# BLUE RIDGE
## TECHNOLOGIES™
### UNIFIED LIGHTING CONTROL
## IT WORKS

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# Introduction and Contents

**Blue Ridge Technologies® | Essentials Help**

## Overview

Essentials™ software is employed with Tech Kit 3.0 to configure all Aperio® and M3 Platform products.
This help system is your guide to using Essentials and configuring systems to your needs.
A video demonstrating the Essentials software is available at the link Essentials Tutorial.

This Help Reference is also available as a PDF on the Blue Ridge website.

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# Concepts and Definitions

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## Overview

This page defines basic concepts and controls used throughout Essentials.

## What do you want to do?

Identify Physical Terms
Identify Logical Terms
Identify BACnet Terms
Identify Control Terms

## Identify Physical Terms

*Physical Tree*: This view is used to add hardware to a *System*, define its properties, and establish its relationships to other hardware. At times, some have also used the term *Network Tree* to refer to it.

*Router* : The IP to BACnet MS/TP *Router* is the entry point and root of a physical BACnet network segment and allows Essentials remote configurability over IP.

*Control Module* : A lighting control unit which resides on the BACnet network. It contains all the configuration settings for the operation of the devices it is connected to.

*I/O Module* : A *Control Module* expander providing additional input/output capacity. It resides on a CANbus shared with other I/O Modules and Stations that are all under the management of the parent Control Module.

*Station* : A user interface which resides on the CANbus network. A *Station* provides ON/OFF, raise/lower, or preset control to the occupant.

*Preset* : A stored light level or state initiated by a designated button on a *Station*.

*Universal Input* (UI) : An input configurable for use with various field devices including switches, occupancy sensors, and light sensors.

*Relay Output* (RO) : An output which provides ON/OFF control of the lighting load.

*Digital Output* (DO) : An output which provides ON/OFF control of the lighting load.

*Analog Output* (AO) : An output which provides level control for dimmable lighting.

*Tri-State Output* (TSO) : An output which provides control for shade control channels.

*Load Status Input* (LSI) : An input which provides a live indicator as to a load's state (ON or OFF).

*Line Voltage Input* (LVI) : An input for use with line voltage switches.

*Name* : All inputs and outputs have a fixed *Name* field for use in Essentials only, allowing for consistent input/output identification throughout Essentials. The default *Name* convention follows this format:
[Input/Output Type]—[2-digit I/O Module Address (00=Control Module)]—[2-digit Input/Output Number].

Example One: UI-05-04

- UI=Universal Input
- 05=IO Module Address 5
- 04=Input Number 4

Example Two: RO-00-01

- RO=Relay Output
- 00=I/O Module Address 0 (Indicates a Control Module)
- 01=Output Number 1

*AKA* : An optional editable field for each input and output. This field gives system designers the option of adding an additional, memorable label for a piece of I/O. This may be of use when assigning the I/O to a *Channel* or using a naming convention adhered to by a third-party.

## Identify Logical Terms

*Logical Tree* : This view is used to geographically organize a *System* and assign hardware control of a space.

*System* : This defines lighting control hardware and the space it controls. *System* is a contextual term and may be scaled from a single building to a campus or multiple campuses. A *System* is created in Essentials before beginning configuration.

*Area* : A logical division of a *System* used to create manageable spaces for configuration.

*Zone* : A division of an *Area* determined by scheduling needs, control strategies, or hardware limitations.

*Channel* : A division of a *Zone* where the relationships between inputs and outputs are established and the logic is executed.

## Identify BACnet Terms

*BACnet Tree*: This view provides a listing of the exposed BACnet points of a *System*. If a BACnet point is visible in this tree, any connected BACnet management tool should be able to discover and read the point's current properties including its Present Value.

For a complete description of the types, naming, numbering and properties of Blue Ridge's BACnet points please see the document BACnet Points List

*Analog Value* (AV) : A data value over a range of numbers. Precision varies depending on what the point describes. An example is CHANNEL_LEVEL.

*Binary Value* (BV) : A data value of 1 or 0 representing ON or OFF. An example is CHANNEL_STATUS.

*Multi-State Value* (MSV) : A discrete, enumerated set of data values each representing a different mode of a device, such as VS_LEVEL_SET.

## Identify Control Terms

File Menu

- *Connect* : This establishes Essentials communication with all reachable *Control Modules* in a system. To *Connect* to a *Control Module* select the *Control Module* or assigned *Zone* in the tree structure, select *Connect*, and chose a connection method.

- *Disconnect* : This terminates Essentials' communication with a *Control Module*.

Configure Menu

- *Add* : This adds components (*Area, Zone, Router, Control Module,* etc.) to a *System*.

- *Send Settings* : This sends local Essentials settings to the *Control Module*.

- *Retrieve Settings* : This imports a *Control Module's* settings into Essentials.

- *Retry Connection* : This attempts to restore a lost connection with a *Control Module*.

- *Move Up* and *Move Down* : These organization tools move the selected item in the *Logical Tree* or *Physical Tree* within the tree structure.

- *Delete* and *Rename* : These affect the selected item in the *Physical Tree* or *Logical Tree*.

Tools Menu

- *Load Control Module* : This loads firmware to a *Control Module*. For more information on loading firmware visit the Downloads Page (an internet connection is required for this link).

- *Show Load Status Threshold* : This setting makes visible a wattage delimited slider of threshold settings for the Load Status accompanying a Relay. This will appear in the Relay Output section of an I/O Module or Control Module when the module's Relays support adjustable thresholds. The visibility of this setting will apply across the system and persist from run to run of Essentials.
The setting is unchecked by default.
It is recommended only to be activated in those situations where one requires a threshold different than the default due to novel circumstances.

- *Show Relay Output Default Action* : This setting makes visible a Relay Output's Default Action.
The Default Action is the physical position of the Relay when is it not being used, i.e. Logically OFF. The large majority or Relays today are the default, *Normally Open*.
Once checked, the setting will appear in the Relay Output section of an I/O Module or Control Module.
The setting is unchecked by default.
For simplicity, it is recommended to only enable in those cases where one's System has Relays whose Default Action is the alternative setting, *Normally Closed*.

- *Show Relay Logical Status* : This setting makes visible an indicator of the Relay's Logical Status and an option to display said status over BACnet as well. The information and option will appear in the Relay Output section of an I/O Module or Control Module when the module's Relays support Load Status. It will both display the Logical Status of the relay and offer a checkbox to enable a read-only BACnet MSV point that will display the Logical Status as well.
The setting is unchecked by default.

- *Show Date/Time Broadcast Option* : This setting will make visible an additional checkbox on Control Modules' General Settings subsections that directs any BACnet TimeSync message sent by Essentials to the Control Module be forwarded on by that Control Module as a broadcast TimeSync to other Control Modules sharing that MS/TP network.
The setting is unchecked by default.
It is recommended to used only if one has full knowledge of the rest of their BACnet MS/TP network. This command will sync the time of any other BACnet controller on the network that has their BACnet network time sync service turned on. It applies not just to Blue Ridge Control Modules, but any other BACnet conformant vendor's device.

