

Application Note #1225:

GP-Pro EX to WAGO 750 I/O via EtherNet/IP Implicit Messaging

Introduction

The Pro-face HMI family, along with the GP-Pro EX development software, supports a wide range of communication protocols including ODVA Ethernet /IP. The Pro-face GP-Pro EX ODVA EtherNet/IP Explicit Messaging device driver (v1.14.04 and later) supports both Explicit and Implicit messaging.

EtherNet/IP defines three device classes based on network communication capabilities: Messaging Class, Adapter Class and Scanner Class. Each class supports a basic set of communications services, but may provide other optional services too.

- Explicit messaging connections are point-to-point general purpose transactions that can be used to reach any network-accessible items within a device. Explicit messaging uses TCP/IP services to transport messages. Examples of Messaging Class devices are Rockwell Micrologix PLCs, some legacy PLCs, and many operator interface and diagnostic applications.
- Adapter class products are targets of real-time I/O data connection requests from Scanner Class products. They receive Explicit message requests from all other classes of products. Examples are VF drives and WAGO System 750 I/O.
- Scanner Class devices are the originators of I/O data connection requests to Adapter Class products. These devices can also be originators of Explicit connection requests to or from other classes of products. Examples of Scanner class products are ControlLogix PLCs and the Pro-face GP-Pro EX ODVA EtherNet/IP Explicit Messaging device driver (v1.14.04 and later).

A single GP-Pro EX application can include a mixture of Explicit, Custom Explicit, and Implicit I/O messaging to the same device. The scope of this application note is to look at a basic Implicit I/O connection to WAGO System 750 I/O. For your convenience a completed sample project is provided. In your application you may choose to exchange additional data with the WAGO System 750 I/O using Implicit and/or Explicit messaging.

Materials Needed to Run the Demo Project

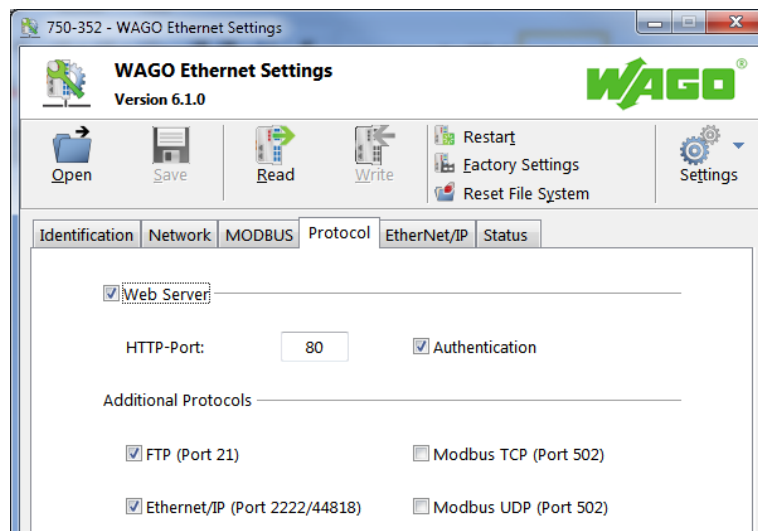
- 1.) Proface GP-Pro EX Screen and Logic Editing software v4.02 or higher
- 2.) Pro-face GP-Pro EX ODVA EtherNet/IP Explicit Messaging device driver (v1.14.04 and later)
- 3.) Proface AGP3300 or other Ethernet Enabled Pro-face Display or Win GP
- 4.) WAGO Ethernet Node consisting of:
 - a. 750-352 Ethernet Fieldbus Coupler
 - b. 750-602 Power Supply 24VDC in
 - c. 750-430 8-point 24VDC Digital Input Module
 - d. 750-504 4-point 24VDC Digital Output Module
 - e. 750-454 2-point 0-10VDC Analog Input Module

