Orion Control Systems

www.orioncontrols.com

PT-Link-BACnet®
Technical Guide

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General Information

The OE368-22-BACNET, PT-Link-BACnet® provides bi-directional communication between your BACnet® protocol network and up to four of any of the following types of Orion controllers—MUA II, VAV/CAV or VCM:

MUA II Controller (Y200405)

VAV/CAV Controller (Y200301)

VCM Controller (SS1016, Y200409, Y200616)

NOTE: The PT-Link-BACnet® device can be used to connect to only four Orion controllers. If more than four Orion controllers are present in a system, you will need one or more additional PT-Link-BACnet® devices for integration with a BACnet® protocol network.

To determine what controller you have, you must look at the label located on the controller EPROM. If the controller label does not match any of the SS or Y numbers listed above, your controller will not work with the PT-Link-BACnet®.

Data Sharing

The PT-Link-BACnet® interface provides the following data sharing capabilities:

- Provides values from points on the Orion side of the gateway to BACnet® devices as if the values were originating from BACnet® objects.
- Allows BACnet® devices to modify point values on the Orion controller side of the PT-Link-BACnet® by using standard BACnet® write services.

Scheduling

- Ability to allow BACnet® devices to send Schedule events to the Orion controller side of the gateway by using standard BACnet® services.

Hardware Specifications

Table 1 contains the hardware specifications for the PT-Link-BACnet® interface.

Technical Data	
BACnet®-Mstp Loop	9600, 19200, 38400, 76800 Mbps
Controller Loop	RS-485, 9600 Baud Rate
Network Protocol	BACnet®
Protocol (WattMaster Loop)	HSI Open Protocol Token Passing
Power Input Voltage	24 VAC
Power Consumption	10 VA Maximum
Operating Temp	10°F to 149°F
Operating Humidity	90% RH Non-Condensing
Weight	8 oz.

Table 1: PT-Link-BACnet® Interface Technical Data

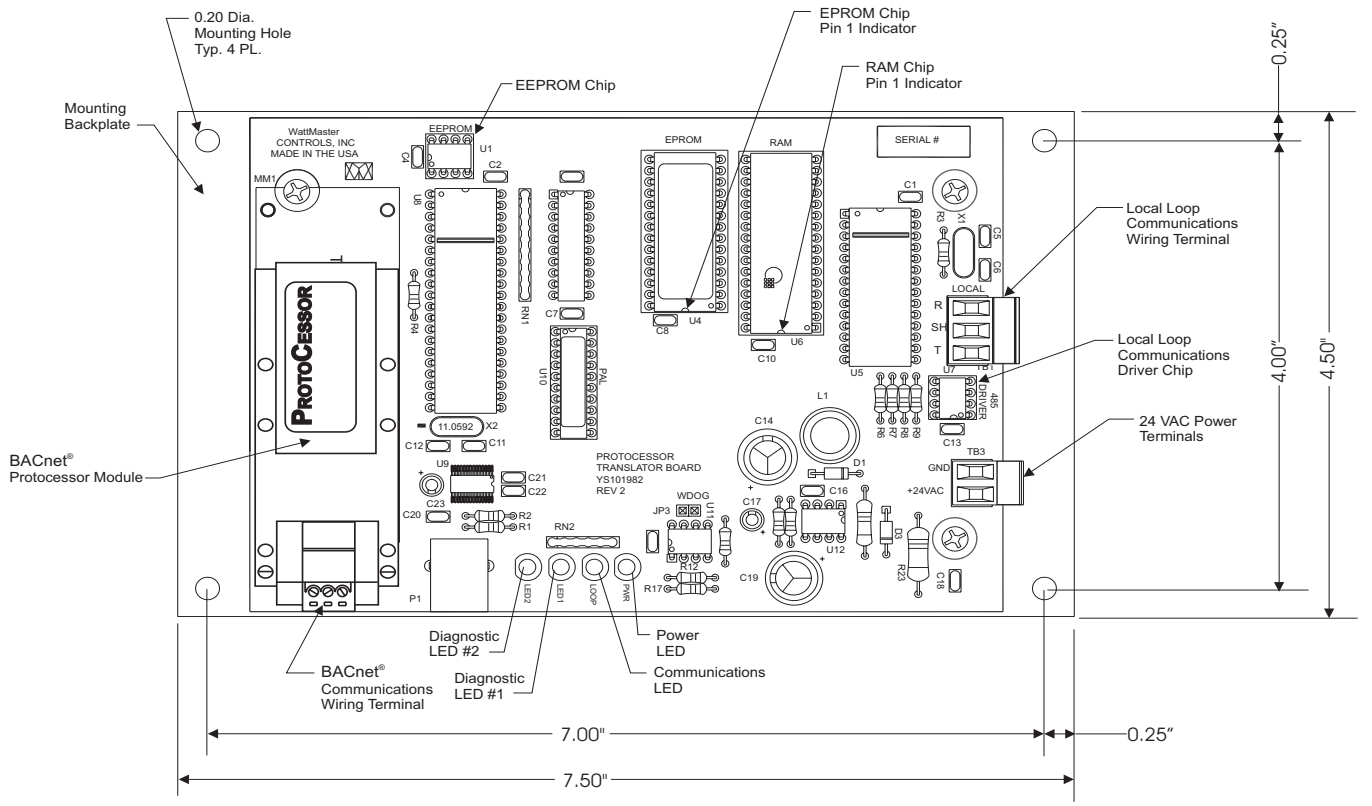


Figure 1: PT-Link-BACnet® Board Components and Dimensions

Connection and Wiring Information

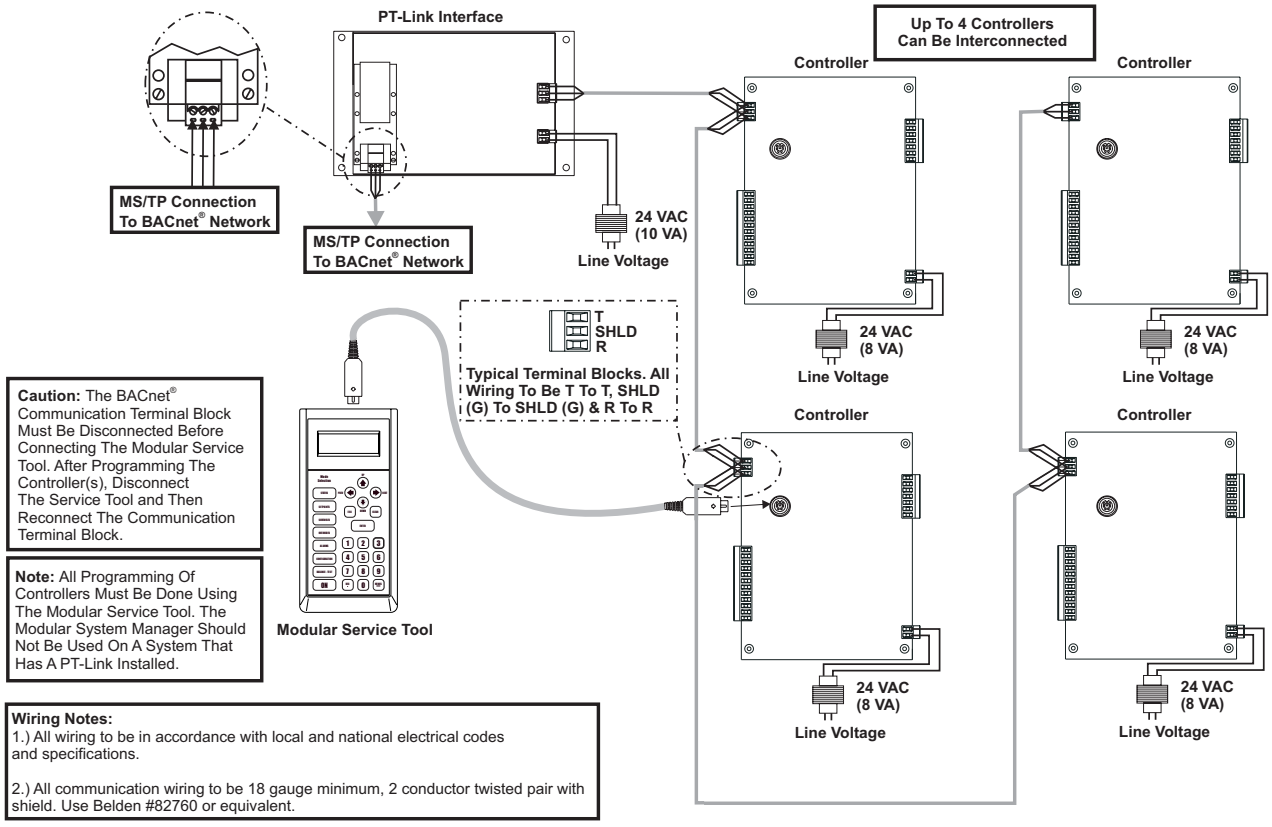


Figure 2: PT-Link-BACnet® Interface Wiring

Configuring the PT-Link Controller

PT-Link Hardware Connection

You have two options for connecting the PT-Link to your PC via Ethernet:

1.) You may connect the PT-Link directly to your PC by using a crossover cable (by others) as shown. **See Figure 3** for details.

2.) You can also connect both your PC and the PT-Link to an Ethernet Hub with standard CAT5 cables. **See Figure 4** for details.

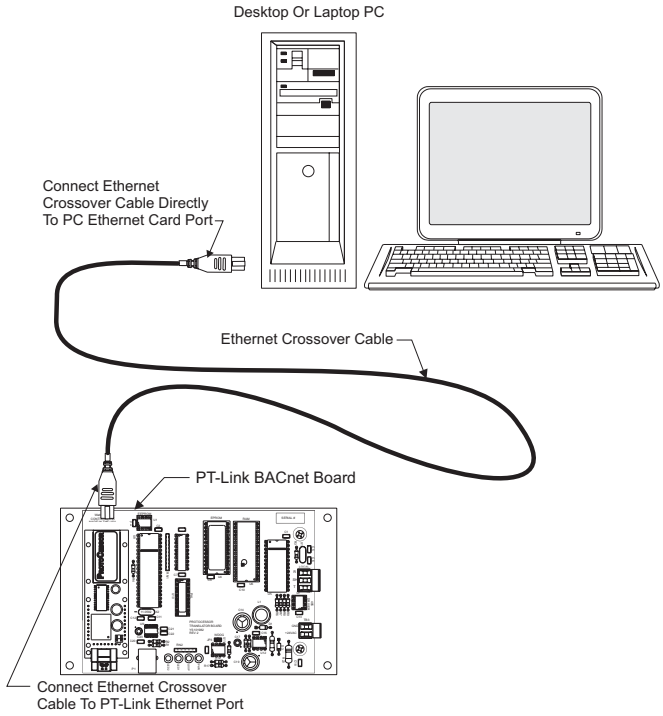


Figure 3: Connecting With Crossover Cable

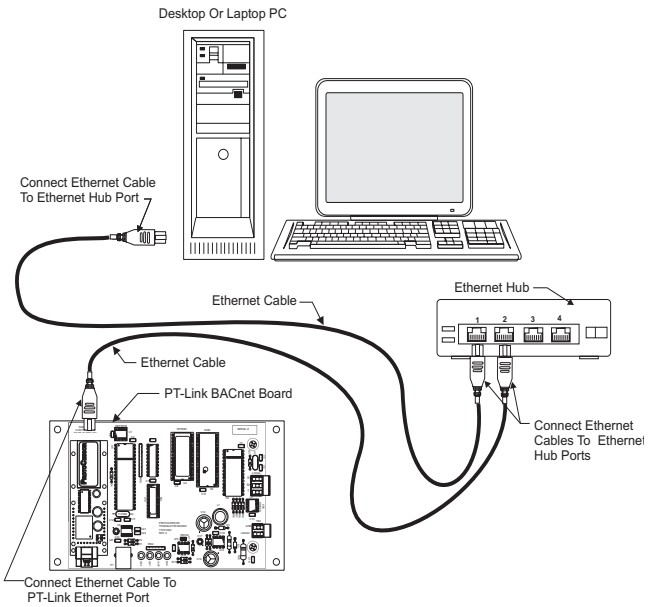


Figure 4: Connecting With Ethernet Cable & Hub

Locate a CAT5 cable and plug one end into your computer's Ethernet port (use a crossover cable if connecting directly to the PT-Link). If connecting directly, plug the other end of the Cable into the Ethernet port on the PT-Link. If connecting through an Ethernet Hub, plug the other end of the PC cable into the hub, and use a second CAT5 cable to connect the PT-Link to the hub as well.

