

Embedded Target for TI C6000 DSP Release Notes

The “Embedded Target for TI C6000 DSP 2.0 Release Notes” on page 1-1 describe Version 2.0 of the Embedded Target for TI TMS320C6000™ DSP Platform. These Release Notes discuss the following topics:

- “New Features” on page 1-2
- “Major Bug Fixes” on page 1-8
- “Installing Embedded Target for TI C6000 DSP” on page 1-9
- “Known Software and Documentation Problems” on page 1-11

Changes from the Previous Release

For Release 13SP2, the following blocks have been affected by changes in the behaviour of source dialogs and the Model Explorer. Refer to “Changes from the Previous Release” section of the “Simulink release notes.

- C6416 DSK DIP Switch
- C6701 DSK DIP Switch
- C6711 DSK DIP Switch
- C6713 DSK DIP Switch

Information About Previous Releases

If you are upgrading from a release earlier than Release 13, you should also refer to “Embedded Target for TI C6000 DSP 1.0 Release Notes” on page 3-1.

Printing the Release Notes

If you would like to print the Release Notes, you can link to a PDF version.



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New Features

This section summarizes the new features and enhancements introduced in the Embedded Target for TI TMS320C6000 DSP Platform 1.1.

Supports Code Composer Studio 2.2 and 2.21

Version 2.0 of the Embedded Target for TI C6000 DSP runs on Code Composer Studio® (CCS) 2.2 and 2.21.

New Supported Hardware

Support for two new DSP starter kits and support for a new daughter card join the product in this release.

Hardware Name	Description
TMS320C6416 DSK	DSP Starter Kit for developing on the C6416 processor
TMS320C6713 DSK	DSP Starter Kit for developing applications for the C6713 processor
TMDX326040A	Daughter card to use with the C6711 DSK. Also called the PCM3003 Audio Daughter Card.

To support the new targets, the following new blocks join the C6000 library:

- ADC, DAC, DIP Switch, LED, and Reset blocks in the C6416 DSK Board Support library
- ADC, DAC, DIP Switch, LED, and Reset blocks in the C6713 DSK Board Support library
- ADC and DAC blocks in the TMDX326040 Daughtercard Support Library

To help you learn about the new targets, the existing demonstration models, include versions that run on the new targets. Enter demos at the MATLAB prompt to open the **Demos** library.

New Block Library for C6416 DSK Target

The blocks in the C64x DSP Library correspond to assembly-code routines in the Texas Instruments TMS320C64x DSP library, which target the TI C64x family of digital signal processors. You use these blocks to develop simulations by building models in Simulink before generating code. Once you have a model developed, you can invoke the Real-Time Workshop to generate code that is optimized to run on the C6416 DSK. During code generation, each C64x DSP library block in your model is mapped to its corresponding TMS320C64x DSP library assembly-code routine to create target-optimized code. The C64x DSP library blocks generally input and output fixed-point data types. For more information about each block, refer to the block reference page in the User's Guide.

The following table lists each block in the C64x DSP library.

Block	Description
Type Conversions	
Convert Floating-Point to Q.15	Convert a floating-point signal to a Q.15 fixed-point signal
Convert Q.15 to Floating-Point	Convert a Q.15 fixed-point signal to a single-precision floating-point signal
Signal Filters	
Complex FIR	Filter a complex input signal using a complex FIR filter
General Real FIR	Filter a real input signal using a real FIR filter
LMS Adaptive FIR	Perform least-mean-squares adaptive FIR filtering
Radix-4 Real FIR	Filter a real input signal using a radix-4 real FIR filter
Radix-8 Real FIR	Filter a real input signal using a radix-8 real FIR filter

