CAS 2700-15

Danfoss AK-SC-255 XML to BACnet IP and Modbus RTU TCP

Manual

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1. Danfoss AK-SC-255 XML to BACnet IP, Modbus RTU TCP Gateway Description

The CAS Gateway's Danfoss driver connects to a Danfoss system via http REST to poll for real time data.

The Gateway connects to the Danfoss System, reads data, and stores it internally. When a remote system requests data, the data is served in a form that is appropriate to the requesting protocol. The CAS Gateway serves data from a Danfoss system as Modbus, BACnet or Web data. The gateway supports all these options simultaneously. Use the data you want and ignore the other.

The driver is an Ethernet driver that uses Ethernet cables and a hub or a switch to connect between the Gateway and the Danfoss system. The Danfoss system must enable and support the XML Interface.

This manual contains additional information about how the Gateway operates as well as instructions on how to setup the connections to the Gateway and how to configure and read data from the Gateway.

The following is a brief description of the sections covered in this manual.

2. Connections

This section contains information about how to connect to the Gateway. It includes block diagrams and any wiring diagrams that are needed.

3. Setting up the Gateway

This section describes how to connect to the Gateway initially and how to set the IP Address

4. Configuring the Gateway

This section has instructions and images of how to configure the Gateway through the web page interface.

5. Reading the Data

This section contains example of the Danfoss data that is stored on the Gateway and how to read the Reports Page

6. Commissioning, Diagnostics, and Troubleshooting

This section contains details on what to bring to site when installing the Gateway, how to take diagnostics and the tools to use, and how to trouble shoot and take logs.

2. Connections

This section contains information about how to connect to the Gateway. It contains a block diagram and limitations and best practices when connecting the Gateway.

2.1 Block Diagram

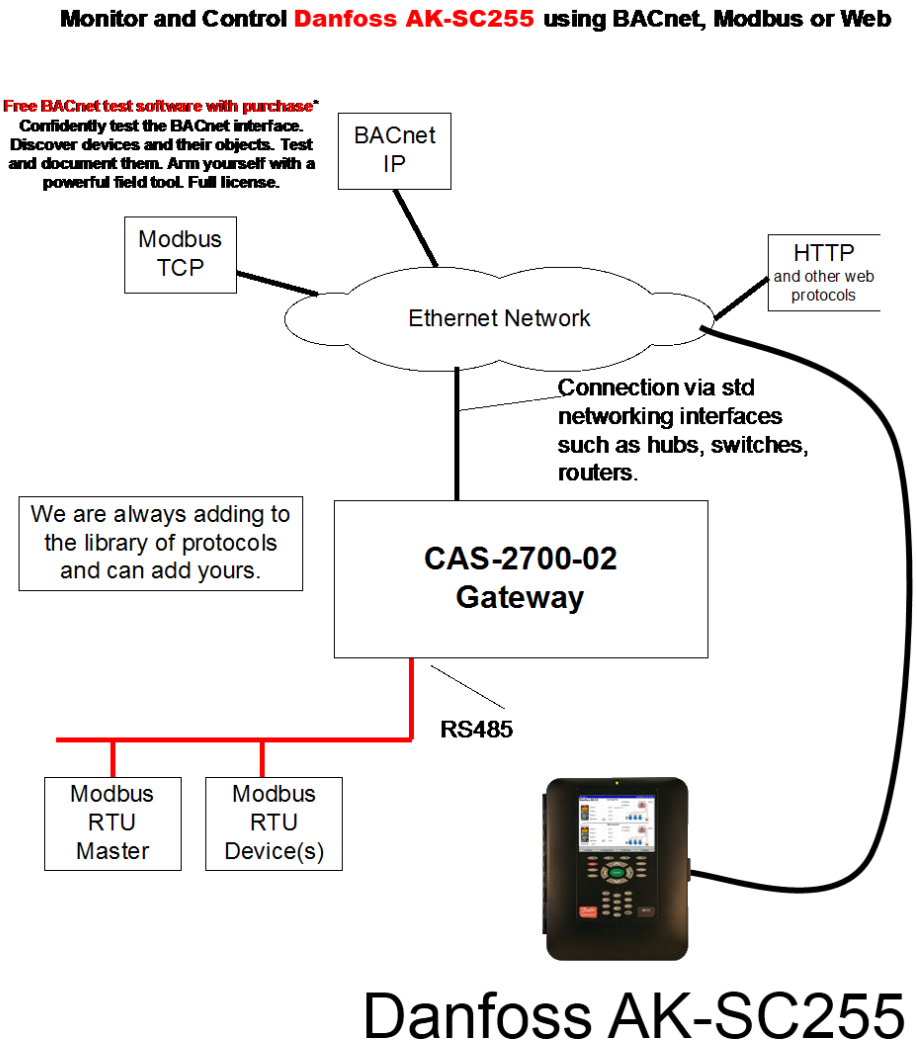


Image 2.1 – Block Diagram of CAS 2700-15 Danfoss AK-SC-255 XML

2.2 Wiring and Connections

This section contains wiring diagrams for the various connections that are possible for this Gateway. The Gateway has 3 main ports:

Port 0

This port is a RS485 port and is used primarily for Modbus RTU. It can support full and half duplex RS485.

Port 1

This port is setup a RS232 port and is **NOT** used by the Gateway.

Ethernet Port

This port is used by the TCP/IP and UDP drivers of the Gateway. Default port for accessing the internal web server of the Gateway is 80.

3. Setting up the Gateway

This section contains information and instructions on what to do when connecting to the Gateway for the first time.

3.1 Determining the IP Address

Before connecting to the Gateway, you will need to determine the IP Address of the Gateway. By default, the Gateway is assigned a Static IP Address of **192.168.1.113** when it is shipped.

