CANbus TD

CAN Bus Trigger and
Decoding Package

In order to get started quickly,
take a few moments to read
through this guide.

Information on basic oscilloscope
operation can be found in the
oscilloscope on-line Help.

When you have more time,
read the CANbus TD Operator's
Manual. That contains more
detailed information about the
full capability of CANbus TD.

QUICK REFERENCE GUIDE

LeCroy

First Steps

CANbus TD is a Trigger and Decoding tool that will greatly increase your ability to debug and analyze embedded controllers that use CAN Bus communications, or entire systems consisting of multiple CAN controllers.

The names of the hardware components in CANbus TD are listed at the right.

Trigger Module

120 Ω Terminations
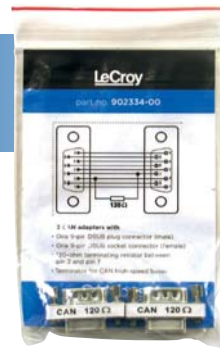
Oscilloscope Interface Module (OIM)

CAN Low Speed and Single-Wire Connection Cable
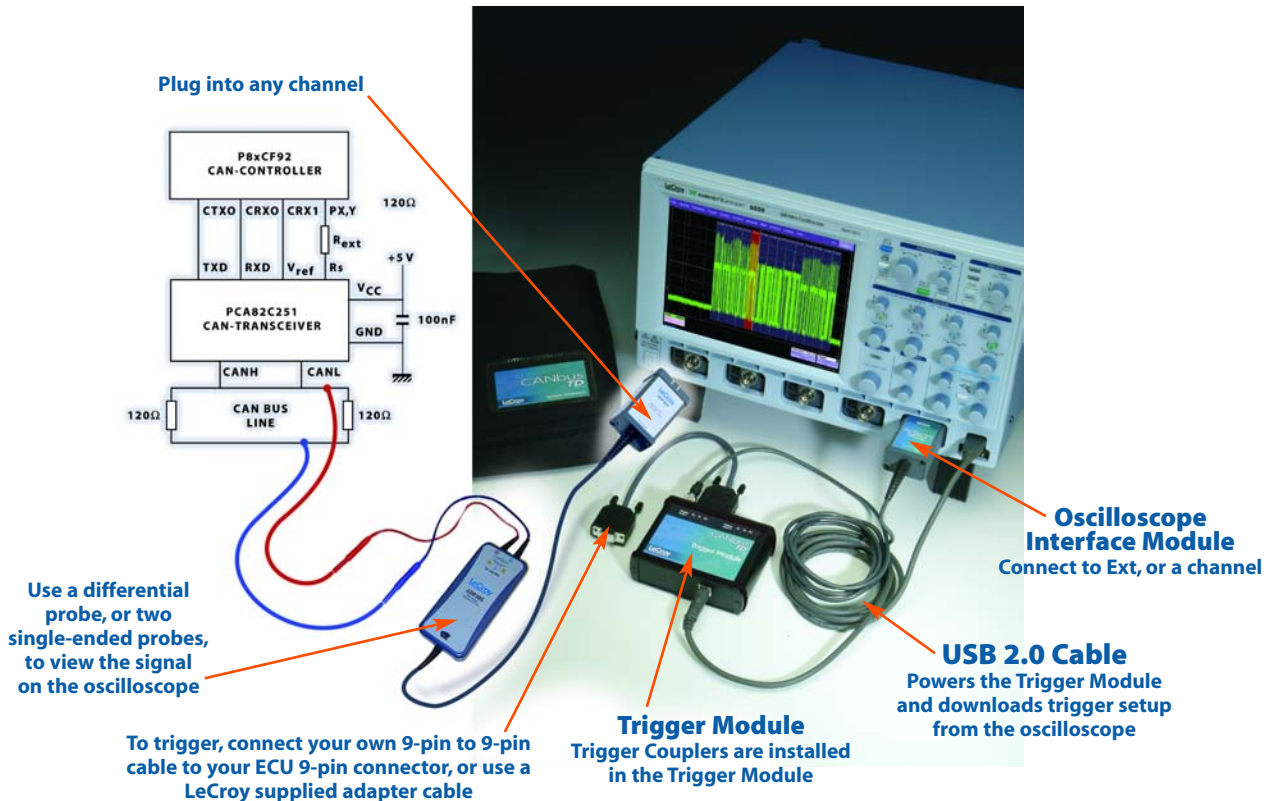
CAN High-speed Connection Cable

USB 2.0 Cable

Connecting the CANbus TD hardware to your LeCroy oscilloscope is easy. Follow these simple steps:

