit ...

Help

To Display a Communication Signal

⚠ **CAUTION.** *To prevent damage, make sure instrument power is turned off before installing sampling modules. To help prevent damage from ESD, always attach and use the wrist strap while making any electrical signal connections.*

Carefully install the sampling module in the instrument. **1**
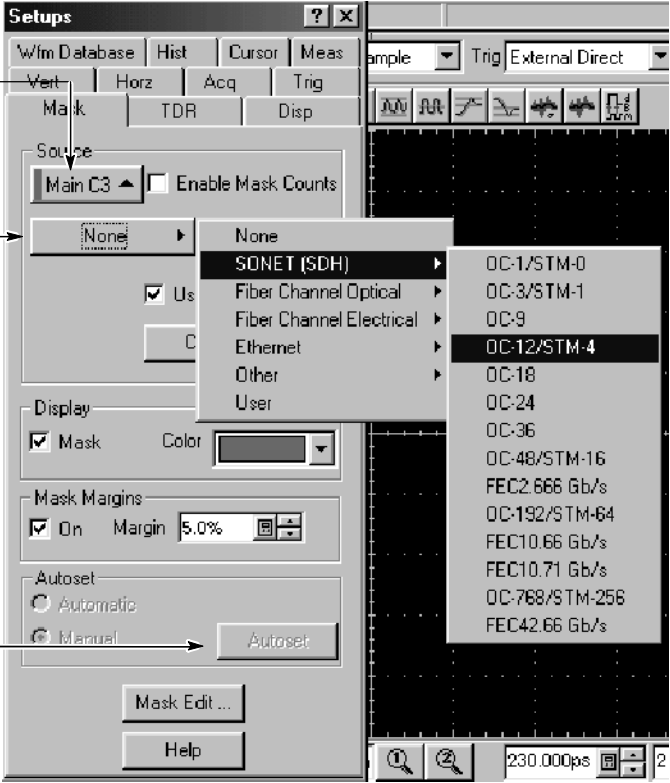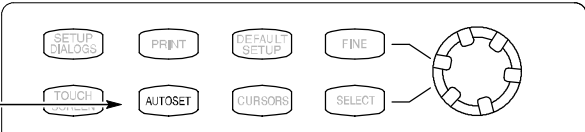
Connect signals to your sampling module. **2**

Communication signal

Trigger

Select the channel that you want to display in the Mask setup dialog box. **3**

Select the communication standard. **4**

Click **Autoset** in the Mask setup dialog box or on the front panel. **5**

Setups ? X

Wfm Database	Hist	Cursor	Meas	ample ▼	Trig	External Direct	▼
Vert	Horz	Acq	Trig
Mask	TDR	Disp

Source

Main C3 ▲ ☐ Enable Mask Counts

None ▶

- None
- SONET (SDH) ▶
- Fiber Channel Optical ▶
- Fiber Channel Electrical ▶
- Ethernet ▶
- Other ▶
- User

| OC-1/STM-0 |
| OC-3/STM-1 |
| OC-9 |
| OC-12/STM-4 |
| OC-18 |
| OC-24 |
| OC-36 |
| OC-48/STM-16 |
| FEC2.666 Gb/s |
| OC-192/STM-64 |
| FEC10.66 Gb/s |
| FEC10.71 Gb/s |
| OC-768/STM-256 |
| FEC42.66 Gb/s |

Display

☑ Mask   Color

Mask Margins

☑ On   Margin 5.0%

Autoset

○ Automatic

● Manual   Autoset

Mask Edit ...

Help

230.000ps

SETUP DIALOGS   PRINT   DEFAULT SETUP   FINE

TOUCH   AUTOSET   CURSORS   SELECT

To Display Optical Signals:

- Install up to two optical modules into the large-module compartments. These optical inputs become channel 1 and channel 2. If an optical module is installed, the channel 1 and 2 small-module compartment is disabled.

- Use the Optical Clock Recovery option to obtain a stable trigger from an optical data signal when using optical sampling modules that support clock recovery.
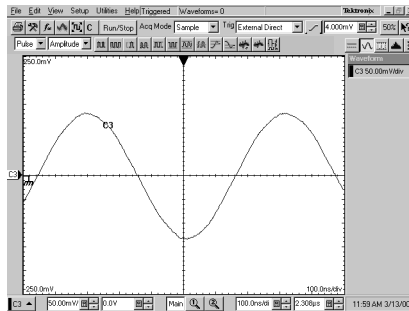
To See More Waveform Detail

Drag across the segment of the waveform that you want to see in greater detail. **1**

