Installing and starting up the ILC 131 STARTER KIT

User manual

PHOENIX CONTACT
INSPIRING INNOVATIONS

User manual
Installing and starting up the ILC 131 STARTER KIT

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Designation: UM QS EN ILC 131 STARTERKIT

Revision: 01

Order No.: —

This user manual is valid for:

Designation	Order No.
ILC 131 STARTERKIT	2701835

Please observe the following notes

User group of this manual

The use of products described in this manual is oriented exclusively to:

- Qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.
- Qualified application programmers and software engineers, who are familiar with the safety concepts of automation technology and applicable standards.

Explanation of symbols used and signal words

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible injury or death.

There are three different categories of personal injury that are indicated with a signal word.

DANGER This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

This symbol together with the signal word **NOTE** and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.

This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

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Table of contents

1 General

1.1 Introduction

The ILC 131 STARTERKIT is a combination of hardware and software. It contains all the components you need in order to create and start up a basic ILC 131 ETH system.

1.2 Information about this document

Using an example project, this document helps you to install and parameterize a bus configuration and to program the application program (according to IEC 61131).

It is assumed that the user has knowledge and experience in the operation of PCs, Windows® operating systems, and knowledge of IEC 61131.

For more detailed information about the hardware components, please refer to the documentation for the components. The documentation is also included on the DVD supplied with the ILC 131 STARTERKIT. It can also be downloaded from phoenixcontact.net/products.

More detailed information about the individual functions of PC WORX EXPRESS can be found in the online help for the program. The entire help function can be called via “Help” in the menu bar. Help for specific functions can be called via F1.

This user manual describes the quickest way to start up. Since the INTERBUS devices are read, a complete physical bus configuration is required.

No functions or commands that require communication with the controller can be executed without a physical bus configuration. However, complete parameterization is possible in the “offline” state. The application program can also be created and compiled. Should you wish to proceed in this way, please refer to the Quick Start Guide for PC WORX EXPRESS.

1.3 Content of the ILC 131 STARTERKIT

The ILC 131 STARTERKIT is assembled on a board and contains the ILC 131 ETH including an analog input module. The starter kit hardware is completely assembled.

The assembly is supplied by the power supply unit provided. To operate the assembly, simply connect the power supply unit to the ILC 131 ETH and to the supply voltage (230 V AC socket) via the socket and connect the ILC 131 ETH to your PC via the Ethernet cable provided.

1.4 Components of the ILC 131 STARTERKIT

Table 1-1 Components of the ILC 131 STARTERKIT

Description	Type	Order No.	Quantity
Hardware (modules)			
Inline controller	ILC 131 ETH	2700973	1
Inline terminal with two analog inputs	IB IL AI 2/SF-ME	2863944	1
Hardware (accessories, included in the starter kit)			
Ethernet patch cable, crossover assignment, 2 m	FL CAT5 FLEX CONF/	2744843	1
Switch module	UM 45-IB-DI/SIM8	2962997	1
Documentation/DVD			
User manual	UM QS EN ILC 131 STARTERKIT	–	1
DVD	DVD ILC 131 STARTERKIT	–	1

The following can be found on the DVD:

- PC WORX EXPRESS programming software
- Example programs
  - FirstSteps_ILC131.zwe
  - QuickStart_ILC131.zwe
- Additional documentation for the starter kit components

1.5 System requirements

1.5.1 Supported operating systems

- Windows® XP SP3
- Windows® Vista Business SP2
- Windows® 7 Professional (32/64 bit) SP1
- Windows® 8 Professional (32/64 bit)
- Windows® 8 Ultimate

1.5.2 Hardware requirements

Table 1-2 Hardware requirements

Hardware requirements for PC WORX EXPRESS	
CPU	Pentium 4, 1 GHz (2 GHz recommended)
RAM	1 Gbyte (minimum), 2 Gbyte (recommended)
Hard disk space	2 Gbyte free memory space
DVD drive	Yes
Interfaces	1 x Ethernet (TCP/IP)
Monitor	XGA, resolution of 1024 x 768 pixels (minimum), SXGA, resolution of 1280 x 1024 (recommended)
Operating devices	Keyboard, mouse
Web browser	Java Standard Edition SE 6 (or later) with at least Java Runtime Environment JRE 6 (Version 1.6.x or later)

1.5.3 Programming software

Table 1-3 Required programming software

Software	Software version
PC WORX EXPRESS	≥ 6.30

1.5.4 Required firmware version

Table 1-4 Required firmware version

Device	Firmware version
ILC 131 ETH	≥ 4.01

If the firmware version on your device is earlier than that specified in Table 1-4, please update your firmware. The latest firmware can be downloaded from phoenixcontact.net/products.

2 Installed hardware and startup

2.1 Installed hardware

2.1.1 Structure of the starter kit

The structure of the starter kit is illustrated in Figure 2-1.

The complete starter kit is supplied fully pre-assembled and wired on a board. The starter kit can be used as soon as the provided power supply unit is connected to the ILC 131 ETH and the supply voltage (230 V AC socket).

Additional documentation for the starter kit components is included on the DVD ILC 131 STARTERKIT provided with the starter kit.

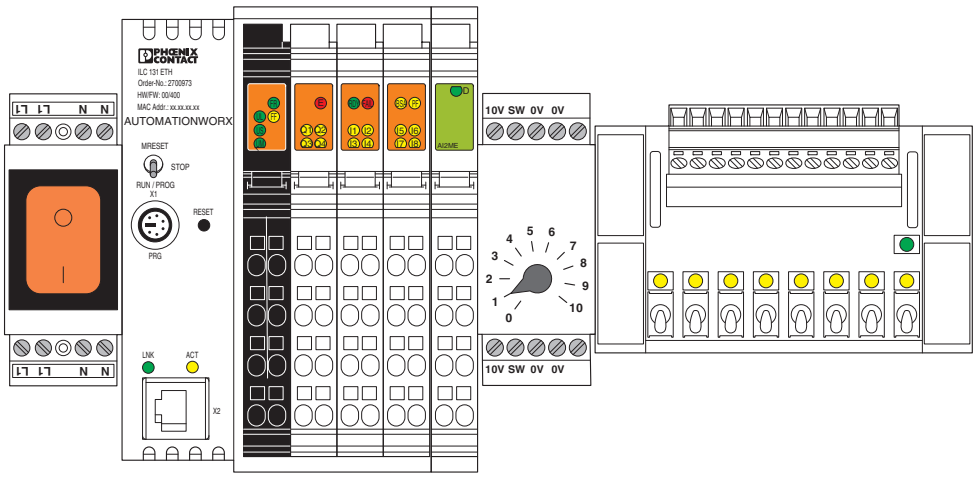


Figure 2-1 ILC 131 STARTERKIT: installed components on the board

2.1.2 Wiring the inputs

For the example program in this documentation, the following inputs are connected:

Table 2-1 Inputs used in the example

Device	Input	Signal at	Variable
ILC 131 ETH	Input I1 Input I2 Input I3 Input I4 Input I5 Input I6 Input I7 Input I8	Plug 3, terminal point 1.1 Plug 3, terminal point 2.1 Plug 3, terminal point 1.4 Plug 3, terminal point 2.4 Plug 4, terminal point 3.1 Plug 4, terminal point 4.1 Plug 4, terminal point 3.4 Plug 4, terminal point 4.4	ONBOARD_INPUT_BIT0 ONBOARD_INPUT_BIT1 ONBOARD_INPUT_BIT2 ONBOARD_INPUT_BIT3 ONBOARD_INPUT_BIT4 ONBOARD_INPUT_BIT5 ONBOARD_INPUT_BIT6 ONBOARD_INPUT_BIT7
IB IL AI 2/SF-ME	Input I9	Plug 5, terminal point 1.1	Input_Analog

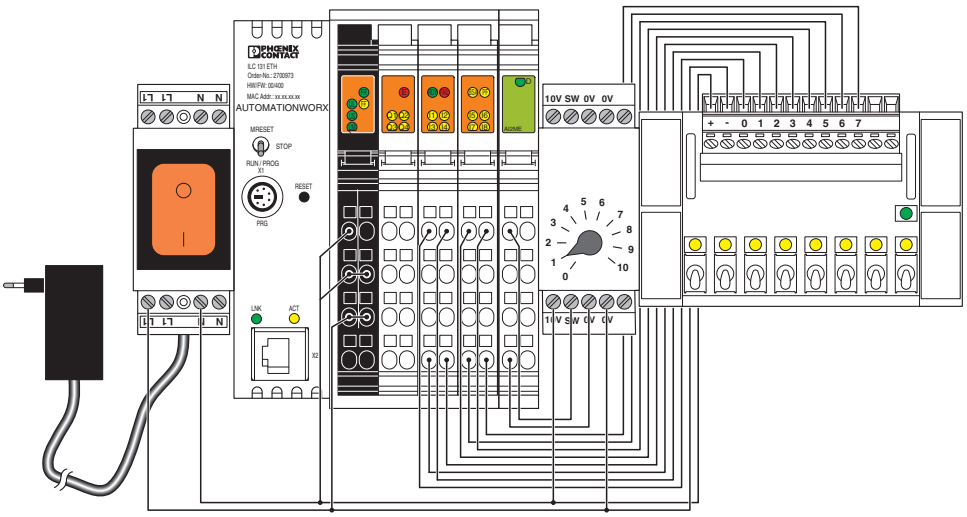


Figure 2-2 ILC 131 STARTERKIT: example wiring for the inputs and the supply lines

2.1.3 Establishing the Ethernet connection

- Connect the Ethernet cable.

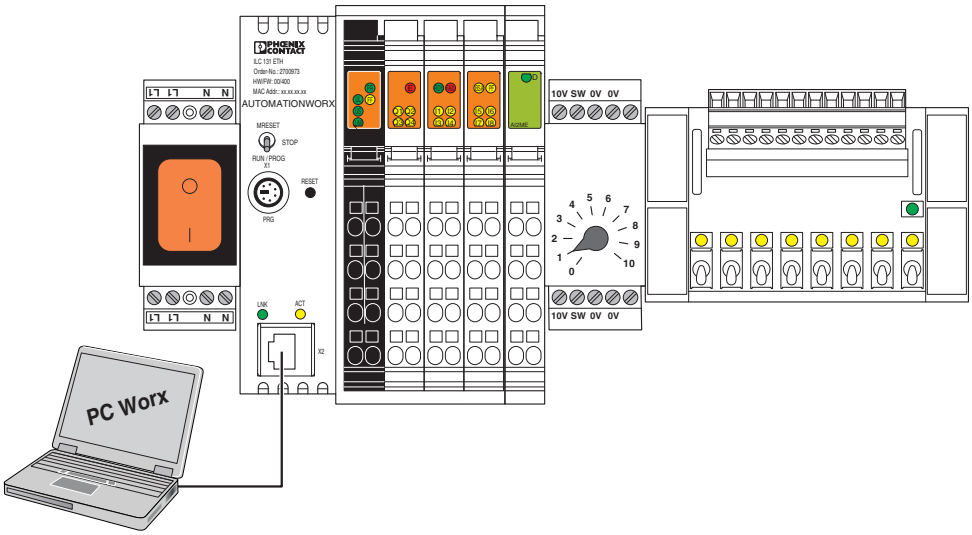


Figure 2-3 ILC 131 STARTERKIT: example of the Ethernet cabling

2.2 Starting up the ILC 131 STARTERKIT

2.2.1 Connecting the supply voltage

- Connect the power supply unit to the ILC 131 ETH. To do this, insert the power supply unit plug into the corresponding socket of the switch module on the left-hand side of the ILC 131 ETH (see Figure 2-2).
- Connect the European plug of the power supply unit to the supply voltage (230 V AC; plug for power cable socket, European version).
- Switch on the supply voltage.

Once you have connected the power to the starter kit, test the controller inputs by activating the switch on the switch module (displayed by the controller input LEDs (I1 ... I8)).

2.3 Example projects

Please note that by default upon delivery of the ILC 131 STARTERKIT there is **no** PC WORX EXPRESS example project stored on the starter kit controller.

Example projects for PC WORX EXPRESS

The DVD provided with the ILC 131 STARTERKIT includes the following example projects for PC WORX EXPRESS in the form of compressed project files:

– FirstSteps_ILC131.zwe
– QuickStart_ILC131.zwe

Section 5.2, ""FirstSteps_ILC131" example project" provides step-by-step instructions for creating the "FirstSteps_ILC131.mwe" example project. If you want to develop the example project yourself, please refer to this section.

We recommend that you only download the "QuickStart_ILC131.mwe" example project to the controller after completing the step-by-step creation of the "FirstSteps_ILC131.mwe" example project, because the creation process will provide you with basic knowledge of the project.

Example visualization

The DVD provided with the ILC 131 STARTERKIT includes the following example project for WebVisit in the form of a self-extracting file:

– FirstSteps_ILC131.exe

The visualization example can be used for both of the above PC WORX EXPRESS example projects.

For information about the "FirstSteps_ILC131.exe" visualization example project and the WebVisit software, please refer to "Visualization with WebVisit" on page 77.

3 Installing the PC WORX EXPRESS software

3.1 Installing the software

3.1.1 Prior to installation

Prior to installation, close all open Windows® applications.

This PC WORX EXPRESS version can be installed in parallel to an existing earlier version.

First install the PC WORX EXPRESS software from the ILC 131 STARTERKIT DVD.

3.1.2 Starting the PC WORX EXPRESS installation program

Once you have inserted the DVD into the drive, the start page of the installation program opens automatically.

If the start page of the installation program does not open automatically, open the installation program via the “index.html” file (“Computer, DVD Drive, Index.html”)

- Select the German language version by clicking the German flag.

You are taken to the main page.

- Select “Programs”.
- Click on the “AUTOMATIONWORX Software Suite 2013 1.81 (PC WORX EXPRESS 6.30.767)” link and download the zip file.
- Extract the zip file to a folder.
- Start the unpacked “Setup.exe” file.
- Follow the instructions in the installation program.

During installation, the installation program asks which components from the ILC 131 STARTERKIT DVD should be installed.

- In the dialog box that opens, specify whether you want to install PC WORX EXPRESS only or other components as well.

The installation program creates all directories that are necessary for operation and copies files according to your selection in the installation program.

- Return to the main page and select “Programs”.
- Click on the “AddON V1 for AUTOMATIONWORX Software Suite 2013 1.81 (Easy IP address assignment via DCP)” link and download the zip file.
- Extract the zip file to a folder.
- Start the unpacked “AddOn V1.exe” file.
- Follow the instructions in the installation program.
- You must restart your PC in order for the configuration file changes to come into effect. To do this, click on “Finish” at the end of the installation process.

3.1.3 Starting PC WORX EXPRESS

- For installation using the default settings, start PC WORX EXPRESS via “Start, Programs, Phoenix Contact, AUTOMATIONWORX Software Suite 1.81, PC WORX EXPRESS 6.xx”.

4 Helpful information about PC WORX EXPRESS

4.1 Online help

More detailed information about the individual functions of PC WORX EXPRESS can be found in the online help for the program. The entire help function can be called via “Help” in the menu bar. Help for specific functions can be called via F1.

4.2 The PC WORX EXPRESS user interface

The user interface consists of the following main components: menu bar, toolbars, main window, and status bar. The contents of the main window depend on the set workspace.

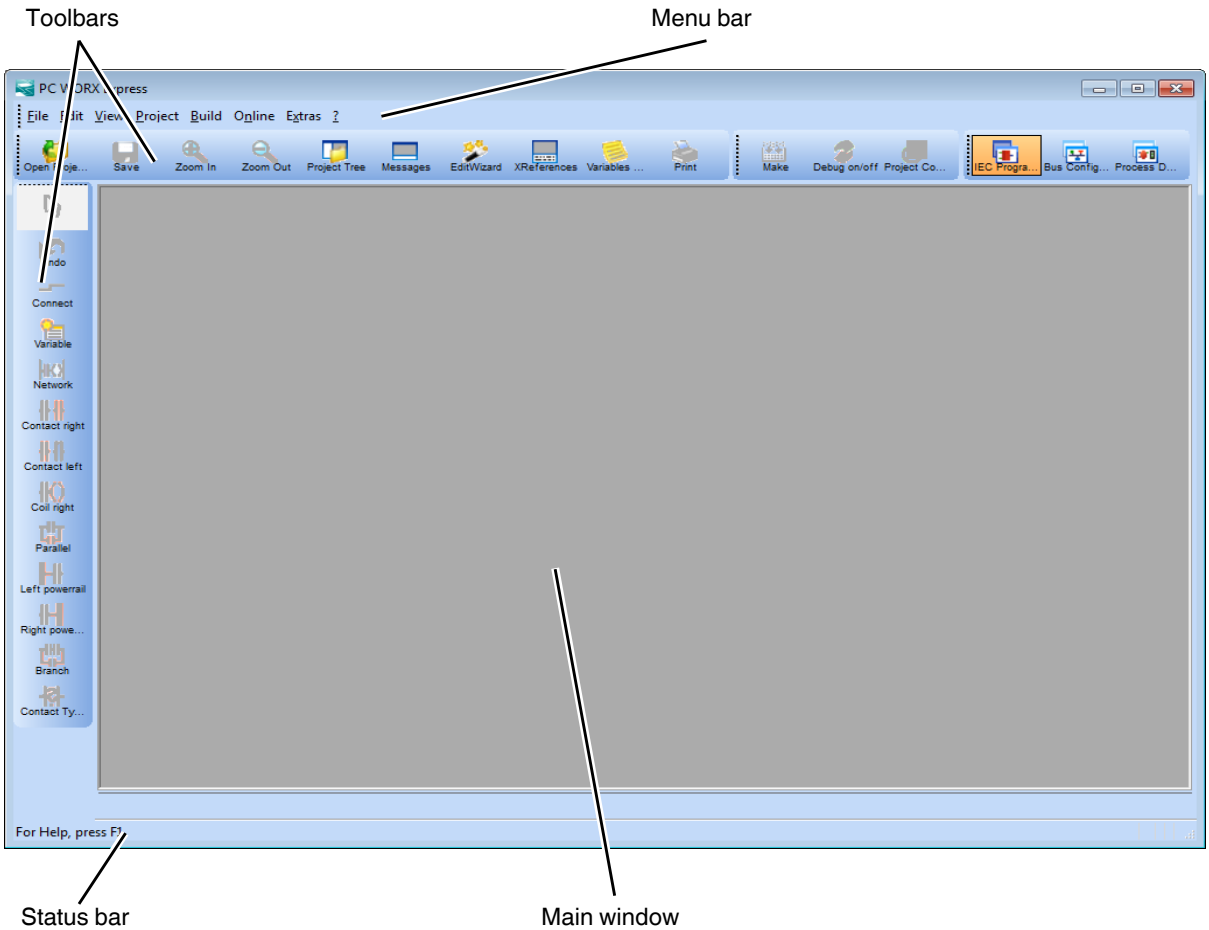


Figure 4-1 User interface

4.3 Toolbars

The program contains several toolbars with different icons, which enable frequently used operations to be executed quickly. Alternatively, these operating steps can be called via menu items or predefined shortcuts. The toolbars that are displayed vary depending on the workspace that is set.

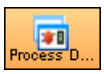
When the mouse pointer is placed over an icon (without clicking on it), a tool tip appears. The tool tip displays the name of the current icon. In addition, a short function description appears in the status bar.

Icons for selecting the workspace

The workspace can be changed via the icons in the toolbar:

Open the IEC Programming Workspace.

Open the Bus Configuration Workspace.



Open the Process Data Workspace.

Frequently used icons for compiling and debugging

Make (compile project; corresponds to “Build, Make” in the menu bar).

Switch debug mode on/off.

Display Project Control Dialog.

4.4 Workspaces

PC WORX EXPRESS is divided into three workspaces:

– IEC Programming
– Bus Configuration
– Process Data

The “View” menu or the corresponding icon in the toolbar can be used to switch between the workspaces. Following initial installation, the IEC Programming workspace is the default setting.

Figure 4-2 to Figure 4-4 show the default workspaces. The windows (“Message Window”, etc.) that you wish to display can be defined at any time for each workspace.

Which windows will actually be displayed depends on which windows have been toggled on. Select the windows that are to be toggled on or off via the “View” menu item.

The last setting for each workspace is saved when the program is closed and restored when it is started again.