- *Email Tech Support* : This collects the current Essentials system file as well as relevant log files into a .ZIP file and places it on the Desktop (if writable). It also composes an email to Blue Ridge Tech Support with the relevant fields pre-filled out. The email's body instructs the user to drag the .ZIP to the email as an attachment and then send. (If Desktop is unwritable, *Preferences* provides a means to select an appropriate location.)

- *Send Feedback* : This will compose an email to Blue Ridge Tech Support with the relevant fields pre-filled out. The email's body instructs the user to include any feedback or questions they might have.

- *Preferences*: Offers a setting to adjust the polling rate of Essentials. When connected to a remote system, the polling rate governs the frequency with which live data (I/O statuses, Channel Status, etc.) is read from the relevant *Control Module*.
Preferences also provides a means to select an alternate default location in which to save the *Email Tech Support* .ZIP file and any .CSV files of BACnet Points generated on the BACnet tab.

# Router: General Settings

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## Overview

*Router: General Settings* allows communication to be established with the router and grants Essentials remote configurability over IP. Essentials creates new systems with a single default router automatically placed at the system's root. More routers can be added as needed.

## Configure Router Settings

*Router: General Settings* defines a router's BACnet communication parameters.

| | |
|---|---|
| MS/TP Network: | 132 |
| BACnet/IP Network: | 1 |
| IP Address: | 192.168.1.68 |
| Port Number: | 47808 |

*Router: General Settings* is composed of four settings. These settings should match those of the appropriate router.

*MS/TP Network :* The MS/TP network number is a 16-bit value (1-65534) that identifies the network within the BACnet internetwork. Each network has its own unique number. No other networks, regardless of type, may have the same number.

*BACnet/IP Network :* The BACnet/IP network number is a 16-bit value (1-65534). As above, each network must have its own unique number. See below for special considerations for this field.

*IP Address* : The IP address of the BACnet router.

*Port Number* : The UDP port number that the router is listening for BACnet/IP traffic upon. Very often this is going to be 47808 (0xBAC0) or 47809 (0xBAC1). Check the router's admin/setiings page to confirm.

## Additional Router Configuration Tips

The BACnet standard mandates that each network on a BACnet internetwork (i.e. a network of networks) have a unique network number. Furthermore, the topology of the internetwork must not have any loops. That is, for the sake of BACnet routers there must be only one path across networks between a source and destination network. Essentials makes a best effort to help a system author enforce this by performing validation on the router settings fields, not just for syntactic correctness, but also to catch numbering conflicts.

When building a multi-router Essentials system, the implicit assumption is that the MS/TP networks will be branches off of an IP-based trunk network. Thus every router should have a different MS/TP Network number. Essentials will show a warning if an MS/TP network number is reused on another router whether in the MS/TP Network or BACnet/IP Network fields.

Returning to the trunk topology, each of the routers in a multi-router system off of a common IP trunk should have the same BACnet/IP Network number. This is the most commonly encountered setup by far. However, if the routers do reside on seperate IP subnets then different BACnet/IP network numbers are warranted for each router. Ultimately, it falls to the system author to know the settings of their router(s) and the topology of their internetwork.

# Control Module: General Settings

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## Overview

*General Settings* allows:

1. Selecting the type of Control Module.
2. Viewing the firmware version.
3. Viewing the serial number and manufacture date.
4. Viewing the boot time and boot count.
5. Viewing and, if need be, setting the time and date on the Control Module.
6. Selecting how the Control Module responds to network time synchronization and time zone related changes.
7. Configuring its DMX mode if applicable.
8. Opting to monitor its I/O Modules' CANbus statuses via BACnet.

Control Module Type: **CM32TD** ▾   Filters: Secondary Comm: **None** ▾   Show Legacy ☐

Firmware Version: **CM32TD_4.2.5_240208**   Serial Number: **0X01704 ( 3/20/20)**   Boot Time: **02/14/2025 15:28:53**   Boot Count: **1**

Time: **04:55:32 PM** ▴▾   Date: **Apr 7, 2025** ▴▾ 🗓   [ Use Local Date/Time ]   [ Send Date/Time to Controller ]   Broadcast Date/Time Send ☐

BACnet Time Sync: ◉ None ○ Local ○ UTC **US / Eastern** ▾

DMX512 Mode: ◉ None ○ Transmit ○ Receive

Show a BACnet BV Point for each I/O Module's CAN Status ☐

## What do you want to do?

Select a Control Module Type
View Device Information
Set the Time and Date
Disable BACnet Time Synchronization
Configure Local BACnet Time Synchronization
Configure UTC BACnet Time Synchronization
Sync Time with Local BACnet Time Synchronization
Sync Time with UTC BACnet Time Synchronization
Configure a Controller for DMX
Configure IOM CAN Status BACnet Points
Enable Do Not Contact

## Select a Control Module Type

Control Module Type: **None** ▾   Filters: Secondary Comm: **All** ▾   Show Legacy ☑

Firmware Version:    | None           erial Number: **Unknown**
Time:               | CM01T   ▴▾   Date: ▴▾ 🗓   [ Reset Local ]
                    | CM02T
                    | CM02TD
BACnet Time Sync:   | CM04T    ocal ○ UTC **US / Eastern** ▾
                    | CM04TD    t ☐

1. The *Control Module Type* list may be filtered to show a subset of available choices.

   Check *Show Legacy* to include BRT Control Modules no longer sold in the *Control Module Type* list.

   Select the desired *Secondary Comm* choice to show either "All" Control Modules, "DMX" for only DMX-capable Control Modules, or "None" to display only those Control Modules with no DMX capability in the *Control Module Type* list.

2. Choose a control module type from the drop down list. The control module type must match the type of the actual control module installed in the field. A mismatch will cause sending/retrieving control module settings and firmware loading to fail.

   Once the selected control module type has been assigned, it can be changed at a later time only if the change wouldn't conflict with obligations subsequently made for the soon-to-be former control module type. For instance, if the type is adding capability, e.g. DMX or more I/O Module capacity, nothing in the system as yet authored would contradict that. If however one is changing to a module type that reduces capability, such as the number of permitted I/O Modules, while having already added all of those I/O Modules, the user will be warned and the impacted channels, I/O Modules, and station assignments for the control module will be removed.
   As always, the new model type must match the actual control module type in the field.

3. Save and send settings.

## View Device Information

Firmware Version: **CM32TD_4.0.9a_220504**     Serial Number: **0x99887 ( 5/19/22)**     Boot Time: **07/22/2022 10:28:39**     Boot Count: **10**

When Essentials has been connected to a system, the above Device Information fields will populate, providing helpful diagnostic information.

- Firmware Version will show the revision of firmware currently running the Control Module.

- Serial Number will display the ID and factory date of the Control Module.

- Boot Time will display the date and time of the most recent start of the Control Module. (This information will appear on Control Modules running firmware 4.1.0 or newer.)

- Boot Count will display the number of times the Control Module has been power cycled. This can be of use in diagnosing power reliability issues. (This information will appear on Control Modules running firmware 4.1.0 or newer.)

