MicroAutoBox III Embedded PC

Hardware Installation and Configuration

Release 2021-A – May 2021

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.
  Tel.: +49 5251 1638-941 or e-mail: support@dspace.de

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 Document

Content
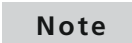
This document introduces you to the MicroAutoBox III Embedded PC and its variants with radio interfaces:

- MicroAutoBox III Embedded PC
- MicroAutoBox III Embedded PC (WLAN)
- MicroAutoBox III Embedded PC (LTE)
- MicroAutoBox III Embedded PC (WLAN/LTE)

The document describes the hardware components and provides information on how to work with the Embedded 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/go/help.
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 Embedded PC, read and ensure that you comply with the following safety precautions. These precautions must be observed during all phases of system operation.

dSPACE General Safety Precautions

In addition to the safety precautions given in this document, read the dSPACE General Safety Precautions. This document describes the risks of injury and damage to the dSPACE hardware in general.

A printed document of the dSPACE General Safety Precautions is delivered together with your hardware. You can also find the document in PDF format on the dSPACE DVD.

Where to go from here

Information in this section

User Qualification and Intended Use

User qualification

Only qualified persons with experience in installing computer hardware and electric devices are allowed to install or uninstall hardware.

Intended use of the Embedded PC

The Embedded PC is intended to be used for the developing, researching, and testing of advanced driver assistance, infotainment, telematics, and image processing applications. The Embedded PC must be used in a clean and dry environment (pollution degree 2, according to IEC 61010-1).

Using the Embedded PC for purposes other than the intended one (e.g., in vehicles intended for sale to consumers, or in machines as part of production machinery) is considered to be improper and non-contractual use.

You are not allowed to open, modify, or service the Embedded PC unless the required instructions are explicitly stated in the user documentation or were sent to you by dSPACE Support in writing. Perform the instructions only if you have the required skills.

The Embedded PC is a CE class A device. This equipment may cause interference in a residential installation. In this case the user is encouraged to perform appropriate measures to correct the interference. For more information on product compliance, refer to Certifications on page 56.

Type Label and Product Safety Labels

Introduction

The type label and product safety labels must be permanently attached to the product. If product safety labels are damaged or not clearly legible, replace them immediately. For replacement labels contact dSPACE Support.

Type label

The type label at the bottom clearly identifies the product. The information on the type label is required for using the product and for questions to dSPACE Support.
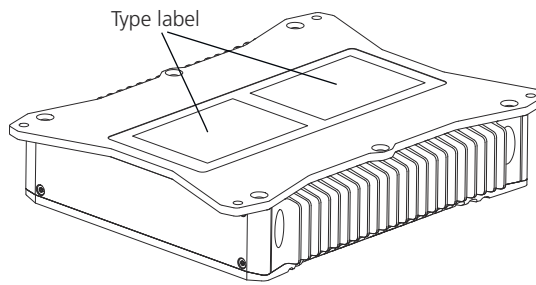
Type label

The type label provides the following information:
- Information to identify the product:
  Name of the product, product type, and serial number
- Operating voltage range
- Rated operating power
- Products with radio interfaces only: Regulatory information
- Contact information

Symbols on the type label   The following table describes the symbols used on the type label. Not all symbols are used on every product.

Symbol	Description
⚠ 📖	Read the user documentation for your dSPACE product. This will give you all the information required to use your dSPACE product safely and efficiently. Keep the user documentation for future reference.
C E	The product complies with the requirements of the applicable EU directives.
♻ (crossed-out wheelie bin)	You must ensure that dSPACE hardware is disposed of in accordance with the applicable regional rules and regulations. You are strongly recommended to contact the regional waste management authorities to find a disposal or recycling center for the proper and environmentally sound disposal of dSPACE hardware (e-waste). Recycle or reuse dSPACE hardware wherever possible.
(Japanese certification symbol)	The product complies with the requirements of the applicable Japanese radio equipment regulations. The type certifications are printed to the right of the symbol.

Product safety labels   No product safety labels are attached to the product.

Safety Precautions for Connecting to Power Supply/Vehicle Battery

Using the correct operating voltage

The Embedded PC must be supplied with the correct operating voltage to avoid electric shock and malfunctions.

- Make sure that the power supply/vehicle battery does not exceed 32 V DC.
- Do not use plugs for the power supply cable that can lead to an accidental connection to hazardous supply voltages, such as the mains voltage.
- If the Embedded PC is built in a MicroAutoBox III, the power input connector of the Embedded PC is covered with a protective cap. Do not remove the protective cap.
- To avoid hardware damage and the risk of electric shock, do not connect the Embedded PC to an AC power source.

Building the power supply cable

A vehicle battery can supply high currents. If a short circuit occurs, e.g., in the cable harness, the current of the vehicle battery (power supply) generates heat in the connected cables. The heat might cause a fire.

- Insert fuses into the power supply cable and other cables that are connected to the battery/power supply to avoid an electrical fire.
- Locate the fuses close to the battery/power supply.
- Choose fuse ratings that ensure that the fuses break the circuit if the connected cables are loaded with the maximum currents supported by the cross sections of the cables used.
- Make sure that you use flame-retardant cables specified for temperatures up to 105 °C (220 °F) that were tested in conformity with IEC 60332-1-2, IEC 60332-2-2, or UL VW-1.
- Make sure that you use flame-retardant connectors specified for temperatures up to 105 °C (220 °F) and V-2 classified in conformity with IEC 60695-11-10 or UL 94.

Connecting to a vehicle battery

Even a brief disconnection of the battery during engine operation can cause the vehicle generator to generate hazardous voltages of more than 100 V (load dump).

- Turn off the vehicle engine before connecting or disconnecting the vehicle battery.

Batteries cannot be switched off. Therefore, locate a disconnect switch in the power supply cabling:

- Use an all-pole disconnect switch that matches the rating of the Embedded PC.

- Make sure that the disconnect switch can be reached by the user in case of an emergency.

Related topics

Basics

Safety Precautions for Installing the Embedded PC

Installing or uninstalling the Embedded PC

You install and uninstall the Embedded PC at your own risk. Any damage to or malfunction of dSPACE hardware caused by improper installation or uninstallation is not covered by the warranty, unless the handling and installation instructions are shown to be defective.

For example, installation work includes:

- Connecting/disconnecting external devices and the power supply.

Before doing any installation or uninstallation work, observe the following points:

- Check the Embedded PC for external damages. You must not put into operation any damaged hardware.
- Disconnect the power supply/vehicle battery.
- Disconnect the external devices from the Embedded PC.
  In case of a fault, connected external devices might conduct dangerous high voltage to the Embedded PC or parts of the circuitry.

The safety precautions in this document must be carried out for installation work and for system operation.

Handling hardware with electrostatic sensitive devices

dSPACE hardware contains sensitive electronic devices. There is a risk of damaging the hardware or reducing its lifetime due to electrical fields or electrostatic discharge (ESD) that occur on touch. To avoid this risk, take the following precautions:

- Only qualified persons with knowledge of protective measures for electrostatic sensitive devices are allowed to unpack, install, or remove sensitive electronic devices.
- During the transport and storage of a sensitive electronic device, place it in closed ESD packaging.
- While handling a sensitive electronic device, place it on a properly grounded workstation, such as a special ESD desk or desk mat.
- You must ensure potential equalization between the environment and you, e.g., by wearing a grounded ESD wristband.

- Do not touch the board or the contacts of the connectors, even after installing the sensitive electronic device.

Connecting and disconnecting external devices

To prevent damage to the hardware:
- Apply voltages/currents to the connector pins only inside the specified ranges.
- Do not connect or disconnect any devices while the Embedded PC is powered up and/or external devices are switched on. Make sure that external devices are turned off beforehand.
- Make sure that the wiring material fulfills the required characteristics.
- Do not use radio connections for safety-relevant functions. The performance of radio connections can be significantly reduced or the connection can be lost due to radio dead spots, insufficient radio range, radio disturbances, or radio shadow.

Connecting to local area networks (LAN)

All the Ethernet ports of the Embedded PC contain safety extra-low voltage (SELV) circuits, which must be connected only to other SELV circuits.
- To avoid electric shock, do not connect the Ethernet ports of the Embedded PC to non-SELV circuits, e.g., telecommunication network voltage (TNV) circuits.
- The LAN or LAN segment of the Embedded PC and all connected equipment must be part of the same low-voltage power distribution system.
- Do not use RJ45 connectors of wide area network (WAN) ports, because WAN ports can contain TNV circuits.
- LAN cables can occasionally be subject to hazardous transient voltages, such as lightning or disturbances in the electric utilities power grid. Handle exposed metal components of the network with caution.

Safety Precautions for Using the Embedded PC

Observing environmental conditions

Make sure that the following environmental conditions are fulfilled when using the Embedded PC:
- Use the Embedded PC only in a normal clean and dry environment and avoid condensation.

  According to IEC 61010-1, using Embedded PC in wet locations (i.e., an electroconductive liquid is present that reduces the human impedance between the electric contacts of the hardware and the user) can result in electric shock due to hazardous voltages or can damage the hardware. Ensure that the Embedded PC is not put into operation in an environment with a pollution degree higher than 2 according to IEC 61010-1.
- Use the Embedded PC only at an altitude below 2,000 m.

  The air section and current leakage path changes at altitudes higher than 2,000 m, which reduces the product safety.

- Do not use the Embedded PC with damaged cables.

  Route all the external cables so that they are neither likely to be walked on nor pinched by items placed upon or against them.

  Replace any damaged cables.
- Observe the operating temperature range of the Embedded PC. Refer to General Characteristics on page 54.

Guidelines for safe in-vehicle use of dSPACE products

Any in-vehicle use of dSPACE products in line with the contractual purposes requires the use of enclosed test tracks that are specially safety-secured for the specific purpose, i.e., with appropriately restricted access and additional appropriate safety measures.

If you intend to use dSPACE products outside enclosed tracks, you have to check with the relevant authorities in your country under which circumstances this is possible. You and the local authorities involved bear full responsibility for this type of use.