Power up the PT-Link by plugging in the power cable. The PT-Link may take up to three minutes to power up completely. Once the PT-Link is powered up, you should notice that the green "**GPI05**" LED light on the ProtoCessor Board remains on continuously. **See Figure 19** for a diagram showing the location of the ProtoCessor "**GPI05**" LED.

Computer IP Address Set-up for Windows 98, NT, and XP

In order for the PT-Link to communicate properly, it is imperative to set the IP address of both the PT-Link as well as the computer to be within the same netmask. You need to change the IP address on your computer. The following instructions will explain how to configure the IP address for Microsoft® Windows 98 and Microsoft® Windows NT and XP computers.

Computer IP Address Set-up for Windows 98

1.) From the Windows START button select **Start->Setting->Control panel**.

2.) Double click on the **Network** icon.

3.) In the **Configuration** window, select the **TCP/IP** entry.

4.) Select **Properties** and go to the **IP Address** tab.

5.) Select **Specify an IP address** and then enter the following information:

   a.) IP Address 192.168.1.5

   b.) Netmask 255.255.255.0

6.) Select **OK** until the network configuration program exits.

7.) You might have to reboot the computer before the IP address is valid.

Configuring the PT-Link Controller

Computer IP Address Set-up for Windows NT or XP

1.) *Click* **<start>**; then *click* **<Control Panel>**.

2.) *Double-click* on the **Network Connections** icon. The Network Connections Window will appear.

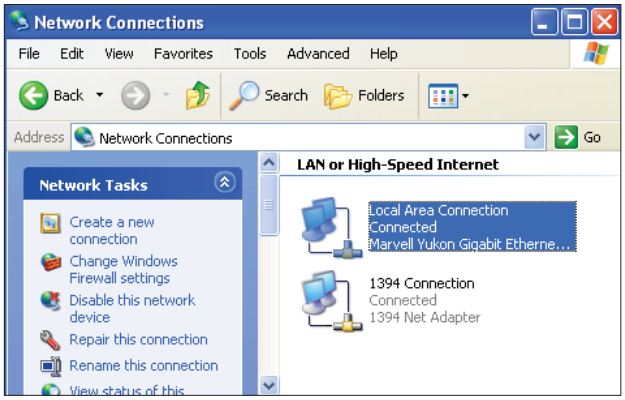


Figure 5: Network Connections Window

NOTE: If any wireless connections are listed, disable them by *right-clicking* the connection and *selecting* **<Disable>**.

3.) In the **Network Connections** window, *select* the **Local Area Connections** entry. The Local Area Connection Status Window will appear.

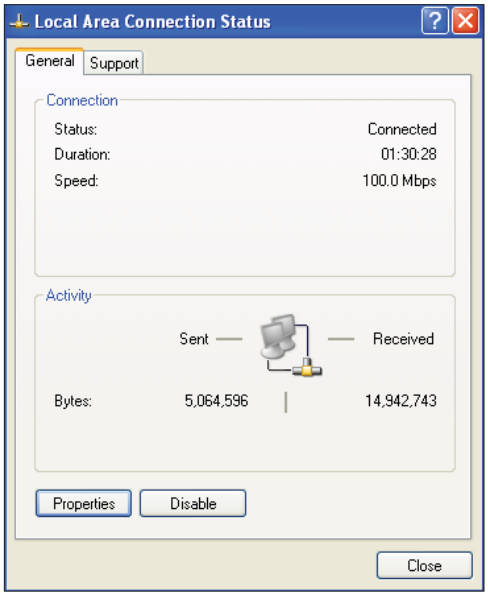


Figure 6: Local Area Connection Status Window

4.) *Click* **<Properties>** in the lower left of the window. The Local Area Connection Properties window will appear.

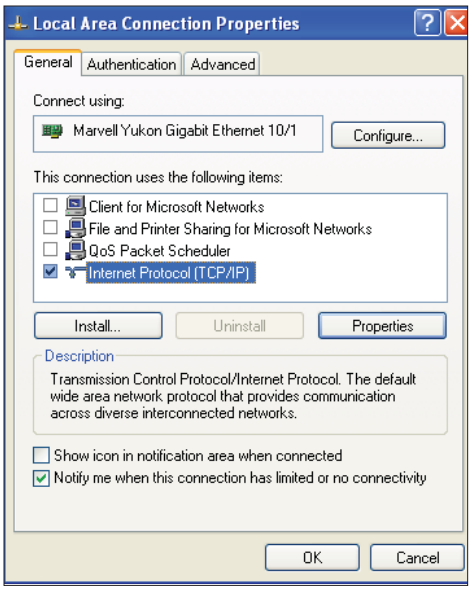


Figure 7: Local Area Connection Properties Window

5). In the Connection Items list box, be sure the Internet Protocol (TCP/IP) is checked. Select the Internet Protocol (TCP/IP) item to highlight it and then *click* **<Properties>**. The Internet Protocol Properties window will appear.

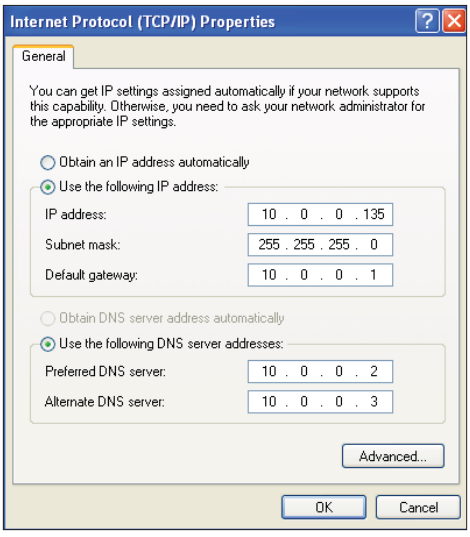


Figure 8: Internet Protocol Properties Window

6). *Type in* the following information:

a.) IP address 192.168.1.5
b.) Subnet mask 255.255.255.0
c.) Default Gateway is blank

7.) *Select* **<OK>** until all of the above network configuration windows are closed. You may have to *reboot* the computer before the new values are valid.

Configuring the PT-Link Controller

Connecting To The PT-Link

In order to communicate and program the PT-Link you will need to install RUINET software on your computer. If you do not have the software, it is available for downloading at www.orioncontrols.com in the software area of the website. After installing the software, proceed with the following instructions:

WARNING: Make sure to load RUINET onto your hard drive and run the program from your hard drive. DO NOT under any circumstances run RUINET from your cd drive.

If RUINET is in the desktop directory (if it isn't, locate its directory), double-click on RUINET, and the RUINET program should run. If you have only one PT-Link connected to the network, then RUINET will automatically connect to that particular PT-Link; otherwise, a menu will appear to allow the selection of the desired PT-Link.

This menu will look similar to the one shown in **Figure 9.**

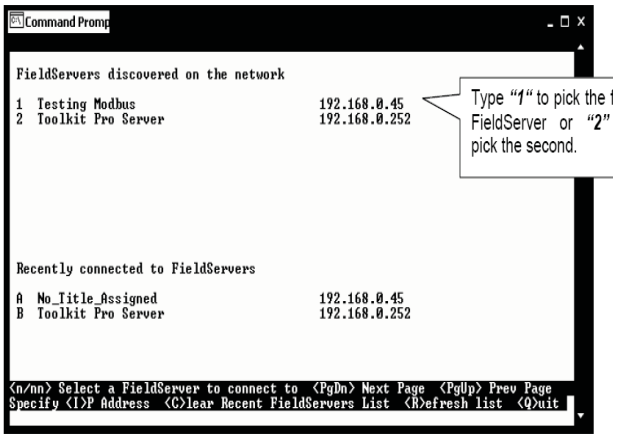


Figure 9: RUINET PT-Link Selection Menu

Select the required PT-Link by typing the Number or Letter in the left hand column. You should now have a menu that looks like **Figure 10**. You are now ready to send and receive files to and from the PT-Link.

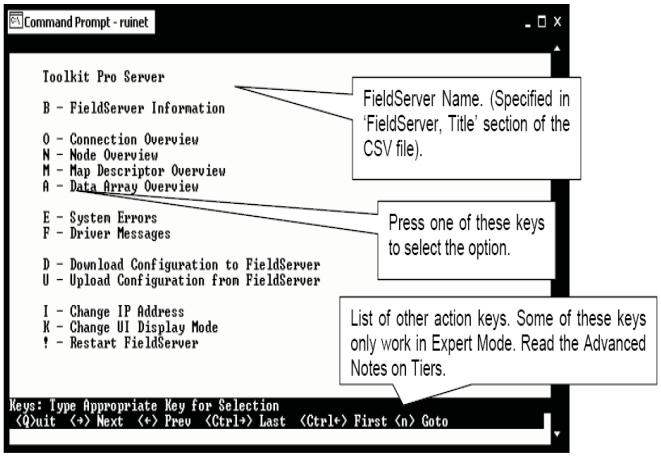


Figure 10: RUINET PT-Link Main Menu

Note: If RUINET is unable to establish a connection, there are a few simple procedures you can perform to try to determine the problem. To verify your network cables, observe the "**Yellow**" LED displayed below "**Ethernet Connection**" on the PT-Link's ProtoCessor Module. This LED should be on if the 10 BaseT cable is good. Secondly, observe the "**Green**" LED below "**Ethernet Connection**". This LED should be solid while RUINET is running. If the LEDs are lit as expected, and RUINET still does not receive replies, then the netmask is probably incorrect. If this does not help, then your Ethernet setup on your PC is possibly not compatible. Ensure that you have an Ethernet adapter installed in your software configuration and that it is configured to run the TCP/IP protocol. If you are still unable to connect, please contact WattMaster Controls.

Making Changes to the Configuration File (config.csv)

To make changes to the configuration file on the PT-Link, use the procedures outlined that follow — Upload, Modify, and Download the Configuration File.

Uploading Config.csv from the PT-Link

The PT-Link contains a configuration file (config.csv) that includes information such as addressing, baud rate, IP address, MAC address, etc. It can be uploaded from the PT-Link for modification if needed. When uploaded, this file can be located in the same directory that the RUINET executable file is stored and run from. Be sure when uploading that the correct file is specified in the upload window. Refer to Figures 11 & 12 for screen details.

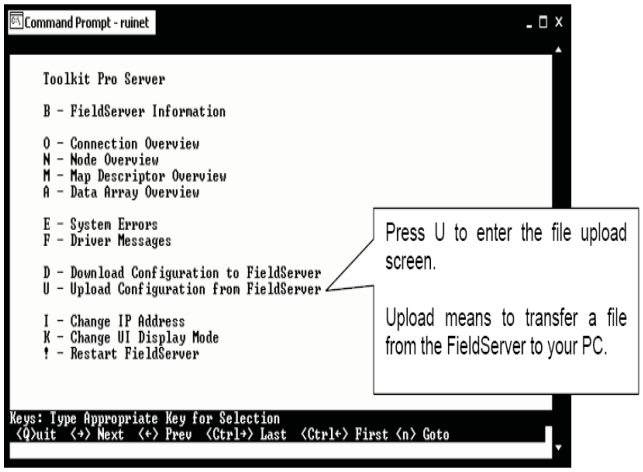


Figure 11: RUINET PT-Link Main Menu - Upload

Configuring the PT-Link Controller

From the Main Menu, type ***"U."*** The menu in Figure 12 will appear.

