Connecting UniOP to Ethernet/IP CIP

This Technical Note contains the information and tips to successfully connect a UniOP operator interface panel to the Rockwell Automation Control Logix 5550 controller equipped with the Ethernet card 1756-ENET. Communication is based on the Ethernet/IP CIP protocol.

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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 mode than one processor module mounted in the same rack. Each rack can have only one Ethernet card.*

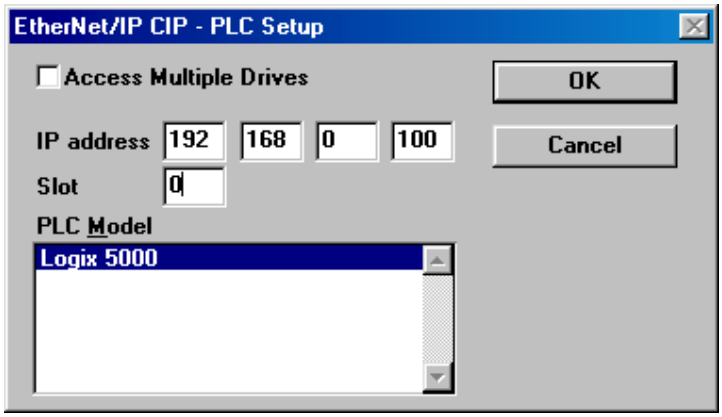

Figure 1

Figure 1 shows the Controller Setup dialog configured for access to only one controller placed in the slot 0 of the rack. The ENET card has the IP address 192.168.0.100.

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.

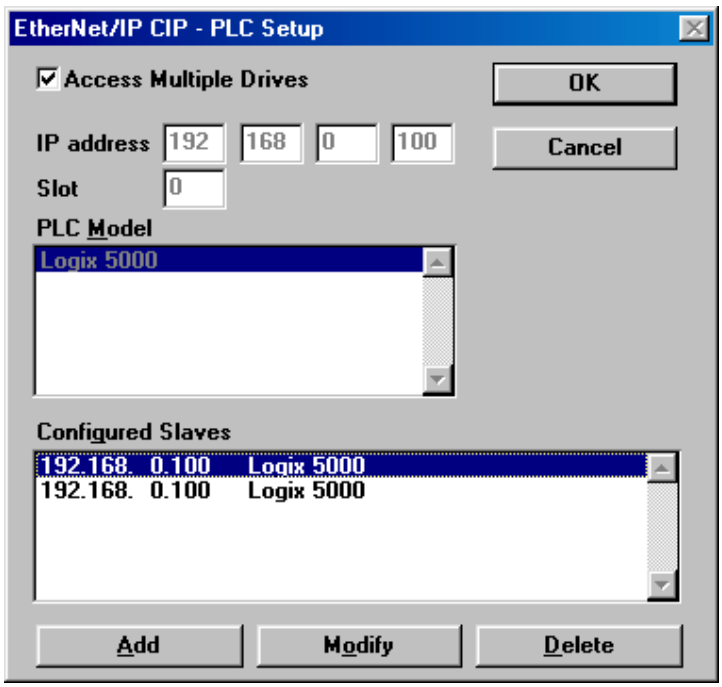

Figure 2

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.

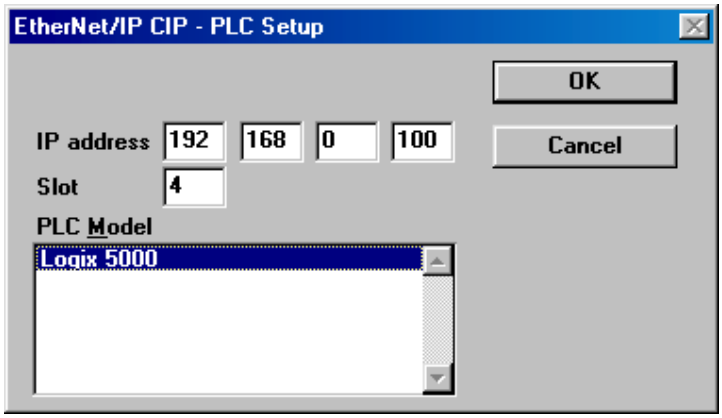

Figure 3

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.

