

USB to CAN/CAN FD Converter (DCI-CAN2)

DCI-CAN2 Feature Reference

Release 2021-A – May 2021

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About This Reference

Content This document provides feature-oriented access to the information you need to interface CAN devices with the DCI-CAN2 to your host PC.

Symbols

dSPACE user documentation uses the following symbols:

Symbol	Description
	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
	Indicates a hazard that, if not avoided, could result in property damage.
	Indicates important information that you should take into account to avoid malfunctions.
	Indicates tips that can make your work easier.
	Indicates a link that refers to a definition in the glossary, which you can find at the end of the document unless stated otherwise.
	Precedes the document title in a link that refers to another document.

Naming conventions

dSPACE user documentation uses the following naming conventions:

%name% Names enclosed in percent signs refer to environment variables for file and path names.

< > Angle brackets contain wildcard characters or placeholders for variable file and path names, etc.

Special folders

Some software products use the following special folders:

Common Program Data folder A standard folder for application-specific configuration data that is used by all users.

%PROGRAMDATA%\dSPACE\<InstallationGUID>\<ProductName>

or

%PROGRAMDATA%\dSPACE\<ProductName>\<VersionNumber>

Documents folder A standard folder for user-specific documents.

%USERPROFILE%\Documents\dSPACE\<ProductName>\<VersionNumber>

Local Program Data folder A standard folder for application-specific configuration data that is used by the current, non-roaming user.

%USERPROFILE%\AppData\Local\dSPACE\<InstallationGUID>\<ProductName>

Accessing dSPACE Help and PDF Files

After you install and decrypt dSPACE software, the documentation for the installed products is available in dSPACE Help and as PDF files.

dSPACE Help (local) You can open your local installation of dSPACE Help:

- On its home page via Windows Start Menu
- On specific content using context-sensitive help via **F1**

dSPACE Help (Web) You can access the Web version of dSPACE Help at www.dspace.com.

To access the Web version, you must have a *mydSPACE* account.

PDF files You can access PDF files via the  icon in dSPACE Help. The PDF opens on the first page.

Safety Precautions

Introduction

To avoid risk of injury and/or damage to the dSPACE hardware, read and ensure that you comply with the following safety precautions. These precautions must be observed during all phases of system operation.

Warning About Using a DCI-CAN2

Introduction

Note the following warning when using a DCI-CAN2.

Danger potential

Connecting a DCI-CAN2 to a CAN bus can affect system behavior. This can lead to unexpected or critical situations, or even constitute a risk of death. Therefore, only persons who are qualified to use a DCI-CAN2, and who have been informed of the dangers and possible consequences, are permitted to use the DCI-CAN2.

Before integrating the DCI-CAN2 and starting operation, read the warnings in this document carefully.

WARNING

Risk of serious injury or death due to electrical shock

The DCI-CAN2 is designed to be connected to devices that do not transmit hazardous voltages. According to the EN 61010 standard, a voltage higher than $33 V_{RMS}/46.7 V_{PEAK}$ AC and 70 V DC is classified as hazardous. It constitutes a risk of serious injury or even death.

Make sure that your system provides safety provisions so that no hazardous voltages are applied to the DCI-CAN2, even in the event of electrical faults.

If there is a risk of hazardous voltages being applied to a DCI-CAN2, the DCI-CAN2 and all devices connected to it must be within a separate test area according to the locally valid safety standards for the installation and operation of electrical test equipment.

Liability

It is your responsibility to adhere to instructions and warnings. Any unskilled operation or other improper use of this product in violation of the respective safety instructions, warnings, or other instructions contained in the user documentation constitutes contributory negligence, which may lead to a limitation of liability by dSPACE GmbH, its representatives, agents and regional dSPACE companies, to the point of total exclusion, as the case may be. Any exclusion or limitation of liability according to other applicable regulations, individual agreements, and applicable general terms and conditions remain unaffected.

