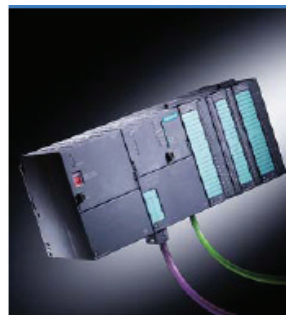# How to configure an Anybus PROFINET IO Slave module with a Siemens Step7 PLC

More information about the network and products

The most recent manuals and GSD files for the Anybus PROFINET IO modules can be found on the HMS webpage www.Anybus.com.

The PROFIBUS & PROFINET International has a webpage on the Internet: www.profinet.com. Several technical guides are available in or via this page.

For information concerning the PLC and the PROFINET IO Controller system refer to the Siemens homepage http://www.automation.siemens.com/_en/portal/index.htm

History

Revision	Date	Description	Author
1.00	2007-08-08	Created	Thorbjörn Palm
1.10	2007-12-07	Released	Thorbjörn Palm
1.11	2008-03-10	Updated layout	Thorbjörn Palm

Contents

1. Applicable Anybus products

Description	Name / Type
Anybus X-gateway	PROFINET IO
Anybus Communicator	PROFINET IO
Anybus-Slave	PROFINET IO
Anybus CompactCom	PROFINET IO
Anybus-PCI	PROFINET IO

2. Requirements

Description	Name / Type	Version
Siemens S7 PLC	CPU 315-2 DP	6ES7 315-2AF02-0AB0
Siemens PLC programming cable	n.a.	n.a.
PC with Siemens PLC programming software	Simatic Step7	5.4.1.0
GSD file for the Anybus-S Slave Interface, Anybus-PCI and the X-gateway Slave Interface	GSD-V1.0-Hms-ABSPRT-20070221.xml	1.0
GSD file for the Anybus Communicator	GSD-V1.0-HMS-ABCPRT-20050317	1.0
GSD-file for the Anybus CompactCom	n.a.	n.a
X-gateway Network Interface Addendum	Anybus X-gateway PROFINET IO, Network Interface Addendum	1.01
X-gateway User Manual	X-gateway Generic , User Manual	1.10
Communicator User Manual	Anybus Communicator for PROFINET IO, User Manual	2.01
Slave Fieldbus Appendix	Anybus-S PROFINET IO, Fieldbus Appendix	2.00
Configuration cables	n.a.	n.a.
Null modem cable (Supplied with the Anybus X-gateway)	n.a.	n.a.
Power supply 24VDC	n.a.	n.a.

Note: The GSD files can be downloaded at the website www.Anybus.com.

3. Solution overview

Below you find an overview of the system configuration that is described in this document. In this case the Anybus Communicator and the Anybus X-gateway are used as an example. Other nodes may be attached to the network, but are not necessary.

Note: This document is valid for all Anybus Slave PROFINET IO modules. However sections written in *italics* describe the configuration of a specific product.
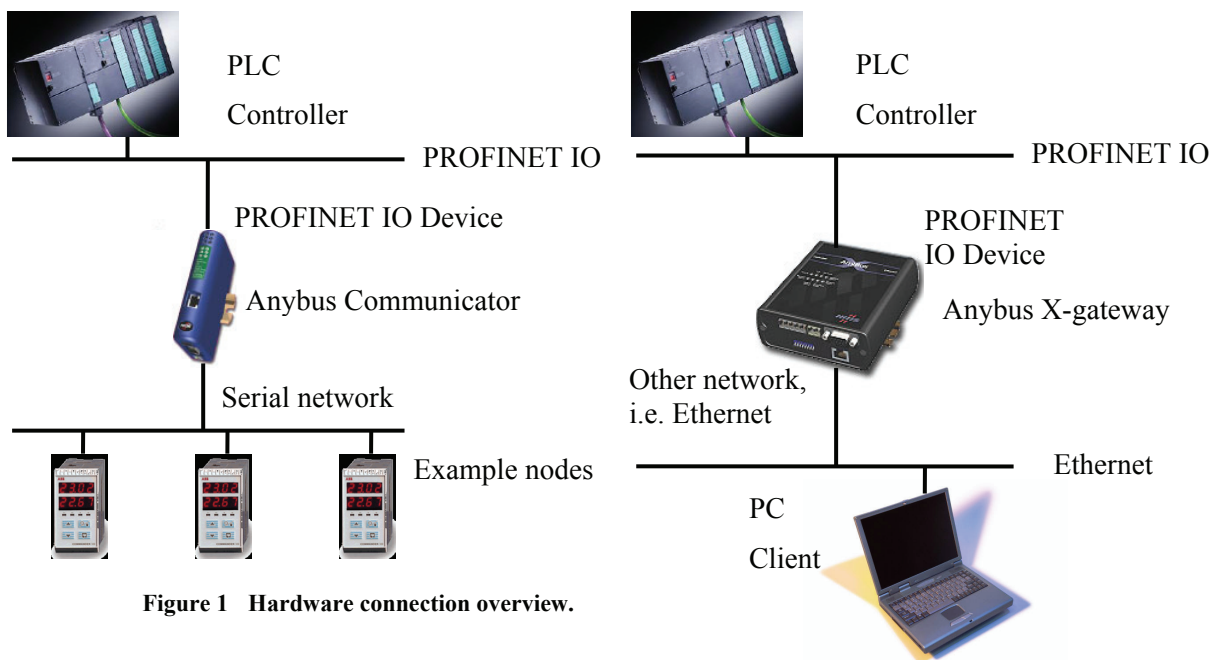

Figure 1 Hardware connection overview.

4. PLC configuration

The PLC system hardware configuration is done solely with the Siemens Step7 tool.

In order to configure the bus it is necessary to set up the PLC and Controller hardware first. In this example we are using an S7315-2 CPU and a 2A power supply with a standard rack. Start the Simatic software and create a new project. Right click on the project name, in this case Default and insert a Simatic 300 Station as shown below.
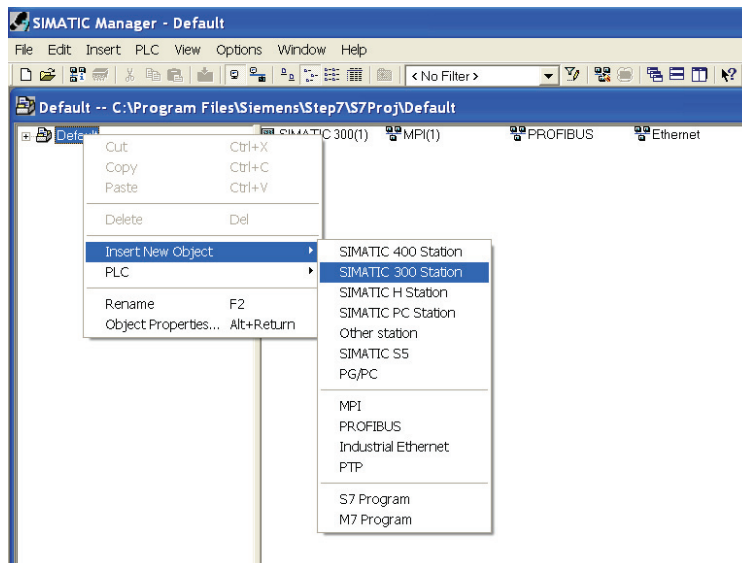

Figure 2   Inserting a new PLC.

Then double click on the new SIMATIC 300 station and on Hardware to open the hardware configuration.
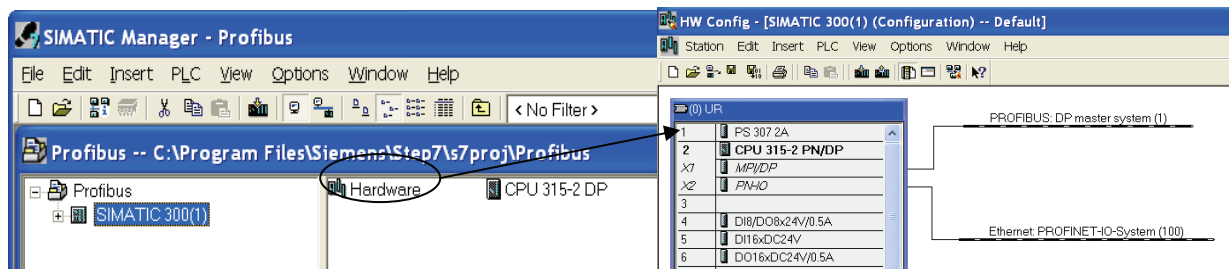

Figure 3   Opening the hardware configuration. The right figure shows the network when completed.

