User Manual

ProtoNode FPC-N34 FPC-N35 User Manual

For interfacing with the following AERCO products:

- AM Series
- C-More
- Modulex
- ECS/SmartPlate
- BMS/BMSII/ACS

For interfacing with the following Building Automation Systems:

- BACnet MS/TP
- BACnet/IP
- Modbus TCP/IP
- Modbus RTU
- Metasys N2
- LonWorks

This user manual applies only to ProtoNode Models **FPC-N34 (P/N 64129)** and **FPC-N35 (P/N 64130).**

For ProtoNode RER (P/N **64084**) and LER (P/N **64085**) see user manual OMM-0080, GF-129.

For ProtoNode **FPC-N34 (P/N 64168)** and **FPC-N35 (P/N 64169)** see user manual OMM-0150.

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The BTL Mark on ProtoNode FPC-N34 is a symbol that indicates that a product has passed a series of rigorous tests conducted by an independent laboratory which verifies that the product correctly implements the BACnet features claimed in the listing. The mark is a symbol of a high-quality BACnet product.
Go to http://www.BACnetInternational.net/btl/ for more information about the BACnet Testing Laboratory. Click here for BACnet PIC Statement

- **LONMARK CERTIFICATION**

LonMark International is the recognized authority for certification, education, and promotion of interoperability standards for the benefit of manufacturers, integrators and end users. LonMark International has developed extensive product certification standards and tests to provide the integrator and user with confidence that products from multiple manufacturers utilizing LonMark devices work together. Sierra Monitor has more LonMark Certified gateways than any other gateway manufacturer, including the ProtoCessor, ProtoCarrier and ProtoNode for OEM applications and the full featured, configurable gateways.

Thank you for purchasing the ProtoNode for AERCO products.

Please call AERCO for Technical support of the ProtoNode product.

SMC does not provide direct support. If AERCO needs to escalate the concern, they will contact Sierra Monitor Corporation for assistance.

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- Auto-Discovery connection points are limited by available memory in the device.
- Auto-Discovery is not available in SSD mode required for BST (Boiler Sequencing Technology) and WHM (Water Heater Management).
- BST and WHM are limited to eight (8) C-More connections.
- BST and WHM require a ProtoNode with all protocols, including Modbus.

INSTRUCTION	SECTION
1. Record the information about the unit.	**2.1**
2. Set the device's Modbus RTU serial settings (i.e. baud rate, parity, stop bits) and Modbus Node-ID for each of the devices that will be connected to ProtoNode FPC-N34 or FPC-N35.	**2.3**
3. ProtoNode FPC-N34 units: Select the Field Protocol (BACnet MS/TP, BACnet/IP, Modbus TCP/IP or Metasys N2) on the S Bank Dip Switches.	**2.4.1**
4. Enable the ProtoNode "Auto Discovery" mode on Dip Switch Bank S.	**2.4.2**
5. BACnet MS/TP (FPC-N34): Set the MAC Address on DIP Switch Bank A.	**2.5.1**
6. BACnet MS/TP or BACnet IP (FPC-N34): Set the BACnet Device Instance	**2.5.2**
7. Metasys N2, Modbus RTU, or Modbus TCP/IP (FPC-N34): Set the Node-ID.	**2.5.3**
8. BACnet MS/TP or Modbus RTU (FPC-N34): Set the BAUD rate of the Field Protocol on DIP Switch Bank B.	**2.5.4**
9. Connect ProtoNode's 6 pin RS-485 connector to the Modbus RS-485 network that is connected to each of the devices.	**3.2**
10. **Connect ProtoNode FPC-N34's** 3 pin RS-485 port to the Field Protocol cabling, **or** **Connect ProtoNode FPC-N35's** 2 pin LonWorks port to the Field Protocol cabling.	**3.3** **3.4**
11. Connect Power to ProtoNode's 6 pin connector.	**3.5**
12. When power is applied it will take about 10 minutes for all the devices to be discovered and the configuration file to be built. Once Auto-Discovery is complete, turn OFF the S3 DIP Switch to save the configuration settings.	**3.6**
13. BACnet/IP or Modbus TCP/IP (FPC-N34): Use the ProtoNode's embedded tool which is accessed with a browser, referred to in this manual as the Web Configurator, to change the IP Address. No changes to the configuration file are necessary.	**CHAPTER 4**
14. LonWorks (FPC-N35): The ProtoNode must be commissioned on the LonWorks Network. This needs to be done by the LonWorks administrator using a LonWorks Commissioning tool.	**CHAPTER 7**

CHAPTER 1. INTRODUCTION

1.1 ProtoNode Gateway

ProtoNode is an external, high performance **Building Automation multi-protocol gateway** that is preconfigured to Auto-Discover any AERCO products (hereafter called a "device") connected to the ProtoNode and automatically configure them for BACnet®[1]MS/TP, BACnet/IP, Metasys®[2] N2 by JCI, Modbus RTU, Modbus TCP/IP, or LonWorks®[3].

It is not necessary to download any configuration files to support the required applications. The ProtoNode is pre-loaded with tested Profiles/Configurations for the supported devices.

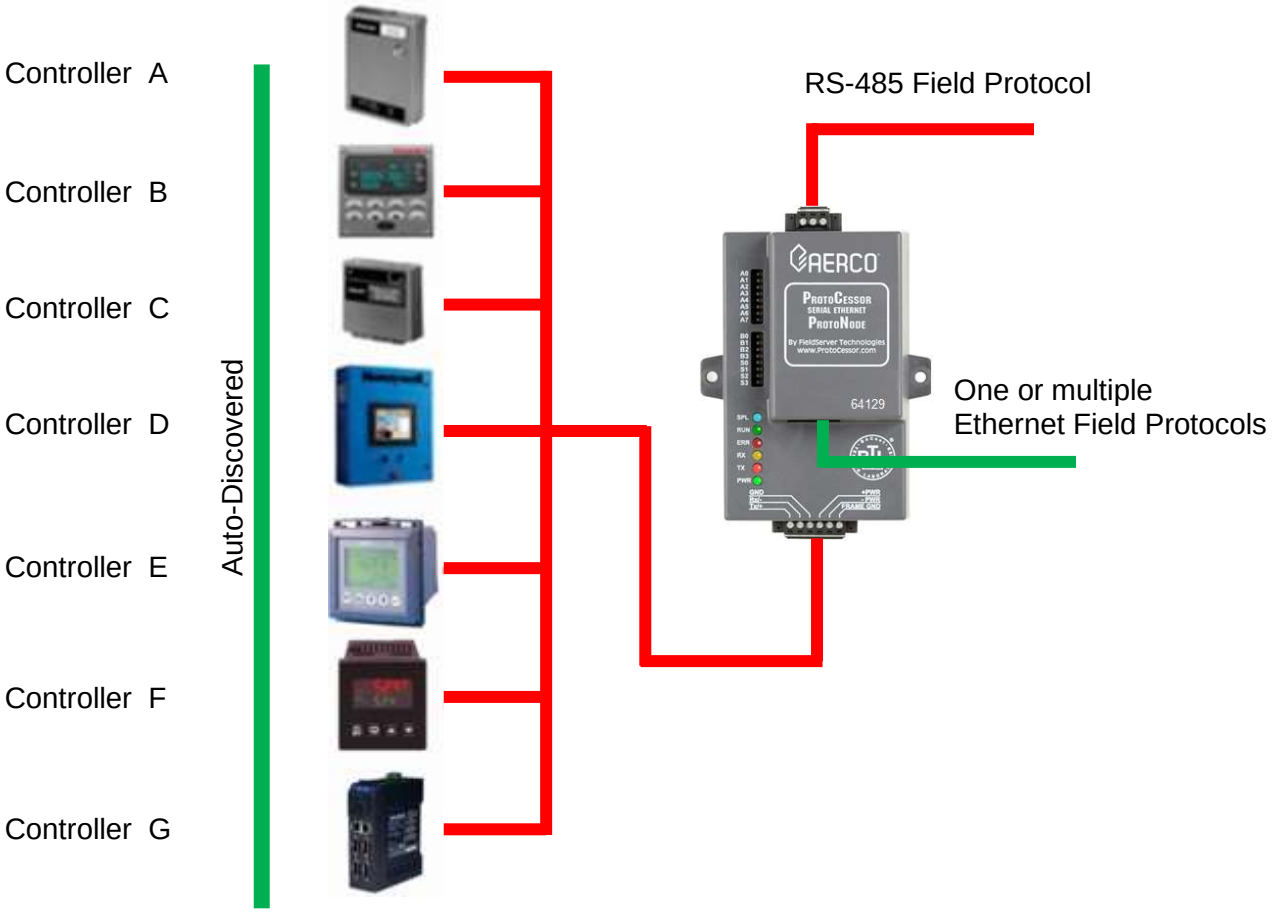

Figure 1-1: ProtoNode Connections to Devices

[1] BACnet is a registered trademark of ASHRAE
[2] Metasys is a registered trademark of Johnson Controls Inc.
[3] LonWorks is a registered trademark of Echelon Corporation

AERCO's multi-protocol communications gateway supports integration of AERCO devices with customers' building control and energy management systems. The plug-n-play package supports integration with BACnet/IP, BACnet MS/TP, LonWorks, and Johnson Controls Metasys N2 systems. AERCO's Communications Gateway is available for all AERCO boilers, water heaters, and electronically controlled indirect systems.

- Built-in translation for BACnet/IP, BACnet MS/ TP, LonWorks, Metasys N2 and Modbus TCP Protocols
- Supports individual units and systems including AERCO's WHM and BST.
- Select protocol and baud rate in the field using simple DIP switch selection
- Captures alarm and trend history for faster troubleshooting
- Non-volatile memory retains point mappings and programs in the event of power loss.
- Approvals: BACnet Testing Labs (BTL) B-ASC on ProtoNode FPC-N34, CE Mark, LonMark 3.4 Certified on ProtoNode FPC-N35, TUV approved to UL 916

Serial ProtoNode FPC-N34
P/N 64129

LonWorks ProtoNode FPC-N35
P/N 64130

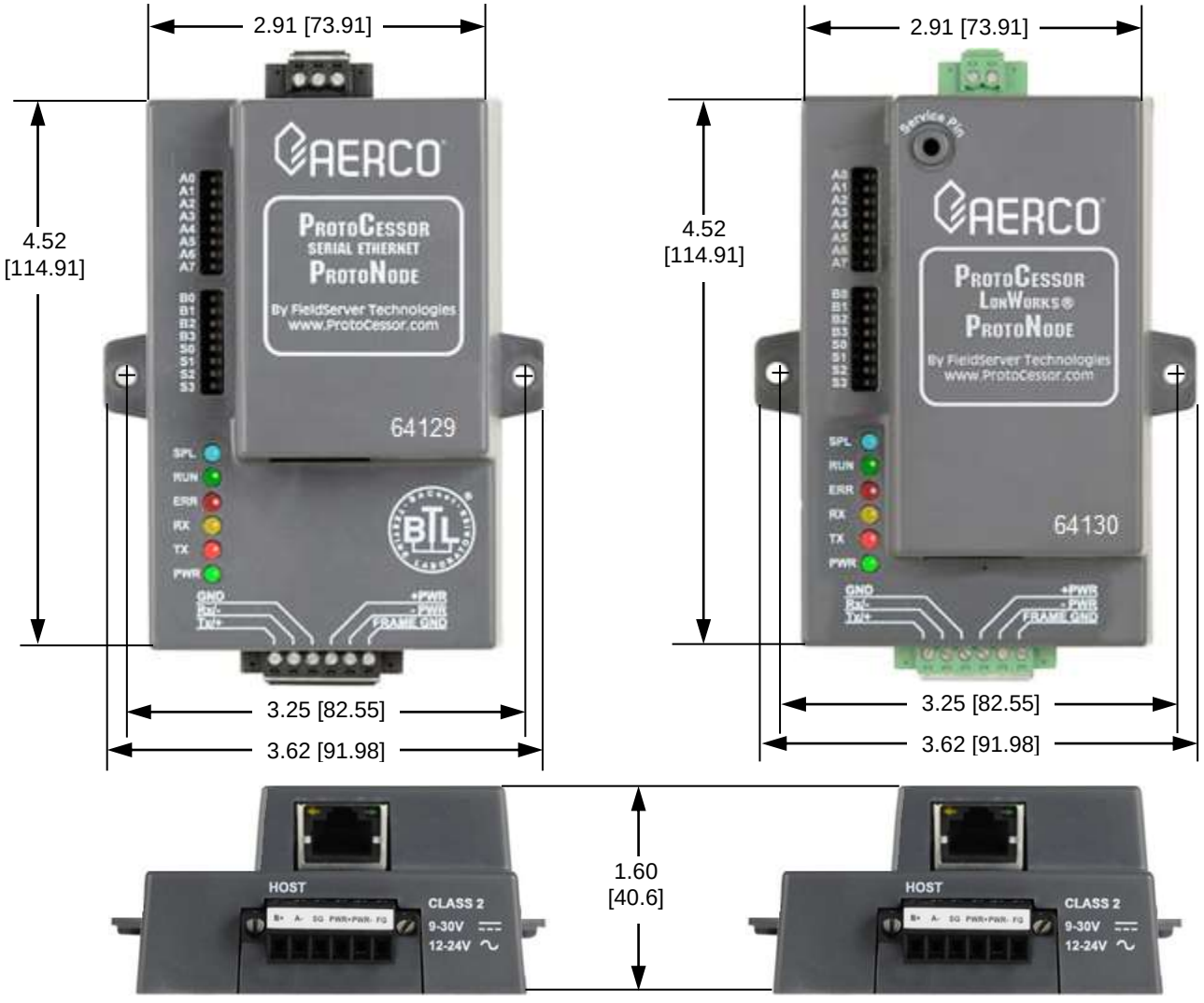

Figure 1-2: ProtoNode Dimensions

AERCO's Communications Gateway (ProtoNode) is an external, high performance, **Building Automation multi-protocol gateway** that has been preprogrammed for AERCO's equipment to support BACnet®[4]MS/TP, BACnet/IP, Metasys®[5] N2 by JCI, Modbus TCP, and LonWorks®[6]. All the different AERCO configurations for the various protocols are stored within the ProtoNode and are selectable via DIP switches for fast and easy installation. There is no need to download any configuration files to support the required applications.

AERCO's Communications Gateway Supports WHM and BST

AERCO has co-developed the ProtoNode to communicate between systems of AERCO units (for example: multiple water heaters running Onboard Water Heater Management (WHM) or multiple AERCO Boilers running Boiler Sequencing Technology (BST). The AERCO ProtoNode in SSD mode eliminates multiple master issues and is included with all AERCO's Communications Gateway ProtoNodes. Use SSD mode to enable a Building Automation System Modbus master to bi-directionally communicate to BST and WHM Modbus masters.

The AERCO SSD device is unique because it enables two Modbus masters to bi-directionally communicate over RS-485. The AERCO SSD device is also specifically designed to support the BST/WHM Automatic failover Feature. While the BST/WHM role can be transferred to another unit (with a different Modbus address) the SSD device operates at a fixed and constant Modbus address. The fixed SSD address is propagated to each unit and allows the BST/WHM master to resume communications after a failover without BAS changes.

This manual provides the necessary information to assist the Installers of the boilers/heaters with the installation of the ProtoNode FPC-N34 on BACnet MS/TP, BACnet/IP, Modbus TCP and Metasys N2 by JCI networks and installation of the ProtoNode FPC-N35 on a LonWorks network.

BACnet International BTL certification is the highest level of BACnet conformance tests that a product can be subjected to.

- The ProtoNode FPC-N34 is BACnet Certified by the BACnet Testing Laboratory (BTL).
- The ProtoNode FPC-N35 is LonMark Certified by LonMark International.

The ProtoNode units feature a small form factor, as indicated in Figure 1.1

[4] BACnet is a registered trademark of ASHRAE
[5] Metasys is a registered trademark of Johnson Controls Inc.
[3] LonMark is a registered trademark of LonMark International
[4] LonWorks is a registered trademark of Echelon Corporation

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CHAPTER 2. BACNET/LONWORKS SETUP FOR PROTONODE FPC-N34/FPC-N35

2.1 Record Identification Data

Each ProtoNode has a unique part number located on the side or the back of the unit. This number should be recorded, as it may be required for technical support. The numbers are as follows:

AERCO ProtoNode	
Model	**AERCO Part Number**
Serial ProtoNode N34	64129
LonWorks ProtoNode N35	64130

Figure 2-1: ProtoNode Part Numbers

- ProtoNode FPC-N34 units have the following 3 ports: RS-485, Ethernet, RS-485
- ProtoNode FPC-N35 units have the following 3 ports: LonWorks, Ethernet, RS-485

2.2 Point Count Capacity and Registers per Device

The total number of Modbus Registers presented by all of the devices attached to the ProtoNode cannot exceed:

Part number	Total Registers
FPC-N34-0645	1,500
FPC-N35-1051	1,500

Figure 2-2: Supported Point Count Capacity

Devices	Registers Per Device	Unit Address Range
AM Managing Boiler/Heater	95	Addr 1 to 16
AM Dependent Boiler/Heater	49	Addr 1 to 16
C-More BMK/INN	12	Addr 1 to 16
Modulex & Modulex EXT	10	Addr 1 to 8
ECS * IND/SP/DW	7	Addr 17 to 32
BMS/BMSII/ACS	51	Addr 128 to 228
BST/WHM	186 (for 1 up to 8 devices)	Addr 1 to 8 on C-More (SSD address = 247)

***** Does not apply to Pneumatic or self-contained controls

Figure 2-3: Modbus Registers per Device

2.3 Configuring Device Communications

2.3.1 Set Modbus COM setting on all of the Devices connected to the ProtoNode

- All of the Serial devices connected to ProtoNode **MUST have the same Baud Rate, Data Bits, Stop Bits, and Parity settings.**
- The Figure below specifies the device serial port settings required to communicate with the ProtoNode.

Serial Port Setting	Device
Protocol	Modbus RTU
Baud Rate	9600
Parity	None
Data Bits	8
Stop Bits	1

Figure 2-4: Modbus RTU COM Settings

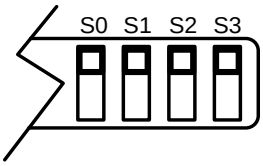
2.3.2 Set Modbus RTU Node-ID for each of the Devices attached to the ProtoNode

- Set Modbus Node-ID for each of the devices attached to ProtoNode. The Modbus Node-ID's need to be uniquely assigned between 1 and 255.
    - **The Modbus Node-ID that is assigned for each device needs to be documented.**
        - The Modbus Node-ID's assigned are used for designating the Device Instance for BACnet/IP and BACnet MS/TP (**Section 2.5.2**)
- The Metasys N2 and Modbus TCP/IP Node-ID will be set to same value as the Node-ID of the Modbus RTU device.

2.4 Selecting the Desired Field Protocol and Enabling Auto-Discovery

2.4.1 Selecting Desired Field Protocol

- ProtoNode FPC-N34 units use the "S" bank of DIP switches (S0 – S2) to select the Field Protocol.
    - See the table in the Figure below for the switch settings to select BACnet MS/TP, BACnet/IP, Modbus TCP/IP, or Metasys N2.
    - The OFF position is when the DIP switches are set closest to the outside of the box.



S0 – S3 DIP Switches

S Bank DIP Switch Location

ProtoNode FPC-N34	S Bank DIP Switches			
Profile	**S0**	**S1**	**S2**	**S3**
BACnet/IP	Off	Off	Off	Off
BACnet MS/TP	**ON**	Off	Off	Off
Metasys N2	Off	**ON**	Off	Off
Modbus TCP/IP or Modbus RTU	**ON**	**ON**	Off	Off
*Modbus to 8 WHM/BST Units	Off	Off	**ON**	Off
*BACnet to 8 WHM/BST Units	**ON**	Off	**ON**	Off
*Metasys N2 to 8 WHM/BST Units	Off	**ON**	**ON**	Off
ProtoNode FPC-N35				
LonWorks	Off	Off	Off	Off
*Lon to 8 WHM/BST Units	**ON**	Off	Off	Off

Figure 2-5: S Bank DIP Switches

***NOTE:** For WHM or BST systems auto-discovery cannot be done. Be sure that the S Bank DIP Switches are set properly.

2.4.2 Enabling Auto-Discovery (Not used on BST or WHM)

The S3 DIP switch is used to both enable Auto-Discovery of known devices attached to the ProtoNode, and to save the recently discovered configuration.

- See the table in Figure below for the switch setting to enable Auto-Discovery.
- If the ProtoNode is being installed for the first time, set S3 to the **ON** position to enable Auto-Discovery.
- Cycle the power to the ProtoNode to start Auto-Discovery
- The ON position is when the DIP switches are set closest to the inside of the box.

  NOTE: Allow 10 minutes for the Auto-Discovery process to complete.
- After Auto-Discovery is complete, turn off S3 to save the configuration.

S3 DIP Switch Auto-Discovery Mode	S3
Auto-Discovery ON – Build New Configuration	ON
Auto-Discover OFF – Save Current Configuration	Off

Figure 2-6: S3 DIP Switch setting for Auto Discovering Devices

2.4.3 Manually Selecting Your Equipment

A laptop or PC is required to do this. This cannot be done for BST or WHM

The ProtoNode's device port can be pre-configured for your equipment. Leave the S3 dip switch in the **OFF** position and follow the instructions below:

1. Be sure the ProtoNode is already configured as outlined in Section 2.3.
2. Select the desired field protocol as outlined in Section 2.4.1.
3. Follow Section 4.1 to connect your PC or laptop to the Ethernet port.
4. Open a web browser on your PC
5. Enter the IP Address of the ProtoNode – the default address is: **192.168.1.24**. The "Configuration Parameters" page appears.
6. Go to the bottom of the page and find the "Active Profiles" section. This is where you can add equipment profiles. Be sure the desired field protocol is already selected, as in Step 2; if the field protocol is changed after the equipment profiles are selected, they become invalid and must be cleared and re-selected again.
7. If any profiles are present and not desired, select them and click **Remove**.
8. Select your desired profiles and click **Add**.
9. Enter the Node ID or equipment address.
10. Select the "Current Profile" of the equipment from the drop-down box.
11. Once your information is correct, click on **Submit**, or click **Cancel** and enter your information again.
12. Repeat steps 8 to 11 to add more equipment profiles, as needed.
13. After selecting all your equipment profiles, click the **System Restart** tab on the bottom to update the ProtoNode.

2.5 BAS Network Settings: MAC Address, Device Instance and Baud Rate

2.5.1 BACnet MS/TP (FPC-N34): Setting the MAC Address for BAS Network

- Only 1 MAC address is set for ProtoNode regardless of how many devices are connected to ProtoNode.
- Set the BACnet MS/TP MAC addresses of the ProtoNode to a value between 1 to 127 (MAC Master Addresses); this is so that the BMS Front End can find the ProtoNode via BACnet auto discovery.
- **Note: Never set a BACnet MS/TP MAC Address from 128 to 255**. Addresses from 128 to 255 are Slave Addresses and ***cannot*** be discovered by BAS Front Ends that support auto discovery of BACnet MS/TP devices.
- Set "A" bank DIP switches A0 – A7 to assign a MAC Address to the ProtoNode for BACnet MS/TP.
- Please refer to Appendix A for the complete range of MAC Addresses and DIP switch settings.

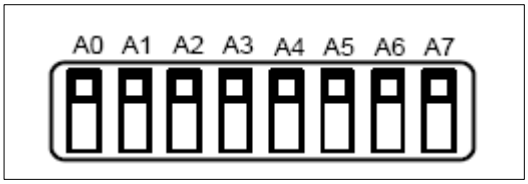


Figure 2-7: MAC Address DIP Switches

NOTE: When setting DIP Switches, please ensure that power to the board is OFF.

NOTE: A MAC address ***greater*** than 127 will cause the ERR LED to light and will disable the ProtoNode from being discovered by the BAS. Either set the MAC address to 127 or lower, or change the "MAX MAC" on the Configuration page.

2.5.2 BACnet MS/TP and BACnet/IP (FPC-N34): Setting the Device Instance

- The BACnet Device Instances will be calculated by adding the Node_Offset (default value is 50,000) to the device's Modbus Node ID (that was assigned in Section 2.3.2).
- The BACnet Device Instance can range from 1 to 4,194,303.

For example:

Node_Offset value (default) = 50,000

- Device 1 has a Modbus Node-ID of 1
- Device 2 has a Modbus Node-ID of 2
- Device 3 has a Modbus Node-ID of 3
- **Given that: Device Instance = Node_Offset + Modbus Node_ID**
- Device Instance, Device 1 = 50,000 + 1 = 50,001
- Device Instance, Device 2 = 50,000 + 2 = 50,002
- Device Instance, Device 3 = 50,000 + 3 = 50,003

2.5.2.1 BACnet MS/TP or BACnet/IP: Assigning Specific Device Instances

With the default Node_Offset value of 50,000 the Device Instances values generated will be within the range of 50,001 to 50,127.

- The values allowed for a BACnet Device Instance can range from 1 to 4,194,303.
- To assign a specific Device Instance (or range), change the Node_Offset value.
- **Methods for changing the Node_Offset value are provided in Chapter 5**
  - This step cannot be performed until after the unit is connected and powered.

2.5.3 Metasys N2 or Modbus TCP/IP (FPC-N34): Setting the Node-ID

- The Modbus RTU Node-ID's assigned to devices attached to the ProtoNode in Section 2.3.2 will be the Metasy N2 or Modbus TCP/IP Node_ID's to the field protocols.
- Metasys N2 and Modbus TCP/IP Node-ID Addressing: Metasys N2 and Modbus TCP/IP Node-ID's range from 1-255.

2.5.4 BACnet MS/TP or Modbus RTU (FPC-N34): Setting the Baud Rate for BAS Network

- "B" bank DIP switches B0 – B3 can be used to set the Field baud rate of the ProtoNode to match the baud rate required by the Building Management System for BACnet MS/TP or Modbus RTU.
- The baud rate on ProtoNode for Metasys N2 is set for 9600. "B" bank DIP switches B0 – B3 are disabled for Metasys N2 on ProtoNode FPC-N34.
- "B" bank DIP switches B0 – B3 are disabled on ProtoNode FPC-N35 (FPC-N35 LonWorks).

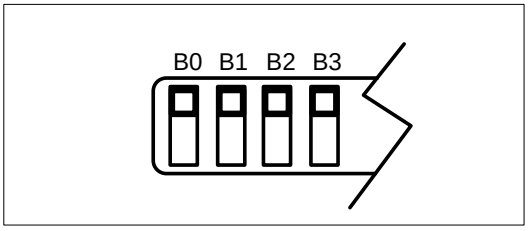


Figure 2-8: BMS Baud Rate DIP Switches

2.5.4.1 Baud Rate DIP Switch Selection

Baud	B0	B1	B2	B3
9600	On	On	On	Off
19200	Off	Off	Off	On
38400 *	**On**	**On**	**Off**	**On**
57600	Off	Off	On	On
76800	On	Off	On	On

* Factory default setting = 38,400

Figure 2-9: BMS Baud Rate

CHAPTER 3. INTERFACING PROTONODE TO DEVICES

3.1 ProtoNode FPC-N34 and FPC-N35 Showing Connection Ports

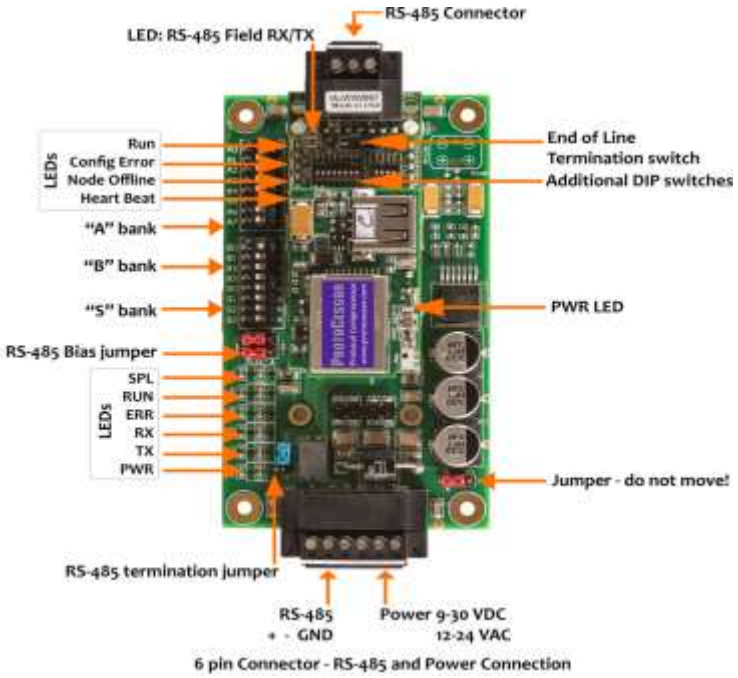


Figure 3-1a: Serial ProtoNode BACnet FPC-N34 (P/N 64129)

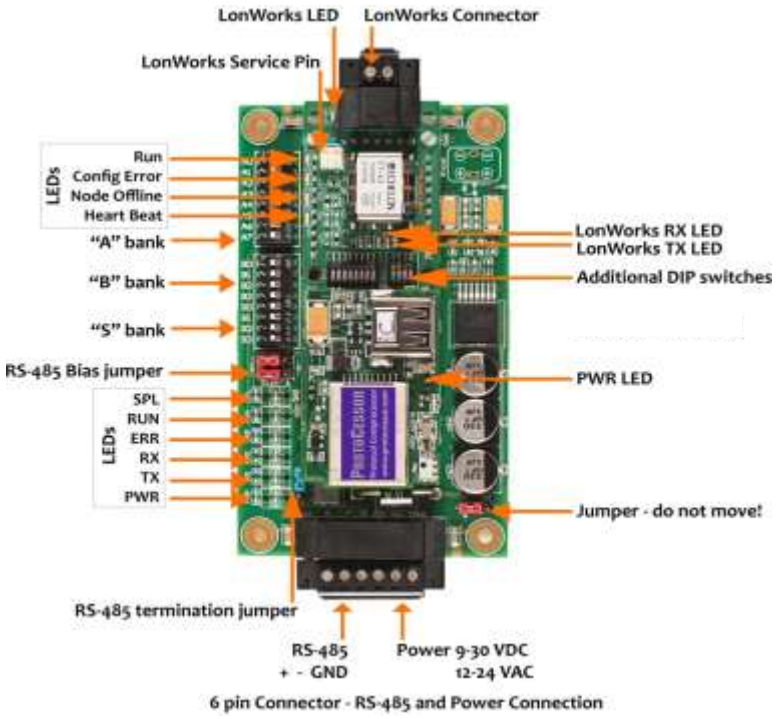


Figure 3-1b: LonWorks ProtoNode FPC-N35 (P/N 64130)

3.2 Device Connections to ProtoNode

ProtoNode 6 Pin Phoenix connector for RS-485 Devices

- **The 6 pin Phoenix connector is the same for ProtoNode FPC-N34 and FPC-N35**.
- Pins 1 through 3 are for Modbus RS-485 devices.
  - The RS-485 GND (Pin 3) is not typically connected.
- Pins 4 through 6 are for power. **Do not connect power** (wait until Section 3.6).

