Date	Version	Author	Reviewer	Description

WebAccess

Driver Configuration Manual

ModSim

MOD_DEV.DLL **Driver date: 2017/7/18**

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Revision History

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1. Introduction

1.1 Introduction to Modbus Ethernet/TCPIP

Advantech WebAccess SCADA Node provides a Modbus master interface using Modbus RTU protocol for communicating with Modbus slave devices. Slave devices include AEG/Modicon 984 and Quantum PLCs, GE Fanuc Series-6, Series-5, Series-90, and many others.

The Modicon driver accesses real-time data and control automation equipment with Modbus RTU protocol.

Modbus is a "De-facto" standard for communications. Modbus is an "open" communications protocol designed for industrial control and monitoring applications. Programmable Logic Controllers (PLC), Single Loop and Multi- Loop Controllers, Remote Terminal Units (RTU, Distributed control Systems (DCS), computers, shop floor operator panels and other devices can communicate throughout plants and substations via Modbus RTU or Modbus Ethernet network.

Especially for connection of SCADA and HMI systems to intelligent operator panels, PLCs and controllers, Modbus became a de-facto standard. Many automation devices support the Modbus protocol in both Serial Modbus RTU and Modbus Ethernet.

1.1.1 Modbus Ethernet/TCPIP

The Advantech WebAccess Modicon Modbus Device Driver can communicate with Ethernet TCP/IP communications (or RS-232, RS-422 or RS-485 as a backup) using a packet version of the Modbus RTU protocol. Any TCP/IP compatible medium is acceptable, the most common being Ethernet.

The Advantech WebAccess COM Ports are “virtual” in the Advantech WebAccess configuration for Modbus TCP/IP. The Advantech WebAccess driver will search all NIC (network Interface Cards) to find the addressed devices regardless of the configured Comport. For the Modbus TCP/IP driver, it is recommended to use a Com Port that does not utilize an actual Serial COM port.

The computer communication port must be designed for use with the Windows 32-bit operating system.

Modicon's Modbus TCP/IP network is a single master, multi-drop network, which supports up to 247 slave devices.

Advantech WebAccess can scan every 100 milliseconds over TCP/IP connections limited only by the PLC, Controller or RTU and the network connection.

The Genuine Advantech WebAccess Modbus Driver is among the fastest Modbus TCP/IP drivers available, if not the fastest.

1.1.2 Ease of Use: Parameters

Like all Genuine Advantech WebAccess drivers, object-oriented "parameters" guide novice users with pre-built templates containing typical addresses.

AI is an Analog Input (30001 to 39999, range of addresses). These are typically read only numbers from the PLC.

AO is an Analog Output (40001 to 49999, range of addresses). These are typically values written to the PLC by operators and programs. Setpoints, Outputs, alarm limits are examples.

DI is a Digital Input (00001 to 09999, range of addresses). These are typically read only statuses (On, Off, True, False, etc.) from the PLC.

DO is a Digital Output (10001 to 19999, range of addresses). These are typically values written to the PLC by operators and programs. On/ OFF, RUN/STOP are examples.

Users can select a parameter type, and then modify the address to the correct register in order to build a tag.

1.1.3 Redundant Comports

Advantech WebAccess supports redundant Comports. Two Ethernet comports can be used, the second acts as a backup to the first. The Advantech

WebAccess COM Ports are “virtual” in the Advantech WebAccess configuration for Modbus TCP/IP. The Advantech WebAccess driver will search all NIC (network Interface Cards) to find the addressed devices regardless of the configured Comport. A Backup port does not need to be specified. However, a second IP address for the PLC must be specified (i.e. the PLC must have two Network Interface cards).

Modbus Ethernet can also be backed up with a Serial connection (and vice versa). The Backup port must be specified as the actual Serial Comport (usually COMPORT 1 or 2).

1.1.4 Modbus Protocols

1.1.4.1 Modbus Ethernet / TCPIP

Modicon's Modbus Ethernet network is a single master, multi-drop network, which supports up to 247 slave devices. The preferred physical layer for the Modbus Ethernet network TCP/IP over Ethernet, although any TCP/IP network connection is supported including the Internet, WANs and LANs. A single IP address can support up to 255 devices. Serial communications can be "encapsulated" into TCP/IP packets using Modbus Serial-to-Ethernet gateways.

The main advantage of Modbus TCP/IP is the greater character density and greater network speed allows better data throughput than Modbus RTU or ASCII.

1.1.4.2 Modbus RTU

The Modbus Serial RTU is described in another User Guide.

This is the default protocol of the Advantech WebAccess Modicon serial device driver. In Modbus RTU, each eight-bit byte, in a message, contains two four- bit hexadecimal characters. The main advantage of Modbus RTU is the greater character density allows better data throughput than Modbus ASCII for same baud rate.

Advantech WebAccess can scan every 100 milliseconds over serial connections limited only by the PLC, Controller or RTU and the connection.

Most modern Modbus serial devices use Modbus RTU.

1.1.4.3 Modbus ASCII

The Modbus Serial ASCII Driver is described in another User Guide.

This is an option to the Modicon protocol of the Advantech WebAccess Modicon serial device drive.