Add a rail, the power module, the PLC and the PROFINET module as shown below. In this case the PLC is configured for both PROFIBUS and PROFINET. In this case slots 4-6 are used for I/O modules.
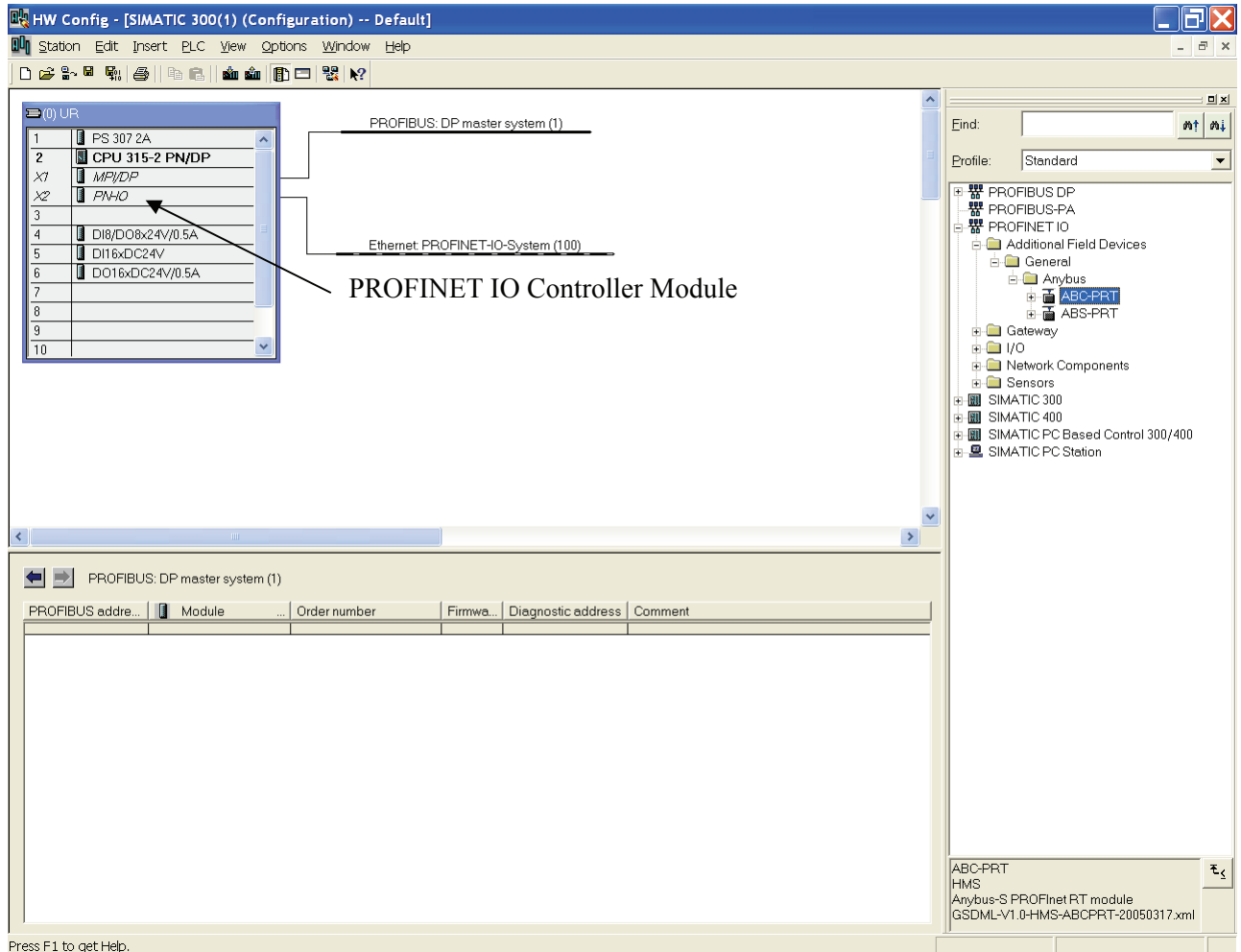

Figure 4   Adding the hardware to the configuration.

The next step is to double click on the PN-IO, PROFINET IO Controller module, to configure the PROFINET IO network. Click on properties in the dialogue as shown below.
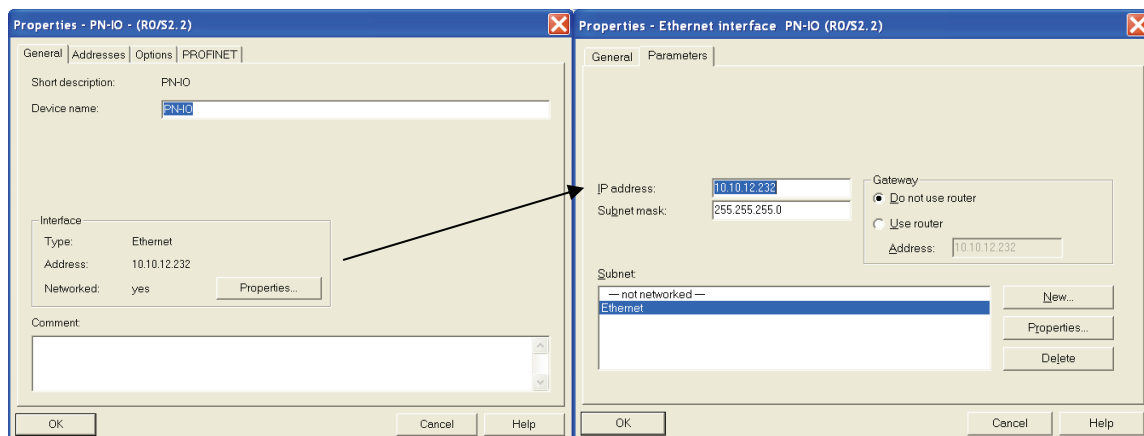

Figure 5   Changing the properties of the PROFINET IO module and defining a new PROFINET IO network.

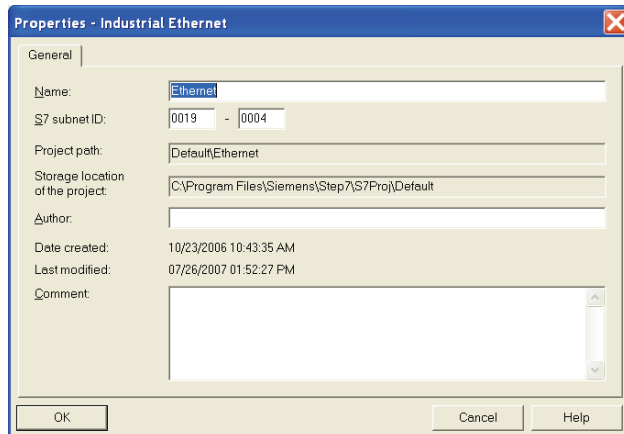Then click on new to define a new network.

Figure 6   Configuring the properties of the PROFINET IO network.

Select the desired settings and press OK.

When the PLC hardware is set up it will look like described in the figure below. In this case a PLC with both PROFIBUS and PROFINET modules are configured.
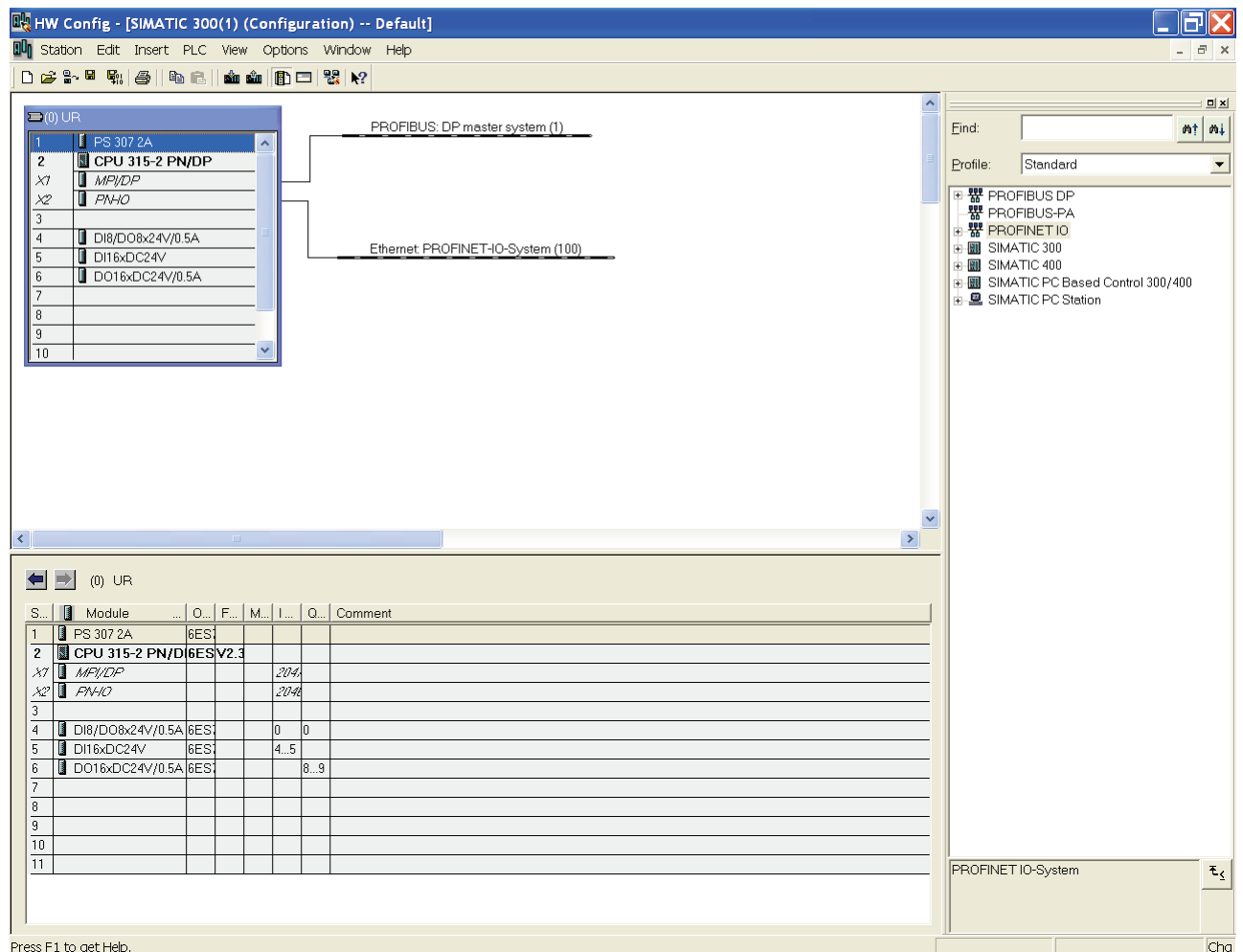

Figure 7   PLC with empty bus.