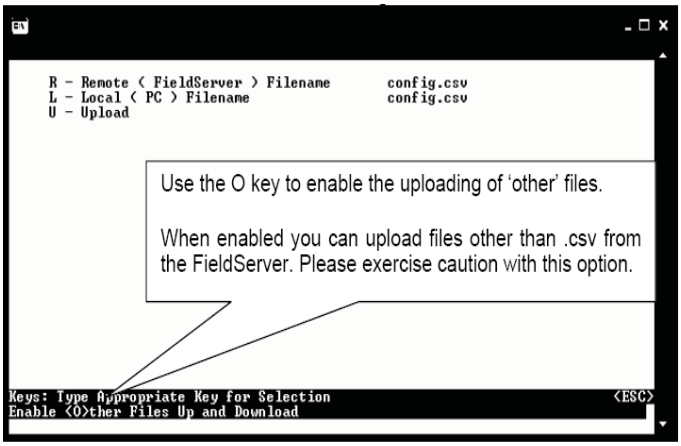


Figure 12: RUINET PT-Link Uploading Files

1). Begin the upload by pressing ***"U."***

2.) When the upload is completed, open the uploaded file using Microsoft® Notepad. This program is supplied with Microsoft Windows®. Type ***"N"*** to open using Notepad.

WARNING: Only edit the config.sys file using Notepad. **Do not** use Excel. Using Excel to edit the config.sys file will corrupt its contents!

Modifying Config.csv

Make sure to upload the configuration file (config.csv) from the PT-Link control using the instructions in the previews section. After the configuration file has been uploaded open, the file using Microsoft® Notepad. Now you are ready to make modifications to the configuration. **See Figures 13, 14 and 15** for a view of the section of code related to the Configuration of the PT-Link.

Changing the Baud Rate

To change the Baud Rate, execute the instructions that follow and **see Figure 13** for an example.

1.) Open the configuration file.
2.) Locate the Connections section.
3.) Locate the Server Baud column.
4.) Change the Server_Baud values to the desired Baud Rate (9600, 19200, 38400, 76800).
5.) Save the configuration file with the new changes.
6.) Download the modified configuration file to the PT-Link.
* See the Download Config.cvs section on page 10.
7.) Restart the PT-Link.

NOTE: For information on how the client will see the Orion units, see the next section.

```
Connections,,,,,,,,,,
Port ,Baud  ,Data_Bits ,Stop_Bits ,Parity ,Protocol, Auto_Config_Client, Auto_Config_Server, Server_Object_ID_Style, Virtual_Server_Nodes, Server_Baud
S1   ,38400,8,1,None   ,wattmstr, Yes              , BACnet-mstp       ,5, No                 ,38400

//===============================================================================,,,,,,,,,,
```

Figure 13: Changing the Baud Rate

Configuring the PT-Link Controller

Changing the Unit Address

To change the Unit Address, execute the instructions that follow and **see Figure 14** for an example.

1.) Open the configuration file.
2.) Locate the Client Side Nodes section.
3.) Locate the Node_ID column.
4.) Change the Node_ID value to the desired Unit Address.
5.) Save the configuration file with the new changes.
6.) Download the modified configuration file to the PT-Link.
7.) Restart the PT-Link.

```
//,,,,,,,,,,
//    Client Side Nodes,,,,,,,,,
//,,,,,,,,,,
"//   The Client Node_ID is used when",,,,,,,,,
//      virtual server side nodes are created for MSTP and MN2,,,,,,,,,
//      The driver adds the Node_ID to the instance number of each,,,,,,,,,
"//   class to make a server node_ID.",,,,,,,,,
//,,,,,,,,,,

Nodes,,,,,,,,,
Node_Name ,Node_ID ,Protocol ,Port
NODE_01   ,1,wattmstr ,S1

//=============================================================================,,,
```

Figure 14: Changing the Unit Address

Changing the MAC Address

To change the MAC Address, execute the instructions that follow and **see Figure 15** for an example.

1.) Open the configuration file.
2.) Locate the Common Information section.
3.) Locate the System_Node_ID column.
4.) Change the System_Node_ID valued to the desired value.
5.) Save the configuration file with the new changes.
6.) Download the modified configuration file to the PT-Link.
7.) Restart the PT-Link.

```
//=============================================================================,
//,
//    Common Information,
//,
//,
"//         System_Node_Id",
"//   --------------",
"//   For BACnet_MSTP the System_Node_id is used as the MAC address.",
//,
//,
Bridge,
"Title              ",System_Node_Id
Wattmaster 1.00c ,11


//=============================================================================,
```

Figure 15: Changing the MAC Address

Downloading Config.csv to the PT-Link

NOTE: Before attempting to send files to the PT-Link, make sure that these files are in the same directory as the RUINET utility being used for sending.

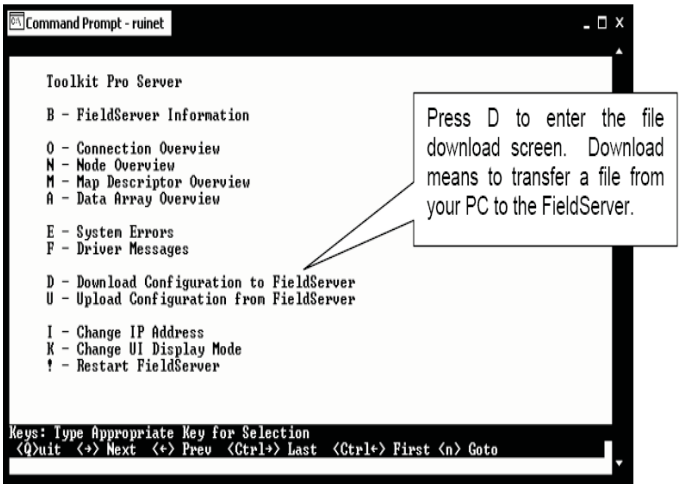


Figure 16: RUINET PT-Link Main Menu - Download

From the Main Menu, type ***"D"***. The menu shown in **Figure 17** will appear.

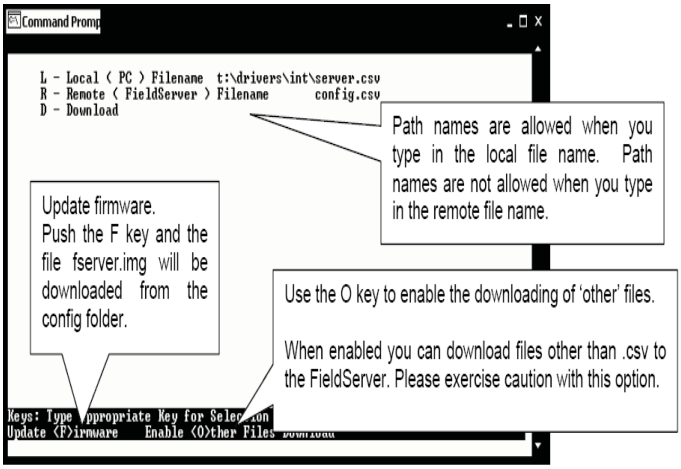


Figure 17: RUINET PT-Link Downloading Files

1.) Begin the download by selecting ***"D."***

NOTE: The utility will indicate when downloading is complete. **DO NOT** reset the PT-Link until this message is displayed, as this will corrupt the PT-Link.

2.) Once the download is complete, push <***Esc***> to get back to the main menu and use the "**!**" option (or simply cycle power to the PT-Link) to put the new file into operation. It is possible to do multiple downloads to the PT-Link before resetting it.

NOTE: The Remote Filename option must always be named "**config.csv**" for configurations; otherwise, they will be ignored by the PT-Link.

Troubleshooting the PT-Link Controller

Addressing WattMaster Devices in a BACnet® Network.

Each PT-Link-BACnet® generates only one BACnet® device regardless of the number of WattMaster controls connected to it. This device will have all the properties of all the WattMaster controls connected. The instance of the device is equal to the unit address (see Changing the Unit Address section of this manual). The properties of each control can be differentiated by an offset of 500. Examples:

1.) Properties of the controller address as 1 will range from 0 to 499.
2.) Properties of the controller address as 2 will range from 500 to 999.
3.) Properties of the controller address as 3 will range from 1000 to 1499.

To search for the instance of a specific property, follow the next formula:

Property Instance = ((Controller Address – 1) * 500) + Instance Number from table.

Example:

1.) The PT-Link-BACnet® has a Node ID equal to five.
2.) Two VCM controllers connected and addressed to one and four.
3.) Searching for the Outdoor Temperature of each controller.
4.) Instance of the Outdoor Temperature in the VCM table equal to AI: 54.
5.) Client will only see Device 5.
6.) Under Device 5 it will see AI: 54 for the Outdoor Temperature of the unit addressed as 1 and AI: 1554 for the Outdoor Temperature of the unit addressed as 4.

NOTE: To simplify the calculation, we recommend that the WattMaster controllers be addressed in sequential order from one to the last controller without any unused address(es) in between.

PT-Link Board LEDs

The PT-Link-BACnet® is equipped with LEDs that can be used for troubleshooting. There are four LEDs on the PT-Link board. **See Figure 18** for the locations of the LEDs on the PT-Link board. The LED descriptions and functions are listed in the following paragraphs.

PWR LED

When the PT-Link-BACnet® is powered up, the "**PWR**" LED should light up and stay on continuously. If it does not light up, check to be sure that you have 24 VAC connected to the board, that the wiring connections are tight, and that they are wired for correct polarity. The 24 VAC power must be connected so that all ground wires remain common. If after making all these checks the "**PWR**" LED still does not light up, please contact WattMaster Controls Technical Support at our Toll Free number—866-918-1100—for assistance.

LOOP LED

When power is applied to the PT-Link-BACnet®, the "**LOOP**" LED will also light up. The LED should flicker rapidly, indicating that the PT-Link is trying to communicate with the controllers on the loop. A "**flicker**" is defined as a brief moment when the LED turns off and back on. If the "**LOOP**" LED does not operate as indicated above, first power down the unit and then reapply power. If this does not work, please contact WattMaster Controls Technical Support at our Toll Free number—866-918-1100—for assistance.

LED 1

When power is first applied, "**LED 1**" will be off temporarily and then will blink one time for each controller it is communicating with. For example, if you have 4 controllers on the loop connected to the PT-Link, "**LED 1**" will blink 4 times. If the amount of blinks does not match the number of controllers connected to the loop, it indicates there is a communications problem. The best way to find out which board is not communicating is to go to each controller and look at its "**COMM**" LED. The "**COMM**" LED should be solid and will flicker occasionally indicating communication with the PT-Link-BACnet®. If the "**COMM**" LED does not flicker, there is no communication with that controller.

LED 2

When power is first applied, "**LED 2**" will be off temporarily and then will blink slowly indicating that the PT-Link baseboard is communicating with the Protocessor Module. If **"LED 2"** does not blink, check that the Protocessor Module is installed correctly in the PT-Link baseboard.

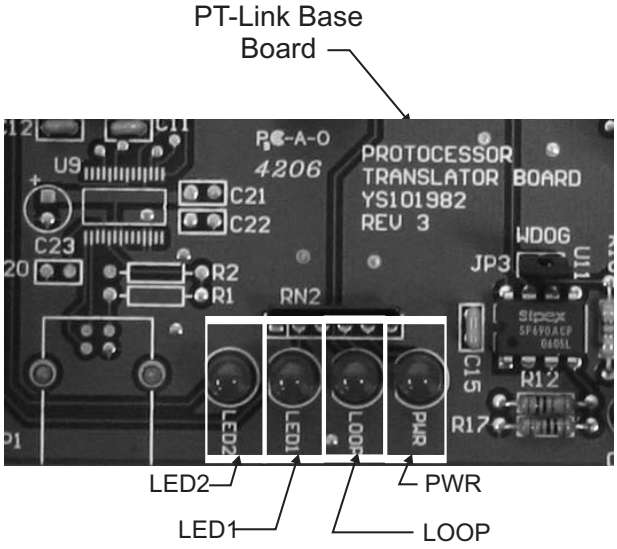


Figure 18: PT-Link-BACnet® LED Locations

Troubleshooting the PT-Link Controller

ProtoCessor Module LEDs

PWR LED

When the PT-Link is first powered up, the "**PWR**" LED should light up and stay on continuously. **See Figure 19**. If the LED doesn't light up, check that the ProtoCessor is installed correctly and firmly connected to the Base Board.

