SIEMENS

SIMATIC

STEP 7 (TIA Portal) options
Target 1500S™ for Simulink® V2.0

Programming Manual

Siemens Distributor

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction 1

1.1 Guide for this manual

Purpose of the documentation

This documentation provides important information about installing and setting up SIMATIC Target 1500S for Simulink and generating an ODK object.

Basic knowledge required

The following knowledge is required in order to understand the documentation:

- General knowledge of automation technology
- Knowledge of the SIMATIC industrial automation system
- Knowledge of working with STEP 7
- Use of Microsoft Windows operating systems
- Proficiency with Mathworks MATLAB and Simulink

Validity of the documentation

This documentation is valid for the product SIMATIC Target 1500S for Simulink.

Notes

Please also observe notes labeled as follows:

Note

A note contains important information on the product described in the documentation, on the handling of the product or on the part of the documentation to which particular attention should be paid.

Definitions and naming conventions

The following terms are used in this documentation:

- Target 1500S: This term refers to the product SIMATIC Target 1500S for Simulink.

- ODK: This term refers to the product Open Development Kit 1500S in the compatible version.

- SO: Shared Object. Output object after an ODK build.

- SCL: Structure Control Language. Programming language in STEP7.

- STEP 7: In this documentation, "STEP 7" is used as a synonym for all versions of the configuration and programming software "STEP 7 (TIA Portal V15 or higher)".

- Matlab: Mathworks MATLAB

  MATLAB and Simulink are registered trademarks of The MathWorks, Inc.

- TIA Portal Openness: Automation interface of TIA Portal V15. Used by Target 1500S to import from external sources.

1.2 Guide to documentation S7-1500 / ET 200MP

The documentation for the SIMATIC S7-1500 automation system and the SIMATIC ET 200MP distributed I/O system is arranged into three areas.
This arrangement enables you to access the specific content you require.
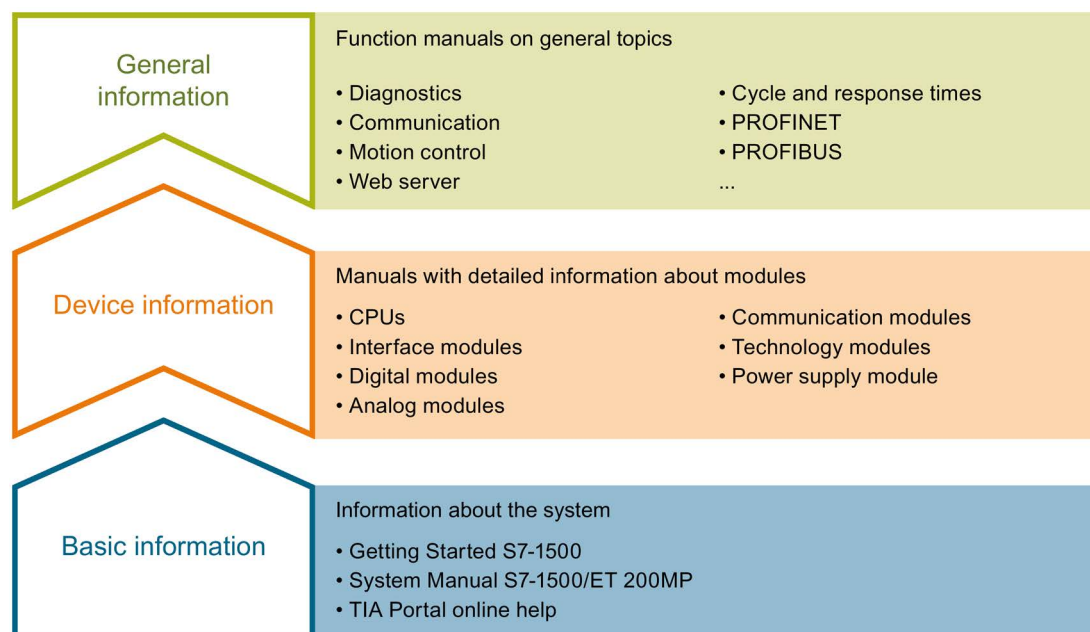
Basic information

The System Manual and Getting Started describe in detail the configuration, installation, wiring and commissioning of the SIMATIC S7-1500 and ET 200MP systems. The STEP 7 online help supports you in the configuration and programming.

Device information

Product manuals contain a compact description of the module-specific information, such as properties, wiring diagrams, characteristics and technical specifications.

General information

The function manuals contain detailed descriptions on general topics regarding the SIMATIC S7-1500 and ET 200MP systems, e.g. diagnostics, communication, motion control, Web server, OPC UA.

You can download the documentation free of charge from the Internet (http://w3.siemens.com/mcms/industrial-automation-systems-simatic/en/manual-overview/Pages/Default.aspx).

Changes and supplements to the manuals are documented in a Product Information.

You can download the product information free of charge from the Internet (https://support.industry.siemens.com/cs/us/en/view/68052815).

Manual Collection S7-1500/ET 200MP

The Manual Collection contains the complete documentation on the SIMATIC S7-1500 automation system and the ET 200MP distributed I/O system gathered together in one file.

You can find the Manual Collection on the Internet (https://support.industry.siemens.com/cs/ww/en/view/86140384).

SIMATIC S7-1500 comparison list for programming languages

The comparison list contains an overview of which instructions and functions you can use for which controller families.

You can find the comparison list on the Internet (https://support.industry.siemens.com/cs/ww/en/view/86630375).

"mySupport"

With "mySupport", your personal workspace, you make the best out of your Industry Online Support.

In "mySupport", you can save filters, favorites and tags, request CAx data and compile your personal library in the Documentation area. In addition, your data is already filled out in support requests and you can get an overview of your current requests at any time.

You must register once to use the full functionality of "mySupport".

You can find "mySupport" on the Internet (https://support.industry.siemens.com/My/ww/en).

"mySupport" - Documentation

In the Documentation area in "mySupport" you can combine entire manuals or only parts of these to your own manual.
You can export the manual as PDF file or in a format that can be edited later.

You can find "mySupport" - Documentation on the Internet (http://support.industry.siemens.com/My/ww/en/documentation).

"mySupport" - CAx data

In the CAx data area in "mySupport", you can access the current product data for your CAx or CAe system.

You configure your own download package with a few clicks.

In doing so you can select:

- Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files

- Manuals, characteristics, operating manuals, certificates

- Product master data

You can find "mySupport" - CAx data on the Internet (http://support.industry.siemens.com/my/ww/en/CAxOnline).

Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus on individual products.

You will find the application examples on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109482830).

TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).
This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one tool.
With the TIA Selection Tool, you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet (http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool).

SIMATIC Automation Tool

You can use the SIMATIC Automation Tool to perform commissioning and maintenance activities simultaneously on various SIMATIC S7 stations as a bulk operation independent of the TIA Portal.

General function overview:

- Network browsing and creation of a table showing the accessible devices in the network.

- Flashing of device LEDs or HMI display to locate a device

- Downloading of addresses (IP, subnet, gateway) to a device

- Downloading the PROFINET name (station name) to a device

- Placing a CPU in RUN or STOP mode

- Setting the time in a CPU to the current time of your PG/PC

- Downloading a new program to a CPU or an HMI device

- Downloading from CPU, downloading to CPU or deleting recipe data from a CPU

- Downloading from CPU or deleting data log data from a CPU

- Backup/restore of data from/to a backup file for CPUs and HMI devices

- Downloading service data from a CPU

- Reading the diagnostics buffer of a CPU

- Performing a CPU memory reset

- Resetting devices to factory settings

- Downloading a firmware update to a device

You can find the SIMATIC Automation Tool on the Internet (https://support.industry.siemens.com/cs/ww/en/view/98161300).

PRONETA

With SIEMENS PRONETA (PROFINET network analysis), you analyze the PROFINET network during commissioning. PRONETA features two core functions:

- The topology overview independently scans PROFINET network and all connected components.

- The IO check is a fast test of the wiring and the module configuration of a system.

You can find SIEMENS PRONETA on the Internet (https://support.industry.siemens.com/cs/ww/en/view/67460624).

SINETPLAN

SINETPLAN, the Siemens Network Planner, supports you in planning automation systems and networks based on PROFINET. The tool facilitates professional and predictive dimensioning of your PROFINET installation as early as in the planning stage. In addition, SINETPLAN supports you during network optimization and helps you to exploit network resources optimally and to plan reserves. This helps to prevent problems in commissioning or failures during productive operation even in advance of a planned operation. This increases the availability of the production plant and helps improve operational safety.

The advantages at a glance

- Network optimization thanks to port-specific calculation of the network load

- Increased production availability thanks to online scan and verification of existing systems

- Transparency before commissioning through importing and simulation of existing STEP 7 projects

- Efficiency through securing existing investments in the long term and optimal exploitation of resources

You can find SINETPLAN on the Internet (https://www.siemens.com/sinetplan).

The Manual Collection includes the complete documentation for distributed I/O system SIMATIC ET 200SP assembled in a single file.

You can find the Manual Collection on the Internet (http://support.automation.siemens.com/WW/view/en/84133942).

Security information

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Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customers' exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under (https://www.siemens.com/industrialsecurity).

Siemens Industry Online Support 3

You can find current information on the following topics quickly and easily here:

- **Product support**

  All the information and extensive know-how on your product, technical specifications, FAQs, certificates, downloads, and manuals.

- **Application examples**

  Tools and examples to solve your automation tasks – as well as function blocks, performance information and videos.

- **Services**

  Information about Industry Services, Field Services, Technical Support, spare parts and training offers.

- **Forums**

  For answers and solutions concerning automation technology.

- **mySupport**

  Your personal working area in Industry Online Support for messages, support queries, and configurable documents.

This information is provided by the Siemens Industry Online Support in the Internet (http://www.siemens.com/automation/service&support).

Industry Mall 4

The Industry Mall is the catalog and order system of Siemens AG for automation and drive solutions on the basis of Totally Integrated Automation (TIA) and Totally Integrated Power (TIP).

You can find catalogs for all automation and drive products on the Internet (https://mall.industry.siemens.com).

Product overview

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5.1 Overview of functions

Basics

Mathworks Matlab is software for the primary solution of mathematical problems and their visualization.

Simulink is an add-on for Matlab for graphical modeling of systems and their simulation.

Target 1500S

Target 1500S is an add-on for Simulink, which generates an executable object for an ODK-enabled controller from a Simulink model. It enables you to run a Simulink model on a controller.

Target 1500S automatically generates all the necessary blocks and files for this. An SCL and SO file is created from the generated C/C++ code.

The SCL file is imported as external source to STEP 7 and contains the generated function blocks.