In Modbus ASCII, each eight-bit byte, in a message, is sent as two ASCII characters. The main advantage is that it allows time intervals of up to one second to occur between characters without causing an error.

2. Configuration of Modicon Ethernet Driver

The steps, in summary, are:

1. Start the Internet Explorer **Web Browser**.
2. Enter IP address of the **Project Node**.
3. Select **WebAccess Configuration**.
4. Open or Create a **Project**.
5. Select a SCADA Node or use **Add SCADA node** to create one. (A SCADA node is the PC that will connect to the automation hardware).
6. Configure a TCP/IP comport using **Add Comport** for the SCADA Node.
7. Select a **TCP/IP** type and Submit
8. Select the Comport to open Comport Properties.
9. Configure a Scan time and Timeout for the Com Port.
10. Select **Add Device**.
11. Select **Modicon** as the **Device Type**. This determines the communications Protocol and Device Driver.
12. Configure IP Address, Port Number, Unit Number and Device Number to match those in the PLC.
13. Refer to later sections in this guide for other fields (they usually are not needed).
14. Use Add Tag or Add Block to create tags.
15. Select a Parameter (AI, AO, DI, and DO) to match the type of data to be read (Analog Input, Analog Output, Digital Input, and Digital Output). The Address of the data must match the Parameter Type:
    - AI is an Analog Input (30001 to 39999, range of addresses). These are typically read only numbers from the PLC.
    - AO is an Analog Output (40001 to 49999, range of addresses). These are typically values written to the PLC by operators and programs. Setpoints, Outputs, alarm limits are examples.
    - DI is a Digital Input (00001 to 09999, range of addresses). These are typically read only statuses (On, Off, True, False, etc.) from the PLC.
    - DO is a Digital Output (10001 to 19999, range of addresses). These are typically values written to the PLC by operators and programs. On/ OFF, RUN/STOP are examples.
16. Modify the Address to match the actual address.
17. Apply a Tag name.
18. Edit Tags in Project Manager to assign Alarms, Scaling, Engineering Units, Description and other features.

Note - It is recommended to select a Comport number greater than 2 so that it does not conflict with a Serial comport that you may want to use later.

Note – Many Modbus Ethernet devices ignore the Device Number if there is only one device at a given IP Address. Device Number = 0 uses the Unit Number as the Device Number. The Unit Number is used for display purposes in Advantech WebAccess. The Device Number is used by the communications protocol to the device.

2.1 Comport Configuration

First of all you create a SCADA node as the normal process with WebAccess. Then, in the WebAccess Project Manager create a new Comport with "TCPIP" interface name on the SCADA node as shown in the figure 2.1.