Click the **Zoom** button. **2**
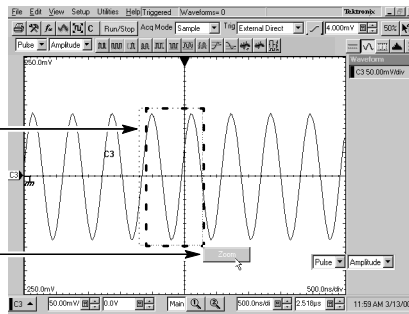
See the waveform reacquired with increased horizontal resolution. **3**

To Add Magnified Views

Click these buttons to add one or two magnified time base views. **1**

Drag the brackets in the main time base to specify the position and scale for the magnified view. **2**

Drag the boundary between two graticules to resize the graticules. **3**

Main View

Mag View

Click a button to select among the displayed views. Horizontal scale, position, and other controls operate on the selected time base view. **4**
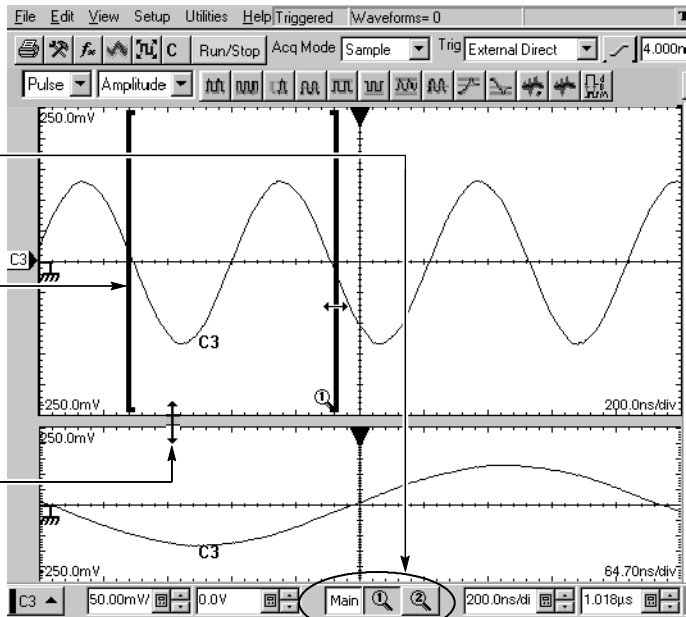
5

Click the magnified time base button again to remove that view from the display. (First click selects; the second removes.)

To Analyze Communication Signals

Use Mask Testing

Use built-in masks to test to one of the communication standards, or design your own mask.

Select a channel to mask test. **1**

Select a standard mask in the Mask setup dialog box. **2**

If you want, disable mask counts. (Selecting a mask in step 2 automatically enabled them.) **3**

If you want, you can enable margins to explore design margins of your communications signal. **4**