The SO file contains the C/C++ implementation and is available to the CPU after transfer to the web server.

5.2 Basic procedure

Overview of the individual steps

To run a Simulink model on a controller, follow these steps:

1. Create a model in Simulink.

2. Configure the properties of the model in Simulink.

3. Under "Code Generation", select Target 1500S as System Target File .

4. Adapt the parameters for Simulink and Target 1500S .

5. Start the build in Simulink.

   The SO and SCL file is generated and stored in the output directory "outputs".

6. Transfer the SO file into the ODK 1500S folder in the Web server of the controller.

7. To import the SCL files after the build automatically to the STEP 7 project, enable the "Import the generated SCL file to CPU(s)" option in the Target 1500S Openness options (Page 29).

   Steps 8 and 9 are automatically executed as a result.

8. Add the SCL file as an external source in STEP 7.

9. Generate blocks from the external source in STEP 7.

10. Call the required blocks in your S7 program.

11. Load the program onto the ODK-enabled controller.

You can find more information on the ODK-relevant steps in the ODK manual (https://support.industry.siemens.com/cs/ww/en/ps/13914/man) of the corresponding version.

Installing 6

6.1 System requirements

Requirements

Your PC must meet the following system requirements in order to use the Target 1500S:

Category	Requirement
Operating system	• Microsoft Windows 7 SP1, 64-bit • Microsoft Windows 8.1, 64-bit • Microsoft Windows 10, 64-bit
Processor and memory	PC system: • 100 MB of free space on the hard disk C:\ • At least systems with Intel Core i5 processor • 1.2 GHz or higher • At least 4 GB RAM
Operator interface	Monitor, keyboard and mouse.
SIMATIC Software	• SIMATIC ODK 1500S V2.0 or V2.5 • Optional: SIMATIC STEP 7 Professional (TIA Portal) V15 or higher with TIA Portal Openness V15 • Optional: SIMATIC CPU 15xx, which supports ODK V2.0 or V2.5

Additional software	• Matlab 2017b (64-bit) in the following configuration:
	  – Matlab 9.3
	  – Matlab Coder 3.4
	  – Simulink 9.0
	  – Simulink Coder 8.13
	• Java Runtime Environment (32-bit)

6.2 Installing Target 1500S

To install Target 1500S, select the installation folder. Follow the instructions of the setup program.

If the setup program does not start automatically, manually start the "Start.exe" file by double clicking it.

Note

Use of antivirus software

To avoid problems during the installation, disable the antivirus software for the period of the installation or exclude the directory "C:\Program Files\Common Files\Siemens\Automation\Siemens Installer Assistant" and the directory in which Start.exe is located, for the antivirus software.

Note

Order of the installed Target 1500S versions

When you install multiple versions, make sure that the older version is installed before the newer one. If problems occur, uninstall all versions and install these again in this order.

Requirements

- You have installed a compatible ODK 1500S version and a 32-bit Java Runtime Environment .

- You need administrator rights for this action.

- Matlab and Simulink are installed in the required configuration.

- Close all Matlab instances.

Procedure

1. Launch the "Start.exe" file manually with a double-click.

2. Select the language for performing the installation.

3. Confirm with "Next".

   The "Configuration" view opens.

4. Click "Next" to confirm the list of components that are to be installed.

   The check mark for Automation License Manager (ALM) cannot be removed.

   Note

   Target 1500S is already installed

   If Target 1500S is already installed, you can select between "Repair (Page 22)" and "Uninstall (Page 21)" here.

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5. Confirm with "Next".

6. Agree to the license conditions and safety information.

7. Confirm with "Next".

   The "Overview" with the installation settings opens.

8. Start the installation with "Install"

   The following directory is created:

   ProgramFiles(x86)%\Siemens\Automation\Target1500S*<current version>*

9. Choose whether you want to carry out the licensing (Page 19) during the installation or at a later time.

Result

The installation is complete. All product languages were installed by default during the installation process. During the installation, Target 1500S was integrated in Simulink and the product help was created in the Windows Start menu.

Note

You can install ODK after Target. Close Matlab and other applications and then restart it after the installation.

6.3   Licensing Target 1500S

The software requires a product-specific license key that you install with the Automation License Manager. Each SIMATIC software product for automation that is subject to license (e.g., STEP 7) has its own license key. You must install the license key for each product.

Working with the Automation License Manager

The Automation License Manager is a product of Siemens AG and is used for managing license keys. The Automation License Manager is supplied on the installation data medium of this product by default and is transferred automatically during the installation process.

Software products that require license keys for operation register the requirement for license keys automatically in the Automation License Manager. If the Automation License Manager finds a valid license key for this software, the software can be used according to the conditions of use associated with this license key.

Certificate of license

A Certificate of License is included in the scope of delivery. It contains your unique license number. The license certificate serves as proof that you have a valid license key. Store this certificate in a safe place.

Note

Obtaining a replacement license key

You must have a valid certificate of license to get a replacement license key.

Recovering the license key in case of defective mass storage

If an error has occurred on the mass storage or USB flash drive containing your license key file, you can restore the license using the license certificate. You can find additional information in a FAQ (https://support.industry.siemens.com/cs/ww/en/view/772175).

License key

The download of Target 1500S allows you to access ordered license keys.

For access, you need:

● A personalized login that you can use to call all license keys assigned to you.

● An anonymous login that you can use to fetch an individual license key, and the corresponding license certificate. This document contains all data required for the anonymous download.

Additional information on the license key and the download is available in the Automation License Manager manual (https://support.industry.siemens.com/cs/ww/en/view/102770153).

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Transferring the license key

The license key can be transferred during the installation or afterwards.

If the USB flash drive with the relevant license key is inserted in the USB port of the PC at the start of installation, the license key will be transferred automatically during the installation. If the USB flash drive is not inserted at the start of installation, you have three options for installing the license key subsequently:

- To transfer the license key **manually** from a network computer or other storage medium, select the "Manual license transfer" button.

- Insert the USB flash drive with license key, and select the "Retry license transfer" button. The Automation License Manager opens in order to transfer the license key.

- If you do not want to install a license key, select the "Skip license transfer" button.

Working without valid license key

For legal reasons, a valid license key is required for this product.

If no valid license key is present on your PC, you cannot generate any projects and the system indicates the non-licensed mode with a message. You have the one-time option of activating a trial license. However, this license is valid for a limited period only and expires after 21 days.

When the trial license has expired, an error message appears during the build process.

Manually transferring the license key subsequently

A message is displayed if you start the Target 1500S without transferred license key. If the Automation License Manager is not yet installed on your computer, you must install it beforehand.

To **manually** transfer the license key for Target 1500S subsequently, follow these steps:

1. Start the installation of Target 1500S with administrator rights.

2. In the "License Transfer" section, select the "Manual license transfer" button.

   A dialog box for synchronization of the license opens.

3. Select the destination and the source of the license key.

4. To transfer the license key, click the "Synchronize" button.

   The license key is transferred.

6.4 Uninstalling Target 1500S

Requirement

- You need administrator rights for this action.
- You have already installed Target 1500S .

Procedure

1. Launch the "Start.exe" file manually with a double-click.
2. Select the language for performing the installation.
3. Confirm with "Next".
   The "Configuration" view opens.
4. Select the "Uninstall" option.
5. Confirm with "Next".

Result

- Target 1500S is removed from the Matlab environment.
- The entry in the Start menu is deleted.
- Target-specific folders are deleted.
  Previously generated output of Target 1500S is not deleted.

6.5 Repairing Target 1500S

Requirement

- You require administrator rights for this procedure.
- You have already installed Target 1500S .

Procedure

1. Launch the "Start.exe" file manually with a double-click.
2. Select the language for performing the installation.
3. Confirm with "Next".

   The "Configuration" view opens.
4. Select the "Repair" option.
5. Confirm with "Next".

Result

Target 1500S is re-installed.

Example of a workflow

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7.1 Creating a Simulink model

Procedure

1. In Matlab, select the storage path for the model under "Current Folder".

    Alternatively, you can also set the storage path in the Simulink preferences under "File generation control".

2. Create the model in Simulink.

    You can also use a model provided by Simulink, for example Bouncing Ball .

3. Save the model.

7.2 Description of Simulink parameters

Some configuration parameters are preset when you select Target 1500S as the System Target File . To do so, select the system target file for Target_1500S (*.tlc) of the required version in the "Configuration Parameters".

Note

Change/migrate the System Target File

If you change parameters in the "Configuration Parameters" and then want to change the System Target File, you need to first confirm the changes with the "Apply" button.

If you migrate an older version of the System Target File after a newer version, the parameters the applied. Parameters that are not present in the older version are set to the default value by the system.
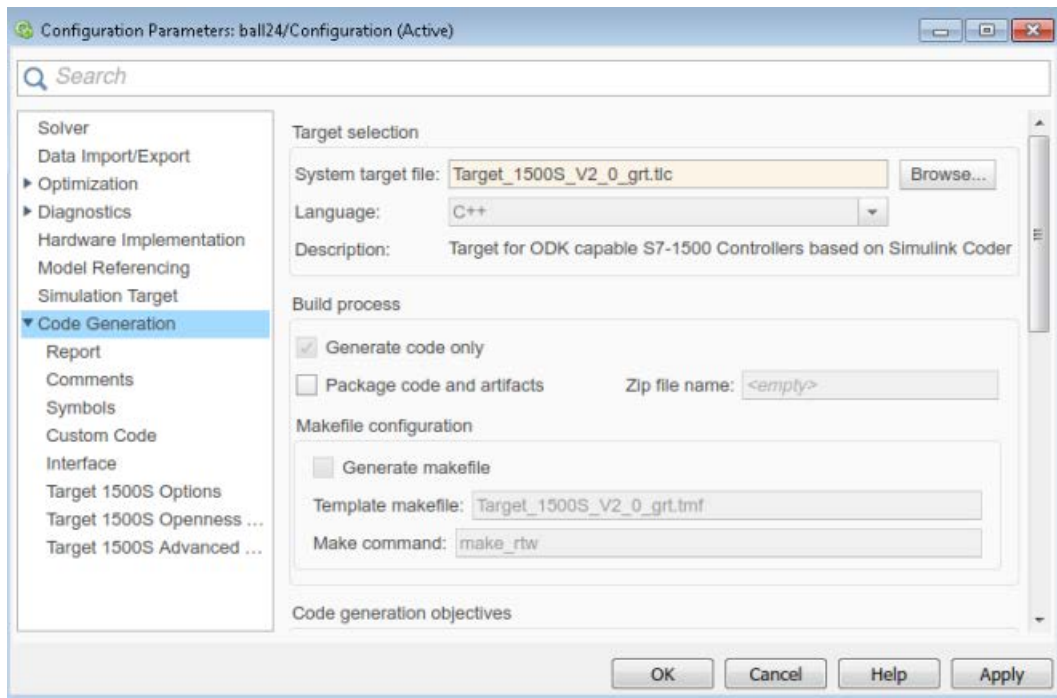

Figure 7-1   Configuration parameters using the System Target File for Target 1500S V2.0 as an example

The default parameters are listed below. To successfully create an ODK object, you are not allowed to change some parameters. These parameters are marked in this product help with "(fixed)". Use the default values whenever possible.

