dSPACE Release

New Features and Migration

For dSPACE Release 3.4

Release 3.4 – May 2002

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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.de/en/Support/Support.htm for software updates and patches.

Important Notice

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About This Document

This document provides you with a brief overview of the major new features on dSPACE Release 3.4.

About dSPACE Releases

For information on how dSPACE software products are released, refer to *About dSPACE Releases* on page 7.

New features and enhancements

For a description of the key features, and a summary of the major enhancements made since dSPACE Release 3.3, refer to:

- *Key Features of dSPACE Release 3.4* on page 9

Migration

In addition, this document provides you with information on the changes you may have to perform when you migrate from previous releases to dSPACE Release 3.4. Refer to:

- *Migrating to dSPACE Release 3.4* on page 21
- *How to Migrate from dSPACE Release 3.2 or Earlier* on page 22

Legend

The following symbols are used in this document.

Warnings provide indispensable information to avoid severe damage to your system and/or your work.

Notes provide important information that should be kept in mind.

Tips show alternative and/or easier work methods.

Examples illustrate work methods and basic concepts, or provide ready-to-use templates.

About dSPACE Releases

All dSPACE products that form a seamlessly integrated tool chain and work with a definite set of third-party products are included in a dSPACE Release:

- A dSPACE Release identifies a unique set of dSPACE product versions. This means that one dSPACE Release does not contain two versions of the same dSPACE product.
- One CD may contain multiple dSPACE Releases, each of which has a separate installation script.

Dependencies on third-party products

- A compatibility matrix given in the `CompList.txt` file (see root directory of the dSPACE CD) describes the dependencies of a dSPACE Release on the products of other vendors (MATLAB, compilers, Windows XX, etc.).
- It is possible for one dSPACE Release to support different MATLAB releases.

Release numbering

- A dSPACE Release number consists of two digits to identify major and minor releases (**major.minor**, for example, dSPACE Release 3.3).

- For patches, a patch number is appended to the dSPACE Release number (**major.minor patch**, for example, dSPACE Release 3.3p1).

Key Features of dSPACE Release 3.4

dSPACE Release 3.4 comes with the following key features:

- The software of dSPACE Release 3.4 offers full compatibility with **MATLAB R12.1** without updates and **MATLAB R12.1** with **Simulink 4.1.1** and **Real-Time Workshop 4.1.1**. It does not support MATLAB R12 or earlier.
- The software of dSPACE Release 3.4 supports Windows 98/Me, Windows NT 4.0 or Windows 2000. It does not support Windows XP.
- dSPACE Release 3.4 includes the new software tool **MotionDesk**. This is the new tool generation for visualizing real-time simulations on your dSPACE system as 3-D online animations. For details, refer to *MotionDesk* on page 18.

Implementation: key feature summary

- DS1005 provides flight recording to the flash memory and access functions to store/restore data to/from the flash memory.

- MicroAutoBox provides multi-channel PWM (drives control), extended flash memory access and software controlled power supply.
- The CAN bus provides extended run-time performance. In addition, it supports raw data access to perform custom encoding.
- The DS4302's CAN bus can now handle an unlimited number of messages.

For details, refer to:

- *New Installation and Configuration Features* on page 11, providing information on the new installation features of dSPACE Release 3.4.
- *New Implementation Features* on page 12, listing the most important new features, enhancements and changes in the implementation software since dSPACE Release 3.3.
- *New Experiment Features* on page 17, listing the most important new features, enhancements and changes in the experiment and test software since dSPACE Release 3.3.
- *New Documentation Features* on page 19, giving some information on the enhancements and changes in the documentation.

New Installation and Configuration Features

dSPACE Release 3.4 comes with a new licensing mechanism that is especially suitable for large development teams. The various dSPACE software modules are license-protected. Up to dSPACE Release 3.3, only single-user licenses were available.

Floating network licenses

For dSPACE Release 3.4, you can also purchase *floating network licenses* that can be used on networked PCs on which the dSPACE software is installed (*dSPACE License Clients*). Using the floating network licenses, only the number of software modules that can run at the same time is limited. The software itself can be installed on more computers. The clients are connected to a PC that manages the corresponding dSPACE licenses (*dSPACE License Server*).

