MATLAB® Coder™ Release Notes

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MATLAB® Coder™ Release Notes

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Contents

Check Bug Reports for Latest Issues and Fixes

Software is inherently complex and is not free of errors. The output of a code generator might contain bugs, some of which are not detected by a compiler. MathWorks reports critical known bugs brought to its attention on its Bug Report system at http://www.mathworks.com/support/bugreports/. Use the **Saved Searches and Watched Bugs** tool with the search phrase “Incorrect Code Generation” to obtain a report of known bugs that produce code that might compile and execute, but still produce wrong answers. Enter the search phrase "Simulation And Code Generation Mismatch" to obtain a report of known bugs where the output of the simulation differs from the output of the generated code.

The bug reports are an integral part of the documentation for each release. Examine periodically all bug reports for a release, as such reports may identify inconsistencies between the actual behavior of a release you are using and the behavior described in this documentation.

In addition to reviewing bug reports, you should implement a verification and validation strategy to identify potential bugs in your design, code, and tools.

Summary by Version

This table provides quick access to what's new in each version. For clarification, see "Using Release Notes" on page 2.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Latest Version V2.2 (R2012a)	Yes Details	Yes Summary	Bug Reports
V2.1 (R2011b)	Yes Details	No	Bug Reports
V2.0 (R2011a)	Yes Details	Yes Summary	Bug Reports

Using Release Notes

Use release notes when upgrading to a newer version to learn about:

- New features
- Changes
- Potential impact on your existing files and practices

Review the release notes for other MathWorks® products required for this product (for example, MATLAB® or Simulink®). Determine if enhancements, bugs, or compatibility considerations in other products impact you.

If you are upgrading from a software version other than the most recent one, review the current release notes and all interim versions. For example, when you upgrade from V1.0 to V1.2, review the release notes for V1.1 and V1.2.

What Is in the Release Notes

New Features and Changes

- New functionality
- Changes to existing functionality

Version Compatibility Considerations

When a new feature or change introduces a reported incompatibility between versions, the **Compatibility Considerations** subsection explains the impact.

Compatibility issues reported after the product release appear under Bug Reports at the MathWorks Web site. Bug fixes can sometimes result in incompatibilities, so review the fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

MathWorks offers a user-searchable Bug Reports database so you can view Bug Reports. The development team updates this database at release time and as more information becomes available. Bug Reports include provisions for any known workarounds or file replacements. Information is available for bugs existing in or fixed in Release 14SP2 or later. Information is not available for all bugs in earlier releases.

Access Bug Reports using your MathWorks Account.

Documentation on the MathWorks Web Site

Related documentation is available on `mathworks.com` for the latest release and for previous releases:

- Latest product documentation
- Archived documentation

Version 2.2 (R2012a) MATLAB Coder

This table summarizes what's new in V 2.2 (R2012a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports

New features and changes introduced in this version are:

Code Generation for MATLAB Classes

In R2012a, there is preliminary support for code generation for MATLAB classes targeted at supporting System objects defined by users. For more information about generating code for MATLAB classes, see "Code Generation for MATLAB Classes". For more information about generating code for System objects, see the DSP System Toolbox™, Computer Vision System Toolbox™ or the Communications System Toolbox™ documentation.

Dynamic Memory Allocation Based on Size

By default, dynamic memory allocation is now enabled for variable-size arrays whose size exceeds a configurable threshold. This behavior allows for finer control over stack memory usage. Also, you can generate code automatically for more MATLAB algorithms without modifying the original MATLAB code.

Compatibility Consideration

If you use scripts to generate code and you do not want to use dynamic memory allocation, you must disable it. For more information, see "Controlling Dynamic Memory Allocation".

C/C++ Dynamic Library Generation

You can now use MATLAB Coder™ to build a dynamically linked library (DLL) from the generated C code. These libraries are useful for integrating into existing software solutions that expect dynamically linked libraries.

For more information, see "Generating C/C++ Dynamically Linked Libraries from MATLAB Code".

Automatic Definition of Input Parameter Types

MATLAB Coder software can now automatically define input parameter types by inferring these types from test files that you supply. This capability facilitates input type definition and reduces the risk of introducing errors when defining types manually.

