How to configure an Anybus Modbus Plus slave module with ProWORX 32

Document history

Revision	Date	Description	Author
1.00	2008-02-06	Created	Thorbjörn Palm
1.01	2008-02-19	Minor revision	Thorbjörn Palm

More information about the network and products

For further information about the Anybus products, please consult the HMS webpage, www.anybus.com. The latest manuals, etcetera can be downloaded from that location.

The Modbus-IDA user organisation has a webpage on the Internet, www.modbus.org. Several technical guides about Modbus in general are available in or via this page.

Contents

1 Applicable Anybus products

The following table specifies the relevant Anybus products for this document.

Description	Name / Type
Anybus X-gateway	Modbus-Plus
Anybus Communicator	Modbus-Plus
Anybus-S Slave	Modbus-Plus

Note. The configuration of the X-gateway and the Anybus Communicator is described in this document. In the case with the remaining Anybus products this document is applicable, but the configuration is depending on the type of application.

2 Requirements

The following equipment is needed to setup a successful configuration.

Description	Name / Type	Version
Schneider Modicon PLC	PC-E984-245	-
PLC software	ProWORX 32	2.0
Communicator configuration software	ABC Config Tool	2.32
X-gateway terminal software	HyperTerminal or TeraTermPro	5.1, 2.3
X-gateway Network Interface Addendum	Anybus X-gateway Modbus Plus Slave, Network Interface Addendum	1.01
X-gateway User Manual	X-gateway Generic User Manual	1.10
Communicator User Manual	Anybus Communicator for Modbus Plus, User Manual	2.52
Slave Fieldbus Appendix	Anybus-S Modbus Plus, Fieldbus Appendix	1.31
CompactCom Network Interface Appendix	CompactCom Modbus PLUS, Network Interface Appendix	1.10
Power supply 24VDC	n.a.	n.a
Configuration cables	n.a.	n.a.

3 Solution overview

This application note describes how to configure an Anybus Modbus Plus Slave product with a Schneider PLC. Below you can find an overview of the system described in this document. Other nodes may be attached to the network, but are not necessary.

The configuration is described in two steps.

1. The configuration of the communication parameters and the I/O data of the Anybus module are described.
2. The PLC configuration is explained.

The pin configuration of the Modbus Plus connector is the same on the Schneider PLC as on the Anybus module. Also make sure the network is terminated in a correct way.

Note: This document is valid for all Anybus Modbus Plus products, however sections written in *italics* describe the configuration of a specific product.

The contents describe step by step how a configuration is done. This document assumes the reader is familiar with industrial communication, Modbus Plus networks and HMS Communicator and X-gateway.

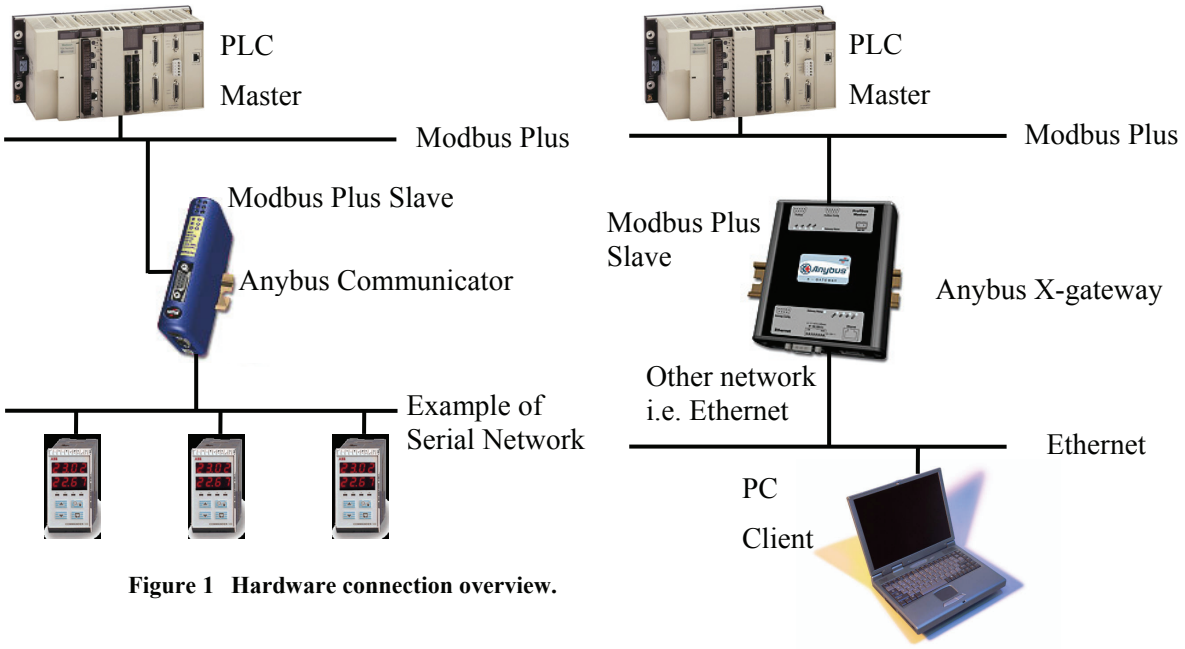


Figure 1 Hardware connection overview.

4 Anybus configuration

The first step is to set the Source ID and Node ID switches in the desired positions. In this case Node ID 2 and Source ID 1 are used. The switches for the Node ID are located closest to the fieldbus connector, please see the respective manual or appendix for details.

Node ID switches
(located next to the fieldbus connector)

#	sw. 1	sw. 2	sw. 3	sw. 4	sw. 5	sw. 6
1	ON	ON	ON	ON	ON	ON
2	ON	ON	ON	ON	ON	OFF
3	ON	ON	ON	ON	OFF	ON
...	...	...	...	...	...	...
64	OFF	OFF	OFF	OFF	OFF	OFF

Source ID switches

#	sw. 1	sw. 2	sw. 3	sw. 4	sw. 5	sw. 6
1	ON	ON	ON	ON	ON	ON
2	ON	ON	ON	ON	ON	OFF
3	ON	ON	ON	ON	OFF	ON
...	...	...	...	...	...	...
64	OFF	OFF	OFF	OFF	OFF	OFF

Figure 2 The table shows the settings for the address switches.

Note: *Using the Anybus-S the Node ID and Source ID can also be set by mailbox command.*

In the following chapters the configuration of the Anybus-S Slave, Communicator and X-gateway are explained.

4.1 Anybus-S Slave configuration

The Anybus-S is initiated and configured via the host application interface using the mailbox interface. Refer to the Anybus-S Fieldbus Appendix for details.

4.2 Communicator configuration

To configure the Communicator start the ABC Config Tool and start a new project. The configuration differs depending on what type of data is used on the Modbus Plus node. Using Global Data only, please see section 1 Using Global Data only. Using Peer-To-Peer Data please see section 2 Using Peer-To-Peer Data below.

1 Using Global Data only

Select the fieldbus Modbus Plus and IO sizes Automatic.

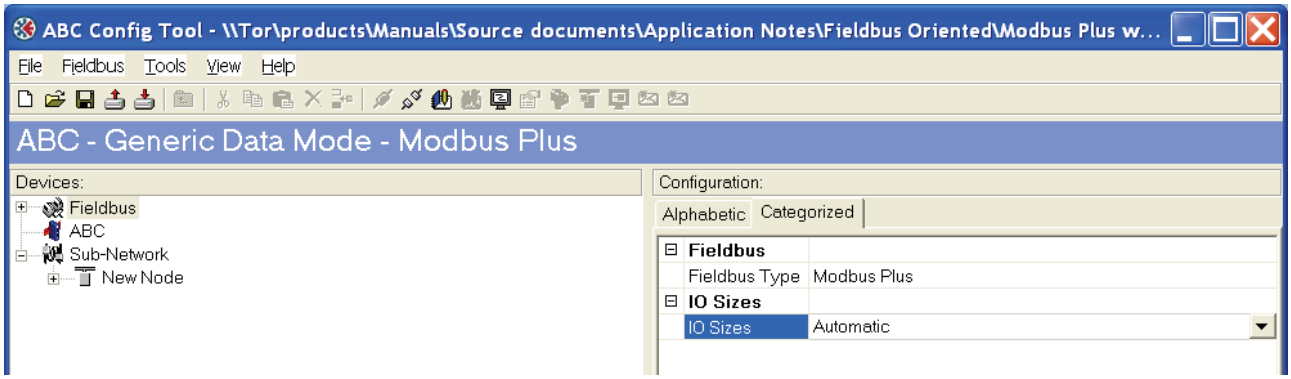


Figure 3 Configuring the Fieldbus.

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

2 Using Peer-To-Peer Data

When using Peer-To-Peer Data the I/O sizes has to be set to user defined as shown below. In this case 64 bytes of I/O data (Global Data) is used.

Note: *The Peer-To-Peer Data is mapped to the Registers after the Global Data.*

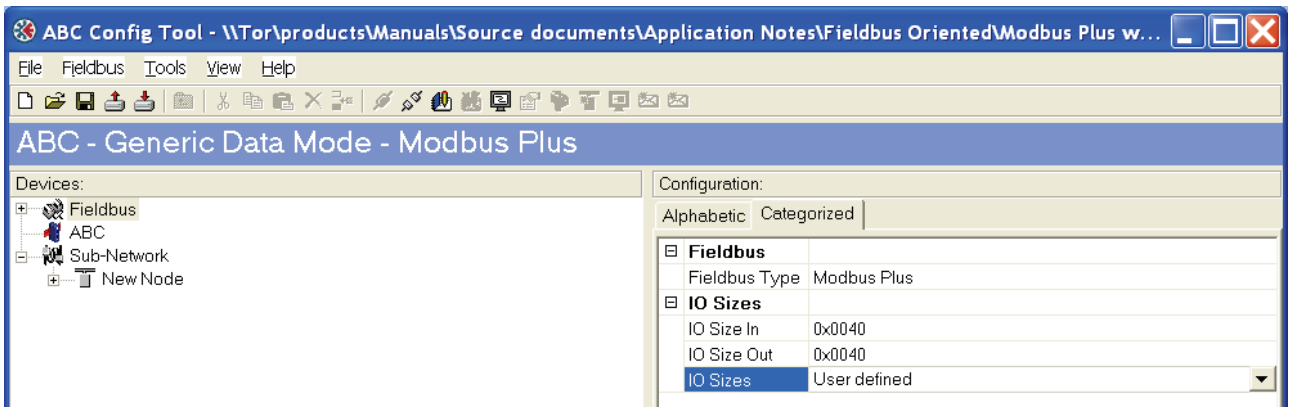


Figure 4 Configuring the Fieldbus using Peer-To-Peer Data.

Note: *The IO size IN and Out, in this case 64 bytes, set the size of the Global Data. The number of bytes of Peer-To-Peer Data will depend on the data configured for the sub-network. The data configured for the sub-network indicates the total I/O size. The number of bytes of Peer-To-Peer Data is the difference between the data size configured for the sub-network and the IO Size In and IO Size Out. In this case the total I/O size is 100 bytes (configured for the sub-network) and the Global Data size is 64 bytes. The Peer-To-Peer Data size is then 100-64=36 bytes.*

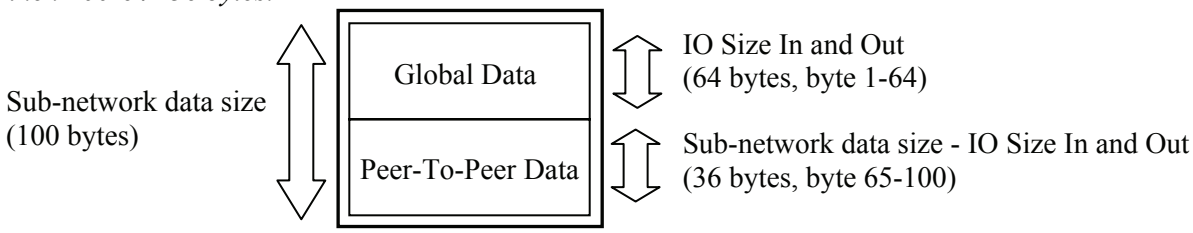


Figure 5 Configuring Peer-To-Peer Data in ABC Config Tool.

3 Sub-network configuration

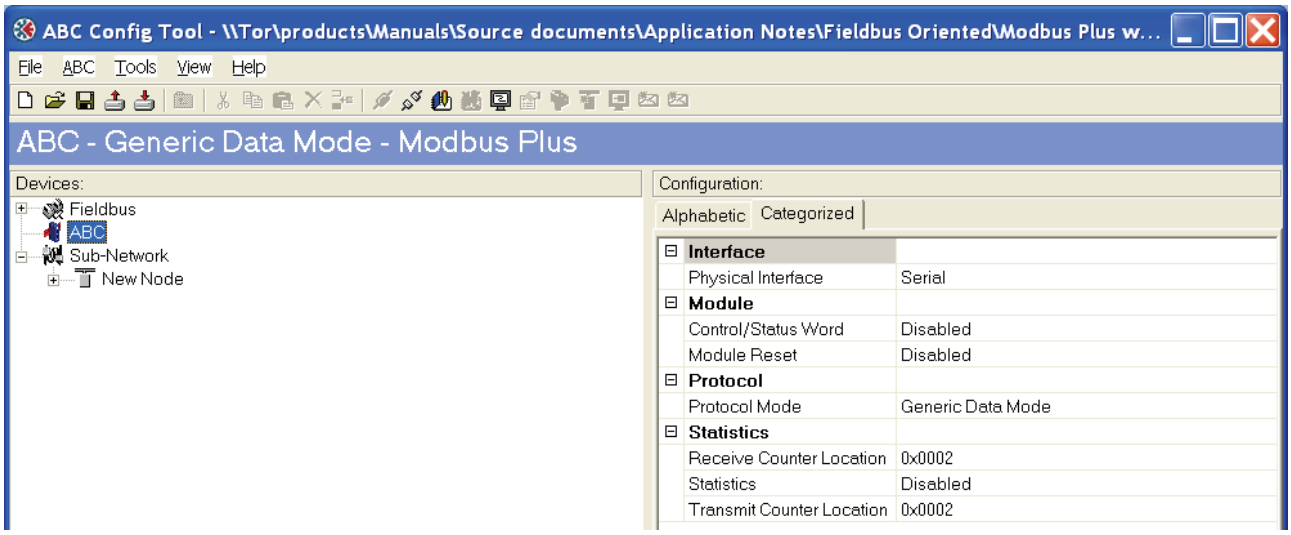


Figure 6 Configuring the Communicator.