You can also set special Target 1500S options here.

Note

Default parameters

The system assigns default parameters, and these may overwrite existing entries.

Requirement

You have selected Target 1500S as the System Target File .

Relevant parameters

Solver

A dynamic system is modeled as a mathematical calculation in Simulink. This calculation is performed at certain time intervals to simulate the execution of the system. The size of this time interval is referred to as the "Step-Size". The method for calculating the states of a model is referred to here as solving the model.

- Solver options

  Determine the solver selection

  – Type (fixed): Fixed Step

  – Solver: auto (Automatic solver selection)

- Tasking and sample time options

  – Periodic sample time constraint: Unconstrained

  – Tasking mode for periodic sample times: Treat each discrete rate as a separate task (disabled)

Optimization

- Code generation

  You can select between "Tunable" and "Inlined" under "Default parameter behavior".

  Select "Tunable" if you want to allow parameter access from STEP 7. You can also change the parameter values during runtime.

  Select "Inlined" so that the values of the parameters are fixed and cannot be changed during runtime. The execution of the code is then faster.

Data Import/Export

The "Save to workspace" area refers to the Matlab workspace.

- Time
- States
- Output
- Final States
- Format
- Limit data points to last
- Decimation

Hardware Implementation

- Device vendor: Intel
- Device type: x86-32 (Windows32)

Code Generation General

- Language (fixed): C++

- Makefile configuration (fixed): "Generate makefile" option disabled

- Generate code only (fixed): "Generate code only" option enabled

Code Generation > Symbols

- Maximum identifier length

  The default value is 256.

  You can enter a higher value, but be aware of the ODK limits.

Code Generation > Debug

- Verbose Build

  This option is disabled by default. Only relevant information is displayed in the Diagnostic Viewer during the build process.

  Enable this option to get more detailed information during the build process.

Code Generation > Interface

- Code interface packaging (fixed): Nonreusable function

- Classic call interface (fixed): "Classic call interface" option disabled

- Single output/update function (fixed): "Single output/update function" option enabled

- MAT-file logging (fixed): "MAT-file logging" option disabled

- Interface

  Select "External mode (Page 43)" to use this. The settings are thereby made automatically.

  You can find the description of the individual parameters under "Setting communication parameters for external mode (Page 44)".

Code Generation > Target 1500S options

The options are described in more detail under "Description of the Target 1500S options (Page 27)", "Description of the Target 1500S Openness options (Page 29)" and "Description of the Target 1500S Advanced options (Page 31)".
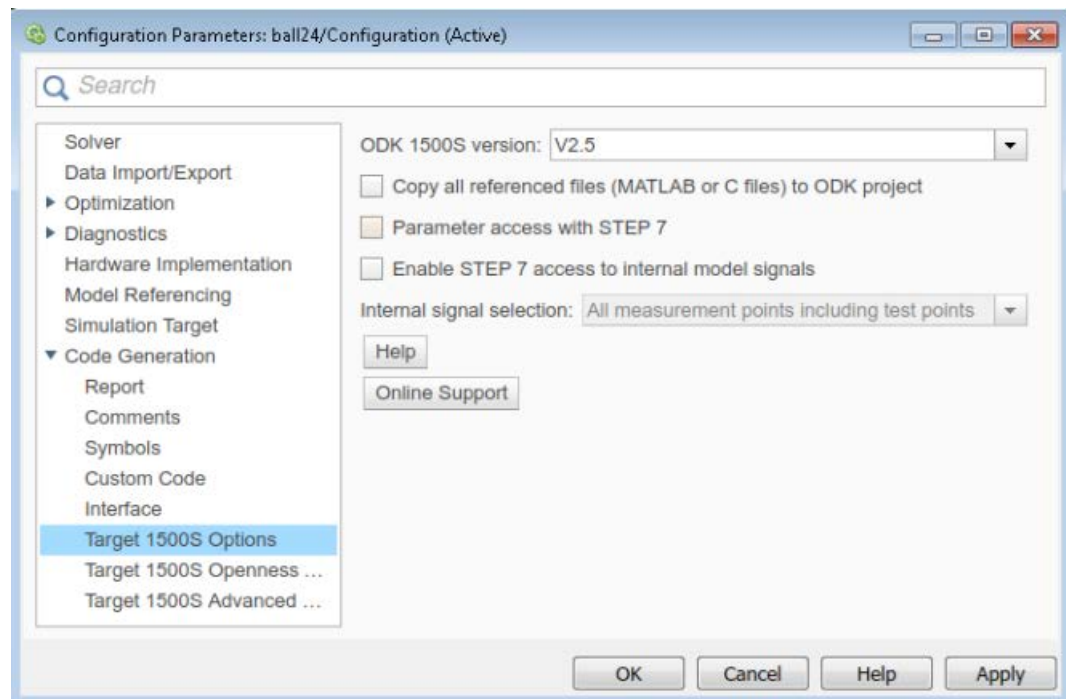
7.3   Description of the Target 1500S options

Some configuration parameters are preset when you select Target 1500S as the System Target File . The default parameters are listed below.

Requirement

You have selected Target 1500S as the System Target File .

Adjustable parameters

ODK 1500S version

Choose an installed ODK version from this list. All versions that are compatible with the installed Target version are shown. Restarting Matlab updates the list, if you have subsequently installed ODK.

Copy all referenced files (MATLAB or C files) to ODK project

Select this option to copy all Matlab source files into the ODK project. The ODK project can then still be compiled on a PC without a Matlab installation.

The referenced files are copied to the folder "<Model-Name>_Target_1500S_<current version>_grt_Output" under "references".

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Parameter access with STEP 7

Select this option to generate special code for accessing model parameters from the S7 program.

Note

Enable / disable Parameter access with STEP 7.

If you enable the Parameter access with STEP 7 under "Optimization" in the "Code generation" area, select the setting "Tunable" from the "Default parameter behavior" selection.

If you disable the Parameter access with STEP 7 under "Optimization" in the "Code generation" area, select the setting "Inlined" from the "Default parameter behavior" selection.

Enable STEP 7 access to internal model signals

To obtain defined measurement points (internal signals) as output(s) of the FB "OneStep", enable this option.

You can find additional information in the section "Access to internal signals (Page 53)".

Internal signal selection

From this list, select the type of internal signals for the access from STEP 7.

● All measurement points including test points

   All measurement points are used as internal signals.

● All measurement points excluding test points

   All measurement points, excluding test points, are used as internal signals.

● Only test points

   Only measurement points defined as test point are used as internal signals.

Help

To open the online help for Target 1500S , click on this button.

Online Support

To open the Support website, click this button.

7.4 Description of the Target 1500S Openness options

The generated SCL source file is automatically imported into a preset STEP 7 project via the automation interface of STEP 7 "TIA Portal Openness".

Some configuration parameters are preset when you select Target 1500S as the System Target File . The default parameters are listed below.

Additional information and application examples on "TIA Portal Openness" can be found on the Internet (https://support.industry.siemens.com/cs/products?search=Tia%20Portal%20Openness&mfn=ps&o=DefaultRankingDesc&lc=en-WW).

Requirements

- You have installed a compatible version of STEP 7 TIA Portal.
- You have installed a compatible version of STEP 7 TIA Portal Openness.
- You have selected Target 1500S as the System Target File .
- You are included in the Computer Management in the user group "Siemens TIA Openness" with your registered user and have restarted the operating system.

Parameters that can be set
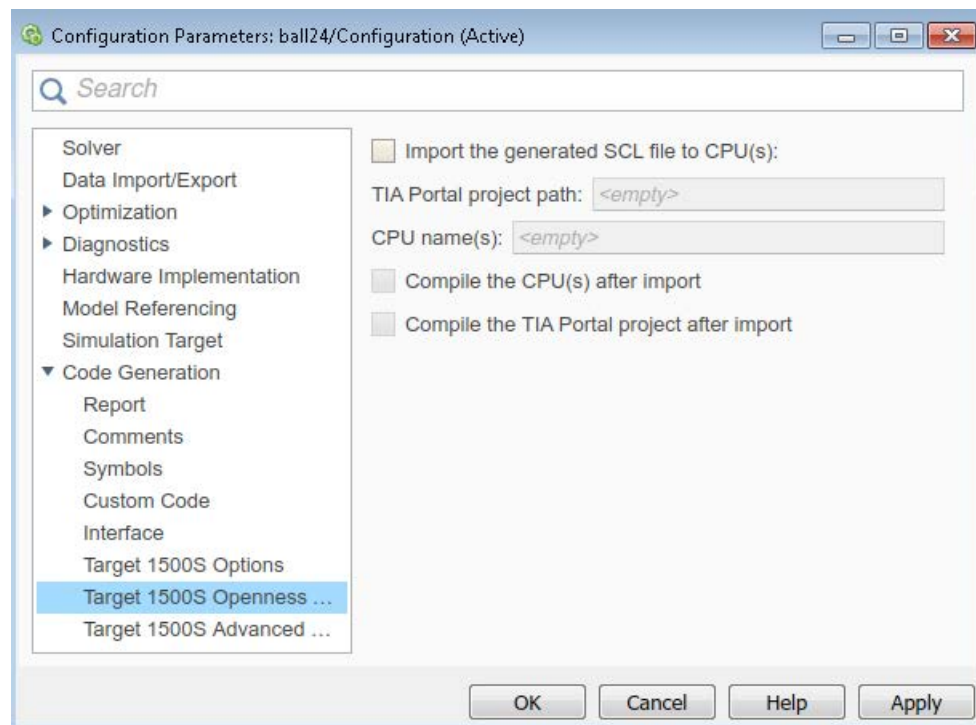
Import the generated SCL file to CPU(s)

To automatically import the generated SCL files into the STEP 7 project after the build, enable this option for one or more CPUs.

TIA Portal project path

Specify the path to the STEP 7 project into which the generated SCL file will be imported.

For example: D:\tiaprojects\project\project.ap15

CPU name(s)

Specify the name of the CPU in the STEP 7 project, into which the generated SCL file will be imported.