- f. 750-554 2-point 0-10VDC Analog Output Module
 - g. 750-600 End Module
 - 5.) WAGO 750-923 USB Communications cable and WAGO Ethernet Settings software
- Optional: WAGO Application Note a203100e.pdf at:
http://www.wago.com/wagoweb/documentation/app_note/a2031/a203100e.pdf

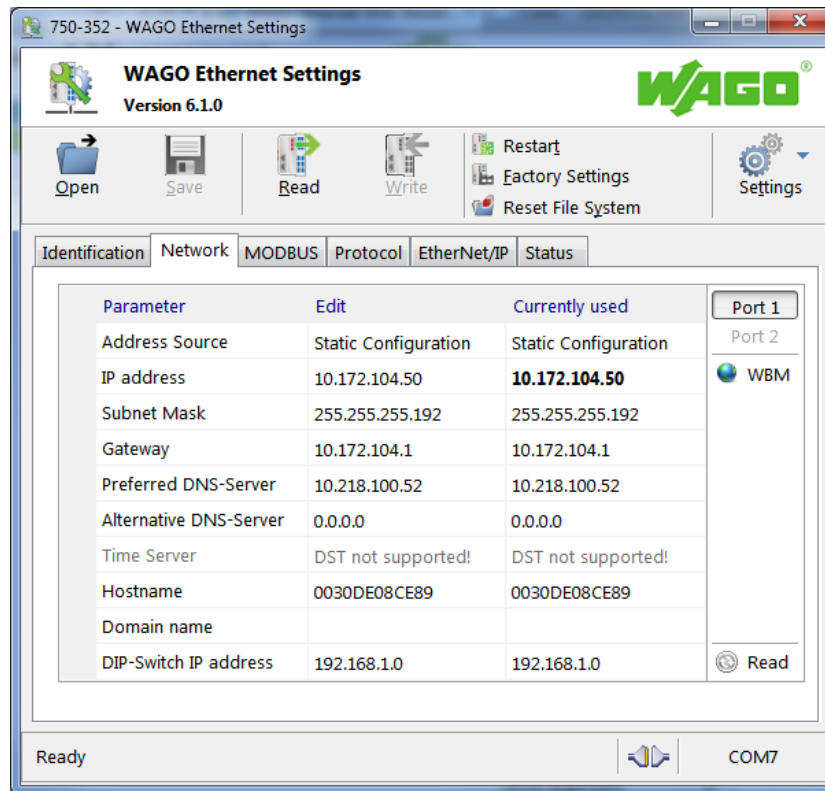
Configure the WAGO EtherNet/IP Adapter and I/O

Refer to WAGO documentation for the steps required to configure and wire the WAGO System 750.

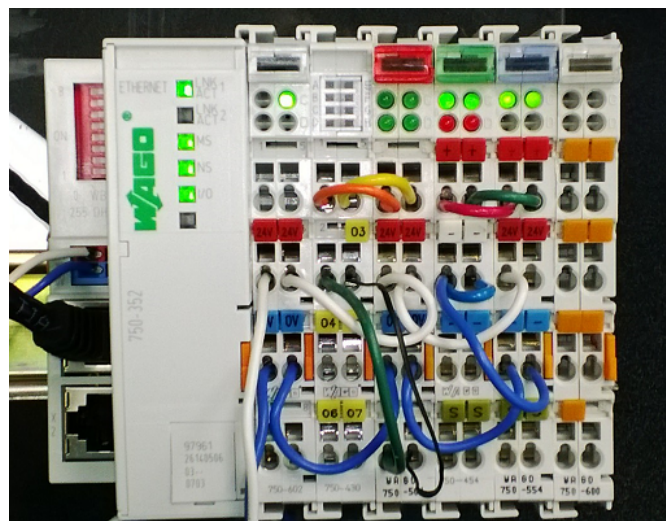
By default, the WAGO 750-352 Ethernet adapter is configured for Modbus TCP. Click on the EtherNet/IP check box to select it (checked). If Modbus UDP or Modbus TCP is enabled, it must be disabled. Click on it to unselect it (unchecked).



