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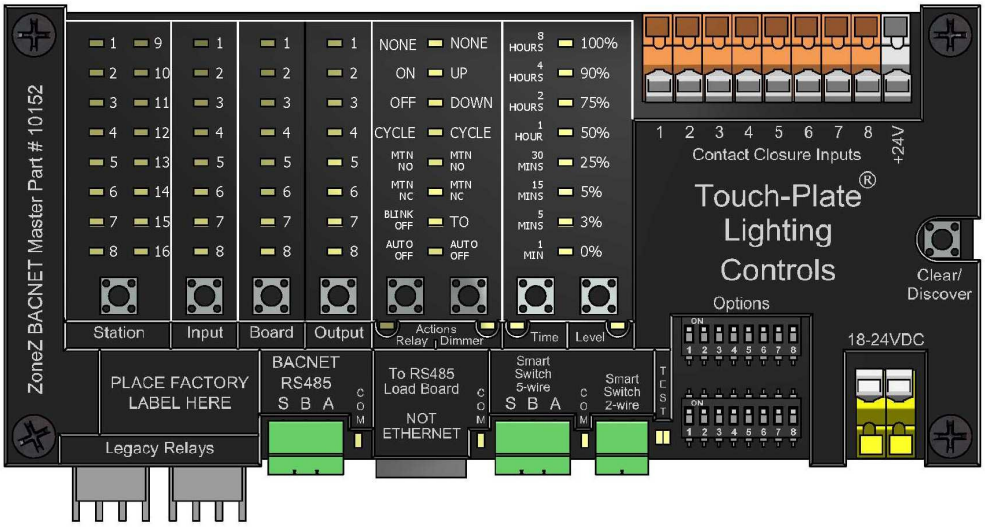
BACnet System Integration



ZoneZ Master Controller
ZMC-128I-64L

Purpose of Document

This document is intended to help system integrators integrate the ZoneZ Master Controller (ZMC) with the BACnet system. Use this document *after* the following tasks have been completed for all devices on the network:

- Installed
- Connected to power and wired together
- Configured locally using the ZMC's soft patch configuration capability, if relevant

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Setting the BACnet MS/TP Baud Rate

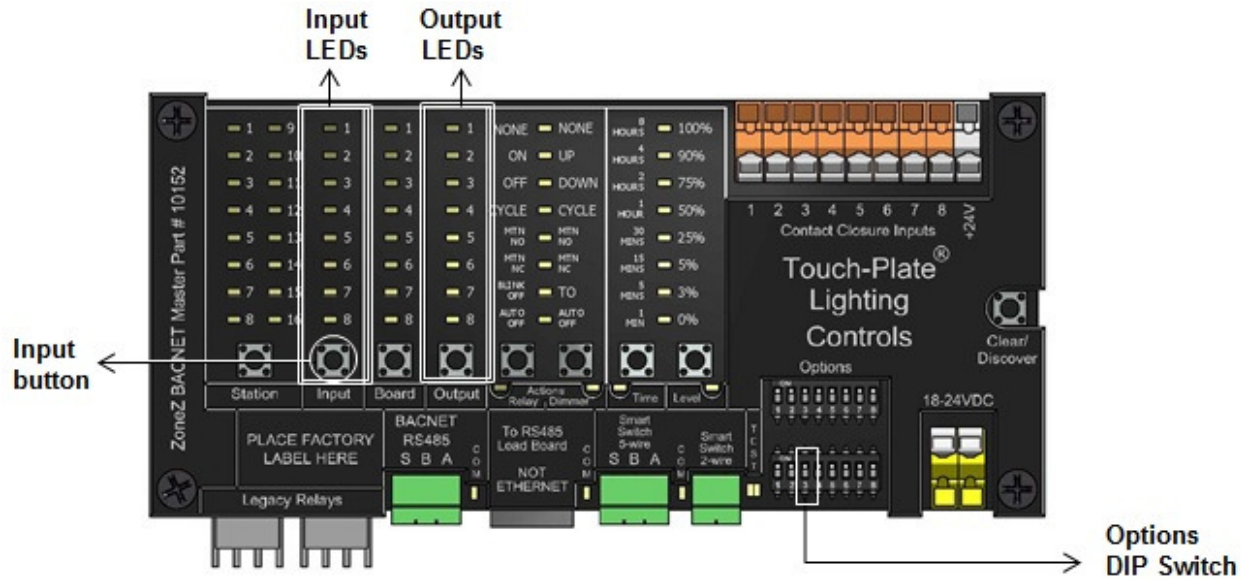
About Baud Rates

Baud rate is the communication speed between devices. The ZMC uses two baud rates:

- Baud rate for communication with output boards in the panel, set in the factory to 115200
- Baud rate for communication on the BACnet MS/TP network

Setting the BACnet MS/TP Baud Rate

Consult your system integrator or operator work station system manual to determine the correct baud rate for communication between the ZoneZ Master Controller and the MS/TP network. Touch-Plate factory default is set to 38400.



