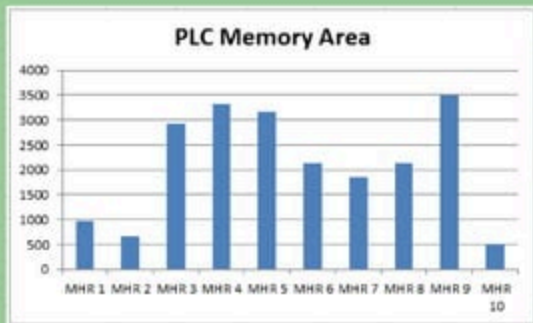


How To Implement Modbus TCP Protocol Using VBA with Excel



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.

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



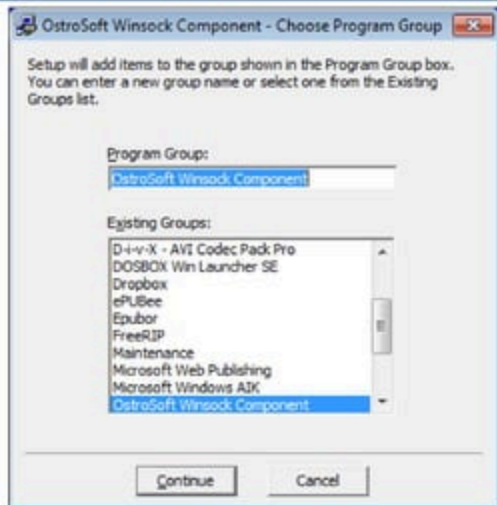
2 – Install OstroSoft Winsock

Hit OK



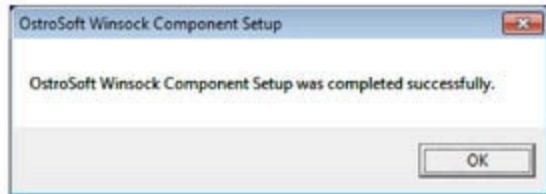
I use the default directories where the program will be installed. Click the button to install.

2 – Install OstroSoft Winsock



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

2 – Install OstroSoft Winsock



Click OK

The OstroSoft Winsock Component is now installed.

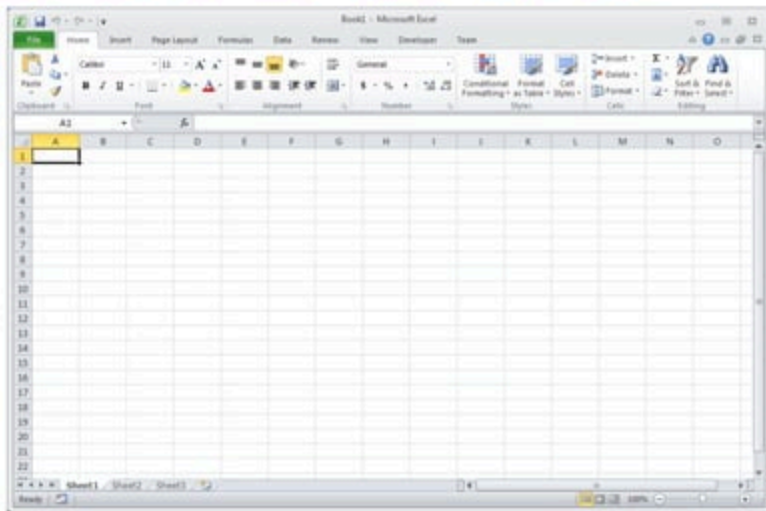
3 Excel and VBA Application (Microsoft Excel 2010)

Start Microsoft Excel.



3 Excel and VBA Application (Microsoft Excel 2010)

Select 'Developer' along the top tabs.



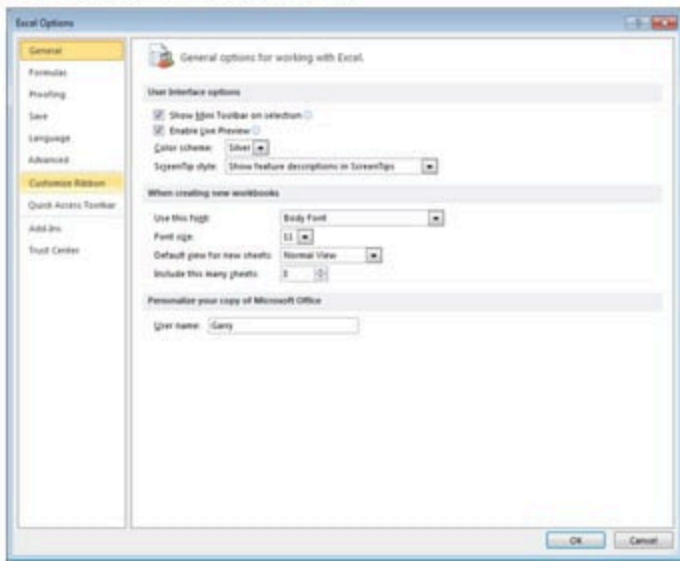
3 Excel and VBA Application (Microsoft Excel 2010)