To learn more about automatically defining types:

- In MATLAB Coder projects, see "Autodefining Input Types".
- At the command line, see the `coder.getArgTypes` function reference page.

Verification of MEX Functions

MATLAB Coder now provides support for test files to verify the operation of generated MEX functions. This capability enables you to verify that the MEX function is functionally equivalent to your original MATLAB code and to check that no run-time errors occur.

To learn more about verifying MEX function behavior:

- In MATLAB Coder projects, see “How to Verify MEX Functions in a Project”.
- At the command line, see the `coder.runTest` function reference page.

Enhanced Project Settings Dialog Box

The **Project Settings** dialog box now groups configuration parameters so that you can easily identify the parameters associated with code generation objectives such as speed, memory, and code appearance. The dialog boxes for code generation configuration objects, `coder.MexCodeConfig`, `coder.CodeConfig`, and `coder.EmbeddedCodeConfig`, also use the same new groupings.

To view the updated **Project Settings** dialog box:

1. In a project, click the **Build** tab.
2. On the **Build** tab, click the More settings link to open the **Project Settings** dialog box.

   For information about the parameters on each tab, click the **Help** button.

To view the updated dialog boxes for the code generation configuration objects:

1. At the MATLAB command line, create a configuration object. For example, create a configuration object for MEX code generation.

   ```
   mex_cfg = coder.config;
   ```

2. Open the dialog box for this object.

   ```
   open mex_cfg
   ```

   For information about the parameters on each tab, click the **Help** button.

Projects Infer Input Types from assert Statements in Source Code

MATLAB Coder projects can now infer input data types from `assert` statements that define the properties of function inputs in your MATLAB entry-point files. For more information, see Defining Inputs Programmatically in the MATLAB File.

Code Generation from MATLAB

For details about new toolbox functions and System objects supported for code generation, see the *Code Generation from MATLAB Release Notes*.

New Demo

The following demo has been added:

Demo...	Shows How You Can...
`coderdemo_reverb`	Generate a MEX function for an algorithm that uses MATLAB classes.

Version 2.1 (R2011b) MATLAB Coder

This table summarizes what's new in V 2.1 (R2011b):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	No	Bug Reports

New features and changes introduced in this version are

Support for Deletion of Rows and Columns from Matrices

You can now generate C/C++ code from MATLAB code that deletes rows or columns from matrices. For example, the following code deletes the second column of matrix `X`:

```
X(:,2) = [];
```

For more information, see "Diminishing the Size of a Matrix" in the MATLAB documentation.

Code Generation from MATLAB

For details of new toolbox functions and System objects supported for code generation, see *Code Generation from MATLAB Release Notes*.

Version 2.0 (R2011a) MATLAB Coder

This table summarizes what's new in V 2.0 (R2011a):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems
Yes Details below	Yes—Details labeled as **Compatibility Considerations**, below. See also Summary.	Bug Reports

New features and changes introduced in this version are

New User Interface for Managing Projects

The new MATLAB Coder user interface simplifies the MATLAB to C/C++ code generation process. Using this user interface, you can:

- Specify the MATLAB files from which you want to generate code

- Specify the data types for the inputs to these MATLAB files
- Select an output type:
  - MEX function
  - C/C++ Static Library
  - C/C++ Executable
- Configure build settings to customize your environment for code generation
- Open the code generation report to view build status, generated code, and compile-time information for the variables and expressions in your MATLAB code

To Get Started

You launch a MATLAB Coder project by doing one of the following:

- From the MATLAB main menu, select **File > New > Code Generation Project**
- Enter `coder` at the MATLAB command line

To learn more about working with MATLAB Coder, see "Generating C Code from MATLAB Code Using the MATLAB Coder Project Interface".

Migrating from Real-Time Workshop emlc Function

In MATLAB Coder, the `codegen` function replaces `emlc` with the following differences:

New codegen Options

Old emlc Option	New codegen Option
`-eg`	`-args`
`emlcoder.egc`	`coder.Constant`
`emlcoder.egs`	`coder.typeof(a,b,1)` specifies a variable-size input with the same class and complexity as `a` and same size and upper bounds as the size vector `b`. Creates `coder.Type` objects for use with the `codegen -args` option. For more information, see `coder.typeof`.
`-F`	No `codegen` option available. Instead, use the Global fimath. For more information, see in the Fixed-Point Toolbox™ documentation.
`-global`	`-globals` **Note** `-global` continues to work with `codegen`
`-N`	This option is no longer supported. Instead, set up `numerictype` in MATLAB.
`-s`	`-config` Use with the new configuration objects, see "New Code Generation Configuration Objects" on page 12.

