



ProtoNode FPC-N54 Start-up Guide

For Interfacing ABB Products:
ACS800, ACS880, ACS880-CTDD

To Building Automation Systems:
BACnet MS/TP, BACnet/IP and SMC Cloud

APPLICABILITY & EFFECTIVITY

Explains ProtoNode hardware and installation.

The instructions are effective for the above as of February 2020.

Technical Support

Thank you for purchasing the ProtoNode for ABB.

Please call ABB for technical support of the ProtoNode product.

MSA Safety does not provide direct support. If ABB needs to escalate the concern, they will contact MSA Safety for assistance.

Support Contact Information:

ABB Inc.
16250 W. Glendale Drive
New Berlin, WI 53151

Customer Service:
+49 30 9177 0

Email: contact.center@de.abb.com

Website: www.abb.com

Quick Start Guide

WARNING: The brief guide below is generic, please refer to the drive specific instructions in [Appendix B.7](#) for [ACS800](#), [ACS880](#) or [ACS880-CTDD](#) before moving forward.

1. Record the information about the unit. (**Section 3.1**)
2. Check that the ProtoNode and customer device COM settings match. (**Section 3.3**)
3. Connect the ProtoNode 3 pin RS-485 R1 port to the RS-485 network connected to the device. (**Section 4.1**)
4. **If using a serial field protocol:**
Connect the ProtoNode 3 pin RS-485 R2 port to the field protocol cabling. (**Section 4.2**)
5. Connect power to ProtoNode 3 pin power port. (**Section 4.5**)
6. Connect a PC to the ProtoNode via Ethernet cable. (**Section 5**)
7. Use a web browser to access the ProtoNode Web Configurator page to select the profile of the device attached to the ProtoNode and enter any necessary device information. Once the device is selected, the ProtoNode automatically builds and loads the appropriate configuration. (**Section 6**)
8. Ethernet Network: If using an Ethernet field protocol, use a web browser to access the ProtoNode Web Configurator page to change the IP Address. (**Section 6.4**)

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1 CERTIFICATION

1.1 BTL Mark – BACnet^{®1} Testing Laboratory



BTL is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of the BACnet International. BTL is a registered trademark of the BACnet International.

The BTL Mark on ProtoNode 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 www.BACnetInternational.net for more information about the BACnet Testing Laboratory. Click [here](#) for the BACnet PIC Statement.

¹ BACnet is a registered trademark of ASHRAE

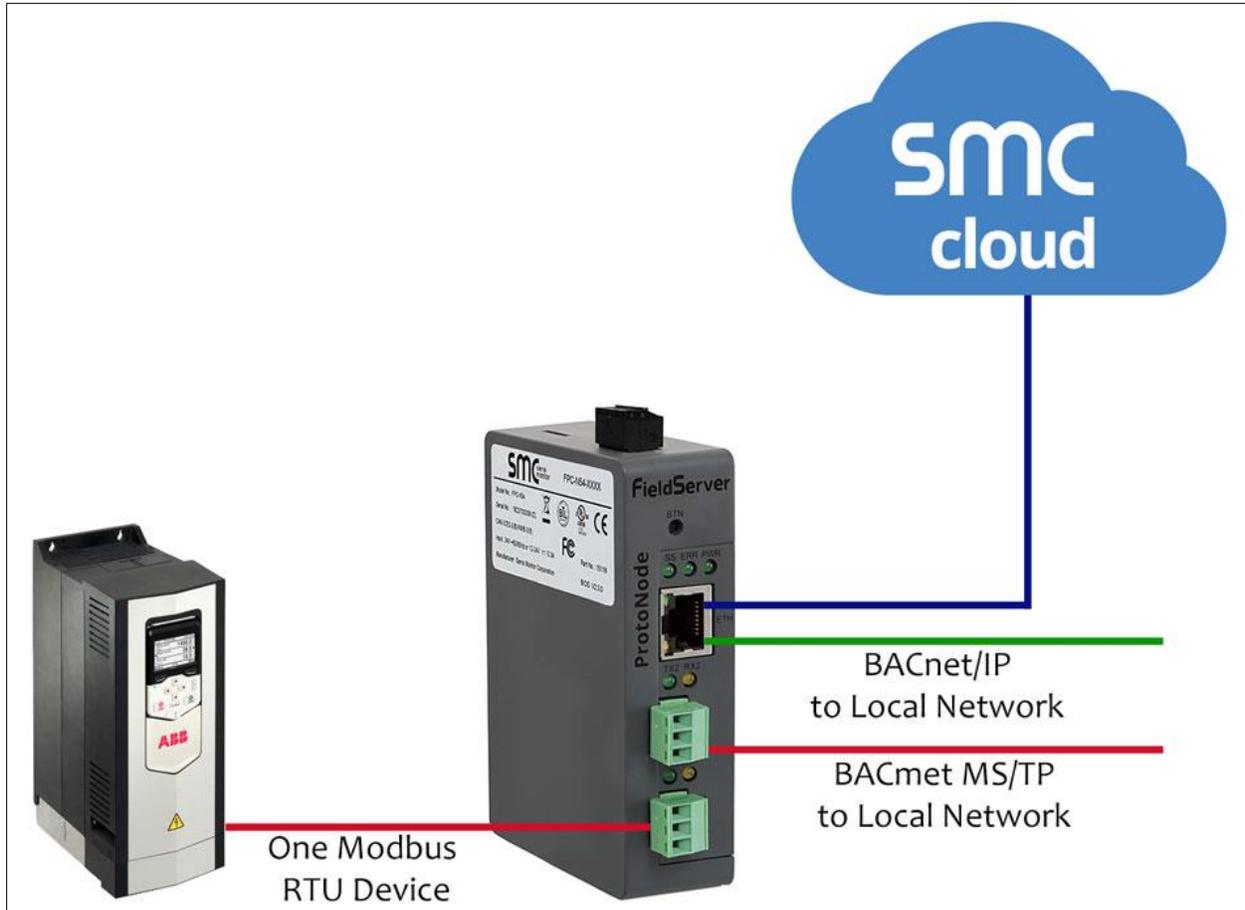
2 INTRODUCTION

2.1 ProtoNode Gateway

The ProtoNode is an external, high performance **building automation multi-protocol gateway** that is preconfigured to automatically communicate between ABB's devices (hereafter simply called "device") connected to the ProtoNode and automatically configures them for BACnet/IP and BACnet MS/TP.

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.

FPC-N54 Connectivity Diagram:



The ProtoNode can connect with the SMC Cloud. The SMC Cloud allows technicians, the OEM's support team and MSA Safety's support team to remotely connect to the ProtoNode. The SMC Cloud provides the following capabilities for any registered devices in the field:

- Remotely monitor and control devices.
- Collect device data and view it on the SMC Cloud Dashboard and the SMC Smart Phone App.
- Create user defined device notifications (alarm, trouble and warning) via SMS and/or Email.
- Generate diagnostic captures (as needed for troubleshooting) without going to the site.

For more information about the SMC Cloud, refer to the [SMC Cloud Start-up Guide](#).

3 PROTONODE SETUP

3.1 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:

Model	Part Number
ProtoNode	FPC-N54-1730
Figure 1: ProtoNode Part Numbers	

- FPC-N54 units have the following 3 ports: RS-485 + Ethernet + RS-485/RS-232

3.2 Point Count Capacity and Registers per Device

The total number of registers presented by the device(s) attached to the ProtoNode cannot exceed:

Part number	Total Registers
FPC-N54-1730	1,500
Figure 2: Supported Point Count Capacity	

3.3 Configuring Modbus Device Communications

3.3.1 Confirm the Device and ProtoNode COM Settings Match

- Any connected serial devices **MUST** have the same baud rate, data bits, stop bits, and parity settings as the ProtoNode.
- Figure 3 specifies the device serial port settings required to communicate with the ProtoNode.

Port Setting	Device
Protocol	Modbus RTU
Baud Rate	19200
Parity	None
Data Bits	8
Stop Bits	1
Figure 3: COM Settings	

3.3.2 Set Node-ID for Any Device Attached to the ProtoNode

- Set Node-ID for the device attached to ProtoNode to 1.

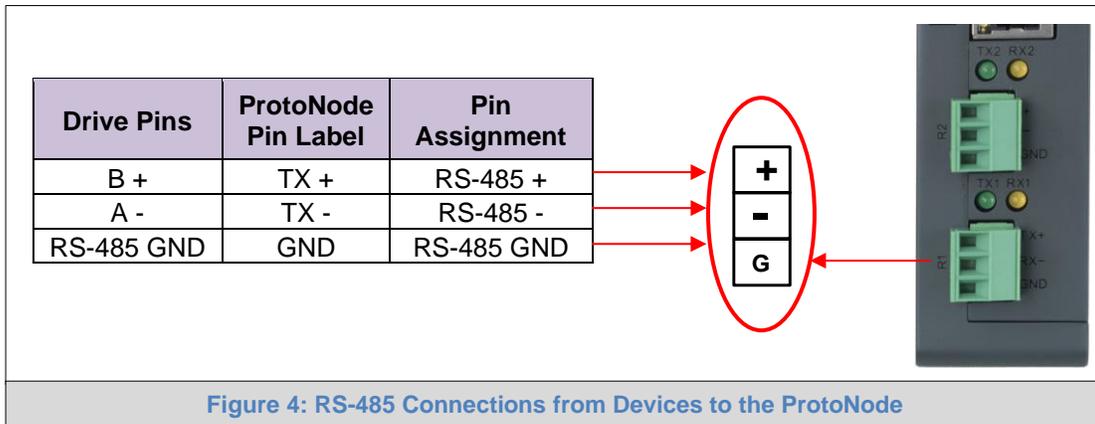
4 INTERFACING PROTONODE TO DEVICES

NOTE: The information in Section 4.1 and 4.2 is generic. For complete wiring instructions for connecting to a specific drive go to [Appendix B.7](#).

4.1 Device Connections to ProtoNode

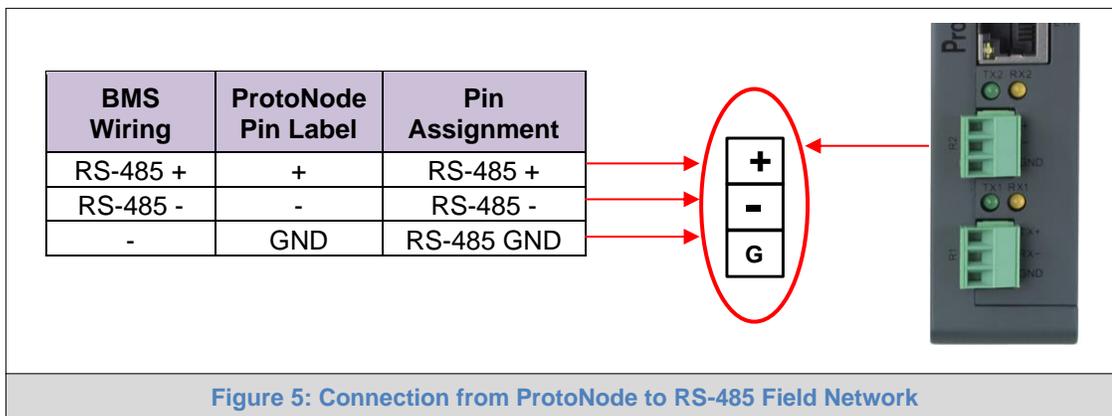
The ProtoNode has a 3-pin Phoenix connector for connecting RS-485 devices on the R1 port.

NOTE: Use standard grounding principles for RS-485 GND.



4.2 Wiring Field Port to RS-485 Serial Network

- Connect the RS-485 network wires to the 3-pin RS-485 connector on the R2 port. ([Figure 5](#))
 - Use standard grounding principles for RS-485 GND
- See [Section 5](#) for information on connecting to the Ethernet network.



