

RTI Bypass Blockset

Application Note

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Contents

About This Application Note	5
Introduction	9
Workflow for Performing Function Bypassing via XCP on FlexRay Using the RTI Bypass Blockset.....	9
Configuration Steps in the FlexRay Configuration Tool	11
Workflow for Configuring the FlexRay Node with the FlexRay Configuration Tool.....	11
Configuration Steps in Simulink	15
Configuration Steps in the RTI FlexRay Configuration Blockset	16
Workflow for Building the FlexRay Node Model.....	16
Configuration Steps in the RTI Bypass Blockset.....	19
How to Configure the RTI Bypass Setup Block.....	19
How to Configure the RTI Bypass Read and RTI Bypass Write Blocks.....	24
Configuring Further RTI Bypass Blocks.....	27
Index	29

About This Application Note

Contents

This application note describes the configuration steps necessary to perform function bypassing via XCP on FlexRay using the RTI Bypass Blockset.





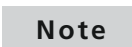



It shows how to set up an XCP master using the dSPACE FlexRay Configuration Package, describes how to implement the bypass model under Simulink, and provides information for configuring the bypass interface and bypass functions using the RTI Bypass Blockset.

Required knowledge

Knowledge in handling the PC, the Microsoft Windows operating system, MATLAB/Simulink, and working with RTI Bypass Blockset is assumed.

Symbols

dSPACE user documentation uses the following symbols:

Symbol	Description
	Indicates a hazardous situation that, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.
	Indicates a hazard that, if not avoided, could result in property damage.
	Indicates important information that you should take into account to avoid malfunctions.
	Indicates tips that can make your work easier.
	Indicates a link that refers to a definition in the glossary, which you can find at the end of the document unless stated otherwise.
	Precedes the document title in a link that refers to another document.

Naming conventions

dSPACE user documentation uses the following naming conventions:

%name% Names enclosed in percent signs refer to environment variables for file and path names.

< > Angle brackets contain wildcard characters or placeholders for variable file and path names, etc.

Examples:

- Where you find terms such as `rti<XXXX>` replace them by the RTI platform support you are using, for example, `rti1007`.
- Where you find terms such as `<model>` or `<submodel>` in this document, replace them by the actual name of your model or submodel. For example, if the name of your Simulink model is `smd_1007_s1.slx` and you are asked to edit the `<model>_usr.c` file, you actually have to edit the `smd_1007_s1_usr.c` file.

RTI block name conventions All I/O blocks have default names based on dSPACE's board naming conventions:

- Most RTI block names start with the board name.
- A short description of functionality is added.
- Most RTI block names also have a suffix.

Suffix	Meaning
B	Board number (for PHS-bus-based systems)
M	Module number (for MicroAutoBox II)
C	Channel number
G	Group number
CON	Converter number
BL	Block number
P	Port number
I	Interrupt number

A suffix is followed by the appropriate number. For example, `DS2201IN_B2_C14` represents a digital input block located on a DS2201 board. The suffix indicates board number 2 and channel number 14 of the block. For more general block naming, the numbers are replaced by variables (for example, `DS2201IN_Bx_Cy`).

Special folders

Some software products use the following special folders:

Common Program Data folder A standard folder for application-specific configuration data that is used by all users.

`%PROGRAMDATA%\dSPACE\<InstallationGUID>\<ProductName>`

or

%PROGRAMDATA%\dSPACE\<ProductName>\<VersionNumber>

Documents folder A standard folder for user-specific documents.

%USERPROFILE%\Documents\dSPACE\<ProductName>\
<VersionNumber>

Local Program Data folder A standard folder for application-specific configuration data that is used by the current, non-roaming user.

%USERPROFILE%\AppData\Local\dSPACE\<InstallationGUID>\
<ProductName>

Accessing dSPACE Help and PDF Files


After you install and decrypt dSPACE software, the documentation for the installed products is available in dSPACE Help and as PDF files.

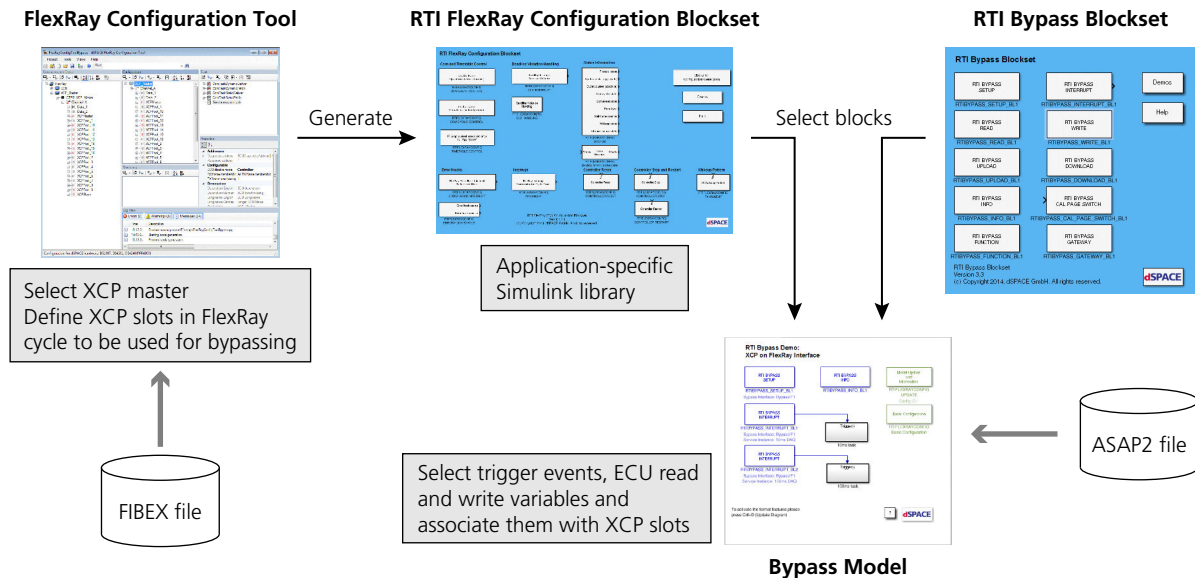
dSPACE Help (local) You can open your local installation of dSPACE Help:

- On its home page via Windows Start Menu
- On specific content using context-sensitive help via **F1**

dSPACE Help (Web) You can access the Web version of dSPACE Help at www.dspace.com.

To access the Web version, you must have a *mydSPACE* account.

PDF files You can access PDF files via the  icon in dSPACE Help. The PDF opens on the first page.



Configuration Steps in Simulink.....	15
Configuration Steps in the FlexRay Configuration Tool.....	11

Configuration Steps in the FlexRay Configuration Tool

Workflow for Configuring the FlexRay Node with the FlexRay Configuration Tool

Introduction

This overview shows the necessary steps for selecting an XCP master and configuring the XCP frames to be used.

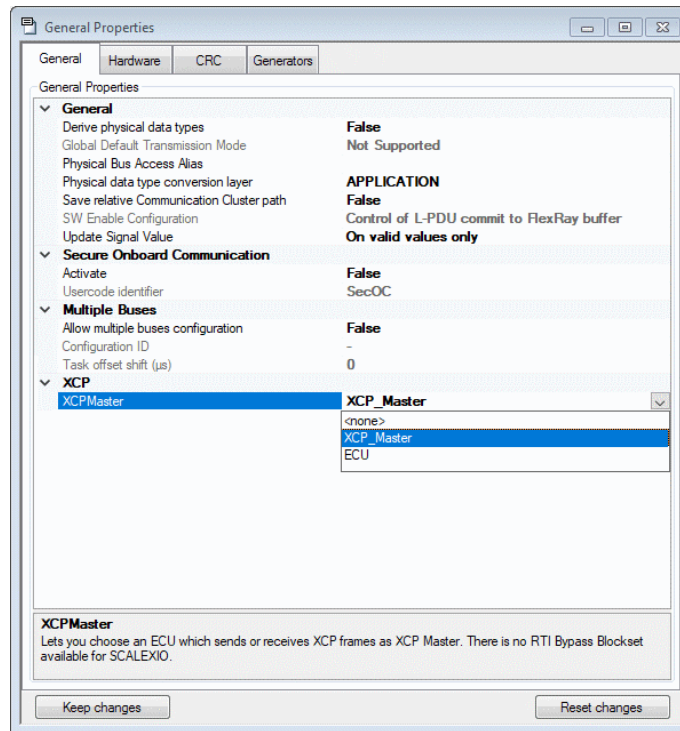
Configuration steps in the FlexRay Configuration Tool

You have to perform the following steps to configure the FlexRay node using the FlexRay Configuration Tool:

1. Import the FIBEX file or AUTOSAR system description file containing the FlexRay network description you want to make your configuration for. Refer to [How to Import a Communication Cluster File \(FlexRay Configuration Tool Guide !\[\]\(67ff022fd78f943b679992c2874bbfd1_img.jpg\)\)](#).

2. Select the XCP master node.

From the Tools menu, select General Properties. On the General page, select the node defining the XCP Master node.

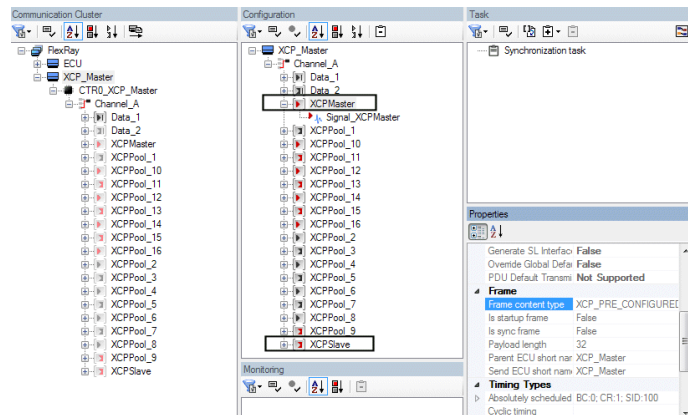
3. Select the hardware your real-time system is based on. Refer to [How to Configure Hardware](#) (FlexRay Configuration Tool Guide).

