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Communication with S7-CPU via M-Bus Gateway

S7-1200, PROFINET, UGW//micro MULTI Modell PROFINET M-Bus

https://support.industry.siemens.com/cs/ww/en/view/109478527

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Table of Contents

1 Task

1.1 Introduction

Gateways enable the communication between two networks which use different communication protocols.

M-Bus is a network protocol for the transfer of data from metering devices.

1.2 Overview of the automation task

The task is to create a communication connection between a SIMATIC PLC via a PROFINET (PN) interface using an M-Bus gateway.

M-bus devices are used, amongst others, for building automation, e.g. for the evaluation of water and power meters, etc. The M-bus device counts the received pulses and forwards the data to the M-bus gateway.

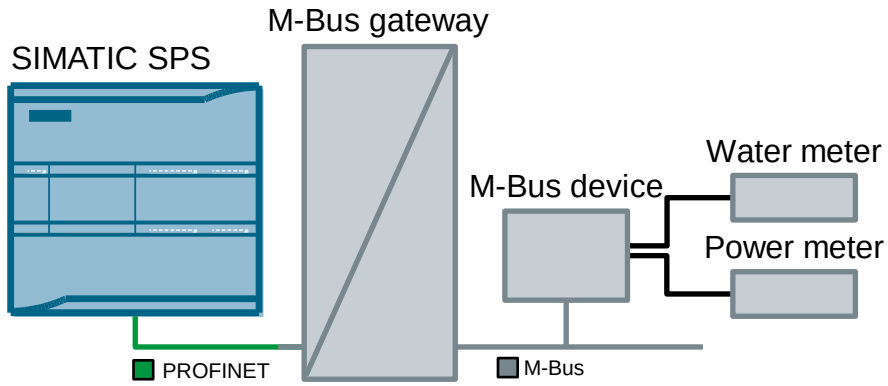
The M-bus gateway receives the data and forwards them to the PROFINET interface which is connected to a SIMATIC PLC.

The SIMATIC PLC receives the data and can process them further.

The objective of this document is to show how the configuration between SIMATIC PLC and the gateway is realized.

The figure below provides an overview of the automation task.

Figure 1-1: Schematic diagram of the automation task



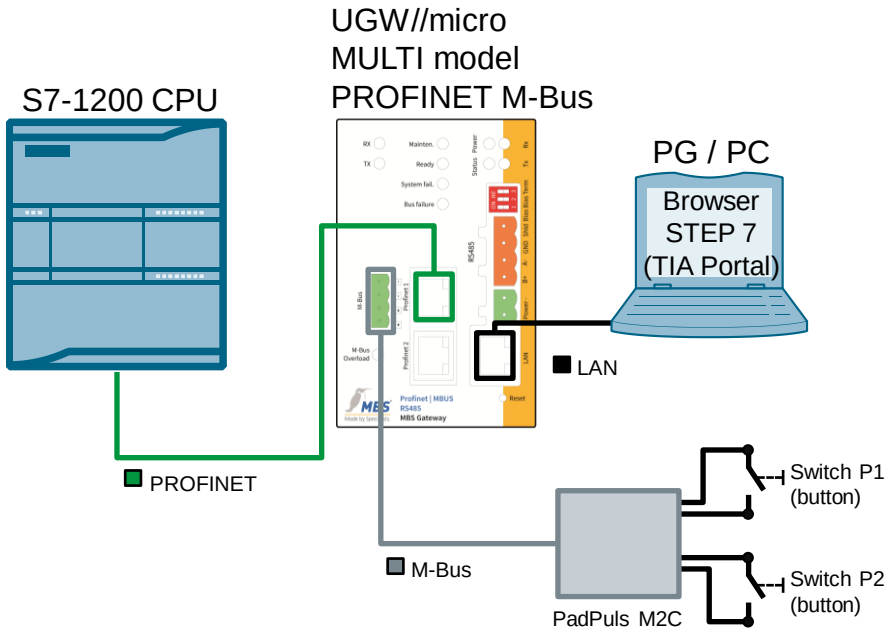
2 Solution

2.1 Overview

Schematic layout

An S7-1200 CPU is used in place of all SIMATIC PLCs. The layout diagram below shows the most important components of the solution for the communication between an S7-1200 CPU and the “UGW//micro MULTI Modell PROFINET M-bus” gateway by MBS GmbH.

Figure 2-1: Schematic diagram of the solution with the components used



Gateway “UGW//micro MULTI Modell PROFINET M-bus” enables communication via PROFINET and M-bus between an S7-1200 CPU and M-bus devices.

In order for the “UGW//micro MULTI Modell PROFINET M-bus” to receive data (counting pulses) via the M-bus, a pulse adapter (PadPuls M2C) must be connected to the M-bus in this application example. Switches P1 and P2 at the M-bus device are used to simulate counting pulses as an example.

Correct communication is verified with a web server of the “UGW//micro MULTI Modell PROFINET M-bus” and a browser and a watch table from STEP 7 (TIA Portal).

The relevant interfaces of the UGW//micro MULTI Modell PROFINET M-bus for this application example are represented in the following table:

Table 2-1: UGW interfaces

Interface designation	Communication medium	Network	Connected device
PROFINET 1 or PROFINET 2	Ethernet	PROFINET	SIMATIC PLC (S7-1200 CPU)
LAN	Ethernet	LAN	PG / PC
M-bus	Two-wire line	M-bus	M-bus impulse adapter (in the example: M2C)

2.1 Overview

Explanation

The following abbreviations are used below:

- UGW: Gateway “UGW//micro MULTI Modell PROFINET M-bus”
- M2C: pulse adapter “PadPuls M2C”

Advantages

The solution presented here offers the following advantages:

- The application example can simply be adjusted to other controller families. The S7-1200 CPU is used here in place of all other SIMATIC PLCs with PROFINET IO interface. This makes the solution scalable for the respective application case.
- The application example can be simply adjusted for plant expansions. The configuration of the UGW gateway is performed with a standard text editor or directly in the gateway web server.
- Configuring and commissioning the UGW gateway does not require any additional software. Standard tools such as internet browser and a simple text editor are sufficient. A special configuration tool for the UGW is not required.
- In addition, the UGW can be configured automatically using the integrated web server in the UGW via the menu “M-bus > Meter scan.” The major part of the configuration is created automatically.

Topics not covered in this application

- In the case of differences in the documentation on the topic of M-bus, the documentation by MBS GmbH is always ruling.
- The document on hand does not replace the UGW//micro MULTI Modell PROFINET M-bus manual.
- The application example on hand only gives an introduction into M-bus communication with SIMATIC PLCs. If you wish to know about further possibilities with M-bus gateway, we recommend the UGW//micro MULTI Modell PROFINET M-bus manual or contacting MBS GmbH directly.
- The communication between UGW and M-bus devices is not part of this application example and is only included for completeness.
- Training, service and support for the UGW are solely provided by MBS GmbH.

Assumed knowledge

- Basic knowledge of STEP 7 (TIA Portal) programming
- Basic knowledge of PROFINET and M-bus communication

Validity

This application example is valid for

- STEP 7 (TIA Portal) V13 SP1 or later
- S7-1200 CPU as of FW4.1 (adjustable for S7-1500 as of FW1.7)
- UGW//micro MULTI Modell PROFINET M-bus

2.2 Description of the core functionality

Configuration

The connection between S7-1200 CPU and UGW is handled via

- the configuration in STEP 7 (TIA Portal).
- configuration files (cfg and txt files) (see Figure 3-3: UGW configuration files) referencing each other.
  These files are loaded into the UGW by means of integrated web server or edited directly.

Data types

This application example contains a STEP 7 project and a data record for the UGW in which INT data is exchanged towards the S7-1200 CPU.

The following formats (UGW / S7 1200) are configured as examples:

Table 2-2: Data types UGW / S7-1200

Switch		UGW			SIMATIC (S7-1200)
-	→	BIT	Status value: M-bus error	→	BOOL
P1	→	SINT16	Meter value	→	INT
-	→	BIT	Status value: M-bus error	→	BOOL
P2	→	SINT16	Meter value	→	INT

The status value (M-bus error) delivers a TRUE signal, when the connection between UGW and M2C is interrupted.

