dSPACE

Real-Time Interface – Blocksets and Toolboxes Support

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1 Blockset and Toolbox Support with RTI

Compatibility of The MathWorks' Blocksets and Toolboxes with RTI

In addition to MATLAB and Simulink, The MathWorks offers a wide range of Blocksets and Toolboxes, which are extensions to the basic MATLAB and Simulink software packages.

As *Blocksets* provide additional Simulink blocks, you must always know if these blocks can be used with Real-Time Workshop/RTI.

In most cases, *Toolboxes* are simply extensions to MATLAB. This means that they generally do not provide additional Simulink blocks and that they have no impact on Real-Time Workshop/RTI compatibility. However, some Toolboxes also provide additional Simulink blocks and you must know if these are supported by Real-Time Workshop/RTI too.

For The MathWorks' Blocksets and Toolboxes that provide Simulink blocks, we test the RTI compatibility with selected demo models taken from the MATLAB installation and/or with our own test models designed especially for this purpose. These tests naturally cannot cover the complete functionality range of the Blocksets. Although we strive to take all possibilities into account, the complexity resulting from the number of Simulink provided blocks and their possible parameterizations is far too large to guarantee tests with a 100% coverage.

Note: As a result, problems might occur even when we state that a certain Blockset or Toolbox is supported by RTI. You can receive information about the known problems from Blockset- or Toolbox-specific pages below or by contacting info@dspace.de.

Compatibility of Blocksets and Toolboxes not from The MathWorks

Please understand that we cannot make any compatibility statement for Blocksets and Toolboxes that are not developed by The MathWorks.

Blockset and Toolbox Support Table

The table below gives an overview of The MathWorks' Blocksets and Toolboxes and their compatibility to RTI. The table entries have the following meanings:

yes	The Toolbox or Blockset is supported. No problems are known.
no	The Toolbox or Blockset is not supported; i.e., the provided Simulink blocks cannot be used in models built with Real-Time Workshop/RTI.
see details	The Toolbox or Blockset is supported, but there are restrictions, known problems, or a special patch is needed to make them work correctly. Click on the corresponding Blockset or Toolbox hyperlink to get more information.
no effect	No effect: Either the Toolbox does not provide Simulink blocks and therefore does not affect Real-Time Workshop and RTI, or the blocks provided by the Toolbox can be left in the model when building it for real-time simulation, but without effect in the generated code (Real-Time Workshop ignores the blocks).
---	The Toolbox or Blockset was not available with the corresponding MATLAB release.
?	No information available, no tests have been made yet.

1.1 Table for RTI 3.0.x - RTI 3.5.x Versions

Toolbox / Blockset	RTI 3.0.x (dSPACE CD 1.0) MATLAB 5.1.1	RTI 3.1.x (dSPACE CD 1.0) MATLAB 5.1.1	RTI 3.1.x (dSPACE CD 1.2) MATLAB 5.2.x	RTI 3.2.x (dSPACE CD 1.3) MATLAB 5.1.1	RTI 3.2.x (dSPACE CD 1.3) MATLAB 5.2.x	RTI 3.3.x (dSPACE CD 2.0) MATLAB 5.1.1	RTI 3.3.x (dSPACE CD 2.0) MATLAB 5.2.x	RTI 3.4.x (dSPACE CD 2.1) MATLAB R11.x	RTI 3.5.x (dSPACE CD 2.3) MATLAB R11.x
Control System Toolbox	yes	yes	yes	yes	yes	yes	yes	yes	yes
Digital Signal Processing (DSP) Blockset	yes	yes	yes	yes	yes	yes	yes	see details	see details
Fixed-Point Blockset	yes	yes	yes	yes	yes	yes	yes	see details	see details
Fuzzy Logic Toolbox	no	see details	see details	see details	see details	see details	see details	see details	see details
MATLAB Compiler	no	no	no	no	no	no	no	no	no
Model Predictive Control (MPC) Toolbox	no	no	no	no	no	no	no	no	no
Mu Analysis and Synthesis Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect
Neural Network Toolbox	see details	see details	see details	see details	see details	see details	see details	see details	see details
Nonlinear Control Design (NCD) Toolbox	no	no	no	no	no	no	no	no	no
Optimization Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect
Power System Blockset	---	---	see details	---	see details	---	see details	see details	see details
Robust Control Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect
Signal Processing Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect
Stateflow	see details	see details	see details	see details	see details	see details	see details	see details	see details
System Identification Toolbox	no	no	no	no	no	no	no	no	no

1.2 Table for RTI 3.6.x - RTI 4.5 Versions

Toolbox / Blockset	RTI 3.6.x (dSPACE Release 3.1) MATLAB R11.x	RTI 4.0.x (dSPACE CD 3.0) MATLAB R12.0	RTI 4.1.x (dSPACE CD 3.2) MATLAB R12.0	RTI 4.2.x (dSPACE CD 3.3) MATLAB R12.1	RTI 4.3.x (dSPACE Release 3.4) MATLAB R12.1	RTI 4.3.5 (dSPACE Release 3.4) MATLAB R13	RTI 4.4 (dSPACE Release 3.5) MATLAB R13	RTI 4.5 (dSPACE Release 4.0) MATLAB R13.0.1
Aerospace Blockset	---	---	---	---	---	see details	see details	see details
Communications Blockset	---	see Details	see Details	see Details	see Details	see details	see details	see details
Communications Toolbox	no	no effect	no effect	no effect	no effect	no effect	no effect	no effect
Control System Toolbox	yes	yes	yes	yes	yes	yes	yes	yes
Digital Signal Processing (DSP) Blockset	see details	see details	see details	see details	see details	yes	yes	yes
Fixed-Point Blockset	see details	see details	see details	see details	see details	no	yes	yes
Fuzzy Logic Toolbox	see details	see details	see details	see details	see details	see details	see details	see details
MATLAB Compiler	no	no	no	no	no	no	no	no
MATLAB C/C++ Graphics Library	no	no	no	no	no	no	no	no
MATLAB C/C++ Math Library	no	no	no	no	no	no	no	no
Model Predictive Control (MPC) Toolbox	no	no	no	no	no	no	no	no
Mu Analysis and Synthesis Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect
Neural Network Toolbox	see details	see details	see details	see details	see details	see details	see details	see details
Nonlinear Control Design (NCD) Toolbox	no	no	no	no	no	no	no	no
Optimization Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect
SimPowerSystems (Power System Blockset)	see details	see details	see details	see details	see details	see details	see details	see details
Signal Processing Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect	no effect

Toolbox / Blockset	RTI 3.6.x (dSPACE Release 3.1) MATLAB R11.x	RTI 4.0.x (dSPACE CD 3.0) MATLAB R12.0	RTI 4.1.x (dSPACE CD 3.2) MATLAB R12.0	RTI 4.2.x (dSPACE CD 3.3) MATLAB R12.1	RTI 4.3.x (dSPACE Release 3.4) MATLAB R12.1	RTI 4.3.5 (dSPACE Release 3.4) MATLAB R13	RTI 4.4 (dSPACE Release 3.5) MATLAB R13	RTI 4.5 (dSPACE Release 4.0) MATLAB R13.0.1
SimMechanics	---	---	---	---	---	no	see details	see details
Stateflow	yes	yes	yes	yes	yes	yes	yes	yes
System Identification Toolbox	no	no	no	no	no	no	no	no