5. PROFINET IO configuration

It is then necessary to configure the Anybus module itself. Firstly the GSD-file has to be imported. This is described in the following chapter. Then the IP address has to be configured. Finally the input and output data area sizes and offset address for the PLC memory are to be configured.

5.1. Importing the GSD file

It is necessary to import the Anybus GSD-file to the configuration tool in order to include the Anybus Module. In this case an Anybus Slave module is added as a slave in the network. The GSD-file can be downloaded at HMS[1] webpage.
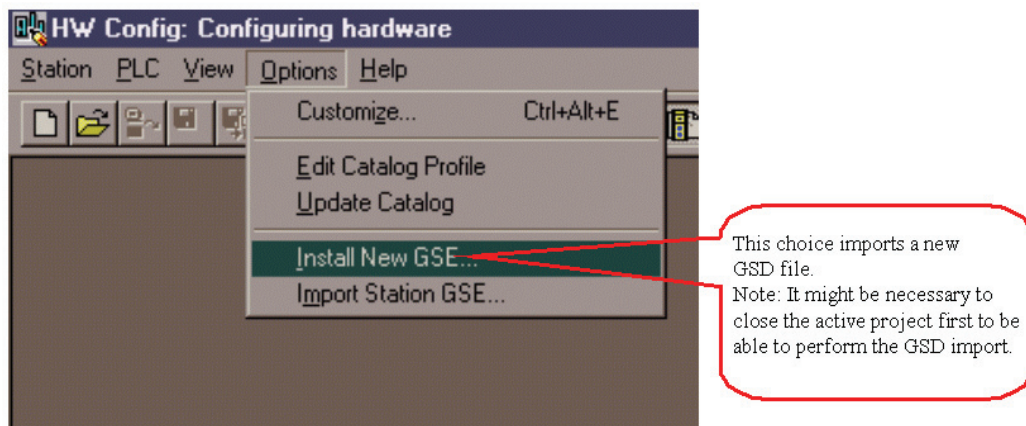

Figure 8   Install a new GSD file in "HW Config".

Open the Options menu as seen above and select Install New GSE.

5.2. Adding the Anybus module to the configuration

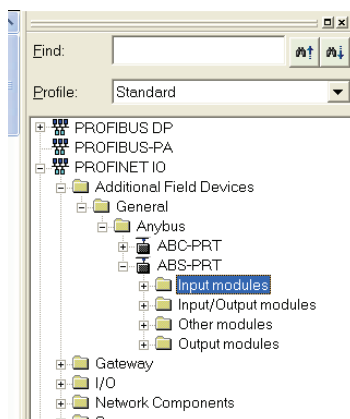The Anybus module can be found in the hardware catalogue after the GSD file has been imported.

Figure 9   The Anybus module in the Hardware Catalogue.

It is now possible to include the Anybus slave in the network.

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[1] www.anybus.com

Open up the "Anybus-S PRT" entry in the hardware catalogue and drag and drop the Anybus module on to the network, see description in Figure 10.
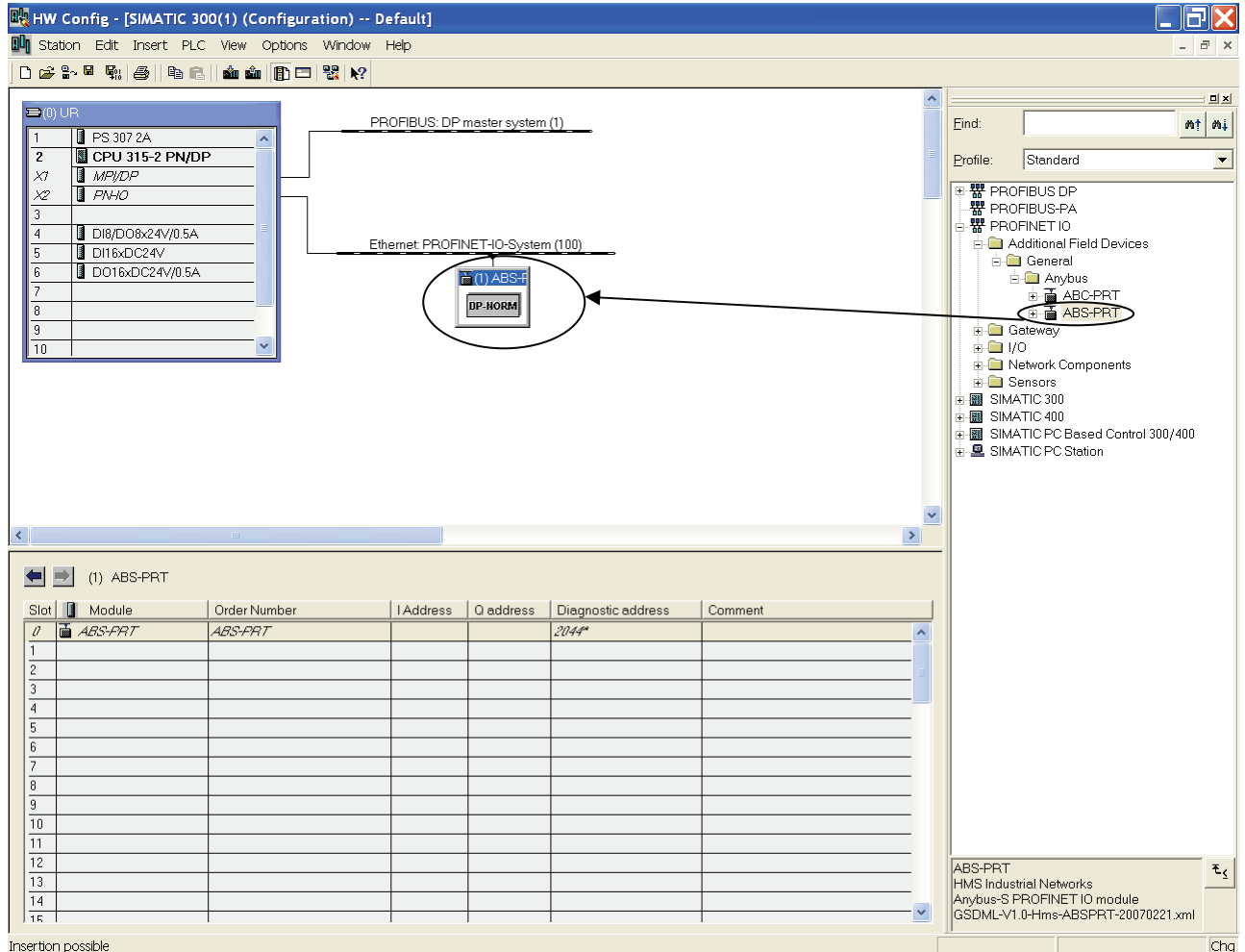

Figure 10 Drag and drop the Anybus module to the network.

5.3. Configuring the IP address and Device name

Each node on the PROFINET network has to have a unique IP address and Device name. A description of how to configure the Device name and IP setting follows below.

To assign the Device Name open the PLC menu and select the Edit Ethernet Node function as seen below.
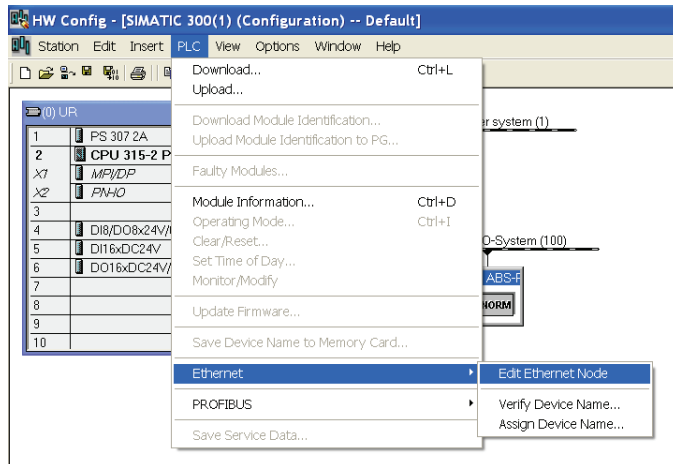

Figure 11 Opening the Edit Ethernet Node function.