2.3 Hardware and software components

The application example was created with the following components:

Hardware components

Table 2-3: Hardware components

Component	Qty	Article number	Note
POWER MODUL PM1207	1	6EP1332-1SH71	Power supply Input: 120/230 AC Output: 24 V DC/2.5 A
SIMATIC S7-1200 FW4.1	1	6ES7212-1AE40-0XB0	Alternatively, any other S7-1200 CPU (as of FW4.1) or S7-1500 CPU (as of FW1.7) can be used.
Compact Switch module	1	6GK7277-1AA10-0AA0	(optional) The switch is only required if S7-1200 and UGW shall be addressed simultaneously from the PG/PC (without “replugging”).
UGW//micro MULTI Modell PROFINET M-bus	1	Manufacturer: MBS GmbH http://www.mbs-software.de/en/ Gateway type: UGW-MICRO7 15.1.1 Version: V2_01G #3701 Operating system: Linux 2.6.34.7 #89	(Contact details of MBS GmbH are also available here) The respective versions are available on the start page of the UGW web server.
PadPuls M2C	1	Manufacturer: Relay GmbH http://www.relay.de/en/relay-gmbh.html	Pulse adapter for connection to pulse encoder
Pushbuttons P1 / P2	2	-	Simulation of pulse encoders
PW3 M-bus master interface	1	Manufacturer: Relay GmbH	(optional) M-bus master interface Level converter as interface between PC and PadPuls M2C for the configuration of the PadPuls M2C
1:1 connection cable RS232 (1x DSUB9 socket and 1x DSUB9 plug)	1		(optional)

Software components

Table 2-4: Software components

Component	Qty	Article number	Note
SIMATIC STEP 7 Basic (TIA Portal) V13 SP1 Update 3	1	6ES7833-1FA13-..	-
GSDML-V2.31-MBS-MICRO3004-20150206	1	Manufacturer: MBS GmbH	Current GSDML files are available directly at MBS GmbH. The UGW is delivered with GSDML file which can be loaded to your PC/PG using a browser. When opening the project, the GSD file is automatically installed. In this example GSDMLV2.31 was used. The files are available in the folder "**AdditionalFiles - GSD**" in the **STEP 7 project**.
MBCONF	1	Manufacturer: Relay GmbH http://www.relay.de/en/produkte/software.html	Available as a download or on CD. Required for the configuration of the PadPuls M2C

Example files and projects

The following table contains all files and projects used in this example.

Table 2-5: Project and configuration files

Component	Note
109478527_MBus_DOKU_Vxx_en.pdf	This document.
109478527_MBus_S7_CODE_Vxx.zip	This zip file contains the STEP 7 project.
109478527_MBus_UGW_CODE_Vxx.zip	This zip file contains the UGW configuration data.

3 Mode of Operation

3.1 Data points and signal course

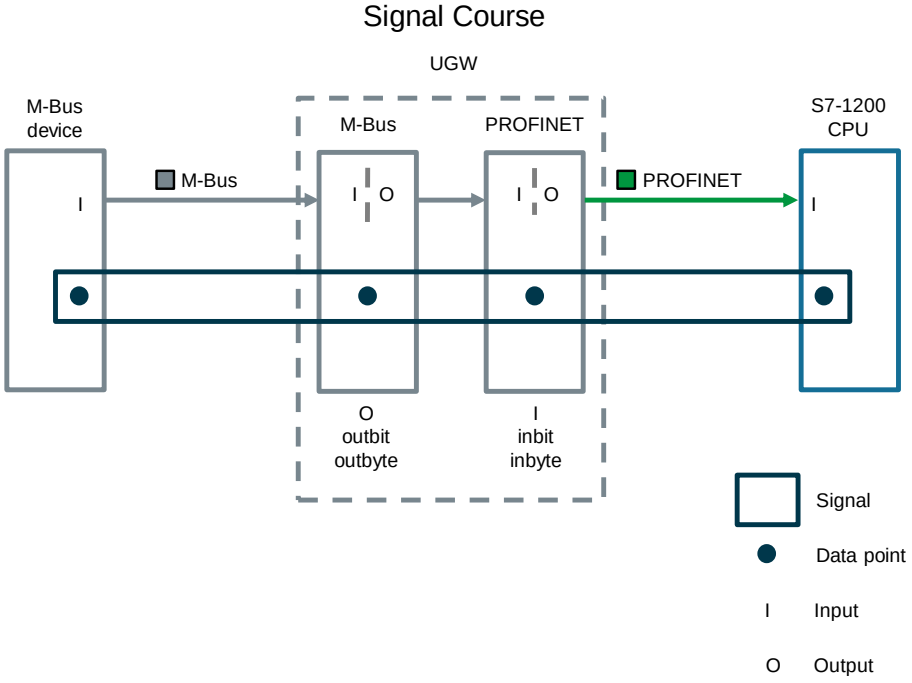
The following figure represents the communication between an S7-1200 CPU and an M-bus device. The communication takes place from the M-bus device to the S7-1200 CPU.

A signal (e.g. meter value) is read by an M-bus device via an S7-1200 CPU input. The UGW compiles the M-bus protocol into a PROFINET protocol here.

Each device interface where the signal runs through represents a data point. The UGW connects two different bus systems and therefore also has two data points.

A definition on the topic of “data points” is available in the UGW//micro MULTI Modell PROFINET M-bus manual (/5/) in section 4 “Protocol Properties and Data Points”.

Figure 3-1: Signal course M-bus device → S7-1200 CPU

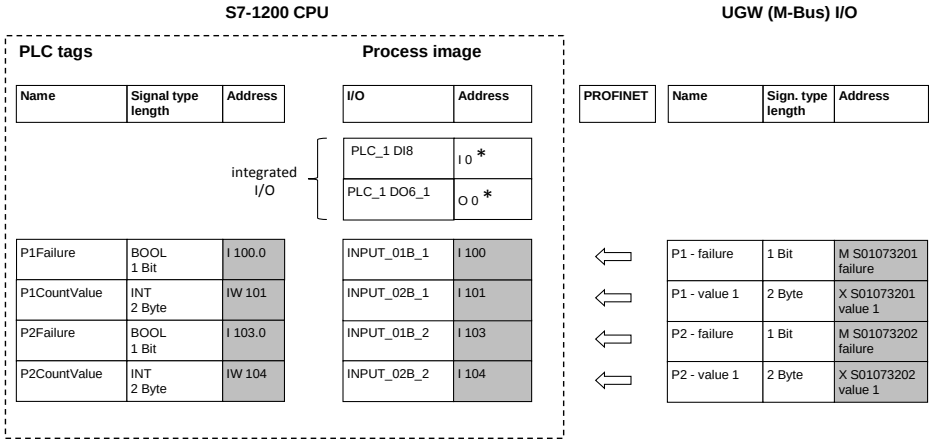


3.2 Process image: S7 CPU and UGW (M-Bus)

The figure below shows all of the used data, as well as how the process image of the S7-1200 CPU is composed during the respective configuration with UGW (M-bus).

Please note that the input or output signal type always relates to the “perspective” of the respective device.

Figure 3-2: Composition of the process image in the S7 CPU



Note

*Compact CPUs (e.g. S7 1200) with integrated digital inputs and outputs:

In STEP 7 (TIA Portal), the integrated digital inputs and outputs are automatically preassigned with the smallest address 0.
Further modules/IOs are automatically assigned to the next free address.

Here, the address space from 100 onward was selected in the process image on purpose. This makes it easier to recognize the connected tags between S7-1200 CPU and UGW.

3.3 Correlation of the UGW configuration files

The configuration of the UGW is performed via various configuration files (cfg, txt). These files are uploaded and activated with the integrated web server in the UGW after programming has been completed in an editor (for example, Notepad++). As an alternative, there is an editor available in the integrated web server. In the UGW, a syntax check is performed and possible errors are displayed.

Since the UGW supports different bus systems (PROFINET, M-bus, …), there are different driver files (cfg) with protocol information. For each driver file, there is a configuration file (txt) with the definition of the used data points.

A central component is the distribution file (dispatch.txt). It contains the assignment of the data points of the different protocols to each other.