GP-Pro EX projects require connected devices to have a fixed IP address. For Address Source select "Static Configuration". Enter a fixed IP address, subnet mask, and gateway address. The 8 DIP switches on the 750-352 should all be off. (to the left)



When the coupler is powered up, it automatically addresses the I/O modules of the node. The data for complex modules (modules using 2 or more bytes) are mapped first in the process image. They are mapped in the order of their physical position after the coupler. As such, they start at byte address 0. Following this, the digital modules are grouped into bytes (8-bits per byte). The bits are arranged in the order of the modules location. When the number of digital points exceeds eight (8-bits), the coupler automatically starts the next byte. ¹



Input Process Image

- Byte 0 - 750-454 Channel 1 Analog Input, Low Byte
- Byte 1 - 750-454 Channel 1 Analog Input, High Byte
- Byte 2 - 750-454 Channel 2 Analog Input, Low Byte
- Byte 3 - 750-454 Channel 2 Analog Input, High Byte
- Byte 4 - 750-430 4-Channel 24VDC Digital Input (bits 0 through 7)

Output Process Image

- Byte 0 - 750-554 Channel 1 Analog Output, Low Byte
- Byte 1 - 750-554 Channel 1 Analog Output, High Byte
- Byte 2 - 750-554 Channel 2 Analog Output, Low Byte
- Byte 3 - 750-554 Channel 2 Analog Output, High Byte
- Byte 4 - 750-504 4-Channel 24VDC Digital Output (bits 0 through 3)

Note that this example has 5-bytes of data in both the Input and Output Process Image.

To demonstrate our test project you might wish to wire some of the digital outputs to digital inputs and the analog outputs to analog inputs.

Using the Sample GP-Pro EX Project

The sample project is ready for you to use. Depending on your Pro-face display model and your network a few minor modifications may be needed.

1. To change the display model open GP-Pro EX and go to Project > System Settings > Display. Click on Change Display and select your display Series and Model. Click change.
2. To enter the IP address of the WAGO 750-352 in GP-Pro EX go to Project > System Settings > Device/PLC Click on the button with a PLC icon on it. Enter the 750-352 IP address.
3. On the Pro-face display in the off-line mode set an IP address for the display within the same sub-net range as the WAGO I/O.

Note: the sample project will work with as well other models of WAGO 750 Series I/O if these limitations are considered: The analog configuration should be 2 points in and 2 points out. The input and output count should be no more than 8 points each.

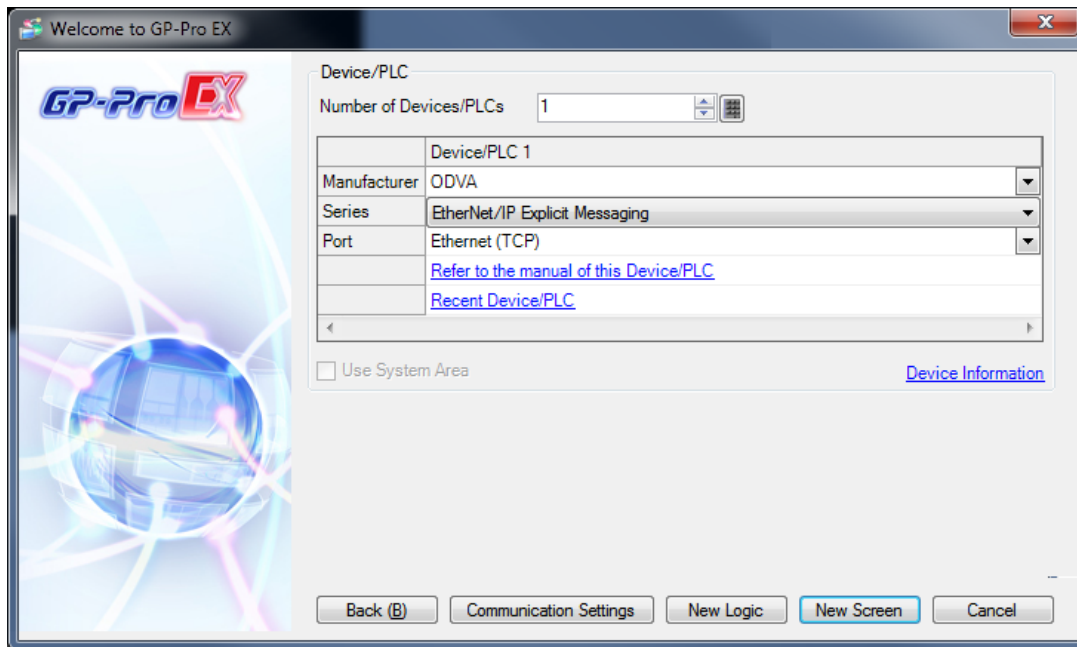
Download the project to the Pro-face display. Connect a Pro-face HMI and the WAGO Series 750 I/O with Ethernet cables and a hub/switch or with an Ethernet crossover cable.

