touch-plate®
LIGHTING CONTROLS

Nexus BACnet Manual

Precautions

The Nexus BACnet hardware is designed to be in environments that have a temperature range of 0-60°C (non-condensing atmosphere). Installing in an environment outside of these parameters will shorten the life span of the hardware.

Touch-Plate recommends the use of 18 to 22 AWG wire for low voltage wiring of contact closure products, 18 AWG wire for all 24V power connections, and 16 AWG wire for 2-wire Smart Switch Stations.

All 120VAC wiring must use wire as specified by National Electric Code for load size and wire length.

Compatible Hardware

- Digital Control Stations
    - 2-Wire Stations (Mystique and Ultra Series)
    - 5-Wire Stations (Mystique and Ultra Series)
- Contact Closure Control Stations via Smart Switch Hub or on board inputs
- Panel Products (Solare, Soluxe, Calypso, and ZoneZ Series)

Warranty

Touch-Plate warrants this product against defects in materials or workmanship, under normal use, for a period of ONE (1) year from date of shipment. If a defect arises and a valid claim is received within the Warranty Period, Touch-Plate will repair or replace the product at no charge.

This warranty does not apply to:

a. Damage to unit(s) caused by accident, acts of God, inappropriate installation, faulty installation, or any negligent use;
b. Unit(s) which have been subject to being taken apart or otherwise modified;
c. Unit not used in accordance with instructions;
d. The finish on any portion of the product, such as surface and/or weathering, as this is considered normal wear and tear;
e. Non-Touch-Plate hardware installed by the user;
f. Damage caused by Non-Touch-Plate products;
g. Damage caused by operating the product outside the permitted or intended uses described by Touch-Plate;
h. -or- Specific plans or Specific application requirements, unless the plans and specifications have been forwarded to Touch-Plate and Touch-Plate has approved and accepted the plans in writing.

EXCEPT AS PROVIDED IN THIS WARRANTY, TOUCH-PLATE IS NOT RESPONSIBLE FOR DIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY BREACH OF WARRANTY OR CONDITION, INCLUDING BUT NOT LIMITED TO, INSTALLATION OR REPLACEMENT LABOR COSTS.

Nexus BACnet Overview

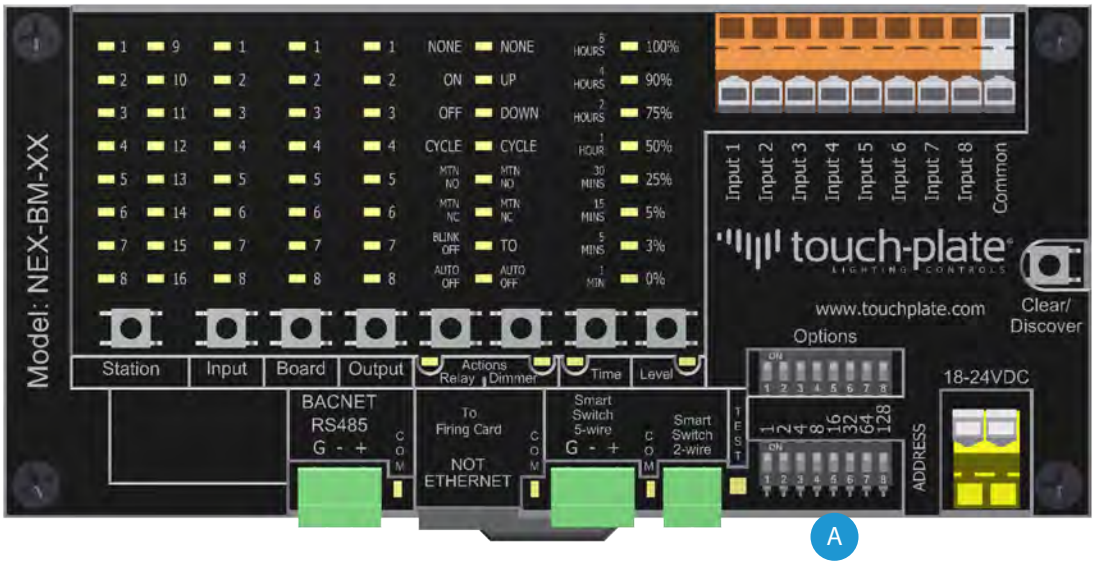
The Nexus BACnet menu is an on board menu. The LEDs lit on the Nexus menu options are the cursors. As you navigate through the menu options look for and use the cursors.

The Nexus BACnet can run at the fastest time possible when the MS/TP network is optimized for speed. To ensure that there is not increased latency and/or delay in loads turning on after a command is issued, use the following to allow for the fastest response time possible.

- Place 10 or fewer panels on each MS/TP network. There can be up to 127 panels on a single MS/TP network, but latency will increase.
- Do not combine lighting with other types of devices, such as HVAC, security, access control, fire and safety, on the same MS/TP network. When possible, isolate the lighting system onto its own MS/TP network.
- HVAC can be used in combination with the Nexus BACnet if the HVAC is controlled using the softpatch configuration capability.
- If multiple Nexus's are on one MS/TP network, place the controller on the same MS/TP network for optimal performance.

The Nexus comes from the factory set as Priority Level 16 and cannot be changed. When the Nexus processes an input to control an output, all outputs are controlled at Priority Level 16. If the operator work station writes to the BO object (relays) or AO object (dimmers) at a higher priority, switch presses and releases will be ignored until the operator workstation relinquishes control of that BO or AO. If the operator workstation issues commands at Level 16, the input and the operator workstation will both be able to control the output.

