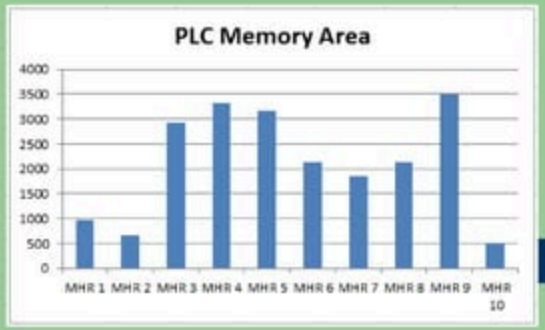
How To Implement Modbus TCP Protocol Using VBA with Excel



ACC Automation

Objectives

- Visual Basic for Applications (VBA) to communicate to a PLC using Modbus TCP protocol.
- Reading ten registers in the PLC and displaying a bar graph in Excel.

Steps to be done:

1. Explain Modbus TCP protocol
2. Install OstroSoft Winsock Component – Winsock API Calls for communication on network
3. Develop the Excel and VBA application (Microsoft Excel 2010)
4. Communicate to the PLC and sample code (Do-More Simulator)

1 – Explain Modbus TCP

Modbus TCP is a Protocol that is used for communications over TCP/IP networks.

This is done on port 502. Modbus TCP does not require a checksum calculation as lower layers already provide checksum protection.

You can think of this as a letter being sent and Ethernet TCP/IP acts like an envelope for the Modbus Commands.

Here are some links to references:

Introduction to Modbus TCP/IP

Simply Modbus – Modbus TCP

2 – Install OstroSoft Winsock

OSWINSCK.dll serves as a wrapper for the Winsock API and helps programmers to abstract from the complexity of API calls and focus on application functionality. Works with programming and scripting languages supporting COM.

You will need to download and install the OstroSoft Winsock Component on your computer.

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Do...

2 – Install OstroSoft Winsock

For use with .NET, Visual Basic 4 or 5, Visual C++, ASP, **VBA**, VBScript, JavaScript or any other language, supporting COM:

1. Download oswinsck.exe

2 – Install OstroSoft Winsock

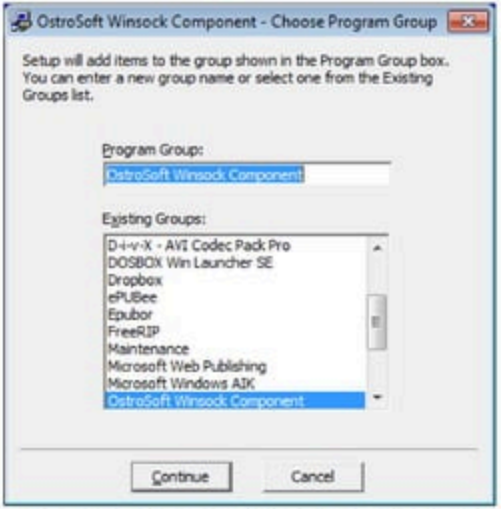
2. Run downloaded file from Windows Explorer or command-line

2 – Install OstroSoft Winsock

Hit OK

I use the default directories where the program will be installed. Click the button to install.

2 – Install OstroSoft Winsock



Leave the program group to the default so I know what the program is after installation. Click continue.

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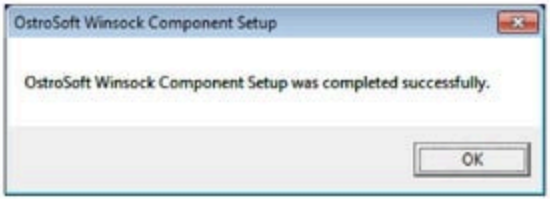
Do...

2 – Install OstroSoft Winsock

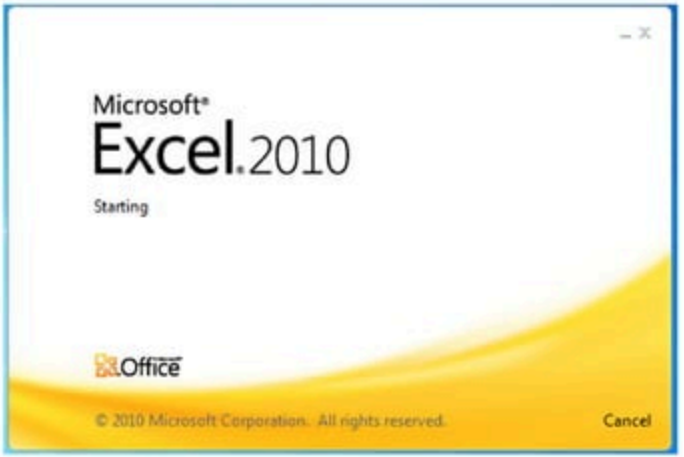


Click OK

The OstroSoft Winsock Component is now installed.

