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Establishing a PN-IE Connection between LOGO! 0BA7 and an S7-300 CPU

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Contents

1 General Notes

Basic knowledge of LOGO! and SIMATIC STEP 7 is required.

The programs shown here can run on any S7-300 CPU and S7-400 CPU in combination with a LOGO! 0BA7.

2 Automation Task

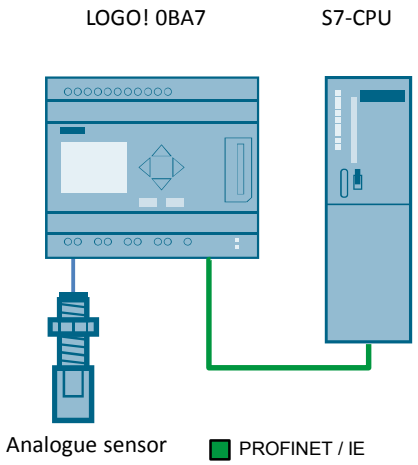
2.1 Task

With this example we show how a LOGO! can remotely acquire measured values and control motors. An S7-300 should be used as a higher-level central controller. Communication between the central and distributed controllers is to be made over PN/IE (Ethernet).

LOGO! is to acquire the values for the fill level and temperature of a tank. LOGO! should also control the connected pumps.

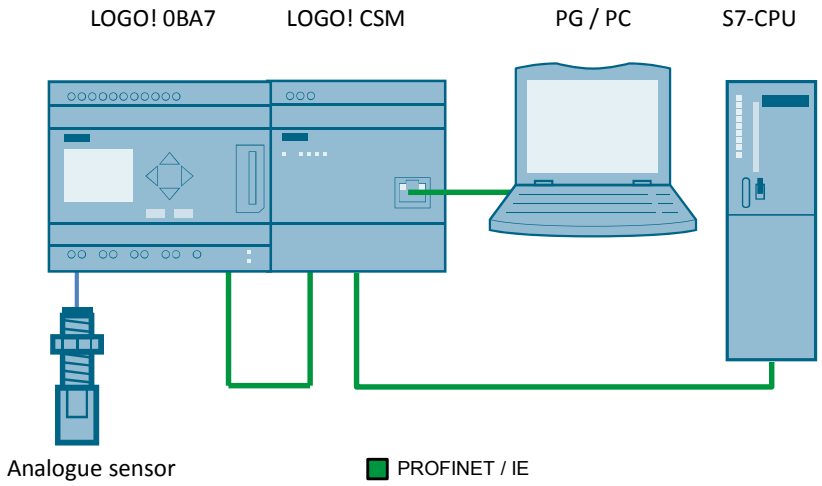
An S7-300 is to monitor the fill level and switch the pumps on and off respectively if the upper and lower threshold levels are exceeded.
It is to contain the program for controlling the pumps as well as the communication blocks for exchanging the transmitting the measured values and commands.

Figure 2-1: Task



3 Automation Solution

Figure 3-1: Automation solution



3.1 Overview of the Complete Solution

A LOGO! 0BA7 is connected by Ethernet with an S7-300. A switch (LOGO! CSM), as shown in Figure 1-2, is only useful during configuration, but not absolutely necessary.

An S7 connection is for transmitting data between the LOGO!..0BA7 and the S7-300 over PN/IE (Ethernet).

The IP addresses of the communication stations differ only in the last octet (192.168.0.x). This is a Class C network. The subnet mask "255.255.255.0" is selected for a Class C network.

Advantages/benefits

- A central and distributed automation system can be installed cost effectively with LOGO! 0BA7.
- Autonomous operation is possible depending on the central/distributed signal processing.
- Signal preprocessing reduces the signal volume at the interfaces and relieves the central controller.
- It is possible to change parameters and threshold values centrally.
- It is possible to use LOGO! cursor keys for local control.

3.2 Hardware and Software Components Used

Products

Table 3-1

	Components	Qty.	MLFB/Article number	Note
1.	LOGO!..0BA7	1	6ED1052-1MD00-0BA7	
2.	S7-300 PN/DP CPU	1	6ES7315-2EH14-0AB0	
3.	PS307 2A Power supply	1	6ES7307-1BA01-0AA0	
4.	LOGO! CSM 12/24	1	6GK7177-1MA10-0AA0	Optional

Accessories

Table 3-2

	Components	Qty.	MLFB/Article number	Note
1.	Ethernet cable	3	6XV1870-3QH20	

Configuration software and tools

Table 3-3

	Components	Qty.	MLFB/Article number	Note
1.	LOGO!Soft Comfort V7 Upgrade	1	6ED1058-0CA02-0YE1	
2.	STEP 7 V5.5	1	6ES7810-4CC10-0YA5	

Sample files and projects

Table 3-4

	Application	File name
1.	S7-300 Program	Serv_Kom_LOGO_S7300.zip
2.	LOGO! Program	Serv_Kom_LOGO_S7300.lsc

3.3 Inputs and Outputs

Inputs and outputs are only on the LOGO! side.