EtherNet/IP Configuration in GP-Pro EX

When creating a project in GP-Pro EX, follow these steps to configure GP-Pro EX to connect to a WAGO 750-352 via Implicit messaging.

Note: The Implicit messaging feature requires GP-Pro EX v4.02 or later and ODVA EtherNet/IP Explicit Messaging device driver v1.14.04 and later.

1. When beginning a new project file select the Display Series and model. On the Device/PLC screen select ODVA. For the series select “EtherNet/IP Explicit Messaging”.



2. Go to the “Device/PLC” tab
3. In the “Device Specific Settings” section click on the button with the PLC image on it. The dialog box should look like the image below.
4. Enter the IP Address of the WAGO 750-352 Ethernet adapter.

Implicit Messaging Configuration

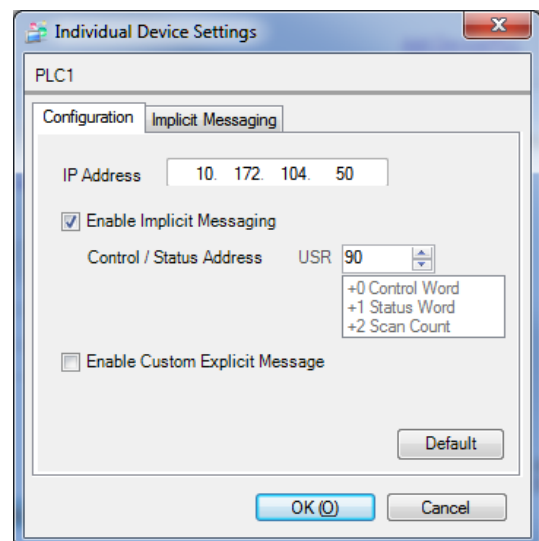
5. Check the “Enable Implicit Messaging” dialog box.

Note: If this selection is missing please upgrade your ODVA PLC/Device driver.

6. The GP-Pro EX ODVA EtherNet/IP driver needs a small array of 3 words allocated in USR memory for Control/Status. For the sample project we used USR90.

Tip: We do not recommend using the default address USR0 anywhere in a completed project.

