

Configuration Instructions for the LB/FB Remote I/O System

Commissioning with SIEMENS STEP 7

Manual



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1 Introduction

These instructions will help you commission and configure an LB/FB remote I/O system using the SIMATIC Manager STEP 7.

1.1 Purpose of the Instructions

These instructions describe the key functions in STEP 7 that help you commission an LB/FB remote I/O system. Customer-specific adaptations are not described. Note that software changes cannot always be taken into account, meaning that deviations in the description may occur.



Note

For more information about STEP 7, refer to the corresponding online Help or documentation.

Commissioning involves the integration of the LB/FB remote I/O system in a PROFINET network. STEP 7 is used for configuration, then parameterization of the LB/FB remote I/O system takes place.

The hardware **configuration** is an offline process that is completed without a connection to the control panel (PLC). In STEP 7, a project is created and the LB/FB remote I/O system is configured. The selection of the gateway and the I/O modules from the hardware catalog enables the exact structure of the LB/FB remote I/O system to be replicated in the software project. In the configuration table, each I/O module is automatically assigned an address. When the automation system starts up, the target configuration created with STEP 7 is compared with the actual configuration. Any errors can thus be detected and reported immediately.

After configuration, the LB/FB remote I/O system is **parameterized**. Parameterization involves setting the device characteristics such as the addresses and stipulating the communication characteristics. The I/Q addresses are used, for example, to define where each binary or analog signal can be read in or out.

When device configuration is complete, the configuration data is compiled in a format that the control panel can understand and loaded into the control panel. You can use variable tables to save different test environments. You can then reproduce tests and process monitoring multiple times during commissioning or for service purposes.

1.2 Technical Basics

The plant operator is responsible for planning, commissioning, and operation.

Only trained and qualified personnel may commission and operate the product. The trained and qualified personnel must have read and understood the instructions and the other documentation.

The documentation comprises the following parts:

- These instructions
- Datasheets
- LB/FB remote I/O system hardware manual

The documentation may also comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

1.3 Registered Trademarks

PROFINET[®]: trademark of PROFIBUS Nutzerorganisation e.V. (PNO)

SIMATIC, STEP[®]: trademark of SIEMENS AG

1.4 Symbols Used

Notices in these instructions are indicated by symbols. The safety notices begin with signal words to indicate the severity of the hazard.

Warning messages



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Information messages



Note

This symbol brings important information to your attention.



Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

1.5 Display conventions



Note

Graphical illustrations in these instructions are provided to aid basic understanding, and may deviate from the actual design.



Note

These instructions refer to the English language version of the STEP 7 configuration software. Other language versions usually apply other names for the program calls, function calls, and menu items referred to in these instructions.

2 User Interface Basics

Several views are available in STEP 7 for your automation project. The views relevant for commissioning are:

- Project view
- Configuration View

For further information on the views, refer to the Siemens AG user documentation.

2.1 Project view

The project view is divided into two parts. The left-hand side of the window (1) displays the project tree. The right-hand side of the window (2) displays the contents of the object selected in the project tree in the selected view (large icons, small icons, list, or details). At the top of the project tree is your project.

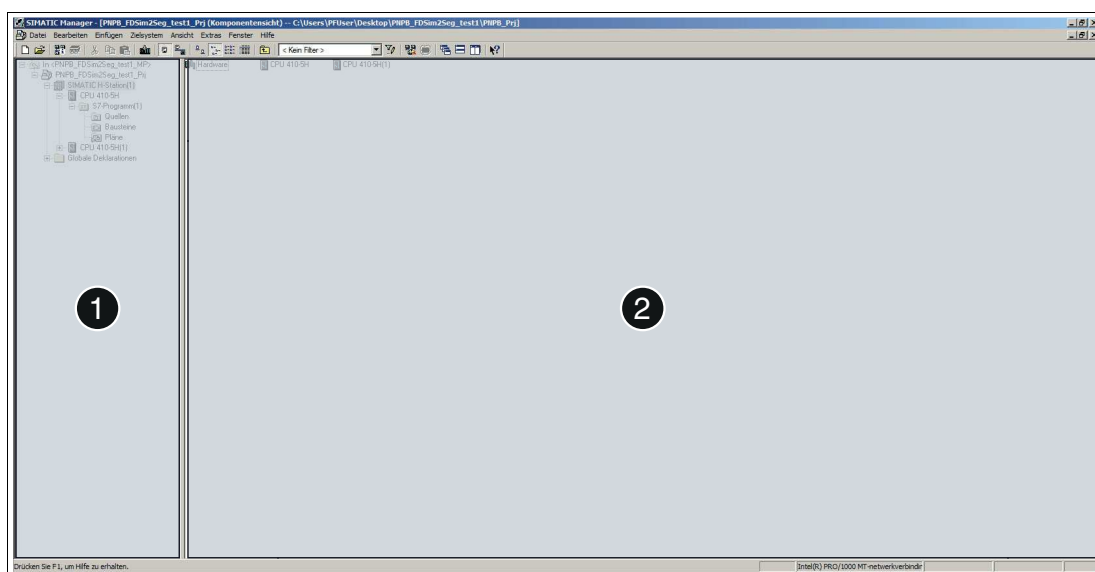


Figure 2.1 Layout of the project view

Item	Description
1	Project tree: the project tree displays the project with the modules that have already been positioned.
2	Project window: the project window displays the objects that can be processed using the selected action.

2.2 Configuration View

The configuration view (HW Config) is an object-oriented view with several windows.

The figure below is a schematic depiction of the configuration view windows. Different content is displayed in the different windows, as explained below.

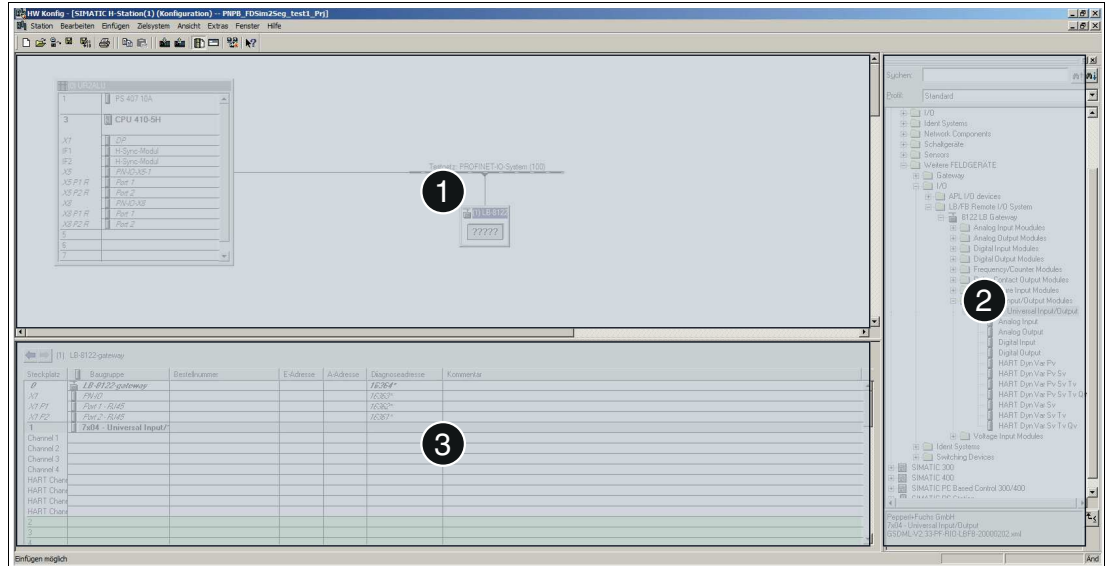


Figure 2.2 Configuration view layout

Item	Description
1	Station window: the station window is used to configure the automation system hardware, create the user program, and carry out project planning for the hardware.
2	Hardware catalog: the hardware catalog shows the available modules.
3	Detail window: the detail window displays additional information about the object selected in the station window or an action that has been performed.

3 Commissioning the LB/FB Remote I/O System

Commissioning involves the integration of an LB/FB remote I/O system into a PROFINET network and its configuration. Commissioning also involves compiling the project configuration and transferring it to the control panel.

The following hardware components of the LB/FB remote I/O system are relevant to commissioning with STEP 7:

- Gateway
- I/O modules

The hardware components must be replicated in the project to configure the LB/FB remote I/O system.

The gateway is the component that communicates with the control panel. The properties must be defined to be able to configure the gateway. These properties include the device name and the IP address.

During parameterization of the channels, the measurement behavior of the I/O modules that process input signals is defined. At the same time, the behavior of the I/O modules that emit output signals is defined. In STEP 7, the channels are the submodules. They are available in the hardware catalog under the I/O modules.

To commission the LB/FB remote I/O system, perform the following steps:

- Preparation for commissioning
- Create the project
- Set up the control system
- Install the GSDML file
- Configure/parameterize the LB/FB remote I/O system
- Compile a project configuration
- Transfer a project configuration
- Check the connection

A description of how to perform the individual steps is provided on the following pages.

Note

The illustrations and information contained in this description relate to the following variants:

- Siemens SIMATIC S7 control panel (PLC/CPU)
- Siemens STEP 7 configuration software
- GSDML file for the LB/FB remote I/O system

Information about other variants can be found in the technical documentation of the control panel and the associated software.



3.1 Preparation for Commissioning

It is necessary to plan the commissioning of an LB/FB remote I/O system beforehand. Planning ensures that all files and information are available to enable efficient commissioning.

You will need the following files and information for commissioning:

GSDML file

A device description file (GSDML file) is required to use the LB/FB remote I/O system. The current GSDML file can be downloaded from our website: www.pepperl-fuchs.com. Enter the product name or item number in the **Product/Keyword** search box and click on **Search**. Select your product from the list of search results and click on the **Software** tab in the product information list. A list of all available downloads is displayed.

The installation of the GSDML file is explained in chapter 3.4.

IP Address

When assigning the IP address, observe fundamental addressing rules, e.g., regarding the use of private or public address areas. Check that the IP address can be used in your automation network (no duplicate address assignment, etc.).

When assigning an address for the gateway or the LB/FB remote I/O system, the following IP address variants are available:

- Dynamic IP address assigned via DHCP (DHCP default setting set to "on")
- Static, customer-specific, or customer-configurable IP address

IP address assignment is described in chapter 3.5.2.

Gateway name

Each PROFINET device is identified via its "Device Name." The gateway must have a unique name before it can be addressed by the control panel.

The following rules must be observed when using the PROFINET specification for the PROFINET device name.

- The device name must not exceed 240 characters. Permitted characters:
 - Letter "a" to "z,"
 - Digits "0" to "9,"
 - Hyphen or period
- A name component within the device name—i.e., a data string between two periods—must not exceed 63 characters.
- The device name must not begin or end with a hyphen.
- The device name must not begin with the character string "port-xyz" (x, y, z = 0 to 9).
- The device name must not have the form n.n.n.n (n = 0 to 9).

Gateway name assignment is described in chapter 3.5.2.

3.2 Creating a New Project

After you have planned the commissioning, create a project. The control panel and hardware components of the LB/FB remote I/O system are replicated in the project.

Creating the project

To create a project, proceed as follows:

1. Start the **SIMATIC Manager**.
2. Select **File > New Project**.

↳ The **New Project** window opens.

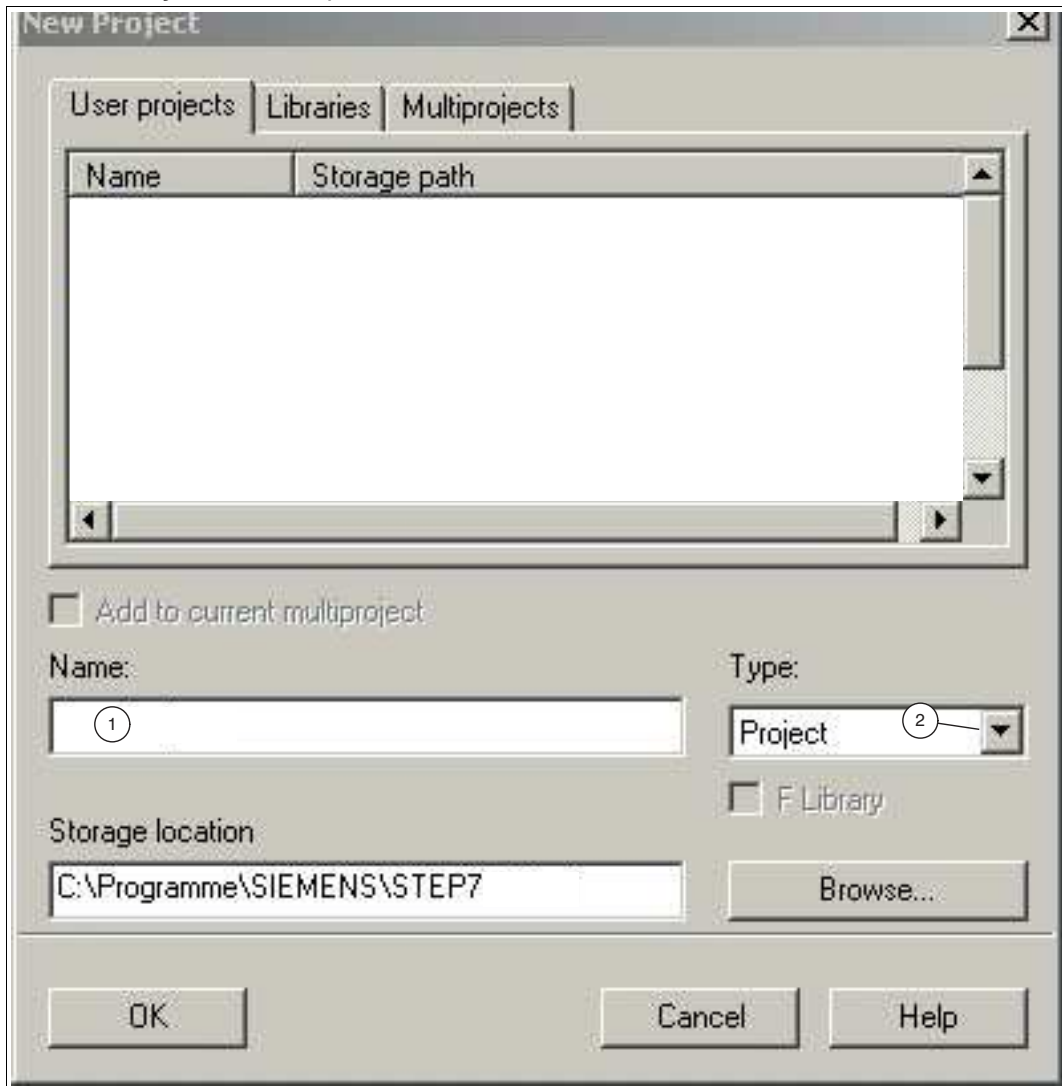


Figure 3.1 **New Project** window

3. In the **Name** input field (1), enter a name for your project.
4. From the **Type** drop-down list (2), select **Project**.
5. Click on **OK** to confirm your selection.

