

SMART CAN TRIGGERING

APPLICATION BRIEF

September 2, 2014

Summary

CANbus TDM is a powerful Trigger, Decoding, and Measurement/Graphing tool for LeCroy oscilloscopes that will greatly increase your ability to debug and validate CAN ECU or network performance. It works by combining the physical layer analysis capabilities of an oscilloscope with message based triggering, protocol decoding, and CAN specific measurements and graphing.

Introduction

LeCroy's CAN Trigger has the unique ability to trigger on Data, Remote, or Error frames. The ID and DATA values for a Data or Remote frame are user definable. Additionally, it can be combined with LeCroy's SMART Trigger™ to provide time and signal qualified triggering.

Figure 1 shows a typical trigger setup where CAN Trigger is combined with Qualified SMART Trigger to select a specific CAN bus message. In this setup, the trigger is enabled or qualified by an analog voltage that represents the input to a sensor. This voltage is applied to channel 2 of the scope and enables the trigger when the source voltage exceeds 5 volts. In this case the trigger point is intended to be the message frame containing the peak input value of the sensor. The sensor uses ID 210, and CAN Trigger is set up to trigger on ID 210, as shown in Figure 2, after the sensor input reaches 5 Volts.

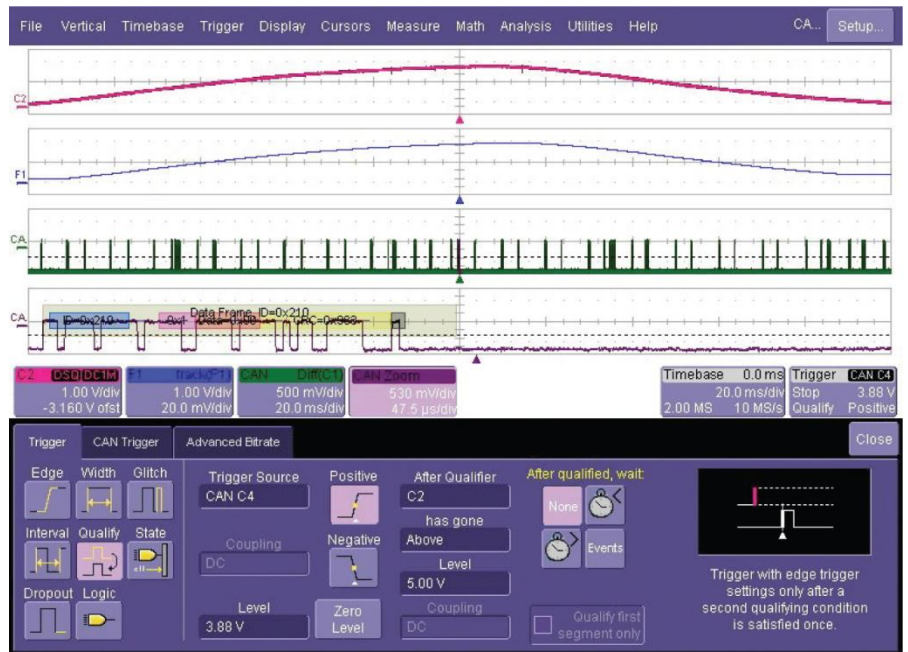


Figure 1: The Set-Up for a qualified CANbus Trigger



Figure 2: The CAN Trigger setup qualified by the amplitude of channel 2

The message content can be read and converted by the unique CAN Bus TDM parameter “CAN to Value.” The time aligned track of the parameter values is shown in trace F1 in Figure 1. The CAN Bus TDM display, trace CA in Figure 1, shows a half second of CANBus traffic. The CAN Zoom expands the view of the message that triggered the scope, decoding the ID, DLC, DATA, and CRC fields of the CAN message.

In addition to edge or threshold crossing qualification, the scope can qualify based on the state of an analog input. In this case the state, such as a gating signal, must be held until the scope triggers. Thus the state qualified trigger is conditionally enabled while the qualified trigger, discussed previously, is unconditionally enabled.

The time sensitive SMART Triggers can also be used with CANBus TDM. Remembering that the CAN Trigger Module outputs a trigger signal whenever a message frame meets the trigger criteria (ID Field, Data content, Frame type, etc.), the SMART Trigger can accept CAN Trigger as a source and trigger on the time intervals between trigger events. This is illustrated in Figure 3, where a glitch trigger has been set up with the CAN Trigger on Channel 4 as a source. In addition to glitch trigger, the width, interval, and dropout triggers may also be applied.

The setup in Figure 3 will trigger on CAN messages that occur within 1.02 ms of each other. The CAN Trigger is set to produce trigger outputs for all message frames as shown in Figure 4. In this way we can see all the possible messages that occur within 1 ms of each other. Another option is to use the CAN Trigger to select specific messages and or content and then trigger when the timing of the specific messages meets user-defined criteria.

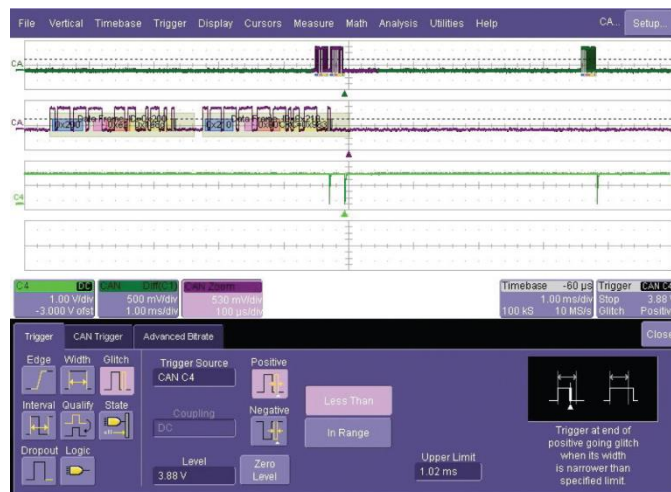


Figure 3: A glitch trigger based on time between CAN Triggers being less than 1 ms



Figure 4: For the glitch trigger setup, the CAN Trigger is accepting all message frames

CANbus TDM extends the usefulness and power of the scope. It has been seamlessly integrated into the fabric of the instrument so that all the existing features can be used with the CANbus trigger, decode measurements, and graph functions.