For further information on the requirements and the handling of floating network licenses, see *Using Floating Network Licenses* in your *Installation and Configuration Guide*.

New Implementation Features

dSPACE Release 3.4 comes with several new implementation features, enhancements and changes that apply to all dSPACE boards, see below.

Compatibility with MATLAB R12.1

RTI and RTI-MP on Release 3.4 offer full compatibility with MATLAB R12.1 with Simulink 4.1.1 and Real-Time Workshop 4.1.1.

In addition, there are changes that apply to specific dSPACE boards:

- *New Implementation Features for DS1103* on page 13
- *New Implementation Features for DS1104* on page 13
- *New Implementation Features for MicroAutoBox* on page 14
- *New Implementation Features for Modular Hardware* on page 14
- *New Implementation Features for the RTI CAN Blockset* on page 16

General Implementation Features, Enhancements and Changes

RTLib, RTI and RTI-MP of dSPACE Release 3.4 provide the following hardware-independent new features and enhancements. Unless stated otherwise, these features can be implemented on all dSPACE systems.

Buffered Task Transition

The Buffered Task Transition blocks now can handle all Simulink data types, with the exception of the complex data types. Refer to *Buffered Task Transition (Read) Block* or *Buffered Task Transition (Write) Block* in the *RTI and RTI-MP Implementation Reference*.

Updating the TRC and SDF files

If the user trace file or the user description file of a model have been changed, the trace file and the system description file of the model can now be updated via MATLAB commands. Refer to *How to Update Trace and System Description Files* in the *RTI and RTI-MP Implementation Guide*.

Excluding subsystems from TRC file

The new TRC Exclusion block lets you reduce the size of the generated variable description file (TRC file). This results in a faster generation process and faster loading in ControlDesk, if you exclude large parts of your model. The block also allows you to hide model parts that are not to be seen by other users. Refer to *Excluding Subsystems from the TRC File* in the *RTI and RTI-MP Implementation Guide*.

Launch Pad integration

Several dSPACE products are now integrated into the MATLAB Launch Pad.

Improved documentation

Descriptions of programming S-functions and tuning parameters of transfer functions, zero-pole and state-space blocks have been improved or added. Refer to *Implementing S-Functions* or *Tuning Parameters of Transfer Fcn, Zero-Pole and State-Space Blocks* in the *RTI and RTI-MP Implementation Guide*.

New Implementation Features for DS1103

dSPACE Release 3.4 provides the following new implementation features and enhancements for the DS1103:

PWM3 and PWMSV signal generation

The synchronization interrupt for PWM3 and PWMSV signal generation can be specified at any position within a PWM period. This feature is not supported by RTI. Refer to *ds1103_slave_dsp_pwm3_init* and *ds1103_slave_dsp_pwm3sv_init* in the *DS1103 RTLib Reference*.

New Implementation Features for DS1104

dSPACE Release 3.4 provides the following new implementation features and enhancements for the DS1104:

Synchronizing I/O features

RTI now provides a setup block for synchronizing the I/O features of the board by an external trigger. Refer to *DS1104SYNC_IO_SETUP* in the *DS1104 RTI Reference*.

PWM3 and PWMSV signal generation

The synchronization interrupt for PWM3 and PWMSV signal generation can be specified at any position within a PWM period. This feature is not supported by RTI. Refer to *ds1104_slave_dsp_pwm3_init* and *ds1104_slave_dsp_pwm3sv_init* in the *DS1104 RTLib Reference*.

New Implementation Features for MicroAutoBox

dSPACE Release 3.4 provides the following new implementation features and enhancements for MicroAutoBox:

Multi-channel PWM

MicroAutoBox provides 3-channel edge aligned and 3- and 6-channel center aligned multi-channel PWM generation. To pick up engine data, an interface function for an incremental encoder is integrated. Refer to *Drives Control (DC)* in the *DS1401 Feature Reference*.

Power hold on/ off

MicroAutoBox provides a software controlled power supply. This allows the termination of all processes to prevent data loss when MicroAutoBox is shut down. Refer to *Power Hold On/Off* in the *DS1401 Feature Reference*.