To find the IP Address, look on the back of the Gateway. There should be a business card attached to the back of the Gateway that has the IP Address and Reference #. See below for an example

Image 3.1 – Business Card attached to back of CAS Gateway

Take note of the Ref# as this will be used by the support team to pull up additional information about the project.

The IP Address that is written on the business card should be the Static IP Address assigned to the Gateway.

3.2 Connecting to the Gateway

To Change the IP Address of the Gateway (Section 3.3) or to Configure the Gateway (Section 4), you use a PC and connect to the Gateway using an Ethernet cable. (The Ethernet cable should have been provided with the Gateway when shipped).

Before connecting the Ethernet cable, set your computer's IP Address to be similar to the Gateway's IP Address.

For Example, a Gateway is assigned the following IP Address by default:

IP Address – 192.168.1.113
Netmask – 255.255.255.0
Gateway – 192.168.1.1

So set your computer to the following:

IP Address – 192.168.1.100
Netmask – 255.255.255.0
Gateway – 192.168.1.1

After setting the IP Address on the computer, connect the Ethernet cable to the computer and to the Gateway.

3.3 Changing the IP Address

To change the IP Address of the Gateway, you will need to use the IP Setup Tool. The tool can be found on the blue USB stick that should have come with the Gateway.

Run the IP Setup Tool application and you will see the following window open:

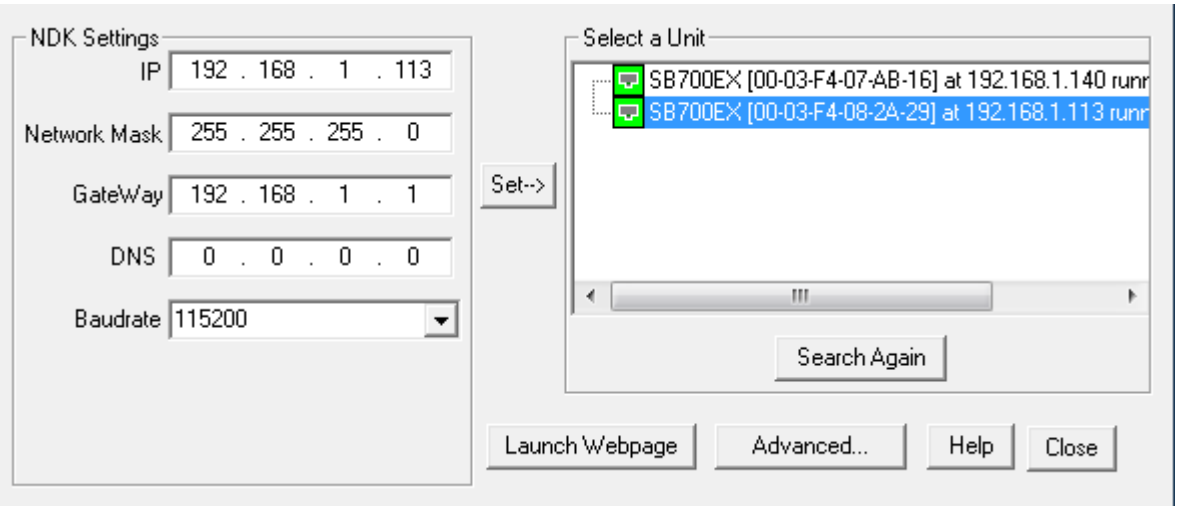


Image 3.3 – IP Setup Tool

The 'Select a Unit' section will have the Gateway you purchased listed with the assigned IP Address.

To change the IP Address, change the fields list on the left side under the 'NDK Settings'

Note: Please do **NOT** change the Baudrate value.

Once you have changed all of the settings, click the 'Set→' button in the middle of the window. The Gateway will automatically reboot to assign the new IP Address.

After you have finished changing the IP Address, you may not see the device in the 'Select a Unit' anymore when pressing the 'Search Again' button. This is because your computer is now on another subnet than the Gateway.

Change your computer back to the original address and you should be able to see the Gateway again when you press the 'Search Again' button.

Now you can add the Gateway to the site network. Note down the new IP Address so that others will know the assigned IP Address.

3.4 Testing the Connection

After changing the IP Address, test the connection to the Gateway.

To test the connection, you can use one of two methods.

1. Open a Web browser and type in the IP Address of the Gateway into the address bar.
2. If the IP Setup Tool is still open, click on the Gateway in the 'Select a Unit' section and press the 'Launch Webpage' button. This will open a Web browser to the start page of the Gateway.

Regardless of the method, you will see the Start Here page of the Gateway. It should be similar to the following:

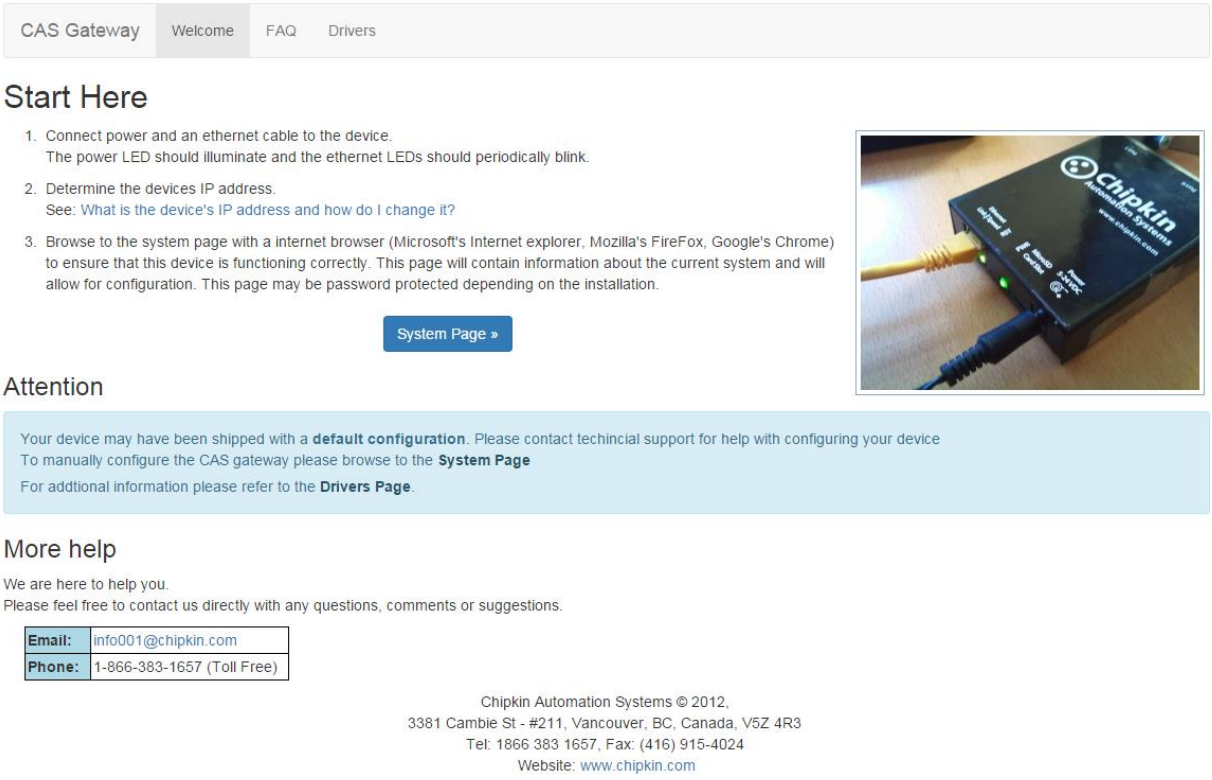


Image 3.4 – CAS Gateway Start Here page

If this page is visible, then the connection to the Gateway is good and you can continue to the next step – Section 4: Configuring the Gateway

3.5 Logging in For the First Time

If you are browsing the webpages of the Gateway for the first time (or whenever the web browser's cache is cleared), you may be prompted for a user name and password.

By default, when shipped, the Gateway comes with the following username and password:

- Username: admin
- Password: admin

After logging in, it is possible to change the password by accessing the System Page at http://**<IP ADDRESS>**/bin/system/ where <IP ADDRESS> is the IP Address of the Gateway.

Look for the "Change Password" section on the System Page as seen in the image below

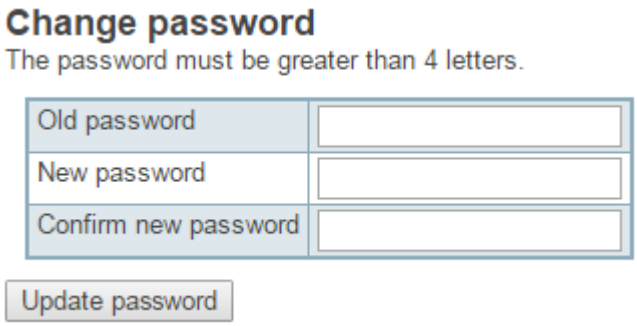


Image 3.5 – CAS Gateway Change Password

Note: Username will always remain 'admin'

4. Configuring the Gateway

4.1 Configuring the Danfoss XML Gateway

To configure the XML to BACnet IP Gateway, refer to the following instructions:

1. Open a Web Browser
2. Browse to the following Web Page:
   http://*<IP ADDRESS>*/bin/danfossxml/config/ where <IP ADDRESS> is the IP Address of the Gateway.

   Or by clicking on the Danfoss XML Configuration link highlighted in the image below.

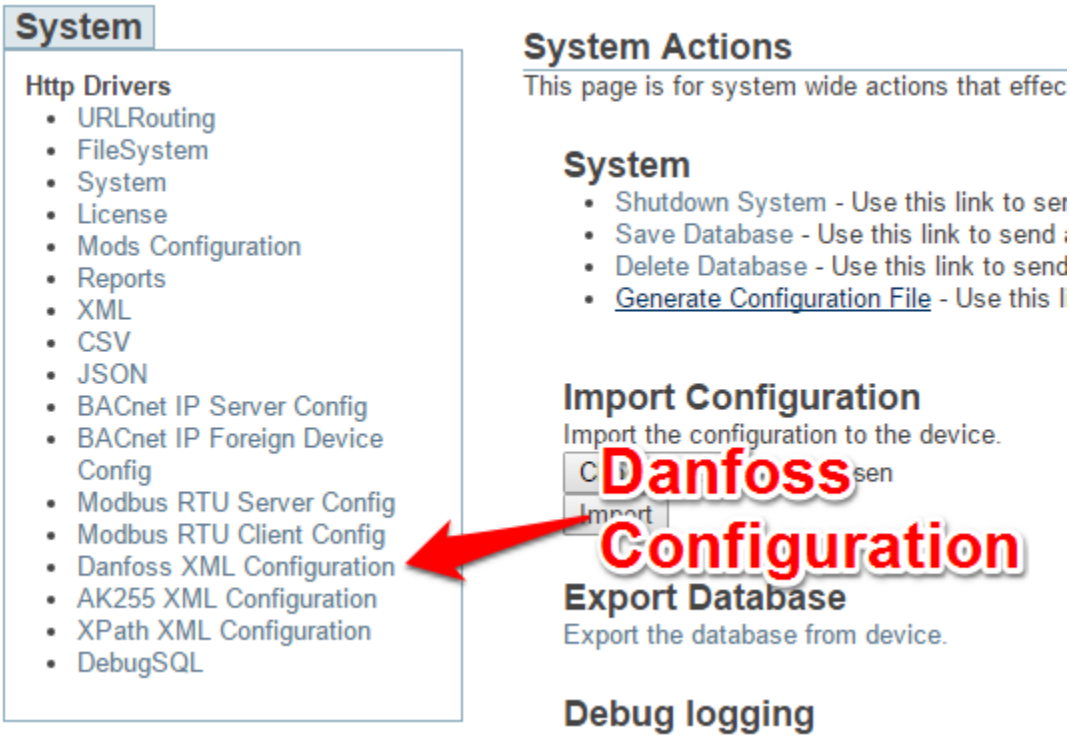


Image 4.1 –Danfoss Configuration Link

You will see the following form:

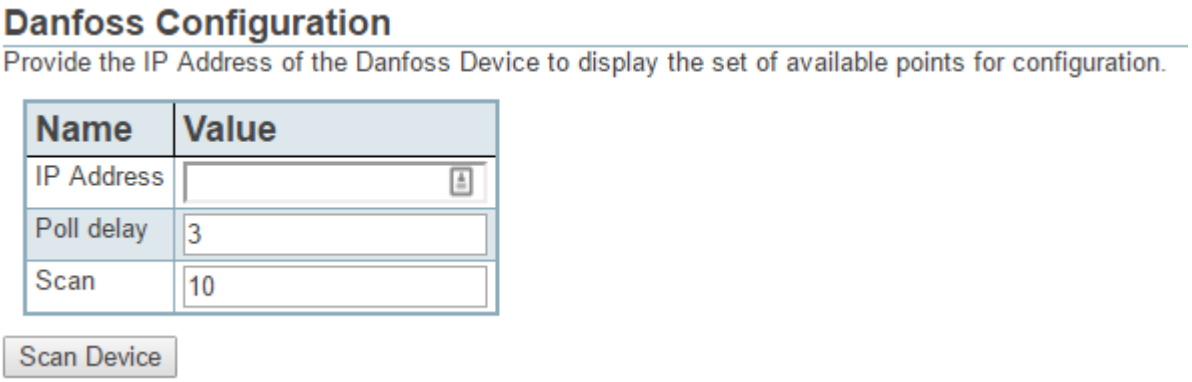


Image 4.2 – Danfoss Configuration Page

3. Enter the IP address of the Danfoss System into the forum and click "Scan Device"

   The CAS Gateway will attempt to scan the Danfoss system for available properties and display them in a series of tables below. This process can take a few mins depending on the size of the configuration on the Danfoss system.

4. Configure the BACnet Server Configuration

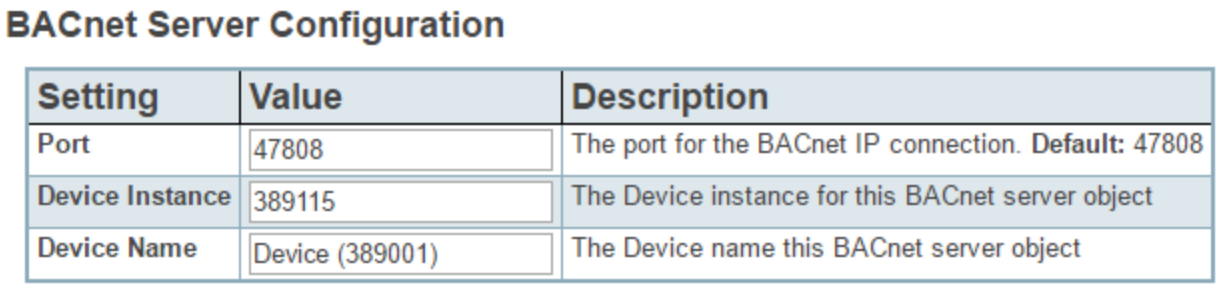


Image 4.2 – BAcnet IP Configuration Page

The parameters for the BACnet IP Server Configuration are as follows:
(Default values are **Bolded)**

- **Port:** The port for the UDP connection for BACnet IP. Default Value: **47808**
- **Device ID:** The BACnet Device ID for the Gateway. Default Value: **389001**
- **Device Name:** The name of this BACnet Device. Default Value: **Device (389001)**

Note: The BACnet Server settings can be reconfigured from the "BACnet IP Server Config" page. http://*<IP ADDRESS>*/bin/bacnetipserver/config/

5. Using the checkboxes next to each parameter in the remaining Danfoss configuration tables, Check the parameters that you are interested in.
6. Click "Save Configuration" button at the bottom of the page.

   This will create read tasks to read parameters from the Danfoss system and BACnet server tasks to make the data available to BACnet IP clients.

Image 4.3 –Danfoss XML Configuration Successful

7. **Note:** After finishing the configuration, you must save and reboot the Gateway for the configured settings to take place.

4.2 Saving the Configuration

After configuring the read tasks for the Danfoss system, return to the System Page by browsing to the following IP Address: http://*<IP ADDRESS>*/bin/system/ where <IP ADDRESS> is the IP Address of the Gateway.

To Save the Database, click the 'Save Database' link , then click the Ok button when prompted. You will see some XML saying that the Save was successful. Click the 'Back' button in the web browser.