Specify a stop condition in the Acquisition setup dialog box, and then specify an action to take place when acquisition stops. (You can set counts for the Mask Hits condition here also.) **5**
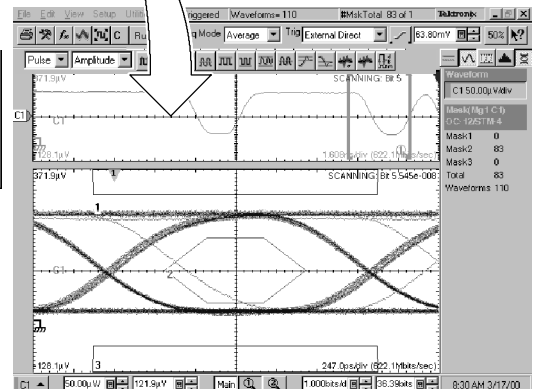
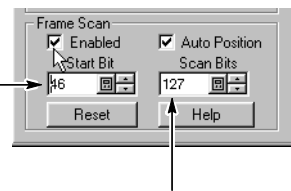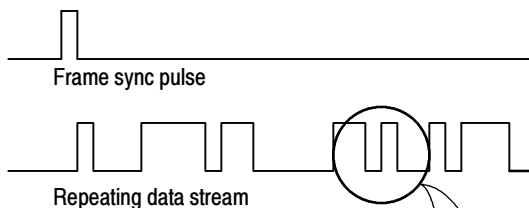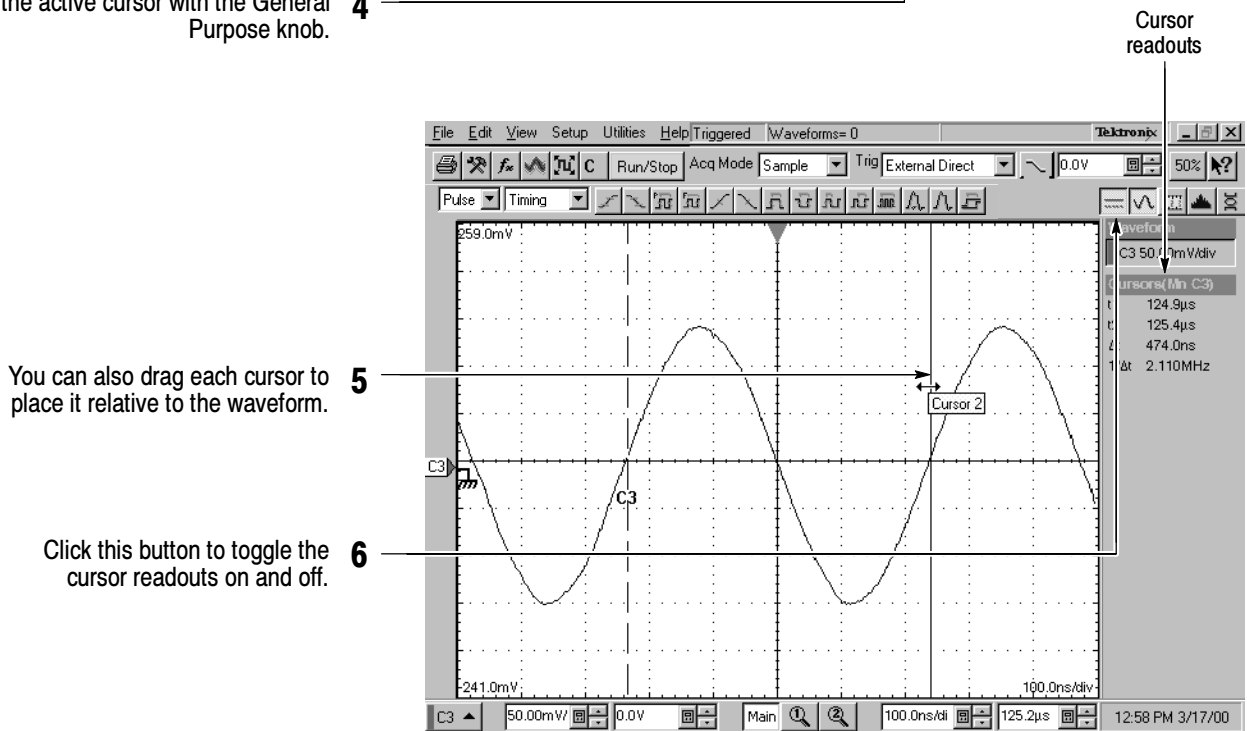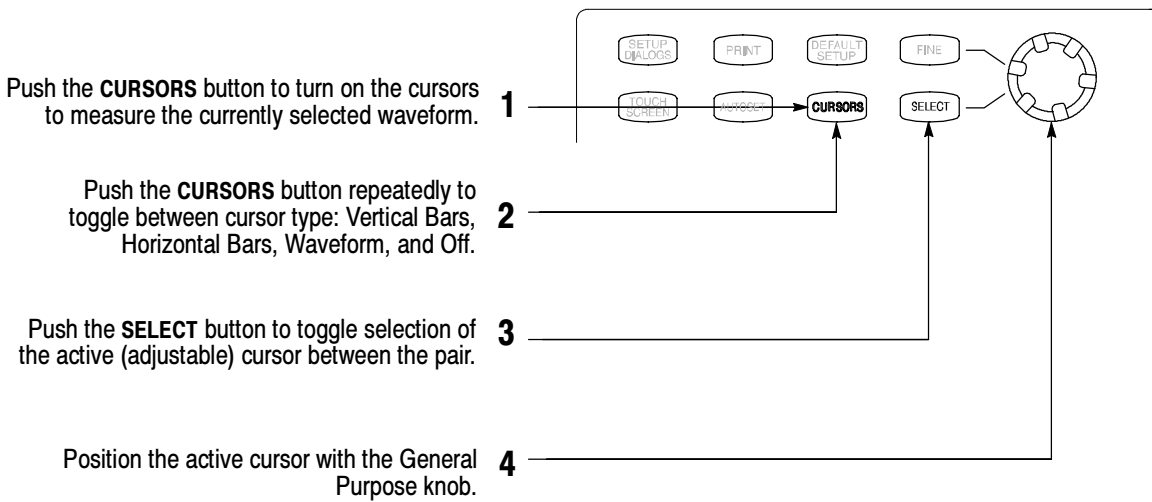Read the mask-hits count in the readout. **6**
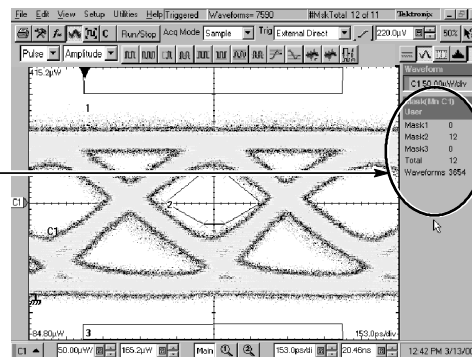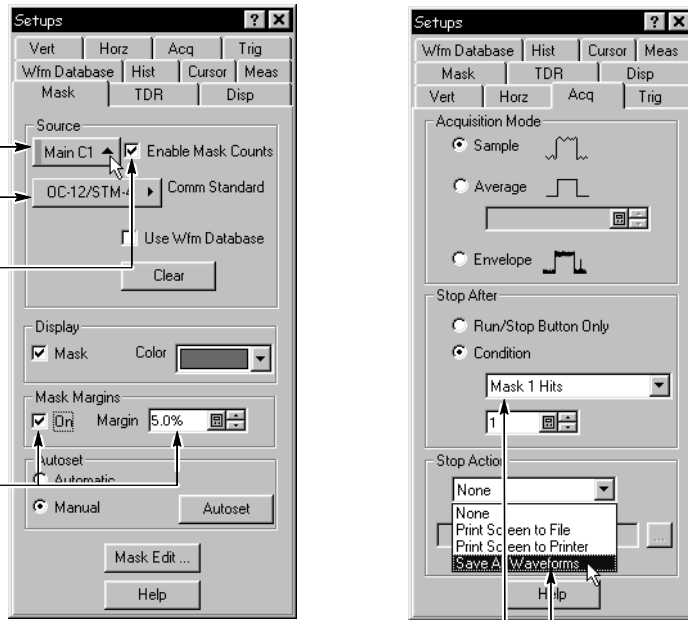
Use FrameScan®