Several camshaft sensor signals

Extended Engine Control provides the use of rapid-start sensor rotors. Several camshaft sensor signals within one engine cycle shorten the synchronization time between camshaft and crankshaft. Refer to *Extended Engine Control (EEC)* in the *DS1401 Feature Reference*.

Flash memory access

MicroAutoBox provides flash memory access to store/restore data to/from the flash memory from the Simulink model. Refer to *Flash Memory Access* in the *DS1401 Feature Reference*.

New Implementation Features for Modular Hardware

dSPACE Release 3.4 provides the following new implementation features and enhancements for modular hardware:

Flight recorder

DS1005 provides flight recording of up to 15.5 MByte data to the flash memory. Up to 250 real-time variables can be recorded. Refer to *Flight Recorder* in the *DS1005 Feature Reference*.

Flash memory access

DS1005 provides flash memory access to store/restore data to/from the flash memory. Refer to *Flash Memory Access* in the *DS1005 Feature Reference*.

New features for DS2210

- A new block is added to the angular processing unit (APU). The block converts absolute angle positions of the APU to angle positions related to the TDC or user-defined positions. Refer to *Engine Position Phase Accumulator* in the *DS2210 Feature Reference*.
- RTLib allows the use of the continuous and event-window based data capture mode at the same time. Refer to *Angular Processing Unit (APU)* in the *DS2210 RTLib Reference*.

New features for DS4002

- RTI now provides a block for reading the states and time stamps of captured events. Refer to *DS4002READ_EVENT_Bx_Cy* in the *DS4002 RTI Reference*.
- Additionally, this block can generate read event interrupts, which can be enabled by using the improved DS4002_HWINT_Bx_Iy block. Refer to *DS4002_HWINT_Bx_Iy* in the *DS4002 RTI Reference*.

New features for DS4302

New features for the DS4302 are provided by the RTI CAN blockset. Refer to *New Implementation Features for the RTI CAN Blockset* on page 16.

New features for DS5001

- The read block for the DS5001 now returns the number of actually detected edges in addition to the states and time stamps. Refer to *DS5001READ_Bx_Cy* in the *DS5001 RTI Reference*.
- Additionally, this block can generate read event interrupts, which can be made available by the improved DS5001_HWINT_Bx_Iy block. Refer to *DS5001_HWINT_Bx_Iy* in the *DS5001 RTI Reference*.

New features for DS5101

The PWM signal generation (DS5101PWM3_Bx_BLy and DS5101PWM6_Bx_BLy) now provides an input port for specifying an interrupt shift signal to change the interrupt position. The interrupts of these blocks can be made available by the improved DS5101_HWINT_Bx_Iy block. Refer to *DS5101PWM3_Bx_BLy*, *DS5101PWM6_Bx_BLy*, or *DS5101_HWINT_Bx_Iy* in the *DS5101 RTI Reference*.

New Implementation Features for the RTI CAN Blockset

dSPACE Release 3.4 provides the following new implementation features and enhancements for the RTI CAN blockset:

Raw data manipulation

RTICAN provides an API to edit CAN messages, for example, to write the value of a checksum to the last message byte. Refer to *Raw Data Manipulation* in the *Feature Reference* of your dSPACE board.

Data type support

The data type for RX, RM and TX blocks can be selected. Refer to *RTICAN CONTROLLER SETUP* in the *RTI CAN Blockset Reference*.

Delayed message transmission

For TX blocks, delay times for sending messages can be defined and used, for example to avoid message bursts. Refer to *Defining Messages* in the *Feature Reference* of your dSPACE board.

New concept for receive message

Only for DS4302: The RX Service Support uses a new concept for receive messages that allows the use of an unlimited number of RX blocks. Refer to *RX Service Support* in the *DS4302 Feature Reference*.

Extended support of C252 transceiver

Only for DS4302: RTI now supports the on-chip error management of a fault-tolerant C252 transceiver. This allows the CAN bus to work when errors occur. For details, refer to *Physical Layer/CAN Transceiver* in the *DS4302 Feature Reference*.

Loop-back functionality

Only for DS4302: The data sent by a TX block can be received on the same CAN controller.

New Experiment Features

ControlDesk on dSPACE Release 3.4 comes with new features and enhancements, see below.