Now Reboot the Gateway by Clicking the 'Reboot System' link. When prompted, click the Ok button. Link is highlighted in the image below

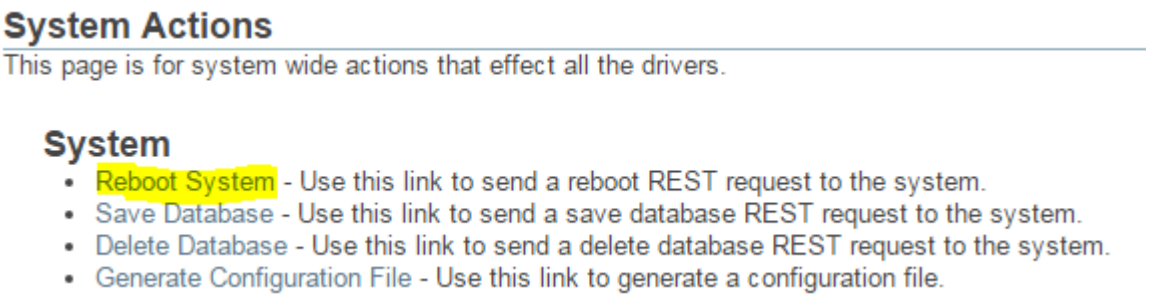


Image 4.7 – System Actions Page – Reboot System

The Gateway will take 30-45 seconds to reboot.

Note: The Gateway must be rebooted after configuration because the BACnet IP Objects are generated during the boot cycle.

5. Reading the Data

The Rib data read by this Gateway is made available through the BACnet IP Protocol. The Gateway acts as a BACnet IP Device. This section describes how the data is formatted, what data is stored in the Modbus Registers, and what functions are supported.

5.1 BACnet IP Data

The Gateway acts as a BACnet IP Server.

For more information about BACnet in general, please read this guide:
http://www.chipkin.com/files/pdf/Bacnet%20For%20Field%20Technicians.pdf

5.1.1 Supported BACnet Services

The Gateway supports the following BACnet services:

- Who-Is
- Who-Has
- Read Property
- Read Property Multiple
- Write Property
- Write Property Multiple
- Subscribe COV
- Time Synchronization

Note: CAS is always updating the BACnet IP Driver. For a recent list of supported services, please visit www.chipkin.com or contact us. If there are services that you require, please contact us to discuss how we can add them to the driver.

6. Communications functions

6.1 Supported functions.

Not all Danfoss communication functions are supported. The following functions are supported by the Web based configuration. Additional functions are supported but must be configured manually.

- **read_val** - This command returns the value or field for each of a list of variables that are identified by node type, node, and either cid and vid, or tag In an EKC device the vid is the PNU number and the cid is zero. A variable in an AK2 device is identified using both the cid and vid. Use the read_parm_info command to get cid and vid values. Variables may be read using tags instead of cid,vid identifiers. The read_parm_info command provides tag, cid, vid, information
- **read_device** - Read detailed information about a specific device
- **read_input** - Read the value (On or Off) of the digital ON/OFF inputs (node type = 0))
- **read_relay** - Read the value of the digital Relay outputs (node type = 1).
- **read_sensor** - Read the value of the analog sensor inputs (node type = 2)
- **read_var_out** - Read the value of the analog variable outputs (node type = 3)

The driver will not send the next command until a response has been received from the previous or until a timeout has expired.

6.2 Supported Devices

The following is a list of the devices that this driver supports: AK-SC255, SM-850

Note: Other Danfoss devices may be supported but have not been tested. Please contact CAS for more information.

7. Commissioning, Diagnostics, and Troubleshooting

7.1 What to Take for Site for Installing and Commissioning the Gateway

The following is a list of general Gateway tools. Take what you would need for your specific project and ignore the others.

1. The gateway and other supplied components.
2. USB->232 Converter and / or USB->RS485 Convertor

Any will do. This will allow you run tests using the 232 or 485 serial connection. Connect to the device and find out which COM port is now available, use CAS Modbus Scanner to retrieve data.

3. Laptop

4. Gateway IP Address Allocation Tool

   Download from
   http://www.chipkin.com/articles/cas-gateway-ip-address-tool

5. Wireshark packet sniffer software

   Download from
   http://www.wireshark.org/download.html

6. CAS Modbus Scanner – free download

   CAS Modbus Scanner is a utility to retrieve coils, inputs, holding registers, and input registers from a Modbus enabled device. Values retrieved from the device can be viewed in many different formats including Binary, HEX, Uint16, Int16, Uint32, Int32, and Float32.

   http://www.chipkin.com/cas-modbus-scanner

7. Serial Mini Tester

8. DB9 and DB25 male and female connector make-up kits (Solder free)

   Always useful but not required if you have tested your cable prior to attending the site.

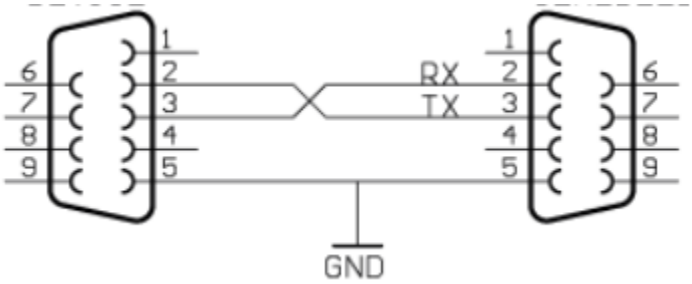
9. Rx / TX cross over.

   Always useful but not required if you have tested your cable prior to attending the site.

   It is useful to be able to swap the conductors connected to pins 2 and 3. Take a module with you. It is easier than changing the wires.

   For example, the Ziotek Null Modem Adapter DB25

   http://www.cyberguys.com/product-details/?productid=751&rtn=750&core_cross=SEARCH_DETAIL_SIMILAR#page=page-1



10. Gender Benders

    Always useful but not required if you have tested your cable prior to attending the site.

11. Ethernet Patch cables

12. Hub

    Used as a last resort if there are problems on Modbus TCP or BACnet IP

    A hub is not a switch. A hub can be used for trouble-shooting whereas only a 'supervised' switch can. Most switches are not supervised.

    http://www.chipkin.com/articles/hubs-vs-switches-using-wireshark-to-sniff-network-packets

7.2 Diagnostics

Gateway Hardware Diagnostics

1. Power Led: Green Solid = Normal Condition.
2. RJ45 LED: Green to show link.

7.3 Trouble-Shooting

7.3.1 Taking Logs

Debugging and Error messages from the Gateway are sent on UDP port 514 to the broadcast IP address: {255.255.255.255} as plain ASCII text.

