

105U/905U-G-ET1 EtherNet IP & CompactLogix PLC

PURPOSE

The purpose of this document is to provide the reader with an application note for using an Allen Bradley CompactLogix Series PLC communicating EtherNet IP with an Elpro 905U-G-ET1 gateway.

This application should be read in conjunction with user manuals for details on powering and programming 905U-G. The reader would also have a firm understanding of the EtherNet IP protocol available from www.odva.org and programming the AB CompactLogix Series PLC's.

There are 2 ways of exchanging data between the Gateway and PLC. The first is by adding the gateway as a module to the PLC this however only limits you to one Input (Consumed) Instance of 256 words and Output (Produced) Instance of 256 words. The second is by creating a message instruction and tags to view the remaining I/O instances. The 905U-G can handle up to 6 produced and 6 consumed connections simultaneously each of 256 words. This application note shows the 1st of adding the Gateway as a module to the PLC.

MATERIALS

The materials used for this application were,

AB CompactLogix L35E PLC,

RSLogix5000 & RSView programming software,

905U-G-ET1,

EDS File for 905U-G,

E-Series Configuration utility,

RS232 DB9 serial cable,

RJ45 Ethernet cables and Network Hub (depending on connection crossover cables may be needed)

905U-G CONFIGURATION

Under Ethernet Settings the modules IP address needs to be set. If going through a network, then this address will need to be entered also under Gateway address. Ensure the Enable Ethernet/IP checkbox has been enabled and Enable Modbus Server has been disabled.

To exchange data between the 905U-G and PLC a series of Fieldbus Configurations that link the I/O registers of the Gateway to the Fieldbus (PLC) need to be made. For this example, the local onboard Digital I/O will be written to (Regs 4300, 4301) and read from (Regs 4324, 4325) the PLC. The configuration below shows the 2 Fieldbus mappings to Input Instance 1 and Output Instance 1.

E-Series Configuration Utility
File View Utilities Unit Options Help

ET1 Application note

- Units
 - EtherNet IP Gateway
 - Mappings
 - Block Mappings
 - Fieldbus Config
 - Sensitivities
 - Ethernet Settings**
 - UpdateTimes
 - Comm's Fail Times

Ethernet Options:

IP Address: 192 • 168 • 0 • 191

Subnet Mask: 255 • 255 • 255 • 0

Gateway Address: 192 • 168 • 0 • 1

Enable Switch Address:

Enable Ethernet Debug:

Connect Timeout (sec): 75

Modbus TCP Options:

Enable Modbus Server:

Connect Timeout (sec): 60

Ethernet Industrial Protocol (Ethernet/IP):

Enable Ethernet/IP:

Web Options:

Enable Admin Mode:

Enable HTTP Server:

Enable FTP Server:

Enable Virtual File System:

Enable Telnet Server:

Enable DHCP/BootP:

Debug Port: 16384

SMTP Server: 255 • 255 • 255 • 255

Network Debug Options:

Settings Program Unit

Debug I/O Reg's Load Unit

Monitor Comms ModbusTCP Debug

Loopback Test

E-Series Configuration Utility
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ET1 Application note

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Fieldbus Options:

Status Location: 4500

..... Disable

Address Mode:

Byte (8 bits)

Word (16 bits)

