Document name : Modbus slave OPC server user manual

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Revision changes : adding Modbus TCP functionality

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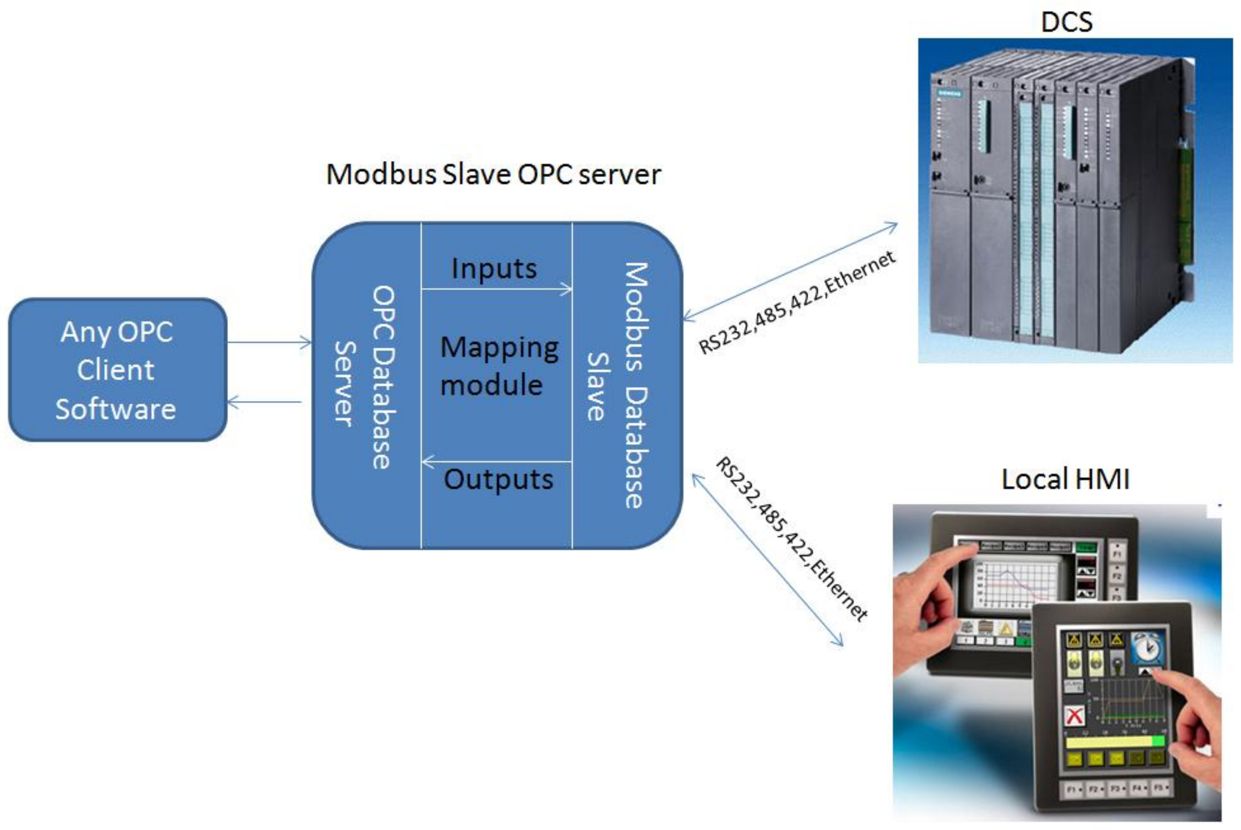
Content

1 - Introduction

pbsControl company developed an OPC server which has Modbus slave functionality .
We used pbsModbusS_OPCSrv module In many projects for Local HMI Connection and higher level Control system connection .
We are using Win-Tech OPC engine, which is a leader in OPC server development toolkit and Microsoft C# language for developing our OPC servers.

In following figure , you can see Modbus Slave OPC Server architecture and operation .



2 – Installation

pbsModbusS_OPCSrv is tested on following operating systems :

- Windows XP professional
- Windows XP embedded 2009
- Windows Vista
- Windows 7
- Windows server 2003 and 2008 (32 and 64 bit)

pbsModbusS_OPCSrv is developed by C#, so you need to have Microsoft Dot net framework 3.5 runtime on your system . Please download and install from www.microsoft.com . (you can install from product CD)

For OPC functionality, you need to install OPC runtime 2.0 on your PC. Please download it from form link:
ftp.pbscontrol.com
user = opcuser
password = opc_2012
directory name : OPCredist2

You can download demo version of pbsModbusS_OPCSrv from following link:
ftp.pbscontrol.com
user = opcuser
password = opc_2012
directory name : pbsModbusS_OPCSrv

Demo version has full functionality, but it works for 30 minutes every time you restart it.
Registered version is located on FTP Site for each client with dedicated User name and password.
You can find all software in products CD .

Copy files from pbsModbusS_OPCSrv directory to a local directory in your PC .
You will see following files in pbsModbusS_OPCSrv directory :
1 - pbsModbusS_OPCSrv.exe : this is main OPC module . You will run this module when you want to run OPC server.
2 - PbsModbusSlave32.dll pbsControl modbus Slave implementation. This is 100% C# managed code library.
3 – pbsOPCSrvAPI.dll Wrapper class for OPC Server toolkit .
4 – WtOPCSvr.dll OPC server API . This is C++ implementation of OPC standard.
5 – ModbusTags.xml modbus tag definition.

6 – options.xml option file for setting OPC server parameters .

When you execute pbsModbusS_OPCSrv.exe for the first time, it will update windows registry. After that you can connect to OPC server by any OPC Client.

3 – Configuration

Edit Options.xml file with notepad editor. You will see following parameters in this file :

For each node there are 3 parameters:
Name = Fix part and do not change it
Desc = Description of Parameter
Value = Parameter Value.

```
<Node>
    <Name>Protocol</Name>
    <Desc>ModbusRTU,ModbusTCP</Desc>
    <Value>ModbusTCP</Value>
</Node>
```

Protocol = Communication protocol . ModbusRTU (for serial communication with RS232 , RS422 or RS485) and ModbusTCP for Ethernet connection .

For RS485 network , you should use Rs485 to RS232 converter or using any External RS485 serial ports with Automatic flow detection functionality .

pbsModbusS_OPCSrv.exe is using RS424 and RS485 like RS232 Port .

```
<Node>
    <Name>COM</Name>
    <Desc>Serial Port for Communication 1,2,3,4,5,...</Desc>
    <Value>1</Value>
</Node>
```

COM = Serial port for ModbusRTU protocol . Just will use for ModbusRTU Protocol .

```
<Node>
    <Name>BaudRate</Name>
    <Desc>Communication baud rate </Desc>
```

```
        <Value>57600</Value>
    </Node>
```

BaudRate = Communication baud rate. Just will use for   ModbusRTU Protocol .

```
    <Node>
        <Name>DataBit</Name>
        <Desc>7,8</Desc>
        <Value>8</Value>
    </Node>
```

DataBit = Communication Data Bits. Just will use for   ModbusRTU Protocol .

```
    <Node>
        <Name>Parity</Name>
        <Desc>None,Even,Odd</Desc>
        <Value>None</Value>
    </Node>
```

Parity = Communication Parity. Just will use for   ModbusRTU Protocol .

```
    <Node>
        <Name>DtrEnable</Name>
        <Desc>DtrEnable</Desc>
        <Value>False</Value>
    </Node>
```

DtrEnable= DTR functionality of Serial Port. Just will use for   ModbusRTU Protocol .

The DTR(Data Terminal Ready) signal is one of the most important call control signals on a data modem. It is the most reliable method by which a computer tells the modem to disconnect (end) a call. Dropping the DTR from high to low for at least 2 seconds accomplishes this.

DTR is using for Modem Connection . Set DtrEnable to False for using without Modem .
If you want to use Modem for communication , please set modem to Auto Answer and Set DtrEnable to True.

RtsEnable and Handshake is for setting flow control on RS232 port .

