User Guide

ValuPoint® 4-23

Model VP4-2330
Programmable I/O for MS/TP Networks
Rev. 1.0 – March 2012

1 Overview

1.1 How to Use This Guide

Section 1 gives an overview of the VP4-2330 programmable I/O device. Section 2 talks about installing the configuration software and connecting the VP4-2330. Sections 3 through 11 are guides for each of the tabs found on the screen of the configuration software. Sections 12 through 14, and Appendix A through C, are reference material.

The first subsection in each of sections 3 through 11 is titled “Do This” or “Skip This”. The “Do This” sections are the minimum required actions necessary for connecting and syncing the device with the tool for the first time. You can then go back and study additional sections that follow “Do This” or go back and do the sections that initially said “Skip This”.

1.2 Important Safety Notice

Proper system design is required for reliable and safe operation of distributed control systems incorporating any Control Solutions product. It is extremely important for the

user and system designer to consider the effects of loss of power, loss of communications, and failure of components in the design of any monitoring or control application. This is especially important where the potential for property damage, personal injury, or loss of life may exist. By using ANY Control Solutions, Inc., product, the user has agreed to assume all risk and responsibility for proper system design as well as any consequence for improper system design.

1.3 Overview of the VP4-2330

Control Solutions' ValuPoint® Programmable I/O for BACnet MS/TP provides the standard profile BACnet Application Specific Controller (B-ASC). ValuPoint 4-2330 features 14 universal context sensitive inputs. When configured as an analog input, the continuously self-calibrating sigma-delta converter produces 15-bit resolution with high noise immunity. When configured as a discrete input, the converter switches to 10-bit resolution at 1,000 samples per second for fast response. ValuPoint 4-2330 also includes 3 analog outputs, 6 Form A relay outputs, and pulse counting capability on all inputs.

The ValuPoint® series of controllers is designed to be a building block in a distributed control system where controllers communicate peer to peer via BACnet MS/TP. Each ValuPoint controller can access BACnet objects in other BACnet devices, both ValuPoint controllers and other manufacturer's devices. Remote objects are mapped to local objects that mirror the value of the remote object.

All of the ValuPoint features available to local objects are also available to the remote mapped objects. This means the remote objects can be incorporated into the local i.CanDrawIt® program.

The user has the ability to assign object allocation as part of setup of the controller. Resources are allocated from a common pool, and the user has the ability to decrease the number of one type of object in order to increase the number of another type. Total object count will range from approximately 100 commandable objects (with full priority array) to 200 read/write objects. Object types include analog, binary, and multi-state variations of input, commandable output, and writeable value.

Hardware Features of Model VP4-2330

- I/O points and undedicated BACnet objects
  - Input objects: AI, BI, MSI
  - Commandable output objects: AO, BO, MSO
  - Writeable value objects: AV, BV, MSV
- Configurable object allocation for I/O and program use
- 14 Analog/universal inputs, software selectable types
  - 0-10VDC, thermistor, discrete, dry contact, pulse
  - 0.1% reference, up to 16-bit resolution
  - Continuously self-calibrating sigma-delta converter
  - Non-volatile totalizing count inputs
    (to 20Hz on all channels, to 5kHz on 2 channels)
- 3 Analog outputs
  - 4-20mA (0-20mA), 8-bit resolution, 500 ohm load max.
- 6 Discrete outputs
  - Form A relay, 5A @ 24VAC (120VAC industrial)
- Battery backed real time clock/calendar
- BACnet MS/TP at 9600 to 76800 baud
- Hardened RS-485 port
- 128KB non-volatile EEPROM configuration file capacity
- ARM 32-bit processor, 512K Flash, 96K RAM

- Powered by 18-30VDC or 24VAC 50/60 Hz
- DIN rail mounting, 100mm H x 105mm W x 60mm D
- -40C to +70C, 5%-95% RH non-condensing
- Certifications: FCC, CE

The VP4-2330 is configured by writing various BACnet properties to the respective objects being configured. Each BACnet object, such as Analog Input, Analog Output, Binary Input, etc., includes properties defining which physical I/O point or remote BACnet object should be mapped to this BACnet object. The usual mandatory object properties are included in each BACnet object found in the VP4-2330. There are additional proprietary object properties defining the physical I/O or BACnet client map parameters.

You can configure the VP4-2330 using any BACnet client capable of reading and writing object properties. This process is streamlined in the VP4-2330 configuration software tool available for free download at www.csimn.com. The configuration tool provides easy-to-use templates you fill in, and then click a ‘Write’ button to send multiple properties to the VP4-2330 at one time. Once configured, you can save your entire configuration to an XML format file on your PC for later re-use. To replicate the same configuration, simply load the XML file back into the configuration tool and click the ‘Write All’ button.

The VP4-2330 configuration tool uses Control Solutions’ MTX002 USB to MS/TP port adapter. The MTX002 allows connecting to MS/TP devices via the USB port on your PC. The MTX002 is intended primarily as an aid in configuring Control Solutions devices, but the tools do include general purpose BACnet object browsing capability usable with any MS/TP device.

The MTX002 operates as an MS/TP client device on the network, reading and writing properties in the device being configured as directed by the configuration tool applicable to the product being configured. As a client, the MTX002 can also read/write any standard BACnet properties in any MS/TP device using the BACnet diagnostic page of the software tool available for free download on the support pages.

MTX002 USB to MS/TP Adapter

1.4 Warranty

This software and documentation is provided “as is,” without warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of fitness or merchantability for a particular purpose. Control Solutions may make improvements and/or changes in this documentation or in the product(s) and/or the program(s) described in this documentation at any time. This product could include software bugs, technical inaccuracies, typographical errors, and the like. Changes are periodically made to the information herein; these changes may be incorporated in new editions of the software.

1.5 Required License Information

The VP4-2330 configuration and line programming tools include the SmartWin library (http://smartwinlib.org) under the following terms:

2 Installation and Connections

2.1 Installing the configuration software

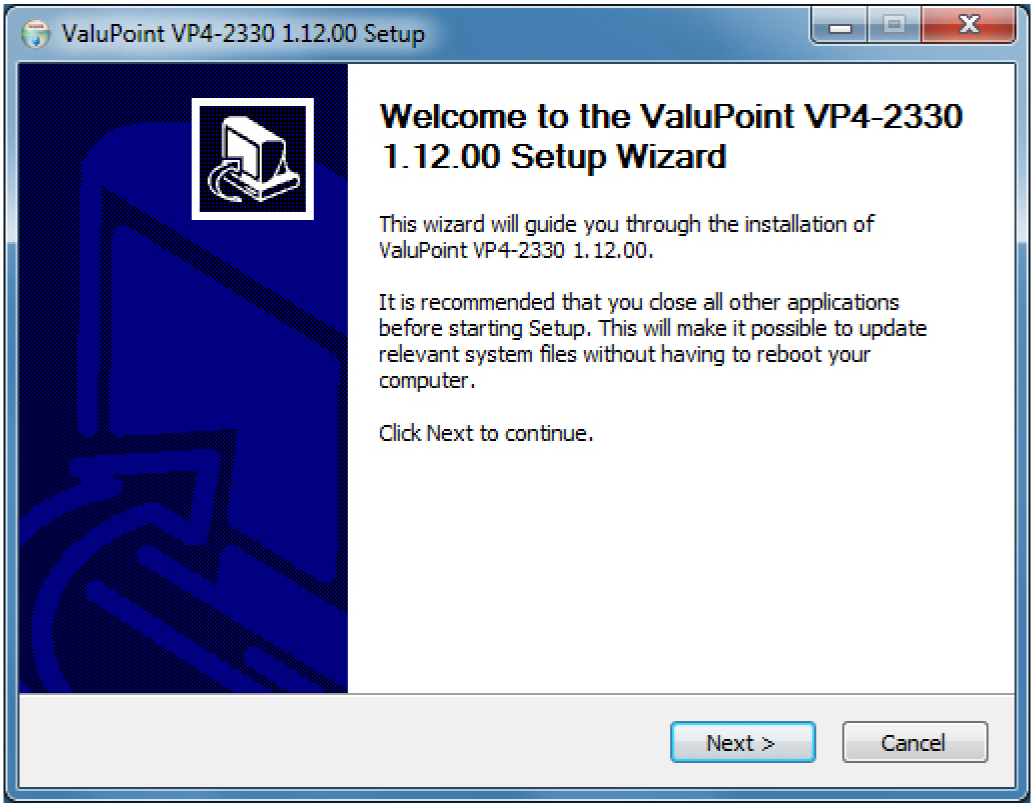
Look for the installer icons in the directory where you unzipped the download that got you to this document. The installer icons look like this:

VP4-2330_Setup.exe

iCanDrawIt_Setup.exe

The installation is a 2-step installation. Install VP4-2330 first. Then install i.CanDrawIt second.

Double click the icon to run the setup.exe. You will be questioned about whether to continue because Windows cannot verify the publisher of the software. Permit installation to continue. The sequence of installer screens include the following on Windows 7:

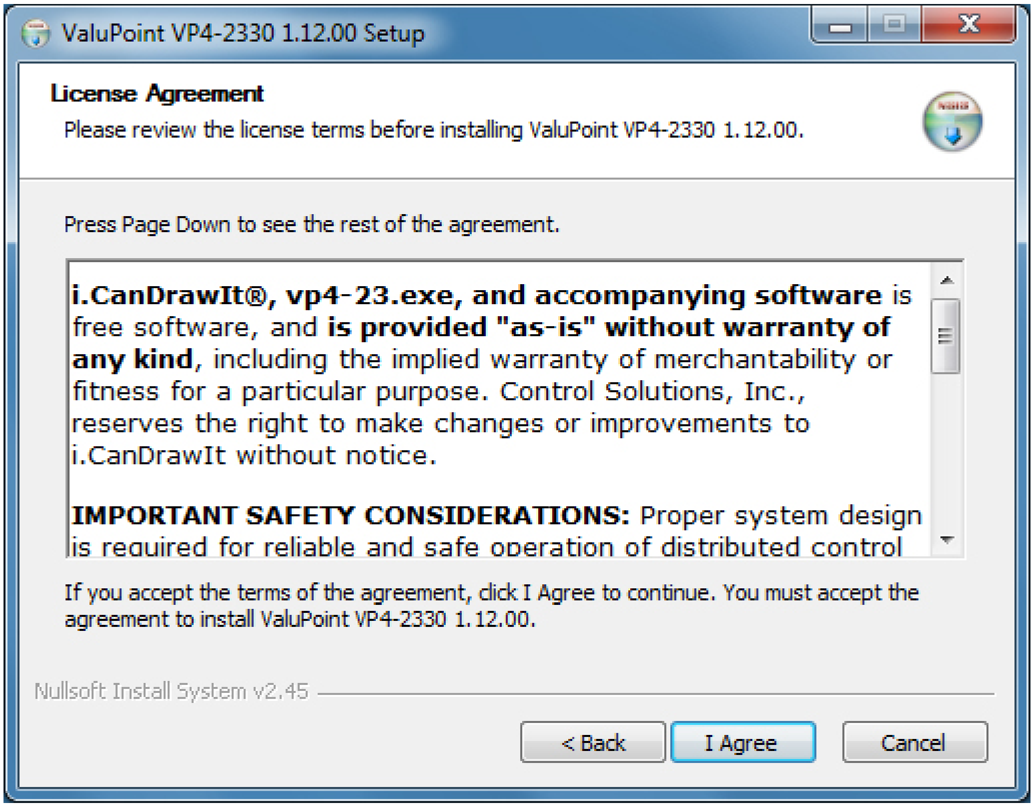


Welcome to the ValuPoint VP4-2330 1.12.00 Setup Wizard

This wizard will guide you through the installation of ValuPoint VP4-2330 1.12.00.

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.



ValuPoint VP4-2330 1.12.00 Setup

License Agreement

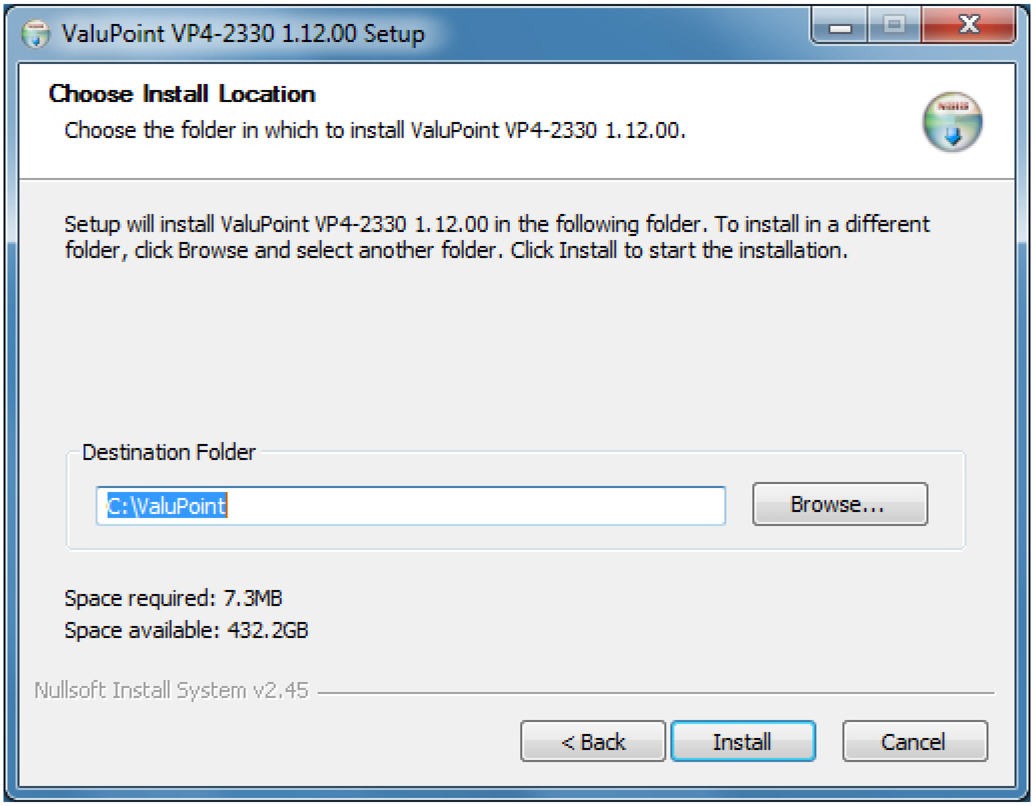
Please review the license terms before installing ValuPoint VP4-2330 1.12.00.

Press Page Down to see the rest of the agreement.

i.CanDrawIt®, vp4-23.exe, and accompanying software is free software, and **is provided "as-is" without warranty of any kind**, including the implied warranty of merchantability or fitness for a particular purpose. Control Solutions, Inc., reserves the right to make changes or improvements to i.CanDrawIt without notice.

IMPORTANT SAFETY CONSIDERATIONS: Proper system design is required for reliable and safe operation of distributed control

If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install ValuPoint VP4-2330 1.12.00.



ValuPoint VP4-2330 1.12.00 Setup

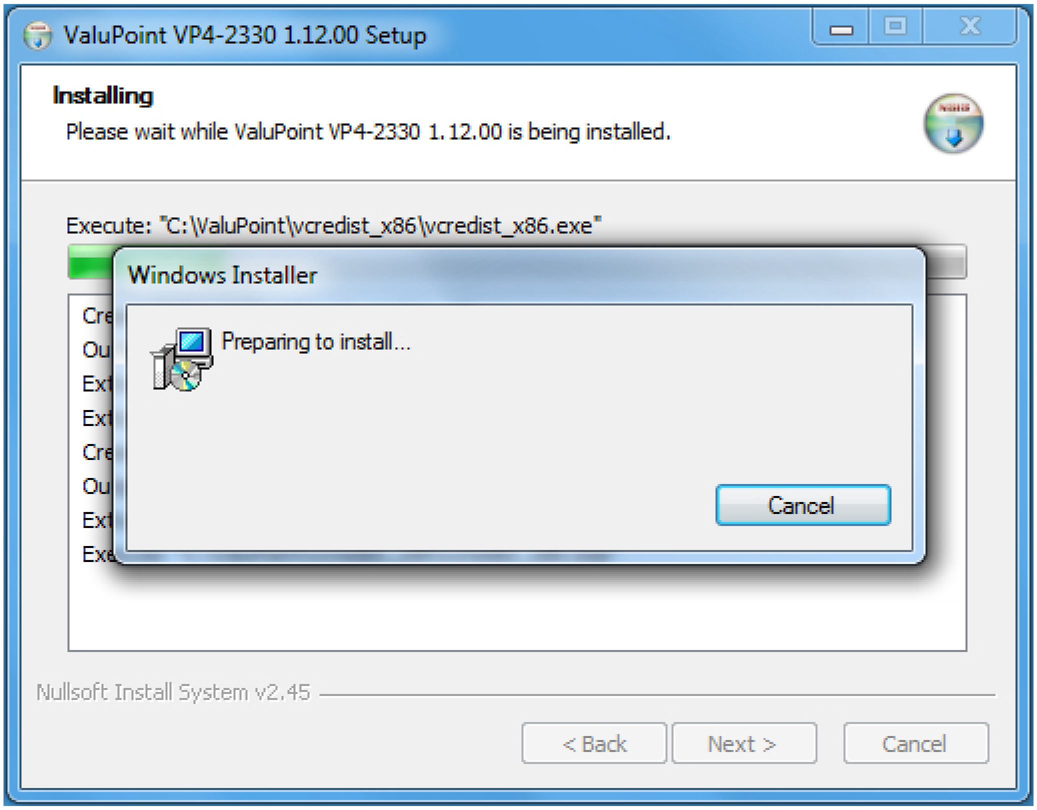
Choose Install Location

Choose the folder in which to install ValuPoint VP4-2330 1.12.00.

Setup will install ValuPoint VP4-2330 1.12.00 in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.

Destination Folder: C:\ValuPoint

Space required: 7.3MB
Space available: 432.2GB



ValuPoint VP4-2330 1.12.00 Setup

Installing

Please wait while ValuPoint VP4-2330 1.12.00 is being installed.

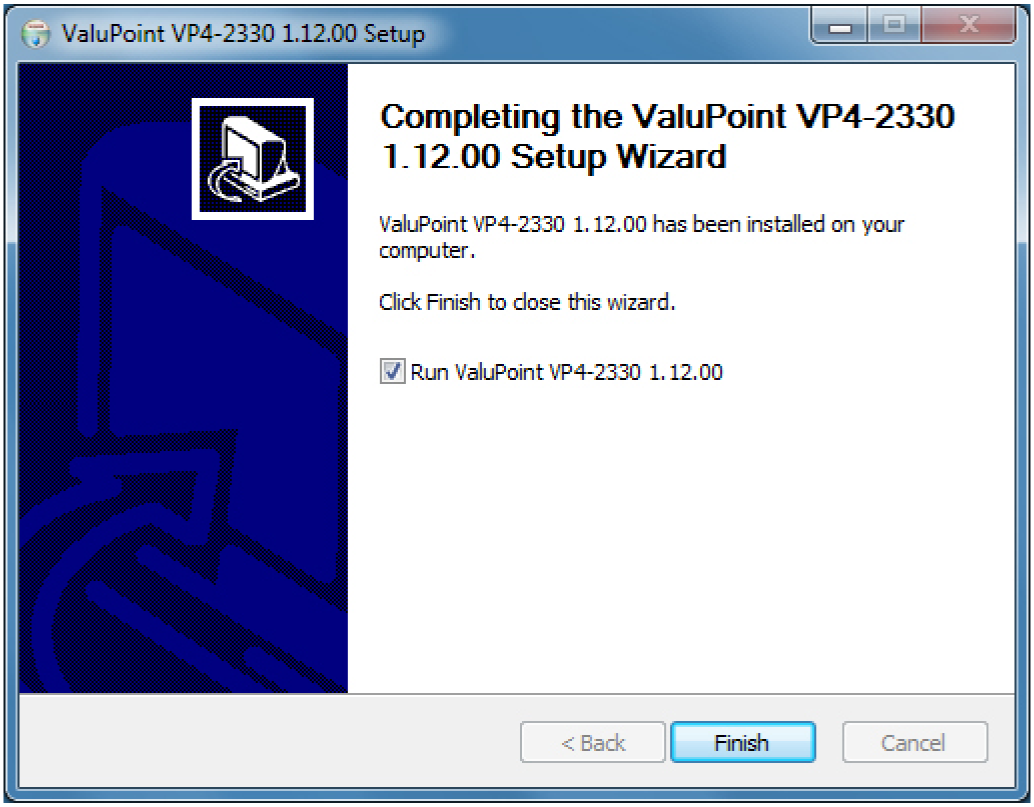
Execute: "C:\ValuPoint\vcredist_x86\vcredist_x86.exe"

Windows Installer

Preparing to install...

The installer will check to see whether Visual C++ support is already installed on your system, and install it if not. This is standard software provided by Microsoft.

When you get to the “Finish” screen, you are ready to go.



ValuPoint VP4-2330 1.12.00 Setup

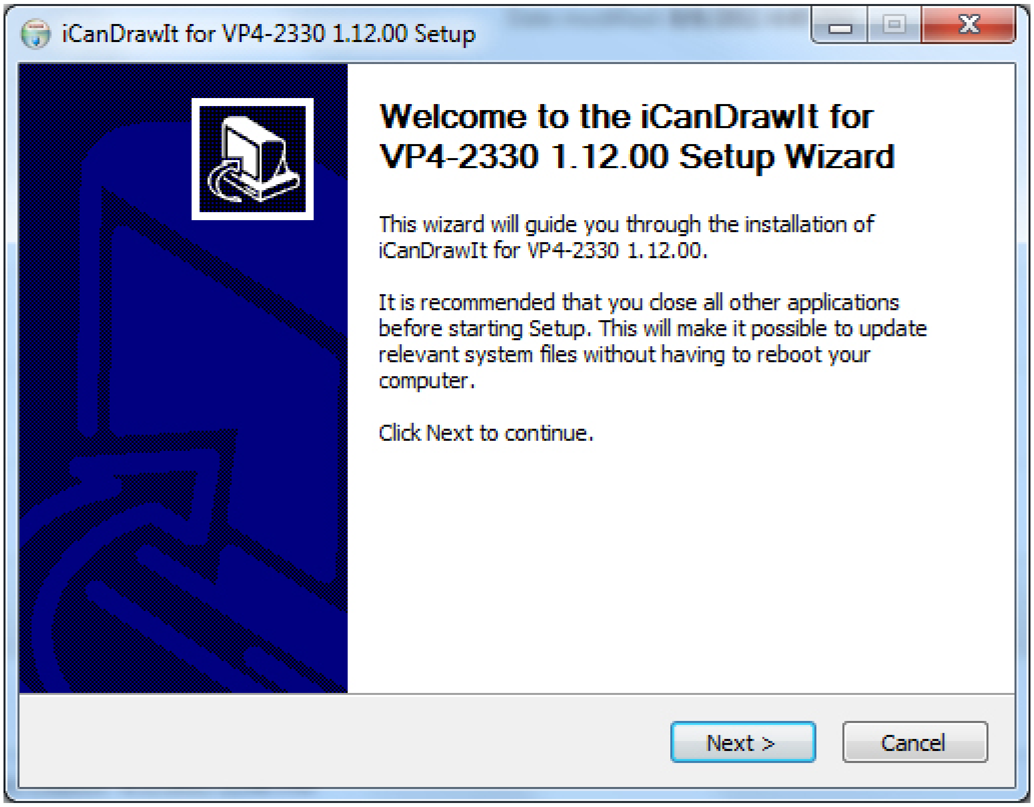
Completing the ValuPoint VP4-2330 1.12.00 Setup Wizard

ValuPoint VP4-2330 1.12.00 has been installed on your computer.

Click Finish to close this wizard.

☑ Run ValuPoint VP4-2330 1.12.00

Next, proceed to install i.CanDrawIt. This part is optional. If you will not be using the VP4-2330 as a programmable controller, you can skip this step. The first installer screen looks like this:



iCanDrawIt for VP4-2330 1.12.00 Setup

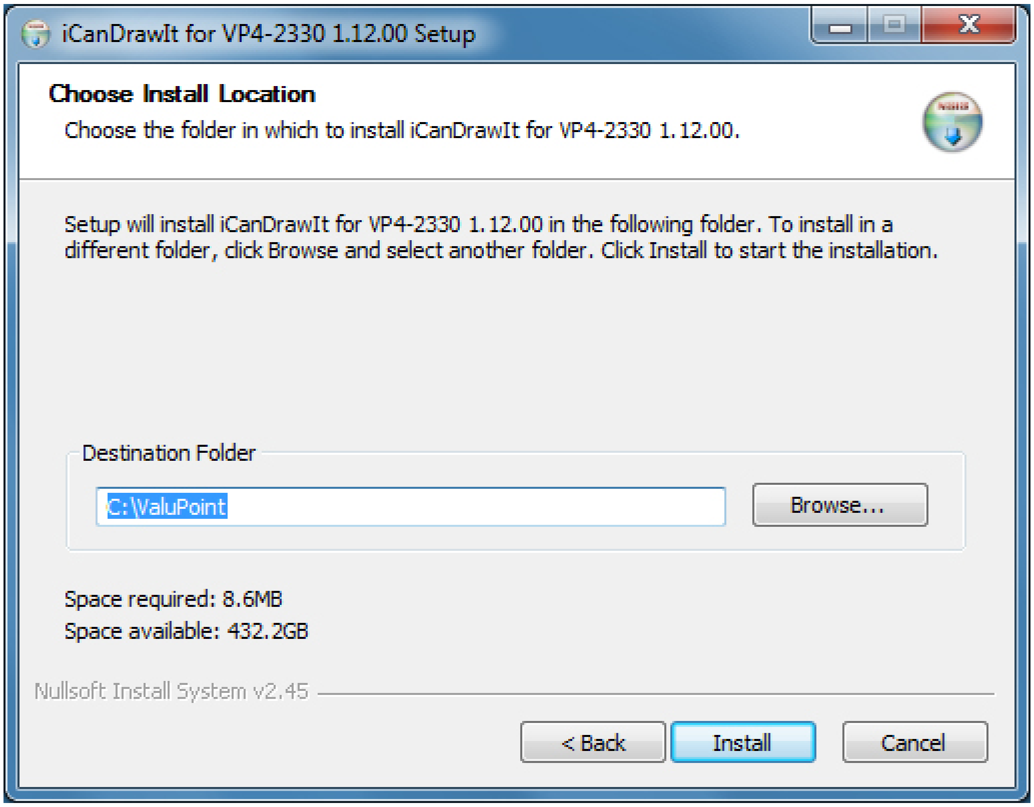
Welcome to the iCanDrawIt for VP4-2330 1.12.00 Setup Wizard

This wizard will guide you through the installation of iCanDrawIt for VP4-2330 1.12.00.

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

The installation directory should be the same directory that VP4-2330 was installed into.



iCanDrawIt for VP4-2330 1.12.00 Setup

Choose Install Location

Choose the folder in which to install iCanDrawIt for VP4-2330 1.12.00.

Setup will install iCanDrawIt for VP4-2330 1.12.00 in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.

Destination Folder

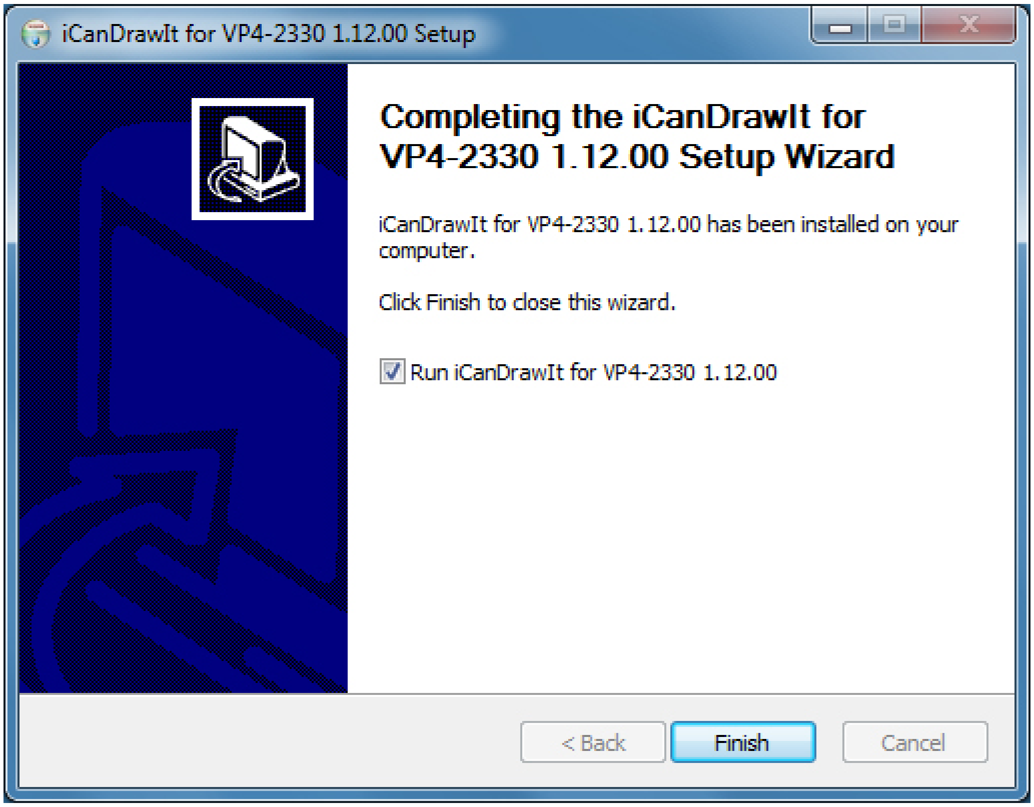
C:\ValuPoint

Space required: 8.6MB

Space available: 432.2GB

Nullsoft Install System v2.45

After a few more screens, you will get the familiar 'done' screen.



Completing the iCanDrawIt for VP4-2330 1.12.00 Setup Wizard

iCanDrawIt for VP4-2330 1.12.00 has been installed on your computer.

Click Finish to close this wizard.

☑ Run iCanDrawIt for VP4-2330 1.12.00

2.2 Installing the USB to MS/TP adapter

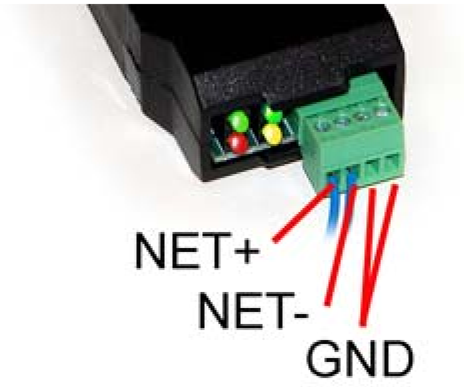
Install the USB adapter by plugging it into your PC. It should indicate new hardware found, and begin the process of asking you where to find its drivers. Do not search the Internet, etc. Direct the installer to the directory where you installed your VP4-2330 software. It will warn you about not being Windows certified. Click “Continue anyway”.

Complete instructions including step by step screen shots are provided in the appendix. It should be noted that this process does not actually install any new software. It simply tells Windows what driver to use from the collection of drivers already included in Windows. Refer to the appropriate appendix in this guide for more about USB installation.

2.3 Connecting the VP4-2330

Connecting Power: Connect +24VDC or 24VAC to the terminal marked POWER. Connect common to the terminal marked GND.

Connecting BACnet MS/TP: Connect RS-485 (EIA-485) data lines to NET+ and NET- next to POWER. Observe polarity of the data lines. Reverse polarity will be tolerated (i.e., not damage the unit) but will not function either. Connect RS-485 common and/or cable shield to one of the terminals marked GND as applicable.

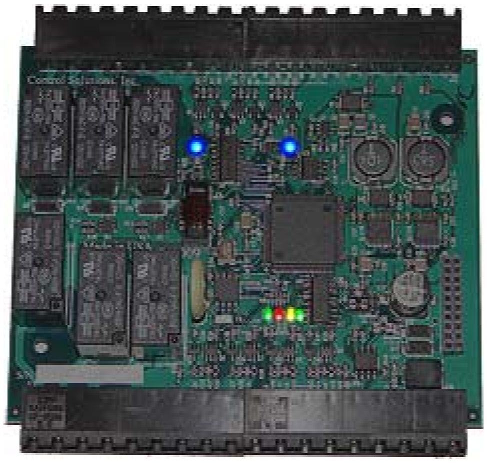


2.4 Connecting the USB Adapter

Connect the NET+ and NET- terminals to the corresponding MS/TP terminals on the gateway (or to +/- on the MS/TP network). Connect GND to network common.

DO NOT connect power to the terminal block on the adapter. The adapter gets its power from the USB port of your PC. The adapter only draws a very small amount of power, well below the limit provided by standard USB ports.

2.5 Indicators on the VP4-2330 Programmable I/O



The LED indicators for the VP4-2330 are mounted on the circuit board inside the device, and are viewable through the vent slots in the case. The two blue LEDs are power indicators. There are two power supplies in the VP4-2330, and both are necessary for proper operation.

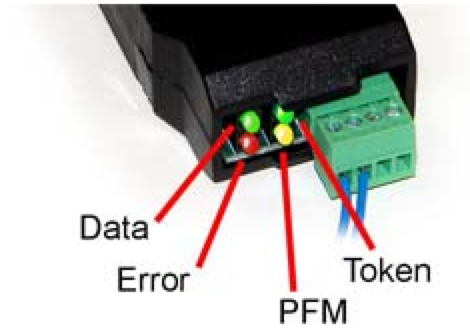
The four LEDs toward the bottom are status and communications - primarily used for communications. The green LED to the left indicates token passing. This LED flashes each time the token is passed. The red LED is the error indicator which flashes red when there is an error, such as request for an object that does not exist in the device. The yellow indicator flashes each time the VP4-2330 polls for master. The green LED to the right flashes each time a data request is replied to.

The yellow poll-for-master LED may flash quite frequently, or nearly never. How often the device polls for master depends on whether there is another master at some higher MAC address after the VP4-2330. If the next consecutive MAC address is in use by another device on the link, the poll for master will rarely flash. If the VP4-2330 has a low MAC address and there are few or no other devices with higher MAC addresses, the poll for master LED will be quite busy.

The token pass led (green LED on left) should always be flashing. If there is a small number of devices on the network, it will flash rapidly. The more devices there are on the network, the more slowly it will flash because there are more devices passing the token around. If it never flashes, there is a communication problem, such as baud rate mismatch.

The red LED is a communication error indicator most of the time. However, during restart it will be on solid. Immediately following startup, it may flash a fault code if a serious error has occurred.

2.6 Indicators on the MTX002 USB to MS/TP Adapter



The yellow LED next to the USB connector will light up any time the PC recognizes this device. There is a blue power LED inside the adapter visible by looking into the adapter through the slot next to the USB adapter. The power LED should always be on if connected to the PC. The yellow LED will only come on when recognized by PC software.

The LEDs next to the terminal block indicate network traffic on the MS/TP network.

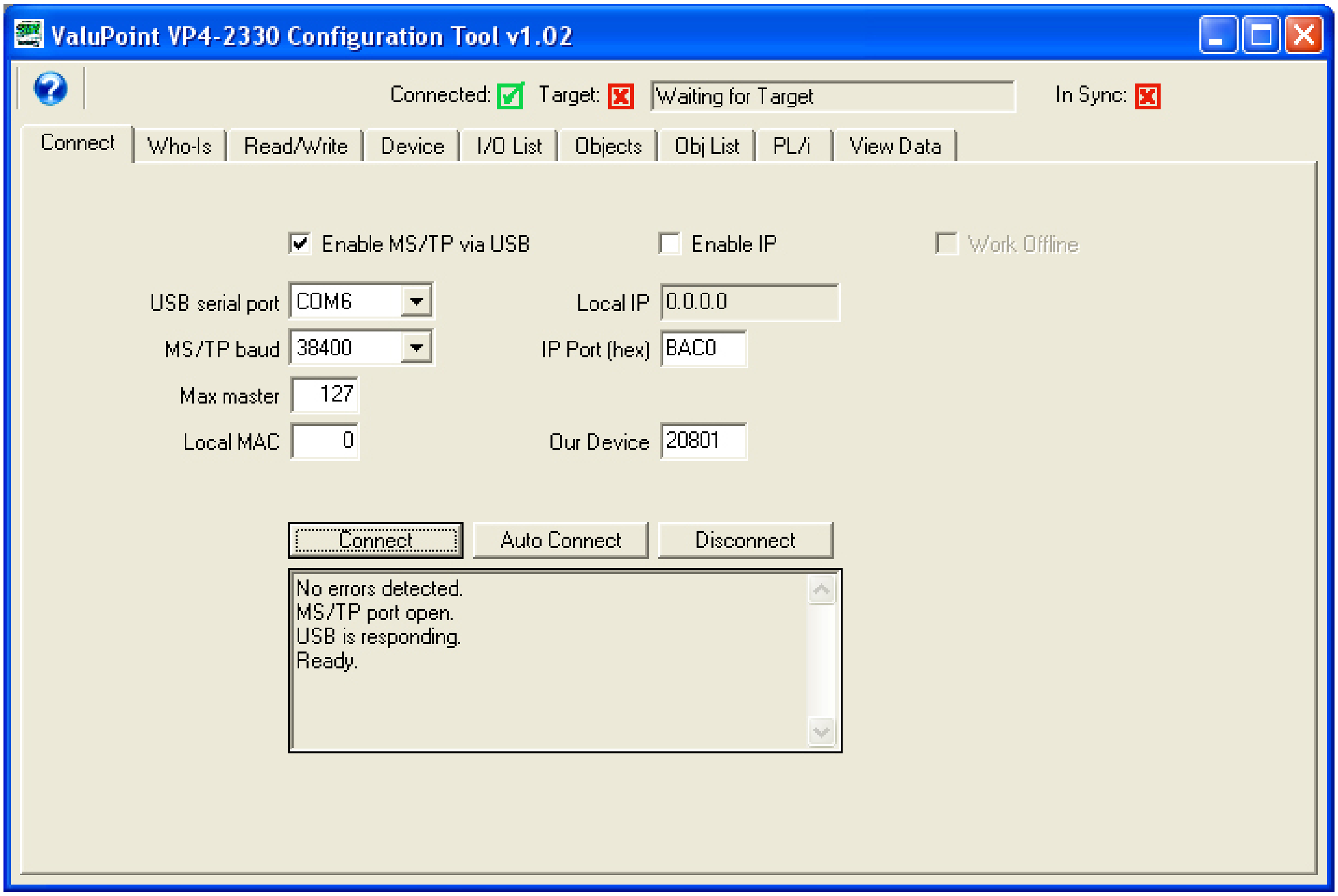
The Token LED flashes green each time the adapter passes the token. The adapter functions as another MS/TP device on the network, and gets into the token passing loop just like any other MS/TP device.

The PFM LED flashes yellow each time the adapter sends a Poll For Master (PFM).

The Data LED flashes green each time a good packet other than token or PFM is received, or a packet other than token or PFM is sent, by the adapter.

The Error LED flashes each time a valid packet is received by the adapter, but resulted in an error. The Error LED can also indicate a timeout waiting for the slave device to respond (typically the device being configured).

3 Local Port



ValuPoint VP4-2330 Configuration Tool v1.02

Connected: ☑ Target: ☒ Waiting for Target In Sync: ☒

☑ Enable MS/TP via USB □ Enable IP □ Work Offline

USB serial port: COM6
MS/TP baud: 38400
Max master: 127
Local MAC: 0
Local IP: 0.0.0.0
IP Port (hex): BAC0
Our Device: 20801

```
No errors detected.
MS/TP port open.
USB is responding.
Ready.
```

3.0 Do This for First Time Startup

Assuming you have connected and installed the USB to MS/TP adapter (“dongle”), check the box ‘Enable MS/TP via USB’. Select the COM port assigned by your PC to your adapter. Find the Device Manager hardware properties in the control panel of your PC and look for the COM port if you have not done so already.

If connecting to a VP4-2330 for the first time, as shipped from the factory, leave the remaining settings at their defaults.

Click the Connect button. You should see the message illustrated above indicating no errors, port open, USB is responding, and Ready. If not, stop here and determine why. Re-check the port number used. See that MTX002 shows up under Ports (COM & LPT) in your PC’s Device Manager hardware list. If MTX002 does not show up, revisit the USB installation above.

In addition to seeing “Ready”, you should see the connected icon at the top change from a red X to a green check mark. When you see "Ready", you are ready to move on to the Who-Is page.

Note: You may see "No errors detected. MS/TP port open." even though your MTX002 is not connected. This means the configuration software found a valid COM port and opened that port, but there is no MTX002 on that port. If you do not see "USB is responding. Ready." then you are not ready.