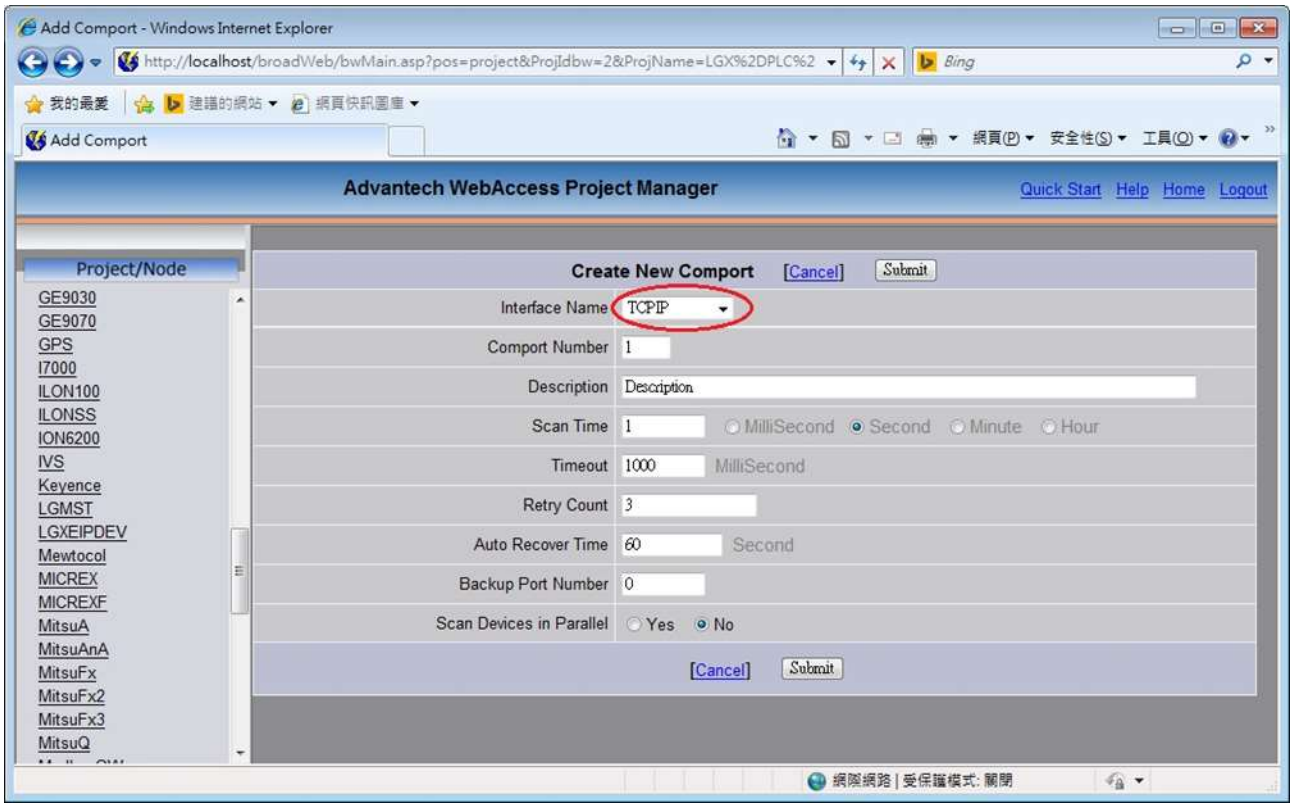

Figure 2.1

2.1.1 Comport Number

The Advantech WebAccess COM Ports are "virtual" in the Advantech WebAccess configuration for TCP/IP. The Advantech WebAccess driver will search all NIC (Network Interface Cards) to find the addressed devices regardless of the configured Comport.

For the Modbus TCP/IP driver, it is recommended to use a Com Port number greater then 2 and that does not utilize an actual Serial com port (e.g. COM1, COM2, etc.) on the SCADA Node..

2.1.2 Description

This is an optional field used for user reference.

2.1.3 Scan Time

This is the time in milliseconds to scan the PLC. This must match the ability of the PLC to respond.
If the PLC cannot respond as fast as the SCAN Time entered, Advantech WebAccess will scan at a slower rate.
Scan Time is also network dependent, it is possible to enter a Scan Time faster than your network can respond, Advantech WebAccess will poll all devices and tags on the Comport before starting a new scan.

2.1.4 Timeout

Timeout is the time waited before re-sending a communications packet that did not have a reply.
Timeout specifies how long the software waits for a response to a data request, specifically to wait for a reply from one packet. A recommended value is 7 to 10 ticks, longer if the communication device is slow.
This is protocol dependent: some protocols do not allow changes in time out.
Combined with Retry count, Timeout also determines time to consider a device or port as BAD.
Timeout is the time to wait since last communication packet sent without a reply. Time is in milliseconds.
The slow or poor quality communications require longer timeout. The faster the communications network or device, the shorter the timeout required. Shorter timeouts notify operators of communications failure more quickly.
Timeout, multiplied by Retry Count plus scan time, is how long Advantech WebAccess will wait before it considers a device bad. Advantech WebAccess will send a packet wait for the Timeout for a reply. If retry count is non-zero, Advantech WebAccess will repeat the request, wait the Timeout, and repeat for the number of Retry Times. A device is marked Bad (or Failed) after the number of Retries fail.
In the example above, Scan Time is 1 second, Retry Count is 3, and Timeout is 200, Advantech WebAccess will:

- Waits 1 second
- Send a packet.
- Wait 200 Milliseconds for a reply.
- Send a packet again if no reply.
- Wait 200 Milliseconds.
- Send A Packet a third Time if no reply
- Wait 200 Milliseconds.
- Mark the device Bad (Failed) if no reply.

In the above example, after approximately 1 + .6 seconds after a device fails, Advantech WebAccess will mark it bad.

2.1.5 Retry Count

Number of times to retry communications if not reply is received from a device. Combined with Timeout, also determines time to consider a device or port as BAD.
In addition, Indicates the number of times after the first attempt has failed that communication should be attempted before indicating a failure.

Specifically, how many times to send a single packet after the field device fail to respond to the first packet. After the retry count is exceeded, all the tags in the packet are marked with asterisks and the next packet of requests is sent. A reasonable value is 3 to 5 times. After this number of tries, the tags in this packet are marked as "fail to respond" (i.e. asterisks) and are disabled. In reality, increasing the number of retries hides failures on the part of the field device to respond to a request. Essentially, increasing the retries gives the field device more chances to reply.

2.1.6 Auto Recover Time

Auto Recover Time is the time to wait after a Device is marked Bad (or Failed) before re-initializing communications. Advantech WebAccess will mark the device good, send a packet and begin the whole retry / timeout process above.

In the above example for Timeout, Advantech WebAccess will wait 1 minute after a device fails before retrying communications. Every One minute the device will go good, 1.6 seconds later it will be marked bad if it is still failed, repeat.

If communications to the PLC is unusually slow due to hardware, communications or network issues, you might consider increasing this value. If communications to the PLC or RTU fails frequently, you may want to decrease this number in order to have Advantech WebAccess try to re- establish communications sooner.

If communications to the PLC, RTU or device Fails (i.e. exceeds Timeout) Advantech WebAccess will wait the Auto Recover Time before trying to re- establish communications.

2.1.7 Backup Port

Auto Recover Time is the time to wait after a Device is marked Bad (or Failed) before re-initializing communications. Advantech WebAccess will mark the device good, send a packet and begin the whole retry / timeout process above.

In the above example for Timeout, Advantech WebAccess will wait 1 minute after a device fails before retrying communications. Every One minute the device will go good, 1.6 seconds later it will be marked Bad if it is still failed, repeat.