... Modbus TCP

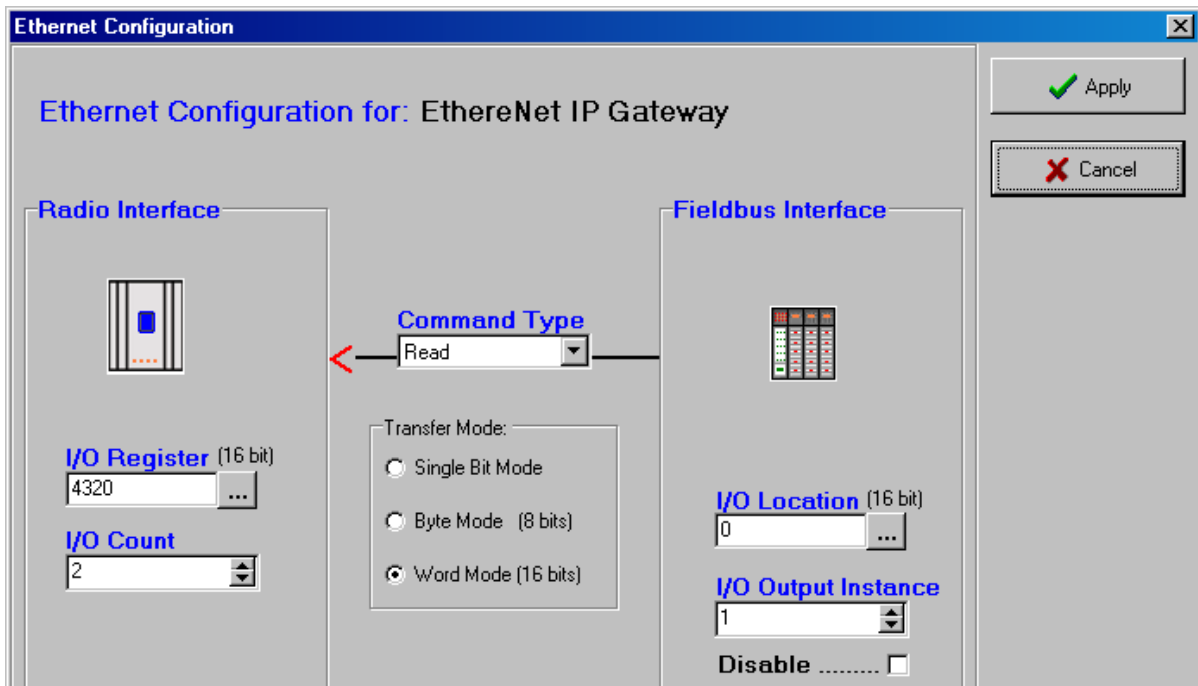
View Raw Config

New Fieldbus Mapping

Edit Fieldbus Mapping

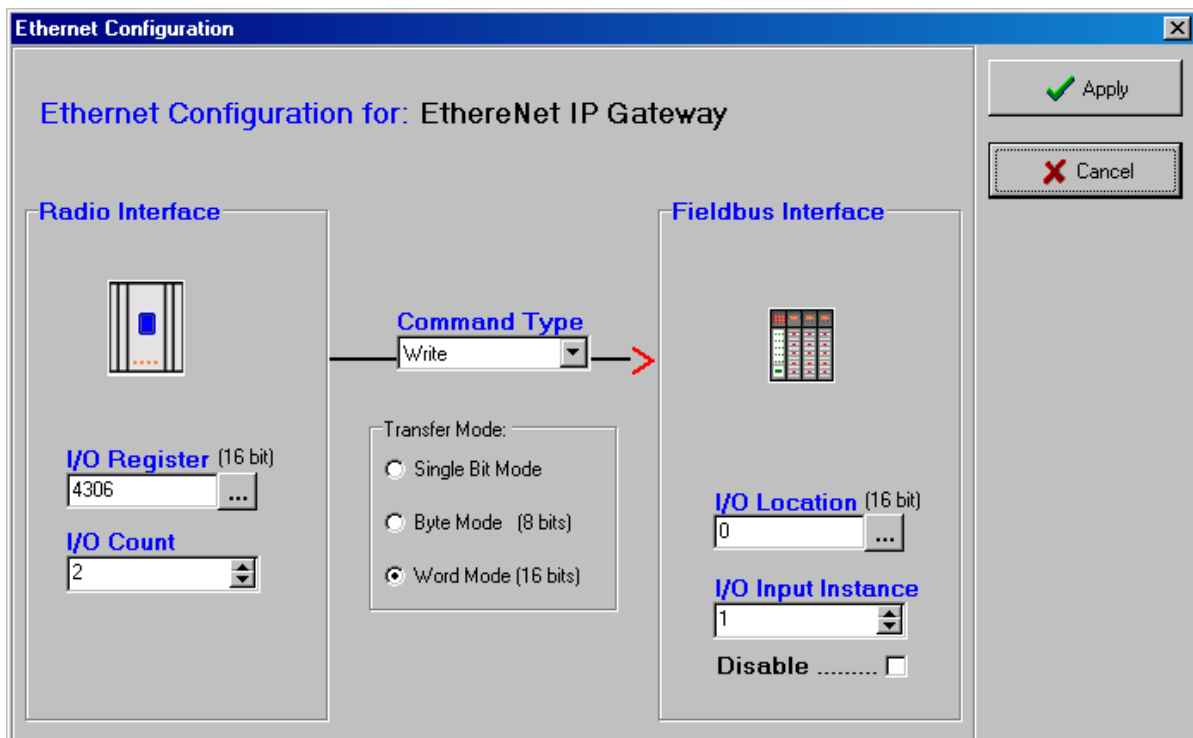
Delete Fieldbus Mapping

	I/O Reg	Fieldbus Lcn	I/O Count	Cmd Type	BIT Offset	I/O Instance
↕	I/O Reg 4306	0	2	Write WORD	N/A	1
↕	I/O Reg 4320	0	2	Read WORD	N/A	1



The above example shows a Command Type Read from the Fieldbus Interface to the Gateway. This will come from the PLC's output tags.

The next Command Type Write mapping below is to the Fieldbus Interface in which the PLC will read this value and store in its Input tags.

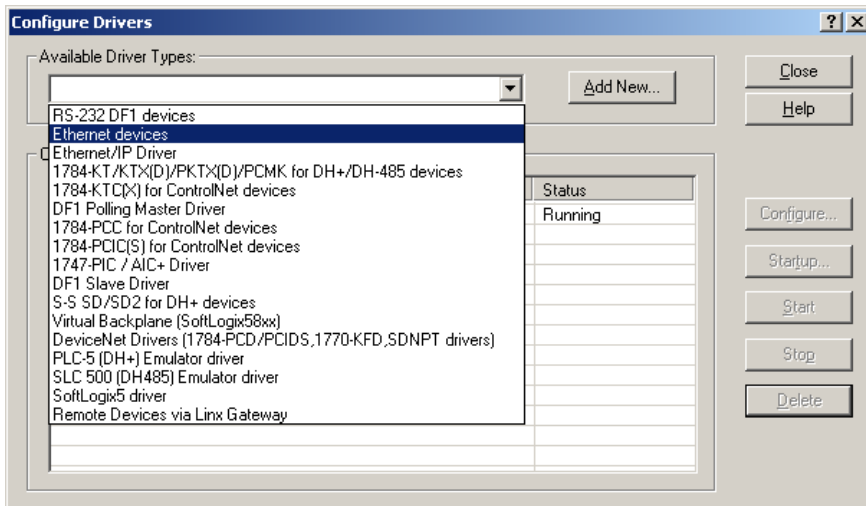
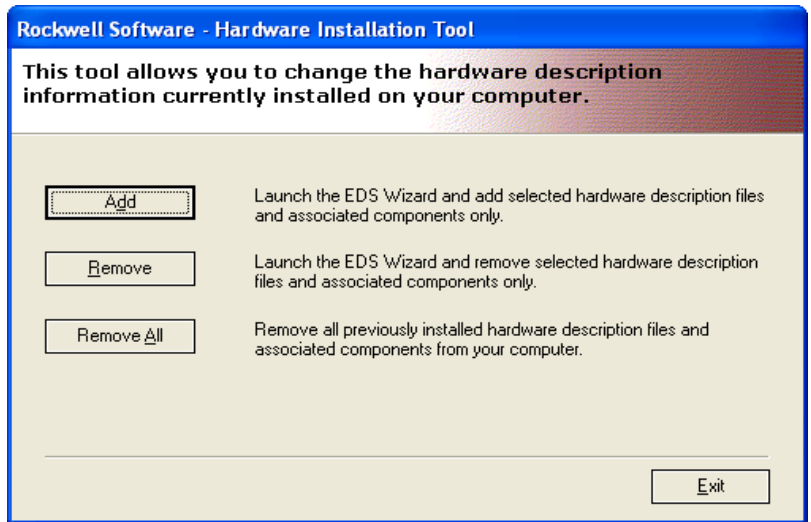


Once mappings are complete configuration will need to be downloaded to module via RS232 cable as per manual.

PLC CONFIGURATION

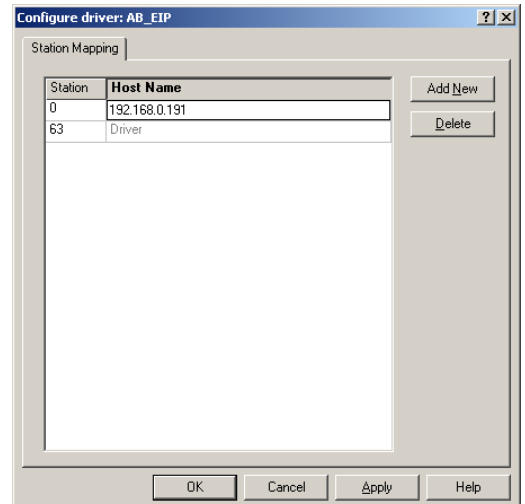
The EDS file for the 905U-G needs to be loaded into RSLinx via the RSLinx tools EDS file Hardware Wizard.

This will give the PLC the parameters of the EtherNet/IP interface of the 905UG. This file is found on the product CD which came with module or from Elpro WEB Site. Select Add and find location of File, Select register it as a single file. Once loaded it will give a result if it was loaded correctly or not.