1.3 Table for RTI 4.5.5 - RTI 5.2.5 Versions

Toolbox / Blockset	RTI 4.5.5 (dSPACE Release 4.0) MATLAB R13 Service Pack 1	RTI 4.6 (dSPACE Release 4.0.1) MATLAB R13.01 & MATLAB R13 Service Pack 1	RTI 5.0 (dSPACE Release 4.1) MATLAB R13.0.1 & MATLAB R13 Service Pack 1	RTI 5.1.5 (dSPACE Release 4.1) MATLAB R14	RTI 5.1.6 (dSPACE Release 4.1) MATLAB R14 Service Pack 1	RTI 5.2 (dSPACE Release 4.2) MATLAB R13.0.1 & MATLAB R13 Service Pack 1 & MATLAB R13 Service Pack 2	RTI 5.2.5 (dSPACE Release 4.2) MATLAB R14 Service Pack 1 & MATLAB R14 Service Pack 2
Aerospace Blockset	see details	see details	see details	see details	see details	see details	see details
Communications Blockset	see details	see details	see details	see details	see details	see details	see details
Communications Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect
Control System Toolbox	yes	yes	yes	yes	yes	yes	yes
Digital Signal Processing (DSP) Blockset/ Signal Processing Blockset	yes	yes	yes	yes	yes	yes	yes
Fixed-Point Blockset / Simulink Fixed Point	yes	yes	yes	yes	yes	yes	yes
Fixed-Point Toolbox	---	---	---	no effect	no effect	---	no effect
Fuzzy Logic Toolbox	see details	see details	see details	see details	see details	see details	see details
MATLAB Compiler	no	no	no	no	no	no	no
MATLAB C/C++ Graphics Library	no	no	no	---	---	no	---
MATLAB C/C++ Math Library	no	no	no	---	---	no	---
Model Predictive Control (MPC) Toolbox	no	no	no	no	no	no	no
Mu Analysis and Synthesis Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect
Neural Network Toolbox	see details	see details	see details	see details	see details	see details	see details
Nonlinear Control Design (NCD) Toolbox	no	no	no	no	no	No	no

Toolbox / Blockset	RTI 4.5.5 (dSPACE Release 4.0) MATLAB R13 Service Pack 1	RTI 4.6 (dSPACE Release 4.0.1) MATLAB R13.01 & MATLAB R13 Service Pack 1	RTI 5.0 (dSPACE Release 4.1) MATLAB R13.0.1 & MATLAB R13 Service Pack 1	RTI 5.1.5 (dSPACE Release 4.1) MATLAB R14	RTI 5.1.6 (dSPACE Release 4.1) MATLAB R14 Service Pack 1	RTI 5.2 (dSPACE Release 4.2) MATLAB R13.0.1 & MATLAB R13 Service Pack 1 & MATLAB R13 Service Pack 2	RTI 5.2.5 (dSPACE Release 4.2) MATLAB R14 Service Pack 1 & MATLAB R14 Service Pack 2
Optimization Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect
SimPowerSystems (Power System Blockset)	see details	see details	see details	see details	see details	see details	see details
Signal Processing Toolbox	no effect	no effect	no effect	no effect	no effect	no effect	no effect
SimDriveline	---	---	---	---	see details	---	see details
SimMechanics	see details	see details	see details	see details	see details	see details	see details
Simulink Control Design	---	---	---	no effect	no effect	---	no effect
Stateflow	yes	yes	yes	yes	yes	yes	yes
System Identification Toolbox	no	no	no	no	no	no	no

1.4 Table for RTI 5.3, 5.3.1, 5.3.5 and 5.3.6 Versions

Toolbox / Blockset	RTI 5.3(dSPACE Release 5.0) MATLAB R13 Service Pack 1+ & MATLAB R13 Service Pack 2	RTI 5.3.5(dSPACE Release 5.0) MATLAB R14 Service Pack 2 & MATLAB R14 Service Pack 2+ & MATLAB R14 Service Pack 3	RTI 5.3.1(dSPACE Release 5.1) MATLAB R13 Service Pack 1+ & MATLAB R13 Service Pack 2	RTI 5.3.6(dSPACE Release 5.1) MATLAB R14 Service Pack 2 & MATLAB R14 Service Pack 2+ & MATLAB R14 Service Pack 3 & MATLAB R2006a & MATLAB R2006a+
Aerospace Blockset	see details	see details	see details	see details
Communications Blockset	see details	see details	see details	see details
Communications Toolbox	no effect	no effect	no effect	no effect
Control System Toolbox	yes	yes	yes	yes
Digital Signal Processing (DSP) Blockset/ Signal Processing Blockset	yes	yes	yes	yes
Fixed-Point Blockset / Simulink Fixed Point	yes	yes	yes	yes
Fixed-Point Toolbox	---	no effect	---	no effect
Fuzzy Logic Toolbox	see details	see details	see details	see details
Neural Network Toolbox	see details	see details	see details	see details
Optimization Toolbox	no effect	no effect	no effect	no effect
SimPowerSystems	see details	see details	see details	see details
Signal Processing Toolbox	no effect	no effect	no effect	no effect
SimDriveline	---	see details	---	see details
SimMechanics	see details	see details	see details	see details
Simulink Control Design	---	no effect	---	no effect
Stateflow/Stateflow Coder	yes	yes	yes	yes
System Identification Toolbox	no	no	no	no

1.5 Table for RTI 5.3.2 - 5.6 Versions

Toolbox / Blockset	RTI 5.3.2(dSPACE Release 5.2) MATLAB R13 Service Pack 1+ & MATLAB R13 Service Pack 2	RTI 5.3.7 (dSPACE Release 5.2) MATLAB R14 Service Pack 3 & MATLAB R2006a+ & MATLAB R2006b	RTI 5.4 (dSPACE Release 5.3) MATLAB R14 Service Pack 3 & MATLAB R2006a+ & MATLAB R2006b	RTI 5.5 (dSPACE Release 5.4) MATLAB R14 Service Pack 3 & MATLAB R2006a+ & MATLAB R2006b & MATLAB R2007a & MATLAB R2007a+	RTI 5.6 (dSPACE Release 6.0) MATLAB R2006a+ & MATLAB R2006b & MATLAB R2007a & MATLAB R2007a+ & MATLAB R2007b
Aerospace Blockset	see details	see details	see details	see details	see details
Communications Blockset	see details	see details	see details	see details	see details
Communications Toolbox	no effect	no effect	no effect	no effect	no effect
Control System Toolbox	yes	yes	yes	yes	yes
Digital Signal Processing (DSP) Blockset/ Signal Processing Blockset	yes	yes	yes	yes	yes
Fixed-Point Blockset / Simulink Fixed Point	yes	yes	yes	yes	yes
Fixed-Point Toolbox	---	no effect	no effect	no effect	no effect
Fuzzy Logic Toolbox	see details	see details	see details	see details	see details
Neural Network Toolbox	see details	see details	see details	see details	see details
Optimization Toolbox	no effect	no effect	no effect	no effect	no effect
SimPowerSystems	see details	see details	see details	see details	see details
Signal Processing Toolbox	no effect	no effect	no effect	no effect	no effect
SimDriveline	---	see details	see details	see details	see details
SimMechanics	see details	see details	see details	see details	see details