If communications to the PLC is unusually slow due to hardware, communications or network issues, you might consider increasing this value. If communications to the PLC or RTU fails frequently, you may want to decrease this number in order to have Advantech WebAccess try to re- establish communications sooner.

If communications to the PLC, RTU or device Fails (i.e. exceeds Timeout) Advantech WebAccess will wait the Auto Recover Time before trying to re- establish communications.

2.2 Device Configuration

First you follow the steps of “Add Device” within the WebAccess, the following web page will appear on the screen as shown in the figure 2.2.

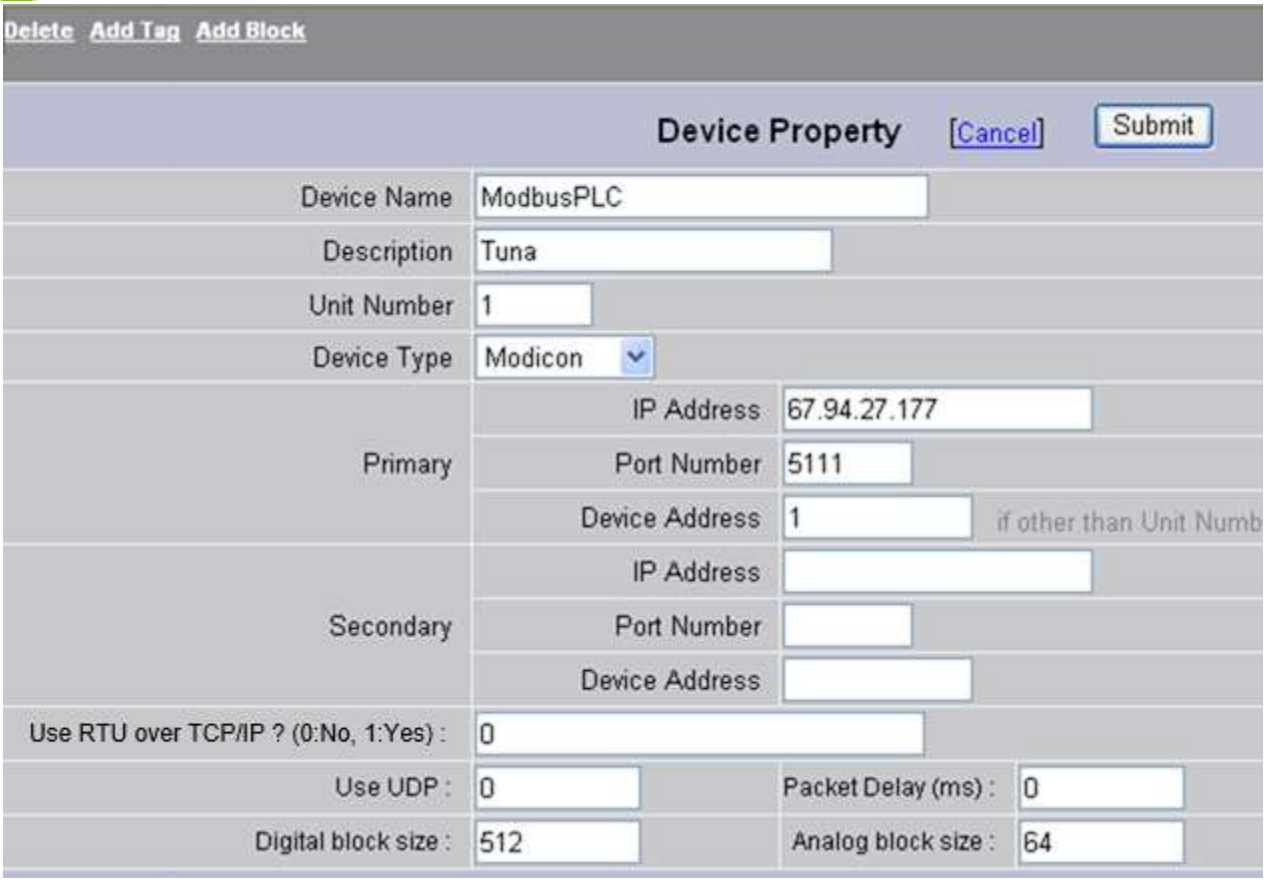

Figure 2.2

2.2.1 Device Name

A Device is a PLC, Controller, VAV or other automation hardware or software entity. Device name is a User-assigned name that will appear in the Project Manager (Configuration Tool) and in runtime VIEW Displays. Choosing a descriptive Name can help technicians identify the location of your device.

Changing only the Device Name will rename the existing device.

Changing both the Device Name and the Unit Number will make a copy of the device (e.g. create another device).

2.2.2 Description

User assigned description up to 70 characters

2.2.3 Unit Number

For Modbus, this must correspond to the Unit Number used in the protocol addressing. This is the address configured in the device or by a dipswitch on the device. The range of Unit Number is 0 to 255 for Modbus.

This Unit Number will appear on the System Status Display, Point Detail, user-built displays and tags to reference the status of this device.

Changing only the Unit Number here will change the existing device.

Changing both the Device Name and the Unit Number will make a copy of the device (e.g. create another device).