4. Select and configure the XCP frames you want to use.

In the Properties window, you can identify XCP frames by the Frame content type property. XCP frames are either XCP_RUNTIME_CONFIGURED or XCP_PRE_CONFIGURED. Frames of the XCP_RUNTIME_CONFIGURED content type can be used only if an XCP master node is selected.

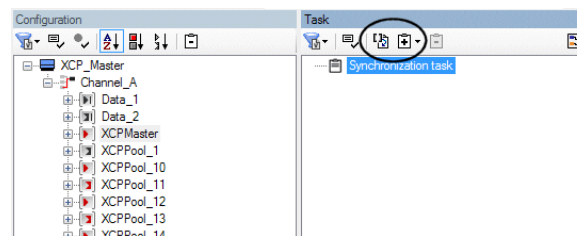
Note

To get the XCP service running, at least the XCP command (from master) and XCP response (from slaves) frames must be configured (see XCPMaster and XCPSlave in the illustration below).



Refer to [How to Select Single Frames and Signals for Simulation \(FlexRay Configuration Tool Guide\)](#).

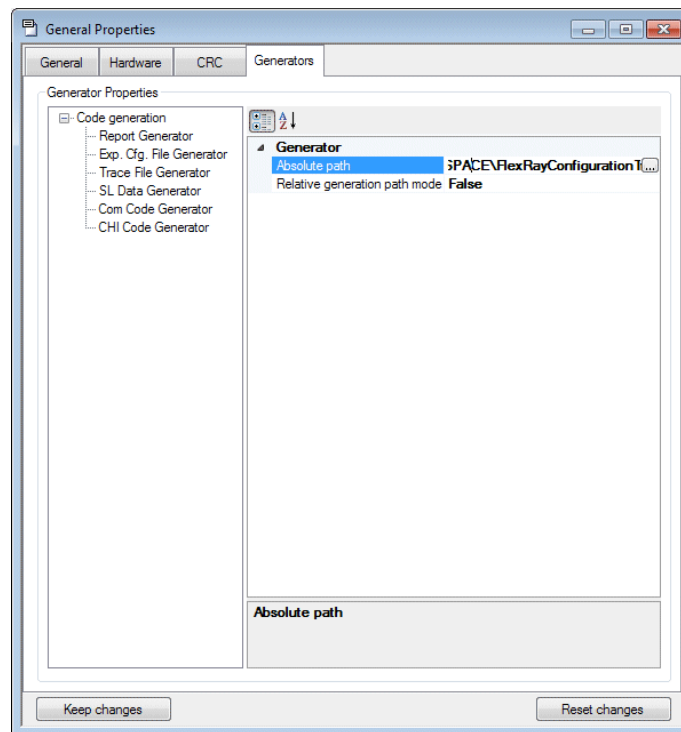
5. Create tasks and assign frames to them. Only frames that are assigned to a task will be sent or received later on. You can create communication and application tasks manually, or let the FlexRay Configuration Tool create communication tasks automatically.



Refer to [How to Create Tasks \(FlexRay Configuration Tool Guide\)](#).

6. Save the project.
7. Specify the settings for generating configuration data and code used to build your real-time application. Generating code covers generating Simulink configuration data, communication layer (Com) code, controller host interface (CHI) code, TRC file, configuration file for the Bus Navigator and optionally a report file. The FlexRay Configuration Tool provides several generator forms.

From the Tools menu, select General Properties. In the General Properties dialog, select the Generators page.



8. Start code generation. Refer to [How to Generate Code \(FlexRay Configuration Tool Guide\)](#).

Tip

For details on using the FlexRay Configuration Tool, refer to the [FlexRay Configuration Tool Guide](#).

Next steps

You can use the generated Simulink configuration data, Com code, and CHI code for simulation purposes with the RTI FlexRay Configuration Blockset and RTI Bypass Blockset. Refer to [Configuration Steps in Simulink](#) on page 15.

Related topics

Basics

[Workflow for Performing Function Bypassing via XCP on FlexRay Using the RTI Bypass Blockset](#)..... 9

Configuration Steps in Simulink

Configuration steps in Simulink

The Simulink configuration data generated by the FlexRay Configuration Tool contains all the necessary parameters for building the RTI blocks needed to model the FlexRay node and run the XCP on FlexRay service.

The following topics describe the configuration process using the RTI FlexRay Configuration Blockset and the RTI Bypass Blockset.

Where to go from here**Information in this section**

Configuration Steps in the RTI FlexRay Configuration Blockset	16
Configuration Steps in the RTI Bypass Blockset.....	19

Configuration Steps in the RTI FlexRay Configuration Blockset

Workflow for Building the FlexRay Node Model

RTI FlexRay Configuration Blockset

The Simulink configuration data generated by the FlexRay Configuration Tool has all the necessary parameters for building the RTI blocks needed to model the FlexRay node. The RTI FlexRay Configuration Blockset contains a MATLAB command which generates the RTI blocks.

The generated FlexRay model can be generated for PDU-based modeling. The automatically generated FlexRay model has RTI blocks for each configured PDU that comprises several signals, i.e., PDU-based modeling handles several signals with one Simulink block.

