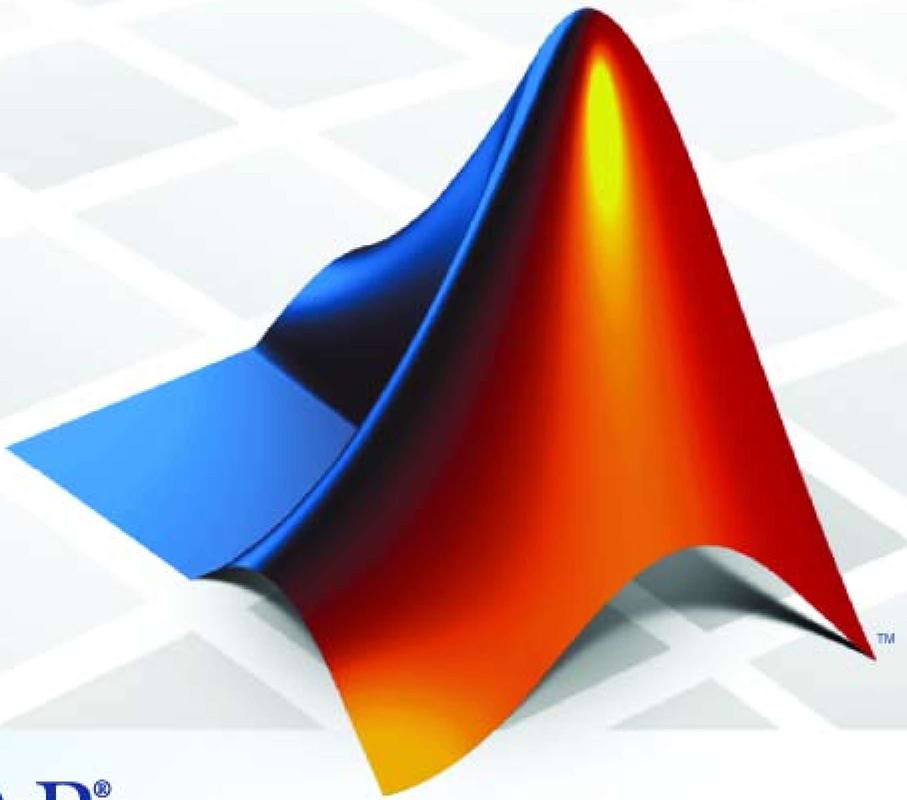
Real-Time Workshop® 7

Reference



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Real-Time Workshop® Reference

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Product Limitations Summary

The following topics identify Real-Time Workshop® feature limitations:

Glossary

application modules

With respect to Real-Time Workshop program architecture, these are collections of programs that implement functions carried out by the system-dependent, system-independent, and application components.

atomic subsystem

Subsystem whose blocks are executed as a unit before moving on. Conditionally executed subsystems are atomic, and atomic subsystems are nonvirtual. Unconditionally executed subsystems are virtual by default, but can be designated as atomic. The Real-Time Workshop build process can generate reusable code only for nonvirtual subsystems.

base sample rate

Fundamental sample time of a model; in practice, limited by the fastest rate at which a processor's timer can generate interrupts. All sample times must be integer multiples of the base rate.

block I/O structure (model_B)

Global data structure for storing block output signals. The number of block output signals is the sum of the widths of the data output ports of all nonvirtual blocks in your model. By default, Simulink® and the Real-Time Workshop build process try to reduce the size of the `*model*_B` structure by reusing the entries in the `*model*_B` structure and making other entries local variables.

block target file

File that describes how a specific Simulink block is to be transformed to a language such as C, based on the block's description in the Real-Time Workshop file (`*model*.rtw`). Typically, there is one block target file for each Simulink block.

code reuse

Optimization whereby code generated for identical nonvirtual subsystems is collapsed into one function that is called for each subsystem instance with appropriate parameters. Code reuse, along with *expression folding*, can dramatically reduce the amount of generated code.

configuration

Set of attributes for a model which defines parameters governing how a model simulates and generates code. A model can have one or more such configuration sets, and users can switch between them to change code generation targets or to modify the behavior of models in other ways.

configuration component

Named element of a configuration set. Configuration components encapsulate settings associated with the **Solver**, **Data Import/Export**, **Optimization**, **Diagnostics**, **Hardware Implementation**, **Model Referencing**, and **Real-Time Workshop** panes in the Configuration Parameters dialog box. A component may contain subcomponents.

embedded real-time (ERT) target

Target configuration that generates model code for execution on an independent embedded real-time system. Requires a Real-Time Workshop® Embedded Coder™ license.

expression folding

Code optimization technique that minimizes the computation of intermediate results at block outputs and the storage of such results in temporary buffers or variables. It can dramatically improve the efficiency of generated code, achieving results that compare favorably with hand-optimized code.

file extensions

The table below lists the Simulink, Target Language Compiler, and Real-Time Workshop file extensions.

Extension	Created by	Description
`.c` or `.cpp`	Target Language Compiler	The generated C or C++ code
`.h`	Target Language Compiler	C/C++ include header file used by the `.c` or `.cpp` program

Extension	Created by	Description
`.mdl`	Simulink	Contains structures associated with Simulink block diagrams
`.mk`	Real-Time Workshop	Makefile specific to your model that is derived from the template makefile
`.rtw`	Real-Time Workshop	Intermediate compilation (*`model`*`.rtw`) of a `.mdl` file used in generating C or C++ code
`.tlc`	The MathWorks and Real-Time Workshop users	Target Language Compiler script files that the Real-Time Workshop build process uses to generate code for targets and blocks
`.tmf`	Supplied with Real-Time Workshop	Template makefiles
`.tmw`	Real-Time Workshop	Project marker file inside a build directory that identifies the date and product version of generated code

generic real-time (GRT) target

Target configuration that generates model code for a real-time system, with the resulting code executed on your workstation. (Execution is not tied to a real-time clock.) You can use GRT as a starting point for targeting custom hardware.

host system
Computer system on which you create and may compile your real-time application. Also referred to as emulation hardware.

inline
Generally, this means to place something directly in the generated source code. You can inline parameters and S-functions using the Real-Time Workshop software and the Target Language Compiler.

inlined parameters
(Target Language Compiler Boolean global variable: `InlineParameters`) The numerical values of the block parameters are hard-coded into the generated code. Advantages include faster execution and less memory use, but you lose the ability to change the block parameter values at run time.

inlined S-function
An S-function can be inlined into the generated code by implementing it as a `.tlc` file. The code for this S-function is placed in the generated model code itself. In contrast, noninlined S-functions require a function call to an S-function residing in an external MEX-file.

interrupt service routine (ISR)
Piece of code that your processor executes when an external event, such as a timer, occurs.

loop rolling
(Target Language Compiler global variable: `RollThreshold`) Depending on the block's operation and the width of the input/output ports, the generated code uses a `for` statement (rolled code) instead of repeating identical lines of code (flat code) over the signal width.

make
Utility to maintain, update, and regenerate related programs and files. The commands to be executed are placed in a *makefile*.

makefiles
Files that contain a collection of commands that allow groups of programs, object files, libraries, and so on, to interact. Makefiles are executed by your development system's make utility.

`model`.rtw

Intermediate record file into which the Real-Time Workshop build process compiles the blocks, signals, states, and parameters a model, which the Target Language Compiler reads to generate code to represent the model.

multitasking

Process by which a microprocessor schedules the handling of multiple tasks. In generated code, the number of tasks is equal to the number of sample times in your model. *See also* pseudo multitasking.

noninlined S-function

In the context of the Real-Time Workshop build process, this is any C MEX S-function that is not implemented using a customized `.tlc` file. If you create a C MEX S-function as part of a Simulink model, it is by default noninlined unless you write your own `.tlc` file that inlines it.

nonreal-time

Simulation environment of a block diagram provided for high-speed simulation of your model. Execution is not tied to a real-time clock.

nonvirtual block

Any block that performs some algorithm, such as a Gain block. The Real-Time Workshop build process generates code for all nonvirtual blocks, either inline or as separate functions and files, as directed by users.

pseudo multitasking

On processors that do not offer *multitasking* support, you can perform pseudo multitasking by scheduling events on a fixed time sharing basis.

real-time model data structure

The Real-Time Workshop build process encapsulates information about the root model in the real-time model data structure, often abbreviated as rtM. rtM contains global information related to timing, solvers, and logging, and model data such as inputs, outputs, states, and parameters.

real-time system

Computer that processes real-world events as they happen, under the constraint of a real-time clock, and that can implement algorithms in dedicated hardware. Examples include mobile telephones, test and measurement devices, and avionic and automotive control systems.

Real-Time Workshop target
Set of code files generated by the Real-Time Workshop build process for a standard or custom target, specified by a Real-Time Workshop configuration component. These source files can be built into an executable program that will run independently of Simulink. *See also* simulation target, configuration.

run-time interface
Wrapper around the generated code that can be built into a stand-alone executable. The run-time interface consists of routines to move the time forward, save logged variables at the appropriate time steps, and so on The run-time interface is responsible for managing the execution of the real-time program created from your Simulink block diagram.

S-function
Customized Simulink block written in C, Fortran, or MATLAB® code. The Real-Time Workshop build process can target C code S-functions as is or users can *inline* C code S-functions by preparing TLC scripts for them.

simstruct
Simulink data structure and associated application program interface (API) that enables S-functions to communicate with other entities in models. Simstructs are included in code generated by the Real-Time Workshop build process for noninlined S-functions.

simulation target
Set of code files generated for a model which is referenced by a Model block. Simulation target code is generated into `/slprj/sim` project directory in the working directory. Also an executable library compiled from these codes that implements a Model block. *See also* Real-Time Workshop target.

single-tasking
Mode in which a model runs in one task, regardless of the number of sample rates it contains.

stiffness

Property of a problem that forces a numerical method, in one or more intervals of integration, to use a step length that is excessively small in relation to the smoothness of the exact solution in that interval.

system target file

Entry point to the Target Language Compiler program, used to transform the Real-Time Workshop file into target-specific code.

target file

File that is compiled and executed by the Target Language Compiler. The block and system target TLC files used specify how to transform the Real-Time Workshop file (`*model*.rtw`) into target-specific code.

Target Language Compiler (TLC)

Program that compiles and executes system and target files by translating a `*model*.rtw` file into a target language by means of TLC scripts and template makefiles.

Target Language Compiler program

One or more TLC script files that describe how to convert a `*model*.rtw` file into generated code. There is one TLC file for the target, plus one for each built-in block. Users can provide their own TLC files to inline S-functions or to wrap existing user code.

target system

Specific or generic computer system on which your real-time application is intended to execute. Also referred to as embedded hardware.

targeting

Process of creating software modules appropriate for execution on your target system.

task identifier (tid)

In generated code, each sample rate in a multirate model is assigned a task identifier (`tid`). The `tid` is used by the model output and update routines to control the portion of your model that should execute at a given time step. Single-rate systems ignore the `tid`. *See also* base sample rate.

template makefile

Line-for-line makefile used by a make utility. The Real-Time Workshop build process converts the template makefile to a makefile by copying the contents of the template makefile (usually `system.tmf`) to a makefile (usually `system.mk`) replacing tokens describing your model's configuration.

virtual block

Connection or graphical block, for example a Mux block, that has no algorithmic functionality. Virtual blocks incur no real-time overhead as no code is generated for them.

work vector

Data structures for saving internal states or similar information, accessible to blocks that may require such work areas. These include state work (`rtDWork`), real work (`rtRWork`), integer work (`rtIWork`), and pointer work (`rtPWork`) structures. For example, the Memory block uses a real work element for each signal.

Function Reference

Build Information

addCompileFlags	Add compiler options to model's build information
addDefines	Add preprocessor macro definitions to model's build information
addIncludeFiles	Add include files to model's build information
addIncludePaths	Add include paths to model's build information
addLinkFlags	Add link options to model's build information
addLinkObjects	Add link objects to model's build information
addNonBuildFiles	Add nonbuild-related files to model's build information
addSourceFiles	Add source files to model's build information
addSourcePaths	Add source paths to model's build information
addTMFTokens	Add template makefile (TMF) tokens that provide build-time information for makefile generation
findIncludeFiles	Find and add include (header) files to build information object
getCompileFlags	Compiler options from model's build information
getDefines	Preprocessor macro definitions from model's build information
getFullFileList	All files from model's build information
getIncludeFiles	Include files from model's build information

getIncludePaths	Include paths from model's build information
getLinkFlags	Link options from model's build information
getNonBuildFiles	Nonbuild-related files from model's build information
getSourceFiles	Source files from model's build information
getSourcePaths	Source paths from model's build information
packNGo	Package model code in zip file for relocation
updateFilePathsAndExtensions	Update files in model's build information with missing paths and file extensions
updateFileSeparator	Change file separator used in model's build information

Build Process

RTW.getBuildDir	Build directory information for specified model
rtwbuild	Initiate build process
rtwrebuild	Rebuild generated code
rtw_precompile_libs	Build libraries within model without building model
switchTarget	Specify target for configuration set

Embedded MATLAB Code Generation

emlc	Generate embeddable C/C++ code from MATLAB code

Project Documentation

rtwreport	Generate report documenting generated code for model
rtwtrace	Trace block to generated code

Rapid Simulation

rsimgetrtp	Global model parameter structure
rsimsetrtpparam	Set parameters of `rtP` model parameter structure

Target Language Compiler and Function Library

tlc	Invoke Target Language Compiler to convert model description file to generated code

See the "TLC Function Library Reference" in the Real-Time Workshop Target Language Compiler documentation for a list of Target Language Compiler functions.

Alphabetical List

Purpose Add compiler options to model's build information

Syntax `addCompileFlags(`*`buildinfo`*`, `*`options`*`, `*`groups`*`)`

`groups` is optional.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`options`
: A character array or cell array of character arrays that specifies the compiler options to be added to the build information. The function adds each option to the end of a compiler option vector. If you specify multiple options within a single character array, for example `'-Zi -Wall'`, the function adds the string to the vector as a single element. For example, if you add `'-Zi -Wall'` and then `'-O3'`, the vector consists of two elements, as shown below.

```
'-Zi -Wall'    '-O3'
```

`groups` (optional)
: A character array or cell array of character arrays that groups specified compiler options. You can use groups to

- Document the use of specific compiler options
- Retrieve or apply collections of compiler options

You can apply

- A single group name to one or more compiler options
- Multiple group names to collections of compiler options (available for nonmakefile build environments only)

To...	Specify *groups* as a...
Apply one group name to all compiler options	Character array.
Apply different group names to compiler options	Cell array of character arrays such that the number of group names matches the number of elements you specify for *options*.

Note

- To specify compiler options to be used in the standard Real-Time Workshop makefile build process, specify *groups* as either `'OPTS'` or `'OPT_OPTS'`.
- To control compiler optimizations for your Real-Time Workshop makefile build at Simulink GUI level, use the **Compiler optimization level** parameter on the **Real-Time Workshop** pane of the Simulink Configuration Parameters dialog box. The **Compiler optimization level** parameter provides
  - Target-independent values `Optimizations on (faster runs)` and `Optimizations off (faster builds)`, which allow you to easily toggle compiler optimizations on and off during code development
  - The value `Custom` for entering custom compiler optimization flags at Simulink GUI level (rather than at other levels of the build process)

  If you use the configuration parameter **Make command** to specify compiler options for your Real-Time Workshop makefile build using `OPT_OPTS`, `MEX_OPTS` (except `MEX_OPTS="-v"`), or `MEX_OPT_FILE`, the value of **Compiler optimization level** is ignored and a warning is issued about the ignored parameter.

addCompileFlags

Description

The `addCompileFlags` function adds specified compiler options to the model's build information. Real-Time Workshop stores the compiler options in a vector. The function adds options to the end of the vector based on the order in which you specify them.

In addition to the required *`buildinfo`* and *`options`* arguments, you can use an optional *`groups`* argument to group your options.

Examples

- Add the compiler option `-O3` to build information `myModelBuildInfo` and place the option in the group `OPTS`.

```
myModelBuildInfo = RTW.BuildInfo;
addCompileFlags(myModelBuildInfo, '-O3', 'OPTS');
```

- Add the compiler options `-Zi` and `-Wall` to build information `myModelBuildInfo` and place the options in the group `OPT_OPTS`.

```
myModelBuildInfo = RTW.BuildInfo;
addCompileFlags(myModelBuildInfo, '-Zi -Wall', 'OPT_OPTS');
```

- For a nonmakefile build environment, add the compiler options `-Zi`, `-Wall`, and `-O3` to build information `myModelBuildInfo`. Place the options `-Zi` and `-Wall` in the group `Debug` and the option `-O3` in the group `MemOpt`.

```
myModelBuildInfo = RTW.BuildInfo;
addCompileFlags(myModelBuildInfo, {'-Zi -Wall' '-O3'}, ...
  {'Debug' 'MemOpt'});
```

See Also

`addDefines`, `addLinkFlags`, `getCompileFlags`
"Customizing Post Code Generation Build Processing"

Purpose

Add preprocessor macro definitions to model's build information

Syntax

`addDefines(`*`buildinfo`*`, `*`macrodefs`*`, `*`groups`*`)`

`groups` is optional.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`macrodefs`
: A character array or cell array of character arrays that specifies the preprocessor macro definitions to be added to the object. The function adds each definition to the end of a compiler option vector. If you specify multiple definitions within a single character array, for example `'-DRT -DDEBUG'`, the function adds the string to the vector as a single element. For example, if you add `'-DPROTO -DDEBUG'` and then `'-DPRODUCTION'`, the vector consists of two elements, as shown below.

```
'-DPROTO -DDEBUG'    '-DPRODUCTION'
```

`groups` (optional)
: A character array or cell array of character arrays that groups specified definitions. You can use groups to

- Document the use of specific macro definitions
- Retrieve or apply groups of macro definitions

You can apply

- A single group name to one or more macro definitions
- Multiple group names to collections of macro definitions (available for nonmakefile build environments only)

To...	Specify *groups* as a...
Apply one group name to all macro definitions	Character array.
Apply different group names to macro definitions	Cell array of character arrays such that the number of group names matches the number elements you specify for *macrodefs*.

Note To specify macro definitions to be used in the standard Real-Time Workshop makefile build process, specify *groups* as either `'OPTS'` or `'OPT_OPTS'`.

Description

The `addDefines` function adds specified preprocessor macro definitions to the model's build information. The Real-Time Workshop software stores the definitions in a vector. The function adds definitions to the end of the vector based on the order in which you specify them.

In addition to the required *buildinfo* and *macrodefs* arguments, you can use an optional *groups* argument to group your options.

Examples

- Add the macro definition `-DPRODUCTION` to build information `myModelBuildInfo` and place the definition in the group `OPTS`.

```
myModelBuildInfo = RTW.BuildInfo;
addDefines(myModelBuildInfo, '-DPRODUCTION', 'OPTS');
```

- Add the macro definitions `-DPROTO` and `-DDEBUG` to build information `myModelBuildInfo` and place the definitions in the group `OPT_OPTS`.

```
myModelBuildInfo = RTW.BuildInfo;
addDefines(myModelBuildInfo, ...
  '-DPROTO -DDEBUG', 'OPT_OPTS');
```

- For a nonmakefile build environment, add the compiler definitions `-DPROTO`, `-DDEBUG`, and `-DPRODUCTION` to build information `myModelBuildInfo`. Place the definitions `-DPROTO` and `-DDEBUG` in the group `Debug` and the definition `-DPRODUCTION` in the group `Release`.

```
myModelBuildInfo = RTW.BuildInfo;
addDefines(myModelBuildInfo, ...
  {'-DPROTO -DDEBUG' '-DPRODUCTION'}, ...
  {'Debug' 'Release'});
```

See Also

`addCompileFlags`, `addLinkFlags`, `getDefines`
"Customizing Post Code Generation Build Processing"

addIncludeFiles

Purpose

Add include files to model's build information

Syntax

`addIncludeFiles(`*`buildinfo`*`, `*`filenames`*`, `*`paths`*`, `*`groups`*`)`

`paths` and *`groups`* are optional.

Arguments

`buildinfo`

Build information returned by `RTW.BuildInfo`.

`filenames`

A character array or cell array of character arrays that specifies names of include files to be added to the build information.

The filename strings can include wildcard characters, provided that the dot delimiter (.) is present. Examples are `'*.*'`, `'*.h'`, and `'*.h*'`.

The function adds the filenames to the end of a vector in the order that you specify them.

The function removes duplicate include file entries that

- You specify as input
- Already exist in the include file vector
- Have a path that matches the path of a matching filename

A duplicate entry consists of an exact match of a path string and corresponding filename.

`paths` (optional)

A character array or cell array of character arrays that specifies paths to the include files. The function adds the paths to the end of a vector in the order that you specify them. If you specify a single path as a character array, the function uses that path for all files.

`groups` (optional)

A character array or cell array of character arrays that groups specified include files. You can use groups to

- Document the use of specific include files
- Retrieve or apply groups of include files

You can apply

- A single group name to an include file
- A single group name to multiple include files
- Multiple group names to collections of multiple include files

To...	Specify *`groups`* as a...
Apply one group name to all include files	Character array.
Apply different group names to include files	Cell array of character arrays such that the number of group names that you specify matches the number of elements you specify for *`filenames`*.

Description

The `addIncludeFiles` function adds specified include files to the model's build information. The Real-Time Workshop software stores the include files in a vector. The function adds the filenames to the end of the vector in the order that you specify them.

In addition to the required *`buildinfo`* and *`filenames`* arguments, you can specify optional *`paths`* and *`groups`* arguments. You can specify each optional argument as a character array or a cell array of character arrays.

If You Specify an Optional Argument as a...	The Function...
Character array	Applies the character array to all include files it adds to the build information
Cell array of character arrays	Pairs each character array with a specified include file. Thus, the length of the cell array must match the length of the cell array you specify for *`filenames`*.

If you choose to specify *groups*, but omit *paths*, specify a null string ('') for *paths*.

Note The packNGo function also can add include files to a model's build information. If you call the packNGo function to package model code, packNGo finds include files from all source and include paths recorded in the model's build information and adds them to the build information.

Examples

- Add the include file mytypes.h to build information myModelBuildInfo and place the file in the group SysFiles.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludeFiles(myModelBuildInfo, ...
'mytypes.h', '/proj/src', 'SysFiles');
```

- Add the include files etc.h and etc_private.h to build information myModelBuildInfo and place the files in the group AppFiles.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludeFiles(myModelBuildInfo, ...
{'etc.h' 'etc_private.h'}, ...
'/proj/src', 'AppFiles');
```

- Add the include files etc.h, etc_private.h, and mytypes.h to build information myModelBuildInfo. Group the files etc.h and etc_private.h with the string AppFiles and the file mytypes.h with the string SysFiles.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludeFiles(myModelBuildInfo, ...
{'etc.h' 'etc_private.h' 'mytypes.h'}, ...
'/proj/src', ...
{'AppFiles' 'AppFiles' 'SysFiles'});
```

- Add all of the .h files in a specified directory to build information myModelBuildInfo and place the files in the group HFiles.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludeFiles(myModelBuildInfo, ...
'*.h', '/proj/src', 'HFiles');
```

See Also

`addIncludePaths`, `addSourceFiles`, `addSourcePaths`, `findIncludeFiles`, `getIncludeFiles`, `updateFilePathsAndExtensions`, `updateFileSeparator`
“Customizing Post Code Generation Build Processing”

addIncludePaths

Purpose Add include paths to model's build information

Syntax `addIncludePaths(buildinfo, paths, groups)`

`groups` is optional.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`paths`
: A character array or cell array of character arrays that specifies include file paths to be added to the build information. The function adds the paths to the end of a vector in the order that you specify them.

  The function removes duplicate include file entries that

  - You specify as input
  - Already exist in the include path vector
  - Have a path that matches the path of a matching filename

  A duplicate entry consists of an exact match of a path string and corresponding filename.

`groups` (optional)
: A character array or cell array of character arrays that groups specified include paths. You can use groups to

  - Document the use of specific include paths
  - Retrieve or apply groups of include paths

  You can apply

  - A single group name to an include path
  - A single group name to multiple include paths
  - Multiple group names to collections of multiple include paths

To...	Specify *groups* as a...
Apply one group name to all include paths	Character array.
Apply different group names to include paths	Cell array of character arrays such that the number of group names that you specify matches the number of elements you specify for *paths*.

Description

The `addIncludePaths` function adds specified include paths to the model's build information. The Real-Time Workshop software stores the include paths in a vector. The function adds the paths to the end of the vector in the order that you specify them.

In addition to the required *buildinfo* and *paths* arguments, you can specify an optional *groups* argument. You can specify *groups* as a character array or a cell array of character arrays.

If You Specify an Optional Argument as a...	The Function...
Character array	Applies the character array to all include paths it adds to the build information.
Cell array of character arrays	Pairs each character array with a specified include path. Thus, the length of the cell array must match the length of the cell array you specify for *paths*.

Examples

- Add the include path `/etcproj/etc/etc_build` to build information `myModelBuildInfo`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addIncludePaths(myModelBuildInfo,...
  '/etcproj/etc/etc_build');
  ```

- Add the include paths `/etcproj/etclib` and `/etcproj/etc/etc_build` to build information `myModelBuildInfo` and place the files in the group `etc`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addIncludePaths(myModelBuildInfo,...
  {'/etcproj/etclib' '/etcproj/etc/etc_build'},'etc');
  ```

- Add the include paths `/etcproj/etclib`, `/etcproj/etc/etc_build`, and `/common/lib` to build information `myModelBuildInfo`. Group the paths `/etc/proj/etclib` and `/etcproj/etc/etc_build` with the string `etc` and the path `/common/lib` with the string `shared`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addIncludePaths(myModelBuildInfo,...
  {'/etc/proj/etclib' '/etcproj/etc/etc_build'...
   '/common/lib'}, {'etc' 'etc' 'shared'});
  ```

See Also

`addIncludeFiles`, `addSourceFiles`, `addSourcePaths`, `getIncludePaths`, `updateFilePathsAndExtensions`, `updateFileSeparator`
"Customizing Post Code Generation Build Processing"

Purpose

Add link options to model's build information

Syntax

`addLinkFlags(`*`buildinfo`*`, `*`options`*`, `*`groups`*`)`

`groups` is optional.

Arguments

`buildinfo`

Build information returned by `RTW.BuildInfo`.

`options`

A character array or cell array of character arrays that specifies the linker options to be added to the build information. The function adds each option to the end of a linker option vector. If you specify multiple options within a single character array, for example `'-MD -Gy'`, the function adds the string to the vector as a single element. For example, if you add `'-MD -Gy'` and then `'-T'`, the vector consists of two elements, as shown below.

```
'-MD -Gy'    '-T'
```

`groups` (optional)

A character array or cell array of character arrays that groups specified linker options. You can use groups to

- Document the use of specific linker options
- Retrieve or apply groups of linker options

You can apply

- A single group name to one or more linker options
- Multiple group names to collections of linker options (available for nonmakefile build environments only)

To...	Specify *groups* as a...
Apply one group name to all linker options	Character array.
Apply different group names to linker options	Cell array of character arrays such that the number of group names matches the number of elements you specify for *options*.

Note To specify linker options to be used in the standard Real-Time Workshop makefile build process, specify *groups* as either `'OPTS'` or `'OPT_OPTS'`.

Description

The `addLinkFlags` function adds specified linker options to the model's build information. The Real-Time Workshop software stores the linker options in a vector. The function adds options to the end of the vector based on the order in which you specify them.

In addition to the required *buildinfo* and *options* arguments, you can use an optional *groups* argument to group your options.

Examples

- Add the linker `-T` option to build information `myModelBuildInfo` and place the option in the group `OPTS`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addLinkFlags(myModelBuildInfo, '-T', 'OPTS');
  ```

- Add the linker options `-MD` and `-Gy` to build information `myModelBuildInfo` and place the options in the group `OPT_OPTS`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addLinkFlags(myModelBuildInfo, '-MD -Gy', 'OPT_OPTS');
  ```

- For a nonmakefile build environment, add the linker options `-MD`, `-Gy`, and `-T` to build information `myModelBuildInfo`. Place the options `-MD` and`-Gy` in the group `Debug` and the option `-T` in the group`Temp`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addLinkFlags(myModelBuildInfo, {'-MD -Gy' '-T'}, ...
    {'Debug' 'Temp'});
  ```

See Also

`addCompileFlags`, `addDefines`, `getLinkFlags`
"Customizing Post Code Generation Build Processing"

addLinkObjects

Purpose Add link objects to model's build information

Syntax

`addLinkObjects(`*`buildinfo`*`, `*`linkobjs`*`, `*`paths`*`, `*`priority`*`, `*`precompiled`*`, `*`linkonly`*`, `*`groups`*`)`

All arguments except *`buildinfo`* , *`linkobjs`*, and *`paths`* are optional. If you specify an optional argument, you must specify all of the optional arguments preceding it.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`linkobjs`
: A character array or cell array of character arrays that specifies the filenames of linkable objects to be added to the build information. The function adds the filenames that you specify in the function call to a vector that stores the object filenames in priority order. If you specify multiple objects that have the same priority (see *`priority`* below), the function adds them to the vector based on the order in which you specify the object filenames in the cell array.

  The function removes duplicate link objects that

  - You specify as input
  - Already exist in the linkable object filename vector
  - Have a path that matches the path of a matching linkable object filename

  A duplicate entry consists of an exact match of a path string and corresponding linkable object filename.

`paths`
: A character array or cell array of character arrays that specifies paths to the linkable objects. If you specify a character array, the path string applies to all linkable objects.

`priority` (optional)

A numeric value or vector of numeric values that indicates the relative priority of each specified link object. Lower values have higher priority. The default priority is 1000.

`precompiled` (optional)

The logical value `true` or `false` or a vector of logical values that indicates whether each specified link object is precompiled.

Specify `true` if the link object has been prebuilt for faster compiling and linking and exists in a specified location.

If precompiled is `false` (the default), the Real-Time Workshop build process creates the link object in the build directory.

This argument is ignored if *`linkonly`* equals `true`.

`linkonly` (optional)

The logical value `true` or `false` or a vector of logical values that indicates whether each specified link object is to be used only for linking.

Specify `true` if the Real-Time Workshop build process should not build, nor generate rules in the makefile for building, the specified link object, but should include it when linking the final executable. For example, you can use this to incorporate link objects for which source files are not available. If *`linkonly`* is true, the value of *`precompiled`* is ignored.

If *`linkonly`* is `false` (the default), rules for building the link objects are added to the makefile. In this case, the value of *`precompiled`* determines which subsection of the added rules is expanded, `START_PRECOMP_LIBRARIES` (`true`) or `START_EXPAND_LIBRARIES` (`false`).

`groups` (optional)

A character array or cell array of character arrays that groups specified link objects. You can use groups to

- Document the use of specific link objects
- Retrieve or apply groups of link objects

You can apply

- A single group name to a linkable object
- A single group name to multiple linkable objects
- Multiple group name to collections of multiple linkable objects

To...	Specify *groups* as a...
Apply one group name to all link objects	Character array.
Apply different group names to link objects	Cell array of character arrays such that the number of group names matches the number elements you specify for *linkobjs*.

The default value of *groups* is `{''}`.

Description

The `addLinkObjects` function adds specified link objects to the model's build information. The Real-Time Workshop software stores the link objects in a vector in relative priority order. If multiple objects have the same priority or you do not specify priorities, the function adds the objects to the vector based on the order in which you specify them.

In addition to the required *buildinfo*, *linkobjs*, and *paths* arguments, you can specify the optional arguments *priority*, *precompiled*, *linkonly*, and *groups*. You can specify *paths* and *groups* as a character array or a cell array of character arrays.

If You Specify *paths* or *groups* as a...	The Function...
Character array	Applies the character array to all objects it adds to the build information.
Cell array of character arrays	Pairs each character array with a specified object. Thus, the length of the cell array must match the length of the cell array you specify for *linkobjs*.

Similarly, you can specify *priority*, *precompiled*, and *linkonly* as a value or vector of values.

If You Specify *priority*, *precompiled*, or *linkonly* as a...	The Function...
Value	Applies the value to all objects it adds to the build information.
Vector of values	Pairs each value with a specified object. Thus, the length of the vector must match the length of the cell array you specify for *linkobjs*.

If you choose to specify an optional argument, you must specify all of the optional arguments preceding it. For example, to specify that all objects are precompiled using the *precompiled* argument, you must specify the *priority* argument that precedes *precompiled*. You could pass the default priority value 1000, as shown below.

```
addLinkObjects(myBuildInfo, 'test1', '/proj/lib/lib1', 1000, true);
```

Examples

- Add the linkable objects `libobj1` and `libobj2` to build information `myModelBuildInfo` and set the priorities of the objects to 26 and 10, respectively. Since `libobj2` is assigned the lower numeric priority value, and thus has the higher priority, the function orders the objects such that `libobj2` precedes `libobj1` in the vector.

```
myModelBuildInfo = RTW.BuildInfo;
addLinkObjects(myModelBuildInfo, {'libobj1' 'libobj2'},...
{'/proj/lib/lib1' '/proj/lib/lib2'}, [26 10]);
```

- Add the linkable objects `libobj1` and `libobj2` to build information `myModelBuildInfo`. Mark both objects as link-only. Since individual priorities are not specified, the function adds the objects to the vector in the order specified.

```
myModelBuildInfo = RTW.BuildInfo;
addLinkObjects(myModelBuildInfo, {'libobj1' 'libobj2'},...
{'/proj/lib/lib1' '/proj/lib/lib2'}, 1000,...
false, true);
```

- Add the linkable objects `libobj1` and `libobj2` to build information `myModelBuildInfo`. Set the priorities of the objects to 26 and 10, respectively. Mark both objects as precompiled, and group them under the name `MyTest`.

```
myModelBuildInfo = RTW.BuildInfo;
addLinkObjects(myModelBuildInfo, {'libobj1' 'libobj2'},...
{'/proj/lib/lib1' '/proj/lib/lib2'}, [26 10],...
true, false, 'MyTest');
```

See Also

"Customizing Post Code Generation Build Processing"

Purpose

Add nonbuild-related files to model's build information

Syntax

`addNonBuildFiles(`*`buildinfo`*`, `*`filenames`*`, `*`paths`*`, `*`groups`*`)`

`paths` and *`groups`* are optional.

Arguments

`buildinfo`

Build information returned by `RTW.BuildInfo`.

`filenames`

A character array or cell array of character arrays that specifies names of nonbuild-related files to be added to the build information.

The filename strings can include wildcard characters, provided that the dot delimiter (`.`) is present. Examples are `'*.*'`, `'*.DLL'`, and `'*.D*'`.

The function adds the filenames to the end of a vector in the order that you specify them.

The function removes duplicate nonbuild file entries that

- Already exist in the nonbuild file vector
- Have a path that matches the path of a matching filename

A duplicate entry consists of an exact match of a path string and corresponding filename.

`paths` (optional)

A character array or cell array of character arrays that specifies paths to the nonbuild files. The function adds the paths to the end of a vector in the order that you specify them. If you specify a single path as a character array, the function uses that path for all files.

`groups` (optional)

A character array or cell array of character arrays that groups specified nonbuild files. You can use groups to

- Document the use of specific nonbuild files
- Retrieve or apply groups of nonbuild files

You can apply

- A single group name to a nonbuild file
- A single group name to multiple nonbuild files
- Multiple group names to collections of multiple nonbuild files

To...	Specify *`groups`* as a...
Apply one group name to all nonbuild files	Character array.
Apply different group names to nonbuild files	Cell array of character arrays such that the number of group names that you specify matches the number of elements you specify for *`filenames`*.

Description

The `addNonBuildFiles` function adds specified nonbuild-related files, such as DLL files required for a final executable, or a README file, to the model's build information. The Real-Time Workshop software stores the nonbuild files in a vector. The function adds the filenames to the end of the vector in the order that you specify them.

In addition to the required *`buildinfo`* and *`filenames`* arguments, you can specify optional *`paths`* and *`groups`* arguments. You can specify each optional argument as a character array or a cell array of character arrays.

If You Specify an Optional Argument as a...	The Function...
Character array	Applies the character array to all nonbuild files it adds to the build information.
Cell array of character arrays	Pairs each character array with a specified nonbuild file. Thus, the length of the cell array must match the length of the cell array you specify for *filenames*.

If you choose to specify *groups*, but omit *paths*, specify a null string ('') for *paths*.

Examples

- Add the nonbuild file `readme.txt` to build information `myModelBuildInfo` and place the file in the group `DocFiles`.

```
myModelBuildInfo = RTW.BuildInfo;
addNonBuildFiles(myModelBuildInfo, ...
'readme.txt', '/proj/docs', 'DocFiles');
```

- Add the nonbuild files `myutility1.dll` and `myutility2.dll` to build information `myModelBuildInfo` and place the files in the group `DLLFiles`.

```
myModelBuildInfo = RTW.BuildInfo;
addNonBuildFiles(myModelBuildInfo, ...
{'myutility1.dll' 'myutility2.dll'}, ...
'/proj/dlls', 'DLLFiles');
```

- Add all of the DLL files in a specified directory to build information `myModelBuildInfo` and place the files in the group `DLLFiles`.

```
myModelBuildInfo = RTW.BuildInfo;
addNonBuildFiles(myModelBuildInfo, ...
'*.dll', '/proj/dlls', 'DLLFiles');
```

See Also

`getNonBuildFiles`
"Customizing Post Code Generation Build Processing"

Purpose Add source files to model's build information

Syntax `addSourceFiles(buildinfo, filenames, paths, groups)`

`paths` and *`groups`* are optional.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`filenames`
: A character array or cell array of character arrays that specifies names of the source files to be added to the build information.

  The filename strings can include wildcard characters, provided that the dot delimiter (.) is present. Examples are `'*.*'`, `'*.c'`, and `'*.c*'`.

  The function adds the filenames to the end of a vector in the order that you specify them.

  The function removes duplicate source file entries that

  - You specify as input
  - Already exist in the source file vector
  - Have a path that matches the path of a matching filename

  A duplicate entry consists of an exact match of a path string and corresponding filename.

`paths` (optional)
: A character array or cell array of character arrays that specifies paths to the source files. The function adds the paths to the end of a vector in the order that you specify them. If you specify a single path as a character array, the function uses that path for all files.

`groups` (optional)
: A character array or cell array of character arrays that groups specified source files. You can use groups to

- Document the use of specific source files
- Retrieve or apply groups of source files

You can apply

- A single group name to a source file
- A single group name to multiple source files
- Multiple group names to collections of multiple source files

To...	Specify *`group`* as a...
Apply one group name to all source files	Character array.
Apply different group names to source files	Cell array of character arrays such that the number of group names that you specify matches the number of elements you specify for *`filenames`*.

Description

The `addSourceFiles` function adds specified source files to the model's build information. The Real-Time Workshop software stores the source files in a vector. The function adds the filenames to the end of the vector in the order that you specify them.

In addition to the required *`buildinfo`* and *`filenames`* arguments, you can specify optional *`paths`* and *`groups`* arguments. You can specify each optional argument as a character array or a cell array of character arrays.

If You Specify an Optional Argument as a...	The Function...
Character array	Applies the character array to all source files it adds to the build information.
Cell array of character arrays	Pairs each character array with a specified source file. Thus, the length of the cell array must match the length of the cell array you specify for *`filenames`*.

If you choose to specify *groups*, but omit *paths*, specify a null string ('') for *paths*.

Examples

- Add the source file driver.c to build information myModelBuildInfo and place the file in the group Drivers.

```
myModelBuildInfo = RTW.BuildInfo;
addSourceFiles(myModelBuildInfo, 'driver.c', ...
'/proj/src', 'Drivers');
```

- Add the source files test1.c and test2.c to build information myModelBuildInfo and place the files in the group Tests.

```
myModelBuildInfo = RTW.BuildInfo;
addSourceFiles(myModelBuildInfo, ...
{'test1.c' 'test2.c'}, ...
'/proj/src', 'Tests');
```

- Add the source files test1.c, test2.c, and driver.c to build information myModelBuildInfo. Group the files test1.c and test2.c with the string Tests and the file driver.c with the string Drivers.

```
myModelBuildInfo = RTW.BuildInfo;
addSourceFiles(myModelBuildInfo, ...
{'test1.c' 'test2.c' 'driver.c'}, ...
'/proj/src', ...
{'Tests' 'Tests' 'Drivers'});
```

- Add all of the .c files in a specified directory to build information myModelBuildInfo and place the files in the group CFiles.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludeFiles(myModelBuildInfo, ...
'*.c', '/proj/src', 'CFiles');
```

See Also

addIncludeFiles, addIncludePaths, addSourcePaths, getSourceFiles, updateFilePathsAndExtensions,

`updateFileSeparator`
“Customizing Post Code Generation Build Processing”

addSourcePaths

Purpose Add source paths to model's build information

Syntax `addSourcePaths(`*`buildinfo`*`, `*`paths`*`, `*`groups`*`)`

`groups` is optional.

Arguments

`buildinfo`

Build information returned by `RTW.BuildInfo`.

`paths`

A character array or cell array of character arrays that specifies source file paths to be added to the build information. The function adds the paths to the end of a vector in the order that you specify them.

The function removes duplicate source file entries that

- You specify as input
- Already exist in the source path vector
- Have a path that matches the path of a matching filename

A duplicate entry consists of an exact match of a path string and corresponding filename.

Note The Real-Time Workshop software does not check whether a specified path string is valid.

`groups` (optional)

A character array or cell array of character arrays that groups specified source paths. You can use groups to

- Document the use of specific source paths
- Retrieve or apply groups of source paths

You can apply

- A single group name to a source path
- A single group name to multiple source paths
- Multiple group names to collections of multiple source paths

To...	**Specify *`groups`* as a...**
Apply one group name to all source paths	Character array.
Apply different group names to source paths	Cell array of character arrays such that the number of group names that you specify matches the number of elements you specify for *`paths`*.

Description

The `addSourcePaths` function adds specified source paths to the model's build information. The Real-Time Workshop software stores the source paths in a vector. The function adds the paths to the end of the vector in the order that you specify them.

In addition to the required *`buildinfo`* and *`paths`* arguments, you can specify an optional *`groups`* argument . You can specify *`groups`* as a character array or a cell array of character arrays.

If You Specify an Optional Argument as a...	**The Function...**
Character array	Applies the character array to all source paths it adds to the build information.
Cell array of character arrays	Pairs each character array with a specified source path. Thus, the length of the character array or cell array must match the length of the cell array you specify for *`paths`*.

Note The Real-Time Workshop software does not check whether a specified path string is valid.

Examples

- Add the source path `/etcproj/etc/etc_build` to build information `myModelBuildInfo`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addSourcePaths(myModelBuildInfo,...
  '/etcproj/etc/etc_build');
  ```

- Add the source paths `/etcproj/etclib` and `/etcproj/etc/etc_build` to build information `myModelBuildInfo` and place the files in the group `etc`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addSourcePaths(myModelBuildInfo,...
  {'/etcproj/etclib' '/etcproj/etc/etc_build'}, 'etc');
  ```

- Add the source paths `/etcproj/etclib`, `/etcproj/etc/etc_build`, and `/common/lib` to build information `myModelBuildInfo`. Group the paths `/etc/proj/etclib` and `/etcproj/etc/etc_build` with the string `etc` and the path `/common/lib` with the string `shared`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addSourcePaths(myModelBuildInfo,...
  {'/etc/proj/etclib' '/etcproj/etc/etc_build'...
   '/common/lib'}, {'etc' 'etc' 'shared'});
  ```

See Also

`addIncludeFiles`, `addIncludePaths`, `addSourceFiles`, `getSourcePaths`, `updateFilePathsAndExtensions`, `updateFileSeparator`
"Customizing Post Code Generation Build Processing"

Purpose

Add template makefile (TMF) tokens that provide build-time information for makefile generation

Syntax

`addTMFTokens(`*`buildinfo`*`, `*`tokennames`*`, `*`tokenvalues`*`, `*`groups`*`)`

`groups` is optional.

Arguments

`buildinfo`
Build information returned by `RTW.BuildInfo`.

`tokennames`
A character array or cell array of character arrays that specifies names of TMF tokens (for example, `'|>CUSTOM_OUTNAME<|'`) to be added to the build information. The function adds the token names to the end of a vector in the order that you specify them.

If you specify a token name that already exists in the vector, the first instance takes precedence and its value used for replacement.

`tokenvalues`
A character array or cell array of character arrays that specifies TMF token values corresponding to the previously-specified TMF token names. The function adds the token values to the end of a vector in the order that you specify them.

`groups` (optional)
A character array or cell array of character arrays that groups specified TMF tokens. You can use groups to

- Document the use of specific TMF tokens
- Retrieve or apply groups of TMF tokens

You can apply

- A single group name to a TMF token
- A single group name to multiple TMF tokens
- Multiple group names to collections of multiple TMF tokens

To...	Specify *groups* as a...
Apply one group name to all TMF tokens	Character array.
Apply different group names to TMF tokens	Cell array of character arrays such that the number of group names that you specify matches the number of elements you specify for *tokennames*.

Description

Call the `addTMFTokens` function inside a post code generation command to provide build-time information to help customize makefile generation. The tokens specified in the `addTMFTokens` function call must be handled appropriately in the template makefile (TMF) for the target selected for your model. For example, if your post code generation command calls `addTMFTokens` to add a TMF token named `|>CUSTOM_OUTNAME<|` that specifies an output file name for the build, the TMF must take appropriate action with the value of `|>CUSTOM_OUTNAME<|` to achieve the desired result. (See "Example" on page 3-35.)

The `addTMFTokens` function adds specified TMF token names and values to the model's build information. The Real-Time Workshop software stores the TMF tokens in a vector. The function adds the tokens to the end of the vector in the order that you specify them.

In addition to the required *buildinfo*, *tokennames*, and *tokenvalues* arguments, you can specify an optional *groups* argument. You can specify *groups* as a character array or a cell array of character arrays.

If You Specify an Optional Argument as a...	The Function...
Character array	Applies the character array to all TMF tokens it adds to the build information.
Cell array of character arrays	Pairs each character array with a specified TMF token. Thus, the length of the cell array must match the length of the cell array you specify for *tokennames*.

Example

Inside a post code generation command, add the TMF token `|>CUSTOM_OUTNAME<|` and its value to build information `myModelBuildInfo`, and place the token in the group `LINK_INFO`.

```
myModelBuildInfo = RTW.BuildInfo;
addTMFTokens(myModelBuildInfo, ...
             '|>CUSTOM_OUTNAME<|', 'foo.exe', 'LINK_INFO');
```

In the TMF for the target selected for your model, code such as the following uses the token value to achieve the desired result:

```
CUSTOM_OUTNAME = |>CUSTOM_OUTNAME<|
...
target:
$(LD) -o $(CUSTOM_OUTNAME) ...
```

See Also

“Customizing Post Code Generation Build Processing”

Purpose

Generate embeddable C/C++ code from MATLAB code

Syntax

```
emlc
-global_options files fcn_1 -options_1...fcn_n -options_n
```

Description

`emlc` *`-global_options files fcn_1 -options_1...fcn_n -options_n`* translates the MATLAB functions *`fcn_1`* through *`fcn_n`* to an embeddable C/C++ library or executable or to a MEX function. Optionally, you can specify custom *`files`* to include in the build. *`global_options`* applies to all functions *`fcn_1`* through *`fcn_n`*. *`options_n`* applies only to the preceding function, *`fcn_n`*.

Input Arguments

`fcn_1 ... fcn_n`

MATLAB functions from which to generate a MEX function, C/C++ library, or C/C++ executable code. *`fcn_1`* ... *`fcn_n`* must comply with the correct syntax and semantics for Embedded MATLAB®, a subset of the MATLAB language.

`files`

Space-separated list of custom files to include in generated code. You can include the following types of files:

- C file (`.c`)
- C++ file (`.cpp`)
- Header file (`.h`)
- Object file (`.o` or `.obj`)
- Library (`.a`, `.so`, or `.lib`)
- Template makefile (`.tmf`)

`global_options`

Choice of compiler options. `emlc` resolves options from left to right. If you specify conflicting options, the rightmost option prevails.

`-c`	Generate C/C++ code, but do not invoke the `make` command. Use only with `rtw`, `rtw:exe`, and `rtw:lib` targets.
`-d` *`out_folder`*	Store generated files in the absolute or relative path specified by *`out_folder`*. If the folder specified by *`out_folder`* does not exist, `emlc` creates it for you. If you do not specify the folder location, `emlc` generates files in the default folder: `emcprj/`*`target`*`/`*`fcn1`*`.` *`target`* can be: • `mexfcn` for MEX functions • `rtwexe` for embeddable C/C++ executables • `rtwlib` for embeddable C/C++ libraries *`fcn1`* is the name of the first MATLAB function specified at the command line. The function does not support the following characters in folder names: asterisk (*), question-mark (?), dollar ($), and pound (#).

`-F` *`fimath_obj`*	Specify *`fimath_obj`* as the default `fimath` object for all fixed-point inputs to the primary function. You can define *`fimath_obj`* using the `fimath` function. If not specified, `emlc` uses the MATLAB default `fimath` value.
`-g`	Compiles MEX functions in debug mode, with optimization turned off. Use only for `mex` targets. If not specified, `emlc` generates MEX functions in optimized mode.
`-global` *`global_values`*	Specify initial values for global variables in Embedded MATLAB files. Use the values in cell array `global_values` to initialize global variables in the function you compile. The cell array should provide the name and initial value of each global variable. You must initialize global variables before compiling with `emlc`. If you do not provide initial values for global variables using the `-global` option, `emlc` checks for the variable in the MATLAB global workspace. If you do not supply an initial value, `emlc` generates an error.

	The Embedded MATLAB subset and MATLAB each have their own copies of global data. To ensure consistency, you must synchronize their global data whenever the two interact. If you do not synchronize the data, their global variables might differ.
`-I` *`include_path`*	Add *`include_path`* to the beginning of the Embedded MATLAB path. `emlc` searches the Embedded MATLAB path *first* when converting MATLAB code to C/C++ code.
`-launchreport`	Generate and open a compilation report. If you do not specify this option, `emlc` generates a report only error or warning messages occur or you specify the `-report` option.
`-N` *`numerictype_obj`*	Specify *`numerictype_obj`* as the default `numerictype` object for all fixed-point inputs to the MATLAB function. You can define *`numerictype_obj`* using the `numerictype` function. If you do not specify the object, you must define fixed-point inputs using the `-eg` option.

`-o` *`output_file_name`*	Generate the MEX function, C/C++ library, or C/C++ executable file with the base name *`output_file_name`* plus an extension: • `.a` or `.lib` for C/C++ libraries • `.exe` or no extension for C/C++ executables • Platform-dependent extension for generated MEX functions *`output_file_name`* can be a file name or include an existing path. If you do not specify an output file name, the base name is *`fcn_1`*, where *`fcn_1`* is the name of the first MATLAB function specified at the command line.
`-O` *`optimization_option`*	Optimize generated code, based on the value of *`optimization_option`*: • `enable:inline` — Enable function inlining • `disable:inline` — Disable function inlining • `enable:blas` — Use BLAS library, if available

	• `disable:blas` — Do not use BLAS library If not specified, `emlc` uses inlining and BLAS library functions for optimization.
`-report`	Generate a compilation report. If you do not specify this option, `emlc` generates a report only if error or warning messages occur or you specify the `-launchreport` option.
`-s` *`config_obj`*	Specify code generation parameters, based on *`config_obj`*, defined as one of these objects: • `emlcoder.HardwareImplementation` — Parameters of the target hardware for embeddable C/C++ code. Use with `rtw`, `rtw:lib`, or `rtw:exe` targets. If not specified, `emlc` generates code compatible with the MATLAB host computer. • `emlcoder.MEXConfig` — Parameters for MEX code generation. Use with `mex` target. • `emlcoder.RTWConfig` — Parameters for embeddable C/C++ code generation. Use

	with `rtw`, `rtw:lib`, and `rtw:exe` targets. Define *`config_obj`* as a MATLAB variable. For example: `rtw_config = emlcoder.RTWConfig`
`-T` *`target_option`*	Specify target for generated code, based on value of *`target_option`*: • `mex` — Generate a MEX function (default) • `rtw` or `rtw:lib` — Generate embeddable C/C++ library file • `rtw:exe` — Generate embeddable C/C++ code executable file. You must provide a `main` function to include in the build. If not specified, `emlc` generates a MEX function.
`-v`	Enable verbose mode to show compilation steps. Use with `rtw`, `rtw:lib`, and `rtw:exe` targets.
`-?`	Display help for `emlc` command.

`options_1 ...  options_n`

`-eg` *`example_inputs`*	Define the size, class, and complexity of all MATLAB function inputs. Use the values in *`example_inputs`* to define these properties. *`example_inputs`* must be a cell array that specifies the same number and order of inputs as the MATLAB function. Specify the example inputs immediately after the function to which they apply.

Examples

Generate a MEX function from an Embedded MATLAB compliant function:

1 Write a MATLAB function `emcrand` that generates a random scalar value drawn from the standard uniform distribution on the open interval (0,1):

```
function r = emcrand() %#eml
% The directive %#eml declares the function
%  to be Embedded MATLAB compliant
r = rand();
```

2 Generate and run the MEX function:

```
emlc emcrand
emcrand
```

Generate C executable files from an Embedded MATLAB compliant function. Specify the main C function as a configuration parameter:

1. Write a MATLAB function `emcrand` that generates a random scalar value drawn from the standard uniform distribution on the open interval (0,1):

   ```
   function r = emcrand() %#eml
   r = rand();
   ```

2. Write a main C function `c:\myfiles\main.c` that calls `emcrand`:

   ```
   /*
   ** main.c
   */
   #include <stdio.h>
   #include <stdlib.h>

   int main()
   {
       emcrand_initialize();

       printf("emcrand=%g\n", emcrand());

       emcrand_terminate();

       return 0;
   }
   ```

3. Configure your code generation parameters to include the main C function, then generate the C executable:

   ```
   rtwcfg = emlcoder.RTWConfig
   rtwcfg.CustomSource = 'main.c'
   rtwcfg.CustomInclude = 'c:\myfiles'
   emlc -T rtw:exe -s rtwcfg emcrand
   ```

   `emlc` generates C executables and supporting files in the default folder `emcprj/rtwexe/emcrand`.

This example shows how to specify a main function as a parameter in the configuration object `emlcoder.RTWConfig`. Alternatively, you can specify the file containing `main()` separately on the command line. You can use a source, object, or library file.

