

RapidPro

Hardware and Software Getting Started

Release 2021-A – May 2021

How to Contact dSPACE

Mail:	dSPACE GmbH Rathenaustraße 26 33102 Paderborn Germany
Tel.:	+49 5251 1638-0
Fax:	+49 5251 16198-0
E-mail:	info@dspace.de
Web:	http://www.dspace.com

How to Contact dSPACE Support

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

- Local dSPACE companies and distributors: <http://www.dspace.com/go/locations>
- For countries not listed, contact dSPACE GmbH in Paderborn, Germany.
Tel.: +49 5251 1638-941 or e-mail: support@dspace.de

You can also use the support request form: <http://www.dspace.com/go/supportrequest>. If you are logged on to mydSPACE, you are automatically identified and do not need to add your contact details manually.

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

Software Updates and Patches

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

Important Notice

This publication contains proprietary information that is protected by copyright. All rights are reserved. The publication may be printed for personal or internal use provided all the proprietary markings are retained on all printed copies. In all other cases, the publication must not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of dSPACE GmbH.

© 2005 - 2021 by:
dSPACE GmbH
Rathenaustraße 26
33102 Paderborn
Germany

This publication and the contents hereof are subject to change without notice.

AUTERA, ConfigurationDesk, ControlDesk, MicroAutoBox, MicroLabBox, SCALEXIO, SIMPHERA, SYNECT, SystemDesk, TargetLink and VEOS are registered trademarks of dSPACE GmbH in the United States or other countries, or both. Other brand names or product names are trademarks or registered trademarks of their respective companies or organizations.

Contents

About This Document	5
Safety Precautions	7
Safe In-Vehicle Use of dSPACE Products.....	7
General Warnings on Using dSPACE Products.....	9
Safety Precautions for Handling the System.....	9
Safety Precautions for Using Specific RapidPro Modules.....	12
Safety Precautions for Using the PS-DINJ 2/1 Module.....	13
Safety Precautions for Using Break-Out Boxes.....	17
Safety Precautions for Shipping a RapidPro Control Unit.....	19
Safety Precautions for Disposing dSPACE Hardware.....	19
Introduction to RapidPro System	21
System Components.....	21
Use Scenarios.....	24
Important Terms and Their Definitions.....	26
Hardware Shipment.....	29
Documentation Overview.....	30
Installing and Connecting RapidPro System	33
Checking the Host PC and Power Supply Requirements.....	33
How to Build a Power Supply Cable.....	34
How to Install and Connect the System.....	37
Viewing the Hardware Equipment	41
How to Load Data of Connected RapidPro Hardware.....	41
How to View Hardware Details of Your System.....	44
How to Update RapidPro Firmware.....	47
Exporting Data of RapidPro Hardware	51
How to Define an Application Based on Connected Hardware.....	52
How to Communicate via Channel Names.....	55

How to Export Pinout Information.....	56
How to Generate Hardware Information Needed by the RTI RapidPro	
Control Unit Blockset.....	58

Index	61
-------	----

About This Document

Contents

This document provides the information you need for getting started with handling the RapidPro hardware via ConfigurationDesk for RapidPro. Specifically, the document:

- Shows the steps necessary for powering and connecting the hardware under laboratory conditions for configuration purposes only.

Note

The connecting instructions given in this document are sufficient only for powering the RapidPro hardware for configuration purposes without running an application and without connected sensors and actuators. For connecting the hardware to power supply in real applications (with connected sensors and actuators), refer to [Basics on Connecting to Power Supply \(RapidPro System Hardware Installation Guide !\[\]\(0aff635c4179ba9e710b00f4b01d3b20_img.jpg\)\)](#).

- Introduces you to ConfigurationDesk for RapidPro and helps you to start handling the RapidPro hardware via ConfigurationDesk for RapidPro.
- Shows how to get an overview of the hardware equipment of your RapidPro System via ConfigurationDesk for RapidPro.
For example, you quickly can check the hardware equipment supplied by dSPACE (hardware components, configuration settings, etc.).
- Shows how to export data from your RapidPro system for use in other worksteps, for example the pinout of the hardware for building the cable harness.









For background information on features and advanced handling techniques, there are links to further documents.

Required knowledge

Knowledge in handling the host PC and the Microsoft operating system is assumed.

Symbols

dSPACE user documentation uses the following symbols:

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

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

Objective	To avoid risk of injury and/or property damage, read and ensure compliance with the safety precautions stated.
------------------	--

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

Safe In-Vehicle Use of dSPACE Products.....	7
General Warnings on Using dSPACE Products.....	9
Safety Precautions for Handling the System.....	9
Safety Precautions for Using Specific RapidPro Modules.....	12
Safety Precautions for Using the PS-DINJ 2/1 Module.....	13
Safety Precautions for Using Break-Out Boxes.....	17
Safety Precautions for Shipping a RapidPro Control Unit.....	19
Safety Precautions for Disposing dSPACE Hardware.....	19

Safe In-Vehicle Use of dSPACE Products

Connecting to the battery/power supply

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

- Insert fuses into the power supply cable and other cables that are connected to the battery/power supply to avoid an electrical fire.
- Locate the fuses close to the battery/power supply.

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

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

- Use an all-pole disconnect switch that matches the rating of the RapidPro system.
- Make sure that the disconnect switch can be reached by the user in case of an emergency.

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.

General Warnings on Using dSPACE Products

Using ConfigurationDesk for RapidPro

Using dSPACE software can be dangerous. You must observe the following safety instructions and the relevant instructions in the user documentation.

WARNING

Improper or negligent use can result in serious personal injury and/or property damage.

Using the ConfigurationDesk for RapidPro software can have a direct effect on dSPACE systems and technical (electrical, hydraulic, mechanical) systems connected to them.

- **Only persons who are qualified to use dSPACE software, and who have been informed of the above dangers and possible consequences, are permitted to use it.**
- All applications where malfunctions or misoperation involve the danger of injury or death must be examined for potential hazards by the user, who must if necessary take additional measures for protection (for example, an emergency off switch).

Liability

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

Data loss during operating system shutdown

The shutdown procedure of Microsoft Windows operating systems causes some required processes to be aborted although they are still being used by dSPACE software. To avoid data loss, the dSPACE software must be terminated manually before a PC shutdown is performed.

Safety Precautions for Handling the System

Objective

To avoid risk of injury and/or damage to the hardware and to achieve safe and trouble-free operation, you have to observe the following guidelines.

Configuring via ConfigurationDesk for RapidPro

Changes to software-configurable hardware parameter values can cause uncontrolled movements of and/or material damage to connected devices. To avoid risk of injury and material damage:

- Before changing software-configurable parameter values, think through the effects of the changes you are planning.
- Ensure that no one is in the potential danger zone of the device (test bench, etc.) when the changes first take effect.

Updating RapidPro firmware

Updating the PLD firmware of any SC or PS module can cause uncontrolled movements of connected devices. To avoid the risk of injury and material damage: Disconnect actuators and/or sensors from the affected modules before updating the firmware.

Electromagnetic compatibility

The RapidPro hardware is a CE class A device. This equipment may cause interference in a residential installation. In this case the user is encouraged to perform appropriate measures to correct the interference. For more information on EMC standards, refer to [RapidPro SC Unit Data Sheet \(RapidPro System Hardware Reference !\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\)](#)), [RapidPro Power Unit Data Sheet \(RapidPro System Hardware Reference !\[\]\(cef08d8c15d8a8acd5e25ab0d65432c3_img.jpg\)](#)), or [RapidPro Control Unit Data Sheet \(RapidPro System Hardware Reference !\[\]\(c244836fd67166dc60ebf5279a0f8377_img.jpg\)](#)).

Using RapidPro hardware on wet locations

The RapidPro hardware is not moisture-proof and is not intended to be used on wet locations according to IEC 61010-1 (product safety).

- Do not use RapidPro hardware on wet locations.

Handling the RapidPro hardware

The housing and the connectors of the RapidPro hardware can reach temperatures above 95 °C (203 °F). To avoid burning your hands:

- Do not touch the housing and the connectors plugged to it during operation.
- Before connecting/disconnecting any device or doing other installation work, wait for the housing to cool down after switching off the unit or use protective gloves.

Connecting devices

To avoid risk of injury and damage to the RapidPro hardware:

- Do not connect any high-voltage devices to the I/O connectors of the units.
- Do not apply voltages/currents outside the specified ranges to the connector pins.
- Do not connect or disconnect any devices (for example, sensors/actuators) while the power supply of the RapidPro system and these devices is switched on.
- Observe all safety precautions described in the documentation of the connected devices.

The RapidPro 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.

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.

Assembling RapidPro hardware

Before doing any installation or assembly work on the RapidPro hardware:

1. Power off the RapidPro hardware.
2. Disconnect all connectors.

Assembling a stack with unit connection bus (UCB)

To avoid malfunctions of your system, do not change the assembly of a stack with unit connection bus (UCB) yourself. Specifically:

- Do not add or remove a unit.
- Do not change the order of the units.

If it is necessary to change a stack with UCB, contact dSPACE (local representative) to have this done.

Handling and mounting modules

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.

Using thermal conduction foil Mounting SC, PS, or COM modules without using thermal conduction foil as isolation between the module and the unit's carrier board damages the hardware. Ensure that there is thermal conduction foil

to avoid electrical contact between the module and the attachment mount of the unit's carrier board.

Soldering devices to modules

Unprofessional soldering damages the hardware and/or leads to loss of hardware functionality.

- 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, for example, a suitable SMD soldering station.
- You solder at your own risk. Any damage to or malfunction of dSPACE hardware caused by improper soldering is not covered by the warranty.

Soldering on powered and mounted modules damages the hardware! Before you begin to solder:

1. Power off the RapidPro hardware.
2. Disconnect all connectors.
3. Uninstall the module you want to modify.

Safety Precautions for Using Specific RapidPro Modules

Knowledge about modules

You need detailed knowledge of the RapidPro modules to be used in your application. You should especially familiarize yourself with the safety precautions for each module. An overview of all the precautions is given below. They must be observed to avoid damage to the hardware and achieve safe and trouble-free operation.

For module details, refer to the module chapters in the *RapidPro System – Installation and Configuration Reference*.

SC-DO 8/1 (DS1646)

Changing the signal polarity parameter in ConfigurationDesk for RapidPro can damage the connected devices.

- Before changing the parameter, think through the effects of the changes you are planning.
- You can also invert the signal via the RTI RapidPro Control Unit Blockset (if used). If you are not sure what the actual polarity is, measure/monitor the output signals before connecting a device.

SC-EGOS 2/1 (DS1634)

Setting the pump reference current unequal 0 A can damage the connected lambda probe.

To avoid damage:

- Change the pump reference current parameter only according to the technical specifications of the lambda probe. The setting must not exceed the maximum current specified in the probe's documentation.

PS-FBD 2/1 (DS1661) and PS-HCFBD 1/1 (DS1667)

Choosing the fast-decay mode can cause uncontrolled movements and/or material damage of connected devices.

In fast-decay mode, both input signals (xxxx_DIR_IN and xxxx_CTRL_IN) are set to low level if you build a Simulink model without connecting PWM signals to the full-bridge. This means that a connected motor starts if you download your application and no PWM signals are connected to the module inputs. If you invert the polarity of the signals via ConfigurationDesk for RapidPro, high-level signals trigger the described behavior.

To avoid risk of injury and material damage:

- When building the Simulink model, think through the effects of the connections you are planning and the settings of the modules.
- Ensure that no one is in the potential danger zone of the device (test bench, etc.) when the changes first take effect.

PS-HCHBD 2/1 (DS1668)

Load dump and/or static overvoltage damages the Power Unit, if you use the PS-HCHBD 2/1 module in low-side driver mode.

To avoid damage to the Power Unit:

- Take suitable measures against load dump and/or static overvoltage on the part of the load.
- Use the PS-HCHBD 2/1 module's low-side driver mode only if load dump and/or static overvoltage cannot occur in your application.

PS-DINJ 2/1 (DS1664)

The PS-DINJ 2/1 module (DS1664) can generate hazardous voltages up to 100 V. To avoid risk of electric shock, observe the precautions stated in [Safety Precautions for Using the PS-DINJ 2/1 Module](#) on page 13.

Safety Precautions for Using the PS-DINJ 2/1 Module

Objective

The PS-DINJ 2/1 module (DS1664) can generate hazardous voltages up to 100 V. According to international standards, a voltage higher than 60 V DC or 42.4 V AC_{peak} is specified as hazardous.

Observe the following safety precautions to avoid risk of electric shock.

Designated use

The PS-DINJ 2/1 module (DS1664) is designed exclusively for use in a RapidPro system to drive electromagnetic injection valves.

The RapidPro system (and therefore the module) must be used only for prototyping purposes, for example, in development and research projects.

Using the PS-DINJ 2/1 module for purposes other than those mentioned above (such as for serial operation in vehicles or machines) is considered contrary to its designated use.