## Set the time and date

Time: [ 09:05:27 PM ]   Date: [ Apr 7, 2025 ] [📅]   [ Use Local Date/Time ]   [ Send Date/Time to Controller ]   Broadcast Date/Time Send ☐

1. If not connected, Connect to the system. The Time and Date fields will populate with the Control Module's Time and Date.

2. Set the Time and Date using one of the three methods below:

   1. Manually enter the Time and Date in the appropriate fields.

   2. Press the *Use Local Date/Time* button to populate Essentials' Time and Date fields using the PC's Time and Date.

   3. Write to the `Local_Time` and `Local_Date` properties of the BACnet Device object.

   After performing either of the first two methods, the time and date fields will be surrounded by a slowly pulsating blue border accompanied by a mouseover tool-tip stating that the Essentials' local time has been altered and no longer agrees with that found on the Control Module. This border emphasis will persist until the locally altered time is sent to the Control Module or until the system is disconnected, whichever comes first.

3. Next, to send the time and date displayed in Essentials to the Control Module, press the *Send Date/Time to Controller* button. This will send date and time to the currently selected Control Module only. A confirmation will be displayed and the blue border around the date and time noting the prior non-synchrony will disappear.

   If it is desired to set the date and time of other devices on the BACnet internetwork in addition to the the Control Module, check the box to the right of *Send Date/Time to Controller*, *Broadcast Date/Time Send*, before pressing *Send Date/Time to Controller*.
   This will cause the currently selected Control Module to broadcast the time and date it receives from Essentials as a BACnet TimeSynchronization Service message after setting its own date and time with the information from Essentials.
   The *Broadcast Date/Time Send* checkbox is not visible by default and must be opted for by selecting it under the *Tools* menu item *Show Date/Time Broadcast Option*.
   The type of TimeSynchronization Service broadcast message that the Control Module sends will be determined by the choice in the BACnet Time Sync radio button panel. If the choice is *None* or *Local*, the broadcast sent will contain the unadorned time and date with no time zone information. It will be processed after receipt only by those devices that have the BACnet TimeSynchronization service enabled. If the choice is *UTC*, the broadcast sent will contain the UTC time and date along with time zone offset information. It will be processed after receipt only by those devices having the BACnet UTCTimeSynchronization service enabled.
   For receiving such a broadcast, each Blue Ridge Control Module should have BACnet Time Sync radio button panel tuned to *Local* or *UTC* as desired (and those settings residing on the Control Module.) For 3rd party devices, the means of enabling TimeSynchronization or UTCTimeSynchronization are a local matter. Any device supporting the matching service on the internetwork that receives the broadcast will update its date and time, regardless of transmitting broadcaster. (The BACnet TimeSynchronization and UTCTimeSynchronization services do not have a mechanism to whitelist a set of Time Sync 'server' MAC addresses. Be acutely aware that on a multi-verndor site a broadcast could potentially set the date and time of any reachable device.)
   Finally, a *Send Settings* will also set the Control Module's time and date, while doing many other things in addition.

## Disable BACnet Time Synchronization

BACnet Time Sync: ⦿ None  ◯ Local  ◯ UTC  [ US / Eastern ▼ ]

1. Select the *None* radio button.

2. Select the appropriate time zone from the drop-down menu. The control module will automatically adjust its on-board time for daylight savings time based on the time zone selected.
   The control module will not process any BACnet TimeSynchronization service requests. It will increment solely off the date and time sent to it via Essentials.

3. Save and send settings.

## Configure Local BACnet Time Synchronization

BACnet Time Sync: ◯ None  ⦿ Local  ◯ UTC  [ US / Eastern ▼ ]

1. Select the *Local* radio button. This will enable the control module to process BACnet TimeSynchronization service requests. It also enables the `Local_Date` and `Local_Time` properties when viewing the control module's Device Object via a BACnet client. When the BACnet (Local) TimeSynchronization service request is received, the device will update its time and date accordingly. Note that with this service, the device does no further processing of the time and date. Notably, no daylight savings offset is applied. It is up to whomever is sending the TimeSynchronization service requests to keep that in order. As such, the time zone drop-down is greyed out when *Local* is the choice, as it is not applicable.

2. Save and send settings.

## Configure UTC BACnet Time Synchronization

BACnet Time Sync: ○ None ○ Local ◉ UTC [ US / Eastern ▾ ]

1. Select the *UTC* radio button. This will enable the control module to process BACnet UTCTimeSynchronization service requests. It also enables the `Local_Date`, `Local_Time`, `UTC_Offset`, and `Daylight_Savings_Status` properties when viewing the control module's Device Object via a BACnet client. When the BACnet UTCTimeSynchronization service request is received, the controller will updates its local time and date accordingly.

2. Select the appropriate time zone from the drop-down menu. The `UTC_Offset` property of the device object will display the offset based on the time zone selected. Additionally, the control module will automatically adjust for daylight savings time based on the time zone selected. The status of daylight savings time is readable for BACnet clients using the `Daylight_Savings_Status` property of the BACnet device object.

3. Save and send settings.

## Sync Time with Local BACnet Time Synchronization

Time: [ 09:05:27 PM ▲▼ ]   Date: [ Apr 7, 2025 ▲▼ ] [📅]   [ Use Local Date/Time ]   [ Send Date/Time to Controller ]   Broadcast Date/Time Send ☐

1. To configure a Local BACnet Time Sync broadcast request emanating from your Control Module, press the *Send Date/Time to Controller* button while the *Broadcast Date/Time Send* box is checked and while connected to the system. A broadcast will be sent to all network controllers that have *Local* Time Sync enabled.

   This will not only affect Blue Ridge Control Modules but any BACnet device on the network that has its BACnet TimeSynchronization service enabled.

2. If the sending Control Module's BACnet Time Sync is set to *None*, then it will broadcast to receiving controllers set to *Local*.

3. Save and send settings.

## Sync Time with UTC BACnet Time Synchronization

Time: [ 09:05:27 PM ▲▼ ]   Date: [ Apr 7, 2025 ▲▼ ] [📅]   [ Use Local Date/Time ]   [ Send Date/Time to Controller ]   Broadcast Date/Time Send ☐

1. To configure a BACnet UTC Time Sync broadcast request emanating from your control module, press the *Send Date/Time to Controller* button while the *Broadcast Date/Time Send* box is checked and while connected to the system. A broadcast will be sent to all network controllers that have UTC Time Sync enabled.

   This will not only affect Blue Ridge Control Modules but any BACnet device on the network that has its BACnet UTCTimeSynchronization service enabled.

2. Save and send settings.

## Configure a Control Module for DMX

Control Module Type: [ CM04TD ▾ ]   Filters: Secondary Comm: [ DMX ▾ ] Show Legacy ☐

Firmware Version: **Unknown**   Serial Number: **Unknown**

Time: [ ▲▼ ]   Date: [ ▲▼ ] [ ] [ Reset Local ] [ Sync Time ]

BACnet Time Sync: ◉ None ○ Local ○ UTC [ US / Eastern ▾ ]

DMX512 Mode: ◉ None   ○ Transmit ○ Receive

1. From the *Control Module Type* list, select a Control Module Type that supports DMX (any ending in "D").

2. Choose one of None, Transmit, or Receive from the *DMX512 Mode* section.

   **None -** This Control Module will not send or receive DMX data.
   **Transmit -** This Control Module will act as the DMX master and send commands to DMX RX devices. Selecting this mode will enable one to add DMX Devices under the Control Module on the Physical Tree. To configure what DMX channel commands are sent, configure the Control Module's Blue Ridge Lighting Channels on the Logical Tree.
   **Receive -** This Control Module will act as a DMX slave and react to DMX commands from the transmitting DMX device on the bus. To configure what DMX channel(s) the Control Module will react to, configure in the Control Module's Blue Ridge Lighting Channels on the Logical Tree.

