Migrating an RFID Project from S7-300/400 to S7-1500 Using FB45

SIMATIC S7-1500, STEP 7 V13, RF200/300/600, MOBY D/U

Description • September 2013

Applications & Tools

Answers for industry.

SIEMENS

Warranty and Liability

Note

The Application Examples are not binding and do not claim to be complete regarding the circuits shown, equipping and any eventuality. The Application Examples do not represent customer-specific solutions. They are only intended to provide support for typical applications. You are responsible for ensuring that the described products are used correctly. These Application Examples do not relieve you of the responsibility to use safe practices in application, installation, operation and maintenance. When using these Application Examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these Application Examples at any time without prior notice.
If there are any deviations between the recommendations provided in these Application Examples and other Siemens publications – e.g. Catalogs – the contents of the other documents have priority.

We do not accept any liability for the information contained in this document.

Any claims against us – based on whatever legal reason – resulting from the use of the examples, information, programs, engineering and performance data etc., described in this Application Example shall be excluded. Such an exclusion shall not apply in the case of mandatory liability, e.g. under the German Product Liability Act (“Produkthaftungsgesetz”), in case of intent, gross negligence, or injury of life, body or health, guarantee for the quality of a product, fraudulent concealment of a deficiency or breach of a condition which goes to the root of the contract (“wesentliche Vertragspflichten”). The damages for a breach of a substantial contractual obligation are, however, limited to the foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change of the burden of proof to your detriment.

Caution

The functions and solutions described in this entry predominantly confine themselves to the realization of the automation task. Please also take into account that corresponding protective measures have to be taken in the context of Industrial Security when connecting your equipment to other parts of the plant, the enterprise network or the Internet. For more information, please refer to Entry 50203404.

http://support.automation.siemens.com/WW/view/en/50203404

Siemens Industry Online Support

This entry is taken from Siemens Industry Online Support. The following link takes you directly to the download page of this document:

http://support.automation.siemens.com/WW/view/en/77467630

Table of Contents

1 Overview

This document describes the FB45_S7_1500_Library block library with the new SIMATIC block MOBY FB (FB45) for S7-1500. FB45 allows you to migrate existing S7-300/400 RFID projects to S7-1500 in STEP 7 V13 and use them with little effort.

The main focus of this document is to describe

- the migration of an S7-300/400 RFID project based on FB45 to S7-1500 (TIA Portal).
- the FB45 function block for the use of RF200/300/600, MOBY D/U with a SIMATIC S7-1500 in STEP 7 V13.
- the functionality implemented through this block.

Furthermore, this documentation shows possible fields of application and helps you integrate the library into your migrated STEP 7 project using step-by-step instructions.

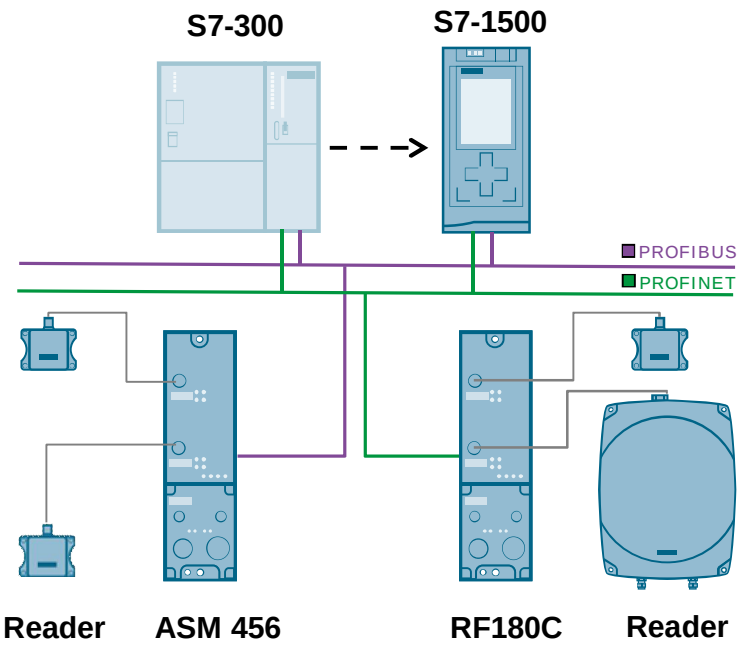
Note The name of the function block for the S7-1500 is still MOBY FB (FB45). This facilitates migration of the existing project to the S7-1500.

1.1 Field of application

Diagrammatic representation

The diagrammatic representation below shows the most important components for the possible use of the library.

Figure 1-1



1.2 Functions

Communication between an S7-1500 CPU and an RFID reader is implemented via an appropriate communication module and with the aid of FB MOBY FB (FB45). The following table describes the core functions of the MOBY FB (FB45) function block.

