Tech-note

Connecting UniOP to Ethernet/IP CIP

Connecting UniOP to Rockwell Automation Control Logix 5550 controller equipped with the Ethernet card 1756-ENET.

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1 Introduction

The protocol Ethernet/IP CIP is implemented in the UPLC159.DLL driver file.
The protocol has been implemented according to the published Ethernet/IP specifications (available from www.odva.org). Implementation on the CIP protocol for access to ControlLogix data is based on the information published by Rockwell Automation.

UniOP requires the optional module SCM11 to support TCP/IP communication.

1.1 Communication Media

The supported Ethernet physical layer is 10BASE-T.
The SCM11 module requires the ETAD01 adapter to convert the 9-pin connector of the AUX port to the standard Ethernet 10BASE-T RJ45 connector. The adapter is delivered with the communication module.

2 Setting up UniOP

To create a UniOP application for Ethernet/IP CIP, select the driver “Ethernet/IP CIP” from the list of available communication drivers in the Change Controller Driver… dialog box.

2.1 The Controller Setup

The system can be composed by one or more ControlLogix systems, each of them equipped with one 1756-ENET Ethernet interface card. Each Ethernet card has its own IP address. In the Controller Setup dialog box you can enter the IP address of the ControlLogix Ethernet card you what to connect. The Control Logix 5550 system has a multiprocessor architecture; the UniOP panel can access data in all the processor modules installed in the rack.

Note: *The Control Logix system can have more than one processor module mounted in the same rack. Each rack can have only one Ethernet card.*

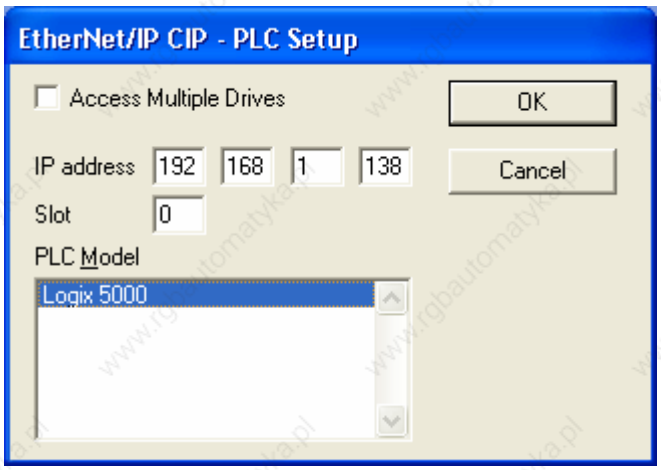

Figure 1

Figure 1 shows the Controller Setup dialog configured for accessing only one controller placed in the slot 0 of the rack. The ENET card has the IP address 192.168.1.138.

2.1.1 More than one Processor in the Same Rack

If the ControlLogix system includes more than one processor in the same rack, the Designer project can be configured to access each individual CPU using the “Access Multiple Drives” options.

