CAS-2700-24

SMA

Modbus (RTU and TCP) / BACnet / HTML Gateway

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1. SMA Gateway Description

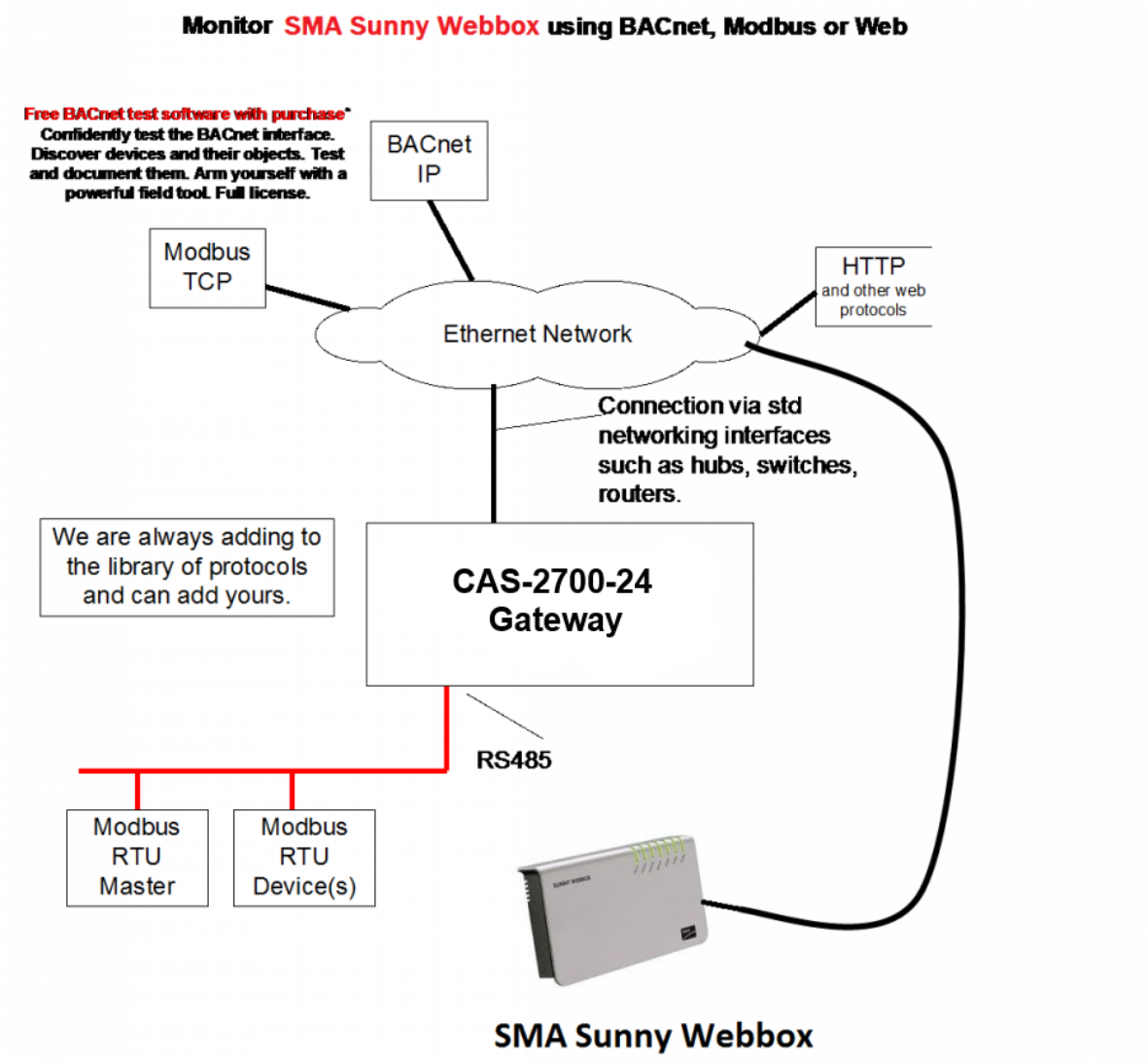
The SMA Gateway connects to a SMA Sunny Webbox via an Ethernet (TCP/IP) connection. The SMA Gateway can then be configured to poll for data values from a number of devices that are connected to the Webbox. These devices can be Sunny Invertors, SensorBox, or Sunny Islands.

After configuration, the Gateway will poll and read the data from the SMA devices and stores it internally. When a remote system requests data, this data is served in a form that is appropriate to the requesting protocol (Modbus TCP/RTU or BACnet). In the event that the connection to the SMA Webbox is lost, or data cannot be read, the gateway can signal this to the remote data clients by changing all the values currently stored to a predefined default value.

The Gateway requires configuration that will be described later in this document.

2. Connections

2.1. Block Diagram

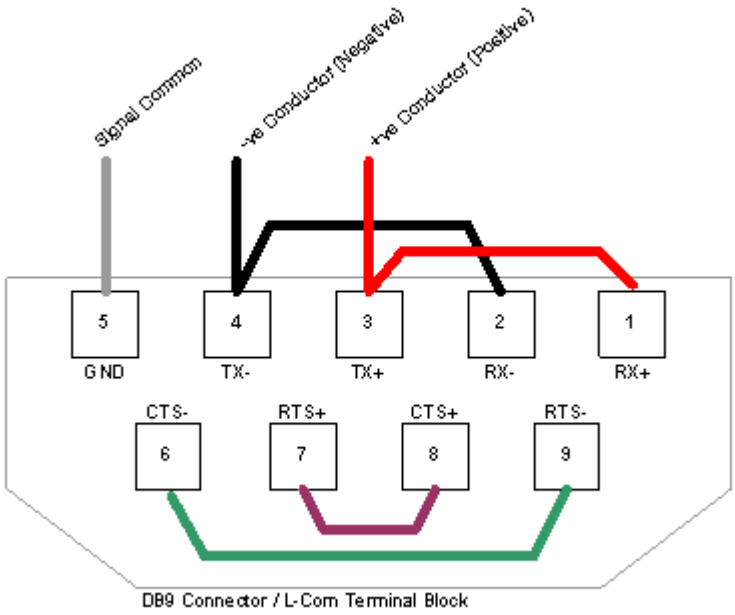


2.2. Wiring / Connections

2.2.1. Modbus RTU Connections

Port 0 – RS485 Mode Terminals

- All 4 jumpers required for 2 wire operation.
- CAS recommends the use of 3 conductors for so called 2-Wire RS485.
- The signal common is there for purpose.



2.3. Limitations and Best Practices

Maximum Number of SMA Sunny Webboxes per Gateway

Only 1 SMA Sunny Webbox can be connected to a single gateway.

RS232 Best Practices

We recommend a maximum of 30ft for the RS232 cable. A well-made cable in a clean environment can easily run to 100ft and provide satisfactory performance.

3. Configuration and Settings

3.1. SMA Sunny Webbox Connection Settings

To poll for data from a Sunny Invertor, Sunny Island, or SensorBox all that is needed is the IP address of the Sunny Webbox that these devices are connected to.

3.2. SMA Sunny Webbox Configuration Options

The following options are set to determine how the data from the SMA devices is handled.

- **Night Data –** SMA Invertors turn off at night. By enabling this option and selecting one of the Night data methods, empty values will be replaced with either a zero value or the last successfully polled value.
- **Night Data Method**
    - Use Default Value – Uses the supplied default value to represent Invertor data at night.
    - Use Last Polled Values – Uses the last successfully polled Invertor data to represent Invertor data at night. If no such data is available, the supplied default value is used.
- **Default Value –** The value that all points are set to initially and when the device is disconnected or offline.

3.3. ModbusTCP Settings

To connect using ModbusTCP you need to know the IP address of the gateway and the Modbus 'Station' number (also known as 'Device Address' or 'Node ID') and the TCP Port for the connection.

The following are the configurable parameters for this connection:

- **Modbus Station Number** (Default value is 1)
- **Modbus TCP Port** (Default value is 502)

Review section *7.6 Another Method for Changing the IP* Address - DHCP to see the default IP Address settings and how to change them.

3.4. ModbusRTU Settings

To connect using ModbusRTU you need to set the connection parameters correctly and the Modbus 'Station' number (also known as 'Device Address' or 'Node ID')

- **Modbus Station Number** (Defaut value is 1)
- **Connection Parameters**:
  - **Baud Rate** – 1200, 2400, 4800, **9600** (Default), 19200, 38400, 76800, 115200
  - **Data Bits** – **8** (Default), 7
  - **Parity** – **None** (Default), Odd, Even
  - **Stop Bits** – **1** (Default), 2

3.5. BACnet IP Settings

BACnet supports discovery. Thus any BACnet tool will discover the gateway and report its properties. Each gateway must be allocated a unique device instance number and thus this is a configurable setting.