The next step is to configure the sub-network. The configuration is depending on the application, in other words what nodes are connected. In this case a loop back dongle at the serial connection of the Communicator is connected. For this purpose the generic data mode is selected; all other values are left at their defaults.

Also the sub-network parameters are configured as seen in Figure 7.

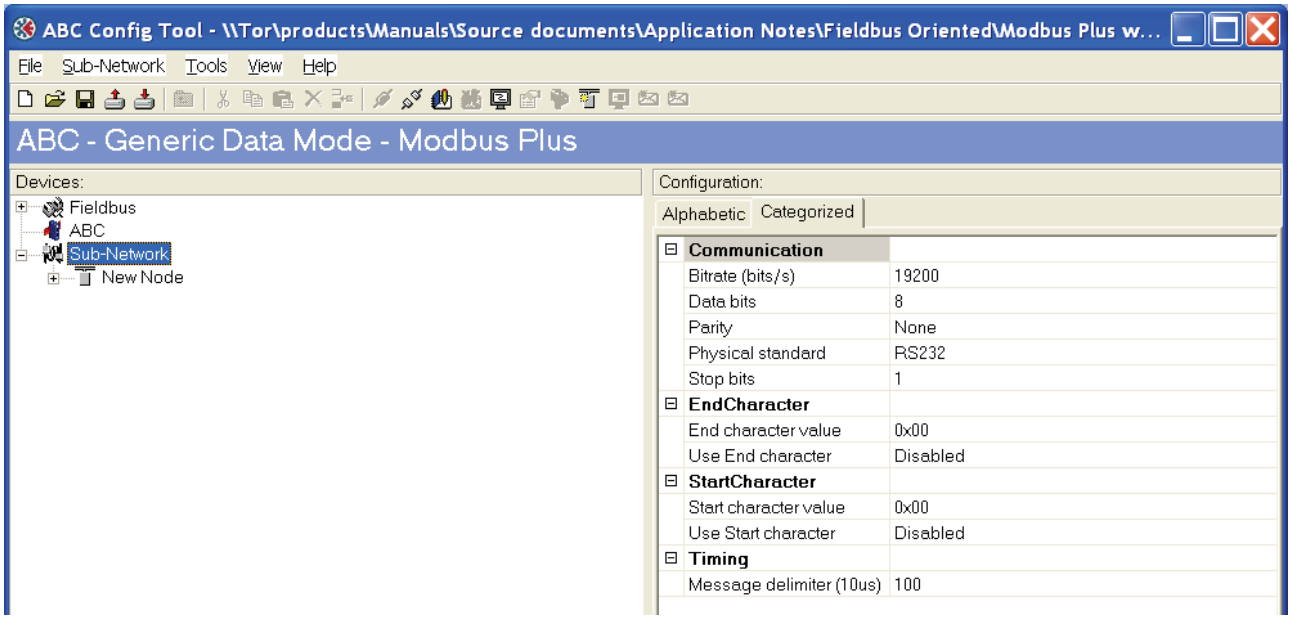


Figure 7 Configuring the sub network.

Right click on new node and add a consume and a produce transaction as shown below.

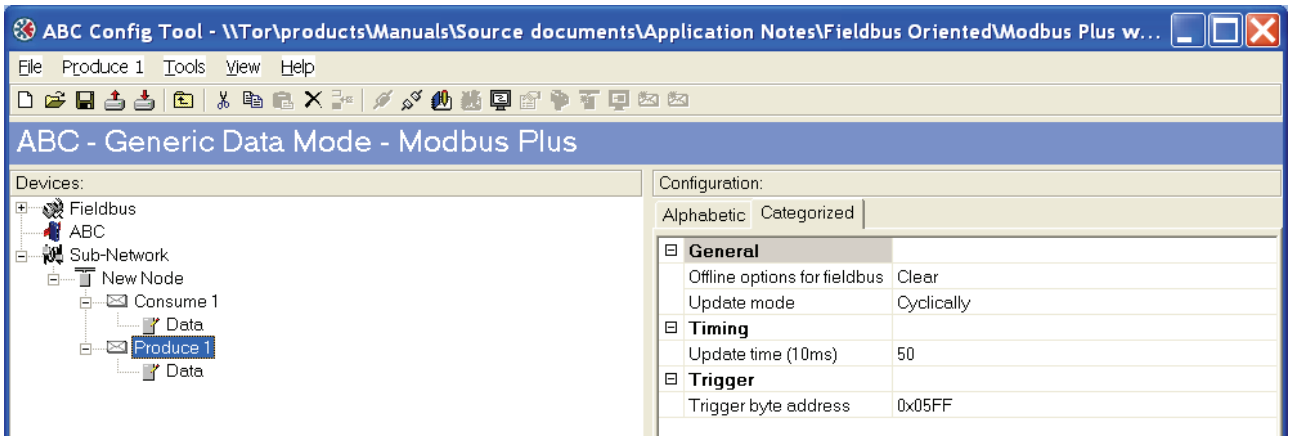
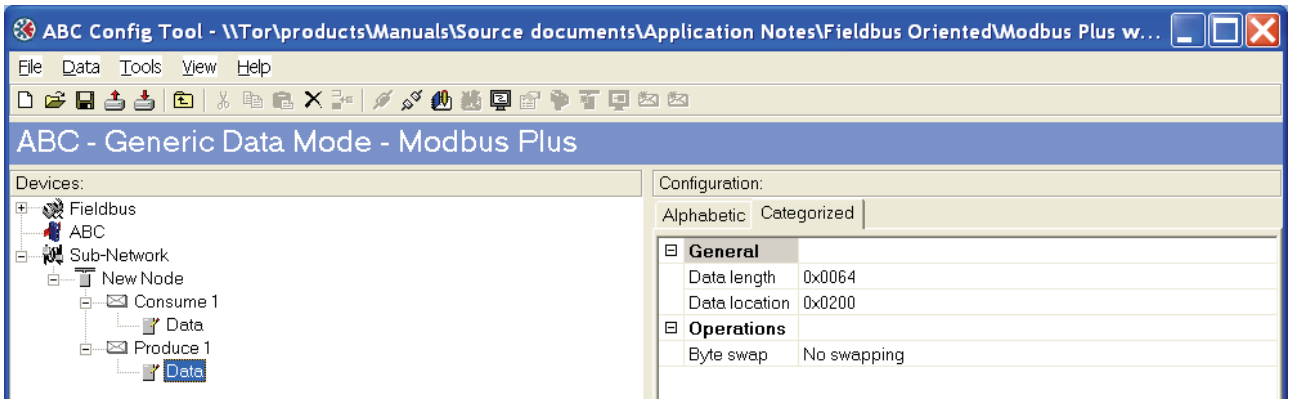


Figure 8 Configuring the Produce Data.

Change the Update time to 500ms and leave the settings for the Consume transaction at the defaults.

***Note:** The update time for the produce transaction is to be set to less than the offline timeout time for the consume transaction; in this case the update time is set to 500ms and the offline timeout time to 1000ms.*



Right click on the produce and consume transaction respectively and select add data. In this case 100 bytes of data is used.

***Note:** The configured Data length sets the total data size using Global and Peer-To-Peer Data. In this case 100 bytes is used. For a more detailed description see the Communicator User Manual.*

The final step is to save the configuration and download it to the module.

4.3 Anybus X-gateway configuration

Use the HyperTerminal on a PC to configure the X-gateway. Connect a serial cable between the PC and the config port on the X-gateway. Start the HyperTerminal and open the "File" menu and click on new. Choose the desired COM port and then click on OK. The following window will appear.

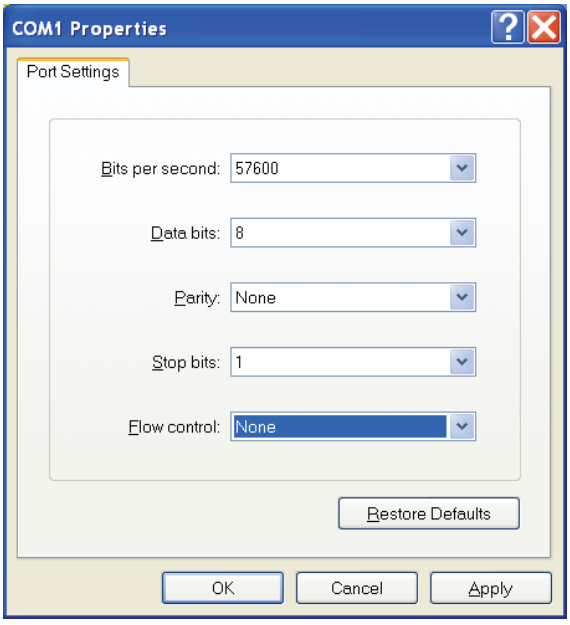


Figure 9 Configuring the connection in the HyperTerminal.

Make sure the settings are identical to those shown in the window above. Alternatively download a HyperTerminal session file from the HMS website[1], double click on it and select COM port.

Connect and press ESC and the following menu will appear.

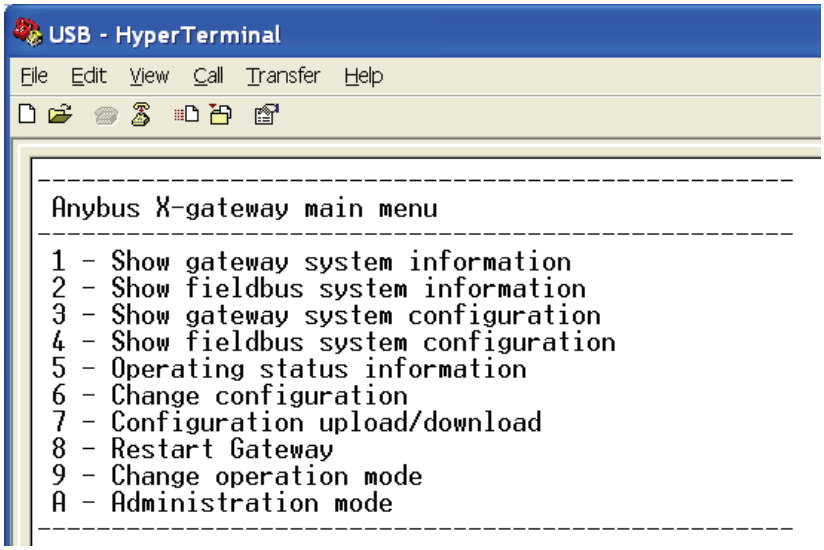


Figure 10 Anybus X-gateway Main menu.

Press 6 and enter the desired configuration.

[1] www.anybus.com

The figure below shows an example; in this case a Modbus Plus Slave to Modbus-TCP Slave X-gateway is used. 100 bytes of I/O data on the Modbus-TCP side and 64 bytes of Global Data and 36 bytes of Parameter (Peer-To-Peer) data are configured.

Note: *The Peer-To-Peer Data is mapped to the Registers after the Global Data.*

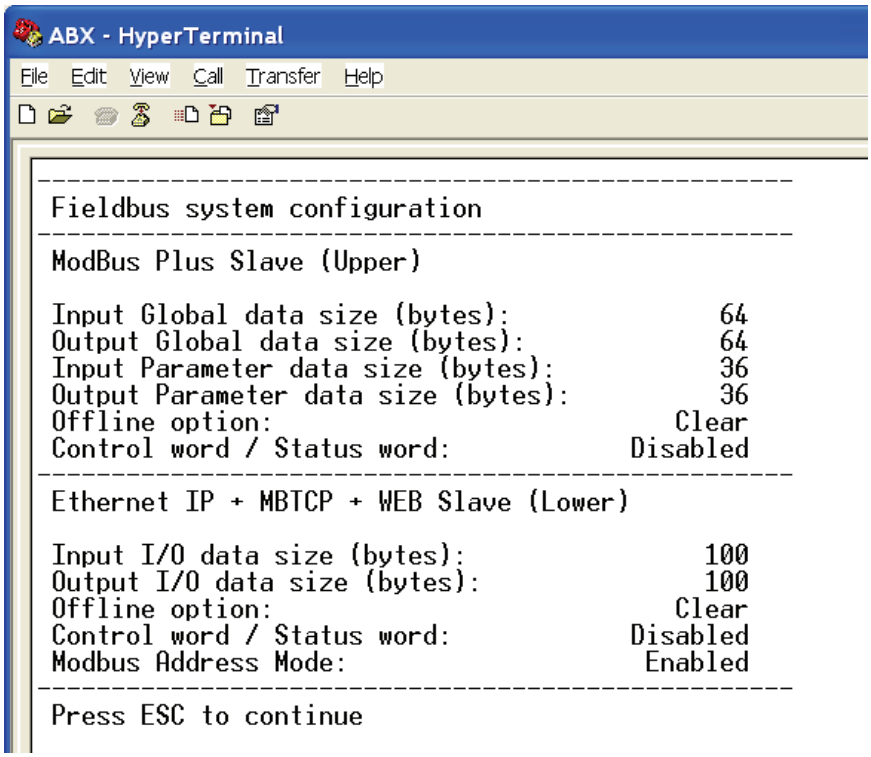


Figure 11 The X-gateway configuration.

5 Modbus Plus configuration

To configure the Modbus Plus Master start the ProWORX 32 software.

5.1 Configuring the type of master

Start a new project from the File menu. The first step is to decide if to use the online or offline alternative.

1 If the PC is connected to the controller chose Online to Controller.

2 Use the Offline alternative when creating an offline configuration. When using the Offline alternative you have to specify the type of Controller manually.

Online
Chose online and click on next to continue the wizard. Then please go directly to chapter 5.2 Configuring the communication settings.