Block	Description
Real Forward Lattice All-Pole IIR	Filter a real input signal using an auto-regressive forward lattice filter
Real IIR	Filter a real input signal using a real auto-regressive moving-average IIR filter
Symmetric Real FIR	Filter a real input signal using a symmetric real FIR filter
Math and Matrices Operations	
Autocorrelation	Compute the autocorrelation of an input vector or frame-based matrix
Block Exponent	Return the minimum exponent (number of extra sign bits) found in each channel of an input
Matrix Multiply	Perform matrix multiplication on two input signals
Matrix Transpose	Compute the matrix transpose of an input signal
Reciprocal	Compute the fractional and exponential portions of the reciprocal of a real input signal
Vector Dot Product	Compute the vector dot product of two real input signals
Vector Maximum Index	Compute the zero-based index of the maximum value element in each channel of an input signal
Vector Maximum Value	Compute the maximum value for each channel of an input signal
Vector Minimum Value	Compute the minimum value for each channel of an input signal

Block	Description
Vector Multiply	Perform element-wise multiplication on two inputs
Vector Negate	Negate each element of an input signal
Vector Sum of Squares	Compute the sum of squares over each channel of a real input
Weighted Vector Sum	Find the weighted sum of two input vectors
Signal Transforms	
Bit Reverse	Bit-reverse the positions of the elements of each channel of a complex input signal
FFT	Compute the decimation-in-frequency forward FFT of a complex input vector
Radix-2 FFT	Compute the radix-2 decimation-in-frequency forward FFT of a complex input vector
Radix-2 IFFT	Compute the radix-2 inverse FFT of a complex input vector

New Blocks for the TMDX326040A Daughter Card (PCM3003 Audio Daughter Card)

To allow you to use the new TMDX326040A daughter card on your C6711 DSK, the new library TMDX326040 Daughtercard Support library contains two new blocks:

- The ADC block configures the input to the codec on the daughter card.
- The DAC block configures the output from the codec on the daughter card.

The PCM3003 codec on the TMDX326040A card provides a stereo, 48 KHz, 16-bit codec that operates in place of the codec on the C6711 DSK for improved audio processing.

The User's Guide contains block reference pages for the new blocks to provide details about using them.

New Video Surveillance Demonstration Model

To demonstrate using the C6416 DSK target, we added a Video Surveillance demo in the library for the C6416 DSK. The new demo is named `c6416vidsurveil_hsrtdx`. From the demos library, click C6416 DSK in Embedded Target for TI C6000 DSP to run the demo, or enter

```
c6416vidsurveil_hsrtdx
```

at the MATLAB prompt.

To run this demo you must use the XDS-560 Emulator for High-Speed RTDX.

New Memory Access Blocks in C6000 DSP Core Support Library

Moving data to and from memory on your target gets easier with the addition of these two blocks to the Embedded Target for TI C6000 DSP.

- From Memory gets a value from target memory into the processor
- To Memory writes a value from the processor out to memory

Reference pages for each block provide some details about how to configure the block options and what the blocks do in simulations and generated code. Note that the block dialog pictures in the reference pages may be different from the actual dialogs from the blocks.

Block Limitations

From Memory and To Memory blocks have several limitations:

- To Memory blocks handle scalar input and scalar output only. Connecting a matrix or vector to the input port causes an error condition. From Memory blocks output scalars only.
- Ensure that the memory address and data type obey any and all alignment restrictions of the digital signal processor.
- Enter memory addresses as hexadecimal values without a prefix—`600012F0`, not `0x600012F0`.

These restrictions should be relaxed in a future release.

Major Bug Fixes

The Embedded Target for TI C6000 DSP 2.0 includes several bug fixes made since Version 1.1. The section includes a link to a description of important Version 2.0 bug fixes.

If you are viewing these Release Notes in PDF form, refer to the HTML form of the Release Notes, using either the Help browser or the MathWorks Web site and use the link provided to see the major fixes.

Installing Embedded Target for TI C6000 DSP

This section describes how to install Embedded Target for TI C6000 DSP 2.0 for the first time. If you already installed Version 1.1, use these steps to upgrade to Version 2.0.