The configurable BACnet IP connection settings are:

- **Device Instance Number** (Default value is 389001)
- **Port** (Default value is 47808)
- **Network** (Default value is 0)

It is important to note that BACnet messages cannot pass from one subnet to another without a BACnet technology called BBMD installed. The easiest installation and the best way to avoid this complication is to set the gateway's IP address so that it is on the same subnet as the BACnet data client (usually the BAS / Scada system).

Review section *7.6 Another Method for Changing the IP* Address - DHCP to see the default IP Address settings and how to change them.

3.6. Change Configuration Settings

Use a Web Browser and type the following into the address bar:

http://192.168.1.113/ bin/sma/config/

IP Address of your unit.

SMA Configuration

BACnet IP Server Configuration

Setting	Value	Notes
Port	47808	The Port for the BACnet IP connection. **Default:** 47808
Device ID	389001	The BACnet IP Device ID for the Gateway. **Default:** 389001
Network	0	The BACnet Network that the Gateway is located on. **Default:** 0

Modbus TCP Server Configuration

Setting	Value	Notes
Port	502	The Port for the Modbus TCP connection. **Default:** 502
Device ID	1	The Modbus TCP Device ID for the Gateway. **Default:** 1

Modbus RTU Server Configuration

Setting	Value	Notes
Baud Rate	9600 ▼	The baud rate for the Modbus RTU connection.
Data Bits	8 ▼	The data bits for the Modbus RTU connection.
Parity	N ▼	The parity for the Modbus RTU connection.
Stop Bits	1 ▼	The stop bits for the Modbus RTU connection.
Device ID	1	The Modbus RTU Device ID for the Gateway. **Default:** 1

SMA Settings

Setting	Value	Notes
Night Data	☐	SMA Invertors turn off at night. By checking this box, and selecting one of the data methods below, empty data values will be replaced with either a zero value or the last successfully polled value.
Night Data Method	Use Default Value ▼	**Use Default Value**: Use the supplied default value to represent Invertor data at night. **Use Last Polled Values**: Uses the last successfully polled Invertor data to represent Invertor data at night. If no such data is available, uses the supplied default value.
Default Value	0	The value that all points are set to when the device is disconnected or offline.

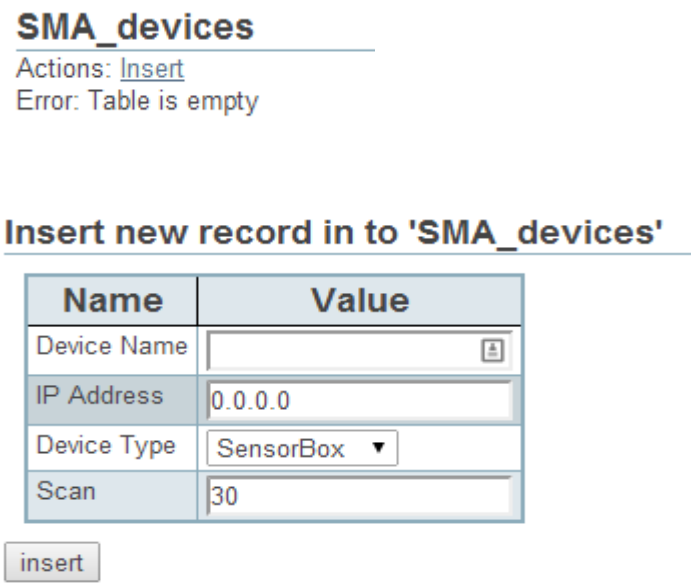
Save Settings

Change the Settings and click Submit to save them. To cancel changes simply close the page without submitting.

Note on IP Addresses: Another method is provided to change the Netmask and Gateway address.

Changes do not take effect until the device restarts. Use the Reset button the web page or recycle the power.

3.7. Adding SMA Devices



Parameters:

Device Name – Name of the device, usually contains serial number, get this value by running the RPC Client application, see 3.8 Configuration Tools.

IP Address – IP address of the Sunny Webbox that the device is connected to

Device Type – Select one of Invertor, SensorBox, or Sunny Island

Scan – The polling interval, defaulted to 30 seconds.

3.8. Configuration Tools

In order to complete the configuration process, the names and serial numbers of the SMA devices are needed.

There is a tool that is required to get this information called the RPC Client.

Please contact Chipkin Automation Systems to get access to this tool and for help with configuration.

4. Reading Data using HTML / Web Browser

Use a Web Browser to browse to this page.

This is the IP address of your gateway

http://192.168.1.113/bin/sma/report

You are presented with a screen similar to this one.

This screen is useful for seeing the current BACnet and Modbus mappings as well as the current value of the data point, which is useful for quickly checking that the connections are good and data is being read.

SMA Spot Value	BACnet IP	Modbus	Value
Test:807080807_Backup State	analog_input (1)	40001	0
Test:807080807_Balancer	analog_input (2)	40002	0
Test:807080807_CO2 saved	analog_input (3)	40003	0
Test:807080807_Error	analog_input (4)	40004	0
Test:807080807_E-Total	analog_input (5)	40005	0
Test:807080807_Event-Cnt	analog_input (6)	40006	0
Test:807080807_Fac	analog_input (7)	40007	0
Test:807080807_Grid Type	analog_input (8)	40008	0
Test:807080807_h-On	analog_input (9)	40009	0
Test:807080807_h-Total	analog_input (10)	40010	0
Test:807080807_Iac	analog_input (11)	40011	0
Test:807080807_Ipv	analog_input (12)	40012	0
Test:807080807_Mode	analog_input (13)	40013	0
Test:807080807_Pac	analog_input (14)	40014	0
Test:807080807_Power On	analog_input (15)	40015	0
Test:807080807_Temperature	analog_input (16)	40016	0

5. Reading Modbus Data

Need to know more about Modbus? Read this guide.

http://www.chipkin.com/september-2010-newsletter

5.1. Modbus Function Supported (RTU and TCP)

The Gateway supports functions 1, 2, 3, and 4. Most masters should be configured to use function 3 (Read Holding Registers). However it will respond to polls that use the other functions with offset equal to zero. You can read this data as 3xxxx, 1xxxx, 0xxxx or 4xxxx data.

5.2. SMA Modbus Data Map

For the following registers, each set of data (Invertor, SensorBox, and Sunny Island) will be described as if it was the first device configured. Each additional device added will be offset by 100. So the first device will have data starting at 40001, the second device will have data starting at 40101, the third device will have data starting at 40201, etc.

Typical Invertor Data

Modbus Address	Value Stored
40001	BackUp State
40002	Balancer
40003	CO2 Saved
40004	Error
40005	E-Total
40006	Event-Cnt
40007	Fac

40008	Grid Type
40009	h-On
40010	h-Total
40011	Iac
40012	Ipv
40013	Mode
40014	Pac
40015	Power On
40016	Temperature
40017	Vac
40018	Vpv
40019	Serial Number
40020	VacL1
40021	VacL2
40022	Vpv-PE
40023	Max Temperature
40024	Max Vpv
40025	Vfan

Note 1: Balancer, Error, Mode, Grid Type are enumerated values. See section 9: SMA Enumerations for more information

Note 2: All of these values will be sent a 16 bit values, therefore any real (decimal) values will be sent as their whole number part (i.e. 24.3 will be sent as 24). If you require the entire decimal value, please contact Chipkin Automation Systems.

Typical SensorBox Data

Modbus Address	Value Stored
40001	ExlSollrr
40002	IntSollrr
40003	OpTm
40004	TmpAmb F
40005	TmpMdul F
40006	TmpAmb C
40007	TmpMdul C
40008	WindVel m/s
40009	WindVel mph

Note 1: All of these values will be sent a 16 bit values, therefore any real (decimal) values will be sent as their whole number part (i.e. 24.3 will be sent as 24). If you require the entire decimal value, please contact Chipkin Automation Systems.