↳ The project view opens.



Figure 3.2 SIMATIC Manager: project view

3.3 Adding the Control Panel to the Project

A control panel is an electronic assembly used in automation technology for open-loop and closed-loop control tasks. The control panel reads process input data and controls the outputs accordingly.

The control panel communicates with the gateway and is required for commissioning.



Integrating the control panel

The following steps require the station window to be open. To set up the control system, proceed as follows:

1. Select **Insert (1) > Station (2) > 1 SIMATIC 300 Station (3)**.



Note

This configuration example uses the SIMATIC 300 station. This may vary depending on your automation project. Please select the control panel that you are using at this point.

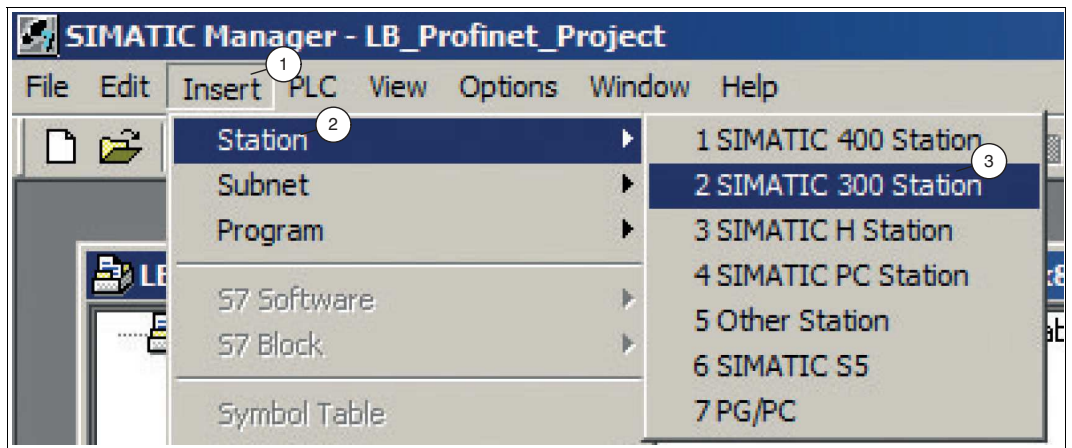


Figure 3.3 Selecting the control panel

↳ A placeholder for the selected control system is added to the project tree.

2. In the project tree, select the placeholder for the control system (1).

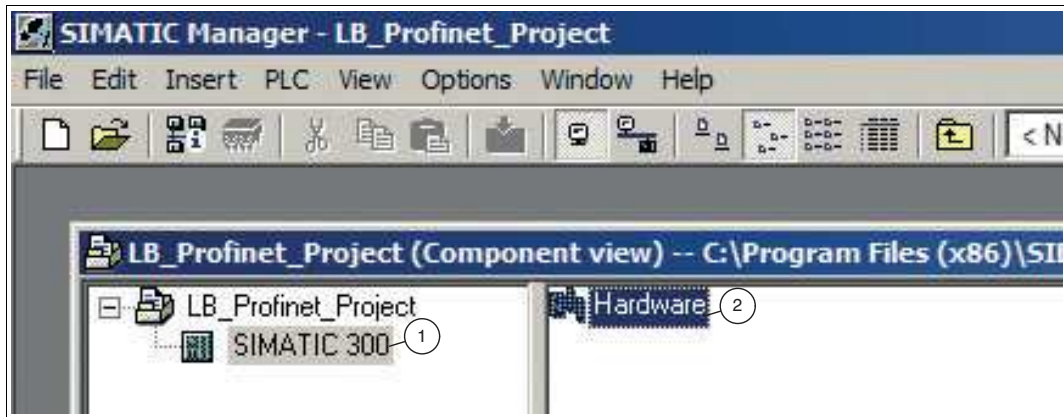



Figure 3.4 Open HW Config

3. In the project window, double-click on **Hardware** (2).

↳ The **HW Config** configuration view opens.



Note

The components of the control system can be found in the hardware catalog on the right-hand side of the window in the configuration view. If the hardware catalog is not automatically displayed, click on the view catalog icon in the menu bar .

Configure the control system according to your requirements. To do this, drag the required components from the hardware catalog into the station window.

The following configuration example is used to promote general understanding and may differ from your configuration.

4. Select your CPU from the **hardware catalog** window (1). In this configuration example, it is an IM151-8 PN/DP CPU for ET200S.

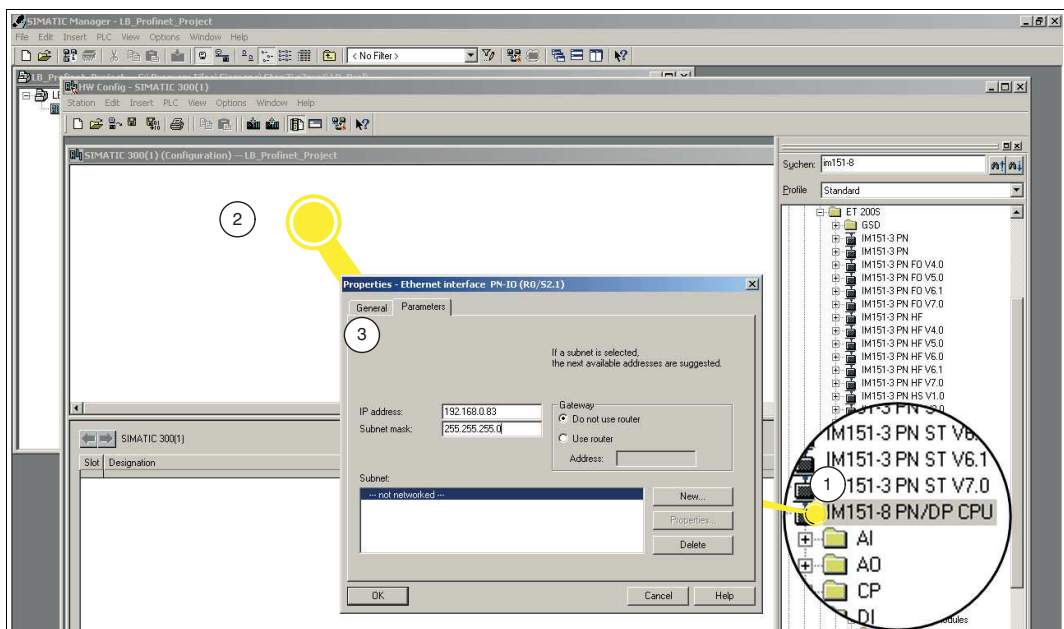


Figure 3.5 Hardware catalog



Note

Check the version of the operating system for your CPU and select that exact version from the **hardware catalog** window.

5. Drag and drop the CPU into the station window (2). You can also double-click on the CPU in the **hardware catalog** window.

↳ The **Properties - Ethernet interface PN-IO (R0/S2.2)** window (3) opens.

6. In the properties window, enter the IP address (1) and the subnet mask (2).



Note

If you work in an Ethernet company network, you will usually receive the address from your network administrator.

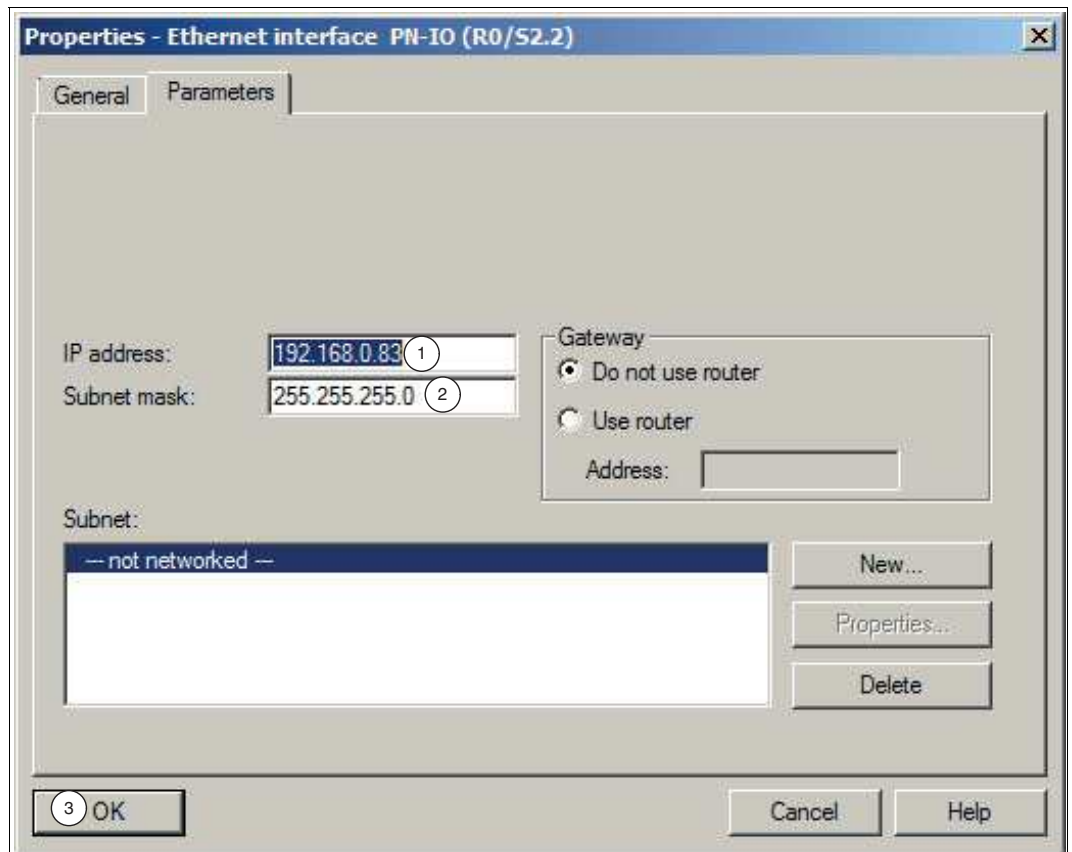


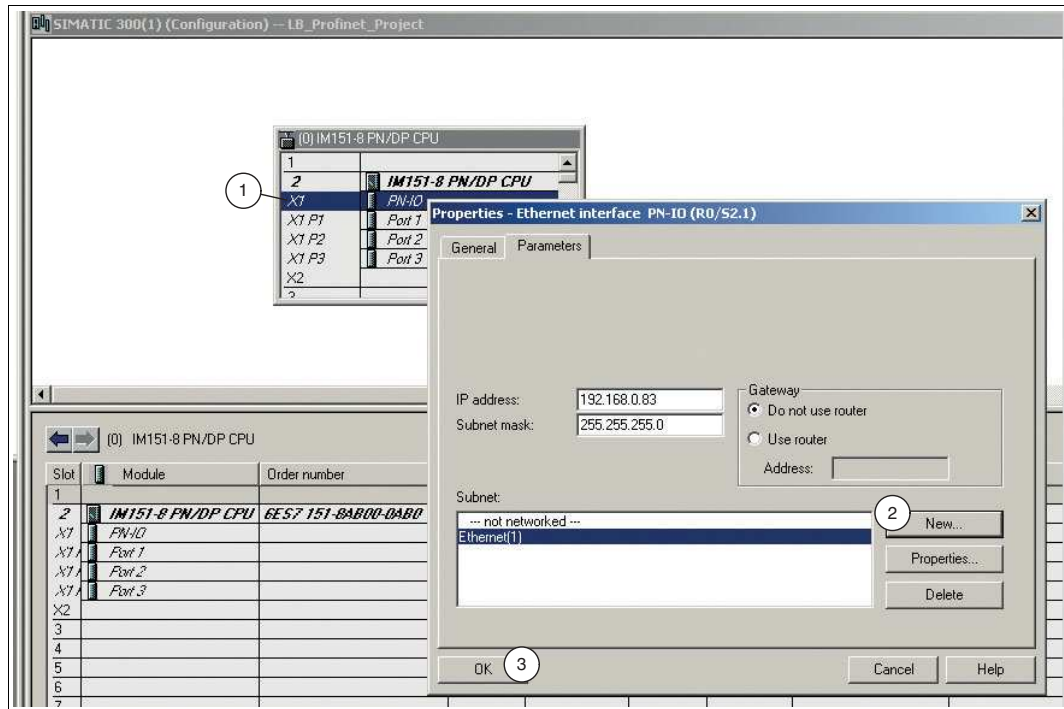
Figure 3.6 IP address and subnet mask

↳ The control panel appears in the form of a small configuration table (1) in the upper part of the station window. The lower part of the station window displays the detail view of the control panel.

