

# WAGO → I/O → SYSTEM 750

## Modular I/O System

### ETHERNET StarterKit 1 510 370 74



### Quick Start ETHERNET Fieldbus Controller 750-842

Version 1.0.3

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Every conceivable measure has been taken to ensure the correctness and completeness of this documentation. However, as errors can never be fully excluded, we would appreciate any information or ideas at any time.

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We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally trademark or patent protected.

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# 1 Important Comments

To ensure fast installation and start-up of the units described in this manual, we strongly recommend that the following information and explanations are carefully read and abided by.

## 1.1 Legal Principles

### 1.1.1 Copyright

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### 1.1.2 Personnel Qualification

The use of the product detailed in this manual is exclusively geared to specialists having qualifications in PLC programming, electrical specialists or persons instructed by electrical specialists who are also familiar with the valid standards. WAGO Kontakttechnik GmbH & Co. KG declines all liability resulting from improper action and damage to WAGO products and third party products due to non-observance of the information contained in this manual.

### 1.1.3 Intended Use

For each individual application, the components supplied are to work with a dedicated hardware and software configuration. Modifications are only permitted within the framework of the possibilities documented in the manuals. All other changes to the hardware and/or software and the non-conforming use of the components entail the exclusion of liability on part of WAGO Kontakttechnik GmbH & Co. KG.

Please direct any requirements pertaining to a modified and/or new hardware or software configuration directly to WAGO Kontakttechnik GmbH & Co. KG.

## 1.2 Symbols



### **Danger**

Always abide by this information to protect persons from injury.



### **Warning**

Always abide by this information to prevent damage to the device.



### **Attention**

Marginal conditions must always be observed to ensure smooth operation.



### **ESD (Electrostatic Discharge)**

Warning of damage to the components by electrostatic discharge. Observe the precautionary measure for handling components at risk.



### **Note**

Routines or advice for efficient use of the device and software optimization.



### **More information**

References on additional literature, manuals, data sheets and INTERNET pages

## 1.3 Number Notation

Number Code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	Within ', Nibble separated with dots

## 1.4 Safety Notes



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### Attention

Switch off the system prior to working on bus modules!

In the event of deformed contacts, the module in question is to be replaced, as its functionality can no longer be ensured on a long-term basis.

The components are not resistant against materials having seeping and insulating properties. Belonging to this group of materials is: e.g. aerosols, silicones, triglycerides (found in some hand creams).

If it cannot be ruled out that these materials appear in the component environment, then additional measures are to be taken:

- installation of the components into an appropriate enclosure
- handling of the components only with clean tools and materials.



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### Attention

Cleaning of soiled contacts may only be done with ethyl alcohol and leather cloths. Thereby, the ESD information is to be regarded.

Do not use any contact spray. The spray may impair the functioning of the contact area.

The WAGO-I/O-SYSTEM 750 and its components are an open system. It must only be assembled in housings, cabinets or in electrical operation rooms. Access must only be given via a key or tool to authorized qualified personnel.

The relevant valid and applicable standards and guidelines concerning the installation of switch boxes are to be observed.



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### ESD (Electrostatic Discharge)

The modules are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. gold contacts.

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## 1.5 Scope

These quick start instructions describe the ETHERNET StarterKit 1 with the Ethernet fieldbus controller 750-842 and the basic components 750-400, -501, -600, 787-602 and 759-312 of the WAGO-I/O-SYSTEM.

You will find detailed information about operation, assembly and start-up in the manuals “Ethernet TCP/IP 750-342, 750-842“ and “WAGO- I/O-PRO CAA“. This documentation is hence only valid in connection with the appropriate manuals.



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**Further information**

You can also find the manuals “Ethernet TCP/IP 750-342, 750-842“ and “WAGO-I/O-PRO CAA“ on our “ELECTRONICC Tools & Docs“ (Item No.: 0888-0412/0001-0101) and on the Internet under: [www.wago.com](http://www.wago.com)

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## 2 Quick Start

### 2.1 Node Assembly

Build up the fieldbus node as follows (from left to right):

750-842; 750-400 ; 750-501 ; 750-600.

Connect the supplies for the controller and power jumper contacts to the DC 24 V power supply unit 787-602 (see Fig.1).

In this example it would be sufficient to bridge “24V“ and “+“ or “0V“ and “-“.

