FieldServer Technologies

PROTOCESSOR

Instruction N°62403594 R08 Jun. 06, 2017

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BTL BACnet Testing Laboratories

LONMARK 3.4

ProtoNode RER and ProtoNode LER
Startup Guide
For Interfacing Cosmogas Products:
Argus Managing/Standalone Boiler and Dependent Boiler
To Building Automation Systems:
BACnet MS/TP, BACnet/IP, Modbus/TCP, Metasys N2 and LonWorks

APPLICABILITY & EFFECTIVITY

Explains ProtoNode RER and LER hardware and how to install it.

The instructions are effective for the above as of March 2014

A Quick Start guide

1. Record the information about the unit. (See Section 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. (Section 2.2)
3. Set the ProtoNode Field Protocol on S Bank DIP Switches for BACnet MS/TP, BACnet/IP, Modbus RTU or Metasys N2. (See section 2.3.11)
4. Enable the ProtoNode "Auto Discovery" mode on Dip Switch Bank S. (See section 2.3.1)
5. Set the BACnet MS/TP MAC Address on DIP Switch Bank A. (See section 2.4)
6. Set BACnet device addresses for ProtoNode FPC-N34: BACnet MS/TP has both a MAC Address and a Device Instance. BACnet/IP only has a Device Instance. (Section 2.4)
7. Set the BACnet MS/TP BAUD rate of the Field Protocol on DIP Switch Bank B. (See section 2.5.15)
8. Connect FPC-N34 ProtoNode's 3 pin RS-485 port to the Field Protocol cabling, or connect FPC-N35 ProtoNode's 2 pin LonWorks port to the Field Protocol cabling.
9. Connect ProtoNode's 6 pin RS-485 connector to the Modbus RS-485 network that is connected to each of the devices. (Section 3)
10. Connect Power to ProtoNode RER or LER. It will take about 3 minutes for all the OEM devices to be discovered, and the configuration file to be built. (See Section 3.5)
11. Once the ProtoNode has finished creating the configuration file, set the "Auto Discovery" Dip Switch to "Off" to save the configuration settings. (See Section 3.5)
12. Where the Field protocol is BACnet/IP or Modbus/TCP, run ProtoNode Web GUI utility program to change the IP address. No changes to the configuration are necessary. (Section 4)
13. ProtoNode FPC-N35 units must be commissioned on the LonWorks Network. This needs to be done by the LonWorks administrator using a LonWorks Commissioning tool. (See Section 5)

Certifications

BTL MARK – BACNET TESTING LABORATORY

The BTL Mark on ProtoNode RER 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.

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. FieldServer Technologies 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.

TABLE OF CONTENTS

INTRODUCTION

1.1 ProtoNode Gateway

ProtoNode is an external, high performance **Building Automation multi-protocol gateway** that is preconfigured to Auto-Discover any of the Cosmogas' products (hereafter called "device") connected to the ProtoNode and automatically configures them for BACnet®[1] MS/TP, BACnet/IP, Metasys®[2] N2 by JCI, Modbus TCP or LonWorks®[3]. It is not necessary to download any configuration files to support the required applications.

1.2 Cosmogas Devices and Point Count Available

- **The total number of devices attached to ProtoNode RER (FPC-N34) cannot exceed 1500 Modbus registers for BACnet MS/TP, BACnet/IP, Modbus/TCP or Metasys N2.**
  - "RER" 485 is a description of the available ports: RS-485 + Ethernet + RS-485
- **The total number of devices attached to ProtoNode LER (FPC-N35) cannot exceed 1000 Modbus registers for LonWorks.**
  - "LER" is a description of the available ports: LonWorks + Ethernet + RS-485

Devices	Point Count
Argus Managing/Standalone Boiler	94
Dependent Boiler	48

Figure 1: Modbus Registers

[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

2 BACNET/LONWORKS SETUP FOR PROTOCESSOR PROTONODE RER/LER

2.1 Record Identification Data

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

Model	Part Number
ProtoNode RER (Bacnet)	FPC-N34-1626
ProtoNode LER (Lonworks)	FPC-N35-1625

Figure 2: ProtoCessor Part Numbers

2.2 Configure Modbus RTU COM Settings on the Devices Connected to ProtoNode RER (FPC-N34) and ProtoNode LER (FPC-N35)

- All devices connected to ProtoNode MUST ALL have the same Baud Rate, Data Bits, Stop Bits, and Parity. (Figure 3)
- The figure below defines the installed default serial port settings necessary to communicate with the device.

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

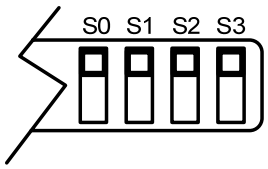
Figure 3: Modbus RTU COM Settings

- 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 (See section 2.4.2)
  - The Metasys N2 and Modbus/TCP Node-ID will be set to same value as the Node-ID of the Modbus RTU device

2.3 Select the Desired Field Protocol – BACnet MS/TP, BACnet/IP, Modbus/TCP or Metasys N2 via S Bank DIP Switches for ProtoNode RER (FPC-N34 BACnet)

2.3.1 Using S0 – S3 bank of DIP Switches

- The S bank of DIP switches, S0 – S2 is used to select BACnet MS/TP, BACnet/IP, Modbus/TCP, or Metasys N2 on ProtoNode RER.
- The S3 DIP switch is used to enable Auto-Discovery of known devices attached to the ProtoNode RER and LER (LonWorks), as well as save the recently discovered configuration. When the S3 DIP is Off, the ProtoNode will load the current save configuration. **Turn S3 to On, if the ProtoNode is being installed for the first time.**
- The S bank of DIP switches on ProtoNode LER is disabled.
- The following chart describes S0 – S2 DIP switch configuration settings for the devices to support **BACnet MS/TP or BACnet/IP** on a ProtoNode RER.
- When the S bank of switches are all off (default setting) BACnet/IP is enabled.
- 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 RER	S Bank DIP Switches			
Profile	**S0**	**S1**	**S2**	**S3**
BACnet IP	Off	Off	Off	Off
BACnet MSTP	On	Off	Off	Off
Metasys N2	Off	On	Off	Off
Modbus TCP	On	On	Off	Off

BACnet MS/TP, BACnet/IP, Modbus/TCP, and Metasys N2 Settings for ProtoNode RER (FPC-N34 BACnet)

Figure 4: S Bank DIP Switches

2.4 Set MAC Address for BACnet MS/TP; Set Device Instance for BACnet MS/TP and BACnet/IP; Set Node-ID for Metasys N2 and Modbus/TCP on ProtoNode RER (FPC-N34)

2.4.1 Setting the MAC Address for BACnet MS/TP for ProtoNode RER (FPC-N34 BACnet)

- Only 1 MAC address is set for ProtoNode regardless of how many devices are connected to ProtoNode.
- Set the BACnet MS/TP MAC address of the ProtoNode to a value between 1 to 127 (Master MAC address); this is so that the BMS Front End can find ProtoNode via BACnet auto discovery.
- **Note: Never set a BACnet MS/TP MAC Address of the ProtoNode to a value from 128 to 255.** Addresses from 128 to 255 are Slave Addresses and can not be discovered by BMS Front Ends that support Auto Discovery of BACnet MS/TP devices.
- Set DIP switches A0 – A7 to assign MAC Address for BACnet MS/TP for the ProtoNode RER (FPC-N34).
- Please refer to Appendix C.1 for the complete range of MAC Addresses and DIP switch settings.
- **When using Metasys N2 and Modbus/TCP, the A Bank of DIP switches are disabled and not used. They should be set to OFF**.

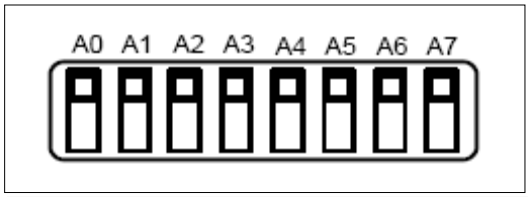


Figure 5: MAC Address DIP Switches

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

2.4.2 Setting the Device Instance (Node-ID) for BACnet MS/TP and BACnet/IP on ProtoNode RER (FPC-N34 BACnet)

- The A Bank of DIP switches are also used to set the BACnet Device Instances.
- The BACnet device instances will be calculated by taking the Node_Offset found in Web Configurator and adding it to the Modbus Node-ID that was assigned to the device (Section 2.2). The BACnet Device Instance can range from 1 to 4,194,303.

For example:

- **Node_Offset 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
- Device 1 - Device Instance = 50,001
- Device 2 - Device Instance = 50,002
- Device 3 - Device Instance = 50,003
- To change the node_offset see Section 2.4.2.1. The node offset can be changed from 50,000 to 1 to 4,194,302 via the Web Configurator.

2.4.2.1 Set Node_Off to Assign Specific Device instances for BACnet MS/TP and BACnet/IP

- If the Device Instances need to be set for addresses other than 50,000 to 50,127, change the Node+-Offset (50,000 is the default for Node+Offset). See Section 4.1 to set the PC's IP address to the same Subnet as the ProtoNode and Section 4.2 to connect to the ProtoNode's Web Configurator which is shown in Figure 6.
- The BACnet Device Instance can range from 1 to 4,194,303.
- BACnet/IP/BACnet MS/TP Addressing: The BACnet device instances will be set by taking the Node_Offset found in Web Configurator (see Figure 6) and adding it to the Modbus Node- ID that was assigned to the device (Section 2.2).
- Set the PC's IP- address to be on the same subnet as the ProtoNode. See section 4.1 on how to change the IP address.
- Open the PC browser; enter the default IP address of ProtoNode 192.168.1.24, which will bring you to the FST Web Configurator landing page for the ProtoNode. (See Figure 6)
- Change the Node+Offset to meet the required device instance.