4.3 Bias Resistors

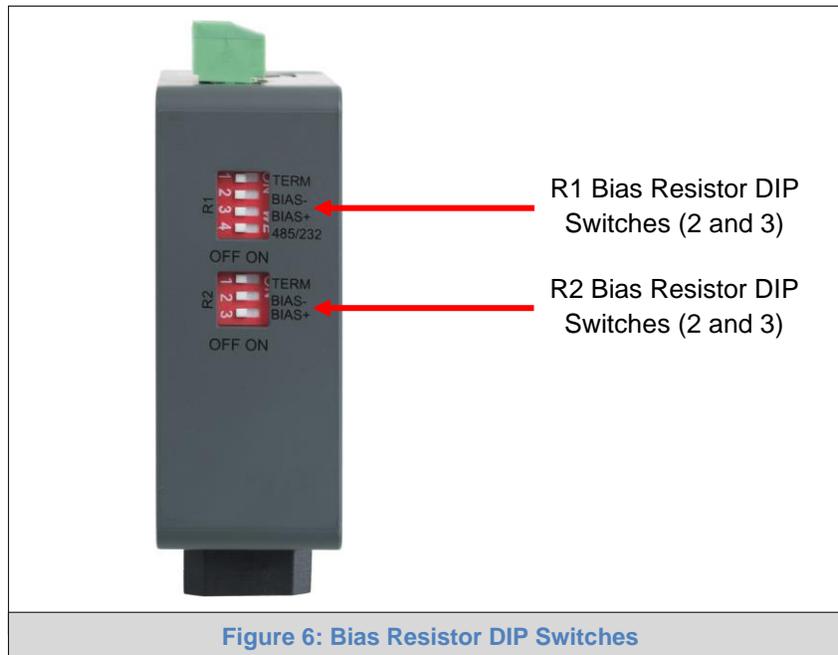


Figure 6: Bias Resistor DIP Switches

To enable Bias Resistors, move both the BIAS- and BIAS+ dip switches to the right as shown in Figure 6.

The ProtoNode bias resistors are used to keep the RS-485 bus to a known state, when there is no transmission on the line (bus is idling), to help prevent false bits of data from being detected. The bias resistors typically pull one line high and the other low - far away from the decision point of the logic.

The bias resistor is 510 ohms which is in line with the BACnet spec. It should only be enabled at one point on the bus (for example, on the field port were there are very weak bias resistors of 100k). Since there are no jumpers, many gateways can be put on the network without running into the bias resistor limit which is < 500 ohms.

NOTE: See www.ni.com/support/serial/resinfo.htm for additional pictures and notes.

NOTE: The R1 and R2 DIP Switches apply settings to the respective serial port.

NOTE: If the gateway is already powered on, DIP switch settings will not take effect unless the unit is power cycled.

4.4 Termination Resistor

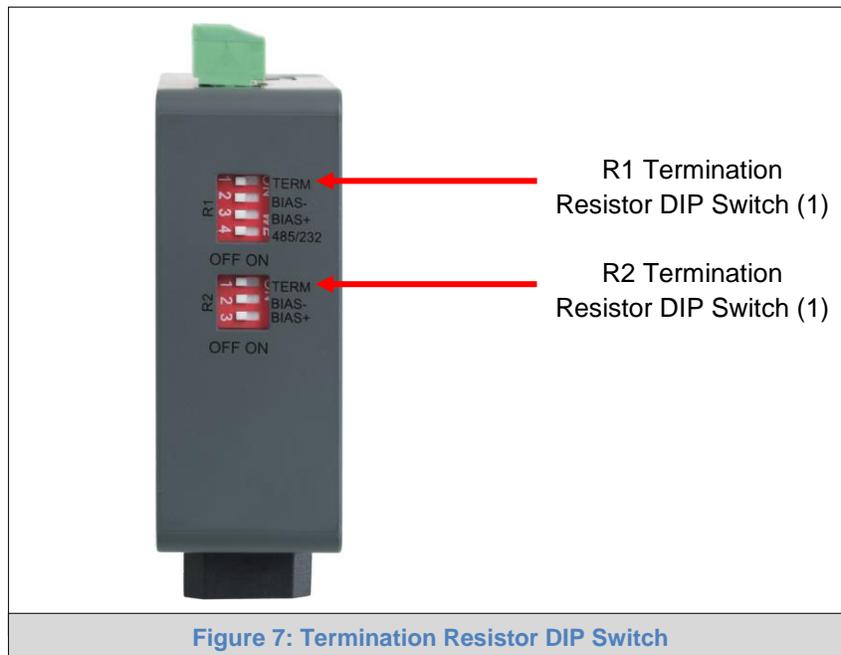


Figure 7: Termination Resistor DIP Switch

If the ProtoNode is the last device on the serial trunk, then the End-Of-Line Termination Switch needs to be enabled. **To enable the Termination Resistor, move the TERM dip switch to the right in the orientation shown in Figure 7.**

Termination resistor is also used to reduce noise. It pulls the two lines of an idle bus together. However, the resistor would override the effect of any bias resistors if connected.

NOTE: The R1 and R2 DIP Switches apply settings to the respective serial port.

NOTE: If the gateway is already powered on, DIP switch settings will not take effect unless the unit is power cycled.

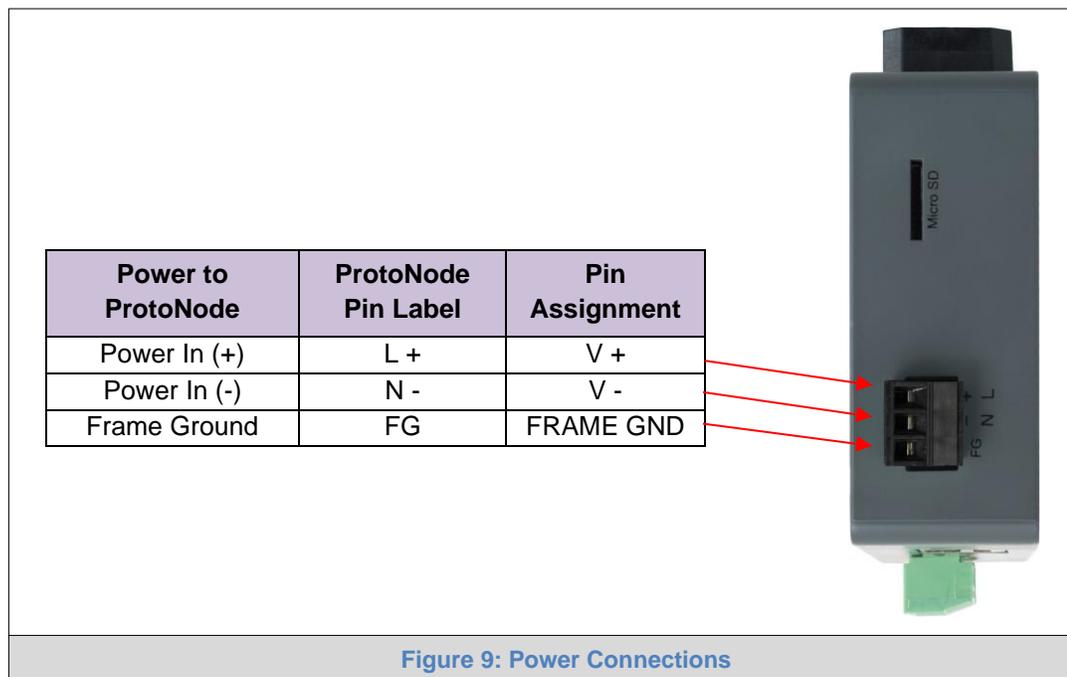
4.5 Power-Up ProtoNode

Check power requirements in the table below:

Power Requirement for ProtoNode External Gateway		
	Current Draw Type	
ProtoNode Family	12VDC	24VDC/AC
FPC – N54 (Typical)	250mA	125mA
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 8: Required Current Draw for the ProtoNode		

Apply power to the ProtoNode as shown below in [Figure 9](#). Ensure that the power supply used complies with the specifications provided in [Appendix C.1](#).

- The ProtoNode accepts 9-30VDC or 24VAC on pins L+ and N-.
- Frame GND should be connected.



NOTE: Go to [Appendix B.7](#) for drive specific power setup and wiring instructions.

5 CONNECT THE PC TO THE PROTONODE

5.1 Connecting to the ProtoNode via Ethernet

Connect a Cat-5 Ethernet cable (straight through or cross-over) between the local PC and ProtoNode.

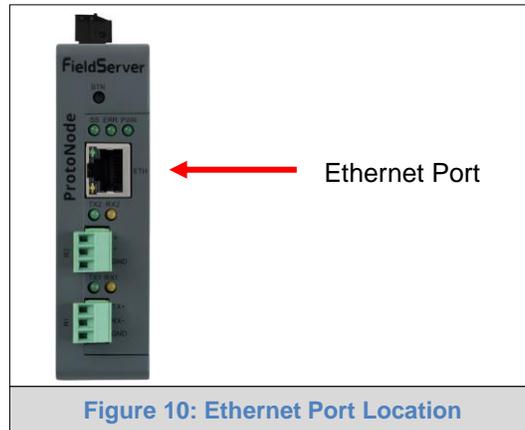


Figure 10: Ethernet Port Location

5.1.1 Changing the Subnet of the Connected PC

The default IP Address for the 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 10:

- Find the search field in the local computer's taskbar (usually to the right of the windows icon ) and type in "Control Panel".
- Click "Control Panel", click "Network and Internet" and then click "Network and Sharing Center".
- Click "Change adapter settings" on the left side of the window.
- Right-click on "Local Area Connection" and select "Properties" from the dropdown menu.
- Highlight **Internet Protocol Version 4 (TCP/IPv4)** and then click the Properties button.
- Select and enter a static IP Address on the same subnet. For example:

Use the following IP address:

IP address:	192 . 168 . 1 . 11
Subnet mask:	255 . 255 . 255 . 0
Default gateway:	. . .

- Click the Okay button to close the Internet Protocol window and the Close button to close the Ethernet Properties window.

6 CONFIGURE THE PROTONODE

6.1 Accessing the ProtoNode Web Configurator

- Navigate to the IP Address of the ProtoNode on the local PC by opening a web browser and entering the IP Address of the ProtoNode; the default Ethernet address is 192.168.1.24.

NOTE: If the IP Address of the ProtoNode has been changed, the IP Address can be discovered using the FS Toolbox utility. See Appendix A.1 for instructions.

6.2 Select Profile and Set Configuration Parameters

- On the Web Configurator page, the first configuration parameter is the Profile Selector.

The screenshot shows the SMC Web Configurator interface with the following configuration parameters:

Parameter Name	Parameter Description	Value
profile_select	Profile Selector Set to 1 for ACS800 Set to 2 for ACS880 Set to 3 for ACS880-CTDD	1
bac_device_id	BACnet Device Instance This sets the BACnet device instance. (1 - 4194303)	11
bac_ip_port	BACnet IP Port This sets the BACnet IP port of the Gateway. The default is 47808. (1 - 65535)	47808
bac_mac_addr	BACnet MSTP Mac Address This sets the BACnet MSTP MAC address. (1 - 127)	11
bac_baud_rate	BACnet MSTP Baud Rate This sets the BACnet MSTP baud rate. (9600/19200/38400/76800)	38400
bac_max_master	BACnet MSTP Max Master This sets the BACnet MSTP max master. (1 - 127)	127
bac_cov_option	BACnet COV This enables or disables COVs for the BACnet connection. Use COV_Enable to enable. Use COV_Disable to disable. (COV_Enable/COV_Disable)	COV_Enable
bac_bbmd_option	BACnet BBMD This enables BBMD on the BACnet IP connection. Use BBMD to enable. Use - to disable. The bdt.ini files also needs to be downloaded. (BBMD/-)	-

At the bottom of the interface, there are buttons for: HELP (?), Network Settings, System Restart, and Diagnostics & Debugging. The interface is powered by FieldServer.

Figure 11: Web Configurator Showing Profile Selector Parameter

- Select the profile by entering the appropriate number into the Profile Selector Value. Click the Submit button. Click the System Restart button to save the updated configuration.
- Ensure that all applicable parameters are entered for successful operation of the gateway. Find the legal value options for each parameter under the Parameter Description in parentheses.

6.3 Verify Device Communications

- Check that the port R1 TX1 and RX1 LEDs are rapidly flashing. See [Appendix A.4](#) for additional LED information and images.
- Confirm the software shows good communications without errors ([Appendix A.2](#)).

6.4 Ethernet Network: Setting IP Address for the Field Network

- Follow the steps outlined in [Section 6.1](#) to access the ProtoNode Web Configurator.
- To access the FS-GUI, click on the “Diagnostics & Debugging” button in the bottom right corner of the page.