1 Connect the USB cable to one of the oscilloscope's USB ports

2 Connect the other end of the USB2.0 Cable to the CANbus TD Trigger Module.

3 Connect the CANbus TD Oscilloscope Interface Module (OIM) to the EXT input of the oscilloscope.

4 Connect the 3-pin plug end of the OIM to the Trigger Module.

Connecting to a CAN Bus Circuit

Plug into any channel

Use a differential probe, or two single-ended probes, to view the signal on the oscilloscope

To trigger, connect your own 9-pin to 9-pin cable to your ECU 9-pin connector, or use a LeCroy supplied adapter cable

Trigger Module
Trigger Couplers are installed in the Trigger Module

USB 2.0 Cable
Powers the Trigger Module and downloads trigger setup from the oscilloscope

Oscilloscope Interface Module
Connect to Ext, or a channel

The CANbus TD Trigger Module operates as a "node" on the CAN Bus. It contains a Microcontroller, CAN controller, and Transceiver (Trigger Coupler) and interfaces to the CAN circuit just like any other node on the bus. However, the Trigger Module only provides triggering capability. In order to "view" the actual CAN physical signal on the oscilloscope display, you must also probe the CANH and CANL lines with the included PP007 single-ended probes, or a differential probe (such as the LeCroy ADP305 or AP033) and input this probe signal(s) to an oscilloscope channel.

You will need to match the Trigger Coupler (Transceiver) in the Trigger Module to the one on your bus. Trigger Module has a 251 transceiver pre-installed. It is easy to install a different Trigger Coupler. Reference the CANbus TD *Operator's Manual* for complete instructions.
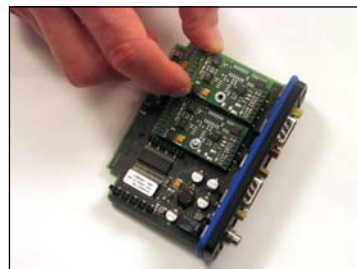
Connecting to a CAN Bus Circuit

| Pin #	Transceiver/ Trigger Coupler					
	251	1041	1050	1054	5790c	10011S
2	CANL	CANL	CANL	CANL		CANL
3				GND	VB-	VB-
4					100 Ω (HS Mode)	
7	CANH	CANH	CANH	CANH	CAN	CANH
Notes	Connect 120 Ω between pins 2 + 7	Connect 120 Ω between pins 2 + 7	Connect 120 Ω between pins 2 + 7			

All of the normal connection rules apply when connecting the CANbus TD Trigger Module to your bus. The bus must be terminated correctly, and CANH, CANL, GND, etc. must be connected to the right locations. If you don't connect to the bus correctly, the CANbus TD Trigger Module may generate error frames, may load down your signal, and will not trigger. Use your own cable, or a LeCroy-supplied cable to connect to your CAN Bus circuit; and connect your circuit to the Trigger Module using the 9-pin connector.
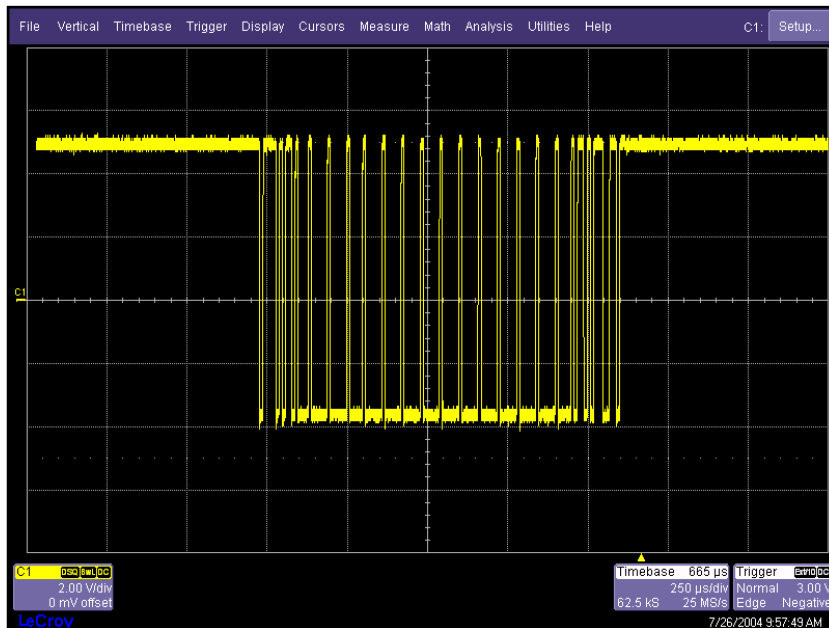
It is usually easiest to view the raw channel input first before setting up the CAN Trace with a defined CAN Source. Reference your oscilloscope's on-line Help if you have questions about displaying a signal on an oscilloscope channel. After the setup is verified, it is then a simple matter to turn the channel OFF and view the CAN Trace, with decoding (as desired), and any other non-CAN signals.