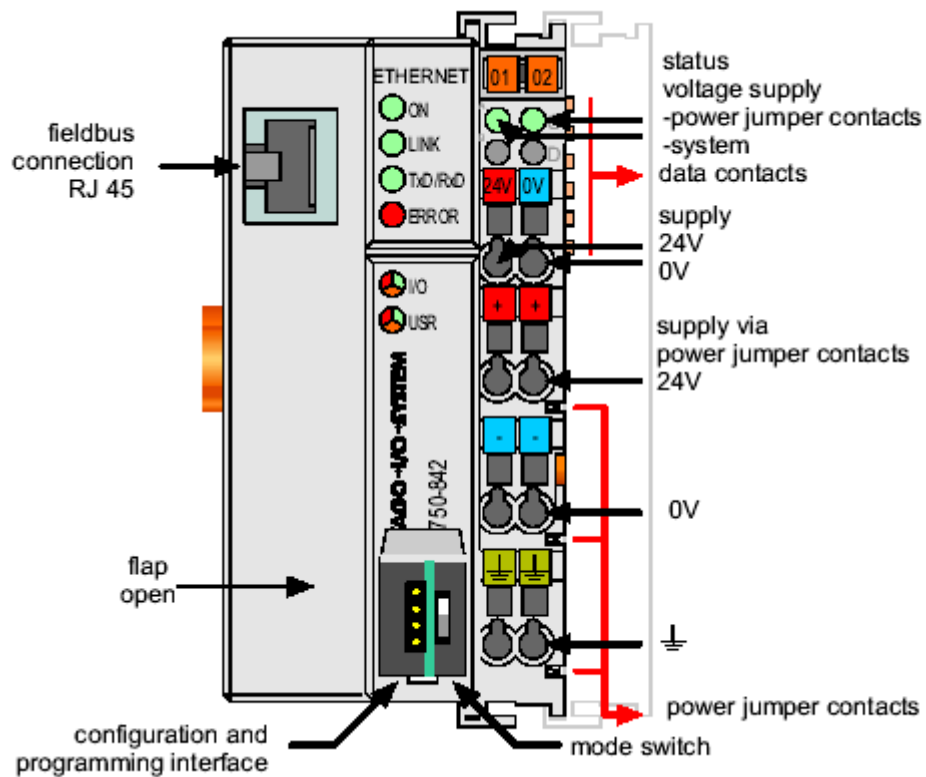


Fig. 1: 10 MBit ETHERNET fieldbus controller 750-842



## 2.2 Ethernet Network Start-Up

Connect the fieldbus node to your Ethernet network.

Either connect it directly to a PC using a crossover cable (crossed Ethernet cables) or to a Hub or a Switch using a 1-to-1 patch cable.

Please write down the following Ethernet settings of your PC: the IP address (e.g. 192.168.1.1), the subnet mask (e.g. 255.255.0.0) and possibly the gateway IP address.

You can see the settings under Start → Settings → Network and Dialup Connections.

Your network administrator can give you more information.

Write down the MAC ID of the controller 750-842 which you can find on the barcode sticker or on the circuit diagram on the back of the controller.

Install the "WAGO BootP Server" which you can find on the "ELECTRONICC Tools and Docs" CD (Item No.: 0888-0412/0001-0101) or on the Internet under: [www.wago.com](http://www.wago.com) → Service → Downloads → Software.

Click the "Edit Bootptab" button. Create an entry in the bootptab file with the following structure:

"Any name" : ht=1 : ha= "MAC Id of the coupler" : ip= "New IP address of the coupler" : sm= "Subnet mask"

Example:

Wago:ht=1:ha=0030DE001234:ip=192.168.1.2:sm=255.255.0.0:

Activate the BootP server by clicking on the "Start" button and then disconnect the fieldbus node from the voltage supply for about 2 seconds. At each startup, the 750-842 controller sends a BootP request to the network. When the BootP server receives that request, it searches the "bootptab" file for the assigned hardware address. After an entry has been found, the BootP server sends the IP address, subnet mask and gateway address with BootP response to the controller. Then the controller stores the assigned IP address and can be accessed immediately at this address.

After each power-on, the controller keeps on asking for an IP address by sending BootP requests. However, if no BootP response is received by the 750-842 controller, the last-assigned IP address will be used.

This behavior differs from that of the 750-841 controller, which requires the presence of a BootP server when the BootP is activated.