1. Flip up Options DIP switch 3 to turn it on. The LED light next to input 3 and output 7 will be on if the device has factory default settings.
2. Press the input button to cycle through inputs 1 through 4 until the correct input LED is selected. For example, the LED light next to input 4 should be lit if you are selecting a baud rate of 76800.

Input LED	Baud Rate
1	9600
2	19200
3	38400
4	76800

3. While Options DIP switch 3 is still flipped up, you can verify that the baud rate for communication with output boards is correctly set to 115200. If it is not, press the output button to cycle through outputs 1 through 8 until output LED 7 is lit.
4. Flip down Options DIP switch 3 to turn it off.
5. Cycle power to the panel for all baud rates to take effect.

Setting the BACnet MS/TP Address

About the BACnet MS/TP Address

Before your device can communicate on the network, it needs to be set with a BACnet MS/TP address. (You may see this referred to as a panel address or network address.)

Valid addresses are from 0 to 127. Addresses are set using the eight 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	128

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 Address DIP switches 1, 3, and 4. The values of those switches is 1 + 4 + 8 = 13

For the exact DIP switch settings for each specific address, see the Address DIP Switch Settings chart in the Appendix.

Setting the BACnet MS/TP Address

Set the BACnet MS/TP address the same as the panel number, or set it to the number indicated by the floor plan, architect, or system integrator.

1. Determine the correct DIP switches needed to set the address. You can determine the correct switches using the Address DIP Switch Value table above, or by using the BACnet MS/TP Address DIP Switch Settings chart in the appendix.
2. Use the Address DIP switches to set the BACnet MS/TP address.
3. Cycle power to the panel for the BACnet MS/TP address to take effect.

Choosing Objects

1. Read the Explanation of Objects to learn what objects are available and what each object does.
2. Use your operator work station to do object discovery.
3. Choose the appropriate objects based on what you want to accomplish.

Explanation of Objects

The chart below shows the objects available for this device, their purpose, and the available object IDs.

Page #	Object	Object Type	Value	Object ID	Used For
5	Momentary Switch Inputs	Binary Input	0 = Off, 1 = On	BI1 - BI128	Control stations and CCIs, to report button presses
7	Maintain Switch Inputs	Binary Input	0 = Off, 1 = On	BI1001 - BI1128	Control stations and CCIs, to report a held button press
9	Relays	Binary Output	0 = Off, 1 = On	BO1 - BO64	Relay control and status
11	Analog Output	Analog value	0-100 %	AO1 – AO64	Dimmers, to control remotely
13	Control Station LED Modes	Analog value	See chart in appendix for values.	AV1 -AV128	Switch stations, to control the flash, color and intensity of the LED lights.
15	Device Options	Analog value	1 = infinite COV 0 = COVs expire	AV1000	To resubscribe to COVs with no expiration of the subscription
16	Input Change Buffer	Analog value	1-128 and 1001-1128	AV1001	To review button presses and releases remotely
17	Relay Override Status	Analog value	0 = no manual override	AV1002	Relays, to remotely monitor manual overrides
18	Device Instance	Analog value		AV1003	To read or change the Device ID or Device Instance, which is set at the factory and marked on a label on the device.
19	Input Emulation	Analog value	1-128 = button press 1001-1128 = release of button 2001-2128 = quick press	AV1004	Control stations, to simulate button presses, releases, and quick presses
20	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
21	Relay Feedbacks	Analog value	0 = Relay Off, 1 = Relay On	AV2001 – AV2064	Relays, to report status
22	Dimmer Feedbacks	Analog value	0-100 %	AV3001 – AV3064	Dimmers, to report status
23	Dimming Time	Analog value	0-65535	AV4001 – AV4064	Dimming time in seconds
24	Device Object	Device object		DEV68000	Describing properties of the device to the BACnet network

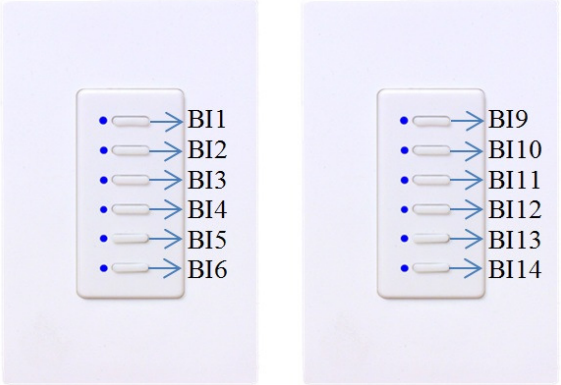
Binary Input Objects
All digital switch station inputs, sensor inputs and CCI inputs (if enabled) get mapped to BI objects. All these objects support COVs. The system creates two databases of objects that are identical in size but each has a different purpose: momentary and maintain.