To build the FlexRay node model from the data generated using the FlexRay Configuration Tool, enter one of the following commands in the MATLAB Command Window (where `FLEXRAYCONFIGPROJECTNAME_data` is the file name of the Simulink configuration data file):

```
rtiflexrayconfig_modelgenerate('FLEXRAYCONFIGPROJECTNAME_data.m')
```

or

```
rtiflexrayconfig_modelgenerate('FLEXRAYCONFIGPROJECTNAME_data.m', 'BlockSet', 'PDU')
)
```

Example Type

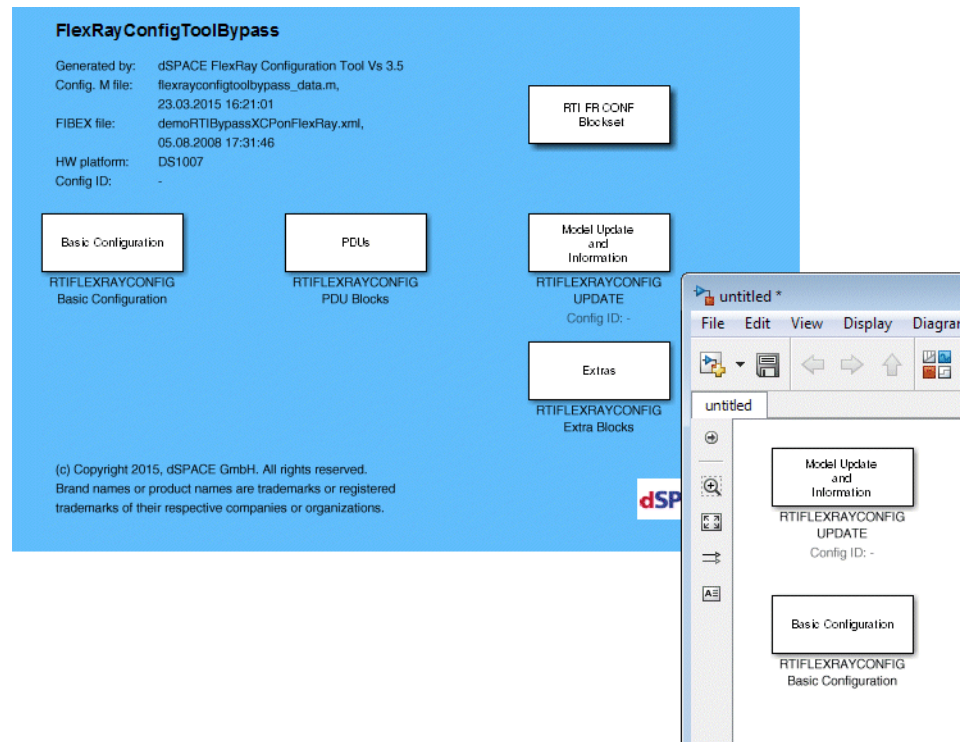
```
rtiflexrayconfig_modelgenerate('FlexRayConfigToolBypass_data.m')
```

in the MATLAB Command Window to generate a model for PDU-based modeling.

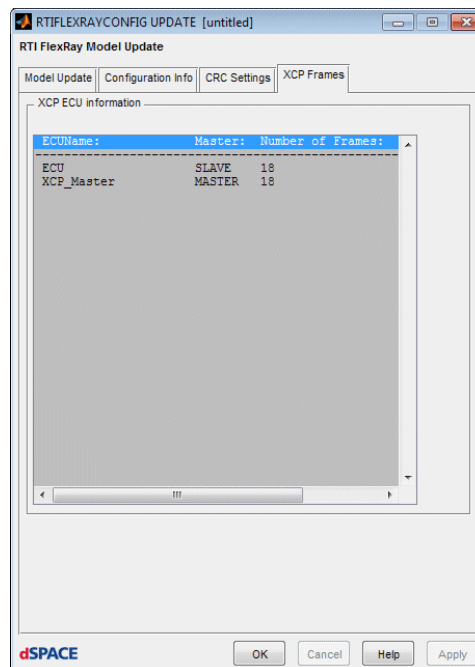
For details on how to build the FlexRay node model using Simulink, refer to [How to Generate RTI Blocks for Designing a FlexRay Node \(FlexRay Configuration Features !\[\]\(e9474ce1d70442456f8fe9c393ea149c_img.jpg\)\)](#).

RTI FlexRayConfig blocks

From the generated FlexRay node model, you have to copy at least the RTIFLEXRAYCONFIG UPDATE and the RTIFLEXRAYCONFIG Basic Configuration blocks to your Simulink model.



Double-click the RTIFLEXRAYCONFIG UPDATE block and select the XCP Frames page to get information on the available XCP frames.



For details on the RTI FlexRay Configuration Blockset, refer to the [RTI FlexRay Configuration Blockset Reference](#) document.


Related topics

Basics

Workflow for Performing Function Bypassing via XCP on FlexRay Using the RTI
Bypass Blockset..... 9

Configuration Steps in the RTI Bypass Blockset

RTI Bypass Blockset

To configure and access the XCP on FlexRay service you need to use the RTI Bypass Blockset. For a blockset description, refer to the [RTI Bypass Blockset Reference](#) .