Toolbox / Blockset	RTI 5.3.2(dSPACE Release 5.2) MATLAB R13 Service Pack 1+ & MATLAB R13 Service Pack 2	RTI 5.3.7 (dSPACE Release 5.2) MATLAB R14 Service Pack 3 & MATLAB R2006a+ & MATLAB R2006b	RTI 5.4 (dSPACE Release 5.3) MATLAB R14 Service Pack 3 & MATLAB R2006a+ & MATLAB R2006b	RTI 5.5 (dSPACE Release 5.4) MATLAB R14 Service Pack 3 & MATLAB R2006a+ & MATLAB R2006b & MATLAB R2007a & MATLAB R2007a+	RTI 5.6 (dSPACE Release 6.0) MATLAB R2006a+ & MATLAB R2006b & MATLAB R2007a & MATLAB R2007a+ & MATLAB R2007b
SimScape (Foundation Library)	---	---	---	no	no
Simulink Control Design	---	no effect	no effect	no effect	no effect
Stateflow/ Stateflow Coder	yes	yes	yes	yes	yes
System Identification Toolbox	no	no	no	no	no

1.6 Table for RTI 6.0 – 6.1 Versions

Toolbox / Blockset	RTI 6.0 (dSPACE Release 6.1) MATLAB R2006a+ & MATLAB R2006b & MATLAB R2007a & MATLAB R2007a+ & MATLAB R2007b	RTI 6.1 (dSPACE Release 6.2) MATLAB R2006a+ & MATLAB R2006b & MATLAB R2007a & MATLAB R2007a+ & MATLAB R2007b & MATLAB R2007b+ & MATLAB R2008a
Aerospace Blockset	see details	see details
Communications Blockset	see details	see details
Communications Toolbox	no effect	no effect
Control System Toolbox	yes	yes

Toolbox / Blockset	RTI 6.0 (dSPACE Release 6.1) MATLAB R2006a+ & MATLAB R2006b & MATLAB R2007a & MATLAB R2007a+ & MATLAB R2007b	RTI 6.1 (dSPACE Release 6.2) MATLAB R2006a+ & MATLAB R2006b & MATLAB R2007a & MATLAB R2007a+ & MATLAB R2007b & MATLAB R2007b+ & MATLAB R2008a
Digital Signal Processing (DSP) Blockset/ Signal Processing Blockset	yes	yes
Fixed-Point Blockset / Simulink Fixed Point	yes	yes
Fixed-Point Toolbox	---	
Fuzzy Logic Toolbox	see details	see details
Neural Network Toolbox	see details	see details
Optimization Toolbox	no effect	no effect
SimPowerSystems	see details	
Signal Processing Toolbox	no effect	no effect
SimDriveline	see details	see details
SimMechanics	see details	see details
SimScape (Foundation Library)	no	no
Simulink Control Design	---	---
Stateflow/ Stateflow Coder	yes	yes
System Identification Toolbox	no	no

2 Details on Blocksets and Toolboxes

2.1 Aerospace Blockset

Aerospace Blockset 1.0 (MATLAB R13) to 2.0.1 (MATLAB R14 Service Pack 3)

The Aerospace Blockset can be used with RTI version 4.3.5 to 5.3.5 (dSPACE Releases 3.4 to 5.0). Please consider the information given by The MathWorks concerning Real-Time Workshop support of this blockset. The MathWorks states that some blocks do not support Real-Time Workshop code generation.

Aerospace Blockset 2.1 (MATLAB R2006a) to 3.1 (MATLAB R2008a)

The Aerospace Blockset can be used with RTI version 5.3.6 to 6.1. (dSPACE Releases 5.1 to 6.2) Please consider the information given by The MathWorks concerning Real-Time Workshop support of this blockset. Some demo models may contain model reference blocks which are not supported by RTI versions 5.3.6 to 6.1 (dSPACE Releases 5.1 to 6.2). With MATLAB R2007b, some blocks may be deprecated but they are still supported from an obsolete library. Consult the Aerospace Blockset documentation for further details.

2.2 Communications Blockset

Since MATLAB R12, the Communications Toolbox and the Communications Blockset are two separate products, while up to MATLAB R11, the corresponding MATLAB functions and Simulink blocks were offered under the name “Communications Toolbox”.

Communications Blockset 2.0.x (MATLAB R12 and MATLAB R12.1)

The Communications Blockset can be used with RTI version 4.0 to 4.3.x (dSPACE Releases 3.0 to 3.4). The MathWorks states that some blocks do not support Real-Time Workshop code generation. Accordingly it is possible to generate code with all blocks using the Real-Time Workshop, except:

- Continuous-time Eye and scatter diagrams, voltage-controlled oscillator, Passband modulators and demodulators, CPM modulators and demodulators, Multipath Rayleigh Fading Channel, Rician Fading Channel

Please note that the Communications Toolbox is required when using the Communications Blockset.

Communications Blockset 2.5.x (MATLAB R13.0.x, MATLAB R13 Service Pack 1 and MATLAB R13 Service Pack 2)

The Communications Blockset can be used with RTI version 4.3.5 to 5.1.1, 5.2, 5.3, 5.3.1 and 5.3.2 (dSPACE Releases 3.4 to 5.2) The MathWorks states that some blocks do not support Real-Time Workshop code generation. Accordingly it is possible to generate code with all blocks using the Real-Time Workshop, except:

- Continuous-Time Eye and Scatter Diagrams, Triggered Read from File, Triggered Write to File, Integer-Input RS Encoder, Integer-Output RS Decoder, Binary-Input RS, Encoder, Binary-Output RS Decoder, Blocks in the CPM sublibrary of the Digital Baseband sublibrary of the Modulation library

Please note that the Communications Toolbox is required when using the Communications Blockset.

Communications Blockset 3.0.x and 3.1 (MATLAB R14, MATLAB R14 Service Pack 1 and MATLAB R14 Service Pack 2)

The Communications Blockset can be used with RTI version 5.1.5, 5.1.6 and 5.2.5 (dSPACE Releases 4.1 and 4.2). The MathWorks states that some blocks do not support Real-Time Workshop code generation. Accordingly it is possible to generate code with all blocks using the Real-Time Workshop, except:

- PM Modulator Passband, PM Demodulator Passband

Please note that the Communications Toolbox is required when using the Communications Blockset.

Communications Blockset 3.2 to 4.0 (MATLAB R14 Service Pack 3, MATLAB R2006a, MATLAB R2006b, MATLAB R2007a, MATLAB R2007a+, MATLABR2007b, MATLAB R2007b+, MATLABR2008a)

The Communications Blockset can be used with RTI version 5.3.5. to 6.1 (dSPACE Releases 5.0 to 6.2). The MathWorks states that some blocks do not fully support Real-Time Workshop code generation. For details, please refer to the Communications Blockset documentation provided by The MathWorks.

Please note that the Communications Toolbox is required when using the Communications Blockset.

2.3 Communications Toolbox

Since MATLAB R12, the Communications Toolbox and the Communications Blockset are two separate products, while up to MATLAB R11, the corresponding MATLAB functions and Simulink blocks were offered under the name “Communications Toolbox”.