You must take appropriate measures to ensure that the overall system enters a safe state if a dangerous situation occurs, e.g., by implementing emergency shutdown or a limp-home mode. This particularly applies in the following cases:

- Where safety-critical interventions that affect vehicle behavior are performed, e.g., the stimulation of a bus system, such as CAN, or the calibration or bypassing of in-vehicle electronic control units (ECUs) that control powertrain, chassis, or body systems.
- Where dSPACE products are deployed in conjunction with ECUs that can pose a hazard if they malfunction.

Accordingly, the guidelines apply to the use of dSPACE products in aircraft or vessels in compliance with the contractual purposes.

Observing workplace regulations

To avoid the risk of personal injury and hardware damage, you have to follow the workplace regulations defined by the national law of your country.

For example:
- Do not use electric devices near explosive materials or flammable fluids, gases, or dusts.
- Do not use electric devices outside the environmental conditions described in the user documentation.

Avoiding burns

The MicroAutoBox III Embedded PC can heat up during operation.
- Verify the temperature of the housing before you touch it, especially if the environment temperature is high.

Handling dSPACE hardware with fans

Improper handling will damage the fan:
- Do not touch any components of the fan, neither during operation nor when it has stopped.

- Do not try to stop a rotating fan with your fingers or with the help of tools.
- Do not apply pressure to the fan bearing during installation and removal of the hardware.

Protecting the data privacy and the integrity of applications

- You are responsible to install the latest security patches and updates that are provided for the installed operating system and applications. Follow the instructions of the application manufacturers in order to eliminate possible security vulnerabilities at an early stage.
- The Embedded PC provides memory components that can store non-volatile data. To avoid the unauthorized propagation of non-volatile data, clear the memory before you pass the Embedded PC to another person.

Notes on Disposal

Disposing an Embedded PC

You must ensure that dSPACE hardware is disposed of in accordance with the applicable regional rules and regulations. You are strongly recommended to contact the regional waste management authorities to find a disposal or recycling center for the proper and environmentally sound disposal of dSPACE hardware (e-waste). Recycle or reuse dSPACE hardware wherever possible.

Battery information   A lithium manganese dioxide coin cell battery is permanently installed in the Embedded PC.

Package Contents

Contents of an Embedded PC Package

Package contents of the stand-alone variant

The table shows the items that are delivered with every stand-alone variant of the Embedded PC.

Contents	Description
1 x Embedded PC	-
1 x CB6073PW	Preconfigured power supply cable to connect the Embedded PC to a power supply.
1 x 7W2 Sub-D connector	Connector to build a power supply cable.
1 x dSPACE General Safety Precautions	Printed document to prevent personal injury and damage to dSPACE hardware due to improper handling.

Additional contents   The table shows the additional items that are delivered with installed modules.

Installed Module	Contents	Description
DS932 Automotive Ethernet	1 x AETH_CAB1	Preconfigured automotive Ethernet connection cable.
DS933 CAN FD	1 x 9-pin female Sub-D connector	Connector to connect a CAN network.

Package contents of the built-in variant

For the package contents of a MicroAutoBox III with a built-in Embedded PC, refer to Contents of a MicroAutoBox III Package (MicroAutoBox III Hardware Installation and Configuration 📖).

Related topics

References

Introduction to the Embedded PC

Where to go from here

Information in this section

Embedded PC Features

Block diagram

The following block diagram provides a functional view of the MicroAutoBox III Embedded PC.

MicroAutoBox III Embedded PC
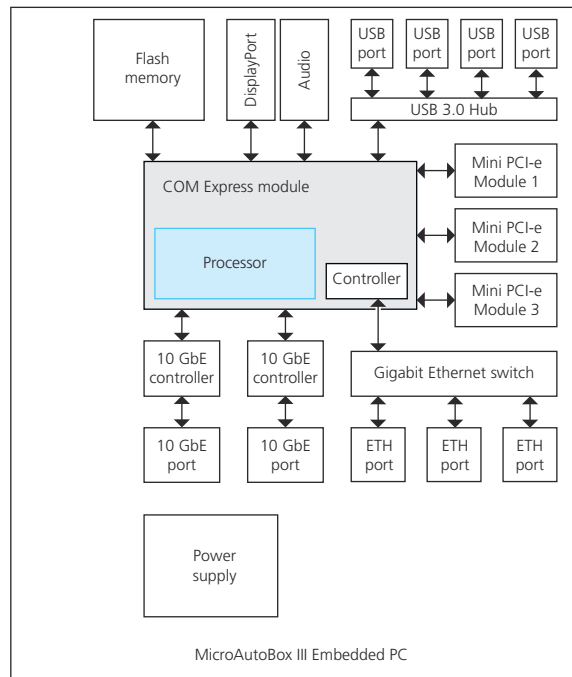
These are the main features of the Embedded PC:

- Compact PC system for in-vehicle use.
- Intel® Xeon® E3-1505L V6 with a clock frequency of 4 x 2.2 GHz and 8 MB cache.
- 240 GB internal flash memory.
- Operating systems:
  - Microsoft® Windows® 10 IoT Enterprise LTSC 2019, 64-bit version, installed by default.
  - Linux distribution as image file on USB recovery stick.
- A total of three modules can be installed by dSPACE in any combination:
  - Up to three DS932 Automotive Ethernet Modules, supported only by Linux
  - Up to three DS933 CAN FD Modules
  - One DS934 WLAN/Bluetooth Module
  - One DS935 LTE/GNSS Module
- Two 100/1,000/10,000 Mbit/s Ethernet ports that are directly connected to the processor.
- Three 10/100/1,000 Mbit/s Ethernet ports are connected to an internal Gigabit Ethernet switch.

- One DisplayPort^{TM} 1.2 connector for up to two monitors.

  You can connect DisplayPort 1.2 MST-capable monitors via daisy chain or you can use a DisplayPort splitter.

- Four USB 3.0 ports.

Related topics

References

The Embedded PC and a MicroAutoBox III in one Housing

Introduction

The built-in variant of the Embedded PC can be combined with a MicroAutoBox III to form a single unit. Internal connections of the power supply and Ethernet interfaces reduce the wiring effort.

> **Note**
>
> You cannot mount a MicroAutoBox III on the stand-alone variant of the Embedded PC. This must be done by dSPACE.
>
> However, you can connect the MicroAutoBox III and the Embedded PC via an external Ethernet cable to get the same functionality.

Block diagram

The following block diagram provides a functional view of a built-in Embedded PC.
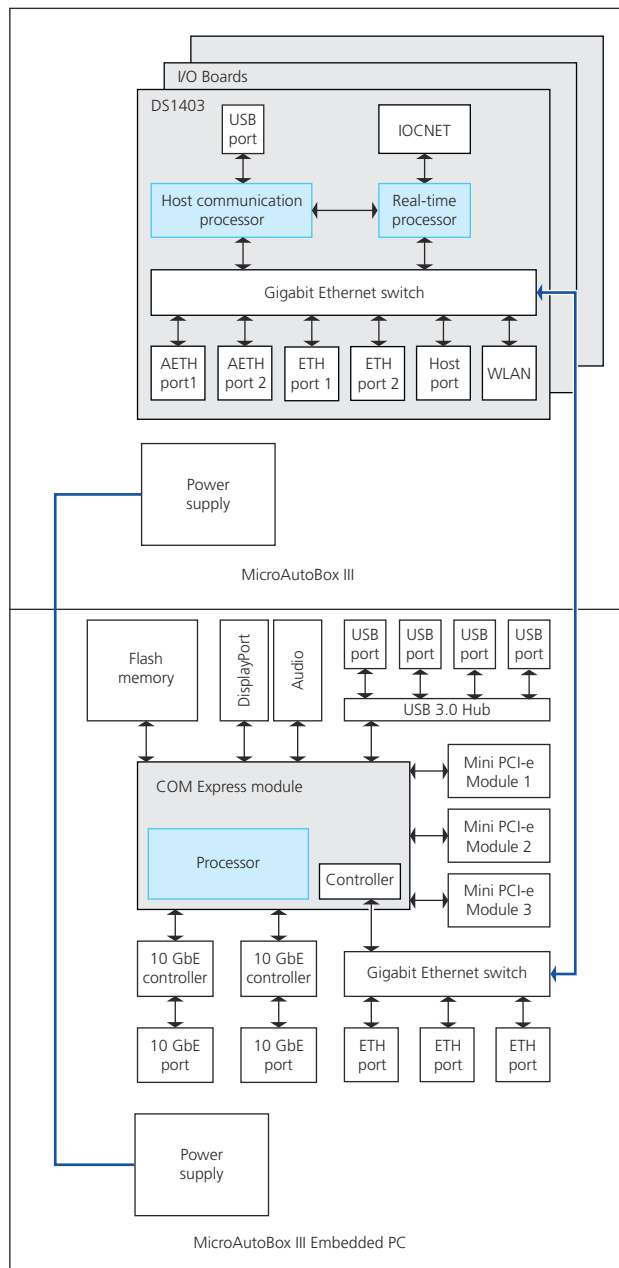
Power supply The Power input connector of the MicroAutoBox III is used for both power supplies.

Ethernet connection The Gigabit Ethernet switch of the Embedded PC is internally connected to the Ethernet switch of the DS1403 Processor Board.

> **Note**
>
> To enable the communication between the Embedded PC and a MicroAutoBox III, you must set a static IP address and a subnet mask on the Embedded PC.
> The default settings of the MicroAutoBox III are:
> - IP address: 192.168.140.10.
> - Subnet mask: 255.255.255.0.
> It is recommended to use the following settings for the Embedded PC:
> - IP address: 192.168.140.4.
> - Subnet mask: 255.255.255.0.

USB connection The USB ports of the MicroAutoBox III are not connected to the Embedded PC. Do not connect a mouse, keyboard, etc., because these peripherals will not work.

Functional safety with the MicroAutoBox III Embedded PC

A MicroAutoBox III provides a safety concept that includes a set of FuSa functionalities.

A MicroAutoBox III Embedded PC is not part of the MicroAutoBox III safety concept.