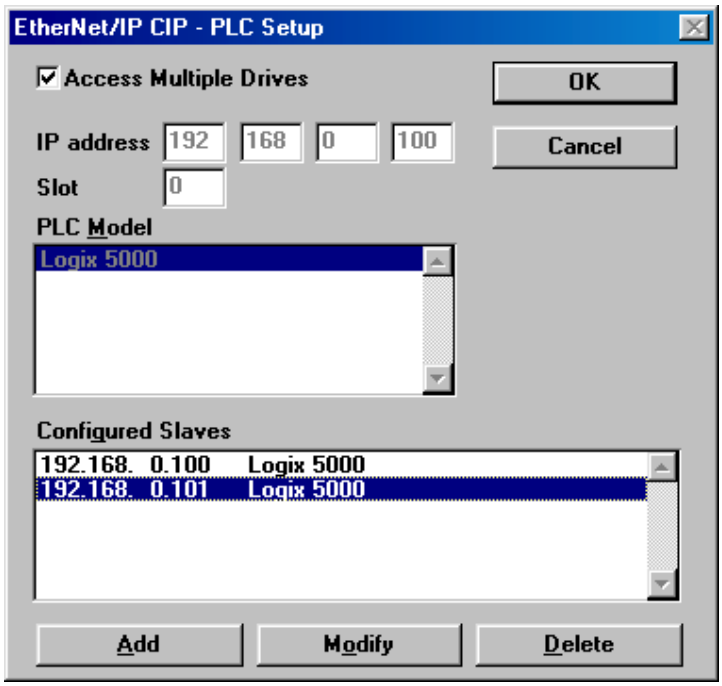

Figure 4

Figure 4 shows the case of a system with two ControlLogix racks, the two ENET cards mounted have IP address respectively 192.168.0.100 and 192.168.0.101.

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.

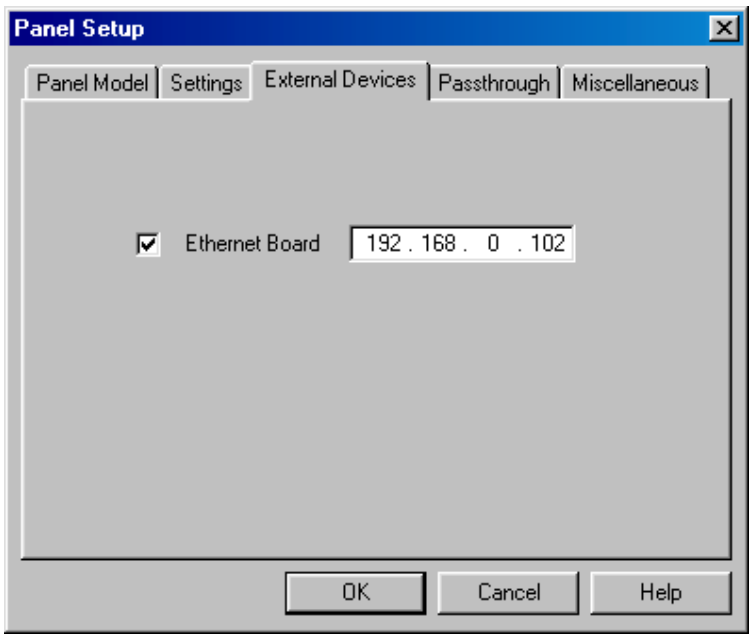

Figure 5

2.3. Controller Tags

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. To do so the Designer software can import the list of tags that has been created by the RSLogix software.