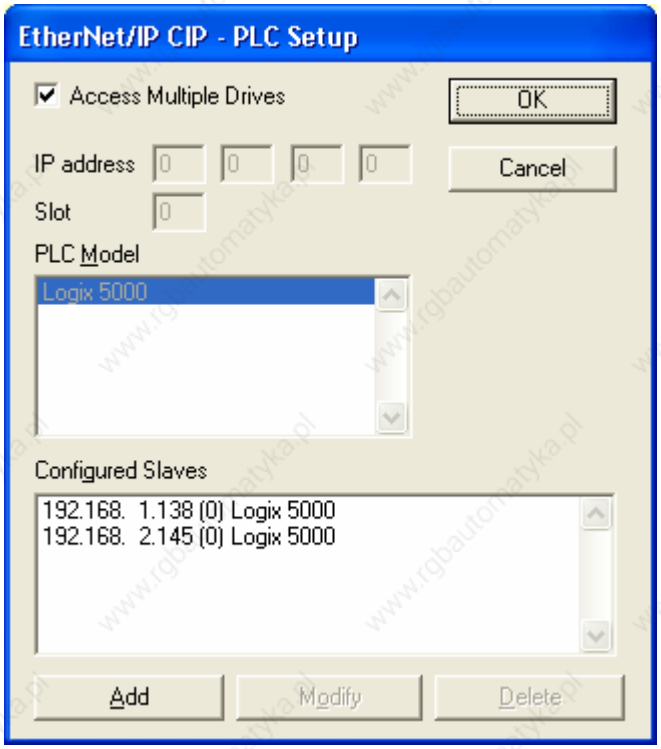

Figure 2

Figure 2 shows the case of two processors mounted in the same rack respectively in the slot 0 and in the slot 4.
Any additional processor mounted in the same rack can be added to the configuration using the “Add” button and specifying both the IP address of the ENET card and the slot number of the processor module. Figure 3 shows the dialog for adding a processor mounted in slot 4.

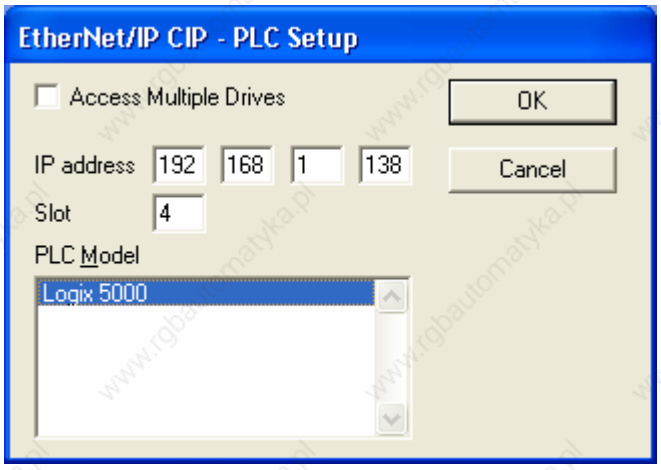

Figure 3

***Note**: As only one ENET card is present in the rack, the IP address is unique for all the processors mounted in that rack.*

2.1.2 Access to Multiple Racks

In the case the complete control system is composed of more than one ControlLogix racks and each rack contains one or more controllers, the “Access Multiple Drives” option can still be used to configure the Designer project to access to each individual CPU mounted in the different racks. In this case the IP address specified in the “PLC Setup” dialog must be different for each rack.

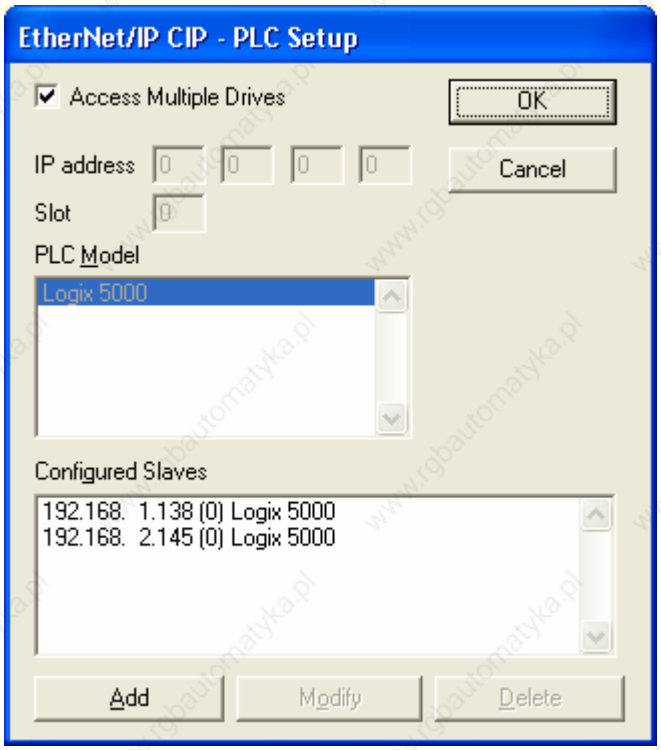

Figure 4

Figure 4 shows the case of a system with two ControlLogix racks, the two ENET cards mounted have IP address respectively 192.168.1.138 and 192.168.2.145.

2.2 Designer Panel Setup

The operator panel must have an IP address to connect to Ethernet.
The IP address of the panel must be entered in Panel Setup dialog box in the tab “External Devices”.
Enter the IP address in the “Ethernet board” field as shown in Figure 5 below.