Related topics

References

MicroAutoBox III Data Sheets (MicroAutoBox III Hardware Installation and Configuration 🕮)

Powering the Embedded PC

Where to go from here

Information in this section
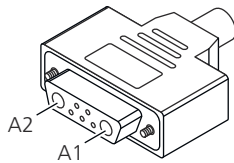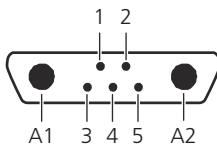
Requirements on the Power Cabling

Introduction

You can use the preconfigured CB6073PW power supply cable to supply the
Embedded PC or you can build a power supply cable. The CB6073PW is
delivered with the Embedded PC.

If you build a power supply cable, the cable must fulfill the requirements on the
power supply cabling.

General requirements on the power supply cabling

The connector of the power supply cable must be a 7-pin, female Sub-D connector with two high-current pins (mixed-layout 7W2 Sub-D). This is a special variant of a 15-pin Sub-D connector. The following table shows the cable connector and the pin numbering of the MicroutoBox III connector.

Cable Connector	Pin Numbering of the MicroAutoBox III Power Input Connector[1]

[1] Front view

The following requirements must be fulfilled by the power supply cable:

- Insert fuses into the power supply cable and other cables that are connected to the battery/power supply to avoid an electrical fire.
- Locate the fuses close to the battery/power supply.
- Choose fuse ratings that ensure that the fuses break the circuit if the connected cables are loaded with the maximum currents supported by the cross sections of the cables used.
- Make sure that you use flame-retardant cables specified for temperatures up to 105 °C (220 °F) that were tested in conformity with IEC 60332-1-2, IEC 60332-2-2, or UL VW-1.
- Make sure that you use flame-retardant connectors specified for temperatures up to 105 °C (220 °F) and V-2 classified in conformity with IEC 60695-11-10 or UL 94.
- Do not use plugs for the power supply cable that can lead to an accidental connection to hazardous supply voltages, such as the mains voltage.

Note

The power supply cable causes a voltage drop so that the supply voltage might fall below the required operating voltage at the power input connector. Especially if you use low operating voltages, choose a sufficiently large cross section for the power supply cable or make sure that the vehicle battery/power supply provides enough voltage to compensate for the voltage drop.

If in doubt, use the recommended wiring material.

Recommended wiring material You can use the following wires with the specified protection for all MicroAutoBox III and Embedded PC variants. Locate fuses close to the power supply/battery.

Wiring material		Connection to Power Input Connector	
		Power Supply Input **Pins A1 and A2**	**Remote Control Input** **Pin 4**
Fuse and Fuse Carrier	Current rating	25 A time lag fuse.	0.1 A time lag fuse.
	Voltage rating	Depends on the supply voltage VBAT: ▪ VBAT = 12 V or 24 V: 32 V DC ▪ VBAT > 24 V: 80 V DC	
	Interrupting rating	The interrupting rating must be greater than the short-circuit current of the respective current path at the applied supply voltage.	
Cable	Cross section	4 mm² (AWG 12)	0.25 mm² ... 0.5 mm² (AWG 20 ... AWG 23)
	Maximum temperature	105 °C (220 °F)	
	Flame retardant test specification	IEC 60332-1-2, IEC 60332-2-2, or UL VW-1	

Requirements on connecting a vehicle battery

Batteries cannot be switched off. Therefore, the following requirements must be fulfilled besides the general requirements on the power supply cabling:

▪ Use a switch for the remote control to switch on/off the Embedded PC via the REMOTE pin (pin 4). You can use the vehicle ignition switch (KL15), for example.

The remote control prevents the vehicle battery from depletion.

▪ Locate a disconnect switch in the power supply cabling:

  ▪ Use an all-pole disconnect switch that matches the rating of the Embedded PC. Refer to General Characteristics on page 54.

  ▪ Make sure that the disconnect switch can be reached by the user in case of an emergency.

The disconnect switch lets you disconnect the Embedded PC from the battery in case of an emergency.

Related topics

References

Powering the Embedded PC with a Laboratory Power Supply

Introduction

Before you install Embedded PC in a vehicle, you are recommended to perform first functionality tests of your application in a laboratory and to configure the hardware.

Required material

The following material is required:

- The preconfigured CB6073PW power supply cable that is delivered with the Embedded PC.
- An SPST (single -pole, single-throw) switch for the remote control, normally open.
- A laboratory power supply that provides the following supply voltage and power:
  - Output voltage: 10 V DC … 32 V DC
  - Power: Depends on the used variant.
    - 80 W for the stand-alone variant.
    - If the Embedded PC is combined with a MicroAutoBox III, refer to the type label at the bottom of the box.

Power input connector

Only the stand-alone variant of the Embedded PC provides a Power input connector.

The built-in variant of the Embedded PC is connected to the power input connector of the MicroAutoBox III. For more information, refer to The Embedded PC and a MicroAutoBox III in one Housing on page 21.

Wiring scheme

The following wiring scheme shows the power cabling using the stand-alone variant of the Embedded PC as an example. For the built-in variant, use the Power input connector of the MicroAutoBox III.

The switch lets you switch on/off the Embedded PC and the optionally installed MicroAutoBox III.

Related topics

Powering the Embedded PC with a Battery

Required material

The following material is required:

- One of the following power supply cables:
  - The preconfigured CB6073PW power supply cable that is delivered with the Embedded PC.
  - Self-made power supply cable that fulfills the requirements on the power supply cabling.

    For the requirements, refer to Requirements on the Power Cabling on page 25.

- A disconnect switch that can disconnect the Embedded PC from the battery in case of an emergency.

  Use an all-pole disconnect switch that matches the rating of the Embedded PC. Refer to General Characteristics on page 54.

Supported vehicle electrical system voltage

The Embedded PC can be supplied by 12 V, 24 V, and 28 V vehicle electrical system voltage. For the operating voltage range of the Embedded PC, refer to General Characteristics on page 54.
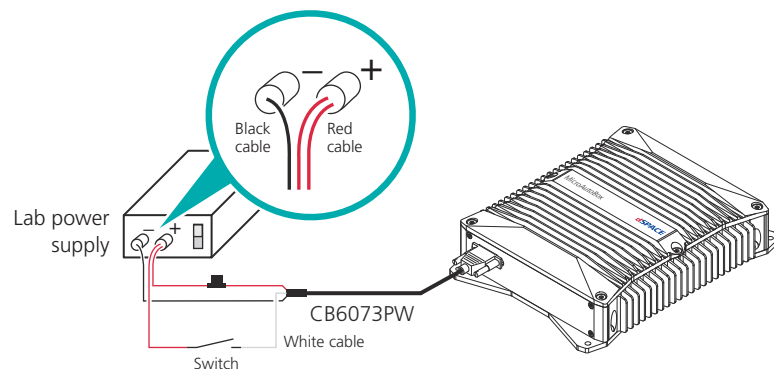
Power input connector

Only the stand-alone variant of the Embedded PC provides a Power input connector.

The built-in variant of the Embedded PC is connected to the power input connector of the MicroAutoBox III. For more information, refer to The Embedded PC and a MicroAutoBox III in one Housing on page 21.

Wiring scheme

The following wiring scheme shows the power cabling using the stand-alone variant of the Embedded PC as an example. If you use the built-in variant, use the Power input connector of the MicroAutoBox III.

You can use the ignition switch to switch on/off the Embedded PC via the REMOTE pin.
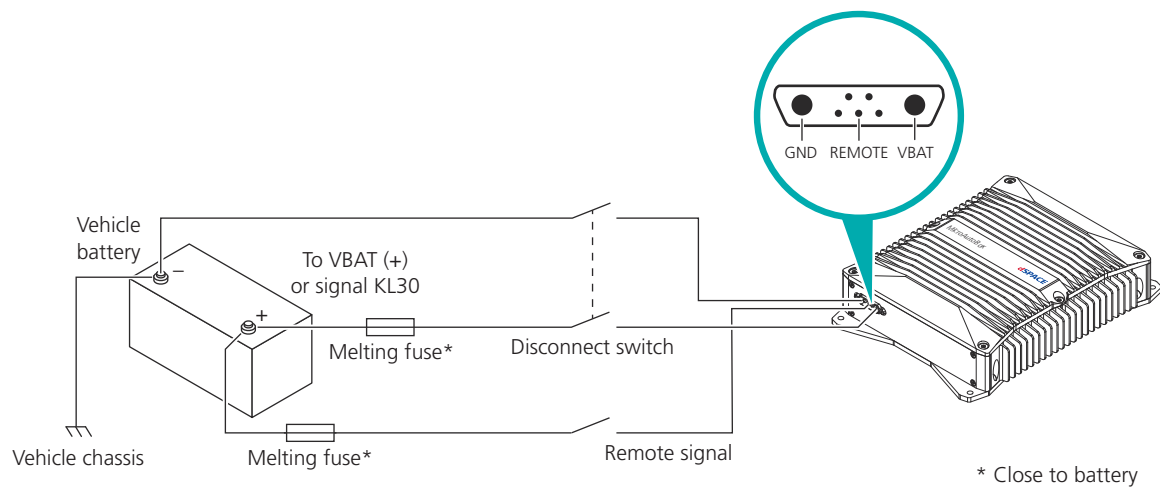
Make sure that the disconnect switch can be reached by the user in case of an emergency.

Features of the MicroAutoBox III   The Power input connector of the MicroAutoBox III provides more features than the Embedded PC. The Embedded PC supports only the remote control feature. Nevertheless, you can use all other features with the MicroAutoBox III.

For a wiring scheme of the MicroAutoBox III power cabling, refer to Building Power Supply Cables for Different Use Cases (MicroAutoBox III Hardware Installation and Configuration 📖).

Related topics

References

How to Switch On the Embedded PC

Objective   Switching on the Embedded PC and the optionally installed MicroAutoBox III.

Avoiding electrical fire

> ⚠ **CAUTION**
>
> **Risk of injury and/or material damage**
>
> An electrical fire might cause personal injury or material damage.
> - Do not use the CB6073PW power supply cable at supply voltages > 32 V DC.
> - Always replace the fuse of the power supply cable by a fuse with the same ratings.