Working with the DCI-CAN2

Introduction	<p>The DCI-CAN2 lets you access the data stream on the following networks:</p> <ul style="list-style-type: none">▪ Controller area network (CAN)▪ CAN with Flexible Data Rate (CAN FD) <p>The interface transfers messages between the CAN-based network and the host PC via the universal serial bus (USB).</p>
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Where to go from here	<p>Information in this section</p> <div><p>Feature Overview.....9</p><p>The DCI-CAN2 has one port to connect it to a CAN bus, and one port to connect it to the host PC.</p><p>Configuring and Operating the DCI-CAN2..... 11</p><p>You can configure and operate the DCI-CAN2 via ControlDesk or via the dSPACE CAN API.</p><p>Fields of Application of the DCI-CAN2..... 13</p><p>With the DCI-CAN2 you can connect CAN-based devices to your host PC. The DCI-CAN2 forwards the CAN messages from and to the host PC.</p></div>
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Feature Overview

Introduction	<p>The DCI-CAN2 has</p> <ul style="list-style-type: none">▪ One port to connect it to a CAN bus▪ One port to connect it to the host PC
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DCI-CAN2 illustration

The following illustration shows the DCI-CAN2:

**CAN features**

You can connect a CAN FD or CAN network to the host PC via the DCI-CAN2.

Support of CAN FD The DCI-CAN2 supports CAN FD.

CAN FD stands for *CAN with Flexible Data Rate*. The CAN FD protocol is based on the CAN protocol as specified in ISO 11898-1. Compared with the classic CAN protocol, CAN FD comes with an increased bandwidth for the serial communication. The improvement is based on two factors:

- The CAN FD protocol allows you to use CAN messages with longer data fields (up to 64 bytes).
- The CAN FD protocol allows you to use a higher bit rate. It is possible to switch inside the message to the faster bit rate.
- The DCI-CAN2 supports ISO CAN FD (compliant to the ISO standard 11898-1:2015) and non-ISO CAN FD.

For information on how to switch between ISO CAN FD and non-ISO CAN FD, refer to [Configuring and Operating the DCI-CAN2](#) on page 11.

Support of CAN 2.0A and CAN 2.0B The DCI-CAN2 supports CAN messages according to CAN 2.0A and 2.0B specifications (11- and 29-bit identifiers).

Bit rates The DCI-CAN2 supports the following bit rates:


	Bit Rate
CAN	40 kbit/s ... 1 Mbit/s
CAN FD	40 kbit/s ... 8 Mbit/s ¹⁾

¹⁾ The maximum bit rate for CAN FD depends on the environment (cable harness, topology, and interferences).

Galvanic isolation The DCI-CAN2 has integrated galvanic isolation. Because the engine, the DAQ modules connected to the DCI-CAN2 and the host PC are connected to the same power supply, ground loops can cause transient currents on the data connection. These can occur during the ignition process, especially when the engine is started. The integrated galvanic isolation prevents these transient currents so that they do not affect the calibration task.

Connection to a CAN bus The physical connection of the DCI-CAN2 to a CAN bus is performed via a 9-pin, male Sub-D connector. You can use your own

CAN cables to connect CAN devices to the DCI-CAN2. For the pinout of the CAN connector, refer to [Connector Pinout](#) on page 17.

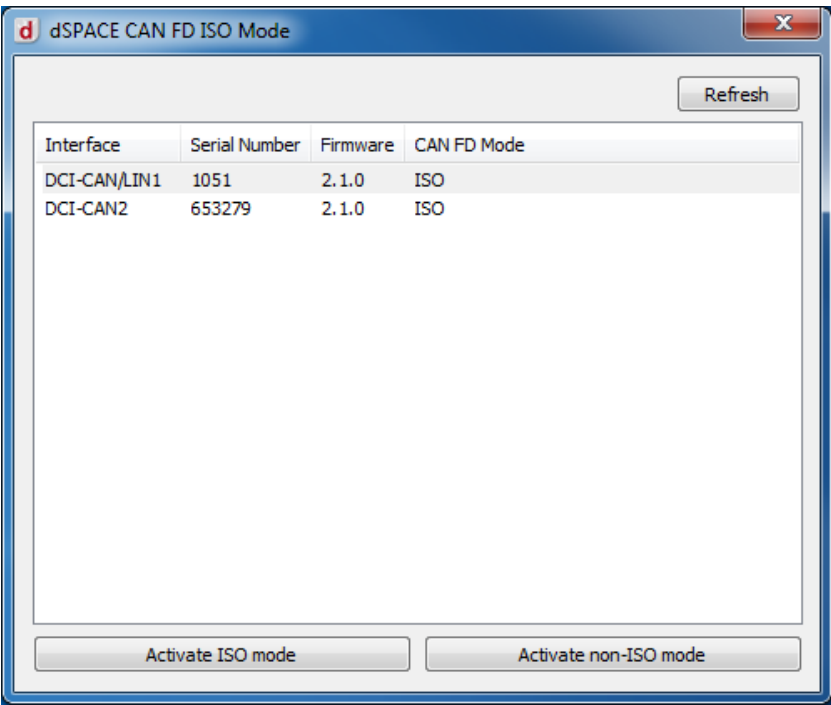
For instructions on how to connect a DCI-CAN2, refer to [How to Connect the DCI-CAN2 or DCI-CAN/LIN1](#) (ECU Interfaces Hardware Installation and Configuration ).