Generate C library files in a custom folder from an Embedded MATLAB compliant function with inputs of different classes and sizes. The first input is a 1-by-4 vector of unsigned 16-bit integers; the second input is a double-precision scalar:

1. Write a MATLAB function `emcadd` that returns the sum of two values:

```
function y = emcadd(u,v) %#eml
y = u + v;
```

2. Generate the C library files in a custom folder `emcaddlib`:

```
emlc -T rtw:lib -d emcaddlib emcadd -eg {zeros(1,4,'uint16'),0}
```

Generate C library files from an Embedded MATLAB compliant function that takes a fixed-point input:

1. Write a MATLAB language function `emcsqrtfi` that computes the square root of a fixed-point input:

```
function y = emcsqrtfi(x) %#eml
y = sqrt(x);
```

2. Define `numerictype` and `fimath` properties for the fixed-point input `x` and generate C library code for `emcsqrtfi`:

```
T = numerictype('WordLength',32, ...
                'FractionLength',23, ...
                'Signed',true)
F = fimath('SumMode','SpecifyPrecision', ...
              'SumWordLength',32, ...
              'SumFractionLength',23, ...
              'ProductMode','SpecifyPrecision', ...
              'ProductWordLength',32, ...
              'ProductFractionLength',23)
   % Define a fixed-point variable with these
   %  numerictype and fimath properties
   myfiprops = {fi(4.0,T,F)}
   emlc -T rtw:lib emcsqrtfi -eg myfiprops
```

`emlc` generates C library and supporting files in the default folder `emcprj/rtwlib/emcsqrtfi`.

Specify global data at the command line.

1 Write a MATLAB function `use_globals` that takes one input parameter `u` and uses two global variables `AR` and `B`:

```
function y = use_globals(u)
%#eml
% Turn off inlining to make
% generated code easier to read
eml.inline('never');
global AR;
global B;
AR(1) = u(1) + B(1);
y = AR * 2;
```

2 Generate a MEX function named `use_globalsx` in the current folder. Specify the properties of the global variables at the command line using the `-global` option:

```
emlc -global {'AR', ones(4), 'B', [1 2 3 4]}
   ... -o use_globalsx use_globals
```

Alternatively, you can initialize the global data in the MATLAB workspace. At the MATLAB prompt, enter:

```
global AR B;
AR = ones(4);
B=[1 2 3];
```

Compile the function to generate a MEX file named `use_globalsx`.

```
emlmex -o use_globalsx use_globals
```

Alternatives

You can use a GUI to modify parameters for code generation with `emlc`:

- To modify hardware implementation parameters using a dialog box:

  ```
  hw_config = emlcoder.HardwareImplementation
  open hw_config
  ```

- To modify C/C++ code generation parameters using a dialog box:

  ```
  rtw_config = emlcoder.RTWConfig
  open rtw_config
  ```

- To modify MEX code generation parameters using a dialog box:

  ```
  mex_config = emlcoder.MEXConfig
  open mex_config
  ```

See Also

`fimath` | `numerictype` | `emlmex` | `mex` | `fi`

Tutorials

- “Tutorial: Generating C Code from MATLAB Code”
- Generating Code for Embedded MATLAB

How To

- “Making MATLAB Code Compliant with the Embedded MATLAB Subset”
- “Converting MATLAB Code to C/C++ Code”
- “Specifying Properties of Primary Function Inputs”

- “Configuring Your Environment for Code Generation”
- “Specifying a Language for Embeddable Code Generation”
- “File Paths and Naming Conventions”
- “Generating C/C++ Code from MATLAB Code That Uses Global Data”
- “Synchronizing Global Data with MATLAB”
- “Compiling More Than One Entry-Point MATLAB Function”

Purpose

Find and add include (header) files to build information object

Syntax

`findIncludeFiles(`*`buildinfo`*`, `*`extPatterns`*`)`

`extPatterns` is optional.

Arguments

`buildinfo`

Build information returned by `RTW.BuildInfo`.

`extPatterns` (optional)

A cell array of character arrays that specify patterns of file name extensions for which the function is to search. Each pattern

- Must start with `*.`
- Can include any combination of alphanumeric and underscore (_) characters

The default pattern is `*.h`.

Examples of valid patterns include

```
*.h
*.hpp
*.x*
```

Description

The `findIncludeFiles` function

- Searches for include files, based on specified file name extension patterns, in all source and include paths recorded in a model's build information object
- Adds the files found, along with their full paths, to the build information object
- Deletes duplicate entries

Examples

Find all include files with filename extension `.h` that are in build information object `myModelBuildInfo`, and add the full paths for any files found to the object.

```
myModelBuildInfo = RTW.BuildInfo;
addSourcePaths(myModelBuildInfo, {fullfile(pwd,...
'mycustomheaders')}, 'myheaders');
findIncludeFiles(myModelBuildInfo);
headerfiles = getIncludeFiles(myModelBuildInfo, true, false);
headerfiles
headerfiles =
     'W:\work\mycustomheaders\myheader.h'
```

See Also

`addIncludeFiles`, `getIncludeFiles`, `packNGo`
"Customizing Post Code Generation Build Processing"

Purpose

Compiler options from model's build information

Syntax

`options` `= getCompileFlags(`*`buildinfo`*`, `*`includeGroups`*`,` *`excludeGroups`*`)`

`includeGroups` and *`excludeGroups`* are optional.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`includeGroups` (optional)
: A character array or cell array of character arrays that specifies groups of compiler flags you want the function to return.

`excludeGroups` (optional)
: A character array or cell array of character arrays that specifies groups of compiler flags you do not want the function to return.

Returns

Compiler options stored in the model's build information.

Description

The `getCompileFlags` function returns compiler options stored in the model's build information. Using optional *`includeGroups`* and *`excludeGroups`* arguments, you can selectively include or exclude groups of options the function returns.

If you choose to specify *`excludeGroups`* and omit *`includeGroups`*, specify a null string (`''`) for *`includeGroups`*.

Examples

- Get all compiler options stored in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addCompileFlags(myModelBuildInfo, {'-Zi -Wall' '-O3'}, ...
  'OPTS');
compflags=getCompileFlags(myModelBuildInfo);
compflags

compflags =
        '-Zi -Wall'    '-O3'
```

- Get the compiler options stored with the group name `Debug` in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addCompileFlags(myModelBuildInfo, {'-Zi -Wall' '-O3'}, ...
  {'Debug' 'MemOpt'});
compflags=getCompileFlags(myModelBuildInfo, 'Debug');
compflags

compflags =

    '-Zi -Wall'
```

- Get all compiler options stored in build information `myModelBuildInfo`, except those with the group name `Debug`.

```
myModelBuildInfo = RTW.BuildInfo;
addCompileFlags(myModelBuildInfo, {'-Zi -Wall' '-O3'}, ...
  {'Debug' 'MemOpt'});
compflags=getCompileFlags(myModelBuildInfo, '', 'Debug');
compflags

compflags =

    '-O3'
```

See Also

`addCompileFlags`, `getDefines`, `getLinkFlags`
"Customizing Post Code Generation Build Processing"

Purpose

Preprocessor macro definitions from model's build information

Syntax

```
[macrodefs, identifiers, values] = getDefines(buildinfo,
includeGroups, excludeGroups)
```

includeGroups and *excludeGroups* are optional.

Arguments

buildinfo
: Build information returned by `RTW.BuildInfo`.

includeGroups (optional)
: A character array or cell array of character arrays that specifies groups of macro definitions you want the function to return.

excludeGroups (optional)
: A character array or cell array of character arrays that specifies groups of macro definitions you do not want the function to return.

Returns

Preprocessor macro definitions stored in the model's build information. The function returns the macro definitions in three vectors.

Vector	Description
macrodefs	Complete macro definitions with `-D` prefix
identifiers	Names of the macros
values	Values assigned to the macros (anything specified to the right of the first equals sign) ; the default is an empty string (`''`)

getDefines

Description

The `getDefines` function returns preprocessor macro definitions stored in the model's build information. When the function returns a definition, it automatically

- Prepends a `-D` to the definition if the `-D` was not specified when the definition was added to the build information
- Changes a lowercase `-d` to `-D`

Using optional *`includeGroups`* and *`excludeGroups`* arguments, you can selectively include or exclude groups of definitions the function is to return.

If you choose to specify *`excludeGroups`* and omit *`includeGroups`*, specify a null string (`''`) for *`includeGroups`*.

Examples

- Get all preprocessor macro definitions stored in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addDefines(myModelBuildInfo, ...
  {'PROTO=first' '-DDEBUG' 'test' '-dPRODUCTION'}, 'OPTS');
[defs names values]=getDefines(myModelBuildInfo);
defs

defs =

    '-DPROTO=first'   '-DDEBUG'   '-Dtest'   '-DPRODUCTION'

names

names =

    'PROTO'
    'DEBUG'
    'test'
    'PRODUCTION'
```

```
values

values = 

    'first'
    ''
    ''
    ''
```

- Get the preprocessor macro definitions stored with the group name `Debug` in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addDefines(myModelBuildInfo, ...
  {'PROTO=first' '-DDEBUG' 'test' '-dPRODUCTION'}, ...
  {'Debug' 'Debug' 'Debug' 'Release'});
[defs names values]=getDefines(myModelBuildInfo, 'Debug');
defs

defs = 

    '-DPROTO=first'   '-DDEBUG'     '-Dtest'
```

- Get all preprocessor macro definitions stored in build information `myModelBuildInfo`, except those with the group name `Debug`.

```
myModelBuildInfo = RTW.BuildInfo;
addDefines(myModelBuildInfo, ...
  {'PROTO=first' '-DDEBUG' 'test' '-dPRODUCTION'}, ...
  {'Debug' 'Debug' 'Debug' 'Release'});
[defs names values]=getDefines(myModelBuildInfo, '', 'Debug');
defs

defs = 

    '-DPRODUCTION'
```

See Also `addDefines`, `getCompileFlags`, `getLinkFlags`
"Customizing Post Code Generation Build Processing"

Purpose

All files from model's build information

Syntax

`[fPathNames, names] = getFullFileList(buildinfo, fcase)`

fcase is optional.

Arguments

buildinfo
: Build information returned by `RTW.BuildInfo`.

fcase (optional)
: The string `'source'`, `'include'`, or `'nonbuild'`. If the argument is omitted, the function returns all files from the model's build information.

If You Specify...	The Function...
`'source'`	Returns source files from the model's build information.
`'include'`	Returns include files from the model's build information.
`'nonbuild'`	Returns nonbuild files from the model's build information.

Returns

Fully-qualified file paths and file names for files stored in the model's build information.

Description

The `getFullFileList` function returns the fully-qualified paths and names of all files, or files of a selected type (source, include, or nonbuild), stored in the model's build information.

The `packNGo` function calls `getFullFileList` to return a list of all files in the model's build information before processing files for packaging.

Examples

List all the files stored in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
[fPathNames, names] = getFullFileList(myModelBuildInfo);
```

See Also “Customizing Post Code Generation Build Processing”

Purpose Include files from model's build information

Syntax

```
files = getIncludeFiles(buildinfo, concatenatePaths,
replaceMatlabroot, includeGroups, excludeGroups)
```

`includeGroups` and *`excludeGroups`* are optional.

Arguments

`buildinfo`
Build information returned by `RTW.BuildInfo`.

`concatenatePaths`
The logical value `true` or `false`.

If You Specify...	The Function...
`true`	Concatenates and returns each filename with its corresponding path.
`false`	Returns only filenames.

`replaceMatlabroot`
The logical value `true` or `false`.

If You Specify...	The Function...
`true`	Replaces the token `$(MATLAB_ROOT)` with the absolute path string for your MATLAB installation directory.
`false`	Does not replace the token `$(MATLAB_ROOT)`.

`includeGroups` (optional)
A character array or cell array of character arrays that specifies groups of include files you want the function to return.

`excludeGroups` (optional)
A character array or cell array of character arrays that specifies groups of include files you do not want the function to return.

Returns

Names of include files stored in the model's build information. The names include any files you added using the `addIncludeFiles` function and, if you called the `packNGo` function, any files `packNGo` found and added while packaging model code.

Description

The `getIncludeFiles` function returns the names of include files stored in the model's build information. Use the *`concatenatePaths`* and *`replaceMatlabroot`* arguments to control whether the function includes paths and your MATLAB root definition in the output it returns. Using optional *`includeGroups`* and *`excludeGroups`* arguments, you can selectively include or exclude groups of include files the function returns.

If you choose to specify *`excludeGroups`* and omit *`includeGroups`*, specify a null string (`''`) for *`includeGroups`*.

Examples

- Get all include paths and filenames stored in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludeFiles(myModelBuildInfo, {'etc.h' 'etc_private.h'...
'mytypes.h'}, {'/etc/proj/etclib' '/etcproj/etc/etc_build'...
'/common/lib'}, {'etc' 'etc' 'shared'});
incfiles=getIncludeFiles(myModelBuildInfo, true, false);
incfiles

incfiles =

    [1x22 char]    [1x36 char]    [1x21 char]
```

- Get the names of include files in group `etc` that are stored in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludeFiles(myModelBuildInfo, {'etc.h' 'etc_private.h'...
'mytypes.h'}, {'/etc/proj/etclib' '/etcproj/etc/etc_build'...
'/common/lib'}, {'etc' 'etc' 'shared'});
incfiles=getIncludeFiles(myModelBuildInfo, false, false,...
'etc');
incfiles

incfiles =

    'etc.h'     'etc_private.h'
```

See Also

`addIncludeFiles`, `findIncludeFiles`, `getIncludePaths`, `getSourceFiles`, `getSourcePaths`
“Customizing Post Code Generation Build Processing”

getIncludePaths

Purpose

Include paths from model's build information

Syntax

`files``=getIncludePaths(`*`buildinfo`*`, `*`replaceMatlabroot`*`,`
`includeGroups``, `*`excludeGroups`*`)`

`includeGroups` and *`excludeGroups`* are optional.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`replaceMatlabroot`
: The logical value `true` or `false`.

If You Specify...	The Function...
`true`	Replaces the token `$(MATLAB_ROOT)` with the absolute path string for your MATLAB installation directory.
`false`	Does not replace the token `$(MATLAB_ROOT)`.

`includeGroups` (optional)
: A character array or cell array of character arrays that specifies groups of include paths you want the function to return.

`excludeGroups` (optional)
: A character array or cell array of character arrays that specifies groups of include paths you do not want the function to return.

Returns

Paths of include files stored in the model's build information.

Description

The `getIncludePaths` function returns the names of include file paths stored in the model's build information. Use the *`replaceMatlabroot`* argument to control whether the function includes your MATLAB root definition in the output it returns. Using optional *`includeGroups`* and *`excludeGroups`* arguments, you can selectively include or exclude groups of include file paths the function returns.

If you choose to specify *excludeGroups* and omit *includeGroups*, specify a null string ('') for *includeGroups*.

Examples

- Get all include paths stored in build information myModelBuildInfo.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludePaths(myModelBuildInfo, {'/etc/proj/etclib'...
'/etcproj/etc/etc_build' '/common/lib'},...
{'etc' 'etc' 'shared'});
incpaths=getIncludePaths(myModelBuildInfo, false);
incpaths

incpaths =

    '\etc\proj\etclib'   [1x22 char]    '\common\lib'
```

- Get the paths in group shared that are stored in build information myModelBuildInfo.

```
myModelBuildInfo = RTW.BuildInfo;
addIncludePaths(myModelBuildInfo, {'/etc/proj/etclib'...
'/etcproj/etc/etc_build' '/common/lib'},...
{'etc' 'etc' 'shared'});
incpaths=getIncludePaths(myModelBuildInfo, false, 'shared');
incpaths

incpaths =

    '\common\lib''
```

See Also

addIncludePaths, getIncludeFiles, getSourceFiles, getSourcePaths
"Customizing Post Code Generation Build Processing"

Purpose Link options from model's build information

Syntax

```
options=getLinkFlags(buildinfo, includeGroups,
excludeGroups)
```

`includeGroups` and *`excludeGroups`* are optional.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`includeGroups` (optional)
: A character array or cell array that specifies groups of linker flags you want the function to return.

`excludeGroups` (optional)
: A character array or cell array that specifies groups of linker flags you do not want the function to return. To exclude groups and not include specific groups, specify an empty cell array (`''`) for *`includeGroups`*.

Returns Linker options stored in the model's build information.

Description The `getLinkFlags` function returns linker options stored in the model's build information. Using optional *`includeGroups`* and *`excludeGroups`* arguments, you can selectively include or exclude groups of options the function returns.

If you choose to specify *`excludeGroups`* and omit *`includeGroups`*, specify a null string (`''`) for *`includeGroups`*.

Examples

- Get all linker options stored in build information `myModelBuildInfo`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addLinkFlags(myModelBuildInfo, {'-MD -Gy' '-T'}, 'OPTS');
  linkflags=getLinkFlags(myModelBuildInfo);
  linkflags

  linkflags =

      '-MD -Gy'    '-T'
  ```

- Get the linker options stored with the group name `Debug` in build information `myModelBuildInfo`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addLinkFlags(myModelBuildInfo, {'-MD -Gy' '-T'}, ...
    {'Debug' 'MemOpt'});
  linkflags=getLinkFlags(myModelBuildInfo, {'Debug'});
  linkflags

  linkflags =

      '-MD -Gy'
  ```

- Get all compiler options stored in build information `myModelBuildInfo`, except those with the group name `Debug`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addLinkFlags(myModelBuildInfo, {'-MD -Gy' '-T'}, ...
    {'Debug' 'MemOpt'});
  linkflags=getLinkFlags(myModelBuildInfo, '', {'Debug'});
  linkflags

  linkflags =

      '-T'
  ```

See Also

`addLinkFlags`, `getCompileFlags`, `getDefines`
"Customizing Post Code Generation Build Processing"

Purpose Nonbuild-related files from model's build information

Syntax

```
files=getNonBuildFiles(buildinfo, concatenatePaths,
replaceMatlabroot, includeGroups, excludeGroups)
```

includeGroups and *excludeGroups* are optional.

Arguments

buildinfo
: Build information returned by `RTW.BuildInfo`.

concatenatePaths
: The logical value `true` or `false`.

If You Specify...	The Function...
`true`	Concatenates and returns each filename with its corresponding path.
`false`	Returns only filenames.

replaceMatlabroot
: The logical value `true` or `false`.

If You Specify...	The Function...
`true`	Replaces the token `$(MATLAB_ROOT)` with the absolute path string for your MATLAB installation directory.
`false`	Does not replace the token `$(MATLAB_ROOT)`.

includeGroups (optional)
: A character array or cell array of character arrays that specifies groups of nonbuild files you want the function to return.

excludeGroups (optional)
: A character array or cell array of character arrays that specifies groups of nonbuild files you do not want the function to return.

Returns

Names of nonbuild files stored in the model's build information.

Description

The `getNonBuildFiles` function returns the names of nonbuild-related files, such as DLL files required for a final executable, or a README file, stored in the model's build information. Use the ***`concatenatePaths`*** and ***`replaceMatlabroot`*** arguments to control whether the function includes paths and your MATLAB root definition in the output it returns. Using optional ***`includeGroups`*** and ***`excludeGroups`*** arguments, you can selectively include or exclude groups of nonbuild files the function returns.

If you choose to specify ***`excludeGroups`*** and omit ***`includeGroups`***, specify a null string (`''`) for ***`includeGroups`***.

Examples

Get all nonbuild filenames stored in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addNonBuildFiles(myModelBuildInfo, {'readme.txt' 'myutility1.dll'...
'myutility2.dll'});
nonbuildfiles=getNonBuildFiles(myModelBuildInfo, false, false);
nonbuildfiles

nonbuildfiles =

    'readme.txt'    'myutility1.dll'    'myutility2.dll'
```

See Also

`addNonBuildFiles`
"Customizing Post Code Generation Build Processing"

Purpose Source files from model's build information

Syntax

```
srcfiles=getSourceFiles(buildinfo, concatenatePaths,
replaceMatlabroot, includeGroups, excludeGroups)
```

includeGroups and *excludeGroups* are optional.

Arguments

buildinfo
: Build information returned by `RTW.BuildInfo`.

concatenatePaths
: The logical value `true` or `false`.

If You Specify...	The Function...
`true`	Concatenates and returns each filename with its corresponding path.
`false`	Returns only filenames.

replaceMatlabroot
: The logical value `true` or `false`.

If You Specify...	The Function...
`true`	Replaces the token `$(MATLAB_ROOT)` with the absolute path string for your MATLAB installation directory.
`false`	Does not replace the token `$(MATLAB_ROOT)`.

includeGroups (optional)
: A character array or cell array of character arrays that specifies groups of source files you want the function to return.

excludeGroups (optional)
: A character array or cell array of character arrays that specifies groups of source files you do not want the function to return.

Returns

Names of source files stored in the model's build information.

Description

The `getSourceFiles` function returns the names of source files stored in the model's build information. Use the *`concatenatePaths`* and *`replaceMatlabroot`* arguments to control whether the function includes paths and your MATLAB root definition in the output it returns. Using optional *`includeGroups`* and *`excludeGroups`* arguments, you can selectively include or exclude groups of source files the function returns.

If you choose to specify *`excludeGroups`* and omit *`includeGroups`*, specify a null string (`''`) for *`includeGroups`*.

Examples

- Get all source paths and filenames stored in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addSourceFiles(myModelBuildInfo,...
{'test1.c' 'test2.c' 'driver.c'}, '',...
{'Tests' 'Tests' 'Drivers'});
srcfiles=getSourceFiles(myModelBuildInfo, false, false);
srcfiles

srcfiles =

    'test1.c'   'test2.c'   'driver.c'
```

- Get the names of source files in group `tests` that are stored in build information `myModelBuildInfo`.

```
myModelBuildInfo = RTW.BuildInfo;
addSourceFiles(myModelBuildInfo, {'test1.c' 'test2.c'...
'driver.c'}, {'/proj/test1' '/proj/test2'...
'/drivers/src'}, {'tests', 'tests', 'drivers'});
incfiles=getSourceFiles(myModelBuildInfo, false, false,...
'tests');
incfiles

incfiles =

    'test1.c'   'test2.c'
```

See Also

`addSourceFiles`, `getIncludeFiles`, `getIncludePaths`, `getSourcePaths`
"Customizing Post Code Generation Build Processing"

getSourcePaths

Purpose

Source paths from model's build information

Syntax

`files``=getSourcePaths(`*`buildinfo`*`, `*`replaceMatlabroot`*`,`
`includeGroups``, `*`excludeGroups`*`)`

`includeGroups` and *`excludeGroups`* are optional.

Arguments

`buildinfo`
Build information returned by `RTW.BuildInfo`.

`replaceMatlabroot`
The logical value `true` or `false`.

If You Specify...	The Function...
`true`	Replaces the token `$(MATLAB_ROOT)` with the absolute path string for your MATLAB installation directory.
`false`	Does not replace the token `$(MATLAB_ROOT)`.

`includeGroups` (optional)
A character array or cell array of character arrays that specifies groups of source paths you want the function to return.

`excludeGroups` (optional)
A character array or cell array of character arrays that specifies groups of source paths you do not want the function to return.

Returns

Paths of source files stored in the model's build information.

Description

The `getSourcePaths` function returns the names of source file paths stored in the model's build information. Use the *`replaceMatlabroot`* argument to control whether the function includes your MATLAB root definition in the output it returns. Using optional *`includeGroups`* and *`excludeGroups`* arguments, you can selectively include or exclude groups of source file paths the function returns.

If you choose to specify *`excludeGroups`* and omit *`includeGroups`*, specify a null string (`''`) for *`includeGroups`*.

Examples

- Get all source paths stored in build information `myModelBuildInfo`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addSourcePaths(myModelBuildInfo, {'/proj/test1'...
  '/proj/test2' '/drivers/src'}, {'tests' 'tests'...
  'drivers'});
  srcpaths=getSourcePaths(myModelBuildInfo, false);
  srcpaths

  srcpaths =

     '\proj\test1'    '\proj\test2'      '\drivers\src'
  ```

- Get the paths in group `tests` that are stored in build information `myModelBuildInfo`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addSourcePaths(myModelBuildInfo, {'/proj/test1'...
  '/proj/test2' '/drivers/src'}, {'tests' 'tests'...
  'drivers'});
  srcpaths=getSourcePaths(myModelBuildInfo, true, 'tests');
  srcpaths

  srcpaths =

       '\proj\test1'    '\proj\test2'
  ```

- Get a path stored in build information `myModelBuildInfo`. First get the path without replacing `$(MATLAB_ROOT)` with an absolute path, then get it with replacement. The MATLAB root directory in this case is `\\myserver\myworkspace\matlab`.

  ```
  myModelBuildInfo = RTW.BuildInfo;
  addSourcePaths(myModelBuildInfo, fullfile(matlabroot,...
   'rtw', 'c', 'src'));
  ```

```
srcpaths=getSourcePaths(myModelBuildInfo, false);
srcpaths{:}

ans =

$(MATLAB_ROOT)\rtw\c\src

srcpaths=getSourcePaths(myModelBuildInfo, true);
srcpaths{:}

ans =

\\myserver\myworkspace\matlab\rtw\c\src
```

See Also `addSourcePaths`, `getIncludeFiles`, `getIncludePaths`, `getSourceFiles`
"Customizing Post Code Generation Build Processing"

Purpose Package model code in zip file for relocation

Syntax

```
packNGo(buildinfo, propVals...)
```

propVals is optional.

Arguments

buildinfo
Build information returned by `RTW.BuildInfo`.

propVals (optional)
A cell array of property-value pairs that specify packaging details.

To...	Specify Property...	With Value...
Package all model code files in a zip file as a single, flat directory	`'packType'`	`'flat'` (default)
Package model code files hierarchically in a primary zip file that contains three secondary zip files: • `mlrFiles.zip` — files in your *`matlabroot`* directory tree • `sDirFiles.zip` — files in and under your build directory • `otherFiles.zip` — required files not in the *`matlabroot`* or `start` directory trees	`'packType'`	`'hierarchical'`Paths for files in the secondary zip files are relative to the root directory of the primary zip file.
Specify a file name for the primary zip file	`'fileName'`	`'`*`string`*`'` Default:`'`*`model`*`.zip'` If you omit the `.zip` file extension, the function adds it for you.

Description The `packNGo` function packages the following code files in a compressed zip file so you can relocate, unpack, and rebuild them in another development environment:

- Source files (for example, `.c` and `.cpp` files)
- Header files (for example, `.h` and `.hpp` files)
- Nonbuild-related files (for example, `.dll` files required for a final executable and `.txt` informational files)
- MAT-file that contains the model's build information object (`.mat` file)

You might use this function to relocate files so they can be recompiled for a specific target environment or rebuilt in a development environment in which MATLAB is not installed.

By default, the function packages the files as a flat directory structure in a zip file named *`model`*`.zip`. You can tailor the output by specifying property name and value pairs as explained above.

After relocating the zip file, use a standard zip utility to unpack the compressed file.

Note The `packNGo` function potentially can modify the build information passed in the first `packNGo` argument. For example, as part of packaging model code, `packNGo` finds include files from all source and include paths recorded in the model's build information and adds them to the build information.

Examples

- Package the code files for model `zingbit` in the file `zingbit.zip` as a flat directory structure.

  ```
  set_param('zingbit','PostCodeGenCommand','packNGo(buildInfo);');
  ```

  Then, rebuild the model.

- Package the code files for model `zingbit` in the file `portzingbit.zip` and maintain the relative file hierarchy.

  ```
  cd zingbat_grt_rtw;
  load buildInfo.mat
  ```

```
packNGo(buildInfo, {'packType', 'hierarchical', ...
 'fileName', 'portzingbit'});
```

See Also

"Customizing Post Code Generation Build Processing"
"Relocating Code to Another Development Environment"
"packNGo Function Limitations"

Purpose

Global model parameter structure

Syntax

```
rsimgetrtp('model')
rsimgetrtp('model', 'AddTunableParamInfo' 'value')
```

Description

`rsimgetrtp('model')` forces a block update diagram action for *`model`*, a model for which you are running rapid simulations, and returns the global parameter structure for that model.

`rsimgetrtp('model', 'AddTunableParamInfo' 'value')` includes tunable parameter information in the parameter structure if *`value`* is `'on'`. The function omits tunable parameters if *`value`* is `'off'`. To use `AddTunableParamInfo`, you must enable inline parameters.

The model parameter structure contains the following fields:

Field	Description
`modelChecksum`	A four-element vector that encodes the structure. The Real-Time Workshop software uses the *`checksum`* to check whether the structure has changed since the RSim executable was generated. If you delete or add a block, and then generate a new version of the structure, the new *`checksum`* will not match the original *`checksum`*. The RSim executable detects this incompatibility in model parameter structures and exits to avoid returning incorrect simulation results. If the structure changes, you must regenerate code for the model.
`parameters`	A structure that defines model global parameters.

The `parameters` substructure includes the following fields:

Field	Description
`dataTypeName`	Name of the parameter data type, for example, `double`
`dataTypeID`	An internal data type identifier
`complex`	Value 1 if parameter values are complex and 0 if real
`dtTransIdx`	Internal use only
`values`	Vector of parameter values

If you set `'AddTunableParamInfo'` to `'on'`, the function creates and then deletes *`model`*`.rtw` from your current working directory and includes a `map` substructure that has the following fields:

Field	Description
`Identifier`	Parameter name
`ValueIndicies`	Vector of indices to parameter values
`Dimensions`	Vector indicating parameter dimensions

Examples

Return global parameter structure for model `rtwdemo_rsimtf` to `param_struct`:

```
rtwdemo_rsimtf
param_struct = rsimgetrtp('rtwdemo_rsimtf')

param_struct =

    modelChecksum: [1.7165e+009 3.0726e+009 2.6061e+009
2.3064e+009]
       parameters: [1x1 struct]
```

See Also

`rsimsetrtpparam`

How To

- "Creating a MAT-File That Includes a Model Parameter Structure"

- “Updating a Block Diagram”
- “Inline parameters”
- “Implementing Block Features”
- “Tuning Parameters”

Purpose

Set parameters of `rtP` model parameter structure

Syntax

```
rtp = rsimsetrtpparam(rtp, idx)
rtp = rsimsetrtpparam(rtp, 'paramName', paramValue)
rtP = rsimsetrtpparam( rtP, idx, 'paramName', paramValue )
```

Description

`rtp = rsimsetrtpparam(rtp, idx)`

Expands the `rtP` structure to have idx sets of parameters

`rtp = rsimsetrtpparam(rtp, 'paramName', paramValue)`

Takes an `rtP` structure with tunable parameter information and sets the values associated with 'paramName' to be paramValue if possible. There can be more than one name-value pair.

`rtP = rsimsetrtpparam( rtP, idx, 'paramName', paramValue )`

The `rsimsetrtpparam` utility allows for defining the values of an existing `rtP` parameter structure.

Takes an `rtP` structure with tunable parameter information and sets the values associated with 'paramName' to be paramValue in the idx'th parameter set. There can be more than one name-value pair. If the `rtP` structure does not have idx parameter sets, the first set is copied and appended until there are idx parameter sets. Subsequently, the idx'th set is changed.

Input Arguments

`rtP`

A parameter structure that contains the sets of parameter names and their respective values.

`idx`

An index used to indicate the number of parameter sets in the `rtP` structure

`paramValue`

The value of the `rtP` parameter, `paramName`

`paramName`

The name of the parameter set to add to the `rtP` structure

Output Arguments

`rtP`

An expanded`rtP` parameter structure that contains idx additional parameter sets defined by the `rsimsetrtpparam` function call.

Definitions

The `rtP` structure should match the format of the structure returned by `rsimsetrtp`(modelName).

Examples

1 Expand the number of parameter sets in the 'rtp' structure to 10.

```
rtp = rsimsetrtpparam(rtp, 10);
```

2 Add three parameter sets to the parameter structure, 'rtp'.

```
rtp = rsimsetrtpparam(rtp, idx, 'X1', iX1, 'X2' ,iX2, 'Num', iNum);
```

See Also

`rsimgetrtp`

Purpose

Build libraries within model without building model

Syntax

`rtw_precompile_libs('model', build_spec)`

Description

`rtw_precompile_libs('model', build_spec)` builds libraries within *`model`*, according to the `build_spec` arguments, and places the libraries in a precompiled folder.

Input Arguments

`model`

Character array. Name of the model containing the libraries that you want to build.

`build_spec`

Structure of field and value pairs that define a build specification; all fields except `rtwmakecfgDirs` are optional:

Field	Value
`rtwmakecfgDirs`	Cell array of strings that names the folders containing `rtwmakecfg` files for libraries that you want to precompile. Uses the `Name` and `Location` elements of `makeInfo.library`, as returned by the `rtwmakecfg` function, to specify name and location of precompiled libraries. If you use the `TargetPreCompLibLocation` parameter to specify the library folder, it overrides the `makeInfo.library.Location` setting. The specified model must contain blocks that use precompiled libraries that the `rtwmakecfg` files specify. The template makefile (TMF)-to-makefile conversion generates the library rules only if the conversion needs the libraries.

Field	**Value**
`libSuffix` (optional)	String that specifies the suffix, including the file type extension, to append to the name of each library (for example, `.a` or `_vc.lib`). The string must include a period (.). Set the suffix with either this field or the `TargetLibSuffix` parameter. If you specify a suffix with both mechanisms, the `TargetLibSuffix` setting overrides the setting of this field.
`intOnlyBuild` (optional)	Boolean flag. When set to `true`, indicates the function optimizes the libraries so that they compile from integer code only. Applies to ERT-based targets only.
`makeOpts` (optional)	String that specifies an option to include in the `rtwMake` command line.
`addLibs` (optional)	Cell array of structures that specify the libraries to build that an `rtwmakecfg` function does not specify. Define each structure with two fields that are character arrays: • `libName` — name of the library without a suffix • `libLoc` — location for the precompiled library The TMF can specify other libraries and how to build them. Use this field if you must precompile libraries.

Examples

Build the libraries in *`my_model`* without building *`my_model`*:

```
% Specify the library suffix
if isunix
   suffix = '.a';
```

```
else
   suffix = '_vc.lib';
end
set_param(my_model, 'TargetLibSuffix', suffix);

% Set the prcompiled library folder
set_param(my_model, 'TargetPreCompLibLocation', fullfile(pwd,'lib'));

% Define a build specification that specifies the location of the files to compile.
build_spec = [];
build_spec.rtwmakecfgDirs = {fullfile(pwd, 'src')};

% Build the libraries in 'my_model'
rtw_precompile_libs(my_model, build_spec);
```

How To

- “Precompiling S-Function Libraries”
- “Recompiling Precompiled Libraries”

rtwbuild

Purpose

Initiate build process

Syntax

```
rtwbuild (model)
rtwbuild (model, 'OkayToPushNags', true)
blockHandle = rtwbuild('subsystem')
blockHandle = rtwbuild('subsystem', 'Mode',
   'ExportFunctionCalls')
```

Description

`rtwbuild (`*`model`*`)` initiates the build process for the specified model using the current model configuration settings. The argument is a handle to the model or a string specifying the model name. `rtwbuild` creates an executable if you clear the **Generate code only** check box in the **Real-Time Workshop** pane of the Configuration Parameters dialog box.

`rtwbuild (`*`model`*`, 'OkayToPushNags', true)` initiates the build process. Specify the parameter `OkayToPushNags` with the value `true` if you want `rtwbuild` to display any build errors that occur in the Simulation Diagnostics Viewer, as well as in the MATLAB command window. If the parameter is omitted or set to `false`, build errors are displayed only in the MATLAB command window.

`blockHandle`` = rtwbuild(`*`'subsystem'`*`)` initiates the build process for the specified subsystem using the current model configuration settings. The argument is a string specifying the subsystem name or the full block path for that subsystem (for example, `'rtwdemo_export_functions/rtwdemo_subsystem'`). If you are licensed for Real-Time Workshop Embedded Coder software and select the **Create SIL block** check box in the **Real-Time Workshop > SIL and PIL Verification** pane of the Configuration Parameters dialog box, `rtwbuild` returns a nonempty block handle, *`blockHandle`*, to an automatically generated ERT S-function wrapper for the subsystem code.

`blockHandle`` = rtwbuild(`*`'subsystem'`*`, 'Mode', 'ExportFunctionCalls')` initiates the build process to export function calls from the specified subsystem. You must be

licensed for Real-Time Workshop Embedded Coder software to export function-call subsystems.

If the model or subsystem is not loaded into the MATLAB environment, `rtwbuild` loads it before initiating the build process.

Examples

Build the `rtwdemo_f14` demo model:

```
rtwbuild('rtwdemo_f14')
```

Build the `rtwdemo_subsystem` function-call subsystem inside the `rtwdemo_export_functions` demo model:

```
rtwdemo_export_functions
rtwbuild('rtwdemo_export_functions/rtwdemo_subsystem','Mode','ExportFunctionCalls')
```

Alternatives

You can initiate code generation and the build process by using the following options:

- Clear the **Generate code only** option on the **Real-Time Workshop** pane of the Configuration Parameters dialog box and click **Build**.
- Press **Ctrl+B**.
- Select **Tools > Real-Time Workshop > Build Model**.
- Invoke the `slbuild` command from the MATLAB command line. (For more information on `slbuild`, see Initiating the Build Process.)

How To

- Initiating the Build Process
- "Building Executables"
- Automatic S-Function Wrapper Generation
- Exporting Function-Call Subsystems

RTW.getBuildDir

Purpose

Build directory information for specified model

Syntax

`struct=RTW.getBuildDir(modelName)`

Arguments

`modelName`

String specifying the name of a Simulink model, which can be open or closed.

Returns

Structure containing the following build directory information about the specified model:

Field	Description
`BuildDirectory`	String specifying the fully qualified path to the build directory for the model.
`RelativeBuildDir`	String specifying the build directory relative to the current working directory (`pwd`).
`BuildDirSuffix`	String specifying the suffix appended to the model name to create the build directory.
`ModelRefRelativeBuildDir`	String specifying the model reference target build directory relative to current working directory (`pwd`).
`ModelRefRelativeSimDir`	String specifying the model reference target simulation directory relative to current working directory (`pwd`).
`ModelRefDirSuffix`	String specifying the suffix appended to the system target file name to create the model reference build directory.

Description

The `RTW.getBuildDir` function returns build directory information for a specified model, which can be open or closed. If the model is closed, the function opens and then closes the model, leaving it in its original state.

This function can be used in automated scripts to programmatically determine the build directory in which a model's generated code would be placed if the model were built in its current state.

Note The RTW.getBuildDir function may take significantly longer to execute if the specified model is large and closed.

Example

Return build directory information for the model mymmodel.

```
>> info=RTW.getBuildDir('mymodel');
>> info

info =

              BuildDirectory: 'c:\work\mymodel_ert_rtw'
            RelativeBuildDir: 'mymodel_ert_rtw'
              BuildDirSuffix: '_ert_rtw'
    ModelRefRelativeBuildDir: 'slprj\ert\mymodel'
      ModelRefRelativeSimDir: 'slprj\sim\mymodel'
           ModelRefDirSuffix: ''
```

rtwrebuild

Purpose

Rebuild generated code

Syntax

```
rtwrebuild()
rtwrebuild('model')
rtwrebuild('path')
```

Description

`rtwrebuild()` recompiles files you modified by invoking the makefile generated during the previous build. If there are no inputs, your current working directory is the build directory of the model.

Use `rtwrebuild('`*`model`*`')` if your current working directory is one level above the build directory of the model(`pwd` when you initiated the Real-Time Workshop build).

Use `rtwrebuild('`*`path`*`')` to specify the path to the build directory of the model.

If your model includes submodels, the Real-Time Workshop software builds the submodels recursively before rebuilding the top model.

Input Arguments

model	String specifying the model name.
path	String specifying the fully qualified path to the build directory for the model.

Examples

Rebuild the `rtwdemo_f14` model:

```
rtwrebuild('rtwdemo_f14')
```

Rebuild the model in a specified path:

```
rtwrebuild(fullfile(matlabroot,'rtwdemo_f14'))
```

See Also

"Rebuilding a Model" — Describes rebuilding the generated code from the Model Explorer.

Purpose

Generate report documenting generated code for model

Syntax

```
rtwreport(model)
rtwreport(model, directory)
```

Description

`rtwreport(model)` generates a report that shows the generated code for a model. *`model`* is a string enclosed in quotes specifying the model name. If necessary, the function loads the model and generates code before generating the report. The report includes:

- Snapshots of block diagrams of the model and its subsystems
- Block execution order list
- Code generation summary that includes a list of generated code files, configuration settings, a subsystem map, and a traceability report.
- Full listings of generated code that resides in the build directory

By default, the Real-Time Workshop software names the generated report `codegen.html` and places the file in your current directory.

`rtwreport(model, directory)` includes a user-specified directory. *`directory`* is a string enclosed in quotes specifying the name of a directory. The Real-Time Workshop software places the generated report in the parent directory of the directory you specify. The Real-Time Workshop project directory (`slprj`) must be in the parent directory. If the user-specified directory cannot be found, an error results and the Real-Time Workshop software does not generate code.

Examples

Generate a report for model `rtwdemo_codegenrpt`:

```
rtwreport('rtwdemo_codegenrpt');
```

Alternatives

In the model window, select **Tools > Report Generator**. See *Simulink® Report Generator™ User's Guide* for more information.

Tutorials

- "Documenting a Code Generation Project"

How To

- “What Is the Report Explorer?”
- Code Generation Summary
- Import Generated Code

Purpose

Trace block to generated code

Syntax

```
rtwtrace(blockpath)
```

Description

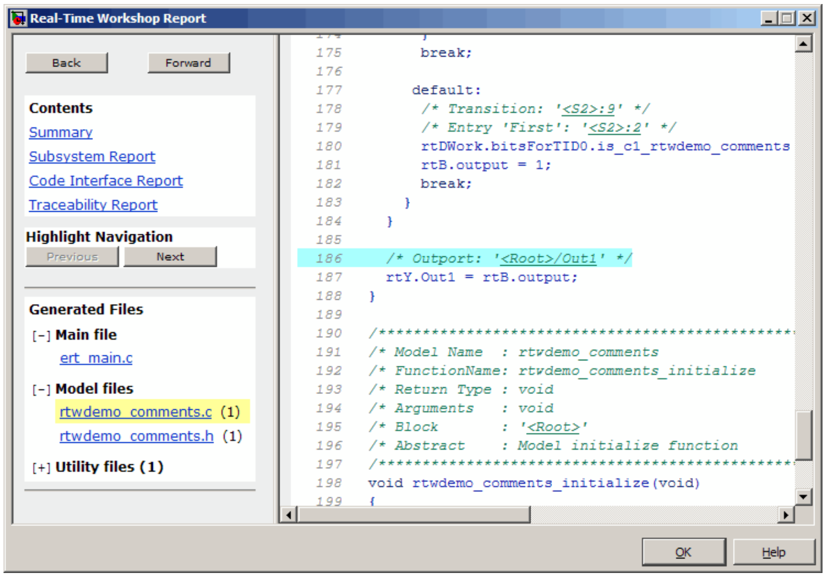
`rtwtrace(`*`blockpath`*`)` opens an HTML code generation report, that displays contents of the source code file, and highlights the line of code corresponding to the specified block. *`blockpath`* is a string enclosed in quotes specifying the full Simulink block path, for example, *`'model_name/block_name'`*. Before calling `rtwtrace`, you must select an ERT-based model and enable model to code navigation. For example, on the Configuration parameter dialog box, select the **Real-Time Workshop > Report** pane, and select the **Model-to-code** parameter. Generate code for your model using the Real-Time Workshop Embedded Coder software. The build directory must be under the current working directory, otherwise `rtwtrace` might produce an error.

Examples

After enabling model to code navigation and generating code for the demo model `rtwdemo_comments`, use the following command to trace to the source code for block `Out1` in the model:

```
rtwtrace('rtwdemo_comments/Out1')
```

The HTML code generation report opens and highlights the first instance of code generated for block `Out1`.


Real-Time Workshop Report

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Generated Files

[-] **Main file**
ert_main.c

[-] **Model files**
rtwdemo_comments.c (1)
rtwdemo_comments.h (1)

[+] **Utility files (1)**

```
          }
          break;

        default:
          /* Transition: '<S2>:9' */
          /* Entry 'First': '<S2>:2' */
          rtDWork.bitsForTID0.is_c1_rtwdemo_comments
          rtB.output = 1;
          break;
        }
      }

      /* Outport: '<Root>/Out1' */
      rtY.Out1 = rtB.output;
    }

    /*****************************************************
    /* Model Name   : rtwdemo_comments
    /* FunctionName: rtwdemo_comments_initialize
    /* Return Type : void
    /* Arguments    : void
    /* Block        : '<Root>'
    /* Abstract     : Model initialize function
    /*****************************************************
    void rtwdemo_comments_initialize(void)
    {
```

OK Help

Alternatives

To trace from a block in the model diagram, right-click a block and select **Real-Time Workshop > Navigate to code**.

How To

- "Tracing Model Objects to Generated Code"
- "Model-to-code" on page 6-47

Purpose

Specify target for configuration set

Syntax

`switchTarget('config_set', 'sys_tgt_file', target_options)`

Description

`switchTarget('config_set', 'sys_tgt_file', target_options)` specifies a system target file for the configuration set that you specify.

Input Arguments

`config_set`

Handle to the active configuration set for the model.

`sys_tgt_file`

String that specifies a system target file.

`target_options`

Structure of field and value pairs to optionally specify the template makefile, TLC options, make command, and description associated with the target. If you do not want to use any options, you must specify an empty structure (`[]`).

Field	**Value**
`TemplateMakefile`	String specifying file name of template makefile.
`TLCOptions`	String specifying TLC argument.
`MakeCommand`	String specifying make command MATLAB language file.
`Description`	String specifying a description of the target.

Examples

Select an `ert.tlc` system target file for the active configuration set:

```
% Get the active configuration set for 'model'
cs = getActiveConfigSet(model);
% Define a system target file
```

```
stf = 'ert.tlc';
% Change the system target file for the configuration set.
switchTarget(cs,stf,[]);
```

Specify an `ert.tlc` system target file and target options for the active configuration set:

```
% Get the active configuration set for 'model'
cs = getActiveConfigSet(model);
% Define a system target file
stf = 'ert.tlc';
% Specify target options
tgtOpt.TemplateMakefile = 'grt_default_tmf';
tgtOpt.TLCOptions = '-aVarName=1';
tgtOpt.MakeCommand = 'make_rtw';
tgtOpt.Description = 'my target';
% Change the system target file and target options
% for the configuration set.
switchTarget(cs,stf,tgtOpt);
```

Alternatives

To select system target files using the Configuration Parameters dialog box:

1. In your model, open the Configuration Parameters dialog box.
2. Navigate to the **Real-Time Workshop > General** pane.
3. Specify the **System target file**.
4. Optionally specify , **Make command**, and **TLC options**.
5. Click **Apply**.

How To

- "Selecting a System Target File Programmatically"
- "Selecting a Target "
- "Setting Target Language Compiler Options"

Purpose

Invoke Target Language Compiler to convert model description file to generated code

Syntax

`tlc [-options] [file]`

Description

`tlc` invokes the Target Language Compiler (TLC) from the command prompt. The TLC converts the model description file, `model.rtw` (or similar files), into target-specific code or text. Typically, you do not call this command because the Real-Time Workshop build process automatically invokes the Target Language Compiler when generating code. For more information, see *Real-Time Workshop Target Language Compiler*.

Note This command is used only when invoking the TLC separately from the Real-Time Workshop build process. You cannot use this command to initiate code generation for a model.

`tlc [-options] [file]`

You can change the default behavior by specifying one or more compilation *options* as described in "Options" on page 3-97

Options

You can specify one or more compilation options with each `tlc` command. Use spaces to separate options and arguments. TLC resolves options from left to right. If you use conflicting options, the rightmost option prevails. The `tlc` options are:

- "-r Specify Real-Time Workshop filename" on page 3-98
- "-v Specify verbose level" on page 3-98
- "-l Specify path to local include files" on page 3-98
- "-m Specify maximum number of errors" on page 3-98
- "-O Specify the output file path" on page 3-98

- "-d[a|c|n|o] Invoke debug mode" on page 3-99
- "-a Specify parameters" on page 3-99
- "-p Print progress" on page 3-99
- "-lint Performance checks and runtime statistics" on page 3-99
- "-xO Parse only" on page 3-99

-r Specify Real-Time Workshop filename

`-r` *file_name*

Specify the filename that you want to translate.

-v Specify verbose level

`-v` *number*

Specify a `number` indicating the verbose level. If you omit this option, the default value is one.

-l Specify path to local include files

`-l` *path*

Specify a directory `path` to local include files. The TLC searches this path in the order specified.

-m Specify maximum number of errors

`-m` *number*

Specify the maximum `number` of errors reported by the TLC prior to terminating the translation of the .tlc file.

If you omit this option, the default value is five.

-O Specify the output file path

`-O` *path*

Specify the directory `path` to place output files.

If you omit this option, TLC places output files in the current directory.

-d[a|c|n|o] Invoke debug mode

`-da` execute any %assert directives

`-dc` invoke the TLC command line debugger

`-dn` produce log files, which indicate those lines hit and those lines missed during compilation.

`-do` disable debugging behavior

-a Specify parameters

`-a` *identifier* = *expression*

Specify parameters to change the behavior of your TLC program. For example, this option is used by the Real-Time Workshop software to set inlining of parameters or file size limits.

-p Print progress

`-p` *number*

Print a '.' indicating progress for every `number` of TLC primitive operations executed.

-lint Performance checks and runtime statistics

`-lint`

Perform simple performance checks and collect runtime statistics.

-xO Parse only

`-xO`

Parse only a TLC file; do not execute it.

updateFilePathsAndExtensions

Purpose

Update files in model's build information with missing paths and file extensions

Syntax

`updateFilePathsAndExtensions(buildinfo, extensions)`

`extensions` is optional.

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`extensions` (optional)
: A cell array of character arrays that specifies the extensions (file types) of files for which to search and include in the update processing. By default, the function searches for files with a `.c` extension. The function checks files and updates paths and extensions based on the order in which you list the extensions in the cell array. For example, if you specify `{'.c' '.cpp'}` and a directory contains `myfile.c` and `myfile.cpp`, an instance of `myfile` would be updated to `myfile.c`.

Description

Using paths that already exist in a model's build information, the `updateFilePathsAndExtensions` function checks whether any file references in the build information need to be updated with a path or file extension. This function can be particularly useful for

- Maintaining build information for a toolchain that requires the use of file extensions
- Updating multiple customized instances of build information for a given model

Examples

Create the directory path `etcproj/etc` in your working directory, add files `etc.c`, `test1.c`, and `test2.c` to the directory `etc`. This example assumes the working directory is `w:\work\BuildInfo`. From the working directory, update build information `myModelBuildInfo` with any missing paths or file extensions.

```
myModelBuildInfo = RTW.BuildInfo;
addSourcePaths(myModelBuildInfo, fullfile(pwd,...
 'etcproj', '/etc'), 'test');
addSourceFiles(myModelBuildInfo, {'etc' 'test1'...
 'test2'}, '', 'test');
before=getSourceFiles(myModelBuildInfo, true, true);
before

before =

    '\etc'    '\test1'    '\test2'

updateFilePathsAndExtensions(myModelBuildInfo);
after=getSourceFiles(myModelBuildInfo, true, true);
after{:}

ans =

w:\work\BuildInfo\etcproj\etc\etc.c


ans =

w:\work\BuildInfo\etcproj\etc\test1.c


ans =

w:\work\BuildInfo\etcproj\etc\test2.c
```

See Also

`addIncludeFiles`, `addIncludePaths`, `addSourceFiles`, `addSourcePaths`, `updateFileSeparator`
"Customizing Post Code Generation Build Processing"

Purpose

Change file separator used in model's build information

Syntax

`updateFileSeparator(*buildinfo*, *separator*)`

Arguments

`buildinfo`
: Build information returned by `RTW.BuildInfo`.

`separator`
: A character array that specifies the file separator \ (Windows®) or / (UNIX®) to be applied to all file path specifications.

Description

The `updateFileSeparator` function changes all instances of the current file separator (/ or \) in a model's build information to the specified file separator.

The default value for the file separator matches the value returned by the MATLAB command `filesep`. For makefile based builds, you can override the default by defining a separator with the `MAKEFILE_FILESEP` macro in the template makefile (see "Cross-Compiling Code Generated on a Microsoft® Windows System". If the `GenerateMakefile` parameter is set, the Real-Time Workshop software overrides the default separator and updates the model's build information after evaluating the `PostCodeGenCommand` configuration parameter.

Examples

Update object `myModelBuildInfo` to apply the Windows file separator.