The Momentary BI objects (BI1 to BI128) will toggle between 0 and 1 for each subsequent press on its corresponding input. In other words, the 0 and 1 cycle or toggle 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 Maintain BI objects (BI1001 to 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.

Momentary Inputs
Object ID: BI1 – BI128
Used for: control stations and contact closure inputs (CCIs), if enabled

The ZoneZ Master Controller will build a dynamic database of Momentary Inputs. The range is 0 (no objects) to 128, in steps of 8. For each switch station or sensor that is connected to the input device network, it will allocate eight Momentary Inputs in the object database. If CCIs are enabled, it will allocate eight Momentary Inputs that will always reside at the end of the database.



For example, if system has two control stations attached and the CCIs are enabled, this will create the Momentary Inputs objects BI1 to BI24. BI1 to BI8 correspond to Station 1, BI9 to BI16 correspond to Station 2, and BI17 to BI24 correspond to CCIs 1 to 8. The Momentary 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 CCI 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 the table below.

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

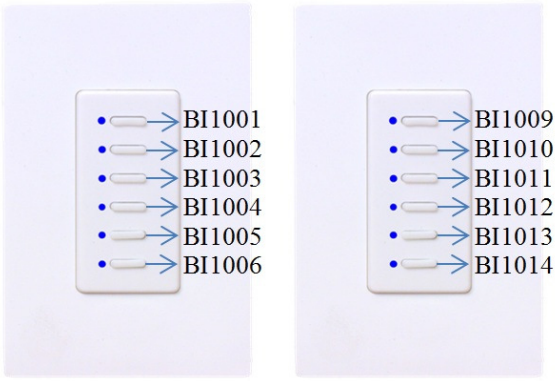
1. PRESENT_VALUE = Level of the input (0 or 1)
2. STATUS_FLAGS = Always false

Binary Input Object Properties for Momentary Inputs

BINARY INPUT PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	3
OBJECT_NAME	“Momentary (Switch Station ## : Input #)” Where : ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8) “Momentary (Local Input Card ## : Input #)” Where : ## = Legacy Input Card address (Range 1 to 16 in increments of 2) # = Input Button (Range 1 to 8) “Momentary (Local CCIs : Input #)” Where : # = CCI Input (Range 1 to 8)
PRESENT_VALUE	This values 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”

Maintain Inputs
Object ID: BI1001 – BI1128
Used for: control stations and CCIs, if enabled
Every time a button is pressed, the corresponding Maintain Input object toggles in value, from 0 to 1 or from 1 to 0.

The ZoneZ Master Controller will build a dynamic database of Maintain Inputs. The range is 0 (no objects) to 128, in steps of 8. For each switch station or sensor that is connected to the Input device network, this will allocate eight Maintain Inputs in the object database. If CCIs are enabled, it will allocate eight Maintain Inputs and will always reside at the end of the database.



For example, if system has two control stations attached and the CCIs are enabled, it will create the Maintain Inputs objects BI1001 to BI1024. BI1001 to BI1008 correspond to Station 1, BI1009 to BI1016 correspond to Station 2, and BI1017 to BI1024 correspond to CCIs 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 CCI 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 the table below.

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

1. PRESENT_VALUE = Level of the input (0 or 1)
2. STATUS_FLAGS = Always false

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

Binary Input Object Properties for Maintain Inputs

BINARY INPUT PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	3
OBJECT_NAME	“Maintain (Switch Station ## : Input #)” Where : ## = Input device address (Range 1 to 16) # = Input Button (Range 1 to 8) “Maintain (Local Input Card ## : Input #)” Where : ## = Legacy Input Card address (Range 1 to 16 in increments of 2) # = Input Button (Range 1 to 8) “Maintain (Local CCIs : Input #)” Where : # = CCI Input (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”

Relays
Object ID: BO1 – BO64
Used for: relay control and monitoring
This object reports the command, but this may not be the state that the relay actually is in, because it may have failed, been overridden, or been controlled by some other device.

The ZoneZ Master Controller will build a dynamic database of Binary Output Objects, where each BO represents a relay. The range is 0 (no relays) 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 ZoneZ Master Controller had 2 MOD-10108 and 2 MOD-10122 relay controllers, this will create an object database from BO1 to BO28. The MOD-10108 can control up to 8 relays and the MOD-10122 can control up to 6 relays.

(8 Relays x 2) + (6 Relays x 2) = 28 Total Relay Output Objects

In the case above, the mapping of BO1 to BO28 corresponds to 4 output devices. The address of each output device sets the numbering assignment of the BO.

Using the above example and defining the address of the output device will set the order. For example:
Address 1 = MOD-10108 → BO1 to BO8
Address 2 = MOD-10108 → BO9 to BO16
Address 5 = MOD-10122 → BO17 to BO22
Address 7 = MOD-10122 → BO23 to BO28

Even though the addressing on the output devices is not sequential, 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 displayed in the OBJECT_NAME name property as shown in the table below.

