

105U/905U-G-ET1 Modbus TCP & OPC Server

PURPOSE

The purpose of this document is to provide the reader with an application note for setting up an OPC Server, (KEPServer Enterprise) communicating Modbus TCP with an Elpro 105/905U-G-ET1 gateway.

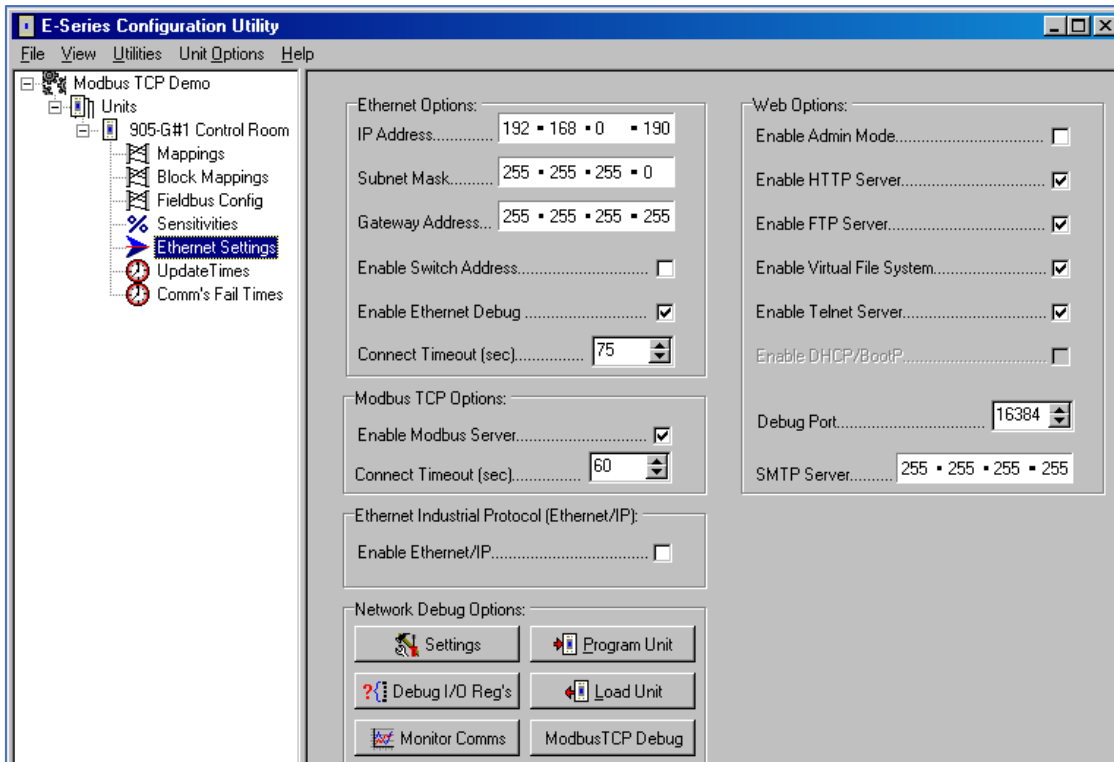
This application should be read in conjunction with user manuals for details on powering and programming 105/905U-G. The reader would also have a firm understanding of the Modbus TCP protocol and programming the Kelpwares KEPServer OPC Server.

