

DS1006 Modular Systems

Hardware Installation and Configuration Guide

For DS1006 Processor Boards and I/O Boards

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

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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.

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Contents

About This Document	7
Safety Precautions	9
Intended Use.....	10
Safety Precautions for Transportation.....	10
Safety Precautions for Installing and Connecting the Hardware.....	11
Safety Precautions for Using Expansion Boxes.....	13
Safe In-Vehicle Use of dSPACE Products.....	14
Safety Precautions for Using Connector Panels.....	15
Safety Precautions for Disposing dSPACE Hardware.....	15
Introduction to PHS-Bus-Based Systems	17
Hardware.....	17
Software.....	19
Before You Start	21
Installation and Configuration Overview.....	21
Checking the System Requirements.....	23
Setting Up the Boards	27
Resource Requirements of dSPACE Boards.....	28
Installation in the Host PC.....	28
Installation in the Expansion Box.....	29
Basics on Specific Board Settings.....	30
Basics on Changing I/O Base Addresses.....	30
Setting Up the Processor Board.....	32
DS1006: How to Change the I/O Base Address.....	32
Setting Up I/O Boards.....	34
Overview of Settings.....	35
How to Set the PHS-bus Address.....	39
DS2210: How to Connect all Digital Inputs to Various Voltage Levels.....	41
DS2210: How to Set the Output Mode for the Transformer Outputs.	42
DS2211: How to Set the Output Mode for the Transformer Outputs.	44

DS2302: Recommended Jumper Setting.....	46
DS2302: How to Change the I/O Base Address.....	46
DS3002: How to Select the Encoder Signal Type.....	48
DS4002: How to Change the Logical Level of the Timing I/O.....	50
DS4201-S: How to Set Up the Transceiver Mode.....	52
DS4201-S: How to Change the Quartz Oscillator.....	53
DS4201, DS4201-S: How to Change the Sub-ID.....	55
DS5001: How to Increase the Hysteresis Level of the Inputs.....	57
DS5101: How to Set Up the Pull-up Behavior.....	58
How to Insert Modules onto I/O Boards.....	59
How to Mount a DS5203M1 Multi-I/O Module on the DS5203 FPGA Board.....	60
How to Remove a DS5203M1 Multi-I/O Module from the DS5203 FPGA Board.....	61
Installing the Hardware	63
Installing dSPACE Boards.....	65
Notes on Installation.....	66
How to Switch Off a dSPACE System.....	71
How to Install dSPACE Boards.....	71
How to Switch On the dSPACE System.....	76
How to Remove a Board from a PHS-Bus-Based System.....	77
How to Connect the Time-Base Connectors in a PX10/PX20 Expansion Box.....	79
How to Remove Optical Transceiver Modules from a DS1006/DS1007.....	81
Upgrading a DS1003 Modular System.....	85
Changes Related to the PHS-Bus Hardware.....	85
Overview of PHS-Bus Cables and Terminators.....	85
Setting Up a Multiprocessor System.....	88
Basics on Setting Up a Multiprocessor System.....	88
How to Connect Several dSPACE Processor Boards.....	91
Installing Connector and LED Panels.....	94
How to Connect a Panel (CP, CLP) to a Board.....	94
How to Connect an LED Panel to a Connector Panel.....	97
How to Mount a Panel in a 19" Rack.....	99
PX20 Expansion Box Installation.....	100
Mounting a PX20 Expansion Box in a 19" Rack.....	100

Partitioning a PHS-Bus-Based System with the DS802 PHS Link Board	101
Introduction to the DS802.....	101
Examples of Using the DS802.....	104
Installation and Configuration Notes.....	108
Putting the DS802 into Operation.....	111
 Connecting an Expansion Box to the Host PC	 113
Connecting via Ethernet.....	114
Basics on Connecting via Ethernet.....	114
Connecting via Bus Interface.....	115
Link Boards Variants.....	115
Limitations With Link Boards.....	117
How to Establish the DS817/DS819 <-> DS814 Bus Interface.....	117
How to Establish the DS815/DS821 <-> DS814 Bus Interface.....	119
DS815 Connector and PC Card Link.....	120
Identifying the Connection Status.....	122
Using dSPACE CardSafe.....	125
Introduction to dSPACE CardSafe.....	125
How to Mount dSPACE CardSafe.....	128
How to Remove dSPACE CardSafe for Transportation.....	130
How to Remove dSPACE CardSafe Completely.....	131
Connecting dSPACE Boxes to the Host PC via DS830.....	133
Features of DS830 MultiLink Panel.....	133
How to Connect the DS830.....	135
DS830: Identifying the Connection Status.....	137
 Setting Up an Ethernet Connection Between PC and Expansion Box	 139
Setting Up The Ethernet Connection.....	140
Setup Procedure.....	140
Proceeding the Setup.....	140
Preparing the TCP/IP Configuration.....	141
How to Set up the TCP/IP Protocol of the Host PC Network Adapter.....	141
Setting Up a Peer-to-Peer Connection	143
How to Set Up a Peer-to-Peer Connection.....	143

Integrating the Expansion Box into a Network.....	144
Workflow for Integrating the Expansion Box into a Network.....	145
How to Change the IP Address of the Expansion Box.....	145
How to Restore the TCP/IP Configuration of the PC.....	146
How to Connect the Expansion Box to the Network and Test the Connection.....	147
 Connecting External Devices to the dSPACE System	 149
How to Connect External Devices to a Board.....	149
How to Connect External Devices to a Connector Panel.....	151
Using Sub-D Connectors.....	152
 Uninstalling the System	 155
Removing the Hardware.....	156
How to Remove Hardware from the Host PC.....	156
How to Remove Hardware from an Expansion Box.....	157
 Maintenance Work	 161
Checking and Replacing the Dust Filter of an Expansion Box/AutoBox.....	162
How to Check and Replace the Dust Filter of an Expansion Box/AutoBox.....	162
 Troubleshooting	 165
Hardware Problems.....	166
Checking the DS1006 and I/O Boards.....	166
Problems Using an Expansion Box via Bus Connection.....	167
Problems Related to the Firmware.....	167
Problems with the Ethernet Connection.....	168
General Errors Using Ethernet Connection.....	168
Restoring BIOS Setup of the Slot CPU.....	169
Problems When Setting Up the TCP/IP Protocol.....	170
Problems with Peer-To-Peer Connection.....	170
Problems with the Integration of an Expansion Box in a Network.....	171
 Index	 173

About This Document

Contents

This document will show you how to install and configure the hardware components of a DS1006 modular system. A DS1006 modular system is a PHS-bus-based system that is assembled from a DS1006 Processor Board.

The document describes the hardware installation procedure and shows how to configure the hardware.

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 dSPACE hardware, 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

Intended Use.....	10
Safety Precautions for Transportation.....	10
Safety Precautions for Installing and Connecting the Hardware.....	11
Safety Precautions for Using Expansion Boxes.....	13
Safe In-Vehicle Use of dSPACE Products.....	14
Safety Precautions for Using Connector Panels.....	15
Safety Precautions for Disposing dSPACE Hardware.....	15

Intended Use

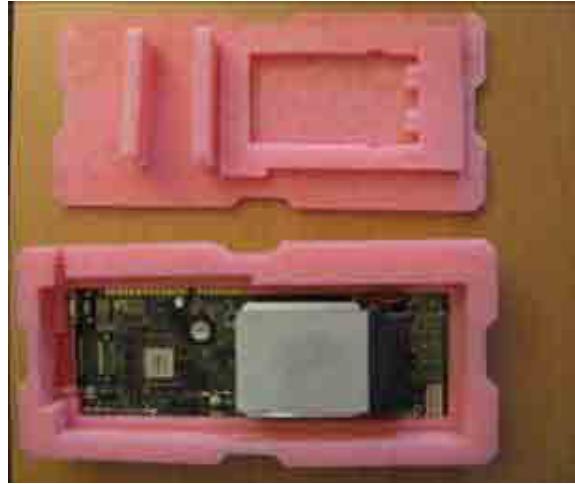
Intended use of PHS-bus-based systems	<p>PHS-bus-based systems are intended to be used as follows:</p> <ul style="list-style-type: none">▪ As rapid control prototyping (RCP) systems for the development, research, and test of functions for electronic control units (ECU).▪ As hardware-in-the-loop (HIL) systems for testing ECUs. <p>Using PHS-bus-based systems for purposes other than these (e.g., in machines as part of production machinery) is considered to be improper and non-contractual use.</p>
--	---

Safety Precautions for Transportation

Transportation of DS1006 installed in an Expansion Box	<p>The DS1006 Processor Board installed inside the expansion box will be damaged during transportation and shipment.</p> <p>Due to the weight of the heat sinks on the board, both the expansion box and the board itself will be damaged by acceleration and shocks.</p> <ul style="list-style-type: none">▪ For shipment and transportation, uninstall a DS1006 Processor Board from the expansion box (PX10 or PX20).▪ Ship the board separately from the box.▪ Ship the board only in the original package from dSPACE.
Wrapping the DS1006 (multicore processor board) for separate transportation	<p>Faulty packaging can damage the DS1006 multicore processor board during shipment/transportation.</p>

To avoid damage to the DS1006:

- Ship the board only in the original package from dSPACE.
- Fix the board firmly in place using the plastic foam from the original package as shown below.



Safety Precautions for Installing and Connecting the Hardware

User qualification

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

In the specific case that electric devices must be soldered, special qualifications for soldering are recommended. For details, refer to [Soldering devices](#) on page 12.

Installation sequence

- Read the instructions carefully before starting installation.
 - Note all given warnings.
 - Install the components of your system in the exact order stated.
- Any other sequence may lead to unpredictable results or even damage the system. For the installation and configuration procedure, refer to [Installation and Configuration Overview](#) on page 21.

Using the hardware on wet locations

The boards and the accessories of a PHS-bus-based system are not moisture-proof and are not intended to be used on wet locations according to IEC 61010-1 (product safety). Using the hardware of a PHS-bus-based system such as the expansion box on wet locations might result in electric shock due to hazardous voltages or damage the hardware.

- Use the hardware of a PHS-bus-based system on dry locations and avoid condensation.

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.
-

Handling boards with fans

Improper handling will damage the fan of the board and/or Gigalink module:

- 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 board.
-

Installing or uninstalling hardware

You install and uninstall dSPACE hardware 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.

Before doing any installation or uninstallation work, make sure that:

- The power supplies of the host PC and the expansion box (if used) are switched off.
- No external devices are connected to the dSPACE system.

In case of a fault, connected external devices might conduct dangerous high voltage to the dSPACE system or parts of the circuitry.

During installation work, make sure that:

- You hold the PHS-bus cable connectors straight to connect or disconnect them.

Holding them at an angle will damage the pins of the connectors on the boards or break the connector shells.

Soldering devices

In some specific cases, electric devices must be soldered to the dSPACE hardware. Unprofessional soldering will damage the hardware and/or lead to loss of hardware functionality.

You solder devices at your own risk. Any damage to or malfunction of dSPACE hardware caused by improper soldering is not covered by the warranty.

To avoid hardware damage:

- Only qualified persons with knowledge and experience in the following areas should solder electric devices:
 - Soldering in general (in particular, soldering SMD devices)
 - PCB (printed circuit boards) assembly
- Use only the correct tools: e.g., a suitable SMD soldering station.

Connecting and disconnecting devices

To prevent damage to the hardware:

- Do not apply voltages or currents outside the specified ranges to the connector pins.
- Do not connect or disconnect any devices while the dSPACE system is powered up and/or external devices are switched on. Make sure that the expansion box and external devices are turned off beforehand.
- Before you connect any external device to the expansion box (if used), plug the expansion box's power cord to the wall outlet.

The plugged power cord connects the expansion box to protective ground to avoid injury and damage to the hardware.

The hardware provides electrical energy at the I/O pins, which can cause a fire if external components such as sensors/actuators are not appropriately connected. This particularly concerns output pins of modular boards that provide internal voltages to supply external components.

- To prevent a fire, apply the general fire safety regulations, e.g., supervise the operation, remove fire loads, and use fire-proof materials and enclosures.

Safety Precautions for Using Expansion Boxes

Unplugging the power cord

External devices might conduct high voltages into the chassis. The plugged power cord connects the expansion box to protective ground to avoid the risk of electric shock or damage to the expansion box.

- Before you unplug expansion box's power cord, ensure that no external device is connected to the expansion box.
- Before you connect any external device to the expansion box, plug the power cord to the wall outlet.
- Ensure that the power cord stays plugged while external devices are connected to the expansion box.

Turning expansion boxes on and off

- Before you work with an expansion box, you should always turn on the expansion box before the host PC.

- Do not switch off the expansion box while the host PC is still running. This might lead to unpredictable errors.

Guidelines for trouble-free use

- The operating temperatures of hardware devices directly affect their lifetime and their function. You must therefore ensure that the ambient temperature of the dSPACE system does not exceed the specified maximum temperature. For details, refer to:
 - [PX10: Ensuring Correct Operating Temperatures \(PHS Bus System Hardware Reference\)](#)
 - [PX20: Ensuring Correct Operating Temperatures \(PHS Bus System Hardware Reference\)](#)
- Do not block the air vents or place the unit too close to a wall or other obstacle.
- Guard against foreign objects (staples, etc.) falling or blowing into the box, or liquids being spilled into it.
- Do not expose the system to excessive dust.
- The fans of the expansion boxes have a dust filter. You have to check the dust filter for dust at least once a year. More frequent checks may be necessary depending on the operating conditions. If the dust filter is dirty, you must replace it.
A dirty dust filter blocks the input air stream and increases the temperature in the box, which may shorten the life of the hardware components. For instructions, refer to [How to Check and Replace the Dust Filter of an Expansion Box/AutoBox](#) on page 162.

Replacing the power cord

Make sure that the power cord fulfills the mains input characteristics of the expansion box.

Safe In-Vehicle Use of dSPACE Products

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.

Safety Precautions for Using Connector Panels

Guidelines for trouble-free use

- Before connecting a panel to a board, make sure that the PC and the expansion box are turned off and no external devices are connected to the panel.
- No chemicals other than alcohol (ethanol or isopropanol) should be used to remove writing from the panel templates, since they might damage the permanent print on the templates or even corrode the panel.
- Guard against foreign objects (staples, etc.) falling or blowing into the unit, or liquids being spilled into it.
- Do not expose the panel to excessive dust.

Safety Precautions for Disposing dSPACE Hardware

Disposing dSPACE hardware

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 installed in the DS1006 Processor Board.

Introduction to PHS-Bus-Based Systems

Objective The dSPACE PHS-bus-based systems comprises hardware and software.

Where to go from here	Information in this section	
	Hardware.....	17
	Software.....	19

Hardware

Components	A PHS-bus-based system is assembled from at least one processor board and a selection of I/O boards. A DS1006 modular system is assembled from the DS1006 Processor Board, which uses an AMD Opteron™ processor as the real-time processor (RTP). The processor controls all the connected I/O boards via the PHS bus.
Slot for CompactFlash card	A slot for a CompactFlash card on the DS1006 allows a real-time application to be stored on a CompactFlash card. This can be used to work with the system without a connection to the host PC.
Installation location	The DS1006 modular system has to be mounted in a PX10 or PX20 Expansion Box and is to be used only in laboratories.

Building a multiprocessor system	With a dSPACE multiprocessor system, you can expand the computing performance of your dSPACE system. You can connect your system to additional dSPACE processor board systems. If you want to set up a multiprocessor system from an existing DS1006-based single-processor system, send your processor boards back to dSPACE to let them be equipped with DS911 Gigalink Modules.
Optimum performance	Depending on the processor and I/O boards used in a single- or multiprocessor system, you can share tasks to achieve optimum performance. Due to the wide range of available I/O boards, you can expand your system for rapid control prototyping (RCP) as well as for hardware-in-the-loop (HIL) simulations. Thus, dSPACE's PHS-bus-based system is ideally suited to dSPACE Prototyper and dSPACE Simulator.
Easy access to input and output signals	Specific interface <i>connector panels</i> provide easy access to all the input and output signals of the PHS-bus-based system: <ul style="list-style-type: none">▪ The CP<xxxx> Connector Panels provide easy-to-use connections between the PHS-bus-based system and devices to be connected to it. Devices can be individually connected, disconnected or interchanged without soldering via BNC connectors and Sub-D connectors. This simplifies system construction, testing and troubleshooting.▪ In addition to the Connector Panels, the CLP<xxxx> Connector/LED Combi Panels provide arrays of LEDs indicating the states of the digital signals.
Shipment with expansion box	If you ordered the PHS-bus-based system together with an expansion box, the hardware is preconfigured and already installed in the box with the exception of the processor board. <div style="background-color: #f0f0f0; padding: 10px; border-radius: 5px; margin-top: 10px;"><p>Note</p><p>To avoid damage to the hardware during transportation, the DS1006 Processor Board is delivered separately and has to be installed in the expansion box.</p></div>
Hardware-related reference information	For detailed hardware-related reference information on the components of a PHS-bus-based system, refer to PHS Bus System Hardware Reference. This documentation provides: <ul style="list-style-type: none">▪ Overview illustrations of the hardware components (boards and connector panels)▪ Connector pinouts

- Information on signal connection to external devices such as
 - Diagrams of on-board I/O circuits
 - Relevant electrical characteristics
 - Notes and tips on signal conditioning
- Data sheets

Software

Host PC software

The dSPACE software, such as the implementation and the experiment software, comes on DVD and has to be installed first. For further information, refer to [Basics on dSPACE Software Installation \(Installing dSPACE Software\)](#). You can find the document in PDF format on the dSPACE DVD.

Before You Start

First steps

Make yourself familiar with the installation and configuration procedures of the PHS-bus-based system and check if your system fulfills the system requirements.

Where to go from here

Information in this section

Installation and Configuration Overview.....	21
Checking the System Requirements.....	23

Installation and Configuration Overview

Installation sequence

NOTICE

Changing the installation sequence may lead to unpredictable results or even damage the system.

- Install the components of your system in exactly the order stated.
- Read the instructions carefully before starting installation.
- Consider all given warnings.

Installing the PHS-bus-based system requires the following steps in the specified order.

1. Check whether the software has been installed on the host PC.

You must first install the software before installing any hardware component to the host PC and before connecting an expansion box to it. For detailed instructions on installing the software, refer to [Installing dSPACE Software](#).

Note

You need administrator rights to install dSPACE software.

2. Check whether your hardware meets the requirements for PHS-bus-based system. Refer to [Checking the System Requirements](#) on page 23.
3. Check if the default setting of the boards must be changed. Refer to [Setting Up the Boards](#) on page 27.
4. Now you can install the hardware. Refer to [Installing the Hardware](#) on page 63.
5. Connect the expansion box to your host PC. Refer to [Connecting an Expansion Box to the Host PC](#) on page 113.

Configuration sequence

After you install your PHS-bus-based system, you can configure it in the following steps:

1. Set the connection mode and register your hardware.
2. Check if your platform is ready to run real-time applications.
3. The firmware of the DS1006 and some of the I/O boards can be updated if you install a new dSPACE Release.

Installation problems

Tip

If you encounter any problems during installation and configuration:

- Check the Support section of our website.
See <http://www.dspace.com/go/support>.
- The FAQ section and application notes provide a lot of useful information.
See <http://www.dspace.com/go/FAQ>.
- To stay up-to-date with information on possible problems, you should periodically check the known problem reports.
See <http://www.dspace.com/go/ProblemReports>.

If self-help does not solve the problem, contact dSPACE Support and give them information about your dSPACE environment and the problems you have. The best way to do this is with the support request form provided on the website at <http://www.dspace.com/go/supportrequest>, but you can also send an e-mail or phone us. For details, refer to [Providing Diagnostic Information](#) .

Next steps

After you install and configure your system, you are ready to implement a model – either via a Simulink model including blocks from dSPACE's Real-Time Interface (RTI) or via a handcoded algorithm – and download the corresponding application to your real-time hardware. You can use ControlDesk to experiment with your real-time application. Refer to [DS100x, DS110x, MicroAutoBox II, MicroLabBox – Software Getting Started](#) .

External devices For information on connecting external devices of your application to the dSPACE system, refer to [Connecting External Devices to the dSPACE System](#) on page 149.

Related topics	Basics						
<table><tr><td>Hardware.....</td><td>17</td></tr><tr><td>Introduction to PHS-Bus-Based Systems.....</td><td>17</td></tr><tr><td>Software.....</td><td>19</td></tr></table>		Hardware.....	17	Introduction to PHS-Bus-Based Systems.....	17	Software.....	19
Hardware.....	17						
Introduction to PHS-Bus-Based Systems.....	17						
Software.....	19						

Checking the System Requirements

Introduction Before installing dSPACE's hardware, you have to check whether your hardware meets the system requirements.

Host PC Your host PC must fulfill the system requirements concerning:

- The dSPACE software and other required third-party software,
- The requirements for the hardware which is needed for connecting the host PC and the expansion box.

For details, refer to [Appendix \(Installing dSPACE Software\)](#).

Expansion box **PX10 and PX20** The DS1006 modular system must be installed in a PX10 or PX20 Expansion Box.

- The PX10 Expansion Box supports one DS1006 Processor Board.
- The PX20 Expansion Box supports up to two DS1006 Processor Boards.

Note

- The PX10/PX20 Expansion Boxes need power supplies and connectors which fulfill the DS1006 requirements to support a DS1006 modular system.
For information on whether your existing expansion box fulfills the requirements, refer to <http://www.dspace.de/goto?pxboxvers>.
- You cannot insert a DS1006 Processor Board in your host PC, in a PX4 Expansion Box, or in an AutoBox/Tandem-AutoBox.

Required slots To install the DS1006 modular system in an expansion box, you need at least as many free slots in the box as the number of boards you want to install. Some boards require more than one slot/bracket:

- The DS1006 Processor Board installed in a PX10 requires up to two adjacent slots, if the board is installed next to the box's power supply. The DS1006 installed in a PX20 requires four adjacent slots (up to board revision DS1006-03) or three adjacent slots (as of board revision DS1006-06). For details, refer to [Notes on Installation](#) on page 66.
- The DS2210 requires two adjacent brackets.
- The DS2202, DS2211, DS4003, and DS4004 require three adjacent brackets.
- All other dSPACE boards require one bracket.

Bus interface If you want to connect the expansion box to the host PC via a bus interface, the DS814 has to be installed in the box.

A suitable dSPACE link board has to be installed in the host PC.

Slot CPU If you want to connect the expansion box to the host PC via Ethernet, a slot CPU has to be installed in the box.

Keep in mind that the host PC requires a network adapter to establish an Ethernet communication.

Resources of dSPACE boards

The resources in the host PC and in the expansion box needed by your dSPACE boards depend on your installation, refer to [Resource Requirements of dSPACE Boards](#) on page 28.

CompactFlash card for DS1006

The DS1006 Processor Board provides a slot for a CompactFlash card to be used as an application flash memory. This card is not included in the shipment. It is recommended to use a CompactFlash card prepared by dSPACE (SanDisk with special shield applied and preformatted), which fulfills all EMC specifications.

If you use your own card, the following CompactFlash cards are recommended. Note that the card must be DOS-formatted (FAT16) before use.

- SanDisk CompactFlash Card (1, 2 or 4 GB)
- SanDisk Ultra II CompactFlash Card (1, 2 or 4 GB)
- SanDisk Extreme III CompactFlash Card (1, 2 or 4 GB)

Environmental conditions

- The DS1006 modular system may be used only in specific ambient conditions.
- The DS1006 is designed only for laboratory use.
 - Due to the weight of the heat sink the processor requires, the DS1006 cannot be used in a vehicle or other environments causing mechanical shocks or vibration.
 - Ambient temperature range 0 ... 40 °C (32 ... 104 °F).

Compatibility to dSPACE Releases

The following notes describe the compatibility of dSPACE Releases to the different board variants of the DS1006 Processor Board:

- Up to board revision DS1006-03:
 - The DS1006 (2.2 GHz) is supported as of dSPACE Release 4.1
 - The DS1006 (2.6 GHz/3.0 GHz) is fully compatible with dSPACE Release 4.2 and later. If you want to use the DS1006 (2.6 GHz/3.0GHz) in conjunction with dSPACE Release 4.1, contact support@dspace.de for compatibility information.
 - The DS1006 (2.6 GHz/3.0 GHz) is fully compatible with dSPACE Release 4.2 and later. If you want to use the DS1006 (2.6 GHz/3.0GHz) in conjunction with dSPACE Release 4.1, contact support@dspace.de for compatibility information.
 - Programs or models that were prepared and compiled for the DS1006 (2.2 GHz/3.0 GHz) do not need to be recompiled for the DS1006 (2.6 GHz).
 - Programs or models that were prepared and compiled for the DS1006 (2.6 GHz/3.0 GHz) run on 2.2 GHz boards without changes. Applications that exploit the complete computing power of the DS1006 (2.6 GHz/3.0 GHz) cause an overrun situation on 2.2 GHz boards.
- As of board revision DS1006-06 used as *single core processor board*:
 - You can use the board in conjunction with Release 4.2 up to Release 6.5 (without Service Pack) if firmware version 1.3 is installed on the DS1006-06.
 - Programs or models that were prepared and compiled for former board revisions do not need to be recompiled if firmware version 1.3 is installed on the DS1006-06.
- As of board revision DS1006-06 used as *multicore processor board*:
 - You can use the board in conjunction with Release 6.5 (with Service Pack) if firmware version 2.0 or later is installed on the DS1006-06.
 - Programs or models that were prepared and compiled for former board revisions must be recompiled.

Related topics**Basics**

Notes on Installation.....	66
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Setting Up the Boards

Presettings	If you ordered your PHS-bus-based system together with an expansion box, the system is preconfigured and already installed in the box, with the exception of the processor board. It is delivered separately and you have to install it. If non-default addresses (PHS-bus addresses, I/O base addresses) were used, an 'Expansion Box Configuration' sheet is delivered together with your system.
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Where to go from here	Information in this section										
	<table><tr><td>Resource requirements</td><td></td></tr><tr><td>Resource Requirements of dSPACE Boards</td><td>28</td></tr></table>	Resource requirements		Resource Requirements of dSPACE Boards	28						
Resource requirements											
Resource Requirements of dSPACE Boards	28										
	<table><tr><td>Address settings</td><td></td></tr><tr><td>How to Set the PHS-bus Address</td><td>39</td></tr><tr><td> If you use boards with the same default PHS-bus address or several boards of the same type, you have to change addresses to avoid address conflicts.</td><td></td></tr><tr><td>Basics on Changing I/O Base Addresses</td><td>30</td></tr><tr><td> For several conditions you have to change the default I/O base addresses (port addresses) of dSPACE boards. This is to avoid conflicts with other devices within your system.</td><td></td></tr></table>	Address settings		How to Set the PHS-bus Address	39	If you use boards with the same default PHS-bus address or several boards of the same type, you have to change addresses to avoid address conflicts.		Basics on Changing I/O Base Addresses	30	For several conditions you have to change the default I/O base addresses (port addresses) of dSPACE boards. This is to avoid conflicts with other devices within your system.	
Address settings											
How to Set the PHS-bus Address	39										
If you use boards with the same default PHS-bus address or several boards of the same type, you have to change addresses to avoid address conflicts.											
Basics on Changing I/O Base Addresses	30										
For several conditions you have to change the default I/O base addresses (port addresses) of dSPACE boards. This is to avoid conflicts with other devices within your system.											
	<table><tr><td>Setup instructions</td><td></td></tr><tr><td>Setting Up the Processor Board</td><td>32</td></tr><tr><td> You have to check if the default factory setting of the I/O base address (port address) must be changed.</td><td></td></tr><tr><td>Setting Up I/O Boards</td><td>34</td></tr><tr><td> For some I/O boards, it is necessary to perform manual settings before they can be used.</td><td></td></tr></table>	Setup instructions		Setting Up the Processor Board	32	You have to check if the default factory setting of the I/O base address (port address) must be changed.		Setting Up I/O Boards	34	For some I/O boards, it is necessary to perform manual settings before they can be used.	
Setup instructions											
Setting Up the Processor Board	32										
You have to check if the default factory setting of the I/O base address (port address) must be changed.											
Setting Up I/O Boards	34										
For some I/O boards, it is necessary to perform manual settings before they can be used.											

Resource Requirements of dSPACE Boards

Motivation Depending on the installation, dSPACE boards require resources in the host PC and the expansion box.

Where to go from here	Information in this section
	Installation in the Host PC..... 28
	Installation in the Expansion Box..... 29

Installation in the Host PC

Resources in the host PC The following table lists the required I/O address range together with the default address and the required memory of dSPACE boards, when installed in the host PC. Some dSPACE boards support plug & play, in which case they require an interrupt request line (IRQ). However, the boards operate correctly even if no free IRQ is available.

Note

The resource requirements listed in this table apply to the host PC.

Board	Slot Type	Required I/O Address Range	Default I/O Base Address	Required Memory Range	Required IRQ
DS1104	PCI	–	–	2 x 4 KB	1 (PCI)
DS1104 (PCIe variant)	PCIe	–	–	2 x 4 KB	1 (PCIe)
DS817	PCI	10H	Plug & play	None	1 (PCI)
DS819	PCI Express	10H	Plug & play	None	1 (PCI Express)
DS821	ExpressCard	10H	Plug & play	None	1 (PCI Express)

Installation in the Expansion Box

Resources in the expansion box

When installed in an expansion box, dSPACE boards require the following resources in the expansion box:

Note

The resource requirements listed in this table apply to the expansion box, not to the host PC.

Board	Required Address Bytes	Default I/O Base Address
DS1006 up to board revision DS1006-03	10H	300H
DS1006 as of board revision DS1006-06 (multicore processor board)	40H	300H
DS2302	10H	380H

Note

The DS1007 PPC Processor Board does not need any resources in the expansion box because it is connected to the host PC via Ethernet.

Resources in the host PC

The resource requirements for the host PC depend on the connection between the host PC and the expansion box:

Connection via DS817, DS819, or DS821 Link Board The Link Boards require the following resources in the host PC:

Required Address Bytes	Default I/O Base Address	Required Memory	IRQ
10H	Plug & play	None	1 ▪ PCI for DS817 ▪ PCI Express for DS819/DS821

Connection via Ethernet The boards installed in the expansion box require no resources in the host PC.

Tip

The slot CPUs installed in the expansion box as provided by dSPACE do not conflict with the default I/O base addresses of dSPACE boards.

Basics on Specific Board Settings

Motivation	The I/O base address (port address) of the DS1006 and the DS2302 (if used) must be changed for several conditions to avoid conflicts with other devices within your system.
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Basics on Changing I/O Base Addresses

Motivation	For several conditions you have to change the default I/O base addresses (port addresses) of dSPACE boards. This is to avoid conflicts with other devices within your system.
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Notes and hints	Note the following hints on changing the default I/O base address.
------------------------	--

NOTICE

Assigning I/O addresses already used by other devices may lead to system failure, data loss on the hard disk, and even hardware damage.

- Refer to your PC's technical reference manual for a description of the standard I/O map and to the documentation of additional I/O boards that might be inserted in the PC.
- Refer also to the lists of resources used in the diagnostic utilities of the PC's operating system. However, these are not always complete.

Note the following hints on changing the default I/O base address of dSPACE boards:

- The I/O address ranges of dSPACE boards in your system must not overlap. If your expansion box is connected via Ethernet, this applies also to the address ranges of the slot CPU.
- If your expansion box is connected via Ethernet, the I/O base address of the processor board must be within the address range 300H ... 330H or 1000H ... FFC0H.
- Suppose you have connected several expansion boxes to your host PC via one of the link boards (PC) DS815, DS817, DS819 or DS821, or via a MultiLink Panel DS830. If two (or more) of these boxes contain a dSPACE board of the same type, you have to set them to different I/O base addresses to allow the identification in ControlDesk.
- Within an Ethernet multiconnect group, the I/O base addresses of all included dSPACE boards must be unique.

Instructions on address changing

For detailed instructions on changing the I/O base address, refer to

- [DS1006: How to Change the I/O Base Address](#) on page 32
- [DS2302: How to Change the I/O Base Address](#) on page 46

Setting Up the Processor Board

Checking default factory setting Before inserting the DS1006 in the expansion box, you have to check if the default factory setting of the I/O base address (port address) must be changed.

Where to go from here **Information in this section**

[DS1006: How to Change the I/O Base Address.....](#) 32

Information in other sections

[Basics on Changing I/O Base Addresses.....](#) 30

For several conditions you have to change the default I/O base addresses (port addresses) of dSPACE boards. This is to avoid conflicts with other devices within your system.

