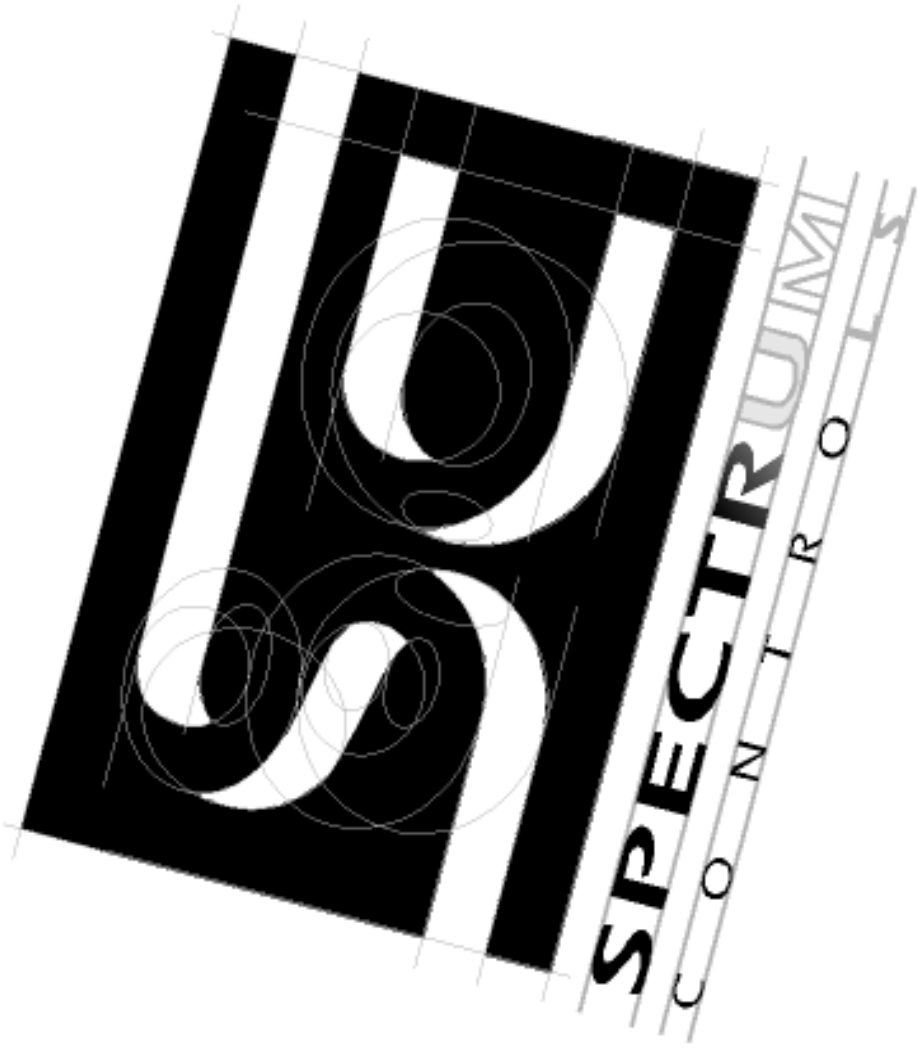
User's Manual Pub. 0300274-01 Rev. A.0

Micro800™
BACnet Communication Module

Catalog Number: 2080sc-BAC



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Important Notes

1. Please read all the information in this owner's guide before installing the product.
2. The information in this owner's guide applies to hardware Series A and firmware version 1.1 or later.
3. This guide assumes that the reader has a full working knowledge of the relevant processor.

Notice

The products and services described in this owner's guide are useful in a wide variety of applications. Therefore, the user and others responsible for applying the products and services described herein are responsible for determining their acceptability for each application. While efforts have been made to provide accurate information within this owner's guide, Spectrum Controls, Inc. assumes no responsibility for the accuracy, completeness, or usefulness of the information herein.

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The information in this owner's guide is subject to change without notice.

Limited Warranty

Spectrum Controls, Inc. warrants that its products are free from defects in material and workmanship under normal use and service, as described in Spectrum Controls, Inc. literature covering this product, for a period of 1 year. The obligations of Spectrum Controls, Inc. under this warranty are limited to replacing or repairing, at its option, at its factory or facility, any product which shall, in the applicable period after shipment, be returned to the Spectrum Controls, Inc. facility, transportation charges prepaid, and which after examination is determined, to the satisfaction of Spectrum Controls, Inc., to be thus defective.

This warranty shall not apply to any such equipment which shall have been repaired or altered except by Spectrum Controls or which shall have been subject to misuse, neglect, or accident. In no case shall the liability of Spectrum Controls, Inc. exceed the purchase price. The aforementioned provisions do not extend the original warranty period of any product which has either been repaired or replaced by Spectrum Controls, Inc.

Table of Contents

Preface

Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- Who should use this manual
- How to use this manual
- Related publications
- Conventions used in this manual
- Rockwell Automation support

Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use Allen-Bradley I/O and/or compatible controllers, such as CompactLogix and ControlLogix.

How to Use This Manual

As much as possible, we organized this manual to explain, in a task-by-task manner, how to install, configure, program, operate, and troubleshoot a control system using the Micro800™ BACnet Communication Module.

Technical Support

For technical support, please contact your local Rockwell Automation TechConnect Office for all Spectrum products. Contact numbers are as follows:

- United States: 1-440-646-6900
- United Kingdom: 01908-635230
- Australia: 1800-809929
- Brazil: 011 (55) 113619-8800
- Mexico: 001-888-365-8677
- Europe: (49) 2104-960-630

or send an email to support@spectrumcontrols.com

Documentation

If you would like a manual, you can download a free electronic version from the Internet at www.spectrumcontrols.com

Conventions Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists (like this one) provide information not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.
- **Bold** type identifies headings and sub-headings:

WARNING 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you to identify a hazard, avoid a hazard, and recognize the consequences.

ATTENTION 	Actions ou situations risquant d'entraîner des blessures pouvant être mortelles, des dégâts matériels ou des pertes financières. Les messages « Attention » vous aident à identifier un danger, à éviter ce danger et en discerner les conséquences.

NOTE 	Identifies information that is critical for successful application and understanding of the product.

Chapter 1
Module Overview

Section 1.1 General Description

The 2080sc-BAC Communication Module is a two-channel communication, plug-in module for use with Rockwell Automation Micro800™ systems.

The plug-in module supports two channels of data communications: one channel is configured for RS-485, half duplex serial communications, and the other channel is configured for 10/100M Ethernet full duplex serial communications. After installation, the module is configured via the Ethernet port. By default, this is the port that the module uses to communicate with external devices such as other BACnet modules or personal computers.

The module plugs into an extension slot on the PLC. The module interfaces with the controller via Asynchronous Parallel Interface (API), and communicates with other BACnet modules using the BACnet protocol. The module stores the data internally. During module setup, you map Micro800 PLC tags to BACnet tags so that the Micro800 system is able to receive, and respond to, BACnet messages. The BACnet protocol is configured to run on the Ethernet port by default.

The data exchanged between a module and controller, or other BACnet modules, includes module configuration, configuration changes, interrupts from the module to the controller, module status queries from the controller, controller reset commands to the module, and other associated communications.

The BACNet configuration software resides on the BACNet module. You use a

web browser to access this software to configure the parameters for the module.

Configuring the communication module includes setting the User Interface password, entering the module device address, IP address, serial baud rate, and mapping PLC tags to BACnet tags. For complete information, refer to Chapter 3, Configuring the Module using Software.

Power for the module is provided across the backplane. MS/TP signals from the field side are connected to the module via the 6-pin connector (RS-485). The Ethernet port handles BACnet/ IP traffic.

Section 1.2 Environment and Enclosure

WARNING

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters (6562 feet) without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of 5 VA, V2, V1, V0 (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see:

Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1, for additional installation requirements.

NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.

WARNING

Cet équipement est prévu pour fonctionner en environnement industriel avec une pollution de niveau 2, dans des applications de surtension de catégorie II (telles que définies dans la publication 60664-1 de la CEI) et à une altitude maximum de 2000 m sans déclassement.

Cet équipement est considéré comme étant un équipement industriel du Groupe 1, classe A selon CEI/CISPR 11. En l'absence de précautions appropriées, des problèmes de compatibilité électromagnétique peuvent survenir dans des environnements résidentiels et dans d'autres environnement en raison de perturbations conduites et rayonnées.

Cet équipement est fourni en tant qu'équipement de type « ouvert ». Il doit être installé à l'intérieur d'une armoire fournissant une protection adaptée aux conditions d'utilisation ambiantes et suffisante pour éviter toute blessure pouvant résulter d'un contact direct avec des composants sous tension.

L'armoire doit posséder des propriétés ignifuges capables d'empêcher ou de limiter la propagation des flammes, correspondant à un indice de propagation de 5VA, V2, V1, V0 (ou équivalent) dans le cas d'une armoire non métallique.

L'accès à l'intérieur de l'armoire ne doit être possible qu'à l'aide d'un outil. Cette armoire doit permettre des connexions d'alimentation par un système de câblage de Classe I, Division 2, conformément au code électrique national (NEC). Certaines sections de la présente publication peuvent comporter des recommandations supplémentaires portant sur les indices de protection spécifiques à respecter pour maintenir la conformité à certaines normes de sécurité.

En plus de cette publication, consultez :

- La publication Rockwell Automation 1770-4.1, « Industrial Automation Wiring and Grounding Guidelines », pour d'autres critères d'installation ;
- La publication 250 de la norme NEMA ou la publication 60529 de la CEI, selon le cas, pour obtenir une description des indices de protection que fournissent les différents types d'armoires.

Section 1.3 Prevent Electrostatic Discharge

WARNING

Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the module.
- If available, use a static-safe work station.
- When not in use, keep the module in its static-shield box.

WARNING

Cet équipement est sensible aux décharges électrostatiques, lesquelles peuvent entraîner des dommages internes et nuire à son bon onctionnement.

Conformez-vous aux directives suivantes lorsque vous manipulez cet équipement :

- Touchez un objet mis à la terre pour vous décharger de toute électricité statique éventuelle ;
- Portez au poignet un bracelet antistatique agréé ;
- Ne touchez pas les connecteurs ni les broches figurant sur les cartes des composants ;
- Ne touchez pas les circuits internes de l’équipement ;
- Utilisez si possible un poste de travail antistatique ;
- Lorsque vous n’utilisez pas l’équipement, stockez-le dans un emballage antistatique.

WARNING

To comply with the CE Low Voltage Directive (LVD), all connected I/O must be powered from a source compliant with the following: Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

WARNING

Pour se conformer à la Directive basse tension CE, cet équipement doit être alimenté à partir d'une source ayant les caractéristiques suivantes: très basse tension de sécurité (TBTS) ou très basse tension de protection (TBTP).

Section 1.4 Parts List

Your package contains one Micro800 BACnet Communication Module, installation screws, and one Quick Start Guide.

You can choose to wire the plug-in before inserting it into the controller, or wire it once the module is secured in place.