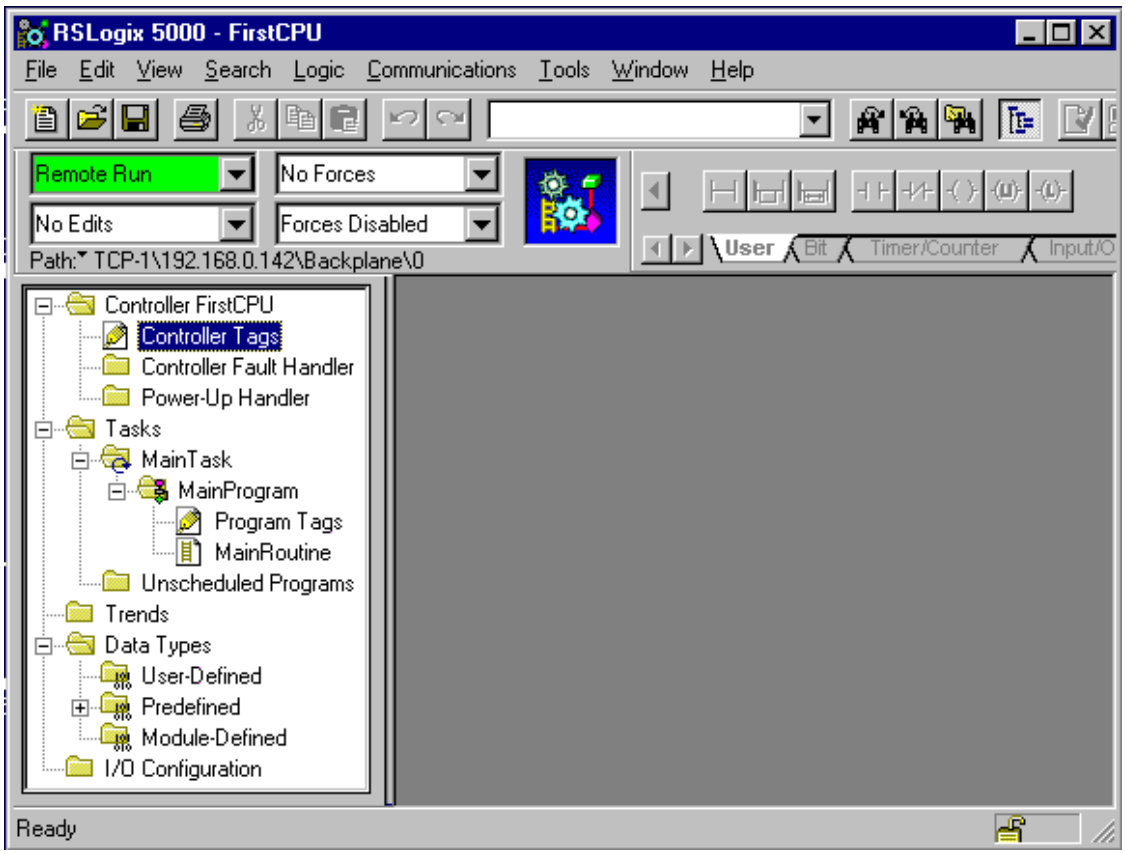

Figure 6

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: *Only “Controller tags” can be imported for use in the Designer project. “Program Tags” are not supported.*