Communications Toolbox 1.0 (MATLAB R11.x)

The MathWorks states that the Communications Toolbox is not compatible with Real-Time Workshop.

Communications Toolbox 2.0.x (MATLAB R12) and higher

The Communications Toolbox itself does not provide any Simulink blocks, it has no effect on Simulink, Real-Time Workshop or RTI. Please see also Communications Blockset.

2.4 Fuzzy Logic Toolbox

Fuzzy Logic Toolbox 1.0.3 (MATLAB 5.1.1) to 2.0.1 (MATLAB R11.1)

RTI version 3.0.x (dSPACE CDs 1.0 to 1.1) does not support the Fuzzy Logic Toolbox.

RTI versions 3.1.x to 3.5.x (dSPACE CDs 1.2 to 2.3.1) support model-building with blocks of the Fuzzy Logic Toolbox. The following problems are known:

- The Fuzzy Logic Controller block performs a lot of time-consuming computations. For this reason the block rapidly imposes a fixed-step size that is too high to satisfy real-time simulations.
- The Fuzzy Logic Controller block needs a lot of dynamic memory. The Toolbox is therefore not recommended on DS1102 boards and on DS1003 boards with little memory. On such systems customized linker command files with increased heap size may help work around memory allocation errors caused by the Fuzzy Logic Controller block.

Fuzzy Logic Toolbox 2.1.x (MATLAB R12.x)

RTI versions 4.0 up to RTI version 4.3.x (dSPACE Releases 3.0 to 3.4) support model-building with blocks of Fuzzy Logic Toolbox. Please note the following changes with the Fuzzy Logic Toolbox:

With MATLAB R12 the “Fuzzy Wizard” is introduced. This automatically generates a hierarchical block diagram representation for most Fuzzy Inference Systems (FIS). As only standard Simulink blocks are used, a more compact and efficient code generation with the Real-Time Workshop is possible compared to former versions.

In order to get an impression of the increase in performance of the Fuzzy Logic Toolbox with the new “Fuzzy Wizard” of version 2.1, the turnaround time of the demo model "sltank.mdl" was measured. After the change from MATLAB R11/FLT2.01 to MATLAB R12/ FLT2.1 the turnaround time improved by a factor of 5.2 using a DS1003 board and a factor of 3.8 using a DS1005 board.

For fuzzy models making use of the “Fuzzy Wizard”, the restrictions listed for former versions regarding real-time applications are no longer valid. Also, the DS1102 platform can now be used together with the Fuzzy Logic Controller Block because the code generated for the new block needs considerably less memory.

Note: Sometimes the "Fuzzy Wizard" cannot create a hierarchical Block diagram from the FIS (e.g. if custom membership functions are used). In these cases the Fuzzy Logic Controller Block uses an S-function to simulate the FIS and the restrictions described for former versions of Fuzzy Logic Toolbox are still valid (see above). For more details refer to 'The Fuzzy Logic Controller Block' on page 2-69 of the Fuzzy Logic Toolbox User's Guide (Version 2) from The MathWorks.

Fuzzy Logic Toolbox 2.1.2 (MATLAB R13.0.x and MATLAB R13 Service Pack 1)

RTI versions 4.3.5 up to RTI version 5.0 (dSPACE Releases 3.4 to 4.1)support model-building with blocks of Fuzzy Logic Toolbox. Please note the following specialities with the Fuzzy Logic Toolbox:

Fuzzy Logic controllers that are built by using the "Fuzzy Wizzard" can be used with all dSPACE platforms. The Fuzzy Wizzard automatically generates a hierarchical block diagram representation for most Fuzzy Inference Systems (FIS). As only standard Simulink blocks are used, a compact and efficient code generation with the Real-Time Workshop is possible.

Sometimes the "Fuzzy Wizard" *cannot* create a hierarchical Block diagram from the FIS (e.g. if custom membership functions are used). In these cases the Fuzzy Logic Controller Block uses an S-function to simulate the FIS and the restrictions described for former versions of Fuzzy Logic Toolbox are still valid (see above). For more details refer to 'The Fuzzy Logic Controller Block' of the Fuzzy Logic Toolbox User's Guide from The MathWorks.

Note: For additional information on how to work with the Fuzzy Logic Toolbox using custom membership functions with dSPACE's Texas Instruments Platforms see "FAQ 208: Using the MATLAB R13 Fuzzy Logic Toolbox with Texas Instruments Platforms".

Fuzzy Logic Toolbox 2.1.3 and 2.2.x (MATLAB R14 to MATLAB R14 Service Pack 3 and MATLABR2006a to MATLAB R2008a)

RTI version 5.1.5 to 6.1 (dSPACE Releases 4.1 to 6.2) supports model-building with blocks of Fuzzy Logic Toolbox. Please note the following specialities with the Fuzzy Logic Toolbox:

For most Fuzzy Inference Systems (FIS), the Fuzzy Logic controller block uses the "Fuzzy Wizzard" to automatically generate a hierarchical block diagram representation. As only standard Simulink blocks are used, a compact and efficient code generation with the Real-Time Workshop is possible.

Sometimes the "Fuzzy Wizard" *cannot* create a hierarchical Block diagram from the FIS (e.g. if custom membership functions are used). In these cases the Fuzzy Logic Controller Block uses an S-function to simulate the FIS and the block performs a lot of time-consuming computations. For this reason the block rapidly imposes a fixed-step size that is very high. For more details refer to 'The Fuzzy Logic Controller Block' of the Fuzzy Logic Toolbox User's Guide from The MathWorks.

2.5 Neural Network Toolbox

Neural Network Toolbox 2.0.4 (MATLAB 5.1.1) to 3.0 (MATLAB 5.2.x)

As installed from the respective dSPACE CDs, RTI versions 3.0.x and 3.1.x (dSPACE CDs 1.0 to 1.2.1) cannot build models containing blocks of the Neural Network Toolbox. In order to allow this, the compiler and make-utility search paths in the template makefiles must be completed manually for the Neural Network Toolbox S-function directories. Please inquire at support.rti@dspace.de on how to do this.

In the Neural Network Toolbox 2.0.4 (MATLAB 5.1.1) and 3.0 (MATLAB 5.2.0) some blocks use C-coded S-functions. This code is missing in the MATLAB installations and can be downloaded from The MathWorks' FTP site: ftp://ftp.mathworks.com/pub/tech-support/library/neural

Please note that for the DS1003 and DS1102 platforms, this C code must be modified to avoid compiler errors related to incompatible pointer types. The changes necessary are described in the RTI User's Guide, Chapter "What's New", section "Converting S-functions".

From the Neural Network Toolbox 3.0 (MATLAB 5.2.x) on, the blocks provided by the toolbox are masked subsystems composed only of standard Simulink blocks. Toolbox 3.0 is fully supported by RTI versions 3.2.x to 3.3.x (dSPACE CDs 1.3 to 2.0), except for the "compet" block from the sublibrary "Transfer Functions". This block uses the MATLAB Fcn block, which is not supported by Real-Time Workshop.

Please note also the peculiarities described below.