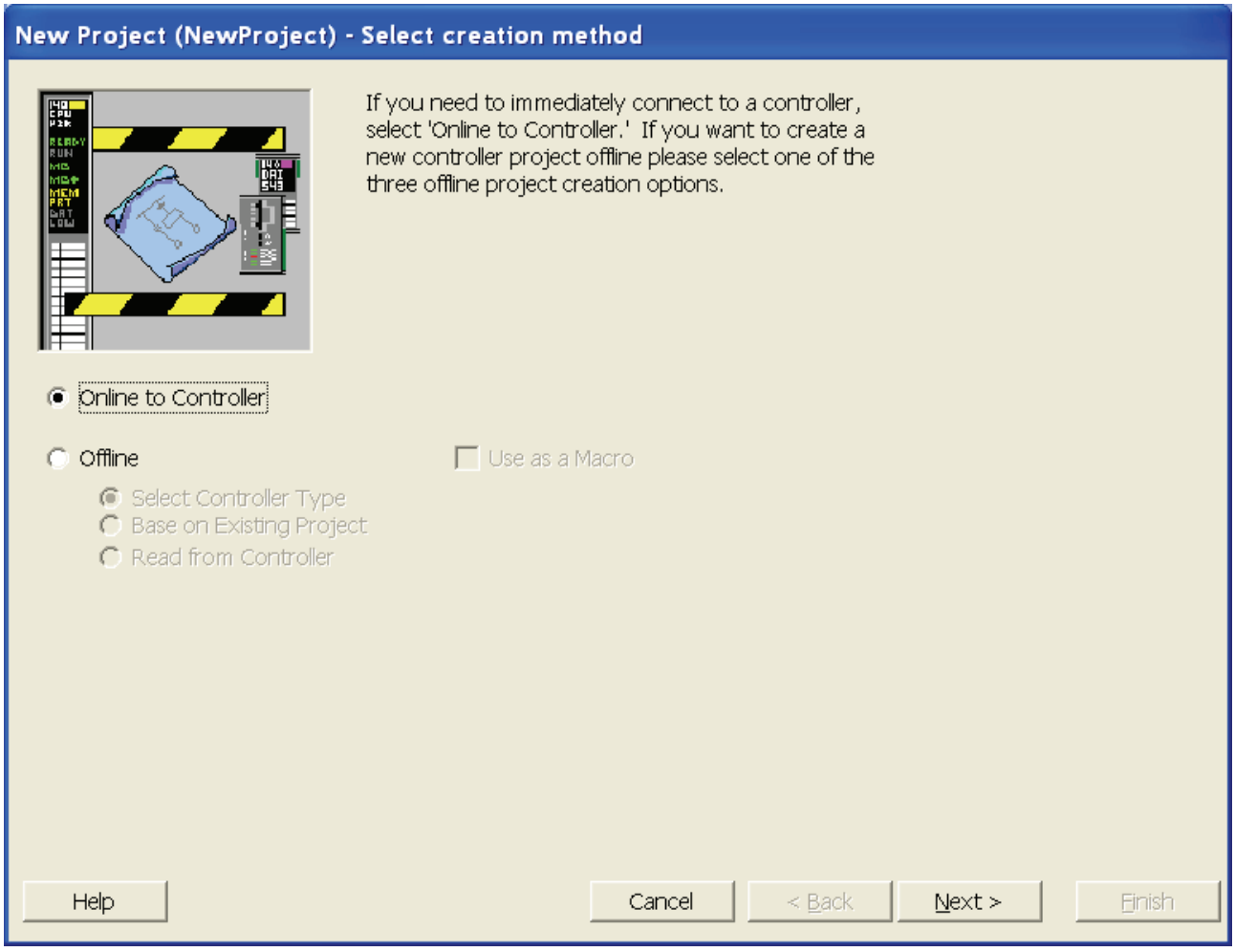


Figure 12 Choosing the Online to Controller configuration.

Offline

If you chose offline, the following window appears.

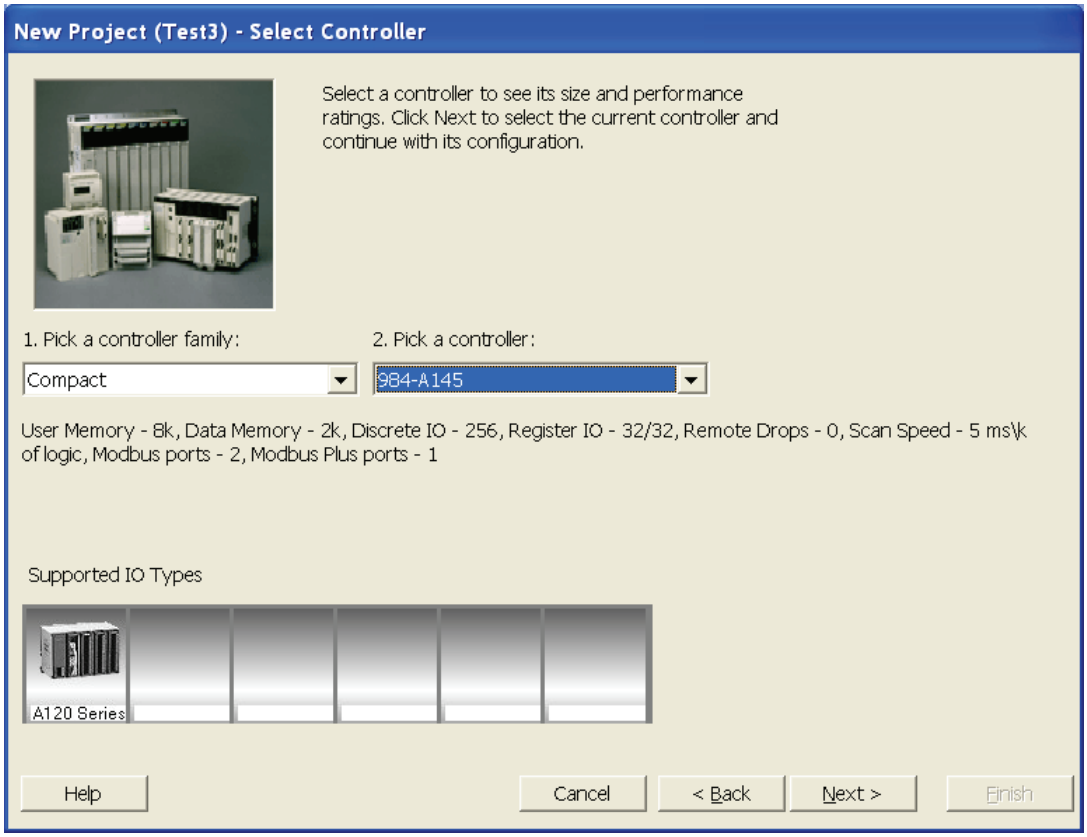


Figure 13 Choosing the Offline to Controller configuration.

Select the type of PLC and click on next.

5.2 Configuring the communication settings

The next step is to configure the communication settings.

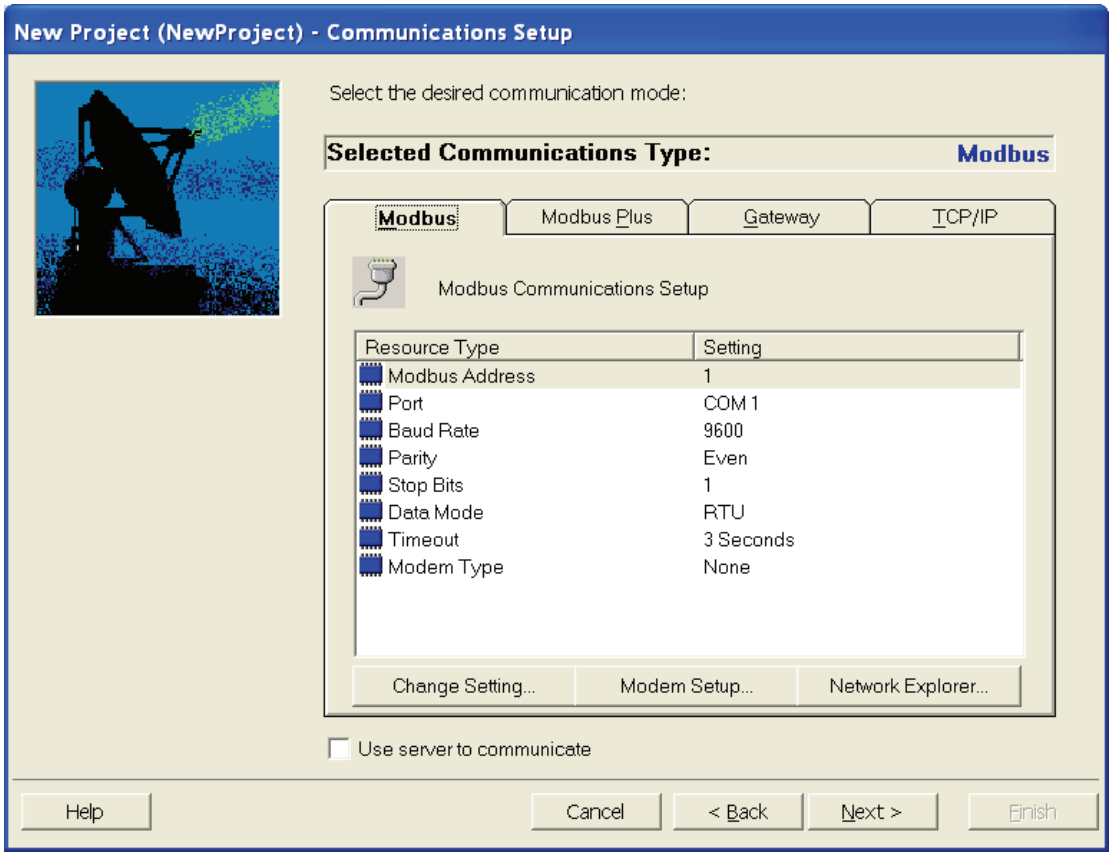


Figure 14 Configuring the Modbus settings.

Check that the correct communication settings are used. In this case the Controller is connected to the PC by the Modbus port located on the PLC.

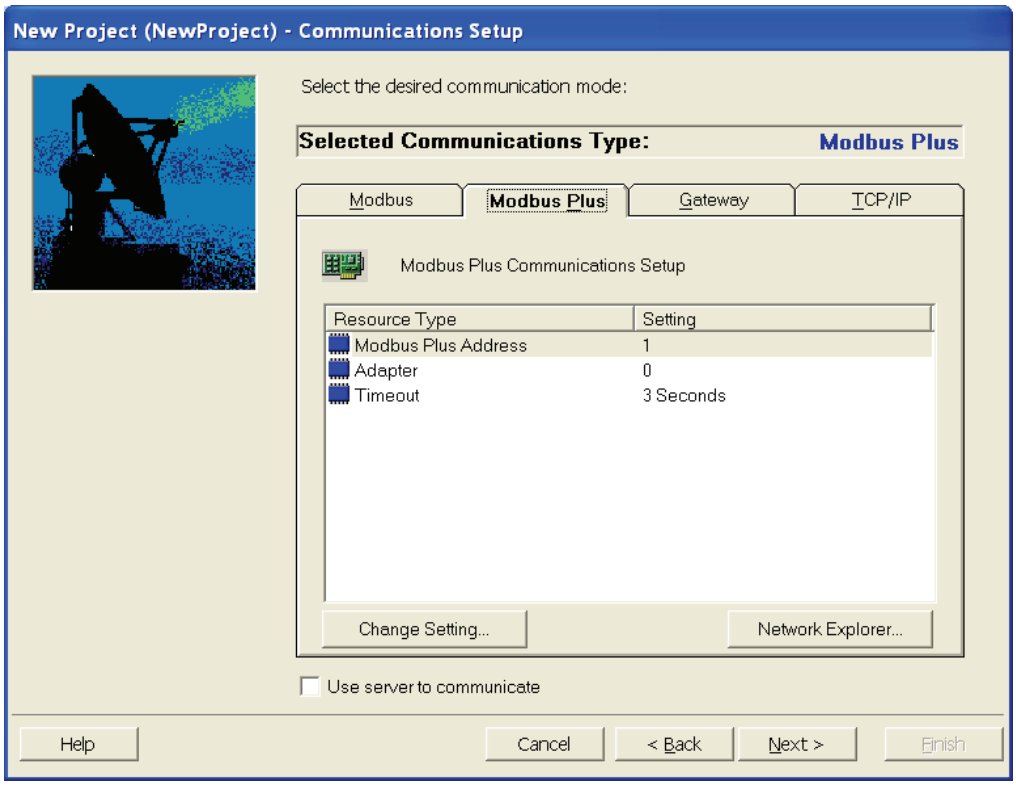


Figure 15 Configuring the Modbus Plus settings.

Also verify the Modbus Plus settings are correct. Click on next to go to the next dialogue window.

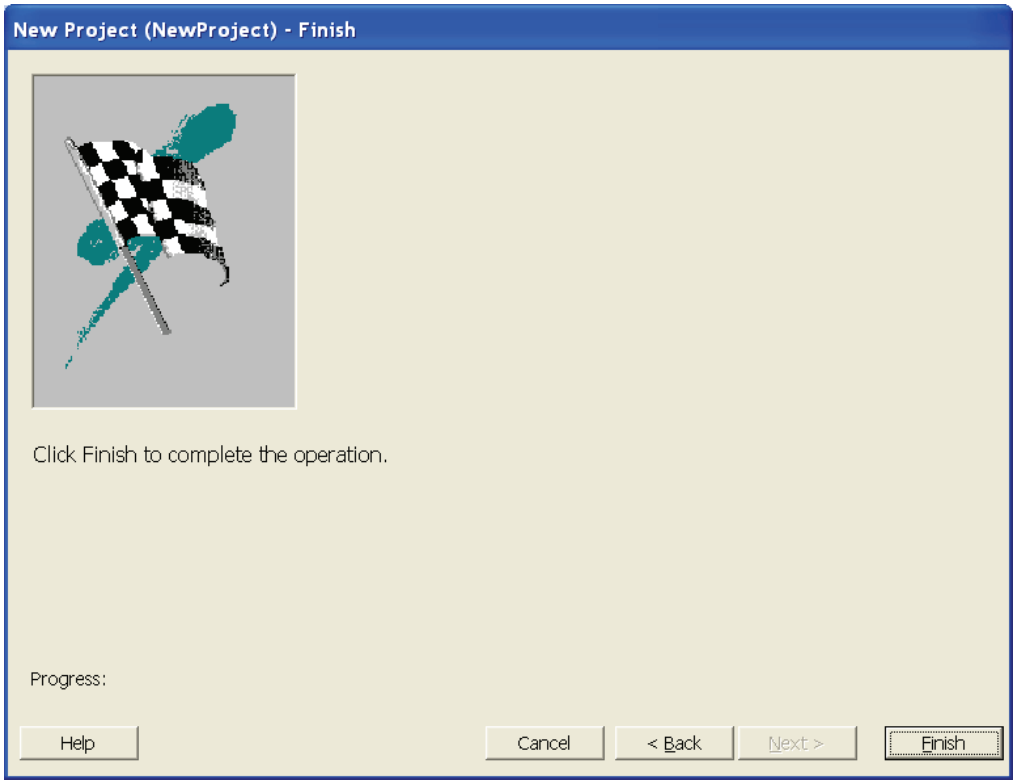


Figure 16 Finishing the New Project wizard.

Then click on next to finish the configuration dialogue.

5.3 Global Data configuration

There are two ways to configure the Global Data:

1 The Global Data can be configured using the Configuration Extension. Using this alternative the Global Data will be exchanged on a cyclic basis. Please see section Configuration Extension below.

2 The other alternative is to use the MSTR blocks in the PLC program. In this case both Global and Peer-To-Peer Data can be exchanged. Please see chapter 5.4 MSTR block configuration.