Table 3-5

Inputs	Outputs
AI1: Fill-level sensor	Q1: Pump
AI2: Temperature sensor	

4 Installation and Parameters

Setting the interfaces

To enable communication between the LOGO! 0BA7 and the S7-300 over PN/IE (Ethernet),
you must assign parameters to the interfaces of the components.

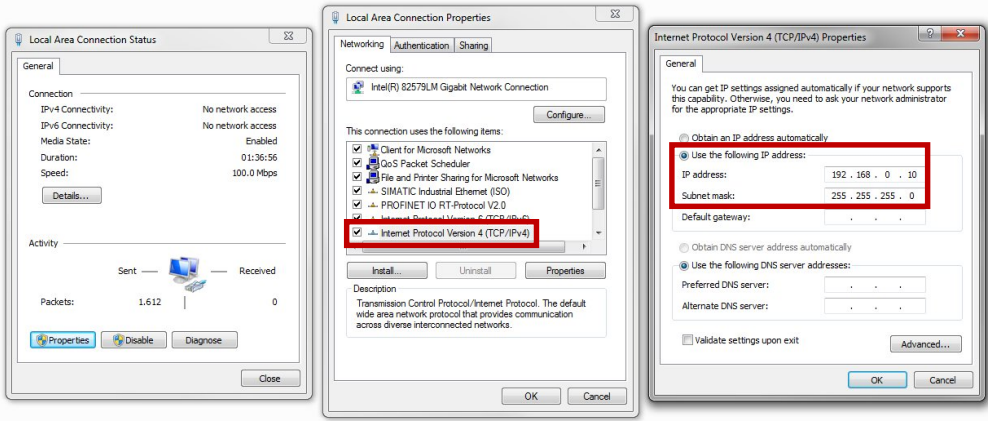
First connect the components as shown in Figure 3-1. If no switch is to be used, connect the LOGO! with the PC for the parameterization and download. To enable successful communication you must ensure that all the network settings are correct.

4.1 Setting the PG/PC Interface

Table 4-1

Step	Action
1.	Select the connection required from the list of network connections: Start → Control Panel → Network and Sharing Center
2.	Open "Change adapter settings".
3.	Double-click the "Local Area Connection".
4.	Click "Properties" and confirm with "Yes".
5.	Double-click Internet Protocol TCP/IPv4.
6.	Assign the IP address and subnet mask: IP address: 192.168.0.10; Subnet mask: 255.255.255.0

Figure 4-1: Settings of the PG/PC Interface



4.2 Setting the IP Address of the S7-300

You set the IP address through STEP 7 / NetPro. This is described under "Configuration and Parameter Assignment" in section 6.2.

4.3 Setting the IP Address of the LOGO!..0BA7

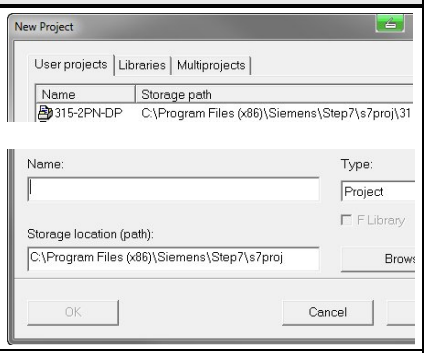
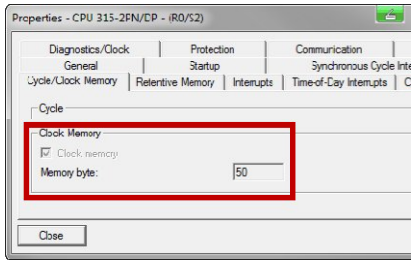
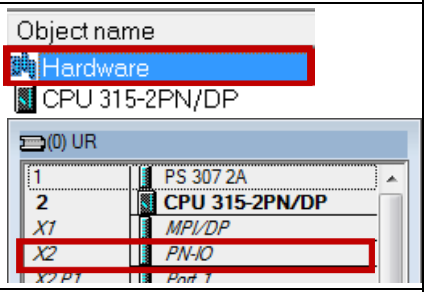
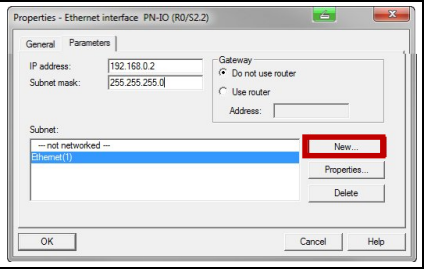
Table 4-2