3. *Optional:* Add a DMX Device.

4. Save and send settings.

## Configure IOM CAN Status BACnet Points

Show a BACnet BV Point for each I/O Module's CAN Status ☑

1. When enabled, a read-only Binary Value (BV) BACnet point will be present for each I/O Module in the system file. The option's default is *Enabled*. The option will appear only if the Control Module is found to be running firmware version 4.1.0 or newer.

   Each BV will have the name IOM_CAN_STATUS_14000xx and ID number 14000xx where xx is the CAN address number of the I/O Module.

   The BV's Present Value will be 0 if the I/O Module has not been heard from by the Control Module via the CAN for more than a heartbeat period. The BV's Present Value will be 1 if the I/O Module has been heard from within the duration of one heartbeat.

   Finally, the description property of each BV will contain the timestamp of the last successful CAN bus communication from the I/O Module. This feature is useful for monitoring for missing or offline I/O Modules using one's preferred BACnet point viewer.

2. Save and send settings.

## Do Not Contact

🔗 ● **01:** Sample CM (CM08T)

This feature is specific to Essentials and its behavior when connected to a system. Click on the chain link icon to the left of the Control Module on the Physical Network tree. When selected, a red line appears through the chain link and the tree row is greyed out.

⛓️ ● **01:** Sample CM (CM08T)

Do Not Contact

When selected, this directs Essentials not to attempt communication with the control module and its children when connected to the larger system.
This is useful in situations where control modules have been authored in Essentials but are not yet physically present on the actual network.
This saves Essentials the time and bandwidth of repeated attempts at connection with a control module that is purposely offline (e.g. turned off, unwired, or simply not present). Another scenario is when one wants to focus on the Zones of one Control Module and exclude others. Finally, this option prevents Essentials from raising warnings that it cannot connect with the Control Module.

# Control Module: Communication Settings

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## Overview

*Relay Panels*, *Modular Controllers*, and *Zone Controllers* communicate using BACnet MS/TP. This section allows the user to establish a Control Module's identity within the BACnet MS/TP network.

## Configure Communication Settings

*Communication Settings* defines a controller's BACnet and MS/TP communication parameters.

MAC Address: [ 1 ▼ ]

Device Object ID: [ 1320101 ]    Max Info Frames: [ 5 ⬍ ]

Device Object Name: [ New Controller ]    Max Masters: [ 127 ⬍ ]

Device Object Desc.: [ Control Module Description Detail ]

1. Select the media access control (MAC) address for the controller. Each controller must have a unique MAC address on a BACnet MS/TP network segment. Possible MAC address values are [1-99].

2. Set the controller's Device Object ID. Each controller must have a unique Device Object ID on a BACnet internetwork. The Device Object ID may be customized with possible values of [0-4194302]. The default device object ID follows the format (132YYXX) where:

   - 132 = Blue Ridge Technologies Vendor ID

   - YY = Two digit router number. Each router in a system is allocated a distinct number, starting at 1, in order of router creation

   - XX = MAC Address

3. Set a Device Object Name. This customizable controller name, will be visible at the "Name" property of the BACnet Device Object by BACnet clients.

4. Set the Device Object Description as an up to 127 character length string. It will be visible as the "Description" property of the BACnet Device Object by BACnet clients. The property may also be customized via a BACnet client. (This option will appear only on Control Modules running firmware version 4.1.0 and up.)

5. Choose a value for Max Masters. A property of the device object, Max Masters is the highest address that will be polled on a BACnet MS/TP network segment by the selected controller. In the vast majority of situations this will only need to be set on the highest addressed controller on the MS/TP segment. Possible values are [1-127].

6. Choose a value for Max Info Frames. A property of the Device Object relevant to MS/TP networks, Max Info Frames stipulates the number of consecutive request packets a control module (AKA an MS/TP master node) may utilize if needed before relinquishing control of the MS/TP network by passing the token to the next master node. Possible values are [1-127]. Five is the default, and provides an equitable balance for bandwidth sharing.

7. Save and send settings.

# DMX Device: General Settings

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## Overview

A DMX Device is any fixture controlled by the Digital Multiplex (DMX512) protocol. DMX512 is a standard for digital communications across a universe of 512 channels. (DMX's use of the term 'channel' is distinct from Blue Ridge's use of the term. In DMX it is akin to a 'lane' for communicating a singe value.) Each DMX channel is commanded to a value ranging from 0-255. DMX receiving devices customarily map a channel to a specfic lighting effect. Examples of qualities represented by a DMX channel on a device are: color strength (red, green, blue), overall intensity, strobe or pulse periodicity, etc.

## What do you want to do?

Add a DMX Device
Configure DMX Settings

## Add a DMX Device



1. Right-click on the Controller in the navigation pane on the left side of Essentials. Click on Add DMX Device. A New DMX Device will be added underneath the controller.

2. If desired, change the default name. This can be done at any time by right-clicking on the DMX device and selecting "Rename". This customizable name allows device identification throughout Essentials.

## Configure DMX Settings



1. The *Base Address* represents the first DMX Channel that will be used by the current DMX Device. For example, if this is the first DMX Device in the network, then by default, the Base Address will be DMX Channel 1. If it is not the first DMX Device in the network, then the Base Address will default to the first available DMX channel on the network.

2. The Number of DMX Channels can also be changed — from 1 channel up to the maximum allowable limit based on DMX Controller Type. The number of DMX channels that can be allocated to a specific device will also be limited based on the total number of DMX Devices on the network.

   The total number of DMX channels available to a Control Module depends on the model. The capacities are as follows CM02TD : 16, CM04TD : 32, CM08TD : 64, CM16TD : 128, CM32TD : 512. The DMX channels are apportioned contiguously across DMX devices starting from 1. Most DMX Rx devices have more than one channel addressable on the device. However, in the limit one could conceivably have one DMX channel per DMX device.

3. If desired, a label can be added in the *Description* field of each DMX Channel assigned to the DMX device. This can be helpful in specifying what lighting effect each DMX Channel controls (for example, DMX Channel 2 could be designated to control red lights while DMX Channel 3 could be used to control green lights, etc.).

4. Make note of the *Status* section. When connected to a controller, *Status* displays the value (0-255) at which the DMX Channel is currently set.

5. Use *Lock* to set a DMX Channel to a specified value (0-255). To enable or disable the *Lock*, select the lock icon. Please note *Lock* is a powerful diagnostic tool that **disables** all occupant control of the output and may not be disabled outside of Essentials. Use *Lock* with care.