For example: Required Device Instance = 20,001

- Node_Offset changed to = 20,000.
- 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
- Device 1 - Device Instance = 20,001
- Device 2 - Device Instance = 20,002
- Device 3 - Device Instance = 20,003

NOTE: The Modbus Node address + Node_Offset = Device Instance setting

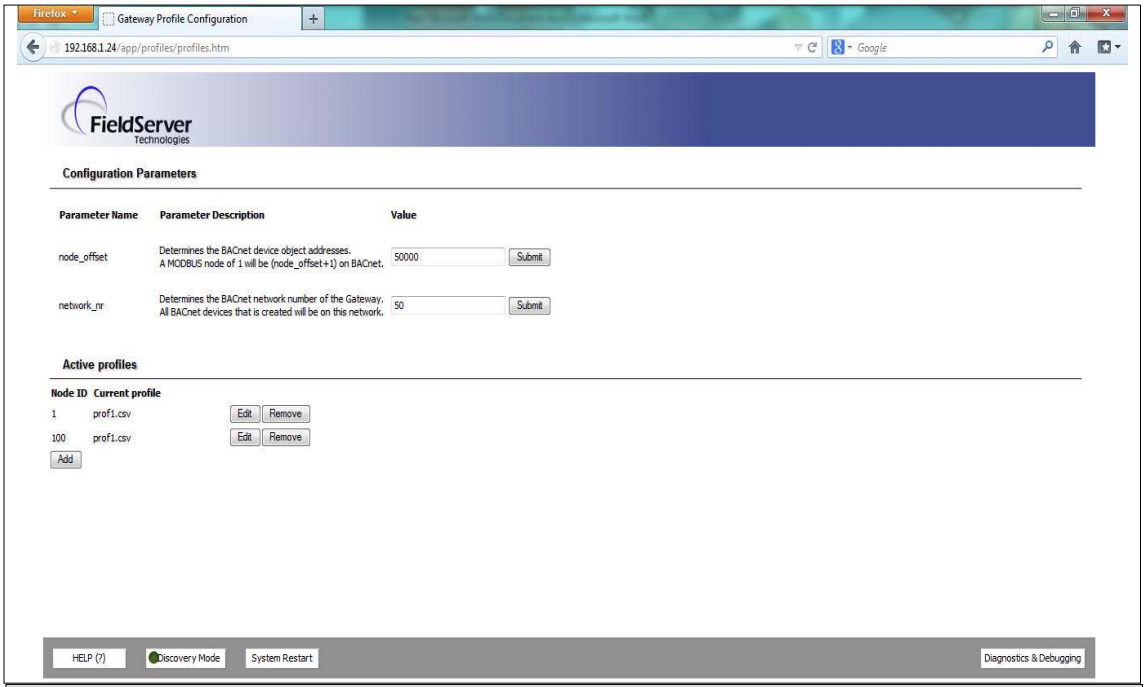


Figure 6: FST Web GUI screen

2.4.3 Setting the Device Node-ID for Metasys N2 and Modbus/TCP on ProtoNode RER (FPC-N34 Metasys N2)

- The Modbus RTU Node-ID's assigned to the devices attached to the ProtoNode in Section 2.2 will be the Metasy N2 and Modbus TCP Node_ID's for the field protocols.
- Metasys N2 and Modbus/TCP Node-ID Addressing: Metasys N2 and Modbus/TCP Node-ID's range from 1-255.

2.5 Set Baud Rate for BACnet MS/TP on ProtoNode RER (FPC-N34 BACnet)

2.5.1 Setting the Serial Baud Rate (DIP Switch B0 – B3) for BACnet MS/TP

- DIP Switches B0 – B3 can be used to set the serial baud rate to match the baud rate provided by the Building Management System for BACnet MS/TP.
- DIP Switches B0 – B3 are disabled on ProtoNode LER (FPC-N35 LonWorks).
- The baud rate on ProtoNode for Metasys N2 is set for 9600. DIP Switches B0 – B3 are disabled for Metasys N2 on ProtoNode RER (FPC-N34).

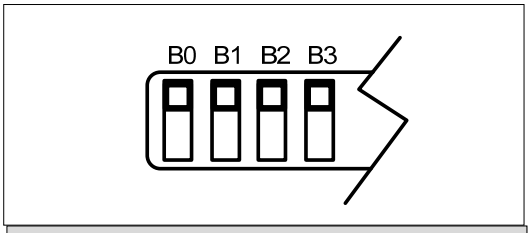


Figure 7: Baud Rate DIP Switches

2.5.1.1 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

Figure 8: Baud Rate

3 INTERFACING PROTONODE TO DEVICES

3.1 ProtoNode RER (FPC-N34) and LER (FPC-N35) Showing Connection Ports

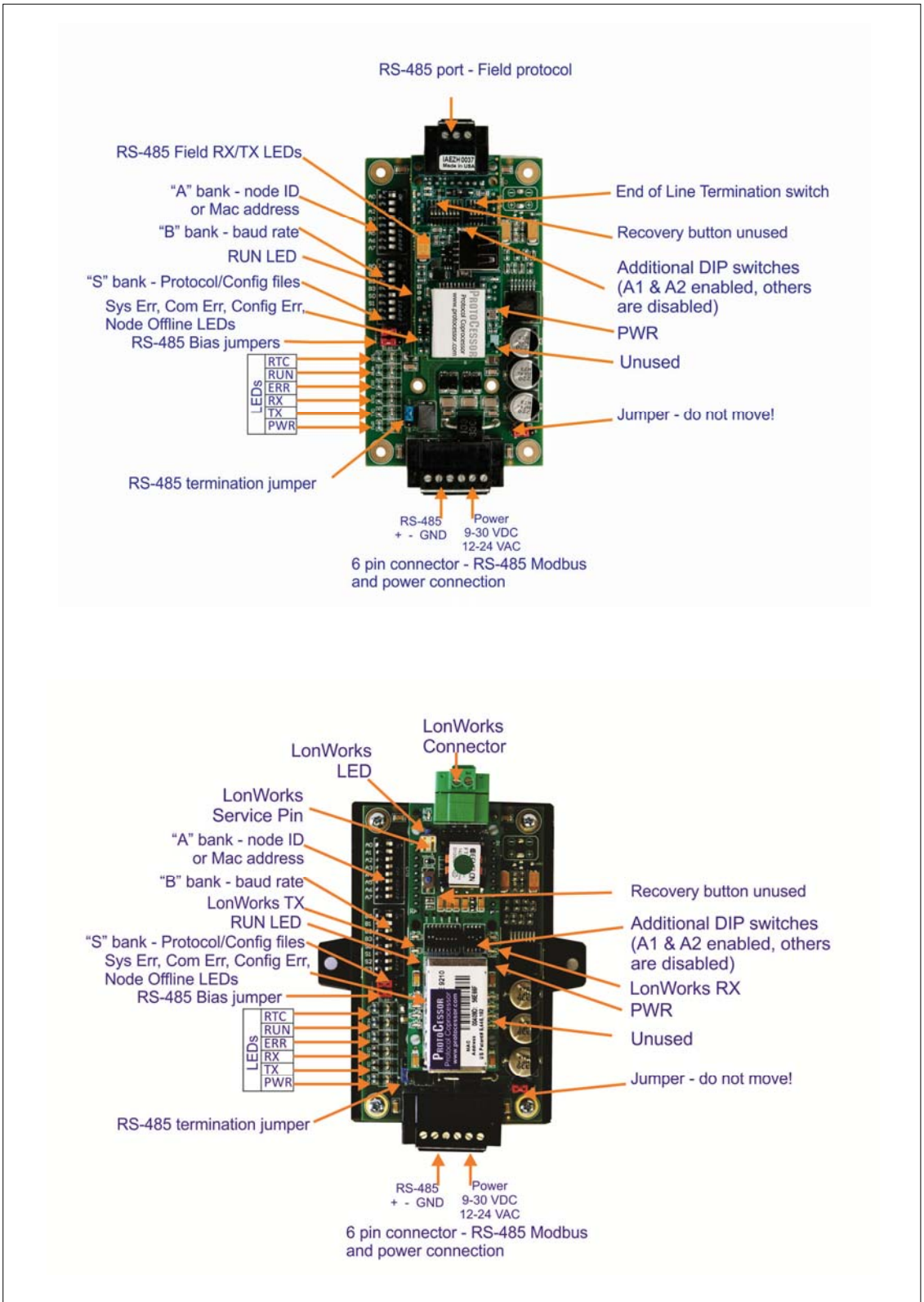


Figure 9: ProtoNode BACnet RER (upper) and ProtoNode LER (lower)

3.2 Wiring Connections to ProtoNode RER (FPC-N34 BACnet) and ProtoNode LER (FPC-N35 LonWorks)

ProtoNode 6 Pin Phoenix connector – Pin outs to Modbus RTU Products

- The 6 pin Phoenix connector is the same for ProtoNode RER (FPC-N34 BACnet) and ProtoNode (FPC-N35 LonWorks). Pins 1 through 3 are for Modbus RS-485 to the devices and pins 4 through 6 are for power.

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

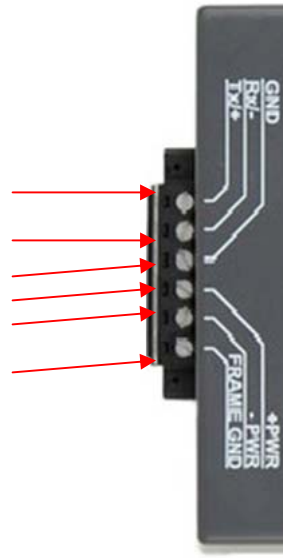


Figure 10: Power and RS-485 Connections

3.2.1 Biasing the Modbus RS-485 Network

- An RS-485 network with more than one device needs to have biasing to ensure proper communication. The biasing needs to be done on one device.
- The ProtoNode has a 510 Ohm resistor switch that is used to set the biasing. The ProtoNode's default position for the Biasing switch is OFF from the factory.
- The biasing MUST always be left in the OFF position. 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 11.
- **It is recommended that the biasing be left in the OFF position, unless there is a problem with communicating with more than one device, then try setting the biasing to ON.**

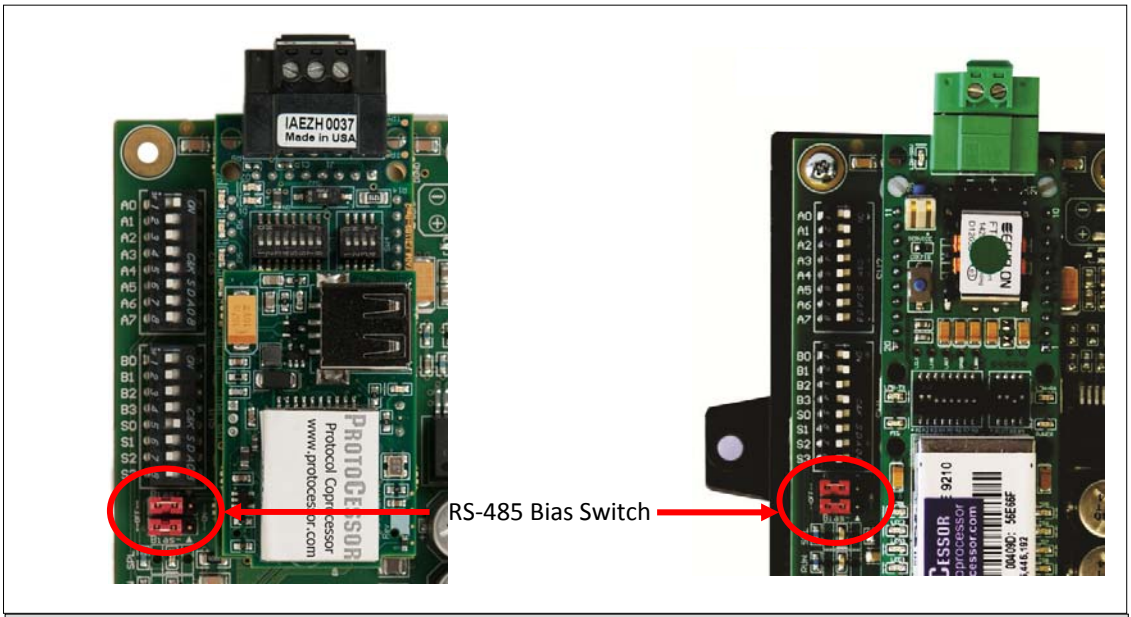


Figure 11: Modbus RS-485 Biasing Switch on the ProtoNode N34 (left) and ProtoNode N35 (right)