Device Pins	ProtoNode Pin #	Pin Assignment
Pin RS-485 +	Pin 1	RS-485 +
Pin RS-485 -	Pin 2	RS-485 -
Pin GND	Pin 3	RS-485 GND
Power In (+)	Pin 4	V +
Power In (-)	Pin 5	V -
Frame Ground	Pin 6	FRAME GND

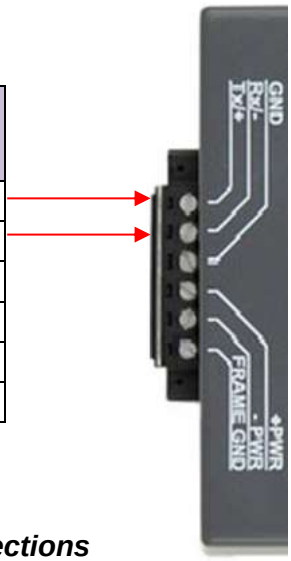


Figure 3-2: Power and RS-485 Connections

3.2.1 Biasing the Modbus RS-485 Device Network

- An RS-485 network with more than one device needs to have biasing to ensure proper communication. The biasing only needs to be done on one device.
- The ProtoNode has 510 Ohm resistors that can be used to set the biasing. The ProtoNode's default positions from the factory for the Biasing jumpers are OFF.
- The OFF position is when the 2 RED biasing jumpers straddle the 4 pins closest to the outside of the board of the ProtoNode (see Figure 3).
- **Only turn biasing ON:**
  - **IF the BAS cannot see more than one device connected to the ProtoNode**
  - **AND you have checked all the settings (Modbus COM settings, wiring, and DIP switches).**
- To turn biasing ON, move the 2 RED biasing jumpers to straddle the 4 pins closest to the inside of the board of the ProtoNode.

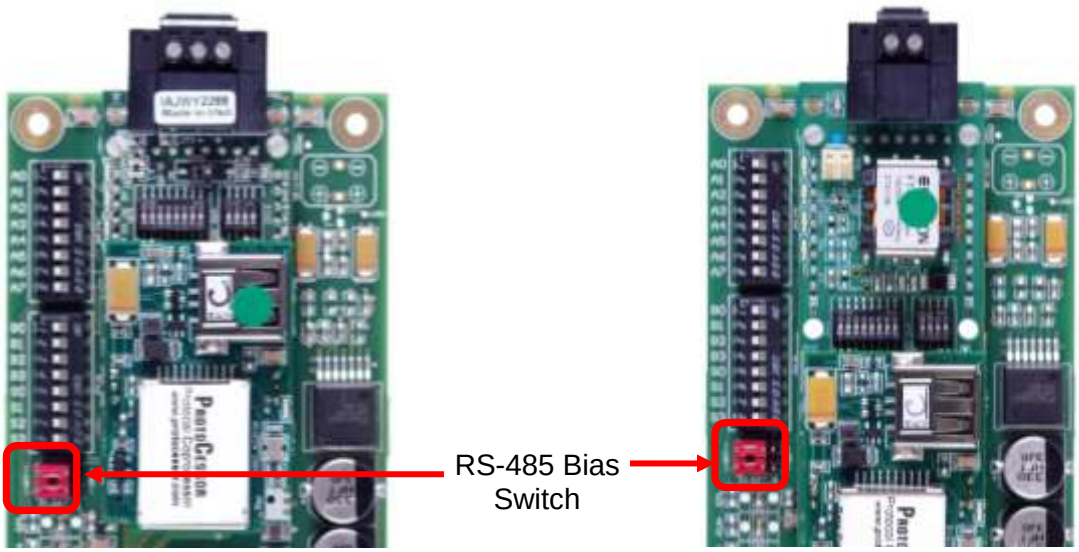


Figure 3-3: Modbus RS-485 Biasing Switch

3.2.2 End of Line Termination Switch for the Modbus RS-485 Device Network

- On long RS-485 cabling runs, RS-485 trunk must be properly terminated at each end.
- The ProtoNode has an End Of Line (EOL) blue jumper. The default setting for this Blue EOL jumper is OFF with the jumper straddling the pins closest to the inside of the board of the ProtoNode.
  - On short cabling runs the EOL jumper may ***not*** need to be turned ON.
- **If the ProtoNode is placed at one of the ends of the trunk, set the blue EOL jumper to the ON position straddling the pins closest to the outside of the board of the ProtoNode.**
- **Always leave single Red Jumper on the right in the A position (default setting).**

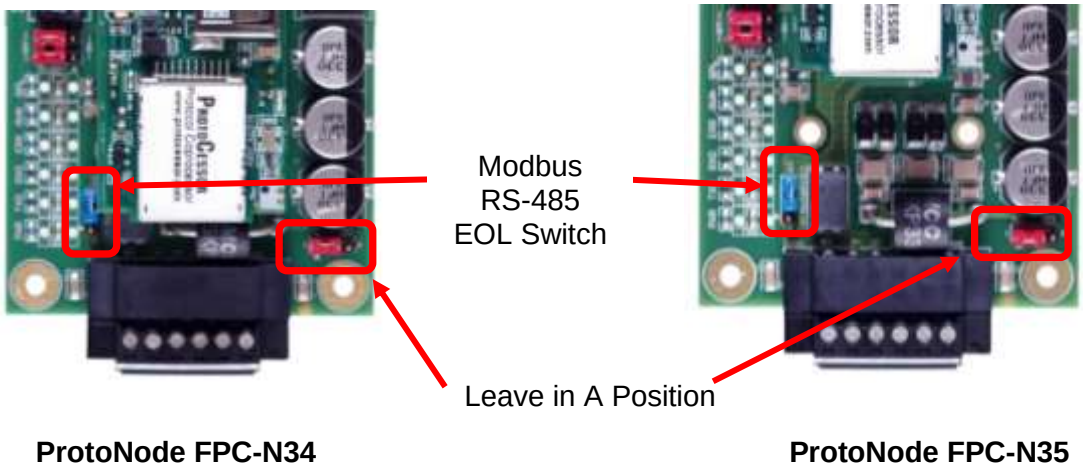


Figure 3-4: Modbus RS-485 End-Of-Line Termination Switch

3.3 BACnet MS/TP, Modbus RTU or Metasys N2 (FPC-N34): Wiring Field Port to RS-485 BAS Network

- Connect the BACnet MS/TP or Metasys N2 RS-485 network wires to the 3-pin RS-485 connector on ProtoNode FPC-N34 as shown below in Figure 3-5.
  - The RS-485 GND (Pin 3) is not typically connected.
- See Chapter 5 for information on connecting to BACnet/IP network.
- If the ProtoNode is the last device on the BACnet MS/TP or Metasys N2 trunk, then the End-Of-Line Termination jumper needs to be enabled (Figure 3-6).
  - The default setting from the factory is OFF (switch position = right side).
  - To enable the EOL Termination, turn the EOL switch ON (switch position = left side).

BMS RS-485 Wiring	ProtoNode Pin #	Pin Assignment
RS-485 +	Pin 1	RS-485 +
RS-485 -	Pin 2	RS-485 -
-	Pin 3	RS-485 GND

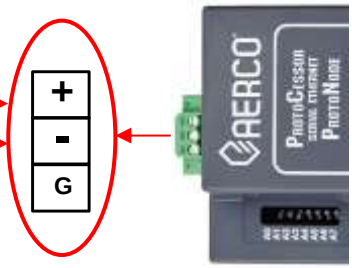


Figure 3-5: Connection from ProtoNode to RS-485 Field Network

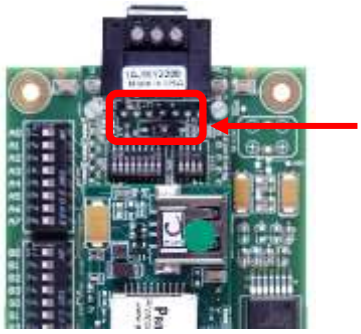


Figure 3-6: RS-485 BMS Network EOL Switch

3.4 LonWorks (FPC-N35): Wiring Field Port to LonWorks Network

- Connect ProtoNode to the field network with the LonWorks terminal using a twisted pair non-shielded cable. LonWorks has no polarity.

Figure 3-7: LonWorks Terminal

3.5 ACS/BMS II Wiring Connections to ProtoNode FPC-N34 and FPC-N35

- When an ACS, BMS OR BMS II is being used, an RS-485-to-RS-232 converter will be required to connect it to the ProtoNode's RS485 port (6-pin Phoenix connector).
- Refer to Figures 3-8 and 3-9 to locate the internal RS-232 connector JP12 (BMS) or JP5 (BMS II/ACS) inside the wiring area of the ACS/BMS II.
- If the AERCO RS232-to-RS485 Converter (part no. 124943) is used, the RS-232 side of the converter contains a connector that plugs directly into header connector JP12 (BMS) or JP5 (BMS II/ACS).
- If a third party converter is used, connect the RS-232 Receive (RxD) and Transmit (TxD) wire leads to the internal RS-232 connector (JP12 or JP5) as shown in Figures 2-5 and 2-6. DO NOT connect the wire shield on this side of the converter.

NOTE

If a third-party RS232-to-RS485 Converter is used, consult the manufacturer's instruction manual for signal polarity.

- On the RS-485 side of the converter (Figure 3-8 and 3-9), connect the wire leads as follows:
  - Connect the TD B (+) terminal to the ProtoNode's RS485+ Port.
  - Connect the TD A (-) terminal to the ProtoNode's RS485- Port.
  - Connect the GND terminal to the ProtoNode's RS485 Frame GND Port.
  - Place the ProtoNode's termination jumper in the **ON** position.

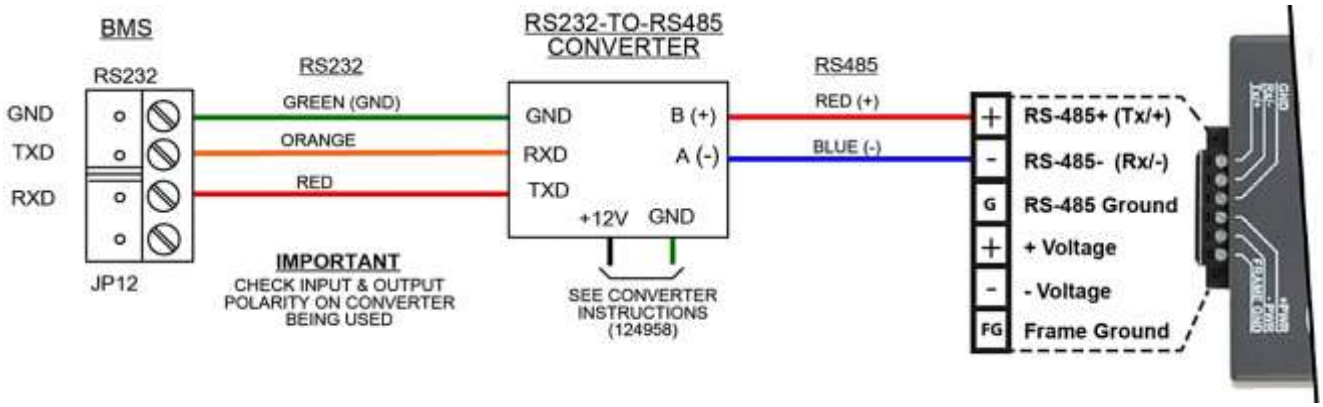


Figure 3-8: RS-232 Connection to BMS

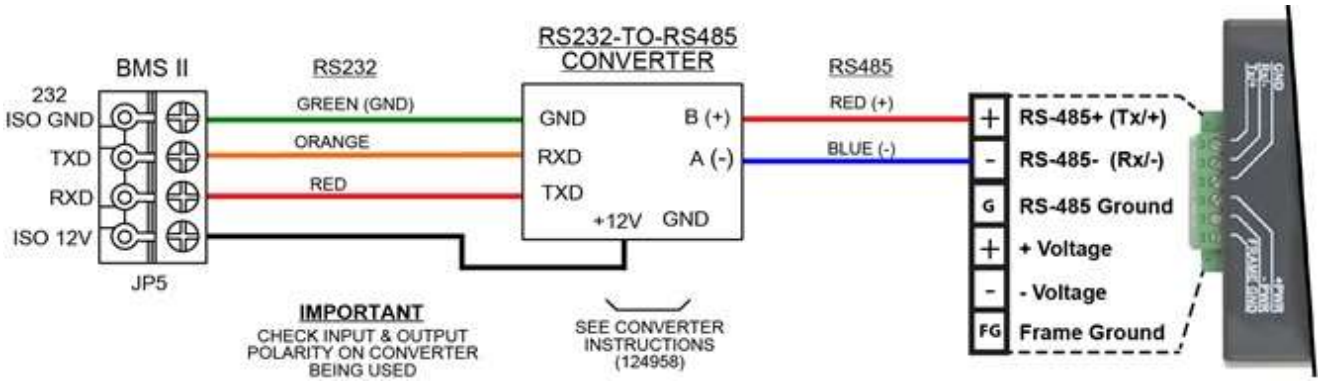


Figure 3-9: RS-232 Connection to ACS/BMS II

3.5.1 Modulex BCM Connections

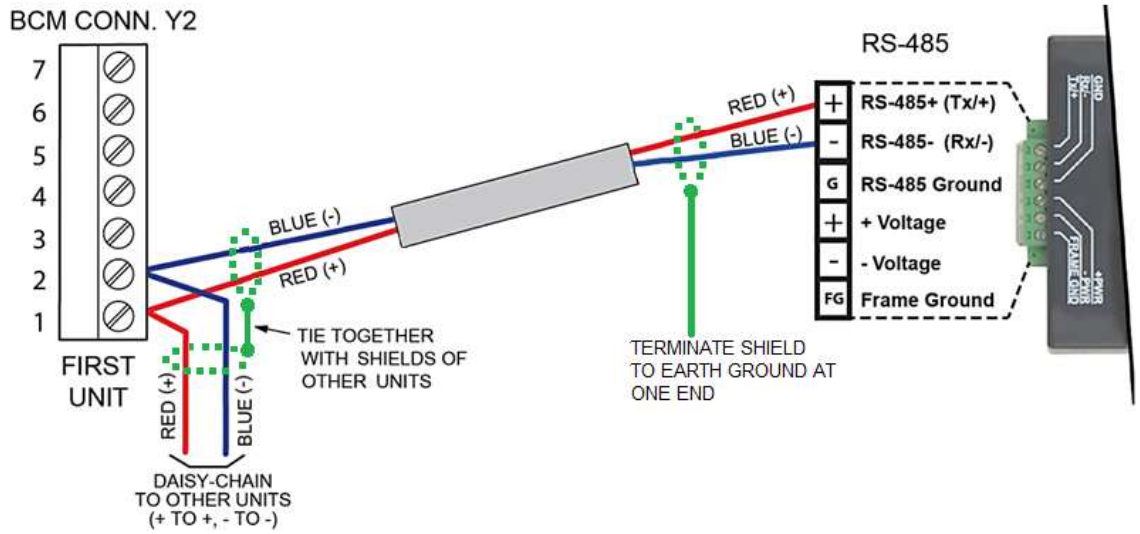
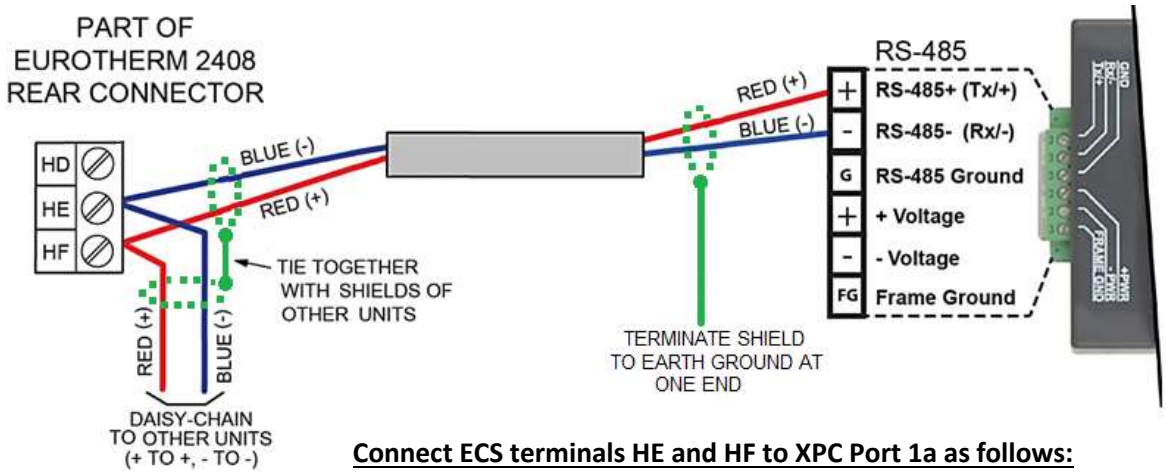


Figure 3-10: RS-485 Connection to BCM

3.5.2 ECS Connections



Connect ECS terminals HE and HF to XPC Port 1a as follows:
Connect the "HF" terminal to the ProtoNode's "RS485 +" port
Connect the "HE" terminal to the ProtoNode's "RS485 -" port

Figure 3-11: RS-485 Connection to ECS

3.5.3 C-MORE Connections

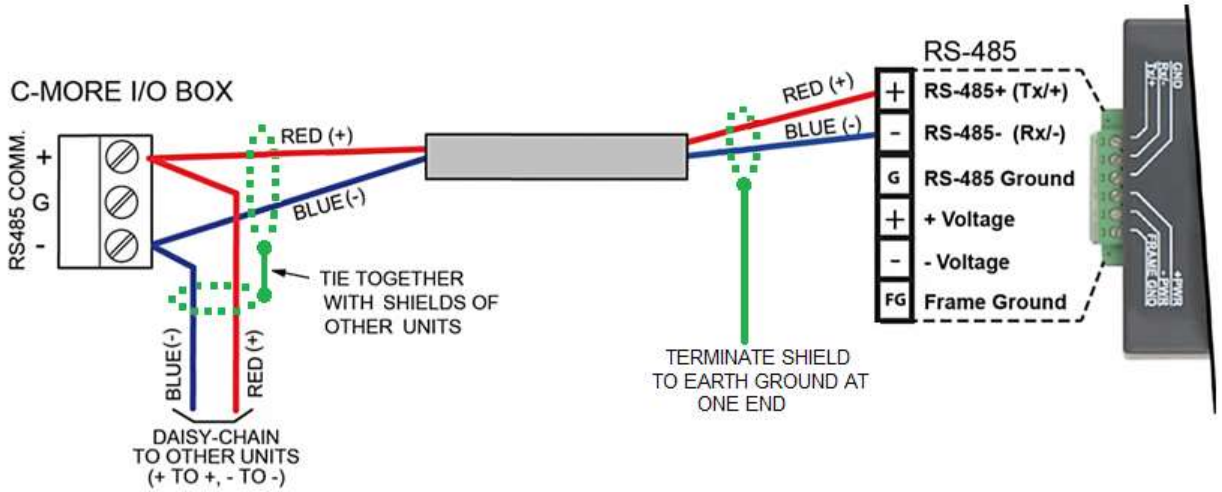


Figure 3-12: RS-485 Connection to C-MORE (RS-485)

3.5.4 AM Series Connections

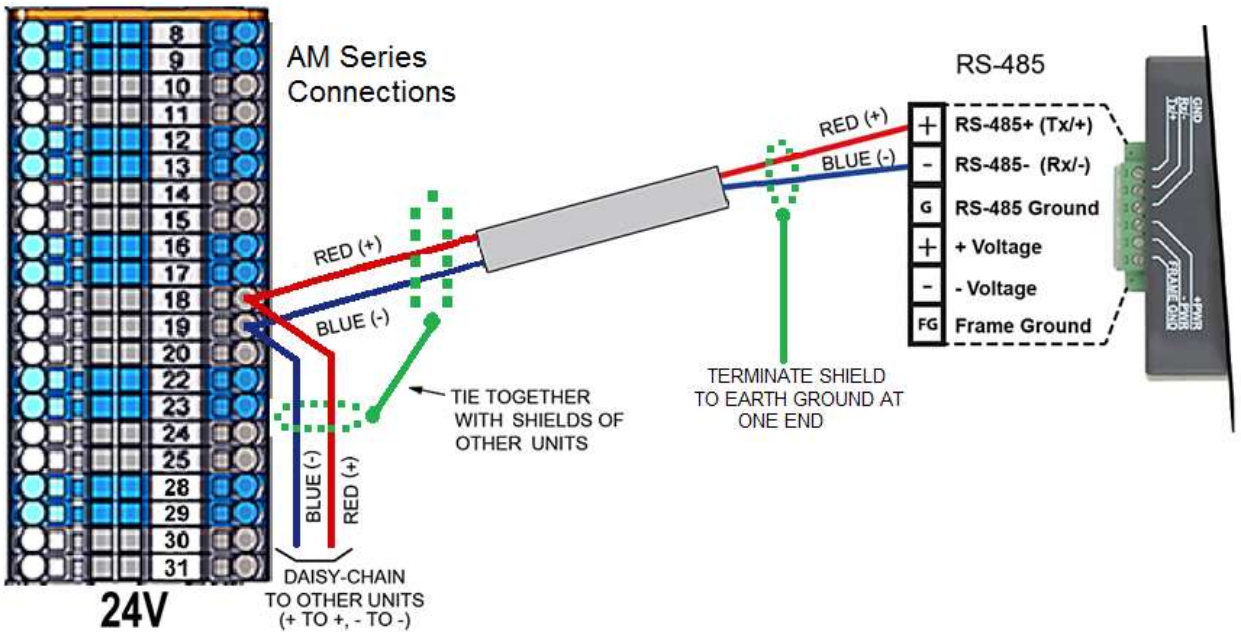


Figure 3-13: RS-485 Connection to AM Series (RS-485)

NOTE

For connection of the ProtoNode along with the AERCO AM Series Cascade Sequencer Controller, see Appendix I.

3.6 Power-Up ProtoNode

Apply power to ProtoNode as shown below in Figure 3-15 Ensure that the power supply used complies with the specifications provided in Appendix J-1**.**

- ProtoNode accepts either 9-30VDC or 12-24 VAC on pins 4 and 5.
- **Frame GND should be connected.**

Power Requirement for ProtoNode External Gateway			
	Current Draw Type		
ProtoNode Family	**12VDC/VAC**	**24VDC/VAC**	**30VDC**
FPC – N34 (Typical)	170mA	100mA	80mA
FPC – N34 (Maximum)	240mA	140mA	100mA
FPC – N35 (Typical)	210mA	130mA	90mA
FPC – N35 (Maximum)	250mA	170mA	110mA
Note: These values are 'nominal' and a safety margin should be added to the power supply of the host system. A safety margin of 25% is recommended.			

Figure 3-14: Required current draw for the ProtoNode

Power to ProtoNode	**ProtoNode Pin #**	**Pin Assignment**
Power In (+)	Pin 4	V +
Power In (-)	Pin 5	V -
Frame Ground	Pin 6	FRAME GND

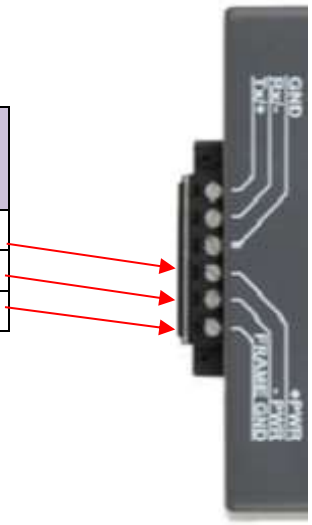


Figure 3-15: Power Connections

3.6.1 Auto-Discovery: After Completion – Turn Off to Save Configuration

The S3 DIP switch for Enabling Auto-Discovery should have been set in Section 2.4.2 before applying power to the ProtoNode. **Do not** Enable Auto-Discovery when the unit is powered.

- When power is applied to a ProtoNode that is set to Enable Auto-Discovery, it will take 10 minutes to complete the discovery of all of the RS-485 devices attached to the ProtoNode.
- **Once the ProtoNode has discovered all of the RS-485 devices, set the S3 DIP switch to the OFF position to save the current configuration.**

ProtoNode FPC-N34 and FPC-N35	
S3 DIP Switch Auto-Discovery Mode	**S3**
Auto-Discovery ON – Build New Configuration	On
Auto-Discover OFF – Save Current Configuration	Off

Figure 3-16: S3 DIP Switch setting for Auto Discovering Devices

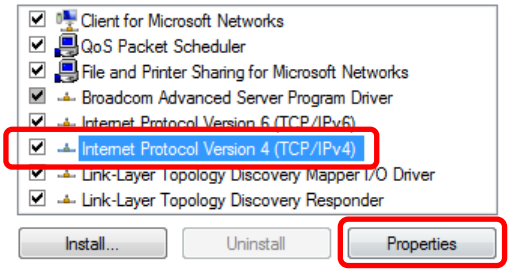
CHAPTER 4. BACNET/IP OR MODBUS TCP/IP: CHANGE THE PROTONODE IP ADDRESS

4.1 Connect the PC to ProtoNode via the Ethernet Port

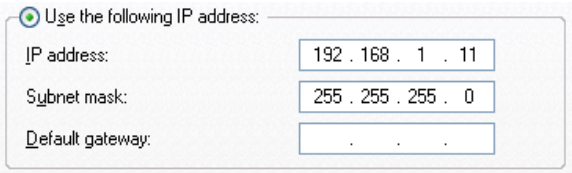
- Connect CAT5 Ethernet cable (straight through or Crossover) between PC and ProtoNode.
  - The Default IP Address of ProtoNode is **192.168.1.24**, Subnet Mask is **255.255.255.0**. If the PC and ProtoNode are on different IP Networks, assign a static IP Address to the PC on the 192.168.1.xxx network.
  - **For Windows XP:**
    1. Click 

, choose **Control Panel**, and then choose **Network Connections**.
    2. Right-click on **Local Area Connection** and choose **Properties**.
    3. Highlight 

  - **For Windows 7:**
    1. Click  and choose **Control Panel**.
    2. If the Control Panel is displayed by category, click **Network and Internet** and then choose **Network and Sharing Center**.
       If the Control Panel is displayed by icon, choose **Network and Sharing Center**.
    3. Choose **Change adapter settings** in the left pane.
    4. Right-click on **Local Area Connection** and choose **Properties**.
    5. Highlight **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.



- Click on the **Use the following IP address** radio button and type in the IP Address.



- Click the **OK** button twice to complete the process.

4.2 BACnet/IP and Modbus TCP/IP: Setting IP Address for Field Network

- After setting your PC to be on the same subnet as the ProtoNode (Section 4.1), open a web browser on your PC and enter the IP Address of the ProtoNode; the default address is **192.168.1.24**.
- The Web Configurator will be displayed as your landing page (see Figure 4-1).
- Below the Active Profiles heading you should see profiles listed for connected devices. If no profiles are present, then the wiring, baud rate, and DIP switch settings must be checked, because there is a problem with device communications. All the active profiles must show the correct Node-ID's before proceeding.
- To access the Web GUI, click on the **Diagnostics & Debugging** button in the lower-right side of the page.

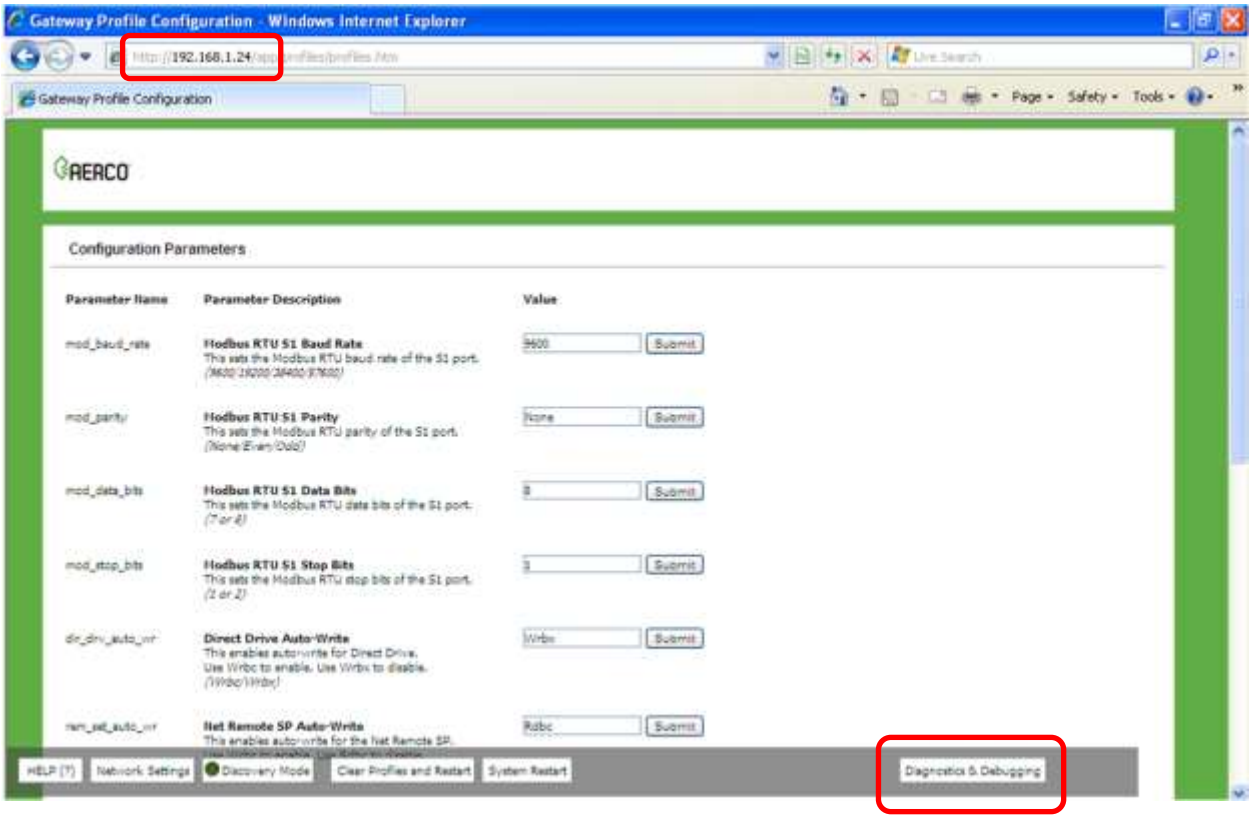


Figure 4-1: Web Configurator Screen with Active Profiles

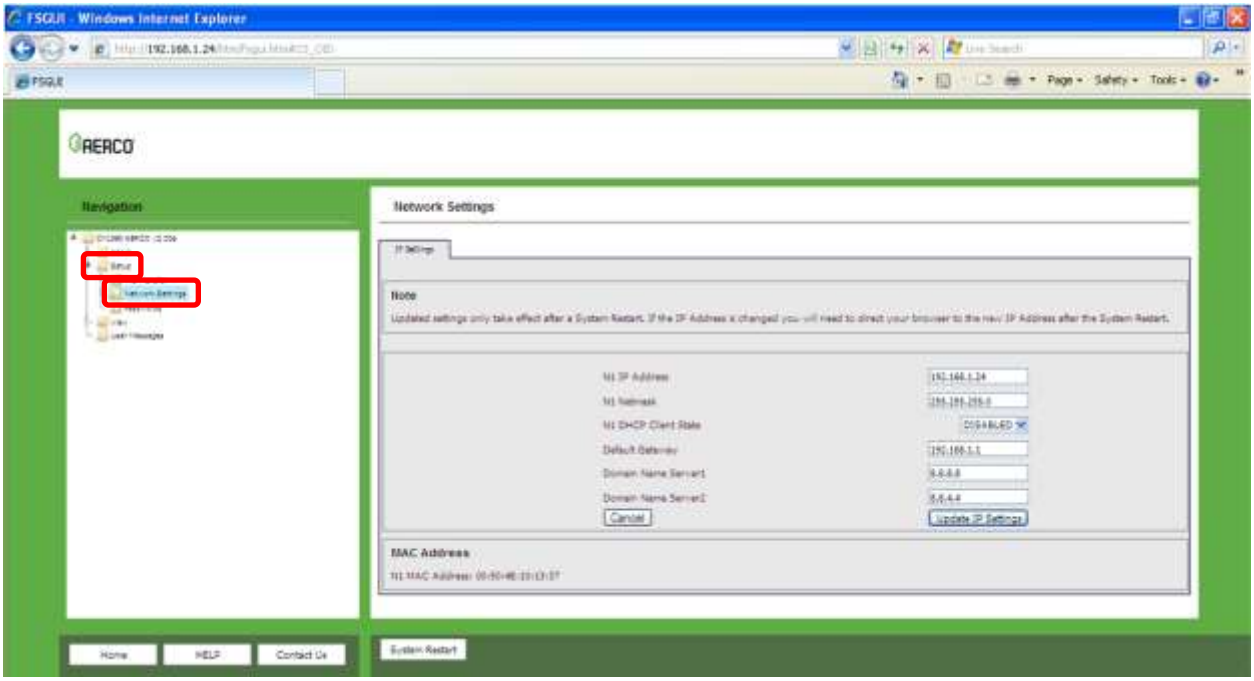


Figure 4-2: Changing IP Address via Web GUI

- From the Web GUI's landing page, click on **Setup** to expand the navigation tree and then select **Network Settings** to access the IP Settings menu **(**Figure 4-2).
- Modify the IP Address (N1 IP Address field) of the ProtoNode Ethernet port.
- If necessary, change the Netmask (N1 Netmask field).
- Type in a new Subnet Mask
- If necessary, change the IP Gateway (Default Gateway field)
- Type in a new IP Gateway

NOTE: If the ProtoNode is connected to a router, the IP Gateway of the ProtoNode should be set to the IP Address of the router that it is connected to.