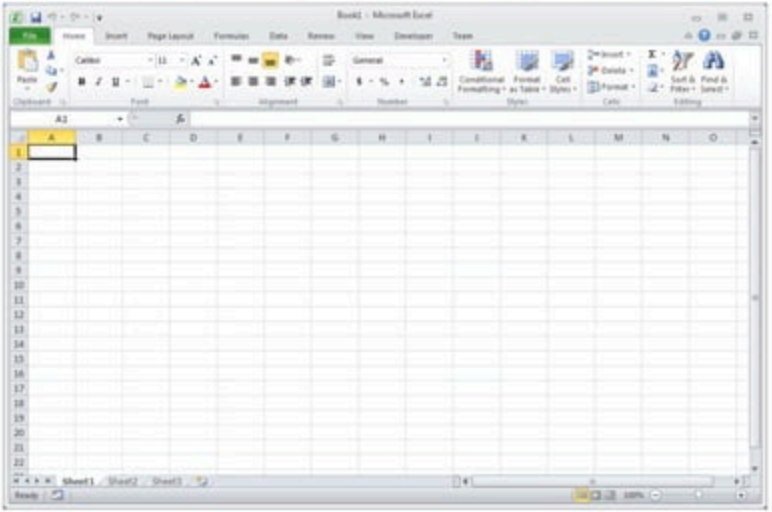
3 Excel and VBA Application (Microsoft Excel 2010)

Start Microsoft Excel.



3 Excel and VBA Application (Microsoft Excel 2010)

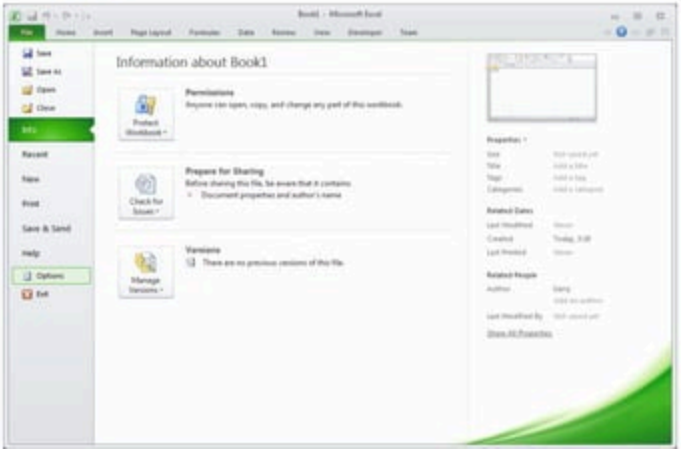
Select ‘Developer’ along the top tabs.



3 Excel and VBA Application (Microsoft Excel 2010)

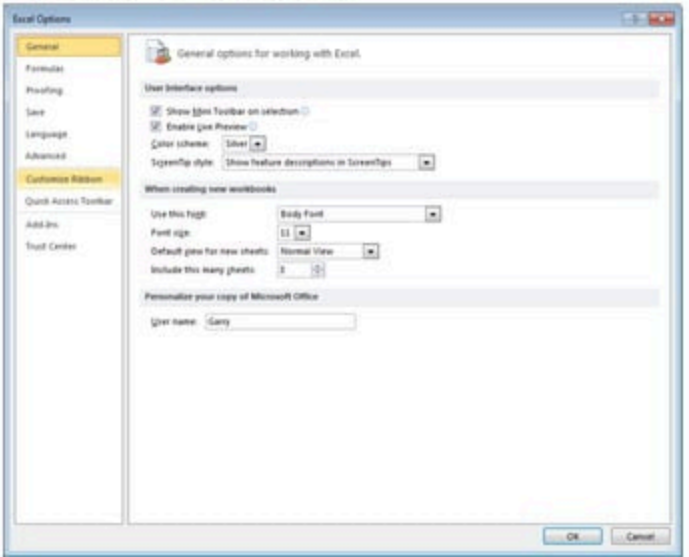
If the Developer tab is not present then we must turn on the developer tab.