3.2.2 End of Line Termination Switch for the Modbus RS-485 port on the ProtoNode

- On long RS-485 cabling runs, the RS-485 trunk must be properly terminated at each end.
- If the ProtoNode is placed at one of the ends of the trunk, you turn the Blue RS-485 End-of- Line Terminating switch to ON position.
- On short cabling runs the EOL switch does not to need to be turned ON. The default setting for this Blue EOL switch is OFF.
- **Always leave the single Red Jumper in the A position.**

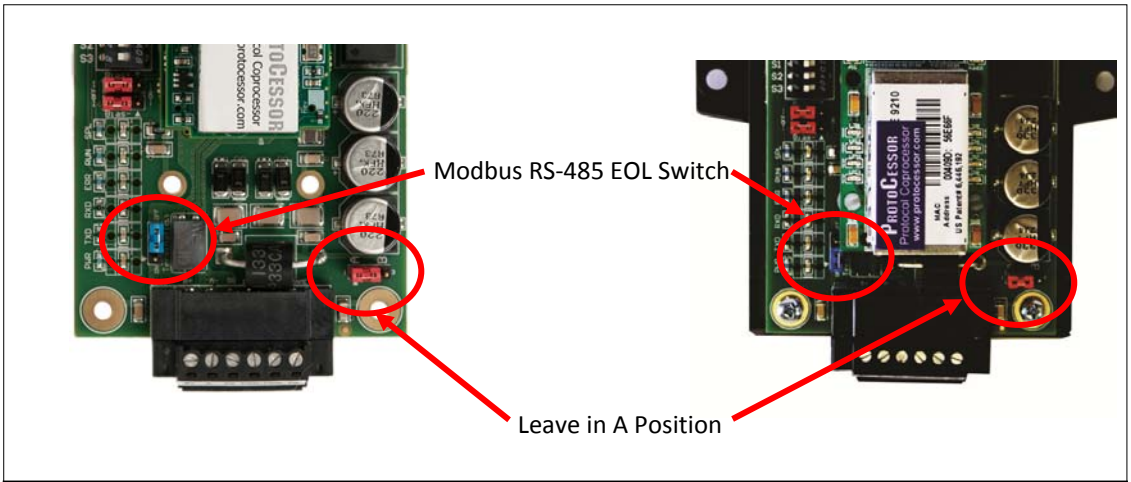
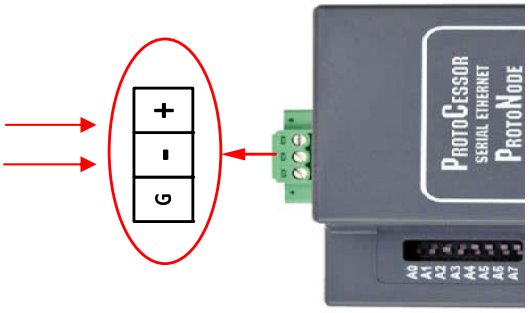


Figure 12: Modbus RS-485 End-Of-Line Termination Switch on the ProtoNode N34 (left) and ProtoNode N35 (right)

3.3 Wiring ProtoNode RER to RS-485 Field Protocol (BACnet MS/TP or Metasys N2)

- Connect BMS BACnet MS/TP or Metasys N2 RS-485 port to the 3-pin RS-485 connector on ProtoNode RER as shown below.

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



- See Section 4.1 for information on connecting ProtoNode RER 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 Terminator needs to be enabled (See Figure 14). It is disabled by default.

Figure 13: Connection from ProtoNode to RS-485 Field Protocol – BACnet MS/TP

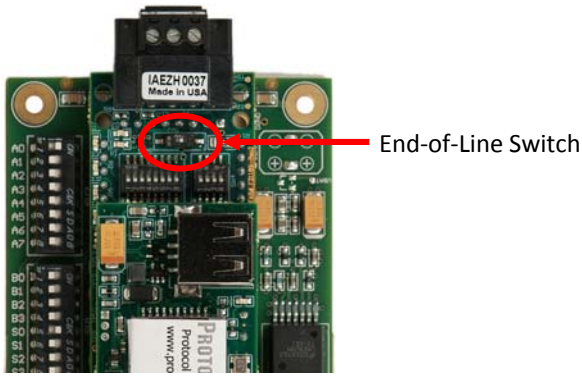


Figure 14: RS-485 EOL Switch

3.4 Wiring ProtoNode LER (FPC-N35) Field Port to a LonWorks Network

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

Figure 15: LonWorks Terminal

3.5 Power-Up ProtoNode RER (FPC-N34 BACnet) or ProtoNode LER (FPC-N35 LonWorks) and Auto-Discover Modbus RTU Devices connected to the ProtoNode.

Apply power to ProtoNode. Ensure that the power supply used complies with the specifications provided in Appendix D.1. Ensure that the cable is grounded using the "Frame-GND" terminal. ProtoNode accepts either 9-30VDC or 12-24 VAC.

Power Requirement for ProtoNode at 9V through 30 VDC or 12-24 VAC			
	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	100mA	90mA
FPC – N35 (Maximum)	250mA	130mA	100mA
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 16: 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

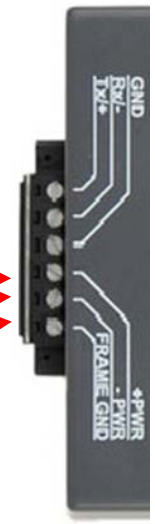


Figure 17: Power Connections

3.5.1 Auto-Discover All Devices, Build and Automatically Loads Configuration File

The following chart describes S3 DIP Switch setting for the Enabling Auto-Discovering of known devices attached to the ProtoNode RER or LER.

- Set S3 DIP switch to turn On position to Auto-Discover any of the products attached to the ProtoNode (make sure power is off when setting the switch)
- When the ProtoNode is wired to the Modbus devices, turn on the power. It will take 3 minutes to discover all Modbus RTU devices attached to the ProtoNode.
- **Once the ProtoNode has discovered all of the Modbus RTU devices, set the S3 DIP switch to the OFF position to save the recently built configuration.**

ProtoNode RER and LER	
S3 DIP Switch Auto-Discovery Mode	**S3**
Auto-Discovery ON – Build New Configuration	On
Auto-Discover OFF – Load Current Configuration	Off

Figure 18: S3 DIP Switch setting for Auto Discovering Devices

Typical installation for ProtoNode RER (BACnet IP and MS/TP) and ProtoNode LER for Lonworks are showed in the figures below:

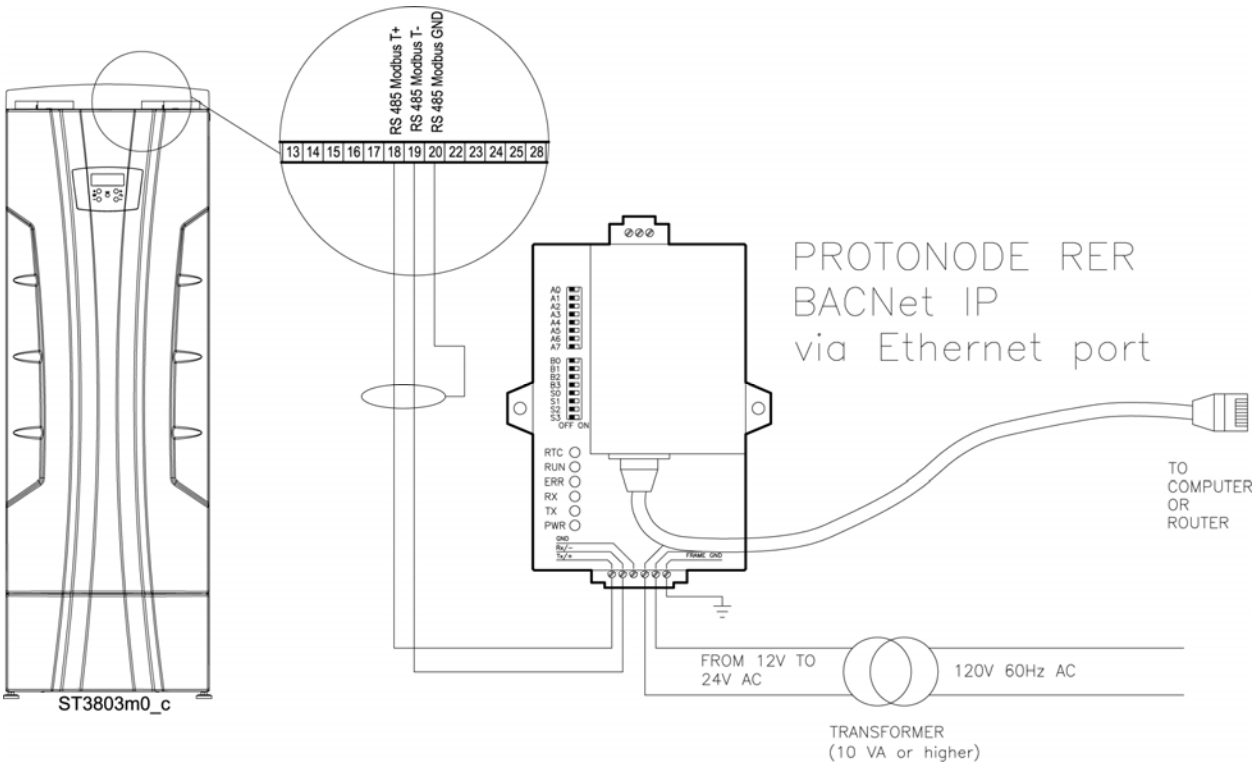


Figure 19: Connection wiring ProtoNode RER for BACnet IP

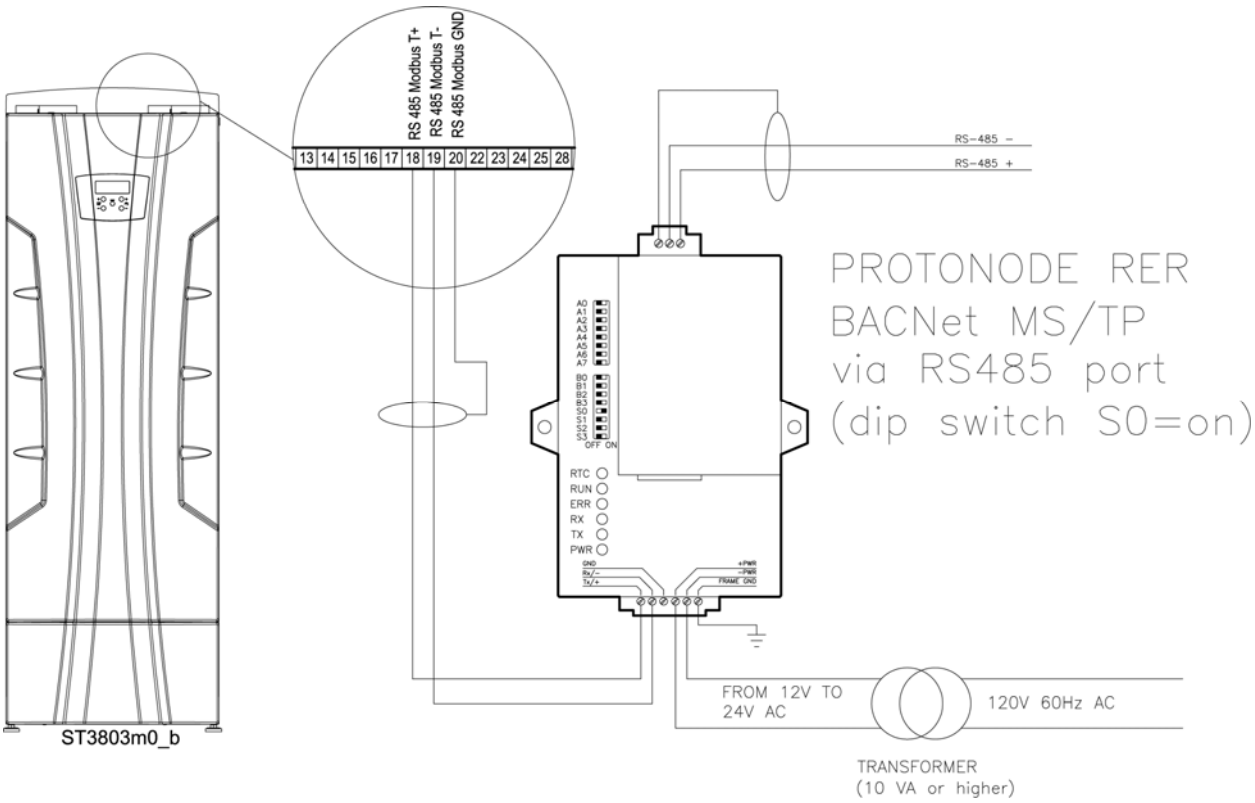


Figure 20: Connection wiring ProtoNode RER for BACnet MS/TP

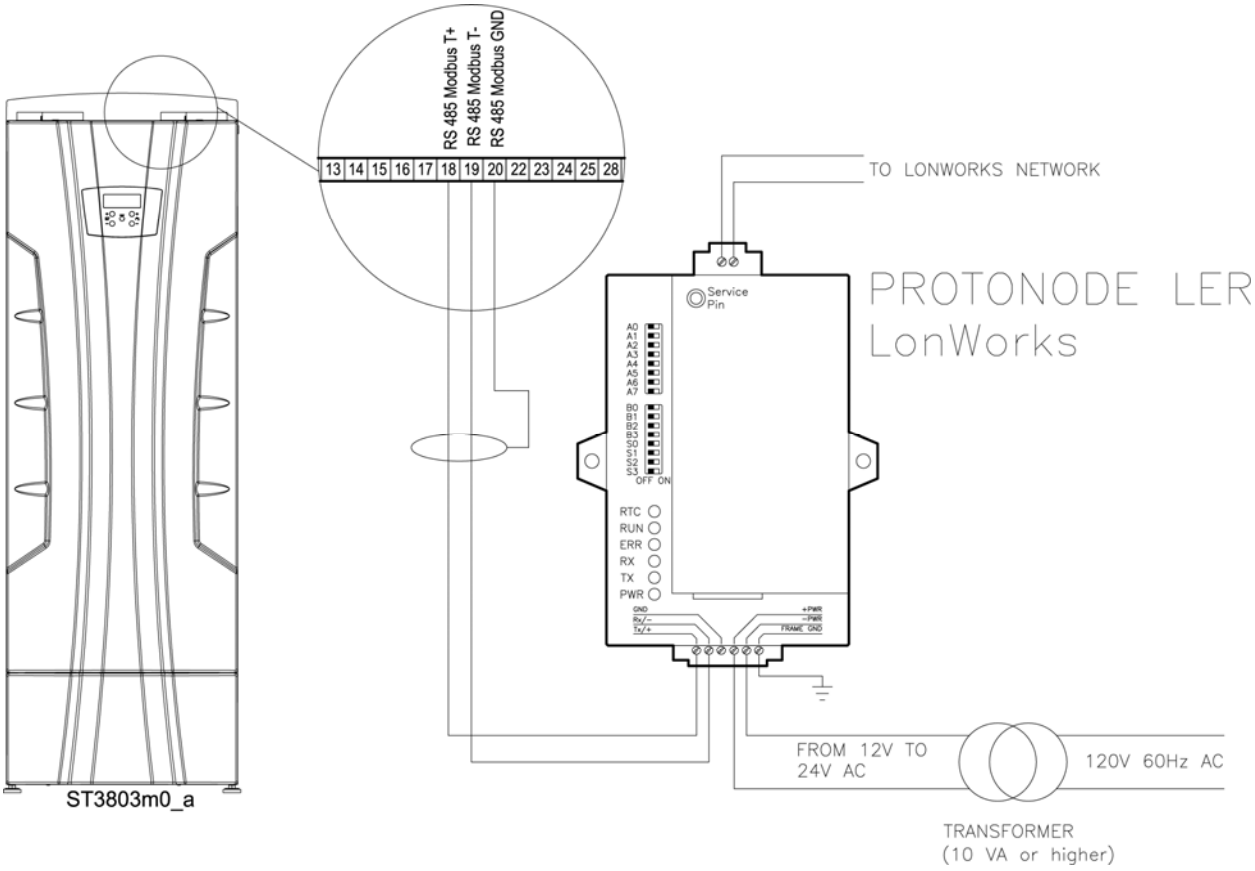


Figure 21: Connection wiring ProtoNode LER for LonWorks

4 CHANGE THE PROTONODE IP ADDRESS USING THE WEB GUI FOR BACNET/IP AND MODBUS TCP

4.1 Connect the PC to ProtoNode via the Ethernet Port

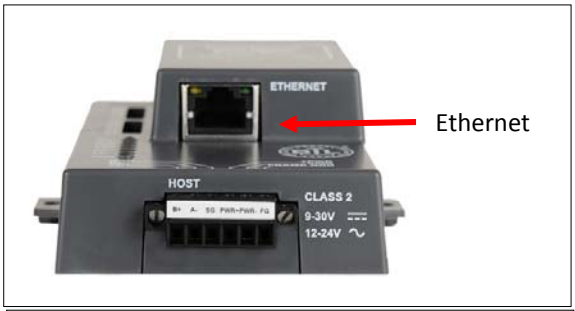
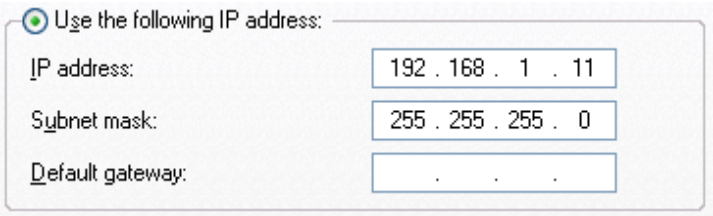


Figure 22: Ethernet Port Location

- Connect a standard 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
- Go to start > Control Panel > Network Connections
- Right-click on Local Area Connection > Properties
- Highlight Internet Protocol (TCP/IP) > Properties
- Select: Use the following IP address



- Click OK twice

4.2 Use the ProtoNode Web GUI to Connect to the ProtoNode

- Open a PC web browser and enter the default IP address 192.168.1.24 of the ProtoNode. The browser's display of the main landing page for the ProtoNode (Figure 20) confirms the ProtoNode is communicating
- Under Active Profiles, the discovered Modbus RTU devices with the associated Modbus RTU Node ID's can be seen. If no profiles are present, then the wiring, baud rate, and DIP switch settings must be checked, because there is a problem with the Modbus COMs. All the active devices must show the correct Modbus Node-ID's before proceeding.

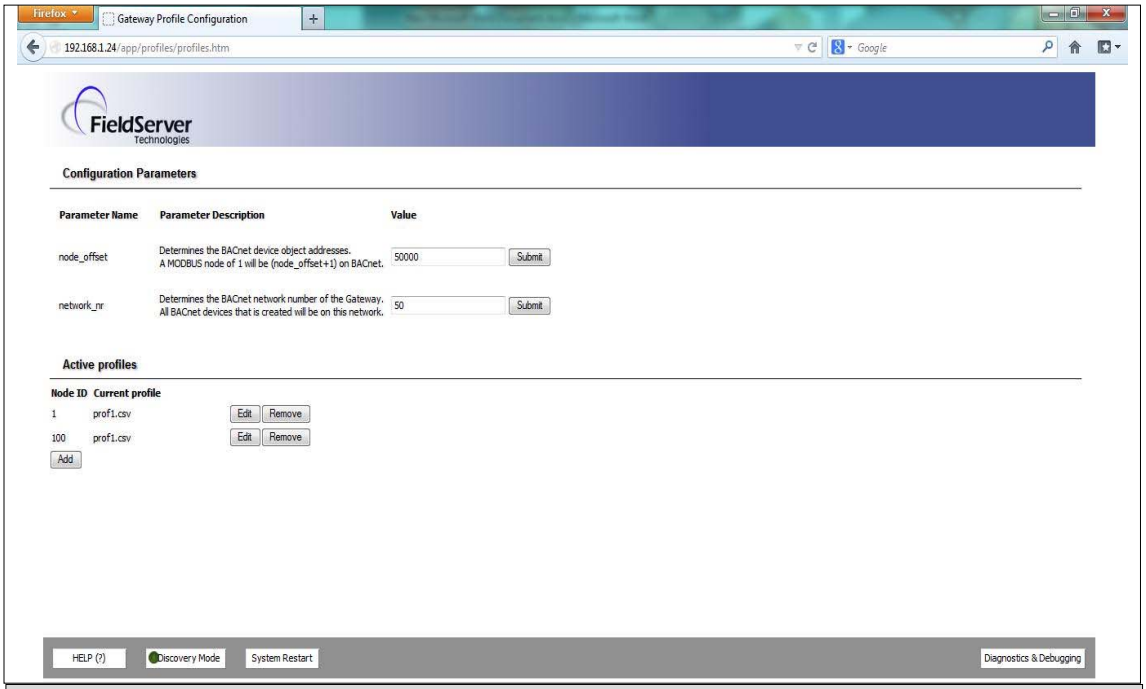


Figure 23: FST Web GUI screen

4.3 Set IP Address for BACnet/IP and Modbus TCP

- Open a PC web browser, enter the default IP address of the ProtoNode 192.168.1.24 and connect to the ProtoNode.
- From the GUI main landing, click on Diagnostics and Debugging to get to the Utilities section of the GUI (to change IP Address and other capabilities). (See Figure 25)