Typical Sunny Island Data

Modbus Address	Value Stored
40001	Adr
40002	AptPhs
40003	AptTmRmg
40004	BatChrgOp
40005	BatChrgVtg

40006	BatSoc
40007	BatSocErr
40008	BatTmp
40009	BatVtg
40010	CardStt
40011	ChpPwrAt
40012	ChpRmgTm
40013	ChpStrRmgTm
40014	ChpStt
40015	EgyCntIn
40016	EgyCntOut
40017	EgyCntTm
40018	Error
40019	E-Total
40020	E-Total-In
40021	ExtCur
40022	ExtCurSlv1
40023	ExtCurSlv2
40024	ExtCurSlv3
40025	ExtFrq
40026	ExtPwrAt
40027	ExtPwrAtSlv1

40028	ExtPwrAtSlv2
40029	ExtPwrAtSlv3
40030	ExtPwrRt
40031	ExtPwrRtSlv1
40032	ExtPwrRtSlv2
40033	ExtPwrRtSlv3
40034	ExtVtg
40035	ExtVtgSlv1
40036	ExtVtgSlv2
40037	ExtVtgSlv3
40038	Fac
40039	Firmware
40040	FwVer
40041	FwVer2
40042	GdCtcCnt
40043	GdEgyCntIn
40044	GdEgyCntOut
40045	GdEgyTmh
40046	GdOpTmh
40047	GdRmgTm
40048	GnDmdSrc
40049	GnEgyCnt

40050	GnEgyTm
40051	GnOpTmh
40052	GnRmgTm
40053	GnRnStt
40054	GnStrCnt
40055	GnStt
40056	h-On
40057	Iac
40058	InvCur
40059	InvCurSlv1
40060	InvCurSlv2
40061	InvCurSlv3
40062	InvFrq
40063	InvOpStt
40064	InvOpSttSlv1
40065	InvOpSttSlv2
40066	InvOpSttSlv3
40067	InvPwrAt
40068	InvPwrAtSlv1
40069	InvPwrAtSlv2
40070	InvPwrAtSlv3
40071	InvPwrRt

40072	InvPwrRtSlv1
40073	InvPwrRtSlv2
40074	InvPwrRtSlv3
40075	InvVtg
40076	InvVtgSlv1
40077	InvVtgSlv2
40078	InvVtgSlv3
40079	Mode
40080	Msg
40081	OnTmh
40082	OpStt
40083	OpSttSlv1
40084	OpSttSlv2
40085	OpSttSlv3
40086	Pac
40087	Prio
40088	Rly1Stt
40089	Rly2Stt
40090	RmgTmEqu
40091	RmgTmFul
40092	Serial Number
40093	Sic1EgyCntIn

40094	Sic1PvPwr
40095	Sic1TdyEgyCntIn
40096	Sic2EgyCntIn
40097	Sic2PvPwr
40098	Sic2TdyEgyCntIn
40099	Sic3EgyCntIn
40100	Sic3PvPwr
40101	Sic3TdyEgyCntIn
40102	Sic4EgyCntIn
40103	Sic4PvPwr
40104	Sic4TdyEgyCntIn
40105	Soh
40106	TotBatCur
40107	TotExtCur
40108	TotExtPwrAt
40109	TotExtPwrRt
40110	TotInvCur
40111	TotInvPwrAt
40112	TotInvPwrRt
40113	TotLodPwr
40114	TotMccLodPwr
40115	TotSicBatCur

40116	TotSicDyEgyCntI
40117	TotSicEgyCntIn
40118	TotSicPvPwr
40119	TotTmh
40120	Vac

5.3. Interpreting Modbus Data

Modbus does not have a mechanism for reporting the validity of data. What happens if the gateway loses its connection to the SMA Webbox? After a timeout period has elapsed the gateway will regard the data it had read previously, as unreliable.

The remote data client will see the value 65535 (-1, configurable) in the registers that contain unreliable data. In other words, rather than serve the old (possibly obsolete) data, the gateway serves a value that clearly identifies that the data is invalid.

If you require the data as floats, please contact Chipkin Automation Systems to update the configuration and Modbus map. These values will be encoded as IEEE754 format floating point numbers. These values use 2x 16bit registers. They are clearly identified in the Modbus Map. Since Modbus does not support floating point numbers so all other values are served as whole numbers.

5.4. Test Procedure – Use CAS Modbus Scanner

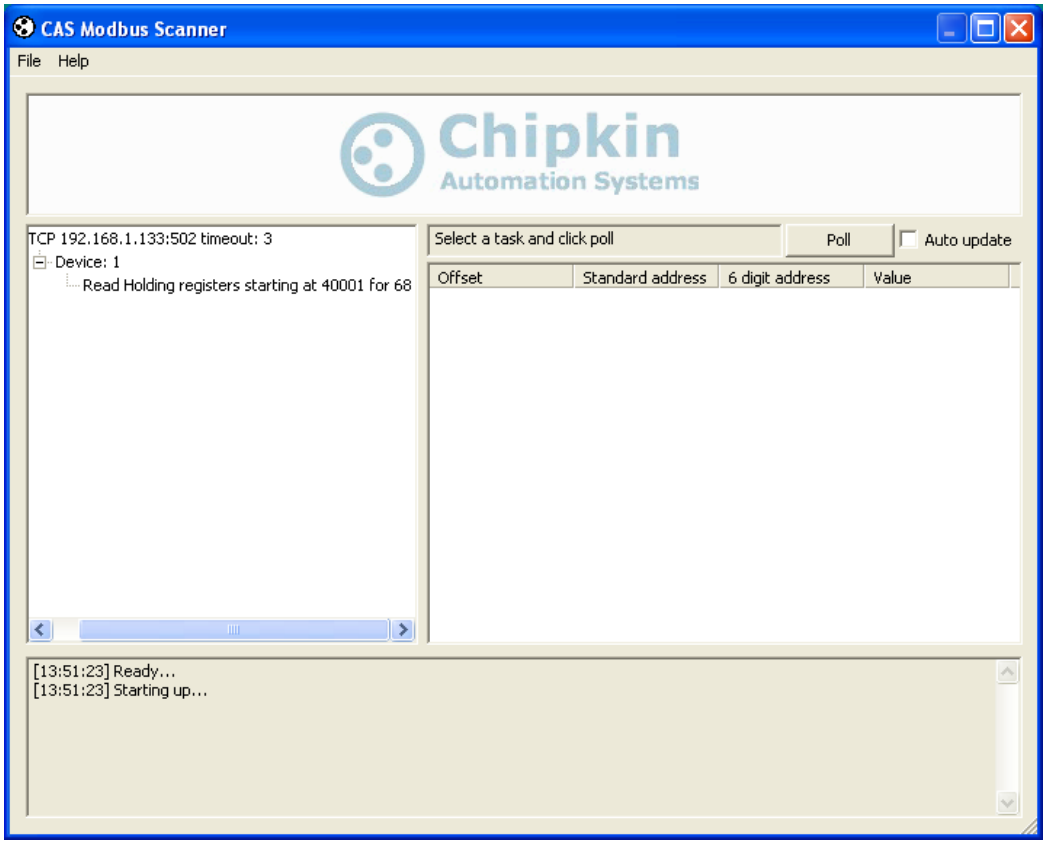
You can test the ModbusTCP data using free test software provided by Chipkin Automation Software.

This is a link to the download page. http://www.chipkin.com/cas-modbus-scanner

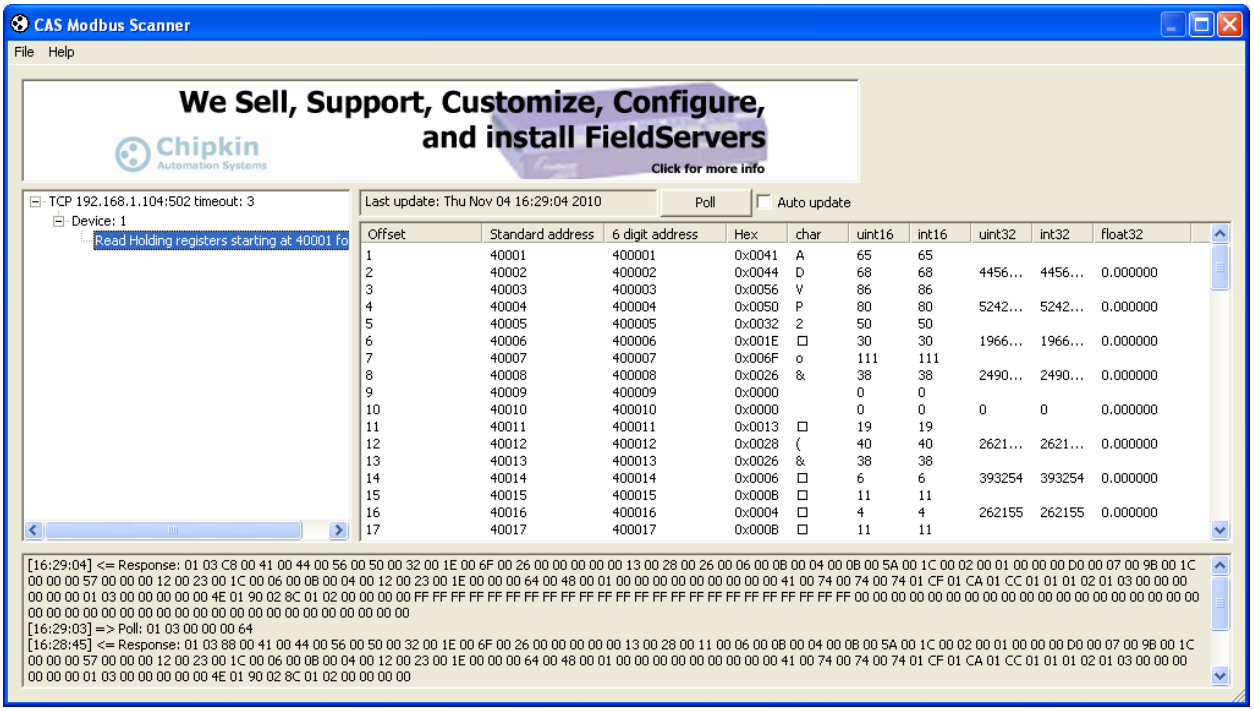
Configure the scanner as follows

1. Add a connection – specify the IP address of the gateway
2. Add a device to the connection. Set the device=1
3. Add a Request to the device: Read Holding register offset=1 Length=68

The result should be like this.