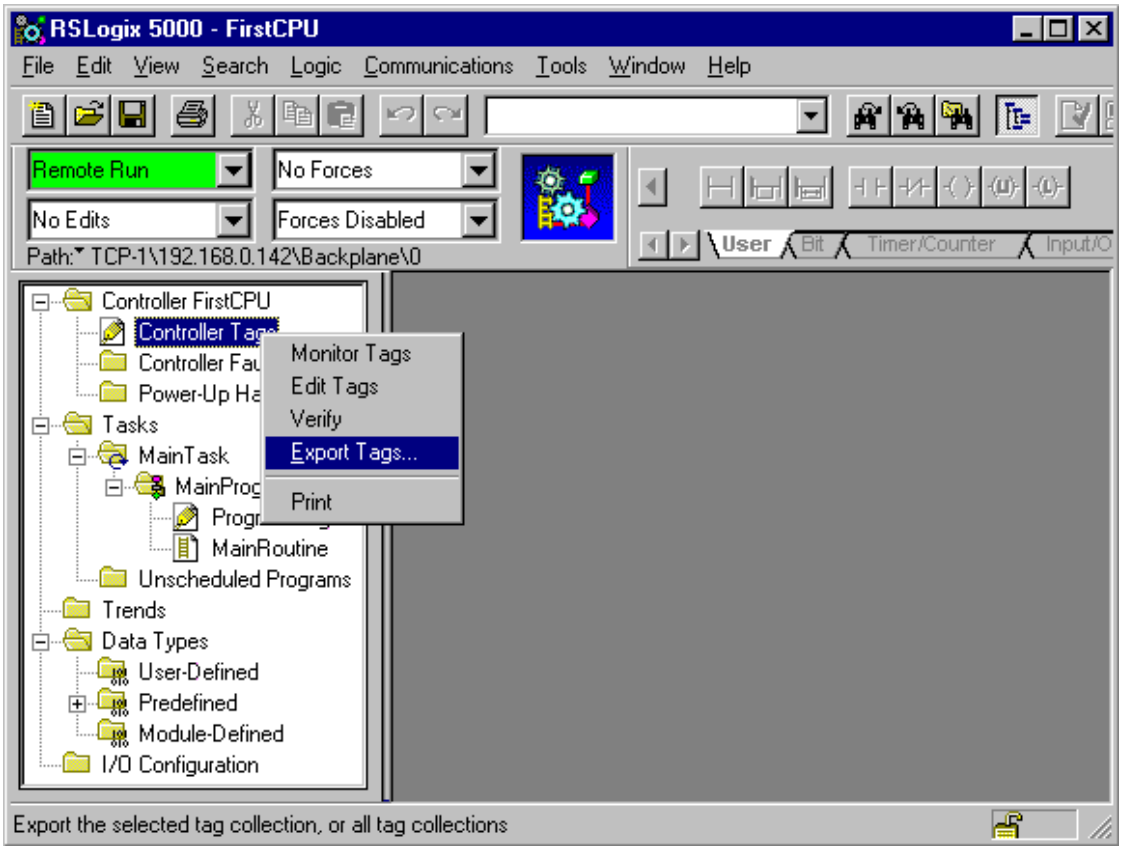

Figure 7

2.3.1. Importing tags in Designer project

The tag file exported from the RSLogix5000 software can be easily imported in Designer.
From the Project menu select “Tag Editor” and then “Import new”. The “List files type:” list box has to be changed to “External Tag file”.
The CSV file can be imported in the Designer Tag Editor.

If only one controller has been configured in the Designer “Controller setup” dialog, the CSV file will be directly imported.

If more than one controller is present in the configuration, Designer needs additional information to properly import the tag file.
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 8 below.

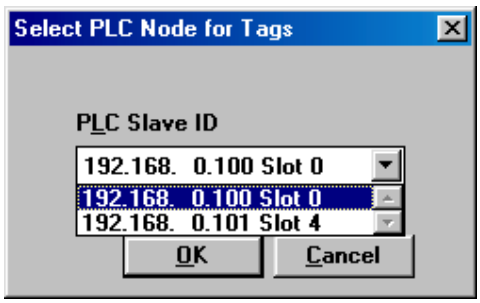

Figure 8

In case the Designer project must be configured to connect to more than one controller, the additional tag files must be imported using the "Import Append" function in Designer Tag Editor.
Figure 9 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 192.168.0.100 and the CPU is mounted in Slot 0; the second rack contains an ENET card with IP address 192.168.0.101 and the CPU is mounted in Slot 4.