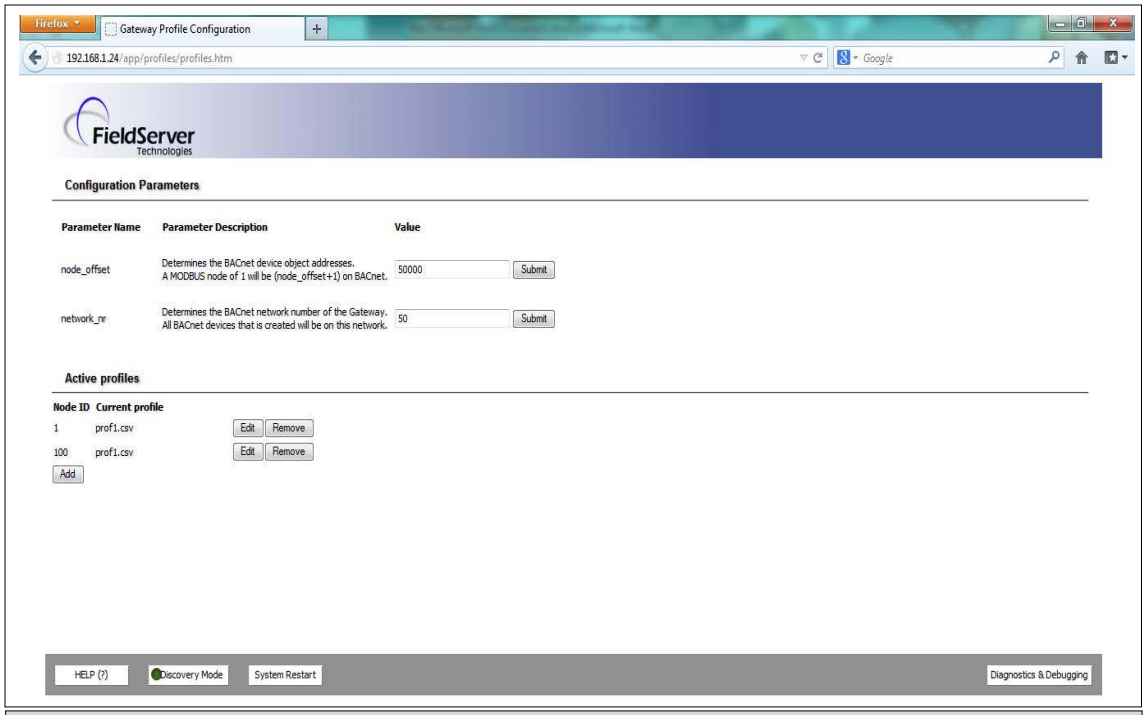


Figure 24: FST Web GUI Utilities page

- From the GUI's Utility page, click on setup and then Network Settings to enter the Edit IP Address Settings menu.
- 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

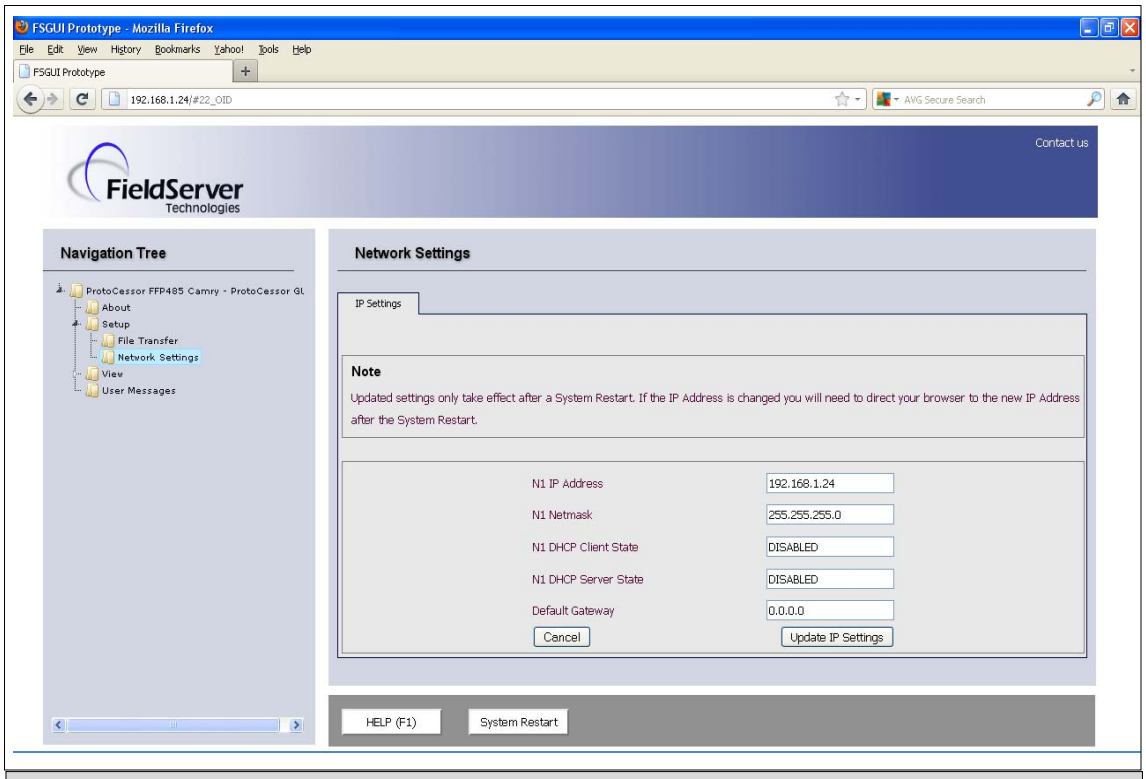


Figure 25: Changing IP Address via FST Web GUI

5 COMMISSIONING PROTONODE LER ON A LONWORKS NETWORK

Commissioning may only be performed by the LonWorks administrator.

5.1 Commissioning ProtoNode LER on a LonWorks Network

The User will be prompted by the LonWorks Administrator to hit the Service Pin on the ProtoNode LER 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 5.1.1 to generate XIF

Figure 26: LonWorks Service Pin Location

5.1.1 Instructions to Upload XIF File from ProtoNode LER Using FieldServer GUI Web Server

- Connect a standard cat5 Ethernet cable 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:

  Go to start > Control Panel > Network Connections

  Right-click on Local Area Connection > Properties

  Highlight Internet Protocol (TCP/IP) > Properties

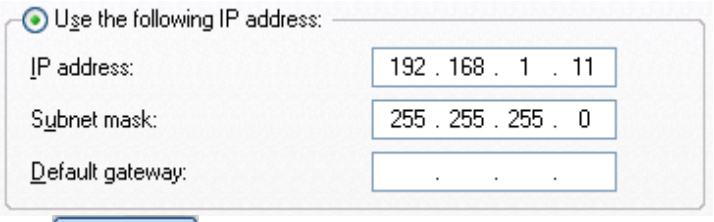
- For Windows 7:

  Go to > Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings

  Right-click on Local Area Connection > Properties

  Highlight Internet Protocol Version 4 (TCP/IPv4) > Properties

- For Windows XP and Windows 7, select: Use the following IP address



- Click OK twice

- Open a web browser and go to the following address: IP address of ProtoCessor/fserver.xif
- 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

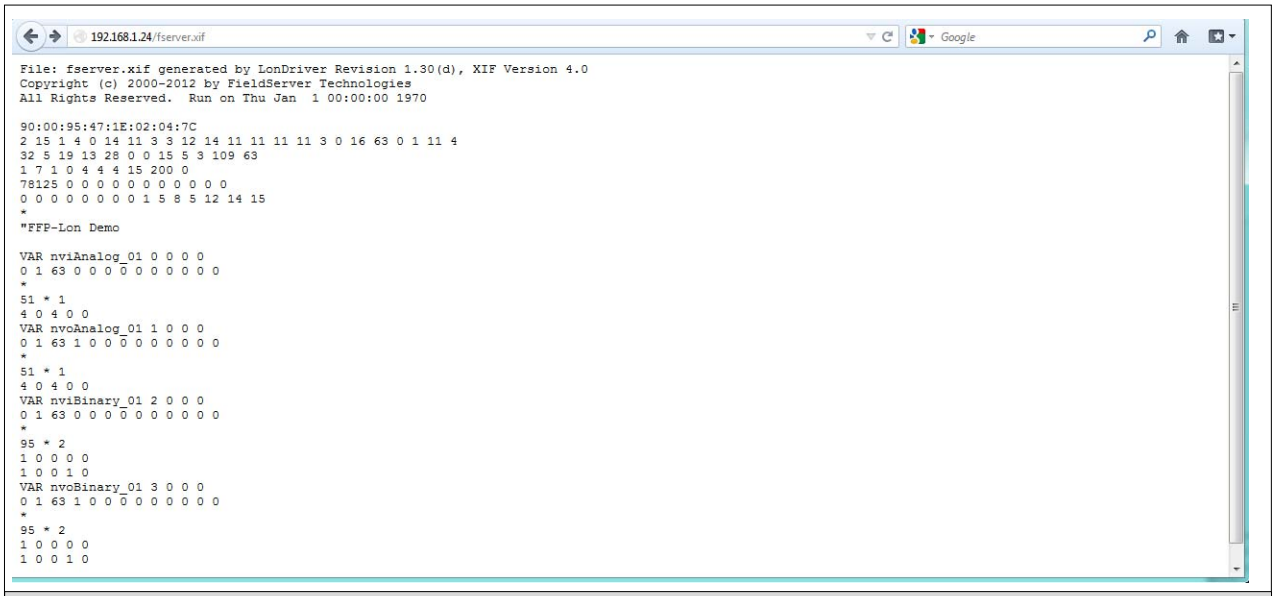


Figure 27: Sample of Fserver.XIF File Being Generated

6 CAS BACNET EXPLORER FOR VALIDATING PROTONODE IN THE FIELD

ProtoCessor 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 BMS Integrator on site. A Serial or USB to RS-485 converter is needed to test BACnet MS/TP.