Configuration Extension

Open the Configuration window and set the size of the Configuration Extension. This will enable the Configuration Extension features. In this case 50 bytes of Config Extension Size is used.

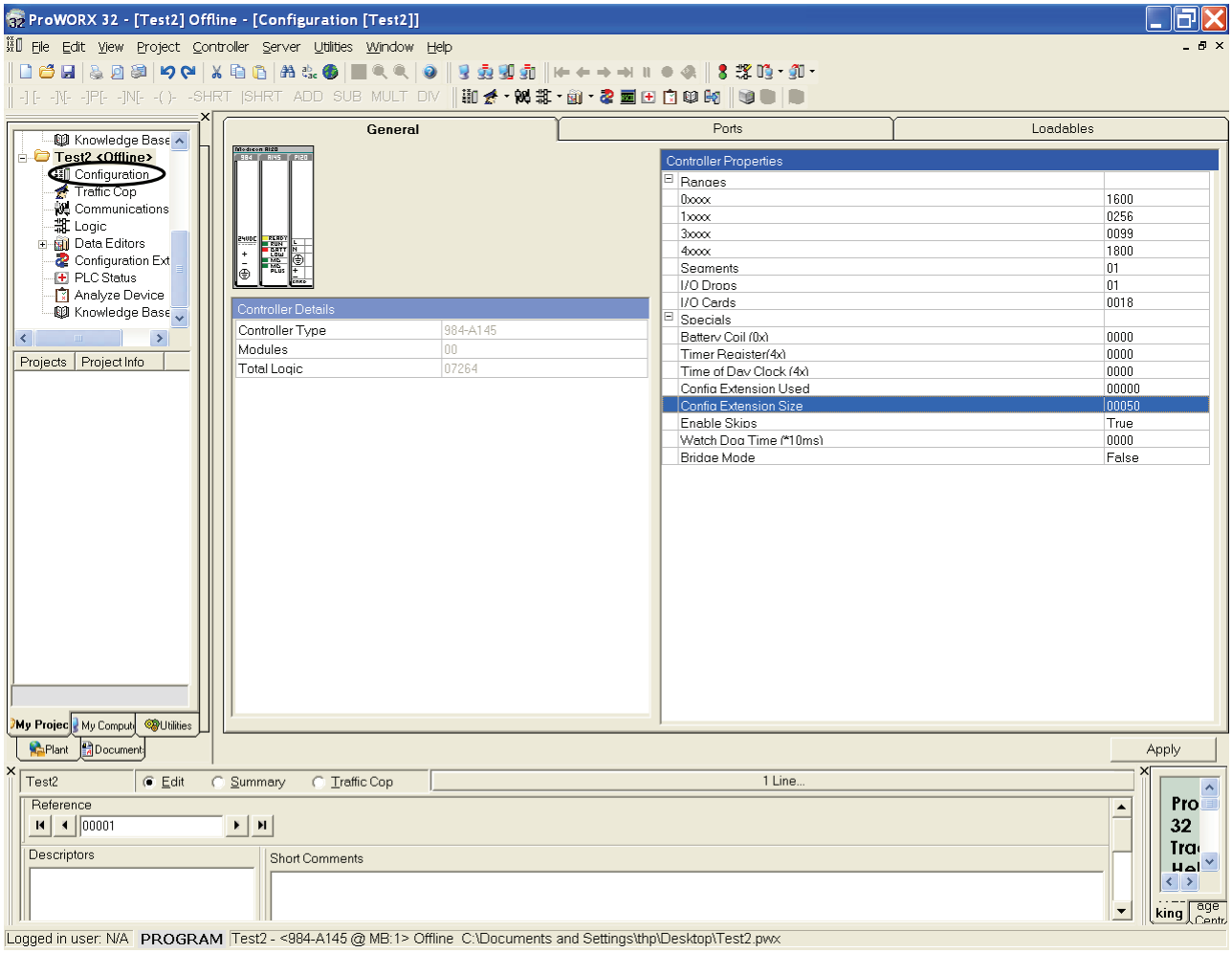


Figure 17 Configuring the Config Extension Size.

Then open the Configuration Extension window❶. Mark the Peer Cop check box❷ to enable the Peer Cop functionality.

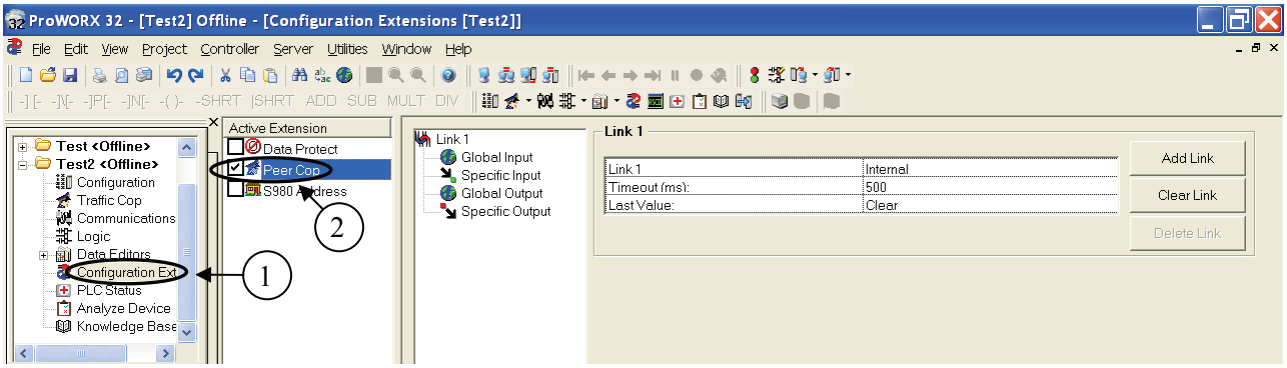


Figure 18 Enabling the Peer Cop functionality.

The next step is to configure the Global Input and Output Data. Open the Global Input Data window and click in the list to configure the Input data. In this case the Anybus Communicator has Nodded 2, so Device 2❶ is selected. The reference❷ is the Registers used in the PLC for the Input data. Also the number of Registers❸ to be read has to be configured.

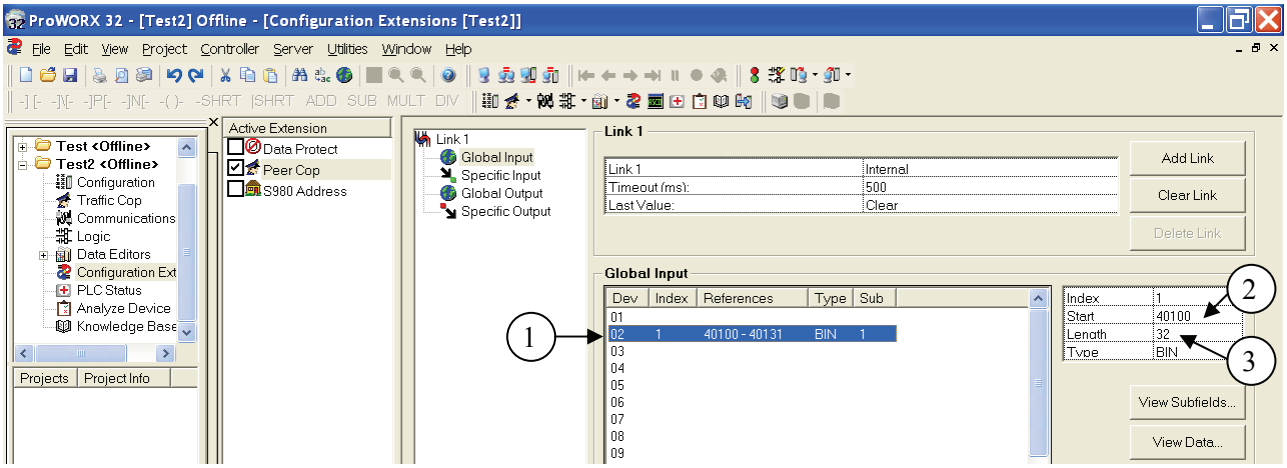


Figure 19 Configuring the Global Input Data.

The Output data is configured in a similar way. Click on the Global Output to configure the Output data. The Registers in the PLC, References❶, and Length❷ is configured as seen below.

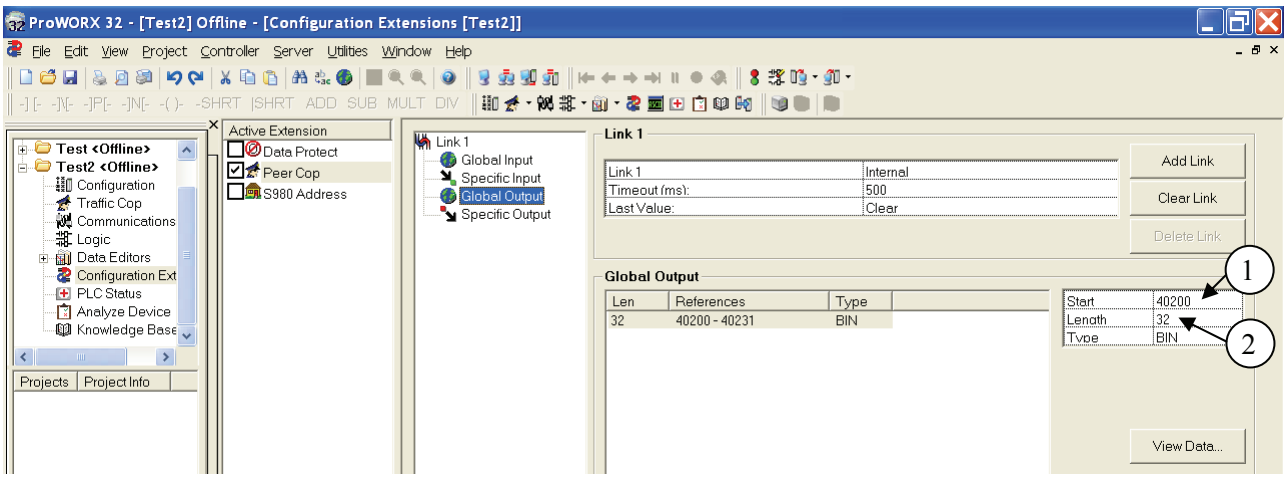
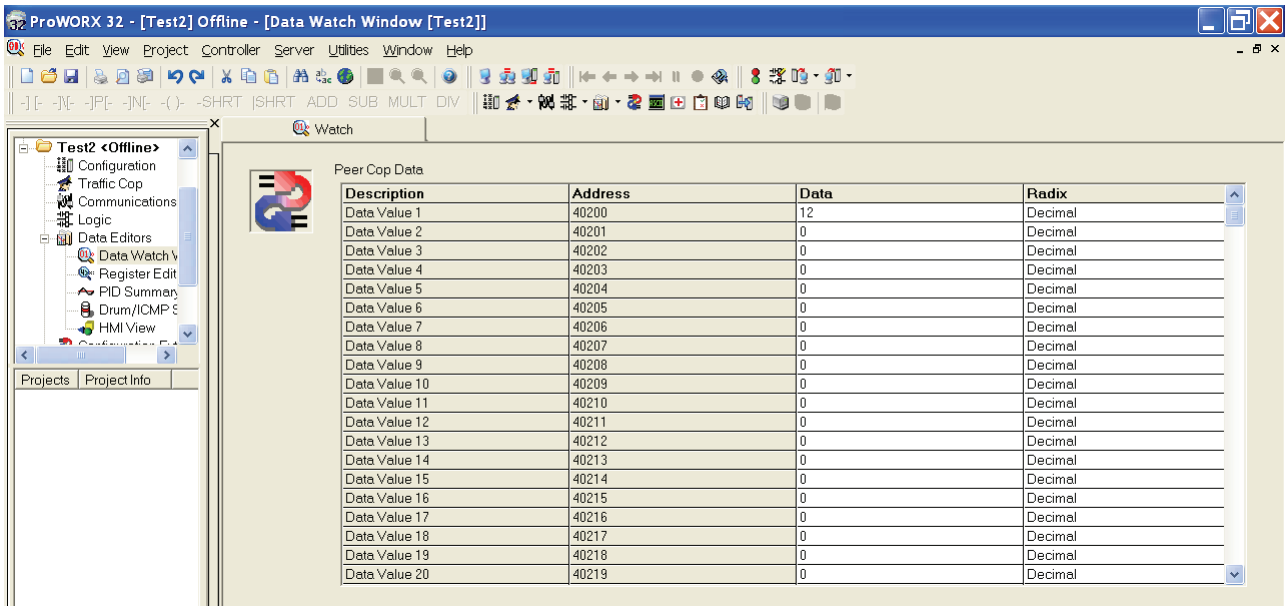


Figure 20 Configuring the Global Output Data.

After clicking on the View Data button the monitor window appears. A value can now be entered to the first Register in the Global Data Output as seen below.



Description	Address	Data	Radix
Data Value 1	40200	12	Decimal
Data Value 2	40201	0	Decimal
Data Value 3	40202	0	Decimal
Data Value 4	40203	0	Decimal
Data Value 5	40204	0	Decimal
Data Value 6	40205	0	Decimal
Data Value 7	40206	0	Decimal
Data Value 8	40207	0	Decimal
Data Value 9	40208	0	Decimal
Data Value 10	40209	0	Decimal
Data Value 11	40210	0	Decimal
Data Value 12	40211	0	Decimal
Data Value 13	40212	0	Decimal
Data Value 14	40213	0	Decimal
Data Value 15	40214	0	Decimal
Data Value 16	40215	0	Decimal
Data Value 17	40216	0	Decimal
Data Value 18	40217	0	Decimal
Data Value 19	40218	0	Decimal
Data Value 20	40219	0	Decimal

Figure 21 Writing a value to the first Register in the Global Data Output.

5.4 MSTR block configuration

To configure both Global Data and Peer-To-Peer Data a simple PLC program has to be done. Open the Logic window by double clicking on the Logic in the project tree.

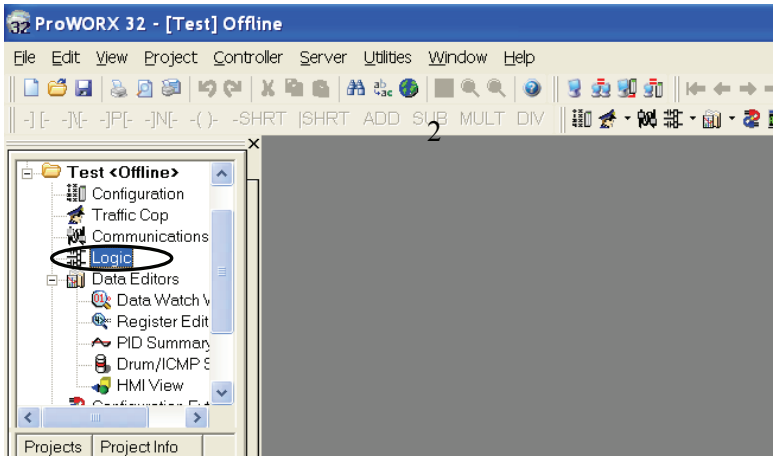


Figure 22 Opening the Logic configuration.