Board Items	Options	Board Position	Page #
Dip Switches	MS/TP Address	A	4



Initial MS/TP Network Setup (BACnet System)

Use the Initial MS/TP Network Setup to correctly setup your system. The following steps refer to standard BACnet properties. Utilize the operator work station to access each device and to set the following parameters. If step by step instructions are needed, consult the operator work station manual.

Utilize the following steps to correctly setup the Nexus.

- Use consecutive numbers starting at one when assigning MS/TP addresses to the panels.

- Set the property 'MAX MASTERS' within each device object to the actual number of devices on the MS/TP network. This needs to be done for every device on the network.

- Set the property 'MAX INFO FRAMES' to 1. This is the factory default. If necessary, this number might need to be set on other manufacturers' devices to keep the token passing running as fast as possible.

- Set the 'APPLICATION DATA' unit size to 480. This is the factory default. If necessary, this number might need to be set on other manufacturers' devices to avoid overrunning the receiver buffers.

- Use the 'CHANGE OF VALUE (COV)' subscriptions instead of polling objects. This will reduce network traffic. Buttons on control stations (BIs) and relays (BOs) support COV subscriptions.

  If COVs are not supported, monitoring of switch inputs can be done by using the Input Change Buffer AV1001 object to reduce the amount of polling done on the network.

- Set the Baud Rate to the highest rate that your devices will support. The factory default is 38400. Set the corresponding Baud Rate on the Nexus.

Setting the BACnet MS/TP Address (MAC)

The Address Dip Switches are used to set the BACnet MS/TP Address.

Normally, these Dip Switches come from the factory pre-programmed to Address #1.

Use the setting diagram to change the Address if needed. Note that for the address changes to take effect, a power cycle needs to occur.

Address	1	2	3	4	5	6	7	8
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
19	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
20	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
Through Address 127 - Use the table below to calculate the MS/TP Address								

Valid addresses are from 1 to 127. Addresses are set using the seven Address Dip Switches, which each have a value noted in the chart below.

Address Dip Switch	1	2	3	4	5	6	7	8
Value	1	2	4	8	16	32	64	--

The values of all switches in the ON position are added together and the total is equal to the address. See the examples below:

MS/TP Address 1: Turn on switch 1 only, and leave all other Address switches off.

MS/TP Address 13: Turn on switches 1, 3 and 4. The value of those switches are 1 + 4 + 8 = 13.

Setting the BACnet MS/TP Baud Rate

The BACnet MS/TP Baud Rate is set using the Option DIP Switches and the Programming Interface.

The Nexus has two baud rate settings that need to be set. The first is for communication on the BACnet MS/TP network and the second is for communication with the firing card(s) in the panel.

Normally, the Nexus comes from the factory pre-programmed to 38400 for the BACnet MS/TP network and to 115200 for the firing card communication.

Use the setting diagram and instructions to change the Baud Rate if needed.

1. Turn on Option Dip Switch #3. The current baud rate for the BACnet MS/TP network will be displayed under the 'INPUT' section. The current baud rate for the firing card communication will be displayed under the 'OUTPUT' section.
2. Press the 'INPUT' button multiple times until the LED is lit next to the desired BACnet MS/TP network baud rate.

Input LED	1	2	3	4	5	6	7	8
BACnet MS/TP Baud Rate	9600	19200	38400	76800	--	--	--	--

3. Press the 'OUTPUT' button multiple times until the LED is lit next to the desired firing card baud rate. This should only be changed if recommended by a Touch Plate technician. Changing this value will require you to change all of the baud rates on each of the individual output boards. Output firing cards come set from the factory at 115200 baud rate.

Output LED	1	2	3	4	5	6	7	8
Firing Card Baud Rate	9600	19200	28800	38400	57600	76800	115200	230400

4. Turn OFF Option Dip Switch #3 when the baud rates have been set. Cycle power to the panel for the baud rates to take effect.

Choosing Objects

These explanations will help to learn what objects are available and what each object does.

Use your operator work station to do object discovery.

OBJECT EXPLANATION					
Table No.	Object	Object Type	Value	Object ID	Used For
BI1	Momentary Switch Inputs	Binary Input	0 = Off, 1 = On	BI1 - BI128	To report button presses of Control Stations
BI2	Maintain Switch Inputs	Binary Input	0 = Off, 1 = On	BI1001 - BI1128	To report button holds of Control Stations
BO1	Relays	Binary Output	0 = Off, 1 = On	BO1 - BO64	Relay control and status
AO1	Dimmers	Analog Output	0-100 %	AO1 – AO64	To control dimmers remotely
AV1	Control Station LED Modes	Analog Value	See chart in appendix for values.	AV1 -AV128	To control flash, color, and intensity of LED lights
AV2	Device Options	Analog Value	1 = Infinite COV's On 0 = Infinite COV's Off	AV1000	To resubscribe to COVs with no expiration of the subscription Write a 0 value for Lifetime when subscribing
AV3	Input Change Buffer	Analog Value	1-128 and 1001-1128	AV1001	To read button presses and releases remotely
AV4	Relay Override Status	Analog Value	0 = no manual override 1-64	AV1002	To remotely monitor relay manual overrides
AV5	Device Instance	Analog Value	1 to 4194300 Default: 68501 - 68999	AV1003	To read or change the Device ID or Device Instance
AV6	Input Emulation	Analog Value	1-128 = button press 1001-1128 = release of button 2001-2128 = quick press	AV1004	To simulate button presses, releases, and quick presses of control stations
AV7	Scene Trigger	Analog Value	1-128 = button press 1001-1128 = button release 2001-2128 = quick press	AV1005	Remotely triggers a scene with button presses, releases, and quick presses
AV11	Sensor Parameters	Analog Value	See AV12 for details Page 43	AV1##1-AV1##10	Reading and writing sensor parameters and levels
DO1	Device Object	Device Object	0 to 4194303	DEV68501 - DEV68999	Describing properties of the device to the BACnet network

Notes:

- ## = 01 - 16 for each station address

Change of Value Events (COVs)

These events only apply to Binary Outputs (BOs).