6.1 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 "Cosmogas2014".** Once completed, the key will be sent to the email address that was submitted. From this email, the long key will need to be copied and pasted into the CAS key activation page.

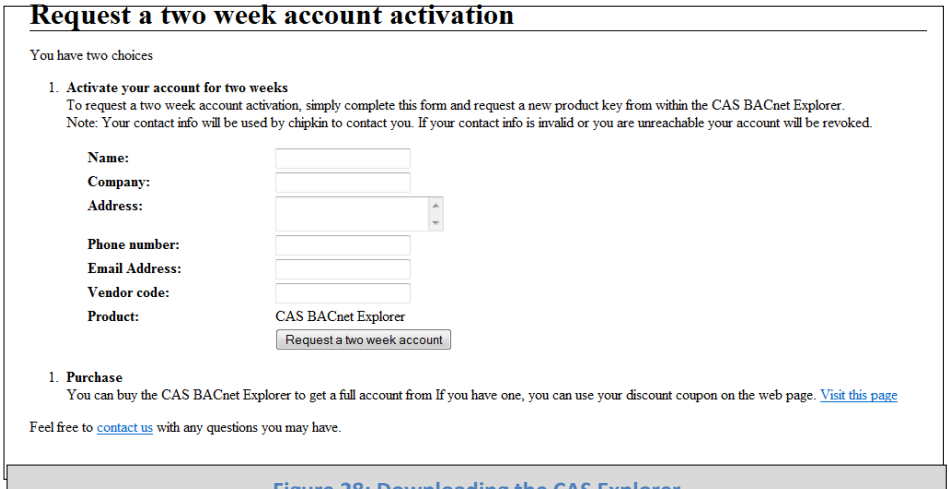


Figure 28: Downloading the CAS Explorer

- 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/
- In the CAS Activation form, enter the email address and paste the CAS key that was sent. Once completed, select Activation.

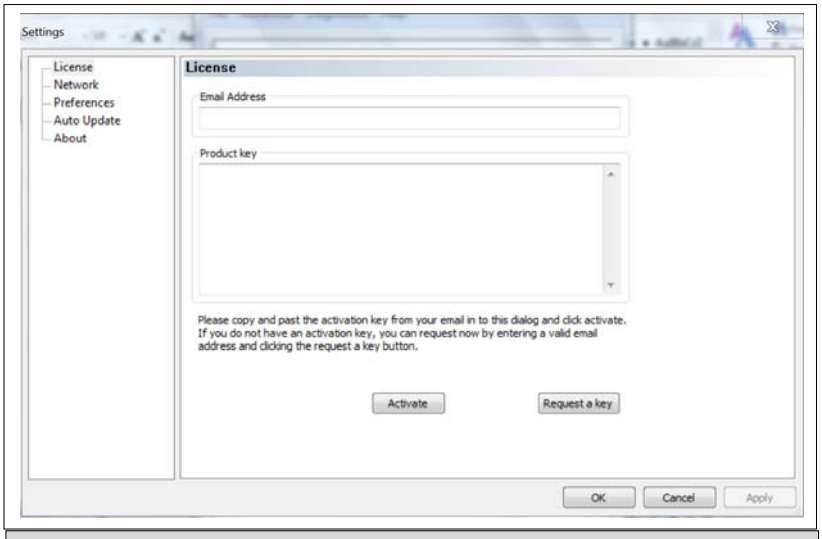


Figure 29: Requesting CAS Activation Key

6.2 CAS BACnet Setup

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

6.2.1 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 RER.
- In CAS Explorer, do the following:
    - Click on settings
    - Check the BACnet MSTP box and uncheck the BACnet/IP and BACnet Ethernet boxes
    - Set the BACnet MSTP MAC address to 0
    - Set the BACnet MSTP Baud Rate to 38400
    - Click Ok
    - On the bottom right-hand corner, make sure that the BACnet MSTP box is green
    - Click on discover
    - Check all 4 boxes
    - Click Send

6.2.2 CAS BACnet BACnet/IP Setup

- See Section 5.1 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 MSTP 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. Troubleshooting

Appendix A.1. 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. (Appendix A.4)
  - Check baud rate, parity, data bits, stop bits
  - Check Modbus device address
  - Verify wiring
  - Verify all the Modbus RTU devices that were discovered in FST Web Configurator. (See Section 204.2)
- Field COM problems:
  - Visual observations of LEDs on ProtoNode. (Appendix A.4)
  - Visual dipswitch 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 FieldServer. (Appendix A.2)

Appendix A.2. Take Diagnostic Capture With the FieldServer Utilities

- **Once the log is Diagnostic Capture is complete, email it to support@protocessor.com. The Diagnostic Capture will allow us to rapidly diagnose the problem.**
- Make sure the FieldServer utilities are loaded on the PC

  http://fieldserver.com/techsupport/utility/utility.php

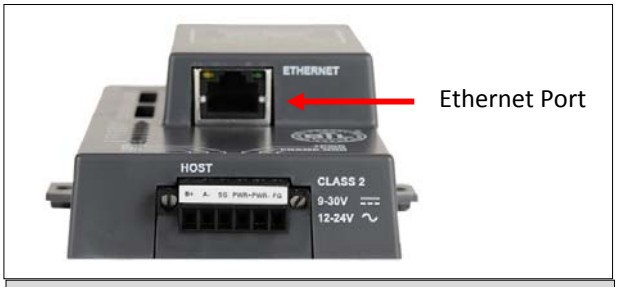


Figure 30: Ethernet Port Location

- 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
- 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:

Go to 

> 

> 
Network Connections

Right-click on Local Area Connection > Properties

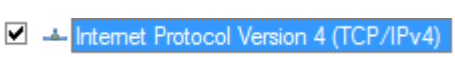
Highlight 

> 

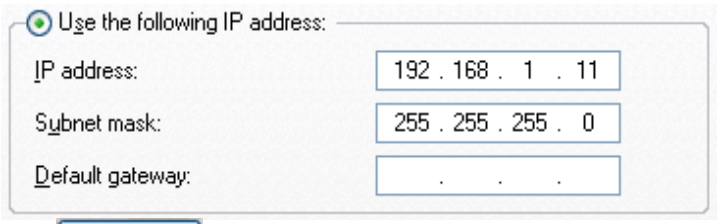
- For Windows 7:

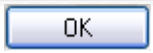
  Go to  > Control Panel > Network and Internet > Network and Sharing Center > Change adapter settings

  Right-click on Local Area Connection > Properties

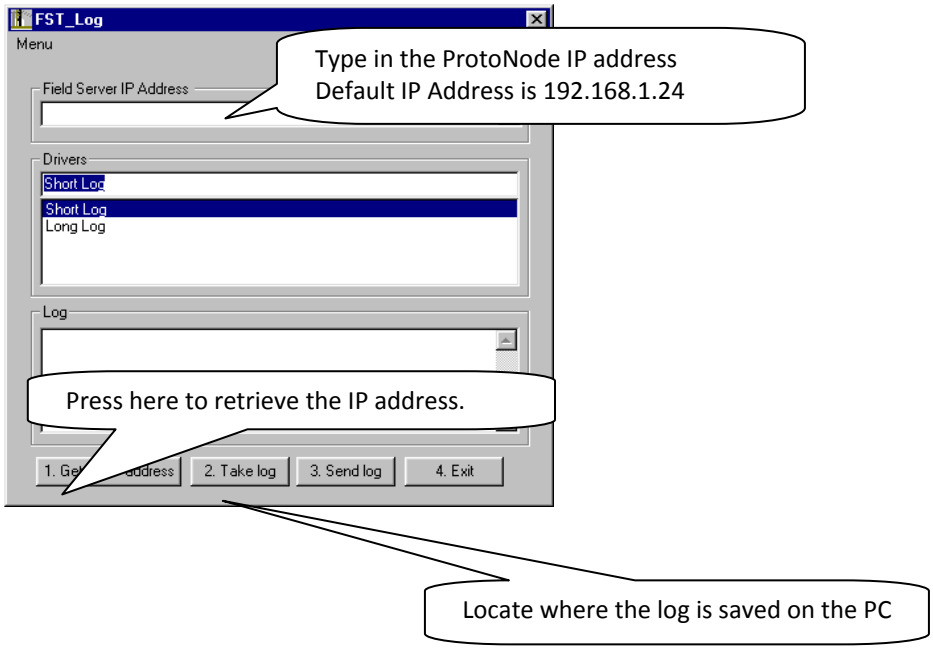
  Highlight  > Properties

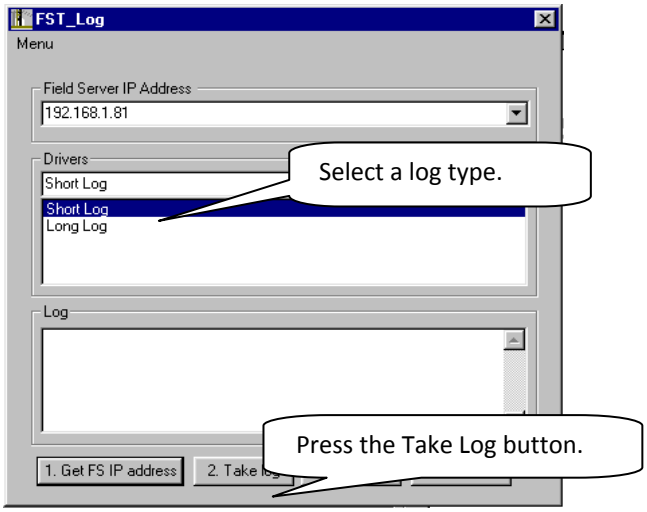
- For Windows XP and Windows 7, select: Use the following IP address



- Click  twice

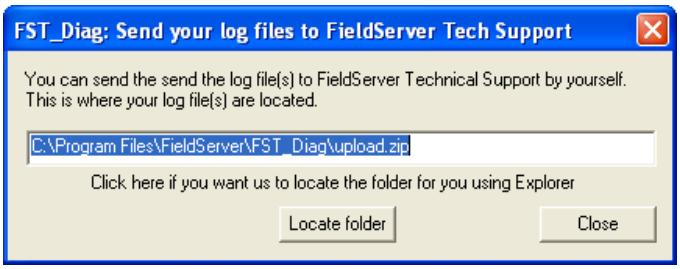
- Double click on the FST Diag Utility
- **Step 1**: Select a Field Server IP Address
- The IP address can be entered manually or selected by clicking on button 1 using the Utility





- **Step 2**: Take a Log
- Press the Take Log button. While the Utility runs a few DOS prompts will flash across the monitor. Don't click or type anything in to these DOS prompts. This step may take a few minutes depending on the chosen Log Type and computer speed. When the Utility is finished you will be presented with a log of events that have occurred.