Drag and drop the MSTR block from the Instructions library to the Ladder area. In the example below, four MSTR blocks have been added and configured.

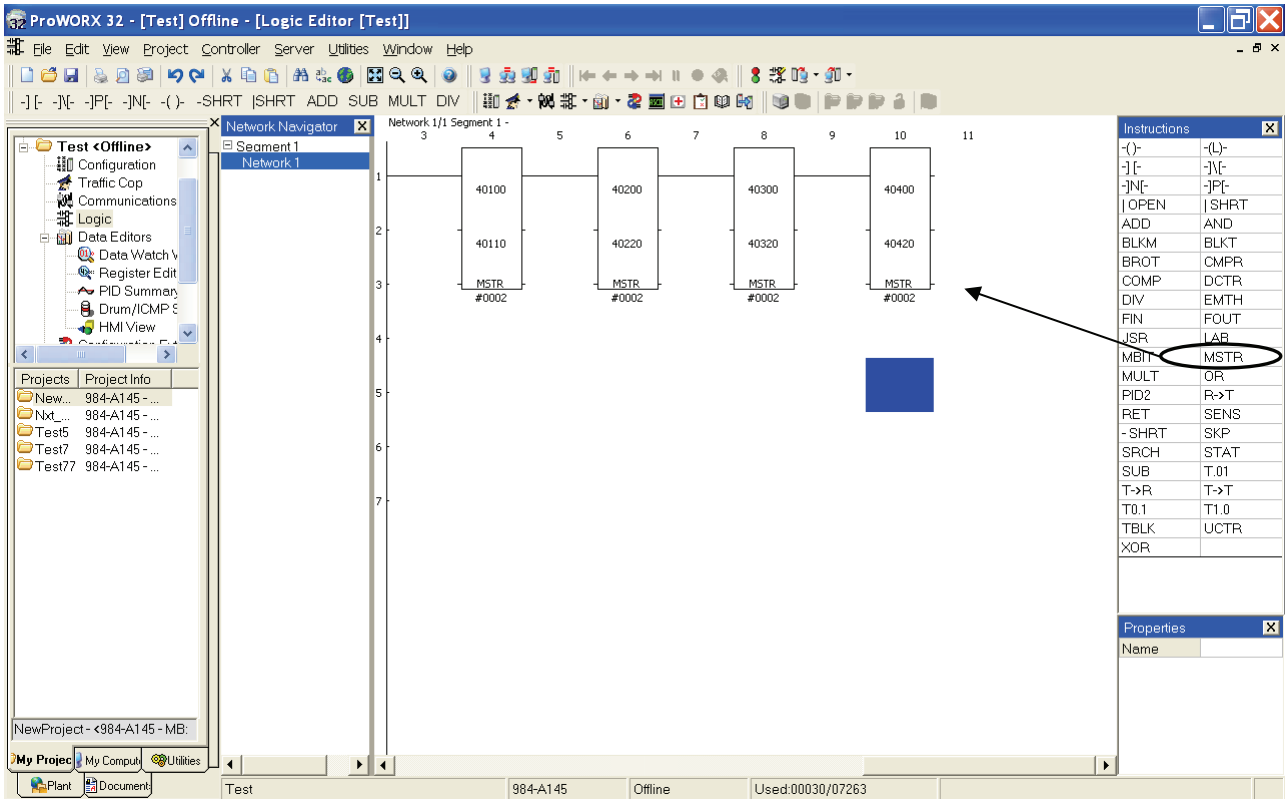


Figure 23 Inserting the MSTR blocks.

To configure the MSTR blocks, just double click on each of them and enter the desired settings as seen below.

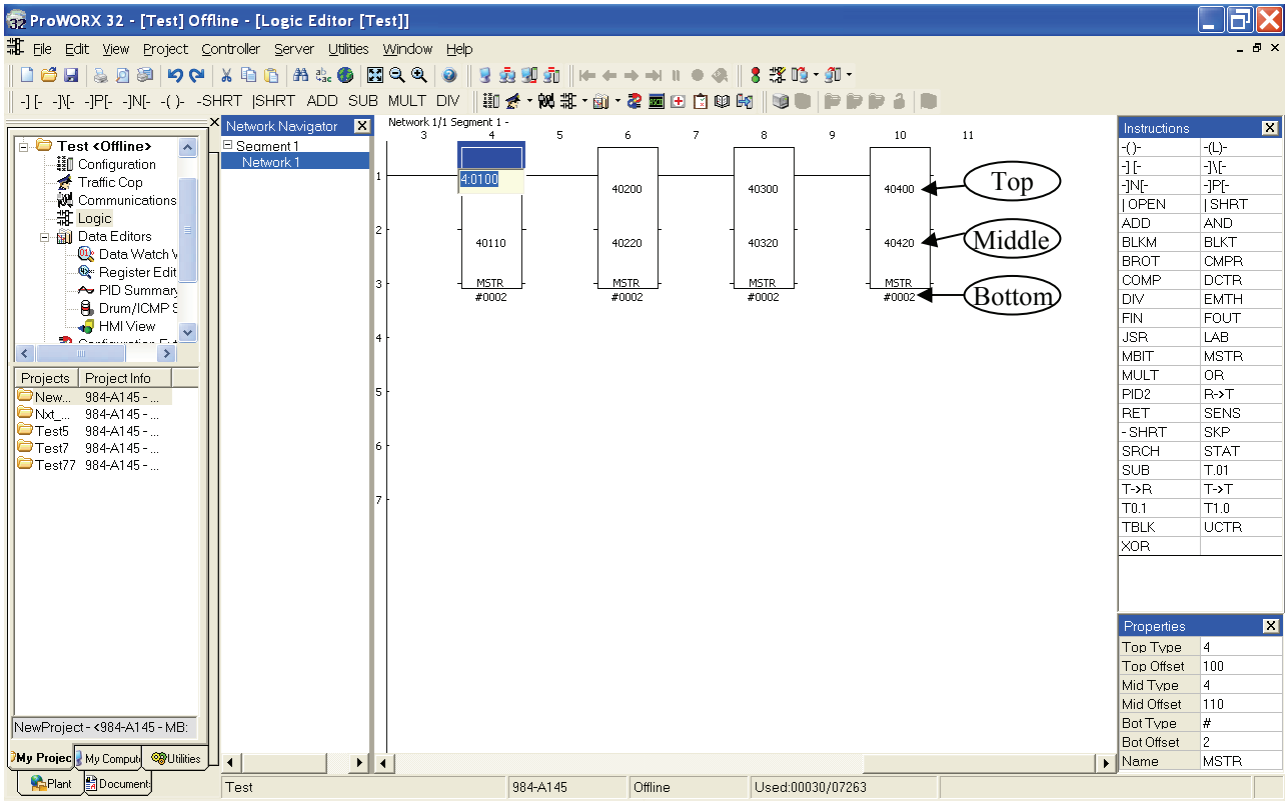


Figure 24 Editing the MSTR block parameters.

The settings are referred as to Top, Middle and Bottom.

Top: The Top is corresponding to a Register holding control information.

Middle: The Register in the PLC for receiving and transmitting data.

Bottom: The bottom contains the number of registers to be read or written.

Note: When inserting a new function block the window below can appear. The settings are entered from the top to the bottom just as in the figure above.

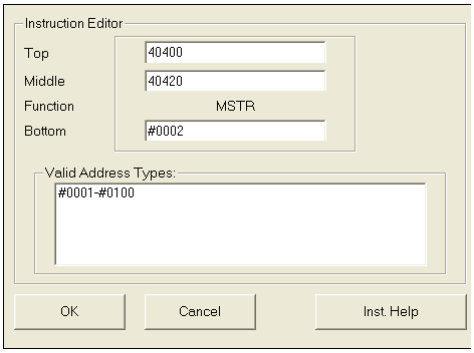


Figure 25 Editing the MSTR block parameters in the Instruction Editor.

After inserting the function blocks each block has to be configured. The MSTR blocks are configured for the following transactions in the order from left to right:

1 Read Registers

2 Read Global Database

3 Write Registers

4 Write Global Database

Right click on the MSTR block and select Data and then Instruction Editor.

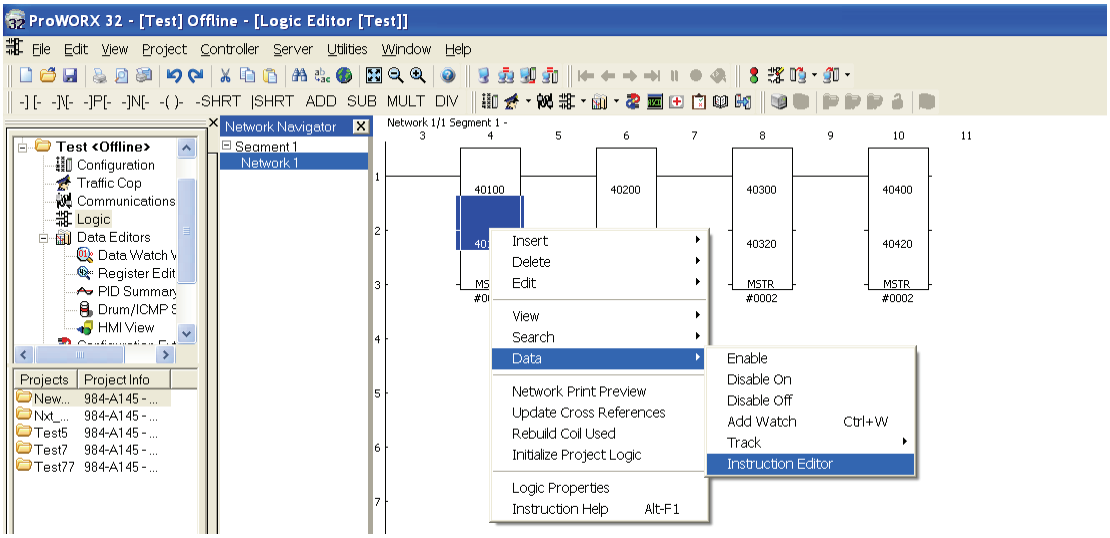


Figure 26 Opening the Instruction Editor.

Enter the desired settings as seen below. In this case the Read Registers command is used.

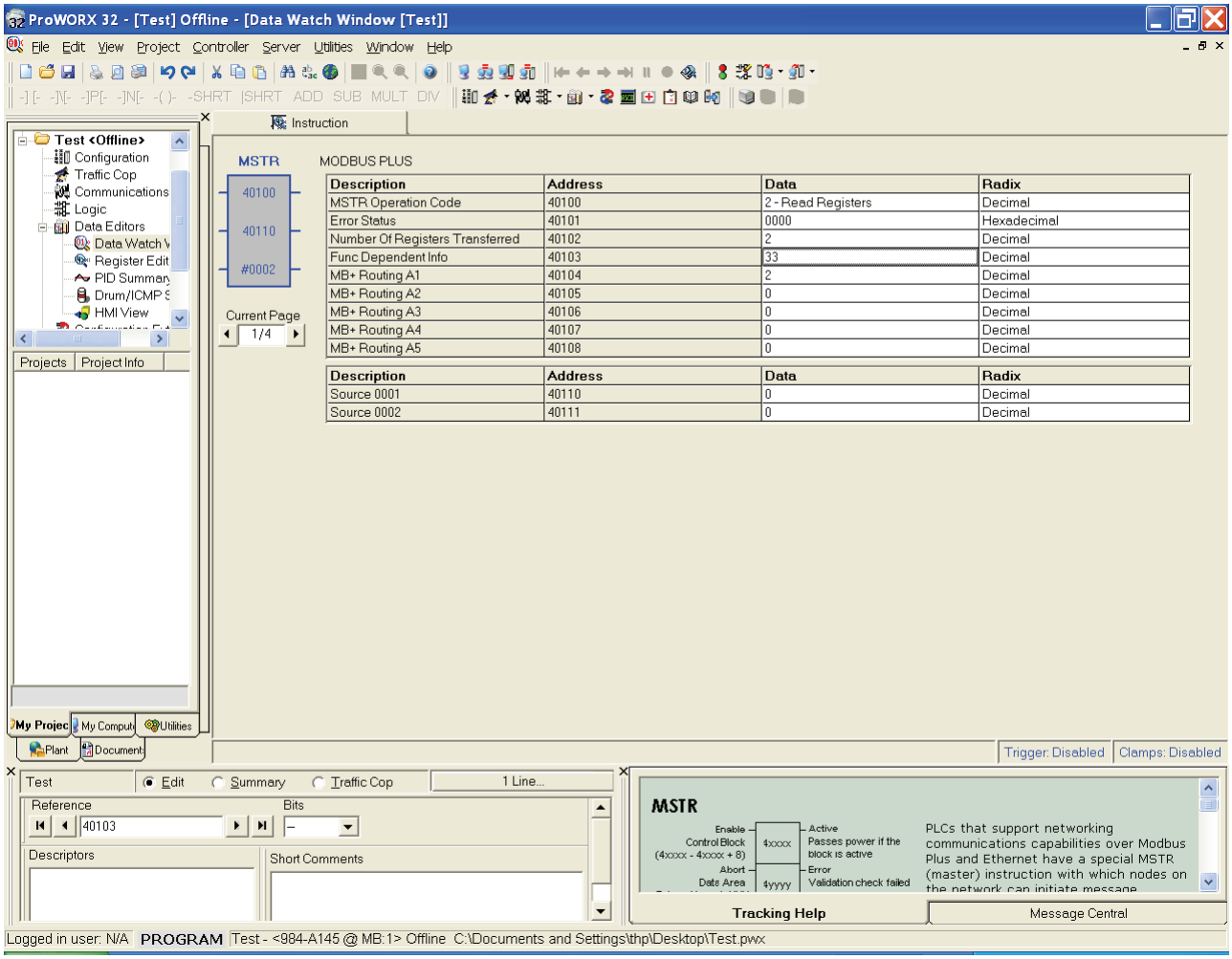


Figure 27 Editing the Modbus Plus instructions.