The data points are programmed as objects. Exact meaning and structure of these files are given in the manual on this UGW (http://www.mbs-software.de/en/). The cfg and txt files also contain respective information as comment line.

The complete configuration is available in the preconfigured UGW configuration files and the contained comments (109478527_MBus_UGW_CODE_Vxx.zip).

Figure 3-3: UGW configuration files

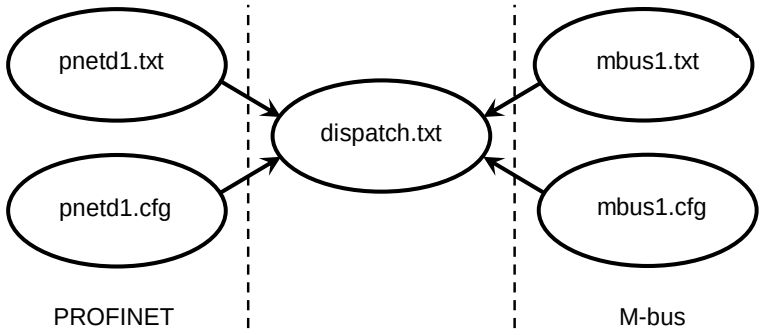


Table 3-1: UGW configuration files

File	Content	Description
pnetd1.cfg	Configuration of PROFINET I/O	This file contains information and settings for the PROFINET network, including the I/O used there. In this case: I/O configuration of the UGW in STEP 7 (TIA Portal)
pnetd1.txt	Definition of the PROFINET data points	It is defined here how and with which data type the data points are interpreted.
dispatch.txt	Assignment of M-bus data points and PROFINET data points	This file describes the assignment of the data points on the PROFINET side (pnetd1.txt) and on the M-bus side (bac1.txt).
mbus1.txt	Definition of the M-bus data points	This file contains the description of the individual data points on the M-bus side.
mbus1.cfg	Configuration of the M-bus device	This file contains information and settings on the UGW on the M-bus side.

Note In the UGW configuration files, M-bus objects are labeled with “mbus1…” and PROFINET objects are labeled with “pnet…”.

This application example describes how this data must be edited and adjusted so they can be used for data exchange. Along with this description, you receive preassembled example files which you can adjust for your own application.

Note In addition, there are the following configuration files that need to be loaded into the UGW but not edited:

- driver.cfg
- ugwc1.cfg
- ugwc1.txt

These files are not further described in this application. If you require further information, open these files or contact MBS GmbH.

The file “109478527_MBus_UGW_CODE_Vxx.zip” contains all required files and the configuration as a zip file (see Table 5-5: Loading existing configuration files to the UGW).

4 Configuration and Settings

This chapter describes the configuration in STEP 7 (TIA Portal) and programming of UGW configuration files.

If you wish to adopt the example configuration of this application example without modifications, you can load the STEP 7 project directly into the S7-1200 CPU and the UGW configuration into the UGW (see Table 5-5: Loading existing configuration files to the UGW).

4.1 UGW device configuration

There are three options to create the configuration files for the UGW:

- Creating the configuration files with an editor
  (see chapter 4.1.1 Creating the configuration files manually)
- Loading the configuration files from the example
  (see chapter 5.3.3 Loading existing configuration files to the UGW)
- Using the auto configuration of the UGW
  (see chapter 5.3.4 Creating the configuration files automatically)

4.1.1 Creating the configuration files manually

Note The configuration files described here were created with the auto configuration of the UGW. The following description serves as an explanation; the files do not have to be created manually.

In general, we recommend using the auto configuration of the UGW (see chapter 5.3.4 Creating the configuration files automatically).

Note The configuration file “pnetd1.cfg” must be created manually.

Table 4-1

No.	Action	Notes
1.	Establish a connection between your PC and the UGW.	How to do this is described in chapter 5.3.1 Backing up data of the UGW.

For the configuration of the UGW, the following files are processed and then loaded into the UGW as a tgz file via the integrated web server.

- mbus1.cfg
- mbus1.txt
- dispatch.txt
- pnetd1.txt
- pnetd1.cfg

Note

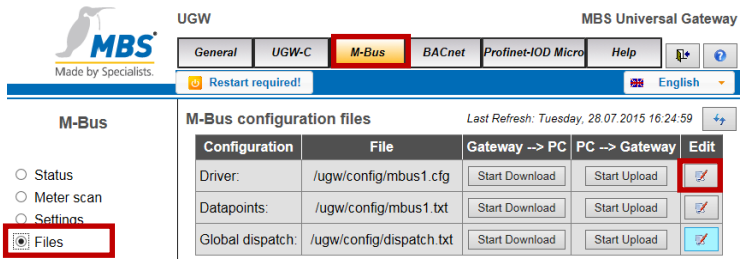
However, the following configuration files also need to be loaded into the UGW, but not edited:

- driver.cfg
- ugwc1.cfg
- ugwc1.txt

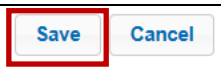
Zip-file “109478527_MBus_UGW_CODE_Vxx.zip” contains all required files.

4.1.2 UGW file “mbus1.cfg”

Table 4-2: Editing the “mbus1.cfg” file

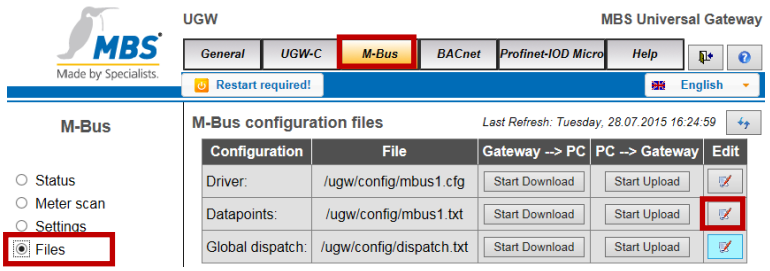
No.	Action	Notes
1.	Edit this file with the editor in the integrated UGW web server.	

2.	Program the M-bus device configuration.
	
	Specify the baud rate for the M-bus devices.
		`# UGW-WEB - generated by m-bus scan`
		`#  file: /ugw/config/mbus1.cfg`
		`# changed: 06.08.2015 15:01:46`
		`#`
		
		`[MBUS]`
		`Baudrate = 300`
		`Databits = 8`
		`Parity = even`
		`Stopbits = 1`
		`Interval = 1`
		`ReceiveTimeout = 5`
		`ReceiveInterCharTimeout = 300`
		`CacheTimeout = 10`
		`FixBaud = 0`
		`DisableDTR = 0`
		`EnableRS485 = 0`
		`SetInvalid = 1`
		`NumberOfDeviceSelections = 2`
		`FollowFrameDelay = 100`
		
		`[MBUS_1]  # special configuration for slave 1`
		`Baudrate = 2400`
		`CacheTimeout = 86400  # request counters daily`
		`Interval = 86400`
		`SND_UD =`
		
		`[MBUS_2]`
		`Baudrate = 0`
		`SetInvalid = 0`
		`SND_UD =`
		
		`[MBUS_P1]`
		`Baudrate = 2400`
		
		`[MBUS_P2]`
		`Baudrate = 2400`
		
		`[MBUS_P81]`
		`Baudrate = 2400`
		
		`[MBUS_P82]`
		`Baudrate = 2400`
		
		`[MBUS_S01073201]`
		`Baudrate = 2400`

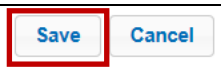
No.	Action	Notes
		[MBUS_S01073202] Baudrate = 2400
3.	Save the file to the UGW.	

4.1.3 UGW file “mbus1.txt”

Table 4-3: Editing the “bac1.txt”file

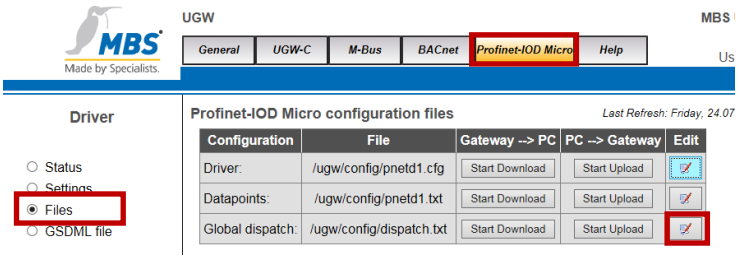
No.	Action	Notes
4.	Edit this file with the editor in the integrated UGW web server.	