After selecting the Edit Ethernet Node function, press the browse button and start scanning the network.
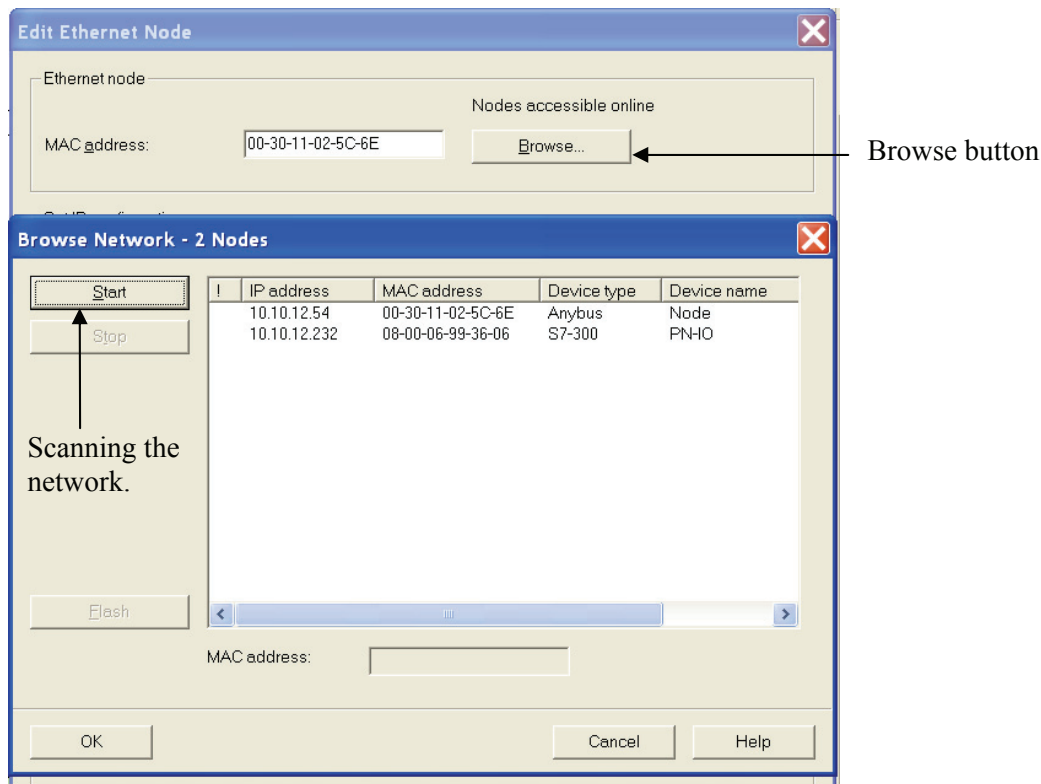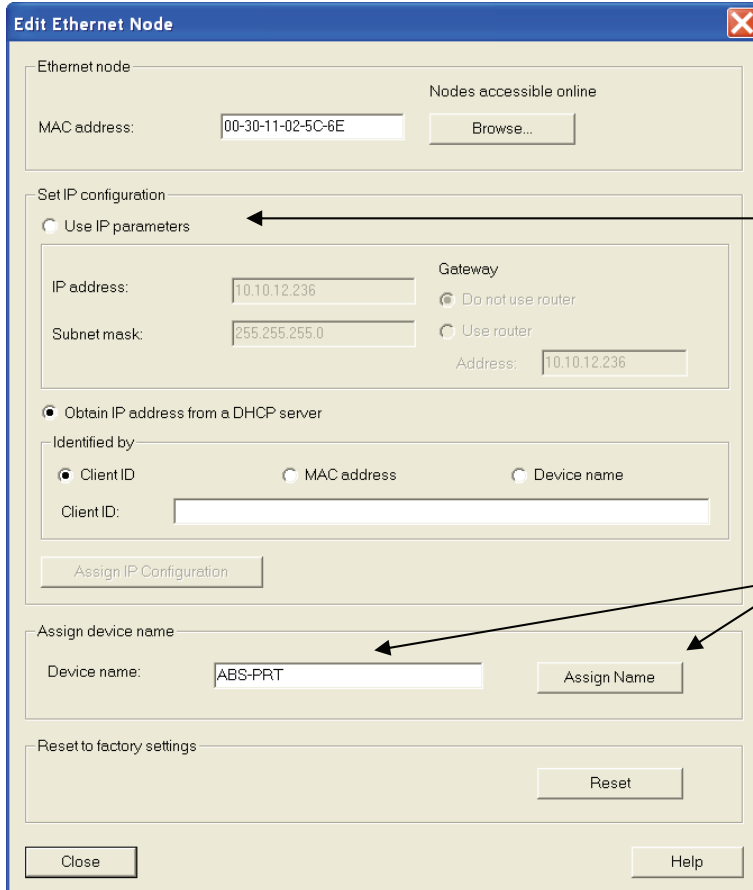

Figure 12 Browsing the Ethernet Nodes.

Then select the desired node to edit and click on OK. The module is easily identified by the MAC ID.

When this is done assign the node the desired Device Name. If desired it is also possible to set the IP settings manually as shown below.

Setting the IP settings manually

Device name configuration

Figure 13 Assigning the Device Name.

When the Anybus PROFINET IO module is to be used for the first time in the network, a Device Name needs to be set for the module. The Device Name must be unique within the network. The name assigned in this case is ABS-PRT. After editing the Device name make sure to press the Assign Name button.

When the Device Name has been set it must be verified that the same Device name is used in the Hardware configuration. To do this double click on the Anybus module in the hardware configuration as shown in Figure 10 Drag and drop the Anybus module to the network. The window shown below will then appear.
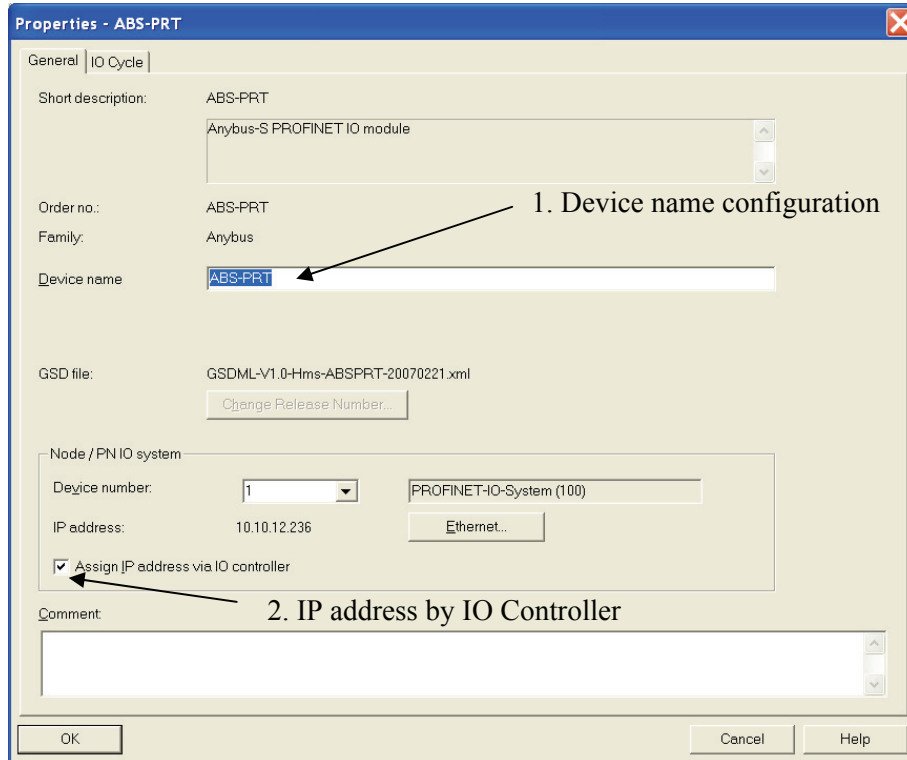

Figure 14 Verifying the Device Name.

The first step is to check out the used Device Name❶. Verify that the same name is used as assigned to the Anybus module as shown in Figure 13 Assigning the Device Name.

Secondly the recommendation is to let the IO Controller to set the IP address, but it is also possible to configure the IP address manually by unchecking the box❷.

5.4.   I/O configuration

The choice of module(s) you like to use depends on what your application demand is. It is possible to choose these modules freely and to compose the I/O sizes needed, see examples in the table below.

Bytes needed by the application	Modules to use
4 In + 2 Out	4 In + 2 Out
7 In + 12 Out	4 In + 2 In + 1 In + 8 Out + 4 Out
32 In + 32 Out	32 In/Out
68 In	64 In + 4 In

Note: Reading or writing more than four bytes consistent data from the I/O image, see the next chapter.