User qualification

Work on the module, and on the connected electrical equipment, must be carried out only by a skilled electrician or by instructed persons under the supervision and guidance of a skilled electrician and in accordance with electrical engineering rules and regulations.

A skilled electrician is a person with sufficient technical training, knowledge, and experience, and knowledge of the relevant regulations, to assess the tasks assigned to him/her and to recognize possible dangers.

Safety guidelines

WARNING

Hazardous voltages! The PS-DINJ 2/1 module (DS1664) generates output voltages up to 100 V.

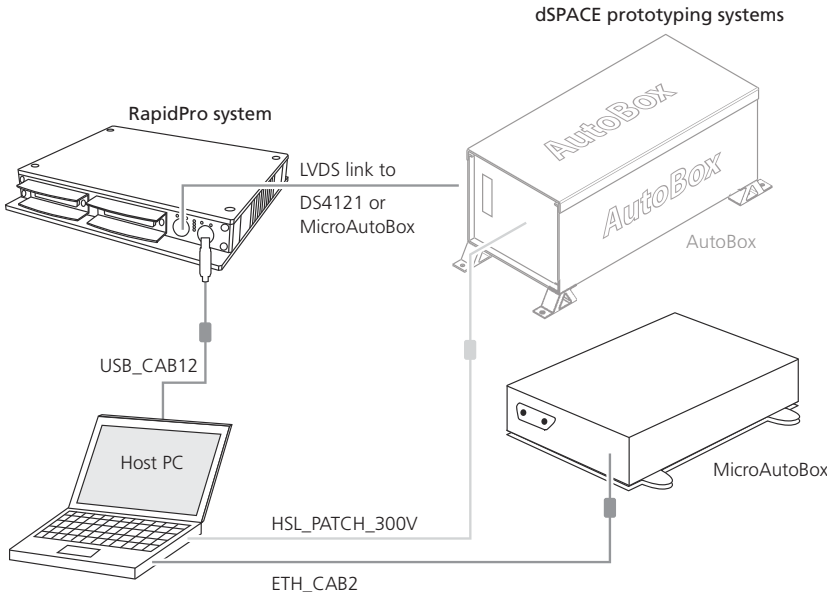
Risk of serious injury or death due to electric shock

- Do not touch the connector pins of the RapidPro Power Unit or any connected terminals and devices while the system is powered.
- Do not power the RapidPro system if the cover of the housing has been removed.
- After the RapidPro system is powered down, wait at least 3 minutes for the internal voltage to dissipate, before connecting/disconnecting devices or doing any installation work.
- **In the event of hardware damage to the PS-DINJ 2/1 module, hazardous voltages also can occur at unexpected positions on any device which is connected directly or indirectly to the RapidPro system. Therefore:**
 - Use only electrically safe host PC connection cables provided by dSPACE.
 - Connect the RapidPro housing to the negative terminal of your power supply (to the negative pole of the battery in the vehicle).
 - Ensure that the RapidPro system and all devices connected to it are within a separate test area according to the locally valid safety standards for the installation and operation of electrical test equipment. See below for detailed descriptions of the necessary safety measures.

Safety measures provided by dSPACE

To avoid the risk of electric shock, dSPACE provides safety measures which take effect even in the event of hardware damage to the PS-DINJ 2/1 module.

Do not use and operate the PS-DINJ 2/1 module (DS1664) without observing the safety measures described below.

Measures	Description
Electrically safe connection between dSPACE hardware and host PC	<p>If you use a RapidPro system with a DS1664 installed inside, you must protect your host PC and yourself against unexpected hazardous voltages. To do so, you must connect the host PC to the dSPACE hardware (RapidPro system and a connected dSPACE prototyping system) via electrically safe PC connection cables as shown below:</p> <ul style="list-style-type: none"> ▪ USB_CAB12: to connect the RapidPro system to the host PC ▪ ETH_CAB2: to connect MicroAutoBox II to the host PC ▪ HSL_PATCH_300V: to connect an expansion box (for example, PX10, AutoBox) to the host PC. Instead of this safe crossed-over patch cable, you can use a connection via fiber-optic cable. <p style="text-align: right;">dSPACE prototyping systems</p>  <p>The cables provide galvanical isolation. They are electrically safe up to voltages of 300 VDC/AC_{RMS} and 600 V_{peak}. The cable names are printed on the cable.</p>
Connection of RapidPro housing to negative terminal	<p>You must connect the housing to the negative terminal of the power supply (to the negative pole of the battery in a vehicle) via a ground lead. If you do not perform the connection, the housing can carry hazardous voltages if hardware damage occurs to the DS1664.</p> <ul style="list-style-type: none"> ▪ RapidPro systems delivered as of November 2006: Each system provides a male cable lug on the rear side as shown below. A ground lead (2.5 mm²) with female cable lug is delivered with every RapidPro system. In a stack, it is

Measures	Description
	<p>sufficient to establish only one connection between housing and negative terminal.</p> <ul style="list-style-type: none"> ▪ RapidPro systems delivered before November 2006: Contact dSPACE to upgrade your system. <p>Star point grounding is recommended. For details, refer to Grounding Examples (RapidPro System Hardware Installation Guide).</p>
Warning labels on the RapidPro hardware	<p>A RapidPro system with DS1664 installed inside has a HAZARDOUS VOLTAGES warning label with safety precautions on the cover of the unit (or stack). The module also has a warning label.</p> <p>Use and operate a RapidPro system with a DS1664 (installed inside) only if the warning labels are properly attached as shown above. If you need further labels, contact dSPACE.</p>
Warning labels on connected Break-Out Boxes	<p>All RapidPro Break-Out Boxes which you want to connect to a RapidPro system with DS1664 installed inside must have the HAZARDOUS VOLTAGES warning label on their housing as shown below.</p> <p>If a Break-Out Box does not have a warning label, attach it firmly to a Sub-D connector of the box. If you need further labels, contact dSPACE.</p>

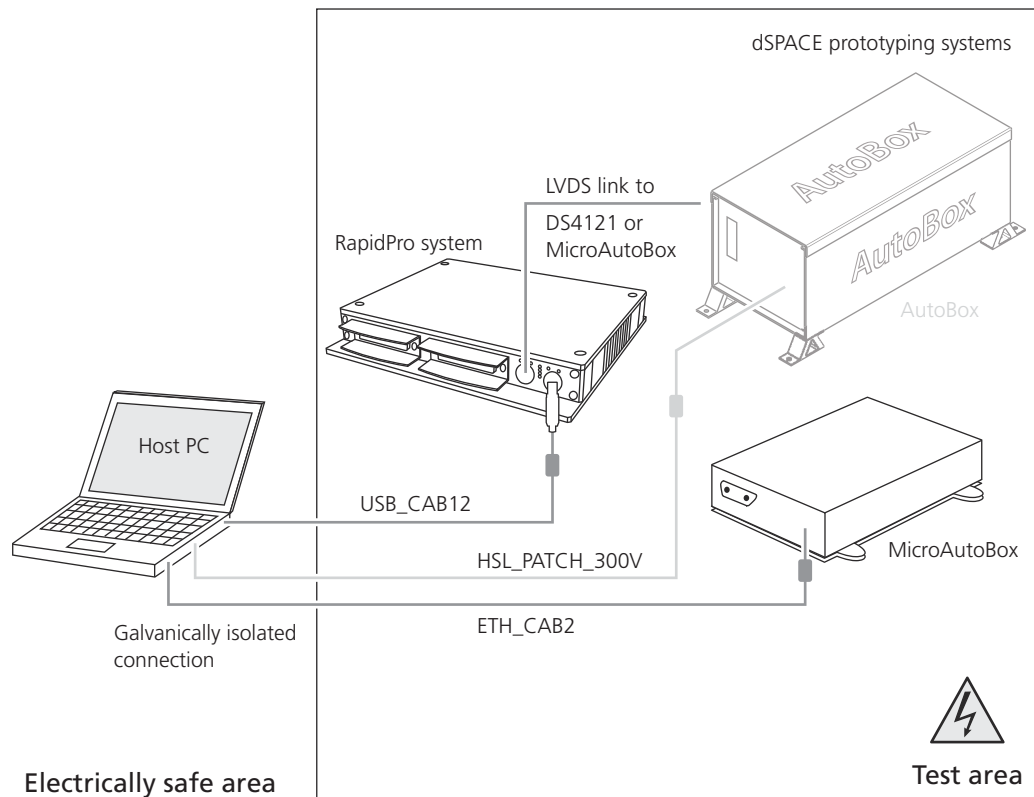
Safety measures to be carried out by the user

In addition to the measures provided by dSPACE, you are responsible for setting up the electrical equipment in your test area. In detail:

- When setting up your electrical system and the equipment of your test bench/vehicle, you have to comply with the locally valid safety standards for the installation and operation of electrical test equipment.
- Ensure that the RapidPro system and all devices connected to it are within a separate test area according to these locally valid safety standards.

Example of setup

As an example, the illustration below shows a setup with dSPACE hardware (RapidPro system and dSPACE prototyping system) connected to the host PC using galvanically isolated cables. This connection is electrically safe if the voltage applied to the hardware within the test area does not exceed 300 V DC/AC_{RMS}, or 600 V_{peak}.



Safety Precautions for Using Break-Out Boxes

Objective

To avoid risk of injury and/or damage to the hardware and to achieve safe and trouble-free operation, you have to observe the following guidelines.

Working with Break-Out Boxes

Depending on the connected devices and the modules used in the connected RapidPro units, there can be hazardous voltages on the contacts of the boxes. To avoid risk of serious injury or death due to electric shock:

- Do not touch bare contacts, connector pins or any connected terminals and devices while the system is powered.
- The PS-DINJ 2/1 module (DS1664) can generate hazardous voltages up to 100 V. To avoid risk of electric shock, also observe the module-specific precautions stated in [Safety Precautions for Using the PS-DINJ 2/1 Module](#) on page 13.

Changing the existing cable harness via Break-Out Box can cause uncontrolled movements of and/or damage to connected devices. To avoid risk of injury and material damage:

- Before changing the cabling, think through the effects of the changes you are planning.
- Ensure that no one is in the potential danger zone of the device (test bench, etc.) when the changes first take effect.

Connecting devices

To avoid risk of injury and damage to the RapidPro hardware:

- Do not connect any high-voltage devices to the I/O connectors of the units.
- Do not apply voltages/currents outside the specified ranges to the connector pins.
- Do not connect or disconnect any devices (for example, sensors/actuators) while the power supply of the RapidPro system and these devices is switched on.
- Observe all safety precautions described in the documentation of the connected devices.

The RapidPro 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.

Connecting UBAT and GND

To avoid damage to the Break-Out Boxes:

- Do not connect your power supply directly to the UBAT and GND terminals of the boxes.
- Observe the instructions given in [Powering a RapidPro System with Connected Break-Out Boxes \(RapidPro System Hardware Installation Guide !\[\]\(adb0331d22f78481623cc605df40612a_img.jpg\)](#)).

Installation location

To avoid damage to the Break-Out Boxes:

- Do not use the Break-Out Boxes in the vehicle's engine compartment.
- Do not use the Break-Out Boxes in humid ambient conditions.

Safety Precautions for Shipping a RapidPro Control Unit

Shipping a RapidPro Control Unit

Observe the following when shipping RapidPro hardware with Control Unit:

- The packaging must be stable and withstand a 1.2 m (47 in.) drop test.
- The packaging must bear the *Lithium Battery Mark* label with UN number 3091 and a phone number of your company for further information.



A person must be available at the phone number provided who can provide information about the device being sent. The phone number must begin with the country code.

- The *Lithium Battery Mark* label must be at least 110 mm (4.4 in.) high and at least 120 mm (4.8 in.) wide.
- If the RapidPro hardware is shipped by plane, enter the following note to the *Nature and Quantity of Goods* field of the airbill:

Lithium metal batteries in compliance with Section II of PI 970

For battery characteristics, refer to [RapidPro Control Unit Data Sheet \(RapidPro System Hardware Reference !\[\]\(5361750c22c4e047a52f4eac1ec2d4cc_img.jpg\)](#)).

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 battery is permanently installed in the RapidPro Control Unit. If your RapidPro hardware contains a Control Unit and you are shipping the RapidPro hardware to a disposal or recycling center, observe the notes on shipment.

For battery characteristics, refer to [RapidPro Control Unit Data Sheet \(RapidPro System Hardware Reference !\[\]\(7d1d6890825e83a6a4a51febe2dcc7f3_img.jpg\)](#)).

Introduction to RapidPro System

Objective The RapidPro system is modular and therefore very scalable. With different units and interchangeable modules, the system can be used in different applications.