Method

To switch on the Embedded PC

1   Connect the Embedded PC to a power supply. For information on connecting to the power supply, refer to one of the following topics:
   - Powering the Embedded PC with a Laboratory Power Supply on page 28
   - Powering the Embedded PC with a Battery on page 29

2   Switch the REMOTE pin (pin 4) to high level, for example, to VBAT. If you use the CB6073PW power supply cable, switch the white wire to a high level.

   The Embedded PC and the optionally installed MicroAutoBox III power up.
   - The Embedded PC is powered when the PWR LED lights up green.
   - The MicroAutoBox III is ready for operation when the PWR and SYS LEDs of the DS1403 Processor Board light up green.

Result

You switched on the Embedded PC and an optionally installed MicroAutoBox III.

Related topics

HowTos

How to Switch Off the Embedded PC

Objective

Switching off the Embedded PC and the optionally installed MicroAutoBox III.

Method

To switch off the Embedded PC

1   Change the voltage level at the REMOTE pin (pin 4) to low level by switching off the remote signal.

   The Embedded PC and the optionally installed MicroAutoBox III power down.

2 Before you switch off/disconnect the power supply, ensure that the Embedded PC and the optionally installed MicroAutoBox III entered the standby mode:

- The PWR LED of the Embedded PC is off.
- The PWR LED of the MicroAutoBox III (DS1403) is flashing blue.

Result   You switched off the Embedded PC and an optionally installed MicroAutoBox III.

Connecting to WLAN and Mobile Networks

Where to go from here

Information in this section

Using Radio Interfaces

Checking the antennas

Variants of the MicroAutoBox III Embedded PC provide radio interfaces.

Consider the following before you attach the antennas:
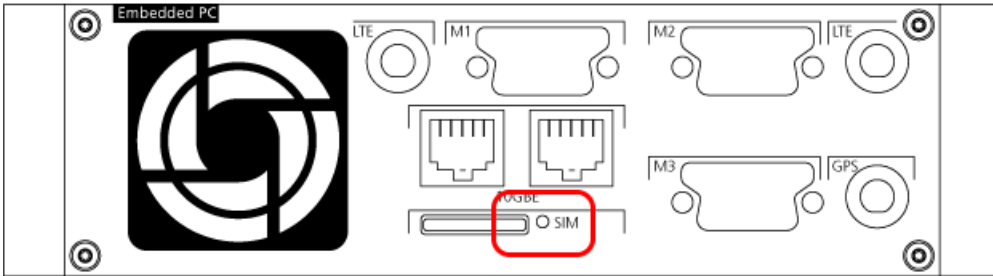
- Check the antennas for integrity. Replace a damaged antenna by a new antenna.
- Attach only the antennas to the WLAN/LTE/GPS connectors that are delivered by dSPACE for this product.
- Consider the restrictions and measurements to avoid interferences to radio communication devices. Refer to Avoiding interference with radio communication devices on page 60.

Related topics

References

How to Insert the SIM Card for Mobile Networking

Objective Inserting the SIM card to be able to connect to a mobile network.

Required Embedded PC variant Only the MicroAutoBox III Embedded PC (LTE) and MicroAutoBox III Embedded PC (WLAN/LTE) provide a radio interface for mobile networking.

Precondition You have a mini SIM card (2FF) that lets you access a mobile network.

Method **To insert the SIM card for mobile networking**

1 At the rear panel, insert a pointed tool into the opening next to the SIM slot and push the tool slightly.

The SIM tray is ejected.

2 Insert the SIM card into the tray with the contacts facing upwards.

3 Insert the SIM tray into the Embedded PC.

Result You inserted the SIM card for mobile networking.

Next steps Unlock the SIM card and enter the network credentials. The PIN of the SIM card must be provided by your network provider.

To unlock the SIM card, connect a monitor, a mouse, and a keyboard to the Embedded PC. For instructions on unlocking the SIM card and entering the network credentials, refer to the user documentation of the installed operating system.

Related topics

Basics

References

Establishing Ethernet Connections to the MicroAutoBox III

How to Establish Ethernet Connections to Real-Time Applications

Objective

Using an Ethernet connection between the Embedded PC and a MicroAutoBox III to exchange data with a real-time application.

The built-in variant of the Embedded PC is connected to the processor board of the MicroAutoBox III via an internal Ethernet connection

Basics on the connection

To enable the communication between the Embedded PC and a MicroAutoBox III, you must set a static IP address and a subnet mask on the Embedded PC.

The default settings of the MicroAutoBox III are:
- IP address: 192.168.140.10.
- Subnet mask: 255.255.255.0.

It is recommended to use the following settings for the Embedded PC:
- IP address: 192.168.140.4.
- Subnet mask: 255.255.255.0.

Method

To establish an Ethernet connection to a real-time application

1 If you use the stand-alone variant of the Embedded PC, connect an ETH port of the Embedded PC and an ETH port of the DS1403 Processor Board with a dSPACE Ethernet connection cable.

You can use ETH_CAB1 Ethernet Connection Cable that is delivered with the MicroAutoBox III, for example. Refer to Ethernet Connection Cables on page 82

2 On the Embedded PC, set a static IP address for the Gigabit Ethernet controller.

For information on setting a static IP address, refer to the documentation of the used operating system.

3 Ensure that the Ethernet switch of the MicroAutoBox III processor board switches the Ethernet traffic to the correct controllers.

The Ethernet switch of the MicroAutoBox III processor board is configurable. For more information, refer to Basics on the Internal Ethernet Switch (MicroAutoBox III Hardware Installation and Configuration 📖).

4 In the real-time model, set the Ethernet controller to the specified Ethernet settings. Refer to Ethernet Setup (ConfigurationDesk I/O Function Implementation Guide 📖).

Result

The real-time application of the MicroAutoBox III can communicate with an application of the Embedded PC via Ethernet.

Related topics

Basics

Basics on Implementing Ethernet Communication in ConfigurationDesk (ConfigurationDesk I/O Function Implementation Guide 📖)

References

CONFIGURATION - Ethernet Board Configuration Page (MicroAutoBox III Hardware Installation and Configuration 📖)

In-Vehicle Installation

How to Install an Embedded PC in a Vehicle

Safety precaution

Comply with the following safety precaution if the Embedded PC provides connectors for radio signals.

> **NOTICE**
>
> **Risk of material damage due to mechanical shock**
>
> Protruding connectors that are exposed to mechanical shock can be damaged and lose their functionality.
> - Handle protruding connectors with care.

Clearances and installation positions

You have to observe the following clearances and installation positions:
- For sufficient heat dissipation and free airflow, observe the minimum clearances of 200 mm (7.9 in.) from the front and rear panels to walls, other devices or objects.
- To prevent hot liquids from leaking from ventilation slots in the exceptional case of an internal fire, observe the illustrated installation positions.

Horizontal:
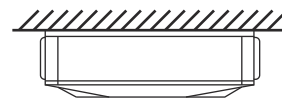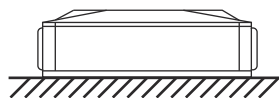
Vertical:
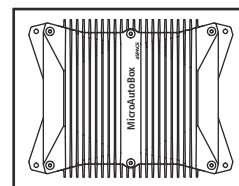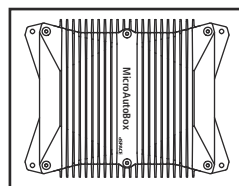
The following installation positions are not allowed.

Vertical:
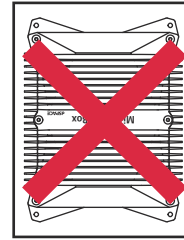
- If the Embedded PC is combined with a MicroAutoBox III, it is recommended to install the box in a horizontal position with the bolt holes at the bottom. The recommended installation position is relevant for heat distribution in the MicroAutoBox III to achieve efficient heat dissipation.

Required tools and material

The following tools and material are required:

- 4 x bolts that ensure a secure hold under the loads expected to be caused by shock and vibration. M5 is recommended.
- Drilling tools and tools to create threads, such as thread taps.
- Cleaning material.

Method

**To install an Embedded PC in a vehicle**

1 Determine the installation location. Observe the following conditions for the surface and the environment:
   - The surface must be flat and clean.
   - The surface must be suitable for thread cutting.
   - The surface must provide a secure hold.
   - The environment must be clean and dry (pollution degree 2, according to IEC IEC 61010-1).

2 Use the following illustration to determine the positions of the bolts.

> **Note**
>
> The illustration is not to scale.
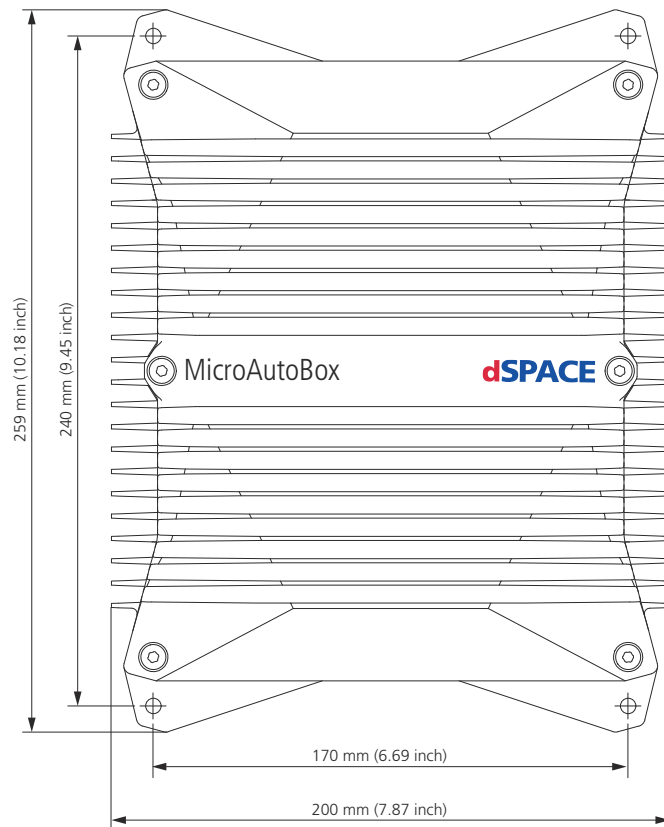
3 Drill the four holes and cut four threads. M5 is recommended. Use four bolts to attach the Embedded PC to the vehicle.