Step	Action
1.	Read out the IP address of the LOGO!. For this you switch to the menu with "ESC" and cursor keys.
2.	Select the item Network → IP address.
3.	Here you set the IP address. IP address: 192.168.0.1; Subnet mask: 255.255.255.0

5 Create the S7 Project

5.1 Configuration and Parameter Assignment

Table 5-1

Step	Action	Note
1.	Open STEP 7 V5.5 and create a new project.	
2.	Add a new S7 CPU using this menu sequence: "Add → Station → SIMATIC 300 station"	The station must have a PN/IE interface. In the example: CPU 315-2PN/DP
3.	Alternatively you can right-click your project and add the station through "Insert New Object → SIMATIC 300 station".	
4.	In the HW Config, under CPU properties you set the clock memory byte to 50.	
5.	Select the "Hardware" object that has now been created in your station folder and double-click to go the configuration of your S7 CPU in the HW Config.	
6.	When creating the CPU you are asked for the settings of the Ethernet interface. Assign the CPU the IP address 192.168.0.2 and the subnet mask 255.255.255.0. Click the "New..." button and confirm the dialog with "OK". A new subnet is created and the S7 CPU connected to it.	

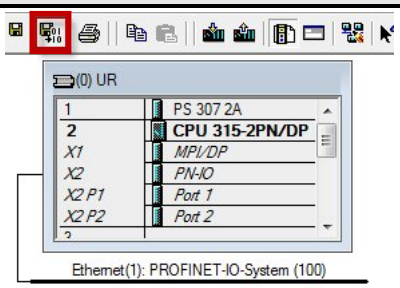
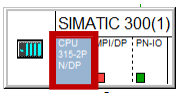
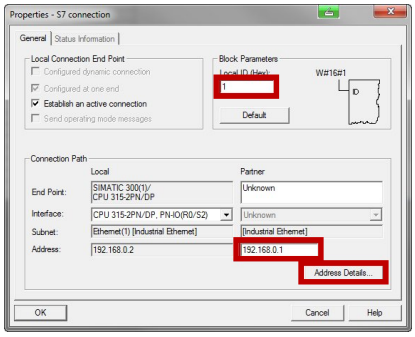
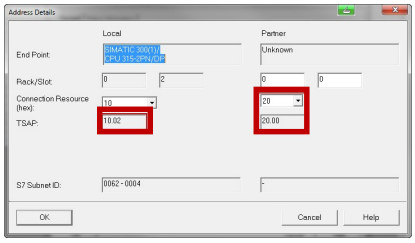
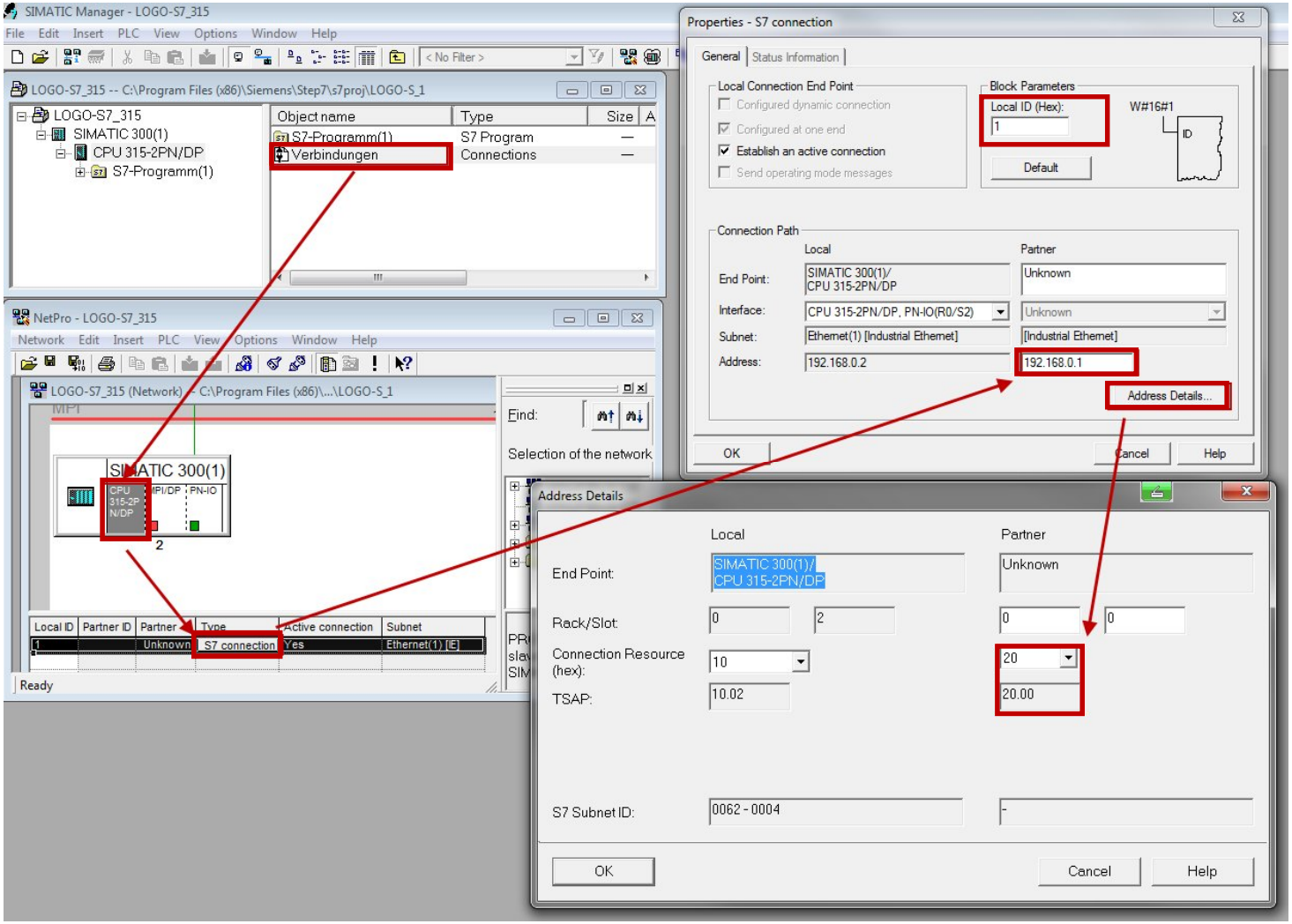
Step	Action	Note
7.	In the status bar you click the "Save and Compile" button and acknowledge the window that opens with "OK" to execute the compilation.	
8.	In the status bar you click the "Configure Network" button to add an unspecified S7 connection.	 The "NetPro" program starts.