USB connection to the host PC	<p>The DCI-CAN2 supports the universal serial bus (USB) for connection to the host PC.</p> <p>USB for connection to the host PC The DCI-CAN2 supports USB for connection to the host PC. It therefore supports hot plug-and-play capability.</p> <p>Physical connection to USB You can connect the DCI-CAN2 to the host PC via the fixed USB connection cable. You need no further adjustments on the host PC.</p>
Supplying external devices	<p>Power can be supplied by the DCI-CAN2 via pin 1 of the Sub-D connector.</p>
Related topics	<p>Basics</p> <div>Configuring and Operating the DCI-CAN2..... 11</div>

Configuring and Operating the DCI-CAN2

Introduction	<p>You can configure and operate the DCI-CAN2 via ControlDesk or via the dSPACE CAN API.</p>
dSPACE CAN FD ISO Mode	<p>The interface supports ISO CAN FD (compliant to the ISO standard 11898-1:2015) and non-ISO CAN FD.</p>

To switch between ISO CAN FD and non-ISO CAN FD, you can use the dSPACE CAN FD ISO Mode (DsCanFdIsoMode.exe) tool. It is installed in the C:\Program Files <(x86)>\Common Files\dSPACE\DSCanApi_<Version>\ folder.



ControlDesk

With ControlDesk, you do not configure or operate the DCI-CAN2 directly. Instead, you configure a CAN-based device – such as an XCP on CAN device or CAN Bus Monitoring device – that uses the DCI-CAN2 as the interface between ControlDesk and the CAN bus.

For details on the configuration, refer to [Handling Devices \(ControlDesk Platform Management\)](#).

dSPACE CAN API

The dSPACE CAN API allows you to configure and operate the DCI-CAN2 stand-alone, that means, without ControlDesk. With the dSPACE CAN API, you can write your own application accessing the CAN bus via the DCI-CAN2. This application can be a simple monitoring application, but also a more complex application that sends and receives CAN messages.

Refer to [dSPACE CAN API 2.0 C Reference](#).

Related topics

Basics	
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Fields of Application of the DCI-CAN2

Introduction

With the DCI-CAN2 you can connect CAN-based devices to your host PC. The DCI-CAN2 forwards the CAN messages from and to the host PC.

Connecting ECUs

The DCI-CAN2 can be used to connect ECUs to the host PC.

Connecting ECUs with XCP on CAN With the DCI-CAN2, you can connect an ECU that supports the XCP on CAN protocol to the host PC. Refer to [Connecting an ECU with CCP or XCP on CAN \(ECU Interfaces Hardware Installation and Configuration !\[\]\(0aff635c4179ba9e710b00f4b01d3b20_img.jpg\)](#)).

Connecting ECUs with CCP With the DCI-CAN2, you can connect an ECU that supports the CCP protocol to the host PC. Refer to [Connecting an ECU with CCP or XCP on CAN \(ECU Interfaces Hardware Installation and Configuration !\[\]\(830769b31eeeaca920791081939ff8ba_img.jpg\)](#)).

Connecting ECUs with diagnostic protocols With the DCI-CAN2, you can connect ECUs with implemented diagnostic protocols to the host PC. This allows you to perform ECU diagnostics tasks and program the flash memory of ECUs via diagnostic protocols. Refer to [How to Connect an ECU with Implemented Diagnostic Protocol via CAN \(ECU Interfaces Hardware Installation and Configuration !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)).

Tip

For ECU diagnostics access via CAN, you can use the same DCI-CAN2 as that used for measurement and calibration, that is, the CAN interface can be shared by measurement, calibration, and ECU diagnostics tasks.

CAN bus monitoring

You can monitor the data stream on a CAN/CAN FD bus within ControlDesk via the DCI-CAN2. CAN monitoring is restricted to the CAN bus members that are described in a specific database file such as DBC. Having added the database file to ControlDesk's CAN Bus Monitoring device, you can show and analyze the signal values of the connected CAN bus members. Refer to [Connecting PC-Based Interfaces for Bus Monitoring \(ECU Interfaces Hardware Installation and Configuration !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)).

Support of time-stamping

All measured or monitored data gets time stamps from the DCI-CAN2. The data is sent to ControlDesk with these time stamps. They have a resolution of 1 μ s. Thus, ControlDesk can take data from different sources into account, in a time-correlated form.

