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Synergy
BACnet FAQ

Frequently Asked Questions

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Introduction:

This FAQ will help you learn how to control a Synergy Network Controller over BACnet. Because BACnet is a protocol, you will need a program or collection of programs to send the BACnet service request and receive the response. The programs used in the examples presented here are part of the 14-program collection of demonstration code from the Open-Source [Bacnet-Stack](#) project. If you want to try the examples, you'll need to download and install this project on your Windows or Linux-based PC.

Reference Documents:

In order to derive the maximum benefit from this FAQ, you may need to refer to these documents:
1. "Synergy Network Controller Expanded Protocol Implementation Conformance Statement"
2. "BACnet-Stack Demo Programs"
3. ASHRAE 135-xxxx, "BACNET -- A Data Communication Protocol for Building Automation and Control Networks"

The Questions:
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1. How do the BACnet-Stack demo programs map to the BACnet services implemented by the Synergy Network Controller?

BIBB Name	Service Description	Demo Program For This Action
DS-RP-A	Data Sharing – Read Property – able to transmit it	bacrp.exe
DS-RPM-A	Data Sharing – Read Property Multiple – able to transmit it	bacrpm.exe
DS-WP-A	Data Sharing – Write Property – able to transmit it	bacwp.exe
DM-DDB-A	Device Management – Dynamic Device Binding – able to transmit it	bacwi.exe
DM-DOB-A	Device Management – Dynamic Object Binding – able to transmit it	bacwh.exe
DM-TS-A	Device Management – Time Synchronization – able to transmit it	bacts.exe
DM-RD-A	Device Management – Reinitialize Device – able to transmit it	bacrd.exe
DM-DCC-A	Device Management – Device Communication Control – able to transmit	bacdcc.exe
DS-RP-B	Data Sharing – Read Property – able to reply to it	bacserv.exe
DS-WP-B	Data Sharing – Write Property – able to reply to it	bacserv.exe
DM-DDB-B	Device Management – Dynamic Device Binding – able to reply to it	bacserv.exe
DM-DOB-B	Device Management – Dynamic Object Binding – able to reply to it	bacserv.exe
DM-TS-B	Device Management – Time Synchronization – able to reply to it	bacserv.exe
DM-RD-B	Device Management – Reinitialize Device – able to reply to it	bacserv.exe
DM-DCC-B	Device Management – Device Communication Control – able to reply to it	bacserv.exe

2. How do I use the BACnet-Stack demo programs?

The BACnet-Stack demos are CLI programs – they take their information from the user in the form of arguments on the command line that invokes the program. They are designed to be run from a DOS prompt, but run equally well when executed from bash (included with most Linux distributions and part of the Open-Source Cygwin project – a Linux-like environment for Windows.) Each individual program will give you usage help if you just invoke it without arguments. But for some commands the usage is very terse, and more information is required. That is why we created the document "BACnet-Stack Demo Programs." It provides plenty of information that will help you use the demo programs with the Synergy Network Controller.

3. How do I find out which BACnet devices are on my network?

Broadcast a Who-Is service request. For example, the demo command "bacwi -1" invites all BACnet devices on the network to reply. This demo command will display all the responses in a table showing the BACnet Device ID, MAC Address, and other information for each responder. Alternatively, if you only want to find out if a specific device is present you can use the device ID of interest instead of -1 (ALL.) For example, if you want to know if BACnet device 38 is on-line, use this demo command: "bacwi 38" and you will get a one-row table if the device is responding or an empty table otherwise.

4. What object types are supported by the Synergy Network Controller?

Object Type Number	BACnet Object	Synergy Object
0	Analog Input (AI)	Analog Input or Button
1	Analog Output (AO)	Dimmer or Relay
2	Analog Value (AV)	Synergy Group
3	Binary Input (BI)	Switch or Button
4	Binary Output (BO)	Relay or Dimmer
5	Binary Value (BV)	Partition (room divider)
8	Device (D)	Cabinet (one Synergy Network Controller)
10	File (F)	Synergy File

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5. How do I find out what objects are in my Synergy Network Controller?

Every Synergy Network Controller has one device object. That object has the Object_List property. This property is an array that has an entry for every addressable object in this Controller. Send a Read Property request to the device object for the Object_List property. This demo command: "bacrp 38 8 38 76 -1" requests the object list from Controller #38. (See "BACnet-Stack Demo Programs" for a detailed explanation of each argument used.)