- Reset ProtoNode
- Unplug Ethernet cable from PC and connect it to the network hub or router
- **Record the IP Address assigned to the ProtoNode for future reference.**

CHAPTER 5. BACNET MS/TP AND BACNET/IP: SETTING NODE_OFFSET TO ASSIGN SPECIFIC DEVICE INSTANCES

- After setting your PC to be on the same subnet as the ProtoNode (Section 4.1), open a web browser on your PC and enter the IP Address of the ProtoNode; the default address is **192.168.1.24**.
- If the IP Address of the ProtoNode has been changed by previous configuration, you will need to get the assigned IP Address from the network administrator.
- The Web Configurator will be displayed as your landing page (see Figure 5-1, below).
- Node_Offset field will be presented displaying the current value (default = 50,000).
- Change the value of Node_Offset to establish the desired Device Instance values, and click the **Submit** button.
    - **Given that: Node_Offset + Modbus Node_ID = Device Instance**
    - Then: **Node_Offset (required) = Device Instance (desired) – Modbus Node_ID**

For example:

- Device 1 has a Modbus Node-ID of 1
- Device 2 has a Modbus Node-ID of 2
- Device 3 has a Modbus Node-ID of 3
- Desired Device Instance for 1st device = 1,001
- **Node_Offset (required) = 1,001 – (Modbus Node_ID) = 1,001 – 1 = 1,000**
- The Node_Offset value will be applied to all devices.
- Device 1 Instance will then be = 1,000 + Modbus Node_ID = 1,000 + 1 = 1,001
- Device 2 Instance will then be = 1,000 + Modbus Node_ID = 1,000 + 2 = 1,002
- Device 3 Instance will then be = 1,000 + Modbus Node_ID = 1,000 + 3 = 1,003

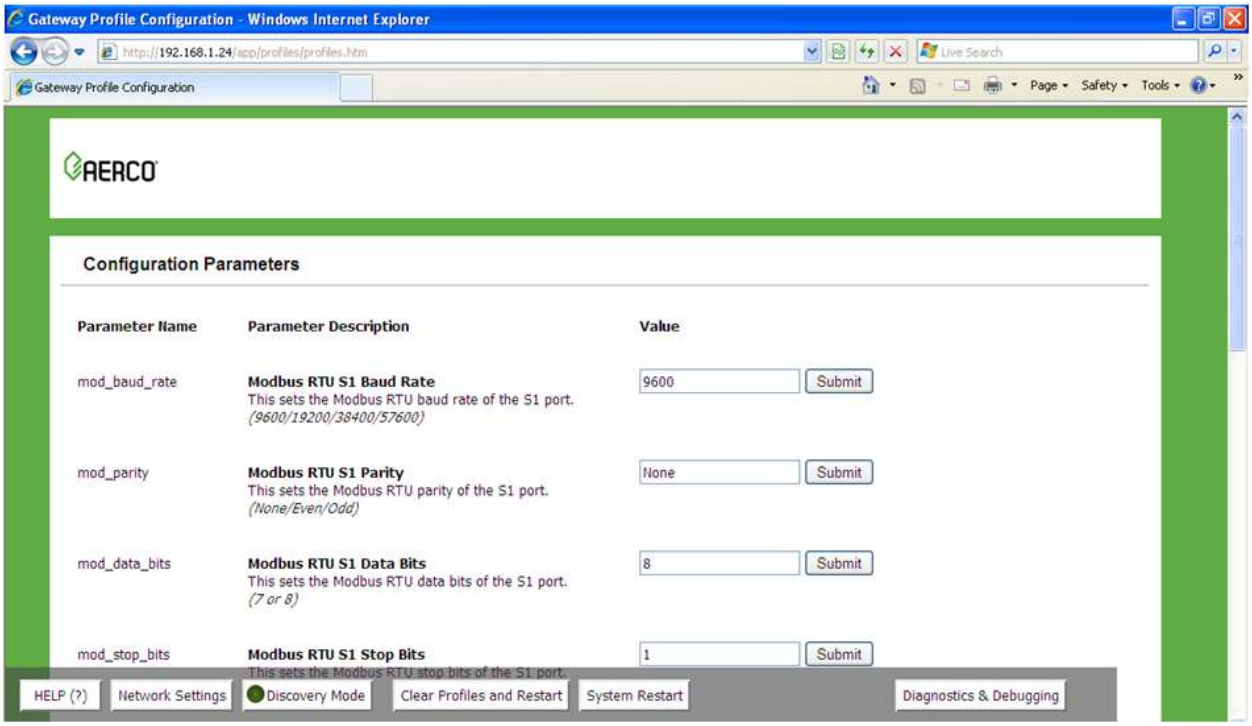


Figure 5-1: Web Configurator screen

CHAPTER 6. HOW TO START THE INSTALLATION OVER: CLEARING PROFILES

- After setting your PC to be on the same subnet as the ProtoNode (Section 4.1), open a web browser on your PC and enter the IP Address of the ProtoNode; the default address is **192.168.1.24**.
- If the IP Address of the ProtoNode has been changed by previous configuration, you will need to get the assigned IP Address from the network administrator.
- The Web Configurator will be displayed as your landing page.
- At the bottom-left of the page, click the **Clear Profiles and Restart** button.
- Click the **System Restart** button.
- Once restart is complete, all the past profiles that were discovered and or added via the Web configurator will be deleted. The unit is now ready to be reinstalled.
- Complete the instructions in one of the following sections:
  - Section **2.4.2** to Auto-Discover your equipment again.

    OR
  - Section **2.4.3** to manually select your equipment again.

CHAPTER 7. LONWORKS (FPC-N35): COMMISSIONING PROTONODE ON A LONWORKS NETWORK

Commissioning may only be performed by the LonWorks administrator.

7.1 Commissioning ProtoNode FPC-N35 on a LonWorks Network

The User will be prompted by the LonWorks Administrator to hit the Service Pin on the ProtoNode FPC-N35 at the correct step of the Commissioning process which is different for each LonWorks Network Management Tool.

- If an XIF file is required, see steps in Section 7.1.1 to generate XIF.

Figure 7-1: LonWorks Service Pin Location

7.1.1 Instructions for Downloading XIF File from ProtoNode FPC-N35 Using Browser

- Connect a CAT5 Ethernet cable (Straight through or Cross-Over) between the PC and ProtoNode.
- The Default IP Address of ProtoNode is **192.168.1.24**, Subnet Mask is **255.255.255.0**. If the PC and ProtoNode are on different IP Networks, assign a static IP Address to the PC on the 192.168.1.xxx network.

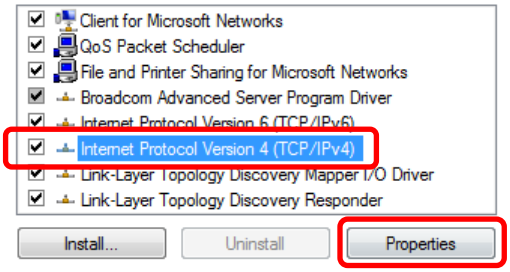
- **For Windows XP:**

  1. Click  , choose **Control Panel**, and then choose **Network Connections**.
  2. Right-click on **Local Area Connection > Properties**.
  3. Highlight 

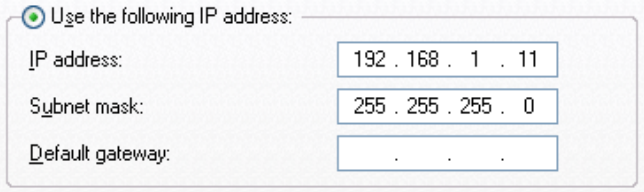
- **For Windows 7:**

  1. Click  and choose **Control Panel.**
  2. If the Control Panel is displayed by category, click **Network and Internet** and then choose **Network and Sharing Center**.
     If the Control Panel is displayed by icon, choose **Network and Sharing Center**.
  3. Choose **Change adapter settings** in the left pane.
  4. Right-click on **Local Area Connection** and choose **Properties**.

5. Highlight **Internet Protocol Version 4 (TCP/IPv4)** and click the **Properties** button.



- For both Windows XP and Windows 7, click on the **Use the following IP address** radio button and type in the IP Address.



- Click the **OK** button twice to complete the process.
- Open a web browser and go to the following address:
  IP Address of **ProtoNode/fserver.xif.**
  For example: **192.168.1.24/fserver.xif**
- If the web browser prompts you to save file, save the file onto the PC. If the web browser displays the xif file as a web page, save the file on your PC as **fserver.xif**

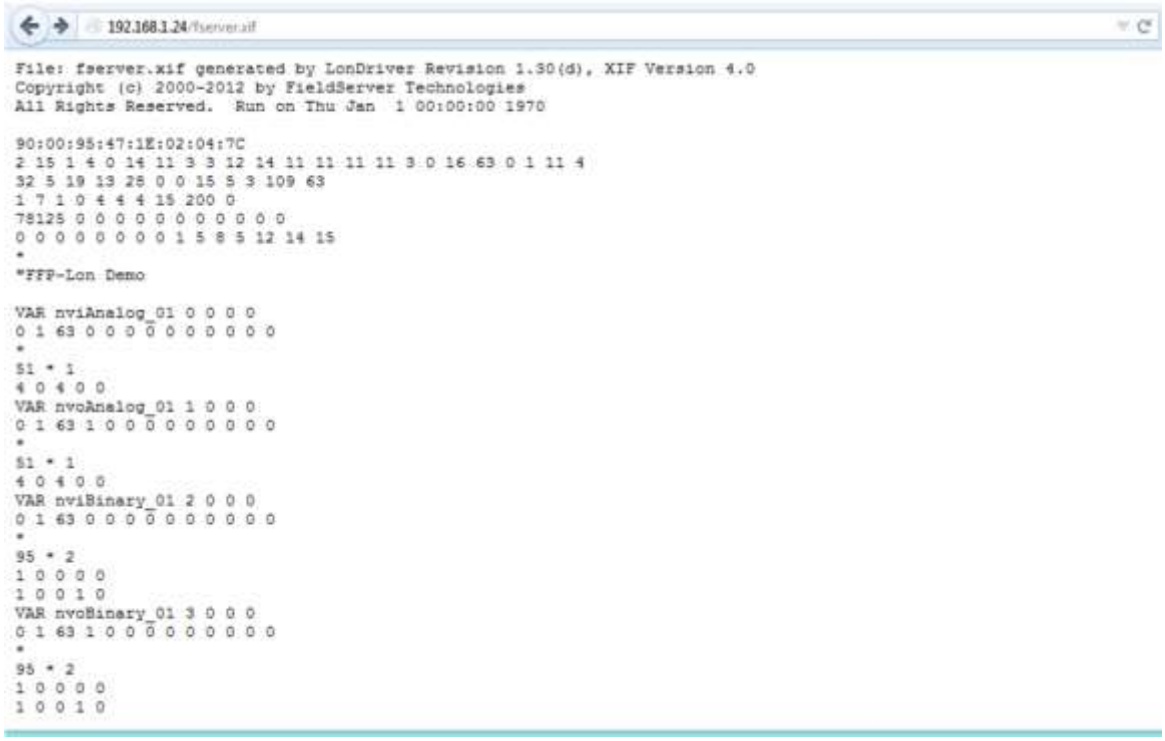


Figure 7-2: Sample of Fserver.XIF File Being Generated

CHAPTER 8. CAS BACNET EXPLORER FOR VALIDATING PROTONODE IN THE FIELD

Sierra Monitor has arranged a complementary 2 week fully functional copy of CAS BACnet Explorer (through Chipkin Automation) that can be used to validate BACnet MS/TP and/or BACnet/IP communications of ProtoNode in the field without having to have the BAS Integrator on site. A Serial or USB to RS-485 converter is needed to test BACnet MS/TP.

8.1 Downloading the CAS Explorer and Requesting an Activation Key

To request the complementary BACnet CAS key:

- Go to **http://app.chipkin.com/activation/twoweek/** and fill in all the information. Enter Vendor Code **AERCO2BACnet**. Once completed, the email address that was submitted will be registered.

Figure 8-1: Downloading the CAS Explorer

- Go to the following web site, download and install the CAS BACnet Explorer to your PC: **http://www.chipkin.com/technical-resources/cas-bacnet-explorer/**

- Open CAS BACnet Explorer; in the CAS Activation form, enter the email address that was registered and click on “Request a key”. The CAS key will then be emailed to the registered address. Cut/paste key from email into the Product key field and click the **Activate** button.

Figure 8-2: Requesting CAS Activation Key

8.2 CAS BACnet Setup

These are the instructions to set CAS Explorer up for the first time on BACnet MS/TP and BACnet/IP.

8.2.1 CAS BACnet MS/TP Setup

Using the Serial or USB to RS-485 converter, connect it to your PC and the 3 Pin BACnet MS/TP connector on ProtoNode FPC-N34.

In CAS Explorer, do the following:

- Click on “**settings**”
- Check the **BACnet MS/TP** box and *uncheck* the **BACnet/IP** and **BACnet Ethernet** boxes
- Set the BACnet MS/TP MAC address to **0**
- Set the BACnet MS/TP Baud Rate to **38400**
- Click “**Ok**”
- On the bottom right-hand corner, make sure that the BACnet MS/TP box is green
- Click on “**discover**”
- Check all 4 boxes
- Click “**Send**”

8.2.2 CAS BACnet BACnet/IP Setup

See Section 4.2 to set the IP Address and subnet of the PC that will be running the CAS Explorer.

Connect a straight through or cross Ethernet cable from the PC to ProtoNode.

In CAS Explorer, do the following:

- Click on "**settings**"
- Check the **BACnet/IP** box and uncheck the **BACnet MS/TP** and **BACnet Ethernet** boxes
- In the "Select a Network Device" box, select the network card of the PC by clicking on it
- Click "**Ok**"
- On the bottom right-hand corner, make sure that the BACnet/IP box is green
- Click on "**discover**"
- Check all 4 boxes
- Click "**Send**

APPENDIX A: "A" BANK DIP SWITCH SETTINGS

"A" Bank DIP Switch Settings

Address	A0	A1	A2	A3	A4	A5	A6	A7
1	**ON**	Off	Off	Off	Off	Off	Off	Off
2	Off	**ON**	Off	Off	Off	Off	Off	Off
3	**ON**	**ON**	Off	Off	Off	Off	Off	Off
4	Off	Off	**ON**	Off	Off	Off	Off	Off
5	**ON**	Off	**ON**	Off	Off	Off	Off	Off
6	Off	**ON**	**ON**	Off	Off	Off	Off	Off
7	**ON**	**ON**	**ON**	Off	Off	Off	Off	Off
8	Off	Off	Off	**ON**	Off	Off	Off	Off
9	**ON**	Off	Off	**ON**	Off	Off	Off	Off
10	Off	**ON**	Off	**ON**	Off	Off	Off	Off
11	**ON**	**ON**	Off	**ON**	Off	Off	Off	Off
12	Off	Off	**ON**	**ON**	Off	Off	Off	Off
13	**ON**	Off	**ON**	**ON**	Off	Off	Off	Off
14	Off	**ON**	**ON**	**ON**	Off	Off	Off	Off
15	**ON**	**ON**	**ON**	**ON**	Off	Off	Off	Off
16	Off	Off	Off	Off	**ON**	Off	Off	Off
17	**ON**	Off	Off	Off	**ON**	Off	Off	Off
18	Off	**ON**	Off	Off	**ON**	Off	Off	Off
19	**ON**	**ON**	Off	Off	**ON**	Off	Off	Off
20	Off	Off	**ON**	Off	**ON**	Off	Off	Off
21	**ON**	Off	**ON**	Off	**ON**	Off	Off	Off
22	Off	**ON**	**ON**	Off	**ON**	Off	Off	Off
23	**ON**	**ON**	**ON**	Off	**ON**	Off	Off	Off
24	Off	Off	Off	**ON**	**ON**	Off	Off	Off
25	**ON**	Off	Off	**ON**	**ON**	Off	Off	Off
26	Off	**ON**	Off	**ON**	**ON**	Off	Off	Off
27	**ON**	**ON**	Off	**ON**	**ON**	Off	Off	Off
28	Off	Off	**ON**	**ON**	**ON**	Off	Off	Off
29	**ON**	Off	**ON**	**ON**	**ON**	Off	Off	Off
30	Off	**ON**	**ON**	**ON**	**ON**	Off	Off	Off
31	**ON**	**ON**	**ON**	**ON**	**ON**	Off	Off	Off
32	Off	Off	Off	Off	Off	**ON**	Off	Off
33	**ON**	Off	Off	Off	Off	**ON**	Off	Off
34	Off	**ON**	Off	Off	Off	**ON**	Off	Off
35	**ON**	**ON**	Off	Off	Off	**ON**	Off	Off
36	Off	Off	**ON**	Off	Off	**ON**	Off	Off
37	**ON**	Off	**ON**	Off	Off	**ON**	Off	Off
38	Off	**ON**	**ON**	Off	Off	**ON**	Off	Off
39	**ON**	**ON**	**ON**	Off	Off	**ON**	Off	Off
40	Off	Off	Off	**ON**	Off	**ON**	Off	Off
41	**ON**	Off	Off	**ON**	Off	**ON**	Off	Off
42	Off	**ON**	Off	**ON**	Off	**ON**	Off	Off
43	**ON**	**ON**	Off	**ON**	Off	**ON**	Off	Off
44	Off	Off	**ON**	**ON**	Off	**ON**	Off	Off

Address	A0	A1	A2	A3	A4	A5	A6	A7
45	**ON**	Off	**ON**	**ON**	Off	**ON**	Off	Off
46	Off	**ON**	**ON**	**ON**	Off	**ON**	Off	Off
47	**ON**	**ON**	**ON**	**ON**	Off	**ON**	Off	Off
48	Off	Off	Off	Off	**ON**	**ON**	Off	Off
49	**ON**	Off	Off	Off	**ON**	**ON**	Off	Off
50	Off	**ON**	Off	Off	**ON**	**ON**	Off	Off
51	**ON**	**ON**	Off	Off	**ON**	**ON**	Off	Off
52	Off	Off	**ON**	Off	**ON**	**ON**	Off	Off
53	**ON**	Off	**ON**	Off	**ON**	**ON**	Off	Off
54	Off	**ON**	**ON**	Off	**ON**	**ON**	Off	Off
55	**ON**	**ON**	**ON**	Off	**ON**	**ON**	Off	Off
56	Off	Off	Off	**ON**	**ON**	**ON**	Off	Off
57	**ON**	Off	Off	**ON**	**ON**	**ON**	Off	Off
58	Off	**ON**	Off	**ON**	**ON**	**ON**	Off	Off
59	**ON**	**ON**	Off	**ON**	**ON**	**ON**	Off	Off
60	Off	Off	**ON**	**ON**	**ON**	**ON**	Off	Off
61	**ON**	Off	**ON**	**ON**	**ON**	**ON**	Off	Off
62	Off	**ON**	**ON**	**ON**	**ON**	**ON**	Off	Off
63	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	Off	Off
64	Off	Off	Off	Off	Off	Off	**ON**	Off
65	**ON**	Off	Off	Off	Off	Off	**ON**	Off
66	Off	**ON**	Off	Off	Off	Off	**ON**	Off
67	**ON**	**ON**	Off	Off	Off	Off	**ON**	Off
68	Off	Off	**ON**	Off	Off	Off	**ON**	Off
69	**ON**	Off	**ON**	Off	Off	Off	**ON**	Off
70	Off	**ON**	**ON**	Off	Off	Off	**ON**	Off
71	**ON**	**ON**	**ON**	Off	Off	Off	**ON**	Off
72	Off	Off	Off	**ON**	Off	Off	**ON**	Off
73	**ON**	Off	Off	**ON**	Off	Off	**ON**	Off
74	Off	**ON**	Off	**ON**	Off	Off	**ON**	Off
75	**ON**	**ON**	Off	**ON**	Off	Off	**ON**	Off
76	Off	Off	**ON**	**ON**	Off	Off	**ON**	Off
77	**ON**	Off	**ON**	**ON**	Off	Off	**ON**	Off
78	Off	**ON**	**ON**	**ON**	Off	Off	**ON**	Off
79	**ON**	**ON**	**ON**	**ON**	Off	Off	**ON**	Off
80	Off	Off	Off	Off	**ON**	Off	**ON**	Off
81	**ON**	Off	Off	Off	**ON**	Off	**ON**	Off
82	Off	**ON**	Off	Off	**ON**	Off	**ON**	Off
83	**ON**	**ON**	Off	Off	**ON**	Off	**ON**	Off
84	Off	Off	**ON**	Off	**ON**	Off	**ON**	Off
85	**ON**	Off	**ON**	Off	**ON**	Off	**ON**	Off
86	Off	**ON**	**ON**	Off	**ON**	Off	**ON**	Off
87	**ON**	**ON**	**ON**	Off	**ON**	Off	**ON**	Off
88	Off	Off	Off	**ON**	**ON**	Off	**ON**	Off

Address	A0	A1	A2	A3	A4	A5	A6	A7
89	**ON**	Off	Off	**ON**	**ON**	Off	**ON**	Off
90	Off	**ON**	Off	**ON**	**ON**	Off	**ON**	Off
91	**ON**	**ON**	Off	**ON**	**ON**	Off	**ON**	Off
92	Off	Off	**ON**	**ON**	**ON**	Off	**ON**	Off
93	**ON**	Off	**ON**	**ON**	**ON**	Off	**ON**	Off
94	Off	**ON**	**ON**	**ON**	**ON**	Off	**ON**	Off
95	**ON**	**ON**	**ON**	**ON**	**ON**	Off	**ON**	Off
96	Off	Off	Off	Off	Off	**ON**	**ON**	Off
97	**ON**	Off	Off	Off	Off	**ON**	**ON**	Off
98	Off	**ON**	Off	Off	Off	**ON**	**ON**	Off
99	**ON**	**ON**	Off	Off	Off	**ON**	**ON**	Off
100	Off	Off	**ON**	Off	Off	**ON**	**ON**	Off
101	**ON**	Off	**ON**	Off	Off	**ON**	**ON**	Off
102	Off	**ON**	**ON**	Off	Off	**ON**	**ON**	Off
103	**ON**	**ON**	**ON**	Off	Off	**ON**	**ON**	Off
104	Off	Off	Off	**ON**	Off	**ON**	**ON**	Off
105	**ON**	Off	Off	**ON**	Off	**ON**	**ON**	Off
106	Off	**ON**	Off	**ON**	Off	**ON**	**ON**	Off
107	**ON**	**ON**	Off	**ON**	Off	**ON**	**ON**	Off
108	Off	Off	**ON**	**ON**	Off	**ON**	**ON**	Off
109	**ON**	Off	**ON**	**ON**	Off	**ON**	**ON**	Off
110	Off	**ON**	**ON**	**ON**	Off	**ON**	**ON**	Off
111	**ON**	**ON**	**ON**	**ON**	Off	**ON**	**ON**	Off
112	Off	Off	Off	Off	**ON**	**ON**	**ON**	Off
113	**ON**	Off	Off	Off	**ON**	**ON**	**ON**	Off
114	Off	**ON**	Off	Off	**ON**	**ON**	**ON**	Off
115	**ON**	**ON**	Off	Off	**ON**	**ON**	**ON**	Off
116	Off	Off	**ON**	Off	**ON**	**ON**	**ON**	Off
117	**ON**	Off	**ON**	Off	**ON**	**ON**	**ON**	Off
118	Off	**ON**	**ON**	Off	**ON**	**ON**	**ON**	Off
119	**ON**	**ON**	**ON**	Off	**ON**	**ON**	**ON**	Off
120	Off	Off	Off	**ON**	**ON**	**ON**	**ON**	Off
121	**ON**	Off	Off	**ON**	**ON**	**ON**	**ON**	Off
122	Off	**ON**	Off	**ON**	**ON**	**ON**	**ON**	Off
123	**ON**	**ON**	Off	**ON**	**ON**	**ON**	**ON**	Off
124	Off	Off	**ON**	**ON**	**ON**	**ON**	**ON**	Off
125	**ON**	Off	**ON**	**ON**	**ON**	**ON**	**ON**	Off
126	Off	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	Off
127	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	Off
128	Off	Off	Off	Off	Off	Off	Off	**ON**
129	**ON**	Off	Off	Off	Off	Off	Off	**ON**
130	Off	**ON**	Off	Off	Off	Off	Off	**ON**
131	**ON**	**ON**	Off	Off	Off	Off	Off	**ON**
132	Off	Off	**ON**	Off	Off	Off	Off	**ON**
133	**ON**	Off	**ON**	Off	Off	Off	Off	**ON**
134	Off	**ON**	**ON**	Off	Off	Off	Off	**ON**
135	**ON**	**ON**	**ON**	Off	Off	Off	Off	**ON**
136	Off	Off	Off	**ON**	Off	Off	Off	**ON**
137	**ON**	Off	Off	**ON**	Off	Off	Off	**ON**

Address	A0	A1	A2	A3	A4	A5	A6	A7
138	Off	**ON**	Off	**ON**	Off	Off	Off	**ON**
139	**ON**	**ON**	Off	**ON**	Off	Off	Off	**ON**
140	Off	Off	**ON**	**ON**	Off	Off	Off	**ON**
141	**ON**	Off	**ON**	**ON**	Off	Off	Off	**ON**
142	Off	**ON**	**ON**	**ON**	Off	Off	Off	**ON**
143	**ON**	**ON**	**ON**	**ON**	Off	Off	Off	**ON**
144	Off	Off	Off	Off	**ON**	Off	Off	**ON**
145	**ON**	Off	Off	Off	**ON**	Off	Off	**ON**
146	Off	**ON**	Off	Off	**ON**	Off	Off	**ON**
147	**ON**	**ON**	Off	Off	**ON**	Off	Off	**ON**
148	Off	Off	**ON**	Off	**ON**	Off	Off	**ON**
149	**ON**	Off	**ON**	Off	**ON**	Off	Off	**ON**
150	Off	**ON**	**ON**	Off	**ON**	Off	Off	**ON**
151	**ON**	**ON**	**ON**	Off	**ON**	Off	Off	**ON**
152	Off	Off	Off	**ON**	**ON**	Off	Off	**ON**
153	**ON**	Off	Off	**ON**	**ON**	Off	Off	**ON**
154	Off	**ON**	Off	**ON**	**ON**	Off	Off	**ON**
155	**ON**	**ON**	Off	**ON**	**ON**	Off	Off	**ON**
156	Off	Off	**ON**	**ON**	**ON**	Off	Off	**ON**
157	**ON**	Off	**ON**	**ON**	**ON**	Off	Off	**ON**
158	Off	**ON**	**ON**	**ON**	**ON**	Off	Off	**ON**
159	**ON**	**ON**	**ON**	**ON**	**ON**	Off	Off	**ON**
160	Off	Off	Off	Off	Off	**ON**	Off	**ON**
161	**ON**	Off	Off	Off	Off	**ON**	Off	**ON**
162	Off	**ON**	Off	Off	Off	**ON**	Off	**ON**
163	**ON**	**ON**	Off	Off	Off	**ON**	Off	**ON**
164	Off	Off	**ON**	Off	Off	**ON**	Off	**ON**
165	**ON**	Off	**ON**	Off	Off	**ON**	Off	**ON**
166	Off	**ON**	**ON**	Off	Off	**ON**	Off	**ON**
167	**ON**	**ON**	**ON**	Off	Off	**ON**	Off	**ON**
168	Off	Off	Off	**ON**	Off	**ON**	Off	**ON**
169	**ON**	Off	Off	**ON**	Off	**ON**	Off	**ON**
170	Off	**ON**	Off	**ON**	Off	**ON**	Off	**ON**
171	**ON**	**ON**	Off	**ON**	Off	**ON**	Off	**ON**
172	Off	Off	**ON**	**ON**	Off	**ON**	Off	**ON**
173	**ON**	Off	**ON**	**ON**	Off	**ON**	Off	**ON**
174	Off	**ON**	**ON**	**ON**	Off	**ON**	Off	**ON**
175	**ON**	**ON**	**ON**	**ON**	Off	**ON**	Off	**ON**
176	Off	Off	Off	Off	**ON**	**ON**	Off	**ON**
177	**ON**	Off	Off	Off	**ON**	**ON**	Off	**ON**
178	Off	**ON**	Off	Off	**ON**	**ON**	Off	**ON**
179	**ON**	**ON**	Off	Off	**ON**	**ON**	Off	**ON**
180	Off	Off	**ON**	Off	**ON**	**ON**	Off	**ON**
181	**ON**	Off	**ON**	Off	**ON**	**ON**	Off	**ON**
182	Off	**ON**	**ON**	Off	**ON**	**ON**	Off	**ON**
183	**ON**	**ON**	**ON**	Off	**ON**	**ON**	Off	**ON**
184	Off	Off	Off	**ON**	**ON**	**ON**	Off	**ON**
185	**ON**	Off	Off	**ON**	**ON**	**ON**	Off	**ON**
186	Off	**ON**	Off	**ON**	**ON**	**ON**	Off	**ON**

