# **CAN-Bus Aborts for Shaker Testing**

# **OVERVIEW**

The CAN bus (Controller Area Network bus) protocol is a peer-to-peer communication standard for automotive devices without relying a complicated central computer. It is configured with two wires (CAN high and CAN low) which vary in voltage to communicate a bit series of 1's and 0's. CAN bus was initially designed in 1990, with the ISO standard released in 1993. Using CAN bus, an electronic car component (ex: car battery, engine control unit, etc.) can communicate any arbitrary data such as its temperature or working status. A DBC file is used to encode and decode the 1's and 0's into meaningful data, which can be a different mapping for each customer. EDM supports integration with CAN bus signals for monitoring and Alarm / Abort purposes. Given a customer's DBC file and custom-built Crystal Instruments USB CAN adapter, CAN bus alarm and abort rules can be configured during a vibration test. For example, a User running vibration tests on an EV battery can now configure EDM to monitor the battery's temperature and stop or pause the test when the temperature matches or exceeds a particular value.



#### **CANBus Interface In EDM**



To read CAN bus signals from the UUT, first connect the CAN Bus USB adapter to the PC running EDM. On the other end of the CAN bus adapter, use the screw terminals to connect the CAN high (CANH) and CAN low (CANL) wires in the CAN1 section. The adapter should light up upon detecting CAN bus signals.

# **Driver for PCAN-USB Adapter (PEAK SYSTEMS)**

When using the Peak Systems USB adapter, please refer to the Peak Systems website to download necessary drivers and documentation. This step should ideally be done before proceeding further and interfacing with EDM.

Peak Systems website URL: https://www.peak-system.com/PCAN-USB.199.0.html?&L=1

× Downloads		
Device driver setup for Windows		
PEAK-System installation package for device drivers and tools for Windows <sup>®</sup> 10, 8.1 (32/64-bit) for our PC interfaces. Included tools: PEAK-CPL, PCAN-View, PUN-View Pro, and Virtual PCAN-Gateway.		🕹 Download
Device driver for Linux		
Device drivers for PEAK CAN interfaces running on Kernel 2.6 and higher.		▶ Website
PCAN-USB manual	🖹 German	🗋 English
PCAN-View		
Windows <sup>®</sup> software for displaying, transmitting, and recording CAN and CAN		🛓 Download

#### **Configuring CANBus On EDM**

Click on **Setup > CANBus** to open the CAN-Bus window, which contains all settings and functionality related to CAN bus.



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CAN-Bus													* >
Mode	Nomal mode	•	Open	DBC File					Rec. inter	val(s)	1.0		
Baud rate	500000	•	Close	Record File					- ON				
Raw Data	Signal list	Signal D	isplay P	ıc								•	
Name			RawData	Physical	Value U	Jnit La	ow alarm	Highalarm	Low abort	Highabort	Config		

There are several modes that can be used for the CAN-Bus window

**Normal mode:** Used when connecting the Crystal Instruments CAN-Bus USB adapter to the PC running EDM. If the USB adapter is installed, you should be able to click Open to locate the DBC file in the filesystem

**Listen only mode:** A similar mode as "Normal mode" where only CAN-Bus signals can be listened to (no sending allowed).

**Self-test mode:** Used when connecting the Crystal Instruments CAN-Bus USB adapter without a CAN-bus node on the other end. Provides a convenient way to "self-test" certain CAN-Bus signals arriving over the wire.

**PCAN-USB:** Used when connecting the Peak Systems PCAN-USB adapter to the PC running EDM. If the USB adapter is installed, you should be able to click Open to locate the DBC file in the filesystem.

**Baud rate:** The rate at which data is transmitted over the network. Must match the Baud rate of the external CAN bus device.

**DBC File:** The .DBC file that describes the data transmitted over CAN bus. Necessary to decode the bits into meaningful information.

**Record File:** Specifies the file location for storing recorded CAN bus data (can be turned ON or OFF).

#### **Viewing Raw Data in CANBus**

The Raw Data tab in the CAN-Bus window shows a stream of incoming raw CAN bus data. For instance, in the below image, we can see that multiple data sets can be received from a CANbus and each of them is associated with an ID and the data being transferred.

Raw data Signal list Signal display										
Config Send Timing send Tom ms 🔍 🖾 🔂 🖬 🕞										
	Number	Time	ID	Туре	Format	Data	Count			
	0	2023-03-20 12:00:22:3850	1	Standard	Data	80 00 00 00	864			
Þ.	1	2023-03-20 11:46:03:0060	319	Standard	Data	AB CD EF 01 00 00 00 00	11			
•										

# Sending Data in CANBus

Below the Raw Data tab is a configuration for sending CAN-Bus data. Click on Config to open the "Send Configuration" window.

nd Config	guration	1				-		>
Frame Frame	type format	Standard frame Data Frame	ID     Data	00 00 01 02 03	Hex 04 05 06 07	,		
-	48	Delete		U	P	De	owin	
Index	ID	Type	Format	DLC	Data			
0 1 2 3	13f 13f 13f 13f	0 0 0	0 0 0	8 8 8 8	0 1 2 3 4 5 17 17 17 1 23 23 23 2 35 35 35 3	6 7 7 17 17 3 23 23 5 35 35	17 17 23 23 35 35	
					ок		Cancel	

Frames of CAN bus data can be configured with the desired ID (in Hexadecimal) and Data body.