WARNING

- This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR 11. Without appropriate precautions, there may be difficulties with electromagnetic compatibility in residential and other environments due to conducted and radiated disturbance.
- Be careful when stripping wires. Wire fragments that fall into the controller could cause damage. Once wiring is complete, make sure the controller is free of all metal fragments before removing the protective debris strip.
- Do not wire more than 2 conductors on any single terminal.
- If you insert or remove the plug-in module while power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.
- Cable length should be less than 10 meters (30 feet).
- Do not insert or remove the plug-in module while power is applied; otherwise, permanent damage to equipment may occur.

WARNING

- Cet équipement est considéré comme étant un équipement industriel du Groupe 1, classe A selon CEI/CISPR 11. En l'absence de precautions appropriées, des problèmes de compatibilité électromagnétique peuvent survenir dans des environnements résidentiels et dans d'autres environnements en raison de perturbations conduites et rayonnées.
- Soyez vigilant en dénudant les fils. Tout fragment de fil tombé dans l'automate risquerait de le détériorer. Une fois le câblage terminé, veillez à ce que l'automate ne présente aucun copeau de métal avant de retirer la bande de protection.
- Ne câblez pas plus de 2 conducteurs sur une même borne.
- L'insertion ou le retrait du module enfichable sous tension peut provoquer un arc électrique, susceptible de provoquer une explosion dans un environnement dangereux. Assurez-vous que l'alimentation est coupée ou que l'environnement est classé non dangereux avant de poursuivre.
- La longueur de câble devrait être inférieure à 10 mètres.
- N'insérez pas et ne retirez pas le module enfichable quand l'équipement est sous tension, au risque de provoquer des dommages irrémédiables à l'équipement.

Section 1.5 Hardware Features

The module plugs into, and communicates with, a controller in the Micro800 family. Communication I/O signals are connected to the module through a 6-pin terminal block and an RJ-45 connector:

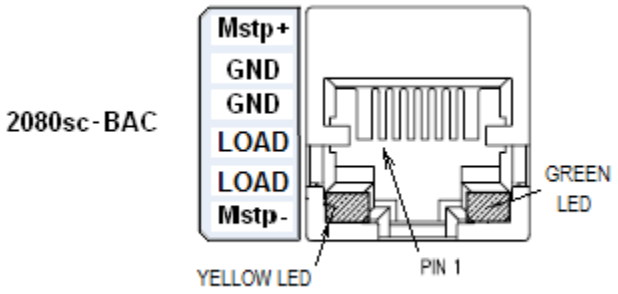
1.5.1 Serial I/O RJ-45 Connector

NOTE

Pins in following table are listed from 6 to 1 to match connector on front panel of module.

The six-pin Connector pinouts are as follows:

Pin	Signal
6	MSTP+
5	GND
4	GND
3	LOAD-
2	LOAD+
1	MSTP-



1.5.2 Ethernet Connector

The Ethernet connector has a default MAC address that may be changed during setup. The Ethernet connector may be used as an external communication port to a personal computer or to another BACnet module. The Ethernet connector is also used to configure the module.

The default IP address for the module is **169.254.3.3**. If the module is already configured, software is available for you to detect the address. See Chapter 3, Configuring the Module Using Software.

Pinouts for the connector (crossover) are:

2080sc-BACnet Module	Personal Computer
1 TX+	**8** Not connected
2 TX-	**7** Not connected
3 RX+	**6** TX-
4 Not connected	**5** Not connected
5 Not connected	**4** Not connected
6 RX-	**3** TX+
7 Not connected	**2** RX-
8 Not connected	**1** RX+

Section 1.6 LED Indicator

A single LED indicator is provided with the module. The LED is green for ON. The LED blinks in case of a fault.

Section 1.7 Software Upgrade

The module software can be upgraded in the field.

Section 1.8 Module DC Power Specifications

The controller provides two Power Supplies to the module:

- 3.3 Volts (3.0 V Min, 3.6 V Max), Current Rating: 40 mA
- 24 Volts (20.4 V Min, 26.4 V Max), Current Rating: 50 mA

You may not use an external power source to power the module. Refer to the specifications in the Appendix for further information.

Section 1.9 Module Chassis Earth Ground

The Micro800 controller does not have a chassis (earth) ground. The 2080sc-BACnet module connects to an isolated ground, ISO-GND, which is exclusive to the external communication interfaces. The purpose of the isolated ground is to prevent possible interference on the I/O channels from permanently damaging the module itself.

Chapter 2
Installation and Wiring

Section 2.1 Insert Module into Controller

Follow the instructions to insert and secure the plug-in module to the controller.

WARNING

Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the module.
- If available, use a static-safe work station.
- When not in use, keep the module in its static-shield box.

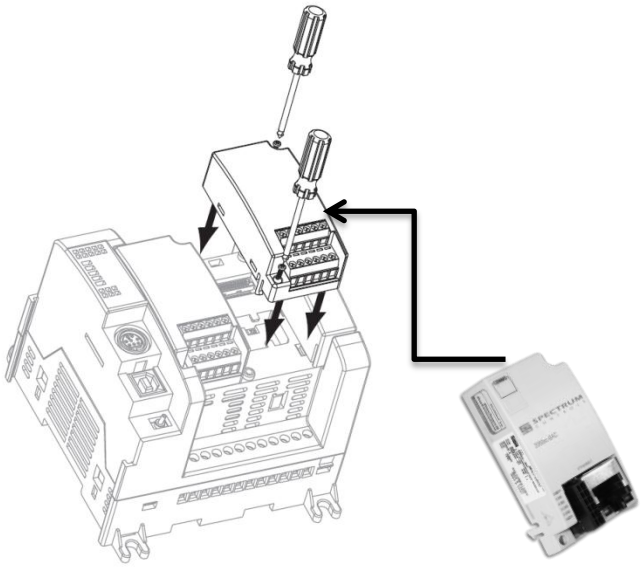
WARNING

Cet équipement est sensible aux décharges électrostatiques, lesquelles peuvent entraîner des dommages internes et nuire à son bon onctionnement.

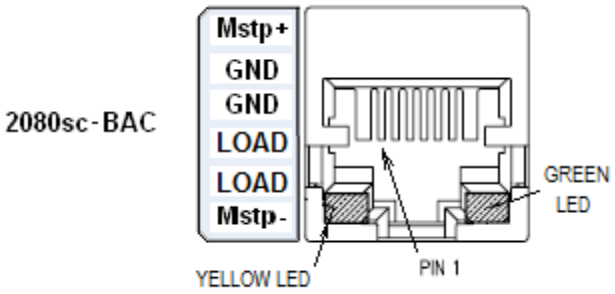
Conformez-vous aux directives suivantes lorsque vous manipulez cet équipement :

- Touchez un objet mis à la terre pour vous décharger de toute électricité statique éventuelle ;
- Portez au poignet un bracelet antistatique agréé ;
- Ne touchez pas les connecteurs ni les broches figurant sur les cartes des composants ;
- Ne touchez pas les circuits internes de l'équipement ;
- Utilisez si possible un poste de travail antistatique ;
- Lorsque vous n'utilisez pas l'équipement, stockez-le dans un emballage antistatique.

1. Position the plug-in module with the terminal block facing the front of the controller as shown. The 2080sc-BACnet module has a different front panel setup, but the installation in the controller is the same:



2. Snap the module into the module bay.
3. Using a screwdriver, tighten the supplied, self-tapping screw to torque specifications.
4. Wire the module using the 6-pin connector as shown:



OR

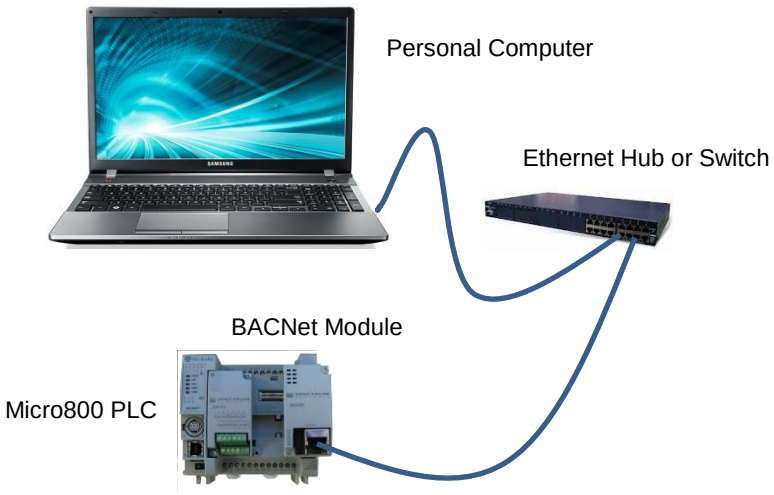
Connect an RJ-45 Ethernet cable and connector between a personal computer and the connector on the front of the module.

Set up the tag mapping using the software described in Chapter 3.

Chapter 3
Configuring the Module using Software

Before configuring the module with the BACnet software:

1. Install your BACnet module in the Rockwell Micro800 controller.
2. Connect a personal computer to an Ethernet switch or network hub. Connect the Ethernet port on the personal computer to the Ethernet switch or hub.
3. Connect another cable between the hub and the Ethernet connector on the BACnet module.



Once the module is set up:

1. Change the personal computer IP address to a static IP address. If you need additional assistance with changing your personal computer's IP address, refer to the Windows Help documentation or use the information provided next to access the module.
2. Map tags between the Micro800 PLC and the BACnet module.
3. Generate the mapping file between the PLC and the module.
4. Download the map file to the module.
5. Generate the structured text to be used when programming the PLC.

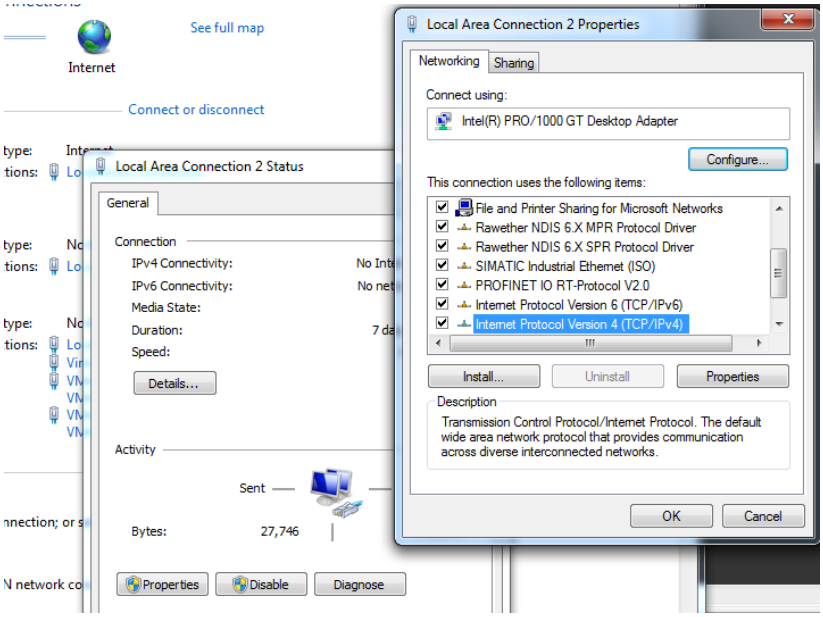
After you have configured your system, the BACnet module listens on Ethernet port number, **0×BAC0**, for data from the network and handles the data according to the BACnet protocol. Detailed instructions for each step of this process are provided below.