2.	Program the M-bus data points.
	
	Use the following syntax:
	`[Type DeviceID.DataPnt]`
	
	The `name` can be selected by the user.
		`# UGW-WEB - generated by m-bus scan`
		`#  file: /ugw/config/mbus1.txt`
		`# changed: 06.08.2015 15:01:46`
		`#`
		
		`[M S01073201 failure]`
		`query = pe`
		`name = P1 - failure`
		
		`[X S01073201 value 1]`
		`query = pe`
		`name = P1 - value 1`
		
		`[M S01073202 failure]`
		`query = pe`
		`name = P2 - failure`
		
		`[X S01073202 value 1]`
		`query = pe`
		`name = P2 - value 1`

3.	Save the file to the UGW.	

4.1.4 UGW file “dispatch.txt”

Table 4-4: Editing the “dispatch.txt” file

No.	Action	Notes
1.	Edit this file with the editor in the integrated UGW web server.	

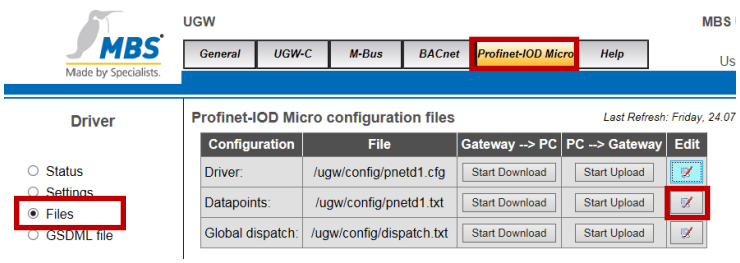
2.	Program the assignment between M-bus data points and PROFINET data points.
	
	Here, the data points in the networks M-bus (`60 mbus…`) and Pnet (`1190 pnet…`) are assigned to each other.
	
	Use the syntax:
	`[Network.DataPoint]`
	`target = Network.DataPoint`
		`# UGW-WEB - generated by m-bus scan`
		`#  file: /ugw/config/dispatch.txt`
		`# changed: 06.08.2015 15:01:46`
		`#`
		`[60.M mbus S01073201 failure]`
		`target=1190.S pnetd inbit 0.0`
		
		`[60.X mbus S01073201 value 1]`
		`target=1190.Y pnetd inbyte 1`
		
		`[60.M mbus S01073202 failure]`
		`target=1190.S pnetd inbit 3.0`
		
		`[60.X mbus S01073202 value 1]`
		`target=1190.Y pnetd inbyte 4`

3.	Save the file to the UGW.	

Note The “dispatch.txt” file can be found in the UGW web server menus “M-bus” and “PROFINET”.
Both files are identical.

4.1.5 UGW file “pnetd1.txt”

Table 4-5: Editing the “pnetd1.txt” file

	Action	Notes
1.	Edit this file with the editor in the integrated UGW web server.	

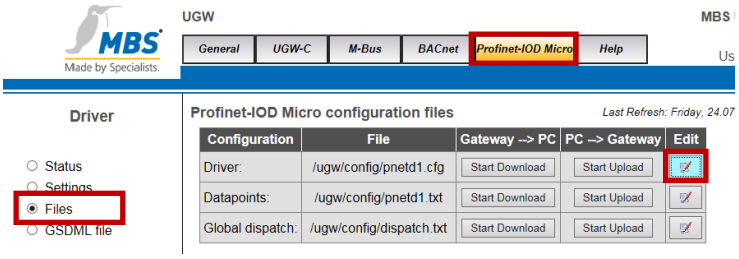
2.	Program the PROFINET data points.
	
	Type and address are specified in square brackets (for example, `[S inbit 0.0]`).
	
	Each data point has different parameters: (`name, format, query, ..`)
	
	The `name` can be selected by the user.
	
	`format` specifies the respective data types of the UGW.
		`# UGW-WEB - generated by m-bus scan`
		`#  file: /ugw/config/pnetd1.txt`
		`# changed: 06.08.2015 15:01:46`
		`#`
		
		`[S inbit 0.0]`
		`query = pe`
		`format = BIT`
		`name = P1 - failure`
		
		`[Y inbyte 1]`
		`query = pe`
		`format = SINT16`
		`name = P1 - value 1`
		
		`[S inbit 3.0]`
		`query = pe`
		`format = BIT`
		`name = P2 - failure`
		
		`[Y inbyte 4]`
		`query = pe`
		`format = SINT16`
		`name = P2 - value 1`

3.	Save the file to the UGW.	

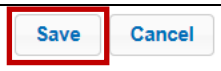
4.1.6 UGW file “pnetd1.cfg”

Note The configuration file “pnetd1.cfg” must be created manually.

Table 4-6: Editing the “pnetd1.cfg” file

No.	Action	Notes
1.	Edit this file with the editor in the integrated UGW web server.	

2.	In this example, one “module” is configured for each PROFINET data point (`Mod001, Mod002, ...`).
	
	An example of how each module type is configured is available in the “pnetd1.cfg” file (available module types).
		`Mod001 = ID:0x11 IN:1 OUT:0 #Mod001, INPUT_01B_1`
		`Mod002 = ID:0x12 IN:2 OUT:0 #Mod002, INPUT_02B_1`
		`Mod003 = ID:0x11 IN:1 OUT:0 #Mod003, INPUT_01B_2`
		`Mod004 = ID:0x12 IN:2 OUT:0 #Mod004, INPUT_02B_2`

3.	Save the file to the UGW.	

Note Further information on the “pnetd1.cfg” file, e.g. type, address, formats and other parameters can be found in the file itself or in the UGW manual from MBS GmbH. Information on all other configuration files of the UGW are shown here as examples.

4.2 Overview of the UGW configuration

The following overview shows you how the UGW configuration files relate to each other using pushbutton P1 as an example.

mbus1.cfg

```
[MBUS_S01073201]
Baudrate = 2400
```

mbus1.txt

```
[M S01073201 failure]
query = pe
name = P1 - failure

[X S01073201 value 1]
query = pe
name = P1 - value 1
```

dispatch.txt

```
[60.M mbus S01073201 failure]
target=1190.S pnetd inbit 0.0

[60.X mbus S01073201 value 1]
target=1190.Y pnetd inbyte 1
```

pned1.txt

```
[S inbit 0.0]
query = pe
format = BIT
name = P1 - failure

[Y inbyte 1]
query = pe
format = SINT16
name = P1 - value 1
```

pnetd1.cfg

```
Mod001 = ID:0x11  IN:1  OUT:0 #Mod001, INPUT_01B_1
Mod002 = ID:0x12  IN:2  OUT:0 #Mod002, INPUT_02B_1
```

4.3 STEP 7 (TIA Portal) device configuration

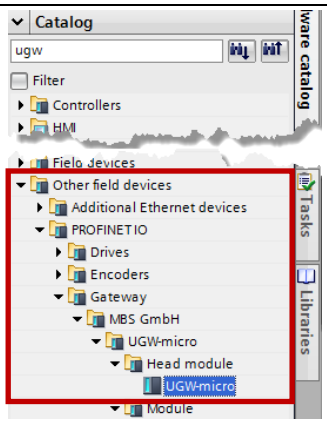
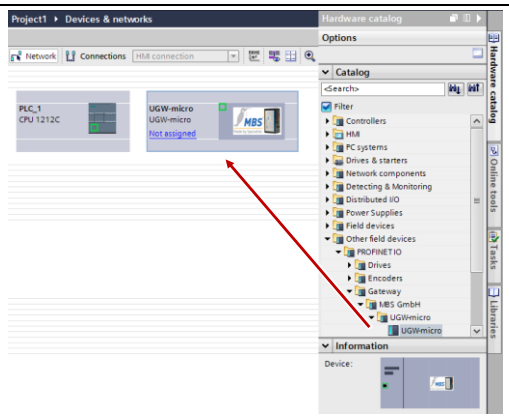
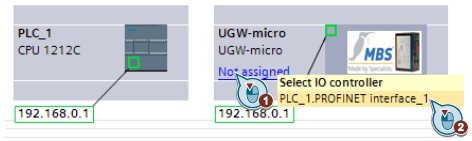
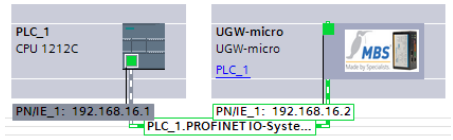
Note