Address	A0	A1	A2	A3	A4	A5	A6	A7
187	**ON**	**ON**	Off	**ON**	**ON**	**ON**	Off	**ON**
188	Off	Off	**ON**	**ON**	**ON**	**ON**	Off	**ON**
189	**ON**	Off	**ON**	**ON**	**ON**	**ON**	Off	**ON**
190	Off	**ON**	**ON**	**ON**	**ON**	**ON**	Off	**ON**
191	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	Off	**ON**
192	Off	Off	Off	Off	Off	Off	**ON**	**ON**
193	**ON**	Off	Off	Off	Off	Off	**ON**	**ON**
194	Off	**ON**	Off	Off	Off	Off	**ON**	**ON**
195	**ON**	**ON**	Off	Off	Off	Off	**ON**	**ON**
196	Off	Off	**ON**	Off	Off	Off	**ON**	**ON**
197	**ON**	Off	**ON**	Off	Off	Off	**ON**	**ON**
198	Off	**ON**	**ON**	Off	Off	Off	**ON**	**ON**
199	**ON**	**ON**	**ON**	Off	Off	Off	**ON**	**ON**
200	Off	Off	Off	**ON**	Off	Off	**ON**	**ON**
201	**ON**	Off	Off	**ON**	Off	Off	**ON**	**ON**
202	Off	**ON**	Off	**ON**	Off	Off	**ON**	**ON**
203	**ON**	**ON**	Off	**ON**	Off	Off	**ON**	**ON**
204	Off	Off	**ON**	**ON**	Off	Off	**ON**	**ON**
205	**ON**	Off	**ON**	**ON**	Off	Off	**ON**	**ON**
206	Off	**ON**	**ON**	**ON**	Off	Off	**ON**	**ON**
207	**ON**	**ON**	**ON**	**ON**	Off	Off	**ON**	**ON**
208	Off	Off	Off	Off	**ON**	Off	**ON**	**ON**
209	**ON**	Off	Off	Off	**ON**	Off	**ON**	**ON**
210	Off	**ON**	Off	Off	**ON**	Off	**ON**	**ON**
211	**ON**	**ON**	Off	Off	**ON**	Off	**ON**	**ON**
212	Off	Off	**ON**	Off	**ON**	Off	**ON**	**ON**
213	**ON**	Off	**ON**	Off	**ON**	Off	**ON**	**ON**
214	Off	**ON**	**ON**	Off	**ON**	Off	**ON**	**ON**
215	**ON**	**ON**	**ON**	Off	**ON**	Off	**ON**	**ON**
216	Off	Off	Off	**ON**	**ON**	Off	**ON**	**ON**
217	**ON**	Off	Off	**ON**	**ON**	Off	**ON**	**ON**
218	Off	**ON**	Off	**ON**	**ON**	Off	**ON**	**ON**
219	**ON**	**ON**	Off	**ON**	**ON**	Off	**ON**	**ON**
220	Off	Off	**ON**	**ON**	**ON**	Off	**ON**	**ON**
221	**ON**	Off	**ON**	**ON**	**ON**	Off	**ON**	**ON**
222	Off	**ON**	**ON**	**ON**	**ON**	Off	**ON**	**ON**

Address	A0	A1	A2	A3	A4	A5	A6	A7
223	**ON**	**ON**	**ON**	**ON**	**ON**	Off	**ON**	**ON**
224	Off	Off	Off	Off	Off	**ON**	**ON**	**ON**
225	**ON**	Off	Off	Off	Off	**ON**	**ON**	**ON**
226	Off	**ON**	Off	Off	Off	**ON**	**ON**	**ON**
227	**ON**	**ON**	Off	Off	Off	**ON**	**ON**	**ON**
228	Off	Off	**ON**	Off	Off	**ON**	**ON**	**ON**
229	**ON**	Off	**ON**	Off	Off	**ON**	**ON**	**ON**
230	Off	**ON**	**ON**	Off	Off	**ON**	**ON**	**ON**
231	**ON**	**ON**	**ON**	Off	Off	**ON**	**ON**	**ON**
232	Off	Off	Off	**ON**	Off	**ON**	**ON**	**ON**
233	**ON**	Off	Off	**ON**	Off	**ON**	**ON**	**ON**
234	Off	**ON**	Off	**ON**	Off	**ON**	**ON**	**ON**
235	**ON**	**ON**	Off	**ON**	Off	**ON**	**ON**	**ON**
236	Off	Off	**ON**	**ON**	Off	**ON**	**ON**	**ON**
237	**ON**	Off	**ON**	**ON**	Off	**ON**	**ON**	**ON**
238	Off	**ON**	**ON**	**ON**	Off	**ON**	**ON**	**ON**
239	**ON**	**ON**	**ON**	**ON**	Off	**ON**	**ON**	**ON**
240	Off	Off	Off	Off	**ON**	**ON**	**ON**	**ON**
241	**ON**	Off	Off	Off	**ON**	**ON**	**ON**	**ON**
242	Off	**ON**	Off	Off	**ON**	**ON**	**ON**	**ON**
243	**ON**	**ON**	Off	Off	**ON**	**ON**	**ON**	**ON**
244	Off	Off	**ON**	Off	**ON**	**ON**	**ON**	**ON**
245	**ON**	Off	**ON**	Off	**ON**	**ON**	**ON**	**ON**
246	Off	**ON**	**ON**	Off	**ON**	**ON**	**ON**	**ON**
247	**ON**	**ON**	**ON**	Off	**ON**	**ON**	**ON**	**ON**
248	Off	Off	Off	**ON**	**ON**	**ON**	**ON**	**ON**
249	**ON**	Off	Off	**ON**	**ON**	**ON**	**ON**	**ON**
250	Off	**ON**	Off	**ON**	**ON**	**ON**	**ON**	**ON**
251	**ON**	**ON**	Off	**ON**	**ON**	**ON**	**ON**	**ON**
252	Off	Off	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**
253	**ON**	Off	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**
254	Off	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**
255	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

APPENDIX B: EQUIPMENT MONITOR AND CONTROL POINT DEFINITIONS

Definitions of the monitor and control points associated with the AERCO Equipment Configurations are provided in the tables below.

Appendix B-1: AERCO C-More & ACS/BMS II/BMS Point Definitions

Point Name	BAS Modbus Data Address	GF-108, GF-124, GF-114 Point Name	Reg. Type	Modbus Data Address (Hex/Dec.)	Units (Range)
C-More Boiler					
Fire Rate Out	30009	Fire Rate Out	Input	0x0008 / 8	% (0 to 100)
Active Setpoint	30017	Active Set Point	Input	0x0010 / 16	deg F (40 to 220)
Net Remote Setpt	40001	Net Remote Set Point	Holding	0x0000 / 0	deg F (40 to 220)
*Net Direct Drive	40002	Net Direct Drive	Holding	0x0001 / 1	% (0 to 100)
Fire Rate In	30018	Fire Rate In	Input	0x0011 / 17	% (0 to 100)
Outlet Temp	30003	Outlet Temp	Input	0x0002 / 2	deg F (30 to 245)
Display Code	30001	Default Message Display Code	Input	0x0000 / 0	Enum (1 to 48) See Appendix F
Unit Status	30002	Unit Status	Input	0x0001 / 1	Enum (0 to 5) 0 = Disabled 1 = Standby 2 = Manual Operation 3 = Remote Operation 4 = Auto Operation 5 = Fault
Run Cycles	30012-30013	Run Cycles	Input	0x000B - 0x000C / 11 - 12	(0 to 999,999)
Run Hours	30014-30015	Run Hours	Input	0x000D - 0x000E / 13 - 14	(0 to 999,999)
Oxygen	30010	O2 Level	Input	0x0009 / 9	% (0 to 25)
Exhaust Temp	30007	Exhaust Temp	Input	0x0006 / 6	Deg F (50 to 550)

* Where available in special profiles

ACS/BMS II/BMS					
Fire Rate Out	30005	Fire Rate Out	Input	0x0004 / 4	% (0 to 100)
Header Set Temp	30006	Header Set Temperature	Input	0x0005 / 5	°F (40 to 220)
Net Header Set Temp	40005	Net Header Set Temp	Holding	0x0004 / 4	°F (40 to 220)
Header Temp	30002	Header Temperature	Input	0x0001 / 1	°F (40 to 220)
Outside Air Temp	30003	Outside Air Temperature	Input	0x0002 / 2	°F (-60 to 120)

Appendix B-1: AERCO C-More & ACS/BMS II/BMS Point Definitions

Point Name	BAS Modbus Data Address	GF-108, GF-124, GF-114 Point Name	Reg. Type	Modbus Data Address (Hex/Dec.)	Units (Range)
Display Code	30011	Fault/Message Code	Input	0x000A / 10	Bit (0 to 65535) Bit 0 = Outside Air Sensor Error Bit 1 = Header Sensor Error Bit 2 = Interlock 1 Error Bit 3 = Interlock 2 Error Bit 4 = Indoor Air/Return Sens Error Bit 5 = 4-20 mA Input Error
Num Boilers Fired	30008	Total Boilers Fired	Input	0x0007 / 7	(0 to 40) BMS (0 to 32) BMSII
Num Boilers Online	30009	Total Boilers On Line	Input	0x0008 / 8	(0 to 40) BMS (0 to 32) BMSII
Last Blr Fired	30017	Last Boiler Fired	Input	0x0010 / 16	(1 to 40) BMS (1 to 32) BMSII
Boiler 1 Status	30018	Boiler 1 Status (PWM Boiler 1)	Input	0x0011 / 17	Enum (1 to 40, 119, 120) 1 to 40 = Fired and Sequence 119 = Not On Line 120 = On Line But Not Fired
Boiler 2 Status	30019	Boiler 2 Status (PWM Boiler 2)	Input	0x0012 / 18	Same As Above
Boiler 3 Status	30020	Boiler 3 Status (PWM Boiler 3)	Input	0x0013 / 19	Same As Above
Boiler 4 Status	30021	Boiler 4 Status (PWM Boiler 4)	Input	0x0014 / 20	Same As Above
Boiler 5 Status	30022	Boiler 5 Status (PWM Boiler 5)	Input	0x0015 / 21	Enum (1 to 40, 119, 120) 1 to 40 = Fired and Sequence 119 = Not On Line 120 = On Line But Not Fired
Boiler 6 Status	30023	Boiler 6 Status (PWM Boiler 6)	Input	0x0016 / 22	Same As Above
Boiler 7 Status	30024	Boiler 7 Status (PWM Boiler 7)	Input	0x0017 / 23	Same As Above
Boiler 8 Status	30025	Boiler 8 Status (PWM Boiler 8)	Input	0x0018 / 24	Same As Above
Net Blr 1 Status	30026	Net Boiler 1	Input	0x0019 / 25	Enum (1 to 40, 119, 120) 1 to 40 = Fired and Sequence 119 = Not On Line 120 = On Line But Not Fired 121 = On Line But Disabled 122 = On Line But Faulted
Net Blr 2 Status	30027	Net Boiler 2	Input	0x001A / 26	Same As Above
Net Blr 3 Status	30028	Net Boiler 3	Input	0x001B / 27	Same As Above
Net Blr 4 Status	30029	Net Boiler 4	Input	0x001C / 28	Same As Above
Net Blr 5 Status	30030	Net Boiler 5	Input	0x001D / 29	Same As Above

Appendix B-1: AERCO C-More & ACS/BMS II/BMS Point Definitions

Point Name	BAS Modbus Data Address	GF-108, GF-124, GF-114 Point Name	Reg. Type	Modbus Data Address (Hex/Dec.)	Units (Range)
Net Blr 6 Status	30031	Net Boiler 6	Input	0x001E / 30	Same As Above
Net Blr 7 Status	30032	Net Boiler 7	Input	0x001F / 31	Same As Above
Net Blr 8 Status	30033	Net Boiler 8	Input	0x0020 / 32	Same As Above
Net Blr 9 Status	30034	Net Boiler 9	Input	0x0021 / 33	Same As Above
Net Blr 10 Status	30035	Net Boiler 10	Input	0x0022 / 34	Same As Above
Net Blr 11 Status	30036	Net Boiler 11	Input	0x0023 / 35	Same As Above
Net Blr 12 Status	30037	Net Boiler 12	Input	0x0024 / 36	Same As Above
Net Blr 13 Status	30038	Net Boiler 13	Input	0x0025 / 37	Same As Above
Net Blr 14 Status	30039	Net Boiler 14	Input	0x0026 / 38	Same As Above
Net Blr 15 Status	30040	Net Boiler 15	Input	0x0027 / 39	Same As Above
Net Blr 16 Status	30041	Net Boiler 16	Input	0x0028 / 40	Same As Above
Net Blr 17 Status	30042	Net Boiler 17	Input	0x0029 / 41	Same As Above
Net Blr 18 Status	30043	Net Boiler 18	Input	0x0030 / 42	Same As Above
Net Blr 19 Status	30044	Net Boiler 19	Input	0x0031 / 43	Same As Above
Net Blr 20 Status	30045	Net Boiler 20	Input	0x0032 / 44	Same As Above
Net Blr 21 Status	30046	Net Boiler 21	Input	0x0033 / 45	Same As Above
Net Blr 22 Status	30047	Net Boiler 22	Input	0x0034 / 46	Same As Above
Net Blr 23 Status	30048	Net Boiler 23	Input	0x0035 / 47	Same As Above
Net Blr 24 Status	30049	Net Boiler 24	Input	0x0036 / 48	Same As Above
Net Blr 25 Status	30050	Net Boiler 25	Input	0x0037 / 49	Same As Above
Net Blr 26 Status	30051	Net Boiler 26	Input	0x0038 / 50	Same As Above
Net Blr 27 Status	30052	Net Boiler 27	Input	0x0039 / 51	Same As Above
Net Blr 28 Status	30053	Net Boiler 28	Input	0x0040 / 52	Same As Above
Net Blr 29 Status	30054	Net Boiler 29	Input	0x0041 / 53	Same As Above
Net Blr 30 Status	30055	Net Boiler 30	Input	0x0042 / 54	Same As Above
Net Blr 31 Status	30056	Net Boiler 31	Input	0x0043 / 55	Same As Above
Net Blr 32 Status	30057	Net Boiler 32	Input	0x0044 / 56	Same As Above
Return Temp	30059	Return Sensor Temp	Input	0x0045 / 58	°F (40 to 220)
Input Output Status	30058	I/O Status	Input	0x0039 / 57	Bit 0 = Aux Relay Bit 1 = Fault Relay Bit 2 = Sys Start Relay Bit 3 = Not Used Bit 4 = Setback Bit 5 = Interlock 2 Bit 6 = Interlock 1 Bit 7 = Not Used

Appendix B-2: AERCO Electronic Control System (ECS) Point Definitions

Point Name	BAS Modbus Data Address	GF-108, GF-124, GF-114 Point Name	Reg. Type	Modbus Data Address (Hex/Dec.)	Units (Range)
Electric Valve (ECS) and SmartPlate					
Cntl Output Signal	30004	OP (Control Output Signal)	Input	0x0003 / 3	% (0 to 100)
Setpoint	30006	w.SP (Setpoint)	Input	0x0005 / 5	°F (40 to 180)
RmSetpt	40027	Remote Input Comms Access parameter(Setpoint)	Holding	0x001A / 26	°F (40 to 180)
Outlet Temp	30002	Top Value (Outlet Temp)	Input	0x0001 / 1	°F (40 to 205)
FBk Sensor Temp	30290	Li1 (Feedback Sensor Temp)	Input	0x0121 / 289	°F (40 to 180)
Over Temp Alarm	30075	AL 1 (Over Temp Alarm)	Input	0x004A / 74	Bit 0 = Alarm 1 State (0 = Safe 1 = Alarm). Bit 1 = Alarm 2 State (0 = Safe 1 = Alarm). Bit 2 = Alarm 3 State (0 = Safe 1 = Alarm). Bit 3 = Alarm 4 State (0 = Safe 1 = Alarm). Bit 4 = Manual Mode (0 = Auto 1 = Manual). Bit 5 = Sensor Break (0 = Good PV 1 = Sensor Broken. Bit 6 = Loop Break (0 = Good closed loop 1 = Open Loop). Bit 7 = Heater Fail (0 = No Fault 1 = Load fault detected).
Flow Rate /Mixed Temp	30291	Li2 (Flow)	Input	0x0122 / 290	GPM

Appendix B-3: AERCO (Modulex) BCM Point Definitions

Appendix B-3: AERCO (Modulex) BCM Point Definitions

Point Name	BAS Modbus Data Address	GF-108, GF-124, GF-114 Point Name	Reg. Type	Modbus Data Address (Hex/Dec.)	Units (Range)
Modulex Boiler with BCM					
Act Mod Lev (Actual Modulation Level)	41009	Global Actual Modulation Level	Holding	0x03F0 / 1008	% (0 to 100)
Target Setpoint	41019	Target Setpoint	Holding	0x03F8 / 1016	°F (32 to 185) (Value x 10)
Req Outlet Temp (Requested Outlet Temp)	41005	Requested Setpoint	Holding	0x03EC / 1004	°F (32 to 185) (Value x 10)
Net Direct Drive	40002	Direct Drive Requested Modulation Level	Holding	0x0001 / 1	% (0 to 100)
Mod Lev In (Modulation Level In)	41201	Monitor Only Global Modulation Level from Cascade Manager	Holding	0x04B0 / 1200	% (0 to 100)
Flow Sens Temp (Flow Sensor Temperature)	41003	Flow Sensor Temperature	Holding	0x03EA / 1002	°F (14 to 212) (Value x 10)

Appendix B-3: AERCO (Modulex) BCM Point Definitions

Point Name	BAS Modbus Data Address	GF-108, GF-124, GF-114 Point Name	Reg. Type	Modbus Data Address (Hex/Dec.)	Units (Range)
Display Code	30001	Status & Error Code (C-more compatible)	Input	0x0000 / 0	Enum (2,8,10,18,23,32,38,42) 2 = Standby 8 = High Temp Switch Open 10 = Low Gas Press Switch Open 18 = Air Flow Switch Open During Ignition 23 = Flame Loss During Run 32 = Residual Flame 38 = Other Conditions Not Listed 42 = Outlet (Flow) Temp Sensor Fault
Error Code	40001	Error Code	Holding	0x0000 / 0	(0 to 0xFFFF) LSB = Error Code MSB = Id Code Of Fault Device (0 = BMM#0, 7 = BMM#7, 255 = BCM). See Appendix B.
Unit Status	30002	Unit Status (C-more Compatible)	Input	0x0001 / 1	Enum (1,3,5) 1 = Standby (ready to run but not fired) 3 = Fired 5 = Fault
Ret Flow Temp (Return Flow Temperature)	41004	Return Flow Temperature	Holding	0x03EB / 1003	°F (32 to 212) (Value x 10)

NOTE

See Appendix B-1 for the ACS/BMS II point definitions.

IMPORTANT

Some Modbus addresses specified in this manual are written generically in hexadecimal/decimal format. However, many Building Automation Systems utilize another form of addressing where:

- 40001 is added to the generic address for a Holding Register address.
- 30001 is added to the generic address for an Input Register address.

Check the addressing scheme being used by the BAS interfaced to the ProtoNode.

Appendix B-4: Water Heater Management System (WHM) and On-Board Boiler Sequencing Technology (BST) Point Definitions

Appendix B-4: AERCO WHM and BST Point Definitions

Point Name	BAS Modbus Data Address	GF-108, GF-124, GF-114 Point Name	Reg. Type	Modbus Data Address (Dec.)	Units (Range)
WHM or BST Master					
Write Control to WHM/BST	40051	SMD_BAS_IP_Ctrl_[1]	Holding	50	Write "1" to send value to WHM/BST
Read Timeout	40053	SMD_BAS_IP_Ctrl_[3]	Holding	52	0 to
Read Mode	30100	SMD_BAS_IP_OpVal_[0]	Input	99	0 = OFF, 1 = Slave, 2 = Master
Read Setpoint	30101	SMD_BAS_IP_OpVal_[1]	Input	100	°F (40 to 200)
Read Setback Setpoint	30102	SMD_BAS_IP_OpVal_[2]	Input	101	°F (40 to 200)
Read Setback Time Start	30103	SMD_BAS_IP_OpVal_[3]	Input	102	12:00 AM to 11:59 PM (see note)
Read Setback Time End*	30104	SMD_BAS_IP_OpVal_[4]	Input	103	12:00 AM to 11:59 PM (see note)
Read Auto Master Status	30105	SMD_BAS_IP_OpVal_[5]	Input	104	0 = NO, 1 = YES
Read Average Outlet Temp.	30106	SMD_BAS_IP_OpVal_[6]	Input	105	°F (30 to 245)
Read # Units Active	30107	SMD_BAS_IP_OpVal_[7]	Input	106	0 to 8
Read # Units Faulted	30108	SMD_BAS_IP_OpVal_[8]	Input	107	0 to 8
Read Master Address	30109	SMD_BAS_IP_OpVal_[9]	Input	108	0, 10-255
Header Temp	30110	SMD_BAS_IP_OpVal_[10]	Input	109	°F (30 to 245)
Outdoor Temp	30111	SMD_BAS_IP_OpVal_[11]	Input	110	°F (-70 to 130)
Percent Output	30112	SMD_BAS_IP_OpVal_[12]	Input	111	% (0 to 100)
Number of Units Firing	30113	SMD_BAS_IP_OpVal_[13]	Input	112	0 to 8
Master Active Setpoint	30114	SMD_BAS_IP_OpVal_[14]	Input	113	°F (40 to 220)
Next Turn-On Percent	30115	SMD_BAS_IP_OpVal_[15]	Input	114	% (16 to 100)
Header High Limit	30116	SMD_BAS_IP_OpVal_[16]	Input	115	°F (Header Low Limit to 220)
Header Low Limit	30117	SMD_BAS_IP_OpVal_[17]	Input	116	°F (40 to Header High Limit)
Header Temp High Limit	30118	SMD_BAS_IP_OpVal_[18]	Input	117	°F (40 to 220)
Header Setpoint Mode	30119	SMD_BAS_IP_OpVal_[19]	Input	118	Number List (0 to 2) 0 = Constant Setpoint 1 = Remote Setpoint 2 = Outdoor Reset
Write Setpoint	40200	SMD_BAS_IP_CtrlVal_[0]	Holding	199	°F (40 to 200)
Write Setback Setpoint	40201	SMD_BAS_IP_CtrlVal_[1]	Holding	200	°F (40 to 200)
Write Setback Time Start	40202	SMD_BAS_IP_CtrlVal_[2]	Holding	201	12:00 AM to 11:59 PM
Write Setback Time End	40203	SMD_BAS_IP_CtrlVal_[3]	Holding	202	12:00 AM to 11:59 PM
WHM Heater or BST Boiler					
Communication Address	3xx00	SMD_BAS_IP_HTR_(xx-2)_[0]	Input	(xx00-1)	0 to 8
Unit Status	3xx01	SMD_BAS_IP_HTR_(xx-2)_[1]	Input	xx00	Enum List (0 to 5) 0 = Disabled 1 = Standby 2 = Manual Operation 3 = Remote Operation 4 = Auto Operation 5 = Fault
Fault Code	3xx02	SMD_BAS_IP_HTR_(xx-2)_[2]	Input	xx01	Fault codes 0-74 matching the C-

Appendix B-4: AERCO WHM and BST Point Definitions

Point Name	BAS Modbus Data Address	GF-108, GF-124, GF-114 Point Name	Reg. Type	Modbus Data Address (Dec.)	Units (Range)
					More fault codes.
Outlet Temperature	3xx03	SMD_BAS_IP_HTR_(xx-2)_[3]	Input	xx02	°F (30 to 245)
FFWD Temperature	3xx04	SMD_BAS_IP_HTR_(xx-2)_[4]	Input	xx03	°F (30 to 245)
Inlet Temperature	3xx05	SMD_BAS_IP_HTR_(xx-2)_[5]	Input	xx04	°F (30 to 245)
Exhaust Temperature	3xx06	SMD_BAS_IP_HTR_(xx-2)_[6]	Input	xx05	°F (50 to 550)
Inlet Air Temperature	3xx07	SMD_BAS_IP_HTR_(xx-2)_[7]	Input	xx06	°F (-70 to 245)
Flame Strength	3xx08	SMD_BAS_IP_HTR_(xx-2)_[8]	Input	xx07	% (0 to 100)
Fire Rate IN	3xx09	SMD_BAS_IP_HTR_(xx-2)_[9]	Input	xx08	% (0 to 100)
Fire Rate OUT	3xx10	SMD_BAS_IP_HTR_(xx-2)_[10]	Input	xx09	% (0 to 100)
Unit Type	3xx11	SMD_BAS_IP_HTR_(xx-2)_[11]	Input	xx10	Enum List (0 to 5 or 8) (see note)
Unit Size	3xx12	SMD_BAS_IP_HTR_(xx-2)_[12]	Input	xx11	Enum List (0 to 21) (see note)
Valve State	3xx13	SMD_BAS_IP_HTR_(xx-2)_[13]	Input	xx12	0 = Closed , 1 = Open
Net Remote Setpoint	3xx14	SMD_BAS_IP_HTR_(xx-2)_[14]	Input	xx13	°F (40 to 200)
Run Cycles Upper 16 bits	3xx15	SMD_BAS_IP_HTR_(xx-2)_[15]	Input	xx14	0 to 65535 (see note)
Run Cycles Lower 16 bits	3xx16	SMD_BAS_IP_HTR_(xx-2)_[16]	Input	xx15	0 to 65535 (see note)
Run Hours Upper 16 bits	3xx17	SMD_BAS_IP_HTR_(xx-2)_[17]	Input	xx16	0 to 65535 (see note)
Run Hours Lower 16 bits	3xx18	SMD_BAS_IP_HTR_(xx-2)_[18]	Input	xx17	0 to 65535 (see note)
Oxygen Level	3xx19	SMD_BAS_IP_HTR_(xx-2)_[19]	Input	xx18	% (0 to 25)

IMPORTANT

For WHM and BST, use the SSD profiles.

NOTE

For WHM Heater or BST Boiler

#1, 'xx' = 03
#2, 'xx' = 04
#3, 'xx' = 05
#4, 'xx' = 06
#5, 'xx' = 07
#6, 'xx' = 08
#7, 'xx' = 09
#8, 'xx' = 10

Time

Time is expressed in minutes since midnight. For example, 360 equals 6 AM.

Run Cycles and Run Hours

Example:

Run Cycles = Run Cycles Upper 16 bits * 65536 + Run Cycles Lower 16 bits
Run Hours = Run Hours Upper 16 bits * 65536 + Run Hours Lower 16 bits

Unit Types for BST

1 = KC Boiler LN
2 = BMK Boiler Std
3 = BMK Blr Std Dual
4 = BMK Boiler LN
5 = BMK Blr LN Dual

Unit Types for WHM

1 = KC Boiler LN
2 = BMK Boiler Std
3 = BMK Blr Std Dual
4 = BMK Boiler LN
5 = BMK Blr LN Dual
6 = KC Water Heater
7 = KC Wtr Heater LN
8 = Innovation WH

Unit Sizes

1 = 600 MBH
2 = 800 MBH
3 = 1060 MBH
4 = 1350 MBH
5 = 600 MBH
6 = 800 MBH
7 = 1060 MBH
8 = 1350 MBH
9 = 500 MBH
10 = 750 MBH
11 = 1000 MBH
12 = 1.5 MBTU
13 = 1500 MBH
14 = 2.0 MBTU
15 = 2000 MBH
16 = 2500 MBH
17 = 3.0 MBTU
18 = 3000 MBH
19 = 4000 MBH
20 = 5000 MBH
21 = 6000 MBH

Appendix B-5: AM Series Point Definitions

For all devices, empty or not, available holding registers return 0. When it is not implemented, requests can be ignored by the Modbus device.

Holding registers below 99 are reserved for legacy devices, and are optional. The functionality of these registers is not changed or influenced by this specification.