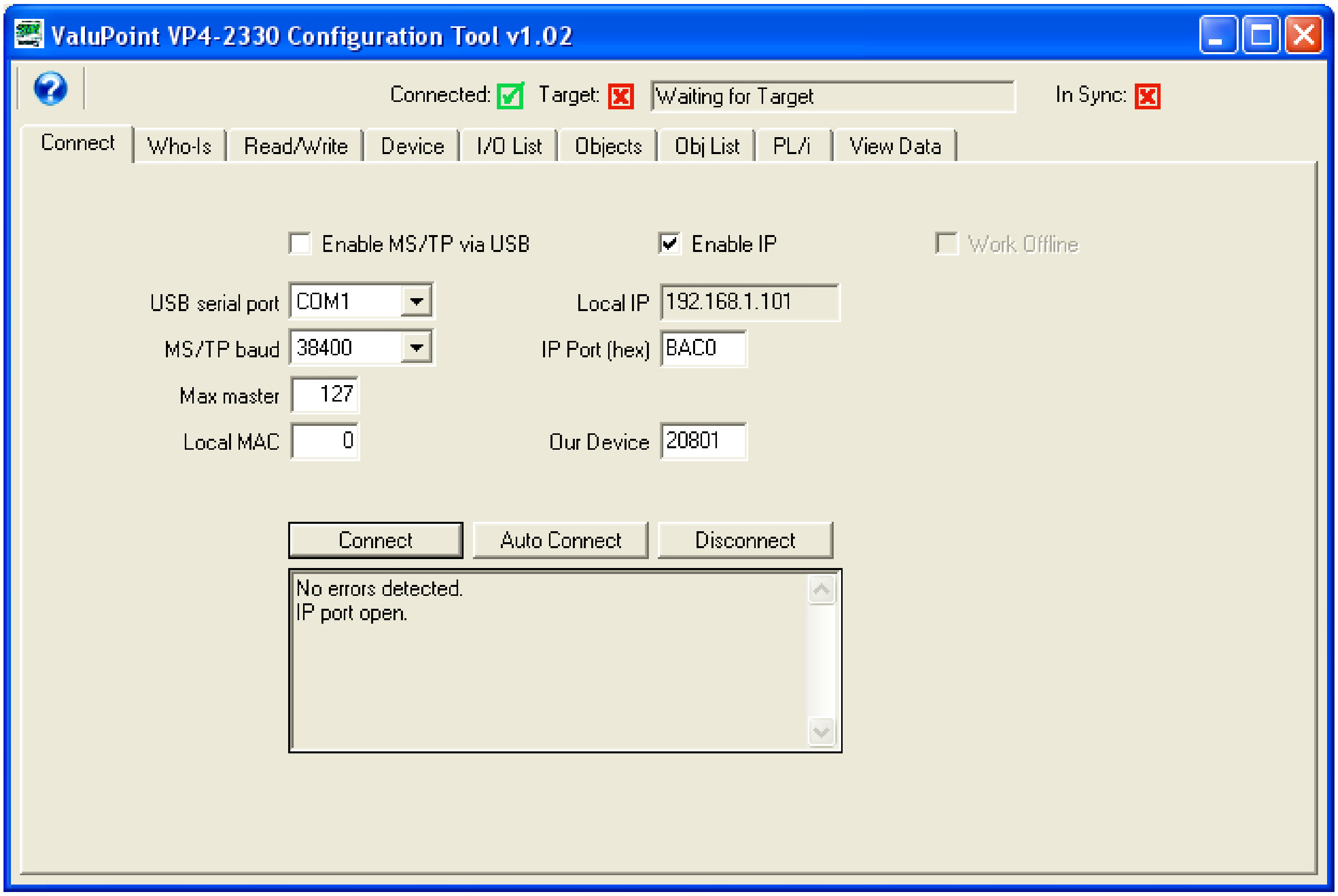
3.1 MS/TP

Check the box ‘Enable MS/TP via USB’ if you will be accessing the VP4-2330 via MS/TP (the most common approach). Select the COM port associated with your USB to MS/TP adapter. Select the baud rate your VP4-2330 is configured to run (default is 38400). Set Max Masters and Local Mac to your known values if they have been changed. If device instance 20801 is already used by some other device, change the ‘Our Device’ number before connecting.

Note: The MS/TP interface for this software requires the MTX002. You cannot use a generic USB to RS485 adapter. This is because the MTX002 is an intelligent adapter that handles all of the token passing within the adapter, and only passes APDU's via USB.

3.2 IP

Check the ‘Enable IP’ box if you will be accessing the VP4-2330 via IP, through a BACnet IP to MS/TP pass-through gateway or router. Enter the port number (0xBAC0 is the default) in hexadecimal. If device instance 20801 is already used by some other device, change the ‘Our Device’ number before connecting.



ValuPoint VP4-2330 Configuration Tool v1.02

Connected: ☑ Target: ☒ Waiting for Target In Sync: ☒

☐ Enable MS/TP via USB ☑ Enable IP ☐ Work Offline

USB serial port: COM1

MS/TP baud: 38400

Max master: 127

Local MAC: 0

Local IP: 192.168.1.101

IP Port (hex): BAC0

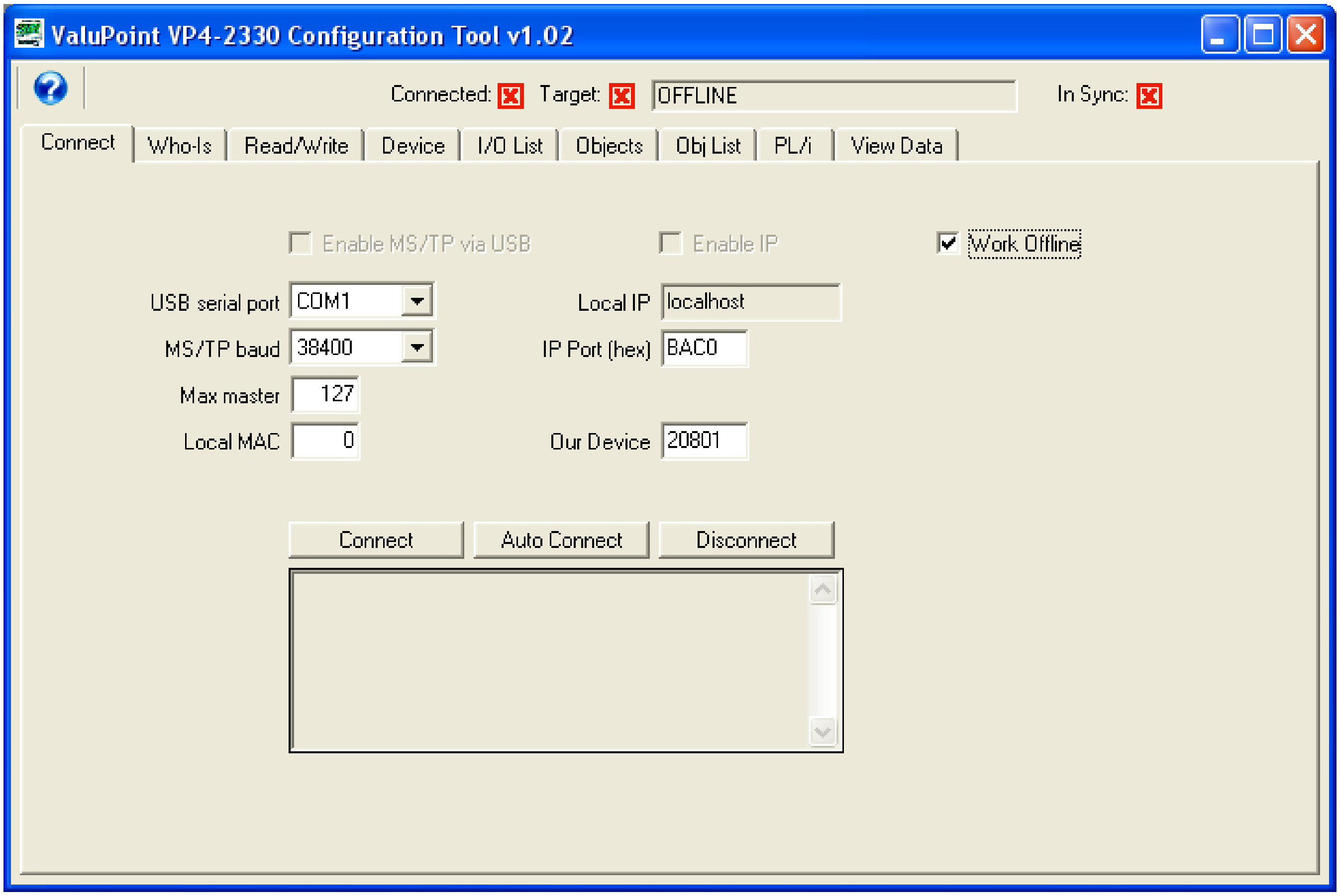
Our Device: 20801

No errors detected.
IP port open.

If the IP port is successfully connected, you will see the message "No errors detected. IP port open." In addition, you will see your PC's IP address appear in the Local IP window. You are now ready to move on to the Who-Is page.

3.3 Work Offline

You will not be allowed to select most of the tabs in the tool until you have made the prerequisite device connection and selection. If you want to work offline, simply using the tool to create a configuration file that you will upload to a device later, check the ‘Work Offline’ box.



Connected: ☒ Target: ☒ OFFLINE In Sync: ☒

☐ Enable MS/TP via USB ☐ Enable IP ☑ Work Offline

USB serial port COM1

MS/TP baud 38400

Max master 127

Local MAC 0

Local IP localhost

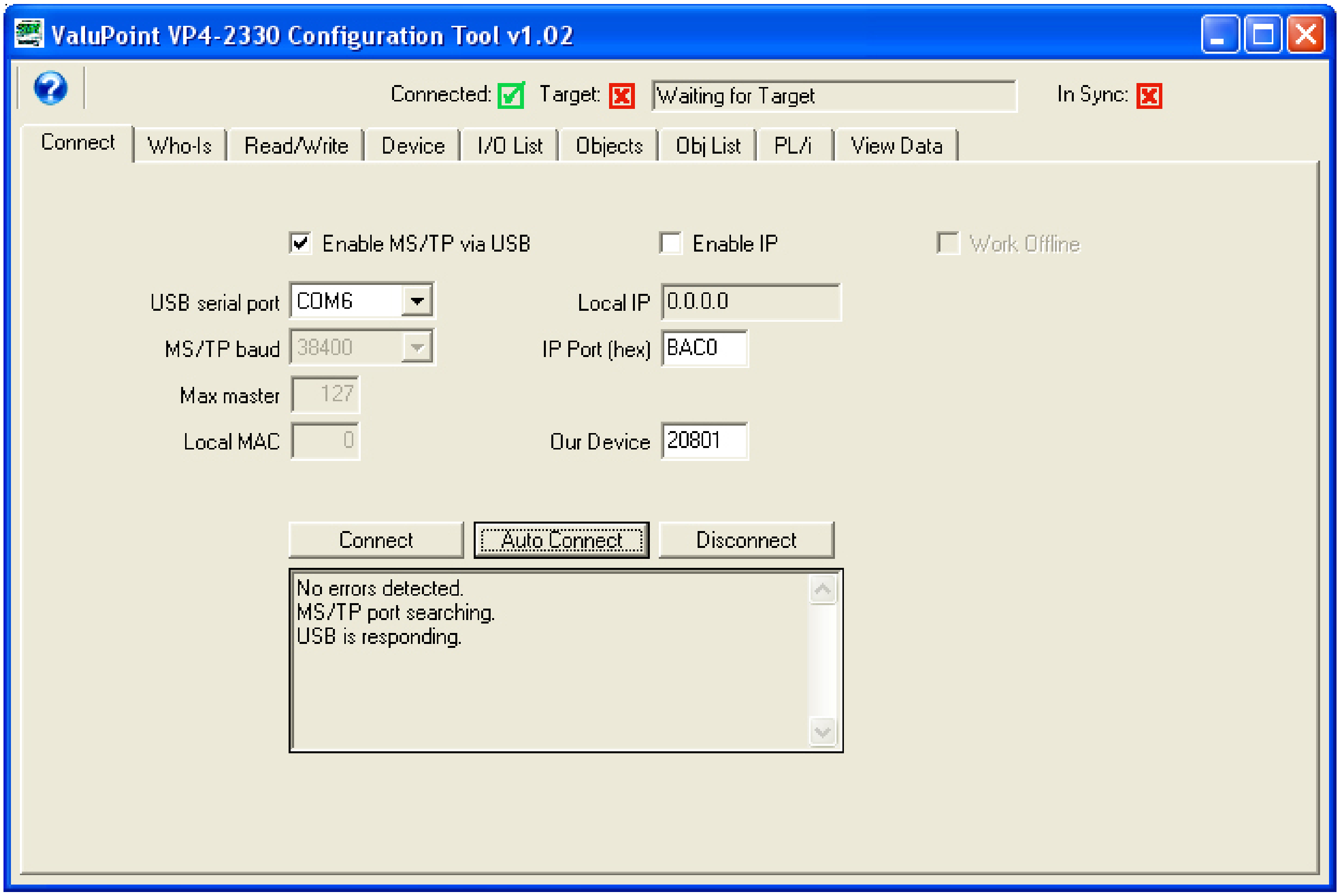
IP Port (hex) BAC0

Our Device 20801

3.4 Auto Connect

The fastest way to connect is to select the known baud rate, max master setting and some unused local MAC. However, if you are connecting to a VP4-2330 that has been previously configured and you do not know its settings, you can use Auto Connect to search for it. The Auto Connect does take some time because it is testing the various possible baud rates. Then when it finds a baud rate that seems right, it spends some time listening to polls for master to determine the max master setting that seems to be in effect. It is also looking for an unused MAC (station ID) to use for the tool itself. The tool will assign itself the highest numbered unused MAC address. Once a seemingly good set of parameters is found, these will be inserted in the appropriate windows for you, and you will see the indication ‘Auto connected’. You may now proceed.

To auto connect, check Enable MS/TP via USB, then click the Auto Connect button. The screen will initially look like this:



Waiting for Target

☑ Enable MS/TP via USB ☐ Enable IP ☐ Work Offline

USB serial port: COM6

MS/TP baud: 38400

Max master: 127

Local MAC: 0

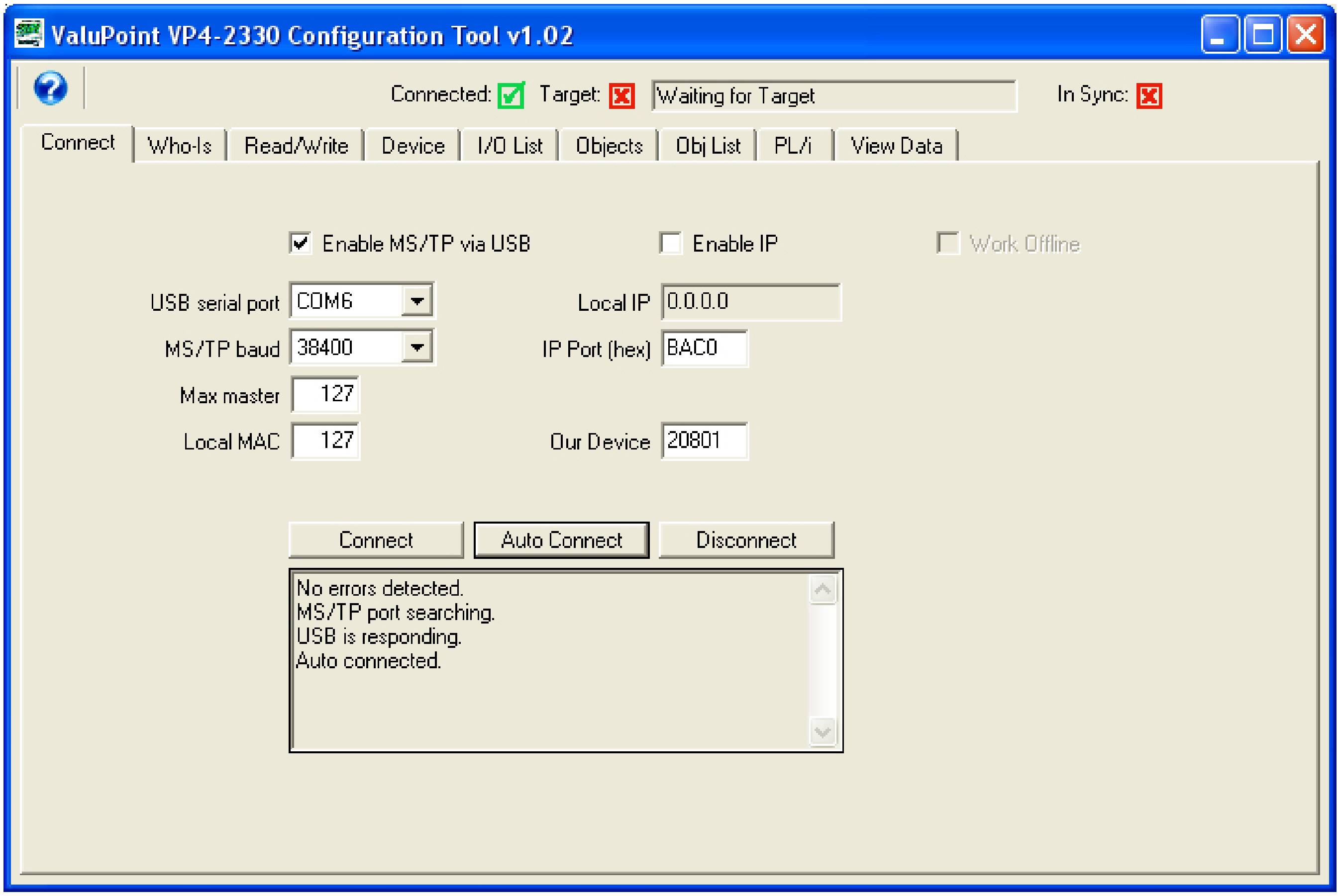
Local IP: 0.0.0.0

IP Port (hex): BAC0

Our Device: 20801

```
No errors detected.
MS/TP port searching.
USB is responding.
```

Once the auto connect process has completed, the disabled windows will become enabled, and will display the parameters found. When you see the message "Auto connected" show up below "USB is responding", you are ready to move on to the Who-Is window.



Connected: ☑ Target: ☒ Waiting for Target In Sync: ☒

☑ Enable MS/TP via USB □ Enable IP □ Work Offline

USB serial port COM6

MS/TP baud 38400

Max master 127

Local MAC 127

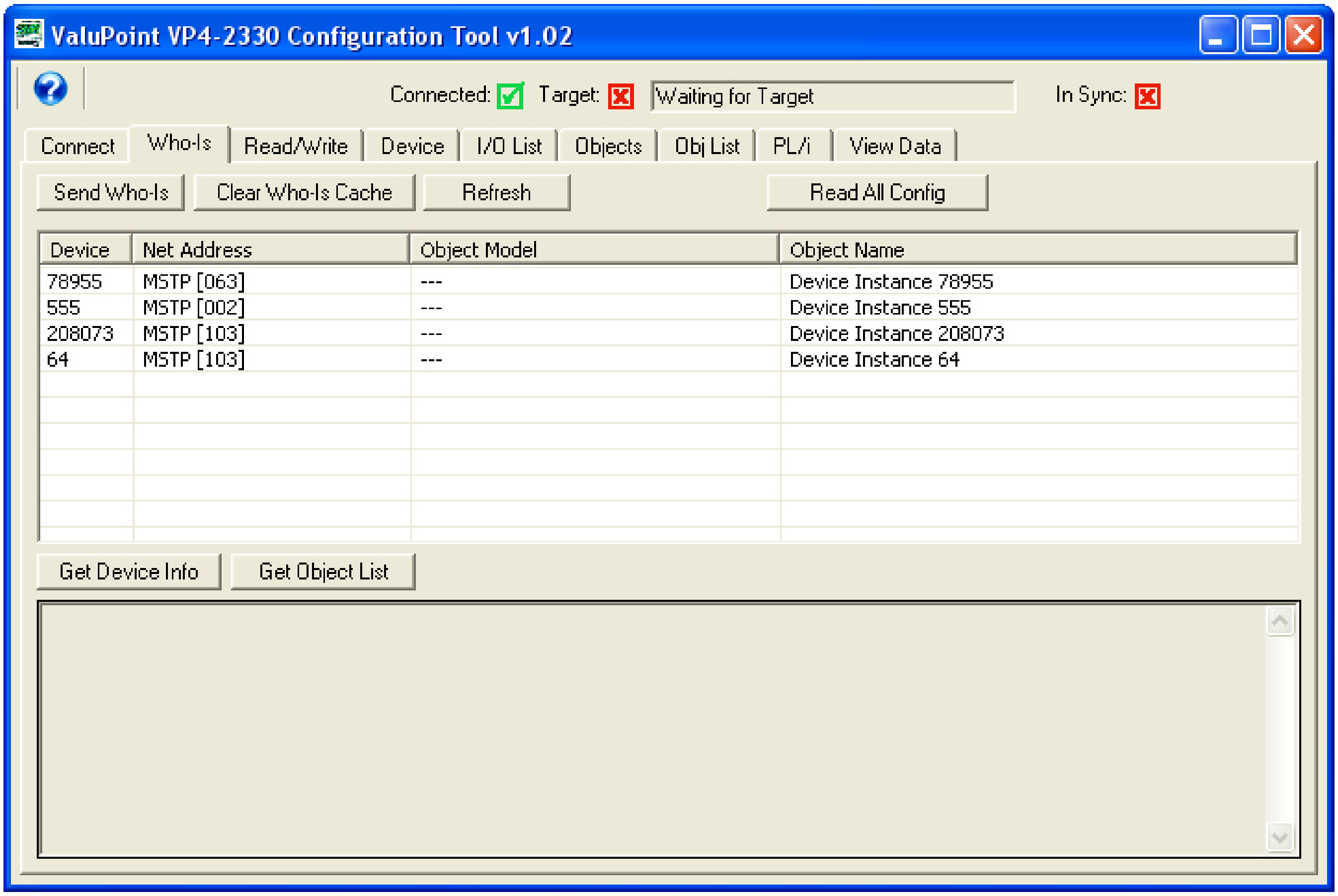
Local IP 0.0.0.0

IP Port (hex) BAC0

Our Device 20801

```
No errors detected.
MS/TP port searching.
USB is responding.
Auto connected.
```

4 Who-Is



ValuPoint VP4-2330 Configuration Tool v1.02

Connected: ☑ Target: ☒ Waiting for Target In Sync: ☒

Device	Net Address	Object Model	Object Name
78955	MSTP [063]	---	Device Instance 78955
555	MSTP [002]	---	Device Instance 555
208073	MSTP [103]	---	Device Instance 208073
64	MSTP [103]	---	Device Instance 64

4.0 Do This for First Time Startup

Alternate between clicking ‘Send Who-Is’ and ‘Refresh’ until the device you wish to configure shows up on the list. Then double-click that device and observe that it shows up in the very top target identification window. The target icon at the top should change from a red X to a green check mark. Then, assuming the device is a VP4-2330, click the Read All Config button to get the configuration tool entirely in sync with the device.

4.1 Send Who-Is

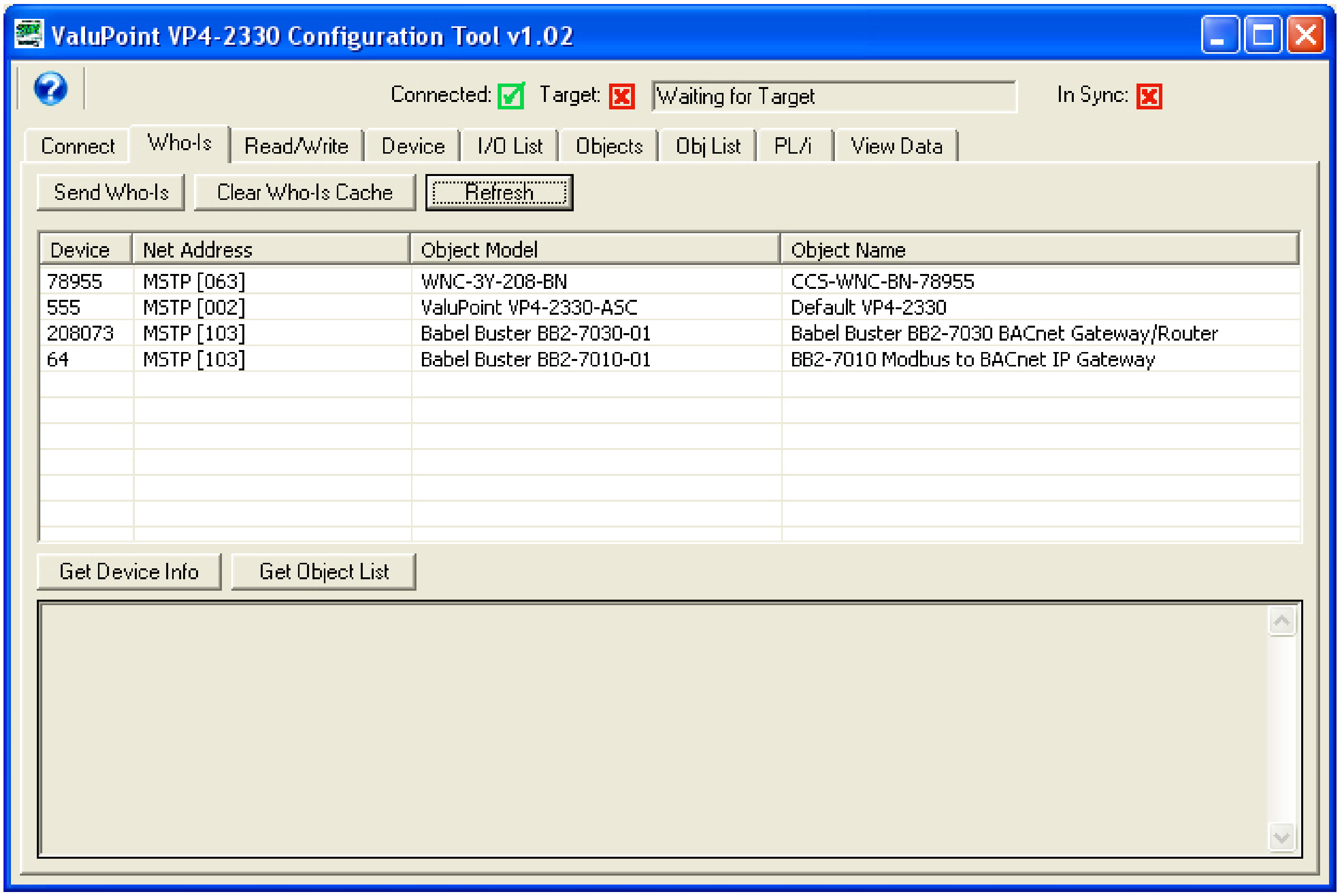
The Who-Is page is used to locate and identify devices on the BACnet network, and select the device that you wish to configure. By the time you switch to this tab after connecting (Local Port tab), it is common to see some devices already listed. You can click ‘Send Who-Is’ any number of times to send out another request for devices to identify themselves.

The Who-Is only locates devices and lists them as illustrated in the first screen shot above. You need to use Refresh to get the object models and names.

The MAC address of MS/TP devices found will be listed in the Net Address column. Note that in the above example, two different device instances show up at the same MAC address. These are actually BACnet IP devices found on the other side of a BACnet router. The MS/TP MAC address of the router is 103 in this example. Additional network information is recorded internally and the configuration tool will use this information as needed to access the devices on the other side of the router.

4.2 Refresh

Click ‘Refresh’ to see which devices have responded. Click ‘Refresh’ at least twice to cause the tool to request object model and name from each responding device. The ‘Send Who-Is’ sends out the who-is request, and ‘Refresh’ sends out read requests for model and name for any MAC that has not already been queried for this information. Following successful refresh, the screen will appear as illustrated below.



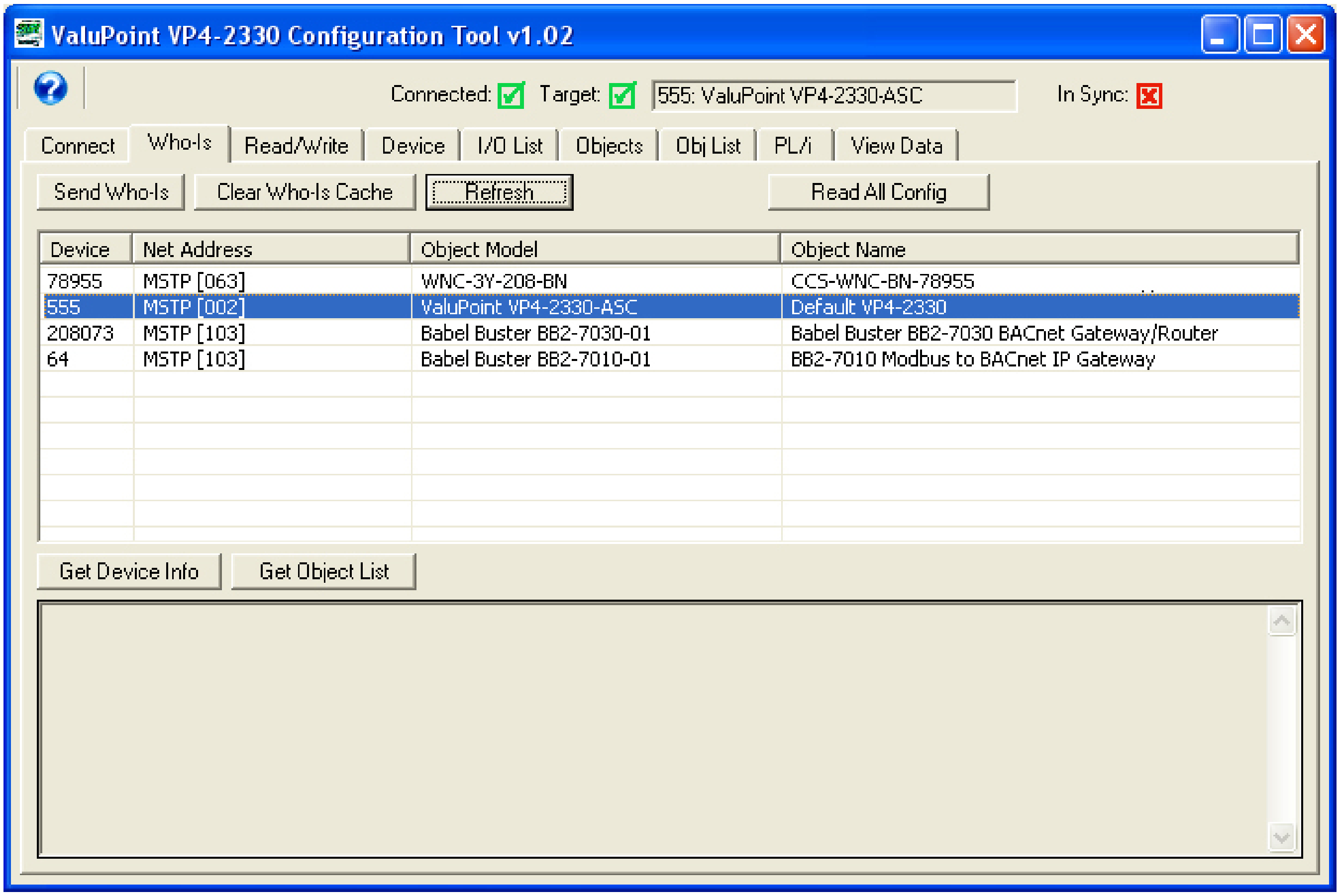
Connected: ✓ Target: ☒ Waiting for Target In Sync: ☒

Device	Net Address	Object Model	Object Name
78955	MSTP [063]	WNC-3Y-208-BN	CCS-WNC-BN-78955
555	MSTP [002]	ValuPoint VP4-2330-ASC	Default VP4-2330
208073	MSTP [103]	Babel Buster BB2-7030-01	Babel Buster BB2-7030 BACnet Gateway/Router
64	MSTP [103]	Babel Buster BB2-7010-01	BB2-7010 Modbus to BACnet IP Gateway

4.3 Select Target

Double-click the device you wish to configure. Its device instance will appear in the target window at the top, along with the device name if it had been obtained by clicking ‘Refresh’ at least twice. The Target icon at the top should also change from a red X to a green check mark.

You must select a device before most of the other tabs will work. The only tab that will work without first selecting a device is the Read/Write tab which is generic in nature and does not actually do any configuration. If you attempt to access a feature that requires device selection first, you will get an error message to that effect.

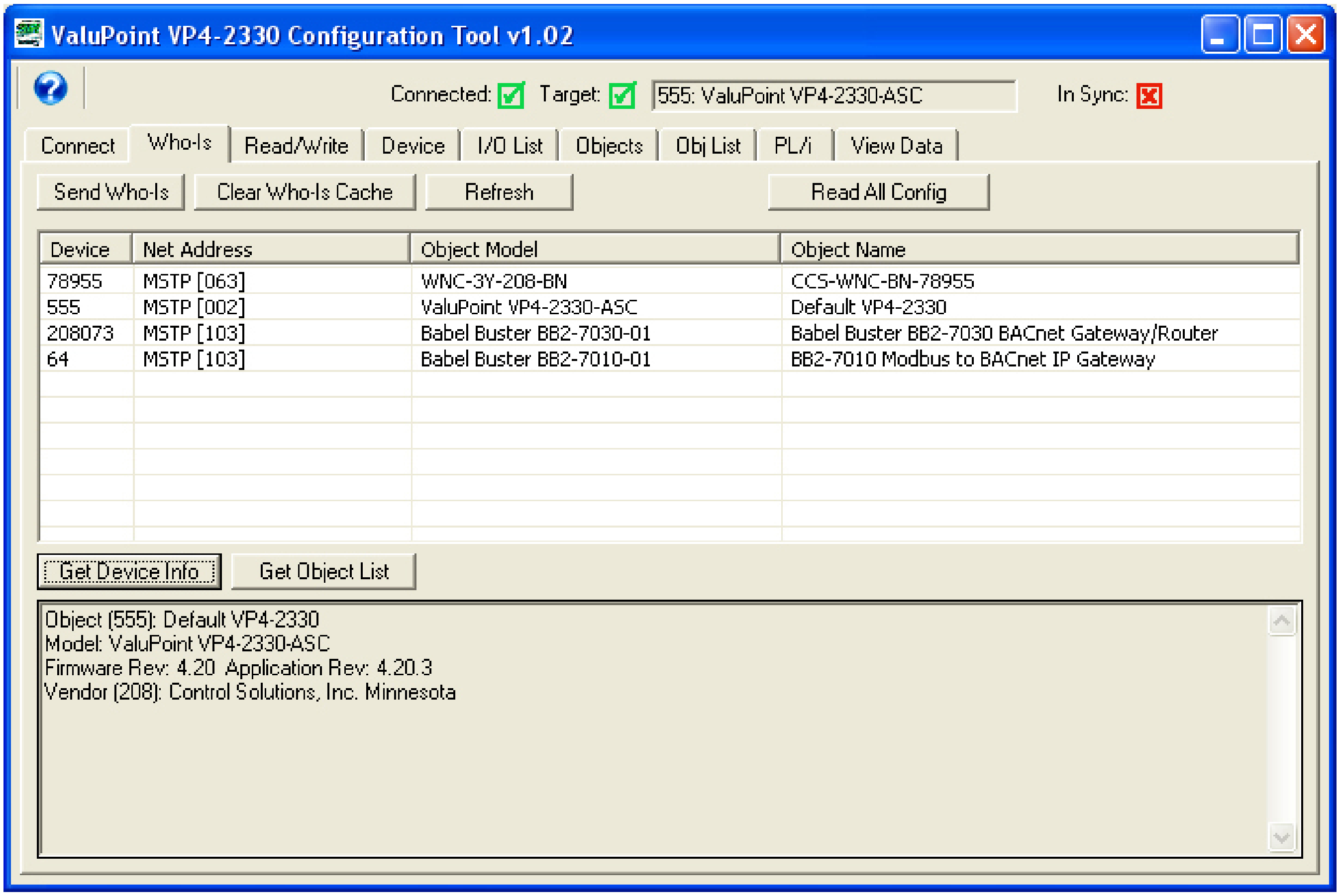


Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

Device	Net Address	Object Model	Object Name
78955	MSTP [063]	WNC-3Y-208-BN	CCS-WNC-BN-78955
555	MSTP [002]	ValuPoint VP4-2330-ASC	Default VP4-2330
208073	MSTP [103]	Babel Buster BB2-7030-01	Babel Buster BB2-7030 BACnet Gateway/Router
64	MSTP [103]	Babel Buster BB2-7010-01	BB2-7010 Modbus to BACnet IP Gateway

4.4 Get Device Info

Click the ‘Get Device Info’ button to get several pieces of information about the device as illustrated below. The Get Device Info button will work for any device selected as "target" regardless of whether it is a VP4-2330.



555: ValuPoint VP4-2330-ASC

Device	Net Address	Object Model	Object Name
78955	MSTP [063]	WNC-3Y-208-BN	CCS-WNC-BN-78955
555	MSTP [002]	ValuPoint VP4-2330-ASC	Default VP4-2330
208073	MSTP [103]	Babel Buster BB2-7030-01	Babel Buster BB2-7030 BACnet Gateway/Router
64	MSTP [103]	Babel Buster BB2-7010-01	BB2-7010 Modbus to BACnet IP Gateway

```
Object (555): Default VP4-2330
Model: ValuPoint VP4-2330-ASC
Firmware Rev: 4.20  Application Rev: 4.20.3
Vendor (208): Control Solutions, Inc. Minnesota
```

4.5 Get Object List

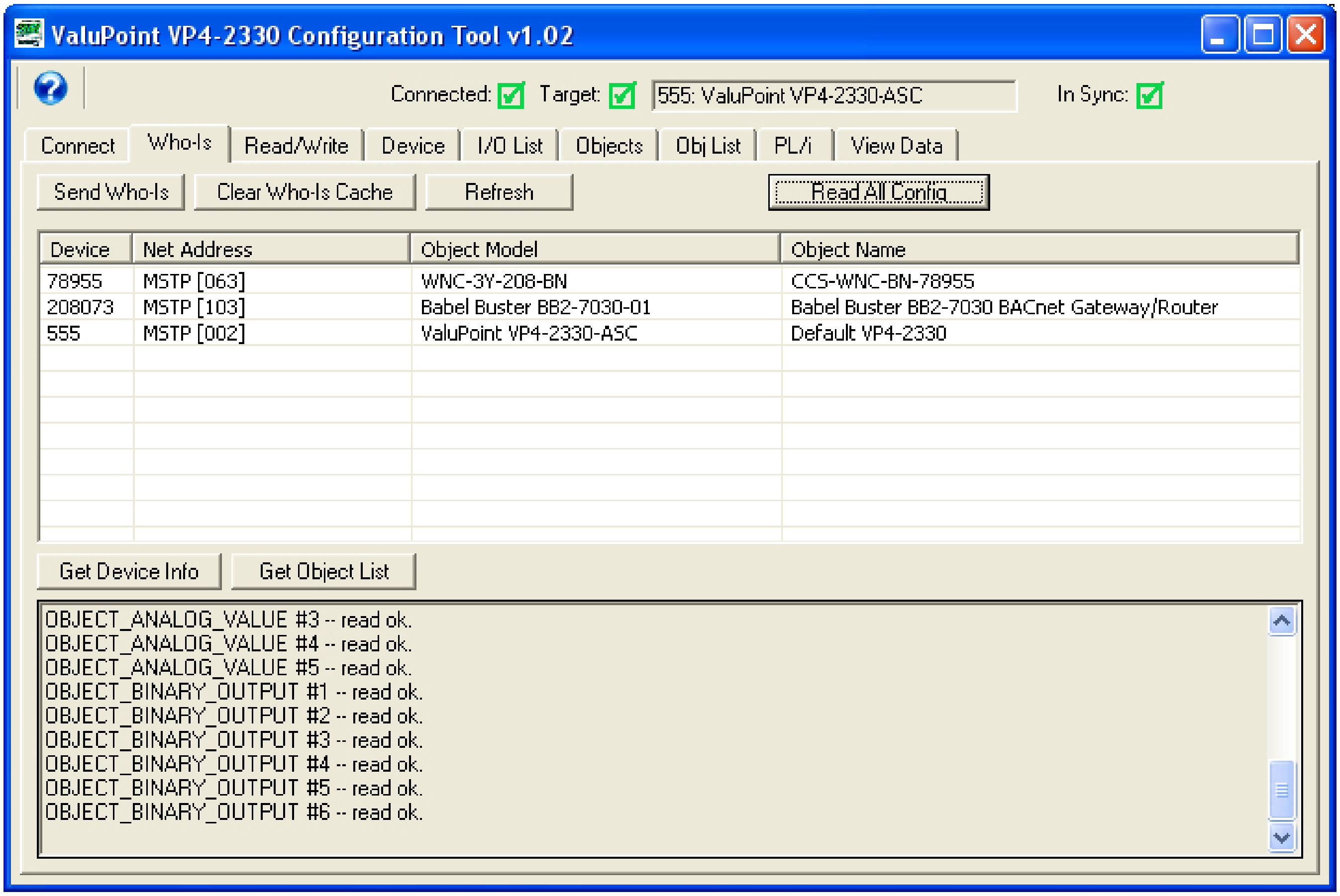
Click 'Get Object List' to get a list of all of the device's currently known objects. Note that the total object count contained in a VP4-2330 is configurable. As shipped, it defaults to 14 Analog Input objects, 3 Analog Output objects, 6 Binary Output objects, and none of any other type. Therefore if you were expecting to see the advertised 200 objects but only see 23, this is to be expected until you allocate additional objects.

4.6 Clear Who-Is Cache

You normally have little use for this button. However, if you change the device's Object ID (device instance), you will need to return to this page, clear the cache, and repeat the device selection process because the device's identity has changed.

4.7. Read All Config

There is a shortcut available for reading the properties found on various pages when getting a device in sync for the first type, usually after powering up the gateway. Click Read All Config to do the equivalent of reading properties on other pages sufficient to get all the red X's to change to green checkmarks.