4. Click the Poll Button
5. Use the values found in the ‘int16 column and the data map table to review the data.


CAS Modbus Scanner
File Help
We Sell, Support, Customize, Configure, and install FieldServers
Chipkin Automation Systems
Click for more info
TCP 192.168.1.104:502 timeout: 3
Device: 1
Read Holding registers starting at 40001 fo
Last update: Thu Nov 04 16:29:04 2010
Poll
Auto update
Offset | Standard address | 6 digit address | Hex | char | uint16 | int16 | uint32 | int32 | float32
1 | 40001 | 400001 | 0x0041 | A | 65 | 65
2 | 40002 | 400002 | 0x0044 | D | 68 | 68 | 4456... | 4456... | 0.000000
3 | 40003 | 400003 | 0x0056 | V | 86 | 86
4 | 40004 | 400004 | 0x0050 | P | 80 | 80 | 5242... | 5242... | 0.000000
5 | 40005 | 400005 | 0x0032 | 2 | 50 | 50
6 | 40006 | 400006 | 0x001E | □ | 30 | 30 | 1966... | 1966... | 0.000000
7 | 40007 | 400007 | 0x006F | o | 111 | 111
8 | 40008 | 400008 | 0x0026 | & | 38 | 38 | 2490... | 2490... | 0.000000
9 | 40009 | 400009 | 0x0000 | | 0 | 0
10 | 40010 | 400010 | 0x0000 | | 0 | 0 | 0 | 0 | 0.000000
11 | 40011 | 400011 | 0x0013 | □ | 19 | 19
12 | 40012 | 400012 | 0x0028 | (| 40 | 40 | 2621... | 2621... | 0.000000
13 | 40013 | 400013 | 0x0026 | & | 38 | 38
14 | 40014 | 400014 | 0x0006 | □ | 6 | 6 | 393254 | 393254 | 0.000000
15 | 40015 | 400015 | 0x000B | □ | 11 | 11
16 | 40016 | 400016 | 0x0004 | □ | 4 | 4 | 262155 | 262155 | 0.000000
17 | 40017 | 400017 | 0x000B | □ | 11 | 11
[16:29:04] <= Response: 01 03 C8 00 41 00 44 00 56 00 50 00 32 00 1E 00 6F 00 26 00 00 00 00 00 13 00 28 00 26 00 06 00 0B 00 04 00 0B 00 5A 00 1C 00 02 00 01 00 00 00 D0 00 07 00 9B 00 1C 00 00 00 57 00 00 00 12 00 23 00 1C 00 06 00 0B 00 04 00 12 00 23 00 1E 00 00 00 64 00 48 00 01 00 00 00 00 00 00 00 00 00 41 00 74 00 74 00 74 01 CF 01 CA 01 CC 01 01 01 02 01 03 00 00 00 00 00 00 01 03 00 00 00 00 00 4E 01 90 02 8C 01 02 00 00 00 00 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
[16:29:03] => Poll: 01 03 00 00 00 64
[16:28:45] <= Response: 01 03 88 00 41 00 44 00 56 00 50 00 32 00 1E 00 6F 00 26 00 00 00 00 00 13 00 28 00 11 00 06 00 0B 00 04 00 0B 00 5A 00 1C 00 02 00 01 00 00 00 D0 00 07 00 9B 00 1C 00 00 00 57 00 00 00 12 00 23 00 1C 00 06 00 0B 00 04 00 12 00 23 00 1E 00 00 00 64 00 48 00 01 00 00 00 00 00 00 00 00 00 41 00 74 00 74 00 74 01 CF 01 CA 01 CC 01 01 01 02 01 03 00 00 00 00 00 00 01 03 00 00 00 00 00 4E 01 90 02 8C 01 02 00 00 00 00

6. Reading BACnet Data

BACnet supports discovery. When you discover the gateway, objects and properties you will find appropriately named objects that report data from the SMA Devices. Because BACnet supports discovery, usually knowledge of the BACnet Device Instance Number does not need to be known in advance.

Each BACnet device (like the gateway) needs to have a unique instance number. Therefore it may be necessary for you to change the instance number.

Need to learn some BACnet basics? Read this guide.

http://www.chipkin.com/bacnet-solutions

6.1. Most Common BACnet Problem

If the device or application that is reading the BACnet data is on another subnet then it will not discover or be able to talk to the gateway. This can be resolved two ways. 1. Change the IP address of the gateway to be on the same subnet – a simple task. 2. Install BBMD – a non trivial task – but a task you can often pass the buck on – it is the responsibility of the company installing the BAS system to provide BBMD. You can read more about it at this link. http://www.chipkin.com/articles/bacnet-bbmd

6.2. Interpreting BACnet Data

If the gateway loses communications with the Veeder Root device or if a data point cannot be read from the controller, the 'Out of Service' property of the data object is set true once the timeout has expired. The value of the 'Present Value' property is not changed, thus the last good value will be shown.

6.3. BACnet Objects

The following is a list of possible BACnet Objects. **Note**: This list only contains what is configured with the default configuration (four tanks and system alarms).

For the following BACnet objects, each set of data (Invertor, SensorBox, and Sunny Island) will be described as if it was the first device configured. Each additional device added will be offset by 100. So the first device will have data starting with analog-input 1, the second device will have data starting at analog-input 101, the third device will have data starting at analog-input 201, etc.

Typical Invertor Data

BACnet IP Object	Description
analog_input (1)	Backup State
analog_input (2)	Balancer
analog_input (3)	CO2 saved
analog_input (4)	Error
analog_input (5)	E-Total
analog_input (6)	Event-Cnt
analog_input (7)	Fac
analog_input (8)	Grid Type
analog_input (9)	h-On
analog_input (10)	h-Total
analog_input (11)	Iac
analog_input (12)	Ipv
analog_input (13)	Mode
analog_input (14)	Pac
analog_input (15)	Power On
analog_input (16)	Temperature
analog_input (17)	Vac

analog_input (18)	Vpv
analog_input (19)	Serial Number
analog_input (20)	VacL1
analog_input (21)	VacL2
analog_input (22)	Vpv-_PE
analog_input (23)	Max Temperature
analog_input (24)	Max Vpv
analog_input (25)	Vfan

Typical SensorBox Data

analog_input (1)	ExlSolIrr
analog_input (2)	IntSolIrr
analog_input (3)	OpTm
analog_input (4)	TmpAmb F
analog_input (5)	TmpMdul F
analog_input (6)	TmpAmb C
analog_input (7)	TmpMdul C
analog_input (8)	WindVel m/s
analog_input (9)	WindVel mph