DS1006: How to Change the I/O Base Address

Objective The I/O base address, meaning the port address, is selected via three rotary switches on the DS1006.

Basics The I/O base address of dSPACE boards in your system must be unique and the I/O address range must not overlap. This also applies if the members of the system are installed in different expansion boxes.

As of board revision DS1006-06 (multicore processor board), each core of the DS1006 is automatically assigned an individual port address. This address is derived from the processor board's I/O base address, which you have selected via the three rotary switches on the board. For example, if the I/O base address of the DS1006 is 300H, the cores of a quad-core system are assigned the addresses 300H, 310H, 320H, and 330H.

Note

If your expansion box is connected via Ethernet, the I/O base address of the DS1006 must be within the address range 300H ... 330H or 1000H ... FFC0H.

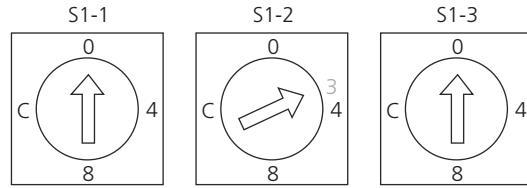
Factory default setting 300H

Precondition

The DS1006 is removed to get access to the rotary switches. For detailed instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method**To change the I/O base address**

- 1 Set the three rotary address switches located on the component side of the board to the desired value.

**I/O base addresses usable for the DS1006**

The following table shows the switch settings for some I/O base addresses for the DS1006.

I/O Base Address (Port Address)	S1-1	S1-2	S1-3
000H ¹⁾	—	—	—
240H ²⁾	0	2	4
280H ²⁾	0	2	8
300H (factory default setting)	0	3	0
310H	0	3	1
380H ²⁾	0	3	8
1000H	1	0	0

¹⁾ The I/O base address 000H is not permissible.

²⁾ Not permissible if the connection between host PC and expansion box is established via Ethernet.

Related topics**HowTos**

DS2302: How to Change the I/O Base Address.....46

Setting Up I/O Boards

Motivation	For some I/O boards, it is necessary to perform manual settings before inserting the boards into the expansion box.
-------------------	---

Where to go from here	Information in this section
	<p>Overview Overview of Settings..... 35</p>
	<p>Setting the PHS-bus address How to Set the PHS-bus Address..... 39 If you use boards with the same default PHS-bus address or several boards of the same type, you have to change addresses to avoid address conflicts.</p>
	<p>Further settings on individual I/O boards DS2210: How to Connect all Digital Inputs to Various Voltage Levels..... 41 DS2210: How to Set the Output Mode for the Transformer Outputs..... 42 DS2211: How to Set the Output Mode for the Transformer Outputs..... 44 DS2302: How to Change the I/O Base Address..... 46 DS3002: How to Select the Encoder Signal Type..... 48 DS4002: How to Change the Logical Level of the Timing I/O..... 50 DS4201-S: How to Set Up the Transceiver Mode..... 52 DS4201-S: How to Change the Quartz Oscillator..... 53 DS4201, DS4201-S: How to Change the Sub-ID..... 55 DS5001: How to Increase the Hysteresis Level of the Inputs..... 57 DS5101: How to Set Up the Pull-up Behavior..... 58</p>
	<p>Inserting modules How to Insert Modules onto I/O Boards..... 59 Several I/O boards can carry piggyback or customization modules.</p>

Information in other sections

[Basics on Changing I/O Base Addresses.....](#) 30

For several conditions you have to change the default I/O base addresses (port addresses) of dSPACE boards. This is to avoid conflicts with other devices within your system.

[Resource Requirements of dSPACE Boards.....](#) 28

[Setting Up the Processor Board.....](#) 32

You have to check if the default factory setting of the I/O base address (port address) must be changed.

Overview of Settings

Required settings

The following table gives an overview of the boards and their required settings:

Board	Manual Settings	For Instructions Refer to ...
DS802	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
DS2001		
DS2002		
DS2003		
DS2101		
DS2102		
DS2103		
DS2201		
DS2202		
DS2210	Setting up the PHS-bus address. You can connect the digital inputs (DIG_INx, PWM_INx, INJx, IGNx, AUXCAPx) on the DS2210 to various voltage levels (VBAT, +5 V or GND).	How to Set the PHS-bus Address on page 39 DS2210: How to Connect all Digital Inputs to Various Voltage Levels on page 41
	You can set the analog outputs of the C31 slave DSP and angular processing unit to different output modes: <ul style="list-style-type: none">▪ Transformer output mode (= signals decoupled from ground)▪ DC output mode	DS2210: How to Set the Output Mode for the Transformer Outputs on page 42

Board	Manual Settings	For Instructions Refer to ...
DS2211	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	You can set the analog outputs of the C33 slave DSP and angular processing unit to different output modes: <ul style="list-style-type: none">▪ Transformer output mode (= signals decoupled from ground)▪ DC output mode	DS2211: How to Set the Output Mode for the Transformer Outputs on page 44
DS2302	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	Jumper setting on the DS2302.	DS2302: Recommended Jumper Setting on page 46
	Setting up the I/O base address.	DS2302: How to Change the I/O Base Address on page 46
	You can insert up to six DAC analog output stages (piggyback) onto the DS2302.	How to Insert Modules onto I/O Boards on page 59
DS2401	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
DS3001	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
DS3002	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	You have to select the encoder signal type and the use of line termination for each channel.	DS3002: How to Select the Encoder Signal Type on page 48
DS4001	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
DS4002	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	You can set up (or change) the logical level for the timing I/O channels (CH1 ... CH8) to a predefined pull-up or pull-down level after power-up.	DS4002: How to Change the Logical Level of the Timing I/O on page 50
DS4003	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	For supporting signal levels other than TTL, you can mount customization modules (piggyback) onto the DS4003.	How to Insert Modules onto I/O Boards on page 59
DS4004	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39

Board	Manual Settings	For Instructions Refer to ...
DS4120	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
DS4121		
DS4201	Setting up the PHS-bus address. Custom software can use the sub-ID number of the board: <ul style="list-style-type: none">▪ To distinguish several DS4201 and/or DS4201-S boards with differential functionalities in one PHS-bus-based system or▪ To perform hardware-specific setups	How to Set the PHS-bus Address on page 39 DS4201, DS4201-S: How to Change the Sub-ID on page 55
	You have to insert your custom board onto the DS4201.	How to Insert Modules onto I/O Boards on page 59
DS4201-S	Setting up the PHS-bus address. You have to set up a special transceiver mode (RS232, RS422 or RS485) on each of the four serial communication channels.	How to Set the PHS-bus Address on page 39 DS4201-S: How to Set Up the Transceiver Mode on page 52
	Custom software can use the sub-ID number of the board: <ul style="list-style-type: none">▪ To distinguish several DS4201 and/or DS4201-S boards with differential functionalities in one PHS-bus-based system or▪ To perform hardware-specific setups	DS4201, DS4201-S: How to Change the Sub-ID on page 55
DS4302	Setting up the PHS-bus address. You can insert up to four customization modules (piggyback) onto the DS4302. Each module may carry a custom CAN transceiver.	How to Set the PHS-bus Address on page 39 How to Insert Modules onto I/O Boards on page 59
DS4330	Setting up the PHS-bus address. You can insert up to four customization modules (piggyback) for custom LIN transceivers onto the DS4330.	How to Set the PHS-bus Address on page 39 How to Insert Modules onto I/O Boards on page 59
DS4501	Setting up the PHS-bus address. You can insert up to four IP modules onto the DS4501.	How to Set the PHS-bus Address on page 39 How to Insert Modules onto I/O Boards on page 59
DS4502	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39

Board	Manual Settings	For Instructions Refer to ...
DS4504	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
DS4505	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	You can insert up to four DS4340 FlexRay Interface Modules and/or DS4342 CAN FD Interface Modules onto the DS4505.	How to Insert Modules onto I/O Boards on page 59
DS5001	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	You can increase the hysteresis level of the input comparators of the timing I/O unit to eliminate voltage spikes on the inputs.	DS5001: How to Increase the Hysteresis Level of the Inputs on page 57
DS5101	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	<ul style="list-style-type: none"> ▪ Up to board revision DS5101-02: You can insert up to eight output modules (piggyback), containing two waveform generation channels each, onto the DS5101. ▪ As of board revision DS5101-04: The board has no output modules. The functional design is integrated in one FPGA (field-programmable gate array). 	How to Insert Modules onto I/O Boards on page 59
	Only as of board revision DS5101-04: Setting up the pull-up behavior of each channel individually.	DS5101: How to Set Up the Pull-up Behavior on page 58
DS5202	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
DS5203	Setting up the PHS-bus address.	How to Set the PHS-bus Address on page 39
	Mounting a DS5203 Multi-I/O Module onto the board	<ul style="list-style-type: none"> ▪ How to Mount a DS5203M1 Multi-I/O Module on the DS5203 FPGA Board on page 60 ▪ How to Remove a DS5203M1 Multi-I/O Module from the DS5203 FPGA Board on page 61

Related topics**Basics**

Basics on Changing I/O Base Addresses.....	30
Setting Up the Processor Board.....	32

How to Set the PHS-bus Address

Objective If you use boards with the same default PHS-bus address or several boards of the same type, you have to change addresses to avoid address conflicts.

PHS bus The Peripheral High Speed (PHS) bus is a fast 32-bit bus for the communication between the processor board and the I/O boards. The PHS bus contains four address lines to select up to 16 I/O boards.
All the I/O boards used in a PHS-bus-based system have to use different PHS-bus addresses.

Note

Do not connect more than one processor board to the same PHS bus.
The processor board is the master of the PHS bus and does not have a PHS-bus address.

The PHS-bus address can be configured via a rotary switch or via four DIP switches.

Limitation Do not set the DS802 PHS Link Board that acts as a master to the PHS-bus base address 00H. This setting might cause malfunctions. Instead, set this DS802 to another available PHS-bus base address.
For details on the PHS-bus address settings of the DS802, refer to [Installation and Configuration Notes](#) on page 108.

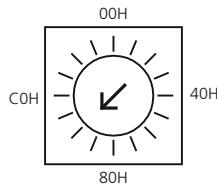
Precondition The board is removed to get access to the switches. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method **To set the PHS-bus address**
1 Determine the PHS-bus base addresses for each I/O board. Make sure to use each address only once.
Write down the addresses, the boards' serial numbers and their slot number to distinguish them.

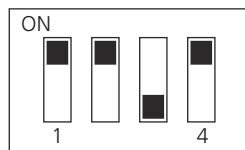
Tip

If your system is preconfigured by dSPACE and non-default values were used, the "Expansion Box Configuration" sheet (delivered with your system) gives you this information.

- 2 For boards with a rotary address switch, use the switch to change the address if necessary. The following figure shows the rotary switch setting for address A0H as an example.



- 3 For the other I/O boards, use the four DIP switches (located next to the PHS-bus connector) to change the addresses if necessary. The following figure shows the setting (0010) for address 20H as an example.



A switch turned ON represents a binary zero and OFF a binary one.

Available PHS-bus base addresses

The following table shows the available PHS-bus base addresses and the corresponding switches settings. It also displays the default PHS-bus address settings of the boards:

PHS-Bus Base Address (Hex)	Setting of the DIP Switches (Binary)	Position of Rotary Switch	Default Setting of the ...
00H ¹⁾	0000	0	DS2001, DS2004, DS4501
10H	0001	1	DS4330, DS4505
20H	0010	2	DS2002, DS2003
30H	0011	3	–
40H	0100	4	DS3001, DS3002
50H	0101	5	–
60H	0110	6	DS4302
70H	0111	7	–
80H	1000	8	DS2101, DS4504
90H	1001	9	DS2102, DS2103
A0H	1010	A	DS2201, DS2202, DS2210, DS2211
B0H	1011	B	DS2302, DS2401, DS4120, DS4121, DS4401, DS4502
C0H	1100	C	DS4001, DS4002, DS4003, DS4004
D0H	1101	D	DS5101

PHS-Bus Base Address (Hex)	Setting of the DIP Switches (Binary)	Position of Rotary Switch	Default Setting of the ...
EOH	1110	E	DS5001
FOH	1111	F	DS802, DS4201, DS4201-S, DS5202, DS5203

¹⁾ Do not set the DS802 PHS Link Board that acts as a master to the PHS-bus base address 00H.

Related topics

Basics

[Setting Up the Processor Board](#).....32

HowTos

[How to Remove a Board from a PHS-Bus-Based System](#).....77

DS2210: How to Connect all Digital Inputs to Various Voltage Levels

Objective

Before inserting the DS2210 in the expansion box, you have to check if the setting of jumper J8 is the required setting for your connected external devices.

By inserting jumper J8 you connect all digital inputs (DIG_INx, PWM_INx, INJx, IGNx, AUXCAPx) of the DS2210 to various voltage levels (VBAT, +5 V or GND) via 4.7 kΩ resistors.

Factory default setting

The digital inputs are connected to VBAT.

Board revision

The pin header for jumper J8 is available as of board revision DS2210-04.

Tip

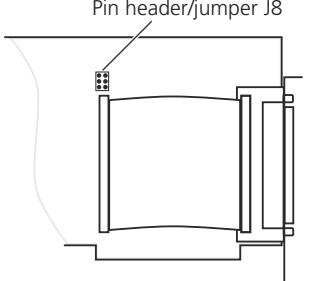
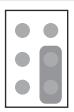
The revision number is printed on the board. You can also read out the number in ControlDesk. Refer to [Board Details Properties \(ControlDesk Platform Management\)](#).

Precondition

The board is removed to get access to the jumpers. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method**To select the desired voltage level**

- 1 Insert the jumper J8 according to the level required as shown in the table below.

Jumper Setting	Description
	All digital inputs are connected to VBAT via 4.7 kΩ resistors. (Factory default setting) VBAT is an external power supply. The nominal voltage is 12 V, the permitted range is +8 V ... +18 V including all tolerances.
	All digital inputs are connected to +5 V via 4.7 kΩ resistors.
	All digital inputs are connected to GND (ground) via 4.7 kΩ resistors.

Note

The digital inputs of the DS2210 are usable only if jumper J8 is inserted in one of the positions shown above.

Related topics**Basics**

[Setting Up the Processor Board](#)..... 32

HowTos

DS2210: How to Set the Output Mode for the Transformer Outputs	42
How to Remove a Board from a PHS-Bus-Based System	77
How to Set the PHS-bus Address	39

DS2210: How to Set the Output Mode for the Transformer Outputs

Objective

Before inserting the DS2210 in the expansion box, you have to check if the setting of jumpers J1 ... J7 is the required setting for your connected external devices.

The analog outputs of the C31 slave DSP and the angular processing unit (APU) are equipped with transformers in order to provide signals that are decoupled

from ground. Jumpers J1 ... J7 allow you to switch between the transformer output mode and the DC output mode.

Factory default setting	Transformer output mode
Board revision	The pin header for jumper J1 ... J7 is available as of board revision DS2210-04.

Tip

The revision number is printed on the board. You can also read out the number in ControlDesk. For details, refer to [Board Details Properties \(ControlDesk Platform Management\)](#).

Precondition	The board is removed to get access to the jumpers. For instructions, refer to How to Remove a Board from a PHS-Bus-Based System on page 77.
---------------------	---

Method	To select the desired output mode								
	<p>1 Insert the jumpers according to the output mode required as shown in the table below:</p> <table border="1"> <thead> <tr> <th>Jumper Setting</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td> </td> <td> <p>DSP0, DSP1: Analog differential knock sensor or wheel speed sensor outputs (C31 Waveform 0 and 1)</p> <p>DSP2, DSP3: Analog differential wheel speed sensor outputs (C31 Waveform 2 and 3)</p> <p>CRANK1: Analog crankshaft differential outputs</p> <p>CAM1, CAM2: Analog camshaft differential outputs</p> </td> </tr> <tr> <td> </td> <td> <p>Transformer output mode (Factory default setting)</p> <p>The outputs are transformer coupled and isolated from system ground. DC voltages cannot be passed to the outputs.</p> </td> </tr> <tr> <td> </td> <td> <p>DC output mode</p> <p>The outputs are referenced to ground. DC voltages can be passed to the outputs.</p> </td> </tr> </tbody> </table>	Jumper Setting	Description	 	<p>DSP0, DSP1: Analog differential knock sensor or wheel speed sensor outputs (C31 Waveform 0 and 1)</p> <p>DSP2, DSP3: Analog differential wheel speed sensor outputs (C31 Waveform 2 and 3)</p> <p>CRANK1: Analog crankshaft differential outputs</p> <p>CAM1, CAM2: Analog camshaft differential outputs</p>		<p>Transformer output mode (Factory default setting)</p> <p>The outputs are transformer coupled and isolated from system ground. DC voltages cannot be passed to the outputs.</p>		<p>DC output mode</p> <p>The outputs are referenced to ground. DC voltages can be passed to the outputs.</p>
Jumper Setting	Description								
 	<p>DSP0, DSP1: Analog differential knock sensor or wheel speed sensor outputs (C31 Waveform 0 and 1)</p> <p>DSP2, DSP3: Analog differential wheel speed sensor outputs (C31 Waveform 2 and 3)</p> <p>CRANK1: Analog crankshaft differential outputs</p> <p>CAM1, CAM2: Analog camshaft differential outputs</p>								
	<p>Transformer output mode (Factory default setting)</p> <p>The outputs are transformer coupled and isolated from system ground. DC voltages cannot be passed to the outputs.</p>								
	<p>DC output mode</p> <p>The outputs are referenced to ground. DC voltages can be passed to the outputs.</p>								

Note

A digital output is usable only if the corresponding jumper J1 ... J7 is inserted in one of the positions shown above.

Related topics

Basics

[Setting Up the Processor Board](#).....32

HowTos

[DS2210: How to Connect all Digital Inputs to Various Voltage Levels](#).....41
[How to Set the PHS-bus Address](#).....39

DS2211: How to Set the Output Mode for the Transformer Outputs

Objective

Before inserting the DS2211 in the expansion box, you have to check if the setting of *jumpers J1 ... J7* is the required setting for your connected external devices.

The analog outputs of the slave DSP and the angular processing unit are equipped with transformers to provide signals that are decoupled from ground. Jumpers J1 ... J7 allow you to switch between the transformer (= AC) output mode and the DC output mode.

Factory default setting

Transformer output mode.

Precondition

The board is removed to get access to the jumpers. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method**To set the output mode for the transformer outputs**

- 1 Insert the jumpers according to the output mode required as shown in the table below:

Jumper Setting	Description						
	<p>DSPO ... DSP3: Analog differential knock sensor or wheel speed sensor outputs (VC33-Waveform 0 ... VC33-Waveform 3)</p> <p>CRANK: Analog differential crankshaft outputs</p> <p>CAM1, CAM2: Analog differential camshaft outputs</p>						
	Transformer (AC) output mode (factory default setting)						
	The outputs are referenced to ground. DC voltages can be passed to the outputs.						
	The outputs are transformer coupled and isolated from system ground. DC voltages cannot be passed to the outputs.						

Note

An output signal is usable only if the corresponding jumper J1 ... J7 is inserted in one of the positions shown above.

Related topics**Basics**

[Setting Up the Processor Board.....](#) 32

HowTos

[How to Remove a Board from a PHS-Bus-Based System.....](#) 77
[How to Set the PHS-bus Address.....](#) 39

DS2302: Recommended Jumper Setting

Jumper setting as of revision DS3202-04

The jumper (J1) on the DS2302 Direct Digital Synthesis Board as of revision DS3202-04 must be closed. This ensures the proper function of the PHS-bus connection.

Only if you use ControlDesk 3.x as experiment and instrumentation software, it is recommended that you open the jumper (J1).

To locate the jumper on the board, refer to [Board Overview \(as of Revision DS3202-04\) \(PHS Bus System Hardware Reference\)](#).

Jumper setting of revision DS3202-01

The jumper (J1) on the DS2302 Direct Digital Synthesis Board as of revision DS3202-01 must be opened. This ensures the proper function of the PHS-bus connection.

To locate the jumper on the board, refer to [Board Overview \(Revision DS3202-01\) \(PHS Bus System Hardware Reference\)](#).

DS2302: How to Change the I/O Base Address

Objective

Before inserting the DS2302 in the expansion box, you have to check if the factory default setting of the I/O base address must be changed.

Changing via switches

The I/O base address, meaning the port address on the ISA bus, is selected by eight DIP switches (on the DS2302-01) or three rotary switches (on the DS2302-04).

Note

DS2302-01: Do not mix up the DIP switches for the I/O address and for the PHS-bus address. The PHS-bus address switch is located next to the PHS-bus connector and only contains four individual switches. The I/O address switch contains eight individual switches.

Factory default setting

- DS2302-01: 320H
 - DS2302-04: 380H
-

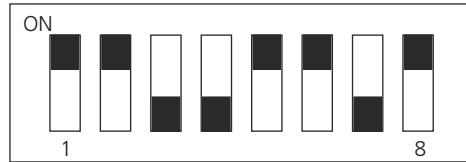
Precondition

The board is removed to get access to the switches. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

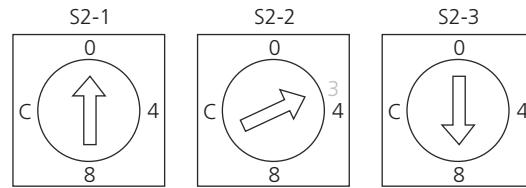
Method**To configure the board manually**

- 1 Set the eight DIP switches or the three rotary switches of the board to the desired value.

The following illustration shows the default setting (320H) of the DIP switches on the DS2302-01. A switch turned "ON" represents a binary zero and "OFF" a binary one.



The following illustration shows the default setting (380H) of the rotary switches on the DS2302-04.

**I/O base addresses usable for the DS2302**

The following table shows the switch settings for some I/O base addresses for the DS2302.

I/O Base Address (Port Address)	DIP Switches (on DS2302-01)								Rotary Switches (on DS2302-04)		
	1	2	3	4	5	6	7	8	S2-1	S2-2	S2-3
200H	0 ¹⁾	0	1	0	0	0	0	0	0	2	0
280H	0	0	1	0	1	0	0	0	0	2	8
300H	0	0	1	1	0	0	0	0	0	3	0
310H	0	0	1	1	0	0	0	1	0	3	1
320H	0	0	1	1	0	0	1	0	0	3	2
380H (default)	0	0	1	1	1	0	0	0	0	3	8
8300H	1	0	1	1	0	0	0	0	8	3	0

¹⁾ 0 = on; 1 = off

Address lines (only DS2302-01)

Switches 1 and 2 determine the address lines A15 and A14, switches 3 to 8 the address lines A9 to A4 of the I/O base address. The address lines A10 and A11 are always treated as binary zero, the values of lines A12 and A13 are not relevant (X).

A15 S1-1	A14 S1-2	A13 X	A12 X	A11 0	A10 0	A9 S1-3	A8 S1-4	A7 S1-5	A6 S1-6	A5 S1-7	A4 S1-8
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Related topics

Basics

Basics on Changing I/O Base Addresses.....	30
Setting Up the Processor Board.....	32

HowTos

How to Remove a Board from a PHS-Bus-Based System.....	77
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DS3002: How to Select the Encoder Signal Type

Objective

Before inserting the DS3002 in the expansion box, you have to select the encoder signal type and the use of line termination manually via jumpers. For each channel a pin header allows you to insert jumpers.

Factory default setting

The TTL single-ended mode without line termination is selected for all channels.

Precondition

The board is removed to get access to the jumpers. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method

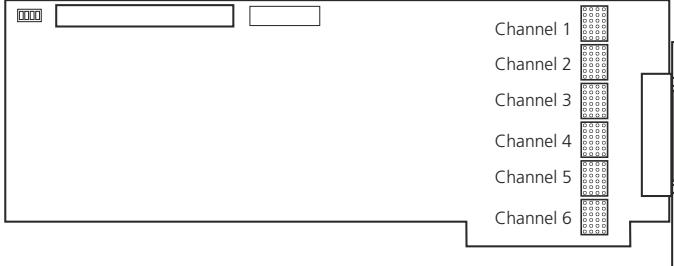
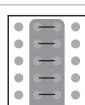
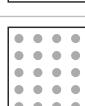
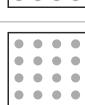
To select the encoder signal type

- 1 Insert or remove jumpers according to the encoder signal type required and the desired line termination (as shown in the table below).

Note

Take care not to bend the pins when inserting and removing jumpers.
Use a pair of pliers to remove multi-way jumpers.

The following table shows the necessary jumper positions:

Encoder Signal Type	Line Termination	Jumper Settings
		
Analog (sinusoidal) signal	With line termination (recommended setting)	
	Without line termination	
	11 μ A _{pp} differential mode (without line termination)	
Digital signal	RS422 differential mode	With line termination (recommended setting)
		
	TTL single-ended mode	Without line termination (recommended setting; factory default setting)
		
	With line termination	

Tip

18 individual jumpers for digital signal settings and 12 six-way jumpers for analog signal settings are shipped with the board.

Further information

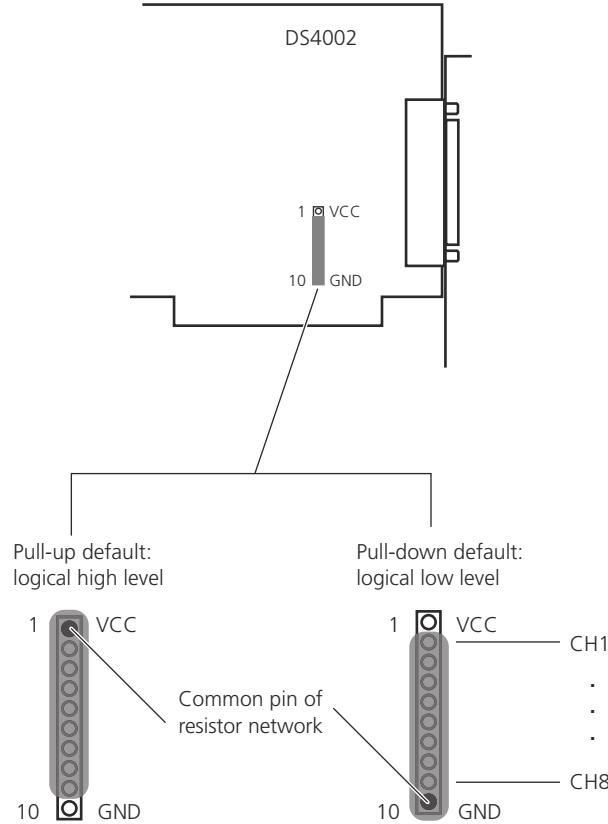
For further information on terminating the lines, refer to *Line Termination* in the DS3002 chapter of the *PHS Bus System Hardware Reference*.

Related topics	Basics
	Setting Up the Processor Board.....32
	HowTos
	How to Remove a Board from a PHS-Bus-Based System.....77
	How to Set the PHS-bus Address.....39

DS4002: How to Change the Logical Level of the Timing I/O

Objective	Before inserting the DS4002 in the expansion box, you have to check if the default logical level of the timing I/O must be changed.
Background	After power-up the timing I/O channels (CH1 ... CH8) are set to the input mode. To avoid damage, some external devices need a predefined logical voltage level at a pin, which might be programmed as an output at a later time.
Changing via a pin socket	To allow you to set up (or change) a predefined logical level, a 10-pin single inline socket is built into the board. Here you can insert a resistor network to provide a pull-up (high) or pull-down (low) default level to <i>all</i> channels (CH1 ... CH8) after power-up.
Factory default setting	A 9-pin resistor network with eight 2.2 kΩ resistors is mounted as a pull-down resistor (= logical low level).
Precondition	The board is removed to get access to the resistor network. For instructions, refer to How to Remove a Board from a PHS-Bus-Based System on page 77.
Method	To change the default logical voltage level 1 Carefully remove the resistor network from the socket, and insert it at the desired position. Depending on the setting, <i>all</i> timing I/O pins (CH1 ... CH8) are either pulled up to VCC or down to GND: <ul style="list-style-type: none">▪ GND = The default logical voltage level after power-up is <i>low</i>.▪ VCC = The default logical voltage level after power-up is <i>high</i>.

The following illustration shows the setup options.



Note

If no resistor network is inserted, the logical voltage level of the timing I/O is not defined after power-up.

Using your own resistor network

The resistor network must be a 9-pin type with a common pin at one end (pin 1) and single resistors at pins 2 to 9. The single resistor values should be not less than $330\ \Omega$.

Related topics

Basics

[Setting Up the Processor Board](#).....32

HowTos

[How to Remove a Board from a PHS-Bus-Based System](#).....77
[How to Set the PHS-bus Address](#).....39

DS4201-S: How to Set Up the Transceiver Mode

Objective

The DS4201-S board provides four independent serial communication channels and supports the RS232-C, RS422 and RS485 transceiver modes. The transceiver modes of the four channels can be mixed as required.

The different modes are selected by inserting appropriate components into the relevant sockets.

Factory default setting

Either the components for the RS232-C transceiver mode (standard) or the components of your ordered setup (option) are inserted.

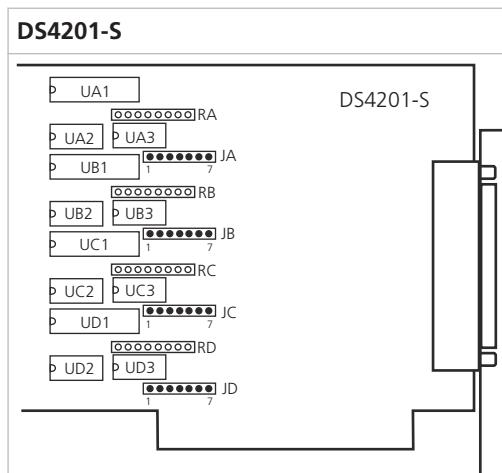
Precondition

The board is removed to get access to the sockets. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method

To set up a special transceiver mode on a particular channel

- 1 Insert (or remove) the desired types of components (ICs, resistor arrays and pin headers) as shown in the illustration below.



DS4201-S		Transceiver Mode		
Socket	RS232-C	RS422	RS485	
Ux1 ¹⁾	AD239	— ²⁾	— ²⁾	
Ux2	— ²⁾	75ALS180	75ALS180	
Ux3	—	75ALS180	75ALS180	
Jx	—	Pin 5–6 ³⁾	Pin 1–2 ³⁾ , 3–4, 6–7	
Rx	—	120 Ω	270 Ω	

- Ux1¹⁾, Ux2, Ux3: IC sockets for transceiver chips
- JA ... JD: pin headers for jumpers
- RA ... RD: resistor array sockets for termination resistor arrays

¹⁾ x = A ... D = Ch1 ... Ch4

²⁾ — = There must be no component inserted at this position

³⁾ These pins must be jumpered.

Related topics**Basics**

Setting Up the Processor Board..... 32

HowTos

DS4201, DS4201-S: How to Change the Sub-ID..... 55

How to Remove a Board from a PHS-Bus-Based System..... 77

How to Set the PHS-bus Address..... 39

DS4201-S: How to Change the Quartz Oscillator

Objective

You can change the quartz oscillator of the DS4201-S board to change the possible baud rate range.

Possible quartz oscillator versions

You can mount quartz oscillators with frequencies from 1.8432 MHz (default) up to 24 MHz.

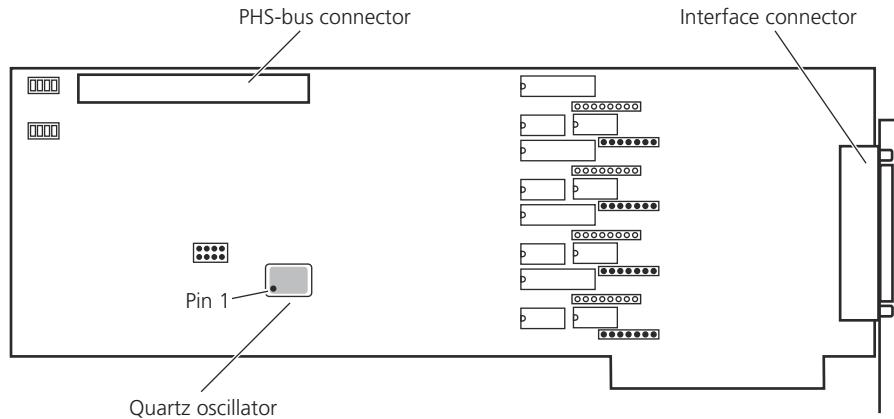
Precondition

- The housing of the quartz oscillator must be a 14-pin DIP.
- The board is removed to get access to the socket of the quartz oscillator. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method**To change the quartz oscillator**

- 1 Release the binder that secures the mounted quartz against accidental disconnection with an appropriate tool (e.g., cable cutter).