9.	Double-click the CPU. “ In the dialog window you select "Insert New Connection". The connection type is "S7 connection". Confirm with "OK".	 The communication table opens. The "Insert New Connection" window opens. The "Properties - S7 connection" window opens.
10.	Enter "1" for the local ID.	
11.	You can enter LOGO! as the partner end point.	
12.	Enter the IP address 192.168.0.1 as partner.	
13.	Click "Address Details...".	
14.	In the "Address Details" window you enter "20" as the connection resource of the partner. This results in a TSAP of "20.00" for the partner, which corresponds to the TSAP of our LOGO!.	
15.	Note the TSAP of your local CPU, because it will be needed later for configuring the LOGO!. In this example the local TSAP is "10.02".	
16.	Save the setting by closing all the windows with "OK".	 Now a new S7 connection should have been created.
17.	Close NetPro.	

Figure 5-1: Overview of steps 8 to 15



5.2 Creating the Program in STEP 7 V5.5

In the example is a project that cyclically reads the fill level and temperature from the LOGO!..0BA7.

The data read out is stored in a data block in the S7 CPU. For this a data block is created with two structures: receive area and send area. The receive area has a size of two words,
the send area has just one data area of one bit for controlling the pump.

The SFC14 ("GET") requests the data every second from the LOGO! 0BA7 and writes the data to the receive area.

The clock memory byte that must be defined in the HW Config is used for the cyclical read-out.

The "ADDR_1" parameter specifies the memory area of the LOGO! 0BA7 through which the data is read-out. In this example: DB1.DBD0.