Using CANbus TD

CAN Trigger
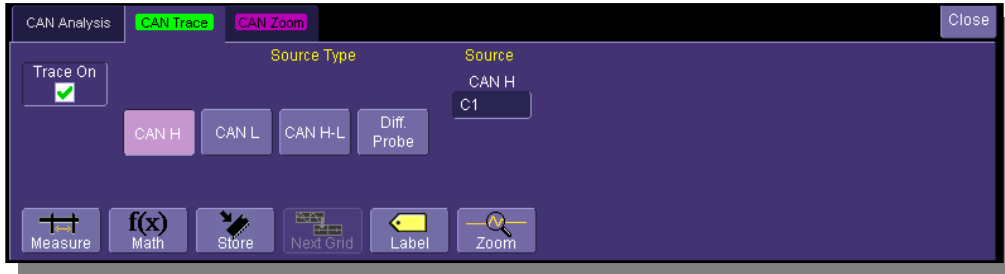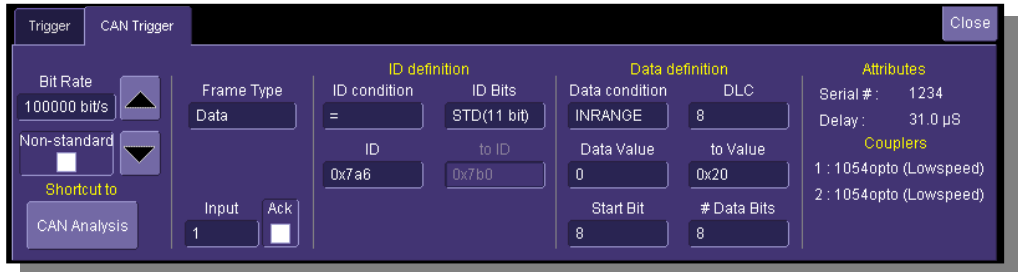
CAN Analysis, CAN Trace, CAN Zoom

Overview

CANbus TD trigger and decoding tools are easily accessible in a variety of ways. The CANbus TD option adds an additional dialog for CAN triggering to the existing oscilloscope Trigger dialog, and a new set of dialogs for setup of the CAN Analysis and viewable CAN Trace and CAN Zoom. The CAN |triggering dialog is conveniently accessed with just one touch of the screen when the CANbus TD Trigger Module is connected to the oscilloscope. The other dialogs are always accessible through the Analysis pull-down menu.

CAN Trigger

When the Trigger Module is completely connected to the oscilloscope (both the USB cable and OIM are connected), the CAN Trigger dialog will automatically be displayed on the oscilloscope display. If you don't wish for it to be displayed, you can simply touch "Close" to close the dialog.

CAN Analysis, CAN Trace, CAN Zoom

These dialogs provide the ability to set up the oscilloscope for protocol decoding of CAN messages, with display of the protocol data above the signal. They also allow quick and easy setup and display of the CAN Trace when you are using either single-ended or differential probes, and when the source is a channel, a stored memory (reference waveform) trace, or some other trace. Zooming of the CAN messages (for more detail) is also included in these dialogs.

When the Oscilloscope Interface Module (OIM) is connected to the oscilloscope, a CAN Trace descriptor box is displayed on the oscilloscope screen. This provides one touch access to the CAN Trace setup dialog, and quick access to the CAN Analysis and CAN Zoom dialogs.

Reference the *Operator's Manual* for instructions on how to access these dialogs at any time.

Useful Features


Error Frame Highlight and Zooming

When capturing long records with hundreds or thousands of CAN messages, only error frame messages are decoded on the compacted display. Error Frames are outlined in red, and easy to find. To see more detail, use the (magenta-colored) CAN Zoom trace.
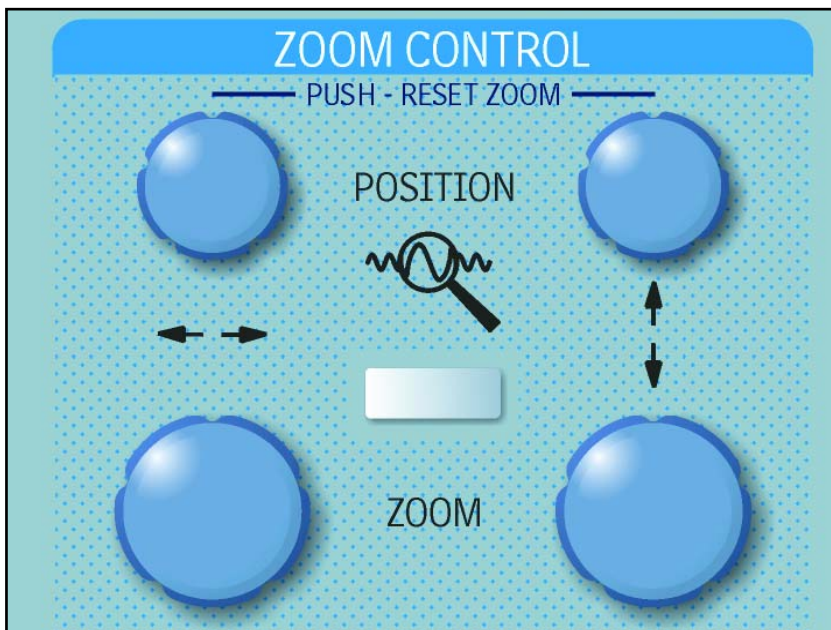
Zoom Controls