COV Operation: When a BO has a COV subscription, the controller will report the following properties when a COV event occurs:
1. PRESENT_VALUE is the value the relay was commanded.
2. FEEDBACK_VALUE shows the actual state of the relay.
3. STATUS_FLAGS shows the override and error flags.

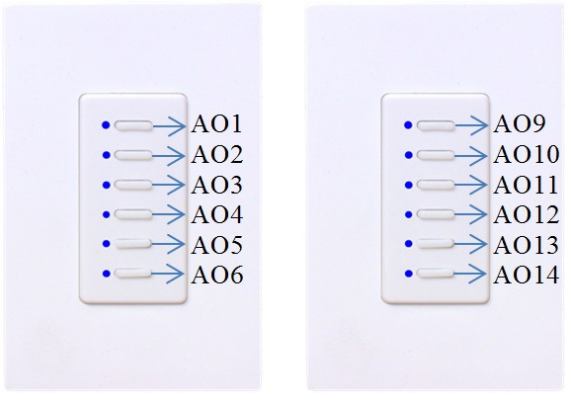
A change in state will generate a COV. One of two events can cause this. The first event is when a relay is commanded using the PRESENT_VALUE and is the opposite of the FEEDBACK_VALUE. This will change the state of the relay and generate a COV. This would be the normal operation of this device. The second event is when someone goes to the physical location of the relays and manually overrides the relay. This will generate a COV event but PRESENT_VALUE and FEEDBACK_VALUE may not be the same. In this situation, the overridden status flag would get set in the STATUS_FLAGS property.

Binary Output Object Properties for Relay Control

BINARY OUTPUT PROPERTIES	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	4
OBJECT_NAME	"Relay #R (Remote Relay Card #D : Output #O)" "Relay # R (Local Relay Card #D : Output #O)" Where: #R = 1 to 64 which corresponds to the BO in the database #D = 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
FEEDBACK_VALUE	0 = if actual state of relay is off, not the commanded state 1 = if actual state of relay is on, not the commanded state
INACTIVE_TEXT	“Off”
ACTIVE_TEXT	“On”
PRIORITY_ARRAY	BACnet Priority Array
RELINQUISH_DEFAULT	0 = Turn Off Relay, 1 = Turn On relay

Analog Outputs
Object ID: AO1 – AO64
Used for: Dimmers
Values: The values range from 0 to 100, with the number referring to the level or percentage of dimming. For example, 50 means that the light is 50% dimmed.

The ZoneZ Master Controller will build a dynamic database of Analog Output Objects, where each AO represents a dimmer. The range is 0 (no dimmers) 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 ZMC had two MOD-10062 and two MOD-10161 dimmer controllers, this will create an object database from AO1 to AO32. The MOD-10062 can control up to 8 dimmers and the MOD-10161 can control up to 8 dimmers.

(8 Dimmers x 2) + (8 Dimmers x 2) = 32 Total Dimmer Output Objects

In the case above, 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.

Using the above example and defining the address of the output device will set the order. For example:

Address 1 = MOD-10062 → AO1 to AO8
Address 2 = MOD-10062 → AO9 to AO16
Address 5 = MOD-10161 → AO17 to AO224
Address 7 = MOD-10161 → AO25 to AO32

Even though the addressing on the output devices is not sequential, 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 dimmer on the highest addressed output device.

If the actual device address and dimmer assignment need to be determined, this information will be displayed in the OBJECT_NAME name property as shown in the table below.

Analog Output Object Properties for Dimmer Control

ANALOG OUTPUT PROPERTIES	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
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%

Control Station LED Mode
Object ID: AV1 – AV128
Used for: LED lights (formerly called pilots) on control stations.
Values: The assigned value for this object sets the color, flash and intensity for the LED. See the appendix for a chart of values.

The ZoneZ Master Controller will build a dynamic database of LEDs. The range is 0 (no objects) to 128, in steps of 8. For each switch station or sensor that is connected to the Input device network, this will allocate 8 LED Modes in the object database. If CCIs are enabled, this will allocate 8 LED Modes and will always reside at the end of the database. For example, if system has two control stations attached and the CCIs are enabled, this will create the LED Mode objects AV1 to AV24.

The LED Modes are used to control the appearance of an LED on a control switch. The color, intensity and flash pattern of digital control station LEDs can be controlled by setting the PRESENT_VALUE. See the appendix for color, intensity and flash pattern values.

If addressing on the input devices is not sequential, 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 displayed in the OBJECT_NAME name property as shown in the table below.

NOTES:
1. Legacy I/O has LED control but is limited to On (PRESENT_VALUE > 0) or Off (PRESENT_VALUE = 0)
2. Occupancy and Light Sensors will allocate 8 LED Modes but currently have no functionality.
3. The Closed Contact Inputs (CCIs) will allocate 8 LED Modes but currently have no functionality.

Analog Value Object Properties for LED Modes

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	2
OBJECT_NAME	"LED Control ### (Switch Station ## : Input #)" "LED Control ### (Local Input Card ## : Input #)" "LED Control ### (Local CCIs : 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.