Use FrameScan to test a specific bit (or range of bits) in a repeating frame of data.

You set up FrameScan from the Horizontal Setup Dialog box. See the instrument user manual for more information.

Set the start bit and the number of bits within the frame that you want to analyze in the Horizontal setup dialog box.

Frame sync pulse

Repeating data stream

To Take Measurements With Cursors

Push the **CURSORS** button to turn on the cursors to measure the currently selected waveform. **1**

Push the **CURSORS** button repeatedly to toggle between cursor type: Vertical Bars, Horizontal Bars, Waveform, and Off. **2**

Push the **SELECT** button to toggle selection of the active (adjustable) cursor between the pair. **3**

Position the active cursor with the General Purpose knob. **4**

You can also drag each cursor to place it relative to the waveform. **5**

Click this button to toggle the cursor readouts on and off. **6**

Cursor readouts

Other Cursor Measurement Tips:

- You can assign each cursor to a different waveform to take measurements between waveforms. Make these selections in the Cursor setup dialog box.

- If you use two magnified time base views, you can take precision timing measurements between two distant points on a waveform. Magnify each point of interest in a separate time base, and then place one cursor on each point. The Δ-time cursor readout will then reflect the position and resolution of the magnified time bases.

To Take Automatic Measurements

Select the measurement signal type. **1**

Select the measurement category. **2**

Click a measurement button to take the measurement on the currently selected waveform. **3**

Or completely set up the measurement in the Meas setup dialog box. **4**

Read the measurement results in the readouts. The dialog box readout displays results with full resolution. **5**

Automatic Measurement Choices

Amplitude						Area	Timing			
AC RMS	Cycle Mean	Eye Opening Factor	Mid	Q Factor	Suppression Ratio (dB)	Area	Bit Rate	Delay	Frequency	+ Width
Amplitude	Cycle RMS	Gain	Min	RMS		Area Cycle	Bit Time	+ Duty Cycle	Period	- Width
Avg. Optical Power (dBm)	Extinction Ratio	High	+ Overshoot	RMS Noise			Burst Width	- Duty Cycle	Phase	
Avg. Optical Power (watts)	Extinction Ratio (%)	Low	- Overshoot	Signal-to-Noise Ratio			+ Cross	Duty Cycle Distortion	Pk-Pk Jitter	
Crossing %	Extinction Ratio (dB)	Max	Pk-Pk	Suppression Ratio			- Cross	Eye Width	Rise Time	
Crossing Level	Eye Height	Mean	Pk-Pk Noise	Suppression Ratio (%)			Crossing Time	Fall Time	RMS Jitter	

Note: All measurements are accessible from the Meas Setup dialog box. Some measurements are not accessible from the Meas. Toolbar at top of the display.

To Customize an Automatic Measurement

Select Region tab and turn on gates to isolate the measurement to a specific part of the waveform.

Select the HiLow tab and choose a method for determining reference levels.

Select the RefLevel tab and adjust the measurement reference levels to different relative or different absolute values.

Select Annotations to see where the measurement is being taken on the waveform.