Typical Sunny Island Data

analog_input (1)	Adr
analog_input (2)	AptPhs
analog_input (3)	AptTmRmg
analog_input (4)	BatChrgOp
analog_input (5)	BatChrgVtg
analog_input (6)	BatSoc
analog_input (7)	BatSocErr
analog_input (8)	BatTmp
analog_input (9)	BatVtg
analog_input (10)	CardStt
analog_input (11)	ChpPwrAt
analog_input (12)	ChpRmgTm
analog_input (13)	ChpStrRmgTm
analog_input (14)	ChpStt
analog_input (15)	EgyCntIn
analog_input (16)	EgyCntOut
analog_input (17)	EgyCntTm
analog_input (18)	Error
analog_input (19)	E-Total
analog_input (20)	E-Total-In
analog_input (21)	ExtCur

analog_input (22)	ExtCurSlv1
analog_input (23)	ExtCurSlv2
analog_input (24)	ExtCurSlv3
analog_input (25)	ExtFrq
analog_input (26)	ExtPwrAt
analog_input (27)	ExtPwrAtSlv1
analog_input (28)	ExtPwrAtSlv2
analog_input (29)	ExtPwrAtSlv3
analog_input (30)	ExtPwrRt
analog_input (31)	ExtPwrRtSlv1
analog_input (32)	ExtPwrRtSlv2
analog_input (33)	ExtPwrRtSlv3
analog_input (34)	ExtVtg
analog_input (35)	ExtVtgSlv1
analog_input (36)	ExtVtgSlv2
analog_input (37)	ExtVtgSlv3
analog_input (38)	Fac
analog_input (39)	Firmware
analog_input (40)	FwVer
analog_input (41)	FwVer2
analog_input (42)	GdCtcCnt
analog_input (43)	GdEgyCntIn

analog_input (44)	GdEgyCntOut
analog_input (45)	GdEgyTmh
analog_input (46)	GdOpTmh
analog_input (47)	GdRmgTm
analog_input (48)	GnDmdSrc
analog_input (49)	GnEgyCnt
analog_input (50)	GnEgyTm
analog_input (51)	GnOpTmh
analog_input (52)	GnRmgTm
analog_input (53)	GnRnStt
analog_input (54)	GnStrCnt
analog_input (55)	GnStt
analog_input (56)	h-On
analog_input (57)	Iac
analog_input (58)	InvCur
analog_input (59)	InvCurSlv1
analog_input (60)	InvCurSlv2
analog_input (61)	InvCurSlv3
analog_input (62)	InvFrq
analog_input (63)	InvOpStt
analog_input (64)	InvOpSttSlv1
analog_input (65)	InvOpSttSlv2

analog_input (66)	InvOpSttSlv3
analog_input (67)	InvPwrAt
analog_input (68)	InvPwrAtSlv1
analog_input (69)	InvPwrAtSlv2
analog_input (70)	InvPwrAtSlv3
analog_input (71)	InvPwrRt
analog_input (72)	InvPwrRtSlv1
analog_input (73)	InvPwrRtSlv2
analog_input (74)	InvPwrRtSlv3
analog_input (75)	InvVtg
analog_input (76)	InvVtgSlv1
analog_input (77)	InvVtgSlv2
analog_input (78)	InvVtgSlv3
analog_input (79)	Mode
analog_input (80)	Msg
analog_input (81)	OnTmh
analog_input (82)	OpStt
analog_input (83)	OpSttSlv1
analog_input (84)	OpSttSlv2
analog_input (85)	OpSttSlv3
analog_input (86)	Pac
analog_input (87)	Prio

analog_input (88)	Rly1Stt
analog_input (89)	Rly2Stt
analog_input (90)	RmgTmEqu
analog_input (91)	RmgTmFul
analog_input (92)	Serial Number
analog_input (93)	Sic1EgyCntIn
analog_input (94)	Sic1PvPwr
analog_input (95)	Sic1TdyEgyCntIn
analog_input (96)	Sic2EgyCntIn
analog_input (97)	Sic2PvPwr
analog_input (98)	Sic2TdyEgyCntIn
analog_input (99)	Sic3EgyCntIn
analog_input (100)	Sic3PvPwr
analog_input (101)	Sic3TdyEgyCntIn
analog_input (102)	Sic4EgyCntIn
analog_input (103)	Sic4PvPwr
analog_input (104)	Sic4TdyEgyCntIn
analog_input (105)	Soh
analog_input (106)	TotBatCur
analog_input (107)	TotExtCur
analog_input (108)	TotExtPwrAt
analog_input (109)	TotExtPwrRt

analog_input (110)	TotInvCur
analog_input (111)	TotInvPwrAt
analog_input (112)	TotInvPwrRt
analog_input (113)	TotLodPwr
analog_input (114)	TotMccLodPwr
analog_input (115)	TotSicBatCur
analog_input (116)	TotSicDyEgyCntl
analog_input (117)	TotSicEgyCntIn
analog_input (118)	TotSicPvPwr
analog_input (119)	TotTmh
analog_input (120)	Vac

6.4. BACnet Test Procedure

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

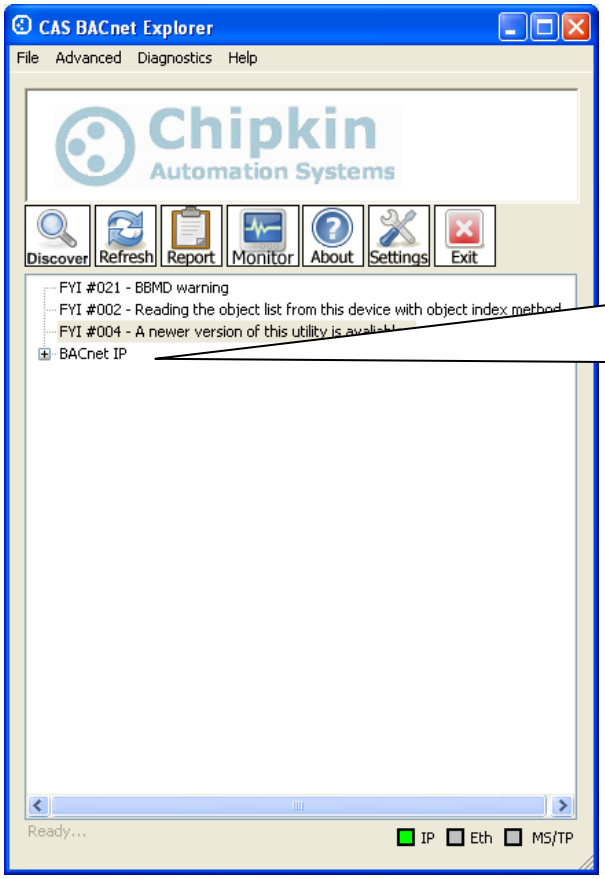
http://www.chipkin.com/cas-bacnet-explorer-licenses-faq

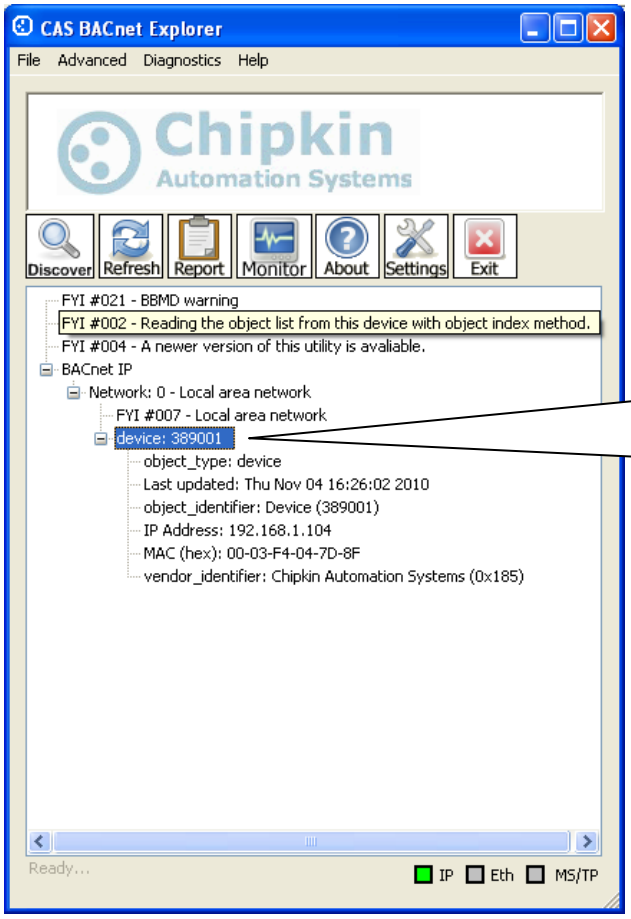
Install and activate the application. Download from here.