Separate multiple CPUs with a comma.

For example: cpu1, cpu2

Compile the CPU(s) after import

To automatically compile the CPU after the import of the SCL file, enable this option.

Compile the TIA Portal project after import

To automatically compile the STEP 7 project after the import of the SCL file, enable this option.

Note

To ensure the consistency of the STEP 7 project, all CPUs in the project are compiled when the option "Compile the TIA Portal project after import" is selected. Including the CPUs that are not named under "CPU name(s)".
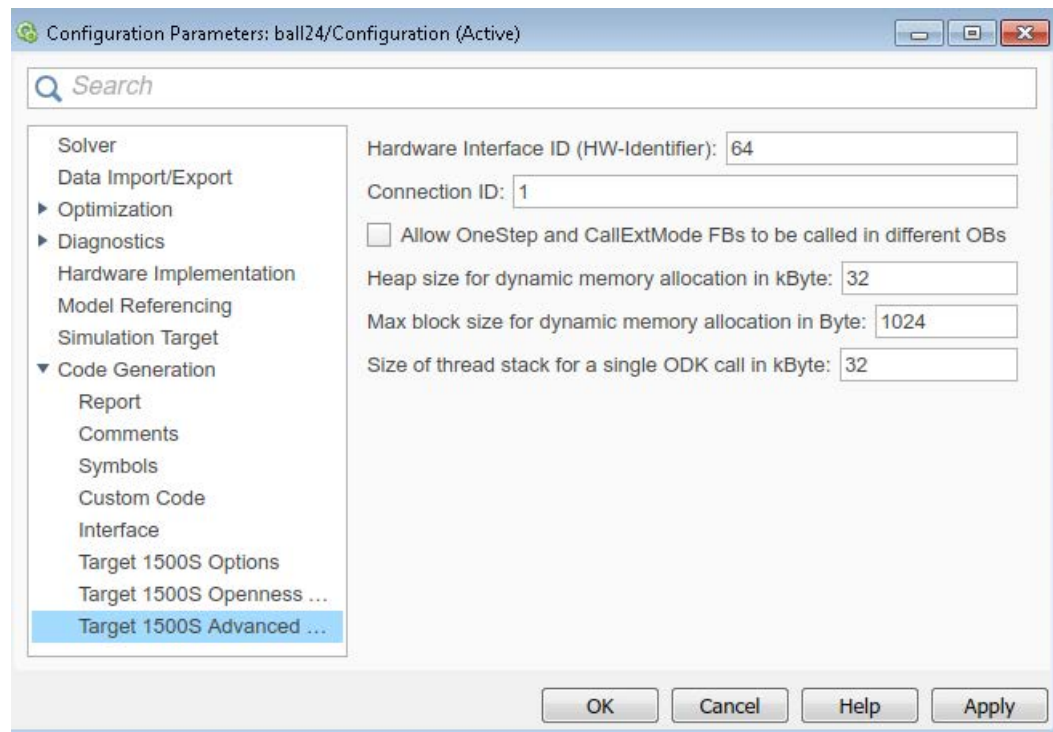

7.5   Description of the Target 1500S Advanced options

Some configuration parameters are preset when you select Target 1500S as the System Target File . The default parameters are listed below.

Requirement

You have selected Target 1500S as the System Target File .

Parameters that can be set

Hardware Interface ID (HW-Identifier)

Enter the numerical value of the hardware identifier for the corresponding communications interface. The value must correspond to the value assigned under "Hardware identifier" for a communications interface in the TIA Portal. If the values do not match, the connection between Simulink and the controller cannot be established via External Mode.
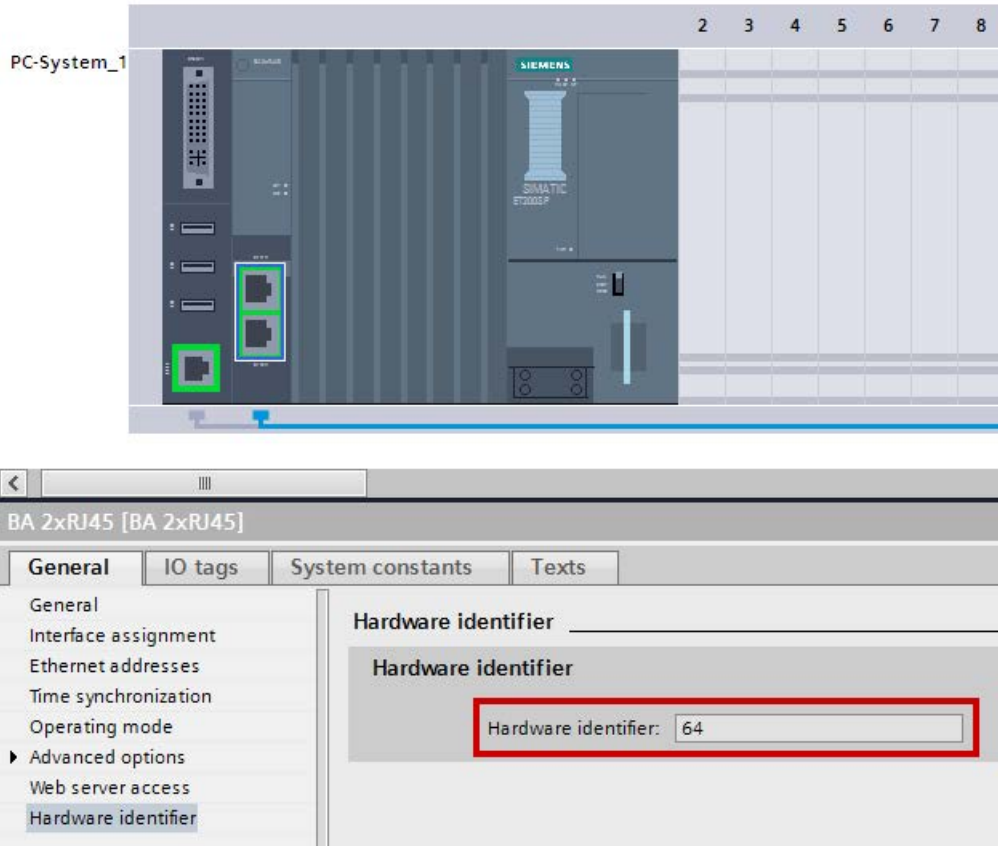
Figure 7-2   Example for setting the hardware identifier

Connection ID

Enter a value between 1 and 4095 for the Open User Communication in STEP 7 for the communication of the External Mode.

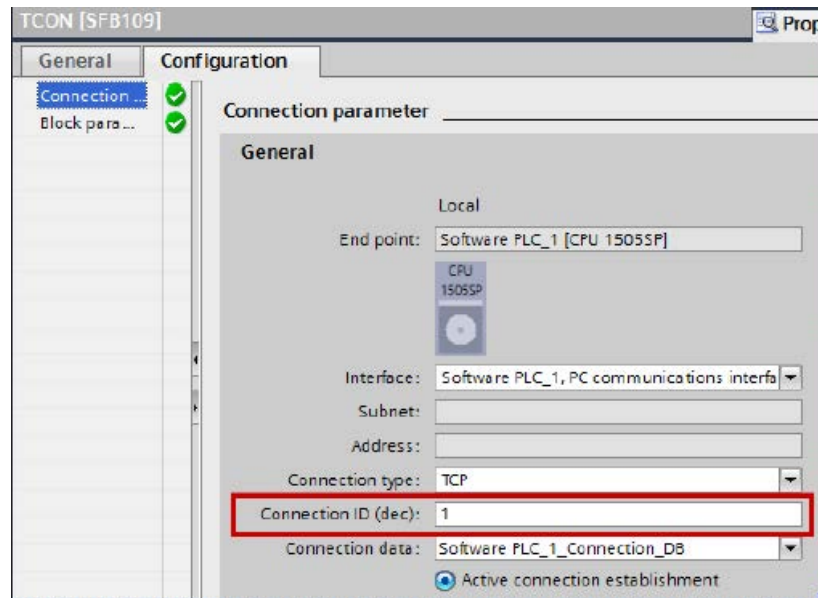The value must be unique for the STEP 7 user program.

Figure 7-3   Example of the setting of the connection ID in STEP 7

Allow OneStep and CallExtMode FBs to be called in different OBs

To call the FB "CallExtMode" in a different block, such as "OneStep", enable this option.

Note

This means that the possible memory for executing the ODK application will be reduced.

Heap size for dynamic memory allocation in kByte (HeapSize)

Specify the memory for dynamic memory allocation in the ODK object numerically. You need a higher memory allocation when you attach more source files to create an ODK project.

You can find additional information in the ODK documentation (https://support.industry.siemens.com/cs/ww/en/ps/13914/man).

Max block size for dynamic memory allocation in Byte (HeapMaxBlockSize)

Specify the memory for dynamic memory allocation in the ODK object numerically. You need a higher memory allocation when you attach more source files to create an ODK project.

You can find additional information in the ODK documentation (https://support.industry.siemens.com/cs/ww/en/ps/13914/man).

Size of thread stack for a single ODK call in kByte (SyncCallStackSize)

Numerically specify the memory for the thread stack of a call in the ODK application.

The value must be between 1 and 1024.

You can find additional information in the ODK documentation (https://support.industry.siemens.com/cs/ww/en/ps/13914/man).

7.6 Importing SCL file automatically into STEP 7 after Simulink build

You can automatically import the generated SCL file into a CPU in the STEP 7 project after the Simulink build. To do so, you can use the Simulink parameters "Code Generation > Target 1500S Openness Options".

Requirements

- You have installed a compatible version of STEP 7.
- You have installed a compatible version of STEP 7 Openness.
- You have selected Target 1500S as System Target File.
- You are included in the Computer Management in the user group "Siemens TIA Openness" with your registered user and have restarted the operating system.

Procedure

1. Enable the "Import the generated SCL file to CPU(s)" option in the Target 1500S Openness options (Page 29).
2. Enter the path of an existing STEP 7 project with file extension in the entry field "TIA Portal project path".
3. In the entry field "CPU name(s)", enter the name of the ODK capable CPU(s) into which the SCL file is to be imported.

   If you want to enter multiple CPUs, separate them using commas.
4. Run the Simulink build.

Note

First execution of the import

The "Openness access" dialog appears the run the import the first time.

To grant on-time access, select "Yes".

To grant permanent access, select "Yes to all".

7.7 Running Simulink build

Procedure

1. Start the build process in Simulink via the menu "Code > C/C++ Code > Build Model".

   The system creates a new ODK Eclipse project in the following folder:

   C:\ProgramData\Siemens\Automation\ODK1500S\<ODK version>\workspace

2. If the ODK workspace is already being used by another Eclipse application, the dialog "ODK 1500S default workspace is locked" opens.