MotionDesk is the new tool generation for visualizing real-time simulations on your dSPACE system as 3-D online animations. For details, refer to *MotionDesk* on page 18.

ControlDesk

ControlDesk on dSPACE Release 3.4 comes with the following new features and enhancements:

Value conversion for several instruments

On common electronic control units (ECUs), floating-point calculation is not available (unlike with PCs or workstations). This means that every physical quantity that would be represented by a floating-point number on a PC or a workstation has to be represented by an integer on the ECU. The floating-point numbers used on a PC can be converted using the appropriate forward scaling function. The integer numbers used on an ECU can be converted using the corresponding backward scaling function. Refer to *Value Conversion* in the *ControlDesk Experiment Guide*.

Limit supervision for Slider and Knob instruments

When failures are simulated, limit supervision of values passed to a simulator platform can be disabled. The limits are either ignored or invalid values cause a warning. You can test the model's behavior around the limits. Refer to *Limit Supervision Page* in the *ControlDesk Instrument Reference*.

Improved firmware handling

For safety reasons, the boot firmware now undergoes CRC checks on every startup of the MicroAutoBox. Refer to *Handling Firmware* in the *ControlDesk Experiment Guide*.

CaptureData class

matlablib now provides the CaptureData class.
An instance of the CaptureData class can be used to load a MAT file generated by the ControlDesk capture functionality. You can access its data, change it or create a new MAT file. Refer to *CaptureData* in the *ControlDesk Test Automation Reference*.

"visible" attribute for MATLAB class

matlablib now provides a "visible" attribute for the MATLAB class. The attribute allows you to hide the MATLAB window or to make it visible. Refer to *Matlab* in the *ControlDesk Test Automation Reference*.

MotionDesk

MotionDesk is the new tool generation for visualizing real-time simulations on your dSPACE system as 3-D online animations. Compared to its predecessor, RealMotion, it provides much more realistic graphics thanks to textured rendering. Cameras and 3-D objects are configured interactively for fast visualization of ECU tests using hardware-in-the-loop simulation.

MotionDesk is used for 3-D animations, for instance in robotics and flight simulation, and in its main application: the automotive field. With a high-end hardware system, MotionDesk is the solution for "man-in-the-loop" applications, because these require a high frame rate and low latency times between simulation and visualization. MotionDesk's graphical user interface is similar to other dSPACE tools. A virtual 3-D world is created by simply dragging and dropping objects from a 3-D library to a scene. The library contains the objects you need to create all the driving scenes you can think of: roads, houses, car bodies and wheels. Additional objects can easily be added as the 3-D object geometries are described in the VRML2 standard. Existing car geometries created with CAD systems are usable when converted to VRML2.

New blockset for MotionDesk

dSPACE Release 3.4 provides a new blockset to support visualizing real-time simulations with MotionDesk, named MotionDesk blockset. The MotionDesk blockset allows you to calculate the motion data and connect your simulation model to MotionDesk under Simulink. For details, refer to *Adapting Simulink Models* in the *MotionDesk 3-D Online Visualization Guide*.

New Documentation Features

The documentation that comes with dSPACE Release 3.4 has been enhanced:

Quick Reference for Automation and Test Automation

The Quick Reference presents every dSPACE-specific Python module in tabular form. Object information from the *ControlDesk Automation Reference* and *ControlDesk Test Automation Reference* is summarized in a set of compact tables. Each table provides a quick overview of the available objects, object dependencies, attributes and methods.

For hardcopy versions, use the PDF files available in HelpDesk's Print directory, see *CDAutoRefQuick.pdf* and *CDTestAutoRefQuick.pdf*.

In HelpDesk, the Quick Reference is extensively cross-referenced with the *ControlDesk Automation Reference* and *ControlDesk Test Automation Reference*.

RTLib references of I/O boards

The RTLib references of all I/O boards are integrated into dSPACE HelpDesk. You now have easy access to each RTLib function.

Migrating to dSPACE Release 3.4

After you install dSPACE Release 3.4, it may be necessary to carry out several steps. Note the following items when migrating from dSPACE Release 3.3 to dSPACE Release 3.4:

Migrating RTI

If you want to work with older models, you may have to carry out some migration steps. Refer to *Migrating to RTI 4.3* on page 23.