MATERIALS

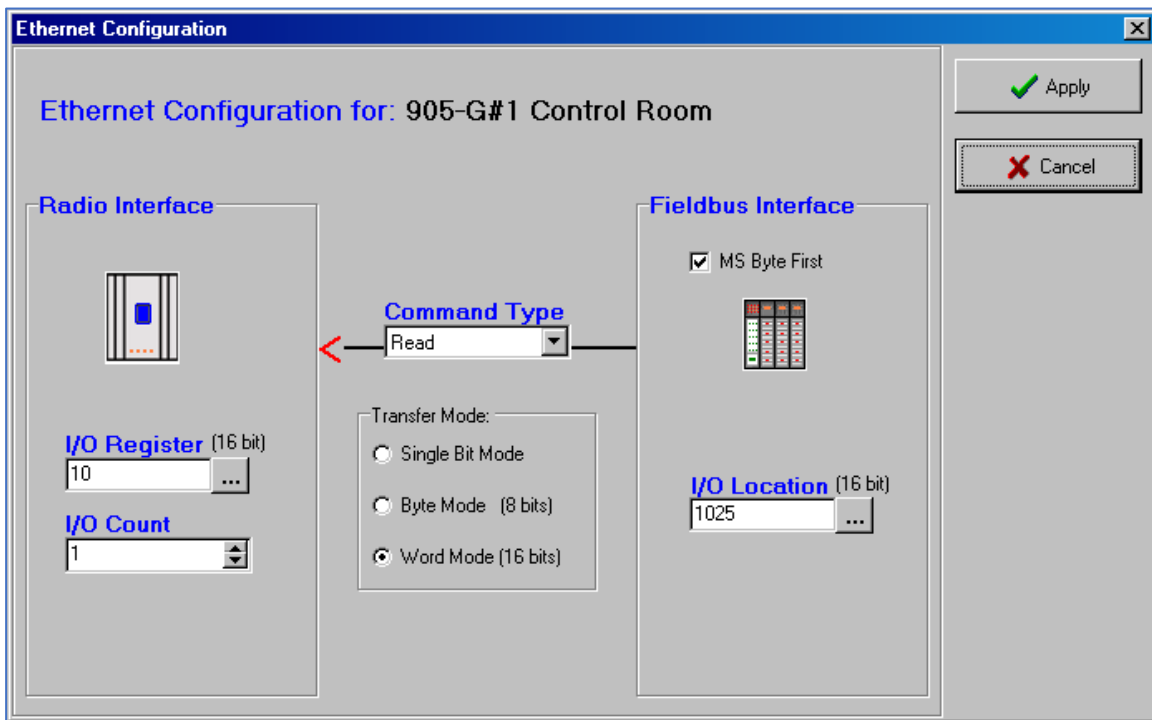
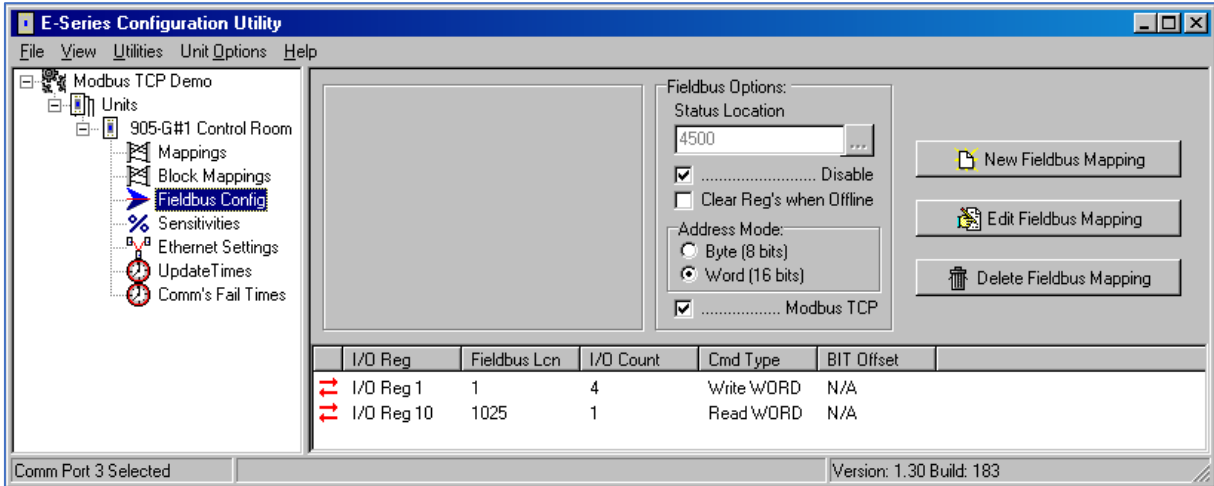
Keeware KEPServer OPC Server Software,
 105/905U-G-ET1,
 E-Series Configuration utility,
 RS232 DB9 serial cable,
 RJ45 Ethernet cables and Network Hub (depending on connection crossover cables may be needed)

105/905U-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 Disabled and Enable Modbus Server has been enabled.

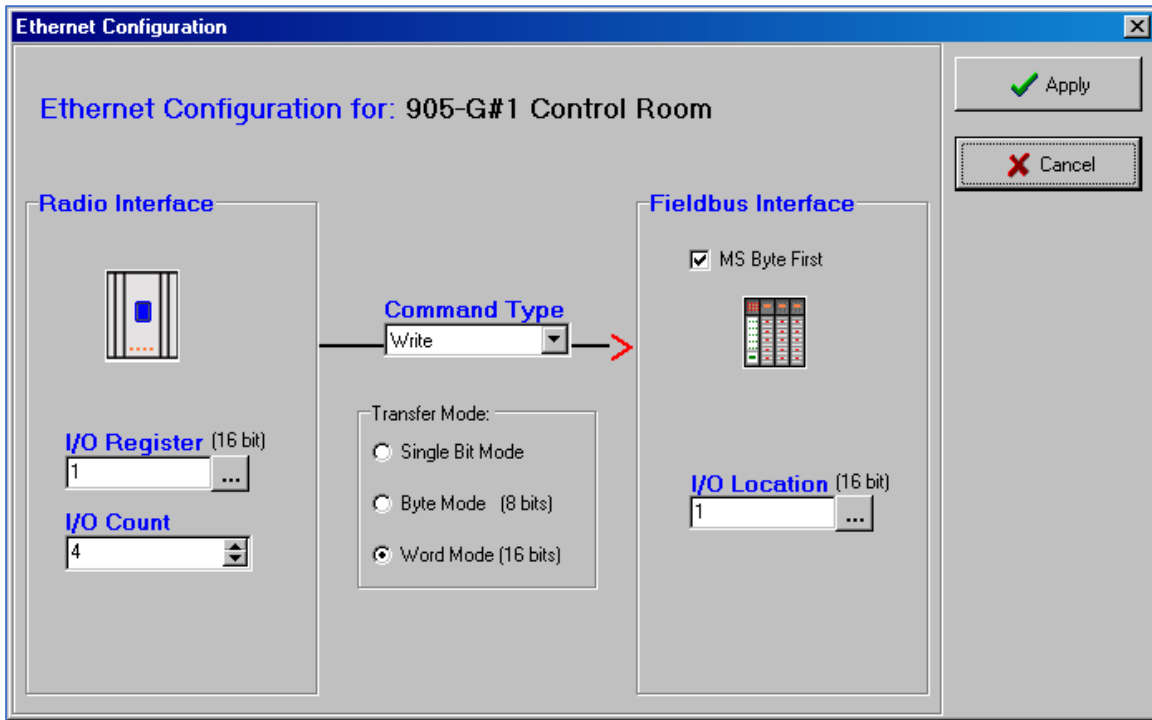


To exchange data between the 105/905U-G and an OPC Server a series of Fieldbus Configurations that link the I/O registers of the Gateway to the Fieldbus need to be made. In the example below Regs 1,2,3,4 are being written across to Fieldbus location 1,2,3,4. Also Fieldbus location 1025 is being read into Reg 10.