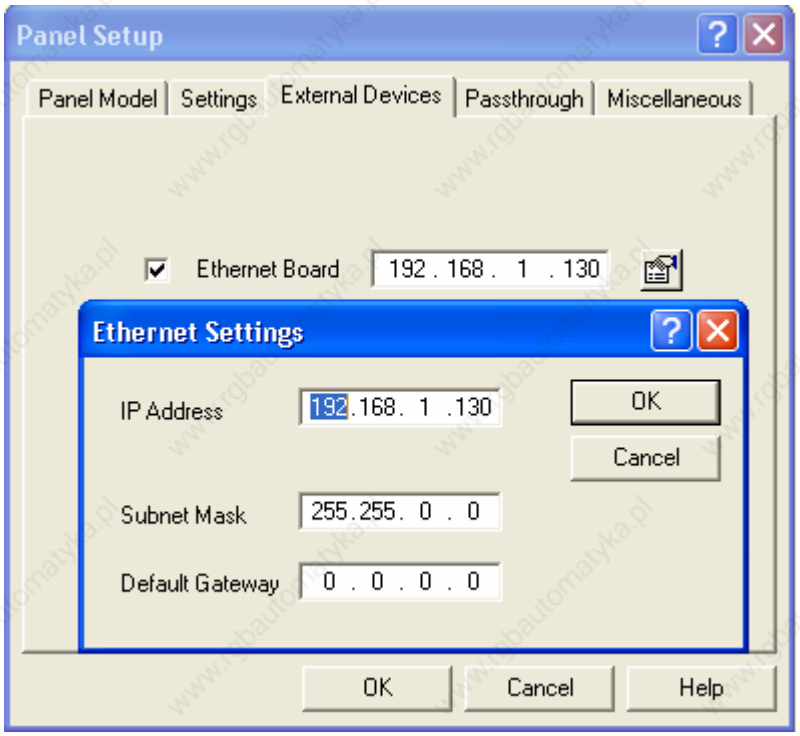

Figure 5

2.3 Tag Editor

The data in the ControlLogix system is based on tags.
The organization of the internal memory organization of the Logix 5550 CPU is not fixed but it is configured by the user at development time. Each data item can be identified by a string called “tag”.
The RSLogix5000 development environment can export the list of tags created for each controller in the configuration of the application.
The project in the panel must refer to the tag names assigned in the RSLogix programming software at development time. The Designer Tag Editor supports direct import of the tag file generated by the RSLogix software.