2.2.4 Device Type

This is the communication Driver used to communicate with all devices on this Com Port. Only one communications protocol is supported on the same COM port. Once a Device Type is created on a COM port, the Device Type of additional devices will be limited to this Device Type.
To use another communications device, you must configure another COM port. Multiple TCP/IP type Com Ports can be added which use the same TCP/IP Network Card on your PC.

2.2.5 IP Address

IP Address is the IP Address of the PLC, RTU or other device you are establishing communications with. The Primary IP Address must be specified. The Secondary IP Address is used only if the PLC or device has redundant communication cards (i.e. two NICs in the PLC).

2.2.6 Port Number

Port Number is the TCP Port (or UDP port) of the PLC. The Primary must be specified. The Secondary is used only if a Secondary IP address is used.

2.2.7 Device Address

Device Address is the Modbus Device Address (0 - 255) used by the Modbus RTU protocol. How this is handled varies by device / manufacturer. Many Modbus TCP/IP devices ignore this Device Address (the Modbus RTU Address). Some Modbus TCP/IP devices have multiple PLCs/ RTUs at the same IP Address, and use the Device Address to route to the correct PLC sharing the same IP address.
If the Device Address is 0, Advantech WebAccess uses the Unit Number as the Device Address.

2.2.8 Use RTU over TCP/IP ? (0: No, 1: Yes)

A remote terminal unit (RTU) is a microprocessor-controlled electronic device that interfaces objects in the physical world to a distributed control system or SCADA (supervisory control and data acquisition) system by transmitting telemetry data to a master system, and by using messages from the master supervisory system to control connected objects. Other terms that may be used for RTU are remote telemetry unit and remote telecontrol unit. .

2.2.9 Use UDP

The default protocol of the Advantech WebAccess TCP/IP driver is TCP. However, some devices use UDP. If the PLC or Device uses UDP, then you must specify Use UDP = 1 for the Advantech WebAccess configuration of this device.

2.2.10 Packet Delay (ms)

Some devices cannot receive very fast request after they respond previous packet. A delay may be required for the next request from Advantech WebAccess for those slow devices, especially for some old power meters.

2.2.11 Digital block size

Some Modbus compatible devices use only a certain part of a Modbus address or only handle a short data range for data request from client. Advantech WebAccess allows users to define the maximum data block size for both requested Digital and Analog type data.

2.2.12 Analog block size

Some Modbus compatible devices use only a certain part of a Modbus address or only handle a short data range for data request from client. Advantech WebAccess allows users to define the maximum data block size for both requested Digital and Analog type data.

2.2.13 Multiple Devices with same Device Address

If you have multiple devices with the same Device Address (e.g. Modbus RTU address 0 - 255), your options are:

1. Configure a Different Advantech WebAccess Unit Number for each device and enter the actual Device Address in the Device Address Field.
2. Configure Multiple Comports and place the devices on separate comports so that each comport has no device with the same Unit Number. (This is especially true if the device address is 0).

Auto Recover Time is the time to wait after a Device is marked Bad (or Failed) before re-initializing communications. Advantech WebAccess will mark the device good, send a packet and begin the whole retry / timeout process above. In the above example, Advantech WebAccess will wait 1 minute after a device fails before retrying communications. Every One minute the device will go Good, 1.6 seconds later it will be marked Bad if it is still failed, repeat.

2.3 Tag Configuration

Summary of steps

This example is to configure two Tags that read an Analog Input (Address 30003) and an Analog Output (Address 40015).

1. Open **Internet Explorer**.
2. Connect to **Project Node**.
3. Start **Advantech WebAccess Configuration**.
4. Select **Project**.
5. Select **SCADA Node**.
6. Select the **Modicon Device**.

7. Select **Add Tag**.
8. From **Parameter** Pull Down List Select **AI**. This will configure an Analog Input. Wait for the Page to update.
9. Optionally, select ALARM from the **ALARM** pulldown list. Wait for the Page to update with a PINK highlight around alarm (an additional Alarm Fields at bottom of page).
10. Enter a **Tagname** users can use to identify this Analog Input measurement. For example, if this is a Flow measurement, enter **Flow1**.
11. Edit the **Address** to the actual address. From the example, Enter:**30003**
12. Enter a Description. This will help identify this tag to Users and Operators. For example, enter Boiler #1 Steam Flow.
13. Optionally enter, Scaling, Span Hi, Span Low, Engineering Units, and Alarms; enable data logging, etc.
14. Press **Submit**.
15. From **Parameter** Pull Down List Select **AO**. This will configure an Analog Output. Wait for the Page to update.
16. Optionally, select **ALARM** from the ALARM pulldown list. Wait for the Page to update with a PINK highlight around alarm (and additional Alarm Fields at bottom of page).
17. Enter a **Tagname** users can use to identify this Analog Output measurement. For example, if this is a signal to a Valve, enter **Valve1**.
18. Edit the **Address** to the actual address. From the above example, Enter: **40015**
19. Enter a Description. This will help identify this tag to Users and Operators. For example, enter Boiler #1 Steam Valve.
20. Optionally enter, Scaling, Span Hi, Span Low, Output Limits, Engineering Units, and Alarms; enable data logging, etc.
21. Press **Submit**.