Frame type: supports "Standard frame" and "Extended frame"

Frame format: supports "Data Frame" and "Remote frame"

# Signal List in CANBus

The Signal List window visualizes the uploaded DBC file as a human-readable list of nested entries.

Raw Data	Signal list	Signal Di	splay	PLC				
Search			Sele	✓ sct group	() Unselect gro	up Ex	• pand	Collapse
Name			View	Measu	re			
4 🗽 Batte	ryTemperatur	e						
- 🔤 m	inModuleTem	perature						
l 🧧 🥯 m	axModuleTerr	nperatu						
▷- hon_ Batte	▷ <u>▶</u> BatteryVoltage							
▷- MA Batte								
⊳ M Batte	▷- M BatteryState							
▷- M Drive	Limit							

Filter through the signals in your DBC file using the Search box above. Click on the **View** icon to see more details about the configured CAN bus entry. Enable the **Measure** checkbox to enable it in the

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# **Alarms and Aborts in CANBus**

The **Signal Display** tab lists all the CAN Bus signals which have been enabled by checking the **Measure** checkbox. This is the page where the CAN bus values can be configured to trigger a "CANBus Abort" or "CANBus Alarm" event that will be handled later in **Event Action Rules**. For instance, in the below image, the test will abort when the physical value exceeds the **High Abort Value**.

CANbus							* ×
CANView ×							-
Mode PCAN-USB	DBC file	C:\Users\PrithviKanu	govi\Downlo	ads\powertrain_	Rec i	nterval(s)	1.0
Baud rate 500 kBit/sec 👻 🕜	Record file	C:\Users\PrithviKanu	govi\Downlo	ads\powertrain_	Reco	rd 👘	ON
CAN ID PCAN_USB 1 (FFh)	Refresh					A	dvanced
Raw data Signal list Signal display							-
Name Config Raw data	Physical value U	nit Low alarm	High alarm	Alarm values	Low abort	High abort	Abort values
maxStringVoltage_861185	1223.7 V 879.62 V	1000	1100		999	1200	
	Note: Set the threshold	axStringVoltage_BMS d of the CANbus signal Alarm SNA	1,000.00 ÷ 1,100.00 ÷	V V Add	×		
	Enter values separat	ed by commas Abort	999.00 ÷	V V V Add V			-
	Enter values separat	ed by commas					

Click on the **Config** icon for each given entry to configure the Alarm / Abort thresholds.

Low and High limits are supported, as well as matching for custom values ("Alarm Values" / "Abort Values").

**Simple mode:** For a simple enlarged view of the limits, right-click on the entries and select "Simple display mode"

Raw Data	Signal list	Signal Dis	splay	PLC								
Name			RawDa	ata	PhysicalValue	Unit	Low	alarm	Highalarm	Low abort	High abort	Config
Se minModuleTemperature						٧		Cimpled	icolau mode			
maxModuleTemperature						٧		Simpled				
								Config				
												<b>—</b>
		Raw Data	Sign	al list	Signal Display	PLC						
		Name						Physi	calValue	Unit		
	minModuleTemperature									v		1
		maxModuleTemperature								v		

#### **Event Action Rules in CANBus**

Use the **Event Action Rules** page under **Setup > Test Config** to finalize the downstream actions for EDM to take once a CAN bus Alarm or Abort has been triggered. Event Action Rules refers to an innovative feature developed by Crystal Instruments offering the flexibility to define arbitrary actions when certain events happen. When CAN bus is enabled, two additional Event names will appear: "CAN-Bus Abort" and "CAN-Bus Alarm". These event names correspond to the Alarm and Abort criteria configured in the previous section.

Click on **Add action, Edit action,** or **Remove action** to further configure the list of actions for EDM to take after an Abort or Alarm is enabled.

This is the final step in the CANbus configuration. EDM is now ready to interface with CANbus data and take necessary actions such as Abort or Alarm during the tests.

Event actions «		Event list
Shaker parameters	Add a user event Edit event nar	me Remove event Run log event strings
Test parameters	Event name	Actions
Pre-test parameters	Save Signals to PC	Save Results to PC
Test profile	Flash Screen and Beep	Flash Screen and Beep
RMS limits	My Report	Create report
Rup schedule	CANbus Abort Values	Pause Test
Lenit change de	CANbus High Abort	Stop the Test
Limit channels	CANbus Low Abort	Flash Screen and Beep
Event actions	CANbus Alarm Values	None
File directory	CANbus High Alarm	None
Save/Recording setup	CANDUS LOW Alarm	None ·
Output settings	Limit Channel Lost	Pause Test
	External Dower Lost	Fause ress Flack Green and Reen
	Control Signal Lost	Flash Screen and Been
	Control Channel Overloaded	Flash Screen and Beep
	Output Reaches Maximum	Pause Test
	Sensor Overload	Flash Screen and Beep
	Channel Overload	Flash Screen and Beep
	User Pressed Stop	Flash Screen and Beep
	Time Signal High Alarm Limit E.	- Flash Screen and Beep, Save Results to PC
		Antiper for entertainment
	In CAMPus IF the Above	Actions for selected event
	Name: CANDUS High Abort	Add action * Edit action Remove action
	Stop the Test: Abort the current t	est run
	Load from library Save to librar	7
Config. library •		QK Qancel

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