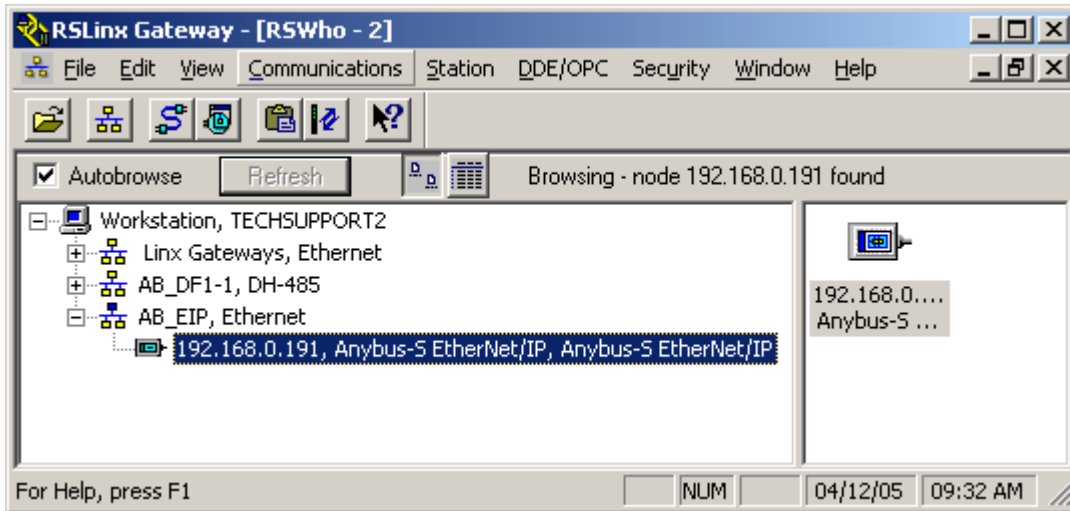


Once the EDS file has been loaded open up in RSLinx you will need to configure a driver. Select “Ethernet Device”

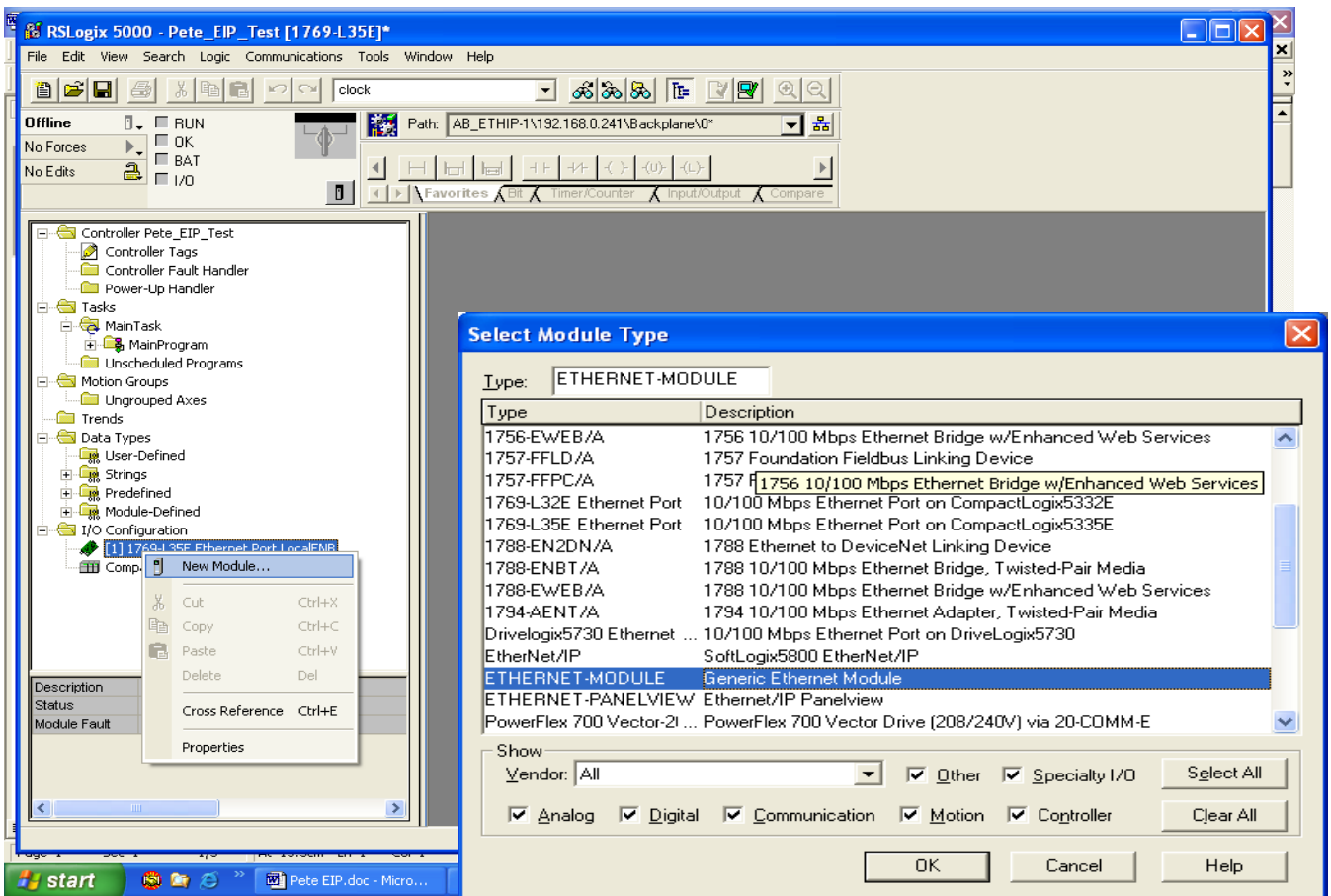
You will then need to assign an IP address to the configured driver



Once the EDS file has been loaded open up into RSLinx, expand the workstation as shown below to locate the 905U-G. The 905U-G will be identified in RSLinx as an Anybus-S EtherNet/IP device.