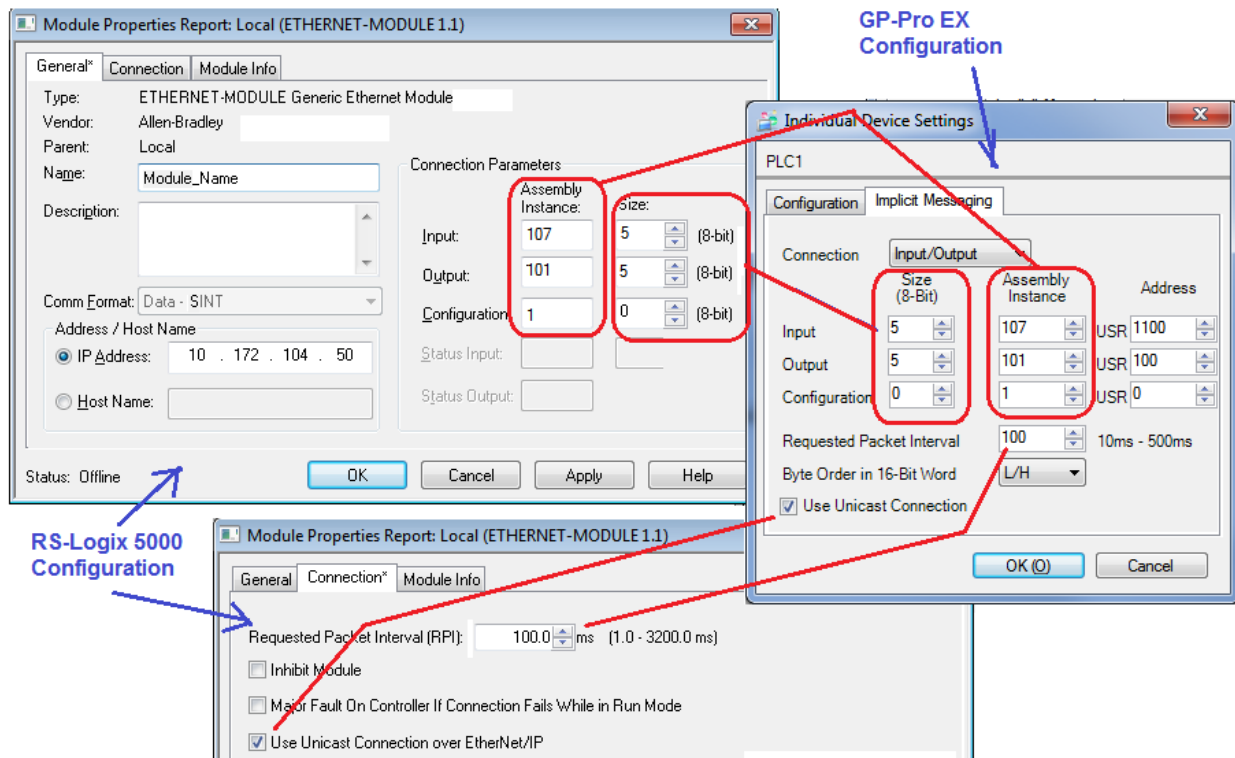
7. Click on the “Implicit Messaging” tab. To obtain entries for this tab refer to the device manufacturers’ instructions for configuring their device as an Implicit generic I/O device.



WAGO provides this information in Application Note a203100e.pdf at:
http://www.wago.com/wagoweb/documentation/app_note/a2031/a203100e.pdf

Note: If the manufacturer offers instructions for configuring their device as a generic device in a ControlLogix class PLC the settings in GP-Pro EX will be very much the same.

Similarity Between RS-Logix Generic Ethernet Module Configuration and GP-Pro EX Configuration



1. Enter the 750-352 adapter Input, Output, and Configuration Size and Assembly Instance information. Note that the correct Assembly Instance setting for each item is required even if the Size is 0. The sample project I/O configuration is:

	Size (8-bit)	Assembly Instance
Input	5	107
Output	5	101
Configuration	0	1

If the I/O configuration has no outputs select "Input Only" for the Connection. The "Output" label in the dialog box will automatically change to "Heartbeat". For WAGO I/O set the Heartbeat Assembly Instance to 198.

- Choose and enter the Addresses in GP-Pro EX where the I/O data exchanged with the WAGO bus coupler will be located. For the sample project we chose USR1100 - USR1102 for Input data and USR 100 – USR 102 for output data. These addresses are used by GP-Pro EX to access the device I/O.

Start Implicit Messaging

Implicit messaging does not automatically start in the Pro-face display. In logic or scripting first set the appropriate initial values for the device outputs. Then start Implicit messaging. Set bit 0 of the first word of the Implicit messaging Control/Status Address to run Implicit Messaging. In the sample project the bit is USR9000. (USR90 bit 00).