Where to go from here

Information in this section

[How to Configure the RTI Bypass Setup Block](#)..... 19

To use the RTI Bypass Blockset library, an RTI Bypass Setup block is required to define the communication to a specific ECU.

[How to Configure the RTI Bypass Read and RTI Bypass Write Blocks](#)..... 24

For reading and writing data event-synchronously from/to the ECU, the RTI Bypass Read and RTI Bypass Write blocks have to be used.

[Configuring Further RTI Bypass Blocks](#)..... 27

Describes the other blocks of the RTI Bypass Blocksets.

How to Configure the RTI Bypass Setup Block

Objective

To use the RTI Bypass Blockset library, you need an RTI Bypass Setup block that defines the communication to a specific ECU. To configure the RTI Bypass Blockset for XCP on FlexRay communication, perform the steps described below.

Basics

For details on the parameters of the RTI Bypass Setup block, refer to [RTIBYPASS_SETUP_BLx](#) ([RTI Bypass Blockset Reference](#) ).

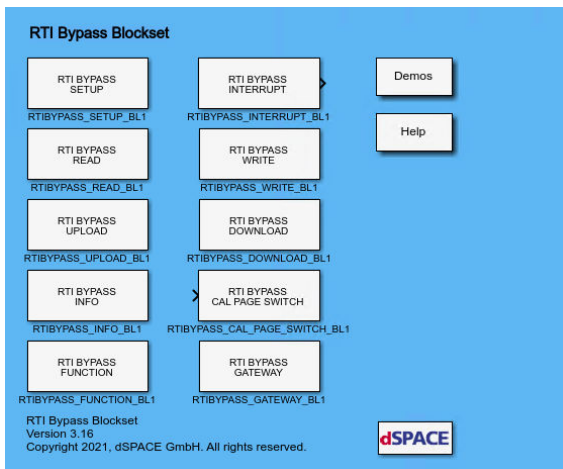
Preconditions

Your FlexRay node model must be prepared as described in [Workflow for Building the FlexRay Node Model](#) on page 16.

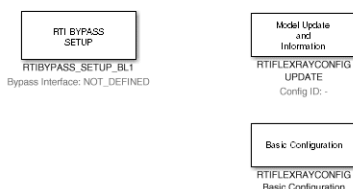
Method

To configure the RTI Bypass Setup block

- 1 Enter `rtibypass` in the MATLAB Command Window to open the RTI Bypass Blockset library.

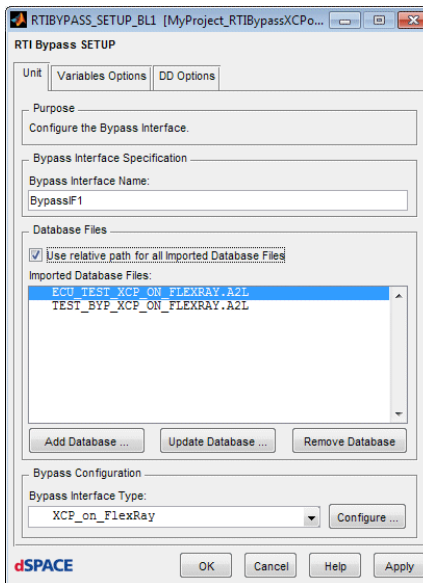


- 2 Drag an RTI Bypass Setup block into your FlexRay node model.



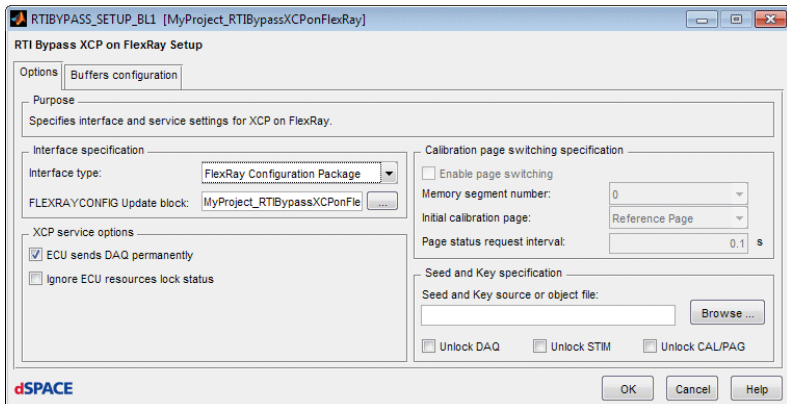
- 3 Double-click the RTI Bypass Setup block to open the block configuration dialog.
- 4 Add the A2L files of the ECU you want to access. At least one A2L file you load must contain a common XCP and a `FLX_Parameters` section corresponding to the ECU service implementation.

- 5 On the Unit page, select XCP_on_FlexRay as the Bypass Interface Type, then click Configure.



This opens the interface-specific configuration dialog.

