



Real-Time Interface – Blocksets and Toolboxes Support

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1 Introduction

The compatibility information in this document covers MATLAB releases from R2006a to R2010a. For information on other MATLAB releases, please contact dSPACE Support.

For information on which dSPACE releases support which MATLAB releases, see:

<http://www.dspace.com/goto?Versions>

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 blocks provided by Simulink and their possible parameterizations is far too large to guarantee tests with 100% coverage.

Note: As a result, problems might occur even when we state that a certain blockset or toolbox is supported by RTI. For information on the known problems, see the blockset- or toolbox-specific chapters below or contact Support.RTI@dspace.de.

Blocksets and Toolboxes Not Listed in This Document

Blocksets and toolboxes that are not listed in this document are not tested with RTI. Therefore we cannot make any compatibility statements concerning these blocksets and toolboxes.

Compatibility of Blocksets and Toolboxes Not from The MathWorks

We cannot make any statement on the compatibility of blocksets and toolboxes that were not developed by The MathWorks.

2 Overview

Legend:

Generally supported	The toolbox or blockset is supported. No problems are known.
Generally not supported	The toolbox or blockset is not supported; i.e., the provided Simulink blocks cannot be used in models built with Real-Time Workshop/RTI.
Supported, but known issues	The toolbox or blockset is supported, but there are restrictions or known problems, or a special patch is needed to make it work correctly. Click the 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 it is built for real-time simulation, without having an effect on the generated code (Real-Time Workshop ignores the blocks).

Blockset	Description
Aerospace Blockset	Supported, but known issues
Communications Blockset	Supported, but known issues
Communications Toolbox	No effect
Control System Toolbox	Generally supported
Signal Processing Blockset	Supported, but known issues
Fixed-Point Blockset / Simulink Fixed-Point	Generally supported
Fixed-Point Toolbox	No effect
Fuzzy Logic Toolbox	Supported, but known issues
Neural Network Toolbox	Supported, but known issues
Optimization Toolbox	No effect
Parallel Computing Toolbox	Supported, but known issues
MATLAB Distributed Computing Server	See Parallel Computing Toolbox
Signal Processing Toolbox	No effect
Simscape, SimElectronics, SimDriveline, SimHydraulics and SimMechanics	Supported, but known issues
SimPowerSystems	Supported, but known issues
Simulink Control Design	Supported, but known issues
Stateflow/Stateflow Coder	Supported, but known issues
System Identification Toolbox	Generally not supported

3 Supported Blocksets with Known Issues

3.1 Aerospace Blockset

3.1.1 General Limitations

RTW Support

Relevance:

MATLAB Releases: general

dSPACE Platforms: all

dSPACE Releases: general

RTI and RTI-MP

Problem Description:

For some MATLAB Releases, The MathWorks states that some blocks do not fully support Real-Time Workshop code generation. For details, refer to the Aerospace Blockset documentation provided by The MathWorks.

3.2 Communications Blockset

3.2.1 General Limitations

RTW Support

Relevance:

MATLAB Releases: general

dSPACE Platforms: all

dSPACE Releases: general

RTI and RTI-MP

Problem Description:

For MATLAB Releases prior to R2008b, The MathWorks states that some blocks do not fully support Real-Time Workshop code generation. For details, refer to the Communications Blockset documentation provided by The MathWorks.

The USRP2 Transmitter and USRP2 Receiver blocks introduced with MATLAB R2010b are not supported by RTI. These blocks need access to Windows-dependent compiler library files, which are not available for dSPACE systems.

3.3 Fuzzy Logic Toolbox

3.3.1 General Limitations

Fuzzy Wizard

Relevance:

MATLAB Releases: R14 to R2010b

dSPACE Platforms: all

dSPACE Releases: 4.1 to 7.0

RTI single-processor and RTI-MP

Problem Description:

For most Fuzzy Inference Systems (FIS), the Fuzzy Logic controller block uses the Fuzzy Wizard to automatically generate a hierarchical block diagram representation. As only standard Simulink blocks are used, 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' in the Fuzzy Logic Toolbox User's Guide from The MathWorks.

3.4 Neural Network Toolbox

3.4.1 General Limitations

Relevance:

MATLAB Releases: MATLAB 5.2.x to R2010b

dSPACE Platforms: all

dSPACE Releases: dSPACE CD 1.3 to Release 7.0

RTI and RTI-MP

Problem Description:

Some of the blocks provided by the Neural Network toolbox are not supported by Real-Time Workshop. Hence they cannot be used with RTI.

Known unsupported blocks are:

- compet block (uses MATLAB Fcn block, up to R2010a)
- NN Predictive Controller block (uses M-file S-function)

3.4.2 Run-Time Issues

Weights for neural networks**Relevance:**

MATLAB Releases: R11.x to R2010b

dSPACE Platforms: all

dSPACE Releases: dSPACE CD 2.1 to Release 7.0

RTI and RTI-MP

Problem Description:

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 to the host PC with MLIB, calculate the new weights in MATLAB, and download the new parameter set to the neural network by using MLIB again.