Version 2.0 requires the following MathWorks products, available on MATLAB Release 13 Service Pack 1 or from the MathWorks Web site:

- MATLAB 6.5.1
- Real-Time Workshop 5.1
- Simulink 5.1
- Signal Processing Toolbox 6.1
- MATLAB Link for Code Composer Studio Development Tools 1.3 (available by Web download)
- DSP Blockset 5.1
- Fixed-Point Blockset 4.1 (recommended)

You can install these products before or after you install CCS 2.2 or 2.21.

Install CCS 2.2 and 2.21

Perform the following steps to install CCS 2.2 and 2.21:

- 1** Install the appropriate version of Texas Instruments Code Composer Studio 2.2. Note that the Embedded Target does not support targeting with the C5000 DSP family.
 - To target C6000 hardware, install Code Composer Studio Version 2.2 for TMS320C6000.
- 2** To upgrade to Code Composer Studio 2.21, download the Code Composer Studio 2.21 patch from the Texas Instruments Web site. Note that the Embedded Target does not support targeting with the C5000 DSP family.
 - To target C6000 hardware, install the Code Composer Studio Version 2.21 for TMS320C6000 patch.

Install the Required MathWorks Products

To install Version 2.0 of Embedded Target for TI C6000 DSP, you must install the required MathWorks products that support it. We recommend that you install the required products before you install Version 2.0:

- 1** Install MATLAB 6.5.1, Real-Time Workshop 5.1, Simulink 5.1, Signal Processing Toolbox 6.1, and DSP Blockset 5.1. Refer to your MATLAB installation instructions for more information about installing this software. These versions are part of the MATLAB Release 13 Service Pack 1.
- 2** Install MATLAB Link for Code Composer Studio Development Tools 1.3. Download this version from the MathWorks Web site.

Install Embedded Target for TI C6000 DSP Version 2.0

Now you can install the Embedded Target for TI C6000 DSP 2.0 from the MATLAB installer.

Known Software and Documentation Problems

This section includes a link to a description of known software and documentation problems in Version 2.0. This section also describes some additional bugs.

If you are viewing these Release Notes in PDF form, please refer to the HTML form of the Release Notes, using either the Help browser or the MathWorks Web site and use the link provided.

For a list of bugs reported in the previous release that remain open, see “Known Software and Documentation Problems” on page 2-10 of the Embedded Target for TI C6000 DSP 1.1.

Note The following bug descriptions do not appear in the linked list above.

Targeting

For reasons related to the Texas Instruments C compiler, you cannot use the following Simulink blocks for targeting:

- Singular Value Decomposition block in the Matrix Factorizations library in DSP Blockset
- Pseudoinverse block in the Matrix Inverses library in DSP Blockset
- SVD Solver block in the Linear System Solvers library in DSP Blockset

These blocks are not included in the run-time libraries and do not build when you generate code from your model.

Demos

In MATLAB Demos (select **Help->Demos** from the MATLAB menu bar), the Embedded Target demonstration model LMS Adaptive Filtering runs slowly on DSP Starter Kit (DSK) boards. Design features of the board cause the slow processing across the RTDX link. Using the Texas Instruments XDS 510 JTAG/PC Controller, the XDS560 JTAG Scan-Based Emulator, or an equivalent emulator, to connect your host to the DSK can alleviate the problem.

General Target Operations

When your target digital signal processor is running, CCS consumes up to 99% of the CPU cycles on your PC. Consequently, some other operations may be very slow, such as running the MATLAB help system or processing other applications.

Embedded Target for TI C6000 DSP

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New Features

This section summarizes the new features and enhancements introduced in the Embedded Target for TI TMS320C6000 DSP Platform 1.1.

If you are upgrading from a release earlier than Release 13, then you should also see “New Features” on page 3-2 of the Embedded Target for TI C6000 DSP 1.0 Release Notes.