- 2** Plug the quartz oscillator. Note the marking on the device and the alignment on the DS4201-S board as shown in the illustration below.



- 3** Secure the new quartz oscillator with a binder to avoid accidental disconnection.

Necessary settings in the RTI blockset

If you have changed the quartz oscillator on the board you must adapt the new quartz frequency on the Advanced page of the Serial Setup in the DS4201-S blockset. For further information, refer to [Advanced Page \(DS4201SER_SETUP_Bx_Cy\) \(DS4201-S RTI Reference\)](#).

Actual baud rate

When you specify a baud rate within RTI or RTLib, the closest physically available baud rate is actually used for serial communication. For example, if you specify 70,000 baud as the baud rate, the baud rate actually used is 57,600 baud ($f_{osc} = 1.8432 \text{ MHz}$) or 71,429 baud ($f_{osc} = 24 \text{ MHz}$).

For further information, refer to [Specifying the Baud Rate of the Serial Interface \(DS4201-S Features\)](#).

Related topics

HowTos

DS4201, DS4201-S: How to Change the Sub-ID.....	55
DS4201-S: How to Set Up the Transceiver Mode.....	52
How to Remove a Board from a PHS-Bus-Based System.....	77

DS4201, DS4201-S: How to Change the Sub-ID

Objective

The sub-ID is intended only to be used by custom software:

- To perform hardware specific setups, etc.
- To distinguish several DS4201 and/or DS4201-S boards with different functionalities in one PHS-bus-based system.

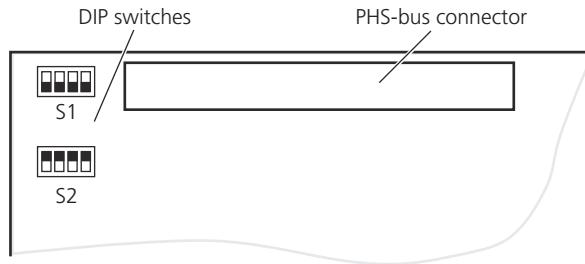
Note

The sub-ID is not used by dSPACE software.

dSPACE software recognizes several DS4201/DS4201-S in one PHS-bus-based system by the PHS-bus base address. So sub-IDs of several boards could be identical.

Changing via DIP switches

Change the sub-ID of the DS4201/DS4201-S board by using DIP switch S2, located on the component side of the board (see below).



Precondition

The board is removed to get access to the DIP switches. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method

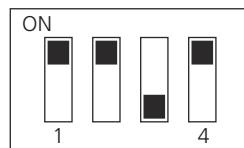
To change the sub-ID

- 1 Determine the sub-ID for each DS4201 and DS4201-S board you want to distinguish by custom software.

Note

Do not use sub-ID “FH”! dSPACE software cannot recognize a board with this sub-ID.

- 2 Use the four DIP switches to change the sub-ID. The following illustration shows the setting (0010) for sub-ID 2H as an example.



A switch turned ON represents a binary zero and OFF a binary one.

DIP switch settings

The following table shows the available sub-IDs and the corresponding DIP switch settings.

Sub-ID (Hex)	Setting of the DIP Switches (Binary)
0H	0000 (factory default setting)
1H	0001
2H	0010
3H	0011
4H	0100
5H	0101
6H	0110
7H	0111
8H	1000
9H	1001
AH	1010
BH	1011
CH	1100
DH	1101
EH	1110

Related topics

Basics

[Setting Up the Processor Board.....](#) 32

HowTos

[DS4201-S: How to Set Up the Transceiver Mode.....](#) 52
[How to Remove a Board from a PHS-Bus-Based System.....](#) 77
[How to Set the PHS-bus Address.....](#) 39

DS5001: How to Increase the Hysteresis Level of the Inputs

Objective

Before inserting the DS5001 in the expansion box, you have to check if the hysteresis level of the input comparators (timing I/O unit) must be increased to eliminate voltage spikes on the inputs.

A fixed hysteresis of about 80 mV prevents ringing on slow changing signals. As of board revision DS5001-06 the board allows you to increase the hysteresis by inserting resistors or resistor networks in a socket on the DS5001.

For information on the effect of increasing the hysteresis level, refer to I/O Circuits and Electrical Characteristics in the DS5001 chapter of the PHS Bus System Hardware Reference.

Factory default setting

No resistors are inserted = 80 mV hysteresis.

Precondition

The board is removed to get access to the resistor socket. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method

To increase the hysteresis level

- 1 Use appropriate resistors for the desired hysteresis.

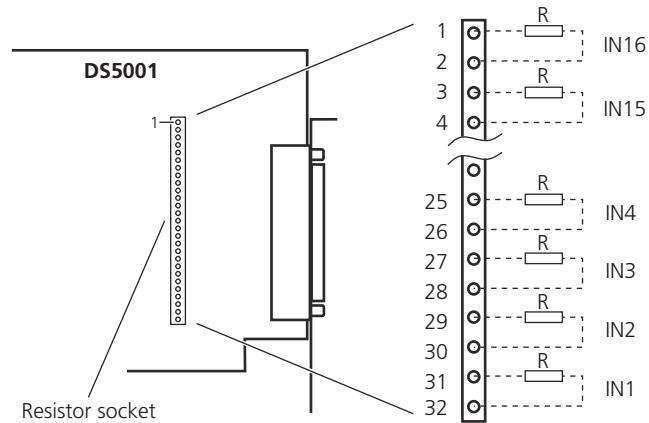
The following table shows the hysteresis levels for various resistance values.

Hysteresis	Resistance
80 mV	No resistor inserted (factory default setting)
150 mV	1 MΩ
210 mV	470 kΩ
360 mV	220 kΩ
680 mV	100 kΩ
1.35 V	47 kΩ
2.8 V	22 kΩ

Tip

To achieve equal resistance values on neighboring channels you should use resistor networks, like BOURNS 4608X-102 (= 4 resistors/package).

- 2 Plug the resistors (or resistor networks) onto the socket pins of the desired input channel as shown in the illustration below.



Related topics

Basics

[Setting Up the Processor Board](#)..... 32

HowTos

[How to Remove a Board from a PHS-Bus-Based System](#)..... 77

[How to Set the PHS-bus Address](#)..... 39

DS5101: How to Set Up the Pull-up Behavior

Objective

You can set the pull-up behavior using jumpers for each channel individually.

Board revision

The pull-up behavior can only be set for DS5101 as of board revision DS5101-04.

Tip

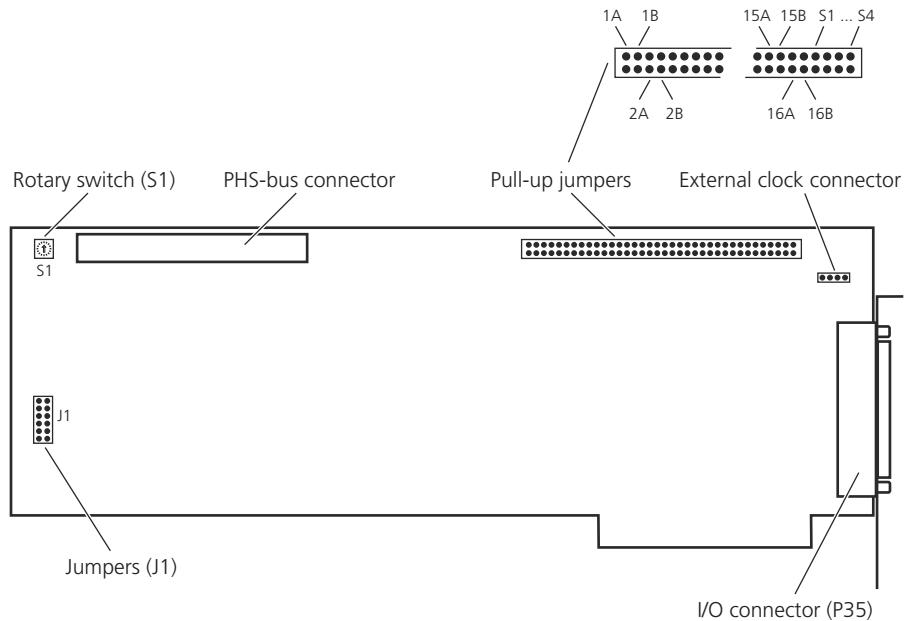
The revision number is printed on the board. You can also read out the number in ControlDesk, refer to [Board Details Properties \(ControlDesk Platform Management\)](#).

Precondition

The board is removed to get access to the jumpers. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

Method**To set up the pull-up behavior**

- 1** Insert the S1 jumper of the pull-up jumpers (see the following illustration).



- 2** Insert the xA and xb jumpers for each channel ($x = 1 \dots 16$) according to the following table

xA Jumper	xB Jumper	Pull-up Behavior on Pin x
Open	Open	No pull function
Closed	Open	Pull down
Open	Closed	Pull up
Closed	Closed	Hold function. The last I/O voltage level on pin x is hold.

Related topics**HowTos**

[How to Remove a Board from a PHS-Bus-Based System.....](#) 77

How to Insert Modules onto I/O Boards

Preconditions

- The board is removed to get access to the module slots. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

- Precautions are taken to avoid damage by high electrostatic voltages. For details, refer to [Safety Precautions for Installing and Connecting the Hardware](#) on page 11.

Method	To insert a module onto an I/O board <ol style="list-style-type: none">1 Put the board on an ESD-protecting surface (for example, the bag the board is delivered in) to avoid electrostatic discharges.2 Insert the module into the desired slot of the I/O board.3 If the I/O board provides mounting holes: Fix the module onto the board with suitable screws.
Next steps	Now you can reinstall the board. For detailed instructions, refer to How to Install dSPACE Boards on page 71.
Related topics	Basics <div style="background-color: #e0e0e0; padding: 5px; text-align: center;">Safety Precautions for Installing and Connecting the Hardware..... 11</div>

How to Mount a DS5203M1 Multi-I/O Module on the DS5203 FPGA Board

Objective	The following instructions apply if you want to mount a DS5203M1 Multi-I/O Module to a DS5203 FPGA Board. The DS5203 FPGA Board provides one slot for the module.
Preconditions	<ul style="list-style-type: none">▪ The board is removed to get access to the module slots. For instructions, refer to How to Remove a Board from a PHS-Bus-Based System on page 77.▪ To avoid risk of injury and/or damage to the dSPACE hardware, read and ensure that you comply with the safety precautions, see Safety Precautions for Installing and Connecting the Hardware on page 11.▪ Ensure you have all the items in the table below before starting:

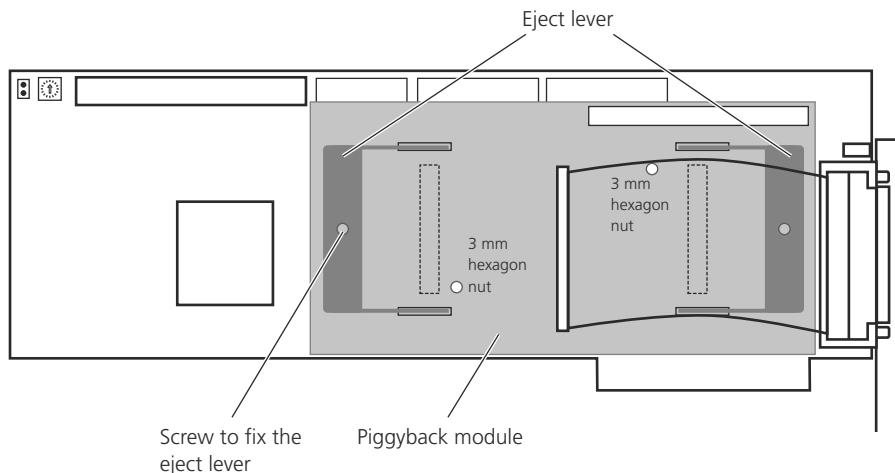
Items	Count	Description
Wrench	1	3 mm
Phillips screwdriver	1	PH0

Method**To mount a DS5203M1 Multi-I/O Module on the DS5203**

- 1** Put the DS5203 FPGA Board on an ESD protection surface (for example, the bag the board is delivered in) to avoid electrostatic discharges.
- 2** Look at the connectors on the bottom of the DS5203M1 Multi-I/O Module and on the top of the DS5203 FPGA Board to get the correct position for mounting.

Note

Ensure that the eject levers are fixed with screws to the piggyback module.



- 3** Carefully insert the module into the slot of the I/O board.
- 4** Secure the module against accidental disconnection using the washers and the 3 mm hexagon nuts.

Result

The DS5203M1 Multi-I/O Module is mounted on the DS5203.

How to Remove a DS5203M1 Multi-I/O Module from the DS5203 FPGA Board

Objective

The following instructions apply if you want to remove a DS5203M1 Multi-I/O Module from a DS5203 FPGA Board.

Preconditions

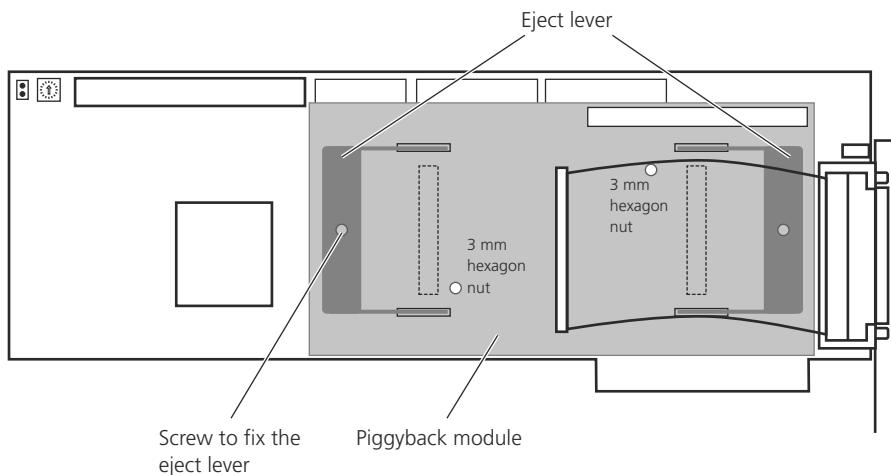
- The board is removed to get access to the module slots. For instructions, refer to [How to Remove a Board from a PHS-Bus-Based System](#) on page 77.

- To avoid risk of injury and/or damage to the dSPACE hardware, read and ensure that you comply with the safety precautions, see [Safety Precautions for Installing and Connecting the Hardware](#) on page 11.
- Ensure you have all the items in the table below before starting:

Items	Count	Description
Wrench	1	3 mm
Phillips screwdriver	1	PH0

Method**To remove a DS5203M1 Multi-I/O Module**

- 1 Put the DS5203 FPGA Board on an ESD protection surface (for example, the bag the board is delivered in) to avoid electrostatic discharges.
- 2 Unscrew the screws of both eject levers.



- 3 Unscrew the 3 mm hexagon nuts and remove the washers.
- 4 Carefully pull up the eject levers and remove the module from the board.

Result

The DS5203M1 Multi-I/O Module is removed from the board.

Installing the Hardware

Objective

The installation work necessary depends on the components you ordered and the amount of preconfiguration done by dSPACE.

If you ordered a PHS-bus-based system together with an expansion box, the system is preconfigured. All the boards except the DS1006 Processor Board are already installed in the box. The processor board is shipped separately to avoid damage to the board and to the expansion box during transportation.

Where to go from here

Information in this section

Installing dSPACE Boards.....	65
After setting up the boards, you can install them in an expansion box.	
Upgrading a DS1003 Modular System.....	85
If you want to upgrade an existing DS1003 modular system to a DS1006 modular system, you must ensure that the correct PHS bus components are used.	
Setting Up a Multiprocessor System.....	88
A multiprocessor system is based on two or more processor boards.	
Installing Connector and LED Panels.....	94
CP and CLP connector panels provide easy-to-use connections between the board and external devices.	
PX20 Expansion Box Installation.....	100
The PX20 Expansion Box is available as either a desktop box or a rack-mount version. You can also install the desktop box in a standard 19" rack.	

Information in other sections

Safety Precautions.....9

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

Installing dSPACE Boards

Objective	The DS1006 modular system must be installed in a PX10 or in a PX20 Expansion Box. It can be connected to the host PC via bus interface or via Ethernet.
------------------	---

Important notes	Note
	<p>You install dSPACE hardware at your own risk. Only qualified persons with experience in installing computer hardware and electric devices should perform the installation. Any damage to or malfunction of dSPACE hardware caused by improper installation is not covered by the warranty, unless the handling and installation instructions are shown to be defective.</p>

Upgrading a DS1005 modular system	If you want to upgrade an existing DS1005 modular system to a DS1006 modular system, the connection to the PHS bus components is fully compatible and you can reuse the connection variant to the host PC (link board or slot CPU).
--	---

Where to go from here	Information in this section										
	<p>Notes</p> <p>Notes on Installation.....66 Before planning the arrangement of the boards in an expansion box, you should consider some hints.</p>										
	<p>Installation work</p> <table> <tr> <td>How to Switch Off a dSPACE System.....</td> <td>71</td> </tr> <tr> <td>How to Install dSPACE Boards.....</td> <td>71</td> </tr> <tr> <td>How to Switch On the dSPACE System.....</td> <td>76</td> </tr> <tr> <td>How to Remove a Board from a PHS-Bus-Based System.....</td> <td>77</td> </tr> <tr> <td>How to Remove Optical Transceiver Modules from a DS1006/DS1007.....</td> <td>81</td> </tr> </table>	How to Switch Off a dSPACE System	71	How to Install dSPACE Boards	71	How to Switch On the dSPACE System	76	How to Remove a Board from a PHS-Bus-Based System	77	How to Remove Optical Transceiver Modules from a DS1006/DS1007	81
How to Switch Off a dSPACE System	71										
How to Install dSPACE Boards	71										
How to Switch On the dSPACE System	76										
How to Remove a Board from a PHS-Bus-Based System	77										
How to Remove Optical Transceiver Modules from a DS1006/DS1007	81										

Information in other sections

Safety Precautions for Installing and Connecting the Hardware	11
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Notes on Installation

Introduction

Read this section before you begin installing dSPACE boards. The following notes and tips are intended to help you achieve optimum results (especially optimal signal performance) when working with a PHS-bus-based system.

Required expansion box

The DS1006 modular system must be installed in a PX10 or PX20 Expansion Box.

Note

The PX10/PX20 Expansion Boxes need power supplies and connectors which fulfill the DS1006 requirements to support a DS1006 modular system.

For information on whether your existing expansion box fulfills the requirements, refer to <http://www.dspace.de/goto?pxboxvers>.

You cannot insert a DS1006 in your host PC, in a PX4 Expansion Box, or in an AutoBox/Tandem-AutoBox.

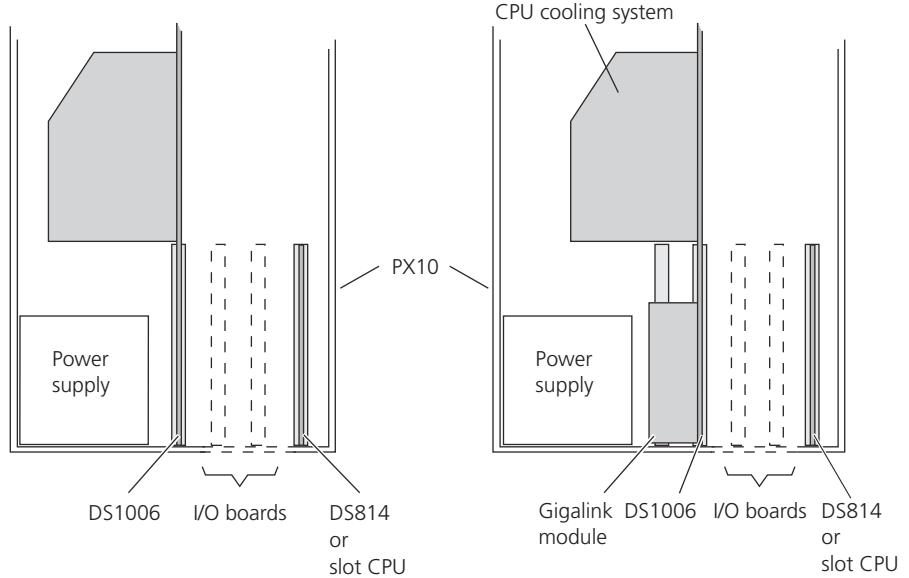
Placing the DS1006

The DS1006 needs up to four adjacent slots for installation to ensure the proper cooling of the AMD Opteron™ processor.

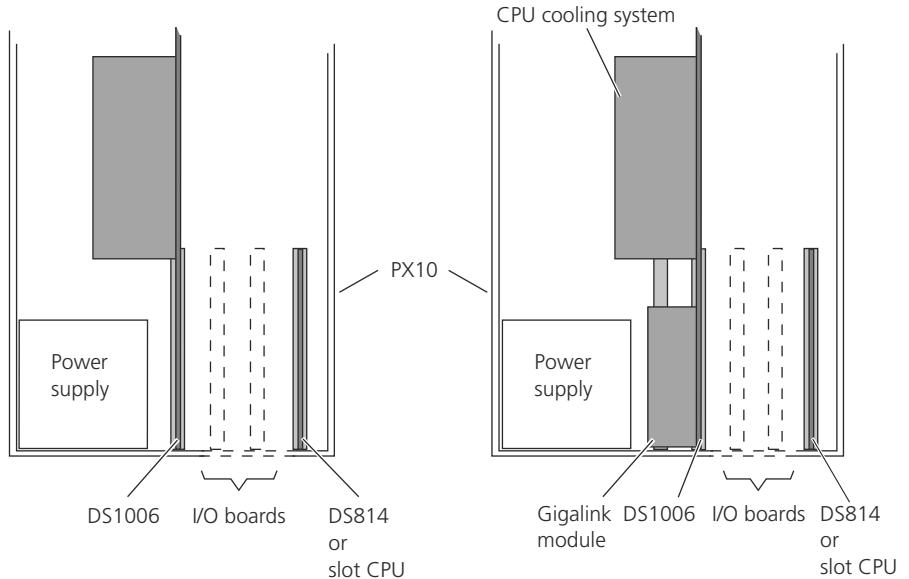
The variants of placing the DS1006 depending on the used expansion box are described below.

DS1006 in PX10 expansion boxes In a PX10, the DS1006 requires either one slot (without Gigalink module) or two slots (with Gigalink module), if it is installed next to the box's power supply.

The illustrations below show how to install the DS1006 (up to board revision DS1006-03) in a PX10.

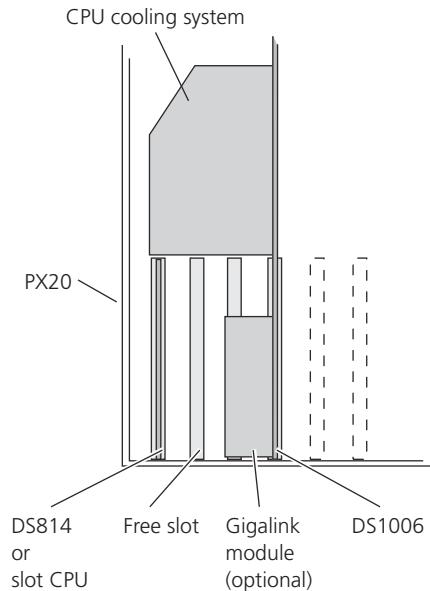


The illustrations below show how to install the DS1006 (as of board revision DS1006-06) in a PX10.



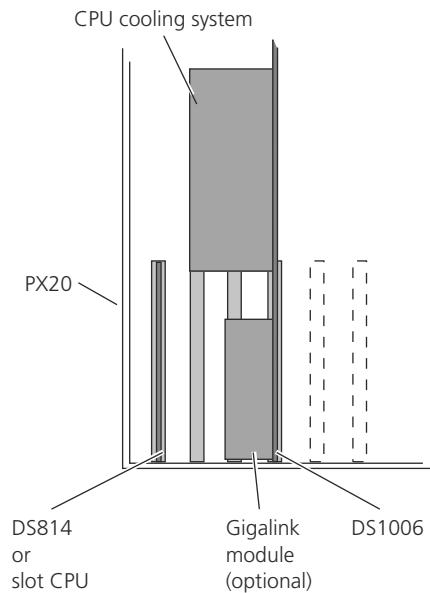
You have to install the DS814 or the slot CPU in the rightmost slot of the PX10 expansion box to make optimum use of the available space. This also leaves sufficient room for the PHS-bus terminator.

DS1006 in PX20 expansion boxes To install the DS1006 (*up to board revision DS1006-03*) in a PX20, four adjacent slots are required. The illustration below shows the DS1006 with the optionally mounted DS911 Gigalink module and DS814 Link Board or slot CPU in a PX20.



Insert the DS814 or the slot CPU in the leftmost slot. No extra slots are required for a DS814 or slot CPU and Gigalink module.

As of board revision DS1006-06 (multicore processor board), the DS1006 requires *three* adjacent slots. The illustration below shows the DS1006 with the optionally mounted DS911 Gigalink module and DS814 Link Board or slot CPU in a PX20.



Insert the DS814 or the slot CPU in the leftmost slot.

Note

Unlike other DS1006 board revisions, you cannot use the slots in front of the CPU cooling system to install a short board such as the DS814.

Placing dSPACE boards

Always put the processor board in the leftmost slot (see illustrations above). You should position the I/O boards to the right of the processor board according to the following rules, if possible.

- I/O boards with only one bracket should have one free slot next to them. This ensures proper ventilation in the box to avoid heating the system.
- I/O boards with more than one bracket should be placed as close as possible to other boards.
- The DS5101 (only up to board revision DS5101-2) generates a lot of heat, if several piggyback modules are used. Therefore never install two DS5101 boards next to each other. If possible, leave the neighboring slot at the side of the modules empty.

Specifics for placing ADC/DAC boards The kind, number and arrangement of the boards within the expansion box can affect ADC and DAC performance. It is strongly recommended to install an ADC/DAC board like the DS2001 at the end of the PHS bus cable, as far away as possible from the processor board and any digital I/O board.

You should leave at least one slot free between an ADC/DAC board and the next board if possible.

If you install ADC and DAC boards together in the expansion box, install the ADC boards at the end of the PHS bus cable. In this case the next board after the free slot should be a DAC board.

Connecting the PHS-bus cable

Use only the 96-line PHS-bus cable with the terminator labeled DS602-02. Refer to [Overview of PHS-Bus Cables and Terminators](#) on page 85.

To ensure proper functioning, you must observe the following rules for connecting the PHS-bus cable:

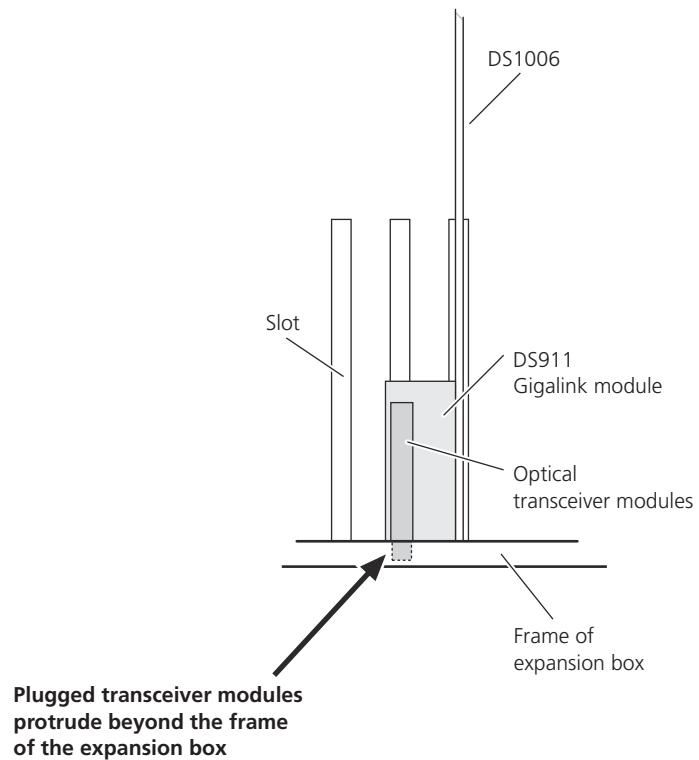
- The first PHS-bus cable connector must be plugged onto the processor board, the next connectors onto the I/O boards. To connect an I/O board with 3 brackets, you must leave one connector unused.
- The PHS-bus terminator must be placed next to the outermost I/O board.
- The PHS-bus cable must not have more than three unused connectors between the last connected I/O board and the PHS-bus terminator.

Handling the processor board with new Gigalink modules

As of October 2011 the DS1006 is equipped with DS911 Gigalink Module Version 6.0. This version provides removable optical transceiver modules (with fiber-optic connectors), making it easy to replace a damaged module with a new one.

You can replace the optical transceiver modules yourself. Spare part transceiver modules are available only from dSPACE. You can purchase them using article No. SFP_TRANS_MOD.

The mounting conditions in an expansion box make it necessary to remove the modules before you insert a processor board (with new Gigalink modules) in an expansion box or remove a board from the box. A board with plugged transceiver modules cannot be inserted or removed (see below).



For instructions on removing the optical transceiver modules, refer to How to Remove Optical Transceiver Modules from a DS1005/DS1006/DS1007.

Related topics

Basics

Overview of PHS-Bus Cables and Terminators..... 85

HowTos

How to Install dSPACE Boards..... 71

How to Remove Optical Transceiver Modules from a DS1006/DS1007..... 81

How to Remove Optical Transceiver Modules from a DS1006/DS1007 81

How to Switch Off a dSPACE System

Objective

You must follow the instructions below.

Method

To switch off a dSPACE system

- 1 Turn off all external devices connected to the dSPACE system.
- 2 Shut down the host PC and turn it off.

Note

Do not switch off the expansion box while the host PC is still running.
This might lead to unpredictable errors.

- 3 Turn off the expansion box.

Result

The dSPACE system is ready for installing or removing hardware components and connecting or disconnecting devices.

Related topics

HowTos

How to Install dSPACE Boards..... 71
How to Remove a Board from a PHS-Bus-Based System..... 77

How to Install dSPACE Boards

Objective

The following instructions will guide you through the installation of dSPACE boards in an expansion box.

Important notes**Note**

You install dSPACE hardware at your own risk. Only qualified persons with experience in installing computer hardware and electric devices should perform the installation. Any damage to or malfunction of dSPACE hardware caused by improper installation is not covered by the warranty, unless the handling and installation instructions are shown to be defective.

Shipment by dSPACE

If you ordered a PHS-bus-based system together with an expansion box, the DS1006 Processor Board is shipped separately to avoid damage to the board and to the expansion box during transportation. However, there is a free slot for installing the processor board.

Preconditions

- The system is switched off. For instructions, refer to [How to Switch Off a dSPACE System](#) on page 71.
- Precautions are taken to avoid damage by high electrostatic voltages. For details, refer to [Safety Precautions for Installing and Connecting the Hardware](#) on page 11.

Method**To install dSPACE boards****⚠ WARNING****Hazardous voltages****Risk of electric shock and/or damage to the hardware**

Before doing any installation work, make sure that:

- The power supply of the host PC and the expansion box are switched off.
- No external device is connected to the dSPACE system.

- 1 Disconnect the expansion box from the host PC and from the power supply.
- 2 Open the enclosure.
- 3 Select enough slots for the number of boards you want to install. Where boards require more than one bracket for installation, slots have to be left free between the boards.

The slots used should be adjacent to keep the PHS-bus cabling as short as possible.

Tip

Before planning the arrangement of the boards in an expansion box, you should note the points contained in [Notes on Installation](#) on page 66.

- 4 Remove the brackets that cover the openings on the rear side of the enclosure.
- 5 If not yet installed, insert the DS814 Link Board or the slot CPU in the rightmost slot in a PX10, or the leftmost slot in a PX20. For further information on link board connection, refer to [Connecting an Expansion Box to the Host PC](#) on page 113.
- 6 Check whether a CompactFlash card is inserted in the DS1006 and remove it.

NOTICE

Improper handling will damage the fan of the board and/or Gigalink module (up to module revision 3.7).

- Do not touch any components of the fan, neither during operation nor when it has stopped.
- Do not apply pressure to the fan bearing during installation and removal of the board.

- 7 Insert the DS1006 Processor Board and connect the first PHS-bus cable connector to the board beforehand.

NOTICE

Improper handling will damage the PHS-bus cable connectors.