If the Developer tab is not present then we must turn on the developer tab.
Select File | Options



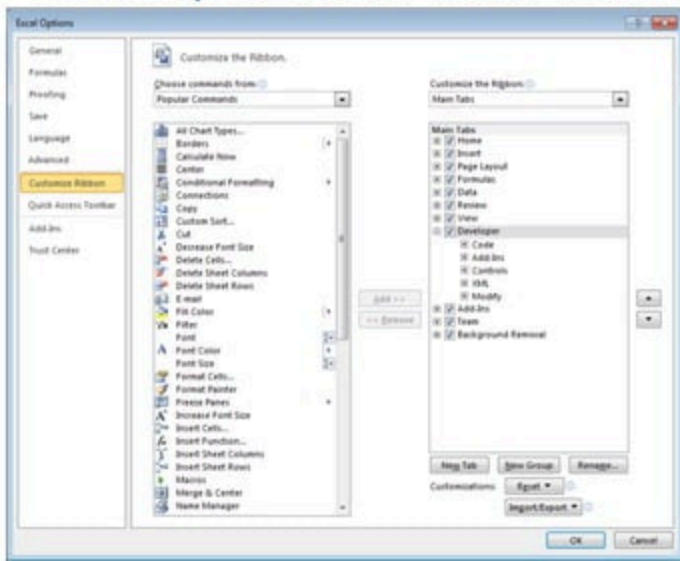
3 Excel and VBA Application (Microsoft Excel 2010)

Select 'Customize Ribbon'



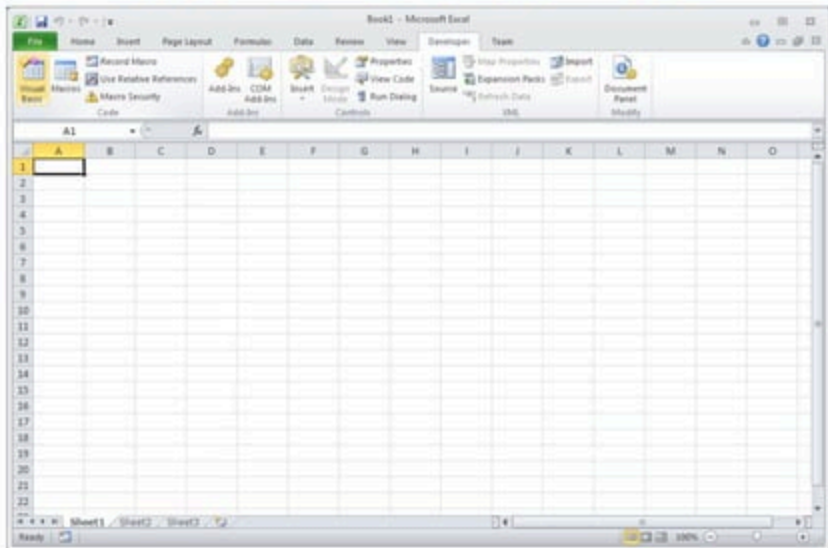
3 Excel and VBA Application (Microsoft Excel 2010)

Check the 'Developer' under Main Tabs.



3 Excel and VBA Application (Microsoft Excel 2010)

Under the Developer menu. Select 'Visual Basic'

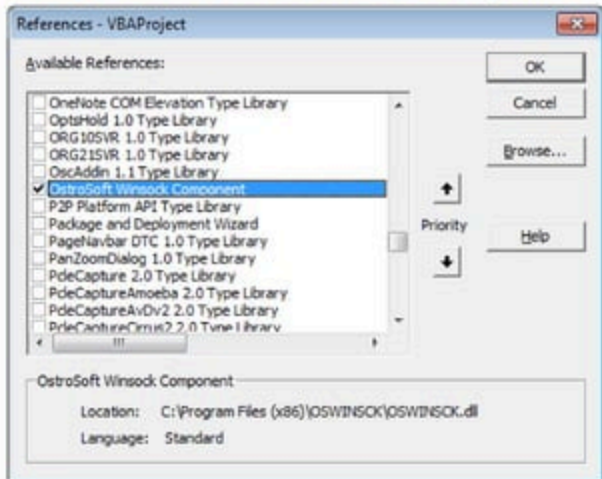


3 Excel and VBA Application (Microsoft Excel 2010)

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).