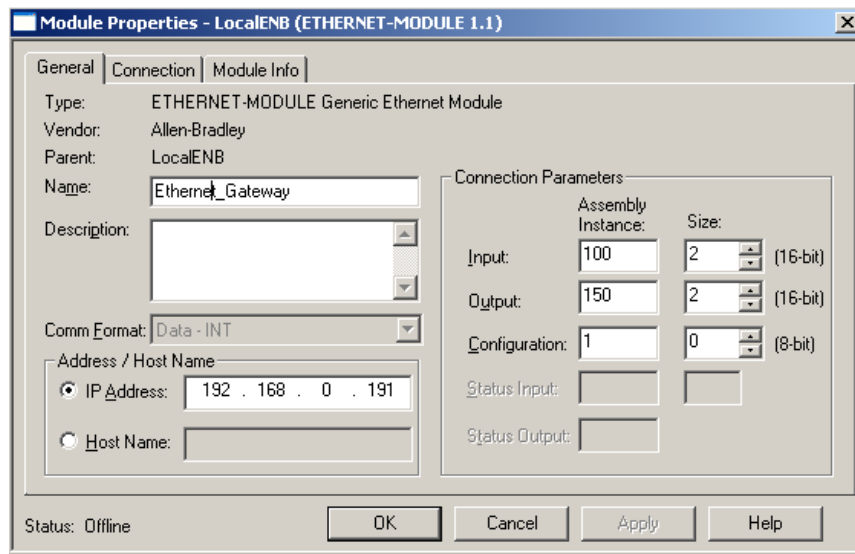


Open RS Logix and create a new project file, under the I/O configuration where the PLC Ethernet port is identified right click on this and add a new module. From the available list select Generic Ethernet module



This now makes the 905U-G EtherNet/IP connection available to the PLC. The Parameters of the 905U-G must be entered in the Module properties

The IP address is the same as the IP address used in the E-series Configuration utility.



The Comm Format and connection parameters must be closely looked at and values entered in respect to the Fieldbus Configuration made earlier.

The Comm Format will select the size of register for the Connection Parameters. Data -INT is a 16-bit register, which is the same size as the 905U-G registers.

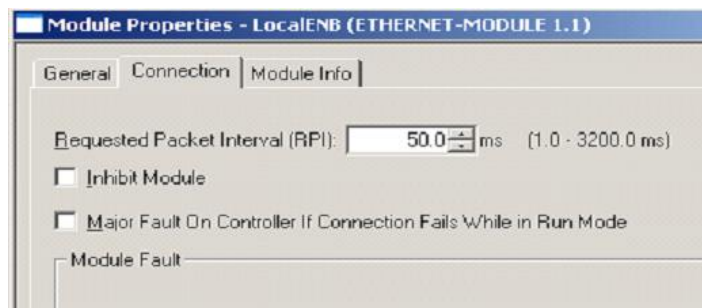
For the Connection Parameters you have to assign which Input Instance and Output Instance you want to read and write from the 905U-G. The Input Assembly Instance 100 is Input Instance 1 on the 905U-G and Output Assembly Instance 150 is Output Instance 1 on 905U-G.

NOTE: The size of Registers that you will be transferring has to be equal to or less than the amount in the Fieldbus configuration otherwise an error will occur as the PLC will be trying to read or write from a location that does not exist on the 905U-G.

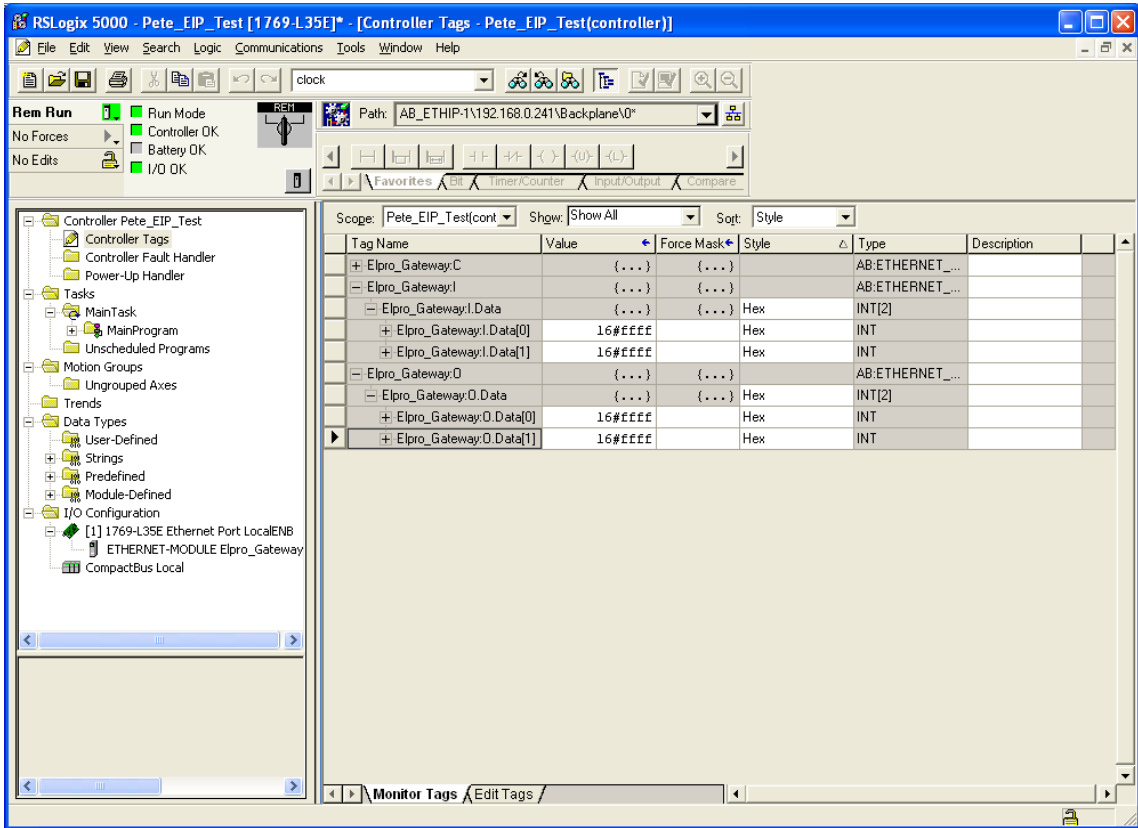
In the Fieldbus Config of the 905U-G, 2 words are being transferred to the Input area and 2 words to the output area so the size for the input & output in this configuration will be 2 with a Comm Format Data - INT

For Configuration Parameter this is not supported with the 905U-G however a value must be entered to proceed with configuration.