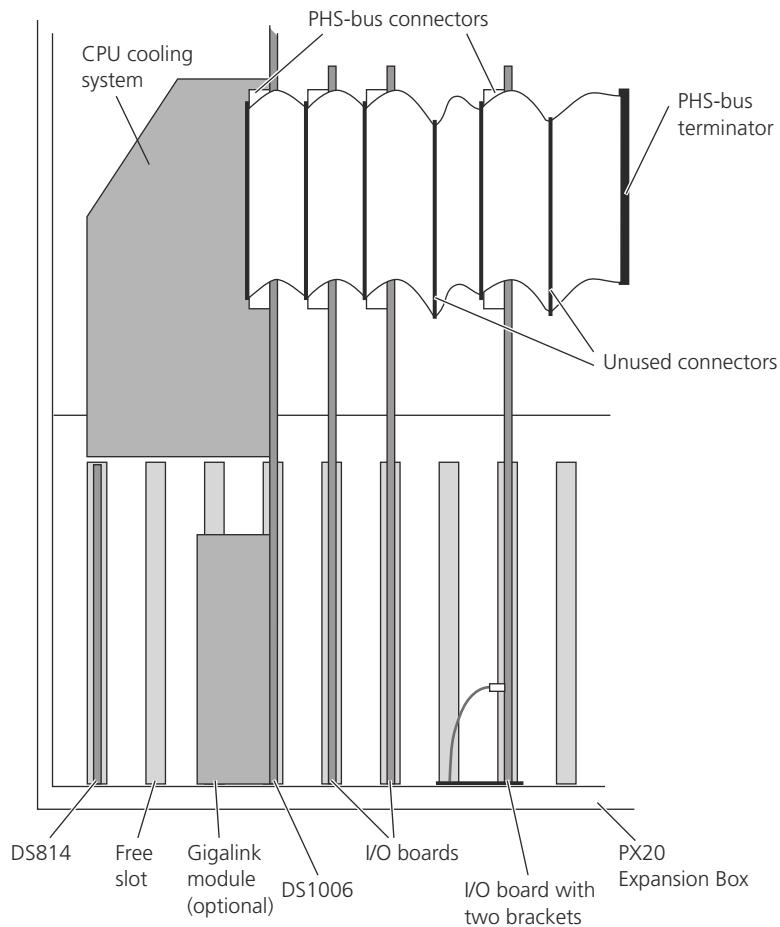
- Make sure that you hold the PHS-bus cable connectors straight to connect or disconnect them. Holding them at an angle will damage the pins of the connectors on the boards or break the connector shells.

Note

Keep in mind that:

- Only the 96-line PHS-bus cable with the terminator labeled DS602-02 must be used.
- The PHS-bus terminator must be placed next to the outermost I/O board, not next to the DS1006.

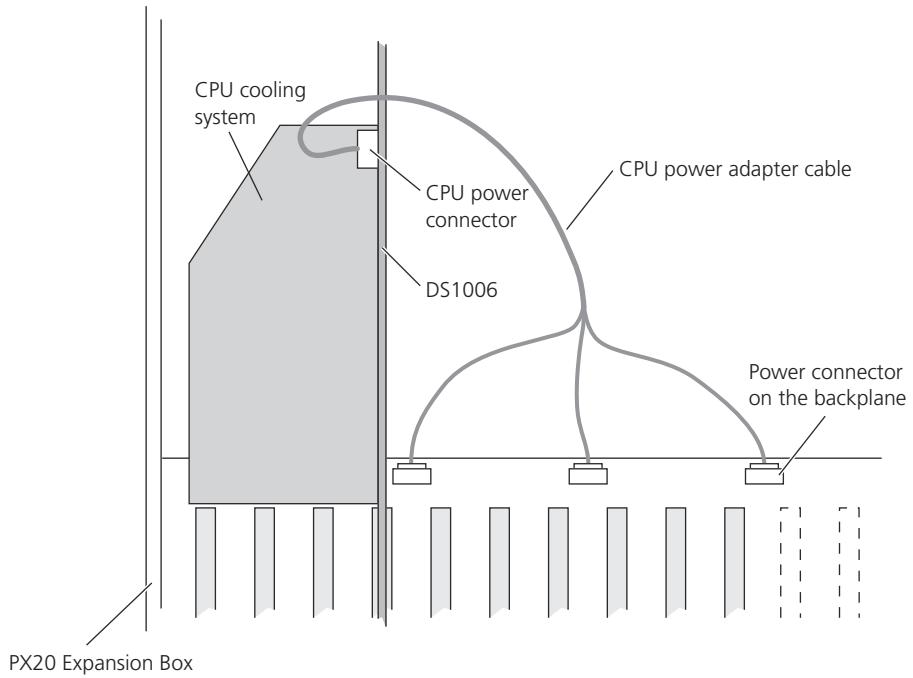
The following illustration shows the installation of a PHS-bus-based system with a DS1006 Processor Board (up to board revision DS1006-03) and I/O boards in a PX20 Expansion Box.

**Note**

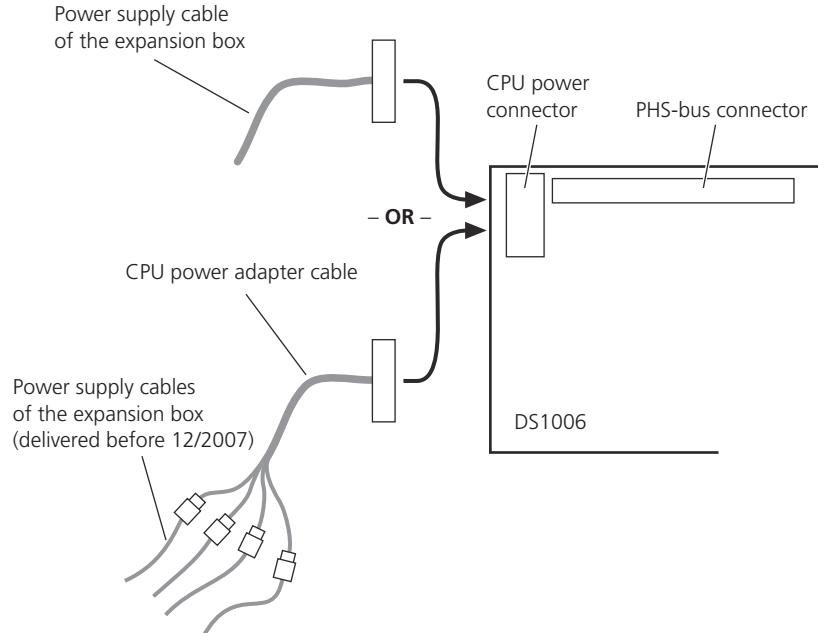
The PHS-bus cable must not have more than three unused connectors between the last connected I/O board and the PHS-bus terminator to ensure proper functioning. Unused connectors can be located between the boards as shown in the illustration above.

8 Connect the CPU power adapter cable to the DS1006.

- In the *PX20 Expansion Box*, the connectors to the CPU power adapter cable are located on the backplane of the expansion box. Connect the CPU power adapter cable, as shown in the illustration below.



- The power supply of the *PX10 Expansion Box* provides its own connector to power the DS1006. For PX10 expansion boxes delivered before December 2007, you need a CPU power adapter cable.



- Insert the I/O boards one after the other and connect the PHS-bus cable to each board beforehand. Repeat this procedure until all I/O boards are inserted and the PHS-bus connection is complete.

10 Secure the boards using the screws that were removed before and make sure that the PHS-bus cable does not touch other devices.

11 Close the enclosure.

12 Reconnect the expansion box to the host PC and all connected devices to the power supply.

Result

The installation is complete.

Next steps

- As your system is installed in an expansion box, it must be connected to your host PC via Ethernet or a bus interface. For further information, refer to [Connecting an Expansion Box to the Host PC](#) on page 113.
- You can switch on the dSPACE system. Refer to [How to Switch On the dSPACE System](#) on page 76

Related topics

Basics

Notes on Installation.....	66
Safety Precautions for Installing and Connecting the Hardware.....	11

HowTos

How to Remove a Board from a PHS-Bus-Based System.....	77
How to Switch Off a dSPACE System.....	71
How to Switch On the dSPACE System.....	76

How to Switch On the dSPACE System

Objective

You must follow the instructions below.

Precondition

The connecting/disconnecting of devices is completed.

Method

To switch on the dSPACE system

- 1** Turn on the expansion box.

Note

To avoid unpredictable errors, you should always turn on the expansion box before the host PC.

- 2** Turn on the host PC.

Result

The dSPACE system is running and you can work with it.

Related topics**HowTos**

How to Remove a Board from a PHS-Bus-Based System..... 77

How to Remove a Board from a PHS-Bus-Based System

Objective

To set up installed boards, it may be necessary to remove them from the host PC or the expansion box.

**Shipment and transportation
in an expansion box****NOTICE**

Processor boards installed inside the expansion box will be damaged during transportation and shipment!

Due to the weight of the heat sinks on the DS1006 Processor Board, both the expansion box and the board itself will be damaged by acceleration and shocks.

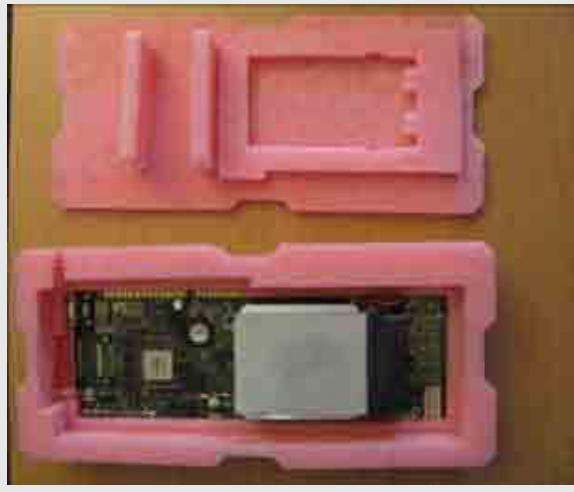
- For shipment or transportation, remove the DS1006 Processor Board from the expansion box.
- Ship the board separately from the box.
- Ship the board only in the original package from dSPACE.

**Wrapping the DS1006
(multicore processor board)
for separate transportation****NOTICE**

Faulty packaging can damage the DS1006 (multicore processor board) during transportation and shipment!

To avoid damage to the DS1006:

- Ship the board only in the original package from dSPACE.
- Fix the board firmly in place using the plastic foam from the original package as shown below.

**Preconditions**

- The system is switched off. For instructions, refer to [How to Switch Off a dSPACE System](#) on page 71.
- Precautions are taken to avoid damage by high electrostatic voltages. For details, refer to [Safety Precautions for Installing and Connecting the Hardware](#) on page 11.

Method**To remove a board from a PHS-bus-based system****⚠ WARNING****Hazardous voltages****Risk of electric shock and/or damage to the hardware**

Before removing any board, make sure that:

- The power supply of the host PC and the expansion box are switched off.
- No external device is connected to the dSPACE system.

- 1 Disconnect the host PC, the expansion box and all external devices connected to them from the power supply.
- 2 Unplug any external devices or connector panels from the I/O connectors of the I/O boards.
- 3 Open the enclosure of the expansion box.

- 4 Beginning with the rightmost I/O board or the processor board (dependent on the place of the board you want to remove), unscrew the bracket of the board.
- 5 Pull the board out of the slot a little.
- 6 Remove the PHS-bus cable from the board.
- 7 Remove the board completely.
- 8 Repeat from step 4 until you have removed the required board(s).
- 9 Close the enclosure.

Next steps

When all devices are reconnected to the system and to the power supply, you can switch on the dSPACE system. For detailed instructions, refer to [How to Switch On the dSPACE System](#) on page 76.

Related topics**Basics**

Safety Precautions for Installing and Connecting the Hardware.....	11
Safety Precautions for Transportation.....	10

HowTos

How to Switch Off a dSPACE System.....	71
How to Switch On the dSPACE System.....	76

How to Connect the Time-Base Connectors in a PX10/PX20 Expansion Box

Objective

You must connect the time-base connectors if you implement an engine position bus (time-base bus).

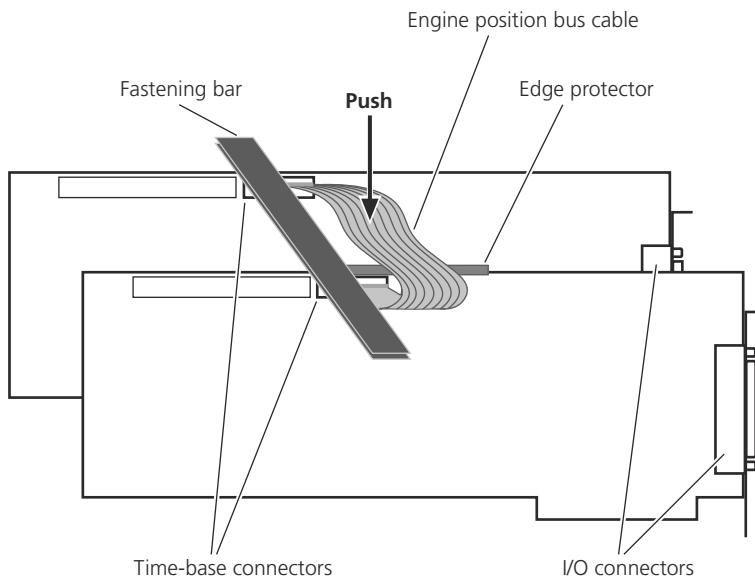
Affected I/O boards

You can connect the engine position bus (time-base bus) of the following I/O boards (the engine position bus of the HIL I/O boards is the same as the time-base bus of the DS4002 and DS5001 boards):

- DS2210
- DS2211
- DS4002 (as of board revision DS4002-04)
- DS5001 (as of board revision DS5001-06)
- DS2302 (as of board revision DS2302-04)
- DS5203

Affected expansion boxes	<ul style="list-style-type: none">▪ PX 10 (as of revision 3.2)▪ PX 20 (as of revision 5.2)
Cable	<ul style="list-style-type: none">▪ Use a standard 26-pin ribbon cable.▪ If the boards are installed next to each other, use a ribbon cable with about 170 mm (6.7 inches) distance between the connectors.▪ If there are free slots (or slots used by other boards) between the boards, the distance between the connectors of the ribbon cable must be about 20 mm (0.8 inch) longer for each free slot. Distance between the connectors = 170 mm (6.8 inches) + 20 mm (0.8 inch) for each free slot. <p>The number of connectors depends on the number of boards you want to connect.</p> <ul style="list-style-type: none">▪ Use 40 mm (1.6 inch) long edge protectors. <p>Suitable cables and edge protectors are available from dSPACE.</p>
Preconditions	<ul style="list-style-type: none">▪ The system is switched off.▪ Precautions are taken to avoid damage by high electrostatic voltages. For details, refer to Safety Precautions for Installing and Connecting the Hardware on page 11.
Method	<p>To connect the time-base connectors in a PX10/PX20 Expansion Box</p> <ol style="list-style-type: none">1 Mount the edge protector at the I/O board edge that is between the time-base connectors that you want to connect. The illustration below shows you the position of the edge protector.2 With the ribbon cable, connect the time-base connectors of the I/O boards and route the cable over the edge protection. <p>The fastening bar must not clamp the ribbon cable.</p>

- 3 Correct the ribbon cable routing by pushing down the ribbon cable in the middle as shown in the illustration below.



The ribbon cable must not be higher than the fastening bar.

Result

You connected the ribbon cable for the engine position bus (time-base bus).

Related topics

Basics

Cascading I/O Boards (DS2210 Features 	11
Safety Precautions for Installing and Connecting the Hardware.....	

HowTos

How to Switch Off a dSPACE System.....	71
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How to Remove Optical Transceiver Modules from a DS1006/DS1007

Objective

The mounting conditions in an expansion box make it necessary to remove the optical transceiver modules before you insert a processor board (equipped with Gigalink Module Version 6.0, delivered as of October 2011) in an expansion box or remove a board from the box.

The following instructions describe how to remove the transceiver modules from an uninstalled board (equipped with DS910 Gigalink Module). The procedure is the same for removing the modules from a board installed in an expansion box.

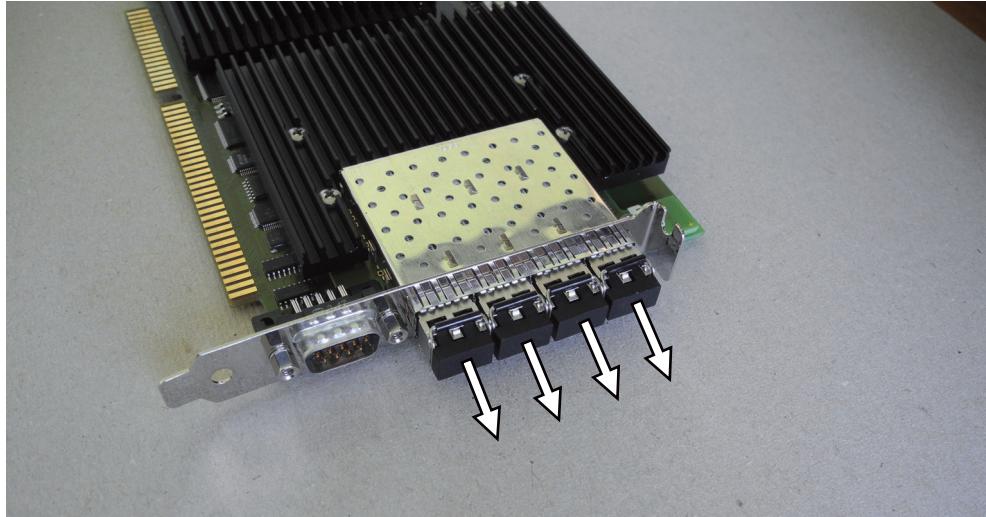
Thus you can remove a damaged optical transceiver module to replace it by a new one without removing the board.

Plugging removed transceiver modules to the board is done in reversed order.

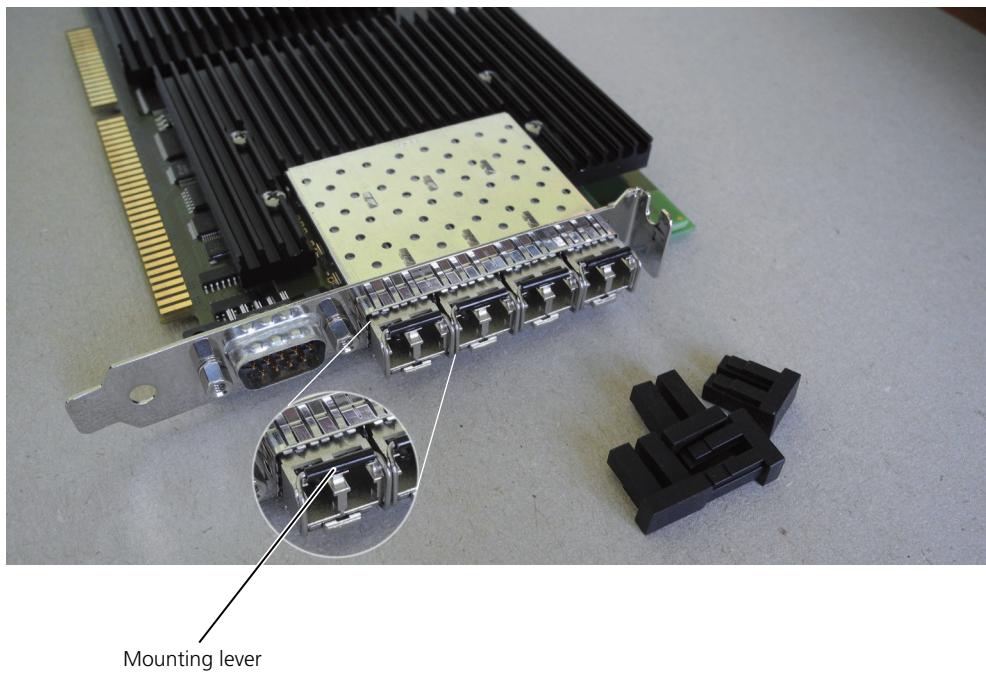
Method

To remove optical transceiver modules from a DS1006/DS1007

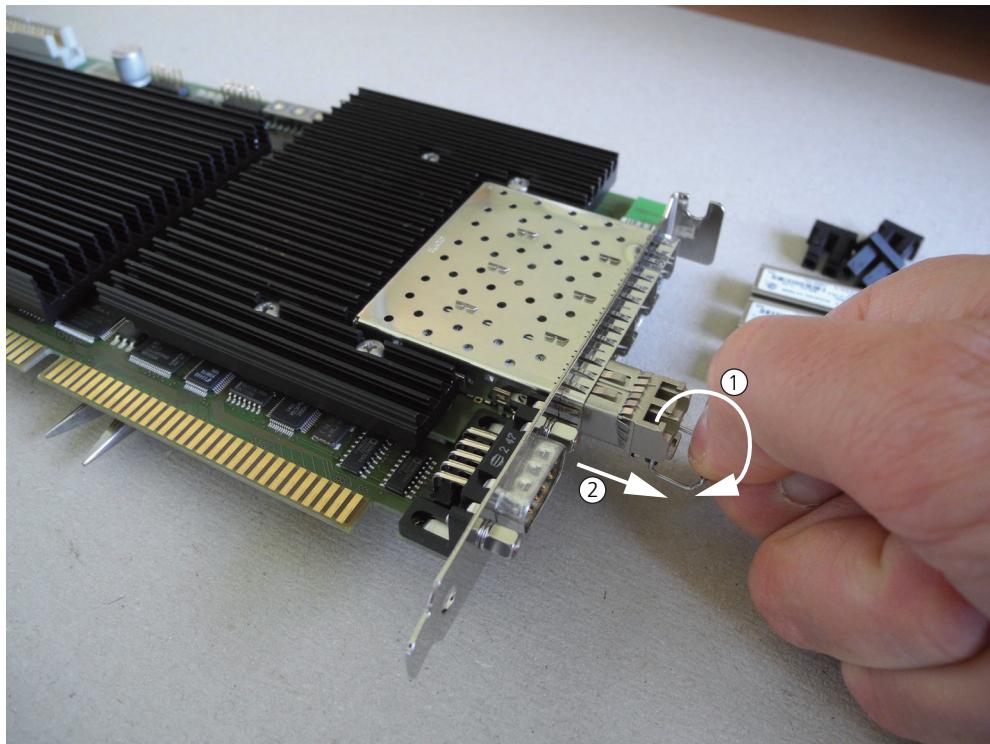
- 1 Remove the protective caps from the transceiver modules with your fingers.



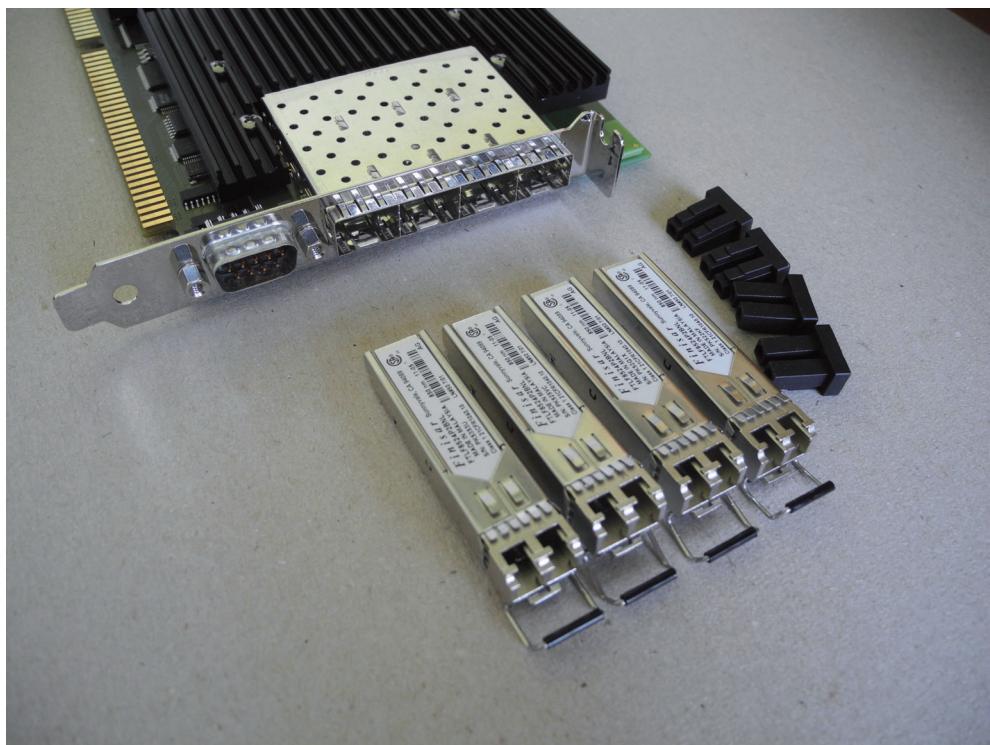
After you have removed the caps the mounting levers can be operated (see below).



- 2 Pull down the mounting lever and unplug the transceiver modules as shown below.



The result should look as shown below:



Result

You have removed the transceiver modules from the board and now the board can be installed in an expansion box.

Plugging the removed transceiver modules to the board is done in reversed order.

Upgrading a DS1003 Modular System

Objective	If you want to upgrade an existing DS1003 modular system to a DS1006 modular system, you must ensure that the correct PHS bus components are used.
Where to go from here	Information in this section Changes Related to the PHS-Bus Hardware..... 85 Overview of PHS-Bus Cables and Terminators..... 85

Changes Related to the PHS-Bus Hardware

Necessary changes	<p>Depending on the date when you purchased your DS1003 modular system you have to make the following changes:</p> <ul style="list-style-type: none"> ▪ If your DS1003 modular system was purchased before February 1999 you have to replace the PHS-bus cable completely. In this case use only the 96-line PHS-bus cables with the terminator labeled DS602-02. ▪ If your DS1003 modular system was purchased after February 1999, you have only to check whether the PHS-bus terminator is labeled DS602-02. If it is not, remove the old terminator by carefully using a flat screwdriver or similar tool as a lever and plug on the DS602-02 version.
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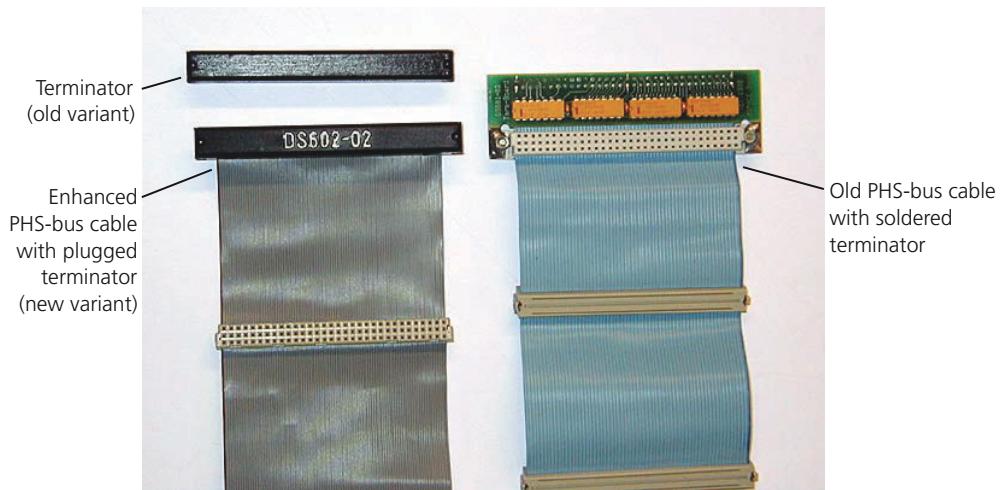
Note

If you are working with several dSPACE systems with different processor boards and you exchange components between systems, take care to always use only the 96-line PHS-bus cable with the terminator labeled DS602-02.

Overview of PHS-Bus Cables and Terminators

Objective	The PHS bus is the connection between several boards of a PHS-bus-based system. The physical component representing the PHS bus is the ribbon cable connected to every board. For proper signal transmission on the PHS bus, the
------------------	--

ribbon cable must be terminated with a PHS-bus terminator. There are several variants of PHS-bus cables and terminators, some of which are shown below.



Old PHS-bus cable

On the right there is a standard PHS-bus cable with 64 lines and a terminator that is soldered to the cable and cannot be removed. This type of cable was delivered up to February 1999.

Enhanced PHS-bus cable

On the left there is an enhanced PHS-bus cable with 96 lines. This cable supports the enhanced PHS++ specification introduced in February 1999. The terminator is plugged on to the last connector of the cable. It is removable and can therefore be replaced by a DS1005/DS1006/DS1007-compatible terminator if needed.

Plug-on terminators

There are two variants of plug-on terminators shown in the picture. The new variant is labeled DS602-02 and plugged on the enhanced PHS-bus cable. Above there is an unlabeled sample of the earlier variant delivered up to April 2000.

Note

Although the terminators are removable their use is not optional. A PHS-bus-based system must not be used without a terminator on the PHS-bus cable.

Usage of cables and terminators

The following table shows which PHS-bus cable and terminator you have to use for your system:

PHS-Bus Based System	PHS-Bus Cables and Terminators to be used	
DS1003 modular system	You can use any PHS-bus cable with any terminator variant.	
DS1005 modular system	Use only the 96-line PHS-bus cables with the terminator labeled DS602-02.	
DS1006 modular system		
DS1007 modular system		

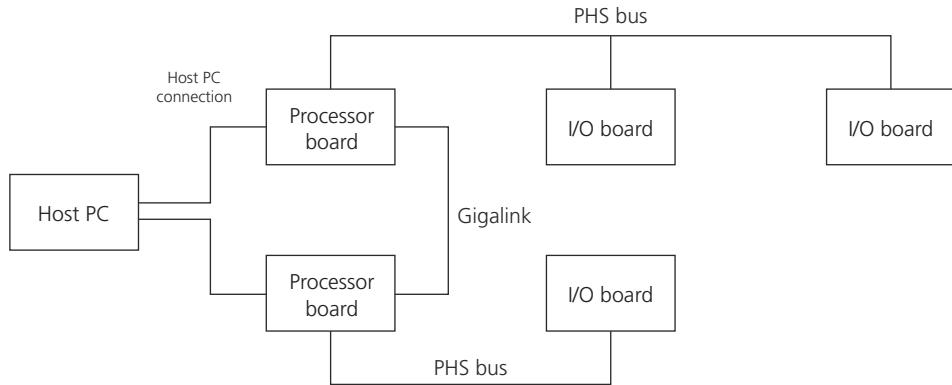
Setting Up a Multiprocessor System

Objective	A multiprocessor system is based on two or more processor boards.				
Where to go from here	Information in this section				
	<table><tr><td>Basics on Setting Up a Multiprocessor System.....</td><td>88</td></tr><tr><td>How to Connect Several dSPACE Processor Boards.....</td><td>91</td></tr></table>	Basics on Setting Up a Multiprocessor System.....	88	How to Connect Several dSPACE Processor Boards.....	91
Basics on Setting Up a Multiprocessor System.....	88				
How to Connect Several dSPACE Processor Boards.....	91				
	Information in other sections				
	<p>Connecting a PHS-Bus-Based System (SCALEXIO Hardware Installation and Configuration </p> <p>You can connect a SCALEXIO system to a PHS-bus-based system (i.e., a modular system with a DS1006 or DS1007) via Gigalink to exchange data.</p>				

Basics on Setting Up a Multiprocessor System

Objective	A multiprocessor system expands one PHS-bus-based system with one or more other PHS-bus-based systems.
Topology of a multiprocessor system	In a multiprocessor system the processor boards of each PHS-bus-based system communicate with each other via interprocessor communication. The interprocessor communication is performed via Gigalink. Gigalink is a dSPACE-specific fiber-optic connection that allows bidirectional serial data transmission at high speed (1.25 Gbit/s).

The following illustration shows a typical multiprocessor topology.



Host PC connection In a multiprocessor system there is no common connection to the host PC. Each processor board must be separately connected to a host PC.

Gigalink One DS911 Gigalink Module is required on each DS1006 board to perform interprocessor communication. Each Gigalink module provides 4 Gigalinks to connect other processor boards. You can use any network topology for Gigalink.

Only multiprocessor systems that consist of the same processor board type support RTI multiprocessor (RTI-MP) applications: e.g., one multiprocessor application can run on two DS1006 boards.

Nevertheless, you can use different processor boards in a multiprocessor system to transfer data between real-time applications. For example, you can connect a DS1006 board with a DS1007 board.