7. In the configuration table, double-click on the **X1 PN-IO** interface (1).

↳ The properties window for the X1 PROFINET interface opens.

8. Click on **New...** (2).



↳ The **New subnet Industrial Ethernet** properties window opens.

9. Assign a name (1) for a new subnet Industrial Ethernet. Click on **OK** (2) to confirm your input.

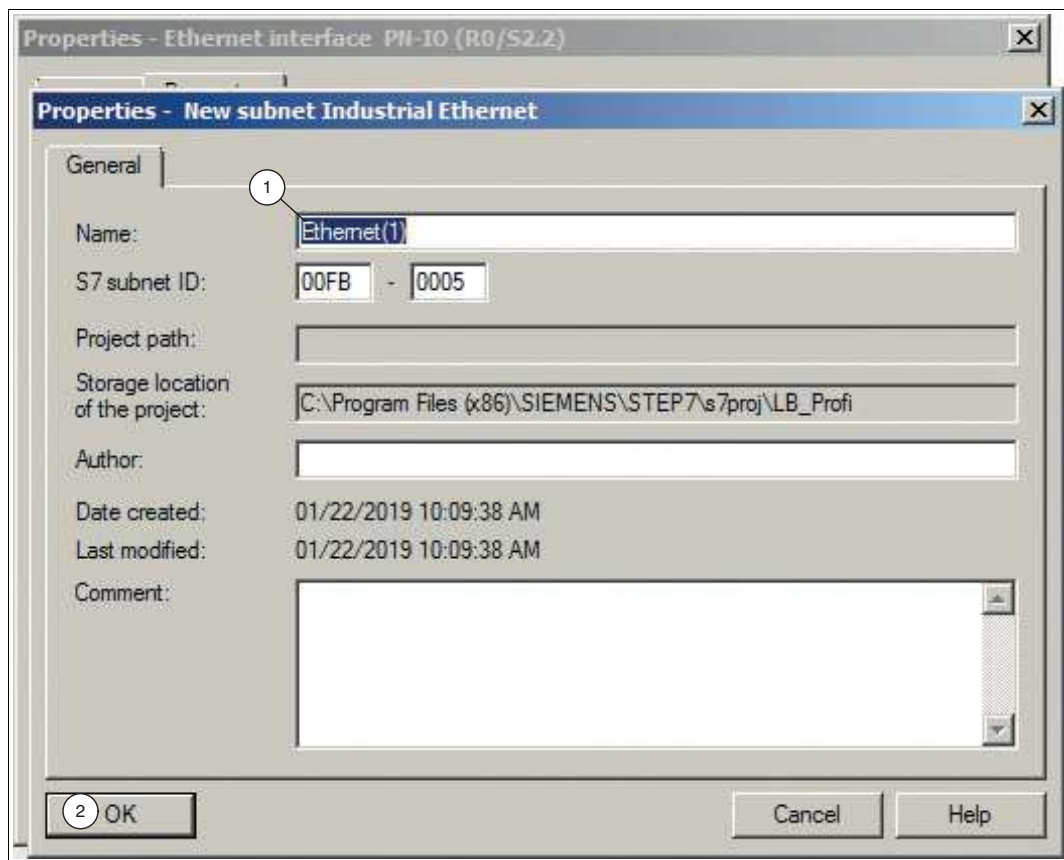


Figure 3.7 Subnet Industrial Ethernet

↳ The properties window for the subnet Industrial Ethernet closes.

10. In the **Properties - Ethernet interface PN-IO (R0/S2.2)** window, click on **OK** (3).

↳ The properties window for the X1 PROFINET interface closes.



Note

In HW Config, you can set further options for the PROFINET interface as required.

Double-click on the X1 PROFINET interface in HW Config to access the settings.

Switch to the Properties tab if necessary. Here you can configure individual network settings as required. The "automatic setting" is selected by default. In normal situations, this guarantees problem-free communication. If communication problems occur (for example, if connections cannot be established or frequent network disruptions occur), this may be because the selected network setting or the automatic network setting is not appropriate. Select a network setting that is suitable for your network configuration.

11. Select the menu command **Station > Save and compile**

↳ The hardware configuration is compiled and saved.

12. Select **Target system > Load in module.**

↳ The dialog box for selecting the target module is displayed. The CPU is already marked as the target module.

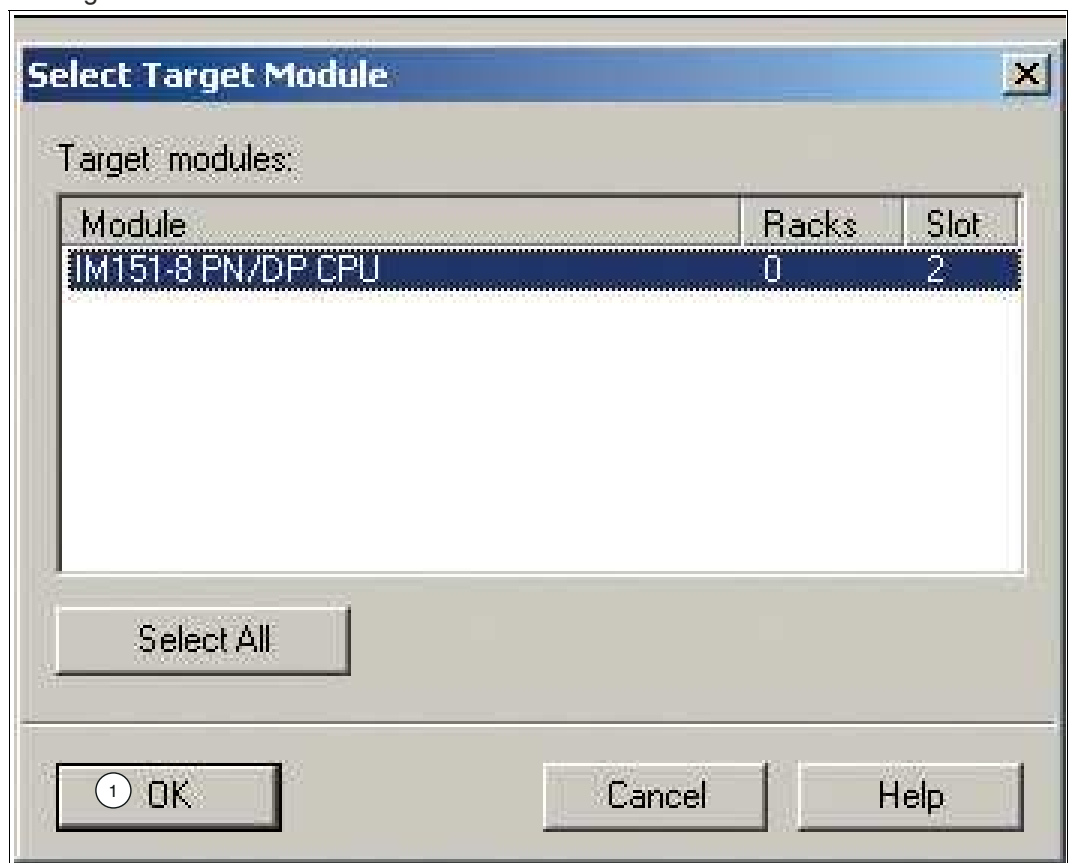


Figure 3.8 Dialog box for selecting the target module

13. Click on **OK** (1).

↳ The **Select Node Address** dialog box is displayed. The CPU is not yet displayed under "Available Nodes."

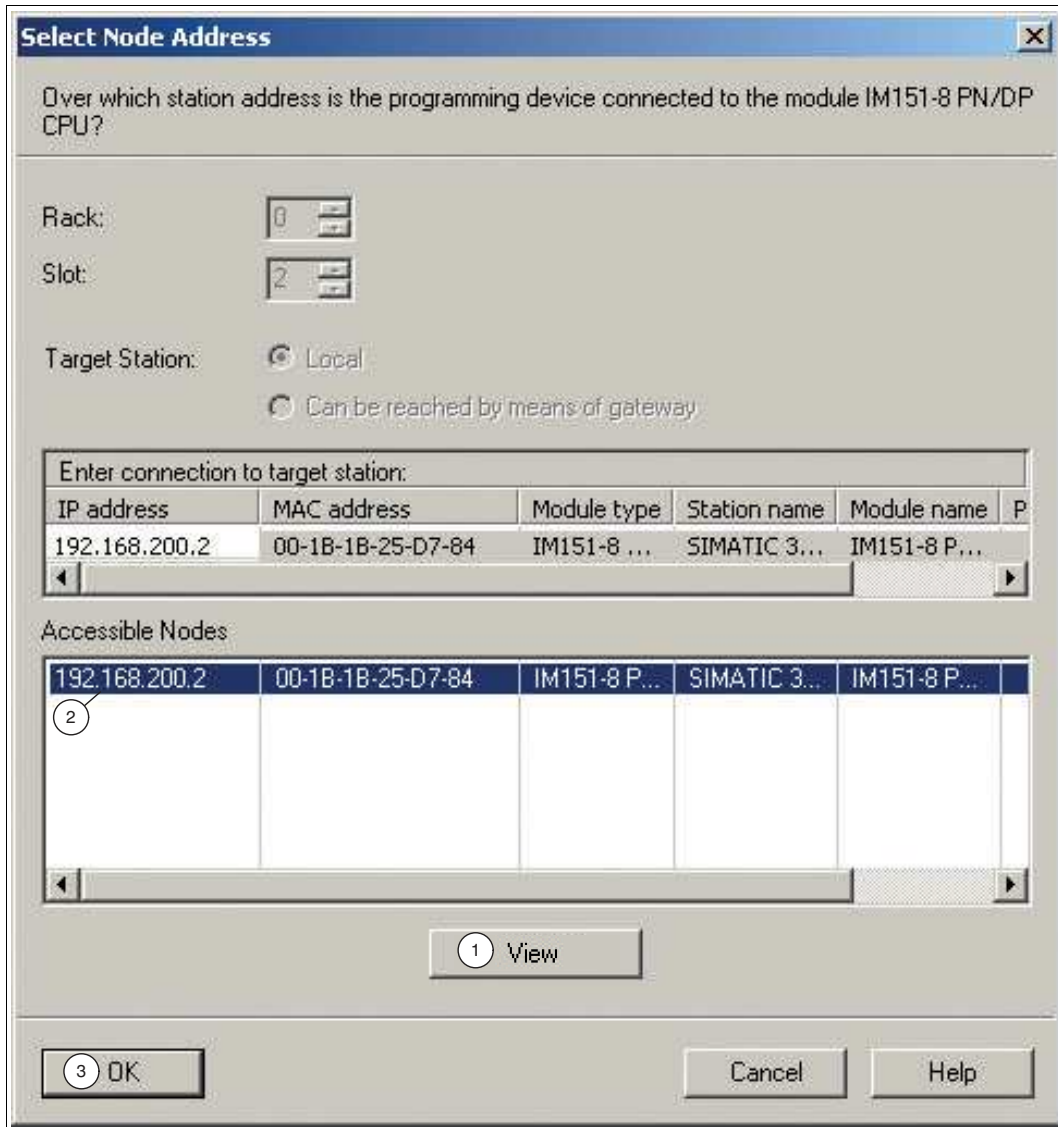


Figure 3.9 Dialog box for selecting the node address

14. Click on **View** (1).

↳ The programming unit reads the MAC ID and displays it in the dialog box.

15. Select the line with the MAC ID of the CPU (2) and confirm with **OK** (3).

↳ The **Download** message window opens.

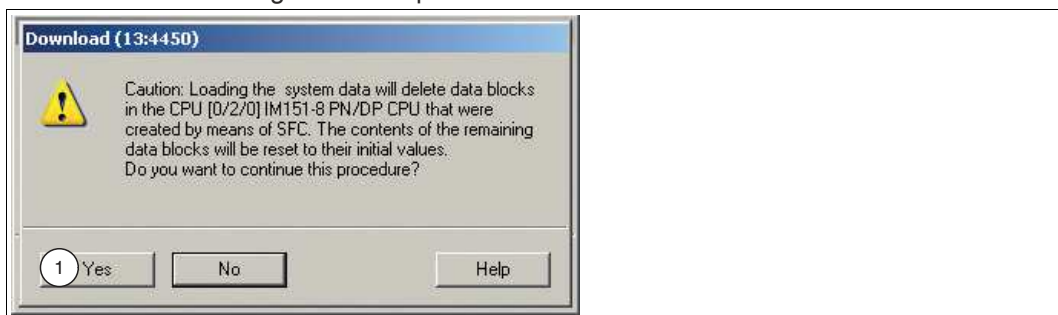


Figure 3.10 Download message window

16. Confirm the message by clicking on **Yes** (1).

↳ An IP address is assigned to the CPU and the configuration is loaded.

