

Technical Note 076

# Testing EFB port on ACH580

## Testing using Modbus RS-485 and BACnet MS/TP

Occasionally a building automation technician or machine integrator may experience issues communicating with a drive. Troubleshooting is then required to determine the root cause of the issue. The goal of Technical Note 076 is to provide instruction on how to prove the ACH580 drive's embedded fieldbus (EFB) port is functional when using Modbus RS-485 or BACnet MS/TP.

A laptop can be connected directly to a drive's EFB port to verify functionality of that port. An appropriate software program is required to allow a laptop to interface with the drive. The four software programs discussed are only suggested software tools, and ABB is not promoting specific software programs. This Technical Note references specific parameter numbers that apply to base drives. Most parameters referenced in parameter group 58 are the same between a base drive and E-Clipse bypass controller, so the concept of this document can be applied to an ACH580 E-Clipse package to verify the E-Clipse bypass controller's EFB is functional.

For Modbus RS485:

- Procedure A - ComTest PRO – Free
- Procedure B - Radzio Modbus Master Simulator - Free

For BACnet MS/TP:

- Procedure C - BACnet Quick Test (BQT) – Free 30 day trial or purchase
- Procedure D - Yet Another BACnet Explorer (YABE) – Free

Before starting the procedures listed below remove the building automation system (BAS) wiring to the ACH580's EFB port and connect a laptop computer with a converter cable to the drive's EFB port.

### RS-485 to USB converter and PC configuration

To communicate between a laptop computer and the drive's EFB port, a RS-485 to USB converter is required. One example is the B&B Electronics USB to RS-485 converter: 485USBTB-2W. Make sure to install the appropriate software drivers for the USB to RS485 converter onto your laptop. When the software driver is properly installed, and the USB to RS-485 converter is connected to the laptop, under Windows "Device Manager" you will see the device listed as shown in Figure 1. The COM# will most likely be different than the below example number of "5".



Figure 1

Once the USB to RS-485 converter is properly configured, the “Latency Timer” needs to be adjusted to a value of “1”. To adjust the latency timer in the “Device Manager” follow these steps:

Steps 1–3 references Figure 1, Figure 2, and Figure 3.

1. Double click on the identified device in Figure 1.
2. Click on the “Port Settings” tab, and then *Advanced* button as shown in Figure 2.
3. Set the *Latency Timer (msec)* to a value of 1 as shown in Figure 3. A reboot of your laptop may be required after adjusting this setting.

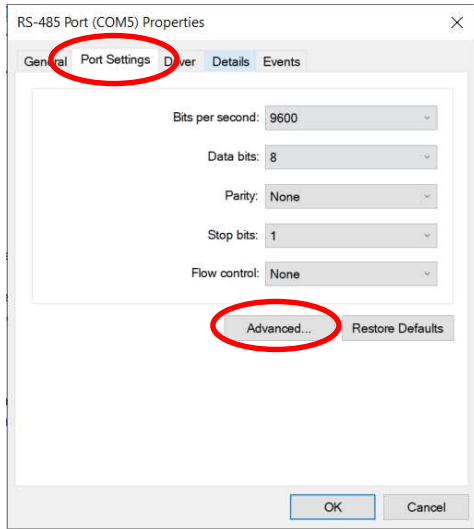


Figure 2

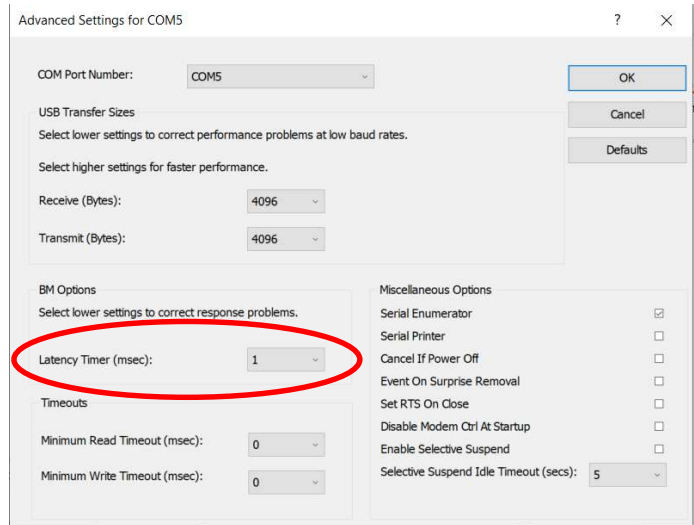


Figure 3

## Modbus RS-485 test with ComTest Pro (Procedure A)

The first program is from the company BaseBlock called ComTest Pro. The following link will take you to the website to download the software program. <https://www.baseblock.com/PRODUCTS/comtestpro.htm>

The image in Figure A1 should appear on your screen when the program opens. Figure A2 shows where multiple settings are configured.