A change in state will generate a COV. The following chart shows the three events that can cause a COV.

EVENTS THAT CAUSE A COV		
Events That Generate a COV	COVs Generated by that Event	Properties Affected by that COV
Someone manually overrides the relay at the physical location of the relay	The state of the relay is changed. The relay was manually overridden.	Present_Value property reflects the state of the relay. The Override flag of the property Status_Flag is set to true.
When a relay is commanded via BACnet or the Nexus softpatch programming interface and the relay fails	The relay failed.	The Fault flag of the Status_Flag property is set to true.

Binary Inputs - Momentary Inputs

Object ID: BI1 – BI128
Used for: Control Stations, Sensors, and Contact Closure Switch Inputs (if enabled)

Momentary BI Objects (BI1 - BI128) will toggle between 0 and 1 between each button press. When the system is first powered up, the input defaults to 0. COVs (if subscribed) will be generated by each button press. Button release events are ignored on these objects.

The Nexus will build a dynamic database of Momentary Inputs. The range is 1 to 128, in steps of 8. For each device that is connected to the input device network, it will allocate 8 Momentary Inputs in the object database. If the Contact Closure Switch Inputs are enabled, it will allocate 8 Momentary Inputs that will always reside at the end of the database.

For example, if a system has two control stations and Contact Closure Switch Inputs are enabled, this will create Momentary Input objects BI1 to BI24. Momentary Input objects BI1 to BI8 correspond to control station 1; BI9 to BI16 correspond to control station 2, and BI17 to BI24 correspond to contact closure inputs 1 to 8. The Momentary Inputs state can be determined by reading the Present_Value property.

If the addressing on the input devices is not sequential, the system will create the numbering for the BI database sequentially. BI1 will always correspond to the first input on the lowest addressed input device, while the highest BI will always reference the last input on the highest addressed output device or the last Contact Closure Switch Input if enabled.

If the actual device address and input assignment need to be determined, this information will be stored in the Object_Name name property as shown in table BI1.

COV Operation: When an input has had a COV subscription, the controller will report the following properties when a COV event occurs:

- Present_Value = Level of the input (0 or 1)
- Status_Flags = Always false

Table BI1

BINARY INPUT OBJECT PROPERTIES FOR MOMENTARY INPUTS	
Binary Input Property	Value
Object_Identifier	BI# Where # = Input Button Number(Range 1 to 128)
Object_Type	3
Object_Name	"Momentary ### (Switch Station ## : Input #)" Where ### = BI Input Number (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8) "Momentary ### (Local CCIs : Input #)" Where ### = BI Input Number (Range 1 to 128) # = CCI Input (Range 1 to 8) "Momentary ### (Multi-Sensor ## : Input #)" Where ### = BI Input Number (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8) "Momentary ### (Outdoor Light Sensor ## : Input #)" Where ### = BI Input Number (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8) "Momentary ### (Virtual Station ## : Input #)" Where ### = BI Input Number (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8)
Present_Value	This value toggles between 1 and 0 with each button press.
Device_Type	"Momentary Contact"
Status_Flags	All flags are false.
Event_State	0
Reliability	0 = No fault
Out_Of_Service	0
Polarity	0 = Normal
Inactive_Text	"Off"
Active_Text	"On"

Binary Inputs - Maintain Inputs

Object ID: BI1001 – BI1128
Used for: Control stations, Sensors, and Contact Closure Switch Inputs (if enabled)
Values: Button press = 1, Button release = 0 Relay control and monitoring

Maintain BI Objects (BI1001 - BI1128) will go to 1 when a button is pressed and then to 0 when the button is released. COVs (if subscribed) will be generated by each button press and release.

The Nexus will build a dynamic database of Maintain Inputs. The range is 1 to 128, in steps of 8. For each device that is connected to the input device network, it will allocate 8 Momentary Inputs in the object database. If the Contact Closure Switch Inputs are enabled, it will allocate 8 Momentary Inputs that will always reside at the end of the database.

For example, if a system has two control stations and the Contact Closure Switch Inputs are enabled, this will create the Maintain Input objects BI1001 to BI1024. Maintain Input objects BI1001 to BI1008 correspond to control station 1, BI1009 to BI1016 correspond to control station 2, and BI1017 to BI1024 correspond to contact closure inputs 1 to 8. The Maintain Inputs state can be determined by reading the Present_Value property.

If addressing on the input devices is not sequential, the system will create the numbering for BI database sequentially. BI1 will always correspond to the first input on the lowest addressed input device, while the highest BI will always reference the last input on the highest addressed output device or the last Contact Closure Switch input if enabled.

If the actual device address and input assignment need to be determined, this information will be displayed in the Object_Name name property as shown in table BI2.