Neural Network Toolbox 3.0.1 (MATLAB R11.x) and Neural Network Toolbox 4.0.x (MATLAB R12.x)

The Simulink blocks provided by the Neural Network toolbox are masked subsystems composed only of standard Simulink blocks. Hence the toolbox is fully supported by RTI versions 3.4.x to 4.3 (dSPACE CD 2.1 to dSPACE Release 3.4), except for the "compet" block from the sublibrary "Transfer Functions". This block uses the MATLAB Fcn block, which is not supported by Real-Time Workshop.

Please note also the peculiarities described below.

Peculiarities with the Neural Network Toolbox

- With Neural Network Toolboxes 2.0.4 (MATLAB 5.1.1) and 3.0 (MATLAB 5.2.x), the Neural Network blocks are not linked to a Simulink library. Thus the models are not automatically updated to the new Neural Network Toolbox blocks when migrating a model to Toolbox version 3.0.1 (R11.x) or higher (manual replacing of blocks is necessary). From Neural Network Toolbox 3.0.1 (R11.x) on, the blocks are library-linked.
- The weights for neural networks that were modeled in Simulink must be determined prior to the build process. It is not possible to directly train neural networks in real-time. If training of a network is required in conjunction with a real-time program, a possible strategy could be: upload data with MLIB/MTRACE to the host PC, calculate the new weights in MATLAB, and download the new parameter set to the neural network by using MLIB/MTRACE again.

Neural Network Toolbox 4.0.x (MATLAB R13.0.x to MATLAB R14 Service Pack 3) Neural Network Toolbox 5.0 (MATLAB R2006a), Neural Network Toolbox 5.01 (MATLAB R2006b), Neural Network Toolbox 5.0.2 (MATLAB R2007a, MATLAB R2007a+), Neural Network Toolbox 5.1 (MATLAB R2007b, MATLAB R2007b+) Neural Network Toolbox 6.0 (MATLAB R2008a)

The Simulink blocks provided by the Neural Network toolbox are masked subsystems composed only of standard Simulink blocks. Hence the toolbox is fully supported by RTI versions 4.3.5 to 6.1 (dSPACE Releases 3.4 to 6.2), except for the "compet" block from the sublibrary "Transfer Functions". This block uses the MATLAB Fcn block, which is not supported by Real-Time Workshop.

Peculiarities with the Neural Network Toolbox

The weights for neural networks that were modeled in Simulink must be determined prior to the build process. It is not possible to directly train neural networks in real-time. If training of a network is required in conjunction with a real-time program, a possible strategy could be: upload data with MLIB to the host PC, calculate the new weights in MATLAB, and download the new parameter set to the neural network by using MLIB again.

2.6 Signal Processing Blockset (formerly DSP Blockset)

DSP Blockset 2.0 (MATLAB 5.1.1) and 2.2 (MATLAB 5.2.x)

RTI versions 3.0.x to 3.3.x (dSPACE CDs 1.0 to 2.0) support model-building with blocks of the DSP Blockset.

There are no known problems.

DSP Blockset 3.0 (MATLAB R11)

The DSP Blockset can be used with RTI versions 3.4.x to 3.6.x. The following problems are known:

- The blocks Covariance Method, Modified Covariance Method, and Overlap-Add cannot be used in conjunction with Real-Time Workshop because these blocks internally produce variables that are discontiguous in memory and force Real-Time Workshop to issue an error message.
- The Detrend block leads to a fatal Real-Time Workshop error during code generation because a required M-function is missing in the MATLAB installation.
- The Repeat block leads to fatal compiler errors because the C code that is generated for this block is faulty.

DSP Blockset 3.1 (MATLAB R11.1)

The DSP Blockset can be used with RTI versions 3.4.x to 3.6.x (dSPACE CDs 2.1 to 3.0). The following problems are known:

- The blocks Covariance Method, Modified Covariance Method, and Overlap-Add cannot be used in conjunction with Real-Time Workshop because these blocks internally produce variables that are discontiguous in memory and force Real-Time Workshop to issue an error message.

The problems that DSP Blockset 3.0 has with the Detrend block and the Repeat block (see above) are fixed in DSP Blockset 3.1.

DSP Blockset 4.0 and (MATLAB R12.0)

The compatibility of this DSP Blockset version depends on the target platform:

- The DSP Blockset can be used with RTI version 4.0/4.1 (dSPACE CD 3.0 to dSPACE Release 3.2) for the DS1005, DS1103, DS1401 and DS1004 platforms. No problems are known for these.
- The DSP Blockset **cannot be used** for the DS1003 and DS1102 platforms with RTI version 4.0/4.1 (dSPACE CD 3.0 to dSPACE Release 3.2). In many cases the code generated by the DSP

Blockset 4.0 is not compatible with the dSPACE TMS320Cxx-based hardware. Models making use of the DSP Blockset may not run correctly on the DS1003 and DS1102 board and crash.

DSP Blockset 4.1 (MATLAB R12.1)

There are no known problems. The DSP Blockset 4.1 can be used with each dSPACE platform and RTI versions 4.2 to 4.3.x (dSPACE Releases 3.3 and 3.4).

DSP Blockset 5.x (MATLAB R13, MATLAB R13.0.1, MATLAB R13 Service Pack 1 and MATLAB R13 Service Pack 2)

There are no known problems. The DSP Blockset 5.x can be used with each dSPACE platform and RTI versions 4.3.5 to 5.1, 5.2 and 5.3 to 5.3.2 (dSPACE Releases 3.4 to 5.2).

Signal Processing Blockset 6.0 to 6.5 (MATLAB R14 to MATLAB R2007a+)

Since MATLAB R14 the DSP Blockset is called Signal Processing Blockset. There are no known problems. The Signal Processing Blockset 6.x can be used with each dSPACE platform and RTI versions 5.1.5, 5.1.6, 5.2.5 and 5.3.5 to 5.5 (dSPACE Releases 4.1 to 5.4).

Signal Processing Blockset 6.6 to 6.7 (MATLAB R2007b to MATLAB R2008a)

Since MATLAB R14 the DSP Blockset is called Signal Processing Blockset. The Signal Processing Blocksets 6.6 to 6.7 can be used with each dSPACE platform and RTI versions 5.6 to 6.1 (dSPACE Releases 6.0 to 6.2). The tunability status of some blocks might have changed with MATLAB R2007b. It may be possible that parameters which could be generated in previous releases into the trc file are missing when migrating a model to MATLAB R2007b, MATLAB R2007b+ or MATLAB R2008a. Consult the Signal Processing BlockSet documentation for MATLAB R2007b to get further details.

2.7 SimDriveline

SimDriveline 1.0 to 1.3 (MATLAB R14 Service Pack 1 to MATLAB R2007a+)

Up to RTI 5.2.5, SimDriveline is not compatible to dSPACE's RTI1006 platform that is based on the AMD Opteron™ processor (DS1006) due to limitations of the GNU Compiler GCC.

For dSPACE platforms based on PowerPC processor (DS1005, DS1103, DS1104 and MicroAutoBox) applications with SimDriveline blocks can be built. Even though the Microtec PowerPC compiler issues some warnings concerning code generated by Real-Time Workshop or provided by SimDriveline, the application can be loaded to the real-time hardware. Tests with demo models provided by SimDriveline have not shown up problems during real-time simulation.

For models containing blocks from SimDriveline, the RTI variable description file option "Include mask and workspace parameters" is not supported.