Related topics

Basics

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DCI-CAN2 Data Sheet

Introduction The data sheet provides the technical data of the DCI-CAN2 and the connector pinout.

Where to go from here	Information in this section
	Technical Specifications of the DCI-CAN2..... 15 Provides a summary of the technical specifications of the DCI-CAN2.
	Connector Pinout..... 17 Provides pinout information for the DCI-CAN2.
	Status LED of the DCI-CAN2..... 18 Provides information on the status LEDs of the DCI-CAN2.

Technical Specifications of the DCI-CAN2

Technical data The following table summarizes the technical specifications of the DCI-CAN2:

Parameter	Specification ¹⁾
General	<ul style="list-style-type: none">▪ CAN FD 1.0 (compatible with CAN 2.0 A/B)▪ Transmission standards:<ul style="list-style-type: none">▪ CAN FD▪ ISO11898-2 (high-speed CAN)▪ Bit rates:<ul style="list-style-type: none">▪ 40 kbit/s ... 1 Mbit/s (CAN)

Parameter		Specification ¹⁾
		<ul style="list-style-type: none"> ▪ 40 kbit/s ... 8 Mbit/s²⁾ (CAN FD) ▪ Time stamp resolution: 1 µs ▪ Transceiver: NXP TJA1044GT
Host interface		USB 2.0 (compatible with USB 1.1 and USB 3.0)
Software configuration		Via: <ul style="list-style-type: none"> ▪ ControlDesk ▪ dSPACE CAN API
Electrical characteristics	Power supply	Power is supplied to the DCI-CAN2 via USB: <ul style="list-style-type: none"> ▪ +5 V DC ▪ < 170 mA
	Supplying external devices	Power can be supplied by the DCI-CAN2 via pin 1 of the Sub-D connector: <ul style="list-style-type: none"> ▪ +5 V DC ▪ < 50 mA
	Termination	No termination of the CAN connector
	Galvanic isolation	Up to 500 V (connector maximum)
Mechanical characteristics	Chassis	Aluminum box
	Connectors	<ul style="list-style-type: none"> ▪ 9-pin, male Sub-D connector for connection to CAN. For the pin assignment, refer to Connector Pinout on page 17. ▪ USB connector (plug type A) with 0.75 m (29.5 in.) cable for connection to the host PC
	Physical size (height x width x depth)	75 mm x 43 mm x 22 mm
	Weight	Approx. 68 g (0.15 lb.)
Environmental	Operating temperature	–40 ... +85 °C (–40 ... +185 °F)
	Storage and transport temperature	–40 ... +100 °C (–40 ... +212 °F)
	Relative humidity	15 ... 90%, not condensing
Ingress protection (IEC 60529)		IP 20
Electromagnetic compatibility		<ul style="list-style-type: none"> ▪ EN 55024: 2011-09 ▪ EN 55022: 2011-12 ▪ EC directive 2014/30/EU

¹⁾ Unless stated otherwise, the specifications are valid only if the dSPACE hardware is correctly powered, switched on, and ready for operation.

²⁾ The maximum bit rate for CAN FD depends on the environment (cable harness, topology, and interferences).

Related topics

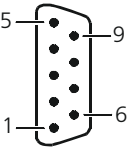
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Connector Pinout

Pinout of the CAN connector of the DCI-CAN2

The following table shows the pinout of a 9-pin, male Sub-D connector for connection to CAN according to CiA-DS 102-1:

CAN Connector	Pin	Signal	Pin	Signal
	5	Not connected	9	Not connected
	4	Not connected	8	Not connected
	3	CAN-GND	7	CAN-H
	2	CAN-L	6	CAN-GND
	1	+5 V_OUT ¹⁾		
<div><div>Note</div><div>Do not feed any voltage to this pin.</div></div>				

¹⁾ Power supply for the device connected to this CAN connector. Referenced to CAN-GND and isolated from USB-GND.

Tip

You can also find the pinout as an imprint on the underside of the DCI-CAN2.

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Status LED of the DCI-CAN2

Introduction

The DCI-CAN2 is equipped with one status LED.

LED description

The following table provides a description of the status LED:

Status	Description
Green (lit)	Connection to operating system driver is established.
Green (slowly blinking)	Software application is connected to the interface.
Green (quickly blinking)	CAN data is being transmitted.
Red (blinking)	Error during CAN data transmission.
Orange (quickly blinking)	Identification of an interface when multiple interfaces are connected.

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