Appendix B-5 Table 1: AM Managing Boiler Parameters

Holding Register		Access		Parameter Name	Automatic Conversion	Range
		R	W			
99	0063	X	X	Control Register	-	Bit 0: Write Enable, Bit 14: Controller Reset
100	0064	X	X	Modbus Units	-	Bit0: °C / °F Bit1: bar / psi
101	0065	X	-	Device type	-	1 = Managing / Stand-alone Boiler
102	0066	X	-	State	-	See state table
103	0067	X	-	Status	-	See status table
104	0068	X	-	Error Code	-	See error list
105	0069	X	-	Warning Code	-	See warning list
106	006A	X	X	Boiler CH setpoint	V	Depending on units °C / °F
107	006B	X	X	Boiler DHW setpoint	V	Depending on units °C / °F
108	006C	X	X	Boiler operation	-	0..x
109	006D	X	X	DHW type	-	0..x
110	006E	X	X	CH mode	-	0..x
111	006F	X	X	DHW mode	-	0..x
112	0070	X	-	Supply temperature	V	Depending on units °C / °F
113	0071	X	-	Return temperature	V	Depending on units °C / °F
114	0072	X	-	DHW temperature	V	Depending on units °C / °F
115	0073	X		Flue gas temperature	V	Depending on units °C / °F
116	0074	X		Heat exchanger temperature	V	Depending on units °C / °F
117	0075	X		Firing Rate	V	0..100%
118	0076	X		Min Firing Rate	V	0..100%
119	0077	X		Flame current	V	0..x uA
120	0078	X		Water pressure	V	Depending on units 0..x bar/psi
121	0079	X		Analog in	V	0..10,0V
122	007A	X		Analog out	V	0..10,0V

Appendix B-5 Table 1: AM Managing Boiler Parameters						
Holding Register		Access		Parameter Name	Automatic Conversion	Range
		R	W			
123	007B	X		Information: (optionally implemented)		Bit0: On/Off - Flame Signal Bit1: Ok/Nok - Water level Bit2: Ok/Nok - Low gas pressure Bit3: Ok/Nok - High gas pressure Bit4: On/Off - Air pressure Bit5: Ok/Nok - Blocked flue Bit6: On/Off - Air damper Bit7:
124	007C	X		CH pump	V	0/100 or 0..100%
125	007D	X		DHW pump	V	0/100 or 0..100%
126	007E	X		Ignition count OK		0..65536, resolution 16
127	007F	X		Ignition count Failed		0..65536, resolution 1
128	0080	X	-	Flame count Failed	-	0..65536, resolution 1
129	0081	X	-	Burner High hours / CH Hours	-	0..65536 hours
130	0082	X	-	Burner Med hours / DHW Hours	-	0..65536 hours
131	0083	X	-	Burner Low hours	-	0..65536 hours
-	..	-	-	Reserved	-	-
150	0096	X		Dependent State	-	See state table
151	0097	X	-	Dependent Status	-	See status table
152	0096	X	-	Dependent Error Number	-	See error list
153	0096	X	-	Dependent Firing Rate	V	0..100%
-	-	-	-	Reserved	-	-
199	00C7	-	-	Reserved	-	-

Appendix B-5 Table 2: AM Controller (Managing) Parameters

Holding Register		Access		Parameter Name	Automatic Conversion	Range
		R	W			
200	00C8	X		Controller State	-	See controller state table
201	00C9	X		Controller Status	-	See controller status table
202	00CA	X		Controller Error Code	-	See controller error list
203	00CB	X		Controller Warning Code	-	See controller warning list
204	00CC	X	X	Controller CH setpoint	V	Depending on units °C / °F
205	00CD	X	X	Controller DHW setpoint	V	Depending on units °C / °F
206	00CE	X	X	High Outdoor Air temperature	V	Depending on units °C / °F
207	00CF	X	X	Minimum outdoor air setpoint	V	Depending on units °C / °F
208	00D0	X	X	Low outdoor air temperature	V	Depending on units °C / °F

Appendix B-5 Table 2: AM Controller (Managing) Parameters

Holding Register		Access		Parameter Name	Automatic Conversion	Range
		R	W			
209	00D1	X	X	Maximum Outdoor air setpoint	V	Depending on units °C / °F
210	00D2	X	X	Outdoor air shutdown temperature	V	Depending on units °C / °F
211	00D3	X	X	Night Setback	-	Depending on units °C / °F
212	00D4	X	-	Header temperature	V	Depending on units °C / °F
213	00D5	X	-	Outside temperature	V	Depending on units °C / °F
214	00D6	X	-	Cascade Firing Rate	V	0..100%
215	00D7	X	-	Min Firing Rate	V	0..100%
216	00D8	X	-	System pump	V	0/100 or 0..100%
	..	-	-	reserved	-	-
299	012B	-	-	reserved	-	-

Appendix B-5 Table 3: AM Dependent Boiler Parameters

Holding Register		Access		Parameter Name	Automatic Conversion	Range
		R	W			
99	0063	X	X	Control Register	-	Bit 0: Write Enable, Bit 14: Controller Reset
100	0064	X	X	Modbus Units	-	Bit0: °C / °F Bit1: bar / psi
101	0065	X	-	Device type	-	2 = Dependent Boiler
102	0066	X	-	State	-	See state table
103	0067	X	-	Status	-	See status table
104	0068	X	-	Error Code	-	See error list
105	0069	X	-	Warning Code	-	See warning list
106	006A	X	X	Boiler CH setpoint	V	Depending on units °C / °F
107	006B	X	X	Boiler DHW setpoint	V	Depending on units °C / °F
108	006C	X	X	Boiler operation	-	0..x
109	006D	X	X	DHW type	-	0..x
110	006E	X	X	CH mode	-	0..x
111	006F	X	X	DHW mode	-	0..x
112	0070	X	-	Supply temperature	V	Depending on units °C / °F
113	0071	X	-	Return temperature	V	Depending on units °C / °F
114	0072	X	-	DHW temperature	V	Depending on units °C / °F
115	0073	X	-	Flue gas temperature	V	Depending on units °C / °F
116	0074	X	-	Heat exchanger temperature	V	Depending on units °C / °F

Appendix B-5 Table 3: AM Dependent Boiler Parameters

Holding Register		Access		Parameter Name	Automatic Conversion	Range
		R	W			
117	0075	X	-	Firing Rate	V	0..100%
118	0076	X	-	Min Firing Rate		0..100%
119	0077	X	-	Flame current	V	0..x uA
120	0078	X	-	Water pressure	V	Depending on units 0..x bar/psi
121	0079	X	-	Analog in	V	0..10,0V
122	007A	X	-	Analog out	V	0..10,0V
123	007B	X	-	Information: (optionally implemented)	-	Bit0: On/Off - Flame Signal Bit1: Ok/Nok - Water level Bit2: Ok/Nok - Low gas pressure Bit3: Ok/Nok - High gas pressure Bit4: On/Off - Air pressure Bit5: Ok/Nok - Blocked flue Bit6: On/Off - Air damper Bit7:
124	007C	X	-	CH pump	V	0/100 or 0..100%
125	007D	X	-	DHW pump	V	0/100 or 0..100%
126	007E	X	-	Ignition count OK	-	0..65536, resolution 16
127	007F	X	-	Ignition count Failed	-	0..65536, resolution 1
128	0080	X	-	Flame count Failed	-	0..65536, resolution 1
129	0081	X	-	Burner High hours / CH hours	-	0..65536 hours
130	0082	X	-	Burner Med hours / DHW hours	-	0..65536 hours
131	0083	X	-	Burner Low hours	-	0..65536 hours
199	00C7	-	-	reserved	-	-

NOTES:

1. Writing to a “write-able” point of an AM Series boiler or heater is a two-step process. First the “Control Register” must be written with a 1 (bit 0 = 1), and then the desired register can be written.

2. A controller may also be reset after a lock out error by setting bit 14 of the Control Register.

3. When no Modbus communication (reading or writing) is sensed for more than 4.0 seconds, the Control Register bits will be reset. The bits will also be reset when undefined bits (i.e. other than bits 0 and 14) are set.

CAUTION!

Writing of parameters (registers) with a different value is limited to 10,000 times. All (CH, DHW) setpoints and parameters are for preset only. They can be changed with an average of two changes per day, but are NOT to be used for dynamic temperature control.

APPENDIX C: AERCO EQUIPMENT POINT MAPPINGS

Appendix C-1: AM Mngr Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Appendix C-1: AM Mngr Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks							
Name / Point Name	**BACnet Object Type**	**BACnet Object ID**	**N2 Data Type**	**N2 Point Address**	**Lon Name**	**Lon SNVT**	**Modbus Address**
Modbus Units	AV	1	AO	1	nvi/nvoModUnits_XXX	SNVT_count_f	40101
Device Type	AI	2	AI	2	nvoDevType_XXX	SNVT_count_f	40102
State	AI	3	AI	3	nvoState_XXX	SNVT_count_f	40103
Status	AI	4	AI	4	nvoStatus_XXX	SNVT_count_f	40104
Error Code	AI	5	AI	5	nvoErrCode_XXX	SNVT_count_f	40105
Warning Code	AI	6	AI	6	nvoWarnCode_XXX	SNVT_count_f	40106
Boiler CH SP	AV	7	AO	7	nvi/nvoBlrCHSP_XXX	SNVT_count_f	40107
Boiler DHW SP	AV	8	AO	8	nvi/nvoBlrDHWSP_XXX	SNVT_count_f	40108
Boiler Operation	AV	9	AO	9	nvi/nvoBlrOp_XXX	SNVT_count_f	40109
DHW Type	AV	10	AO	10	nvi/nvoDHWType_XXX	SNVT_count_f	40110
CH Mode	AV	11	AO	11	nvi/nvoCHMode_XXX	SNVT_count_f	40111
DHW Mode	AV	12	AO	12	nvi/nvoDHWMode_XXX	SNVT_count_f	40112
Supply Temp	AI	13	AI	13	nvoSupTmp_XXX	SNVT_count_f	40113
Return Temp	AI	14	AI	14	nvoRetTmp_XXX	SNVT_count_f	40114
DHW Temp	AI	15	AI	15	nvoDHWTmp_XXX	SNVT_count_f	40115
Flue Gas Temp	AI	16	AI	16	nvoFluGasTmp_XXX	SNVT_count_f	40116
Heat Exchanger Temp	AI	17	AI	17	nvoHtExcTmp_XXX	SNVT_count_f	40117
Firing Rate	AI	18	AI	18	nvoFirRate_XXX	SNVT_lev_percent	40118
Min Firing Rate	AI	19	AI	19	nvoMinFirRat_XXX	SNVT_lev_percent	40119
Flame Current	AI	20	AI	20	nvoFlmCrnt_XXX	SNVT_count_f	40120
Water Pressure	AI	21	AI	21	nvoWtrPrs_XXX	SNVT_count_f	40121
Analog in	AI	22	AI	22	nvoAnalogin_XXX	SNVT_count_f	40122
Analog out	AI	23	AI	23	nvoAnalogout_XXX	SNVT_count_f	40123

Appendix C-1: AM Mngr Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks							
Name / Point Name	**BACnet Object Type**	**BACnet Object ID**	**N2 Data Type**	**N2 Point Address**	**Lon Name**	**Lon SNVT**	**Modbus Address**
Information	AI	24	AI	24	nvoInfo_XXX	SNVT_count_f	40124
CH pump	AI	25	AI	25	nvoCHpump_XXX	SNVT_count_f	40125
DHW pump	AI	26	AI	26	nvoDHWpump_XXX	SNVT_count_f	40126
Ignition Count OK	AI	27	AI	27	nvoIgnCntOK_XXX	SNVT_count_f	40127
Ignition Count Failed	AI	28	AI	28	nvoIgnCntFl_XXX	SNVT_count_f	40128
Flame Count Failed	AI	29	AI	29	nvoFlmCntFl_XXX	SNVT_count_f	40129
Burner High Hours / CH Hours	AI	30	AI	30	nvoBrnHiHrs_XXX	SNVT_time_hour	40130
Burner Med Hours / DHW Hours	AI	31	AI	31	nvoBrnMedHrs_XXX	SNVT_time_hour	40131
Burner Low Hours	AI	32	AI	32	nvoBrnLoHrs_XXX	SNVT_time_hour	40132
1st Lockout in History	AI	33	AI	33	nvo1LkotHst_XXX	SNVT_count_f	40133
Time after 1st Lockout	AI	34	AI	34	nvoTime1Lkot_XXX	SNVT_time_hour	40134
2nd Lockout	AI	35	AI	35	nvo2LkotHst_XXX	SNVT_count_f	40135
Time after 2nd Lockout	AI	36	AI	36	nvoTime2Lkot_XXX	SNVT_time_hour	40136
3rd Lockout	AI	37	AI	37	nvo3LkotHst_XXX	SNVT_count_f	40137
Time after 3rd Lockout	AI	38	AI	38	nvoTime3kot_XXX	SNVT_time_hour	40138
4th Lockout	AI	39	AI	39	nvo4Lkot_XXX	SNVT_count_f	40139
Time after 4th Lockout	AI	40	AI	40	nvoTime4Lkot_XXX	SNVT_time_hour	40140
1st Blocking Error in History	AI	41	AI	41	nvo1BlkErHst_XXX	SNVT_count_f	40143
Time after 1st Blocking Error	AI	42	AI	42	nvoTime1Blk_XXX	SNVT_time_hour	40144
2nd Blocking Error	AI	43	AI	43	nvo2BlkErHst_XXX	SNVT_count_f	40145
Time after 2nd Blocking Error	AI	44	AI	44	nvoTime2Blk_XXX	SNVT_time_hour	40146
3rd Blocking Error	AI	45	AI	45	nvo3BlkErHst_XXX	SNVT_count_f	40147
Time after 3rd Blocking Error	AI	46	AI	46	nvoTime3Blk_XXX	SNVT_time_hour	40148
4th Blocking Error	AI	47	AI	47	nvo4BlkErHst_XXX	SNVT_count_f	40149
Time after 4th Blocking Error	AI	48	AI	48	nvoTime4Blk_XXX	SNVT_time_hour	40150
Dependent_1 State	AI	49	AI	49	nvoD1State_XXX	SNVT_count_f	40151
Dependent_1 Status	AI	50	AI	50	nvoD1Status_XXX	SNVT_count_f	40152

Appendix C-1: AM Mngr Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks							
Name / Point Name	**BACnet Object Type**	**BACnet Object ID**	**N2 Data Type**	**N2 Point Address**	**Lon Name**	**Lon SNVT**	**Modbus Address**
Dependent_1 Error Number	AI	51	AI	51	nvoD1ErrNum_XXX	SNVT_count_f	40153
Dependent_1 Firing Rate	AI	52	AI	52	nvoD1FirRat_XXX	SNVT_lev_percent	40154
Dependent_2 State	AI	53	AI	53	nvoD2State_XXX	SNVT_count_f	40156
Dependent_2 Status	AI	54	AI	54	nvoD2Status_XXX	SNVT_count_f	40157
Dependent_2 Error Number	AI	55	AI	55	nvoD2ErrNum_XXX	SNVT_count_f	40158
Dependent_2 Firing Rate	AI	56	AI	56	nvoD2FirRat_XXX	SNVT_lev_percent	40159
Dependent_3 State	AI	57	AI	57	nvoD3State_XXX	SNVT_count_f	40161
Dependent_3 Satus	AI	58	AI	58	nvoD3Satus_XXX	SNVT_count_f	40162
Dependent_3 Error Number	AI	59	AI	59	nvoD3ErrNum_XXX	SNVT_count_f	40163
Dependent_3 Firing Rate	AI	60	AI	60	nvoD3FirRat_XXX	SNVT_lev_percent	40164
Dependent_4 State	AI	61	AI	61	nvoD4State_XXX	SNVT_count_f	40166
Dependent_4 Status	AI	62	AI	62	nvoD4Status_XXX	SNVT_count_f	40167
Dependent_4 Error Number	AI	63	AI	63	nvoD4ErrNum_XXX	SNVT_count_f	40168
Dependent_4 Firing Rate	AI	64	AI	64	nvoD4FirRat_XXX	SNVT_lev_percent	40169
Dependent_5 State	AI	65	AI	65	nvoD5State_XXX	SNVT_count_f	40171
Dependent_5 Status	AI	66	AI	66	nvoD5Status_XXX	SNVT_count_f	40172
Dependent_5 Error Number	AI	67	AI	67	nvoD5ErrNum_XXX	SNVT_count_f	40173
Dependent_5 Firing Rate	AI	68	AI	68	nvoD5FirRat_XXX	SNVT_lev_percent	40174
Dependent_6 State	AI	69	AI	69	nvoD6State_XXX	SNVT_count_f	40176
Dependent_6 Status	AI	70	AI	70	nvoD6Status_XXX	SNVT_count_f	40177
Dependent_6 Error Number	AI	71	AI	71	nvoD6ErrNum_XXX	SNVT_count_f	40178
Dependent_6 Firing Rate	AI	72	AI	72	nvoD6FirRat_XXX	SNVT_lev_percent	40179
Dependent_7 State	AI	73	AI	73	nvoD7State_XXX	SNVT_count_f	40181
Dependent_7 Status	AI	74	AI	74	nvoD7Status_XXX	SNVT_count_f	40182
Dependent_7 Error Number	AI	75	AI	75	nvoD7ErrNum_XXX	SNVT_count_f	40183
Dependent_7 Firing Rate	AI	76	AI	76	nvoD7FirRat_XXX	SNVT_lev_percent	40184
Controller State	AI	77	AI	77	nvoCtlState_XXX	SNVT_count_f	40201
Controller Status	AI	78	AI	78	nvoCtlStats_XXX	SNVT_count_f	40202

Appendix C-1: AM Mngr Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks							
Name / Point Name	**BACnet Object Type**	**BACnet Object ID**	**N2 Data Type**	**N2 Point Address**	**Lon Name**	**Lon SNVT**	**Modbus Address**
Controller Error Code	AI	79	AI	79	nvoCtlErrCod_XXX	SNVT_count_f	40203
Controller Warning Code	AI	80	AI	80	nvoCtlWrnCod_XXX	SNVT_count_f	40204
Controller CH SP	AV	81	AO	81	nvi/nvoCtlCHSP_XXX	SNVT_count_f	40205
Controller DHW SP	AV	82	AO	82	nvi/nvoCtlDHWSP_XXX	SNVT_count_f	40206
High Outdoor Air Temp	AV	83	AO	83	nvi/nvoHiOATmp_XXX	SNVT_count_f	40207
Minimum Outdoor Air SP	AV	84	AO	84	nvi/nvoMinOASP_XXX	SNVT_count_f	40208
Low Outdoor Air Temp	AV	85	AO	85	nvi/nvoLoOATmp_XXX	SNVT_count_f	40209
Maximum Outdoor Air SP	AV	86	AO	86	nvi/nvoMaxOASP_XXX	SNVT_count_f	40210
Outdoor Air Shutdown Temp	AV	87	AO	87	nvi/nvoOAShdnTmp_XXX	SNVT_count_f	40211
Night Setback	AV	88	AO	88	nvi/nvoNightStbk_XXX	SNVT_count_f	40212
Header Temp	AI	89	AI	89	nvoHeaderTmp_XXX	SNVT_count_f	40213
Outside Temp	AI	90	AI	90	nvoOutsidTmp_XXX	SNVT_count_f	40214
Cascade Firing Rate	AI	91	AI	91	nvoCscFirRat_XXX	SNVT_lev_percent	40215
Min Firing Rate	AI	92	AI	92	nvoMinFirR2_XXX	SNVT_lev_percent	40216
System Pump	AI	93	AI	93	nvoSysTmpump_XXX	SNVT_count_f	40217
Amount of Dep Detected	AI	94	AI	94	nvoDepDetect_XXX	SNVT_count_f	40218
Control Register	MV	95	AO	95	nviCtlWord_XXX	SNVT_count_f	40100

Appendix C-2: AM Dep Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Appendix C-2: AM Dep Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Name / Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Modbus Address
Modbus Units	AV	1	AO	1	nvi/nvoModUnits_XXX	SNVT_count_f	40101
Device Type	AI	2	AI	2	nvoDevType_XXX	SNVT_count_f	40102
State	AI	3	AI	3	nvoState_XXX	SNVT_count_f	40103
Status	AI	4	AI	4	nvoStatus_XXX	SNVT_count_f	40104
Error Code	AI	5	AI	5	nvoErrCode_XXX	SNVT_count_f	40105
Warning Code	AI	6	AI	6	nvoWarnCode_XXX	SNVT_count_f	40106
Boiler CH SP	AV	7	AO	7	nvi/nvoBlrCHSP_XXX	SNVT_count_f	40107
Boiler DHW SP	AV	8	AO	8	nvi/nvoBlrDHWSP_XXX	SNVT_count_f	40108
Boiler Operation	AV	9	AO	9	nvi/nvoBlrOp_XXX	SNVT_count_f	40109
DHW Type	AV	10	AO	10	nvi/nvoDHWType_XXX	SNVT_count_f	40110
CH Mode	AV	11	AO	11	nvi/nvoCHMode_XXX	SNVT_count_f	40111
DHW Mode	AV	12	AO	12	nvi/nvoDHWMode_XXX	SNVT_count_f	40112
Supply Temp	AI	13	AI	13	nvoSupTmp_XXX	SNVT_count_f	40113
Return Temp	AI	14	AI	14	nvoRetTmp_XXX	SNVT_count_f	40114
DHW Temp	AI	15	AI	15	nvoDHWTmp_XXX	SNVT_count_f	40115
Flue Gas Temp	AI	16	AI	16	nvoFluGasTmp_XXX	SNVT_count_f	40116
Heat Exchanger Temp	AI	17	AI	17	nvoHtExcTmp_XXX	SNVT_count_f	40117
Firing Rate	AI	18	AI	18	nvoFirRate_XXX	SNVT_lev_percent	40118
Min Firing Rate	AI	19	AI	19	nvoMinFirRat_XXX	SNVT_lev_percent	40119
Flame Current	AI	20	AI	20	nvoFlmCrnt_XXX	SNVT_count_f	40120
Water Pressure	AI	21	AI	21	nvoWtrPrs_XXX	SNVT_count_f	40121
Analog in	AI	22	AI	22	nvoAnalogin_XXX	SNVT_count_f	40122
Analog out	AI	23	AI	23	nvoAnalogout_XXX	SNVT_count_f	40123
Information	AI	24	AI	24	nvoInfo_XXX	SNVT_count_f	40124
CH pump	AI	25	AI	25	nvoCHpump_XXX	SNVT_count_f	40125
DHW pump	AI	26	AI	26	nvoDHWpump_XXX	SNVT_count_f	40126

Appendix C-2: AM Dep Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Name / Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Modbus Address
Ignition Count OK	AI	27	AI	27	nvoIgnCntOK_XXX	SNVT_count_f	40127
Ignition Count Failed	AI	28	AI	28	nvoIgnCntFl_XXX	SNVT_count_f	40128
Flame Count Failed	AI	29	AI	29	nvoFlmCntFl_XXX	SNVT_count_f	40129
Burner High Hours / CH Hours	AI	30	AI	30	nvoBrnHiHrs_XXX	SNVT_time_hour	40130
Burner Med Hours / DHW Hours	AI	31	AI	31	nvoBrnMedHrs_XXX	SNVT_time_hour	40131
Burner Low Hours	AI	32	AI	32	nvoBrnLoHrs_XXX	SNVT_time_hour	40132
1st Lockout in History	AI	33	AI	33	nvo1LkotHst_XXX	SNVT_count_f	40133
Time after 1st Lockout	AI	34	AI	34	nvoTime1Lkot_XXX	SNVT_time_hour	40134
2nd Lockout	AI	35	AI	35	nvo2LkotHst_XXX	SNVT_count_f	40135
Time after 2nd Lockout	AI	36	AI	36	nvoTime2Lkot_XXX	SNVT_time_hour	40136
3rd Lockout	AI	37	AI	37	nvo3LkotHst_XXX	SNVT_count_f	40137
Time after 3rd Lockout	AI	38	AI	38	nvoTime3kot_XXX	SNVT_time_hour	40138
4th Lockout	AI	39	AI	39	nvo4Lkot_XXX	SNVT_count_f	40139
Time after 4th Lockout	AI	40	AI	40	nvoTime4Lkot_XXX	SNVT_time_hour	40140
1st Blocking Error in History	AI	41	AI	41	nvo1BlkErHst_XXX	SNVT_count_f	40143
Time after 1st Blocking Error	AI	42	AI	42	nvoTime1Blk_XXX	SNVT_time_hour	40144
2nd Blocking Error	AI	43	AI	43	nvo2BlkErHst_XXX	SNVT_count_f	40145
Time after 2nd Blocking Error	AI	44	AI	44	nvoTime2Blk_XXX	SNVT_time_hour	40146
3rd Blocking Error	AI	45	AI	45	nvo3BlkErHst_XXX	SNVT_count_f	40147
Time after 3rd Blocking Error	AI	46	AI	46	nvoTime3Blk_XXX	SNVT_time_hour	40148
4th Blocking Error	AI	47	AI	47	nvo4BlkErHst_XXX	SNVT_count_f	40149
Time after 4th Blocking Error	AI	48	AI	48	nvoTime4Blk_XXX	SNVT_time_hour	40150
Control Register	MV	95	AO	95	nviCtlWord_XXX	SNVT_count_f	40100

Appendix C-3: C-More Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Appendix C-3: C-More Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Name	Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Modbus Address
Fire Rate Out	boilerstate_XXX	AV	1	ADF	1	nvoBlrState_XXX	SNVT_count_inc	30009
Active Setpoint	effectsetpt_XXX	AV	2	ADF	2	nvoEffSetpt_XXX	SNVT_count_inc	30017
Net Remote Setpoint	setpt_XXX	AV	3	ADF	3	nviSetpt_XXX	SNVT_count_inc	40001
Net Direct Drive	boilercmd_XXX	AV	4	ADF	4	nviBlrCmd_XXX	SNVT_count_inc	40002
Fire Rate In	boilerload_XXX	AV	5	ADF	5	nvoBlrLoad_XXX	SNVT_count_inc	30018
Outlet Temp	localsuptemp_XXX	AV	6	ADF	6	nvoLocSupTmp_XXX	SNVT_count_inc	30003
Display Code	dispcode_XXX	AV	7	ADF	7	nvoDispCode_XXX	SNVT_count_inc	30001
Unit Status	unitstat_XXX	AV	8	ADF	8	nvoUnitStat_XXX	SNVT_count_inc	30002
Run Cycles	runcycles_XXX	AV	9	ADF	9	nvoRunCycles_XXX	SNVT_count_f	30012, 30013
Run Hours	runhours_XXX	AV	10	ADF	10	nvoRunHours_XXX	SNVT_count_f	30014, 30015
Oxygen Level	o2level_XXX	AV	11	ADF	11	nvoO2Lev_XXX	SNVT_count_inc	30010
Exhaust Temp	exhtemp_XXX	AV	12	ADF	12	nvoLocExhTmp_XXX	SNVT_count_inc	30007

Appendix C-4: Modulex Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Appendix C-4: Modulex Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Name	Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Modbus Address
Actual Modulation Level	boilerstate_XXX	AV	1	ADF	1	nvoMlxState_XXX	SNVT_count_inc	41009
Target Setpoint	effectsetpt_XXX	AV	2	ADF	2	nvoMlxSetpt_XXX	SNVT_count_inc	41019
Requested Outlet Temp	setpt_XXX	AV	3	ADF	3	nviMlxSPRq_XXX	SNVT_count_inc	41005
Net Direct Drive	boilercmd_XXX	AV	4	ADF	4	nviMlxCmd_XXX	SNVT_count_inc	40002
Modulation Level In	boilerload_XXX	AV	5	ADF	5	nvoMlxLoad_XXX	SNVT_count_inc	41201

Appendix C-4: Modulex Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Name	Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Modbus Address
Flow Sensor Temp	localsuptemp_XXX	AV	6	ADF	6	nvoMlxSupTmp_XXX	SNVT_count_inc	41003
Display Code	dispcode_XXX	AV	7	ADF	7	nvoMlxDispCd_XXX	SNVT_count_inc	30001
Error Code	errcode_XXX	AV	8	ADF	8	nvoMlxErrCod_XXX	SNVT_count_f	40001
Unit Status	unitstat_XXX	AV	9	ADF	9	nvoMlxStat_XXX	SNVT_count_inc	30002
Return Flow Temp	returntemp_XXX	AV	10	ADF	10	nvoMlxRetTmp_XXX	SNVT_count_inc	41004

Appendix C-5: ECS Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Appendix C-5: ECS Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Name	Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Modbus Address
Control Output Signal	boilerstate_XXX	AV	1	ADF	1	nvoEcsState_XXX	SNVT_count_inc	30004
Target Setpoint	effectsetpt_XXX	AV	2	ADF	2	nvoEcsSetpt_XXX	SNVT_count_inc	30006
Remote Setpoint	setpt_XXX	AV	3	ADF	3	nviEcsSPRq_XXX	SNVT_count_inc	40027
Outlet Temp	localsuptemp_XXX	AV	4	ADF	4	nvoEcsSupTmp_XXX	SNVT_count_inc	30002
Fbk Sensor Temp	localrettemp_XXX	AV	5	ADF	5	nvoEcsRetTmp_XXX	SNVT_count_inc	30290
Over Temp Alarm	unitstat_XXX	AV	6	ADF	6	nvoEcsStat_XXX	SNVT_count_inc	30075
Flow Rate/Mixed Temp	flowrate_XXX	AV	7	ADF	7	nvoEcsFlow_XXX	SNVT_count_inc	30291

Appendix C-6: ACS/BMSII/BMS Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Appendix C-6: ACS/BMSII/BMS Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Name	Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Modbus Address
Fire Rate Out	boilerstate_XXX	AV	1	ADF	1	nvoBlrState_XXX	SNVT_count_inc	30005
Header Set Temp	effectsetpt_XXX	AV	2	ADF	2	nvoEffSetpt_XXX	SNVT_count_inc	30006
Net Header Set Temp	setpt_XXX	AV	3	ADF	3	nviSetpt_XXX	SNVT_count_inc	40005
Header Temp	localsuptemp_XXX	AV	4	ADF	4	nvoLocSupTmp_XXX	SNVT_count_inc	30002
Outside Air Temp	localoatemp_XXX	AV	5	ADF	5	nvoLocOATmp_XXX	SNVT_count_inc	30003
Display Code	dispcode_XXX	AV	6	ADF	6	nvoDispCode_XXX	SNVT_count_inc	30011
Number Boilers Fired	blrfired_XXX	AV	7	ADF	7	nvoBlrsFired_XXX	SNVT_count_inc	30008
Number Boilers Online	blronline_XXX	AV	8	ADF	8	nvoBlrOnline_XXX	SNVT_count_inc	30009
Last Boiler Fired	blrlast_XXX	AV	9	ADF	9	nvoLastFired_XXX	SNVT_count_inc	30017
Boiler 1 Status	blr1stat_XXX	AV	10	ADF	10	nvoBlr1Stat_XXX	SNVT_count_inc	30018
Boiler 2 Status	blr2stat_XXX	AV	11	ADF	11	nvoBlr2Stat_XXX	SNVT_count_inc	30019
Boiler 3 Status	blr3stat_XXX	AV	12	ADF	12	nvoBlr3Stat_XXX	SNVT_count_inc	30020
Boiler 4 Status	blr4stat_XXX	AV	13	ADF	13	nvoBlr4Stat_XXX	SNVT_count_inc	30021
Boiler 5 Status	blr5stat_XXX	AV	14	ADF	14	nvoBlr5Stat_XXX	SNVT_count_inc	30022
Boiler 6 Status	blr6stat_XXX	AV	15	ADF	15	nvoBlr6Stat_XXX	SNVT_count_inc	30023
Boiler 7 Status	blr7stat_XXX	AV	16	ADF	16	nvoBlr7Stat_XXX	SNVT_count_inc	30024
Boiler 8 Status	blr8stat_XXX	AV	17	ADF	17	nvoBlr8Stat_XXX	SNVT_count_inc	30025
Net Boiler 1 Status	netblr1stat_XXX	AV	18	ADF	18	nvoNetBlr1Stat_XXX	SNVT_count_inc	30026
Net Boiler 2 Status	netblr2stat_XXX	AV	19	ADF	19	nvoNetBlr2Stat_XXX	SNVT_count_inc	30027
Net Boiler 3 Status	netblr3stat_XXX	AV	20	ADF	20	nvoNetBlr3Stat_XXX	SNVT_count_inc	30028
Net Boiler 4 Status	netblr4stat_XXX	AV	21	ADF	21	nvoNetBlr4Stat_XXX	SNVT_count_inc	30029
Net Boiler 5 Status	netblr5stat_XXX	AV	22	ADF	22	nvoNetBlr5Stat_XXX	SNVT_count_inc	30030
Net Boiler 6 Status	netblr6stat_XXX	AV	23	ADF	23	nvoNetBlr6Stat_XXX	SNVT_count_inc	30031
Net Boiler 7 Status	netblr7stat_XXX	AV	24	ADF	24	nvoNetBlr7Stat_XXX	SNVT_count_inc	30032

Appendix C-6: ACS/BMSII/BMS Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2, Modbus TCP/IP and LonWorks