IEC Programming workspace

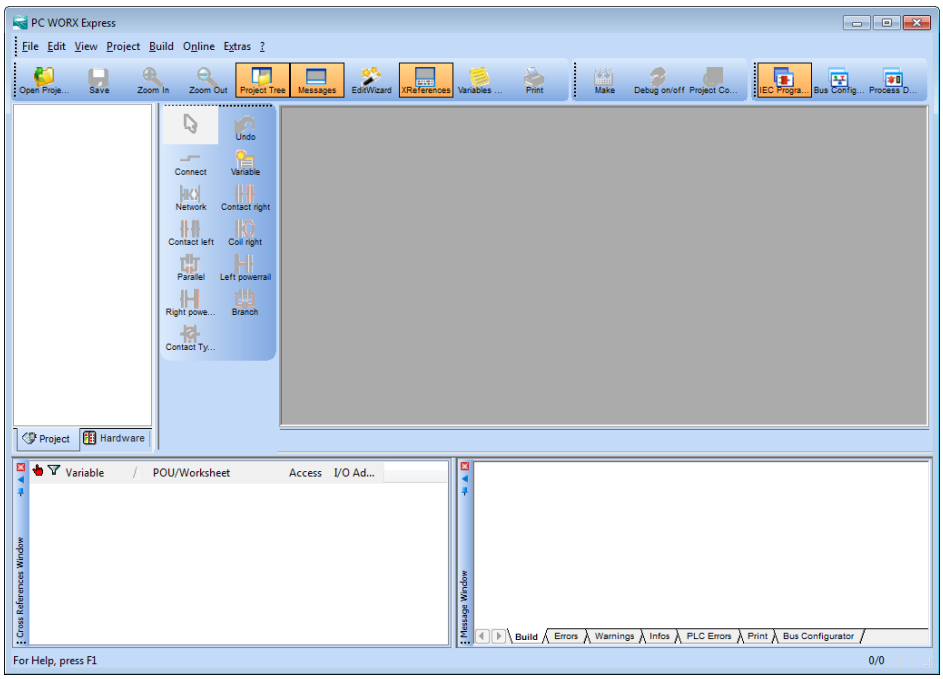


Figure 4-2 IEC Programming workspace

Bus Configuration workspace

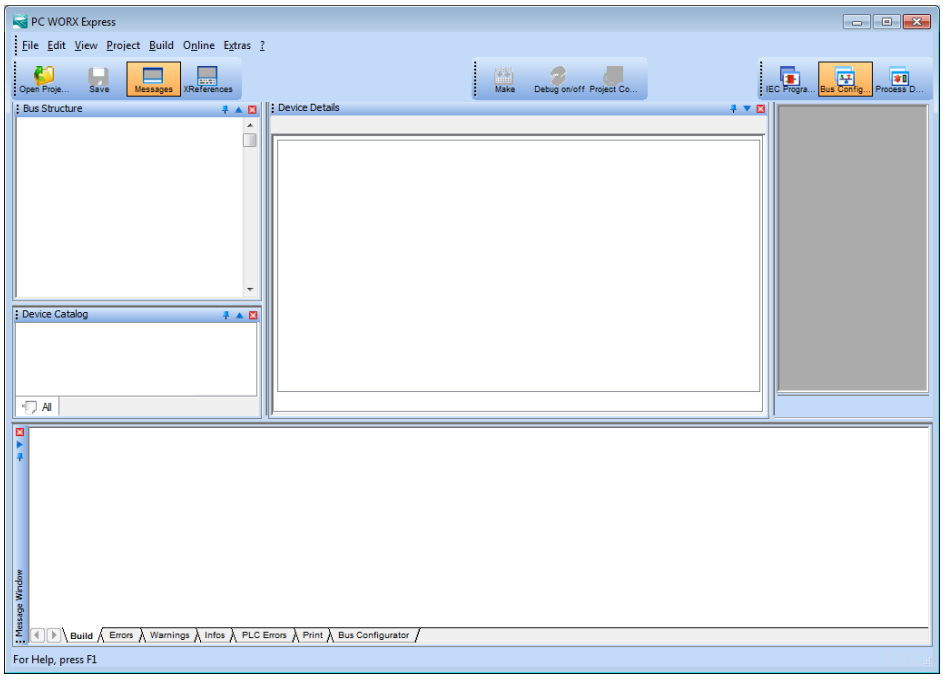


Figure 4-3 Bus Configuration workspace

Process Data workspace

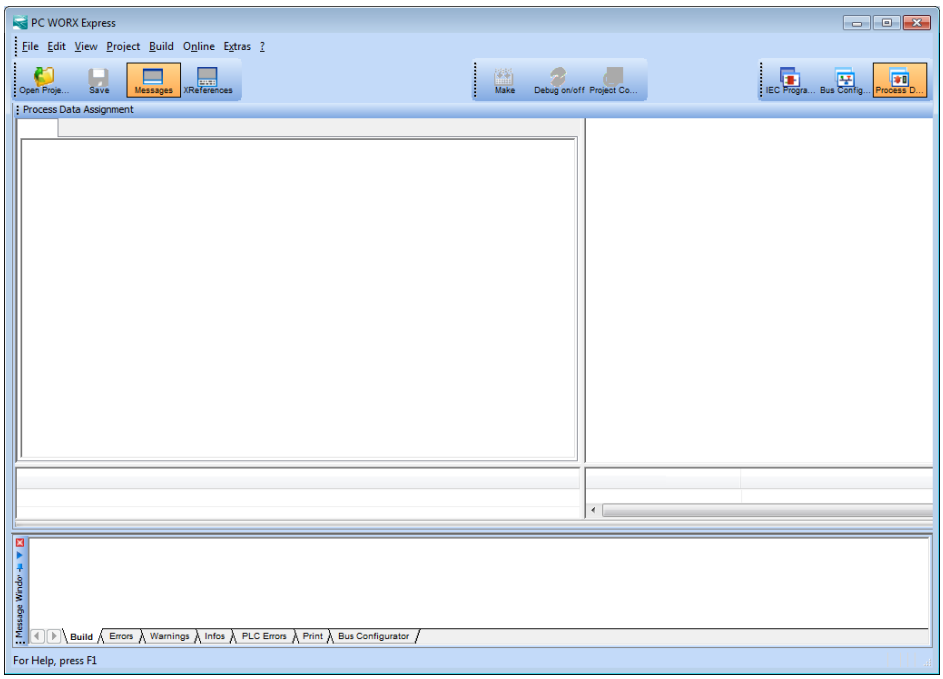


Figure 4-4 Process Data workspace

Toggling windows on/off

Each window can be toggled on/off via the “View” menu by selecting the corresponding menu item.

Docking/undocking windows

For each window, you can specify whether or not it is to be docked in the other windows. There are various options for docking/undocking windows:

1. Permanent docking/undocking:

   In the title bar or the gray frame of the relevant window, right-click with the mouse and activate/deactivate the “Allow docking” menu item.
   Move an undocked window to the position where it is to be inserted in the desktop.

2. Temporary undocking:

   Double-click on the gray window frame or the title bar of the window. The window is then displayed as a “normal” window. Its size can be modified and it can be moved to any position on the screen. In order to re-dock the window, i.e., to reinsert it in the desktop, double-click on the title bar.

4.5 “Bus Structure” window

The “Bus Structure” window is used to display and edit the bus topology of the project.

4.5.1 Icons in the “Bus Structure” window

4.5.1.1 Logical device functions

The individual device functions are identified in the “Bus Structure” window with logical icons. The logical icons in the example bus configuration have the following meaning:

Table 4-1 Icons for logical device functions (examples)

Icon	Meaning
	**Controller resource** When creating the project using a template, the controller resource is inserted below this icon. When creating the project using the wizard, the controller resource is inserted below this icon.
	**INTERBUS master** Below this icon, insert the INTERBUS devices that are directly connected to the device that this icon refers to (local bus and remote bus).

4.5.1.2 Validity of actions

When editing the bus configuration with the mouse, the mouse pointer indicates the validity of your actions.

Table 4-2 Icons when editing the bus configuration

Icon	Meaning
	Insert at the same level The device can only be inserted in/moved to the same level as existing devices.
	Insert in the lower level The device can only be inserted in/moved to a lower level than existing devices.
	Replace The device under the mouse pointer can be replaced by holding down the <Ctrl> key and placing the mouse pointer on the existing device.
	Not permitted This icon indicates a mouse pointer position for which actions are not permitted.

4.5.1.3 Display of status information

In the “Bus Structure” window, some icons, which superimpose other graphics, are used to display important status information.

Table 4-3 Icons for displaying status information

Icon	Meaning
	The device is hidden or the bus is deactivated.
	Errors have occurred for the device.
	Warnings have occurred for the device.
	The pin indicates a module that is a fixed component of a device. This element cannot be deleted or replaced.

4.5.2 Display in the “Bus Structure” window

The display in the “Bus Structure” window can be adapted to your requirements.

- Switch to the Bus Configuration workspace.
- In the context menu, open a device via the “Edit Device Representation...” menu item.

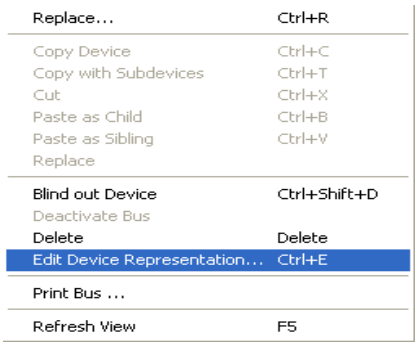


Figure 4-5 “Edit Device Representation...” menu item

- Select the criteria that you would like to see in the display.

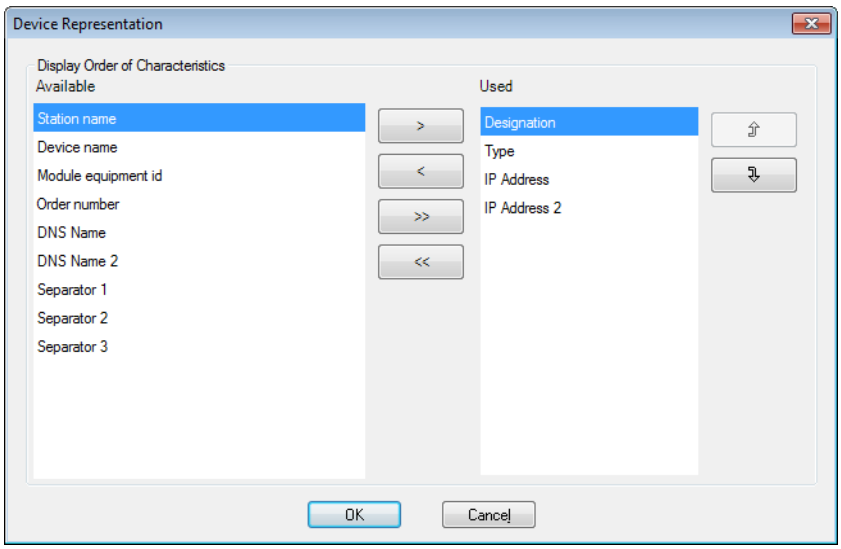
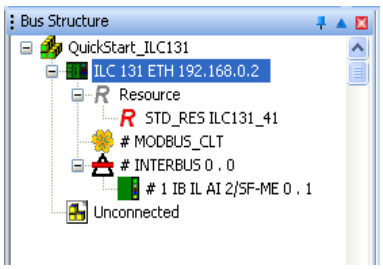
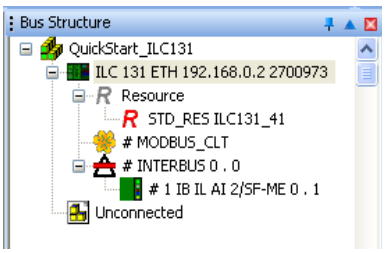


Figure 4-6 Device representations

Examples of different device representations:



Designation and IP address



Designation, IP address, and order number

Figure 4-7 Examples of different device representations

The selected representation only affects the representation of a specific device group.

These groups are for example:

– Controllers
– INTERBUS devices

For example, the setting for the Inline controller does not have any influence on the representation of the Inline modules (see Figure 4-7).

4.6 Compiling and transmitting a project and performing a cold restart

4.6.1 Compiling a project

- When compiling a project for the first time, select the “Rebuild Project” command from the “Build” menu. For further compiling processes you can also use the “Make” command (see also “Compiling (additional information)” on page 28).
- If errors occur when compiling, remove the errors and repeat the compiling process until it is completed successfully. Error messages must be removed. Warning messages do not have to be removed.

If you are compiling the project but have not yet programmed anything, you will receive the “Empty worksheet” warning message. This warning message does not affect the next step. The warning message can be ignored.

The results of the compiling process are displayed in the “Message window” together with details of the number of errors and warnings.

4.6.2 Sending a project

When sending the project to the controller, the desired INTERBUS configuration is transmitted and activated.

- Open the “Project Control Dialog”.

If only the “Close” button is enabled in the Project Control Dialog that opens, there is no valid connection to the ILC 131 ETH. In this case, check the communication path.

Project Control Dialog

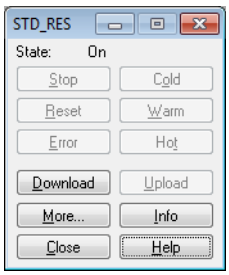


Figure 4-8 Project Control Dialog

Before sending the project to the controller, the download options can be set.

- Click on “More...”.

Download Options

The “Download Options” dialog box opens.

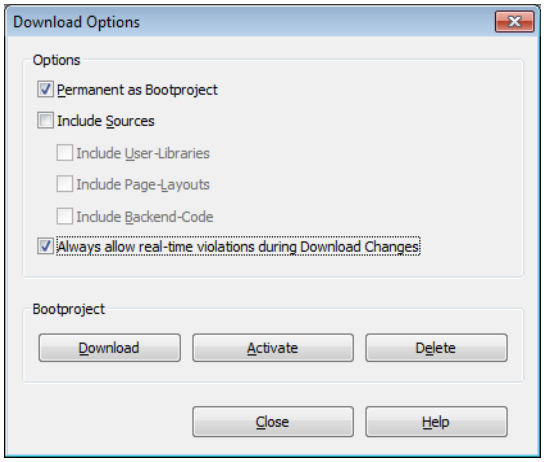


Figure 4-9 “Download Options” dialog box

In the dialog box in Figure 4-9, the following download options can be selected for the project, which is to be transmitted to the controller. In addition, the boot project of the current project can be sent separately or activated/deleted on the controller. The settings selected in this dialog box are used for all transmissions to this specific controller (ILC 131 ETH in the example).

“Options” area

- Permanent as Bootproject — This option can be deactivated to exclude the boot project when sending to the controller.
- Include Sources — This option enables additional options that can be used to select sources, which are included when transmitting a project.
  - Include User-Libraries — All included user libraries are included in the packed program source.
  - Include Page-Layouts — All page layouts that are used are included in the packed program source.
  - Include Backend-Code — All project source data including the compilation is included in the packed program source.

– Always allow realtime violations during “Download Changes”

This checkbox refers to the “Download Changes” function.

When it is selected, the following standard procedure applies: next time “Download Changes” is executed, the system does not attempt to observe the realtime conditions (i.e., execution of the user task at the exact time) on the controller. Instead the system stops program execution on the controller, transmits the project, copies all instance-related data, and then resumes execution of the modified program. The system does not issue a warning message prior to the associated violation of realtime conditions.

Using this option is recommended if “Download Changes” cannot be executed while observing the realtime conditions because there is too much POU instance data (modified project parts) to be copied.

Once you have selected the checkbox, this setting is applied to all future “Download Changes” actions.

The box is also selected if the checkbox of the same name is selected in the message dialog box (“Download changes could not be executed in realtime. Try again?”)

NOTE: If realtime violations are permitted, first ensure that your project is running within safe limits. Please note that each realtime violation may result in unexpected consequences in the automation system, as under certain circumstances user tasks are not processed for a short time. Therefore, check the level of risk before enabling this option.

“Bootproject” area

– “Download” button — The boot project is sent separately to the controller without the complete project.

– “Activate” button — The boot project saved on the controller is activated. Following activation, the boot project can be executed.

– “Delete” button — The boot project saved on the controller is deleted.

- Close the “Download Options” dialog box once you have made the necessary settings for your project.
- To do this, click on “Download” in the Project Control Dialog.

The project is now in the RAM of the controller.

4.6.3 Performing a cold restart

In order to activate the project, it is necessary to perform a cold restart.

- To do this, click on “Cold” in the Project Control Dialog.

Figure 4-10 Project Control Dialog

The ILC 131 ETH has been started up successfully if the green FR LED is on.

4.6.4 Compiling (additional information)

There are two options for compiling:

1 “Build, Make” or

2 “Build, Rebuild Project”

Rebuilding the project

Use this command to compile an **entire** project for the first time or after modifying a user library.

“Rebuild Project” compiles and links all worksheets. Errors and warnings that are discovered by the compiler are logged in the “Message window”. After the syntax has been checked successfully, the system automatically generates the IEC code and the special PLC code. Finally, the project can be sent to the controller.

The “Rebuild Project” command should only be used if errors occurred when compiling with “Make” or your project was unpacked without frontend.

Make

The “Make” command is the standard mode for compiling. Use this command after editing and completing your project.
When the “Make” menu item is executed, all **modified** worksheets are compiled/linked and the modified PLC code is generated.
This command can be executed from the menu bar via “Build, Make”, with the “Make” icon in the toolbar or using the shortcut F9.
Modified worksheets in the project tree are identified by an asterisk that appears after the worksheet name.

Both

After the compiler has been started, the “Message window” appears automatically if it was closed before. This window shows the steps the compiler is currently performing. In addition, errors, warnings, and additional information about the process are logged here. Once the compiling process has been completed successfully (i.e., no errors have been reported), the modified project can be sent to the controller.

5 Step-by-step development of an example project

In this section, it is assumed that the following steps have already been completed:

Step		Section
–	The hardware is installed.	See Section 2, “Installed hardware and startup”
–	The software is installed.	See Section 3, “Installing the PC WORX EXPRESS software”

Objective

The objective of this section is to familiarize you with the following functions of PC WORX EXPRESS:

Functionality		Section
–	Creating a PC WORX EXPRESS project	See Section 5.1.2, “Creating a new project”
–	Establishing a communication connection between the controller and your PC/assigning a valid IP address	See Section 5.1.3, “Adapting the project information” and Section 5.1.4, “Assigning the IP address for the controller”
–	Reading an existing INTERBUS configuration	See Section 5.1.5, “Reading in INTERBUS”
–	Programming a PC WORX EXPRESS project in function block diagram (FBD)	See Section 5.3, “Creating the program”
–	Transmitting the project to the controller and starting the application	See Section 5.3, “Creating the program”

5.1 Creating a project in PC WORX EXPRESS, establishing a connection to the controller, and reading in INTERBUS devices

5.1.1 Overview

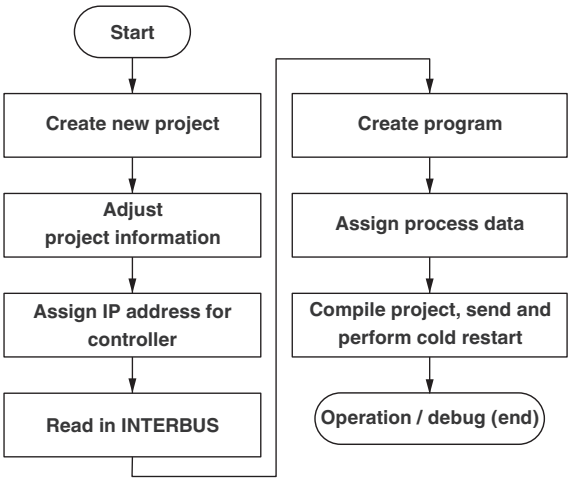


Figure 5-1 Project creation sequence

5.1.2 Creating a new project

In the following sections, an example project is developed using function block diagram (FBD).

Please note that the example project is available in compressed format as the “FirstSteps_ILC131.zwe” file on the DVD ILC 131 STARTERKIT.

– If you want to try out the following steps yourself, please use the same identifiers and names as in this quick start guide in order to achieve the best possible result.
– Read the detailed description in ““FirstSteps_ILC131” example project” on page 45 if you want to use the example project directly from the DVD in PC WORX EXPRESS.