RTS / CTS Flow Control is another flow control mechanism that is part of the RS232 standard. It makes use of two further pins on the RS232 connector, RTS (Request to Send) and CTS (Clear to Send). These two lines allow the receiver and the transmitter to alert each other to their state. A transmitter raises its RTS line, which causes an interrupt on the receiver, i.e - hey can I send some data?. If the receiver is in a position to receive the data it will assert its CTS line, i.e - yes you can start sending. The raising and lowering of these lines allows device drivers which implement hardware flow control code to maintain a reliable data connection between transmitter and receiver. The advantage to this approach is that damaging data in transit does not effect the flow control mechanism (as in XOn / XOff).

```
<Node>
    <Name>RtsEnable</Name>
    <Desc>RtsEnable</Desc>
    <Value>False</Value>
</Node>

<Node>
    <Name>Handshake</Name>
    <Desc>None,RequestToSend,RequestToSendXOnXOff,XOnXOff</Desc>
    <Value>None</Value>
</Node>
```

```
None
 // Summary:
  //     No control is used for the handshake.

 XOnXOff
  // Summary:
  //     The XON/XOFF software control protocol is used. The XOFF control is sent
  //     to stop the transmission of data. The XON control is sent to resume the transmission.
  //     These software controls are used instead of Request to Send (RTS) and Clear
  //     to Send (CTS) hardware controls.

  RequestToSend
  // Summary:
  //     Request-to-Send (RTS) hardware flow control is used. RTS signals that data
  //     is available for transmission. If the input buffer becomes full, the RTS
  //     line will be set to false. The RTS line will be set to true when more room
  //     becomes available in the input buffer.

  RequestToSendXOnXOff
  // Summary:
  //     Both the Request-to-Send (RTS) hardware control and the XON/XOFF software
  //     controls are used.
```

```
<Node>
   <Name>ReadBufferSize</Name>
   <Desc>ReadBufferSize</Desc>
   <Value>1024</Value>
</Node>

<Node>
   <Name>WriteBufferSize</Name>
   <Desc>WriteBufferSize</Desc>
   <Value>1024</Value>
</Node>
```

ReadBuffersize and WriteBufferSize is read and write buffer size for Serial port . 1024 is suitable for ModbusRTU protocol .

```
<Node>
   <Name>SlaveAddress</Name>
   <Desc>SlaveAddress</Desc>
   <Value>2</Value>
</Node>
```

Slaveaddress = Each modbusRTU Slave device must has an unique ID on RS485 network .

```
<Node>
   <Name>ShiftAddress</Name>
   <Desc>ShiftAddress</Desc>
   <Value>0</Value>
</Node>
```

Shiftaddress = Sometimes Modbus Master Devices are requesting Modbus Tags with 1 Address different . ShiftAddress is adding to any Address which is requested by Master .

```
<Node>
   <Name>PhysicalLayerScanTime</Name>
   <Desc>PhysicalLayerScanTime(ms)</Desc>
   <Value>100</Value>
</Node>
```

PhysicalLayerScanTime is cyclic time that OP server is reading Serial port for getting new request from Master . 100ms is optimized for many systems. If frame length which is receiving from master is long , Please increase this parameter to 150 , or 200 msec .

```
<Node>
    <Name>StatusListNum</Name>
    <Desc>StatusListNum</Desc>
    <Value>256</Value>
</Node>
```

OPC server will clear status list in main page of OPC server after each StatusListNum line .

```
<Node>
    <Name>TCPPort</Name>
    <Desc>Modbus TCP Port Number</Desc>
    <Value>502</Value>
</Node>
```

When protocol is ModbusTCP , you should set TCP port for communication . Port number 502 is registered for ModbusTCP protocol.

```
<Node>
    <Name>TCPLocalIP</Name>
    <Desc>Modbus TCP LocalIP</Desc>
    <Value>127.0.0.1</Value>
</Node>
```

TCPLocalPort : if you have many network ports on the PC which you install OPC server , you should set exact port IP which you want to use for ModbusTCP Communication .

```
<Node>
    <Name>Instance</Name>
    <Desc>OPC Server instance 1,2,3,4</Desc>
    <Value>1</Value>
</Node>
```

You can run maximum 4 different Modbus Slave OPC Server on a PC . For each OPC server you should select different Instance Number (1 , 2, 3, 4)
Make four different directory and copy pbsModbusS_OPCSrv directory files to each directory .
When you set different instance Number for each OPC server , OPC Server will make different registry setting in Windows registry for OPC client connections .

OPC Server tag Configuration

For defining Modbus tags in OPC server, Please open ModbusTags.xml file by Notepad editor.

For each Modbus Tag , you should define one Tag Node .

Sample Modbus tag Definition File:

```
<?xml version="1.0"?>
<OPCSrvTags>

  <Tag  Address="1" Name="P1_CURRENT" Type="UINTI" Init="0" />
  <Tag  Address="5" Name="P1_TODAY_RT" Type="UINTI" Init="0" />
  <Tag  Address="9" Name="P1_YD_RT" Type="UINTI" Init="0" />
  <Tag  Address="13" Name="P1_TOT_RT" Type="UINTI" Init="0" />
  <Tag  Address="17" Name="P2_CURRENT" Type="UINTI" Init="0" />
  <Tag  Address="21" Name="P2_TODAY_RT" Type="UINTI" Init="0" />
  <Tag  Address="25" Name="P2_YD_RT" Type="UINTI" Init="0" />
  <Tag  Address="29" Name="P2_TOT_RT" Type="UINTI" Init="0" />
  <Tag  Address="33" Name="P3_CURRENT" Type="UINTI" Init="0" />
  <Tag  Address="37" Name="P3_TODAY_RT" Type="UINTI" Init="0" />
  <Tag  Address="41" Name="P3_YD_RT" Type="UINTI" Init="0" />
  <Tag  Address="45" Name="P3_TOT_RT" Type="UINTI" Init="0" />
  <Tag  Address="49" Name="POWER" Type="FI" Init="0" />
  <Tag  Address="53" Name="INS_POWER" Type="UINTI" Init="0" />
  <Tag  Address="57" Name="StormWaterPump_Duty" Type="UINTI" Init="0" />



  <Tag  Address="1" Name="P1_Seal_Failed" Type="DI" Init="false" />
  <Tag  Address="2" Name="D1_LEVEL" Type="DI" Init="false" />
  <Tag  Address="3" Name="D2_LEVEL" Type="DI" Init="false" />
  <Tag  Address="4" Name="D3_LEVEL" Type="DI" Init="false" />
  <Tag  Address="5" Name="HIGH_LEVEL" Type="DI" Init="false" />
  <Tag  Address="6" Name="LOW_LEVEL" Type="DI" Init="false" />
  <Tag  Address="7" Name="STOP_LEVEL" Type="DI" Init="false" />
  <Tag  Address="8" Name="P1_STATUS" Type="DI" Init="false" />
  <Tag  Address="9" Name="P2_STATUS" Type="DI" Init="false" />
  <Tag  Address="10" Name="P3_STATUS" Type="DI" Init="false" />
```

```
<Tag  Address="11" Name="DEWA_SUPPLY" Type="DI" Init="false" />
<Tag  Address="12" Name="FIRE_ALARM" Type="DI" Init="false" />
<Tag  Address="13" Name="P2_Seal_Failed" Type="DI" Init="false" />
<Tag  Address="14" Name="KIOSK_DOOR" Type="DI" Init="false" />
<Tag  Address="15" Name="P1_EARTH_LEAKAGE" Type="DI" Init="false" />
<Tag  Address="16" Name="P1_Over_Current" Type="DI" Init="false" />
<Tag  Address="17" Name="P1_High_Temp" Type="DI" Init="false" />
<Tag  Address="18" Name="P1_Starter_Power" Type="DI" Init="false" />
<Tag  Address="19" Name="P2_EARTH_LEAKAGE" Type="DI" Init="false" />
<Tag  Address="20" Name="P2_Over_Current" Type="DI" Init="false" />
<Tag  Address="21" Name="P2_High_Temp" Type="DI" Init="false" />
<Tag  Address="22" Name="FloatSwitch_Duty2" Type="DI" Init="false" />
<Tag  Address="23" Name="FloatSwitch_Duty1" Type="DI" Init="false" />
<Tag  Address="24" Name="FloatSwitch_CommonStop" Type="DI" Init="false" />
<Tag  Address="25" Name="P2_Starter_Power" Type="DI" Init="false" />
<Tag  Address="26" Name="P1_REMLOC" Type="DI" Init="false" />
<Tag  Address="27" Name="P2_REMLOC" Type="DI" Init="false" />
<Tag  Address="28" Name="P1_EN" Type="DI" Init="false" />
<Tag  Address="29" Name="P2_EN" Type="DI" Init="false" />
<Tag  Address="30" Name="Station_Enable" Type="DI" Init="false" />
<Tag  Address="31" Name="P1_AUTO" Type="DI" Init="false" />
<Tag  Address="32" Name="P3_Seal_Failed" Type="DI" Init="false" />
<Tag  Address="33" Name="P1_Hand" Type="DI" Init="false" />
<Tag  Address="34" Name="P2_AUTO" Type="DI" Init="false" />
<Tag  Address="35" Name="P2_Hand" Type="DI" Init="false" />
<Tag  Address="36" Name="P1_STOP" Type="DI" Init="false" />
<Tag  Address="37" Name="P2_STOP" Type="DI" Init="false" />
<Tag  Address="38" Name="GEN_SUPPLY" Type="DI" Init="false" />
<Tag  Address="39" Name="P3_EARTH_LEAKAGE" Type="DI" Init="false" />
<Tag  Address="40" Name="P3_Over_Current" Type="DI" Init="false" />
<Tag  Address="41" Name="P3_High_Temp" Type="DI" Init="false" />
<Tag  Address="42" Name="P3_Starter_Power" Type="DI" Init="false" />
<Tag  Address="43" Name="P3_REMLOC" Type="DI" Init="false" />
<Tag  Address="44" Name="P3_EN" Type="DI" Init="false" />
<Tag  Address="45" Name="P3_AUTO" Type="DI" Init="false" />
<Tag  Address="46" Name="P3_Hand" Type="DI" Init="false" />
<Tag  Address="47" Name="P3_STOP" Type="DI" Init="false" />



<Tag  Address="48" Name="SpareDI48" Type="DI" Init="false" />
```

Modbus address:

Address = Modbus Address , without 0x,1x,3x and 4x address part . if modbus Tag in Master is 30001 in OPC server it is 1 , with Tag type AI

