This Application Note applies to the H300 and Affinity Drives

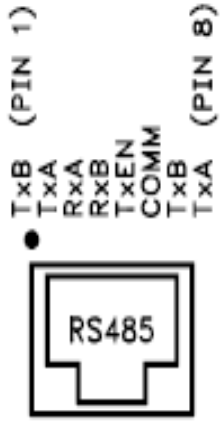
Banet example

This application note shows a basic example of two drives on a Bacnet network. The master in this example is a CTVue HMI and it uses the pre mapped Banet objects. Many HVAC applications are using Banet control for their means of Building Automation. As you may already know, Control Techniques Affinity and H300 drives have Banet protocol built-in. This application note will guide you in programming the Affinity Drive for Banet Object Control.

This application note shows how to configure the drive for this requirement. CTSoft (for Affinity drives) or HVAC Connect (for H300 drives) and CT-USB-Cable are recommended, but not needed for programming. If programing a H300 via software the Ki-485-Adaptor is also needed. All software is complimentary.

Wiring

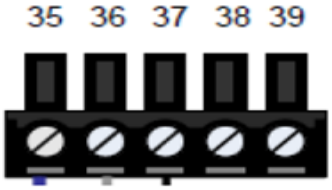
The nomenclature on each device (CTVue, H300 and Affinity) is different, and the connectors are also different but as long as the correct connections are made each device will communicate. There should be a 120 Ohm termination resistor at the end of the communication line. Ensure there is only one path for communication to each device, loops or multiple communication paths to one device will cause problems on the network. The CTVue has a RJ-45 port, the H300 has a 3 pin connector and the Affinity has a 5 pin connector all connectors shown below:



CTVue

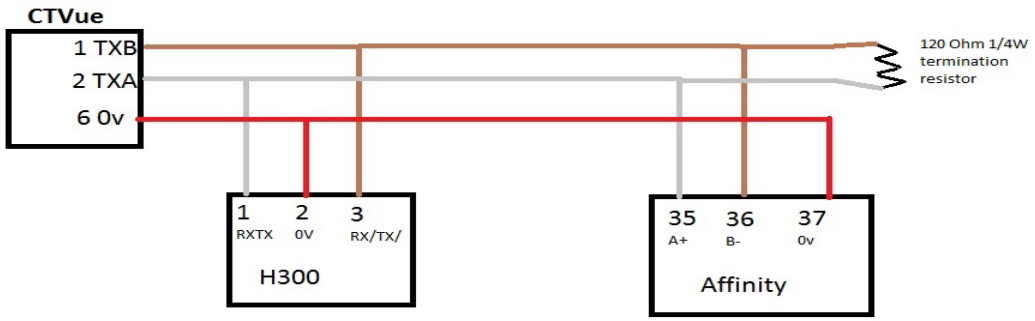
Pin	
1	RX TX
2	Isolated 0 V
3	RX\ TX\

H300



35	Previous node A(+)
36	Previous node B (-)
37	Isolated ground
38	Next node A(+)
39	Next node B(-)

Affinity



Drive setup

Before making any changes to the drive for the specific application, the drive should be run using the drives Hand mode (which is the default configuration) to verify proper operation of the drive and motor. This involves entering the basic motor information, which is located in Menu 0. The key parameters are listed below. In this set up, the drive is controlled by the front keypad controls.

H300

Motor rated voltage	parameter	00.018
Motor rated speed	parameter	00.019
Motor rated current	parameter	00.020

Affinity

Motor rated voltage	parameter	00.44
Motor rated speed	parameter	00.45
Motor rated current	parameter	00.46

If Banet will control the drives run forward bit (Pr6.030) we need to remove the I/O assignment to prevent a conflict so set the following parameters if you plan to control the run bit.

H300

08.023 to 00.000 then press reset now save parameters

Affinity

08.23 to 00.00 then press reset now save parameters

Once the drive has been successfully run in Hand mode and the I/O assignment is cleared, Banet can be configured.

Banet Drive Setup

Care must be taken when setting up a Banet network. Planning must be done to determine the address for each device before any devices are installed. There are 3 parts to a Banet address:

MAC Address

This uniquely identifies a device on a network segment, each device on the same segment must have a unique MAC address, a device on another network segment may use the same MAC address as this device (messages are not passed at the internetwork level using the MAC address) master devices can have a MAC address of 0-127 and slave devices can have a MAC address of 0-254. Typically MAC address 0 and 1 are reserved for temporary access and most Banet designer's start Master Mac address at 3. Address 128-254 are strictly for slave devices. Each MAC address should be consecutive (do not leave gaps) and 5-10 MAC address should be left open for future expansion.