COV Operation: When an input has had a COV subscription, the controller will report the following properties when a COV event occurs:

- Present_Value = Level of the input (0 or 1)
- Status_Flags = Always false

Table BI2

BINARY INPUT OBJECT PROPERTIES FOR MAINTAIN INPUTS	
Binary Input Property	Value
Object_Identifier	BI1### Where ### = Input Button Number(Range 1 to 128)
Object_Type	3
Object_Name	"Momentary ### (Switch Station ## : Input #)" Where ### = BI Input Number (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8) "Momentary ### (Local CCIs : Input #)" Where ### = BI Input Number (Range 1 to 128) # = CCI Input (Range 1 to 8) "Momentary ### (Multi-Sensor ## : Input #)" Where ### = BI Input Number (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8) "Momentary ### (Outdoor Light Sensor ## : Input #)" Where ### = BI Input Number (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8) "Momentary ### (Virtual Station ## : Input #)" Where ### = BI Input Number (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8)
Present_Value	1 = Button Press or Contact Closed 0 = Button Release or Contact Open
Device_Type	"Maintain Contact"
Status_Flags	All flags are false.
Event_State	0
Reliability	0 = No fault
Out_Of_Service	0
Polarity	0 = Normal
Inactive_Text	"Off"
Active_Text	"On"

Binary Outputs - Relays

Object ID: BO1 – BO64
Used for: Relay control and monitoring

Binary Ouputs are used to command a relay. The state of the relay might be different from what the present value property of this object is because the relay might have failed, been overridden, or been controlled by some other device. To determine the actual state of the relay, read the Feedback Property of this object or use the Relay Feedback object AV2001-2064.

The Nexus will build a dynamic database of Binary Output Objects, where each BO represents a relay. The range is 0 to 64. For each output device connected that has relays, the controller will allocate a BO for each relay that is reported by the output device.

For example, if the Nexus has 2 CPS-PMs and 2 SLX-OMs, this will create an object database from BO1 to BO28. The CPS-PM can control up to 8 relays and the SLX-OM can control up to 6 relays. The mapping of BO1 to BO28 corresponds to 4 output devices. The address of each output device sets the numbering assignment of the BO.

An example of how defining the address of the output device is (using the same boards as above):

- Address 1 = CPS-PM → BO1 to BO8
- Address 2 = CPS-PM → BO9 to BO16
- Address 3 = SLX-OM → BO17 to BO22
- Address 4 = SLX-OM → BO23 to BO28

Even if the addressing of the output device is not sequential, although not recommended, the system will create the numbering for BO data base sequentially. BO1 will always correspond to the first relay on the lowest addressed output device, while the highest BO will always reference the last relay on the highest addressed output device.

If the actual device address and relay assignment need to be determined, this information will be stored in the Object_Name name property as shown in table BO1.

COV Operation: When a BO has a COV subscription, the controller will report the following properties when a COV event occurs:

- Present_Value shows the actual state of the relay.
- Status_Flags shows the override and error flags.

Table BO1

BINARY OUTPUT OBJECT PROPERTIES FOR RELAY CONTROL	
Binary Output Property	Value
Object_Identifier	BO# Where # = Output Relay Number(Range 1 to 64)
Object_Type	4
Object_Name	"Relay #R (Remote Relay Card #C : Output #O)" Where #R = 1 to 64 which corresponds to the BO in the database #C = 1 to 16 which corresponds to the Output Device Address set by the DIP switches #O = the relay output on the output device at address #C
Present_Value	0 = Turn Off Relay, 1 = Turn On relay
Device_Type	"Lighting Contactor"
Status_Flags	Override = True when relay has been manually overridden. Fault = True when the relay has a fault condition.
Event_State	0
Reliability	0 = No fault
Out_Of_Service	0
Polarity	0 = Normal
Inactive_Text	"Off"
Active_Text	"On"
Priority_Array	BACnet Priority Array
Relinquish_Default	Follows BO Present_Value property.

Analog Output - Dimmers

Object ID: AO1 – AO64
Used for: Dimmers to set a light level remotely
Values: Values range from 0 to 100, with the number referring to the percentage of dimming.

The Nexus will build a dynamic database of Analog Output Objects, where each AO represents a dimmer. The range is 0 to 64. For each output device connected that has dimmers, the controller will allocate an AO for each dimmer that is reported by the output device.

For example, if the Nexus has two SLR-EMs and two SLR-SMs, this would create an object database from AO1 to AO28. The SLR-EM can control up to 8 dimmers and the SLR-SM can control up to 6 dimmers. The mapping of AO1 to AO32 corresponds to the 4 output devices. The address of each output device sets the numbering assignment of the AO.

An example of how defining the address of the output device is (using the same boards as above):

- Address 1 = SLR-EM → AO1 to AO8
- Address 2 = SLR-EM → AO9 to AO16
- Address 3 = SLR-SM → AO17 to AO22
- Address 4 = SLR-SM → AO23 to AO28

Even if the addressing of the output device is not sequential, although not recommended, the system will create the numbering for AO data base sequentially. AO1 will always correspond to the first relay on the lowest addressed output device, while the highest AO will always reference the last relay on the highest addressed output device.

If the actual device address and dimmer assignment need to be determined, this information will be stored in the Object_Name name property as shown in table AO1.

Table AO1

ANALOG OUTPUT OBJECT PROPERTIES FOR DIMMER CONTROL	
Binary Output Property	Value
Object_Identifier	AO# Where # = Output Percentage Number(Range 1 to 64)
Object_Type	1
Object_Name	"Dimmer #D (Remote Dimmer Card #C : Output #O)" Where #D = 1 to 64 which corresponds to the AO in the database #C = 1 to 16 which corresponds to the Output Device Address set by the DIP switches #O = the dimmer output on the output device at address #C
Present_Value	0 to 100%
Device_Type	"Lighting Dimmer"
Status_Flags	0
Event_State	0
Reliability	0 = No fault
Out_Of_Service	0
Units	98 = Percent for BACnetEngineeringUnits
Priority_Array	BACnet Priority Array
Relinquish_Default	0 to 100%

Analog Value - Control Station LED Mode

Object ID: AV1 – AV128
Used for: LED lights (pilots) on control stations.
Values: The assigned value for this object sets the color, flash and intensity for the LED. See Appendix II (Page 50) for a chart of values.