Device Options
Object ID: AV1000
Values: 1 = all COV subscriptions do not expire. 0 = all COV subscriptions will expire according to the lifetime that was written to them when they were initially set up.

This is useful for operator work stations that do not resubscribe before the current COV expires. By default, all COV values expire. If you want to continue to get messages that buttons were pressed, you can either resubscribe before the current COV expires or you can set this object to COV subscriptions that do not expire. This object affects all subscription objects within that device.

Analog Value Object Properties for Device Options

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
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

Input Change Buffer
Object ID: AV1001
Used for: polling objects to monitor button presses
For operator work stations that cannot do COV subscriptions, polling via AV1001 can be used to reduce latency. This polls and reports every button press on every station. The present value of the object tells the state of the object.

The ZoneZ Master Controller inputs can be read by using the Momentary and Maintain Binary Input Objects. An alternate method to read the inputs can be done by reading the PRESENT_VALUE property of the Input Change Buffer Analog Value Object AV1001. Every button press/release, sensor press/release, and CCI press/release will get stored in a buffer that can be read from the Input Change Buffer AV1001 Object. This object also supports COVs.

The values represented by the PRESENT_VALUE property have two parts to it. First, the numbering follows the numbering 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 reading the Input Change Buffer will return a value of 9, indicating that button 9 was pressed. Once a user releases the button then a value of 1009 will be read. When the value of 1000 is added to the input number this signifies a button release. For example, if the polling reads "9, 10, 1009, 1010, 0, 0, 0," this shows that button 9 was pressed and then button 10 was pressed, then 9 was released, then 10 was released, and then no buttons were pressed at each of the next times objects were polled.

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

1. 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.
2. STATUS_FLAGS are always false.

Analog Value Object Properties for Input Change Buffer

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	2
OBJECT_NAME	"Input Change Buffer"
PRESENT_VALUE	Queues up all button presses so a controller can read input changes at a fast rate without using COVs. COVs are supported if desired. 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

Relay Override Status
Object ID: AV1002
Used for: Reporting a manual override of a relay at the panel
Value: If value is 0, no output loads have been manually overridden. If value is not 0, the value is the lowest number of the relay that was overridden. If multiple relays were overridden on the panel, the value is still the first relay on the panel. It is the responsibility of the front end controller to look at all relay feedback values to determine if additional ones have been overrriden.

To clear the override flag, write a zero to the object AV1002 present value property.

When you read AV1002 it returns the number of last manually overridden relay in panel. Writing a zero to AV1002 will clear all override status flags, but the state of the relay is not changed. In addition, a COVs subscription can be applied to this object.

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

1. PRESENT_VALUE = the last relay that was manually overridden.
2. STATUS_FLAGS are always false.

Analog Value Object Properties for Relay Override Status

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
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

Device Instance
Object ID: AV1003
Device instance is a system-wide unique identifier that is pre-set at the factory. You can use this object to read the current device instance for the ZoneZ Master Controller 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.

Analog Value Object Properties for Device Instance

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	Bacnet Object Identifier
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

Input Emulation
Object ID: AV1004
Values: 1-128 for a button press, 1001-1128 for a release of the button press, and 2001-2128 for a quick press. The value represents the number of the button you are remotely pressing. Values 1-128 act as a button press, and the button will stay pressed until you send a number 1001-1128. Values 1001-1128, act to release the button. Values 2001-2128 act as a quick press and do not need to be followed by a release.

For example, this is useful when you want to blink all lights at 5:55 in warning that the lights will shut off in five minutes, but you want the panel to handle the timer and the operator work station to handle the clock. If the operator work station has a time clock and the panel has a timer without a time clock, then the panel needs to be told by the front end that the clock time is ready for the timer to activate.

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. For example, if Input 9 was required to be simulated, sending a value of 9 to the PRESENT_VALUE property would simulate a user pressing that button. To simulate a button release, add 1000 to switch input values. In this case, send 1009 to PRESENT_VALUE property. To simulate a quick press (for dimmers), add 2000 to switch input values. For example, send 2009 to PRESENT_VALUE property. Simulated button press and release are not required to be paired for proper operation. For example, when sending a 9 it's not required to send 1009 to simulate the release. This would be required if the relay or dimmer action requires a button press and release (for example, Maintain Actions).

Analog Value Object Properties for Input Emulation

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
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

Scene Trigger
Object ID: AV1005
Values: 1-128 for a button press, 1001-1128 for a release of the button press, and 2001-2128 for a quick press. The value represents the number of the button you are remotely pressing. Values 1-128 act as a button press, and the button will stay pressed until you send a number 1001-1128. Values 1001-1128, act to release the button. Values 2001-2128 act as a quick press and do not need to be followed by a release.

Scene triggering is useful for safety, energy management, maintenance, and emergencies. It allows the system integrator to create and activate scenes that have not been created via soft patch configuration and are therefore not able to be triggered at the control station buttons or via input emulation objects.