Name = Tag Name

Type = Modus Tag Type

Init = Init Value for Tag

Modbus Tag Type :

```
     "DI": Digital input (Discrete Input in Modbus)
     "AI": Analog Input (Input Register in Modbus)
     "DO": Digital output (Coil in Modbus)
     "AO": Analog output (Holding register in Modbus)
     "FI": Float Input (2 Input register as one float)
     "FO": Float Output (2 Holding register as one float)
     "INTI":32bit signed int Input( 2 input register as one int)
     "INTO":32 bit signed int Output( 2 Holding register as one int)
     "UINTO":32 unsigned int Output( 2 Holding register as one unsigned int)
     "UINTI":32 unsigned int Input( 2 Input  register as one unsigned int)
     "SFI": Swap Float Input (2 Input register as one float)
     "SFO": Swap Float Output (2 Holding register as one float)
     "SINTI": Swap 32bit signed int Input( 2 input register as one int)
     "SINTO": Swap 32 bit signed int Output( 2 Holding register as one int)
     "SUINTO": Swap 32 unsigned int Output( 2 Holding register as one
unsigned int)
     "SUINTI": Swap 32 unsigned int Input( 2 Input  register as one unsigned
int)
```

```
FI,FO Maximum and Minimum Value :

MaxValue = 3.40282e+038f;
MinValue = -3.40282e+038f;


INITI , INITO Maximum and Minimum Value :
MaxValue = 2,147,483,647;
MinValue = -2,147,483,648;

UINITI , UINITO Maximum and Minimum Value :
```

```
MaxValue = 4,294,967,295;
MinValue = 0;
```

Supported Modbus Function codes:

Following Modbus Function codes are supported in Modbus Slave OPC Server:

```
        FC_ReadCoilStatus = 0x1,
        FC_ReadInputStatus = 0x2,
        FC_ReadHoldingRegisters = 0x3,
        FC_ReadInputRegisters = 0x4,
        FC_ForceSingleCoil = 0x5,
        FC_PreSetSingleRegister = 0x6,
        FC_ForceMultiCoils = 0xf,
        FC_PreSetMultiRegisters = 0x10
```

01 Read Coil Status

Description

Reads the ON/OFF status of discrete outputs (0X references, coils) in the slave.

02 Read Input Status

Description

Reads the ON/OFF status of discrete inputs (1X references) in the slave.

03 Read Holding Registers

Description

Reads the binary contents of holding registers (4X references) in the slave.

04 Read Input Registers

Description

Reads the binary contents of input registers (3X references) in the slave.

05 Force Single Coil

Description
Forces a single coil (0X reference) to either ON or OFF.

06 Preset Single Register

Description
Presets a value into a single holding register (4X reference).

15 (0F Hex) Force Multiple Coils

Description
Forces each coil (0X reference) in a sequence of coils to either ON or OFF.

16 (10 Hex) Preset Multiple Registers

Description
Presets values into a sequence of holding registers (4X references).

Samples:

Modbus master tag	OPC tag Address	OPC Tag Type
00001	1	DO
00002	2	DO
10001	1	DI
100010	10	DI
40001	1	AO
400020	20	AO
30001	1	AI
30002	2	AI
300020 300021	20	FI
300022 300023	22	FI
400020 400021	20	FO
400022 400023	22	FO
300030 300031	30	INITI
300032	32	UINTI

300033		
400040 400041	40	INITO
400042 400043	42	UINTO

4 – Operation

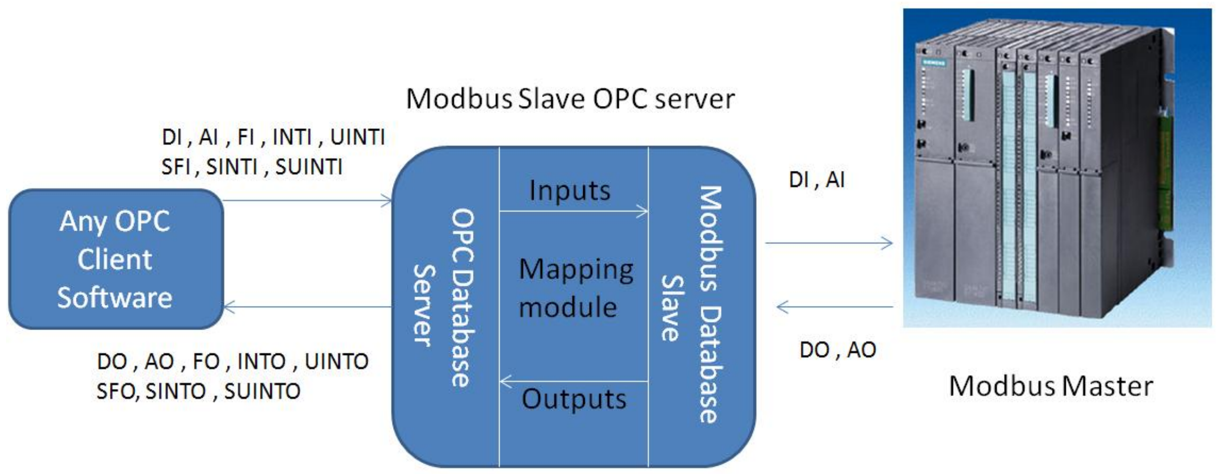
1 - When Modbus Slave OPC server is started, it will define Modbus tags and OPC tags as following :

- Modbus coil , Discrete Input ➔ one Modbus tag (internally) and One OPC Tags .
- Modbus register , Holding register ➔ one Modbus tag (internally) and One OPC Tags .
- FI , INIT, UINTI ➔ OPC server will define two register (internally) and one OPC tags
- FO , INITO, UINTIO ➔ OPC server will define two Holding register (internally) and one OPC tags

2 - OPC client writes data to DI , AI , FI , INIT and UINTI tags ,OPC server writes to internal Modbus tags . for FI , INIT and UINTI OPC server will write on 2 Modbus register

3 – Modbus master is reading data from OPC server(Modbus Slave Device) , OPC server is answering based on Modbus protocol and will send all internally Modbus tags which master requested

4 – Modbus master is writing data To Coils and Holding registers , OPC server will convert tags and write to OPC Client . OPC server converts 2 Holding register to FO , INTO and UINTO and writes to OPC client .



-OPC client writes DI , AI , FI , INTI , UINTI , SFI , SINTI and SUINTI to Modbus Slave OPC server
-OPC Server maps OPC tags to Modbus tags
-Modbus Master is reading Input Status , Coils Status , Input Register and Holding registers

-Modbus Master Writes Coil and Holding registers to OPC server
-OPC server Maps Modbus Tags to OPC Tags
-OPC Client will receive DO , AO , FO , INTO , UINTO , SFO , SINTO and SUINTO values

4 – Sample Configuration

Step 1:

Options.xml

```
<?xml version="1.0"?>
<Options>
  <Version>1.0.0</Version>
  <Node>
    <Name>Protocol</Name>
    <Desc>ModbusRTU,ModbusTCP</Desc>
    <Value>ModbusTCP</Value>
  </Node>

  <Node>
    <Name>COM</Name>
    <Desc>Serial Port for Communication 1,2,3,4,5,...</Desc>
    <Value>1</Value>
  </Node>
  <Node>
    <Name>BaudRate</Name>
    <Desc>Communication baud rate </Desc>
    <Value>57600</Value>
  </Node>

  <Node>
    <Name>DataBit</Name>
    <Desc>7,8</Desc>
    <Value>8</Value>
  </Node>
  <Node>
    <Name>Parity</Name>
    <Desc>None,Even,Odd</Desc>
    <Value>None</Value>
  </Node>

  <Node>
    <Name>DtrEnable</Name>
    <Desc>DtrEnable</Desc>
    <Value>False</Value>
  </Node>
  <Node>
    <Name>RstEnable</Name>
    <Desc>RstEnable</Desc>
    <Value>False</Value>
  </Node>

  <Node>
    <Name>Handshake</Name>
    <Desc>None,RequestToSend,RequestToSendXOnXOff,XOnXOff</Desc>
    <Value>None</Value>
  </Node>

  <Node>
```

```
        <Name>ReadBufferSize</Name>
        <Desc>ReadBufferSize</Desc>
        <Value>1024</Value>
    </Node>

    <Node>
        <Name>WriteBufferSize</Name>
        <Desc>WriteBufferSize</Desc>
        <Value>1024</Value>
    </Node>

    <Node>
        <Name>SlaveAddress</Name>
        <Desc>SlaveAddress</Desc>
        <Value>2</Value>
    </Node>

    <Node>
        <Name>ShiftAddress</Name>
        <Desc>ShiftAddress</Desc>
        <Value>1</Value>
    </Node>
    <Node>
        <Name>PhysicalLayerScanTime</Name>
        <Desc>PhysicalLayerScanTime(ms)</Desc>
        <Value>100</Value>
    </Node>

    <Node>
        <Name>StatusListNum</Name>
        <Desc>StatusListNum</Desc>
        <Value>256</Value>
    </Node>

    <Node>
        <Name>TCPPort</Name>
        <Desc>Modbus TCP Port Number</Desc>
        <Value>502</Value>
    </Node>
    <Node>
        <Name>TCPLocalIP</Name>
        <Desc>Modbus TCP LocalIP</Desc>
        <Value>127.0.0.1</Value>
    </Node>
    <Node>
        <Name>Instance</Name>
        <Desc>OPC Server instance 1,2,3,4</Desc>
        <Value>1</Value>
    </Node>

</Options>
```