Zooming is easy with LeCroy's front panel zoom controls. Zoom controls are "active" for the last non-channel trace turned ON or OFF, or for whatever trace has been made active by touching the descriptor box.

Helpful Hints
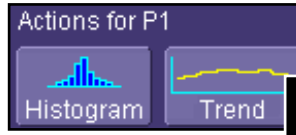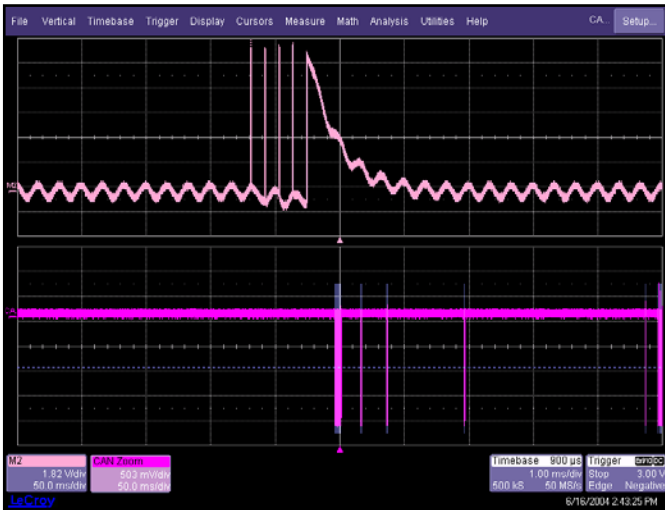
Characterize System Performance

You can use many different built-in oscilloscope tools, such as cursors, measurement parameters, statistics and histicons to understand performance of your embedded controller board. Depending on other options installed in your oscilloscope, you may also be able to Histogram and Trend measurement parameters. Reference your *Operator's Manual* for more detailed information.

Sequence Mode Helps Capture Infrequent Events

Sequence Mode is a powerful feature that allows you to trigger and capture CAN Bus or other events and save them to acquisition memory with minimal dead time (< 6 us) between triggers. This can be helpful for capturing sensor data, error frame conditions or any event where distinct events are spaced very close together (spacing is less than oscilloscope re-arm time), or very far apart (minutes, hours or days).

CANbus TD Overview

1 Open the CAN Trace setup dialog by touching this area. Select the source channel for the CAN Trace in this dialog, and turn the CAN Trace ON/OFF. The source can also be a memory or a math function. Also select whether you are using a single-ended or differential probe.

2 Touch this area to open the CAN Zoom dialog. Control the CAN Zoom trace from this dialog, and turn it ON/OFF.

3 Descriptor labels allow quick access to dialogs. Touch them to open the dialog specific to that descriptor label.

4 The CAN trigger can be set up from within the Trigger dialog. Touch the Trigger descriptor label, then select the CAN Trigger tab. You can also access the Trigger dialog from the menu bar.

5 The Timebase dialog can be used to fix the sample rate to a specific value. Touch the Timebase descriptor label to open the dialog. Use a value at least 4x the bit rate, or the decoding algorithm will not compute.

6 Add cursors to your display by touching this area and selecting the appropriate cursors. Adjust cursor position with the front panel knobs. Or, turn the cursor knobs to turn cursors ON.

7 Add measurement parameters by touching this area. Or, touch the MEASURE button in the toolbar in the CAN Trace and CAN Zoom dialogs.

8 A descriptor label with a different color background indicates that this trace is "Active". If it is a CAN Zoom, Memory, or Math Trace, and is "Active", the front panel zoom controls will zoom and position that particular trace.

9 Escape from the CANbus TD program at any time to add math, measurement parameters, or to make changes to your setup. Re-enter through Analysis, or by touching the CAN Trace or CAN Zoom descriptor labels below the grid.