Old emlc Option	New codegen Option
`-T rtw:exe`	`-config:exe` Use this option to generate a C/C++ executable using default build options. Otherwise, use `-config` with a `coder.CodeConfig` or `coder.EmbeddedCodeConfig` configuration object.
`-T mex`	`-config:mex` Use this option to generate a MEX function using default build options. Otherwise, use `-config` with a `coder.MexCodeConfig` configuration object.
`-T rtw` `-T rtw:lib`	`-config:lib` Use either of these options to generate a C/C++ library using default build options. Otherwise, use `-config` with a `coder.CodeConfig` or `coder.EmbeddedCodeConfig` configuration object.

New Code Generation Configuration Objects

The `codegen` function uses new configuration objects that replace the old `emlc` objects with the following differences:

Old emlc Configuration Object	New codegen Configuration Object
`emlcoder.MEXConfig`	`coder.MexCodeConfig`
`emlcoder.RTWConfig` `emlcoder.RTWConfig('grt')`	`coder.CodeConfig` The `SupportNonFinite` property is now available without an Embedded Coder™ license. The following property names have changed: • `RTWCompilerOptimization` is now `CCompilerOptimization`

Old emlc Configuration Object	New codegen Configuration Object
	• `RTWCustomCompilerOptimization` is now `CCustomCompilerOptimization` • `RTWVerbose` is now `Verbose`
`emlcoder.RTWConfig('ert')`	`coder.EmbeddedCodeConfig` The following property names have changed: • `MultiInstanceERTCode` is now `MultiInstanceCode` • `RTWCompilerOptimization` is now `CCompilerOptimization` • `RTWCustomCompilerOptimization` is now `CCustomCompilerOptimization` • `RTWVerbose` is now `Verbose`
`emlcoder.HardwareImplementation`	`coder.HardwareImplementation`

The codegen Function Has No Default Primary Function Input Type

In previous releases, if you used the `emlc` function to generate code for a MATLAB function with input parameters, and you did not specify the types of these inputs, by default, `emlc` assumed that these inputs were real, scalar, doubles. In R2011a, the `codegen` function does not assume a default type. You must specify at least the class of each primary function input. For more information, see "Specifying Properties of Primary Function Inputs in a Project".

Compatibility Consideration. If your existing script calls `emlc` to generate code for a MATLAB function that has inputs and does not specify the input types, and you migrate this script to use `codegen`, you must modify the script to specify inputs.

The codegen Function Processes Compilation Options in a Different Order

In previous releases, the `emlc` function resolved compilation options from left to right so that the right-most option prevailed. In R2011a, the `codegen` function gives precedence to individual command-line options over options specified using a configuration object. If command-line options conflict, the right-most option prevails.

Compatibility Consideration. If your existing script calls `emlc` specifying a configuration object as well as other command-line options, and you migrate this script to use `codegen`, `codegen` might not use the same configuration parameter values as `emlc`.

New coder.Type Classes

MATLAB Coder includes the following new classes to specify input parameter definitions:

- `coder.ArrayType`
- `coder.Constant`
- `coder.EnumType`
- `coder.FiType`
- `coder.PrimitiveType`
- `coder.StructType`
- `coder.Type`

New coder Package Functions

The following new package functions let you work with objects and types for C/C++ code generation:

Function	Purpose
`coder.config`	Create MATLAB Coder code generation configuration objects
`coder.newtype`	Create a new `coder.Type` object

Function	Purpose
`coder.resize`	Resize a `coder.Type` object
`coder.typeof`	Convert a MATLAB value into its canonical type

Script to Upgrade MATLAB Code to Use MATLAB Coder Syntax

The `coder.upgrade` script helps you upgrade to MATLAB Coder by searching your MATLAB code for old commands and options and replacing them with their new equivalents. For more information, at the MATLAB command prompt, enter `help coder.upgrade`.