Name	Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Modbus Address
Net Boiler 8 Status	netblr8stat_XXX	AV	25	ADF	25	nvoNetBlr8Stat_XXX	SNVT_count_inc	30033
Net Boiler 9 Status	netblr9stat_XXX	AV	26	ADF	26	nvoNetBlr9Stat_XXX	SNVT_count_inc	30034
Net Boiler 10 Status	netblr10stat_XXX	AV	27	ADF	27	nvoNetBlr10Stat_XXX	SNVT_count_inc	30035
Net Boiler 11 Status	netblr11stat_XXX	AV	28	ADF	28	nvoNetBlr11Stat_XXX	SNVT_count_inc	30036
Net Boiler 12 Status	netblr12stat_XXX	AV	29	ADF	29	nvoNetBlr12Stat_XXX	SNVT_count_inc	30037
Net Boiler 13 Status	netblr13stat_XXX	AV	30	ADF	30	nvoNetBlr13Stat_XXX	SNVT_count_inc	30038
Net Boiler 14 Status	netblr14stat_XXX	AV	31	ADF	31	nvoNetBlr14Stat_XXX	SNVT_count_inc	30039
Net Boiler 15 Status	netblr15stat_XXX	AV	32	ADF	32	nvoNetBlr15Stat_XXX	SNVT_count_inc	30040
Net Boiler 16 Status	netblr16stat_XXX	AV	33	ADF	33	nvoNetBlr16Stat_XXX	SNVT_count_inc	30041
Net Boiler 17 Status	netblr17stat_XXX	AV	34	ADF	34	nvoNetBlr17Stat_XXX	SNVT_count_inc	30042
Net Boiler 18 Status	netblr18stat_XXX	AV	35	ADF	35	nvoNetBlr18Stat_XXX	SNVT_count_inc	30043
Net Boiler 19 Status	netblr19stat_XXX	AV	36	ADF	36	nvoNetBlr19Stat_XXX	SNVT_count_inc	30044
Net Boiler 20 Status	netblr20stat_XXX	AV	37	ADF	37	nvoNetBlr20Stat_XXX	SNVT_count_inc	30045
Net Boiler 21 Status	netblr21stat_XXX	AV	38	ADF	38	nvoNetBlr21Stat_XXX	SNVT_count_inc	30046
Net Boiler 22 Status	netblr22stat_XXX	AV	39	ADF	39	nvoNetBlr22Stat_XXX	SNVT_count_inc	30047
Net Boiler 23 Status	netblr23stat_XXX	AV	40	ADF	40	nvoNetBlr23Stat_XXX	SNVT_count_inc	30048
Net Boiler 24 Status	netblr24stat_XXX	AV	41	ADF	41	nvoNetBlr24Stat_XXX	SNVT_count_inc	30049
Net Boiler 25 Status	netblr25stat_XXX	AV	42	ADF	42	nvoNetBlr25Stat_XXX	SNVT_count_inc	30050
Net Boiler 26 Status	netblr26stat_XXX	AV	43	ADF	43	nvoNetBlr26Stat_XXX	SNVT_count_inc	30051
Net Boiler 27 Status	netblr27stat_XXX	AV	44	ADF	44	nvoNetBlr27Stat_XXX	SNVT_count_inc	30052
Net Boiler 28 Status	netblr28stat_XXX	AV	45	ADF	45	nvoNetBlr28Stat_XXX	SNVT_count_inc	30053
Net Boiler 29 Status	netblr29stat_XXX	AV	46	ADF	46	nvoNetBlr29Stat_XXX	SNVT_count_inc	30054
Net Boiler 30 Status	netblr30stat_XXX	AV	47	ADF	47	nvoNetBlr30Stat_XXX	SNVT_count_inc	30055
Net Boiler 31 Status	netblr31stat_XXX	AV	48	ADF	48	nvoNetBlr31Stat_XXX	SNVT_count_inc	30056
Net Boiler 32 Status	netblr32stat_XXX	AV	49	ADF	49	nvoNetBlr32Stat_XXX	SNVT_count_inc	30057
Return Temp	localrettemp_XXX	AV	50	ADF	50	nvoLocRetTmp_XXX	SNVT_count_inc	30059
Input/Output Status	Iostat_XXX	AV	51	ADF	51	nvoIOStat_XXX	SNVT_count_inc	30058

APPENDIX D: EIGHT C-MORE BOILERS/HEATERS AND BST/WHM MASTER

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
Blr Addr 1										
1	Comm Address	SMD_BAS_IP_HTR_01_[0]	✓	AV:300	Data Float	46	nvoHTR_01_1	inc count (9)	Output (non-polled)	30300
1	Unit Status	SMD_BAS_IP_HTR_01_[1]	✓	AV:301	Data Float	47	nvoHTR_01_2	inc count (9)	Output (non-polled)	30301
1	Fault Code	SMD_BAS_IP_HTR_01_[2]	✓	AV:302	Data Float	48	nvoHTR_01_3	inc count (9)	Output (non-polled)	30302
1	Outlet Temp	SMD_BAS_IP_HTR_01_[3]	✓	AV:303	Data Float	49	nvoHTR_01_4	inc count (9)	Output (non-polled)	30303
1	FFWD Temp	SMD_BAS_IP_HTR_01_[4]	✓	AV:304	Data Float	50	nvoHTR_01_5	inc count (9)	Output (non-polled)	30304
1	Inlet Temp	SMD_BAS_IP_HTR_01_[5]	✓	AV:305	Data Float	51	nvoHTR_01_6	inc count (9)	Output (non-polled)	30305
1	Exhaust Temp	SMD_BAS_IP_HTR_01_[6]	✓	AV:306	Data Float	52	nvoHTR_01_7	inc count (9)	Output (non-polled)	30306
1	Air Temp	SMD_BAS_IP_HTR_01_[7]	✓	AV:307	Data Float	53	nvoHTR_01_8	inc count (9)	Output (non-polled)	30307
1	Flame Strength	SMD_BAS_IP_HTR_01_[8]	✓	AV:308	Data Float	54	nvoHTR_01_9	inc count (9)	Output (non-polled)	30308
1	Fire Rate In	SMD_BAS_IP_HTR_01_[9]	✓	AV:309	Data Float	55	nvoHTR_01_10	inc count (9)	Output (non-polled)	30309
1	Fire Rate Out	SMD_BAS_IP_HTR_01_[10]	✓	AV:310	Data Float	56	nvoHTR_01_11	inc count (9)	Output (non-polled)	30310
1	Unit Type	SMD_BAS_IP_HTR_01_[11]	✓	AV:311	Data Float	57	nvoHTR_01_12	inc count (9)	Output (non-polled)	30311
1	Unit Size	SMD_BAS_IP_HTR_01_[12]	✓	AV:312	Data Float	58	nvoHTR_01_13	inc count (9)	Output (non-polled)	30312
1	Value State	SMD_BAS_IP_HTR_01_[13]	✓	AV:313	Data Float	59	nvoHTR_01_14	inc count (9)	Output (non-polled)	30313
1	Net Remote Setpt	SMD_BAS_IP_HTR_01_[14]	✓	AV:314	Data Float	60	nvoHTR_01_15	inc count (9)	Output (non-polled)	30314
1	Run Cycles Upper	SMD_BAS_IP_HTR_01_[15]	✓	AV:315	Data Float	61	nvoHTR_01_16	inc count (9)	Output (non-polled)	30315
1	Run Cycles Lower	SMD_BAS_IP_HTR_01_[16]	✓	AV:316	Data Float	62	nvoHTR_01_17	inc count (9)	Output (non-polled)	30316
1	Run Hours Upper	SMD_BAS_IP_HTR_01_[17]	✓	AV:317	Data Float	63	nvoHTR_01_18	inc count (9)	Output (non-polled)	30317
1	Run Hours Lower	SMD_BAS_IP_HTR_01_[18]	✓	AV:318	Data Float	64	nvoHTR_01_19	inc count (9)	Output (non-polled)	30318
1	Oxygen Level	SMD_BAS_IP_HTR_01_[19]	✓	AV:319	Data Float	65	nvoHTR_01_20	inc count (9)	Output (non-polled)	30319

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
Blr Addr 2										
2	Comm Address	SMD_BAS_IP_HTR_02_[0]	✓	AV:400	Data Float	66	nvoHTR_02_1	inc count (9)	Output (non-polled)	30400
2	Unit Status	SMD_BAS_IP_HTR_02_[1]	✓	AV:401	Data Float	67	nvoHTR_02_2	inc count (9)	Output (non-polled)	30401
2	Fault Code	SMD_BAS_IP_HTR_02_[2]	✓	AV:402	Data Float	68	nvoHTR_02_3	inc count (9)	Output (non-polled)	30402
2	Outlet Temp	SMD_BAS_IP_HTR_02_[3]	✓	AV:403	Data Float	69	nvoHTR_02_4	inc count (9)	Output (non-polled)	30403
2	FFWD Temp	SMD_BAS_IP_HTR_02_[4]	✓	AV:404	Data Float	70	nvoHTR_02_5	inc count (9)	Output (non-polled)	30404
2	Inlet Temp	SMD_BAS_IP_HTR_02_[5]	✓	AV:405	Data Float	71	nvoHTR_02_6	inc count (9)	Output (non-polled)	30405
2	Exhaust Temp	SMD_BAS_IP_HTR_02_[6]	✓	AV:406	Data Float	72	nvoHTR_02_7	inc count (9)	Output (non-polled)	30406
2	Air Temp	SMD_BAS_IP_HTR_02_[7]	✓	AV:407	Data Float	73	nvoHTR_02_8	inc count (9)	Output (non-polled)	30407
2	Flame Strength	SMD_BAS_IP_HTR_02_[8]	✓	AV:408	Data Float	74	nvoHTR_02_9	inc count (9)	Output (non-polled)	30408
2	Fire Rate In	SMD_BAS_IP_HTR_02_[9]	✓	AV:409	Data Float	75	nvoHTR_02_10	inc count (9)	Output (non-polled)	30409
2	Fire Rate Out	SMD_BAS_IP_HTR_02_[10]	✓	AV:410	Data Float	76	nvoHTR_02_11	inc count (9)	Output (non-polled)	30410
2	Unit Type	SMD_BAS_IP_HTR_02_[11]	✓	AV:411	Data Float	77	nvoHTR_02_12	inc count (9)	Output (non-polled)	30411
2	Unit Size	SMD_BAS_IP_HTR_02_[12]	✓	AV:412	Data Float	78	nvoHTR_02_13	inc count (9)	Output (non-polled)	30412
2	Value State	SMD_BAS_IP_HTR_02_[13]	✓	AV:413	Data Float	79	nvoHTR_02_14	inc count (9)	Output (non-polled)	30413
2	Net Remote Setpt	SMD_BAS_IP_HTR_02_[14]	✓	AV:414	Data Float	80	nvoHTR_02_15	inc count (9)	Output (non-polled)	30414
2	Run Cycles Upper	SMD_BAS_IP_HTR_02_[15]	✓	AV:415	Data Float	81	nvoHTR_02_16	inc count (9)	Output (non-polled)	30415
2	Run Cycles Lower	SMD_BAS_IP_HTR_02_[16]	✓	AV:416	Data Float	82	nvoHTR_02_17	inc count (9)	Output (non-polled)	30416
2	Run Hours Upper	SMD_BAS_IP_HTR_02_[17]	✓	AV:417	Data Float	83	nvoHTR_02_18	inc count (9)	Output (non-polled)	30417
2	Run Hours Lower	SMD_BAS_IP_HTR_02_[18]	✓	AV:418	Data Float	84	nvoHTR_02_19	inc count (9)	Output (non-polled)	30418
2	Oxygen Level	SMD_BAS_IP_HTR_02_[19]	✓	AV:419	Data Float	85	nvoHTR_02_20	inc count (9)	Output (non-polled)	30419
Blr Addr 3										
3	Comm Address	SMD_BAS_IP_HTR_03_[0]	✓	AV:500	Data Float	86	nvoHTR_03_1	inc count (9)	Output (non-polled)	30500
3	Unit Status	SMD_BAS_IP_HTR_03_[1]	✓	AV:501	Data Float	87	nvoHTR_03_2	inc count (9)	Output (non-polled)	30501

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
3	Fault Code	SMD_BAS_IP_HTR_03_[2]	✓	AV:502	Data Float	88	nvoHTR_03_3	inc count (9)	Output (non-polled)	30502
3	Outlet Temp	SMD_BAS_IP_HTR_03_[3]	✓	AV:503	Data Float	89	nvoHTR_03_4	inc count (9)	Output (non-polled)	30503
3	FFWD Temp	SMD_BAS_IP_HTR_03_[4]	✓	AV:504	Data Float	90	nvoHTR_03_5	inc count (9)	Output (non-polled)	30504
3	Inlet Temp	SMD_BAS_IP_HTR_03_[5]	✓	AV:505	Data Float	91	nvoHTR_03_6	inc count (9)	Output (non-polled)	30505
3	Exhaust Temp	SMD_BAS_IP_HTR_03_[6]	✓	AV:506	Data Float	92	nvoHTR_03_7	inc count (9)	Output (non-polled)	30506
3	Air Temp	SMD_BAS_IP_HTR_03_[7]	✓	AV:507	Data Float	93	nvoHTR_03_8	inc count (9)	Output (non-polled)	30507
3	Flame Strength	SMD_BAS_IP_HTR_03_[8]	✓	AV:508	Data Float	94	nvoHTR_03_9	inc count (9)	Output (non-polled)	30508
3	Fire Rate In	SMD_BAS_IP_HTR_03_[9]	✓	AV:509	Data Float	95	nvoHTR_03_10	inc count (9)	Output (non-polled)	30509
3	Fire Rate Out	SMD_BAS_IP_HTR_03_[10]	✓	AV:510	Data Float	96	nvoHTR_03_11	inc count (9)	Output (non-polled)	30510
3	Unit Type	SMD_BAS_IP_HTR_03_[11]	✓	AV:511	Data Float	97	nvoHTR_03_12	inc count (9)	Output (non-polled)	30511
3	Unit Size	SMD_BAS_IP_HTR_03_[12]	✓	AV:512	Data Float	98	nvoHTR_03_13	inc count (9)	Output (non-polled)	30512
3	Value State	SMD_BAS_IP_HTR_03_[13]	✓	AV:513	Data Float	99	nvoHTR_03_14	inc count (9)	Output (non-polled)	30513
3	Net Remote Setpt	SMD_BAS_IP_HTR_03_[14]	✓	AV:514	Data Float	100	nvoHTR_03_15	inc count (9)	Output (non-polled)	30514
3	Run Cycles Upper	SMD_BAS_IP_HTR_03_[15]	✓	AV:515	Data Float	101	nvoHTR_03_16	inc count (9)	Output (non-polled)	30515
3	Run Cycles Lower	SMD_BAS_IP_HTR_03_[16]	✓	AV:516	Data Float	102	nvoHTR_03_17	inc count (9)	Output (non-polled)	30516
3	Run Hours Upper	SMD_BAS_IP_HTR_03_[17]	✓	AV:517	Data Float	103	nvoHTR_03_18	inc count (9)	Output (non-polled)	30517
3	Run Hours Lower	SMD_BAS_IP_HTR_03_[18]	✓	AV:518	Data Float	104	nvoHTR_03_19	inc count (9)	Output (non-polled)	30518
3	Oxygen Level	SMD_BAS_IP_HTR_03_[19]	✓	AV:519	Data Float	105	nvoHTR_03_20	inc count (9)	Output (non-polled)	30519
Blr Addr 4										
4	Comm Address	SMD_BAS_IP_HTR_04_[0]	✓	AV:600	Data Float	106	nvoHTR_04_1	inc count (9)	Output (non-polled)	30600
4	Unit Status	SMD_BAS_IP_HTR_04_[1]	✓	AV:601	Data Float	107	nvoHTR_04_2	inc count (9)	Output (non-polled)	30601
4	Fault Code	SMD_BAS_IP_HTR_04_[2]	✓	AV:602	Data Float	108	nvoHTR_04_3	inc count (9)	Output (non-polled)	30602
4	Outlet Temp	SMD_BAS_IP_HTR_04_[3]	✓	AV:603	Data Float	109	nvoHTR_04_4	inc count (9)	Output (non-polled)	30603
4	FFWD Temp	SMD_BAS_IP_HTR_04_[4]	✓	AV:604	Data Float	110	nvoHTR_04_5	inc count (9)	Output (non-polled)	30604

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
4	Inlet Temp	SMD_BAS_IP_HTR_04_[5]	✓	AV:605	Data Float	111	nvoHTR_04_6	inc count (9)	Output (non-polled)	30605
4	Exhaust Temp	SMD_BAS_IP_HTR_04_[6]	✓	AV:606	Data Float	112	nvoHTR_04_7	inc count (9)	Output (non-polled)	30606
4	Air Temp	SMD_BAS_IP_HTR_04_[7]	✓	AV:607	Data Float	113	nvoHTR_04_8	inc count (9)	Output (non-polled)	30607
4	Flame Strength	SMD_BAS_IP_HTR_04_[8]	✓	AV:608	Data Float	114	nvoHTR_04_9	inc count (9)	Output (non-polled)	30608
4	Fire Rate In	SMD_BAS_IP_HTR_04_[9]	✓	AV:609	Data Float	115	nvoHTR_04_10	inc count (9)	Output (non-polled)	30609
4	Fire Rate Out	SMD_BAS_IP_HTR_04_[10]	✓	AV:610	Data Float	116	nvoHTR_04_11	inc count (9)	Output (non-polled)	30610
4	Unit Type	SMD_BAS_IP_HTR_04_[11]	✓	AV:611	Data Float	117	nvoHTR_04_12	inc count (9)	Output (non-polled)	30611
4	Unit Size	SMD_BAS_IP_HTR_04_[12]	✓	AV:612	Data Float	118	nvoHTR_04_13	inc count (9)	Output (non-polled)	30612
4	Value State	SMD_BAS_IP_HTR_04_[13]	✓	AV:613	Data Float	119	nvoHTR_04_14	inc count (9)	Output (non-polled)	30613
4	Net Remote Setpt	SMD_BAS_IP_HTR_04_[14]	✓	AV:614	Data Float	120	nvoHTR_04_15	inc count (9)	Output (non-polled)	30614
4	Run Cycles Upper	SMD_BAS_IP_HTR_04_[15]	✓	AV:615	Data Float	121	nvoHTR_04_16	inc count (9)	Output (non-polled)	30615
4	Run Cycles Lower	SMD_BAS_IP_HTR_04_[16]	✓	AV:616	Data Float	122	nvoHTR_04_17	inc count (9)	Output (non-polled)	30616
4	Run Hours Upper	SMD_BAS_IP_HTR_04_[17]	✓	AV:617	Data Float	123	nvoHTR_04_18	inc count (9)	Output (non-polled)	30617
4	Run Hours Lower	SMD_BAS_IP_HTR_04_[18]	✓	AV:618	Data Float	124	nvoHTR_04_19	inc count (9)	Output (non-polled)	30618
4	Oxygen Level	SMD_BAS_IP_HTR_04_[19]	✓	AV:619	Data Float	125	nvoHTR_04_20	inc count (9)	Output (non-polled)	30619
Blr Addr 5										
5	Comm Address	SMD_BAS_IP_HTR_05_[0]	✓	AV:700	Data Float	126	nvoHTR_05_1	inc count (9)	Output (non-polled)	30700
5	Unit Status	SMD_BAS_IP_HTR_05_[1]	✓	AV:701	Data Float	127	nvoHTR_05_2	inc count (9)	Output (non-polled)	30701
5	Fault Code	SMD_BAS_IP_HTR_05_[2]	✓	AV:702	Data Float	128	nvoHTR_05_3	inc count (9)	Output (non-polled)	30702
5	Outlet Temp	SMD_BAS_IP_HTR_05_[3]	✓	AV:703	Data Float	129	nvoHTR_05_4	inc count (9)	Output (non-polled)	30703
5	FFWD Temp	SMD_BAS_IP_HTR_05_[4]	✓	AV:704	Data Float	130	nvoHTR_05_5	inc count (9)	Output (non-polled)	30704
5	Inlet Temp	SMD_BAS_IP_HTR_05_[5]	✓	AV:705	Data Float	131	nvoHTR_05_6	inc count (9)	Output (non-polled)	30705
5	Exhaust Temp	SMD_BAS_IP_HTR_05_[6]	✓	AV:706	Data Float	132	nvoHTR_05_7	inc count (9)	Output (non-polled)	30706
5	Air Temp	SMD_BAS_IP_HTR_05_[7]	✓	AV:707	Data Float	133	nvoHTR_05_8	inc count (9)	Output (non-polled)	30707

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
5	Flame Strength	SMD_BAS_IP_HTR_05_[8]	✓	AV:708	Data Float	134	nvoHTR_05_9	inc count (9)	Output (non-polled)	30708
5	Fire Rate In	SMD_BAS_IP_HTR_05_[9]	✓	AV:709	Data Float	135	nvoHTR_05_10	inc count (9)	Output (non-polled)	30709
5	Fire Rate Out	SMD_BAS_IP_HTR_05_[10]	✓	AV:710	Data Float	136	nvoHTR_05_11	inc count (9)	Output (non-polled)	30710
5	Unit Type	SMD_BAS_IP_HTR_05_[11]	✓	AV:711	Data Float	137	nvoHTR_05_12	inc count (9)	Output (non-polled)	30711
5	Unit Size	SMD_BAS_IP_HTR_05_[12]	✓	AV:712	Data Float	138	nvoHTR_05_13	inc count (9)	Output (non-polled)	30712
5	Value State	SMD_BAS_IP_HTR_05_[13]	✓	AV:713	Data Float	139	nvoHTR_05_14	inc count (9)	Output (non-polled)	30713
5	Net Remote Setpt	SMD_BAS_IP_HTR_05_[14]	✓	AV:714	Data Float	140	nvoHTR_05_15	inc count (9)	Output (non-polled)	30714
5	Run Cycles Upper	SMD_BAS_IP_HTR_05_[15]	✓	AV:715	Data Float	141	nvoHTR_05_16	inc count (9)	Output (non-polled)	30715
5	Run Cycles Lower	SMD_BAS_IP_HTR_05_[16]	✓	AV:716	Data Float	142	nvoHTR_05_17	inc count (9)	Output (non-polled)	30716
5	Run Hours Upper	SMD_BAS_IP_HTR_05_[17]	✓	AV:717	Data Float	143	nvoHTR_05_18	inc count (9)	Output (non-polled)	30717
5	Run Hours Lower	SMD_BAS_IP_HTR_05_[18]	✓	AV:718	Data Float	144	nvoHTR_05_19	inc count (9)	Output (non-polled)	30718
5	Oxygen Level	SMD_BAS_IP_HTR_05_[19]	✓	AV:719	Data Float	145	nvoHTR_05_20	inc count (9)	Output (non-polled)	30719
Blr Addr 6										
6	Comm Address	SMD_BAS_IP_HTR_06_[0]	✓	AV:800	Data Float	146	nvoHTR_06_1	inc count (9)	Output (non-polled)	30800
6	Unit Status	SMD_BAS_IP_HTR_06_[1]	✓	AV:801	Data Float	147	nvoHTR_06_2	inc count (9)	Output (non-polled)	30801
6	Fault Code	SMD_BAS_IP_HTR_06_[2]	✓	AV:802	Data Float	148	nvoHTR_06_3	inc count (9)	Output (non-polled)	30802
6	Outlet Temp	SMD_BAS_IP_HTR_06_[3]	✓	AV:803	Data Float	149	nvoHTR_06_4	inc count (9)	Output (non-polled)	30803
6	FFWD Temp	SMD_BAS_IP_HTR_06_[4]	✓	AV:804	Data Float	150	nvoHTR_06_5	inc count (9)	Output (non-polled)	30804
6	Inlet Temp	SMD_BAS_IP_HTR_06_[5]	✓	AV:805	Data Float	151	nvoHTR_06_6	inc count (9)	Output (non-polled)	30805
6	Exhaust Temp	SMD_BAS_IP_HTR_06_[6]	✓	AV:806	Data Float	152	nvoHTR_06_7	inc count (9)	Output (non-polled)	30806
6	Air Temp	SMD_BAS_IP_HTR_06_[7]	✓	AV:807	Data Float	153	nvoHTR_06_8	inc count (9)	Output (non-polled)	30807
6	Flame Strength	SMD_BAS_IP_HTR_06_[8]	✓	AV:808	Data Float	154	nvoHTR_06_9	inc count (9)	Output (non-polled)	30808
6	Fire Rate In	SMD_BAS_IP_HTR_06_[9]	✓	AV:809	Data Float	155	nvoHTR_06_10	inc count (9)	Output (non-polled)	30809
6	Fire Rate Out	SMD_BAS_IP_HTR_06_[10]	✓	AV:810	Data Float	156	nvoHTR_06_11	inc count (9)	Output (non-polled)	30810

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
6	Unit Type	SMD_BAS_IP_HTR_06_[11]	✓	AV:811	Data Float	157	nvoHTR_06_12	inc count (9)	Output (non-polled)	30811
6	Unit Size	SMD_BAS_IP_HTR_06_[12]	✓	AV:812	Data Float	158	nvoHTR_06_13	inc count (9)	Output (non-polled)	30812
6	Value State	SMD_BAS_IP_HTR_06_[13]	✓	AV:813	Data Float	159	nvoHTR_06_14	inc count (9)	Output (non-polled)	30813
6	Net Remote Setpt	SMD_BAS_IP_HTR_06_[14]	✓	AV:814	Data Float	160	nvoHTR_06_15	inc count (9)	Output (non-polled)	30814
6	Run Cycles Upper	SMD_BAS_IP_HTR_06_[15]	✓	AV:815	Data Float	161	nvoHTR_06_16	inc count (9)	Output (non-polled)	30815
6	Run Cycles Lower	SMD_BAS_IP_HTR_06_[16]	✓	AV:816	Data Float	162	nvoHTR_06_17	inc count (9)	Output (non-polled)	30816
6	Run Hours Upper	SMD_BAS_IP_HTR_06_[17]	✓	AV:817	Data Float	163	nvoHTR_06_18	inc count (9)	Output (non-polled)	30817
6	Run Hours Lower	SMD_BAS_IP_HTR_06_[18]	✓	AV:818	Data Float	164	nvoHTR_06_19	inc count (9)	Output (non-polled)	30818
6	Oxygen Level	SMD_BAS_IP_HTR_06_[19]	✓	AV:819	Data Float	165	nvoHTR_06_20	inc count (9)	Output (non-polled)	30819
Blr Addr 7										
7	Comm Address	SMD_BAS_IP_HTR_07_[0]	✓	AV:900	Data Float	166	nvoHTR_07_1	inc count (9)	Output (non-polled)	30900
7	Unit Status	SMD_BAS_IP_HTR_07_[1]	✓	AV:901	Data Float	167	nvoHTR_07_2	inc count (9)	Output (non-polled)	30901
7	Fault Code	SMD_BAS_IP_HTR_07_[2]	✓	AV:902	Data Float	168	nvoHTR_07_3	inc count (9)	Output (non-polled)	30902
7	Outlet Temp	SMD_BAS_IP_HTR_07_[3]	✓	AV:903	Data Float	169	nvoHTR_07_4	inc count (9)	Output (non-polled)	30903
7	FFWD Temp	SMD_BAS_IP_HTR_07_[4]	✓	AV:904	Data Float	170	nvoHTR_07_5	inc count (9)	Output (non-polled)	30904
7	Inlet Temp	SMD_BAS_IP_HTR_07_[5]	✓	AV:905	Data Float	171	nvoHTR_07_6	inc count (9)	Output (non-polled)	30905
7	Exhaust Temp	SMD_BAS_IP_HTR_07_[6]	✓	AV:906	Data Float	172	nvoHTR_07_7	inc count (9)	Output (non-polled)	30906
7	Air Temp	SMD_BAS_IP_HTR_07_[7]	✓	AV:907	Data Float	173	nvoHTR_07_8	inc count (9)	Output (non-polled)	30907
7	Flame Strength	SMD_BAS_IP_HTR_07_[8]	✓	AV:908	Data Float	174	nvoHTR_07_9	inc count (9)	Output (non-polled)	30908
7	Fire Rate In	SMD_BAS_IP_HTR_07_[9]	✓	AV:909	Data Float	175	nvoHTR_07_10	inc count (9)	Output (non-polled)	30909
7	Fire Rate Out	SMD_BAS_IP_HTR_07_[10]	✓	AV:910	Data Float	176	nvoHTR_07_11	inc count (9)	Output (non-polled)	30910
7	Unit Type	SMD_BAS_IP_HTR_07_[11]	✓	AV:911	Data Float	177	nvoHTR_07_12	inc count (9)	Output (non-polled)	30911
7	Unit Size	SMD_BAS_IP_HTR_07_[12]	✓	AV:912	Data Float	178	nvoHTR_07_13	inc count (9)	Output (non-polled)	30912
7	Value State	SMD_BAS_IP_HTR_07_[13]	✓	AV:913	Data Float	179	nvoHTR_07_14	inc count (9)	Output (non-polled)	30913

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
7	Net Remote Setpt	SMD_BAS_IP_HTR_07_[14]	✓	AV:914	Data Float	180	nvoHTR_07_15	inc count (9)	Output (non-polled)	30914
7	Run Cycles Upper	SMD_BAS_IP_HTR_07_[15]	✓	AV:915	Data Float	181	nvoHTR_07_16	inc count (9)	Output (non-polled)	30915
7	Run Cycles Lower	SMD_BAS_IP_HTR_07_[16]	✓	AV:916	Data Float	182	nvoHTR_07_17	inc count (9)	Output (non-polled)	30916
7	Run Hours Upper	SMD_BAS_IP_HTR_07_[17]	✓	AV:917	Data Float	183	nvoHTR_07_18	inc count (9)	Output (non-polled)	30917
7	Run Hours Lower	SMD_BAS_IP_HTR_07_[18]	✓	AV:918	Data Float	184	nvoHTR_07_19	inc count (9)	Output (non-polled)	30918
7	Oxygen Level	SMD_BAS_IP_HTR_07_[19]	✓	AV:919	Data Float	185	nvoHTR_07_20	inc count (9)	Output (non-polled)	30919
Blr Addr 8										
8	Comm Address	SMD_BAS_IP_HTR_08_[0]	✓	AV:1000	Data Float	186	nvoHTR_08_1	inc count (9)	Output (non-polled)	31000
8	Unit Status	SMD_BAS_IP_HTR_08_[1]	✓	AV:1001	Data Float	187	nvoHTR_08_2	inc count (9)	Output (non-polled)	31001
8	Fault Code	SMD_BAS_IP_HTR_08_[2]	✓	AV:1002	Data Float	188	nvoHTR_08_3	inc count (9)	Output (non-polled)	31002
8	Outlet Temp	SMD_BAS_IP_HTR_08_[3]	✓	AV:1003	Data Float	189	nvoHTR_08_4	inc count (9)	Output (non-polled)	31003
8	FFWD Temp	SMD_BAS_IP_HTR_08_[4]	✓	AV:1004	Data Float	190	nvoHTR_08_5	inc count (9)	Output (non-polled)	31004
8	Inlet Temp	SMD_BAS_IP_HTR_08_[5]	✓	AV:1005	Data Float	191	nvoHTR_08_6	inc count (9)	Output (non-polled)	31005
8	Exhaust Temp	SMD_BAS_IP_HTR_08_[6]	✓	AV:1006	Data Float	192	nvoHTR_08_7	inc count (9)	Output (non-polled)	31006
8	Air Temp	SMD_BAS_IP_HTR_08_[7]	✓	AV:1007	Data Float	193	nvoHTR_08_8	inc count (9)	Output (non-polled)	31007
8	Flame Strength	SMD_BAS_IP_HTR_08_[8]	✓	AV:1008	Data Float	194	nvoHTR_08_9	inc count (9)	Output (non-polled)	31008
8	Fire Rate In	SMD_BAS_IP_HTR_08_[9]	✓	AV:1009	Data Float	195	nvoHTR_08_10	inc count (9)	Output (non-polled)	31009
8	Fire Rate Out	SMD_BAS_IP_HTR_08_[10]	✓	AV:1010	Data Float	196	nvoHTR_08_11	inc count (9)	Output (non-polled)	31010
8	Unit Type	SMD_BAS_IP_HTR_08_[11]	✓	AV:1011	Data Float	197	nvoHTR_08_12	inc count (9)	Output (non-polled)	31011
8	Unit Size	SMD_BAS_IP_HTR_08_[12]	✓	AV:1012	Data Float	198	nvoHTR_08_13	inc count (9)	Output (non-polled)	31012
8	Value State	SMD_BAS_IP_HTR_08_[13]	✓	AV:1013	Data Float	199	nvoHTR_08_14	inc count (9)	Output (non-polled)	31013
8	Net Remote Setpt	SMD_BAS_IP_HTR_08_[14]	✓	AV:1014	Data Float	200	nvoHTR_08_15	inc count (9)	Output (non-polled)	31014
8	Run Cycles Upper	SMD_BAS_IP_HTR_08_[15]	✓	AV:1015	Data Float	201	nvoHTR_08_16	inc count (9)	Output (non-polled)	31015
8	Run Cycles Lower	SMD_BAS_IP_HTR_08_[16]	✓	AV:1016	Data Float	202	nvoHTR_08_17	inc count (9)	Output (non-polled)	31016