Most Synergy Network Controllers will contain hundreds or even thousands of objects, which means the Object_List will be too long to fit into a single reply message (segmented message support will be required.) At the time of this writing, the demo programs do not support segmentation. But there is an additional program named "bacepics.exe" that can dump out not only the object list, but most of the information that is supplied in the PICS (Protocol Implementation Conformance Statement.) The output is very long, and it may take a minute or more to get the information. Redirect the command's output to a file. For example, get the object list from BACnet device #2 with this demo command: "bacepics 2 >pics02.txt" and the information will be saved in the file named "pics02.txt" in your current directory.

6. How do I find out exactly how many objects are in my Synergy Network Controller?

Send a Read Property request to the device object for the count (array index zero) for the Object_List property. This demo command: "bacrp 2 8 2 76 0" requests the number of objects from Controller #2.

7. How do I get the instance number of my Synergy Network Controller's device object?

There is only one device object per Controller. Its instance number is always the same as the Controller's BACnet device ID. See the answer to question 3 "How do I find out which BACnet devices are on my network?"

8. How do I figure out which instance number to use to refer to a specific object?

BACnet instance numbers map directly to the Synergy "Hotel" numbering system used to identify inputs and outputs. The Synergy Network Controller is directly connected to 1-16 modules, each of which contains inputs to receive information from the building and outputs to control lighting loads. The module types are relay, dimmer, legacy and SIMPLY5. Each module has an address wheel which is set to a unique (to its Controller) number, 0-15. This number or module ID is the upper two digits of the "Hotel" number. The module's inputs are numbered sequentially beginning with 1, as are the module's outputs. These numbers are the lower two digits of the "Hotel" number. For example, if a system has a 8-output relay card at module ID 2, then the "Hotel" numbers corresponding to these outputs are 201, 202, 203, 204, 205, 206, 207 and 208. They may be accessed over BACnet as either Analog Output (AO) or Binary Output (BO) objects.

SIMPLY5-Group instance numbers (3MLGG) are in the inclusive range is 30000-39215. The least-significant 4-digits (MLGG) identify the module (M), DALI loop (L), and group number (GG.) The least-significant two digits (GG) are the group number which is always in the inclusive range 0-15 (16 groups per loop.) The next most significant digit (L) identifies which of the three loops the group is on. The inclusive range for the loop number is 0-2. The next most significant digit (M) is the module address. Because there is only one digit for the DALI Module's address, it must be set to a value in the inclusive range 0-9.

SIMPLY5 instance numbers (2MLPP) are in the inclusive range is 20000-39263. The least-significant 4-digits (MLPP) identify the module (M), DALI loop (L), and point number (PP.) The least-significant two digits (PP) are the point number which is always in the inclusive range 0-63 (64 points per loop.) The next most significant digit (L) identifies which of the three loops the point is on. The inclusive range for the loop number is 0-2. The next most significant digit (M) is the module address. Because there is only one digit for the DALI Module's address, it must be set to a value in the inclusive range 0-9.

Legacy dimmer (maxstar) instance numbers (1MPPP) are in the inclusive range 10000-13999. The least-significant 4-digits (MPPP) identify the module (M) and the point number (PPP.) The least-significant 3-digits (PPP) are the point number which is always in the inclusive range 0-999. The next most significant digit (M) is the module address. Legacy dimmer (maxstar) module addresses are restricted to the inclusive range 0-3.

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Remote Station instance numbers (2000 + SSBB) are in the inclusive range 2000-7999. First subtract 2000 to get a number in the range 0-5999. This is the Remote Station Hotel Number (SSBB.) The least-significant two digits (BB) are the button/input number, and the two next most significant digits (SS) are the station number (0-59.)

Relay and Dimmer instance numbers (MMPP) are in the inclusive range 0-1507. The least-significant two digits (PP) are the point number. For relay modules, this is always in the inclusive range 0-7. For dimmer modules, this is always in the inclusive range 0-5. The next two most significant digits (MM) are the module address, which is always limited to the inclusive range 0-15.

The instance number for the Synergy Group will be directly related to the "Hotel" number for the output or set of outputs that belong to the group. For example, by default dimmers 101 thru 103 are in group 101.

The instance numbers for partitions begin with 1 and go up.

The instance number for the device object is always the same as the Controller's BACnet ID. See the answer to question 7 "How do I get the instance number of my Synergy Network Controller's device object."

The instance number for the file object begins with 0 and goes up. See the answer to question 13 "What files can I read and write on my Synergy Network Controller."