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

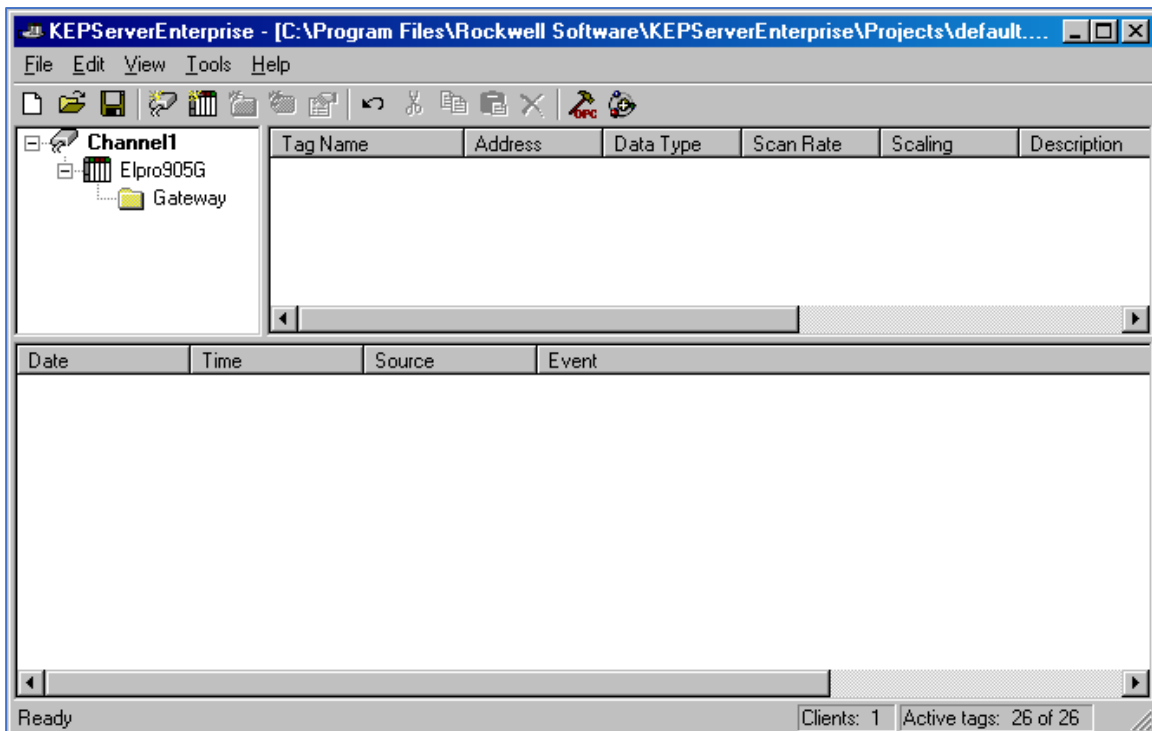
The next Command Type Write mapping below is to the Fieldbus Interface in which the OPC Server will read this value and store in its Input tags.



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

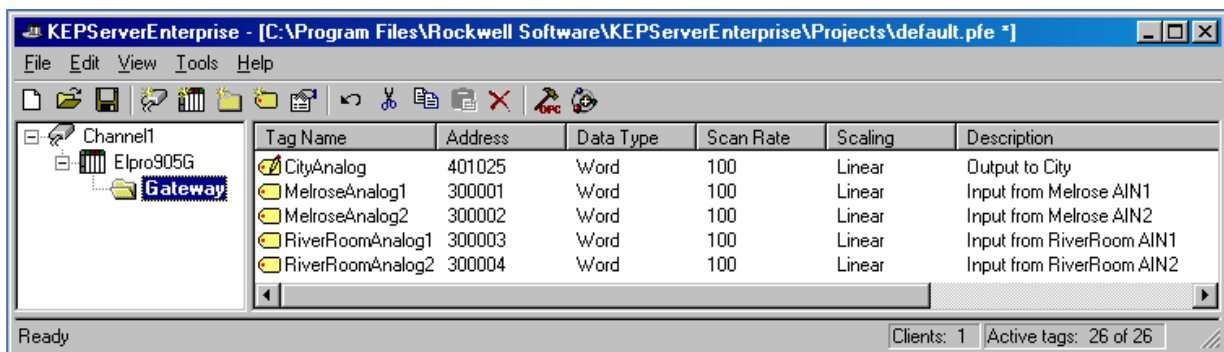
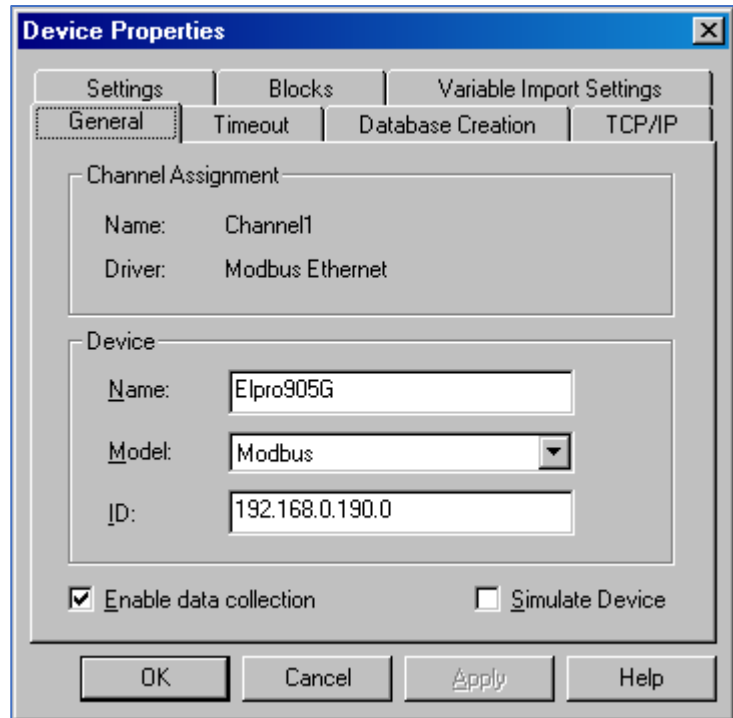
OPC SERVER CONFIGURATION