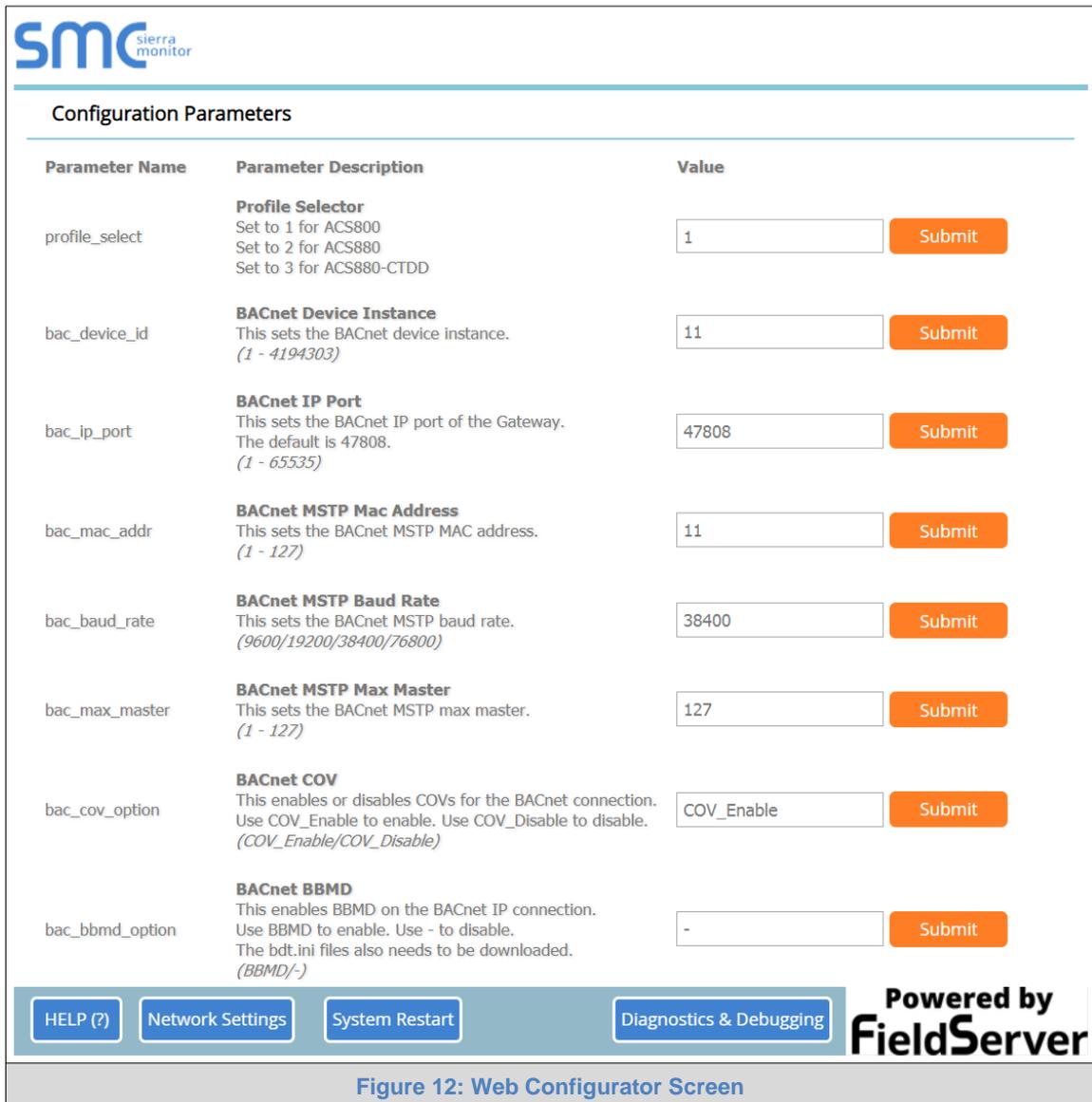


Figure 12: Web Configurator Screen

- From the FS-GUI landing page, click on “Setup” to expand the navigation tree and then select “Network Settings” to access the IP Settings menu. (Figure 13)

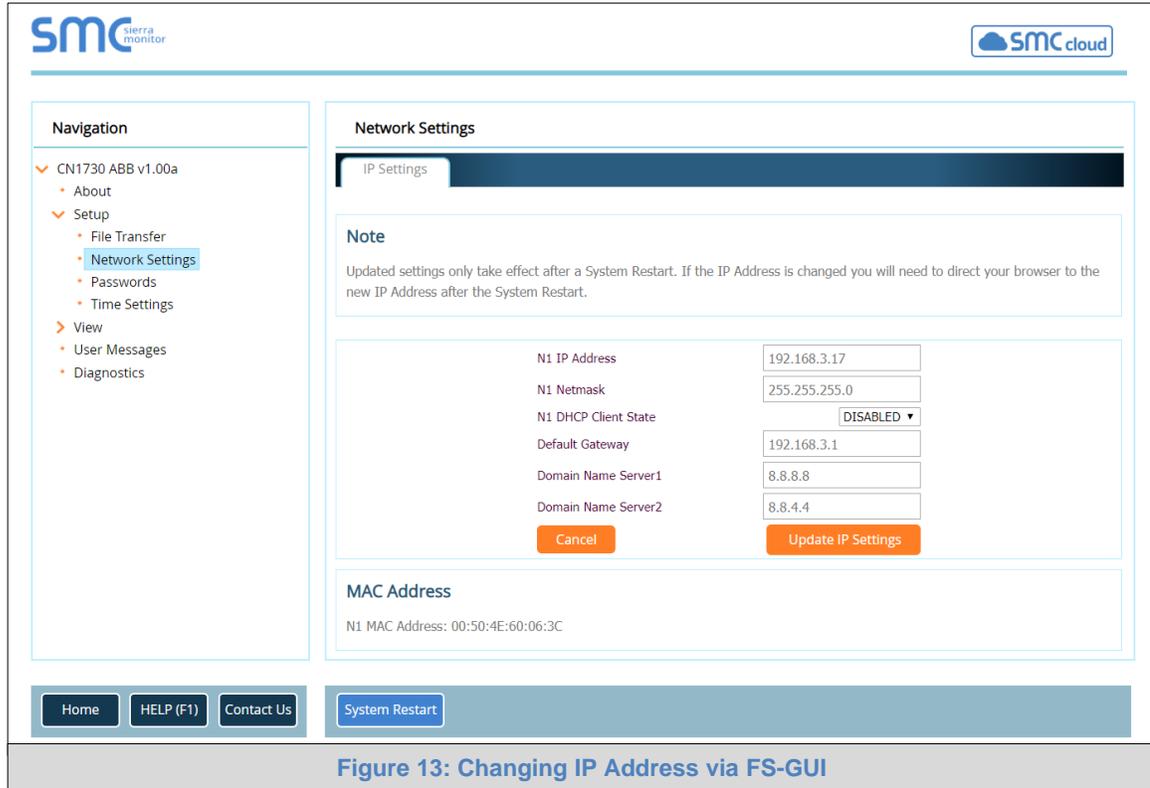


Figure 13: Changing IP Address via FS-GUI

- Modify the IP Address (N1 IP Address field) of the ProtoNode Ethernet port.
- If necessary, change the Netmask (N1 Netmask field).
- If necessary, change the IP Gateway (Default Gateway field).

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

- Click the “System Restart” button at the bottom of the page to apply changes and restart the ProtoNode.
- Unplug Ethernet cable from PC and connect it to the network switch or router.
- Record the IP Address assigned to the ProtoNode for future reference.

NOTE: The SMC Cloud button  (see Figure 13) allows users to connect to the SMC Cloud, MSA Safety’s device cloud solution for IIoT. The SMC Cloud enables secure remote connection to field devices through a FieldServer and its local applications for configuration, management, maintenance. For more information about the SMC Cloud, refer to the [SMC Cloud Start-up Guide](#).

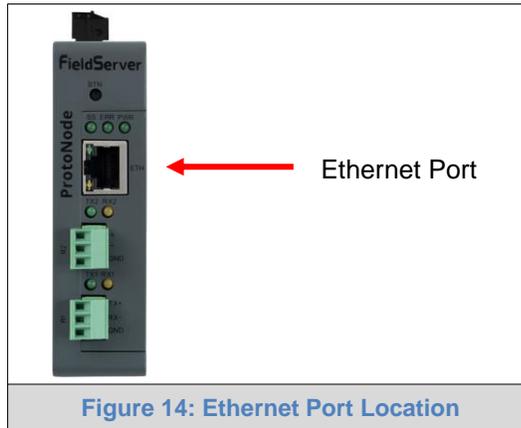
6.5 How to Start the Installation Over: Clearing Profiles

- Follow the steps outlined in **Section 6.1** to access the ProtoNode Web Configurator.
- At the bottom-left of the page, click the “Clear Profiles and Restart” button.
- Once restart is complete, all past profiles discovered and/or added via Web configurator are deleted. The unit can now be reinstalled.

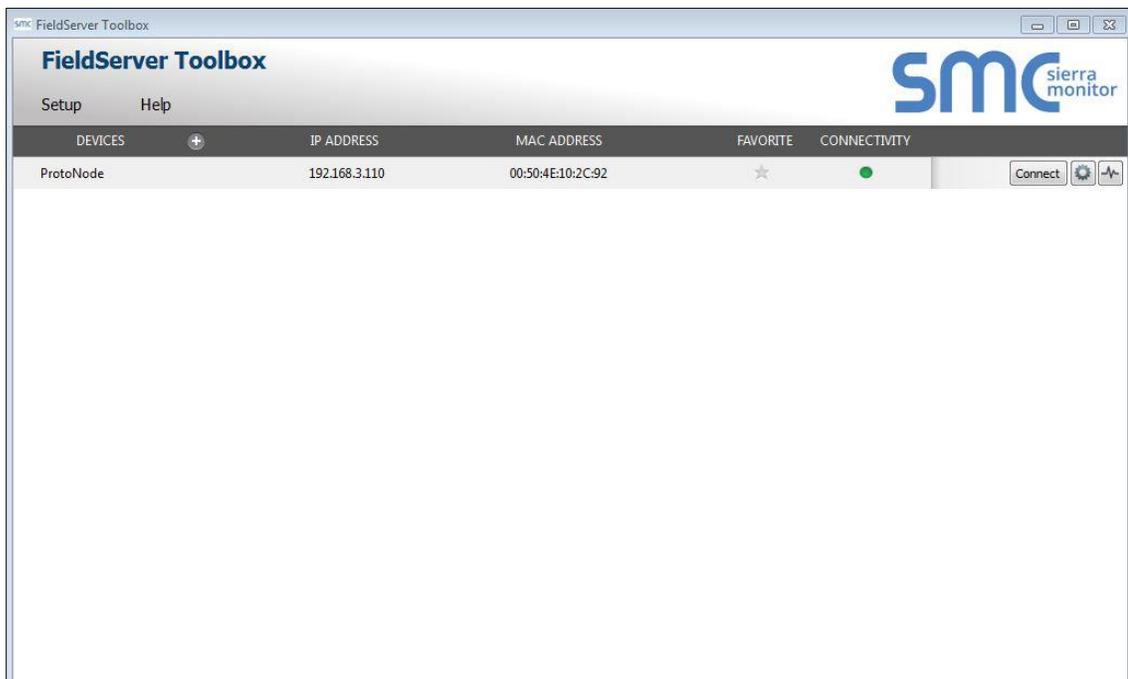
Appendix A Troubleshooting

Appendix A.1 Lost or Incorrect IP Address

- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor website's [Software Downloads](#).
- Extract the executable file and complete the installation.



- Connect a standard Cat-5 Ethernet cable between the user's PC and ProtoNode.
- Double click on the FS Toolbox Utility and click Discover Now on the splash page.
- Check for the IP Address of the desired gateway.



- If correcting the IP Address of the gateway: click the settings icon  on the same row as the gateway, then click Network Settings, change the IP Address and click Update IP Settings to save.

Appendix A.2 Viewing Diagnostic Information

- Type the IP Address of the ProtoNode into the web browser or use the FieldServer Toolbox to connect to the ProtoNode.
- Click on Diagnostics Button, then click on view, and then on connections.
- If there are any errors showing on the Connections page, refer to [Appendix A.3](#) to check the wiring and settings.

The screenshot shows the SMC web interface. On the left is a navigation sidebar with the following items:

- Navigation
 - ✓ CN1730 ABB v1.00a
 - About
 - Setup
 - ✓ View
 - ✓ Connections
 - R1 - MODBUS_RTU
 - R2 - BACnet_MSTP
 - N1 - BACnet_IP
 - Data Arrays
 - Nodes
 - Map Descriptors
 - User Messages
 - Diagnostics

The main content area is titled 'Connections' and has an 'Overview' tab selected. Below the tab is a table with the following data:

Index	Name	Tx Msg	Rx Msg	Tx Char	Rx Char	Errors
0	R1 - MODBUS_RTU	21	0	168	0	21
1	R2 - BACnet_MSTP	1	0	14	0	0
2	N1 - BACnet_IP	1	116	14	696	0

At the bottom of the interface, there are buttons for 'Home', 'HELP (F1)', 'Contact Us', and 'Reset Statistics'.