Most SimDriveline blocks have special driveline ports that are connected with special driveline connection lines. These connection lines are not normal Simulink lines. As a result, for these ports and connection lines, variables are not available in RTI's variable description file (<model>.trc file). For details on driveline ports and connection lines refer to SimDriveline User's Guide of The MathWorks.

For RTI-MP, the following limitation applies:
SimDriveline blocks must not be inserted at the root level of a model. Else one of the following problems will occur:

- SimDriveline connection lines are not copied during model separation
- Model separation is aborted with an error message

No problems occur if the SimDriveline blocks are contained in subsystems.

SimDriveline 1.4 (MATLAB R2007b)

For dSPACE platforms based on PowerPC processor (DS1005, DS1103, DS1104 and MicroAutoBox) applications with SimDriveline blocks can be built. Even though the Microtec PowerPC compiler issues some warnings concerning code generated by Real-Time Workshop or provided by SimDriveline, the application can be loaded to the real-time hardware. For models containing blocks from SimDriveline, the RTI variable description file option “Include mask and workspace parameters” is not supported.

Most SimDriveline blocks have special driveline ports that are connected with special driveline connection lines. These connection lines are not normal Simulink lines. As a result, for these ports and connection lines, variables are not available in RTI’s variable description file (<model>.trc file). For details on driveline ports and connection lines refer to SimDriveline User’s Guide of The MathWorks.

With MATLAB R2007b, it is possible to connect driveline connection lines in SimDriveline to a Physical Network line connected to SimScape’s Foundation Library blocks. Foundation Library blocks specify linearly implicit systems of ODEs. Real-Time Workshop supports linearly implicit systems of ODEs for GRT, ERT, and xPC targets only. (See also details on blocksets and toolboxes for SimScape)

New SimDriveline demos are available with MATLAB R2007b containing SimScape’s Foundation Library blocks. These demos can not be built when configured for RTI platforms.

For RTI-MP, the following limitation applies:
SimDriveline blocks must not be inserted at the root level of a model. Otherwise, one of the following problems will occur:

- SimDriveline connection lines are not copied during model separation
- Model separation is aborted with an error message

No problems occur if the SimDriveline blocks are contained in subsystems.

SimDriveline 1.5 (MATLAB R2008a)

For dSPACE platforms based on PowerPC processor (DS1005, DS1103, DS1104 and MicroAutoBox) applications with SimDriveline blocks can be built. Even though the Microtec PowerPC compiler issues some warnings concerning code generated by Real-Time Workshop or provided by SimDriveline, the application can be loaded to the real-time hardware. For models containing blocks from SimDriveline, the RTI variable description file option “Include mask and workspace parameters” is not supported.

Most SimDriveline blocks have special driveline ports that are connected with special driveline connection lines. These connection lines are not normal Simulink lines. As a result, for these ports and connection lines, variables are not available in RTI’s variable description file (<model>.trc file). For details on driveline ports and connection lines refer to SimDriveline User’s Guide of The MathWorks.

With MATLAB R2008a, it is possible to connect driveline connection lines in SimMechanics to a Physical Network line connected to SimScape’s Foundation Library blocks. Foundation Library blocks are not supported by RTI.

New SimDriveline demos are available since MATLAB R2007b containing SimScape’s Foundation Library blocks. These demos can not be built when configured for RTI platforms.

For RTI-MP, the following limitation applies:
SimDriveline blocks must not be inserted at the root level of a model. Otherwise, one of the following problems will occur:

- SimDriveline connection lines are not copied during model separation
- Model separation is aborted with an error message

No problems occur if the SimDriveline blocks are contained in subsystems.

2.8 SimMechanics

SimMechanics 1.x (MATLAB R12.1 and MATLAB R13)

Real-Time Workshop of The MathWorks does not support SimMechanics therefore SimMechanics can not be compatible with RTI.

SimMechanics. 2.0 to 2.3 (MATLAB R13.0 to MATLAB R14 Service Pack 3)

SimMechanics is not compatible to dSPACE platforms that are based on Texas Instruments DSPs (DS1003) due to limitations of the Texas Instruments compiler. Up to RTI 5.2.5 (dSPACE Release 4.2), it is also not compatible to dSPACE platforms that are based on AMD Opteron™ processor (DS1006) and the GNU Compiler GCC.

For dSPACE platforms based on PowerPC processor (DS1005, DS1103, DS1104 and MicroAutoBox) applications with SimMechanics can be built and downloaded only if compiler optimization of the Microtec PowerPC compiler is completely turned off. Even though the compiler still issues several warnings in this case, the application can be loaded to the real-time hardware and will be precessed. When using any other (e.g. higher) level of compiler optimization the build process will be stopped due to compiler errors.

Because of the existing compiler warnings that concern code generated by the Real-Time Workshop or provided by the SimMechanics Toolbox we can finally not judge the degree of compatibility.

Most SimMechanics blocks have special connection ports that are connected with special connection lines. These connection lines are not normal Simulink lines. As a result, for these ports and connection lines, variables are not available in RTI's variable description file (<model>.trc file). For details on connection ports and connection lines refer to SimMechanics User's Guide of The MathWorks.

For RTI-MP, the following limitation applies:
SimMechanics blocks must not be inserted at the root level of a model. Else one of the following problems will occur:

- SimMechanics connection lines are not copied during model separation
- Model separation is aborted with an error message

No problems occur if the SimMechanics blocks are contained in subsystems.

SimMechanics 2.4 to 2.6 (MATLAB R2006a to MATLAB R2007a+)

For dSPACE platforms based on PowerPC processor (DS1005, DS1103, DS1104 and MicroAutoBox) applications with SimMechanics can be built and downloaded only if compiler optimization of the Microtec PowerPC compiler is completely turned off. When using any other (e.g. higher) level of compiler optimization the build process will be stopped due to compiler errors. This limitation only applies in conjunction with dSPACE Releases 5.1 to 5.4. Since dSPACE Release 6.0, an updated version of the Microtec PowerPC compiler (version 3.x) is delivered which can handle compilation of SimMechanics sources using higher compiler optimizations.

Most SimMechanics blocks have special connection ports that are connected with special connection lines. These connection lines are not normal Simulink lines. As a result, for these ports and connection lines, variables are not available in RTI's variable description file (<model>.trc file). For details on connection ports and connection lines and limitations for code generation from models containing SimMechanics blocks refer to SimMechanics User's Guide of The MathWorks.

For RTI-MP, the following limitation applies:
SimMechanics blocks must not be inserted at the root level of a model. Else one of the following problems will occur:

- SimMechanics connection lines are not copied during model separation
- Model separation is aborted with an error message

No problems occur if the SimMechanics blocks are contained in subsystems.

SimMechanics 2.7 (MATLAB R2007b)

Most SimMechanics blocks have special connection ports that are connected with special connection lines. These connection lines are not normal Simulink lines. As a result, for these ports and connection lines, variables are not available in RTI's variable description file (<model>.trc file). For details on connection ports and connection lines and limitations for code generation from models containing SimMechanics blocks refer to SimMechanics User's Guide of The MathWorks.

For RTI-MP, the following limitation applies:
SimMechanics blocks must not be inserted at the root level of a model. Else one of the following problems will occur:

- SimMechanics connection lines are not copied during model separation
- Model separation is aborted with an error message

No problems occur if the SimMechanics blocks are contained in subsystems.