Note: System variable [PLC1]#H_ScanOffControl turns on and off the entire device driver which is enabled by default. It is a different function than the Implicit Messaging Control Word.

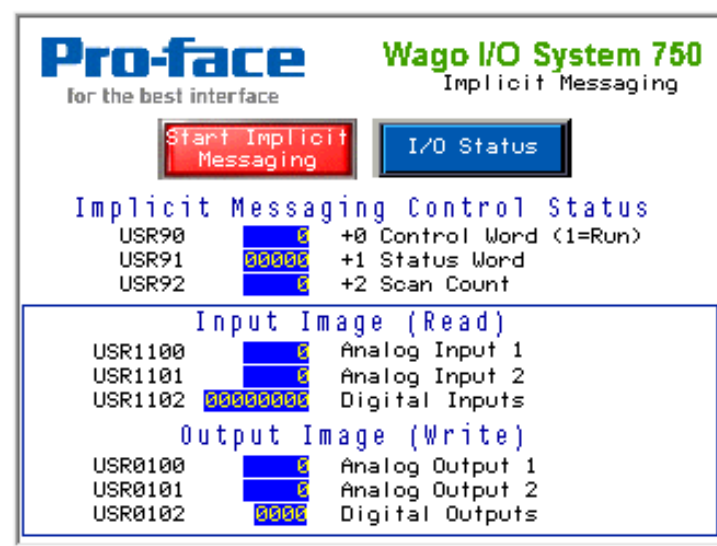
Create the screens

Only a simple script or logic rung is required to start Implicit Messaging in the Pro-face display. Logic or scripting in GP-Pro EX is not required for basic operation of the WAGO I/O. Simply create the buttons and data displays you need for your project with Symbol Variables and download it to your Pro-face display.

About the Sample Project Screens

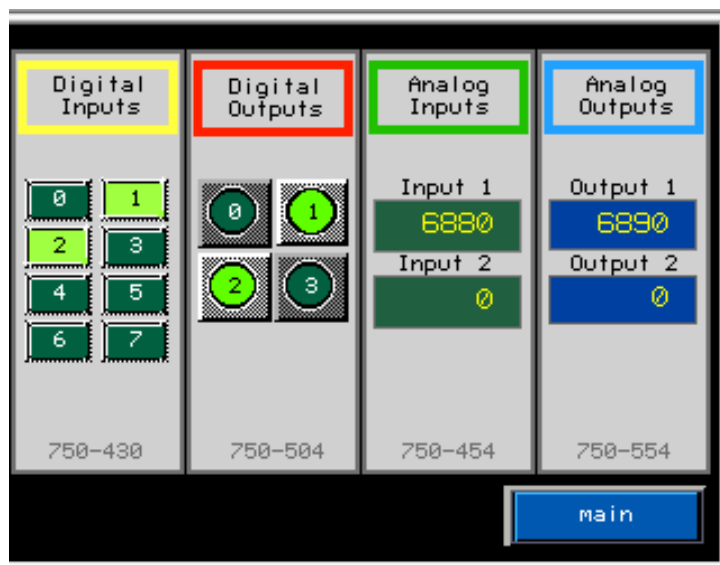
Screen B1; Main Panel

The first screen displays the Implicit Messaging control/status words and all data exchanged with the WAGO system 750 I/O. On power up the data displays will all be zero and Implicit Messaging will be inactive. Press the red button to start Implicit I/O messaging.



Screen B2: I/O Status

Demonstrates I/O operation using EtherNet/IP Implicit I/O Messaging.



For more information on Pro-face and our full line of HMI, Operator Interface and Industrial PC products please visit our web site at www.profaceamerica.com.

For technical support email: support@profaceamerica.com or call: 800.289.9266.

Bibliography:

¹ a203100e.pdf: "Using the WAGO 750-341 as Remote I/O with a ControlLogix Ethernet/IP Bridge Module"; Copyright © 2004 by WAGO Kontakttechnik GmbH & Co. KG

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