ModbusTags.xml

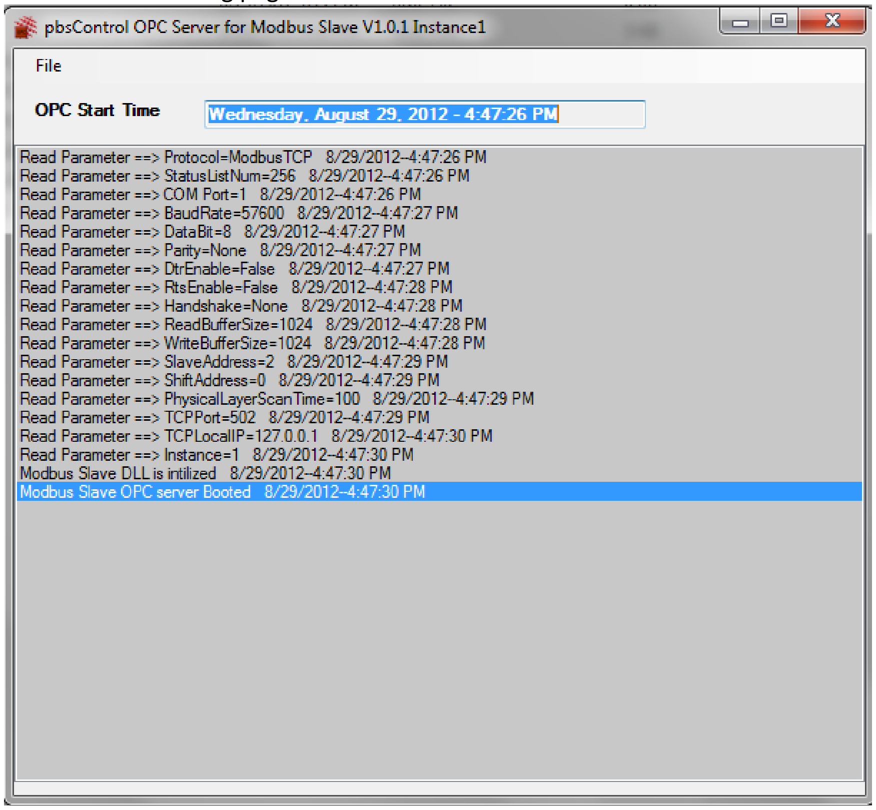
```
<?xml version="1.0"?>
<OPCSrvTags>

   <Tag  Address="1" Name="DI1" Type="DI" Init="False" />
   <Tag  Address="2" Name="DI2" Type="DI" Init="False" />
   <Tag  Address="3" Name="DI3" Type="DI" Init="False" />
   <Tag  Address="4" Name="DI4" Type="DI" Init="False" />
   <Tag  Address="5" Name="DI5" Type="DI" Init="False" />
   <Tag  Address="6" Name="DI6" Type="DI" Init="False" />
   <Tag  Address="7" Name="DI7" Type="DI" Init="False" />
   <Tag  Address="8" Name="DI8" Type="DI" Init="False" />


   <Tag  Address="1" Name="reg.AI1" Type="AI" Init="0" />
   <Tag  Address="2" Name="reg.AI2" Type="AI" Init="0" />
   <Tag  Address="3" Name="reg.AI3" Type="AI" Init="0" />
   <Tag  Address="4" Name="reg.AI4" Type="AI" Init="0" />
   <Tag  Address="5" Name="reg.AI5" Type="AI" Init="0" />
   <Tag  Address="6" Name="reg.AI6" Type="AI" Init="0" />
   <Tag  Address="7" Name="reg.AI7" Type="AI" Init="0" />
   <Tag  Address="8" Name="reg.AI8" Type="AI" Init="0" />


   <Tag  Address="10" Name="FI1" Type="SFI" Init="0" />
   <Tag  Address="12" Name="FI2" Type="SFI" Init="0" />
   <Tag  Address="14" Name="FI3" Type="SFI" Init="0" />
   <Tag  Address="16" Name="FI4" Type="SFI" Init="0" />
   <Tag  Address="18" Name="FI5" Type="SFI" Init="0" />
   <Tag  Address="20" Name="FI6" Type="SFI" Init="0" />
   <Tag  Address="22" Name="FI7" Type="SFI" Init="0" />
   <Tag  Address="24" Name="FI8" Type="SFI" Init="0" />


   <Tag  Address="30" Name="INTI1" Type="SINTI" Init="0" />
   <Tag  Address="32" Name="INTI2" Type="SINTI" Init="0" />
   <Tag  Address="34" Name="INTI3" Type="SINTI" Init="0" />
   <Tag  Address="36" Name="INTI4" Type="SINTI" Init="0" />
   <Tag  Address="38" Name="INTI5" Type="SINTI" Init="0" />
   <Tag  Address="40" Name="INTI6" Type="SINTI" Init="0" />
   <Tag  Address="42" Name="INTI7" Type="SINTI" Init="0" />
   <Tag  Address="44" Name="INTI8" Type="SINTI" Init="0" />


   <Tag  Address="50" Name="UINTI1" Type="SUINTI" Init="0" />
   <Tag  Address="52" Name="UINTI2" Type="SUINTI" Init="0" />
   <Tag  Address="54" Name="UINTI3" Type="SUINTI" Init="0" />
```

```
<Tag  Address="56" Name="UINTI4" Type="SUINTI" Init="0" />
<Tag  Address="58" Name="UINTI5" Type="SUINTI" Init="0" />
<Tag  Address="60" Name="UINTI6" Type="SUINTI" Init="0" />
<Tag  Address="62" Name="UINTI7" Type="SUINTI" Init="0" />
<Tag  Address="64" Name="UINTI8" Type="SUINTI" Init="0" />



<Tag  Address="1" Name="DO1" Type="DO" Init="False" />
<Tag  Address="2" Name="DO2" Type="DO" Init="False" />
<Tag  Address="3" Name="DO3" Type="DO" Init="False" />
<Tag  Address="4" Name="DO4" Type="DO" Init="False" />
<Tag  Address="5" Name="DO5" Type="DO" Init="False" />
<Tag  Address="6" Name="DO6" Type="DO" Init="False" />
<Tag  Address="7" Name="DO7" Type="DO" Init="False" />
<Tag  Address="8" Name="DO8" Type="DO" Init="False" />


<Tag  Address="1" Name="AO1" Type="AO" Init="0" />
<Tag  Address="2" Name="AO2" Type="AO" Init="0" />
<Tag  Address="3" Name="AO3" Type="AO" Init="0" />
<Tag  Address="4" Name="AO4" Type="AO" Init="0" />
<Tag  Address="5" Name="AO5" Type="AO" Init="0" />
<Tag  Address="6" Name="AO6" Type="AO" Init="0" />
<Tag  Address="7" Name="AO7" Type="AO" Init="0" />
<Tag  Address="8" Name="AO8" Type="AO" Init="0" />


<Tag  Address="10" Name="Group1.FO1" Type="SFO" Init="0" />
<Tag  Address="12" Name="Group1.FO2" Type="SFO" Init="0" />
<Tag  Address="14" Name="Group1.FO3" Type="SFO" Init="0" />
<Tag  Address="16" Name="Group1.FO4" Type="SFO" Init="0" />
<Tag  Address="18" Name="Group1.FO5" Type="SFO" Init="0" />
<Tag  Address="20" Name="Group1.FO6" Type="SFO" Init="0" />
<Tag  Address="22" Name="Group1.FO7" Type="SFO" Init="0" />
<Tag  Address="24" Name="Group1.FO8" Type="SFO" Init="0" />


<Tag  Address="30" Name="Group2.INTO1" Type="SINTO" Init="0" />
<Tag  Address="32" Name="Group2.INTO2" Type="SINTO" Init="0" />
<Tag  Address="34" Name="Group2.INTO3" Type="SINTO" Init="0" />
<Tag  Address="36" Name="Group2.INTO4" Type="SINTO" Init="0" />
<Tag  Address="38" Name="Group2.INTO5" Type="SINTO" Init="0" />
<Tag  Address="40" Name="Group2.INTO6" Type="SINTO" Init="0" />
<Tag  Address="42" Name="Group2.INTO7" Type="SINTO" Init="0" />
<Tag  Address="44" Name="Group2.INTO8" Type="SINTO" Init="0" />
```

```
  <Tag  Address="50" Name="UINTO1" Type="SUINTO" Init="0" />
  <Tag  Address="52" Name="UINTO2" Type="SUINTO" Init="0" />
  <Tag  Address="54" Name="UINTO3" Type="SUINTO" Init="0" />
  <Tag  Address="56" Name="UINTO4" Type="SUINTO" Init="0" />
  <Tag  Address="58" Name="UINTO5" Type="SUINTO" Init="0" />
  <Tag  Address="60" Name="UINTO6" Type="SUINTO" Init="0" />
  <Tag  Address="62" Name="UINTO7" Type="SUINTO" Init="0" />
  <Tag  Address="64" Name="UINTO8" Type="SUINTO" Init="0" />


</OPCSrvTags>
```