Congratulations! You have just configured a Measurement and Output Tags to Modbus device.

2.3.1 Analog Input data type

The web page of setting for “Analog Input” is shown in the figure 2.3.

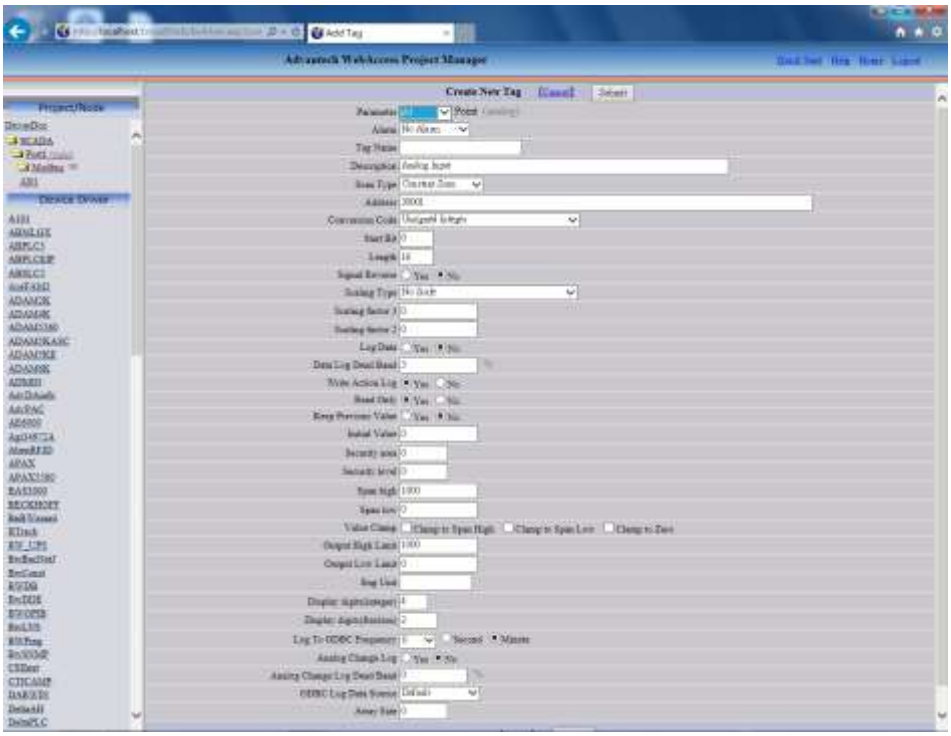

Figure 2.3

2.3.2 Analog Output data type

The web page of setting for “Analog Output” is shown in the figure 2.4.

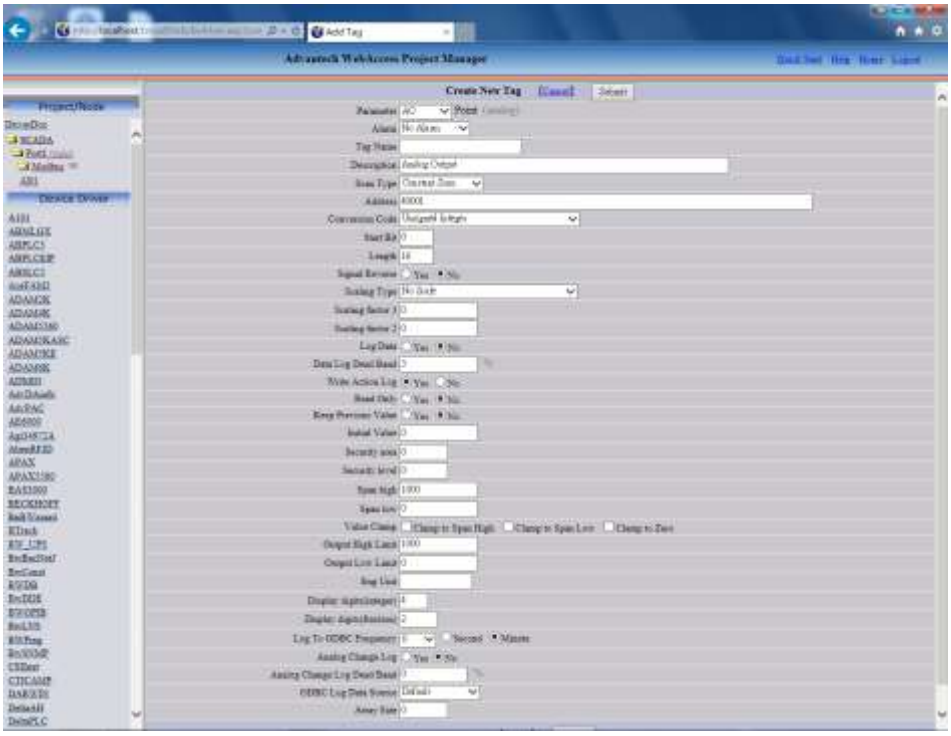

Figure 2.4

2.3.3 Discrete Input data type

The web page of setting for “Discrete Input” is shown in the figure 2.5.