Migrating to MotionDesk

If you formerly worked with RealMotion and want to migrate to MotionDesk, refer to *Migrating from RealMotion to MotionDesk* on page 24.

If you migrate from dSPACE Release 3.2 or earlier, you have to carry out some additional steps to migrate to dSPACE Release 3.4, see below.

How to Migrate from dSPACE Release 3.2 or Earlier

If you migrate from dSPACE Release 3.2 or earlier, you have to carry out some additional steps to migrate to dSPACE Release 3.4. The table below shows the necessary steps for a few releases.

Former Release	Steps
dSPACE Release 3.2	1. See *Migrating to dSPACE Release 3.3* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.3.
dSPACE Release 3.1	1. See *Migrating to dSPACE Release 3.2* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.2. 2. See *Migrating to dSPACE Release 3.3* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.3.
dSPACE CD 3.0 with MATLAB R12	1. See *Migrating to dSPACE Release 3.2* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.2. As you have already used MATLAB R12 prior to migrating to Release 3.3, only the following sections are relevant: • *Migrating RTI for the DS2210* • *Migrating RTI for MicroAutoBox* • *Migrating RTI-MP* • *Migrating ControlDesk* 2. See *Migrating to dSPACE Release 3.3* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.3.
dSPACE CD 3.0 with MATLAB R11	1. See *Migrating to dSPACE Release 3.2* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.2. 2. See *Migrating to dSPACE Release 3.3* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.3.

Former Release	Steps
dSPACE CD 2.3.x	1. See *Migrating to dSPACE CD 3.0* in the *dSPACE Product CD New Features and Migration* of dSPACE CD 3.0. 2. See *Migrating to dSPACE Release 3.2* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.2. 3. See *Migrating to dSPACE Release 3.3* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.3.
dSPACE CD 2.2	1. See *Migrating to dSPACE CD 2.3* in the *dSPACE Product CD New Features and Migration* of dSPACE CD 2.3. 2. See *Migrating to dSPACE CD 3.0* in the *dSPACE Product CD New Features and Migration* of dSPACE CD 3.0. 3. See *Migrating to dSPACE Release 3.2* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.2. 4. See *Migrating to dSPACE Release 3.3* in the *dSPACE Release New Features and Migration* of dSPACE Release 3.3.

You can find the PDF files of the *New Features and Migration Guides* for previous releases on the dSPACE CD in the folder `\Doc\Print` or download them from http://www.dspace.de/en/Info/download.HTM#Software.
The PDF files are named `NewFeaturesAndMigrationxx.pdf`, where `xx` stands for the version or release number.

Migrating to RTI 4.3

Migrating RTI1401

- The Flight Recorder now requires a FLASH_SETUP block. The block must be added to a model manually.
- The Engine Control blockset is no longer supported. You can use the new Extended Engine Control blockset instead.

Migrating from RealMotion to MotionDesk

RealMotion users who want to migrate to MotionDesk should note the following points:

3-D Real-Time Services

MotionDesk provides a Simulink blockset for the necessary transformation operations of model states into 3-D coordinates (MotionDesk blockset). However, since MotionDesk is fully compatible with the 3-D services that RealMotion uses, you are not forced to reimplement existing kinematic transformations with the 3-D MotionDesk blockset. It is not even necessary to recompile the real-time model.

Scenes

Since MotionDesk's graphical scenes are described in the VRML2 standard, scenes originally created for RealMotion (known as CTL files) cannot be used within MotionDesk. Automated conversion is not possible, so manual modifications are necessary in order to benefit from the immense graphical capabilities that MotionDesk provides. We therefore recommend recreating the desired scenes with Internet Scene Assembler (a 3rd-party tool shipped with MotionDesk) to produce VRML2 files.

Objects

MotionDesk's usual standard format for geometries of movable objects is VRML2. However, it is possible to reuse RealMotion geometry objects if they are available in the RealMotion MOV format. A MOV-to-VRML2 converter is delivered together with MotionDesk. Manual post-editing is necessary for shading methods other than flat shading and for textures.

For details, refer to *Migrating from RealMotion* in the *MotionDesk 3-D Online Visualization Guide*.