Select File | Options



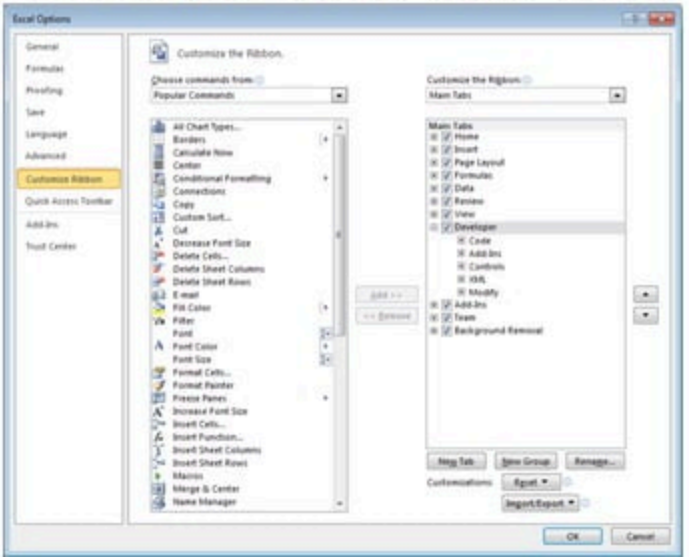
3 Excel and VBA Application (Microsoft Excel 2010)

Select ‘Customize Ribbon’



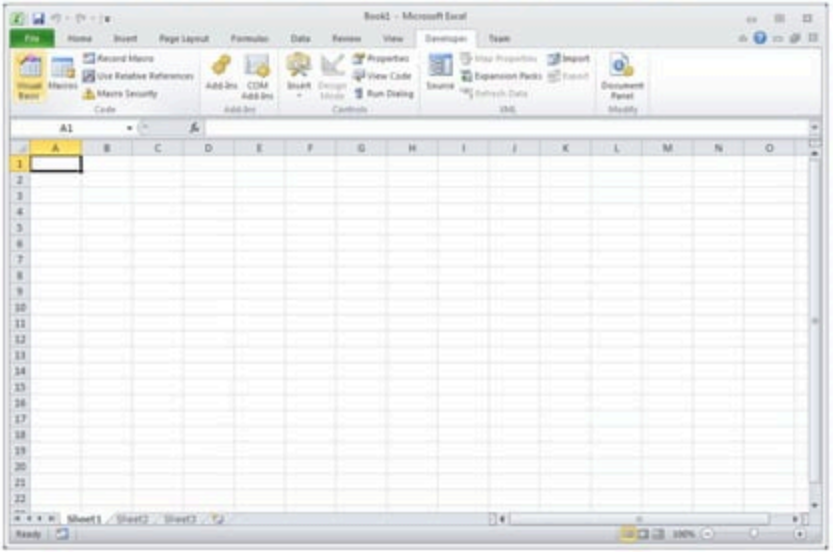
3 Excel and VBA Application (Microsoft Excel 2010)

Check the ‘Developer’ under Main Tabs.



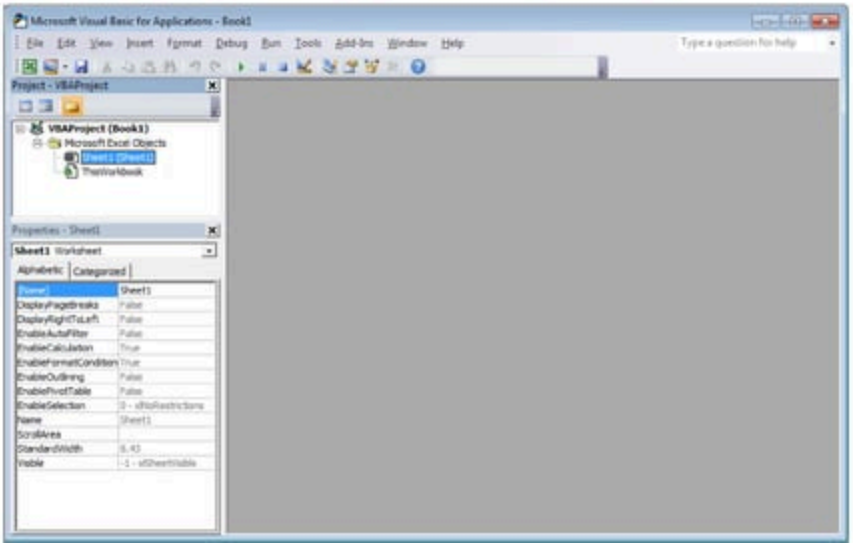
3 Excel and VBA Application (Microsoft Excel 2010)

Under the Developer menu. Select ‘Visual Basic’



3 Excel and VBA Application (Microsoft Excel 2010)

The Visual Basic Editor window will now be displayed.