Expand the Anybus-S PRT tree in the navigation list to the right. The modules are then displayed together in the "module list" of the Anybus module as shown in the figure below.
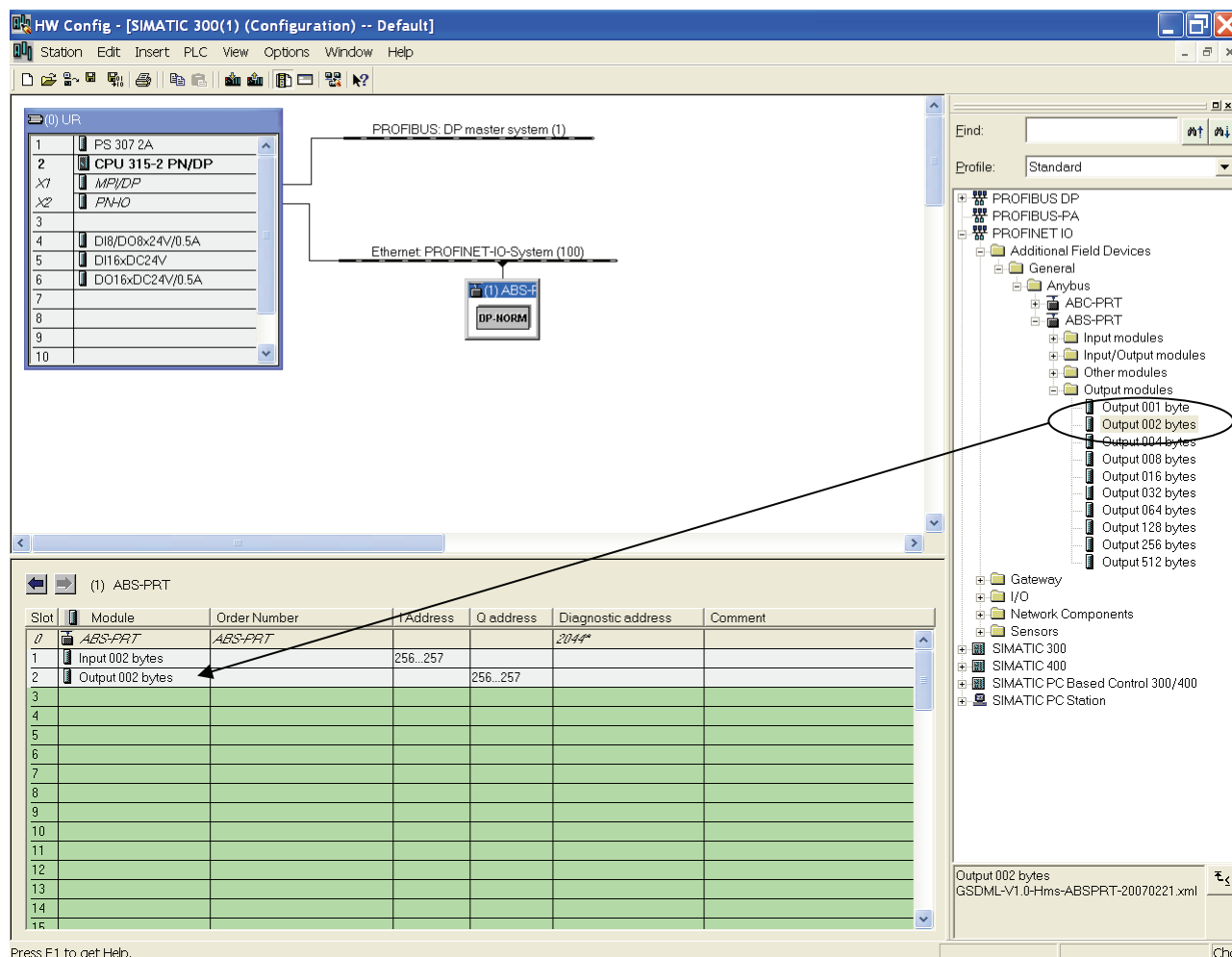

Figure 15 Selecting Input and Output modules with "Drag and Drop".

By double clicking on a module in the "module list" it is possible to set the offset addresses. See example in the next figure.
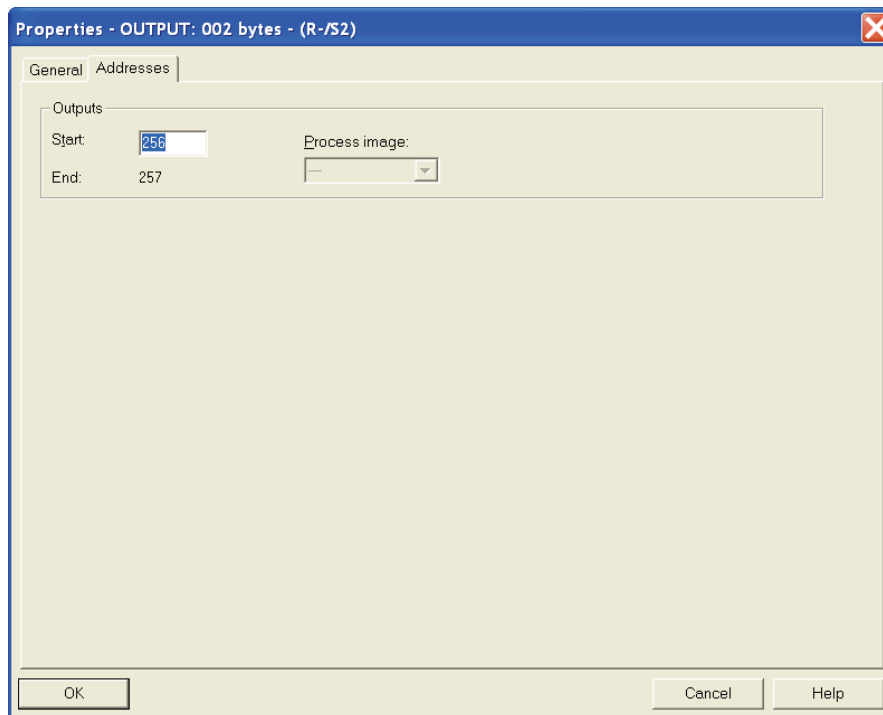
Figure 16 Adjusting the offset address.

The offset addresses can be chosen freely but certain restrictions may apply depending on what CPU is used.

When all the above settings are done it is possible to perform a download of the configuration to the PLC. Press the Save and Compile button and then the Download button.
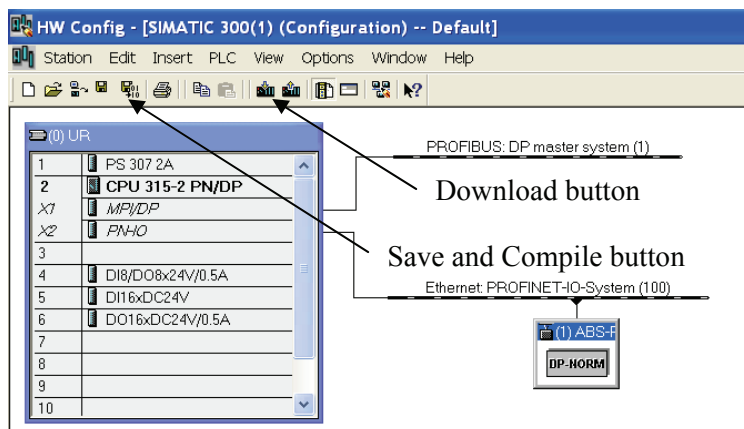

Figure 17 Downloading the configuration to the PLC.

The bus will then go online and start data exchange when the PLC is set to run mode.

5.5.   I/O configuration using data consistency

The S7 PLC can read out one, two or four bytes consistent from the I/O-image directly by accessing the data as a Byte, a Word or a Double Word. If it is required to read out other consistent data areas it is necessary to use the System Function Blocks SFC14 and SFC15. A convenient way to execute the System Function Blocks is to use the Block OB1 for the program.

The first thing that has to be done is to specify the consistent data area in the hardware configuration. Select the desired modules with "drag and drop" as shown in Figure 18. The modules will have the size 8 bytes or more. In this example 8 bytes of consistent input and output data is configured. For smaller modules the Siemens PLC can handle the data consistency without using any special System Function Blocks.
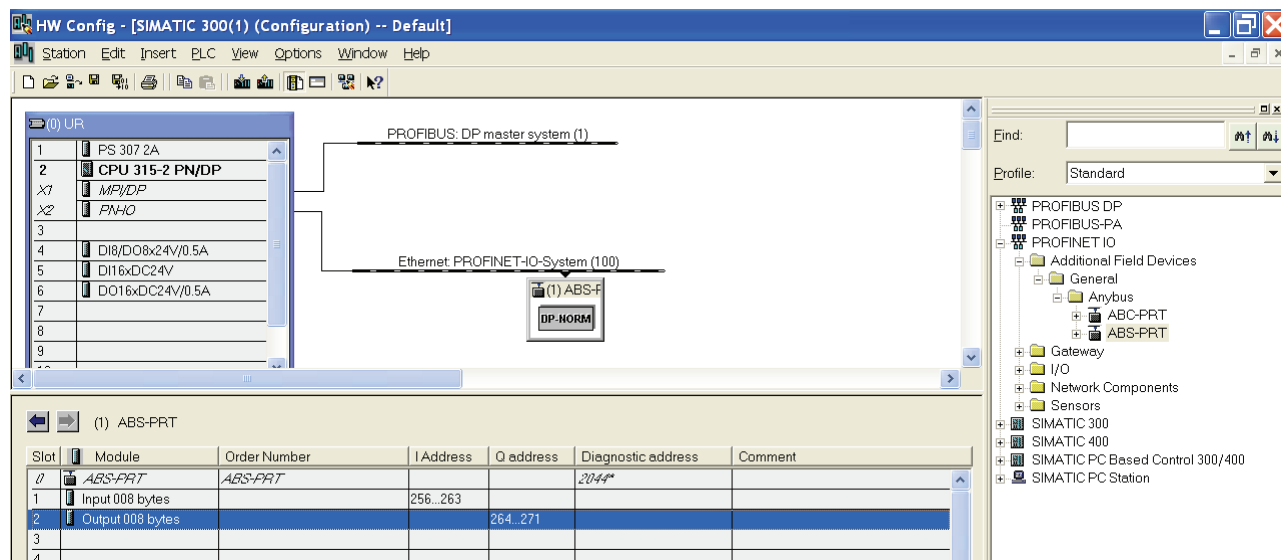

Figure 18 Selecting modules for consistent data transfer.