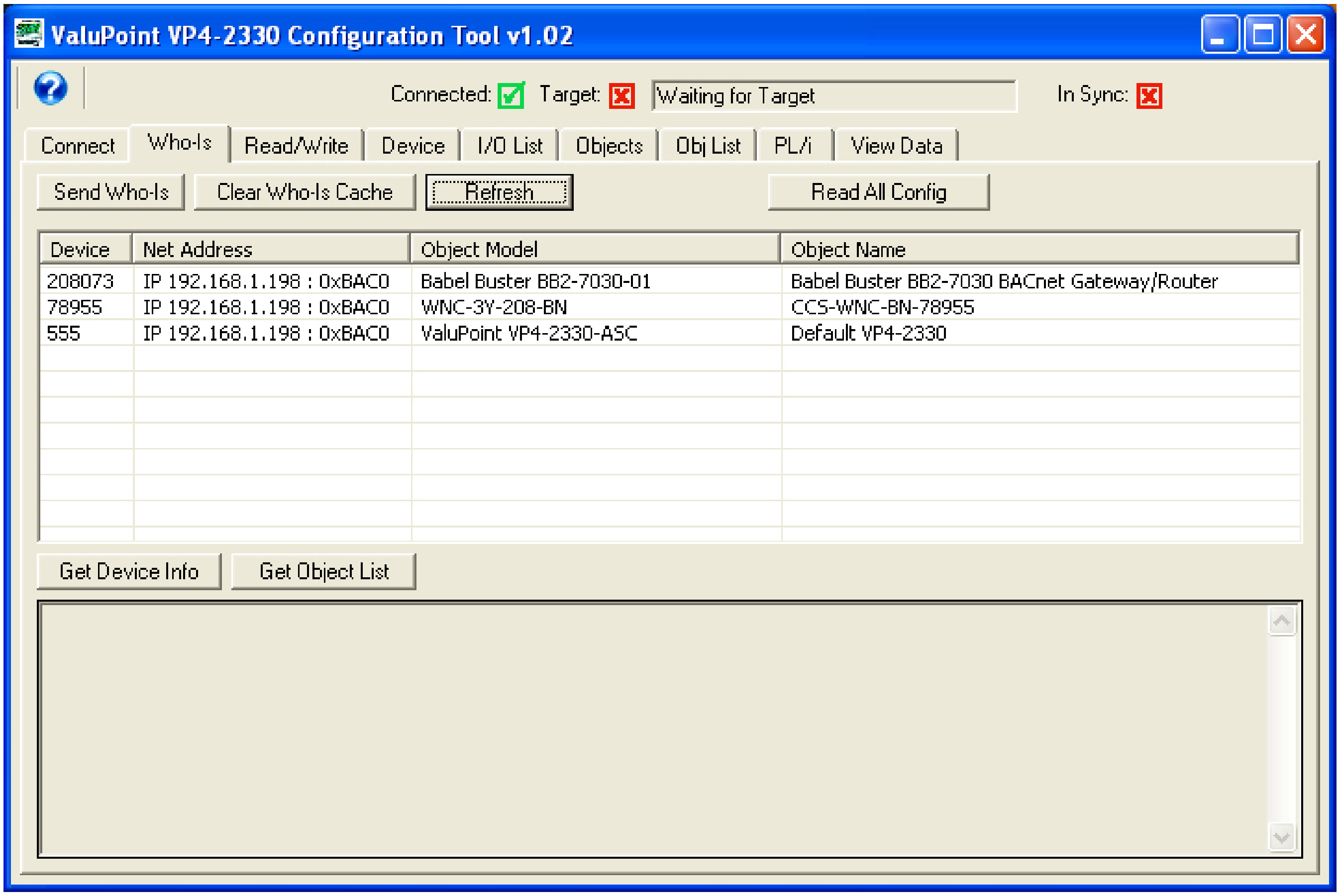


Device	Net Address	Object Model	Object Name
78955	MSTP [063]	WNC-3Y-208-BN	CCS-WNC-BN-78955
208073	MSTP [103]	Babel Buster BB2-7030-01	Babel Buster BB2-7030 BACnet Gateway/Router
555	MSTP [002]	ValuPoint VP4-2330-ASC	Default VP4-2330

```
OBJECT_ANALOG_VALUE #3 -- read ok.
OBJECT_ANALOG_VALUE #4 -- read ok.
OBJECT_ANALOG_VALUE #5 -- read ok.
OBJECT_BINARY_OUTPUT #1 -- read ok.
OBJECT_BINARY_OUTPUT #2 -- read ok.
OBJECT_BINARY_OUTPUT #3 -- read ok.
OBJECT_BINARY_OUTPUT #4 -- read ok.
OBJECT_BINARY_OUTPUT #5 -- read ok.
OBJECT_BINARY_OUTPUT #6 -- read ok.
```

4.8. Who-Is via IP Router

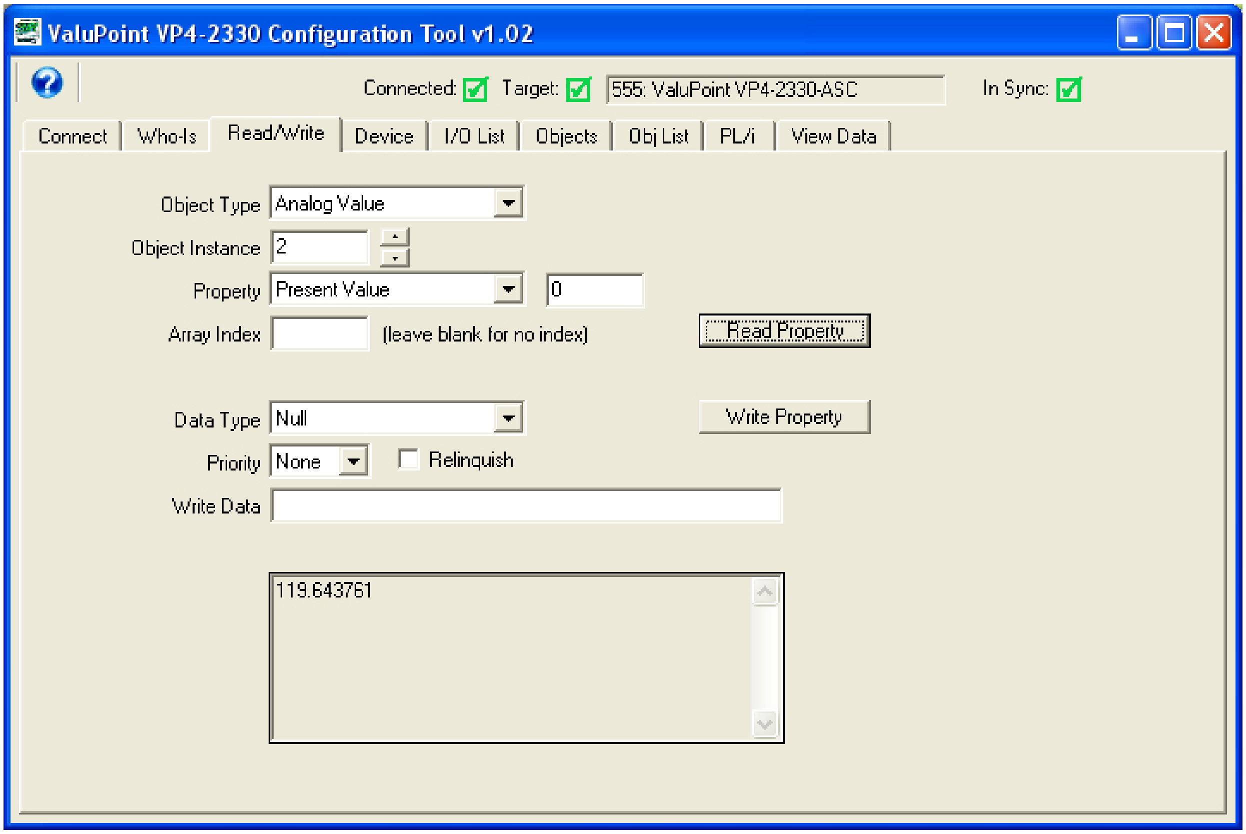
The VP4-2330 configuration tool will work when connected via a BACnet IP router (check Enable IP on Connect page). The Who-Is list of devices will appear as illustrated below when connected via IP. Note that all of the MS/TP devices will appear at the same IP address. This is the IP address of the BACnet IP router. Network number and MS/TP MAC address are recorded internally by the configuration tool and used as needed to access the MS/TP device via the router.



Waiting for Target

Device	Net Address	Object Model	Object Name
208073	IP 192.168.1.198 : 0xBAC0	Babel Buster BB2-7030-01	Babel Buster BB2-7030 BACnet Gateway/Router
78955	IP 192.168.1.198 : 0xBAC0	WNC-3Y-208-BN	CCS-WNC-BN-78955
555	IP 192.168.1.198 : 0xBAC0	ValuPoint VP4-2330-ASC	Default VP4-2330

5 Read / Write



Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑

Object Type: Analog Value

Object Instance: 2

Property: Present Value 0

Array Index: (leave blank for no index)

Data Type: Null

Priority: None □ Relinquish

Write Data:

```
119.643761
```

5.0 Skip This for First Time Startup

This page is not necessary for initially getting the device in sync with the tool. This page is also not necessary for performing any configuration functions.

This page may be used as soon as a device is selected on the Who-Is page, and the device does not have to be a VP4-2330 to use the generic object property read/write on this page.

5.1 Read Property

Select object type, instance, property, and array index if any, and then click ‘Read Property’. If the request is successful, the data will be displayed in the log window at the bottom.

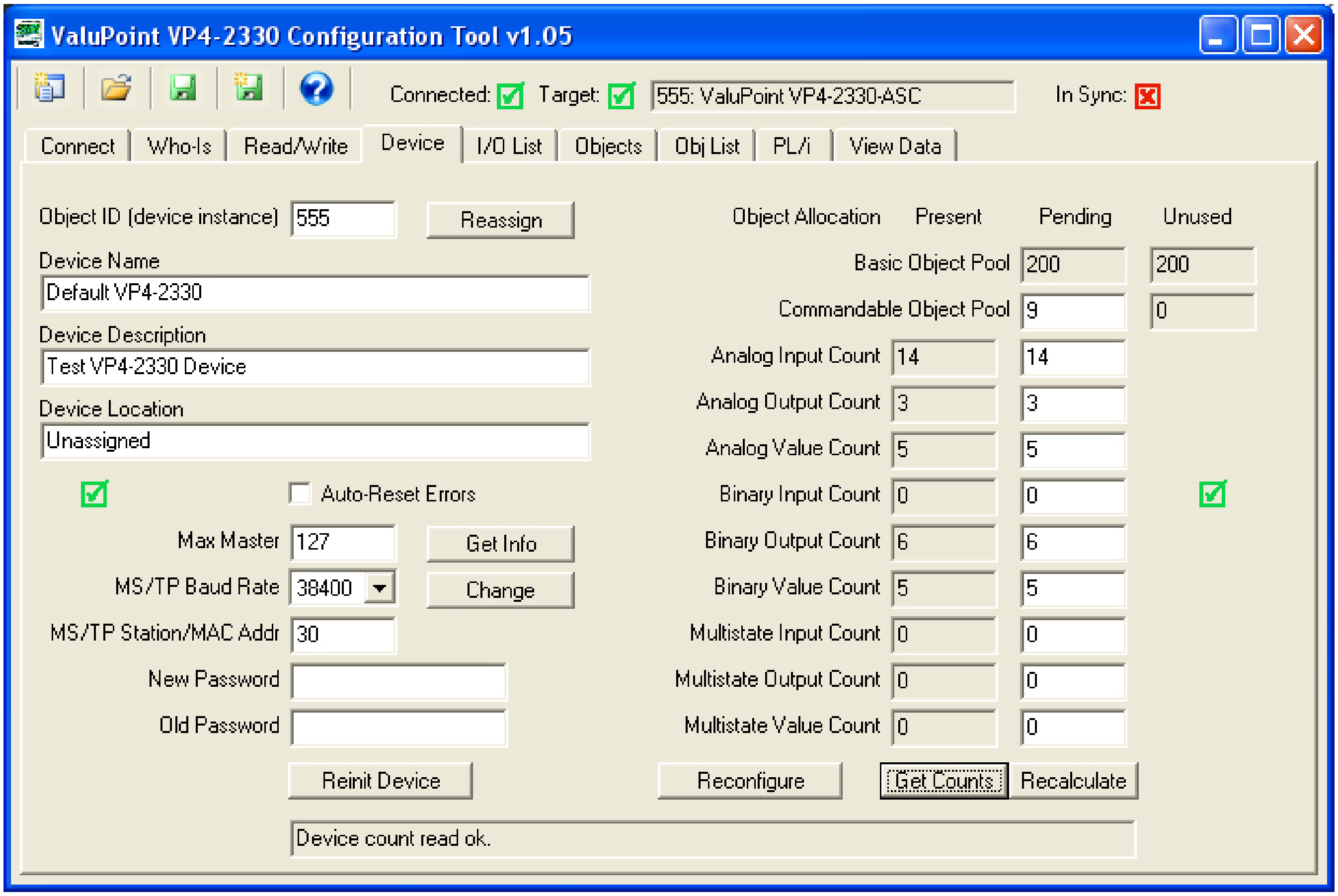
A collection of most often used property types are included in the drop list. If the desired property is not shown, select ‘Other-->’ and enter the property type code in the window next to the list. The property type codes are those defined by the BACnet standard. For example, Present Value can also be obtained using ‘Other --> 85’.

5.2 Write Property

Select all of the same settings as you would for Read Property, and in addition, specify data type, priority (if commandable, use ‘none’ if not commandable), and data to write. Then click ‘Write Property’.

Format for most data types is simply a numeric string. The data type ‘character string’ will consume everything found in the data window as ASCII text copied verbatim. Octet strings should consist of 8-bit values in hexadecimal notation (1 to 3 hex digits), with each octet separated by a comma. Bit strings should consist of a series of T and F characters, optionally separated by a comma. The first T or F is bit zero.

6 Device Page



Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

Object ID (device instance) 555

Device Name: Default VP4-2330

Device Description: Test VP4-2330 Device

Device Location: Unassigned

☑ □ Auto-Reset Errors

Max Master 127

MS/TP Baud Rate 38400

MS/TP Station/MAC Addr 30

New Password

Old Password

Object Allocation	Present	Pending	Unused
Basic Object Pool		200	200
Commandable Object Pool		9	0
Analog Input Count	14	14	
Analog Output Count	3	3	
Analog Value Count	5	5	
Binary Input Count	0	0	☑
Binary Output Count	6	6	
Binary Value Count	5	5	
Multistate Input Count	0	0	
Multistate Output Count	0	0	
Multistate Value Count	0	0	

Device count read ok.

6.0 Do This for First Time Startup

Click ‘Get Info’ near left center of the screen. Then click ‘Get Counts’ near the lower right corner. This will read the device properties and get the tool in sync with the device.

Note: This has already been done if you clicked the 'Read All Config' button on the Who-Is page.

6.1 Get Info

Clicking the ‘Get Info’ button will read all of the information shown on the left half on this page, except that no password is ever read out (not permitted by the device).

6.2 Change Info

Changes to any of the device information on the left-hand half of this page may be made. Once changes are made, click the ‘Change’ button to register all changes except device instance (see Reassign). To cause changes such as baud rate, MAC address, or Max Master setting to take effect, it is necessary to reinitialize the device (see Reinit Device).

6.3 Reassign Device Instance

To change this device property, enter the new object ID (device instance) and click the ‘Reassign’ button. Once you do this, you will need to return to the Who-Is page, clear the cache, repeat the Send Who-Is and Refresh, and reselect your target device. You will get an ‘unknown device’ error if you try to continue without reselecting the device since the device ID has now changed.

6.4 Get Counts

Click ‘Get Counts’ to read the present object allocation configured in the device. The counts will show up in the ‘Present’ column.

Working offline: Enter the object counts you will configure your device for at some point in the future, then click ‘Get Counts’ to accept the changes for working offline.

6.5 Recalculate and Reconfigure Counts

Enter new object counts in the windows in the ‘Pending’ column. Click ‘Recalculate’ to check to see if the count is valid. The recalculate will also be automatic any time you move the mouse cursor from one window to another.

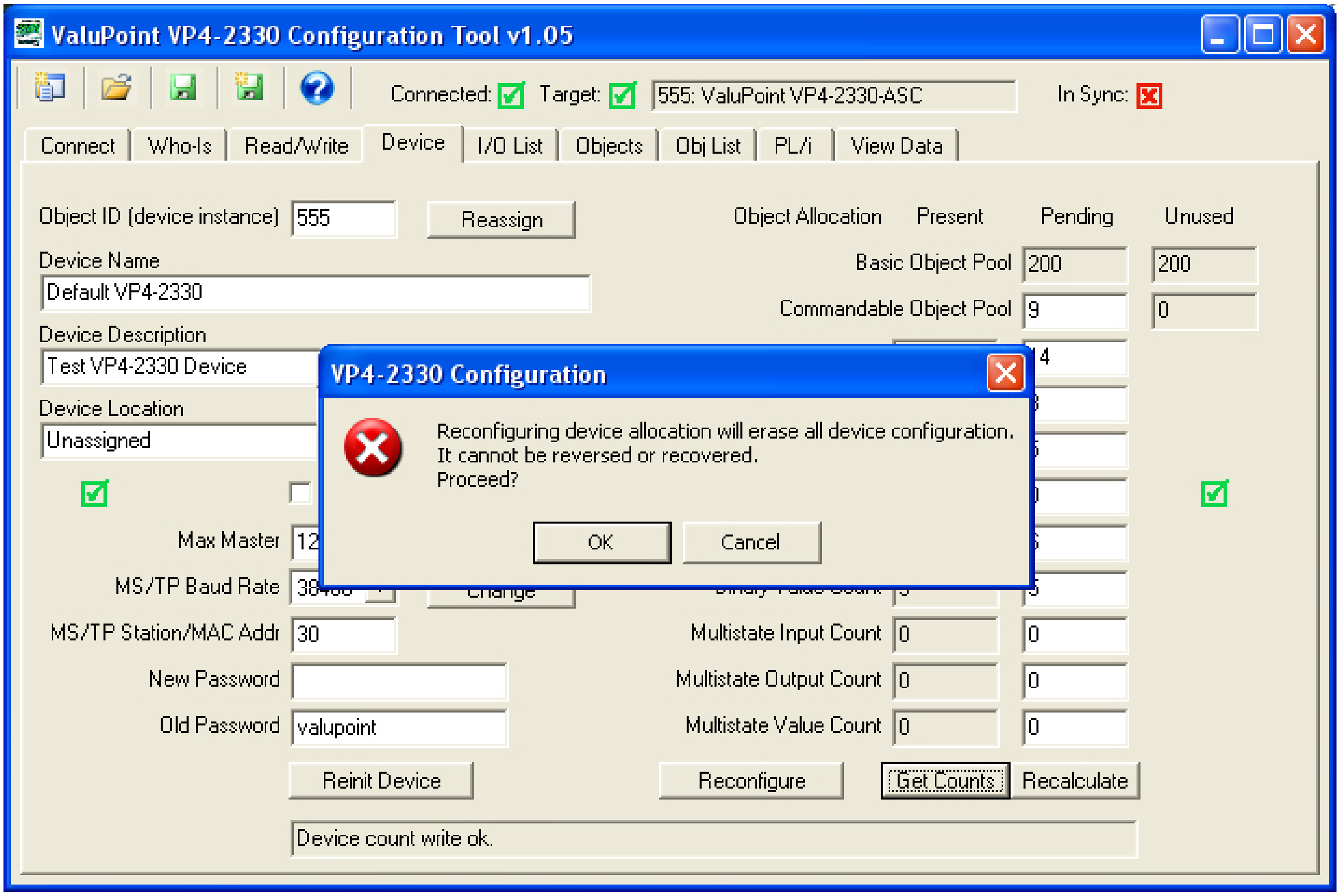
Begin by deciding how many commandable objects you want in the new configuration, and enter that number as the Commandable Object Pool. The Basic Object Pool will be recalculated to use the remaining resources. Commandable objects take more resources than basic objects. With zero commandable objects, you can expect to see 315 basic objects. The maximum number of commandable objects is 136, which leaves only 1 basic object. As you can see, there is more than a 2 to 1 ratio of resource requirements.

Once you have allocated some number of commandable objects in the pool, proceed to enter object counts for each of the object types. A count of zero is permissible.

When you are ready to reconfigure the device with the new object allocation, click the ‘Reconfigure’ button. *NOTE: This action will completely erase all prior object map configuration.*

If you get services error code 46, or an error message about invalid configuration, you are probably attempting to increase object counts toward the top of the list while decreasing counts further down the list in a device with a relatively full count. Start by reinitializing to all object counts set to zero except for Analog Inputs (which can be set to some low number). Now that the device sees available objects in the pool, you can proceed to allocate as desired.

Upon clicking Reconfigure, you can expect to see the following sequence:



Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

Object ID (device instance) 555

Device Name Default VP4-2330

Device Description Test VP4-2330 Device

Device Location Unassigned

☑ □ ☑

Max Master 12

MS/TP Baud Rate 384

MS/TP Station/MAC Addr 30

New Password

Old Password valupoint

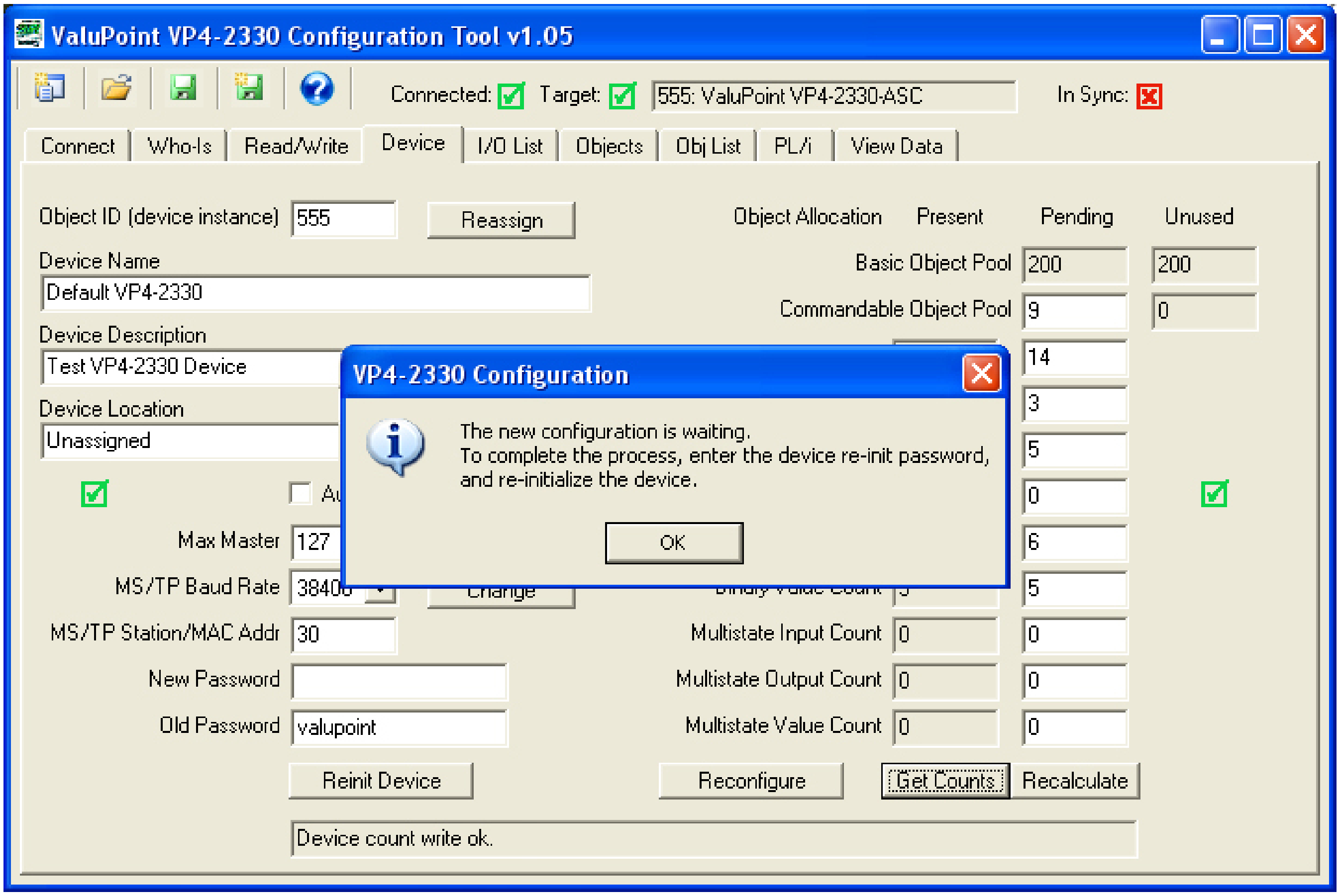
Object Allocation	Present	Pending	Unused
Basic Object Pool		200	200
Commandable Object Pool		9	0
		4	
		3	
		5	
		0	
		6	
	5	5	
Multistate Input Count	0	0	
Multistate Output Count	0	0	
Multistate Value Count	0	0	

Device count write ok.

VP4-2330 Configuration

Reconfiguring device allocation will erase all device configuration.
It cannot be reversed or recovered.
Proceed?

OK Cancel



Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

Object ID (device instance) 555

Device Name Default VP4-2330

Device Description Test VP4-2330 Device

Device Location Unassigned

☑ □ Au ☑

Max Master 127

MS/TP Baud Rate 38400

MS/TP Station/MAC Addr 30

New Password

Old Password valupoint

Object Allocation	Present	Pending	Unused
Basic Object Pool		200	200
Commandable Object Pool		9	0
		14	
		3	
		5	
		0	
		6	
	5	5	
Multistate Input Count	0	0	
Multistate Output Count	0	0	
Multistate Value Count	0	0	

Device count write ok.

VP4-2330 Configuration

The new configuration is waiting.
To complete the process, enter the device re-init password,
and re-initialize the device.

OK

6.6 Reinit Device

Click ‘Reinit Device’ to restart the VP4-2330 using new settings to baud rate, MAC address, or Max Master setting. You will need to enter the old password since the device reinitialize is password protected. If you had entered a new password when you clicked ‘Change Info’, it will become effective after using the old password one last time to cause the changes to take effect. NOTE: The default initial password is "buster".

If you have changed baud rate or other communications settings, you will most likely need to completely restart the configuration tool, starting with disconnecting and reconnecting on the Local Port page.

6.7 File Read / Write (Device XML)

Click the ‘new’ icon to erase everything shown on the device page.

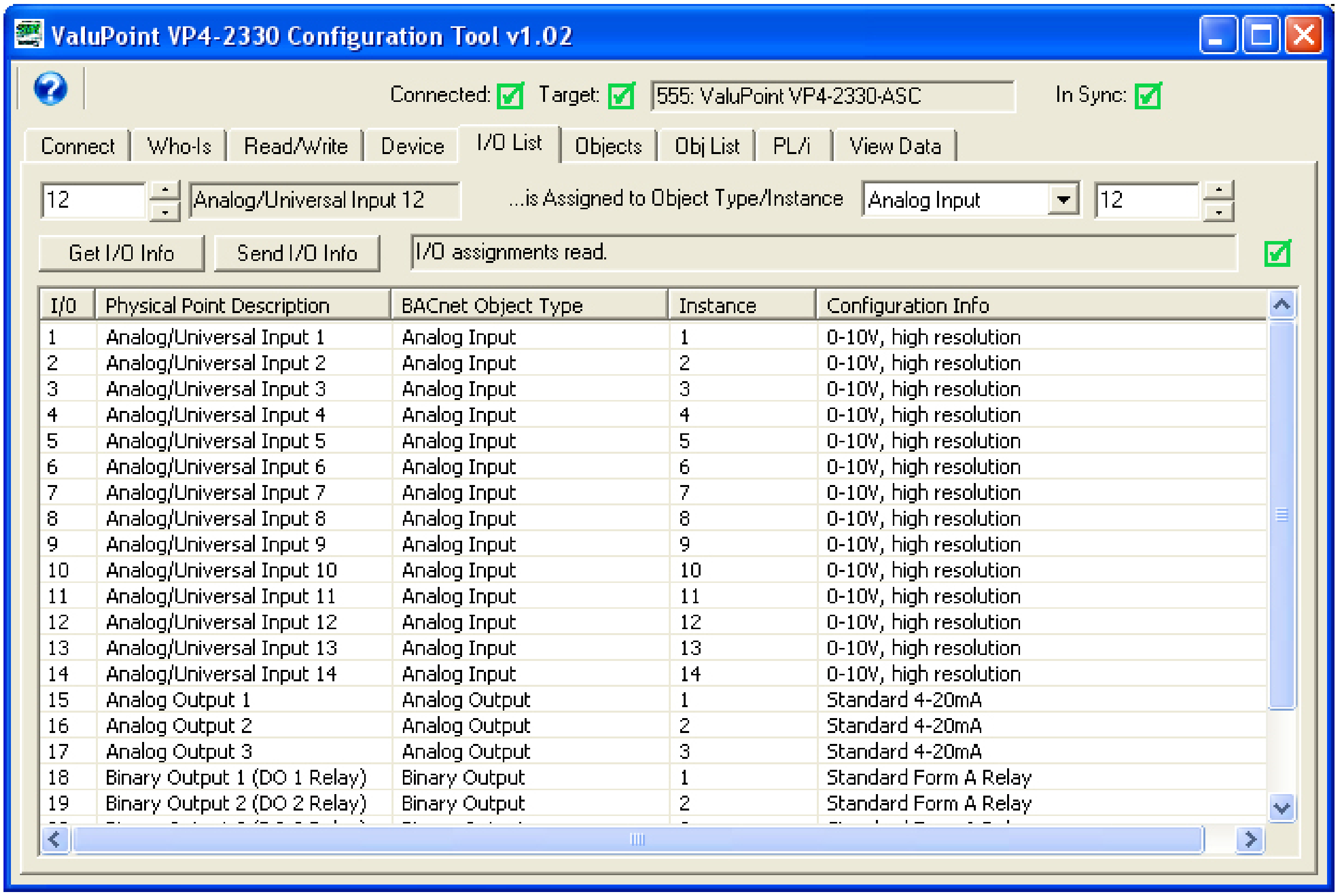
Click the ‘open file’ icon to read a device configuration from an XML file. If you will be replicating the same device configuration multiple times, you will save time by creating a file that can be reloaded. The currently open file will be indicated in the title bar of the program.

Click the ‘save’ icon to re-save the previously opened file, or to save for the first time if creating a new file. The presently displayed device configuration will be saved.

Click the ‘save as’ icon to create a copy of a previously opened file. A file dialog will appear allowing you to browse a selected directory and rename the file.

The file icons at the top of the tool screen will be different colors on different pages, and will be absent on some pages. These icons only appear where a file save is applicable. The different colors are meant to suggest different file types are used with different pages. There are 3 file types: (i) Device XML, (ii) Object Map XML, (iii) Object Map CSV.

7 I/O Point Assignments



ValuPoint VP4-2330 Configuration Tool v1.02

Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑

12 Analog/Universal Input 12 ...is Assigned to Object Type/Instance Analog Input 12

I/O assignments read. ☑

I/O	Physical Point Description	BACnet Object Type	Instance	Configuration Info
1	Analog/Universal Input 1	Analog Input	1	0-10V, high resolution
2	Analog/Universal Input 2	Analog Input	2	0-10V, high resolution
3	Analog/Universal Input 3	Analog Input	3	0-10V, high resolution
4	Analog/Universal Input 4	Analog Input	4	0-10V, high resolution
5	Analog/Universal Input 5	Analog Input	5	0-10V, high resolution
6	Analog/Universal Input 6	Analog Input	6	0-10V, high resolution
7	Analog/Universal Input 7	Analog Input	7	0-10V, high resolution
8	Analog/Universal Input 8	Analog Input	8	0-10V, high resolution
9	Analog/Universal Input 9	Analog Input	9	0-10V, high resolution
10	Analog/Universal Input 10	Analog Input	10	0-10V, high resolution
11	Analog/Universal Input 11	Analog Input	11	0-10V, high resolution
12	Analog/Universal Input 12	Analog Input	12	0-10V, high resolution
13	Analog/Universal Input 13	Analog Input	13	0-10V, high resolution
14	Analog/Universal Input 14	Analog Input	14	0-10V, high resolution
15	Analog Output 1	Analog Output	1	Standard 4-20mA
16	Analog Output 2	Analog Output	2	Standard 4-20mA
17	Analog Output 3	Analog Output	3	Standard 4-20mA
18	Binary Output 1 (DO 1 Relay)	Binary Output	1	Standard Form A Relay
19	Binary Output 2 (DO 2 Relay)	Binary Output	2	Standard Form A Relay

7.0 Skip This for First Time Startup

When connecting and syncing for the first time, you should go to the 'Object Map List' page and read all object maps with one click of the mouse. You can read all properties here, but you must click once per object (as many as 200 times for a fully loaded device). Better yet, just click 'Read All Config' on the Who-Is page after selecting your target device.

If you do not wish to start with the default hardware assignments, then you should first allocate object counts, then come to this page to assign I/O before moving on.

7.1 Assigning Physical I/O Points to BACnet Objects

The screen shot above illustrates the default I/O point assignment that the VP4-2330 is shipped with. It may not be necessary to make any changes. The most common change that will be made is to assign analog/universal inputs (A/UI) to Binary Input objects instead of Analog Input objects. The Binary Input objects would then be configured as discrete or dry contact inputs on the Objects page.

Assignments are made or changed using the top line of input windows. The large window is for display only. The steps for assigning an I/O point to a BACnet object are as follows:

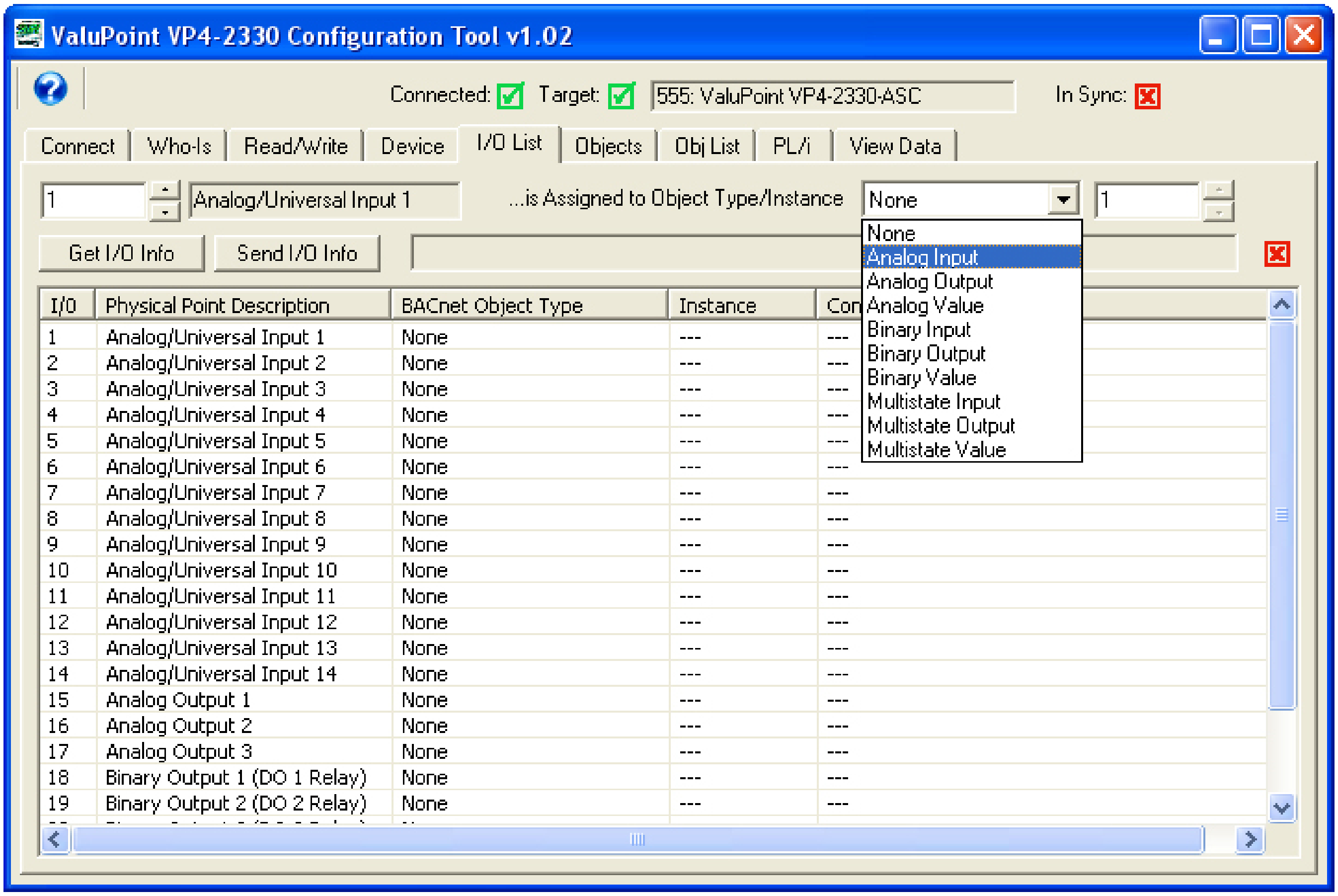
(i) Scroll the number on the left to the desired physical I/O point number. You can also double click on a line in the large display window to directly select that point.

(ii) Select a BACnet object type from the drop-down list on the right.

(iii) Scroll the number on the right to the BACnet object instance desired.

Get I/O Info – Click this button to read I/O assignments currently in effect in the device. Everything previously displayed on the page will be overwritten with information read from the device.

Send I/O Info – Click this button to send the I/O assignments displayed to the device. Until you click this button, the assignments only exist on your PC.



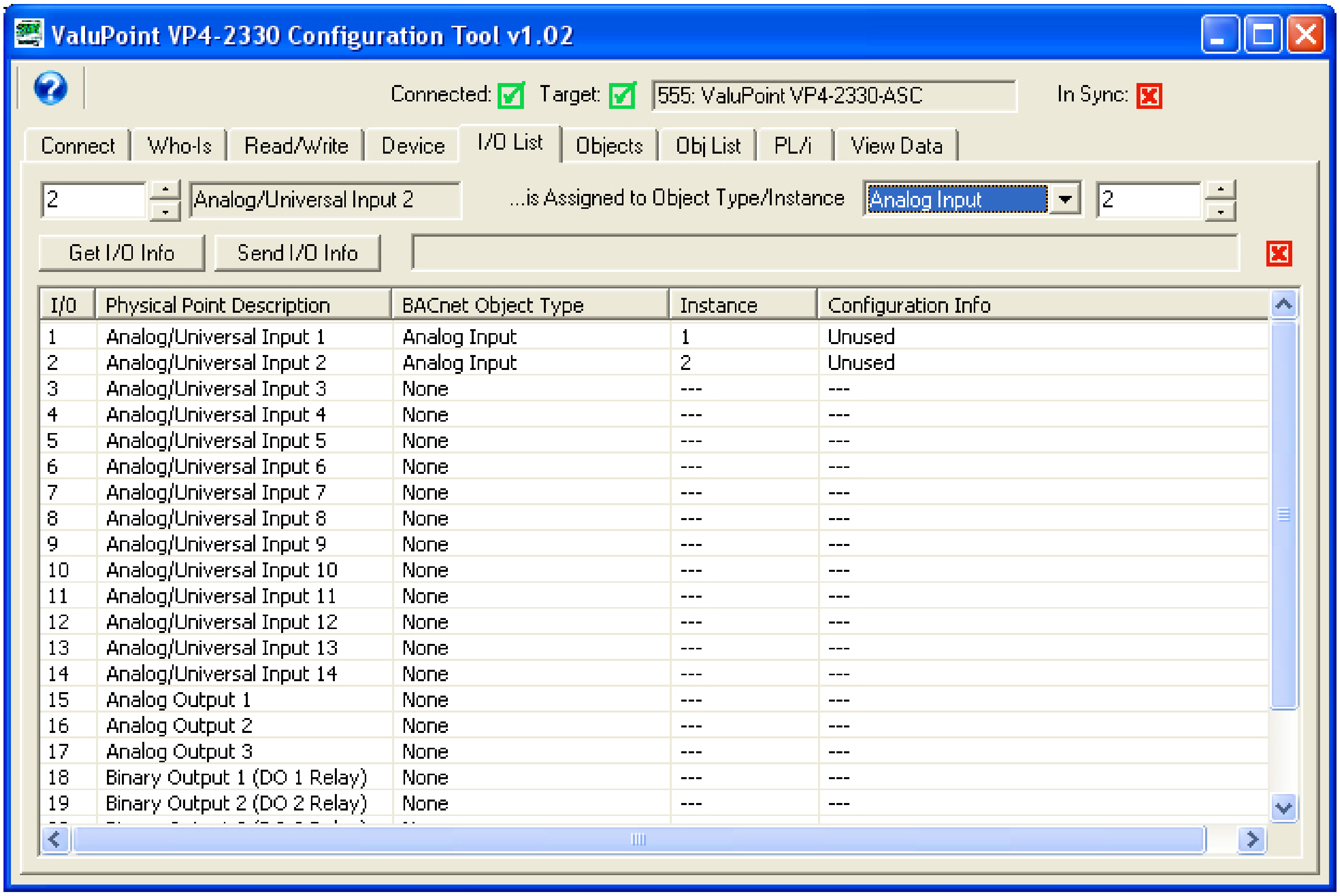
Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

1 Analog/Universal Input 1 ...is Assigned to Object Type/Instance None 1

I/O	Physical Point Description	BACnet Object Type	Instance	Con
1	Analog/Universal Input 1	None	---	---
2	Analog/Universal Input 2	None	---	---
3	Analog/Universal Input 3	None	---	---
4	Analog/Universal Input 4	None	---	---
5	Analog/Universal Input 5	None	---	---
6	Analog/Universal Input 6	None	---	---
7	Analog/Universal Input 7	None	---	---
8	Analog/Universal Input 8	None	---	---
9	Analog/Universal Input 9	None	---	---
10	Analog/Universal Input 10	None	---	---
11	Analog/Universal Input 11	None	---	---
12	Analog/Universal Input 12	None	---	---
13	Analog/Universal Input 13	None	---	---
14	Analog/Universal Input 14	None	---	---
15	Analog Output 1	None	---	---
16	Analog Output 2	None	---	---
17	Analog Output 3	None	---	---
18	Binary Output 1 (DO 1 Relay)	None	---	---
19	Binary Output 2 (DO 2 Relay)	None	---	---

You can only map an I/O point to an object that is not already mapped. If you see skips in object instances, it may be because some objects are already claimed by other points or other uses.

Configuration will initially be displayed as "Unused". Once I/O points have been associated with BACnet objects, proceed to the Objects page to configure the I/O point.