Supports Code Composer Studio 2.12

Version 1.1 of the Embedded Target for TI C6000 DSP runs on Code Composer Studio (CCS) 2.12. While you can use CCS 2.1 without problems, some features of the Embedded Target for TI C6000 DSP software require CCS 2.12. We recommend 2.12 for software configuration.

New Demonstration Model for C6711 DSK

We added a new Simulink model that demonstrates targeting on the C6711 DSK—C6711 DSK—Acoustic Noise Cancellation.

The Acoustic Noise Cancellation demo presents a model that uses an LMS filter to adapt to and remove the noise in a signal. Using the demonstration model, you can build and download the model to your C6711 DSK target and run the noise cancellation on the digital signal processor. We provide two versions—one for conventional RTDX and the other for high-speed RTDX. Note that the high-speed version requires the XDS560™ emulator.

Improved Generated Code Profiling Features

Profiling now supports multirate models. Certain restrictions apply. Read more about the limitations of profiling multirate models by referring to the section “Profiling Generated Code” in the Help browser, under Embedded Target for TI C6000 DSP.

High-Speed RTDX Support with Texas Instruments XDS560 PCI-Bus JTAG Scan-Based Emulator

You can use your XDS560emulator with Version 1.1 of the targeting product. Using the emulator can dramatically increase the communications speed between MATLAB and your target when you use RTDX in your models.

New Options to Enable RTDX

The To RTDX and From RTDX blocks include a new feature that lets you enable the RTDX channels defined by the blocks in your models.

When you add RTDX blocks to your model, you enable the associated channels by selecting the **Enable RTDX** option when you configure the block. When you generate code from the model, the generation process dynamically sets the buffer sizes for the channels.

In addition, you can use more than one To RTDX and From RTDX block in a model, giving you more freedom where and when data communication occurs.

Added DSP Process Overrun Indicators

Along with reinstating the overrun indicators, you now have options that specify how the targeting software notifies you about an overrun condition in your program and how your program responds to the overrun. Briefly, the new options, which appear in the **Overrun notification method** list, are

- **Print_message**—print a message to stdout, or to the message log if your application uses DSP/BIOS
- **Turn_on_LEDs**—illuminate the user LEDs on the target, either the external LED on the C6701 EVM or all of the user LEDs on the C6711 DSK
- **Print_message_and_turn_on_LEDs**—light the LEDs and print a message

To enable these notification options, select an **Overrun Action**:

- **None**—your program does not respond to overrun conditions during processing.
- **Notify_and_continue**—when your program enters an overrun condition, it notifies you that it encountered an overrun and continues executing. In interrupt driven programs, overrun situations arise when the next interrupt occurs before the processing for the previous interrupt reaches completion. The notification you receive depends on your selection for the **Overrun notification method**.
- **Notify_and_halt**—when your program enters an overrun condition, it notifies you that it encountered an overrun and stops executing. In interrupt driven programs, overrun situations arise when the next interrupt occurs before the processing for the previous interrupt reaches completion. The

notification you receive depends on your selection for the **Overrun notification method**.

Generated Code Honors the Simulation Stop Time

When you run your generated code on your C6000 target, the process now runs for the amount of time specified by the **Stop time** option on the **Solver** tab in the **Simulation Parameters** dialog for your Simulink model. For example, if you set the **Stop time** to be 10 seconds, your generated code runs for 10 seconds on the target.

Major Bug Fixes

The Embedded Target for TI C6000 DSP 1.1 includes several bug fixes made since Version 1.0. This section describes the particularly important Version 1.1 bug fixes.

If you are viewing these Release Notes in PDF form, please refer to the HTML form of the Release Notes, using either the Help browser or the MathWorks Web site and use the link provided.

Installing Embedded Target for TI C6000 DSP

This section describes how to install Embedded Target for TI C6000 DSP 1.1 for the first time. If you already installed Version 1.0, refer to “Upgrading from an Earlier Release” on page 2-8 for information about upgrading to this new version.