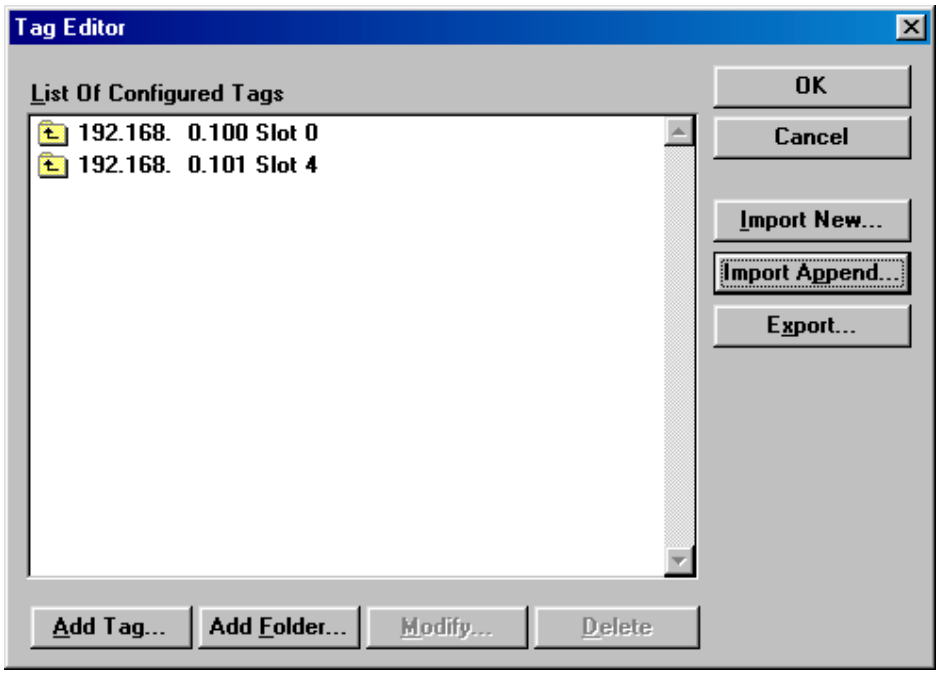

Figure 9

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 10 shows the Define Field dialog box. The "Select Tag" button is available to enter the name of the item.

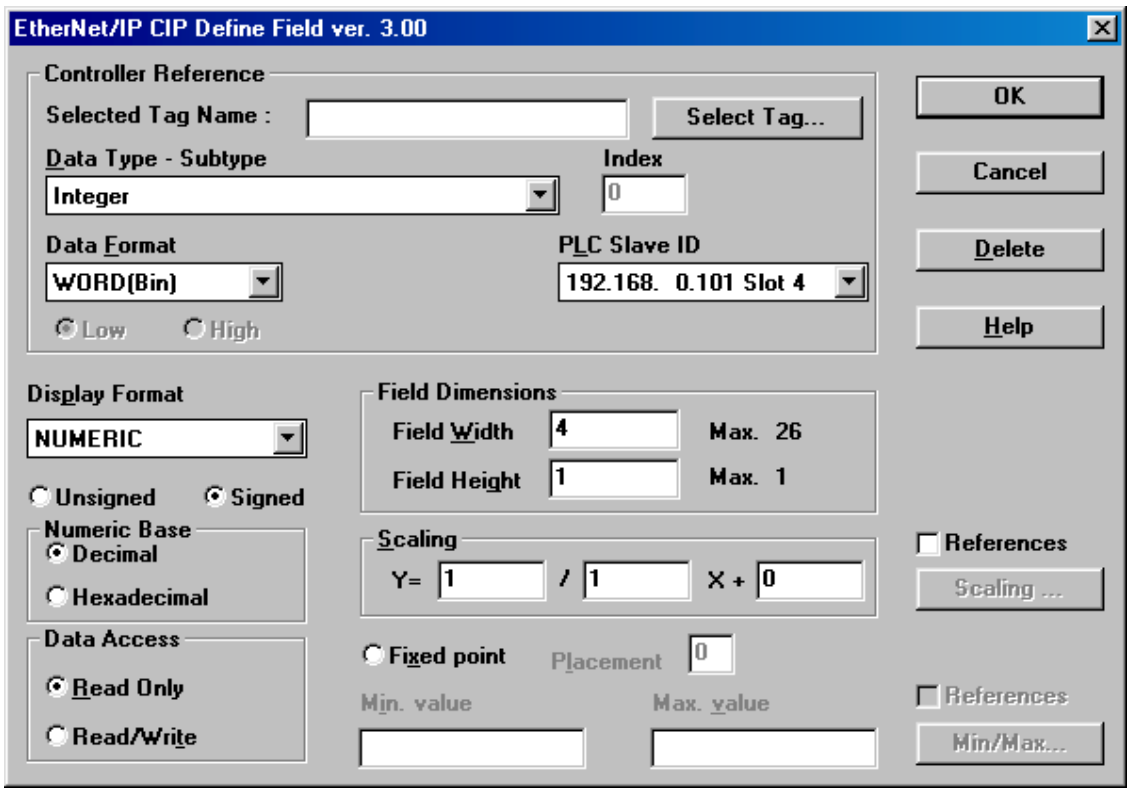

Figure 10

Figure 11 shows the “Tag Selection” dialog box.