Step 2:

Run pbsModbusS_OPCSrv.exe application
You will see following page:

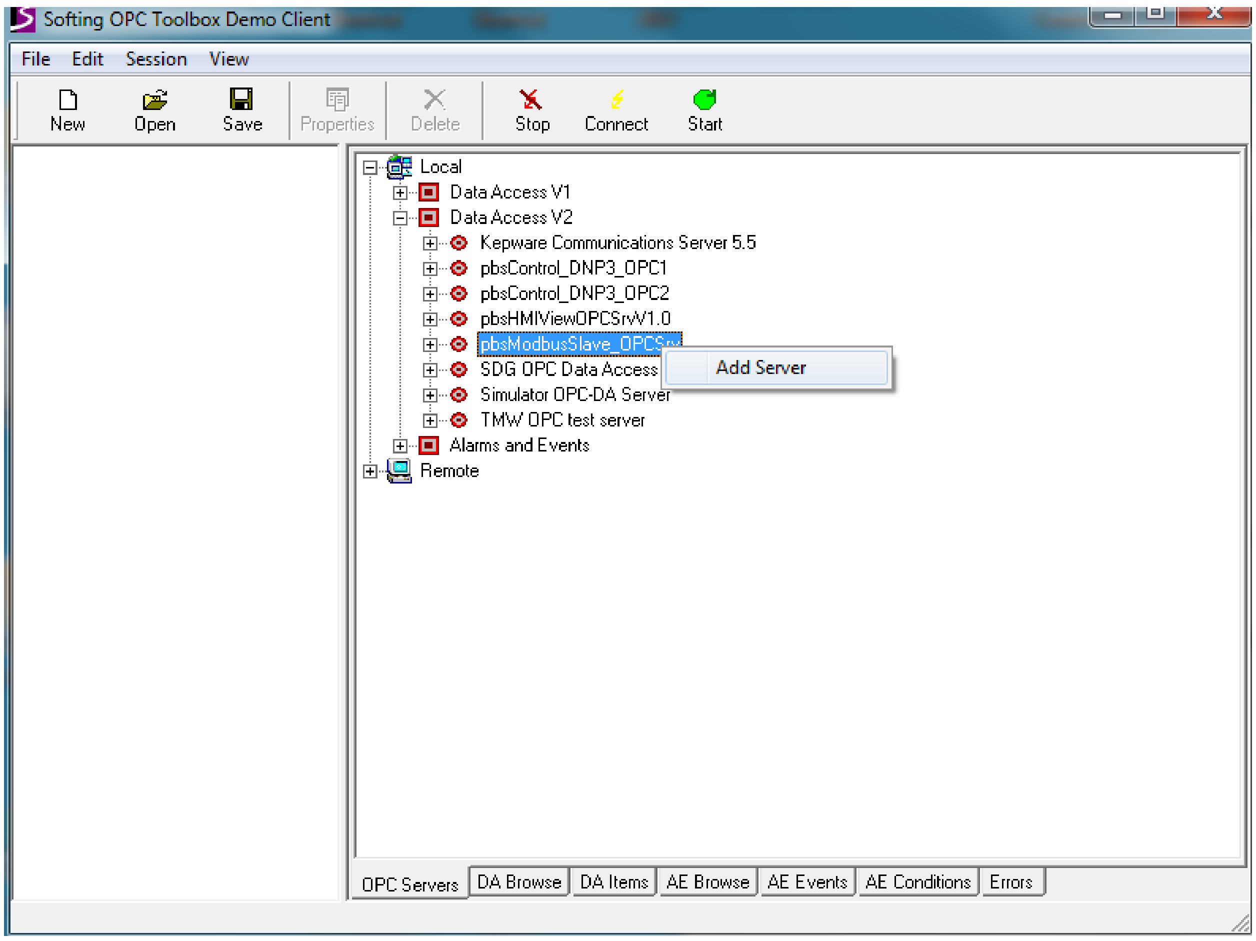


OPC Start Time Wednesday, August 29, 2012 - 4:47:26 PM

```
Read Parameter ==> Protocol=ModbusTCP   8/29/2012--4:47:26 PM
Read Parameter ==> StatusListNum=256   8/29/2012--4:47:26 PM
Read Parameter ==> COM Port=1   8/29/2012--4:47:26 PM
Read Parameter ==> BaudRate=57600   8/29/2012--4:47:27 PM
Read Parameter ==> DataBit=8   8/29/2012--4:47:27 PM
Read Parameter ==> Parity=None   8/29/2012--4:47:27 PM
Read Parameter ==> DtrEnable=False   8/29/2012--4:47:27 PM
Read Parameter ==> RtsEnable=False   8/29/2012--4:47:28 PM
Read Parameter ==> Handshake=None   8/29/2012--4:47:28 PM
Read Parameter ==> ReadBufferSize=1024   8/29/2012--4:47:28 PM
Read Parameter ==> WriteBufferSize=1024   8/29/2012--4:47:28 PM
Read Parameter ==> SlaveAddress=2   8/29/2012--4:47:29 PM
Read Parameter ==> ShiftAddress=0   8/29/2012--4:47:29 PM
Read Parameter ==> PhysicalLayerScanTime=100   8/29/2012--4:47:29 PM
Read Parameter ==> TCPPort=502   8/29/2012--4:47:29 PM
Read Parameter ==> TCPLocalIP=127.0.0.1   8/29/2012--4:47:30 PM
Read Parameter ==> Instance=1   8/29/2012--4:47:30 PM
Modbus Slave DLL is intilized   8/29/2012--4:47:30 PM
Modbus Slave OPC server Booted   8/29/2012--4:47:30 PM
```

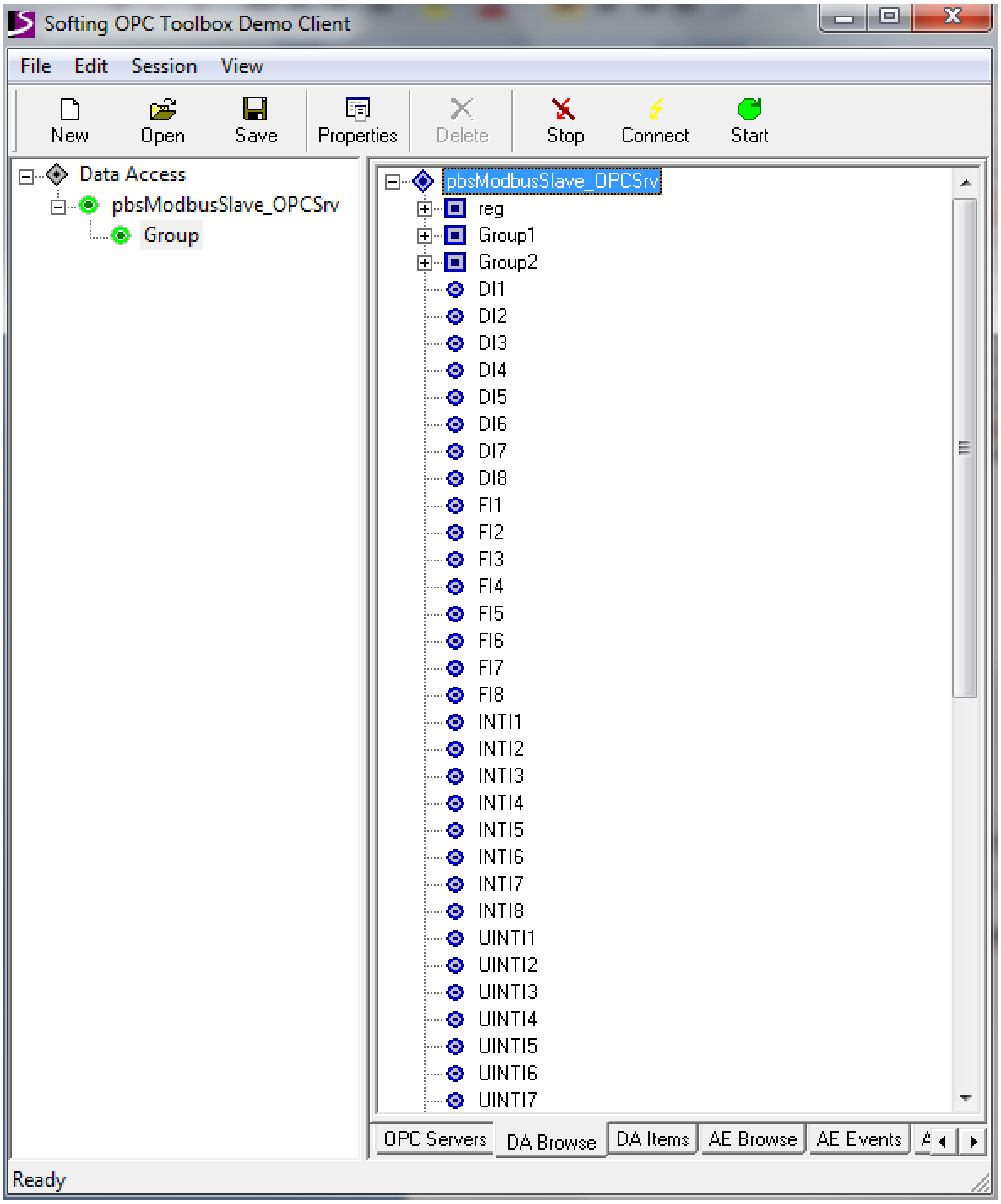
In Status list you can see all parameters and status of OPC server.
OPC server will automatically minimize.