Figure 15: Error Messages Screen

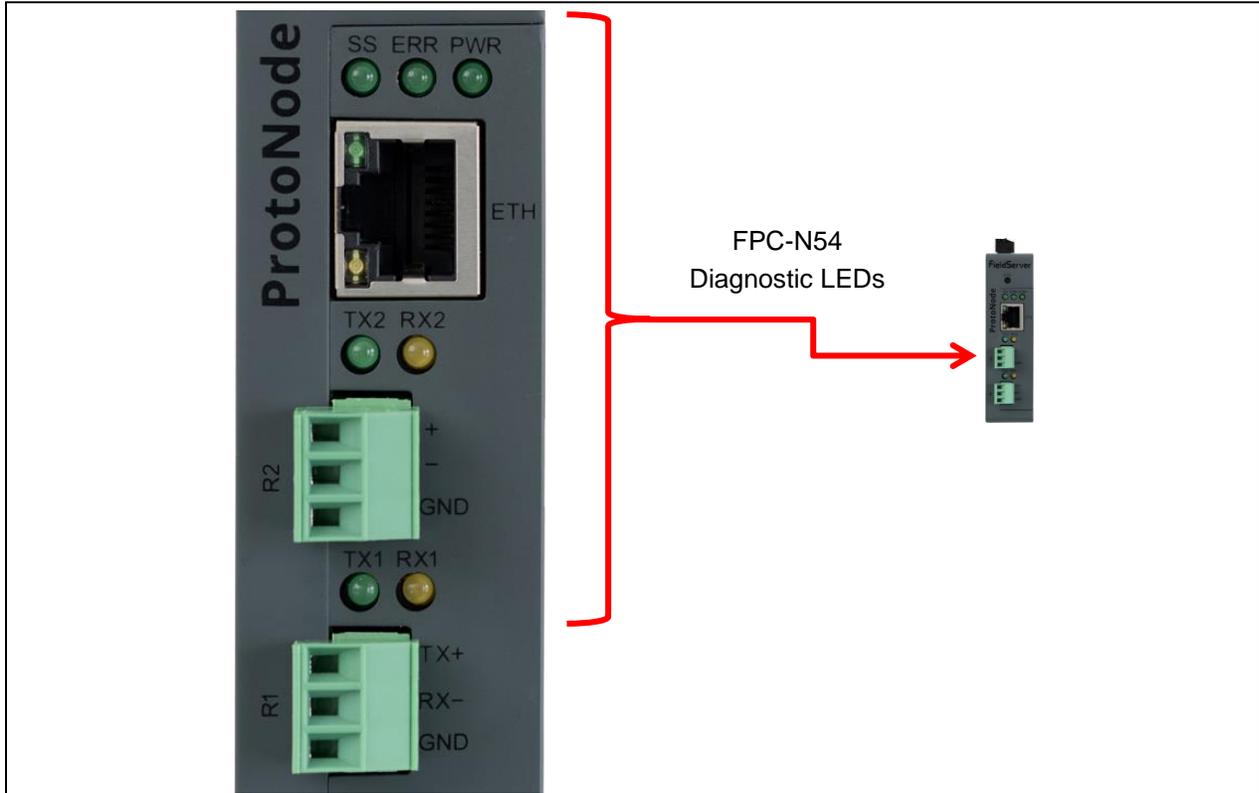
Appendix A.3 Checking Wiring and Settings

- No COMS on Modbus RTU side. If the Tx/Rx LEDs are not flashing rapidly then there is a COM issue. To fix this, check the following:
 - Visual observations of LEDs on ProtoNode ([Appendix A.4](#))
 - Check baud rate, parity, data bits, stop bits
 - Check Detector ID matches the correct device
 - Verify wiring
- Field COM problems:
 - Visual observations of LEDs on the ProtoNode ([Appendix A.4](#))
 - Verify IP Address setting
 - Verify wiring

NOTE: If the problem still exists, a Diagnostic Capture needs to be taken and sent to technical support. ([Appendix A.5](#))

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

See the diagram below for ProtoNode FPC-N54 LED Locations.



Tag	Description
SS	The SS LED will flash once a second to indicate that the bridge is in operation.
ERR	The SYS ERR LED will go on solid indicating there is a system error. If this occurs, immediately report the related “system error” shown in the error screen of the FS-GUI interface to support for evaluation.
PWR	This is the power light and should always show steady green when the unit is powered.
RX	The RX LED will flash when a message is received on the serial port on the 3-pin connector. If the serial port is not used, this LED is non-operational. RX1 applies to the R1 connection while RX2 applies to the R2 connection.
TX	The TX LED will flash when a message is sent on the serial port on the 3-pin connector. If the serial port is not used, this LED is non-operational. TX1 applies to the R1 connection while TX2 applies to the R2 connection.

Figure 16: Diagnostic LEDs

Appendix A.5 Take a FieldServer Diagnostic Capture

When there is a problem on-site that cannot easily be resolved, perform a diagnostic capture before contacting support so that support can quickly solve the problem. There are two methods for taking diagnostic captures:

- **FieldServer Toolbox:**

This method requires installation of the FS Toolbox program. A FS Toolbox diagnostic capture takes a snapshot of the loaded configuration files and a log of all the communications on the serial ports over a specified period of time. If the problem occurs over an Ethernet connection, then take a Wire Shark capture.

- **Gateway's FS-GUI Page:**

This method doesn't require downloading software. The diagnostic capture utilities are embedded in the FS-GUI web interface. Starting a diagnostic capture takes a snapshot of the loaded configuration files and a log of all the communications over a specified period of time. This works for both serial and Ethernet connections.

NOTE: The information in the zipped files contains everything support needs to quickly resolve problems that occur on-site.

Appendix A.5.1 Using the FieldServer Toolbox

Once the Diagnostic Capture is complete, email it to technical support. The Diagnostic Capture will accelerate diagnosis of the problem.

- Ensure that FieldServer Toolbox is loaded onto the local PC. Otherwise, download the FieldServer-Toolbox.zip via the Sierra Monitor website's [Software Downloads](#).
- Extract the executable file and complete the installation.

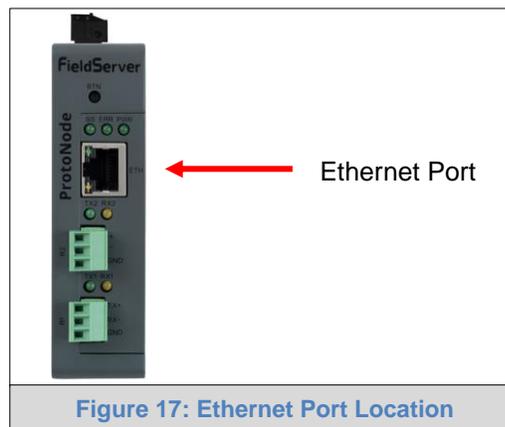
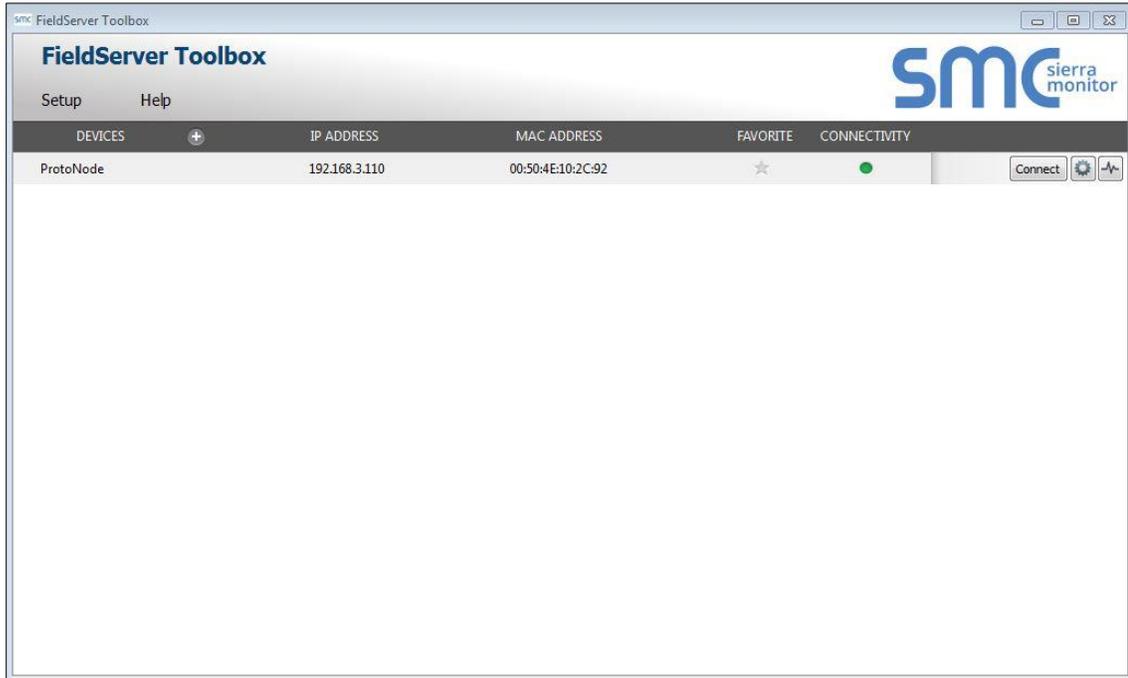


Figure 17: Ethernet Port Location

- Connect a standard Cat-5 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

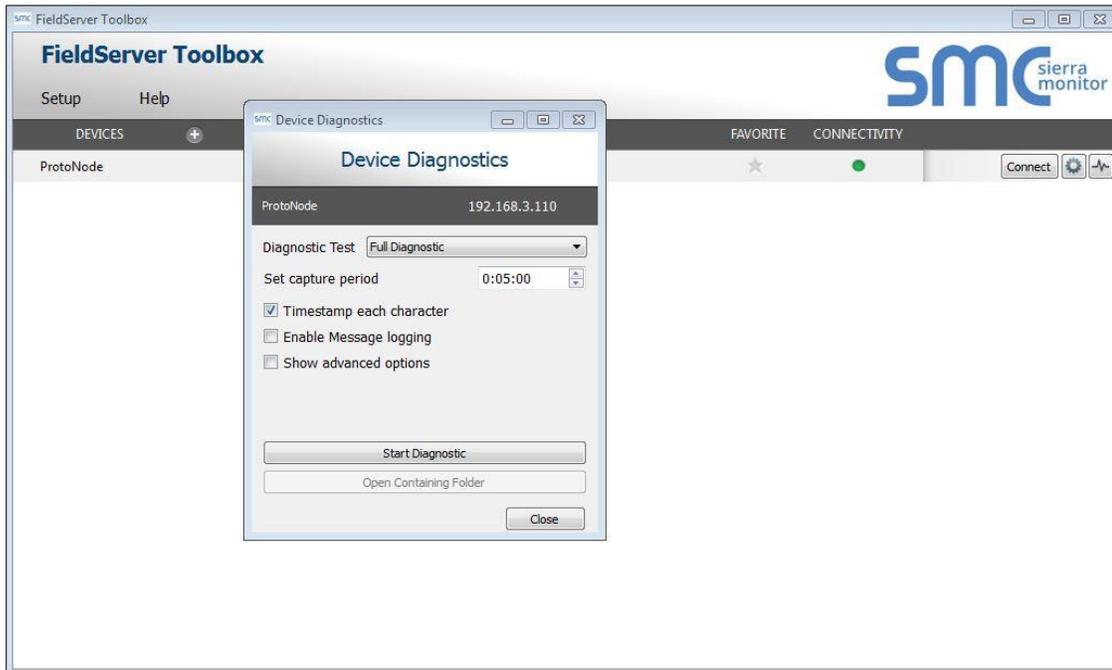


- Ensure “Full Diagnostic” is selected (this is the default)

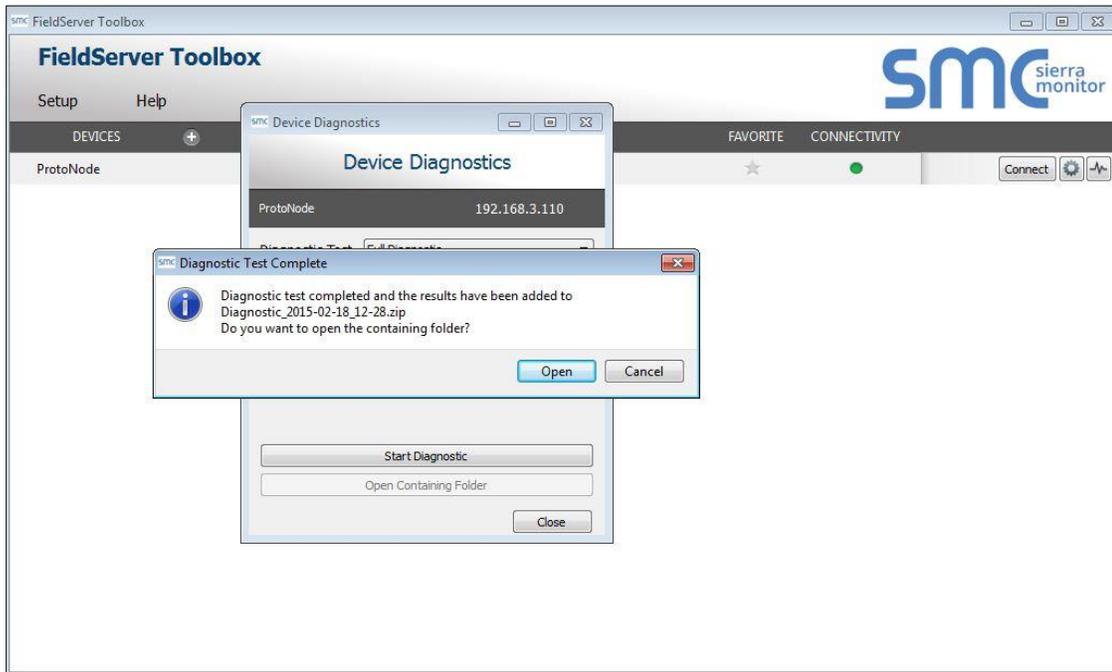


NOTE: If desired, the default capture period can be changed.