```
myModelBuildInfo = RTW.BuildInfo;
updateFileSeparator(myModelBuildInfo, '\');
```

See Also

`addIncludeFiles`, `addIncludePaths`, `addSourceFiles`, `addSourcePaths`, `updateFilePathsAndExtensions`
"Customizing Post Code Generation Build Processing"
"Cross-Compiling Code Generated on a Microsoft Windows System"

Block Reference

Custom Code

Model Header	Specify custom header code
Model Source	Specify custom source code
System Derivatives	Specify custom system derivative code
System Disable	Specify custom system disable code
System Enable	Specify custom system enable code
System Initialize	Specify custom system initialization code
System Outputs	Specify custom system outputs code
System Start	Specify custom system startup code
System Terminate	Specify custom system termination code
System Update	Specify custom system update code

Interrupt Templates

Async Interrupt	Generate Versa Module Eurocard (VME) interrupt service routines (ISRs) that are to execute downstream subsystems or Task Sync blocks
Task Sync	Spawn VxWorks task to run code of downstream function-call subsystem or Stateflow® chart

S-Function Target

RTW S-Function	Represent model or subsystem as generated S-function code

VxWorks

Async Interrupt	Generate Versa Module Eurocard (VME) interrupt service routines (ISRs) that are to execute downstream subsystems or Task Sync blocks
Protected RT	Handle transfer of data between blocks operating at different rates and ensure data integrity
Task Sync	Spawn VxWorks task to run code of downstream function-call subsystem or Stateflow chart
Unprotected RT	Handle transfer of data between blocks operating at different rates and ensure determinism

5

Blocks — Alphabetical List

Async Interrupt

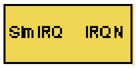
Purpose

Generate Versa Module Eurocard (VME) interrupt service routines (ISRs) that are to execute downstream subsystems or Task Sync blocks

Library

Interrupt Templates, VxWorks

Description



For each specified VxWorks VME interrupt level, the Async Interrupt block generates an interrupt service routine (ISR) that calls one of the following:

- A function call subsystem
- A Task Sync block
- A Stateflow chart configured for a function call input event

You can use the block for simulation and code generation.

Parameters

VME interrupt number(s)

An array of VME interrupt numbers for the interrupts to be installed. The valid range is `1..7`.

The width of the Async Interrupt block output signal corresponds to the number of VME interrupt numbers specified.

Note A model can contain more than one Async Interrupt block. However, if you use more than one Async Interrupt block, do not duplicate the VME interrupt numbers specified in each block.

VME interrupt vector offset(s)

An array of unique interrupt vector offset numbers corresponding to the VME interrupt numbers entered in the **VME interrupt number(s)** field. The Stateflow software passes the offsets to the VxWorks call `intConnect(INUM_TO_IVEC(offset),...)`.

Simulink task priority(s)

The Simulink priority of downstream blocks. Each output of the Async Interrupt block drives a downstream block (for example, a function-call subsystem). Specify an array of priorities corresponding to the VME interrupt numbers you specify for **VME interrupt number(s)**.

The **Simulink task priority** values are required to generate the proper rate transition code (see "Rate Transitions and Asynchronous Blocks" in the Real-Time Workshop documentation). Simulink task priority values are also required to ensure absolute time integrity when the asynchronous task needs to obtain real time from its base rate or its caller. The assigned priorities typically are higher than the priorities assigned to periodic tasks.

Note The Simulink software does not simulate asynchronous task behavior. The task priority of an asynchronous task is for code generation purposes only and is not honored during simulation.

Preemption flag(s); preemptable-1; non-preemptable-0

The value 1 or 0. Set this option to 1 if an output signal of the Async Interrupt block drives a Task Sync block.

Higher priority interrupts can preempt lower priority interrupts in VxWorks. To lock out interrupts during the execution of an ISR, set the preemption flag to `0`. This causes generation of `intLock()` and `intUnlock()` calls at the beginning and end of the ISR code. Use interrupt locking carefully, as it increases the system's interrupt response time for all interrupts at the `intLockLevelSet()` level and below. Specify an array of flags corresponding to the VME interrupt numbers entered in the **VME interrupt number(s)** field.

Note The number of elements in the arrays specifying **VME interrupt vector offset(s)** and **Simulink task priority** must match the number of elements in the **VME interrupt number(s)** array.

Manage own timer
: If checked, the ISR generated by the Async Interrupt block manages its own timer by reading absolute time from the hardware timer. Specify the size of the hardware timer with the **Timer size** option.

Timer resolution (seconds)
: The resolution of the ISRs timer. ISRs generated by the Async Interrupt block maintain their own absolute time counters. By default, these timers obtain their values from the VxWorks kernel by using the `tickGet` call. The **Timer resolution** field determines the resolution of these counters. The default resolution is `1/60` second. The `tickGet` resolution for your board support package (BSP) might be different. You should determine the `tickGet` resolution for your BSP and enter it in the **Timer resolution** field.

  If you are targeting VxWorks, you can obtain better timer resolution by replacing the `tickGet` call and accessing a hardware timer by using your BSP instead. If you are targeting an RTOS other than VxWorks, you should replace the `tickGet` call with an equivalent call to the target RTOS, or generate code to read the appropriate timer register on the target hardware. See “Using Timers in Asynchronous Tasks” and “Async Interrupt Block Implementation” in the Real-Time Workshop documentation for more information.

Timer size
: The number of bits to be used to store the clock tick for a hardware timer. The ISR generated by the Async Interrupt block uses the timer size when you select **Manage own timer**. The size can

be `32bits` (the default), `16bits`, `8bits`, or `auto`. If you select `auto`, the Real-Time Workshop software determines the timer size based on the settings of **Application lifespan (days)** and **Timer resolution**.

By default, timer values are stored as 32-bit integers. However, when **Timer size** is `auto`, you can indirectly control the word size of the counters by setting the **Application lifespan (days)** option. If you set **Application lifespan (days)** to a value that is too large for the code generator to handle as a 32-bit integer of the specified resolution, the code generator uses a second 32-bit integer to address overflows.

For more information, see “Controlling Memory Allocation for Time Counters”. See also “Using Timers in Asynchronous Tasks”.

Enable simulation input

If checked, the Simulink software adds an input port to the Async Interrupt block. This port is for use in simulation only. Connect one or more simulated interrupt sources to the simulation input.

Note Before generating code, consider removing blocks that drive the simulation input to ensure that those blocks do not contribute to the generated code. Alternatively, you can use the Environment Controller block, as explained in “Dual-Model Approach: Code Generation”. However, if you use the Environment Controller block, be aware that the sample times of driving blocks contribute to the sample times supported in the generated code.

Inputs and Outputs

Input

A simulated interrupt source.

Output

Control signal for a

- Function-call subsystem
- Task Sync block
- Stateflow chart configured for a function call input event

Assumptions and Limitations

- The block supports VME interrupts 1 through 7.
- The block requires a VxWorks Board Support Package (BSP) that supports the following VxWorks system calls:

```
sysIntEnable
sysIntDisable
intConnect
intLock
intUnlock
tickGet
```

Performance Considerations

Execution of large subsystems at interrupt level can have a significant impact on interrupt response time for interrupts of equal and lower priority in the system. As a general rule, it is best to keep ISRs as short as possible. Connect only function-call subsystems that contain a small number of blocks to an Async Interrupt block.

A better solution for large subsystems is to use the Task Sync block to synchronize the execution of the function-call subsystem to a VxWorks task. Place the Task Sync block between the Async Interrupt block and the function-call subsystem. The Async Interrupt block then uses the Task Sync block as the ISR. The ISR releases a synchronization semaphore (performs a `semGive`) to the task, and returns immediately from interrupt level. VxWorks then schedules and runs the task. See the description of the Task Sync block for more information.

See Also

Task Sync
"Handling Asynchronous Events" in the Real-Time Workshop documentation

Model Header

Purpose

Specify custom header code

Library

Custom Code

Description

The Model Header block adds user-specified custom code to the *`model`*`.h` file that the code generator creates for the model that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

Top of Model Header
Code to be added at the top of the model's generated header file.

Bottom of Model Header
Code to be added at the top of the model's generated header file.

Example

See "Example: Using a Custom Code Block".

See Also

Model Source, System Derivatives, System Disable, System Enable, System Initialize, System Outputs, System Start, System Terminate, System Update
"Integrating External Code Using Custom Code Blocks" in the Real-Time Workshop documentation

Model Source

Purpose

Specify custom source code

Library

Custom Code

Description

The Model Source block adds user-specified custom code to the *`model`*`.c` or *`model`*`.cpp` file that the code generator creates for the model that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

Top of Model Source
: Code to be added at the top of the model's generated source file.

Bottom of Model Source
: Code to be added at the top of the model's generated source file.

Example

See "Example: Using a Custom Code Block".

See Also

Model Header, System Derivatives, System Disable, System Enable, System Initialize, System Outputs, System Start, System Terminate, System Update
"Integrating External Code Using Custom Code Blocks" in the Real-Time Workshop documentation

Protected RT

Purpose

Handle transfer of data between blocks operating at different rates and ensure data integrity

Library

VxWorks

Description

The Protected RT block is a Rate Transition block that is preconfigured to ensure data integrity during data transfers. For more information, see Rate Transition in the Simulink Reference.

Purpose

Represent model or subsystem as generated S-function code

Library

S-Function Target

Description

An instance of the RTW S-Function block represents code the Real-Time Workshop software generates from its S-function target for a model or subsystem. For example, you extract a subsystem from a model and build an RTW S-Function block from it, using the S-function target. This mechanism can be useful for

- Converting models and subsystems to application components
- Reusing models and subsystems
- Optimizing simulation — often, an S-function simulates more efficiently than the original model

For details on how to create an RTW S-Function block from a subsystem, see "Creating an S-Function Block from a Subsystem" in the Real-Time Workshop documentation.

Requirements

- The S-Function block must perform identically to the model or subsystem from which it was generated.
- Before creating the block, you must explicitly specify all Inport block signal attributes, such as signal widths or sample times. The sole exception to this rule concerns sample times, as described in "Sample Time Propagation in Generated S-Functions" in the Real-Time Workshop documentation.
- You must set the solver parameters of the RTW S-function block to be the same as those of the original model or subsystem. This ensures that the generated S-function code will operate identically to the original subsystem (see Choice of Solver Type in the Real-Time Workshop documentation for an exception to this rule).

Parameters

Generated S-function name (model_sf)

The name of the generated S-function. The Real-Time Workshop software derives the name by appending `_sf` to the name of the model or subsystem from which the block is generated.

Show module list

If checked, displays modules generated for the S-function.

See Also

“Creating an S-Function Block from a Subsystem” in the Real-Time Workshop documentation

System Derivatives

Purpose

Specify custom system derivative code

Library

Custom Code

Description

The System Derivatives block adds user-specified custom code to the declaration, execution, and exit code sections of the `SystemDerivatives` function that the code generator creates for the model or subsystem that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

System Derivatives Function Declaration Code
Code to be added to the declaration section of the generated `SystemDerivatives` function.

System Derivatives Function Execution Code
Code to be added to the execution section of the generated `SystemDerivatives` function.

System Derivatives Function Exit Code
Code to be added to the exit section of the generated `SystemDerivatives` function.

Example

See “Example: Using a Custom Code Block”.

See Also

Model Header, Model Source, System Disable, System Enable, System Initialize, System Outputs, System Start, System Terminate, System Update
“Integrating External Code Using Custom Code Blocks” in the Real-Time Workshop documentation

System Disable

Purpose

Specify custom system disable code

Library

Custom Code

Description

The System Disable block adds user-specified custom code to the declaration, execution, and exit code sections of the `SystemDisable` function that the code generator creates for the model or subsystem that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

System Disable Function Declaration Code
Code to be added to the declaration section of the generated `SystemDisable` function.

System Disable Function Execution Code
Code to be added to the execution section of the generated `SystemDisable` function.

System Disable Function Exit Code
Code to be added to the exit section of the generated `SystemDisable` function.

Example

See "Example: Using a Custom Code Block".

See Also

Model Header, Model Source, System Derivatives, System Enable, System Initialize, System Outputs, System Start, System Terminate, System Update
"Integrating External Code Using Custom Code Blocks" in the Real-Time Workshop documentation

Purpose

Specify custom system enable code

Library

Custom Code

Description

The System Enable block adds user-specified custom code to the declaration, execution, and exit code sections of the `SystemEnable` function that the code generator creates for the model or subsystem that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

System Enable Function Declaration Code
Code to be added to the declaration section of the generated `SystemEnable` function.

System Enable Function Execution Code
Code to be added to the execution section of the generated `SystemEnable` function.

System Enable Function Exit Code
Code to be added to the exit section of the generated `SystemEnable` function.

Example

See “Example: Using a Custom Code Block”.

See Also

Model Header, Model Source, System Derivatives, System Disable, System Initialize, System Outputs, System Start, System Terminate, System Update
“Integrating External Code Using Custom Code Blocks” in the Real-Time Workshop documentation

System Initialize

Purpose

Specify custom system initialization code

Library

Custom Code

Description

The System Initialize block adds user-specified custom code to the declaration, execution, and exit code sections of the `SystemInitialize` function that the code generator creates for the model or subsystem that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

System Initialize Function Declaration Code
Code to be added to the declaration section of the generated `SystemInitialize` function.

System Initialize Function Execution Code
Code to be added to the execution section of the generated `SystemInitialize` function.

System Initialize Function Exit Code
Code to be added to the exit section of the generated `SystemInitialize` function.

Example

See "Example: Using a Custom Code Block".

See Also

Model Header, Model Source, System Derivatives, System Disable, System Enable, System Outputs, System Start, System Terminate, System Update
"Integrating External Code Using Custom Code Blocks" in the Real-Time Workshop documentation

Purpose

Specify custom system outputs code

Library

Custom Code

Description

The System Outputs block adds user-specified custom code to the declaration, execution, and exit code sections of the `SystemOutputs` function that the code generator creates for the model or subsystem that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

System Outputs Function Declaration Code
: Code to be added to the declaration section of the generated `SystemOutputs` function.

System Outputs Function Execution Code
: Code to be added to the execution section of the generated `SystemOutputs` function.

System Outputs Function Exit Code
: Code to be added to the exit section of the generated `SystemOutputs` function.

Example

See “Example: Using a Custom Code Block”.

See Also

Model Header, Model Source, System Derivatives, System Disable, System Enable, System Initialize, System Start, System Terminate, System Update
“Integrating External Code Using Custom Code Blocks” in the Real-Time Workshop documentation

Purpose

Specify custom system startup code

Library

Custom Code

Description

The System Start block adds user-specified custom code to the declaration, execution, and exit code sections of the `SystemStart` function that the code generator creates for the model or subsystem that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

System Start Function Declaration Code
Code to be added to the declaration section of the generated `SystemStart` function.

System Start Function Execution Code
Code to be added to the execution section of the generated `SystemStart` function.

System Start Function Exit Code
Code to be added to the exit section of the generated `SystemStart` function.

Example

See “Example: Using a Custom Code Block”.

See Also

Model Header, Model Source, System Derivatives, System Disable, System Enable, System Initialize, System Outputs, System Terminate, System Update
“Integrating External Code Using Custom Code Blocks” in the Real-Time Workshop documentation

Purpose

Specify custom system termination code

Library

Custom Code

Description

The System Terminate block adds user-specified custom code to the declaration, execution, and exit code sections of the `SystemTerminate` function that the code generator creates for the model or subsystem that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

System Terminate Function Declaration Code
Code to be added to the declaration section of the generated `SystemTerminate` function.

System Terminate Function Execution Code
Code to be added to the execution section of the generated `SystemTerminate` function.

System Terminate Function Exit Code
Code to be added to the exit section of the generated `SystemTerminate` function.

Example

See “Example: Using a Custom Code Block”.

See Also

Model Header, Model Source, System Derivatives, System Disable, System Enable, System Initialize, System Outputs, System Start, System Update
“Integrating External Code Using Custom Code Blocks” in the Real-Time Workshop documentation

System Update

Purpose Specify custom system update code

Library Custom Code

Description The System Update block adds user-specified custom code to the declaration, execution, and exit code sections of the `SystemUpdate` function that the code generator creates for the model or subsystem that contains the block.

Note If you include this block in a submodel (model referenced by a Model block), the Real-Time Workshop build process ignores the block for simulation target builds, but includes any specified custom code in the build process for other targets.

Parameters

System Update Function Declaration Code
: Code to be added to the declaration section of the generated `SystemUpdate` function.

System Update Function Execution Code
: Code to be added to the execution section of the generated `SystemUpdate` function.

System Update Function Exit Code
: Code to be added to the exit section of the generated `SystemUpdate` function.

Example See “Example: Using a Custom Code Block”.

See Also Model Header, Model Source, System Derivatives, System Disable, System Enable, System Initialize, System Outputs, System Start, System Terminate
“Integrating External Code Using Custom Code Blocks” in the Real-Time Workshop documentation

Purpose

Spawn VxWorks task to run code of downstream function-call subsystem or Stateflow chart

Library

Interrupt Templates, VxWorks

Description

The Task Sync block spawns a VxWorks task that calls a function-call subsystem or Stateflow chart. Typically, you place the Task Sync block between an Async Interrupt block and a function-call subsystem block or Stateflow chart. Alternatively, you might connect the Task Sync block to the output port of a Stateflow diagram that has an event, `Output to Simulink`, configured as a function call.

The Task Sync block performs the following functions:

- Uses the VxWorks system call `taskSpawn` to spawn an independent task. When the task is activated, it calls the downstream function-call subsystem code or Stateflow chart. The block calls `taskDelete` to delete the task during model termination.
- Creates a semaphore to synchronize the connected subsystem with execution of the block.
- Wraps the spawned task in an infinite `for` loop. In the loop, the spawned task listens for the semaphore, using `semTake`. The first call to `semTake` specifies NO_WAIT. This allows the task to determine whether a second `semGive` has occurred prior to the completion of the function-call subsystem or chart. This would indicate that the interrupt rate is too fast or the task priority is too low.
- Generates synchronization code (for example, `semGive()`). This code allows the spawned task to run. The task in turn calls the connected function-call subsystem code. The synchronization code can run at interrupt level. This is accomplished through the connection between the Async Interrupt and Task Sync blocks, which triggers execution of the Task Sync block within an ISR.
- Supplies absolute time if blocks in the downstream algorithmic code require it. The time is supplied either by the timer maintained by

the Async Interrupt block, or by an independent timer maintained by the task associated with the Task Sync block.

When you design your application, consider when timer and signal input values should be taken for the downstream function-call subsystem that is connected to the Task Sync block. By default, the time and input data are read when VxWorks activates the task. For this case, the data (input and time) are synchronized to the task itself. If you select the **Synchronize the data transfer of this task with the caller task** option and the Task Sync block is driven by an Async Interrupt block, the time and input data are read when the interrupt occurs (that is, within the ISR). For this case, data is synchronized with the caller of the Task Sync block.

Parameters

Task name (10 characters or less)
The first argument passed to the VxWorks `taskSpawn` system call. VxWorks uses this name as the task function name. This name also serves as a debugging aid; routines use the task name to identify the task from which they are called.

Simulink task priority (0–255)
The VxWorks task priority to be assigned to the function-call subsystem task when spawned. VxWorks priorities range from 0 to 255, with 0 representing the highest priority.

Note The Simulink software does not simulate asynchronous task behavior. The task priority of an asynchronous task is for code generation purposes only and is not honored during simulation.

Stack size (bytes)
Maximum size to which the task's stack can grow. The stack size is allocated when VxWorks spawns the task. Choose a stack size based on the number of local variables in the task. You should

determine the size by examining the generated code for the task (and all functions that are called from the generated code).

Synchronize the data transfer of this task with the caller task

If not checked (the default),

- The block maintains a timer that provides absolute time values required by the computations of downstream blocks. The timer is independent of the timer maintained by the Async Interrupt block that calls the Task Sync block.
- A **Timer resolution** option appears.
- The **Timer size** option specifies the word size of the time counter.

If checked,

- The block does not maintain an independent timer, and does not display the **Timer resolution** field.
- Downstream blocks that require timers use the timer maintained by the Async Interrupt block that calls the Task Sync block (see "Using Timers in Asynchronous Tasks" in the Real-Time Workshop documentation). The timer value is read at the time the asynchronous interrupt is serviced, and data transfers to blocks called by the Task Sync block and execute within the task associated with the Async Interrupt block. Therefore, data transfers are synchronized with the caller.

Timer resolution (seconds)

The resolution of the block's timer in seconds. This option appears only if **Synchronize the data transfer of this task with the caller task** is not checked. By default, the block gets the timer value by calling the VxWorks `tickGet` function. The default resolution is 1/60 second. The `tickGet` resolution for your BSP might be different. You should determine the `tickGet` resolution for your BSP and enter it in the **Timer resolution** field.

Timer size

The number of bits to be used to store the clock tick for a hardware timer. The size can be `32bits` (the default), `16bits`, `8bits`, or `auto`. If you select `auto`, the Real-Time Workshop software determines the timer size based on the settings of **Application lifespan (days)** and **Timer resolution**.

By default, timer values are stored as 32-bit integers. However, when **Timer size** is `auto`, you can indirectly control the word size of the counters by setting the **Application lifespan (days)** option. If you set **Application lifespan (days)** to a value that is too large for the code generator to handle as a 32-bit integer of the specified resolution, it uses a second 32-bit integer to address overflows.

For more information, see “Controlling Memory Allocation for Time Counters”. See also “Using Timers in Asynchronous Tasks”.

Inputs and Outputs

Input

A call from an Async Interrupt block.

Output

A call to a function-call subsystem.

See Also

Async Interrupt
“Handling Asynchronous Events” in the Real-Time Workshop documentation

Purpose Handle transfer of data between blocks operating at different rates and ensure determinism

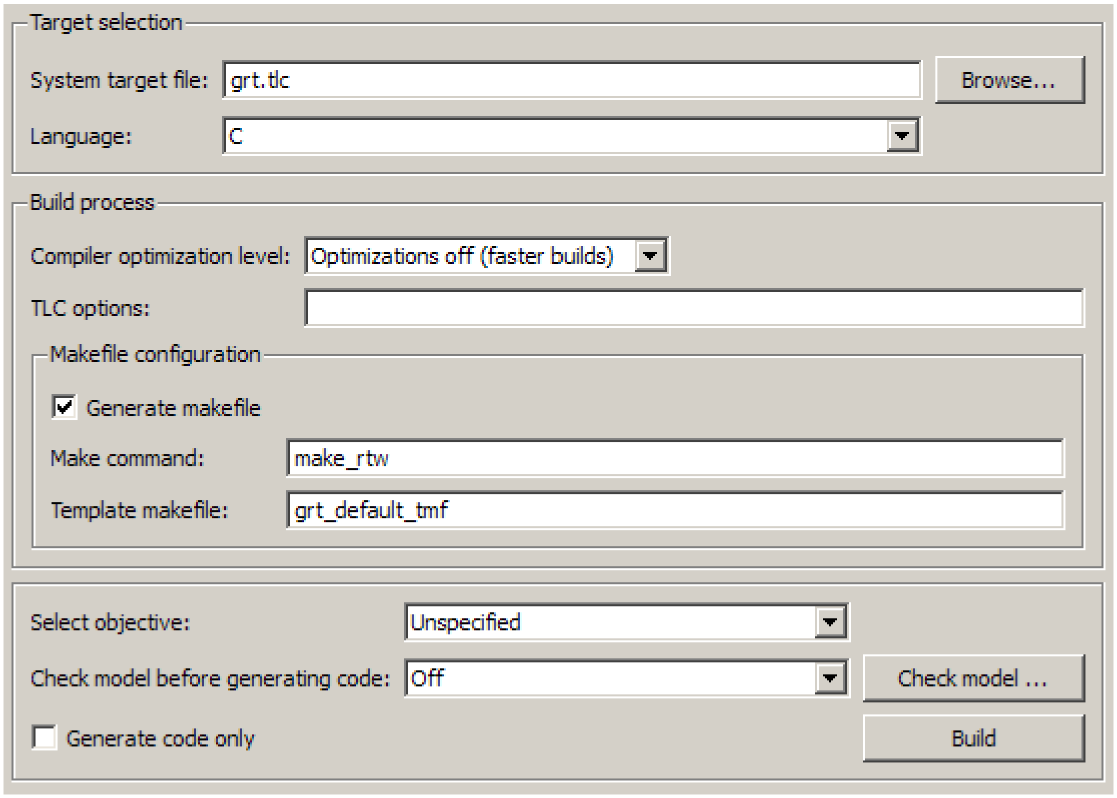
Library VxWorks

Description The Unprotected RT block is a Rate Transition block that is preconfigured to ensure deterministic data transfers. For more information, see Rate Transition in the SimulinkVxWorks Reference.

Configuration Parameters for Simulink Models

Real-Time Workshop Pane: General

When the Real-Time Workshop product is installed on your system and you select a GRT-based target, the Real-Time Workshop General pane includes the following parameters.



Target selection

System target file: grt.tlc

Language: C

Build process

Compiler optimization level: Optimizations off (faster builds)

TLC options:

Makefile configuration

[✓] Generate makefile

Make command: make_rtw

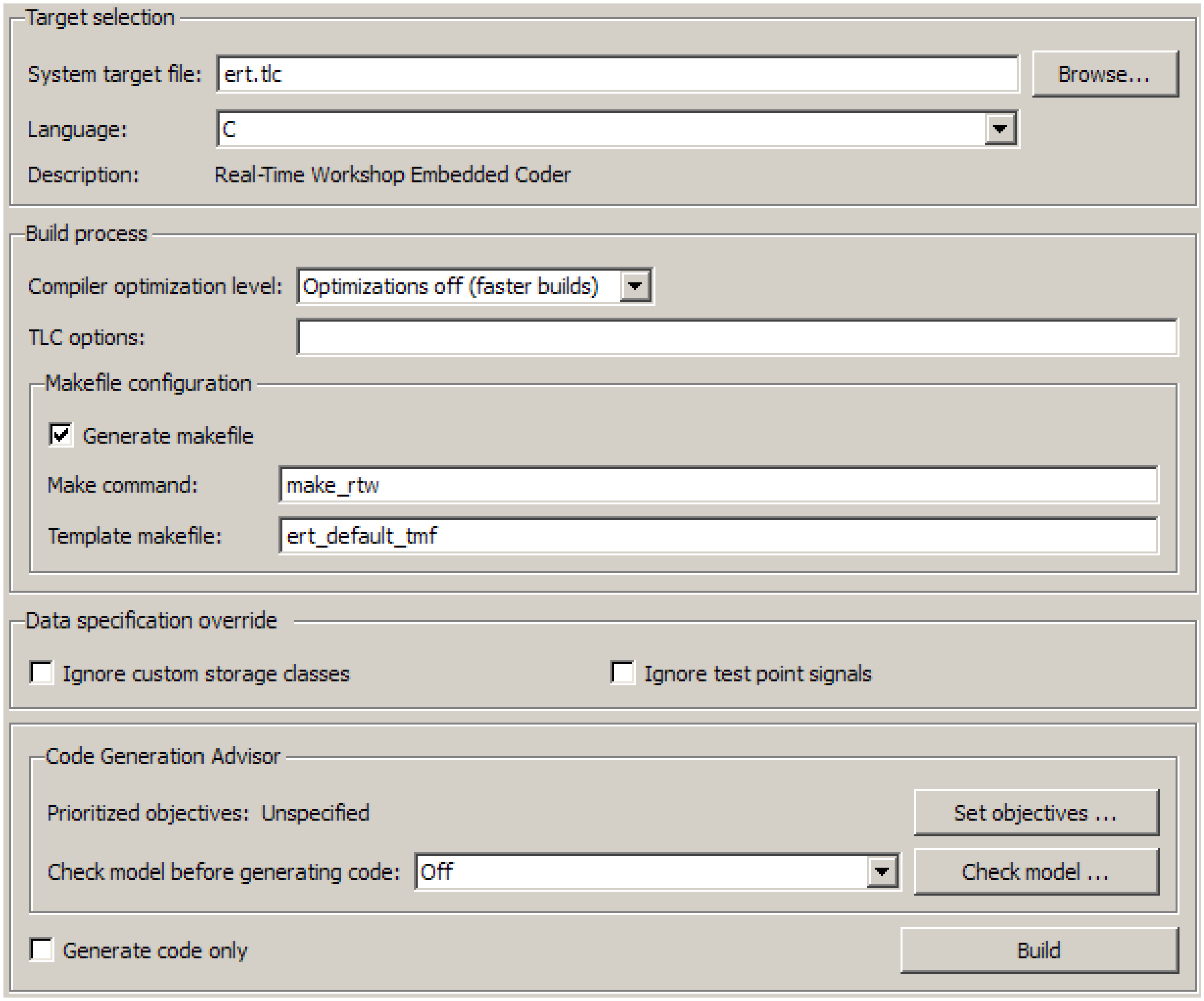
Template makefile: grt_default_tmf

Select objective: Unspecified

Check model before generating code: Off

[ ] Generate code only

When the Real-Time Workshop product is installed on your system and you select an ERT-based target, the Real-Time Workshop General pane includes the following parameters. ERT-based target parameters require a Real-Time Workshop Embedded Coder license when generating code.



Target selection

System target file: ert.tlc

Language: C

Description: Real-Time Workshop Embedded Coder

Build process

Compiler optimization level: Optimizations off (faster builds)

TLC options:

Makefile configuration

[✓] Generate makefile

Make command: make_rtw

Template makefile: ert_default_tmf

Data specification override

[ ] Ignore custom storage classes

[ ] Ignore test point signals

Code Generation Advisor

Prioritized objectives: Unspecified

Check model before generating code: Off

[ ] Generate code only

In this section...

Real-Time Workshop: General Tab Overview

Set up general information about code generation for a model's active configuration set, including target selection, documentation, and build process parameters.

See Also

Real-Time Workshop Pane

System target file

Specify the system target file.

Settings

Default: `grt.tlc`

You can specify the system target file in these ways:

- Use the System Target File Browser. Click the **Browse** button, which lets you select a preset target configuration consisting of a system target file, template makefile, and make command.
- Enter the name of your system target file in this field.

Tips

- The System Target File Browser lists all system target files found on the MATLAB path. Some system target files require additional licensed products, such as the Real-Time Workshop Embedded Coder product.
- To configure your model for rapid simulation, select `rsim.tlc`.
- To configure your model for xPC Target™, select `xpctarget.tlc` or `xpctargetert.tlc`.

Command-Line Information

Parameter: `SystemTargetFile`
Type: string
Value: any valid system target file
Default: `'grt.tlc'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	No impact
Safety precaution	No impact (GRT) ERT based (requires Real-Time Workshop Embedded Coder license)

See Also

Available Targets

Language

Specify C or C++ code generation.

Settings

Default: `C`

`C`
: Generates `.c` files and places the files in your build directory.

`C++`
: Generates C++ compatible `.cpp` files and places the files in your build directory.

`C++ (Encapsulated)`
: Generates C++ encapsulated `.cpp` files and places the files in your build directory. Selecting this value causes the build to generate a C++ class interface to model code. The generated interface encapsulates all required model data into C++ class attributes and all model entry point functions into C++ class methods.

Note Using `C++ (Encapsulated)` for code generation requires a Real-Time Workshop Embedded Coder license and the ERT target. The value `C++ (Encapsulated)` appears in the **Language** menu if you select an ERT target for your model, but you cannot use the ERT target and the `C++ (Encapsulated)` value for model building without a Real-Time Workshop Embedded Coder license.

Tip

You might need to configure the Real-Time Workshop software to use the appropriate compiler before you build a system.

Command-Line Information

Parameter: `TargetLang`
Type: string
Value: `'C'` | `'C++'` | `'C++ (Encapsulated)'`
Default: `'C'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

Choosing and Configuring a Compiler

"Controlling Generation of Function Prototypes"

"Controlling Generation of Encapsulated C++ Model Interfaces"

Compiler optimization level

Provides flexible and generalized control over compiler optimizations for building generated code.

Settings

Default: `Optimizations off (faster builds)`

`Optimizations off (faster builds)`
: Customizes compilation during the Real-Time Workshop makefile build process to minimize compilation time.

`Optimizations on (faster runs)`
: Customizes compilation during the Real-Time Workshop makefile build process to minimize run time.

`Custom`
: Allows you to specify custom compiler optimization flags to be applied during the Real-Time Workshop makefile build process.

Tips

- Target-independent values `Optimizations on (faster runs)` and `Optimizations off (faster builds)` allow you to easily toggle compiler optimizations on and off during code development.
- `Custom` allows you to enter custom compiler optimization flags at Simulink GUI level, rather than editing compiler flags into template makefiles (TMFs) or supplying compiler flags to Real-Time Workshop make commands.
- If you specify compiler options for your Real-Time Workshop makefile build using `OPT_OPTS`, `MEX_OPTS` (except `MEX_OPTS="-v"`), or `MEX_OPT_FILE`, the value of **Compiler optimization level** is ignored and a warning is issued about the ignored parameter.

Dependencies

This parameter enables **Custom compiler optimization flags**.

Command-Line Information

Parameter: `RTWCompilerOptimization`
Type: string
Value:`'Off' | 'On' | 'Custom'`
Default: `'Off'`

Recommended Settings

Application	Setting
Debugging	`Optimizations off (faster builds)`
Traceability	`Optimizations off (faster builds)`
Efficiency	`Optimizations on (faster runs)` (execution), No impact (ROM, RAM)
Safety precaution	No impact

See Also

- Custom compiler optimization flags
- Controlling Compiler Optimization Level and Specifying Custom Optimization Settings

Custom compiler optimization flags

Specify compiler optimization flags to be applied to building the generated code for your model.

Settings

Default: `''`

Specify compiler optimization flags without quotes, for example, `-O2`.

Dependency

This parameter is enabled by selecting the value `Custom` for the parameter **Compiler optimization level**.

Command-Line Information

Parameter: `RTWCustomCompilerOptimizations`
Type: string
Value:`""` | user-specified flags
Default: `""`

Recommended Settings

See Compiler optimization level.

See Also

- Compiler optimization level
- Controlling Compiler Optimization Level and Specifying Custom Optimization Settings

TLC options

Specify Target Language Compiler (TLC) options for code generation.

Settings

Default: `''`

You can enter TLC command-line options and arguments.

Tips

- Specifying TLC options does not add flags to the **Make command** field.
- The summary section of the generated HTML report lists the TLC options that you specify for the build in which you generate the report.

Command-Line Information

Parameter: `TLCOptions`
Type: string
Value: any valid TLC argument
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

- TLC Options
- Command-Line Arguments

- “Customizing the Target Build Process with the STF_make_rtw Hook File”
- “Understanding and Using the Build Process”

Generate makefile

Specify generation of a makefile.

Settings

Default: on

☑ On

Generates a makefile for a model during the build process.

☐ Off

Suppresses the generation of a makefile. You must set up any post code generation build processing, including compilation and linking, as a user-defined command.

Dependencies

This parameter enables:

- **Make command**
- **Template makefile**

Command-Line Information

Parameter: `GenerateMakefile`
Type: string
Value: `'on' | 'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

- Customizing Post Code Generation Build Processing
- “Customizing the Target Build Process with the STF_make_rtw Hook File”
- “Understanding and Using the Build Process”

Make command

Specify a make command and optionally append make command arguments.

Settings

Default: `make_rtw`

The make command, a high-level MATLAB command, invoked when you start a build, controls the Real-Time Workshop build process.

- Each target has an associated make command, automatically supplied when you select a target file using the System Target File Browser.
- Some third-party targets supply a make command. See the vendor's documentation.
- You can specify arguments in the **Make command** field which pass into the makefile-based build process. Append the arguments after the make command, as in the following example:

  ```
  make_rtw OPTS="-DMYDEFINE=1"
  ```

  The syntax for make command options differs slightly for different compilers.

Tip

Most targets use the default command.

Dependency

This parameter is enabled by **Generate makefile**.

Command-Line Information

Parameter: `MakeCommand`
Type: string
Value: any valid make command MATLAB language file
Default: `'make_rtw'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	`make_rtw`

See Also

- Template Makefiles and Make Options
- "Customizing the Target Build Process with the STF_make_rtw Hook File"
- "Understanding and Using the Build Process"

Template makefile

Specify a template makefile.

Settings

Default: `grt_default_tmf`

The template makefile determines which compiler runs, during the make phase of the build, to compile the generated code. You can specify template makefiles in the following ways:

- Generate a value by selecting a target configuration using the System Target File Browser.
- Explicitly enter a custom template makefile filename (including the extension). The file must be on the MATLAB path.

Tips

- If you do not include a filename extension for a custom template makefile, the code generator attempts to find and execute a MATLAB language file.
- You can customize your build process by modifying an existing template makefile or by providing your own template makefile.

Dependency

This parameter is enabled by **Generate makefile**.

Command-Line Information

Parameter: `TemplateMakefile`
Type: string
Value: any valid template makefile filename
Default: `'grt_default_tmf'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

- Template Makefiles and Make Options
- Available Targets

Ignore custom storage classes

Specify whether to apply or ignore custom storage classes.

Settings

Default: off

☑ On

Ignores custom storage classes by treating data objects that have them as if their storage class attribute is set to `Auto`. Data objects with an `Auto` storage class do not interface with external code and are stored as local or shared variables or in a global data structure.

☐ Off

Applies custom storage classes as specified. You must clear this option if the model defines data objects with custom storage classes.

Tips

- Clear this parameter before configuring data objects with custom storage classes.
- Setting for top-level and referenced models must match.

Dependencies

- This parameter only appears for ERT-based targets.
- Clear this parameter to enable module packaging features.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `IgnoreCustomStorageClasses`
Type: string
Value: `'on' | 'off`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

Custom Storage Classes

Ignore test point signals

Specify allocation of memory buffers for test points.

Settings

Default: Off

☑ On

Ignores all test points during code generation, allowing optimal buffer allocation for signals with test points, facilitating transition from prototyping to deployment and avoiding accidental degradation of generated code due to workflow artifacts.

☐ Off

Allocates separate memory buffers for test points, resulting in a loss of code generation optimizations such as reducing memory usage by storing signals in reusable buffers.

Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `IgnoreTestpoints`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	Off
Traceability	No impact

Application	Setting
Efficiency	On
Safety precaution	No impact

See Also

- "Signals with Test Points" in the Real-Time Workshop User's Guide
- "Working with Test Points" in the Simulink User's Guide
- "Signal Considerations" in the Real-Time Workshop User's Guide

Select objective

Select code generation objectives to use with the Code Generation Advisor.

Settings

Default: `Unspecified`

`Unspecified`
: No objective specified. Do not optimize code generation settings using the Code Generation Advisor.

`Debugging`
: Specifies debugging objective. Optimize code generation settings for debugging the code generation build process using the Code Generation Advisor.

Tips

For more objectives, specify an ERT-based target.

Dependency

This parameter appears only for GRT-based targets.

Command-Line Information

Parameter: `'ObjectivePriorities'`
Type: cell array of strings
Value: `{''} | {'Debugging'}`
Default: `{''}`

Recommended Settings

Application	Setting
Debugging	`Debugging`
Traceability	Not applicable for GRT-based targets
Efficiency	Not applicable for GRT-based targets
Safety precaution	Not applicable for GRT-based targets

See Also

- “Mapping Application Objectives to Model Configuration Parameters” in the Real-Time Workshop Embedded Coder documentation.
- “Configuring Code Generation Objectives” in the Real-Time Workshop User’s Guide.

Prioritized objectives

Lists objectives that you specify by clicking the **Set objectives** button.

Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Command: `get_param('`*`model`*`', 'ObjectivePriorities')`

See Also

- “Mapping Application Objectives to Model Configuration Parameters” in the Real-Time Workshop Embedded Coder documentation.
- “Configuring Code Generation Objectives” in the Real-Time Workshop User’s Guide.

Set objectives

Opens Configuration Set Objectives dialog box.

Dependency

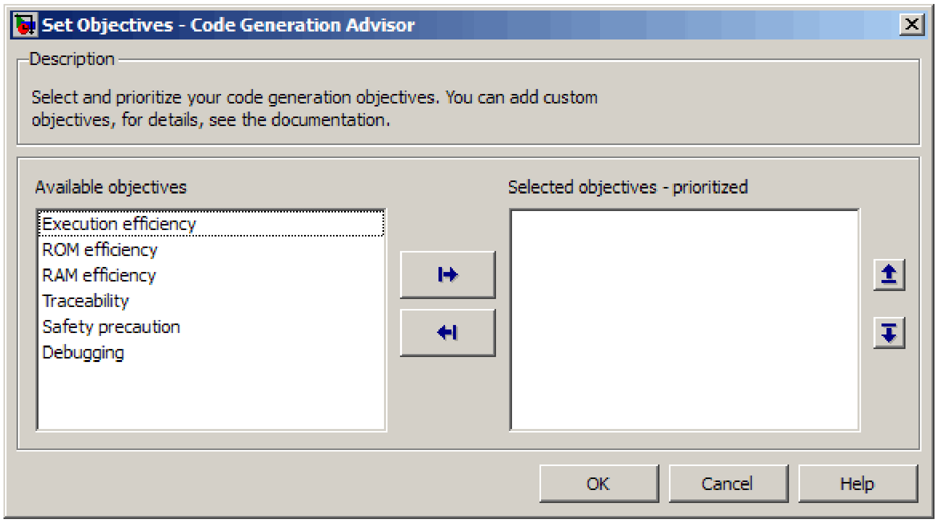
This button appears only for ERT-based targets.

See Also

- "Mapping Application Objectives to Model Configuration Parameters" in the Real-Time Workshop Embedded Coder documentation.
- "Configuring Code Generation Objectives" in the Real-Time Workshop User's Guide.

Set Objectives — Code Generation Advisor Dialog Box

Select and prioritize code generation objectives to use with the Code Generation Advisor.


Set Objectives - Code Generation Advisor
Description
Available objectives
Selected objectives - prioritized
OK
Cancel
Help

Select and prioritize your code generation objectives. You can add custom objectives, for details, see the documentation.

Execution efficiency
ROM efficiency
RAM efficiency
Traceability
Safety precaution
Debugging

Settings

1 From the **Available objectives** list, select objectives.

2 Click the select button (arrow pointing right) to move the objectives that you selected into the **Selected objectives - prioritized** list.

3 Click the higher priority (up arrow) and lower priority (down arrow) buttons to prioritize the objectives.

Objectives. List of available objectives.

`Execution efficiency` — Configure code generation settings to achieve fast execution time.

`ROM efficiency` — Configure code generation settings to reduce ROM usage.

`RAM efficiency` — Configure code generation settings to reduce RAM usage.

`Traceability` — Configure code generation settings to provide mapping between model elements and code.

`Safety precaution` — Configure code generation settings to increase clarity, determinism, robustness, and verifiability of the code.

`Debugging` — Configure code generation settings to debug the code generation build process.

Priorities. After you select objectives from the **Available objectives** parameter, organize the objectives in the **Selected objectives - prioritized** parameter with the highest priority objective at the top.

Dependency

This dialog box appears only for ERT-based targets.

Command-Line Information

Parameter: `'ObjectivePriorities'`
Type: cell array of strings; any combination of the available values
Value: `{''} | {'Execution efficiency'} | {'ROM efficiency'} | {'RAM efficiency'} | {'Traceability'} | {'Safety precaution'} | {'Debugging'}`
Default: `{''}`

See Also

- "Mapping Application Objectives to Model Configuration Parameters" in the Real-Time Workshop Embedded Coder documentation.
- "Configuring Code Generation Objectives" in the Real-Time Workshop User's Guide.

Check model

Runs the Code Generation Advisor checks.

Settings

1 Specify code generation objectives using the **Select objective** parameter (available with GRT-based targets) or in the Configuration Set Objectives dialog box, by clicking **Set objectives** (available with ERT-based targets).

2 Click **Check model**. The Code Generation Advisor runs the code generation objectives checks.

Dependency

You must specify objectives before checking the model.

See Also

- "Mapping Application Objectives to Model Configuration Parameters" in the Real-Time Workshop Embedded Coder documentation.
- "Configuring Code Generation Objectives" in the Real-Time Workshop User's Guide.

Check model before generating code

Choose whether to run Code Generation Advisor checks before generating code.

Settings

Default: `Off`

`Off`
: Generates code without checking whether the model meets code generation objectives. The code generation report summary and file headers indicate the specified objectives and that the validation was not run.

`On (proceed with warnings)`
: Checks whether the model meets code generation objectives using the Code Generation Objectives checks in the Code Generation Advisor. If the Code Generation Advisor reports a warning, the Real-Time Workshop software continues generating code. The code generation report summary and file headers indicate the specified objectives and the validation result.

`On (stop for warnings)`
: Checks whether the model meets code generation objectives using the Code Generation Objectives checks in the Code Generation Advisor. If the Code Generation Advisor reports a warning, the Real-Time Workshop software does not continue generating code.

Command-Line Information

Parameter: `CheckMdlBeforeBuild`
Type: string
Value: `'Off'` | `'Warning'` | `'Error'`
Default: `'Off'`

Recommended Settings

Application	Setting
Debugging	`On (proceed with warnings)` or `On (stop for warnings)`
Traceability	`On (proceed with warnings)` or `On (stop for warnings)`
Efficiency	`On (proceed with warnings)` or `On (stop for warnings)`
Safety precaution	`On (proceed with warnings)` or `On (stop for warnings)`

See Also

- "Mapping Application Objectives to Model Configuration Parameters" in the Real-Time Workshop Embedded Coder documentation.
- "Configuring Code Generation Objectives" in the Real-Time Workshop User's Guide.

Generate code only

Specify code generation versus an executable build.

Settings

Default: off

☑ On

The caption of the **Build/Generate code** button becomes **Generate code**. The build process generates code and a makefile, but it does not invoke the make command.

☐ Off

The caption of the **Build/Generate code** button becomes **Build**. The build process generates and compiles code, and creates an executable file.

Tip

Generate code only generates a makefile only if you select **Generate makefile**.

Dependency

This parameter changes the function of the **Build/Generate code** button.

Command-Line Information

Parameter: `GenCodeOnly`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	Off
Traceability	No impact

Application	Setting
Efficiency	No impact
Safety precaution	No impact

See Also

Customizing Post Code Generation Build Processing

Build/Generate code

Start the build or code generation process.

Tip

You can also start the build process by pressing **Ctrl+B**.

Dependency

When you select **Generate code only**, the caption of the **Build** button changes to **Generate code**.

Command-Line Information

Command: `rtwbuild`
Type: string
Value: `'`*`modelname`*`'`

Recommended Settings

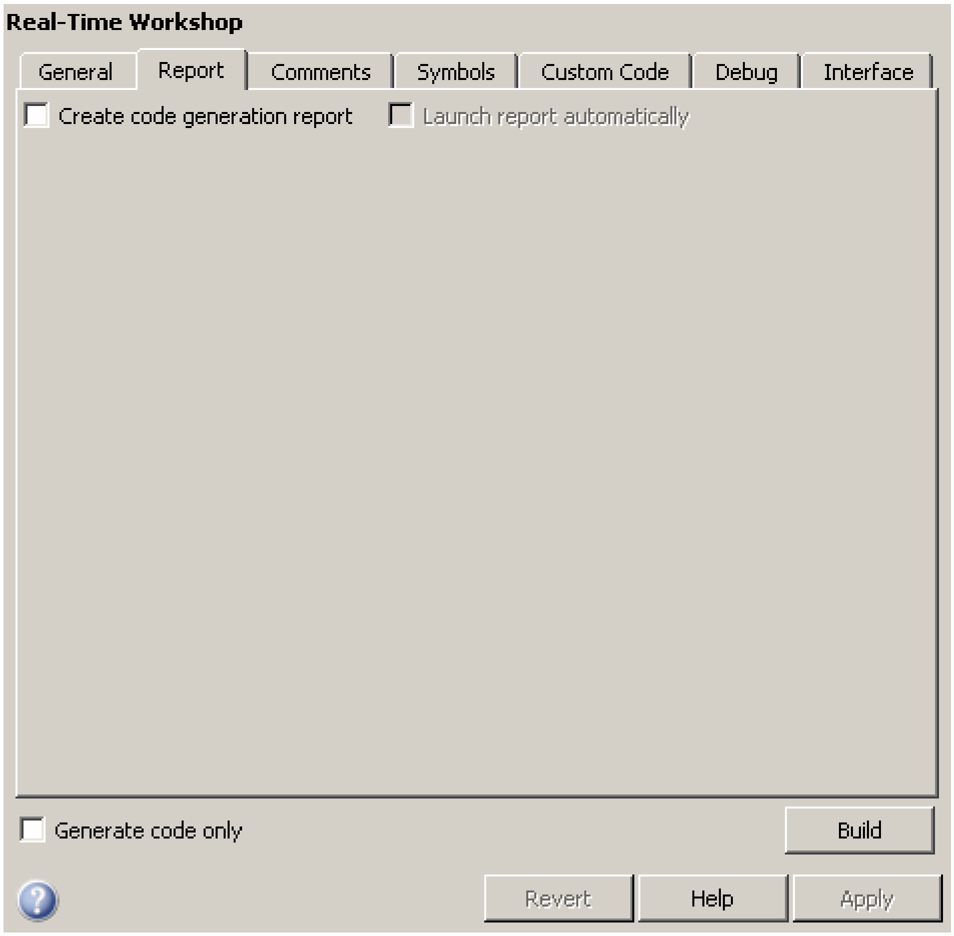
Application	Setting
Debugging	**Build**
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

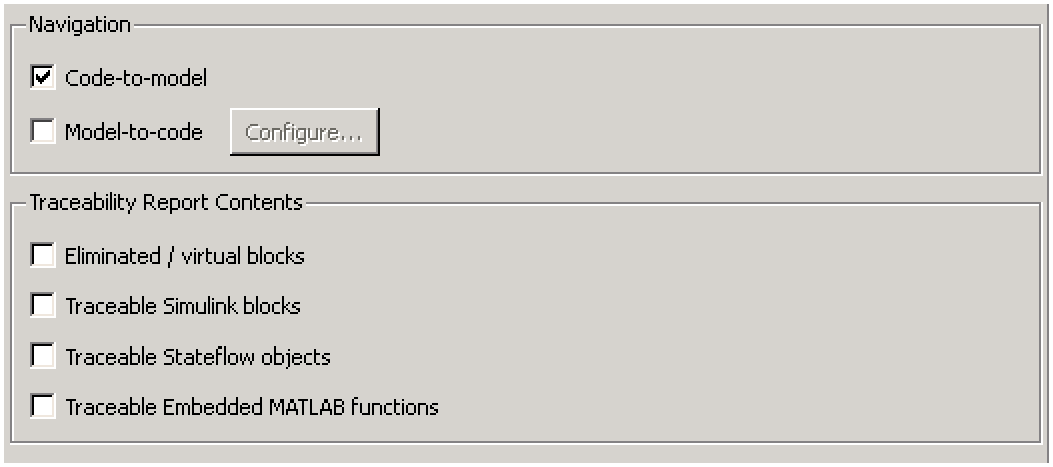
Initiating the Build Process

Real-Time Workshop Pane: Report

The Real-Time Workshop Report pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select a GRT-based target.



The Real-Time Workshop Report pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select an ERT-based target. ERT-based target parameters require a Real-Time Workshop Embedded Coder license when generating code.


Navigation

☑ Code-to-model

☐ Model-to-code

Traceability Report Contents

☐ Eliminated / virtual blocks

☐ Traceable Simulink blocks

☐ Traceable Stateflow objects

☐ Traceable Embedded MATLAB functions

In this section...

Real-Time Workshop: Report Tab Overview

Control the Code Generation report that the Real-Time Workshop software automatically creates.

Configuration

To create a Code Generation report during the build process, select the **Create code generation report** parameter.

See Also

- Generate HTML Report

  If you have a Real-Time Workshop Embedded Coder license, see also Creating and Using a Code Generation Report.
- “Real-Time Workshop Pane: Report” on page 6-37

Create code generation report

Document generated code in an HTML report.

Settings

Default: Off

☑ On

Generates a summary of code generation source files in an HTML report. Places the report files in an `html` subdirectory within the build directory. In the report,

- The **Summary** section lists version and date information. The **Configuration Settings at the Time of Code Generation** link opens a noneditable view of the Configuration Parameters dialog that shows the Simulink model settings, including TLC options, at the time of code generation.
- The **Subsystem Report** section contains information on nonvirtual subsystems in the model.
- The **Code Interface Report** section provides information about the generated code interface, including model entry point functions and input/output data (requires a Real-Time Workshop Embedded Coder license and the ERT target).
- The **Traceability Report** section allows you to account for **Eliminated / Virtual Blocks** that are untraceable, versus the listed **Traceable Simulink Blocks / Stateflow Objects / Embedded MATLAB Scripts**, providing a complete mapping between model elements and code (requires a Real-Time Workshop Embedded Coder license and the ERT target).

In the **Generated Files** section, you can click the names of source code files generated from your model to view their contents in a MATLAB Web browser window. In the displayed source code,

- Global variable instances are hyperlinked to their definitions.
- If you selected the traceability option **Code-to-model**, hyperlinks within the displayed source code let you view the blocks or subsystems from which the code was generated. Click on the hyperlinks to view the relevant blocks or subsystems in a Simulink model window

(requires a Real-Time Workshop Embedded Coder license and the ERT target).

- If you selected the traceability option **Model-to-code**, you can view the generated code for any block in the model. To highlight a block's generated code in the HTML report, right-click the block and select **Real-Time Workshop > Navigate to Code** (requires a Real-Time Workshop Embedded Coder license and the ERT target).

☐ Off
Does not generate a summary of files.

Dependency

This parameter enables and selects

- **Launch report automatically**
- **Code-to-model** (ERT target)

This parameter enables

- **Model-to-code** (ERT target)
- **Eliminated / virtual blocks** (ERT target)
- **Traceable Simulink blocks** (ERT target)
- **Traceable Stateflow objects** (ERT target)
- **Traceable Embedded MATLAB functions** (ERT target)

.

Command-Line Information

Parameter: `GenerateReport`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	On

See Also

"Generating a Report"

"Reviewing Generated Code"

If you have a Real-Time Workshop Embedded Coder license, see also "Generating Reports for Code Reviews and Traceability Analysis".

Launch report automatically

Specify whether to display Code Generation reports automatically.

Settings

Default: Off

☑ On
  Displays the Code Generation report automatically in a new browser window.

☐ Off
  Does not display the Code Generation report, but the report is still available in the `html` directory.

Dependency

This parameter is enabled and selected by **Create code generation report**.

Command-Line Information

Parameter: `LaunchReport`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	No impact

See Also

"Generating a Report"

"Reviewing Generated Code"

If you have a Real-Time Workshop Embedded Coder license, see also "Generating Reports for Code Reviews and Traceability Analysis".

Code-to-model

Include hyperlinks in a Code Generation report that link code to the corresponding Simulink blocks, Stateflow objects, and Embedded MATLAB functions in the model diagram.

Settings

Default: Off

☑ On
Includes hyperlinks in the Code Generation report that link code to corresponding Simulink blocks, Stateflow objects, and Embedded MATLAB functions in the model diagram. The hyperlinks provide traceability for validating generated code against the source model.

☐ Off
Omits hyperlinks from the generated report.

Tip

Clear this parameter to speed up code generation. For large models (containing over 1000 blocks), generation of hyperlinks can be time consuming.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled and selected by **Create code generation report**.
- You must select **Include comments** on the **Real-Time Workshop** > **Comments** tab to use this parameter.

Command-Line Information

Parameter: `IncludeHyperlinkInReport`
Type: string
Value: `'on' | 'off`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	On

See Also

Creating and Using a Code Generation Report.

Model-to-code

Links Simulink blocks, Stateflow objects, and Embedded MATLAB functions in a model diagram to corresponding code segments in a generated HTML report so that the generated code for a block can be highlighted on request.

Settings

Default: Off

☑ On

Includes model-to-code highlighting support in the Code Generation report. To highlight the generated code for a Simulink block, Stateflow object, or Embedded MATLAB script in the Code Generation report, right-click the item and select **Real-Time Workshop > Navigate to Code**.

☐ Off

Omits model-to-code highlighting support from the generated report.

Tip

Clear this parameter to speed up code generation. For large models (containing over 1000 blocks), generation of model-to-code highlighting support can be time consuming.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled when you select **Create code generation report**.
- This parameter selects:
  - **Eliminated / virtual blocks**
  - **Traceable Simulink blocks**
  - **Traceable Stateflow objects**

- **Traceable Embedded MATLAB functions**

- You must select the following parameters to use this parameter:
  - **Include comments** on the **Real-Time Workshop** > **Comments** tab
  - At least one of the following:
    - **Eliminated / virtual blocks**
    - **Traceable Simulink blocks**
    - **Traceable Stateflow objects**
    - **Traceable Embedded MATLAB functions**

Command-Line Information

Parameter: `GenerateTraceInfo`
Type: Boolean
Value: `on | off`
Default: `off`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	On

See Also

Creating and Using a Code Generation Report.

Configure

Use the **Configure** button to open the **Model-to-code navigation** dialog box. This dialog box provides a way for you to specify a build directory containing previously-generated model code to highlight. Applying your build directory selection will attempt to load traceability information from the earlier build, for which **Model-to-code** must have been selected.

Dependency

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Model-to-code**.

See Also

Creating and Using a Code Generation Report.

Eliminated / virtual blocks

Include summary of eliminated and virtual blocks in Code Generation report.

Settings

Default: Off

☑ On
Includes a summary of eliminated and virtual blocks in the Code Generation report.

☐ Off
Does not include a summary of eliminated and virtual blocks.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Create code generation report**.
- This parameter is selected by **Model-to-code**.

Command-Line Information

Parameter: `GenerateTraceReport`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On

Application	Setting
Efficiency	No impact
Safety precaution	On

See Also

Creating and Using a Code Generation Report.

Traceable Simulink blocks

Include summary of Simulink blocks in Code Generation report.

Settings

Default: Off

☑ On

Includes a summary of Simulink blocks and the corresponding code location in the Code Generation report.

☐ Off

Does not include a summary of Simulink blocks.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Create code generation report**.
- This parameter is selected by **Model-to-code**.

Command-Line Information

Parameter: `GenerateTraceReportSl`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On

Application	Setting
Efficiency	No impact
Safety precaution	On

See Also

Creating and Using a Code Generation Report.

Traceable Stateflow objects

Include summary of Stateflow objects in Code Generation report.

Settings

Default: Off

☑ On

Includes a summary of Stateflow objects and the corresponding code location in the Code Generation report.

☐ Off

Does not include a summary of Stateflow objects.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Create code generation report**.
- This parameter is selected by **Model-to-code**.

Command-Line Information

Parameter: `GenerateTraceReportSf`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On

Application	Setting
Efficiency	No impact
Safety precaution	On

See Also

Creating and Using a Code Generation Report.

Traceability of Stateflow Objects in Generated Code.

Traceable Embedded MATLAB functions

Include summary of Embedded MATLAB functions in Code Generation report.

Settings

Default: Off

☑ On

Includes a summary of Embedded MATLAB functions and corresponding code locations in the Code Generation report.

☐ Off

Does not include a summary of Embedded MATLAB functions.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Create code generation report**.
- This parameter is selected by **Model-to-code**.

Command-Line Information

Parameter: `GenerateTraceReportEml`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On

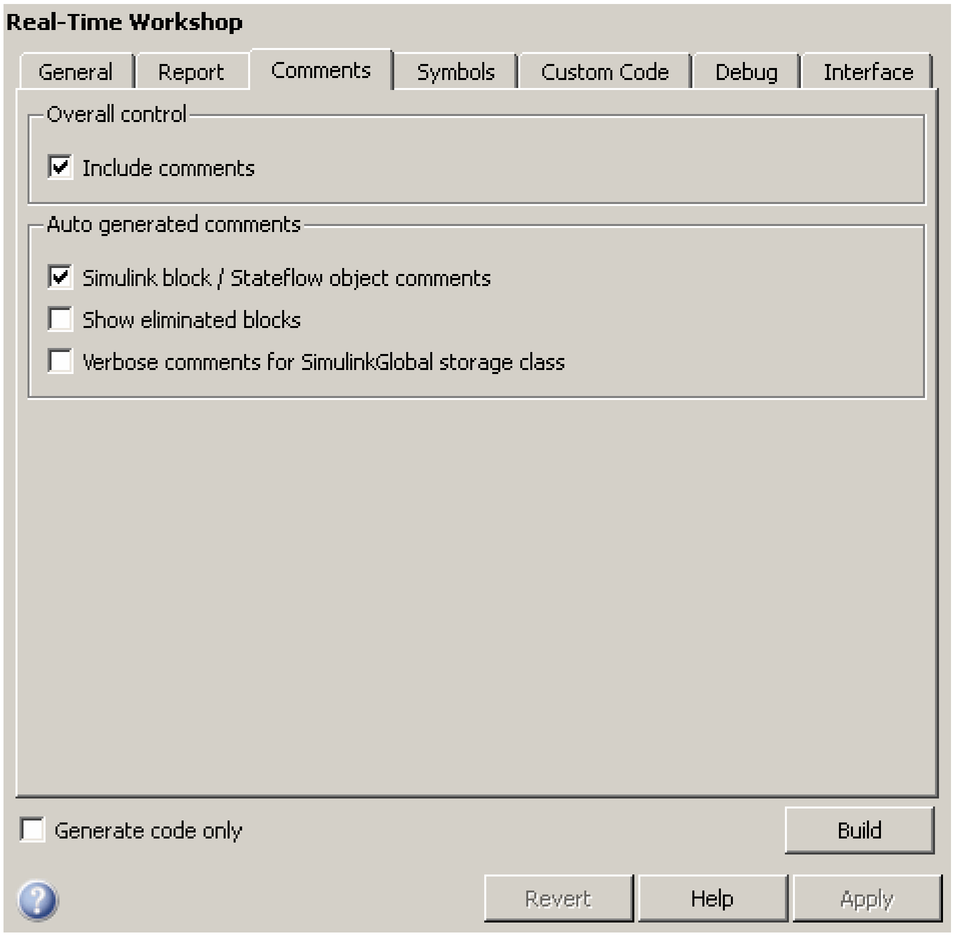
Application	Setting
Efficiency	No impact
Safety precaution	On

See Also

Creating and Using a Code Generation Report.

Real-Time Workshop Pane: Comments

The Real-Time Workshop Comments pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select a GRT-based target.



Overall control

[✓] Include comments

Auto generated comments

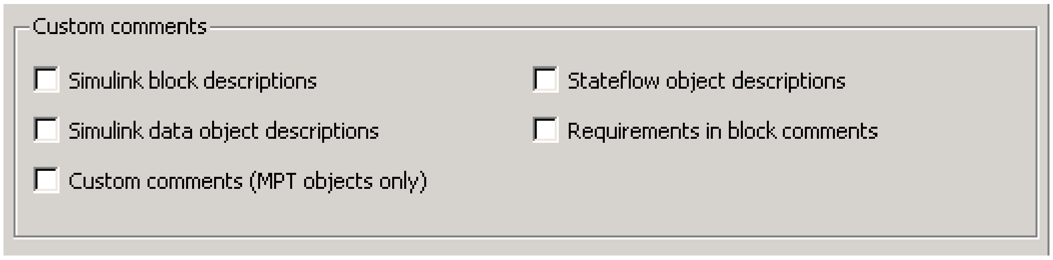
[✓] Simulink block / Stateflow object comments

[ ] Show eliminated blocks

[ ] Verbose comments for SimulinkGlobal storage class

[ ] Generate code only

The Real-Time Workshop Comments pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select an ERT-based target. ERT-based target parameters require a Real-Time Workshop Embedded Coder license when generating code.


Custom comments

- [ ] Simulink block descriptions
- [ ] Stateflow object descriptions
- [ ] Simulink data object descriptions
- [ ] Requirements in block comments
- [ ] Custom comments (MPT objects only)

In this section...

Real-Time Workshop: Comments Tab Overview

Control the comments that the Real-Time Workshop software automatically creates and inserts into the generated code.

See Also

"Real-Time Workshop Pane: Comments" on page 6-58

Include comments

Specify which comments are in generated files.

Settings

Default: on

☑ On

Places comments in the generated files based on the selections in the **Auto generated comments** pane.

☐ Off

Omits comments from the generated files.

Dependencies

This parameter enables:

- **Simulink block / Stateflow object comments**
- **Show eliminated blocks**
- **Verbose comments for SimulinkGlobal storage class**

Command-Line Information

Parameter: `GenerateComments`
Type: string
Value: `'on' | 'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	On

Simulink block / Stateflow object comments

Specify whether to insert Simulink block and Stateflow object comments.

Settings

Default: on

☑ On

Inserts automatically generated comments that describe a block's code and objects. The comments precede that code in the generated file.

☐ Off

Suppresses comments.

Dependency

This parameter is enabled by **Include comments**.

Command-Line Information

Parameter: `SimulinkBlockComments`
Type: string
Value: `'on'` | `'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	On

Show eliminated blocks

Specify whether to insert eliminated block's comments.

Settings

Default: off

☑ On

Inserts statements in the generated code from blocks eliminated as the result of optimizations (such as parameter inlining).

☐ Off

Suppresses statements.

Dependency

This parameter is enabled by **Include comments**.

Command-Line Information

Parameter: `ShowEliminatedStatement`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	On

Verbose comments for SimulinkGlobal storage class

You can control the generation of comments in the model parameter structure declaration in `model_prm.h`. Parameter comments indicate parameter variable names and the names of source blocks.

Settings

Default: off

☑ On

Generates parameter comments regardless of the number of parameters.

☐ Off

Generates parameter comments if less than 1000 parameters are declared. This reduces the size of the generated file for models with a large number of parameters.

Dependency

This parameter is enabled by **Include comments**.

Command-Line Information

Parameter: `ForceParamTrailComments`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	On

Simulink block descriptions

Specify whether to insert descriptions of blocks into generated code as comments.

Settings

Default: off

☑ On

Includes the following comments in the generated code for each block in the model, with the exception of virtual blocks and blocks removed due to block reduction:

- The block name at the start of the code, regardless of whether you select **Simulink block / Stateflow object comments**
- Text specified in the **Description** field of each Block Parameter dialog box

The block names and descriptions can include international (non-US-ASCII) characters.

☐ Off

Suppresses the generation of block name and description comments in the generated code.

Dependency

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `InsertBlockDesc`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	No impact

See Also

Support for International (Non-US-ASCII) Characters

Simulink data object descriptions

Specify whether to insert descriptions of Simulink data objects into generated code as comments.

Settings

Default: off

☑ On

Inserts contents of the **Description** field in the Model Explorer Object Properties pane for each Simulink data object (signal, parameter, and bus objects) in the generated code as comments.

The descriptions can include international (non-US-ASCII) characters.

☐ Off

Suppresses the generation of data object property descriptions as comments in the generated code.

Dependency

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `SimulinkDataObjDesc`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On

Application	Setting
Efficiency	No impact
Safety precaution	No impact

Custom comments (MPT objects only)

Specify whether to include custom comments for module packaging tool (MPT) signal and parameter data objects in generated code.

Settings

Default: off

☑ On

Inserts comments just above the identifiers for signal and parameter MPT objects in generated code.

☐ Off

Suppresses the generation of custom comments for signal and parameter identifiers.

Dependency

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter requires that you include the comments in a function defined in a MATLAB language file or TLC file that you specify with **Custom comments function**.

Command-Line Information

Parameter: `EnableCustomComments`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	No impact

See Also

Adding Custom Comments

Custom comments function

Specify a file that contains comments to be included in generated code for module packing tool (MPT) signal and parameter data objects

Settings

Default: `''`

Enter the name of the MATLAB language file or TLC file for the function that includes the comments to be inserted of your MPT signal and parameter objects. You can specify the file name directly or click **Browse** and search for a file.

Tip

You might use this option to insert comments that document some or all of an object's property values.

Dependency

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Custom comments (MPT objects only)**.

Command-Line Information

Parameter: `CustomCommentsFcn`
Type: string
Value: any valid file name
Default: `''`

Recommended Settings

Application	Setting
Debugging	Any valid file name
Traceability	Any valid file name
Efficiency	No impact
Safety precaution	No impact

See Also

Adding Custom Comments

Stateflow object descriptions

Specify whether to insert descriptions of Stateflow objects into generated code as comments.

Settings

Default: off

☑ On

Inserts descriptions of Stateflow states, charts, transitions, and graphical functions into generated code as comments. The descriptions come from the **Description** field in Object Properties pane in the Model Explorer for these Stateflow objects. The comments appear just above the code generated for each object.

The descriptions can include international (non-US-ASCII) characters.

☐ Off

Suppresses the generation of comments for Stateflow objects.

Dependency

- This parameter only appears for ERT-based targets.
- This parameter requires a Stateflow license.

Command-Line Information

Parameter: `SFDataObjDesc`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On

Application	Setting
Efficiency	No impact
Safety precaution	No impact

See Also

Support for International (Non-US-ASCII) Characters

Requirements in block comments

Specify whether to include requirement descriptions assigned to Simulink blocks in generated code as comments.

Settings

Default: off

☑ On

Inserts the requirement descriptions that you assign to Simulink blocks into the generated code as comments. The Real-Time Workshop software includes the requirement descriptions in the generated code in the following locations.

Model Element	Requirement Description Location
Model	In the main header file `model.h`
Nonvirtual subsystems	At the call site for the subsystem
Virtual subsystems	At the call site of the closest nonvirtual parent subsystem. If a virtual subsystem has no nonvirtual parent, requirement descriptions are located in the main header file for the model, `model.h`.
Nonsubsystem blocks	In the generated code for the block

The requirement text can include international (non-US-ASCII) characters.

☐ Off

Suppresses the generation of comments for block requirement descriptions.

Dependency

- This parameter only appears for ERT-based targets.
- This parameter requires Real-Time Workshop Embedded Coder and Simulink® Verification and Validation™ licenses when generating code.

Command-Line Information

Parameter: `ReqsInCode`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

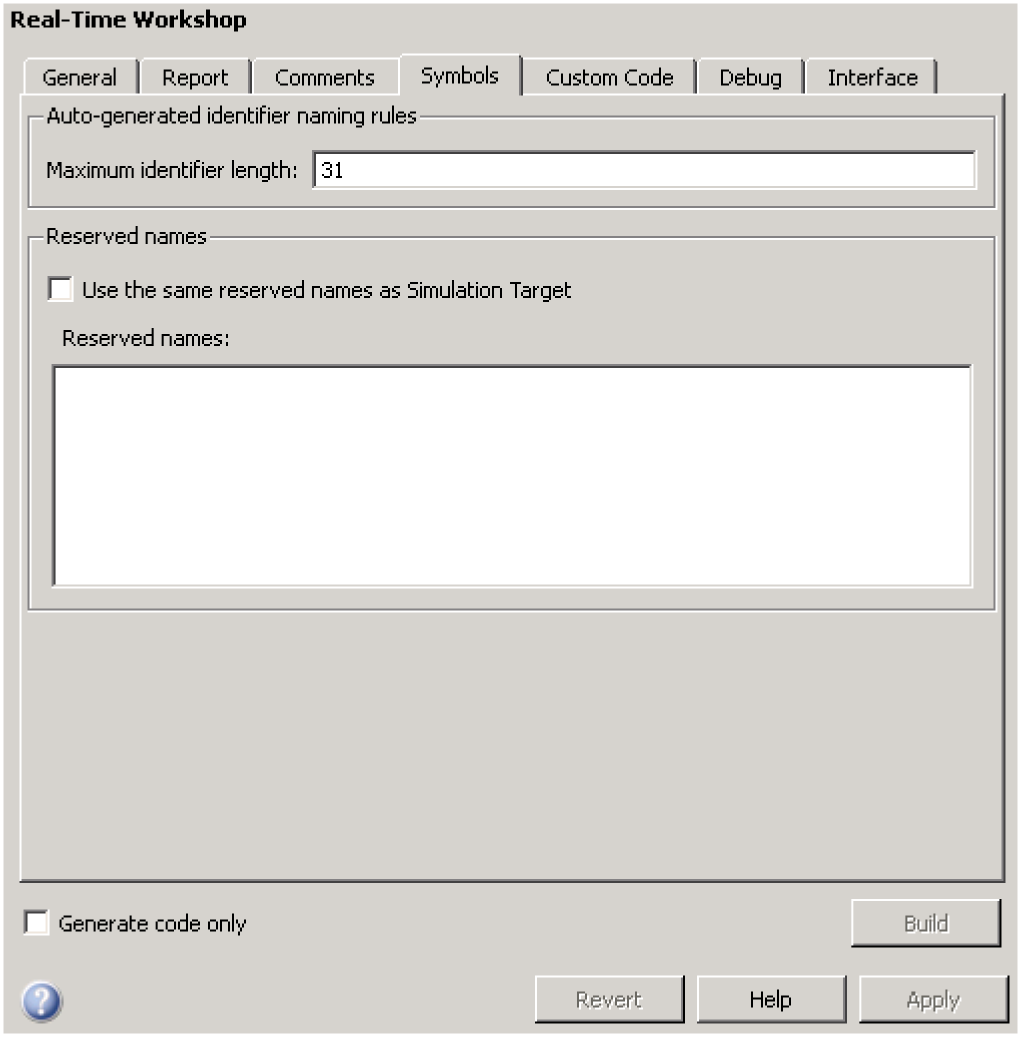
Application	Setting
Debugging	On
Traceability	On
Efficiency	No impact
Safety precaution	On

See Also

"Including Requirements Information with Generated Code" in the Simulink Verification and Validation documentation

Real-Time Workshop Pane: Symbols

The Real-Time Workshop Symbols pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select a GRT-based target.



Auto-generated identifier naming rules

Maximum identifier length: 31

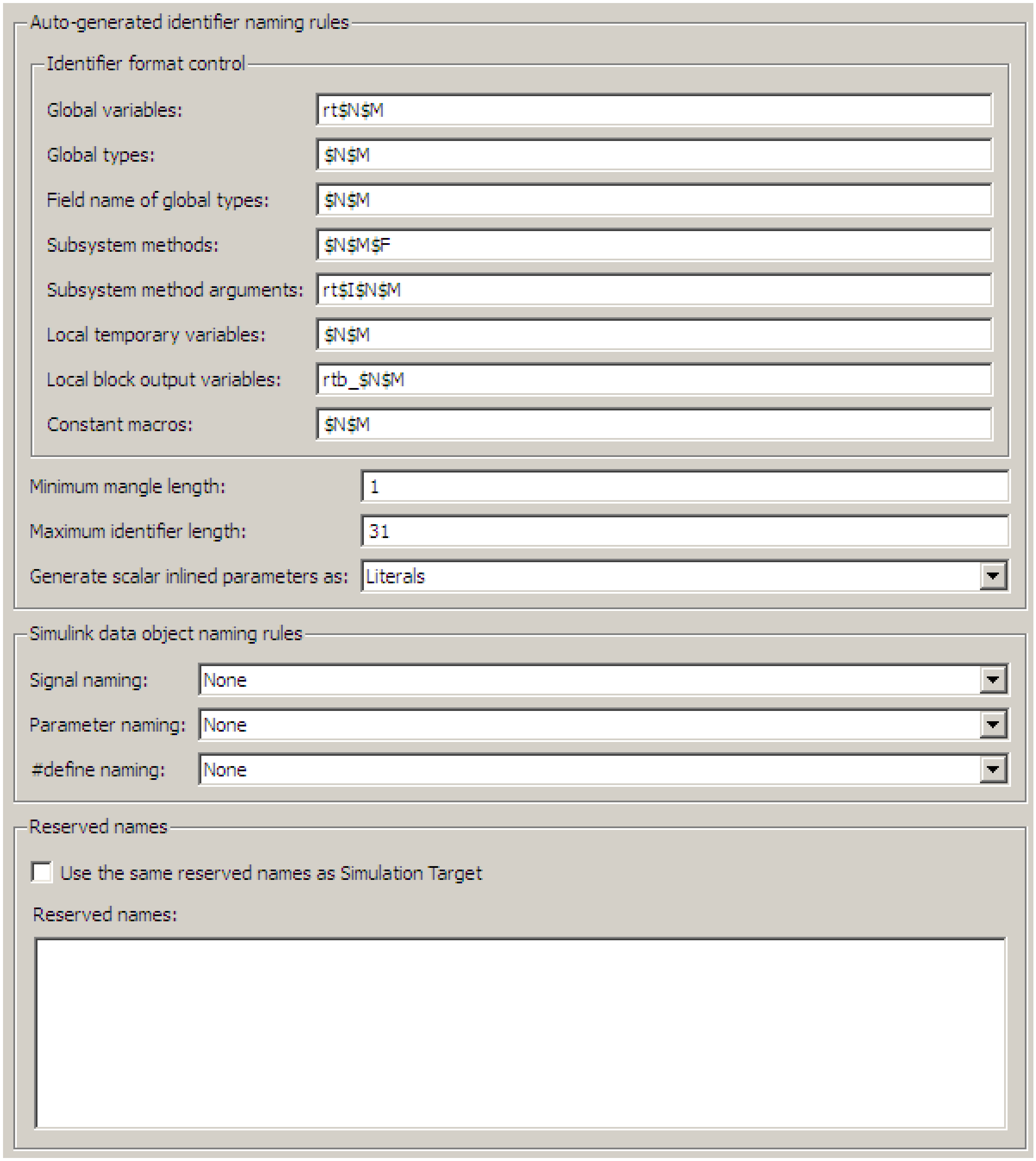
Reserved names

☐ Use the same reserved names as Simulation Target

Reserved names:

☐ Generate code only

The Real-Time Workshop Symbols pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select an ERT-based target. ERT-based target parameters require a Real-Time Workshop Embedded Coder license when generating code.



Auto-generated identifier naming rules

Identifier format control

Global variables:	rt$N$M
Global types:	NM
Field name of global types:	NM
Subsystem methods:	$N$M$F
Subsystem method arguments:	rt$I$N$M
Local temporary variables:	NM
Local block output variables:	rtb_NM
Constant macros:	NM

Minimum mangle length:	1
Maximum identifier length:	31
Generate scalar inlined parameters as:	Literals

Simulink data object naming rules

Signal naming:	None
Parameter naming:	None
#define naming:	None

Reserved names

☐ Use the same reserved names as Simulation Target

Reserved names:

In this section...

Real-Time Workshop: Symbols Tab Overview

Select the automatically generated identifier naming rules.

See Also

- “Configuring Generated Identifiers” in the Real-Time Workshop documentation
- “Real-Time Workshop Pane: Symbols” on page 6-77

Global variables

Customize generated global variable identifiers.

Settings

Default: `$R$N$M`

Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated identifier. The macro string can include a combination of the following format tokens.

Token	Description
`$M`	Insert name mangling string if required to avoid naming collisions. Required.
`$N`	Insert name of object (block, signal or signal object, state, parameter or parameter object) for which identifier is being generated.
`$R`	Insert root model name into identifier, replacing any unsupported characters with the underscore (_) character. Required for model referencing.

Tips

- Avoid name collisions in general. One way is to avoid using default block names (for example, Gain1, Gain2...) when your model has many blocks of the same type.
- Where possible, increase the **Maximum identifier length** to accommodate the length of the identifiers you expect to generate. Reserve at least three characters for a name mangling string.
- If you specify `$R`, the value you specify for **Maximum identifier length** must be large enough to accommodate full expansions of the `$R` and `$M` tokens.
- When a name conflict occurs between an identifier within the scope of a higher-level model and an identifier within the scope of a referenced model,

the code generator preserves the identifier from the referenced model. Name mangling is performed on the identifier in the higher-level model.

- This option does not affect objects (such as signals and parameters) that have a storage class other than `Auto` (such as `ImportedExtern` or `ExportedGlobal`).

Dependency

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `CustomSymbolStrGlobalVar`
Type: string
Value: any valid combination of tokens
Default: `'$R$N$M'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Any valid combination of tokens
Efficiency	No impact
Safety precaution	`$R$N$M`

See Also

- “Specifying Identifier Formats” in the Real-Time Workshop Embedded Coder documentation
- “Name Mangling” in the Real-Time Workshop Embedded Coder documentation

- “Model Referencing Considerations” in the Real-Time Workshop Embedded Coder documentation
- “Identifier Format Control Parameters Limitations” in the Real-Time Workshop Embedded Coder documentation

Global types

Customize generated global type identifiers.

Settings

Default: `$N$R$M`

Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated identifier. The macro string can include a combination of the following format tokens.

Token	Description
`$M`	Insert name mangling string if required to avoid naming collisions. Required.
`$N`	Insert name of object (block, signal or signal object, state, parameter or parameter object) for which identifier is being generated.
`$R`	Insert root model name into identifier, replacing any unsupported characters with the underscore (_) character. Required for model referencing.

Tips

- Avoid name collisions in general. One way is to avoid using default block names (for example, Gain1, Gain2...) when your model has many blocks of the same type.
- Where possible, increase the **Maximum identifier length** to accommodate the length of the identifiers you expect to generate. Reserve at least three characters for a name mangling string.
- If you specify `$R`, the value you specify for **Maximum identifier length** must be large enough to accommodate full expansions of the `$R` and `$M` tokens.
- When a name conflict occurs between an identifier within the scope of a higher-level model and an identifier within the scope of a referenced model,

the code generator preserves the identifier from the referenced model. Name mangling is performed on the identifier in the higher-level model.

- Name mangling conventions do not apply to type names (that is, `typedef` statements) generated for global data types. The **Maximum identifier length** setting does not apply to type definitions. If you specify `$R`, the code generator includes the model name in the `typedef`.
- This option does not affect objects (such as signals and parameters) that have a storage class other than `Auto` (such as `ImportedExtern` or `ExportedGlobal`).

Dependency

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `CustomSymbolStrType`
Type: string
Value: any valid combination of tokens
Default: `'$N$R$M'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Any valid combination of tokens
Efficiency	No impact
Safety precaution	`$N$R$M`

See Also

- “Specifying Identifier Formats” in the Real-Time Workshop Embedded Coder documentation
- “Name Mangling” in the Real-Time Workshop Embedded Coder documentation
- “Model Referencing Considerations” in the Real-Time Workshop Embedded Coder documentation
- “Identifier Format Control Parameters Limitations” in the Real-Time Workshop Embedded Coder documentation

Field name of global types

Customize generated field names of global types.

Settings

Default: `$N$M`

Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated identifier. The macro string can include a combination of the following format tokens.

Token	Description
`$A`	Insert data type acronym (for example, `i32` for long integers) into signal and work vector identifiers.
`$H`	Insert tag indicating system hierarchy level. For root-level blocks, the tag is the string `root_`. For blocks at the subsystem level, the tag is of the form `sN_`, where `N` is a unique system number assigned by the Simulink software.
`$M`	Insert name mangling string if required to avoid naming collisions. Required.
`$N`	Insert name of object (block, signal or signal object, state, parameter or parameter object) for which identifier is being generated.

Tips

- Avoid name collisions in general. One way is to avoid using default block names (for example, Gain1, Gain2...) when your model has many blocks of the same type.
- Where possible, increase the **Maximum identifier length** to accommodate the length of the identifiers you expect to generate. Reserve at least three characters for a name mangling string.
- The **Maximum identifier length** setting does not apply to type definitions.

- This option does not affect objects (such as signals and parameters) that have a storage class other than `Auto` (such as `ImportedExtern` or `ExportedGlobal`).

Dependency

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `CustomSymbolStrField`
Type: string
Value: any valid combination of tokens
Default: `'$N$M'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Any valid combination of tokens
Efficiency	No impact
Safety precaution	`$N$M`

See Also

- "Specifying Identifier Formats" in the Real-Time Workshop Embedded Coder documentation
- "Name Mangling" in the Real-Time Workshop Embedded Coder documentation
- "Identifier Format Control Parameters Limitations" in the Real-Time Workshop Embedded Coder documentation

Subsystem methods

Customize generated function names for reusable subsystems.

Settings

Default: `$R$N$M$F`

Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated identifier. The macro string can include a combination of the following format tokens.

Token	Description
`$F`	Insert method name (for example, `_Update` for update method). Empty for Stateflow functions.
`$H`	Insert tag indicating system hierarchy level. For root-level blocks, the tag is the string `root_`. For blocks at the subsystem level, the tag is of the form `sN_`, where `N` is a unique system number assigned by the Simulink software. Empty for Stateflow functions.
`$M`	Insert name mangling string if required to avoid naming collisions. Required.
`$N`	Insert name of object (block, signal or signal object, state, parameter or parameter object) for which identifier is being generated.
`$R`	Insert root model name into identifier, replacing any unsupported characters with the underscore (_) character. Required for model referencing.

Tips

- Avoid name collisions in general. One way is to avoid using default block names (for example, Gain1, Gain2...) when your model has many blocks of the same type.
- Where possible, increase the **Maximum identifier length** to accommodate the length of the identifiers you expect to generate. Reserve at least three characters for a name mangling string.
- If you specify `$R`, the value you specify for **Maximum identifier length** must be large enough to accommodate full expansions of the `$R` and `$M` tokens.
- When a name conflict occurs between an identifier within the scope of a higher-level model and an identifier within the scope of a referenced model, the code generator preserves the identifier from the referenced model. Name mangling is performed on the identifier in the higher-level model.
- Name mangling conventions do not apply to type names (that is, `typedef` statements) generated for global data types. The **Maximum identifier length** setting does not apply to type definitions. If you specify `$R`, the code generator includes the model name in the `typedef`.
- This option does not affect objects (such as signals and parameters) that have a storage class other than `Auto` (such as `ImportedExtern` or `ExportedGlobal`).

Dependency

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `CustomSymbolStrFcn`
Type: string
Value: any valid combination of tokens
Default: `'$R$N$M$F'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Any valid combination of tokens
Efficiency	No impact
Safety precaution	`$R$N$M$F`

See Also

- “Specifying Identifier Formats” in the Real-Time Workshop Embedded Coder documentation
- “Name Mangling” in the Real-Time Workshop Embedded Coder documentation
- “Model Referencing Considerations” in the Real-Time Workshop Embedded Coder documentation
- “Identifier Format Control Parameters Limitations” in the Real-Time Workshop Embedded Coder documentation

Subsystem method arguments

Customize generated function argument names for reusable subsystems.

Settings

Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated argument name. The macro string can include a combination of the following format tokens.

Token	Description
`$I`	Insert an `u` if the argument is an input. Insert a `y` if the argument is an output. Optional.
`$M`	Insert name mangling string if required to avoid naming collisions. Required.
`$N`	Insert name of object (block, signal or signal object, state, parameter or parameter object) for which identifier is being generated. Recommended to ensure readability of generated code.

Tips

- Avoid name collisions in general. One way is to avoid using default block names (for example, Gain1, Gain2...) when your model has many blocks of the same type.
- Where possible, increase the **Maximum identifier length** to accommodate the length of the identifiers you expect to generate. Reserve at least three characters for a name mangling string.

Dependencies

This parameter:

- Appears only for ERT-based targets.

- Requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `CustomSymbolStrFcnArg`
Type: string
Value: any valid combination of tokens
Default: `'rtu_$N$M'` or `'rty_$N$M'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Any valid combinations of tokens
Efficiency	No impact
Safety precaution	`rtu_$N$M` or `rty_$N$M`

See Also

- "Real-Time Workshop Pane: Symbols" on page 6-77
- "Specifying Identifier Formats" in the Real-Time Workshop Embedded Coder documentation
- "Name Mangling" in the Real-Time Workshop Embedded Coder documentation
- "Identifier Format Control Parameters Limitations" in the Real-Time Workshop Embedded Coder documentation

Local temporary variables

Customize generated local temporary variable identifiers.

Settings

Default: `$N$M`

Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated identifier. The macro string can include a combination of the following format tokens.

Token	Description
`$M`	Insert name mangling string if required to avoid naming collisions. Required.
`$N`	Insert name of object (block, signal or signal object, state, parameter or parameter object) for which identifier is being generated.
`$R`	Insert root model name into identifier, replacing any unsupported characters with the underscore (_) character. Required for model referencing.

Tips

- Avoid name collisions in general. One way is to avoid using default block names (for example, Gain1, Gain2...) when your model has many blocks of the same type.
- Where possible, increase the **Maximum identifier length** to accommodate the length of the identifiers you expect to generate. Reserve at least three characters for a name mangling string.
- If you specify `$R`, the value you specify for **Maximum identifier length** must be large enough to accommodate full expansions of the `$R` and `$M` tokens.
- When a name conflict occurs between an identifier within the scope of a higher-level model and an identifier within the scope of a referenced model,

the code generator preserves the identifier from the referenced model. Name mangling is performed on the identifier in the higher-level model.

- This option does not affect objects (such as signals and parameters) that have a storage class other than `Auto` (such as `ImportedExtern` or `ExportedGlobal`).

Dependency

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `CustomSymbolStrTmpVar`
Type: string
Value: any valid combination of tokens
Default: `'$N$M'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Any valid combination of tokens
Efficiency	No impact
Safety precaution	`$N$M`

See Also

- "Specifying Identifier Formats" in the Real-Time Workshop Embedded Coder documentation
- "Name Mangling" in the Real-Time Workshop Embedded Coder documentation

- "Model Referencing Considerations" in the Real-Time Workshop Embedded Coder documentation
- "Identifier Format Control Parameters Limitations" in the Real-Time Workshop Embedded Coder documentation

Local block output variables

Customize generated local block output variable identifiers.

Settings

Default: `rtb_$N$M`

Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated identifier. The macro string can include a combination of the following format tokens.

Token	Description
`$A`	Insert data type acronym (for example, `i32` for long integers) into signal and work vector identifiers.
`$M`	Insert name mangling string if required to avoid naming collisions. Required.
`$N`	Insert name of object (block, signal or signal object, state, parameter or parameter object) for which identifier is being generated.

Tips

- Avoid name collisions in general. One way is to avoid using default block names (for example, Gain1, Gain2...) when your model has many blocks of the same type.
- Where possible, increase the **Maximum identifier length** to accommodate the length of the identifiers you expect to generate. Reserve at least three characters for a name mangling string.
- This option does not affect objects (such as signals and parameters) that have a storage class other than `Auto` (such as `ImportedExtern` or `ExportedGlobal`).

Dependency

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `CustomSymbolStrBlkIO`
Type: string
Value: any valid combination of tokens
Default: `'rtb_$N$M'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Any valid combination of tokens
Efficiency	No impact
Safety precaution	`rtb_$N$M`

See Also

- "Specifying Identifier Formats" in the Real-Time Workshop Embedded Coder documentation
- "Name Mangling" in the Real-Time Workshop Embedded Coder documentation
- "Identifier Format Control Parameters Limitations" in the Real-Time Workshop Embedded Coder documentation

Constant macros

Customize generated constant macro identifiers.

Settings

Default: `$R$N$M`

Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated identifier. The macro string can include a combination of the following format tokens.

Token	Description
`$M`	Insert name mangling string if required to avoid naming collisions. Required.
`$N`	Insert name of object (block, signal or signal object, state, parameter or parameter object) for which identifier is being generated.
`$R`	Insert root model name into identifier, replacing any unsupported characters with the underscore (_) character. Required for model referencing.

Tips

- Avoid name collisions in general. One way is to avoid using default block names (for example, Gain1, Gain2...) when your model has many blocks of the same type.
- Where possible, increase the **Maximum identifier length** to accommodate the length of the identifiers you expect to generate. Reserve at least three characters for a name mangling string.
- If you specify `$R`, the value you specify for **Maximum identifier length** must be large enough to accommodate full expansions of the `$R` and `$M` tokens.
- When a name conflict occurs between an identifier within the scope of a higher-level model and an identifier within the scope of a referenced model,

the code generator preserves the identifier from the referenced model. Name mangling is performed on the identifier in the higher-level model.

- This option does not affect objects (such as signals and parameters) that have a storage class other than `Auto` (such as `ImportedExtern` or `ExportedGlobal`).

Dependency

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `CustomSymbolStrMacro`
Type: string
Value: any valid combination of tokens
Default: `'$R$N$M'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Any valid combination of tokens
Efficiency	No impact
Safety precaution	`$R$N$M`

See Also

- "Specifying Identifier Formats" in the Real-Time Workshop Embedded Coder documentation
- "Name Mangling" in the Real-Time Workshop Embedded Coder documentation

- “Model Referencing Considerations” in the Real-Time Workshop Embedded Coder documentation
- “Identifier Format Control Parameters Limitations” in the Real-Time Workshop Embedded Coder documentation

Minimum mangle length

Increase the minimum number of characters used for generating name mangling strings that help avoid name collisions.

Settings

Default: 1

Specify an integer value that indicates the minimum number of characters the code generator is to use when generating a name mangling string. As necessary, the minimum value automatically increases during code generation as a function of the number of collisions. A larger value reduces the chance of identifier disturbance when you modify the model.

Tips

- Minimize disturbance to the generated code during development, by specifying a value of 4. This value is conservative and safe; it allows for over 1.5 million collisions for a particular identifier before the mangle length increases.
- Set the value to reserve at least three characters for the name mangling string. The length of the name mangling string increases as the number of name collisions increases.

Dependency

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `MangleLength`
Type: integer
Value: any valid value
Default: `1`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	1
Efficiency	No impact
Safety precaution	No impact

See Also

- "Name Mangling" in the Real-Time Workshop Embedded Coder documentation
- "Traceability" in the Real-Time Workshop Embedded Coder documentation
- "Minimizing Name Mangling" in the Real-Time Workshop Embedded Coder documentation

Maximum identifier length

Specify maximum number of characters in generated function, type definition, variable names.

Settings

Default: `31`
Minimum: `31`
Maximum: `256`

You can use this parameter to limit the number of characters in function, type definition, and variable names.

Tips

- Consider increasing identifier length for models having a deep hierarchical structure.
- When generating code from a model that uses model referencing, the **Maximum identifier length** must be large enough to accommodate the root model name and the name mangling string (if any). A code generation error occurs if **Maximum identifier length** is too small.
- This parameter must be the same for both top-level and referenced models.
- When a name conflict occurs between a symbol within the scope of a higher level model and a symbol within the scope of a referenced model, the symbol from the referenced model is preserved. Name mangling is performed on the symbol from the higher level model.

Command-Line Information

Parameter: `MaxIdLength`
Type: integer
Value: any valid value
Default: `31`

Recommended Settings

Application	Setting
Debugging	Any valid value
Traceability	>30
Efficiency	No impact
Safety precaution	>30

See Also

"Creating Model Components" in the Real-Time Workshop documentation

Generate scalar inlined parameter as

Control expression of scalar inlined parameter values in the generated code.

Settings

Default: `Literals`

`Literals`
: Generates scalar inlined parameters as numeric constants. This setting can help with debugging TLC code, as it makes it easy to search for parameter values in the generated code.

`Macros`
: Generates scalar inlined parameters as variables with `#define` macros. This setting makes generated code more readable.

Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `InlinedPrmAccess`
Type: string
Value: `'Literals'` | `'Macros'`
Default: `'Literals'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	`Macros`
Efficiency	`Literals`
Safety precaution	No impact

Signal naming

Specify rules for naming signals in generated code.

Settings

Default: `None`

`None`
: Makes no change to signal names when creating corresponding identifiers in generated code. Signal identifiers in the generated code match the signal names that appear in the model.

`Force upper case`
: Uses all uppercase characters when creating identifiers for signal names in the generated code.

`Force lower case`
: Uses all lowercase characters when creating identifiers for signal names in the generated code.

`Custom M-function`
: Uses the MATLAB function specified with the **M-function** parameter to create identifiers for signal names in the generated code.

Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- Setting this parameter to `Custom M-function` enables **M-function**.
- This parameter must be the same for top-level and referenced models.

Limitation

This parameter has no effect on signal names that are specified by an embedded signal object created using the **Real Time Workshop** tab of a signal's **Signal Properties** dialog box. See "Applying a CSC Using an Embedded Signal Object" for information about embedded signal objects.

Command-Line Information

Parameter: `SignalNamingRule`
Type: string
Value: `'None'` | `'UpperCase'` | `'LowerCase'` | `'Custom'`
Default: `'None'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	`Force upper case`
Efficiency	No impact
Safety precaution	No impact

See Also

- "Applying Naming Rules to Identifiers Globally" in the Real-Time Workshop Embedded Coder documentation
- "Functions and Scripts" in the MATLAB documentation

M-function

Specify rule for naming identifiers in generated code.

Settings

Default: `''`

Enter the name of a MATLAB language file that contains the naming rule to be applied to signal, parameter, or `#define` parameter identifiers in generated code. Examples of rules you might program in such a MATLAB function include:

- Remove underscore characters from signal names.
- Add an underscore before uppercase characters in parameter names.
- Make all identifiers uppercase in generated code.

Tip

The MATLAB language file must be in the MATLAB path.

Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Signal naming**.
- This parameter must be the same for top-level and referenced models.

Command-Line Information

Parameter: `DefineNamingFcn`
Type: string
Value: any MATLAB language file
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

- “Applying Naming Rules to Identifiers Globally” in the Real-Time Workshop Embedded Coder documentation
- “Functions and Scripts” in the MATLAB documentation

Parameter naming

Specify rule for naming parameters in generated code.

Settings

Default: `None`

`None`
: Makes no change to parameter names when creating corresponding identifiers in generated code. Parameter identifiers in the generated code match the parameter names that appear in the model.

`Force upper case`
: Uses all uppercase characters when creating identifiers for parameter names in the generated code.

`Force lower case`
: Uses all lowercase characters when creating identifiers for parameter names in the generated code.

`Custom M-function`
: Uses the MATLAB function specified with the **M-function** parameter to create identifiers for parameter names in the generated code.

Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- Setting this parameter to `Custom M-function` enables **M-function**.
- This parameter must be the same for top-level and referenced models.

Command-Line Information

Parameter: `ParamNamingRule`
Type: string
Value: `'None'` | `'UpperCase'` | `'LowerCase'` | `'Custom'`
Default: `'None'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	`Force upper case`
Efficiency	No impact
Safety precaution	No impact

See Also

- “Applying Naming Rules to Identifiers Globally” in the Real-Time Workshop Embedded Coder documentation
- “Functions and Scripts” in the MATLAB documentation

#define naming

Specify rule for naming `#define` parameters (defined with storage class `Define (Custom)`) in generated code.

Settings

Default: `None`

`None`
: Makes no change to `#define` parameter names when creating corresponding identifiers in generated code. Parameter identifiers in the generated code match the parameter names that appear in the model.

`Force upper case`
: Uses all uppercase characters when creating identifiers for `#define` parameter names in the generated code.

`Force lower case`
: Uses all lowercase characters when creating identifiers for `#define` parameter names in the generated code.

`Custom M-function`
: Uses the MATLAB function specified with the **M-function** parameter to create identifiers for `#define` parameter names in the generated code.

Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- Setting this parameter to `Custom M-function` enables **M-function**.
- This parameter must be the same for top-level and referenced models.

Command-Line Information

Parameter: `DefineNamingRule`
Type: string
Value: `'None' | 'UpperCase' | 'LowerCase' | 'Custom'`
Default: `'None'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	`Force upper case`
Efficiency	No impact
Safety precaution	No impact

See Also

- "Applying Naming Rules to Identifiers Globally" in the Real-Time Workshop Embedded Coder documentation
- "Functions and Scripts" in the MATLAB documentation

Use the same reserved names as Simulation Target

Specify whether to use the same reserved names as those specified in the **Simulation Target > Symbols** pane.

Settings

Default: Off

☑ On

Enables using the same reserved names as those specified in the **Simulation Target > Symbols** pane.

☐ Off

Disables using the same reserved names as those specified in the **Simulation Target > Symbols** pane.

Command-Line Information

Parameter: `UseSimReservedNames`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Reserved names

Enter the names of variables or functions in the generated code that match the names of variables or functions specified in custom code.

Settings

Default: `{}`

This action changes the names of variables or functions in the generated code to avoid name conflicts with identifiers in custom code. Reserved names must be shorter than 256 characters.

Tips

- Do not enter Real-Time Workshop keywords since these names cannot be changed in the generated code. For a list of keywords to avoid, see "Reserved Keywords" in the *Real-Time Workshop User's Guide*.
- Start each reserved name with a letter or an underscore to prevent error messages.
- Each reserved name must contain only letters, numbers, or underscores.
- Separate the reserved names using commas or spaces.
- You can also specify reserved names by using the command line:

  ```
  config_param_object.set_param('ReservedNameArray',
  {'abc','xyz'})
  ```

  where *config_param_object* is the object handle to the model settings in the Configuration Parameters dialog box.

Command-Line Information

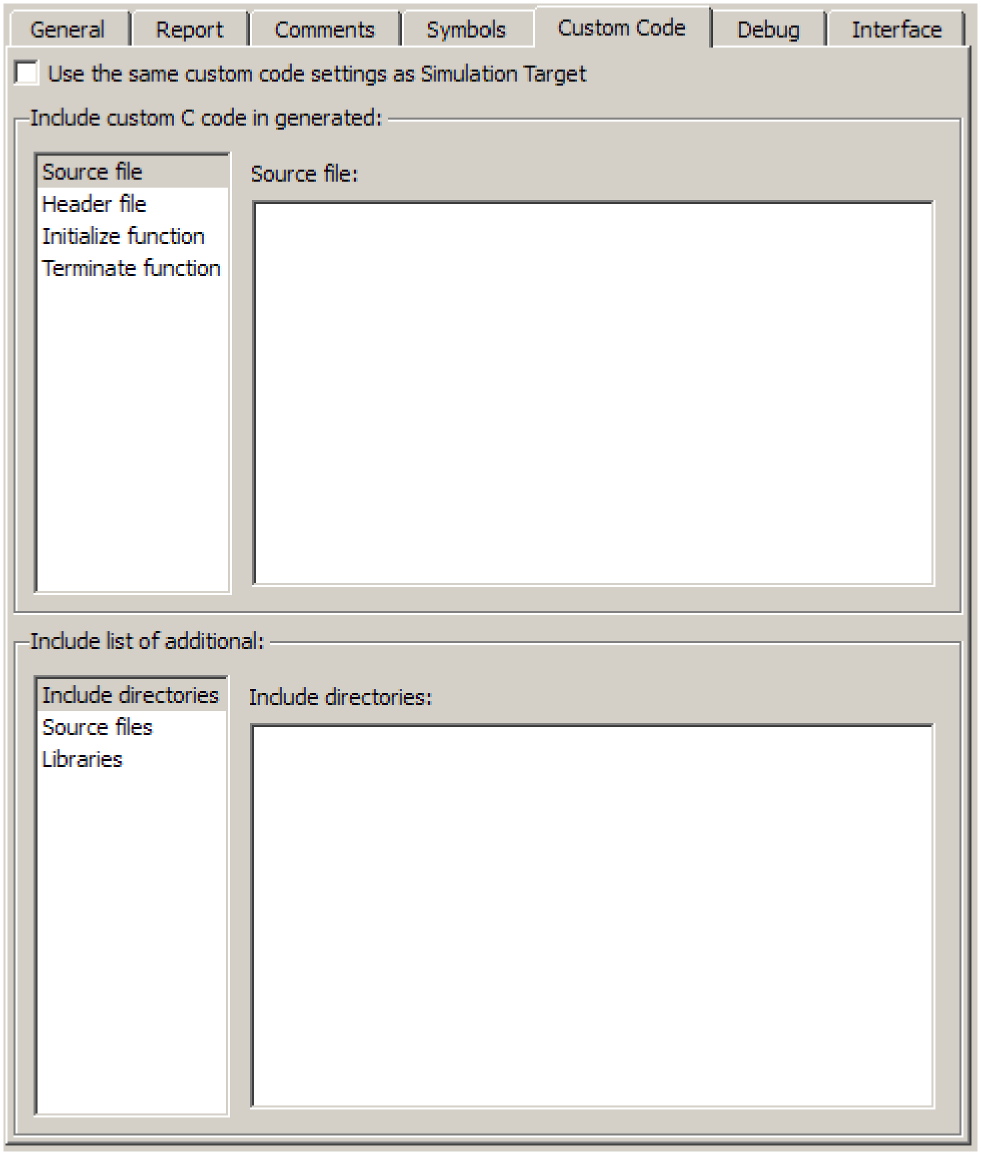
Parameter: `ReservedNameArray`
Type: string array
Value: any reserved names shorter than 256 characters
Default: `{}`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Real-Time Workshop Pane: Custom Code

The Real-Time Workshop Custom Code pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select a GRT- or ERT-based target.



Use the same custom code settings as Simulation Target

Include custom C code in generated:

Source file:

Include list of additional:

Include directories:

In this section...

Real-Time Workshop: Custom Code Tab Overview

Enter custom code to include in generated model files and create a list of additional directories, source files, and libraries to use when building the model.

Configuration

1. Select the type of information to include from the list on the left side of the pane.
2. Enter custom code or enter a string to identify a directory, source file, or library.
3. Click **Apply**.

See Also

- Configuring Custom Code
- "Real-Time Workshop Pane: Custom Code" on page 6-119

Use the same custom code settings as Simulation Target

Specify whether to use the same custom code settings as those in the **Simulation Target** > **Custom Code** pane.

Settings

Default: Off

☑ On

Enables using the same custom code settings as those in the **Simulation Target** > **Custom Code** pane.

☐ Off

Disables using the same custom code settings as those in the **Simulation Target** > **Custom Code** pane.

Command-Line Information

Parameter: `RTWUseSimCustomCode`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Use local custom code settings (do not inherit from main model)

Specify if a library model can use custom code settings that are unique from the main model.

Settings

Default: Off

☑ On
: Enables a library model to use custom code settings that are unique from the main model.

☐ Off
: Disables a library model from using custom code settings that are unique from the main model.

Dependency

This parameter is available only for library models that contain Embedded MATLAB Function blocks, Stateflow charts, or Truth Table blocks. To access this parameter, select **Tools > Open RTW Target** in the Embedded MATLAB Editor or Stateflow Editor for your library model.

Command-Line Information

Parameter: `RTWUseLocalCustomCode`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	No impact
Safety precaution	No impact

Source file

Specify custom code to include near the top of the generated model source file.

Settings

Default:`''`

The Real-Time Workshop software places code near the top of the generated *`model`*`.c` or *`model`*`.cpp` file, outside of any function.

Command-Line Information

Parameter: `CustomSourceCode`
Type: string
Value: any source file name
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Header file

Specify custom code to include near the top of the generated model header file.

Settings

Default:`''`

The Real-Time Workshop software places header file code near the top of the generated *`model`*`.h` header file.

Command-Line Information

Parameter: `CustomHeaderCode`
Type: string
Value: any header file name
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Initialize function

Specify custom code to include in the generated model initialize function.

Settings

Default: `''`

The Real-Time Workshop software places code inside the model's initialize function in the *`model`*`.c` or *`model`*`.cpp` file.

Command-Line Information

Parameter: `CustomInitializer`
Type: string
Value: any code
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Terminate function

Specify custom code to include in the generated model terminate function.

Settings

Default: `''`

Specify code to appear in the model's generated terminate function in the `*model*.c` or `*model*.cpp` file.

Dependency

A terminate function is generated only if you select the **Terminate function required** check box on the **Real-Time Workshop** pane, **Interface** tab.

Command-Line Information

Parameter: `CustomTerminator`
Type: string
Value: any code
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Include directories

Specify a list of include directories to add to the include path.

Settings

Default:`''`

Enter a space-separated list of include directories to add to the include path when compiling the generated code.

- Specify absolute or relative paths to the directories.
- Relative paths must be relative to the directory containing your model files, not relative to the build directory.
- The order in which you specify the directories is the order in which they are searched for header, source, and library files.

Note If you specify a Windows path string containing one or more spaces, you must enclose the string in double quotes. For example, the second and third path strings in the **Include directories** entry below must be double-quoted:

```
C:\Project "C:\Custom Files" "C:\Library Files"
```

If you set the equivalent command-line parameter `CustomInclude`, each path string containing spaces must be separately double-quoted within the single-quoted third argument string, for example,