The Nexus will build a dynamic database of LEDs. The range is 1 to 128, in steps of 8. For each control station or sensor that is connected to the input device network, this will allocate 8 LED Modes in the object database. If Contact Closure Inputs are enabled, this will not allocate 8 LED Modes for them.

For example, if a system has two control stations attached and the Contact Closure Inputs are enabled, this will create the Control Station LED Mode objects AV1 to AV16. Control Station LED Mode AV1 to AV8 correspond to control station 1 and AV9 to AV16 correspond to control station 2, and AV17 to AV24 correspond to contact closure inputs 1 to 8. The Control Station LED Mode can be controlled by writing to the Present_Value. See Appendix II (Page 50) for color, intensity, and flash pattern values.

Even if the addressing on the input devices is not sequential, although not recommended, the system will create the numbering for AV database sequentially. AV1 will always correspond to the first LED on the lowest addressed input device, while the highest AV will always reference the last LED on the highest addressed output device or the last CCI input if enabled.

If the actual device address and LED assignment need to be determined, this information will be stored in the Object_Name name property as shown in table AV1.

NOTES:

- Occupancy and Light Sensors will allocate 8 LED Modes but currently have no functionality.
- The Closed Contact Inputs (CCIs) will not allocate 8 LED Modes.

Table AV1

ANALOG VALUE OBJECT PROPERTIES FOR LED MODES	
Analog Value Property	Value
Object_Identifier	AV# Where # = LED Number(Range 1 to 128)
Object_Type	2
Object_Name	"LED Control ### (Switch Station ## : Input #)" Where ### = Entry in the AV LED mode database (Range 1 to 128) ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8)
Present_Value	This value is used to set the 1. Intensity 2. Color 3. Flash Pattern See LED Modes in the Appendix for details on setting these values.
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0
Units	No Units = 95
Priority_Array	BACnet Priority Array
Relinquish_Default	LED mode that the system defaults to when not being controlled by a controller with a higher priority. • Writing a value of (0-255) from the table in Appendix II sets the value for when the target is OFF. • Writing a value of 1000 + (0-255) from the table in Appendix II sets the value for when the target is ON. • When reading the Relinquish_Default the OFF value is only read.

Analog Value - Device Options

Object ID: AV1000

Values: 1 = Enables the user to write 0 to the COV lifetime, which enables indefinite COV mode, in which the subscriptions will not expire.
0 = All COV subscriptions will expire according to the lifetime that was written to them when they were initially set up.

Device Options are useful for operator workstations that do not resubscribe before the current COV expires. By default, all COV values expire. If it is desired to continue to receive messages that buttons were pressed, either resubscribe before the current COV expires or enable indefinite COVs. This object affects all subscription objects within that device.

COV Lifetime: When a COV operation is performed, the COV lifetime has to be set (the time for which the subscription will continue).

COV Lifetime Value = > 0: The subscription will expire after the set time, according to the lifetime that was written to them when they were set up.

COV Lifetime Value = 0: Subscriptions do not expire. Before the COV lifetime to 0 can be set, first enable the Nexus to accept 0 as a COV lifetime value by writing 1 to the AV1000 object.

For further information see table AV2.

To enable indefinite COV mode:

1. Write 1 to the AV1000 object.
2. Set the COV lifetime to 0 for each subscription that you want to be infinite.

Table AV2

ANALOG VALUE OBJECT PROPERTIES FOR DEVICE OPTIONS	
Analog Value Property	Value
Object_Identifier	AV1000
Object_Type	2
Object_Name	"Device Options"
Present_Value	1 = enabling infinite COVs, else = 0 (Default)
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0
Units	No Units = 95

Analog Value - Input Change Buffer

Object ID: AV1001

Values: 0 = No presses or releases.
1-128 = Button press on corresponding input.
1001-1028 = Button release on corresponding input.

The Input Change Buffer object polls and reports every button press and release on every input. This includes button presses and releases from control stations, virtual button presses from sensors, Contact Closure Inputs, and smart switch hubs. These get stored in a buffer that can be read from the Input Change Buffer AV1001 Object. This object also supports COVs. For operator workstations that cannot do COV subscriptions, polling via AV1001 can be used to reduce latency.

The values in the Present Value property follow the numbering conventions of the Momentary and Maintain Binary Input Objects.

For example, if a user presses a button that can be read on Momentary or Maintain Binary Input 9, then the Input Change Buffer will return a value of 9, indicating that button 9 was pressed. A button release is signified by the input number plus 1000, so once a user releases the button then a value of 1009 will be read.

COV Operation: When an Input Change AV has had a COV subscription, the controller will report the following properties when a COV event occurs:

- Present_Value = the last button press or release that occurred. The value for a button press can be a value from 1 to 128. For a button release, add 1000 to the input number.
- Status_Flags are always false.