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
8	Run Hours Upper	SMD_BAS_IP_HTR_08_[17]	✓	AV:1017	Data Float	203	nvoHTR_08_18	inc count (9)	Output (non-polled)	31017
8	Run Hours Lower	SMD_BAS_IP_HTR_08_[18]	✓	AV:1018	Data Float	204	nvoHTR_08_19	inc count (9)	Output (non-polled)	31018
8	Oxygen Level	SMD_BAS_IP_HTR_08_[19]	✓	AV:1019	Data Float	205	nvoHTR_08_20	inc count (9)	Output (non-polled)	31019
Master Addr 247										
Master Control Values										
247	Write Cntrl Val to BST/WHM	SMD_BAS_IP_Ctrl_[1]	* write "1" to send Value to WHM	AV:51	Data Float	2	nvoCtrl_2	inc count (9)	Input/Output	40051
247	BST/WHM Timeout	SMD_BAS_IP_Ctrl_[3]	**Read Only**, 0=WHM Present, 1=WHM Absent	AV:53	Data Float	4	nvoCtrl_4	inc count (9)	Input/Output	40053
Read Master Operating Values										
247	Mode	SMD_BAS_IP_OpVal_[0]	✓	AV:100	Data Float	6	nvoOpVal_1	inc count (9)	Output (non-polled)	30100
247	Setpoint	SMD_BAS_IP_OpVal_[1]	✓	AV:101	Data Float	7	nvoOpVal_2	inc count (9)	Output (non-polled)	30101
247	Setback Setpt	SMD_BAS_IP_OpVal_[2]	✓	AV:102	Data Float	8	nvoOpVal_3	inc count (9)	Output (non-polled)	30102
247	Setback Start	SMD_BAS_IP_OpVal_[3]	✓	AV:103	Data Float	9	nvoOpVal_4	inc count (9)	Output (non-polled)	30103
247	Setback End	SMD_BAS_IP_OpVal_[4]	✓	AV:104	Data Float	10	nvoOpVal_5	inc count (9)	Output (non-polled)	30104
247	Auto Master	SMD_BAS_IP_OpVal_[5]	✓	AV:105	Data Float	11	nvoOpVal_6	inc count (9)	Output (non-polled)	30105
247	Avg Outlet Temp	SMD_BAS_IP_OpVal_[6]	✓	AV:106	Data Float	12	nvoOpVal_7	inc count (9)	Output (non-polled)	30106
247	Units Active	SMD_BAS_IP_OpVal_[7]	✓	AV:107	Data Float	13	nvoOpVal_8	inc count (9)	Output (non-polled)	30107
247	Units Faulted	SMD_BAS_IP_OpVal_[8]	✓	AV:108	Data Float	14	nvoOpVal_9	inc count (9)	Output (non-polled)	30108
247	Master Addr	SMD_BAS_IP_OpVal_[9]	✓	AV:109	Data Float	15	nvoOpVal_10	inc count (9)	Output (non-polled)	30109
247	Header Temp	SMD_BAS_IP_OpVal_[10]	✓	AV:110	Data Float	16	nvoOpVal_11	inc count (9)	Output (non-polled)	30110
247	Outdoor Temp	SMD_BAS_IP_OpVal_[11]	✓	AV:111	Data Float	17	nvoOpVal_12	inc count (9)	Output (non-polled)	30111
247	Percent Output	SMD_BAS_IP_OpVal_[12]	✓	AV:112	Data Float	18	nvoOpVal_13	inc count (9)	Output (non-polled)	30112

Appendix D: Eight C-More Boilers/Heaters and BST/WHM Master

Equip	Point Name	Name	Read Only	BACnet Type:ID	N2 Type	N2 ID	Lon NAME	Lon SNVT	Lon Direction	Modbus Address
247	Number of Units Firing	SMD_BAS_IP_OpVal_[13]	✓	AV:113	Data Float	19	nvoOpVal_14	inc count (9)	Output (non-polled)	30113
247	Master Active Setpoint	SMD_BAS_IP_OpVal_[14]	✓	AV:114	Data Float	20	nvoOpVal_15	inc count (9)	Output (non-polled)	30114
247	Next Turn-On Percent	SMD_BAS_IP_OpVal_[15]	✓	AV:115	Data Float	21	nvoOpVal_16	inc count (9)	Output (non-polled)	30115
247	Header High Limit	SMD_BAS_IP_OpVal_[16]	✓	AV:116	Data Float	22	nvoOpVal_17	inc count (9)	Output (non-polled)	30116
247	Header Low Limit	SMD_BAS_IP_OpVal_[17]	✓	AV:117	Data Float	23	nvoOpVal_18	inc count (9)	Output (non-polled)	30117
247	Header Temp High Limit	SMD_BAS_IP_OpVal_[18]	✓	AV:118	Data Float	24	nvoOpVal_19	inc count (9)	Output (non-polled)	30118
247	Header Setpoint Mode	SMD_BAS_IP_OpVal_[19]	✓	AV:119	Data Float	25	nvoOpVal_20	inc count (9)	Output (non-polled)	30119
Write Master Operating Values										
247	Setpt	SMD_BAS_IP_CtrlVal_[0]		AV:200	Data Float	26	nvoCtrlVal_1	inc count (9)	Input (non-polling)	40200
247	Setback Setpt	SMD_BAS_IP_CtrlVal_[1]		AV:201	Data Float	27	nvoCtrlVal_2	inc count (9)	Input (non-polling)	40201
247	Setback Start	SMD_BAS_IP_CtrlVal_[2]		AV:202	Data Float	28	nvoCtrlVal_3	inc count (9)	Input (non-polling)	40202
247	Setback End	SMD_BAS_IP_CtrlVal_[3]		AV:203	Data Float	29	nvoCtrlVal_4	inc count (9)	Input (non-polling)	40203

*** NOTE**

Writing a setpoint to WHM or BST is a two-step process. First write the setpoint to the “Write Setpoint” address. Next, write a “1” to the “Write Control” address. This will cause the ProtoNode to send the setpoint to the master C-More. After the setpoint is sent, this address value will change to “0” when read.

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APPENDIX E: TROUBLESHOOTING

Appendix E-1: Viewing Diagnostic Information

- Type the IP Address of the ProtoNode into your web browser or use the FieldServer Toolbox to connect to the ProtoNode.
- Click on the **Diagnostics and Debugging** button (see Figure 4-1).
- Click on **View** and then on click on **Connections** (see Figure E-1).

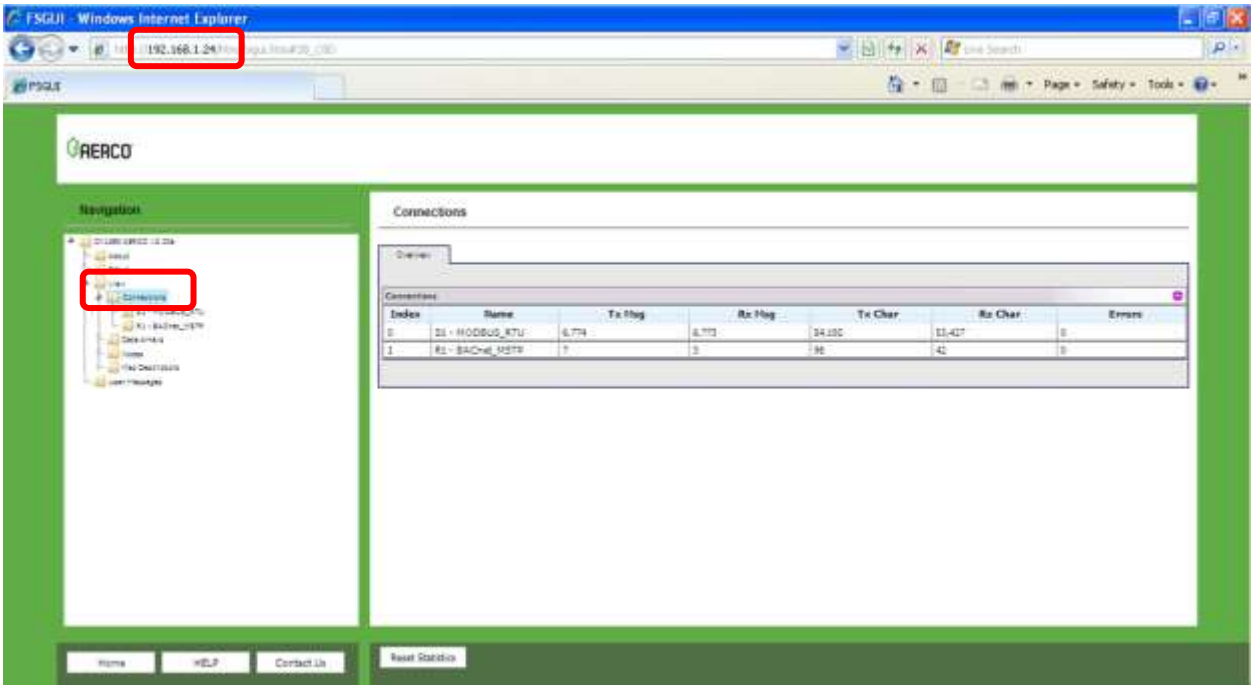


Figure E-1: Error Messages Screen

If there are any errors showing on the Connection page, please refer to **Appendix E.2**, below, for the relevant wiring and settings.

Appendix E-2: Check Wiring and Settings

No COMS on Modbus RTU side. If Tx/Rx are not flashing rapidly, then there is a COM issue on the Modbus side and you need to check the following things:

- Visual observations of LEDs on ProtoNode (see Appendix E-5)
- Check baud rate, parity, data bits, stop bits
- Check Modbus device address
- Verify wiring
- Verify all the Modbus RTU devices were discovered in Web Configurator. (Chapter 5)

- Field COM problems:
  - Visual observations of LEDs on ProtoNode (see Appendix E-5).
  - Visual DIP switch settings (using correct baud rate and device instance)
  - Verify IP Address setting
  - Verify wiring

If the problem still exists, a Diagnostic Capture needs to be taken and sent to **Sierra Monitor Corporation** (see Appendix E-3).

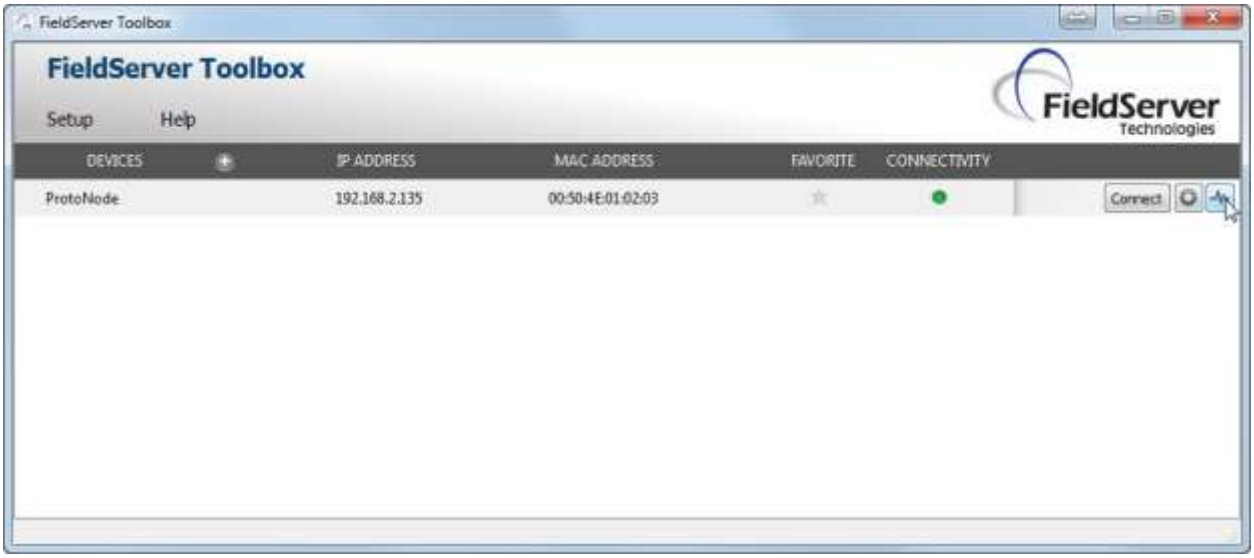
Appendix E-3: Diagnostic Capture with the FieldServer Utilities

Once the Diagnostic Capture is complete, email it to **support@sierramonitor.com**. The Diagnostic Capture will allow us to rapidly diagnose the problem.

- Ensure that FieldServer Toolbox is Loaded on the PC that is currently being used, or download FieldServer-Toolbox.zip on the Sierra Monitor Corporation webpage, under Customer Care: Resource Center, Software Downloads: http://www.sierramonitor.com/customer-care/resource-center?filters=software-downloads
- Extract the executable file and complete the installation.

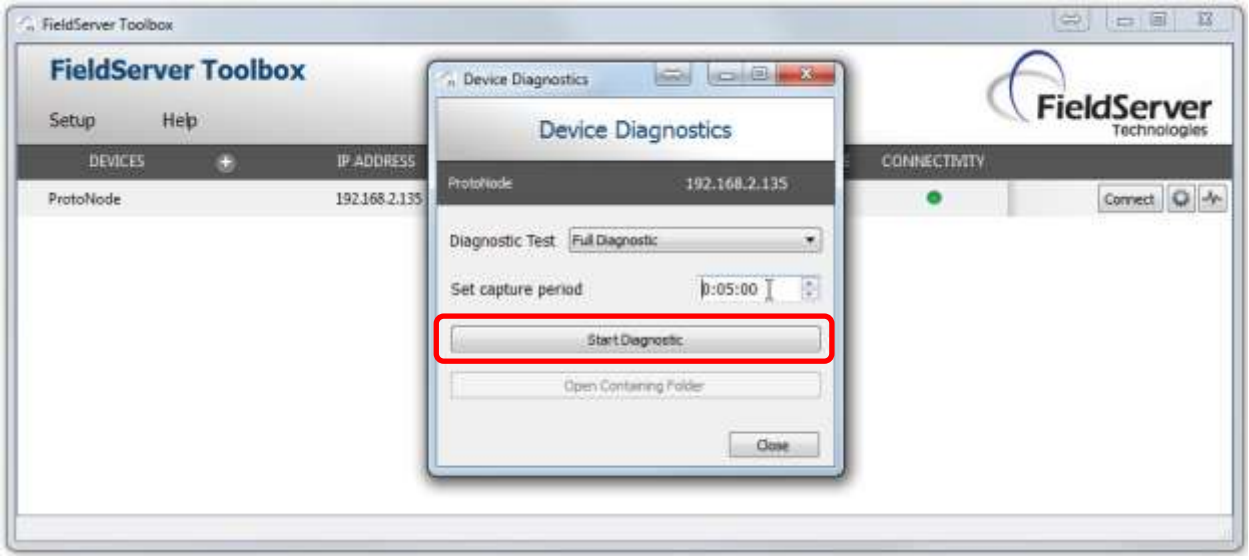
Figure E-2: Ethernet Port Location

- Disable any wireless Ethernet adapters on the PC/Laptop
- Disable firewall and virus protection software if possible
- Connect a standard CAT5 Ethernet cable between the PC and ProtoNode
- Double click on the FS Toolbox Utility
- **Step 1:** Take a Log:
  - Click on the diagnose icon  of the desired device.



- Select **Full Diagnostic**.

- If desired, the default capture period can be changed.
- Click on **Start Diagnostic**.



- Wait for Capture period to finish. The Diagnostic Test Complete window will appear.

- **Step 2**: Send Log
    - Once the Diagnostic test is complete, a .zip file will be saved on the PC.

    - Choose open to launch explorer and have it point directly at the correct folder. Send the Diagnostic zip file to support@sierramonitor.com

Appendix E-4: BACnet: Setting Network_Number for more than one ProtoNode on Subnet

For both BACnet MS/TP and BACnet/IP, if more than one ProtoNode is connected to the same subnet, they must be assigned unique Network_Number values.

On the main Configuration Parameters screen, update the Network Number with the **network_nr** field and click the **Submit** button. The default value is 50.

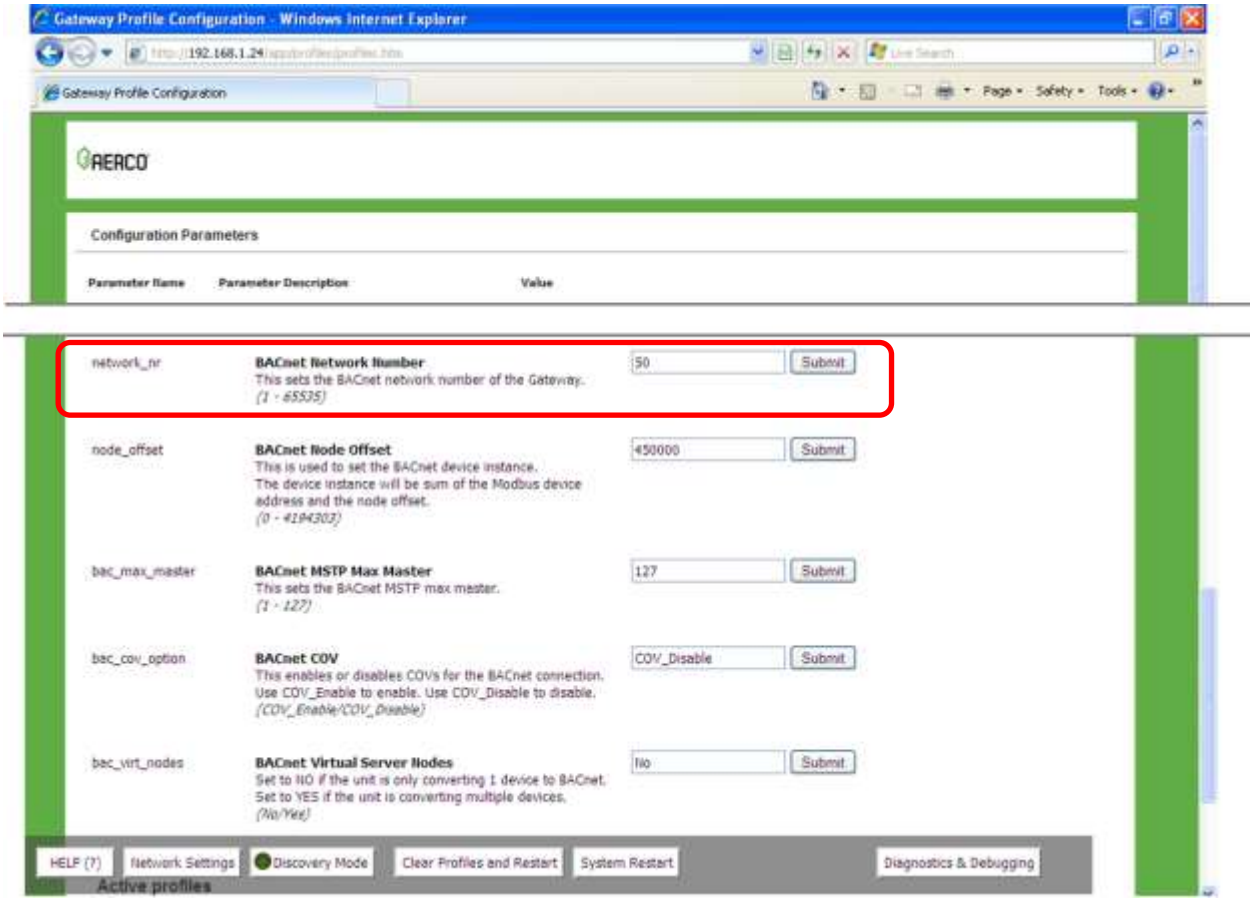
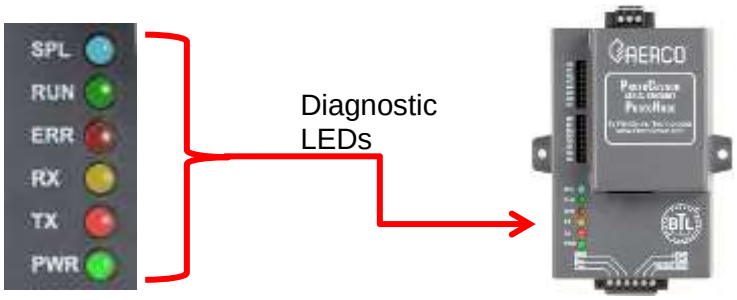


Figure E-3: Web Configurator showing setting the network number for BACnet

Appendix E-5: LED Diagnostics for Modbus RTU Communications Between ProtoNode and Devices

Please see the diagram below for ProtoNode FPC-N34 and FPC-N35 LED locations.



Tag	Description
SPL	The SPL LED will light if the ProtoNode or any of the devices is off line. **For FPC-N35**, the LED will also light until ProtoNode is Commissioned on the LonWorks network.
RUN	The RUN LED will start flashing 20 seconds after power indicating normal operation.
ERR	The SYS ERR LED will go on solid 15 seconds after power up. It will turn off after 5 seconds. A steady red light indicates a system error on ProtoNode. If this occurs, immediately report the related “system error” shown in the error screen of the GUI interface to Sierra Monitor for evaluation. **NOTE:** A possible cause for this LED to go on solid for BACnet MSTP is when the MAC Address is greater than 127 and the “bac_max_master” is 127 or less.
RX	The RX LED will flash when a message is received on the host port.
TX	The TX LED will flash when a message is sent on the host port.
PWR	This is the power light and should show steady green at all times when ProtoNode is powered.

Figure E-4: Diagnostic LEDs

Appendix E-6: Passwords

Access to the ProtoNode can be restricted by enabling a password. There are 2 access levels defined by 2 account names: Admin and User.

- The Admin account has unrestricted access to the ProtoNode.
- The User account can view any ProtoNode information, but cannot make any changes or restart the ProtoNode.

The password must be a ***minimum*** of eight characters and ***is case sensitive***.

If you forgot your password, click cancel on the password authentication popup window, and e-mail the password recovery token to the AERCO support team (find the appropriate email address at www.aerco.com) to receive a temporary password. You can now access the ProtoNode to set a new password.

APPENDIX F: C-MORE STATUS AND FAULT MESSAGES

Appendix F: C-More Status and Fault Messages

Display Code	Message		Description
1 *	DISABLED HH:MM pm MM/DD/YY		Displayed if ON/OFF switch is set to OFF. The display also shows the time and date that the unit was disabled.
2 *	STANDBY		Displayed when ON/OFF switch is in the ON position, but there is no demand for heat. The time and date are also displayed.
3 *	DEMAND DELAY XX sec		Displayed if Demand Delay is active.
4 *	PURGING XX sec		Displayed during the purge cycle during startup. The duration of the purge cycle counts up in seconds.
5 *	IGNITION TRIAL XX sec		Displayed during ignition trial of startup sequence. The duration of cycle counts up in seconds.
6 *	FLAME PROVEN		Displayed after flame has been detected for a period of 2 seconds. Initially, the flame strength is shown in %. After 5 seconds has elapsed, the time and date are shown in place of flame strength.
7 *	WARMUP XX sec		Displayed for 2 minutes during the initial warm-up only.
8	HIGH WATER TEMP SWITCH OPEN		The High Water Temperature Limit Switch is open.
9	LOW WATER LEVEL		The Water Level Control board is indicating low water level.
10	LOW GAS PRESSURE	GAS PRESSURE FAULT	The Low Gas Pressure Limit Switch is open.
11	HIGH GAS PRESSURE	GAS PRESSURE FAULT	The High Gas Pressure Limit Switch is open.
12 *	INTERLOCK OPEN		The Remote Interlock is open.
13	DELAYED INTERLOCK OPEN		The Delayed Interlock is open.
14	AIRFLOW FAULT DURING PURGE		The Blower Proof Switch opened during purge.
15	SSOV FAULT DURING PURGE		The SSOV switch opened during purge.

Appendix F: C-More Status and Fault Messages

Display Code	Message	Description
16	**PRG SWTCH OPEN DURING PURGE**	The Purge Position Limit switch on the Air/Fuel valve opened during purge.
17	**IGN SWTCH OPEN DURING IGNITION**	The Ignition Position Limit switch on the Air/Fuel valve opened during ignition.
18	**AIRFLOW FAULT DURING IGN**	The Blower Proof Switch opened during ignition.
19	**AIRFLOW FAULT DURING RUN**	The Blower Proof Switch opened during run.
20	**SSOV FAULT DURING IGN**	The SSOV switch closed or failed to open during ignition.
21	**SSOV FAULT DURING RUN**	The SSOV switch closed for more than 15 seconds during run.
22	**FLAME LOSS DURING IGN**	The Flame signal was not seen during ignition or lost within 5 seconds after ignition.
23	**FLAME LOSS DURING RUN**	The Flame signal was lost during run.
24	**HIGH EXHAUST TEMPERATURE**	The High Exhaust Temperature Limit Switch is closed.
25	**LOSS OF POWER**	A power loss occurred. The time and date when power was restored is displayed.
26	**LOSS OF SENSOR**	Not Currently Used
27	**LOSS OF SIGNAL**	Not Currently Used
28	**HIGH O2 LEVEL**	Not Currently Used
29	**LOW O2 LEVEL**	Not Currently Used
30	**HIGH CO LEVEL**	Not Currently Used
31	**SSOV RELAY FAILURE**	A failure has been detected in one of the relays that control the SSOV.
32	**RESIDUAL FLAME**	The Flame signal was seen for more than 60 seconds during standby.
33	**HEAT DEMAND FAILURE**	The Heat Demand Relays on the Ignition board failed to activate when commanded.
34	**IGN SWTCH CLOSED DURING PURGE**	The Ignition Position Limit switch on the Air/Fuel valve closed during purge.
35	**PRG SWTCH CLOSED DURING IGNITION**	The Purge Position Limit switch on the Air/Fuel valve closed during ignition.
36	**SSOV SWITCH OPEN**	The SSOV switch opened during standby.

Appendix F: C-More Status and Fault Messages

Display Code	Message	Description
37	IGNITION BOARD COMM FAULT	Communication fault between the Ignition board and the CPU board.
38 *	WAIT	Prompts the operator to wait.
39	DIRECT DRIVE SIGNAL FAULT	The direct drive signal is not present or is out of range.
40	REMOTE SETPT SIGNAL FAULT	The remote setpoint signal is not present or is out of range.
41	OUTDOOR TEMP SENSOR FAULT	The temperature measured by the Outdoor Air Sensor is out of range.
42	OUTLET TEMP SENSOR FAULT	The temperature measured by the Outlet Sensor is out of range.
43	FFWD TEMP SENSOR FAULT	The temperature measured by the FFWD Sensor is out of range.
44	HIGH WATER TEMPERATURE	The temperature measured by the Outlet Sensor exceeded the Temp Hi Limit setting.
45	LINE VOLTAGE OUT OF PHASE	The High AC voltage is out of phase from the low AC voltage.
46	STEPPER MOTOR FAILURE	The stepper motor failed to move the valve to the desired position.
47 *	SETPT LIMITING ACTIVE	Setpoint temperature has exceeded the maximum allowable setting.
48	MODBUS COMM FAULT	The RS485 (Modbus) network information is not present or is corrupted.
49 *	WAIT IGNITION RETRY	Retrial for ignition.
50	WAIT FAULT PURGE	Fault while purging.
51 *	WAIT RETRY PAUSE	Pause before retrial for ignition.
52	EXHAUST TEMP SENSOR SHORT	Exhaust temperature sensor is shorted.
53	EXHAUST TEMP SENSOR OPEN	Exhaust temperature sensor is open or missing.
54	WARNING EXHAUST TEMP HIGH	Exhaust temperature is getting high.
55	EXHAUST TEMP HIGH	Exhaust temperature is too high.
56	INLET WATER TEMP SENSOR SHORT	Inlet water temperature sensor is shorted.

Appendix F: C-More Status and Fault Messages

Display Code	Message	Description
57	INLET WATER TEMP SENSOR OPEN	Inlet water temperature sensor is open or missing.
58	WARNING IN WTR TEMP HIGH	Inlet water temperature is getting too high.
59	WARNING IN WTR TEMP HIGH	Inlet water temperature is getting too low.
60	INLET GAS PRESS SENSOR OPEN	Inlet gas pressure switch is open.
61	GAS PLATE DP SENSOR OPEN	Gas plate differential pressure switch is open.
62	O2 PERCENTAGE LOW	Oxygen level is too low.
63	O2 SENSOR MALFUNCTION	Oxygen sensor reading is out of range.
64	WARNING O2 LEVEL HIGH	Oxygen level is too high.
65	RECIRC PUMP FAILURE	Heater recirculation pump has malfunctioned.
66 *	IGNITION MONITOR X SEC	Waiting for proof of ignition.
67	NO FLOW SAFETY LOCKOUT	Flow input not registering when boiler is starting up.
68	IGNITION SPARK FAULT	No ignition current measured when igniter is energized.
69	PRE IGNITION X SEC	Waiting for SSOV to prove open.
70 *	CLEANING IGNITER X SEC	Ignition transformer is energized with SSOV closed.
71 *	TOO MANY CYCLES IN 24 HOURS	The number of cycles in 24 hour period has been exceeded.
72 *	TOO MANY OVRTMPS IN 24 HOURS	The number of over temperature events in 24 hour period has been exceeded.
73	AIR SENSOR FAULT	The inlet air sensor is out of range.
74 *	Auto Diagnostic Mode ACTIVE	Informational message.
75 *	Auto Diagnostic Mode COMPLETED	Informational message.
76 *	Auto Diagnostic Mode ABORTED	Informational message.
77 *	DHW HEATING ACTIVE	Domestic Hot Water is enabled. Message shows when in combo mode with a fault in the drive signal.
78 *	Cooling Heat Exchanger	Informational message during slow shutdown mode.
79	BST NETWORK TEMP SENSOR FAULT	The BST Modbus header temperature sensor is out of range.

