USB-to-K-Line Converter (DCI-KLine1)

DCI-KLine1 Feature Reference

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dSPACE

How to Contact dSPACE

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How to Contact dSPACE Support

If you encounter a problem when using dSPACE products, contact your local dSPACE representative:

- Local dSPACE companies and distributors: http://www.dspace.com/go/locations
- For countries not listed, contact dSPACE GmbH in Paderborn, Germany.
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You can also use the support request form: http://www.dspace.com/go/supportrequest. If you are logged on to mydSPACE, you are automatically identified and do not need to add your contact details manually.

If possible, always provide the relevant dSPACE License ID or the serial number of the CmContainer in your support request.

Software Updates and Patches

dSPACE strongly recommends that you download and install the most recent patches for your current dSPACE installation. Visit http://www.dspace.com/go/patches for software updates and patches.

Important Notice

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About This Reference

Contents

This document provides feature-oriented access to the information you need to interface an ECU with implemented K-Line-based diagnostic protocol with the DCI-KLine1 to your host PC.

Symbols

dSPACE user documentation uses the following symbols:

Symbol	Description
DANGER	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a hazard that, if not avoided, could result in property damage.
Note	Indicates important information that you should take into account to avoid malfunctions.
Tip	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 and Legal Information

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-KLine1

Introduction

Note the following warning when using a DCI-KLine1.

Danger potential

Connecting a DCI-KLine1 to an ECU 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-KLine1, and who have been informed of the dangers and possible consequences, are permitted to use the DCI-KLine1.

Before integrating the DCI-KLine1 and starting operation, read the warnings in this document carefully.

⚠ WARNING

Risk of serious injury or death due to electrical shock

The DCI-KLine1 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 a dSPACE ECU interface, even in the event of electrical faults.

If there is a risk of hazardous voltages being applied to a DCI-KLine1, the DCI-KLine1 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.

Features of the DCI-KLine1

Introduction

The DCI-KLine1 (dSPACE Communication Interface – KLine1) is a USB-to-K-Line interface which can be used to connect an ECU to the host PC via K-Line. This allows you to perform ECU diagnostics and ECU flash programming purposes via K-Line.

Where to go from here

Information in this section

Basics of K-Line-Based Communication and the DCI-KLine1

Introduction

With the DCI-KLine1, you can connect an ECU with implemented diagnostic protocol based on K-Line to your ControlDesk PC for ECU diagnostics and ECU flash programming purposes. The DCI-KLine1 forwards the messages and data from and to the host PC.

The illustration below shows the DCI-KLine1:

Note

The DCI-KLine1 can be used only in connection with ControlDesk's ECU Diagnostics Module.

General information on K-Line based communication

K-Line is a one-wire communication connection between one or more ECUs in a vehicle and a diagnostic tester (such as ControlDesk) for ECU diagnostics, maintenance, or ECU flash programming purposes. K-Line communication is specified in the ISO 9141 and ISO 14230 standards.

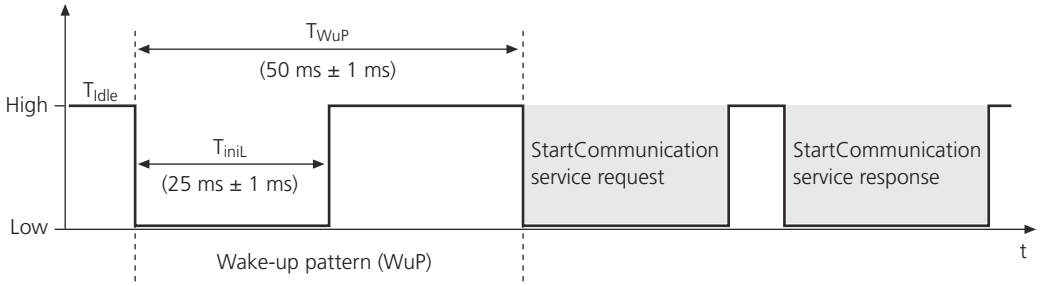
Note

With the DCI-KLine1, you can connect one ECU to the host PC (point-to-point connection). This allows communication between ControlDesk and one ECU at a time.

Bidirectional line K-Line is a serial, bidirectional data link. It is used for initialization and for communication between the ECU and the K-Line interface in both directions. Signals are represented by voltage levels with respect to ground.