   Close the Eclipse application and confirm the dialog with "OK".

3. If there is already an ODK project of the same name in the ODK workspace, the dialog "Existing ODK Projekt" opens.

   Click "Yes" to replace the existing project in the ODK workspace.

   Click "No" to cancel the build process.

Note

Regenerate model with other Target version

If you re-generate a model with the same ODK version but a different version of the System Target Files , the existing ODK project will be overwritten.


Results

- The Diagnostic Viewer (Page 36) displays information about the build process.

- A folder containing all generated files was created. The folder name is: <Model name>_Target1500S_V<Current version>.

  The relevant files are stored in the "outputs" subfolder.

  You can find more information on the generated files in the appendix (Page 40).

7.8 The Diagnostic Viewer

The Diagnostic Viewer displays information about the build process.

Layout
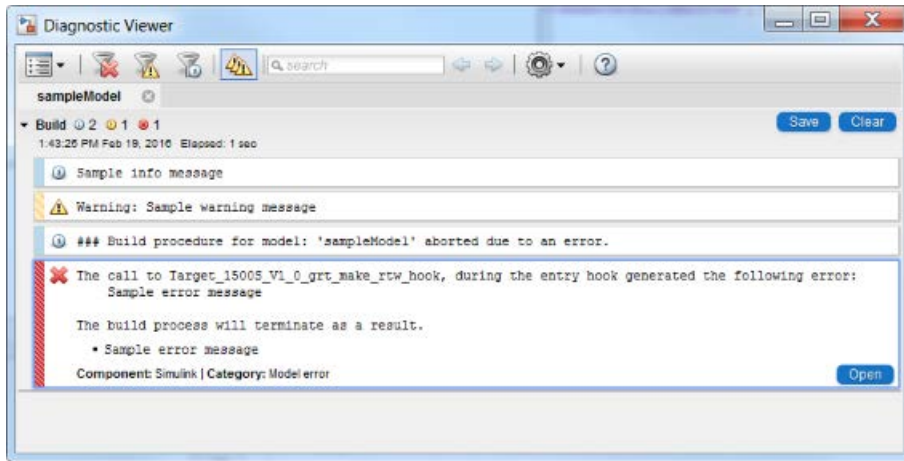
Symbol	Designation	Meaning
ⓘ	Information	This alarm provides information about the progress of the build process.
⚠	Warning	This alarm does not abort the build process. You are made aware of special considerations and possible problems.
✖	Error	This alarm indicates an error that results in termination of the build process.

You can find the possible information, warning and error messages under Alarms (Page 56).

7.9 Loading and running the ODK application

The procedure for loading and executing an ODK application is described in the next steps. More information about the individual steps is provided in the manual of the Open Development Kit 1500S (https://support.industry.siemens.com/cs/ww/en/ps/13914/man).
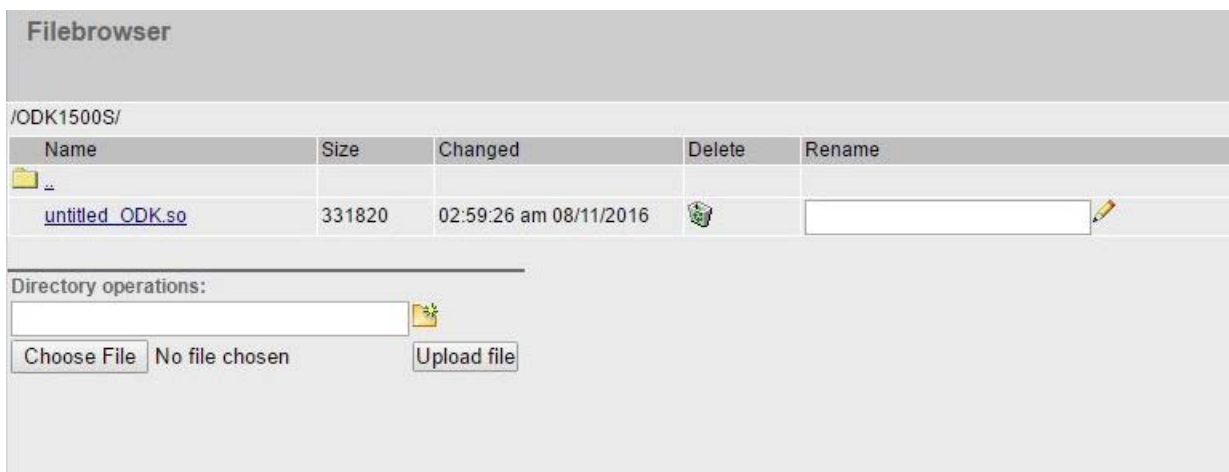
Procedure

1. Open the Web server of the ODK-enabled S7-1500 CPU.

2. Upload the SO file to the ODK 1500S folder via "Filebrowser".

The SO file is transferred to the load memory.

3. Insert the SCL file in the project tree in STEP 7 as an external source.

4. Generate the program blocks from the external source in STEP 7 by right-clicking on the SCL file > "Generate blocks from source".

   Depending on the parameters set, the following function blocks are created:

   – <Simulink model>_ Load

   – <Simulink model>_ Unload

   – <Simulink model>CallExtMode

   – <Simulink model>OneStep

   – <Simulink model>ReadWriteParameters

5. Load the application from the load memory to the work memory of the CPU with the instruction "<Simulink model>_ Load".

6. Run the application with the instruction "<Simulink model>OneStep".

Note

Run a modified SO file

A modified SO file is only executed if the old SO file is unloaded using the function <Simulink-Model>_ Unload and the new SO file was loaded to work memory using the function <Simulink-Model>_ Load.

If old SO files were not unloaded, these remain in the work memory and reduce the work memory. This can mean that no additional SO files can be loaded, as the work memory is too small. To empty the work memory, shut down your system and restart it. Make sure that the "old" SO files are unloaded before you load the new modified SO files.

Using an example project 8

An example project is ready for you on the Internet (https://support.industry.siemens.com/cs/ww/en/view/109482830) to help getting started with the Target 1500S.

Files generated by coders

<div style="text-align: right; font-size: 3em;">A</div>

To create ODK-enabled data, the Target 1500S TLC is used in addition to the Simulink Coder . The generated files and their main functions are explained below.

Files created by Simulink Coder

- <Simulink model>.cpp

  This file has three main functions:

  – void <Simulink model>_step(void)

    This function is called by the OneStep FB and runs the Simulink model.

  – void <Simulink model>_initialize(void)

    This function is called by the <Simulink model>_Load FB.

  – void <Simulink model>_terminate(void)

    This function is called by the <Simulink model>_UnLoad FB.

- <Simulink model>.h

Files created by the Target 1500S TLC

- <Simulink model>_ODK.odk

  This file is used as input for the ODK code generator.

- <Simulink model>_ODK.cpp

  This file contains the execution of OnLoad-, OnUnload- and OneStep functions.

- <Simulink model>_ODK.scl.additional

  This file is only generated when external mode (Page 43) is activated.

Target 1500S TLC generated a comment with the following information in the files:

- Name and version of the Simulink model.

- Name and date of creation of file.

- Target 1500S version and the System Target File used.

- ODK 1500S version

- Versions of the Matlab configuration

Referenced models

B

Since Version V1.0 Update 1, Target 1500S has been supporting the code generation of referenced models for controllers with ODK capability. With referenced modules, a parent model contains one or more referenced child models. A referenced child model can itself reference child models.

Special considerations for code generation with referenced models

Target 1500S detects referenced models and processes the models from the child models to the parent models during the build. The system creates an ODK Eclipse project at the end of the build.

You can configure the parameters for the parent model and the referenced child models differently under "Configuration Parameters (Page 24)". In the following table, you can see the response to the respective parameters.

Parameter	Response to homing	
	Only the settings of the parent model area taken into consideration.	The settings are individually evaluated
ODK 1500S version	✓	
Copy all referenced files to ODK project	✓	
Parameter Access with STEP 7		✓
Enable STEP 7 access to internal model signals		✓
Import the generated SCL file to CPU(s)	✓	
Hardware Interface ID	✓	
Connection ID	✓	
Allow OneStep and CallExtMode FBs to be called in different OBs	✓	
Heap size for dynamic memory allocation	✓	
Max block size for dynamic memory allocation	✓	
Size of thread stack for a single ODK call	✓	

External mode

If the external mode (Page 43) is enabled in the parent model, it can also be used for the referenced child models contained therein.

For code generation, the "Interface" settings of the referenced child models are ignored and the settings of the parent model are used.

If you select a setting other than "External mode" or "None" for the child model under "Interface", an error message appears during the compiling.

Independent build of child models

You can also run the build of child models independently of the referenced model. Data independent of the referenced model are created.

External mode

<div align="right">

C

</div>

C.1 The external mode

The external mode of Simulink enables you to monitor the model during runtime and change the parameters of the model online.

For Simulink to be able to communicate with the model on the controller via external mode, external mode must be activated before starting the build process. In this case, the code is supplemented by communication code for the data exchange between Simulink and the controller. The communication is realized on the basis of TCP/IP.

> ⚠ **DANGER**
>
> **Changes to the model only in the test environment**
>
> Use the external mode for test purposes only.
>
> Changing the tag values while the plant is operating may result in severe damage to property and personal injury in the event of malfunctions or program errors. Make sure that dangerous states cannot occur before you use the "Modify" function.
>
> When using the external mode, note that no CPU password is required to control tags.

Activating external mode

Select the value "External mode" under "Code Generation > Interface > Data exchange > Interface" for the Simulink parameters (Page 24) to activate external mode.

C.2   Setting communication parameters for external mode

- Transport layer (fixed)

  tcpip

- MEX-file arguments

  – IP address:

    IP address of the ODK-enabled controller which is to run the application.

    Default: '192.168.0.1'

  – Verbosity level (optional):

    Set the value "1" in order to obtain detailed information about the external mode in the "Diagnostic Viewer (Page 36)".

  – Port number (optional):

    The port number of the server for the TCP/IP connection (ODK-enabled controller).

    Default: 17725

  – WaitForStart (optional):

    The simulation starts automatically as soon as the "OneStep" function is executed.

    If you set the value to "1", the execution of the Simulink model does not start automatically. In this case, you need to restart the simulation in the Simulink window after the connection is made using the " ▶ " button.

  Standard format: '<IPAddress>'

  By default, only the IP address of the target device is specified for the object file in the MEX-file arguments . All other communication parameters obtain the default value described.