Version 1.1 requires the following MathWorks products:

- MATLAB 6.5.1
- Real-Time Workshop 5.1
- Simulink 5.1
- Signal Processing Toolbox 6.1
- MATLAB Link for Code Composer Studio® Development Tools 1.1
- DSP Blockset 5.1
- Fixed-Point Blockset 4.1 (recommended)

You can install these products before or after you install CCS 2.12.

Install CCS 2.12

Perform the following steps to install CCS 2.12:

- 1** Install the appropriate version of Texas Instruments Code Composer Studio 2.1. Note that the Embedded Target does not support targeting with the C5000 DSP family.
 - To target C6000 hardware, install the Code Composer Studio Version 2.1 for TMS320C6000.

- 2** Download and apply a patch for DSP/BIOS—“CCStudio v2.1 - Config Server Registration Fix”—to Code Composer Studio 2.1. You can apply this patch to CCS version 2.1 only. The patch is available only from the following URL:

<https://www-a.ti.com/downloads/sds_support/ALL-2.00-SA-to-TI-BIOSRTA-REG01.htm>

- 3** Install the appropriate version of Texas Instruments Code Composer Studio 2.12. Note that the Embedded Target does not support targeting with the C5000 DSP family.

- To target C6000 hardware, install the Code Composer Studio Version 2.12 for TMS320C6000.

Install the Required MathWorks Products

To install Version 1.1 of Embedded Target for TI C6000 DSP, you must install the required MathWorks products that support it.

- 1** Install MATLAB 6.5.1, Real-Time Workshop 5.1, Simulink 5.1, Signal Processing Toolbox 6.1, and DSP Blockset 5.1. Refer to your MATLAB installation instructions for more information about installing this software.
- 2** Install MATLAB Link for Code Composer Studio® Development Tools 1.1.

Install Embedded Target for TI C6000 DSP Version 1.1

Now you can install the Embedded Target for TI C6000 DSP 1.1 from the MATLAB installer.

If you are upgrading from a version earlier than 1.1, refer to “Upgrading from an Earlier Release” on page 3-8.

Upgrading from an Earlier Release

This section describes the upgrade issues involved in moving from the Embedded Target for TI C6000 DSP Version 1.0 to Embedded Target for TI C6000 DSP Version 1.1.

Version 1.1 requires the following MathWorks products:

- MATLAB 6.5.1
- Real-Time Workshop 5.1
- Signal Processing Toolbox 6.1
- Simulink 5.1
- MATLAB Link for Code Composer Studio® Development Tools 1.1
- DSP Blockset 5.1
- Fixed-Point Blockset 4.1 (recommended)

To upgrade your current Embedded Target for TI C6000 DSP Version 1.0 to Version 1.1, you need to:

- Upgrade CCS to Version 2.12
- Install and upgrade the required MathWorks products

Upgrade CCS to Version 2.12

Note This procedure assumes that you already installed CCS 2.1 and added the patch as required for Embedded Target for TI C6000 DSP 1.0. If not, refer to “Installing Embedded Target for TI C6000 DSP” on page 2-6.

- 1 Install the appropriate version of Texas Instruments Code Composer Studio 2.12. Note that the Embedded Target does not support targeting with the C5000 DSP family.
 - To target C6000 hardware, install the Code Composer Studio Version 2.12 for TMS320C6000.

Upgrade and Install Required MathWorks Products

- 1** Upgrade to MATLAB 6.5.1, Real-Time Workshop 5.1, Simulink 5.1, Signal Processing Toolbox 6.1, and DSP Blockset 5.1.
- 2** Install MATLAB Link for Code Composer Studio[®] Development Tools 1.1

Install Embedded Target for TI C6000 DSP Version 1.1

Now you can install the Embedded Target for TI C6000 DSP 1.1 from the MATLAB installer.

If you are upgrading from a version earlier than 1.1, refer to “Upgrading from an Earlier Release” on page 3-8.

Known Software and Documentation Problems

This section includes a link to a description of known software and documentation problems in Version 1.1. This section also describes some additional bugs.