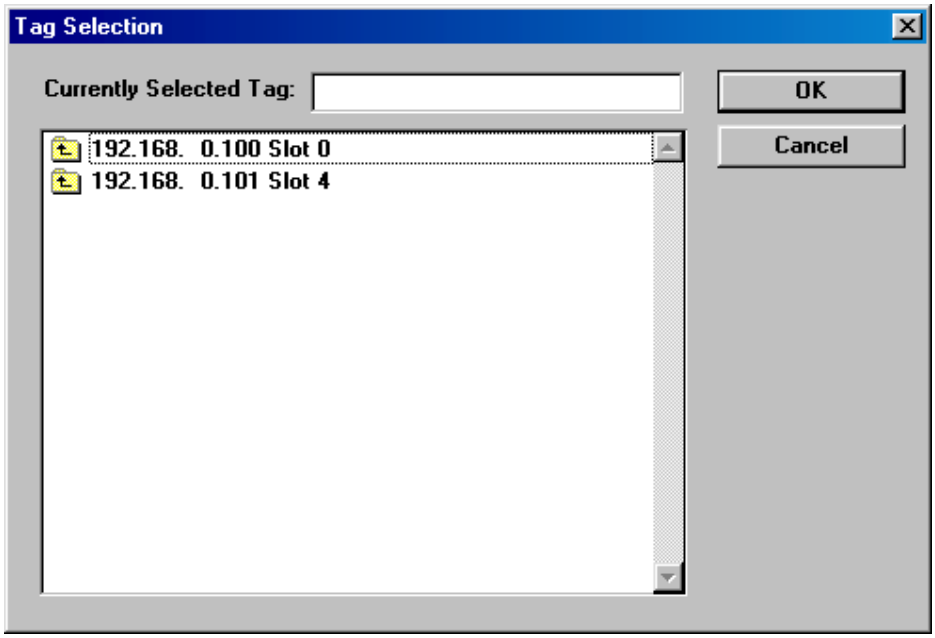

Figure 11

Figure 12 shows the Define field dialog box automatically filled by Designer after a tag item has been selected.