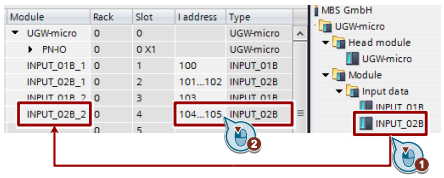
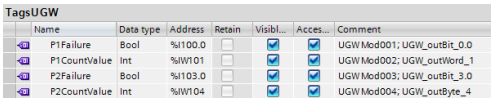
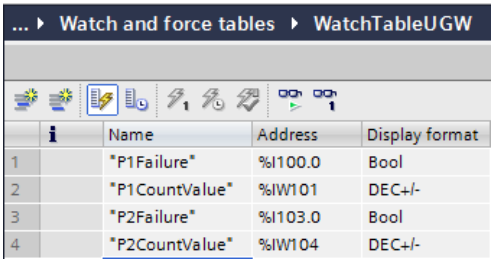
Before you can perform the UGW in STEP 7 (TIA Portal), you need to install the GSD file of the UGW.

To do this, simply open the STEP 7 project "109478527_MBus_S7_CODE_Vxx.zip". The GSD will then be automatically installed.

As an alternative to the following description, you can also open the preassembled programming example (109478527_MBus_S7_CODE_Vxx.zip).

Table 4-7: Device configuration UGW, PLC tag table and watch table in the TIA Portal

No.	Action	Notes
1.	Create a STEP 7 (TIA Portal) project, and insert an S7-1200 CPU (S7-1212 C DC/DC/DC FW4.1).	-
2.	Open the "Network view" in "Devices & networks". In the hardware catalog you navigate to head module "UGW-micro". Make sure that the firmware (V2.31) has been installed.	
3.	Use drag&drop to move UGW-micro from the hardware catalog into the "Devices & networks" editor.	
4.	Click on "not assigned" and select "PLC_1.PROFINET…".	
5.	Set the following IP addresses: S7-1200 CPU:192.168.16.1 UGW-micro: 192.168.16.2	

No.	Action	Notes
6.	Double-click on the UGW-micro to open the device view.	-
7.	Open the hardware catalog and equip the UGW-micro with the required modules (see chapter 4.1.6 UGW file “pnetd1.cfg”). Adjust the I/O addresses to the range from 100 onward.	
8.	Create the PLC tag table “TagsUGW” as in the figure on the right.	
9.	Create watch table “WatchTableUGW” with all of the tags.	

Note

A PLC program is not required for this simple example. All tags are monitored by means of the watch table.

Since the tags directly access the process image, no system blocks are necessary (SFC, SFB).

5 Installation and Commissioning

This chapter describes the steps necessary for commissioning the configuration files from this example.

Note

The following setup guidelines must generally be followed

- System manual “S7-1200 Automation System”
- UGW//micro manual

5.1 Installing the software

This chapter describes the steps for the installation of the software.

Table 5-1: Installing the software

No.	Action	Notes
1.	Install the current version of STEP 7 (TIA Portal) on your PG/PC.	As of STEP 7 (TIA Portal) V13 SP1
2.	As an option, install the configuration tool MBCONF (see Table 2-4: Software components) for configuring the M-bus devices from Relay.	Execute the file mbconf_setup_01.exe* or mbconf_setup.exe* and follow the installation instruction. * (File names on the installation CD or downloaded may differ)

5.2 Installing the hardware

5.2.1 Configuring the PadPuls M2C pulse adapter

Before the M2C can be integrated in the test setup, it must be configured. Doing this requires an M-bus master interface (PW3).

Figure 5-1: Configuration of the M2C

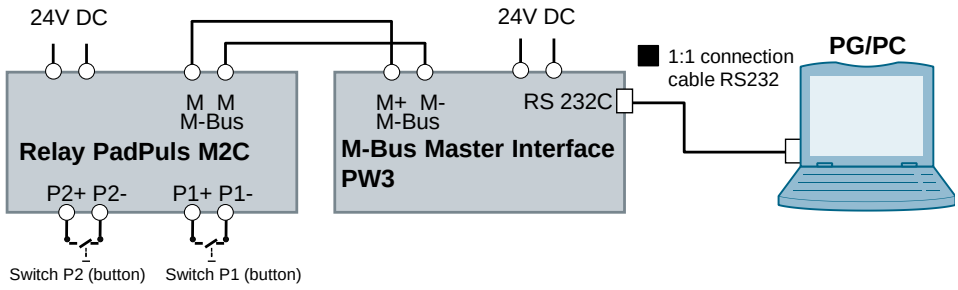
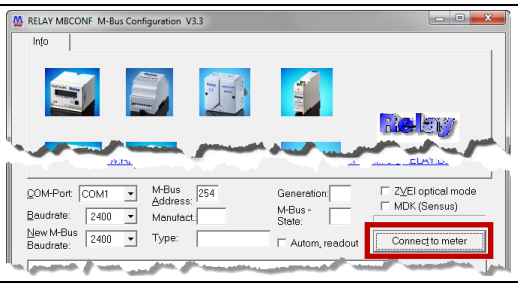
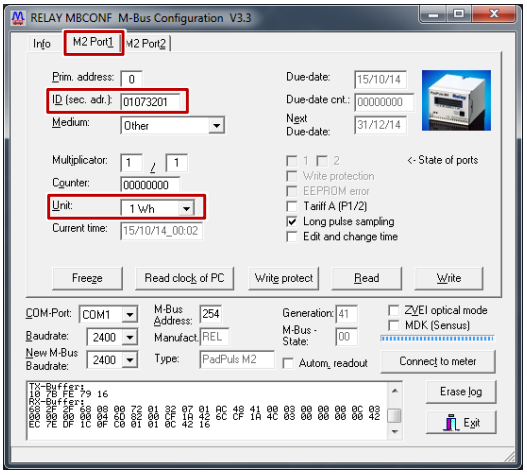


Table 5-2: Configuration of the M2C

No.	Action	Notes
1.	Connect the PW3 to the COM interface of your PC with a 1:1 RS232 connection cable.	-
2.	Start the configuration software “MBCONF”.	
3.	Click on the “Connect to meter” button.	
4.	Check if both ports have been found. The data points in the file mbus1.txt must correspond to the addresses displayed in the “ID” field. The “Unit” field is used to specify the measurement unit. In this example, “1Wh” was selected. Configuration of port 2 is identical to port 1. Only “ID” and “Prim address” are different: M2 Port1: ID: 0107320**1**; Prim address: **0** M2 Port2: ID: 0107320**2**; Prim address: **1**	
5.	This concludes the configuration of the M2C. The setup from Figure 5-1: Configuration of the M2C is no longer required.	-

5.2.2 Setup under laboratory conditions

For the function test of this application under laboratory conditions, the following setup using a switch is the best option. This helps operating all of the following functions (see advantages) simultaneously with a single PG/PC. This is possible since the S7 1200 and the UGW are based on Ethernet. The setup also includes an M-bus device for testing purposes.