- Select the “New Project...” command from the “File” menu to create a new project using a template.

The tree structure and the selection of the controller are now prepared.

- Select the “ILC 131 ETH Rev. > 00/4.20” controller and confirm your selection with “OK”.

The list of displayed controllers is not sequential. The “ILC 131 ETH Rev. > 00/4.20” controller appears further down the list and only becomes visible when you scroll down.

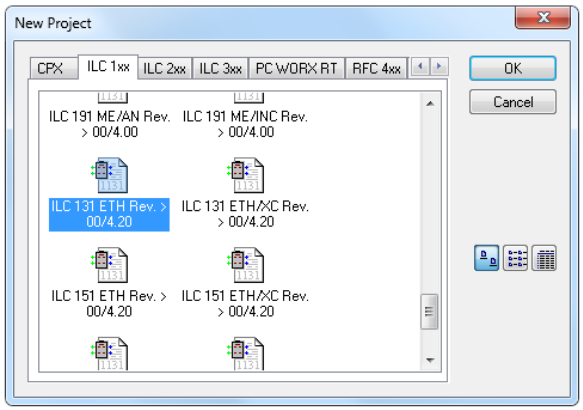


Figure 5-2 “New Project” dialog box: project templates

- Select the “File, Save Project As/Zip Project As...” command.
- Enter a project name (here: FirstSteps_ILC131) and save the project.

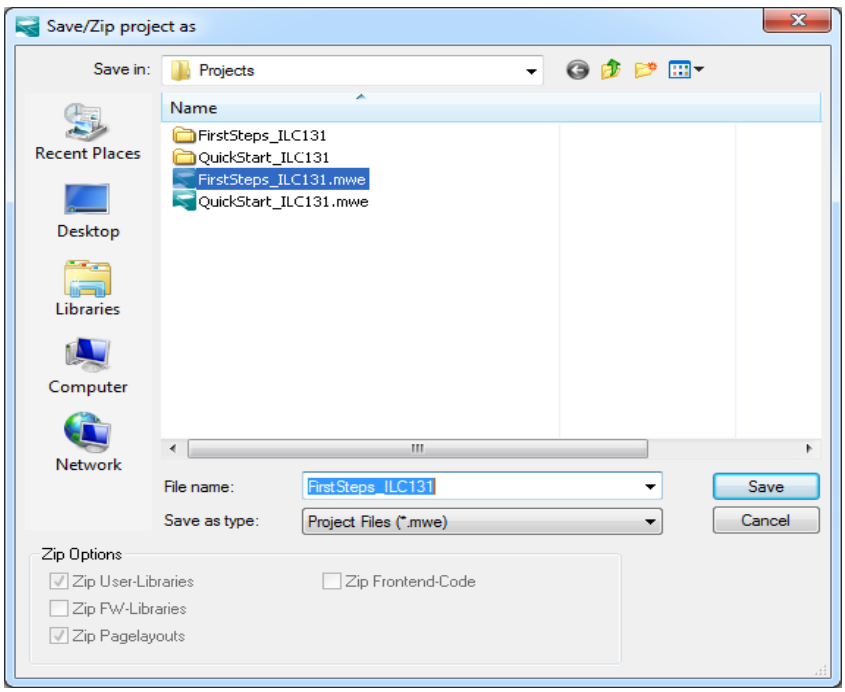
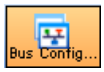


Figure 5-3 “Save/Zip project as” window

5.1.3 Adapting the project information



- Switch to the Bus Configuration workspace.

After creating a new project, the project information is displayed in the Bus Configuration workspace.

- Adapt the project information to your project.

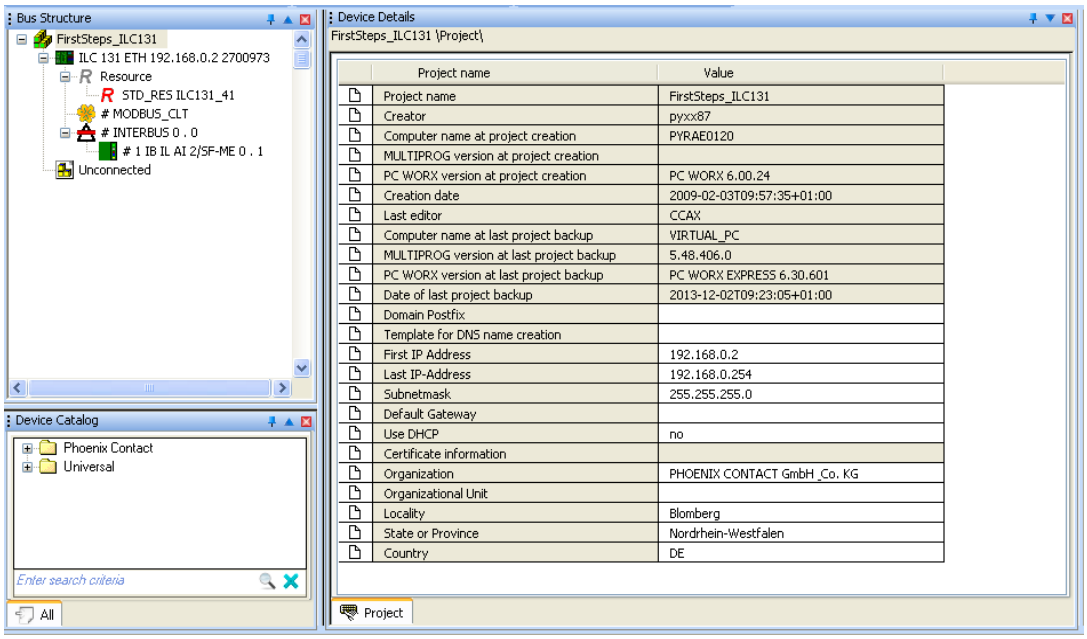


Figure 5-4 Project information after creating a new project

First and last IP address, subnet mask

During project creation, PC WORX EXPRESS automatically assigns an IP address area for a **local network** (area from 192.168.0.2 to 192.168.0.254). If you would like to use another address area (e.g., a **global network**), adapt the start and end address on the project node (here: FirstSteps_ILC131) to your application.

If the IP parameters are modified in the project settings, the IP addresses of the controller may have to be modified manually (see “Assigning the IP address for the controller” on page 34).

If you are using the addresses of a local network in your project, also assign the corresponding address (e.g., 192.168.0.2) to the PC on which PC WORX EXPRESS is installed. Otherwise the devices in the local network cannot be accessed.

For information on the IP addresses to be used within your system, please contact your system administrator.

If the start address of the new address area to be entered is higher than the previous end address, modify the end address first.

If you manually assign IP parameters that are outside the defined area, they will not be accepted.

Example IP addresses are shown in the following screenshots. Adapt the IP address to your system.

5.1.4 Assigning the IP address for the controller

By default upon delivery of the ILC 131 STARTERKIT, the ILC 131 ETH has no preset IP address. Initial setting of the controller's IP address can be carried out with the PC WORX EXPRESS software manually via the serial interface, using the DCP PROFINET protocol or by means of a BootP server. The IP address can be changed later with the PC WORX EXPRESS software via the serial connection, via Ethernet or via the DCP PROFINET protocol.

Phoenix Contact recommends that you assign the IP address via the DCP PROFINET protocol.

5.1.4.1 Dynamic Configuration Protocol (DCP)

The Inline controller from firmware version 4.20 or later and from PC Worx version 6.30.767 or later (part of the AUTOMATIONWORX Software Suite 1.81 incl. AddON V1) supports the DCP PROFINET protocol.

The DCP PROFINET protocol is used to assign an IP address and a name to individual network devices. The PC WORX EXPRESS software sends a broadcast request with a DCP telegram to the devices within the network. The devices respond with their MAC address and device type. By default upon delivery, the ILC 131 ETH has no IP address and therefore responds with 0.0.0.0 and its specific MAC address. In the next step, the IP address is set in PC WORX EXPRESS; then the IP address is transmitted to the ILC 131 ETH by means of a DCP telegram.

PC/network adapter

To determine whether your network permits the IP settings used in the example project (see Figure 5-4 on page 32), proceed as follows:

- In the Windows Control Panel, check the settings for your PC network adapter.
- If necessary, adjust these settings so that the ILC 131 ETH can be accessed in your network via the IP address used in the example project.

If your network does not permit the use of the IP address used in the example project, adjust the settings in the project information accordingly (see Figure 5-4 on page 32).

If any modifications are made to the project information that affect the IP settings for the controller, a warning is displayed. However, the modification is not implemented automatically. When a new project is created, the default settings are specified under “IP Settings” (see Figure 5-4 on page 32 and Figure 5-10 on page 39).

Before the IP address can be assigned via the DCP PROFINET protocol, you must first select the correct Ethernet network card.

- In the “Extras” menu, select the “PROFINET Configuration ...” command.

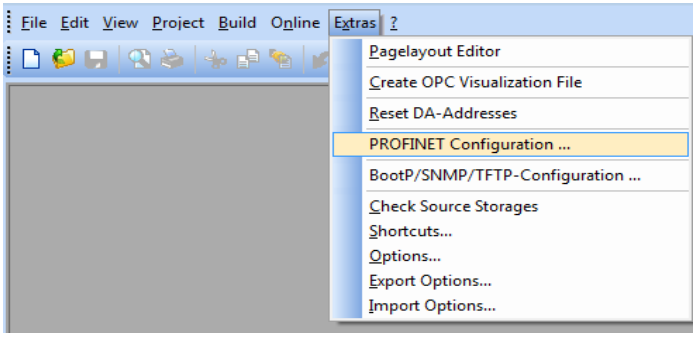


Figure 5-5 Select “PROFINET Configuration ...”

The “PROFINET” window is opened.

- Select the desired Ethernet network card.
- Keep the DCP timeout setting at 2000 ms.

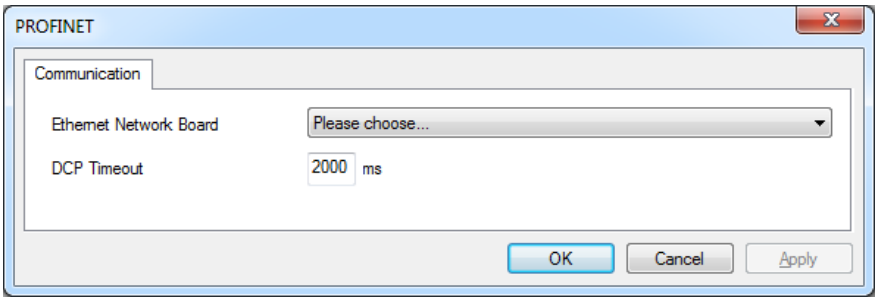


Figure 5-6 “PROFINET” window

- Confirm your entry with “OK”.

The IP address is assigned via the DCP PROFINET protocol in the PC WORX EXPRESS software via the “Device Details” window:

- Select the “IP Settings” tab.
- Select the controller in the bus configuration.

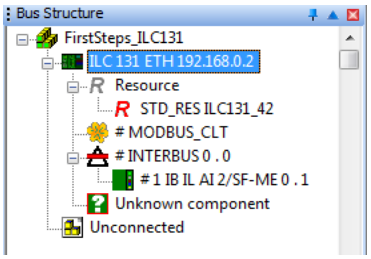


Figure 5-7 Bus configuration: Selecting the controller

- Enter the IP address of the Inline controller.

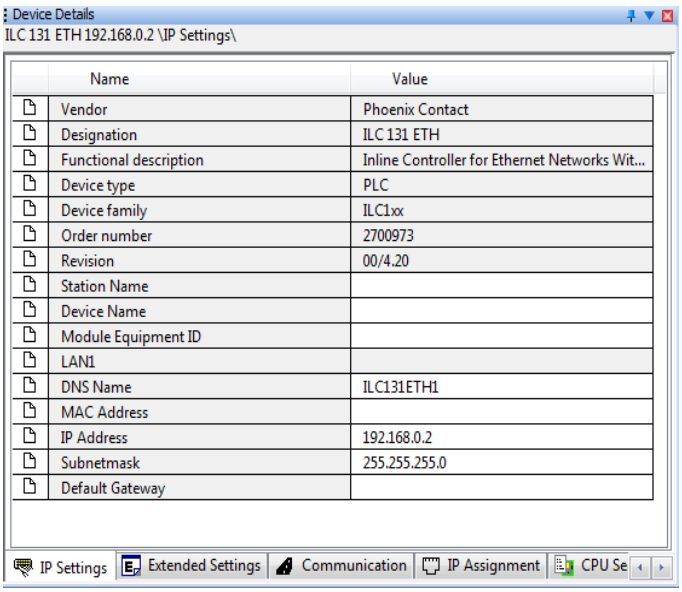


Figure 5-8 DCP: Setting the IP address

The “IP Assignment” tab is used for actual IP address assignment with DCP.

- Select the “IP Assignment” tab.

After selecting the “IP Assignment” tab, the PROFINET network is searched for DCP devices.

- Deactivate the checkbox in the “Filter” area.
- Select the controller.
- Click on “Assign IP” to start IP address assignment with DCP.

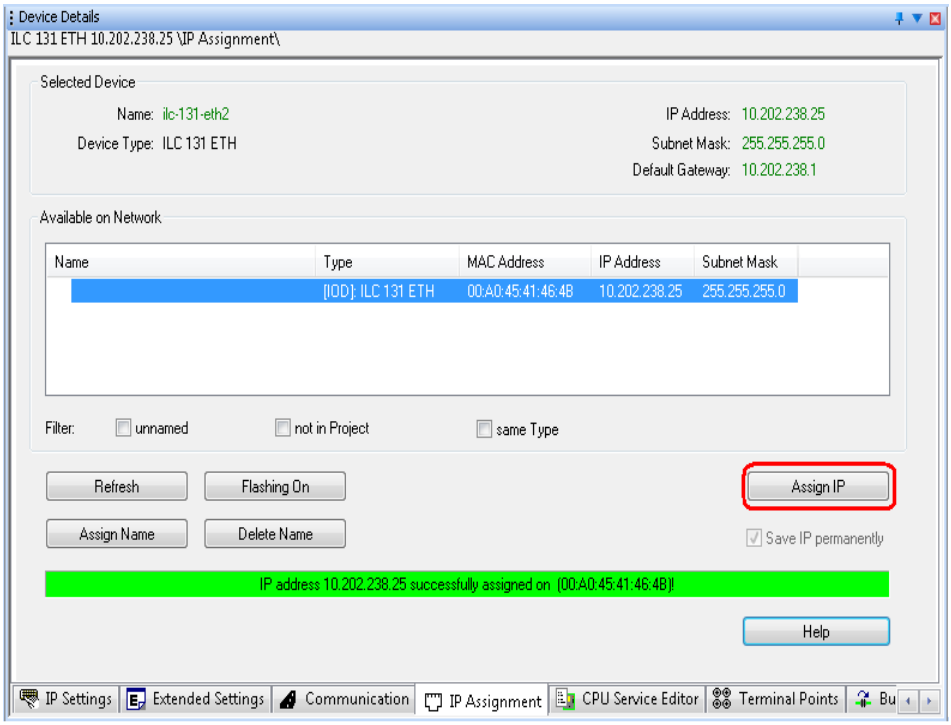


Figure 5-9 Starting IP address assignment via DCP

A green status indicator indicates successful IP address assignment.

The PROFINET device name is assigned in the same way.

Then check the communication between PC WORX EXPRESS and the ILC 131 ETH:

- In the “Device Details” window select the “Communication” tab.
- Click on the “Test” button.

A green status indicator indicates successful communication.

If communication could not be established between PC WORX EXPRESS and the ILC 131 ETH, check again whether your network permits the IP settings used in the example project (see section 5.1.3 on page 32). After you have made any necessary changes, check the communication between PC WORX EXPRESS and the ILC 131 ETH again.

5.1.4.2 BootP server

IP address assignment via a BootP server is an alternative to IP address assignment via the DCP PROFINET protocol. If you have already assigned the IP address via the DCP PROFINET protocol, you can skip Section 5.1.4.2, “BootP server”.

The connecting cable (RS-232 cable) PRG CAB MINI DIN (Order No. 2730611) is available as an optional accessory for connecting the controller to a PC via the serial interface.

Bootstrap protocol (BootP)

In an Ethernet network, BootP is used to assign an IP address to a BootP client using a BootP server. For this example (by default for the ILC 131 STARTERKIT), the ILC 131 ETH (BootP client) sends a BootP_Request as a broadcast into the network. The MAC address of the transmitter is sent with the BootP_Request to provide unique identification. If the BootP server has been activated in PC WORX EXPRESS, PC WORX EXPRESS responds with a BootP_Reply. PC WORX EXPRESS uses this BootP_Reply to inform the ILC 131 ETH of its IP address and subnet mask. Please ensure that:

– The BootP server knows the MAC address sent by the BootP client.
– A corresponding IP address and subnet mask have been assigned in PC WORX EXPRESS for the MAC address.

Once the IP data has been transferred to the ILC 131 ETH successfully, PC WORX EXPRESS sends a corresponding acknowledgment message.

PC/network adapter

To determine whether your network permits the IP settings used in the example project (see Figure 5-4 on page 32), proceed as follows:

- In the Windows Control Panel, check the settings for your PC network adapter.
- If necessary, adjust these settings so that the ILC 131 ETH can be accessed in your network via the IP address used in the example project.

If your network does not permit the use of the IP address used in the example project, adjust the settings in the project information accordingly (see Figure 5-4 on page 32).

If any modifications are made to the project information that affect the IP settings for the controller, a warning is displayed. However, the modification is not implemented automatically. When a new project is created, the default settings are specified under “IP Settings” (see Figure 5-4 on page 32 and Figure 5-10 on page 39).

Assigning IP settings

The IP settings for the controller are made when the project is created. To set the IP address in PC WORX EXPRESS, proceed as described below:

Please note that by default for the ILC 131 STARTERKIT, BootP is preset on the ILC 131 ETH.

The IP address that is assigned here for the controller is also implemented as the IP address for the communication path via TCP/IP.

After assigning the IP parameters, PC WORX EXPRESS automatically sets TCP/IP as a communication path to the ILC 131 ETH.

- Establish an Ethernet connection between your PC and the controller.

- Switch to the Bus Configuration workspace.
- Select the Inline controller node (here: “ILC 131 ETH”).
- Select the “IP Settings” tab in the “Device Details” window.
- Enter the MAC address of the controller (see Figure 5-10 on page 39). It is printed on the device. It starts with 00.A0.45.

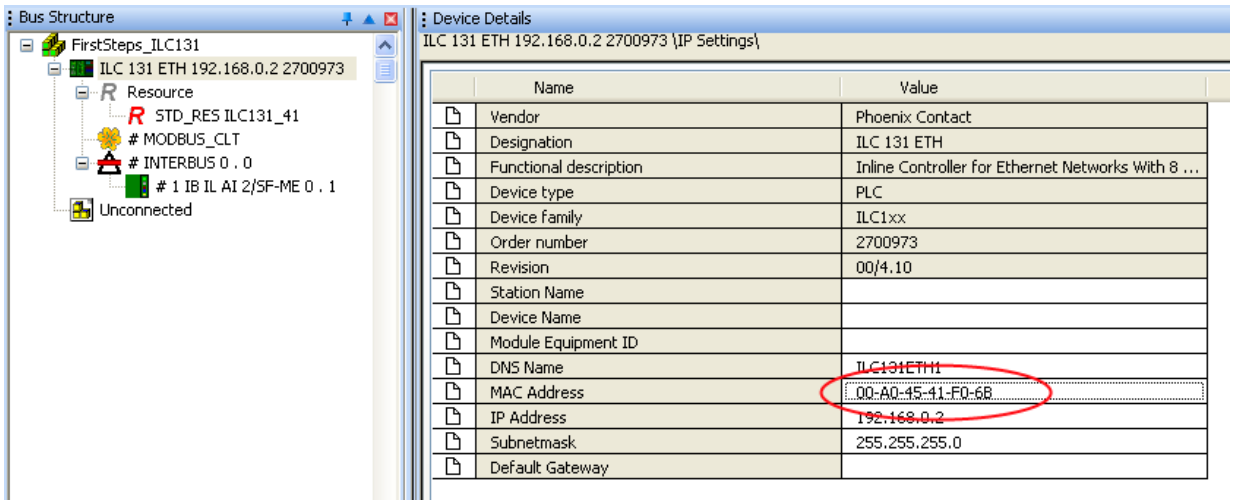


Figure 5-10 Entering the MAC address

- In the PC WORX EXPRESS menu bar, select the “Extras, BootP/SNMP/TFTP-Configuration...” menu.