You can connect to OPC server by any OPC client or Browser . In pbsModbusSlave CD you can see a free OPC Browser . After you run OPC Browser you can connect to Modbus Slave OPC server .



OPC Server name is **pbsModbusSlave_OPCSrv**
Add Server and Click on DA Browse Tab. You can see all tags which is defined in the Modbustag.xml file .
Notice that When you separate Tag Name by "." It will make a new segment in OPC server . in This example following tags defined In same segment :
reg.AI1
reg.AI2
reg.AI3
.....

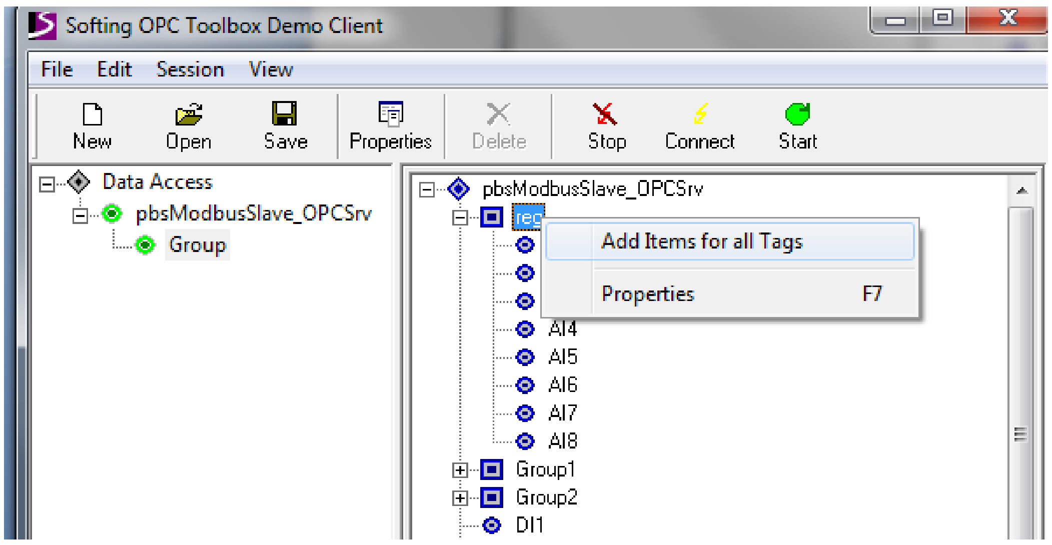
You can make multi segment by adding "." To tag Name .



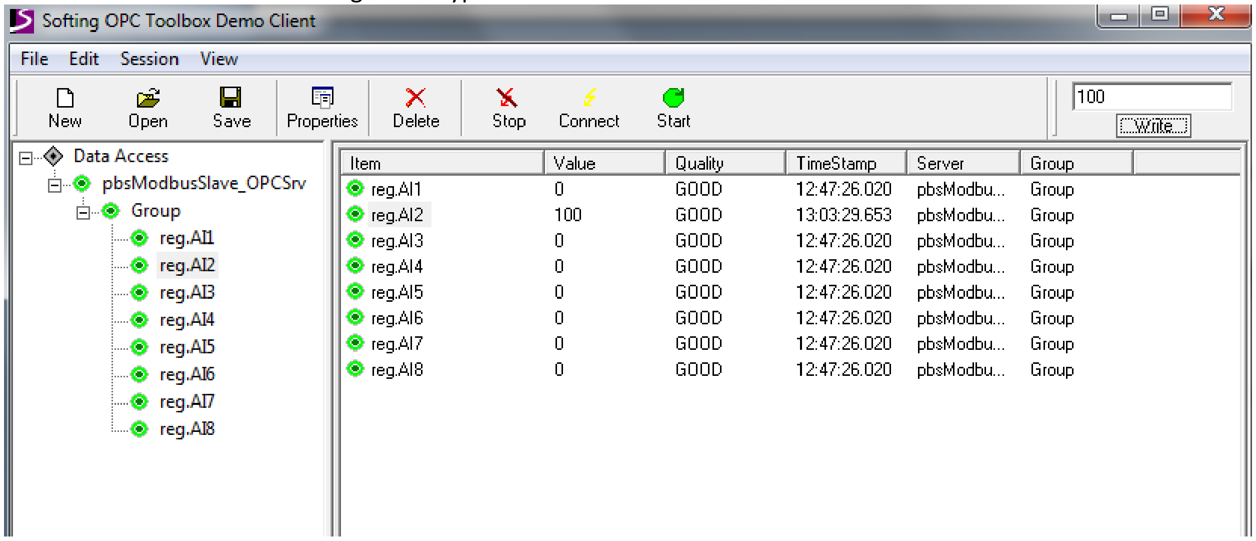
Data Access
pbsModbusSlave_OPCSrv
Group

pbsModbusSlave_OPCSrv
reg
Group1
Group2
DI1
DI2
DI3
DI4
DI5
DI6
DI7
DI8
FI1
FI2
FI3
FI4
FI5
FI6
FI7
FI8
INTI1
INTI2
INTI3
INTI4
INTI5
INTI6
INTI7
INTI8
UINTI1
UINTI2
UINTI3
UINTI4
UINTI5
UINTI6
UINTI7

Right click on “reg” segment and add all tags

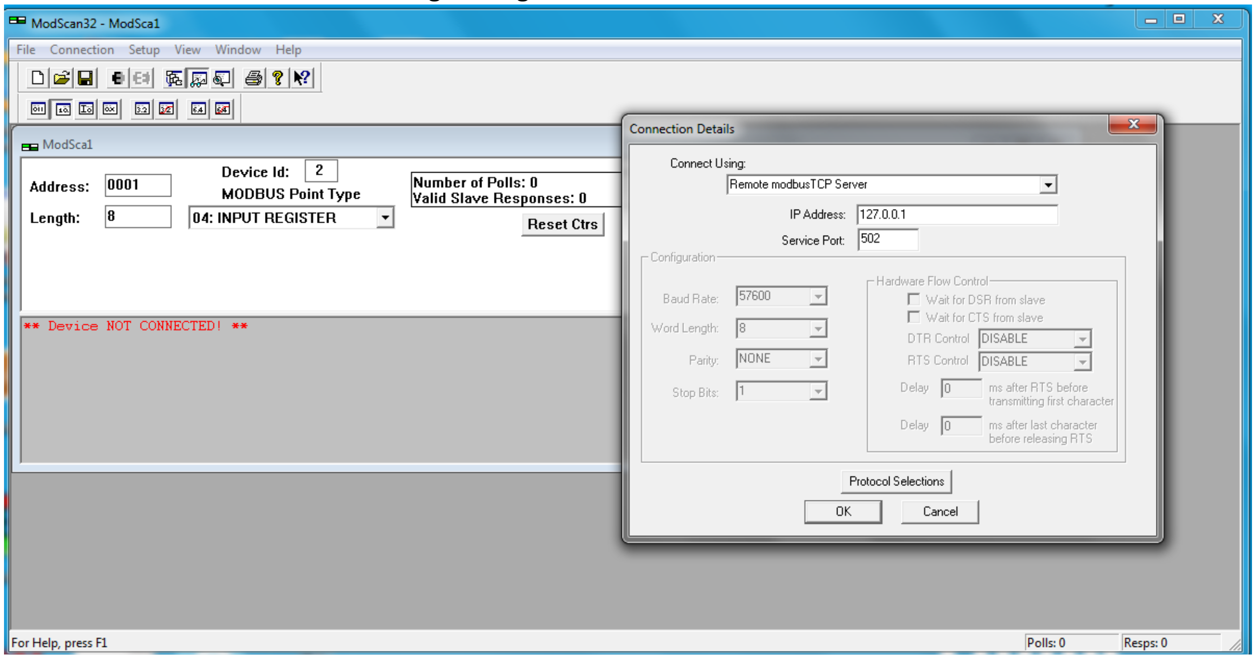


In OPC Browser View Menu select “DA Write Bar” . No you can write to Input tags .
Click on DA Items and click on reg.AI2 . Type 100 on DA Bar and write value .