Table 1-1

Function	Command	sub_command (hex)	Description
WRITE	01	-	Write data to transponder (max. 1024 bytes)
READ	02	-	Read data from transponder (max. 1024 bytes)
INIT	03	00 to FF hexadecimal value with which the transponder is written to	Initialize transponder
SLG_STATUS	04	RF200: 81h RF300: 81h RF600: 87h MOBY D/U: 81h	Check reader status
SET-ANT	0A	RF200/300: 01:Turn on antenna 02:Turn off antenna RF600: 00: Turn off antenna 1,2 01:Turn on antenna 1 02:Turn on antenna 2 03:Turn on antenna 1,2	Antenna On/Off
MDS-STATUS	0B	RF200: 83h RF300: 82h RF600: 84h MOBY D: 83h	Check transponder status

1.3 Hardware and software requirements

Requirements for this library

To be able to use the functionality of the library described in this document, the following hardware and software requirements must be met:

Hardware

Table 1-2 Hardware components

No.	Component	Order no.	Qty.
1.	Communication module (ASM 456 or RF180C)	6GT2002-0ED00 6GT2002-0JD00	1

No.	Component	Order no.	Qty.
2.	Reader of the RFID families RF200/300/600, MOBY D/U (RS422 INTERFACE)	RF200: 6GT2821xxx RF300: 6GT2801xxx RF600: 6GT2811xxx MOBY D: 6GT2602xxx MOBY U: 6GT2698xxx	Up to 2
3.	Reader cable		Up to 2
4.	RF transponder		n

Note FB45 can also be used for communication between an S7-1500 CPU and an MV420/MV440 code reading system (see \9\).

Software

Table 1-3 Software

No.	Component	Order no.	Qty.
1.	TIA Portal V13 SP1	6ES7822-1AE02-0YA5	1
2.	GSD file for the communication module	Available for download in Online Support: PROFIBUS:\6\ PROFINET:\7\	1

1.4 Library resources and performance data

The following section gives you an overview of the size of the blocks of the FB45_S7_1500_Library in the main memory.

Memory requirement

The following table shows the size of the library blocks in the main memory.

Table 1-4

Block	Size in main memory (bytes)
MOBY FB (FB45)	12437
Ident Profile	10603

Transfer time without an additional user program in OB1

The following table shows the average transfer times measured for the data between the S7 CPU 1516-3 PN/DP and the RF360T transponder with the RF310R reader via the ASM 456 communication module.

Table 1-5

Command	Data length (bytes)	Average transfer time
READ	10	41 ms
	100	60 ms
	1024	316 ms
WRITE	10	38 ms
	100	62 ms
	1024	326 ms

2 Blocks of the Library

The MOBY FB (FB45) function block is used for communication between an S7-1500 CPU and an RFID reader via an appropriate communication module.

2.1 List of the blocks

The following table lists all blocks of the FB45_S7_1500_Library.

Table 2-1

Block	Description	
MOBY FB (FB45)	FB MOBY FB (FB45) already includes the above-described functions (Table 1-1) on a fully implemented basis. The ident profile is called in this block.	
Ident Profile	An instruction to read and write data records from/to the transponder. This instruction allows you to parameterize complex command structures.	
PLC data types	MOBY CMD_e: Definition of a command MOBY Param_e: Parameterization of an RFID channel (reader) MOBY SLG-Status_e: Saving of the SLG (write/read device) status	These PLC data types are identical to the UDTs of the existing FB45 for S7-300/400. It is not necessary to copy them to the migrated project.
	MOBY MDS-Status_e: Saving of the MDS status	This PLC data type has been newly created. If you want to check the MDS status, you have to copy it to the migrated project.
	Datatypes_Ident_Profil: • HW_CONNECT_VAR: To physically address the communication module and the reader and to synchronize the function blocks used per reader (ident profile) • PIB_COMMAND: For the ident profile, to parameterize the commands.	Elements required for the Ident profile. They must be copied to the migrated project.
PLC tags	PIB_Constants: Constants of the ident profile.	

2.2 FB MOBY FB (FB45)

The MOBY FB library block already includes the above-described functions (Table 1-1) on a fully implemented basis. The following figure and table show the call interface of the MOBY FB (FB45) library block.

Figure 2-1

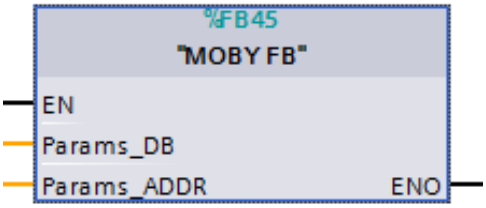


Table 2-2

	Symbol	Data type	Explanation
INPUT	EN	BOOL	Enable input. Relevant only in FBD and LAD representation.
	Params_DB	INT	Parameter data block number for an RFID channel (reader).
	Params_ADDR	INT	Address pointer in the parameter data block to the start of a “MOBY Param_e”.
OUTPUT	ENO	BOOL	Enable output. Relevant only in FBD and LAD representation.