If you are viewing these Release Notes in PDF form, please refer to the HTML form of the Release Notes, using either the Help browser or the MathWorks Web site and use the link provided.

For a list of bugs reported in the previous release that remain open, see “Known Software and Documentation Problems” on page 3-9 of the Embedded Target for TI C6000 DSP 1.0.

Note The following bug descriptions do not appear in the linked list above.

Targeting

For reasons related to the Texas Instruments C compiler, you cannot use certain Simulink blocks for targeting. They are

- Singular Value Decomposition block in the library dspfactors
- Pseudoinverse block in the library dspinverses
- SVD Solver block in the library dspolvers

These blocks are not included in the run-time libraries and do not build when you generate code from your model.

Demos

In MATLAB Demos (select **Help->Demos** from the MATLAB menu bar), the Embedded Target demonstration model LMS Adaptive Filtering runs slowly on DSP Starter Kit (DSK) boards. Design features of the board cause the slow processing across the RTDX link. Using the Texas Instruments XDS 510 JTAG/PC Controller, the XDS560 JTAG Scan-based emulator, or an equivalent emulator, to connect your host to the DSK can alleviate the problem.

General Target Operations

When your target digital signal processor is running, CCS consumes up to 99% of the CPU cycles on your PC. Consequently, some other operations may be very slow, such as running the MATLAB help system or processing other applications.

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New Features

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- “Model Profiling Capability Added” on page 3-6
- “Added Support for Multirate Models Through a Software Scheduler” on page 3-6
- “Inline DSP Blockset Functions Option Added” on page 3-7

Note The Developer’s Kit for Texas Instruments™ DSP has been repackaged as two separate products, including the Embedded Target for TI C6000 and the MATLAB Link for Code Composer Studio™.

Two Virtual Targets Added

Embedded Target for TI C6000 DSP adds support for two virtual target, the C6211 DSP Starter Kit and the C6201 Evaluation module. Both are virtual because you use the C6711 DSK and C6701 EVM with fixed-point blocks to emulate the C6211 DSK and C6211 EVM.

Added C62x DSP Library

The blocks in the C62x DSP Library correspond to functions in the Texas Instruments TMS320C62x DSP Library assembly-code library, which target the TI C62x family of digital signal processors. You can use these blocks to develop simulations by building models in Simulink before generating code. Once a model is developed, you can invoke the Real-Time Workshop to generate code that is optimized to run on the C6711 DSK or C6701 EVM. During code generation, each C62x DSP Library block in your model is mapped to its corresponding TMS320C62x DSP Library assembly-code routine to create

target-optimized code. The C62x DSP Library blocks generally input and output fixed-point data types.

The following table list each block in the C62x DSP Library.

Block	Description
Conversions	
Convert Floating-Point to Q.15	Convert a floating-point signal to a Q.15 fixed-point signal
Convert Q.15 to Floating-Point	Convert a Q.15 fixed-point signal to a single-precision floating-point signal
Filters	
Complex FIR	Filter a complex input signal using a complex FIR filter
General Real FIR	Filter a real input signal using a real FIR filter
LMS Adaptive FIR	Perform least-mean-square adaptive FIR filtering
Radix-4 Real FIR	Filter a real input signal using a real FIR filter
Radix-8 Real FIR	Filter a real input signal using a real FIR filter
Real Forward Lattice All-Pole IIR	Filter a real input signal using an auto-regressive forward lattice filter
Real IIR	Filter a real input signal using a real auto-regressive moving-average IIR filter
Symmetric Real FIR	Filter a real input signal using a symmetric real FIR filter