Where to go from here

Information in this section

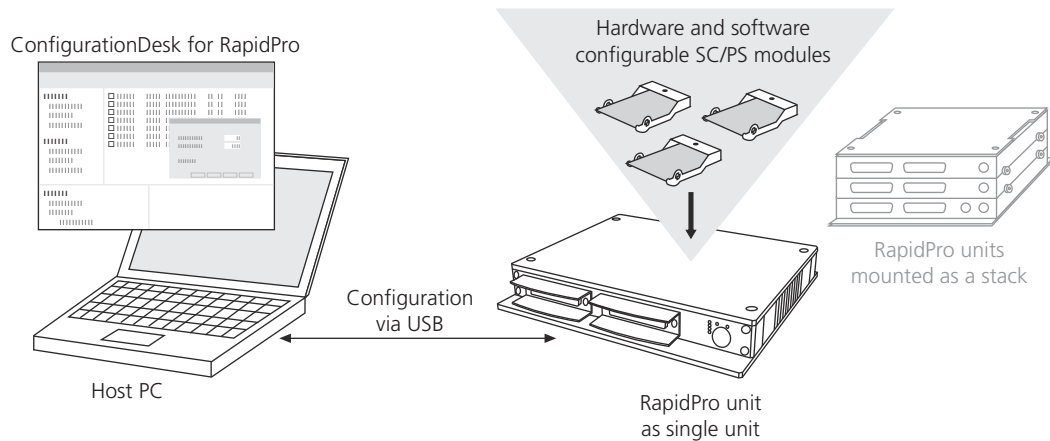
System Components.....	21
In addition to the RapidPro hardware, the system comprises configuration software and implementation software.	
Use Scenarios.....	24
There are different use scenarios where the RapidPro system can be used.	
Important Terms and Their Definitions.....	26
Knowing specific terms and their meanings helps you to handle the RapidPro hardware and work with the configuration software.	
Hardware Shipment.....	29
The RapidPro hardware comes preconfigured as ordered. Standard and optional accessories (if ordered) are also supplied.	
Documentation Overview.....	30
dSPACE provides different types of documentation: online help, PDF files and printed documents. This overview shows the contents of the available RapidPro documents and where you can access them.	

System Components

Objective The RapidPro system has a modular, scalable, and configurable system architecture.

System components

With three unit types and different interchangeable modules, the RapidPro system can be adapted to various requirements. You can easily configure the hardware parameters of the modules using the ConfigurationDesk for RapidPro software from dSPACE.



RapidPro units

The RapidPro hardware consists of three different unit types:

- RapidPro SC Unit (signal conditioning unit)
- RapidPro Power Unit (power stage unit)
- RapidPro Control Unit (microcontroller unit)

With their compact and robust housing, the units are especially designed for in-vehicle use, but can also be used in laboratories and on test benches. The units are installed as single units (= separate units) or assembled as a stack of several units.

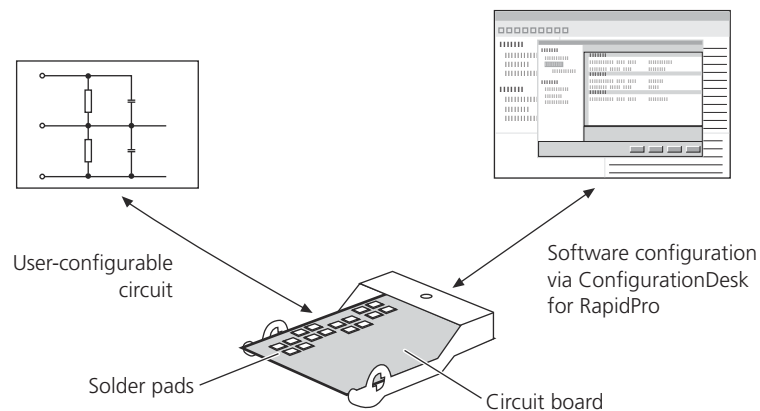
SC/PS modules

Signal conditioning (SC) and power stage (PS) modules can be mounted on the RapidPro units to set up application-specific systems.

They can be configured via software and/or by adding hardware components as follows:

- Parameters like input voltage range, output voltage range, filter frequency, etc. are configurable from a host PC (for example, notebook) with ConfigurationDesk for RapidPro via USB interface.
- Input circuits/output circuits of various modules can be configured by soldering additional electronic components (for example, pull-up or pull-down resistors) to user-configurable circuits on the modules.

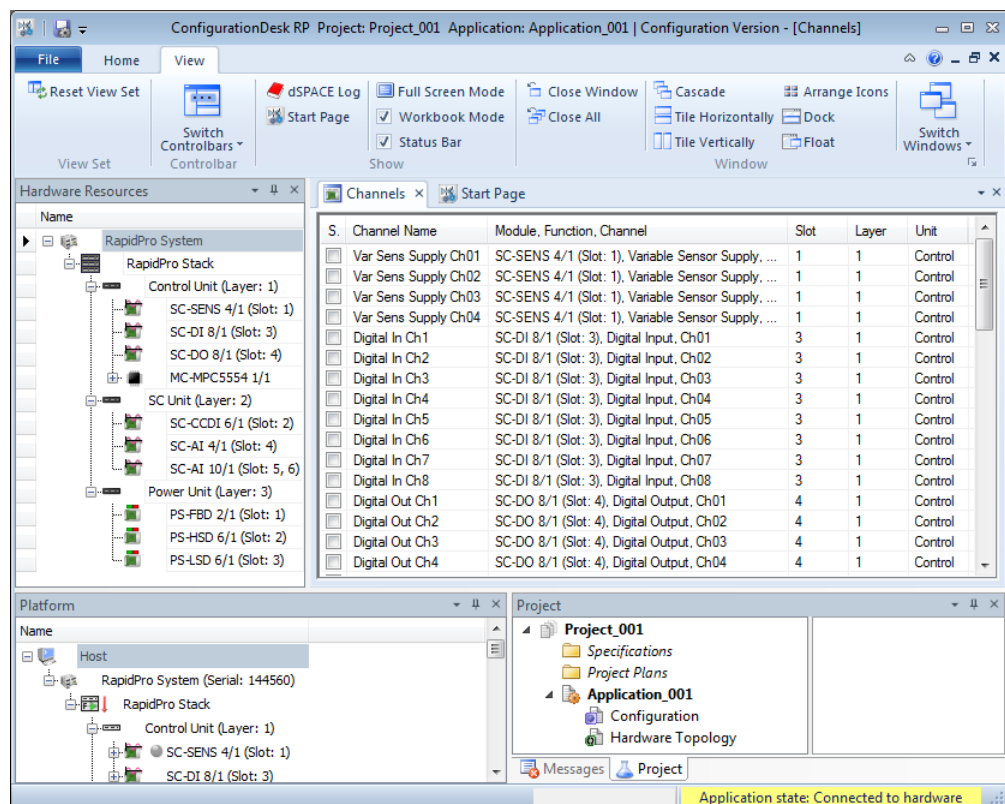
The illustration below shows the SC-AI 4/1 module as an example. This module provides both configuration options. This is not the case with every module type.



ConfigurationDesk for RapidPro

ConfigurationDesk for RapidPro is a stand-alone Windows application for intuitive and efficient configuration, diagnostics, and monitoring of the RapidPro hardware.

It also provides detailed information on the hardware components installed in a RapidPro system (like modules used, hardware versions, serial numbers, and pinout information of the I/O connectors).



Implementation Software

The implementation software that is needed depends on the use scenario. For running models on a prototyping system, dSPACE provides:

- Real-Time Interface (RTI) as a link between the hardware and the Simulink® development software from MathWorks®. The RTI RapidPro Control Unit Blockset in combination with the Control Unit and a prototyping system (MicroAutoBox II or modular system based on DS1007) allows you to perform extensive standard I/O functionalities and special functionalities for engine, chassis and drives control.
- Real-Time Libraries (RTLs) provide functions and macros to implement your models via handcoded C programs.

Use Scenarios

Objective

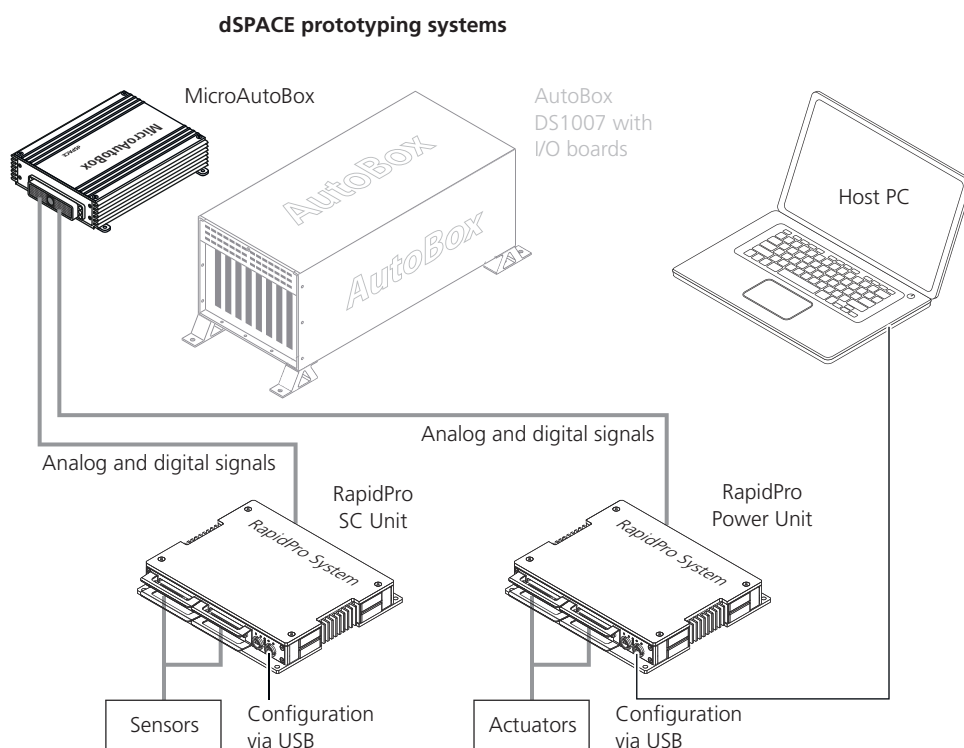
The RapidPro hardware can be used in the following scenarios:

- The RapidPro hardware adds solutions for signal conditioning and power stages to an existing dSPACE prototyping system.
- The RapidPro hardware is used as an intelligent I/O subsystem for an existing rapid control prototyping (RCP) system including signal conditioning and power stages.

Signal conditioning and power stages

In this scenario, automotive sensors and actuators are adapted to the dSPACE prototyping system with the help of the RapidPro SC Unit and the RapidPro Power Unit:

- The SC Unit supports your prototyping system by performing signal conditioning tasks, such as amplification, attenuation, filtering, and electrical isolation.
- The Power Unit adds the necessary power stages to your prototyping system to provide current and/or voltages required by actuators like drives, valves, injectors, lamps, and relays.



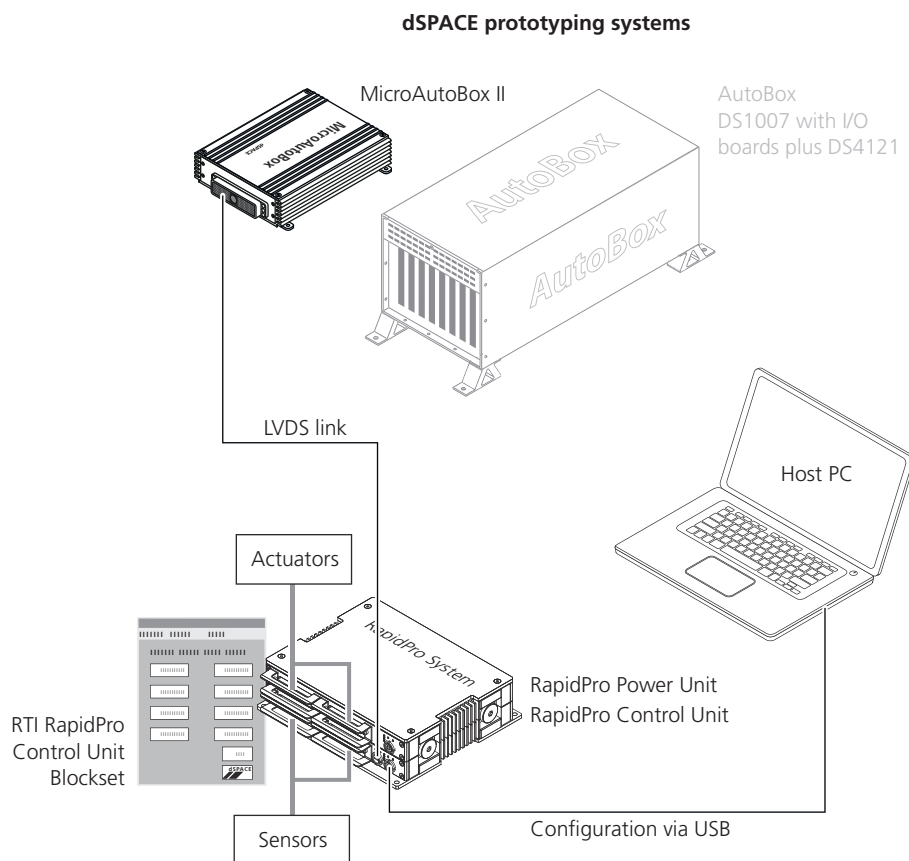
Intelligent I/O subsystem

The RapidPro Control Unit is used in this scenario. The RapidPro Control Unit is based on a microcontroller (MPC565), which is used here as a slave microcontroller to add extra I/O functionality to existing prototyping systems (MicroAutoBox II or AutoBox including DS1007 plus DS4121).