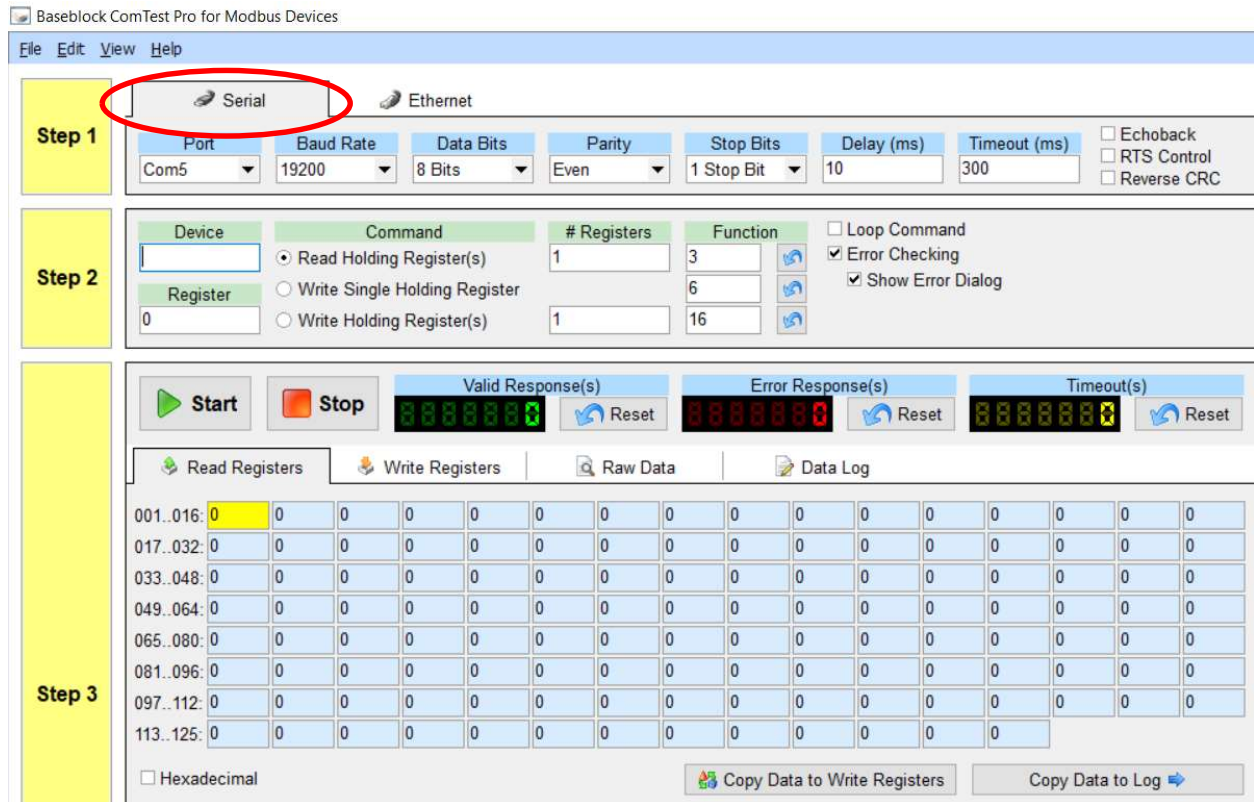


Figure A1



Figure A2

Steps 1 – 13 discuss setup of the ACH580 drive and ComTest Pro software program to read a drive's register, proving the EFB terminal works.

Steps 1 – 5 references Figure A1 and Figure A2.

1. When the program is opened make sure the serial communication tab is selected, see Figure A1 red circle.
2. *Port* setting *Com#* should match your laptops "Device Manager" setting, see Figure A1 and Figure A2 as an example.
3. Set the *Baud Rate* drop down to match drive parameter *58.04*, see Figure A2.
4. Set *Data Bits*, *Parity*, and *Stop Bits* drop down menus to match drive parameter *58.05*, see Figure A2.
5. *Delay (ms)* and *Timeout (ms)* can be ignored along with the check boxes *Echoback*, *RTS Control*, and *Reverse CRC*, see Figure A2.

Steps 6 – 11 references Figure A3.

6. Set the *Device* number to match drive parameter *58.03*. If you are going to be communicating to multiple drives or other devices daisy chained together, ensure all the devices have unique *Device/Node Addresses*.
7. The *Register* setting will be the parameter being read in the drive. DC bus parameter *01.11* is an excellent test parameter to read, as it will always have a unique value if the drive is powered on from line voltage, regardless of the drives run/stop state. ComTest Pro software tool has an offset of (-1) when reading or writing to Modbus registers, so drive parameter *01.11* (111 decimal) will be entered into the below software tool as 110.
8. Make sure *Read Holding Register(s)* is selected.
9. Make sure *# Registers* is at default 1.
10. Under *Function* leave the default values of *3, 6, 16*.
11. The *Error Checking* and *Show Error Dialog* boxes can be checked. Leave *Loop Command* box unchecked.