4 Attach the Embedded PC.

Result You installed the Embedded PC.

Installing the Operating System

How to Install the Operating System

Objective   Reinstalling the Microsoft Windows operating system or installing the delivered Linux distribution.

Installation medium   The provided USB stick contains the operating systems as a bootable ISO image.

Required devices   The following devices are required:
- Power supply
- Monitor with DisplayPort input
- DisplayPort cable
- USB keyboard
- USB mouse

Preconditions   Observe the following preconditions:
- You saved all user data from the Embedded PC.
- Only the power cable is connected to the Embedded PC. All I/O wiring from the system (Ethernet, LEMO, ZIF, Sub-D connectors) is removed.
- The Embedded PC is switched off.

Method   **Installing the operating system**

1 Connect a monitor to the DisplayPort connector of the Embedded PC.

2 Connect the keyboard and mouse to the USB connectors of the Embedded PC.

3 Plug the USB stick with the ISO image into a USB connector.

4 Switch on the Embedded PC.

5 Follow the menu-driven application.

6 If you installed Linux, install the Linux drivers for the Embedded PC:

- Change to the `driverInstallation` directory on the USB stick.
- Execute the `sudo sh installDriver.sh` command.
  The user password is `user`.

Result You installed the operating system.

Related topics HowTos

Maintenance

Where to go from here

Information in this section

How to Check and Replace the Dust Filter

Objective

Ensuring a sufficient airflow for cooling.

Checking interval

You have to check the dust filter at least once a year. More frequent checks might be necessary, depending on the operating conditions.

Effect of clogged dust filters

A clogged dust filter blocks the input air stream and increases the temperature in the Embedded PC, which might shorten the life of the hardware components. Cleaning the dust filter is not sufficient to restore the characteristics of a new one.

Tools

Use a slotted screwdriver, blade about 3 mm (0.1 inch).

Method	**To check and replace the dust filter**
	1 Switch off the Embedded PC and remove all wires.
	2 Remove the cover of the dust filter. To do this, use a slotted screwdriver as shown below.

1. Loosen cover
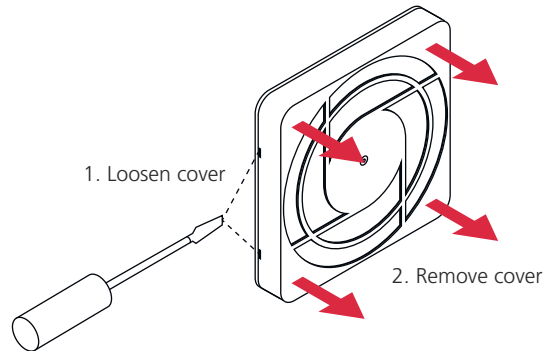
2. Remove cover

3   Remove the dust filter and check for dust.

If required, replace it with a new filter. For obtaining a new filter, contact dSPACE Support.

4   Place the dust filter to the cover of the filter.

5   Put the cover on the Embedded PC.

Result	You checked and if necessary replaced the dust filter.

How to Replace the Fuse of the CB6073PW Power Supply Cable

Objective	Replacing the fuse of the CB6073PW power supply cable.

Spare fuse	Regular 25A/32V ATO fuse

Method	**To replace the fuse of the CB6073PW power supply cable**
	1 Disconnect the CB6073PW power supply cable from the power supply/battery.

2 Open the fuse carrier.
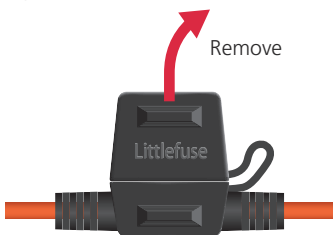
Remove

3 Replace the fuse with a regular 25A/32V ATO fuse.

4 Close the fuse carrier.

Result   You replaced the fuse.

Removing the Embedded PC

How to Remove the Embedded PC from a Vehicle

Objective   Safely removing the Embedded PC.

Method   **To remove the Embedded PC from a vehicle**

> ⚠ **WARNING**
>
> **Disconnecting the vehicle battery can result in serious injury or death**
>
> Even a brief disconnection of the battery during engine operation can cause the vehicle generator to generate hazardous voltages of more than 100 V (load dump).
> - Turn off the vehicle engine before connecting or disconnecting the vehicle battery.

1 Turn off the vehicle engine.

2 Open the disconnect switch.

3 Disconnect the power supply cable.

4 Disconnect the I/O wiring.

5 Remove the four bolts and remove the Embedded PC from the vehicle.

Result   You removed the Embedded PC and its cable harness.

Related topics   Basics

Data Sheet of the Embedded PC

Where to go from here

Information in this section

General Information

Where to go from here

Information in this section

Embedded PC Panel Components

Front panel overview

Component		Description
Connectors	Power input	Supplies and switches on/off the Embedded PC: ▪ Provided only by the stand-alone variant. ▪ For the input characteristics, refer to Supply Characteristics on page 68. ▪ For the pinout, refer to Power Input Connector Pinout on page 66.

Component		Description
		The built-in variant is supplied by the Power input connector of the MicroAutoBox III. Refer to DS1403 Panel Components (MicroAutoBox III Hardware Installation and Configuration 📖).
	USB	Provides four USB 3.0 ports to connect USB devices: ▪ For the interface characteristics, refer to USB Characteristics on page 72.
	DP	Outputs the video signals for up to two monitors: ▪ For the interface characteristics, refer to DisplayPort Interface Characteristics on page 71.
	IN (Audio)	Inputs the microphone signal: ▪ For the interface characteristics, refer to Audio Interface Characteristics on page 70.
	OUT (Audio)	Outputs the audio signals for headphones: ▪ For the interface characteristics, refer to Audio Interface Characteristics on page 70.
	ETH	Provides three Gigabit Ethernet ports. ▪ Matching adapter cables for the LEMO connector can be ordered from dSPACE. ▪ For the interface characteristics, refer to Ethernet Characteristics on page 71.
Antennas	WLAN	Optional connectors to attach two WLAN/Bluetooth antennas: ▪ Attach only a delivered antenna to this radio interface. Do not use antennas that are not provided by dSPACE for this product. Refer to Using Radio Interfaces on page 33. ▪ For the WLAN and Bluetooth characteristics, refer to DS934 WLAN/Bluetooth Module Data Sheet on page 78.
LEDs	PWR	For the LED status description, refer to LED Status on page 73.
	HDD	
	USR	
	ETH	

Rear

Component		Details
Connectors	M1 … M3	Provides signals of optionally installed interface modules inside the Embedded PC. The installed modules are written on the type label at the bottom of the Embedded PC.

Component		Details
		Refer to the following data sheets for the pinouts and signal descriptions: ▪ DS932 Automotive Ethernet Module Data Sheet on page 75 ▪ DS933 CAN FD Module Data Sheet on page 77
	10GBE	Provides two 10 Gigabit Ethernet ports. ▪ For the interface characteristics, refer to Ethernet Characteristics on page 71.
Antennas	LTE	Optional connectors to attach two LTE antennas and a GNS antenna:
	GPS	▪ Attach only a delivered antenna to this radio interface. Do not use antennas that are not provided by dSPACE for this product. Refer to Using Radio Interfaces on page 33. ▪ For instruction on connecting to a mobile network, refer to How to Insert the SIM Card for Mobile Networking on page 34. ▪ For the LTE and GNSS characteristics, refer to DS935 LTE/GNSS Module Data Sheet on page 79.
LED	10GBE	For the LED status description, refer to LED Status on page 73.

MicroAutoBox III housing components

The MicroAutoBox III housing components depend on the installed boards and I/O modules. Refer to Housing Components (MicroAutoBox III Hardware Installation and Configuration 📖).

Features of the Embedded PC

Feature overview

Refer to Embedded PC Features on page 20.

General Characteristics

Power input characteristics (VBAT)

The characteristics are specified for the following conditions, unless stated otherwise:

▪ All voltages are referenced to GND.
▪ All voltage values specify voltages on the connector pins.
▪ The protected voltage levels do not imply a functional operation.

Parameter		Specification[1]
Operating voltage range	For start-up	8 V DC … 32 V DC[2], [3]
	For operating	10 V DC … 32 V DC[2], [3]
Operating power (rated power)		80 W
Standby current		Typ. 5 mA

Parameter	Specification[1]
Protected reverse voltage	Up to -40 V
Load dump protection	Up to +60 V

[1] Unless stated otherwise, the specifications are valid only if the dSPACE hardware is correctly powered, switched on, and ready for operation.
[2] Undervoltage (cold crank) +8 V DC … +10 V DC for a maximum of 10 s only.
[3] With an additional absolute maximum tolerance of +4 V.

Interface characteristics

For interface characteristics, refer to Interface Characteristics on page 70.

Environmental conditions

The following table shows the environmental conditions the Embedded PC is designed for.

Parameter	Specification
Environment	For in-vehicle and indoor use.
Operating temperature range	0 °C … +60 °C (+32 °F … +140 °F)[1]
Storage temperature range	-20 °C … +70 °C (-4 °F … +158 °F)
Relative humidity	10% … 95%, noncondensing
Pollution degree	2, according to IEC 61010-1 (normal clean and dry environment)
Altitude	Up to 2,000 m

[1] Embedded PC variant with DS935 LTE/GNSS Module only: The maximum LTE performance can be achieved only if the operating temperature does not exceed 50 °C (122 °F).

Housing dimensions

The Embedded PC has the following dimensions.
- Length: 259 mm (10.18 in.)
- Width: 200 mm (7.87 in.)
- Height:
  - 72 mm (2.83 in.) for the stand-alone variant
  - For the height of a MicroAutoBox III with a built-in Embedded PC, refer to General Characteristics (MicroAutoBox III Hardware Installation and Configuration 📖).

Weight

The Embedded PC stand-alone variant weighs about 3,300 g.

For the total weight of an Embedded PC built into a MicroAutoBox III, refer to General Characteristics (MicroAutoBox III Hardware Installation and Configuration 📖).

Requirements on the Installation Location

Heat dissipation and installation position

For requirements on the installation location, refer to How to Install an Embedded PC in a Vehicle on page 39.