GPI05 LED

The "**GPI05**" LED will light up when the Base Board and the ProtoCessor Module have established communications. **See Figure 19**. This can take up to 3 minutes depending on the number of units connected to the PT-Link. If it fails to light up after 3 minutes, check that the ProtoCessor is installed correctly and firmly to the Base Board.

LB LED

Once the unit is powered up, the "**LB**" LED must be blinking constantly. **See Figure 19**. If this LED is constantly on or off, the Module is not working properly and needs to be replaced.

LA LED

Once the unit is powered up, the "**LA**" LED must be blinking constantly. **See Figure 19**. If this LED is constantly on or off, the Module is not working properly and needs to be replaced.

TX & RX LEDs

The "**TX**" and "**RX**" LEDs work together to indicate that communication is being established with the desired protocol network. If both LEDs are blinking, then communication is working properly. **See Figure 19**. If not, check the protocol network wiring and the baud rate in the configuration file.

If all of these tests are made and the controller still doesn't operate, please contact WattMaster Controls Technical Support at our Toll Free number—866-918-1100—for assistance.

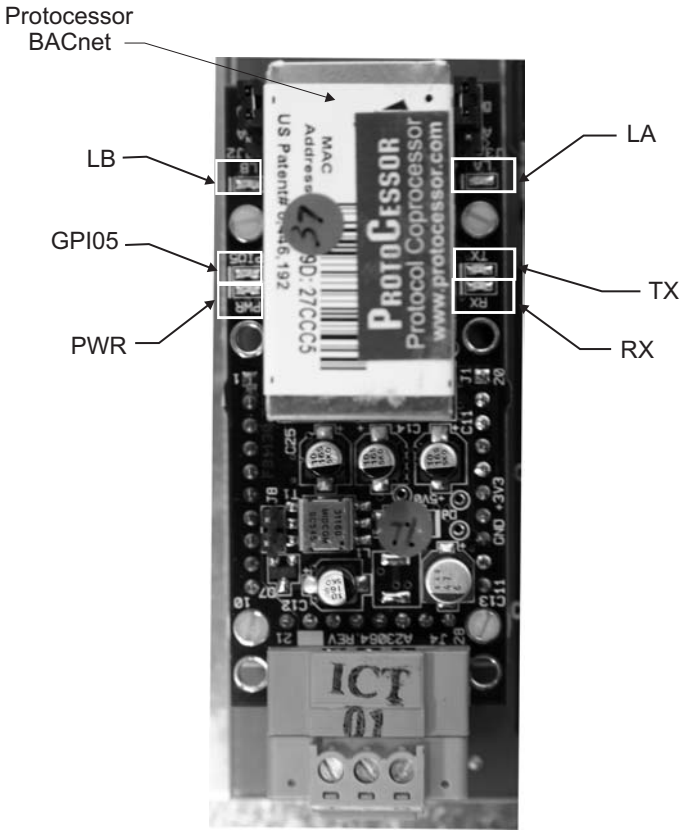


Figure 19: PT-Link-BACnet® LED Locations

Troubleshooting the PT-Link Controller

Using RUINET

Before continuing with the troubleshooting, make sure the PT-Link is connected correctly and the RUINET software is installed, running, and functioning correctly.

Verifying Proper Communications

From the **Main Screen**, press ***"O"*** to go the **Connection Overview Screen**. This screen supplies information on communication between the PT-Link and remote devices. A number of aspect screens are available, and some of the aspect screens have more than one page. Use the space bar to toggle between aspects and use the ***<PgUp>*** and ***<PgDn>*** keys to toggle between pages of the same aspect. The **Connection Overview and Settings Aspect Screen** is shown in **Figure 20**.

The main purpose in this screen is to verify that messages and characters are being transmitted and received. In addition, it shows the number of communication errors. If the PT-Link connection "**03**" is the protocol connection, verify that is communicating appropriately. If it is not, check that the PT-Link LEDs are working properly, the unit is wired correctly, and the PT-Link is configured correctly (Baud Rate, Unit Address & MAC Address). If the number of errors is constantly increasing, move to the **Error Screen** by pressing the ***<Space Bar>*** 3 times to find out the cause of the errors. Use the ***<PgUp>*** and ***<PgDn>*** keys to toggle between pages of the **Error Screen**.

Verifying Proper Values

To verify that the correct values for each unit are being communicated to the PT-Link, move to the **Data Array Overview Screen.** To get to the screen, press ***"A"*** from the **Main Menu**. **See Figure 21** for screen details.

In the **Data Array Overview Screen** (**Figure 21**) you will be able to see the data arrays of all the units connected to the PT-Link denoted by an array name **"DA_XXX_IY"—Y** being the address of the unit minus one. The Address of the unit is determined by a set of dip switches. To view the values being communicated from a specific unit, move to the **Data Array Detail Screen** (**Figure 22**) of the unit by entering the number under which it is listed. For example, for the unit listed in the third position, enter **"03"**.

To understand what each value means, look at the Data Array Tables for the desired unit type, VAV/CAV, MUA II, or VCM. You can change the writable values from this screen by using the modify command. To use the modify command press ***"M"*** from the **Data Array Detail Screen** and then enter the Offset you want to change followed by a space and the new value. Example: To change the Cooling Supply Setpoint to 60 in the VAV/CAV, press ***"M"***, enter ***"58 60"***, and then press ***<Enter>***. This could be useful to prove that the unit can take and keep the set-points properly.

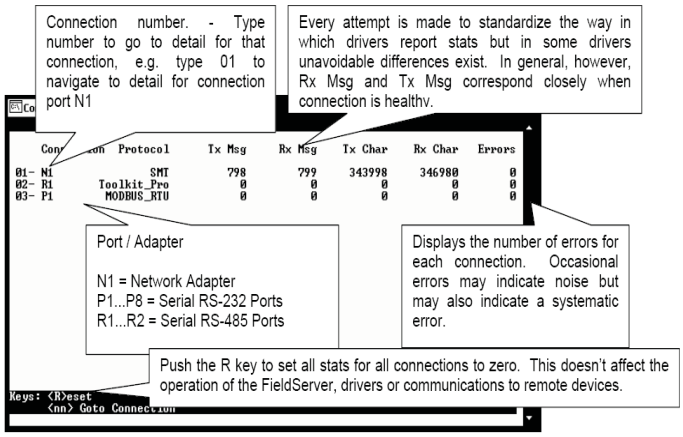


Figure 20: Connection Overview Screen

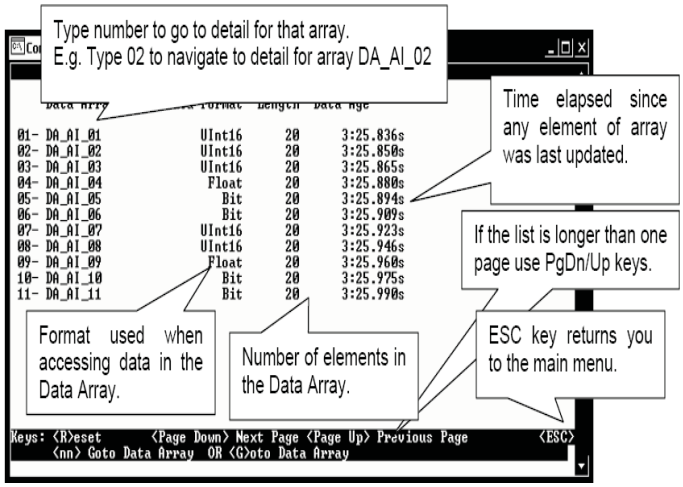


Figure 21: Data Array Overview Screen

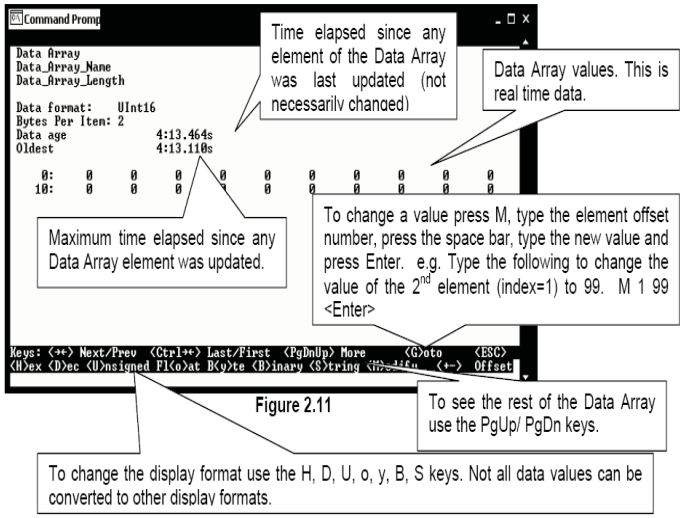


Figure 22: Data Array Detail Screen

Data Arrays

MUA II Data Arrays For Field Server								
Offset	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	AppVer	SaTpStM	OaTp	OaClSt	OaHtSt	OaDwpt	OaDwptSt	OaRh
8	OaEtp	OaEtpSt	OaEtpDb	CtrlSts	CtrlMod	ClDnmd	HtDmnd	DehmDmnd
16	FanDly	PofCfg	InRhIns	SpcTpIns	ExHtCfg	RtRlyCfg	MdHt2Ins	Rt2Ins
24	OnRlys	ExRlys1	ExRlys2	ExRlys3	InRh	AlmSts	SaTpAlm	OaTpAlm
32	RhAlm	PofAlm	LoSaAlm	HiSaAlm	ExHtPos	SpcTp	MdHt2Pos	Rt2Pos
40	SaTp	ClDb	HtDb	DptSt	EtpDb	SaRstSt	SpcTpMax	SpcTpMin
48	DptRstLt	InRhMax	InRhMin	ExHtPBd	SaTpSt	SchdFrc	OnRly1	OnRly2
56	OnRly3	OnRly4	OnRly5	ExRly1	ExRly2	ExRly3	ExRly4	ExRly5
64	ExRly6	ExRly7	ExRly8	ExRly9	ExRly10	ExRly11	ExRly12	ExRly13
72	ExRly14	ExRly15	ExRly16	–	–	–	–	–

Table 2: MUA II Data Array For Field Server

VAV/CAV Data Arrays For Field Server								
Offset	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	AppVer	ClSt	HtSt	OaWtbl	TpDmnd	SpcTp	SaTp	RaTp
8	OaTp	DuctPr	OaRh	CrltSts	CtrlMod	AhuEco	OaTpAlm	CO2Cfg
16	HtClDsbl	DehmMod	MdHt2Ins	Rt2Ins	CntlInf	ClDmnd	HtDmnd	ClEnbl
24	HtEnbl	EcoEnbl	FanDly	WmupDmnd	PofAlm	HumSt	PofCfg	CavCfg
32	HtPmpCfg	RhCfg	WtblCfg	RfPrCfg	OnRlys	ExRlys12	ExRlys3	ExRlys4
40	EcoPos	VfdBwPos	VfdExPos	AlmSts	SpcTpAlm	MchClAlm	MchHtAlm	DrtFlAlm
48	HiSpcAlm	LoSpcAlm	RfPr	CrtlTp	OcpClSt	OcpHcSt	UnClSt	UnHtSt
56	StgDb	WtblSt	SaClSt	SaHtSt	WmupSt	SpcTpOst	SaTpOst	RaTpOst
64	OaTpOst	SchdFrc	OnRly1	OnRly2	OnRly3	OnRly4	OnRly5	ExRly1
72	ExRly2	ExRly3	ExRly4	ExRly5	ExRly6	ExRly7	ExRly8	ExRly9
80	ExRly10	ExRly11	ExRly12	ExRly13	ExRly14	ExRly15	ExRly16	DuctPrSt
88	MinEcoSt	RfPrSt	CO2Level	CO2St	–	–	–	–