The settings are as follows:

Description	Explanation	Data
MSTR Operation Code	Type of operation	2 – Read Registers
Number of Registers Transferred	Number of registers to be read	2
Func Dependent Info	The Register address of the slave	33
MB+ Routing A1	The Node ID of the slave	2
Source 0001	Shows the value of the first Register when online	-

Then open the Instruction Editor for the next MSTR block. The MSTR block is configured for Reading Global Data.

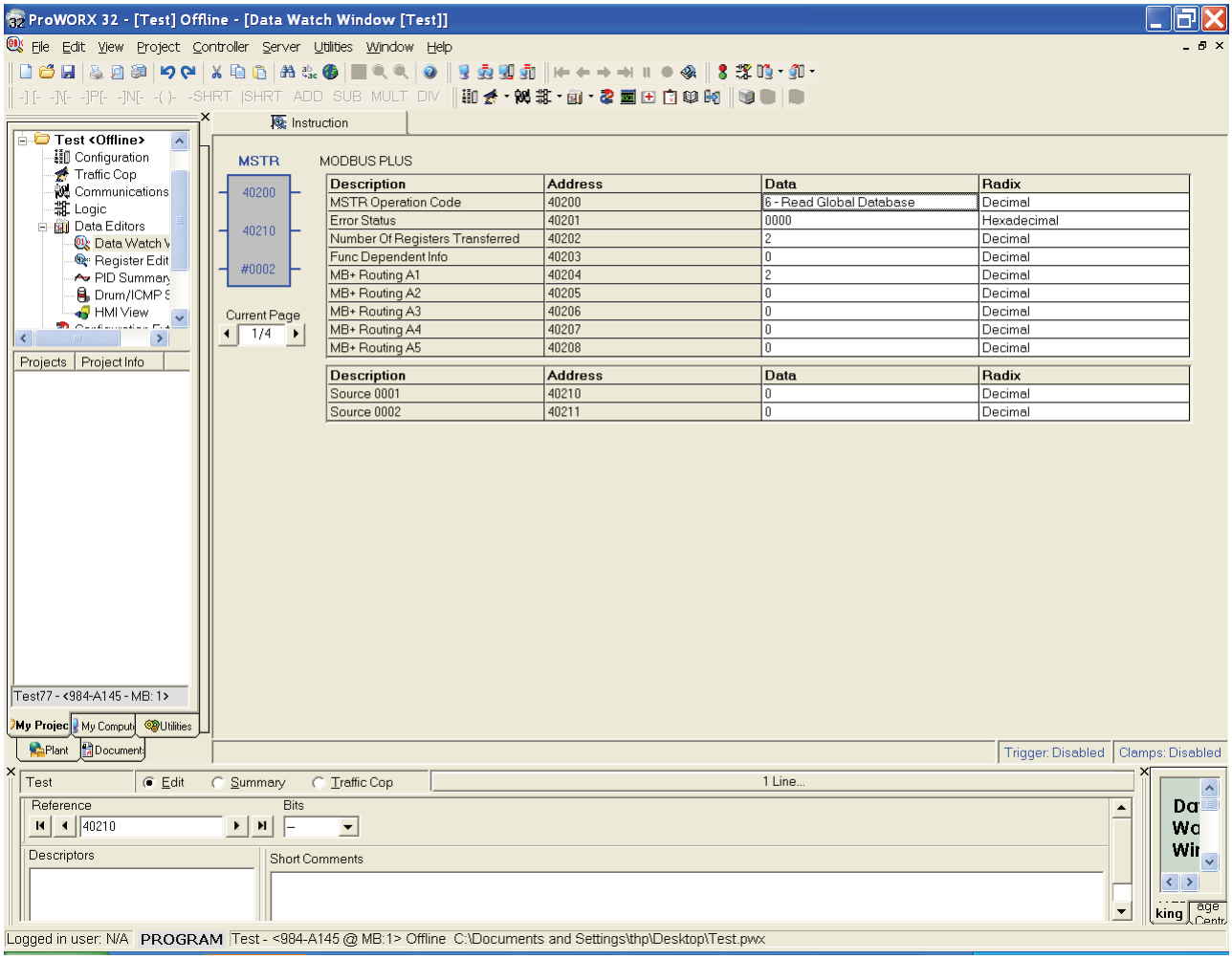


Figure 28 Reading Global Data.

Description	Explanation	Data
MSTR Operation Code	Type of operation	6 – Read Global Database
Number of Registers Transferred	Number of registers to be read	2
Func Dependent Info	Reserved (shows the size of Global Data)	Not entered
MB+ Routing A1	The Node ID of the slave	2
Source 0001	Shows the value of the first Register when online	-

In the next block Peer-To-Peer Data is written.

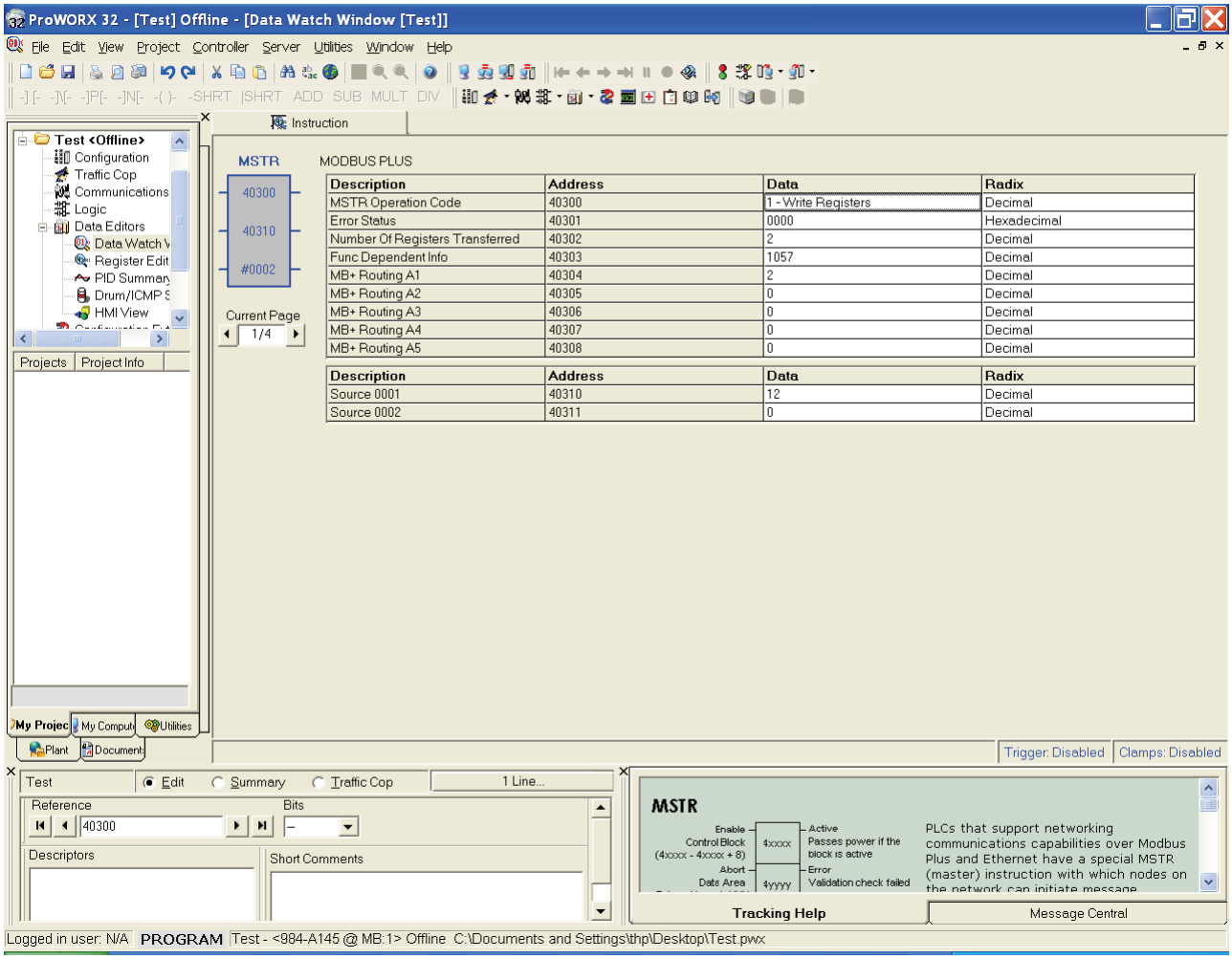


Figure 29 Writing Peer-To-Peer Data.

Description	Explanation	Data
MSTR Operation Code	Type of operation	1 – Write Registers
Number of Registers Transferred	Number of registers to be written	2
Func Dependent Info	The Register address of the slave	1057
MB+ Routing A1	The Node ID of the slave	2
Source 0001	The first value to be written	12

Note: The input Peer-To-Peer Data (from the network) is mapped to Register 1025 and higher. The output Peer-To-Peer Data (to the network) is mapped to Register 1 and higher.

In the last configured MSTR block Global Data is written.

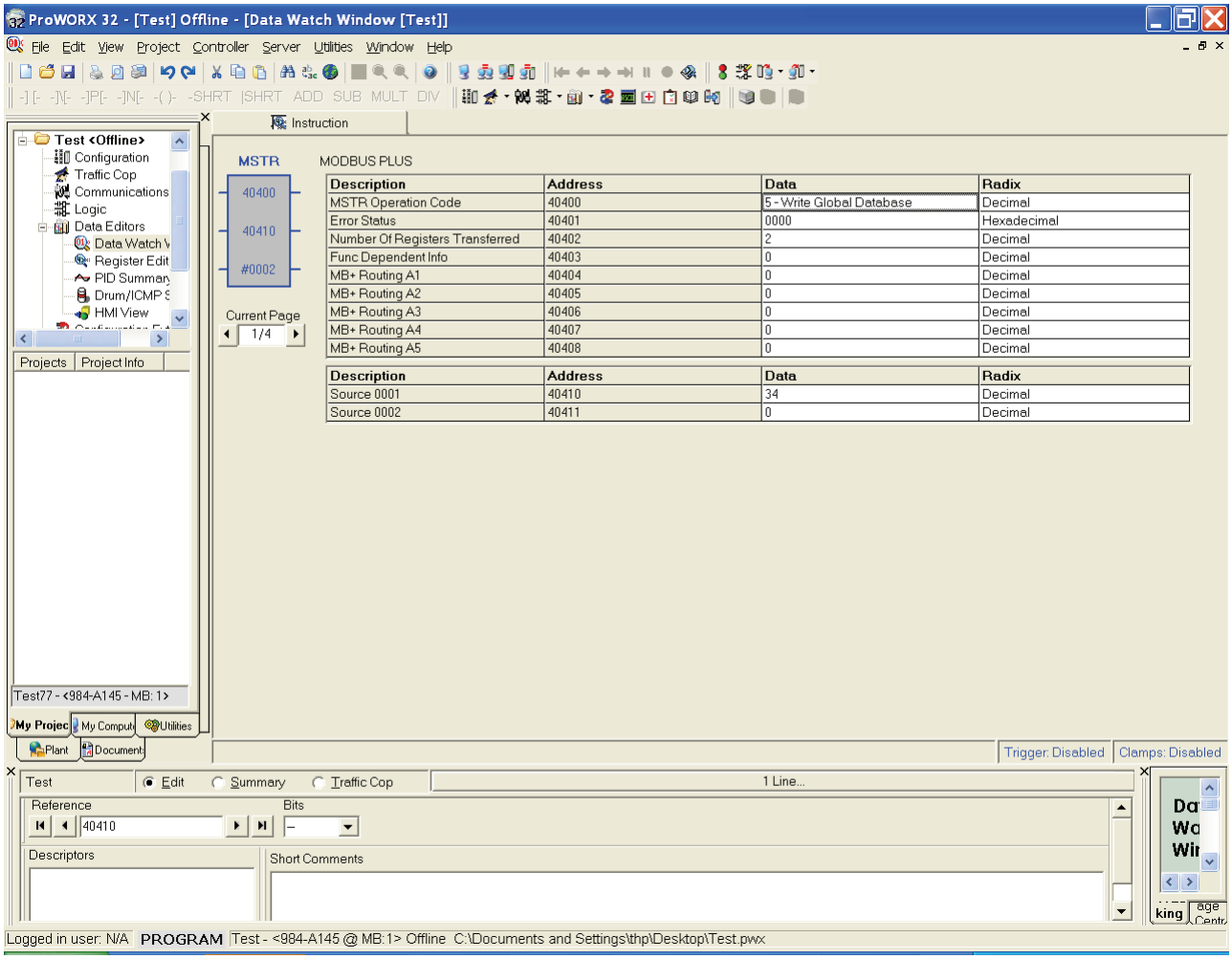


Figure 30 Writing Global Data.

Description	Explanation	Data
MSTR Operation Code	Type of operation	6 – Write Global Database
Number of Registers Transferred	Number of registers to be written	2
Func Dependent Info	Reserved (shows the size of Global Data)	Not entered
MB+ Routing A1	Not used	Not entered
Source 0001	The first value to be written	34

The final step is to save and download the configuration to the PLC. Also make sure the PLC is in Running mode.

6 Testing

The testing of the network can now be done after finishing the configuration.

6.1 Monitoring using ProWORX

In this particular case the Communicator with a loop dongle at the sub-network connector is used for test purpose.

The Modbus Plus Input and Output data can then be monitored in the ProWORX program.

1 Using Configuration Extension

Open the Configuration Extension window again and select Global Output Data. Click on the View Data button to open the monitor window.

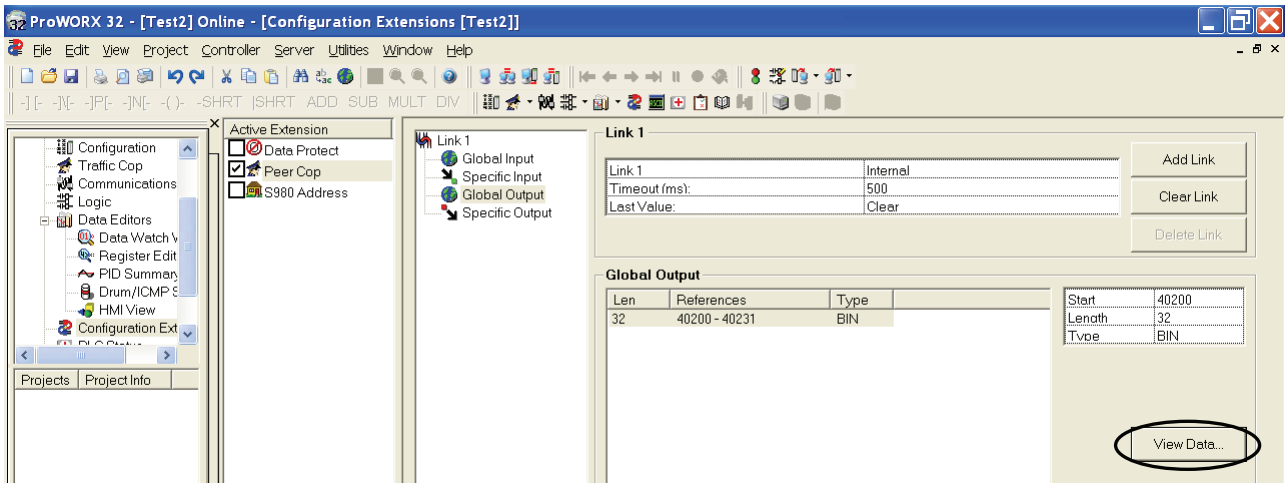


Figure 31 Opening the monitor window.