Step 2

Device	Command	# Registers	Function	
2	<input checked="" type="radio"/> Read Holding Register(s)	1	3	
	<input type="radio"/> Write Single Holding Register		6	
Register 110	<input type="radio"/> Write Holding Register(s)	1	16	

☐ Loop Command  
☒ Error Checking  
☒ Show Error Dialog

Figure A3

Steps 12 – 13 references Figure A4.

12. Make sure the *Hexadecimal* box in the bottom left corner is unchecked.
13. Press the *Start* button once. A value should appear in the upper left cell that represents the DC bus voltage on the drive. The value returned is a decimal number with no decimal point. Parameter *01.11* VDC bus voltage provides a value out to the tenth of a decimal, so take the value returned and divide by 10. In the below example  $3148d / 10 = 314.8$ . 314.8 VDC should match very closely the value on the drive control panel screen for parameter *01.11*.

Step 3

Start
Stop

Valid Response(s)

88888888

Reset

Error Response(s)

00000000

Reset

Timeout(s)

00000000

Reset

Read Registers
 Write Registers
 Raw Data
 Data Log

001..016:	3148d	-	-	-	-	-	-	-	-	-	-	-	-	-	-
017..032:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
033..048:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
049..064:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
065..080:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
081..096:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
097..112:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
113..125:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

☐ Hexadecimal

Copy Data to Write Registers
Copy Data to Log

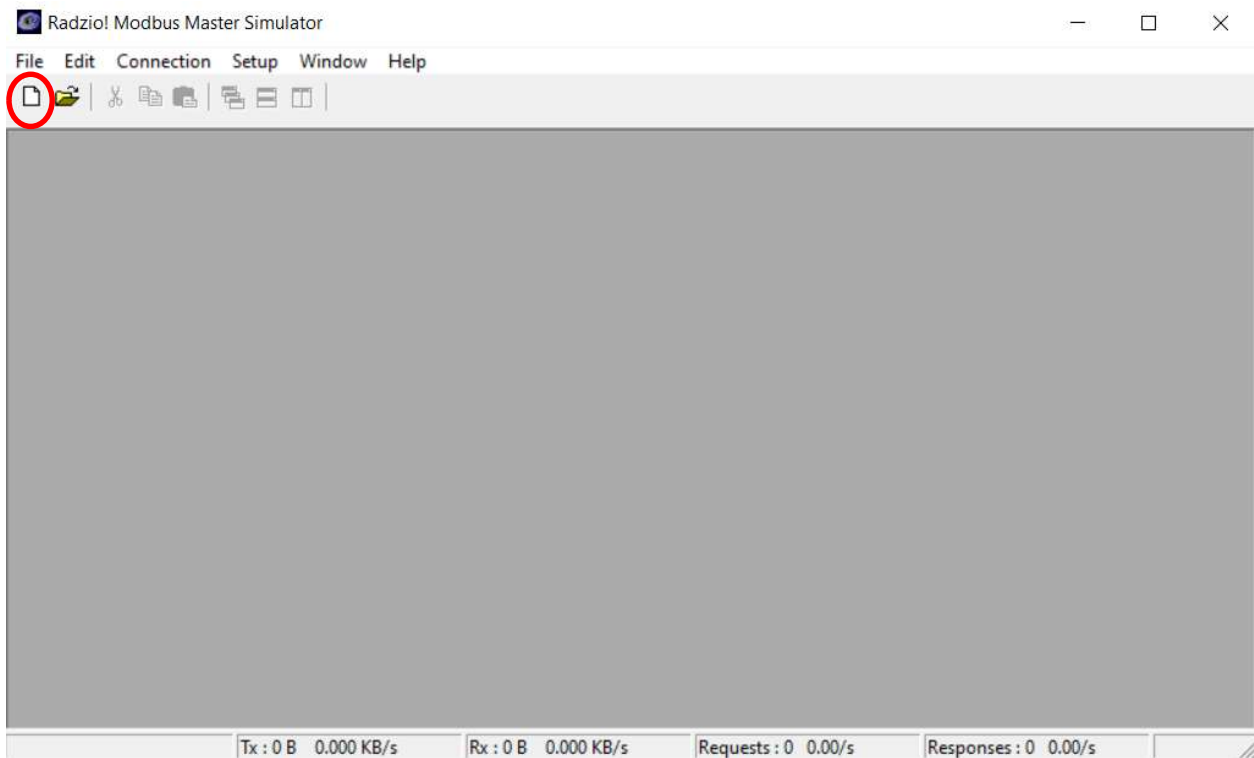
Figure A4

### Modbus RS-485 test with Radzio Modbus Master Simulator (Procedure B)

The second program is called Radzio Modbus Master Simulator. The following link will take you to the website to download the software program.