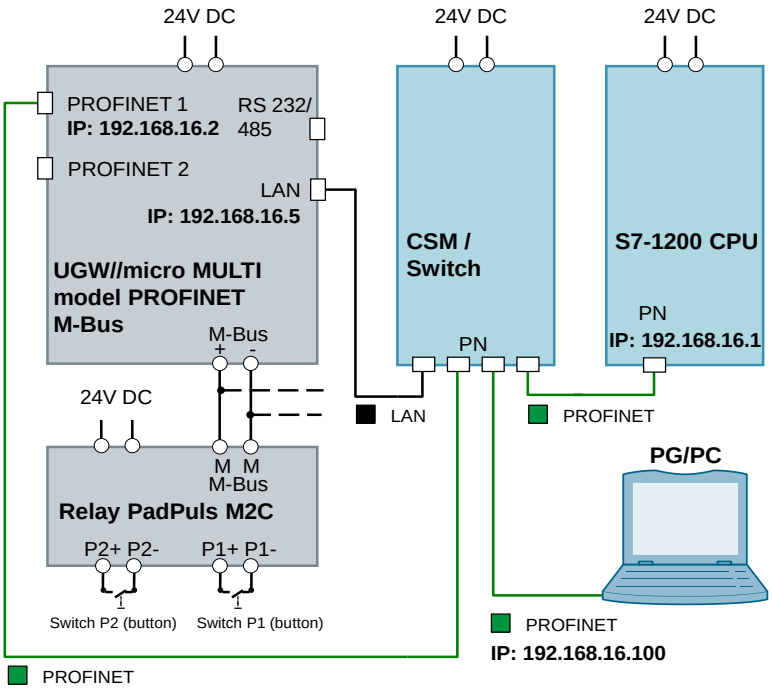
Advantages:

- STEP 7 (TIA Portal) online functions → S7-1200 CPU test
- UGW web server → Configuring the M-bus

Disadvantages:

- PROFINET and LAN interfaces not separated in terms of topology at the UGW.
- The IP base addresses of all devices must be identical.

Figure 5-2: Setup under “laboratory conditions”



5.2.3 Setup under plant conditions

Under “real” conditions, two larger network topologies are normally interconnected via a UGW, for example, a network of several SIMATIC PLCs (PROFINET) with a network of metering devices (M-bus). The UGW is integrated here into a PROFINET network via both PROFINET interfaces, and connected with the M-bus network via the two-wire line.

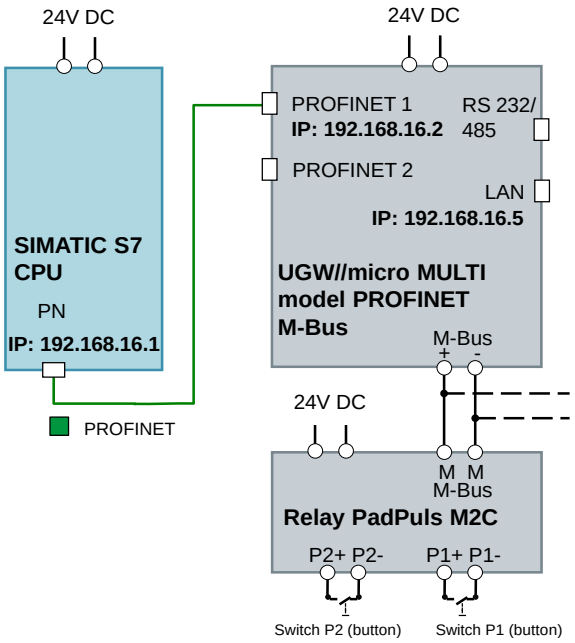
Advantages:

- PROFINET and LAN interfaces are separated in terms of topology at the UGW.

Disadvantages:

- A simultaneous connection between PG/PC and UGW web server and S7-1200 is not possible.

Figure 5-3: Setup under plant conditions



5.3 Commissioning

This chapter describes the steps for loading the example code into the S7-1200 CPU and the UGW.

Note

For some actions in the UGW web server you require a user name and password.

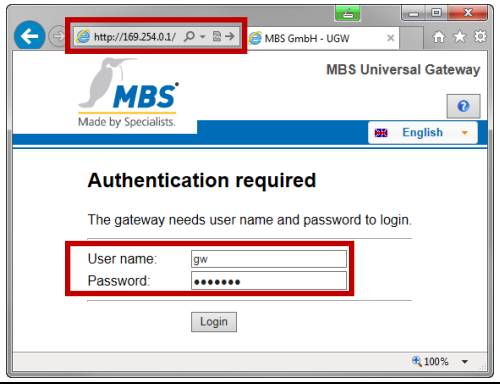
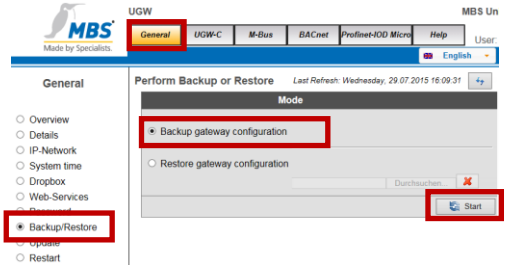
Standard setting (in the as-supplied state):

User name: gw IP: 169.254.0.1
Password: GATEWAY

If this login doesn't work, read the UGW manual or contact MBS GmbH.

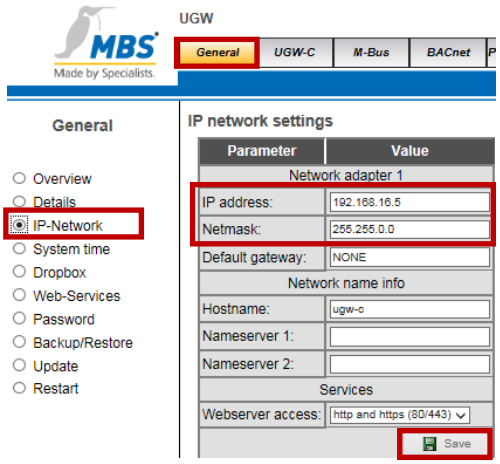
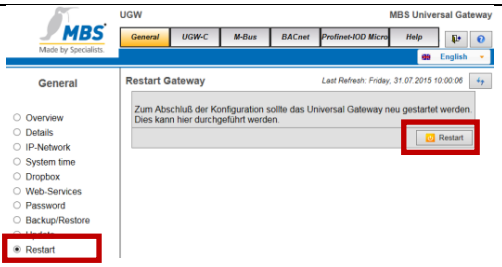
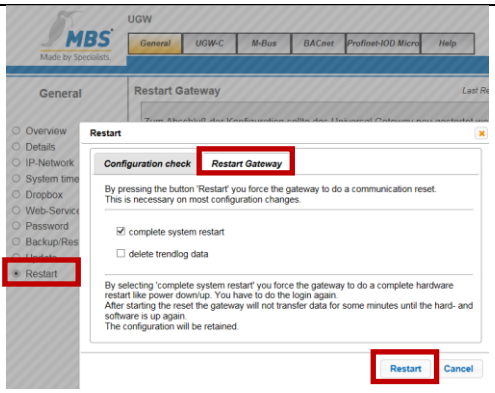
5.3.1 Backing up data of the UGW

Table 5-3: Backing up data of the UGW

No.	Action	Notes
1.	Make sure that, • your PC is located in the same subnet as all of the involved components, • all of the components are interconnected via LAN cable, • all of the components are connected to a power supply and switched on.	See chapter 5.2 Installing the hardware
2.	Start your preferred web browser and connect with the web server integrated in the UGW. The default settings are: • IP address: 169.254.0.1 • User: "gw" • Password: "GATEWAY"	
3.	When required, save all UGW configuration files with the "Backup/Restore" menu to be able to restore the delivery state if needed (see UGW menu option "Help > Online help"). Go to the "General > Backup/Restore > Backup gateway configuration" menu option to perform a data backup. Click on "Start" and follow the menu navigation.	 The UGW assigns the following default name for the backup file: "ugwbackup.zip" for 169.254.0.1

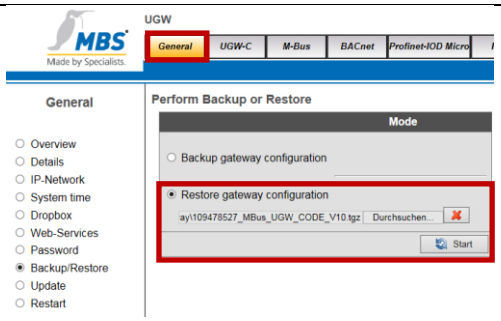
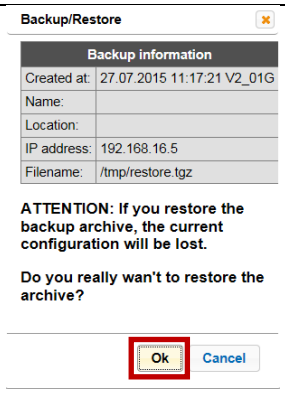
5.3.2 Setting the UGW IP address

Table 5-4: Setting the UGW IP address

No.	Action	Notes
1.	To set the LAN interface IP, go to “General > IP-Network”.	
2.	Change the IP address to: 192.168.16.5 click on “Save” to save the setting. Set the IP address of the PC to 192.168.16.100. After downloading the STEP 7 (TIA Portal) example projects, this places all IP addresses into the same subnet.	
3.	Restart (reboot) the UGW. Click the “Restart” button.	
4.	Click the “Restart Gateway” register, tick the “Complete system restart” checkbox. Click the “Restart” button and follow the menu navigation. The gateway is restarted. You will have to log in again at the UGW after that. In case of problems with the password, reset your browser and restart the UGW (power recovery).	