To access the software on your module:

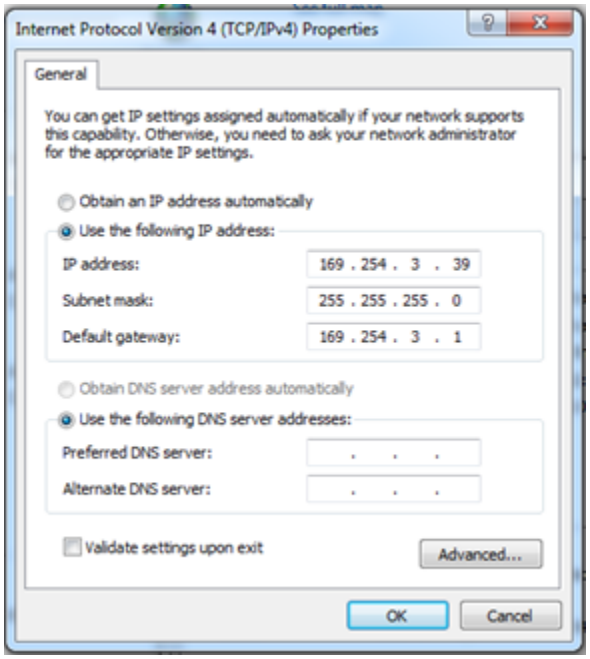
1. Access your PC local area connection properties dialog as shown below:

   Start:Control Panel:Network and Sharing Center:Change Adapter Settings:Local Area Connection Settings:Properties.

2. From the Local Area Connection n Properties dialog, select the **Internet Protocol Version 4 (TCP/IPv4)** option:

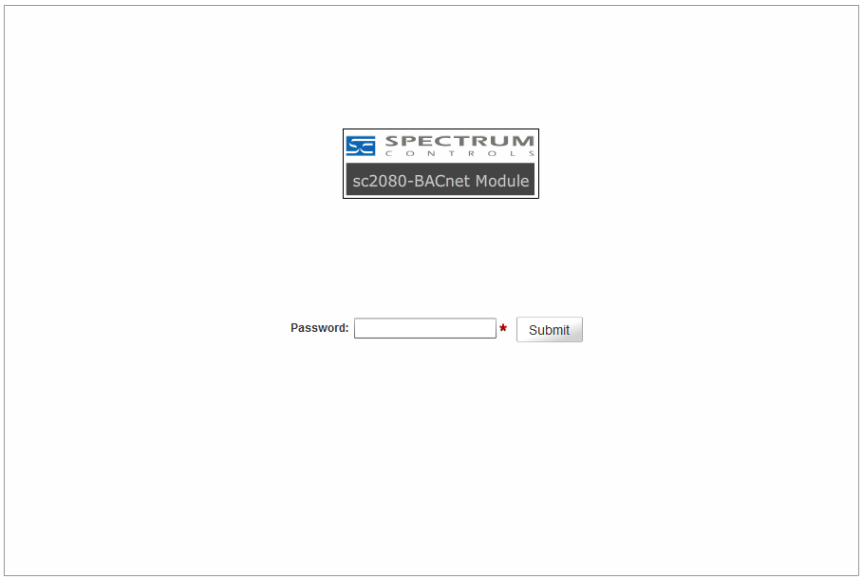


3. Change the settings to the equivalent settings for your personal computer as shown next:

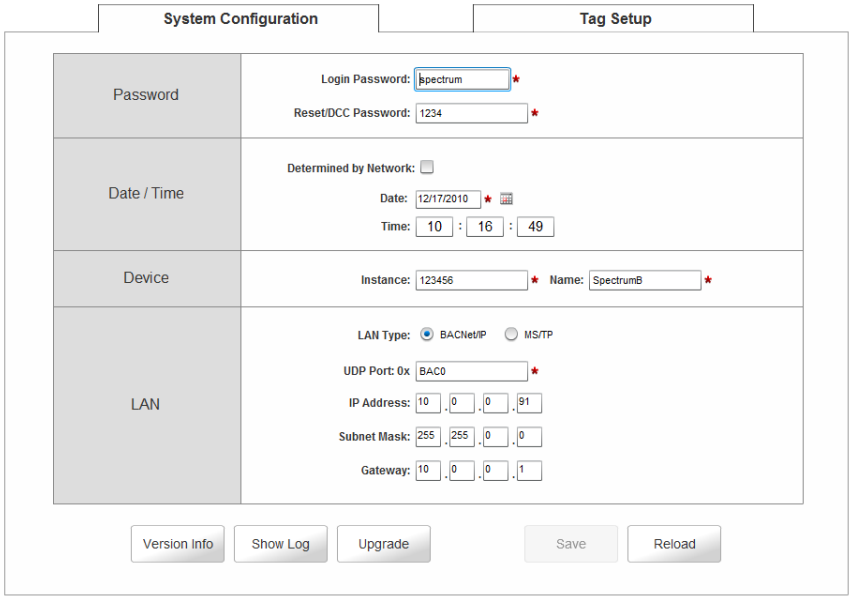


4. Open a web browser and type in the IP default address of your BACnet module, which is **169.254.3.3**.

The following dialog appears:



5. Type the password **spectrum** into the **Password** field and click **Submit**.
   The BACnet configuration dialog appears.
   The examples shown below use IP addresses that have been reconfigured to work on a different network from the default IP address :



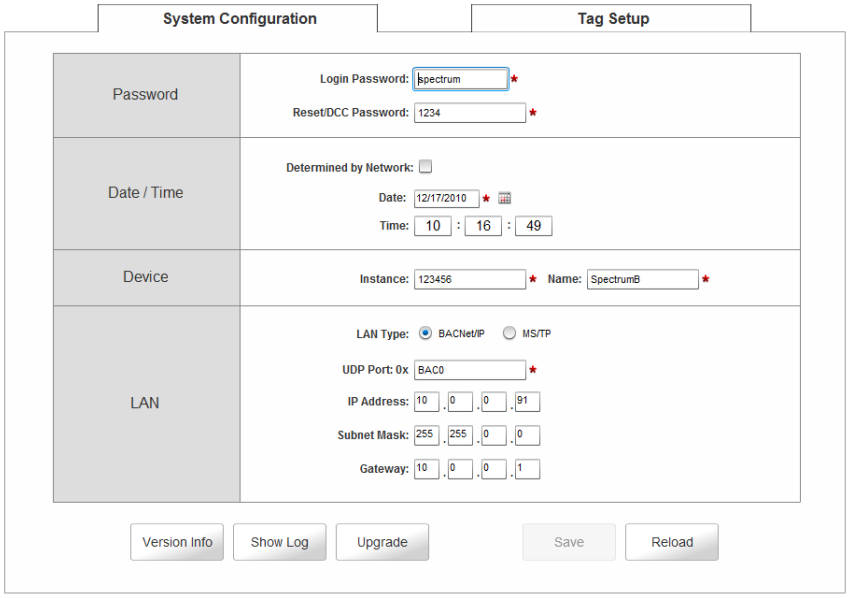
6. View or modify the following options:
   - **System Configuration**. Use to set up password, date and time, device, and LAN settings.
   - **Tag Setup**. Use to set up tag mapping between your Micro800 controller and the BACnet Communications module.

Section 3.1 Configuring the System

System configuration includes setting up or changing your system password, setting the date and time, choosing your device, and setting up the LAN.

To set up or change system configuration settings:

1. Access the System Configuration tab:



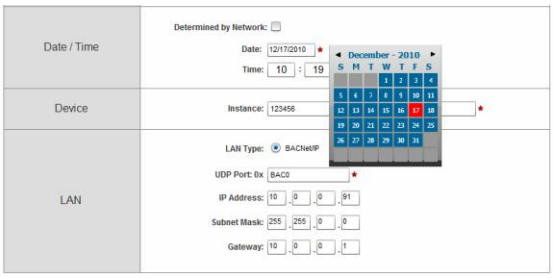
2. View or specify the following options:

   - **Password**. The software ships with a default password, **spectrum**. You log onto the module software User Interface with this password when you first log onto the module. However, Spectrum Controls, Inc. highly recommends that you immediately change this password to one of your own choosing. There are two passwords:

     - Login Password. This is the password you use to log onto software which ships with the BACnet module. The default user password is **spectrum**. If you reset your module to factory default settings, this is the password that you use to log in.

     - Reset/DCC Password. BACnet has a remote reset command. When the module receives the remote reset command, it reboots itself. You use this password as the BACnet reset message password to reboot the module.

   - **Date/Time**. At startup, the module retrieves the NIST time, if network is set to retrieve it. If connected to the Internet at that point, the module's time is set from the server. The date and time are held for 2 to 3 days if power is lost. If needed, you may manually enter the date and time:

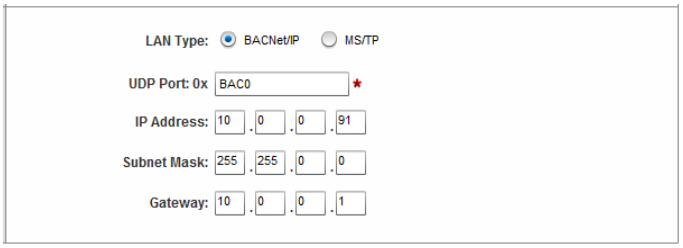


- Date. Enter the date as *MM/DD/YYYY* where *MM* is month, *DD* is day, and *YYYY* is year. If necessary, select the date from the calendar provided.
- Time. 24-hour time format. Enter the time in hours, minutes, and seconds.

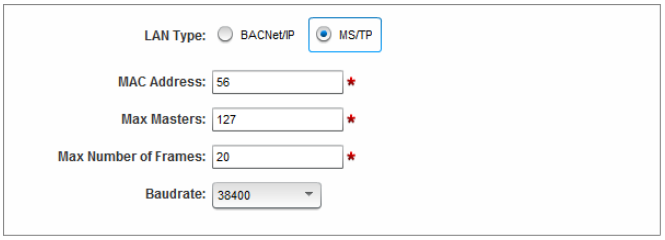
- **Device**. Enter the device instance and name. The device instance is the unique ID of a device used by BACnet. Default Device ID is **#200121**. All messages directed to the module are addressed to this ID. The allowable range is from 1 to 4,194,034. When the protocol wishes to talk to a device, the master sends out a 'WhoIs *n*' message[1], where *n* is a Device ID. The device responds with an 'I-Am n' and provides the master with either an IP address if the device is an Ethernet type, or a MAC address if the device is an MS/TP type (RS-485). The master is then able to talk to the device:
  - Instance. Specify the device instance entry.
  - Name. Enter the device name.
- **LAN**. Specifies LAN type and communication parameters for the LAN type selected. After saving your values, you must cycle power on the module to allow the new settings to take effect.

[1] Technically, the module sends a 'WhoIs *m* to *n*' message, where m is the lower limit, and n is the upper limit. It may also send a 'WhoIs null', which is a broadcast to all reachable devices, and will bind all responding devices' addresses to their device ID.