In applications such as engine or vehicle dynamics control, complex I/O tasks can be shifted from the prototyping system to the RapidPro Control Unit via the RTI RapidPro Control Unit Blockset. Thus, complex I/O signals can be acquired and generated independently of the main CPU of the prototyping system.

In addition, the RapidPro Control Unit provides slots for signal conditioning modules, so that different sensors can be adapted to the system.

To build a system, the RapidPro Control Unit can be used separately or in combination with the Power Unit and/or SC Unit to support power stages and further signal conditioning. An integrated unit connection bus (UCB) then connects several RapidPro SC or Power Units electrically to the Control Unit without external wiring. In the illustration below, two RapidPro units form a stack with UCB including signal conditioning (on the Control Unit) and power stages.



In this scenario, communication between the RapidPro system and the prototyping system is via a high-speed serial link (LVDS). No further connections between the two systems are required.

Note

MicroAutoBox III does not support this scenario.

Important Terms and Their Definitions

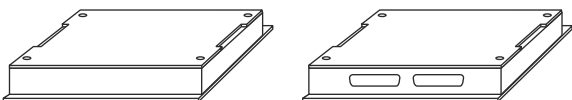
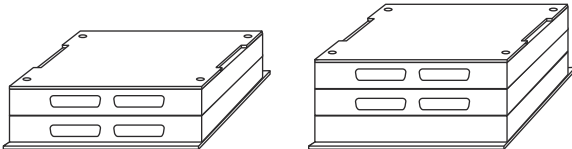
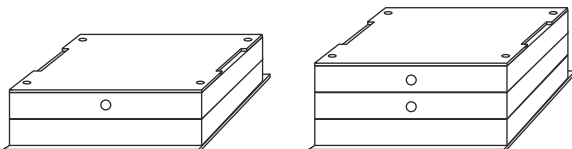
Objective

Knowledge of specific terms concerning the RapidPro system helps you to handle and work with the product. These terms are often mentioned in the documentation, so it is worth taking the time to familiarize yourself with them.

Unit assembly

The modular design of the RapidPro housing allows you to use the units in different combinations. The following terms help to distinguish the

combinations. The hardware is easy to identify from the rear: Single SC Units and single Power Units are equipped with rear I/O connectors.

Term	Definition	Assembly Examples
Single unit	A single unit is a unit which is used separately.	<p>View from rear</p>  <p>Control Unit Power Unit or SC Unit</p>
Stack without UCB	Several single units are mounted together mechanically to build a stack. The stack has no internal electrical connections between the units. Each unit functions as a separate RapidPro system, exactly as when used as a single unit.	<p>View from rear</p> <p>Mechanical connection only</p>  <p>Power and SC Unit mounted to a stack (without UCB) Power, SC and Control Unit mounted to a stack (without UCB)</p>
Stack with UCB	The RapidPro Control Unit is combined with RapidPro SC and/or Power Units in a stack to build a common system. An integrated unit connection bus (UCB) connects the SC and Power Units electrically to the Control Unit without external wiring.	<p>View from rear</p> <p>Electrically connected</p>  <p>Power and Control Unit mounted to a stack with UCB Power, SC and Control Unit mounted to a stack with UCB</p>

Depending on your order, your system is a single unit or a stack with UCB. You cannot mount a single unit in a stack with UCB without having modifications done. The same applies if you want to take a unit out of a stack with UCB and operate it as a single unit. If a modification is necessary, contact your dSPACE local representative.

Unit connection bus (UCB) If a RapidPro Control Unit is combined with one or more SC and/or Power Units to make a common system, the UCB is the electrical connection between the units.

In a stack with UCB, the Control Unit provides the following external connections:

- All the units in a stack are powered via the Control Unit. However, if there is a Power Unit in the stack, it must be additionally connected to the power supply for driving loads at its outputs.
- To configure your system, you only have to connect the Control Unit to the host PC.

- To connect the RapidPro system to a prototyping system like MicroAutoBox, only the Control Unit has to be connected via a high-speed serial link (LVDS).

Hardware equipment

The following terms are used in connection with the hardware equipment of a RapidPro system:

Routing code The routing code defines which SC or PS module can be installed on which slot of a RapidPro unit and contains the necessary pin-mapping information. The routing code is provided by dSPACE and you cannot change it. The code varies according to the unit type, the unit assembly, and the microcontroller used in the Control Unit.

RoutingID Unique identification number of a routing code.

Hardware topology The hardware topology describes the hardware components (number and types of units and modules) used in a RapidPro system and their installation location within the system.

TopologyID Unique identification number of a hardware topology.

HTF file The hardware topology file contains hardware-related information on a specific RapidPro system, such as components, their installation positions and serial numbers, and the TopologyID. It is automatically generated and stored on your host PC when the hardware data of a connected system is loaded to an application. This file also allows you to work with ConfigurationDesk for RapidPro without connected hardware.

CDS file The configuration file contains information on the configuration settings (for example, the settings of software-configurable parameters) on a specific ConfigurationDesk application. It is automatically generated and stored on your host PC when the hardware data of a connected system is loaded to an application. This file also allows configuration without connected hardware.

HWT file This file is a specific hardware topology file needed to introduce the RapidPro hardware to the RTI RapidPro Control Unit Blockset. It contains all the hardware-related information needed by the blockset.

Operating modes of RapidPro hardware

Your RapidPro hardware can operate in different modes. The following are the most important:

Idle mode No real-time application is being executed on the hardware. You can change the settings of software-configurable hardware parameters via ConfigurationDesk for RapidPro. Display of diagnostic messages is not supported.

Execution mode A real-time application is being executed on the hardware. You cannot configure hardware parameters. Display of diagnostic messages is provided.

For detailed basic information on the operating modes, refer to [Switching to Modes and States \(ConfigurationDesk for RapidPro - Guide !\[\]\(248b91fcdac4810ffd15cf33fb6aec6f_img.jpg\)](#)).

Application states in ConfigurationDesk for RapidPro

An application is the basis for carrying out a specific configuration task. It contains data relating to specific RapidPro hardware, for example, the configuration of SC and PS modules. An application can work in three different states.

Not connected to hardware In this state the active application has no relationship to the connected hardware or there is no hardware connected. If you change configuration settings, the changes are only saved in the configuration file (*.CDS).

Connected to hardware In this state the application is compatible with the connected hardware. If you change configuration settings, the changes are saved in the configuration file (*.CDS). They are downloaded to the connected hardware just after you switch the application state to module setup mode.

Module setup mode In module setup mode, you have direct access to the connected RapidPro hardware. If you change configuration settings, the changes are immediately saved on the hardware.

For detailed basic information on the various states, refer to [Switching to Modes and States \(ConfigurationDesk for RapidPro - Guide !\[\]\(0aff635c4179ba9e710b00f4b01d3b20_img.jpg\)](#)).

Hardware Shipment

Objective

The RapidPro hardware comes preconfigured as ordered. Standard and optional accessories (if ordered) are also supplied.

Delivery state

The RapidPro system is assembled, for example to a stack, with the required modules installed in the units. The configuration settings are as follows:

- The software-configurable parameters of the modules are set to defined factory default settings. You can use ConfigurationDesk for RapidPro to display and change the parameters.
- The equipment of the user-configurable circuits (available on various modules) is shipped by dSPACE as follows:
 - If you did not specify components in your order, the user-configurable circuit is shipped with factory default components to provide the module's basic functionality.
 - If you specified components in your order, these are already soldered by dSPACE.
 - In both cases component values or parameters defined by component values (for example, filter frequencies) are stored as reminders on the hardware. You can use ConfigurationDesk for RapidPro to display these values and parameters.

Standard accessories

The following hardware accessories are delivered with every RapidPro system as standard:

- *Two hexagon socket wrenches* for assembling the units, in different sizes: 6 mm (0.24 in.) and 2.5 mm (0.1 in.)
- *Sub-D connectors* for matching the I/O connectors on the unit(s) delivered. The type and the number depends on the number of I/O connectors on the delivered system.
- *Crimp contacts* for crimping. The number depend on the Sub-D connectors supplied.

Optional accessories

Optional accessories (such as the dSPACE RapidPro Crimper Tool and the PC connection cable) are supplied on request. For a complete overview, refer to [Hardware Accessories \(RapidPro System Hardware Installation Guide !\[\]\(950a62bbddad88d64435fd35607dfc42_img.jpg\)](#)).

Documentation Overview

Objective

After you install the dSPACE software, you can access the documentation as online help or printable Adobe PDF files.

Available documentation

The table shows the documents which are available for the RapidPro hardware, ConfigurationDesk for RapidPro, and the RapidPro implementation software.

Document	Contents	PDF File Name	Printed Version ¹⁾
Software Installation (including ConfigurationDesk for RapidPro)			
Installing dSPACE Software	<ul style="list-style-type: none"> ▪ Describes the software installation from scratch. ▪ Guides you to further basic information and advanced installation practices. 	InstallingdSPACESoftware.pdf	X
Managing dSPACE Software Installations	<ul style="list-style-type: none"> ▪ Provides detailed information on managing dSPACE software installations on your host PC. 	InstallationManagerManagingdSPACEInstallations.pdf	–
RapidPro Hardware			
Getting Started	<ul style="list-style-type: none"> ▪ Describes how to start handling the RapidPro hardware via ConfigurationDesk for RapidPro. ▪ Describes the steps necessary for powering and connecting the hardware under laboratory conditions for configuration purposes only. 	RapidProSystemGettingStarted.pdf	X
Hardware Installation Guide	Provides all information relevant to installing and connecting the RapidPro hardware, such as: <ul style="list-style-type: none"> ▪ Installing the hardware ▪ Building the cable harness ▪ Connecting the hardware ▪ Changing RapidPro hardware 	RapidProSystemHardwareInstallationGuide.pdf	–

Document	Contents	PDF File Name	Printed Version ¹⁾
Installation and Configuration Reference	Provides hardware-related reference information on the components of the RapidPro hardware, such as: <ul style="list-style-type: none"> ▪ Technical data ▪ I/O circuits/block diagrams ▪ Configuration features 	RapidProSystemHardwareReference.pdf	–
ConfigurationDesk for RapidPro			
Guide	Introduces you to ConfigurationDesk for RapidPro and shows how to use it: <ul style="list-style-type: none"> ▪ Setting up projects and applications ▪ Configuring RapidPro hardware ▪ Monitoring hardware ▪ Exporting data that is required by other applications and users 	ConfigurationDeskforRapidProGuide.pdf	–
Reference	Provides detailed information on the menus, context menus, and dialogs contained in ConfigurationDesk for RapidPro.	ConfigurationDeskforRapidProUserInterfaceReference.pdf	–
RapidPro System (I/O Subsystem) – RTI/RTLib Implementation Software			
I/O Subsystem – MPC565 Implementation Features	<ul style="list-style-type: none"> ▪ Introduces you to the RapidPro implementation software and to the features which are supported by the RTI RapidPro Control Unit Blockset and the RapidPro RTLib functions and programs. ▪ Gives instructions and examples for implementing your control models with the RTI RapidPro Control Unit Blockset. 	RapidProSystemIOSubsystemMPC565ImplementationFeatures.pdf	–
I/O Subsystem – MPC565 RTI Reference	Provides detailed information on the blocks of the RTI RapidPro Control Unit Blockset.	RapidProSystemIOSubsystemMPC565RTIReference.pdf	–
I/O Subsystem – MPC565 RTLib Reference	Provides detailed descriptions of the C functions needed to program RTI-specific Simulink S-functions or implement your control models via C programs (handcoding).	RapidProSystemIOSubsystemMPC565RTLibReference.pdf	–

¹⁾ Available on demand.

Installing and Connecting RapidPro System

Objective Installing and connecting covers all the steps required for powering the RapidPro system and working with it.

Where to go from here

Information in this section

[Checking the Host PC and Power Supply Requirements..... 33](#)

You have to provide a host PC and a power supply which fulfill the requirements listed.

[How to Build a Power Supply Cable..... 34](#)

The power supply inputs of the RapidPro units are located with other inputs and outputs on the I/O connectors. dSPACE does not provide a cable for access only to the power supply inputs. You have to provide this cable yourself.