9. What proprietary properties are supported by the Synergy Network Controller?

Property Number	Description	Containing Object(s)
512	Strike_Count	AO, BO
513	Hour_Count	AO, BO
514	Dawn	D
515	Dusk	D
42001	Group_Object_ID	BI
42002	Member_List	AV
42003	Script_Update	F

10. What BACnet priority values are used by the Synergy Network Controller?

Priority	Description
3	On
4	Off
10	Normal (use for nearly all write property actions)
13	Low

11. How do I find out the version of my Synergy Network Controller software?

Send a Read Property command to the Controller's device object for the Firmware_Revision property. For example, to read the software version from Controller #38, use this demo command: "bacrp 38 8 38 44".

12. How do I find out which modules are connected to my Synergy Network Controller?

Send a Read Property command to the Controller's device object for the Application_Software_Version property. This will return one string that contains the build date for the Synergy Network Controller software followed by the version number, quantity or bus ID and firmware version of every active module (on the ACCESS.BUS.) Because they are listed in bus ID order, the keyboard is always first (ID-0.) The separator between the date and the first device/quantity (and between every following device/quantity) is "..". For example, "bacrp 38 8 38 12" returns this string:
"16-Apr-2009..Keyboard 1 v1.07 ..Dimmer   1 v1V07 ..Relay   2 v1.20 ..DALI   3 v2.02 ..Dimmer   4 v1V07 "

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13. What files can I read and write on my Synergy Network Controller?

The following table provides the file instance number and the corresponding file name for all supported files.

Instance Number	Filename
0	TEMP.TXT
1	SCRIPT.TXT
2	LOGIC.TXT
3	PASS.BIN
4	LOG.BIN
5	STRIKE.BIN
6	CONFIG.INI
7	SYNERGY.RTB
8	GREET.RIF
9	THANKS.RIF
10	PRIORITY.BIN
11	TASKINFO.DAT
12	LOGIC.TMP
13	LOG.INI
14	LOGIC.BAD
15	SCRIPT.BAD
16	NOTES.TXT
17	GREET.WAV
18	THANKS.WAV
19	REQUEST.WAV
32	GATEWAY.INI
33	GATEWAY.RTB
34	LUTRON.INI
35	PASSWORD.BIN
64	LITE.RTB
100	FILE100
101	FILE101
102	FILE102
103	FILE103
104	FILE104
105	FILE105
106	FILE106
107	FILE107
108	FILE108
109	FILE109

14. How do I get the Script Logic out of my Synergy Network Controller?

Send an Atomic Read File request for file instance 2 ("LOGIC.TXT.") For example, this demo command: "bacarf 38 2 logic.txt" will read LOGIC.TXT from Controller #38 and save it in the file named "logic.txt" in your current directory. See the answer to question 13 "What files can I read and write on my Synergy Network Controller" for the complete list of file instance numbers.

15. How do I update the Script file to my Synergy Network Controller?

Send an Atomic Write File request for file instance 1 ("SCRIPT.TXT.") For example, this demo command: "bacawf 38 1 my_script.txt" will read your file named "my_script.txt" in your current directory and write over the "SCRIPT.TXT" file on Controller #38.

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16. What level "commands" can be sent to relay, dimmer, and Synergy Group objects?

The Present_Value property for Analog Output and Analog Value objects usually represents an output level as a percent (0-100.) But there is more to it, as show by the following table:

Present Value	Description
0	OFF and relinquish the priority
1	OFF, w/o relinquishing the priority
2-99	level, percentage
100	ON
128	STOP
129	LOWER
130	RAISE
131	BLINK
132	FLASH (SIMPLY5 dimmers only)
255	NULL (relinquish the priority)
1000.0 * fade-time + level	FADE
NOTE: fade-time is in 1/10 second units	

17. How do you close a relay at "normal" priority?

Send a 1 ("ON") at priority 10, to the Present_Value property of the BO object representing the relay you want to energize. For example, for Controller #38, if you want to close relay 3 on the relay module whose ID is 2, this demo command will do it: "bacwp 38 4 203 85 10 -1 9 1". Similarly, if want to open that same relay, this demo command will do it: "bacwp 38 4 203 85 10 -1 9 0". See the document "BACnet-Stack Demo Programs" for details on this command. See the answer to question 10 "What BACnet priority values are used by the Synergy Network Controller" for the full list of priorities.