Microsoft Visual Basic for Applications - Book1 - [Sheet1] (Code)

File Edit View Insert Format Debug Run Tools Add-Ins Window Help

Type a question for help

Project - VBAProject

(General) (Declarations)

VBAProject (Book1)

- Microsoft Excel Objects
 - Sheet1 (Sheet1)
 - ThisWorkbook

Properties - Sheet1

Sheet1 Worksheet

Alphabetic | Categorized

Index	Sheet1
DisplayPagebreaks	False
DisplayRightToLeft	False
EnableAutoFilter	False
EnableCalculation	True
EnableFormatCondition	True
EnableOutlining	False
EnablePivotTable	False
EnableSelection	0 - xlNoRestrictions
Name	Sheet1
ScrollArea	
StandardWidth	8.43
Visible	-1 - xlSheetVisible

Code window: (Empty)

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)

The screenshot displays the Microsoft Excel 2010 interface with the following elements:

- Ribbon:** The Developer tab is active, showing options like Visual Basic, Record Macro, and View Code.
- Worksheet:**
 - Row 1: [ACC Automation](#)
 - Row 2: **ACC Modbus TCP Communications:**
 - Row 3: Blank
 - Row 4: IP Address: 192.168.1.1 (highlighted in yellow)
 - Row 5: Transaction Ident.: 0000
 - Row 6: Protocol Ident.: 0000
 - Row 7: Message Length: 0006
 - Row 8: Unit Ident.: 00
 - Row 9: Function Code: 03
 - Row 10: Address First Reg.: 0000
 - Row 11: Number of Reg.: 0020
- Buttons:** Two buttons are visible: "Stop Data" and "Retrieve Data".
- Table:**

Area	Values
MHR 1	
MHR 2	
MHR 3	
MHR 4	
MHR 5	
MHR 6	
MHR 7	
MHR 8	
MHR 9	
MHR 10	
- Graph:** A line graph titled "PLC Memory Area" with a vertical axis from 0 to 1.2 and a horizontal axis labeled MHR 1 through MHR 10. The graph area is currently empty.

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)

The screenshot shows the 'System Configuration' dialog box for a Do-more PLC simulator. The 'Configuration-Entries' tree on the left is expanded to 'I/O Configuration', which includes 'CPU Configuration', 'Do-more Sim Local I/O Master', 'Do-more Sim Local I/O Module Configuration(s)', 'Device Configuration', 'I/O Messings', and 'Memory Configuration'. The main area is titled 'DH485 CPU Configuration' and is divided into several sections:

- Serial Port Mode:** The CPU's internal serial port can be used for programming, for guest protocols, or configured as a general-purpose port and placed under program control. Options include:
 - Do-more Programming
 - X-Sequence Server
 - Modbus RTU Server (Slave)
 - Modbus RTU Client (Master)
 - General PurposeA 'Device Settings...' button is located below these options.
- Default Watchdog Timeout:** Do-more CPUs read the value stored in 05723 (Watchdog/TimerA) at the top of every scan, and update the system watchdog timeout value. The valid range is 30-45525 ms. The 'Default Timeout' is set to 3000 ms.
- Internal Ethernet Port:** IP: 192.168.1.8, Net Mask: 255.255.255.0. A 'Configure...' button is next to the IP address. Below, there are options for:
 - Enable Secondary Ethernet Connection (LDP Port Number: 5000)
 - TimeSync Configuration:** Do-more CPUs equipped with Ethernet ports can automatically synchronize their internal clocks. Options include:
 - Select:
 - Disabled
 - Client
 - Server (Update Interval: 60 min)
 - Alternate (60 min)
- Ethernet I/O Master:** CPUs with an internal Ethernet port can use that port to connect to compatible Ethernet I/O slave devices. Enable Ethernet I/O Master
- Modbus/TCP Server Configuration:** Do-more CPUs equipped with Ethernet ports can provide a Modbus/TCP Server. Server can support a maximum of 16 concurrent sessions. Use the fewest required concurrent sessions to reduce scan time and improve scan consistency. Enable Modbus/TCP Server. Maximum Concurrent Sessions: 1-16. Client Inactivity Timeout: 60 seconds. TCP Port Number: 502 (502 is default)
- Ethernet/IP Explicit Message Server:** CPUs with an Ethernet port can provide an Ethernet/IP Explicit Message Server that provides unconnected explicit messaging (SOM) access to Do-more memories. Enable Ethernet/IP Server. An 'Ethernet/IP Settings...' button is located below.