6. Use *Min Value* and *Max Value* to set *Min* and *Max* range values on the DMX Channel output. A value of 0 represents "off", and any value (1-255) represents the light turned "on". Generally, the higher the value, the brighter the light will be (or increased strobe effect, etc.).

7. Save and send settings.

# Controller: Connect

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

Blue Ridge Technologies controllers can be connected to using IP, and both Bluetooth and USB connectivity with additional hardware. *Connect* allows the user to connect to a controller or network of controllers using one of the three aforementioned methods. Note that an *Essentials* system must be created and contain the controller with the correct address before the *Connect* window can be accessed.

## What do you want to do?

Connect via Bluetooth
Connect via IP
Connect via USB

## Connect via Bluetooth
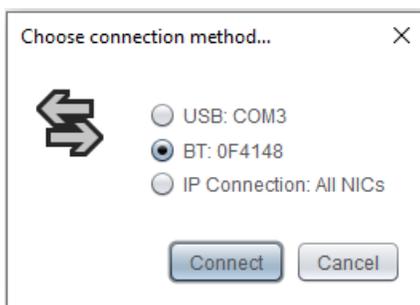


1. Verify that your controller's Bluetooth is linked with your computer. If you have not yet taken the time to pair the controller with your computer, instructions on how to do so can be found here (an internet connection is required for this link),

2. If a system has not yet been created, set one up now by clicking File > New on the task bar.

3. Add the controller you wish to connect to and set the address under Controller Communication Settings.

4. Access the *Connect* window either by clicking File > Connect on the task bar, or by using the hotkey command, Ctrl+Shift+C.

5. Select the *BT:* option for your Bluetooth device and click *Connect*.

## Connect via IP
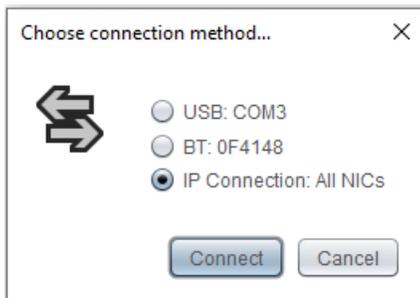


1. If a system has not yet been created, set one up now by clicking File > New on the task bar.

2. Verify that a router has been added to the network tree. If a router has not been added, the option to connect via IP will not be presented on the *Connect* window. To add a router, right click on the system level in the network tree and click "Add Router". Instructions on how to configure the router can be found in the General Settings of the router page.

3. Add the controller you wish to connect to and set the address under Controller Communication Settings.

4. Access the *Connect* window either by clicking File > Connect on the task bar, or by using the hotkey command, Ctrl+Shift+C.

5. Select the *IP Connection* option and click *Connect*.

## Connect via USB
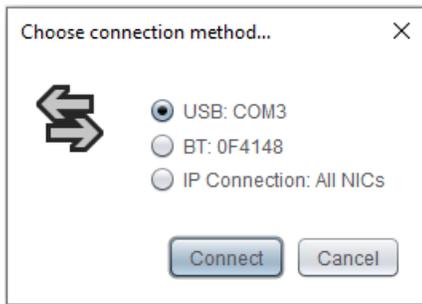
1. Verify that your firmware is at least version 3.5 or higher.
2. If a system has not yet been created, set one up now by clicking File > New on the task bar.
3. Add the controller you wish to connect to and set the address under Controller Communication Settings.
4. Access the *Connect* window either by clicking File > Connect on the task bar, or by using the hotkey command, Ctrl+Shift+C.
5. Select the *USB* option and click *Connect*.

# Control Module: Send Settings

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Send Settings* allows the user to synchronize a configuration file with a Control Module or network of Control Modules.

## Send Settings to a Control Module

1. Choose File > Save or click the *Save* button to save changes to the .brt file.

2. If not connected, Connect to the system.

3. Choose Configure > Send Settings to write changes to the Control Module. The choice of settings sent will be dependent on the present tree selection in the left side Logical or Physical tree panel. If an entity that encompasses more than one Control Module is selected, such as a Router or Area, then settings will be sent to each of the Control Modules underneath that entity. In such, a multi-Control Module send settings case, a summary pop-up window will be provided at the conclusion, detailing to which Control Modules settings were sent successfully, and, if any were unsuccessful, the reasons why.

# I/O Module: General Settings

**Blue Ridge Technologies® | Essentials Help**

## Overview

*I/O Modules* are discrete devices, local to a given Control Module, which augment the amount of inputs and outputs available to the zones managed by that Control Module. I/O Modules extend the abilities of a Control Module by providing additional input/output capacity. I/O Modules reside on a Control Module's private CANbus Network. The quantity and type of I/O Modules that may be attached to a given control module is governed by the type of the parent Control Module.

## What do you want to do?

Configure an I/O Module by Type and Address
Serial Number and Firmware Version of I/O Module
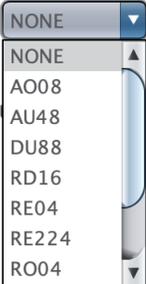Configure an AO Expander by serial address
CANbus Notifications

## Configure an I/O Module by Type and Address

*General Settings* define an I/O Module's hardware type and communication characteristics.

I/O Module Type: NONE ▼   Show Legacy ☐

| NONE |
| AO08 |
| AU48 |
| DU88 |
| RD16 |
| RE04 |
| RE224 |
| RO04 |

1. Choose an *I/O Module Type* from the drop-down list. The *I/O Module Type* must match the physical type installed in the field. Select the *Show Legacy* checkbox to display discontinued product types in the drop-down list.

   Once the selected I/O Module type has had any of its I/O assigned within a channel, further changing the I/O Module type will cause channel assignments for I/O on the I/O Module to be removed from all the assigned channels.

   I/O Module Type: NONE ▼   Show Legacy ☐

   Address: 1 ▼

   | 1 |
   | 2 |
   | 3 |
   | 4 |
   | 5 |
   | 6 |
   | 7 |
   | 8 |
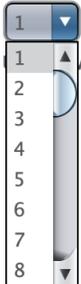
2. Choose an *Address* from the drop-down list. Each I/O Module must have a unique *Address*. Helpfully, Essentials will enforce this constraint for a user. For example, if a Control Module already has an I/O Module using the Address "1", then the *Address* drop-down list of a subsequently added I/O Module will not offer the Address "1". In general, when adding new a I/O Module, Essentials will automatically select the lowest available address for the user.

   When selecting an *Address* there are three other considerations to be aware of:

   First, though a given Control Module may be limited in the total quantity of I/O Modules it may utilize, the entirety of the I/O Module *address range* is available as a choice for the I/O Module's specific address. The *address range* for I/O Modules is 1-32 inclusive.

   Second, though I/O Modules share a given Control Module's CANbus with Stations, their address space is separate from Stations' address space. The Control Module knows how to distinguish Stations from I/O Modules on the CANbus, first by device class, and then by address. For example, one may have a Station with Address "1" and an I/O Module with Address "1" with no conflicting issues. Tellingly, using a given number for a Station address will not make that number disappear from the I/O Module *Address* drop-down list.