To read out the consistent data specified in Figure 18 a PLC program has to be written that uses SFC14 and SFC15. An example of this is shown in Figure 19. These two SFC:s are included in the Step7 standard package and they also have to be imported into the active project. They can be copied from the "Standard Library" or from the CPU online. Refer to the Step7 documentation for details regarding this.

The function blocks ensure that data consistency is secured over the complete data length. Where the data is to be read or put in the process image is decided in the hardware configuration, see Figure 18.

Note: Data consistency can only be secured for one module only. Using several modules one SFC for each module has to be used.

SFC14 Input data

The purpose of SFC14 is to read out the data from the Input area of the process image and then copy the data to another storage location.

LADDR: specifies the start byte address of the data to be read. The value is entered in Hex. In this case the start byte address is 256 (=100 Hex) which can be found in Figure 18.

RET_VAL: Storage location for error messages. This is a Word, in this case MW4.

RECORD: This is where the data is copied to. In this case it is copied to memory byte 10 to 17. (i.e. MB10-MB17). The length must equal the length set in Figure 18.

SFC15 Output data

The Purpose of SFC15 is to read the data from any storage location and then copy it to the Output area of the process image.

LADDR: specifies the start byte address of the data to be sent. The value is entered in Hex. In this case the start byte address is 264 (=108 Hex) which can be found in Figure 18.

RET_VAL: Storage location for error messages. This is a Word, in this case MW6.

RECORD: This is where the data is read from. In this case it is read from memory byte 48-55. (i.e. MB48-MB55). The length must equal the length set in Figure 18.

The data can then be processed as desired (i.e. as byte, word, double word or bit wise) at the other storage location specified at RECORD.
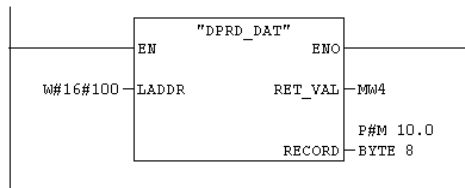
In the example below (Figure 19) it is described how the PLC program can be done.

```
OB1 :  "Main Program Sweep (Cycle)"
Comment:

Network 1 : SFC 14 Read data from PROFINET IO slave
Comment:

                    "DPRD_DAT"
              EN              ENO
W#16#100 — LADDR      RET_VAL — MW4
                              P#M 10.0
                    RECORD — BYTE 8

Network 2 : SFC 15 Send data to PROFINET IO slave
Comment:

                    "DPWR_DAT"
              EN              ENO
W#16#108 — LADDR      RET_VAL — MW6
P#M 48.0
   BYTE 8 — RECORD
```
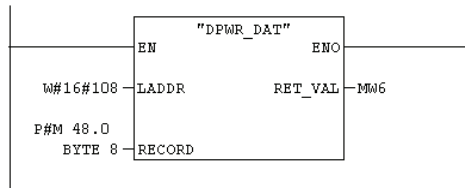
Figure 19 The use of the SFC14 and SFC15 in the PLC program.

By highlighting the SFC in the LAD-editor and then pressing "F1" the help function will start and display extended information such as error codes and syntax examples.

6. Anybus configuration

The Anybus product has to be configured for the same I/O sizes as set up in the PROFINET IO configuration.

Note: The I/O sizes are depending on the application, the configured I/O sizes in this chapter are just examples.

Anybus-S Slave Interface and the Anybus PCI card

The Anybus Slave Interface and the Anybus PCI card are configured by mailbox commands. Refer to the respective Fieldbus Appendix for details.

Anybus CompactCom

The Anybus CompactCom is configured by messages sent by the application. Refer to the Design Appendix for details.

Anybus Communicator and the Anybus X-gateway

The configuration of the Anybus Communicator and the Anybus X-gateway is described in separate sections below.

6.1. Communicator configuration

To configure the Communicator, open the ABC Config Tool and start a new project. Select the fieldbus PROFINET IO and the desired I/O data size. In this case 2 bytes of I/O data is configured, the same as in the configuration of the PROFINET IO network.
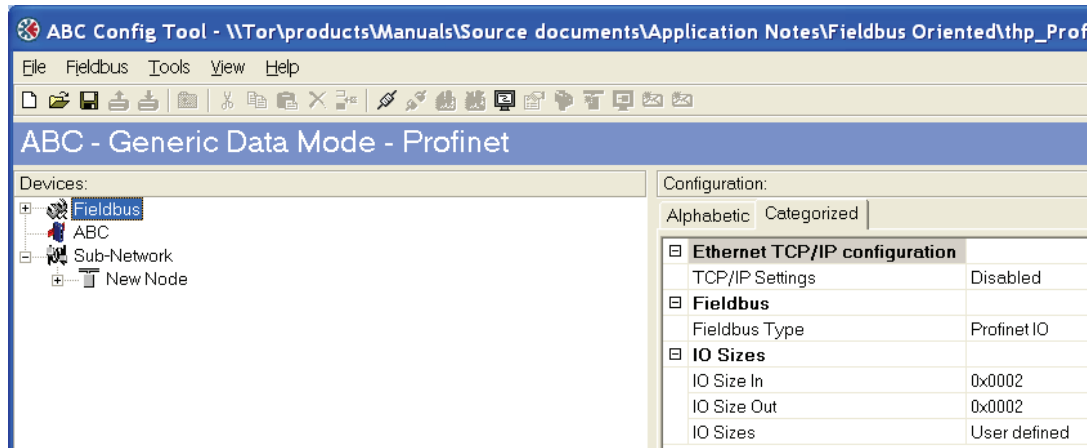

Figure 20 Bus type setup.

Note: Using the Automatic setting for the IO size, the amount of data configured for the fieldbus is depending on the sub-network configuration. The fieldbus I/O data will in that case be of the same size as configured for the sub-network.

The TCP/IP settings are disabled in this case, i.e. the settings are handled by the DHCP server. If the settings are enabled the IP settings are configured manually.

The Anybus Communicator is configured for generic data mode; all other values are left at their defaults.
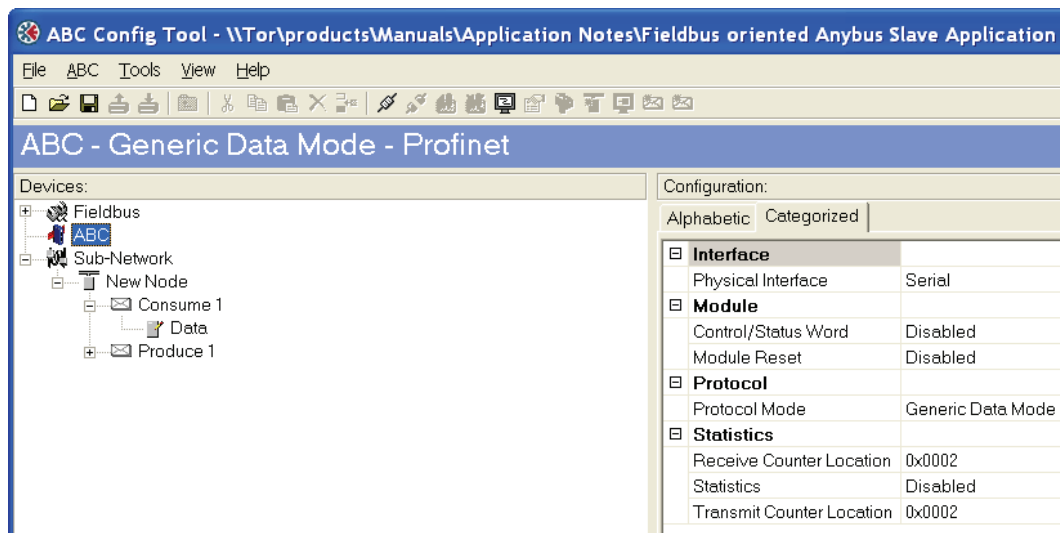

Figure 21 Protocol mode configuration.

The next step is to configure the sub-network. Right click on New Node and add a consume and a produce transaction as shown below. Change the Offline timeout time for the consume transaction to 2000 ms and the update time for the produce transaction to 1000 ms. Right click on the produce and consume transaction respectively and select add data. In this case 2 bytes of data is used.