To store the IP address permanently, the BootP request must be zeroed. This setting can be done using the "EthernetSettings.exe" tool.



**Note**

The permanent storage of the IP address for the ETHERNET fieldbus controller 750-842 is achieved in a different way as it is the case with the ETHERNET fieldbus controller 750-841.

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**Note**

When DHCP servers are used in the same network, there is a risk that a new IP address might be automatically allocated to the 750-842 controller after power-on, since BootP requests are sent by the controller after power-on. This can only be avoided by disabling the BootP requests. Disabling the BootP requests is done using the "WAGO EthernetSettings" tool, which you can find on the "ELECTRONICC Tools & Docs" CD (Item No.: 0888-0412/0001-0101) or on the Internet at: [www.wago.com](http://www.wago.com)

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Leave the controller turned on and turn off the BootP Server.

Start a browser (e.g. Internet Explorer, Netscape Navigator).

Enter the IP address of the controller 750-842 into the address bar of your browser (e.g. <http://192.168.1.2>).

The Proxy server should be avoided for local addresses.



**Further information**

Please find more information about avoiding the Proxy server in the browser help section under "Proxy server" and "LAN settings".

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The integrated Web server will now create two Web pages (no data can be entered).

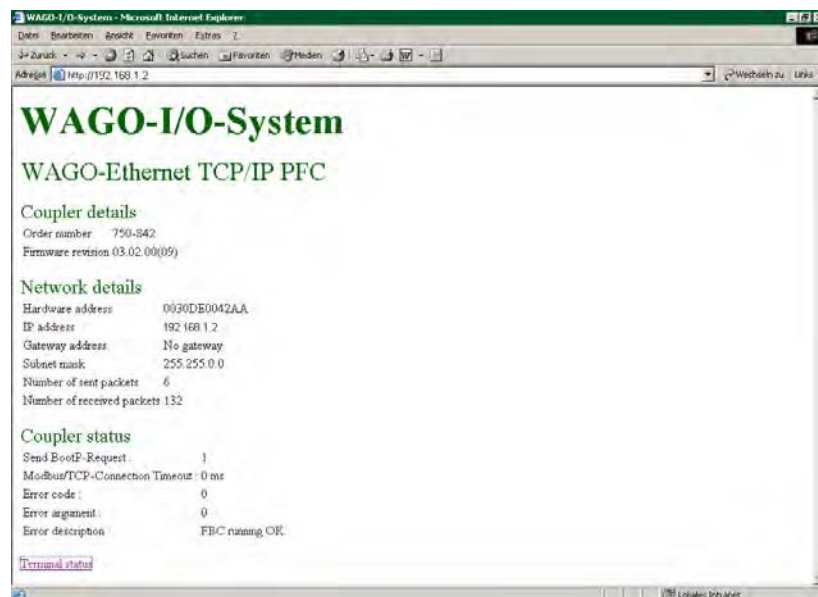


Fig. 2: Web server 750-842 "WAGO-Ethernet TCP/IP PFC", status information

## 2.3 The First Program

### Prerequisite:

The WAGO-I/O-PRO CAA software (CoDeSys) has to be installed correctly and started.

You can start a new project via → File → New.

Example:

Before programming the 750-842 controller, select the controller in the “Target Settings” window.



Fig. 3: Target settings

Please select the “WAGO\_750-842\_DEMO” target in this window.

Then confirm the selected target with “OK” in the dialog box above.

A POU can now be created in the following dialog box. In this example, a new “PLC\_PRG” is created in “ST” programming language (Fig. 4).