Table AV3

ANALOG VALUE OBJECT PROPERTIES FOR INPUT CHANGE BUFFER	
Analog Value Property	Value
Object_Identifier	AV1001
Object_Type	2
Object_Name	"Input Change Buffer"
Present_Value	Button Press = Input # Button Release = Input # + 1000
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0
Units	No Units = 95
Priority_Array	BACnet Priority Array
Relinquish_Default	0

Analog Value - Relay Override Status

Object ID: AV1002

Used For: Reporting a manual override of a relay at the panel

Values: 0 = No output loads have been manually overridden.
If the value is not 0, the value is the number of the last manually overridden relay.
If multiple relays were overridden on the panel, the value is the first relay in the panel or the relay with the lowest number.
It is the responsibility of the front end controller to look at all relay object status flags to determine which other relays have been overridden.

To clear the override status flag, press and hold the Clear/Discover button for approximately three seconds. The Test LED will light yellow first and then turn red when all flags have been cleared. The manual override cannot be cleared remotely. This is a safety feature required by most local electrical codes and is considered an electricians lock-out while the panel is being serviced and control must be relinquished manually back to the front end controller by performing the above manual clearing operation.

COV Operation: When a Relay Override AV has had a COV subscription, the controller will report the following properties when a COV event occurs:

- Present_Value = the last relay that was manually overridden
- Status_Flags are always false.

Table AV4

ANALOG VALUE OBJECT PROPERTIES FOR RELAY OVERRIDE STATUS	
Analog Value Property	Value
Object_Identifier	AV1002
Object_Type	2
Object_Name	"Relay Override"
Present_Value	Last overridden relay. << DESCRIBE MORE>>
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0
Units	No Units = 95

Analog Value - Device Instance

Object ID: AV1003

Used For: Is a BACnet system-wide unique identifier that is pre-set by the factory to a unique ID of 68002 - 68100 when ordered in a panel with the device instance assigned on a label located on the lower left of the Nexus.
You can use this object to read the current device instance or to change it.

If you change the device instance, the Device Object ID will change from DEV68000. If you change the device instance AV1003 to a value of 70000, then the Device Object ID will be DEV70000.

Table AV5

ANALOG VALUE OBJECT PROPERTIES FOR DEVICE INSTANCE	
Analog Value Property	Value
Object_Identifier	AV1003
Object_Type	2
Object_Name	"Device Options"
Present_Value	Device instance value
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0
Units	No Units = 95
Priority_Array	BACnet Priority Array
Relinquish_Default	0

Analog Value - Input Emulation

Object ID: AV1004

Values: 1-128 for a button press and the button will stay pressed until you send another number. 1001-1128 for a release of the button press. 2001-2128 for a quick press and do not need to be followed by a release. The value represents the number of the button you are remotely pressing.

When the system builds its object database for inputs, each input is assigned a number starting at 1. Button presses and releases can be simulated using the Input Emulation AV1004 Object.

An example of a button press would be, if Input 9 was required to be simulated, sending a value of 9 to the Present_Value property. To simulate the button release of Input 9 send a value of 1009 to Present_Value property.

For all actions except Maintain and Dim Cycle actions, simulated button press and release are not required to be paired for proper operation.

An example of an emulated button press would be, if input 9 was to turn a light on, write 9 to the Present_Value property. It is not required to write 1009 to emulate the release.

An example of an emulated dim cycle command would be, if input 8 was to dim, write 8 to the Present_Value property to dim a light up, 1008 to stop dimming up, 8 to dim down, 1008 to stop dimming down, and 2008 for a quick press. to turn the output on or off

Table AV6

ANALOG VALUE OBJECT PROPERTIES FOR INPUT EMULATION	
Analog Value Property	Value
Object_Identifier	AV1004
Object_Type	2
Object_Name	"Input Emulation"
Present_Value	Logical scene to trigger
Status_Flags	All flags are false.
Event_State	0
Out_Of_Service	0
Units	No Units = 95

Analog Value - Sensor Parameters

Object ID: AV1##01 - AV1##10
Used For: Reading and writing sensor parameters
Values: Values range from 01 to 16, with the number referring to the sensor address.

When using an exterior or interior sensor, the units are connected as any other input device. Each connected sensor has two different ways to be configured.

Configuration via Remote:

To configure the sensor(s) via remote, please consult the sensor manual. Once the sensor is configured, use Options DIP Switch #5 to retrieve the sensor parameters.

Configuration via BACnet:

Each sensor has 8 predefined switch inputs that are used to softpatch the sensor actions to relays and dimmers. Since these inputs map to BI objects, they can be monitored the same as a switch input using Binary Input Objects 1 to 128. See table AV12 for further details.

Table AV11

SENSOR BI OBJECT DEFINITIONS			
BI Object	Exterior Sensor	Interior Sensor : Mode = 0	Interior Sensor : Mode = 1/2
X+1	Ambient light less than Threshold_12 - Hysteresis	Ambient light less than Threshold_12 - Hysteresis	Ambient light less than Threshold_12 - Hysteresis
X+2	Ambient light more than Threshold_12 + Hysteresis	Ambient light more than Threshold_12 + Hysteresis	Ambient light more than Threshold_12 + Hysteresis
X+3	Ambient light less than Threshold_34 - Hysteresis	Ambient light less than Threshold_34 - Hysteresis	Occupied Maintain Sensor ON = Send button press Send press 1 sec. later Sensor OFF = Send button release Send release 1 sec. later
X+4	Ambient light more than Threshold_34 + Hysteresis	Ambient light more than Threshold_34 + Hysteresis	Occupied Pulsed Repeat Sensor ON = Send button press Send release 1 sec. later Repeat pulse every 2 mins. Sensor OFF = Send button release
X+5	Ambient light less than Threshold_56 - Hysteresis	Ambient light less than Threshold_56 - Hysteresis	Occupied Pulsed Once Sensor ON = Send button press Send release 1 sec. later
X+6	Ambient light more than Threshold_56 + Hysteresis	Ambient light more than Threshold_56 + Hysteresis	Vacant Pulsed Once Sensor OFF = Send button press Send release 1 sec. later
X+7	Ambient light less than Threshold_78 - Hysteresis	Ambient light less than Threshold_78 - Hysteresis	If dark and room occupied
X+8	Ambient light more than Threshold_78 + Hysteresis	Ambient light more than Threshold_78 + Hysteresis	Light is good; Light level is with the Hystersis