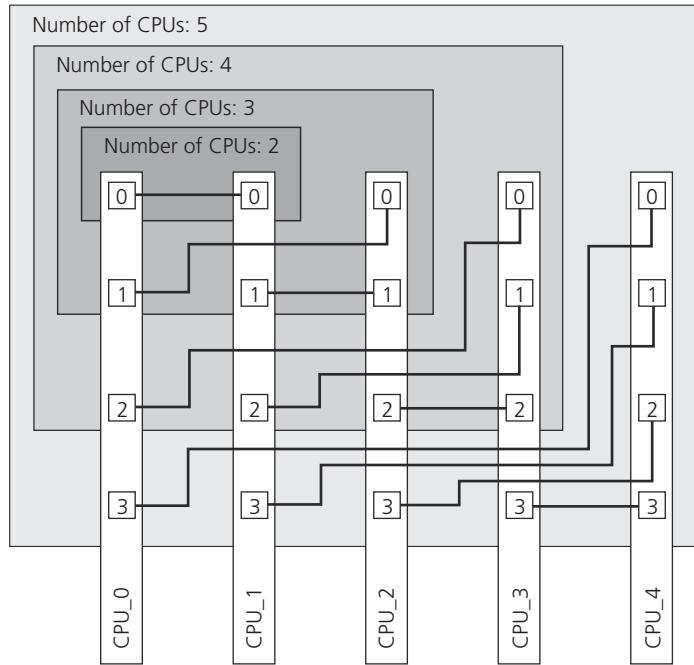
For details on interprocessor communication, refer to [Interprocessor Communication \(RTI and RTI-MP Implementation Guide](#) (link icon)).

Note

The first Gigalink channel (GL0) is used to synchronize the other Gigalink channels. Therefore, you must connect GL0 in your multiprocessor system to avoid transmission errors. Do not use multiprocessor topologies without connecting the GL0 channels.

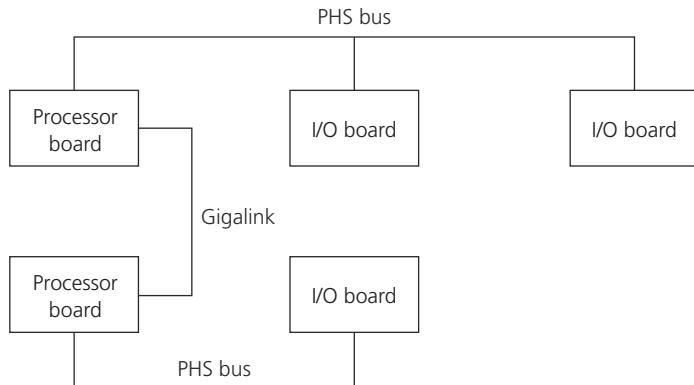
If you must use topologies with unconnected GL0 channels, contact dSPACE Support for help.

To shorten the interrupt times, it is useful to connect the processor boards so that each processor board has a direct connection to all other processor boards. The following illustration shows you a solution for connecting up to five processor boards so that each processor board has a direct connection to all other processor boards:

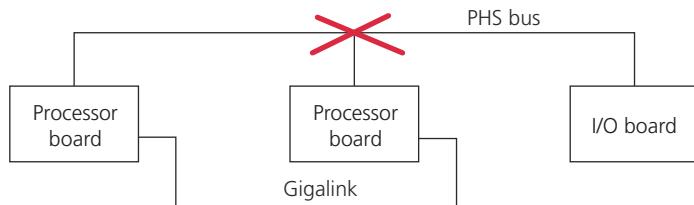


For details on connecting the Gigalinks, refer to [How to Connect Several dSPACE Processor Boards](#) on page 91.

PHS bus Each processor board is connected to its own PHS bus. Processor boards must not be connected to other processor boards via PHS bus.



The following illustration shows a multiprocessor system with an incorrect PHS-bus topology. Two processor boards are connected to the same PHS bus.



Multiprocessor systems can also be used in partitioned PHS-bus systems. For examples of system architectures, refer to [Examples of Using the DS802](#) on page 104.

Master processor

For RTI-MP applications one DS1006 has to be the master. RTI-MP automatically selects the CPU with the name **master** as the master CPU. If no CPU is named **master**, RTI-MP selects the CPU with the name that is the first in the alphabet. The master CPU is marked with an (M) on the Main page of the Multiprocessor Setup dialog. For details, see [How to Configure Models for MP Systems \(RTI and RTI-MP Implementation Guide\)](#).

Related topics**Basics**

[Interprocessor Communication \(RTI and RTI-MP Implementation Guide\)](#)
[Standard Network Topology \(RTI and RTI-MP Implementation Guide\)](#)

HowTos

[How to Configure Models for MP Systems \(RTI and RTI-MP Implementation Guide\)](#)
[How to Connect Several dSPACE Processor Boards](#).....91

Examples

[Examples of Using the DS802](#).....104

How to Connect Several dSPACE Processor Boards

Objective

When the Gigalink modules are mounted on the processor boards you can connect several boards.

Mounting the Gigalink modules

If you order a system with several processor boards, the Gigalink modules will be mounted on the DS1006 boards by dSPACE.

If you want to upgrade an already existing DS1006-based single-processor system with DS911 Gigalink Modules, send your DS1006 board(s) back to dSPACE. You cannot mount these modules yourself.

Cables**Note**

Use only the fiber-optic cables that come with the upgraded DS1006 boards.

Precondition	The system is switched off. For instructions, refer to How to Switch Off a dSPACE System on page 71.
---------------------	--

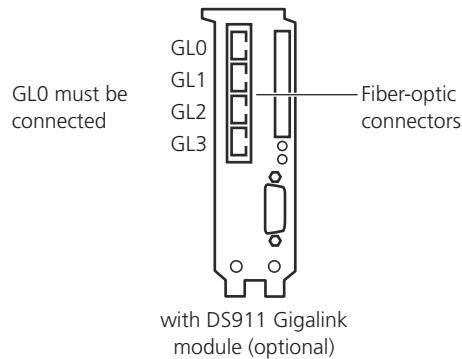
Method	To connect several processor boards
---------------	--

NOTICE

Improper handling damages the fiber-optic cable and the Gigalink module.

- Do not bend the fiber-optic cables beyond a radius of less than 40 mm.
- Do not remove the protective caps of unused Gigalinks.

- 1 Insert all boards of your multiprocessor system in your expansion box(es). For details, see [How to Install dSPACE Boards](#) on page 71.
- 2 Remove the black protective caps from the Gigalinks.
- 3 Remove the white protective caps from the fiber-optic cables.
- 4 Connect the processor boards according to the desired processor topology. Insert the plugs of the fiber-optic cables into the Gigalinks.

**Note**

You must connect GL0 in your multiprocessor system to avoid transmission errors. Do not use multiprocessor topologies without connecting the GL0 channel.

Next step

Now you can switch on the dSPACE system. Refer to [How to Switch On the dSPACE System](#) on page 76.

Related topics

Basics

[Connecting a PHS-Bus-Based System \(SCALEXIO Hardware Installation and Configuration !\[\]\(e7babd4568f7b72a243ad3df57726eb6_img.jpg\)](#)

HowTos

How to Switch Off a dSPACE System.....	71
How to Switch On the dSPACE System.....	76

Installing Connector and LED Panels

Objective	The CP and CLP connector panels provide easy-to-use connections between the board and external devices. Devices can be individually connected, disconnected or interchanged without soldering. This simplifies system construction, testing and troubleshooting. The CLPs additionally provide arrays of LEDs, which indicate the states of the digital signals. By contrast the LED panels (LPs) provide arrays of LEDs only.
------------------	---

Where to go from here	Information in this section
	How to Connect a Panel (CP, CLP) to a Board 94 After you have installed the board in an expansion box, you can connect the accompanying panel to the board.
	How to Connect an LED Panel to a Connector Panel 97 When an LED panel has been delivered individually, you must connect it to the respective connector panel.
	How to Mount a Panel in a 19" Rack 99 As a standard, the CP and CLP connector panels are installed in a desktop box made from aluminum profiles. They can optionally be mounted in a 19" industry rack.

How to Connect a Panel (CP, CLP) to a Board

Safety precautions	For safe and trouble-free operation of the panels, various guidelines must be observed. For details, refer to Safety Precautions for Using Connector Panels on page 15.
Preconditions	<ul style="list-style-type: none">▪ The system is switched off. For instructions, refer to How to Switch Off a dSPACE System on page 71.▪ If the panel is to be mounted in a 19" rack, this should be done first (see How to Mount a Panel in a 19" Rack on page 99).▪ Individually shipped LED panels must be connected to the corresponding connector panels (see How to Connect an LED Panel to a Connector Panel on page 97).
Possible methods	Check if the PC connector of the panel you want to install is equipped with slide latches:

- With slide latches, refer to Method 1
- Without slide latches, refer to Method 2

Method 1**To connect a panel to a board (PC connector with slide switches)****NOTICE**

Connecting external devices while the power supply is switched on may damage the dSPACE hardware.

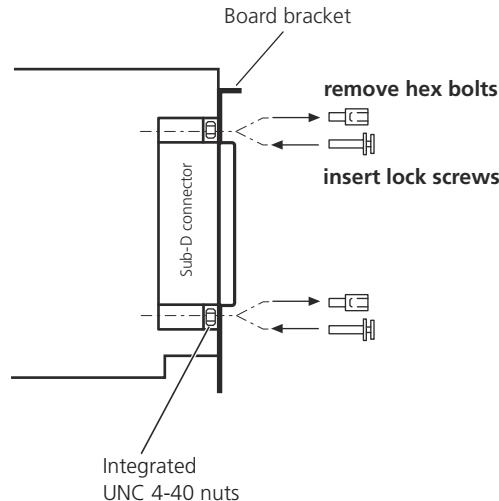
- Do not connect or disconnect any device while the power supply is switched on.
- Turn off the host PC, the expansion box, and the external devices beforehand.

- 1 Remove the hex bolts of the corresponding peripheral boards and install lock screws. A 4.5 mm wrench or a pair of pliers will be necessary to accomplish this.

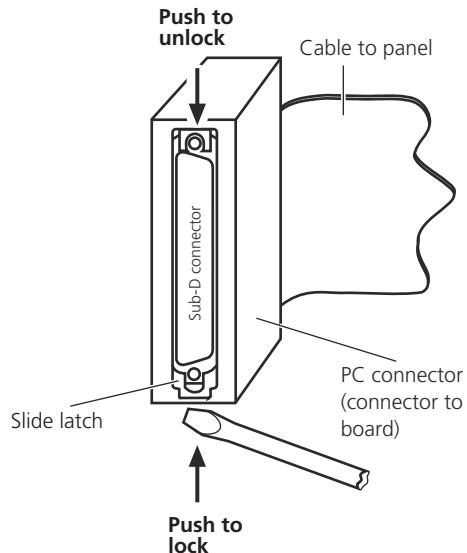
Note

If the panels have been delivered together with a dSPACE system, these screws are already installed to the corresponding peripheral boards.

The following illustration shows the top view of a dSPACE board installed in a PC or expansion box.



- 2 Plug the PC connector to the I/O connector of the board, and engage the slide latch as shown in the figure below.



- 3 Put templates on the panel. Turn the black clips on the panel through 90 degrees to secure the templates to the panel.

Method 2

To connect a panel to a board (PC connector without slide latches)

NOTICE

Connecting external devices while the power supply is switched on may damage the dSPACE hardware.

- Do not connect or disconnect any device while the power supply is switched on.
- Turn off the host PC, the expansion box, and the external devices beforehand.

- 1 Plug in the PC connectors that are not equipped with slide latches. Secure the connectors by tightening the screws provided.
- 2 Put templates on the panel. Turn the black clips on the panel through 90 degrees to secure the templates to the panel.

Next steps

Now you can:

- Connect devices to the panel. For detailed instructions, refer to [How to Connect External Devices to a Connector Panel](#) on page 151.
- Switch on the dSPACE system. Refer to [How to Switch On the dSPACE System](#) on page 76.

Related topics**Basics**

[Safety Precautions for Using Connector Panels.....](#) 15

HowTos

[How to Connect External Devices to a Connector Panel.....](#) 151

[How to Switch Off a dSPACE System.....](#) 71

How to Connect an LED Panel to a Connector Panel

Objective

When an LED panel (LP) has been delivered separately, you must connect it to the respective connector panel (CP) to get access to the digital signals available at the CP. LPs are available for the CP2201 and CP4001 connector panels.

Hardware package

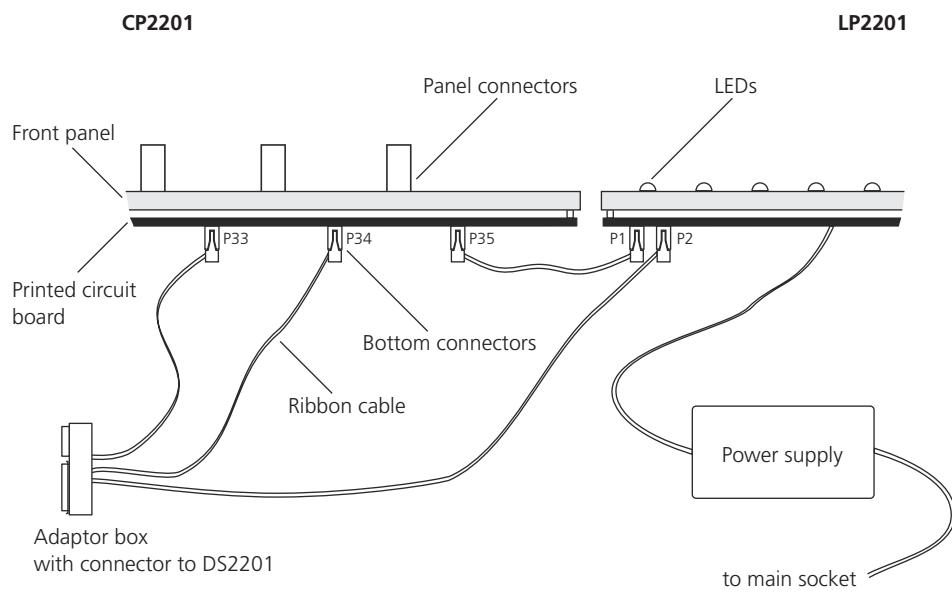
The shipment of the LPs includes an additional short ribbon cable and the power supply.

Method**To connect an LED panel to a connector panel:**

- 1 To get access to the bottom connectors of the CP, remove the enclosure (aluminum box or the 19" industry rack) of the panel.
- 2 Connect the ribbon connectors according to the wiring scheme below.
- 3 Reinstall the CP and the LP in the desired enclosure.
- 4 Connect the power supply to the mains.

**Wiring scheme
CP2201-LP2201**

Disconnect the ribbon cable which is connected to P35 on the CP2201 and connect it to connector P2 on the LP2201 as shown below. Use the short ribbon cable for the connection between the LP and the CP.

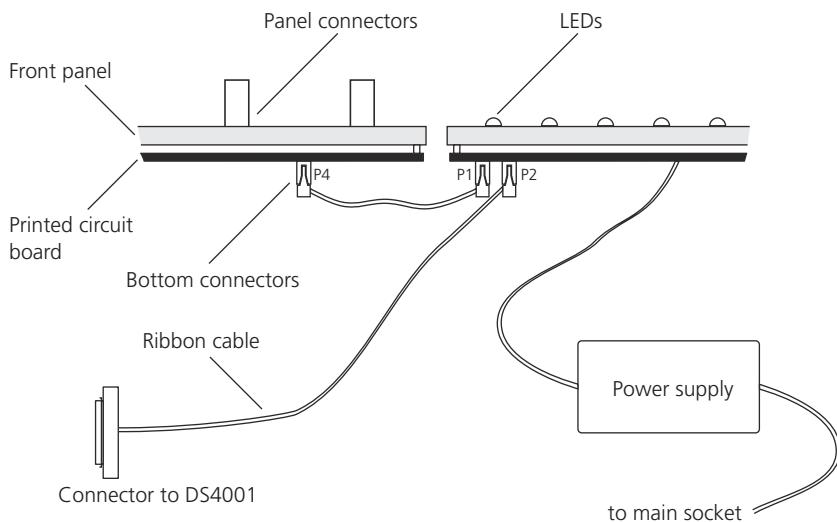


**Wiring scheme
CP4001-LP4001**

Disconnect the ribbon cable which is connected to P4 on the CP4001 and connect it to connector P2 on the LP4001. Use the short ribbon cable for the connection between the LP and the CP.

CP4001

LP4001



How to Mount a Panel in a 19" Rack

Objective

The connector and LED panels are installed in a desktop box made from aluminum profiles as a standard. They can optionally be mounted in a 19" industry rack.

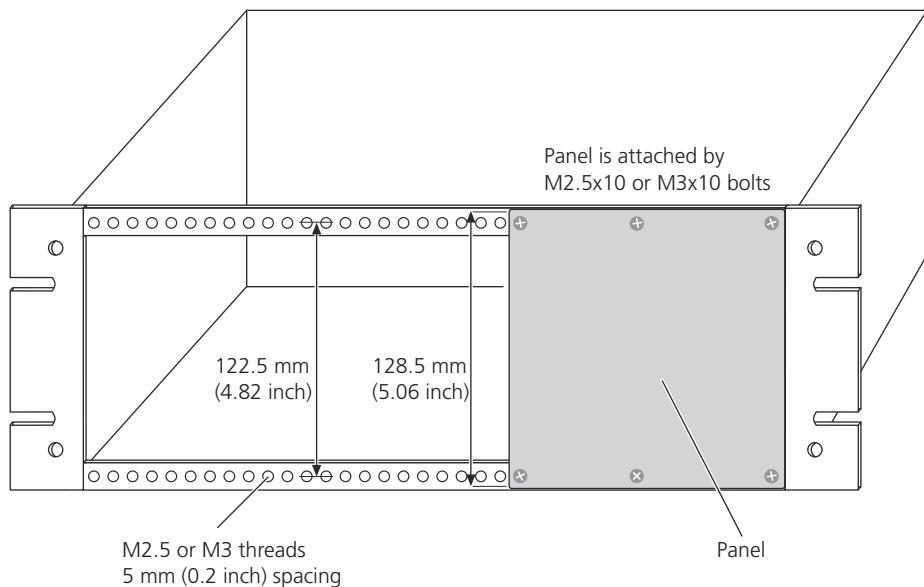
Preconditions

- The system is switched off. For instructions, refer to [How to Switch Off a dSPACE System](#) on page 71.
- All connections to external devices are removed.

Method

To mount panels in a standard 19" industry rack

- 1 Remove the aluminum box. To do so, unscrew one of its side panels (4 screws). If there is a ribbon cable strain relief at the bottom of the box, it must be cut open.
- 2 Bolt the panel to the front of a 19" rack as shown below. Depending on the rack used, several M2.5x10 or M3x10 bolts are required.



PX20 Expansion Box Installation

Objective

You can install a PX20 desktop box in a 19" rack.

Mounting a PX20 Expansion Box in a 19" Rack

Objective

The PX20 Expansion Box is available as either a desktop box or a rack-mount version. However, you can also install the desktop box in a 19" rack.

Notes for mounting

- When the outer decorative cover of a PX20 is removed, its chassis can be mounted in a standard 19" rack. There are five M5 threads on either side of the chassis. The bolts should be as short as possible to prevent short circuits inside the unit, and must not protrude more than 5 mm (0.2") into the box. With common 19" racks, M5 x 6 bolts can be used.
- To prevent the system from overheating make sure that the ventilation is not obstructed.

Tip

The plastic front cover can be snapped off and can be replaced by a special version with rack handles, which is available upon request.

Partitioning a PHS-Bus-Based System with the DS802 PHS Link Board

Introduction With the DS802 PHS Link Board, you can spatially partition the PHS bus by arranging the I/O boards in several expansion boxes.

Where to go from here	Information in this section
	Introduction to the DS802 101
	Examples of Using the DS802 104
	Installation and Configuration Notes 108 Before you install the DS802, you should note some specifics for the DS802 to achieve optimum results and to avoid malfunctions.
	Putting the DS802 into Operation 111

Introduction to the DS802

Use scenarios	Usually the processor board and the I/O boards of a PHS-bus-based system are installed in a single expansion box. With the DS802 PHS Link Board, you can spatially partition the PHS bus by arranging the I/O boards in several expansion boxes. You can use the DS802, for example, in the following scenarios: <ul style="list-style-type: none">▪ According to your development stage, you can easily extend the PHS-bus-based system with new I/O boards by connecting a separate preconfigured expansion box to the existing expansion box.
----------------------	---

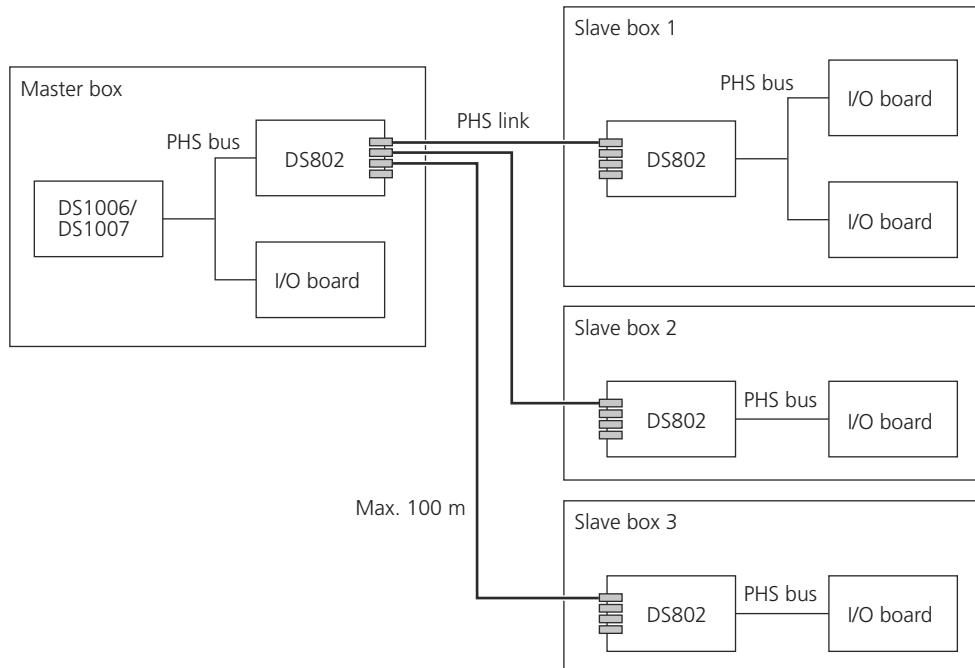
- Components of the PHS-bus-based system (installed in a separate expansion box) can easily be replaced and reused, for example, in other projects, without additional configuration work.
- If the devices of a test bench are spread out over a large area, you can shorten the cabling between dSPACE hardware and external devices (sensors/actuators) by installing I/O boards in a separate expansion box which is near the external devices.
- In a few cases the components of your PHS-bus-based system might require more power than the maximum that a single expansion box supplies. In this case, you can distribute the I/O boards on several boxes via DS802. This avoids power limitations in your system caused by single expansion boxes.

Note

The DS802 does not increase the number of usable I/O boards in a PHS-bus-based system. Note that the PHS bus provides 16 PHS-bus base addresses. Each I/O board in a PHS-bus-based system and each DS802 installed in a master box require a unique PHS-bus address. So, up to 15 I/O boards can be used in a PHS-bus-based system with one DS802.

System overview

The following illustration shows a typical system architecture of a partitioned PHS-bus-based system.



The box which contains the processor board is called the master box. Boxes which contain only I/O boards are called slave boxes. One DS802 must be installed in the master box and one in every slave box.

The DS802 boards provide the necessary link between the boxes via fiber-optic cable (up to 100 m). As shown above, the link must be a direct connection between the communication ports of a master box and a slave box. It does not matter which ports you use to connect a master box to a slave box. All ports provide the same functionality. DS802 boards installed in a slave box can use only one communication port. You must not connect one slave box to several master boxes at the same time or connect slave boxes in series.

You can also partition the PHS bus in multiprocessor systems, where several processor boards are connected via Gigalink modules.

For examples on partitioned PHS bus, refer to [Examples of Using the DS802](#) on page 104.

Number of connectable boxes

The DS802 provides four communication ports (fiber-optic connectors) to connect max. four slave boxes to one DS802 installed in a master box.

The DS802 is extendable by an optional extension module. It is not shown in the illustration above. The extension module is a piggy-back module and provides four additional communication ports.

Each master box can contain max. two DS802 boards, so max. 16 slave boxes can be connected to one master box (with extension module). However, only up to 14 I/O boards can be used in this scenario due to the address requirements.

Note

Note that the PHS bus provides 16 PHS-bus base addresses. Each DS802 installed in the master box requires one PHS-bus address.

Behavior of the real-time application

The logical behavior of the real-time application (for example, building or executing) when used with a partitioned PHS-bus-based system is the same as when used with a non-partitioned PHS-bus-based system.

There is one difference. Partitioning results in additional latencies. This means that the execution times for C functions of I/O boards installed in a slave box increase with the number of PHS-bus accesses.

The execution times increase by a factor in a range of approx. 3 ... 7. You can use this range for other functions and I/O boards, to estimate the function execution time for an I/O board installed in a slave box.

Tip

The function execution times for boards used in a non-partitioned PHS-bus-based system are documented in the *RTLib References* of the respective I/O board. The function execution times for I/O boards installed in a slave box are not documented. Use the above mentioned factor to get comparable values.

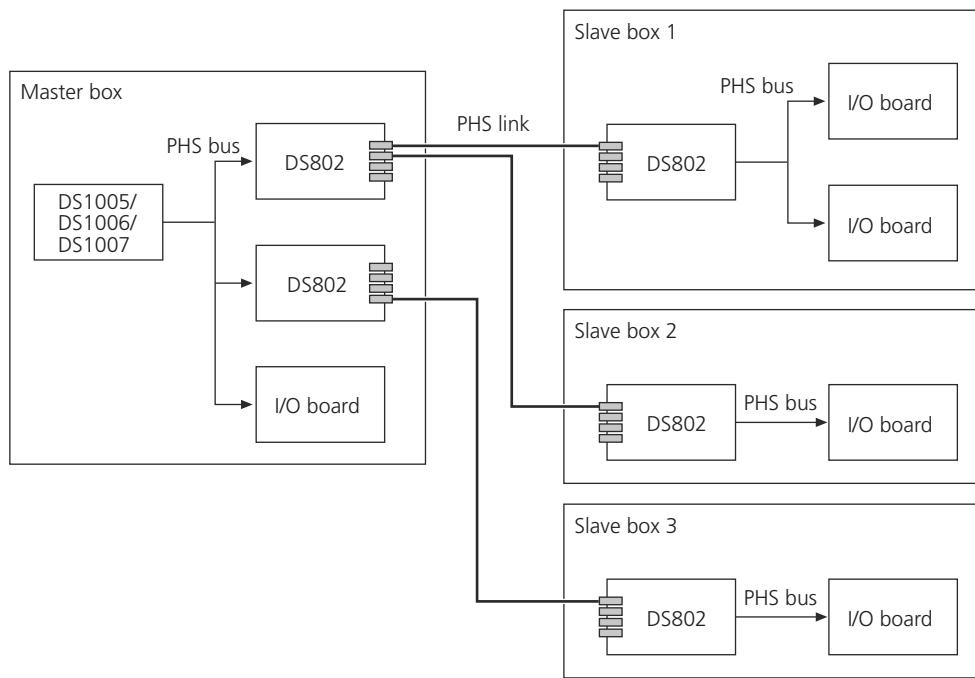
Compatibility information	<p>Compatibility with processor boards The DS802 can be used in PHS-bus-based systems. Newer versions of the DS1006 Processor Boards are fully compatible with the DS802. There are older versions which are compatible after an update done by dSPACE.</p> <p>For a complete list of compatible processor board versions, refer to DS802 Data Sheet (PHS Bus System Hardware Reference).</p> <p>Supported I/O boards The DS802 can be used in combination with many types of available dSPACE I/O boards. However, some I/O boards and some functionalities of specific I/O boards are not supported.</p> <p>The I/O board support depends on the dSPACE software release which you use. For a list of supported I/O boards, refer to DS802 Data Sheet (PHS Bus System Hardware Reference).</p>
----------------------------------	--

Board components	For further hardware information on the DS802 (overview illustration, board components, etc.), refer to DS802 Board Overview (PHS Bus System Hardware Reference) .
-------------------------	--

Examples of Using the DS802

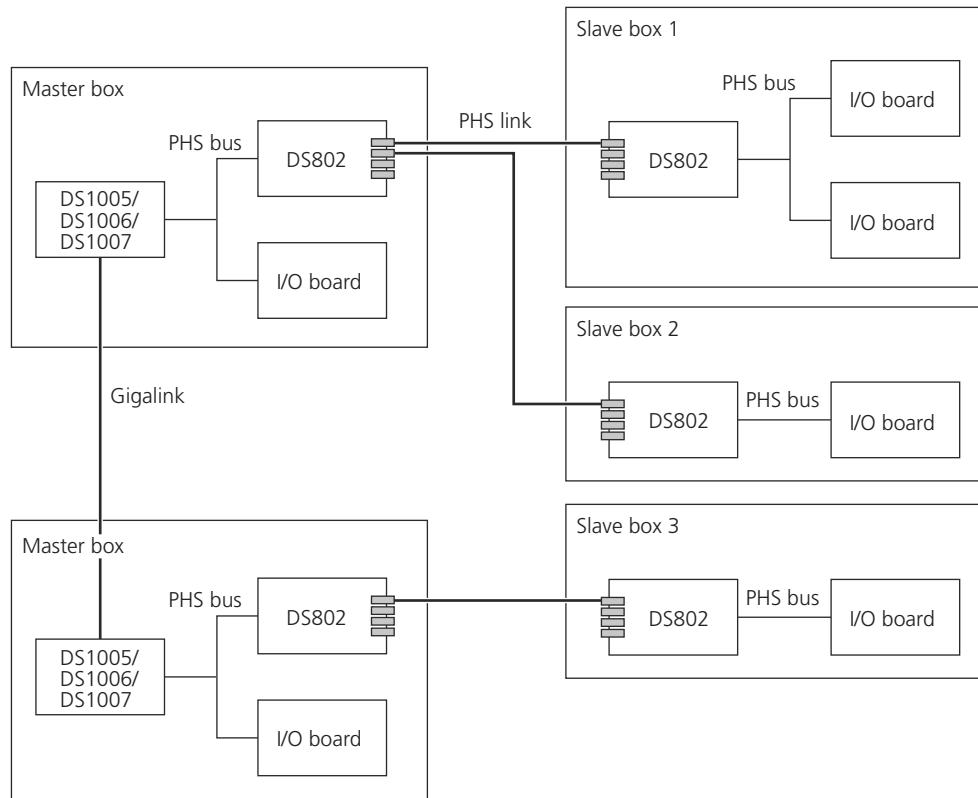
Introduction	The following illustrations show some examples of correct and incorrect use of the DS802 PHS Link board.
---------------------	--

System with two DS802 in a master box	You can install max. two DS802 in a master box. Keep in mind, that each DS802 installed in a master box needs a unique PHS-bus address. This reduces the number of usable I/O boards in the partitioned PHS-bus-based system.
--	---



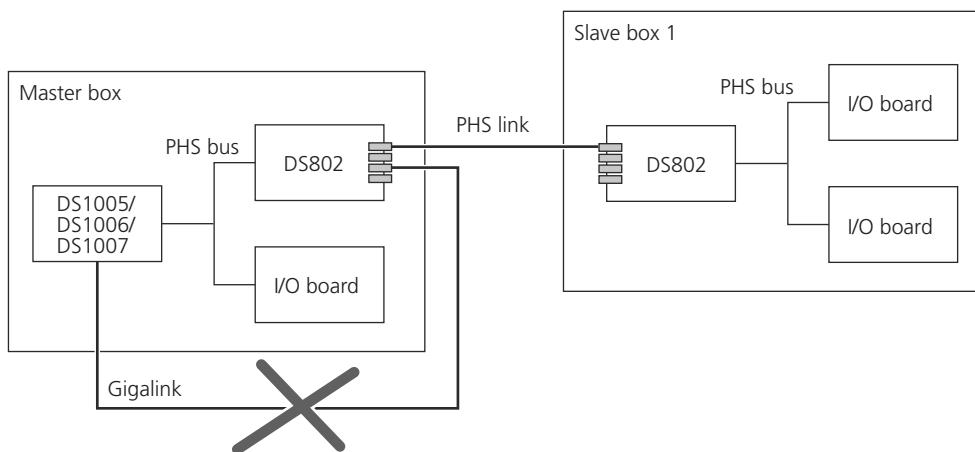
System with Gigalink connection

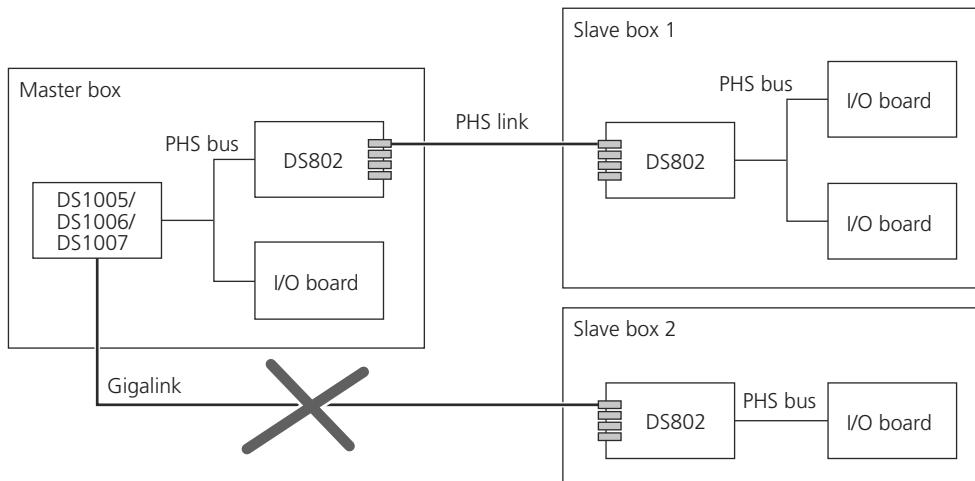
The illustration below shows a multiprocessor system based on Gigalink modules with PHS-bus partitioning.