   Finally, none of these Essentials addressing safeguards is a substitute for the correct setting of the rotaries on the I/O Module. The rotary settings must be within I/O Module address range and must match the Address and Type found in Essentials. There is nothing to physically prevent one from using duplicate I/O Module rotary addresses on the CANbus. If this happens, it will result in communication errors between

the Control Module and the duplicatively addressed I/O Modules. If such a duplicate situation is uncovered during inspection, just change the rotary while the I/O Module or Station is running. More recent I/O Module and Station firmwares automatically update the address they use to communicate within thirty seconds after their rotaries are changed during operation. This happen without needing a reboot/power cycle, as required in older firmwwares.

3. Save and send settings.

## Serial Number and Firmware Version of I/O Module

The *Serial Number* and *Firmware Version* of non-legacy I/O Modules are reported to the Control Module over the CANbus. While connected to the Control Module via Essentials, this field will auto-populate based on the I/O Module at this address. This can help to ensure that the correct I/O Module is reporting back for that address, by cross-checking the serial number printed on the I/O Module board in the field.

Firmware Version: **1**   Serial Number: **0A00003**

## Configure a legacy AO08v1 I/O Module by serial address

*Version 1* of the AO08 analog output board utilized serial numbers instead of rotary dials to set a couple for an address. These require the serial number to be input into Essentials and sent to the Control Module in order for the Control Module to communicate with the I/O Module.

I/O Module Type:  AO08v1  ▼          Show Legacy ✔

Address:  5  ▼

Firmware Version: **Unknown**   Serial Number:  0A  00055 ▲▼

1. Choose an *Address* from the drop-down list. Each I/O Module must have a unique *Address*. The *Address* must be different from *Addressable* I/O Modules in the field. (i.e all other I/O Module types, which are selected by use of rotary dial).

2. Choose the *AO08v1* aka *8 Analog Outputs with Serial Number Addressing* from the drop-down list.

   An AO08 with rotary dial addressing will use the *AO08* I/O Module Type from that drop-down list along with the *"8 Analog Outputs"* mouseover description.

3. The *Serial Number* printed on the board, must be manually entered into the field. This will allow the Control Module to send messages to the I/O Module based on serial number instead of by address.

4. Save and send settings.

## CANbus Notifications

All non-legacy I/O Modules have the on-board ability to visually notify a technician of ongoing CANbus communication issues via LED signaling.

1. Loss of CANbus communication will result in the *RUN* LED blinking three times in rapid succession, followed by an off period, and then repeating. This indicates that the CANbus has accumulated enough errors over a recent time frame to consider the CANbus to be down. Through this, the I/O Module will continue to attempt communication over the CANbus. Once enough successful messages have been sent, the error tally will be cleared and the periodic three blinks will stop. There are a few things that may cause this blinking to happen.

   - The End-of-Lines are not terminated and causing the communications to fail.
   - There could be a loose connection to the I/O Module.
   - There may be a short in the communication cable.

2. If the I/O Module does not receive communication from the Control Module, the *RUN* LED on the I/O Module will flash two times. There are a few things that may cause this blinking to happen.

   - The Control Module may not be powered on.
   - The Control Module may not be wired correctly to the CANbus.
   - If the Control Module is running firmware version older than 3.0.0 and its system settings tell it not to expect any devices on the CANbus, it will not be attempting any communication on the CANbus.

# I/O: Universal Inputs

## Blue Ridge Technologies® | Essentials
## Help

### Overview

*Universal Inputs (UI)* provide wired connections to field mounted sensing devices. Devices can be binary—sensing ON/OFF conditions, or analog—sensing a defined range of conditions.
Occupancy sensors, current switches, and dry contact switches are binary devices.
Light level sensors, temperature sensors, and humidity sensors are analog devices.

### What do you want to do?

Configure a Universal Input for a Binary Device
Configure a Universal Input for an Analog Device
Expose a Universal Input for BACnet Client Discovery
Allow a Universal Input to be assigned globally

### Configure a Universal Input for a Binary Device

| Name | AKA | Status | Type | Calibration | Device Range |
|---|---|---|---|---|---|

**UI-00-01** [                    ]  Occupancy Sensor ▼   Min: 0   Max: 1   Min: 0   Max: 0

☐ BV:1000001   Normally Open ▼   Units: Foot Candles ▼

DIGITAL_INPUT_1000001   ☐ Make global

1. The *Name* field provides a consistent means for keeping track of I/O across Essentials. The default *Name* format is as follows: Input Type—I/O Module Address (00=Control Module)—Input Number. The *Name* is used throughout Essentials when referring to the input. For example, the name UI-02-01 parses as the following: UI=Universal Input, 02=I/O Module Address 2, and 01=Input Number 1.

2. If desired, add an *AKA* label to the UI. It provides an additional, memorable label to more readily distinguish between UIs. If present, the *AKA* label will accompany the *Name* field in Channels and dropdown lists.

3. From the Type drop-down list choose the binary signal needed for the required channel sequence. Supported signals are described below:

   1. Maintained—A sustained change *from* the device's normal contact state signals ON. A sustained change *to* the device's normal contact state signals OFF.

   2. Momentary On/Off—A momentary transition from the device's normal contact state, e.g. contact open, to its alternate position signals a transition to the opposite state. For example, if the UI state is ON, a Momentary On/Off signal causes the UI state to change to OFF.

   3. Momentary On—A momentary change from the device's normal contact state signals ON.

   4. Momentary Off—A momentary change from the device's normal contact state signals OFF.

   5. Change of State—A sustained change from the device's current contact state inverts the input signal. If the current signal is OFF, it changes to ON. If the current signal is ON, it changes to OFF.

   6. Occupancy Sensor—A sustained change from the device's normal contact state signals ON. A sustained change to the device's normal contact state signals OFF.

   Once the UI type has been chosen, and the UI has been assigned in any channels, further changing the UI type may cause those channel assignments to be removed if the new type of the UI would render those assignments non-applicable.

4. Change the action of the device by selecting Normally Open or Normally Closed from the action drop-down list located below the Type drop-down list. Normally Open means the device signals an ON state by closing its contacts. Normally Closed means the device signals an ON state by opening its contacts.

5. Save and send settings.

When connected to a system, the *Status* field displays the input's current state (ON or OFF).

### Configure a Universal Input for an Analog Device

| Name | AKA | Status | Type | Calibration | Device Range |
|---|---|---|---|---|---|

**UI-00-01** [                    ]  0-10Vdc ▼   Min: 0   Max: 10   Min: 0   Max: 100

☐ AV:1000001   Normally Open ▼   Units: Foot Candles ▼

ANALOG_INPUT_1000001   ☐ Make global

1. The *Name* field provides a consistent means for keeping track of I/O across Essentials. The default *Name* format is as follows: Input Type—I/O Module Address (00=Control Module)—Input Number. The *Name* is used throughout Essentials when referring to the input. For example, the name UI-02-01 parses as the following: UI=Universal Input, 02=I/O Module Address 2, and 01=Input Number 1.

2. If desired, add an *AKA* label to the UI. It provides an additional, memorable label to more readily distinguish between UIs. If present, the *AKA* label will accompany the *Name* field in Channels and dropdown lists.

3. From the *Type* drop-down list choose the analog signal needed for the field device. Supported signals are 4-20mA, 0-5Vdc, and 0-10Vdc.