Fast initialization To signal the start of communication based on the K-Line-based diagnostic protocol, a signal pattern according to ISO 14230, called the "wake-up pattern" (WuP), is transmitted from the diagnostic tester to the vehicle ECU.

The following illustration shows the timing during fast initialization:



Prior to any activity, there is a bus idle time (T_{Idle}). To initialize communication, the diagnostic tester sends a wake-up pattern on the K-Line bus to the ECU. The pattern begins after the idle time on K-Line with a low time (T_{iniL}). Following the first falling edge after the wake-up time interval (T_{WuP}) has expired, the diagnostic tester starts transmitting a StartCommunication request to the ECU, followed by the StartCommunication response message from the ECU. All the information required to establish communication is contained in the ECU response.

The DCI-KLine1 provides fast initialization with wake-up patterns generated by the hardware.

Fields of application of the DCI-KLine1

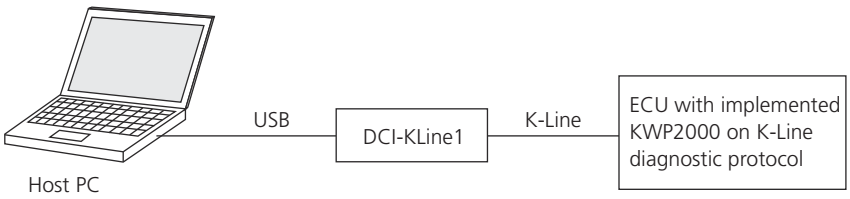
The DCI-KLine1 can be used for ECU diagnostics according to KWP2000 on K-Line (ISO 14230). It lets you connect an electronic control unit (ECU) with implemented KWP2000 on K-Line diagnostic protocol to the host PC to perform ECU diagnostics tasks or program the ECU's flash memory via the diagnostic protocol. Communication between the ECU and the DCI-KLine1 runs via K-Line. The DCI-KLine1 transfers the messages and data to and from the host PC via the universal serial bus (USB).

The DCI-KLine1 can be used with ECUs designed for 12 V and 24 V voltage supply.

For further information on ECU diagnostics, refer to ControlDesk ECU Diagnostics 🕮.

ECU access

For ECU diagnostics access via K-Line, an ECU with implemented KWP2000 on K-Line diagnostic protocol communicates with the ControlDesk PC via the DCI-KLine1.



Requirement for the ECU Since the DCI-KLine1 provides the fast initialization mode, it can be used only with ECUs supporting the wake-up pattern mechanism according to ISO 14230. The wake-up pattern uses a baud rate of 10.4 kBd.

Configuring and operating the DCI-KLine1

The DCI-KLine1 is configured and operated via ControlDesk. However, with ControlDesk you do not configure or operate the DCI-KLine1 directly. Instead, you configure an ECU Diagnostics device that uses the DCI-KLine1 as the interface between ControlDesk and the K-Line.

For details on the configuration, refer to ECU Diagnostics Device Configuration (ControlDesk Platform Management 🕮).

Serial number

Each DCI-KLine1 is identified by a unique serial number. The number is on an adhesive label on the DCI-KLine1's enclosure. Additionally, the serial number is stored electronically in the hardware and can be read by ControlDesk. This allows ControlDesk to identify a physical DCI-KLine1 when assigning an ECU Diagnostics device to it.

Connection Features

Introduction

The DCI-KLine1 provides several connectors for connecting the interface to the host PC, to K-Line, and to an external power supply.

USB connection to the host PC

The DCI-KLine1 supports the universal serial bus (USB) connectivity standard for connection to the host PC. It therefore supports hot plug-and-play capability. You can connect the DCI-KLine1 to the host PC via the fixed USB connection cable. You need no further adjustments on the host PC.

Connection to K-Line

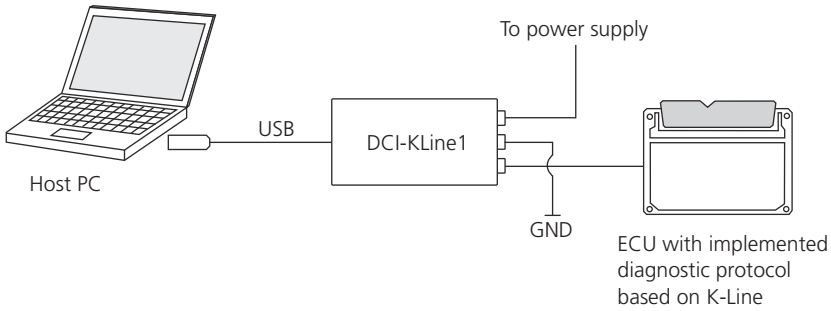
The DCI-KLine1 provides a 4 mm female connector (green) for the physical connection to K-Line.