The OPC Server software now needs to be setup.



Create a new Channel and add the following

- Name – Any name you want
- Model – Select Modbus
- IP address – Must be the same as the one configured in the 105/905U-G-ET1
- Timeout times -Default. Connect timeout = 3, Request Timeout = 1000, Fail after = 3.
- TCP/IP port - 502.



When this is done you can setup appropriate tags for the I/O.

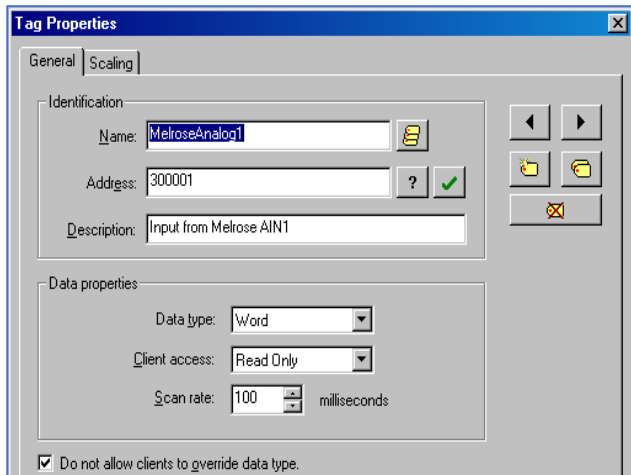
In this example I have setup 4 Modbus Read Word Tags starting at Modbus address 30001 tags and 1 Modbus Write word Tag at address 41025.

The Modbus Command is made up of a Command and a Modbus Address.

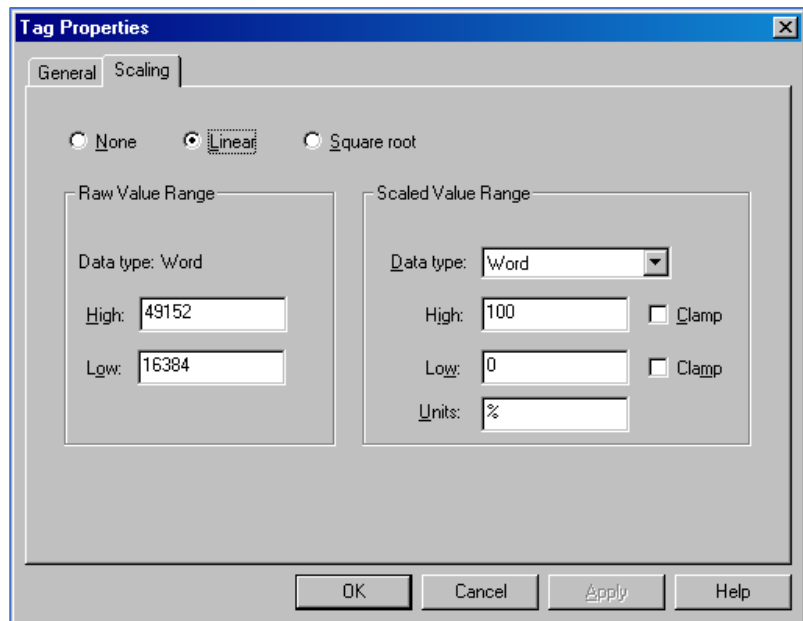
Modbus commands are 0X = Write Bit, 1X = Read Bit, 3X = Read Word, 4X = Write Word
So, 30001 will Read Word at Modbus location 1 or 41025 will Write Word to Modbus Location 1025.

For Further Information on addressing refer to ELPRO 105/905U-G Manual for Modbus TCP Addressing Ranges

Each Tag needs to have
 Name – Tag name
 Modbus address – Standard Modbus command & address i.e 1X, 3X, 4X or 0X
 Description - Description of what the I/O is.
 Data type – Select Word as all Gateway registers are 16 bit
 Client Access – Read only for inputs or Read/Write for Outputs.
 Scan Rate – Default 100 mSec.