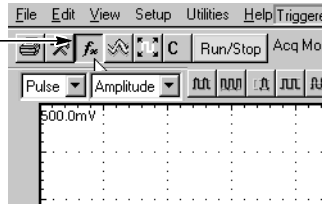**Select Statistics to see accumulated statistics as the measurement is being performed.**

Setups (Region tab)

Vert | Horz | Acq | Trig
Mask | TDR | Disp
Wfm Database | Hist | Cursor | Meas

Meas 1 | ☑ On
Select Meas | C3 Rise
Value
Show Stats | Clear Stats

Source1 Source2 | Set to Default
Source | Region | HiLow | RefLevel

Gates
G1 | 5.0% | 21.62ns
G2 | 5.0% | 23.23ns
☑ On

Edges
Slope | ○ +/- | ○ + | ○ -
Direction | ⊙ --> | ○ <--

☑ Statistics | Weighting 32
☑ Annotations | Help

Setups (HiLow tab)

Vert | Horz | Acq | Trig
Mask | TDR | Disp
Wfm Database | Hist | Cursor | Meas

Meas 1 | ☑ On
Select Meas | C3 Rise
Value
Show Stats | Clear Stats

Source1 Source2 | Set to Default
Source | Region | HiLow | RefLevel

Tracking Method
⊙ Auto | ○ Min/Max
○ Mode | ○ Mean

☐ Track High
High | 50.00mV
☐ Track Low
Low | 50.00mV

☑ Statistics | Weighting 32
☑ Annotations | Help

Setups (RefLevel tab)

Vert | Horz | Acq | Trig
Mask | TDR | Disp
Wfm Database | Hist | Cursor | Meas

Meas 1 | ☑ On
Select Meas | C3 Rise
Value
Show Stats | Clear Stats

Source1 Source2 | Set to Default
Source | Region | HiLow | RefLevel

Reference Level Calc Method
⊙ Relative | ○ Absolute
○ High Delta | ○ Low Delta

Reference
Hi | 90.0%
Mid
Low | 10.0%

☑ Statistics | Weighting 32
☐ Annotations | Help

Oscilloscope Display

File Edit View Setup Utilities Help Triggered | Waveforms= 0 | Tektronix

Run/Stop | Acq Mode Average | Trig External Direct | 133.2mV | 50%

Pulse | Timing

865.0mV

Waveform
C3 50.00mV/div

Measurement
1 C3 Rise 47.66 ns
Min 46.76 ns
Max 47.71 ns
Mean 47.66 ns
StdDev 4.803 ps

C3

Meas1 Rise:
C3 rising edge low cross point = 1.36609689µs

-135.0mV | 20.00ns/div

C3 | 50.00mV/ | 0.0V | Main | 20.00ns/di | 1.287µs | 11:58 AM 3/15/00

To Use Math Waveforms

Click the *f_x* button to display the
Define Math dialog box.

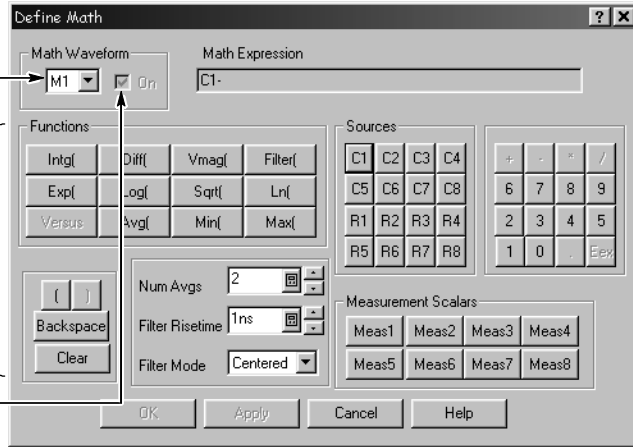**1**

Select the math waveform you want to define.

2

Use the controls in the Define Math dialog
box to define the math expression. Build
the waveform expression using sources,
operators, constants, and functions.

3

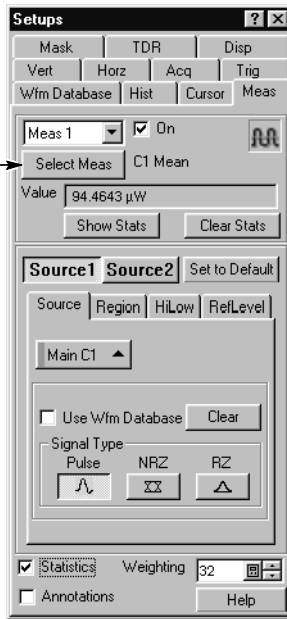Click to check the On box to display
the math waveform.