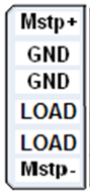
- The module and personal computer's IP addresses must also be on the same network to allow the two devices to communicate:
  - BACnet/IP. When you set up your module to use an Ethernet physical interface, specify a UDP port number for BACnet/IP, IP address, Subnet Mask, and Gateway. The UDP port communicates between the PC and the module. It is used to retrieve the module's IP address and password authentication:



    View or specify the following options:
    - *UDP Port: 0x XXXN*. Default address: **0×BAC0**
    - *IP Address*. Enter IP address. Example: **10.0.0.91**
    - *Subnet Mask*. Enter subnet mask. Default mask value is **255.255.255.0**
    - *Gateway*. Enter gateway address. Example: **10.0.0.1**
  - MS/TP. (Master-Slave/Token Ring Passing.)



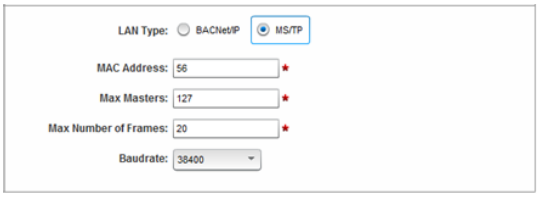
  - This connection is set up using the 6-pin connector on the front panel of the BACnet module. **Mstp+** is **RS-485+**; **Mtsp-** is **RS-485-**:



    When you set up your module to use an MS/TP physical interface, which is RS-485, half-duplex communication, you specify the following fields:
    - *MAC Address*. Enter the module MS/TP MAC address. Default suggested value is any value between 1 and 127. If there are more devices on

your MS/TP network you will need to determine what MAC address to use that makes this device unique on your network. You will need to exercise care to avoid entering duplicate MAC addresses in your device network.

- *Max Masters*. In a token ring network, each node is responsible for searching for the next node and passing the token to it. **Max Masters** is the maximum MAC address this module searches for. For example, if this module's MAC address is **5** and the **Max Master** value is **20**, this module will poll MAC address from 6 to 20 for the next node. Enter the **Max Masters** address. Default suggested value is **127** (range is 1 to 127).
- *Max Number of Frames*. In a token ring network, when a node receives a token, it needs to pass the token to the next node in a timely manner. Setting **Max Number of Frames** to 20 means when this module receives the token, it can send out a maximum of 20 messages before it has to pass the token to the next node. A good starting value to enter is **20**. If you have a very busy network, you may need to reduce this number to allow your network to function optimally.
- *Baudrate*. Select an MS/TP communication baud rate (9600, 19200, 38400, or 76800):



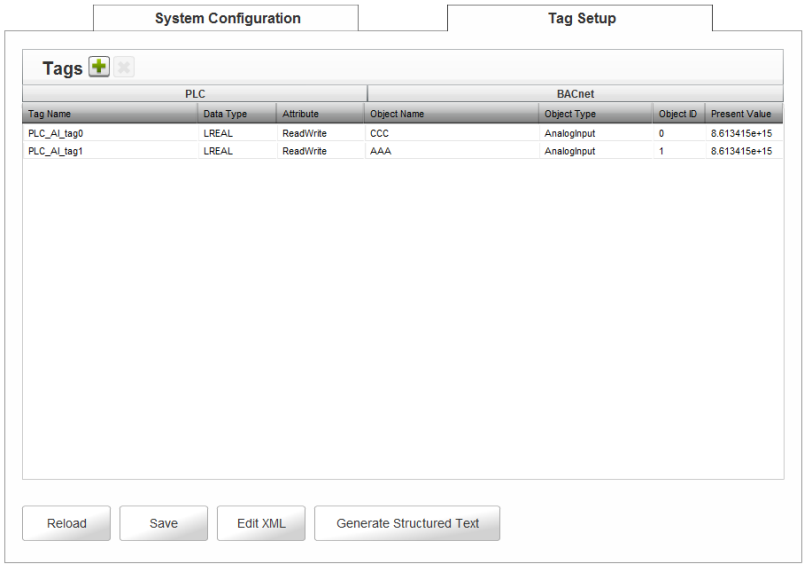
Section 3.2 Setting Up Tags

You use this dialog to map PLC tags to BACnet objects. The 2080sc-BACnet Communication Module supports BACnet AnalogInput (AI), AnalogOutput (AO), BinaryInput (BI), and BinaryOutput (BO) objects. When you map a BACnet object to a PLC tag, you should match the same or similar data types (covered later in this chapter). For example, map PLC data type BOOL to BACnet binary input or output objects. Other PLC data types can be mapped to BACnet analog input or analog output objects.

- If a BACnet object is AnalogInput, the module reads the mapped PLC tag and sends the data back to the AI read property request.
- If a BACnet object is AnalogOutput, the module writes the mapped PLC tag when it receives an AO write property request.

To set up tag mapping between the Micro800 PLC and BACnet objects:

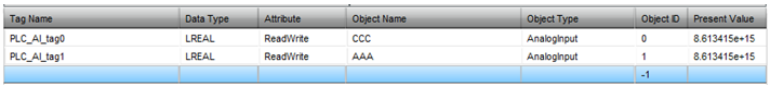
1. Select the Tag Setup tab.
   The Tag Setup dialog appears:



2. View or specify the following options:
   - **Add Tags**. To add a tag, click the **Add Tag** icon:

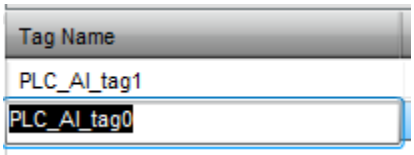
     

     A new row is added to the tag list.

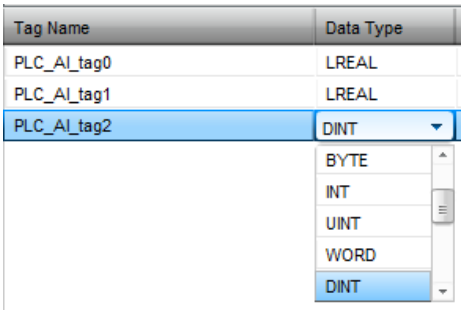
     

     Enter the tag data for each of the editable fields in the PLC and BACnet mapping fields as follows:

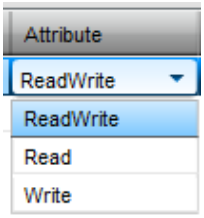
     - Tag Name. Enter the PLC variable tag name. Click on the field and type in the name:

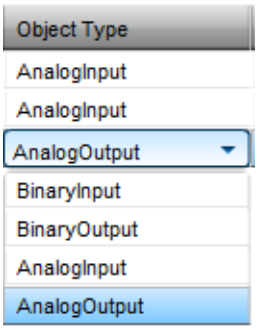
     - Data Type. Select the PLC variable data type. Click on the field and select the correct data type associated with the tag:

- Attribute. Enter the PLC variable attribute.



- Object Name. Enter the BACnet object name. Use a meaningful description, such as **Damper Angle**.
- Object Type. Click on the field and select the relevant object type for the PLC tag:



- Object ID. This is the BACnet object instance. Valid range is from 0 to 63, which means you can define 64 object instances of each object type. Each object is uniquely defined by object-instance and type. Support is provided for 256 BACnet objects. Click on the field and type in the ID value.
- Present Value. Not editable (from user interface). When the BACnet module requests the PLC report a specific value, the PLC returns the present value in the specific index. Example: When the PLC receives a BACnet command to report the present value of Analog Value Index 1, the PLC sends the present value of AV 1 back to the requester. This value is displayed in the **Present Value** column.

- **Delete Tags**. To delete a tag, click the **Delete Tag** button:

The selected tag row is deleted.

- **Reload Tags**. Reloads tag preset values.
- **Save Tags**. Saves tag changes. You have to save changes before you may generate structured text from the tag information.
- **Edit XML**. Allows you to manually edit tag information in XML format. See Editing XML Tag Information next.
- **Generate Structured Text**. Converts tag information to CCW structured text. See Generating Structured Text later in this chapter.

Section 3.3 Editing XML Tag Information

You normally modify tags through the software's user interface. However, the module uses an XML file format to save the tag mapping information. To save time, you may also modify the XML file directly.

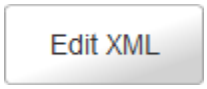
NOTE When modifying XML directly, be sure to make a backup of your original file first. Otherwise you may find errors or accidental deletions of entries cause problems with your file. Once you save the file, the changes are permanent.

NOTE To expedite the tag mapping process, you may copy and paste PLC tags from CCW directly into the XML window. Use this feature when you are editing a large number of tags.

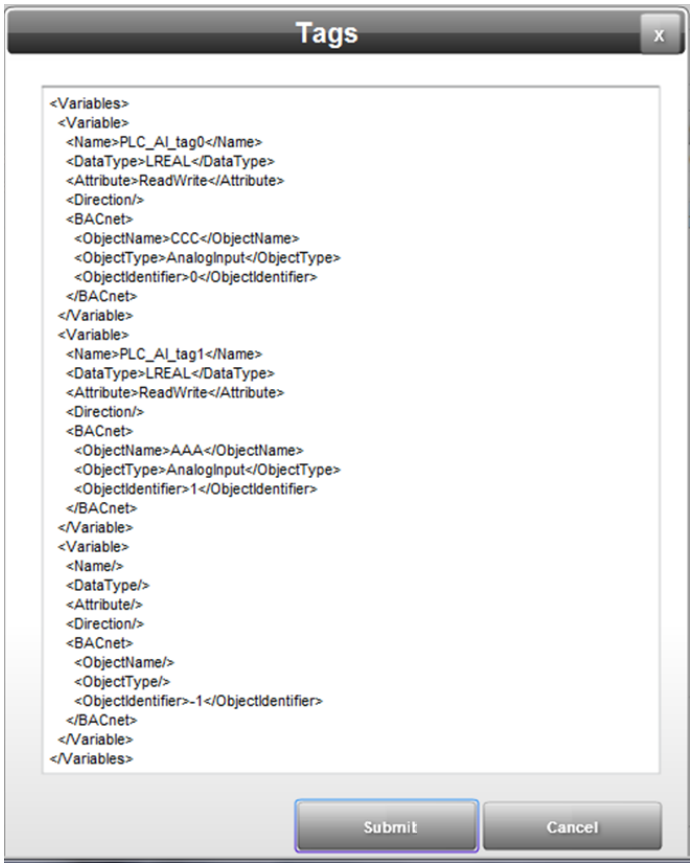
This module uses XML file format to save the tag mapping.

To view all the variables in the XML file:

1. Click Edit XML:

   The Tags dialog appears with all the tags in the list in XML format:

2. If needed, manually modify individual entries in the XML file.

Example. In the above Tags list, you may change:

<Name>__IO_EM_DO_00</Name>

TO

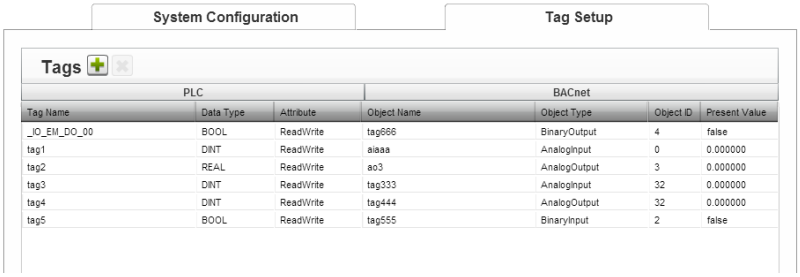
<Name>__IO_EM_DO_123</Name> manually.