The "RD_1" parameter defines the storage location of the data read in the S7 CPU. The data area is also specified here. In this example: DB3.DBD0.

Two comparator blocks check the fill-level values read against two threshold values. If the fill level is greater than 2000 liters, the pump connected to the LOGO! 0BA7 is switched on and only switched off again when the fill level is less than 500 liters.

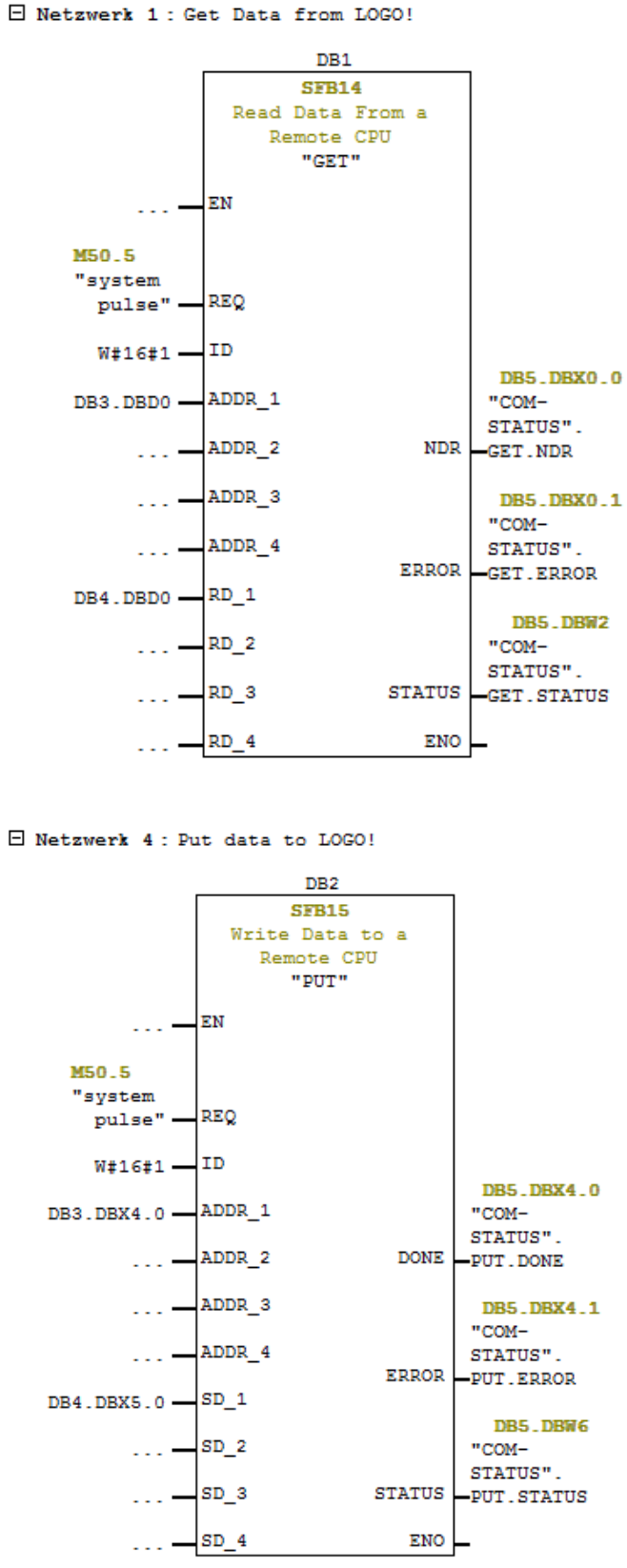
The SFC15 ("PUT") has a similar structure to the SFC 14 described. The "ADDR_1" parameter specifies the location of the partner CPU, in other words the LOGO! 0BA7 in which the data to be sent is stored. The "SD_1" parameter specifies the exact address of the data to be written from the S7 CPU to the LOGO! 0BA7.

In this example only the bit for switching the pump on and off is to be written. This is why no data length is specified, because it is only one single bit.

Note **The inputs "ADDR_2" to "ADDR_4" and "RD_2" to "RD_4" of the SFC14 and SFC 15 can only be used by the S7-400.**

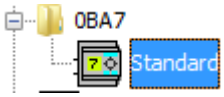
Note Use the STEP 7 Help for more information about the SFBs. Mark the relevant block and press the F1 key.