4

A Math Waveform Example

Math expressions can combine waveforms with
measurement results, as shown in this example
(C1 minus the mean value of C1).

Define Meas1 as the Mean value of
C1 in the Meas setup dialog box.

1

Enter this sequence in the Define
Math dialog box to build the math
waveform expression.

2
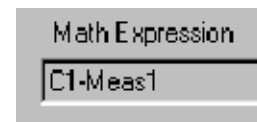
To Use TDR

⚠ **CAUTION.** To help prevent damage from ESD, always attach and use the wrist strap while making electrical signal connections.

Attach your network to TDR-capable sampling modules. **1**

Click the **Preset** button to automatically display the incident and reflected steps by automating the following tasks: **2**

- Turns on the channel
- Turns on a step
- Does a TDR autoset

Click the polarity button to toggle the step edge to the polarity you chose. **3**

Set the vertical scale Units to V (volts), Ω (ohms), or ϱ (rho). **4**

If performing differential TDR, select a channel pair for deskew adjustment from pulldown list (even numbered channel gets adjusted). **5**

Then use the box arrows (or click the keypad icon and use a virtual keypad) to set the deskew percent value. **6**

Select an internal clock rate from the pulldown list. The instrument will generate TDR pulses at this rate. Use a lower clock rate to examine long cables or other interconnections. **7**
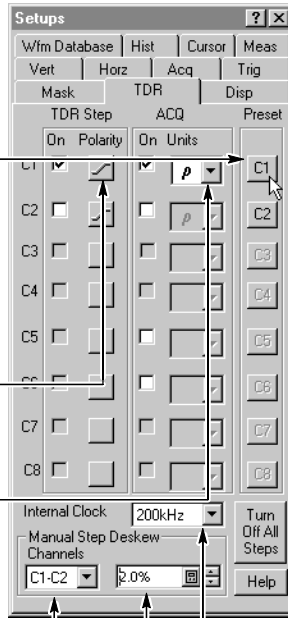
To Use Histograms

1 Select and enable a vertical or horizontal histogram in the Hist(ogram) setup dialog box.

2 Click and drag the edges of the histogram box to enclose a portion of the waveform.

3 The histogram displays at the edge of the graticule. The histogram statistics are displayd in the readout.

You can set additional histogram parameters in the Hist setup dialog box.
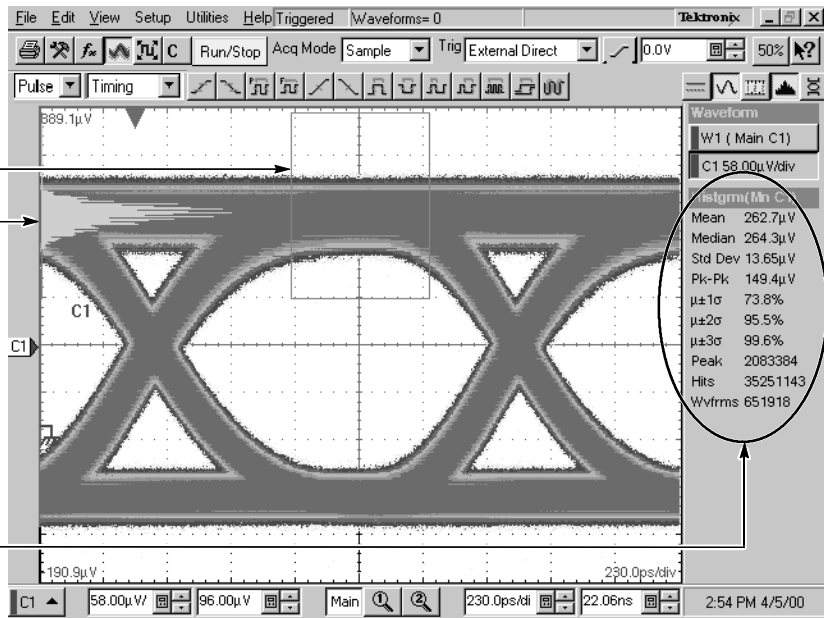
To Use Color Grading

1 Click here to assign the selected waveform to an internal waveform database and to display the waveform using color grading. Click the button again to toggle display of color grading off.