You can use Wireshark to take a log of these messages.

A Wireshark log is also very useful for any TCP (like Modbus TCP) or UDP (like BACnet IP) protocols as the bytes and messages that are sent and received from the Gateway will also be logged.

Note: To properly take a log, a hub (not a switch) is required.

For more help with taking logs, please feel free to contact us.

7.3.2 Testing BACnet – Use CAS BACnet Explorer

You have been provided with a USB key to the CAS BACnet Explorer. This key activates the software. It cannot run without it. If you don't have your USB key, you can still activate the application – it requires an internet connection. A video provides help.

http://www.chipkin.com/articles/cas-bacnet-explorer-software-activation-video

You might also want to refer to these articles.

http://www.chipkin.com/articles/cas-bacnet-explorer-usbsoftware-activation-problems

http://www.chipkin.com/cas-bacnet-explorer-licenses-faq

Install and activate the application. Download from here.

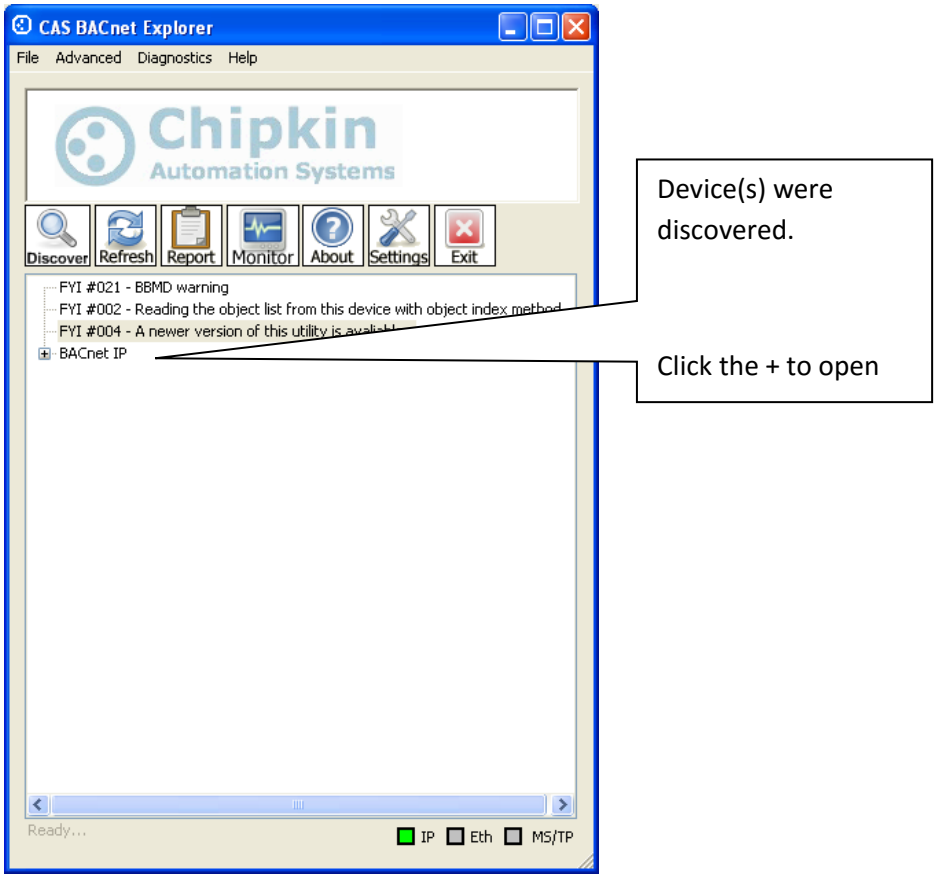
http://www.chipkin.com/cas-bacnet-explorer/

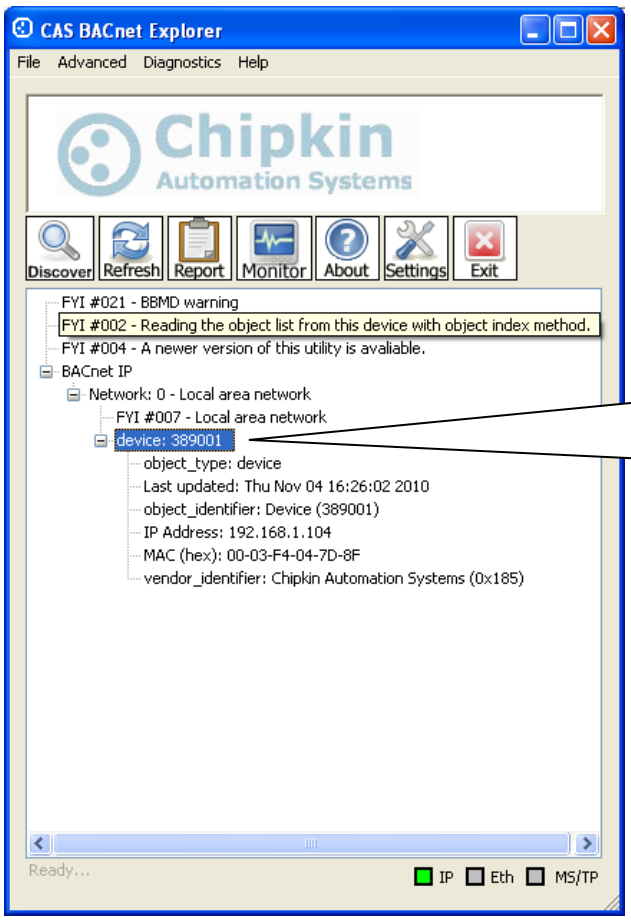
Procedure

1. Start the application
2. Click Settings
3. Check IP – uncheck MSTP and Ethernet
4. Click on the network card you will use.
5. Click Ok.