Item	Value	Quality	TimeStamp	Server	Group
reg.AI1	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI2	100	GOOD	13:03:29.653	pbsModbu...	Group
reg.AI3	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI4	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI5	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI6	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI7	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI8	0	GOOD	12:47:26.020	pbsModbu...	Group

For testing Modbus Slave OPC Server , you need to have a Modbus Master Software .
In product CD you can see demo version of ModScan32 software .
Run ModScan32 and make following setting :



Address: 0001
Device Id: 2
MODBUS Point Type
Length: 8
04: INPUT REGISTER
Number of Polls: 0
Valid Slave Responses: 0
** Device NOT CONNECTED! **

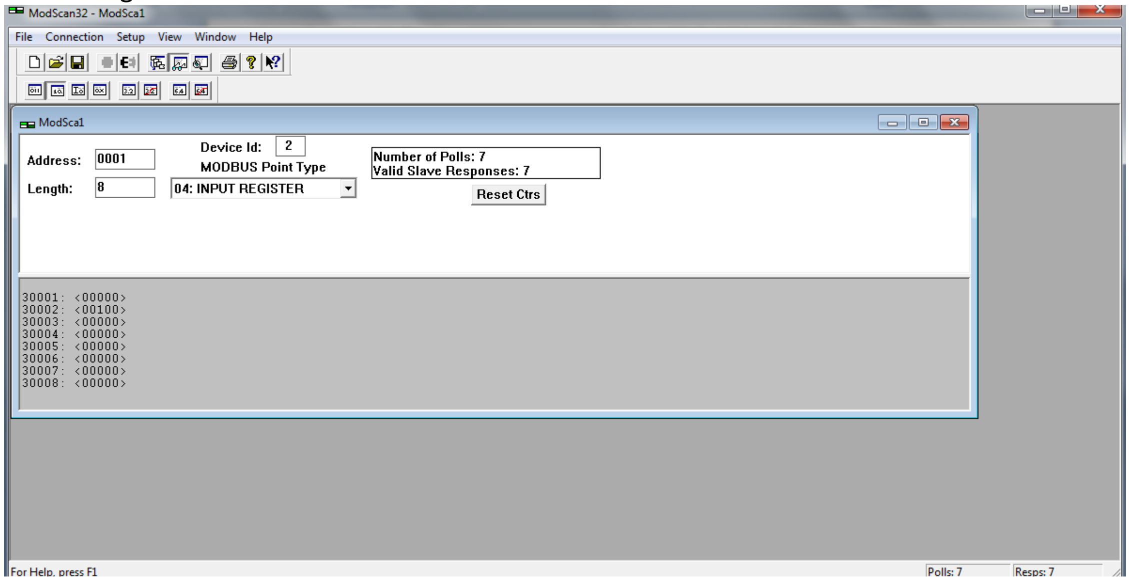
Connect Using: Remote modbusTCP Server
IP Address: 127.0.0.1
Service Port: 502
Configuration
Baud Rate: 57600
Word Length: 8
Parity: NONE
Stop Bits: 1
Hardware Flow Control
Wait for DSR from slave
Wait for CTS from slave
DTR Control DISABLE
RTS Control DISABLE
Delay 0 ms after RTS before transmitting first character
Delay 0 ms after last character before releasing RTS

Polls: 0
Resps: 0

Length = 8
DeviceID = 2
Modbus Point Type = Input Register

In Connection Menu use following :
 remote Modbus TCP Server
IP address = 127.0.0.1
Port = 502

Click on OK .
In This stage ModScan32 will connect to Modbus Slave OPC Server .

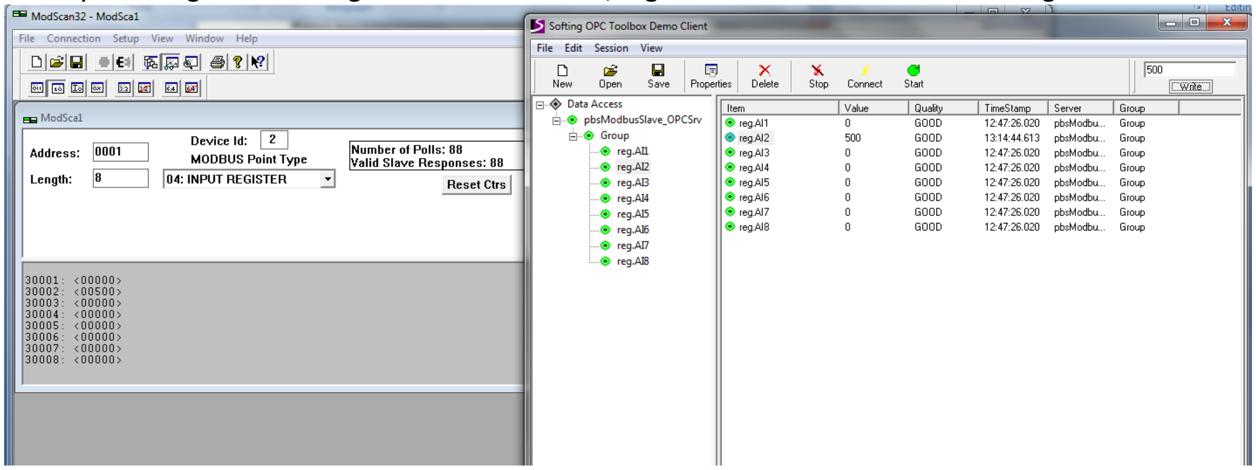


Address: 0001
Device Id: 2
MODBUS Point Type
Length: 8
04: INPUT REGISTER
Number of Polls: 7
Valid Slave Responses: 7

```
30001: <00000>
30002: <00100>
30003: <00000>
30004: <00000>
30005: <00000>
30006: <00000>
30007: <00000>
30008: <00000>
```

Polls: 7
Resps: 7

When you change value of reg.AI2 in OPC Browser , register number 30002 will be change .



Device Id: 2
Address: 0001
MODBUS Point Type
Length: 8
04: INPUT REGISTER
Number of Polls: 88
Valid Slave Responses: 88

```
30001: <00000>
30002: <00500>
30003: <00000>
30004: <00000>
30005: <00000>
30006: <00000>
30007: <00000>
30008: <00000>
```

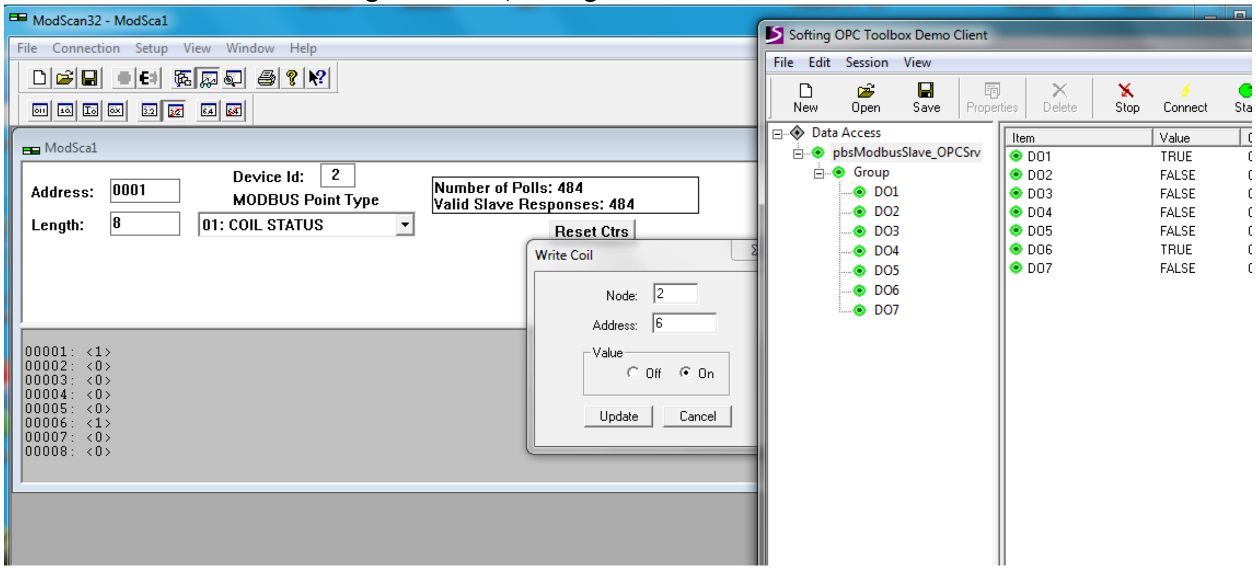
500

Item	Value	Quality	TimeStamp	Server	Group
reg.AI1	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI2	500	GOOD	13:14:44.613	pbsModbu...	Group
reg.AI3	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI4	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI5	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI6	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI7	0	GOOD	12:47:26.020	pbsModbu...	Group
reg.AI8	0	GOOD	12:47:26.020	pbsModbu...	Group

Step 3: (Writing Coil by Modbus Master to OPC)
Add DO Tags in OPC Browser , and change Modbus master setting as following :

- Address = 1
- Length = 8
- Device ID = 2
- Coil Status

Double click on a coil and change its value , changes will transfer to OPC Client .