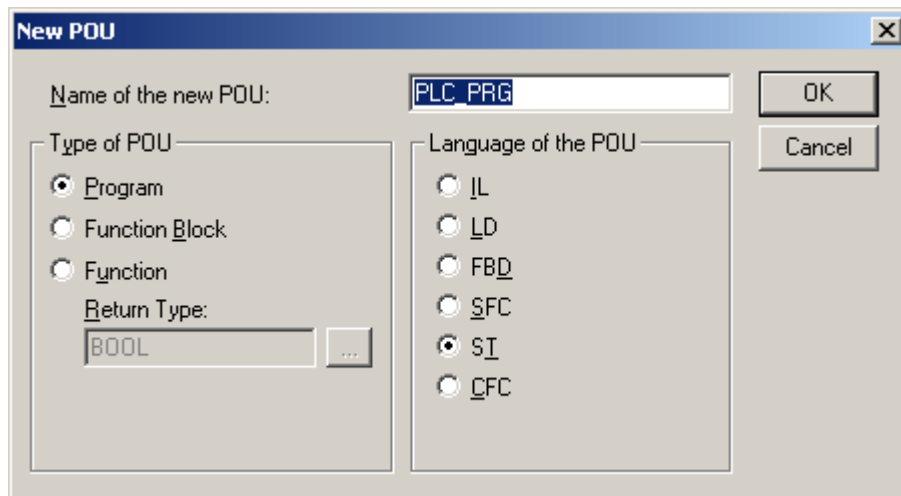


Fig. 4: WAGO-I/O-PRO CAA, creating a new POU

Before starting to create a POU, a PLC configuration must be performed.

To do so, change to PLC configuration in the “Resources” register.

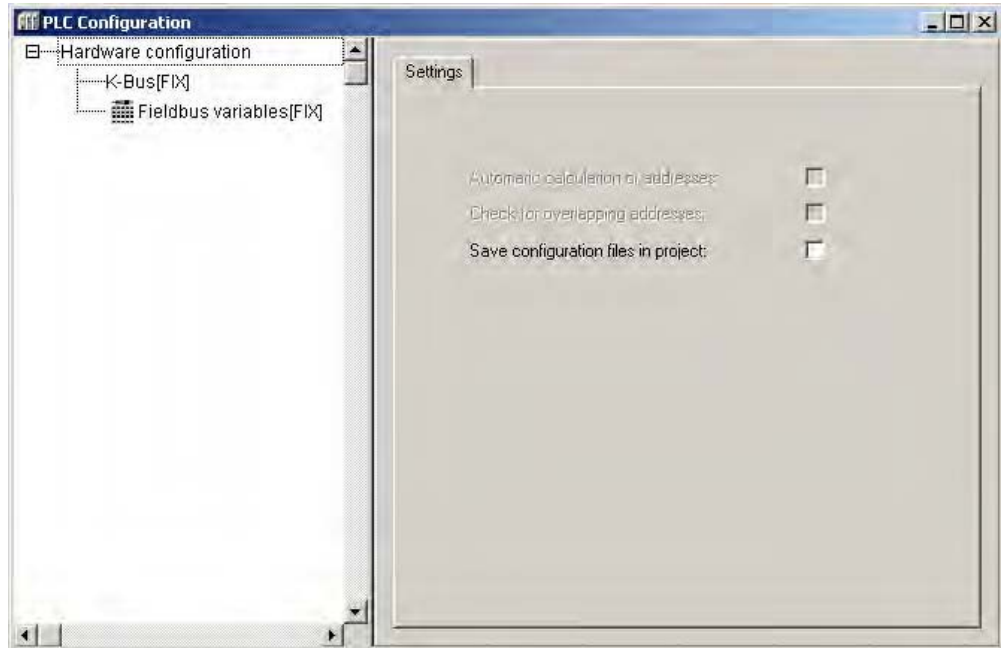


Fig. 5: WAGO-I/O-PRO CAA, PLC configuration

In the PLC configuration, first select “K-Bus[FIX]“, then right-click the mouse to open the context menu and select ”Append sub-element“. This will open the I/O configuration window.