[How to Install and Connect the System..... 37](#)

Follow the instructions given to avoid malfunctions.



Checking the Host PC and Power Supply Requirements

Objective You need a host PC for ConfigurationDesk for RapidPro and a power supply to power the RapidPro hardware.

Requirements

The host PC and power supply must fulfill the following requirements:

Item	Requirement
Host PC	Hardware equipment <ul style="list-style-type: none"> For details on the required processor, clock rate and main memory (RAM), refer to

Item	Requirement	
		Host PC Hardware (Installing dSPACE Software ) . <ul style="list-style-type: none"> ▪ One USB port for configuration ▪ Depending on the license mechanism you have purchased: One port (parallel, or USB) for the execution key (dongle).
	Operating system	For details, refer to Operating System (Installing dSPACE Software ) .
Power supply (car battery or lab power supply)	Output voltage range	<ul style="list-style-type: none"> ▪ +6 V ... +60 V DC ▪ +12 V ... +14 V DC are recommended for best efficiency
	Output current	5 A start-up current required (each unit) ¹⁾
	Power consumption ²⁾	Up to 10 W (each unit)

¹⁾ For example: Three units in a stack with UCB require 15 A start-up current.

²⁾ The power consumption stated is sufficient for working with the RapidPro hardware without connected sensors and actuators and without running an application. To run an application without connected loads, each unit requires up to 30 W depending on the RapidPro modules used. External loads may require much more additional power.

Related topics

References

[Appendix: System Requirements \(Installing dSPACE Software !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)\)](#)

How to Build a Power Supply Cable

Objective

To power the RapidPro system, you can connect it to a car battery or a laboratory power supply. You first have to provide a power supply cable with a Sub-D connector to access the power supply inputs of the RapidPro hardware.

Power supply inputs

The power supply inputs are located on the I/O connectors of the front panels of the units. The pins are named UBAT and GND.

Soldering/crimping

You have to solder and/or crimp wires to a female Sub-D I/O connector. Use the especially designed dSPACE RapidPro crimper tool for crimping. If you are not experienced in crimping, refer to [Crimping Contacts \(RapidPro System Hardware Installation Guide !\[\]\(e3275251d0893157c3584e20c81dc3ba_img.jpg\)\)](#).

Restrictions

The instructions given below are sufficient only for powering the RapidPro hardware for configuration purposes without running an application and without connected sensors and actuators.

For connecting the hardware to the power supply in real applications (with connected sensors and actuators), refer to [Basics on Connecting to Power Supply \(RapidPro System Hardware Installation Guide !\[\]\(4729e517bc6a7cd81c8025b9646574fb_img.jpg\)](#)).

Preconditions

Ensure you have all the items in the table below before starting:

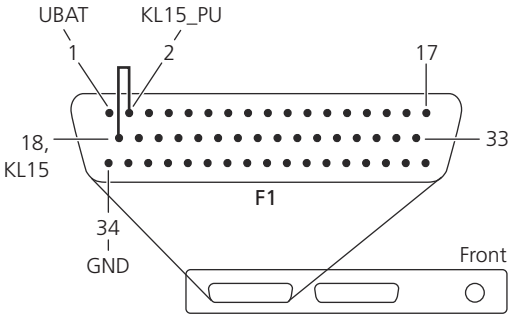
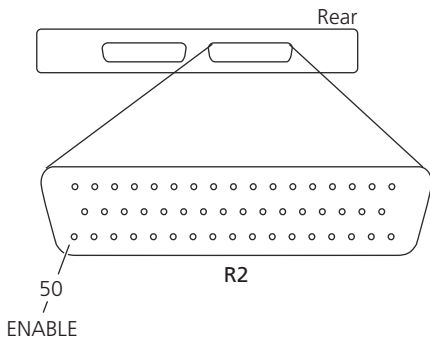
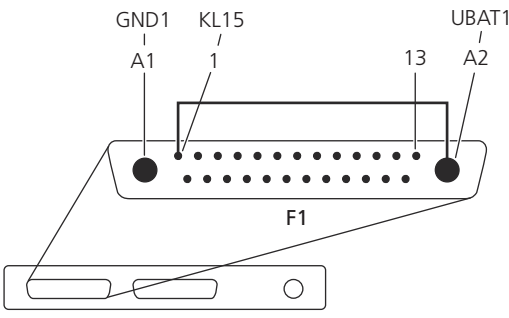
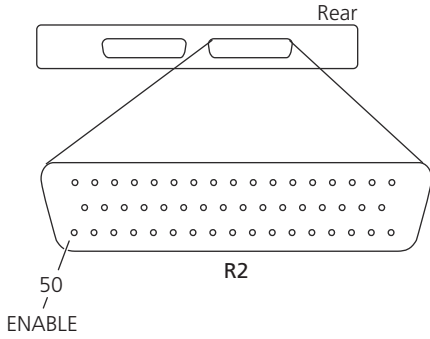
Items	Description
1 female Sub-D connector	<ul style="list-style-type: none"> Matching the F1 I/O connector at the unit. Comes with the RapidPro hardware package.
Crimp contacts	Come with the RapidPro hardware package.
2 wires	<ul style="list-style-type: none"> To build the cable to the power supply. Recommended: <ul style="list-style-type: none"> Min. cross-section 2 mm² (AWG 14) ¹⁾ Max. length 5 m (16.4 ft.)
RapidPro Crimper Tool	<ul style="list-style-type: none"> Especially designed to crimp the contacts needed for the RapidPro I/O connectors. Comes with the RapidPro hardware package if ordered.
Soldering station	As usual

¹⁾ To build a cable for a single SC Unit, a min. cross-section of 0.8 mm² (AWG 18) is recommended.

Method**To build a power supply cable:**

- 1 From the hardware package select the female Sub-D connector, which matches the F1 connector at the unit, which has to be connected to power supply (see illustration below).
- 2 Crimp and/or solder wires to the pins of the female Sub-D connector.

- 3 To provide continuous operation of the hardware, connect the remote control inputs (KL15 pins) as shown below within the connector shell.

Unit	Front Panel with Connectors and Pins	Remarks
SC Unit (as single unit)		<ul style="list-style-type: none"> Connect KL15 with KL15_PU within the connector shell.
		<ul style="list-style-type: none"> To switch on the outputs of the modules installed in the unit, you have to connect the ENABLE input to an external +5 V DC signal.
Power Unit (as single unit)		<ul style="list-style-type: none"> Connect KL15 with UBAT within the connector shell. High-current contacts (A1, A2) have to be soldered, others must be crimped.
		<ul style="list-style-type: none"> To switch on the outputs of the modules installed in the unit, you have to connect the ENABLE input to an external +5 V DC signal.

Unit	Front Panel with Connectors and Pins	Remarks
Control Unit		<ul style="list-style-type: none"> Connect KL15 with KL15_PU within the connector shell. High-current contacts (A1, A2) have to be soldered, others must be crimped.
Stack with UCB	<p>If the SC or Power Unit is part of a stack with UCB, you do not have to connect it to the power supply separately. The supply voltage connected on the F1 I/O connector of the stack's Control Unit is passed on to the other units via UCB. Only the Control Unit has to be connected to the power supply.</p>	

- 4 Mark the two wires (which form the cable), to identify the positive terminal (UBAT) and the negative terminal (GND) of the cable.
- 5 Close the connector shell.

Result You built a power supply cable which you can also use for configuration purposes on further RapidPro systems.

Next step Continue with [How to Install and Connect the System](#) on page 37.

How to Install and Connect the System

Objective The RapidPro system is based on the RapidPro hardware and ConfigurationDesk for RapidPro. To avoid malfunctions, install and connect the components in the exact order stated.

Preconditions Ensure you have all the items in the table below before starting:

Items	Description
dSPACE Release	<ul style="list-style-type: none"> As of dSPACE Release 4.2, ConfigurationDesk for RapidPro is part of the dSPACE DVD. <i>For software installation, you need administrator rights.</i>
License	ConfigurationDesk for RapidPro is license-protected.
Host PC and power supply	<ul style="list-style-type: none"> These items must fulfill the requirements listed in Checking the Host PC and Power Supply Requirements on page 33.

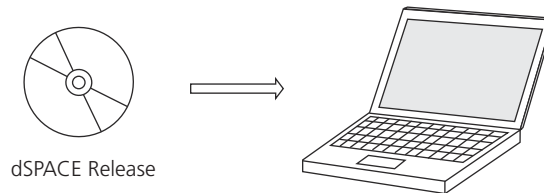
Items	Description
PC connection cable	<ul style="list-style-type: none"> ▪ USB cable for communication between the RapidPro hardware and your host PC. ▪ Comes with the RapidPro hardware package if ordered. ▪ Use only the cable which is supplied by dSPACE.
Power supply cable	<ul style="list-style-type: none"> ▪ You have to provide this cable yourself. For instructions on building it, refer to How to Build a Power Supply Cable on page 34.

Method

To install the RapidPro system

- 1 Install ConfigurationDesk for RapidPro on your host PC.

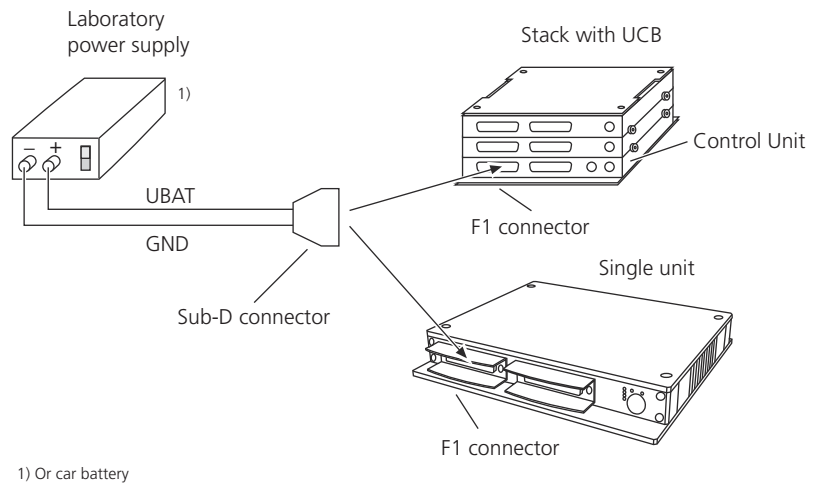
To get the full functionality of ConfigurationDesk for RapidPro, you must install the ConfigurationDesk for RapidPro product set (available on DVD 2) and the Real-Time Interface product set (available on DVD 1). The latter product set contains additional software for the RapidPro system: the latest RapidPro firmware, a firmware update tool, and the implementation software for the RapidPro Control Unit (for example, the RTI RapidPro Control Unit Blockset).



- 2 Connect the RapidPro hardware to the power supply as shown below.

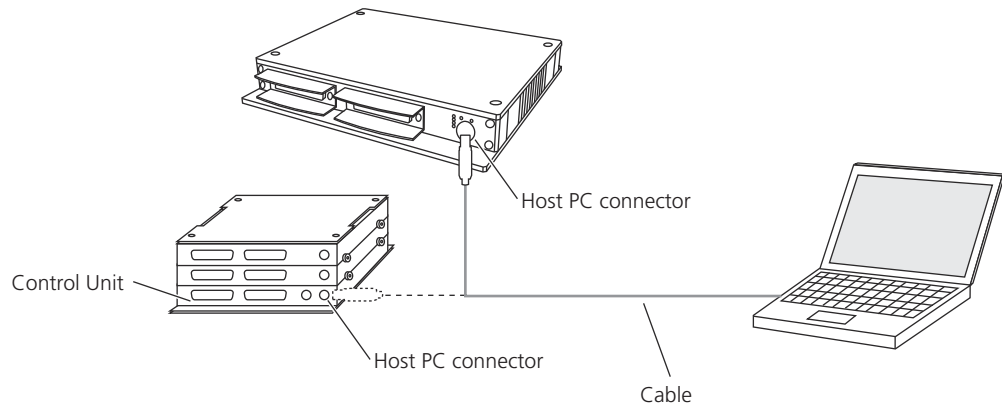
Note

Before connecting switch off your power supply.
If your RapidPro system is a stack with UCB, it is sufficient to connect only the Control Unit to the power supply.



3 Establish a communication connection between the RapidPro system and your host PC.

The RapidPro hardware supports the universal serial bus (USB) for connection to the host PC. It therefore supports hot plug-and-play capability. This means you can connect the devices at any time, regardless of whether they are powered on or not.



Note

If your RapidPro system is a stack with UCB, you must only connect the Control Unit to the host PC.

Result

Installation and connection work is complete.

Next step

For access to the hardware components of your RapidPro hardware via ConfigurationDesk for RapidPro, continue with [Viewing the Hardware Equipment](#) on page 41.

Viewing the Hardware Equipment

Objective You can review the hardware equipment of your RapidPro system without opening the housing via ConfigurationDesk for RapidPro. ConfigurationDesk for RapidPro provides all important information, such as installed components, their installation locations in the system, and other specific hardware details.