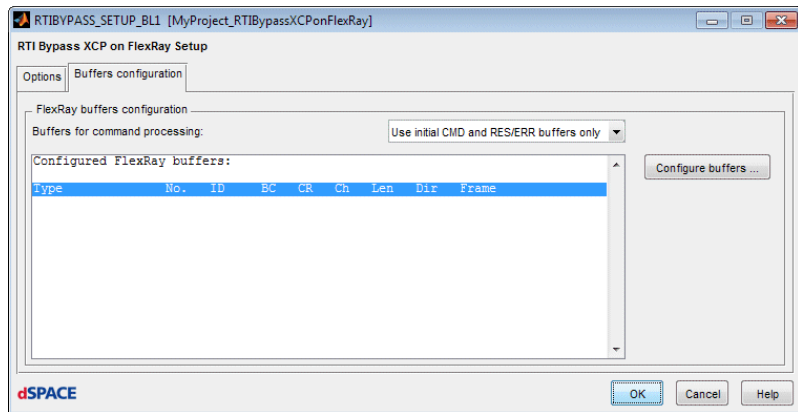
- 6 On the Options page, select FlexRay Configuration Package as the Interface type, and specify the FLEXRAYCONFIG Update block to be used. Specify all the XCP-specific parameters according to your ECU service implementation.



For a description of the XCP-specific parameters, refer to [Options Page \(RTIBYPASS_SETUP_BLx for XCP on FlexRay\)](#) (RTI Bypass Blockset Reference).

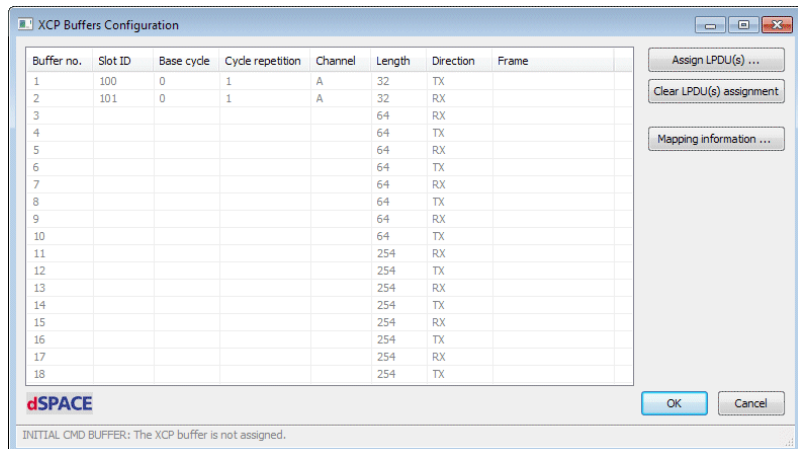
- 7 On the Buffers configuration page, select the buffers to be used for command processing:
- Use initial CMD and RES/ERR buffers only: Only statically predefined buffers are used for command processing.
 - Use all available buffers: All dynamically configured buffers are used for command and response processing in addition to the predefined buffers. This increases the time for the XCP initialization and the Upload and

Download block execution, but can enhance measurement data (DAQ) transmission by the XCP service.



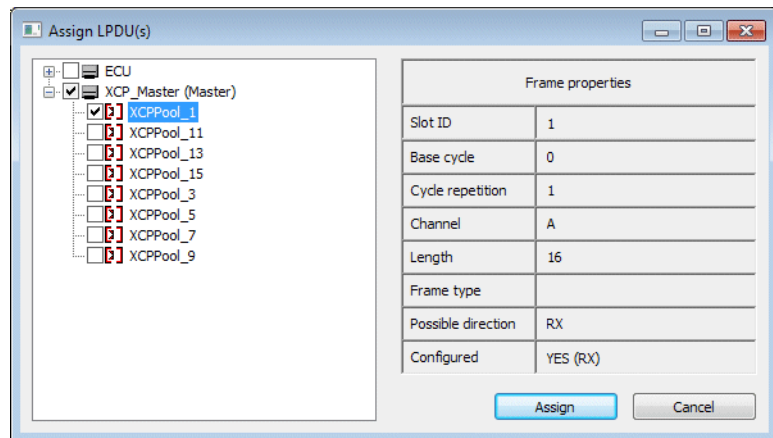
8 Click Configure buffers.

The Buffers configuration dialog opens, listing all the FlexRay buffers provided by the ECU that are defined in the specified A2L files.



9 Select the buffers to be used for communication, then click Assign LPDU(s).

This opens the Assign LPDU(s) dialog. The dialog displays all the unassigned frames of your FlexRay network made available by the current RTIFLEXRAY Configuration Package configuration, which match the requirements of the currently selected buffers.



Select the checkboxes of the XCP FlexRay frames for assignment, then click **Assign** to perform the assignment of the selected FlexRay frames to the selected FlexRay buffers.

Repeat this step to configure all the buffers you want to use for the current communication. Only assigned buffers will be available for XCP communication.

Tip

You can let the RTI Bypass Blockset make the LPDU assignment for you. You have to perform the following steps for this:

- In the Buffers configuration dialog, select all the buffers that are to be assigned from the list.
Multiple selection is possible by pressing **Ctrl** or **Shift** when selecting the buffers. **Ctrl+A** selects all buffers in a single step.
- Click **Assign LPDU(s)**.
- In the **Assign LPDU(s)** dialog, select the checkbox next to the node of the ECU you want to communicate with.
- Click **Assign**.