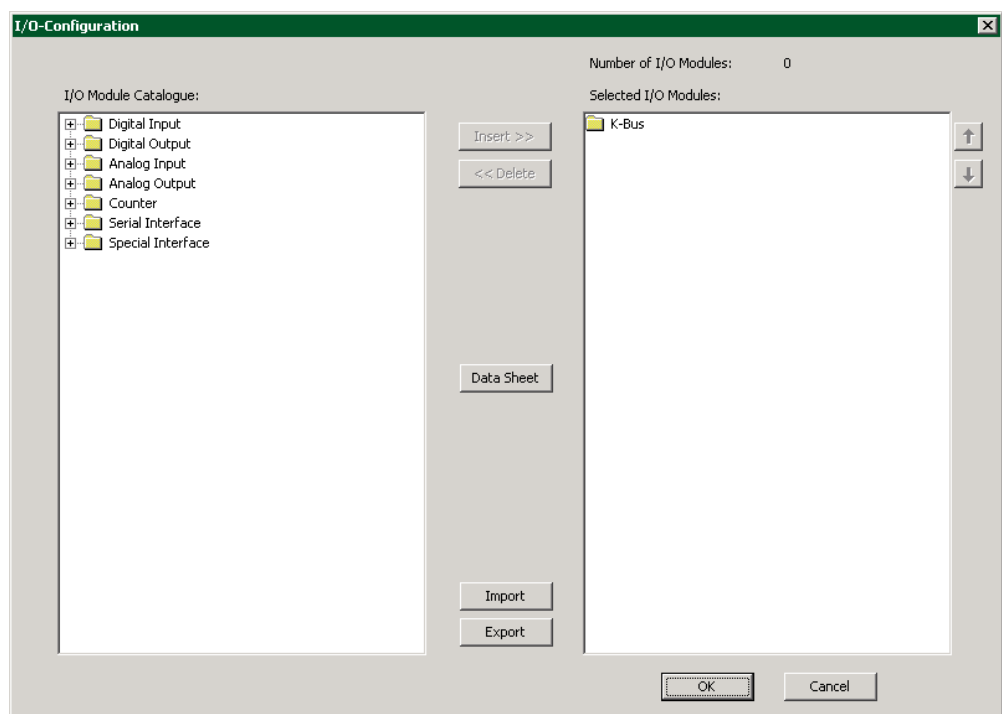


Fig. 6: WAGO-I/O-PRO CAA, I/O configuration

In the application example shown in section 2.1, a single 750-400 digital input module has been connected to the 750-842 controller, followed by a 750-501 digital output module. The 750-600 end module is arranged on the very right hand side.

In the I/O module catalog on the left, first click on “Digital Input” to select the 750-400 module and then move the module to the right into your selection using the “Insert“ button.

Then, select the 750-501 module from the I/O module catalog on the left by clicking on “Digital Output” and move it to the right into your selection using the “Insert“ button.

If you wish to delete some modules from your selection, select the appropriate module on the right-hand side and click the ”Delete“ button.

You can change the position of a module in your selection by selecting and moving the module using the up and down arrow buttons on the right-hand side of the window.

The 750-600 end module is not shown in the I/O configuration window.

Then confirm your selection with “OK“.

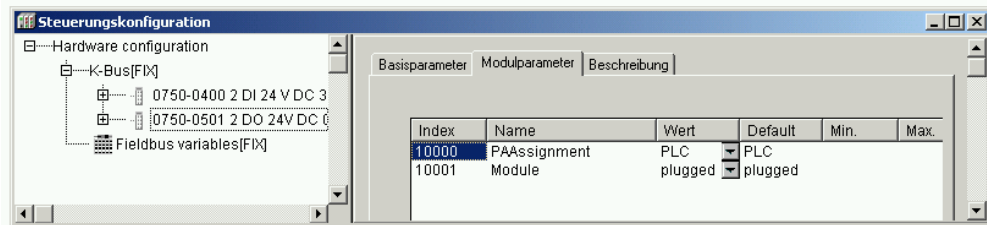


Fig. 7: WAGO-I/O-PRO CAA, I/O configuration with 750-400 and –501

The I/O configuration window now shows the address of each channel, and thus each individual bit on the module.

Left clicking on the arrow next to “AT“ will open a text box in which you can enter a variable name (Fig. 8).