  Example: '192.168.0.1'

  Extended format: '<IPAddress>' <VerbosityLevel> <PortNumber> <WaitForStart>

  Using a space for separation, you can set the value of the verbosity level, the port number and the flag for "WaitForStart".

  Example: '192.168.0.1' 0 17725 1

Note

Pay attention to the apostrophes when entering the IP address.

When <PortNumber> is changed, you can either run a Simulink build, and transfer and load the new ODK application or adapt the port number at the "CallExtMode" block (see "The function block CallExtMode (Page 46)").

Adhere to the structure

If you do not comply with the format specified in the examples, it is not possible to establish a connection.

- Static memory buffer size

  This memory is required for communication of the external mode.

  Increasing "Static memory buffer size", however, simultaneously reduces the available memory for loading the ODK object. Adhere to the ODK limits. If necessary, you can enter a higher value or change your model.
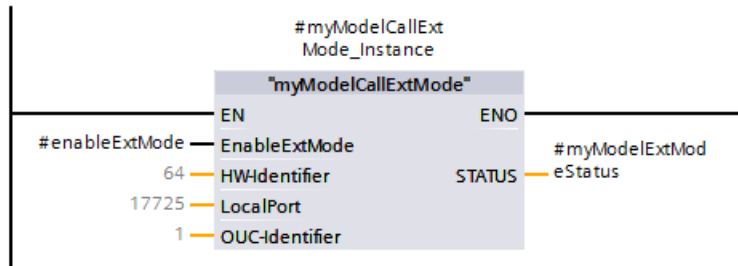

Note

Change the parameters of the external mode

If you change the parameters of the external mode, you need to re-generate the Simulink model. Then update the STEP 7 user program and the SO file on the CPU (see "Loading and running the ODK application (Page 37)").

C.3   The function block CallExtMode

Structure of the function block (FB)

The "<Simulink model>CallExtMode" FB has the following input parameters:

- EnableExtMode (Bool)

  To establish an external mode connection, set this parameter to "true" using a tag.

- HW-Identifier (UInt)

  Set the value of the hardware identifier for the communication interface in the Target 1500S options.

  The default value is "64".

- LocalPort (UInt)

  Set the value of the port number in the interface options under "MEX-file arguments".

  Change the value to establish the external mode connection using a different CPU port.

- OUC-Identifier

  Set the value for the OUC-Identifier in the Target 1500S options.

  The OUC-Identifier is the Connection ID for the Open User Communication.

  The value must be unique for the STEP 7 user program.

The "<Simulink model>CallExtMode" FB has the following output parameters:

- STATUS

  The status parameter has the type <Simulink model>ExtModeStatus_UDT (User Definied Datatype) and contains the following parameters:

  – Status_TCON (Word)

  – Status_TDISCON (Word)

  – Status_TRCV (Word)

  – Status_TSEND (Word)

  – Status_ODK (Int)

  – Status_ExtMode (Word)

  You can find the status descriptions for "TCON", "TDISCON", "TRCV", "TSEND" in the STEP 7 help.

  You can find the status descriptions for ODK in the manual (https://support.industry.siemens.com/cs/ww/en/ps/13914/man).

Note

Special features of the option "Allow OneStep and CallExtMode FBs to be called in different OBs"

If the option is disabled, call the "CallExtMode" FB in the same block (OB, FB) as "OneStep". Otherwise, the model calculation is not performed synchronously with the data connection.

If the option is enabled, you can call the FB "CallExtMode" in a different block, such as "OneStep".

Note the following when option is enabled:

- The block which contains the FB "OneStep" must have a higher priority than the block with the FB "CallExtMode".
- The possible available memory for running ODK applications is reduced.
- Call the FB "CallExtMode" in a cyclic OB.
- If the cyclic interruption time is less than 100 µs, interruptions in the graphs (scope) may occur during the simulation of the module in Simulink.

Functionality of the block

The FB has the following tasks:

- Communication between PC and controller.
- Data transfer between Simulink and controller.

Return value for Status_ExtMode	Description
0x0000	Return value after successful execution or initial state.
0x0001	Not enough memory for the external mode.
	The allocated memory may be too small for a complex Simulink model.
	Increase the value in the interface options under "Static memory buffer size". To apply the value, generate the ODK object again.
	"Static memory Buffer size", however, reduces the space available for the application at the same time.

C.4 Establishing an external mode connection

Procedure

1. Call the FB "<Simulink model>CallExtMode" in the same cyclic organization block (OB) as the FB "<Simulink model> OneStep" and enable the access (EnableExtMode).
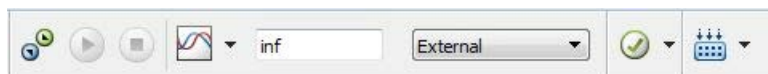

Note

Run the OneStep FB before the external mode connection is made.

Once the OneStep FB is called in the cyclic OB, simulation steps are performed. If the external mode connection is not yet established, these steps are lost.

To prevent this, set the flag for "Wait For Start" to "1" in the interface options under "MEX-file arguments".

---

2. Select "External" as the simulation mode.

3. As the simulation stop time, select the value "inf" for endless simulation or an appropriate value for your model.

Note

Checking the solver settings

Check whether the setting "fixed-step-size (fundamental sample time)" under "Solver > Additional options" is set appropriately for your model.

You can find more information on the parameters in the Matlab / Simulink documentation.

---

4. To establish the external mode connection, click on the " " icon.

Result

You can monitor the model during runtime of the controller and change parameters of the model online.

Note

When the simulation is completed or canceled, the CPU must be switched from "STOP" to "RUN" in order to start a new connection with subsequent simulation. Data from the previous simulation is overwritten.

Parameter access from STEP 7 D

D.1 Introduction

Certain parameters can be read and changed during runtime after activation of the parameter access in STEP 7. These parameters can be defined by you or provided directly by Simulink.

It is possible to read and change the model at the same time using external mode in order to test and adapt your model during runtime.

D.2 Enabling parameter access

Procedure

1. Enable the "Parameter access with STEP 7" in the Target 1500S options (Page 27).

2. In order to generate the UDT "<Simulink model>Params" and FB "<Simulink model>ReadWriteParameters" in the SCL file, select "Tunable" under "Default parameter behavior" in the Optimization options.

Note

You can also configure other tags as tunable. You can add the tags defined in Matlab workspace in the "Model Parameter configuration" area. To do this, suspend one of the following memory classes:

- SimulinkGlobal
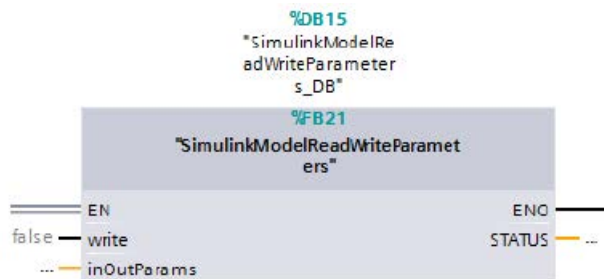- ExportedGlobal
- ImportedExtern

The memory class "ImportedExternPointer" is not supported.

3. Compile the model and transfer the corresponding files to STEP 7 or the web server as before.

D.3 The ReadWriteParameters function block

In order to read and change parameters, you need the UDT "<Simulink model>Params" and the FB "<Simulink model>ReadWriteParameters".

Structure of the function block (FB)

The "<Simulink model>ReadWriteParameters" FB has the following input parameters:

- write (Bool)

  To write the parameters from the S7 program to the Simulink model, set this value to "true". The values passed with the "inOutParams" parameter are processed by the Simulink model.

  To read the parameters from the Simulink model, set this value to "false". The current values of the Simulink model parameters are written to a tag interconnected to "inOutParams".

The "<Simulink model>ReadWriteParameters" FB has the following parameters:

- inOutParams

  The inOutParams has the type <Simulink model>Params UDT and is used for reading or writing parameters in the Simulink model.

The "<Simulink model>ReadWriteParameters" FB has the following output parameters:

- STATUS

  This return value is automatically generated by ODK.

  The return value is "0" when the execution is successful.

  You can find information on the other error codes in the ODK manual (https://support.industry.siemens.com/cs/ww/en/ps/13914/man)

The values of the FB are initialized with "0" by default. The values are updated when read access takes place for the first time.

D.4 Establishing parameter access

Procedure

1. Generate blocks from the SCL file in STEP 7.

2. Use the blocks generated in STEP 7.

   – To set the values in the same cycle, call the "ReadWriteParameters" FB before "OneStep".

   – To set the values in the following cycle, call the "ReadWriteParameters" FB after "OneStep".

Note

Call the FB "<Simulink model>ReadWriteParameters" in the same cyclic OB as the FB "<Simulink model>OneStep".

The values of the FB are initialized with "0" by default. The values are updated when read access takes place for the first time.

Note

Changed model parameters in the S7 program are kept in the work memory. If the associated ODK object is re-initialized, the parameters are reset to the values set in Simulink.

Access to internal signals

You can create measurement points in the Simulink model by giving a name to the model blocks.
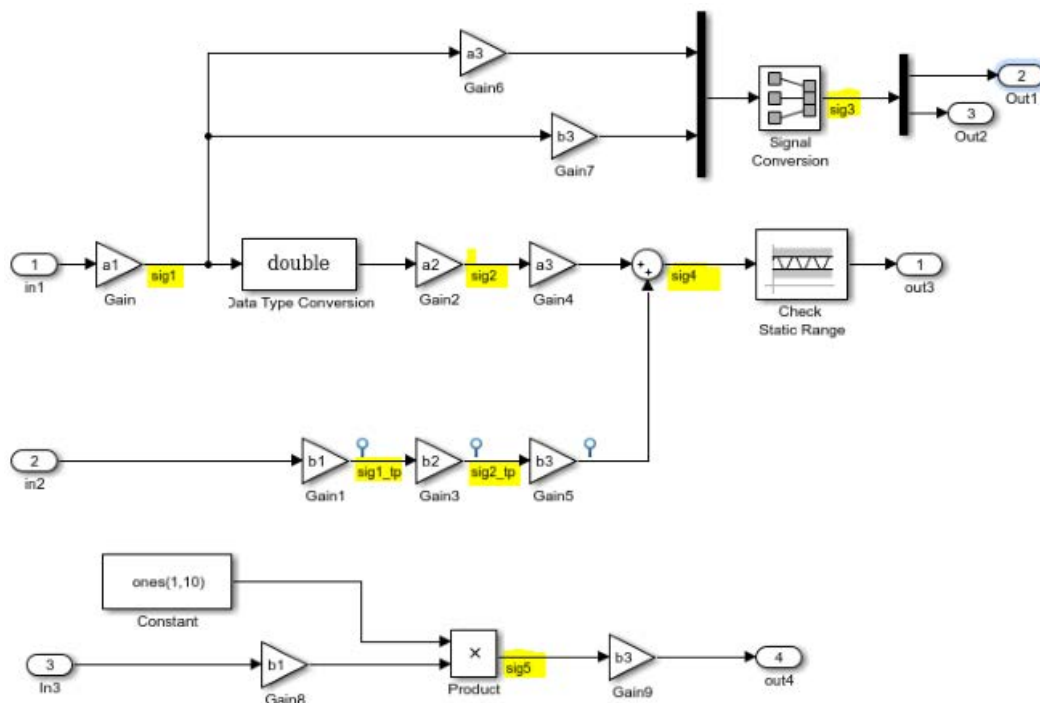

Figure E-1   Example model with integrated signals

If you enable the option "Enable STEP 7 access to internal model signals" in the Target 1500S options (Page 27), these internal signals are generated as output in the FB "OneStep" during the generation of the code.