4. Calibration settings allow compensation for variance in sensor signal values (Vdc or mA). Generally these values should be left to default.

5. In the *Device Range* section, enter the minimum and maximum sensed values for the device. For example, for a 0-100 fc sensor enter 0 for the minimum and 100 for the maximum. Don't forget to configure these otherwise your device will appear to have no range. Even though the input voltage will vary, the interpretation into units along the range will map to 0.

6. Choose the measurement units for device range values in the *Units* drop-down list. Light level sensors can be configured for either foot-candles (fc) or lux (lx).

7. Save and send settings.

When connected to a system, the *Status* field displays the input's current sensed light level in foot-candles or lux.


## Expose a Universal Input for BACnet Client Discovery

☑ AV:1000001          ☑ BV:1000001
   ANALOG_INPUT_1000001      DIGITAL_INPUT_1000001

1. Check the *BACnet* checkbox. The point type will alter according to whether the input is set to a Binary Input type or an Analog Input type.

2. Save and send settings.


## Allow a Universal Input to be assigned globally

| Name | AKA | Status | Type |
|------|-----|--------|------|
| UI-00-01 | | | Occupancy Sensor ▼ |
| | ☑ BV:1000001 | | Normally Open ▼ |
| | DIGITAL_INPUT_1000001 | | ☑ Make global |

By allowing a Universal Input to be assigned globally, it will be selectable where point assignments are made. For example, when an occupancy sensor UI is allowed to be global, it will show up in the occupancy sensor assignment dropdown list of every Channel's "Occupancy Sensor" section. It does not matter if that Channel's Zone is bound to a different control module.

1. Check the *Global* checkbox. Note that when the *Global* checkbox is checked, the BACnet checkbox will in turn be force checked. Universal inputs available globally must also be exposed as BACnet points. This is because the changes to the UI's present value are shared via BACnet COV (change of value) broadcasts.

2. The following types of Universal Input may be made Global:

    1. Maintained
    2. Momentary On
    3. Momentary Off
    4. 4-20mA
    5. 0-5Vdc
    6. 0-10Vdc
    7. Occupancy Sensor

3. Save and send settings.

# I/O: Digital Inputs

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

*Digital Inputs (DI)* provide a wired connection to field mounted switching devices. Devices are binary, sensing ON/OFF conditions. Occupancy sensors, current switches, and dry contact switches are examples of binary devices.

## What do you want to do?

Configure a Digital Input
Expose a Digital Input for BACnet Client Discovery
Allow a Digital Input to be assigned globally

## Configure a Digital Input for a Binary Device

| Name | Status | Type |
|---|---|---|
| DI-01-01 | | Momentary On/Off ▼ |
| ☐ BV:1000101 | | Normally Open ▼ |
| DIGITAL_INPUT_1000101 | | ☐ Make global |

1. If desired, change the input name from its default in the *Name* field. The digital input's *Name* is customizable and allows input identification throughout Essentials. The default *Name* follows this format (Input Type - I/O Module Address (00=Control Module) - Input Number). For example, for DI-02-01, DI=Digital Input, 02=I/O Module Address 2, and 01=Input Number 1.

2. From the Type drop-down list choose the binary signal needed for the required channel sequence. Supported signals are described below:

   1. Maintained—A sustained change from the device's normal contact state signals ON. A sustained change to the device's normal contact state signals OFF.

   2. Momentary On/Off—A momentary transition from the devices normal contact state, i.e. contact open, to its alternate position signals a transition to the opposite state. For example, if the UI state is ON, a Momentary On/Off signal causes the UI state to change to OFF.

   3. Momentary On—A momentary change from the device's normal contact state signals ON.

   4. Momentary Off—A momentary change from the device's normal contact state signals OFF.

   5. Change of State—A sustained change from the device's current contact state inverts the current signal. If the current signal is OFF, it changes to ON. If the current signal is ON, it changes to OFF.

   6. Occupancy Sensor—A sustained change from the device's normal contact state signals ON. A sustained change to the device's normal contact state signals OFF.

      Once the DI type has been chosen, and the DI has been assigned in any channels, further changing the DI type may cause those channel assignments to be removed if the new type of the UI would render those assignments non-applicable.

3. Change the action of the device by selecting Normally Open or Normally Closed from the action drop-down list located below the Type drop-down list. Normally Open means the device signals an ON state by closing its contacts. Normally Closed means the device signals an ON state by opening its contacts.

4. Save and send settings.

When connected to a system, the *Status* field displays the input's current state (ON or OFF).

## Expose a Digital Input for BACnet Client Discovery

☑ BV:1000101
DIGITAL_INPUT_1000101

1. Check the *BACnet* checkbox.

2. Save and send settings.

## Allow a Digital Input to be assigned globally

| Name | Status | Type |
|------|--------|------|
| DI-01-01 | | Occupancy Sensor ▼ |

☑ BV:1000101

   DIGITAL_INPUT_1000101

Normally Open ▼

☑ Make global

By allowing a Digital Input to be assigned globally, it will be selectable where point assignments are made. For example, when an occupancy sensor DI is enabled to be global, it will show up in the occupancy sensor assignment drop down list in the "Occupancy Sensor Channel" section of all channels across all control modules.

1. Check the *Global* checkbox. Note that when the *Global* checkbox is checked that the BACnet checkbox is forced to be checked. Points exposed globally are required to also be exposed to BACnet because points are made available globally via BACnet COV (change of value) subscriptions.

2. The following types of Digital inputs may be made Global:

    1. Maintained
    2. Momentary On
    3. Momentary Off
    4. Occupancy Sensor

3. Save and send settings.

# I/O: Line Voltage Inputs

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

*Line Voltage Inputs* allows custom naming, provides status, and adjustment of characteristics. These settings apply to control modules and I/O modules with line voltage inputs only.

## What do you want to do?

Configure a Line Voltage Input
Allow a Line Voltage Input to be assigned globally
Expose a Line Voltage Input for BACnet Client Discovery

## Configure a Line Voltage Input

*Line Voltage Inputs* configuration is composed of six components:

| Name | AKA | Status | Type | Action |
|------|-----|--------|------|--------|
| LVI-00-01 | | | Maintained ▼ | Normally Open ▼ |

☐ BV:1200001
LINE_VOLTAGE_INPUT_1200001

☐ Make global

1. The *Name* field provides a consistent means for keeping track of I/O across Essentials. The default *Name* format is as follows: Input Type— I/O Module Address (00=Control Module)—Input Number. The *Name* is used throughout Essentials when referring to the input. For example, the name LVI-02-01 parses as the following: LVI=Line Voltage Input, 02=I/O Module Address 2, and 01=Input Number 1.

2. If desired, add an *AKA* label to the LVI. It provides an additional, memorable label to more readily distinguish between LVIs. If present, the *AKA* label will accompany the *Name* field in Channels and dropdown lists.

3. Make note of the *Status* section. When connected to a control module, *Status* displays the input's current state (ON or OFF).