At the bottom of the dialog are 'OK', 'Cancel', and 'Help' buttons.

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.

Internal Ethernet Port

IP: 192.168.1.8

Net Mask: 255.255.255.0

Configure...

CPUs with Ethernet can enable a second programming connection on a different UDP port number.

Enable Secondary Ethernet Connection

UDP Port Number: 5000 0x1388

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.

Modbus/TCP Server Configuration

Do-more CPUs equipped with Ethernet ports can provide a Modbus/TCP Server.

Server can support a maximum of 16 concurrent sessions. Use the fewest required concurrent sessions to reduce scan time and improve scan consistency.

Enable Modbus/TCP Server

Maximum Concurrent Sessions: 1 - 16

Client Inactivity Timeout: seconds

TCP Port Number: (502 is default)

4 Communicate to the PLC (Do-More Simulator)

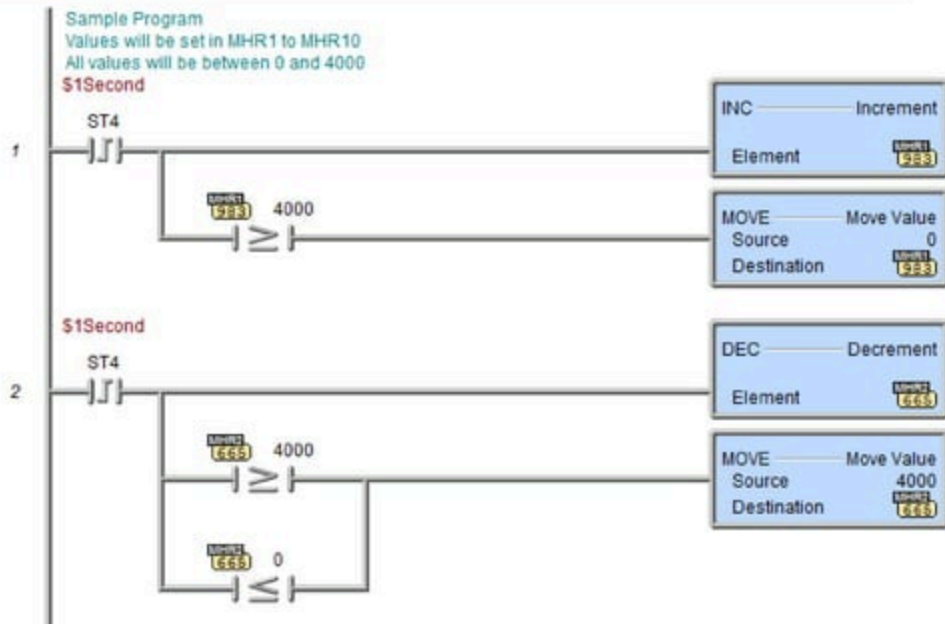
The sample PLC program will write values in the range from 0 to 4000. These values will be put in MHR 1 to MHR 10.

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.

4 Communicate to the PLC (Do-More Simulator)



4 Communicate to the PLC (Do-More Simulator)

Running the program will produce the following:

[Acc Automation](#)

ACC Modbus TCP Communications:

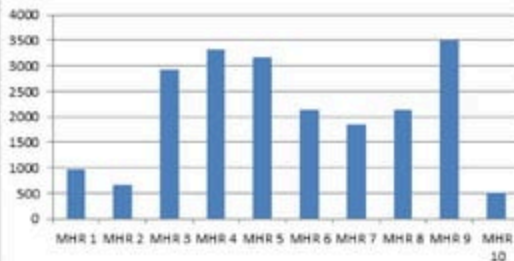
IP Address	192.168.1.3	Unit Ident.	00
Transaction Ident.	0000	Function Code	03
Protocol Ident.	0000	Address First Reg.	0000
Message Length	0006	Number of Reg.	0020

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

PLC Memory Area



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](#)