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

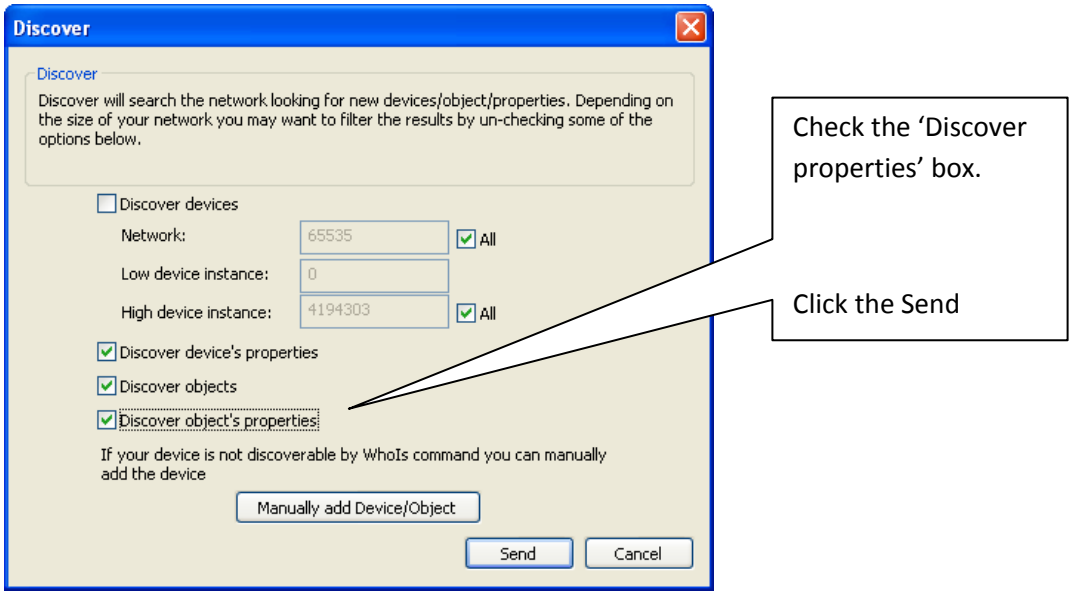
Procedure

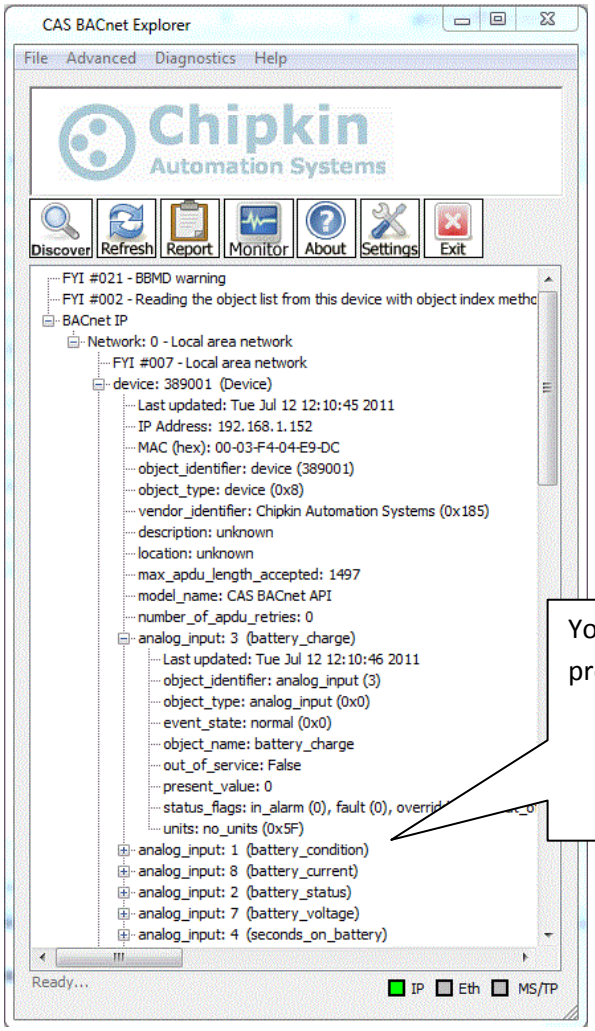
1. Start the application
2. Click Settings
3. Check IP – uncheck MSTP and Ethernet
4. Click on the network card you will use.
5. Click Ok.
6. Now click discover
7. Click Send

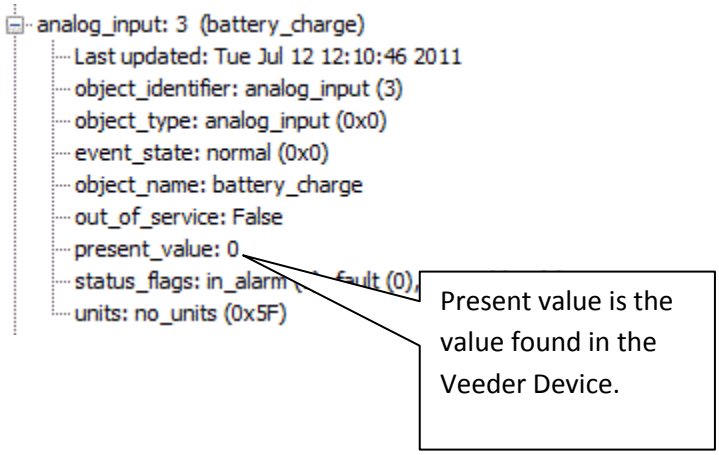

CAS BACnet Explorer
File Advanced Diagnostics Help
Chipkin
Automation Systems
Discover
Refresh
Report
Monitor
About
Settings
Exit
FYI #021 - BBMD warning
FYI #002 - Reading the object list from this device with object index method
FYI #004 - A newer version of this utility is avaliable
BACnet IP
Ready...
IP
Eth
MS/TP
Device(s) were discovered.
Click the + to open



Select the device and click discover again.


Discover
Discover
Discover will search the network looking for new devices/object/properties. Depending on the size of your network you may want to filter the results by un-checking some of the options below.
Discover devices
Network:
65535
All
Low device instance:
0
High device instance:
4194303
All
Discover device's properties
Discover objects
Discover object's properties
If your device is not discoverable by WhoIs command you can manually add the device
Manually add Device/Object
Send
Cancel
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
status_flags: in_alarm (0), fault (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
status_flags: in_alarm
fault (0),
units: no_units (0x5F)
Present value is the value found in the Veeder Device.

7. Commissioning, Diagnostics and Trouble Shooting

7.1. What to Take to Site for Commissioning

1. The gateway and other supplied components.
2. USB->485 Converter

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

3. Serial Cables

   A Null Modem cable is used to connect to the gateway diagnostic port. Take one with you.

4. Laptop
5. Gateway IP Address Allocation Tool

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

6. Wireshark packet sniffer software – free download

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

7. 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

8. Serial Mini Tester

9. 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.

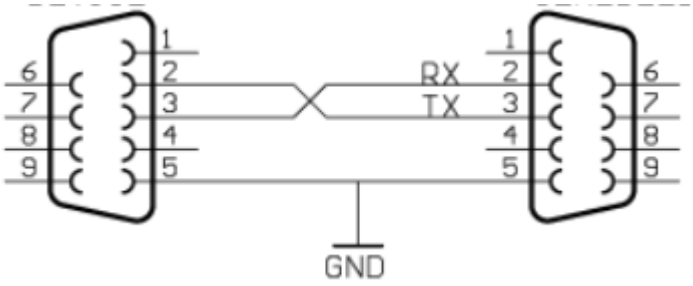
10. Rx / TX cross over.

    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



11. Gender Benders

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

12. Ethernet Patch cables

13. Hub

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

    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. Gateway Status

Browse to http://192.168.1.113/bin/sma/report and you will the present values of the data points

If all of the data values are displayed as "-1" (or whatever the configured default value is) then it could mean one of two things.

1) The Gateway has just been configured and has begun to poll for values. Wait for a little while for the first couple of scan intervals to finish, and then refresh the page. Current correct values should be displayed.

2) The Gateway is not connected to the Veeder Device. Either the Gateway was never connected, or the Gateway got disconnected from the device. After an amount of time has passed (as configured in the Disconnect Time parameter of the configuration), the Gateway will set all values to the default value.

You must manually refresh this page to get the updated values.

7.3. Gateway Diagnostics

Power Led: Green Solid = Normal Condition.

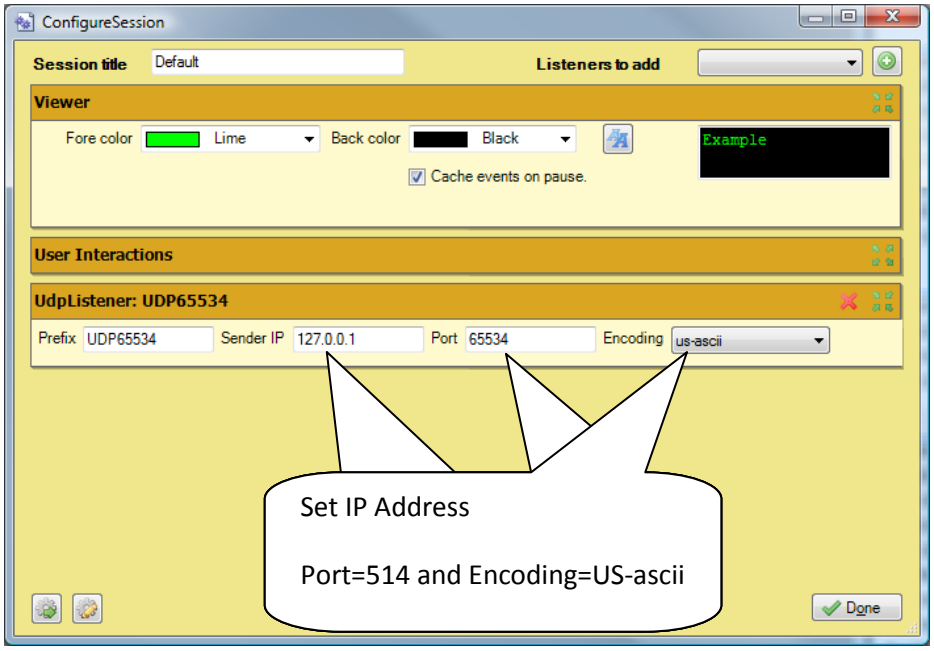
RJ45 LED: Green to show link.