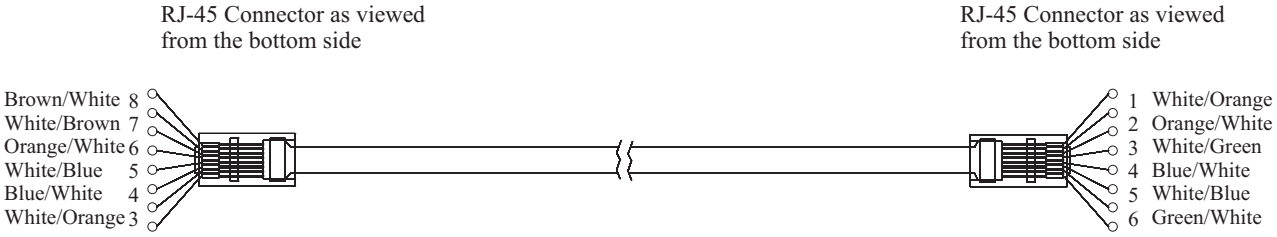
Table 3: VAV/CAV Data Array For Field Server

Data Arrays

VCM Data Arrays For Field Server								
Offset	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	AppVer	ClSt	HtSt	OaWtbl	TpDmnd	SpcTp	SaTp	RaTp
8	OaTp	DuctPr	OaRh	UnitMode	CtrlSts	ClDmnd	HtDmnd	DehmDmnd
16	ClEnbl	HtEnbl	EcoEnbl	FanDly	WmupDmnd	PofCfg	CO2Cfg	MdHt2Ins
24	Rt2Ins	OnRlys	ExRlys12	ExRlys34	EcoPos	VfdBwPos	VfdExPos	AlrmSts
32	AlrmGrp1	AlrmGrp2	AlrmGrp3	SaTpAlm	OpTpAlm	SpcTpAlm	MchClAlm	MchHtAlm
40	PofAlm	DrtFlAlm	SmokeAlm	LoSaAlm	HiSaAlm	CtrlTpCF	CtrlTpHF	CtrlTp
48	InRh	InRhStM	DptStM	MdClPos	MdHtPos	MdHt2Pos	Rt2Pos	OcpClSt
56	OcpHtSt	UnClOst	UnHtOst	WtblSt	SaClSt	SaHtSt	WmupSt	SpcTpOst
64	SaTpOst	RaTpOst	OaTpOst	CoilTpSt	DptSt	InRhSt	DuctPrSt	RfPrSt
72	SchdFrc	OnRly1	OnRly2	OnRly3	OnRly4	OnRly5	ExRly1	ExRly2
80	ExRly3	ExRly4	ExRly5	ExRly6	ExRly7	ExRly8	ExRly9	ExRly10
88	ExRly11	ExRly12	ExRly13	ExRly14	ExRly15	ExRly16	CO2St	MinEcoSt
96	CO2Level	ByPasDmp	RaDmp	RfPr	–	–	–	–

Table 4: VCM Data Array For Field Server

Appendix A



Use the standard EIA/TIA color code for "CROSS OVER CABLE" as shown.
It is not the same as a standard Cat 5 patch cabling. The outer cable jacket should Be "Orange" in color. This is not a straight thru pin 1 to pin 1 cable.

Figure 23: RJ-45 8P8C Cable for WattMaster Cross Over Networking - WattMaster Part #HZ000136

Appendix B

ProtoCessor Driver - (PICS) BACnet Protocol Implementation Conformance Statement

BACnet® Protocol

Date:	July 13, 2006
Vendor Name:	FieldServer Technologies
Product Name:	FieldServer
Product Model Number:	ASP-485 ProtoCessor
Product Description:	This software product will provide bi-directional communication between various RTU, DCS, SCADA and PLC using most common protocols and a BACnet system. The FieldServer can perform protocol conversion (as opposed to routing) between the different BACnet Data Link Layer options. This is arranged by way of static mappings.
Protocol Conversions:	See FieldServer Technologies list of protocol drivers available to determine available protocol conversions.

BACnet Standarized Device Profile (Annex L)

- √ BACnet Smart Sensor (B-SS)
- √ BACnet Smart Actuator (B-SA)
- √ BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K):

- √ K.1.2 BIBB - Data Sharing - ReadProperty-B (DS-RP-B)
- √ K.1.8 BIBB - Data Sharing - WriteProperty-B (DS-WP-B)
- √ K.5.2 BIBB - Device Management - Dynamic Device Binding-B (DM-DDB-B)

Segmentation Capability: None

Standard Object Types Supported

- √ Device Object
- √ Analog Input
- √ Analog Output
- √ Analog Value
- √ Binary Input
- √ Binary Output
- √ Binary Value
- √ Multi State Input Output
- √ Multi State Output
- √ Multi State Value

For all of these properties, the following applies:

1). Does not support BACnet CreateObject

2.) Does not support BACnet DeleteObject

3.) Does not support any optional properties

4.) No additional writeable properties exist

5.) No proprietary properties exist

6.) No range restrictions exist

Data Link Layer Options:

- √ MS/TP master (Clause 9), baud rate up to 76800 bps
- √ MS/TP slave (Clause 9), baud rate up to 76800 bps

Device Address Binding: Not supported

Character Sets Supported:

Where support for multiple character sets is indicated, this does not imply that they can all be supported simultaneously.

- √ ANSI X3.4
- □ ISO 10646 (UCS-2)
- □ IBM/Microsoft DBCS
- □ ISO 10646 (ICS-4)
- □ ISO 8859-1
- □ JIS C

Appendix C - VCM BACnet Parameters

BACnet Properties For VCM Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Application Software Version	AppVer	AI: 99	Current version of the software in the unit.	
Alarm Status	AlrmSts	AI: 1	Needed only in legacy application.	
Unit Mode	UnitMode	AI: 123	Needed only in legacy application.	
Control Status	CtrlSts	AI: 4	Current operational status.	
Control Temperature	CtrlTp	AI: 9	Current value of the control temperature sensor.	
Cooling Setpoint	ClSt	AI: 7	Current calculated cooling setpoint.	
Duct Static Pressure	DuctPr	AI: 14	Current value of the duct static pressure sensor.	
Economizer Position	EcoPos	AI: 16	Current position of the economizer damper.	
External Relays 1-2	ExRlys12	AI: 111	Needed only in legacy application.	
External Relays 3-4	ExRlys34	AI: 112	Needed only in legacy application.	
Indoor Humidity	InRh	AI: 67	Current value of the indoor humidity sensor.	
Heating Setpoint	HtSt	AI: 31	Current calculated heating setpoint.	
On Board Relays	OnRlys	AI: 44	Needed only in legacy application.	
Outdoor Air Humidity	OaRh	AI: 52	Current value of the outdoor humidity sensor.	
Outdoor Air Temperature	OaTp	AI: 54	Current value of the outdoor temperature sensor.	
Outdoor Air Wetbulb	OaWtbl	AI: 55	Current calculated value of the outdoor wetbulb temperature.	
Relief Pressure	RfPr	AI: 62	Current value of the building pressure sensor.	
Return Air CO_2 Level	CO2Level	AI: 150	Current value of the CO_2 sensor.	
Return Air Temperature	RaTp	AI: 64	Current value of the return temperature sensor.	
Space Temperature	SpcTp	AI: 72	Current value of the space temperature sensor.	
Supply Air Temperature	SaTp	AI: 83	Current value of the supply air temperature sensor.	

Table 5: VCM Instance Number Base

BACnet Properties For VCM Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Temperature Demand	TpDmnd	AI: 84	Based on the comparison between the current Control Temperature and the Heating or Cooling Setpoint Temperatures. Does not work for supply air control.	
VFD Blower Fan	VfdBwPos	AI: 88	Current position of the VFD blower fan signal.	
VFD Relief Fan	VfdExPos	AI: 89	Current position of the VFD relief fan signal.	
Modulating Gas Valve Position	MdHt2Pos	AI: 38	Current position of MODGAS II modulating gas valve control.	
Reheat Value Position	Rt2Pos	AI: 60	Current position of MHGRV II modulating hot gas reheat valve control.	
Alarm Group 1	AlrmGrp1	AI: 104	Needed only in legacy application.	
Alarm Group 2	AlrmGrp2	AI: 105	Needed only in legacy application.	
Alarm Group 3	AlrmGrp3	AI: 106	Needed only in legacy application.	
Dewpoint Setpoint Mirror	DptStM	AI: 110	Mirror of the DPtSt "read only."	
Indoor RH Setpoint Mirror	InRhStM	AI: 114	Mirror of the InRhSt "read only."	
Modulating Cool Position	MdClPos	AI: 115	Current position of the modulating cooling signal (Chilled water or digital compressor).	
Modulating Heat Position	MdHtPos	AI: 116	Current position of the modulating heating signal (hot water or SCR heat).	
Bypass Damper Position	ByPasDmp	AI: 153	Current position of the bypass damper signal.	
Return Damper Position	RaDmp	AI: 154	Current position of the return damper signal.	

Table 5 Cont'd: VCM Instance Number Base

Appendix C - VCM BACnet Parameters

BACnet Properties For VCM Controller					
Parameter	**Name**	**Object**	**Description**	**Limits**	
Outdoor Air Dewpoint	OaDwpt	AI: 47	Current calculated outdoor air dewpoint added on version 1.09.		
Supply Air Setpoint Mirror	SaTpStM	AI: 82	Current supply air temperature setpoint added on version 1.09.		
Coil Temperature	CoilTp	AI: 181	Current coil temperature reading added on version 1.09.		
CO_2 Setpoint	CO2St	AO: 149	When the CO_2 level rises above the CO_2 Protection Limit Max Level, the Economizer's Minimum Position will begin to reset open proportionally between the CO_2 Protection Limit Max Level Setpoint and the Reset Range Setpoint.	0	3000
Static Pressure Setpoint	DuctPrSt	AO: 152	This is the target duct pressure to be maintained by the VFD blower signal.	0.01	3
Minimum Outside Air Setpoint	MinEcoSt	AO: 151	This is the minimum position of the economizer in the occupied modes.	1	100
Occupied Cooling Setpoint	OcpClSt	AO: 42	If the control temperature rises one degree above this setpoint, the control will activate the cooling demand. If the control temperature is the Supply Air Sensor, then the cooling demand is always active.	0	100

Table 5 Cont'd: VCM Instance Number Base

BACnet Properties For VCM Controller					
Parameter	**Name**	**Object**	**Description**	**Limits**	
Occupied Heating Setpoint	OcpHtSt	AO: 43	If the control temperature drops one degree below this setpoint, the control will activate the heating demand.If the control temperature is the Supply Air Sensor, then there is no heating demand.	0	100
Outdoor Air Sensor Offset	OaTpOst	AO: 53	If the Outdoor Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100
Relief Pressure Setpoint	RfPrSt	AO: 118	This is the target building pressure to be maintained by the VFD Relief signal.	-0.2	0.2
Return Air Sensor Offset	RaTpOst	AO: 65	If the Return Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100
Schedule Force	SchdFrc	AO: 66	Enter a value equal to 1 to force the unit to occupied and a value equal to 0 to send the unit to unoccupied.	0	2
Space Sensor Offset	SpcTpOst	AO: 71	If the Space Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100
Supply Air Cooling Setpoint	SaClSt	AO: 77	This is the supply air target temperature during the cooling mode.	40	80

Table 5 Cont'd: VCM Instance Number Base

Appendix C - VCM BACnet Parameters

BACnet Properties For VCM Controller					
Parameter	**Name**	**Object**	**Description**	**Limits**	
Supply Air Heating Setpoint	SaHtSt	AO: 78	This is the supply air target temperature during the heating mode.	40	200
Supply Air Sensor Offset	SaTpOst	AO: 80	If the Supply Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-100	100
Unoccupied Cooling Offset	UnClOst	AO: 124	During the Unoccupied Mode of Operation, this Setpoint spreads the Occupied Cooling Setpoint out by a user adjustable amount. If you do not want Cooling to operate during the Unoccupied Mode, use the default setting of 30°F for these setpoints.	0	30
Unoccupied Heating Offset	UnHtOst	AO: 125	During the Unoccupied Mode of Operation, this Setpoint spreads the Occupied Heating Setpoint out by a user adjustable amount. If you do not want Heating to operate during the Unoccupied Mode, use the default setting of 30°F for these setpoints.	0	30
Dewpoint Setpoint	DptSt	AO: 13	If the outdoor dewpoint rises above this setpoint, the unit will activate the Dehumidification Demand.	35	80