Figure 5-2: Parameterization of the communication blocks



6 Create the LOGO! Project

6.1 Creating a New Project

Step	Action	
1.	Start LOGO!Soft Comfort.	
2.	Create a new project using the "New" button.	
3.	In the hardware selection ("Tools" → "Select Hardware") you set a LOGO!..0BA7 as basic device.	

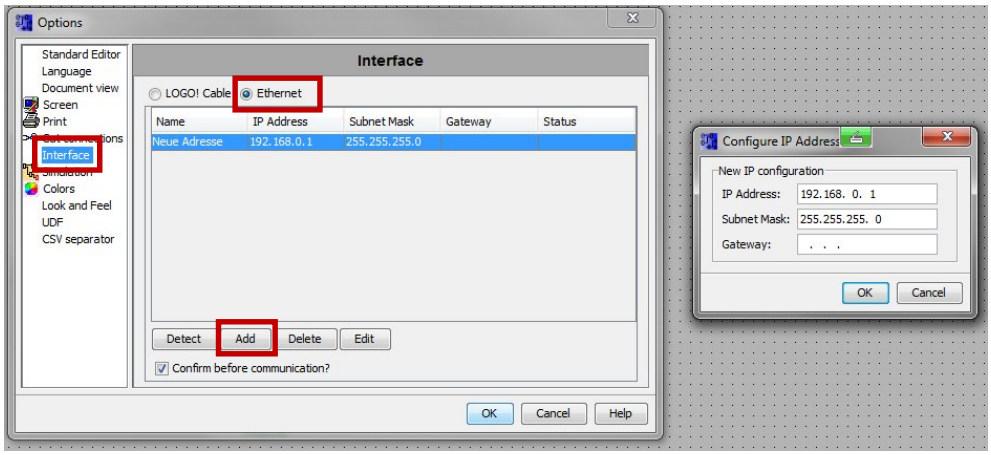
6.2 Creating a Connection in LOGO!Soft Comfort V7

Parameterizing the connection

Table 6-1

Step	Action
1.	To set the interface in LOGO!Soft Comfort you select "Tools → Options → Interface".
2.	Select the "Ethernet" item.
3.	Add a new connection using the "Add" button.
4.	Enter the IP address and subnet mask set for the LOGO! (see Table 4-2).

Figure 6-1: Parameterization of the connection

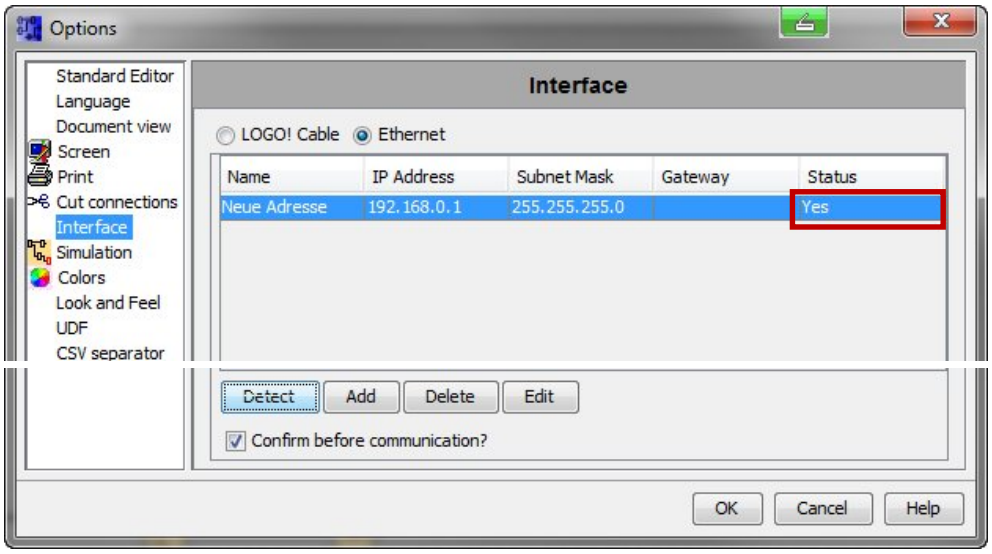


Checking the connection

Table 6-2

Step	Action
1.	Make sure that the LOGO! is connected to the PC by Ethernet and is switched on.
2.	Click the "Detect" button (see Figure 6-2).
3.	If the LOGO! is detected by LOGO!Soft Comfort, "Yes" is displayed in the "Status" column (see figure below).