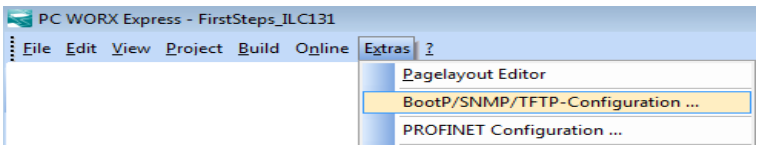


Figure 5-11 “Extras, BootP/SNMP/TFTP-Configuration...” menu

- Click on the “Activate BootP” button.

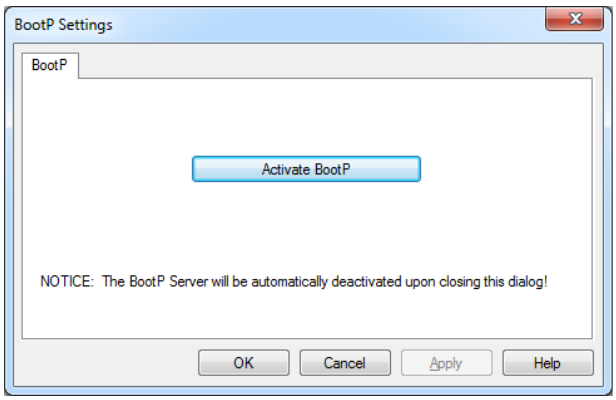


Figure 5-12 “Activate BootP” button

- Perform a cold restart for the controller. To do this, switch the supply voltage off and then on again after about two seconds.

The controller is assigned the IP address which is specified in the project for the controller. The following message appears in the “Message Window” in the “Bus Configurator” tab.

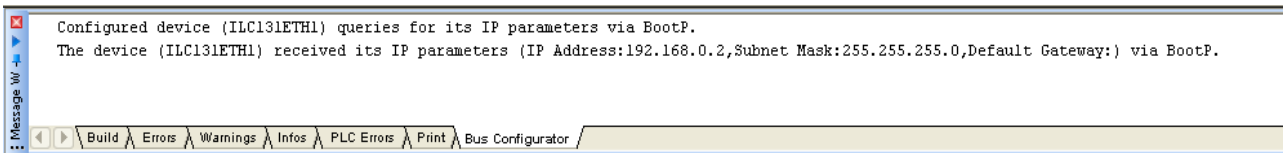


Figure 5-13 “Message window” following BootP

The IP address is now permanently stored on the controller Flash memory.

5.1.5 Reading in INTERBUS

An INTERBUS system that is connected **to an Inline controller** can be read in once the communication path to the Inline controller has been established.

In the example structure (see Figure 2-1 on page 11) one INTERBUS module is connected to the ILC 131 ETH.

How to proceed

- Select the “Connected INTERBUS” command from the “View” menu to read in the connected INTERBUS.

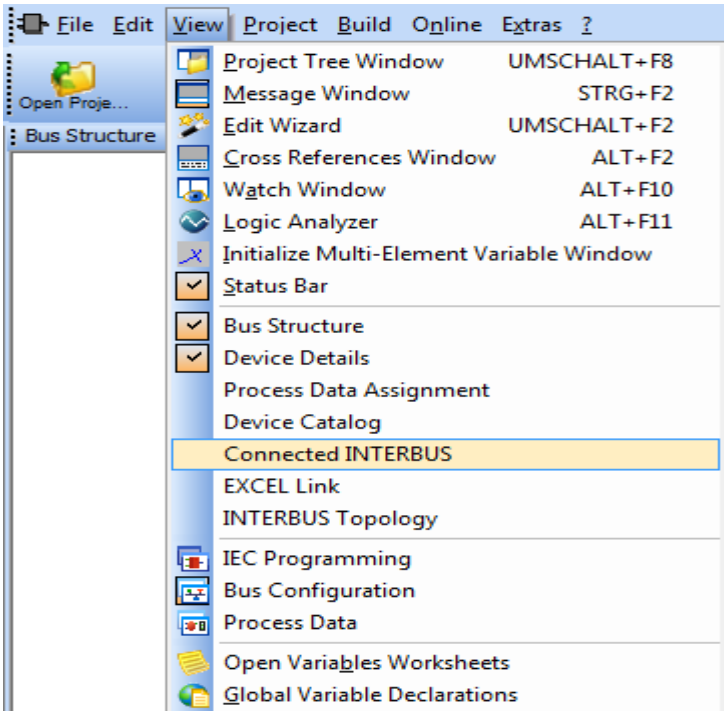


Figure 5-14 “View, Connected INTERBUS” command

- Select the controller in the “Connected INTERBUS” window.

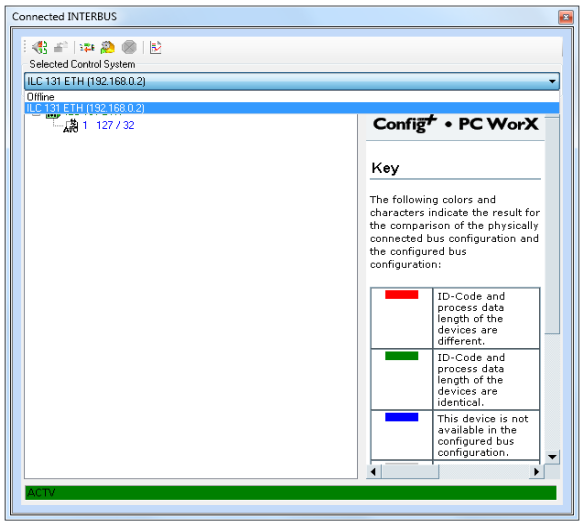


Figure 5-15 Selecting the ILC 131 ETH

This activates the “online” operating state and the controller reads in the connected INTERBUS configuration.

Reading in INTERBUS devices

Once the controller has read in the connected INTERBUS, the INTERBUS devices must be imported into the project.

- To do so, select the controller in the “Connected INTERBUS” window.
- Open the context menu and select the “Import to Project” command.

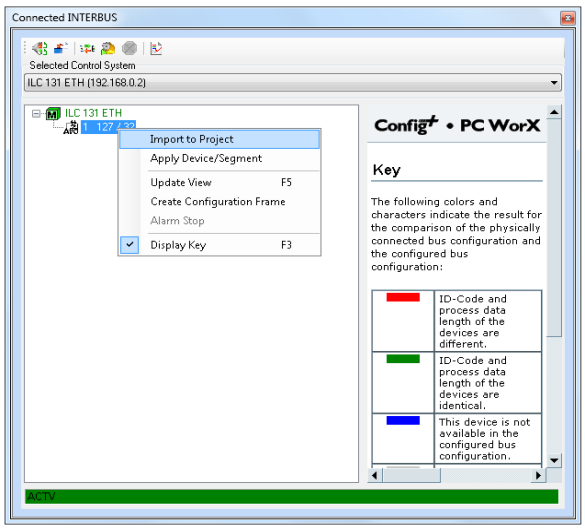


Figure 5-16 Importing devices into the project

Selecting INTERBUS devices

The “Select Device” window that opens lists the modules whose device description corresponds to that of the connected devices.

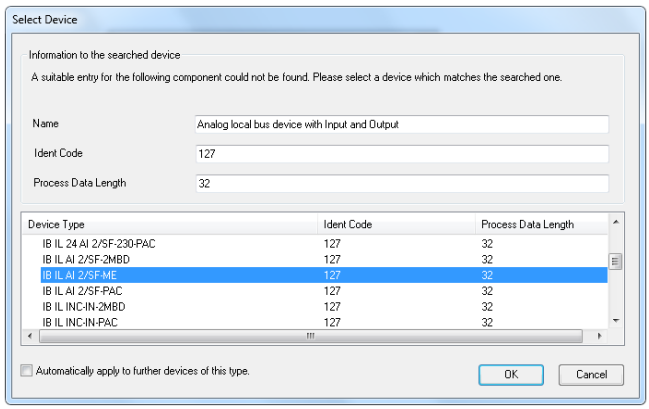


Figure 5-17 “Select Device” window

- Select the device that is actually connected in the INTERBUS and repeat this step until all the devices are linked to their device description. For the ILC 131 STARTERKIT, simply select the IB IL AI 2/SF-ME Inline terminal.

Complete bus configuration

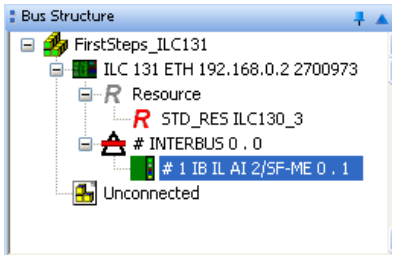


Figure 5-18 Complete bus configuration for the example project

Breaking the connection

- Break the connection by selecting “Offline” under “Selected Control System” in the “Connected INTERBUS” window.

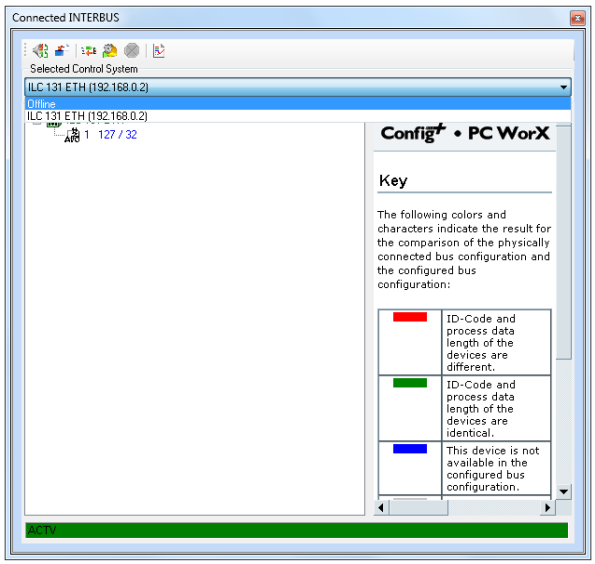


Figure 5-19 “Connected INTERBUS” window: “Selected Control System - Offline”

5.1.6 Compiling and sending a project, and performing a cold restart after reading in the bus topology

Now the project contains the full bus configuration. At this point you can compile your project in order to detect any errors that may have occurred.

- In order to start up the project, compile it, send it to the controller, and perform a cold restart. Proceed as described in Section 4.6, “Compiling and transmitting a project and performing a cold restart”.

The ILC 131 ETH Inline controller and the connected Inline terminal are now started up. The D LED on the Inline terminal is permanently on. INTERBUS is running.

5.2 “FirstSteps_ILC131” example project

5.2.1 General

Please note that the “FirstSteps_ILC131” example project is available in compressed format as the “FirstSteps_ILC131.zwe” file on the ILC 131 STARTERKIT DVD. The following sections provide step-by-step instructions for creating this example project.

Developing the example project yourself

If you wish to develop the project yourself, please read the following section before starting. It describes how to create the program. The example project is programmed in function block diagram (FBD).

Viewing the example project in PC WORX EXPRESS

If you wish to view the complete example project in PC WORX EXPRESS without developing it yourself, load the “FirstSteps_ILC131.zwe” file from the DVD for the ILC 131 STARTERKIT.

Loading the example project from the DVD

- Save the “FirstSteps_ILC131.zwe” file on your PC, e.g., under the default path for PC WORX EXPRESS “\Bibliotheken\Dokumente\PC Worx Express”.
- Select “Open Project / Unzip Project...” under the “File” menu item.
- Select the “FirstSteps_ILC131.zwe” file from the path under which you saved the file.
- Confirm the prompt asking whether the project should be extracted to the directory containing the zwe file with “Yes” if the file is to be extracted to this directory. Or select a different directory. PC WORX EXPRESS extracts the file automatically.
- If PC WORX EXPRESS prompts you to overwrite layouts (e.g., page layouts) or bitmaps, confirm this prompt with “No to all”.

Once PC WORX EXPRESS has unzipped the project, it is available for you to view/edit.

Complete the following steps before starting the project:

- Check the IP settings in the example project. Adapt the settings if this is required for your network environment. To do this, proceed as described in Section 5.1.4, “Assigning the IP address for the controller”.
- Compile the example project, send it to the controller, and perform a cold restart. Proceed as described in Section 4.6, “Compiling and transmitting a project and performing a cold restart”.

The ILC 131 ETH Inline controller and the connected Inline terminal are now started up with the example project program.

You can now switch to debug mode, for example, and view the variable states while activating the switches on the switch module and/or modifying the potentiometer setting (see “Operation and debug mode – viewing values online” on page 65).

5.2.2 Program description

This section describes program steps, which can be used to set up the entire “FirstSteps_ILC131.mwe” example project. These program steps are used in Section 5.3, “Creating the program” to set up the entire “FirstSteps_ILC131.mwe” example project step-by-step.

1. Direct linking of a controller input with a controller output using onboard variables
   - Creating variables (user variables/system variables)
   - Linking variables
2. Use of function blocks from the function block library
   - Selecting a function block from the library and inserting it in the worksheet
   - Wiring/connecting the inputs and outputs of function blocks
   - Linking onboard variables using a function block
3. Connecting function blocks using the example of clock generation
   - Fixed clock
   - Variable clock
4. Direct linking of two analog value variables/process data assignment/complete program
   - Creating analog value variables
   - Process data assignment of a device input to an analog value variable
   - Designating variables for transfer to visualization tools

“FirstSteps_ILC131.mwe” program code

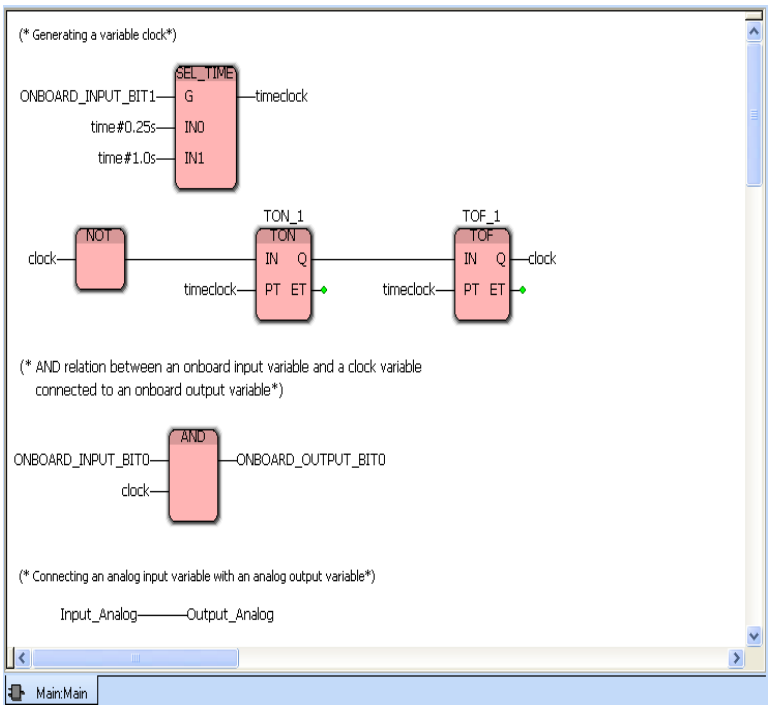


Figure 5-20 “FirstSteps_ILC131.mwe” complete program

Figure 5-20 on page 46 illustrates the “FirstSteps_ILC131.mwe” example program described in this section.

– In the top part of the program, a clock is generated. There are two clock frequencies that can be selected.
– In the middle part, the clock is ANDed with an input signal from the controller. When the input signal is present, the clock signal is switched through to a controller output.
– In the lower part, an analog input signal (adjustable voltage) from voltage input channel 1 of the Inline input terminal is connected to an analog value variable.

The clock frequency is set according to the positions of switches 0 and 1 of the switch module. This is indicated by the Q1 LED.

In addition, the switch positions of switches 0 to 7 of the switch module are indicated using LEDs I1 to I8 of inputs 1 to 8 of the controller.

Variables in the program

The entire program is implemented in the POU “Main”. The **ONBOARD_INPUT_BIT0** to **ONBOARD_INPUT_BIT7** (system variables; **ONBOARD_INPUT_BIT0** and **ONBOARD_INPUT_BIT1** are used in the program) map the status of the inputs to which the toggle switches are connected. The **Input_Analog** variable (user variable) maps the status of the analog input to which the adjustable voltage is supplied.

Within the POU “Main”, the clock speed is set according to the **ONBOARD_INPUT_BIT0** and **ONBOARD_INPUT_BIT1** input variables. In addition, the clock signal is generated (**clock**) and output to a controller output (**ONBOARD_OUTPUT_BIT0**). An analog input value (**Input_Analog** variable) is also connected to an internal program variable (**Output_Analog**).

The basic steps for creating this program are described below.

Visualization

The “**FirstSteps_ILC131.prj**” example visualization can be used to display the states of the controller LEDs and the states of LEDs for the switch module in your web browser. The state of the analog input signal is displayed as a bar graph.

For more information about installing and starting up the example visualization on the controller and the requirements for your web browser, refer to Section 7, “Visualization with WebVisit”.

5.3 Creating the program

5.3.1 IEC programming worksheet

For programming, proceed as follows:

- Switch to the IEC Programming workspace.
- Double-click on “Main” in the “Project Tree Window” to activate the IEC programming interface.
- In the “Main” worksheet, click on the empty position where you would like to insert the function block.

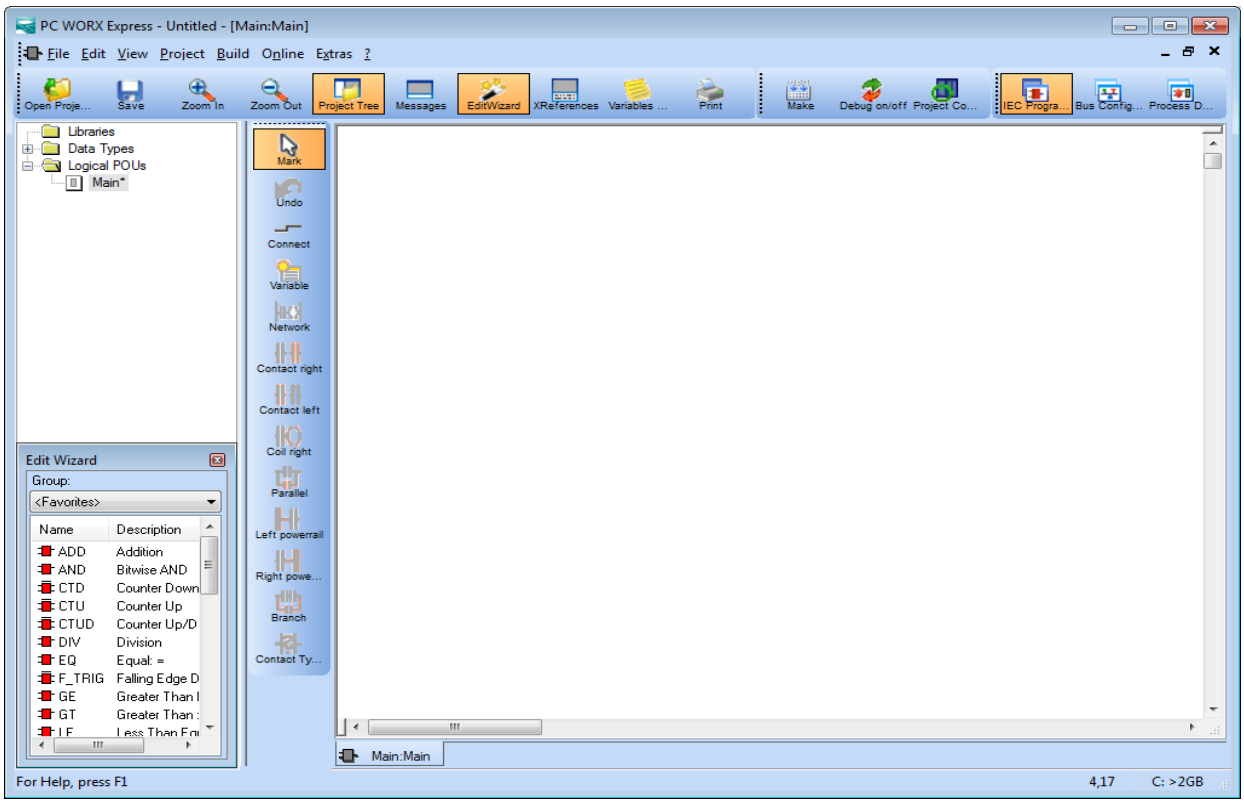


Figure 5-21 IEC Programming workspace

5.3.2 Entering a comment

- Click on the desired position in the worksheet to set a cursor.
- To insert a comment, select the “Text (Comment)...” command from the “Objects” menu.