System with incorrect Gigalink connections

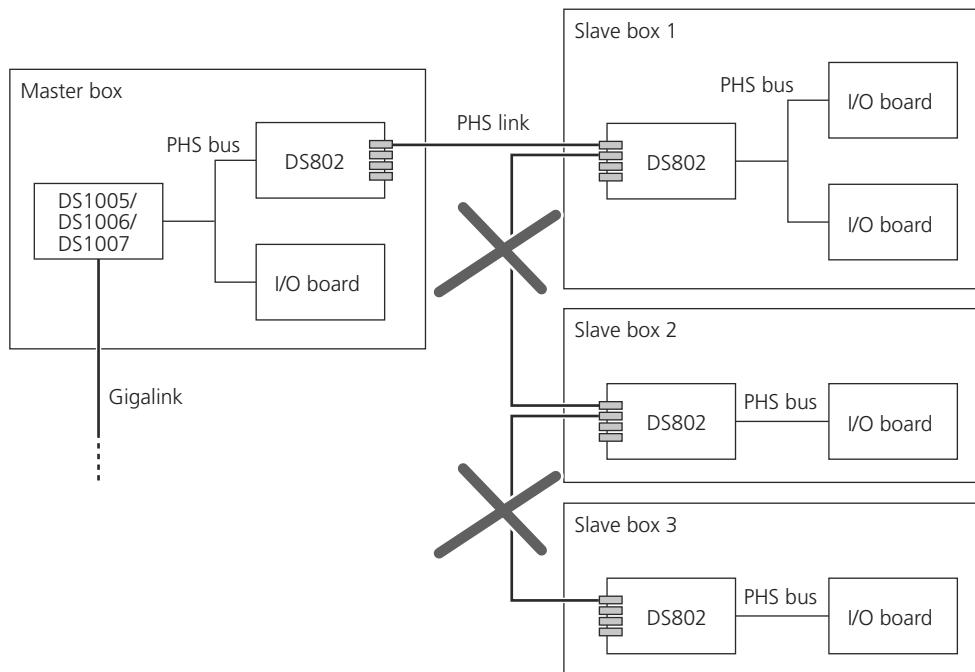
Do not mix the Gigalink connection with the PHS link connection as shown below.



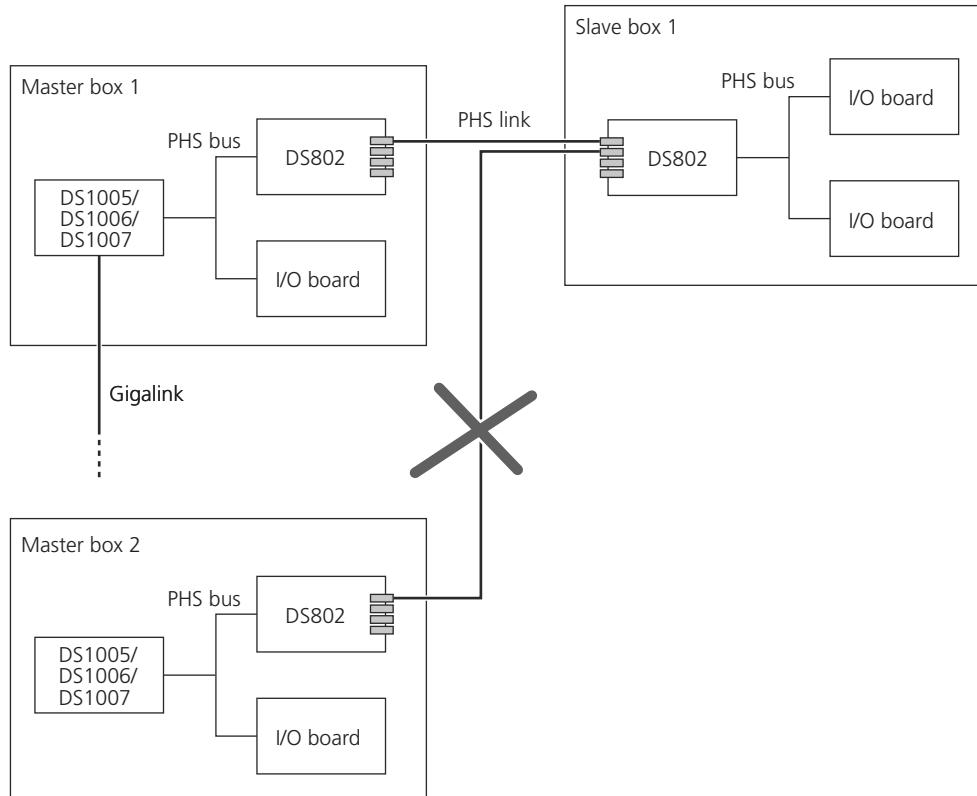


System with incorrect PHS-link connection

You cannot cascade the PHS bus by connecting several DS802 in series as shown below.



Several master boxes cannot share one slave box at the same time as shown below. Keep in mind that you can use and connect only one communication port of a DS802 installed in a slave box.



Installation and Configuration Notes

Introduction	Before you install the DS802, you should note some specifics for the DS802 to achieve optimum results and to avoid malfunctions.
Supported expansion boxes	You can install the DS802 PHS Link Board in a PX4, PX10 or PX20 Expansion Box. <div data-bbox="544 1442 1262 1590" style="background-color: #f0f0f0; padding: 10px;"><p>Note</p><ul style="list-style-type: none">▪ If you want to install the DS802 in a PX5 Expansion Box, contact dSPACE for further instructions.▪ Installation in an AutoBox/Tandem-AutoBox is not supported.</div>
Placing the DS802	The DS802 requires: <ul style="list-style-type: none">▪ One slot (without extension module)▪ One slot and one additional bracket (with extension module)

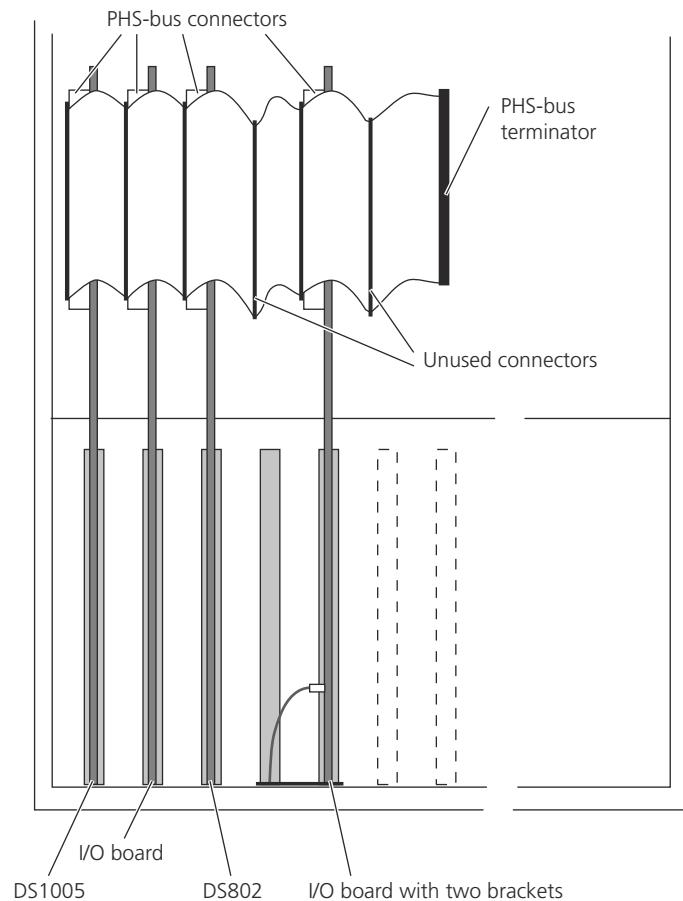
The placing of the DS802 depends on whether it is installed in a slave or a master box.

Placing the DS802 in a master box Insert the DS802 like an I/O board in one of the slots which are not required for the processor board.

Tip

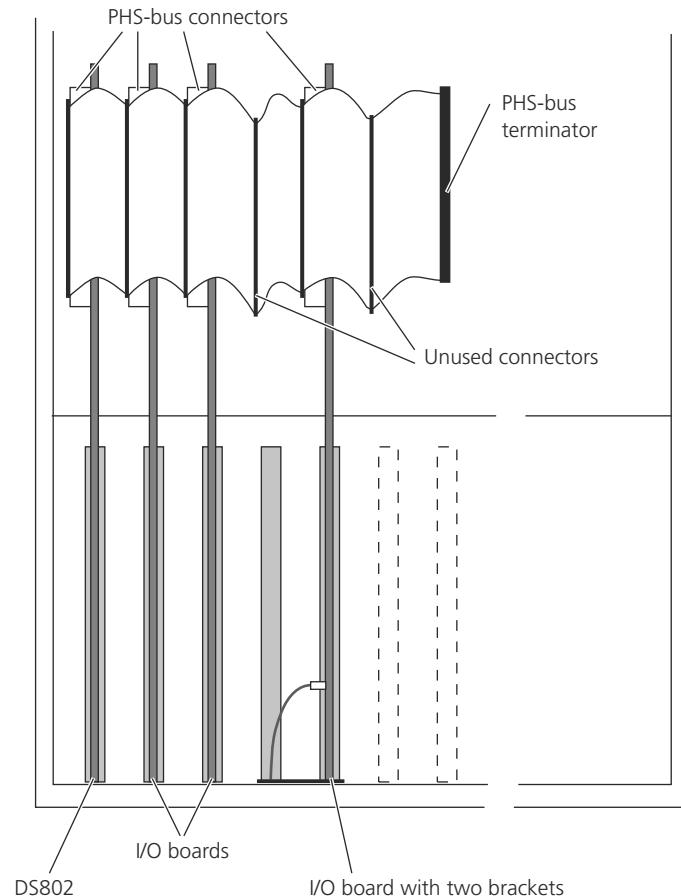
It is easier to replace the DS802 if you mount it next to the outermost I/O board.

A typical installation is shown in the illustration below.



Placing the DS802 in a slave box Insert the DS802 in the leftmost slot in the expansion box as shown below.

The PHS-bus terminator must be placed next to the outermost I/O board, not next to the DS802.



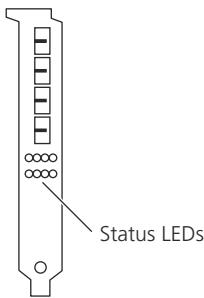
For detailed installation instructions, refer to [Installing dSPACE Boards](#) on page 65.

Master/slave configuration

The DS802 automatically detects whether it has to act as a master or as a slave. No further configuration is necessary. If a malfunction occurs, the automatic detection can be overwritten via jumpers. For details, refer to [DS802 Board Overview \(PHS Bus System Hardware Reference\)](#).

Identification via status LEDs If no fiber-optic cable is connected to the DS802, the status LEDs (on the board's bracket) display the master/slave usage.

- All LEDs lit *green*: The DS802 is installed in a master box (= processor board inside).
- All LEDs lit *orange*: The DS802 is used in a slave box (= no processor board inside).



For further details on the status LEDs, refer to [DS802 Status LEDs \(PHS Bus System Hardware Reference\)](#).

PHS-bus address setting

To identify the I/O boards (and also the DS802) in a PHS-bus-based system unambiguously, all the boards used in the system must have different PHS-bus addresses. The following rules apply to the DS802:

- **DS802 installed in a *master box***

Each DS802 is treated as an I/O board, and the configured address must be unique and differ from the settings of other I/O boards (master box and connected slave boxes) used in the PHS-bus-based system. Do not set the DS802 to the PHS-bus base address 00H. This setting might cause malfunctions.

- **DS802 installed in a *slave box***

Unlike the I/O boards used in a slave box, the PHS-bus address of the DS802 is ignored. Therefore the setting has no effect.

For instructions, refer to [How to Set the PHS-bus Address](#) on page 39.

Mounting the extension module

If you order a board with an extension module, they will be sent to you with the module already mounted. If you want to extend any of your existing DS802 boards, send it/them back to dSPACE (local representative) for an upgrade. You cannot mount the extension modules yourself.

[Putting the DS802 into Operation](#)

Connecting the boxes

Before you power up your PHS-bus-based system, all connection work has to be completed, including the connection between master and slave boxes.

It does not matter which ports (fiber-optic connector) you use to connect a master box to a slave box. All ports provide the same functionality.

Switching on a system with DS802

After the boxes are connected, you can switch on the system.

To avoid unpredictable errors, you should always apply the following sequence:

1. Turn on the expansion boxes used as slave boxes.
 2. Turn on the expansion box used as master box.
 3. Turn on the host PC.
-

Identifying the connection status

The DS802 is equipped with eight status LEDs, which display the current status of the connection. Each LED belongs to one fiber-optic connector (communication port).

The LEDs are located on the bracket of the DS802. For the meaning of the display, refer to [DS802 Status LEDs \(PHS Bus System Hardware Reference\)](#).

Displaying the DS802 in ControlDesk

After you have registered your PHS-bus-based system in ControlDesk, the DS802 is displayed in the Platform Navigator. You can identify a partitioned PHS-bus-based system by a board-specific entry. For details, refer to [Board Details Properties \(ControlDesk Platform Management\)](#).

Switching off a system with DS802

To avoid unpredictable errors, you should always apply the following sequence:

1. Shut down the host PC and turn it off.
 2. Turn off the expansion boxes (master and slave boxes).
-

Related topics

HowTos

How to Switch Off a dSPACE System.....	71
How to Switch On the dSPACE System.....	76

Connecting an Expansion Box to the Host PC

Objective	Your DS1006 modular system installed in an expansion box has to be connected to the host PC.
Where to go from here	Information in this section
	Prior to connecting or working with expansion boxes, ensure you have familiarized yourself with the relevant safety precautions. Safety Precautions for Using Expansion Boxes13
	The connection to your host PC can be implemented via Ethernet or a bus interface. Connecting via Ethernet114 Connecting via Bus Interface115

Connecting via Ethernet

Where to go from here

Information in this section

Basics on Connecting via Ethernet..... 114

Information in other sections

Setting Up an Ethernet Connection Between PC and Expansion Box..... 139

Basics on Connecting via Ethernet

Objective

You can connect an expansion box to your host PC via Ethernet. In this case, the expansion box is treated as a network client.

Preconditions

Both the host and client require a network adapter to establish communication. The expansion box with Ethernet connection is delivered with a slot CPU with a built-in network adapter.

Note

If you want to install new dSPACE boards such as the DS1006 in an expansion box connected via Ethernet, contact dSPACE to check the slot CPU's compatibility with the new boards.

Setting up a connection

After connecting the expansion box to the host PC via net cable, you have to set up the Ethernet connection. Refer to [Setting Up an Ethernet Connection Between PC and Expansion Box](#) on page 139.

Related topics

Basics

Connecting via Bus Interface..... 115

Connecting via Bus Interface

Introduction

You can connect an expansion box to your host PC via a bus interface. In this case you have to install dSPACE's link boards.

Where to go from here

Information in this section

Before using link boards you should familiarize yourself with the alternatives and limitations that apply to dSPACE's link boards.

[Link Boards Variants](#).....115

[Limitations With Link Boards](#).....117

Establishing a bus connection via link boards

[How to Establish the DS817/DS819 <-> DS814 Bus Interface](#).....117

[How to Establish the DS815/DS821 <-> DS814 Bus Interface](#).....119

Status LED for connection indication

[Identifying the Connection Status](#).....122

The link boards have LEDs on the bracket to indicate the current status of the connection.

Information in other sections

[Connecting via Ethernet](#).....114

[Connecting dSPACE Boxes to the Host PC via DS830](#).....133

dSPACE's DS830 MultiLink Panel allows you to connect up to 16 dSPACE boxes to one host PC. With the DS830, you need to install only one link board (PC) in the host PC.

Link Boards Variants

Overview of alternatives

If you use a bus interface to connect the host PC to an expansion box, you currently have the five alternatives listed in the following table.

Link Boards (PC)	Link Boards (Box)
DS815	DS814
DS817	DS814

Link Boards (PC)	Link Boards (Box)
DS819	DS814
DS821	DS814

DS814 Link Board (Box) The DS814 Link Board (Box) must be installed in the expansion box. It requires a free 16-bit ISA slot in the expansion box.

DS815 Link Board (PC) The DS815 to be installed in the host PC (usually a notebook) is a PC Card, and requires a free PC card slot in the host PC.

DS817 Link Board (PC) The DS817 to be installed in the host PC is a PCI interface, and requires a free PCI slot in the host PC.

DS819 Link Board (PC) The DS819 to be installed in the host PC is a PCI Express x1 interface, and requires a free PCI Express slot (x1 ... x32) in the host PC.

DS821 Link Board (PC) The DS821 to be installed in the host PC (usually a notebook) is available in two variants:

- DS821-54 mm, requires a free ExpressCard/54 slot in the host PC
- DS821-34 mm, requires a free ExpressCard/34 slot or a free ExpressCard/54 slot in the host PC

To use the DS821-34 mm in an ExpressCard/54 slot, dSPACE highly recommends to improve lateral stability in the notebook slot by using an ExpressCard Kit. Contact dSPACE for further information.

dSPACE recommends to use the DS821-34 mm only in combination with newer notebooks which provide a free ExpressCard/34 slot. If you use them with older notebooks (for example, which provide only ExpressCard/54 slots), your system might crash when you boot your notebook. To solve this problem, update the BIOS of your notebook.

Note

It is highly recommended to use the DS821 Link Board only in combination with the dSPACE CardSafe. For details, refer to [Using dSPACE CardSafe](#) on page 125.

Limitations With Link Boards

Introduction	The following limitations currently apply for the link boards DS814, DS815, DS817, DS819, and DS821.
Required software	The DS819 and DS821 link boards are supported as of dSPACE Release 5.2.
Number of link boards (PC)	<ul style="list-style-type: none">▪ You can install only up to eight DS817, or DS819 boards in one host PC.▪ Windows allows only one DS815. This limitation also applies to DS815 boards which are installed in the host PC via a PCI-to-PC Card adapter.▪ If you want to work with more than one expansion box, use the DS817, DS819, DS821, or DS830.▪ If you want to work with several boxes, you can use the DS830 MultiLink Panel as an alternative. With the DS830, you need to install only one link board (PC) in the host PC. For further information, refer to Connecting dSPACE Boxes to the Host PC via DS830 on page 133.
Other limitations	<ul style="list-style-type: none">▪ The length of the cable between a link board (PC) and a link board (Box) is limited to 10 m (patch cable) and 100 m (fiber-optic cable).▪ The DS815 and DS821 link boards do not support Hot-Plug mode (= installing and uninstalling the boards while the PC is powered).▪ After installing a DS815 or DS821, your host PC cannot switch to stand-by mode.

How to Establish the DS817/DS819 <-> DS814 Bus Interface

Objective	The following instructions apply if you want to install a bus connection with the link boards DS817/DS819 and DS814.
Cables	Use only the cables (crossed-over patch cable or fiber-optic cable) which come with the hardware package.
Preconditions	<ul style="list-style-type: none">▪ The system is switched off. For instructions, refer to How to Switch Off a dSPACE System on page 71.▪ A link board (DS817 or DS819) is installed in your host PC.▪ The DS814 is installed in your expansion box.

Possible methods

There are two ways you can establish a bus connection:

- Via crossed-over patch cable. Refer to Method 1.
 - Via fiber-optic cable. Refer to Method 2.
-

Method 1

To establish the bus interface via crossed-over patch cable

- 1 Connect the DS817 or the DS819 to the DS814.

Note

Do not connect the crossed-over patch cable to an Ethernet LAN or the LAN connectors of a PC or a notebook.

- 2 Switch on the system. Refer to [How to Switch On the dSPACE System](#) on page 76.
-

Method 2

To establish the bus interface via fiber-optic cable

NOTICE

Bending may damage the fiber-optic cable.

- Do not bend the fiber-optic cable beyond a radius of less than 40 mm.

- 1 Remove the protective caps from the connectors of the DS817 or DS819 and DS814.
 - 2 Remove the small protective caps from the plugs.
 - 3 Connect the DS817 or the DS819 to the DS814.
 - 4 Switch on the system. Refer to [How to Switch On the dSPACE System](#) on page 76.
-

Next steps

The dSPACE system is now ready to run real-time applications.

To check the proper installation and the board properties, and to get started with the system, refer to [DS100x, DS110x, MicroAutoBox II, MicroLabBox – Software Getting Started](#).

Related topics

HowTos

How to Install dSPACE Boards.....	71
How to Switch Off a dSPACE System.....	71

How to Establish the DS815/DS821 <-> DS814 Bus Interface

Objective

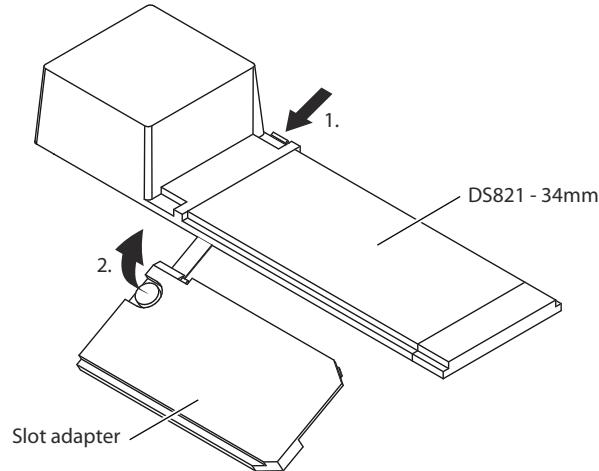
The following instructions apply if you want to install a bus connection with link boards DS815, DS821 and DS814.

Cables

- Use only the cables which come with the hardware package.
- DS815 Link Boards (PC) delivered before November 2001 are equipped with other connectors. You need a matching link cable. For details, refer to [DS815 Connector and PC Card Link](#) on page 120.
- To connect the DS815 with a standard patch cable an adapter cable is available from dSPACE. For details, refer to [DS815-RJ45 adapter cable](#) on page 121.

Using the DS821-34 mm in an ExpressCard/54 notebook slot

If you use a DS821-34 mm in an ExpressCard/54 notebook slot, dSPACE highly recommends to use a slot adapter (ExpressCard Kit). The slot adapter improves lateral stability and comes with the DS821-34 mm hardware package.



Using the dSPACE CardSafe

To hold the DS815 or DS821 firmly in a notebook slot, you can use the dSPACE CardSafe. The dSPACE CardSafe protects a card against unwanted removal from the host PC.

Note

It is highly recommended to use the DS821 only in combination with the dSPACE CardSafe.

For details, refer to [Using dSPACE CardSafe](#) on page 125.

Preconditions	<ul style="list-style-type: none">▪ The system is switched off. For instructions, refer to How to Switch Off a dSPACE System on page 71.▪ A DS815 or DS821 is inserted in your host PC.▪ A DS814 is installed in your expansion box.
----------------------	--

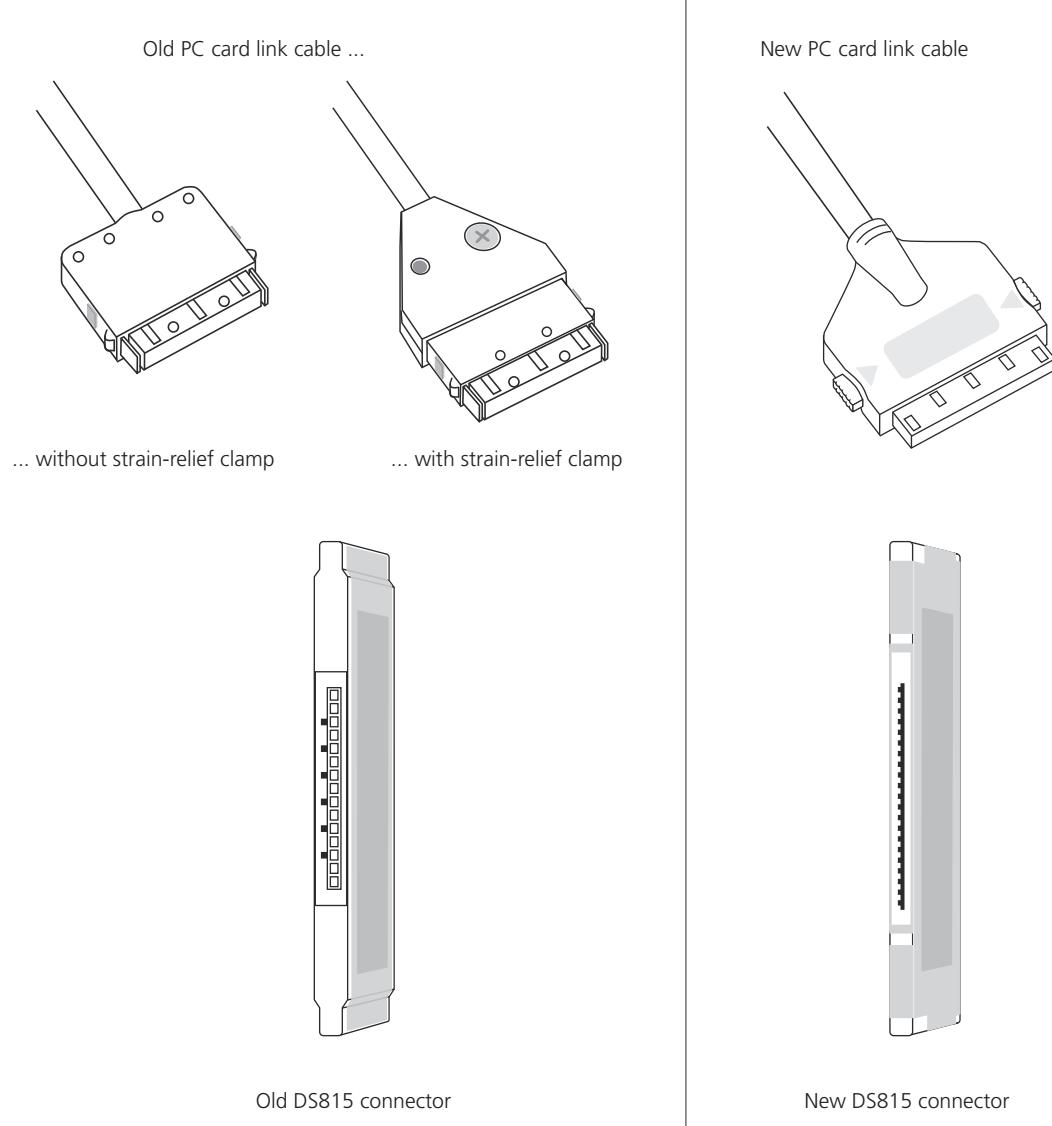
Method	<p>To establish the DS815/DS821 <-> DS814 bus interface</p> <p>1 Attach the connector of the DS815 or DS821 to the DS814 Link Board (Box) with the crossed-over patch cable.</p> <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"><p>Note</p><p>Do not connect the crossed-over patch cable to an Ethernet LAN or the LAN connectors of a PC or a notebook.</p></div> <p>2 Switch on the system. Refer to How to Switch On the dSPACE System on page 76.</p>
---------------	---

Result	If you use the DS821-34 mm with older notebooks (for example, which provide only ExpressCard/54 slots), your system might crash when you boot your notebook. To solve this problem, update the BIOS of your notebook. The system is now ready to run real-time applications.
---------------	---

DS815 Connector and PC Card Link

PC card link cable	<i>DS815 Link Boards (PC) delivered as of November 2001 are equipped with a new connector and come with a new matching link cable.</i>
---------------------------	--

The PC card link cables of DS815 boards delivered before November 2001 are not compatible with the new cables.

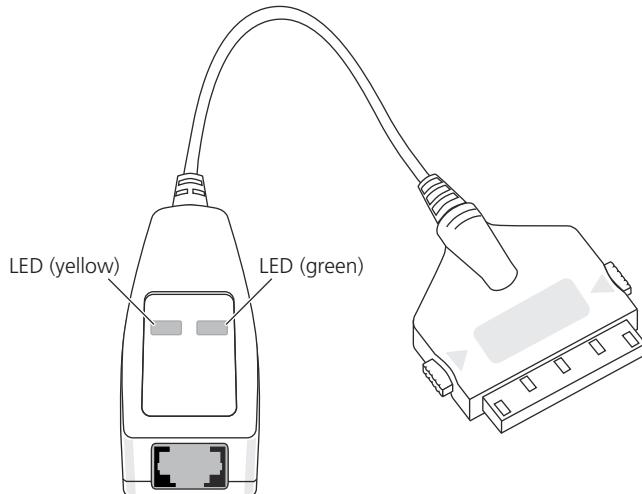


Tip

DS815 boards delivered before November 2001 have a blue label. Boards delivered later have a red label, or a blue label with "Vs. 2.0".

DS815-RJ45 adapter cable

An adapter cable is available for the new DS815 connector to adapt the DS815 to a standard patch cable with an RJ45 connector. The adapter cable is labeled "DS815-RJ45 Vs 2.0".



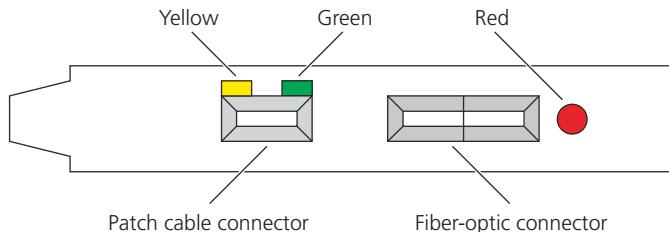
Note

For the connection between the DS815-RJ45 adapter cable and the DS814 Link Board (Box), you must use a crossed-over patch cable.

Identifying the Connection Status

DS814, DS817, DS819

Three LEDs on the brackets of the DS814, DS817 and DS819 indicate the current status of the connection.



Yellow LED A lit yellow LED indicates that the connection between the host PC and the expansion box is ready for communication.

Red LED A lit red LED indicates that the active connection between the host PC and the expansion box uses a fiber-optic cable.

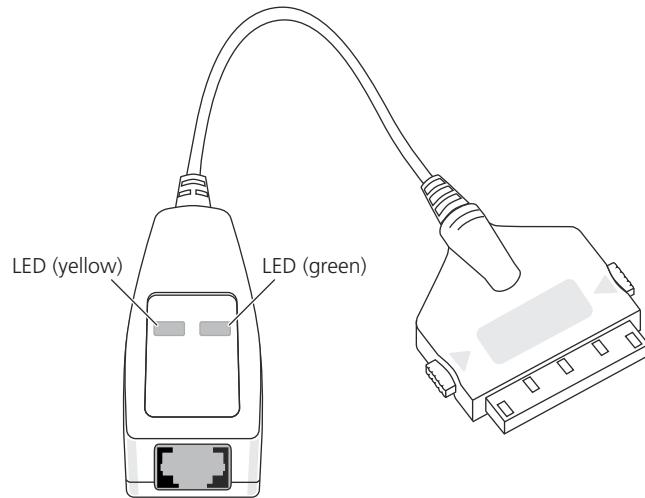
Green LED A lit green LED indicates that data is being sent or received.