Figure 6-2: Detecting the LOGO! over the PG/PC interface



You have successfully connected the LOGO! to the PC and can now download and upload programs or change the settings of the LOGO! through LOGO!Soft Comfort.

Configuration of the Ethernet connection between the LOGO! 0BA7 and the S7-300

Table 6-3

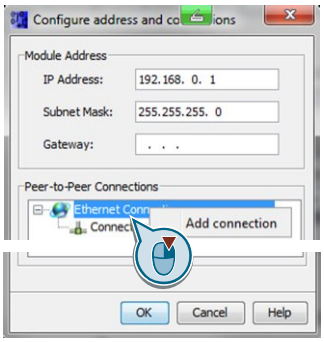
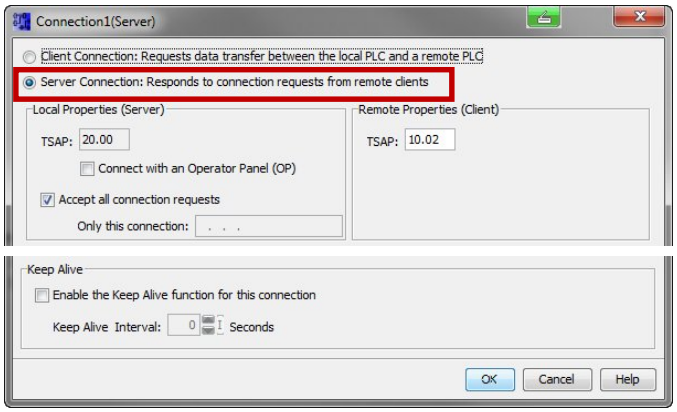
Step	Action	Note
1.	Click "Tools" → "Ethernet Connections.	
2.	Set the IP address and subnet mask of your LOGO! ..0BA7.	IP address: 192.168.0.1; Subnet mask: 255.255.255.0
3.	Right-click "Ethernet Connections" to add a new connection under Peer-to-Peer Connections.	
4.	Double-click to open the Properties of the connection and configure as shown in the next figure.	Note: The "TSAP" parameter under "Remote Properties (Client)" must be entered in the xx.xx format (example: 10.02) (see Figure 6-3).