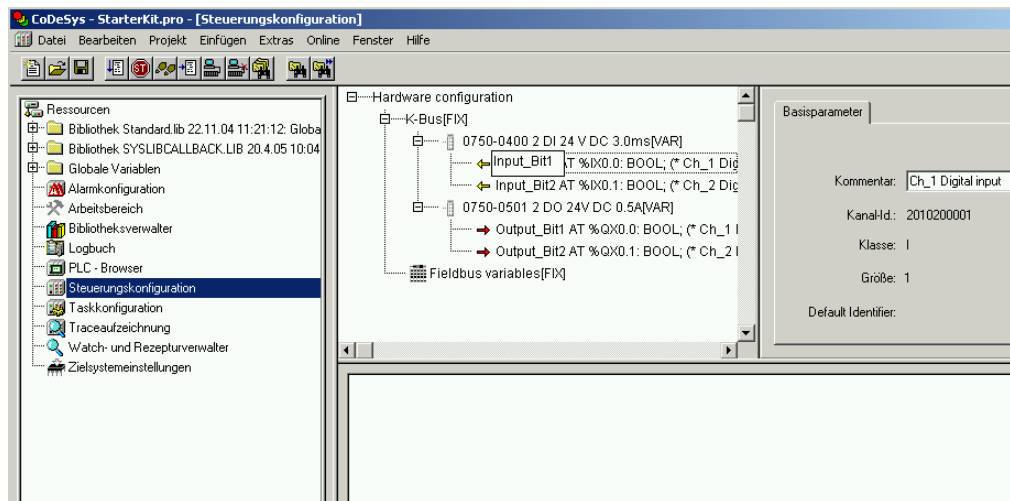


Fig. 8: WAGO-I/O-PRO, Declaration of variables with I/O configuration dialog

Now enter the following variable names:

Input\_Bit1 (for the %IX0.0 address)  
 Input\_Bit2 (for the %IX0.1 address)  
 Output\_Bit1 (for the %QX0.0 address)  
 Output\_Bit2 (for the %QX0.1 address)

Then, open the “PLC\_PRG“ program from the “POUs“ register and complete a simple assignment within the statement part of the program:

Output\_Bit1 := Input\_Bit1;  
 Output\_Bit2 := Input\_Bit2;

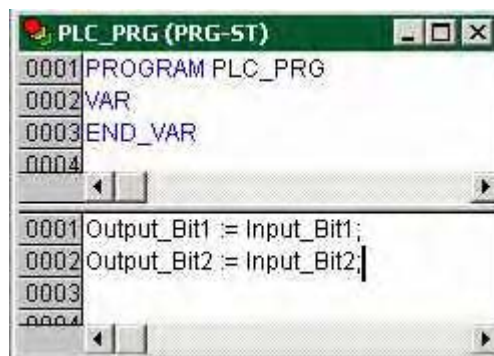


Fig. 9: WAGO-I/O-PRO CAA,  
Declaration and statement part of the PLC-PRG program

This way, both the first two inputs and first two outputs are assigned to each other (Fig. 9).

The program can now be loaded if the test program has been successfully compiled.

Compilation is initiated via → Project → Rebuild all.

## 2.4 Program Download to the 750-842 Controller

Click → Online → Communication parameter in the menu and create a new communication channel.

Choose Ethernet\_TCP\_IP (WAGO Ethernet TCP/IP driver).

Enter the IP address of the coupler under “IP Address“ (e.g. 192.168.1.2).  
Enter port number 2455. The transport protocol is TCP.

Please note that *the simulation is deactivated*.

You can now download the program via → Online → Login.

Start the program via → Online → Run.



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### Note

It is not possible to store programs permanently using the demo version of WAGO-I/O-PRO; i.e. the program must be downloaded and started anew after a power failure.

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## 2.5 Alternative to the Variable Declaration in the PLC Configuration

Instead of addressing bits individually and globally in the PLC configuration, a whole byte can also be addressed locally in the declaration part of the “PLC-PRG“ program.

Open the “PLC\_PRG“ program under the “POUs“ register and declare the local process image as follows:

```
Input_Byte          AT    %IB0:    BYTE;  
Output_Byte         AT    %QB0:    BYTE;
```

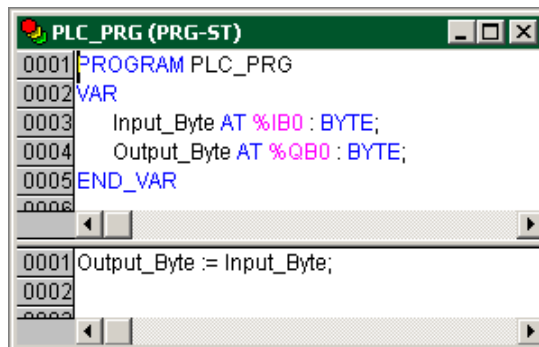


Fig. 10: WAGO-I/O-PRO CAA,  
Declaration and statement part of the PLC-PRG program



A simple assignment in the statement part of the program could be:  
Output\_Byte := Input\_Byte;

This way, the inputs are assigned to the outputs (Fig. 10).

The program can now be loaded if the test program has been successfully compiled.

Compilation is activated via → Project → Rebuild all.  
(Continue in section 2.4 “Program Download to the 750-842 Controller”)

## 2.6 Modbus/TCP DLL Application Examples

Before you can use the Modbus/TCP-DLL, it needs to be installed on your computer (preferably in the Windows System directory).  
Restart your computer.