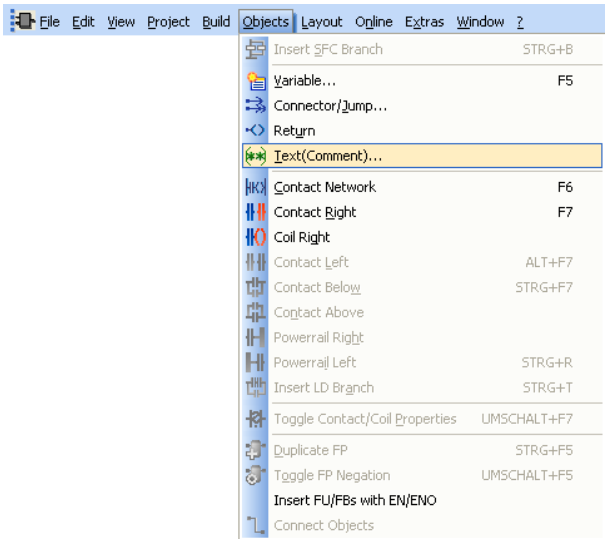


Figure 5-22 “Objects, Text (Comment)...” menu

- In the “Comment” dialog box that opens, enter the desired comment for the POU “Main”.

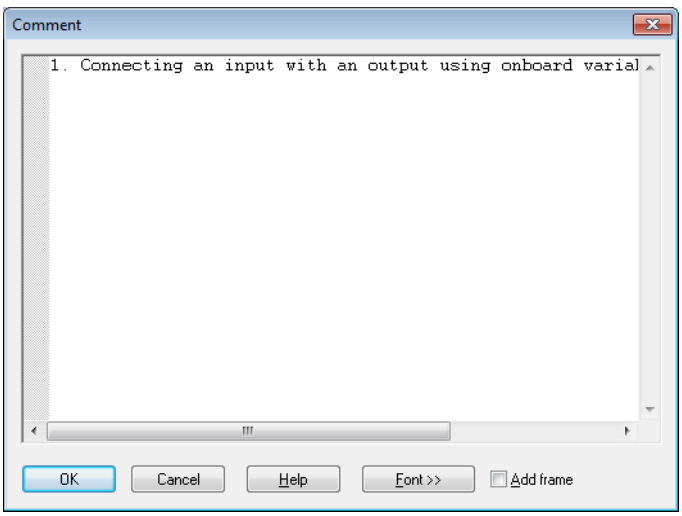


Figure 5-23 “Comment” dialog box

5.3.3 Creating variables

The onboard inputs and outputs of the ILC 131 ETH are mapped to system variables. The variable for processing the analog input value (Input_Analog), for example, is created as a user variable. In PC WORX EXPRESS, the use of a variable must be declared.

A variable that is used within a POU is declared as a local variable using one of the keywords VAR, VAR_INPUT, VAR_OUTPUT or VAR_IN_OUT. A variable that is used in the entire project is declared as a global variable using the keyword VAR_GLOBAL.

Make sure that the “Hide external variables” checkbox is selected in the “Options” dialog box (“Extras, Options...” menu).

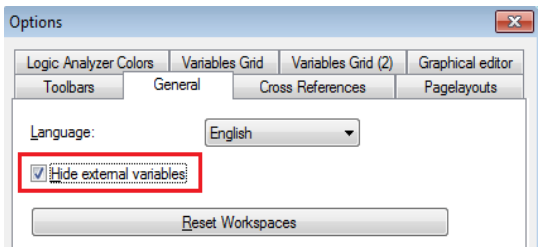


Figure 5-24 “Options” dialog box, “General” tab: “Hide external variables”

Local/global scope of validity

These option buttons are always inactive. When a new variable is declared in PC WORX EXPRESS, the validity can only be set via “Usage”. When selecting a variable that has already been declared, its validity can be determined via the icons in the “Name” drop-down menu.

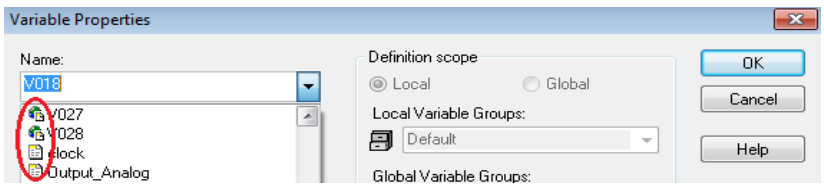


Figure 5-25 “Variable Properties” window – icons

: Local variable

: Global variable

Local variable groups and global variable groups

For reasons of compatibility with PC Worx, the “Local Variable Groups” and “Global Variable Groups” items are shown in the “Variable Properties” dialog box, but cannot be set.

5.3.4 Step 1: Direct linking of a controller input with a controller output using onboard variables

– Creating variables (user/system variables)
– Linking variables

• Click on the desired position in the worksheet to set a cursor.

• Click on “Variable” to add a variable to the worksheet. Alternatively, select the “Variable...” command from the context menu for the cursor.

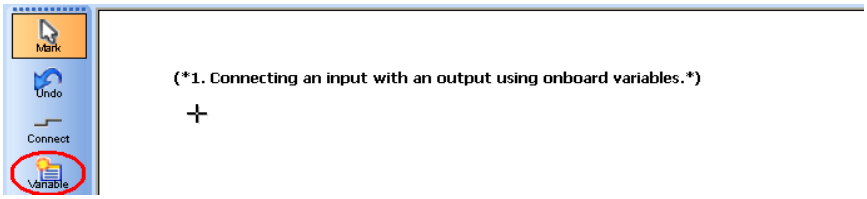


Figure 5-26 Positioning the cursor in the worksheet of the POU “Main”

• In the “Variable Properties” dialog box, select the “ONBOARD_INPUT_BIT0” onboard variable (controller input I1).

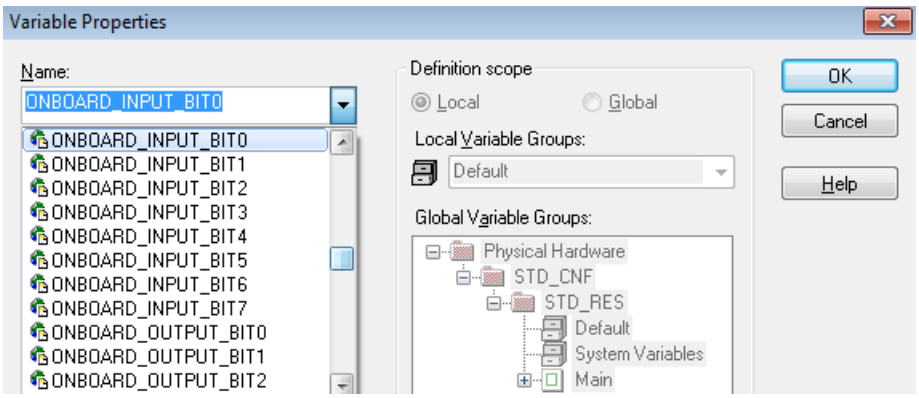


Figure 5-27 Selecting the onboard variable: Input

– The data type is “BOOL”.
– The usage is “VAR_GLOBAL”.

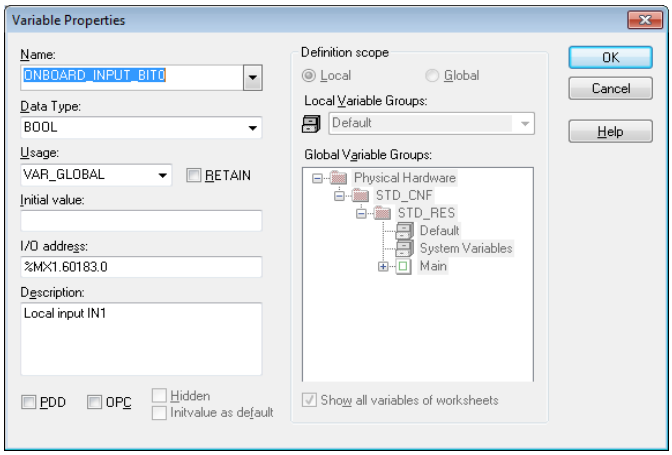


Figure 5-28 Variable Properties (system variables)

• Confirm your entries by clicking on “OK”.

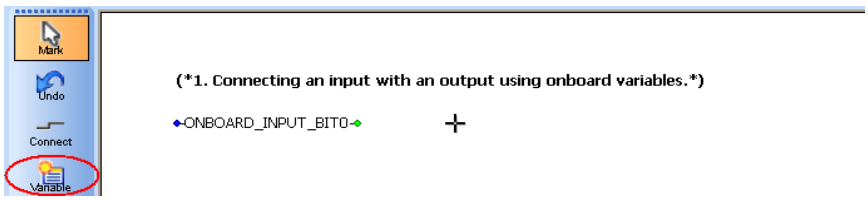


Figure 5-29 System variable created: Input

• Click in the worksheet again (see Figure 5-29) to set a cursor.

• Click on “Variable” to add another variable to the worksheet.

- In the “Variable Properties” dialog box, select the “ONBOARD_OUTPUT_BIT0” onboard variable (controller output Q1).

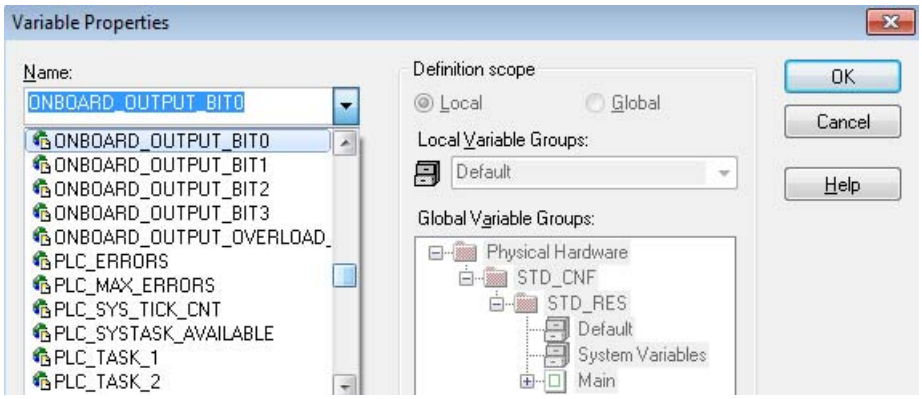


Figure 5-30 Selecting the onboard variable: Output

– The data type is “BOOL”.
– The usage is “VAR_GLOBAL”.
- Confirm your entries by clicking on “OK”.

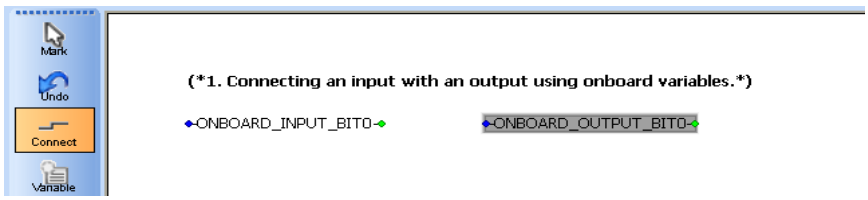
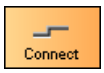


Figure 5-31 System variable created: Output



- Click on “Connect” to establish a connection between the variables created above.
- Click first on the output for the ONBOARD_INPUT_BIT0 variable and then on the input for the ONBOARD_OUTPUT_BIT0 variable.

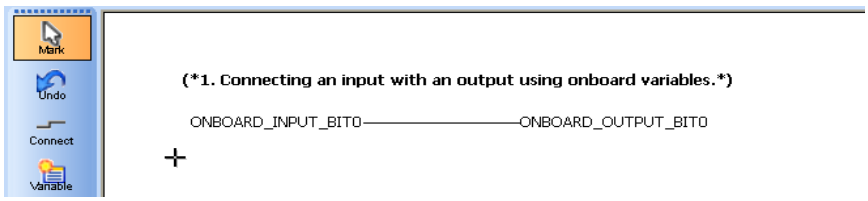


Figure 5-32 Connecting variables

Compiling the program

Compile the program that has been created.

- Click on the “Make” icon in the toolbar.

The program code that has been created is compiled. Once the compilation process is complete, PC WORX EXPRESS displays a corresponding message in the message window.

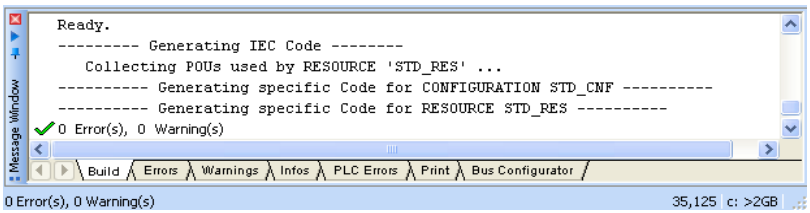


Figure 5-33 Compilation process completed without errors

If the program code has not been entered properly, the message indicates the number of errors and warnings (“Build” tab). More detailed information about errors/warnings is displayed in the “Errors” and/or “Warnings” tabs.

Transmitting the program to the controller

To test the program, transmit it to the controller.

- Click on the “Project Control Dialog” icon in the toolbar.

If only the “Close” button is enabled in the Project Control Dialog that opens, there is no valid connection to the ILC 131 ETH. In this case, check the communication path.

The Project Control Dialog is opened.

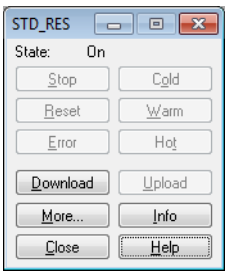


Figure 5-34 Project Control Dialog

- Click on the “Download” button.

The download process is indicated in the status bar.

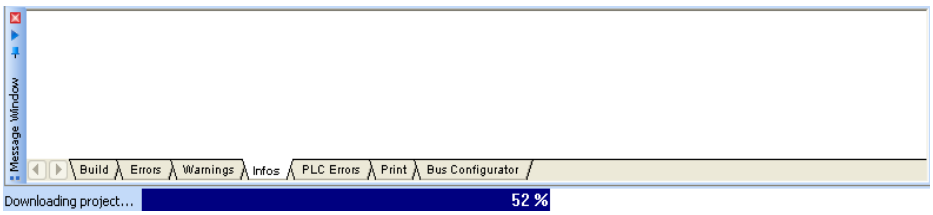


Figure 5-35 Download process

Once the download is complete, PC WORX EXPRESS displays a corresponding message in the message window.

Performing a cold restart

To activate the project, perform a cold restart for the controller.

- To do this, click on “Cold” in the Project Control Dialog.

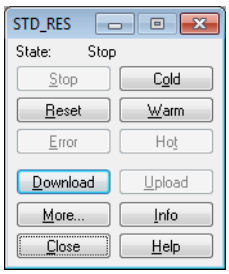


Figure 5-36 Project Control Dialog

The ILC 131 ETH has been started up successfully if the green FR LED is on.

Testing the program

- Activate switch 0 of the switch module to test the program.

If all of the steps described above have been carried out properly, the I1 and Q1 LEDs light up on the controller.

5.3.5 Step 2: Use of function blocks from the function block library

– Selecting a function block from the function block library and inserting it in the worksheet
– Wiring/connecting the inputs and outputs of function blocks
– Linking onboard variables using a function block

Delete the worksheet before entering the following program code.

To do this, click in one corner of the worksheet. Holding down the mouse button, select the elements to be deleted by dragging the mouse pointer over these elements. Select the “Edit, Delete” menu item to delete the selected elements.

- Click on the desired position in the worksheet to set a cursor.
- In the edit wizard, select the “AND” function block by double-clicking on it.

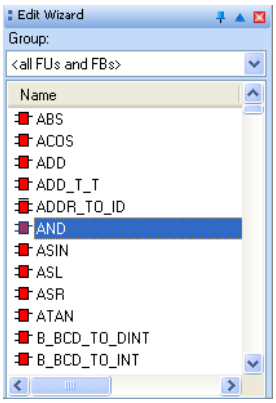


Figure 5-37 Function block in the edit wizard

The function block is inserted in the worksheet at the cursor position.

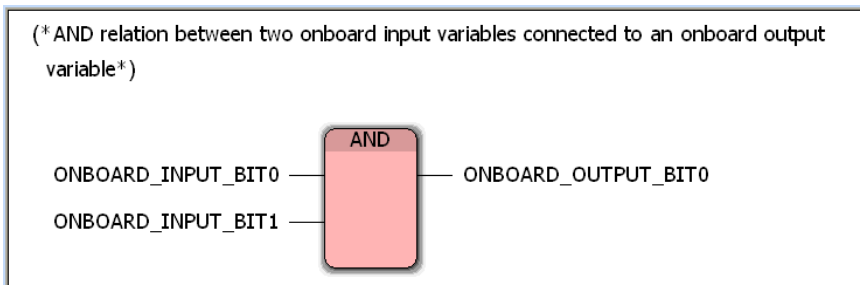


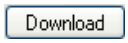
Figure 5-38 ANDing

If you know the name of the desired function block, another option is to enter the function block name directly using your PC keyboard once you have positioned the cursor in the worksheet.

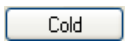
- Insert the ONBOARD_INPUT_BIT0, ONBOARD_INPUT_BIT1, and ONBOARD_OUTPUT_BIT0 system variables in the worksheet according to Figure 5-38 on page 56.
- To connect a variable to an input/output of the function block, click on the variable in the worksheet. Hold down the mouse button and move the variable. Release the mouse button again once the output of the variable is positioned on an input of the function block or the input of the variable is positioned on an output of the function block.

Compiling the program, transmitting it to the controller, and performing a cold restart

Compile the program that has been created.



To test the program, transmit it to the controller.



To activate the project, perform a cold restart for the controller.

For a more detailed description, please refer to “Compiling the program” on page 54.

The ILC 131 ETH has been started up successfully if the green FR LED is on.

Testing the program

If the ILC 131 ETH has started up successfully, the program can be tested.

- Activate switches 0 and 1 of the switch module to test the program.

If all of the steps described above have been carried out properly, the I1 and Q1 LEDs light up on the controller when switches 0 and 1 are set to ON simultaneously.

5.3.6 Step 3: Connecting function blocks using the example of clock generation

– Generating a fixed clock
– Generating a variable clock

Note on clock generation:
Connecting two delay elements (TON/TOF) in succession and feeding back the output signal (clock) generates an “oscillating” system, which is used for clock generation.

Generating a fixed clock

Delete the worksheet before entering the following program code (see Section 5.3.5 on Page 56).

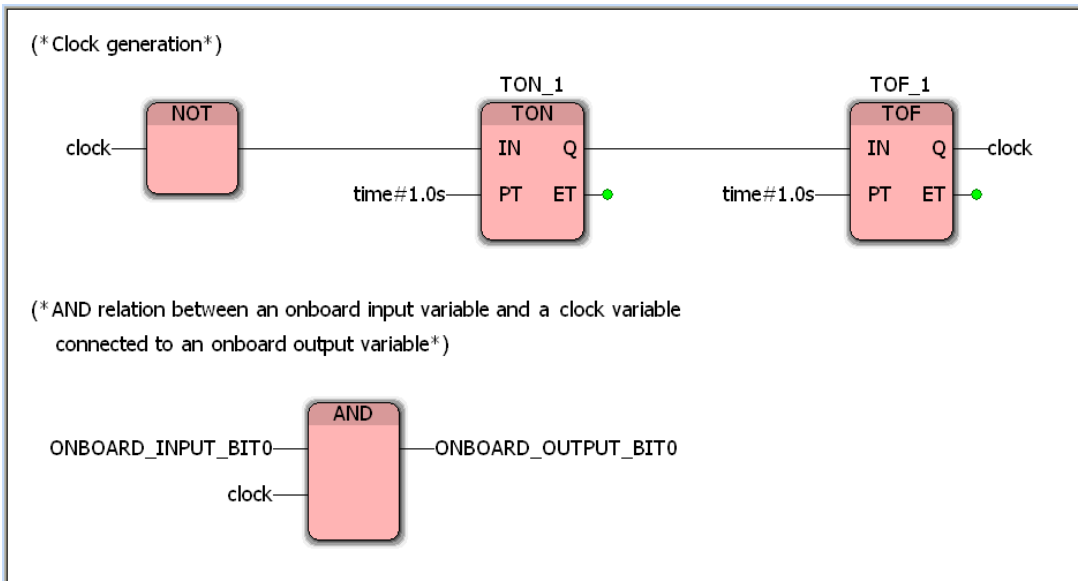


Figure 5-39 Generating a fixed clock and displaying it at a controller output

To enter the program code in the worksheet according to Figure 5-39, carry out the following steps:

- Insert the comments in the worksheet (see Section 5.3.2 on Page 49).
- Insert the function blocks from the edit wizard in the worksheet (see Section 5.3.5 on Page 56).
- Insert the system variables (ONBOARD_INPUT_BIT0/ONBOARD_OUTPUT_BIT0) (see Section 5.3.4 on Page 51).