Where to go from here

Information in this section

How to Load Data of Connected RapidPro Hardware.....	41
To obtain an overview of the hardware components in your system, you must announce your RapidPro system to ConfigurationDesk for RapidPro.	
How to View Hardware Details of Your System.....	44
After hardware data is loaded to ConfigurationDesk for RapidPro, you can check details of the installed hardware, such as configuration settings, or specific identification information like version and serial numbers.	
How to Update RapidPro Firmware.....	47
Your RapidPro system always contains the newest firmware available at the time of delivery. However, a firmware update is mandatory if ConfigurationDesk for RapidPro displays RapidPro hardware with out-of-date firmware.	

How to Load Data of Connected RapidPro Hardware

Objective ConfigurationDesk for RapidPro requires data on the hardware components installed and the installation location of the components in your system (= hardware topology). ConfigurationDesk for RapidPro can read out the data directly from the hardware.

Multiple connection

Only one RapidPro system can be accessed via ConfigurationDesk for RapidPro. If multiple RapidPro systems are connected to the host PC and powered, the first RapidPro system detected by the host PC is accessible via ConfigurationDesk for RapidPro.

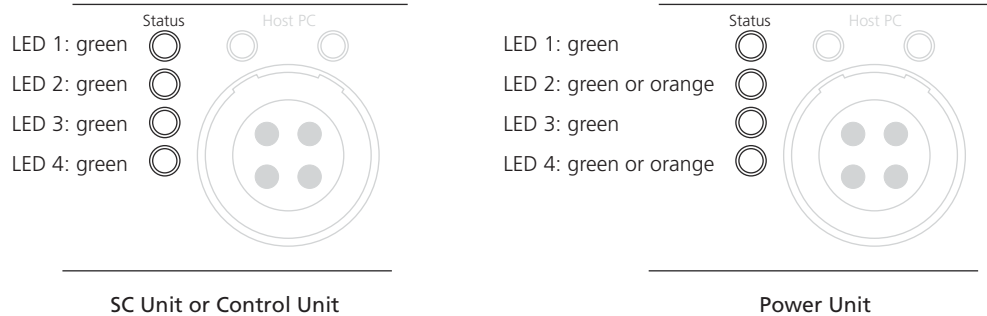
Preconditions


- ConfigurationDesk for RapidPro is installed on your host PC.
- The hardware is connected to your host PC and to the power supply.

Method**To load data of connected RapidPro hardware to ConfigurationDesk for RapidPro**

- 1 Power on the RapidPro hardware.

Status LEDs 1 ... 4 on the front panel of the units in the connected system must be lit as follows:



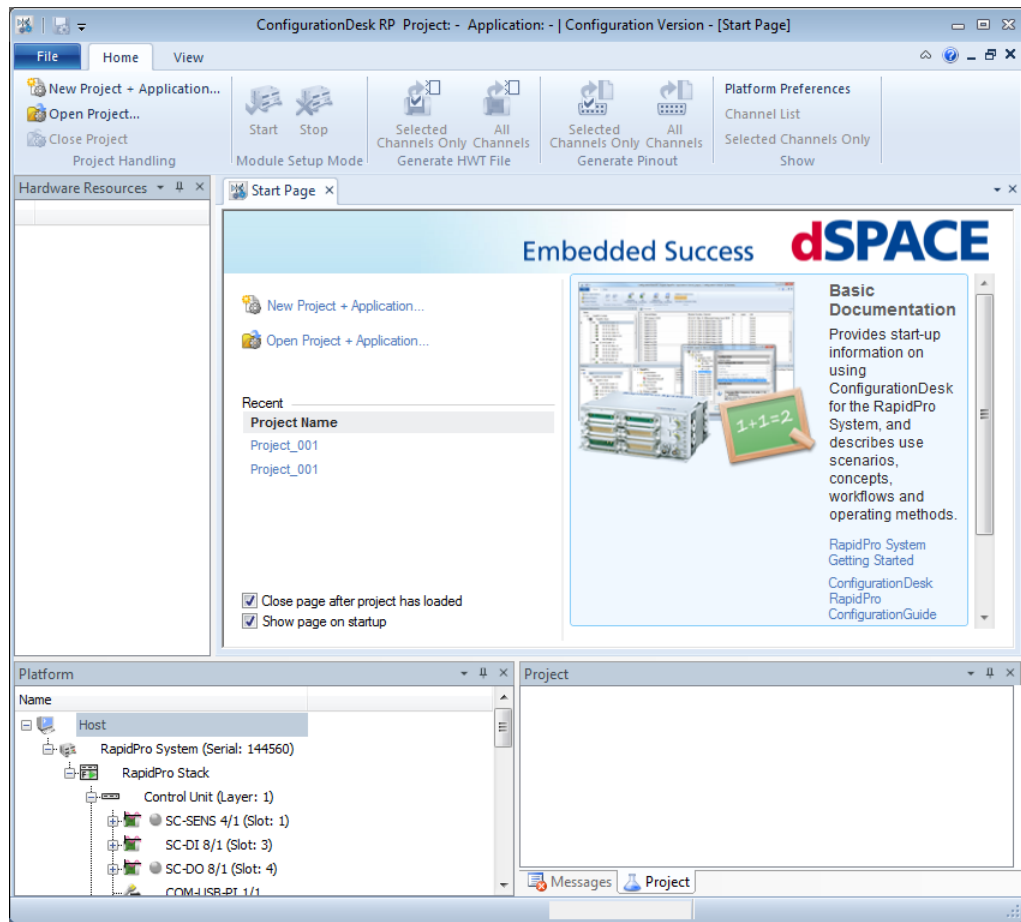
For the meanings of the LEDs, refer to the respective chapters of the RapidPro units in the [RapidPro System Hardware Reference](#) .

- 2 From the Start menu, select dSPACE ConfigurationDesk for RapidPro <x.y>, and click dSPACE ConfigurationDesk for RapidPro <x.y>.

<x.y> is a placeholder for the software version, since your host PC can have multiple installations and multiple items in your start menu.

Result

ConfigurationDesk for RapidPro opens. The hardware data of the connected system is loaded. ConfigurationDesk for RapidPro displays the connected hardware in the Platform Manager in a structured tree.



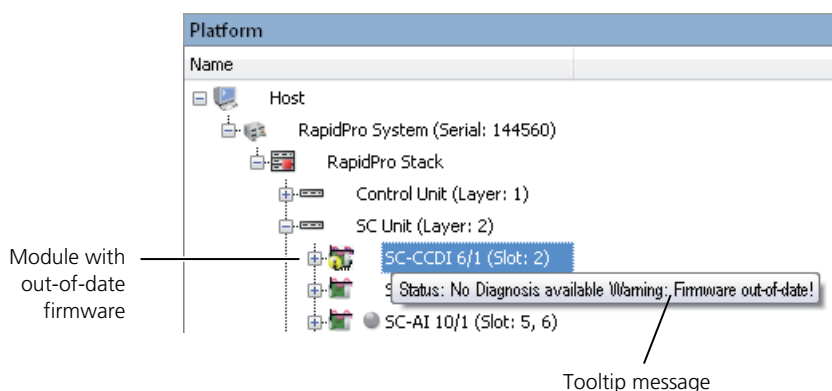
Firmware check

While loading hardware data, ConfigurationDesk for RapidPro checks if your RapidPro system contains out-of-date firmware.

Note

ConfigurationDesk for RapidPro provides this automatic firmware check only if the Real-Time Interface product set is installed on your PC. This product set contains the latest RapidPro firmware and the required firmware update tool.

Affected components are marked with a specific symbol. In addition, a tooltip message is provided. If the firmware is out-of-date, working with these components is not possible.



To work without restrictions, you have to update the firmware. For instructions, refer to [How to Update RapidPro Firmware](#) on page 47.

Next step

Now you can access more hardware details. Continue with [How to View Hardware Details of Your System](#) on page 44.

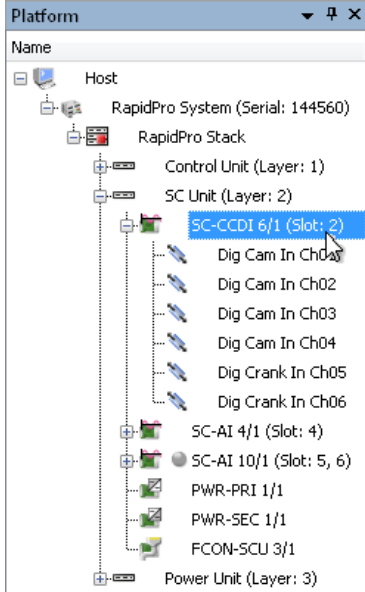
How to View Hardware Details of Your System

Objective

After you have loaded hardware data of the connected system to ConfigurationDesk for RapidPro, you can view and check details of the installed hardware, such as configuration settings or specific identification information like version and serial numbers.

Accessing hardware details

Via the Platform Manager you can access all hardware-related data.

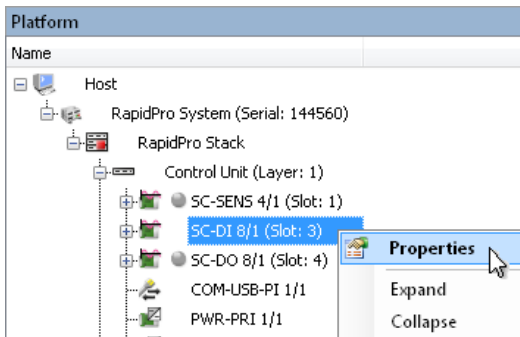
Display	Description
	<ul style="list-style-type: none"> The Platform Manager displays all units, modules, and channels of your RapidPro system in a structured tree: <ul style="list-style-type: none"> RapidPro System holds all the components of the connected RapidPro system. A unit is displayed as a container for the modules (SC, PS modules, and other hardware modules of the unit). A module is displayed as a container for the channels. The system is identified by its unique serial number. This number is displayed next to the "RapidPro System" item and also printed on the rear side of the RapidPro housing. If your system is a stack with UCB (unit connection bus), the serial number of the system is equivalent to the serial number of the Control Unit installed in the stack. For details on the meanings of the icons in the Platform Manager, refer to Platform Manager (ConfigurationDesk for RapidPro User Interface Reference).

Note

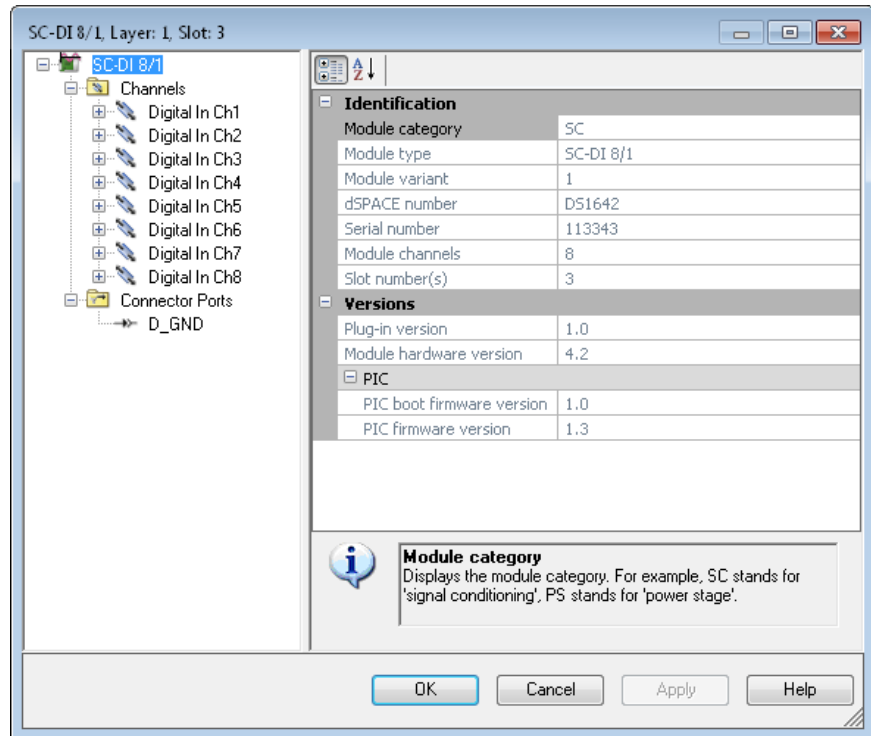
You cannot change the configuration settings which affect the hardware's behavior via the Platform Manager. These settings can be changed only via the Configuration Manager. For details, refer to [Configuring RapidPro Hardware \(ConfigurationDesk for RapidPro - Guide\)](#).

Method**To view hardware details of your system**

- 1 In the hardware tree of the Platform Manager, right-click a hardware component and select Properties from the context menu.



The properties dialog opens.