- **Step 3**: Send Log
- Click the "Send Log" button located near the bottom of the dialog. The following dialog should appear



- Push the 'Locate Folder' button to launch explorer and have it point directly at the correct folder. The file upload.zip must be sent to support@fieldserver.com
- **Step 4**: Close the Program
- Press the exit button when the log is completed 

Appendix A.3. Setting the Network Number for BACnet/IP when more than one ProtoNode is on the same Subnet

On the main Web Configurator screen, update the Network Number in the Network_Nr and hit Submit. Please note that the default value is 50.

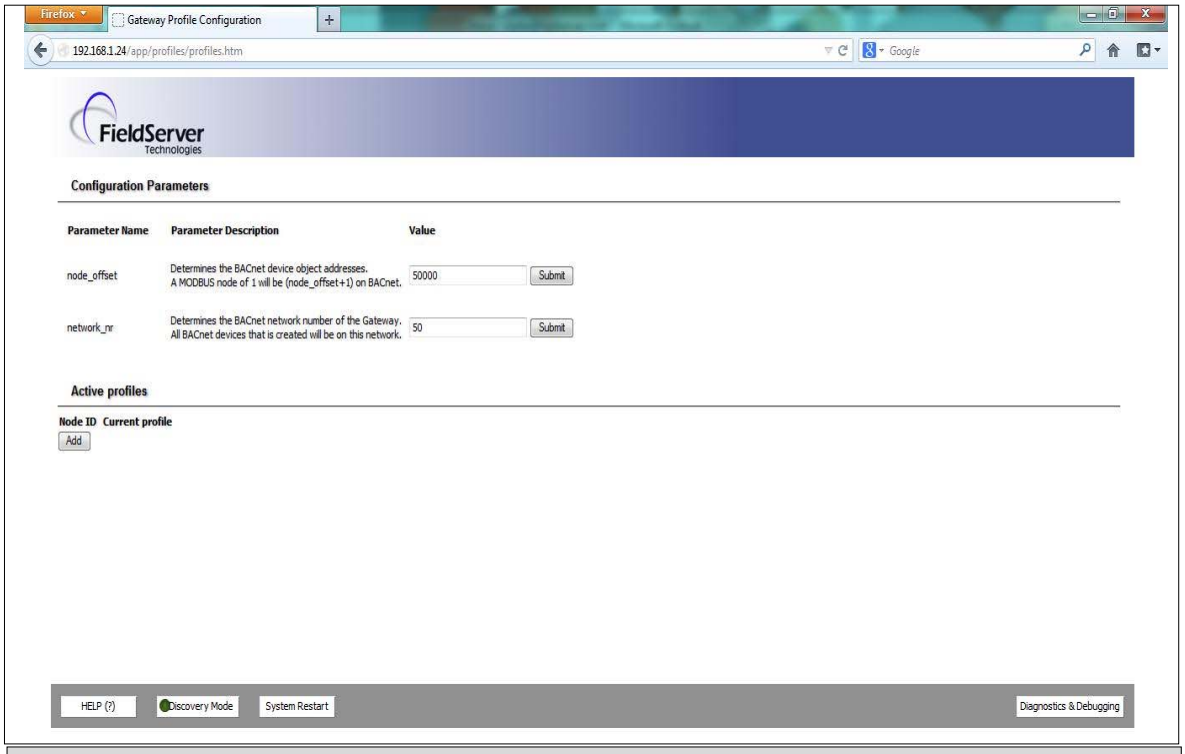
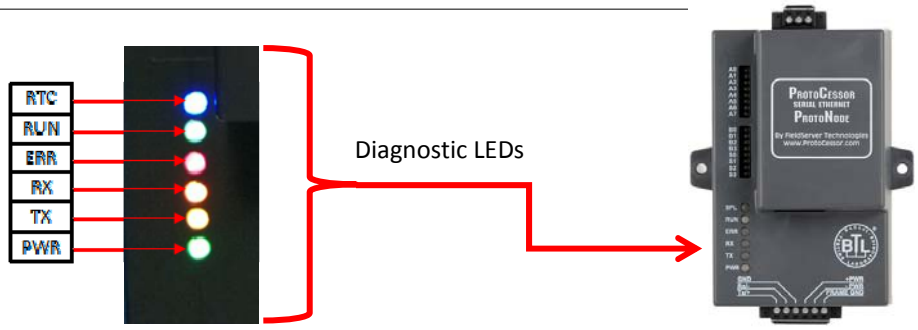


Figure 31: Web Configurator showing setting the network number for BACnet/IP

Appendix A.4. LED Diagnostics for Modbus RTU Communications Between ProtoNode and Devices

Please see the diagram below for ProtoNode RER and LER LED Locations.



Tag	Description
RTC	Unused
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 will indicate there is a system error on ProtoNode. If this occurs, immediately report the related "system error" shown in the error screen of the GUI interface to FieldServer Technologies for evaluation.
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 32: Diagnostic LEDs

Appendix B. Vendor Information - Cosmogas

Appendix B.1. Argus Modbus RTU Mappings to BACnet MS/TP, BACnet/IP, Metasys N2 and LonWorks

Point Name	BACnet Object Type	BACnet Object ID	N2 Data Type	N2 Point Address	Lon Name	Lon SNVT	Description
Modbus Units	AV	1	AO	1	nvoModUnits_000	SNVT_count_f	Bit 0: °C/°F Bit 1: bar/psi
State	AI	2	AI	2	nvoState_002	SNVT_count_f	State of the burner on appliances with one burner only
Status	AI	3	AI	3	nvoStatus_003	SNVT_count_f	Status of the burner on appliances with one burner only
Error Code	AI	4	AI	4	nvoErrCode_004	SNVT_count_f	Error code on appliances with one burner only For complete error list, see the heater manual. 255 means "No error".
Boiler CH SP	AV	5	AO	5	nvoBlrCHSP_006	SNVT_count_f	Heating setpoint: range 68 to 179 °F
Boiler DHW SP	AV	6	AO	6	nvoBlrDHWSP_007	SNVT_count_f	Indirect water heater setpoint: range 104 to 140 °F
CH Mode	AV	7	AO	7	nvoCHMode_010	SNVT_count_f	0: CH with RT; 1: CH with RT and outdoor reset; 2: CH with full outdoor reset; 3: CH with permanent heat demand; 4: CH with 0-10 Vcc input
DHW Mode	AV	8	AO	8	nvoDHWMode_011	SNVT_count_f	0 = no DHW; 1 = DHW store with sensor; 2 = DHW store with thermostat; 3 = N/A; 4 = N/A; 5 = N/A
Supply Temp	AI	9	AI	9	nvoSupTmp_012	SNVT_count_f	Supply temperature of the Burner 1 (Master)
Return Temp	AI	10	AI	10	nvoRetTmp_013	SNVT_count_f	Return temperature of the Burner 1 (Master)
DHW Temp	AI	11	AI	11	nvoDHWTmp_014	SNVT_count_f	DHW tank temperature
Flue Gas Temp	AI	12	AI	12	nvoFluGasTmp_015	SNVT_count_f	Flue gas temperature of the Burner 1 (Master)
Heat Exchanger Temp	AI	13	AI	13	nvoHtExcTmp_016	SNVT_count_f	Header Temperature (Header on the back of the heater)
Firing Rate	AI	14	AI	14	nvoFirRate_017	SNVT_lev_percent	Firing rate on appliances with one burner only
Flame Current	AI	15	AI	15	nvoFlmCrnt_019	SNVT_count_f	Flame current of the Burner 1 (Master)
Water Pressure	AI	16	AI	16	nvoWtrPrs_020	SNVT_count_f	Water pressure
Analog in	AI	17	AI	17	nvoAnalogin_021	SNVT_count_f	Firing rate on appliances with one burner only
CH pump	AI	18	AI	18	nvoCHpump_024	SNVT_count_f	State of the Burner 1 (Master) motorized valve (if any)
Dependent_1 State	AI	19	AI	19	nvoD1State_048	SNVT_count_f	State of the Burner 1 (Master)
Dependent_1 Status	AI	20	AI	20	nvoD1Status_049	SNVT_count_f	Status of the Burner 1 (Master)

Dependent_1 Error Code	AI	21	AI	21	nvoD1ErrNum_050	SNVT_count_f	Error code of the Burner 1 (Master)
Dependent_1 Firing Rate	AI	22	AI	22	nvoD1FirRat_051	SNVT_lev_percent	Firing rate of the Burner 1 (Master)
Dependent_2 State	AI	23	AI	23	nvoD2State_052	SNVT_count_f	State of the Burner 2
Dependent_2 Status	AI	24	AI	24	nvoD2Status_053	SNVT_count_f	Status of the Burner 2
Dependent_2 Error Code	AI	25	AI	25	nvoD2ErrNum_054	SNVT_count_f	Error code of the Burner 2
Dependent_2 Firing Rate	AI	26	AI	26	nvoD2FirRat_055	SNVT_lev_percent	Firing rate of the Burner 2
Dependent_3 State	AI	27	AI	27	nvoD3State_056	SNVT_count_f	State of the Burner 3
Dependent_3 Satus	AI	28	AI	28	nvoD3Satus_057	SNVT_count_f	Status of the Burner 3
Dependent_3 Error Code	AI	29	AI	29	nvoD3ErrNum_058	SNVT_count_f	Error code of the Burner 3
Dependent_3 Firing Rate	AI	30	AI	30	nvoD3FirRat_059	SNVT_lev_percent	Firing rate of the Burner 3
Dependent_4 State	AI	31	AI	31	nvoD4State_060	SNVT_count_f	State of the Burner 4
Dependent_4 Status	AI	32	AI	32	nvoD4Status_061	SNVT_count_f	Status of the Burner 4
Dependent_4 Error Code	AI	33	AI	33	nvoD4ErrNum_062	SNVT_count_f	Error code of the Burner 4
Dependent_4 Firing Rate	AI	34	AI	34	nvoD4FirRat_063	SNVT_lev_percent	Firing rate of the Burner 4
Spring Outdoor Air Temp	AV	35	AO	35	nvoHiOATmp_082	SNVT_count_f	Spring outdoor temperature (parameter 2023 of the boiler)
Spring Supply Temp	AV	36	AO	36	nvoMinOASP_083	SNVT_count_f	Spring supply temperature (parameter 2024 of the boiler)
Winter Supply Temp	AV	37	AO	37	nvoMaxOASP_085	SNVT_count_f	Winter supply temperature (parameter 2022 of the boiler)
Warm Weather Shutdown Temp	AV	38	AO	38	nvoOAShdnTmp_086	SNVT_count_f	Warm weather shut down temperature (parameter 2020 of the boiler)
Night Setback Temp	AV	39	AO	39	nvoNightStbk_087	SNVT_count_f	Night setback temperature (parameter 2027 of the boiler)
Outdoor Temp	AI	40	AI	40	nvoOutsidTmp_089	SNVT_count_f	Outdoor temperature
Control Register	MV	95	MV	95	nviCtlWord_109	SNVT_count_f	Set to 1 before any variable change