- Click on “Start Diagnostic”



- Wait for Capture period to finish, then the Diagnostic Test Complete window will appear
- **Step 2: Send Log**
 - Once the Diagnostic test is complete, a .zip file is saved on the PC



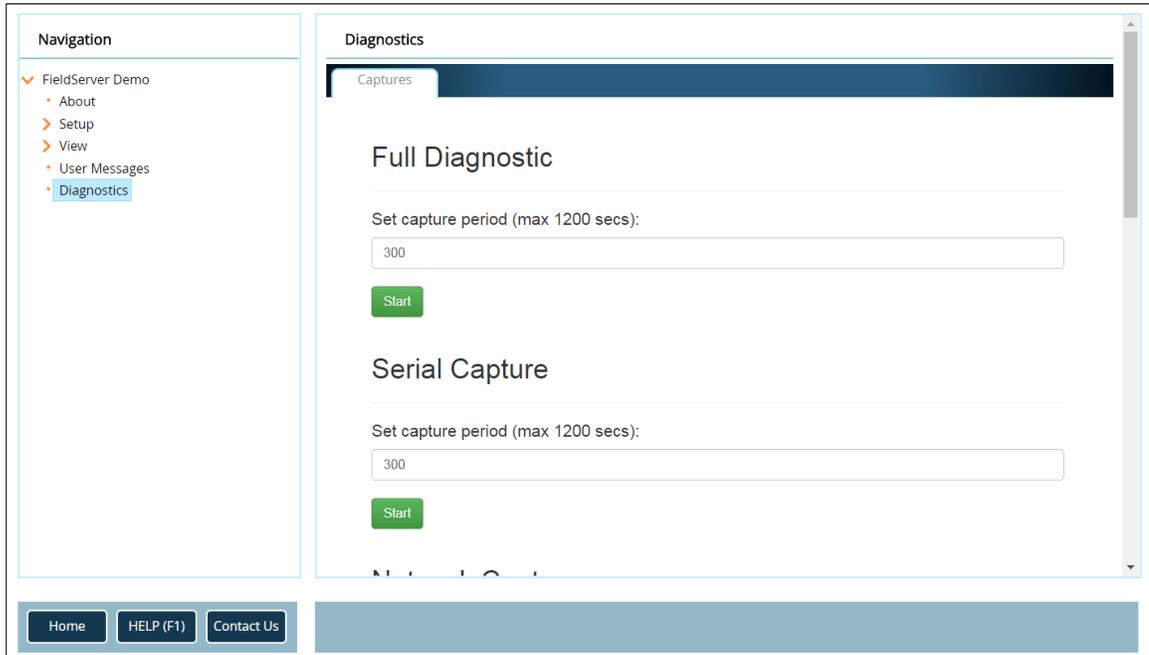
- Choose “Open” to launch explorer and have it point directly at the correct folder
- Email the diagnostic zip file to technical support.



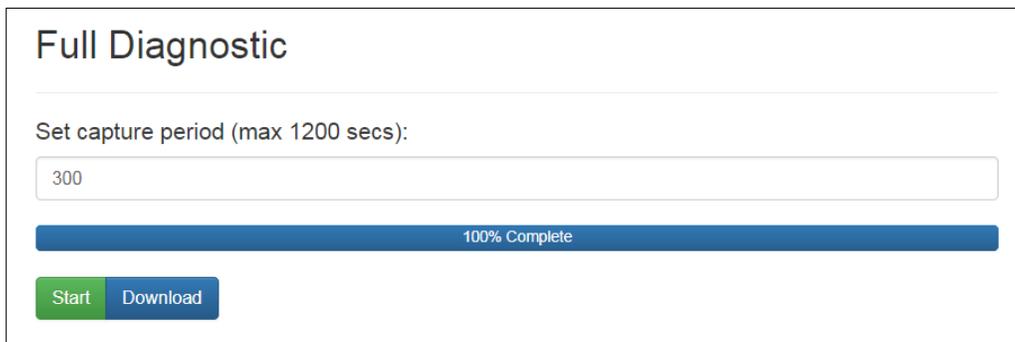
Appendix A.5.2 Using FS-GUI

Completing a Diagnostic Capture through the FieldServer allows network connections (such as Ethernet and Wi-Fi) to be captured. **Once the Diagnostic Capture is complete, email it to technical support. The Diagnostic Capture will accelerate diagnosis of the problem.**

- Open the FieldServer FS-GUI page.
- Click on Diagnostics in the Navigation panel.



- Go to Full Diagnostic and select the capture period.
- Click the Start button under the Full Diagnostic heading to start the capture.
 - When the capture period is finished, a Download button will appear next to the Start button



- Click Download for the capture to be downloaded to the local PC.
- Email the diagnostic zip file to technical support.

NOTE: Diagnostic captures of BACnet MS/TP communication are output in a “.PCAP” file extension which is compatible with Wireshark.

Appendix B Additional Information

Appendix B.1 Updating Firmware

To load a new version of the firmware, follow these instructions:

1. Extract and save the new file onto the local PC.
2. Open a web browser and type the IP Address of the FieldServer in the address bar.
 - Default IP Address is 192.168.1.24
 - Use the FS Toolbox utility if the IP Address is unknown ([Appendix A.1](#))
3. Click on the “Diagnostics & Debugging” button.
4. In the Navigation Tree on the left-hand side, do the following:
 - a. Click on “Setup”
 - b. Click on “File Transfer”
 - c. Click on the “General” tab
5. In the General tab, click on “Choose Files” and select the web.img file extracted in step 1.
6. Click on the orange “Submit” button.
7. When the download is complete, click on the “System Restart” button.

Appendix B.2 Securing ProtoNode with Passwords

Access to the ProtoNode can be restricted by enabling a password on the FS-GUI Passwords page – click Setup and then Passwords in the navigation panel. 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 needs to be a minimum of eight characters and **is case sensitive**.

If the password is lost, click cancel on the password authentication popup window, and email the password recovery token to technical support to receive a temporary password from the customer support team. Access the ProtoNode to set a new password.

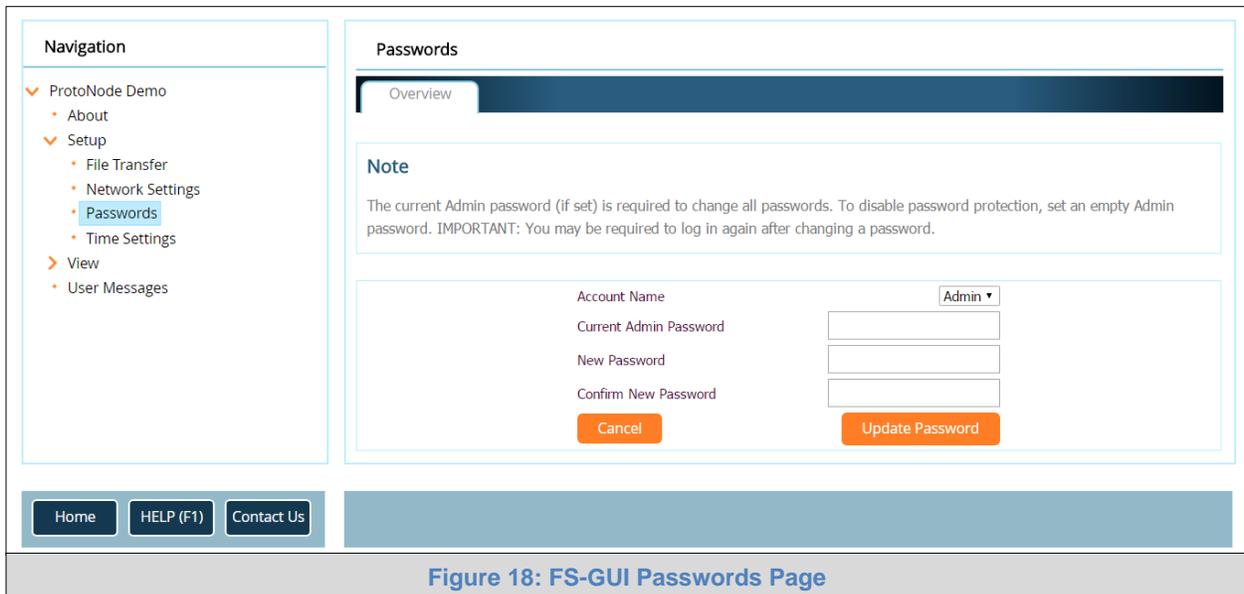


Figure 18: FS-GUI Passwords Page

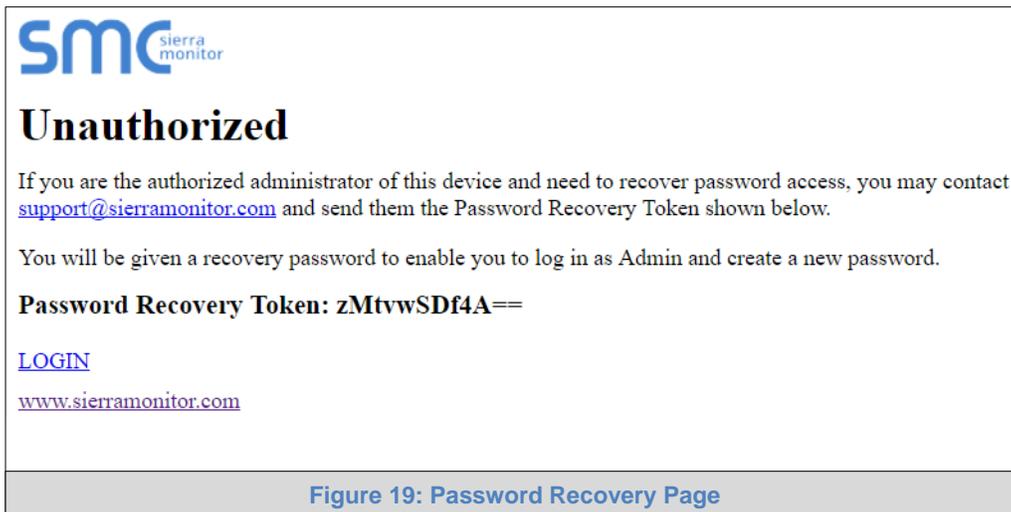


Figure 19: Password Recovery Page

Appendix B.3 Factory Reset Instructions

For instructions on how to reset a FieldServer back to its factory released state, see [ENOTE - FieldServer Next Gen Recovery](#).

Appendix B.4 Internet Browsers Not Supported

- Internet Explorer

NOTE: Internet Explorer is no longer supported as recommended by Microsoft. Please use the latest version of Chrome, Firefox or Edge.

Appendix B.5 Mounting

The ProtoNode can be mounted using the DIN rail mounting bracket on the back of the unit.