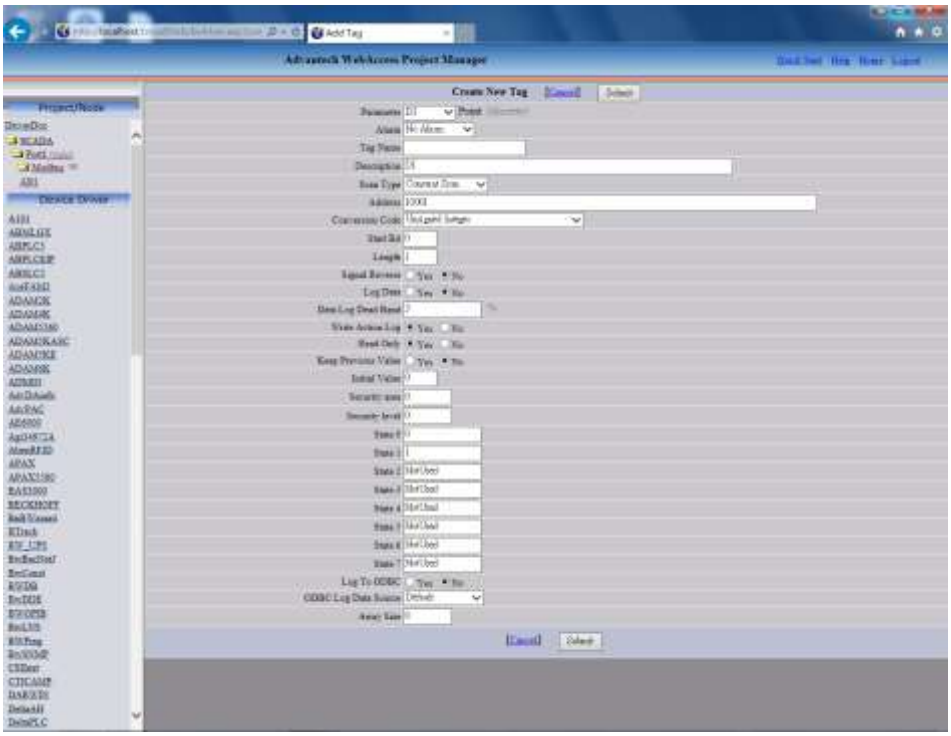

Figure 2.5

2.3.4 Discrete Output data type

The web page of setting for “Discrete Output” is shown in the figure 2.6.

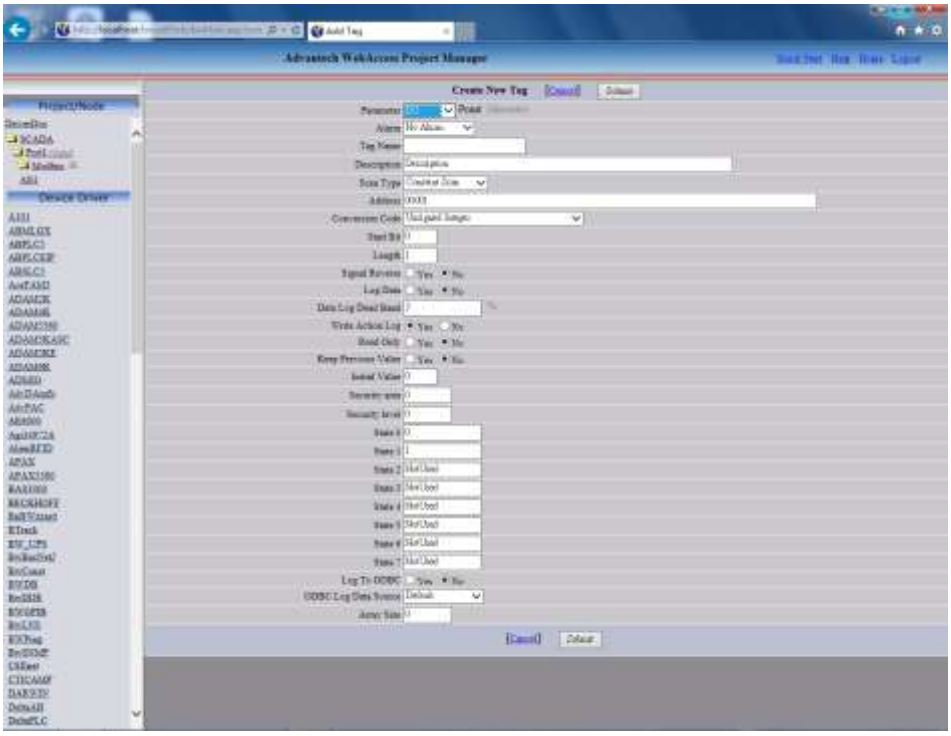

Figure 2.6

2.3.5 Text data type

The web page of setting for “Text” is shown in the figure 2.7.