17. Close HW Config via **Station > Finish** and answer Yes when you are prompted to save.
↳ HW Config closes. In the SIMATIC Manager, the CPU is now visible in the station.

3.4 Installing the GSDML File

The device description file (GSDML file) is required to use the LB/FB remote I/O system. The GSDML file can be downloaded from our website: www.pepperl-fuchs.com. Enter the product name or item number in the **Product/Keyword** search box and click on **Search**. Select your product from the list of search results and click on the **Software** tab in the product information list. A list of all available downloads is displayed.



Installing the GSDML file

The GSDML file contains all the information required to configure the LB/FB remote I/O system using the STEP 7 configuration software. This makes it possible to replicate the gateway and the I/O modules in the project. To install the GSDML file, proceed as follows:

1. Open the configuration view (HW Config).
2. Close all open stations in the station window. To do this, select **Station > Close**.
3. Select **Options (1) > Install GSD file (2)**.

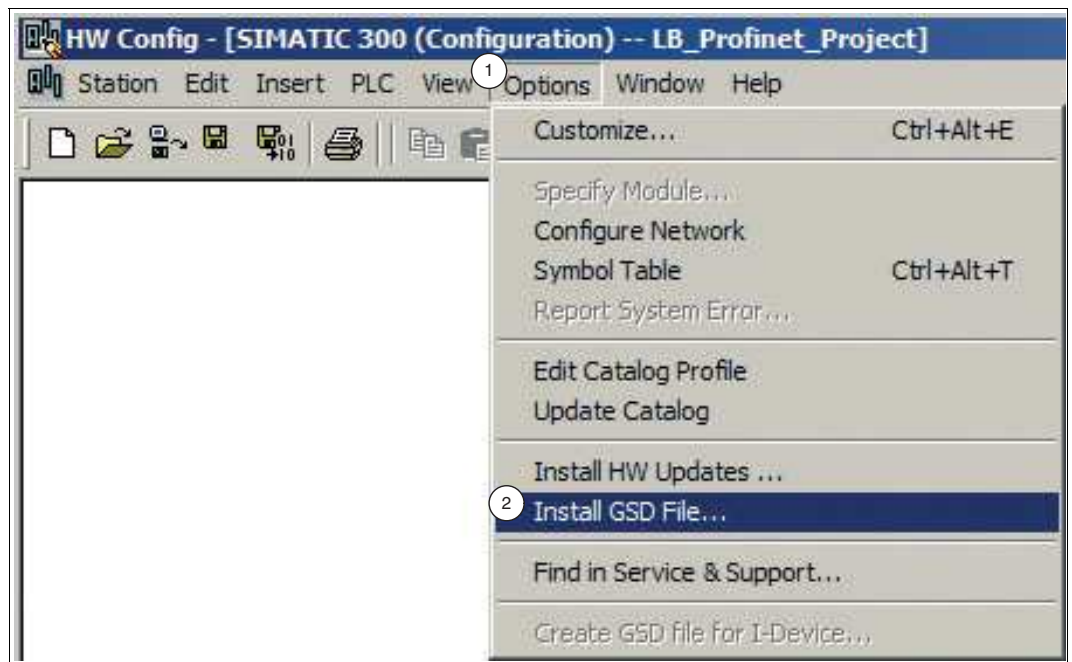


Figure 3.11 GSDML file

↳ The **Install GSD Files** window opens.

4. Click on **Browse (1)** to search for the GSDML file on your storage medium.

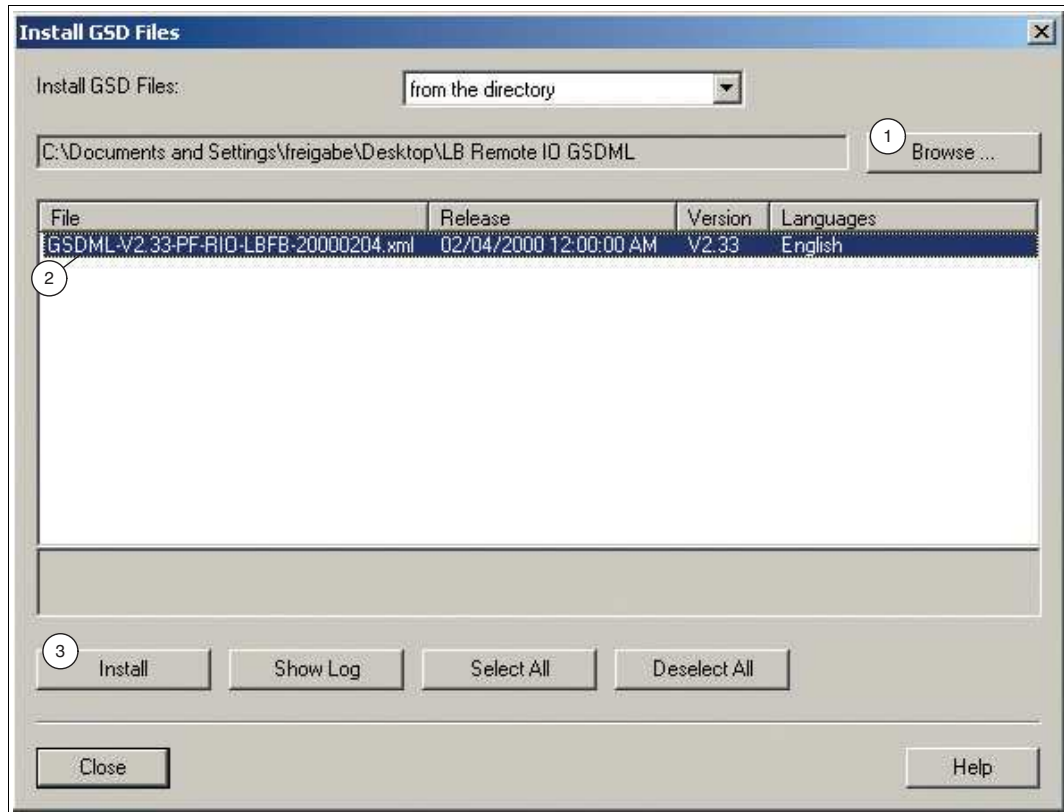


Figure 3.12 Search for GSDML file

5. Select the folder containing the GSDML file.
 - ↳ All GSDML files in the selected folder are displayed in the **Install GSD Files** window.
6. In the selection window, select the required GSDML file (2).
7. Click on **Install** (3).
 - ↳ The system tells you that the installation of the GSDML file cannot be undone.
8. Click on **Yes**.
 - ↳ Installation of the GSDML file begins.
9. Click on **OK** to close the information window. The device data is loaded in the hardware catalog.
10. Open the previously closed SIMATIC station. To do this, select your SIMATIC station from the **Station** menu.

3.5 Configuring the LB/FB Remote I/O System

The hardware components of the LB/FB remote I/O system are replicated in the project to guarantee communication between the control panel and the LB/FB remote I/O system.



Note

Ensure that the project is in offline mode. Otherwise, it will not be possible to replicate the hardware components.



Note

Please note: This description cannot cover all details of the PROFINET communication.

3.5.1 Gateway Integration

The gateway forms part of the LB/FB remote I/O system and handles communication with the control panel.



Integrating the gateway

To integrate the gateway, proceed as follows:

Select the gateway (1) from the hardware catalog and drag and drop it into the station window (2).

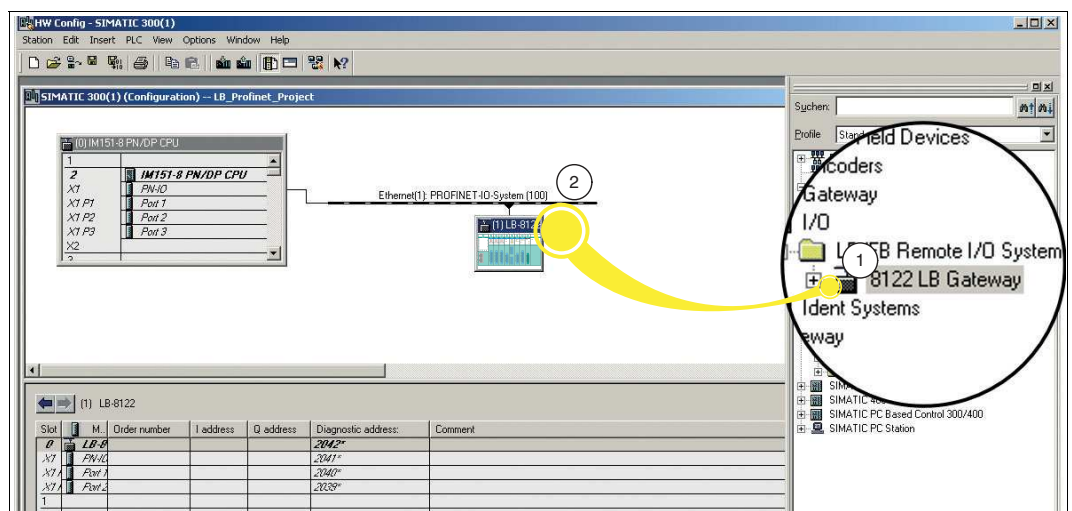


Figure 3.13 Integrating the gateway

↳ The gateway appears in the station window and is connected to the control panel.

3.5.2 Gateway Configuration

The control panel generally assigns the IP address automatically and assigns it to the gateway on the basis of the gateway name. If it is a standalone network, you can use the default IP address and subnet mask specified by the control panel. If the network is a part of an existing Ethernet company network, obtain the IP address and subnet mask from your network administrator.

Gateway name

In the PROFINET IO system, each device has a unique device name (symbolic name). In the configuration program, the device name can be automatically assigned using the device name from the GSDML file and a sequential number. The gateway can only be addressed by the control panel after the name has been assigned via the configuration software e.g., for transferring project planning data or for exchanging user data in cyclic operation.

IP addresses

Each PROFINET device must have an IP network address to establish an application relationship. There are a number of ways to manage these network IP addresses:

- **Configuration during project planning**
During project planning of the LB/FB remote I/O system, a range of network addresses is made available to the configuration program. The configuration program assigns an IP address to the control panel and the gateway. During system configuration, the control panel receives a list of IP addresses and assigns these to the individual gateways during initialization of the application relationships.
- **Management by a DHCP server**
If the IP addresses are managed by a DHCP server, the IP addresses are requested independently by the individual gateways. When the application relationship is established, the control panel addresses the gateway using its name to access the IP address assigned to it.
- **Fixed setting**
In principle, the network administrator can manage IP addresses manually using the DCP (Dynamic Configuration Protocol) or a local interface on the field device. This approach makes it difficult to replace devices as the IP addresses always have to be reentered.

Gateway number

In addition to the gateway name, STEP 7 assigns a device number starting with "1" when the gateway is plugged in. This device number can be used to identify the gateway in the user program. Unlike the gateway name, the gateway number is not visible in the user program.



Configuring the gateway

The control panel generally assigns the IP address automatically and assigns it to the gateway on the basis of the gateway name. If it is a standalone network, you can use the default IP address and subnet mask specified by the control panel. If the network is a part of an existing Ethernet company network, obtain the IP address and subnet mask from your network administrator. To configure the gateway, proceed as follows:

1. In the station window, double-click on the symbol name for the gateway (1).

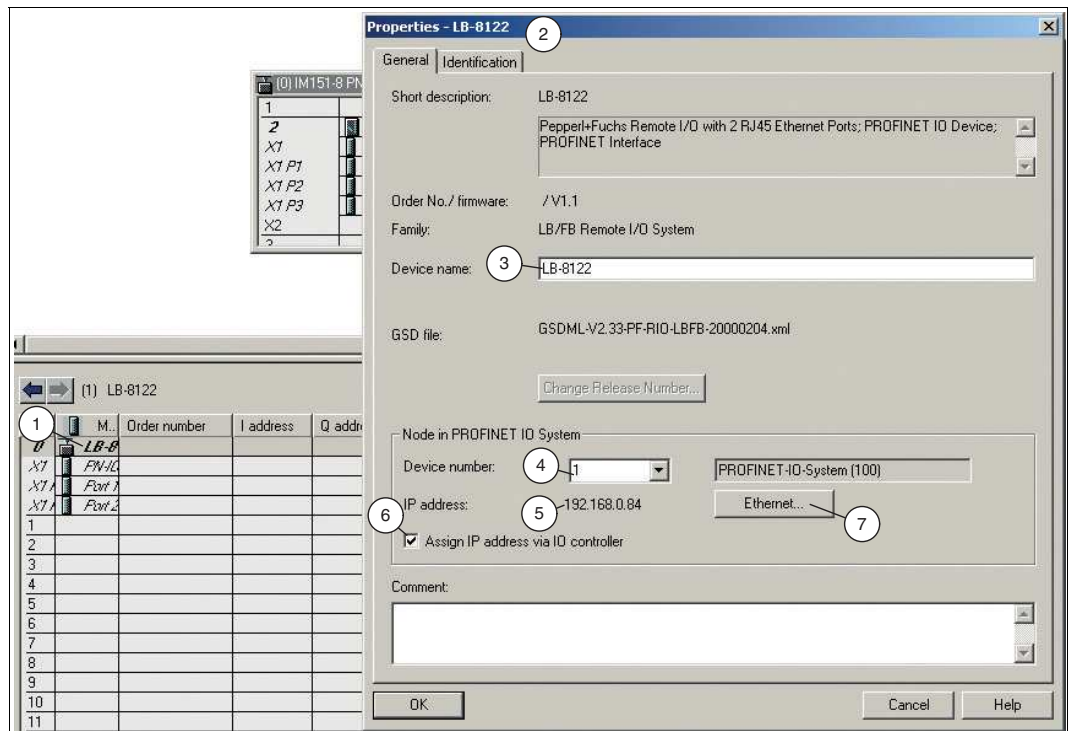


Figure 3.14 Example: Properties dialog LB8122* (applies analog to FB8222*)

↳ The **Properties - LB-8122** window (2) of the gateway opens.