Appendix B.6 Physical Dimension Drawing

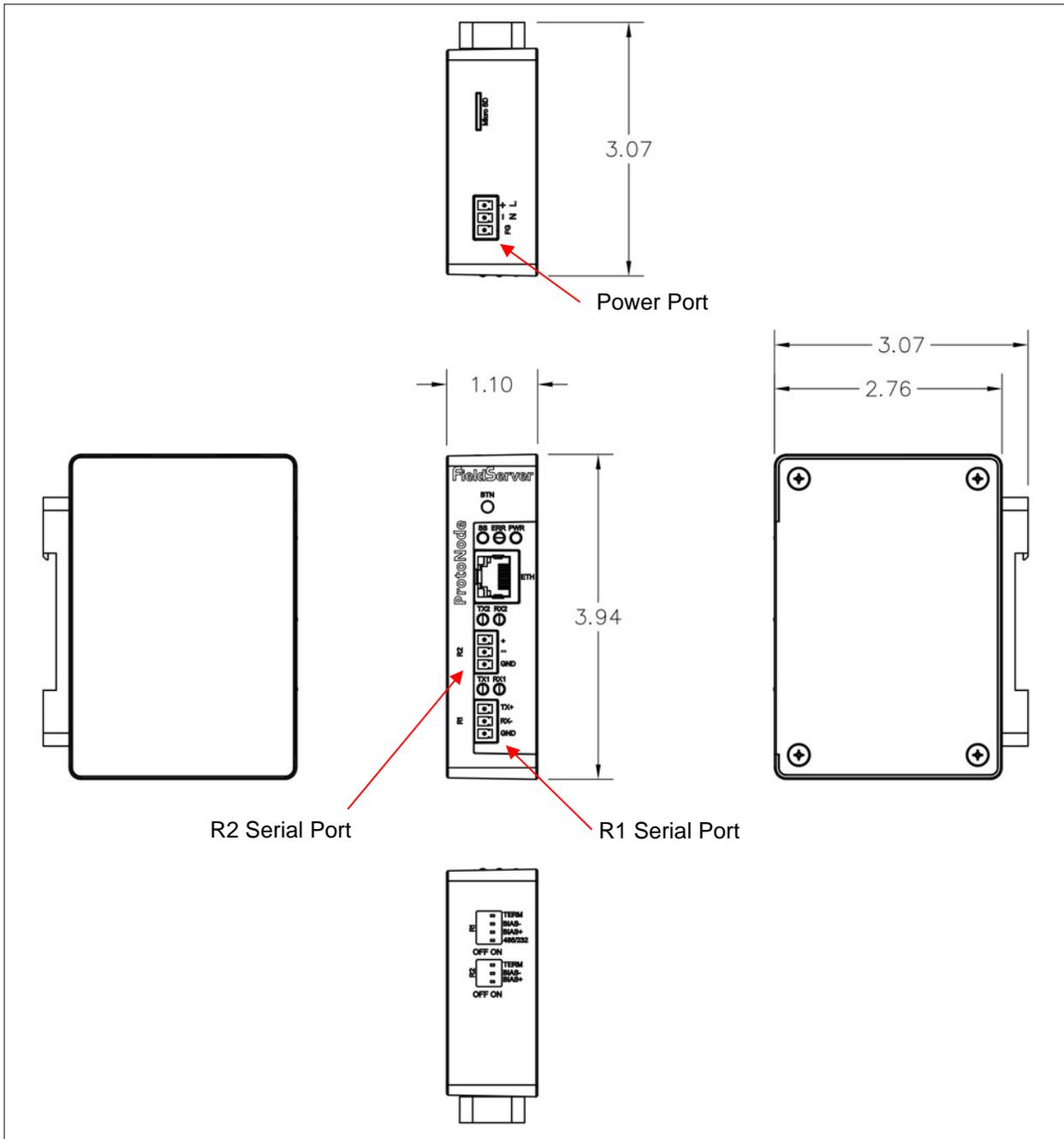


Figure 21: ProtoNode FPC-N54 Dimensions

Appendix B.7 Drive Specific QuickStart Guides

Appendix B.7.1 ACS800 Drive Setup

The instructions below explain how to setup a FPC-N54 BACnet gateway to connect to a ACS800 drive that has standard firmware installed. The ACS800 drive can be a 6-pulse or active front end version. This BACnet communication solution allows basic monitoring and/or control of the drive over BACnet. If motor rotation direction control is required, setup run/stop/direction control via hardwire.

If the FPC-N54 gateway comes packaged with the drive, connections may already be setup for power and serial Modbus communication with the drive. The FPC-N54 can be powered through the drive or from a remote power source. See **Section 4.5** for input power source details.

Review the drive and gateway terminal connections diagram (**Figure 22**). The ACS800 requires a RMBA-01 module for modbus communication to the FPC-N54 gateway. Review the RMBA-01 user's manual for installation help if needed. Verify the wire on B(+) terminal 2 on the RMBA-01 card connects to the "+" terminal on the R1 port on the gateway. Verify the wire on A(-) terminal 1 on the RMBA-01 card connects to "-" terminal on the R1 port on the gateway. Verify the wire on terminal 3 GND on the RMBA-01 card connects to the "GND" terminal on the R1 port on the gateway. For further clarification of the connections to the individual ports of the FPC-N54, see the following: **Figure 4**, **Figure 5**, **Figure 9**, **Figure 10** and **Figure 22**.

Appendix B.7.1.1 ACS800 Drive Wiring

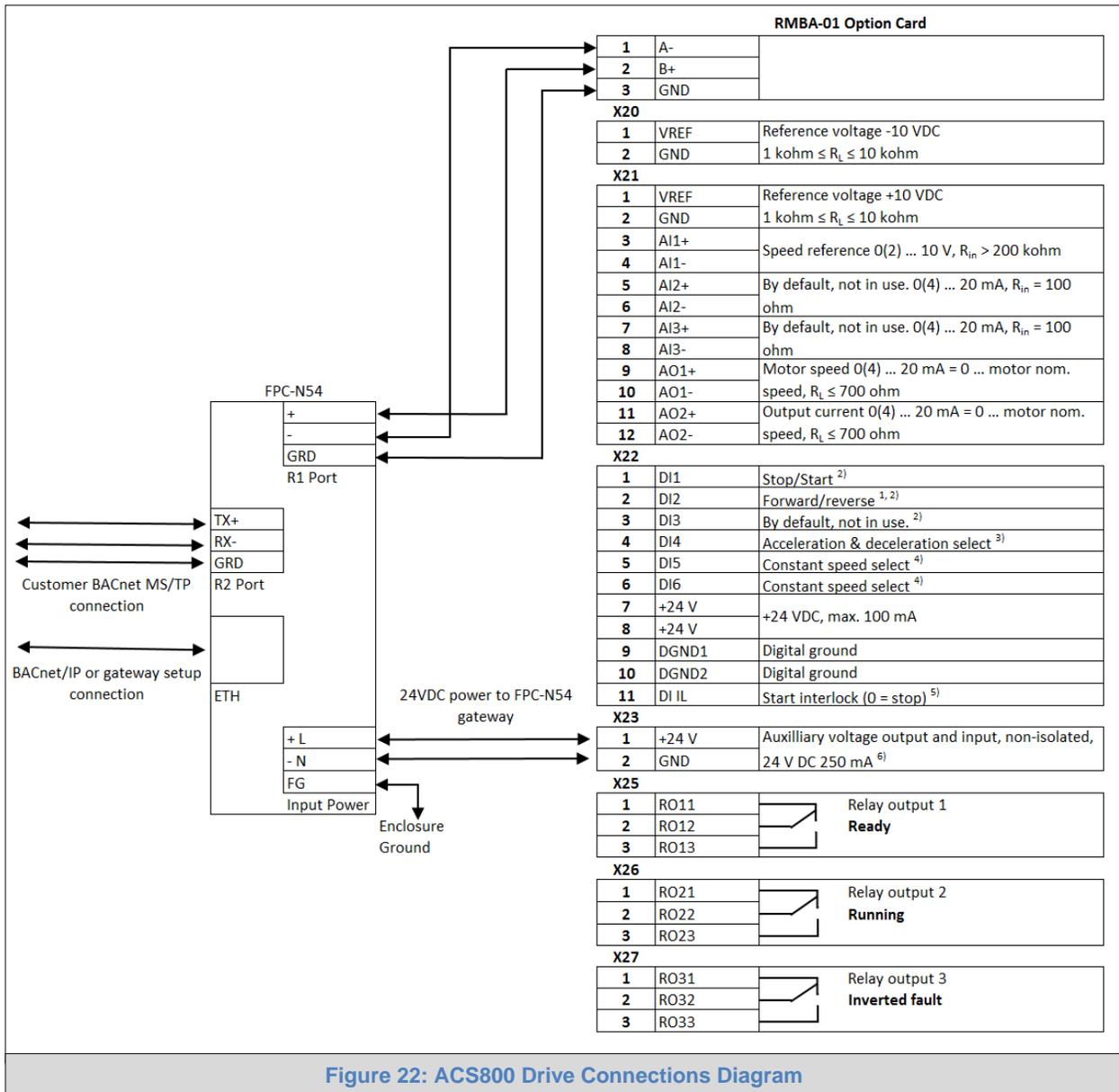


Figure 22: ACS800 Drive Connections Diagram

Appendix B.7.1.2 ACS800 Drive Setup Instructions

1. Navigate to parameter group 52 (Embedded Fieldbus) and make the following adjustments to these parameters:

9802 = STD Modbus

52.01 = 1

52.02 = 19.2 kbps

52.03 = NONE1STOPBIT

Leave all other group 52 parameters at their default settings. These parameter adjustments allow the drive to communicate to the gateway. Once the above settings are entered, power must be cycled on the drive to activate them. Make sure the drive control panel goes blank before re-applying power.

2. **If BACnet is only used to monitor the drive, skip this step.**

To control the drive’s run/stop and/or speed over BACnet, use the following parameters to setup the ACS800.

Run/Stop control over BACnet setup:

Parameter 10.01 (EXT1 STRT/STP/DIR) = [10] COMM.CW

Frequency/Speed Control over BACnet setup:

Parameter 11.03 (EXT REF1 SELECT) = [20] COMM.REF

NOTE: Consult ABB technical support for additional information.

3. Follow instructions in **Section 6** of this document to configure the FPC-N54 gateway to communicate with the BACnet network. Make sure the profile selected is the ACS800 option value “1” in the web configurator (**Section 6.2**).

profile_select	<p>Profile Selector Set to 1 for ACS800 Set to 2 for ACS880 Set to 3 for ACS880-CTDD</p>	<input type="text" value="1"/>	<input type="button" value="Submit"/>
----------------	--	--------------------------------	---------------------------------------

Appendix B.7.1.3 ACS800 Modbus RTU Mappings to BACnet

Object ID	Object Name
AV1	REFERENCE 1 COMMAND
AV2	REFERENCE 2 COMMAND
AV3	REFERNECE 4 COMMAND
AV4	REFERENCE 5 COMMAND
AV5	ACCEL TIME
AV6	DECEL TIME
AV7	PID GAIN
AV8	PID I TIME
AI1	MOTOR SPEED
AI2	FREQUENCY
AI3	CURRENT
AI4	DC BUS VOLTAGE
AI5	MAIN VOLTAGE
AI6	OUTPUT VOLTAGE
AI7	EXTERNAL REF 1
AI8	EXTERNAL REF 2
AI9	ACTIVE CONTROL LOCATION
AI10	RUNTIME
AI11	KWN
AI12	AI 1 STATUS
AI13	AI 2 STAUTS
AI14	AI 3 STATUS
AI15	AO 1 STATUS
AI16	AO 2 STATUS
AI17	PID 1 FEEDBACK
AI18	PID 2 FEEDBACK
AI19	PID DEVIATION
AI20	HEATSINK TEMPERATURE
AI21	POWER
BV1	START/STOP
BV2	ALARM RESET
BV3	EXT1/EXT2 SELECT
BV4	RO1 COMMAND
BV5	RO2 COMMAND
BV6	RO3 COMMAND
BI1	READY
BI2	RUN ENABLED
BI3	TRIPPED
BI4	ALARM
BI5	DRV AT SETPOINT
BI6	EXT1/EXT2 MODE
BI7	DI 1 STATUS
BI8	DI 2 STATUS
BI9	DI 3 STATUS
BI10	DI 4 STATUS
BI11	DI 5 STATUS
BI12	DI 6 STATUS
BI13	RO1 STATUS
BI14	RO2 STATUS
BI15	RO3 STATUS

Appendix B.7.2 ACS880 Drive Setup

The instructions below explain how to setup a FPC-N54 BACnet gateway to connect to a ACS880 drive that has standard firmware installed. The ACS880 drive can be a 6-pulse or active front end version. This BACnet communication solution allows basic monitoring and/or control of the drive over BACnet. If motor rotation direction control is required, this must be done via hardwire to a digital input, as direction control is not available over BACnet.

If the FPC-N54 gateway comes packaged with the drive, connections may already be setup for power and serial Modbus communication with the drive. The FPC-N54 can be powered through the drive or from a remote power source. See **Section 4.5** for input power source details.