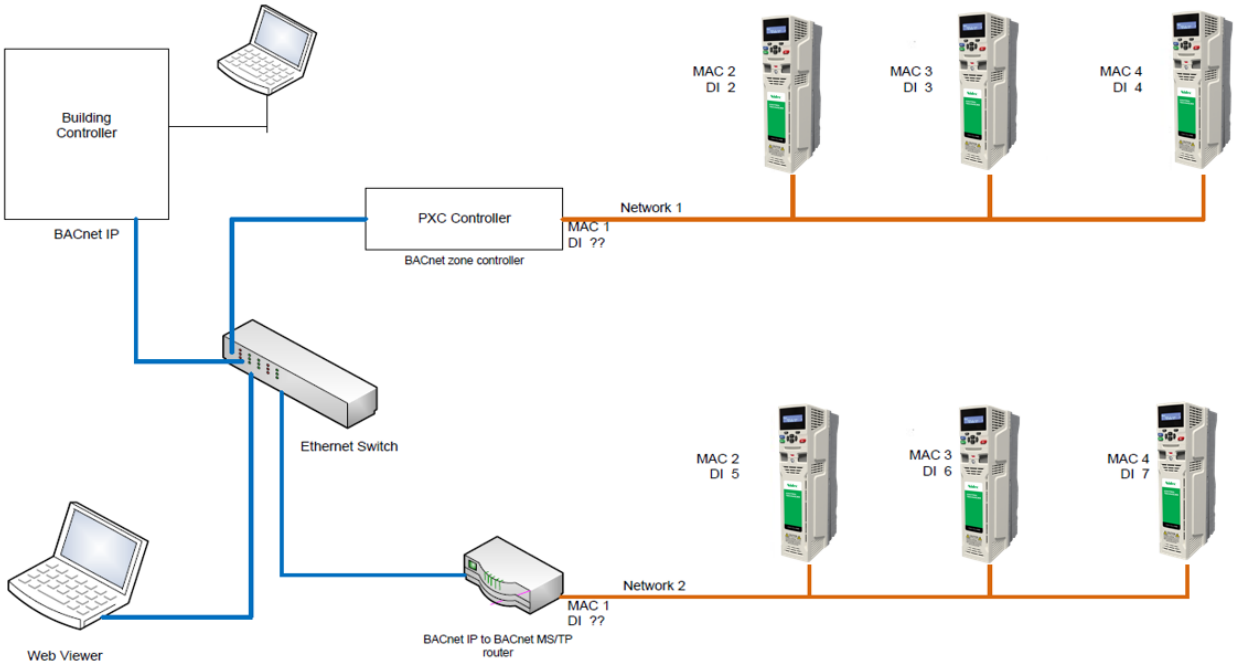
Device Instance

This uniquely identifies a device on the entire network. There can be any duplicates of the Device ID in the internetwork, unlike the MAC address which can be reused in different segments. The Device Instance can range from 0 to 4194303.

Network

This part of the address is not used by the individual devices, each network segment on the Banet interwork should have its own Network number. A router would use the network number to find a segment them the MAC address and finally the Device Instance.

Below is a typical small Banet internetwork, as you can see there are two segments (networks) and the MAC ID is reused in the second segment.



Affinity		H300	
MAC ID	17.03	MAC ID	11.023
Device Instance	17.10	Device Instance	29.004
Protocal selection	17.05(set to BacNet)	Protocal Selection	29.001(set to BacNet)

Baud

The Baud rate must bet set the same on each de-ice.

In the Affinity the baud rate is set 17.04:
0 = protocal default (19200 for Banet)
1= 1200
2 = 2400
3= 4800
4= 9600
5= 19200
6= 38400
7= 57600
8= 76800
>8 = protocal default

In the H300 the baud rate is set in 11.025
0= 300
1= 600
2= 1200
3= 2400
4= 4800
5= 9600
6= 19200
7= 384000
8= 76800
9= 76800
10 = 115200