Table 5 Cont'd: VCM Instance Number Base

BACnet Properties For VCM Controller					
Parameter	**Name**	**Object**	**Description**	**Limits**	
Coil Temperature Setpoint	CoilTpSt	AO: 107	This is the coil suction temperature target during dehumidification mode. Produces dewpoint in the supply air approximately 10°F above this setpoint.	35	70
Indoor Humidity Setpoint	InRhSt	AO: 120	If the indoor humidity rises above this setpoint, the unit will activate the Dehumidification Demand.	0	100
Warm Up Setpoint	WmupSt	AO: 91	In a VAV application, upon entering the occupied mode, the Warm-up Demand will be activated if the return air temperature rises one degree above this setpoint.	50	90
Wet Bulb Setpoint	WtblSt	AO: 92	The economizer is enabled if the outdoor wetbulb reading rises above this setpoint.	0	80
Bad Supply Air Sensor	SaTpAlm	BI: 2	Alarm that indicates a failure in the supply air sensor.		
CO_2 Sensor Installed	CO2Cfg	BI: 3	Status that indicates the CO_2 function has been configured.		
Cooling Demand	ClDmnd	BI: 5	Status that indicates a demand for cooling.		
Cooling Enabled	ClEnbl	BI: 6	Status that indicates mechanical cooling is enabled.		
Economizer Enabled	EcoEnbl	BI: 15	Status that indicates the economizer is enabled.		
Fan Start Up Delay	FanDly	BI: 25	Status that indicates the fan is commanded to run, but it is in the start up delay mode.		

Table 5 Cont'd: VCM Instance Number Base

Appendix C - VCM BACnet Parameters

BACnet Properties For VCM Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Fan Proving Alarm	PofAlm	BI: 26	Alarm that indicates a failure in the flow of the VFD blower.	
Heating Demand	HtDmnd	BI: 29	Status that indicates a demand for heating.	
Heating Enabled	HtEnbl	BI: 30	Status that indicates that mechanical heating is enabled.	
High Supply Air Temperature	HiSaAlm	BI: 33	Alarm that indicates the supply air temperature has risen above acceptable levels. The unit will shutdown.	
Low Supply Air Temperature	LoSaAlm	BI: 37	Alarm that indicates the supply air temperature dropped below acceptable levels. The unit will shutdown.	
MODGAS II Connected	MdHt2Ins	BI: 39	Status that indicates the MODGAS II controller is connected.	
Proof of Flow Configured	PofCfg	BI: 57	Status that indicates the proof of flow function has been configured.	
REHEAT II Connected	Rt2Ins	BI: 58	Status that indicates the MHGRV II controllers is connected to the system.	
Warm Up Mode Active	WmupDmnd	BI: 90	Status that indicates the control is in the Warm-up mode.	
Mechanical Cooling Alarm	MchClAlm	BI: 94	Alarm that indicates the compressors are running, but the supply air temperature has not dropped more than 5°F w/in a user adjusted time period.	

Table 5 Cont'd: VCM Instance Number Base

BACnet Properties For VCM Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Mechanical Heating Alarm	MchHtAlm	BI: 95	Alarm that indicates the stages of heat are running, but the supply air temperature has not risen more than 5°F w/in a user adjusted time period.	
Dirty Filter Detected	DrtFlAlm	BI: 96	Alarm that indicates the filters are dirty.	
Control Temperature Cool Failure	CtrlTpCF	BI: 108	This alarm is activated if the control temperature does not get within 5°F to the occupied cooling setpoint in an hour in the cooling mode. This alarm is not used in 100% outside air units or supply air control.	
Control Temperature Heat Failure	CtrlTpHF	BI: 109	This alarm is activated if the control temperature does not get within 5°F to the occupied heating setpoint in an hour in the heating mode. This alarm is not used in 100% outside air units or supply air control.	
Dehumidification Demand	DehmDmnd	BI: 113	Status that indicates a demand for dehumidification.	
Outdoor Air Temperature Lost	OaTpAlm	BI: 117	Alarm that indicates a failure in the outdoor air temperature.	
Smoke Detected Alarm	SmokeAlm	BI: 119	Alarm that indicates the Smoke sensor has been activated.	
Space Temperature Sensor Lost	SpcTpAlm	BI: 101	Alarm that indicates a failure in the space temperature sensor.	
On Board Relay 1	OnRly1	BI: 127	Current status of relay 1.	
On Board Relay 2	OnRly2	BI: 128	Current status of relay 2.	
On Board Relay 3	OnRly3	BI: 129	Current status of relay 3.	
On Board Relay 4	OnRly4	BI: 130	Current status of relay 4.	

Table 5 Cont'd: VCM Instance Number Base

Appendix C - VCM BACnet Parameters

BACnet Properties For VCM Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
On Board Relay 5	OnRly5	BI: 131	Current status of relay 5.	
Expansion Relay 1	ExRly1	BI: 133	Current status of relay 6.	
Expansion Relay 2	ExRly2	BI: 134	Current status of relay 7.	
Expansion Relay 3	ExRly3	BI: 135	Current status of relay 8.	
Expansion Relay 4	ExRly4	BI: 136	Current status of relay 9.	
Expansion Relay 5	ExRly5	BI: 137	Current status of relay 10.	
Expansion Relay 6	ExRly6	BI: 138	Current status of relay 11.	
Expansion Relay 7	ExRly7	BI: 139	Current status of relay 12.	
Expansion Relay 8	ExRly8	BI: 140	Current status of relay 13.	
Expansion Relay 9	ExRly9	BI: 141	Current status of relay 14.	
Expansion Relay 10	ExRly10	BI: 142	Current status of relay 15.	
Expansion Relay 11	ExRly11	BI: 143	Current status of relay 16.	
Expansion Relay 12	ExRly12	BI: 144	Current status of relay 17.	
Expansion Relay 13	ExRly13	BI: 145	Current status of relay 18.	
Expansion Relay 14	ExRly14	BI: 146	Current status of relay 19.	
Expansion Relay 15	ExRly15	BI: 147	Current status of relay 20.	
Expansion Relay 16	ExRly16	BI: 148	Current status of relay 21.	

Table 5 Cont'd: VCM Instance Number Base

VCM PT-Link-BACnet® Property Identifier:

The PT-Link-BACnet® Link amends the following property identity to the BACnet® property identifier.

BACNETPropertyIdentifier :

WattBACNETScheduleForce ::= ENUMERATED {
NormalOperation (0),
ForceOccupied (1),
ForceUnoccupied (2)
}

VcmUnitMode ::= ENUMERATED {
Unoccupied (0),
RemoteContactOccupied (1),
NormalScheduleOccupied (2),
PushButtonOrZoneOverride (3),
HolidayModeActive (4),
UnoccupiedZoneDemand (5),
RemoteScheduleOverride (6),
CurrentOutputForceMode (7),
SATHighOrLowCutOff (8),
CO2OverrideInProgress (9),
PurgeModeActive (10)
}

VcmControlStatusBits ::= BIT STRING {
AhuControlEconomizer (0),
NoOutdoorAirTempSensor (1),
CarbonDioxideSensorPresent (2),
HeatCoolStagingDisabled (3),
DehumidificationMode (4),
ModGasIIConnected (5),
ReheatIIConnected (6)
}

VcmOnBoardRelaysBits ::= BIT STRING {
OnBoardRelay1 (0),
OnBoardRelay2 (1),
OnBoardRelay3 (2),
OnBoardRelay4 (3),
OnBoardRelay5 (4)
}

Appendix C - VCM BACnet Parameters

VcmExternal Relays1-2Bits::= BIT STRING {

ExpansionBoard1Relay1	(0),
ExpansionBoard1Relay2	(1),
ExpansionBoard1Relay3	(2),
ExpansionBoard1Relay4	(3),
ExpansionBoard2Relay1	(4),
ExpansionBoard2Relay2	(5),
ExpansionBoard2Relay3	(6),
ExpansionBoard2Relay4	(7)

}

VcmExternal Relays2-4Bits::= BIT STRING {

ExpansionBoard3Relay1	(0),
ExpansionBoard3Relay2	(1),
ExpansionBoard3Relay3	(2),
ExpansionBoard3Relay4	(3),
ExpansionBoard4Relay1	(4),
ExpansionBoard4Relay2	(5),
ExpansionBoard4Relay3	(6),
ExpansionBoard4Relay4	(7)

}

VcmAlarmStatusBits ::= BIT STRING {

Alarm Group1	(0),
Alarm Group2	(1),
Alarm Group3	(2)

}

VcmAlarmGroup1Bits ::= BIT STRING {

SupplyTempSensorFailure	(0),
LostOutdoorTempSensorSignal	(1),
LostSpaceTempSensorSignal	(2)

}

VcmAlarmGroup2Bits ::= BIT STRING {

MechanicalCoolingAlarm	(0),
MechanicalHeatingAlarm	(1),
FanProvingAlarm	(2),
DirtyFilterDetected	(3),
SmokeDetected	(4)

}

VcmAlarmGroup3Bits ::= BIT STRING {

LowSupplyAirTempAlarm	(0),
HighSupplyAirTempAlarm	(1),
LowControlTempAlarm	(2),
HighControlTempAlarm	(3)

}

Appendix D - MUA II BACnet Parameters

BACnet Properties for the MUA II Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Application Software Version	AppVer	AI: 99	Current version of the software in the unit.	
Alarm Status	AlmSts	AI: 1	Needed only in legacy application.	
Control Status	CtrlSts	AI: 4	Needed only in legacy application.	
Control Mode	CtrlMod	AI: 97	Needed only in legacy application.	
External Heat Position	ExHtPos	AI: 24	Current position of the external modulating heating signal.	
External Relays Group #1	ExRlys1	AI: 18	Needed only in legacy application.	
External Relays Group #2	ExRlys2	AI: 19	Needed only in legacy application.	
External Relays Group #3	ExRlys3	AI: 20	Needed only in legacy application.	
Modulating Gas Valve Position	MdHt2Pos	AI: 38	Current position of MODGAS II modulating gas valve control.	
On Board Relays	OnRlys	AI: 44	Needed only in legacy application.	
Outdoor Air Cooling Setpoint	OaClSt	AI: 45	Current calculated outdoor air cooling setpoint.	
Outdoor Air Dew Point	OaDwpt	AI: 47	Current calculated outdoor air dewpoint.	
Outdoor Air Dew Point Setpoint	OaDwptSt	AI: 48	Mirror of the DPtSt "read only."	
Outdoor Air Enthalpy	OaEtp	AI: 49	Current calculated outdoor air enthalpy.	
Outdoor Air Enthalpy Deadband	OaEtpDb	AI: 51	Mirror of the DtpDb "read only."	
Outdoor Air Enthalpy Setpoint	OaEtpSt	AI: 50	Calculated Enthalpy Setpoint at which the compressors start staging during dehumidification operation.	
Outdoor Air Heating Setpoint	OaHtSt	AI: 46	Current calculated outdoor air heating setpoint.	
Outdoor Air Humidity	OaRh	AI: 52	Current value of the outdoor humidity sensor.	