7.4. Debug log.

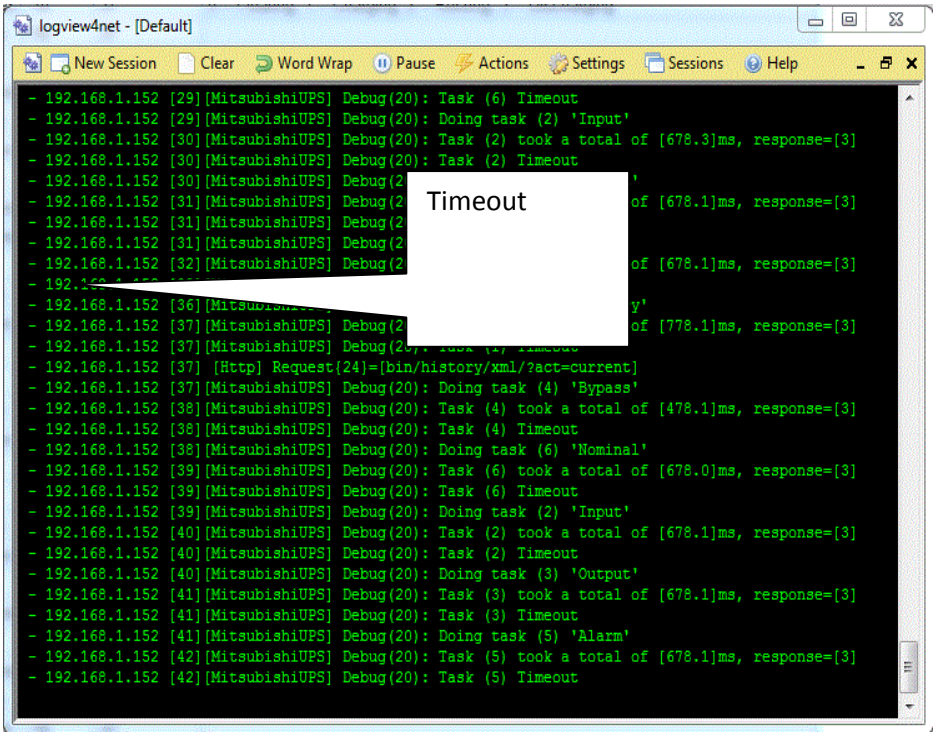
The debug messages are sent on UDP port 514 to the broadcast IP address: {255.255.255.255} as plain ASCII text. You can use "logview4net" tool to view and recorded the debug messages as they are sent from the device.

Logview4net

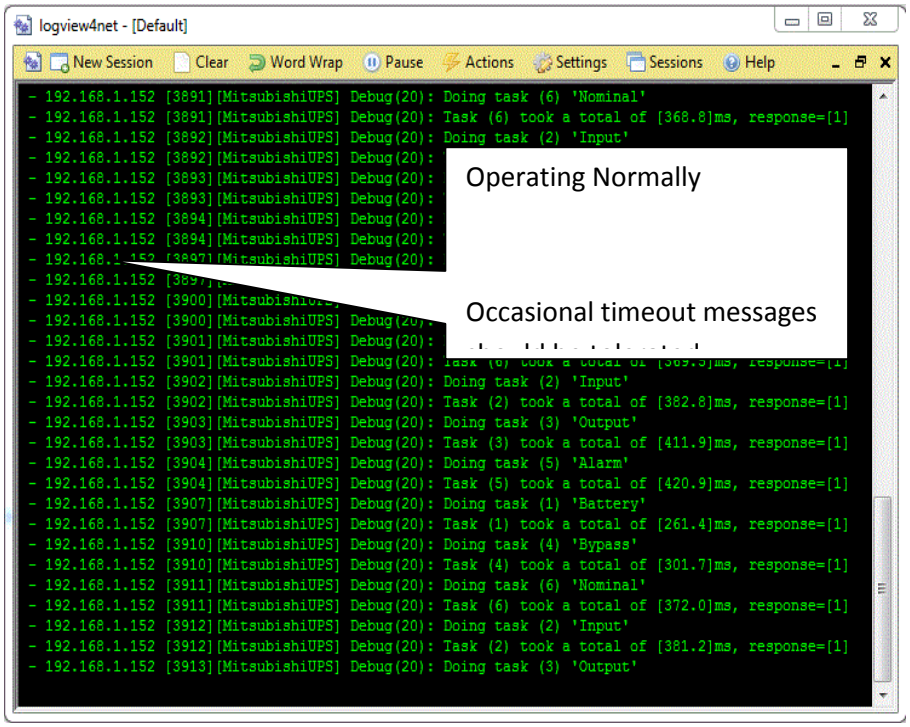
Free and open source tool built to viewing and monitoring logs. It works with many different file formats and protocols including UDP. This tool can be download for "free" from the publishers website http://logview4net.com/



Click Done



Abnormal operation. No communication with device. Perform Veeder Device Connection Diagnostics.



Normal Operation.

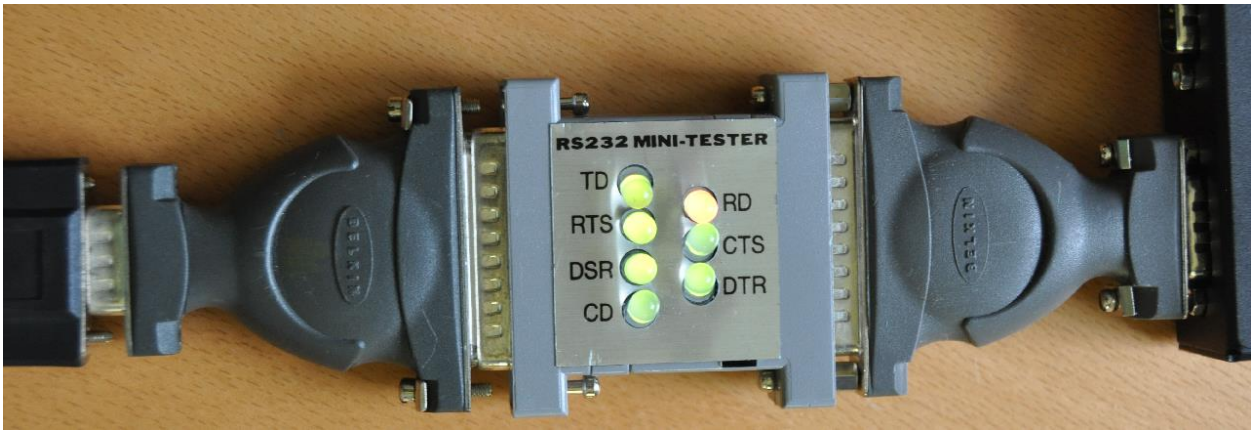
7.5. Veeder Device Connection

Use a mini tester to check the serial ports.

Connect the cable to the Veeder device only – RD should be green. If it isn't this means the cable to the Veeder device is wrong or the port isn't working.

Connect the cable to the gateway only – TD should be green. If it isn't this means the cable to the gateway is wrong or the port isn't working.

During normal operation RD will flicker green/red


RS232 MINI-TESTER
TD
RTS
DSR
CD
RD
CTS
DTR
BELKIN

7.6. Another Method for Changing the IP Address - DHCP

This device supports DHCP and DHCP is disabled.