When the system builds its object database for inputs, each input is assigned a number starting at 1. For example, if Input 9 was required to be simulated, sending a value of 9 to the PRESENT_VALUE property would simulate a user pressing that button. To simulate a button release, add 1000 to switch input values. In this case, send 1009 to PRESENT_VALUE property. To simulate a quick press (for dimmers), add 2000 to switch input values. For example, send 2009 to PRESENT_VALUE property. Simulated button press and release are not required to be paired for proper operation. For example, when sending a 9 it's not required to send 1009 to simulate the release. This would be required if the relay or dimmer action requires a button press and release (for example, Maintain Actions).

Analog Value Object Properties for Input Emulation

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	2
OBJECT_NAME	"Scene Trigger"
PRESENT_VALUE	Physical scene to trigger
STATUS_FLAGS	All flags are false.
EVENT_STATE	0
OUT_OF_SERVICE	0
UNITS	No Units = 95

Relay Feedbacks
Object ID: AV2001 – AV2064
Used for: relay control and monitoring.
Values: 0 = Relay Off, 1 = Relay On
This object is used to determine from the operator work station what state the relay is in. This is useful to determine whether the relay failed, was overridden, or was commanded at a higher priority level.

The ZoneZ Master Controller will build a dynamic database of Binary Output Objects, where each BO represents a relay. The range is 0 (no relays) to 64. The Relay Feedback Objects represent the feedback status of each relay that is in the Relay Binary Output Object database. AV2001 corresponds to BO1 and AV2064 corresponds to BO64. The purpose for this object is that some front ends and controllers may not support the FEEDBACK_VALUE property on the relay's corresponding Binary Output Object.

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

1. PRESENT_VALUE shows the actual state of the relay.
2. STATUS_FLAGS shows the override and error flags status.

A change in state will generate a COV. One of two events can cause this. The first event is when a relay is commanded using the PRESENT_VALUE of the BO Relay Object and the state of the relay is the opposite of the value written to PRESENT_VALUE. This would be the normal operation of this device. The second event is when someone goes to the physical location of the relays and manually overrides the relay. This will generate a COV event with PRESENT_VALUE showing the state of the relay. In addition, the overridden status flag would get set in the STATUS_FLAGS property.

Analog Value Object Properties for Relay Feedback

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	2
OBJECT_NAME	"Relay Feedback #R (Remote Relay Card #D : Output #O)" "Relay Feedback # R (Local Relay Card #D : Output #O)" Where: #R = 1 - 64 corresponding to the BO in the database #D = 1 - 16 corresponding to the Output Device Address set by DIP switches #O = the relay output on the output device at address #C
PRESENT_VALUE	Relay Feedback status (0 = Off, 1 = On)
STATUS_FLAGS	These flags mirror the status of its corresponding BO object.
EVENT_STATE	0
OUT_OF_SERVICE	0
UNITS	No Units = 95
PRIORITY_ARRAY	BACnet Priority Array
RELINQUISH_DEFAULT	0

Dimmer Feedbacks
Object ID: AV3001 – AV3064
Used for: dimmer control and monitoring
Values: 0-100
This object is used to determine from the operator work station what state the dimmer is in. This is useful to determine whether the dimmer failed, was overridden, or was commanded at a higher priority level. The value reports what light level the dimmer is at. For example, if the value = 50, the light level is dimmed to 50%.

The ZoneZ Master Controller will build a dynamic database of Analog Output Objects, where each AO represents a dimmer. The range is 0 (no dimmers) to 64. The Dimmer Feedback Objects represent the feedback status of each dimmer that is in the Dimmer Output Object database. AV3001 corresponds to AO1 and AV3064 corresponds to AO64.

Analog Value Object Properties for Dimmer Feedback

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	2
OBJECT_NAME	"Dimmer Feedback #R (Remote Dimmer Card #D : Output #O)" Where: #R = 1 to 64 which corresponds to the AO in the database #D = 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	Dimmer Feedback status (0 to 100%)
STATUS_FLAGS	0
EVENT_STATE	0
OUT_OF_SERVICE	0
UNITS	98 = Percent for BACnetEngineeringUnits
PRIORITY_ARRAY	BACnet Priority Array
RELINQUISH_DEFAULT	0

Dimming Time
Object ID: AV4001-AV4064
Used for: dimmers
To use this object, first set the time in seconds it will take to reach the target light level and then set the new target light level. When the command is issued, it will then move from its current light level to the target light level in the set amount of time.

The ZoneZ Master Controller will build a dynamic database of Analog Output Objects, where each AO represents a dimmer. The range is 0 (no dimmers) to 64. The Dimmer Time Objects represent the amount of time (in seconds) that the dimmer will ramp from its present level to its newly commanded level (AO1 to AO64) of each dimmer that is in the Dimmer Output Object database. AV4001 corresponds to AO1 and AV4064 corresponds to AO64.