You can find a DLL function description in the API Modbus/TCP DLL manual, chapter 2.1 ff, which is on the “WAGO DLL Modbus/TCP“ CD-ROM (759-312).

In the “Samples” directory you will find examples for DLL applications under VBA, VB6, Delphi5, vb.net, VC++6, C#, LabVIEW7

An updated list is available from our support center.

## 3 Addressing

### 3.1 Address Ranges of the 750-842 Controller

#### 3.1.1 Word Access

Method	Modbus addresses	Modbus addresses	IEC1131 addresses	Description
FC3 – Read Multiple Register (read data word by word)	0... 255	0x0000 – 0x00FF	%IW0... %IW255	Phys. inputs
	256... 511	0x0100 – 0x01FF	%QW256... %QW511	PFC-OUT variables
	512 ... 767	0x0200 – 0x02FF	%QW0... %QW255	Phys. outputs
	768 ... 1023	0x0300 – 0x03FF	%IW256... %IW511	PFC-IN variables
	Illegal address range	0x0400 – 0x0FFF	Not supported	
	4096... 8191	0x1000 – 0x1FFF	Not supported	Configuration register (see annex 3.2 or manual)
	8192 ... 12287	0x2000 - 0x2FFF	Not supported	Firmware register (see annex 3.2 or manual)
	12288... 16383	0x3000 - 0x3FFF	%MW0... %MW4095	RETAIN variables
FC16 – Write Multiple Register (write data word by word)	0... 255	0x0000 – 0x00FF	%QW0... %QW255	Phys. outputs
	256... 511	0x0100 – 0x01FF	%IW256... %IW511	PFC-IN variables
	512... 767	0x0200 – 0x02FF	%QW0... %QW255	Phys. outputs
	768 ... 1023	0x0300 – 0x03FF	%IW256... %IW511	PFC-IN variables
	Illegal address range	0x0400 – 0x0FFF	Not supported	
	4096... 8191	0x1000 – 0x1FFF	Not supported	Configuration register (see manual)
	Illegal address range	0x2000 - 0x2FFF	Not supported	Firmware register (see manual)
	12288... 16383	0x3000 - 0x3FFF	%MW0... %MW4095	RETAIN variables

### 3.1.2 Bit Access

Method	Modbus addresses	Modbus addresses	IEC1131 addresses	Description
FC2 - Read Input Discrete (read data bit by bit)  FC1 = FC2 + 0x0200 - Read Coils (read data bit by bit with address offset of 0x0200, used to read back output bits)	0... 511	0x0000 – 0x01FF	%IX( DigitalOffSet + 0 ).0 ... %IX( DigitalOffSet + 31).15	Phys. inputs
	512... 1023	0x0200 – 0x03FF	%QX( DigitalOffSet + 0 ).0 ... %QX( DigitalOffSet + 31).15	Phys. outputs
	Illegal address range	0x0400 – 0x0FFF	Not supported	
	4096... 8191	0x1000 – 0x1FFF	%QX256.0 ... %QX511.15	PFC-OUT variables
	8192... 12287	0x2000 – 0x2FFF	%IX256.0 ... %IX511.15	PFC-IN variables
	12288... 32767	0x3000 - 0x7FFF	%MX0.0 .. %MX1274.15	RETAIN variables
	Not supported	Not supported	%MX1275.0 .. %MX4095.15	
FC15- - Force Multiple Coils (write data bit by bit)	0... 511	0x0000 – 0x01FF	%QX( DigitalOffSet + 0 ).0 ... %QX( DigitalOffSet + 31).15	Phys. outputs
	512... 1023	0x0200 – 0x03FF	%QX( DigitalOffSet + 0 ).0 ... %QX( DigitalOffSet + 31).15	
	Illegal address range	0x0400 – 0x0FFF	Not supported	
	4096... 8191	0x1000 – 0x1FFF	%IX256.0 ... %IX511.15	PFC-IN variables
	8192... 12287	0x2000 – 0x2FFF	%IX256.0 ... %IX511.15	
	12288... 32767	0x3000 - 0x7FFF	%MX0.0 .. %MX1279.15	RETAIN variables
	Not supported	Not supported	%MX1279.0 .. %MX4095.15	

#### Notes:

The “DigitalOffSet“ of the digital inputs is 0, when no analog input modules / specialty modules and no ”SET\_DIGITAL\_INPUT\_OFFSET“ POU (from the ”mod\_com.lib“ library) are used.