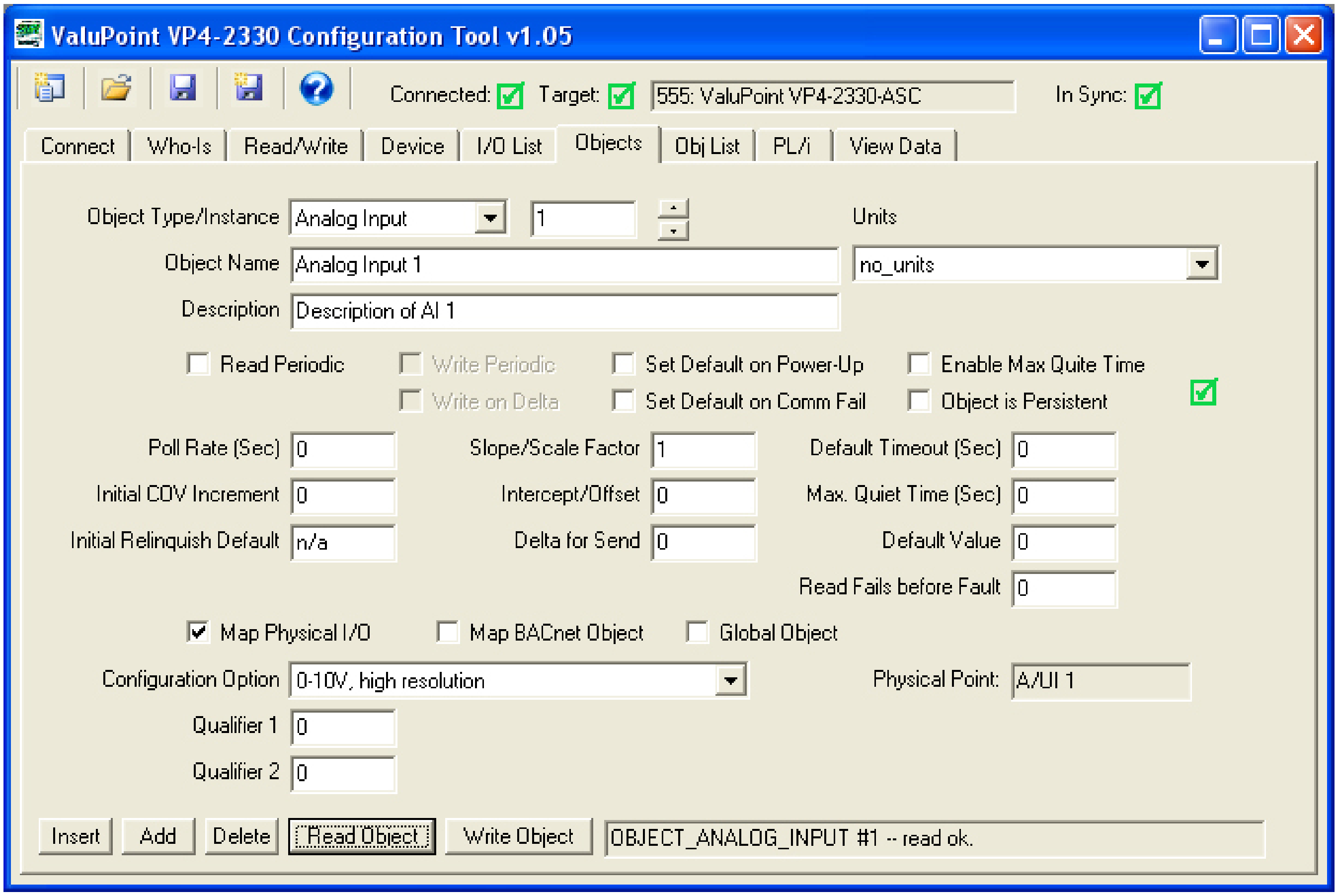


Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

2 Analog/Universal Input 2 ...is Assigned to Object Type/Instance Analog Input 2

I/O	Physical Point Description	BACnet Object Type	Instance	Configuration Info
1	Analog/Universal Input 1	Analog Input	1	Unused
2	Analog/Universal Input 2	Analog Input	2	Unused
3	Analog/Universal Input 3	None	---	---
4	Analog/Universal Input 4	None	---	---
5	Analog/Universal Input 5	None	---	---
6	Analog/Universal Input 6	None	---	---
7	Analog/Universal Input 7	None	---	---
8	Analog/Universal Input 8	None	---	---
9	Analog/Universal Input 9	None	---	---
10	Analog/Universal Input 10	None	---	---
11	Analog/Universal Input 11	None	---	---
12	Analog/Universal Input 12	None	---	---
13	Analog/Universal Input 13	None	---	---
14	Analog/Universal Input 14	None	---	---
15	Analog Output 1	None	---	---
16	Analog Output 2	None	---	---
17	Analog Output 3	None	---	---
18	Binary Output 1 (DO 1 Relay)	None	---	---
19	Binary Output 2 (DO 2 Relay)	None	---	---

8 Object Map Page



Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑

Object Type/Instance: Analog Input 1

Units: no_units

Object Name: Analog Input 1

Description: Description of AI 1

□ Read Periodic □ Write Periodic □ Set Default on Power-Up □ Enable Max Quite Time

□ Write on Delta □ Set Default on Comm Fail □ Object is Persistent ☑

Poll Rate (Sec)	0	Slope/Scale Factor	1	Default Timeout (Sec)	0
Initial COV Increment	0	Intercept/Offset	0	Max. Quiet Time (Sec)	0
Initial Relinquish Default	n/a	Delta for Send	0	Default Value	0
				Read Fails before Fault	0

☑ Map Physical I/O □ Map BACnet Object □ Global Object

Configuration Option: 0-10V, high resolution

Physical Point: A/UI 1

Qualifier 1: 0

Qualifier 2: 0

OBJECT_ANALOG_INPUT #1 -- read ok.

8.0 Skip This for First Time Startup

When connecting and syncing for the first time, you should go to the ‘Object Map List’ page and read all object maps with one click of the mouse. You can read all properties here, but you must click once per object (as many as 200 times for a fully loaded device). Better yet, just click 'Read All Config' on the Who-Is page after selecting your target device.

8.1 Common Parameters

Object Type/Instance – Select BACnet object type from the list, and enter or scroll to the desired object instance. The object number will stop scrolling at the limit set by object counts on the Device page.

Object Name – Enter an alphanumeric name for the object. This name must be unique within the device.

Description – Enter an alphanumeric description for the object. This is informational only.

Units – Select a BACnet units type from the list.

Read Periodic (check box) – Check this box if the BACnet object will be periodically reading from the slave Modbus device or slave BACnet device. ‘Read’ is valid for Input and Value type objects.

Write Periodic (check box) – Check this box if the BACnet object will be periodically writing to the slave Modbus device or slave BACnet device. ‘Write’ is valid for Output and Value type objects.

Write on Delta (check box) – Check this box if the BACnet object will be writing to the slave device only when the object’s value changes by a specified ‘Delta’. It is valid to check both Write Periodic and Write on Delta at the same time, or check just one or the other. ‘Write’ is valid for Output and Value type objects.

Set Default on Power-Up (check box) – Check this box if the object should assume the default value every time the VP4-2330 powers up.

Set Default on Comm Fail (check box) – Check this box if the object should assume the default value when communication with the slave device has failed some number of times.

Enable Max Quiet Time (check box) – Check this box to enable maximum quiet time. This is applicable to an object which is set to Write on Delta. The result is that if there has been no change within the max quite time, the slave device will be re-written anyway.

Object is Persistent (check box) – Checking this box means the Present Value of the object will be retained through restart or power cycle, rather than reset to zero. This is applicable to only certain objects.
Analog Input objects mapped to physical inputs, for example, will not honor the Persistent flag - an Analog Input will always reflect the actual input value. Analog Outputs will also not honor the Persistent flag - if a specific power-up value is desired, use the Default Value and check 'Set Default on Power-Up'.
Analog Value objects will always honor the Persistent flag. Binary and Multistate objects follow similar rules.

Poll Rate (Sec) – This rate applies to periodic reading or writing, and simply specifies how often the slave device is read from or written to. (This parameter does not apply to physical I/O.)

Initial COV Increment – The initial COV increment specified here will apply when another BACnet client subscribes to this object’s COV with a simple Subscribe COV. This initial increment will remain in effect until some other BACnet client writes a new COV increment to this object. If the BACnet client does a Subscribe COV Property, then the COV increment specified in the subscription is used instead of this Initial COV Increment. COV Increment applies only to Analog objects. COV will be reported on any change in a Binary or Multi-state object.

Initial Relinquish Default – The Initial Relinquish Default will take effect when the VP4-2330 is first powered up. After that, any BACnet client can write a new Relinquish Default value to the object. The Relinquish Default value applies to any Commandable object, and the Present Value of the object will assume this value when all 16 priorities have been relinquished.

Slope/Scale Factor – Scaling applies the formula y=mx+b. When reading from the slave, the raw data as read is multiplied by the scale factor, then the offset is added to produce the resulting Present Value. When writing to the slave, the offset is first subtracted from Present Value, and that result is divided by the scale factor to produce the raw data actually written to the slave device. NOTE: If no scale factor is given (zero is entered), no scaling will be done, as if slope=1 and intercept=0.

Intercept/Offset – The offset portion of the scaling as noted above.

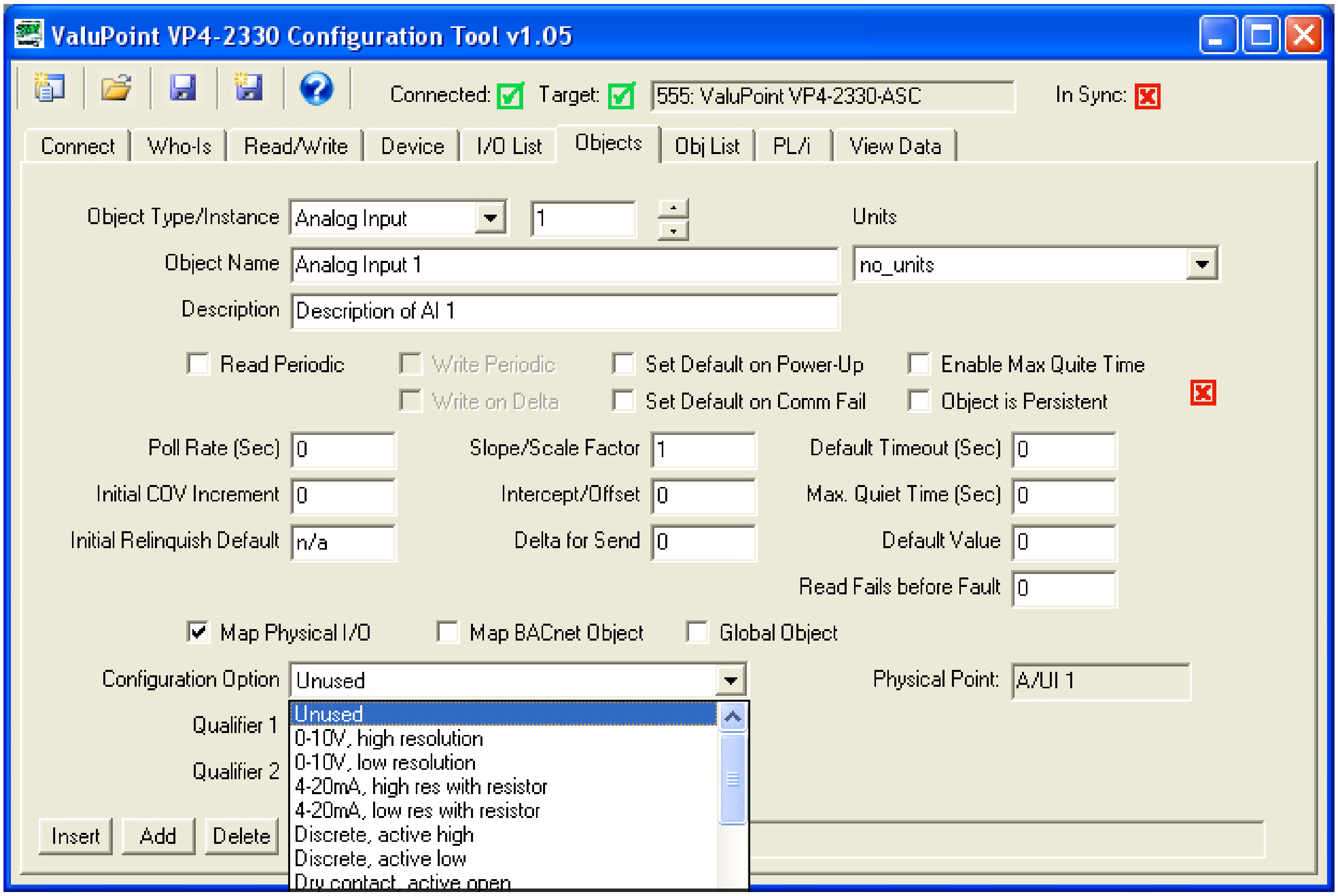
Delta for Send – Enter the threshold for writing when configured to Write on Delta. If a value of 5.0 is entered, the value must change by more than 5.0 before the slave device will be written to. Delta applies only to Analog objects. Binary and Multi-state objects will send on any change when Write on Delta is enabled.

Default Timeout (Sec) – Timeout for Modbus slaves is specified on the Modbus page. When the slave device is another BACnet device, the timeout given here specifies the amount of time the VP4-2330 will wait for a response before calling it an error.

Max. Quiet Time (Sec) – This is applicable to an object which is set to Write on Delta. The result is that if there has been no change within this amount of time, the slave device will be re-written anyway. In addition to entering a nonzero value here, you must check the ‘Enable Max Quiet Time’ box.

Default Value – This is the value that should become the Present Value upon power-up or upon communications failure, if either of these options are selected by the appropriate check boxes above.

Read Fails before Fault – When 'Set Default on Comm Fail' is checked, this entry will allow you to disregard a small number of spurious errors. At least this many errors must occur consecutively before a fault will actually be flagged. Causing a fault as a result of a single instance of spurious noise on a communication line can be a nuisance. This setting allows quieting the nuisance fault notifications. (This parameter does not apply to physical I/O.)



ValuPoint VP4-2330 Configuration Tool v1.05

Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

Object Type/Instance: Analog Input, 1

Units: no_units

Object Name: Analog Input 1

Description: Description of AI 1

☐ Read Periodic ☐ Write Periodic ☐ Set Default on Power-Up ☐ Enable Max Quite Time

☐ Write on Delta ☐ Set Default on Comm Fail ☐ Object is Persistent ☒

Poll Rate (Sec): 0
Slope/Scale Factor: 1
Default Timeout (Sec): 0
Initial COV Increment: 0
Intercept/Offset: 0
Max. Quiet Time (Sec): 0
Initial Relinquish Default: n/a
Delta for Send: 0
Default Value: 0
Read Fails before Fault: 0

☑ Map Physical I/O ☐ Map BACnet Object ☐ Global Object

Configuration Option: Unused

Physical Point: A/UI 1

Qualifier 1

Qualifier 2

Unused
0-10V, high resolution
0-10V, low resolution
4-20mA, high res with resistor
4-20mA, low res with resistor
Discrete, active high
Discrete, active low
Dry contact, active open

8.2 Physical Hardware I/O Parameters

Map Physical I/O (check box) – Check this box to map the displayed BACnet object to a physical I/O point. The I/O point that has been set to be associated with this object will appear in the Physical Point window to the right. To change the association between I/O points and BACnet objects, go to the I/O List page and make changes there. If an object has already been mapped by checking this box, be sure to uncheck it first to release the object for reassignment before making changes on the I/O List page.

Configuration Option – Select the I/O configuration desired for the physical point. This only applies to A/UI analog/universal input points. The A/UI inputs may function as any of the following:

0-10V, high resolution
0-10V, low resolution
4-20mA, high res with resistor
4-20mA, low res with resistor
Discrete, active high
Discrete, active low
Dry contact, active open
Dry contact, active closed
Pulse, high speed

Pulse, low speed (no hi-res)
Resistance, high resolution
Resistance, low resolution
Position pot, hi-res, 1K-30K
Position pot, lo-res, 1K-30K

Thermistor, 10K type III hi-res, F
Thermistor, 10K type II hi-res, F
Thermistor, 3K type II hi-res, F
Thermistor, 20K type IV hi-res, F
Thermistor, 5K type II hi-res, F
Thermistor, 10K type III hi-res, C
Thermistor, 10K type II hi-res, C
Thermistor, 3K type II hi-res, C
Thermistor, 20K type IV hi-res, C
Thermistor, 5K type II hi-res, C

Thermistor, 10K type III lo-res, F
Thermistor, 10K type II lo-res, F
Thermistor, 3K type II lo-res, F
Thermistor, 20K type IV lo-res, F
Thermistor, 5K type II lo-res, F
Thermistor, 10K type III lo-res, C
Thermistor, 10K type II lo-res, C
Thermistor, 3K type II lo-res, C
Thermistor, 20K type IV lo-res, C
Thermistor, 5K type II lo-res, C

The designation hi-res and lo-res refer to the A/D resolution. There are two types of A/D in the VP4-2330. The 'hi-res' A/D is a delta-sigma integrating converter that produces 15-bit results (16-bit including sign, which is always positive with the input circuitry implemented). The 'lo-res' A/D is a fast successive approximation converter which produces 10-bit results.

Due to the fact that 'hi-res' conversion is relatively slow (about 1/4 second compared to a few microseconds for lo-res), some combinations of I/O are not possible. Low speed pulse counting to 10Hz is only possible when all inputs are in lo-res mode. All discrete or dry contact modes are lo-res. High speed pulse counting (to 1kHz) is possible with any combination of modes; however high speed counting uses dedicated hardware and is only available in inputs channels 13 and 14.

Low speed pulse counting in combination with hi-res input conversions is possible, but input pulse rate is limited to about 2Hz. To increase this limit to 10Hz, all analog inputs must be using lo-res modes.

<u>Qualifier 1</u> – Enter the configuration qualifier value, if applicable, for the selected configuration. Qualifiers are required only in the following modes:

4-20mA modes: The qualifier is the resistance in ohms of the dropping resistor used to convert the current to voltage. An external resistor must be provided, connected between the A/UI input and ground/common. The resistor needs to be 1/2 watt (2 watt to withstand 24V power), and is left external simply because miswiring the 4-20mA sensor can easily apply 24V power directly to the input and cause the dropping resistor to heat up and possibly fail. The external resistor is simple to replace, whereas an internal resistor on a circuit board would be more trouble to replace.

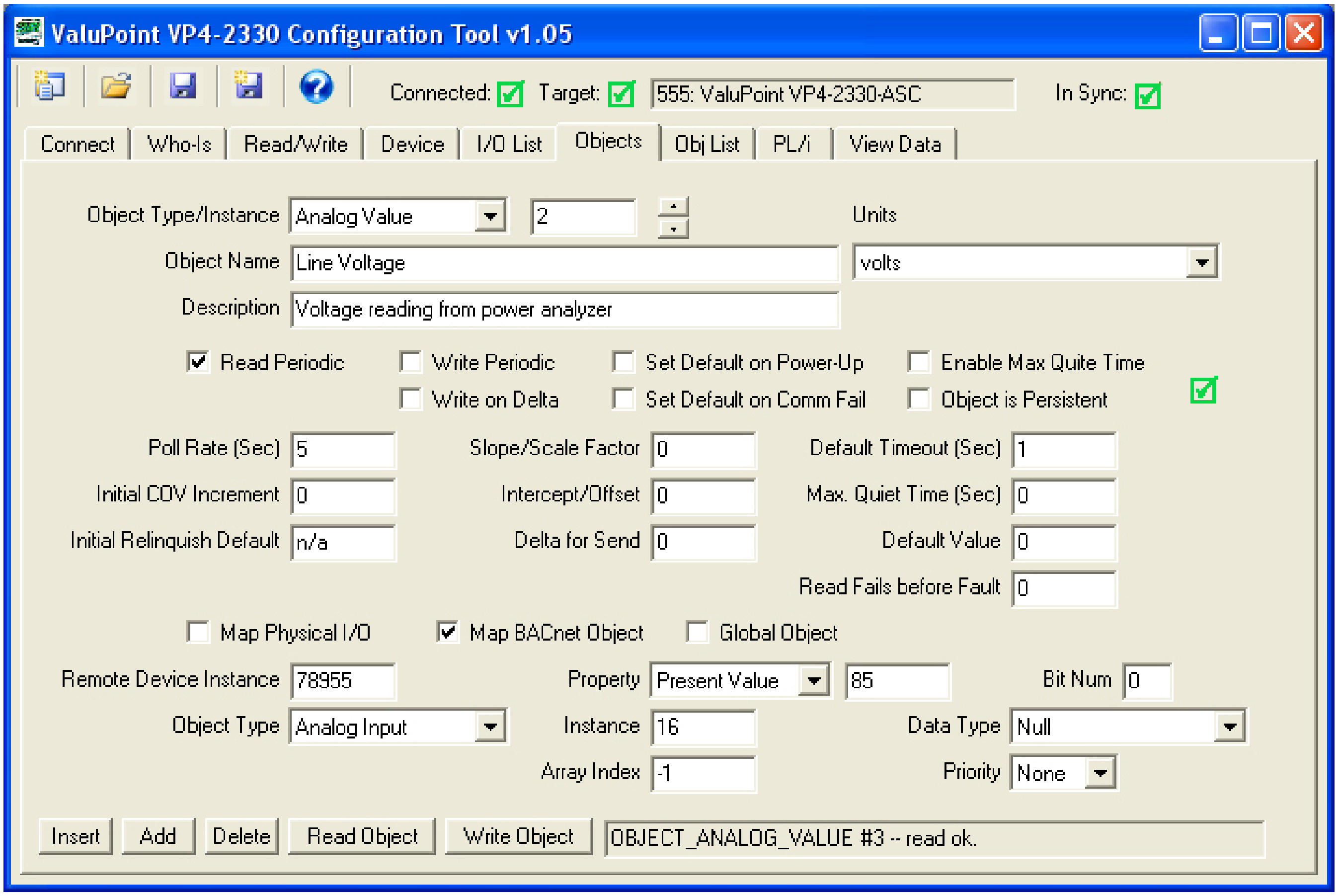
Discrete and Dry Contact modes: The qualifier is a threshold between 1% and 99% at which the input should trip from off to on or vice versa. Although the A/UI inputs are specified as 0-10V inputs, they will actually measure up to 11.4V accurately in hi-res mode, and up to 15.0V in lo-res mode. Therefore, since discrete inputs are sampled as lo-res analog values and compared to a threshold, the qualifier here is a percentage of 15V for the trip point. A value of 50% will mean a threshold of around 7.5V.

Pulse, Low Speed mode: Because low speed pulse input is really a different interpretation of discrete input, a threshold setting is required for pulse sensing. The same threshold as used for discrete input applies here. Without any threshold (or with value of zero), no pulse counting will occur.

Position Pot: Position is simply a different interpretation of resistance measurement. The value resulting from position pot measurement will be a percentage from 0% to 100%, but this percentage will be a ratio based on the resistance value in ohms provided as the qualifier.

Qualifier 2 – Enter a second configuration qualifier value if instructed to do so. This qualifier is reserved for future use.

Physical Point – The physical I/O point assigned to the displayed object is indicated here.



Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑

Object Type/Instance: Analog Value, 2

Units: volts

Object Name: Line Voltage

Description: Voltage reading from power analyzer

☑ Read Periodic ☐ Write Periodic ☐ Set Default on Power-Up ☐ Enable Max Quite Time

☐ Write on Delta ☐ Set Default on Comm Fail ☐ Object is Persistent ☑

Poll Rate (Sec): 5
Slope/Scale Factor: 0
Default Timeout (Sec): 1

Initial COV Increment: 0
Intercept/Offset: 0
Max. Quiet Time (Sec): 0

Initial Relinquish Default: n/a
Delta for Send: 0
Default Value: 0

Read Fails before Fault: 0

☐ Map Physical I/O ☑ Map BACnet Object ☐ Global Object

Remote Device Instance: 78955
Property: Present Value, 85
Bit Num: 0

Object Type: Analog Input
Instance: 16
Data Type: Null

Array Index: -1
Priority: None

OBJECT_ANALOG_VALUE #3 -- read ok.

8.3 MS/TP BACnet Client Parameters

Map BACnet Object (check box) – Check this box when the VP4-2330 should look for another BACnet device as the slave device (instead of a Modbus slave). This box can be checked any time, but is of particular interest when using the VP4-2330 as a Modbus slave and BACnet master for connecting BACnet devices to a Modbus network.

Remote Device Instance – Enter the device instance of the remote BACnet slave. The remote device must be able to support Who-Is/I-Am for locating device by device instance.

Object Type – Select the object type from the list, such as Analog Input, etc.

Mac address (no who-is) – Sets the MS/TP Mac address (station ID) if the slave device does not support Who-Is and I-Am. Device instance will be used to automatically capture the Mac address when Who-Is/I-Am is supported. This setting should be zero to use Who-Is, or set to some non-zero Mac address if the slave does not support Who-Is.

Property – Select the property to be read/written. A collection of most often used property types are included in the drop list. If the desired property is not shown, select ‘Other-->’ and enter the property type code in the window next to the list. The property type codes are those defined by the BACnet standard. For example, Present Value can also be obtained using ‘Other --> 85’.

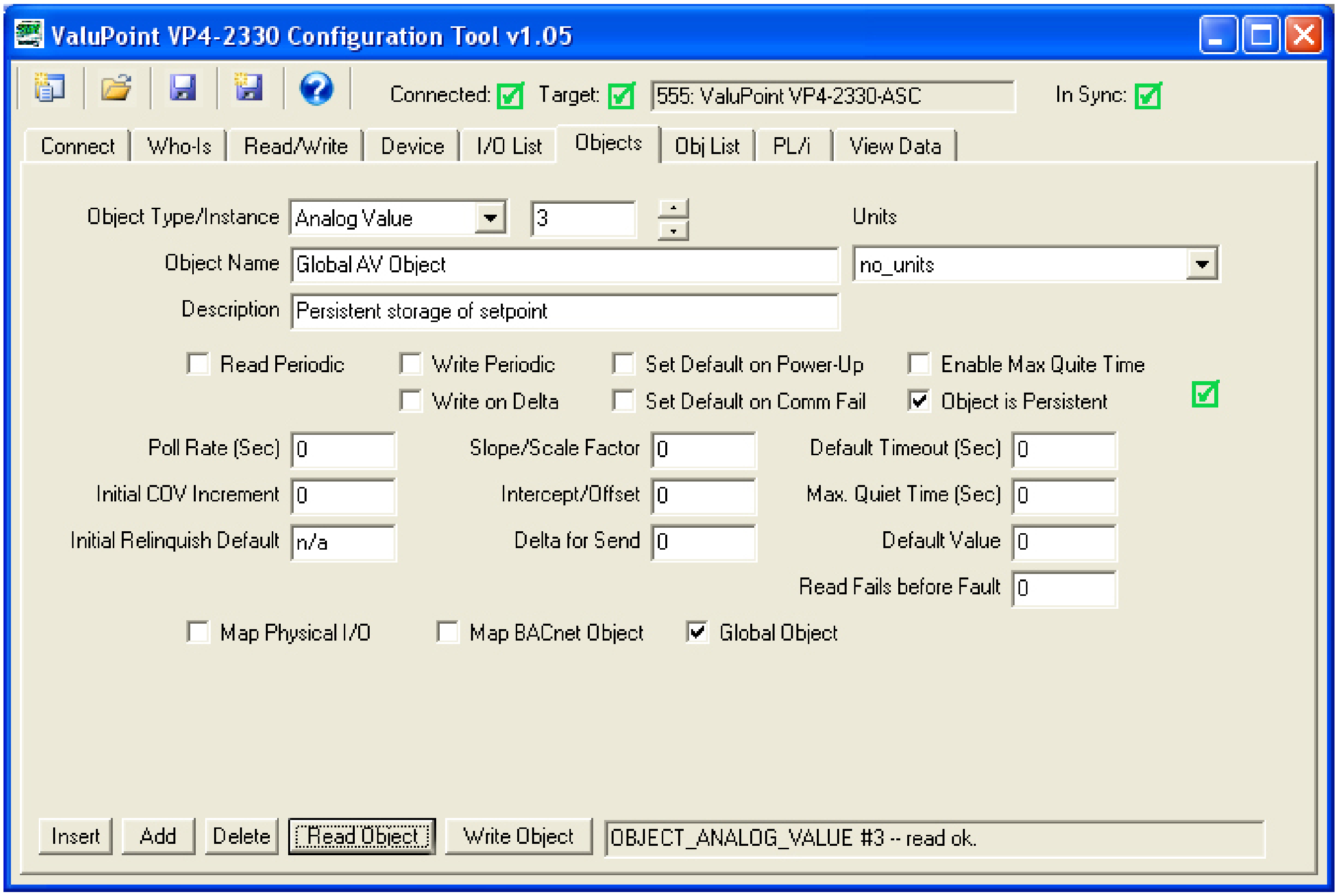
Instance – Select the object instance. There are usually multiple instances of objects in a device. This identifies which one you want.

Array Index – Some properties are an array of values. If applicable, enter the array index here. Enter -1 to indicate no array index is to be used. Zero is a valid index.

Bit Num – When the property type is a bit string, this entry may be used to specify which bit you wish to single out, especially when applying the result to a Binary object. If no bit number is provided, the entire bit string will be assembled as an integer value representing a mask containing all bits.

Data Type – Select the data type expected from this list. Note that some types are not supported here. Character string, for example, is one type of data that cannot be forced into Analog, Binary, or Multi-state objects by the VP4-2330.

Priority – You must use a priority level when writing to a Commandable object. If the object is not commandable, you must select ‘None’ here to avoid having the request rejected.



ValuPoint VP4-2330 Configuration Tool v1.05

Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑

Object Type/Instance: Analog Value, 3
Units: no_units
Object Name: Global AV Object
Description: Persistent storage of setpoint

□ Read Periodic □ Write Periodic □ Set Default on Power-Up □ Enable Max Quite Time
□ Write on Delta □ Set Default on Comm Fail ☑ Object is Persistent ☑

Poll Rate (Sec): 0
Initial COV Increment: 0
Initial Relinquish Default: n/a
Slope/Scale Factor: 0
Intercept/Offset: 0
Delta for Send: 0
Default Timeout (Sec): 0
Max. Quiet Time (Sec): 0
Default Value: 0
Read Fails before Fault: 0

□ Map Physical I/O □ Map BACnet Object ☑ Global Object

OBJECT_ANALOG_VALUE #3 -- read ok.

8.4 Global Object

You may with to set aside an object that is simply there to hold data written by another BACnet device, or generated by the internal PL/i program. You would not want this object mapped to physical I/O or to some property in another BACnet device. The means of setting aside or 'reserving' an object is to simply check 'Global Object' instead of either of the Map options. If none of the Map or Global check boxes are selected, the object will not be included in the View Data list or in the XML file defining the objects.

8.5 Insert, Add, Delete

Clicking ‘Insert’ will insert a blank map before the currently displayed object map. Clicking ‘Add’ will insert a blank map after the currently displayed object map. Clicking ‘Delete’ will remove the currently displayed map and slide the remainder of the list up by one slot on the list.

The only time position matters much in the list is when configuring a packed register that maps a single Modbus register to multiple BACnet objects. The members of the packed register must appear in consecutive maps unless the ‘Pack Mixed Object Types’ is checked. Do not check ‘mixed object types’ unless you really need to mix analog and binary objects (for example) in the same packed Modbus register. Packing mixed object types is very inefficient since the gateway must scan the entire list of object maps for every instance of packed register. When packing the same object types, placing them in consecutive maps results in very efficient execution.

8.6 Read / Write Device

When changes are made, the in-sync icon changes to a red X on the right hand side of this page. When properties are either read or written, the device is now in sync, and the red X changes to a green check mark. This icon will change on an object by object basis indicating those objects that are in sync.

When all aspects of device configuration are in sync, between device and tool, the ‘In Sync’ icon in the top right corner of the screen will change to a green check box. This is the master In-Sync icon, and will be green only when all other in-sync icons are also green. This icon is effectively a summary icon.

8.7 File Read / Write (Object Map XML)

Click the ‘new’ icon to erase all object maps.

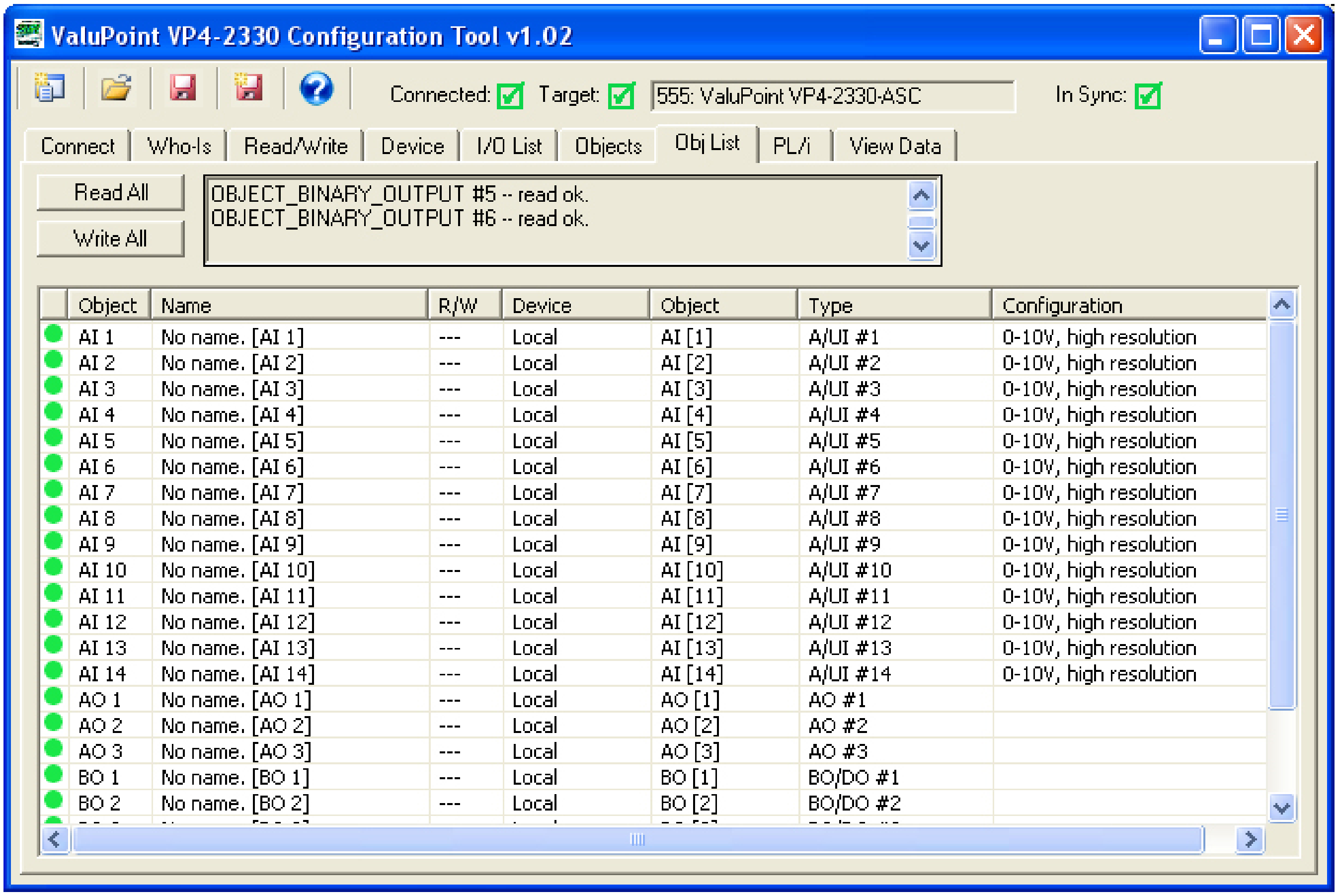
Click the ‘open file’ icon to read a set of object maps from an XML file. If you will be replicating the same configuration multiple times, you will save time by creating a file that can be reloaded. The currently open file will be indicated in the title bar of the program.

Click the ‘save’ icon to re-save the previously opened file, or to save for the first time if creating a new file. The presently displayed device configuration will be saved.

Click the ‘save as’ icon to create a copy of a previously opened file. A file dialog will appear allowing you to browse a selected directory and rename the file.

The file icons at the top of the tool screen will be different colors on different pages, and will be absent on some pages. These icons only appear where a file save is applicable. The different colors are meant to suggest different file types are used with different pages. There are 3 file types: (i) Device XML, (ii) Object Map XML, (iii) Object Map CSV.

9 Object Map List



555: ValuPoint VP4-2330-ASC

```
OBJECT_BINARY_OUTPUT #5 -- read ok.
OBJECT_BINARY_OUTPUT #6 -- read ok.
```

	Object	Name	R/W	Device	Object	Type	Configuration
●	AI 1	No name. [AI 1]	---	Local	AI [1]	A/UI #1	0-10V, high resolution
●	AI 2	No name. [AI 2]	---	Local	AI [2]	A/UI #2	0-10V, high resolution
●	AI 3	No name. [AI 3]	---	Local	AI [3]	A/UI #3	0-10V, high resolution
●	AI 4	No name. [AI 4]	---	Local	AI [4]	A/UI #4	0-10V, high resolution
●	AI 5	No name. [AI 5]	---	Local	AI [5]	A/UI #5	0-10V, high resolution
●	AI 6	No name. [AI 6]	---	Local	AI [6]	A/UI #6	0-10V, high resolution
●	AI 7	No name. [AI 7]	---	Local	AI [7]	A/UI #7	0-10V, high resolution
●	AI 8	No name. [AI 8]	---	Local	AI [8]	A/UI #8	0-10V, high resolution
●	AI 9	No name. [AI 9]	---	Local	AI [9]	A/UI #9	0-10V, high resolution
●	AI 10	No name. [AI 10]	---	Local	AI [10]	A/UI #10	0-10V, high resolution
●	AI 11	No name. [AI 11]	---	Local	AI [11]	A/UI #11	0-10V, high resolution
●	AI 12	No name. [AI 12]	---	Local	AI [12]	A/UI #12	0-10V, high resolution
●	AI 13	No name. [AI 13]	---	Local	AI [13]	A/UI #13	0-10V, high resolution
●	AI 14	No name. [AI 14]	---	Local	AI [14]	A/UI #14	0-10V, high resolution
●	AO 1	No name. [AO 1]	---	Local	AO [1]	AO #1	
●	AO 2	No name. [AO 2]	---	Local	AO [2]	AO #2	
●	AO 3	No name. [AO 3]	---	Local	AO [3]	AO #3	
●	BO 1	No name. [BO 1]	---	Local	BO [1]	BO/DO #1	
●	BO 2	No name. [BO 2]	---	Local	BO [2]	BO/DO #2	

9.0 Do This for First Time Startup

Click ‘Read All’ to read the entire object map list from the device. You must have already read the device information on the Device page, namely to get the allocated object counts. Without the object counts, the tool does not know how many, and what type, object maps to ask for from the device.

Note: This has already been done if you clicked the 'Read All Config' button on the Who-Is page.

9.1 Read All, Write All

Click ‘Read All’ to begin the process of reading all of the available object maps from the device. If the tool was not in sync with the device previously, the red dots in the first column will turn green as the map on that line is updated and synced with the device.

Click ‘Write All’ to begin the process of writing all object maps to the device. It would generally be assumed that you will only click this button after opening a file containing a previously defined configuration.

9.2 Select for Edit

Click any line in the list of objects to be taken directly to the object map editing page for that object.

9.3 File Read / Write (Object Map CSV)

Click the ‘new’ icon to erase all object maps.

Click the ‘open file’ icon to read a set of object maps from a CSV file. If you will be replicating the same configuration multiple times, you will save time by creating a file that can be reloaded. The currently open file will be indicated in the title bar of the program.

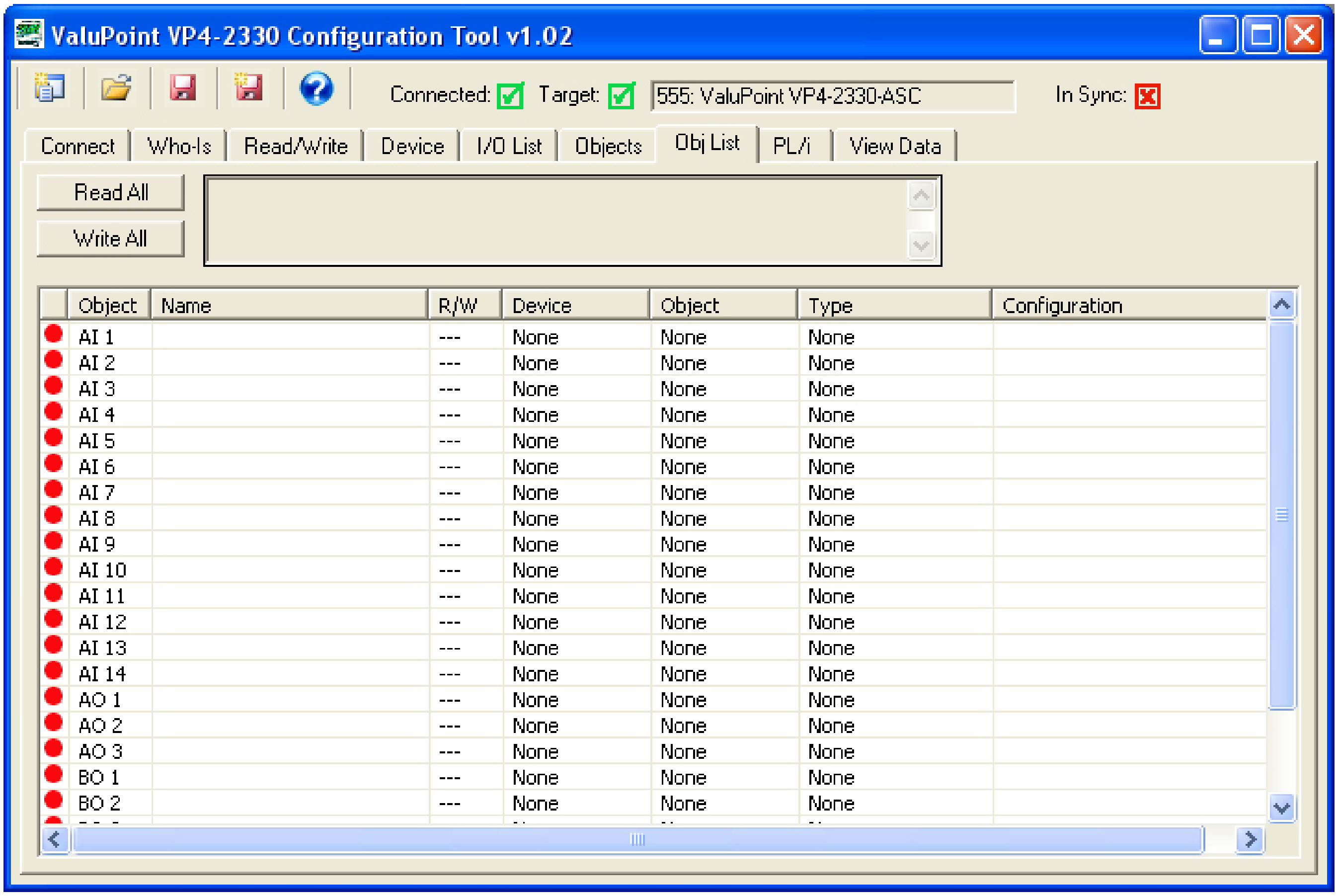
Click the ‘save’ icon to re-save the previously opened file, or to save for the first time if creating a new file. The presently displayed device configuration will be saved.

Click the ‘save as’ icon to create a copy of a previously opened file. A file dialog will appear allowing you to browse a selected directory and rename the file.

The file icons at the top of the tool screen will be different colors on different pages, and will be absent on some pages. These icons only appear where a file save is applicable. The different colors are meant to suggest different file types are used with different pages. There are 3 file types: (i) Device XML, (ii) Object Map XML, (iii) Object Map CSV.

NOTE: The CSV file must be in a specific format. The CSV file can be edited with any standard spread sheet program such as Microsoft Excel®. When creating or manipulating a large configuration, this can be a time saving approach to creating the configuration. However, some practice will be required to learn proper formatting, etc, before it will become a time saver. Refer to the section ‘Editing a CSV Object Map File’ that follows later.