Appendix C. MAC Address DIP Switch Settings

Appendix C.1. MAC Address DIP Switch Settings

Address	A0	A1	A2	A3	A4	A5	A6	A7
0	Off	Off	Off	Off	Off	Off	Off	Off
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
45	On	Off	On	On	Off	On	Off	Off
46	Off	On	On	On	Off	On	Off	Off

Address	A0	A1	A2	A3	A4	A5	A6	A7
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
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

Address	A0	A1	A2	A3	A4	A5	A6	A7
94	Off	On	On	On	On	Off	On	Off
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Address	A0	A1	A2	A3	A4	A5	A6	A7
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191	On	On	On	On	On	On	Off	On

Address	A0	A1	A2	A3	A4	A5	A6	A7
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Address	A0	A1	A2	A3	A4	A5	A6	A7
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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
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254	Off	On	On	On	On	On	On	On
255	On	On	On	On	On	On	On	On

Appendix D. Reference

Appendix D.1. Specifications

	ProtoNode RER	ProtoNode LER
Electrical Connections	One 6-pin Phoenix connector, one RS-485 +/- ground port, power +/- frame ground port One 3-pin RS-485 Phoenix connector, one RS-485 +/- ground port One Ethernet-10/100 Ethernet port	One 6-pin Phoenix connector, one RS-485 +/- ground port, power +/- frame ground port One Ethernet 10/100 BaseT port One FTT-10 LonWorks port
Approvals:	Pending CE (EN55022;EN55024; EN60950), UL916, Pending FCC Class A Part 15, DNP3 Conformance Tested, OPC Self-tested for Compliance, 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 33: Specifications

Appendix D.1.1. 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.

Appendix E. Cascade connection with MODBUS

Appendix E.1. Example of MODBUS connection for heaters with serial number up to 14999999

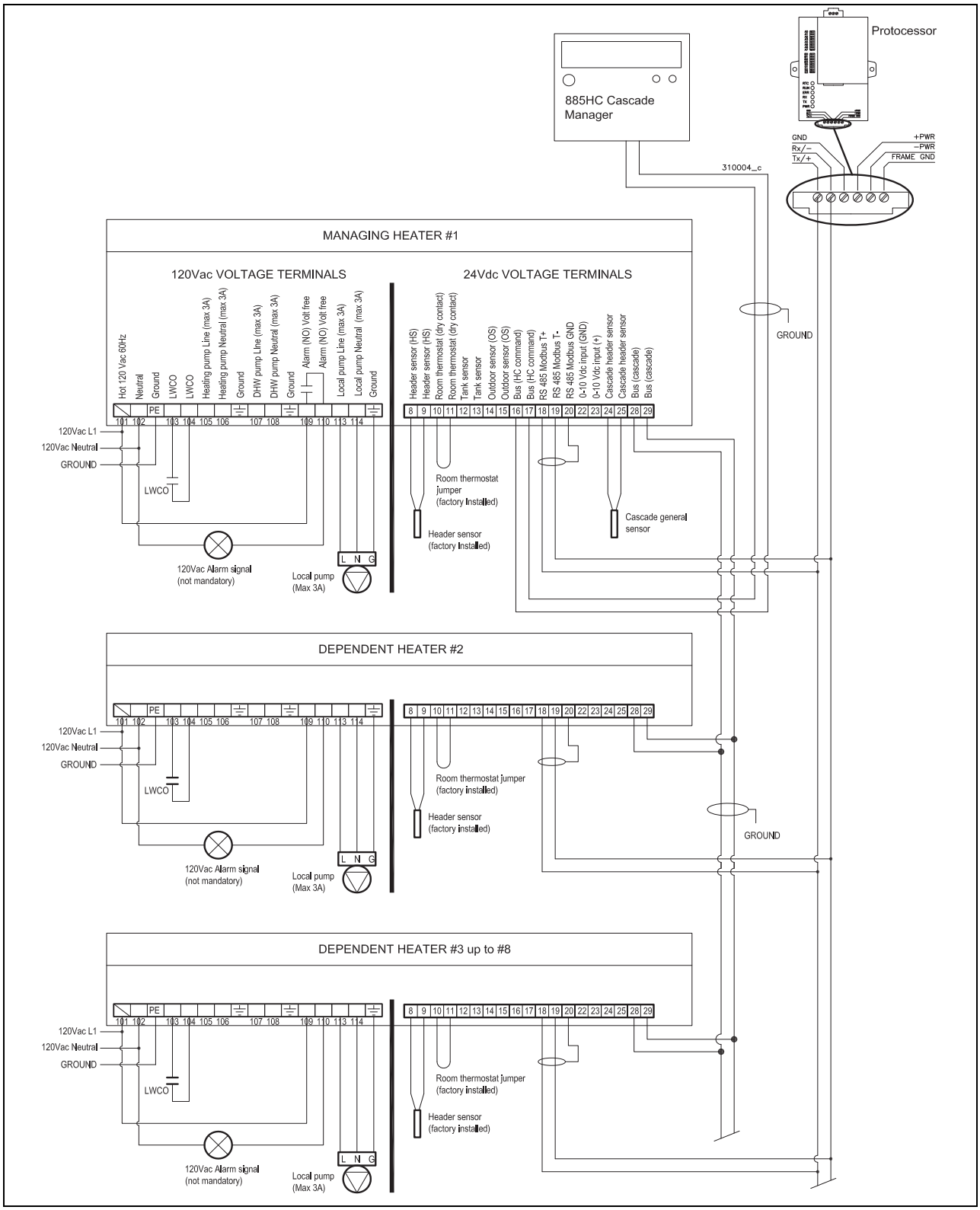

Figure 34: Cascade connection with MODBUS

Appendix E.2. Example of MODBUS connection for heaters with serial number higher than 15000000

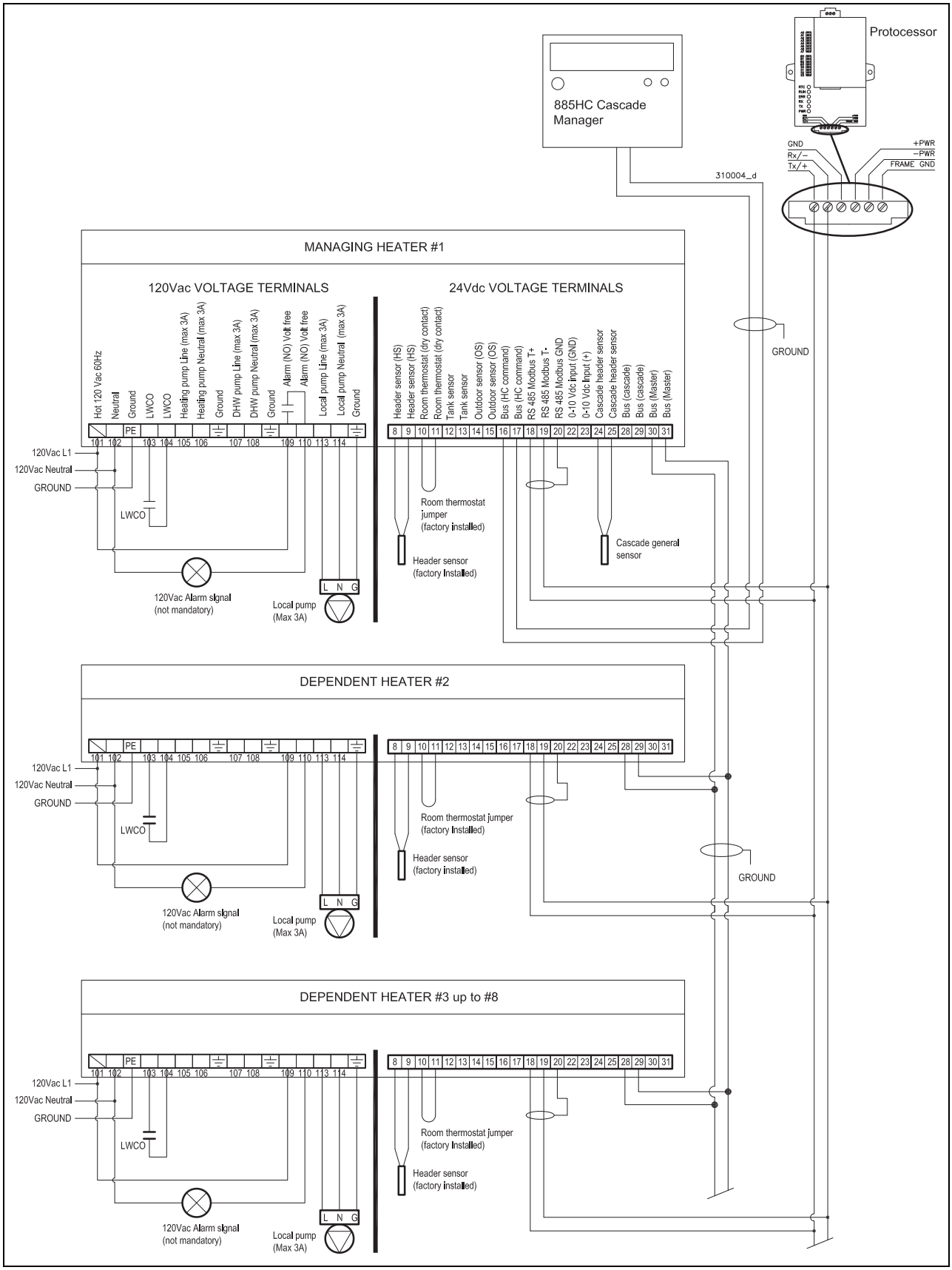

Figure 35: Cascade connection with MODBUS

To connect each heater of a cascade to a MODBUS cascade protocol, installer have to:

1 - Make a daisy chain between terminals 28 and 29 of each heater should be already in place follow instruction of the 885HC cascade sequencer (see figure 34). For heaters with serial number higher than 15000000 the manager heater need to have the wiring connected to terminals 30 and 31 (see figure 35);
2 - Connect a daisy chain between terminals 18, 19 and 20 of all units (see Figures 34 or 35).
3 - Connect the daisy chain to the Rx Tx terminals of the protonode (see Figure 34 or 35).
4 - Using the display of the heater, set on each heater the parameter 3085 in the follow way: "1" for the manager unit, "2" for the first dependent, "3" for the second dependent, etc…(check heater manual for instruction on how to change parameter 3085);
5 – Using the 885HC command, set on each heater the "Boiler address" parameter as illustrated on the 885HC command instruction.

CAUTION! Perform steps in the order given to avoid malfunctions to the communication systems

RELIABLE. BOLD. INNOVATIVE.

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