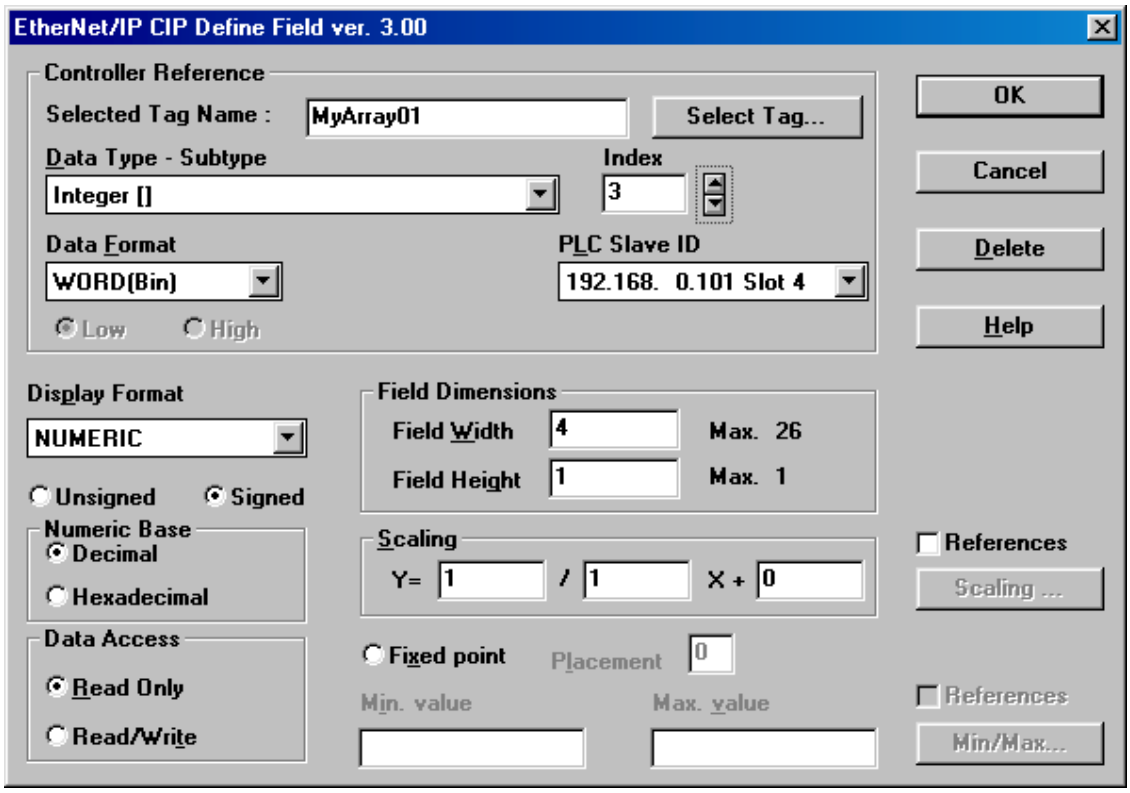

Figure 12

The “PLC Slave ID” list box 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 “Do not download Tags” options available from the Transfer menu following the path Transfer\Option\Advanced Option has to be un-checked. See Figure 13.

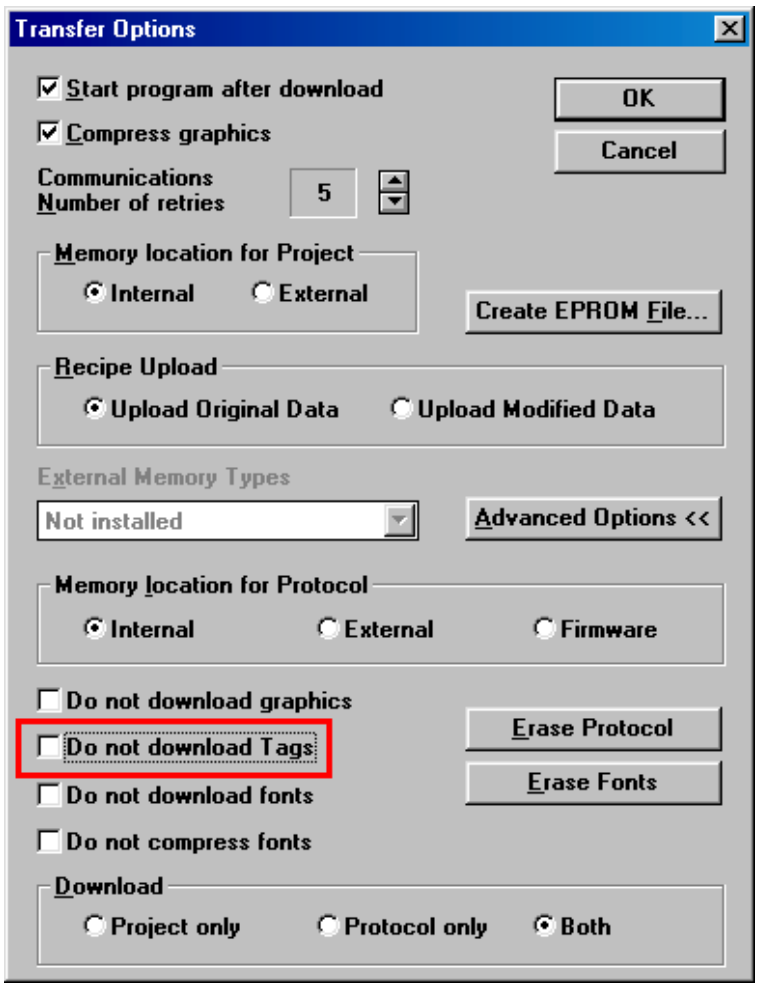
Transfer Options
Start program after download
Compress graphics
OK
Cancel
Communications
Number of retries
5
Memory location for Project
Internal
External
Create EPROM File...
Recipe Upload
Upload Original Data
Upload Modified Data
External Memory Types
Not installed
Advanced Options <<
Memory location for Protocol
Internal
External
Firmware
Do not download graphics
Do not download Tags
Do not download fonts
Do not compress fonts
Erase Protocol
Erase Fonts
Download
Project only
Protocol only
Both

Figure 13

Appendix A. Communication Status Codes

Current communication status is displayed in the System Menu of the UniOP. Beside the string describing current state of the communication, there is an additional error code representing the last (which may be not the current one) error encountered. The codes are following:

00 **No errors**
Normal communication.

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 due for instance :to a disconnected communication cable or tags are 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.