Certifications

CE compliance

The MicroAutoBox III Embedded PC without radio interfaces meets the requirements of the European directive 2014/30/EU (Electromagnetic Compatibility Directive) for CE marking.

The MicroAutoBox III Embedded PC (WLAN), the MicroAutoBox III Embedded PC (LTE), and the MicroAutoBox III Embedded PC (WLAN/LTE) meet the requirements of the European directive 2014/53/EU (Radio Equipment Directive) for CE marking, refer to Radio Devices Regulatory Notice on page 58.

Vibration and shock tests

To verify the reliability of the Embedded PC under realistic operating conditions, it was exposed to vibration and shock tests. During the tests, the Embedded PC executed a program without any faults.

Applied standards

The characteristics of the Embedded PC were tested according to the standards shown in the following table:

Tested Characteristics	Applied Standard	Description
Electromagnetic compatibility (EMC)	EN 55024:2010	Information technology equipment - immunity characteristics
	EN 61326-1:2013	Electric equipment for measurement, control and laboratory use - immunity according to table 2 (industrial environment)[1]
	EN 55022:2010	Information technology equipment - radio disturbance (class A)
	EN 61326-1:2013	Electric equipment for measurement, control and laboratory use Radio disturbance (class A)
	FCC 47 CFR Part 15	Radio disturbance
Vibration	ISO 16750-3:2012 / 4.1.2.4 Test IV	Test conditions: Broad band noise, 2 h per axis, RMS-acceleration 29.7 m/s^2
	DO-160F.8 / B1 Test Conditions	Test conditions: Broad band noise, 2 h per axis, based on DO160F Section 8, Category B1
	EN 60068-2-6	Test conditions: ▪ Swept sine, 1 octave per minute, 3-axis test ▪ 5 ... 2000 Hz, up to 5 g, 2 sweeps per axis

Tested Characteristics	Applied Standard	Description
		▪ Operating
Shock	ISO 16750-3:2012 / 4.2.2.	Test conditions: ▪ Linear shock (1/2 sine pulse), 6-axis ▪ 500 m/s^2, 6 ms, 10 pulses per axis ▪ Operating
	RTCA / DO-160F Section 7 Test 7.2 Category A Test type R	Operational shocks test (standard): ▪ Saw-tooth wave, 6-axis ▪ 200 m/s^2, 11 ms, 10 pulses per axis ▪ Operating
	RTCA / DO-160F Section 7 Test 7.2 Category D Test type R	Operational shocks test (low frequency): ▪ Saw-tooth wave, 6-axis ▪ 200 m/s^2, 20 ms, 10 pulses per axis ▪ Operating

[1] Connected cables might affect the specified characteristics due to physical effects, such as crosstalk, voltage drops, and influences through electromagnetic fields.

Notes on Regulations, Software Licenses, and Agreements

Where to go from here

Information in this section

Radio Devices Regulatory Notice

Introduction

The MicroAutoBox III Embedded PC (WLAN), MicroAutoBox III Embedded PC (LTE), and MicroAutoBox III Embedded PC (WLAN/LTE) comply with the radio frequency and safety standards of any country or region in which it has been approved for wireless use.

The Embedded PC variants with radio interfaces can contain the following modules:

- The MicroAutoBox III Embedded PC (WLAN) contains the Intel® Wireless-AC 9260NGW module to provide a WLAN and Bluetooth interface (DS934).
- The MicroAutoBox III Embedded PC (LTE) contains the Sierra Wireless AirPrime® EM7565 module to provide mobile communication and GNSS connectivity (DS935).
- The MicroAutoBox III Embedded PC (WLAN/LTE) contains the DS934 and the DS935 module.

The modules must be used in strict accordance with the regulations and constraints of the country of use. For more information, contact the local regulatory office in the country of use.

In the following, *product* stands for the MicroAutoBox III Embedded PC, *device* stands for the modules, and *equipment* for the device with the delivered antennas.

Radiation exposure statement

This product must be installed and operated with a minimum distance of 200 mm (7.87 in) between the product and persons and between the product and external antennas.

Modifications to the equipment

Any changes or modifications to this equipment not expressly approved by dSPACE could void the user's authority to operate the equipment.

The device is an integral part of the product and cannot be removed.

Europe: EU declaration of conformity

$C\epsilon$

This device bears the CE mark in accordance with Directive 2014/53/EU. To obtain a full copy of the EU declaration of conformity, contact dSPACE Support.

This equipment may be operated in:							
AT	BE	CY	CZ	DK	EE	FI	FR
DE	GR	HU	IE	IT	LV	LT	LU
MT	NL	PL	PT	SK	SI	ES	SE
GB	IS	LI	NO	CH	BG	RO	TR

RF band restrictions in European Community Countries   WLAN operation in the 5 GHz RF band is restricted to indoor use.

For outdoor operation in EU member states and EFTA countries, the user must use the 2.4 GHz RF band to comply with European spectrum usage laws for wireless LAN operation. The user must use a wireless LAN utility to check the current channel of operation. If the device is operated outside of the allowable frequencies for outdoor use, as listed above, the user must contact the applicable national spectrum regulator to request a license for outdoor operation.

FCC interference statement

This equipment has been tested and found to comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference, including interference that may cause undesired operation of the device.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the distance between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.
- WLAN operation in the 5 GHz RF band are restricted to indoor use.

ISED RSS-GEN statement

This device has been approved by Industry Canada to operate with the delivered antenna with the maximum permissible gain indicated. Other antennas are strictly prohibited for use with this device.

This device complies with Innovation, Science and Economic Development Canada license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les livrer antenne et ayant un gain admissible maximal. Autre antennes sont strictement interdits pour l'exploitation de l'émetteur.

Le présent appareil est conforme aux CNR Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage.
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Avoiding interference with radio communication devices

An improper installation or unauthorized use of radio interfaces can cause harmful interference with radio communication devices:

- If you operate the WLAN interface in the 5 GHz frequency range, the device is restricted to indoor use.
- Attach only the delivered antennas to the equipment. Do not use antennas that are not provided by dSPACE.
- Any modification of the antennas will void the FCC/ISED and CE certifications and your warranty.

The following statement applies to the products covered in this document, unless otherwise specified herein. The statement for other products will appear in the accompanying documentation.

dSPACE GmbH is not responsible for any harmful interference with radio communications caused by unauthorized modifications of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by dSPACE GmbH. The correction of interference caused by such unauthorized modification, substitution, or attachment will be the responsibility of the user.

The use of shielded communication cables is required when connecting this equipment to any and all optional peripheral or host devices. Failure to do so can violate FCC and ICES rules.

Regulatory IDs

The table shows the regulatory IDs that cover the device:

Country	DS934 WLAN/Bluetooth Module	DS935 LTE/GNSS Module
Canada	IC: 1000M-9260NG	IC: 2417C-EM75
Japan	▪ RF 003-170125 ▪ TEL D170079003	RF 003-170295
USA	FCC ID: PD99260NG	FCC ID: N7NEM75

Supplier's Declaration of Conformity

47 CFR § 2.1077 Compliance Information

Unique Identifier: MicroAutoBox III Embedded PC

Variants: *MicroAutoBox III Embedded PC,*
MicroAutoBox III Embedded PC (WLAN),
MicroAutoBox III Embedded PC (LTE),
MicroAutoBox III Embedded PC (WLAN/LTE)

Identification of the authorized components used in the assembly:
Name: MicroAutoBox III Embedded PC
Model Number: MABX_III_EMB_PC, EMB_PC_WIFI, and EMB_MOB_COM
FCC IDs: PD99260NG and N7NEM75

Responsible Party - U.S. Contact Information

Contact
     Dr. Peter Waeltermann
Address: dSPACE Inc., 50131 Pontiac Trail, Wixom, MI, USA
     48393-2020
Phone: +1 248 295-4700
Fax: +1 248 295-2950
Email: info@dspaceinc.com
Website: www.dspaceinc.com

FCC Compliance Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Linux Open Source Software Notice

Information on used Linux packages and kernel

A PDF file that provides information on the used Linux packages, versions, and license types is available on the USB recovery stick.

To get a list of the used Linux packages, execute the `dpkg -l` command in a terminal.

The source code of the modified Linux kernel and a make environment for compiling are part of the installation/Linux image. The source code and the make environment are located in the `/home/usr/kernel/` directory.

The source code of selected Linux packages can be obtained on request and at self cost.

Licensing Agreement

End user license agreement

The Embedded PC is manufactured by Janz Tec AG.

If the Embedded PC is used with the provided Windows operating system, the EULA terms at http://www.dspace.com/go/eula-epc apply.

Presettings of the Operating Systems

Where to go from here

Information in this section

Microsoft® Windows® as the Operating System

Installed Windows variant

This topic shows the presettings of the Embedded PC with installed Microsoft® Windows® 10 IoT Enterprise LTSC 2019, 64-bit version.

Presettings of the Windows configuration

Windows is installed on the Embedded PC with standard configuration features. To increase the performance of the Embedded PC, Windows is preset as follows:

Presetting	Option
Power save	Sleep and Hibernate are deactivated.
Telnet client	Installed
Installed CAN driver	PEAK-CAN & CAN-FD device driver 4.x
.NET and JAVA	Not installed
Virus scanner	Not installed
Windows firewall	Deactivated
User account control	Deactivated
User account rights	Administrator rights
	No login
Screensaver	Deactivated

Presetting		Option
Measures to reduce write access to the mSATA flash memory	ATA TRIM	Activated
	Automatic defragmentation	Deactivated
	Readyboost	Deactivated
	Windows search and file indexing	Deactivated
	Time stamp	Deactivated
	Windows system restore	Deactivated
Supported languages		English, German, French, Italian, Japanese, Chinese

Drive presettings

Integrated flash memory
- Drive name: System

  To store the operating system, programs, and data.
- Format: NTFS

BIOS presettings

The BIOS presettings are:
- The advanced host controller interface (AHCI) mode is activated to optimize read/write access to the mSATA flash memory.
- The USB connectors are first in the boot sequence, which enables you to boot from the USB stick that contains the operating system if reinstallation is required.