- Insert the “clock” user variable.

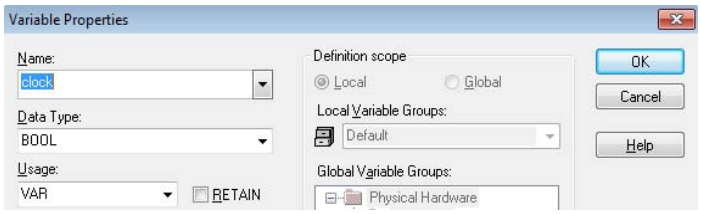


Figure 5-40 Creating a user variable

To create a user variable, specify a name (“Name” field) and data type (“Data Type” field). In the “Usage” field, specify whether the variable is to be used only in this worksheet (local: VAR) or in other worksheets (global: VAR_GLOBAL).

– The name is “clock”.
– The data type is “BOOL”.
– The usage is “VAR”.

- Define a time constant for the PT inputs of the TON and TOF function blocks.
- Double-click on the corresponding input of a function block. In the “Variable Properties” dialog box, enter the time constant according to Figure 5-41.

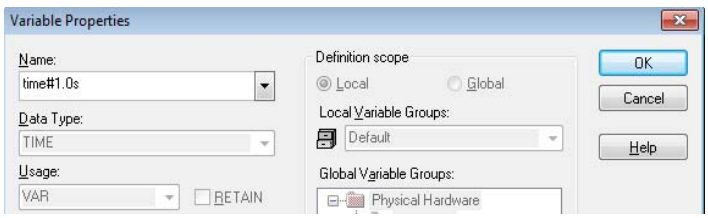
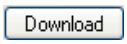


Figure 5-41 Specifying the time constant

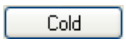
- Establish all necessary connections between variables and function blocks and between function blocks according to Figure 5-39 on page 58.

Compiling the program, transmitting it to the controller, and performing a cold restart

Compile the program that has been created.



To test the program, transmit it to the controller.



To activate the project, perform a cold restart for the controller.

For a more detailed description, please refer to “Compiling the program” on page 54.

The ILC 131 ETH has been started up successfully if the green FR LED is on.

Testing the program

- Activate switch 0 of the switch module to test the program.

If all of the steps described above have been carried out properly, the Q1 LED flashes every second when switch 0 is set to ON (I1 LED lights up).

Generating a variable clock

Do not delete the worksheet. Modify the program created in “Generating a fixed clock” on page 58 according to Figure 5-42.

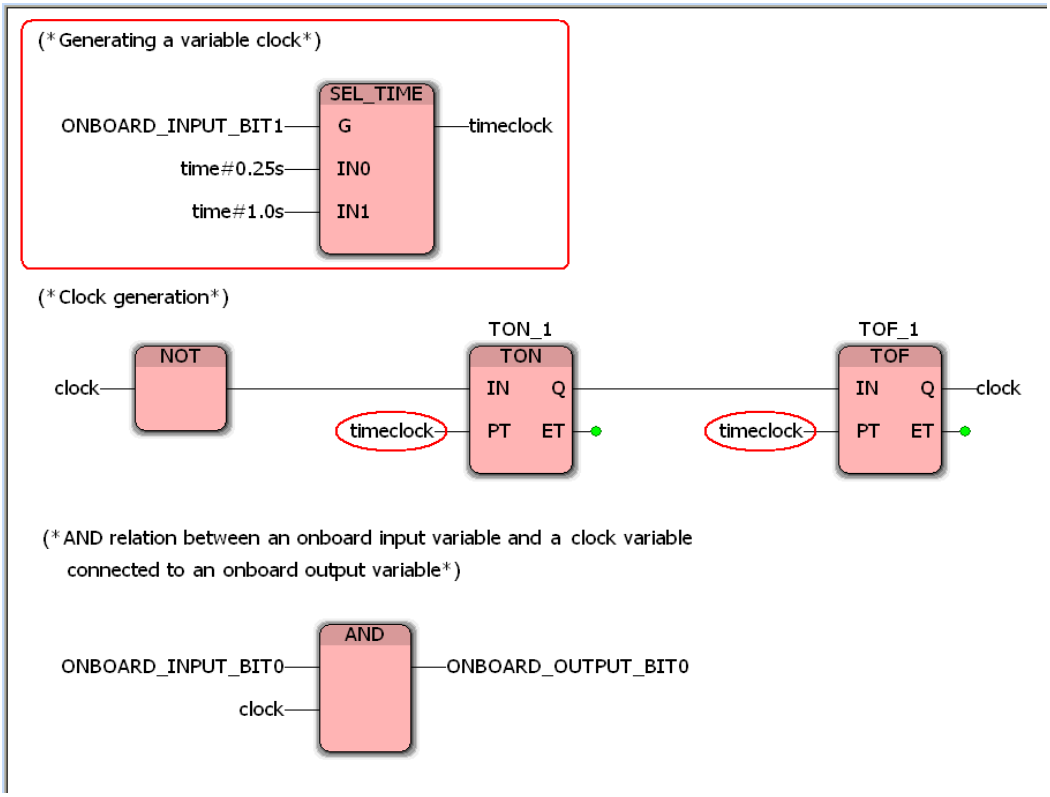


Figure 5-42 Generating a variable clock and displaying it at a controller output

To enter the program code in the worksheet according to Figure 5-42, carry out the following steps:

- Insert the comment in the worksheet (see Section 5.3.2 on Page 49).
- Insert the SEL_TIME function block from the edit wizard in the worksheet (see Section 5.3.5 on Page 56).
- Insert the ONBOARD_INPUT_BIT1 system variable (see Section 5.3.4 on Page 51).

- Insert the “timeclock” user variable (TIME data type).

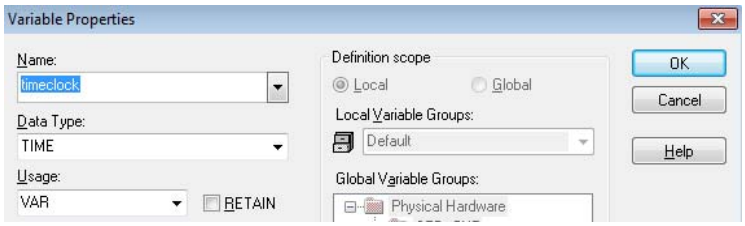
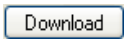


Figure 5-43 Creating a user variable

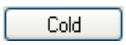
- Define the time constants for the IN0/IN1 inputs of the SEL_TIME function block (see “Generating a fixed clock” on page 58).
- Establish all necessary connections between variables and function blocks according to Figure 5-42 on page 60.

Compiling the program, transmitting it to the controller, and performing a cold restart

Compile the program that has been created.



To test the program, transmit it to the controller.



To activate the project, perform a cold restart for the controller.

For a more detailed description, please refer to “Compiling the program” on page 54.

The ILC 131 ETH has been started up successfully if the green FR LED is on.

Testing the program

- Activate switches 0/1 of the switch module to test the program.

Switch 0 (ONBOARD_INPUT_BIT0) switches the clock signal (clock) to the output (ONBOARD_OUTPUT_BIT0). Switch 1 (ONBOARD_INPUT_BIT1) is used to switch over the clock frequency (timeclock).

If all of the steps described above have been carried out properly, the Q1 LED flashes when switch 0 is set to ON (I1 LED lights up). With switch 1 set to OFF, the time constant is 0.25 seconds; with switch 1 set to ON, the time constant is 1 second.

5.3.7 Step 4: Direct linking of two analog value variables/process data assignment/complete program

Do not delete the worksheet. Modify the program created in “Generating a variable clock” on page 60 according to Figure 5-44.

- Creating analog value variables
- Process data assignment of a device input to an analog value variable
- Designating variables for transfer to visualization tools

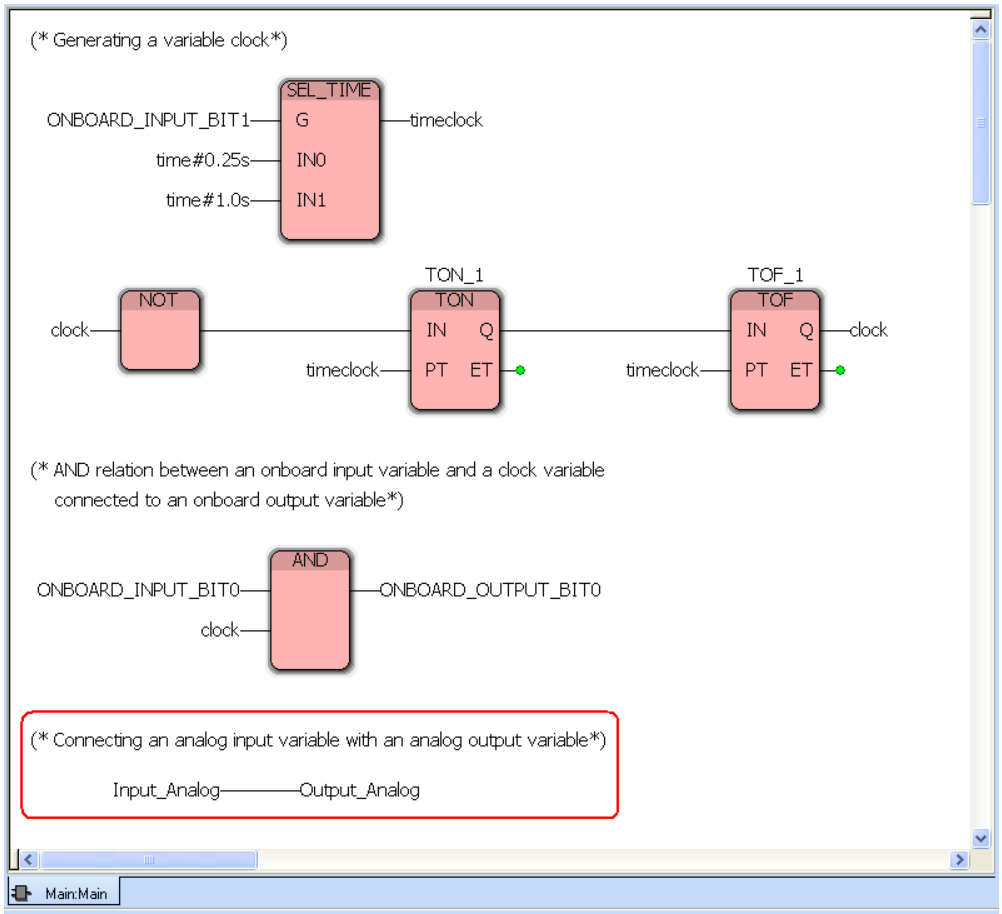


Figure 5-44 Analog value variables

To enter the program code in the worksheet according to Figure 5-44, carry out the following steps:

- Insert the comment in the worksheet (see Section 5.3.2 on Page 49).
- Insert the “Input_Analog” variable to edit an analog value.
- Enter the text “Input_Analog” in the “Name” field.
- Set the data type to WORD (analog value).
- In the “Usage” field, select the “VAR_GLOBAL” entry because the variable will be used to transfer your value to other software tools.

- Select the “PDD” checkbox.

When the “PDD” checkbox is activated, process data is transferred to visualization programs (WebVisit in the example). The process data is transferred using a CSV file.

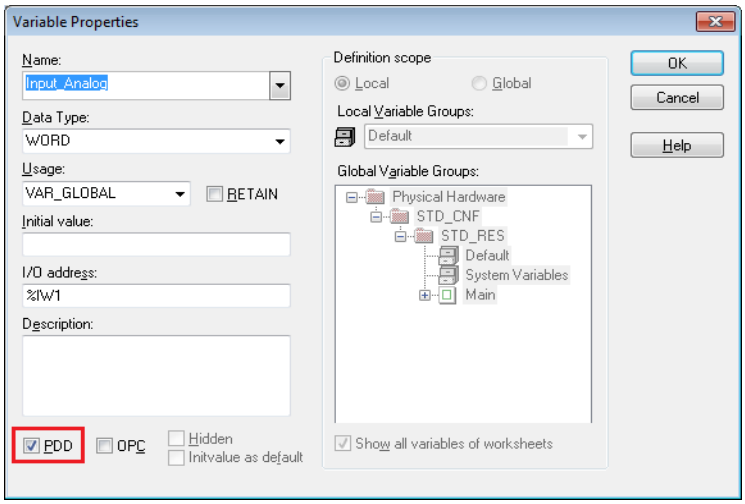


Figure 5-45 Variable Properties (analog value)

- Confirm your entries by clicking on “OK”.
- Insert the “Output_Analog” variable.
- Connect both variables according to Figure 5-44 on page 62.

Assigning process data

Process data and control variables are assigned in the Process Data workspace.

- Switch to the Process Data workspace.

Link the process data from the analog input terminal to the “Input_Analog” variable (see Figure 5-46 on page 64).

- Click on the controller in the top right window. The standard configuration is displayed in the top left window (“Symbols/Variables”).
- In the top left window, “Symbols/Variables”, click on the “STD_RES : ILC131_42” resource.
- In the top right window, click on the device for which you would like to link the process data to variables (here: IB IL AI 2/SF-ME).
- Click on the process data item to be linked (here: terminal point 1.1).

Since the “Input_Analog” variable was created as a global variable (VAR_GLOBAL), it is displayed in the bottom left window.

- Use drag and drop to link the selected “terminal point 1.1” process data item to the “Input_Analog” variable.
- Place the selected process data item on the “Input_Analog” variable.

In the bottom left window, the assignment between the variable and process data item is displayed.

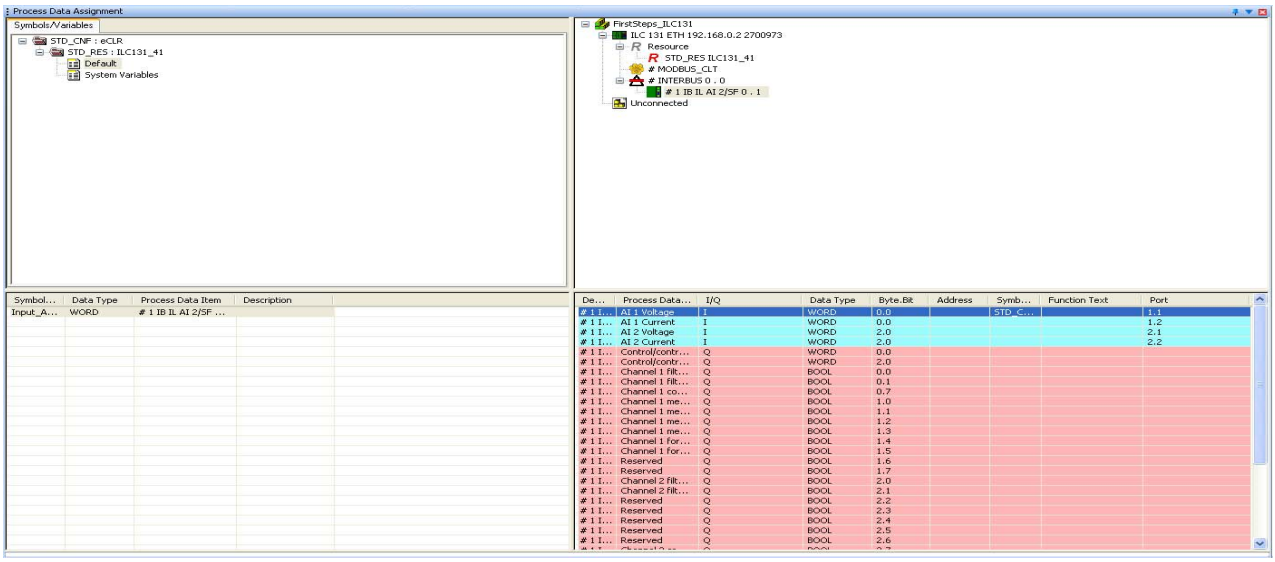
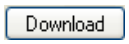


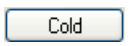
Figure 5-46 Process Data Assignment

Compiling the program, transmitting it to the controller, and performing a cold restart

Compile the program that has been created.



To test the program, transmit it to the controller.



To activate the project, perform a cold restart for the controller.

For a more detailed description, please refer to “Compiling the program” on page 54.

The ILC 131 ETH has been started up successfully if the green FR LED is on.

Testing the program

- Activate switches 0/1 of the switch module or change the potentiometer setting to test the program.

Switch 0 (ONBOARD_INPUT_BIT0) switches the clock signal (clock) to the output (ONBOARD_OUTPUT_BIT0). Switch 1 (ONBOARD_INPUT_BIT1) is used to switch over the clock frequency (timeclock).

If all of the steps described above have been carried out properly, the Q1 LED flashes when switch 0 is set to ON (I1 LED lights up). With switch 1 set to OFF, the time constant is 0.25 seconds; with switch 1 set to ON, the time constant is 1 second.

In order to view changes to analog value variables (Input_Analog/Output_Analog), you must switch to debug mode. When debug mode is activated in PC WORX EXPRESS, the variable status can be viewed online. For additional information about debug mode, please refer to Section 5.4, “Operation and debug mode – viewing values online”.

5.4 Operation and debug mode – viewing values online

While the program is running on the controller, it is possible to activate debug mode in PC WORX EXPRESS. In debug mode, the operation of the program can be monitored online.

- Activate debug mode.

The program status of the POU “Main” is displayed in the “Main:Main” worksheet (see Figure 5-47). Switches 0 and 1 of the switch module and/or the potentiometer can be activated in order to modify the states of the variables displayed in Figure 5-47:

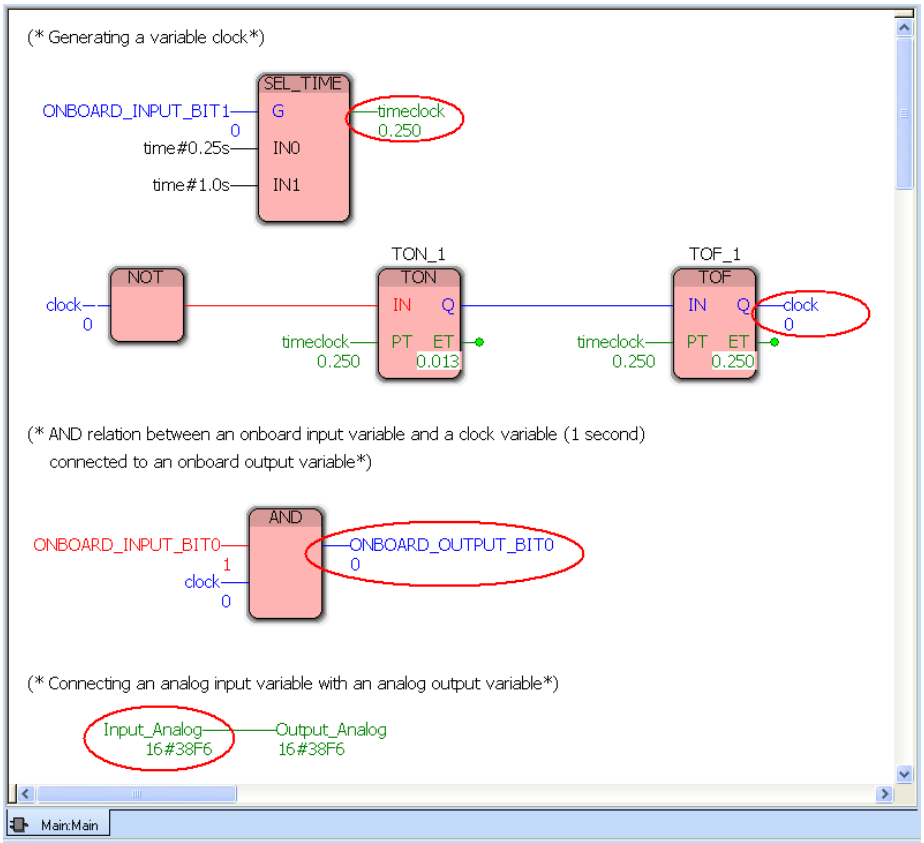


Figure 5-47 Variables in debug mode: program variables

- Switch to the IEC Programming workspace.
- Open “Hardware Structure” by clicking on the “Hardware” tab in the project tree window.
- To display the global variables, double-click on “Global_Variables”.