Notes:

- The X in the BI object column = Sensor Address - 1 to 8
- Mode 0 = describes a button press, otherwise the button is released
- Mode 1/2 = lines X + 3 through X + 7 are disabled when the sensor is in mode 2

AV1##01 Light Level
Table AV13

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##01 Where ## = Address(Range 1 to 16)	AV1##01 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Light Level"	"Light Level"
Present_Value	0 to 65535 Luxes (Read Only)	0 to 65535 Luxes (Read Only)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	Luxes = 37	Luxes = 37

AV1##02 Light Sensor Hysteresis
Table AV14

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##02 Where ## = Address(Range 1 to 16)	AV1##02 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Light Sensor Hysteresis"	"Light Sensor Hysteresis"
Present_Value	1 - 100% (Default = 1%)	1 - 100% (Default = 1%)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	Percent = 98	Percent = 98

AV1##03 Light Sensor Delay
Table AV15

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##03 Where ## = Address(Range 1 to 16)	AV1##03 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Light Sensor Delay"	"Light Sensor Delay"
Present_Value	1 - 3600 Seconds (Default = 1)	1 - 3600 Seconds (Default = 1)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	Seconds = 73	Seconds = 73

AV1##04 Lux Threshold Button 1/2

Table AV16

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##04 Where ## = Address(Range 1 to 16)	AV1##04 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Lux Threshold Button 1/2"	"Lux Threshold Button 1/2"
Present_Value	0 to 65535 Luxes (Default =100)	0 to 65535 Luxes (Default = 10)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	Luxes = 37	Luxes = 37

AV1##05 Lux Threshold Button 3/4

Table AV17

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##05 Where ## = Address(Range 1 to 16)	AV1##05 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Lux Threshold Button 3/4"	"Lux Threshold Button 3/4"
Present_Value	0 to 65535 Luxes (Default = 100)	0 to 65535 Luxes (Default = 100)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	Luxes = 37	Luxes = 37

AV1##06 Lux Threshold Button 5/6

Table AV18

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##06 Where ## = Address(Range 1 to 16)	AV1##06 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Lux Threshold Button 5/6"	"Lux Threshold Button 5/6"
Present_Value	0 to 65535 Luxes (Default = 200)	0 to 65535 Luxes (Default = 500)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	Luxes = 37	Luxes = 37

AV1##07 Lux Threshold Button 7/8

Table AV19

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##07 Where ## = Address(Range 1 to 16)	AV1##07 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Lux Threshold Button 7/8"	"Lux Threshold Button 7/8"
Present_Value	0 to 65535 Luxes (Default = 1000)	0 to 65535 Luxes (Default = 1000)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	Luxes = 37	Luxes = 37

AV1##08 Room Vacancy Delay

Table AV20

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##08 Where ## = Address(Range 1 to 16)	AV1##08 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Room Vacancy Delay"	"Room Vacancy Delay"
Present_Value	1 to 120 Minutes (Default = 1)	Always -1 (Read Only)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	Minutes = 72	

AV1##09 Motion Sensitivity Offset

Table AV21

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##09 Where ## = Address(Range 1 to 16)	AV1##09 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Motion Sensitivity Offset"	"Motion Sensitivity Offset"
Present_Value	2 to 254 (Default = 25)	Always -1 (Read Only)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	No Units = 95	No Units = 95

AV1##10 Occupancy Sensor Mode

Table AV22

Analog Value Property	Interior Sensor Value	Exterior Sensor Value
Object_Identifier	AV1##10 Where ## = Address(Range 1 to 16)	AV1##10 Where ## = Address(Range 1 to 16)
Object_Type	2	2
Object_Name	"Occupancy Sensor Mode"	"Occupancy Sensor Mode"
Present_Value	0 = Motion Disabled 1 = Motion Enabled 2 = Motion Ignored	Always -1 (Read Only)
Status_Flags	All flags are false	All flags are false
Event_State	0	0
Out_Of_Service	0	0
Units	No Units = 95	No Units = 95

Appendix I - PIC Statement

Vendor Name:	Touch-Plate® Lighting Controls
Product Name:	Nexus System Controller
Product Model Number:	NEX-MB
Applications Software Version:	1.5d
Firmware Revision:	2.48
BACnet Protocol Revision:	7 (135-2008)

Product Description:

This unit is a general purpose lighting controller that is capable of monitoring up to 128 inputs and controlling up to 64 outputs. The outputs can be a relays, dimmers, or a combination of both.

The 128 inputs can are represented as binary input objects and the associated 128 LEDs are represented as analog value objects. All installed relays in the system are represented as binary output objects. The system can support Touch-Plate's relay firing cards.

The inputs and relays support subscribed and unsubscribed Change Of Value (COV) operation. Relays can be overridden at the panel for maintenance and service purpose, which also could generate a COV as well. MS/TP MAC address, baud rate, I/O configuration may be set using DIP switches.