The output data can then be monitored as seen below.

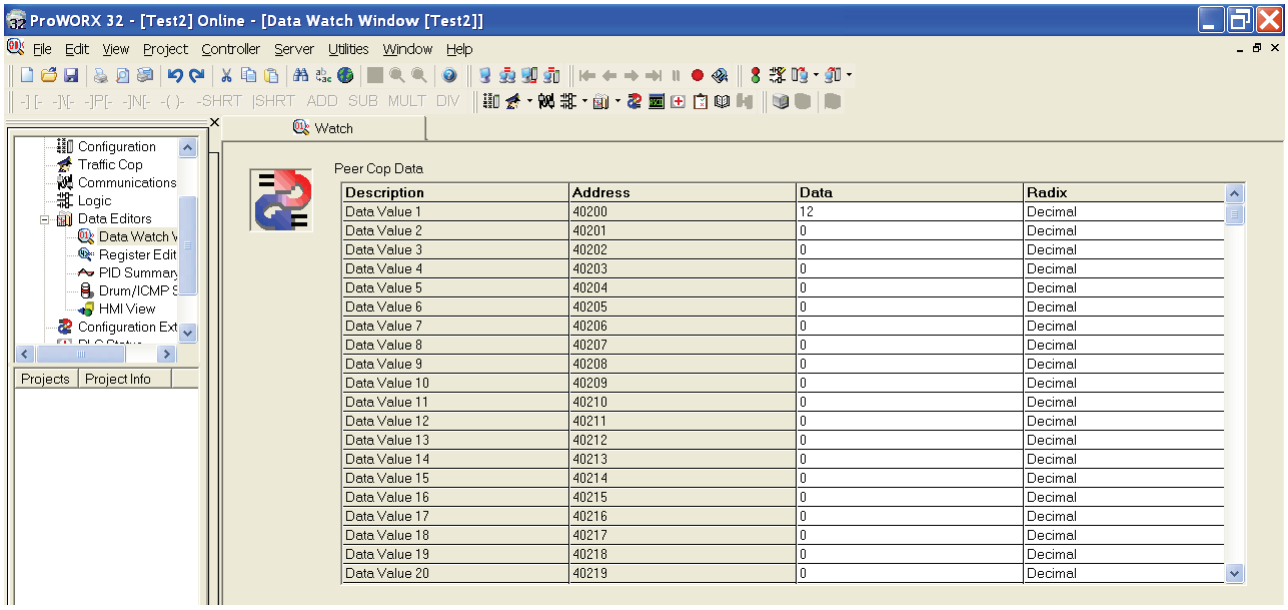
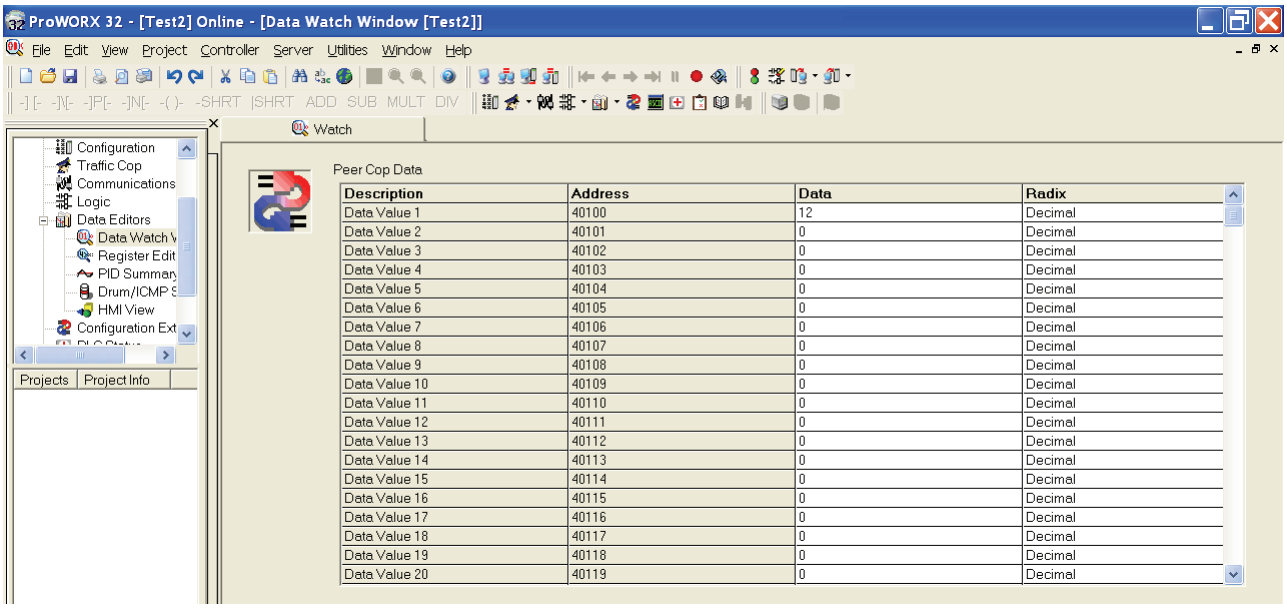


Figure 32 Monitoring the Output data.

To monitor the input data open the Global Input Data and click on the View Data button.



Description	Address	Data	Radix
Data Value 1	40100	12	Decimal
Data Value 2	40101	0	Decimal
Data Value 3	40102	0	Decimal
Data Value 4	40103	0	Decimal
Data Value 5	40104	0	Decimal
Data Value 6	40105	0	Decimal
Data Value 7	40106	0	Decimal
Data Value 8	40107	0	Decimal
Data Value 9	40108	0	Decimal
Data Value 10	40109	0	Decimal
Data Value 11	40110	0	Decimal
Data Value 12	40111	0	Decimal
Data Value 13	40112	0	Decimal
Data Value 14	40113	0	Decimal
Data Value 15	40114	0	Decimal
Data Value 16	40115	0	Decimal
Data Value 17	40116	0	Decimal
Data Value 18	40117	0	Decimal
Data Value 19	40118	0	Decimal
Data Value 20	40119	0	Decimal

Figure 33 Monitoring the Input data.

In this case the output is looped back to input, so the same value as in Figure 32 will be seen.

2 Using the MSTR blocks

It is possible to monitor the input and output data in the MSTR configuration window. In this case the Read Registers command is monitored❶.

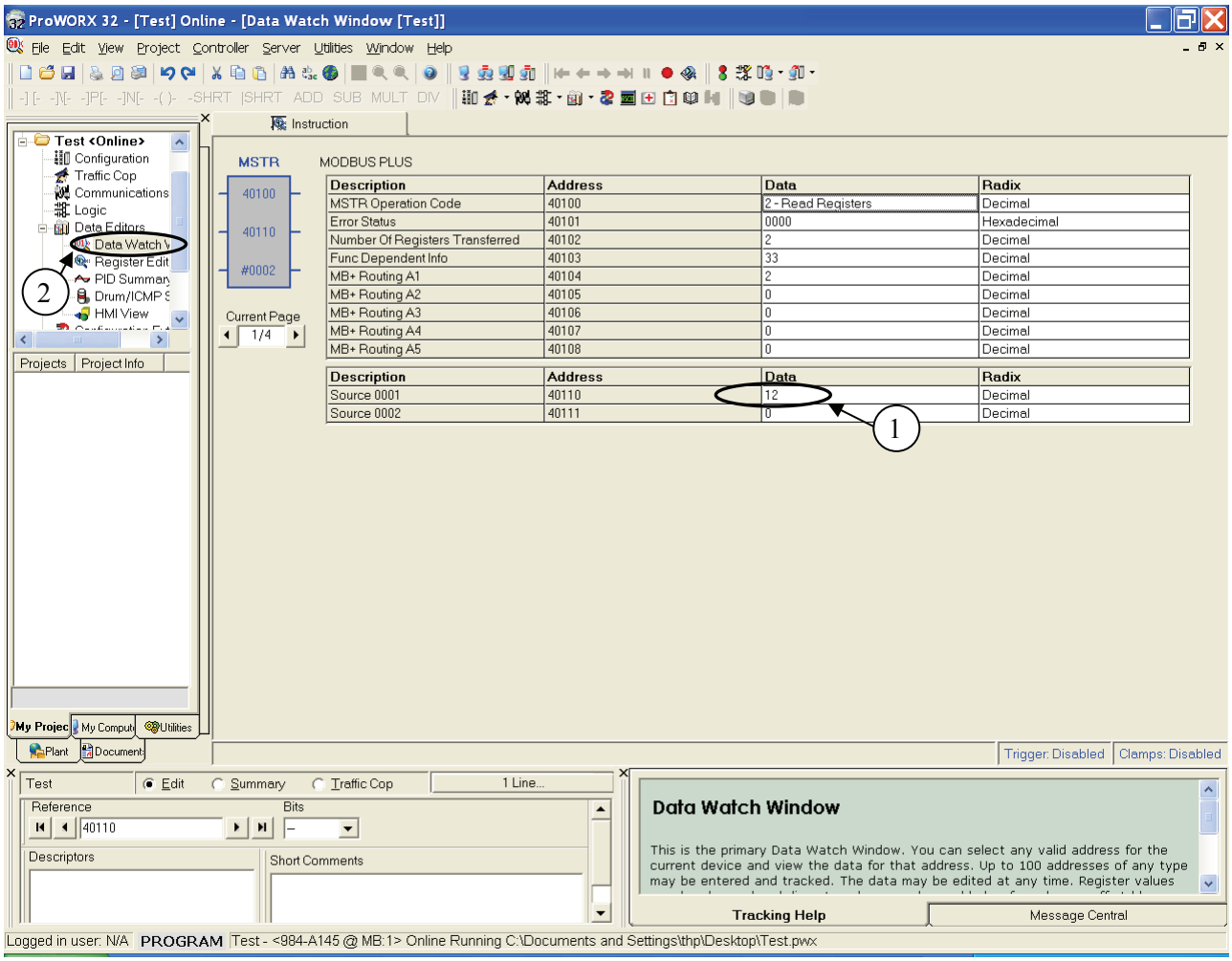


Figure 34 Viewing the MSTR block settings.

To monitor both Global and Peer-To-Peer Data in one window double click on the Data Watch Window❷ in the project tree to the left. This will open the monitor window.

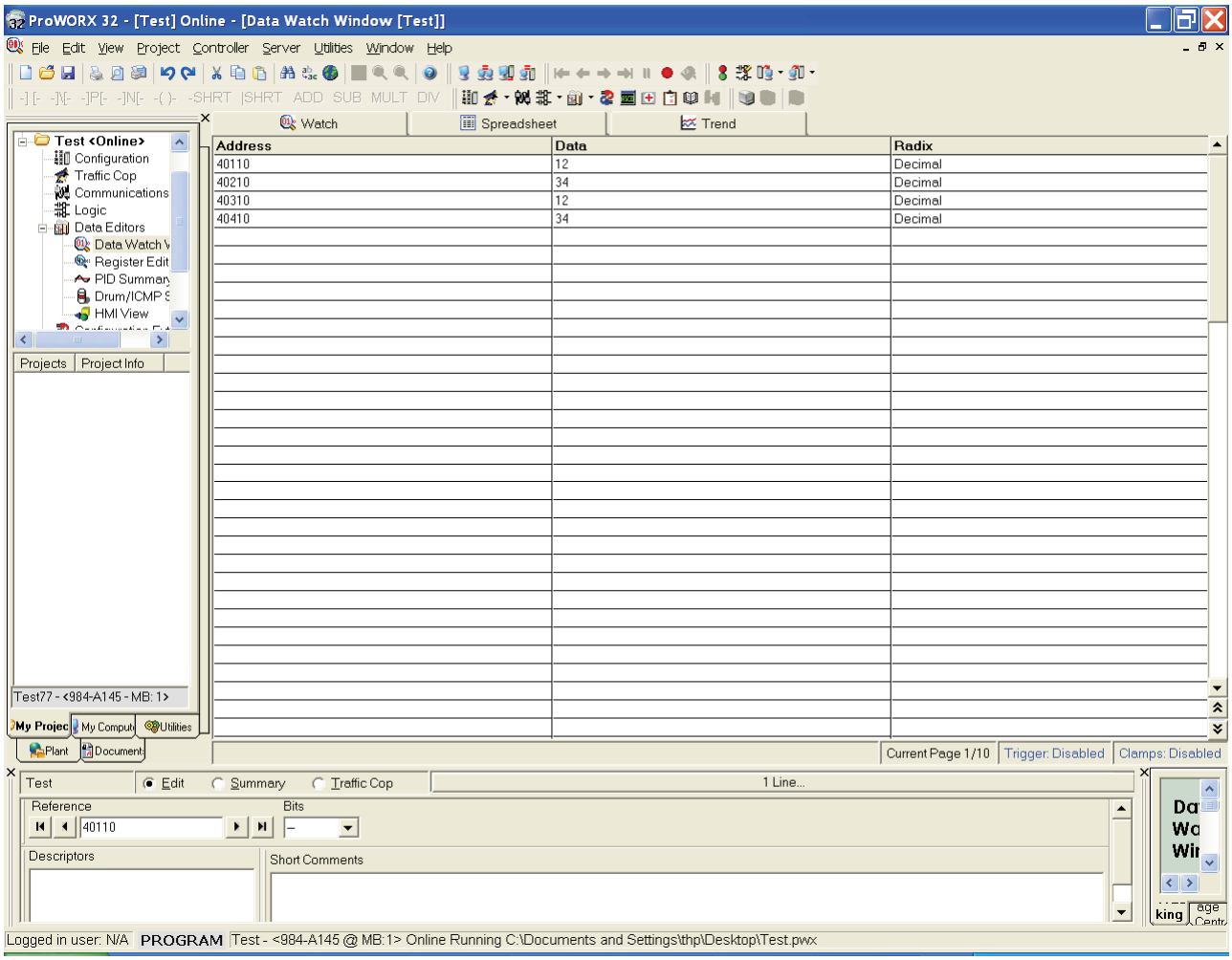


Figure 35 Viewing the Global and Peer-To-Peer Data.