Review the drive and gateway terminal connections diagram (**Figure 23**). Verify the wire on B(+) terminal on the drive connects to the "+" terminal on the R1 port on the gateway. Verify the wire on A(-) terminal on the drive connects to "-" terminal on the R1 port on the gateway. Verify the wire on terminal BGND on the drive connects to the "GND" terminal on the R1 port on the gateway. For further clarification of the connections to the individual ports of the FPC-N54, see the following: **Figure 4**, **Figure 5**, **Figure 9**, **Figure 10** and **Figure 23**.

Appendix B.7.2.1 ACS880 Drive Wiring

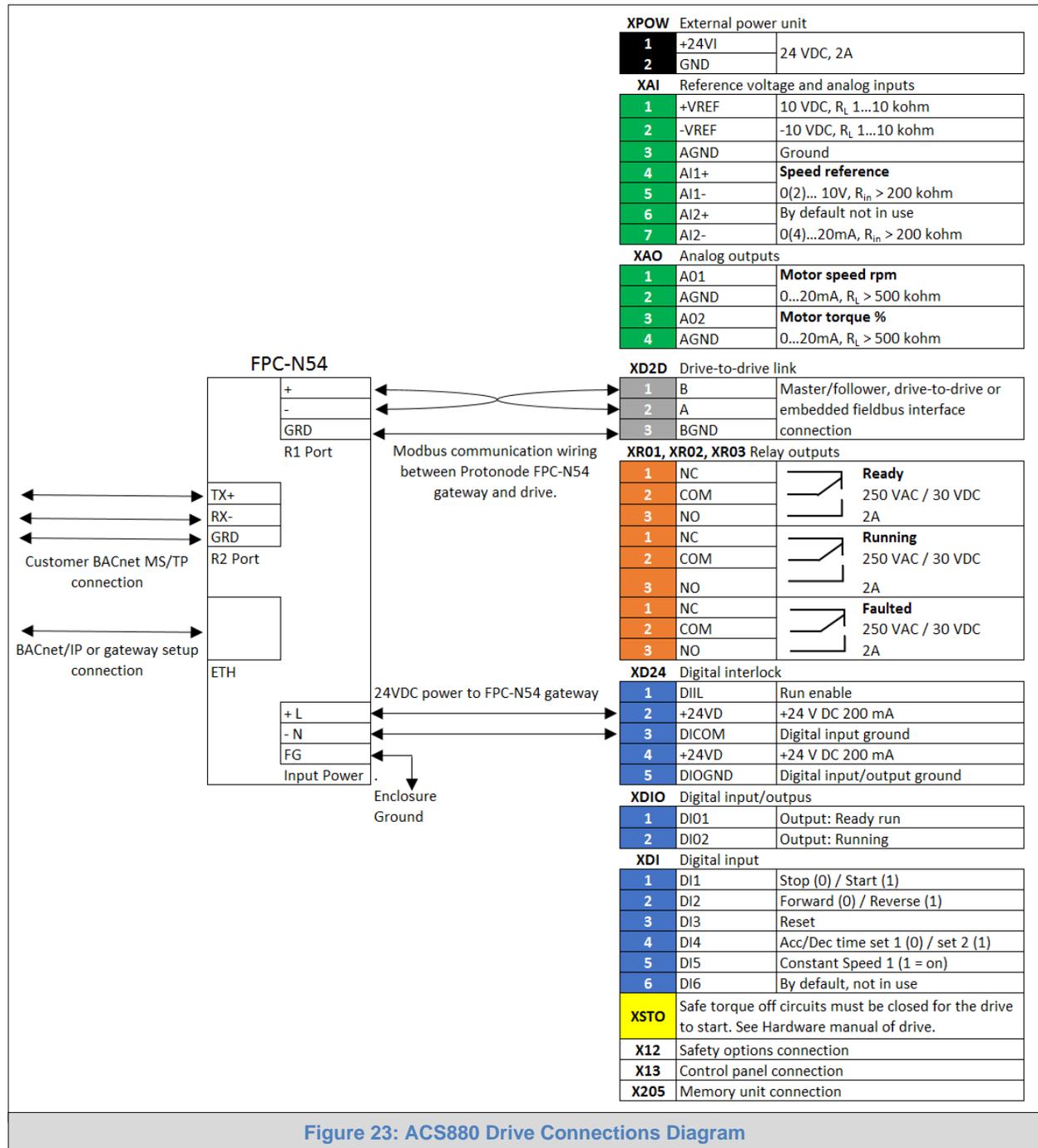


Figure 23: ACS880 Drive Connections Diagram

Appendix B.7.2.2 ACS880 Drive Setup Instructions

1. Navigate to parameter group 58 (Embedded Fieldbus) and make the following adjustments to these parameters:

58.01 = Modbus RTU

58.03 = 1

58.04 = 19.2 kbps

58.05 = 8 None 1

All other group 58 parameters should be left at their default setting. These parameter adjustments allow the drive to communicate to the gateway.

Remote	ACS880	0.0 Hz
58 Embedded fieldbus		
58.01 Protocol enable	Modbus RTU	
58.02 Protocol ID	1002 hex	
58.03 Node address	1	
58.04 Baud rate	19.2 kbps	
58.05 Parity	8 NONE 1	
Back	04:05 p.m.	Edit

Once the above settings are entered, power must be cycled on the drive to activate them. Make sure the drive control panel goes blank before re-applying power.

2. **If BACnet is only used to monitor the drive, skip all of step 2.**

To control the drive's run/stop and/or speed over BACnet, update the following settings on the ACS880.

- a. **Setup Run/Stop control over BACnet.**

Remote	ACS880	0.0 Hz
20.01 Ext1 commands		
[14] Embedded fieldbus		
[15] M/F link		
[21] Application Program		
[22] ATF		
[16] DDCS controller		
Cancel	04:04 p.m.	Save

- b. **Setup Frequency/Speed Control over BACnet by checking the settings below.**

- i. Identify the Motor control setup being used: DTC or Scalar mode

Remote	ACS880	0.0 Hz
99.04 Motor control mode		
[0] DTC		
[1] Scalar		
Cancel	04:05 p.m.	Save

- ii. If using Scalar mode, parameter 28.11 needs to be set to “EFB ref1”

Remote	ACS880	0.0 Hz
28.11 Frequency ref1 source		
[8]	EFB ref1	
[9]	EFB ref2	
[10]	DDCS ctrl ref1	
[11]	DDCS ctrl ref2	
[12]	M/F reference 1	
Cancel	04:04 p.m.	Save

- iii. If using DTC mode, parameter 22.11 needs to be adjusted to “EFB ref1”

Remote	ACS880	0.0 Hz
22.11 Speed ref1 source		
[8]	EFB ref1	
[9]	EFB ref2	
[10]	DDCS ctrl ref1	
[11]	DDCS ctrl ref2	
[12]	M/F reference 1	
Cancel	04:05 p.m.	Save

NOTE: Consult ABB technical support for additional information.

- 3. Follow instructions in **Section 6** of this document to configure the FPC-N54 gateway to communicate with the BACnet network. Make sure the profile selected is the ACS880 option value “2” in the web configurator (**Section 6.2**).

profile_select	Profile Selector		
	Set to 1 for ACS800		
	Set to 2 for ACS880		
	Set to 3 for ACS880-CTDD		
		<input type="text" value="2"/>	<input type="button" value="Submit"/>

Appendix B.7.2.3 ACS880 Modbus RTU Mapping to BACnet

Object Name	BACnet Object ID	Present Value Access Type (R=Read only, W=Writable, C=Commendable)	Notes	Modbus Register List: 16 or 32 bit Modbus register and bit(s)
Binary Inputs				
BI0	RO1-Monitor	R	Value 1=ON, Value 0=OFF	41021 bit 0
BI1	RO2-Monitor	R	Value 1=ON, Value 0=OFF	41021 bit 1
BI2	RO3-Monitor	R	Value 1=ON, Value 0=OFF	41021 bit 2
BI6	DI1-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 0
BI7	DI2-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 1
BI8	DI3-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 2
BI9	DI4-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 3
BI10	DI5-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 4
BI11	DI6-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 5
BI12	DIIL-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 15
Binary Values				
BV0	RUN-STOP MONITOR	R	1=Drive has been started	40616; Drive Status Word 1 Bit 5
BV1	Direction-Monitor	R	Over BACnet returned Value of 0=Forward, 1=Reverse	40619, bit 1=Forward, Bit 2=Reverse
BV2	OK-Fault-Monitor	R	Over BACnet 0=NO Fault; 1=Fault	40611, Main Status Word Bit 3
BV4	Local-Remote	R	1=Remote, 0=Local Control	40611 Main Status word bit 9
BV5	Warning-Monitor	R	1=Warning; 0=No warning	40611 Main Status word bit 7
BV7	Ready-Monitor	R	1=Drive is in a Ready to start state, 0=Drive is not ready to start	40611 Main Status word bit 0
BV8	At-Setpoint-Monitor	R	Over BACnet 0=NOT at Setpoint; 1=At setpoint	40004 Status word bit 8
BV9	Enabled-Monitor	R	0=Not Enabled; 1=Enabled	40616 bit 0
BV10	Run-Stop Command	C	1=Run, 0=Stop	40001
Analog Inputs				
AI0	AI1-Monitor	R	0-100% value of drive input AI1	41217, 41218,41211
AI1	AI2-Monitor	R	0-100% value of drive input AI2	41227, 41228,41221
Analog Values				
AV0	Output-RPM	R	RPM	420202
AV1	Output-Frequency	R	-500, 500Hz	420212
AV2	DC-Bus-Voltage	R	VDC	40111
AV3	Output-Voltage	R	VAC	40113
AV4	Output-Current	R	A	420214
AV6	Output-Power	R	kW or HP	420228
AV7	Heatsink-Temperature	R	Estimated drive temperature in percent of fault limit. The actual trip temperature varies according to the type of the drive. 0.0%=0 °C (32 °F) 94% approx.=Warning limit 100.0%=Fault limit	40511
AV9	Inverter-kW-hours	R	kWh	420240
AV14	Running days	R	Days;	40502
AV16	Input-Reference-1	C	0 to 100%	40002
AV18	Active-Fault-Code	R	Provides a Hexa Decimal number for the fault code	40401

Appendix B.7.3 ACS880-CTDD Drive Setup

The ACS880 with Cooling Tower Direct Drive firmware (CTDD) is used on cooling tower applications where the motor is directly connected to the fan blades. The ACS880-CTDD has special firmware packaged loaded into the ACS880 drive to allow it to control a permanent magnet motor used in cooling tower applications. Potential plus code(s) that indicate the special firmware loading package in the drive part number are: +N5350. The following setup instructions are for the cooling tower direct drives only.

The FPC-N54 gateway can be setup to monitor and/or control the ACS880-CTDD drive over BACnet.

If the FPC-N54 gateway comes packaged with the drive, connections may already be setup for power and serial Modbus communication with the drive. The FPC-N54 can be powered through the drive or from a remote power source. See **Section 4.5** for input power source details.

Review the drive and gateway terminal connections diagram (**Figure 24**). Verify the drive's B(+) terminal wire connects to the "+" terminal on the R1 port of the gateway. Verify the drive's A(-) terminal wire connects to the "-" terminal on the R1 port of the gateway. Verify the drive's terminal BGND wire connects to the "GND" terminal on the R1 port of the gateway. For further clarification of the connections to the individual ports of the FPC-N54, see the following: **Figure 4**, **Figure 5**, **Figure 9**, **Figure 10** and **Figure 24**.

Appendix B.7.3.1 ACS880-CTDD Drive Wiring

Specific terminal names are for 76.03 = 4. All other control and safeties should be wired per the ACS880-CTDD manual.