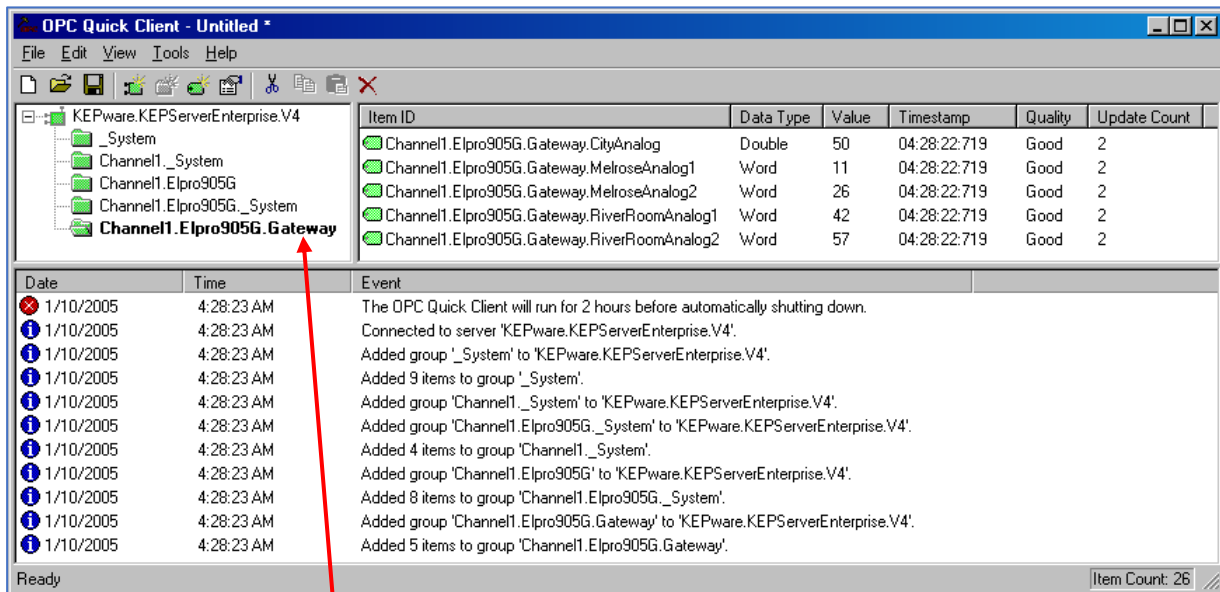


You can also setup Scaling on each of the Tags if you wish. 105/905U-G I/O registers are 16 bit (0 – 65535) and a typical range for an analog value from a field station is 4mA = 16384 decimal 20mA = 49152 decimal This is shown here as being a linear scale of 0 to 100 % is equal to decimal value 16384 to 49152



For Firmware versions 1.76 and above Scaling of the I/O registers can be applied in the E-series configuration software for all read and write commands.

When all tags have been setup select “Launch OPC Quick Client” from the Tools drop down Menu and this will launch the OPC Client. See below.



We can see it generate a number of default groups showing system status etc but the main one we are interested in is the Channel1.Elpro105/905G.Gateway group which shows all of the Tags we configured in the previous step.

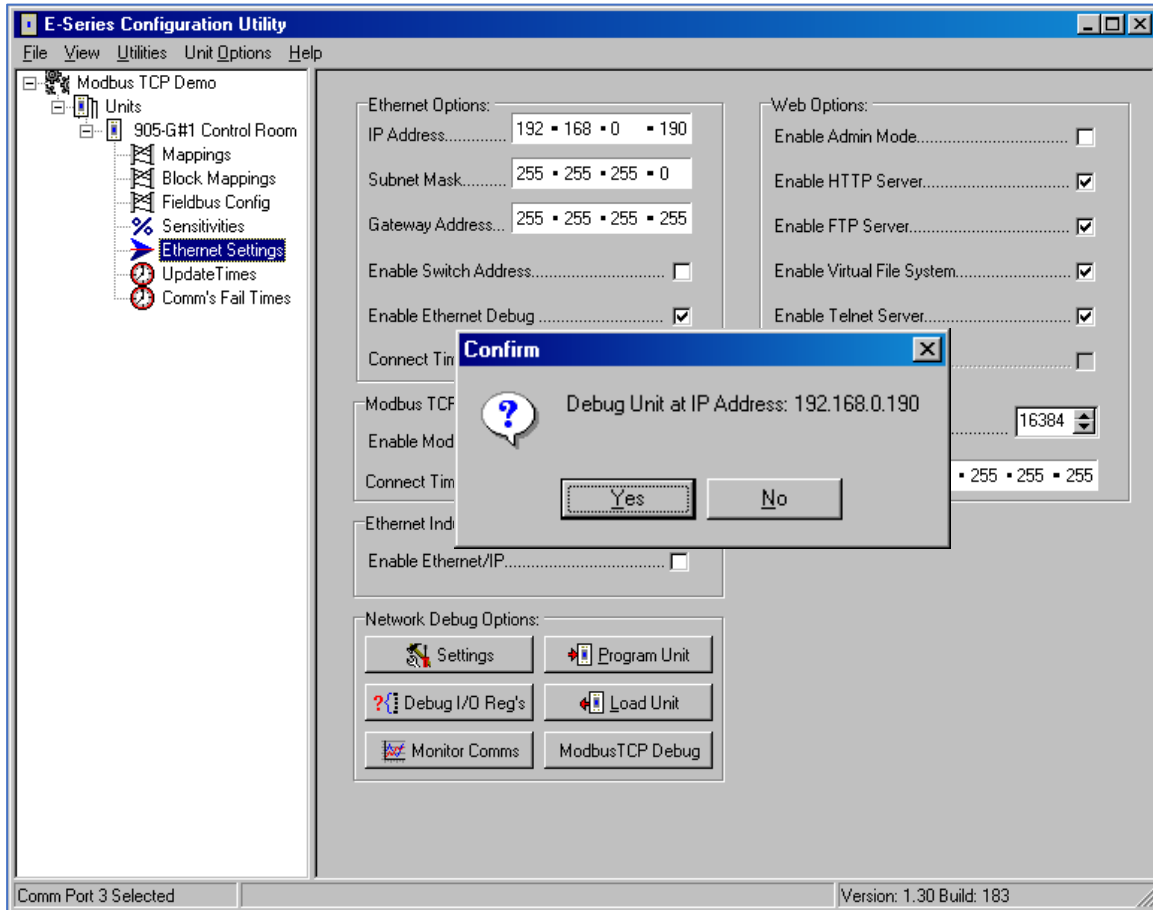
Item ID	Data Type	Value	Timestamp	Quality	Update Count
Channel1.Elpro905G.Gateway.CityAnalog	Word	50	05:02:32:765	Good	2
Channel1.Elpro905G.Gateway.MelroseAnalog1	Word	11	05:02:32:765	Good	2
Channel1.Elpro905G.Gateway.MelroseAnalog2	Word	26	05:02:32:765	Good	2
Channel1.Elpro905G.Gateway.RiverRoomAnalog1	Word	42	05:02:32:765	Good	2
Channel1.Elpro905G.Gateway.RiverRoomAnalog2	Word	57	05:02:32:765	Good	2