2 Choose between varying color or intensity of the waveform database to indicate how often a data point occurs.

3 Set count emphasis, where higher values increasingly emphasizes in the display the count differences between the samples with low counts and those with high counts.
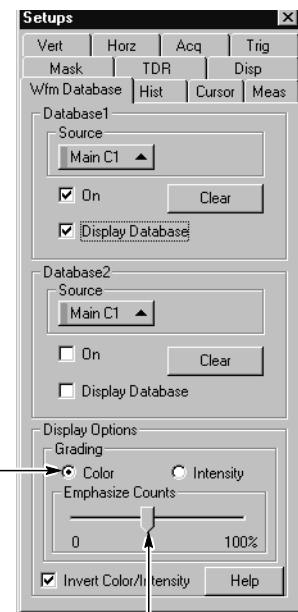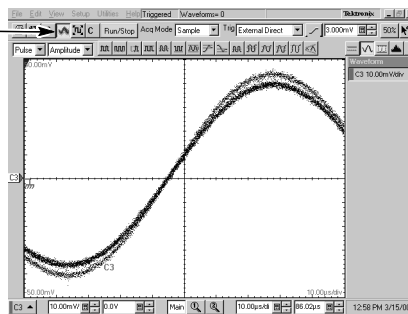
To Document Your Results

To Save a setup or a waveform, click **Save Setup** or **Save Waveform** in the File menu.
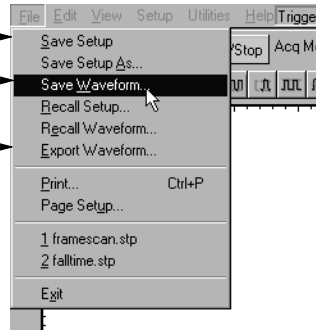

To export waveform data into a comma-separated ASCII file, click **Export Waveform** in the File menu.

```
0.006586,0.131347,0.180097,0.194866,
0.198260,0.199148,0.199192,0.199377,
0.199380,0.199479,0.199614,0.199705,
0.199631,0.199742,0.199782,0.200030,
0.199810,0.199899,0.200003,0.199860,
0.199931,0.200004,0.199855,0.199919,
0.200003,0.200217,0.199920,0.200049,
```

To print a hard copy to an attached printer or a network printer, click the print icon in the toolbar. If necessary, you can make changes to the page orientation in the Page Setup dialog box, and you can select Ink-saver mode, to save ink when printing.
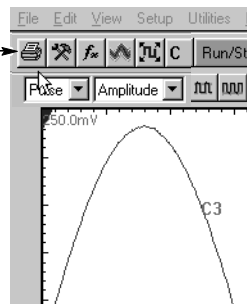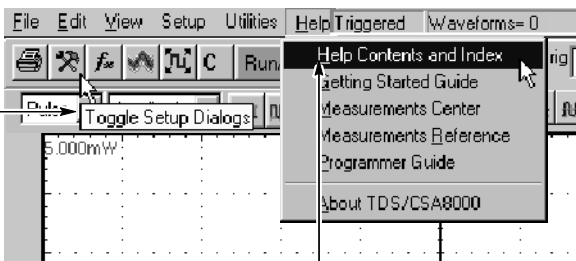

To copy a screen image into another application, choose the **Print to file** option in the print dialog. Save the screen image in a format that is compatible with your application, and then insert the screen image into your document.
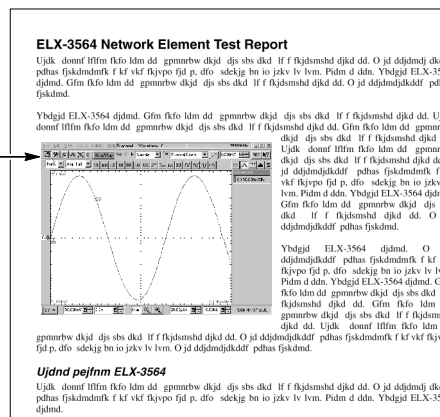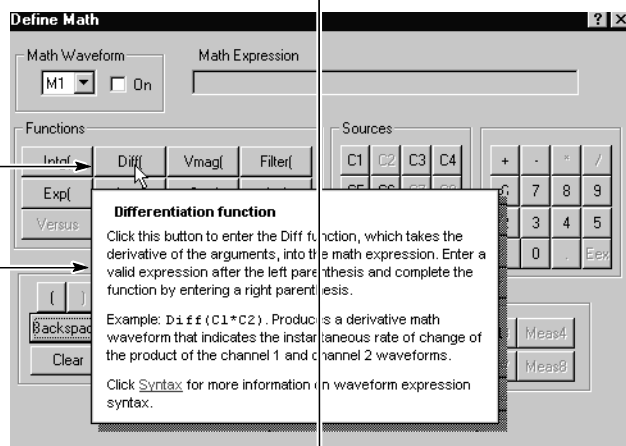
To Access the Help System

1 Tool tips automatically identify many screen controls when you point to them with the mouse.

2 Click the What's This? icon in the main window or the icon in a dialog box and then click on any screen element.

A small window appears that provides a brief description and sometimes links to additional information about the screen element.

You can also right click on an element in any setup dialog box to access What's This? help on that element.

3 Click the Help menu in the UI application menu bar to access the Table of Contents and the Index of the help system. If you have a keyboard, you can enter keywords to search for a help topic.