Prior to reading any objects, the screen will appear as follows:

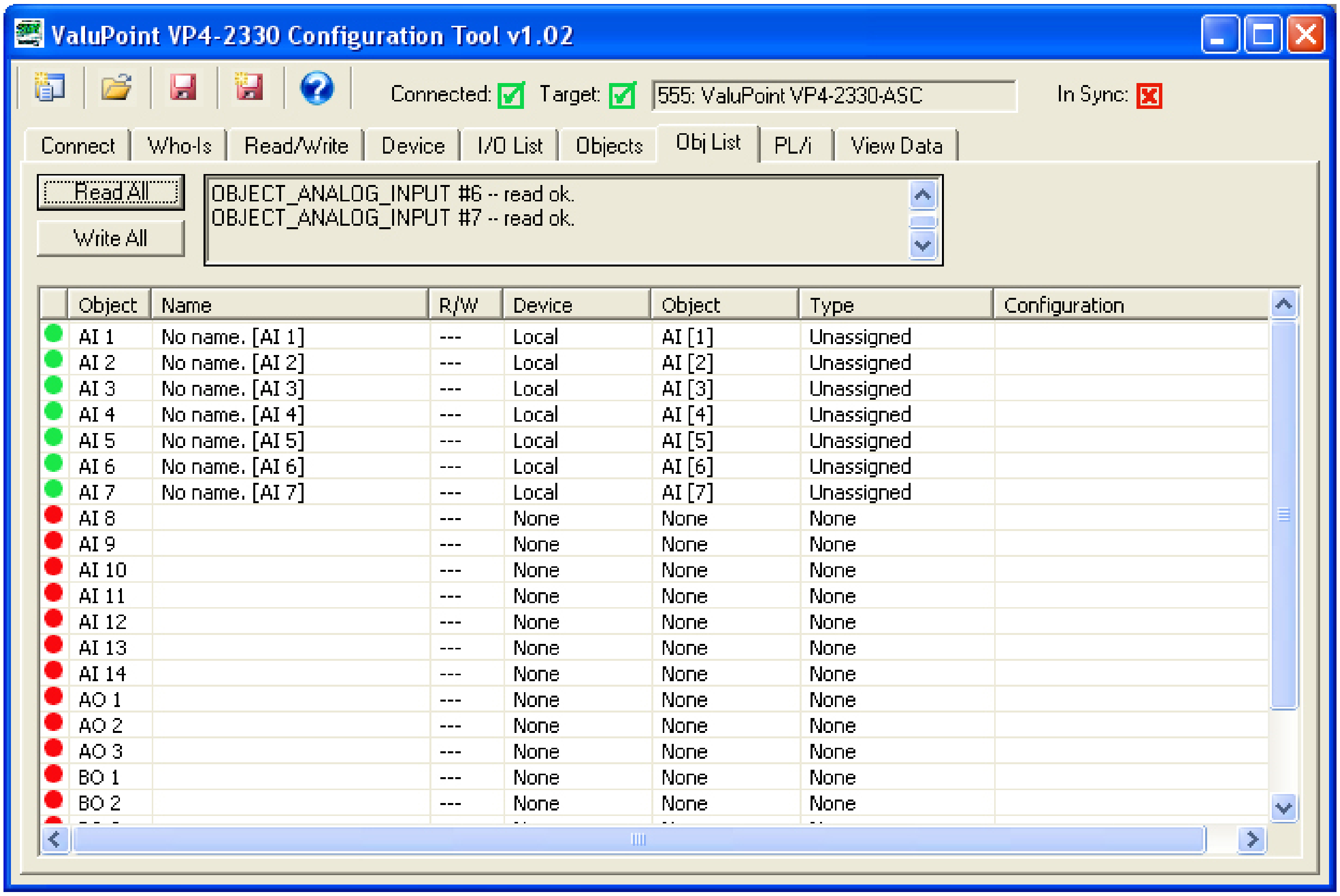


ValuPoint VP4-2330 Configuration Tool v1.02

Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

	Object	Name	R/W	Device	Object	Type	Configuration
●	AI 1		---	None	None	None	
●	AI 2		---	None	None	None	
●	AI 3		---	None	None	None	
●	AI 4		---	None	None	None	
●	AI 5		---	None	None	None	
●	AI 6		---	None	None	None	
●	AI 7		---	None	None	None	
●	AI 8		---	None	None	None	
●	AI 9		---	None	None	None	
●	AI 10		---	None	None	None	
●	AI 11		---	None	None	None	
●	AI 12		---	None	None	None	
●	AI 13		---	None	None	None	
●	AI 14		---	None	None	None	
●	AO 1		---	None	None	None	
●	AO 2		---	None	None	None	
●	AO 3		---	None	None	None	
●	BO 1		---	None	None	None	
●	BO 2		---	None	None	None	

During the process, the screen will appear as follows:



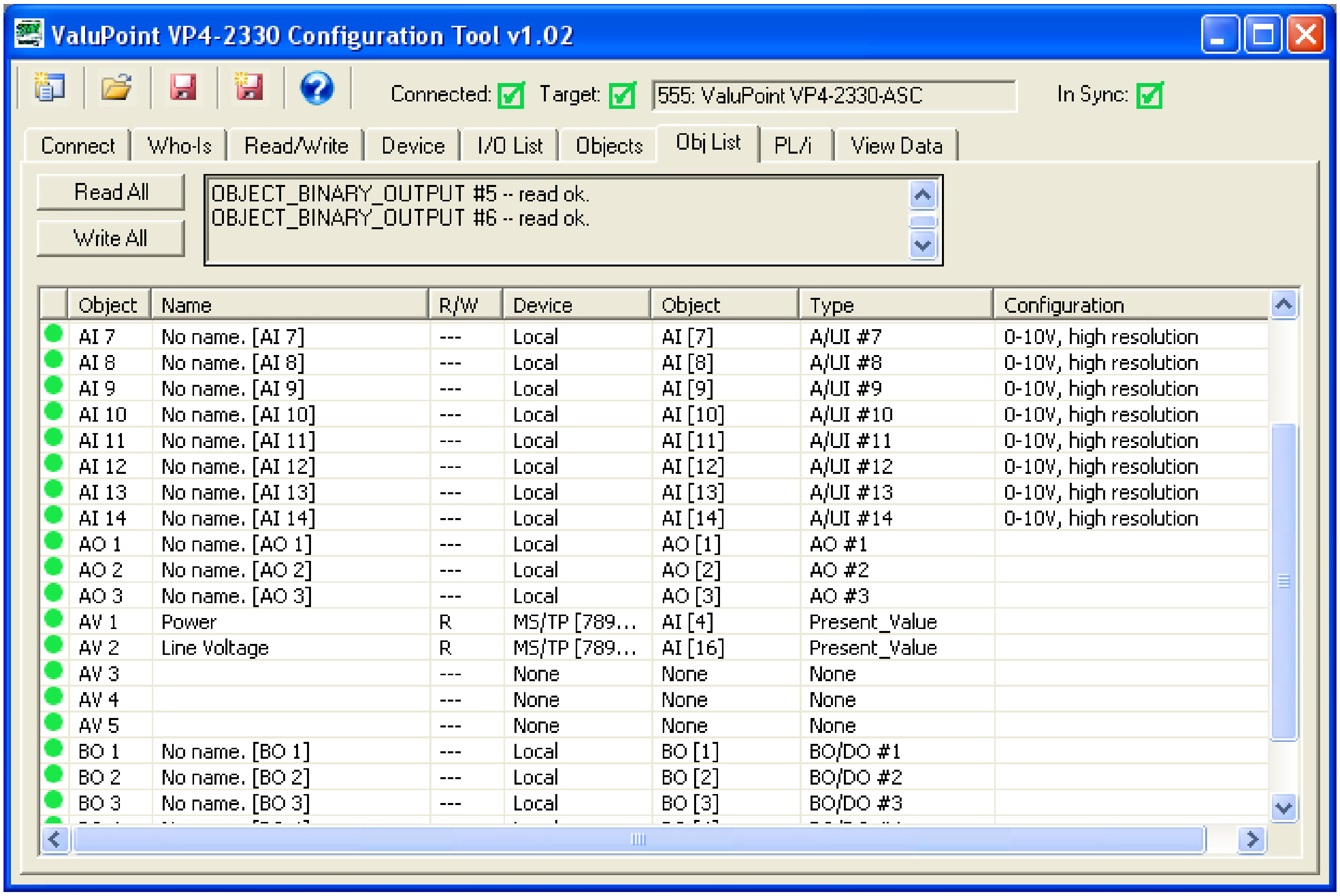
ValuPoint VP4-2330 Configuration Tool v1.02

Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☒

```
OBJECT_ANALOG_INPUT #6 -- read ok.
OBJECT_ANALOG_INPUT #7 -- read ok.
```

	Object	Name	R/W	Device	Object	Type	Configuration
🟢	AI 1	No name. [AI 1]	---	Local	AI [1]	Unassigned	
🟢	AI 2	No name. [AI 2]	---	Local	AI [2]	Unassigned	
🟢	AI 3	No name. [AI 3]	---	Local	AI [3]	Unassigned	
🟢	AI 4	No name. [AI 4]	---	Local	AI [4]	Unassigned	
🟢	AI 5	No name. [AI 5]	---	Local	AI [5]	Unassigned	
🟢	AI 6	No name. [AI 6]	---	Local	AI [6]	Unassigned	
🟢	AI 7	No name. [AI 7]	---	Local	AI [7]	Unassigned	
🔴	AI 8		---	None	None	None	
🔴	AI 9		---	None	None	None	
🔴	AI 10		---	None	None	None	
🔴	AI 11		---	None	None	None	
🔴	AI 12		---	None	None	None	
🔴	AI 13		---	None	None	None	
🔴	AI 14		---	None	None	None	
🔴	AO 1		---	None	None	None	
🔴	AO 2		---	None	None	None	
🔴	AO 3		---	None	None	None	
🔴	BO 1		---	None	None	None	
🔴	BO 2		---	None	None	None	

When complete, the screen will appear as follows. Physical I/O points on the VP4-2330 will be listed as 'Local' in the Device column. When an object is mapped via the MS/TP Client to another BACnet device, the notation 'MS/TP' and the device instance will be indicated in the Device column.

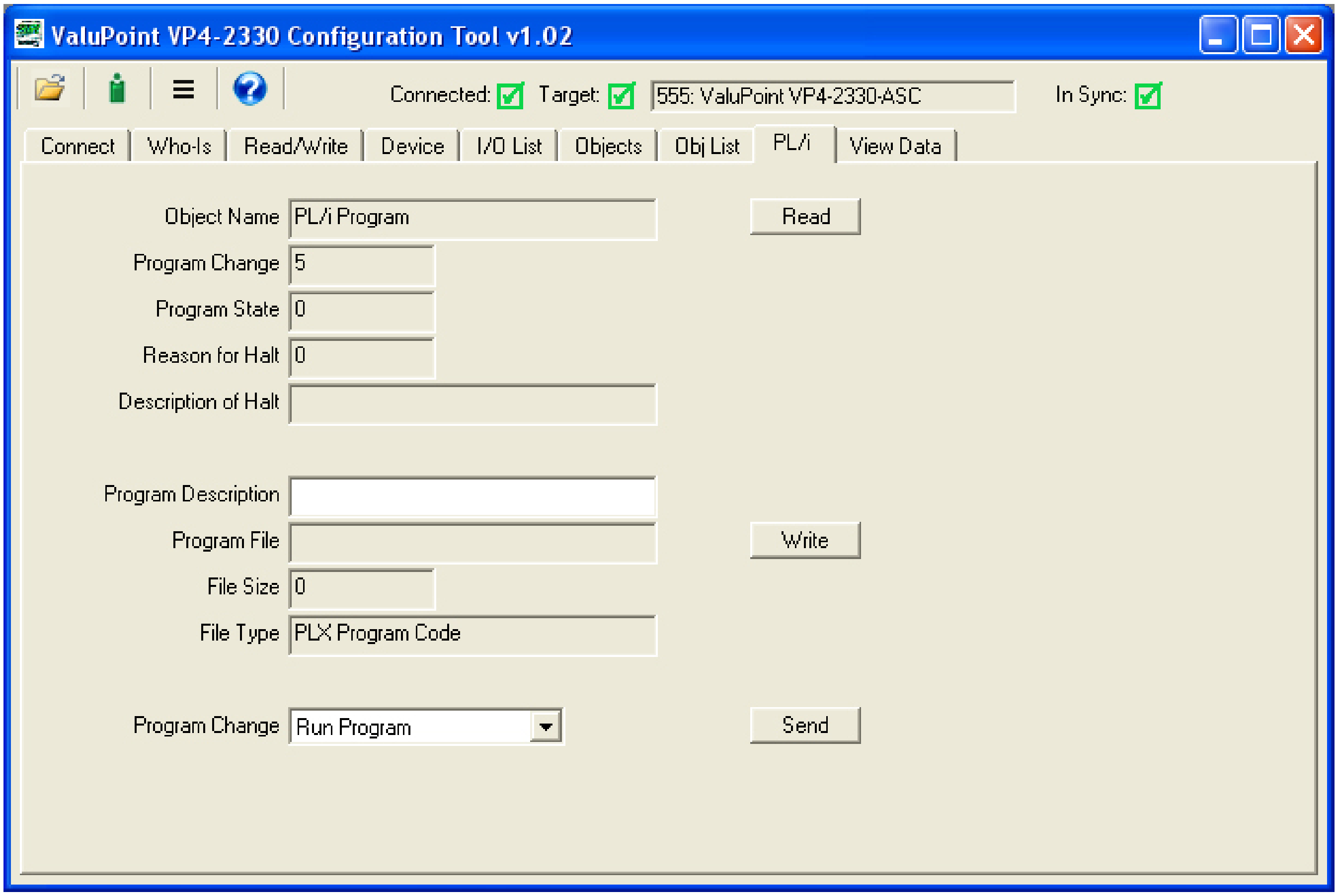


Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑

```
OBJECT_BINARY_OUTPUT #5 -- read ok.
OBJECT_BINARY_OUTPUT #6 -- read ok.
```

	Object	Name	R/W	Device	Object	Type	Configuration
●	AI 7	No name. [AI 7]	---	Local	AI [7]	A/UI #7	0-10V, high resolution
●	AI 8	No name. [AI 8]	---	Local	AI [8]	A/UI #8	0-10V, high resolution
●	AI 9	No name. [AI 9]	---	Local	AI [9]	A/UI #9	0-10V, high resolution
●	AI 10	No name. [AI 10]	---	Local	AI [10]	A/UI #10	0-10V, high resolution
●	AI 11	No name. [AI 11]	---	Local	AI [11]	A/UI #11	0-10V, high resolution
●	AI 12	No name. [AI 12]	---	Local	AI [12]	A/UI #12	0-10V, high resolution
●	AI 13	No name. [AI 13]	---	Local	AI [13]	A/UI #13	0-10V, high resolution
●	AI 14	No name. [AI 14]	---	Local	AI [14]	A/UI #14	0-10V, high resolution
●	AO 1	No name. [AO 1]	---	Local	AO [1]	AO #1	
●	AO 2	No name. [AO 2]	---	Local	AO [2]	AO #2	
●	AO 3	No name. [AO 3]	---	Local	AO [3]	AO #3	
●	AV 1	Power	R	MS/TP [789...	AI [4]	Present_Value	
●	AV 2	Line Voltage	R	MS/TP [789...	AI [16]	Present_Value	
●	AV 3		---	None	None	None	
●	AV 4		---	None	None	None	
●	AV 5		---	None	None	None	
●	BO 1	No name. [BO 1]	---	Local	BO [1]	BO/DO #1	
●	BO 2	No name. [BO 2]	---	Local	BO [2]	BO/DO #2	
●	BO 3	No name. [BO 3]	---	Local	BO [3]	BO/DO #3	

10 PL/i Programming for Control



ValuPoint VP4-2330 Configuration Tool v1.02

Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑

Object Name: PL/i Program

Program Change: 5

Program State: 0

Reason for Halt: 0

Description of Halt:

Program Description:

Program File:

File Size: 0

File Type: PLX Program Code

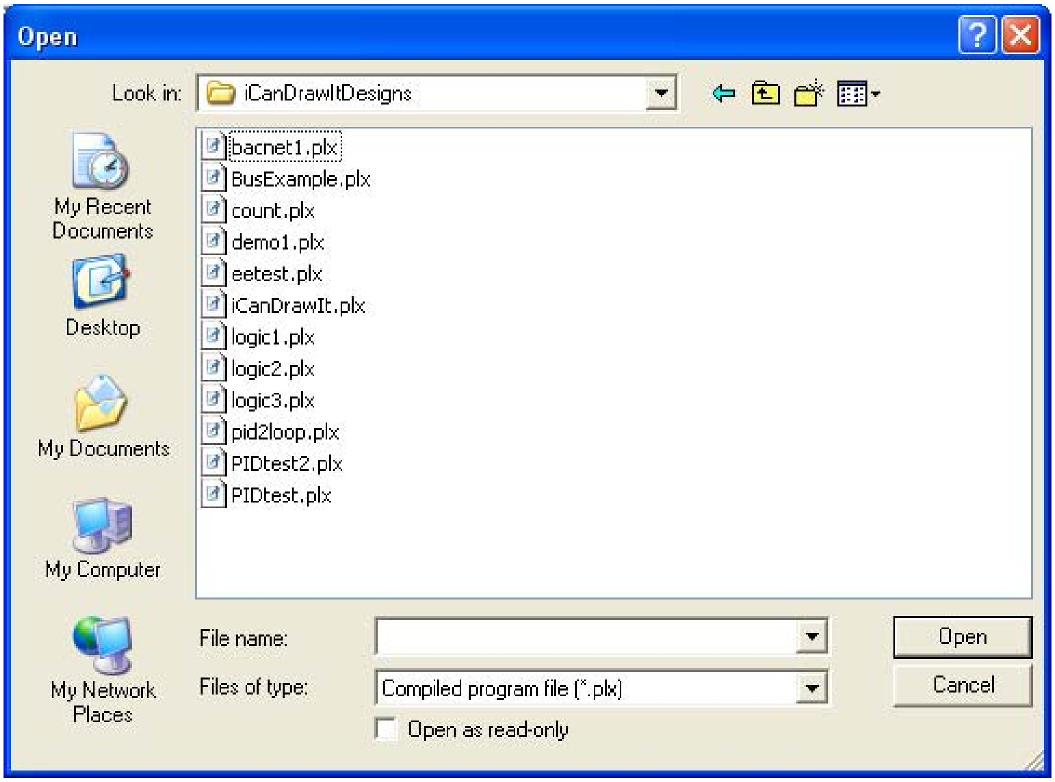
Program Change: Run Program

10.0 Skip This for First Time Startup

There is nothing that needs to be done on this page for initial startup. To use the VP4-2330 as a simple slave I/O device, you will not need this page at all. If you want to turn the VP4-2330 into a programmable controller, you will start here.

10.1 Program Loading and Execution

Click on the file folder icon at the top left to open a file. The file open dialog will appear. Select a .plx file from the list. If you do not yet have any programs compiled, you will need to use the program editing tools to create and compile a program.



Look in: iCanDrawItDesigns

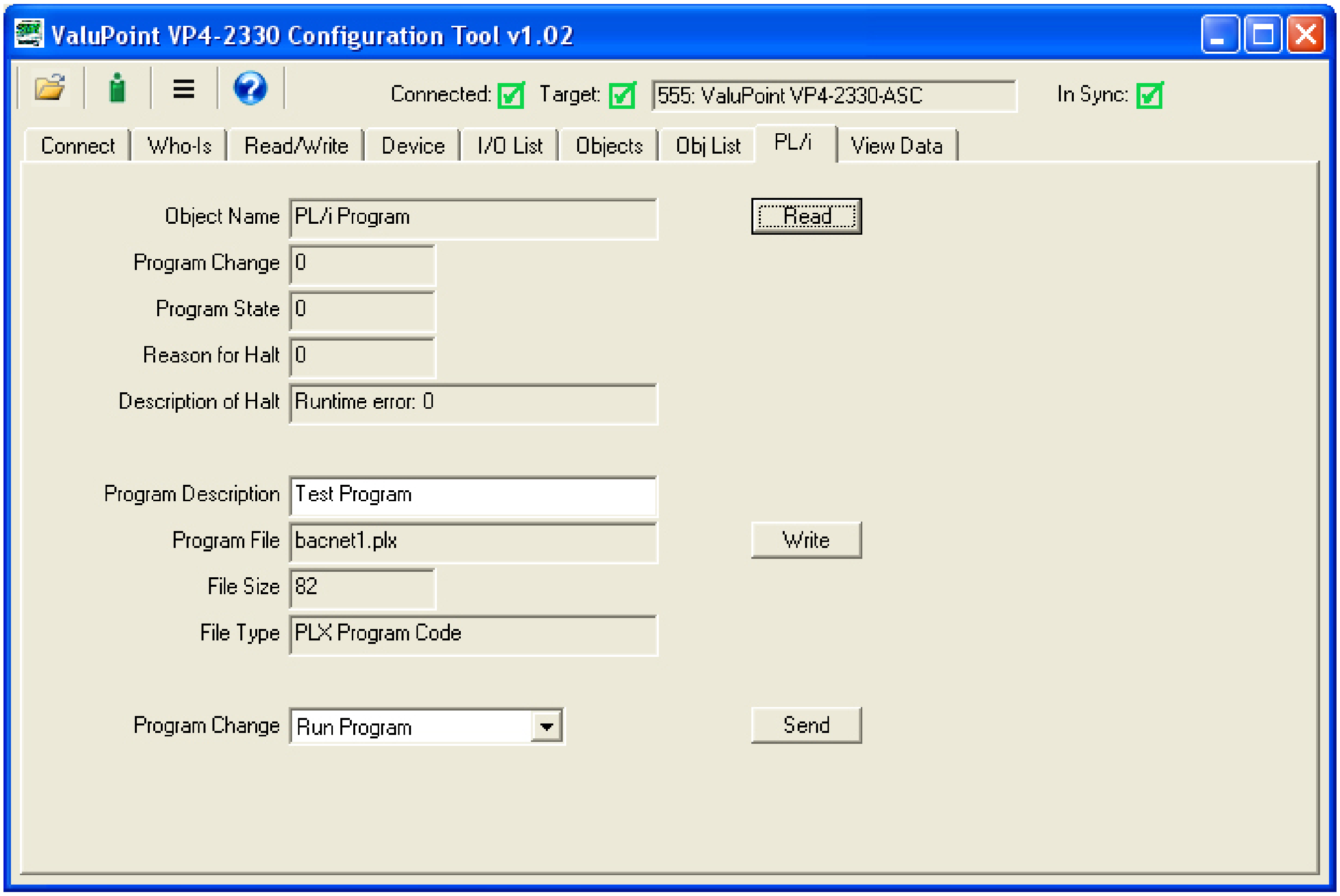
bacnet1.plx
BusExample.plx
count.plx
demo1.plx
eetest.plx
iCanDrawIt.plx
logic1.plx
logic2.plx
logic3.plx
pid2loop.plx
PIDtest2.plx
PIDtest.plx

File name:

Files of type: Compiled program file (*.plx)

□ Open as read-only

After a program (.plx file) has been opened, click the Write button to send that program to the VP4-2330. You can click the Read button at any time to see what program has been loaded, and what its execution state is. The screen shot below shows that 'bacnet1.plx' has been loaded, but it is idle.



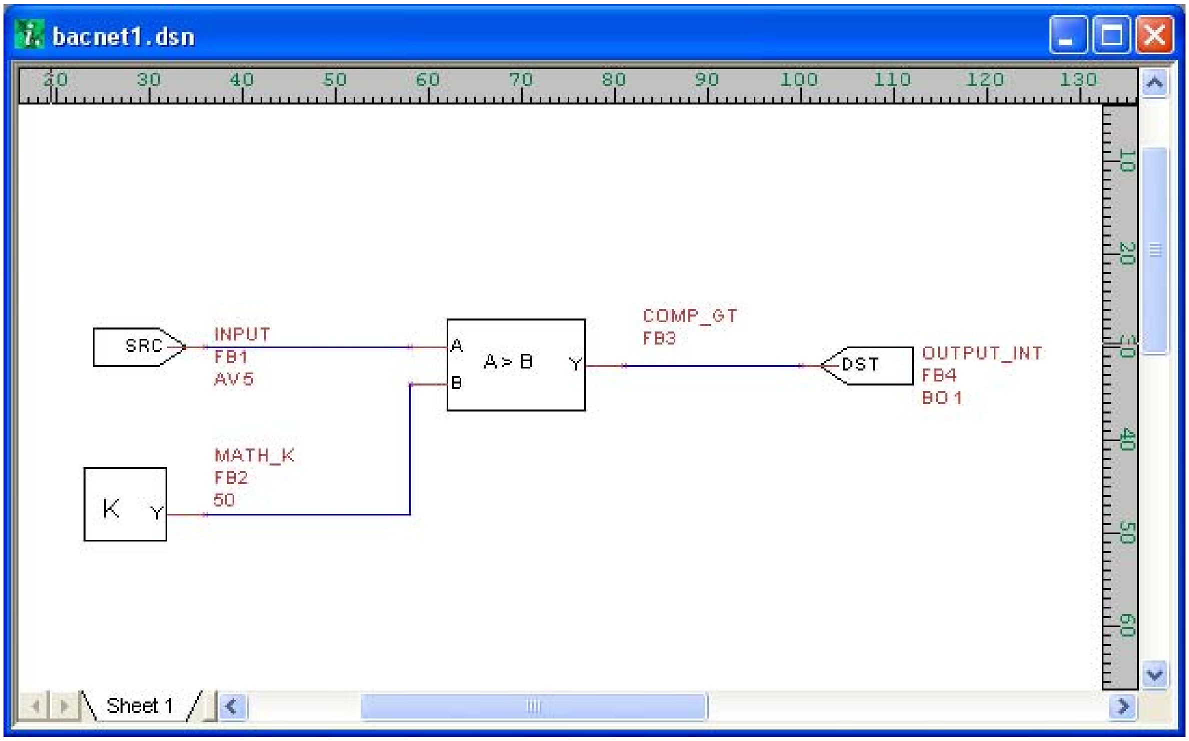
Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑

Object Name: PL/i Program
Program Change: 0
Program State: 0
Reason for Halt: 0
Description of Halt: Runtime error: 0

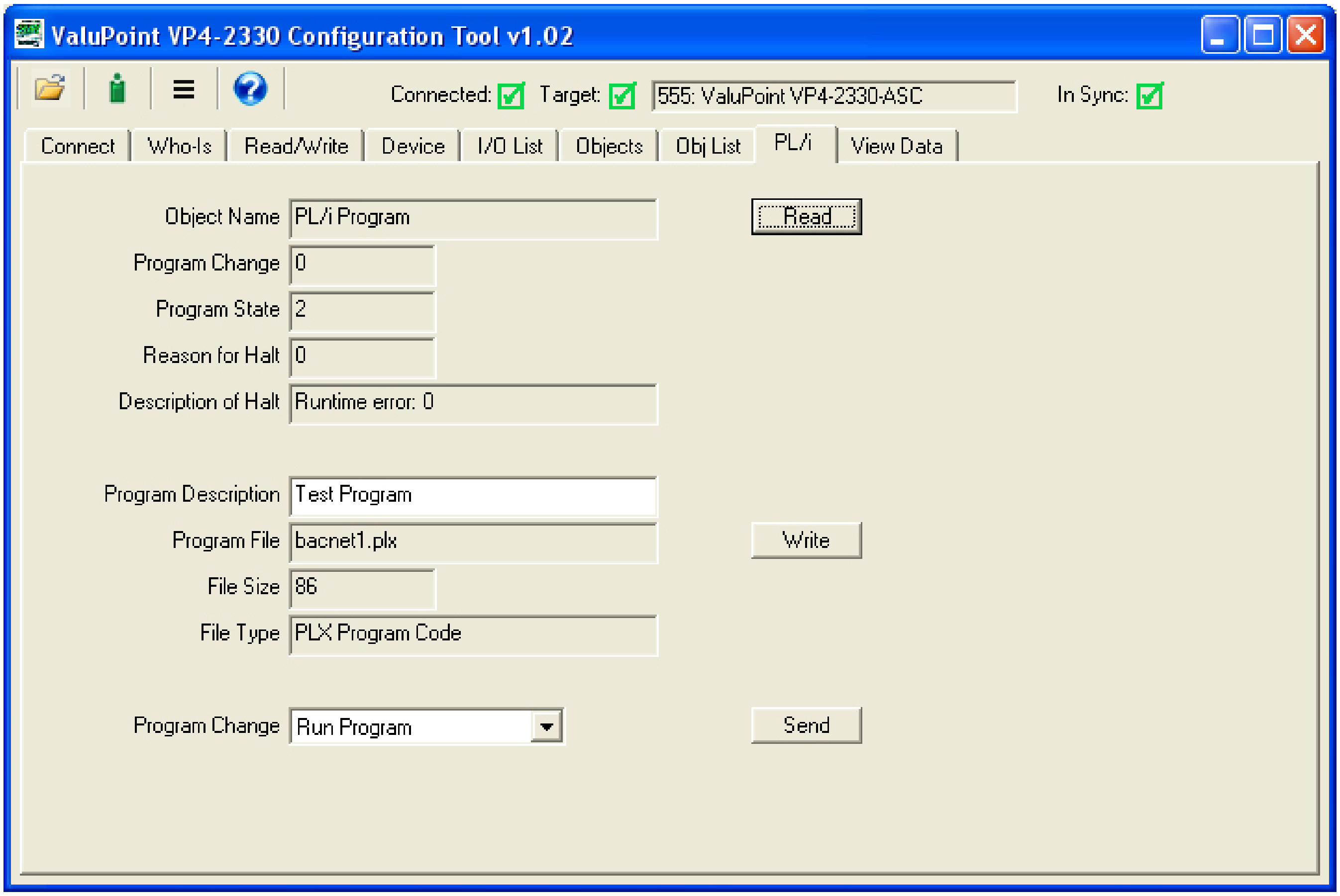
Program Description: Test Program
Program File: bacnet1.plx
File Size: 82
File Type: PLX Program Code

Program Change: Run Program

The example here shows that the program file size is 82 bytes. This example program is a very simple threshold program that will turn on the relay at BO 1 if the value of AV 5 exceeds a value of 50. The program as would be illustrated in i.CanDrawIt is shown below.



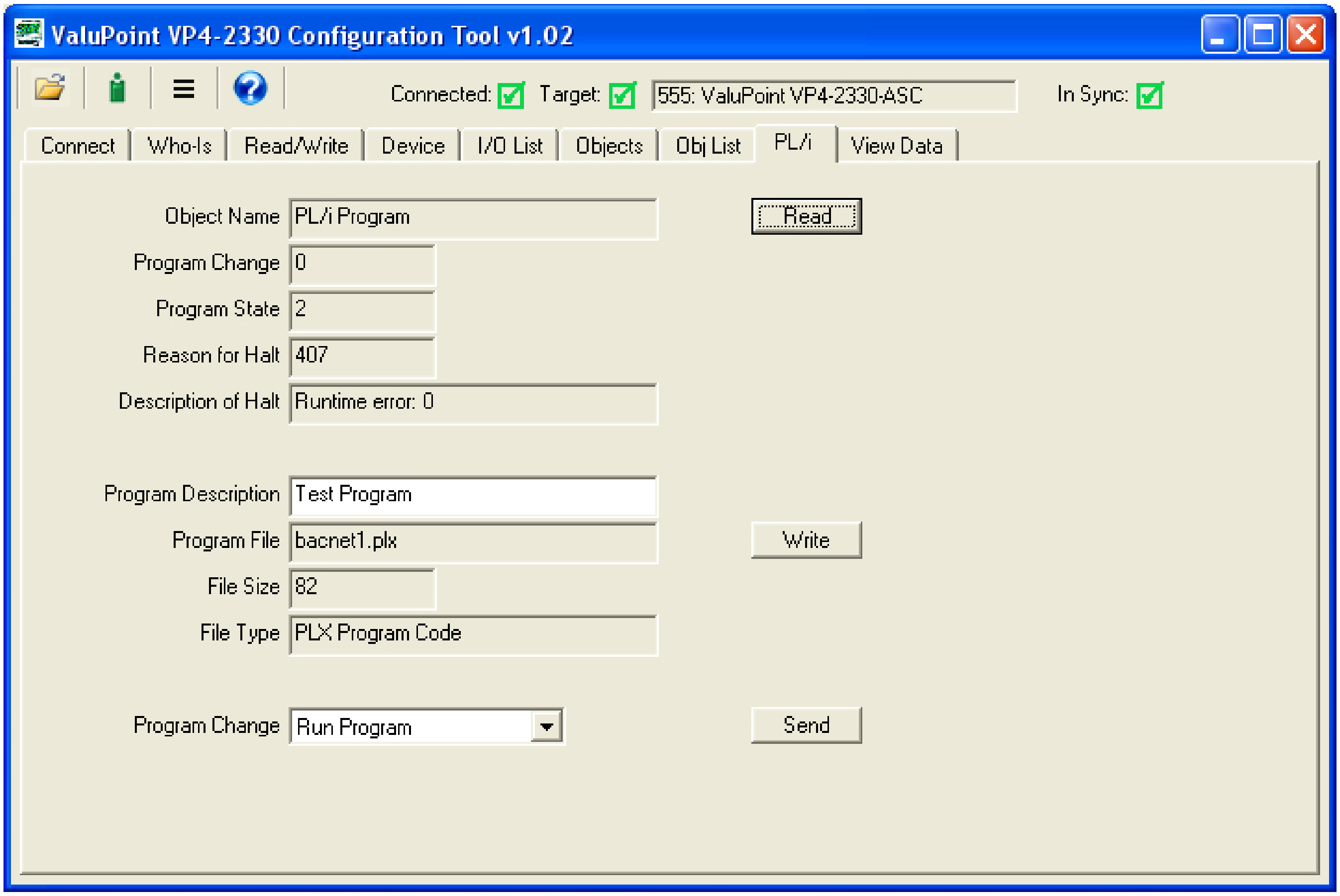
To invoke execution of the program, select 'Run Program' from the Program Change list, and then click Send.



555: ValuPoint VP4-2330-ASC

Object Name	PL/i Program
Program Change	0
Program State	2
Reason for Halt	0
Description of Halt	Runtime error: 0
Program Description	Test Program
Program File	bacnet1.plx
File Size	86
File Type	PLX Program Code
Program Change	Run Program

If the program encounters a fatal error during execution, it will be reported as Reason for Halt as illustrated below. See section below for codes that may appear.


ValuPoint VP4-2330 Configuration Tool v1.02
Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑
Connect
Who-Is
Read/Write
Device
I/O List
Objects
Obj List
PL/i
View Data
Read
Write
Send

Object Name: PL/i Program
Program Change: 0
Program State: 2
Reason for Halt: 407
Description of Halt: Runtime error: 0
Program Description: Test Program
Program File: bacnet1.plx
File Size: 82
File Type: PLX Program Code
Program Change: Run Program

10.2 Program Editing and Debugging

Click the green "i" icon next to the folder icon to open the i.CanDrawIt graphical programming tool that was used to create the program illustrated above. It has its own set of help pages. Click on the "?" icon in that tool for more about programming.

Click the "line" icon next to the "?" icon to open the line programming tool. If you do not want to "draw" a program, but would rather write a program using the native PL/i programming language, you can do this. The line programming tool also has its own set of help pages.

The PL/i programming language is a derivative of PL/1 but is not the same as PL/1. The language is referred to as PL/i with "i" as in i.CanDrawIt.

10.3 Program Capacity

Maximum compiled program (.plx file) size: 65,280 bytes
Maximum RAM available for program variable and stack space: 8192 bytes
Maximum EEPROM available: 2048 bytes

10.4 Program States and Error Codes

BACnet Program Change codes:

0 = ready
1 = load
2 = run
3 = halt
4 = restart
5 = unload

BACnet Program State codes:

- 0 = idle
- 1 = loading
- 2 = running
- 3 = waiting
- 4 = halted
- 5 = unloading

Reason for Halt codes (BACnet Program Error):

- 0 = no error (not halted)
- 1 = program load failed
- 64 = normal stop, end of program reached
- 65 = external stop via Program Change
- 66 = debug execution, suspended
- +n = error code (400 or above)

Non-fatal runtime errors:

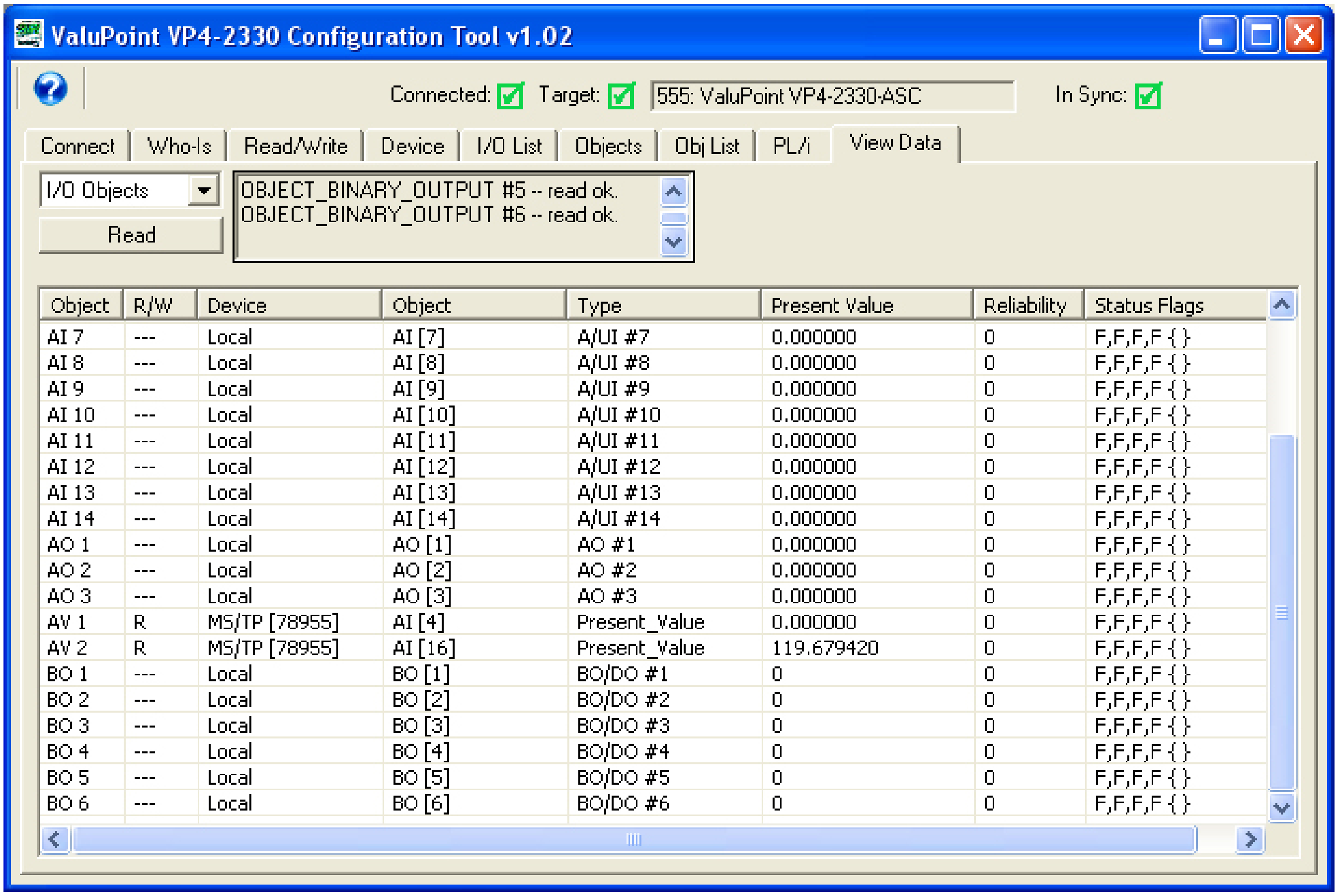
401: subscript out of bounds, non-fatal
402: divide by zero, non-fatal
406: EEPROM address out of range, operation skipped
407: object instance out of bounds, operation skipped

Note: Error codes will show up as "Reason for Halt" even if the error was not necessarily fatal. This is because "Reason for Halt" is the only available standard Program Object property whose purpose is to report errors. Check toe Program State to determine if the program is actually halted.

Fatal runtime errors:

451: unrecognized opcode, fatal
452: stack overflow, fatal
453: stack underflow, fatal
454: program pc out of bounds, fatal

11 Data List


ValuPoint VP4-2330 Configuration Tool v1.02
Connected: ☑ Target: ☑ 555: ValuPoint VP4-2330-ASC In Sync: ☑
Connect
Who-Is
Read/Write
Device
I/O List
Objects
Obj List
PL/i
View Data
I/O Objects
Read

```
OBJECT_BINARY_OUTPUT #5 -- read ok.
OBJECT_BINARY_OUTPUT #6 -- read ok.
```

Object	R/W	Device	Object	Type	Present Value	Reliability	Status Flags
AI 7	---	Local	AI [7]	A/UI #7	0.000000	0	F,F,F,F { }
AI 8	---	Local	AI [8]	A/UI #8	0.000000	0	F,F,F,F { }
AI 9	---	Local	AI [9]	A/UI #9	0.000000	0	F,F,F,F { }
AI 10	---	Local	AI [10]	A/UI #10	0.000000	0	F,F,F,F { }
AI 11	---	Local	AI [11]	A/UI #11	0.000000	0	F,F,F,F { }
AI 12	---	Local	AI [12]	A/UI #12	0.000000	0	F,F,F,F { }
AI 13	---	Local	AI [13]	A/UI #13	0.000000	0	F,F,F,F { }
AI 14	---	Local	AI [14]	A/UI #14	0.000000	0	F,F,F,F { }
AO 1	---	Local	AO [1]	AO #1	0.000000	0	F,F,F,F { }
AO 2	---	Local	AO [2]	AO #2	0.000000	0	F,F,F,F { }
AO 3	---	Local	AO [3]	AO #3	0.000000	0	F,F,F,F { }
AV 1	R	MS/TP [78955]	AI [4]	Present_Value	0.000000	0	F,F,F,F { }
AV 2	R	MS/TP [78955]	AI [16]	Present_Value	119.679420	0	F,F,F,F { }
BO 1	---	Local	BO [1]	BO/DO #1	0	0	F,F,F,F { }
BO 2	---	Local	BO [2]	BO/DO #2	0	0	F,F,F,F { }
BO 3	---	Local	BO [3]	BO/DO #3	0	0	F,F,F,F { }
BO 4	---	Local	BO [4]	BO/DO #4	0	0	F,F,F,F { }
BO 5	---	Local	BO [5]	BO/DO #5	0	0	F,F,F,F { }
BO 6	---	Local	BO [6]	BO/DO #6	0	0	F,F,F,F { }

11.0 Skip This for First Time Startup

Nothing needs to be done on this page to get the tool initially synced to the device.