3. To implement the changes, click **Submit**. The name changes to **__IO_EM_DO_123**.

Section 3.4 Generating Structured Text

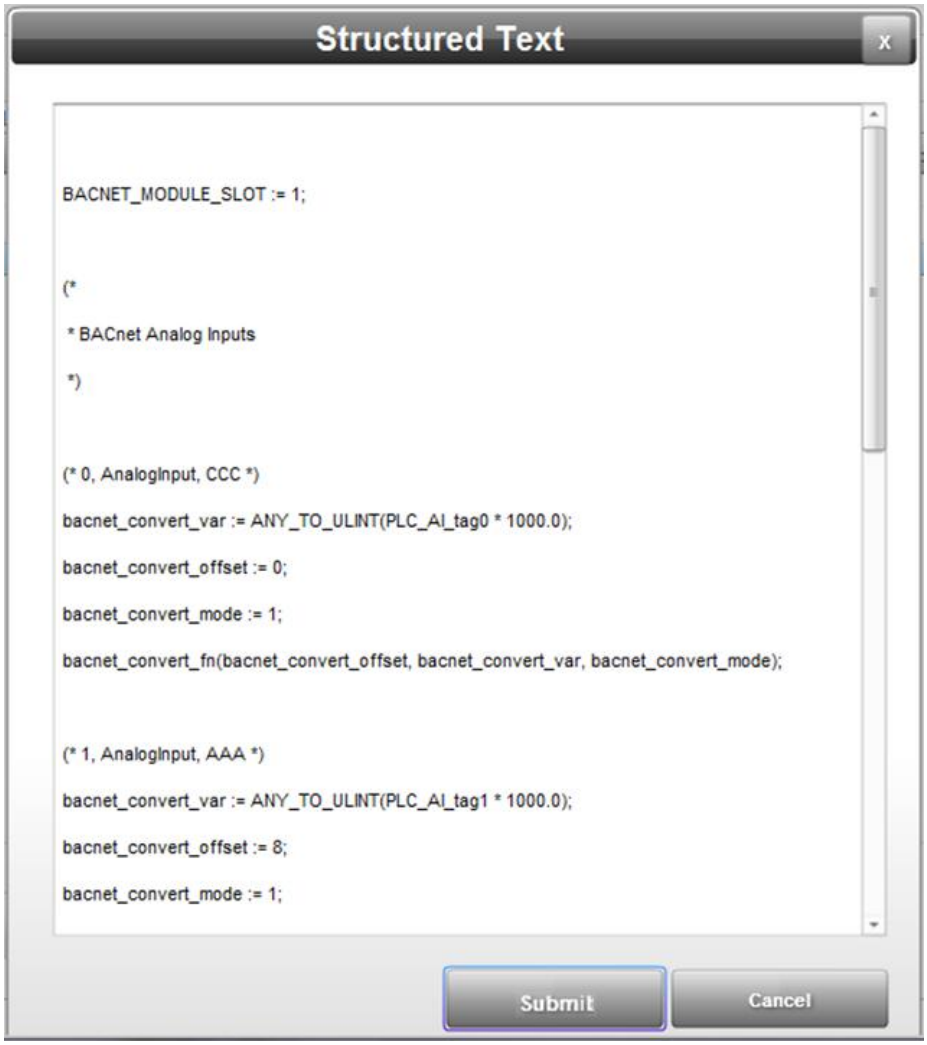
Rockwell Connected Component Workshop (CCW) software interfaces with the BACnet module. Tag mapping is executed through CCW, which reads and writes to the BACnet module using CCW structured text code . When you finish mapping tags, you convert the tag information to structured text code.

1. To convert tag information to structured text code, add your tags using the Tags dialog:



2. From the Tags dialog, click **Generate Structured Text**:

The software generates the CCW structured text and shows the text in the Structured Text dialog:



3. Copy the structured text and paste into your CCW software as Main function.

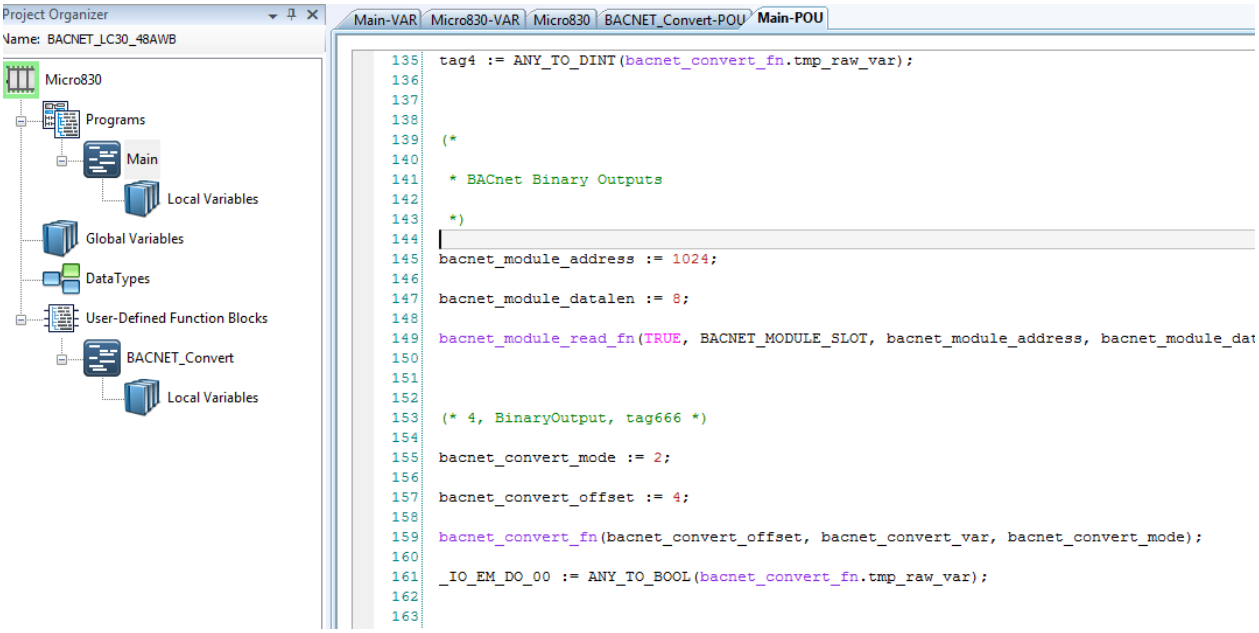
Section 3.5 Using the CCW Structured Text Example

Spectrum Controls, Inc. provides a sample CCW project with a sample Main function and a Function block named BACNET_Convert in a zipped project file, BACNET_Utilities.zip, downloadable from the Spectrum Controls website. If you have the same PLC as the sample project, you may directly use this project. Otherwise this project can only be referenced in relation to the PLC in which you installed your BACnet module. There is no project portability among different PLCs. You have to create a new project if you are using a different Micro830 PLC.

The CCW sample project consists of a Main function and one, user defined, function block. The Main function is generated by the Module when you click **Generate Structured Text** on the Tags dialog.

The Function block **BACNET_Convert** is provided in the sample project.

This function block does not need to change when you make a tag mapping change.



NOTE

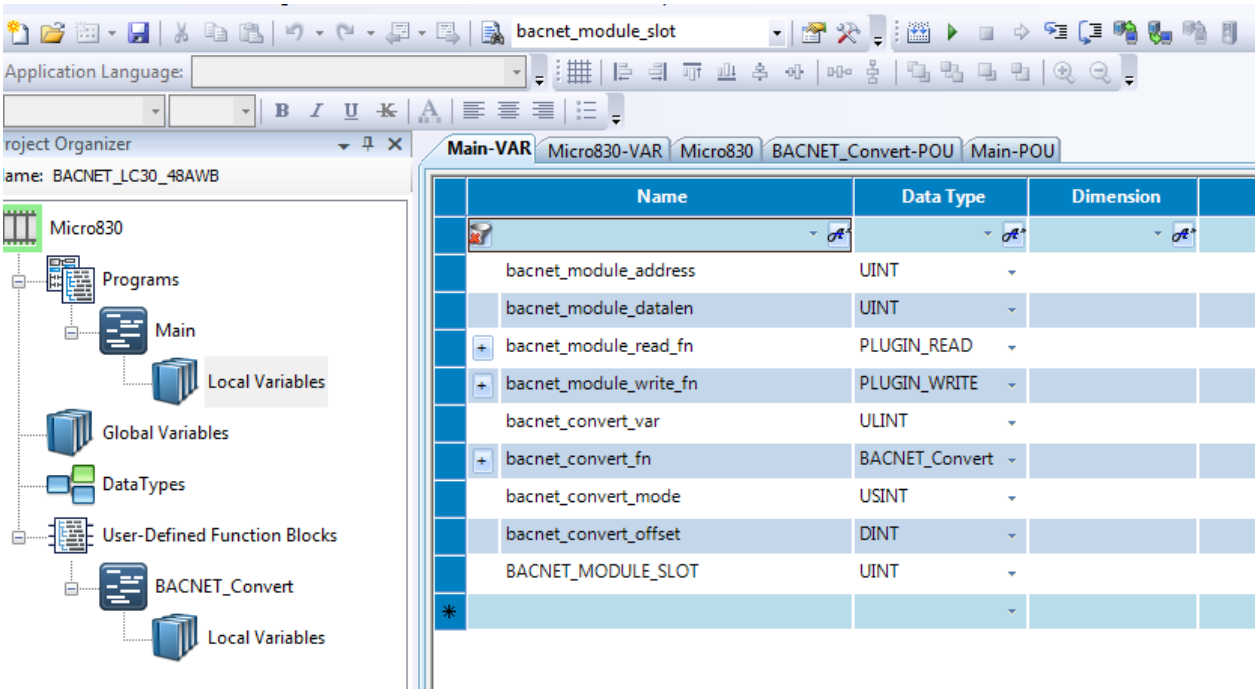
There is no defined behavior for the module when the controller enters Program Mode, remotely or manually. When placed in Program Mode, the module will still respond to BACnet requests with the same functionality as exists in normal operation, with the exception that PLC will not receive updated Output values from the module, nor will it update Input values to the module. Once the controller leaves Program mode and re-enters Run mode, the PLC's tags mapped to Output objects get updated to match the module's stored value, and the module updates Input values to be consistent with the PLC.

3.5.1 Main function

Below is an example of generated Main function structured text.

This example shows how an analog output variable is read from module, and an analog input variable is written to the module from CCW. Review the following example for information about how to implement this.

The first step is to create Local Variables for the Main program.



The second step is to paste in the structured text generated by the Module configuration user interface to the Main program of the CCW. Below is an example of this Main program.