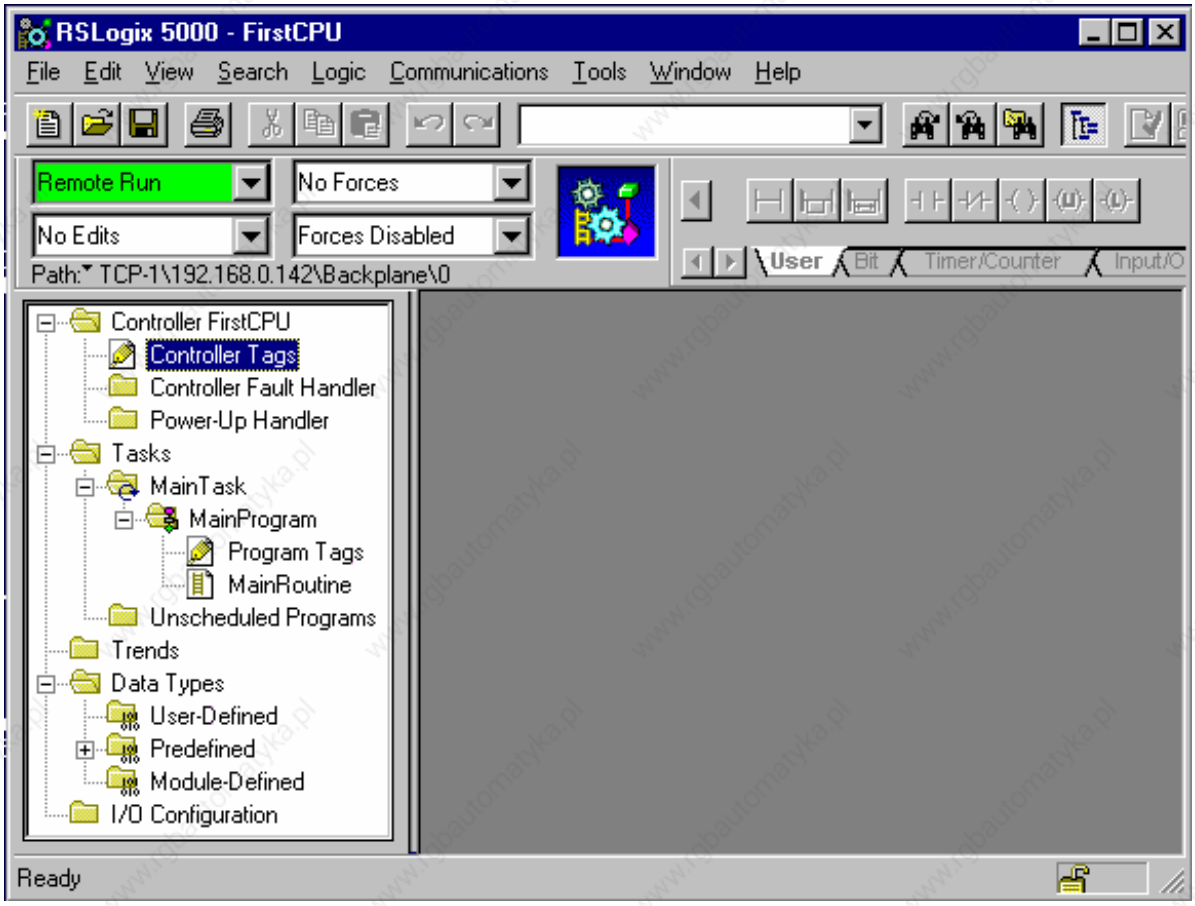

Figure 6

Figure 6 shows an application created for one CPU mounted in slot 0 using an ENET card with IP address 192.168.0.142.
The project tree in the leftmost part of the window shows the “Controller Tags” folder.
To export the tags defined for the selected controller, right-click on the “Controller Tags” folder and select “Export Tags...” as shown in Figure 7. The RSLogix5000 software will create a file in CSV format.

Note: *Starting from version 5.21 – 4.08 the communication driver can access both Controller and Program Tags. Earlier versions supported only “Controller tags”.*