11.1 Read All

Click ‘Read All’ to cause the tool to query all BACnet objects in the VP4-2330 device. A brief summary of the object’s mapping is displayed along with its Present Value, Reliability code, and Status Flags. Progress of the ‘Read All’ process will scroll through the log window at the top.

11.2 Data Definitions

The Object column indicates the type and instance of BACnet object in the local VP4-2330.

The R/W column indicates the following: R means periodic read, W means periodic write, W+ means write on delta. RW+ means a combination of those, etc.

The Device column will show 'Local', or show what remote slave device this object is mapped to. 'Local' means a physical I/O point on the local VP4-2330. ‘MS/TP[N]’ means BACnet slave whose device instance is N.

The Object column is significant only when the object is mapped via the MS/TP client to a remote device. Object shows what object in the slave device is mapped to this local object. The object type and instance are shown, e.g. ‘AI[1]’ means Analog Input 1.

Type shows the physical I/O point locally, or the remote object property type, such as Present Value.

Present Value shows a representation of the present value of the BACnet object in the VP4-2330.

Reliability code for the BACnet object in the VP4-2330 is shown. These are listed in a later section.

Status Flags shows the status flags for the object. The standard flags are: IN_ALARM, FAULT, OVERRIDDEN, and OUT_OF_SERVICE respectively (i.e. last T/F is out of service flag). The flag is F to show false/0 and T to show true/1.

12 Object Properties

12.1 Data Object Properties (Analog, Binary, Multi-state)

The following properties are found in the Analog, Binary, and Multi-state types of Input, Output, and Value objects. Some properties apply only to certain object types as noted where applicable.

Property	Encoding
Object_Identifier (75)	BACnetObjectIdentifier
Object_Name (77) (W)	CharacterString "Analog Input *n*"
Object_Type (79)	BACnetObjectType ENUMERATED: analog-input (0) analog-output (1) analog-value (2) binary-input (3) binary-output (4) binary-value (5) device (8) multi-state-input (13) multi-state-output (14) multi-state-value (19)
Present_Value (85) (W)	REAL (analog objects) ENUMERATED (binary objects) Unsigned (multi-state objets) (no index) (priority required when writing commandable objects) (input objects writeable only when out of service)
Status_Flags (111)	BACnetStatusFlags BIT STRING: fault(1), out-of-service(3)
Event_State (36)	BACnetEventState ENUMERATED: normal(0), fault(1)
Reliability (103)	BACnetReliability ENUMERATED: normal(0) *Vendor specific:* no response (64) crc error (65) exception, illegal function code (66) exception, illegal data address (67) exception, illegal data value (68) exception, code+65, rarely used (69..79) configuration property fault (80) exception, code not recognized (81) BACnet client read/write timeout (82) BACnet client received error response from slave (83)
Out_Of_Service (81) (W)	BOOLEAN
COV_Increment (22) (W)	REAL (analog objects only)
Priority_Array (87)	BACnetPriorityArray (commandable objects only) SEQUENCE SIZE (16) OF BACnetPriorityValue REAL (each element, analog output objects) ENUMERATED (each element, binary output objects) Unsigned (each element, multi-state output objects)
Relinquish_Default (104) (W)	REAL (analog objects) ENUMERATED (binary objects) Unsigned (multi-state objets)
Polarity (84)	BACnetPolarity (binary objects only) ENUMERATED: normal(0)

Number_Of_States (74)	Unsigned (multi-state objects only)
Units (117)	BACnetEngineeringUnits (analog objects only)
Vendor Specific Object Properties:	
Object_Map_Usage (801) (W)	BIT STRING: (0) object is mapped to BACnet object on another device (1) object is mapped to local physical I/O (2) set default on power-up (3) set default on comm. fail (4) read periodic (5) write periodic (6) write on delta (7) enable max quiet (8) object value is persistent (9) object is reserved for global use
Poll_Period (802) (W)	Unsigned Modbus poll/update time in seconds

Slope (809) (W)	REAL
	BACnet = Modbus * slope + intercept
	Modbus = (BACnet – intercept) / slope

Intercept (810) (W)	REAL
Default_Value (811) (W)	REAL (analog objects) ENUMERATED (binary objects) Unsigned (multi-state objects)
Max_Quiet_Time (812) (W)	Unsigned
BACnet_Slave_Timeout (813) (W)	Unsigned
Max_Read_Fail_Count (814) (W)	Unsigned
Send_On_Delta (815) (W)	REAL (analog objects only)
Initial_COV_Increment (816) (W)	REAL (analog objects only)
Initial_Relinquish_Default (818) (W)	REAL (analog objects) ENUMERATED (binary objects) Unsigned (multi-state objects)
BACnet_Slave_Device (819) (W)	Unsigned
Slave_Object_Type (820) (W)	ENUMERATED
Slave_Object_Instance (821) (W)	Unsigned
Slave_Index (822) (W)	Unsigned (value is index+1, 0=no index)
Slave_Priority (823) (W)	ENUMERATED (1..16)
Slave _Property_Type (824) (W)	ENUMERATED (see BACnet protocol specification for type codes)
Slave_Data_Encoding (825) (W)	ENUMERATED (0) Null, (1) Boolean, (2) Unsigned integer, (3) Signed Integer, (4) Real (floating point), (8) Bit string, (9) Enumerated
Slave _Bit_Position (826) (W)	ENUMERATED
Slave_Address (827) (W)	ENUMERATED (MAC address if BACnet slave does not support dynamic binding)
Error_Class (830)	Unsigned

Error_Code (831)	Unsigned
Config_Write_Command (832) (W)	ENUMERATED (1) write config to EEPROM
Hardware_Configuration (841) (W)	ENUMERATED
Hardware_Qualifier_1 (842) (W)	ENUMERATED
Hardware_Qualifier_2 (843) (W)	ENUMERATED
Feedback (848)	Unsigned
Raw_Data (849)	Unsigned

12.2 Device Object Properties

The following properties are found in the Device object of the BB2-3010. In addition to standard Device properties, configuration properties that apply at a system level to the whole device are included here.

Property	Encoding
Object_Identifier (75) (W)	BACnetObjectIdentifier
Object_Name (77) (W)	CharacterString
Object_Type (79)	BACnetObjectType ENUMERATED: device (8)
System_Status (112)	BACnetDeviceStatus
Vendor_Name (121)	CharacterString
Vendor_Identifier (120)	Unsigned16 (should always return 208)
Model_Name (70)	CharacterString
Fimrware_Revision (44)	CharacterString
Application_Software_Version (12)	CharacterString
Protocol_Version (98)	Unsigned
Protocol_Revision (139)	Unsigned
Protocol_Services_Supported (97)	BACnetServicesSupported
Protocol_Object_Types_Supported (96)	BACnetObjectTypesSupported
Object_List (76)	BACnetARRAY[N] of BACnetObjectIdentifier
Max_APDU_Length_Accepted (62)	Unsigned
Segmentation_Supported (107)	BACnetSegmentation
APDU_Timeout (11) (W)	Unsigned
Number_Of_APDU_Retries (73) (W)	Unsigned
Device_Address_Binding (30)	List of BACnetAddressBinding
Database_Revision (155)	Unsigned
Max_Master (64) (W)	Unsigned
Max_Info_Frames (63) (W)	Unsigned
Location (58) (W)	CharacterString
Max_Segments_Accepted (167)	Unsigned
APDU_Segment_Timeout (10) (W)	Unsigned
Active_COV_Subscriptions (152)	List of BACnetCOVSubscription

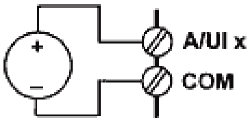
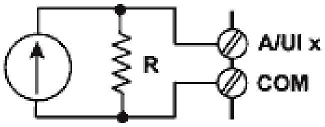
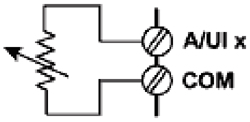
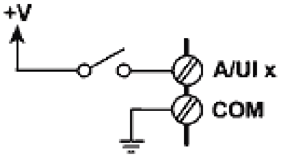
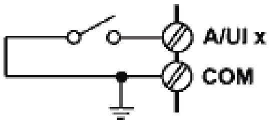
Last_Restart_Reason (196)	BACnetRestartReason
Local_Time (57) (W)	Time
Local_Date (56) (W)	Date
UTC_Offset (119) (W)	INTEGER
Daylight_Savings_Status (24) (W)	BOOLEAN
Restart_Notification_Recipients (202)	List of BACnetRecipient
Time_Of_Device_Restart (203)	BACnetTimeStamp
Vendor Specific Object Properties:	
Physical I/O Assignment (881) (W)	BACnetObjectIdentifier Index: 1..MAX_HARDWARE_POINT
MSTP_Port_Baud_Rate (1201) (W)	ENUMERATED: (9600, 19200, 38400, 76800) NOTE: Changes to port settings will take effect only after a COLDSTART or WARMSTART command is issued.
MSTP_Station_ID (1202) (W)	Unsigned
Enable_Auto_Reset (1203) (W)	BOOLEAN (True if reliability codes should auto return to zero)
Reinit_Password (1205) (WO)	CharacterString Note: This property is write-only, and is only writeable with unlock sequence.
Password_Unlock (1206) (W)	Unsigned Note: Must write device's own device instance to this property to unlock password for writing, and next property written must be 1205. Any other sequence will reset and lock out password write.
Device_Allocation (1251) (W)	Unsigned Index: Use object type analog-input (0) analog-output (1) analog-value (2) binary-input (3) binary-output (4) binary-value (5) multi-state-input (13) multi-state-output (14) multi-state-value (19) (value is count allocated of objects of type indexed) (attempting to write a count that is not acceptable will return error class Services, code Invalid Configuration Data) NOTE: After writing all 9 object allocation counts, a WARMSTART must be issued. All object maps will be cleared.

13 Physical I/O Connections

13.1 Connection of Inputs

The VP4-2330 contains no configuration jumpers. There is no need to open the enclosure for configuration of I/O. Analog input types are switched between voltage and thermistor inputs under software control.

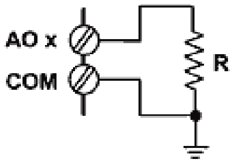
Input points should be connected as indicated in the various diagrams below. In addition to selecting a wiring diagram, the corresponding selections should be made on the I/O List page of the configuration tool.

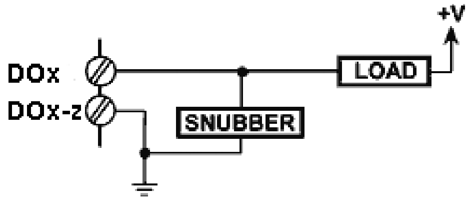
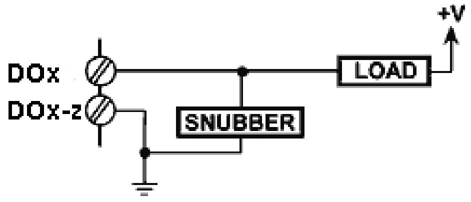
I/O Point Type	Wiring Guide	Additional Information
A/UI Analog Input: 0-10VDC Voltage Input		A/UI inputs 1-14 will accept voltage inputs of up to 10VDC. Voltages to 12VDC will be measured. Voltages to 24VDC will be tolerated, but measurement is internally limited to a reading of 12VDC.
A/UI Analog Input: 0-20mA Current Input		A/UI inputs 1-14 will accept current inputs of 0-20mA with the addition of a 500 ohm 1/2 watt external resistor. A 500 ohm resistor will produce a 0-10VDC signal. A 250 ohm resistor may also be used to produce a 0-5VDC signal.
A/UI Analog Input: Thermistor Input		A/UI inputs 1-14 will accept thermistors of 3k, 10k, or 20k ohms. Linearization via interpolation of a 56-point table is performed internally.
A/UI Discrete Input: Discrete Voltage		A/UI inputs 1-14 may be connected as discrete voltage sensing inputs. Inputs up to 24VDC are tolerated, but threshold sensing only functions over the 0-10VDC range.
A/UI Discrete Input: Dry Contact Closure to Ground		A/UI inputs 1-14 may be connected as discrete inputs sensing dry contact closure to ground. Internal excitation of 5V @ 1mA is provided.

13.2 Connection of Outputs

The VP4-2330 contains no configuration jumpers. There is no need to open the enclosure.

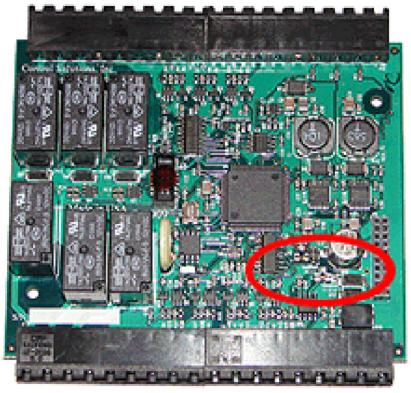
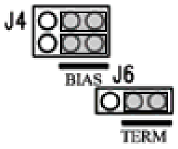
Output points should be connected as indicated in the various diagrams below. The discrete (relay) outputs are SPST N.O. with the common side banked in groups of 3. The DO1-3 and DO4-6 are not electrically common to each other or to COM/GND connections.

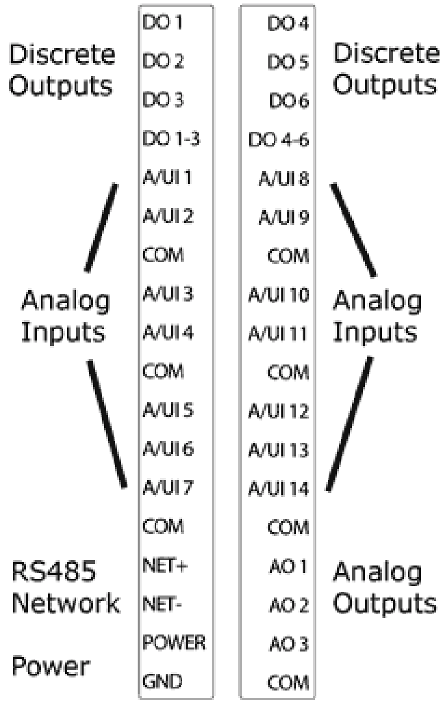
I/O Point Type	Wiring Guide	Additional Information
Analog Output: 0-20mA Current Output		AO outputs 1-3 produce outputs of 0-20mA. Use of an external 500 ohm resistor will produce a 0-10VDC voltage output. For best results, locate the resistor at the input of the receiving device.

Discrete Output: Form A Relay AC Load		BO/DO outputs 1-6 are Form A dry contact relays rated for 5A @ 120VAC (resistive). Snubbers should be used with inductive loads. Rating for inductive load is 2A @ 120VAC.
Discrete Output: Form A Relay DC Load		BO/DO outputs 1-6 are Form A dry contact relays, also rated for 5A @ 30VDC (resistive). Snubbers should be used with inductive loads. Rating for inductive load is 2A @ 30VDC.

13.3 Connection of Power and Communications

Power and communications should be connected as indicated below.

I/O Point Type	Wiring Guide	Additional Information
Power	Connect AC or +DC power to Power terminal. Connect common or -DC power to GND terminal. GND is common to all terminals labeled COM.	Nominal power consumption is 6 watts, or 0.25A @ 24VDC, with all relays on and all analog outputs at 20mA.
Communications	Connect MS/TP RS-485 network to NET+/- terminals.	Communication signals comply with EIA-485 standard.
Line Conditioning	 	The VP4-2330 is shipped with network line bias and termination disabled. If the VP4-2330 will be the last device at the end of the RS-485 link, then termination should be enabled. Often it is also necessary to have line bias enabled, but this must only be done at one point on the network (not both ends like termination). The bias and termination jumpers are located in the area of the circuit board highlighted. The bias and termination are enabled when the shunts are aligned with the white bars next to the header pins. Move the shunts to the opposite end to disable. It is not necessary to enable both at the same time. (Illustration shows both enabled.) To open the VP4-2330, use a very small screw driver to slide the cover up over the plastic tabs on the ends of the case. Do not push the tabs in as they are fragile. Slide the cover over the tabs by prying the cover slightly away from the tabs.
		Screw terminals ratings are substantially in excess

Wiring Terminals	 Discrete Outputs DO 1 DO 2 DO 3 DO 1-3 DO 4 DO 5 DO 6 DO 4-6 Discrete Outputs Analog Inputs A/UI 1 A/UI 2 COM A/UI 3 A/UI 4 COM A/UI 5 A/UI 6 A/UI 7 A/UI 8 A/UI 9 COM A/UI 10 A/UI 11 COM A/UI 12 A/UI 13 A/UI 14 Analog Inputs COM COM RS485 Network NET+ NET- AO 1 AO 2 Analog Outputs Power POWER GND AO 3 COM	of any I/O point ratings. Screw terminals are pluggable. They unplug from the unit in 9-position blocks. Any combination of smaller 5.00mm terminal blocks can optionally be used instead.

14 Trouble Shooting

14.1 Error Codes, Reliability Codes

Reliability codes (read via the Reliability property) are as follows:

Configuration property fault (80)
BACnet client read/write timeout (82)
BACnet client received error response from slave (83)

If the object’s reliability indicates code 83, meaning an error code was returned by a remote BACnet device, the actual code returned can be learned by reading the local object’s properties 830 (class) and 831 (code).

14.2 Auto-Reset Errors

Reliability codes will “latch” by default and require that you read the Reliability property in order to reset it to zero, assuming the problem has gone away. Once the non-zero reliability code has been read (by reading the Reliability property), it will reset to zero the next time the object is updated, provided the problem has been resolved.

Since many systems do not automatically read Reliability codes, but do automatically respond to the Fault Status Flag associated with the non-zero reliability code, an auto-reset option is available. When set, reliability codes will return to zero as soon as the problem has been resolved, regardless of whether the non-zero reliability code was ever acknowledged by reading it.

14.3 MS/TP Trouble Shooting - Connecting the USB Adapter

(a) Is the yellow LED next to the USB cable lit? If not, the PC does not recognize the adapter. Verify installation. Verify that MTX002 shows up as a Port in the Device Manager on your PC. The yellow LED next to the USB cable must be lit before continuing.

(b) Open the configuration tool. Select the port number indicated in the Device Manager. Select a known baud rate, max master setting, and unused Mac address. Click ‘Connect’. Does the log window show “USB is responding”? If not, close the configuration tool, then disconnect and reconnect the USB cable to force a hard reset of the adapter. Retry the ‘Connect’. If you get an error message about the COM port, see that the supercom.dll is found in the same directory as the configuration tool, and recheck the port number on the PC’s Device Manager. You must get “USB is responding” followed by “Ready” or “Auto connected” before continuing.

(c) Is the Token LED on the USB adapter flickering? If not, either there is nothing on the MS/TP network or the network has not recognized the adapter’s reply to poll for master. If the network was online before the adapter was connected, the adapter will wait for the token indefinitely. If no other device on the network grants the token, the adapter will never begin communicating. Failure to get in sync, assuming all devices appear otherwise functional, is most often caused by either a mismatch in baud rate, mismatch in max master setting, or unusable choice of mac address.

(d) Is the PFM (poll for master) LED on the USB adapter nearly solid on? This means the adapter is busy sending out polls for master but not seeing any response. This can be caused by nothing being on the network, a mismatch in baud rate, or other low level communication problems. The normal LED activity when the adapter is connected and in sync with the network will be continuous flickering of the Token LED, usually but not always some periodic flickering of the PFM LED, and occasional flashing of the Data LED. The error LED could also flicker once in a while, but hopefully not often.

NOTE: The two “not really connected” indications you are most likely to see are (i) None of the LEDs next to the terminal block on the adapter ever flash; (ii) The PFM (yellow) LED is always flickering (nearly constant on). It is a somewhat random coincidence whether other devices on the network or the adapter gets ahead in polling. Devices on the MS/TP network always wait for the right opportunity to respond. If they never get that opportunity due to being out of sync as a result of incorrect baud rate, etc, they will appear to be “offline”. Meanwhile, a device polling to look for other devices will constantly just poll because it is not getting any response. Because the device doing the constant polling will generate enough traffic on the line to make the line look busy to other devices, the other devices will never come online.

14.4 MS/TP Trouble Shooting - Device Behavior

The above discussion is focused on getting the USB to MS/TP adapter connected. However, the situation involving one device being out of sync with the network can happen with any device on the network. This is the situation that creates the appearance of a single device refusing to go online, or a single device taking down the network. If a device appears to work normally when connected to only the USB adapter, but either refuses to go online or appears to take down the network when connected to a running network, its port settings are out of sync with the rest of the network. It will take a few seconds for the network to re-sync any time a new device is added, but if the network does not return to normal token passing within a reasonable time, the newly added device needs attention.

Trouble shooting the VP4-2330 MS/TP Connection

(a) Does the device have power? The blue LEDs inside the case, visible through the air vent slots, will both be on if there is power present.

(b) Are any LEDs flickering inside VP4-2330? The yellow poll-for-master LED and green token-pass LED inside the VP4-2330 should be flickering some color rather constantly. Green indicates token passing, yellow indicates poll for master. Constant yellow (never green) means no other devices are responding. Constant off (both colors) means other devices are generating traffic on the network, but it is not being recognized by the VP4-2330 as anything it can respond to. No token passing activity means either there are no other devices on the network, or there is a low level communications problem, namely one or more communication parameters are mismatched. There could also be a wiring problem. Check for reversed polarity on the data lines. If uncertain, just try swapping them – no physical harm will be done.

14.5 System Fault Indications

The red LED visible inside the VP4-2330 case, viewed through the vent slots, is the system fault indicator. It will be on during initial power-up boot mode operation, but should otherwise be off except for indicating communications errors such as request for non-existent object.

Following a device reinitialize command from BACnet, the system fault LED will remain on for approximately 10 seconds, then turn off (or indicate system fault).

During normal operation, a watchdog timer is always running to force a soft restart the system in the event of a software hang. Should the system restart as a result of watchdog timeout, the system fault LED will flicker at a very rapid rate for approximately 10 seconds. An intentional software hang followed by watchdog timeout is used to force a restart upon receiving a restart command from BACnet. Therefore the indications are the same. However, if the restart indication is observed without sending the restart command from BACnet, please notify technical support.

System fault indication past the initial few seconds of boot mode followed by possible soft restart indication would consist of the red LED being mostly on, flashing off briefly some number of times, followed by a longer pause remaining on. Count the number of ‘off’ flashes. This is the fault code.

Fault codes are as follows:

(1-6) Processor abort codes
(7) System configuration CRC failed
(8) Bad configuration parameter found in system configuration
(9) EEPROM read failed
(10) EEPROM write failed
(11) EEPROM lock failed
(12) Object allocation failed

Report any of these to technical support. There are both a primary copy and backup copy of system configuration information. Both need to fail before the fault code will be indicated. These will generally indicate a hardware failure requiring factory attention. You should really never see any fault codes.

A processor abort will initially be indicated by the red LED on solid, and the yellow LED flashing a code from 1 to 6. However, the watchdog timer will normally restart the system sooner than you can observe this code and normal system fault indication will continue from that point. The abort cause is saved through soft restart. The term ‘soft restart’ means processor reset and complete reboot of the system as if power cycled. A power cycle is required for hard reset, and results in the same startup sequence except that processor abort codes are not retained.

15 Editing a CSV Object Map File

The easiest way to begin the process of configuring a device by editing a CSV file is to first create one using the configuration tool. Set up the device first. In particular, allocate the appropriate number of each object type on the Device page. Then go to the Object Map List page. Even though there will be an essentially blank list here, click the Save button to create a file with place holders for all of the objects. Then use a spread sheet program to modify the various entries to your liking.

Column A: Object – ASCII string identifying the local object type and instance, TT-N where N is instance 1..MAX_OBJECT, and TT is one of the following:

AI = Analog Input
AO = Analog Output
AV = Analog Value
BI = Binary Input
BO = Binary Output
BV = Binary Value
MI = Multi-state Input
MO = Multi-state Output
MV = Multi-state Value

Column B: IsPhysical – T if mapped to physical I/O point, or F

Column C: IsBACnet – T if mapped to BACnet, or F

Column D: IsGlobal - T if reserved for use without mapping, or F

Column E: IsPersistent - T if present value is preserved through power outage, or F

Column F: ReadPoll – T if periodic Read, or F

Column G: WritePoll – T if periodic Write, or F

Column H: WriteDelta – T if Write on Delta, or F

Column I: DefPOR – T if default on POR enabled, or F

Column J: DefNOK – T if default on comm. fail enabled, or F

Column K: MaxQuiet – T if max. quiet enabled, or F

Column L: PollTime – Integer, Periodic poll time in seconds

Column M: Timeout – Integer, BACnet slave timeout in seconds

Column N: MaxQuiet – Integer, max quiet time in seconds

Column O: Scale – Real, scale factor

Column P: Offset – Real, offset for scaling

Column Q: DefaultValue – Real or Integer as applicable to object type, default value

Column R: SendDelta – Real, delta threshold for Write on Delta

Column S: InitCOVincrement – Real, initial COV increment

Column T: InitRelinquish – Real or Integer as applicable to object type, initial relinquish default

Column U: FailCount – Integer, count of comm. fails before Fault indicated

Column V: Units – Integer, Units code as defined by BACnet standard

Column W: ObjectName – Character String

Column X: HwCfg - Hardware configuration code if object is mapped to physical I/O (see Section 8 for codes)

Column Y: HwQual1 - Hardware configuration qualifier value #1

Column Z: HwQual2 - Hardware configuration qualifier value #2

Column AA: HwPoint - Physical point number mapped to this object

Column AB: ObjDevice – Integer, BACnet device instance to read/write when mapped via BACnet Client

Column AC: ObjType – Integer, BACnet object type code as defined by BACnet standard

Column AD: ObjInstance – Integer, BACnet object instance to read/write via client

Column AE: ObjProperty – Integer, BACnet property code as defined by BACnet standard

Column AF: ObjIndex – Integer, array index, -1 if no index

Column AG: ObjPriority – Integer, priority 1-16 or 0 if none

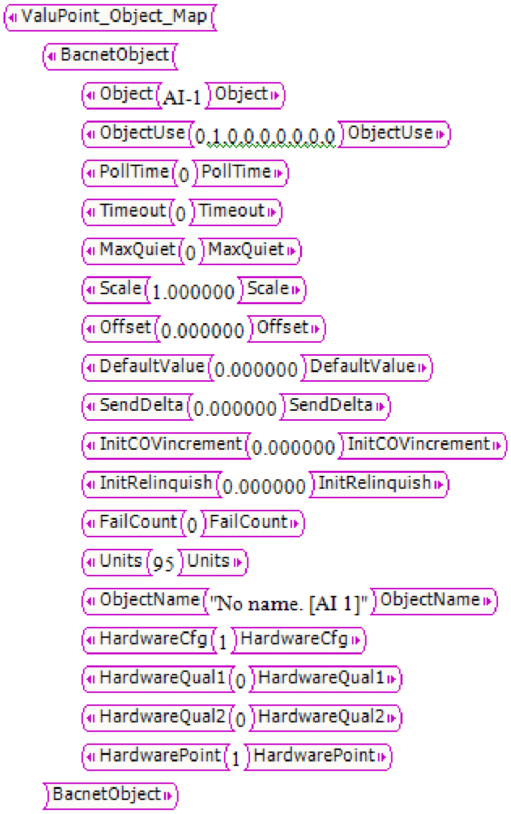
Column AH: ObjEncoding – Integer, object encoding
(0) Null
(1) Boolean
(2) Unsigned Integer
(3) Signed Integer
(4) Real
(8) Bit String
(9) Enumerated

Column AI: BitNumber – Integer, bit number

16 Editing an XML File

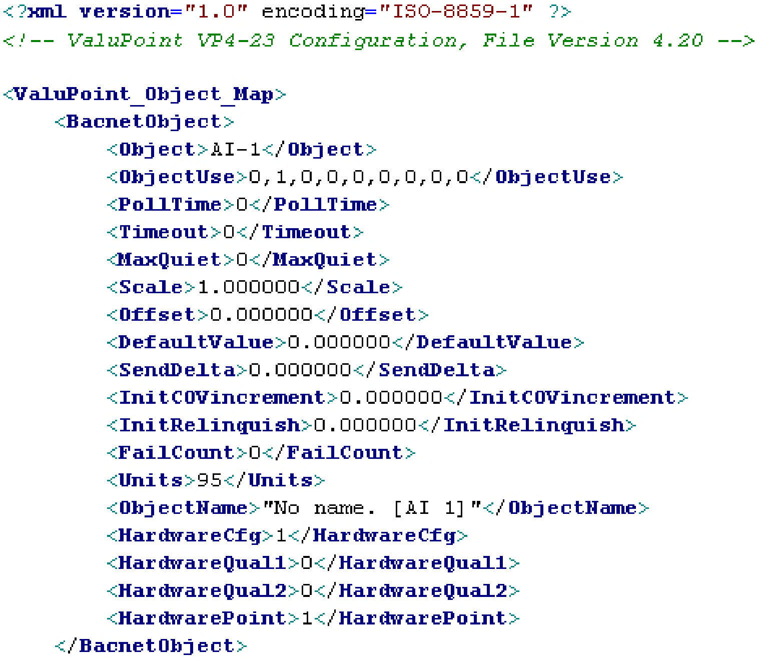
Manually editing an object map file is generally going to be more efficient in CSV spread sheet format using a spread sheet program. However, you can edit an XML file using any plain text editor. (The device file is only available in XML.) You can also use Microsoft Word, which is XML aware and will restrict editing to only the data fields. MS Word will prevent you from inadvertently corrupting the XML tags themselves.

The first several lines of the XML object map in MS Word looks like this:



```
ValuPoint_Object_Map
    BacnetObject
        Object AI-1 Object
        ObjectUse 0,1,0,0,0,0,0,0,0,0 ObjectUse
        PollTime 0 PollTime
        Timeout 0 Timeout
        MaxQuiet 0 MaxQuiet
        Scale 1.000000 Scale
        Offset 0.000000 Offset
        DefaultValue 0.000000 DefaultValue
        SendDelta 0.000000 SendDelta
        InitCOVincrement 0.000000 InitCOVincrement
        InitRelinquish 0.000000 InitRelinquish
        FailCount 0 FailCount
        Units 95 Units
        ObjectName "No name. [AI 1]" ObjectName
        HardwareCfg 1 HardwareCfg
        HardwareQual1 0 HardwareQual1
        HardwareQual2 0 HardwareQual2
        HardwarePoint 1 HardwarePoint
    BacnetObject
```

The first several lines of the XML object map in text form looks like this:

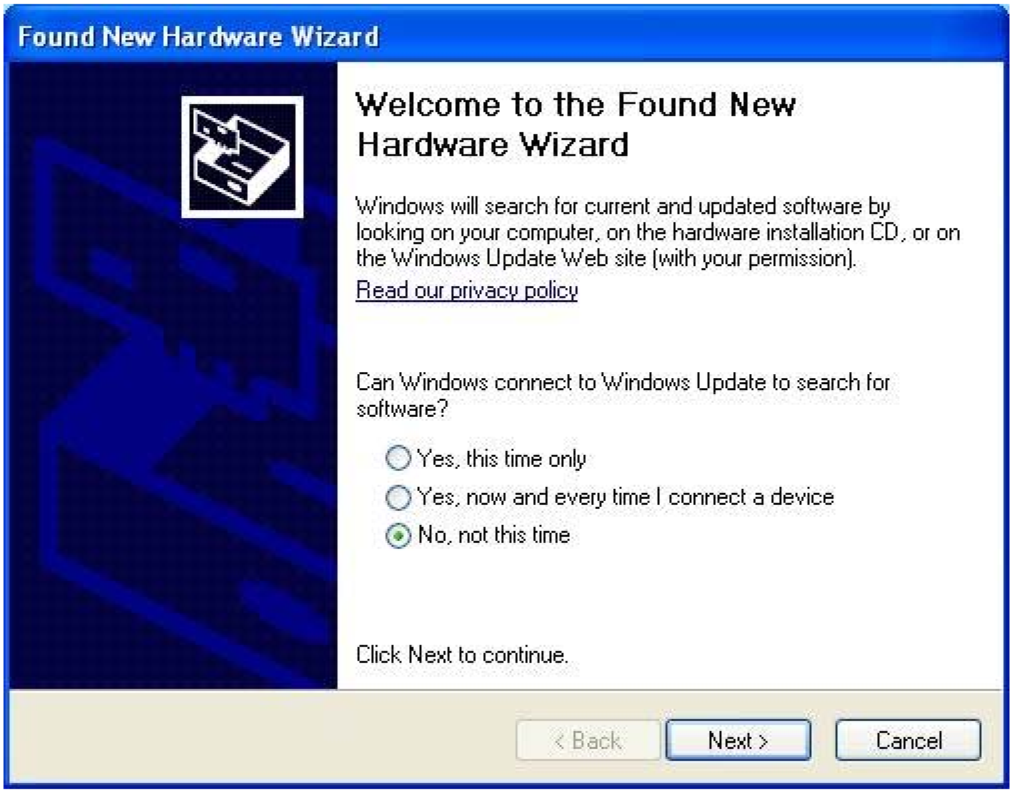


```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!-- ValuPoint VP4-23 Configuration, File Version 4.20 -->

<ValuPoint_Object_Map>
    <BacnetObject>
        <Object>AI-1</Object>
        <ObjectUse>0,1,0,0,0,0,0,0,0,0</ObjectUse>
        <PollTime>0</PollTime>
        <Timeout>0</Timeout>
        <MaxQuiet>0</MaxQuiet>
        <Scale>1.000000</Scale>
        <Offset>0.000000</Offset>
        <DefaultValue>0.000000</DefaultValue>
        <SendDelta>0.000000</SendDelta>
        <InitCOVincrement>0.000000</InitCOVincrement>
        <InitRelinquish>0.000000</InitRelinquish>
        <FailCount>0</FailCount>
        <Units>95</Units>
        <ObjectName>"No name. [AI 1]"</ObjectName>
        <HardwareCfg>1</HardwareCfg>
        <HardwareQual1>0</HardwareQual1>
        <HardwareQual2>0</HardwareQual2>
        <HardwarePoint>1</HardwarePoint>
    </BacnetObject>
```

Appendix A – Installing the MTX002 USB to MS/TP Adapter on Windows XP

Plug the MTX002 into your PC after installing the configuration tool software. You will automatically get the typical “found new hardware” dialog when you first plug the MTX002 into your PC. Select “No, not this time” when asked about searching for software.



Found New Hardware Wizard

Welcome to the Found New Hardware Wizard

Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).

Read our privacy policy

Can Windows connect to Windows Update to search for software?

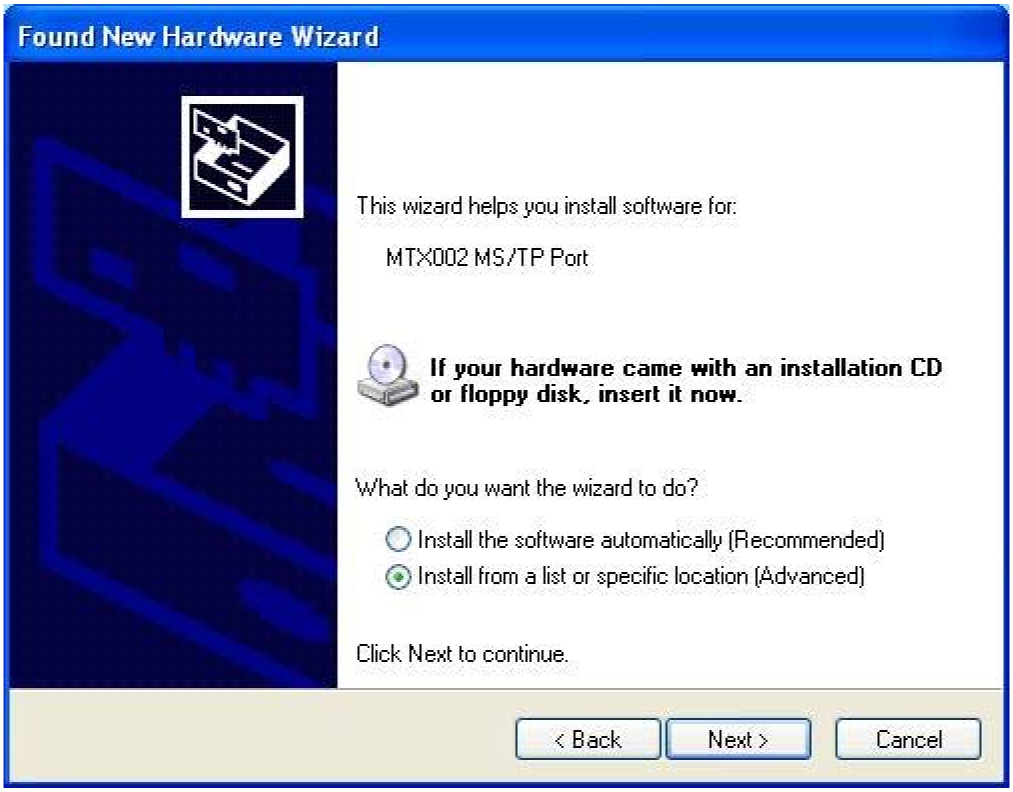
○ Yes, this time only

○ Yes, now and every time I connect a device

● No, not this time

Click Next to continue.

You will install from a specific location.



Found New Hardware Wizard

This wizard helps you install software for:

MTX002 MS/TP Port

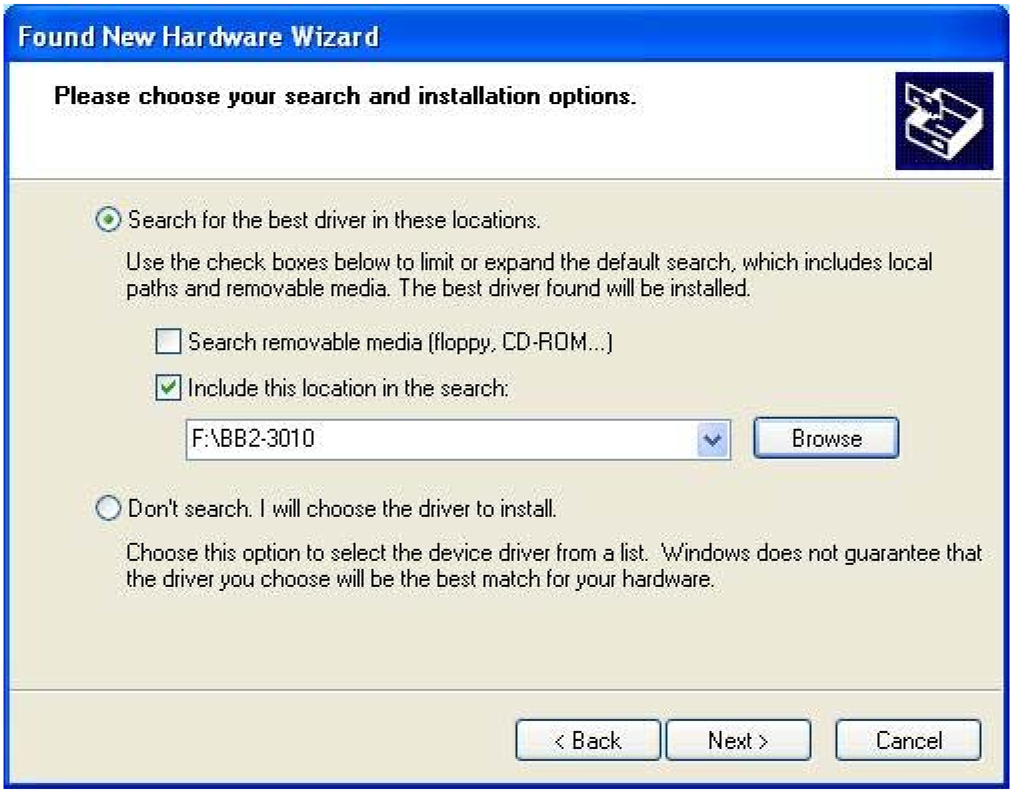
If your hardware came with an installation CD or floppy disk, insert it now.

What do you want the wizard to do?

○ Install the software automatically (Recommended)
● Install from a list or specific location (Advanced)

Click Next to continue.

Do not search the CD-ROM, etc. The specific location you will search will be the directory you installed your configuration software into.



Found New Hardware Wizard

Please choose your search and installation options.

● Search for the best driver in these locations.

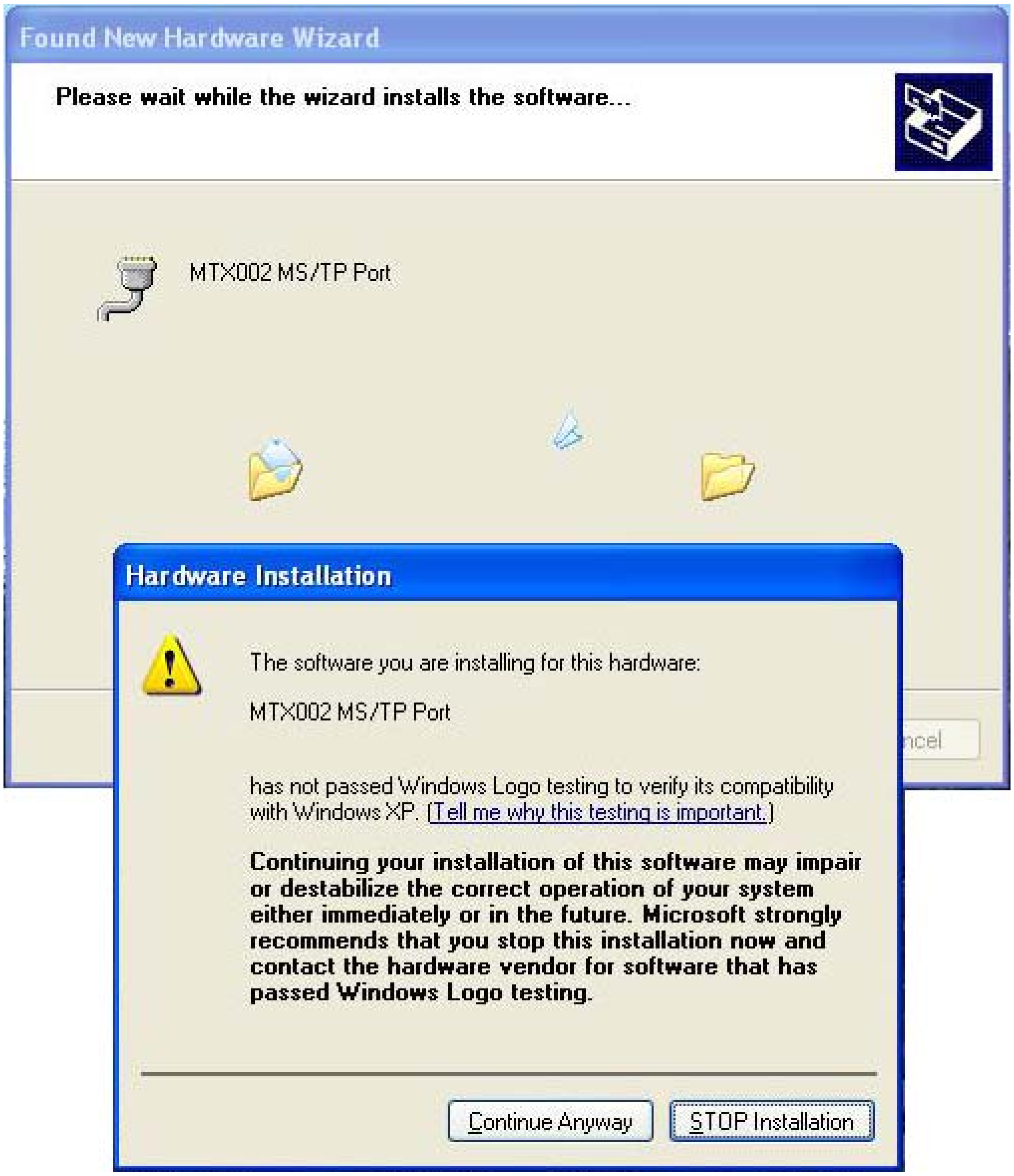
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.