```
>> set_param('mymodel', 'CustomInclude', ...
             'C:\Project "C:\Custom Files" "C:\Library Files"')
```

Command-Line Information

Parameter: `CustomInclude`
Type: string
Value: any directory file name
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Source files

Specify a list of additional source files to compile and link with the generated code.

Settings

Default: `''`

Enter a space-separated list of source files to compile and link with the generated code.

Limitation

This parameter does not support Windows file names that contain embedded spaces.

Tip

The file name is sufficient if the file is in the current MATLAB directory or in one of the include directories.

Command-Line Information

Parameter: `CustomSource`
Type: string
Value: any source file name
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Libraries

Specify a list of additional libraries to link with the generated code.

Settings

Default: `''`

Enter a space-separated list of static library files to link with the generated code.

Limitation

This parameter does not support Windows file names that contain embedded spaces.

Tip

The file name is sufficient if the file is in the current MATLAB directory or in one of the include directories.

Command-Line Information

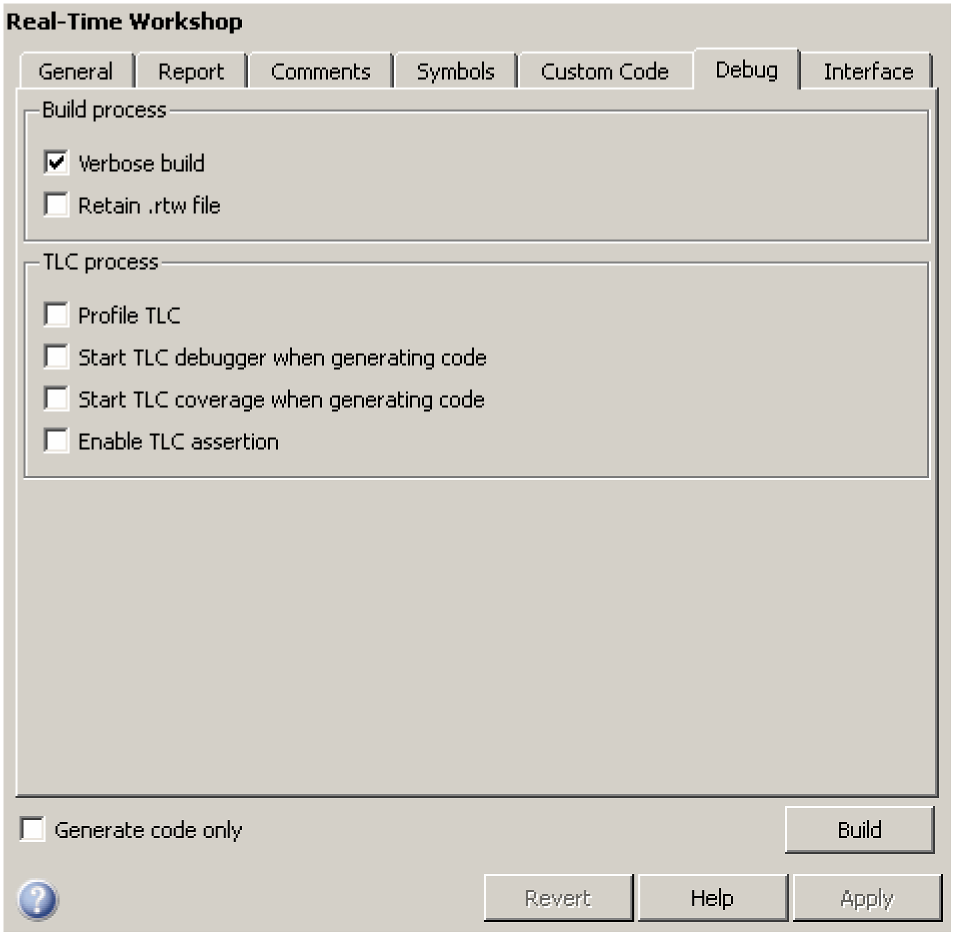
Parameter: `CustomLibrary`
Type: string
Value: any library file name
Default: `''`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Real-Time Workshop Pane: Debug

The Real-Time Workshop Debug pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select a GRT- or ERT-based target.



Real-Time Workshop

Build process

[✓] Verbose build

[ ] Retain .rtw file

TLC process

[ ] Profile TLC

[ ] Start TLC debugger when generating code

[ ] Start TLC coverage when generating code

[ ] Enable TLC assertion

[ ] Generate code only

In this section...

Real-Time Workshop: Debug Tab Overview

Select build process and Target Language Compiler (TLC) process options.

See Also

- Troubleshooting the Build Process
- “Real-Time Workshop Pane: Debug” on page 6-134

Verbose build

Display code generation progress.

Settings

Default: on

☑ On

The MATLAB Command Window displays progress information indicating code generation stages and compiler output during code generation.

☐ Off

Does not display progress information.

Command-Line Information

Parameter: `RTWVerbose`
Type: string
Value: `'on'` | `'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	No impact
Safety precaution	On

Retain .rtw file

Specify *model*.rtw file retention.

Settings

Default: off

☑ On

Retains the *model*.rtw file in the current build directory. This parameter is useful if you are modifying the target files and need to look at the file.

☐ Off

Deletes the *model*.rtw from the build directory at the end of the build process.

Command-Line Information

Parameter: `RetainRTWFile`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Profile TLC

Profile the execution time of TLC files.

Settings

Default: off

☑ On

The TLC profiler analyzes the performance of TLC code executed during code generation, and generates an HTML report.

☐ Off

Does not profile the performance.

Command-Line Information

Parameter: `ProfileTLC`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Start TLC debugger when generating code

Specify use of the TLC debugger

Settings

Default: `off`

☑ On
The TLC debugger starts during code generation.

☐ Off
Does not start the TLC debugger.

Tips

- You can also start the TLC debugger by entering the `-dc` argument into the **System target file** field.
- To invoke the debugger and run a debugger script, enter the `-df` *`filename`* argument into the **System target file** field.

Command-Line Information

Parameter: `TLCDebug`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Start TLC coverage when generating code

Generate the TLC execution report.

Settings

Default: off

☑ On

Generates `.log` files containing the number of times each line of TLC code is executed during code generation.

☐ Off

Does not generate a report.

Tip

You can also generate the TLC execution report by entering the `-dg` argument into the **System target file** field.

Command-Line Information

Parameter: `TLCCoverage`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Enable TLC assertion

Produce the TLC stack trace

Settings

Default: off

☑ On
: The build process halts if any user-supplied TLC file contains an `%assert` directive that evaluates to FALSE.

☐ Off
: The build process ignores TLC assertion code.

Command-Line Information

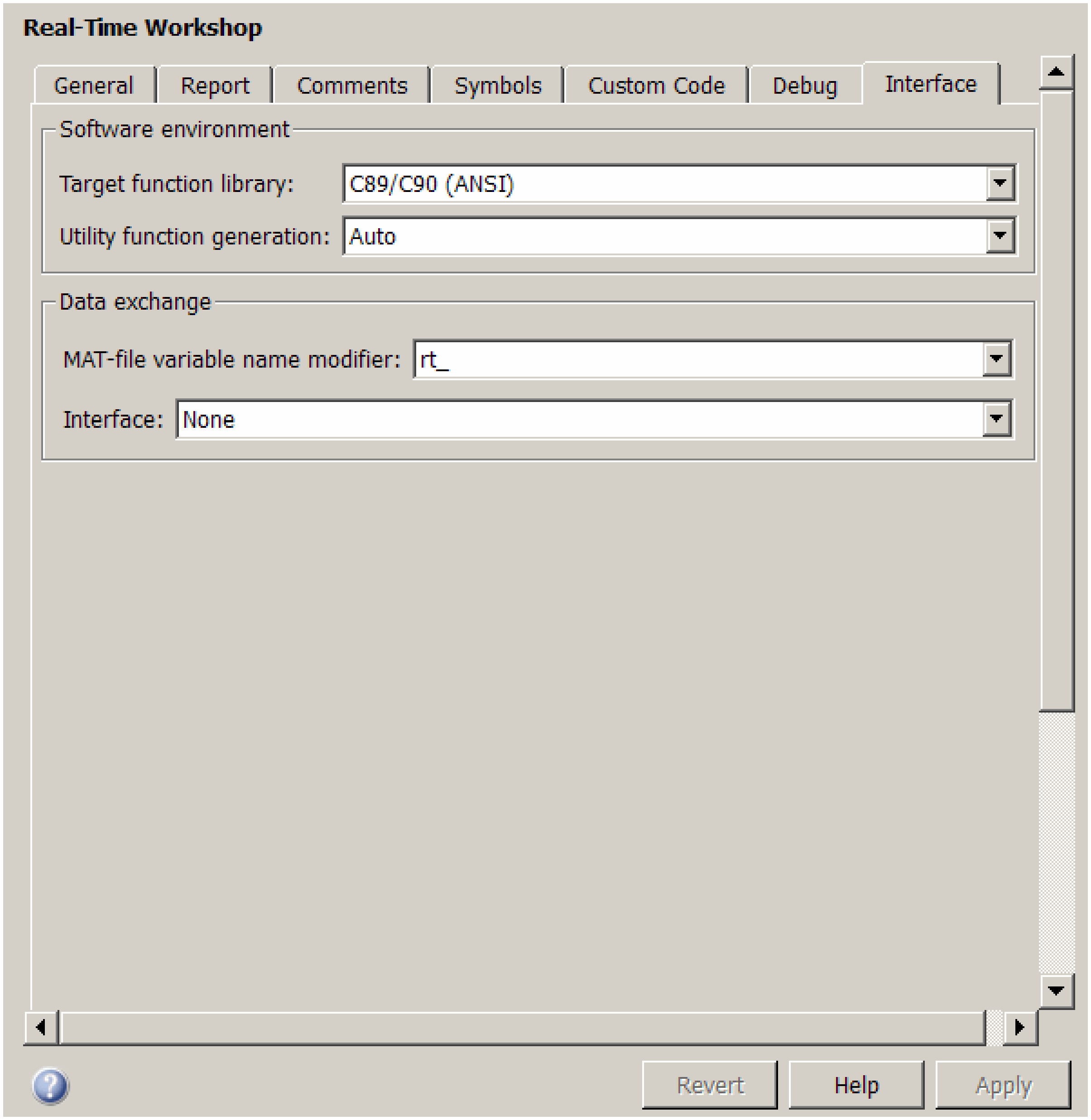
Parameter: `TLCAssert`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	No impact
Safety precaution	On

Real-Time Workshop Pane: Interface

The Real-Time Workshop Interface pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select a GRT-based target.


Real-Time Workshop

Software environment

Target function library: C89/C90 (ANSI)

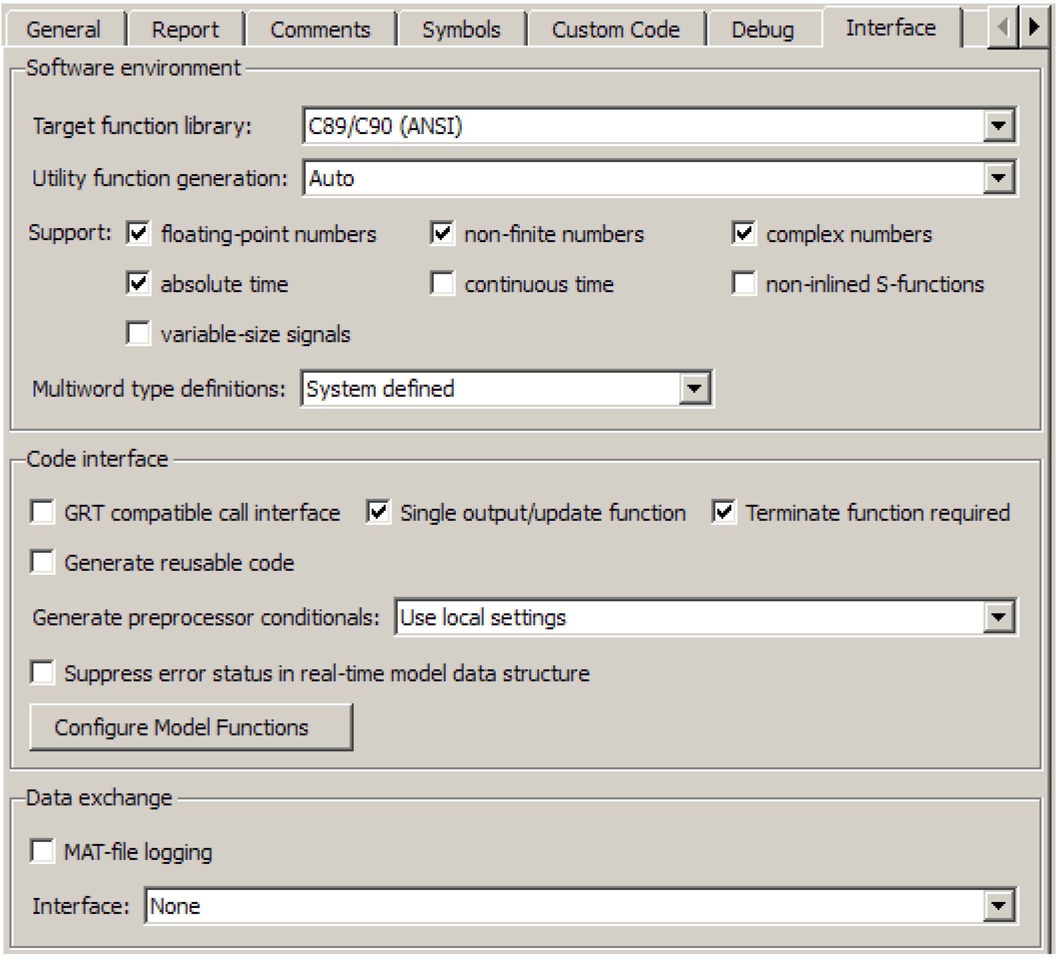
Utility function generation: Auto

Data exchange

MAT-file variable name modifier: rt_

Interface: None

The Real-Time Workshop Interface pane includes the following parameters when the Real-Time Workshop product is installed on your system and you select an ERT-based target. ERT-based target parameters require a Real-Time Workshop Embedded Coder license when generating code.



Software environment

Target function library: C89/C90 (ANSI)

Utility function generation: Auto

Support: [✓] floating-point numbers [✓] non-finite numbers [✓] complex numbers

[✓] absolute time [ ] continuous time [ ] non-inlined S-functions

[ ] variable-size signals

Multiword type definitions: System defined

Code interface

[ ] GRT compatible call interface [✓] Single output/update function [✓] Terminate function required

[ ] Generate reusable code

Generate preprocessor conditionals: Use local settings

[ ] Suppress error status in real-time model data structure

Data exchange

[ ] MAT-file logging

Interface: None

In this section...

In this section...

Real-Time Workshop: Interface Tab Overview

Select the target software environment, output variable name modifier, and data exchange interface.

See Also

- “Configuring the Target Hardware Environment”
- “Real-Time Workshop Pane: Interface” on page 6-143

Target function library

Specify a target-specific math library for your model.

Settings

Default: `C89/C90 (ANSI)`

`C89/C90 (ANSI)`
: Generates calls to the ISO®/IEC 9899:1990 C standard math library for floating-point functions.

`C99 (ISO)`
: Generates calls to the ISO/IEC 9899:1999 C standard math library.

`GNU99 (GNU)`
: Generates calls to the GNU® gcc math library, which provides C99 extensions as defined by compiler option `-std=gnu99`.

`C++ (ISO)`
: Generates calls to the ISO/IEC 14882:2003 C++ standard math library.

Note Additional **Target function library** values may be listed if you have created and registered target function libraries with the Real-Time Workshop Embedded Coder software, or if you have licensed any Link or Target products. For more information on the **Target function library** values for Link or Target products, see your Link or Target product documentation.

Tip

Before setting this parameter, verify that your compiler supports the library you want to use. If you select a parameter value that your compiler does not support, compiler errors can occur.

Dependencies

The `C++ (ISO)` math library is available for use only if you select a compatible value for the **Language** parameter on the **Real-Time Workshop** pane of the Configuration Parameters dialog box:

- For the GRT target, select `C++`.

- For an ERT-based target, select `C++` or `C++ (Encapsulated)`.

Using the ERT target and the `C++ (Encapsulated)` value for code generation requires a Real-Time Workshop Embedded Coder license.

Command-Line Information

Parameter: `GenFloatMathFcnCalls`
Type: string
Value: `'ANSI_C'` | `'C99 (ISO)'` | `'GNU99 (GNU)'` | `'C++ (ISO)'`
Default: `'ANSI_C'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Any valid library
Safety precaution	No impact

See Also

"Configuring the Target Hardware Environment"

Utility function generation

Specify the location for generating utility functions.

Settings

Default: `Auto`

`Auto`

Operates as follows:

- When the model contains Model blocks, place utilities within the `slprj/target/_sharedutils` directory.
- When the model does not contain Model blocks, place utilities in the build directory (generally, in *`model`*`.c` or *`model`*`.cpp`).

`Shared location`

Directs code for utilities to be placed within the `slprj` directory in your working directory.

Command-Line Information

Parameter: `UtilityFuncGeneration`
Type: string
Value: `'Auto'` | `'Shared location'`
Default: `'Auto'`

Recommended Settings

Application	Setting
Debugging	`Shared location` (GRT) No impact (ERT)
Traceability	`Shared location` (GRT) No impact (ERT)
Efficiency	No impact (execution, RAM), `Shared location` (ROM)
Safety precaution	No impact

See Also

"Configuring the Target Hardware Environment"

Support: floating-point numbers

Specify whether to generate floating-point data and operations.

Settings

Default: On (GUI), `'off'` (command-line)

☑ On

Generates floating-point data and operations.

☐ Off

Generates pure integer code. If you clear this option, an error occurs if the code generator encounters floating-point data or expressions. The error message reports offending blocks and parameters.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- Selecting this parameter enables **Support: non-finite numbers** and clearing this parameter disables **Support: non-finite numbers**.
- This parameter must be the same for top-level and referenced models.

Command-Line Information

Parameter: `PurelyIntegerCode`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Note The command-line values are reverse of the settings values. Therefore, `'on'` in the command line corresponds to the description of "Off" in the settings section, and `'off'` in the command line corresponds to the description of "On" in the settings section.

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Off (GUI), `'on'` (command-line) — for integer only
Safety precaution	No impact

Support: absolute time

Specify whether to generate and maintain integer counters for absolute and elapsed time values.

Settings

Default: on

☑ On

Generates and maintains integer counters for blocks that require absolute or elapsed time values. Absolute time is the time from the start of program execution to the present time. An example of elapsed time is time elapsed between two trigger events.

If you select this option and the model does not include blocks that use time values, the target does not generate the counters.

☐ Off

Does not generate integer counters to represent absolute or elapsed time values. If you do not select this option and the model includes blocks that require absolute or elapsed time values, an error occurs during code generation.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- You must select this parameter if your model includes blocks that require absolute or elapsed time values.

Command-Line Information

Parameter: `SupportAbsoluteTime`
Type: string
Value: `'on' | 'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Off
Safety precaution	Off

See Also

"Using Timers"

Support: non-finite numbers

Specify whether to generate nonfinite data and operations.

Settings

Default: on

☑ On

Generates nonfinite data (for example, `NaN` and `Inf`) and related operations.

☐ Off

Does not generate nonfinite data and operations. If you clear this option, an error occurs if the code generator encounters nonfinite data or expressions. The error message reports offending blocks and parameters.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Support: floating-point numbers**.
- This parameter must be the same for top-level and referenced models.

Command-Line Information

Parameter: `SupportNonFinite`
Type: string
Value: `'on' | 'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Off (execution, ROM), No impact (RAM)
Safety precaution	Off

Support: continuous time

Specify whether to generate code for blocks that use continuous time.

Settings

Default: off

☑ On

Generates code for blocks that use continuous time.

☐ Off

Does not generate code for blocks that use continuous time. If you do not select this option and the model includes blocks that use continuous time, an error occurs during code generation.

Dependencies

- This option only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This option must be on if your model includes blocks that require absolute or elapsed time values.
- This option must be off when generating an S-function wrapper for an ERT target; the code generator does not support continuous time for this target scenario.
- If you have customized `ert_main.c` or `.cpp` to read model outputs after each base-rate model step, be aware that selecting the options **Support: continuous time** and **Single output/update function** together may cause output values read from `ert_main` for a continuous output port to differ from the corresponding output values in the model's logged data. This is because, while logged data is a snapshot of output at major time steps, output read from `ert_main` after the base-rate model step potentially reflects intervening minor time steps. To eliminate the discrepancy, either separate the generated output and update functions (clear the **Single output/update function** option) or place a Zero-Order Hold block before the continuous output port.

Command-Line Information

Parameter: `SupportContinuousTime`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Off (execution, ROM), No impact (RAM)
Safety precaution	Off

See Also

- "Using Discrete and Continuous Time"
- "Generating S-Function Wrappers"

Support: complex numbers

Specify whether to generate complex data and operations.

Settings

Default: on

☑ On

Generates complex numbers and related operations.

☐ Off

Does not generate complex data and related operations. If you clear this option, an error occurs if the code generator encounters complex data or expressions. The error message reports offending blocks and parameters.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter must be the same for top-level and referenced models.

Command-Line Information

Parameter: `SupportComplex`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	Off (for real only)
Safety precaution	No impact

Support: non-inlined S-functions

Specify whether to generate code for noninlined S-functions.

Settings

Default: Off

☑ On

Generates code for noninlined S-functions.

☐ Off

Does not generate code for noninlined S-functions. If this parameter is off and the model includes a noninlined S-function, an error occurs during the build process.

Tip

- Inlining S-functions is highly advantageous in production code generation, for example, for implementing device drivers. In such cases, clear this option to enforce use of inlined S-functions for code generation.
- Noninlined S-functions require additional memory and computation resources, and can result in significant performance issues. Consider using an inlined S-function when efficiency is a concern.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- Selecting this parameter also selects **Support: floating-point numbers** and **Support: non-finite numbers**. If you clear **Support: floating-point numbers** or **Support: non-finite numbers**, a warning is displayed during code generation because these parameters are required by the S-function interface.

Command-Line Information

Parameter: `SupportNonInlinedSFcns`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Off
Safety precaution	Off

See Also

- "Generating S-Function Wrappers"
- "Integrating External Code Using S-Functions"

Support: variable-size signals

Specify whether to generate code for models that use variable-size signals.

Settings

Default: Off

☑ On
  Generates code for models that use variable-size signals.

☐ Off
  Does not generate code for models that use variable-size signals. If this parameter is off and the model uses variable-size signals, an error occurs during code generation.

Dependencies

- This parameter only appears for ERT-based targets
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `SupportVariableSizeSignals`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Off
Safety precaution	Off

Multiword type definitions

Specify whether to use system-defined or user-defined type definitions for multiword data types in generated code.

Settings

Default: `System defined`

`System defined`
: Use the default system type definitions for multiword data types in generated code. During code generation, if multiword usage is detected, multiword types will be generated into the file `rtwtypes.h`.

`User defined`
: Allows you to control how multiword type definitions are handled during the code generation process. Selecting this value enables the associated parameter **Maximum word length**, which allows you to specify a maximum word length, in bits, for which the code generation process will generate multiword types into the file `rtwtypes.h`. The default maximum word length is 256. If you select 0, no multiword types are generated into the file `rtwtypes.h`, which provides you complete control over type definitions for multiword data types in generated code.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- Selecting the value `User defined` for this parameter enables the associated parameter **Maximum word length**.

Command-Line Information

Parameter: ERTMultiwordTypeDef
Type: string
Value: `'System defined'` | `'User defined'`
Default: `'System defined'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Specifying `User defined` and a low value for **Maximum word length** reduces the size of the generated file `rtwtypes.h`
Safety precaution	Use default

Maximum word length

Specify a maximum word length, in bits, for which the code generation process will generate system-defined multiword types

Settings

Default: `256`

Specify a maximum word length, in bits, for which the code generation process will generate multiword types into the file `rtwtypes.h`. All multiword types up to and including this number of bits will be generated. If you select 0, no multiword types are generated into the file `rtwtypes.h`, which provides you complete control over type definitions for multiword data types in generated code.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by selecting the value `User defined` for the parameter **Multiword type definitions**.

Command-Line Information

Parameter: ERTMaxMultiwordLength
Type: integer
Value: Any valid quantity of bits representing a word size
Default: `256`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	Smaller values reduce the size of the generated file `rtwtypes.h`
Safety precaution	Use default

GRT compatible call interface

Specify whether to generate model function calls compatible with the main program module of the GRT target.

Settings

Default: off

☑ On

Generates model function calls that are compatible with the main program module of the GRT target (`grt_main.c` or `grt_main.cpp`).

This option provides a quick way to use ERT target features with a GRT-based custom target that has a main program module based on `grt_main.c` or `grt_main.cpp`.

☐ Off

Disables the GRT compatible call interface.

Tips

The following are unsupported:

- Data type replacement
- Nonvirtual subsystem option **Function with separate data**

Dependencies

- This parameter only appears for ERT-based targets with **Language** set to `C` or `C++` (not `C++ (Encapsulated)`).
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- Selecting this parameter also selects the required option **Support: floating-point numbers**. If you subsequently clear **Support: floating-point numbers**, an error is displayed during code generation.
- Selecting this parameter disables the incompatible option **Single output/update function**. Clearing this parameter enables **Single output/update function**.

Command-Line Information

Parameter: `GRTInterface`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	Off
Efficiency	Off (execution, ROM), No impact (RAM)
Safety precaution	Off

See Also

"Using Discrete and Continuous Time"

Single output/update function

Specify whether to generate the *`model`*`_step` function.

Settings

Default: on

☑ On

Generates the *`model`*`_step` function for a model. This function contains the output and update function code for all blocks in the model and is called by `rt_OneStep` to execute processing for one clock period of the model at interrupt level.

☐ Off

Does not combine output and update function code into a single function, and instead generates the code in separate *`model`*`_output` and *`model`*`_update` functions.

Tips

Errors or unexpected behavior can occur if a Model block is part of a cycle, the Model block is a direct feedthrough block, and an algebraic loop results. See "Model Blocks and Direct Feedthrough" for details.

Real-Time Workshop ignores this parameter for a referenced model if any of the following conditions apply to that model:

- Is multi-rate
- Has a continuous sample time
- Is logging states (using the **States** or **Final States** parameters in the **Configuration Parameters > Data Import/Export** pane

Dependencies

- This option only appears for ERT-based targets with **Language** set to `C` or `C++` (not `C++ (Encapsulated)`).
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

- This option and **GRT compatible call interface** are mutually incompatible and cannot both be selected through the GUI. Selecting **GRT compatible call interface** disables this option and clearing **GRT compatible call interface** enables this option.
- When you use this option, you must clear the option **Minimize algebraic loop occurrences** on the **Model Referencing** pane.
- If you have customized `ert_main.c` or `.cpp` to read model outputs after each base-rate model step, be aware that selecting the options **Support: continuous time** and **Single output/update function** together may cause output values read from `ert_main` for a continuous output port to differ from the corresponding output values in the model's logged data. This is because, while logged data is a snapshot of output at major time steps, output read from `ert_main` after the base-rate model step potentially reflects intervening minor time steps. To eliminate the discrepancy, either separate the generated output and update functions (clear the **Single output/update function** option) or place a Zero-Order Hold block before the continuous output port.

Command-Line Information

Parameter: `CombineOutputUpdateFcns`
Type: string
Value: `'on'` | `'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	On
Efficiency	On
Safety precaution	On

See Also

"rt_OneStep and Scheduling Considerations"

Terminate function required

Specify whether to generate the *`model`*`_terminate` function.

Settings

Default: on

☑ On

Generates a *`model`*`_terminate` function. This function contains all model termination code and should be called as part of system shutdown.

☐ Off

Does not generate a *`model`*`_terminate` function. Suppresses the generation of this function if you designed your application to run indefinitely and does not require a terminate function.

Dependencies

- This parameter only appears for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter must be the same for top-level and referenced models.

Command-Line Information

Parameter: `IncludeMdlTerminateFcn`
Type: string
Value: `'on'` | `'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	Off (execution, ROM), No impact (RAM)
Safety precaution	Off

See Also

`model_terminate`

Generate reusable code

Specify whether to generate reusable, reentrant code.

Settings

Default: off

☑ On

Generates reusable, multi-instance code that is reentrant. The code generator passes model data structures (root-level inputs and outputs, block states, parameters, and external outputs) in, by reference, as arguments to `model_step` and the other model entry point functions. The data structures are also exported with `model.h`. For efficiency, the code generator passes in only data structures that are used. Therefore, when you select this option, the argument lists generated for the entry point functions vary according to model requirements.

☐ Off

Does not generate reusable code. Model data structures are statically allocated and accessed by model entry point functions directly in the model code.

Tips

- Entry points are exported with `model.h`. To call the entry-point functions from hand-written code, add an `#include model.h` directive to the code. If this option is selected, you must examine the generated code to determine the calling interface required for these functions.
- When this option is selected, the code generator generates a pointer to the real-time model object (`model_M`).
- In some cases, when this option is selected, the code generator might generate code that compiles but is not reentrant. For example, if any signal, DWork structure, or parameter data has a storage class other than `Auto`, global data structures are generated.

Dependencies

- This parameter only appears for ERT-based targets with **Language** set to `C` or `C++` (not `C++ (Encapsulated)`).
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter enables **Reusable code error diagnostic** and **Pass root-level I/O as**.
- You must clear this option if you are using:
  - The static `ert_main.c` module, rather than generating a main program
  - The `model_step` function prototype control capability
  - The subsystem parameter **Function with separate data**
  - A subsystem that
    - Has multiple ports that share the same source
    - Has a port used by multiple instances has different sample times, data types, complexity, frame status, or dimension across the instances
    - Has output marked as a global signal
    - For each instance contains identical blocks with different names or parameter settings
- This parameter has no effect on code generated for function-call subsystems.

Command-Line Information

Parameter: `MultiInstanceERTCode`
Type: string
Value: `'on'` | `'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On (for single instance)
Safety precaution	No impact

See Also

- "Model Entry Points"
- "Creating Subsystems"
- "Code Reuse Limitations"
- "Determining Why Subsystem Code Is Not Reused"
- "Writing S-Functions That Support Code Reuse"
- "Static Main Program Module"
- "Controlling Generation of Function Prototypes"
- "Nonvirtual Subsystem Modular Function Code Generation"
- "Exporting Function-Call Subsystems"
- `model_step`

Reusable code error diagnostic

Select the severity level for diagnostics displayed when a model violates requirements for generating reusable code.

Settings

Default: `Error`

`None`
: Proceed with build without displaying a diagnostic message.

`Warning`
: Proceed with build after displaying a warning message.

`Error`
: Abort build after displaying an error message.

Under certain conditions, the Real-Time Workshop Embedded Coder software might

- Generate code that compiles but is not reentrant. For example, if signal, DWork structure, or parameter data has a storage class other than `Auto`, global data structures are generated.
- Be unable to generate valid and compilable code. For example, if the model contains an S-function that is not code-reuse compliant or a subsystem triggered by a wide function-call trigger, the coder generates invalid code, displays an error message, and terminates the build.

Dependencies

- This parameter only appears for ERT-based targets with **Language** set to `C` or `C++` (not `C++ (Encapsulated)`).
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Generate reusable code**.

Command-Line Information

Parameter: `MultiInstanceErrorCode`
Type: string
Value: `'None' | 'Warning' | 'Error'`
Default: `'Error'`

Recommended Settings

Application	Setting
Debugging	`Warning` or `Error`
Traceability	No impact
Efficiency	`None`
Safety precaution	No impact

See Also

- "Model Entry Points"
- "Creating Subsystems"
- "Code Reuse Limitations"
- "Determining Why Subsystem Code Is Not Reused"
- "Nonvirtual Subsystem Modular Function Code Generation"

Pass root-level I/O as

Control how root-level model input and output are passed to the `model_step` function.

Settings

Default: `Individual arguments`

`Individual arguments`
: Passes each root-level model input and output value to `model_step` as a separate argument.

`Structure reference`
: Packs all root-level model input into a `struct` and passes `struct` to `model_step` as an argument. Similarly, packs root-level model output into a second `struct` and passes it to `model_step`.

Dependencies

- This parameter only appears for ERT-based targets with **Language** set to `C` or `C++` (not `C++ (Encapsulated)`).
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is enabled by **Generate reusable code**.

Command-Line Information

Parameter: `RootIOFormat`
Type: string
Value: `'Individual arguments'` | `'Structure reference'`
Default: `'Individual arguments'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	No impact
Safety precaution	No impact

See Also

- "Model Entry Points"
- "Creating Subsystems"
- "Nonvirtual Subsystem Modular Function Code Generation"
- `model_step`

Block parameter visibility

Specify whether to generate the block parameter structure as a `public`, `private`, or `protected` data member of the C++ model class.

Settings

Default: `private`

`public`
: Generates the block parameter structure as a `public` data member of the C++ model class.

`private`
: Generates the block parameter structure as a `private` data member of the C++ model class.

`protected`
: Generates the block parameter structure as a `protected` data member of the C++ model class.

Dependencies

- This parameter appears only for ERT-based targets with **Language** set to `C++ (Encapsulated)`.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `ParameterMemberVisibility`
Type: string
Value: `'public' | 'private' | 'protected'`
Default: `'private'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	`protected`

See Also

"Configuring Code Interface Options"

Internal data visibility

Specify whether to generate internal data structures such as Block I/O, DWork vectors, Run-time model, Zero-crossings, and continuous states as `public`, `private`, or `protected` data members of the C++ model class.

Settings

Default: `private`

`public`
: Generates internal data structures as `public` data members of the C++ model class.

`private`
: Generates internal data structures as `private` data members of the C++ model class.

`protected`
: Generates internal data structures as `protected` data members of the C++ model class.

Dependencies

- This parameter appears only for ERT-based targets with **Language** set to `C++ (Encapsulated)`.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `InternalMemberVisibility`
Type: string
Value: `'public' | 'private' | 'protected'`
Default: `'private'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	`protected`

See Also

“Configuring Code Interface Options”

Block parameter access

Specify whether to generate access methods for block parameters for the C++ model class.

Settings

Default: `None`

`None`
: Does not generate access methods for block parameters for the C++ model class.

`Method`
: Generates noninlined access methods for block parameters for the C++ model class.

`Inlined method`
: Generates inlined access methods for block parameters for the C++ model class.

Dependencies

- This parameter appears only for ERT-based targets with **Language** set to `C++ (Encapsulated)`.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `GenerateParameterAccessMethods`
Type: string
Value: `'None' | 'Method' | 'Inlined method'`
Default: `'None'`

Recommended Settings

Application	Setting
Debugging	`Inlined method`
Traceability	`Inlined method`
Efficiency	`Inlined method`
Safety precaution	`None`

See Also

"Configuring Code Interface Options"

Internal data access

Specify whether to generate access methods for internal data structures, such as Block I/O, DWork vectors, Run-time model, Zero-crossings, and continuous states, for the C++ model class.

Settings

Default: `None`

`None`
: Does not generate access methods for internal data structures for the C++ model class.

`Method`
: Generates noninlined access methods for internal data structures for the C++ model class.

`Inlined method`
: Generates inlined access methods for internal data structures for the C++ model class.

Dependencies

- This parameter appears only for ERT-based targets with **Language** set to `C++ (Encapsulated)`.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `GenerateInternalMemberAccessMethods`
Type: string
Value: `'None' | 'Method' | 'Inlined method'`
Default: `'None'`

Recommended Settings

Application	Setting
Debugging	`Inlined method`
Traceability	`Inlined method`
Efficiency	`Inlined method`
Safety precaution	`None`

See Also

"Configuring Code Interface Options"

External I/O access

Specify whether to generate access methods for root-level I/O signals for the C++ model class.

Note This parameter affects generated code only if you are using the default (`void-void` style) step method for your model class; *not* if you are explicitly passing arguments for root-level I/O signals using an I/O arguments style step method. For more information, see “Passing No Arguments (void-void)” and “Passing I/O Arguments”.

Settings

Default: `None`

`None`
: Does not generate access methods for root-level I/O signals for the C++ model class.

`Method`
: Generates noninlined access methods for root-level I/O signals for the C++ model class.

`Inlined method`
: Generates inlined access methods for root-level I/O signals for the C++ model class.

Dependencies

- This parameter appears only for ERT-based targets with **Language** set to `C++ (Encapsulated)`.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `GenerateExternalIOAccessMethods`
Type: string
Value: `'None'` | `'Method'` | `'Inlined method'`
Default: `'None'`

Recommended Settings

Application	Setting
Debugging	`Inlined method`
Traceability	`Inlined method`
Efficiency	`Inlined method`
Safety precaution	`None`

See Also

"Configuring Code Interface Options"

Generate destructor

Specify whether to generate a destructor for the C++ model class.

Settings

Default: on

☑ On

Generates a destructor for the C++ model class.

☐ Off

Does not generate a destructor for the C++ model class.

Dependencies

- This parameter appears only for ERT-based targets with **Language** set to `C++ (Encapsulated)`.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `GenerateDestructor`
Type: string
Value: `'on' | 'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	Off

See Also

“Configuring Code Interface Options”

Use operator new for referenced model object registration

Specify whether generated code uses the operator `new`, during model object registration, to instantiate objects for referenced models configured with a C++ encapsulation interface.

Settings

Default: off

☑ On

Generates code that uses dynamic memory allocation to instantiate objects for referenced models configured with a C++ encapsulation interface. Specifically, during instantiation of an object for the top model in a model reference hierarchy, the generated code uses `new` to instantiate objects for referenced models.

Selecting this option frees a parent model from having to maintain information about submodels beyond its direct children.

☐ Off

Does not generate code that uses `new` to instantiate referenced model objects.

Clearing this option means that a parent model maintains information about all of its submodels, including its direct and indirect children.

Dependencies

- This parameter appears only for ERT-based targets with **Language** set to `C++ (Encapsulated)`.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Command-Line Information

Parameter: `UseOperatorNewForModelRefRegistration`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	On
Safety precaution	Off

See Also

"Configuring Code Interface Options"

Generate preprocessor conditionals

Generate preprocessor conditional directives globally for a model or locally for each Model block with variant models.

Settings

Default: `Use local settings`

`Use local settings`
: Generates preprocessor conditional directives based on the value of the **Generate preprocessor conditionals** parameter on the Model block parameters dialog. If you select the **Generate preprocessor conditionals** parameter in the Model block parameters dialog, the generated code contains preprocessor conditional directives for all variant models of that Model block. If you do not select this parameter for a Model block, code is generated for the active variant model.

`Enable all`
: Generates preprocessor conditional directives for all variant models of the Model blocks. Disables the **Generate preprocessor conditionals** parameter in the Model block parameters dialog.

`Disable all`
: Only generates code for the active variant model of the Model block. Disables the **Generate preprocessor conditionals** parameter in the Model block parameters dialog for all Model blocks.

Tips

For generating preprocessor directives we recommend the following settings:

- Select the “Inline parameters” parameter on the Optimization pane of the Configuration Parameters dialog box.
- Deselect the “Ignore custom storage classes” on page 6-21 parameter on the Real-Time Workshop pane of the Configuration Parameters dialog.

Dependencies

- This parameter only appears for ERT-based targets.

- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- Setting this parameter to `Use local settings` enables **Generate preprocessor conditionals** parameter on the Model block parameters dialog.
- Setting this parameter to `Enable all` or `Disable all` disables the **Generate preprocessor conditionals** check box on the Model block parameters dialog.
- Setting this parameter to `Enable all` sets the **Selected variant** control on the Model block parameter dialog to `(derive from conditions)`.

Command-Line Information

Parameter: `GeneratePreprocessorConditionals`
Type: string
Value: `'Use local settings'` | `'Enable all'` | `'Disable all'`
Default: `'Use local settings'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

- "Using Model Reference Variants"
- "Generating Code Variants for Variant Models"

Suppress error status in real-time model data structure

Specify whether to log or monitor error status.

Settings

Default: off

☑ On

Omits the error status field from the generated real-time model data structure `rtModel`. This option reduces memory usage.

Be aware that selecting this option can cause the code generator to omit the `rtModel` data structure from generated code.

☐ Off

Includes an error status field in the generated real-time model data structure `rtModel`. You can use available macros to monitor the field for error message data or set it with error message data.

Dependencies

- This parameter appears only for ERT-based targets.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
- This parameter is cleared if you select the incompatible option **MAT-file logging**. If you subsequently select this parameter, code generation displays an error.
- Selecting this parameter clears **Support: continuous time**.
- If your application contains multiple integrated models, the setting of this option must be the same for all of the models to avoid unexpected application behavior. For example, if you select the option for one model but not another, an error status might not get registered by the integrated application.

Command-Line Information

Parameter: `SuppressErrorStatus`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	Off
Traceability	No impact
Efficiency	On
Safety precaution	On

See Also

"Using the Real-Time Model Data Structure"

Configure Model Functions

Click the **Configure Model Functions** button to open the Model Interface dialog box. In this dialog box, you can specify whether the code generator uses default `*model*_initialize` and `*model*_step` function prototypes or model-specific C prototypes. Based on your selection, you can preview and modify the function prototypes.

Dependencies

- This button appears only for ERT-based targets with **Language** set to `C` or `C++` (not `C++ (Encapsulated)`).
- This button requires a Real-Time Workshop Embedded Coder license when generating code.
- This button is active only if your model uses an attached configuration set. If your model uses a referenced configuration set, the button is greyed out. If you want to configure a model-specific step function prototype for a referenced configuration set, use the MATLAB function prototype control functions described in “Configuring Model Function Prototypes Programmatically”.

See Also

- “Controlling Generation of Function Prototypes”
- `model_initialize`
- `model_step`
- “Launching the Model Interface Dialog Boxes”

Configure C++ Encapsulation Interface

Click the **Configure C++ Encapsulation Interface** button to open the Configure C++ encapsulation interface dialog box. In this dialog box, you can customize the C++ class interface for your model code. Based on your selections, you can preview and modify the model-specific C++ encapsulation interface.

Dependencies

- This button appears only for ERT-based targets with **Language** set to `C++ (Encapsulated)`.
- This button requires a Real-Time Workshop Embedded Coder license when generating code.
- This button is active only if your model uses an attached configuration set. If your model uses a referenced configuration set, the button is greyed out. If you want to configure a model-specific C++ encapsulation interface for a referenced configuration set, use the MATLAB C++ encapsulation interface control functions described in "Configuring C++ Encapsulation Interfaces Programmatically".

See Also

- "Controlling Generation of Encapsulated C++ Model Interfaces"
- `model_step`
- "Configuring the Step Method for Your Model Class"

MAT-file logging

Specify whether to enable MAT-file logging.

Settings

Default: off

☑ On

Enables MAT-file logging. When you select this option, the generated code saves to MAT-files any data specified in the **Configuration Parameters > Data Import/Export Pane > Save to workspace** subpane, and the data specified by any To Workspace blocks. See “Data Import/Export Pane” and To Workspace. In simulation, this data would be written to the MATLAB workspace, as described in “Exporting Data to the MATLAB Base Workspace”, but setting MAT-file logging redirects the data to a MAT-file instead. The file is named `model.mat`, where `model` is the name of your model.

☐ Off

Disables MAT-file logging. Clearing this option has the following benefits:

- Eliminates overhead associated with supporting a file system, which typically is not needed for embedded applications
- Eliminates extra code and memory usage required to initialize, update, and clean up logging variables
- Under certain conditions, eliminates code and storage associated with root output ports
- Omits the comparison between the current time and stop time in the `model_step`, allowing the generated program to run indefinitely, regardless of the stop time setting

Dependencies

- This parameter only appears for ERT-based targets and the Tornado® target.
- This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

- Selecting this parameter also selects the required options **Support: floating-point numbers**, **Support: non-finite numbers**, and **Terminate function required**. If you subsequently clear **Support: floating-point numbers**, **Support: non-finite numbers**, or **Terminate function required**, an error is displayed during code generation.
- Selecting this parameter clears the incompatible option **Suppress error status in real-time model data structure**. If you subsequently select **Suppress error status in real-time model data structure**, an error is displayed during code generation.
- Selecting this parameter enables **MAT-file variable name modifier**.
- Clear this option if you are using exported function calls.

Limitation

MAT-file logging does not work in a referenced model, and no code is generated to implement it.

Command-Line Information

Parameter: `MatFileLogging`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	Off
Safety precaution	Off

See Also

"Using Virtualized Output Ports Optimization"

MAT-file variable name modifier

Select the string to add to MAT-file variable names.

Settings

Default: `rt_`

`rt_`
: Adds a prefix string.

`_rt`
: Adds a suffix string.

`none`
: Does not add a string.

Dependency

When an ERT target is selected, this parameter is enabled by **MAT-file logging**.

Command-Line Information

Parameter: `LogVarNameModifier`
Type: string
Value: `'none'` | `'rt_'` | `'_rt'`
Default: `'rt_'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

"Data Logging"

Interface

Specify the data exchange interface (API) to include.

Settings

Default: `None`

`None`
: Does not include an API in the generated code.

`C API`
: Uses the `C API` data interface.

`External mode`
: Uses an external data interface.

`ASAP2`
: Uses the `ASAP2` data interface.

Dependencies

Selecting **C API** enables the following parameters:

- **Generate interface to: signals**
- **Generate interface to: parameters**
- **Generate interface to: states**

Selecting **External mode** enables the following parameters:

- **Transport layer**
- **MEX-file arguments**
- **Static memory allocation**

Command-Line Information

Parameter: see table
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

To enable...	Set this parameter...	To this value...
`None`	`RTWCAPIParams`, `RTWCAPISignals`, `RTWCAPIStates`, `ExtMode`, `GenerateASAP2`	`'off'`
`C API`	`RTWCAPIParams`, `RTWCAPISignals`, `RTWCAPIStates`	`'on'`
`External mode`	`ExtMode`	`'on'`
`ASAP2`	`GenerateASAP2`	`'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact during development `None` for production code generation

See Also

- "Interacting with Target Application Data Using the C API"
- "Communicating With Code Executing on a Target System Using Simulink External Mode"
- "Using External Mode with the ERT Target"

- “Generating Model Information for Host-Based ASAP2 Data Measurement and Calibration”

Generate C API for: signals

Generate a C API signals structure.

Settings

Default: on

☑ On
    Generates C API interface to global block outputs.

☐ Off
    Does not generate C API signals.

Dependency

This parameter is enabled by selecting **Interface** > `C API`.

Command-Line Information

Parameter: `RTWCAPISignals`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

"Interacting with Target Application Data Using the C API"

Generate C API for: parameters

Generate C API parameter tuning structures.

Settings

Default: on

☑ On

Generates C API interface to global block parameters.

☐ Off

Does not generate C API parameters.

Dependency

This parameter is enabled by selecting **Interface** > `C API`.

Command-Line Information

Parameter: `RTWCAPIParams`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

"Interacting with Target Application Data Using the C API"

Generate C API for: states

Generate a C API states structure.

Settings

Default: off

☑ On

Generates C API interface to discrete and continuous states.

☐ Off

Does not generate C API states.

Dependency

This parameter is enabled by selecting **Interface** > `C API`.

Command-Line Information

Parameter: `RTWCAPIStates`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

"Interacting with Target Application Data Using the C API"

Transport layer

Specify the transport protocol for external mode communications.

Settings

Default: `tcpip`

`tcpip`
: Applies a TCP/IP transport mechanism. The MEX-file name is `ext_comm`.

`serial_win32`
: Applies a serial transport mechanism. The MEX-file name is `ext_serial_win32_comm`.

Tip

The **MEX-file name** displayed next to **Transport layer** cannot be edited in the Configuration Parameters dialog box. The value is specified either in *`matlabroot`*`/toolbox/simulink/simulink/extmode_transports.m`, for targets provided by The MathWorks™, or in an `sl_customization.m` file, for custom targets and/or custom external mode transports.

Dependency

This parameter is enabled by selecting `External mode` in the **Interface** parameter.

Command-Line Information

Parameter: `ExtModeTransport`
Type: integer
Value: `0 | 1`
Default: `0`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

- “Target Interfacing”
- “Creating a TCP/IP Transport Layer for External Communication”

MEX-file arguments

Specify arguments to pass to an external mode interface MEX-file for communicating with executing targets.

Settings

Default: `""`

For TCP/IP interfaces, `ext_comm` allows three optional arguments:

- Network name of your target (for example, `'myPuter'` or `'148.27.151.12'`)
- Verbosity level (`0` for no information or `1` for detailed information)
- TCP/IP server port number (an integer value between `256` and `65535`, with a default of `17725`)

For a serial transport, `ext_serial_win32_comm` allows three optional arguments:

- Verbosity level (`0` for no information or `1` for detailed information)
- Serial port ID (for example, `1` for `COM1`, and so on)
- Baud rate (selected from the set `1200`, `2400`, `4800`, `9600`, `14400`, `19200`, `38400`, `57600`, `115200`, with a default baud rate of `57600`)

Dependency

Depending on the specified "System target file" on page 6-6, this parameter is enabled by **Data Exchange > Interface > External mode** or by **External Mode**.

Command-Line Information

Parameter: `ExtModeMexArgs`
Type: string
Value: any valid arguments
Default: `""`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

- "Target Interfacing"
- "Client/Server Implementations"

Static memory allocation

Control memory buffer for external mode communication.

Settings

Default: off

☑ On

Enables the **Static memory buffer size** parameter for allocating dynamic memory.

☐ Off

Uses a static memory buffer for external mode instead of allocating dynamic memory (calls to malloc).

Tip

To determine how much memory you need to allocate, select verbose mode on the target to display the amount of memory it tries to allocate and the amount of memory available.

Dependencies

- Depending on the specified “System target file” on page 6-6, this parameter is enabled by **Data Exchange > Interface > External mode** or by **External Mode**.
- This parameter enables **Static memory buffer size**.

Command-Line Information

Parameter: `ExtModeStaticAlloc`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

"External Mode Interface Options"

Static memory buffer size

Specify the memory buffer size for external mode communication.

Settings

Default: `1000000`

Enter the number of bytes to preallocate for external mode communications buffers in the target.

Tips

- If you enter too small a value for your application, external mode issues an out-of-memory error.
- To determine how much memory you need to allocate, select verbose mode on the target to display the amount of memory it tries to allocate and the amount of memory available.

Dependency

This parameter is enabled by **Static memory allocation**.

Command-Line Information

Parameter: `ExtModeStaticAllocSize`
Type: integer
Value: any valid value
Default: `1000000`

Recommended Settings

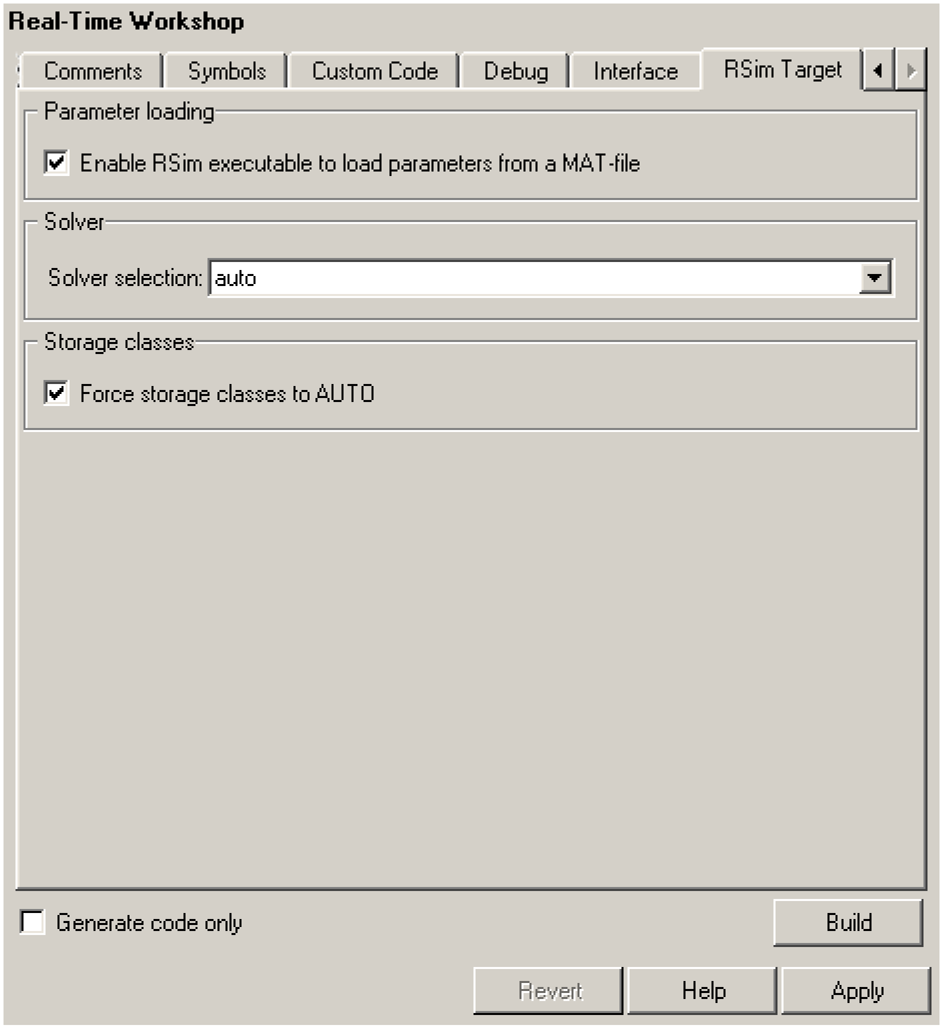
Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

"External Mode Interface Options"

Real-Time Workshop Pane: RSim Target

The Real-Time Workshop RSim Target pane includes the following parameters when the Real-Time Workshop product is installed on your system and you specify the `rsim.tlc` system target file.



Real-Time Workshop

Parameter loading

☑ Enable RSim executable to load parameters from a MAT-file

Solver

Solver selection: auto

Storage classes

☑ Force storage classes to AUTO

☐ Generate code only

In this section...

Real-Time Workshop: RSim Target Tab Overview

Set configuration parameters for rapid simulation.

Configuration

This tab appears only if you specify the `rsim.tlc` system target file.

See Also

- Configuring and Building a Model for Rapid Simulation
- Running Rapid Simulations
- "Real-Time Workshop Pane: RSim Target" on page 6-221

Enable RSim executable to load parameters from a MAT-file

Specify whether to load RSim parameters from a MAT-file.

Settings

Default: on

☑ On
  Enables RSim to load parameters from a MAT-file.

☐ Off
  Disables RSim from loading parameters from a MAT-file.

Command-Line Information

Parameter: `RSIM_PARAMETER_LOADING`
Type: string
Value: `'on'` | `'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

Creating a MAT-File That Includes a Model's Parameter Structure

Solver selection

Instruct the target how to select the solver.

Settings

Default: `auto`

`auto`
: Lets the target choose the solver. The target uses the Simulink solver module if you specify a variable-step solver on the Solver pane. Otherwise, the target uses a Real-Time Workshop built-in solver.

`Use Simulink solver module`
: Instructs the target to use the variable-step solver that you specify on the Solver pane.

`Use Real-Time Workshop fixed-step solvers`
: Instructs the target to use the fixed-step solver that you specify on the Solver pane.

Command-Line Information

Parameter: `RSIM_SOLVER_SELECTION`
Type: string
Value: `'auto'` | `'usesolvermodule'` | `'usefixstep'`
Default: `'auto'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Force storage classes to AUTO

Specify whether to retain your storage class settings in a model or to use the automatic settings.

Settings

Default: on

☑ On
Forces the Simulink software to determine all storage classes.

☐ Off
Causes the model to retain storage class settings.

Tips

- Turn this parameter on for flexible custom code interfacing.
- Turn this parameter off when it is necessary to retain storage class settings such as `ExportedGlobal` or `ImportExtern`.

Command-Line Information

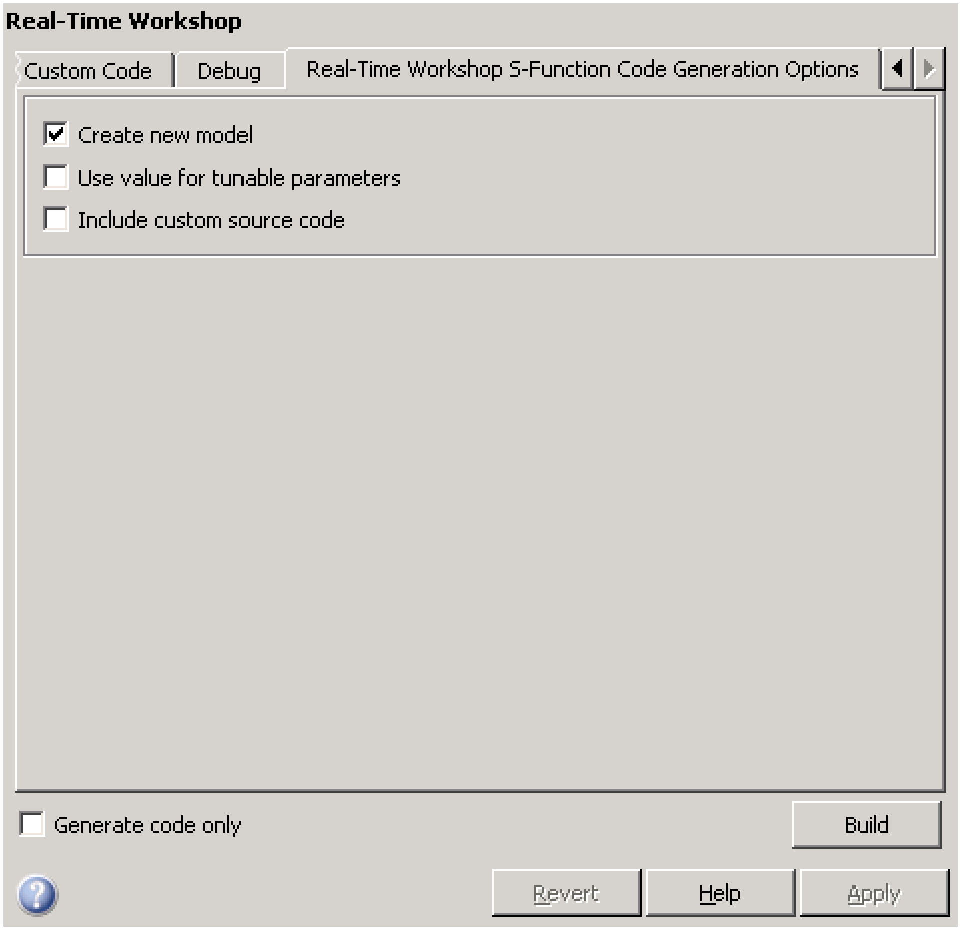
Parameter: `RSIM_STORAGE_CLASS_AUTO`
Type: string
Value: `'on'` | `'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

Real-Time Workshop Pane: Real-Time Workshop S-Function Code Generation Options

The Real-Time Workshop S-Function Code Generation Options pane includes the following parameters when the Real-Time Workshop product is installed on your system and you specify the `rtwsfcn.tlc` system target file.



Real-Time Workshop

Custom Code | Debug | Real-Time Workshop S-Function Code Generation Options

- [✓] Create new model
- [ ] Use value for tunable parameters
- [ ] Include custom source code

- [ ] Generate code only

In this section...

Real-Time Workshop S-Function Code Generation Options Tab Overview

Control Real-Time Workshopcode generated for the S-function target (`rtwsfcn.tlc`).

Configuration

This tab appears only if you specify the S-function target (`rtwsfcn.tlc`) **System target file**.

See Also

- Real-Time Workshop S-Function Code Generation Options
- S-Function Target
- "Real-Time Workshop Pane: Real-Time Workshop S-Function Code Generation Options" on page 6-227

Create new model

Create a new model containing the generated Real-Time Workshop S-function block.

Settings

Default: on

☑ On

Creates a new model, separate from the current model, containing the generated Real-Time Workshop S-function block.

☐ Off

Generates code but a new model is not created.

Command-Line Information

Parameter: `CreateModel`