Special features for the FB "OneStep"

Target 1500S defines the internal signals during the generation of the code in an ODK_STRUCT with the name "InternalModelSignals". The FB "OneStep" needs a new output parameter "OUT" with the name "internalSignals" for this purpose.

Properties of the signal
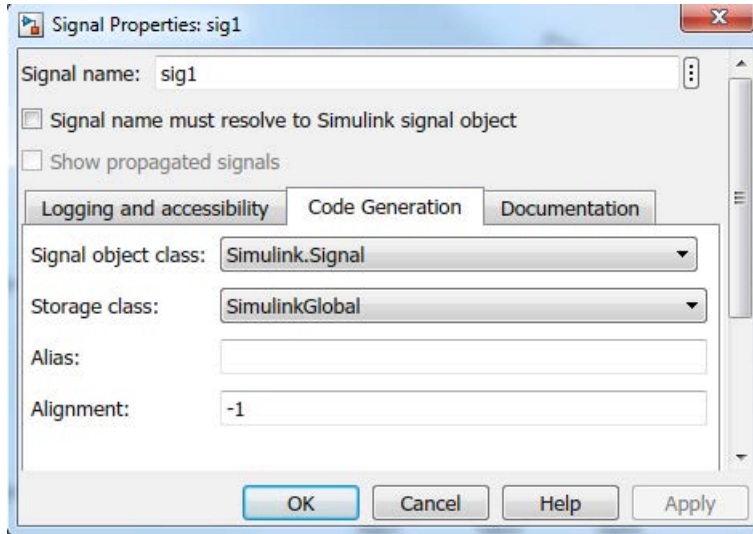
Figure E-2   Dialog box Signal Properties

1. Under "Signal name:", enter the name of the signal.

2. In the "Code Generation" tab, select a supported memory class under "Storage class:".

   The following memory classes are supported:

Memory class	Support
Auto	Yes, if it leads to "SimulinkGlobal".
SimulinkGlobal	Yes
ExportedGlobal	Yes
ImportedExtern	Yes
ImportedExternPointer	No
Custom storage class	No

Using bus objects in STEP 7

F.1 Bus objects

You can define bus objects in the Simulink model. These objects may include simple data types or additional bus objects.

Converting bus objects

Bus objects are compiled with the Simulink build in PLC data types for the S7 program.

The following figure shows bus objects in Simulink on the right and the generated PLC data types in STEP 7 on the left.
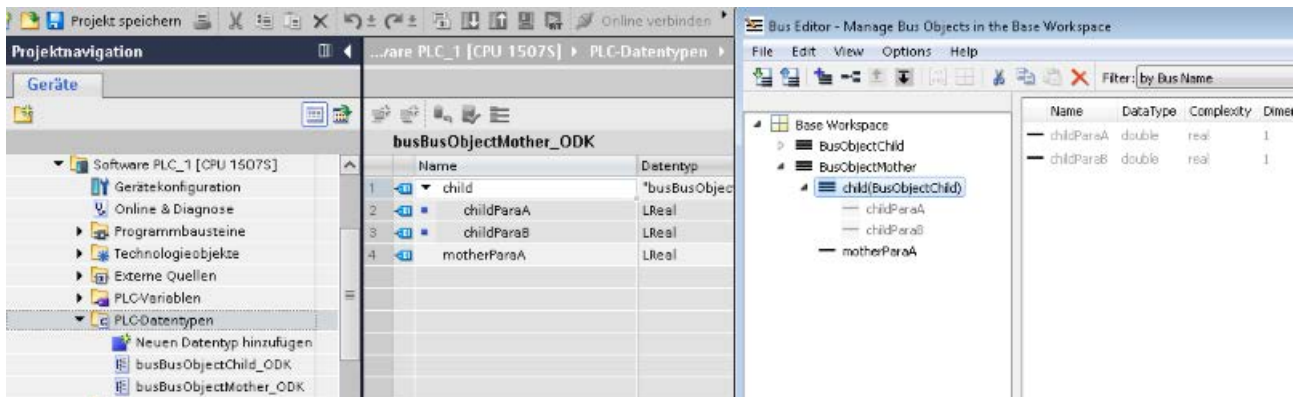
The bus object can be used as input/output parameter for the Simulink model.

Reference

You can find more information about using PLC data types in the STEP 7 help system.

Alarms

<div style="text-align: right; font-size: large;">**G**</div>

G.1 Alarms during the build process

Meaning of the alarms

- Information messages (Page 56)

  This alarm provides information about the progress of the build process.

- Warnings (Page 58)

  This alarm does not abort the build process. You are made aware of special considerations and possible problems.

- Error messages (Page 60)

  This alarm indicates an error that results in termination of the build process.

G.2 Information messages

Info no.	Alarm	Meaning
1	"Build of <SimulinkModel> with Target 1500S <Version> is started"	The build process starts
2	"Generating Target 1500S specific files: <Filename> is generated <Filename> is generated ..."	Files created by Target 1500S.
3	"Generating Simulink Model sources"	The Simulink Coder generates source files.
4	"Creating ODK 1500S project <SimulinkModel>_ODK under <OutputPath>"	ODK creates an ODK project.
5	"ODK 1500S Project <SimulinkModel>_ODK is created successfully"	The ODK project has been successfully created.
6	"Building ODK 1500S project <SimulinkModel>_ODK"	An ODK project is generated. If you have selected the "Verbose" option in the Options menu of the code generator, the Diagnostic Viewer displays each output.
7	"<SimulinkModel>_ODK project build is finished successfully"	The ODK project creation was completed successfully.

Info no.	Alarm	Meaning
8	"<SimulinkModel> build is finished successfully. <SimulinkModel>_ODK.scl and <SimulinkModel>_ODK.so files are available in folder "outputs". Web server (CPU): 1. <SimulinkModel>_ODK.so file has to be uploaded using the web server into ODK1500S folder. If the option "Import the SCL file generated by the build to a CPU" is deactivated or is activated but the operation is not successful, sources can be updated manually on TIA Portal: 1. Navigate to the CPU / 'External Source' area and import the <SimulinkModel>_ODK.scl file. 2. Select the imported file and generate blocks out of this source (right-click or Tool menu) 3. Integrate the blocks into your CPU program in order to load and execute it. You can find details about deploying an ODK 1500S Object to CPU in ODK 1500S documentation (https://support.industry.siemens.com/cs/ww/en/view/109752683)."	The Simulink build was completed successfully. The files "<Simulink model>_ODK.scl" and "<Simulink model>_ODK.so" are available in the "outputs" folder. Web server of the controller: 1. Load the file "<Simulink model>_ODK.so" into the ODK 1500S folder via the web server. If you have disabled the option "Import the SCL file generated by the build to a CPU" or if the execution was unsuccessful, you can update the sources manually via the TIA Portal. Proceed as follows for this: 1. Navigate to the CPU in the area "External source" and import the file "<Simulink model>_ODK.scl". 2. Select the imported files and right-click to generate blocks from the source. 3. Integrate the blocks into your program to load and execute them. You can find additional information in the ODK manual (https://support.industry.siemens.com/cs/ww/en/view/109752683).
9	"Removing <SimulinkModel>_ODK from ODK 1500S default workspace"	You have confirmed the "Existing ODK Projekt" dialog with "Yes". The existing project is overwritten.
10	"<SimulinkModel>_ODK is removed from ODK 1500S default workspace"	You have confirmed the "Existing ODK Projekt" dialog with "Yes". The existing project was overwritten.
101	"Openness workflow started"	The openness process starts.
102	"Checking for compatible TIA Portal and Openness installations"	The compatibility of STEP 7 and Openness plugin is tested.
103	"Opening / attaching to the TIA Portal project <TiaPortalProjectName>"	The STEP 7 instance used is attached to the STEP 7 project.
104	"CPU <CpuName>: Searching for it in the TIA Portal project"	Search for CPU(s) in the STEP 7 project.
105	"CPU <CpuName>: <SimulinkModel>_ODK.scl is being imported"	The SCL file is imported.
106	"CPU <CpuName>: Blocks are being generated out of the imported SCL source"	Blocks are generated from the SCL file.
107	"CPU <CpuName>: CPU is being compiled"	You have selected the option "Compile the CPU(s) after import". The CPU is being compiled.
108	"The TIA Portal project <TiaPortalProjectName> is being compiled"	You have selected the option "Compile the CPU(s) after import". All CPUs within the STEP 7 project are compiled.
109	"Openness workflow finished successfully"	The Openness process was completed successfully.