DS815

The DS815 is not equipped with optical status indicators. Using the DS815-RJ45 adapter cable, you can identify the current status of the connection by the two LEDs integrated in the shell of the RJ45 connector.

DS815-RJ45 adapter cable

Two LEDs indicate the current status of the connection.

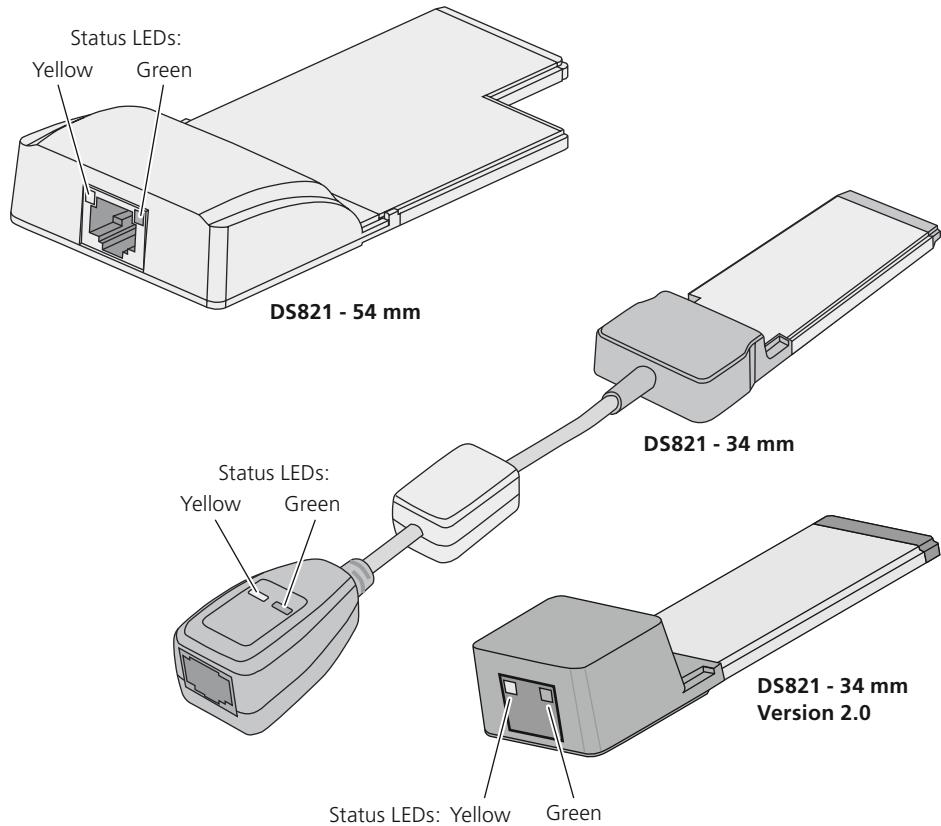


Yellow LED A lit yellow LED indicates that the connection between the host PC and the expansion box is ready for communication.

Green LED A lit green LED indicates that data is being sent or received.

DS821

Two LEDs indicate the current status of the connection.



Yellow LED A lit yellow LED indicates that the connection between the host PC and the expansion box is ready for communication.

Green LED A lit green LED indicates that data is being sent or received.

Using dSPACE CardSafe

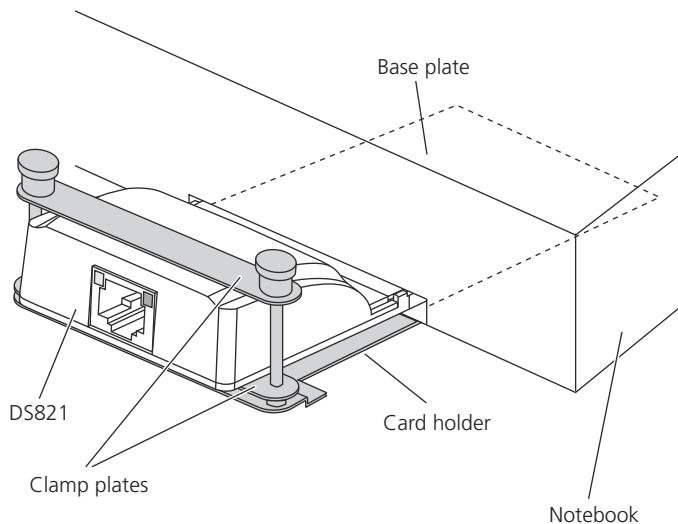
Objective	To hold the DS815 or DS821 firmly in a notebook slot, you can use the dSPACE CardSafe. The dSPACE CardSafe protects the inserted dSPACE link boards, cables, or connectors against unwanted removal from the notebook and against damage.
------------------	---

Where to go from here	Information in this section
	Introduction to dSPACE CardSafe125
	How to Mount dSPACE CardSafe128
	How to Remove dSPACE CardSafe for Transportation130
	How to Remove dSPACE CardSafe Completely131

Introduction to dSPACE CardSafe

Overview	The dSPACE CardSafe consists of a base plate and a card holder. The base plate is fixed to the underside of the notebook and does not have to be removed for transportation. The card holder must be plugged into the base plate. The height of the clamp plates can be adapted to the notebook slot via bolt spacers.
-----------------	--

The illustration below shows the main components of dSPACE CardSafe with a DS821-54 mm.

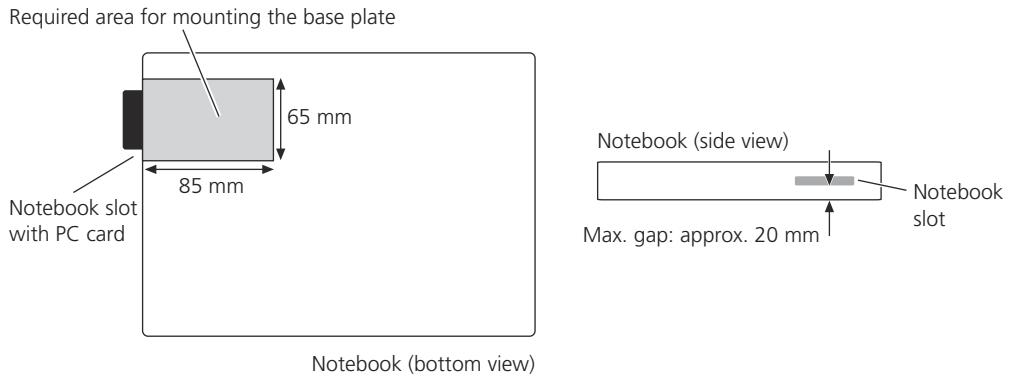


To use the DS821-34 mm in an ExpressCard/54 slot, dSPACE highly recommends to improve lateral stability in the notebook slot by using a slot adapter. A slot adapter is delivered with the DS821-34 mm hardware package. For details, refer to [How to Establish the DS815/DS821 <-> DS814 Bus Interface](#) on page 119.

Required mounting area

The illustration below shows the position and the space required for mounting the base plate on the underside of the notebook. You can level out an uneven surface on the underside with acrylic foam tapes, which are part of the delivery.

You can level out the gap between the underside of the notebook and the notebook slot via bolt spacers. The max. gap is approx. 20 mm (see below).



Items delivered

dSPACE CardSafe comes as a mounting kit with the following components:

Number	Item	Illustration
1 x	Acrylic foam tape	
1 x	Mounting template	
1 x	Base plate with velcro tape	
2 x	Card fixture (different sizes)	
2 x	Clamp plate	
6 x	Screw (different lengths)	
2 x	Knurled nut	
10 x	Bolt spacer (different lengths)	
4 x	Rubber feet	
1 x	Mounting instructions	–

The items delivered are subject to change without notice.

How to Mount dSPACE CardSafe

Method

To mount dSPACE CardSafe

NOTICE

Do not mount the CardSafe over any ventilation slots at the bottom of the notebook. This could cause overheating and possibly destroy the notebook processor.

Step	Illustration	Instruction
1		Only if the surface of the notebook at the mounting position is not smooth: Remove the protective foil and put the acrylic foam tapes on the notebook so that there is a smooth surface at the mounting position.
2		Fold and then cut the template for mounting the dSPACE CardSafe.
3		Center the template on the underside of the notebook with a partially inserted link board.

Step	Illustration	Instruction
4		Remove the protective foil from the velcro tape.
5		Press the complete CardSafe (as delivered) to the underside of the notebook in the opening of the template. The procedure is the same for each card fixture type and for all the spacers and screws that can be mounted.
6		Push a small coin on the spring of the base plate to release the card fixture. <i>To avoid injury, do not use your fingernail to unlock the connector fixture.</i>
7		While pressing the spring, unplug the card fixture. The base plate stays in position. After this remove the template.
8		Fix the four rubber feet to the underside of the notebook. This is to compensate the height of the CardSafe and ensure the stability of the notebook.

Step	Illustration	Instruction
9		Plug in the card fixture. For a stable assembly, use the card fixture that best fits your link board in combination with your notebook.
10		Adjust the bottom clamp plate with spacers as needed.
11		Plug in the link board and mount the other clamp plate.
12		Fix the link board/connector with the knurled nuts.

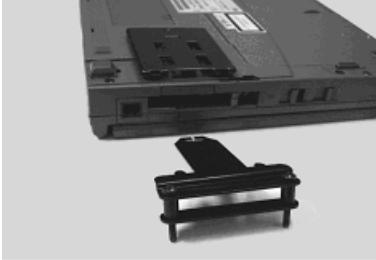
How to Remove dSPACE CardSafe for Transportation

Objective

To transport the notebook in a bag, you have to remove only the card fixture of the CardSafe.

Preconditions	<ul style="list-style-type: none"> ▪ DS815: The connector of the DS815 Link Board is removed. The link board can remain in the notebook. ▪ DS821: The DS821 Link Board is removed from the notebook.
----------------------	--

Method	<i>To remove dSPACE CardSafe for transportation</i>
---------------	---

Step	Illustration	Instruction
1		<p>Push a small coin on the spring of the base plate.</p> <p><i>To avoid injury, do not use your fingernail to unlock the connector fixture.</i></p>
2		Remove the card fixture.

How to Remove dSPACE CardSafe Completely

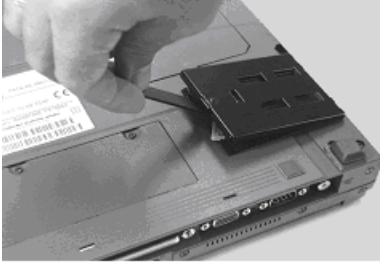
Objective	Some notebooks with an installed CardSafe may no longer fit in docking stations. In such cases the CardSafe must be removed completely.
------------------	---

Preconditions	<ul style="list-style-type: none"> ▪ DS815: The connector of the DS815 Link Board is removed. The link board can remain in the notebook. ▪ DS821: The DS821 Link Board is removed from the notebook.
----------------------	--

Method	<i>To remove dSPACE CardSafe completely</i>
---------------	---

NOTICE

The base plate is fixed by velcro tape. Remove the base plate carefully when peeling the tape off, as the bottom of a notebook is very thin and sensitive.

Step	Illustration	Instruction
1		<p>Push a small coin on the spring of the base plate.</p> <p><i>To avoid injury, do not use your fingernail to unlock the connector fixture.</i></p>
2		Remove the card fixture.
3		Carefully remove the base plate with a screwdriver.
4		Leave the velcro tapes on the notebook at the mounting positions.

Connecting dSPACE Boxes to the Host PC via DS830

Objective

dSPACE's DS830 MultiLink Panel allows you to connect up to 16 dSPACE boxes to one host PC. With the DS830, you need to install only one link board (PC) in the host PC.

Where to go from here

Information in this section

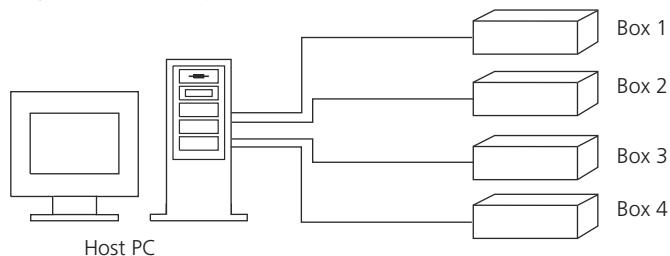
Features of DS830 MultiLink Panel.....	133
How to Connect the DS830.....	135
DS830: Identifying the Connection Status.....	137

Features of DS830 MultiLink Panel

Situation without DS830

You can connect several dSPACE boxes – expansion boxes and/or MicroAutoBoxes – to one host PC. Each connection requires a separate link board (PC) installed in the PC. The number of dSPACE boxes you can connect to the PC is limited by the number of free slots for link boards.

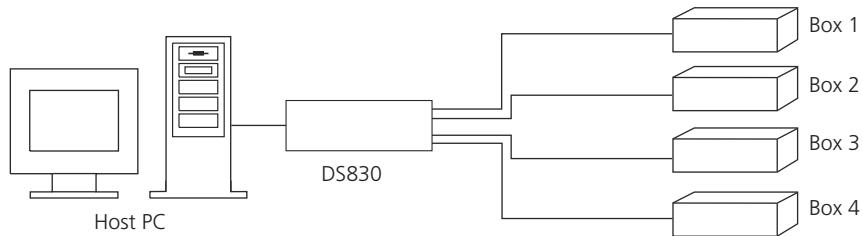
As an example, the following illustration shows how you can connect four boxes to your PC. You require four link boards (PC) in the PC.



Situation with DS830

dSPACE's DS830 MultiLink Panel allows you to connect up to 16 dSPACE boxes to one host PC. With the DS830, you need to install only one link board (PC) in the host PC.

As an example, the following illustration shows how to connect the DS830 to the host PC and four dSPACE boxes.



Tip

- You can connect any combination of expansion boxes and MicroAutoBoxes to the DS830.
- You can connect several DS830 panels to one host PC. Each DS830 has to be connected to the PC via a separate link board (PC).
- To install your dSPACE system in a vehicle, you can use the car battery as the power supply for the DS830.

Connecting and installing the DS830

To connect the DS830 to the host PC as well as to the dSPACE boxes, you can use any combination of crossed-over patch cables and fiber-optic cables. For example, you can connect the DS830 to the host PC and an expansion box via a fiber-optic cable, and to a MicroAutoBox via a patch cable.

The DS830 can be used in a laboratory or in vehicle. The cables required to supply power to the DS830 via a mains socket or a car battery are part of the DS830 hardware package. The cable for the mains socket includes a power supply unit (15.0 V, 4.0 A).

For instructions on the installation, see [How to Connect the DS830](#) on page 135.

Switching on a system with DS830

After the boxes are connected, you can switch on the system.

To avoid unpredictable errors, you should always apply the following sequence:

1. Turn on the dSPACE boxes (expansion boxes and/or MicroAutoBox).
2. Turn on the DS830.
3. Turn on the host PC.

Limitations

The following limitations currently apply to the DS830:

- Up to 4 (DS830/4), 8 (DS830/8) or 16 (DS830/16) dSPACE boxes can be connected to one panel.
- The length of each connection is limited to
 - 10 m (crossed-over patch cable), and
 - 100 m (fiber-optic cable).

Therefore, the maximum distance between a host PC and a box is 200 m (DS830 connected to both the PC and the box via fiber-optic cables).

- DS830 panels cannot be cascaded, which means that you cannot connect one DS830 to another. Each DS830 must be connected directly to a link board (PC).

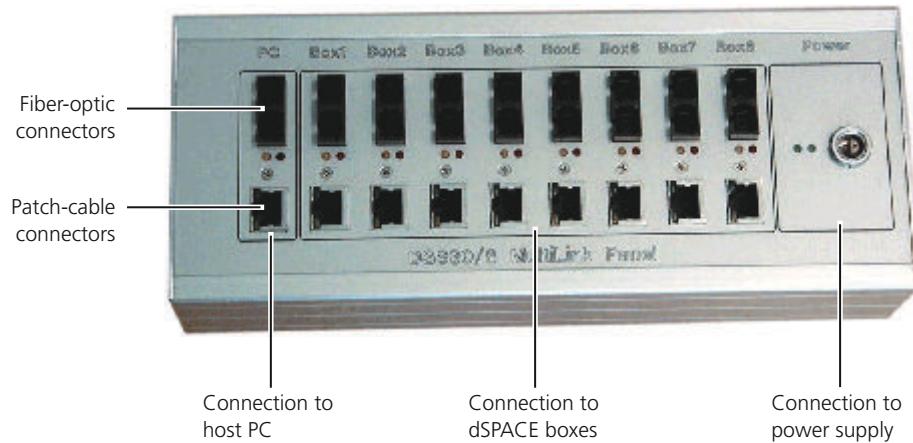
Data sheet	For the specifications of the DS830, refer to DS830 MultiLink Panel (PHS Bus System Hardware Reference  .
Status LEDs	The DS830 is equipped with status LEDs: see DS830: Identifying the Connection Status on page 137.
Related topics	<p>Basics</p> <p>DS830: Identifying the Connection Status..... 137</p> <p>HowTos</p> <p>How to Connect the DS830..... 135</p> <p>References</p> <p>DS830 MultiLink Panel (PHS Bus System Hardware Reference </p>

How to Connect the DS830

Objective	To install the DS830, you have to connect it to the host PC and the dSPACE boxes, and supply power to the panel.
May 2021	135 DS1006 Hardware Installation and Configuration Guide

Panel front

The front of the DS830 panel provides all the connectors required for installation. The following illustration shows the front of the DS830/8.



Cables

Note

Use only the cable (fiber-optic or patch cable) supplied with the dSPACE hardware package.

The DS830 hardware package also includes the cables for connecting the DS830 to the power supply.

Possible methods

You can supply power to the DS830 Multilink Panel:

- Via mains socket. Refer to Method 1.
- Via car battery. Refer to Method 2.

Method 1

To connect the DS830 via mains socket

- 1 Connect the DS830 to the host PC.
- 2 Connect the DS830 to the dSPACE boxes (expansion box and/or MicroAutoBoxes).
- 3 Use the cable with the integrated power supply unit. Plug the power supply cable into the LEMO connector of the DS830.

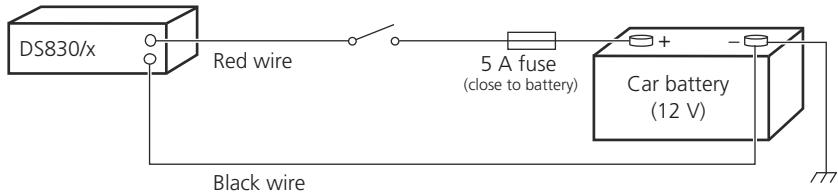
Method 2

To connect the DS830 via car battery

- 1 Connect the DS830 to the host PC.
- 2 Connect the DS830 to the dSPACE boxes (expansion box and/or MicroAutoBoxes).

- 3 Use the cable with the unterminated end and connect this end to the car battery. Use a 5 A fuse to protect the DS830.

The illustration below shows how to supply power to the DS830 if installed in a vehicle.



Note

It is highly recommended to insert a fuse into the main power supply wire. The fuse should be installed close to the battery.

If you connect the red wire to the car battery directly, the DS830 will always be turned on, and the car battery will soon run down if the engine does not operate. Thus, a switch is highly recommended.

Note

Use only a switch and wires that are designed for at least 5 A.

Further steps

After the boxes are connected, you can switch on the system.

Note

To avoid unpredictable errors, you should always turn on the dSPACE boxes (expansion box or MicroAutoBox) before the DS830 MultiLink Panel (if used) and the host PC.

Related topics

Basics

[DS830: Identifying the Connection Status.....](#) 137

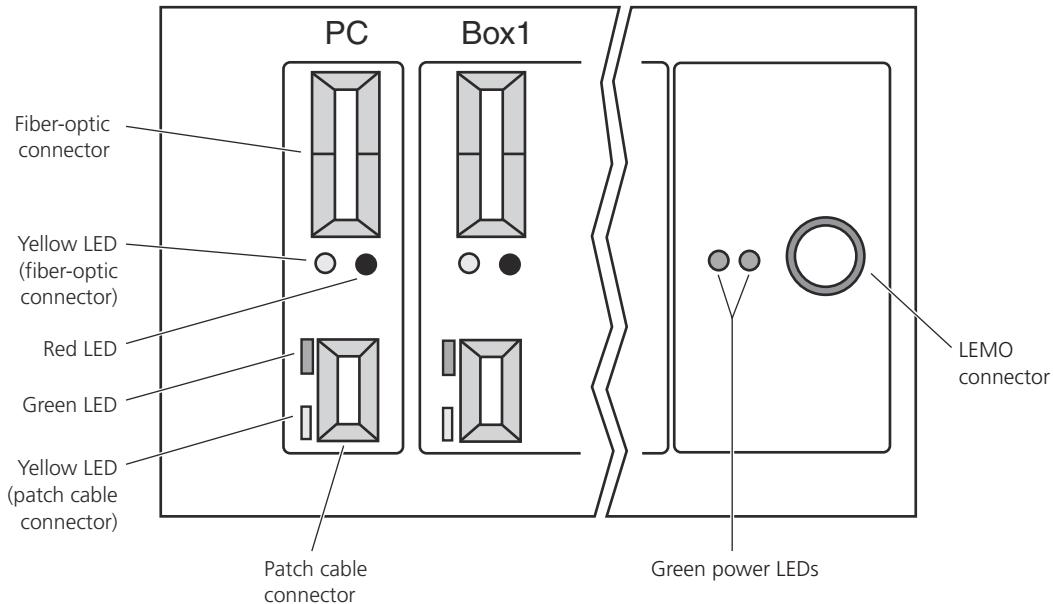
DS830: Identifying the Connection Status

Objective

The front of the DS830 panel has several LEDs, which indicate the current status of the connection to the host PC and the connected dSPACE boxes (expansion boxes or MicroAutoBoxes), as well as the status of the panel's power supply.

Status LEDs

The illustration below shows the status LEDs for one pair of fiber-optic and patch cable connectors.



Yellow LED (fiber-optic connector) Lit if the host PC and the corresponding dSPACE box are currently used for communication.

Red LED Lit if a fiber-optic cable is used.

Green LED Lit when data is being sent or received.

Yellow LED (patch cable connector) Lit if the connection to the host PC or a connected dSPACE box is ready for communication.

Green power LEDs Lit both when power is supplied correctly to the DS830.

Related topics

HowTos

[How to Connect the DS830](#)..... 135

Setting Up an Ethernet Connection Between PC and Expansion Box

Objective

You can connect an expansion box to your host PC via Ethernet. In this case, the expansion box is treated as a network client.

Note

Establishing a connection between an expansion box and the host PC via Ethernet is recommended for users who are familiar with Ethernet network configurations.

Setting Up The Ethernet Connection

Where to go from here

Information in this section

Setup Procedure.....	140
Preparing the TCP/IP Configuration.....	141
Setting Up a Peer-to-Peer Connection	143
Integrating the Expansion Box into a Network.....	144

Setup Procedure

Proceeding the Setup

Introduction

The connection between the PC (host) and an expansion box (client) is based on the TCP/IP protocol provided by Windows. There are two ways to connect a client to the host:

- *Peer-to-peer connection (P2P)*

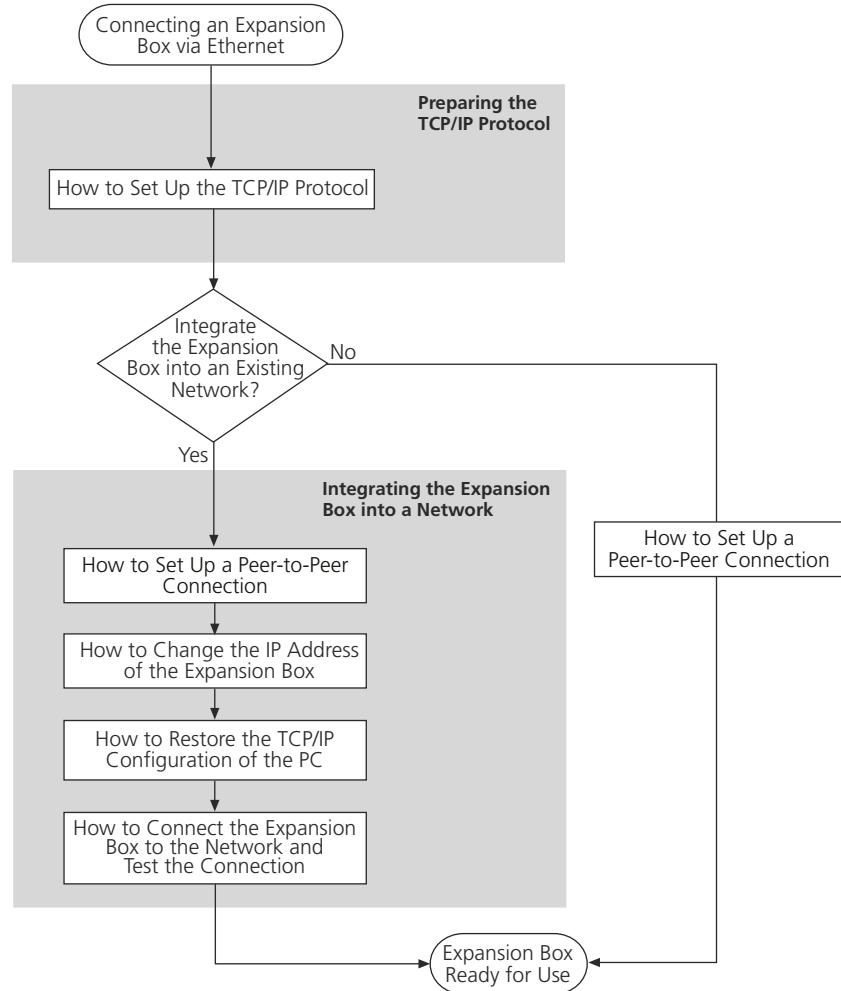
The expansion box and the host PC are directly connected in a peer-to-peer configuration.

- *Integration in an existing network*

The expansion box becomes part of an existing network using TCP/IP, for example, a local area network.

Setup procedure

To connect an expansion box via Ethernet, follow the instructions given in the flow chart below. The boxes in the flow chart refer to the corresponding sections in the text.



Preparing the TCP/IP Configuration

How to Set up the TCP/IP Protocol of the Host PC Network Adapter

Objective

Before you can connect the expansion box to the host PC via Ethernet, you have to set up the TCP/IP protocol of the network adapter of your host PC.

Precondition	Note Setting up the TCP/IP configuration requires administrator rights.
Previous TCP/IP configuration	During this procedure, write down the previous TCP/IP configuration for later restoration.
Method	To set up the TCP/IP protocol of the host PC network adapter 1 Click the Windows Start button and select Settings – Network & Internet – Network and Sharing Center. The Network and Sharing Center dialog opens. 2 In View your active networks, select Ethernet. The Ethernet Status dialog opens. 3 In the Ethernet Status dialog, click Properties. The Ethernet Properties dialog opens. 4 Select Internet Protocol Version 4 (TCP/IPv4), and click Properties. The Internet Protocol 4 (TCP/IPv4) Properties dialog opens. 5 From the Internet Protocol 4 (TCP/IPv4) Properties dialog, write down all the configured values and options so that you can restore them later. 6 In the Internet Protocol 4 (TCP/IPv4) Properties dialog, select Use the following IP address, and enter the value 192.100.100.1 in the IP address edit field. 7 In the Subnet Mask edit field, enter the value 255.255.255.0 . 8 Click OK to close the Internet Protocol 4 (TCP/IPv4) Properties dialog. 9 Click Close to close the Ethernet Properties dialog. 10 Click Close to close the Ethernet Status dialog. 11 If prompted, confirm to restart the host PC.
Next steps	Proceed with: <ul style="list-style-type: none">▪ How to Set Up a Peer-to-Peer Connection on page 143 or▪ Integrating the Expansion Box into a Network on page 144.
Solving problems	Tip If a problem occurs when you set up the TCP/IP protocol, see Problems When Setting Up the TCP/IP Protocol on page 170.

Setting Up a Peer-to-Peer Connection

How to Set Up a Peer-to-Peer Connection

Objective

A peer-to-peer connection between the host and client means that neither the host nor the client is connected to any other network.

You must carry out this step, even if you want to integrate the expansion box into an existing network. In that case the IP address of the expansion box must comply with the conventions of the network. So its default IP address (192.100.100.98) must be changed after setting up a peer-to-peer connection between the host PC and the expansion box.

Required information

To set up a peer-to-peer connection, you must know the IP address of the expansion box. The default IP address is 192.100.100.98.

If you do not know the IP address, connect a VGA monitor to the slot CPU. The IP address is displayed during power-up.

Method

To set up and test a peer-to-peer connection

- 1 If the host PC is already part of an existing network, switch it off, and disconnect it from the network.
- 2 Connect the expansion box to the host PC, using the supplied crossed-over patch cable.

Note

For a peer-to-peer connection, the crossed-over patch cable supplied with the expansion box must be used. If connecting to an existing network, for example, via a hub, a standard patch cable must probably be used. If you are uncertain, ask your network administrator.

- 3 Turn on the expansion box.

During booting, the expansion box beeps several times.

In the following it is assumed that the default IP address (192.100.100.98) is active.

- 4 Turn on the host PC.

Note

The host PC will take longer to boot and will display error messages because of the missing connection to the network. Ignore these error messages for now.

The connection between the host PC and the expansion box can now be tested.

- 5 Open a Command Prompt window (DOS window): For example, from the Start menu, choose Run ..., enter cmd and click OK.
- 6 Enter the command: `ping 192.100.100.98`, which is the default IP address of the expansion box.

If the following message appears, the peer-to-peer connection is ready for use (the values vary on different computers and networks):

```
Pinging 192.100.100.98 with 32 bytes of data:  
Reply from 192.100.100.98: bytes=32 time<10ms TTL=32  
Reply from 192.100.100.98: bytes=32 time<10ms TTL=32  
Reply from 192.100.100.98: bytes=32 time<10ms TTL=32  
Reply from 192.100.100.98: bytes=32 time<10ms TTL=32
```

Next steps

- If the expansion box is used *only in a peer-to-peer connection*, the network setup is now complete. Continue with the [DS100x, DS110x, MicroAutoBox II, MicroLabBox – Software Getting Started](#) document.
- If the expansion box is to be *used in an existing network*, proceed with [How to Change the IP Address of the Expansion Box](#) on page 145.

Solving problems

Tip

If any problem comes up when you set up a peer-to-peer connection, see [Problems with Peer-To-Peer Connection](#) on page 170.

Integrating the Expansion Box into a Network

Where to go from here

Information in this section

Workflow for Integrating the Expansion Box into a Network.....	145
How to Change the IP Address of the Expansion Box.....	145
How to Restore the TCP/IP Configuration of the PC.....	146
After you have changed the IP address of the expansion box to integrate it in a network, you can restore the previous IP address of the host PC.	
How to Connect the Expansion Box to the Network and Test the Connection.....	147

Information in other sections**How to Set Up a Peer-to-Peer Connection..... 143**

After setting up the TCP/IP protocol, you can set up the peer-to-peer connection.

Workflow for Integrating the Expansion Box into a Network

Setup steps

The following step-by-step instructions show you how to integrate an expansion box into an existing network:

1. A peer-to-peer connection is needed temporarily to change the IP address of the expansion box. Refer to [How to Set Up a Peer-to-Peer Connection](#) on page 143.
2. Change the IP address of the expansion box so it complies with the IP addresses used in the network. Refer to [How to Change the IP Address of the Expansion Box](#) on page 145.
3. After you changed the IP address of the expansion box, you can restore the previous IP address of the host PC. Refer to [How to Restore the TCP/IP Configuration of the PC](#) on page 146.
4. Finish by performing the steps in [How to Connect the Expansion Box to the Network and Test the Connection](#) on page 147.

Related topics**HowTos**

How to Change the IP Address of the Expansion Box.....	145
How to Connect the Expansion Box to the Network and Test the Connection.....	147
How to Restore the TCP/IP Configuration of the PC.....	146
How to Set Up a Peer-to-Peer Connection.....	143

How to Change the IP Address of the Expansion Box

Setip utility

To change the IP address, use the `setip` utility located in `<InstallationFolder>\exe`.

Preconditions

Note

- Before trying to change the IP address, be sure that you have tested the peer-to-peer connection to your expansion box via the ping command.
- The IP address of the expansion box can be changed only if the old IP address is known and the host can connect to the expansion box. If the IP address of the expansion box is unknown, refer to [IP address lost](#) on page 168.

Method

To change the IP Address

- 1 Contact your network administrator to obtain an unused IP address that you can use for the expansion box.
- 2 Open a Command Prompt window (DOS window): For example, from the Start menu, choose Run ..., enter cmd and click OK.
- 3 Enter the command **setip <current IP address> <new IP address>**
The new IP address will be valid after rebooting the expansion box.