When shipped the device

IP = 192.168.1.113

Mask = 255.255.255.0

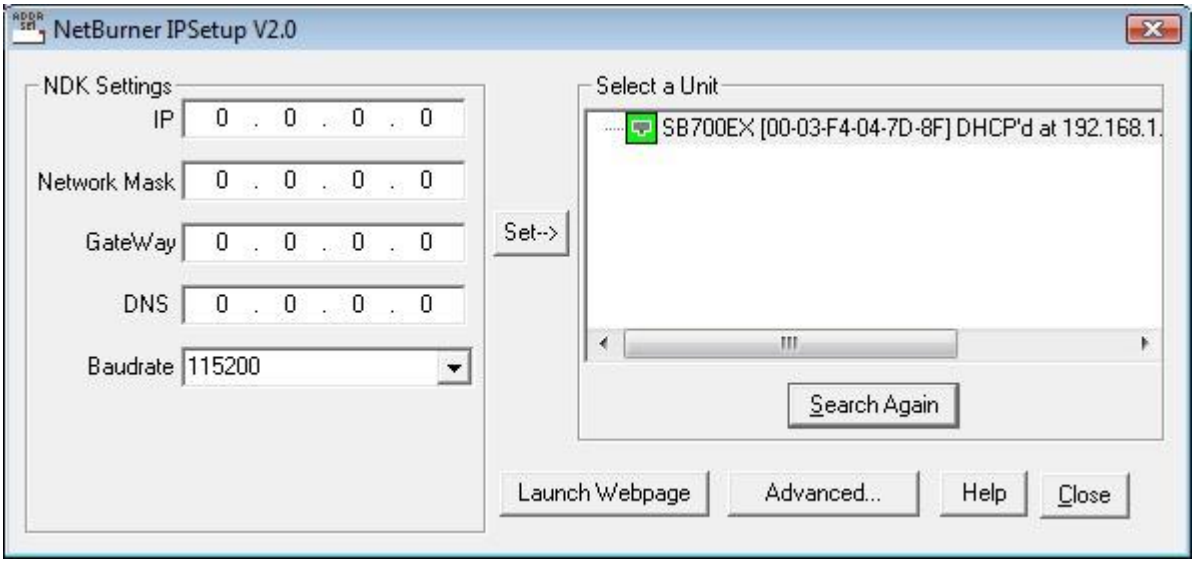
Gateway = 192.168.1.1

If you simply want to change the IP address then use the simpler method provided in section 3.6 Change Configuration Settings.

A tool is provided to change the IP address of the gateway. The tool can be downloaded from:

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

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.



To change the IP address complete the Fields and click the 'Set' button.

Please set the IP, Network Mask, and Gateway fields.

To set it to DHCP, simply put all fields to 0.0.0.0 and click the 'Set' button.

7.7. Discovering the Gateway

Use the tool provided to change the IP address to discover the gateway and learn what its pre-allocated IP address is. See section 7.6 Another Method for Changing the IP Address

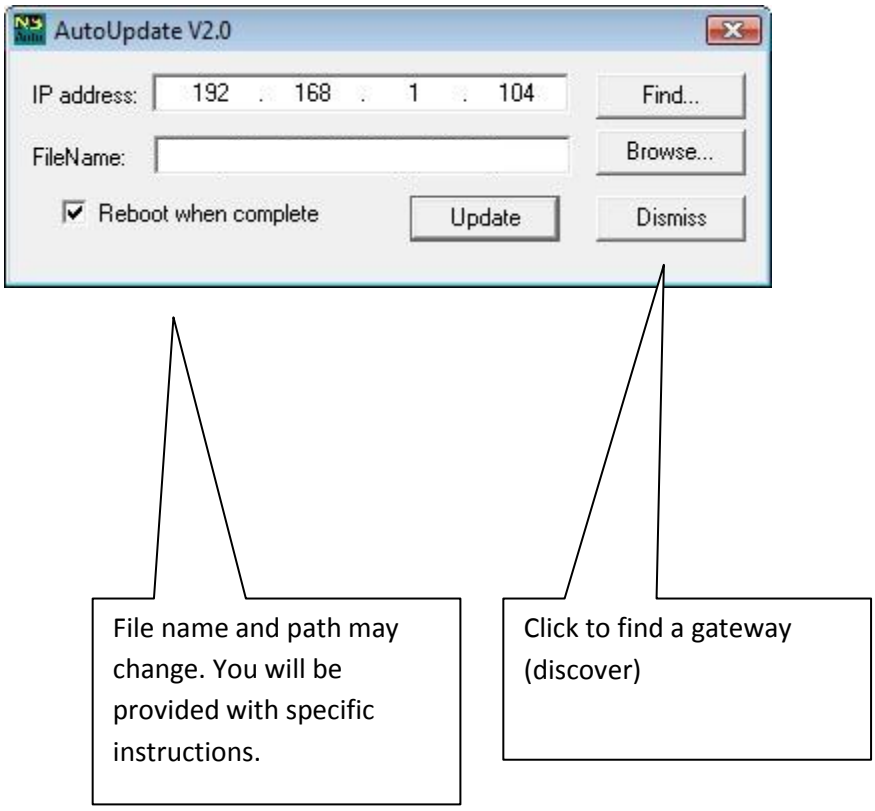
7.8. Downloading New Firmware

If you are sent new firmware you will be provided with specific instructions. These are generic – i.e. folder and file names may be different.

A tool is provided. It can be downloaded from

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

Screen Shot from the Firmware update tool.



8. Specifications

- **UL and ULc approved**
- 10/100BaseT with RJ-45 connector
- 1x RS232 Port
- 1x RS485 Port (Different Models have additional ports)
- 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. SMA Enumerations

The following lists are the enumerated values for various SMA Data points

9.1. SMA Invertor Data Enumerations

9.1.1. Mode

0	Offset
1	Stop
2	Grid Monitoring
3	Waiting
4	V Const
5	Turbine
6	MPP Search
7	MPP
8	Disturbance
9	Error
10	Mpp Peak
11	Derating
12	Balanced

9.1.2. Grid Type

0	No Grid
1	277V
2	208V
3	240V
4	208V without N
5	240V without N

9.1.3. Balancer

0	Off
1	Phase Guard
2	Power Guard
3	Fault Guard

9.1.4. Backup State

0	No State
1	Grid
2	Off Grid

9.1.5. Error

0	No Error	32	EarthCurMax Srr
1	MSD VAC	33	S1
2	MSD FAC	34	S2
3	B1	35	S3
4	K1 Open	36	S4
5	K2 Open	37	S5
6	EEPROM p	38	S6
7	ROM	39	S7
8	Power Balance	40	S8
9	MSD Idif	41	S9
10	EarthCurMax Bfr	42	S10
11	Derating	43	S11
12	XFMR TEMP W	44	S12
13	EeRestore	45	S13
14	Grid Timeout	46	S14
15	VacL1 Bfr	47	S15
16	VacL2 Bfr	48	S16
17	B2	49	S17
18	B3	50	S18
19	EEPROM	51	XFMR
20	Bfr Srr	52	Grid Fault S
21	K1 Close	53	VacL1 Srr
22	Watchdog	54	VacL2 Srr
23	SRR Timeout	55	OFFSET
24	VpvMax	56	Imax
25	GFDI Fuse Open	57	ShutDown
26	B4	58	I Sense
27	B5	59	Vac Srr
28	Vac Bfr	60	Fac Srr
29	Fac Bfr	61	S21
30	XFMR TEMP F	62	S22
31	B6	63	S23

9.2. SMA Sunny Island Data Enumerations

9.2.1. Mode

Same as 9.1.1 SMA Invertor Data Enumerations – Mode

9.2.2. Invertor Operating State (InvOpStt)

0 None
1 Startup
2 Standby
3 Run
4 EmCharge
5 Error

9.2.3. Relay State (Rly1Stt, Rly2Stt)

0 Off
1 On

9.2.4. Battery Charging Process (BatChrgOp)

1 Boost
2 Full
3 Float
4 Equalize
5 Silent

9.2.5. Absorption Phase (AptPhs)

1 Off
2 On

9.2.6. GnDmdSrc

1 None
2 Bat
3 Lod
4 Tim
5 Run1h
6 Start
7 ExtSrcReq

9.2.7. GnStatus

1	Off	7	Retry
2	Init	8	Disconnect
3	Ready	9	Cool
4	Warm	10	Lock
5	Connect	11	Fail
6	Run	12	FailLock

9.2.8. GnRnStatus

1	Off
2	On

9.2.9. CHPStatus

0	Idle
1	Run
2	Lock

9.2.10. Address (Adr)

1	Master
2	Slave1
3	Slave2
4	Slave4

9.2.11. Operating Status (OpStt)

0	None
1	Operating
2	Warning
3	Failure

9.2.12. Card Status (CardStt)

1	Off
2	Operational
3	Mount
4	OutOfSpace
5	BadFileSys
6	Incomp
7	Parameter
8	ParamFailed
9	WriteLogData
10	WriteLogFailed

9.2.13. Error

0	None
1	1xx_INV
2	2xx_BAT
3	3xx_EXT
4	4xx_GEN
5	5xx_GRD
6	6xx_RLY
7	7xx_SYS
8	8xx_AUX

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10. Revision History

Date	Resp	Format	Driver Ver.	Doc. Rev.	Comment
12 Feb 2014	ACF		0.11	0	Document Created

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