3.5 Parallel Computing Toolbox / MATLAB Distributed Computing Server

3.5.1 Parallel build of model reference hierarchies

Relevance:

MATLAB Releases: R2009a to R2010b

dSPACE Platforms: all

dSPACE Releases: Release 6.4 to Release 7.0

RTI and RTI-MP

Problem Description:

Real-Time Workshop can accelerate code generation and compilation for models containing large model reference hierarchies by building referenced models in parallel whenever possible. This parallel build feature has been introduced with Real-Time Workshop R2009a and additionally requires the Parallel Computing Toolbox. It is supported by RTI and RTI-MP since dSPACE Release 6.6.

RTI does not support parallel builds of model reference hierarchies using MATLAB Distributed Computing Server.

For details on the parallel build feature refer to the RTI Implementation Guide and the Real Time Workshop User's Guide from The MathWorks.

3.6 Signal Processing Blockset

3.6.1 General Limitations

Relevance:

MATLAB Releases: R2010a to R2010b

dSPACE Platforms: all

dSPACE Releases: 6.6 to 7.0

RTI and RTI-MP

Problem Description:

The UDP Send and UDP Receive blocks introduced with MATLAB R2010a are not supported by RTI. These blocks need access to Windows-dependent compiler library files, which are not available for dSPACE systems.

Trying to build a model containing UDP Send and UDP Receive blocks with an RTI target file will result in a compiler error.

3.6.2 TRC File Issues

Block parameters access via variable description file

Relevance:

MATLAB Releases: R2007b to R2010b

dSPACE Platforms: all

dSPACE Releases: 6.0 to 7.0

RTI and RTI-MP

Problem Description:

Depending on the MATLAB release in use, it is possible that some block parameters are not accessible from the variable description file (<model>.trc file).

3.7 Simscape, SimElectronics, SimDriveline, SimHydraulics and SimMechanics

3.7.1 General Limitations

SimElectronics, SimDriveline, SimHydraulics, SimMechanics, Simscape's Foundation Library Blocks

Relevance:

MATLAB Releases: R2007b to R2008a

dSPACE Platforms: all

dSPACE Releases: 5.4 to 7.0

RTI and RTI-MP

Problem Description:

Simscape's Foundation Library blocks and blocks from SimElectronics and SimHydraulics are not supported by RTI up to MATLAB R2008a.

RTI-MP Limitation

Relevance:

MATLAB Releases: R14 Service Pack 1 to R2010b

dSPACE Platforms: RTI1005 RTI1006

dSPACE Releases: 4.1 to 7.0

RTI-MP

Problem Description:

For RTI-MP, the following limitation applies:

Simscape, SimDriveline, SimElectronics, SimHydraulics and SimMechanics blocks must not be inserted at the root level of a model. Otherwise one of the following problems will occur:

- Connection lines are not copied during model separation.
- Model separation is aborted with an error message.

No problems occur if these blocks are contained in subsystems.

3.7.2 TRC File Issues

Special ports and parameters not available in system description file (<model>.trc file)

Relevance:

MATLAB Releases: R14 Service Pack 1 to R2010b

dSPACE Platforms: all

dSPACE Releases: 4.1 to 7.0

RTI and RTI-MP

Problem Description:

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

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

3.7.3 Compiler Issues

PPC compiler warnings

Relevance:

MATLAB Releases: R14 Service Pack 1 to R2010b

dSPACE Platforms: RTI1005 RTI1103 RTI1104 RTI1401

dSPACE Releases: 4.1 to 7.0

RTI and RTI-MP

Problem Description:

Applications with Simscape blocks can be built for dSPACE platforms based on a PowerPC processor (DS1005, DS1103, DS1104 and MicroAutoBox). Even though the Microtec PowerPC compiler issues some warnings concerning code generated by Real-Time Workshop or provided by Simscape, SimElectronics or SimHydraulics, the application can be loaded to the real-time hardware.

For models containing SimMechanics blocks, the compiler optimization option -Ox should be turned off to avoid compiler warnings.

PPC compiler limitations

Relevance:

MATLAB Releases: R13.0 to R2007a+

dSPACE Platforms: RTI1005 RTI1103 RTI1104 RTI1401

dSPACE Releases: Release 5.1 to 5.4

RTI and RTI-MP, Microtec PowerPC Compiler 2.x

Problem Description:

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 processed. With any other level of compiler optimization, the build process is stopped due to compiler errors.

3.7.4 Run-time Issues

Exception occurs when using SimDriveline blocks in Atomic Subsystems and with the option "minimize algebraic loops occurrence" enabled

Relevance:

MATLAB Releases: R2006b

dSPACE Platforms: all

dSPACE Releases: 4.1 to 6.4

RTI and RTI-MP

Problem Description:

When SimDriveline blocks reside within an atomic subsystem, and the subsystem option “minimize algebraic loops occurrence” is enabled, an exception occurs during the download to the hardware. Since MATLAB R2007a, the build procedure is aborted during code generation and an error message is issued.