Analog Value Object Properties for Dimmer Time

ANALOG VALUE PROPERTY	VALUE
OBJECT_IDENTIFIER	BACnet Object Identifier
OBJECT_TYPE	2
OBJECT_NAME	"Dimmer Time #R (Remote Dimmer Card #D : Output #O)" Where: #R = 1 to 64 which corresponds to the AO in the database #D = 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	Dimmer Time (0 to 65535 seconds)
STATUS_FLAGS	0
EVENT_STATE	0
OUT_OF_SERVICE	0
UNITS	73 = Seconds for BACnetEngineeringUnits
PRIORITY_ARRAY	BACnet Priority Array
RELINQUISH_DEFAULT	0

Device Object
Object ID: DEV68000

Device Object Properties

Device Object Properties	Value
Object_Identifier	BACnet Object Identifier (Default = DEV68000)
Object_Name	“BAC10152”
Object_Type	8
System_Status	0 = Normal
Vendor_Name	“Touch-Plate Inc.”
Vendor_Identifier	68
Model_Name	“BAC-10152”
Firmware_Revision	“2.47”
Application_Software_Version	“1.20”
Protocol_Version	1
Protocol_Revision	2
Protocol_Services_Supported	SubscribeCOV, readProperty, readPropertyMultiple, writeProperty, writePropertyMultiple, deviceCommunicationControl, reinitializeDevice i-Am, who-Is
Protocol_Object_Types_Supported	Analog_Value Binary_Input Binary_Output Device
Object_List	List all the objects in the Object Database
Max_APDU_Length_Accepted	244
Segmentation_Supported	3 = no-segmentation
Max_Segments_Accepted	1
APDU_Timeout	3000
Number_Of_APDU_Retries	0
Device_Address_Binding	List is always empty
Database_Revision	1

Appendix

Address DIP Switch Settings

Use the chart to set the BACnet MS/TP address with the Address DIP switches.

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	ON	ON	ON	OFF	OFF	OFF	OFF
13	ON	ON	ON	ON	OFF	OFF	OFF	OFF
14	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
15	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
16	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
17	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
18	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
19	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
20	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
21	ON	ON	ON	OFF	ON	OFF	OFF	OFF
22	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
23	ON	ON	ON	OFF	ON	OFF	OFF	OFF
24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
25	ON	OFF	OFF	ON	ON	OFF	OFF	OFF
26	OFF	ON	OFF	ON	ON	OFF	OFF	OFF
27	ON	ON	OFF	ON	ON	OFF	OFF	OFF
28	OFF	OFF	ON	ON	ON	OFF	OFF	OFF
29	ON	OFF	ON	ON	ON	OFF	OFF	OFF
30	OFF	ON	ON	ON	ON	OFF	OFF	OFF
31	ON	ON	ON	ON	ON	OFF	OFF	OFF
32	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
33	ON	ON	OFF	OFF	OFF	ON	OFF	OFF
34	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
35	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF

Address	1	2	3	4	5	6	7	8
36	OFF	ON	ON	OFF	OFF	ON	OFF	OFF
37	ON	ON	ON	OFF	OFF	ON	OFF	OFF
38	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
39	ON	OFF	ON	OFF	OFF	ON	OFF	OFF
40	OFF	ON	OFF	ON	OFF	ON	OFF	OFF
41	ON	ON	OFF	ON	OFF	ON	OFF	OFF
42	OFF	ON	OFF	ON	OFF	ON	OFF	OFF
43	ON	ON	OFF	ON	OFF	ON	OFF	OFF
44	OFF	OFF	ON	ON	OFF	ON	OFF	OFF
45	ON	OFF	ON	ON	OFF	ON	OFF	OFF
46	OFF	ON	ON	ON	OFF	ON	OFF	OFF
47	ON	ON	ON	ON	OFF	ON	OFF	OFF
48	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
49	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
50	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
51	ON	ON	OFF	OFF	ON	ON	OFF	OFF
52	OFF	ON	ON	OFF	ON	ON	OFF	OFF
53	ON	ON	ON	OFF	ON	ON	OFF	OFF
54	OFF	OFF	ON	OFF	ON	ON	OFF	OFF
55	ON	OFF	ON	OFF	ON	ON	OFF	OFF
56	OFF	ON	OFF	ON	ON	ON	OFF	OFF
57	ON	ON	OFF	ON	ON	ON	OFF	OFF
58	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
59	ON	OFF	OFF	ON	ON	ON	OFF	OFF
60	OFF	ON	ON	ON	ON	ON	OFF	OFF
61	ON	ON	ON	ON	ON	ON	OFF	OFF
62	OFF	ON	ON	ON	ON	ON	OFF	OFF
63	ON	ON	ON	ON	ON	ON	OFF	OFF
64	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
65	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
66	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF
67	ON	ON	OFF	OFF	OFF	OFF	ON	OFF
68	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
69	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
70	OFF	ON	ON	OFF	OFF	OFF	ON	OFF
71	ON	ON	ON	OFF	OFF	OFF	ON	OFF
72	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
73	ON	ON	OFF	ON	OFF	OFF	ON	OFF
74	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF
75	ON	OFF	OFF	ON	OFF	OFF	ON	OFF