2. In the **Device name** input field (3), assign the gateway an appropriate name or a user-specific designation.
3. In the drop-down list of the **Device number** field (4), select a unique device number.
4. Ensure that the right IP address (5) is assigned.
5. If you want to change the IP address, uncheck the **Assign IP address via IO controller** check box (6) and click on **Ethernet** (7).

↳ The **Properties - Ethernet interface LB-8122** window (1) opens

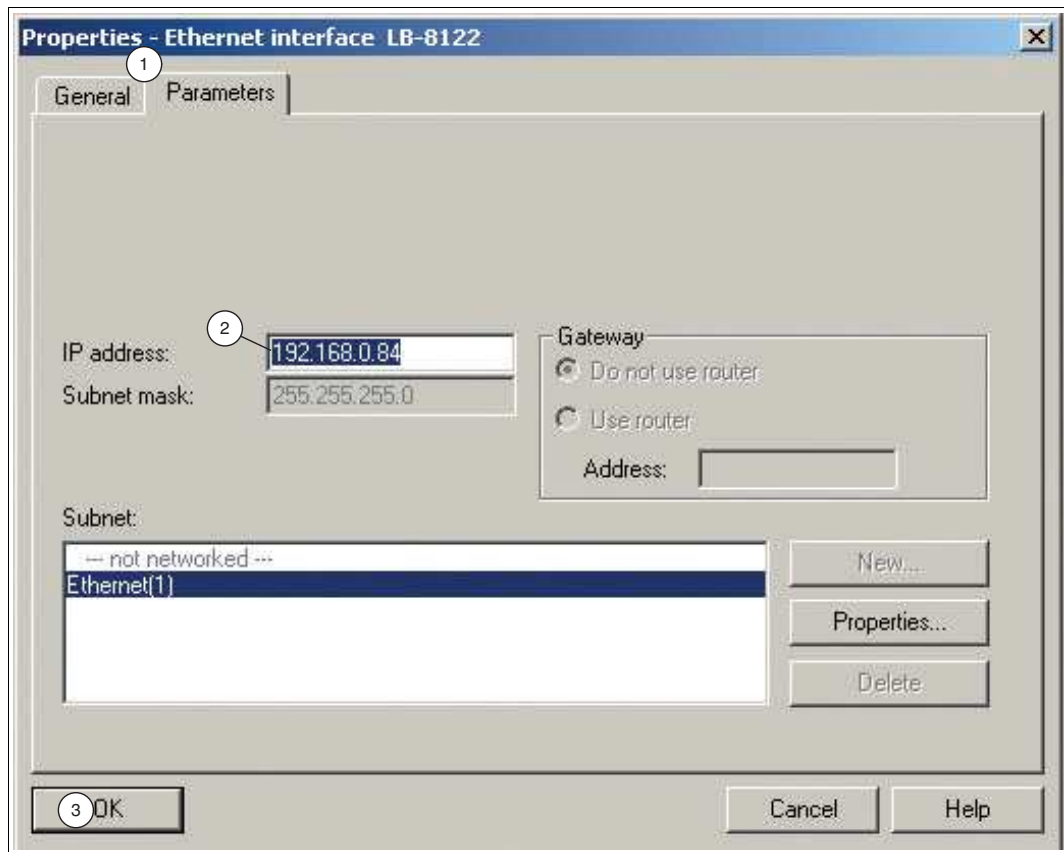


Figure 3.15 Example: Ethernet interface property dialog LB8122* (applies analog to FB8222*)

6. In the **IP address** input field (2), enter the IP address.



Note

If you establish a connection via a router, you must also enter the address of the router.

7. Click on **OK** (3) to confirm your input.
↳ The **Properties - Ethernet interface LB-8122** window closes.
8. Click on the **OK** button.
↳ The **Properties - LB-8122** window of the gateway closes.

3.5.3 Configuring the I/O Modules

The I/O modules form part of the LB/FB remote I/O system. I/O modules are used to record measured values and to output signals for process intervention purposes.

The configuration example in these instructions replicates the following hardware arrangement of an LB/FB remote I/O system:

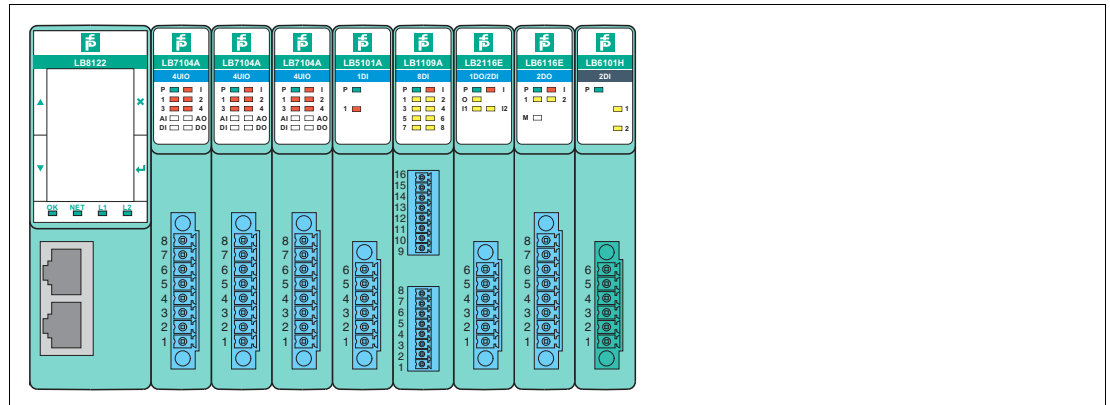


Figure 3.16 Sample hardware configuration with LB Remote I/O System (FB Remote I/O System analog)

- LB8122*/FB8222* Gateway
- LB7104*/FB7204* Universal input/output (HART)
- LB7104*/FB7204* Universal input/output (HART)
- LB7104*/FB7204* Universal input/output (HART)
- LB5102*/FB5202* RTD signal converter input
- LB1109*/FB1209* Digital input
- LB2116*/FB2216* Digital output with position feedback
- LB6116*/FB6216* Digital output with shutdown input
- LB6101*/FB6301* Relay output

I/O module groups

One channel of an I/O module is represented by one submodule in STEP 7. The functions of an I/O module can be specified by subordinating one or more submodules to an I/O module.

The I/O modules are organized by type in the hardware catalog in the Module section. The channels of the I/O modules are organized in the hardware catalog in the **Submodules** section.

A distinction is made between three different I/O module groups:

- I/O modules with fixed preassigned input channels or output channels, e.g., 6x01 relay output. The channels (submodules) of these I/O modules cannot be removed from the device overview. The submodules of this I/O module group are not listed in the hardware catalog.
- I/O modules without fixed default input channels or output channels, e.g., 5x05 thermocouple signal converter. These I/O modules are not assigned predefined channels (submodules). The preassigned submodules can be removed from the device overview and other submodules from the hardware catalog suitable for the I/O module can be used.
- I/O module 7x04 with unassigned input channels and output channels. You must assign the channels (submodules) for this I/O module.



Adding I/O modules

To integrate the I/O modules, proceed as follows:



Note

Important information for the integration

The I/O modules are added in the same order as they are positioned on the backplane. The gateway is placed in slot 0 in advance. You can place your I/O modules in slot 1 onward.



Note

In the search field (1) of the hardware catalog, you can enter the name of the I/O module instead of navigating to the I/O module.



Note

Wide I/O modules take up two slots on the backplane. STEP 7 does not identify wide I/O modules by itself. If you drag a wide I/O module into the project, leave the slot below empty in the table.

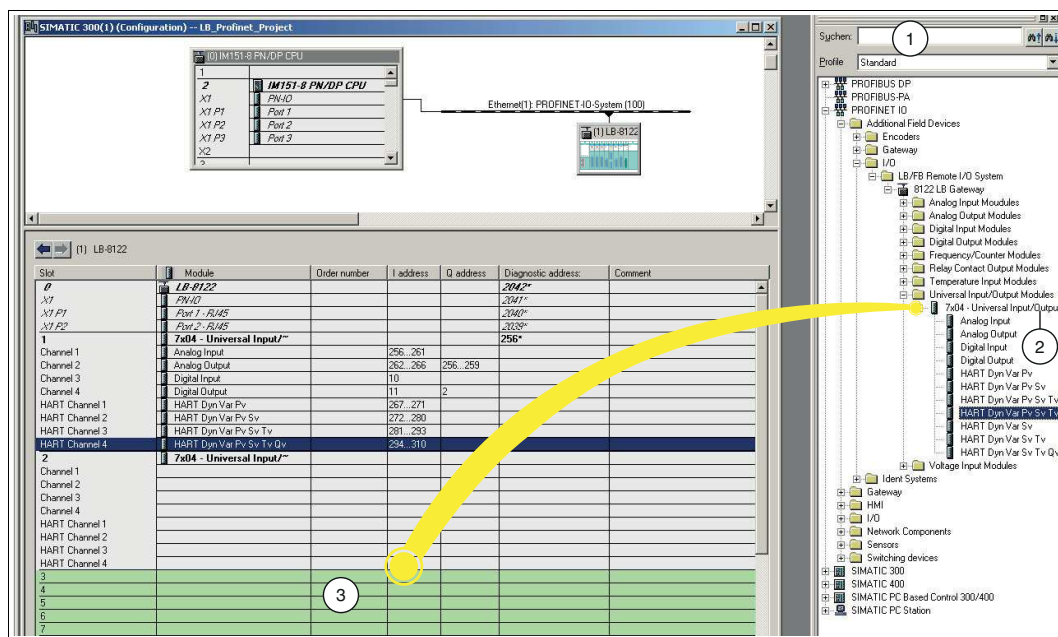


Figure 3.17 Integrating I/O modules

1. Open the hardware catalog.
2. Choose your I/O modules from the hardware catalog (2) and drag and drop them into the configuration table below the gateway (3). Free slots have a light green background in the table.



Note

When you drag an I/O module into the configuration table, STEP 7 automatically assigns an address range to the I/O module. The address assignment size (e.g., 2 bytes) is determined by STEP 7 using the GSDML file. You can change the I/O addresses; see the next section.



Note

The **Slot** column in the configuration table represents the physical slot on the backplane. The **I address** column represents the address assignment of the input channel, and the **Q address** column represents the address assignment of the output channel.

↳ The I/O modules are automatically assigned an address range.



Changing the I/O address

1. In the configuration table, double-click on the module name whose I/O address you wish to change.

↳ The **Properties – ...** window (1) for the selected I/O module opens.

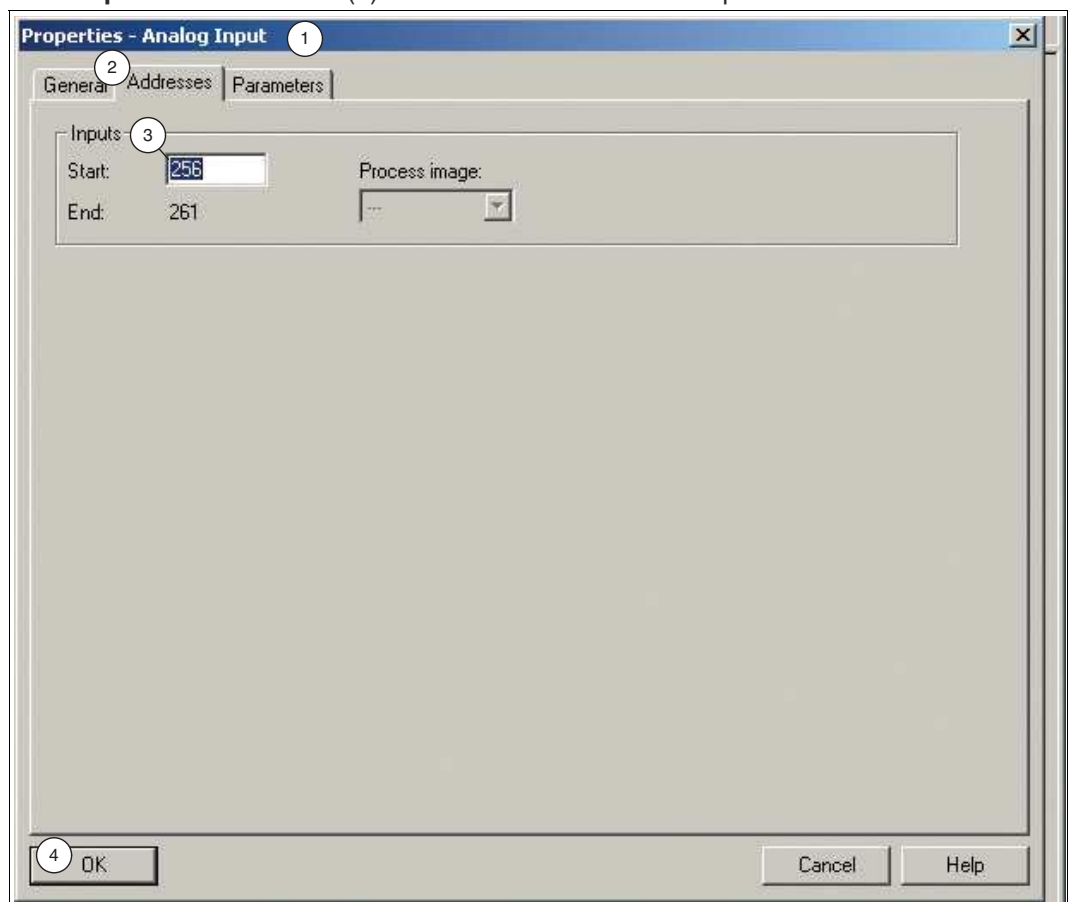


Figure 3.18 I/O module properties window

2. Select the **Addresses** tab (2).
3. Change the **Start** address (3) for the **inputs or outputs**.
4. Click on **OK** (4) to confirm the input.