Block	Description
Math and Matrices	
Autocorrelation	Compute the autocorrelation of an input vector or frame-based matrix
Block Exponent	Return the minimum exponent (number of extra sign bits) found in each channel of an input
Matrix Multiply	Perform matrix multiplication on two input signals
Matrix Transpose	Compute the matrix transpose of an input signal
Reciprocal	Compute the fractional and exponential portions of the reciprocal of a real input signal
Vector Dot Product	Compute the vector dot product of two real input signals
Vector Maximum Index	Compute the zero-based index of the maximum value element in each channel of an input signal
Vector Maximum Value	Compute the maximum value for each channel of an input signal
Vector Minimum Value	Compute the minimum value for each channel of an input signal
Vector Multiply	Perform element-wise multiplication on two inputs
Vector Negate	Negate each element of an input signal
Vector Sum of Squares	Compute the sum of squares over each channel of a real input
Weighted Vector Sum	Find the weighted sum of two input vectors

Block	Description
Transforms	
Bit Reverse	Bit-reverse the positions of the elements of each channel of a complex input signal
FFT	Compute the decimation-in-frequency forward FFT of a complex input vector
Radix-2 FFT	Compute the radix-2 decimation-in-frequency forward FFT of a complex input vector
Radix-2 IFFT	Compute the radix-2 inverse FFT of a complex input vector

Fixed-Point Code Generation of Product, Sum, and Gain Blocks

The built-in Simulink™ blocks Gain, Product, and Sum now generate code specifically for fixed-point code generation. This adds more support for generating true fixed-point capable code from the Embedded Target for TI C6000 DSP.

Support for Adding DSP/BIOS™ to Projects

With this release, you can generate code that incorporates DSP/BIOS™ modules and the DSP/BIOS API. Adding the DSP/BIOS functionality lets you take advantage of the modules and tools in DSP/BIOS to provide multithreading, real-time analysis, optimization, and other instrumentation in your Code Composer Studio™ (CCS) projects and executable files. For more information about adding DSP/BIOS to your generated code, refer to “Using DSP/BIOS” in the Embedded Target for TI C6000™ DSP User’s Guide.

ADC and DAC Block Requirement Removed

By adding a scheduler to the target software (synchronized to the clock on the board), we have eliminated the requirement that you include at least one ADC or DAC block in the models you develop for targeting. When your model does not include the ADC or DAC blocks, the new scheduler provides the interrupts to trigger events in your model instead of relying on the DMA on the board.

Note that the interrupt scheduler assumes that the signal processor clock is running at 100 MHz for the C6701 EVM target or 150 MHz for the C6711 DSK target. If the clock rate does not match the assumed rate, the sample rates in your model will be incorrect and your model will generate incorrect results.

Model Profiling Capability Added

When you build CCS projects that include DSP/BIOS, the Embedded Target for TI C6000 DSP software provides the ability to profile the operation of your generated code.

- If you created your project in CCS or you are using an existing CCS project, profiling returns information about the code and how it executes on the target.
- If you created your project and executable from a Simulink model, `profile` analyzes your model performance down to the atomic subsystem level and reports the results in an HTML file.

Invoke the profile capability either from the **RTW Options** panel in the **Simulation Parameters** dialog in Simulink, or from the MATLAB command line using `profile`. For more information on profiling generated code, refer to “Profiling Generated Code.”

Added Support for Multirate Models Through a Software Scheduler

Now you can create models for targeting that use more than one processing rate. The processing rate of your model can change from the model base rate, such as using decimation or interpolation in your algorithm.

One important note—the target software assumes that your target C6000 digital signal processor (DSP) is running at the factory default rate of 100 MHz when your target is the C6701 EVM and 150 MHz for the C6711 DSK. The scheduler calculates all the interrupt rates for your model using the clock rate. If you change the rate of the DSP clock, the interrupt rates in your model will still be calculated with the base rate, not the one you set. As a result, the rates in your model will be wrong and the results will not be correct. For example, if your model contains a Sine block running at 1 KHz sample rate and your target is your C6701 EVM, the scheduler uses the 100 MHz rate to calculate the interrupt timing to generate the sin wave sampled at 1KHz :

$$\begin{aligned}\text{interrupt rate} &= \text{DSP clock rate}/\text{Sine block sample rate} \\ &= 100 \text{ MHz}/1\text{KHz} \\ &= 100 \text{ KHz}\end{aligned}$$

yielding a sample period of 10 μsec , one interrupt sent to the sine wave generator every 100000 clock cycles.