4 Click the **Help** button in a setup dialog box to get help on that particular setup.
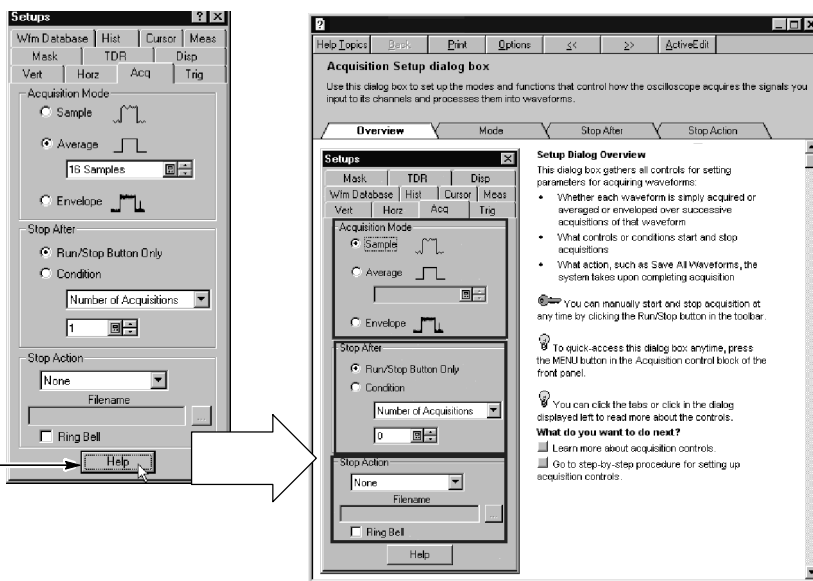
To Use Instrument I/O

On the Front Panel

Accommodates optical and electrical modules:

Compartments for large modules, up to two channels

Compartments for small modules, up to eight channels

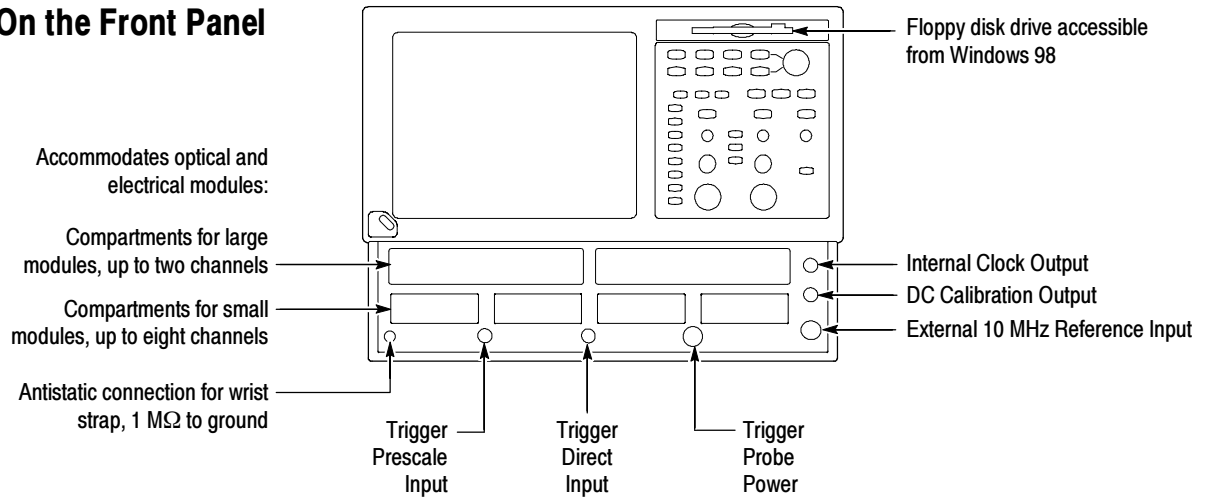Antistatic connection for wrist strap, 1 MΩ to ground

Floppy disk drive accessible from Windows 98

Internal Clock Output

DC Calibration Output

External 10 MHz Reference Input

Trigger Prescale Input

Trigger Direct Input

Trigger Probe Power

On the Rear Panel

Removable hard disk drive to provide individual environment for each user or to secure data, press to release

CDROM drive accessible from Windows 98, press to open

USB connector for mouse or keyboard and mouse

PS-2 connectors for mouse and keyboard

Upper VGA port to connect a monitor for dual-monitor display

Lower VGA port to connect a monitor for instrument display

Parallel port (Centronics) to connect printer or other device

GPIB port to connect to controller

RJ-45 connector to connect to network

COM1 serial port

PCMCIA slots for two type-1 cards, two type-2 cards, or one type-3 card

TRIGGER GATE (TTL)