↳ The modified address is displayed in the configuration table.

3.6 Parameterizing Submodules

Parameterizing allows you to configure the behavior of the I/O modules individually. A submodule represents a channel in an I/O module and determines the function performed by an I/O module. A distinction is made between the following variants of parameterization:

- Configure measuring behavior: During parameterization of the submodules, the measuring behavior of the I/O modules that process input signals is configured.
- Define measuring limits: You can define measuring limits during parameterization. If these measuring limits are exceeded or not reached, the gateway sends an alarm to the control panel.
- Influence output signals: The behavior of I/O modules that emit output signals is also defined during parameterization. These output signals affect the process.



Parameterizing submodules

To parameterize a submodule, proceed as follows:

1. Start the PROFINET hardware configuration in your configuration software.
2. In the configuration table, double-click on a channel of an I/O module (1) that you want to parameterize.

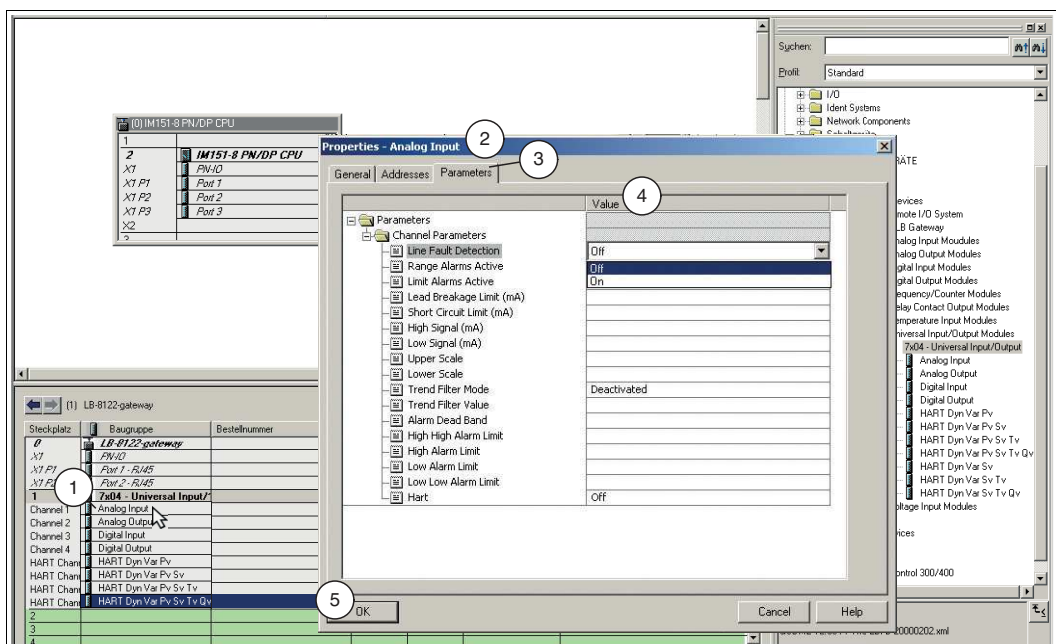


Figure 3.19 Parameterizing submodules

↳ The **Properties – ...** window for the channel opens.

3. Click on the **Parameters** tab (3).

↳ The parameters input screen for the selected channel opens.



Note

For more information on the parameters and their properties, refer to the software manual for the PROFINET gateway.

4. Define the parameter values in the field of the **Value** column (4).
5. Click on **OK** (5) to confirm the change.

3.7 Compiling and Loading the Project Configuration

When you have configured the LB/FB remote I/O system and parameterized the I/O modules, compile and transfer the project configuration. During compilation, the project configuration is converted such that it can be read by the control panel. When you transfer the product configuration, this provides the control panel with all the settings and data for data exchange.



Compiling and loading project configuration

To compile and transfer the project configuration, proceed as follows:

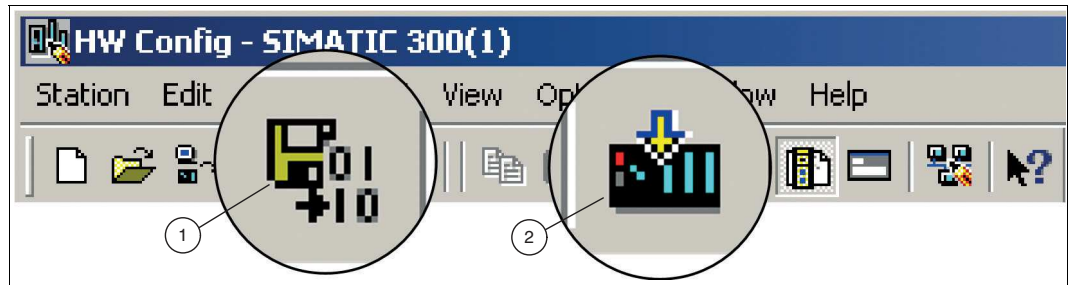


Figure 3.20 Compiling and transferring project configuration

1. Save and compile the project by clicking on **Compile** (1).
2. Transfer the project configuration to the CPU of the control panel by clicking on **Download** (2).
3. Click **OK** to confirm the dialog box and confirm the following dialogs to restart the control panel and apply the changes.

↳ If the configuration is error-free, the settings are loaded.

4 Diagnosis

You can use the integrated alarm functions in STEP 7 to detect faults. The diagnostics can only be accessed in online mode.

The gateway detects faults on the following components:

- Backplane
- Gateway
- I/O module
- Channel
- Power supply

Cyclic and acyclic data traffic

If the gateway detects a fault, it transmits fault data and diagnostic data via cyclic and acyclic data traffic. The gateway transmits fault bits and alarm bits via cyclic data traffic. The gateway uses the PROFINET alarm function via acyclic data traffic. Alarms are reported when events in the LB/FB remote I/O system or in the process occur and disappear again.

The following alarm types are sent via acyclic data traffic:

- **Diagnostic alarms**

Diagnostic alarms relate to faults in LB/FB remote I/O system components, e.g., wire break on one of the channels.

Diagnostic alarms are transmitted with one of the following priorities: "Fault," "Maintenance required," or "Maintenance demanded." "Fault" has the highest priority. If an event occurs on a channel that leads to a top-priority diagnostic alarm (fault) (e.g., lead breakage), the corresponding cyclic data is automatically deemed bad via the IO Producer Status (IOPS = Bad) and can no longer be used for the control panel. In such cases, the control panel must continue processing the faulty input data appropriately in accordance with its substitute value strategy.

- **Process alarms**

Process alarms relate to measured values in the process. The limits of measuring ranges are defined during parameterization of the channels (submodules) in STEP 7. For example, it is possible to define that the gateway should report a process alarm to the control panel if the measured value of a temperature sensor exceeds 30 °C. For more information about the parameterization of I/O modules, see chapter 3.6.

- **Pull alarms**

The gateway transmits pull alarms when an I/O module is pulled out of the backplane.

- **Plug alarms**

The gateway transmits plug alarms if an I/O module is plugged into the backplane.

Alarms are generated by the gateway and reported to the control panel. If the gateway reports an alarm, the alarm is always acknowledged by the control panel. Organization blocks (OB) are available in STEP 7 for further processing of alarms. The organization blocks are triggered by alarms. For more information about organization blocks, refer to the Siemens AG user documentation.

If you are connecting STEP 7 to the PROFINET network, you can access diagnostic information about faults online.

The following figure illustrates cyclic and acyclic data traffic.

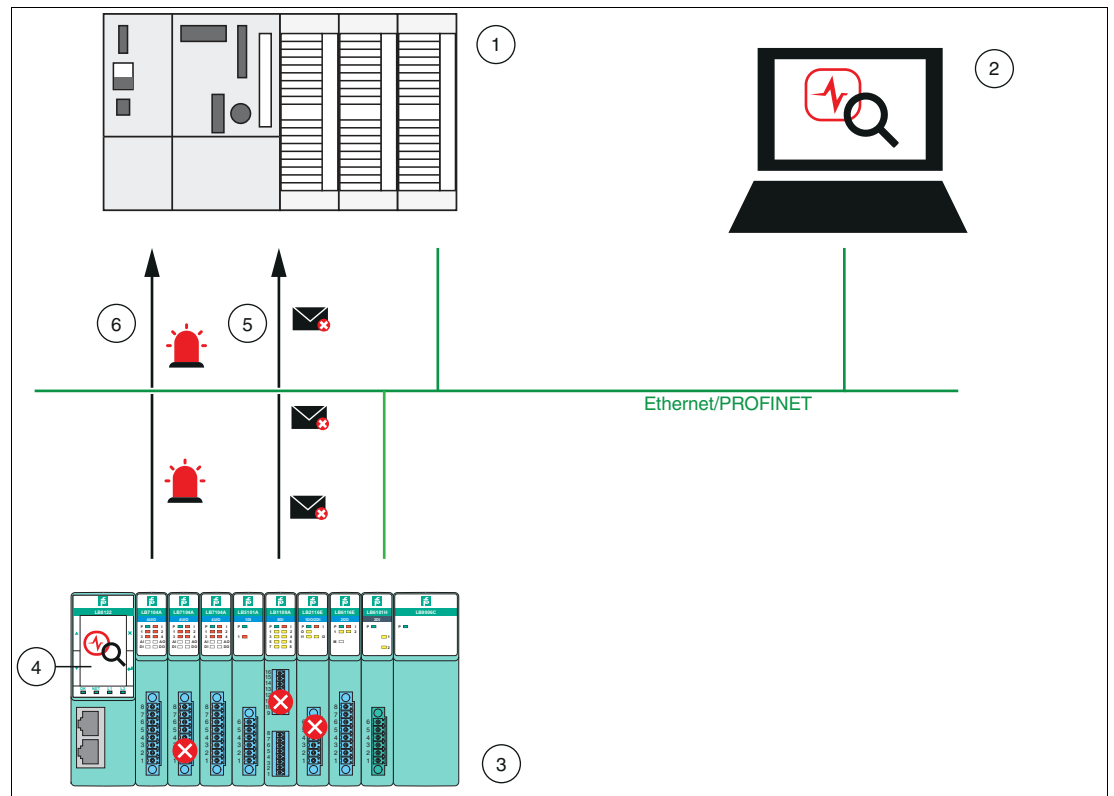


Figure 4.1 Diagnostic information

Item	Description
1	Control panel
2	STEP 7
3	LB/FB remote I/O system
4	Gateway diagnosis
5	Cyclic data: fault bits and alarm bits
6	Acyclic data: alarms

This chapter describes only the diagnostics that are available in STEP 7.

For further information about fault bits and alarm bits in the cyclic data and the diagnostic data that you can access in the gateway, refer to the software manual for the PROFINET gateway.



Identifying faults

1. Select the menu command **View > Online**.
↳ The online window of the project opens.
2. Open your automation project to ensure that the configured programmable modules are displayed.
3. Determine which module is displaying a diagnostic icon that indicates a fault or a malfunction.



Note

Press the F1 key on your keyboard to open the Help page that explains the diagnostic icons.

4. Select the module you want to examine.
5. Select the menu command **Target system > Diagnosis/settings > Module status** to display the module status of the LB/FB remote I/O system.

4.1 Alarms

Alarms are part of the acyclic data traffic and are used to report events in the process or in the LB/FB remote I/O system. A distinction is made between the following alarm types: diagnostic, process, pull, and plug. Diagnostic alarms are transmitted with different priorities.

The following table includes all the alarms supported by the LB/FB remote I/O system. Refer to the software manual for the PROFINET gateway for comprehensive information on which alarms are supported by the relevant I/O module.

Alarm	Alarm type	Priority	Description
Line fault (Error type 257)	Diagnostic alarm	Fault	A lead breakage or a short circuit is present.
Open wire (Error type 6)	Diagnostic alarm	Fault	A lead breakage is present.
Short circuit (Error type 1)	Diagnostic alarm	Fault	A short circuit is present.
Roll over (Error type 259)	Process alarm	–	The counter limit has been reached and the counter is automatically reset.
Roll under (Error type 260)	Process alarm	–	Zero crossing of the counter value has taken place.
Over range (Error type 7)	<ul style="list-style-type: none"> • Analog output: process alarm • Analog input: diagnostic alarm 	Maintenance demanded	The measured value has exceeded the upper limit of the permitted measuring range.
Under range (Error type 8)	<ul style="list-style-type: none"> • Analog output: process alarm • Analog input: diagnostic alarm 	Maintenance demanded	The measured value has fallen below the lower limit of the permitted measuring range.
Low low alarm (Error type 264)	Process alarm	–	The measured value has fallen below the limit defined in the Low Low Alarm Limit parameter.
Low alarm (Error type 263)	Process alarm	–	The measured value has fallen below the limit defined in the Low Alarm Limit parameter.
High alarm (Error type 262)	Process alarm	–	The measured value has exceeded the limit defined in the High Alarm Limit parameter.
High high alarm (Error type 261)	Process alarm	–	The measured value has exceeded the limit defined in the High High Alarm Limit parameter.
Backplane error (Error type 280)	Diagnostic alarm	Fault	A fault is present on the backplane.
Invalid (Error type 265)	Diagnostic alarm	Maintenance required	The output data from the control panel is invalid.
Done (counter) (Error type 258)	Process alarm	–	The counter has reached the cyclic output value that the commissioning engineer defined during parameterization of the I/O modules.