Data Framing

In the Affinity the Data Framing Parameter 17.38 (start bits, data bits, stop bits, parity)	In the H300 the baud rate is set in Parameter 11.024 (start bits, data bits, stop bits, parity, M = modified)	
0 Protocal default	0 (1, 8, 2, No)	8 (1, 7, 2, No)
1 (1, 8, 1, No)	1 (1, 8, 1, No	9 (1, 7, 1, No)
2 (1, 8, 2, No)	2 (1, 8, 1, Even)	10 (1, 7, 1, Even)
3 (1, 8, 1, Even)	3 (1, 8, 1, Odd)	11 (1, 7, 1, Odd)
4 (1, 8, 1, Odd)	4 (1, 8, 2, No, M)	12 (1, 7, 2, No, M)
>4 Protocal default	5 (1, 8, 1, No, M)	13 (1, 7, 1, No, M)
	6 (1, 8, 1, Even, M)	14 (1, 7, 1, Even, M)
	7 (1, 8, 1, Odd, M)	15 (1, 7, 1, Odd, M)

Defaults

Modbus RTU= (1, 8, 2, No)
Banet = (1, 8, 1, No)
Metasys N2 = (1, 8, 1, No)

Banet Objects

The following tables describe the BACnet objects that are available from the drive. The device object list can also be produced when queried by a master on the network.

Code	Type	Description
RO	Read only	The present value of these objects can only be read
RW	Read/write	The present value property of these objects can be both read from and written to. Writes from different BACnet devices will overwrite each other
C	Commanded	The present value property of these objects can be both read from and written to. Writes are accompanied by a priority level in the range 1 to 16, the underlying drive parameter is set to the value written at the highest priority level

Analog input objects

Object ID (AI*n*)	Object name	Description	Present value access mode
1	Drive analog input 1	Analog input 1 on drive (Pr **07.001**)	RO
2	Drive analog input 2	Analog input 2 on drive (Pr **07.002**)	RO
3	Drive analog input 3	Analog input 3 on drive (Pr **07.003**)	RO
4	Module x analog input 1	The first available analog input on a Solutions Module.	RO
↓	↓	↓	↓
n	Module x analog input *n*	The n^{th} available analog input on a Solutions Module	RO

Analog output objects

To control an analog output via BACnet the source parameter for the output must be set to a read/write parameter on menu 18. (Pr **18.011** to Pr **18.030** are acceptable).

Object ID (AO*n*)	Object name	Description	Present value access mode
1	Drive analog output 1	Analog output 1 on drive	C
2	Drive analog output 2	Analog output 2 on drive	C
3	Module x analog output 1	The first available analog output on a Solutions Module	C
↓	↓	↓	↓
n	Module x analog output 1	The first available analog output on a Solutions Module	C

Nidec
All for dreams

Analog value objects

Object ID (AV*n*)	Object name	Description	Present value access mode
1	Drive parameter	The drive parameter to read/write	RW
2	Parameter value	The new value for the parameter, or the value read from the parameter	RW
3	Parameter read/write	Whether the parameter should be read or written (1 = write, 2 = read)	RW
4	Speed reference	The required output frequency/speed reference (Pr **01.021**)	C
5	Maximum speed reference	The maximum reference clamp value (Pr **01.006**)	RW
6	Output current	Motor output current magnitude (Pr **04.001**)	RO
7	Output torque	Motor output torque (Pr **04.020**) as a percentage of full load	RO
8	Output frequency	Drive output frequency (Pr **05.001**)	RO
9	Output speed	Motor speed (Pr **05.004**)	RO
10	Output power	Drive output power (Pr **05.003**)	RO
11	Drive status word	Drive status word (Pr **10.040**)	RO
12	User trip parameter	User trip (Pr **10.38**)	RW
13	Last trip	Last drive trip (Pr **10.020**)	RO
14	Filter change (dt)	Time between filter changes (Pr **06.021**)	RW
15	Time to next filter change	Time before filter change due (Pr **06.023**)	RO
16	Energy meter (MWH)	Energy meter (MWh) (Pr **06.025**)	RO
17	Energy meter (KWH)	Energy meter (kWh) (Pr **06.026**)	RO
18	PID 1 digital reference	Digital reference for PID 1 (Pr **14.025**)	C
19	PID 1 digital feedback	Digital feedback for PID 1 (Pr **14.026**)	C
20	PID 1 reference	Sum of all reference inputs to PID 1 (Pr **14.020**)	RO
21	PID 1 feedback	Sum of all feedback inputs to PID 1 (Pr **14.021**)	RO
22	PID 1 output	The output from PID 1 (Pr **14.001**)	RO
23	PID 2 digital reference	Digital reference for PID 2 (Pr **14.055**)	C
24	PID 2 digital feedback	Digital feedback for PID 2 (Pr **14.056**)	C
25	PID 2 reference	Sum of all reference inputs to PID 2 (Pr **14.050**)	RO
26	PID 2 feedback	Sum of all feedback inputs to PID 2 (Pr **14.051**)	RO
27	PID 2 output	The output from PID 2 (Pr **14.031**)	RO
28	Universal parameter access	User selectable parameter 1 (Pr **29.010**)	RW/RO/C
29	Universal parameter access	User selectable parameter 2 (Pr **29.011**)	RW/RO/C
30	Universal parameter access	User selectable parameter 3 (Pr **29.012**)	RW/RO/C
31	Universal parameter access	User selectable parameter 4 (Pr **29.013**)	RW/RO/C
32	Universal parameter access	User selectable parameter 5 (Pr **29.014**)	RW/RO/C
33	Universal parameter access	User selectable parameter 6 (Pr **29.015**)	RW/RO/C
34	Universal parameter access	User selectable parameter 7 (Pr **29.016**)	RW/RO/C
35	Universal parameter access	User selectable parameter 8 (Pr **29.017**)	RW/RO/C
36	Universal parameter access	User selectable parameter 9 (Pr **29.018**)	RW/RO/C
37	Universal parameter access	User selectable parameter 10 (Pr **29.019**)	RW/RO/C