A variable called `tag1` is converted to ULINT variable `bacnet_convert_var` and then placed at offset 0 of the byte array table because you are writing AnalogInput 0. If it is AnalogInput 1, the offset will be 8 as each BACNET object instance takes 8 bytes. Variable `bacnet_convert_mode` is 1. This means this is a write operation. 0 identifies a read operation:

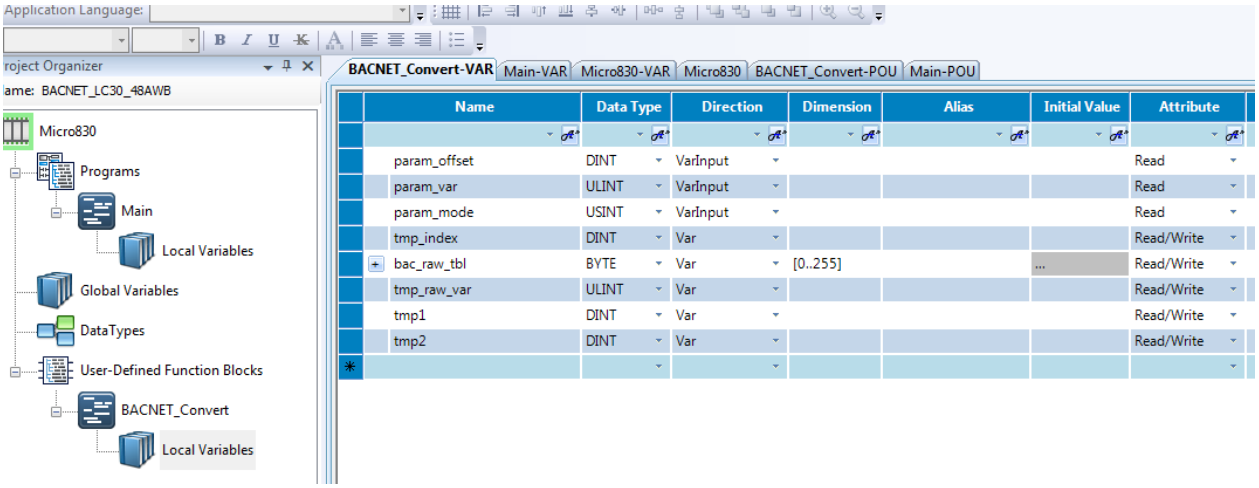
```
(* 0, AnalogInput, aiaaa *)

bacnet_convert_var := ANY_TO_ULINT(tag1);
bacnet_convert_offset := 0;
bacnet_convert_mode := 1;
bacnet_convert_fn(bacnet_convert_offset,
bacnet_convert_var, bacnet_convert_mode);

(* Write Input Table to Module *)

bacnet_module_address := 112;
bacnet_module_datalen := 8;
bacnet_module_write_fn(TRUE, BACNET_MODULE_SLOT,
bacnet_module_address, bacnet_module_datalen,
bacnet_convert_fn.bac_raw_tbl);
```

Similarly, for Analog Output, a read is performed to read the whole analog table to `bac_raw_tbl`, defined in function block `bacnet_convert_fn`. Next, individual AnalogOutput objects are to be written to the variable after conversion from ULINT to a tag data type.

```
(* Read Output Table from Module *)

bacnet_module_read_fn(TRUE, BACNET_MODULE_SLOT,
bacnet_module_address, bacnet_module_datalen,
bacnet_convert_fn.bac_raw_tbl);

(* 0, AnalogOutput, ao0 *)

bacnet_convert_mode := 0;
bacnet_convert_offset := 0;
bacnet_convert_fn(bacnet_convert_offset,
bacnet_convert_var, bacnet_convert_mode);

tag4 := ANY_TO_INT(bacnet_convert_fn.tmp_raw_var);
```

3.5.2 Function Blocks

A user-defined function block has to be defined by the user (yourself if that is the case). Local variables for this function block are similar to those shown below.



After creating the local variables, you need to create a function block called `BACNET_Convert` and paste the code below to this function block.

```
(*
 if param_mode = 0
  convert byte array bac_raw_tbl to ULINT variable tmp_raw_var
  This is for Analog Output Table
*)

IF param_mode = 0 THEN
```

```
        tmp_index := param_offset;
        tmp_raw_var := 0;
        tmp_raw_var := tmp_raw_var + ANY_TO_ULINT(bac_raw_tbl[tmp_index]) *
1;
        tmp_index := tmp_index + 1;
        tmp_raw_var := tmp_raw_var + ANY_TO_ULINT(bac_raw_tbl[tmp_index]) *
16#100;
        tmp_index := tmp_index + 1;
        tmp_raw_var := tmp_raw_var + ANY_TO_ULINT(bac_raw_tbl[tmp_index]) *
16#10000;
        tmp_index := tmp_index + 1;
        tmp_raw_var := tmp_raw_var + ANY_TO_ULINT(bac_raw_tbl[tmp_index]) *
16#1000000;
        tmp_index := tmp_index + 1;
        tmp_raw_var := tmp_raw_var + ANY_TO_ULINT(bac_raw_tbl[tmp_index]) *
16#100000000;
        tmp_index := tmp_index + 1;
        tmp_raw_var := tmp_raw_var + ANY_TO_ULINT(bac_raw_tbl[tmp_index]) *
16#10000000000;
        tmp_index := tmp_index + 1;
        tmp_raw_var := tmp_raw_var + ANY_TO_ULINT(bac_raw_tbl[tmp_index]) *
16#1000000000000;
        tmp_index := tmp_index + 1;
        tmp_raw_var := tmp_raw_var + ANY_TO_ULINT(bac_raw_tbl[tmp_index]) *
16#100000000000000;

(*
 if param_mode == 1
  convert ULINT variable tmp_raw_var to byte array bac_raw_tbl
  This is for Analog Input Table
*)

ELSIF param_mode = 1 THEN
 tmp_index := param_offset;
 tmp_raw_var := param_var;

        bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp_raw_var);
        tmp_raw_var := tmp_raw_var / 256;
        tmp_index := tmp_index + 1;
        bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp_raw_var);
        tmp_raw_var := tmp_raw_var / 256;
        tmp_index := tmp_index + 1;
        bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp_raw_var);
        tmp_raw_var := tmp_raw_var / 256;
        tmp_index := tmp_index + 1;
        bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp_raw_var);
        tmp_raw_var := tmp_raw_var / 256;
        tmp_index := tmp_index + 1;
        bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp_raw_var);
        tmp_raw_var := tmp_raw_var / 256;
        tmp_index := tmp_index + 1;
        bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp_raw_var);
        tmp_raw_var := tmp_raw_var / 256;
        tmp_index := tmp_index + 1;
        bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp_raw_var);
        tmp_raw_var := tmp_raw_var / 256;
        tmp_index := tmp_index + 1;
        bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp_raw_var);
        tmp_index := tmp_index + 1;

(*
 if param_mode == 2
  This is for Binary Output Table
*)

ELSIF param_mode = 2 THEN
 tmp_index := param_offset / 8;
 tmp1  := MOD(param_offset, 8);

 tmp2  := ANY_TO_DINT(bac_raw_tbl[tmp_index]);
 tmp2  := SHR(tmp2, tmp1);
```

```
 tmp2 := AND_MASK(tmp2, 1);
 IF tmp2 = 1 THEN
        tmp_raw_var := 1;
 ELSE
        tmp_raw_var := 0;
 END_IF;

(*
 if param_mode == 3
  This is for Binary Input Table
*)

ELSIF param_mode = 3 THEN
 tmp_index := param_offset / 8;
 tmp1 := MOD(param_offset, 8);
 tmp2 := 1;
 tmp2 := SHL(tmp2, tmp1);

 tmp1 := ANY_TO_DINT(bac_raw_tbl[tmp_index]);
 IF param_var = 0 THEN  (* set 0 *)
        tmp1 := NOT_MASK(tmp1);
        tmp1 := OR_MASK(tmp1, tmp2);
        tmp1 := NOT_MASK(tmp1);
 ELSE    (* set 1 *)
        tmp1 := OR_MASK(tmp1, tmp2);
 END_IF;
 bac_raw_tbl[tmp_index] := ANY_TO_BYTE(tmp1);
ELSE
 (* do nothing *)
 (* tmp_index := param_offset / 8; *)

END_IF;
```

In the Main function, you see a variable called `bacnet_convert_fn` type as `BACNET_Convert` is called. This is how the Main function calls the user-defined function block.

Since CCW has many different types of data types, this function block is able to convert all the different data types to a bytes array. When CCW reads from the module, the module fills this bytes array first. Then CCW reads the array and converts the data to different data types. When CCW writes to the module, CCW converts a variable to this 8 bytes array, and writes it to the module. The following examples shows how an analog output variable is read from module, and an analog input variable is written to the module from CCW. Structured text is generated by the module.

A variable called `tag1` is converted to ULINT variable `bacnet_convert_var` and then placed at offset 0 of the byte array table because you are writing AnalogInput 0. If it is AnalogInput 1, the offset will be 8 as each BACNET object instance takes 8 bytes. Variable `bacnet_convert_mode` is 1 means this is a write operation. 0 indicates a read operation.

```
(* 0, AnalogInput, aiaaa *)

bacnet_convert_var := ANY_TO_ULINT(tag1);
bacnet_convert_offset := 0;
bacnet_convert_mode := 1;
bacnet_convert_fn(bacnet_convert_offset,
bacnet_convert_var, bacnet_convert_mode);
```

```
(* Write Input Table to Module *)

bacnet_module_address := 112;
bacnet_module_datalen := 8;
bacnet_module_write_fn(TRUE, BACNET_MODULE_SLOT,
bacnet_module_address, bacnet_module_datalen,
bacnet_convert_fn.bac_raw_tbl);
```

Similarly, for Analog Output, a read operation is performed to read the whole analog table to `bac_raw_tbl` defined in function block `bacnet_convert_fn`. Then individual AnalogOutput objects are written to the variable after conversion from ULINT to a tag data type.

```
(* Read Output Table from Module *)

bacnet_module_read_fn(TRUE, BACNET_MODULE_SLOT,
bacnet_module_address, bacnet_module_datalen,
bacnet_convert_fn.bac_raw_tbl);

(* 0, AnalogOutput, ao0 *)

bacnet_convert_mode := 0;
bacnet_convert_offset := 0;
bacnet_convert_fn(bacnet_convert_offset,
bacnet_convert_var, bacnet_convert_mode);

tag4 := ANY_TO_INT(bacnet_convert_fn.tmp_raw_var);
```

3.5.3 Memory Mapping

This section discusses memory mapping between a BACnet module and the PLC. The BACnet module has internal memory that is mapped to the PLC memory range. On the PLC, each slot has 2 Kbytes of memory. The internal RAM in the Module is arranged as below.

This section is for reference only as all the mappings are automatically generated in the structured text.

BACnet Binary Input Block (0×60 – 0×67)

Register Name	Addr.	Comments	Default	R/W From PLC	R/W From Module
BAC_BI	0×60 – 0×67	BACnet Binary Input data (tags 0 – 63)	0	W	R

Each bit of the BACnet Binary Input represents a true/false value for one BACnet Binary Input object. This block supports up to 64 such objects.

BACnet Binary Output Block (0×400 – 0×407)

Register Name	Addr.	Comments	Default	R/W From PLC	R/W From Module
BAC_BO	0×400 – 0×407	BACnet Binary Output data (tags 0 – 63)	0	W	R

Each bit of the BACnet Binary Value represents a true/false value for one BACnet Binary Value object. This block supports up to 64 such objects.