Note: The update time for the produce transaction must be set to less than the offline timeout time for the consume transaction; in this case the update time is set to 1000 ms and the offline timeout time to 2000 ms.
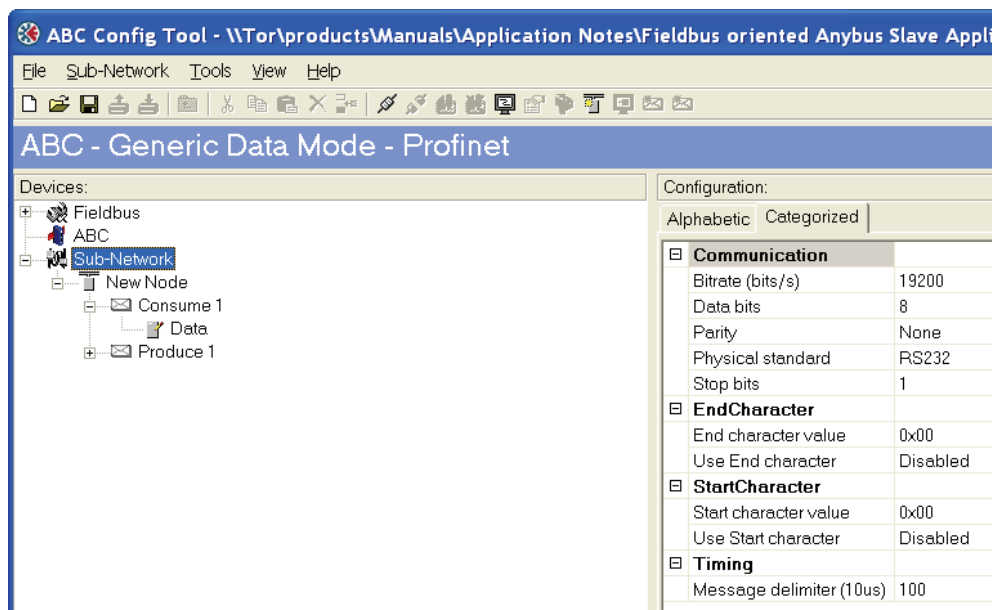

Figure 22 Configuration of the sub network

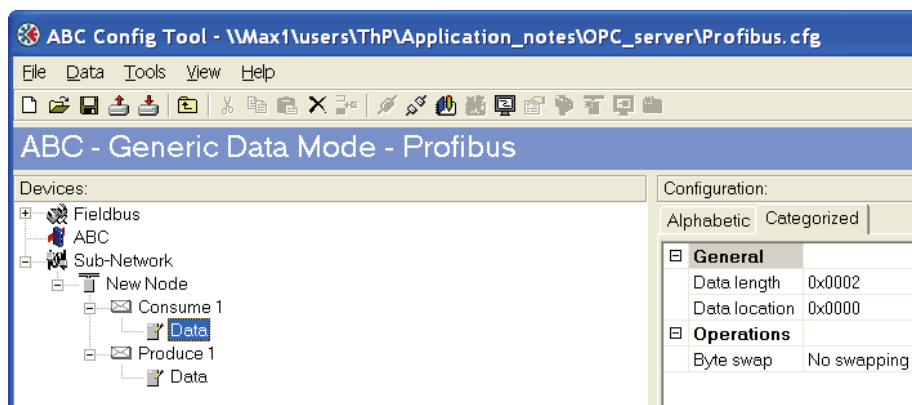*Two bytes of I/O data are used as shown in the figure below.*

Figure 23 Configuration of I/O data.

6.2. X-gateway configuration

Use the HyperTerminal on a PC and configure the X-gateway, connect a serial cable between the PC and the config port on the X-gateway. Open the "File" menu and click on new, choose the desired COM port and click on OK. The following window will appear.
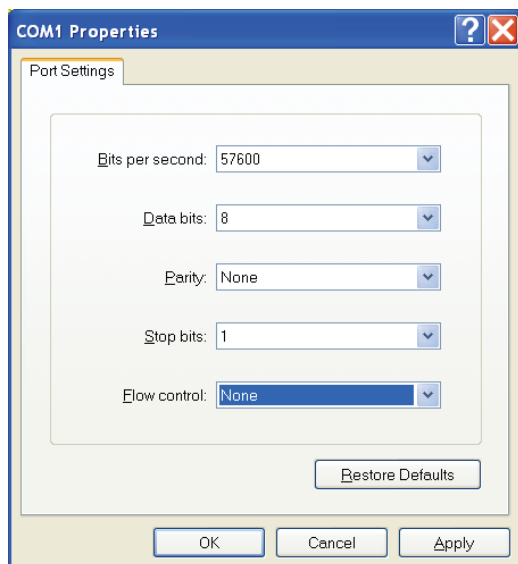

Figure 24 Configuring the connection in the HyperTerminal.

Make sure the settings are identical to those shown in the window above. An alternative method is to download the HyperTerminal session file from HMS website[2], double click on it and select COM port.

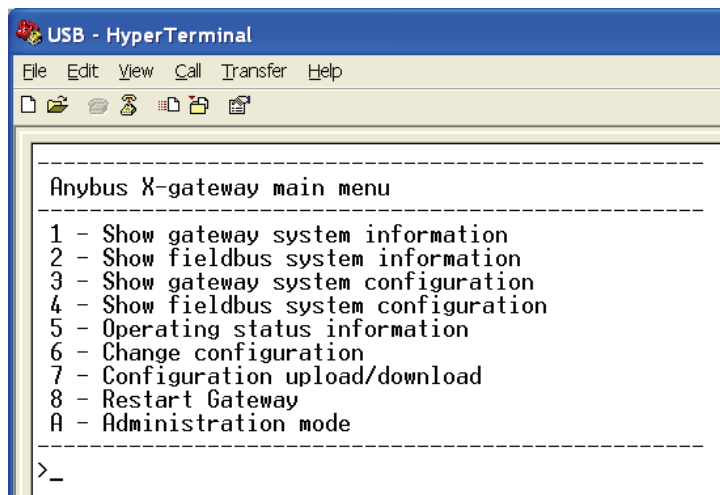*Connect and press ESC and the following menu will appear.*

Figure 25 Anybus X-gateway Main menu.

Press 6 and enter the desired configuration.

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[2] www.Anybus.com

The I/O sizes are depending on the application, the I/O sizes used in this case are just an example. The figure below shows an example; in this case a PROFINET IO/Modbus RTU X-gateway is used. The PROFINET IO Slave is configured for 2 bytes of I/O data and the Modbus RTU Slave for 2 bytes of I/O data.
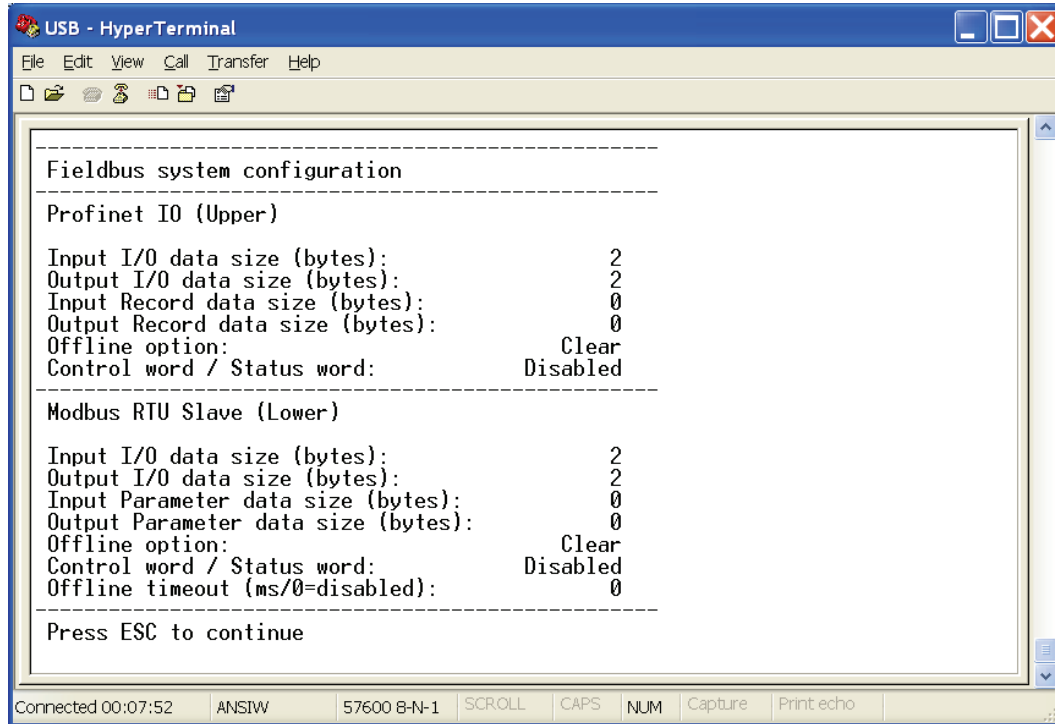

Figure 26 The X-gateway configuration.

7. Testing

To verify that the Anybus module and the PLC are correctly configured it is possible to monitor the Input and Output modules in the Hardware config in the SIMATIC software. An Anybus Communicator with a loop back dongle at the serial port is used for the test. In the HW Config window, mark the Output module and open the PLC menu and select Monitor/Modify.
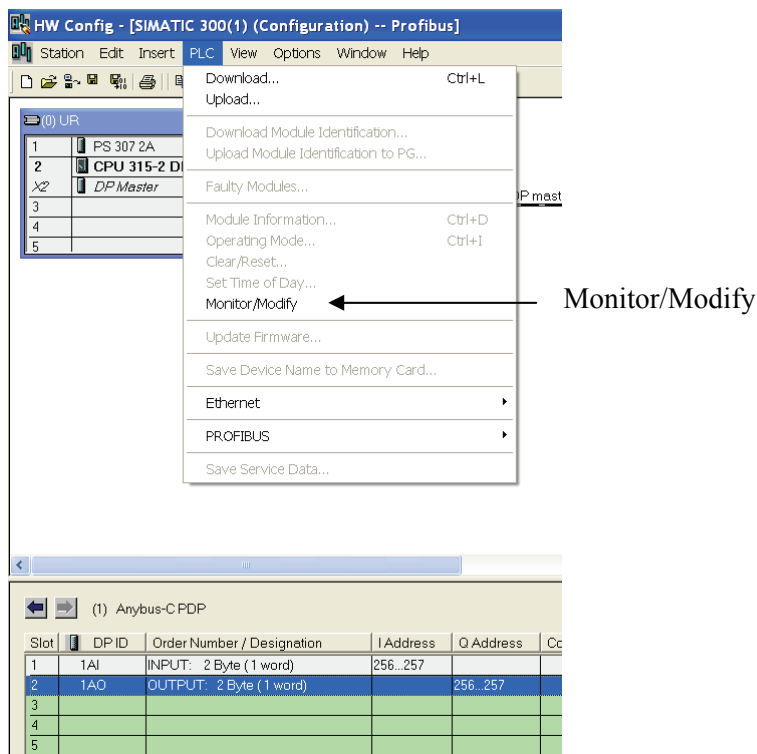

Figure 27 Opening the monitor/modify window.