Binary input objects

Object ID (BIn)	Object name	Description	Present value access mode
1	Drive binary input 1	Digital input 1 on drive (bi-dir Pr **08.001**)	RO
2	Drive binary input 2	Digital input 2 on drive (bi-dir Pr **08.002**)	RO
3	Drive binary input 3	Digital input 3 on drive (bi-dir Pr **08.003**)	RO
4	Drive binary input 4	Digital input 4 on drive (bi-dir Pr **08.004**)	RO
5	Drive binary input 5	Digital input 5 on drive (bi-dir Pr **08.005**)	RO
6	Drive binary input 6	Digital input 6 on drive (bi-dir Pr **08.006**)	RO
7	Drive binary input 7	Drive enable input (Pr **08.009**)	RO

Binary output objects

Object ID (BOn)	Object name	Description	Present value access mode
1	Drive binary output 1	Digital output 1 on drive (bi-dir Pr **08.001**)	C
2	Drive binary output 2	Digital output 2 on drive (bi-dir Pr **08.002**)	C
3	Drive binary output 3	Digital output 3 on drive (bi-dir Pr **08.003**)	C
4	Drive binary output 4	24V Output (Pr **08.008**)	C
5	Drive binary relay 1	Drive relay 1 (Pr **08.007**)	C
6	Drive binary relay 2	Drive relay 2 (Pr **08.045**)	C

To control a binary output via BACnet the source parameter for the output must be set to a read/write bit parameter on menu 18. (Pr **18.031** to Pr **18.050** are acceptable).