If your actual clock rate on your C6701 EVM has been reset to 150 MHz, the 10 μsec period is wrong and the sine wave is generated incorrectly.

Inline DSP Blockset Functions Option Added

Code generated from blocks in DSP Blockset use functions in a static run-time library. With this option, you can elect to inline those functions in your generated code. Inlining the functions creates more optimized code at the expense of some increased memory used.

Upgrading from an Earlier Release

This section describes the upgrade issues involved in moving from the Developer's Kit for Texas Instruments™ DSP 1.2 to Embedded Target for TI C6000 DSP Version 1.0.

Note The Developer's Kit for Texas Instruments™ DSP has been repackaged as two separate products, including the Embedded Target for TI C6000 DSP and the MATLAB Link for Code Composer Studio.

To upgrade your current Developer's Kit to Embedded Target for TI C6000 DSP Version 1.0, do the following tasks in order:

- Install the appropriate version of Texas Instruments Code Composer Studio 2.1. Note that the Embedded Target does not support targeting with the C5000 DSP family.
 - To target C6000 hardware, install the Code Composer Studio Version 2.1 for TMS320C6000.
 - To link to C6000 hardware, install the Code Composer Studio Version 2.1 for TMS320C6000.
- Download and apply a patch for DSP/BIOS—"CCStudio v2.1 - Config Server Registration Fix"—to Code Composer Studio 2.1. The patch is available only from the following URL:
https://www-a.ti.com/downloads/sds_support/ALL-2.00-SA-to-TI-BIOSRTA-REG01.htm
- Install MATLAB Link for Code Composer Studio™ Development Tools 1.0
- Install Embedded Target for TI C6000 DSP Version 1.0

Known Software and Documentation Problems

This section includes a link to a description of known software and documentation problems in Version 2.0.

Targeting

- For reasons related to the Texas Instruments C compiler, you cannot use certain Simulink blocks for targeting. They are
 - Singular Value Decomposition block in the library dspfactors
 - Pseudoinverse block in the library dspinverses
 - SVD Solver block in the library dspolvers

These blocks are not included in the run-time libraries and do not build when you generate code from your model.

- For this of the Embedded Target, the LED overrun indicator has been removed.

Demos

In MATLAB Demos (select **Help->Demos** from the MATLAB menu bar), the Embedded Target demonstration program LMS Adaptive Filtering runs slowly on DSP Starter Kit (DSK) boards. Design features of the board cause the slow processing across the RTDX link. Using the Texas Instruments XDS 510 JTAG/PC Controller, or an equivalent emulator, to connect your host to the DSK can alleviate the problem.

Data Types

C5000 and C6000 family processors handle integer data types differently. On C5000 family processors, 8-bit values do not have unique addresses. The C5000 family processors use 16-bit addresses natively. When you read and write to C5000 family processors, 8-bit integers in MATLAB are stored as 16-bit integers on the processor. In detail, the differences are

- When you write an 8-bit integer from MATLAB to a C5000 family processor, MATLAB pads the value to 16 bits and the processor stores the value as a 16-bit integer.
- When you read an 8-bit integer from the processor into MATLAB, the read function takes 16 bits from processor memory, discards the eight most

significant bits, and returns the remaining eight bits to MATLAB as the integer value.

For these reasons, scripts that run on C6000 family processors may not run without modification on C5000 family processors.

General Target Operations

When your target digital signal processor is running, CCS uses up to 99% of the CPU cycles on your PC. Consequently, some other operations may be very slow, such as running the MATLAB help system or processing other applications.

LED Overrun Indicator

For this version of the product, the LED overrun indicator available in earlier product versions is not included.