Note Params_DB and Params_ADDR form a pointer to a data structure. This data structure is defined by calling “MOBY Param_e”. A separate data structure must be defined for each RFID channel (reader).

“MOBY Param_e”, “MOBY CMD_e”, “MOBY SLG-Status_e” PLC data types

These PLC data types are required to parameterize each RFID reader, define a command and save the read out reader status (SLG status). You must define these PLC data types in any data blocks.

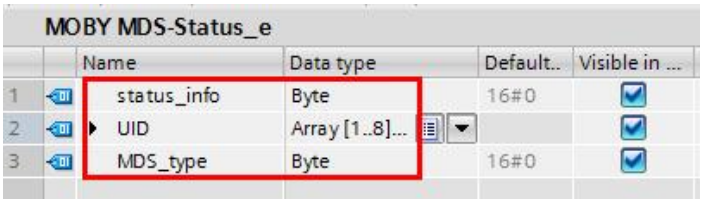
Note For the description of these structures, please refer to the following manual: “RFID systems FB 45 for MOBY U, MOBY D, RF200, RF300” (see \4\, Chapter 3 and the following chapters).

Note These structures are identical to the structures of the existing FB45 for S7-300/400. As they already exist, it is not necessary to copy them to the migrated project.

“MOBY MDS-Status_e” PLC data type

This structure is necessary to save the read out MDS status.

Figure 2-2

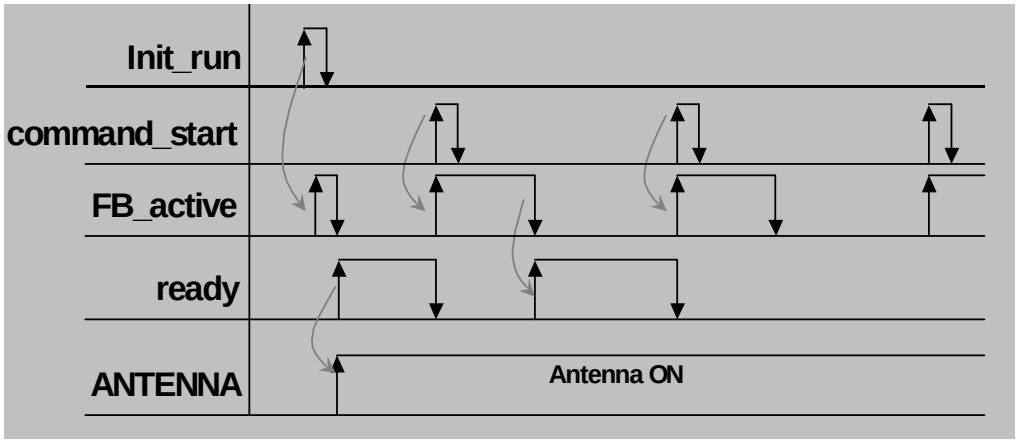


Note This PLC data type has been newly created. If you want to check the MDS status, it is necessary to copy it to the migrated project and create it in a data block.

2.3 Function chart

The following chart shows the time sequences of a command. The signals shown in the figure can be found in the “MOBY Param_e” PLC data type.

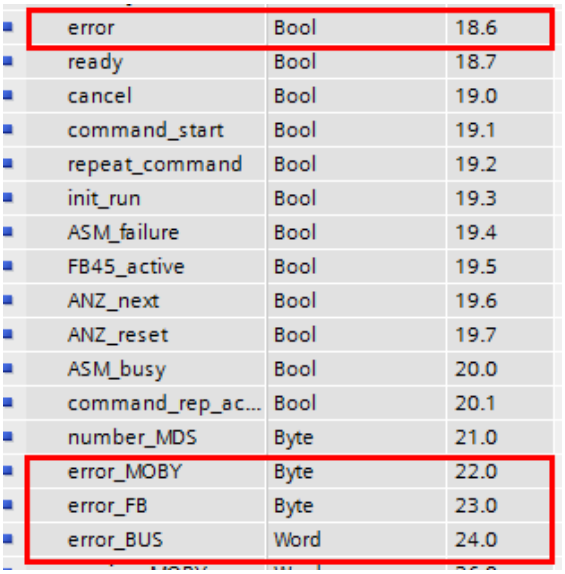
Figure 2-3



2.4 Error and status display

An error has occurred in FB MOBY FB (FB45) when “error” = TRUE is displayed in the “MOBY Param_e” parameter. This error can then be analyzed via the “error_MOBY”, “error_FB” or “error_BUS” “MOBY Param_e” parameter.

Figure 2-4 PLC data type: “MOBY Param_e”



error	Bool	18.6
ready	Bool	18.7
cancel	Bool	19.0
command_start	Bool	19.1
repeat_command	Bool	19.2
init_run	Bool	19.3
ASM_failure	Bool	19.4
FB45_active	Bool	19.5
ANZ_next	Bool	19.6
ANZ_reset	Bool	19.7
ASM_busy	Bool	20.0
command_rep_ac...	Bool	20.1
number_MDS	Byte	21.0
error_MOBY	Byte	22.0
error_FB	Byte	23.0
error_BUS	Word	24.0

Note If error messages are displayed, the received data is invalid.