Address	1	2	3	4	5	6	7	8
76	OFF	ON	ON	ON	OFF	OFF	ON	OFF
77	ON	ON	ON	ON	OFF	OFF	ON	OFF
78	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
79	ON	OFF	ON	ON	OFF	OFF	ON	OFF
80	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
81	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
82	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
83	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
84	OFF	OFF	ON	OFF	ON	OFF	ON	OFF
85	ON	OFF	ON	OFF	ON	OFF	ON	OFF
86	OFF	ON	ON	OFF	ON	OFF	ON	OFF
87	ON	ON	ON	OFF	ON	OFF	ON	OFF
88	OFF	OFF	OFF	ON	ON	OFF	ON	OFF
89	ON	OFF	OFF	ON	ON	OFF	ON	OFF
90	OFF	ON	OFF	ON	ON	OFF	ON	OFF
91	ON	ON	OFF	ON	ON	OFF	ON	OFF
92	OFF	ON	ON	ON	ON	OFF	ON	OFF
93	ON	ON	ON	ON	ON	OFF	ON	OFF
94	OFF	OFF	ON	ON	ON	OFF	ON	OFF
95	ON	OFF	ON	ON	ON	OFF	ON	OFF
96	OFF	ON	OFF	OFF	OFF	ON	ON	OFF
97	ON	ON	OFF	OFF	OFF	ON	ON	OFF
98	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF
99	ON	OFF	OFF	OFF	OFF	ON	ON	OFF
100	OFF	ON	ON	OFF	OFF	ON	ON	OFF
101	ON	ON	ON	OFF	OFF	ON	ON	OFF
102	OFF	ON	ON	OFF	OFF	ON	ON	OFF
103	ON	ON	ON	OFF	OFF	ON	ON	OFF
104	OFF	OFF	OFF	ON	OFF	ON	ON	OFF
105	ON	OFF	OFF	ON	OFF	ON	ON	OFF
106	OFF	ON	OFF	ON	OFF	ON	ON	OFF
107	ON	ON	OFF	ON	OFF	ON	ON	OFF
108	OFF	OFF	ON	ON	OFF	ON	ON	OFF
109	ON	OFF	ON	ON	OFF	ON	ON	OFF
110	OFF	ON	ON	ON	OFF	ON	ON	OFF
111	ON	ON	ON	ON	OFF	ON	ON	OFF
112	OFF	ON	OFF	OFF	ON	ON	ON	OFF
113	ON	ON	OFF	OFF	ON	ON	ON	OFF
114	OFF	OFF	OFF	OFF	ON	ON	ON	OFF
115	ON	OFF	OFF	OFF	ON	ON	ON	OFF

Address	1	2	3	4	5	6	7	8
116	OFF	ON	ON	OFF	ON	ON	ON	OFF
117	ON	ON	ON	OFF	ON	ON	ON	OFF
118	OFF	OFF	ON	OFF	ON	ON	ON	OFF
119	ON	OFF	ON	OFF	ON	ON	ON	OFF
120	OFF	ON	OFF	ON	ON	ON	ON	OFF
121	ON	ON	OFF	ON	ON	ON	ON	OFF
122	OFF	ON	OFF	ON	ON	ON	ON	OFF
123	ON	ON	OFF	ON	ON	ON	ON	OFF
124	OFF	OFF	ON	ON	ON	ON	ON	OFF
125	ON	OFF	ON	ON	ON	ON	ON	OFF
126	OFF	ON	ON	ON	ON	ON	ON	OFF
127	ON	ON	ON	ON	ON	ON	ON	OFF

PIC Statement

Vendor Name:	Touch-Plate, Inc.
Product Name:	ZoneZ **BAC-10152 Lighting Controller**
Product Model Number:	**BAC-10152**
Applications Software Version:	**1.20**
Firmware Revision:	**2.47**
BACnet Protocol Revision:	**4 (135-2004)**

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 control boards (e.g., MOD-10108).

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): þ 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:

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	----

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

Device Address Binding: Is static device binding supported? þ No

Networking Options: No routing or BBMD functions are supported.

Character Sets Supported: þ ANSI X3.4

LED Modes

This chart shows the values to use to set the control station LEDs to the desired intensity, color and flash pattern.

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

Flash Patterns	**LED On/Off @ 8Hz**
Off:	000 = 00000000
Slow Flash:	001 = 11110000
Slow Flash Reverse:	010 = 00001111
Fast Flash:	011 = 10101010
Fast Flash Reverse:	100 = 01010101
Wink:	101 = 10100000
Wink Reverse:	110 = 00001010
On:	111 = 11111111

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