Type: string
Value: `'on' | 'off'`
Default: `'on'`

See Also

S-Function Target

Use value for tunable parameters

Use the variable value instead of the variable name in generated block mask edit fields for tunable parameters.

Settings

Default: off

☑ On

Uses variable values for tunable parameters instead of the variable name in the generated block mask edit fields.

☐ Off

Uses variable names for tunable parameters in the generated block mask edit fields.

Command-Line Information

Parameter: `UseParamValues`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

See Also

S-Function Target

Include custom source code

Include custom source code in the code generated for the Real-Time Workshop S-function.

Settings

Default: off

☑ On
: Always include provided custom source code in the code generated for the Real-Time Workshop S-function.

☐ Off
: Do not include custom source code in the code generated for the Real-Time Workshop S-function.

Command-Line Information

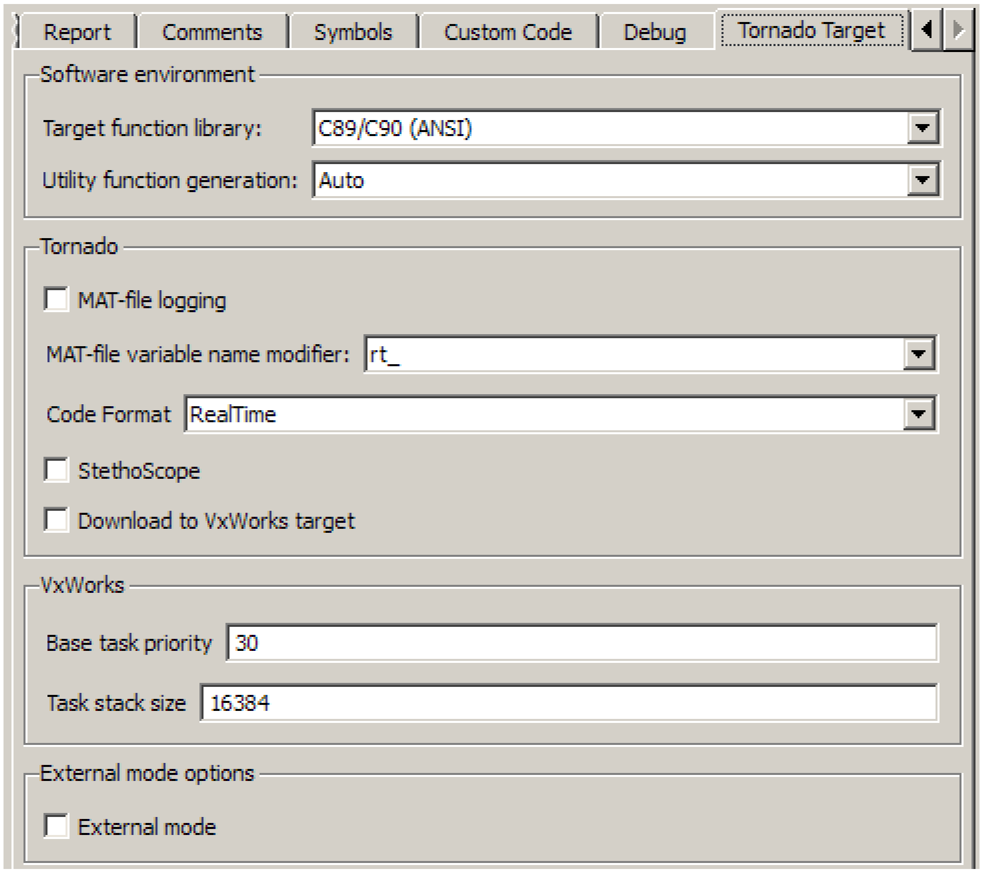
Parameter: `AlwaysIncludeCustomSrc`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

See Also

S-Function Target

Real-Time Workshop Pane: Tornado Target

The Real-Time Workshop Tornado Target pane includes the following parameters when the Real-Time Workshop product is installed on your system and you specify the `tornado.tlc` system target file.



Software environment

Target function library: C89/C90 (ANSI)

Utility function generation: Auto

Tornado

☐ MAT-file logging

MAT-file variable name modifier: rt_

Code Format RealTime

☐ StethoScope

☐ Download to VxWorks target

VxWorks

Base task priority 30

Task stack size 16384

External mode options

☐ External mode

In this section...

Real-Time Workshop: Tornado Target Tab Overview

Control Real-Time Workshop generated code for the Tornado Target.

Configuration

This tab appears only if you specify `tornado.tlc` as the System target file.

See Also

- *Tornado User's Guide* from Wind River® Systems
- *StethoScope User's Guide* from Wind River Systems
- Targeting Tornado for Real-Time Applications
- "Real-Time Workshop Pane: Tornado Target" on page 6-233

Target function library

Specify a target-specific math library for your model.

Settings

Default: `C89/C90 (ANSI)`

`C89/C90 (ANSI)`
: Generates calls to the ISO/IEC 9899:1990 C standard math library for floating-point functions.

`C99 (ISO)`
: Generates calls to the ISO/IEC 9899:1999 C standard math library.

`GNU99 (GNU)`
: Generates calls to the GNU gcc math library, which provides C99 extensions as defined by compiler option `-std=gnu99`.

`C++ (ISO)`
: Generates calls to the ISO/IEC 14882:2003 C++ standard math library. This setting is visible only if you selected `C++` for the **Language** parameter on the **Real-Time Workshop** pane of the Configuration Parameters dialog box.

Tip

Before setting this parameter, verify that your compiler supports the library you want to use. If you select a parameter value that your compiler does not support, compiler errors can occur.

Command-Line Information

Parameter: `GenFloatMathFcnCalls`
Type: string
Value: `'ANSI_C'` | `'C99 (ISO)'` | `'GNU99 (GNU)'` | `'C++ (ISO)'`
Default: `'ANSI_C'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Any valid library
Safety precaution	No impact

See Also

Configuring Model Interfaces

Utility function generation

Specify the location for generating utility functions.

Settings

Default: `Auto`

`Auto`

Operates as follows:

- When the model contains Model blocks, place utilities within the `slprj/target/_sharedutils` directory.
- When the model does not contain Model blocks, place utilities in the build directory (generally, in *`model`*`.c` or *`model`*`.cpp`).

`Shared location`

Directs code for utilities to be placed within the `slprj` directory in your working directory.

Command-Line Information

Parameter: `UtilityFuncGeneration`
Type: string
Value: `'Auto'` | `'Shared location'`
Default: `'Auto'`

Recommended Settings

Application	Setting
Debugging	`Shared location`
Traceability	`Shared location`
Efficiency	No impact (execution, RAM), `Shared location` (ROM)
Safety precaution	No impact

See Also

Configuring Model Interfaces

MAT-file logging

Specify whether to enable MAT-file logging.

Settings

Default: off

☑ On

Enables MAT-file logging. When you select this option, the generated code saves to MAT-files any data specified in the **Configuration Parameters > Data Import/Export Pane > Save to workspace** subpane, and the data specified by any To Workspace blocks. See “Data Import/Export Pane” and To Workspace. In simulation, this data would be written to the MATLAB workspace, as described in “Exporting Data to the MATLAB Base Workspace”, but setting MAT-file logging redirects the data to a MAT-file instead. The file is named `*model*.mat`, where *`model`* is the name of your model.

☐ Off

Disables MAT-file logging. Clearing this option has the following benefits:

- Eliminates overhead associated with supporting a file system, which typically is not needed for embedded applications
- Eliminates extra code and memory usage required to initialize, update, and clean up logging variables
- Under certain conditions, eliminates code and storage associated with root output ports
- Omits the comparison between the current time and stop time in the `*model*_step`, allowing the generated program to run indefinitely, regardless of the stop time setting

Dependencies

This parameter only appears for ERT-based targets and the Tornado target.

Limitation

MAT-file logging does not work in a referenced model, and no code is generated to implement it.

Command-Line Information

Parameter: `MatFileLogging`
Type: string
Value: `'on'` | `'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact
Efficiency	Off
Safety precaution	Off

See Also

Using Virtualized Output Ports Optimization

MAT-file variable name modifier

Select the string to add to the MAT-file variable names.

Settings

Default: `rt_`

`rt_`
: Adds a prefix string.

`_rt`
: Adds a suffix string.

`none`
: Does not add a string.

Dependency

When an ERT target is selected, this parameter is enabled by **MAT-file logging**.

Command-Line Information

Parameter: `LogVarNameModifier`
Type: string
Value: `'none'` | `'rt_'` | `'_rt'`
Default: `'rt_'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

Data Logging

Code Format

Specify the code generation format.

Settings

Default: `RealTime`

`RealTime`
: Specifies the Real-Time code generation format.

`RealTimeMalloc`
: Specifies the Real-Time Malloc code generation format.

Command-Line Information

Parameter: `CodeFormat`
Type: string
Value: `'RealTime' | 'RealTimeMalloc'`
Default: `'RealTime'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

Targeting Tornado for Real-Time Applications

StethoScope

Specify whether to enable StethoScope, an optional data acquisition and data monitoring tool.

Settings

Default: off

☑ On
  Enables StethoScope.

☐ Off
  Disables StethoScope.

Tips

You can optionally monitor and change the parameters of the executing real-time program using either StethoScope or Simulink external mode, but not both with the same compiled image.

Dependencies

Enabling **StethoScope** automatically disables **External mode**, and vice versa.

Command-Line Information

Parameter: `StethoScope`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	On
Traceability	No impact

Application	Setting
Efficiency	Off
Safety precaution	Off

See Also

- *Tornado User's Guide* from Wind River Systems
- *StethoScope User's Guide* from Wind River Systems
- Targeting Tornado for Real-Time Applications
- StethoScope Tasks
- StethoScope Monitoring

Download to VxWorks target

Specify whether to automatically download the generated program to the VxWorks target.

Settings

Default: off

☑ On

Automatically downloads the generated program to VxWorks after each build.

☐ Off

Does not automatically download to VxWorks, you must downloaded generated programs manually.

Tips

- Automatic download requires specifying the target name and host name in the makefile, as described in Configuring for Automatic Downloading.
- Before every build, reset VxWorks by pressing **Ctrl+X** on the host console or power-cycling the VxWorks chassis. This ensures that no dangling processes or stale data exist in VxWorks when the automatic download occurs.

Command-Line Information

Parameter: `DownloadToVxWorks`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	No impact
Safety precaution	Off

See Also

- *Tornado User's Guide* from Wind River Systems
- Targeting Tornado for Real-Time Applications
- Configuring for Automatic Downloading
- Building the Application
- Automatic Download and Execution

Base task priority

Specify the priority with which the base rate task for the model is to be spawned.

Settings

Default: 30

Tips

- For a multirate, multitasking model, the Real-Time Workshop software increments the priority of each subrate task by one.
- The value you specify for this option will be overridden by a base priority specified in a call to the `rt_main()` function spawned as a task.

Command-Line Information

Parameter: `BasePriority`
Type: integer
Value: any valid value
Default: `30`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	May affect efficiency, depending on other task's priorities
Safety precaution	No impact

See Also

- *Tornado User's Guide* from Wind River Systems

- Targeting Tornado for Real-Time Applications

Task stack size

Stack size in bytes for each task that executes the model.

Settings

Default: 16384

Command-Line Information

Parameter: `TaskStackSize`
Type: integer
Value: any valid value
Default: `16384`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	Larger stack may waste space
Safety precaution	Larger stack reduces the possibility of overflow

See Also

- *Tornado User's Guide* from Wind River Systems
- Targeting Tornado for Real-Time Applications
- Task Stack Size

External mode

Specify whether to enable communication between the Simulink model and an application based on a client/server architecture.

Settings

Default: on

☑ On

Enables external mode. The client (Simulink model) transmits messages requesting the server (application) to accept parameter changes or to upload signal data. The server responds by executing the request.

☐ Off

Disables external mode.

Dependencies

Selecting this parameter enables:

- **Transport layer**
- **MEX-file arguments**
- **Static memory allocation**

Command-Line Information

Parameter: `ExtMode`
Type: string
Value: `'on'` | `'off'`
Default: `'on'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact

Application	Setting
Efficiency	No impact
Safety precaution	No impact

See Also

External Mode

Transport layer

Specify the transport protocol for external mode communications.

Settings

Default: `tcpip`

`tcpip`
: Applies a TCP/IP transport mechanism. The MEX-file name is `ext_comm`.

Tip

The **MEX-file name** displayed next to **Transport layer** cannot be edited in the Configuration Parameters dialog box. For targets provided by The MathWorks, the value is specified in *`matlabroot`*`/toolbox/simulink/simulink/extmode_transports.m`.

Dependency

This parameter is enabled by **External Mode**.

Command-Line Information

Parameter: `ExtModeTransport`
Type: integer
Value: `0 | 1`
Default: `0`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

Target Interfacing

MEX-file arguments

Specify arguments to pass to an external mode interface MEX-file for communicating with executing targets.

Settings

Default: `""`

For TCP/IP interfaces, `ext_comm` allows three optional arguments:

- Network name of your target (for example, `'myPuter'` or `'148.27.151.12'`)
- Verbosity level (`0` for no information or `1` for detailed information)
- TCP/IP server port number (an integer value between `256` and `65535`, with a default of `17725`)

Dependency

This parameter is enabled by **External Mode**.

Command-Line Information

Parameter: `ExtModeMexArgs`
Type: string
Value: any valid arguments
Default: `""`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

- Target Interfacing
- Client/Server Implementations

Static memory allocation

Control the memory buffer for external mode communication.

Settings

Default: off

☑ On

Enables the **Static memory buffer size** parameter for allocating allocate dynamic memory.

☐ Off

Uses a static memory buffer for external mode instead of allocating dynamic memory (calls to malloc).

Tip

To determine how much memory you need to allocate, select verbose mode on the target to display the amount of memory it tries to allocate and the amount of memory available.

Dependencies

- This parameter is enabled by **External Mode**.
- This parameter enables **Static memory buffer size**.

Command-Line Information

Parameter: `ExtModeStaticAlloc`
Type: string
Value: `'on' | 'off'`
Default: `'off'`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

External Mode Interface Options

Static memory buffer size

Specify the memory buffer size for external mode communication.

Settings

Default: `1000000`

Enter the number of bytes to preallocate for external mode communications buffers in the target.

Tips

- If you enter too small a value for your application, external mode issues an out-of-memory error.
- To determine how much memory you need to allocate, select verbose mode on the target to display the amount of memory it tries to allocate and the amount of memory available.

Dependency

This parameter is enabled by **Static memory allocation**.

Command-Line Information

Parameter: `ExtModeStaticAllocSize`
Type: integer
Value: any valid value
Default: `1000000`

Recommended Settings

Application	Setting
Debugging	No impact
Traceability	No impact
Efficiency	No impact
Safety precaution	No impact

See Also

External Mode Interface Options

Parameter Reference

In this section...

Recommended Settings Summary

The following table summarizes the impact of each configuration parameter on debugging, traceability, efficiency, and safety considerations, and indicates the factory default configuration settings for the GRT and ERT targets, unless otherwise specified.

For parameters that are available only when an ERT target is specified, see the "Recommended Settings Summary" in the Real-Time Workshop Embedded Coder documentation.

For additional details, click the links in the Configuration Parameter column.

Mapping Application Requirements to the Solver Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Start Time	No impact	No impact	No impact	0.0	0.0 seconds
Stop time	No impact	No impact	No impact	Any positive value	10.0 seconds
Type	`Fixed-step`	`Fixed-step`	`Fixed-step`	`Fixed-step`	`Variable-step` (you must change to `Fixed-step` for code generation)

Mapping Application Requirements to the Solver Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Solver"	No impact	No impact	No impact	`Discrete (no continuous states)`	`ode3 (Bogacki-Shampine)`
"Periodic sample time constraint"	No impact	No impact	No impact	`Specified` or `Ensure sample time independent`	`Unconstrained`
"Sample time properties"	No impact	No impact	No impact	Period, offset, and priority of each sample time in the model; faster sample times must have higher priority than slower sample times	`''`

Mapping Application Requirements to the Solver Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Tasking mode for periodic sample times	No impact	No impact	No impact	No impact	Auto
"Automatically handle rate transition for data transfer"	No impact	No impact (for simulation and during development) Off (for production code generation)	No impact	Off	Off

Mapping Application Requirements to the Data Import/Export Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Input"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	Off
"Initial state"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	Off

Mapping Application Requirements to the Data Import/Export Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Time"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	On
"States"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	Off
"Output"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	On
"Final states"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	Off
"Signal logging"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	On
"Inspect signal logs when simulation is paused/stopped"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	Off
"Limit data points to last"	No impact	No impact	No impact	No impact (GRT) Off (ERT)	On

Mapping Application Requirements to the Data Import/Export Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
“Decimation”	No impact	No impact	No impact	No impact (GRT) Off (ERT)	1
“Format”	No impact	No impact	No impact	No impact (GRT) Off (ERT)	`Array`
“Output options”	No impact	No impact	No impact	No impact (GRT) Off (ERT)	`Refine output`
“Refine factor”	No impact	No impact	No impact	No impact (GRT) Off (ERT)	1
“Output times”	No impact	No impact	No impact	No impact (GRT) Off (ERT)	`'[]'`

Mapping Application Requirements to the Optimization Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Block reduction	Off (GRT) No impact (ERT)	Off	On	Off	On
Implement logic signals as Boolean data (vs. double)	No impact	No impact	On	On	On
Inline parameters	Off (GRT) On (ERT)	On	On	No impact	Off
Conditional input branch execution	No impact	On	On (execution), No impact (ROM, RAM)	Off	On
Signal storage reuse	Off	Off	On	No impact	On
Application lifespan (days)	No impact	No impact	Finite value	`inf`	`inf`
Enable local block outputs	Off	No impact	On	No impact	On
Eliminate superfluous local variables (Expression folding)	Off	No impact (GRT) Off (ERT)	On	No impact	On

Mapping Application Requirements to the Optimization Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Minimize data copies between local and global variables"	Off	Off	No impact (execution), On (ROM, RAM)	No impact	Off
Loop unrolling threshold	No impact	No impact	>0	>1	5
Maximum stack size (bytes)	No impact	No impact	No impact	No impact	`Inherit from target`
Use memcpy for vector assignment	No impact	No impact	On	No impact	On
Memcpy threshold (bytes)	No impact	No impact	Accept default or determine target-specific optimal value	No impact	64
Use memset to initialize floats and doubles to 0.0	No impact	No impact	On* (execution, ROM), No impact (RAM)	No impact	On
Reuse block outputs	Off	Off	On	No impact	On
Inline invariant signals	Off	Off	On	No impact	Off

Mapping Application Requirements to the Optimization Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Remove code from floating-point to integer conversions that wraps out-of-range values	Off	Off	On (execution, ROM), No impact (RAM)	Off (GRT) On (ERT)	Off
Remove code from floating-point to integer conversions with saturation that maps NaN to zero	Off	Off	On	Off (GRT) On (ERT)	On
"Use bitsets for storing state configuration"	Off	Off	Off (execution, ROM), On (RAM)	No impact	Off
"Use bitsets for storing Boolean data"	Off	Off	Off (execution, ROM), On (RAM)	No impact	Off
*The command-line value is reverse of the listed value.					

Mapping Application Requirements to the Diagnostics: Solver Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
“Algebraic loop”	`error`	No impact	No impact	`error`	`warning`
“Minimize algebraic loop”	No impact	No impact	No impact	`error`	`warning`
“Block priority violation”	No impact	No impact	No impact	`error`	`warning`
“Consecutive zero-crossings violation”	No impact	No impact	No impact	`warning` or `error`	`error`
“Unspecified inheritability of sample time”	No impact	No impact	No impact	`error`	`warning`
“Solver data inconsistency”	`warning`	No impact	`none`	No impact	`warning`
“Automatic solver parameter selection”	No impact	No impact	No impact	`error`	`warning`

Mapping Application Requirements to the Diagnostics: Sample Time Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
“Source block specifies -1 sample time”	No impact	No impact	No impact	`error`	`none`
“Discrete used as continuous”	No impact	No impact	No impact	`error`	`warning`

Mapping Application Requirements to the Diagnostics: Sample Time Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Multitask rate transition"	No impact	No impact	No impact	`error`	`error`
"Single task rate transition"	No impact	No impact	No impact	`none` or `error`	`none`
"Multitask conditionally executed subsystem"	No impact	No impact	No impact	`error`	`error`
"Tasks with equal priority"	No impact	No impact	No impact	`none` or `error`	`warning`
"Enforce sample times specified by Signal Specification blocks"	No impact	No impact	No impact	`error`	`warning`

Mapping Application Requirements to the Diagnostics: Data Validity Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Signal resolution"	No impact	No impact	No impact	`Explicit only`	`Explicit only`
"Division by singular matrix"	No impact	No impact	No impact	`error`	`none`
"Underspecified data types"	No impact	No impact	No impact	`error`	`none`
"Simulation range checking"	`warning` or `error`	`warning` or `error`	`none`	`error`	`none`

Mapping Application Requirements to the Diagnostics: Data Validity Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Detect overflow"	No impact	No impact	No impact	`error`	`warning`
"Inf or NaN block output"	No impact	No impact	No impact	`error`	`none`
""rt" prefix for identifiers"	No impact	No impact	No impact	`error`	`error`
"Detect downcast"	No impact	No impact	No impact	`error`	`error`
"Detect overflow"	No impact	No impact	No impact	`error`	`error`
"Detect underflow"	No impact	No impact	No impact	`error`	`none`
"Detect precision loss"	No impact	No impact	No impact	`error`	`error`
"Detect loss of tunability"	No impact	No impact	No impact	`error`	`none`
"Detect read before write"	No impact	No impact	No impact	`error`	`Enable all as warnings`
"Detect write after read"	No impact	No impact	No impact	`error`	`Enable all as warning`
"Detect write after write"	No impact	No impact	No impact	`error`	`Enable all as errors`
"Multitask data store"	No impact	No impact	No impact	`error`	`warning`
"Duplicate data store names"	`warning`	No impact	`none`	No impact	`none`

Mapping Application Requirements to the Diagnostics: Data Validity Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Check undefined subsystem initial output"	No impact	No impact	No impact	On	On
"Check preactivation output of execution context"	No impact	No impact	No impact	On	Off
"Check runtime output of execution context"	No impact	No impact	No impact	On	Off
Model Verification block enabling	No impact	No impact	No impact	No impact (GRT) `Disable all` (ERT)	`Use local settings`

Mapping Application Requirements to the Diagnostics: Type Conversion Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Unnecessary type conversions"	No impact	No impact	No impact	`warning`	`none`
"Vector/matrix block input conversion"	No impact	No impact	No impact	`error`	`none`

Mapping Application Requirements to the Diagnostics: Type Conversion Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"32-bit integer to single precision float conversion"	No impact	No impact	No impact	`warning`	`warning`

Mapping Application Requirements to the Diagnostics: Connectivity Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Signal label mismatch"	No impact	No impact	No impact	`error`	`none`
"Unconnected block input ports"	No impact	No impact	No impact	`error`	`warning`
"Unconnected block output ports"	No impact	No impact	No impact	`error`	`warning`
"Unconnected line"	No impact	No impact	No impact	`error`	`none`
"Unspecified bus object at root Outport block"	No impact	No impact	No impact	`error`	`warning`
"Element name mismatch"	No impact	No impact	No impact	`error`	`warning`
"Mux blocks used to create bus signals"	No impact	No impact	No impact	`error`	`warning`

Mapping Application Requirements to the Diagnostics: Connectivity Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Bus signal treated as vector"	No impact	No impact	No impact	`error`	`warning`
"Invalid function-call connection"	No impact	No impact	No impact	`error`	`error`
"Context-dependent inputs"	No impact	No impact	No impact	`Enable all`	`Use local settings`

Mapping Application Requirements to the Diagnostics: Compatibility Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"S-function upgrades needed"	No impact	No impact	No impact	`error`	`none`

Mapping Application Requirements to the Diagnostics: Model Referencing Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Model block version mismatch"	No impact	No impact	No impact	`none`	`none`
"Port and parameter mismatch"	No impact	No impact	No impact	`error`	`none`

Mapping Application Requirements to the Diagnostics: Model Referencing Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
“Model configuration mismatch”	No impact	No impact	No impact	`warning`	`none`
“Invalid root Inport/Outport block connection”	No impact	No impact	No impact	`error`	`none`
“Unsupported data logging”	No impact	No impact	No impact	`error`	`warning`

Mapping Application Requirements to the Diagnostics: Saving Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
“Block diagram contains disabled library links”	No impact	No impact	No impact	No impact	`warning`
“Block diagram contains parameterized library links”	No impact	No impact	No impact	No impact	`none`

Mapping Application Requirements to the Hardware Implementation Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Device vendor	No impact	No impact	No impact	No impact	No impact
Device type	No impact	No impact	No impact	No impact	No impact
Number of bits	No impact	No impact	Target specific	No impact (GRT) Match operation of target compiler and hardware (ERT)	8, 16, 32, 32, 32
Byte ordering	No impact	No impact	No impact	No impact	Unspecified
Signed integer division rounds to	No impact (GRT) `Undefined` (ERT)	No impact (GRT) `Zero` or `Floor` (ERT)	No impact (GRT) `Zero` (ERT)	No impact (GRT) `Floor` (ERT)	`Undefined`
Shift right on a signed integer as arithmetic shift	No impact	No impact	On	No impact	On
Emulation hardware (code generation only)	No impact	No impact	No impact	No impact	On

Mapping Application Requirements to the Model Referencing Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Rebuild options"	No impact	No impact	No impact	`Never` or `If any changes detected`	`If any changes detected`
"Never rebuild targets diagnostic"	No impact	No impact	No impact	`error` if targets require rebuild	`error`
"Enable parallel model reference builds"	No impact	No impact	No impact	No impact	Off
"MATLAB worker initialization for builds"	No impact	No impact	No impact	No impact	`None`
"Total number of instances allowed per top model"	No impact	No impact	No impact	No impact	`Multiple`
"Pass fixed-size scalar root inputs by value for Real-Time Workshop"	No impact	No impact	No impact	Off	Off
"Minimize algebraic loop occurrences"	No impact	No impact	No impact	Off	Off

Mapping Application Requirements to the Model Referencing Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Propagate sizes of variable-size signals"	No impact	No impact	No impact	Off	`Infer from blocks in model`
"Model dependencies"	No impact	No impact	No impact	No impact	`''`

Mapping Application Requirements to the Simulation Target: General Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Enable debugging/animation"	On	No impact	Off	On	On
"Enable overflow detection (with debugging)"	On	No impact	Off	On	On
"Ensure memory integrity"	On	On	Off	On	On
"Echo expressions without semicolons"	On	No impact	Off	No impact	On
"Use BLAS library for faster simulation"	No impact	No impact	On	No impact	On

Mapping Application Requirements to the Simulation Target: General Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Ensure responsiveness"	On	On	Off	On	On
"Simulation target build mode"	No impact	No impact	No impact	No impact	`Incremental build`

Mapping Application Requirements to the Simulation Target: Symbols Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Reserved names"	No impact	No impact	No impact	No impact	`{}`

Mapping Application Requirements to the Simulation Target: Custom Code Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Source file"	No impact	No impact	No impact	No impact	`''`
"Header file"	No impact	No impact	No impact	No impact	`''`
"Initialize function"	No impact	No impact	No impact	No impact	`''`
"Terminate function"	No impact	No impact	No impact	No impact	`''`

Mapping Application Requirements to the Simulation Target: Custom Code Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
"Include directories"	No impact	No impact	No impact	No impact	`''`
"Source files"	No impact	No impact	No impact	No impact	`''`
"Libraries"	No impact	No impact	No impact	No impact	`''`

Mapping Application Requirements to the Real-Time Workshop: General Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
System target file	No impact	No impact	No impact	No impact (GRT) ERT based (ERT)	`grt.tlc`
Language	No impact	No impact	No impact	No impact	C
Compiler optimization level	`Optimizations off (faster builds)`	`Optimizations off (faster builds)`	`Optimizations on (faster runs)` (execution), No impact (ROM, RAM)	No impact	`Optimizations off (faster builds)`
Custom compiler optimization flags	`Optimizations off (faster builds)`	`Optimizations off (faster builds)`	`Optimizations on (faster runs)`	No impact	`Optimizations off (faster builds)`
TLC options	No impact	No impact	No impact	No impact	`''`

Mapping Application Requirements to the Real-Time Workshop: General Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Generate makefile	No impact	No impact	No impact	No impact	On
Make command	No impact	No impact	No impact	`make_rtw`	`make_rtw`
Template makefile	No impact	No impact	No impact	No impact	`grt_default_tmf`
"Select objective" on page 6-25	`Debugging`	Not applicable for GRT-based targets	Not applicable for GRT-based targets	Not applicable for GRT-based targets	`Unspecified`
"Check model before generating code" on page 6-32	`On (proceed with warnings)` or `On (stop for warnings)`	`On (proceed with warnings)` or `On (stop for warnings)`	`On (proceed with warnings)` or `On (stop for warnings)`	`On (proceed with warnings)` or `On (stop for warnings)`	`Off`
Generate code only	Off	No impact	No impact	No impact	Off

Mapping Application Requirements to the Real-Time Workshop: Report Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precautions	
"Create code generation report" on page 6-40	On	On	No impact	On	Off
"Launch report automatically" on page 6-43	On	On	No impact	No impact	Off

Mapping Application Requirements to the Real-Time Workshop: Comments Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Include comments	On	On	No impact	On	On
Simulink block / Stateflow object comments	On	On	No impact	On	On
Show eliminated blocks	On	On	No impact	On	Off
Verbose comments for Simulink Global storage class	On	On	No impact	On	Off

Mapping Application Requirements to the Real-Time Workshop: Symbols Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Maximum identifier length	Any valid value	>30	No impact	>30	31
Use the same reserved names as Simulation Target	No impact	No impact	No impact	No impact	Off
Reserved names	No impact	No impact	No impact	No impact	{}

Mapping Application Requirements to the Real-Time Workshop: Custom Code Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Use the same custom code settings as Simulation Target	No impact	No impact	No impact	No impact	Off
Source file	No impact	No impact	No impact	No impact	''
Header file	No impact	No impact	No impact	No impact	''
Initialize function	No impact	No impact	No impact	No impact	''
Terminate function	No impact	No impact	No impact	No impact	''
Include directories	No impact	No impact	No impact	No impact	''

Mapping Application Requirements to the Real-Time Workshop: Custom Code Pane (Continued)

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Source files	No impact	No impact	No impact	No impact	''
Libraries	No impact	No impact	No impact	No impact	''

Mapping Application Requirements to the Real-Time Workshop: Debug Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Verbose build	On	No impact	No impact	On	On
Retain .rtw file	On	No impact	No impact	No impact	Off
"Profile TLC" on page 6-139	On	No impact	No impact	No impact	Off
Start TLC debugger when generating code	On	No impact	No impact	No impact	Off
Start TLC coverage when generating code	On	No impact	No impact	No impact	Off
Enable TLC assertion	On	No impact	No impact	On	Off

Mapping Application Requirements to the Real-Time Workshop: Interface Pane

Configuration Parameter	Settings for Building Code				Factory Default
	Debugging	Traceability	Efficiency	Safety Precaution	
Target function library	No impact	No impact	Any valid value	No impact	`C89/C90 (ANSI)`
Utility function generation	Shared location (GRT) No impact (ERT)	Shared location (GRT) No impact (ERT)	No impact (execution, RAM), Shared location (ROM)	No impact	`Auto`
MAT-file variable name modifier	No impact	No impact	No impact	No impact	`rt_`
Interface	No impact	No impact	No impact	No impact (GRT) `None` (ERT)	`None`
Generate C API for: signals	No impact	No impact	No impact	No impact	On
Generate C API for: parameters	No impact	No impact	No impact	No impact	On
Generate C API for: states	No impact	No impact	No impact	No impact	Off
Transport layer	No impact	No impact	No impact	No impact	`tcpip`
MEX-file arguments	No impact	No impact	No impact	No impact	`''`
Static memory allocation	No impact	No impact	No impact	No impact	Off
"Static memory buffer size" on page 6-260	No impact	No impact	No impact	No impact	1000000

Parameter Command-Line Information Summary

The following table lists Real-Time Workshop parameters that you can use to tune model and target configurations. The table provides brief descriptions, valid values (bold type highlights defaults), and a mapping to Configuration Parameter dialog box equivalents. For descriptions of the panes and options in that dialog box, see Configuration Parameters in the Real-Time Workshop documentation.

Use the `get_param` and `set_param` commands to retrieve and set the values of the parameters on the MATLAB command line or programmatically in scripts.

The Configuration Wizard in the Real-Time Workshop Embedded Coder product provides buttons and scripts for customizing code generation. See "Using Configuration Wizard Blocks" in the Real-Time Workshop Embedded Coder documentation for information on using Configuration Wizard features.

For information about Simulink parameters, see "Configuration Parameters Dialog Box" in the Simulink documentation. For information on using `get_param` and `set_param` to tune the parameters for various model configurations, see "Parameter Tuning by Using MATLAB Commands".

For parameters that are specific to the ERT target, or targets based on the ERT target, see "Parameter Command-Line Information Summary" in the Real-Time Workshop Embedded Coder documentation.

Note Parameters that are specific to Stateflow or Simulink® Fixed Point™ products are marked with (Stateflow) and (Simulink Fixed Point), respectively.

The default setting for a parameter might vary for different targets.

Command-Line Information: Optimization Pane

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description

`BooleanDataType`
`off`, **`on`**
	Optimization > Implement logic signals as Boolean data (vs. double)	Control the output data type of blocks that generate logic signals.

`BufferReuse`
`off`, **`on`**
	Optimization > Reuse block outputs	Reuse local (function) variables for block outputs wherever possible. Selecting this option trades code traceability for code efficiency.

`DataBitsets` (Stateflow) **`off`**, `on`	**Optimization > Use bitsets for storing Boolean data**	Use bit sets for storing Boolean data.

`EfficientFloat2IntCast`
`off`, `on`
	Optimization > Remove code from floating-point to integer conversions that wrap out-of-range values	Remove wrapping code that handles out-of-range floating-point to integer conversion results.

`EfficientMapNaN2IntZero`
`off`, **`on`**
	Optimization > Remove code from floating-point to integer conversions with saturation that maps NaN to zero	Remove code that handles floating-point to integer conversion results for `NaN` values.

`EnableMemcpy`
`off`, **`on`**
	Optimization > Use memcpy for vector assignment	Optimize code generated for vector assignment by replacing `for` loops with `memcpy` function calls.

Command-Line Information: Optimization Pane (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`EnforceIntegerDowncast` `off`, **`on`**	**Optimization > Ignore integer downcasts in folded expressions** **Note** **Ignore integer downcasts in folded expressions** parameter is no longer on the Optimization Pane.	Remove casts of intermediate variables. When you set this option to `on`, expressions involving 8-bit and 16-bit arithmetic on microprocessors of a larger bit size are less likely to overflow in code than in simulation. **Note** `EnforceIntegerDowncast` will be removed in a future release.
`EnhancedBackFolding` **`off`**, `on`	**Optimization > Minimize data copies between local and global variables**	Reuse existing global variables to store temporary results.
`ExpressionFolding` `off`, **`on`**	**Optimization > Eliminate superfluous local variables (Expression folding) > Interface**	Collapse block computations into single expressions wherever possible. This improves code readability and efficiency.
`InitFltsAndDblsToZero` **`off`**, `on`	**Optimization > Use memset to initialize floats and doubles to 0.0**	Optimize initialization of storage for `float` and `double` values. Set this option if the representation of floating-point zero used by your compiler and target CPU is identical to the integer bit pattern 0.
`InlineInvariantSignals` `off`, **`on`**	**Optimization > Inline invariant signals**	Precompute and inline the values of invariant signals in the generated code.

Command-Line Information: Optimization Pane (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`LifeSpan` *`string`*	**Optimization > Application lifespan (days)**	Optimize the size of counters used to compute absolute and elapsed time, using the specified application life span value.

`LocalBlockOutputs`
`off`, **`on`**
	Optimization > Enable local block outputs	Declare block outputs in local (function) scope wherever possible to reduce global RAM usage.

`MemcpyThreshold`
`int - `**`64`**
	Optimization > Memcpy threshold (bytes)	Specify the minimum array size in bytes for which `memcpy` function calls should replace `for` loops in the generated code for vector assignments.

`NoFixptDivByZeroProtection`
(Simulink Fixed Point)
`off`, `on`
	Optimization > Remove code that protects against division arithmetic exceptions	Suppress generation of code that guards against division by zero for fixed-point data.

`RollThreshold`
`int - `**`5`**
	Optimization > Loop unrolling threshold	Specify the minimum signal width for which a `for` loop is to be generated.

`MaxStackSize`
`<Specify a value>`, **`Inherit from target`**
	Optimization > Maximum stack size (bytes)	Specify the maximum stack size in bytes for your model.

Command-Line Information: Optimization Pane (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`StateBitsets` (Stateflow) **`off`**, `on`	**Optimization > Use bitsets for storing state configuration**	Use bit sets for storing state configuration.
`UseIntDivNetSlope` (Simulink Fixed Point) **`off`**, `on`	**Optimization > Use integer division to handle net slopes that are reciprocals of integers**	Perform net slope correction using integer division when simplicity and accuracy conditions are met.

Command-Line Information: Real-Time Workshop Pane: General Tab

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description

`CheckMdlBeforeBuild`
`string` - **`off`**, `warning`, `error`
	Real-Time Workshop > General > Check model before generating code	Specify whether to run Code Generation Advisor checks before generating code.

`GenCodeOnly`
`string` - **`off`**, `on`
	Real-Time Workshop > General > Generate code only	Generate source code, but do not execute the makefile to build an executable.

`GenerateMakefile`
`string` - `off`, **`on`**
	Real-Time Workshop > General > Generate makefile	Specify whether to generate a makefile during the build process for a model.

`MakeCommand`
`string` - **`make_rtw`**
	Real-Time Workshop > General > Make command	Specify the `make` command and optional arguments to be used to generate an executable for the model.

Command-Line Information: Real-Time Workshop Pane: General Tab (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`ObjectivePriorities` (GRT) string - **`{ }`**, `{'Debugging'}`	**Real-Time Workshop > General > Select objective**	Specify the code generation objectives to use with the Code Generation Advisor.
`ObjectivePriorities` (ERT) string - **`{ }`**, `{'Efficiency'}`, `{'Traceability'}`, `{'Safety precaution'}`, `{'Debugging'}`	**Real-Time Workshop > General > Set objectives**	Specify and prioritize the code generation objectives to use with the Code Generation Advisor.
`RTWCompilerOptimization` string - **`Off`**, `On`, `Custom`	**Real-Time Workshop > General > Compiler optimization level**	Use this parameter to trade off compilation time against run time for your model code without having to supply compiler-specific flags to other levels of the Real-Time Workshop build process. `Off` - Turn compiler optimizations off for faster builds `On` - Turn compiler optimizations on for faster code execution `Custom` - Specify custom compiler optimization flags via the `RTWCustomCompilerOptimizations` parameter
`RTWCustomCompiler Optimizations` `string` - , unquoted string of compiler optimization flags	**Real-Time Workshop > General > Custom compiler optimization flags**	If you specified `Custom` to the `RTWCompilerOptimization` parameter, use this parameter to specify custom compiler optimization flags, for example, `-O2`.

`SaveLog`
`off`, `on`
	Real-Time Workshop > General > Save build log	Save build log.

Command-Line Information: Real-Time Workshop Pane: General Tab (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description

`SystemTargetFile`
`string` - **`grt.tlc`**
	**Real-Time Workshop
	> General
	> System target file**
		Specify a system target file.

`TargetLang` `string` - **`C`**, `C++`, `C++ (Encapsulated)` (ERT)	**Real-Time Workshop > General > Language**	Specify whether to generate C code, C++ compatible code, or C++ encapsulated code. The `C++ (Encapsulated)` value appears only when you select an ERT system target file for the model. Using `C++ (Encapsulated)` to generate code requires a Real-Time Workshop Embedded Coder license.

`TemplateMakefile`
`string` - **`grt_default_tmf`**
	**Real-Time Workshop
	> General
	> Template makefile**
		Specify the current template makefile for building a Real-Time Workshop target.

`TLCOptions` *`string`* -	**Real-Time Workshop > General > TLC options**	Specify additional TLC command line options.

Command-Line Information: Real-Time Workshop Pane: Report Tab

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description

`GenerateReport`
`string` - **`off`**, `on`
	**Real-Time Workshop
	> Report
	> Create code generation report**
		Document the generated C or C++ code in an HTML report.

`LaunchReport`
`string` - **`off`**, `on`
	**Real-Time Workshop
	> Report
	> Launch report automatically**
		Display the HTML report after code generation completes.

Command-Line Information: Real-Time Workshop Pane: Comments Tab

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description

`ForceParamTrailComments`
`string` - **`off`**, `on`
	Real-Time Workshop > Comments > Verbose comments for SimulinkGlobal storage class	Specify that comments be included in the generated file. To reduce file size, the model parameters data structure is not commented when there are more than 1000 parameters.

`GenerateComments`
`string` - `off`, **`on`**
	Real-Time Workshop > Comments > Include comments	Include comments in generated code.

`ShowEliminatedStatement`
`string` - **`off`**, `on`
	Real-Time Workshop > Comments > Show eliminated blocks	Show statements for eliminated blocks as comments in the generated code.

`SimulinkBlockComments`
`string` - `off`, **`on`**
	Real-Time Workshop > Comments > Simulink block / Stateflow object comments	Insert Simulink block and Stateflow object names as comments above the generated code for each block.

Command-Line Information: Real-Time Workshop Pane: Symbols Tab

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description

`MaxIdLength`
`int - `**`31`**
	Real-Time Workshop > Symbols > Maximum identifier length	Specify the maximum number of characters that can be used in generated function, type definition, and variable names.

Command-Line Information: Real-Time Workshop Pane: Symbols Tab (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description

`ReservedNameArray`
`string array` - **`{}`**
	Real-Time Workshop > Symbols > Reserved names	Enter the names of variables or functions in the generated code that match the names of variables or functions specified in custom code to avoid name conflicts.

`UseSimReservedNames`
`string` - **`off`**, `on`
	Real-Time Workshop > Symbols > Use the same reserved names as Simulation Target	Specify whether to use the same reserved names as those specified in the **Simulation Target > Symbols** pane.

Command-Line Information: Real-Time Workshop Pane: Custom Code Tab

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`CustomHeaderCode` *`string`* -	**Real-Time Workshop > Custom Code > Header file**	Specify code to appear near the top of the generated model header file.
`CustomInclude` *`string`* -	**Real-Time Workshop > Custom Code > Include directories**	Specify a space-separated list of include directories to add to the include path when compiling the generated code.

Command-Line Information: Real-Time Workshop Pane: Custom Code Tab (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
		Note If your list includes any Windows path strings that contain spaces, each instance must be enclosed in double quotes within the argument string, for example, `'C:\Project "C:\Custom Files"'`
`CustomInitializer` *`string`* -	**Real-Time Workshop > Custom Code**	Specify code to appear in the generated model initialize function.
`CustomLibrary` *`string`* -	**Real-Time Workshop > Custom Code > Initialize function Libraries**	Specify a space-separated list of static library files to link with the generated code.
`CustomSource` *`string`* -	**Real-Time Workshop > Custom Code > Source files**	Specify a space-separated list of source files to compile and link with the generated code.
`CustomSourceCode` *`string`* -	**Real-Time Workshop > Custom Code > Source file**	Specify code to appear near the top of the generated model source file.
`CustomTerminator` *`string`* -	**Real-Time Workshop > Custom Code > Terminate function**	Specify code to appear in the generated model terminate function.
`RTWUseSimCustomCode` `string` - **`off`**, `on`	**Real-Time Workshop > Custom Code > Use the same custom code settings as Simulation Target**	Specify whether to use the same custom code settings as those in the **Simulation Target > Custom Code** pane.

Command-Line Information: Real-Time Workshop Pane: Debug Tab

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`ProfileTLC` string - **`off`**, `on`	**Real-Time Workshop > Debug > Profile TLC**	Profile the execution time of each TLC file used to generate code for this model in HTML format.
`RTWVerbose` string - `off`, **`on`**	**Real-Time Workshop > Debug > Verbose build**	Display messages indicating code generation stages and compiler output.
`RetainRTWFile` string - **`off`**, `on`	**Real-Time Workshop > Debug > Retain .rtw file**	Retain the *`model`*`.rtw` file in the current build directory.
`TLCAssert` string - **`off`**, `on`	**Real-Time Workshop > Debug > Enable TLC assertion**	Produce a TLC stack trace when the argument to the `assert` directives evaluates to `false`.
`TLCCoverage` string - **`off`**, `on`	**Real-Time Workshop > Debug > Start TLC coverage when generating code**	Generate `.log` files containing the number of times each line of TLC code is executed during code generation.
`TLCDebug` string - **`off`**, `on`	**Real-Time Workshop > Debug > Start TLC debugger when generating code**	Start the TLC debugger during code generation at the beginning of the TLC program. TLC breakpoint statements automatically invoke the TLC debugger regardless of this setting.

Command-Line Information: Real-Time Workshop Pane: Interface Tab

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description

`ExtMode`
`off`, `on`
	Real-Time Workshop > Interface > Interface	Specify the data interface to be generated with the code.

`ExtModeMexArgs` *`string`* ( )	**Real-Time Workshop > Interface > Interface > External > MEX-file arguments**	Specify arguments that are passed to an external mode interface MEX-file for communicating with executing targets.

`ExtModeStaticAlloc`
`off`, `on`
	Real-Time Workshop > Interface > Static memory allocation	Use a static memory buffer for external mode instead of allocating dynamic memory (calls to `malloc`).

`ExtModeStaticAllocSize` *`integer`* (**1000000**)	**Real-Time Workshop > Interface > Static memory buffer size**	Specify the size in bytes of the external mode static memory buffer.
`ExtModeTransport` `int` - **`0`** for TCP/IP, `1` for 32-bit Windows serial	**Real-Time Workshop > Interface > Interface > External > Transport layer**	Specify transport protocols for external mode communications.

`GenerateASAP2`
`off`, `on`
	Real-Time Workshop > Interface > Interface	Specify the data interface to be generated with the code.

Command-Line Information: Real-Time Workshop Pane: Interface Tab (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`GenFloatMathFcnCalls` string - **`ANSI_C`**, `C99 (ISO)`, `GNU99 (GNU)`, `C++ (ISO)` (For ERT-based models, additional target-specific values may be available; see the **Target function library** drop-down list in the Configuration Parameters dialog box.)	**Real-Time Workshop > Interface > Target function library**	Specify a target-specific math library for your model. Verify that your compiler supports the library you want to use; otherwise compile-time errors can occur. `ANSI_C` - ISO/IEC 9899:1990 C standard math library for floating-point functions `C99 (ISO)` - ISO/IEC 9899:1999 C standard math library `GNU99 (GNU)` - GNU gcc math library, which provides C99 extensions as defined by compiler option `-std=gnu99` `C++ (ISO)` - ISO/IEC 14882:2003 C++ standard math library
`LogVarNameModifier` string - **`none`**, `rt_`, `_rt`	**Real-Time Workshop > Interface > MAT-file variable name modifier**	Augment the MAT-file variable name.
`MatFileLogging` (ERT) string - **`off`**, `on`	**Real-Time Workshop > Interface > MAT-file logging**	Generate code that logs data to a MAT-file.
`RTWCAPIParams` string - **`off`**, `on`	**Real-Time Workshop > Interface > Generate C API for: parameters**	Generate C API parameter tuning structures.
`RTWCAPISignals` string - **`off`**, `on`	**Real-Time Workshop > Interface > Generate C API for: signals**	Generate C API signal structure.

Command-Line Information: Real-Time Workshop Pane: Interface Tab (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`RTWCAPIStates` string - **`off`**, `on`	**Real-Time Workshop > Interface > Generate C API for: states**	Generate C API state structure.
`UtilityFuncGeneration` string - **`Auto`**, `Shared location`	**Real-Time Workshop > Interface > Utility function generation**	Specify where utility functions are to be generated.

Command-Line Information: Not in GUI

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`CodeGenDirectory`	Not available	For MathWorks™ use only.
`Comment`	Not available	For MathWorks use only.

`CompOptLevelCompliant`
`off`, `on`
	Not available	Set in `SelectCallback` for a target to indicate whether the target supports the ability to use the **Compiler optimization level** parameter on the **Real-Time Workshop** pane to control the compiler optimization level for building generated code.
		
		Default is `off` for custom targets and `on` for targets provided with the Real-Time Workshop and Real-Time Workshop Embedded Coder products.

`ConfigAtBuild`	Not available	For MathWorks use only.

Command-Line Information: Not in GUI (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`ConfigurationMode`	Not available	For MathWorks use only.
`ConfigurationScript`	Not available	For MathWorks use only.
`ERTCustomFileBanners`	Not available	For MathWorks use only.
`EvaledLifeSpan`	Not available	For MathWorks use only.
`ExtModeMexFile`	Not available	For MathWorks use only.
`ExtModeTesting`	Not available	For MathWorks use only.
`FoldNonRolledExpr`	Not available	For MathWorks use only.
`GenerateFullHeader`	Not available	For MathWorks use only.
`IncAutoGenComments`	Not available	For MathWorks use only.
`IncludeRegionsInRTWFile BlockHierarchyMap`	Not available	For MathWorks use only.
`IncludeRootSignalInRTWFile`	Not available	For MathWorks use only.
`IncludeVirtualBlocksInRTW FileBlockHierarchyMap`	Not available	For MathWorks use only.
`IsERTTarget`	Not available	For MathWorks use only.
`IsPILTarget`	Not available	For MathWorks use only.
`ModelReferenceCompliant` string - `off`, **`on`**	Not available	Set in `SelectCallback` for a target to indicate whether the target supports model reference.
`ParamNamingFcn`	Not available	For MathWorks use only.
`PostCodeGenCommand` *`string`* -	Not available	Add the specified post code generation command to the model build process.
`PreserveName`	Not available	For MathWorks use only.
`PreserveNameWithParent`	Not available	For MathWorks use only.

Command-Line Information: Not in GUI (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`ProcessScript`	Not available	For MathWorks use only.
`ProcessScriptMode`	Not available	For MathWorks use only.
`SignalNamingFcn`	Not available	For MathWorks use only.
`SystemCodeInlineAuto`	Not available	For MathWorks use only.
`TargetFcnLib`	Not available	For MathWorks use only.
`TargetLibSuffix` *string* -	Not available	Control the suffix used for naming a target's dependent libraries (for example, `_target.lib` or `_target.a`). If specified, the string must include a period (.). (For generated model reference libraries, the library suffix defaults to `_rtwlib.lib` on Windows systems and `_rtwlib.a` on UNIX systems.)
`TargetPreCompLibLocation` *string* -	Not available	Control the location of precompiled libraries. If you do not set this parameter, the code generator uses the location specified in `rtwmakecfg.m`.
`TargetPreprocMaxBitsSint` int - **32**	Not available	Specify the maximum number of bits that the target C preprocessor can use for signed integer math.

Command-Line Information: Not in GUI (Continued)

Parameter and Values	Configuration Parameters Dialog Box Equivalent	Description
`TargetPreprocMaxBitsUint` int - **32**	Not available	Specify the maximum number of bits that the target C preprocessor can use for unsigned integer math.

`TargetTypeEmulationWarn`
`SuppressLevel`
`SuppressLevel`
int - **0**
	Not available	When greater than or equal to 2, suppress warning messages that the Real-Time Workshop software displays when emulating integer sizes in rapid prototyping environments.

Configuration Parameters for Embedded MATLAB Coder

Real-Time Workshop Dialog Box for Embedded MATLAB Coder

In this section...

Real-Time Workshop Dialog Box Overview

Specifies parameters for embeddable C code generation using Embedded MATLAB Coder.

Displaying the Dialog Box

To display the **Real-Time Workshop** dialog box for Embedded MATLAB Coder, follow these steps at the MATLAB command prompt:

1 Define a configuration object variable for embeddable C code generation in the MATLAB workspace by issuing a constructor command like this:

```
codegen_cfg=emlcoder.RTWConfig('system_target');
```

Set `system_target` to:

- **`grt`** for GRT-based targets (default)
- **`ert`** for ERT-based targets

Note ERT-based targets require a Real-Time Workshop Embedded Coder license when generating code.

2 Open the property dialog box using one of these methods:

- Double-click the configuration object variable in the MATLAB workspace
- Issue the `open` command from the MATLAB prompt, passing it the configuration object variable, as in this example:

```
open codegen_cfg;
```

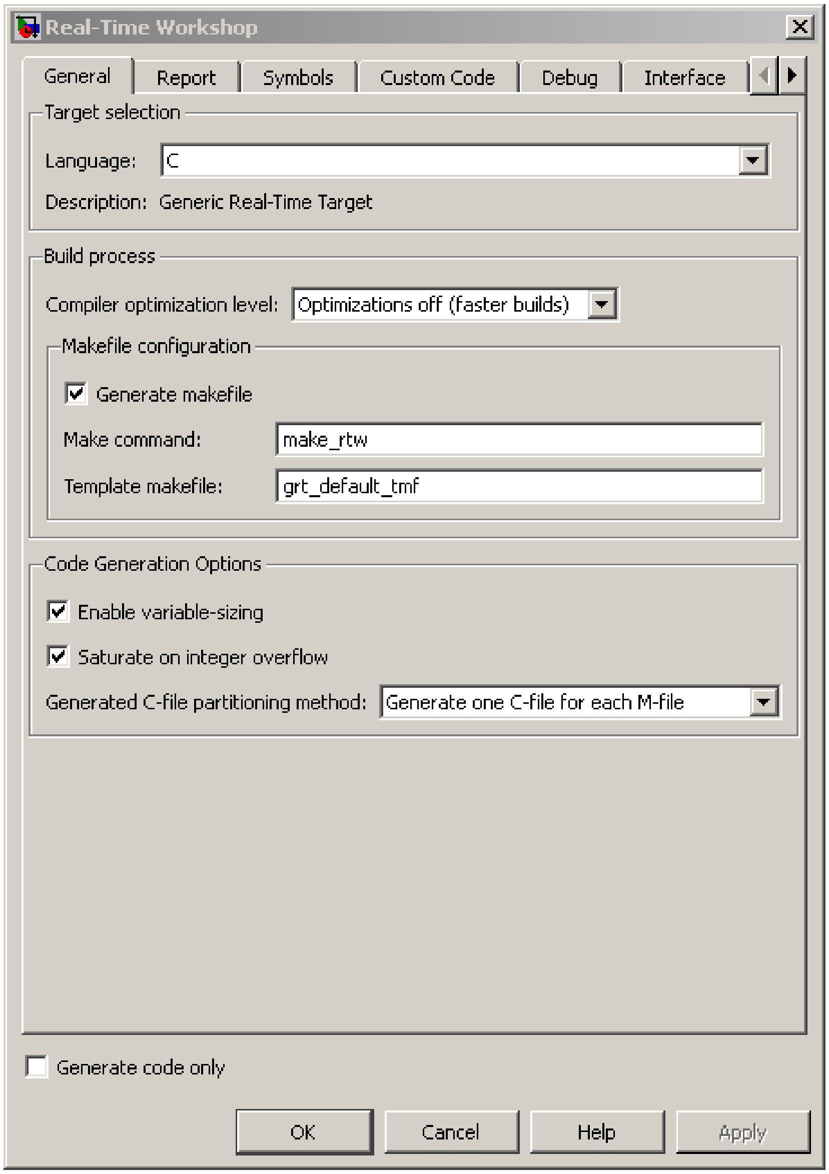
The dialog box displays on your desktop.

See Also

"Configuring Your Environment for Code Generation"

General Tab

Specifies general parameters for embeddable C code generation using Embedded MATLAB Coder.



Target selection

Language: C

Description: Generic Real-Time Target

Build process

Compiler optimization level: Optimizations off (faster builds)

Makefile configuration

[✓] Generate makefile

Make command: make_rtw

Template makefile: grt_default_tmf

Code Generation Options

[✓] Enable variable-sizing

[✓] Saturate on integer overflow

Generated C-file partitioning method: Generate one C-file for each M-file

[ ] Generate code only

Parameters

The following table describes the general parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

General Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Language	`TargetLang` *string*, **`C`** , `'C++'`	Specify code generation language.
"Compiler optimization level" on page 6-10	`RTWCompilerOptimization` *string*, **`Off`** , `'On'`, `'Custom'`	Specify level of compiler optimization for generating code. Turning optimizations off shortens compile time; turning optimizations on minimizes run time.
"Custom compiler optimization flags" on page 6-12	`RTWCustomCompilerOptimizations` *string*,	Specify compiler optimization flags to apply to the generated code. **Note** Requires that you select **Custom** for **Compiler optimization level**

"Generate makefile" on page 6-15	`GenerateMakefile`
	`true`, `false`
		Specify whether to generate a makefile during the build process.

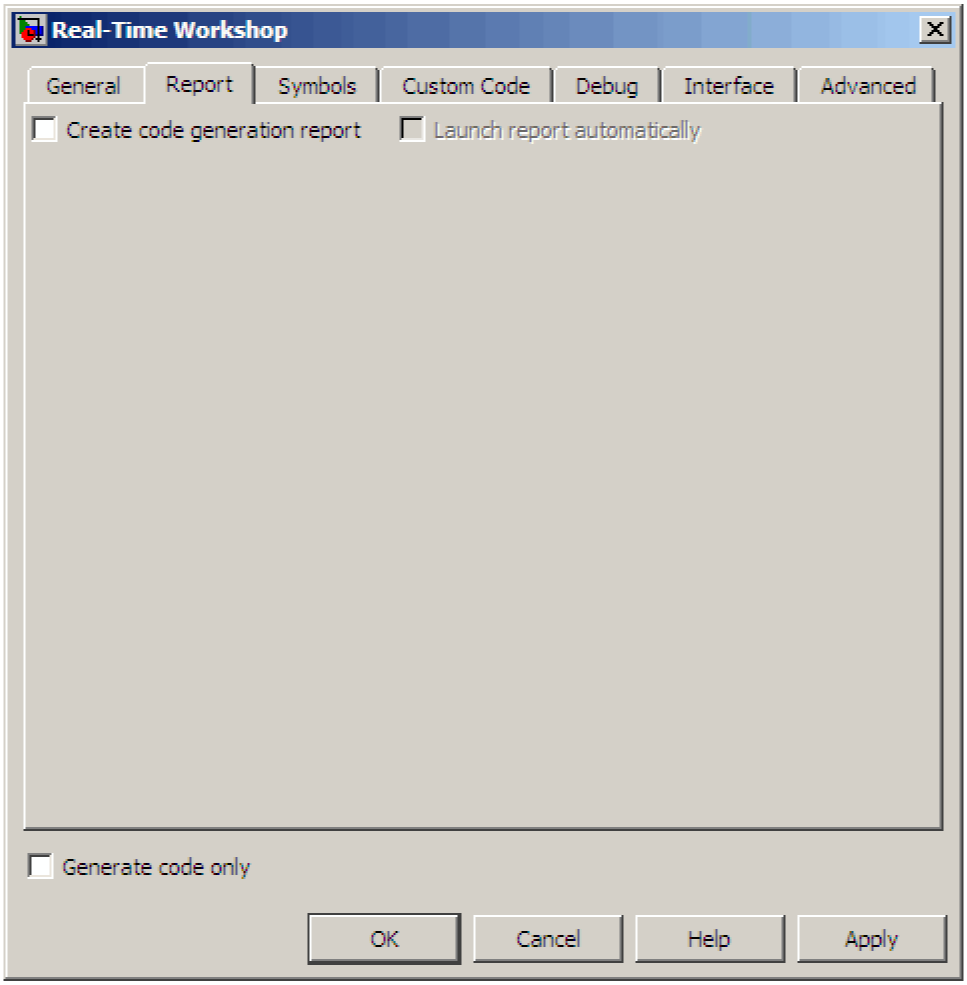
"Make command" on page 6-17	`MakeCommand` *string*, **`make_rtw`**	Specify a make command (if **Generate makefile** is selected).
"Template makefile" on page 6-19	`TemplateMakeFile` *string*, **`grt_default_tmf`**	Specify a template makefile (if **Generate makefile** is selected).

Enable variable-sizing	`EnableVariableSizing`
	`true`, `false`
		Enable support for variable-sized arrays.

General Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Saturate on integer overflow	`SaturateOnIntegerOverflow` **`true`**, `false`	Add checks in the generated code to detect integer overflow or underflow.
Generated C-file partitioning method	`FilePartitionMethod` *`string`*, **`MapMFileToCFile`**, `SingleFile`	Specify whether to generate one C-file for each MATLAB language file or generate all C functions into a single file.

Report Tab

Controls the report that is created for embeddable C code generation using Embedded MATLAB Coder.



☐ Create code generation report ☐ Launch report automatically

☐ Generate code only

Parameters

The following table describes the report parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

Report Parameter	Equivalent Command-Line Property and Values (default in bold)	Description

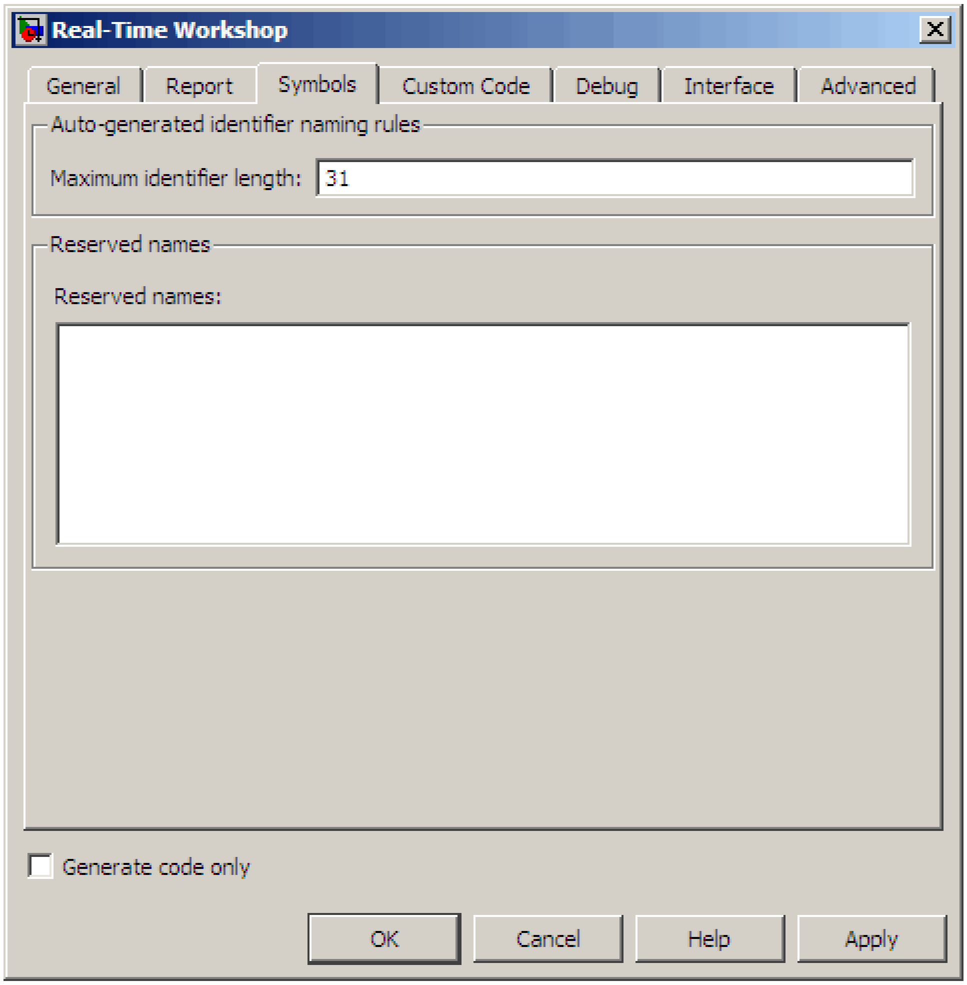
"Create code generation report" on page 6-40	`GenerateReport`
	`true`, **`false`**
		Document generated code in an HTML report.

"Launch report automatically" on page 6-43	`LaunchReport`
	`true`, **`false`**
		Specify whether to automatically display HTML reports after code generation completes.
		
		Note Requires that you select **Create code generation report**

Symbols Tab

Specifies parameters for selecting automatically generated naming rules for identifiers in embeddable C code generation using Embedded MATLAB Coder.

The Symbols tab appears as follows for GRT-based targets:



Auto-generated identifier naming rules

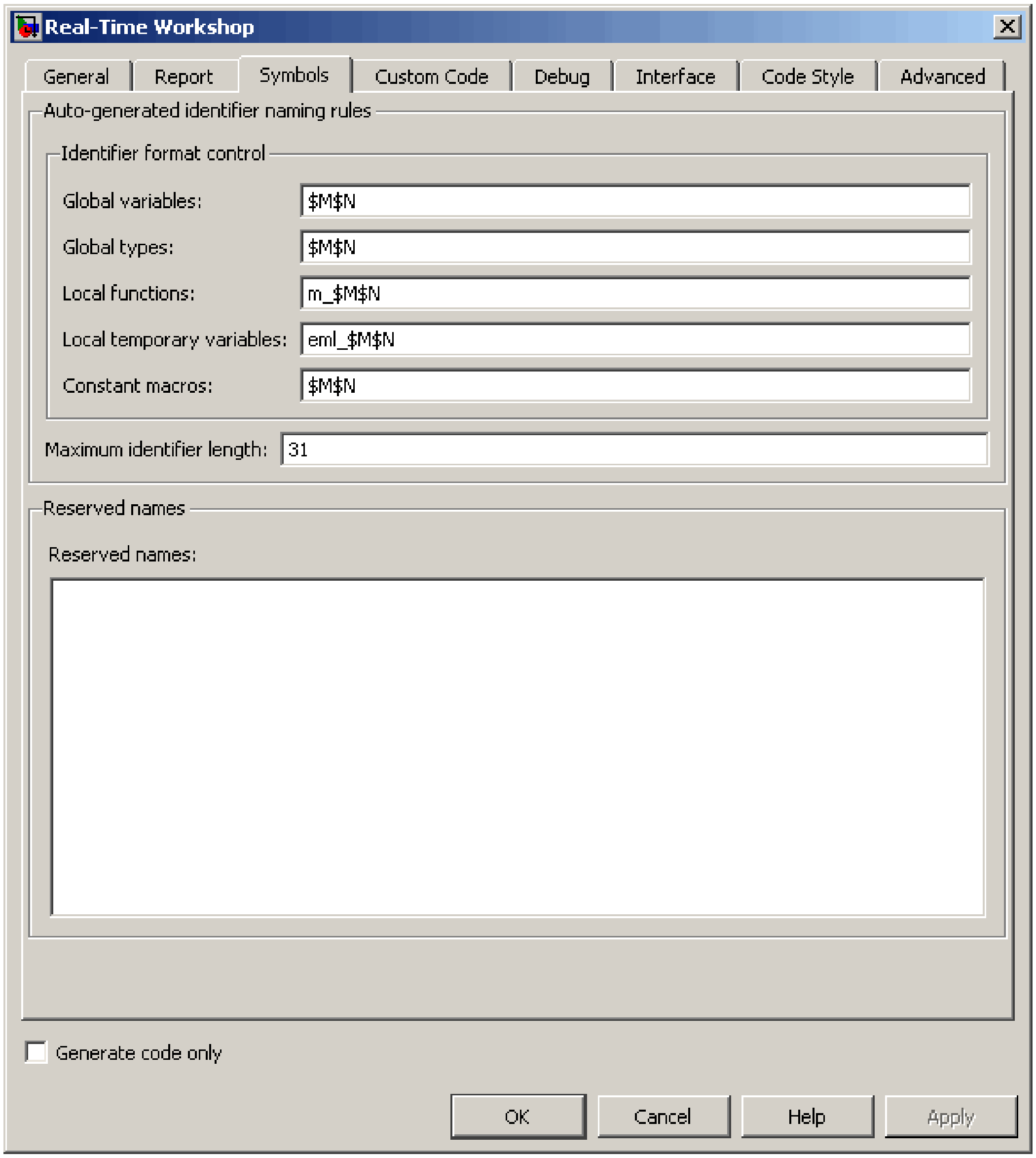
Maximum identifier length: 31

Reserved names

Reserved names:

☐ Generate code only

The Symbols tab appears as follows for ERT-based targets:



Auto-generated identifier naming rules

Identifier format control

Global variables:	MN
Global types:	MN
Local functions:	m_MN
Local temporary variables:	eml_MN
Constant macros:	MN

Maximum identifier length: 31

Reserved names

Reserved names:

☐ Generate code only

Parameters

The following table describes the symbols parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

Symbols Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Global variables	`CustomSymbolStrGlobalVar` *string*, **`$M$N`** For more details, see "Settings" on page 7-13	Customize generated global variable identifiers. Dependencies: • This parameter only appears for ERT-based targets. • This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
Global types	`CustomSymbolStrType` *string*, **`$M$N`** For more details, see "Settings" on page 7-13	Customize generated global type identifiers. Dependencies: • This parameter only appears for ERT-based targets. • This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Symbols Parameter	**Equivalent Command-Line Property and Values (default in bold)**	**Description**
Local functions	`CustomSymbolStrFcn` *string*, **`m_$M$N`** For more details, see "Settings" on page 7-13	Customize generated local function identifiers. Dependencies: • This parameter only appears for ERT-based targets. • This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
Local temporary variables	`CustomSymbolStrTmpVar` *string*, **`eml_$M$N`** For more details, see "Settings" on page 7-13	Customize generated local temporary variable identifiers. Dependencies: • This parameter only appears for ERT-based targets. • This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

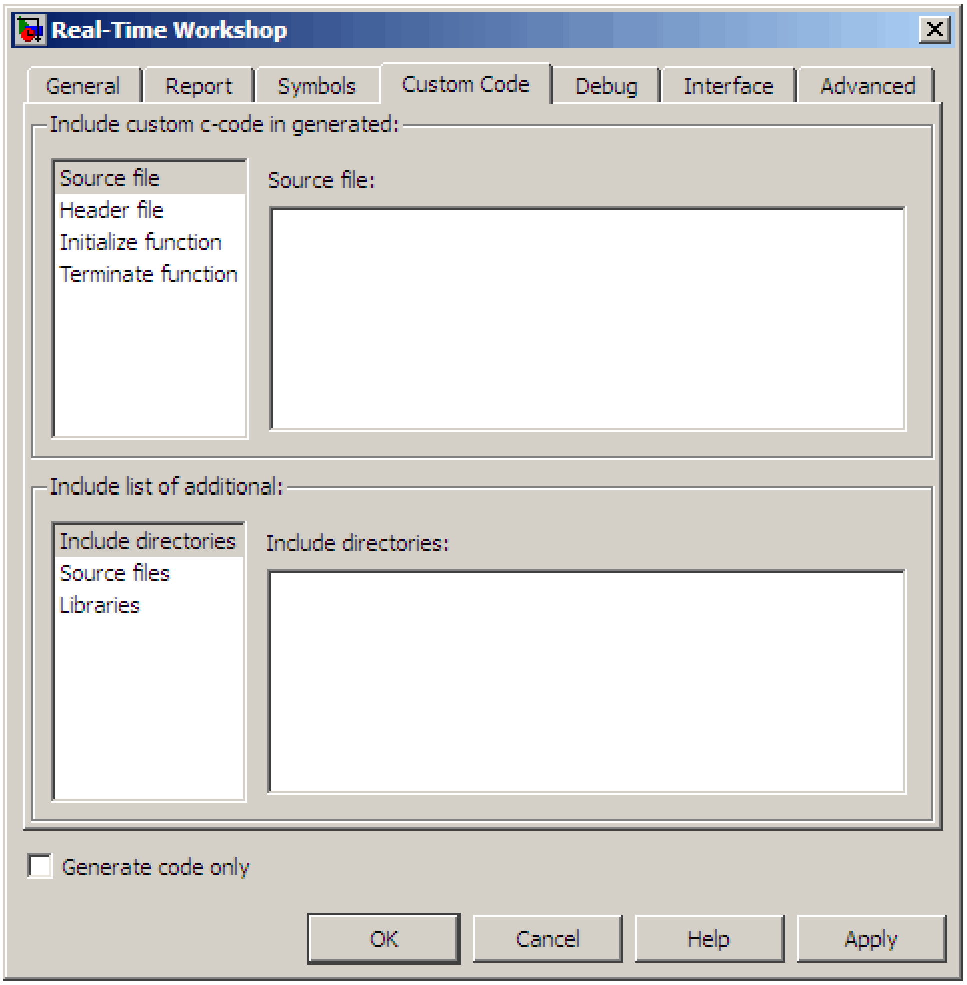
Symbols Parameter	**Equivalent Command-Line Property and Values (default in bold)**	**Description**
Constant macros	`CustomSymbolStrMacro` *string*, **`$M$N`** For more details, see “Settings” on page 7-13	Customize generated constant macro identifiers. Dependencies: • This parameter only appears for ERT-based targets. • This parameter requires a Real-Time Workshop Embedded Coder license when generating code.
“Maximum identifier length” on page 6-105	`MaxIdLength` *integer*, **31**	Specify maximum number of characters in generated function, type definition, and variable names. Minimum is 31.
“Reserved names” on page 6-117	`ReservedNameArray` *string*,	Enter the names of variables or functions in the generated code that match the names of variables or functions specified in custom code.

Settings. Enter a macro string that specifies whether, and in what order, certain substrings are to be included in the generated identifier. The macro string can include valid C-identifier characters and a combination of the following format tokens:

Token	Description
`$M`	Insert name mangling string to avoid naming collisions. Required.
`$N`	Insert name of parameter (global variable, global type, local function, local temporary variable or constant macro) for which identifier is being generated. Recommended to ensure readability of generated code.
`$R`	Insert root project name into identifier, replacing any unsupported characters with the underscore (_) character.

Custom Code Tab

Creates a list of custom C code, directories, source and header files, and libraries to be included in files generated by Embedded MATLAB Coder.



Configuration

1. Select the type of information to include from the list on the left side of the pane.
2. Enter a string to identify the specific code, directory, source file, or library.
3. Click **Apply**.

Parameters

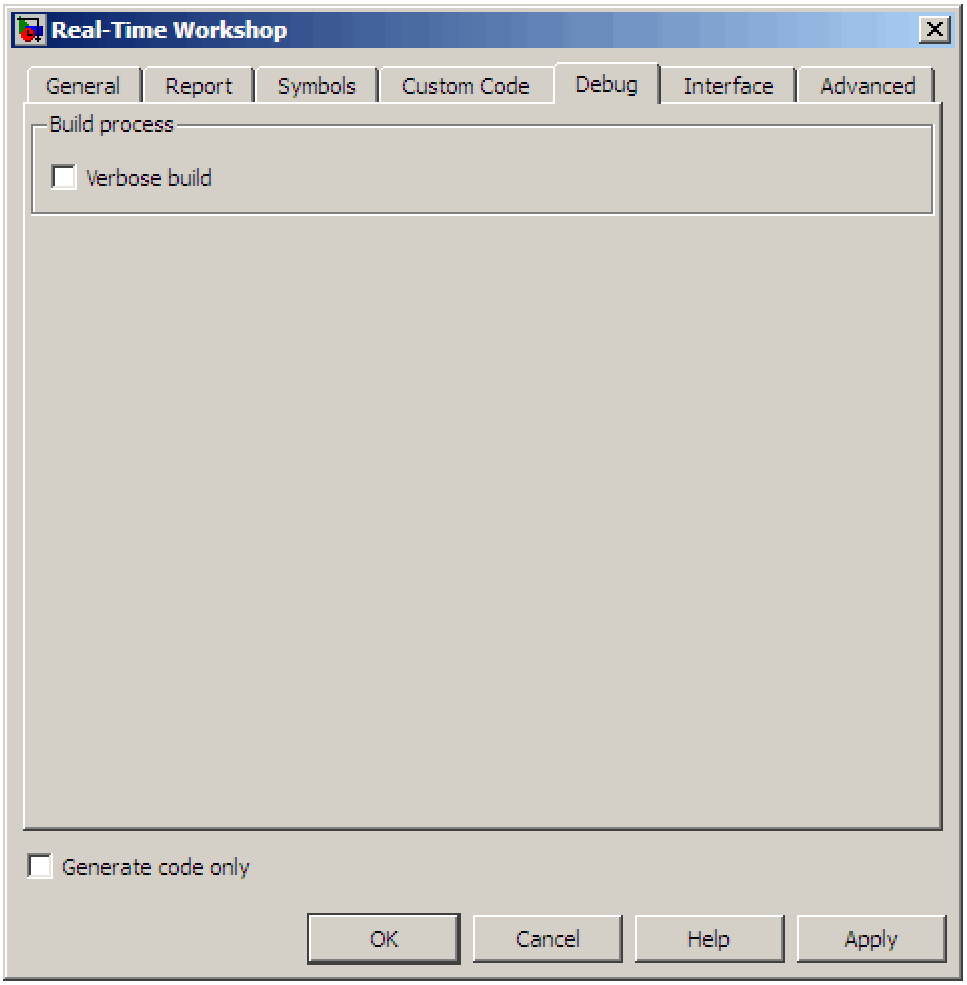
The following table describes the custom code parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

Custom Code Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Source file" on page 6-126	`CustomSourceCode` *`string`*,	Specify code appearing near the top of the generated `.c` or `.cpp` file, outside of any function.
"Header file" on page 6-127	`CustomHeaderCode` *`string`*,	Specify code appearing near the top of the generated `.h` file.
"Initialize function" on page 6-128	`CustomInitializer` *`string`*,	Specify code appearing in the initialize function of the generated `.c` or `.cpp` file.
"Terminate function" on page 6-129	`CustomTerminator` *`string`*,	Specify code appearing in the terminate function of the generated `.c` or `.cpp` file.
"Include directories" on page 6-130	`CustomInclude` *`string`*,	Specify a space-separated list of include directories to add to the include path when compiling the generated code. **Note** If your list includes any Windows path strings that contain spaces, each instance must be enclosed in double quotes within the argument string, for example, `'C:\Project "C:\Custom Files"'`

Custom Code Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Source files" on page 6-132	`CustomSource` *`string`*,	Specify a space-separated list of source files to compile and link with the generated code.
"Libraries" on page 6-133	`CustomLibrary` *`string`*,	Specify a space-separated list of static library files to link with the generated code.

Debug Tab

Specifies parameters for debugging the Embedded MATLAB Coder build process.



Parameters

The following table describes the debug parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

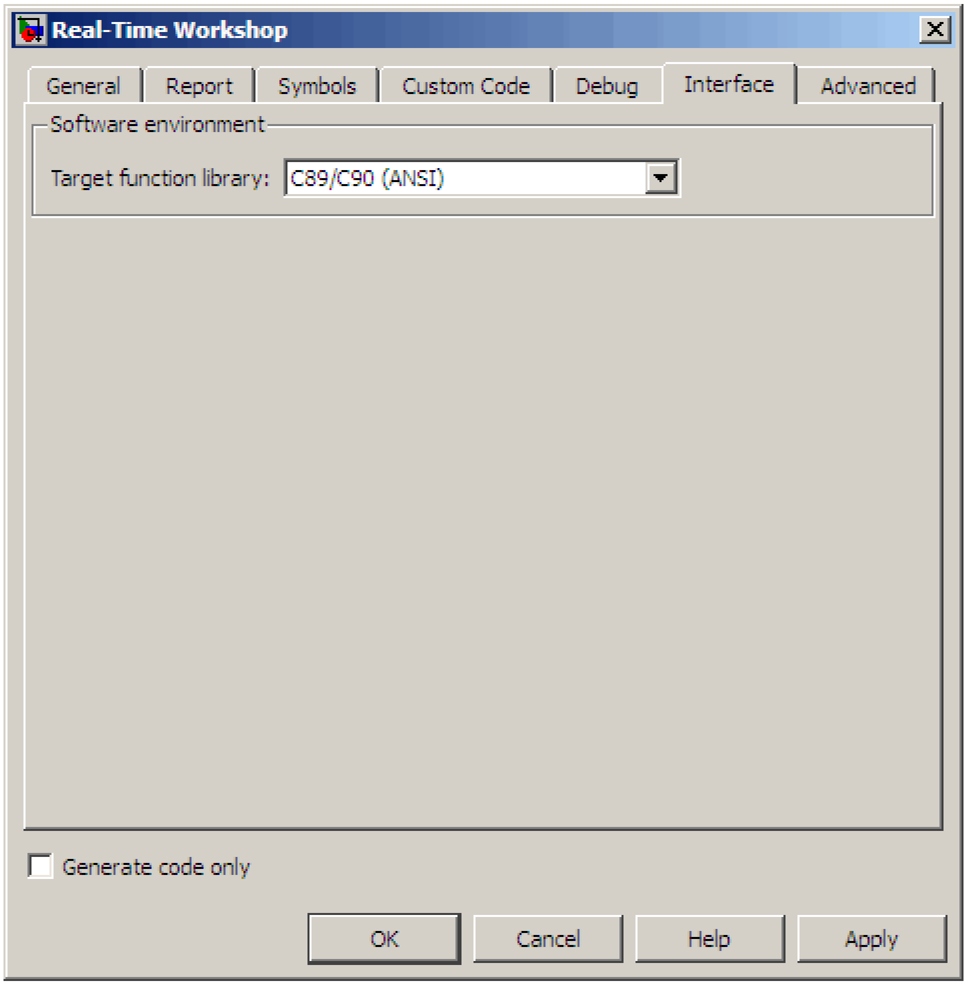
Debug Parameter	Equivalent Command-Line Property and Values (default in bold)	Description

"Verbose build" on page 6-137	`RTWVerbose`
	`true`, **`false`**
		Display code generation progress.

Interface Tab

Specifies parameters for selecting the target software environment for the code generated by Embedded MATLAB Coder.

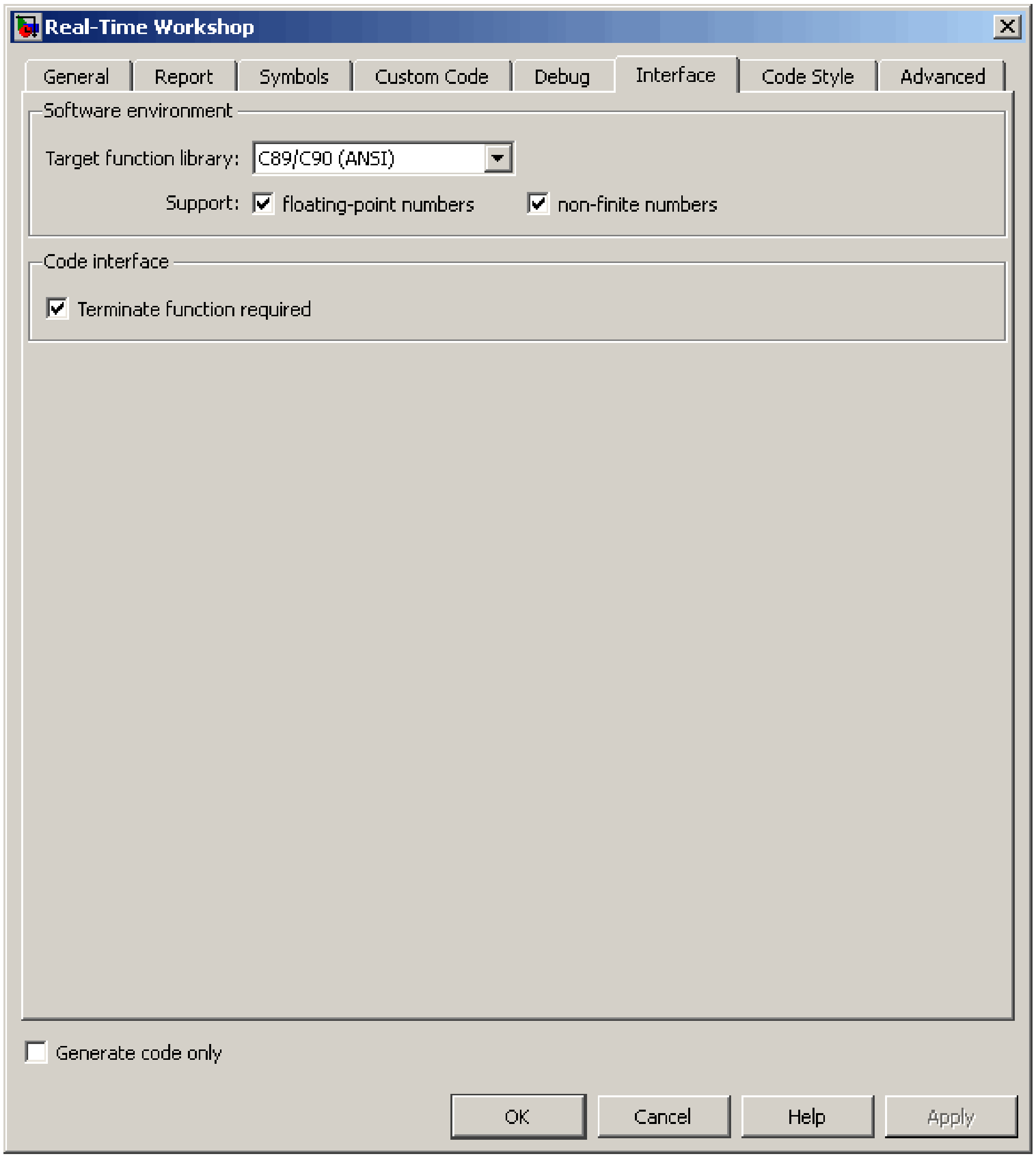
The Interface tab appears as follows for GRT-based targets:


Software environment

Target function library: C89/C90 (ANSI)

[ ] Generate code only

The Interface tab appears as follows for ERT-based targets:



Software environment

Target function library: C89/C90 (ANSI)

Support: ✓ floating-point numbers ✓ non-finite numbers

Code interface

✓ Terminate function required

☐ Generate code only

Parameters

The following table describes the interface parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

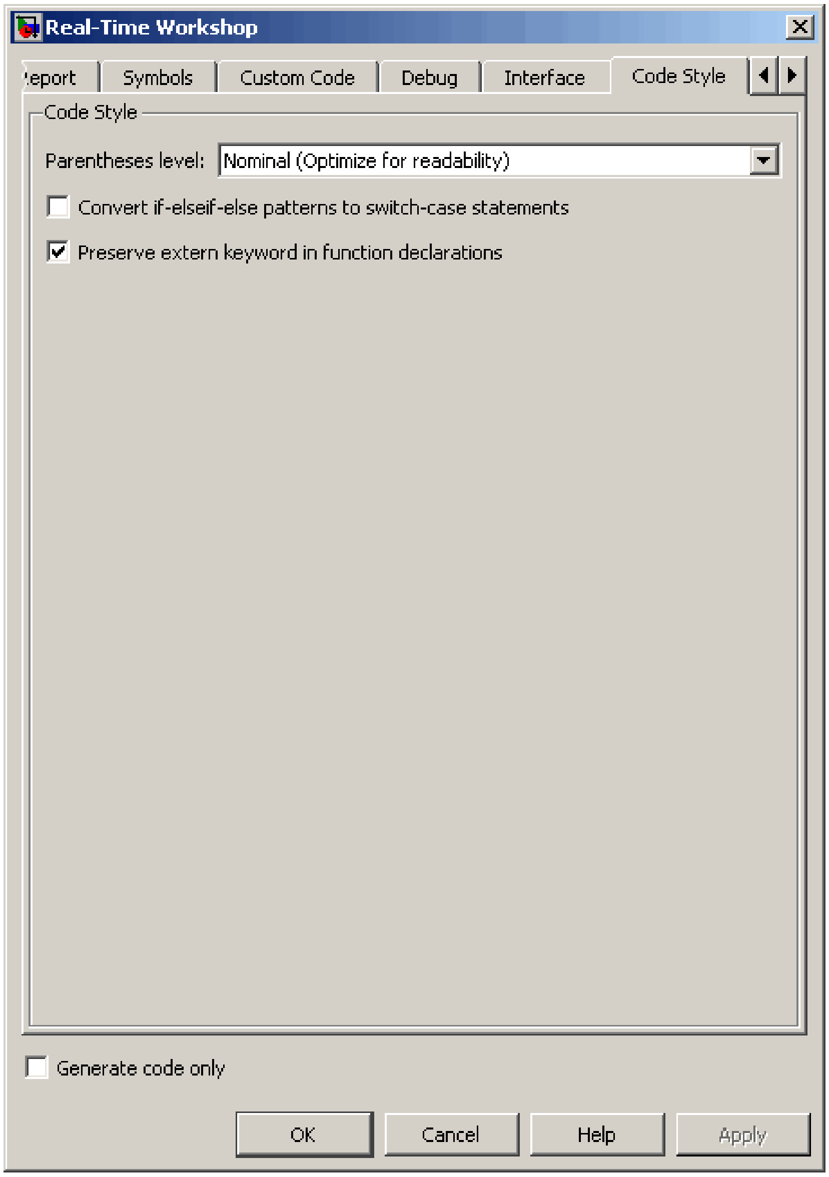
Interface Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Target function library" on page 6-149	`TargetFunctionLibrary` *string*, **`ANSI_C`**	Specify a target-specific math library for your model. Supports target function libraries (TFLs) for `GRT` system target files. If you have a Real-Time Workshop Embedded Coder license, you can configure Embedded MATLAB Coder to use `ERT` TFLs when generating C code. You enable this feature by defining a configuration object for C code generation using an `ert` parameter at the MATLAB command prompt, as in this example: `rtwcfg = emlcoder.RTWConfig('ert')`
"Support: floating-point numbers" on page 6-153	`PurelyIntegerCode` *string*, **`on`** , `'off'`	Specify whether to generate floating-point data and operations. Dependencies: • This parameter only appears for ERT-based targets. • This parameter requires a Real-Time Workshop Embedded Coder license when generating code. • Selecting this parameter enables **Support: non-finite numbers** and clearing this parameter disables **Support: non-finite numbers**.

Interface Parameter	**Equivalent Command-Line Property and Values (default in bold)**	**Description**
"Support: non-finite numbers" on page 6-157	`SupportNonFinite` *string*, **on** , 'off'	Specify whether to generate nonfinite data and operations. Dependencies: • This parameter only appears for ERT-based targets. • This parameter requires a Real-Time Workshop Embedded Coder license when generating code. • This parameter is enabled by **Support: floating-point numbers**.
Terminate function required	`IncludeMdlTerminateFcn` *string*, **on** , 'off'	Generate a project terminate function. Dependencies: • This parameter only appears for ERT-based targets. • This parameter requires a Real-Time Workshop Embedded Coder license when generating code.

Code Style Tab

Specifies parameters for customizing the style of the code generated by Embedded MATLAB Coder for ERT-based targets.

The Code Style tab appears only for ERT-based targets:



Code Style

Parentheses level: Nominal (Optimize for readability)

☐ Convert if-elseif-else patterns to switch-case statements

☑ Preserve extern keyword in function declarations

☐ Generate code only

Parameters

The following table describes the code style parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

Interface Parameter	Equivalent Command-Line Property and Values (default in bold)	Description

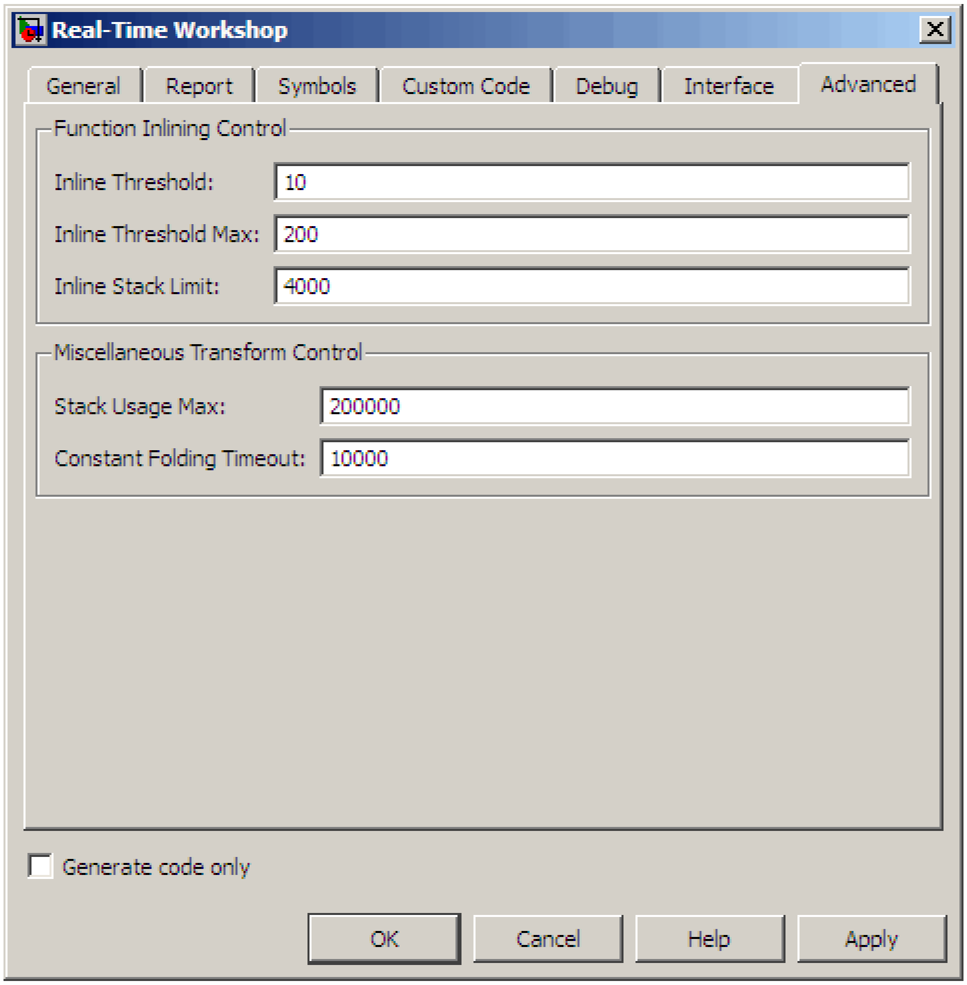
"Parentheses level"	`ParenthesesLevel`
	`string`, **`Nominal`** , `'Minimum'`, `'Maximum'`
		Specify the level of parenthesization in the code.
		Dependencies:
		• This parameter only appears for ERT-based targets.

"Convert if-elseif-else patterns to switch-case statements"	`ConvertIfToSwitch`
	`string`, **`off`** , `'on'`
		Select whether to convert if-elseif-else patterns to switch-case statements.
		Dependencies:
		• This parameter only appears for ERT-based targets.

"Preserve extern keyword in function declarations"	`PreserveExternInFcnDecls`
	`string`, **`on`** , `'off'`
		Specify whether the declarations of external functions generated by `emlc` will include the `extern` keyword.
		Dependencies:
		• This parameter only appears for ERT-based targets.

Advanced Tab

Specifies parameters for fine-tuning the behavior of the compiler.



Real-Time Workshop

Function Inlining Control

Inline Threshold: 10

Inline Threshold Max: 200

Inline Stack Limit: 4000

Miscellaneous Transform Control

Stack Usage Max: 200000

Constant Folding Timeout: 10000

☐ Generate code only

Parameters

The following table describes the advanced parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

Advanced Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Inline Threshold	`InlineThreshold` *integer*, **10**	Specify the maximum size of functions to be inlined.
Inline Threshold Max	`InlineThresholdMax` *integer*, **200**	Specify the maximum size of functions after inlining.
Inline Stack Limit	`InlineStackLimit` *integer*, **4000**	Specify the stack size limit on inlined functions.
Stack Usage Max	`StackUsageMax` *integer*, **200000**	Specify the maximum stack usage per function.
Constant Folding Timeout	`ConstantFoldingTimeout` *integer*, **10000**	Specify the maximum number of instructions to be executed by the constant folder.

Generate code only

Specify code generation versus an executable build. See "Generate code only" on page 6-34.

Automatic C MEX Generation Dialog Box for Embedded MATLAB Coder

In this section...

Automatic C MEX Generation Dialog Box Overview

Specifies parameters for C MEX generation using Embedded MATLAB Coder.

Displaying the Dialog Box

To display the Automatic C MEX Generation dialog box for Embedded MATLAB Coder, follow these steps at the MATLAB command prompt:

1 Define a configuration object variable for C MEX generation in the MATLAB workspace by issuing a constructor command like this:

```
mexgen_cfg=emlcoder.MEXConfig;
```

2 Open the property dialog box using one of these methods:

- Double-click the configuration object variable in the MATLAB workspace
- Issue the `open` command from the MATLAB prompt, passing it the configuration object variable, as in this example:

```
open mexgen_cfg;
```

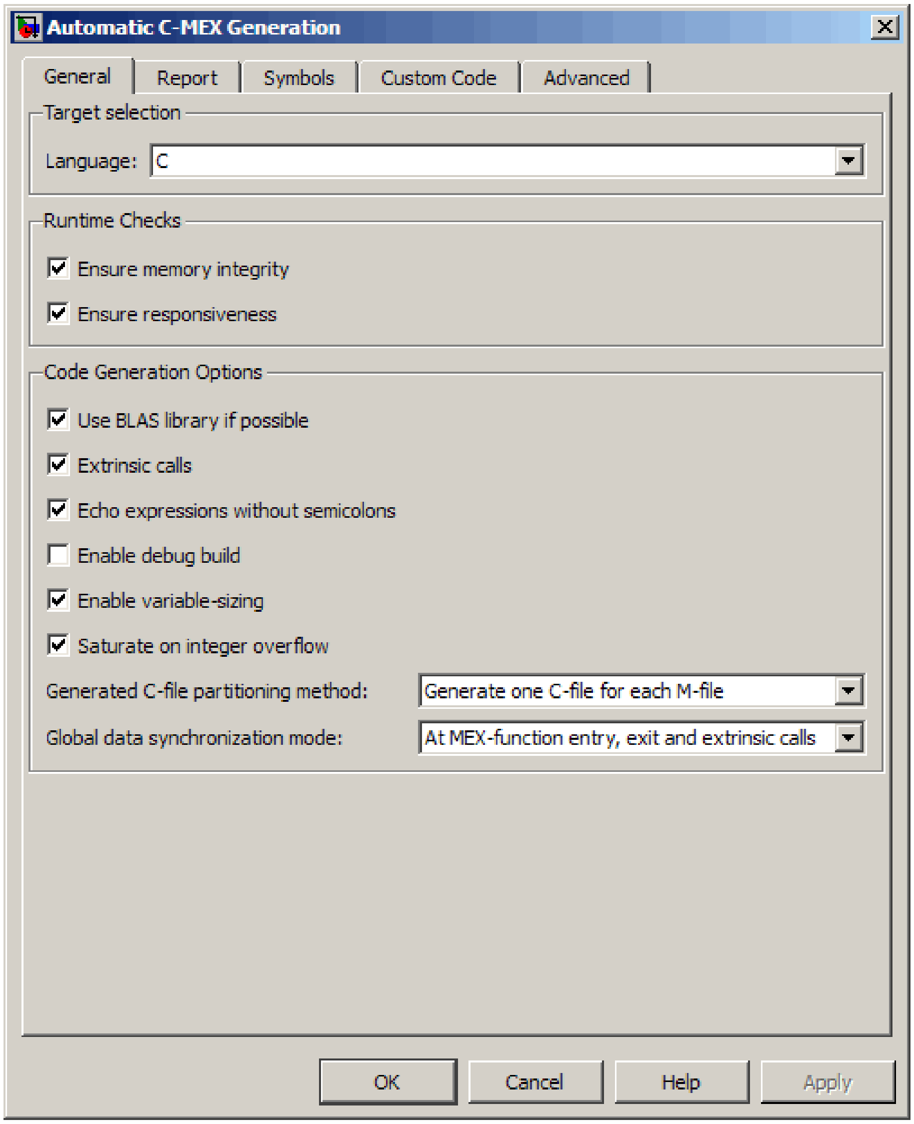
The dialog box displays on your desktop.

See Also

"Configuring Your Environment for Code Generation"

General Tab

Specifies general parameters for C MEX generation using Embedded MATLAB Coder.


Automatic C-MEX Generation

Target selection

Language: C

Runtime Checks

- [✓] Ensure memory integrity
- [✓] Ensure responsiveness

Code Generation Options

- [✓] Use BLAS library if possible
- [✓] Extrinsic calls
- [✓] Echo expressions without semicolons
- [ ] Enable debug build
- [✓] Enable variable-sizing
- [✓] Saturate on integer overflow

Generated C-file partitioning method: Generate one C-file for each M-file

Global data synchronization mode: At MEX-function entry, exit and extrinsic calls

Parameters

The following table describes the general parameters for the Embedded MATLAB Coder Automatic C MEX Generation dialog box:

General Parameter	**Equivalent Command-Line Property and Values (default in bold)**	**Description**

Language	`TargetLang`
	`string`, **`C`** , `'C++'`
		Specify code generation language

Ensure memory integrity	`IntegrityChecks`
	`true`, `false`
		Detect violations of memory integrity in code generated for Embedded MATLAB functions and stops execution with a diagnostic message. Setting `IntegrityChecks` to `false` also disables the runtime stack.

Ensure responsiveness	`ResponsivenessChecks`
	`true`, `false`
		Enable responsiveness checks in code generated for Embedded MATLAB functions.

Use BLAS library if possible	`EnableBLAS`
	`true`, `false`
		Speed up low-level matrix operations during simulation by calling the Basic Linear Algebra Subprograms (BLAS) library.

General Parameter	Equivalent Command-Line Property and Values (default in bold)	Description

Extrinsic calls	`ExtrinsicCalls`
	`true`, `false`
		Allow calls to extrinsic functions.
		
		An extrinsic function is a function on the MATLAB path that Embedded MATLAB dispatches to MATLAB software for execution. Embedded MATLAB does not compile or generate code for extrinsic functions.
		
		When enabled (`true`), generates code for the call to a MATLAB function, but does not generate the function's internal code.
		
		When disabled (`false`), ignores the extrinsic function. Does not generate code for the call to the MATLAB function — as long as the extrinsic function does not affect the output of the Embedded MATLAB function. Otherwise, issues a compiler error.

"Echo expressions without semicolons" on page 7-35	`EchoExpressions`
	`true`, `false`
		Specify whether or not actions that do not terminate with a semicolon appear in the MATLAB Command Window.

Enable debug build	`EnableDebugging`
	`true`, **`false`**
		Compile the generated code in debug mode.

Enable variable-sizing	`EnableVariableSizing`
	`true`, `false`
		Enable support for variable-sized arrays.

General Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Saturate on integer overflow	`SaturateOnIntegerOverflow` **`true`**, `false`	Add checks in the generated code to detect integer overflow or underflow.
Generated C-file partitioning method	`FilePartitionMethod` *`string`*, **`MapMFileToCFile`**, `SingleFile`	Specify whether to generate one C-file for each MATLAB language file or generate all C functions into a single file.

General Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Global Data Synchronization Mode	`GlobalDataSyncMethod` *string*, **`SyncAlways`**, `SyncAtEntryAndExits`, `NoSync`	Controls when Embedded MATLAB global data is synchronized with the MATLAB global workspace. By default (`SyncAlways`), synchronizes global data at MEX function entry and exit and for all extrinsic calls to ensure maximum consistency between MATLAB and Embedded MATLAB. If the extrinsic calls do not affect global data, use this option in conjunction with the `eml.extrinsic -sync:off` option to turn off synchronization for these calls to maximize performance. `SyncAtEntryAndExits` synchronizes global data at MEX function entry and exit only. If your code contains extrinsic calls, but only a few affect global data, use this option in conjunction with the `eml.extrinsic -sync:on` option to turn on synchronization for these calls to maximize performance. `NoSync` disables synchronization. Ensure that your Embedded MATLAB code does not interact with MATLAB before disabling synchronization otherwise

General Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
		inconsistencies between MATLAB and Embedded MATLAB might occur.

See Also.

- "Speeding Up Simulation with the Basic Linear Algebra Subprograms (BLAS) Library" in the *Real-Time Workshop User's Guide*.
- "Controlling Runtime Checks" in the *Real-Time Workshop User's Guide*.
- "Working with Variable-Size Data" in the *Embedded MATLAB User's Guide*.
- "Generating C/C++ Code from MATLAB Code That Uses Global Data" in the *Real-Time Workshop User's Guide*.

Echo expressions without semicolons

For C MEX code generation, specify whether or not actions that do not terminate with a semicolon appear in the MATLAB Command Window.

Settings. **Default:** `true`

☑ `true`
Enables output to appear in the MATLAB Command Window for actions that do not terminate with a semicolon.

☐ `false`
Disables output from appearing in the MATLAB Command Window for actions that do not terminate with a semicolon.

Command-Line Information.

Parameter: `EchoExpressions`
Type: boolean
Value: `true | false`
Default: `true`

Recommended Settings.

Application	Setting
Debugging	`true`
Traceability	No impact
Efficiency	`false`
Safety precaution	No impact

Enable debug build

For C MEX code generation, specify whether Embedded MATLAB Coder compiles the generated code in debug mode.

Settings. Default: `false`

☑ `true`
Compile generated code in debug mode.

☐ `false`
Compile generated code in release (or optimized) mode.

Command-Line Information.

Parameter: `EnableDebugging`
Type: boolean
Value: `true | false`
Default: `false`

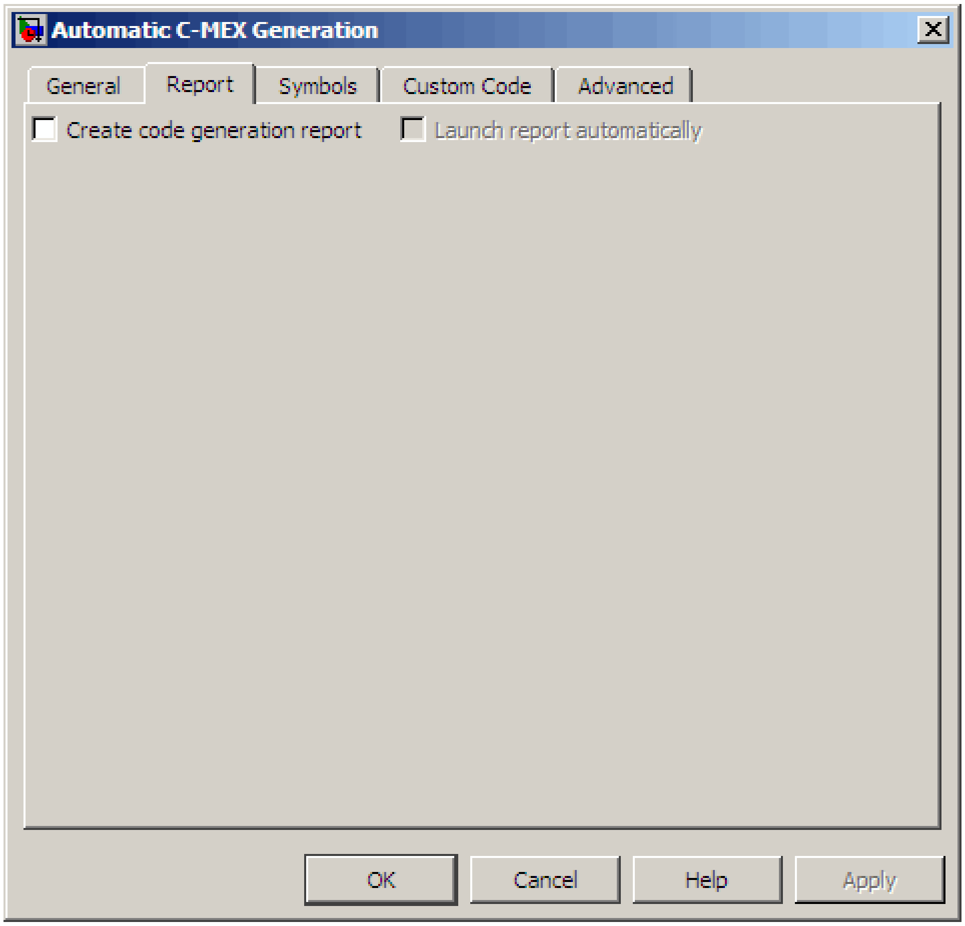
Recommended Settings.

Application	Setting
Debugging	`true`
Traceability	`true`
Efficiency	`false`
Safety precaution	No impact

See Also. "How Debugging Affects Simulation Speed" in the Simulink User's Guide.

Report Tab

Controls the report that is created for C MEX generation using Embedded MATLAB Coder.



☐ Create code generation report ☐ Launch report automatically

Parameters

The following table describes the report parameters for the Embedded MATLAB Coder Automatic C MEX Generation dialog box:

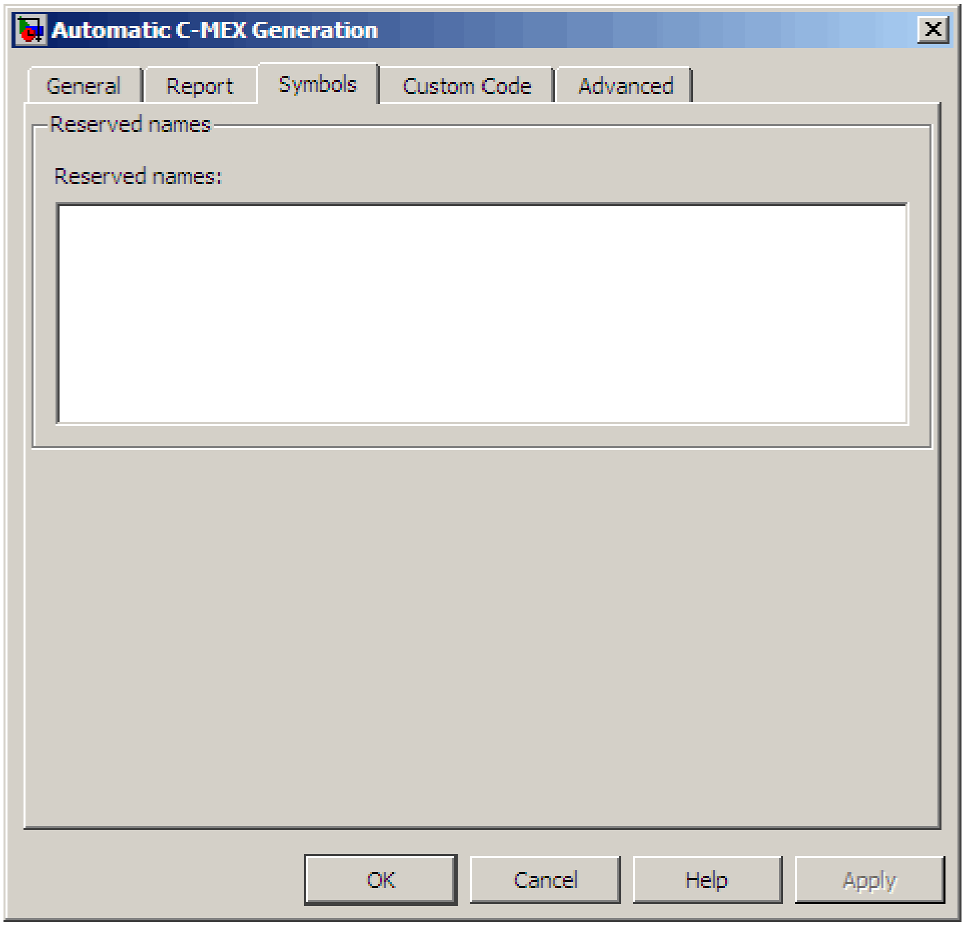
Report Parameter	Equivalent Command-Line Property and Values (default in bold)	Description

"Create code generation report" on page 6-40	`GenerateReport`
	`true`, **`false`**
		Document generated code in an HTML report.

"Launch report automatically" on page 6-43	`LaunchReport`
	`true`, **`false`**
		Specify whether to automatically display HTML reports after code generation completes.
		
		Note Requires that you select **Create code generation report**

Symbols Tab

Specifies parameters for selecting automatically generated naming rules for identifiers in C MEX generation using Embedded MATLAB Coder.



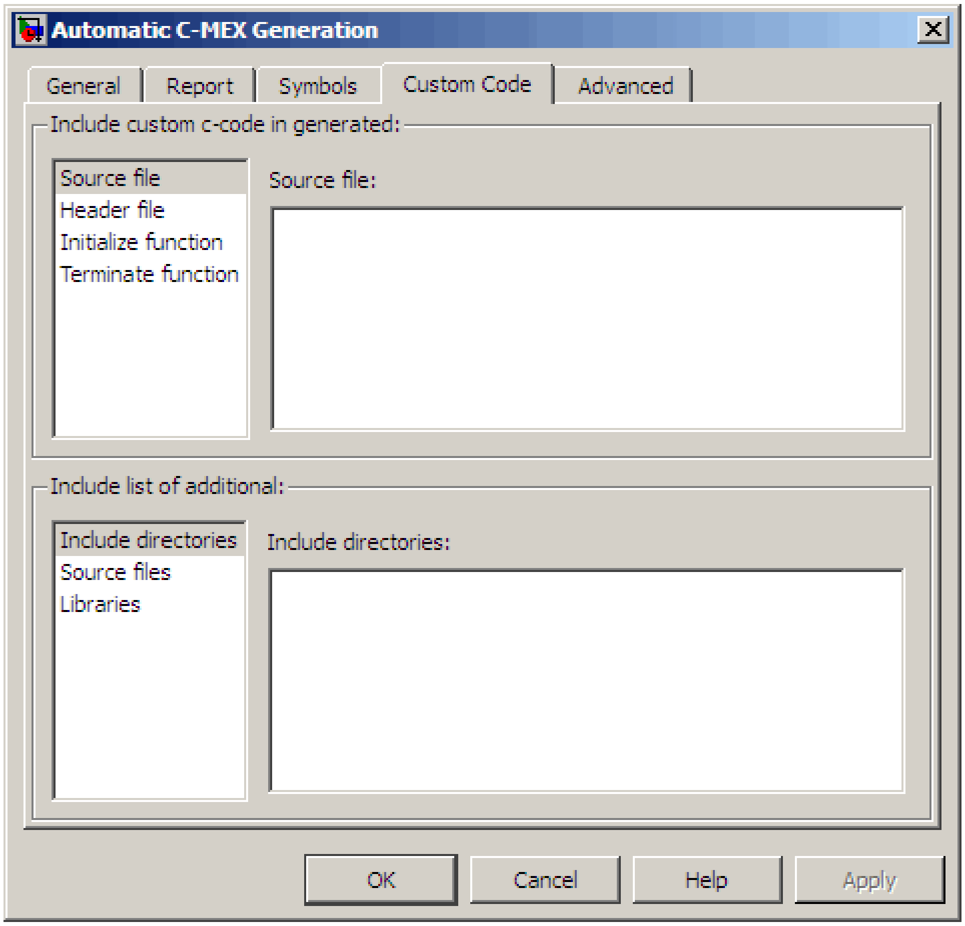
Parameters

The following table describes the symbols parameters for the Embedded MATLAB Coder Automatic C MEX Generation dialog box:

Symbols Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Reserved names" on page 6-117	`ReservedNameArray` *`string`*,	Enter the names of variables or functions in the generated code that match the names of variables or functions specified in custom code.

Custom Code Tab

Creates a list of custom C code, directories, source and header files, and libraries to be included in files generated by Embedded MATLAB Coder.



Configuration

1. Select the type of information to include from the list on the left side of the pane.
2. Enter a string to identify the specific code, directory, source file, or library.
3. Click **Apply**.

Parameters

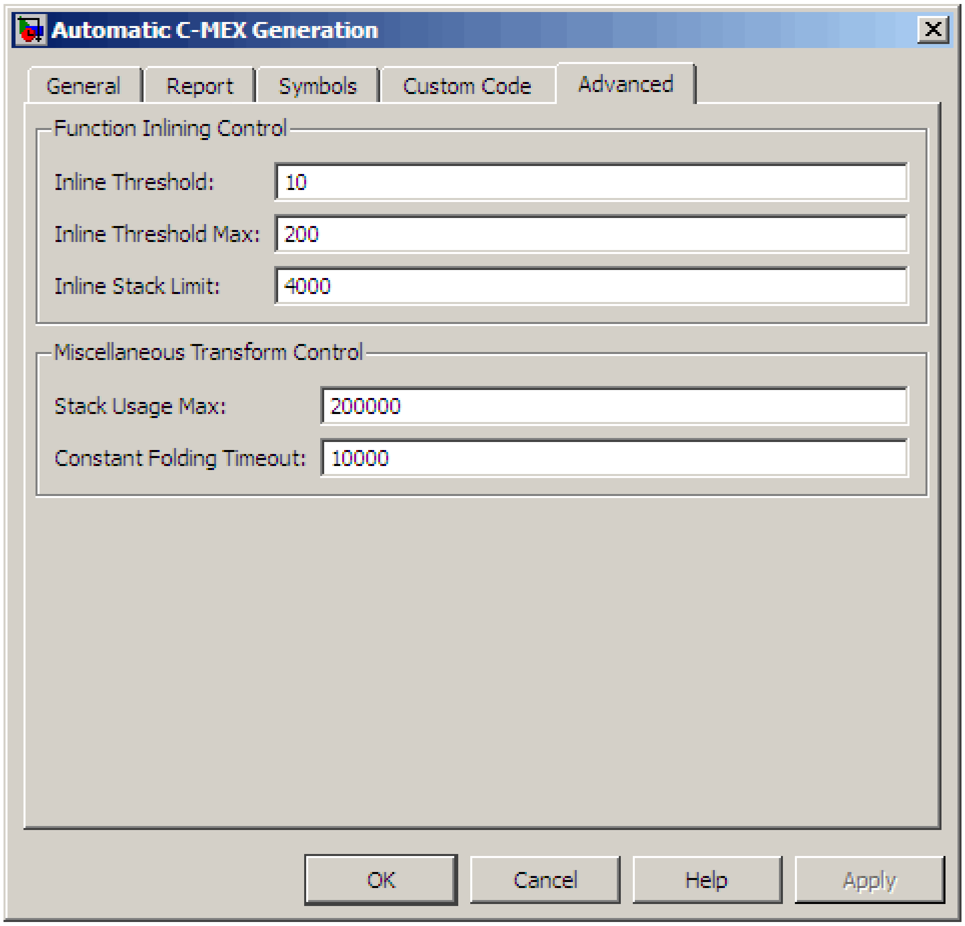
The following table describes the custom code parameters for the Embedded MATLAB Coder Automatic C MEX Generation dialog box:

Custom Code Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Source file" on page 6-126	`CustomSourceCode` *`string`*,	Specify code appearing near the top of the generated C MEX file.
"Header file" on page 6-127	`CustomHeaderCode` *`string`*,	Specify code appearing near the top of the generated header `.h` file.
"Initialize function" on page 6-128	`CustomInitializer` *`string`*,	Specify code appearing in the initialize function of the generated C MEX file.
"Terminate function" on page 6-129	`CustomTerminator` *`string`*,	Specify code appearing in the terminate function of the generated `.c` or `.cpp` file.
"Include directories" on page 6-130	`CustomInclude` *`string`*,	Specify a space-separated list of include directories to add to the include path when compiling the generated code. **Note** If your list includes any Windows path strings that contain spaces, each instance must be enclosed in double quotes within the argument string, for example, `'C:\Project "C:\Custom Files"'`

Custom Code Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Source files" on page 6-132	`CustomSource` *`string`*,	Specify a space-separated list of source files to compile and link with the generated code.
"Libraries" on page 6-133	`CustomLibrary` *`string`*,	Specify a space-separated list of static library files to link with the generated code.

Advanced Tab

Specifies parameters for fine-tuning the behavior of the compiler.



Function Inlining Control

Inline Threshold: 10

Inline Threshold Max: 200

Inline Stack Limit: 4000

Miscellaneous Transform Control

Stack Usage Max: 200000

Constant Folding Timeout: 10000

Parameters

The following table describes the advanced parameters for the Embedded MATLAB Coder **Real-Time Workshop** dialog box:

Advanced Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Inline Threshold	`InlineThreshold` *integer*, **10**	Specify the maximum size of functions to be inlined.
Inline Threshold Max	`InlineThresholdMax` *integer*, **200**	Specify the maximum size of functions after inlining.
Inline Stack Limit	`InlineStackLimit` *integer*, **4000**	Specify the stack size limit on inlined functions.
Stack Usage Max	`StackUsageMax` *integer*, **200000**	Specify the maximum stack usage per function.
Constant Folding Timeout	`ConstantFoldingTimeout` *integer*, **10000**	Specify the maximum number of instructions to be executed by the constant folder.

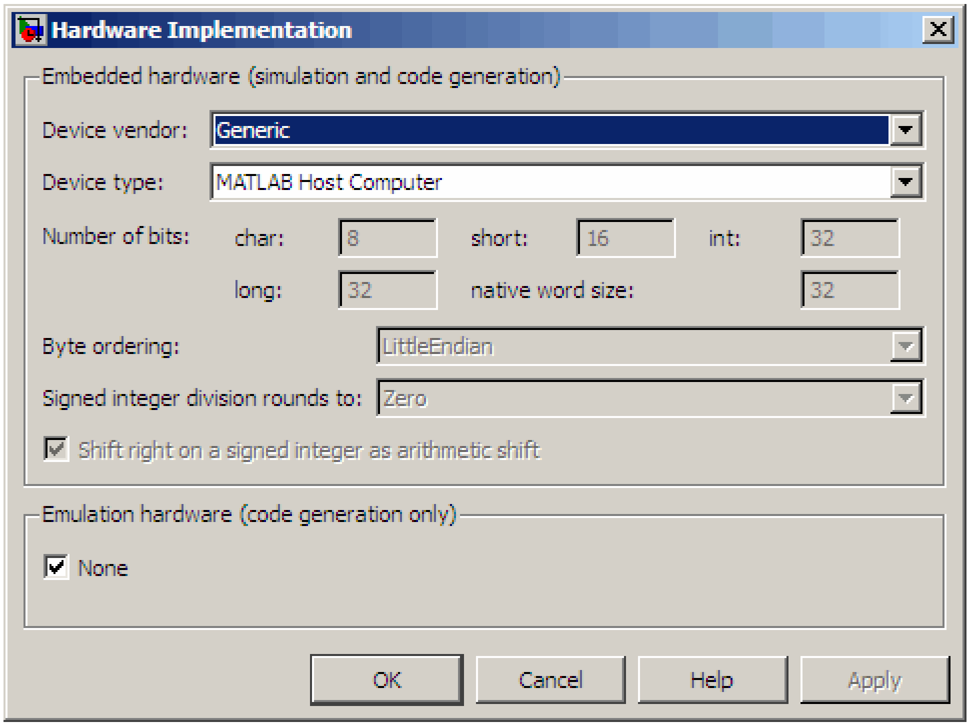
Hardware Implementation Dialog Box for Embedded MATLAB Coder

In this section...

Hardware Implementation Parameters Dialog Box Overview

Specifies parameters of the target hardware implementation.

The Hardware Implementation parameters dialog box appears as follows by default. (The **long** and **native word size** values shown are for a 32-bit MATLAB host computer.) In this case, the test hardware and the deployment hardware are the same and you use the **Embedded hardware** pane to set the hardware properties for both.


Hardware Implementation

Embedded hardware (simulation and code generation)

Device vendor: Generic

Device type: MATLAB Host Computer

Number of bits: char: 8 short: 16 int: 32

long: 32 native word size: 32

Byte ordering: LittleEndian

Signed integer division rounds to: Zero

[✓] Shift right on a signed integer as arithmetic shift

Emulation hardware (code generation only)

[✓] None

Displaying the Dialog Box

To display the Hardware Implementation dialog box for Embedded MATLAB Coder, follow these steps at the MATLAB command prompt:

1 Define a configuration object variable for hardware implementation in the MATLAB workspace by issuing a constructor command like this:

```
hwi_cfg=emlcoder.HardwareImplementation;
```

2 Open the property dialog box using one of these methods:

- Double-click the configuration object variable in the MATLAB workspace
- Issue the `open` command from the MATLAB prompt, passing it the configuration object variable, as in this example:

```
open hwi_cfg;
```

The dialog box displays on your desktop.

See Also

"Configuring Your Environment for Code Generation"

Hardware Implementation Parameters

The following table describes the hardware implementation parameters for Embedded MATLAB Coder:

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Device vendor"	`ProdHWDeviceType` *string*, **`Generic->MATLAB Host Computer`**	Specify manufacturer of hardware you will use to implement the production version of the system.
"Device type"	`ProdHWDeviceType` *string*, **`Generic->MATLAB Host Computer`**	Specify type of hardware you will use to implement the production version of the system.
"Number of bits: char"	`ProdBitPerChar` *integer*, **8**	Describe length in bits of the C `char` data type supported by the deployment hardware.
"Number of bits: short"	`ProdBitPerShort` *integer*, **16**	Describe length in bits of the C `short` data type supported by the deployment hardware.
"Number of bits: int"	`ProdBitPerInt` *integer*, **32**	Describe length in bits of the C `int` data type supported by the deployment hardware.

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Number of bits: long"	`ProdBitPerLong` *`integer`*, **host-specific value (32 or 64)**	Describe length in bits of the C `long` data type supported by the deployment hardware.
"Number of bits: native word size"	`ProdWordSize` *`integer`*, **host-specific value (32 or 64)**	Describe microprocessor native word size for the deployment hardware.

"Byte ordering"	`ProdEndianess`
	`'Unspecified'`,
	`LittleEndian` ,
	`'BigEndian'`
		Describe significance of the first byte of a data word for the deployment hardware.

"Signed integer division rounds to"	`ProdIntDivRoundTo`
	`'Undefined'`, **`Zero`** ,
	`'Floor'`
		Describe how your compiler rounds the result of dividing one signed integer by another to produce a signed integer quotient.

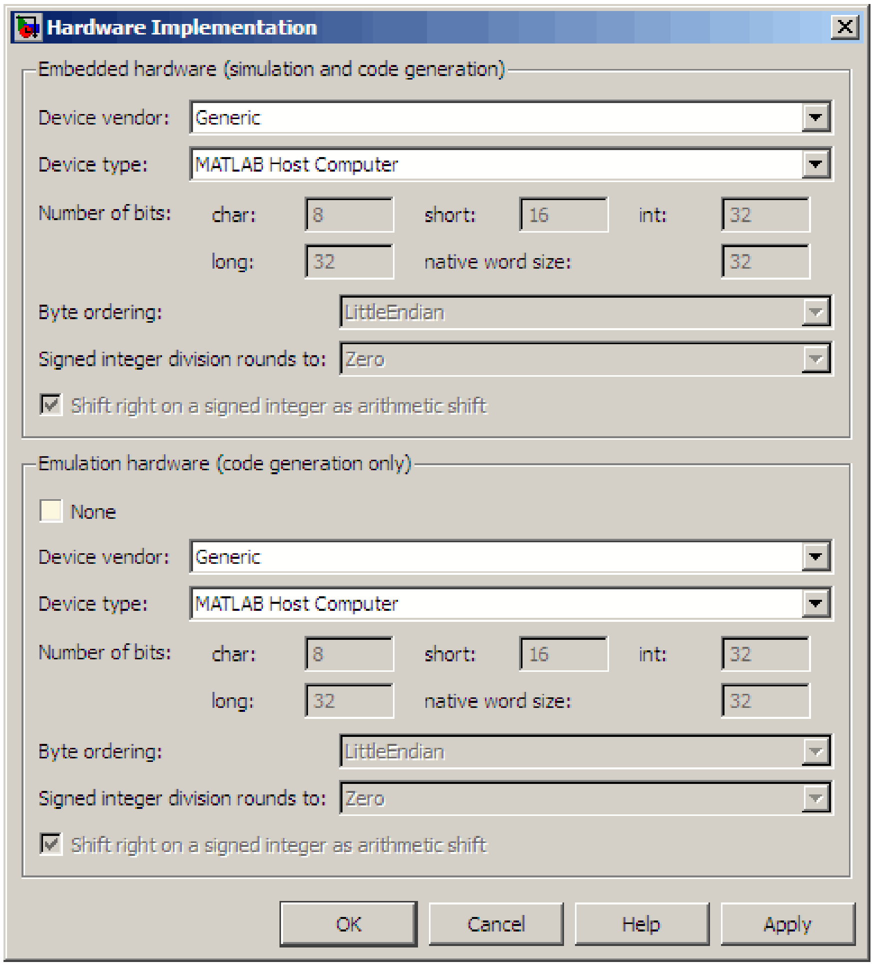
"Shift right on a signed integer as arithmetic shift"	`ProdShiftRightIntArith`
	`true`, `false`
		Describe whether your compiler implements a signed integer right shift as an arithmetic right shift.

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description

None	`ProdEqTarget`
	`true`, `false`
		Specify whether the test hardware differs from the deployment hardware.
		
		Note By default they are the same.
		
		Dependencies:
		• Setting this parameter to `true` disables the **Emulation hardware (code generation only)** subpane.
		• Setting this parameter to `false` enables the **Emulation hardware (code generation only)** subpane. This subpane is used to specify the test hardware properties.
		See "Emulation Hardware Subpane" on page 7-51

Emulation Hardware Subpane

The Hardware Implementation parameters dialog box displays the **Emulation hardware (code generation only)** subpane when the test hardware and the deployment hardware differ. In this case, you use the **Embedded hardware (simulation and code generation)** subpane to specify the deployment hardware properties and the **Emulation hardware (code generation only)** pane to specify the test hardware properties.


Hardware Implementation

Embedded hardware (simulation and code generation)

Device vendor: Generic

Device type: MATLAB Host Computer

Number of bits: char: 8 short: 16 int: 32

long: 32 native word size: 32

Byte ordering: LittleEndian

Signed integer division rounds to: Zero

[✓] Shift right on a signed integer as arithmetic shift

Emulation hardware (code generation only)

[ ] None

Device vendor: Generic

Device type: MATLAB Host Computer

Number of bits: char: 8 short: 16 int: 32

long: 32 native word size: 32

Byte ordering: LittleEndian

Signed integer division rounds to: Zero

[✓] Shift right on a signed integer as arithmetic shift

The following table describes the emulation hardware implementation parameters for Embedded MATLAB Coder:

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Device vendor"	`TargetHWDeviceType` *string*, **Generic->MATLAB Host Computer**	Select the manufacturer of the hardware that will be used to test the generated code. Dependency: • **None** is set to `false`
"Device type"	`TargetHWDeviceType` *string*, **Generic->MATLAB Host Computer**	Select the type of hardware that will be used to test the generated code. Dependency: • **None** is set to `false`
"Number of bits: char"	`TargetBitPerChar` *integer*, **8**	Describe length in bits of the C `char` data type supported by the test hardware. Dependency: • **None** is set to `false`
"Number of bits: short"	`TargetBitPerShort` *integer*, **16**	Describe length in bits of the C `short` data type supported by the test hardware. Dependency: • **None** is set to `false`

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Number of bits: int"	`TargetBitPerInt` *integer*, **32**	Describe length in bits of the C `int` data type supported by the test hardware. Dependency: • **None** is set to `false`
"Number of bits: long"	`TargetBitPerLong` *integer*, **host-specific value (32 or 64)**	Describe length in bits of the C `long` data type supported by the test hardware. Dependency: • **None** is set to `false`
"Number of bits: native word size"	`TargetWordSize` *integer*, **host-specific value (32 or 64)**	Describe the microprocessor native word size for the test hardware. Dependency: • **None** is set to `false`

"Byte ordering"	`TargetEndianess`
	`'Unspecified'`,
	`LittleEndian` ,
	`'BigEndian'`
		Describe significance of the first byte of a data word for the test hardware.
		Dependency:
		• **None** is set to `false`

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
"Signed integer division rounds to"	`TargetIntDivRoundTo` `'Undefined'`, **`Zero`** , `'Floor'`	Describe how to produce a signed integer quotient for the test hardware. Dependency: • **None** is set to `false`
"Shift right on a signed integer as arithmetic shift"	`TargetShiftRightIntArith` **`true`**, `false`	Describe how your compiler rounds the result of two signed integers for the test hardware. Dependency: • **None** is set to `false`

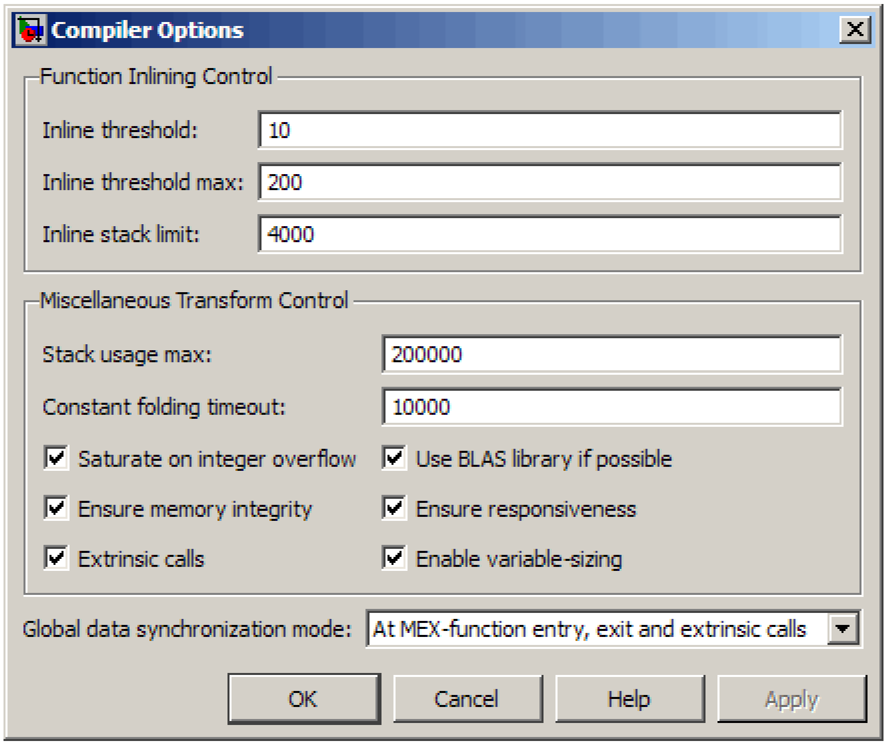
Compiler Options Dialog Box

In this section...

Compiler Options Parameters Dialog Box Overview

Note This dialog is for use with the Embedded MATLAB function `emlmex` only. It is available for use with Embedded MATLAB Coder for backwards compatibility purposes only and will be removed in a future release. To specify parameters for embeddable C code generation using Embedded MATLAB Coder, use the “Real-Time Workshop Dialog Box for Embedded MATLAB Coder” on page 7-2. To specify parameters for C MEX generation using Embedded MATLAB Coder, use the “Automatic C MEX Generation Dialog Box for Embedded MATLAB Coder” on page 7-28.

Specifies parameters for fine-tuning the behavior of the compiler.



Function Inlining Control

Inline threshold: 10

Inline threshold max: 200

Inline stack limit: 4000

Miscellaneous Transform Control

Stack usage max: 200000

Constant folding timeout: 10000

[✓] Saturate on integer overflow
[✓] Use BLAS library if possible
[✓] Ensure memory integrity
[✓] Ensure responsiveness
[✓] Extrinsic calls
[✓] Enable variable-sizing

Global data synchronization mode: At MEX-function entry, exit and extrinsic calls

Displaying the Dialog Box

To display the Compiler Options dialog box for Embedded MATLAB Coder, follow these steps at the MATLAB command prompt:

1 Define a configuration object variable for compiler options in the MATLAB workspace by issuing a constructor command like this:

```
co_cfg=emlcoder.CompilerOptions;
```

2 Open the property dialog box using one of these methods:

- Double-click the configuration object variable in the MATLAB workspace
- Issue the `open` command from the MATLAB prompt, passing it the configuration object variable, as in this example:

```
open co_cfg;
```

The dialog box displays on your desktop.

Compiler Options Parameters

The following table describes the parameters for fine-tuning the behavior of the compiler for Embedded MATLAB Coder:

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Inline Threshold	`InlineThreshold` *integer*, **10**	Specify the maximum size of functions to be inlined.
Inline Threshold Max	`InlineThresholdMax` *integer*, **200**	Specify the maximum size of functions after inlining.
Inline Stack Limit	`InlineStackLimit` *integer*, **4000**	Specify the stack size limit on inlined functions.
Stack Usage Max	`StackUsageMax` *integer*, **200000**	Specify the maximum stack usage per function.
Constant Folding Timeout	`ConstantFoldingTimeout` *integer*, **10000**	Specify the maximum number of instructions to be executed by the constant folder.
Saturate on integer overflow	`SaturateOnIntegerOverflow` **`true`**, `false`	Add checks in the generated code to detect integer overflow or underflow.
Use BLAS library if possible	`EnableBLAS` **`true`**, `false`	Speed up low-level matrix operations during simulation by calling the Basic Linear Algebra Subprograms (BLAS) library.
Ensure memory integrity	`IntegrityChecks` **`true`**, `false`	Detect violations of memory integrity in code generated for Embedded MATLAB functions and stop execution with a diagnostic message.

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Ensure responsiveness	`ResponsivenessChecks` **`true`**, `false`	Enable responsiveness checks in code generated for Embedded MATLAB functions.

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description

Extrinsic calls	`ExtrinsicCalls`
	`true`, `false`
		Allow calls to extrinsic functions.
		
		An extrinsic function is a function on the MATLAB path that Embedded MATLAB dispatches to MATLAB software for execution. Embedded MATLAB does not compile or generate code for extrinsic functions.
		
		When enabled (`true`), excludes the extrinsic function from the generated code for Real-Time Workshop and custom targets— as long as the extrinsic function does not affect the output of the Embedded MATLAB function. Otherwise, issues a compiler error.
		
		When disabled (`false`), ignores the extrinsic function. Does not generate code for the call to the MATLAB function for any target — as long as the extrinsic function does not affect the output of the Embedded MATLAB function. Otherwise, issues a compiler error.

Enable variable-sizing	`EnableVariableSizing`
	`true`, `false`
		Enable support for variable-sized arrays.

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
Global Data Synchronization Mode	`GlobalDataSyncMethod` *string*, **`SyncAlways`**, `SyncAtEntryAndExits`, `NoSync`	Controls when Embedded MATLAB global data is synchronized with the MATLAB global workspace. By default (`SyncAlways`), synchronizes global data at MEX function entry and exit and for all extrinsic calls to ensure maximum consistency between MATLAB and Embedded MATLAB. If the extrinsic calls do not affect global data, use this option in conjunction with the `eml.extrinsic-sync:off` option to turn off synchronization for these calls to maximize performance. `SyncAtEntryAndExits` synchronizes global data at MEX function entry and exit only. If your code contains extrinsic calls, but only a few affect global data, use this option in conjunction with the `eml.extrinsic-sync:on` option to turn on synchronization for these calls to maximize performance. For more information, see `eml.extrinsic`. `NoSync` disables synchronization. Ensure that your Embedded MATLAB code does not interact with

Parameter	Equivalent Command-Line Property and Values (default in bold)	Description
		MATLAB before disabling synchronization otherwise inconsistencies between MATLAB and Embedded MATLAB might occur.

Model Advisor Checks

Real-Time Workshop Checks

In this section...

Real-Time Workshop Overview

Use Real-Time Workshop Model Advisor checks to configure your model for code generation.

See Also

- Consulting Model Advisor
- Simulink Model Advisor Check Reference
- Simulink Verification and Validation Model Advisor Check Reference

Check solver for code generation

Check model solver and sample time configuration settings.

Description

Incorrect configuration settings can stop the Real-Time Workshop software from generating code. Underspecifying sample times can lead to undesired results. Avoid generating code that might corrupt data or produce unpredictable behavior.

Results and Recommended Actions

Condition	Recommended Action
The solver type is set incorrectly for model level code generation.	Set **Configuration Parameters** > **Solver** > • **Type** to `Fixed-step` • **Solver** to `Discrete (no continuous states)`
Multitasking diagnostic options are not set to `error`.	Set **Configuration Parameters** > **Diagnostics** > • **Sample Time** > **Multitask conditionally executed subsystem** to `error` • **Sample Time** > **Multitask rate transition** to `error` • **Data Validity** > **Multitask data store** to `error`

Tips

You do not have to modify the solver settings to generate code from a subsystem. The Real-Time Workshop Embedded Coder build process automatically changes **Solver type** to `fixed-step` when you select **Real-Time Workshop** > **Build Subsystem** or **Real-Time Workshop** > **Generate S-Function** from the subsystem context menu.

See Also

- “Configuring Scheduling”
- “Executing Multitasking Models”

Identify questionable blocks within the specified system

Identify blocks not supported by code generation or not recommended for deployment.

Description

The code generator creates code only for the blocks that it supports. Some blocks are not recommended for production code deployment.

Results and Recommended Actions

Condition	Recommended Action
A block is not supported by the Real-Time Workshop software.	Remove the specified block from the model or replace the block with the recommended block.
A block is not recommended for production code deployment.	Remove the specified block from the model or replace the block with the recommended block.
Check for Gain blocks whose value equals 1.	Replace Gain blocks with Signal Conversion blocks.

See Also

"Block Support Considerations"

Check the hardware implementation

Identify inconsistent or underspecified hardware implementation settings

Description

The Simulink and Real-Time Workshop software require two sets of target specifications. The first set describes the final intended production target. The second set describes the currently selected target. If the configurations do not match, the code generator creates extra code to emulate the behavior of the production target. Inconsistencies or underspecification of hardware attributes can lead to inefficient or incorrect code generation for the target hardware.

Results and Recommended Actions

Condition	Recommended Action
Device type is set to `Unspecified (assume 32-bit Generic)`.	Set **Configuration Parameters > Hardware Implementation > Device type** to the target hardware.
Hardware implementation parameters are not set to recommended values.	Specify the following **Configuration Parameters** > **Hardware Implementation** parameters: • **Byte ordering** • **Signed integer division rounding**
Hardware implementation **Embedded hardware** settings do not match **Emulation hardware** settings.	Consider selecting the **Configuration Parameters** > **Hardware Implementation** > **None** check box, or modify the settings to match.

See Also

Making GRT-Based Targets ERT-Compatible

Identify questionable software environment specifications

Identify questionable software environment settings.

Description

- Support for some software environment settings can lead to inefficient code generation and nonoptimal results.
- Industry standards for C, such as ISO and MISRA®, require identifiers to be unique within the first 31 characters.
- Stateflow charts with weak Simulink I/O data types lead to inefficient code.

Results and Recommended Actions

Condition	Recommended Action
The maximum identifier length does not conform with industry standards for C.	Set the **Configuration Parameters** > **Real-Time Workshop** > **Symbols** > **Maximum identifier length** parameter to `31` characters.
Real-Time Workshop Interface parameters are not set to recommended values.	Set the following **Configuration Parameters** > **Real-Time Workshop** > **Interface** parameters to the recommended values: • **Support: continuous time** • **Support: non-finite numbers** • **Support: non-inlined S-functions**
Real-Time Workshop Symbols parameters are not set to recommended values.	Set the **Configuration Parameters** > **Real-Time Workshop** > **Symbols** > **Generate scalar inlined parameters as** parameter to `Literals`.

Condition	Recommended Action
Support: variable-size signals is selected. This might lead to inefficient code.	If you do not intend to support variable-sized signals, clear the **Real-Time Workshop > Interface > "Support: variable-size signals" on page 6-165** check box in the Configuration Parameters dialog box.
The model contains Stateflow charts with weak Simulink I/O data type specifications.	Select the Stateflow chart property **Use Strong Data Typing with Simulink I/O**. You might need to adjust the data types in your model after selecting the property.

Limitations

A Stateflow license is required when using Stateflow charts.

See Also

"Strong Data Typing with Simulink I/O"

Identify questionable code instrumentation (data I/O)

Identify questionable code instrumentation.

Description

- Instrumentation of the generated code can cause nonoptimal results.
- Test points require global memory and are not optimal for production code generation.

Results and Recommended Actions

Condition	Recommended Action
Interface parameters are not set to recommended values.	Set the **Configuration Parameters** > **Real-Time Workshop** > **Interface** parameters to the recommended values.
Blocks generate assertion code.	Set the **Configuration Parameters** > **Diagnostics** > **Data Validity** > **Model Verification block enabling** parameter to `Disable All` on a block-by-block basis or globally.
Block output signals have one or more test points and the **Ignore test point signals** check box is cleared in the **Real-Time Workshop** pane of the Configuration Parameters dialog box.	Remove test points from the specified block output signals. For each signal, in the Signal Properties dialog box, clear the **Test point** check box. Alternatively, if the model is using an ERT-based system target file, select the **Ignore test point signals** check box in the **Real-Time Workshop** pane of the Configuration Parameters dialog box to ignore test points during code generation.

Check for blocks that have constraints on tunable parameters

Identify blocks with constraints on tunable parameters.

Description

Lookup Table and Lookup Table (2-D) blocks have strict constraints when they are tunable. If you violate lookup table block restrictions, the generated code produces wrong answers.

Results and Recommended Actions

Condition	Recommended Action
Lookup Table blocks have tunable parameters.	When tuning parameters during simulation or when running the generated code, you must: • Preserve monotonicity of the setting for the **Vector of input values** parameter. • Preserve the number and location of zero values that you specify for **Vector of input values** and **Vector of output values** parameters if you specify multiple zero values for the **Vector of input values** parameter.
Lookup Table (2-D) blocks have tunable parameters.	When tuning parameters during simulation or when running the generated code, you must: • Preserve monotonicity of the setting for the **Row index input values** and **Column index of input values** parameters. • Preserve the number and location of zero values that you specify for **Row index input values**, **Column index of input values**,

Condition	Recommended Action
	and **Vector of output values** parameters if you specify multiple zero values for the **Row index input values** or **Column index of input values** parameters.

See Also

Lookup Table block

Check for blocks not recommended for MISRA-C:2004 compliance

Identify blocks that are not supported or recommended for MISRA-C:2004 compliant code generation.

Description

Following the recommendations of this check increases the likelihood of generating MISRA-C:2004 compliant code for embedded applications.

See hisl_0020: Blocks Not Recommended for MISRA-C:2004 Compliance.

Analysis Results and Recommended Actions

Condition	Recommended Action
Blocks that are not supported or recommended for MISRA-C:2004 compliant code generation were found in the model or subsystem. For a list of blocks, see hisl_0020: Blocks Not Recommended for MISRA-C:2004 Compliance.	Consider replacing the specified blocks.

Limitations

This check does not review libraries.

See Also

- “Developing Models and Code That Comply with MISRA C® Guidelines” in the Real-Time Workshop Embedded Coder documentation.
- “MISRA-C:2004 Compliance Considerations” in the Simulink documentation.

Check configuration parameters for MISRA-C:2004 compliance

Identify configuration parameters that might impact MISRA-C:2004 compliant code generation.

Description

Following the recommendations of this check increases the likelihood of generating MISRA-C:2004 compliant code for embedded applications.

See hisl_0060: Configuration Parameters to Improve MISRA-C:2004 Compliance.

Analysis Results and Recommended Actions

Condition	Recommended Action
Model Verification block enabling is set to `Use local settings` or `Enable All`.	In the Configuration Parameters dialog box, on the **Diagnostics > Data Validity** pane, set **Model Verification block enabling** to `Disable All`.
System target file is set to a GRT-based target.	In the Configuration Parameters dialog box, on the **Real-Time Workshop > General** pane, set **System target file** to an ERT-based target.
Real-Time Workshop > Interface parameters are not set to the recommended values.	In the Configuration Parameters dialog box, on the **Real-Time Workshop > Interface** pane: • Clear **Support: non-finite numbers** • Clear **Support: continuous time** • Clear **Support: non-inlined S-functions**

Condition	Recommended Action
	• Clear **MAT-file logging** • Set **Target function library** to `C89/C90 (ANSI)` **Note** These parameters are enabled by setting **System target file** to an ERT-based target.
Parenthesis level is not set to `Maximum (Specify precedence with parentheses)`.	In the Configuration Parameters dialog box, on the **Real-Time Workshop > Code Style** pane, set **Parenthesis level** to `Maximum (Specify precedence with parentheses)`.
Optimization parameters are not set to the recommended values.	In the Configuration Parameters dialog box, on the **Optimization** pane, clear **Remove code from floating-point to integer conversions that wraps out-of-range values**. At the MATLAB command line, set `EnforceIntegerDowncast` to `on`.
Maximum identifier length is not set to `31`.	In the Configuration Parameters dialog box, on the **Real-Time Workshop > Symbols** pane, set **Maximum identifier length** to `31`.
Shift right on a signed integer as arithmetic shift is selected.	In the Configuration Parameters dialog box, on the **Hardware Implementation > Embedded hardware** pane, clear **Shift right on a signed integer as arithmetic shift**.

Action Results

Clicking **Modify All** changes the parameter values to the recommended values.

Limitations

This check does not review referenced models.

See Also

- "Developing Models and Code That Comply with MISRA C Guidelines" in the Real-Time Workshop Embedded Coder documentation.
- "MISRA-C:2004 Compliance Considerations" in the Simulink documentation.

Check for model reference configuration mismatch

Identify referenced model configuration parameter settings that do not match the top model configuration parameter settings.

Description

The code generator cannot create code for top models that contain referenced models with different, incompatible configuration parameter settings.

Results and Recommended Actions

Condition	Recommended Action
The top model and the referenced model have inconsistent configuration parameter settings.	Modify the specified Configuration Parameters settings.

See Also

Model Referencing Configuration Parameter Requirements

Disable signal logging

Note Using **Disable signal logging** is not recommended. Use **Identify questionable code instrumentation (data I/O)** instead.

Disables unnecessary signal logging.

Description

Disabling unnecessary signal logging avoids declaring extra signal memory in generated code.

Analysis Results and Recommended Actions

Conditions	Recommended Action
Signals are logged.	Disable signal logging on all signals.

Action Results

Clicking **Modify All** disables signal logging on all logged signals.

Identify blocks that generate expensive saturation and rounding code

Check for blocks that generate expensive saturation or rounding code.

Description

- Setting the **Saturate on integer overflow** parameter can produce condition-checking code that your application might not require.
- Generated rounding code is inefficient because of **Integer rounding mode** parameter setting.

Results and Recommended Actions

Condition	Recommended Action
Blocks generate expensive saturation code.	Check each block to ensure that your application requires setting **Function Block Parameters** > **Signal Attributes** > **Saturate on integer overflow**. Otherwise, clear the **Saturate on integer overflow** parameter to ensure the most efficient implementation of the block in the generated code.
Generated code is inefficient.	Set the **Function Block Parameters** > **Integer rounding mode** parameter to the recommended value.

Check sample times and tasking mode

Set up the sample time and tasking mode for your system.

Description

Incorrect tasking mode can result in inefficient code execution or incorrect generated code.

Results and Recommended Actions

Condition	Recommended Action
The model represents a multirate system but is not configured for multitasking.	Set the **Configuration Parameters > Solver > Tasking mode for periodic sample times** parameter as recommended.
The model is configured for multitasking, but multitasking is not appropriate for the target hardware.	Set the **Configuration Parameters > Solver > Tasking mode for periodic sample times** parameter to `SingleTasking`, or change the **Configuration Parameters > Hardware Implementation** settings.

See Also

"Single-Tasking and Multitasking Execution Modes"

Identify questionable subsystem settings

Identify questionable subsystem block settings.

Description

Subsystem blocks implemented as void/void functions in the generated code use global memory to store the subsystem I/O.

Results and Recommended Actions

Condition	Recommended Action
Subsystem blocks have the **Subsystem Parameters > Real-Time Workshop system code** option set to `Function`.	Set the **Subsystem Parameters > Real-Time Workshop system code** parameter to `Auto`.

See Also

Subsystem block

Identify questionable fixed-point operations

Identify fixed-point operations that can lead to nonoptimal results.

Description

The following operations can lead to nonoptimal results:

- Division
  - The rounding behavior of signed integer division is not fully specified by C language standards. Therefore, the generated code for division is large to ensure bit-true agreement between simulation and code generation.
  - Integer division generated code contains protection against arithmetic exceptions such as division by zero, INT_MIN/-1, and LONG_MIN/-1. If you construct models making it impossible for exception triggering input combinations to reach a division operation, the protection code generated as part of the division operation is redundant.
  - The index search method `Evenly-spaced points` requires a division operation, which can be computationally expensive.
- Multiplication
  - Product blocks are configured to do more than one division operation. Multiplying all the denominator terms together first, and then computing only one division operation improves accuracy and speed in floating-point and fixed-point calculations.
  - Product blocks are configured to do more than one multiplication or division operation. Using several blocks, with each block performing one multiplication or one division operation, allows you to control the data type and scaling used for intermediate calculations. The choice of data types for intermediate calculations affects precision, range errors, and efficiency.
  - Blocks that have the **Saturate on integer overflow** parameter selected, and have an ideal multiplication product with a larger integer size than the target integer size, must determine the ideal product in generated C code. The C code required to do this multiplication is large and slow.

  - Blocks with relative scaling of inputs and outputs must determine the ideal product in the generated C code. The C code required to do this multiplication is large and slow.
  - Blocks that multiply signals with nonzero bias require extra steps to implement the multiplication. Inserting Data Type Conversion blocks remove the biases, and allow you to control data type and scaling for intermediate calculations. The conversion is done once and all blocks in the subsystem benefit from simpler, bias-free math.
  - Blocks are multiplying signals with mismatched slope adjustment factors. This mismatch causes the overall operation to involve two multiply instructions.
  - Blocks are multiplying signals with mismatched slope adjustment factors. This mismatch causes the overall operation to involve integer multiplication followed by shifts. Under certain simplicity and accuracy conditions when the net slope is a reciprocal of an integer, it is sometimes more efficient to replace the multiplication and shifts with an integer division.
  - The Real-Time Workshop software generates a reciprocal operation followed by a multiply operation for Product blocks that have a divide operation for the first input, and a multiply operation for the second input. If you reverse the inputs so that the multiplication occurs first and the division occurs second, the Real-Time Workshop software generates a single division operation for both inputs.
  - An input with an invariant constant value is used as the denominator in an online division operation. If the operation is changed to multiplication, and the invariant input is replaced by its reciprocal, then the division is done offline and the online operation is multiplication. This leads to faster and smaller generated code.
- Addition
  - Sum blocks can have a range error when the input range exceeds the output range.
  - A Sum block has an input with a slope adjustment factor that does not equal the slope adjustment factor of the output. This mismatch requires the Sum block to do one or more multiplication operations.

  - The net sum of the Sum block input biases does not equal the bias of the output. The generated code includes one extra addition or subtraction instruction to correctly account for the net bias adjustment. For better accuracy and efficiency, nonzero bias terms are collected into a single net bias correction term. The ranges given for the input and output exclude their biases.

- Using Relational Operator blocks
  - The data types of the Relational Operator block inputs are not the same. A conversion operation is required every time the block is executed. If one of the inputs is invariant, then changing the data type and scaling of the invariant input to match the other input improves the efficiency of the model.
  - The Relational Operator block inputs have different ranges, resulting in a range error when casting, and a precision loss each time a conversion is performed. You can insert Data Type Conversion blocks before the Relational Operator block to convert both inputs to a common data type that has sufficient range and precision to represent each input, making the relational operation error-free.
  - The inputs of the Relational Operator block have different slope adjustment factors. The mismatch causes the Relational Operator block to require a multiply operation each time the input with lesser positive range is converted to the data type and scaling of the input with greater positive range.
  - When you select `isNan`, `isFinite`, or `isInf` as the operation for the Relational Operator block, the block switches to one-input mode. In this mode, if the input data type is fixed point, boolean, or a built-in integer, the output is always FALSE for `isInf` and `isNan`, TRUE for `isFinite`. This might result in dead code which will be eliminated by Real-Time Workshop.

- Using MinMax blocks
  - The input and output of the MinMax block have different data types. A conversion operation is required every time the block is executed. The model is more efficient with the same data types.
  - The input of the MinMax block is converted to the data type and scaling of the output before performing a relational operation, resulting in a

range error when casting, or a precision loss each time a conversion is performed.

  - The input of the MinMax block has a different slope adjustment factor than the output. This mismatch causes the MinMax block to require a multiply operation each time the input is converted to the data type and scaling of the output.

- Discrete-Time Integrator blocks have a complicated initial condition setting. The initial condition for the Discrete-Time Integrator blocks are used to initialize the state and output. As a result, the output equation generates excessive code and an extra global variable is required.
- The Compare to Zero block uses the input data type to represent zero. If the input data type of the Compare to Zero block cannot represent zero exactly, the input signal is compared to the closest representable value of zero, resulting in parameter overflow.
- The Compare to Constant block uses the input data type to represent its **Constant value** parameter. If the **Constant value** is outside the range that the input data type can represent, the input signal is compared to the closest representable value of the constant, resulting in parameter overflow.

Analysis Results and Recommended Actions

Conditions	Recommended Action
Integer division generated code is large.	Set the **Configuration Parameters > Hardware Implementation > Signed integer division rounds to** parameter to the recommended value.
Protection code generated as part of the division operation is redundant.	Verify that your model cannot cause exceptions in division operations and then remove redundant protection code by setting the **Configuration Parameters > Optimization > Remove code that protects against division arithmetic exceptions** parameter.

Conditions	Recommended Action
Generated code is inefficient.	Set the **Function Block Parameters > Integer rounding mode** parameter to the recommended value.
Lookup Table vector of input values is not evenly spaced.	If breakpoint data is nontunable, adjust the data to have even, power of 2 spacing. See `fixpt_look1_func_approx`.
Lookup Table vector of input values is not evenly spaced when quantized, but it is very close to being evenly spaced.	If breakpoint data is nontunable, adjust the data to have even, power of 2 spacing. See `fixpt_evenspace_cleanup`.
Lookup Table vector of input values is evenly spaced, but the spacing is not a power of 2.	If breakpoint data is nontunable, adjust the data to have even, power of 2 spacing. See `fixpt_look1_func_approx`.
For a Prelookup or Lookup Table (n-D) block, **Index search method** is `Evenly spaced points`. Breakpoint data does not have power of 2 spacing.	If breakpoint data is nontunable, adjust the data to have even, power of 2 spacing. Otherwise, in the block parameter dialog box, specify a different **Index search method** to avoid the computation-intensive division operation.
Lookup Table (n-D) breakpoint data is not evenly spaced and **Index search method** is not `Evenly spaced points`.	If breakpoint data is nontunable, adjust the data to have even, power of 2 spacing and then set **Index search method** to `Evenly spaced points`.
Lookup Table (n-D) breakpoint data is evenly spaced and **Index search method** is `Evenly spaced points`. But the spacing is not a power of 2.	If breakpoint data is nontunable, adjust the data to have even, power of 2 spacing. See `fixpt_look1_func_approx`.

Conditions	Recommended Action
Lookup Table (n-D) breakpoint data is evenly spaced, but the spacing is not a power of 2. Also, **Index search method** is not `Evenly spaced points`.	Set **Index search method** to `Evenly spaced points`. Also, if the data is nontunable, consider an even, power of 2 spacing.
Lookup Table (n-D) breakpoint data is evenly spaced, and the spacing is a power of 2. But the **Index search method** is not `Evenly spaced points`.	Set **Index search method** to `Evenly spaced points`.
Blocks require cumbersome multiplication.	Restrict multiplication operations: • So the product integer size is no larger than the target integer size. • To the recommended size.
Blocks multiply signals with nonzero bias.	Insert a Data Type Conversion block before and after the block containing the multiplication operation.
Product blocks are multiplying signals with mismatched slope adjustment factors.	Change the scaling of the output so that its slope adjustment factor is the product of the input slope adjustment factors.
Product blocks are multiplying signals with mismatched slope adjustment factors. The net slope correction uses multiplication followed by shifts, which is inefficient for some target hardware.	Select **Use integer division to handle net slopes that are reciprocals of integers** if the net slope is the reciprocal of an integer and division is more efficient than multiplication and shifts on the target hardware.

Conditions	Recommended Action
	Note This optimization takes place only if certain simplicity and accuracy conditions are met. For more information, see "Handle Net Slope Correction" in the Simulink Fixed Point documentation.
Product blocks are configured to do multiple division operations.	Multiply all the denominator terms together, and then do a single division using cascading Product blocks.
Product blocks are configured to do many multiplication or division operations.	Split the operations across several blocks, with each block performing one multiplication or one division operation.
Product blocks are configured with a divide operation for the first input and a multiply operation for the second input.	Reverse the inputs so the multiply operation occurs first and the division operation occurs second.
An input with an invariant constant value is used as the denominator in an online division operation.	Change the operation to multiplication, and replace the invariant input by its reciprocal.
The data type range of the inputs of Sum blocks exceeds the data type range of the output, which can cause overflow or saturation.	Change the output and accumulator data types so the range equals or exceeds all input ranges. For example, if the model has two inputs • `int8` (–128 to 127) • `uint8` (0 to 255) The data type range of the output and accumulator must equal or

Conditions	Recommended Action
	exceed –128 to 255. A `int16` (–32768 to 32767) data type meets this condition.
A Sum block has an input with a slope adjustment factor that does not equal the slope adjustment factor of the output.	Change the data types so the inputs, outputs, and accumulator have the same slope adjustment factor.
The net sum of the Sum block input biases does not equal the bias of the output.	Change the bias of the output scaling, making the net bias adjustment zero.
The inputs of the Relational Operator block have different data types.	• Change the data type and scaling of the invariant input to match other inputs. • Insert Data Type Conversion blocks before the Relational Operator block to convert both inputs to a common data type.
The inputs of the Relational Operator block have different slope adjustment factors.	Change the scaling of either input.
The output of the Relational Operator block is constant. This might result in dead code which will be eliminated by Real-Time Workshop.	Review your model design and either remove the Relational Operator block or replace it with the constant.
The input and output of the MinMax block have different data types.	Change the data type of the input or output.
The input of the MinMax block has a different slope adjustment factor than the output.	Change the scaling of the input or the output.

Conditions	Recommended Action
The initial condition of the Discrete-Time Integrator block is used to initialize both the state and the output.	Set the **Function Block Parameters** > **Use initial condition as initial and reset value for** parameter to `State only (most efficient)`.
Parameter overflow occurred for the Compare to Zero block. This block uses the input data type to represent zero. The input data type cannot represent zero exactly, so the input value was compared to the closest representable value of zero.	Select an input data type that can represent zero.
Parameter overflow occurred for the following Compare to Constant block. This block uses the input data type to represent its **Constant value** parameter. The **Constant value** parameter is outside the range that the input data type can represent. The input signal was compared to the closest representable value of the **Constant value** parameter.	Choose an input data type that can represent the **Constant value** parameter or change the **Constant value** parameter to match the input data type.

Limitations

A Simulink Fixed Point license is required to generate fixed-point code.

See Also

- Lookup Table
- Lookup Table (n-D)
- Prelookup
- Remove code that protects against division arithmetic exceptions

Check model configuration settings against code generation objectives

Check the configuration parameter settings for the model against the code generation objectives.

Description

Each parameter in the Configuration Parameters dialog box might have different recommended settings for code generation based on your objectives. This check helps you identify the recommended setting for each parameter so that you can achieve optimized code based on your objective.

Analysis Results and Recommended Actions

Condition	Recommended Action
Parameters are set to values other than the value recommended for the specified objectives.	Set the parameters to the recommended values. **Note** A change to one parameter value can impact other parameters. Successfully passing the check might take multiple iterations.

Action Results

Clicking **Modify Parameters** changes the parameter values to the recommended values.

See Also

- The Real-Time Workshop "Recommended Settings Summary" on page 6-262
- The Real-Time Workshop Embedded Coder "Recommended Settings Summary"
- "Configuring Code Generation Objectives" in the Real-Time Workshop User's Guide.

- "Mapping Application Objectives to Model Configuration Parameters" in the Real-Time Workshop Embedded Coder documentation.

Check for efficiency optimization parameters

Identify optimization parameters that depend on the Execution efficiency or ROM efficiency objectives.

Description

Setting the optimization parameter **Use memcpy for vector assignment** to the recommended value increases the execution efficiency and reduces ROM usage.

Analysis Results and Recommended Actions

Condition	Recommended Action
The model specifies an execution or ROM efficiency objective and the **Use memcpy for vector assignment** parameter is cleared.	In the Configuration Parameters dialog box, on the **Optimization** pane, select **Use memcpy for vector assignment**.

Action Results

Clicking **Modify** changes the parameter value to the recommended value.

Limitations

This check is in the Code Generation Advisor only.

See Also

- "Optimizing Code Generated for Vector Assignments"
- "Use memcpy for vector assignment" in the Simulink documentation

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