Alarm	Alarm type	Priority	Description
Configuration fault (parameter fault) (Error type 10)	Diagnostic alarm	Fault	A fault is present in the parameters of one of the following components: <ul style="list-style-type: none"> • Gateway • I/O module • Channel
Gateway over temperature (Error type 5)	Diagnostic alarm	Maintenance required	The gateway temperature has exceeded the permissible value.
Pull	Pull alarm	–	An I/O module has been pulled out of the backplane.
Plug	Plug alarm	–	An I/O module has been plugged into the backplane.

Table 4.1 Alarms

5 Testing with Variable Tables

You can use variable tables to save different test environments. You can then reproduce tests and process monitoring multiple times during commissioning or for service purposes.

The following functions are available for testing with variable tables:

- **Monitoring of variables**
Assign variables to individual submodules to monitor their values.
- **Control of variables**
Assign fixed values to individual variables.



Note

Controlling output values can result in a potentially dangerous operating state.

These functions should be used exclusively for test purposes or for troubleshooting. For more information on using these functions, refer to the manual for your configuration software.

The variables that you want to view or control are grouped together in the variable table.

Define the trigger point and the trigger condition to determine when and how often the variables are monitored or overwritten with values.

5.1 Symbol Table

The symbol table is used to assign a symbolic name and the data type to all absolute addresses that you address in your subsequent program. These names are valid for your entire project and are referred to as global symbols. Symbolic programming allows you to improve the readability of your program.



Creating a symbol table

The process outlined here shows how to modify or redefine symbols via dialog boxes when compiling your I/O modules in the project.

1. From the configuration table, select the I/O module to which you wish to assign a symbol. Right-click on the I/O module (1) and select **Edit Symbols** (2) from the dialog box.

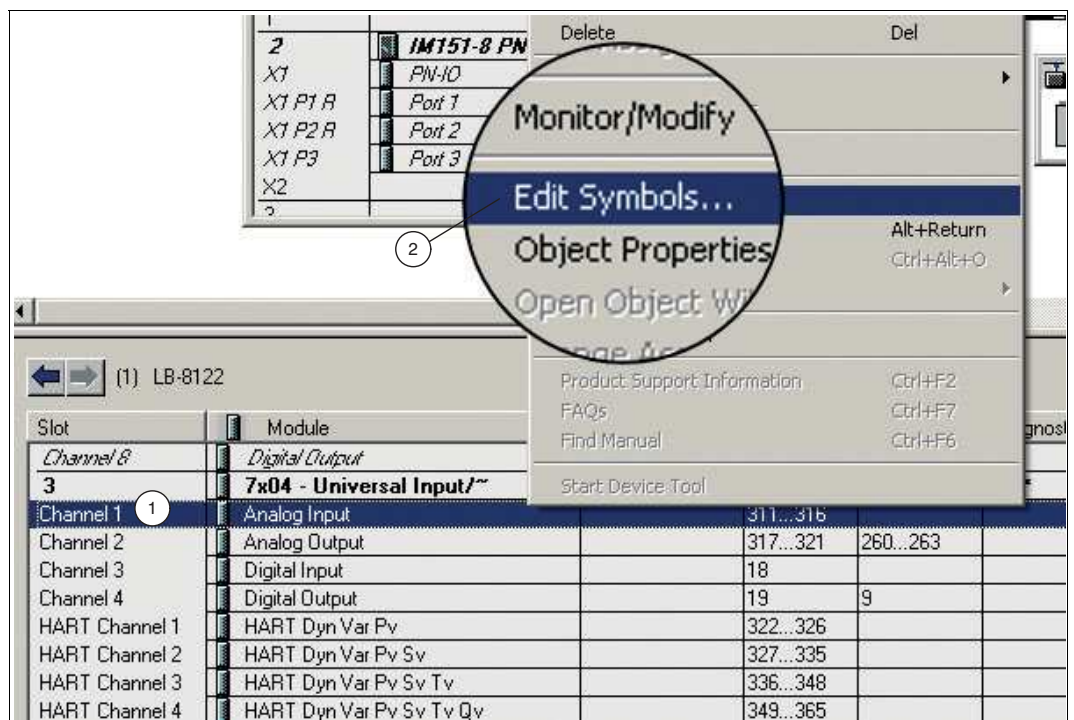


Figure 5.1 Opening the symbol table

- ↳ The **Edit Symbols - ...** input window for the selected I/O module opens. All symbols that are assigned to a channel are displayed. The addresses are derived from the GSDML file and the automatically assigned address range.
- Enter a symbolic name in the Symbol column (1). E.g., for input "PED 311," enter symbol "AnaINSlot1Ch1." You can enter a comment for your symbol in the Comment column.

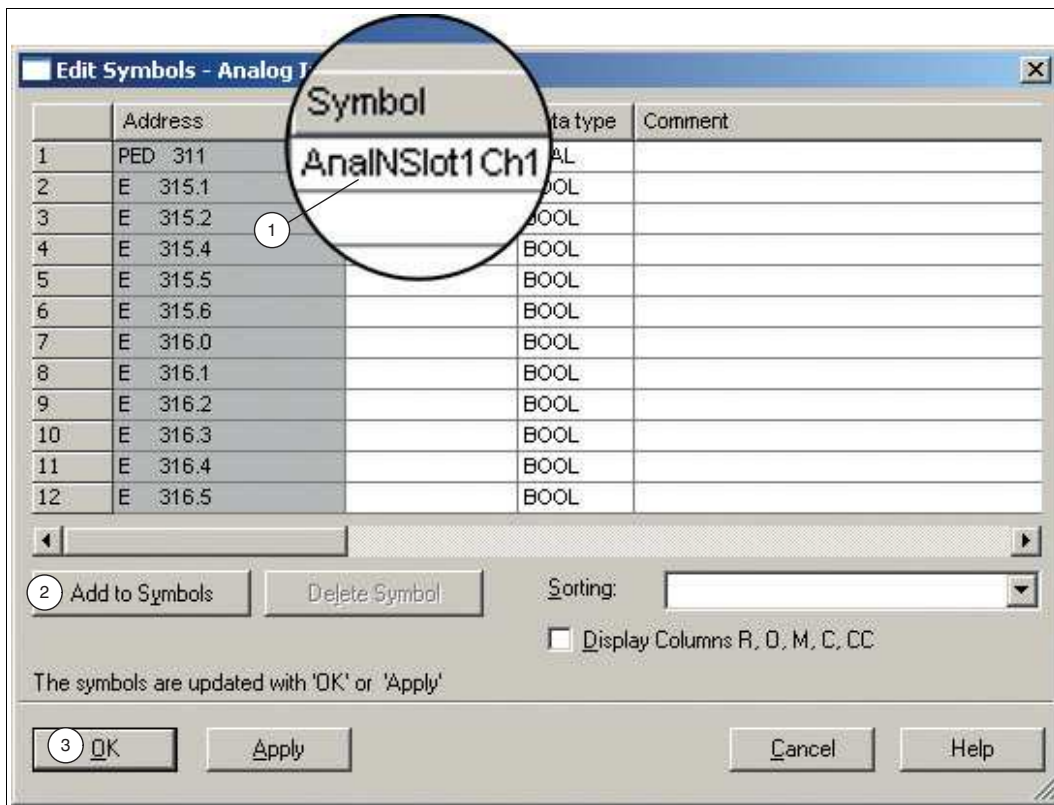


Figure 5.2 Assigning a symbol name



Note

Data Type

The data type determines the type of signals that the CPU is to process. In this project, the following data types are used:

- BOOL, BYTE, WORD, DWORD: data of this type are bit combinations. 1 bit (BOOL) to 32 bit (DWORD).
- INT, DINT, REAL: data of this type is available for processing numeric values (e.g., to calculate arithmetic expressions).



Note

You can add to the symbols automatically from the GSDML file. Click on **Add to Symbol** (2).

- Click on **OK** (3) to confirm your changes.

↳ The changes are transferred to the symbol table.
- Click **Options** (1) > **Symbol Table** (2) to open the symbol table for editing.

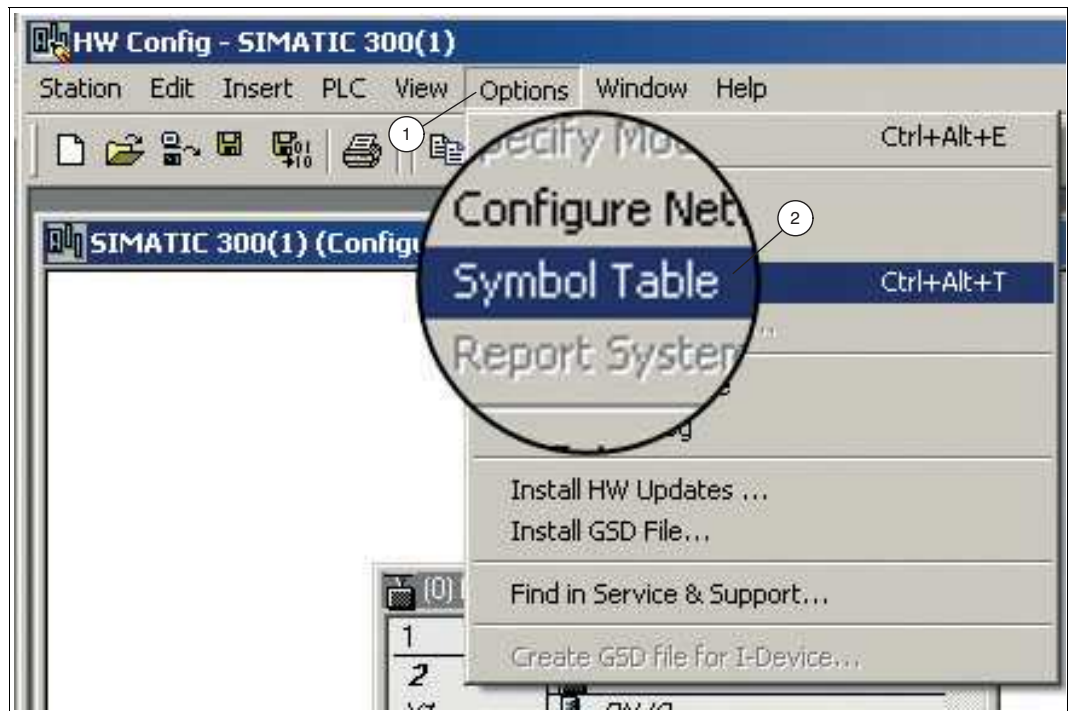


Figure 5.3 Opening the symbol table

↳ The symbol table for the current program is displayed in a separate window. You can now create or modify symbols. When you create a symbol table, it will still be empty when you open it for the first time.



Saving the symbol table

When you conduct a new test of your program, you can use saved symbol names again for monitoring and control.

Save the symbol table using the menu command **Symbol Table (1) > Save (2)**.



Figure 5.4 Saving the symbol table

↳ When you save the symbol table, all current settings and the table format are saved.

5.2 Variable Table

You can use the variable table to test the program in the signal memory. The advantage of this is that you see exactly which signal states are read at the start of the cycle and which are sent to the modules at the end of the cycle. You can thus distinguish between an error in the program or in the hardware. You can save variable tables for different test environments. You can therefore reproduce the tests during commissioning, or for service and maintenance purposes.