18. How do I read the relay position?

Read the Present_Value property of the BO object representing the relay you want to check. For example, for Controller #38, if you want to check relay 4 on the relay module whose ID is 2, this demo command will do it: "bacrp 38 4 204 85". See the document "BACnet-Stack Demo Programs" for details on this command.

19. How do you do a 3-second fade-off of (non-SIMPLY5) dimmable ballasts?

First use the formula in the table at the end of the answer to question 16 'What level "commands" can be sent to relay, dimmer, and Synergy Group objects' to calculate the Present_Value number. Translate the 3 second fade time to 30 tenths, multiply it by 1000 and add the final output level (0) to get 30000. If you were doing a 5 second fade-on to 100%, the Present_Value number would be 50100. Now pick out your ballast by module ID and output number, and write the calculated Present_Value to the specific Controller's Analog Output object. For example, to do a 3-second fade-off on Controller #38 of output 6 of the dimmer whose module ID is 4, use this demo command: "bacwp 38 1 406 85 10 -1 4 30000". To do the 5 second fade-on to 100% for the same dimmer, use this demo command: "bacwp 38 1 406 85 10 -1 4 50100.0".

20. What's different about fading SIMPLY5 ballasts?

Just the instance number is different. For example, to do a 2.3 second fade-on to 100% on Controller #38 of SIMPLY5 ballast 1 on loop 0 of the SIMPLY5 dimmer module whose ID is 3, the instance number you need is 23001. This demo command will do the job: "bacwp 38 1 23001 85 10 -1 4 23100". To do a 7 second fade-off for the same SIMPLY5 ballast, try this demo command: "bacwp 38 1 23001 85 10 -1 4 70000".

21. How do you turn dimmable ballasts "ON" or "OFF"?

There are two ways to do it. If you use the Analog Output object for the specific ballast, send a 0% (to turn it "OFF") or 100% (to turn it "ON") to the Present_Value of the correct instance number. For example, to turn off output 6 of the dimmer whose module ID is 4 on Controller #38, use this demo command: "bacwp 38 1 406 85 10 -1 4 0.0". If you use the Binary Output object, send a 0 ("OFF") or a 1 ("ON") to the Present_Value of the correct instance number. For

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example, using the same ballast as for the Analog Object case, the demo command to turn it off looks like this: "bacwp 38 4 406 85 10 -1 9 0".

22. How do you renumber a SIMPLY5 ballast?

You write the new instance number to the Object-Identifier of the Binary Output object whose instance number represents the ballast you want to move. What actually happens is the ballast addresses are swapped between the two fixtures. The only rule is both the "old" and "new" instance numbers must represent SIMPLY5 ballasts that are on the same loop of the same SIMPLY5 dimmer module. For example, for Controller #38, to renumber SIMPLY5 fixture 1 on loop 0 of module ID 3 to be SIMPLY5 fixture 5 on loop 0 of module ID 3, use this demo command: "bacwp 38 4 23001 75 10 -1 12 4:23005". Once you do this, all future commands must use the "new" instance number to address the same physical ballast.

23. How do you "press" and "un-press" a button on a Remote Station?

Write a 1 ("ON") to the Present_Value of the Binary Input object and instance that represents the desired button. For this example, we assume Controller #38 has a 16-channel Remote Station at address 1. The button to be remotely pressed is Preset 1. The instance number is 2101. See the answer to question 8 "How do I figure out which instance number to use to refer to a specific object" for the explanation. The demo command that does this is: "bacwp 38 3 2101 85 10 -1 9 1". If you want to "un-press" that same button, just write a 0 ("OFF") to the Present_Value, like this demo command does: "bacwp 38 3 2101 85 10 -1 9 0".

24. How do you read all the members of a Synergy group?

We assume Controller #38 has a 16-channel Remote Station at address 1. Preset 1 of this station by default will control Synergy group 2101. We assume group 2101 has three members:

	GROUP MEMBERS		
member values	1	2	3
device_id	0	0	0
object_type	2	2	2
instance_number	2117	2118	2119
level	74	43	20
fade_time (seconds)	0	0	0

You read property 42002 (Member_List) of Analog Value instance 2101 with an array index of -1 (ALL). The demo command that reads all the members of Synergy group 2101 is: "bacrp 38 2 2101 42002 -1" and the displayed result is: "{0,2,2117,74,0,0,2,2118,43,0,0,2,2119,20,0}."

25. How do you find out how many members are in a Synergy group?

We assume the same situation as described in question 24 "How do you read all the members of a Synergy group" and read property 42002 (Member_List) of Analog Value instance 2101 with an array index of 0. The demo command that reads the number of members for Synergy group 2101 is: "bacrp 38 2 2101 42002 0".