If the OPC Server is reading values from the Gateway you will see under “Quality” – Good. It will show “Bad” if there is a communications problem.

Also you will have a value which is the scaled value from the Gateway registers.

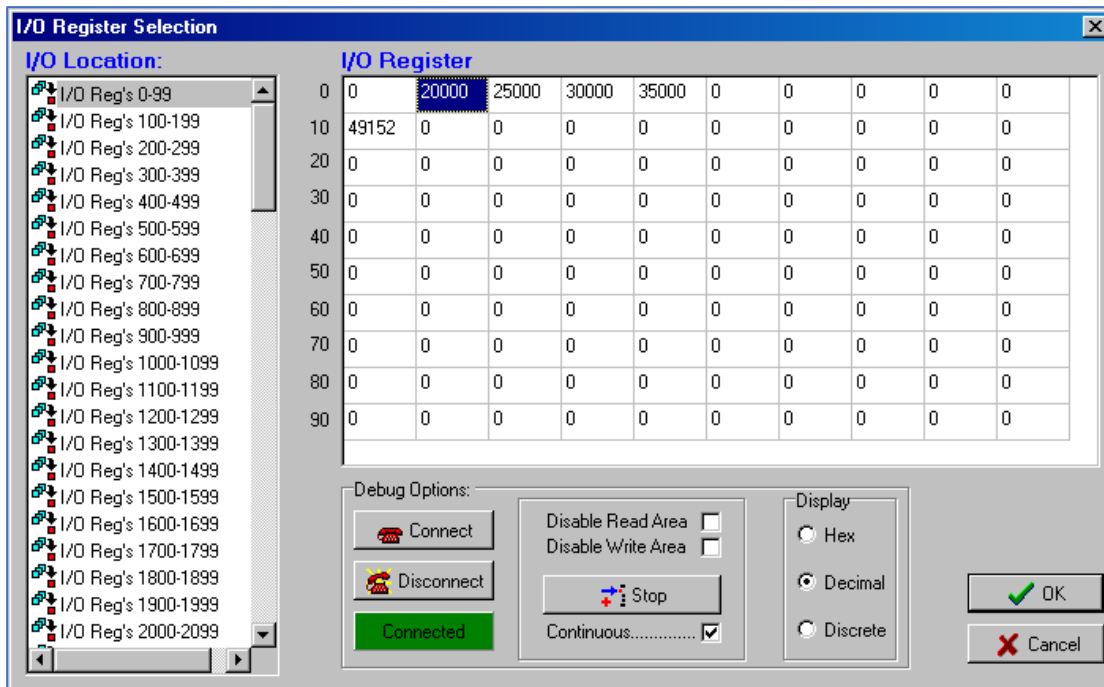
You can view the current values in the Elpro registers by using online diagnostics over an Ethernet Connection to tags show the correct values or debug any problems

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.



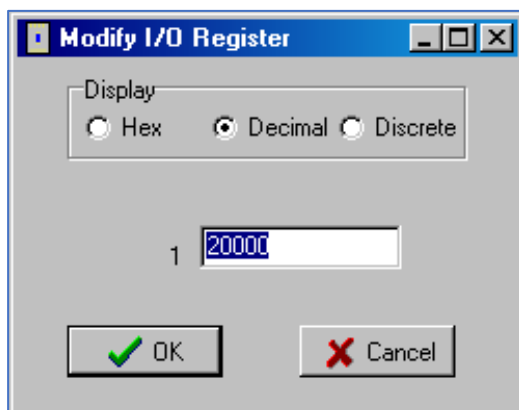
Press “Connect” button and you should get a Green Connected indication. Then tick “Continuous” and press “Read” button.

The E-series configuration will now be continuously scanning the I/O Database in the 105/905U-G.



Back in the 105/905U-G Configuration section we configured Registers 1,2,3,4 to be written across to the Fieldbus location 1,2,3,4 (Modbus Tag Commands 30001,30002, 30003, 30004) and also Fieldbus location 1025 (Modbus Tag Command 41025) is being read into Reg 10.