Additional error messages of the FB MOBY FB (FB45) function block

Table 2-3

STATUS	Description	Remedy
16#1A	The “END” command is not supported	• Change “command” • Re-enable “command start”
16#1B	The entered sub_command is not supported.	• Change “sub_command” • Re-enable “command start”
16#1C	Error messages from the communication module/reader or the ident profile.	• Read out the status from the instance DB of the ident profile (“STATUS” (output of the identification profile) in the multi-instance DB of MOBY FB). • For the meaning of this STATUS, please refer to \5\, Chapter 5.3.2.

Note All other error messages that are not described in Table 2-3 can be found in the following Function Manual: “FB 45 for MOBY U, MOBY D, RF200, RF300” (see \4\, Chapter 5).

3 Migrating an RFID Project from S7-300/400 to S7-1500

In order to work with the new MOBY FB (FB45) and all other elements of the library, you need a new STEP 7 V13 project or an S7-300/400 project that is to be migrated to STEP 7 V13. The following sections describe the procedure for migrating an existing S7-300/400 RFID project to S7-1500.

Requirements

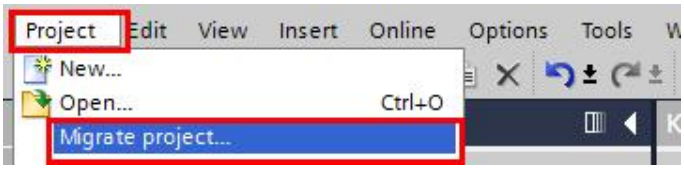
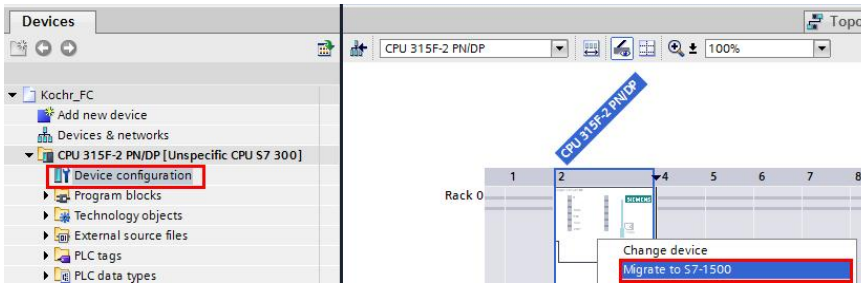
For successful migration, the following requirements must be met:

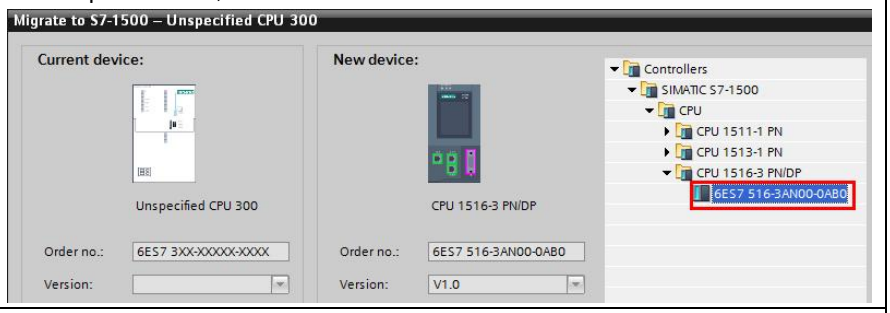
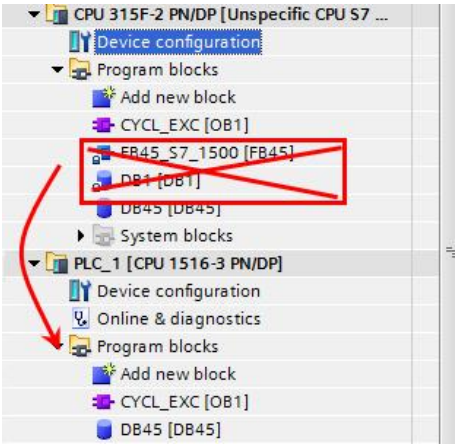
- In addition to STEP 7 Professional (TIA Portal) and STEP 7 V5.4/5.5, all software option packages used in the project must be installed on the computer.
- The project must be consistent.
- The hardware included in the project must be included in STEP 7 Professional (TIA Portal) or the project must be migrated without HW Config.
- Unencrypted migration of blocks is recommended.
- Consider the components that cannot be migrated.
- All open TIA projects must be closed.

Procedure

The following table describes how to migrate an S7-300/400 RFID project to S7-1500.