Creating a new variable table

To create a new variable table, proceed as follows:

1. In the project tree, select your control panel and navigate to the **Blocks** function (1).

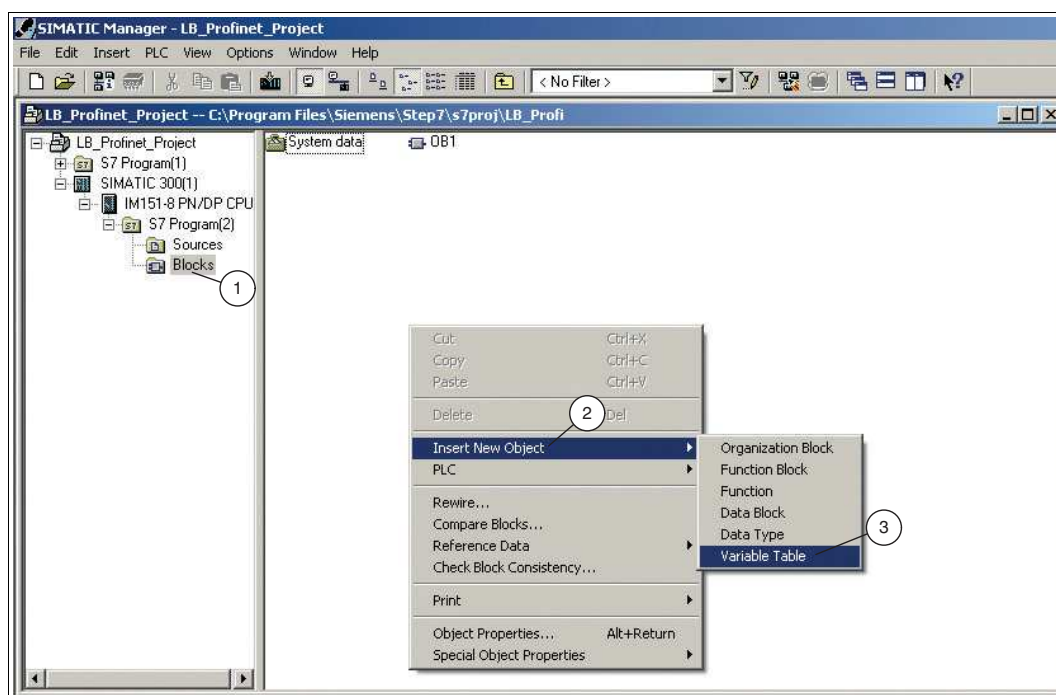


Figure 5.5 Creating a variable table

2. Right-click in the project window and select the function **Insert New Object** (2) > **Variable Table** (3).

↳ The **Properties - Variable Table** window opens.

3. Name the variable table and confirm the entry with **OK**.
4. Double-click on the icon for the variable table in the project window.

↳ An empty variable table opens.



Note

In the open variable table, the required input or output addresses are entered under **Address**. The **Symbol** column shows the symbolic name. The **Display format** menu item is used to select the data type, which can be changed by right-clicking. The **Status value** column indicates the current value of the variables in the CPU. The **Modify value** column contains the future variable value, which is transferred via the **Modify variable** function key. Use the **Monitor variable** function key to obtain the current status value in the CPU in the variable table.

5. In the first empty row under Symbol, enter the symbol name you created earlier (1).

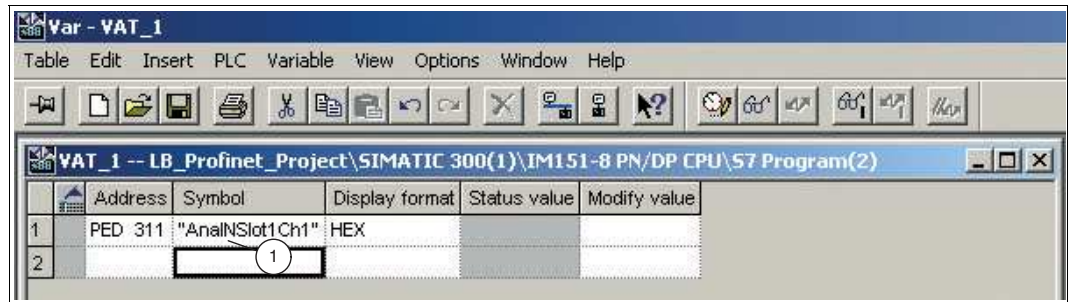


Figure 5.6 Variable Table

↳ The address is assigned automatically.

- Right-click in the cell of your variable under **Display format** (1) and select a data type from the selection list (2).

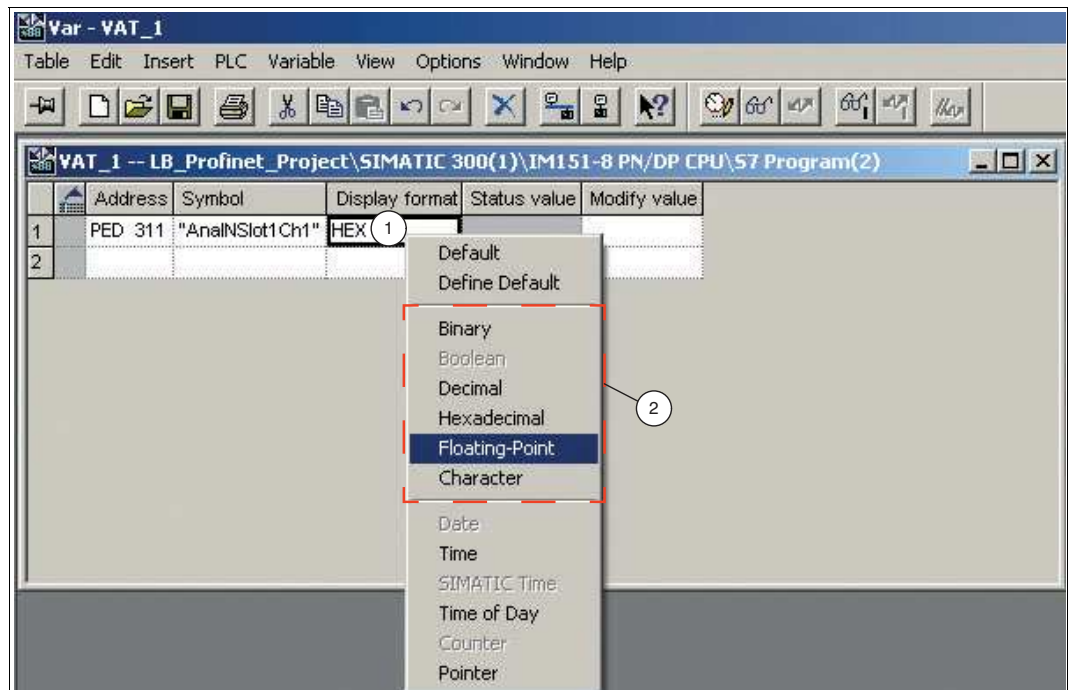


Figure 5.7 Select data type

- Save the variable table using the menu command **Table > Save**.
↳ When you save the variable table, all current settings are saved.



Monitoring variables

Monitoring variables is a way to test both your program and error-free functioning of your hardware. To monitor variables, proceed as follows:

1. Click on **Monitor variable** (1).

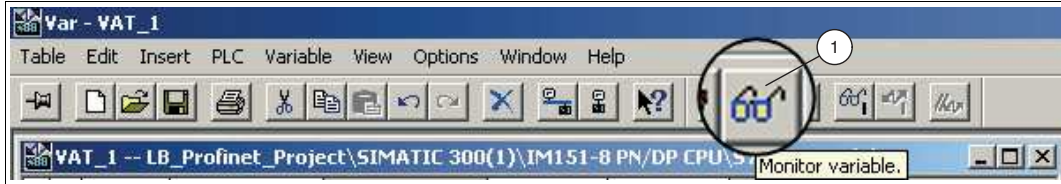


Figure 5.8 Monitoring variables

↳ The variable table is now online. You can monitor the variables.

2. Click on **Update Monitor Values** (1).

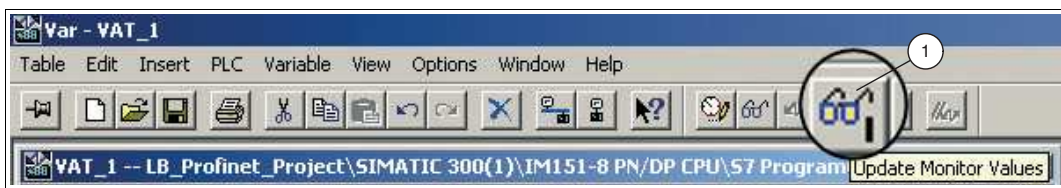


Figure 5.9 Values updated

↳ The values of the selected variables are immediately updated as a one-off procedure.

3. If you press the **ESC** key on your keyboard while monitoring is in progress, monitoring will cease without prompting.



Controlling Variables

In control mode, you can assign values to variables and simulate certain situations for the program sequence. To control variables, proceed as follows:

1. Click on **Modify variable** (1).

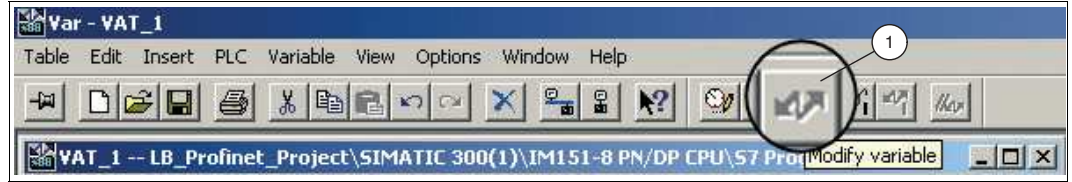


Figure 5.10 Controlling Variables

2. In the **Modify value** column, enter the value "TRUE," for example. The control value is not yet active.



Note

It is not only binary operands that can be controlled. For non-binary operands, you should first select the data type and then enter a corresponding control value. To change the display format of a variable, click on the type in the display format column.

3. Click on **Active modify values**. (1).

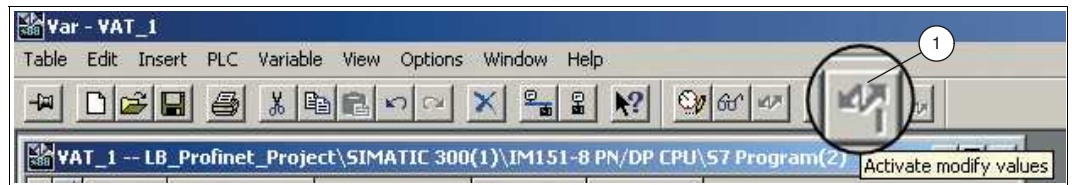


Figure 5.11 Values updated

4. Monitor the effects of the controlled variables in the **Status value** column.
5. Click on **Modify variable** button.
 - ↳ Depending on the set trigger point and the set trigger condition, the values of the selected variables are shown in the variable table.
6. If you press the **ESC** key on your keyboard while monitoring is in progress, monitoring will cease without prompting.

Trigger conditions

Click on the **Variable Trigger** button (1) to open the trigger settings. In the **Trigger** window (2), you can set the trigger point for "monitoring" or "modifying." The trigger point is the point at which the CPU reads its values from the system memory or writes its values to the system memory. You can set whether reading and writing is to take place once or periodically.

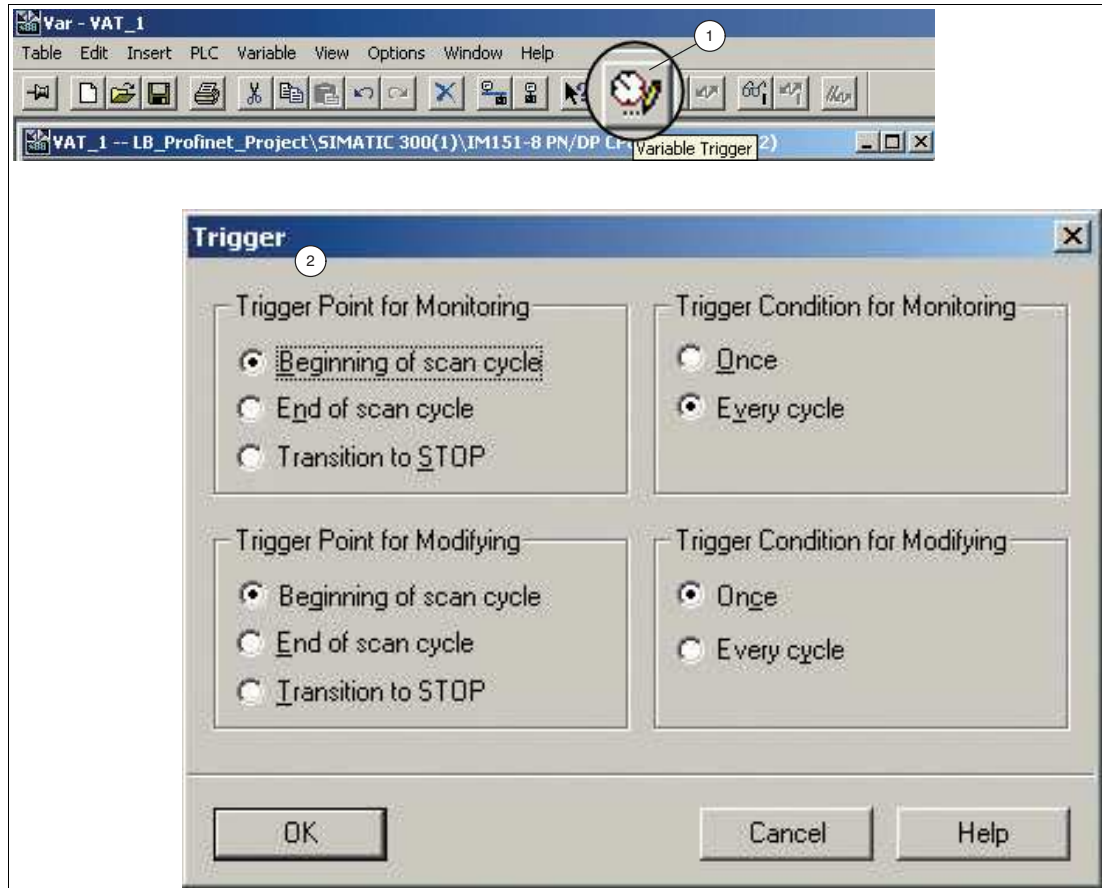


Figure 5.12 Trigger conditions

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- Proximity Sensors
- Photoelectric Sensors
- Industrial Vision
- Ultrasonic Sensors
- Rotary Encoders
- Positioning Systems
- Inclination and Acceleration Sensors
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