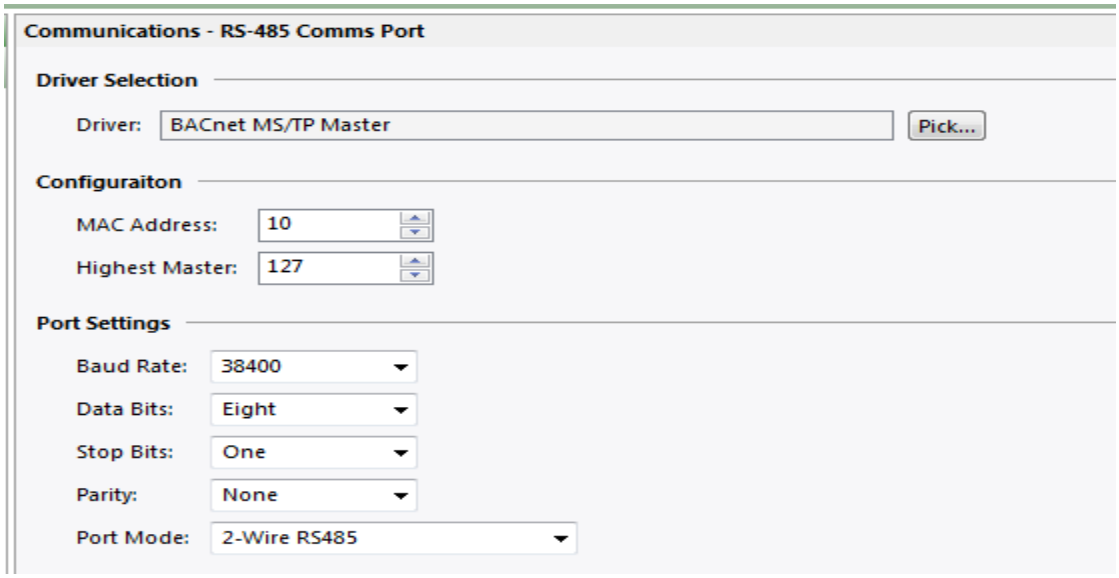
Binary value objects

Object ID (BVn)	Object name	Description	Present value access mode
1	Reset energy meter	Reset drive energy meter (Pr **06.024**)	RW
2	Filter change required	Filter change required/done (Pr **06.022**)	RW*
3	Drive run forward	Run forward (Pr **06.030**)	C
4	Drive Heathy	Drive Heathy indication (Pr **10.001**)	RO
5	Drive warning	Drive warning/alarm state (Pr **10.019**)	RO
6	Drive reset	Drive reset (Pr **10.033**)	RW**

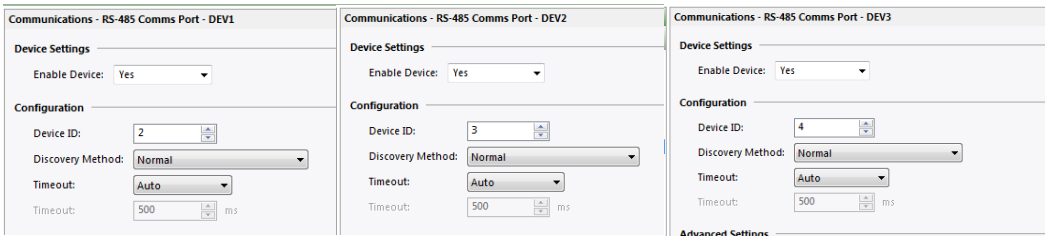
Banet Master Setup

As stated earlier this example is using a CTVue as the master and this section will only show the communication set up and the tags and the CTVue display pages will not be discussed here, there are other app notes for CTVue setup that will show display pages.

First set the masters Mac Address and baud rate. Shown below is the CTVues set up where the 485 port is set to be the BACnet MS/TP Master, the Mac address is 10 the Baud rate is 38400 and it is set to 2 wire 485.



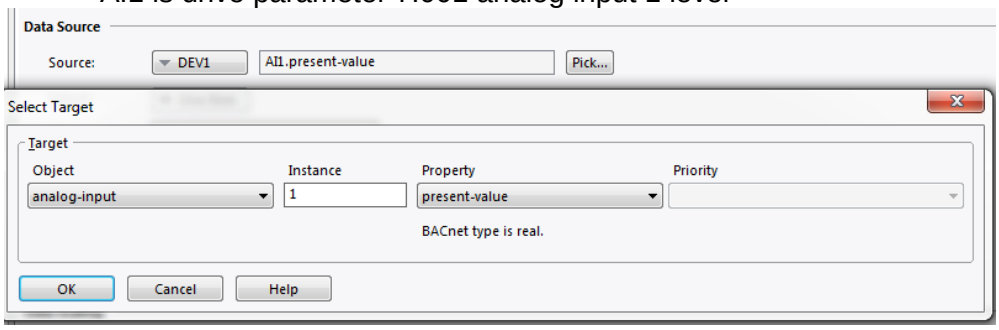
The master needs to know where to look for the drives so you will need to tell the master what Mac IDs to look for devices at. Here are the first three drives in this set up (note Mac ID 1 is typically reserved for technician access so the drives start at address 2):



The next step is to determine what variable you wish to read or write based on the Banet Object list on a previous page. This example has one object from each object type shown except Analog Output Value as the drive does not use them directly:

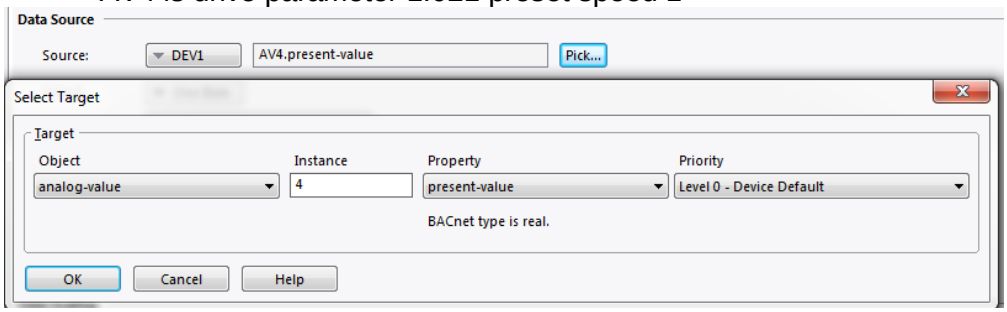
Analog Input Object

AI1 is drive parameter 7.001 analog input 1 level



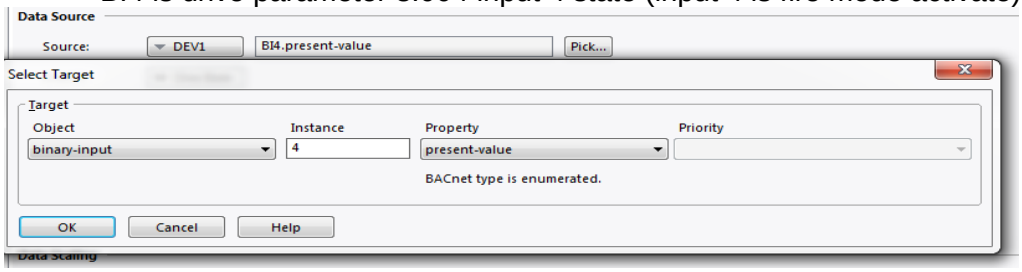
Analog Value Object

AV4 is drive parameter 1.021 preset speed 1



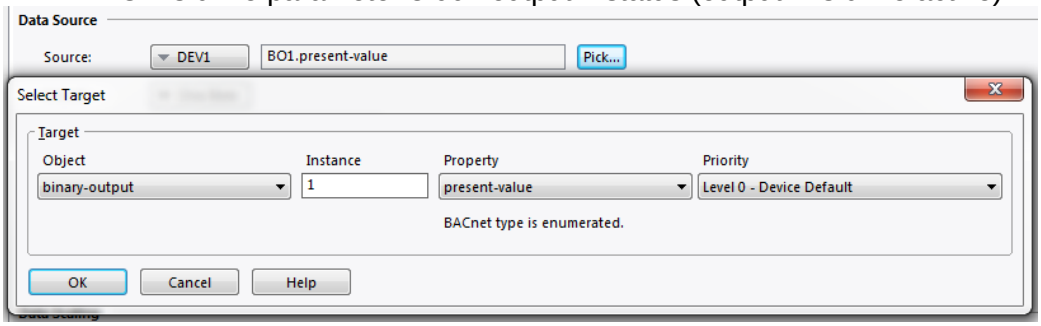
Binary Input Object

BI4 is drive parameter 8.004 input 4 state (input 4 is fire mode activate)



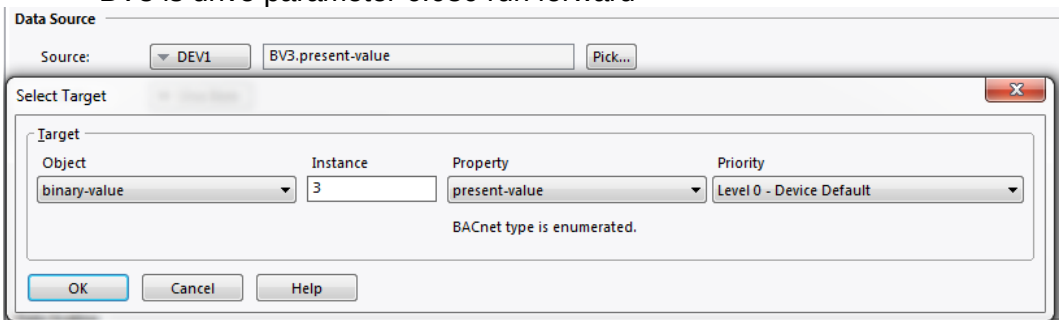
Binary Output Object

BO1 is drive parameter 8.001 output 1 status (output 1 is drive active)



Binary Value Object

BV3 is drive parameter 6.030 run forward



Now you should be able to read or write to the BacNet Objects, the chart at the beginning of the Banet Object List will show which Object can be written to and which ones are read only.

Resources: can be found on our website: www.controltechniques.com
For help contact techsupport.cta@mail.nidec.com, or
call Technical Support at 952-995-8000, 24/7/365