BACnet Analog Input 1 Block (0×100 – 0×1FF)

Register Name	Addr.	Comments	Default	R/W From PLC	R/W From Module
BAC_AI_0	0×100 – 0×107	BACnet Analog Input tag 0	0	W	R
BAC_AI_1	0×108 – 0×10F	BACnet Analog Input tag 1	0	W	R
…	…	…	…	…	…
BAC_AI_31	0×1F8 – 0×1FF	BACnet Analog Input tag 31	0	W	R

This block is for the first 32 BACnet Analog Input tag values.

BACnet Analog Input objects are read from a user-specified PLC variable, written by the PLC to the module, and then made available via the BACnet stack as a read-only value.

BACnet Analog Input 2 Block (0×200 – 0×2FF)

Register Name	Addr.	Comments	Default	R/W From PLC	R/W From Module
BAC_AI_32	0×200 – 0×207	BACnet Analog Input tag 32	0	W	R
…	…	…	…	…	…
BAC_AI_63	0×2F8 – 0×2FF	BACnet Analog Input tag 63	0	W	R

This block is for the last 32 BACnet Analog Input tag values.

BACnet Analog Output 1 Block (0×500 – 0×5FF)

Register Name	Addr.	Comments	Default	R/W From PLC	R/W From Module
BAC_AO_0	0×500 – 0×507	BACnet Analog Output tag 0	0	R	W
BAC_AO_1	0×508 – 0×50F	BACnet Analog Output tag 1	0	R	W
…	…	…	…	…	…

Register Name	Addr.	Comments	Default	R/W From PLC	R/W From Module
BAC_AO_31	0×5F8 – 0×5FF	BACnet Analog Output tag 31	0	R	W

This block is for the first 32 BACnet Analog Output tag values.

BACnet Analog Output objects are made available via the BACnet stack as a writable value that is then written by the module to the PLC. The data are then copied into a user-specified PLC variable.

BACnet Analog Output 2 Block (0×600 – 0×6FF)

Register Name	Addr.	Comments	Default	R/W From PLC	R/W From Module
BAC_AO_32	0×600 – 0×607	BACnet Analog Output tag 32	0	R	W
…	…	…	…	…	…
BAC_AO_63	0×6F8 – 0×6FF	BACnet Analog Output tag 63	0	R	W

This block is for the last 32 BACnet Analog Output tag values.

Module Block (0×00 – 0×1F)

Register Name	Addr.	Comments	Default	R/W From PLC	R/W From Module
MOD_ID_LO	0×00	Module ID	193	R	W
MOD_ID_HI	0×01		0	R	W
VENDOR_ID_LO	0×02	Vendor ID	58	R	W
VENDOR_ID_HI	0×03		0	R	W
PRODUCT_TYPE_LO	0×04		10	R	W
PRODUCT_TYPE_HI	0×05		0	R	W

3.5.4 Data Type Range

The maximum and minimum value of the tags is decided by the PLC data type and it is also limited by data storage and conversion.

- BOOL TRUE or FALSE
- SINT -128 to 127
- USINT 0 to 255
- BYTE 0 to 255
- INT -32768 to 32767
- UINT 0 to 65535
- WORD 0 to 65535
- DINT -2147483648 to 2147483647
- UDINT 0 to 429467295

- DWORD 0 to 429467295
- LINT -1e18 to 1e18[2]
- ULINT 0 to 1e18
- LWORD 0 to 1e18
- REAL -1e18 to 1e18[3]
- LREAL -1e18 to 1e18

3.5.5 Tools

Spectrum Controls, Inc. provides multiple Windows command-line executables you may use to communicate with the module. These utilities are compiled from an open source BACnet stack. The tools require an Ethernet-to-BACnet router. This gives you the ability to send BACnet messages across the BACnet RS-484 network for easier troubleshooting. You can find the source code on sourceforge at http://sourceforge.net/projects/bacnet/files/bacnet-stack/

Setup

To access the BACnet/IP traffic, set the module IP address using a network address that on the same network as the PC IP address.

To access the MS/TP connection on the module, set the baud rate and other parameters using the User Interface. Then connect a BACnet router to your setup. The router converts BACnet/IP packets to MS/TP packets that are then routed to the module. Set the router IP address using a network address that is also on the host network.

WhoIs

The executable, bacwi.exe, looks for who is on the BACnet network. Example: “bacwi -1” will find all the nodes on the BACnet network.

ReadProperty

This executable, bacrp.exe, will read the property of the module.

Examples. To read AI 1 present value, do this – `bacrp 200121 0 1 85`

- {param 1} – 200121. This is a module instance number.
- {param 2} – 0. This is the object type. Object type is defined as: BI(3), BO(4), AI(0), AO(1).
- {param 3} – 1. This is the object instance.
- {param 4} – 85. This is the property. Example: present value(85), object name(77).

WriteProperty

This executablebacwp.exe will write the property of the module.

[2] LINT and ULINT cannot have the same upper range.
[3] LREAL has twice as many bits to work with than REAL

Examples: To write BO 3 present value to 1, do this – "bacwp 200121 4 3 85 15 -1 9 1"

- {param 1} – 200121. This is the module instance number.
- {param 2} – 0. This is the object type. Object type is defined as: BI (3), BO(4), AI(0), AO(1).
- {param 3} – 3. This is the object instance.
- {param 4} – 85. This is the property (present value 85, property array 87, object name 77, object list 76).
- {param 5} – 15. This is the priority. BACnet property write uses priority, levels from 1 to 16. The module keeps a table for those priorities; high priority overrides lower priority. So if there is a value in priority 14, priority 15 value has no effect.
- {param 6} – -1. This is the index. Use -1 for a single property write.
- {param 7} – 9. Value type. Use 9 for BI and BO; use 4 for AI and AO.
- {param 8} – 1. Value. This is the actual value to be written to the tag.

Section 3.6 Viewing Version Information

To view the current version of your software:

1. From the main software dialog, click **Version Info**:

The Version Info dialog appears:

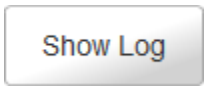
The current software version is listed.

2. To exit, click **OK**.

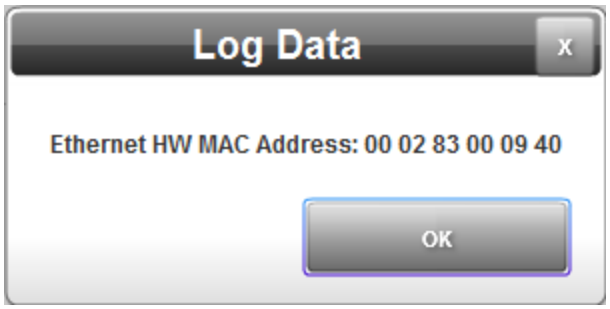
Section 3.7 Viewing Log Information

To view current Log Information:

1. From the main software dialog, click **Show Log**:



The Log Data dialog appears:



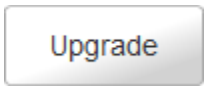
The Ethernet hardware MAC address is listed.

2. To exit, click **OK**.

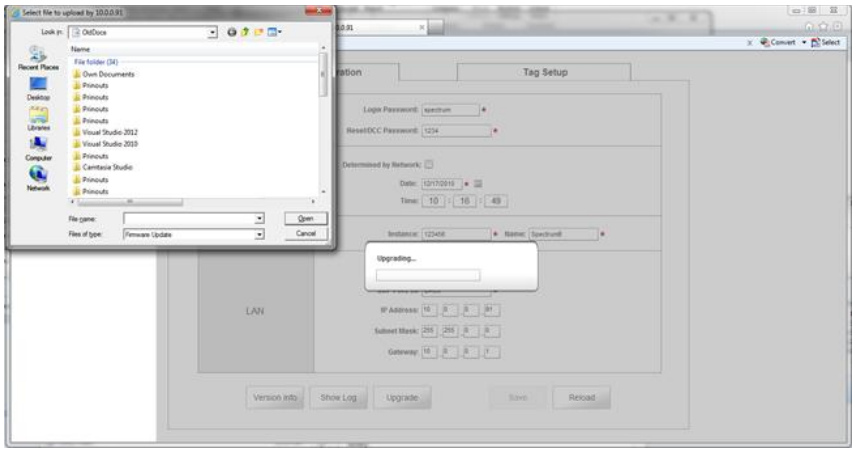
Section 3.8 Upgrading the Software

To upgrade to a new version of software:

1. Navigate to the correct BACnet location on the Spectrum Controls, Inc. web site (www.spectrumcontrols.com), and download the software upgrade to your personal computer. The software upgrade file will have a .UPT file extension.
2. From the main software dialog, click **Upgrade**:



3. Use the dialog that opens to navigate to where you downloaded the upgrade file, and click on the file.



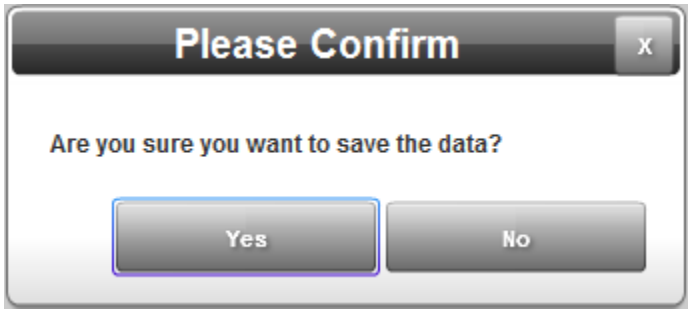
The software upgrades and the module reboots once the upgrade is complete.

Section 3.9 Saving Changes

To save changes made to the software fields:

1. From the main software dialog, click **Save**:

Confirm you wish to save the data:



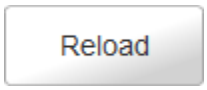
- To save the data, click **Yes**.
- To cancel the data save, click **No**.

2. If you select **Yes**, the software saves the changes to the system configuration on the module.

Section 3.10 Reloading System Configuration

To reload the system configuration from the module:

1. From the main software dialog, click **Reload**:



2. The software reloads the system configuration from the module into the software.

Chapter 4
Implementing the BACnet Protocol

This chapter describes the BACnet protocol and its implementation in the BACnet Communications Module:

- BACnet Protocol Requirements
- Tag Mapping
- API Address Mapping and other considerations

Section 4.1 BACnet Object Types

The following data shows the supported BACnet object types and the properties supported for each object type. Each table also includes the property data type, the identifier number, and whether the property is read or read/write.