<http://en.radzio.dxp.pl/modbus-master-simulator/>

The image in Figure B1 should appear on your screen when the program opens.



**Figure B1**

Steps 1 - 13 will guide thru how to setup the ACH580 VFD and Radzio Modbus Master Simulator software program to read a drive's register, proving the EFB terminal works.

Step 1 references Figure B1.

1. Select under *File* -> *New* or click on the blank sheet in the red circle, see Figure B1.

Steps 2 – 7 references Figure B2 and Figure B3.

2. Select from the top header dropdown menu *Connection -> Settings*, see figure B2.
3. Make sure *Modbus RTU* is selected, see Figure B3.
4. *Port* setting *Com#* should match your laptops “*Device Manager*” setting as seen in Figure 1 example.
5. Set the *Bitrate* drop down to match drive parameter *58.04*.
6. *Parity* and *Stop bits* should match drive parameter *58.05*. Ignore the fact that a value of “8” is not shown in the setup.
7. No need to make any adjustments for *Modbus TCP* or *General*.

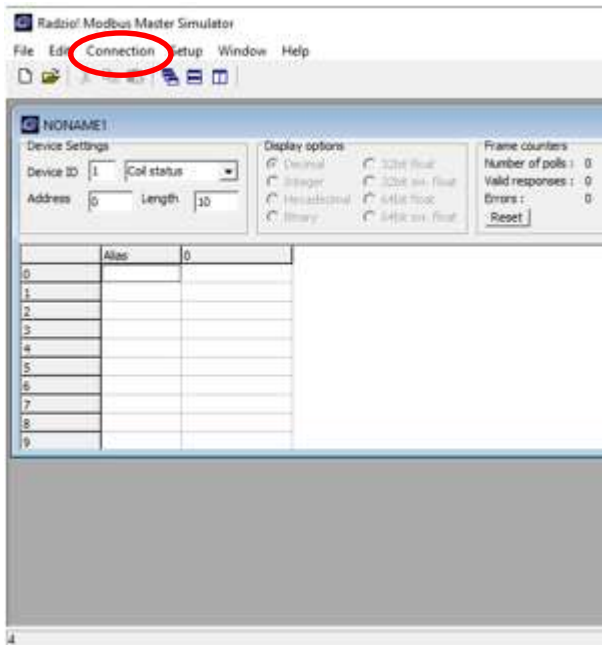


Figure B2

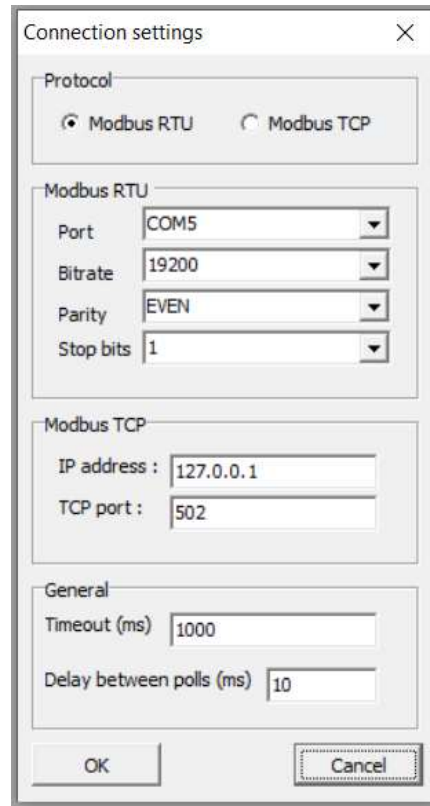


Figure B3

Steps 8 – 13 references Figure B2 and Figure B4.

8. Under *Device Settings* set the *Device ID* equal to the value in drive parameter *58.03*, see Figure B4
9. Under *Device Settings* select *Holding registers* in the drop down menu, see Figure B4
10. Under *Device Settings* set the *Address* to *110*, see Figure B4. The *Address* setting will be the parameter we want to read in the drive. DC bus parameter *01.11* is an excellent test parameter to read, as it will always have a unique value if the drive is powered on from line voltage, regardless of the drives run/stop state. Radzio Modbus Master Simulator software tool has an offset of (-1) when reading a Modbus registers, so drive parameter *01.11* (111 decimal) will be entered into the below software tool as 110.
11. Under *Device Setting* set the *Length* to *1*, see Figure B4.
12. Select from the top header dropdown menu *Connection -> Connect*, see Figure B2.
13. In the below red circle you can see the value of *3164* which represents the drives DC bus voltage. The value returned is a decimal number with no decimal point. Parameter *01.11* DC bus voltage provides a value out to the tenth of a decimal, so take the value returned and divide by 10. In the below example  $3164 / 10 = 316.4$ . 316.4 VDC should match very closely the value on the drive control panel.