- 2 In the hardware tree, click a hardware component to view the related properties.
- 3 For detailed descriptions of the properties, click Help or F1.
dSPACE HelpDesk opens, displaying detailed reference information.

Accessible properties

The table below shows the property categories which are available for the components.

Component	Hardware-related Data	Notes
RapidPro system	<ul style="list-style-type: none"> Stack name RoutingID TopologyID 	The Stack name parameter is not available for single SC and PS units.
Units	<ul style="list-style-type: none"> Unit name Identification information Version information Monitored system values 	—
Modules	<ul style="list-style-type: none"> Identification information Version information Configuration parameters relevant to <i>all channels</i> of a module 	—
Connector ports ¹⁾	<ul style="list-style-type: none"> Port description 	—

Component	Hardware-related Data	Notes
Channels	<ul style="list-style-type: none"> Configuration parameters relevant to a <i>specific channel</i> 	–
	<ul style="list-style-type: none"> Parameter of user-configurable circuits 	<ul style="list-style-type: none"> The values entered are stored on the hardware as reminders. They do not affect the channel's behavior. ConfigurationDesk for RapidPro does not check whether the entries comply with the hardware equipment on the module.
Module ports ²⁾	<ul style="list-style-type: none"> Port description Configuration parameters of specific signals Signal monitoring values 	–
Connector ports ¹⁾	<ul style="list-style-type: none"> Port description 	–

¹⁾ A connector port represents one signal of a channel (or a channel-independent signal of a module) which is connected to the front I/O connectors of a RapidPro unit. Each channel (and each module) can contain multiple connector ports.

²⁾ A module port represents a signal of a channel (or a channel-independent signal of a module) which is connected to further signal processing. Depending on the use case, it is connected to the microcontroller of the Control Unit or to the rear I/O connectors of single SC and Power Units. Each channel (and each module) can contain multiple module ports.

How to Update RapidPro Firmware

Objective

Your RapidPro system always contains the newest firmware available at the time of delivery. As part of continuous development, dSPACE updates the firmware to support new features or to fix bugs.

A firmware update is mandatory if ConfigurationDesk for RapidPro displays RapidPro hardware with out-of-date firmware. In this case working with the RapidPro system is restricted.

Distribution

Firmware updates are distributed either in the regular dSPACE Releases or as patches on <http://www.dspace.com/goto?support>.

Recommendation

dSPACE recommends to check the status of your firmware periodically and to update the firmware to the latest version.

Update tool

To simplify the update procedure, dSPACE provides a specific RapidPro Firmware Update tool. The tool compares the current firmware versions with those

available in the active dSPACE installation. You are prompted to state whether your system needs an update.

You can also use this tool if you are not sure about the state of your firmware.

Note

You can only access the RapidPro firmware update tool if the **Real-Time Interface** product set is installed on your PC. This product set includes the latest RapidPro firmware and the tool itself.

Preconditions

- The **Real-Time Interface** product set is installed on your PC, which contains the latest RapidPro firmware and the RapidPro Firmware Update tool.
- The RapidPro system is connected to your host PC via USB.
- If you use the RapidPro system as an I/O subsystem (for example, single Control Unit, or a stack with UCB):
 - The Control Unit is connected to the rapid control prototyping (RCP) hardware (MicroAutoBox II or DS1007) via LVDS.
 - The RCP hardware (MicroAutoBox II or DS1007) is connected to your host PC.
- All systems (host PC, RapidPro, RCP) are switched on.

Method**To update RapidPro firmware****NOTICE**

Interrupting the update process disables the function of the hardware.

If the firmware update is interrupted, you have to restart the update process.

- 1 Check that all required connections exist and the involved systems are switched on. See preconditions above.
- 2 Close ConfigurationDesk for RapidPro.
- 3 Open a Command Prompt window (= DOS window) via the **Command Prompt for dSPACE RCP and HIL** <x.y> shortcut from the Windows Start menu.

Tip

If you use the **Command Prompt for dSPACE RCP and HIL** shortcut the required paths and environment settings are automatically set.

- 4 Type the following at the command line: **RapidProUpdate**

- 5 Follow the instructions on the screen and check if the *PLD firmware* of SC and/or PS modules has to be updated.

⚠ WARNING

Risk of injury and/or material damage. Updating the PLD firmware of any SC or PS module can cause uncontrolled movements of connected devices.

Disconnect actuators and/or sensors from the affected modules before you continue the update process.

Result

The firmware update for the RapidPro system is complete.

Exporting Data of RapidPro Hardware

Objective	Specific hardware data of your RapidPro system is needed for other worksteps. For example, when you have to prepare and build the cable harness you have to know the pinout information of the I/O connectors. ConfigurationDesk for RapidPro features functions for access to this specific information.
------------------	---

Where to go from here	Information in this section
	<div>How to Define an Application Based on Connected Hardware..... 52 To export data of the RapidPro hardware, it is necessary to define an application first. An application is the basis for carrying out configuration tasks and managing data.</div> <div>How to Communicate via Channel Names..... 55 The worksteps needed to prepare the RapidPro hardware are often performed by different users. To avoid misunderstandings on the I/O signals, you can change channel names to those defined for your project.</div> <div>How to Export Pinout Information..... 56 Because the RapidPro hardware is modular, the pinout of the I/O connectors is not fixed. To build a cable harness for example, you must know the current pinout of your specific RapidPro hardware.</div> <div>How to Generate Hardware Information Needed by the RTI RapidPro Control Unit Blockset..... 58 The RTI RapidPro Control Unit Blockset also requires information about the RapidPro hardware. This is essential for implementing a model where a RapidPro Control Unit is involved.</div>

How to Define an Application Based on Connected Hardware

Application

An application contains topology and configuration data relating to a specific RapidPro hardware, for example, the configuration settings of SC and PS modules. An application is the basis for carrying out configuration tasks and managing hardware data.

Project Wizard-based data handling

A project manages one or more applications that belong together. A Project Wizard leads you through all the steps necessary to define a project and an application, and load all RapidPro hardware data that is required for an application.

Preconditions

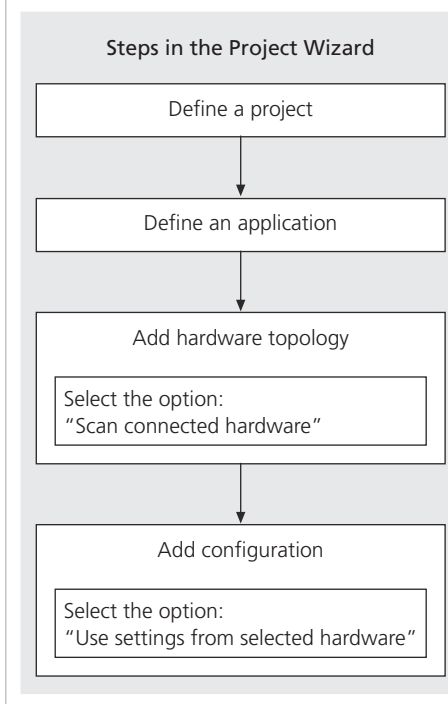
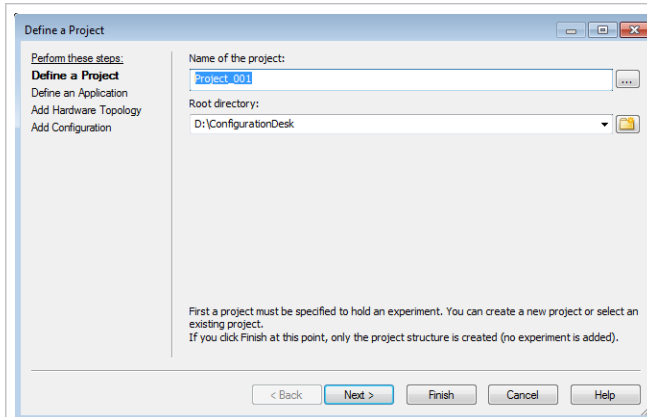
- A valid license for ConfigurationDesk for RapidPro is available.
- RapidPro hardware is connected to your host PC and displayed in the Platform Manager.

Method

To define an application based on connected hardware

- 1 From the File menu, select New Project + Application.

ConfigurationDesk for RapidPro opens the first dialog of the Project Wizard, the Define a Project dialog.

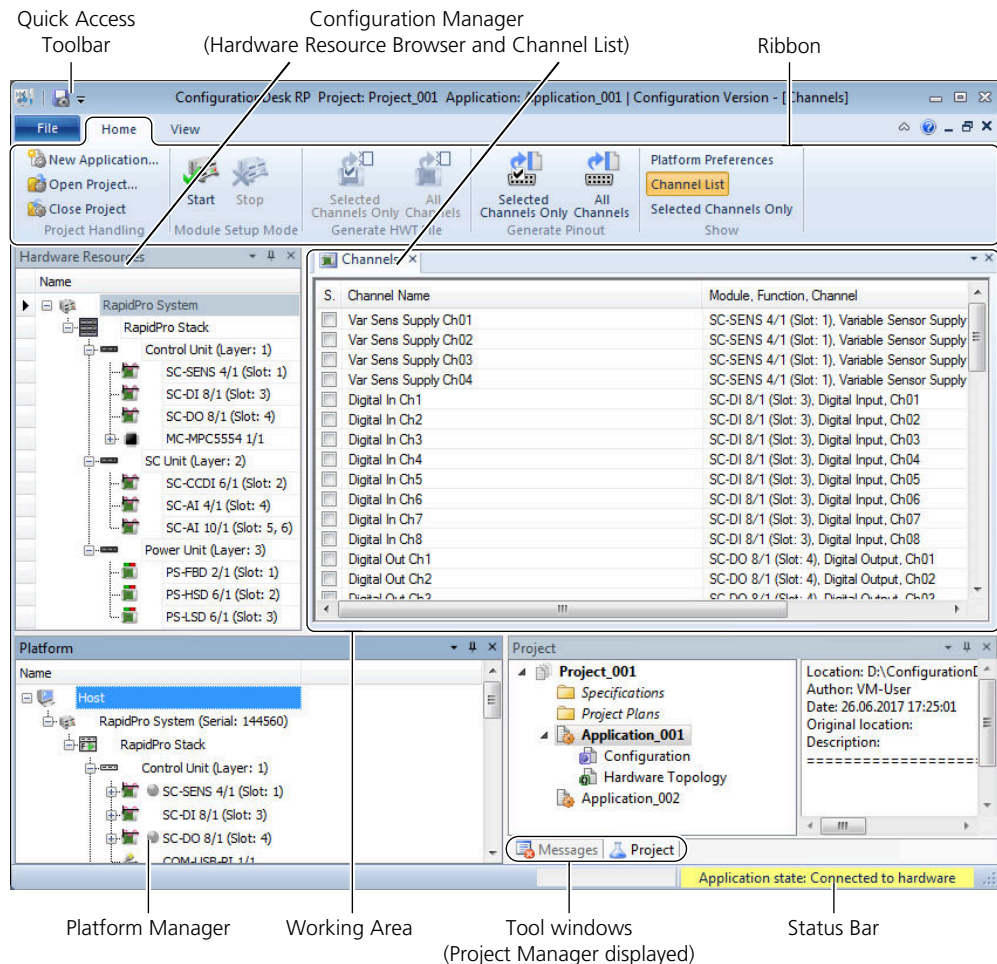


- The Project Wizard guides you through all the steps necessary to define a project and application, and to add a hardware topology and a system configuration to an application.
- The wizard comprises four steps. Each step has its own dialog.
- For more basic information on the features of the Project Wizard and detailed instructions on advanced usage, refer to [Managing Projects and Applications \(ConfigurationDesk for RapidPro - Guide\)](#).

- 2 Click the Next> button to move from step to step in the Project Wizard, selecting the options shown in the illustration above.

Result

The hardware data of the connected system is loaded to the new application. ConfigurationDesk for RapidPro displays the hardware in the Configuration Manager in a structured tree and a list view.



Component	Description
Configuration Manager	<p>The Configuration Manager consists of the Hardware Resource Browser (left) and the Channel List (in the working area):</p> <ul style="list-style-type: none"> The <i>Hardware Resource Browser</i> displays the hardware topology (units and modules). You can access all unit-, module-, and channel-related data via the Module Browser. The <i>Channel List</i> displays the input and output channels of the modules. You can access all channel- and module-related data via the Channel List.
Platform Manager	<p>The Platform Manager displays the hardware components (stack, units, modules, and channels) of RapidPro systems connected to your host PC. How many systems are displayed in ConfigurationDesk for RapidPro depends on your use case. Each hardware component in the Platform Manager offers you component-specific commands.</p>
Tool Window	<p>The Tool Window shows either the Project Manager, or the Message Viewer, which you can choose via the Project and Messages tabs:</p> <ul style="list-style-type: none"> The <i>Project Manager</i> displays the structure of your project data and lets you manage your applications.