5.3.3 Loading existing configuration files to the UGW

Table 5-5: Loading existing configuration files to the UGW

No.	Action	Notes
1.	Unzip the file “109478527_MBus_UGW_CODE_Vxx.zip“ (e.g. with “7-Zip”).	As a result, the file “109478527_MBus_UGW_CODE_Vxx.tgz” is output.
2.	To load the configuration file from this application example to the UGW, click on “Restore gateway configuration” and “Browse”. Navigate to the file “109478527_MBus_UGW_CODE_Vxx.tgz”.	
3.	Then click on “Start” and in the subsequent window “OK”. The contained data are unpacked and directly loaded to the UGW. **The following files are overwritten in the UGW:** • bac1.cfg • bac1.txt • dispatch.txt • driver.cfg • gateway.cfg • mbus1.cfg • mbus1.txt • ntp.cfg • pnetd1.cfg • pnetd1.txt • ugwc1.cfg • ugwc1.txt	 The UGW must then be restarted (see chapter 5.3.5 Resetting the UGW).

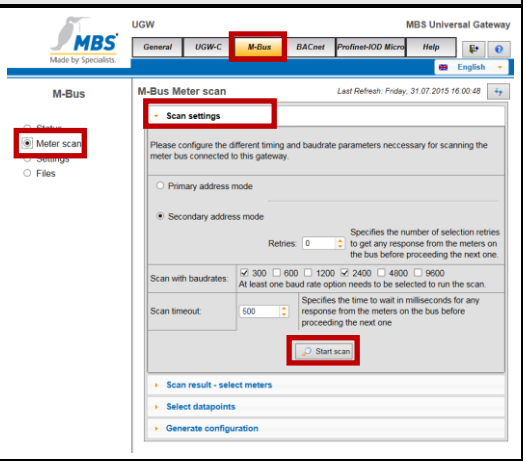
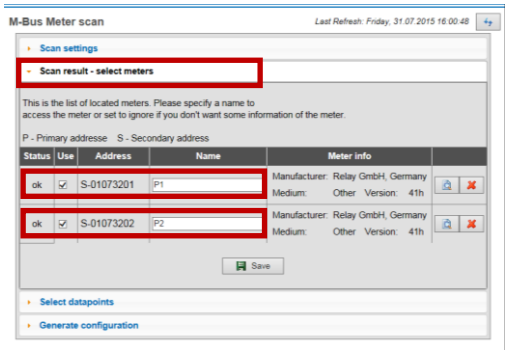
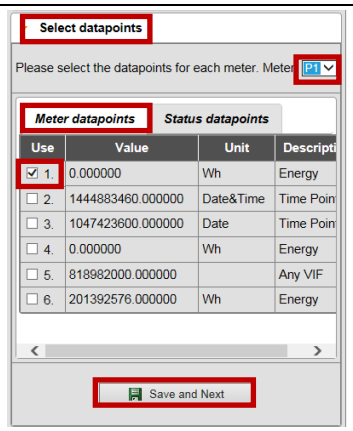
5.3.4 Creating the configuration files automatically

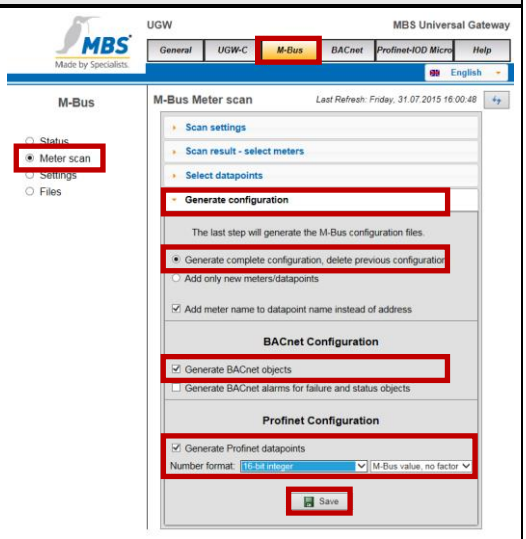
You also have the option to have the configuration files created automatically by the UGW. For this, all M-bus participants must be at the M-bus and must be switched on.

We recommend this option to create the configuration files, because you require less know-how on configuration files and errors in the configuration are thus ruled out.

NOTE An existing configuration in the UGW will be overwritten.

Table 5-6: Automatic commissioning of the UGW

No.	Action	Notes
1.	Click on the M-bus register and on the option “Meter scan”. Click the “Start scan” button and the menu option “Scan settings”. The M-bus is then scanned.	
2.	The program will automatically proceed to the menu option “Scan settings”. Verify the M-bus participants found. The addresses correspond to the data points in the file mbus1.txt. Save the scan result by clicking “Save”.	
3.	The program will automatically proceed to the menu option “Selected datapoints”. In the “Meter datapoints”, tick “Use” in the first option box. Repeat the steps for meter P2. Save the setting with “Save and Next”.	

No.	Action	Notes
4.	The program will automatically proceed to the menu option “Generate configuration”. Activate the following option boxes or tick the following option boxes: • Generate complete configuration, .. • Add meter name to datapoint .. • Generate Profinet datapoints Select from the drop-down lists: • Number format: 16-Bit Integer • M-bus value, no factor Click the “Save” button. All required configuration files will be created. These files are available in the UGW.	
5.	The file “pnetd1.cfg” must be created manually.	

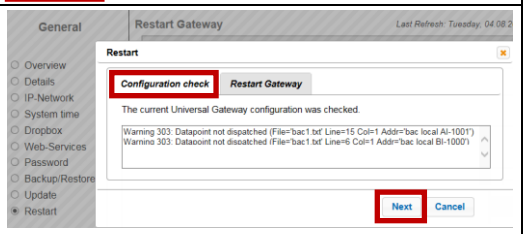
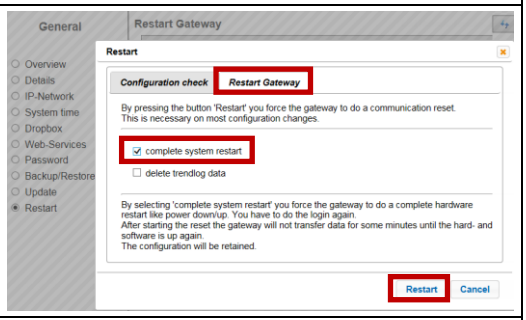
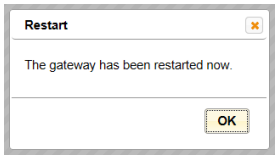
6.	In this example, one “module” is configured for each PROFINET data point (`Mod001, Mod002, ...`).
	
	An example of how each module type is configured is available in the “pnetd1.cfg” file (available module types).
		`Mod001 = ID:0x11  IN:1  OUT:0`
		`#Mod001, INPUT_01B_1`
		`Mod002 = ID:0x12  IN:2  OUT:0`
		`#Mod002, INPUT_02B_1`
		`Mod003 = ID:0x11  IN:1  OUT:0`
		`#Mod003, INPUT_01B_2`
		`Mod004 = ID:0x12  IN:2  OUT:0`
		`#Mod004, INPUT_02B_2`

7.	Save the file to the UGW.	

5.3.5 Resetting the UGW

Note After changing the configuration files on the UGW, you need to restart it.