	Alias	Value
0		3164
1		0
2		0
3		0
4		0
5		0
6		0
7		0
8		0
9		0

Figure B4

### BACnet MS/TP test with BQT (Procedure C)

The first software program discussed for testing BACnet MS/TP is from the company Polarsoft called BACnet Quick Test (BQT). A free 30 day trial of BQT can be acquired, otherwise the software program can be purchased. The following link will take you to the website to request a download of the software program.

<https://polarsoft.com/bqt.asp>

The image in Figure C1 should appear on your screen when the program opens.

The following steps 1 - 9 will guide thru how to setup the ACH580 drive and BQT software program to read a drive's BACnet Objects, proving the EFB terminal works.

Steps 1 - 7 references Figure C1 and Figure C2.

1. Click on *Port* on the main header, and Figure C2 will appear.
2. Select *MS/TP* by checking the box near the bottom of the window.
3. Adjust the *COM Port* to match the setting in “*Device Manager*”, see Figure C2.
4. Set the *Baud Rate* to match drive parameter *58.04*.
5. Adjust the *MAC Address* to a value between 1 – 127 that does not equal the value set in any connected drive parameter *58.03*. Each device must have a unique MAC address on the wire.
6. *Max Master* can be left at a setting of 127 for this simple test.
7. Select *OK* to close out of the port setting window.

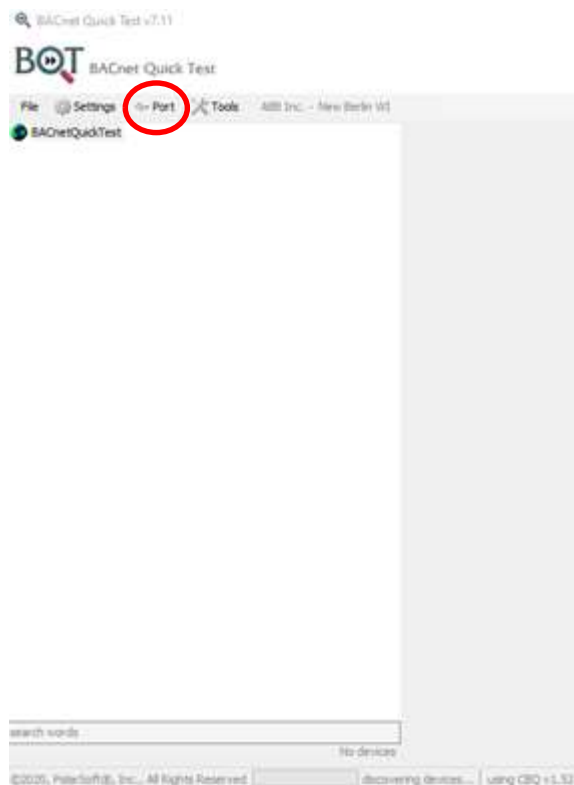


Figure C1

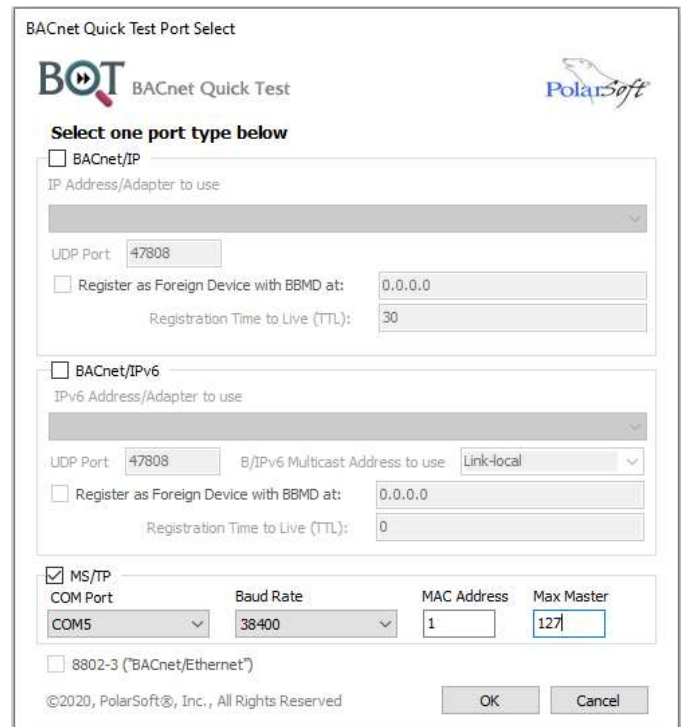


Figure C2



Steps 8 - 9 references Figure C3, Figure C4, and Figure C5.