Analog Input-BACnetObjectType = 0

Properties Supported	Property Data	Type Identifier	Read/Write
Object_Identifier	BACnetObjectIdentifier	75	R
Object_Name	CharacterString	77	R
Object_Type	BACnetObjectType	79	R
Present_Value	REAL	85	R
Status_Flags	BACnetStatusFlags	111	R
Event_State	BACnetEventState	36	R
Out_Of_Service	BOOLEAN	81	R
Units	BACnetEngineeringUnits	117	R

Analog Output-BACnetObjectType = 1

Properties Supported	Property Data	Type Identifier	Read/Write
Object_Identifier	BACnetObjectIdentifier	75	R
Object_Name	CharacterString	77	R
Object_Type	BACnetObjectType	79	R
Present_Value	REAL	85	R/W
Status_Flags	BACnetStatusFlags	111	R

Properties Supported	Property Data	Type Identifier	Read/Write
Event_State	BACnetEventState	36	R

Binary Input-BACnetObjectType = 3

Properties Supported	Property Data	Type Identifier	Read/Write
Object_Identifier	BACnetObjectIdentifier	75	R
Object_Name	CharacterString	77	R
Object_Type	BACnetObjectType	79	R
Present_Value	BACnetBinaryPV	85	R/W
Status_Flags	BACnetStatusFlags	111	R
Event_State	BACnetEventState	36	R
Out_Of_Service	BOOLEAN	81	R
Polarity	BACnetPolarity	84	R

Binary Output-BACnetObjectType = 4

Properties Supported	Property Data	Type Identifier	Read/Write
Object_Identifier	BACnetObjectIdentifier	75	R
Object_Name	CharacterString	77	R
Object_Type	BACnetObjectType	79	R
Present_Value	BACnetBinaryPV	85	R/W
Status_Flags	BACnetStatusFlags	111	R
Event_State	BACnetEventState	36	R
Out_Of_Service	BOOLEAN	81	R
Polarity	BACnetPolarity	84	R

Device-BACnetObjectType = 8

Properties Supported	Property Data	Type Identifier	Read/Write
Object_Identifier	BACnetObjectIdentifier	75	R
Object_Name	CharacterString	77	R
Object_Type	BACnetObjectType	79	R
System_Status	BACnetDeviceStatus	112	R
Vendor_Name	CharacterString	121	R

Properties Supported	Property Data	Type Identifier	Read/Write
Vendor_Identifier	Unsigned16	120	R
Model_Name	CharacterString	70	R
Firmware_Revision	CharacterString	44	R
Application_Software_Version	CharacterString	12	R
Protocol_Version	Unsigned	98	R
Protocol_Revision	Unsigned	139	R
Protocol_Services_Supported	BACnetServicesSupported	97	R
Protocol_Object_Type_Supported	BACnetObjectTypesSupported	96	R
Object_List	Sequence of BACnetObjectIdentifier	76	R
Max_APDU_Length_Supported	Unsigned	62	R
Segmentation_Supported	BACnetSegmentation	107	R
Local_Time	Time	57	R
Local_Date	Date	56	R
UTC_Offset	Integer	119	R/W
APDU_Timeout	Unsigned	11	R
Number_Of_ADPU_Retries	Unsigned	73	R
Max_Master	Unsigned	64	R/W
Max_Info_Frames	Unsigned	63	R/W
Device_Address_Binding	Sequence of BACnetAddressBinding	30	R
Database_Revision	Unsigned	155	R

The following table lists BACnet object types and properties supported by the BACnet Communications Module.

Supported Object Types Properties

Property	Device	Binary Value	Analog Value
Object Identifier	√	√	√
Object Name	√	√	√
Object Type	√	√	√
System Status	√		
Vendor Name	√		
Vendor Identifier	√		
Model Name	√		
Firmware Revision			

Property	Device	Binary Value	Analog Value
Preset Value	√		
Status Flags	√		
Event State	√		
Out-of-Service	√		
Appl Software revision	√		
Protocol Version	√		
Protocol Revision	√		
Services Supported			
Object Types Supported			
Object List	√		
Max APDU Length	√		
Segmentation Support	√		
APDU Timeout	√		
Number APDU Retries	√		
Max Master	√		
Max Info Frames	√		
Device Address Binding			
Database Revision			
Present Value		√	√
Status Flags		√	√
Event State		√	√
Units			√
Priority Array		√	√
Relinquish Default		√	√
Polarity			

Section 4.2 Parameter Offset for Module Block (0.00 [0] to 0×1F [31])

Register	Address	Comments	Default
MOD_ID_LO	0×00	Module ID	193
MOD_ID_HI	0×01		0
VENDOR_ID_LO	0×02	Vendor ID	58 (0×3a)
VENDOR_ID_HI	0×03		0

Register	Address	Comments	Default
PRODUCT_TYPE_LO	0×04		10 (0×0A)
PRODUCT_TYPE_HI	0×05		0
PRODUCT_CODE_LO	0×06		80 (0× 50)
PRODUCT_CODE_HI	0×07		0
MOD_REV_LO	0×08	Minor revision, 1-255	1
MOD_REV_HI	0×09	Major revision, 1-127	1

Section 4.3 User Interface Options

The configuration software uses Adobe Flash. Your personal computer must be able to run an Adobe Flash Player compatible browser. You use the configuration software to set up the system. See Chapter 3, Configuring the Module using Software.

Technical Assistance

Note that your module contains electrostatic components that are susceptible to damage from electrostatic discharge (ESD). An electrostatic charge can accumulate on the surface of ordinary wrapping or cushioning material. **In the unlikely event that the module should need to be returned to Spectrum Controls, Inc., please ensure that the unit is enclosed in approved ESD packaging (such as static-shielding/metallized bag or black conductive container).** Spectrum Controls, Inc. reserves the right to void the warranty on any unit that is improperly packaged for shipment.

For further information or assistance, please contact your local distributor, or call the technical support number provided under the Technical Support section in the Preface.

Appendix A Configuration Information

This appendix contains configuration information as follows:

Environmental Specifications

Environmental Tests	Industry Standards	Test Level Limits
Temperature (Operating) (Performance Criteria A)	IEC60068-2-1: (Test Ad, Operating Cold), IEC60068-2-2: (Test Bd, Operating Dry Heat), IEC60068-2-14: (Test Nb, Operating Thermal Shock)	-20°C to 65°C (-4°F to 149°F)
Temperature (Non-operating) (Performance Criteria B)	IEC60068-2-1: (Test Ab, Unpackaged Non-operating Cold), IEC60068-2-2: (Test Bb, Unpackaged Non-operating Dry Heat), IEC60068-2-14: (Test Na, Unpackaged Non-operating Thermal Shock)	-40°C to 85°C (-40°F to 185°F)
Humidity (Operating) (Performance Criteria A)	IEC60068-2-30: (Test Db, Unpackaged Damp Heat):	5 to 95% non-condensing
Vibration (Operating) (Performance Criteria A)	IEC60068-2-6: (Test Fc, Operating)	5 G @ 10 to 500 Hz, 0.030 in. max. peak-to-peak
Shock (Operating) (Performance Criteria A)	IEC60068-2-27: (Test Ea, Unpackaged Shock)	30 g,11 ms half-sine (3 mutually perpendicular axes)
Shock (Non-operating) (Performance Criteria B)	IEC60068-2-27: (Test Ea, Unpackaged Shock)	50 g, 11 ms half-sine (3 mutually perpendicular axes)
Radiated Emissions	CSIPR 11; Group 1, Class A Rockwell Document QTP#X0327	(Enclosure) Class A, 30 MHz – 1 GHz

Environmental Tests	Industry Standards	Test Level Limits
Conducted Emissions	IEC 61000-6-4:2007 Rockwell Document QTP#X0327	Group 1, Class A (AC Mains), 15 0 kHz – 30 MHz
ESD immunity (Performance Criteria B)	IEC 61000-4-2 Rockwell Document QTP#X0327	6 kV Indirect (Coupling Plate) 6 kV Contact Discharge (to points of initial contact) 8 kV Air Discharge (to points of initial contact)
Radiated RF immunity (Performance Criteria A)	IEC 61000-4-3: Level 3 Rockwell Document QTP#X0327	10 V/M with 1 kHz sine-wave 80% AM from 80…2000 MHz 10 V/M with 200 Hz sine-wave 50% Pulse 100% AM @900 MHz 10 V/M with 200 Hz sine-wave 50% Pulse 100% AM @1890 MHz 1 V/M with 1 kHz sine-wave 80% AM from 2000…2700 MHz (3 V/M goal)
EFT/B immunity (Performance Criteria B)	IEC 61000-4-4* Rockwell Document QTP#X0327	Signal Ports: ± 3 kV @ 5 kHz for 5 minutes, Criteria B (Marine?) ± 2 kV @ 5 kHz for 5 minutes, Criteria A (Marine?) ± 2 kV @ 5 kHz for 5 minutes, Criteria B (standard) Power Ports: ± 2 kV @ 5 kHz for 5 minutes, Criteria A (Marine?) ± 2 kV @ 5 kHz for 5 minutes, Criteria B (standard)
Surge transient immunity (Performance Criteria B)	IEC 61000-4-5 Rockwell Document QTP#X0327	Signal Ports: ± 2 kV line-earth {CM}@ 2Ω on shielded ports Power Ports ± 2 kV CM @ 12Ω ± 1 kV DM @ 2Ω
Conducted RF immunity (Performance Criteria A)	IEC 61000-4-6 Rockwell Document QTP#X0327	10 V rms with 1 kHz sine wave 80% AM from 150 kHz…80 MHz on signal and power ports

Environmental Tests	Industry Standards	Test Level Limits
Magnetic Field (Performance Criteria A)	IEC 61000-4-8 Rockwell Document QTP#X0327	30 Arms/m
AC Mains Voltage Dips, Interruptions and Variations	IEC 61000-4-11 Rockwell Document QTP#X0327	Follow the 61000-4-11.

Safety Tests and Test Limits

Safety Tests	Industry Standards
cUL	UL 508 Industrial Control Equipment Seventeenth Edition Dated January 28 1999, with revisions through July 11, 2005 (ANSI/UL 508-2005) (NRAQ, NRAQ7) cUL CSA C22.2 No. 142 -M1987 Process Control Equipment May 1987 ULH ANSI/ISA–12.12.01–2007 Non-incendive Electrical Equipment for Use in Class I, Division 2 Hazardous (Classified) Locations CULH CSA C22.2 No. 213-M1987 - Non-incendive Electrical Equipment for use in Class I Division 2 Hazardous Locations - March 1987
CE	CE LVD IEC 61131-2 Programmable Controllers Part 2: Equipment Requirements and Tests; Second Edition 2003-02, Section 11-14

Performance Requirements

Input Specifications	
Inputs per module	2 serial channels, non-concurrent operation
Interface, channel 1	RS-485, configurable during setup
Hardware flow control	None
Baud rates	9600, 19.2 k, 38.4 k, 76.8 k
Interface, channel 2	10/100M Ethernet, auto sensing
Crosstalk	-40 dB, minimum
Input protection	24 VDC continuous.
Power source	3.3 VDC and 24 VDC from backplane, 40 mA from 3.3 VDC and 50 mA maximum from 24 VDC
Power, RTC Backup	72 hours, minimum
Accuracy, RTC Backup	+1.0,- 3.0 minutes/month.
Power consumption	<45 mA at 3.3 V, <55 mA at 24 V, <1.5 W Total
Inrush current	<500 mA at 3.3 V, <500 mA at 24 V

Input Specifications	
Fusing	2.7 Ω 1/10 W resistor, 24 VDC input 0.47 Ω 1/10 W resistor, 3.3 VDC input
Input to backplane isolation	707 VDC for 1 minute
Channel to channel isolation	None
Fault detection	None
Wire size	#22 to #30 AWG (for the mating connector)
Operating temperature	-20 ºC to 65 ºC
Storage temperature	-40 ºC to 85 ºC
Operating humidity	5% to 95% (non-condensing)
Manufacturing	RoHS & REACH compliant
Dimensions	58.4 mm × 29.3 mm × 25 mm

Reliability

The Mean Time between Failure (MTBF) target for the 2080sc-BAC is 250,000 hours.

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