The RTI Bypass Blockset makes as many LPDU assignments as possible for the selected buffers, according to the definitions in the A2L file.

- 10** Click **OK** in the Buffers configuration dialog, on the interface-specific pages, and in the RTI Bypass Setup block dialog to finish the configuration of the RTI Bypass Setup block.

Result

The bypass interface specified by the RTI Bypass Setup block now is available in all the other blocks of the RTI Bypass library. You can now add these blocks to the model via drag and drop from the RTI Bypass Blockset library.

Next steps

To read data from and write data to the ECU, you can add Read and Write blocks from the RTI Bypass Blockset to the model. Refer to [How to Configure the RTI Bypass Read and RTI Bypass Write Blocks](#) on page 24.

Related topics

Basics

[Configuring Further RTI Bypass Blocks.....](#) 27

HowTos

[How to Configure the RTI Bypass Read and RTI Bypass Write Blocks.....](#) 24

How to Configure the RTI Bypass Read and RTI Bypass Write Blocks

Objective

The RTI Bypass Read and Write blocks have to be used for reading and writing data event-synchronously from/to the ECU.

Common configuration steps

In addition to the steps for configuring the Read and Write blocks for FlexRay communication described below, you also have to perform common configuration steps. For details, refer to [RTIBYPASS_READ_BLx \(RTI Bypass Blockset Reference !\[\]\(e1c624d4757f08486e89482c18364c17_img.jpg\)\)](#) and [RTIBYPASS_WRITE_BLx \(RTI Bypass Blockset Reference !\[\]\(fd44bd93e945cfa8875a8962f08e5b64_img.jpg\)\)](#).

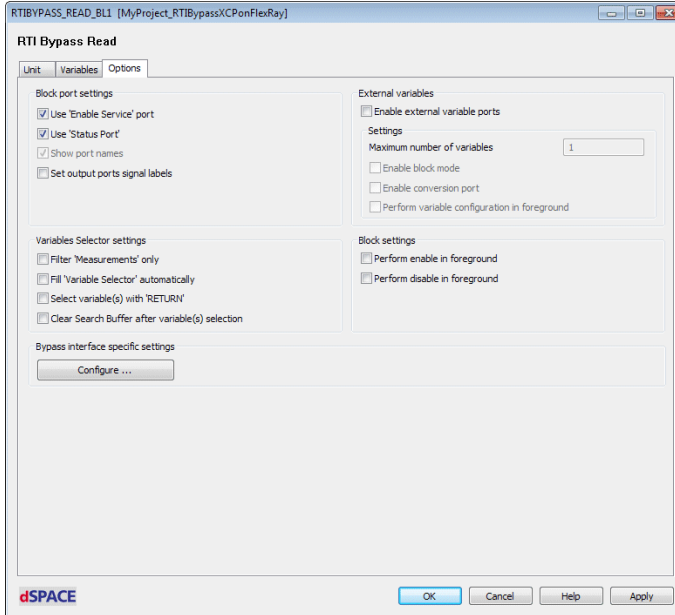
Preconditions

You must have added the required Read and Write blocks from the RTI Bypass Blockset library to the model.

Method

To configure the RTI Bypass Read and Write blocks

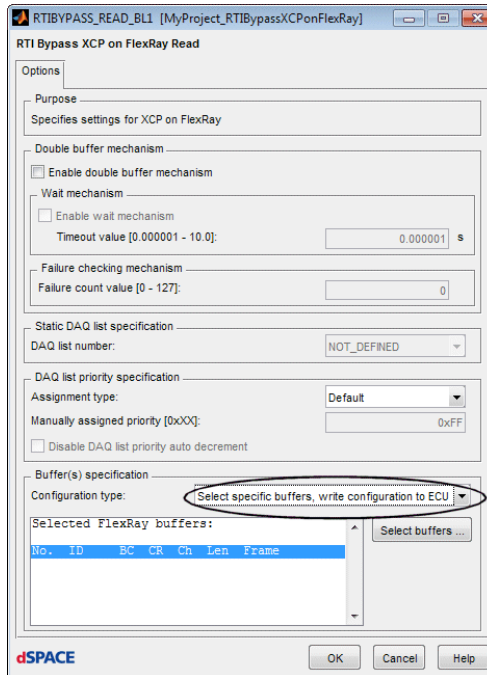
- 1 Double-click the RTI Bypass Read or RTI Bypass Write block, select the Options page and click Configure.