8. The BQT program may automatically detect the VFD, if it does not select *Tools -> Restart Device Discovery*. In the below example Figure C3 shows the drives Instance ID number is 303. At this point you can say the VFD is discoverable and the EFB port on the ACH580 drive works.
9. BQT does allow you to easily see all the VFDs objects if the list is expanded as show in Figure C4. Note that it may take approximately a minute for all the drive objects to be populated. Select for *DC-Voltage (analog-value-2)*, and in the right window it will show under *present-value* the actual drive's DC bus voltage, see Figure C5, which will match drive parameter 01.11.

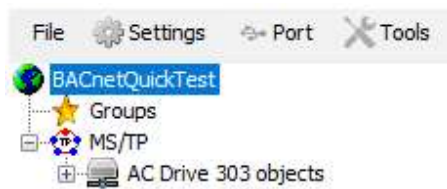


Figure C3

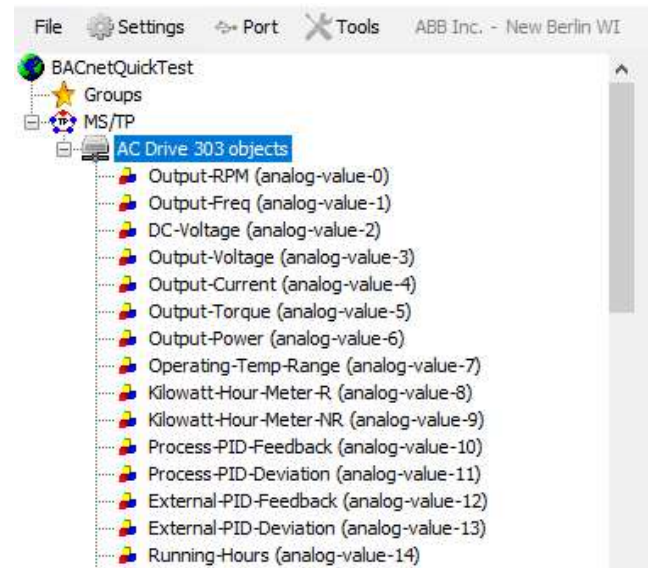


Figure C4

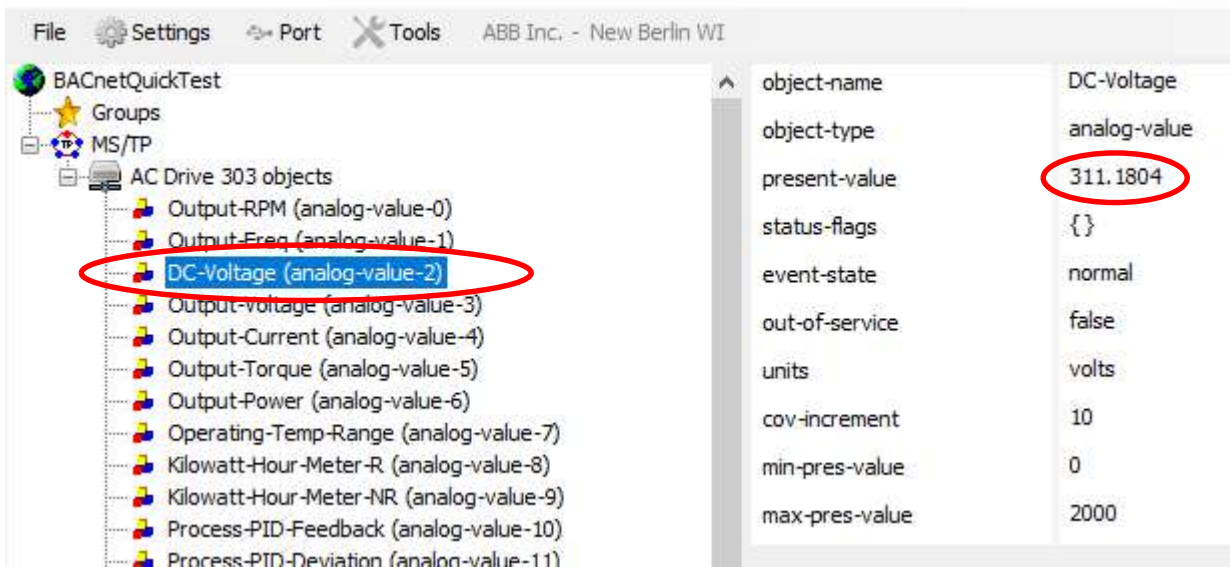


Figure C5

### BACnet MS/TP test with YABE (Procedure D)

The second software program discussed for testing BACnet MS/TP is a free BACnet explorer tool called YABE (Yet Another BACnet Explorer). The following link will take you to the website to request a download of the software program. <https://sourceforge.net/projects/yetanotherbacnetexplorer/>

The image in Figure D1 should appear on your screen when the program opens.