In the Address field, enter the Registers used internally by the PLC for receiving and transmitting data. The addresses can be find in Figure 24 Editing the MSTR block parameters. When using a loop dongle at the slave as in this case the corresponding read and write data will get the same value.

Address	Description
40110	Representing the first Read Register data
40210	Representing the first Read Global Database data
40310	Representing the first Write Register data
40410	Representing the first Write Global Database data

6.2 Monitoring using the Communicator

Using the ABC Config Tool the Node Monitor can be used to monitor the input and output data. Open the ABC Config Tool and right click on New Network. Select Node Monitor in the menu as seen below.

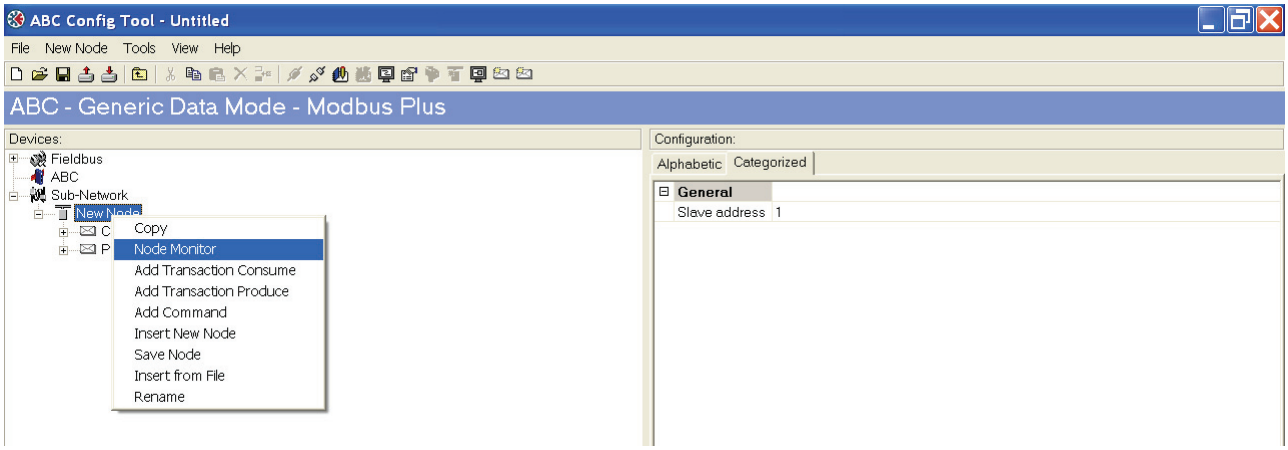


Figure 36 Opening the Node Monitor in the ABC Config Tool.

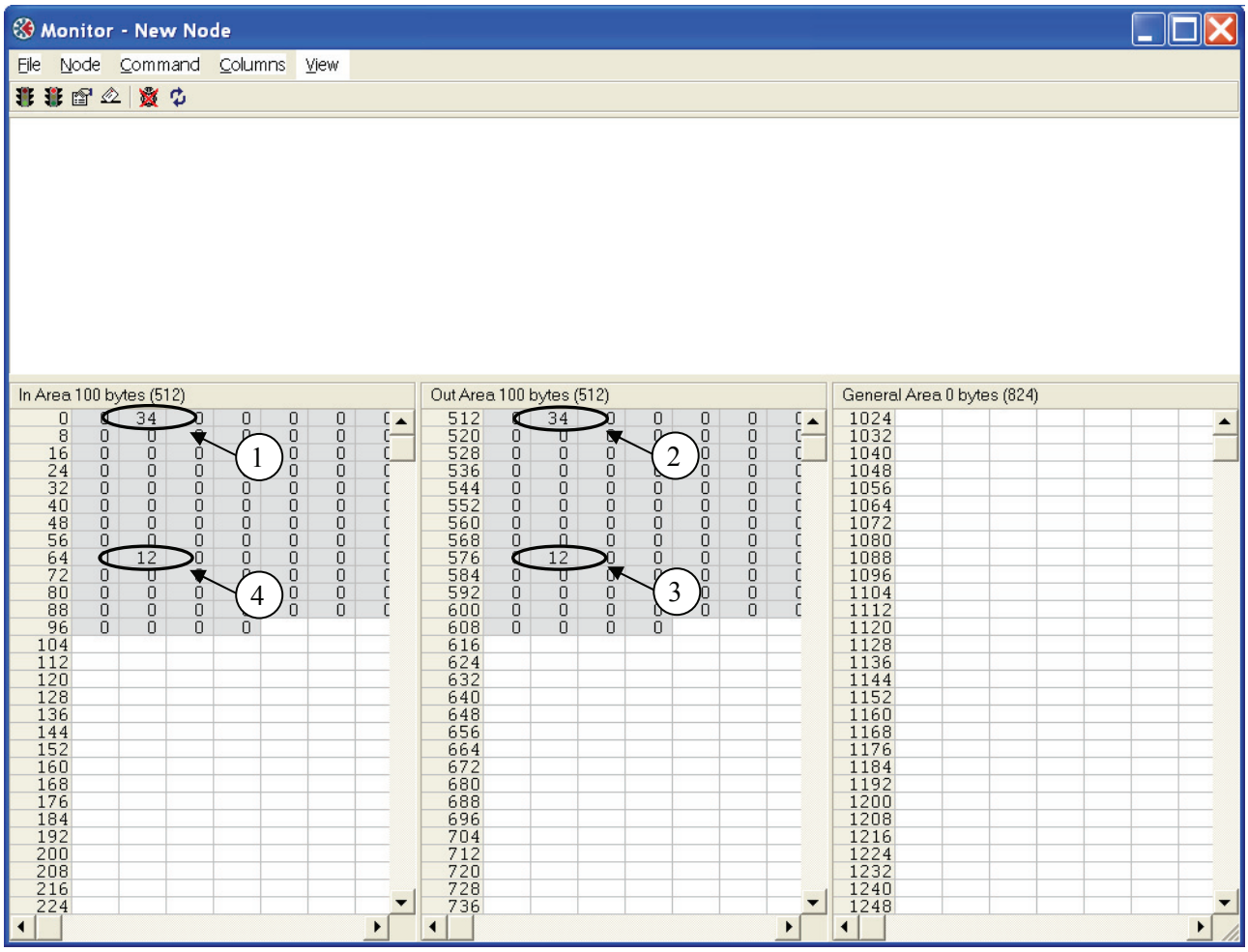


Figure 37 Monitoring using the Node Monitor.

The Node Monitor shows the data send and received on the sub-network. The In Area represents the data sent to the fieldbus side and the Out Area the data received from the fieldbus side.

- *The Global Data from the fieldbus can be seen at byte 513 ❶ in the Out Area.*
- *The Global Data to the fieldbus can be seen at byte 1 ❷ in the In Area.*
- *The Peer-To-Peer Data from the fieldbus can be seen at byte 577 ❸ in the Out Area.*
- *The Peer-To-Peer Data to the fieldbus can be seen at byte 65 ❹ in the In Area.*

6.3 Monitoring using the X-gateway

To monitor the data in the X-gateway a program that scans the network on the other network side is needed. If the other network is Ethernet based, the tool ModScan32 can be used. In that case the X-gateway also has a web interface where the configuration can be viewed.

1 Monitoring using ModScan32

To verify that the data is exchanged between the two networks using the Anybus X-gateway, the program ModScan32 is used.

***Note:** To use ModScan for testing is it is required that the gateway has an Ethernet or Modbus-RTU connection. Use the Anybus IPconfig to find or set the IP-address. The IPconfig tool can be downloaded at www.anybus.com.*

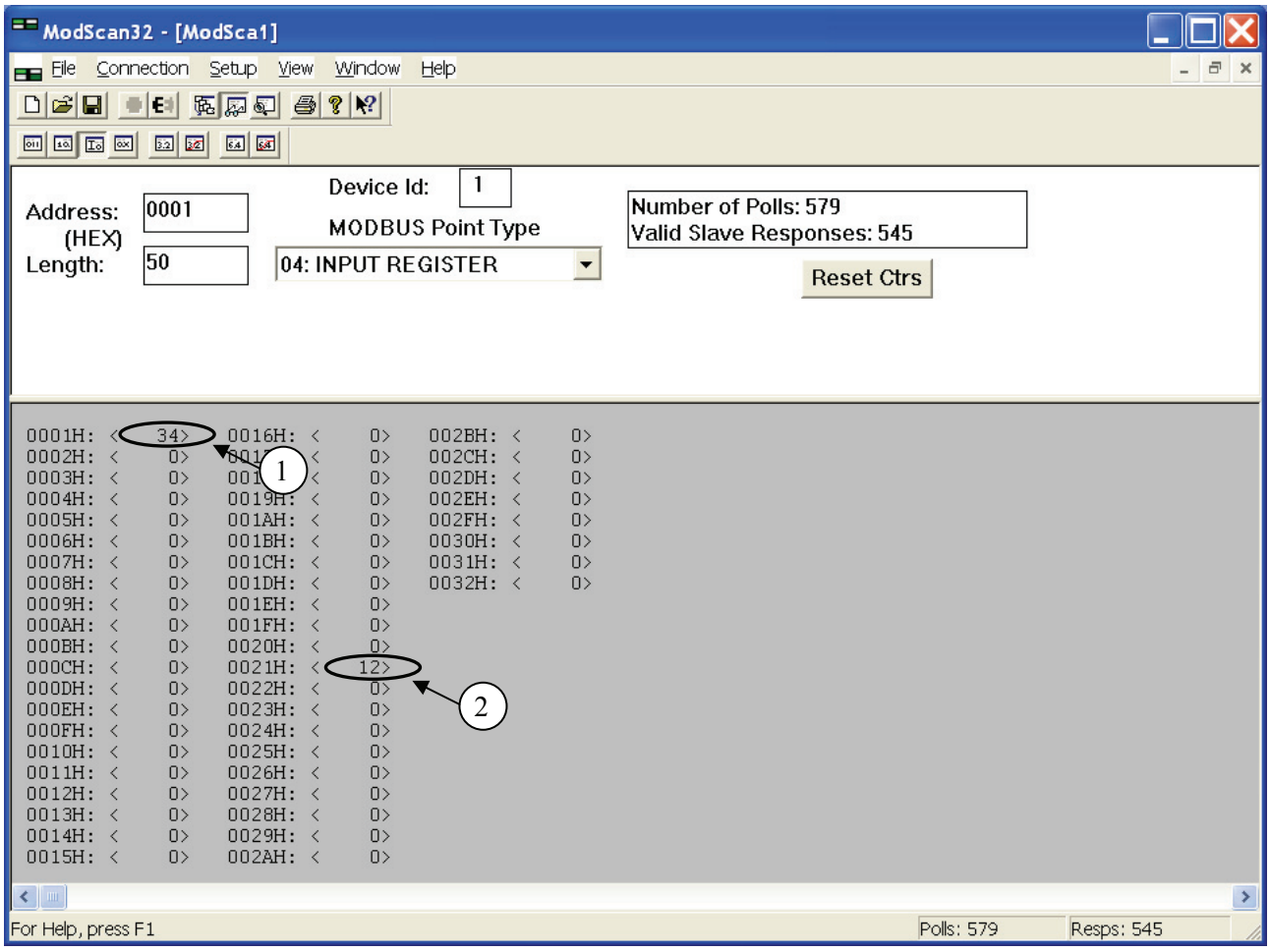


Figure 38 Monitoring the input data using ModScan32.

The window above shows the data from the PLC represented as Global ❶ and Peer-To-Peer Data ❷. The data values are corresponding to the data values seen in Figure 29 Writing Peer-To-Peer Data. and Figure 30 Writing Global Data.

2 Web interface

The configuration can also be verified using the web interface in the X-gateway.

***Note:** To use the web interface it is required that the X-gateway has an Ethernet connection. Use the Anybus IPconfig to find or set the IP-address. The IPconfig tool can be downloaded at www.anybus.com.*

To enter the web interface, enter the IP-address of the Ethernet module in a web browser, e.g. http://192.168.0.7. Open the General Status window to view the slave settings. The I/O size is corresponding to the Global Data size and the parameter data size the same as Peer-To-Peer Data.

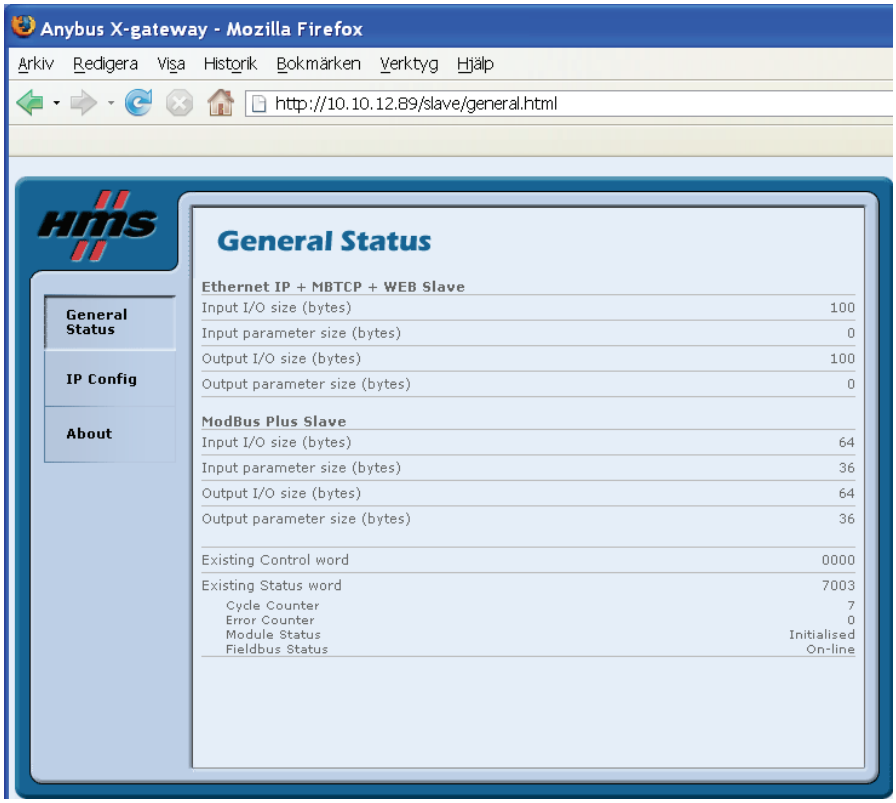


Figure 39 Viewing the General Status in the web interface.