Appendix F: C-More Status and Fault Messages

Display Code	Message	Description
80	**BST NETWORK TEMP COM FAULT**	The BST Modbus failed to read the header temperature sensor.
81	**BST LOCAL HEADER SENSOR FAULT**	The BST direct connected header temperature sensor is out of range.
82	**BST NET OUTDOOR SENSOR FAULT**	The BST Modbus connected outdoor air temperature sensor is out of range.
83	**BST NET OUTDOOR COM FAULT**	The BST Modbus device failed to read the outdoor air sensor.
84	**BST LOCAL OUTDR SENSOR FAULT**	The BST direct connected outdoor air temperature sensor is out of range.
85	**FAULT ACTIVE**	Temporary status message while the system is determining actual fault.

*** NOTE**

Status messages are indicated by a *The others are fault messages

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APPENDIX G: CONVERSION EQUATIONS FOR TEMPERATURE VARIABLES

Table G-1: Conversion Equations for Temperature Variables (Variable Counts to Temp)

Register Variable Type	Degrees Fahrenheit (°F)	Degrees Celsius (°C)
DEGREES_1	$\text{Temp(F)} = \left[\frac{(\text{RegVar}) * (230) + 500}{1000}\right] + 20$	$\text{Temp(C)} = \left[\frac{(\text{RegVar}) * (128) + 500}{1000}\right] - 7$
DEGREES_2	$\text{Temp(F)} = \left[\frac{(\text{RegVar}) * (220) + 500}{1000}\right] - 80$	$\text{Temp(C)} = \left[\frac{(\text{RegVar}) * (183) + 500}{1000}\right] - 62$
DEGREES_3	$\text{Temp(F)} = \left[\frac{(\text{RegVar}) * (520) + 500}{1000}\right] + 40$	$\text{Temp(C)} = \left[\frac{(\text{RegVar}) * (289) + 500}{1000}\right] - 4$
ABS_DEG_1	For (RegVar≥0): $\text{Temp(F)} = \left[\frac{(\text{RegVar}) * (230) + 500}{1000}\right]$ For (RegVar<0): $\text{Temp(F)} = \left[\frac{(\text{RegVar}) * (230) - 500}{1000}\right]$	For (RegVar≥ 0): $\text{Temp(C)} = \left[\frac{(\text{RegVar}) * (128) + 500}{1000}\right]$ For (RegVar< 0): $\text{Temp(C)} = \left[\frac{(\text{RegVar}) * (128) - 500}{1000}\right]$

Table G-2: Conversion Equations for Temperature Variables (Temp to Variable Counts)

Register Variable Type	Degrees Fahrenheit (°F)	Degrees Celsius (°C)
DEGREES_1	$\text{RegVar} = \left[\frac{(\text{degF} - 20) * (1000) + 115}{230}\right]$	$\text{RegVar} = \left[\frac{(\text{degC} + 7) * (1000) + 64}{128}\right]$
DEGREES_2	$\text{RegVar} = \left[\frac{(\text{degF} - 80) * (1000) + 110}{220}\right]$	$\text{RegVar} = \left[\frac{(\text{degC} + 62) * (1000) + 91.5}{183}\right]$
DEGREES_3	$\text{RegVar} = \left[\frac{(\text{degF} + 40) * (1000) + 300}{600}\right]$	$\text{RegVar} = \left[\frac{(\text{degC} - 4) * (1000) + 144.5}{289}\right]$
ABS_DEG_1	For (degF>0): $\text{RegVar} = \left[\frac{(\text{degF}) * (1000) + 115}{230}\right]$ For (degF<0): $\text{RegVar} = \left[\frac{(\text{degF}) * (1000) - 115}{230}\right]$	For (degC> 0): $\text{RegVar} = \left[\frac{(\text{degC}) * (1000) - 115}{128}\right]$ For (degC<0): $\text{RegVar} = \left[\frac{(\text{degC}) * (1000) - 64}{128}\right]$

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APPENDIX H: BCM AND BMM FAULT CODES FOR MODULEX E8 CONTROLLER

Appendix H-1: BCM and BMM Fault Code Conversion Table

Table H-1, below, shows how to interpret the displayed fault code in the E8 Controller display, while Table H-2, on the next page, shows a description of the fault and troubleshooting tips associated with the BMMs. Table H-3, following, is for BCM faults.

In order to derive the correct error code from what is shown in the E8 Controller display, use Table H-1, below, to determine the working error code. To use the table, identify the displayed number from the first column, identify the affected module from the second column, apply the formula from the third column, and identify the Error Table to reference from the fourth column.

Table H-1: BCM and BMM Fault Code Conversion Table

Observed Code	Observed Code	Code to Look Up in	Table
Code = **0**	N/A	No Fault	-
Code between **1** and **255**	BMM #0 Fault	Look up code	F-2
Code between **256** and **511**	BMM #1 Fault	Subtract **256** from reading	F-2
Code between **512** and **767**	BMM #2 Fault	Subtract **512** from reading	F-2
Code between **768** and **1023**	BMM #3 Fault	Subtract **768** from reading	F-2
Code between **1024** and **1279**	BMM #4 Fault	Subtract **1024** from reading	F-2
Code between **1280** and **1535**	BMM #5 Fault	Subtract **1280** from reading	F-2
Code between **1536** and **1791**	BMM #6 Fault	Subtract **1536** from reading	F-2
Code between **1792** and **2047**	BMM #7 Fault	Subtract **1792** from reading	F-2
Code between **2048** and **65279**	N/A	Invalid Codes	-
Code above **65280**	BCM Fault	Subtract **65280** from reading	F-2

Example:

Based on the above, a code reading of “261” means the fault occurred on BMM #1. The fault code is (261 – 256 =) 5. An Error Code of 5 from the BMM Fault Codes table means “Flame Loss During Run”.

Appendix H-2: BMM Fault Code Table

The table below lists the fault codes and troubleshooting tips associated with the BMM.

Table H-2: BMM Fault Code Table

Code	Description	Effect	Correction	Reset
1	High Limit (STB) Thermostat activated	All burners turned OFF and Pump ON at maximum speed.	Check FlowSensor thermal connection to boiler.	MANUAL - push reset switch when temperature goes below limit.
2	Low Gas Pressure	All burners turned OFF.	Check gas pressure or gas pressure switch.	AUTOMATIC - when gas pressure switch closes.
4	No flame detected at burner start	Burner control lockout.	Check flame rod or combustion.	MANUAL - push reset switch or cycle power.
5	Flame loss during run.	Ignition retry.	Check combustion and wiring.	MANUAL - push reset switch or cycle power.
6	High outlet temperature. FlowSensor temperature > 203°F.	All burners turned OFF and Pump ON at maximum speed.	Check Flow Sensor or system pump.	AUTOMATIC - when FlowSensor < 176°F.
10	Internal Failure	Ignition is inhibited.	Contact Factory for new BCM.	MANUAL - cycle the power.
11	Flame signal detected before ignition.	Ignition is inhibited.	Disconnect flame rod wire from BMM. If problem goes away change flame rod and/or wire. If problem does not go away change BMM.	MANUAL - push reset switch or cycle power.
12	FlowSensor fault.	All burners turned OFF.	Check flow sensor or wiring.	AUTOMATIC
13	Aux Sensor fault	The boiler will operate from the FlowSensor without the AuxSensor.	Check aux sensor or wiring.	AUTOMATIC
14	Return Sensor fault	All burners turned OFF.	Check return sensor or wiring.	AUTOMATIC

Table H-2: BMM Fault Code Table

Code	Description	Effect	Correction	Reset
15	Maximum Δ-temperature protection. Flow temperature - Return Temperature > Water Δ-Temp Protection + 50°F	All burners turned OFF and Pump ON at maximum speed.	Check the system installation.	AUTOMATIC - when Δ-temperature < Water Δ-Temp Protection.
16	Boiler Pipe is frozen. FlowSensor temperature is 36°F or less.	Ignition is inhibited. Pump runs for 5 min at max speed.	Carefully defrost boiler.	AUTOMATIC - when FlowSensor is greater than 41°F.
20	Flame signal detected after burner is OFF.	Ignition is inhibited.	Disconnect gas valve wire from BMM. If failure goes away, check wiring or change BMM. If failure remains check or change gas valve.	MANUAL - push reset switch or cycle power.
22	No air flow at burner after fan started for 30 seconds.	Ignition retry after 60 second delay and failure remains until we have a successful burner operation.	If fan is stopped, check supply voltage and fan wiring. If OK try another fan. If still not working change the BMM. If fan is not stopped, check the exhaust gas outlet for blockage. If OK then check the air pressure switch wiring. If still not working try another air pressure switch. If still not working, change the BMM.	AUTOMATIC/ MANUAL
23	The air pressure switch doesn't switch off.	Ignition is inhibited.	Disconnect the air proving switch. If problem goes away install a new switch. If not, check the wiring. If wiring OK then change BMM.	AUTOMATIC
24	Fan speed out of control: It doesn't reach pre-purge speed within 30 seconds.	Ignition retry after 60 second delay and failure remains until we have a successful burner operation.	Check fan wiring.	AUTOMATIC/ MANUAL

Table H-2: BMM Fault Code Table

Code	Description	Effect	Correction	Reset
26	Fan speed out of control: It doesn't stop within 30 seconds after turned OFF.	Ignition is inhibited.	Check fan wiring.	AUTOMATIC
27	Air flow failure during ignition.	Restart pre-purge timer. The failure remains until we have a successful burner operation.	Check fan and wiring. Check air proving switch and wiring.	AUTOMATIC
28	Flue/Chimney Obstruction	Ignition is inhibited.	Check flue/chimney	
29	Water inside the combustion chamber.	Ignition is inhibited.	Check for water in the exhaust manifold	
30	Settings Corrupted	Ignition is inhibited. Pump runs for 5 min at max speed.	Re-program the settings. Contact Factory	MANUAL - cycle the power or send reset message.
32	Line voltage too low. (<96 VAC)	Wait for proper line voltage. (>102 VAC)	Check input voltage else try another BMM.	AUTOMATIC
40	Low Water Flow. Low water flow switch activated.	Burners turned OFF.	Check water flow or check switch.	AUTOMATIC

Appendix H-3: BCM Fault Code Table

The table below lists the fault codes and troubleshooting tips associated with the BCM.

Table H-3: BCM Fault Code Table

Code	Description	Effect	Correction	Reset
17	Boiler Pipe is frozen. FlowSensor temp. is 36°F or less.	Ignition is inhibited. Pump runs for 5 min at max speed.	Carefully defrost boiler	AUTOMATIC - when FlowSensor is greater than 41°F.

Table H-3: BCM Fault Code Table

Code	Description	Effect	Correction	Reset
18	Maximum Δ-temperature protection. Flow temperature - Return Temperature > Water Δ-Temp Protection + 50°F	All burners turned OFF and Pump ON at maximum speed.	Check the system installation.	AUTOMATIC - when Δ-temperature < Water Δ-Temp Protection.
19	High outlet temperature. FlowSensor temperature > 203°F.	All burners turned OFF and Pump ON at maximum speed.	Check Flow Sensor or system pump	AUTOMATIC - when FlowSensor < 176°F.
37	Crash	Ignition is inhibited	Change the BCM	MANUAL – push reset switch to cycle power
38	Settings Corrupted	Ignition is inhibited. Pump runs for 5 min at max speed.	Re-program the settings. Contact Factory	MANUAL - push reset switch or cycle power.
50	Internal Failure	Ignition is inhibited.	Contact Factory for new BCM.	MANUAL - cycle the power.
56	Standby. No remote control detected and Request input is open.	Ignition is inhibited.	Close Request input for Manual operation.	MANUAL - push reset switch or cycle power.
57	No BMM detected.	Ignition is not possible.	Check the BMM eBus wiring.	MANUAL - push reset switch or cycle power.
58	FlowSensor fault.	All burners turned OFF.	Check flow sensor or wiring.	AUTOMATIC

APPENDIX I: AM ERROR, STATE AND STATUS TABLES

Appendix I-1: AM Lockout Error Codes Table

Lockout errors are indicated by an 'A' displayed before the error code number.

"A" Lockout Error Codes			
'A' CODE	ERROR NAME	INT. #	DESCRIPTION
1	IGNIT_ERROR	1	Three unsuccessful ignition attempts in a row
2	GV Relay Error	2	Failure detected in the GV Relay
3	GV Relay not open error	3	Failure detected in the GV Relay
4	GV Relay not closing error	4	Failure detected in the GV Relay
5	Safety relay error	5	Failure detected in the Safety Relay
6	Safety relay open error	6	Failure detected in the Safety Relay
7	Safety relay closed error	7	Failure detected in the Safety Relay
11	Blocking too long error	11	Control had a blocking error for more than 20 hours in a row.
12	Fan error	12	Fan MF deviation for more than 60 sec
13	Ram error	13	Internal software error
14	Wrong eeprom signature	14	Contents of e2prom is not up-to-date
15	X ram error	15	Internal software error
16	E2prom error	16	No communication with E2prom
17	E2prom error safety C	17	Wrong safety parameters in e2prom
18	E2prom error Calibration table	18	Wrong calibration table parameters
19	State error	19	Internal software error
20	Rom error	20	Internal software error
21	Rom error C	21	Internal software error
22	Air sw not open	22	Air pressure switch not working
23	15MS XRL error	23	Internal software error
24	Air sw not closed	24	Air pressure switch not working
25	Max Temp. Error	25	The external overheat protection is activated
26	Stack error	26	Internal error
27	Flame out too late	27	Flame still present 10 sec. after closing the gas valve
28	Flame error 1	28	Flame is detected before ignition
29	20MS XRL error	29	Internal software error
30	41MS XRL error	30	Internal software error
31	Too many flame failures	31	Three times flame lost during one demand
32	Flow switch not closed	32	Flow switch not working / No flow
33	Flow switch not open	33	Flow switch not working / No flow
34	Flag byte integrity	34	Internal software error
35	AD Hi cpl.	35	Internal software error
36	AD Lo cpl.	36	Internal software error
37	Register error	37	Internal software error

Appendix I-2: AM Blocking Error Codes Table

The following errors are related to the general control functions. Blocking errors are indicated by an 'E' before the error code number.

"E" Blocking Error Codes			
'E' CODE	ERROR NAME	INT. #	DESCRIPTION
45	WD INTERNAL ERROR	45	Internal software error
46	WD INTERNAL ERROR	46	Internal software error
47	WD INTERNAL ERROR	47	Internal software error
48	WD INTERNAL ERROR	48	Internal software error
49	WD INTERNAL ERROR	49	Internal software error
50	REFHI TOO LO	50	Internal hardware error
51	REFHI TOO HI	51	Internal hardware error
52	REFLO TOO LO	52	Internal hardware error
53	REFLO TOO HI	53	Internal hardware error
54	FALSE FLAME	54	Flame is detected, but no flame is observed.
55	WATER LEVEL DETECT	55	Low water level detected
56	WATER LEVEL MEAS	56	Low water level measurement error
57	LOW WATER CUTOFF	57	Low water sensor error
58	LOW WATER PRESSURE	58	Low water pressure error
59	WATER PRESSURE SENSOR	59	Low water pressure
60	FLUE GAS PRESSURE	60	Flue gas pressure error
61	RETURN TEMP	61	Return temperature is higher than stay burning temperature
62	BLOCKED DRAIN	62	Block drain switch is active
64	WD FREQ ERROR	64	No Frequency signal or no communication with the WD
65	PHASE ERROR	65	Hot neutral reversed
66	NET FREQ ERROR	66	Net freq. error detected in the main
67	FAULTY EARTH ERROR	67	Faulty earth connection
68	WD COMM ERROR	68	Watchdog communication error
72	SUPPLY OPEN	72	Supply sensor open
73	RETURN OPEN	73	Return sensor open
76	DHW OPEN	76	DHW sensor open
80	SUPPLY SHORTED	80	Supply sensor shorted
81	RETURN SHORTED	81	Return sensor shorted
84	DHW SHORTED	84	DHW sensor shorted
86	FLUE SHORTED	86	Flue sensor shorted
87	RESET BUTTON	87	Reset button error
93	APPLIANCE SELECTION	93	Appliance selection error
107	GAS PRESSURE ERROR	107	Gas too low
108	FLUW PRESSURE ERROR	108	Flue gas pressure error
109	TRIO_MASTER_ERROR	109	Trio master error
110	FLAP_NOT_OPEN	110	Flap not open
111	FLAP_NOT_CLSD	111	Flap not closed
112	FLOW_SWT_NOT_CLSD_BL	112	Flow switch not closed
113	PASSWORD_INCORRECT	113	Password incorrect
114	TOO_LOW_WATER_FLOW	114	Water flow for CH is too low.
115	MULTI_BRN_PARAM_ERROR	115	Multiple burner settings are incorrect.

Appendix I-3: AM State Parameters Table

The table below lists a detailed description of the possible values of the *STATE* parameter.

MN States			
STATE		STATE NAME	DESCRIPTION
Dec.	Hex		
0	0x00	RESET_0	initialising
1	0x01	RESET_1	initialising
2	0x02	STANDBY_0	standing by (waiting for demand)
3	0x03	PRE_PURGE	initiating boiler demand handling
4	0x04	PRE_PURGE_1	initiating boiler demand handling
5	0x05	SAFETY_ON	initiating boiler demand handling
6	0x06	SAFETY_OFF	initiating boiler demand handling
7	0x07	IGNIT_0	initiating boiler demand handling
8	0x08	IGNIT_1	initiating boiler demand handling
9	0x09	BURN_0	handle boiler demand
10	0x0A	RELAY_TEST_0	
11	0x0B	RELAY_TEST_1	
12	0x0C	POST_PURGE_0	ending boiler demand handling
13	0x0D	POST_PURGE_1	ending boiler demand handling
14	0x0E	PUMP_CH_0	handling ch demand without boiler demand
15	0x0F	PUMP_CH_1	Post pumping after ch demand end
16	0x10	PUMP_HW_0	handling hw demand without boiler demand
17	0x11	PUMP_HW_1	Post pumping after dhw demand end
18	0x12	ALARM_1	Error handling
19	0x13	ERROR_CHECK	error handling
20	0x14	BURNER_BOOT	controller (re)start
21	0x15	CLEAR_E2PROM_ERROR	error handling
22	0x16	STORE_BLOCK_ERROR	error handling
23	0x17	WAIT_A_SECOND	error handling

Appendix I-4: AM Status Parameters Table

1. The *STATUS* parameter values are described below

MN Status			
STATUS		STATUS NAME	DESCRIPTION
Dec.	Hex		
0	0x00	STANDBY	standing by (waiting for demand)
14	0x0E	BLOCK	error handling
10	0x0A	ALARM	error handling
15	0x0F	FROST_PROTECT	demand for frost protection
16	0x10	CH	demand for central heating
17	0x11	RESET_STATE	initializing
18	0x12	STORAGE	demand for store
19	0x13	TAP	demand for tap (hw)
20	0x14	PRE_HEAT	demand for pre heat (of hw heat exchanger)
21	0x15	STORE_WARM_HOLD	demand for pre heat (of hw store)
22	0x16	GENERAL_PUMPING	

Appendix I-5: Cascade Connection of AM Boiler with ProtoNode

The diagram below shows MODBUS connection for AM Series boilers with serial number *up to* 14999999.

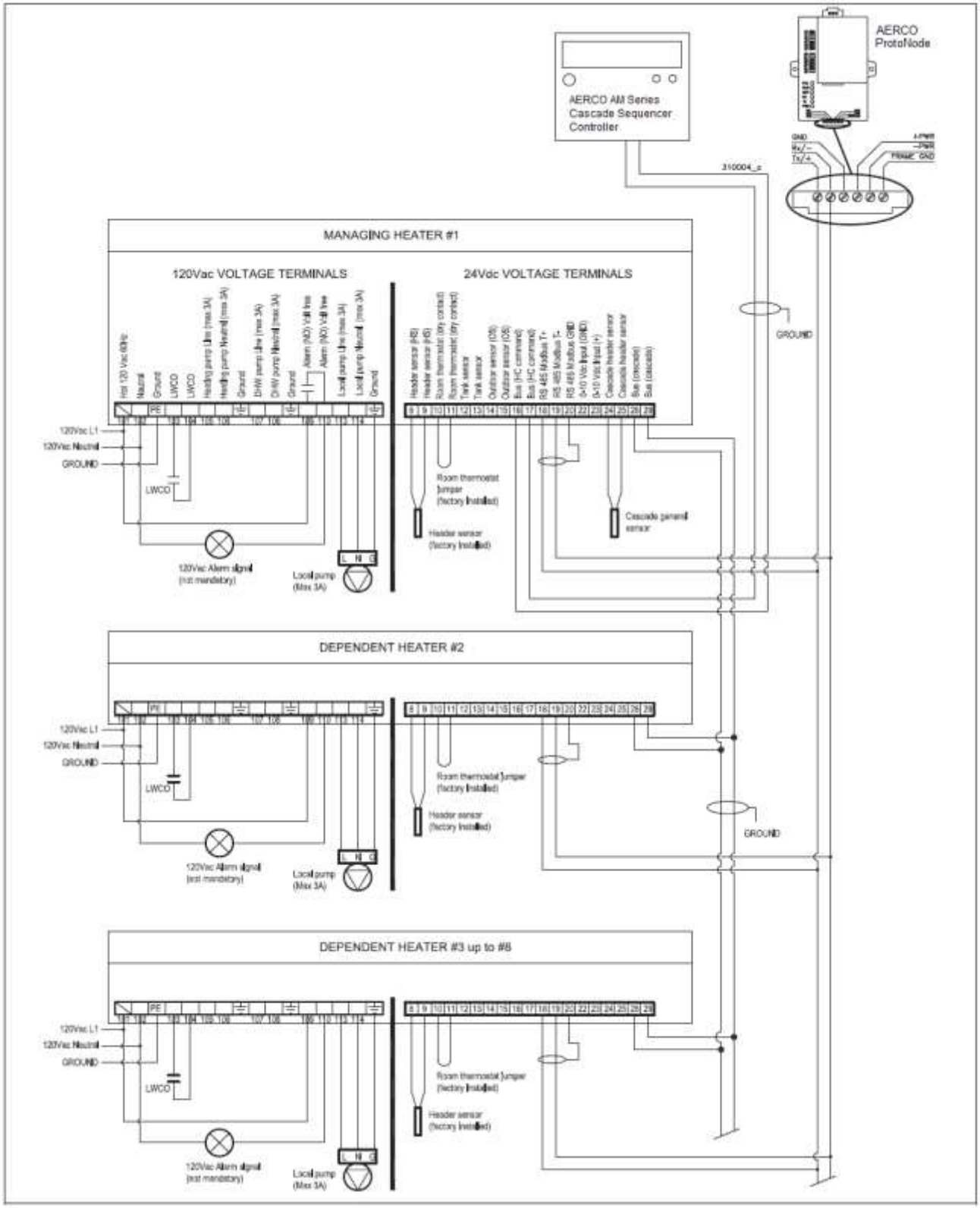

Figure I-1: MODBUS connection to AM Series boilers with serial number < 14999999

The diagram below shows MODBUS connection for AM Series boilers with serial number *above* 15000000.

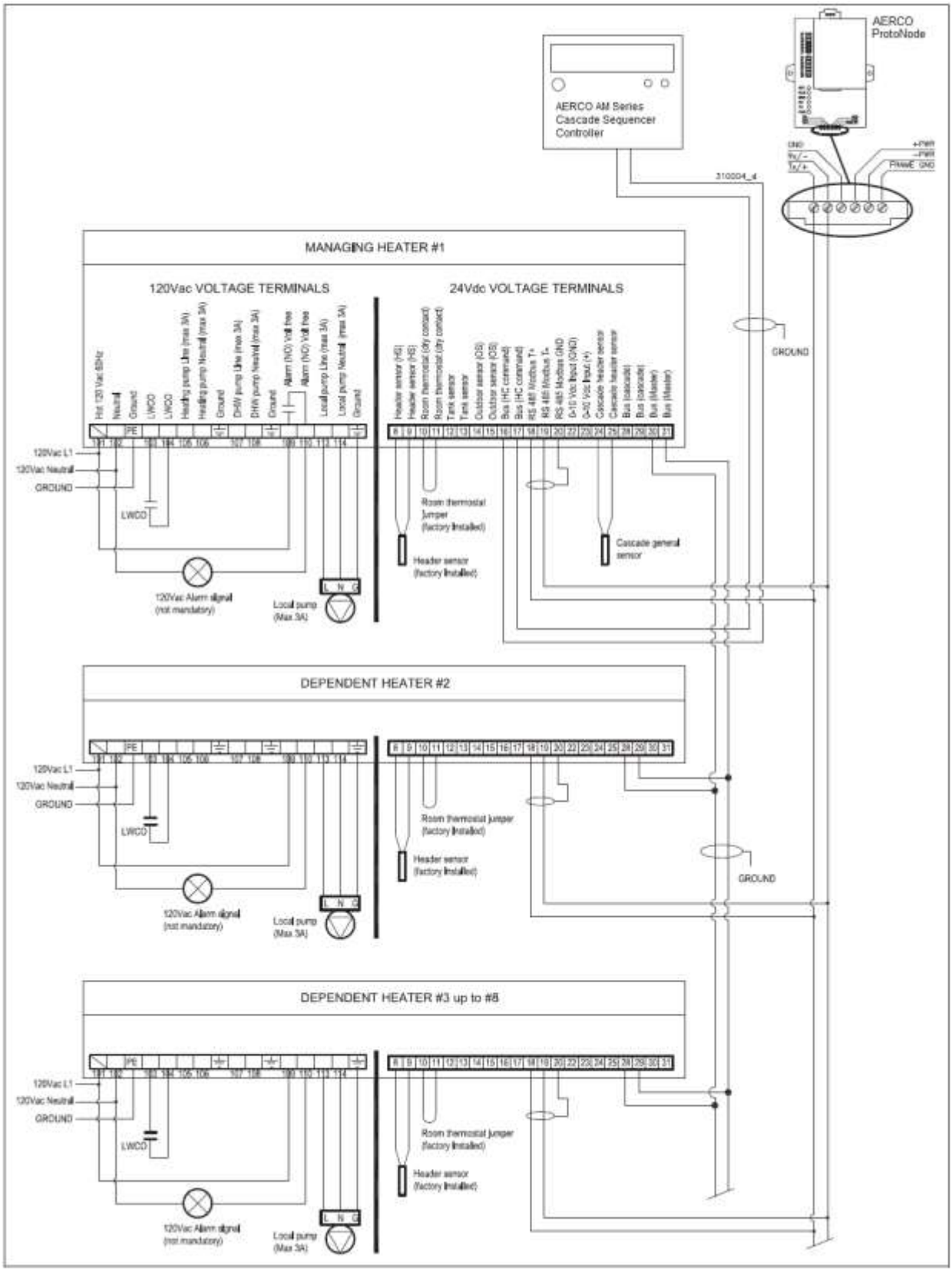

Figure I-2: MODBUS connection to AM Series boilers with serial number > 15000000

To connect each AM Series boiler of a cascade to a ProtoNode:

1. A daisy chain between terminals 28 and 29 of each heater should be already in place. Follow instruction in the *AM Series Cascade Sequencer Controller*, OMM-0101, GF-146-CS and Figure I-1, above. For heaters with serial number higher than 15000000, the Manager Heater needs to have the wiring connected to terminals 30 and 31, labeled **Bus (Master)**. See the *AM Series Cascade Sequencer Controller*, OMM-0101, GF-146-CS and Figure I-2, above.
2. Connect a daisy chain between terminals 18, 19 and 20 of all units (see Figure I-1 or I-2).
3. Connect the daisy chain to the Rx Tx terminals of the ProtoNode (see Figures I-1 or I-2).
4. Using the display of the heater, set parameter 3085 on each heater as shown below (for instruction on how to change parameter 3085, see the *AM Series User Manual*, OMM-0100, GF-146):
    - "1" for the manager unit
    - "2" for the first dependent
    - "3" for the second dependent, etc…
5. Using the AM Series Cascade Sequencer Controller, set the "**Boiler address**" parameter on each unit as directed in the *AM Series Cascade Sequencer Controller*, OMM-0101, GF-146-CS.

CAUTION!

Perform the steps in the order given to avoid malfunctions to the communication systems.

APPENDIX J: REFERENCE

Appendix J-1: Specifications

	ProtoNode FPC-N34	ProtoNode FPC-N35
Electrical Connections:	One 6-pin Phoenix connector with: RS-485 port (+ / - / gnd) Power port (+ / - / Frame-gnd) One 3-pin Phoenix connector with: RS-485 port (+ / - / gnd) One Ethernet 10/100 BaseT port	One 6-pin Phoenix connector with: RS-485 port (+ / - / gnd) Power port (+ / - / Frame-gnd) One Ethernet 10/100 BaseT port One FTT-10 LonWorks port
Approvals:	CE Certified; TUV approved to UL 916, EN 60950-1, EN 50491-3 and CSA C22-2 standards; FCC Class A Part 15; DNP3 Conformance Tested; RoHS Compliant; CSA 205 Approved	
	BTL Marked	LonMark Certified
Power Requirements:	Multi-mode power adapter: 9-30VDC or 12 - 24VAC	
Physical Dimensions:	11.5 cm L x 8.3 cm W x 4.1 cm H (4.5 x 3.2 x 1.6 in.)	
Weight:	0.2 kg (0.4 lbs)	
Operating Temperature:	-40°C to 75°C (-40°F to167°F)	
Surge Suppression:	EN61000-4-2 ESD EN61000-4-3 EMC EN61000-4-4 EFT	
Humidity:	5 - 90% RH (non-condensing)	

(Specifications subject to change without notice)

Figure J-1: Specifications

Appendix J-2: Compliance with UL Regulations

For UL compliance, the following instructions must be met when operating ProtoNode.

- The units shall be powered by listed LPS or Class 2 power supply suited to the expected operating temperature range.
- The interconnecting power connector and power cable shall:
  - Comply with local electrical code.
  - Be suited to the expected operating temperature range.
  - Meet the current and voltage rating for ProtoNode/Net
- Furthermore, the interconnecting power cable shall:
  - Be of length not exceeding 3.05m (118.3”)

- Be constructed of materials rated VW-1 or FT-1 or better

- If the unit is to be installed in an operating environment with a temperature above 65 °C, it should be installed in a Restricted Access Area requiring a key or a special tool to gain access
- This device must not be connected to a LAN segment with outdoor wiring.

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APPENDIX K: LIMITED 2 YEAR WARRANTY

Sierra Monitor Corporation warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. Sierra Monitor Corporation will repair or replace any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by Sierra Monitor Corporation personnel.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without Sierra Monitor Corporation's approval or which have been subjected to accident, improper maintenance, installation or application, or on which original identification marks have been removed or altered. This Limited Warranty also will not apply to interconnecting cables or wires, consumables or to any damage resulting from battery leakage.

In all cases Sierra Monitor Corporation's responsibility and liability under this warranty shall be limited to the cost of the equipment. The purchaser must obtain shipping instructions for the prepaid return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

Except for the express warranty stated above, Sierra Monitor Corporation disclaims all warranties with regard to the products sold hereunder including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of Sierra Monitor Corporation for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.

Change Log:

Date	Description	Changed By
03/29/2016	Rev A: Initial Release (reference PIR 1255)	
03/07/2017	Rev B: Added Control Register point which allows one to write to the AM unit and to reset the controller, new Appendix I-5	Chris Blair