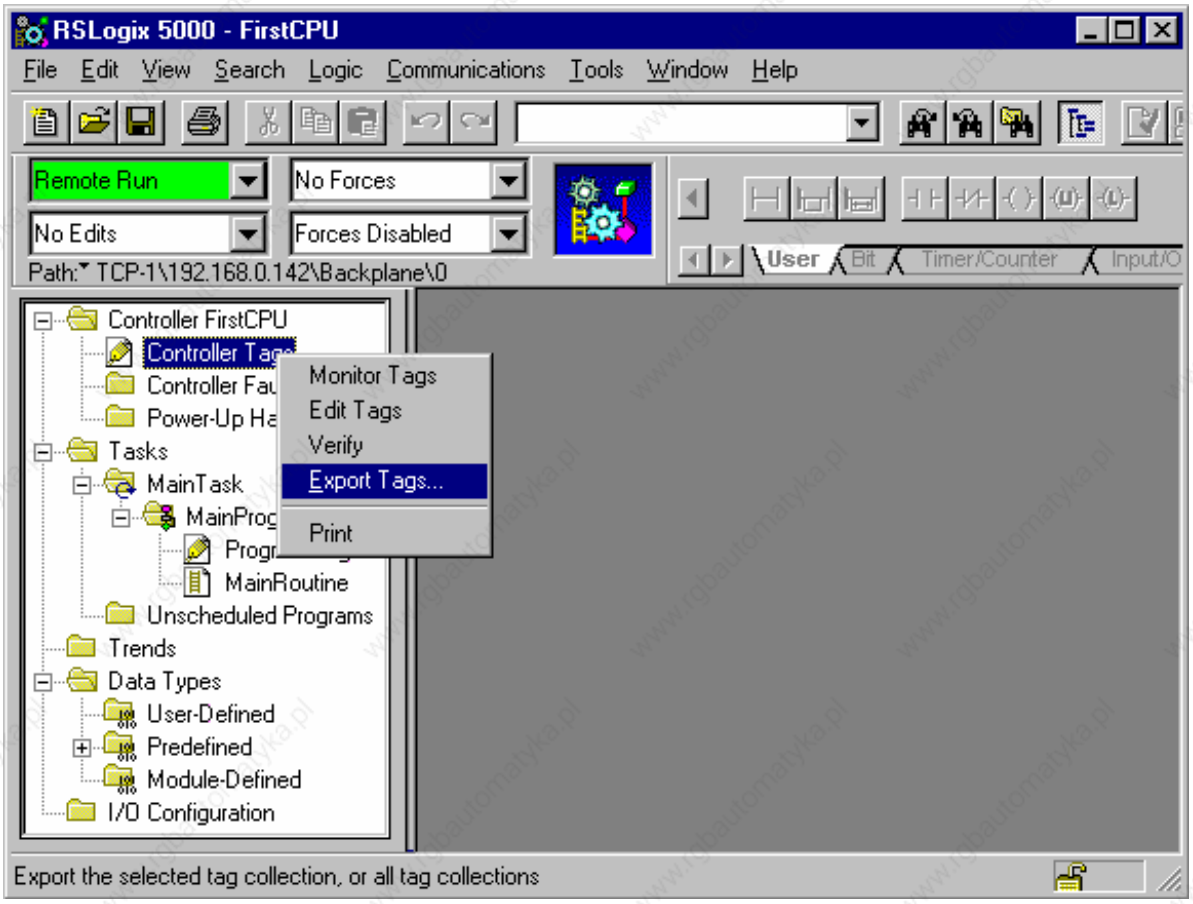

Figure 7

2.3.1 Importing the Tag File

The tag file exported from the RSLogix5000 software can be easily imported in Designer Tag Editor selecting the “Import tags” command from the “File” menu of the Tag Editor. The first step of the import process is shown in Figure 8; in the list of the available controllers the Ethernet IP/CIP is listed.