Power supply

The power for the DCI-KLine1 is supplied by the ECU or the vehicle. The DCI-KLine1 provides a 4 mm female connector (red) to connect it to the external power supply (VBAT) and a 4 mm female connector (black) to connect it to the power supply ground (GND).

Connection scenario

The following illustration shows the resulting setup:



For instructions on how to connect a DCI-KLine1, refer to How to Connect an ECU with Implemented Diagnostic Protocol via K-Line (ECU Interfaces Hardware Installation and Configuration 🕮).

Status LED for USB connection and K-Line traffic

The DCI-KLine1 is equipped with a status LED. The following table shows the states of the LED:

LED	USB and K-Line Status
Off	USB not powered/not connected[1)]
Lit (yellow)	USB not initialized[2)], VBAT on
Lit (red)	USB initialized, VBAT off
Lit (green)	USB initialized, VBAT on
Flashing (green)	K-Line traffic

[1)] The DCI-KLine1 is not connected to the host PC, or the host PC is switched off.
[2)] The USB driver is missing or deactivated, or the host PC has not finished booting.

Support of optoisolation

The DCI-KLine1 has integrated optoisolation. The optoisolation prevents ground loops, which can occur especially when the engine is cranked. Thus, transient currents do not affect the data transmission.

Related topics

References

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DCI-KLine1 Data Sheet

Introduction

The data sheet summarizes the technical data of the DCI-KLine1.

Technical Specifications of the DCI-KLine1

Technical data

The following table summarizes the technical specifications of the DCI-KLine1:

Parameter		**Specification**[1)]
General		▪ Support of fast initialization on K-Line via hardware-generated wake-up pattern (WuP) ▪ Baud rate range: 183 … 115,200 baud[2)] for communication Provides the standard PC baud rates according to ISO 14230 (9.6 kBd, 19.2 kBd, 38.4 kBd, 57.6 kBd, 115.2 kBd) and other specific baud rates. ▪ FT232BM USB-to-serial converter
Host interface		USB 1.1 (compatible with USB 2.0) dSPACE does not guarantee compatibility with USB 3.0.
Software configuration		Via ControlDesk
Electrical characteristics	Power supply	Power is supplied by the ECU or the vehicle. ▪ Voltage range: 4 V … 40 V ▪ Overvoltage protection: ±60 V, including all possible wrong wirings of K-Line, GND, and VBAT
	Power consumption	▪ < 100 mA (from USB) ▪ 40 mA max. (from VBAT) ▪ Approx. 2 mA (from VBAT, in standby mode)
	Galvanic isolation	Up to 60 V DC (connector maximum) via optoisolation

Parameter		Specification[1)]
Mechanical characteristics	Chassis	Aluminum box

	Connectors	▪ 4 mm female connectors for connection to the ECU and power supply:
		  ▪ Red: VBAT
		  ▪ Black: GND
		  ▪ Green: K-Line
		▪ A-type USB connector with 1.5 m (59 in.) cable for connection to the host PC

	Status LED	▪ Off: USB not powered/not connected ▪ Lit (yellow): USB not initialized, VBAT on ▪ Lit (red): USB initialized, VBAT off ▪ Lit (green): USB initialized, VBAT on ▪ Flashing (green): K-Line traffic
	Physical size (height × width × depth)	16 mm × 55 mm × 84 mm (0.63 in. × 2.16 in. × 3.30 in.)
	Weight	Approx. 150 g (0.33 lb.)
Environmental	Ambient temperature	-40 … +85 °C (-40 … +185 °F)
	Storage temperature	-65 … +125 °C (-85 … +257 °F)
CE compliance		Meets the requirements of applicable European directives for CE marking as follows: ▪ 2014/35/EU (Low-Voltage Directive) ▪ 2014/30/EU (Electromagnetic Compatibility Directive)

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

2) The lower limit is determined by the USB-to-serial converter. The upper limit is determined by the driver circuit and capacitance of K-Line.