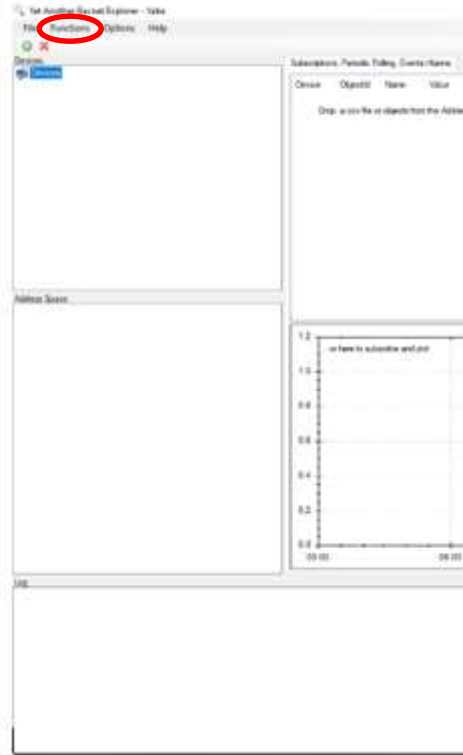


Figure D1

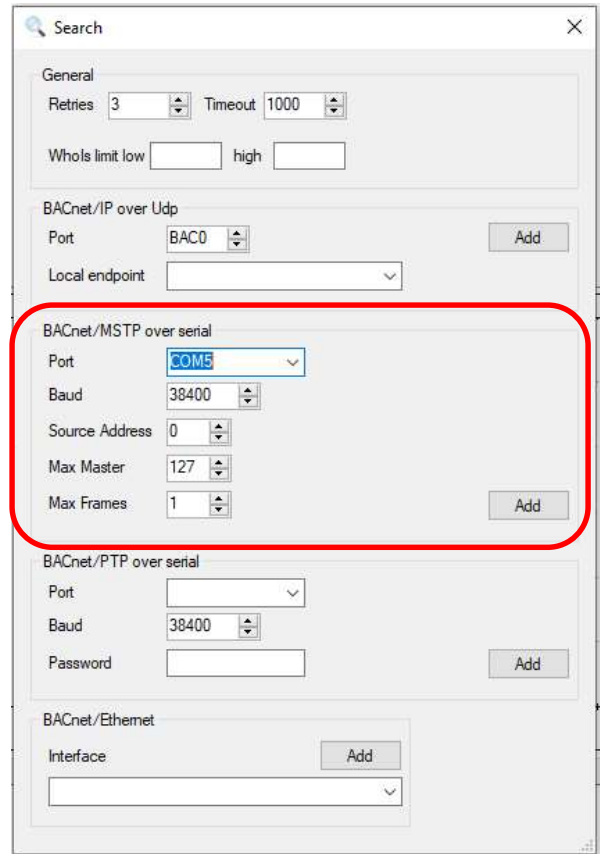


Figure D2

The following steps 1 - 13 will guide thru how to setup the ACH580 drive and YABE software program to read a drive's BACnet Object, proving the EFB terminal works.

Steps 1 – 7 references Figure D1 and Figure D2.

1. From the header bar select *Functions* -> *Add device*, see Figure D1. Figure D2 should open on the screen.
2. Under *BACnet/MSTP over serial* adjust the *Port* to match the setting in “*Device Manager*” see Figure 1.
3. Set the *Baud* to match drive parameter *58.04*.
4. Adjust the *Source Address* to a value between 1 – 127 that does not equal the value set in any connected drive parameter *58.03*. Each device must have a unique MAC address on the wire.
5. *Max Master* can be left at a setting of “127” for this simple test.
6. *Max Frames* can be left at a setting of “1”.
7. Press the *Add* button

Steps 8 – 11 references Figures D3 and D4.

8. In the upper left box under *Devices* the ACH580 drive should appear as shown. The first number in the red oval refers to the *Device object ID* number per drive parameter 58.40. The second number refers to the *Node address* setup in drive parameter 58.03. Sometimes only a single number will be listed next to the drive representing just the *Node address*.
9. Left click on the *Device* computer screen image in the oval in Figure D3.
10. In the box below on the left side of the screen all the drive's objects should populate. See Figure D4.
11. Left click on *ANALOG\_VALUE:2*. This value represents the VFDs current DC bus voltage per drive parameter 01.11.