The “DigitalOffSet“ of the digital outputs is 0, when no analog output modules / specialty modules and no “SET\_DIGITAL\_OUTPUT\_OFFSET“ POU (from the “mod\_com.lib“ library) are used.

Therefore, the following address spaces are available for the communication with a WAGO 750-842 Controller.

Address space	Modbus access	PLC access	Description
Phys. inputs	read	read	Physical inputs (%IW0 ... %IW255)
Phys. outputs	read/write	read/write	Physical outputs (%QW0 ... %QW255)
PFC-IN variables	read/write	read	Volatile PLC input variables (%IW256 ... %IW511)
PFC-OUT variables	read	read/write	Volatile PLC output variables (%QW256 ... %QW511)
Configuration register	read/write	---	See section 3.2 or manual
Firmware register	read	---	See section 3.2 or manual
RETAIN variables	read/write	read/write	Remanent memory (%MW0 ... %MW4095)

In contrast to the WAGO 750-842 Controller, only the following address spaces are available for communication with a WAGO 750-342 Coupler.

Address space	Modbus access	Description
Phys. inputs	read	Physical inputs (%IW0 ... %IW255)
Phys. outputs	read/write	Physical outputs (%QW0 ... %QW255)
Configuration register	read/write	See section 3.2 or manual
Firmware register	read	See section 3.2 or manual

## 3.2 Internal Addresses

### 3.2.1 Configuration Register

Address	Access	Length (word)	Comment
0x1000	R/W	1	Watchdog-time read/write
0x1001	R/W	1	Watchdog coding mask 1-16
0x1002	R/W	1	Watchdog coding mask 17-32
0x1003	R/W	1	Watchdog trigger
0x1004	R	1	Minimum trigger time
0x1005	R/W	1	Stop watchdog (write sequence 0xAAAA, 0x5555)
0x1006	R	1	Watchdog status
0x1007	R/W	1	Restart watchdog (write sequence 0x1)
0x1008	R/W	1	Stop watchdog (write sequence 0x55AA or 0xAA55)
0x1009	R/W	1	Close Modbus and HTTP at watchdog timeout
0x100A	R/W	1	Watchdog configuration ( serial or Modicon compatible )
0x100B	W	1	Save watchdog parameters
0x1020	R	1-2	LED error code
0x1021	R	1	LED error argument
0x1022	R	1-4	Number of analog outputs in process image (in bits)
0x1023	R	1-3	Number of analog inputs in process image (in bits)
0x1024	R	1-2	Number of digital outputs in process image (in bits)
0x1025	R	1	Number of digital inputs in process image (in bits)
0x1027	R	1	Perform internal bus cycle (only 750-x42 )
0x1028	R/W	1	Configuration through BootP on/off
0x1029	R	18	Modbus-TCP statistic
0x102A	R	1	Number of Modbus/TCP connections
0x1030	R/W	1	Modbus connection monitoring
0x1031	R	3	MAC Id
0x1040	R/W	1	Process data interface (only 750-842)
0x1050	R	3	Module diagnostics

### 3.2.2 Firmware Register

0x2000	R	1	Constant 0x0000
0x2001	R	1	Constant 0xFFFF
0x2002	R	1	Constant 0x1234
0x2003	R	1	Constant 0xAAAA
0x2004	R	1	Constant 0x5555
0x2005	R	1	Constant 0x7FFF
0x2006	R	1	Constant 0x8000
0x2007	R	1	Constant 0x3FFF
0x2008	R	1	Constant 0x4000
0x2010	R	1	Firmware version
0x2011	R	1	Series code
0x2012	R	1	Bus coupler code
0x2013	R	1	For special firmware versions (0xFFFF)
0x2014	R	1	For special firmware versions (0xFFFF)
0x2020	R	128	Short description of coupler
0x2021	R	16	Compile time of the firmware
0x2022	R	16	Compile date of the firmware
0x2023	R	32	Firmware loader specification
0x2030	R	65	Description of the connected modules ( module 0 - 64 )
0x2040	W	1	Software reset (write sequence 0x55AA or 0xAA55)

### 3.3 Module Diagnostics via Modbus

The module diagnostics can be requested via 0x1050 register. Three words must be requested.

Word 1: Module number

Word 2: Channel number

Word 3: Diagnostics





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