Component	Description
	<ul style="list-style-type: none"> The <i>Message Viewer</i> displays all system messages in chronological order, for example, diagnostic messages. It lets you search for messages and filters the messages to be displayed.
Status Bar	Displays the application state: <ul style="list-style-type: none"> Not connected to hardware Connected to hardware Module setup mode

How to Communicate via Channel Names

Objective

The worksteps for preparing the RapidPro hardware for use in your application are often performed by different users. This means that I/O signals must have unique names to avoid confusion. ConfigurationDesk for RapidPro lets you define your own channel names to comply with your project definitions.

Access to channel names

The channel names which you see in ConfigurationDesk for RapidPro and which you can rename are part of the exported output data required by other worksteps. You can view these channel names:

- In the pinout information list
- In the settings of the blocks in the RTI RapidPro Control Unit Blockset

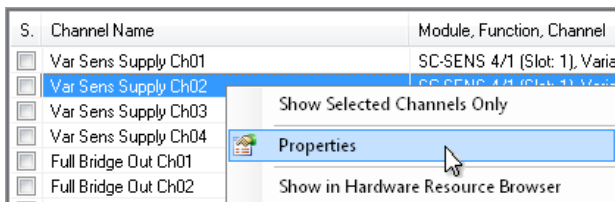
Preconditions

An application which contains hardware data (topology and configuration data) is active. For instructions, refer to [How to Define an Application Based on Connected Hardware](#) on page 52.

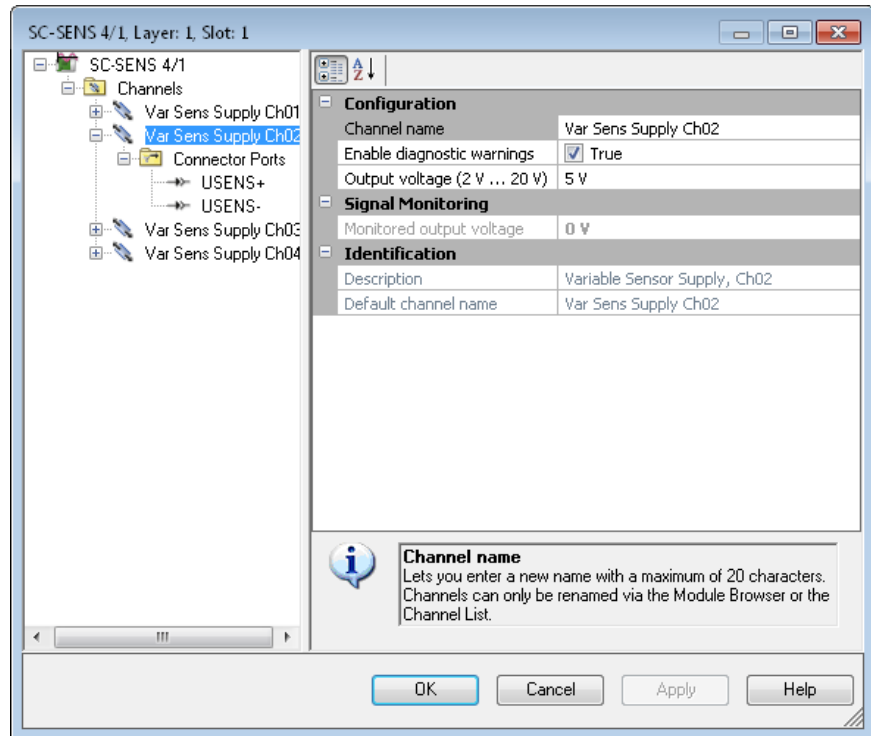
Method

To communicate via channel names

- In the Channel List, right-click the channel and select Properties from the context menu.



The properties dialog opens.



- 2 Click in the Channel name edit field.
- 3 Enter a new channel name and click OK.

Result

The channel is renamed. The new channel name is displayed in the Channel List. If you are working in module setup mode, the new name is also stored on the RapidPro hardware.

Next steps

It is recommended to export RapidPro hardware data when the channel names comply with your naming definitions. Depending on your task, continue with:

- [How to Export Pinout Information](#) on page 56 or
- [How to Generate Hardware Information Needed by the RTI RapidPro Control Unit Blockset](#) on page 58

How to Export Pinout Information

Objective

You need the pinout information of your RapidPro system:

- For building the I/O connectors of the cable harness
- For implementing hardware-related RTLib functions of the RapidPro implementation software

The pinout depends on the types of the installed modules and the slots on the units that they are inserted in. ConfigurationDesk for RapidPro lets you export the required pinout information to a file.

File format

The pinout information can be exported in a CSV file (*comma separated value*) or in an XLS file (Microsoft Excel™). CSV files can be viewed with CSV viewers, or with Microsoft Excel.

Reasons for updating the pinout information

If you change the RapidPro hardware as follows, the pinout information has to be updated:

- Add or remove a module
- Replace a module with one of another type
- Insert a module in another slot

Note

The following actions are also possible and require a pinout update, but must be performed by dSPACE:

- Add or remove a unit
- Rebuild a stack with the units in a different order

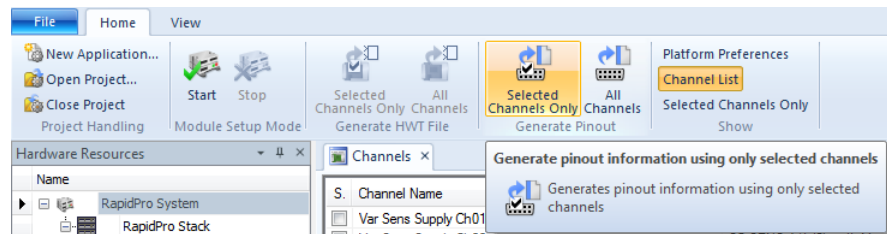
Preconditions

An application which contains hardware data (topology and configuration data) is active. For instructions, refer to [How to Define an Application Based on Connected Hardware](#) on page 52.

Method

To export pinout information

- 1 Click either Home – Generate Pinout – Selected Channels Only or Home – Generate Pinout – All Channels according to your needs.



The Save as dialog opens.

- 2 Choose a folder.
- 3 If Microsoft Excel is installed on your PC, you can select the Excel file name extension (**.xls**) in the Save as type list, otherwise **.csv**.
- 4 Enter a file name (with or without file extension).
- 5 Click Save.

Result

The pinout information of the active application is exported as follows, depending on the file type chosen:

File Type Chosen	Generated Files
.xls	XLS and CSV files
.csv	CSV file

Example

The following illustration shows an exported file opened with Microsoft Excel. The entries in the file are for a *Power Unit* used as a *single unit*.

F-Connector, Pin	R-Connector, Pin	Signal	Signal Description	Channel	Channel Name	Channel Description	Module	Layer	Unit Type	Slot
F1_017		FB_OUTB	Driver output B	1	Door left - Ch01	Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	1
F1_005		FB_OUTA	Driver output A	1	Door left - Ch01	Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	1
	R2_001	FB_PWM_IN	PWM control input	1		Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	1
	R2_002	FB_DIR_IN	Direction control input	1		Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	1
	R1_001	FB_VU_OUT	Current measurement output	1		Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	1
F1_016		FB_OUTB	Driver output B	2	Door right - Ch02	Full Bridge Output, Ch02	PS-FBD 2/1	1	Power	1
F1_004		FB_OUTA	Driver output A	2	Door right - Ch02	Full Bridge Output, Ch02	PS-FBD 2/1	1	Power	1
	R2_003	FB_PWM_IN	PWM control input	2		Full Bridge Output, Ch02	PS-FBD 2/1	1	Power	1
	R2_004	FB_DIR_IN	Direction control input	2		Full Bridge Output, Ch02	PS-FBD 2/1	1	Power	1
	R1_002	FB_VU_OUT	Current measurement output	2		Full Bridge Output, Ch02	PS-FBD 2/1	1	Power	1
F1_025		FB_OUTB	Driver output B	1	Full Bridge Out Ch01	Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	2
F1_013		FB_OUTA	Driver output A	1	Full Bridge Out Ch01	Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	2
	R2_007	FB_PWM_IN	PWM control input	1		Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	2
		FB_DIR_IN	Direction control input	1		Full Bridge Output, Ch01	PS-FBD 2/1	1	Power	2

One channel – several I/O pins

Note that several I/O pins on the front I/O connector (F-Connector) and rear I/O connector (R-Connector) may be related to a single logical channel number, for example, for complex I/O channels like full bridge drivers.

If you export the pinout information of a RapidPro stack with UCB, the “R-Connector, Pin” column is replaced by the “MC Channel” column. The “MC Channel” column indicates which channel of the Control Unit’s microcontroller module is involved.

How to Generate Hardware Information Needed by the RTI RapidPro Control Unit Blockset

Objective

If your RapidPro system is used as an I/O subsystem for an existing rapid control prototyping (RCP) system, the corresponding RTI Blockset requires hardware topology information.

ConfigurationDesk for RapidPro lets you generate the required information to an HWT file. The HWT file can be imported in the RTI RapidPro Control Unit Blockset, and introduces the RapidPro hardware to the blockset.

Reasons for generating a (new) HWT file

If you perform one of the following actions, a new HWT file has to be generated:

- Change the name of a channel
- Change of the RapidPro hardware (= change of the TopologyID):
 - Add or remove a module
 - Replace a module with one of another type
 - Insert a module in another slot

Note

The following actions are also possible and require an HWT file update, but must be performed by dSPACE:

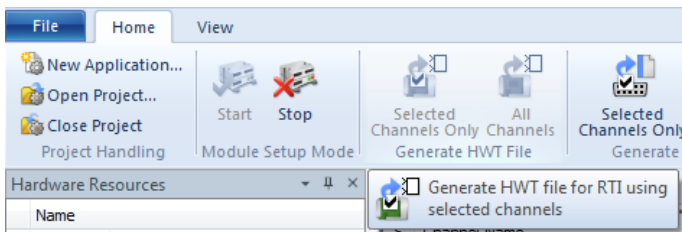
- Add or remove a unit
- Rebuild a stack with the units in a different order

Preconditions

- An application which contains hardware data (topology and configuration data) is active. For instructions, refer to [How to Define an Application Based on Connected Hardware](#) on page 52.
- Generating an HWT file for RTI is only possible if your application holds hardware data of a RapidPro system which is used in an I/O subsystem scenario (= Control Unit based on MPC565 microcontroller).

Method**To generate hardware information needed by RTI RapidPro Control Unit Blockset**

- 1 Click either Home – Generate HWT File – Selected Channels Only or Home – Generate HWT File – All Channels according to your needs.



The Save as dialog opens.

- 2 Choose a folder.
- 3 Enter a file name (with or without file name extension **.hwt**) and click Save.

Result

An HWT file is generated and saved in the chosen folder. This file can be imported in the RTI RapidPro Control Unit Blockset. For instructions, refer to [How to Import the Hardware Topology to a Model \(RapidPro System – I/O Subsystem MPC565 Implementation Features\)](#).

A

accessing hardware details via ConfigurationDesk for RapidPro 45
 application state
 connected 29
 not connected 29

B

building power supply cable 35

C

CDS file 28
 ConfigurationDesk for RapidPro
 accessing hardware details 45
 application states 29
 Channel List 53
 Message Viewer 53
 Module Browser 53
 Platform Manager 42
 Project Manager 53
 Project Wizard 52

D

documentation, available 30

E

execution mode 28
 exporting data about RapidPro hardware
 exporting data for RTI Blockset 58
 exporting pinout information 56

F

files
 CDS file 28
 HTF file 28
 HWT file 28
 firmware
 check 43
 out-of-date 43
 update instructions 48
 update tool 47

H

Hardware Resource Browser 53
 hardware shipment
 delivery state 29
 optional accessories 30
 standard accessories 30
 hardware topology 28
 HTF file 28
 HWT file 28

I

I/O subsystem 25
 idle mode 28

implementation software 24

L

loading RapidPro hardware data 42

M

Message Viewer 53
 module setup mode 29

P

pinout information 56
 Platform Manager 42
 power supply cable
 crimping 34
 soldering 34
 power supply inputs 34
 Project Manager 53
 Project Wizard 52
 PS modules 22

R

RapidPro hardware modes
 execution mode 28
 idle mode 28
 RapidPro System
 components 22
 ConfigurationDesk for RapidPro 23
 implementation software 24
 PS modules 22
 SC modules 22
 RapidPro units
 single unit 28
 stack with UCB 26
 stack without UCB 26
 unit combinations 26
 unit connection bus 26, 27
 rename a channel 55
 routing code 28
 RoutingID 28
 RTI RapidPro Control Unit Blockset 24

S

safety precautions 7
 SC modules 22
 signal conditioning and power stages 24
 single unit 28
 stack with UCB 26
 stack without UCB 26

T

TopologyID 28

U

UCB 26, 27
 unit combinations 26
 unit connection bus 26, 27
 use scenarios

I/O subsystem 25

signal conditioning and power stages 24