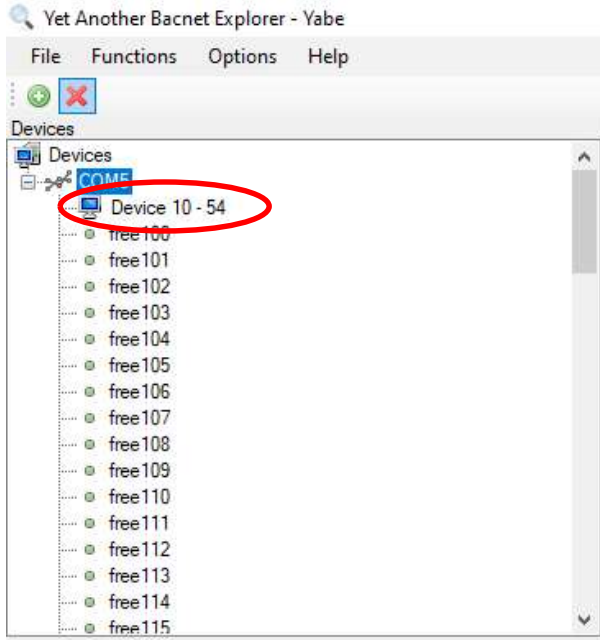


Figure D3

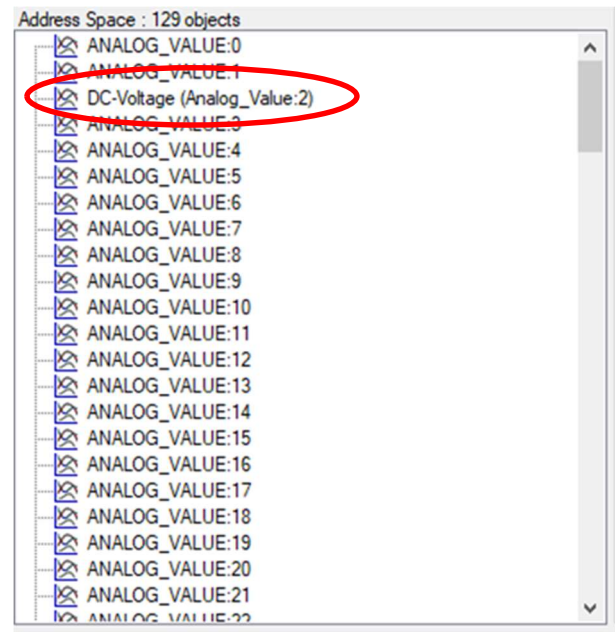


Figure D4

Steps 12 - 13 references Figure D5

12. In the far upper right corner of the explorer screen under *Properties*, information will populate about the VFD object *ANALOG\_VALUE:2*
13. As can be seen in Figure D5 in the red oval the *Present Value*, closely matches drive's DC bus voltage parameter 01.11.

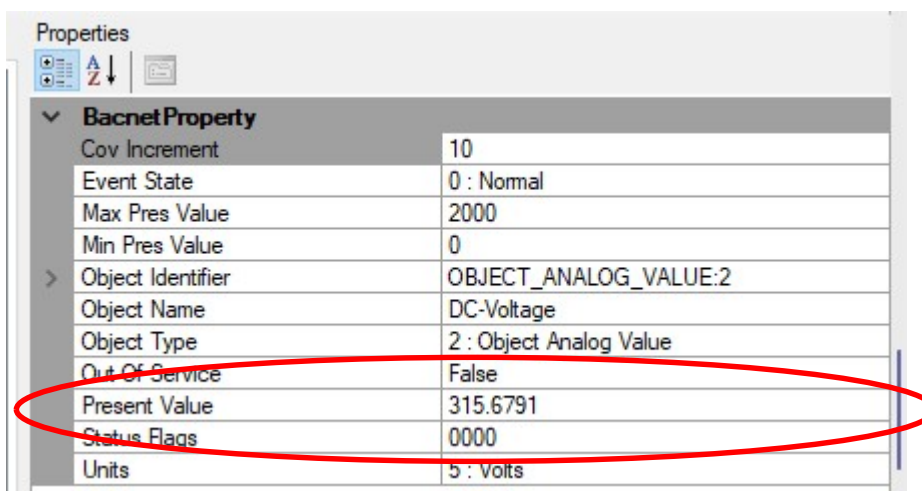


Figure D5

**Summary**

The above steps for two different free Modbus software simulators and two different BACnet software simulators will help demonstrate that an ACH580 drive's EFB port is functional. Other drive parameters or drive registers can also be read or written to using these software programs. Proving the EFB port is functioning properly allows future troubleshooting efforts to focus other topics as the root cause of the problem. Reach out to your local ABB representative for further support as needed.