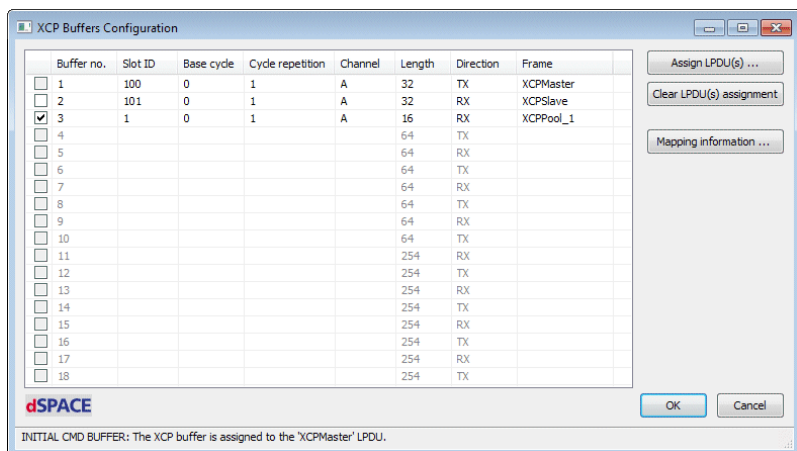
- 2 In the bypass interface-specific settings dialog of the Read or Write block, configure the XCP-specific settings according to your ECU service implementation and the ECU event which triggers reading DAQ data from the ECU or writing STIM data to the ECU. For details on the XCP-specific parameters, refer to [RTI Bypass Pages for XCP on FlexRay \(RTI Bypass Blockset Reference\)](#).
- 3 In the Buffer(s) specification frame of the interface-specific settings dialog, specify the Configuration type. This selects how FlexRay buffers are to be used for ECU communication using the RTI Bypass Read or RTI Bypass Write block:
 - Use all available buffers: All FlexRay buffers with RX frame direction or TX frame direction configured in the RTI Bypass Setup block are used to transmit DAQ data from/STIM data to the ECU.
 - Select specific buffers, write configuration to ECU: Lets you select specific buffers for reading or writing data related to the current block. The

specified buffer configuration will be written to the ECU. The ECU must support the selection of specific buffers for DAQ/STIM processing.

- Select specific buffers (available only for Write blocks): Lets you select specific buffers for writing data related to the current write block. The specified buffer configuration will not be written to the ECU.



- 4 If you specified Select specific buffers, write configuration to ECU or Select specific buffers as the Configuration type, click Select buffers. The XCP Buffers Configuration dialog opens.
- 5 Select the specific FlexRay buffers to be used for communication with the ECU. In the list, all the buffers currently specified for data transmission from/to the ECU with the current Read or Write block are selected in the column on the left. You can change the buffer selection for the block by selecting or clearing the checkboxes next to the buffers. A selected checkbox indicates that the buffer is selected for communication.



If necessary, you can modify the buffer assignment configuration made in the Setup block. Reconfiguring the LPDU assignment is the same as performing LPDU assignment during the Setup block configuration. See [How to Configure the RTI Bypass Setup Block](#) on page 19.

Note

Reconfiguring the buffer assignments is global. It affects all the blocks related to the current bypass interface and the global buffer configuration made in the corresponding Setup block.

- 6 Click OK to confirm your selection and close the Buffers configuration dialog.

The buffers currently selected for the Read or Write block are displayed in the Selected FlexRay buffers list in the bypass interface-specific settings dialog of the Read or Write block.

Related topics

Basics


[Configuring Further RTI Bypass Blocks](#)..... 27

HowTos



[How to Configure the RTI Bypass Setup Block](#)..... 19

Configuring Further RTI Bypass Blocks

RTI Bypass Interrupt block

The RTI Bypass Interrupt block provides a functional trigger output dedicated to an ECU event. There are no FlexRay-specific configuration options. For details on the block parameters, refer to [RTIBYPASS_INTERRUPT_BLx](#) (RTI Bypass Blockset Reference .

RTI Bypass Upload/Download blocks


The RTI Bypass Upload and RTI Bypass Download blocks perform asynchronous data transfer from/to the ECU using the XCP SET_MTA and UPLOAD/DOWNLOAD commands. There are no FlexRay-specific configuration options. For details on the block parameters, refer to [RTIBYPASS_UPLOAD_BLx](#) (RTI Bypass Blockset Reference ) and [RTIBYPASS_DOWNLOAD_BLx](#) (RTI Bypass Blockset Reference .

RTI Bypass Page Switch block

The RTI Bypass Page Switch block monitors the current active page and performs a page switch to a page defined by the block input. There are no

FlexRay-specific configuration options. For details on the block parameters, refer to [RTIBYPASS_CAL_PAGE_SWITCH_BLx](#) (RTI Bypass Blockset Reference ).

RTI Bypass Info block

The RTI Bypass Info block shows some information about the current interface configuration. No FlexRay-specific configuration information is displayed. For details on the block, refer to [RTIBYPASS_INFO_BLx](#) (RTI Bypass Blockset Reference ).

Note

For XCP on FlexRay, some interface-specific parameters can be incorrect.

Related topics

HowTos

How to Configure the RTI Bypass Read and RTI Bypass Write Blocks.....	24
How to Configure the RTI Bypass Setup Block.....	19

B

building the FlexRay node model 16

C

Common Program Data folder 6

D

Documents folder 7

I

Introduction 9

L

Local Program Data folder 7

U

using blocks of the RTI Bypass Blockset 19

W

workflow

building the FlexRay node model 16

setting up an XCP on FlexRay master
service 9

using blocks of the RTI Bypass Blockset 19