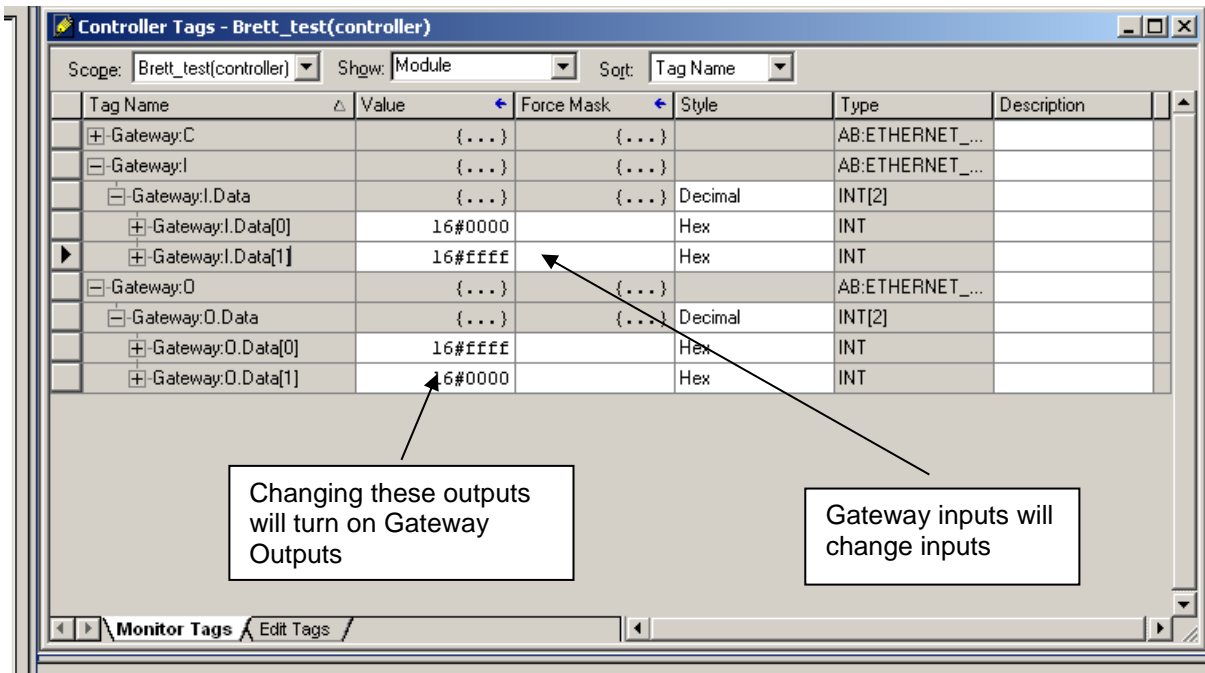
Select next and enter in the RPI time of 50ms then finish. This is the time interval that the PLC will request data from the Gateway module and will need to be adjusted to suit the application noting that network traffic may be increased due to fast packet interval time.



RS Logix now has the 905U-G setup in the current project, which will be seen under I/O configuration in PLC project. To view and write data to the 905U-G first download project to PLC and then select Controller Tags from top of project tree.

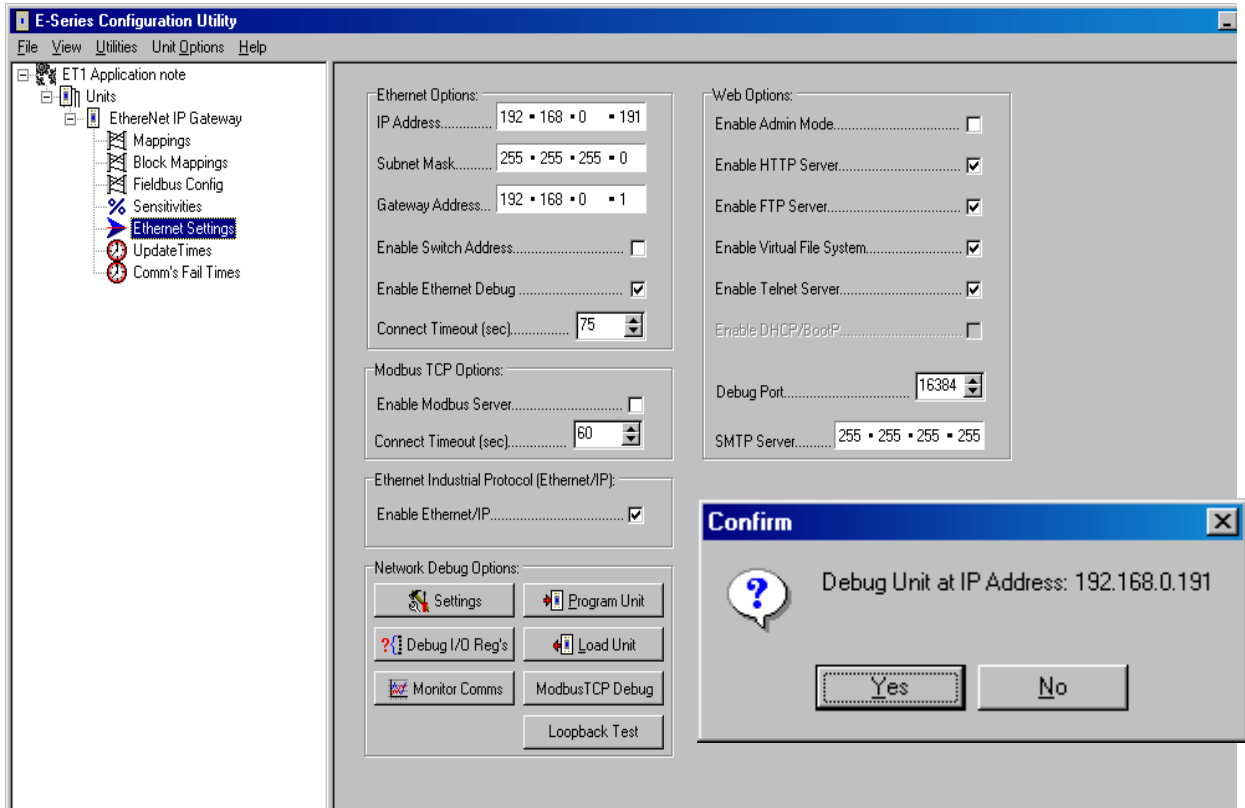


To view the inputs to PLC expand "I & O" data fields, select style to Hex and expand again to see the 2 words. The "I" data Tag will show values when the local DIO 1 and DIO 2 have been turned on from the Gateway.



If a value is entered in the O data Tag this will be sent to the 905U-G. A value of FFFF will turn on one of the local Digital outputs as configured in the E-Series Fieldbus Config.