We can edit the registers in the I/O Register Selection Window by double clicking on the register which will open a modify box like this



From here we can enter a value into the register in the available formats i.e Hex, Decimal or Discrete. Then press “OK” and you should notice the Tag Value change on the OPC Server screen

Item ID	Data Type	Value	Timestamp	Quality
Channel1.Elpro905G.Gateway.CityAnalog	Word	50	05:02:32:765	Good
Channel1.Elpro905G.Gateway.MelroseAnalog1	Word	11	05:02:32:765	Good
Channel1.Elpro905G.Gateway.MelroseAnalog2	Word	26	05:02:32:765	Good
Channel1.Elpro905G.Gateway.RiverRoomAnalog1	Word	42	05:02:32:765	Good
Channel1.Elpro905G.Gateway.RiverRoomAnalog2	Word	57	05:02:32:765	Good

You will see each of the Tags in the OPC Server Corresponds to the values entered into the Debug I/O screen

Melrose Analog 1 has a scaled value of 11 for 20000

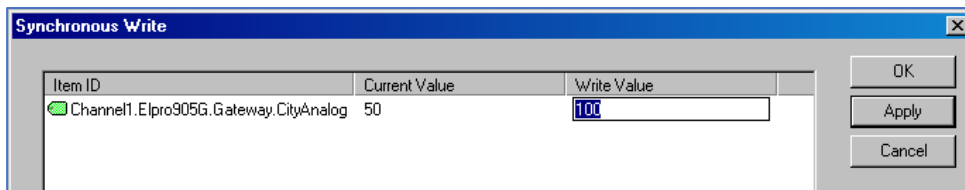
Melrose Analog 2 has a scaled value of 26 for 25000

River Room Analog 1 has a scaled value of 42 for 30000

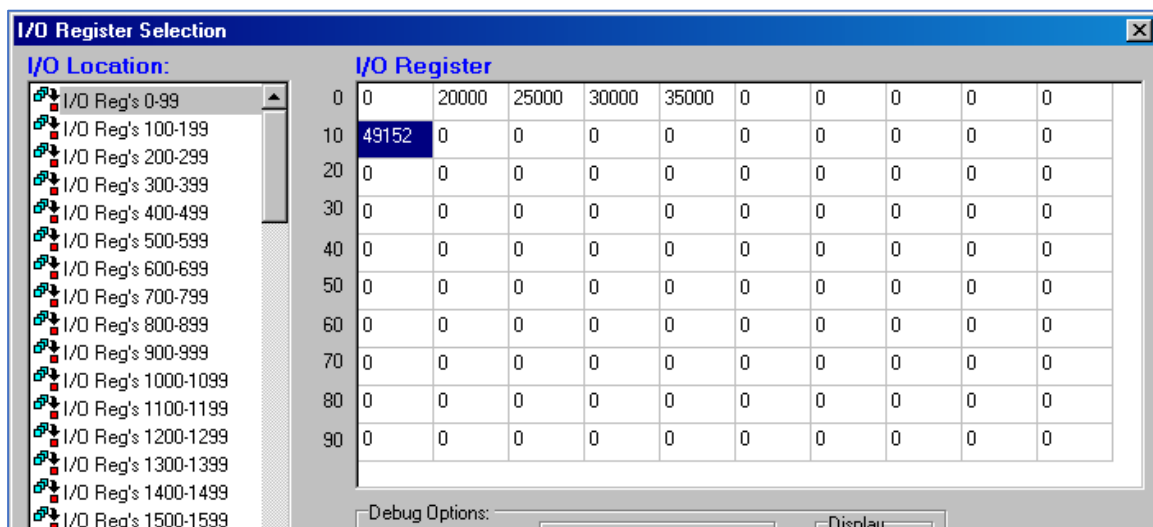
River Room Analog 2 has a scaled value of 57 for 35000.

We can now check that we can write a value into the OPC Server and read a value in the Debug I/O reg screen.

Right click the Output Tag in this case it is Channel1.Elpro105/905G.Gatway.CityAnalog and enter a scaled value you wish to change.



You should now be able to go back to the Debug I/O register screen and see that the register has changed. In this case the scaled value was set for 100 % which would change the register value to 49152 (20mA)



CSV File Import and Export

The server supports the import and export of tag data in a CSV (comma separated variable) file. The CSV functions are only available when a Device or Tag Group is selected. Using CSV import and export, tags can be created quickly in the application of your choice.

Important Note: The easiest way to create an import CSV file is to create a template using File|Export CSV. Define the channels and devices that the project will contain. Next define a tag for each device. Export each device or tag group as a CSV file. Use this template in a spreadsheet application that supports CSV files and modify the file. The resulting CSV file can then be saved to disk and imported back into the server under the same device or tag group or under a new device or tag group.

Exporting a Server Tag List:

This generates a .CSV (comma separated variable) text file that contains a heading record followed by a record for each tag defined under the selected device or tag group. The heading record contains the following fields.

Tag Name - Name of the tag as it will be referenced in an OPC client.

Address - The device location referenced by the tag.

Data Type - The data type used for the tag as shown in the server Tag Data Type drop down list box.

Respect Data Type - This forces the tag to follow its defined data type not the OPC client request.(1, 0)

Client Access - Read/ Write access (RO, RW, WO)

Scan Rate - The rate in milliseconds that the tag address will be scanned when used with most non-OPC clients.

Scaling - Scaling mode (Linear, Square Root)

Raw Low - Low raw value

Raw High - High raw value

Scaled Low - Scaled low value

Scaled High - Scaled high value

Scaled Data Type - The data type used for the tag after scaling is applied.