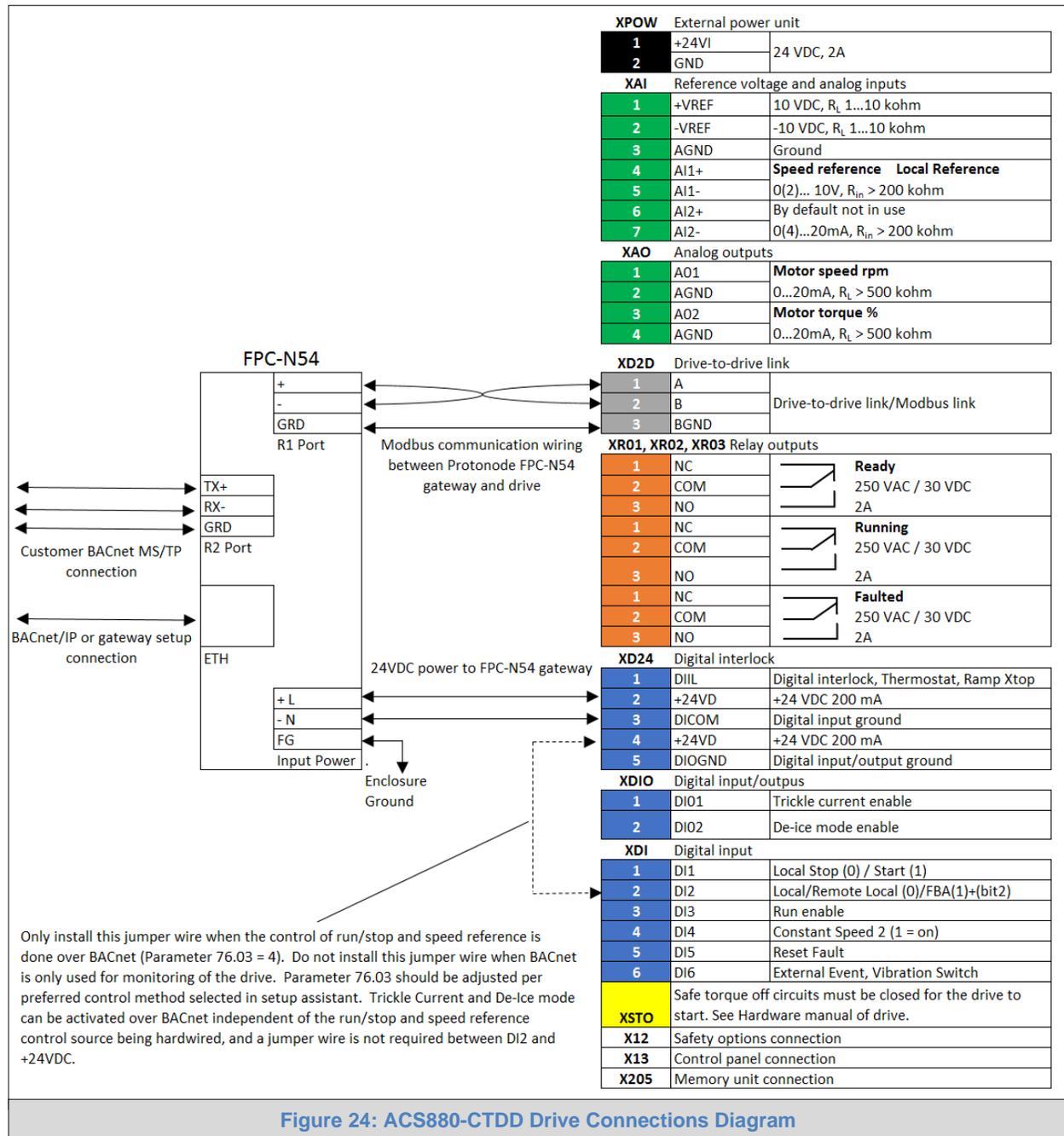
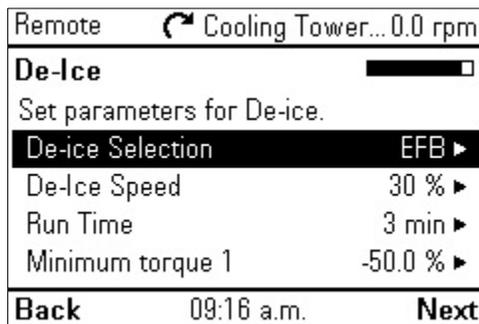
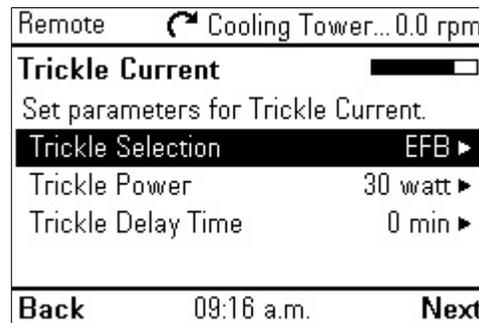
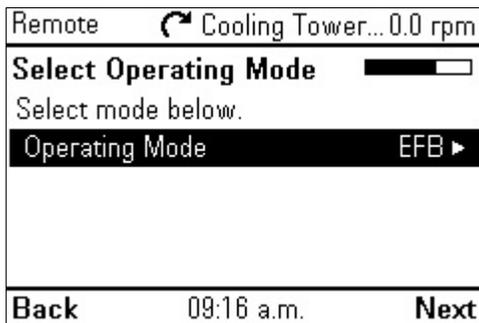


Figure 24: ACS880-CTDD Drive Connections Diagram

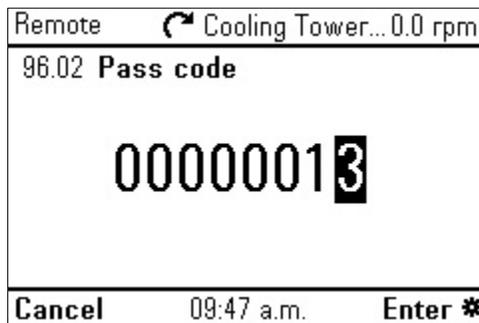
Appendix B.7.3.2 ACS880-CTDD Drive Setup Instructions

Before completing the startup assistant on the drive, determine if the BACnet connection is being used just for monitoring or also to remotely control the drive. If remote control of the drive over BACnet is needed, both run/stop and speed reference are available. As shown in Figure 24 a wire connecting terminals +24VDC and DI2 on the drive must be connected in order for the drive to receive run/stop and speed commands over BACnet. For ACS880-CTDD, it isn't possible to separate the run/stop and speed reference commands, so that one is hardwire and the other is over BACnet. De-Ice mode and trickle current can be setup to be activated over BACnet, even if run/stop and speed reference commands weren't setup to work over BACnet.

1. First complete the standard drive startup assistant under the main menu. The below screen shots show the functions of run/stop and speed reference, trickle current, and De-ice mode set to "EFB" (Embedded Fieldbus) for the functions to be controlled over BACnet.



2. Go to parameter 96.02 (the drive) and enter in the code "13" to unlock access to parameter group 58 (EFB setup parameters).



3. Navigate to parameter group 58 (Embedded Fieldbus) and make the following adjustments to these parameters:

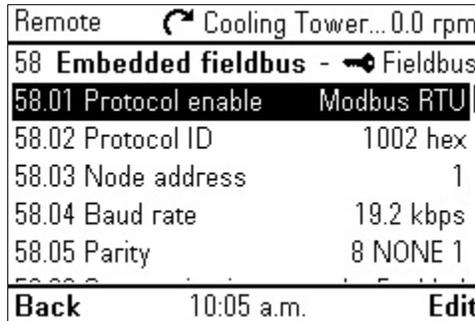
58.01 = Modbus RTU

58.03 = 1

58.04 = 19.2 kbps

58.05 = 8 None 1

All other group 58 parameters should be left at their default setting. These parameter adjustments allow the drive to communicate to the gateway.



Once the above settings are entered, power must be cycled on the drive to activate them. Make sure the drive control panel goes blank before re-applying power.

4. Follow instructions in **Section 6** of this document to setup the FPC-N54 gateway to communicate with the BACnet network. Make sure the profile selected is ACS880-CTDD option value "3" in the web configurator (**Section 6.2**).

profile_select

Profile Selector
 Set to 1 for ACS800
 Set to 2 for ACS880
 Set to 3 for ACS880-CTDD

Appendix B.7.3.3 ACS880-CTDD Modbus RTU Mappings to BACnet

Object Name	BACnet Object ID	Present Value Access Type (R=Read only, W=Writable, C=Commendable)	Notes	Modbus Register List: 16 or 32 bit Modbus register and bit(s)
Binary Inputs				
BI0	RO1-Monitor	R	Value 1=ON, Value 0=OFF	41021 bit 0
BI0	RO1-Monitor	R	Value 1=ON, Value 0=OFF	41021 bit 0
BI1	RO2-Monitor	R	Value 1=ON, Value 0=OFF	41021 bit 1
BI2	RO3-Monitor	R	Value 1=ON, Value 0=OFF	41021 bit 2
BI6	DI1-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 0
BI7	DI2-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 1
BI8	DI3-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 2
BI9	DI4-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 3
BI10	DI5-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 4
BI11	DI6-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 5
BI12	DIII-Monitor	R	Value 1=ON, Value 0=OFF	41001 bit 15
Binary Values				
BV0	RUN-STOP-Monitor	R	0=Drive is not in active run state; 1=Drive has been started	40616; Drive Status Word 1 Bit 5
BV1	Direction-Monitor	R	0= Forward; 1=means reverse	40619, bit 2 (0 based bit count)
BV2	OK-Fault-Monitor	R	0=No Fault; 1=Fault	40611, Main Status Word Bit 3
BV4	Local-Remote	R	1=Remote; 0=Local Control	40611 Main Status word bit 9
BV5	Warning-Monitor	R	1=Warning; 0=No warning	40611 Main Status word bit 7
BV7	Ready-Monitor	R	1=Drive is in a Ready to start state; 0=Drive is not ready to start	40611 Main Status word bit 0
BV8	At-Setpoint-Monitor	R	0=Not at Setpoint; 1=At setpoint	40611 Status word bit 8
BV9	Enabled-Monitor	R	0=Not Enabled; 1=Enabled	40616 bit 0
BV10	RUN-STOP-Command	C	0=Stop command, 1=Run Command; Digital input DI2 must be activated; Parameter 76.03=EFB	40001 bit 2 (0 based bit count on control word)
BV11	Reverse-Direction-Command/De-Ice-mode	C	0=De-activated; 1=reverse run command; Parameter 75.01=EFB; See Below note 1.	40001 bit 1 (0 based bit count on control word)
BV28	Motor-Heating-Command	W	0=Motor heating deactivated; 1=Trickle Current Heating; Parameter 74.01=EFB	40001 bit 0 (0 based bit count on control word)
BV29	Motor-Heating-Monitor	R	0=Motor heating not active; 1=Motor heating is Active	0611 bit 10 (0 based bit count)
Note 1: De-Ice mode runs for a fixed period of time per parameter 75.03. Once this time period has expired to reactivate De-Ice mode a 0 must be sent to BACnet object BV11, before a 1 is sent again.				
Analog Inputs				
AI0	AI1-Monitor	R	0-100% value of drive input AI1	Math equation with 41217, 41218,41211
AI1	AI2-Monitor	R	0-100% value of drive input AI2	Math equation with 41227, 41228,41221
Analog Values				
AV0	Output-RPM	R	RPM	420202
AV1	Output-Frequency	R	-500, 500Hz	420212
AV2	DC-Bus-Voltage	R	VDC	40111
AV3	Output-Voltage	R	VAC	40113
AV4	Output-Current	R	A	420214
AV6	Output-Power	R	kW or HP	420228
AV7	Heatsink-Temperature	R	Estimated drive temperature in percent of drive fault limit. The actual trip temperature varies according to the HP of the drive. 0.0%=0 °C (32 °F) 94% approx.=Warning limit 100.0%=Fault limit	40511
AV9	Inverter-kW-hours	R	kWh	420240
AV14	Days-Run	R	Whole integer numbers only	40502
AV16	Input-Reference-1	C	0 to # RPM; Units: RPM; Example: Enter 200 over BACnet, the drive runs the motor at 200 RPM.	40002
AV18	Active-Fault-Code	R	Provides a Hexa-Decimal number for the fault code	40401

Appendix C Reference

Appendix C.1 Specifications



	ProtoNode FPC-N54 ²	
Electrical Connections	One 3-pin Phoenix connector with: RS-485/RS-232 (Tx+ / Rx- / gnd) One 3-pin Phoenix connector with: RS-485 (Tx+ / Rx- / gnd) One 3-pin Phoenix connector with: Power port (+ / - / Frame-gnd) One Ethernet 10/100 BaseT port	
Power Requirements	<i>Input Voltage:</i> 9-30VDC or 24VAC <i>Max Power:</i> 3 Watts	<i>Current draw:</i> 24VAC 0.125A 9-30VDC .25A @12VDC
Approvals	CE and FCC class B & C part 15, UL 60950, WEEE compliant, IC Canada, RoHS compliant, DNP 3.0 conformance tested	
Physical Dimensions	4 x 1.1 x 2.7 in (10.16 x 2.8 x 6.8 cm)	
Weight	0.4 lbs (0.2 Kg)	
Operating Temperature	-20°C to 70°C (-4°F to 158°F)	
Humidity	10-95% RH non-condensing	

Figure 25: Specifications

Appendix C.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
- Furthermore, the interconnecting power cable shall:
 - Be of length not exceeding 3.05m (118.3")
 - Be constructed of materials rated VW-1, 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.

² Specifications subject to change without notice.

Appendix D Limited 2 Year Warranty

MSA Safety warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. MSA Safety 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 MSA Safety 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 MSA Safety'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 MSA Safety'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, MSA Safety 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 MSA Safety for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.