Then enter a value to the Output module. In this case the value 45 is entered in the column Modify value. To accept press the Modify value button.
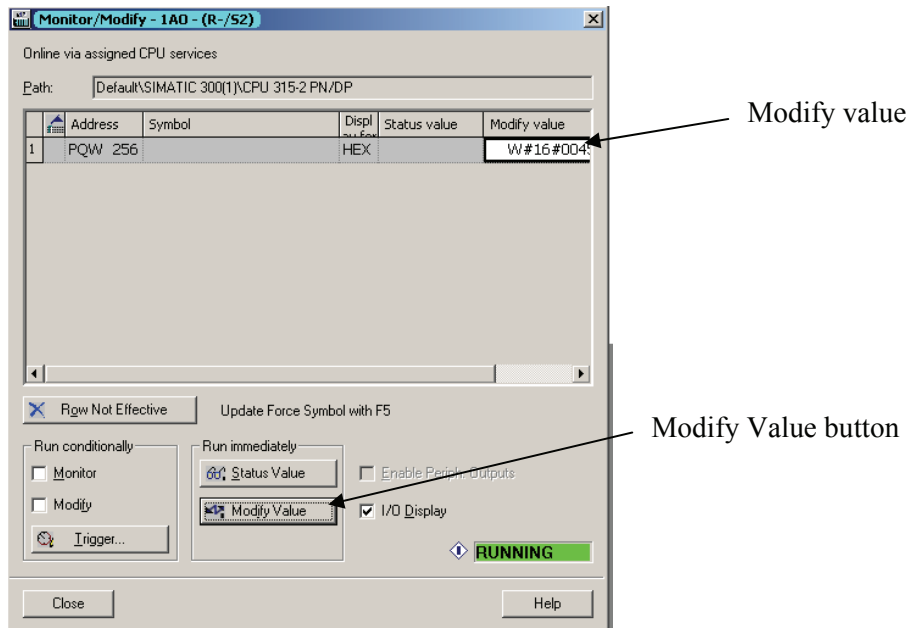

Figure 28 Modifying the Output module.

In the same way the Input module can be monitored. Mark the Input module and open the Monitor/Modify window. Using the correct settings the value 45 will be seen in the Input module after pressing the Status Value button.
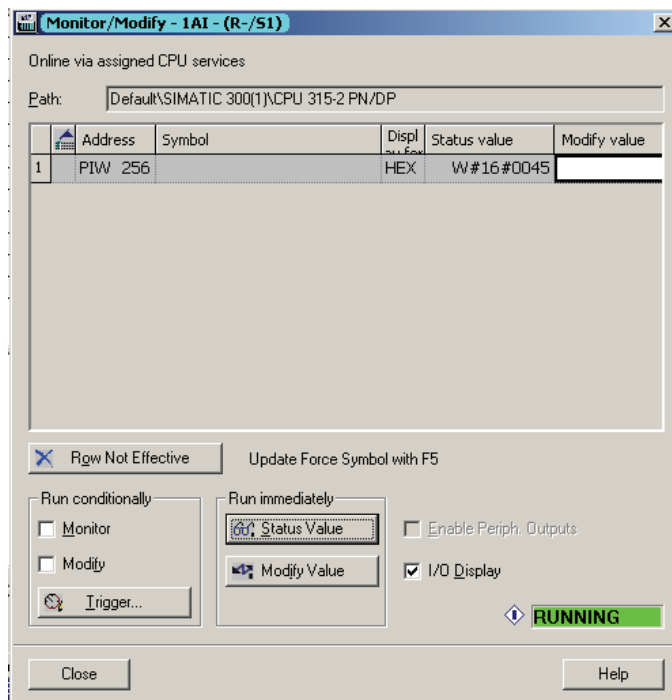

Figure 29 Monitoring the Input module.

Appendix

Diagnostics in Step7

Step7 and the HW Config program provide diagnostic possibilities via the PROFINET IO Controller over the network. Start with going online by clicking on the button ❶ in Figure 30. Then right-click on ❷ and chose "Module Information" and the diagnostic function will be started. The window ❸ will be displayed and available diagnostics can be read out.

What diagnostics that is available depends on the application. In standard mode there are no application specific diagnostics available. All the standard PROFINET IO diagnostics are supported and information regarding this can be found in the online documentation of Step7. Application specific diagnostics, error codes etc. can be found in the documentation of the application.

If the message shown in the window ❸ appears, the reason can be the following:

- The Anybus module is not attached properly to the PROFINET IO network. Check cabling.

- The Anybus module is faulty and does not start up properly. Check the LEDs on the Anybus module.

If for example the Device Name of the Anybus module does not match the Device Name set in the Simatic Hardware Config program or an incorrect GSD-file has been used this will be shown in the diagnostics window as well.
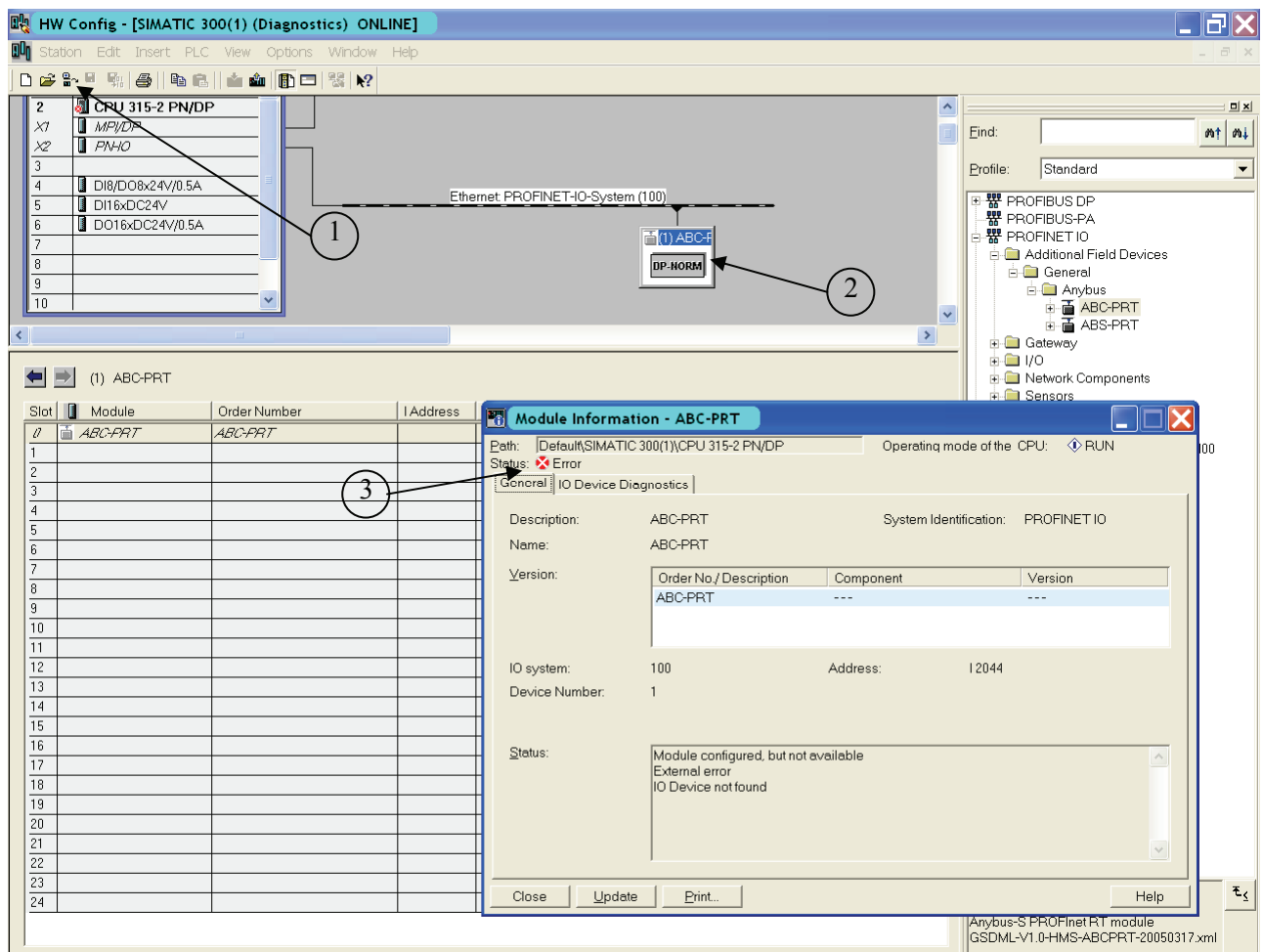

Figure 30 Step7 Hardware diagnostics.