26. How do you read only one member of a Synergy group?

We assume the same situation as described in the answer to question 24 "How do you read all the members of a Synergy group" and read property 42002 (Member_List) of Analog Value instance 2101 with an array index of 1, 2, or 3, depending on which member you want to read. The demo command that reads the first member of Synergy group 2101 is: "bacrp 38 2 2101 42002 1", and the displayed result is: "{0,2,2117,74,0}."

27. How do you create or write all the members of a Synergy group?

We assume the same Synergy group number used in the answer to question 24 "How do you read all the members of a Synergy group" and issue a Write Property request for property 42002 (Member_List) of Analog Value instance 2101 with an array index of -1 (ALL) and provide all the group members. If the group did not already exist, it is created. If it already existed, all of its current members are replaces with the new ones. The members are added in the same order they are provided. If a duplicate is in the input, the write will fail at the point in the input where the first duplicate is found, and Write_Access_Denied is returned. In other words, the write may partially succeed. This demo command writes all

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the members of Synergy group 2101: "bacwp 38 2 2101 42002 10 -1 2 0 2 2 2117 2 74 2 0 2 0 2 2 2118 2 43 2 0 2 0 2 2 2119 2 20 2 0".

28. How do you remove all the members of a Synergy group?

We assume the same Synergy group number used in the answer to question 24 "How do you read all the members of a Synergy group." Use a Write Property request for property 42002 (Member_List) of Analog Value instance 2101 to write either one NULL data type or one UNSIGNED zero, with Array-Index=0 to empty the array of all group members. Writing anything other than a NULL (data type) or an UNSIGNED zero with Array-Index=0 is not permitted. The demo command that clears Synergy group 2101 of all members is: "bacwp 38 2 2101 42002 10 0 0 0".

29. How do you remove one member from a Synergy group?

We assume the same Synergy group number and list of members used in the answer to question 24 "How do you read all the members of a Synergy group" and use a Write Property request for property 42002 (Member_List) of Analog Value instance 2101 with an Array-Index of 1, 2, or 3, depending on which member we want to remove, and provide only a NULL data type as the content. This demo command removes the second group member (Synergy group 2117) from Synergy group 2101: "bacwp 38 2 2101 42002 10 2 0 0".

30. How do you change one member in a Synergy group?

We assume the same Synergy group number and list of members used in the answer to question 24 "How do you read all the members of a Synergy group" and write one existing member (by Array-Index) with one Tuple to change the level and fade_time values for that member. The first three members of the Tuple (device_id, object_type, and instance_number) must match the same attributes of the member being singled out by the value of Array-Index. If there isn't a match, the Inconsistent_Parameters error is returned and the request is not performed. The demo command will change the level and fade time of the third member of Synergy group 2101: "bacwp 38 2 2101 42002 10 3 2 0 2 2 2 2119 2 99 2 4".

31. How do you add one member to a Synergy group?

We assume the same Synergy group number and list of members used in the answer to question 24 "How do you read all the members of a Synergy group" and write one Tuple with an Array-Index greater than the number of members add the desired group member, with level and fade_time. The new member is appended immediately after the last member with no gaps. If the member being added is a duplicate, Write_Access_Denied is returned and the request is ignored. This demo command will add local group member 2525 to Synergy group 2101: "bacwp 38 2 2101 42002 10 12 2 0 2 2 2 2525 2 98 2 8".

<mark>32. How do you change a button label for a SYGS wallstation?</mark>

<mark>Because each SYGS can be configured for a different number of presets and channels, an error (unknown-object) will be returned if you try to read or write properties of a button that is not defined for that wallstation. Use the Analog Input or Binary Input object when reading or writing wallstation button properties. Wallstation hotel numbers are always in the format "2SSBB" (see the answer to question 8 "How do I figure out which instance number to use to refer to a specific object.") This demo command will change the label of button 1 of station 5 to "breakfast": 'bacwp 38 0 2501 28 10 -1 7 "breakfast"'. If you are near the station, you can see the label is changed immediately.</mark>

33. How do you force an update to the SCRIPT.TXT file?

After you have made all your changes, via BACnet, to a particular Controller, it will eventually save your changes to the SCRIPT.TXT file (at 57 minute intervals.) If you are worried about power failures, you can force the update to take place immediately with this demo command: "bacwp 38 10 1 42003 10 -1 2 1".