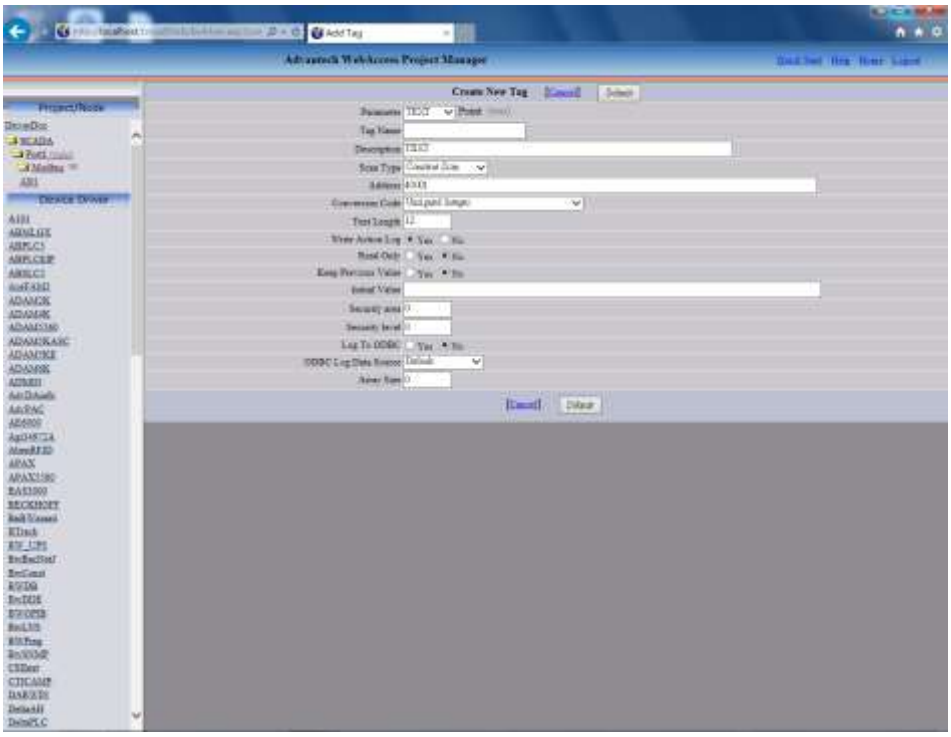

Figure 2.7

2.4 Parameter Configuration

For the convenient of user, the WebAccess provide the default parameter sets as shown in figure 2.8.

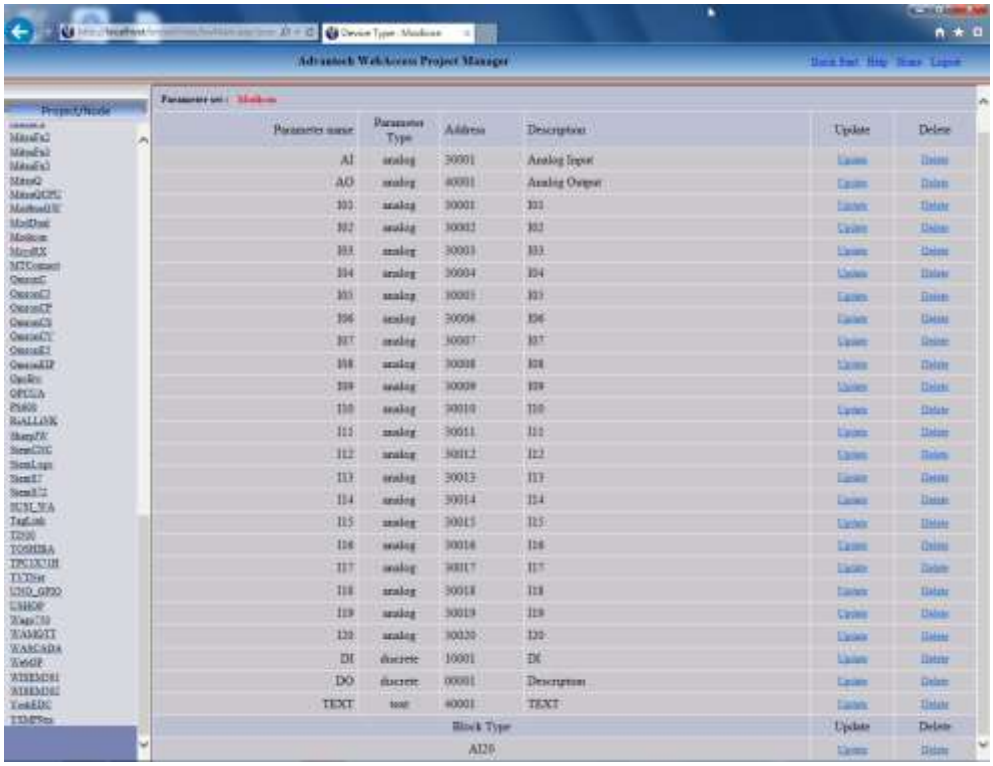

Figure 2.8

User could add or modify these Parameter Sets as the standard procedure provided by the WebAccess.

3. Error Code

8200 LRC/CRC error

808X Function error

8300 Incorrect message sequence

-> means Unit ID incorrect or

-> Function Code incorrect (e.g. expect return 1 / 0, but actually returns 1000)

83XX Write command error code

8C2C CRC error (MP900)

8100 Open port failed/Message size error

8FFF Data type received mismatchs with coigured type

8FFE Conversion code error

8000 Communication Timeout

FFFF Driver init failure

0XF002 / F002 Type mismatch

9000 Fail to send packet to device three times continuously (appears after 8000 error code)

0xa111 Data convert error(GMT_TO_TEXT)