Linux as the Operating System

Installed operating system

This topic shows the presettings of the configuration when the Linux distribution ISO image from the USB stick is installed on the Embedded PC.

Presettings of the Linux configuration

A Linux distribution will be installed on the Embedded PC with standard configuration features. To increase the performance of the Embedded PC, the Linux distribution is preset as follows:

Presetting	Option
Computer name	MABXIIIEPC
User name	user
User password	user
Root password	epc

Presetting		Option
User rights		▪ No root rights, root password required ▪ No logon
Default network configuration		DHCP client is activated.
Screensaver		Deactivated
Power save		Suspend-to-Disk and Suspend-to-RAM are deactivated.
SSH client and server		Installed
Installed CAN driver		Peak PCAN-miniPCIe FD as of version 8.4
Automotive Ethernet driver		dSPACE
Ethernet timestamping		Linuxptp
Measures to reduce write access to the mSATA flash memory		▪ Saving the last access time is deactivated. ▪ ATA Trim is activated.
Language	Display	English
	Keyboard	
	Supported	English, German, French, Italian, Japanese, Chinese

Drive presettings

Integrated flash memory

▪ Drive name: System

  To store the operating system and programs.

▪ Format: Ext4

BIOS presettings

The BIOS presettings are:

▪ The advanced host controller interface (AHCI) mode is activated to optimize read/write access to the mSATA flash memory.

▪ The USB connectors are first in the boot sequence, which enables you to boot from the USB stick that contains the operating system if reinstallation is required.

Connector Pinouts

Where to go from here

Information in this section
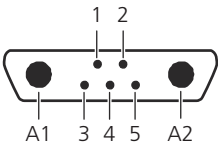
Power Input Connector Pinout

Purpose

Connector to supply and switch on/off the Embedded PC stand alone variant.

Pinout for the built-in variant

If the Embedded PC is combined with a MicroAutoBox III, the Power input connector of the MicroAutoBox III is used. Refer to Power Input Connector Pinout (MicroAutoBox III Hardware Installation and Configuration 📖).

Pinout

The Power input connector is a 7-pin, male connector with two high-current pins. It is a special variant of a 15-pin Sub-D connector (mixed-layout 7W2 Sub-D). The following illustration shows the pin numbering of the Power Input connector (front view of the Embedded PC):

Power Input Connector	Pin	Signal
1 2 / A1 3 4 5 A2	A1	GND
	A2	VBAT
	1	Do not connect
	2	Do not connect
	3	Do not connect
	4	REMOTE
	5	Do not connect

Signal descriptions	The following table shows the description of the signals. The signals are grouped by their functionality.	

Signal	Description	Characteristics
VBAT	Power input to supply the Embedded PC.	General Characteristics on page 54
GND	Power supply ground. GND is also connected to the housing of the Embedded PC.	
REMOTE	Remote control input to switch on/off the Embedded PC.	Remote Control Characteristics on page 69

Related topics

References

Power Input Connector Pinout (MicroAutoBox III Hardware Installation and Configuration 📖)

Module Connector Pinouts

Introduction

The Embedded PC provides the signals of optional interface modules at three module connectors.

The connector type and the pinout depend on the interfaces of the installed modules.

Installed modules

The type label at the bottom of your Embedded PC indicates the optionally installed interface modules and which module connector they use.

Installing the modules

All interface modules must be installed by dSPACE.

Module data sheets

Refer to the following data sheet providing information on the interface characteristics and the pinouts:

- DS932 Automotive Ethernet Module Data Sheet on page 75
- DS933 CAN FD Module Data Sheet on page 77

Supply Characteristics

Where to go from here

Information in this section

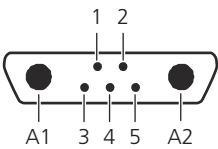## Power Input Characteristics

Purpose

Power input to supply the Embedded PC.

Power input characteristics

Refer to General Characteristics on page 54.

Signal mapping

The following table shows the Power input connector of the Embedded PC.

Power Input Connector	Supply	Pin
	VBAT	A2
	Supply Ground	
	GND	A1

Related topics

Basics

Remote Control Characteristics

Purpose

Remote control input to switch on/off the Embedded PC.

Remote signal characteristics

The characteristics are specified for the following conditions, unless stated otherwise:
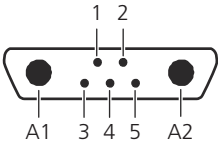
- All voltages are referenced to GND.
- All voltage values specify voltages on the connector pins.

Parameter	Specification[1]
Input voltage range	0 V … VBAT
Input high voltage	Min. 4.7 V
Input low voltage	Max. 0.8 V
Input hysteresis voltage	Min. 0.5 V, typ. 1 V
Input resistance	Min. 60 kΩ, max. 185 kΩ
Input type	Level-based input A high level switches on the Embedded PC.

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

Signal mapping

The following table shows the connector pins of the Power input connector.

Power Input Connector	Signal	Pin
	REMOTE	4
	Signal Ground	
	GND	A1

For the complete pinout, refer to Power Input Connector Pinout on page 66.

Related topics

HowTos

Interface Characteristics

Where to go from here

Information in this section

Audio Interface Characteristics

Interface characteristics

The following table shows the characteristics of the Audio interface.

Parameter	Specification [1]
Channels	▪ 1 x line in for microphones ▪ 1 x line out for headphones
Sound	Digital High Definition Audio Interface with support for multiple audio codecs.
Connectors	▪ Line in: 1 x 3.5 mm mono phone socket ▪ Line out: 1 x 3.5 mm stereo phone socket For the location, refer to Embedded PC Panel Components on page 52.

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

DisplayPort Interface Characteristics

Interface characteristics   The following table shows the characteristics of the DisplayPort interface.

Parameter	Specification [1]
Number of interfaces	1
Standard	DisplayPort 1.2
Connector	1 x DisplayPort connector For the location, refer to Embedded PC Panel Components on page 52.

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

Ethernet Characteristics

ETH characteristics   The following table shows the characteristics of the Gigabit Ethernet interfaces.

Parameter	Specification [1]
Number of controllers	1
Controller	Intel® 219-LM
Number of ports	3, connected to an internal Gigabit Ethernet switch
Ethernet switch type	Marvell® Link Street®-88E6390X, unmanaged
Supported standards	▪ 1000BASE-T[2] ▪ IEEE 802.1 AS compatible
Data rate	10/100/1,000 Mbit/s (autonegotiation)
Wake on LAN	Supported
Connectors	▪ 2 x RJ45 connector, located on front side. ▪ 1 x 8-pin LEMO connector, located on front side. A matching cable with a LEMO-RJ45 adapter is supplied by dSPACE on request. ▪ For the location, refer to Embedded PC Panel Components on page 52.

[1] Unless stated otherwise, the specifications are valid only if the dSPACE hardware is correctly powered, switched on, and ready for operation.
[2] Adapted and reprinted with permission from IEEE. Copyright IEEE 2018. All rights reserved.

10 GBE characteristics

The following table shows the characteristics of the 10 Gigabit Ethernet interfaces.

Parameter	Specification [1]
Number of controllers	2
Controller	Intel® X550AT2
Number of ports	2, one per controller
Supported standards	▪ 10GBASE-T[2] ▪ IEEE 802.1 AS compatible
Data rate	100/1,000/10,000 Mbit/s (autonegotiation)
Wake on LAN	Supported
Connectors	▪ 2 x RJ45, located on rear side. ▪ For the location, refer to Embedded PC Panel Components on page 52.

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

[2] Adapted and reprinted with permission from IEEE. Copyright IEEE 2018. All rights reserved.

USB Characteristics

Purpose

USB 3.0 ports to connect USB devices.

USB interface characteristics

The following table shows the characteristics of the USB interfaces.

Parameter	Specification [1]
Number of ports	4
Standard	USB 3.0
Data rate	Max. 5 Gbit/s The ports are internally connected to a USB Hub.
Output current	900 mA per port
Connector	4 x USB 3.0 Type A connector For the location, refer to Embedded PC Panel Components on page 52.

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

LED Status Descriptions

LED Status

Ethernet LEDs

The Ethernet LEDs are located on the front panel close to the Ethernet connectors.

RJ45 connector   Two LEDs provide status information on each RJ45 connector. The table below describes the LEDs statuses:

LED Status	Meaning
Both LEDs off	Indicates no connection.
Left LED yellow	The connection is serviceable.
Right LED flashing green	Indicates data traffic.

LEMO connector   One LED provides status information on the Ethernet LEMO connector. The table below describes the LED statuses:

LED Status	Meaning
Off	Indicates no data traffic.
Green	The connection is serviceable.
Green flashing	Indicates data traffic.

HDD LED

The HDD LED is located on the front panel. The table below describes the LED statuses:

LED Status	Meaning
Off	Indicates no access to the flash memory.
Green flashing	Indicates access to the flash memory.

PWR LED

The PWR LED is located on the front panel. The table below describes the LED statuses:

LED Status	Meaning
Off	The Embedded PC is not powered.
Green	The Embedded PC is powered.

USR LEDs

Two USR LEDs are located on the front panel.

The USR LEDs are customizable and can be controlled by your applications.

Related topics

References

Module Data Sheets

Where to go from here

Information in this section

DS932 Automotive Ethernet Module Data Sheet

Main feature

The DS932 Automotive Ethernet Module provides two independent automotive
Ethernet channels.

Connector description

The connector is a 4-pin, female LEMO connector giving access to two
automotive Ethernet channels.

Pinout   The following illustration shows the pin numbering and signals (front view of the Embedded PC).

LEMO Connector	Pin	Signal
Pin 1 ... Pin 4 Pin 2 ... Pin 3	1	TRX+ Port 1
	2	TRX- Port 2
	3	TRX+ Port 2
	4	TRX- Port 1

Pin naming   The pins are named as follows:

Pin Name	Description
TRX+	Positive bus signal
TRX-	Negative bus signal

Ethernet connection cable   The AETH_CAB1 Automotive Ethernet Connection Cable can be used to connect the automotive Ethernet port to a network.

For more information, refer to AETH_CAB1 Automotive Ethernet Connection Cable on page 83.