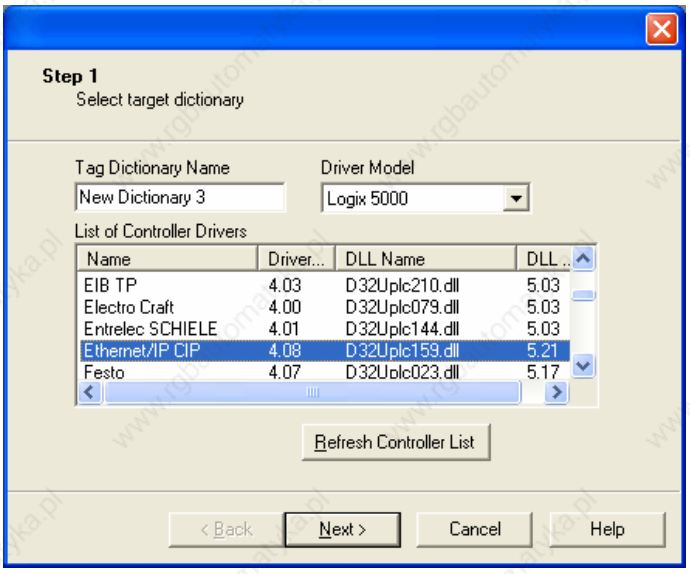

Figure 8

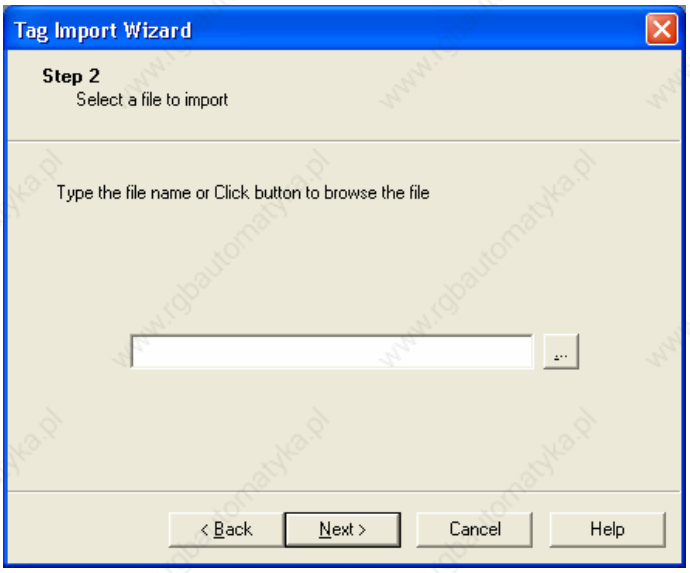

Figure 9

If more than one controller is present in the configuration, Designer project needs to be properly configured.
As the RSLogix5000 software does not include in the tag file any information on the controller owning the exported tag list, the Designer Tag Editor needs to associate explicitly the tags to the appropriate processor. The selection dialog is shown in Figure 10 below.

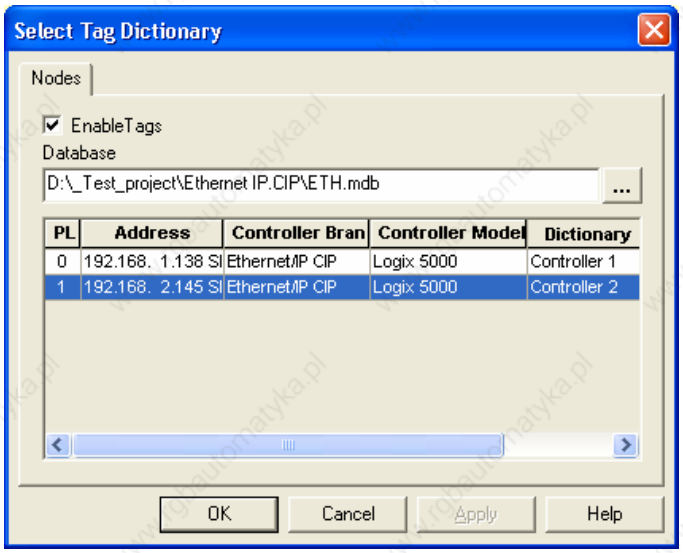

Figure 10

In case the Designer project must be configured to connect to more than one controller, two Dictionaries must be present into the Tag Editor database.

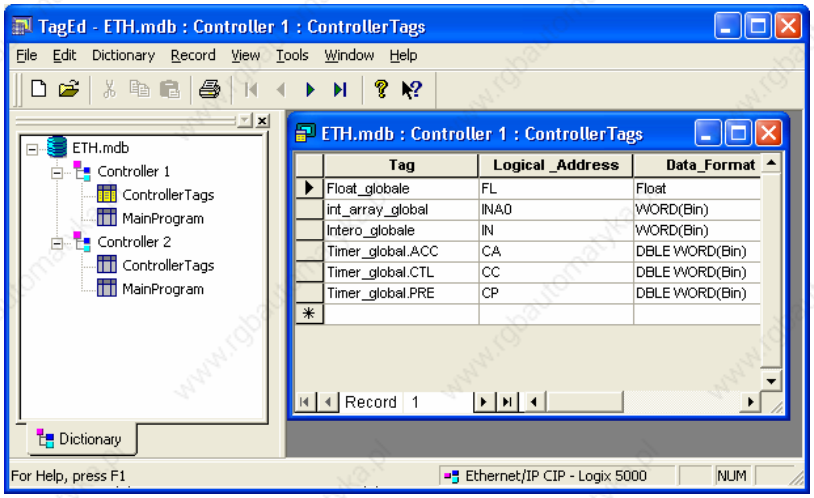

Figure 11

Figure 12 shows the case of two controllers mounted respectively in slot 0 and slot 4 of two different racks. The first rack contains an ENET card with IP address 192.168.1.138 and the CPU is mounted in Slot 0; the second rack contains an ENET card with IP address 192.168.2.145 and the CPU is mounted in Slot 4.