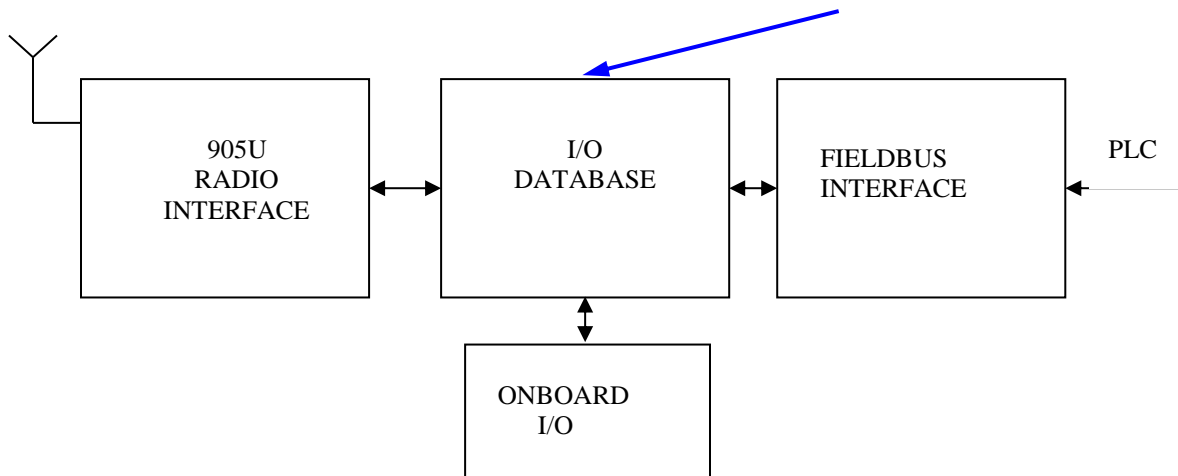
You can view the current values in the Elpro registers by using online diagnostics over an Ethernet Connection to debug any problems



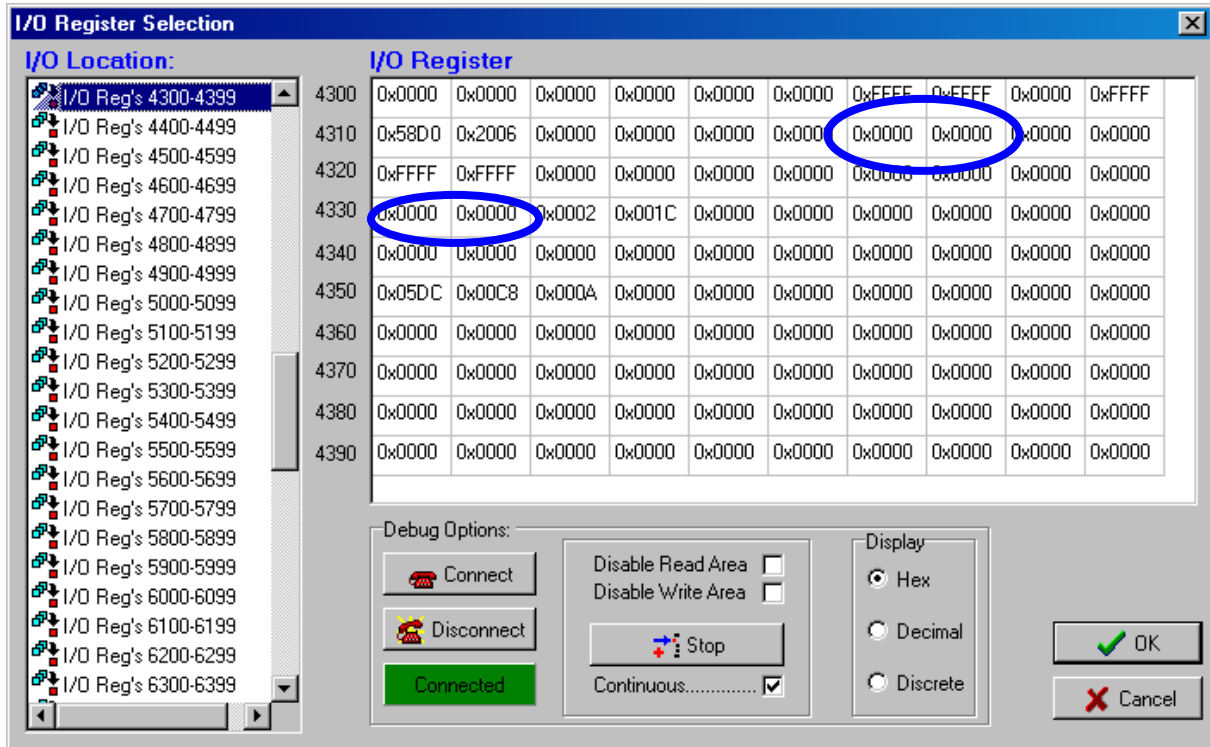
Select Ethernet Settings in Configuration Program, Select Debug I/O Regs and confirm that you want to debug the I/O registers at IP address.

Once in the register Selection screen select Connect and ensure you have the Green connected box below to indicate you have a valid Ethernet connection to the 905U-G from the Software. From the I/O location bar on the left-hand side scroll down to I/O reg's 4300-4399. Check the continuous check box and select read.

The E-series configuration will now continuously scan the I/O Database in the 905U-G.



Registers 4306 and 4307 are Digital inputs 7 & 8 configured to be sent to the PLC. If you had made these inputs, then a value of 0xFFFF will be seen indicating the module has received the message and sent to the Fieldbus area. This would then be seen on the PLC as a Input. If input is not seen on PLC, the Fieldbus configuration would need to be checked to confirm you have a config of a write command from this register to the Fieldbus Interface. If this is correct, then in RS Logix when setting up the 905U-G confirm that the correct amount of Inputs was configured for that Instance & Comm Format is correct.



From the PLC if you entered in a value to turn the Digital Outputs on and from above application FFFF was used you would see these values in registers 4320 & 4321. The DI/O LEDs 1 & 2 would also be lit on the 905U-G. If you had made a Change of state message on PLC and was not seen in these registers, then the Fieldbus configuration would need to be checked to confirm you have a config of a read command from Fieldbus Interface to these 3 registers. If this is correct, then in RS Logix when setting up the 905U-G confirm that the correct amount of Outputs was configured for that Instance.

You will see values in other registers these are internal status of the 905U-G e.g. Low Battery Volts Reg 4308, Supply Volts Reg 4309, Batt Volts Reg 4310 &, System Clock Reg 4330 - 4333.



The Disable Read Area and Disable Write Area are used when diagnostics are needed for configurations over the radio network.

If you can read values from the slave device but are not able to get them sent to the correct destination or you believe values are incorrect you can select Disable Read Area. This will stop the PLC overwriting values from the Fieldbus Interface into the I/O database so you can then double click on a register location that is being mapped over the radio network enter in a value and check it at the destination module to confirm correct location and value. Once this has been confirmed ensure that the Disable Read Area has been deselected.

If you want to do local diagnostics to view values coming in from the radio network without sending value to the PLC and you cannot disconnect the Ethernet cable due to creating a possible Bus Failure for other devices on the network, you can select Disable Write Area. This will stop any values being written to the Fieldbus and onto the PLC. Once this testing is completed ensure that the Disable Write Area has been deselected.