Table 3-1

No.	Procedure
1.	Unzip your S7-300/400 RFID project.
2.	Open STEP 7 V13 in the Project view.
3.	Migrate the S7-300/400 RFID project. “Project > Migrate Project > Source path > .s7p open > Migrate” 
4.	Open the device configuration of your S7-300 station.
5.	Migrate it to S7-1500. “Select the S7-300 station > Right-click > Migrate to S7-1500” 

No.	Procedure
6.	In the open window, select an S7-1500 controller and click on “OK”. 
7.	Adjust the IP address and subnet mask of the new CPU: “Device configuration> Device view> Click on the PROFINET interface of the CPU> Properties> Ethernet addresses> IP protocol”
8.	In the Device configuration of the new station, open the Device view of the communication module (see note) and customize the USER mode=“RFID standard profile”: “Properties> Device-specific parameters> USER mode> RFID standard profile”
	Result: • A new station appears in your project. • All elements that were only relevant to S7-300 were automatically deleted. 

Note If the communication module was automatically deleted during migration, reinsert it from the hardware catalog. Enter the PROFIBUS address (ASM 456) or IP address (RF180C) and set MOBY mode and USER mode (see Table 3-1, No. 8).

4 Working with the MOBY FB (FB45) Function Block

This chapter consists of instructions for integrating the FB45_S7_1500_Library into STEP 7 and instructions for integrating the library blocks into a migrated STEP 7 project.

Note The following description refers only to the RFID part of your project. If necessary, you have to customize all other elements of the project.

4.1 Integrating the library into STEP 7 V13

In order to use the previously described functions of the new MOBY FB (FB45) function block, first integrate the library into the configuration software. The necessary steps are listed in the following table.

Table 4-1

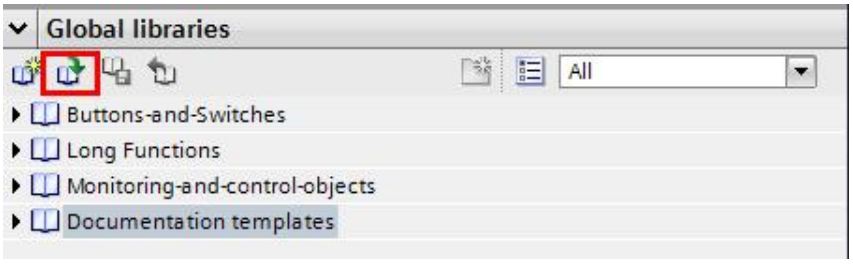
No.	Procedure
1.	The library is available on the HTML page from which you downloaded this document. Save the **77467630_FB45_S7_1500_Library_V10.zip** library to your hard drive.
2.	Unzip the library.

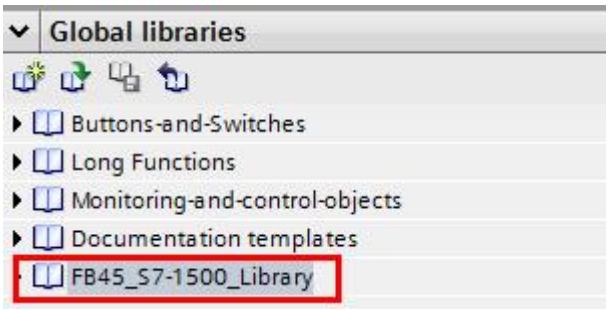
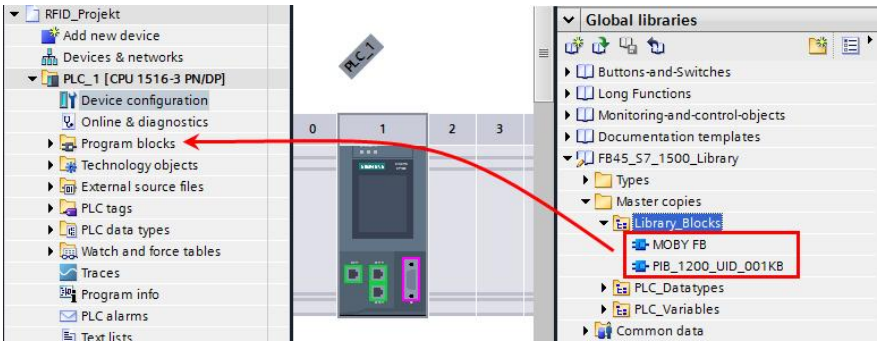
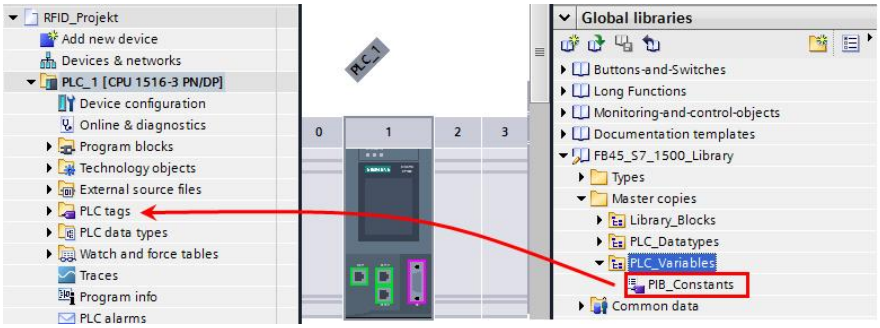
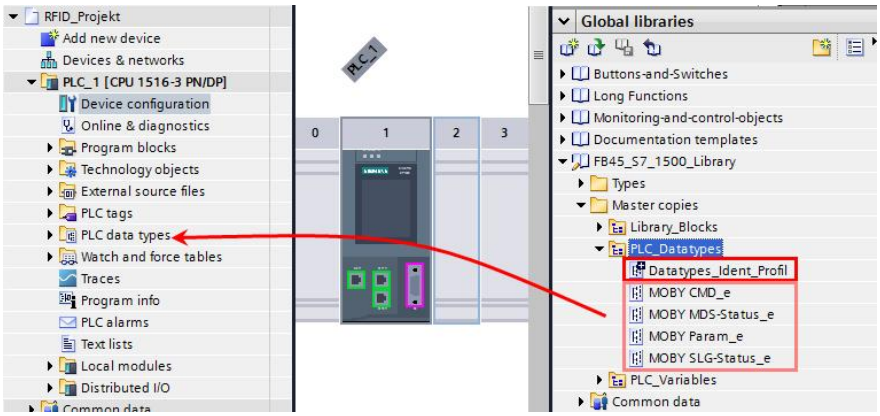
4.2 Integrating the library blocks into the migrated STEP 7 V13 project