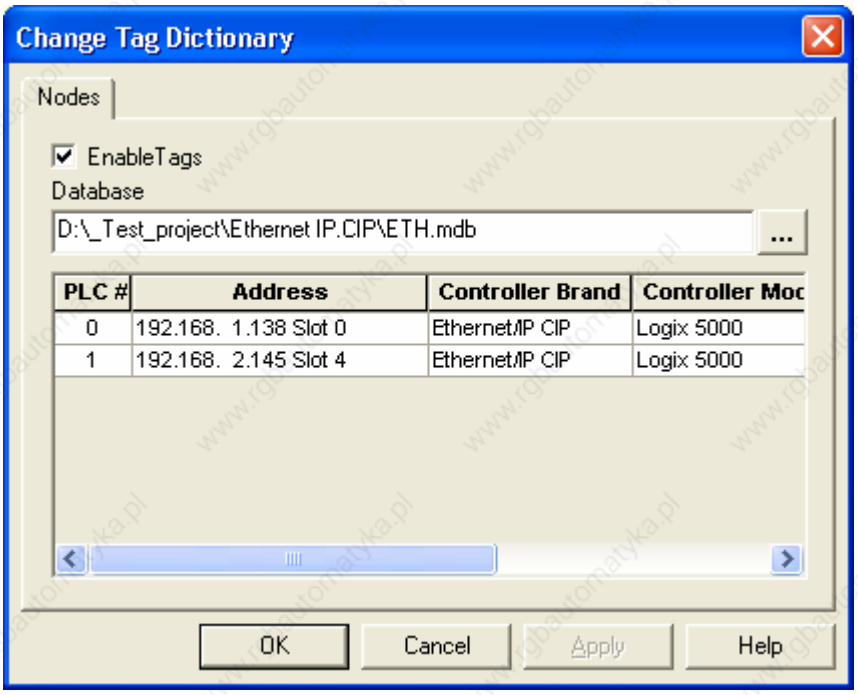

Figure 12

2.3.2 The Define Field Dialog Box

When working with Designer software you can create data fields connected directly to any of the controller tags present in the dictionary.
Figure 13 shows the Define Field dialog box. The “Enable Tag” button is available to enter the name of the item.

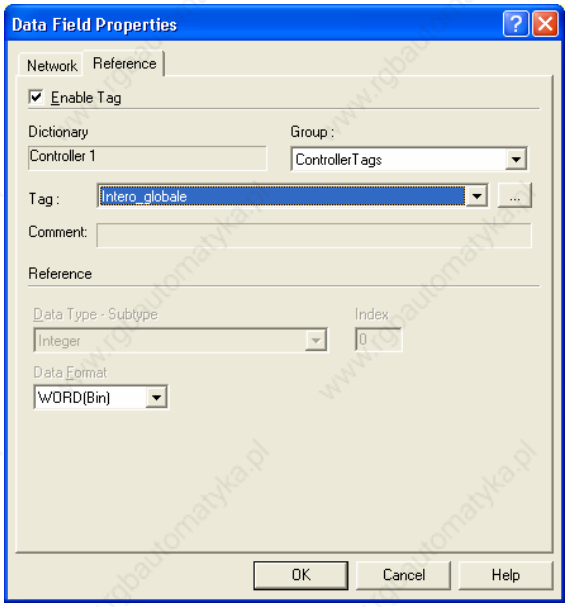

Figure 13

Figure 14 shows the Define field dialog box automatically filled by Designer after a tag item has been selected.

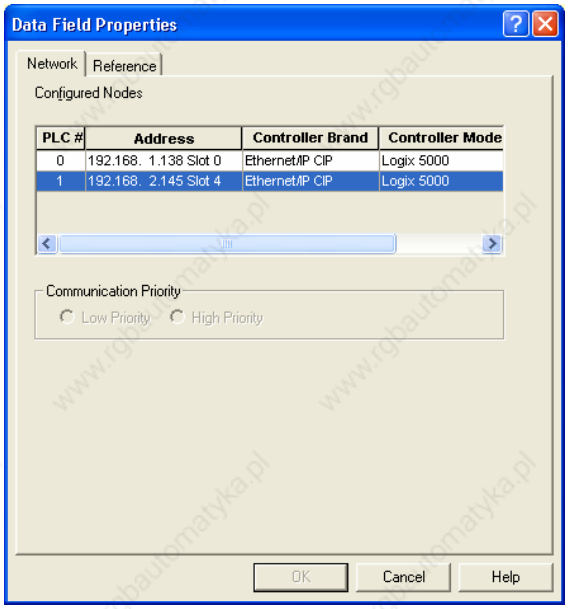

Figure 14

The “PLC Slave ID” specifies the controller that contains the requested data item.