With MATLAB R2007b, it is possible to connect driveline connection lines in SimMechanics to a Physical Network line connected to SimScape's Foundation Library blocks. Foundation Library blocks specify linearly implicit systems of ODEs. Real-Time Workshop supports linearly implicit systems of ODEs for GRT, ERT and xPC targets only. (See also details on blocksets and toolboxes for SimScape)

New SimMechanics demos are available with MATLAB R2007b containing SimScape's Foundation Library blocks. These demos can not be built when configured for RTI platforms.

SimMechanics 2.7.1 (MATLAB R2008a)

Most SimMechanics blocks have special connection ports that are connected with special connection lines. These connection lines are not normal Simulink lines. As a result, for these ports and connection lines, variables are not available in RTI's variable description file (<model>.trc file). For details on connection ports and connection lines and limitations for code generation from models containing SimMechanics blocks refer to SimMechanics User's Guide of The MathWorks.

For RTI-MP, the following limitation applies:
SimMechanics blocks must not be inserted at the root level of a model. Else one of the following problems will occur:

- SimMechanics connection lines are not copied during model separation
- Model separation is aborted with an error message

No problems occur if the SimMechanics blocks are contained in subsystems.

With MATLAB R2008a, it is possible to connect driveline connection lines in SimMechanics to a Physical Network line connected to SimScape's Foundation Library blocks. Foundation Library blocks are not supported by RTI.

2.9 SimPowerSystems (formerly "Power System" Blockset)

Power System Blockset 1.0 (MATLAB 5.2.x) and 1.1 (MATLAB R11.x)

Theoretically, the Power System Blockset (PSB) can be used with RTI. However, we do not recommend it for the following reasons:

- A fundamental problem is that in most cases Power System Blockset models need stiff solvers with a variable step-size. However, Real-Time Workshop supports only fixed-step integrators. To obtain stability, these would require very small step-sizes which cannot be achieved in real time anymore. Only very simple models using linear components only, can be simulated with a fixed-step solver in real-time. See also the Power System Blockset User's Guide, Chapter 3 "Advanced Topics", section "Which Integration Algorithm Must be Used". Note that RTI Version 3.4.x and later support a non-real-time simulation mode with which it is possible to simulate Power System Blockset models with step sizes too small for real-time simulations.
- Due to the structure of the Power System Blockset blocks, these cannot be treated like standard Simulink blocks with respect to TRACE, COCKPIT or ControlDesk. The Power System Blockset blocks contain no visible functional information as do other Simulink blocks. The actual information is generated into "Measurement blocks" in the form of State-Space blocks. For this reason, the output variables of most Power System Blockset blocks do not show meaningful results during the real-time simulation. For the same reason, accessing parameters of Power System Blockset blocks with COCKPIT or ControlDesk is also unclear.

See also The MathWorks' support page "Can I use Real-Time Workshop on a Simulink model containing blocks from the Power System Blockset?" under:

http://www.mathworks.com/support/solutions/data/1-16PJA.html

Power System Blockset 2.0, 2.1 and 2.2 (MATLAB R12.x)

Since Version 2.0 the Power System Blockset is equipped with the 'Discrete System Block'. When this is added to a Simulink model containing blocks of the Power System Blockset, the time-continuous model is discretized in time. This allows the use of fixed step solvers, so that code-generation with the Real-Time Workshop is possible.

In general, the simulation of discretized models can be assumed to run faster than the corresponding simulations of time-continuous counterparts. But whether a simulation can be performed under real-time conditions still depends on the complexity of the model. In addition, the step size used for discretization still influences the precision of the numerical calculations.

In summary: Discretizing a model can dramatically reduce the time consumption of numerical calculations, but some blocks in the Power System Blockset still require a lot of computing power, and whether a model using the Power System Blockset is suitable for real-time simulations has to be decided from case to case.

See also The MathWorks' support page "Can I use RTW on a Simulink model containing blocks from the Power System Blockset?" under:

http://www.mathworks.com/support/solutions/data/1-16PJA.html

Please consider the following peculiarities:

- Due to the structure of the Power System Blockset blocks, these cannot be treated like standard Simulink blocks with respect to instrument layouts in ControlDesk. The Power System Blockset blocks contain no visible functional information as do other Simulink blocks. The actual information is generated into "Measurement blocks" in the form of State-Space blocks. For this reason, the output variables of most Power System Blockset blocks do not show meaningful results during the real-time simulation.
- The equivalent systems that are generated into Measurement blocks of the Power System Blockset make extensive use of From and Goto tags with global scope to exchange simulation data. The use of these blocks can circumvent the multiprocessor data exchange mechanism implemented by IPC (Interprocessor Communication) blocks of the RTI-MP Blockset. This is why all parts of a multiprocessor Simulink model using the Power System Blockset should be assigned to one single processor.
- Switches from the Power System Blockset can cause peaks in the turnaround time of the model execution, which may significantly exceed the steady state turnaround time. This effect is caused

by the recalculation of the model's system matrices (A, B, C and D) during run time if a switch enables and/or disables different portions of the model.

- The source files of some S-Functions used with the Power System Blockset reside in directories of the MATLAB installation, which are not known to the Real-Time Workshop/RTI build process (<matlab_root>\simulink\src). Consequently it is not possible to finish the Real-Time Workshop/RTI build process successfully for models containing these blocks, e.g., "Breaker" and "Discrete System" block (sfun_psbbreaker.c, sfun_psbdiscc.c).
  As a workaround it is possible to copy these C files into the current working directory or to make the files known to the Real-Time Workshop/RTI build process by using the User Makefile (please see the 'RTI and RTI-MP File Reference').

SimPowerSystems 2.3, 3.x to 4.6 (MATLAB R13.x, to MATLAB R2008a)

Since MATLAB R13 the Power System Blockset is called "SimPowerSystems". SimPowerSystems is based on the same technology as described for the Power System Blockset 2.0 (see above).

With SimPowerSystems 2.3 the "phasor simulation feature" is introduced, that might reduce the simulation time significantly by replacing the differential equation description of a network by a set of algebraic equations at a fixed frequency. Not all blocks of SimPowerSystems can be used with the phasor simulation method. For details on the phasor simulation method refer to SimPowerSystems User's Guide of The MathWorks.

With SimPowerSystems 3.0 the "Physical Modeling port and connection lines" are introduced. As a result, the output variables of most SimPowerSystems blocks are no longer available in RTI's variable description file (<model>.trc file). For details on the new port and connection lines refer to SimPowerSystems User's Guide of The MathWorks.

For models containing blocks from SimPowerSystems, the RTI variable description file option "Include mask and workspace parameters" is not supported.

Please consider the following peculiarities:

- Due to the structure of SimPowerSystems blocks, these cannot be treated like standard Simulink blocks with respect to instrument layouts in ControlDesk. The Power System Blockset blocks contain no visible functional information as do other Simulink blocks. The actual information is generated into "Measurement blocks" in the form of State-Space blocks.
- The equivalent systems that are generated into Measurement blocks of SimPowerSystems make extensive use of From and Goto tags with global scope to exchange simulation data. The use of these blocks can circumvent the multiprocessor data exchange mechanism implemented by IPC (Interprocessor Communication) blocks of the RTI-MP Blockset. This is why all parts of a multiprocessor Simulink model using the Power System Blockset should be assigned to one single processor.
- SimPowerSystems blocks must not be inserted at the root level of an RTI-MP model. Else one of the following problems will occur:
  - SimPowerSystems connection lines are not copied during model separation
  - Model separation is aborted with an error message

  No problems occur if the SimPowerSystems blocks are contained in subsystems.