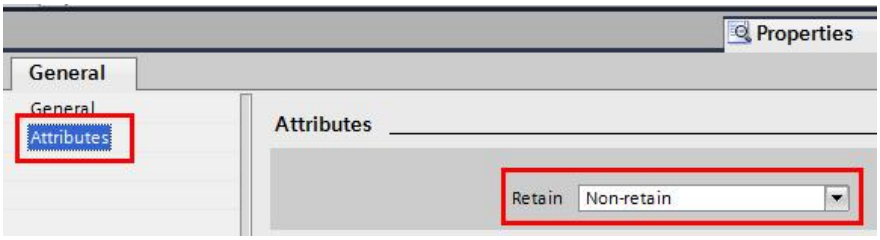
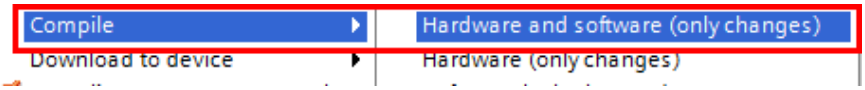
Note You can also integrate the blocks of the library into a new project.

The following table lists the steps for integrating the blocks of the FB45_S7_1500_Library into your migrated STEP 7 project. After that, you can use the blocks of the library.

Table 4-2

No.	Procedure
1.	Open the STEP 7 V13 project you have already migrated.
2.	In the “Global libraries” palette in the toolbar, click on “Open global library” or in the “Options” menu, select the “Global libraries > Open library” command. The “Open global library” dialog box opens. 

No.	Procedure
3.	Select the global FB45_S7_1500_Library.al12. 
4.	Use drag and drop to move all function blocks from the “Library_Blocks” folder of the Library to the “Program blocks” folder of your device. 
5.	Use drag and drop to move the “PIB_Constants” from the “PLC_Variables” folder of the Library to the “PLC tags” folder of your device. 
6.	Use drag and drop top move “Datatypes_Ident_Profil” and all other PLC data types (see Table 2-1) from the “PLC_Datatypes” folder of the Library needed for FB45 to the “PLC data types” folder of your device. 

No.	Procedure
7.	Open the data blocks where you have created the PLC data types for parameterizing the reader, defining the commands and saving the data. Customize them accordingly.
8.	Customize the start address of the communication module, “ASM_address”, in the “MOBY Param_e” data type. 
9.	Customize the sub_commands in “MOBY_CMD_e” accordingly (see Table 1-1).
10.	Set the open data block to “Non-retain” to ensure that the initial values are applied each time the CPU is restarted: “Properties> Attributes> Retain> Non-retain” 
11.	Compile the hardware and software of the S7-1500 station: In the Project tree, right-click on the device and select the “Compile > Hardware and software (only changes)” menu. 
12.	Download the new project to your controller.

5 Using the new MOBY FB (FB45) Function Block

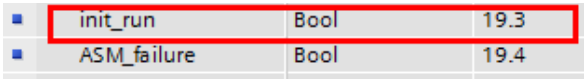
This chapter shows you how to use the above-described functions (Table 1-1) implemented in MOBY FB (FB45).