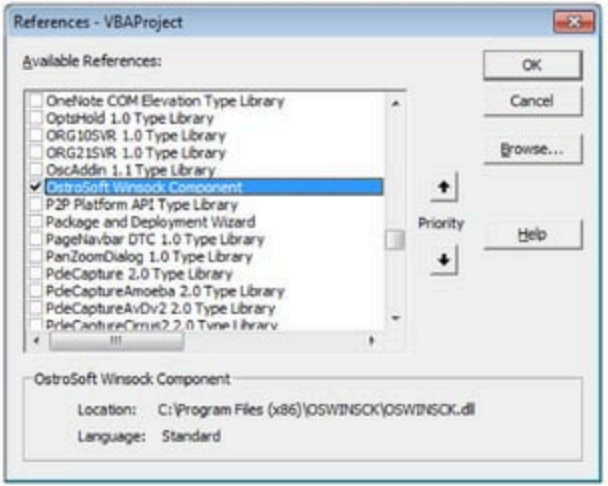


3 Excel and VBA Application (Microsoft Excel 2010)

From the menu – Tools | References

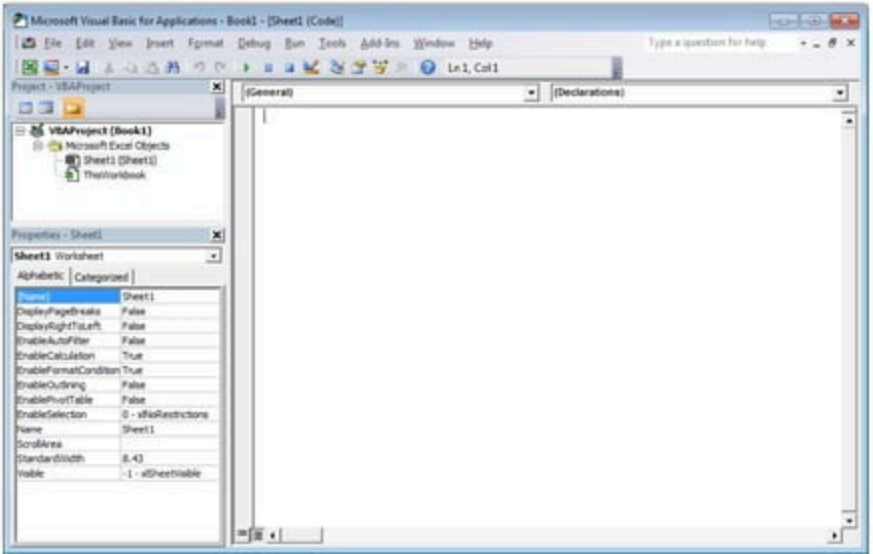
We can now add the OstroSoft Winsock Component to our application.

Select OK



3 Excel and VBA Application (Microsoft Excel 2010)

Select Sheet1(Sheet1).



3 Excel and VBA Application (Microsoft Excel 2010)

Now put the visual basic code in the Sheet1(Sheet1)

The code can be downloaded here:

3 Excel and VBA Application (Microsoft Excel 2010)

- **Note**: The program utilizes the CHR and STR functions to convert the data from binary to ASCII and back.
  The highest value of a byte of data is 256.
  This is why we have to multiply the highest significant byte with 256

3 Excel and VBA Application (Microsoft Excel 2010)

Interface:

Go back to Sheet1 and we can now put on the worksheet what we would like to see.

Note the following:

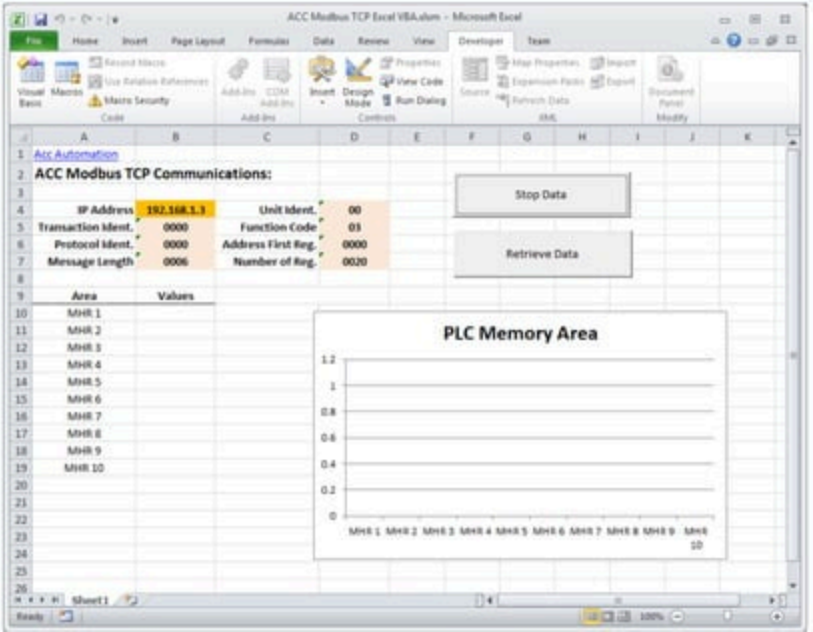
IP Address = B4

MHR 1 to 10 values located at B10 to B19

'Stop Data' – CommandButton2

'Retrieve Data' – CommandButton1

3 Excel and VBA Application (Microsoft Excel 2010)



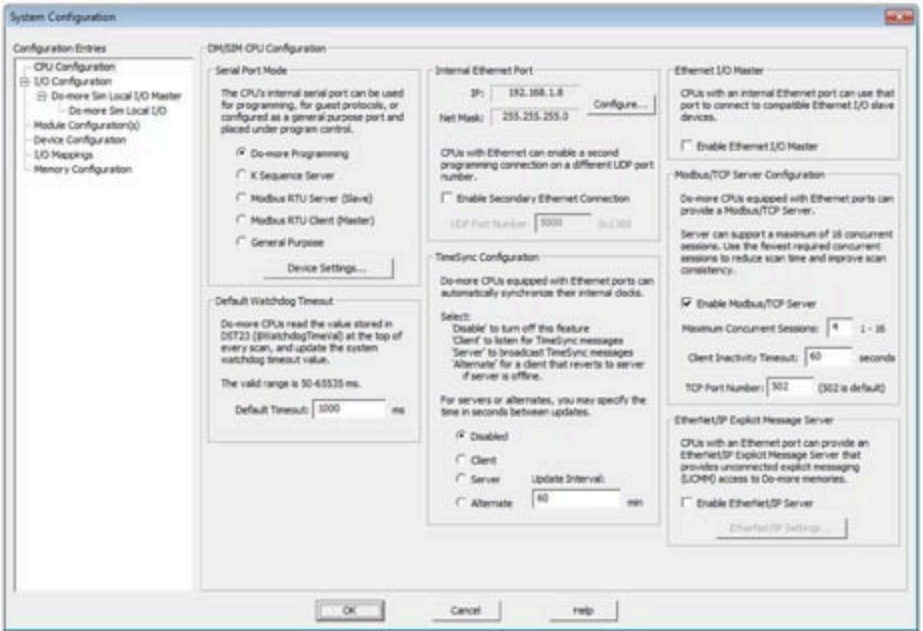
4 Communicate to the PLC (Do-More Simulator)

The software can be downloaded from the following URL:

http://support.automationdirect.com/products/domore.html

Start the Do-More Designer software. Under the Project Browser select ‘System Configuration’

4 Communicate to the PLC (Do-More Simulator)



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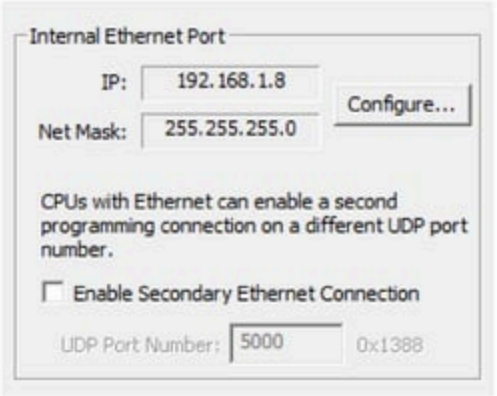
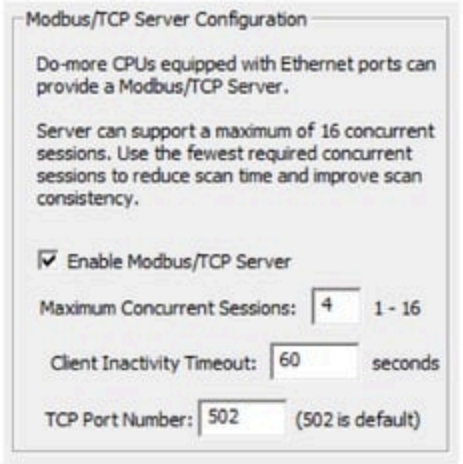
4 Communicate to the PLC (Do-More Simulator)

Make note of the IP address. If you are running the simulator then this is automatically filled in.