Table 6: MUA II Number Base

BACnet Properties for the MUA II Controller					
Parameter	**Name**	**Object**	**Description**	**Limits**	
Outdoor Air Temperature	OaTp	AI: 54	Current value of the outdoor temperature sensor.		
Reheat Value Position	Rt2Pos	AI: 60	Current position of the MHGRV II modulating hot gas reheat valve control.		
Space Humidity	InRh	AI: 67	Current value of the space humidity sensor.		
Space Temperature	SpcTp	AI: 72	Current value of the space air temperature sensor.		
Supply Air Setpoint Mirror	SaTpStM	AI: 82	Mirror of the SaTpSt "read only."		
Supply Air Temperature	SaTp	AI: 83	Current value of the supply air temperature sensor.		
Cooling Deadband	ClDb	AO: 98	The Cooling Deadband added to the Supply Air Setpoint gives the Cooling Mode Setpoint. When the Outside Air Temperature rises above this setpoint, the unit will go to Cooling Mode.	2	20
Dew Point Reset Limit	DptRstLt	AO: 12	During space humidity reset of the dewpoint, this is the lower limit of the dewpoint reset.	40	DP Spt.
Dewpoint Setpoint	DptSt	AO: 13	If the outdoor dewpoint rises above this setpoint, the unit will activate the Dehumidification Demand.	40	80
Enthalpy Deadband	EtpDb	AO: 17	The Enthalpy Deadband is the amount of Enthalpy in the Outside Air needed to activate an extra stage of cooling.	3	20
External Heat Proportion Band	ExHtPBd	AO: 23	The External Heat Proportional Deadband is the range through which the external heating device will proportionally modulate.	1	30

Table 6 Cont'd: MUA II Number Base

Appendix D - MUA II BACnet Parameters

BACnet Properties for the MUA II Controller					
Parameter	**Name**	**Object**	**Description**	**Limits**	
Heating Deadband	HtDb	AO: 28	The Heating Deadband is subtracted from the Supply Air Setpoint to get the Heating Mode Setpoint. When the Outside Air Temperature drops below this setpoint, the unit will go to Heating Mode.	2	20
Schedule Force	SchdFrc	AO: 66	Enter a value equal to 1 to force the unit to occupied and a value equal to 0 to send the unit to unoccupied.	0	2
Space Humidity At Max Supply	InRhMax	AO: 68	During space humidity reset of the dewpoint, this is the higher limit of the space humidity. This produces the lowest dewpoint possible.	0	100
Space Humidity At Min Supply	InRhMin	AO: 69	During space humidity reset of the dewpoint, this is the lower limit of the space humidity. This produces the highest dewpoint possible.	0	100
Space Temperature At Max Supply	SpcTpMax	AO: 74	During space temperature reset of the supply setpoint, this is the higher limit of the space temperature. This produces the lowest supply air setpoint possible.	40	100
Space Temperature At Min Supply	SpcTpMin	AO: 75	During space temperature reset of the supply setpoint, this is the lower limit of the space temperature. This produces the highest supply air setpoint possible.	40	100
Supply Air Reset Limit	SaRstSt	AO: 79	During space temperature reset of the supply setpoint, this is the highest limit of the supply setpoint reset.	SA Spt.	SA Spt. + 50

Table 6 Cont'd: MUA II Number Base

BACnet Properties for the MUA II Controller					
Parameter	**Name**	**Object**	**Description**	**Limits**	
Supply Air Setpoint	SaTpSt	AO: 81	The Supply Air Setpoint is the desired temperature to be delivered by the unit at any time during the occupied mode of operation.	50	90
Bad Supply Air Sensor	SaTpAlm	BI: 2	Alarm that indicates a failure in the supply air sensor.		
Cooling Demand	ClDnmd	BI: 5	Status that indicates a demand for cooling.		
Dehumidification Demand	Dehm Dmnd	BI: 10	Status that indicates a demand for dehumidification.		
External Heat Configured	ExHtCfg	BI: 22	Status that indicates the unit has been configured to control modulating external heat source.		
Fan Start Up Delay	FanDly	BI: 25	Status that indicates the fan is commanded to run, but it is on the start up delay mode.		
Fan Proving Alarm	PofAlm	BI: 26	Alarm that indicates a failure in the flow of the VFD blower.		
Heating Demand	HtDmnd	BI: 29	Status that indicates a demand for heating.		
High Supply Air Temperature	HiSaAlm	BI: 33	Alarm that indicates the supply air temperature has risen above acceptable levels. The unit will shutdown.		
Missing Humidity Sensor	RhAlm	BI: 36	Alarm that indicates a failure in the outdoor humidity sensor.		
Low Supply Air Temperature	LoSaAlm	BI: 37	Alarm that indicates the supply air temperature dropped below acceptable levels. The unit will shutdown.		
MODGAS II Connected	MdHt2Ins	BI: 39	Status that indicates the MODGAS II controller is connected.		
No Outdoor Air Temperature	OaTpAlm	BI: 40	Alarm that indicates a failure in the outdoor air temperature.		
Proof of Flow Configured	PofCfg	BI: 57	Status that indicates the proof of flow function has been configured.		

Table 6 Cont'd: MUA II Number Base

Appendix D - MUA II BACnet Parameters

BACnet Properties for the MUA II Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
REHEAT II Connected	Rt2Ins	BI: 58	Status that indicates the MHGRV II controller is connected to the system.	
Reheat Relay Configured	RtRlyCfg	BI: 59	Status that indicates the unit has a reheat relay configured.	
Indoor Humidity Sensor Installed	InRhCfg	BI: 70	Status that indicates the unit is configured to read a space humidity sensor.	
Space Temperature Sensor Installed	SpcTpIns	BI: 73	Status that indicates the unit has a space temperature sensor installed.	
On Board Relay 1	OnRly1	BI: 127	Current status of relay 1.	
On Board Relay 2	OnRly2	BI: 128	Current status of relay 2.	
On Board Relay 3	OnRly3	BI: 129	Current status of relay 3.	
On Board Relay 4	OnRly4	BI: 130	Current status of relay 4.	
On Board Relay 5	OnRly5	BI: 131	Current status of relay 5.	
Expansion Relay 1	ExRly1	BI: 133	Current status of relay 6.	
Expansion Relay 2	ExRly2	BI: 134	Current status of relay 7.	
Expansion Relay 3	ExRly3	BI: 135	Current status of relay 8.	
Expansion Relay 4	ExRly4	BI: 136	Current status of relay 9.	
Expansion Relay 5	ExRly5	BI: 137	Current status of relay 10.	
Expansion Relay 6	ExRly6	BI: 138	Current status of relay 11.	
Expansion Relay 7	ExRly7	BI: 139	Current status of relay 12.	
Expansion Relay 8	ExRly8	BI: 140	Current status of relay 13.	
Expansion Relay 9	ExRly9	BI: 141	Current status of relay 14.	
Expansion Relay 10	ExRly10	BI: 142	Current status of relay 15.	
Expansion Relay 11	ExRly11	BI: 143	Current status of relay 16.	
Expansion Relay 12	ExRly12	BI: 144	Current status of relay 17.	
Expansion Relay 13	ExRly13	BI: 145	Current status of relay 18.	

Table 6 Cont'd: MUA II Number Base

BACnet Properties for the MUA II Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Expansion Relay 14	ExRly14	BI: 146	Current status of relay 19.	
Expansion Relay 15	ExRly15	BI: 147	Current status of relay 20.	
Expansion Relay 16	ExRly16	BI: 148	Current status of relay 21.	

Table 6 Cont'd: MUA II Number Base

MUA II PT-Link-BACnet® Property Identifier

The PT-Link-BACnet® amends the following property identity to the BACnet® property identifier.

BACNETPropertyIdentifier :

WattBACNETScheduleForce ::= ENUMERATED {
NormalOperation (0),
ForceOccupied (1),
ForceUnoccupied (2)
}

MuaIIControlMode ::= ENUMERATED {
Unoccupied (0),
RemoteContactOccupied (1),
NormalScheduleOccupied (2),
HolidayModeActive (3),
ScheduleForceOccupied (4),
ScheduleForceUnoccupied (5),
CurrentOutputForceMode (6),
PushButtonOverride (7)
}

MuaIIOnBoardRelaysBits ::= BIT STRING {
OnBoardRelay1 (0),
OnBoardRelay2 (1),
OnBoardRelay3 (2),
OnBoardRelay4 (3),
OnBoardRelay5 (4)
}

Appendix D - MUA II BACnet Parameters

MuaIIExRelaysGroup1Bits ::= BIT STRING {

ExpansionBoard1Relay1	(0),
ExpansionBoard1Relay2	(1),
ExpansionBoard1Relay3	(2),
ExpansionBoard1Relay4	(3)

}

MuaIIExRelaysGroup2Bits ::= BIT STRING {

ExpansionBoard2Relay1	(0),
ExpansionBoard2Relay2	(1),
ExpansionBoard2Relay3	(2),
ExpansionBoard2Relay4	(3)

}

MuaIIExRelaysGroup3Bits ::= BIT STRING {

ExpansionBoard3Relay1	(0),
ExpansionBoard3Relay2	(1),
ExpansionBoard3Relay3	(2),
ExpansionBoard3Relay4	(3)

}

MuaIIAlarmStatusBits ::= BIT STRING {

BadSupplyAirTemperatureSensor	(0),
NoOutdoorAirTemperatureAvailable	(1),
MissingHumiditySensor	(2),
FanProvingAlarm	(3),
LowSupplyAirTemperature	(4),
HighSupplyAirTemperature	(5)

}

Appendix E - VAV/CAV BACnet Parameters

BACnet Properties for VAV/CAV Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Application Software Version	AppVer	AI: 99	Current version of the software in the unit.	
Alarm Status	AlmSts	AI: 1	Needed only in legacy application.	
Configuration	CntlInf	AI: 100	Needed only in legacy application.	
Control Mode	CtrlMod	AI: 97	Needed only in legacy application.	
Control Status	CrtlSts	AI: 4	Needed only in legacy application.	
Control Temperature	CrtlTp	AI: 9	Current value of the control temperature sensor.	
Cooling Setpoint	ClSt	AI: 7	Current calculated cooling setpoint.	
Duct Static Pressure	DuctPr	AI: 14	Current value of the duct static pressure sensor.	
Economizer Position	EcoPos	AI: 16	Current position of the economizer damper.	
External Relays Group #1	Exlys12	AI: 111	Needed only in legacy application.	
External Relays Group #2	ExRlys3	AI: 20	Needed only in legacy application.	
External Relays Group #3	ExRlys4	AI: 21	Needed only in legacy application.	
Heating Setpoint	HtSt	AI: 31	Current calculated heating setpoint.	
On Board Relays	OnRlys	AI: 44	Needed only in legacy application.	
Outdoor Air Humidity	OaRh	AI: 52	Current value of the outdoor humidity sensor.	
Outdoor Air Temperature	OaTp	AI: 54	Current value of the outdoor temperature sensor.	
Outdoor Air Wetbulb	OaWtbl	AI: 55	Current calculated value of the outdoor wetbulb temperature.	
Relief Pressure	RfPr	AI: 62	Current value of the building pressure sensor.	
Return Air CO_2 Level	CO2Level	AI: 150	Current value of the CO_2 sensor.	
Return Air Temperature	RaTp	AI: 64	Current value of the supply air temperature sensor.	
Space Temperature	SpcTp	AI: 72	Current value of the space temperature sensor.	