□ Search removable media (floppy, CD-ROM...)
☑ Include this location in the search:

F:\BB2-3010

○ Don't search. I will choose the driver to install.

Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.



Found New Hardware Wizard

Please wait while the wizard installs the software...

MTX002 MS/TP Port

Hardware Installation

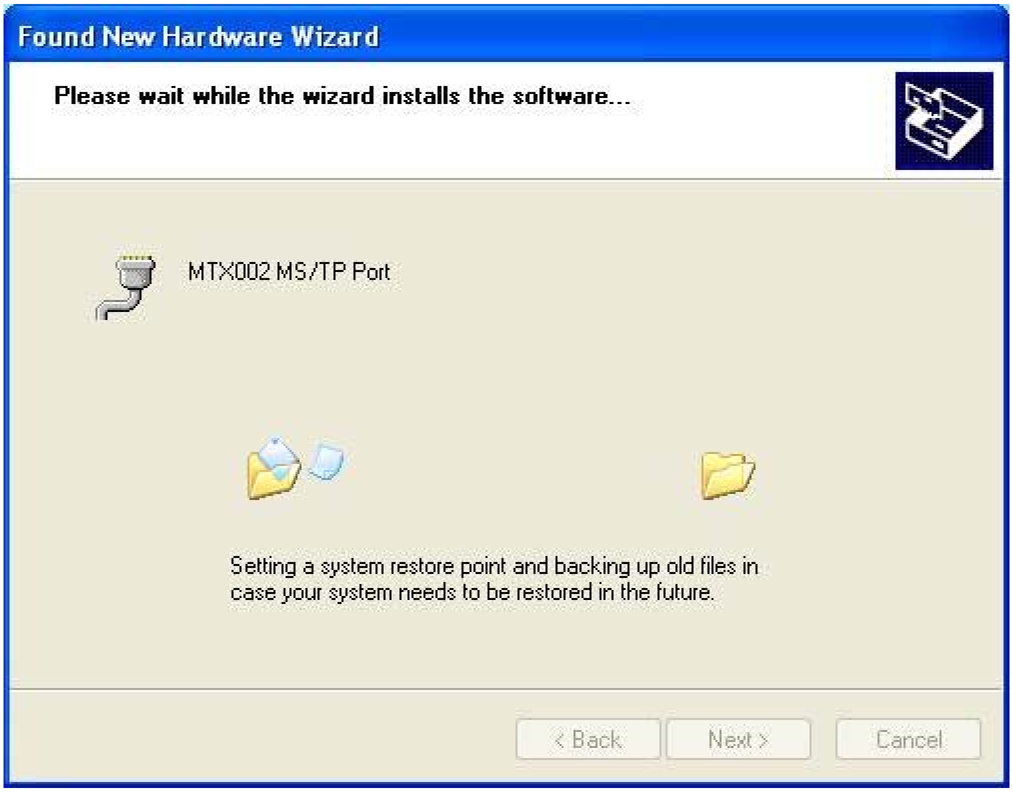
The software you are installing for this hardware:

MTX002 MS/TP Port

has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.

Click Continue Anyway – this notice about Windows Logo testing is automatic. You will not actually be installing any new software at this point. The installation process only tells Windows which driver to use, and this driver is already included in Windows.



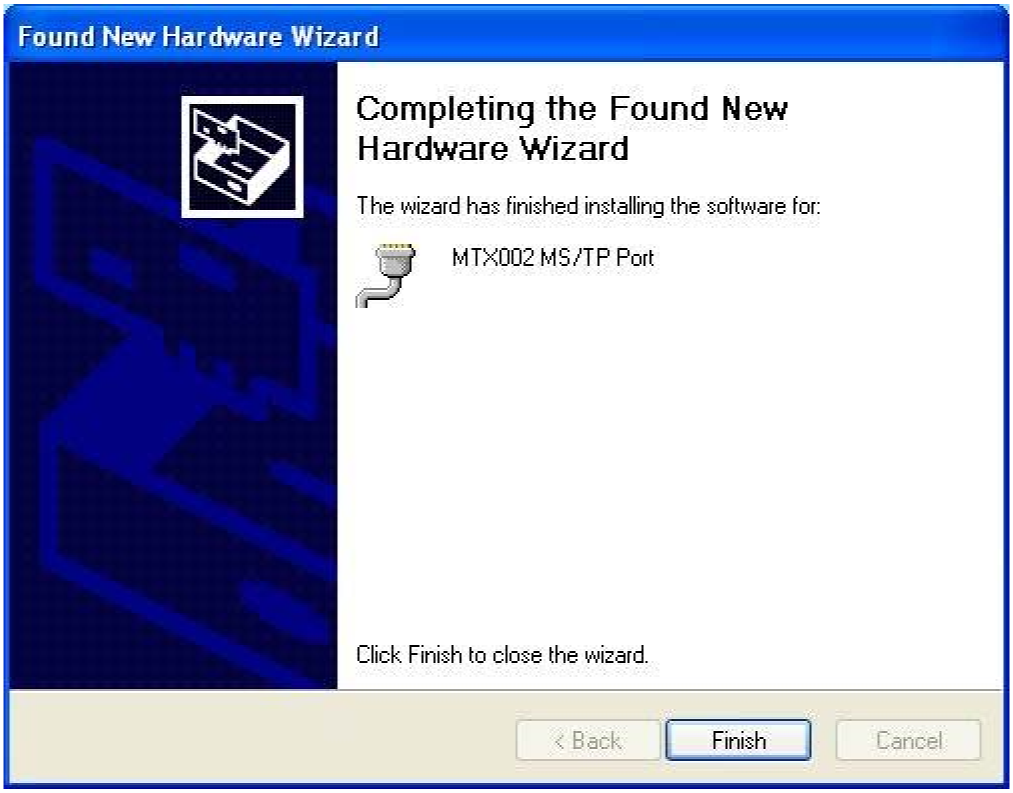
Found New Hardware Wizard

Please wait while the wizard installs the software...

MTX002 MS/TP Port

Setting a system restore point and backing up old files in case your system needs to be restored in the future.

You should ultimately end up seeing “The wizard has finished…”



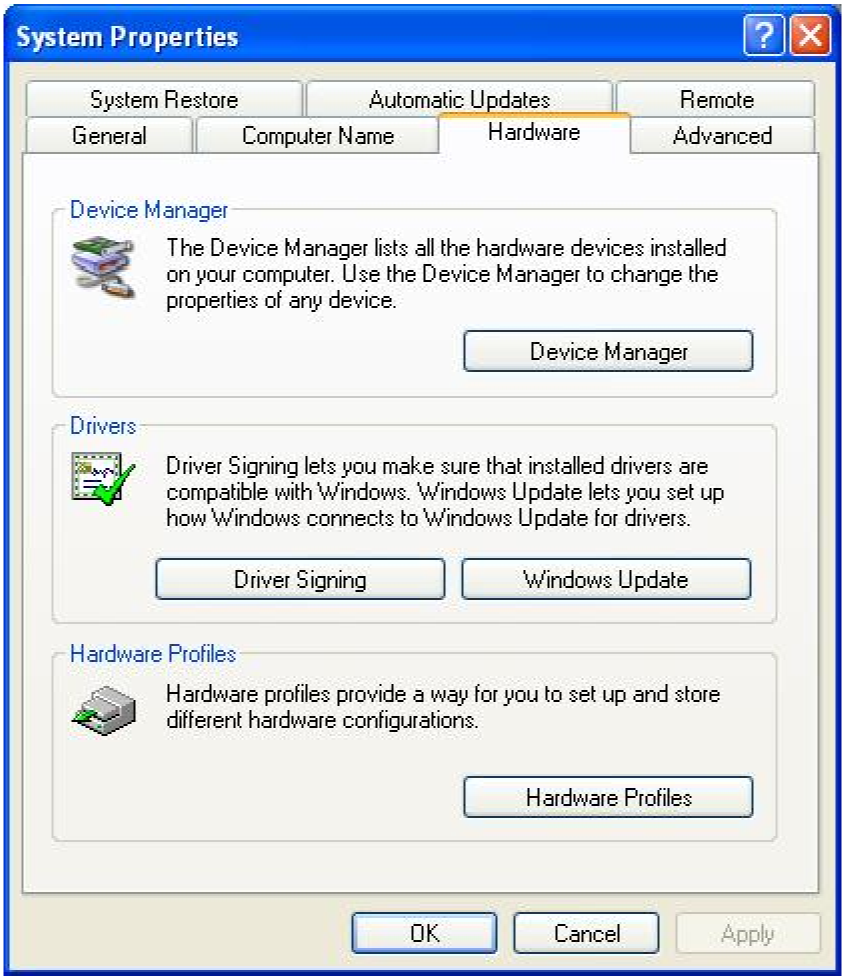
Found New Hardware Wizard

Completing the Found New Hardware Wizard

The wizard has finished installing the software for:

MTX002 MS/TP Port

Click Finish to close the wizard.



Device Manager

The Device Manager lists all the hardware devices installed on your computer. Use the Device Manager to change the properties of any device.

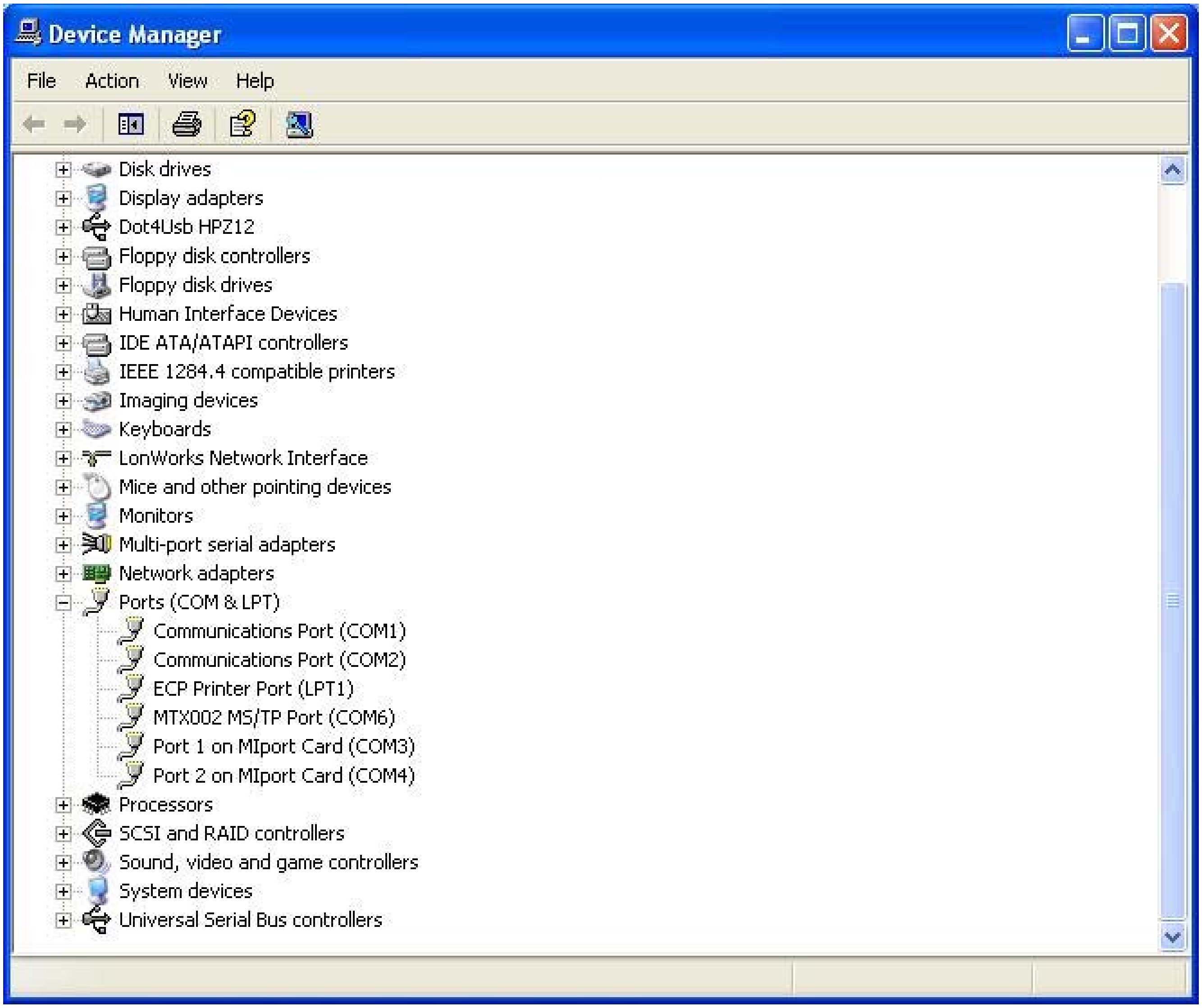
Drivers

Driver Signing lets you make sure that installed drivers are compatible with Windows. Windows Update lets you set up how Windows connects to Windows Update for drivers.

Hardware Profiles

Hardware profiles provide a way for you to set up and store different hardware configurations.

Now go to your PC’s control panel, click on the System icon (in classic view) or go to Performance and Maintenance view and then select System. Go to the Device Manager. Expand the Ports view as illustrated below, and look for MTX002. Note the port number – you will need to know it when opening the configuration tool.

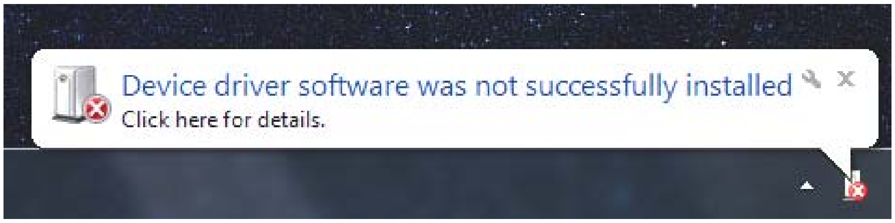


Disk drives
Display adapters
Dot4Usb HPZ12
Floppy disk controllers
Floppy disk drives
Human Interface Devices
IDE ATA/ATAPI controllers
IEEE 1284.4 compatible printers
Imaging devices
Keyboards
LonWorks Network Interface
Mice and other pointing devices
Monitors
Multi-port serial adapters
Network adapters
Ports (COM & LPT)
- Communications Port (COM1)
- Communications Port (COM2)
- ECP Printer Port (LPT1)
- MTX002 MS/TP Port (COM6)
- Port 1 on MIport Card (COM3)
- Port 2 on MIport Card (COM4)

Processors
SCSI and RAID controllers
Sound, video and game controllers
System devices
Universal Serial Bus controllers

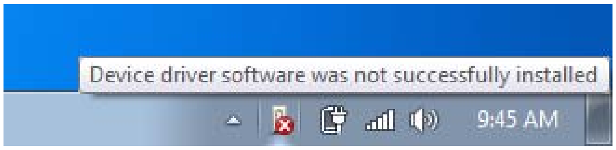
Appendix B – Installing the MTX002 USB to MS/TP Adapter on Windows 7

Plug the MTX002 into your PC after installing the configuration tool software. You will automatically get the typical “found new hardware” dialog when you first plug the MTX002 into your PC. But you will get a driver installation failed notice because Windows does not know what a MTX002 is. You will initially get this pop-up bubble, but it will fade away quickly.



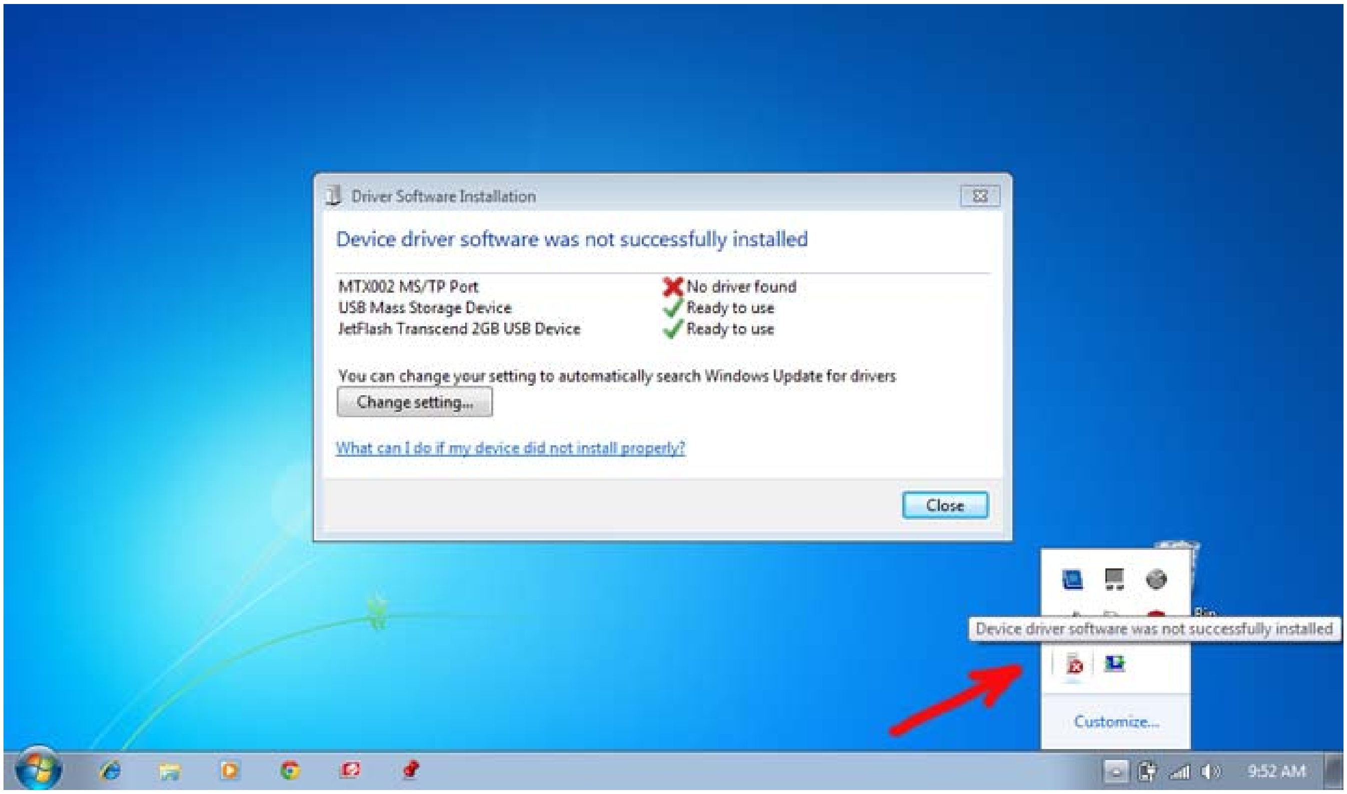
Device driver software was not successfully installed
Click here for details.

The device problem icon will remain in the right-hand side of the task bar for a while.



Device driver software was not successfully installed

If the problem icon is not visible, click on the pop-up to see hidden icons. If you click it, you will see "No driver found".



Driver Software Installation

Device driver software was not successfully installed

MTX002 MS/TP Port ✗ No driver found
USB Mass Storage Device ✓ Ready to use
JetFlash Transcend 2GB USB Device ✓ Ready to use

You can change your setting to automatically search Windows Update for drivers

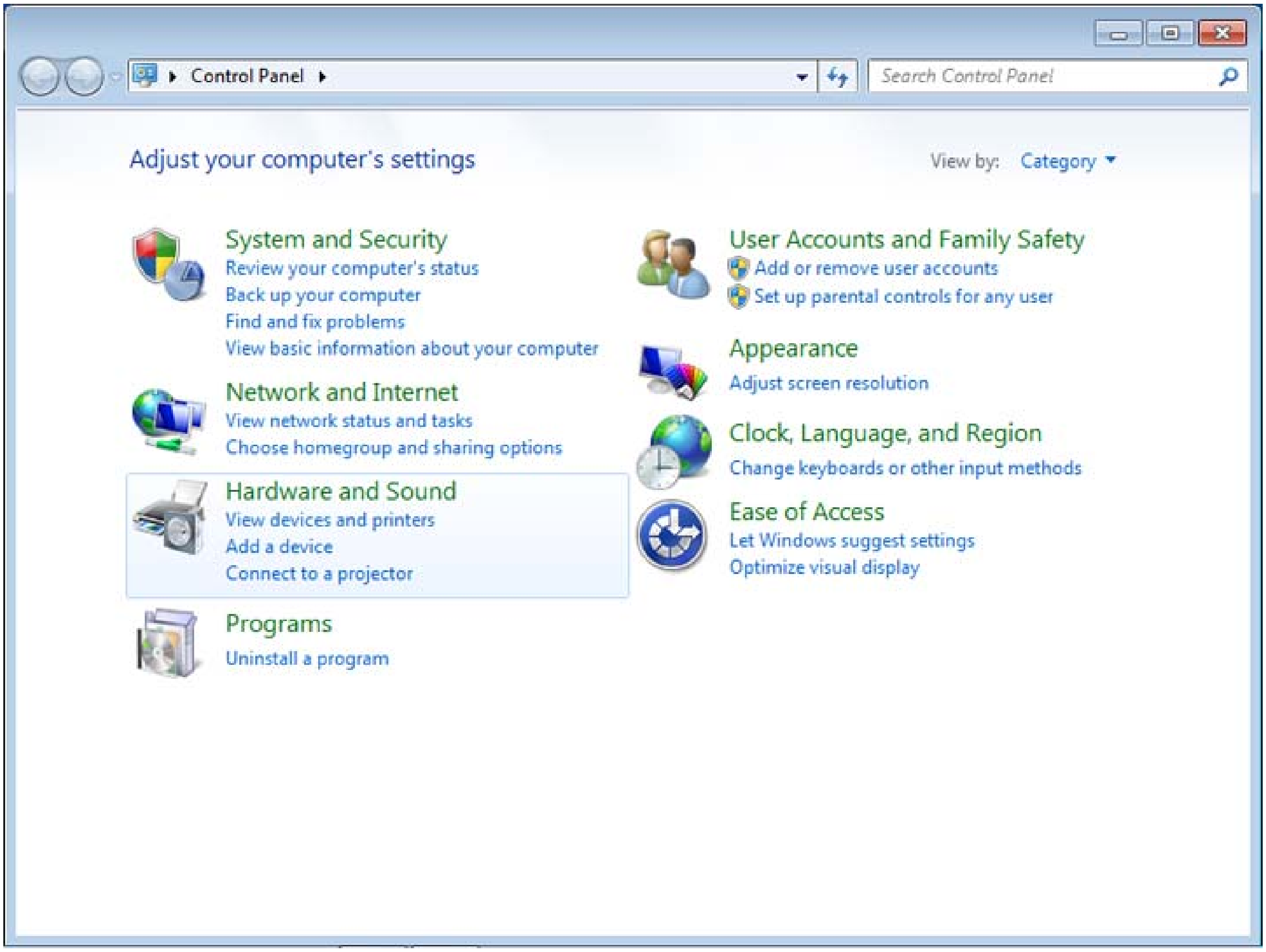
Change setting...

What can I do if my device did not install properly?

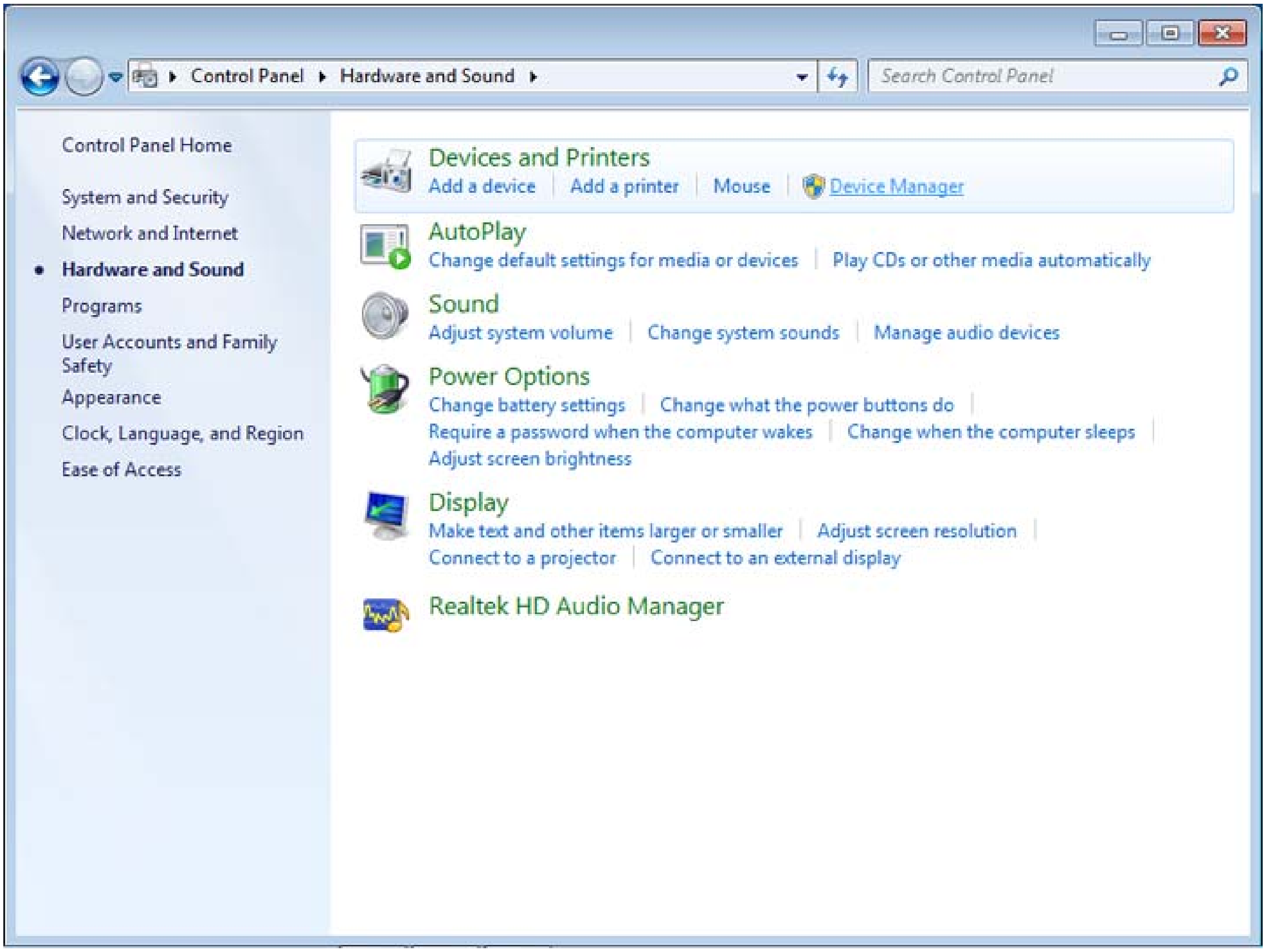
Close

Device driver software was not successfully installed

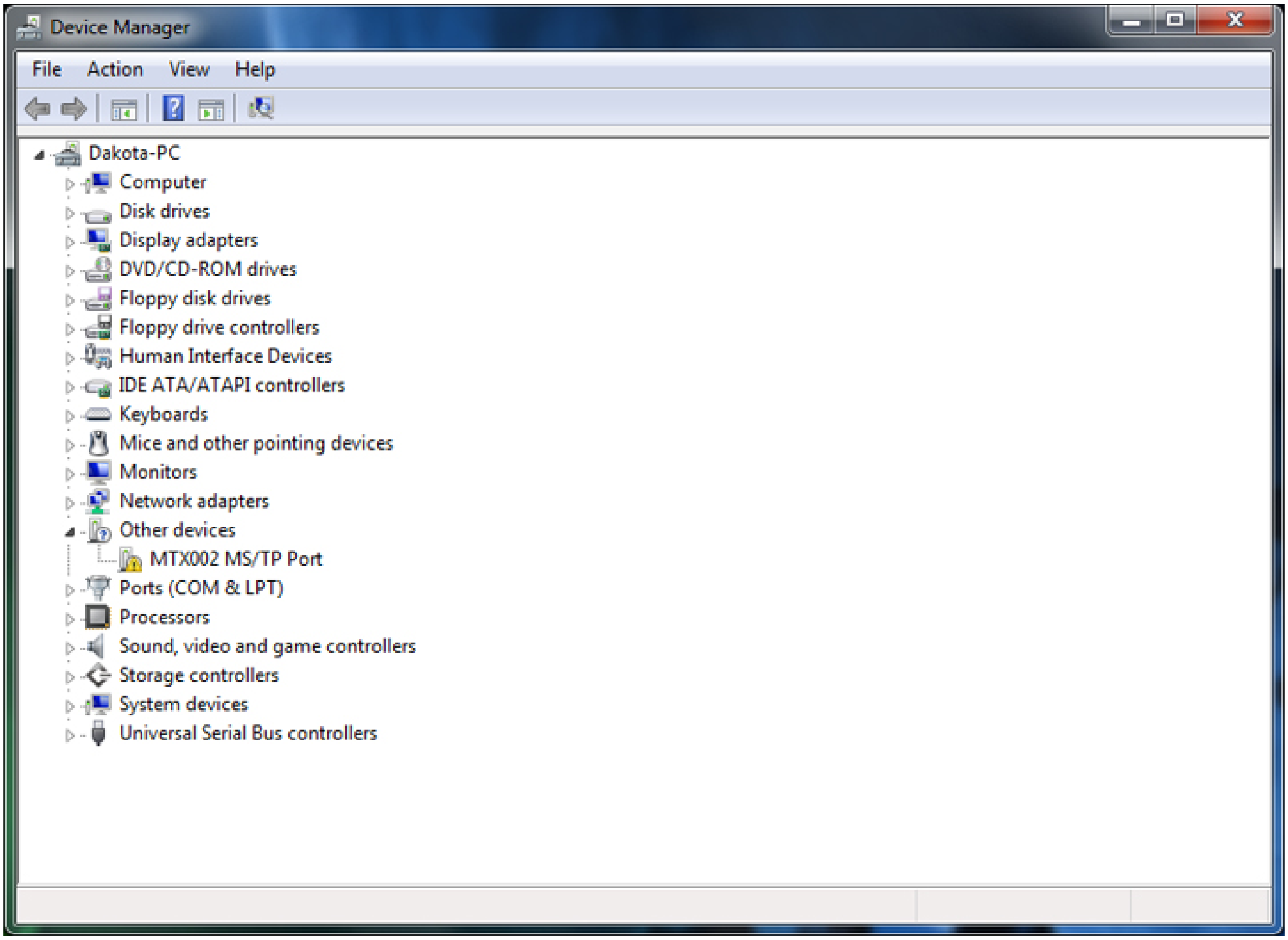
To remedy the driver problem, open your control panel, and select "Hardware and Sound".


Control Panel
Search Control Panel
Adjust your computer's settings
View by: Category
System and Security
Review your computer's status
Back up your computer
Find and fix problems
View basic information about your computer
Network and Internet
View network status and tasks
Choose homegroup and sharing options
Hardware and Sound
View devices and printers
Add a device
Connect to a projector
Programs
Uninstall a program
User Accounts and Family Safety
Add or remove user accounts
Set up parental controls for any user
Appearance
Adjust screen resolution
Clock, Language, and Region
Change keyboards or other input methods
Ease of Access
Let Windows suggest settings
Optimize visual display

Select Device Manager from the next window that pops up after selecting Hardware and Sound.

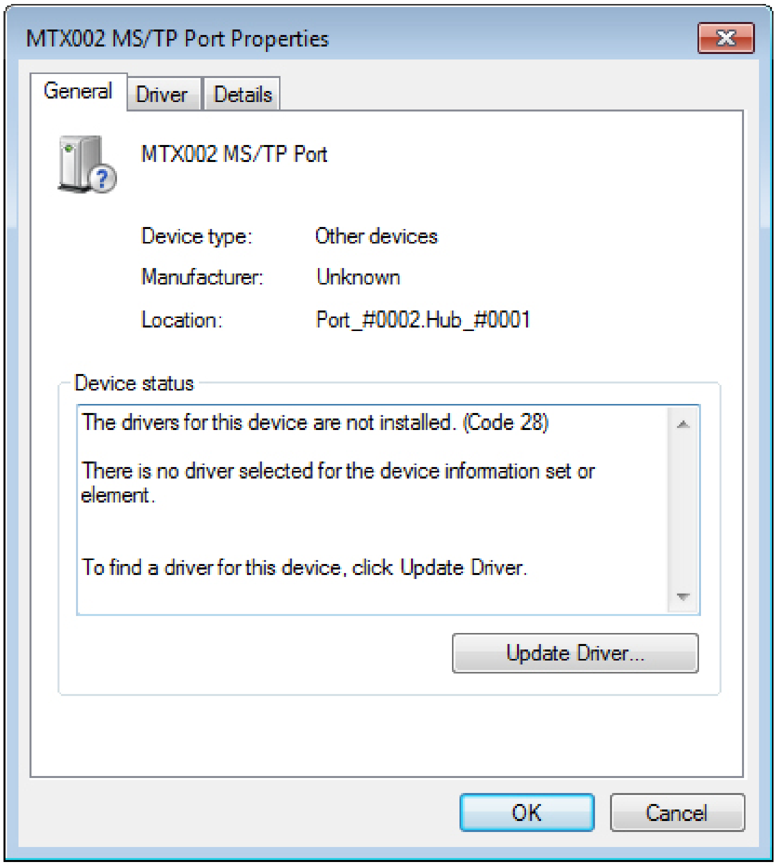

Control Panel ▸ Hardware and Sound ▸
Search Control Panel
Control Panel Home
System and Security
Network and Internet
Hardware and Sound
Programs
User Accounts and Family Safety
Appearance
Clock, Language, and Region
Ease of Access
Devices and Printers
Add a device | Add a printer | Mouse | Device Manager
AutoPlay
Change default settings for media or devices | Play CDs or other media automatically
Sound
Adjust system volume | Change system sounds | Manage audio devices
Power Options
Change battery settings | Change what the power buttons do | Require a password when the computer wakes | Change when the computer sleeps | Adjust screen brightness
Display
Make text and other items larger or smaller | Adjust screen resolution | Connect to a projector | Connect to an external display
Realtek HD Audio Manager

You should see the MTX002 shown as "Other devices" with a warning icon. Double click MTX002.



Dakota-PC
- Computer
- Disk drives
- Display adapters
- DVD/CD-ROM drives
- Floppy disk drives
- Floppy drive controllers
- Human Interface Devices
- IDE ATA/ATAPI controllers
- Keyboards
- Mice and other pointing devices
- Monitors
- Network adapters
- Other devices
  - MTX002 MS/TP Port
- Ports (COM & LPT)
- Processors
- Sound, video and game controllers
- Storage controllers
- System devices
- Universal Serial Bus controllers

The MTX002 Port Properties window will pop up. It will show that drivers are not installed. Click Update Driver.



MTX002 MS/TP Port

Device type: Other devices

Manufacturer: Unknown

Location: Port_#0002.Hub_#0001

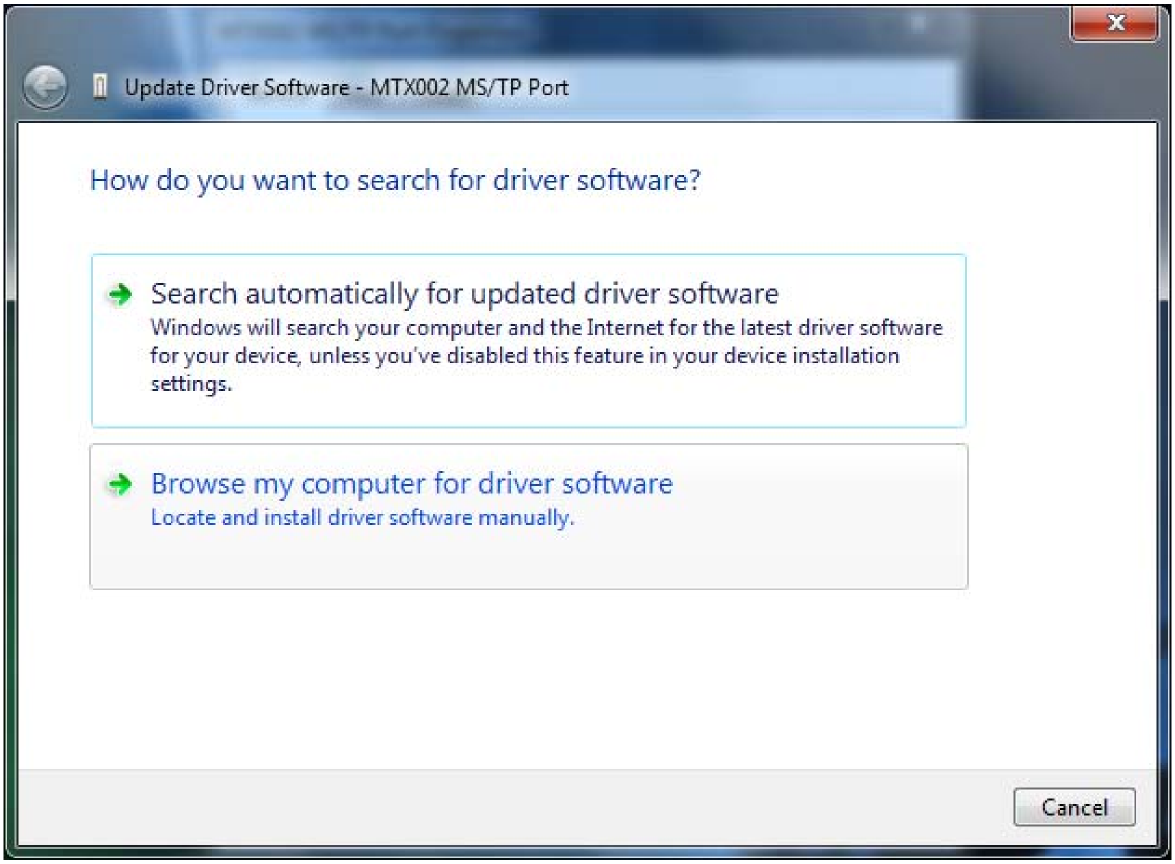
Device status

The drivers for this device are not installed. (Code 28)

There is no driver selected for the device information set or element.

To find a driver for this device, click Update Driver.

Do not let Windows search for a driver on its own. It will not find it. Click 'Browse my computer for driver software'.



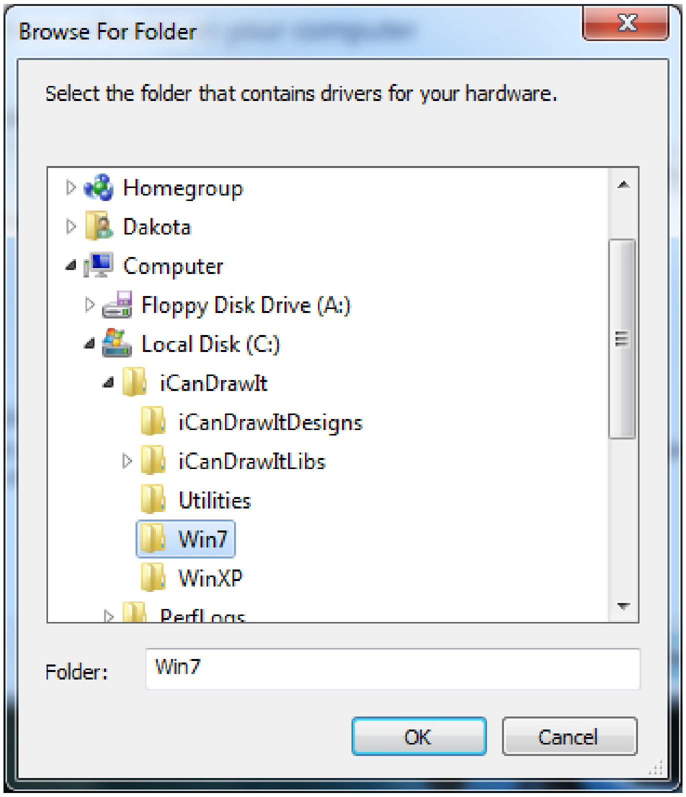
Update Driver Software - MTX002 MS/TP Port

How do you want to search for driver software?

Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.

Browse my computer for driver software
Locate and install driver software manually.

Browse to the iCanDrawIt folder, and click on the Win7 sub-folder. Then click OK.