4 Communicate to the PLC (Do-More Simulator)

Ensure that the Enable Modbus/TCP Server is checked. Also make sure that the TCP Port Number is 502.



4 Communicate to the PLC (Do-More Simulator)

The sample PLC program will write values in the range from 0 to 4000. These values will be put in MHR 1 to MHR 10.

Here is the first couple of rungs of the PLC program. It will use clock bit flags to increment the MHR 1 channel. When it gets to the value above 4000, a move instruction will put a 0 back into MHR 1.
If input X0 turns on then the value in XW0 will be moved into MHR1 and the previous clock bit will not be in effect. Values will be between 0 and 4096. (12 bit resolution)
This is repeated with different internal clock bit flags up to MHR10.

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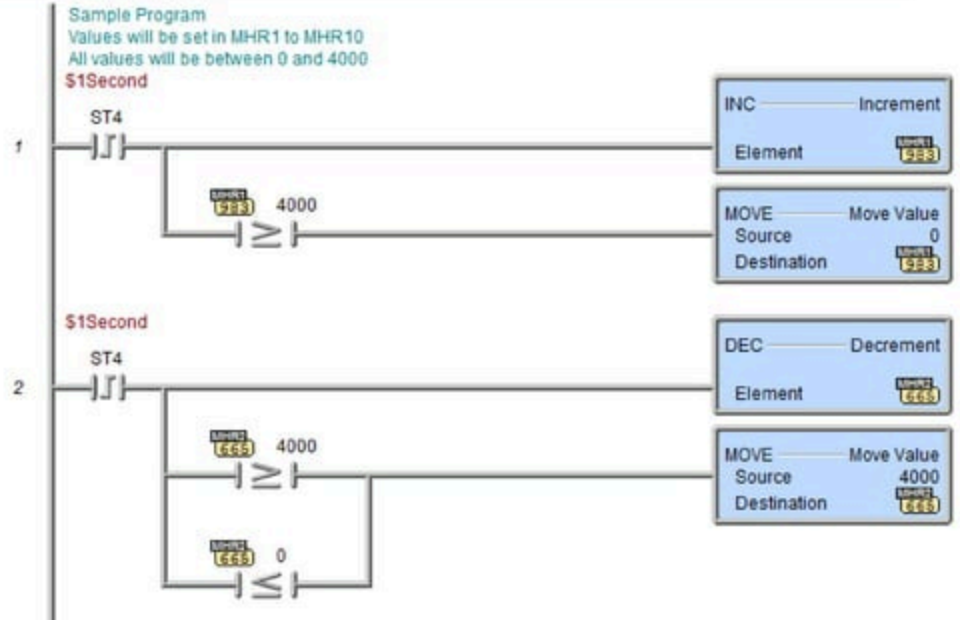
Do...

4 Communicate to the PLC (Do-More Simulator)



4 Communicate to the PLC (Do-More Simulator)

Running the program will produce the following:

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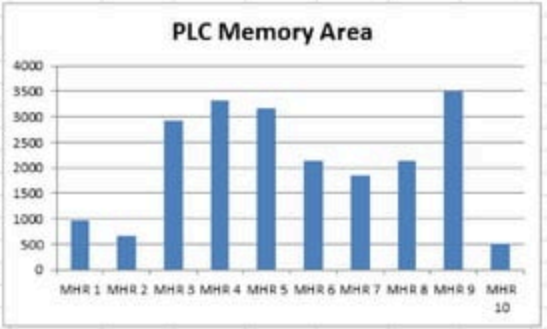
ACC Modbus TCP Communications:

IP Address	192.168.1.3	Unit Ident.	00
Transaction Ident.	0000	Function Code	03
Protocol Ident.	0000	Address First Reg.	0000
Message Length	0006	Number of Reg.	0020

Stop Data

Retrieve Data

Area	Values
MHR 1	983
MHR 2	665
MHR 3	2928
MHR 4	3315
MHR 5	3177
MHR 6	2142
MHR 7	1857
MHR 8	2143
MHR 9	3493
MHR 10	507



ACC Automation

Additional information can be obtained from our website:

How to Implement Modbus TCP Protocol using VBA with Excel - Video

Additional Information:
Excel – Conditional Movement of Data