- Switches from SimPowerSystems can cause peaks in the turnaround time of the model execution, which may significantly exceed the steady state turnaround time. This effect is caused by the recalculation of the model's system matrices (A, B, C and D) during run time if a switch enables and/or disables different portions of the model.
- In MATLAB R13.x and MATLAB R13 Service Pack 1, the source files of some S-Functions used with the Power System Blockset reside in directories of the MATLAB installation, which are not known to the Real-Time Workshop/RTI build process (<matlab_root>\simulink\src). Consequently

it is not possible to finish the Real-Time Workshop/RTI build process successfully for models containing these blocks, e.g., “Discrete System” block (sfun_psbdiscc.c). See The MathWorks’ support page “Why do I receive an error when I try to generate code for a model using SimPowerSystems 2.3 (R13SP1) in Real-Time Workshop 5.1 (R13SP1)?” for more information on this problem: http://www.mathworks.com/support/solutions/data/1-1BG7A.html

- Since MATLAB R2007b new SimPowerSystem demos are supported. For dSPACE platforms based on PowerPC processor (DS1005, DS1103, DS1104 and MicroAutoBox) the compile process of these models may take a long time. The compile time can be reduced by completely turning off compiler optimization of the Microtec PowerPC compiler.
- See also The MathWorks’ support page “Can I use Real-Time Workshop on a Simulink model containing blocks from the SimPowerSystems Blockset?” under: http://www.mathworks.com/support/solutions/data/1-16PJA.html

2.10 Simulink Fixed Point (formerly Fixed-Point Blockset)

Fixed-Point Blockset 1.1 (MATLAB 5.1.1) and 1.2 (MATLAB 5.2.x)

RTI Versions 3.0.x to 3.3.x (dSPACE CDs 1.0 to 2.0)support model-building with blocks of the Fixed-Point Blockset.

There are no known problems.

Fixed-Point Blockset 2.0 (MATLAB R11.x)

As installed from dSPACE CDs 2.1 and 2.2, RTI versions 3.4 and 3.4.1 do not support the Fixed-Point Blockset. However, a patch is available on demand that enables you to build fixed-point models. This patch enables you also to visualize data and tune parameters with ControlDesk, but only the scaled data (and not the physical values) can be visualized and tuned.

RTI versions 3.5.x and 3.6.x (dSPACE CDs 2.3 to 3.1) support model-building with blocks of the Fixed-Point Blockset. The following problems are known:

- Only the raw physical values (and not the scaled data) can be visualized and tuned from within ControlDesk.
- The 1D and 2D Fixed-Point Look-Up Table blocks cannot be instrumented with ControlDesk's TableEditor instrument because the Variable Description File (<model>.trc file) generated by RTI 3.5.x does not contain the required entries. For this problem, a patch is available on demand. With RTI 3.6.x this problem no longer remains.

Fixed-Point Blockset 3.0 (MATLAB R12) up to 3.1 (MATLAB R12.1)

The Fixed-Point Blockset can be used with RTI version 4.0 up to RTI version 4.3.x (dSPACE CD 3.0 to dSPACE Release 3.4). Please consider the following limitation:

- Only the raw physical values (and not the scaled data) can be visualized and tuned from within ControlDesk.

Fixed-Point Blockset 4.0.x (MATLAB R13 and MATLAB R13.0.1)

The Fixed-Point Blockset can not be used with RTI version 4.3.5 (MATLAB R13 Compatibility Update for dSPACE Release 3.4).

The Fixed-Point Blockset can be used with RTI version 4.4, 4.5.x, 4.6 and 5.0 (dSPACE Releases 3.5 to 4.1). There are no known problems.

Simulink Fixed Point 4.1 to 5.6 (R13 Service Pack 1 to MATLAB R2008a)

Simulink Fixed Point can be used with RTI versions 4.5.5 to 6.1 (dSPACE Releases 4.0 to 6.2). There are no known problems.

2.11 Stateflow/Stateflow Coder

Stateflow 1.0.5 (MATLAB 5.1.1) to 6.2 (MATLAB R14 Service Pack 2)

Stateflow charts in Simulink models are supported by RTI.

The following problems are known:

- States and transitions of Stateflow charts are not accessible via the Variable Description File (<model>.trc file). As a workaround, add additional outputs to Simulink that are set to specific values in the state chart to allow the monitoring of the state activity. From MATLAB R11.x on, Stateflow offers the “Output State Activity” option that enables you to easily add these outputs. It can be set individually for each state.
- Stateflow charts can be triggered by hardware or software interrupts. Up to Stateflow 1.0.7 (MATLAB 5.2.1), all state charts in a model share the same global variables. The Stateflow code generated is therefore not reentrant and unpredictable results might occur if charts interrupt each other. From Stateflow 2.0 (R11) on, the situation is less restrictive: each state chart has its own code and own set of global variables. However, some global variables related to the whole state machine may remain and impose the same limitations related to charts interrupting each other.
- Calling RTLib functions (e.g. I/O access) in states and transitions of a Stateflow chart became problematic with Stateflow 2.0 (MATLAB R11) because the Stateflow parser is much more restrictive from that version on. Another source for implementation difficulties is the fact that the RTLib functions are not defined for the Simulink target of the state machine. If I/O access is required from within a state chart, we recommend handling this via S-functions that are placed in function-call subsystems and to trigger these subsystems by event outputs of the state charts.
- Code generated by Stateflow Coder 3.0.3 (update version for MATLAB R11.1) and Stateflow Coder 4.0 (MATLAB R12) prevents the initialization of certain Stateflow-internal variables when a simulation is stopped and restarted via the simState variable under ControlDesk. The values of the last simulation run are used instead. This can cause unexpected simulation behavior. This problem does not exist in Stateflow 3.0 (original version of R11.1) and is also fixed with Stateflow 4.0.2 (update version for MATLAB R12) and higher versions.

Please also note the following:

- Stateflow lets you add “data” (variables) to its data dictionary, which can be modified by the state charts. With RTI Version 3.4.x and later, data parented by the state machine is written to an extra group of the variable description file (<model>.trc file).

Stateflow 6.3 (MATLAB R14 Service Pack 3) to 7.1 (MATLAB R2008a)

Stateflow charts in Simulink models are supported by RTI.

- Calling RTLib functions (e.g. I/O access) in states and transitions of a Stateflow chart is not recommended. If I/O access is required from within a state chart, we recommend handling this via S-functions that are placed in function-call subsystems and to trigger these subsystems by event outputs of the state charts.
- For a Stateflow chart, the following variables are accessible in the variable description file (<model>.trc file):
  - Stateflow states and local data that are set as test points
  - Stateflow chart outputs
- Global Stateflow data parented by the state machine is written to an extra group called “State Machine Data” of the variable description file (<model>.trc file).