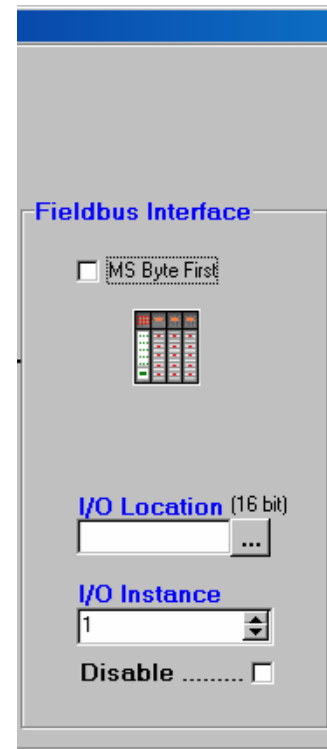
Note: This application note is using the local Digital Inputs for testing the communications. A digital input is either On or Off and depending on the format you read it as in the PLC i.e. Hex, Discrete or Decimal it will always be the same for on (FFFF, 1, 65535) and off (0000, 0, 0). When transferring Integer values such as for level, pressure and temp then values will always be different. The 905U-G uses a Motorola Brand Processor and Allen Bradley PLC's use Intel processors. The common problem between these 2 types of Processors is that the byte order is swapped around. This is called Big Endean Little Endean. For example, if the value of ABCD was stored in the 905U-G this would be shown as CDAB in the PLC tag database.

There are ways of correcting this depending on the Firmware version of the Gateway which can be found from the module serial number located on the underside of the module. The firmware version is written in digits 5 through 7 of the serial number, so a module with serial number 04051709468 has firmware version 1.70

For Firmware versions 1.70 or higher.

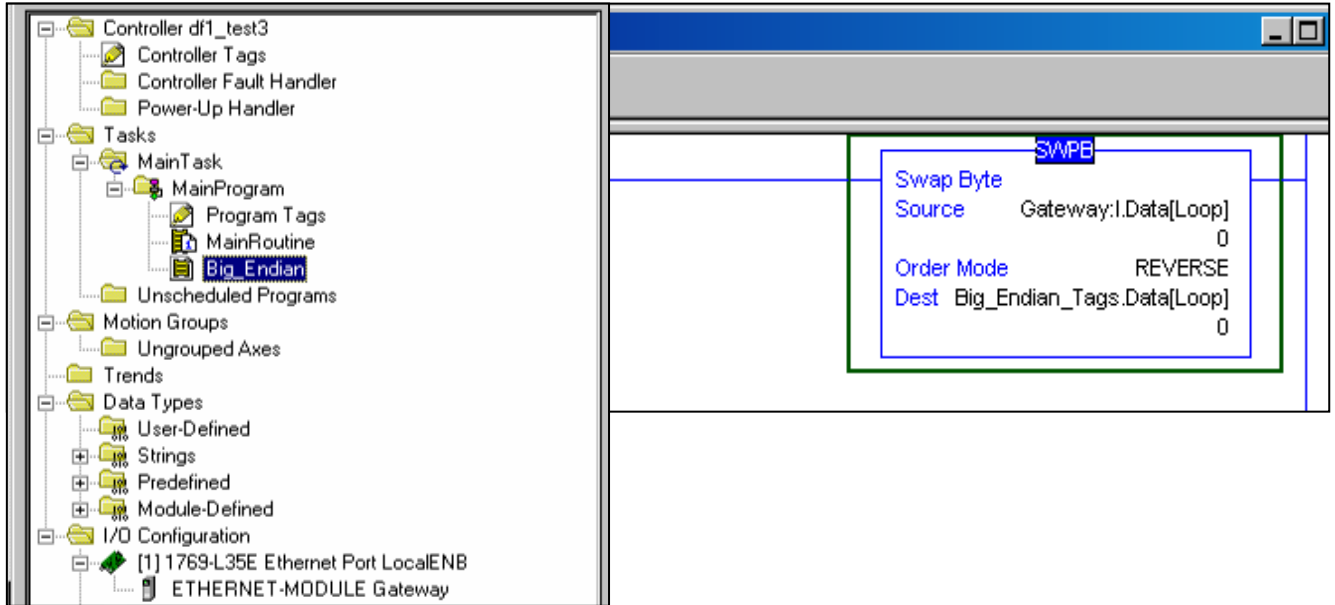
When creating a Fieldbus Mapping you can select How you want the byte order to be. You can have it swapped in the configuration software so the PLC will see the correct value or leave it as it is and use the PLC logic to do a Swap Byte function.

If using the Configuration software when you create a Fieldbus Config mapping, ensure that you have the MS Byte First Check box un-checked. This way the actual byte order will be swapped around



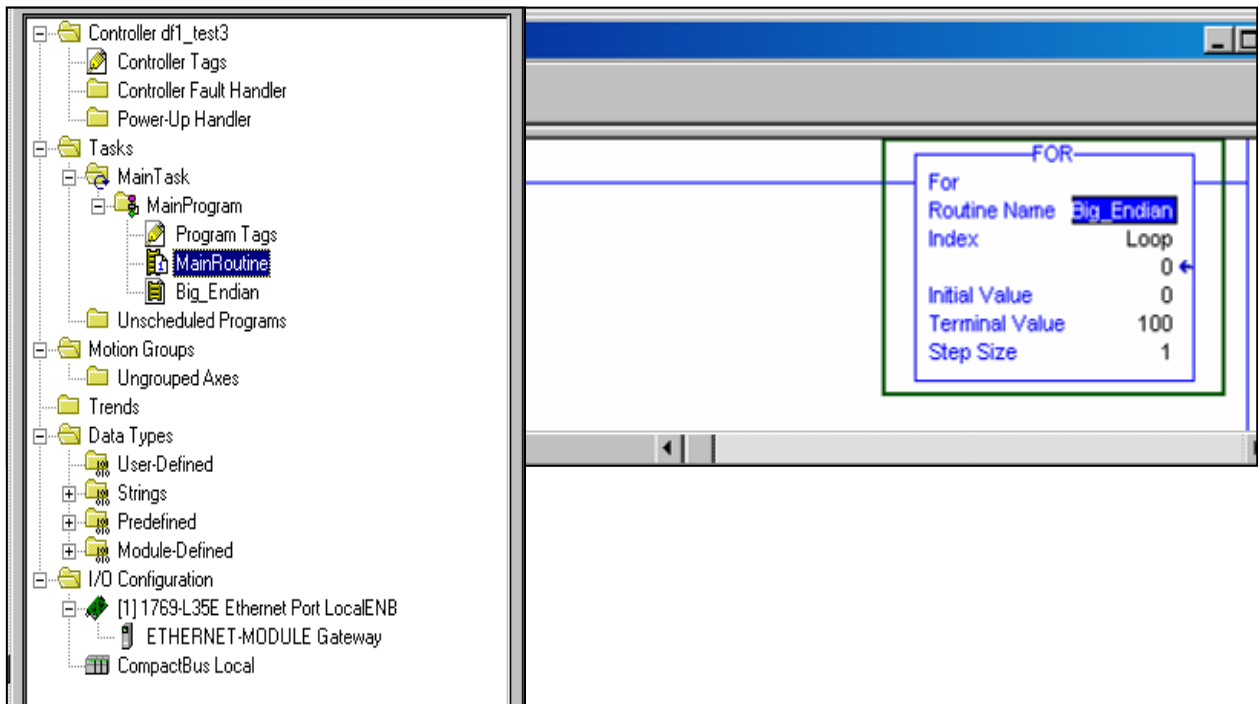
For Firmware versions below 1.70.