Note After restarting the communication module, a reset must be performed.

5.1 Resetting the communication module

The table below provides instructions for resetting the communication module.

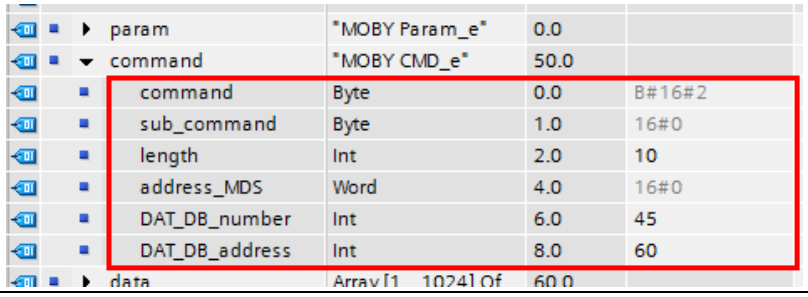
Table 5-1

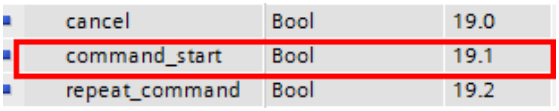
No.	Procedure
7.	Open the data block where you have created the “MOBY Param_e” PLC data type and enter the INPUT parameters (see \4\, Chapter 3.1).
8.	Enable “init_run” (control bit in “MOBY Param_e”, address: 19.3). 
	Result: The communication module has been reset.

5.2 Reading RFID data

The following table provides instructions for reading RFID data from the transponder.

Table 5-2

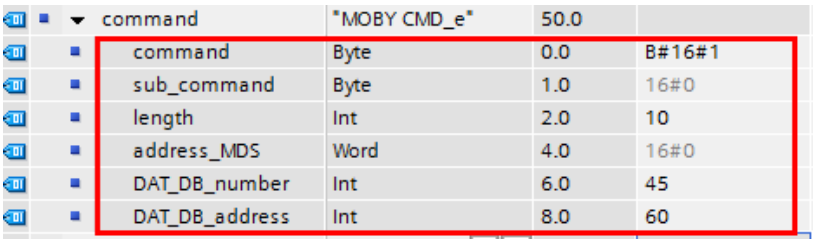
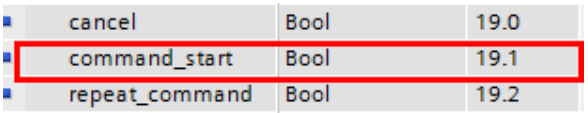
No.	Procedure
1.	Open the data block where you have created the “MOBY CMD_e” PLC data type and enter the required parameters. 
2.	Compile and download the changes to your device.
3.	Stop and restart your CPU to apply the changes to the DB.

No.	Procedure
4.	Enable “command_start” (control bit in “MOBY Param_e”, address: 19.1). 
	Result: The data read in this example can be found in DB45 starting with address 60.

5.3 Writing RFID data

The following table provides instructions for writing RFID data to the transponder.

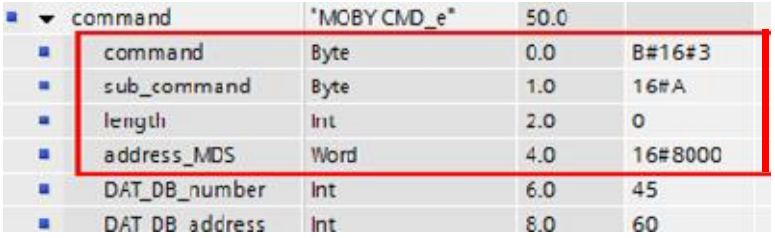
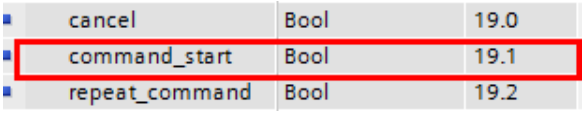
Table 5-3

No.	Procedure
1.	Open the data block where you have created the “MOBY CMD_e” PLC data type and enter the required parameters. 
2.	Compile and download the changes to your device.
3.	Stop and restart your CPU to apply the changes to the DB.
4.	Enable “command_start” (control bit in “MOBY Param_e”, address: 19.1). 

5.4 Initializing the transponder

The following table provides instructions for initializing the transponder.

Table 5-4

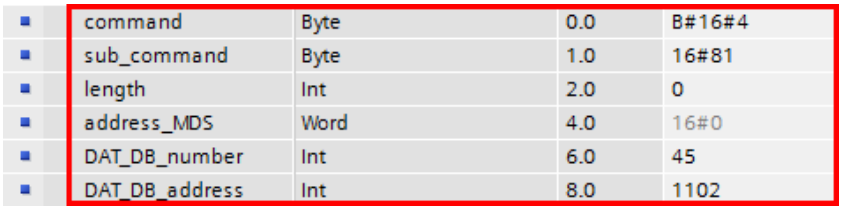
No.	Procedure
1.	Open the data block where you have created the “MOBY CMD_e” PLC data type and enter the required parameters.  For more information on the memory size of the transponder to be initialized, please refer to \4\, Table 3-9.
2.	Compile and download the changes to your device.
3.	Stop and restart your CPU to apply the changes to the DB.
4.	Enable “command_start” (control bit in “MOBY Param_e”, address: 19.1). 
	Result: The value 16#A was written to the transponder.