The table that is opened displays the status of the global variables.

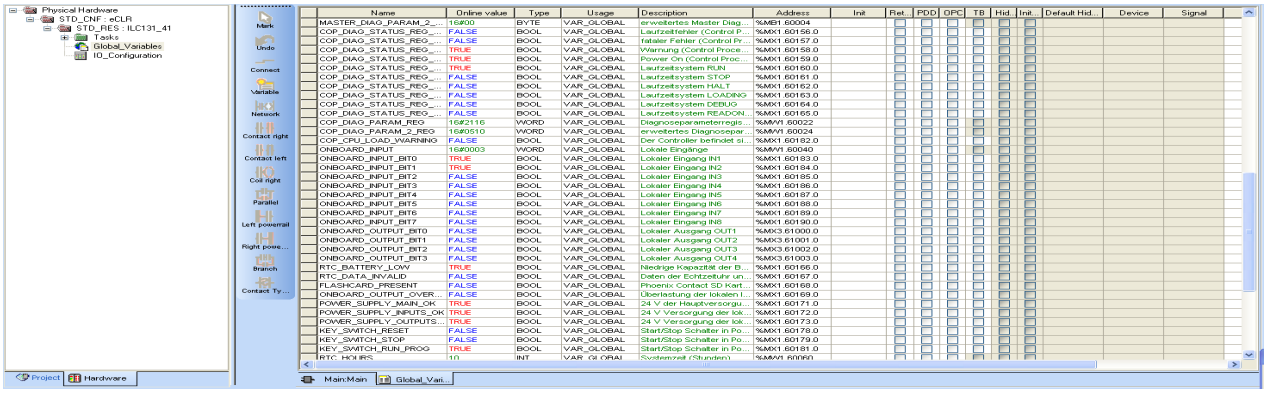


Figure 5-48 Variables in debug mode: global variables

The following states are shown in this workspace, for example.

Variable	Online value	Description
ONBOARD_INPUT_BIT0	TRUE	Switch 0 ON
ONBOARD_INPUT_BIT1	TRUE	Switch 1 ON
Input_Analog	16#445B	Analog input value at input I1
ONBOARD_OUTPUT_BIT0	TRUE	Clock signal at output Q1 of the controller

- Open the “Project Tree” by clicking on the “Project” tab in the project tree window.

Variables of the POU “Main”

- Double-click on the POU “Main” and then on the “Variables Worksheet” icon in the toolbar.

The status of the variables used in the POU “Main” is displayed in the table that opens.

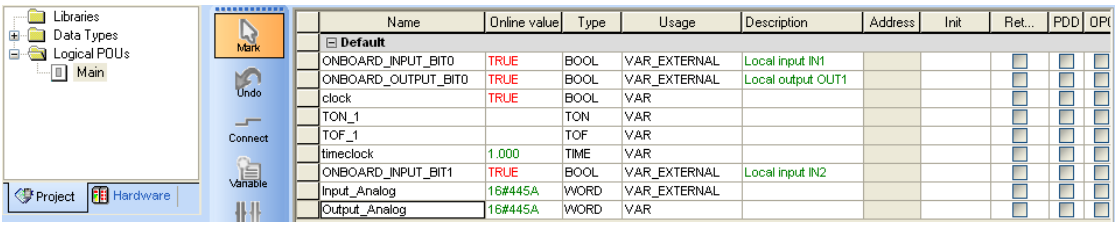


Figure 5-49 Variables in debug mode: POU “Main” variables (examples)

The following states are illustrated in Figure 5-49 (examples):

Variable	Online value	Description
ONBOARD_INPUT_BIT0	TRUE	Switch 0 ON
ONBOARD_OUTPUT_BIT0	TRUE	Clock signal at output Q1 of the controller
clock	TRUE	Variable (clock signal)
TON_1	–	Instance of function block TON (switch-on delay)
TOF_1	–	Instance of function block TOF (switch-off delay)
timeclock	1000	Variable (clock frequency)
ONBOARD_INPUT_BIT1	TRUE	Switch 1 ON
Input_Analog	16#445A	Analog input value at input I1
Output_Analog	16#445A	Analog variable that is described with the value of the Input_Analog variable

6 Additional functions of PC WORX EXPRESS

6.1 Diagnostics with Diag+

Diag+ is a diagnostics tool for the consistent diagnostics of INTERBUS.

When installing PC WORX EXPRESS, Diag+ is installed automatically and is integrated in PC WORX EXPRESS. Diag+ can be called via the INTERBUS master context menu (see Figure 6-1).

An online connection to the controller via the Ethernet interface is required in order to use Diag+.

- Start Diag+ via the INTERBUS master context menu.

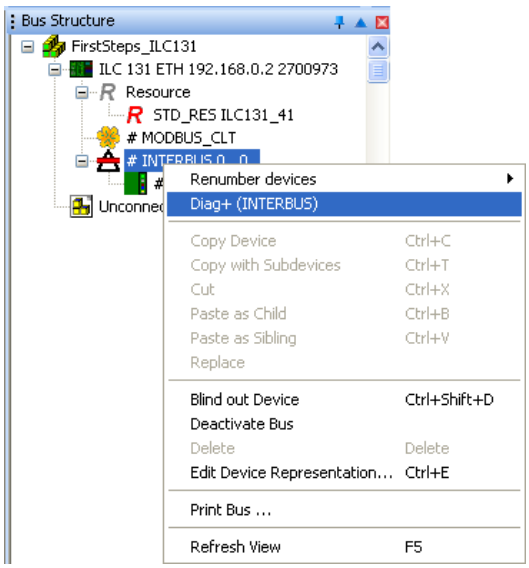


Figure 6-1 Calling up Diag+: INTERBUS master context menu

When started, Diag+ establishes a connection to the controller (in the example bus configuration: ILC 131 ETH with IP address “192.168.0.2”, see Figure 6-1) and Diag+ is opened.

“Bus Info” tab

In the following dialog box, the “Bus Info” tab is displayed (see Figure 6-2).

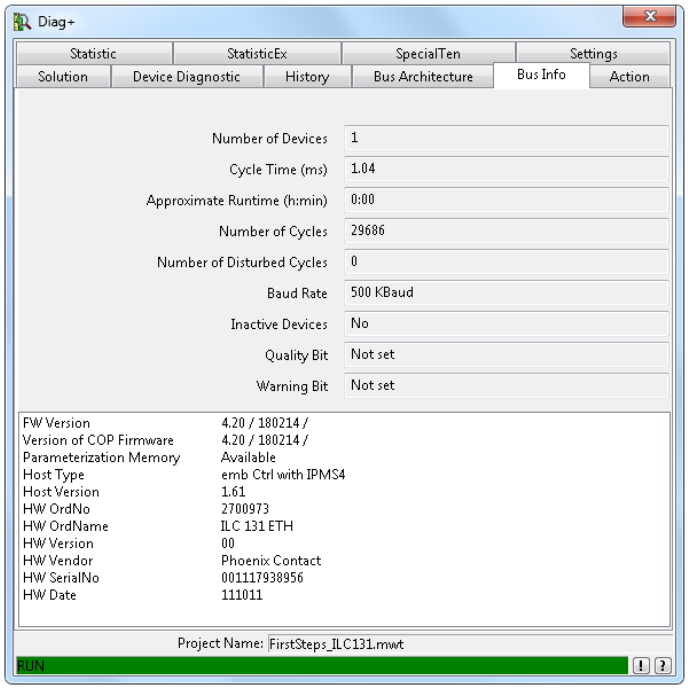


Figure 6-2 “Bus Info” tab (start screen)

“Settings” tab

- Select the “Settings” tab (see Figure 6-3).

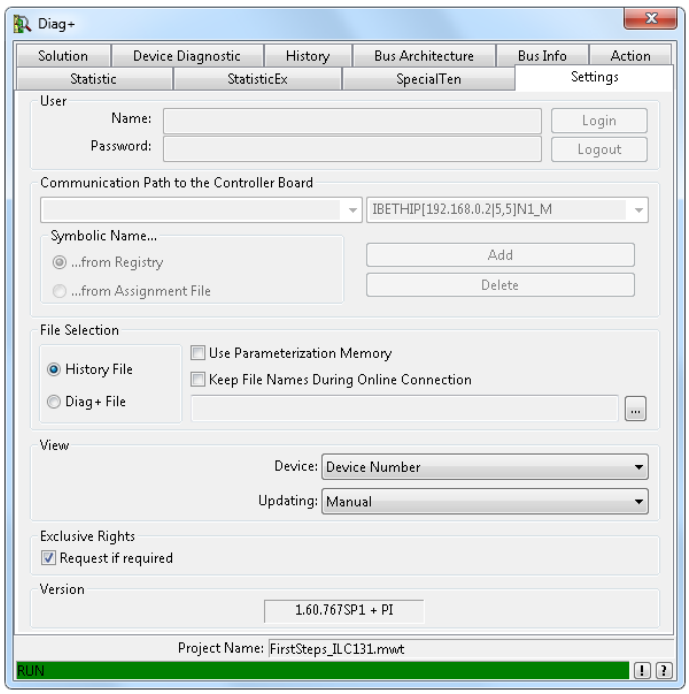


Figure 6-3 “Settings” tab

- Under “View”, select:
  - Which device information should be displayed (e.g., device number) and
  - How often the diagnostic data should be updated (e.g., manually when changing tabs).

“Bus Architecture” tab

- Select the “Bus Architecture” tab (see Figure 6-4).

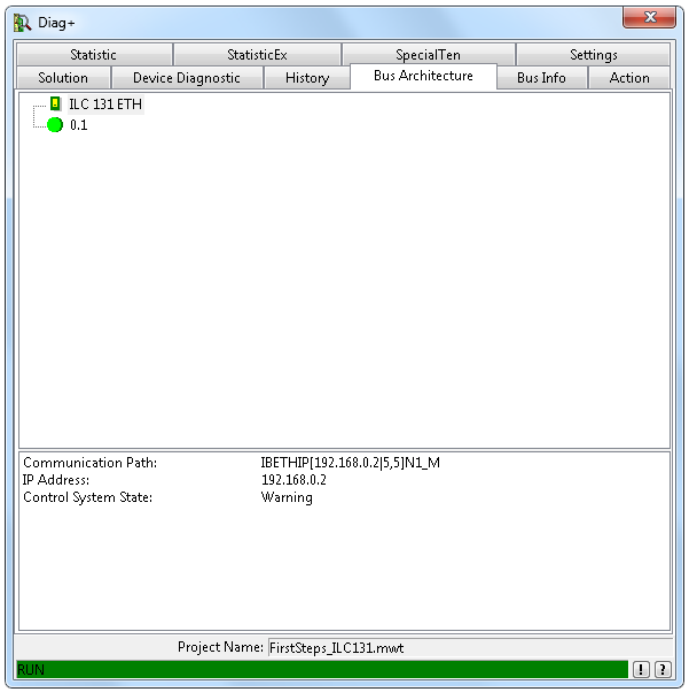


Figure 6-4 “Bus Architecture” tab (no error)

An error is simulated. The IB IL AI 2/SF-ME Inline terminal is removed.

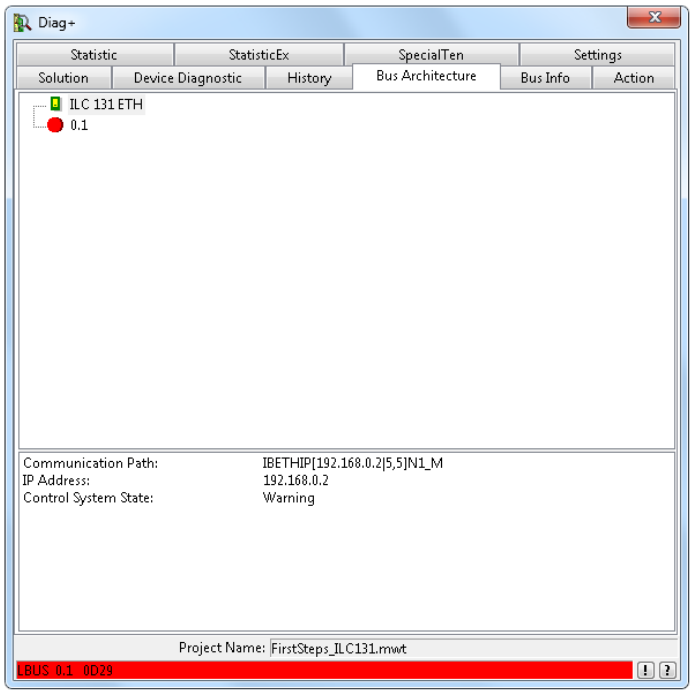


Figure 6-5 “Bus Architecture” tab (error)

“Solution” tab

- Select the “Solution” tab.

Here, information is provided about how to remove the error.

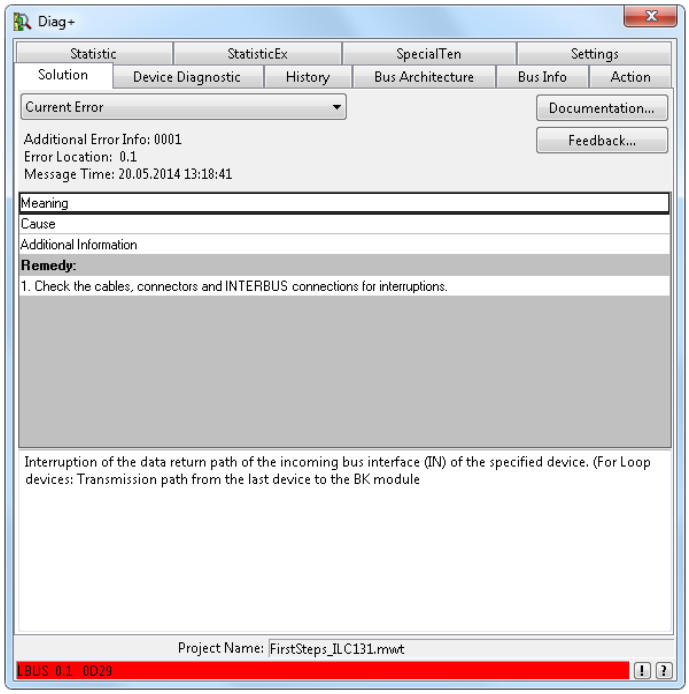


Figure 6-6 “Solution” tab

- Remove the error (here: insert Inline terminal again).

“Action” tab

If the bus is not started automatically, the “Action” tab can be used, for example, to acknowledge errors, reset the controller, and start the bus.

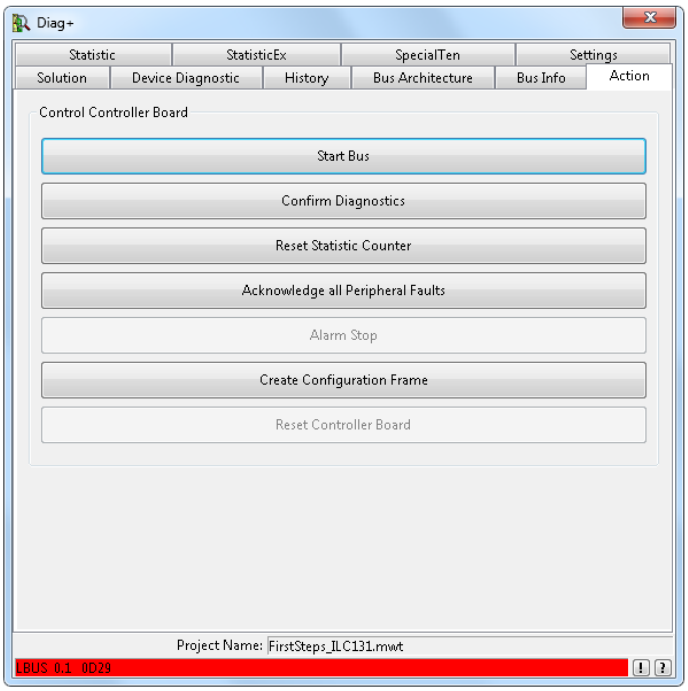


Figure 6-7 “Action” tab

- Click on “Start Bus” to start up the entire bus configuration again following error removal.

Depending on the bus configuration that you have set, peripheral faults may have to be reset before the bus can be restarted following error removal.

- In this case, click on “Acknowledge all Peripheral Faults” to reset the error message for the corresponding module.
- Click on “Start Bus” again to start up the entire bus configuration again following error removal.

Successful error removal with error-free bus operation is indicated in the status bar:

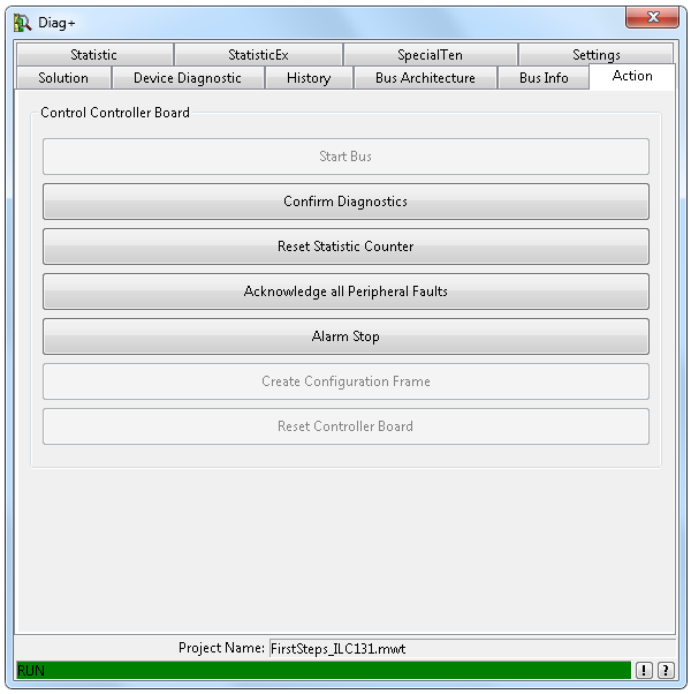


Figure 6-8 “Action” tab: bus running without errors (RUN)

7 Visualization with WebVisit

7.1 General

The WebVisit software is used to visualize the global variables of the Inline controller used under PC WORX EXPRESS. WebVisit is a software tool used to generate web pages. The software runtime component is a web server, which is stored on the controller. The variable values are actually visualized via a Java-compatible standard browser.

For visualization, you need a web browser with Java Standard Edition SE 6 (or later) with at least Java Runtime Environment JRE 6 (Version 1.6.x or later).