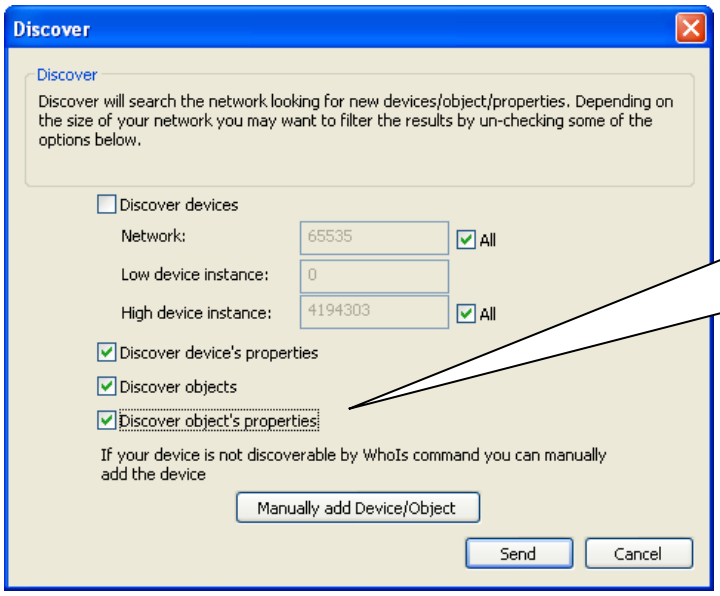
6. Now click discover
7. Click Send

See the following set of images that describe the discovery process.



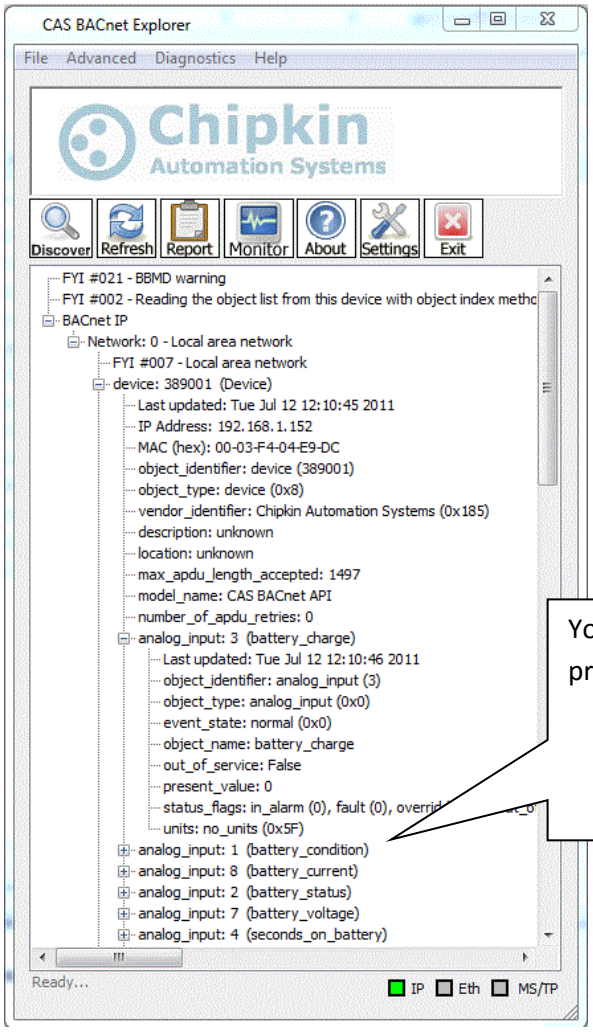


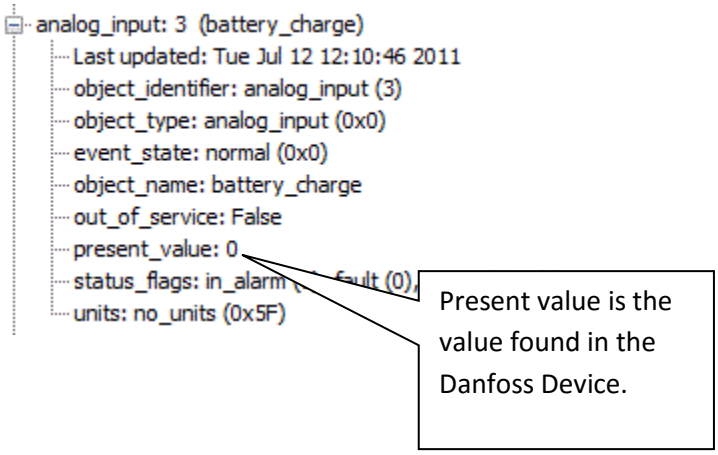
Select the device and click discover again.



Check the 'Discover properties' box.