Figure 6-3: Setting the remote client TSAP

Figure 6-4

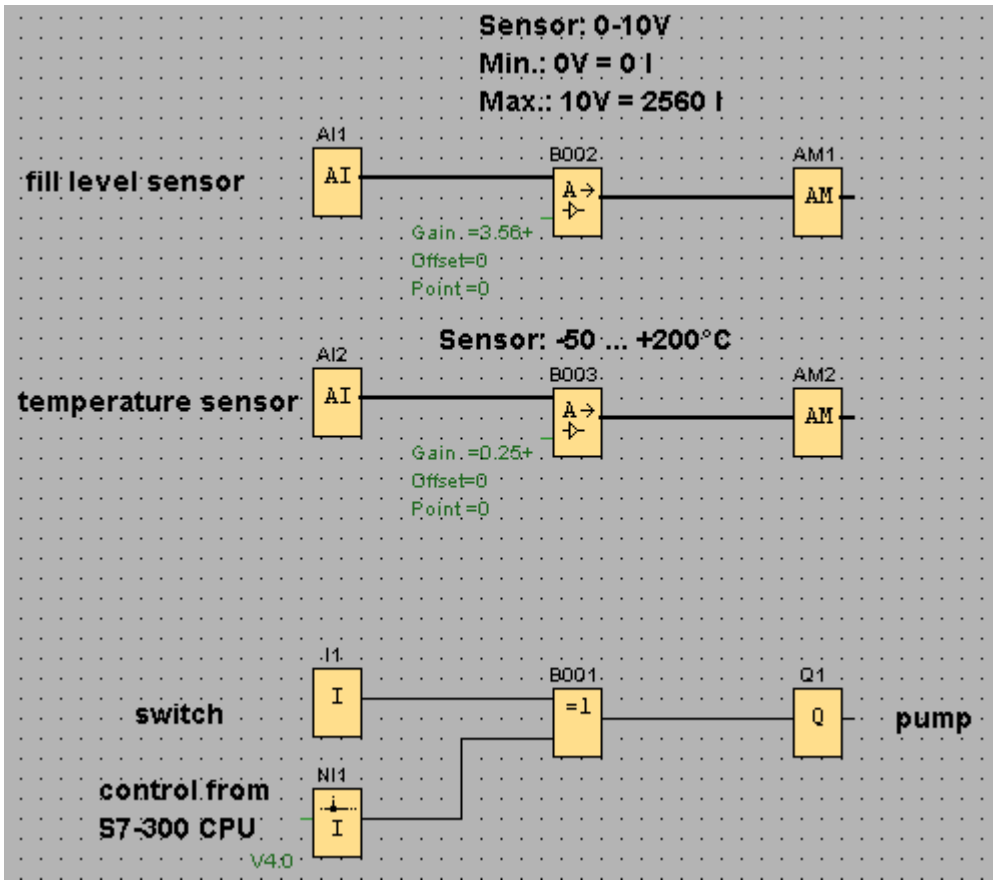


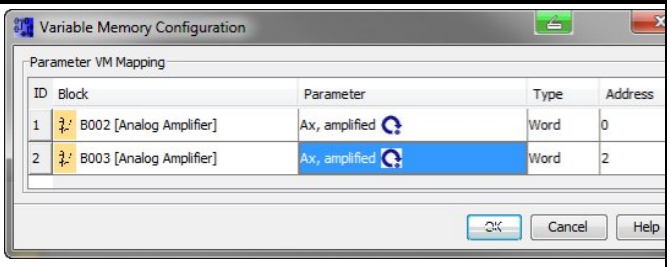
6.3 Creating the Program in LOGO!Soft Comfort V7

The project consists of evaluation of the fill-level and temperature sensor values and transmission of the values to the S7-300. The pump is controlled over a digital input and a network input. The network input enables switching of the pump over the S7-300. The XOR element provides a two-way circuit for switching the pump on and off.

The variable is set to V4.0 in the Properties of the network input, because the variable byte is the next free byte in the variable memory of the LOGO!.

Figure 6-5: LOGO! program



Step	Action	Note
1.	Under "Tools" you create "Parameter VM Mapping" as shown in the next figure.	 The values of the two analog amplifier blocks are enabled for the S7 connection.

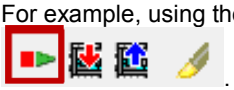
6.4 Loading the Project into the LOGO!

Table 6-4

Step	Action	Note
1.	Use the button shown on the right to load the program into your LOGO! and follow the instructions displayed.	

7 Run the Project

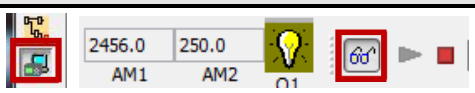
Table 7-1

Step	Action	Note
1.	Start your S7-300.	For example, set the operating mode switch on the CPU to "Run".
2.	Start your LOGO!.	For example, using the marked button  .

The project is now running.

You also have the option of monitoring the values running over the communication connection.

Table 7-2

Step	Action	Note
1.	Use the buttons shown on the right to go to the Online Test in LOGO!Soft Comfort.	
2.	In STEP 7 use the button shown on the right to go into Monitor Mode.	

Now you can see how the variables are exchanged over the communication connection and how the controllers process the values and react.

Figure 7-1: LOGO!Soft Online Test

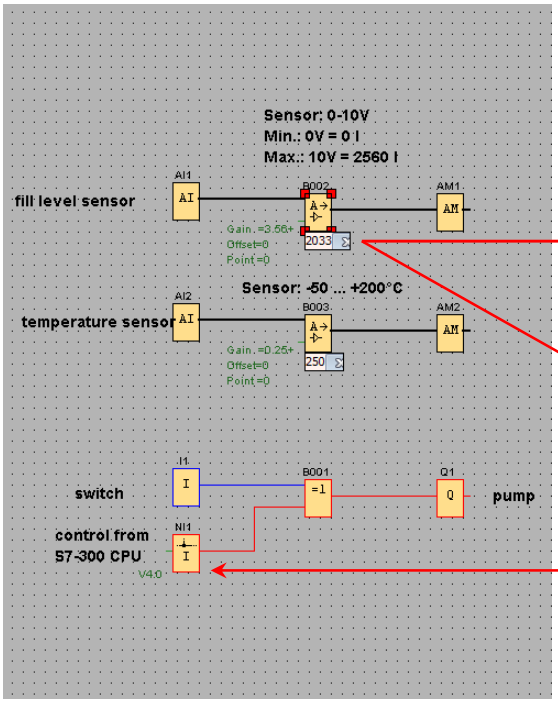


Figure 7-2: STEP 7: Monitor