Variables in PC WORX EXPRESS

To visualize variables from your PC WORX EXPRESS project in WebVisit, activate the "PDD" checkbox in PC WORX EXPRESS:

– In the "Variable Properties" window (Figure 7-1)
– Or in the variables worksheet (Figure 7-2)

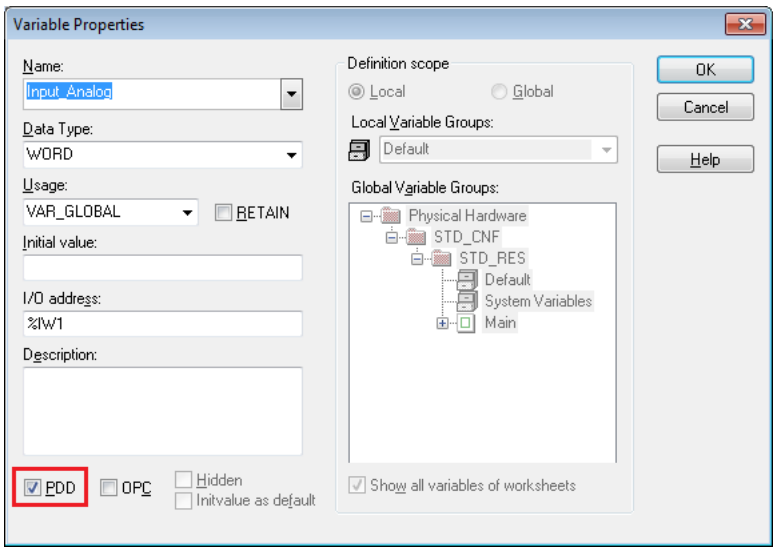


Figure 7-1 Activating the "PDD" checkbox in the "Variable Properties" window

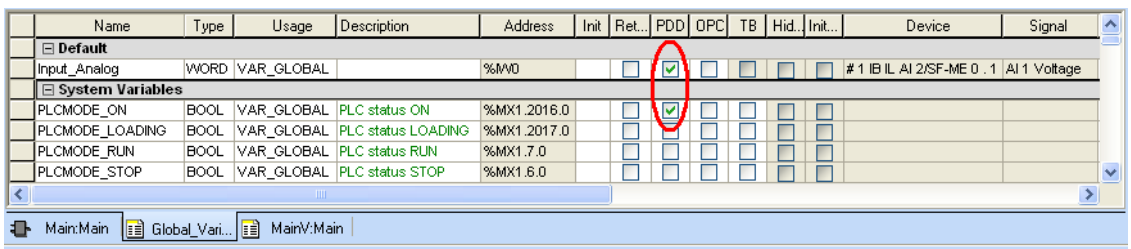


Figure 7-2 Activating "PDD" in the variables worksheet (Global_Variables)

When compiling the project, a file called “pdd.csv” is generated, which is used by WebVisit for the visualization.

In WebVisit, enter the PC WORX EXPRESS project used (recommended) or the corresponding pdd.csv file. When carrying out standard installation and naming the PC WORX EXPRESS project as per Section “Step-by-step development of an example project” on page 29, you will find

– the project in the following directory:
\Libraries\Documents\PC WORX EXPRESS

and

– the corresponding pdd.csv file in the following directory: **\Libraries\Documents\PC WORX EXPRESSS\xxx\C\STD_CNF\R\STD_RES**
(xxx = project name, FirstSteps_ILC131 in the example).

When you enter this path, the path for the pdd.csv file is updated automatically. Please see Figure 7-6 on page 81.

For further information about using WebVisit, please refer to the corresponding documentation.

Changing the language setting

As of version 6.21.00, it is possible to change the language of the user interface in WebVisit. Proceed as follows to change the language of the user interface:

- In the menu bar select “Tools, Tool Configurations...”.

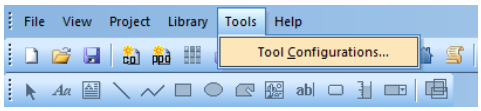


Figure 7-3 Open “Tool Configurations”

- Click on the “Language” cell.

A drop-down menu appears in the cell to the right of the “Language” cell.

- Select the desired language.

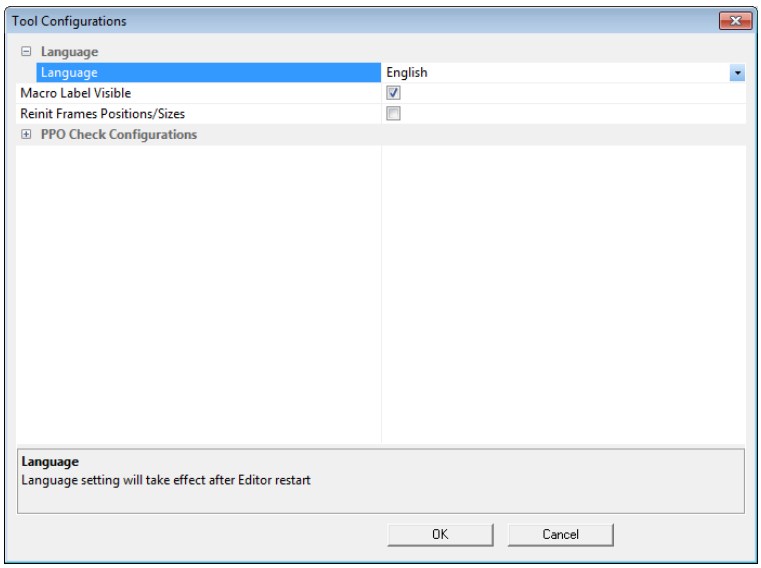


Figure 7-4 “Tool Configurations” window

- Confirm your selection with “OK”.

The language setting takes effect after WebVisit is restarted.

7.2 Loading the visualization on the controller

The DVD ILC 131 STARTERKIT includes a WebVisit example project (FirstSteps_ILC131.exe). This visualization can be viewed once the project has been downloaded to the controller using the WebVisit software.

To download the visualization project to the controller, proceed as follows:

- Save the compressed FirstSteps_ILC131.exe WebVisit project (web server project) from the DVD ILC 131 STARTERKIT to your hard disk.
- Extract the file to the project directory of your WebVisit installation (standard installation path: \Program Files (x86)\Phoenix Contact\Software Suite 181\WebVisit6\Projects). To do this, double-click on the self-extracting “FirstSteps_ILC131.exe” file.
- Start WebVisit.
- Open the project (“FirstSteps_ILC131.prj” file) in WebVisit via the “File, Open project...” menu item.

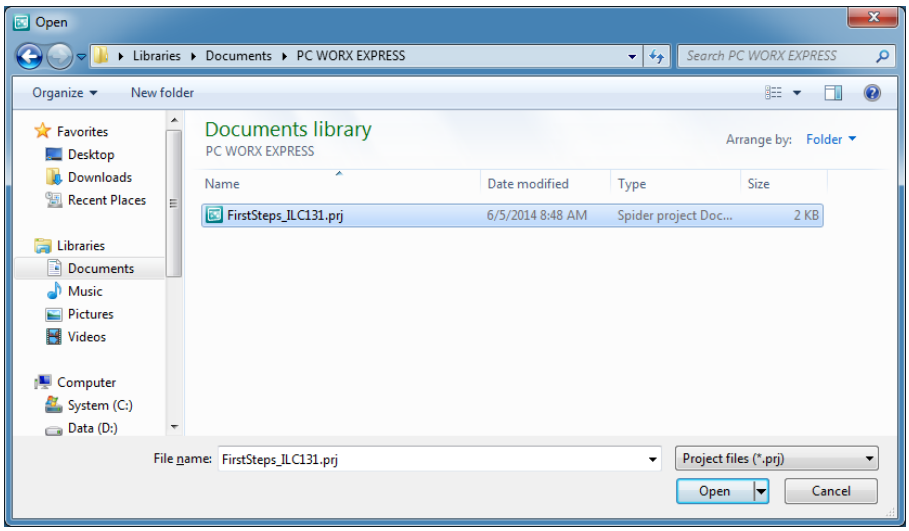


Figure 7-5 Opening the WebVisit project

If an error message is displayed indicating that WebVisit cannot open the “pdd.csv” file when opening the WebVisit project, proceed as follows.

- Confirm the error message with “OK”.
- Select the “Project, Project settings...” menu item and open the “Project, Advanced” tab.
- Confirm any further error messages with “OK”.

- In the dialog box, set the path under which you have saved the “FirstSteps_ILC131.mwe” PC WORX EXPRESS example project for the starter kit on your PC.

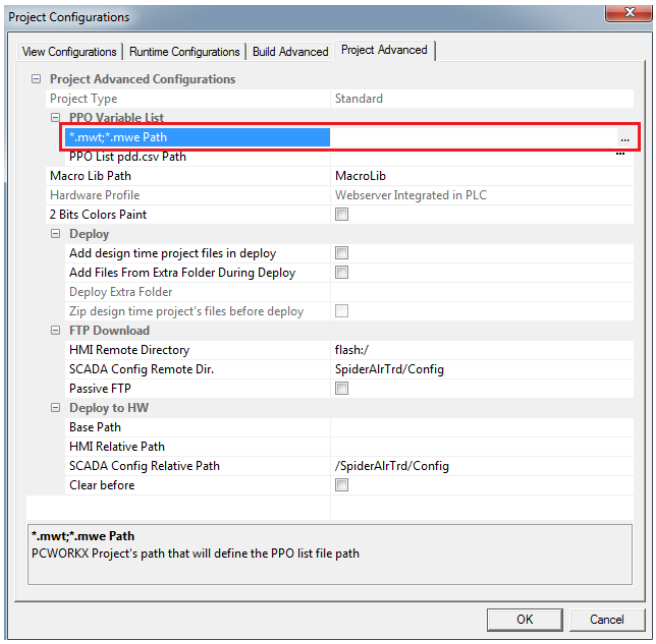


Figure 7-6 PC WORX EXPRESS example project: setting the path

- Confirm your entries with “OK”.

Calling the download dialog box

- Download the project to the controller via the “Project, Download project...” menu item.
- In the “Connect” area, set the IP address of the controller under “Server” (“192.168.0.2” in the example, see Figure 7-7).

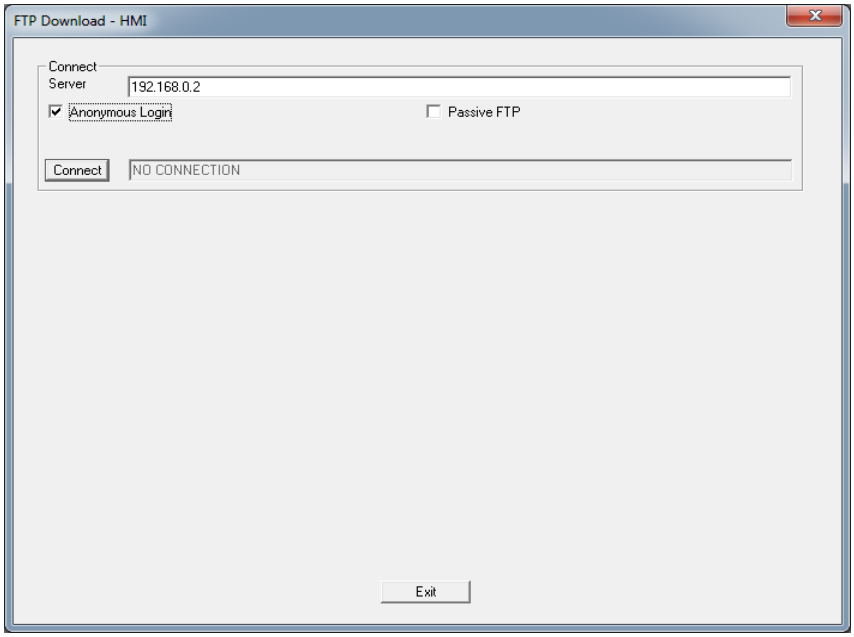


Figure 7-7 WebVisit FTP download to the controller

- Click on the “Connect” button.

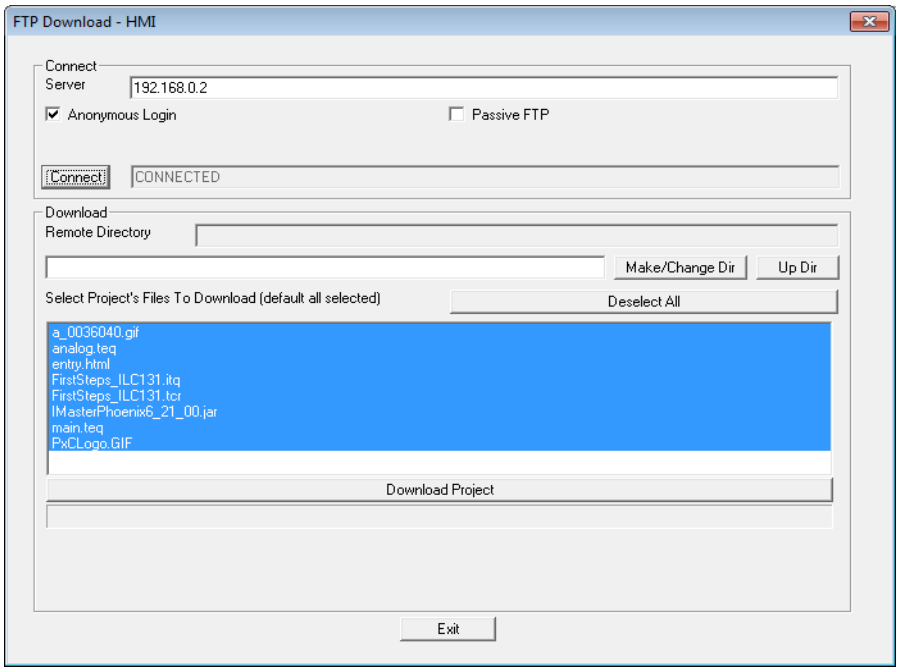


Figure 7-8 WebVisit connected to the controller

- Click on the “Download project” button.

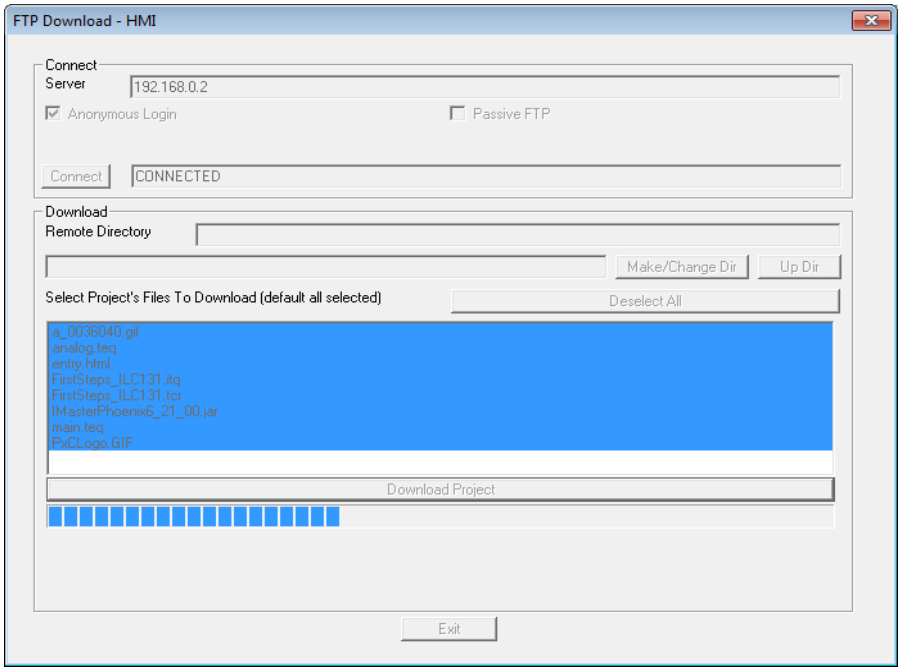


Figure 7-9 Loading the WebVisit project to the controller

The progress indicator shows the transmission status.

The visualization project has been transmitted to the controller. The visualization can now be displayed via your web browser. Read more in Section “Starting the visualization” on page 84.

7.3 Starting the visualization

Please ensure that the visualization is only started once the following setting has been made in the Windows® Control Panel.

- In the Windows® Control Panel, open the Java settings window.
- In the settings for temporary files, specify that temporary files cannot be kept on the computer.

- In the address window of your Java-compatible web browser, enter the IP address of the controller (in the example: “http://192.168.0.2”).

If all settings have been made properly, your web browser will display the visualization start page after a brief loading time. This includes animated representations of LEDs, which can be activated/deactivated using the switches of the switch module. A button can also be used to call another page of the visualization. This page includes an animated bar graph which represents an analog input value.

Visualization start page

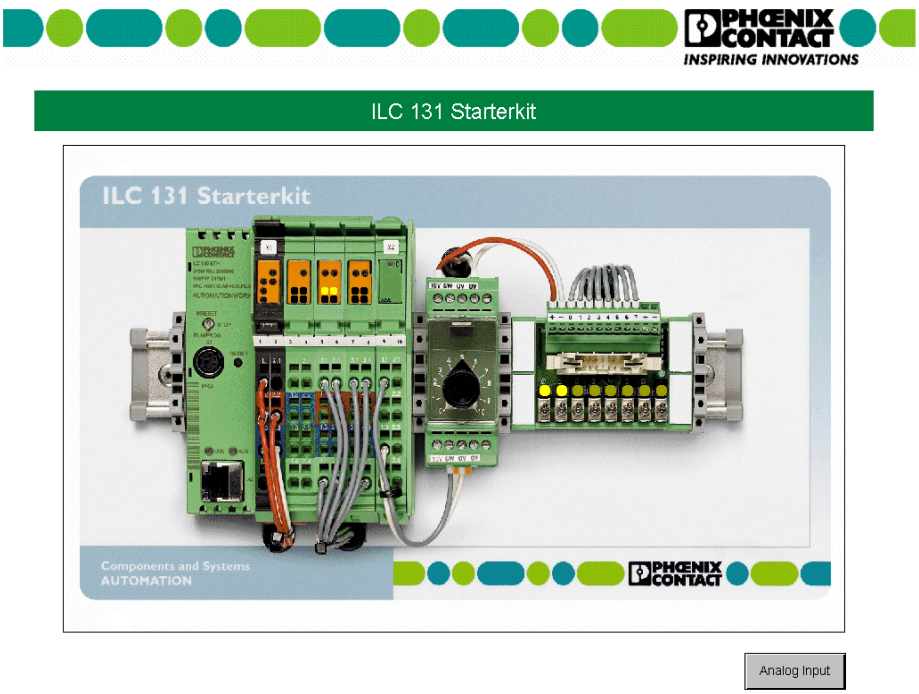


Figure 7-10 Visualization start page

Visualization of an analog value

- Click on the “Analog Input” button to view the visualization of the analog input value.

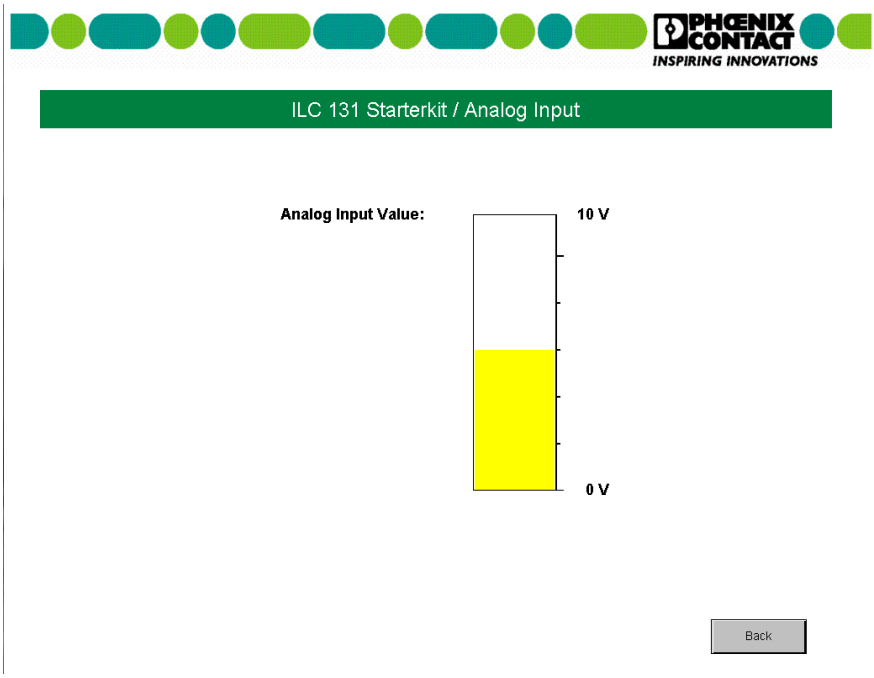


Figure 7-11 Display of the analog input value (Input_Analog variable)

- Adjust the starter kit potentiometer to change the level of the bar graph.

A Appendixes

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Section 5

Section 6

Section 7

A 2 List of tables

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Section 4