2.3.3 Downloading the Project

Since the UniOP protocols needs for communication with the controller the name of the tags used in the project, the tag items have to de downloaded to the panel. Before starting the project download the “Download tags (New)” options available from the Transfer advanced menu following the path Transfer\Option\Transfer Advanced Option has to be checked (normally is checked by default). See Figure 15.

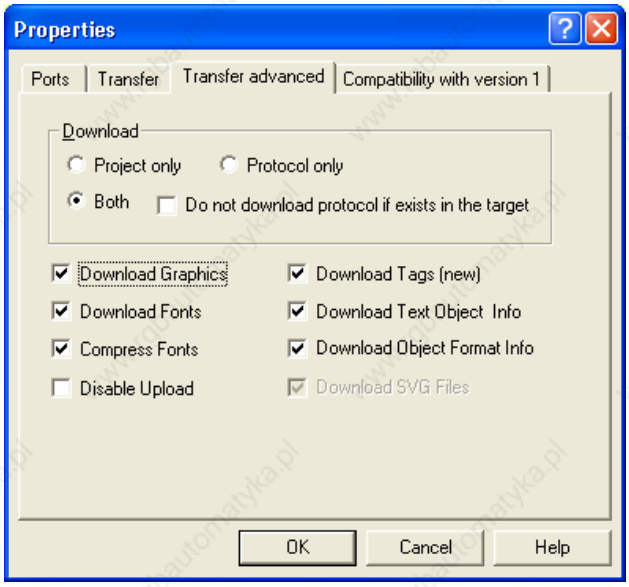
Properties
Ports
Transfer
Transfer advanced
Compatibility with version 1
Download
Project only
Protocol only
Both
Do not download protocol if exists in the target
Download Graphics
Download Tags (new)
Download Fonts
Download Text Object Info
Compress Fonts
Download Object Format Info
Disable Upload
Download SVG Files
OK
Cancel
Help

Figure 15

Appendix A. Communication Error Codes

Current communication status is displayed in the System Menu of the UniOP.
A message and a numeric error code describe the error status.
The message reports the current communication status. The number shows the code of the current communication error or, if the communication is correct, the code of the last error encountered. When the error code 0 is shown, it means there have been no communication errors since this system start-up.

Code	Description	Notes
00	No error	There are no communication errors and there have been no errors since start-up.
04	Negative acknowledgement to request	The request sent to the PLC was not valid and the PLC responded with a NAK. This can occur because: a) the request was trying to access a tag that doesn't actually exist in the PLC b) the request was trying to access an array element beyond the maximum array size for the tag c) the request was trying to write a value to the tag outside the allowed range for the tag type d) the request was trying to write a value to a read only type
05	Failed to create a connection with the Controller	The Forward Open request failed. Perhaps the PLC has too many open connections
06	Unexpected response length	Means that the response frame was received from the PLC but the frame length was not what was expected.
08	Failed to decode the PLC response or the PLC did not respond to the request within the timeout interval	It is the typical timeout error caused by a disconnected communication cable or tags not downloaded with the Designer project.
10	Unexpected response format	Indicates that the response frame was received from the PLC but the frame format was not what was expected.
12	Unexpected response data length	Indicates that the response frame was received from the PLC but the length of its data part was not what was expected.
16	Low level protocol error	Should never happen. Contact the manufacturer.

Appendix B. Requirements and Compatibility

This communication driver is included in the Designer DLL file UPLC159.DLL.
The initial release level is 3.00 for the communication driver and 5.03 for the DLL (both version numbers can be seen in the Change Controller Driver dialog box of the Designer software).

The format of the RSLogix5000 tag file is compatible with RSLogix5000 version 2.51.00 and may not be compatible with other versions of the software.

Designer software version 5.08 or higher is required for supporting tags.

A communication module of type SCM11 is required.
The UniOP panel must have hardware type –0045 or -0050; firmware version number 4.42 or higher is required to support operation with the SCM11 module.

Direct Access is not supported.