Clamp Low - Force the resulting scaled value to stay within the limit of Scaled Low.(1, 0)

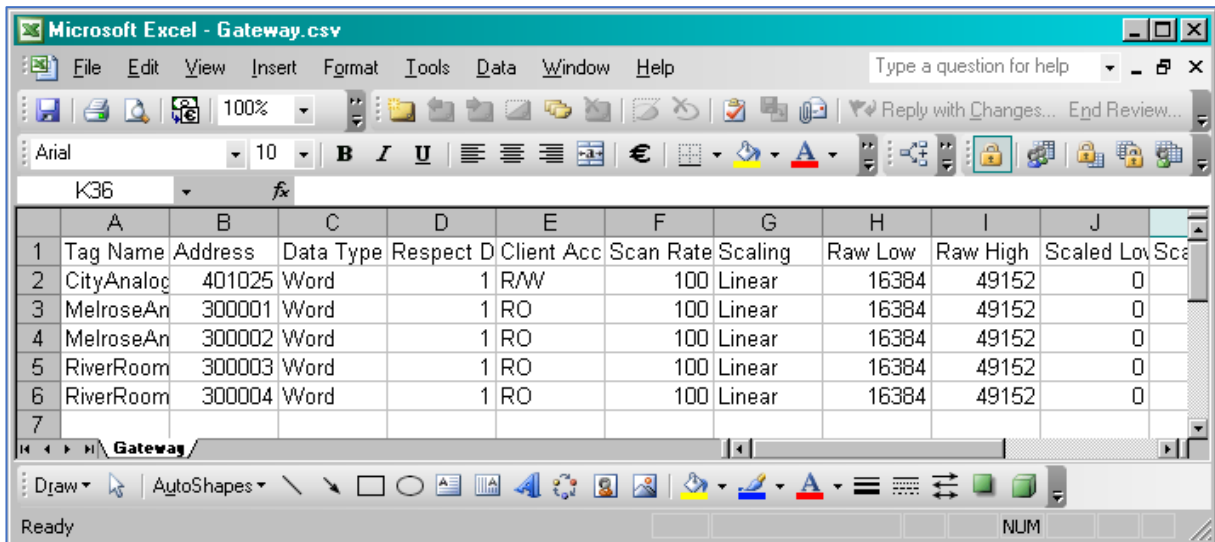
Clamp High - Force the resulting scaled value to stay within the limit of Scaled High.(1, 0)

Eng. Units - Units string.

Description - Tag description

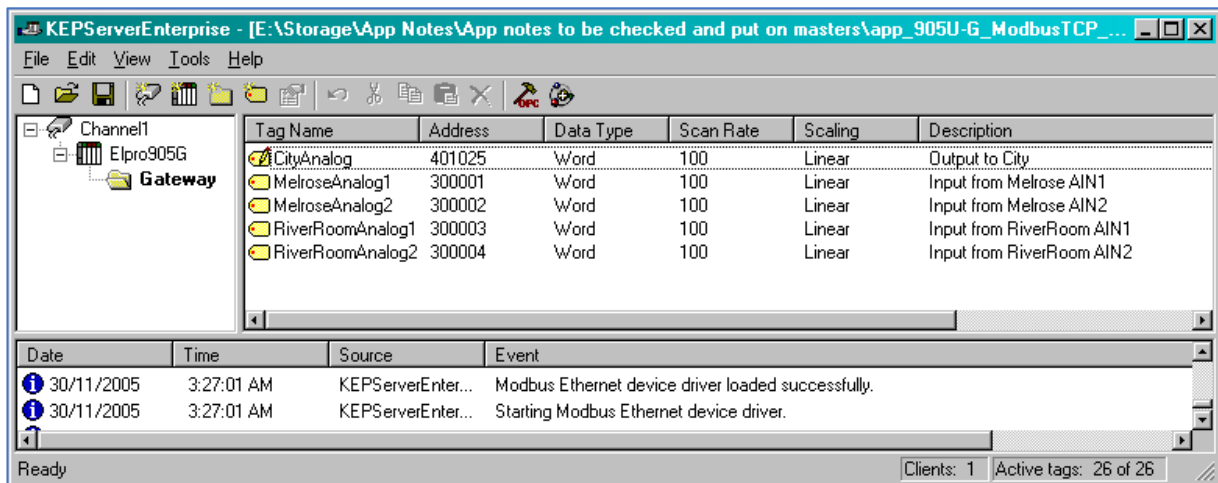
Each tag record contains the data for each field in a tag record.

Microsoft's Excel makes an excellent tool for editing large groups of tags outside of the server. Once a template CSV file has been exported it can be loaded directly into Excel for editing. A CSV file load in Excel would appear as follows:



Importing a CSV tag list into the Server

Once you have finished editing your tag list it can be imported back into the server using the import CSV function File Import CSV. This option is available only when you have either a device or tag group selected.



Note: This application note is using the Analog Inputs for testing the communications. When transferring Integer values such as for level, pressure and temp from field 105/905U-1,2,3,4 etc the values will always in the range of 16384 to 49152 for 4-20mA and 8192 to 49152 for 0-20mA.

A digital input is either On or Off and depending on the format you read it as in the Debug I/O screen i.e Hex, Decimal or Discrete you will see FFFF, 65535, 1 for ON & 0000, 0, 0 for OFF respectively.

Amendment Register:

No.	Issue	Date	Details of Amendment
1.0		1-10-05	Draft Issue
1.1		6-12-05	Added CSV File Import/Export
1.2		18-04-06	Name Change for 105/905
1.3		11-02-19	Elpro Branding/Reformat