Matching cable connector   To build an Ethernet cable, use the following standard LEMO connector:

- Connector type: LEMO 4-pole Connector 1B Series with G-coding
- Example: FGG.1B.304.CYCD

For more information, refer to www.lemo.com.

Ethernet characteristics

Parameter	Specification[1]
Number of ports	2
Supported standard	BroadR-Reach
Data rate	100 Mbit/s for each port
Limitation	Supported only by the Linux operation system.

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

Related topics

Basics

References

DS933 CAN FD Module Data Sheet

| **Main feature** | The DS933 CAN FD Module provides two independent CAN channels, each of which can be used for CAN with flexible data rate (FD) or for standard CAN. |
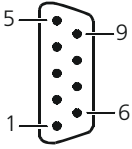
Connector description

The connector is a 9-pin, male Sub-D connector providing access to the I/O signals.

Pinout   The pin numbering used for Sub-D connectors is not standardized. The following illustration shows the numbering used (front view).

> **Note**
>
> **Do not rely on the numbers written on the Sub-D connectors.**

Sub-D Connector	Pin	Signal	Pin	Signal
5 — 9 1 — 6	5	CAN Ch. 2 Low FT		
	4	CAN Ch. 2 Low	9	CAN Ch. 2 High FT
	3	Ground	8	CAN Ch. 2 High
	2	CAN Ch. 1 Low	7	CAN Ch. 1 High
	1	CAN Ch. 1 Low FT	6	CAN Ch. 1 High FT

Pin naming   The pins are named as follows:

Pin Name	Description
CAN Ch. <x> High	CAN high signal, channel <x>
CAN Ch. <x> Low	CAN low signal, channel <x>
CAN Ch. <x> High FT	CAN high signal, feed-through line, channel <x>
CAN Ch. <x> Low FT	CAN low signal, feed-through line, channel <x>

CAN characteristics

The characteristics are specified for the following conditions, unless stated otherwise:

- All voltages are referenced to GND.
- All voltage values specify voltages on the connector pins.
- The protected voltage levels do not imply a functional operation.

Parameter	Specification[1]
Number of channels	2, each channel provides feed-through lines
Data rate (arbitration)	25 kbit/s … 1,000 kbit/s
Data rate (payload)	25 kbit/s … 12,000 kbit/s
Protected voltage range	- -40 V … +40 V between CAN pins and GND (CAN_{high}, CAN_{low})

Parameter	Specification[1]
	▪ -5 V … +5 V between CAN High pin and CAN Low pin (CAN_{diff})

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

Related topics

Basics

DS934 WLAN/Bluetooth Module Data Sheet

Main feature

The DS934 WLAN/Bluetooth Module provides a radio interface for WLAN and Bluetooth communication. This module is installed only to the MicroAutoBox III Embedded PC (WLAN) and MicroAutoBox III Embedded PC (WLAN/LTE).

Module characteristics

Parameter	Specification
Module type	Intel® Wireless-AC 9260
Standard	▪ IEEE 802.11a/b/g/n[1] ▪ IEEE 802.11ac[1] ▪ Supports MU-MIMO (multi-user, multiple-input, multiple-output) ▪ Bluetooth 5.1
RF band	2.4 GHz and 5 GHz
Connector	▪ 2 x SMA connector (WLAN) at the front panel. ▪ Attach only a delivered antenna to this radio interface. Do not use antennas that are not provided by dSPACE for this product. ▪ For the location, refer to Embedded PC Panel Components on page 52.

[1] Adapted and reprinted with permission from IEEE. Copyright IEEE 2018. All rights reserved.

Related topics

DS935 LTE/GNSS Module Data Sheet

Main feature

The DS935 LTE/GNSS Module provides a radio interface for mobile communication and GNSS connectivity. This module is installed only to the MicroAutoBox III Embedded PC (LTE) and MicroAutoBox III Embedded PC (WLAN/LTE).

Module characteristics

Parameter	Specification [1]
Module type	Sierra Wireless AirPrime® EM7565
LTE characteristics	
Technology	▪ LTE ▪ DC-HSPA+ ▪ HSPA+ ▪ HSPA ▪ UMTS (WCDMA)
Frequency bands	▪ LTE: B1 … B5, B7 … B9, B12, B13, B18 … B20, B26, B28 … B30, B32, B41 … B43, B46, B48, B66 ▪ UMTS: B1, B2, B4, B5, B6, B8, B9, B19
Peak download rate[2]	600 Mbit/s
Peak upload rate[2]	150 Mbit/s
Antenna connector	▪ 2 x SMA connector (LTE) at the rear panel. ▪ Attach only a delivered antenna to this radio interface. Do not use antennas that are not provided by dSPACE for this product. ▪ For the location, refer to Embedded PC Panel Components on page 52.
GNSS characteristics	
Supported GNSS	GPS, GLONASS, BeiDou, Galileo, QZSS
Satellite channels	Maximum 30 channels (16 x GPS, 14 x GLONASS), simultaneous tracking

Parameter	Specification [1]
Protocols	NMEA 0183 V3.0
Acquisition time[3]	- Hot start: 1 s - Warm start: 29 s - Cold start: 32 s
Accuracy	- Horizontal: < 2 m (50%); < 5 m (90%) - Altitude: < 4 m (50%); < 8 m (90%) - Velocity: < 0.2 m/s
Operational limits	Velocity < 100 m/s
Antenna connector	1 x SMA connector (GPS) at the rear panel. - Attach only a delivered antenna to this radio interface. Do not use antennas that are not provided by dSPACE for this product. - For the location, refer to Embedded PC Panel Components on page 52.

[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 LTE performance can be achieved only if the operating temperature does not exceed 50 °C (122 °F).

[3] Acquisition times measured with signal strength = -135 dBm

Related topics

Basics

HowTos

References

Accessories

Connection Cables

Where to go from here

Information in this section

Ethernet Connection Cables

Where to go from here

Information in this section

To connect a MicroAutoBox III (DS1403-04) or an Embedded PC to an automotive Ethernet network.

To connect a MicroAutoBox II/III/Embedded PC or a DCI-GSI2 to hardware with an RJ45 connector.

To connect a MicroAutoBox II/III/Embedded PC or a DCI-GSI2 to hardware with an RJ45 connector.

To connect a MicroAutoBox II/III/Embedded PC or a DCI-GSI2 to hardware with an RJ45 connector.

AETH_CAB1 Automotive Ethernet Connection Cable

Technical data   The following table shows the technical specifications of the cable:

Parameter	Specification[1]		
Purpose	To connect a MicroAutoBox III (DS1403-04) or an Embedded PC to an automotive Ethernet network.		
Illustration			
Connector	LEMO-1B, 4 pins		4 x open wire
Label on the cable	AETH_CAB1		
Length	5 m (197 in.)		
Operating temperature	-40 °C … +85 °C (-40 °F … +185 °F)		
Max. transfer rate	100 Mbit/s		

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

Color coding of the wires   The open wires are coded as follows:
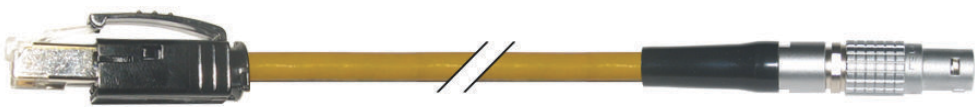
Color Code	Signal
Orange-brown	TRX+
Orange-black	TRX-

ETH_CAB1 Ethernet Connection Cable

Technical data   The following table shows the technical specifications of the cable:
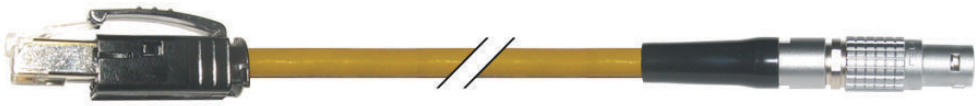
Parameter	Specification[1]	
Purpose	To connect a MicroAutoBox II/III/Embedded PC or a DCI-GSI2 to hardware with an RJ45 connector.	
Illustration		
Connector	RJ45 jack	LEMO-1B, 8 pins
Label on the cable	ETH_CAB1	
Length	5 m (197 in.)	
Operating temperature	-40 … +85 °C (-40 … +185 °F)	
Max. transfer rate	1 Gbit/s	

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

ETH_CAB4 Ethernet Connection Cable

Technical data   The following table shows the technical specifications of the cable:

Parameter	Specification[1]	
Purpose	To connect a MicroAutoBox II/III/Embedded PC or a DCI-GSI2 to hardware with an RJ45 connector.	
Illustration		
Connector	RJ45 jack	LEMO-1B, 8 pins
Label on the cable	ETH_CAB4	
Length	10 m (394 in.)	
Operating temperature	-40 … +85 °C (-40 … +185 °F)	
Max. transfer rate	1 Gbit/s	

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

ETH_CAB5 Ethernet Connection Cable

Technical data   The following table shows the technical specifications of the cable:

Parameter	Specification[1]		
Purpose	To connect a MicroAutoBox II/III/Embedded PC or a DCI-GSI2 to hardware with an RJ45 connector.		
Illustration			
Connector	RJ45 jack		LEMO-1B, 8 pins
Label on the cable	ETH_CAB5		
Length	5 m (197 in.)		
Operating temperature	-40 … +150 °C (-40 … +302 °F)		
Max. transfer rate	1 Gbit/s		

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

Power Supply Cables

Where to go from here   Information in this section

CB6073PW Power Supply Cable

Technical data

The following table shows the technical specifications of the CB6073PW power supply cable:

Parameter	Specification[1]		
Purpose	To supply a MicroAutoBox III, MicroAutoBox III Embedded PC, or SCALEXIO AutoBox.		
Connector	7-pin female Sub-D Connector with two high‑current pins (mixed-layout 7W2 Sub-D)		3 open wires
Label on the cable	CB6073PW		
Length	2.5 m (98 in.)		
Operating temperature	▪ −20 °C … +70 °C (−4 °F … + 158 °F) with movement ▪ −20 °C … +85 °C (−4 °F … + 185 °F) without movement		

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

Color coding of the wires

The open wires are coded as follows:

Color Code	Signal
Black	GND
Red	Positive voltage
White	Remote control