For all other firmware versions this must be done in the PLC configuration. In RS Logix 5000 there is an instruction called Swap Byte (SWPB) found under the Move/Logical heading. Which reads the input values does the swap byte order and places them into a new tag destination.

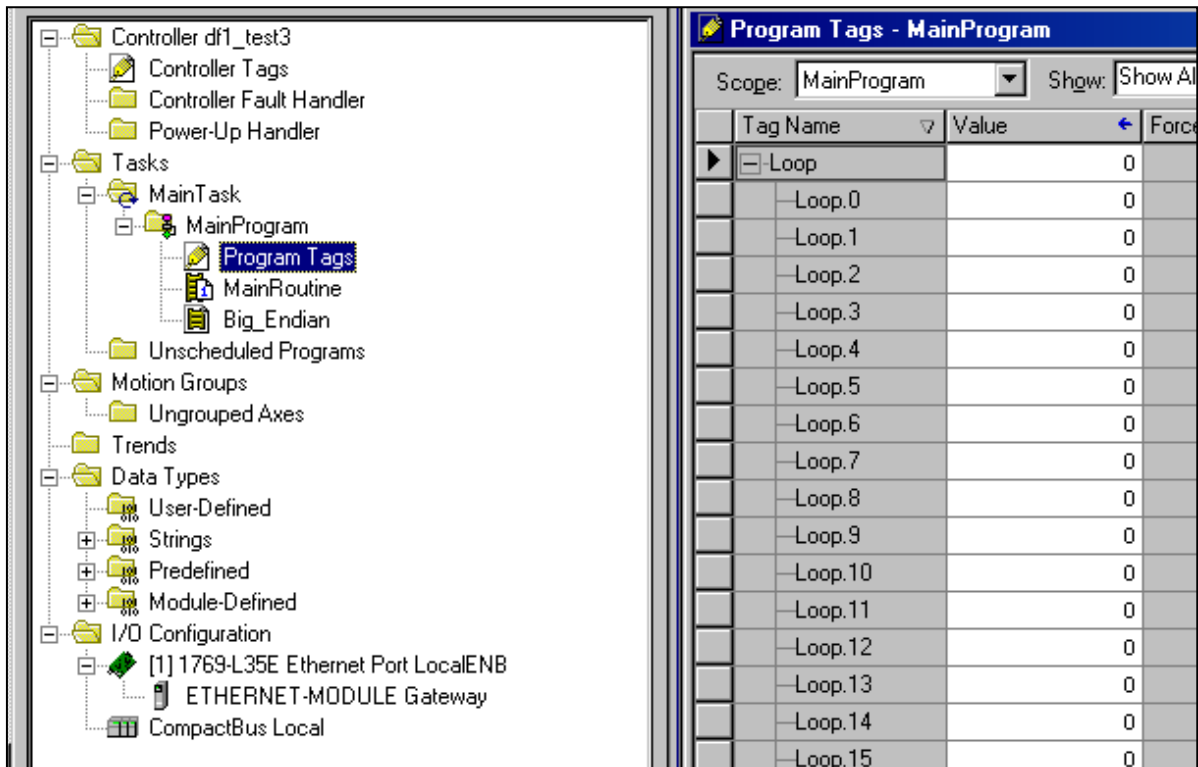


If a large amount of words are being transferred then instead of doing this function for each word

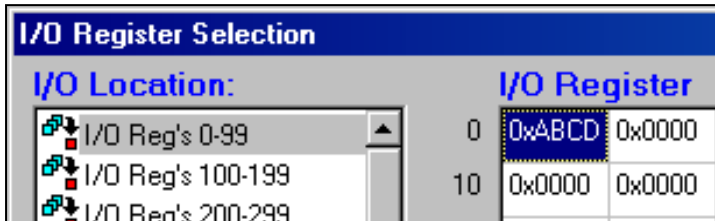
You can create a FOR instruction which will execute a routine repeatedly. This example has the routine of Big-Endian being looped for a list of 100 I/O points under the Terminal Value section. If transferring 200 I/O points, then you would put a value of 200 or higher in this section. The above routine is Big Endian which is the Swap Byte instruction.



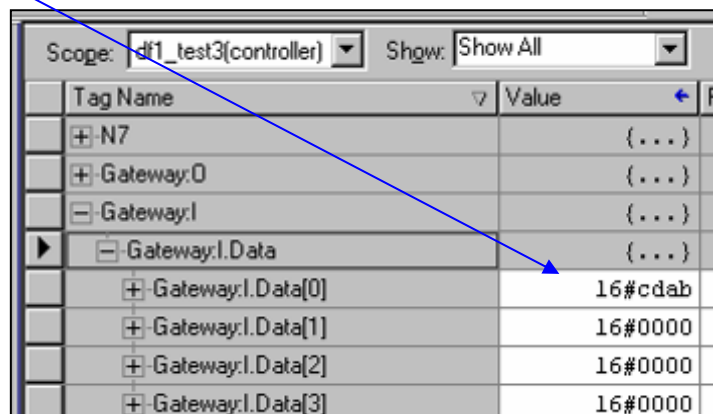
The index of Loop from above is a program tag set up in the main program under tasks.



Example below shows a value of hex ABCD entered into the Gateway register 0



This is read into the PLC as CDAB



After the Swap Byte Order routine is complete the corrected value is placed into the destination Tag.

Tag Name	Value
+ N7	{...}
+ Gateway:O	{...}
+ Gateway:I	{...}
+ Gateway:C	{...}
- Big_Endian_Tags	{...}
- Big_Endian_Tags.Data	{...}
+ Big_Endian_Tags.Data[0]	16#abcd
+ Big_Endian_Tags.Data[1]	16#0000
+ Big_Endian_Tags.Data[2]	16#0000

Amendment Register:

Issue No.	Date	Details of Amendment
1.0	01-03-05	Draft Issue
1.1	10-05-05	Minor changes
1.2	18-05-05	Diagnostics Added
1.3	04-07-05	Adjusted for new build of Configuration Software
1.4	12-04-06	Combined 105U & 905U into one file, Minor Changes
1.5	11-02-19	Elpro Branding