Note

Write down the new IP address of the expansion box. You will need it later to establish the connection.

Example

The default IP address of the expansion box is 192.100.100.98. The IP address assigned to the host PC for the peer-to-peer connection is 192.100.100.1. With these settings the host PC can connect to the expansion box as described in [How to Set Up a Peer-to-Peer Connection](#) on page 143. Assume that the IP address of the host PC was previously set to 183.27.33.14. The IP address to be used for the expansion box is 183.27.33.18.

In a Command Prompt window (DOS window), enter the command:

setip 192.100.100.98 183.27.33.18

Next step

Proceed with [How to Restore the TCP/IP Configuration of the PC](#) on page 146.

How to Restore the TCP/IP Configuration of the PC

Objective

After you have changed the IP address of the expansion box to integrate it in a network, you can restore the previous IP address of the host PC.

Precondition To restore the TCP/IP configuration of the host PC, you need the values and options which you wrote down when setting up the TCP/IP protocol (see [How to Set up the TCP/IP Protocol of the Host PC Network Adapter](#) on page 141).

Method

To restore the TCP/IP configuration of the host PC

- 1 Click the Windows Start button and select Settings – Network & Internet – Network and Sharing Center.
The Network and Sharing Center dialog opens.
- 2 In View your active networks, select Ethernet.
The Ethernet Status dialog opens.
- 3 Click Properties.
The Ethernet Properties dialog opens.
- 4 Select Internet Protocol Version 4 (TCP/IPv4), and click Properties.
The Internet Protocol (TCP/IP) Properties dialog opens.
- 5 Enter all the configured values and options you wrote down before.
- 6 Click OK to close the Internet Protocol (TCP/IP) Properties dialog.
- 7 Click Close to close the Ethernet Properties dialog.
- 8 Click Close to close the Ethernet Status dialog.
- 9 If prompted, confirm to restart the host PC.

Next steps Proceed with [How to Connect the Expansion Box to the Network and Test the Connection](#) on page 147.

How to Connect the Expansion Box to the Network and Test the Connection

Cabling

Note

The supplied crossed-over patch cable cannot be used to connect the expansion box to an existing network. Use a normal (non crossed-over) cable.

Method

To connect the expansion box to the network and test the connection

- 1 Turn off the host PC and the expansion box.
- 2 Connect the expansion box and the host PC to the network.

- 3 Turn on the expansion box.

Note

To avoid unpredictable errors, you should always turn on the expansion box before the host PC.

- 4 Turn on the host PC.

The connection between the host PC and the expansion box can now be tested.

- 5 Open a Command Prompt window (DOS window): For example, from the Start menu, choose Run ..., enter cmd and click OK.

- 6 Enter the command:

```
ping <IP address of the expansion box>
```

Result

If the following message appears, the network connection is ready for use (the values vary on different computers and networks). The IP address 10.1.202.178 serves as an example.

```
Pinging 10.1.202.178 with 32 bytes of data:  
Reply from 10.1.202.178: bytes=32 time<10ms TTL=32  
Reply from 10.1.202.178: bytes=32 time<10ms TTL=32  
Reply from 10.1.202.178: bytes=32 time<10ms TTL=32  
Reply from 10.1.202.178: bytes=32 time<10ms TTL=32
```

The network setup is now complete.

If you want to use the board with dSPACE Releases, continue with the [DS100x, DS110x, MicroAutoBox II, MicroLabBox – Software Getting Started](#) document.

Solving problems

Tip

If any problem comes up when you integrate an expansion box in a network, see [Problems with the Integration of an Expansion Box in a Network](#) on page 171.

Connecting External Devices to the dSPACE System

Objective	Prior to connecting external devices to an I/O board or a connector panel, make sure that you are familiar with the related instructions.						
Where to go from here	Information in this section <table><tr><td>How to Connect External Devices to a Board.....</td><td>149</td></tr><tr><td>How to Connect External Devices to a Connector Panel.....</td><td>151</td></tr><tr><td>Using Sub-D Connectors.....</td><td>152</td></tr></table>	How to Connect External Devices to a Board.....	149	How to Connect External Devices to a Connector Panel.....	151	Using Sub-D Connectors.....	152
How to Connect External Devices to a Board.....	149						
How to Connect External Devices to a Connector Panel.....	151						
Using Sub-D Connectors.....	152						

How to Connect External Devices to a Board

Method	To connect external devices to an I/O board
---------------	--

⚠ CAUTION

Connected components can cause fire

The hardware provides electrical energy at the I/O pins, which can cause a fire if external components such as sensors/actuators are not appropriately connected. This particularly concerns output pins of modular boards that provide internal voltages to supply external components.

- To prevent a fire, apply the general fire safety regulations, e.g., supervise the operation, remove fire loads, and use fire-proof materials and enclosures.

NOTICE

Connecting external devices while the power supply is switched on may damage the dSPACE hardware.

- Do not connect or disconnect any device while the power supply is switched on.
- Turn off the host PC, the expansion box, and the external devices beforehand.

- 1 Turn off all external devices which are to be connected to the dSPACE system.
- 2 Turn off the host PC.

Note

Do not switch off the expansion box while the host PC is still running.
This might lead to unpredictable errors.

- 3 Turn off the expansion box and all devices connected to it.
- 4 Disconnect the host PC, the expansion box and all devices connected to them from the power supply.

⚠ WARNING

Hazardous voltages

Risk of electric shock and/or damage to the hardware

- Do not connect any high-voltage devices to the I/O connectors of the hardware.
- Do not apply voltages/currents outside the specified ranges to the connector pins.

- 5 Connect the devices belonging to your application to the I/O board.
- 6 Reconnect the host PC, the expansion box and all external devices to the power supply.
- 7 Turn on the expansion box.

Note

To avoid unpredictable errors, you should always turn on the expansion box before the DS830 MultiLink Panel (if used) and the host PC.

- 8 If used, turn on the DS830 MultiLink Panel.
- 9 Turn on the host PC.
The host PC should boot as usual.
- 10 Turn on all external devices connected to the dSPACE system.

Related topics**HowTos**

How to Connect External Devices to a Connector Panel..... 151

How to Connect External Devices to a Connector Panel

Method**To connect external devices to a connector panel****▲ CAUTION****Connected components can cause fire**

The hardware provides electrical energy at the I/O pins, which can cause a fire if external components such as sensors/actuators are not appropriately connected. This particularly concerns output pins of modular boards that provide internal voltages to supply external components.

- To prevent a fire, apply the general fire safety regulations, e.g., supervise the operation, remove fire loads, and use fire-proof materials and enclosures.

NOTICE**Connecting external devices while the power supply is switched on may damage the dSPACE hardware.**

- Do not connect or disconnect any device while the power supply is switched on.
- Turn off the host PC, the expansion box, and the external devices beforehand.

- 1 Turn off all external devices which are to be connected to the dSPACE system.
- 2 Turn off the host PC.

Note

Do not switch off the expansion box while the host PC is still running. This might lead to unpredictable errors.

- 3 Turn off the expansion box and all devices connected to it.

- 4 Disconnect the host PC, the expansion box and all devices connected to them from the power supply.

 **WARNING**

Hazardous voltages

Risk of electric shock and/or damage to the hardware

- Do not connect any high-voltage devices to the I/O connectors of the hardware.
- Do not apply voltages/currents outside the specified ranges to the connector pins. The isolation of the panels has been designed for low-voltage operation only.

- 5 Connect the devices belonging to your application to the panel.
- 6 Reconnect the host PC, the expansion box and all external devices to the power supply.
- 7 Turn on the expansion box.

Note

To avoid unpredictable errors, you should always turn on the expansion box before the DS830 MultiLink Panel (if used) and the host PC.

- 8 If used, turn on the DS830 MultiLink Panel.
- 9 Turn on the host PC.
The host PC should boot as usual.
- 10 Turn on all external devices connected to the dSPACE system.

Related topics

HowTos

How to Connect External Devices to a Board.....	149
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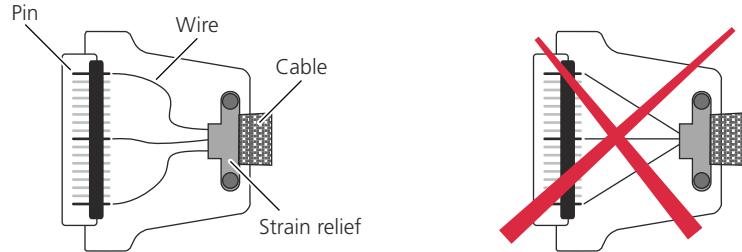
Using Sub-D Connectors

Checking connectors before first use

Before you use a crimped or soldered connector for the first time, check the following points:

- The pins are straight and not deformed.
 - The contact surfaces of the male and female connectors are clean.
- Especially the contact surfaces of soldered connectors must be free from solder and flux.

- Inside the connector, the wires of the connector cable are long enough and do not stretch the connector pins.



To easily plug the connector the pins are loosely mounted. When the connector pins are stretched, it might not be possible to connect the connector to its counterpart.

- The connector shell is mounted.

This helps you hold the connector straight for plugging.

Plugging the connector

NOTICE

Improper plugging might deform connector pins

Using connectors with deformed connector pins might result in defective contacts and disturbed signals.

- Hold the connector shell straight and do not force the connector.
Holding the connector at an angle might deform pins.

Uninstalling the System

Uninstallation order

All components of a dSPACE system, software and hardware, can be removed in the following order:

1. You have to remove the software first.
 2. Afterwards you can remove the hardware.
-

Where to go from here

Information in this section

[Removing the Hardware.....](#) 156

Information in other sections

[Removing dSPACE Software \(Installing dSPACE Software !\[\]\(475aadd60d2568b1b7571c86b7f461a4_img.jpg\)\)](#)

Removing the Hardware

Introduction dSPACE hardware is installed in the host PC and in the expansion box. Thus, the instructions on removing may differ.

Where to go from here	Information in this section
	How to Remove Hardware from the Host PC156
	How to Remove Hardware from an Expansion Box157

How to Remove Hardware from the Host PC

Objective The boards to be removed from your host PC depend on the installation of the PHS-bus-based system.

Installation cases

- If the PHS-bus-based system installed in an expansion box is connected to the host PC via a *bus interface*, the DS817 Link Board must be removed. The DS815 and DS821 can simply be ejected from the host PC.
- If the PHS-bus-based system installed in an expansion box is connected to the host PC via *Ethernet*, only the network cable of the expansion box needs to be disconnected from the PC or the local area network.

Preconditions

- The system is switched off. For instructions, refer to [How to Switch Off a dSPACE System](#) on page 71.
- Precautions are taken to avoid damage by high electrostatic voltages. For details, refer to [Safety Precautions for Installing and Connecting the Hardware](#) on page 11.

Method **To remove dSPACE boards from the host PC**

WARNING

Hazardous voltages

Risk of electric shock and/or damage to the hardware

Before removing any board, make sure that:

- The power supply of the host PC and the expansion box are switched off.
- No external device is connected to the dSPACE system.

- 1 Disconnect the host PC, the expansion box and all external devices connected to them from the power supply.
- 2 Open the enclosure of the host PC.
- 3 Unscrew the brackets of the dSPACE boards you want to remove.
- 4 Remove the boards from the slots.
- 5 Reinstall the original brackets to cover the openings at the rear side of the enclosure.
- 6 Close the enclosure, reconnect the PC to the power supply, and turn it on.

Result

The host PC should boot as usual.

Related topics**Basics**

[Safety Precautions for Installing and Connecting the Hardware.....](#) 11

HowTos

[How to Switch Off a dSPACE System.....](#) 71

[How to Switch On the dSPACE System.....](#) 76

How to Remove Hardware from an Expansion Box

**Shipment and transportation
in an expansion box****NOTICE**

Processor boards installed inside the expansion box will be damaged during transportation and shipment.

Due to the weight of the heat sinks on the DS1006 Processor Board, both the expansion box and the board itself will be damaged by acceleration and shocks.

- For shipment or transportation, remove the DS1006 Processor Board from the expansion box.
- Ship the board separately from the box.
- Ship the board only in the original package from dSPACE.

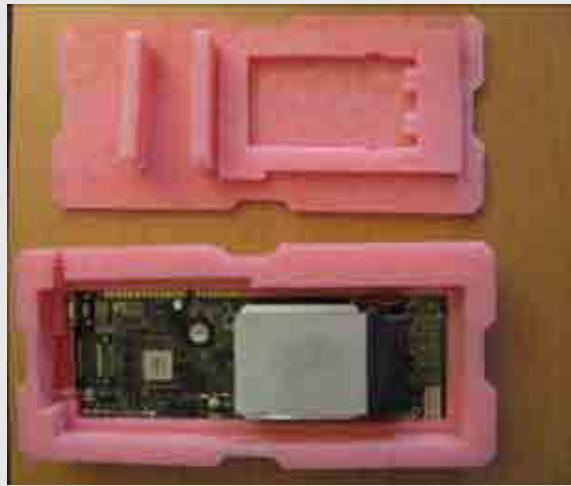
**Wrapping the DS1006
(multicore processor board)
for separate transportation**

NOTICE

Faulty packaging can damage the DS1006 (multicore processor board) during transportation and shipment!

To avoid damage to the DS1006:

- Ship the board only in the original package from dSPACE.
- Fix the board firmly in place using the plastic foam from the original package as shown below.



Preconditions

- The system is switched off. Refer to [How to Switch Off a dSPACE System](#) on page 71.
- Precautions are taken to avoid damage by high electrostatic voltages. Refer to [Safety Precautions for Installing and Connecting the Hardware](#) on page 11.

Method

To remove hardware from an expansion box

⚠ WARNING

Hazardous voltages

Risk of electric shock and/or damage to the hardware

Before removing any board, make sure that:

- The power supply of the host PC and the expansion box are switched off.
- No external device is connected to the dSPACE system.

- 1 Disconnect the host PC, the expansion box and all external devices connected to them from the power supply.
- 2 Unplug any external devices or connector panels from the I/O connectors of the I/O boards.
- 3 Open the enclosure of the expansion box.

- 4 Beginning with the rightmost I/O board or the processor board (dependent on the place of the board you want to remove), unscrew the bracket of the board.
- 5 Pull the board out of the slot a little.
- 6 Remove the PHS-bus cable from the board.
- 7 Remove the board completely.
- 8 Repeat from step 4 until you have removed the required board(s).
- 9 Close the enclosure.

Next steps

When all devices are reconnected to the system and to the power supply, you can switch on the dSPACE system. Refer to [How to Switch On the dSPACE System](#) on page 76.

Related topics**Basics**

[Safety Precautions for Installing and Connecting the Hardware](#).....11

HowTos

[How to Switch Off a dSPACE System](#).....71

Maintenance Work

Objective	You have to check the PHS system hardware regularly for safe and trouble-free use.
------------------	--

Checking and Replacing the Dust Filter of an Expansion Box/AutoBox

Objective

The fans of various expansion boxes (PX10, PX20, AutoBox, Tandem-AutoBox) have a dust filter. Check the filter periodically. If it is dirty, you must replace it.

How to Check and Replace the Dust Filter of an Expansion Box/AutoBox

Objective

The fans of various expansion boxes (PX10, PX20, AutoBox, Tandem-AutoBox) have a dust filter. Check the filter periodically. If it is dirty, you must replace it. Cleaning the dust filter is not sufficient to restore the characteristics of a new one.

Checking interval

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

Effect of using dirty dust filters

NOTICE

A dirty dust filter blocks the input air stream and increases the temperature in the box, which may shorten the life of the hardware components.

Tools and spare parts

You need the following tools and spare parts:

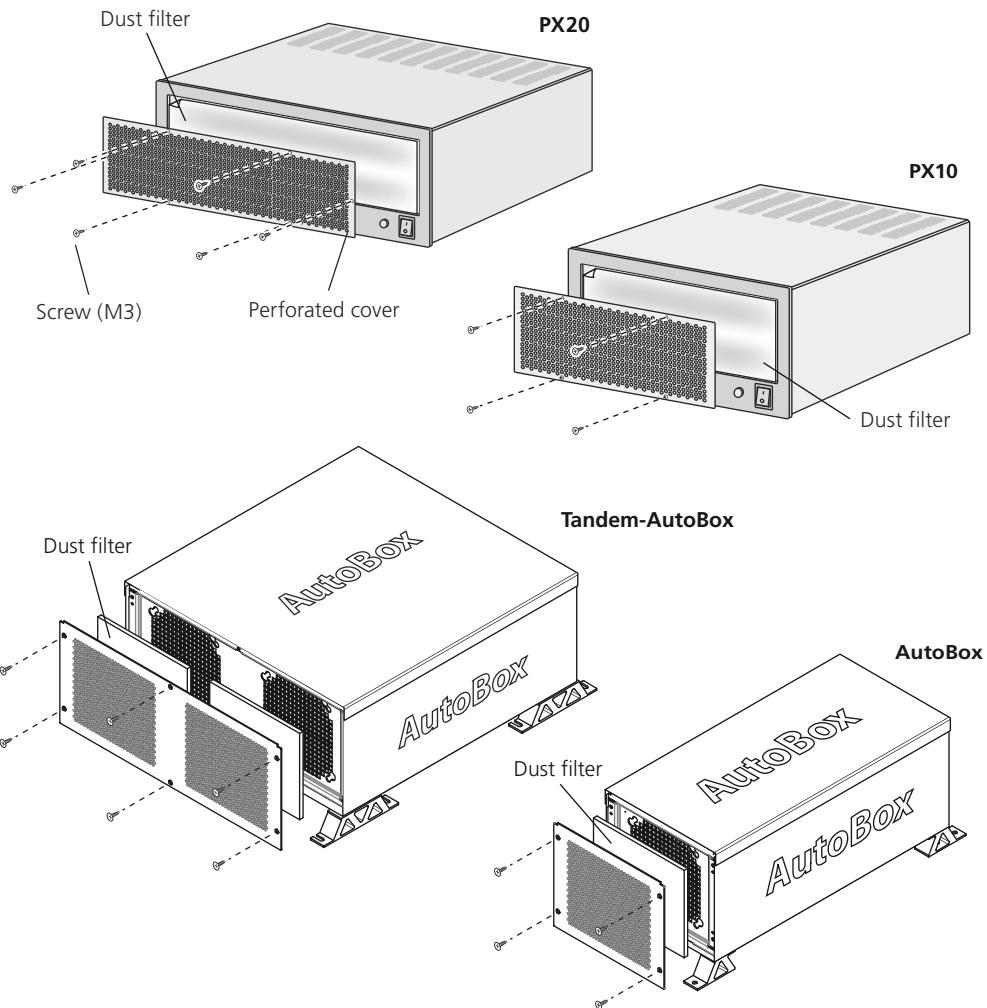
- Phillips screwdriver, PH 1
 - If the filter is dirty, you need a new one: dSPACE provides a pack of three replacement dust filters for the different expansion boxes. The order numbers are as follows:
 - PX10: FILTER_PAD_PX10
 - PX20: FILTER_PAD_PX20
 - AutoBox, Tandem-AutoBox: FILTER_PAD_ABX
- The Tandem-AutoBox has two dust filters.

Method

To check and replace the dust filter of an expansion box

- 1 Switch off the expansion box or the power supply of the car engine (if using an AutoBox, Tandem-AutoBox).

2 Unscrew the Phillips screws (M3) as shown in the illustrations below.



- 3** Remove the perforated cover from the box.
- 4** Remove the dust filter and check it for dust. If necessary replace it by a new one.
- 5** Replace the dust filter and fix it to the box with the perforated cover and the Phillips screws (M3).

Result

You have checked and if necessary replaced the dust filter.

Troubleshooting

Objective If any problem related to the installation and configuration of your system comes up, refer to the information given in this section.

Getting further support

Support Knowledge Base If the information in this section does not help you to solve the problem, check the Support Knowledge Base on our website. See <http://www.dspace.com/go/kb>.

dSPACE Support If self-help does not help you to solve the problem, contact dSPACE Support and provide information about your dSPACE environment and the problems you have. It is recommended to use the support request form provided on the website at <http://www.dspace.com/go/supportrequest>. However, you can also send an e-mail or phone us.

Where to go from here	Information in this section				
	<table><tr><td>Hardware Problems.....</td><td>166</td></tr><tr><td>Problems with the Ethernet Connection.....</td><td>168</td></tr></table>	Hardware Problems.....	166	Problems with the Ethernet Connection.....	168
Hardware Problems.....	166				
Problems with the Ethernet Connection.....	168				

Hardware Problems

Where to go from here	Information in this section
	Checking the DS1006 and I/O Boards..... 166
	Problems Using an Expansion Box via Bus Connection..... 167
	Problems Related to the Firmware..... 167

Checking the DS1006 and I/O Boards

Check list	Perform the following checks if the DS1006 and the connected I/O boards do not operate correctly:
	<ul style="list-style-type: none">▪ Check whether host PC and expansion box operate correctly.▪ Check the I/O base addresses of the boards. You can detect an address conflict of the DS1006 by observing the status LEDs for troubleshooting located on the component side of the board. If you download an application to the board, this must be indicated by the red LEDs. For details, refer to <i>Status LEDs</i> in the DS1006 chapter of PHS Bus System Hardware Reference.▪ An address conflict does not necessarily result in the host PC or expansion box not booting anymore (see Basics on Changing I/O Base Addresses on page 30).▪ If you use a DS821-34 mm Link Board with older notebooks (for example, which provide only ExpressCard/54 slots), your system might crash when you boot your host PC. To solve this problem, update the BIOS of your host PC.▪ Check the PHS-bus addresses of the I/O boards (see How to Set the PHS-bus Address on page 39).▪ Check whether the CPU power supply is plugged in correctly on the DS1006 processor board and in the expansion box. Refer to How to Install dSPACE Boards on page 71.▪ Check the status LEDs for troubleshooting placed on the component side of the board. If none of them lights up when the expansion box or host PC is running, the board's power supply is defective. For details, refer to Status LEDs (PHS Bus System Hardware Reference).

Related topics**Basics**

Basics on Changing I/O Base Addresses..... 30

HowTos

How to Set the PHS-bus Address..... 39

Problems Using an Expansion Box via Bus Connection

Guidelines to avoid problems

- You should follow these guidelines when connecting the host PC to an expansion box via a bus interface:
- When switching on the system, the expansion box should usually be switched on first, followed by the PC.
 - Do not switch off the expansion box while the PC is still running. This might lead to unpredictable errors.

Problems Related to the Firmware

Firmware update

If you are prompted to update your firmware when downloading an application to your real-time processor(s), refer to the [Firmware Manager Manual](#) for further information.

Problems with the Ethernet Connection

Where to go from here

Information in this section

General Errors Using Ethernet Connection.....	168
Restoring BIOS Setup of the Slot CPU.....	169
Problems When Setting Up the TCP/IP Protocol.....	170
To solve problems when setting up the TCP/IP protocol.	
Problems with Peer-To-Peer Connection.....	170
Problems with the Integration of an Expansion Box in a Network.....	171

General Errors Using Ethernet Connection

Objective

The following general errors may occur when you work with an expansion box connected to your host PC via Ethernet.

Expansion box does not boot

The expansion box contains a slot CPU with a built-in network adapter as well as a VGA graphics adapter. A Flash Disk on the slot CPU stores all the necessary software for the network connection on the client side.

If you cannot establish a connection to the expansion box anymore, then the BIOS setup might be missing and the expansion box will not boot.

For restoring the BIOS setup, refer to [Restoring BIOS Setup of the Slot CPU](#) on page 169.

IP address lost

The host and the expansion box cannot be connected via Ethernet if the IP address of the expansion box is unknown. The default IP address is 192.100.100.98.

To find out the client's IP address, connect a VGA monitor to the slot CPU. The IP address is displayed during power-up. Use this address to connect to the expansion box again.

Wrong IP address	The IP addresses of expansion box and network, or expansion box and host PC (for peer-to-peer connection) must adhere to the following rules: <ul style="list-style-type: none">▪ The network part of the IP address must be identical on both systems. Only the workstation part may differ. For details, refer to a definition of IP address classes.▪ The IP address of each node must be unique within the network.▪ The IP address must not be one of the reserved loopback addresses 127.0.0.0 and 127.0.0.1. Additional restrictions may apply.
Wrong subnet mask	The expansion box does not support subnetting. The subnet mask is always adjusted automatically according to the selected IP address class when changing the IP address using the setip utility. Zero subnet bits are set.
Wrong cable	<p>The supplied crossed-over patch cable can only be used for a peer-to-peer connection via Ethernet. It cannot be used to connect the expansion box to an existing network.</p> <p>Use a normal (non crossed-over) cable to integrate the expansion box into an existing network.</p>
Specific problems	In addition, problems to the following specific topics may occur: <ul style="list-style-type: none">▪ Problems When Setting Up the TCP/IP Protocol on page 170▪ Problems with Peer-To-Peer Connection on page 170▪ Problems with the Integration of an Expansion Box in a Network on page 171

Restoring BIOS Setup of the Slot CPU

Objective	If you cannot establish a connection to the expansion box anymore, then the BIOS setup might be missing and the expansion box will not boot.
Slot CPU	The expansion box contains a slot CPU and a built-in network adapter as well as a VGA graphics adapter. A Flash Disk on the slot CPU stores all the necessary software for the network connection on the client side.
Remedy	To restore the missing BIOS setup of the slot CPU, contact dSPACE Support for further instructions.

Problems When Setting Up the TCP/IP Protocol

Troubleshooting

When you check the installation of the TCP/IP protocol with the **ping** command, the following error messages may occur.

Error Message	Reason	Solution
Bad command or file name	The TCP/IP protocol has not been installed properly.	Install the TCP/IP protocol again.
The name specified is not recognized as an internal or external command, operable program or batch file	The TCP/IP protocol has not been installed properly.	Install the TCP/IP protocol again.
Unable to contact IP driver, error code x found.	The TCP/IP protocol has not been installed properly.	Install the TCP/IP protocol again.
Pinging 127.0.0.1 with x bytes of data: Request timed out	The TCP/IP protocol has not been configured properly.	Check the configuration of the TCP/IP protocol. If you are uncertain, ask your system administrator.

Related topics

HowTos

[How to Set up the TCP/IP Protocol of the Host PC Network Adapter.....](#) 141

Problems with Peer-To-Peer Connection

Objective

You may encounter some problems when you set up a peer-to-peer connection between your host PC and an expansion box.

Error message

Pinging 192.100.100.98 with 32 bytes of data:

Request timed out

Remedies

- Check whether the network adapter of the host PC has been installed and configured correctly.
- Make sure that the correct crossed-over patch cable is connected.
A standard patch cable cannot be used for this type of connection.

- Check whether the expansion box is switched on.
- Check whether the expansion box is configured to a wrong IP address. For details, refer to: [IP address lost](#) on page 168.
- Check the IP address of the host PC.

It should be set to **192.100.100.1**. If a different IP address is used, the host might not be able to connect to the client.

Problems with the Integration of an Expansion Box in a Network

Objective	You may encounter some problems when you integrate an expansion box in a network.
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Check list	<ul style="list-style-type: none">▪ Check whether the network adapter of the host PC has been installed and configured correctly.▪ Check whether the correct standard patch cable is connected and the expansion box is switched on.▪ Check whether the expansion box is configured to a wrong IP address: see IP address lost on page 168.▪ Check whether the previous TCP/IP configuration of the host PC was restored properly.
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Numerics

19 inch rack (PX20) 100

A

adapter cable
DS815-RJ45 121
AutoBox
Ethernet connection 139

B

boards
connecting external devices 149
setting up 27
bus connection 115
bus interface 115
available combinations 115
bracket LEDs 122
DS814 116
DS815 116
DS817 116
DS821 116
bus interfaces 113

C

changing I/O base address 30
changing sub-ID
DS4201, DS4201-S 55
changing the I/O base address 32
Common Program Data folder 8
compatibility to dSPACE Releases 25
connecting
expansion box 113
external devices 149
Gigalinks 91
processor boards 92
several DS1006 91
connecting the engine position bus 79
connecting the time-base connector 79
connection
DS815/DS814 interface 120
DS817/DS814 interface 117
DS821/DS814 interface 120
DS830 MultiLink Panel 135
connector panels
connecting external devices 151
connecting to the board 94
mounting in a 19 inch rack 99

D

de-installation 155
DIP switches 39
Documents folder 8
DS1006
installation location 17
multiprocessor topology 88
PHS-bus cable 86
shipment 18

troubleshooting 166
DS2210
connecting inputs to various voltage levels 41
setting output mode for transformer outputs 42
DS2211
setting output mode for transformer outputs 44
DS2302
changing I/O base address 46
DS4002
changing logical level of timing I/O 50
DS4201
changing sub-ID 55
DS4201-S
adapting quartz oscillator 53
DS4201-S
changing sub-ID 55
setting up the transceiver mode 52
DS5001
increasing hysteresis level of inputs 57
DS802
behavior of real-time application 103
compatibility information 104
displaying in ControlDesk 111
examples of using 104
master/slave configuration 110
mounting extension module 111
number of connectable boxes 103
partitioning a PHS-bus based system 101
PHS-bus address settings 111
placing in expansion boxes 108
putting into operation 111
supported expansion boxes 108
system overview 102
use scenarios 101
DS802 PHS Link Board 101
DS814 116
DS814 Link Board
bracket LEDs 122
limitations 117
DS815 116
DS815 Link Board
bracket LEDs 122
connection 120
limitations 117
DS815-RJ45
adapter cable 121
DS817 116
DS817 Link Board
bracket LEDs 122
connection 117
limitations 117
DS819 116
DS819 Link Board
bracket LEDs 122
connection 117
limitations 117
DS821 116
DS821 Link Board
bracket LEDs 124
connection 120
limitations 117
DS830 MultiLink Panel 133
connection 135
limitations 134
to supply power 136
DS910 Gigalink Module 91
DS911 Gigalink Module 91
dSPACE boards
installation 71
resource requirements 28
dSPACE CardSafe
introduction 125
mounting 128
removing completely 131
removing for transportation 130
required mounting area 126
dSPACE Prototyper for RCP 17, 18
dSPACE Simulator for HIL simulation 18
dSPACE system
turning off 71
turning on 76

E

engine position bus
connecting 79
Ethernet connection 139
peer-to-peer 140
Setup procedure 140
slot CPU 114
under Windows 140
expanding the system 72
expansion box
19" rack (PX20) 100
connecting 113
connection via bus interface 115
connection via Ethernet 114
Ethernet connection 139
important notes 13
installing boards 72
integration in existing network 140
peer-to-peer connection 140
requirements 23
safety precautions 13
turning the box on/off 13
expansion box (bus connection)
troubleshooting 167
expansion box (Ethernet connection)
troubleshooting 168
external devices
connecting to the dSPACE system 149

F

firmware
troubleshooting 167

G

Gigalink
connection 91

H

hardware
 installation 63
 uninstallation 156
host PC
 installing boards 72
 requirements 23

I

I/O base address
 changing 30
I/O boards
 DIP switches 39
inserting modules onto I/O boards 59
installation
 connector panels 94
 dSPACE boards 72
 dSPACE Boards 71
 hardware 63
 troubleshooting 165
IP Address Lost 168

L

limitations
 link boards 117
link boards
 available combinations 115
 expansion box 115
 host PC 115
Local Program Data folder 8

M

master processor in DS1006MP systems 91
modular hardware 17
multiprocessor system 18

O

overview
 setting up the boards 35

P

PC card
 link cables 120
peripheral high speed bus 39
PHS bus 39
 addresses 39
 cable
 DS1006 86
 cables and terminators 85
 configuration 39
 DIP switches 39
PHS++ bus standard 86
preconfigured dSPACE system 27
processor board
 setting up 32

Q

quartz oscillator
 DS4201-S 53

R

removing the hardware 156
requirements
 dSPACE boards
 resources 28
 expansion box 23
 host PC 23
resource requirements of dSPACE boards 28
resources
 for installation in expansion box 29
 for installation in host PC 28

S

safety precautions 9
setip 145
setting up a multiprocessor system 88
setting up a PHS-bus based system 65
setting up processor board 32
setting up the boards 27
 overview 35
slot CPU 114
 Ethernet connection 139
status LEDs
 DS830 137
system requirements 23

T

Tandem-AutoBox
 Ethernet connection 139
TCP/IP protocol
 setting up 142
time-base connectors
 connecting 79
topology
 DS1006 MP system 88
turning off
 dSPACE system 71
turning on
 dSPACE system 76

U

uninstalling the hardware 156
upgrading a DS1003 system 85

W

wrong cable 169
wrong subnet mask 169