Table 7: VAV/CAV Instance Number Base

BACnet Properties for VAV/CAV Controller					
Parameter	**Name**	**Object**	**Description**	**Limits**	
Supply Air Temperature	SaTp	AI: 83	Current value of the supply air temperature sensor.		
Temperature Demand	TpDmnd	AI: 84	Based on the comparison between the current Control Temperature and the Heating or Cooling Setpoint Temperatures. Does no work for supply air control.		
VFD Blower Fan	VfdBwPos	AI: 88	Current position of the VFD blower fan signal.		
VFD Exhaust Fan	VfdExPos	AI: 89	Current position of the VFD relief fan signal.		
CO_2 Setpoint	CO2St	AO: 149	When the CO_2 level rises above the CO_2 Protection Limit Max Level, the Economizer's Minimum Position will begin to reset open proportionally between the CO_2 Protection Limit Max Level Setpoint and the Reset Range Setpoint.	0	8000
Duct Static Setpoint	DuctPrSt	AO: 152	This is the target duct pressure to be maintained by the VFD blower signal.	0.01	3
Minimum Outside Air Setpoint	MinEcoSt	AO: 151	This is the minimum position of the economizer in the occupied modes.	1	99
Occupied Cooling Setpoint	OcpClSt	AO: 42	If the control temperature rises one degree above this setpoint, the control will activate the cooling demand. If the control temperature is the Supply Air sensor, the cooling demand is always active.	0	90

Table 7 Cont'd: VAV/CAV Instance Number Base

Appendix E - VAV/CAV BACnet Parameters

BACnet Properties for VAV/CAV Controller

Parameter	Name	Object	Description	Limits	
Occupied Heating Setpoint	OcpHtSt	AO: 43	If the control temperature drops one degree below this setpoint, the control will activate the heating demand. If the control temperature is the Supply Air sensor, there is no heating demand.	0	90
Outdoor Air Sensor Offset	OaTpOst	AO: 53	If the Outdoor Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-10	10
Relief Pressure Setpoint	RfPrSt	AO: 118	This is the target building pressure to be maintained by the VFD Relief signal.	-0.3	0.3
Return Air Sensor Offset	RaTpOst	AO: 65	If the Return Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-10	10
Schedule Force	SchdFrc	AO: 66	Enter a value equal to 1 to force the unit to occupied and a value equal to 0 to send the unit to unoccupied.	0	2
Space Sensor Offset	SpcTpOst	AO: 71	If the Space Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-10	10

Table 7 Cont'd: VAV/CAV Instance Number Base

BACnet Properties for VAV/CAV Controller

Parameter	Name	Object	Description	Limits	
Staging Deadband	StgDb	AO: 76	All heating and cooling stages are staged up and down as the Supply Air rises above or falls below the Supply Setpoint by an amount equal to the number of stages divided into the Deadband Setpoint.	0	10
Supply Air Cooling Setpoint	SaClSt	AO: 77	This is the supply air target temperature during the cooling mode.	50	70
Supply Air Heating Setpoint	SaHtSt	AO: 78	This is the supply air target temperature during the heating mode.	0	300
Supply Air Sensor Offset	SaTpOst	AO: 80	If the Supply Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature.	-10	10
Unoccupied Cooling Setpoint	UnClSt	AO: 86	During the Unoccupied Mode of Operation, this Setpoint spreads the Occupied Cooling Setpoint out by a user adjustable amount. If you do not want Cooling to operate during the Unoccupied Mode, use the default setting of 30°F for these setpoints.	0	30
Unoccupied Heating Setpoint	UnHtSt	AO: 87	During the Unoccupied Mode of Operation, this Setpoint spreads the Occupied Heating Setpoint out by a user adjustable amount. If you do not want Heating to operate during the Unoccupied Mode, use the default setting of 30°F for these setpoints.	-30	0

Table 7 Cont'd: VAV/CAV Instance Number Base

Appendix E - VAV/CAV BACnet Parameters

BACnet Properties for VAV/CAV Controller

Parameter	Name	Object	Description	Limits	
Warm Up Setpoint	WmupSt	AO: 91	In a VAV application, upon entering the occupied mode, the Warm-up Demand will be activated if the return air temperature rises one degree above this setpoint.	50	90
Wetbulb Setpoint	WtblSt	AO: 92	The economizer is enabled if the outdoor wetbulb reading rises above this setpoint.	0	80
AHU Controls Economizer	AhuEco	BI: 55	Status that indicates the unit has an economizer to be controlled.		
CO_2 Sensor Installed	CO2Cfg	BI: 3	Status that indicates the CO_2 function has been configured.		
Cooling Demand	ClDmnd	BI: 5	Status that indicates a demand for cooling.		
Cooling Enabled	ClEnbl	BI: 6	Status that indicates mechanical cooling is enabled.		
Constant Volume Configured	CavCfg	BI: 8	Status that indicates the unit will operate as a constant volume unit.		
Dehumidification Mode	DehmMod	BI: 11	Status that indicates a demand for dehumidification.		
Economizer Enabled	EcoEnbl	BI: 15	Status that indicates the economizer is enabled.		
Fan Start Up Delay	FanDly	BI: 25	Status that indicates the fan is commanded to run, but it is on the start up delay mode.		
Heat / Cool Staging Disabled	HtClDsbl	BI: 27	Status that indicates the mechanical heating and cooling is disabled.		
Heating Demand	HtDmnd	BI: 29	Status that indicates a demand for heating.		
Heating Enabled	HtEnbl	BI: 30	Status that indicates mechanical heating is enabled.		
Heat Pump Configured	HtPmpCfg	BI: 32	Status that indicates the unit will operate as a heat pump.		

Table 7 Cont'd: VAV/CAV Instance Number Base

BACnet Properties for VAV/CAV Controller

Parameter	Name	Object	Description	Limits
Humidistat Contact	Humst	BI: 34	Status that indicates the humidistat has been activated.	
Outdoor Humidity Sensor Configured	RhCfg	BI: 35	Status that indicates the unit will read the outdoor humidity sensor.	
MODGAS II Connected	MdHt2Ins	BI: 39	Status that indicates the MODGAS II controller is connected.	
No Outdoor Air Temperature	OaTpAlm	BI: 40	Alarm that indicates a failure in the outdoor air temperature.	
Fan Proving Alarm	PofAlm	BI: 26	Alarm that indicates a failure in the flow of the VFD blower.	
Proof of Flow Configured	PofCfg	BI: 57	Status that indicates the proof of flow function has been configured.	
REHEAT II Configured	Rt2Ins	BI: 58	Status that indicates the MHGRV II controllers is connected to the system.	
Relief Pressure Configured	RfPrCfg	BI: 63	Status that indicates the unit is configured to control building pressure.	
Warm Up Mode Active	WmupDmnd	BI: 90	Status that indicates the control is in the Warm-up mode.	
Wet Bulb Sensor Configured	WtblCfg	BI: 93	Status that indicates the unit will use wetbulb reading instead of the drybulb reading to enable the economizer.	
Mechanical Cooling Alarm	MchClAlm	BI: 94	Alarm that indicates the compressors are running, but the supply air temperature has not dropped more than 5°F w/in a user adjusted time period.	
Mechanical Heating Alarm	MchHtAlm	BI: 95	Alarm that indicates the stages of heat are running, but the supply air temperature has not risen more than 5°F w/in a user adjusted time period.	

Table 7 Cont'd: VAV/CAV Instance Number Base

Appendix E - VAV/CAV BACnet Parameters

BACnet Properties for VAV/CAV Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Dirty Filter Detected	DrtFlAlm	BI: 96	Alarm that indicates a dirty filter has been detected.	
Bad Space Temperature Sensor	SpcTpAlm	BI: 101	Alarm that indicates a failure in the space temperature sensor.	
High Space Temperature	HiSpcAlm	BI: 102	This alarm is activated if the space tempera-ture does not get within 5°F to the occupied heating setpoint in an hour in the heating mode. This alarm is available during space control operation.	
Low Space Temperature	LoSpcAlm	BI: 103	This alarm is acti-vated if the space temperature does not get within 5°F to the occupied cooling setpoint in an hour in the cooling mode. This alarm is available during space control operation.	
On Board Relay 1	OnRly1	BI: 127	Current status of relay 1.	
On Board Relay 2	OnRly2	BI: 128	Current status of relay 2.	
On Board Relay 3	OnRly3	BI: 129	Current status of relay 3.	
On Board Relay 4	OnRly4	BI: 130	Current status of relay 4.	
On Board Relay 5	OnRly5	BI: 131	Current status of relay 5.	
Expansion Relay 1	ExRly1	BI: 133	Current status of relay 6.	
Expansion Relay 2	ExRly2	BI: 134	Current status of relay 7.	
Expansion Relay 3	ExRly3	BI: 135	Current status of relay 8.	
Expansion Relay 4	ExRly4	BI: 136	Current status of relay 9.	
Expansion Relay 5	ExRly5	BI: 137	Current status of relay 10.	
Expansion Relay 6	ExRly6	BI: 138	Current status of relay 11.	
Expansion Relay 7	ExRly7	BI: 139	Current status of relay 12.	

Table 7 Cont'd: VAV/CAV Instance Number Base

BACnet Properties for VAV/CAV Controller				
Parameter	**Name**	**Object**	**Description**	**Limits**
Expansion Relay 8	ExRly8	BI: 140	Current status of relay 13.	
Expansion Relay 9	ExRly9	BI: 141	Current status of relay 14.	
Expansion Relay 10	ExRly10	BI: 142	Current status of relay 15.	
Expansion Relay 11	ExRly11	BI: 143	Current status of relay 16.	
Expansion Relay 12	ExRly12	BI: 144	Current status of relay 17.	
Expansion Relay 13	ExRly13	BI: 145	Current status of relay 18.	
Expansion Relay 14	ExRly14	BI: 146	Current status of relay 19.	
Expansion Relay 15	ExRly15	BI: 147	Current status of relay 20.	
Expansion Relay 16	ExRly16	BI: 148	Current status of relay 21.	

Table 7 Cont'd: VAV/CAV Instance Number Base

VAV/CAV PT-Link-BACnet® Property Identifier

The PT-Link-BACnet® Link amends the following property identity to the BACnet® property identifier.

BACNETPropertyIdentifier :

WattBACNETScheduleForce ::= ENUMERATED {
NormalOperation (0),
ForceOccupied (1),
ForceUnoccupied (2)
}

VavCavControlMode ::= ENUMERATED {
Unoccupied (0),
RemoteContactOccupied (1),
NormalScheduleOccupied (2),
PushButtonOrZoneOverride (3),
HolidayModeActive (4),
UnoccupiedZoneDemand (5),
RemoteScheduleOverride (6),
CurrentOutputForceMode (7),
SATHighOrLowCutOff (8),
CO2OverrideInProgress (9),
PurgeModeActive (10)
}

Appendix E - VAV/CAV BACnet Parameters

VavCavControlStatusBits ::= BIT STRING {
AhuControlEconomizer (0),
NoOutdoorAirTempSensor (1),
CarbonDioxideSensorPresent (2),
HeatCoolStagingDisabled (3),
DehumidificationMode (4),
ModGasIIConnected (5),
ReheatIIConnected (6)
}

VavCavConfigurationBits ::= BIT STRING {
CoolingDemand (0),
HeatingDemand (1),
CoolingEnabled (2),
HeatingEnabled (3),
EconomizerEnabled (4),
FanInStartUpDelay (5),
WarmUpModeActive (6),
ProofOfFlow (7),
HumidistatContact (8),
ProofOfFlowConfig (9),
ConstantVolumeConfig (10),
HeatWheelConfig (11),
HumiditySensorConfig (12),
WetBulbSensorConfig (13),
ReliefPressureConfig (14)
}

VavCavOnBoardRelaysBits ::= BIT STRING {
OnBoardRelay1 (0),
OnBoardRelay2 (1),
OnBoardRelay3 (2),
OnBoardRelay4 (3),
OnBoardRelay5 (4)
}

VavCavExRelaysGroup1Bits ::= BIT STRING {
ExpansionBoard1Relay1 (0),
ExpansionBoard1Relay2 (1),
ExpansionBoard1Relay3 (2),
ExpansionBoard1Relay4 (3),
ExpansionBoard2Relay1 (4),
ExpansionBoard2Relay2 (5),
ExpansionBoard2Relay3 (6),
ExpansionBoard2Relay4 (7)
}

VavCavExRelaysGroup2Bits ::= BIT STRING {
ExpansionBoard3Relay1 (0),
ExpansionBoard3Relay2 (1),
ExpansionBoard3Relay3 (2),
ExpansionBoard3Relay4 (3)
}

VavCavExRelaysGroup3Bits ::= BIT STRING {
ExpansionBoard4Relay1 (0),
ExpansionBoard4Relay2 (1),
ExpansionBoard4Relay3 (2),
ExpansionBoard4Relay4 (3)
}

VavCavAlarmStatusBits ::= BIT STRING {
BadSpaceTempSensor (0),
FanProvingAlarm (1),
MechanicalCoolingAlarm (2),
MechanicalHeatingAlarm (3),
DirtyFilterDetected (4),
HighSpaceTempAlarm (5),
LowSpaceTempAlarm (6)
}

Notes

Orion Control Systems

Form: OR-PTBACNET-TGD-01F Printed in the USA August 2007

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