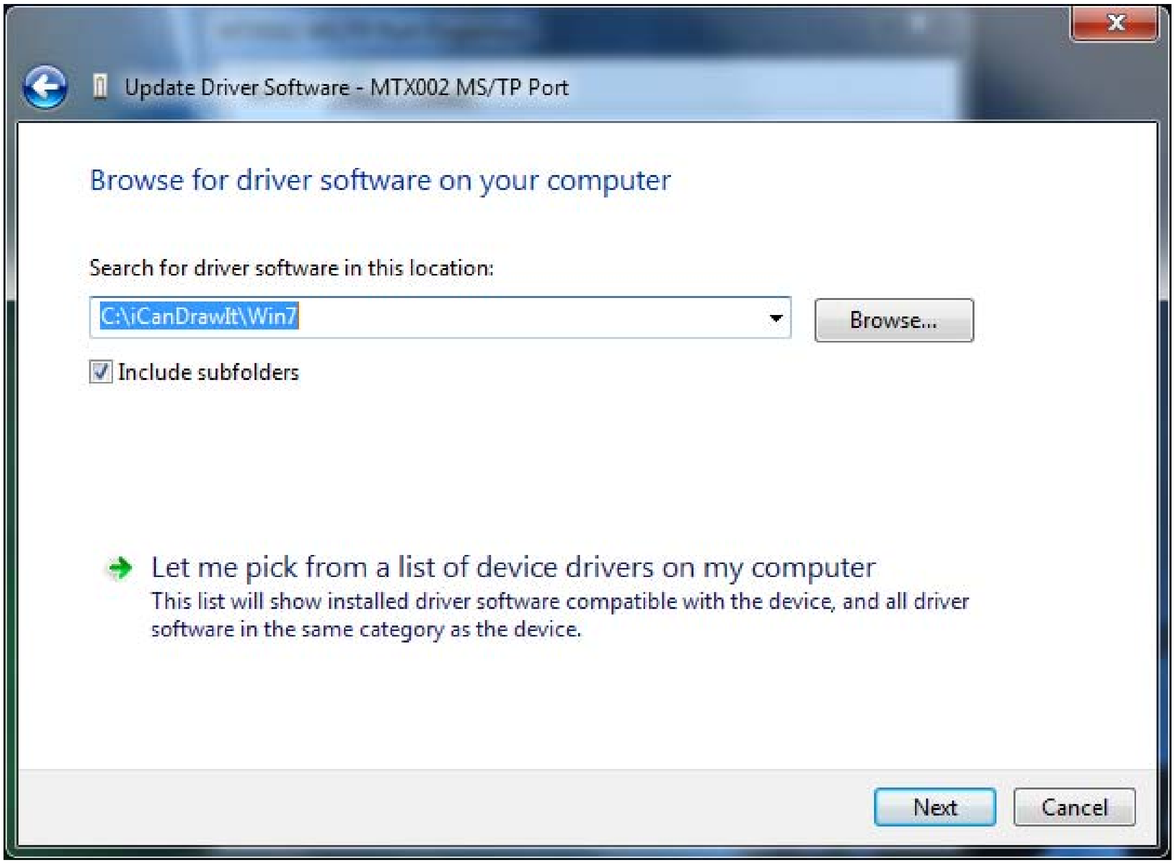


Browse For Folder

Select the folder that contains drivers for your hardware.

Folder: Win7

After selecting the Win7 folder and clicking OK, you should see the following window. Now click Next.



Update Driver Software - MTX002 MS/TP Port

Browse for driver software on your computer

Search for driver software in this location:

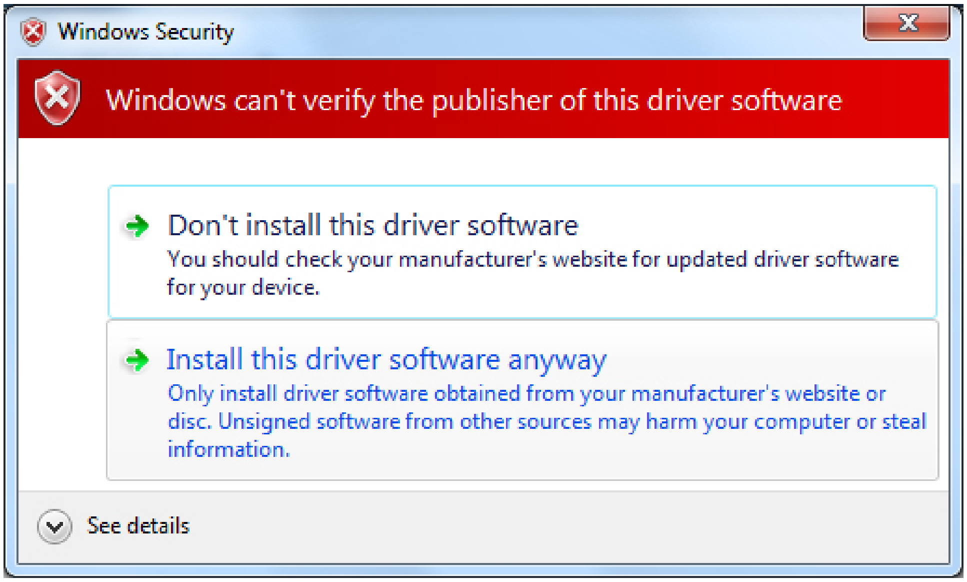
C:\iCanDrawIt\Win7

☑ Include subfolders

Let me pick from a list of device drivers on my computer

This list will show installed driver software compatible with the device, and all driver software in the same category as the device.

Windows does not recognize the manufacturer. However, the driver itself is actually a generic serial driver already provided in Windows. The "inf" file simply contains some configuration information telling Windows what driver to associate with this device.



Windows Security

Windows can't verify the publisher of this driver software

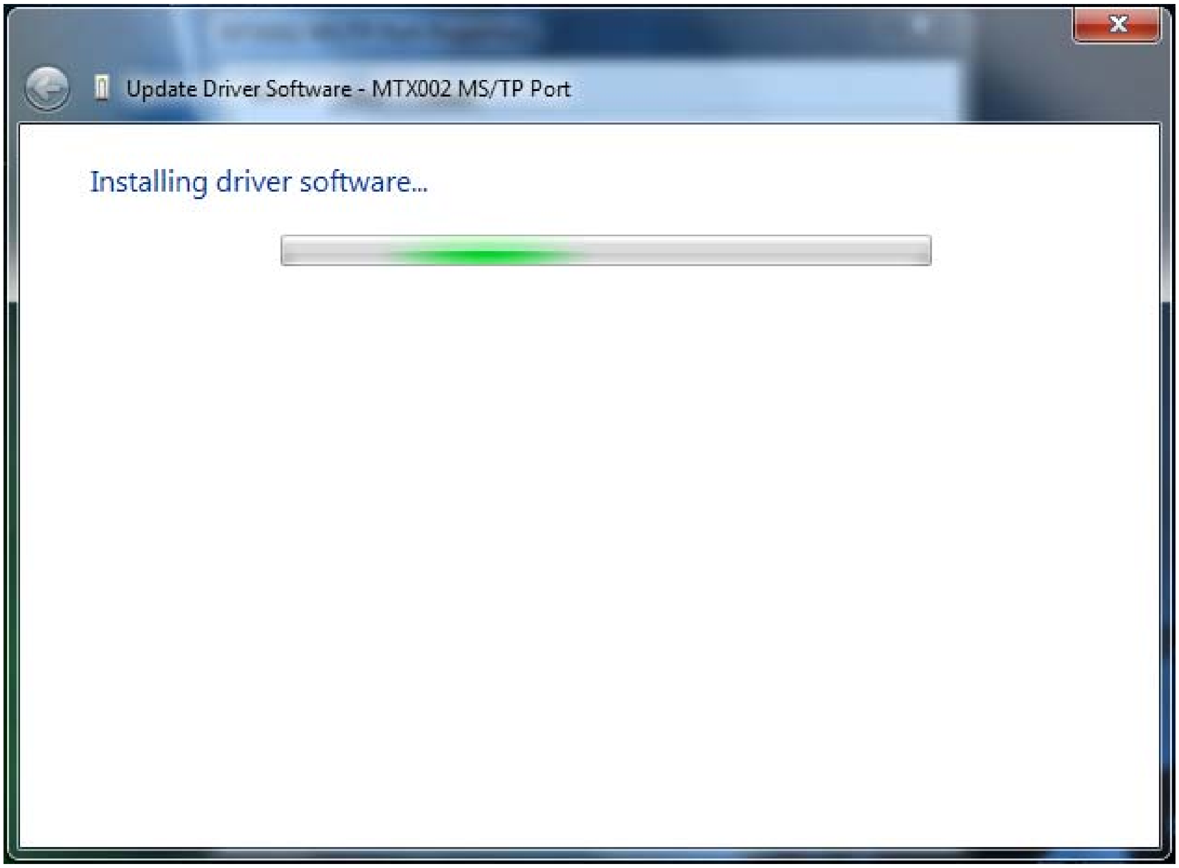
Don't install this driver software

You should check your manufacturer's website for updated driver software for your device.

Install this driver software anyway

Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.

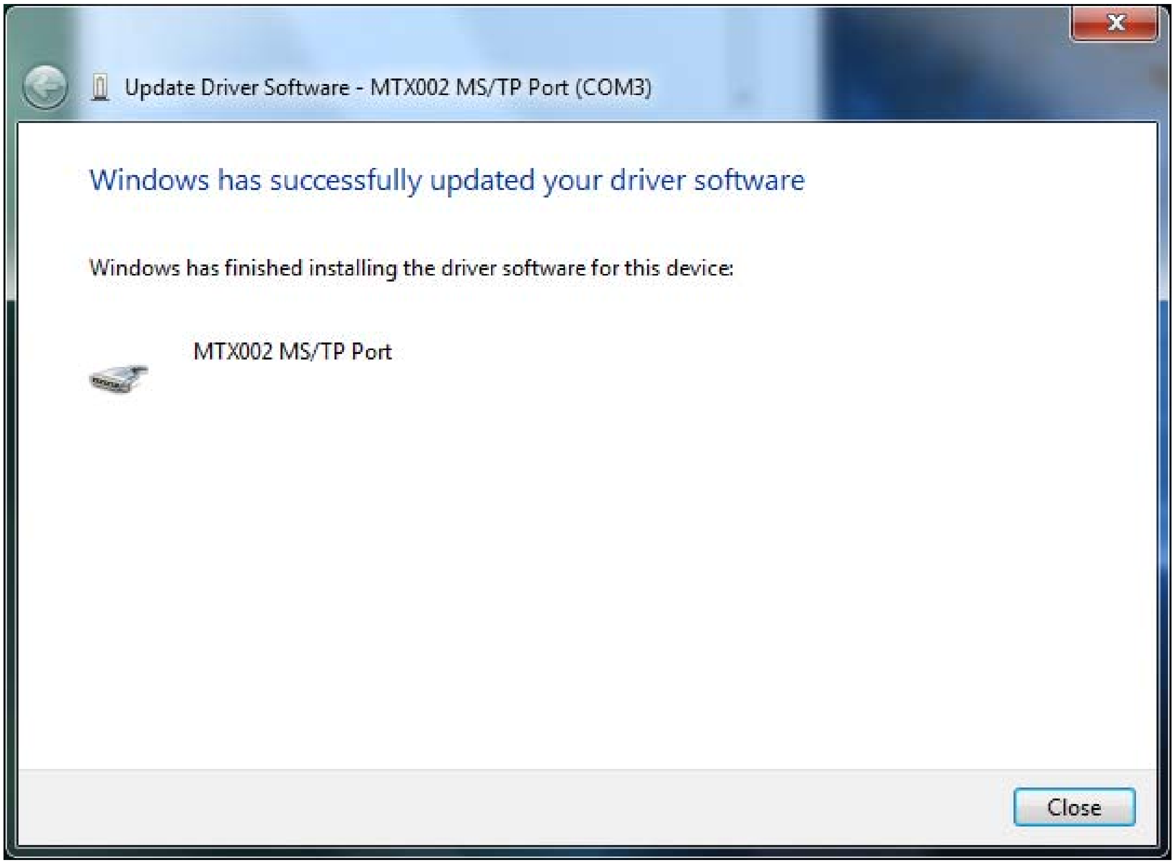
You should now see 'Installing…".



Update Driver Software - MTX002 MS/TP Port

Installing driver software...

When finished, you should see the following window, and note the COM port that is now assigned to the MTX002. The COM port number will vary depending upon how many serial devices have been previously installed on your PC.



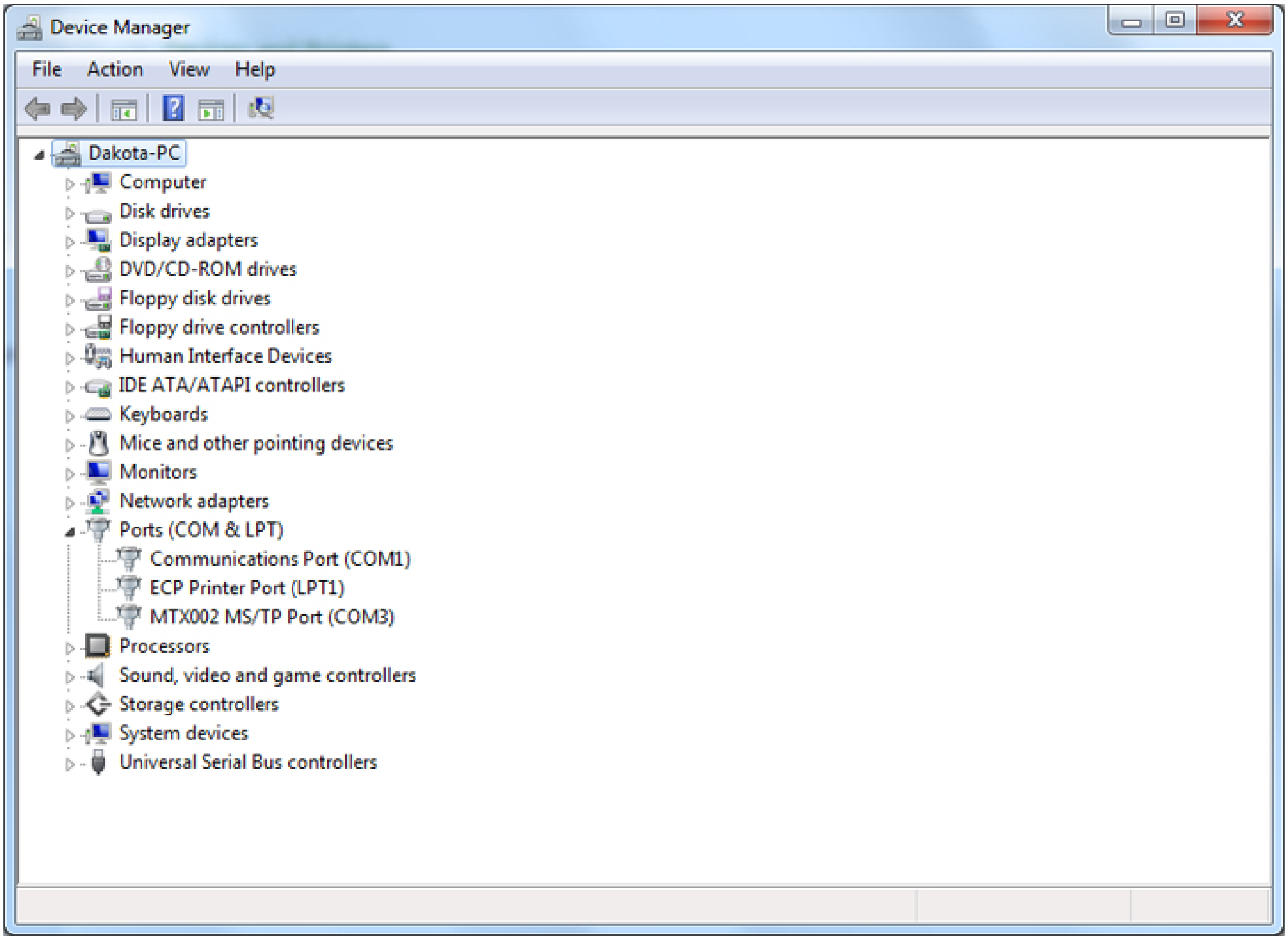
Update Driver Software - MTX002 MS/TP Port (COM3)

Windows has successfully updated your driver software

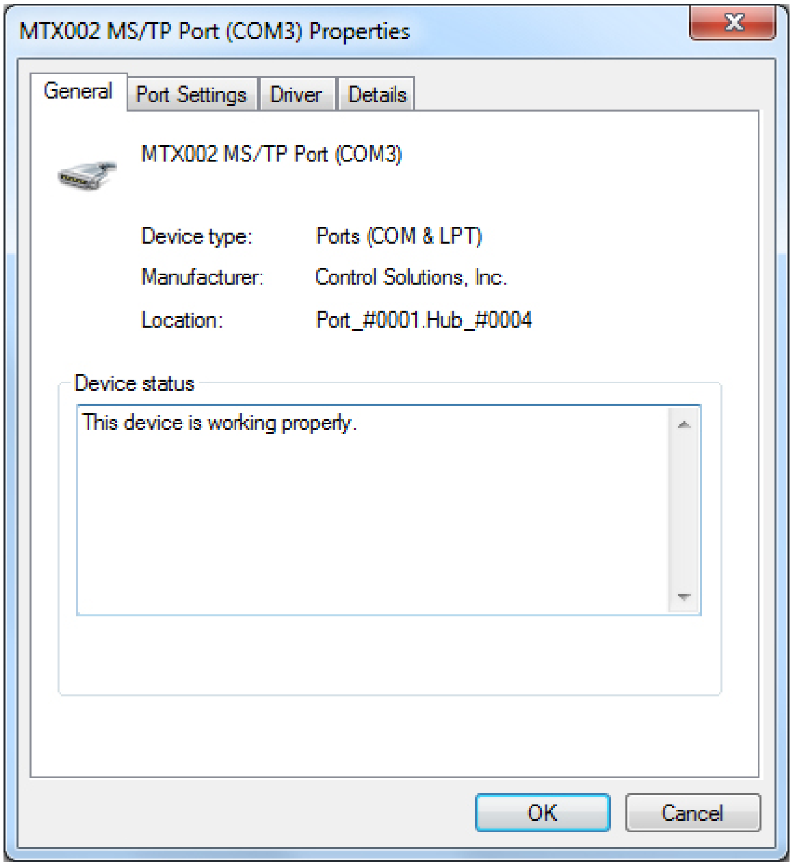
Windows has finished installing the driver software for this device:

MTX002 MS/TP Port

If you return to the Device Manager, you should now see the MTX002 listed in the Ports section as illustrated below.



Double click on MTX002, and this time you should see "This device is working properly".



MTX002 MS/TP Port (COM3)

Device type: Ports (COM & LPT)

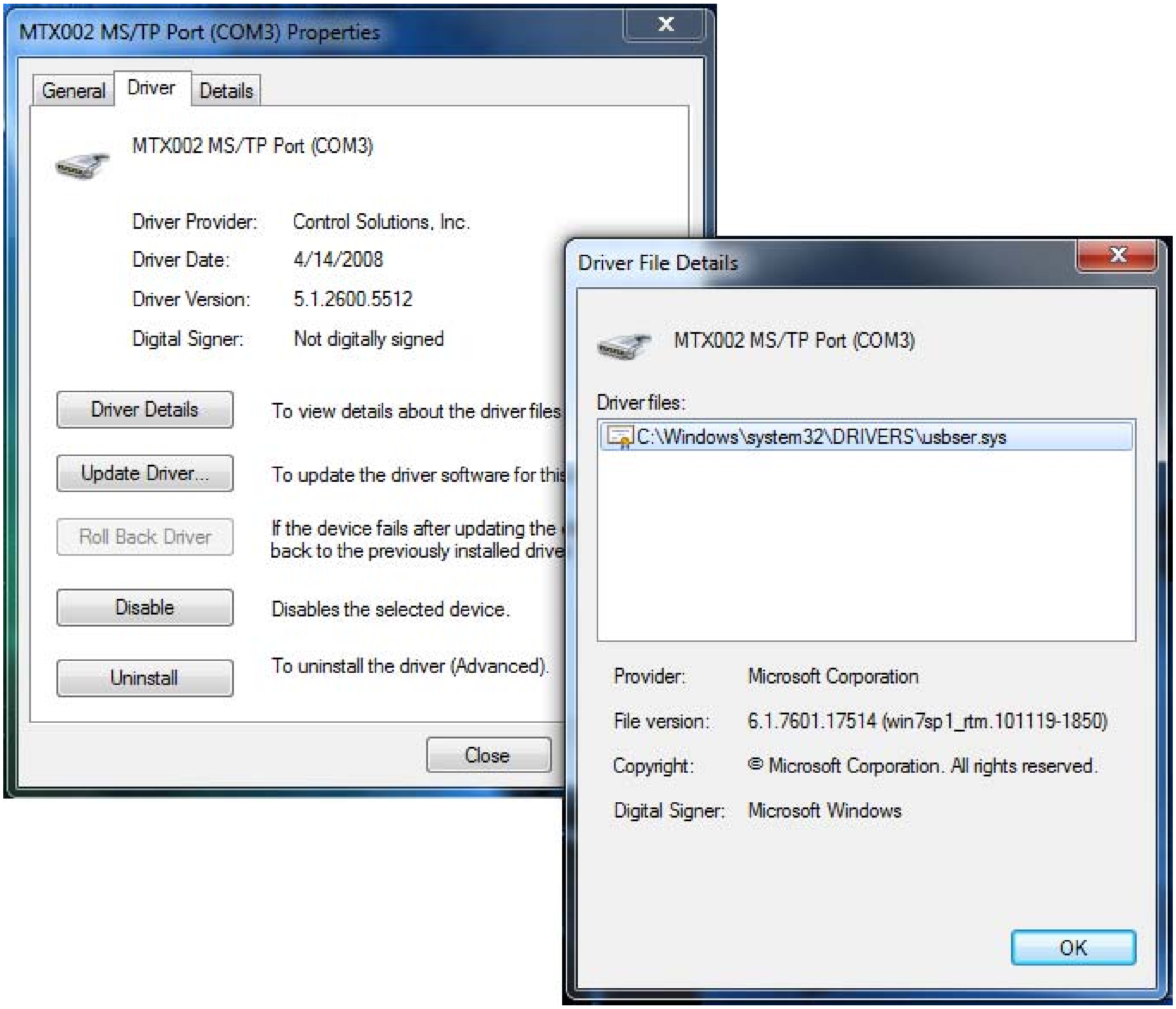
Manufacturer: Control Solutions, Inc.

Location: Port_#0001.Hub_#0004

Device status

This device is working properly.

If you click on the Driver tab, then click Driver Details, you will see where in Windows the driver was found.



MTX002 MS/TP Port (COM3) Properties

MTX002 MS/TP Port (COM3)

Driver Provider: Control Solutions, Inc.

Driver Date: 4/14/2008

Driver Version: 5.1.2600.5512

Digital Signer: Not digitally signed

To view details about the driver files

To update the driver software for this

If the device fails after updating the back to the previously installed drive

Disables the selected device.

To uninstall the driver (Advanced).

Driver File Details

MTX002 MS/TP Port (COM3)

Driver files:

C:\Windows\system32\DRIVERS\usbser.sys

Provider: Microsoft Corporation

File version: 6.1.7601.17514 (win7sp1_rtm.101119-1850)

Copyright: © Microsoft Corporation. All rights reserved.

Digital Signer: Microsoft Windows

You are now ready to use your MTX002 at the COM port found in the Device Manager.

Appendix C – BACnet Property Type Codes

BACnet property type codes may be found in your copy of the BACnet protocol specification, ANSI/ASHRAE Standard 135-2008. That document is copyrighted, but the C enumeration shown below for reference is taken from open source code available under GPL at http://sourceforge.net, and provides essentially the same information (copyrighted by Steve Karg, licensed under GPL as noted at http://sourceforge.net).

```
typedef enum {
    PROP_ACKED_TRANSITIONS = 0,
    PROP_ACK_REQUIRED = 1,
    PROP_ACTION = 2,
    PROP_ACTION_TEXT = 3,
    PROP_ACTIVE_TEXT = 4,
    PROP_ACTIVE_VT_SESSIONS = 5,
    PROP_ALARM_VALUE = 6,
    PROP_ALARM_VALUES = 7,
    PROP_ALL = 8,
    PROP_ALL_WRITES_SUCCESSFUL = 9,
    PROP_APDU_SEGMENT_TIMEOUT = 10,
    PROP_APDU_TIMEOUT = 11,
    PROP_APPLICATION_SOFTWARE_VERSION = 12,
    PROP_ARCHIVE = 13,
    PROP_BIAS = 14,
    PROP_CHANGE_OF_STATE_COUNT = 15,
    PROP_CHANGE_OF_STATE_TIME = 16,
    PROP_NOTIFICATION_CLASS = 17,
    PROP_BLANK_1 = 18,
    PROP_CONTROLLED_VARIABLE_REFERENCE = 19,
    PROP_CONTROLLED_VARIABLE_UNITS = 20,
    PROP_CONTROLLED_VARIABLE_VALUE = 21,
    PROP_COV_INCREMENT = 22,
    PROP_DATE_LIST = 23,
    PROP_DAYLIGHT_SAVINGS_STATUS = 24,
    PROP_DEADBAND = 25,
    PROP_DERIVATIVE_CONSTANT = 26,
    PROP_DERIVATIVE_CONSTANT_UNITS = 27,
    PROP_DESCRIPTION = 28,
    PROP_DESCRIPTION_OF_HALT = 29,
    PROP_DEVICE_ADDRESS_BINDING = 30,
    PROP_DEVICE_TYPE = 31,
    PROP_EFFECTIVE_PERIOD = 32,
    PROP_ELAPSED_ACTIVE_TIME = 33,
    PROP_ERROR_LIMIT = 34,
    PROP_EVENT_ENABLE = 35,
    PROP_EVENT_STATE = 36,
    PROP_EVENT_TYPE = 37,
    PROP_EXCEPTION_SCHEDULE = 38,
    PROP_FAULT_VALUES = 39,
    PROP_FEEDBACK_VALUE = 40,
    PROP_FILE_ACCESS_METHOD = 41,
    PROP_FILE_SIZE = 42,
    PROP_FILE_TYPE = 43,
    PROP_FIRMWARE_REVISION = 44,
    PROP_HIGH_LIMIT = 45,
    PROP_INACTIVE_TEXT = 46,
    PROP_IN_PROCESS = 47,
    PROP_INSTANCE_OF = 48,
    PROP_INTEGRAL_CONSTANT = 49,
    PROP_INTEGRAL_CONSTANT_UNITS = 50,
    PROP_ISSUE_CONFIRMED_NOTIFICATIONS = 51,
    PROP_LIMIT_ENABLE = 52,
    PROP_LIST_OF_GROUP_MEMBERS = 53,
    PROP_LIST_OF_OBJECT_PROPERTY_REFERENCES = 54,
    PROP_LIST_OF_SESSION_KEYS = 55,
    PROP_LOCAL_DATE = 56,
    PROP_LOCAL_TIME = 57,
    PROP_LOCATION = 58,
    PROP_LOW_LIMIT = 59,
    PROP_MANIPULATED_VARIABLE_REFERENCE = 60,
    PROP_MAXIMUM_OUTPUT = 61,
    PROP_MAX_APDU_LENGTH_ACCEPTED = 62,
    PROP_MAX_INFO_FRAMES = 63,
    PROP_MAX_MASTER = 64,
    PROP_MAX_PRES_VALUE = 65,
    PROP_MINIMUM_OFF_TIME = 66,
    PROP_MINIMUM_ON_TIME = 67,
    PROP_MINIMUM_OUTPUT = 68,
    PROP_MIN_PRES_VALUE = 69,
    PROP_MODEL_NAME = 70,
    PROP_MODIFICATION_DATE = 71,
    PROP_NOTIFY_TYPE = 72,
    PROP_NUMBER_OF_APDU_RETRIES = 73,
    PROP_NUMBER_OF_STATES = 74,
    PROP_OBJECT_IDENTIFIER = 75,
    PROP_OBJECT_LIST = 76,
    PROP_OBJECT_NAME = 77,
    PROP_OBJECT_PROPERTY_REFERENCE = 78,
    PROP_OBJECT_TYPE = 79,
    PROP_OPTIONAL = 80,
    PROP_OUT_OF_SERVICE = 81,
    PROP_OUTPUT_UNITS = 82,
    PROP_EVENT_PARAMETERS = 83,
    PROP_POLARITY = 84,
    PROP_PRESENT_VALUE = 85,
    PROP_PRIORITY = 86,
    PROP_PRIORITY_ARRAY = 87,
    PROP_PRIORITY_FOR_WRITING = 88,
    PROP_PROCESS_IDENTIFIER = 89,
    PROP_PROGRAM_CHANGE = 90,
    PROP_PROGRAM_LOCATION = 91,
    PROP_PROGRAM_STATE = 92,
    PROP_PROPORTIONAL_CONSTANT = 93,
    PROP_PROPORTIONAL_CONSTANT_UNITS = 94,
    PROP_PROTOCOL_CONFORMANCE_CLASS = 95,       /* deleted in version 1 revision 2
*/
    PROP_PROTOCOL_OBJECT_TYPES_SUPPORTED = 96,
    PROP_PROTOCOL_SERVICES_SUPPORTED = 97,
    PROP_PROTOCOL_VERSION = 98,
    PROP_READ_ONLY = 99,
    PROP_REASON_FOR_HALT = 100,
    PROP_RECIPIENT = 101,
    PROP_RECIPIENT_LIST = 102,
    PROP_RELIABILITY = 103,
    PROP_RELINQUISH_DEFAULT = 104,
    PROP_REQUIRED = 105,
    PROP_RESOLUTION = 106,
    PROP_SEGMENTATION_SUPPORTED = 107,
    PROP_SETPOINT = 108,
    PROP_SETPOINT_REFERENCE = 109,
    PROP_STATE_TEXT = 110,
    PROP_STATUS_FLAGS = 111,
    PROP_SYSTEM_STATUS = 112,
    PROP_TIME_DELAY = 113,
    PROP_TIME_OF_ACTIVE_TIME_RESET = 114,
    PROP_TIME_OF_STATE_COUNT_RESET = 115,
    PROP_TIME_SYNCHRONIZATION_RECIPIENTS = 116,
    PROP_UNITS = 117,
    PROP_UPDATE_INTERVAL = 118,
    PROP_UTC_OFFSET = 119,
    PROP_VENDOR_IDENTIFIER = 120,
    PROP_VENDOR_NAME = 121,
    PROP_VT_CLASSES_SUPPORTED = 122,
    PROP_WEEKLY_SCHEDULE = 123,
    PROP_ATTEMPTED_SAMPLES = 124,
    PROP_AVERAGE_VALUE = 125,
    PROP_BUFFER_SIZE = 126,
    PROP_CLIENT_COV_INCREMENT = 127,
    PROP_COV_RESUBSCRIPTION_INTERVAL = 128,
    PROP_CURRENT_NOTIFY_TIME = 129,
    PROP_EVENT_TIME_STAMPS = 130,
    PROP_LOG_BUFFER = 131,
    PROP_LOG_DEVICE_OBJECT = 132,
    /* The enable property is renamed from log-enable in
       Addendum b to ANSI/ASHRAE 135-2004(135b-2) */
    PROP_ENABLE = 133,
    PROP_LOG_INTERVAL = 134,
    PROP_MAXIMUM_VALUE = 135,
    PROP_MINIMUM_VALUE = 136,
    PROP_NOTIFICATION_THRESHOLD = 137,
    PROP_PREVIOUS_NOTIFY_TIME = 138,
    PROP_PROTOCOL_REVISION = 139,
    PROP_RECORDS_SINCE_NOTIFICATION = 140,
    PROP_RECORD_COUNT = 141,
    PROP_START_TIME = 142,
    PROP_STOP_TIME = 143,
    PROP_STOP_WHEN_FULL = 144,
    PROP_TOTAL_RECORD_COUNT = 145,
    PROP_VALID_SAMPLES = 146,
    PROP_WINDOW_INTERVAL = 147,
    PROP_WINDOW_SAMPLES = 148,
    PROP_MAXIMUM_VALUE_TIMESTAMP = 149,
    PROP_MINIMUM_VALUE_TIMESTAMP = 150,
    PROP_VARIANCE_VALUE = 151,
    PROP_ACTIVE_COV_SUBSCRIPTIONS = 152,
    PROP_BACKUP_FAILURE_TIMEOUT = 153,
    PROP_CONFIGURATION_FILES = 154,
    PROP_DATABASE_REVISION = 155,
    PROP_DIRECT_READING = 156,
    PROP_LAST_RESTORE_TIME = 157,
    PROP_MAINTENANCE_REQUIRED = 158,
    PROP_MEMBER_OF = 159,
    PROP_MODE = 160,
    PROP_OPERATION_EXPECTED = 161,
    PROP_SETTING = 162,
    PROP_SILENCED = 163,
    PROP_TRACKING_VALUE = 164,
    PROP_ZONE_MEMBERS = 165,
    PROP_LIFE_SAFETY_ALARM_VALUES = 166,
    PROP_MAX_SEGMENTS_ACCEPTED = 167,
    PROP_PROFILE_NAME = 168,
    PROP_AUTO_SLAVE_DISCOVERY = 169,
    PROP_MANUAL_SLAVE_ADDRESS_BINDING = 170,
    PROP_SLAVE_ADDRESS_BINDING = 171,
    PROP_SLAVE_PROXY_ENABLE = 172,
    PROP_LAST_NOTIFY_TIME = 173,
    PROP_SCHEDULE_DEFAULT = 174,
    PROP_ACCEPTED_MODES = 175,
    PROP_ADJUST_VALUE = 176,
    PROP_COUNT = 177,
    PROP_COUNT_BEFORE_CHANGE = 178,
    PROP_COUNT_CHANGE_TIME = 179,
    PROP_COV_PERIOD = 180,
    PROP_INPUT_REFERENCE = 181,
    PROP_LIMIT_MONITORING_INTERVAL = 182,
    PROP_LOGGING_DEVICE = 183,
    PROP_LOGGING_RECORD = 184,
    PROP_PRESCALE = 185,
    PROP_PULSE_RATE = 186,
    PROP_SCALE = 187,
    PROP_SCALE_FACTOR = 188,
    PROP_UPDATE_TIME = 189,
    PROP_VALUE_BEFORE_CHANGE = 190,
    PROP_VALUE_SET = 191,
    PROP_VALUE_CHANGE_TIME = 192,
    /* enumerations 193-206 are new */
    PROP_ALIGN_INTERVALS = 193,
    PROP_GROUP_MEMBER_NAMES = 194,
    PROP_INTERVAL_OFFSET = 195,
    PROP_LAST_RESTART_REASON = 196,
    PROP_LOGGING_TYPE = 197,
    PROP_MEMBER_STATUS_FLAGS = 198,
    PROP_NOTIFICATION_PERIOD = 199,
    PROP_PREVIOUS_NOTIFY_RECORD = 200,
    PROP_REQUESTED_UPDATE_INTERVAL = 201,
    PROP_RESTART_NOTIFICATION_RECIPIENTS = 202,
    PROP_TIME_OF_DEVICE_RESTART = 203,
    PROP_TIME_SYNCHRONIZATION_INTERVAL = 204,
    PROP_TRIGGER = 205,
    PROP_UTC_TIME_SYNCHRONIZATION_RECIPIENTS = 206,
    /* enumerations 207-211 are used in Addendum d to ANSI/ASHRAE 135-2004 */
    PROP_NODE_SUBTYPE = 207,
    PROP_NODE_TYPE = 208,
    PROP_STRUCTURED_OBJECT_LIST = 209,
    PROP_SUBORDINATE_ANNOTATIONS = 210,
    PROP_SUBORDINATE_LIST = 211,
    /* enumerations 212-225 are used in Addendum e to ANSI/ASHRAE 135-2004 */
    PROP_ACTUAL_SHED_LEVEL = 212,
    PROP_DUTY_WINDOW = 213,
    PROP_EXPECTED_SHED_LEVEL = 214,
    PROP_FULL_DUTY_BASELINE = 215,
    /* enumerations 216-217 are used in Addendum i to ANSI/ASHRAE 135-2004 */
    PROP_BLINK_PRIORITY_THRESHOLD = 216,
    PROP_BLINK_TIME = 217,
    /* enumerations 212-225 are used in Addendum e to ANSI/ASHRAE 135-2004 */
    PROP_REQUESTED_SHED_LEVEL = 218,
    PROP_SHED_DURATION = 219,
    PROP_SHED_LEVEL_DESCRIPTIONS = 220,
    PROP_SHED_LEVELS = 221,
    PROP_STATE_DESCRIPTION = 222,
    /* enumerations 223-225 are used in Addendum i to ANSI/ASHRAE 135-2004 */
    PROP_FADE_TIME = 223,
    PROP_LIGHTING_COMMAND = 224,
    PROP_LIGHTING_COMMAND_PRIORITY = 225,
    /* enumerations 226-235 are used in Addendum f to ANSI/ASHRAE 135-2004 */
    PROP_DOOR_ALARM_STATE = 226,
    PROP_DOOR_EXTENDED_PULSE_TIME = 227,
    PROP_DOOR_MEMBERS = 228,
    PROP_DOOR_OPEN_TOO_LONG_TIME = 229,
    PROP_DOOR_PULSE_TIME = 230,
    PROP_DOOR_STATUS = 231,
    PROP_DOOR_UNLOCK_DELAY_TIME = 232,
    PROP_LOCK_STATUS = 233,
    PROP_MASKED_ALARM_VALUES = 234,
    PROP_SECURED_STATUS = 235,
    /* enumerations 236-243 are used in Addendum i to ANSI/ASHRAE 135-2004 */
    PROP_OFF_DELAY = 236,
    PROP_ON_DELAY = 237,
    PROP_POWER = 238,
    PROP_POWER_ON_VALUE = 239,
    PROP_PROGRESS_VALUE = 240,
    PROP_RAMP_RATE = 241,
    PROP_STEP_INCREMENT = 242,
    PROP_SYSTEM_FAILURE_VALUE = 243,
    /* enumerations 244-311 are used in Addendum j to ANSI/ASHRAE 135-2004 */
    PROP_ABSENTEE_LIMIT = 244,
    PROP_ACCESS_ALARM_EVENTS = 245,
    PROP_ACCESS_DOORS = 246,
    PROP_ACCESS_EVENT = 247,
    PROP_ACCESS_EVENT_AUTHENTICATION_FACTOR = 248,
    PROP_ACCESS_EVENT_CREDENTIAL = 249,
    PROP_ACCESS_EVENT_TIME = 250,
    PROP_ACCESS_RULES = 251,
    PROP_ACCESS_RULES_ENABLE = 252,
    PROP_ACCESS_TRANSACTION_EVENTS = 253,
    PROP_ACCOMPANIED = 254,
    PROP_ACTIVATION_TIME = 255,
    PROP_ACTIVE_AUTHENTICATION_POLICY = 256,
    PROP_ASSIGNED_ACCESS_RIGHTS = 257,
    PROP_AUTHENTICATION_FACTOR_INPUT_LIST = 258,
    PROP_AUTHENTICATION_FACTORS = 259,
    PROP_AUTHENTICATION_POLICY_LIST = 260,
    PROP_AUTHENTICATION_POLICY_NAMES = 261,
    PROP_AUTHORIZATION_MODE = 262,
    PROP_BELONGS_TO = 263,
    PROP_CREDENTIAL_DISABLE = 264,
    PROP_CREDENTIAL_STATUS = 265,
    PROP_CREDENTIALS = 266,
    PROP_CREDENTIALS_IN_ZONE = 267,
    PROP_DAYS_REMAINING = 268,
    PROP_ENTRY_POINTS = 269,
    PROP_EXIT_POINTS = 270,
    PROP_EXPIRY_TIME = 271,
    PROP_EXTENDED_TIME_ENABLE = 272,
    PROP_FAILED_ATTEMPT_EVENTS = 273,
    PROP_FAILED_ATTEMPTS = 274,
    PROP_FAILED_ATTEMPTS_TIME = 275,
    PROP_FORMAT_CLASS_SUPPORTED = 276,
    PROP_FORMAT_TYPE = 277,
    PROP_LAST_ACCESS_EVENT = 278,
    PROP_LAST_ACCESS_POINT = 279,
    PROP_LAST_CREDENTIAL_ADDED = 280,
    PROP_LAST_CREDENTIAL_ADDED_TIME = 281,
    PROP_LAST_CREDENTIAL_REMOVED = 282,
    PROP_LAST_CREDENTIAL_REMOVED_TIME = 283,
    PROP_LAST_USE_TIME = 284,
    PROP_LOCKDOWN = 285,
    PROP_LOCKDOWN_RELINQUISH_TIME = 286,
    PROP_MASTER_EXEMPTION = 287,
    PROP_MAX_FAILED_ATTEMPTS = 288,
    PROP_MEMBERS = 289,
    PROP_MASTER_POINT = 290,
    PROP_NUMBER_OF_AUTHENTICATION_POLICIES = 291,
    PROP_OCCUPANCY_COUNT = 293,
    PROP_OCCUPANCY_COUNT_ENABLE = 294,
    PROP_OCCUPANCY_COUNT_EXEMPTION = 295,
    PROP_OCCUPANCY_LOWER_THRESHOLD = 296,
    PROP_OCCUPANCY_LOWER_THRESHOLD_ENFORCED = 297,
    PROP_OCCUPANCY_STATE = 298,
    PROP_OCCUPANCY_UPPER_LIMIT = 299,
    PROP_OCCUPANCY_UPPER_LIMIT_ENFORCED = 300,
    PROP_PASSBACK_EXEMPTION = 301,
    PROP_PASSBACK_MODE = 302,
    PROP_PASSBACK_TIMEOUT = 303,
    PROP_POSITIVE_ACCESS_RULES = 304,
    PROP_READ_STATUS = 305,
    PROP_REASON_FOR_DISABLE = 306,
    PROP_THREAT_AUTHORITY = 307,
    PROP_THREAT_LEVEL = 308,
    PROP_TRACE_FLAG = 309,
    PROP_TRANSACTION_NOTIFICATION_CLASS = 310,
    PROP_USER_EXTERNAL_IDENTIFIER = 311,
    /* enumerations 312-313 are used in Addendum k to ANSI/ASHRAE 135-2004 */
    PROP_CHARACTER_SET = 312,
    PROP_STRICT_CHARACTER_MODE = 313,
    /* enumerations 312-313 are used in Addendum k to ANSI/ASHRAE 135-2004 */
    PROP_BACKUP_AND_RESTORE_STATE = 314,
    PROP_BACKUP_PREPARATION_TIME = 315,
    PROP_RESTORE_PREPARATION_TIME = 316,
    /* enumerations 317-323 are used in Addendum j to ANSI/ASHRAE 135-2004 */
    PROP_USER_INFORMATION_REFERENCE = 317,
    PROP_USER_NAME = 318,
    PROP_USER_TYPE = 319,
    PROP_USES_REMAINING = 320,
    PROP_VENDOR_FORMAT_IDENTIFIER = 321,
    PROP_ZONE_FROM = 322,
    PROP_ZONE_TO = 323,
    /* enumerations 324-325 are used in Addendum i to ANSI/ASHRAE 135-2004 */
    PROP_BINARY_ACTIVE_VALUE = 324,
    PROP_BINARY_INACTIVE_VALUE = 325
        /* The special property identifiers all, optional, and required  */
        /* are reserved for use in the ReadPropertyConditional and */
        /* ReadPropertyMultiple services or services not defined in this standard.
*/
        /* Enumerated values 0-511 are reserved for definition by ASHRAE.  */
        /* Enumerated values 512-4194303 may be used by others subject to the  */
        /* procedures and constraints described in Clause 23.  */
} BACNET_PROPERTY_ID;
```