BACnet Standardized Device Profile (Annex L):

BACnet Application Specific Controller (B-ASC)

BACnet Interoperability Building Blocks Supported (Annex K):

DS-RP-B, DS-RPM-B, DS-WP-B, DS-WPM-B, DS-COV-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B

Segmentation Capability: Not supported

Standard Object Types Supported:

STANDARD OBJECT TYPES SUPPORTED				
Object	Create	Delete	Optional Properties	Custom Properties
Binary Input	N	N	DEVICE_TYPE, RELIABILITY, INACTIVE_TEXT, ACTIVE_TEXT	---
Binary Output	N	N	DEVICE_TYPE, RELIABILITY, FEEDBACK_VALUE, INACTIVE_TEXT, ACTIVE_TEXT	---
Analog Value	N	N	---	---
Analog Output	N	N	DEVICE_TYPE, RELIABILITY	---

DataLink Layer Options: MS/TP master, baud rate(s): 9600, 19200, 38400, 76800

Device Address Binding: Is static device binding supported? No

Networking Options: No routing or BBMD functions are supported.

Character Sets Supported: ANSI X3.4

Appendix II - LED Modes

This chart shows the values to write to the Present_Value property of AV1-128 object. These values allow you to set the control station LEDs to the desired intensity, color and flash pattern.

Color	Intensity	Slow Flash	Slow Flash Reverse	Fast Flash	Fast Flash Reverse	Wink	Wink Reverse	On
Red	25%	9	10	11	12	13	14	15
Red	50%	73	74	75	76	77	78	79
Red	75%	137	138	139	140	141	142	143
Red	100%	201	202	203	204	205	206	207
Green	25%	17	18	19	20	21	22	23
Green	50%	81	82	83	84	85	86	87
Green	75%	145	146	147	148	149	150	151
Green	100%	209	210	211	212	213	214	215
Blue	25%	25	26	27	28	29	30	31
Blue	50%	89	90	91	92	93	94	95
Blue	75%	153	154	155	156	157	158	159
Blue	100%	217	218	219	220	221	222	223
Yellow	25%	33	34	35	36	37	38	39
Yellow	50%	97	98	99	100	101	102	103
Yellow	75%	161	162	163	164	165	166	167
Yellow	100%	225	226	227	228	229	230	231
Purple	25%	41	42	43	44	45	46	47
Purple	50%	105	106	107	108	109	110	111
Purple	75%	169	170	171	172	173	174	175
Purple	100%	233	234	235	236	237	238	239
Cyan	25%	49	50	51	52	53	54	55
Cyan	50%	113	114	115	116	117	118	119
Cyan	75%	177	178	179	180	181	182	183
Cyan	100%	241	242	243	244	245	246	247
White	25%	57	58	59	60	61	62	63
White	50%	121	122	123	124	125	126	127
White	75%	185	186	187	188	189	190	191
White	100%	249	250	251	252	253	254	255

Appendix III - Binary Code for LED Modes

If you want to write binary code to the Present_Value property of AV1-128 object, use the following bit assignment:

Bits 7 - 6 = Intensity Bits 5 - 3 = Color Bits 2 - 0 = Flash Pattern

Intensity

LED Intensity	Binary Code for Bits 7-6
25%	00
50%	01
75%	10
100%	11

Color

LED Color	Binary Code for Bits 5-3
Black	000
Red	001
Green	010
Blue	011
Yellow	100
Purple	101
Cyan	110
White	111

Flash Patterns

The LED flash pattern at 8Hz is made up of a pattern of on and off that each take 1/8th of a second.

LED Intensity	Binary Code for Bits 2-0	Flash Pattern Timing Diagram 0 = OFF, 1 = ON							
Off	000	0	0	0	0	0	0	0	0
Slow Flash	001	1	1	1	1	0	0	0	0
Slow Flash Reverse	101	0	0	0	0	1	1	1	1
Fast Flash	011	1	0	1	0	1	0	1	0
Fast Flash Reverse	100	0	1	0	1	0	1	0	1
Wink	101	1	0	1	0	0	0	0	0
Wink Reverse	110	0	0	0	0	1	0	1	0
On	111	1	1	1	1	1	1	1	1

For example, to make a purple LED at 50% brightness with a wink flash pattern, write the values 01101101 binary = 109 decimal to the Present_Value property of the AV1-128 object.

Frequently Asked Questions

1. What is the Device ID?
    a. The Device ID is a value that ranges from 0 to 4194302 to uniquely identify a BACnet device on a network. Touch-Plate sets the Device ID between 68000 to 68999. This is based on Touch-Plate's BACnet ID of 68.
    b. Although this is not a required practice, it will help create a unique ID when other manufacturers use this method. This value can be changed to any of the valid values.

2. What if there is no response from the main controller?
    a. Verify that the MS/TP cable is correctly connected.
    b. Verify that there are not conflicts with the MS/TP MAC addresses. Each device on a MS/TP network must have unique MS/TP MAC address.
    c. Run the Device Discovery. Upon running this, verify that any communication is possible with the Nexus. If this is not the problem then verify that the Baud Rates match up. Touch-Plate's device default is 38400.

3. Why are the relays not able to be cycled from the front end controller?
    a. Verify that another controller does not have the relay locked out by using a higher priority.
    b. Verify that the relay output boards are properly communicating with the Nexus.

4. Are the Contact Closure Inputs dry contacts?
    a. Yes they are dry contacts. Common outputs are what put out voltage. The common output on the Nexus puts out +24V.

touch-plate®
LIGHTING CONTROLS

Touch-Plate Nexus BACnet Manual

Revision: 2.0c

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ENVIRONMENTALLY
DESIGNED PRODUCTS