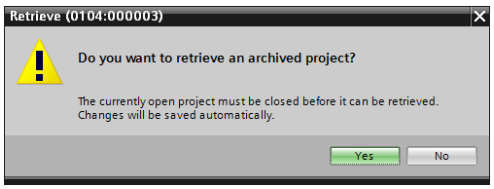
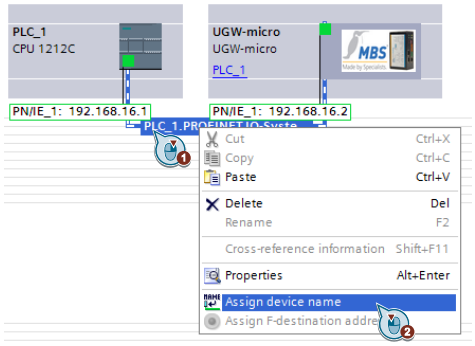
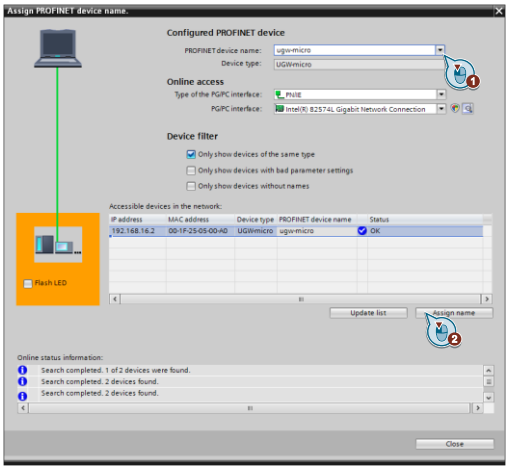
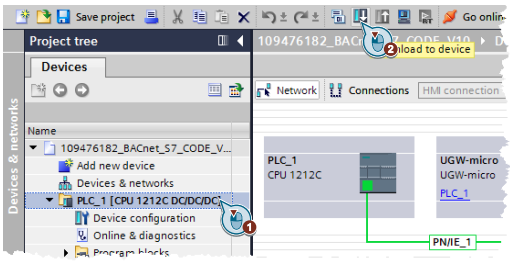
Table 5-7

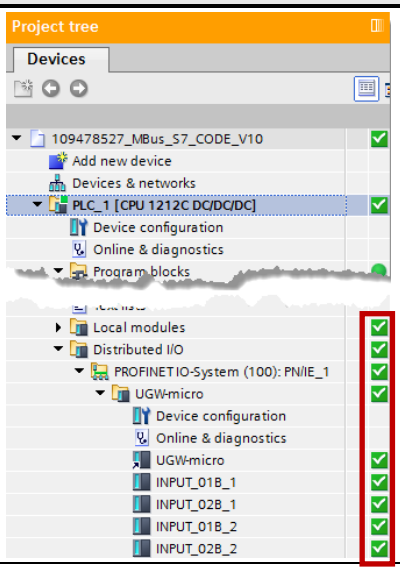
No.	Action	Notes
1.	For a restart, go to the “General > Restart > Restart” menu option.	
2.	In the “Configuration check” register, the UGW will automatically verify the configuration files and displays errors and warnings and in which file in which line the cause can be found. Check the corresponding files. When the current configuration in the UGW is correct, click “Next”.	 The UGW also has driver data for BACnet. The configuration files for BACnet will be created automatically, if the automatic configuration is carried out. This has no impact on M-bus and PROFINET functioning. These warnings can be ignored in this application example.
3.	In the “Restart Gateway” register, tick the “complete system restart” option box and confirm with clicking on “Restart” and follow the menu navigation.	
4.	After the restart is complete, the successful restart is displayed. You have to log in again after the UGW has been restarted (see Table 5-3 point 2). The “OK” button takes you to the “Authentication” screen.	

Note In the case of error messages after transferring the txt and cfg files to the UGW with the correct configurations, the comments line (#...) might be the cause. In this case, the comments line must be written to a separate line.

5.3.6 Commissioning the S7-1200 CPU

Table 5-8: Commissioning the S7-1200 CPU

No.	Action	Notes
1.	Start the STEP 7 (TIA Portal) and unzip the project from “109478527_MBUS_S7_CODE_Vxx.zap13”.	
2.	Open “Devices & Networks”.	-
3.	Right-click on the connection and select “Assign device name”.	
4.	Assign the device name to S7-1200 CPU and UGW using the “Assign name” button.	
5.	In the project navigation, select the S7-1200 CPU (here PLC_1) and click on the “Download to device” button in the menu bar.	
6.	Acknowledge the Download dialogs and set the S7-1200 CPU to RUN mode.	After the download, your PROFINET IP addresses were also assigned to the devices.

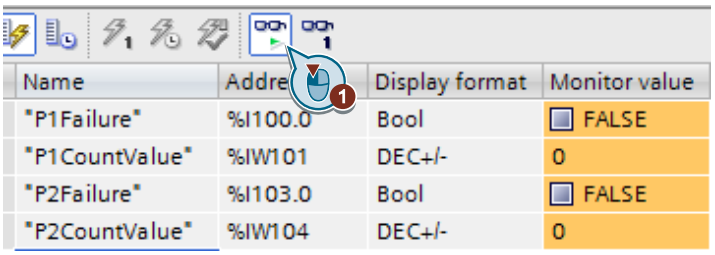
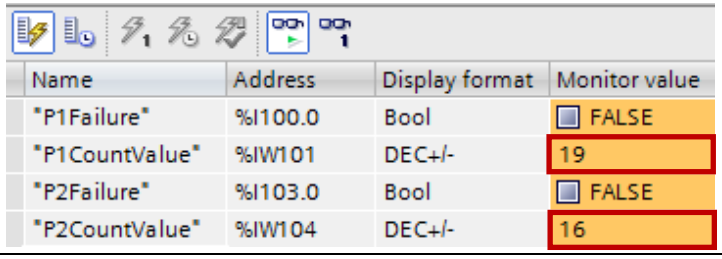
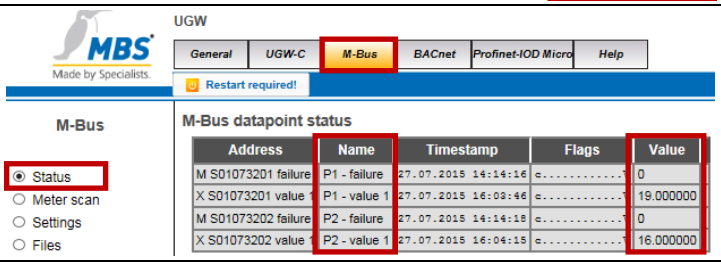
No.	Action	Notes
7.	Select the S7-1200 (PLC_1) in project navigation and click on “Go online” in the menu bar. When everything was parameterized and downloaded correctly, all icons turn green.	

6 Operating the Application Example

Monitoring values on the SIMATIC side

Since no program was created in S7-1200, the tags are monitored with the watch table.

Table 6-1: Monitoring the meter values in the watch table in TIA Portal and in the M-bus status

No.	Action	Notes
1.	In STEP 7 (TIA Portal) open “WatchTableUGW”.	
2.	Click the “Monitor all” button.	
3.	Press the buttons P1 and P2 to generate meter pulses at the M2C pulse adapter. The meter values are displayed in the watch table.	
4.	In addition, you can verify the values in the UGW which are sent via the M-bus. To do this, go to “M-bus > Status”.	

7 Links & Literature

Table 7-1

	Topic	Title
\1\	Siemens Industry Online Support	https://support.industry.siemens.com/cs/start?lc=en-DE
\2\	Download page of the entry	https://support.industry.siemens.com/cs/ww/en/view/109478527
\3\	System Manual SIMATIC S7-1200 automation system	http://support.automation.siemens.com/WW/view/en/53741769
\4\	Update of the S7-1200 system manual	http://support.automation.siemens.com/WW/view/en/89851659
\5\	UGW Manual	The “MBS Gateways” Manual can be found directly on the UGW. • Enter the IP address of the UGW LAN interface and then click on the “Help” menu and the option box “Online help”.

8 Contact MBS GmbH

Figure 8-1: Contact MBS GmbH

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9 History

Table 9-1: History

Version	Date	Modifications
V1.0	09/2015	First version