Embedded MATLAB Now Called Code Generation from MATLAB

MathWorks is no longer using the term *Embedded MATLAB* to refer to the language subset that supports code generation from MATLAB algorithms. This nomenclature incorrectly implies that the generated code is used in embedded systems only. The new term is *code generation from MATLAB*. This terminology better reflects the full extent of the capability for translating MATLAB algorithms into readable, efficient, and compact MEX and C/C++ code for deployment to both desktop and embedded systems.

MATLAB Coder Uses rtwTargetInfo.m to Register Target Function Libraries

In previous releases, the `emlc` function also recognized the customization file, `sl_customization.m`. In R2011a, the MATLAB Coder software does not recognize this customization file, you must use `rtwTargetInfo.m` to register a Target Function Library (TFL). To register a TFL, you must have Embedded Coder software. For more information, see "Use the rtwTargetInfo API to Register a CRL with MATLAB Coder Software" in the Embedded Coder documentation.

New Getting Started Tutorial Video

To learn how to generate C code from MATLAB code, see the "Generating C Code from MATLAB Code" video in the MATLAB Coder Getting Started demos.

New Demos

The following demos have been added:

Demo...	Shows How You Can...
Hello World	Generate and run a MEX function from a simple MATLAB program
Working with Persistent Variables	Compute the average for a set of values by using persistent variables
Working with Structure Arrays	Shows how to build a scalar template before growing it into a structure array, a requirement for code generation from MATLAB.
Balls Simulation	Simulates bouncing balls and shows that you should specify only the entry function when you compile the application into a MEX function.
General Relativity with MATLAB Coder	Uses Einstein's theory of general relativity to calculate geodesics in curved space-time.
Averaging Filter	Generate a standalone C library from MATLAB code using `codegen`
Edge Detection on Images	Generate a standalone C library from MATLAB code that implements a Sobel filter
Read Text File	Generate a standalone C library from MATLAB code that uses the `coder.ceval`, `coder.extrinsic` and `coder.opaque` functions.

Demo...	Shows How You Can...
"Atoms" Simulation	Generate a standalone C library and executable from MATLAB code using a code generation configuration object to enable dynamic memory allocation
Replacing Math Functions and Operators	Use target function libraries (TFLs) to replace operators and functions in the generated code **Note** To run this demo, you need Embedded Coder software.
Kalman Filter	• Generate a standalone C library from a MATLAB version of a Kalman filter • Accelerate the Kalman filter algorithm by generating a MEX function

Functionality Being Removed in a Future Version

This function will be removed in a future version of MATLAB Coder software.

Function Name	What Happens When You Use This Function?	Compatibility Considerations
`emlc`	Still runs in R2011a	None

Function Elements Being Removed in a Future Release

Function or Element Name	What Happens When You Use the Function or Element?	Use This Element Instead
`%#eml`	Still runs	`%#codegen`
`eml.allowpcode`	Still runs	`coder.allowpcode`

Function or Element Name	What Happens When You Use the Function or Element?	Use This Element Instead
`eml.ceval`	Still runs	`coder.ceval`
`eml.cstructname`	Still runs	`coder.cstructname`
`eml.extrinsic`	Still runs	`coder.extrinsic`
`eml.inline`	Still runs	`coder.inline`
`eml.nullcopy`	Still runs	`coder.nullcopy`
`eml.opaque`	Still runs	`coder.opaque`
`eml.ref`	Still runs	`coder.ref`
`eml.rref`	Still runs	`coder.rref`
`eml.target`	Still runs	`coder.target`
`eml.unroll`	Still runs	`coder.unroll`
`eml.varsize`	Still runs	`coder.varsize`
`eml.wref`	Still runs	`coder.wref`

Compatibility Summary for MATLAB Coder

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided in the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version V2.2 (R2012a)	See the **Compatibility Considerations** subheading for this new feature or change: • "Dynamic Memory Allocation Based on Size" on page 5
V2.1 (R2011b)	None
V2.0 (R2011a)	See the **Compatibility Considerations** subheading for this new feature or change: • "The codegen Function Has No Default Primary Function Input Type" on page 13 • "The codegen Function Processes Compilation Options in a Different Order" on page 14