Click the Send


CAS BACnet Explorer
File Advanced Diagnostics Help
Chipkin
Automation Systems
Discover
Refresh
Report
Monitor
About
Settings
Exit
FYI #021 - BBMD warning
FYI #002 - Reading the object list from this device with object index metho
BACnet IP
Network: 0 - Local area network
FYI #007 - Local area network
device: 389001 (Device)
Last updated: Tue Jul 12 12:10:45 2011
IP Address: 192.168.1.152
MAC (hex): 00-03-F4-04-E9-DC
object_identifier: device (389001)
object_type: device (0x8)
vendor_identifier: Chipkin Automation Systems (0x185)
description: unknown
location: unknown
max_apdu_length_accepted: 1497
model_name: CAS BACnet API
number_of_apdu_retries: 0
analog_input: 3 (battery_charge)
Last updated: Tue Jul 12 12:10:46 2011
object_identifier: analog_input (3)
object_type: analog_input (0x0)
event_state: normal (0x0)
object_name: battery_charge
out_of_service: False
present_value: 0
units: no_units (0x5F)
analog_input: 1 (battery_condition)
analog_input: 8 (battery_current)
analog_input: 2 (battery_status)
analog_input: 7 (battery_voltage)
analog_input: 4 (seconds_on_battery)
Ready...
IP
Eth
MS/TP
You get a list of objects with properties.


analog_input: 3 (battery_charge)
Last updated: Tue Jul 12 12:10:46 2011
object_identifier: analog_input (3)
object_type: analog_input (0x0)
event_state: normal (0x0)
object_name: battery_charge
out_of_service: False
present_value: 0
units: no_units (0x5F)
Present value is the value found in the Danfoss Device.

7.4 Additional Functionality

7.4.1 Another Method for Changing the IP Address – DHCP

This device supports DHCP, but when shipped, usually a Static IP Address is assigned.

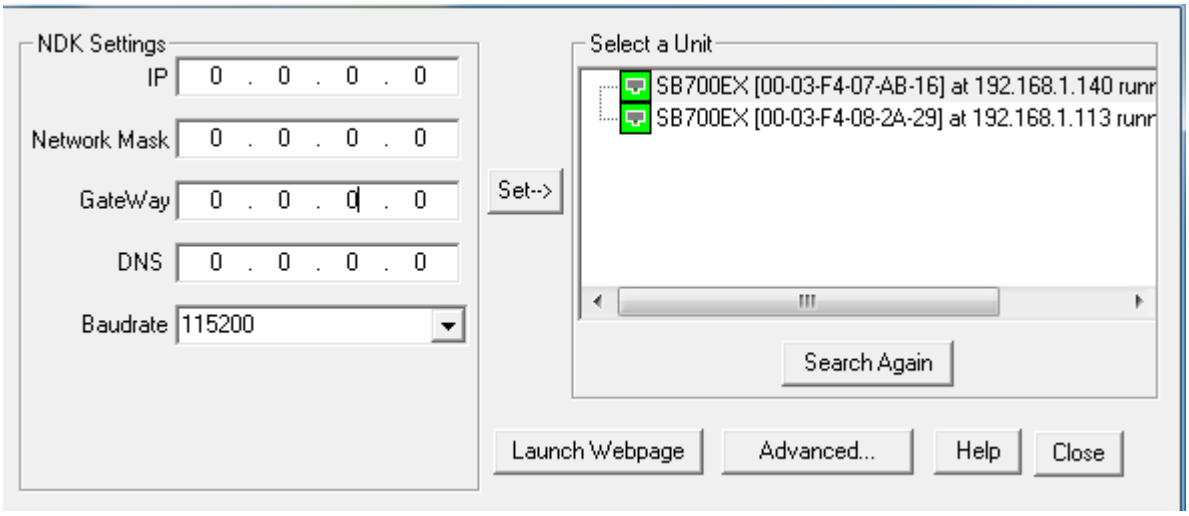
IP = 192.168.1.113
Netmask = 255.255.255.0
Gateway = 192.168.1.1

To enable and to set the Gateway to DHCP, follow these instructions:

1. Download the tool to change the IP address of the gateway. The tool can be downloaded from:

   http://www.chipkin.com/articles/cas-gateway-ip-address-tool

2. When you start this tool it discovers gateways and list them in the right had side 'Select a Unit' area. If the area is blank then click the 'Search Again' button. If it remains blank check that the Ethernet connection is made – is there a green link LED on the RJ45 and on the hub/switch you are connected to.



3. To set it to DHCP, simply put all fields to 0.0.0.0 and click the 'Set' button as displayed in the image above.

7.4.2 Downloading New Firmware

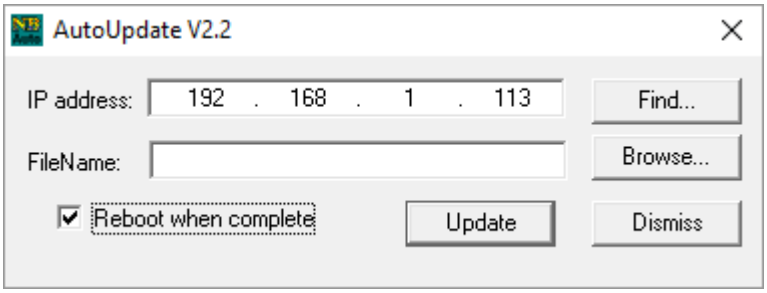
During support, it is sometimes required to download new firmware with bug fixes or additional debugging details.

If you are sent new firmware, you will be provided with specific instructions on how to load it. The following instructions are generic:

A tool is provided. It can be downloaded from

http://www.chipkin.com/articles/cas-gateway-firmware-download-tool

Screenshot from the Firmware update tool.



7.5 Support Contact Information

This driver was developed by Chipkin Automation Systems (CAS). CAS is proud to provide support for the driver. For support please call CAS at +1 (866) 383-1657 or contact by email at support@chipkin.com

8. Hardware Specification

- UL and ULc approved
- 10/100BaseT with RJ-45 connector
- 1x RS232 Port
- 1x RS485 Port
- 2MBytes flash memory, 8MBytes of SDRAM
- Power: 5-24VDC
- Operating Temperature: 0 to 70 C
- Dimensions: 4.2" x 3.25" x 1"
- LEDs: Link, Speed/Data, Power

9. Revision History

Date	Resp	Driver Ver.	Doc. Rev.	Comment
04 Mar 2016	SWS	0.01	0	Document Created