Note Readers of the RF200 family do not support this function.

5.5 Checking the SLG status

The following table provides instructions for checking the SLG status.

Table 5-5

No.	Procedure
1.	Open the data block where you have created the “MOBY CMD_e” PLC data type and enter the required parameters.  sub_commands=81h and 87h are supported in FB45 (see Table 1-1).
2.	Compile and download the changes to your device.
3.	Stop and restart your CPU to apply the changes to the DB.

No.	Procedure
4.	Enable "command_start" (control bit in "MOBY Param_e", address: 19.1). cancel Bool 19.0 command_start Bool 19.1 repeat_command Bool 19.2
	Result: The status was saved in DB45 starting with address 1102.

5.6 Turning the reader's antenna off/on

The following table provides instructions for turning the reader's antenna off/on.

Table 5-6

No.	Procedure	
1.	Open the data block where you have created the "MOBY CMD_e" PLC data type and enter the required parameters. command "MOBY CMD_e" 50.0 command Byte 0.0 B#16#A sub_command Byte 1.0 16#2	
	sub_command RF200/300 01:Turn on antenna 02:Turn off antenna	sub_command RF600 00: Turn off antenna 1,2 01:Turn on antenna 1 02:Turn on antenna 2 03:Turn on antenna 1,2
2.	Compile and download the changes to your device.	
3.	Stop and restart your CPU to apply the changes to the DB.	
4.	Enable "command_start" (control bit in "MOBY Param_e", address: 19.1). cancel Bool 19.0 command_start Bool 19.1 repeat_command Bool 19.2	
	Result: The antenna was turned off.	

5.7 Checking the MDS status

The following table provides instructions for checking the MDS status.

Table 5-7

No.	Procedure
1.	Open a new data block (for example: DB45) and call the new PLC data type “MOBY CMD_e”.
2.	Open the data block where you have called the “MOBY CMD_e” PLC data type and enter the required parameters. command Byte 0.0 B#16#B sub_command Byte 1.0 16#82 length Int 2.0 0 address_MDS Word 4.0 16#0 DAT_DB_number Int 6.0 45 DAT_DB_address Int 8.0 1084 sub_commands=82h, 83h and 84h are supported in FB45 (see Table 1-1).
3.	Compile and download the changes to your device.
4.	Stop and restart your CPU to apply the changes to the DB.
5.	Enable “command_start” (control bit in “MOBY Param_e”, address: 19.1). cancel Bool 19.0 command_start Bool 19.1 repeat_command Bool 19.2
	Result: The status was saved in DB45 starting with address 1084.

6 References

6.1 Bibliography

This list is by no means complete and only presents a selection of related references.

Table 6-1

	Topic	Title
/1/	STEP7 SIMATIC S7-300/400	Automating with STEP7 in STL and SCL Author: Hans Berger Publicis Corporate Publishing ISBN: 978-3-89578-412-5
/2/	STEP7 SIMATIC S7-300/400	Automating with STEP 7 in LAD and FBD Author: Hans Berger Publicis Corporate Publishing ISBN: ISBN: 978-3-89578-410-1

6.2 Internet links

This list is by no means complete and only provides a selection of useful information.

Table 6-2

	Topic	Title
\1\	Reference to the entry	http://support.automation.siemens.com/WW/view/en/77467630
\2\	Siemens Industry Online Support	http://support.automation.siemens.com
\3\	S7-1500 Automation System	http://support.automation.siemens.com/WW/view/en/59191792
\4\	RFID Systems FB 45 for MOBY U, MOBY D, RF200, RF300	http://support.automation.siemens.com/WW/view/en/21738808
\5\	RFID Systems Communications Module RF120C with Application Blocks for S7-1200 and S7-1500	http://support.automation.siemens.com/WW/view/en/77485950
\6\	PROFIBUS GSD Files: IDENT	http://support.automation.siemens.com/WW/view/en/113562
\7\	PROFINET GSD Files: Identity	http://support.automation.siemens.com/WW/view/en/22747865
\8\	SIMATIC Ident RFID Systems SIMATIC RF620R/RF630R Configuration Manual	http://support.automation.siemens.com/WW/view/en/33287195
\9\	Code Reader Systems SIMATIC MV420 / SIMATIC MV440	http://support.automation.siemens.com/WW/view/en/73204122

7 History

Table 7-1

Version	Date	Modifications
V1.0	09/2013	First version