Device Id: 2
Address: 0001
MODBUS Point Type
Length: 8
01: COIL STATUS
Number of Polls: 484
Valid Slave Responses: 484

Node: 2
Address: 6
Value: ( ) Off [✓ On]

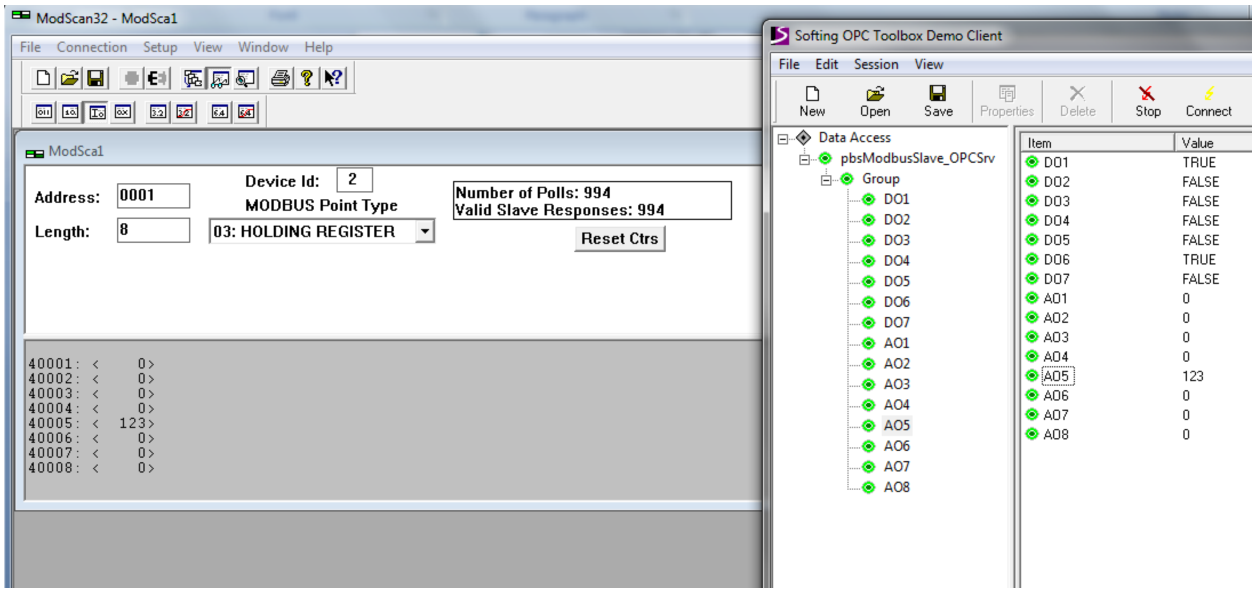
```
00001: <1>
00002: <0>
00003: <0>
00004: <0>
00005: <0>
00006: <1>
00007: <0>
00008: <0>
```

Item	Value
DO1	TRUE
DO2	FALSE
DO3	FALSE
DO4	FALSE
DO5	FALSE
DO6	TRUE
DO7	FALSE

Step 4 (Writing Holding register by Modbus Master to OPC)

Add AO1 to AO8 tags to OPC browser and do following setting on Modbus Master :
Address = 1
Length = 8
Holding register

Double click on register 5 on Modbus Master page and change its value , new value will move to OPC client .
At Modscan32 program change display option in setup menu to integer.

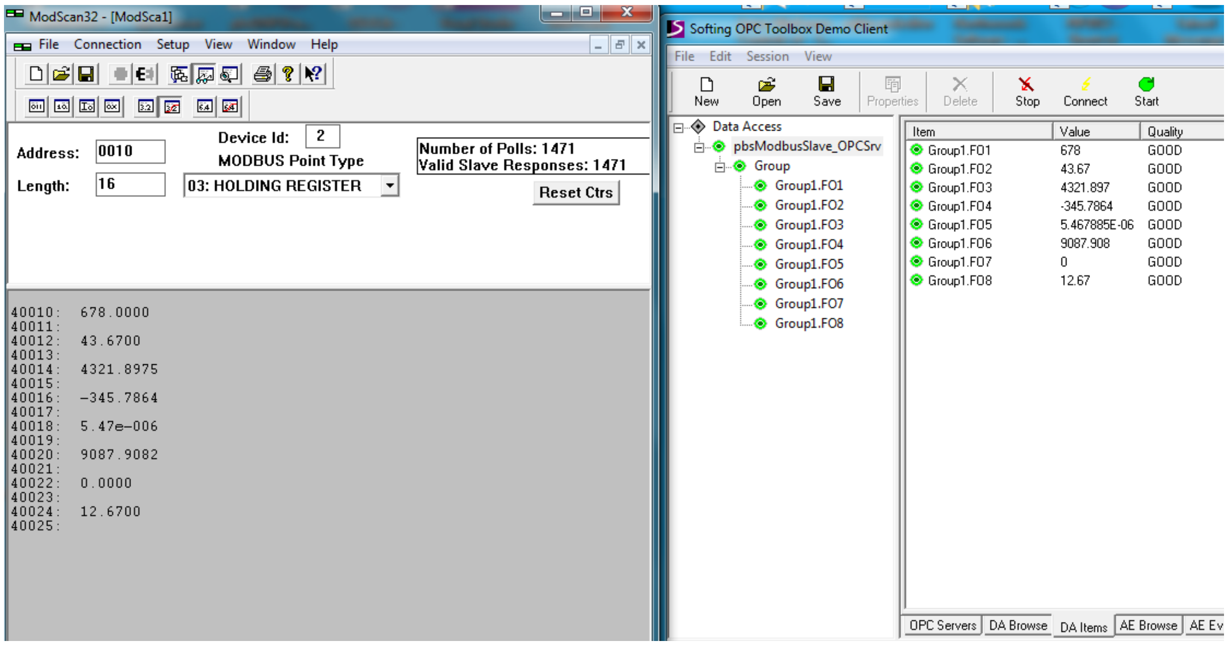

ModScan32 - ModSca1
File Connection Setup View Window Help
ModSca1
Softing OPC Toolbox Demo Client
File Edit Session View
New Open Save Properties Delete Stop Connect
Data Access
pbsModbusSlave_OPCSrv
Group

Address: 0001
Device Id: 2
MODBUS Point Type
Length: 8
03: HOLDING REGISTER
Number of Polls: 994
Valid Slave Responses: 994
Reset Ctrs

```
40001: <     0>
40002: <     0>
40003: <     0>
40004: <     0>
40005: <   123>
40006: <     0>
40007: <     0>
40008: <     0>
```

Item	Value
DO1	TRUE
DO2	FALSE
DO3	FALSE
DO4	FALSE
DO5	FALSE
DO6	TRUE
DO7	FALSE
AO1	0
AO2	0
AO3	0
AO4	0
AO5	123
AO6	0
AO7	0
AO8	0

Step5 (Writing Floating point from Modbus master to OPC)
In OPC Browser select group1 and add all tags .
In Modscan do following setting: (In setup menu of Modscan , Display Option change to Swap FP)
Address = 10
Length = 16
Holding register
Device ID = 2



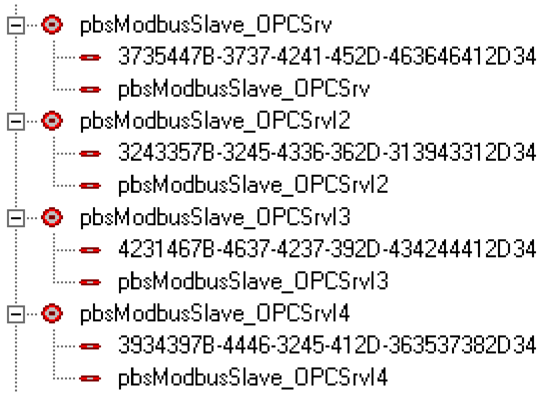
Address: 0010
Device Id: 2
MODBUS Point Type
Length: 16
03: HOLDING REGISTER
Number of Polls: 1471
Valid Slave Responses: 1471
Reset Ctrs

```
40010:  678.0000
40011:
40012:  43.6700
40013:
40014:  4321.8975
40015:
40016:  -345.7864
40017:
40018:  5.47e-006
40019:
40020:  9087.9082
40021:
40022:  0.0000
40023:
40024:  12.6700
40025:
```

Item	Value	Quality
Group1.FO1	678	GOOD
Group1.FO2	43.67	GOOD
Group1.FO3	4321.897	GOOD
Group1.FO4	-345.7864	GOOD
Group1.FO5	5.467885E-06	GOOD
Group1.FO6	9087.908	GOOD
Group1.FO7	0	GOOD
Group1.FO8	12.67	GOOD

5 – Product Specification

OPC Standard = DA2.0
Number of Modbus tags = no Limitation
Modbus TCP Protocol Support = YES
Modbus RTU protocol support = YES
ModbusASCII Protocol Support = NO
Number of OPC Server instance = 4 instance in the same time



```
pbsModbusSlave_OPCSrv
    3735447B-3737-4241-452D-463646412D34
    pbsModbusSlave_OPCSrv
pbsModbusSlave_OPCSrvl2
    3243357B-3245-4336-362D-313943312D34
    pbsModbusSlave_OPCSrvl2
pbsModbusSlave_OPCSrvl3
    4231467B-4637-4237-392D-434244412D34
    pbsModbusSlave_OPCSrvl3
pbsModbusSlave_OPCSrvl4
    3934397B-4446-3245-412D-363537382D34
    pbsModbusSlave_OPCSrvl4
```

When using as ModbusTCP , you can connect to 4 different Ethernet port .
When using as ModbusRTU , you can connect to 4 different Serial ports .

Supported modbus Function codes :

```
FC_ReadCoilStatus = 0x1,
FC_ReadInputStatus = 0x2,
FC_ReadHoldingRegisters = 0x3,
FC_ReadInputRegisters = 0x4,
FC_ForceSingleCoil = 0x5,
FC_PreSetSingleRegister = 0x6,
FC_ForceMultiCoils = 0xf,
FC_PreSetMultiRegisters = 0x10
```