G.3 Warnings

Warning no.	Alarm	Meaning
1	"Using 'External Mode' can cause serious damage to property or injury to persons if there are functional disturbances or program errors. Make sure that no dangerous situations can arise before you conduct a test with the 'External Mode' function."	If "External Mode" is enabled in the settings under "Code Generation", this alarm appears at the end of the build process.
2	"'Default parameter behavior' shall be set to 'Tunable' when 'Parameter access with STEP 7' is checked. Otherwise no parameter access is possible."	You have activated the "Parameter access with STEP 7" option and selected "Inlined" under "Default parameter behavior". Set the selection to "Tunable".
3	"The syntax of the current MEX-file arguments is not correct. It might happen, that the External Mode cannot be established. The correct syntax: '<IPAddress>' <VerbosityLevel> <PortNumber> <WaitForStart> • IPAdress and PortNumber is related with your PLC. • Set VerbosityLevel to 1 for getting detailed in diagnostic viewer. • If WaitForStart is set to 1, the application will wait for the Simulink start command Please check the SIMATIC Target 1500S documentation for further information."	The structure of the "MEX-file arguments" is incorrect. External mode may not run properly. The correct structure is: '<IPAddress>' <VerbosityLevel> <PortNumber> <WaitForStart> • The IP address and port number depends on your controller. • Set the VerbosityLevel to 1 in order to obtain detailed information in the Diagnostic Viewer. • If WaitforStart is set to 1, the application waits for the start command from Simulink.
4	Establishing external mode communication will not be possible since 'UpdateModelReferenceTargets' is set to 'Always' for the model <SimulinkModel>. Please change it to another option in order to be able to use external mode.	Communication for the external mode cannot be set up because the "UpdateModelReferenceTargets" setting for the <SimulinkModel> is set to "Always". Change this to another setting to use external mode.
5	Since multiple number of instances of <ChildModel> is allowed to be referenced, STEP 7 access to some internal signals of this model may not be possible because 'SimulinkGlobal' or 'Auto' storage class definition has been detected. For <ChildModel>, set 'Total number of instances allowed per top model' to 'One' or set storage class for internal signals to 'ExportedGlobal' or 'ImportedExtern' in order to access all internal signals.	Since multiple instances of the child model may be referenced, access from STEP 7 to some internal signals of this model may not be possible because the memory class "SimulinkGlobal" or "Auto" was selected. To access all internal signals, set "Total number of instances allowed per top model" to "One" for the child module or set the memory class for internal signals to "ExportedGlobal" or "ImportedExtern".
701	"OpennessHandler.dll does not exist in the bin folder. Please repair or uninstall/install Target 1500S setup."	The "OpennessHandler.dll" file does not exist in the "<TARGET_ROOT_DIR>\bin\" directory. Repair or uninstall/install the Target 1500S.
702	"No compatible TIA Portal installed. Please install a compatible TIA Portal version in order to use this feature. A list of compatible TIA Portal versions can be found in the Target 1500S documentation."	You have installed no compatible STEP 7. You can find the compatible STEP 7 versions at "Importing SCL file automatically into STEP 7 after Simulink build (Page 34)".

Warning no.	Alarm	Meaning
703	"No compatible TIA Portal Openness installation found. Please install a compatible TIA Portal Openness in order to use this feature. A list of compatible TIA Portal Openness versions can be found in the Target 1500S documentation."	You have installed no compatible Openness plugin. You can find the compatible Openness plugin at "Importing SCL file automatically into STEP 7 after Simulink build (Page 34)".
704	"Error while loading the Openness library"	An error has occurred while loading the Openness.dll.
710	"TIA Portal project path is empty. Please provide path to an existing TIA Portal project with file extension."	The input box "TIA Portal project path" is empty. Specify the path with file extension.
711	"CPU name is empty. Please provide the name of the CPU(s) within the TIA Portal project."	The input box "CPU name(s)" is empty. Specify the names of the CPU(s) in the project.
712	"CPU names are not in correct format. Please separate multiple CPU names with comma."	The CPU names entered in the entry field "CPU name(s)" are not correct. Separate multiple CPU names using commas.
713	"Provided path to TIA Portal project does not exist or is an invalid project path. Please provide path to a valid TIA Portal project with file extension."	The path entered in the entry field "TIA Portal project path" does not exist or is incorrect. Specify the path with file extension.
720	"No CPU could be found in the TIA Portal project with the provided CPU name. Please provide the name of the CPU within the TIA Portal project. If multiple CPUs shall be used, separate them with comma."	The CPU name entered in the entry field "CPU name(s)" cannot be found. Specify the names of the CPU(s) in the project. Separate multiple CPU names using commas.
721	"Generated SCL file does not exist in the ODK project output directory. Please rebuild."	The generated SCL file does not exist. Restart the build process.
730	"Error while attaching to the TIA Portal instance"	An error occurred while attaching to the STEP 7 instance.
731	"Error while initiating the TIA Portal instance"	An error occurred while starting a new STEP 7 instance.
732	"Error while opening the TIA Portal project"	An error occurred while opening the STEP 7 project.
733	"Previously existing SCL source could not be deleted"	An already existing SCL file with the same name cannot be deleted.
734	"The SCL file could not be imported as an external source"	The SCL file cannot be imported.
735	"Error while generating blocks from the imported SCL source"	An error occurred while generating the blocks from the SCL file.
736	"Error while compiling the CPU"	An error occurred while compiling the CPU.
737	"Error while compiling the project"	An error occurred while compiling the project.
799	"Unknown error"	An error has occurred.
1000	Building model with Target 1500S trial mode: <RemainingDaysInTrialPeriod> day(s) left	The model was created with the Target 1500S test version.

G.4 Error messages

Error no.	Alarm	Meaning
1	Depending on the error, the corresponding error message is displayed.	Appears in case of Target 1500S and Simulink Coder error.
2	"Eclipse workspace is locked. Please close any Eclipse instance(s) that might have locked ODK 1500S default workspace."	Close all affected Eclipse instances with a standard ODK Workspace, which is also used by Target 1500S.
4	Depending on the error, the corresponding error message is displayed.	Appears when an error occurs during the creation of the ODK project.
5	"ODK 1500S Code Generator gives the following error for <SimulinkModel>_ODK project: <Fehlertext des ODK Code Generators> Please refer to ODK 1500S documentation (https://support.industry.siemens.com/cs/ww/en/view/109752683) or contact customer support!"	If the code generator of ODK detects an error during the build process, this alarm appears. You can find additional information in the ODK manual (https://support.industry.siemens.com/cs/ww/en/view/109752683) or by contacting Customer Support.
7	**For Matlab versions older than R2016b:** "Only 'SingleTasking' is allowed as tasking mode for Target 1500S <Version>. Please choose 'SingleTasking' in the solver options menu in order to proceed with build." **For Matlab version R2016b or higher:** "Only 'SingleTasking' is allowed as tasking mode for Target 1500S <Version>. Please uncheck the option 'Treat each discrete rate as a separate task' under the solver options in order to proceed with build."	Disable the option "Treat each discrete rate as a separate task" in the properties of the code generator under "Solver".
8	"'ImportedExternPointer' is not allowed as Storage Class for tunable parameters for Target 1500S <Version>. Please change Storage Class of <ParameterName> to other than 'ImportedExternPointer' in order to proceed with build."	Select a different memory class than "ImportedExternPointer".
10	"No compatible ODK 1500S version is installed. Please first install a compatible version and restart MATLAB in order to proceed with build. A list of compatible ODK 1500S versions can be found in the Target 1500S documentation."	No compatible ODK version available. Install a compatible ODK 1500S version (Page 16) and restart Matlab.
11	"The selected ODK 1500S version doesn't work properly. The reason could be installation of the selected ODK 1500S version failed due to some reason. ODK 1500S <OdkVersion> documentation describes, how to check the functionality of the ODK 1500S installation."	The selected ODK version is not working properly. The reason can be the installation of the selected ODK version failed. You can find information on checking the functionality in the ODK manual (https://support.industry.siemens.com/cs/ww/en/view/109752683).
12	"Size of input and output parameters of <SimulinkModel> reaches to the limits of ODK 1500S. Please reconsider your model and try to reduce the size of your parameters in order to proceed with build."	The maximum ODK data volume is exceeded. Check the model and reduce the parameter size.

Error no.	Alarm	Meaning
13	"A parameter which exceeds limits of ODK 1500S maximum array size is defined in <SimulinkModel>. Please reconsider your model and try to reduce the size of array which exceeds ODK 1500S limits in order to proceed with build."	The maximum array size is exceeded. Check the model and reduce the array size.
15	"<SimulinkModel> causes to exceed limits of ODK 1500S naming rules for generated functions or structs. Please perform one of the following actions in order to proceed with build: 1- Set 'Maximum identifier length' in symbols options to a smaller value. 2- Set <SimulinkModel> to a shorter name."	Prefix and function name are too long. Reduce the value of "maximum identifier length" in the properties of the code generator under "Symbols" or shorten the name of the Simulink model.
16	"<Variable> name exceeds the limits of ODK 1500S maximum variable name size. Please perform one of the following actions in order to proceed with build: 1- Set 'Maximum identifier length' in symbols option to a smaller value. 2- Set <Variable> to a shorter name."	The tag name is too long. Decrease the value of "maximum identifier length" in the properties of the code generator under "Symbols" or shorten the name of the tag.
17	"Because of the length of <SimulinkModel> name and path of your model, some generated files reach to the path limits of Windows. Please perform one of the following actions in order to proceed with build: 1- Set your <SimulinkModel> name to a shorter string. 2- Move your <SimulinkModel> to a shorter path."	The maximum Windows path length has been exceeded. Shorten the name of the Simulink model or move your Simulink model to a shorter path.
18	"An ODK 1500S project with same name as <SimulinkModel>_ODK exists in ODK 1500S default workspace. In order to proceed either change name of your <SimulinkModel> or remove/rename the project from workspace manually"	The ODK workspace already contains an ODK project with the same name. Change the name of the Simulink model or delete/rename the existing project manually.
20	"An error occurred during removing <SimulinkModel>_ODK project from default workspace of ODK 1500S. Please either change name of your <SimulinkModel> or remove/rename the project from workspace manually"	Removal of the ODK project from the workspace was unsuccessful. Change the name of the Simulink model or delete/rename the project manually from the workspace.
21	"Build of <SimulinkModel>_ODK is failed due to the following error(s): <Error text coming from gcc compiler with the complete line and multiple errors> Please enable 'Verbose' mode in Code Generation Options to see the stack trace and contact customer support!"	Generation of the ODK project was unsuccessful due to a compiler error. Enable "Verbose" mode in the properties of the code generator to see the stack trace and contact Customer Support.

Error no.	Alarm	Meaning
22	"'Device vendor' can be only selected as 'Intel' and 'Device type' can be only selected as 'x86-32 (Windows32)' in hardware implementation options. Please select the proper values in order to proceed with build."	Select "x86-32 (Windows32)" in the properties under "Device type".
23	"The maximum data size for external mode is 64k. The current used data (<sizeOfData>) exceeds this limit. Please reconsider your model and try to reduce the size of the parameters."	The maximum data size for external mode is 64k. The data currently used exceeds this limit. Revise your model and reduce the size of the parameters.
24	"An incompatible version of Java Runtime Environment (JRE) could be installed. Please prove, if the installed Java Runtime Environment (JRE) and its architecture (x86, x64) is compatible with the selected ODK 1500S Version. ODK 1500S <ODK Version> documentation describes, how to check the functionality of the ODK 1500S installation."	No compatible JRE is installed on the PC. You can find information on checking the functionality in the ODK manual (https://support.industry.siemens.com/cs/ww/en/view/109752683).
1000	License key missing	The Target 1500S license was not transferred and the test version has expired.
1001	Retrieving license key not possible	The ALM is not installed.

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