3.8 SimPowerSystems

3.8.1 General Limitations

Using SimPowerSystems with Real-Time Workshop**Relevance:**

MATLAB Releases: R13.x to R2010b

dSPACE Platforms: all

dSPACE Releases: 3.5 to 7.0

RTI and RTI-MP

Problem Description:

Real-Time Workshop does not support code generation for some blocks of SimPowerSystems.

See also The MathWorks’ support page “Is it possible to 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>

Multiprocessor limitations**Relevance:**

MATLAB Releases: R13.x to R2010b

dSPACE Platforms: RTI1005 RTI1006

dSPACE Releases: 3.5 to 7.0

RTI-MP

Problem Description:

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.

SimPowerSystems blocks must not be inserted at the root level of an RTI-MP model

Relevance:

MATLAB Releases: R13.x to R2010b

dSPACE Platforms: RTI1005 RTI1006

dSPACE Releases: 3.5 to 7.0

RTI-MP

Problem Description:

SimPowerSystems blocks must not be inserted at the root level of an RTI-MP model. Otherwise 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.

3.8.2 TRC File Issues

Special ports and parameters not available in system description file (<model>.trc file)**Relevance:**

MATLAB Releases: R13.x to R2010b

dSPACE Platforms: all

dSPACE Releases: 3.5 to 7.0

RTI and RTI-MP

Problem Description:

SimPowerSystems 3.0 introduces the “Physical Modeling port and connection lines”. 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 the SimPowerSystems User’s Guide from The MathWorks.

The RTI variable description file option “Include mask and workspace parameters” is not supported for models containing blocks from SimPowerSystems.

3.8.3 Compiler Issues

PowerPC Compiler optimization**Relevance:**

MATLAB Releases: R2007b to R2010a

dSPACE Platforms: RTI1005 RTI1103 RTI1104 RTI1401

dSPACE Releases: 5.4 to 6.6

RTI and RTI-MP

Problem Description:

MATLAB R2007b supports new SimPowerSystem demos. For dSPACE releases prior to 7.0 the compile process of these models may take a long time for platforms based on PowerPC processor (DS1005, DS1103, DS1104 and MicroAutoBox).

The compile time can be reduced by completely turning off compiler optimization of the Microtec PowerPC compiler.

PowerPC Compiler error when compiling certain S-function***Relevance:***

MATLAB Releases: R2006a to R2007a

dSPACE Platforms: RTI1005 RTI1103 RTI1104 RTI1401

dSPACE Releases: 6.0 to 6.4

RTI and RTI-MP

Problem Description:

When compiling the S-function `sfun_spssw_discc.c`, the PPC Compiler aborts the build procedure with the message “a value of type “const mxArray *” cannot be used to initialize an entity of type “real_T *”. This problem is resolved since MATLAB R2007b.

For further information and a workaround, see <http://www.dspace.com/goto?faq273>.

PowerPC Compiler error using the Three-Phase-Breaker block***Relevance:***

MATLAB Releases: R2006a to R2010b

dSPACE Platforms: all

dSPACE Releases: 5.4 to 7.0

RTI and RTI-MP

Problem Description:

The Three-Phase Breaker block does not support code generation. The PPC Compiler aborts the build procedure with the error directive:

```
# error This_file_can_be_used_only_during_simulation_inside_Simulink.
```

3.8.4 Run-Time Issues

Parameter access***Relevance:***

MATLAB Releases: R13.x to R2010b

dSPACE Platforms: all

dSPACE Releases: 3.5 to 7.0

RTI and RTI-MP

Problem Description:

Due to the structure of SimPowerSystems blocks, they cannot be treated like standard Simulink blocks with respect to instrument layouts in ControlDesk. SimPowerSystems blocks do not contain visible functional information. The actual information is generated into Measurement blocks in the form of State-Space blocks.

3.9 Simulink Control Design

3.9.1 General Limitations

RTI support

Relevance:

MATLAB Releases: R2007b to R2010b

dSPACE Platforms: all

dSPACE Releases: 6.0 to 7.0

RTI and RTI-MP

Problem Description:

The Trigger-Based Operating Point Snapshot block contains a Level-2 M-file S-Function which is not supported by RTI.

3.10 Stateflow/Stateflow Coder

3.10.1 General Limitations

Using RTLib functions with Stateflow

Relevance:

MATLAB Releases: general

dSPACE Platforms: all

dSPACE Releases: general

RTI and RTI-MP

Problem Description:

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 triggering these subsystems by event outputs of the state charts.

3.10.2 TRC File Issues

Accessible variables via variable description file

Relevance:

MATLAB Releases: R14 Service Pack 3 to R2010b

dSPACE Platforms: all

dSPACE Releases: 5.0 to 7.0

RTI and RTI-MP

Problem Description:

Refer to the RTI documentation.