4. Select the *Type* to allow configuration of input type (Maintained or Change of State). These input types have unique operating characteristics. For example (based on normally open input):

   1. Maintained : Channel is OFF and maintained switch is open. Switch is toggled to closed and channel turns ON. Schedule or additional input (switch, occupancy sensor, etc.) turns channel OFF. Maintained switch is toggled to open and channel remains OFF. Switch is toggled to closed and channel turns ON.

   2. Change of State : Channel is OFF and change of state switch is open. Switch is toggled to closed and channel turns ON. Schedule or additional input (switch, occupancy sensor, etc.) turns channel OFF. Change of state switch is toggled to open and channel turns ON.

5. Choose a selection under the *Action* tab. This allows configuration of the input action (Normally Open or Normally Closed).

6. Select the check box point to expose a BACnet Binary Value (BV) point representing line voltage input status to the BACnet clients. Possible values to read are [0] OFF and [1] ON.

7. Save and send settings.

## Allow a Line Voltage Input to be assigned globally

| Name | AKA | Status | Type | Action |
|------|-----|--------|------|--------|
| LVI-00-01 | | | Maintained ▼ | Normally Open ▼ |

☑ BV:1200001
LINE_VOLTAGE_INPUT_1200001

☑ Make global

By allowing a Line Voltage Input to be assigned globally, it will be a selectable option where point assignments are made in channels of zones bound to other controllers in the system.

1. Check the *Global* checkbox. Note that when the *Global* checkbox is checked, the BACnet checkbox will become checked if is not already. This is mandatory, as the mechanism for sharing the present value of the input amongst control modules is by exposing a BACnet Binary Value (BV) point. Changes to the present value of this point are broadcast as unconfirmed COV (change of value) notifications to the other control modules.

   Line Voltage Inputs are only available globally when the Type is Maintained. Change of State is not offered because it represents a relative rather than absolute interpretation of the LVI's status.

2. Save and send settings.

## Expose a Line Voltage Input for BACnet Client Discovery

☑ BV:1200001
   LINE_VOLTAGE_INPUT_1200001

1. Check the *BACnet* checkbox.

2. Save and send settings.

# I/O : Relay Outputs
**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

The *Relay Outputs* section allows custom naming, displays the commanded-to position of relay, provides the load status, enables locking, shows agreement of remote lock settings with that of Essentials, allows adjustment of the relay's contact action, and provides a quick link to the channel into which the relay has been placed.

## What do you want to do?

Configure Relay Outputs with Load Status
Configure Relay Outputs without Load Status
Choose Relay Type
Control Lock Settings
Configure Relay Outputs with Adjustable Load Status

## Configure Relay Outputs with Load Status

| Name | AKA | Cmded Value | Sensed Status | Status Visible via BACnet | Lock | Action | Ch Assignment |
|------|-----|-------------|---------------|---------------------------|------|--------|---------------|
| RO-01-01 | | | | ☐ BV:1100101 LOAD_STATUS_1100101 | 🔓 Off ▼ | Normally Open ▼ | Channel A |
| RO-01-02 | | | | ☐ BV:1100102 LOAD_STATUS_1100102 | 🔓 Off ▼ | Normally Open ▼ | None |

1. The *Name* field provides a consistent means for keeping track of I/O across Essentials. The default *Name* format is as follows: (Output Type—I/O Module Address (00=Control Module)—Output Number). The *Name* is used throughout Essentials when referring to the output. For example, the name RO-02-01 parses as the following: RO=Relay Output, 02=I/O Module Address 2, and 01=Output Number 1.

2. If desired, add an *AKA* label to the RO. It provides an additional, memorable label to more readily distinguish between ROs. If present, the *AKA* label will accompany the *Name* field in Channels and dropdown lists.

3. Make note of the *Cmded Value* column. When connected to a controller, *Cmded Value* displays the current logical state to which the relay has been commanded (ON or OFF).

4. Make note of the *Sensed Status* section. When connected to a controller, *Load Status* displays the presently sensed Load Status (ON or OFF).

5. The *Status Visible via BACnet* column contains a check box to expose a BACnet Binary Value (BV) point representing the load status sensor monitoring this relay. Possible values to be read are [0] OFF-No Load Sensed and [1] ON-Load Sensed.

6. Use *Lock* to set and lock a relay output to the specified logical state (ON or OFF). A *Lock* setting's physical state will be determined by the mapping based on the relay's *Action* configuration. To enable or disable the *Lock* select the padlock icon. Please note *Lock* is a powerful diagnostic tool. *Lock* **disables** all BACnet and occupant control of the output and may not be disabled outside of Essentials. Use *Lock* with care, being sure to *Unlock* when finished.

7. Make a selection in the *Action* column to determine how the physical state of the relay maps to its logical interpretation. The default is Normally Open, and is most commonly seen. This means that the relay is logically OFF when open and logically ON when closed. Conversely, if Normally Closed is chosen it will mean that the relay is logically OFF when closed and logically ON when open.

8. The *Ch Assignment* column displays the name of the channel that the relay has been placed. The name can be clicked upon to visit the logical tree location and panel for that channel. If the relay is not in a channel the label will read None. If the author has made the channel and zone the empty string then the name label will be auto generated as Z-xx:Ch-y, where xx is the zone number and y the channel number on the zone.

9. Save and send settings.

## Configure Relay Outputs without Load Status

| Name | AKA | Cmded Value | Lock | Action | Ch Assignment |
|------|-----|-------------|------|--------|---------------|
| RO-00-01 | | | 🔓 Off ▼ | Normally Open ▼ | None |
| RO-00-02 | | | 🔓 Off ▼ | Normally Open ▼ | None |

1. The *Name* field provides a consistent means for keeping track of I/O across Essentials. The default *Name* format is as follows: (Output Type—I/O Module Address (00=Control Module)—Output Number). The *Name* is used throughout Essentials when referring to the output. For example, the name RO-02-01 parses as the following: RO=Relay Output, 02=I/O Module Address 2, and 01=Output Number 1.

2. If desired, add an *AKA* label to the RO. It provides an additional, memorable label to more readily distinguish between ROs. If present, the *AKA* label will accompany the *Name* field in Channels and dropdown lists.

3. Make note of the *Cmded Value* column. When connected to a controller, *Cmded Value* displays the current logical state to which the relay has been commanded (ON or OFF).

4. Use *Lock* to set and lock a relay output to the specified logical state (ON or OFF). A *Lock* setting's physical state will be determined by the mapping based on the relay's *Action* configuration. To enable or disable the *Lock* select the padlock icon. Please note *Lock* is a powerful diagnostic tool. *Lock* **disables** all BACnet and occupant control of the output and may not be disabled outside of Essentials. Use *Lock* with care, being sure to *Unlock* when finished.

5. Make a selection in the *Action* column to determine how the physical state of the relay maps to its logical interpretation. The default is Normally Open, and is most commonly seen. This means that the relay is logically OFF when open and logically ON when closed. Conversely, if Normally Closed is chosen it will mean that the relay is logically OFF when closed and logically ON when open.

6. The *Ch Assignment* column displays the name of the channel that the relay has been placed. The name can be clicked upon to visit the logical tree location and panel for that channel. If the relay is not in a channel the label will read None. If the author has made the channel and zone the empty string then the name label will be auto generated as Z-xx:Ch-y, where xx is the zone number and y the channel number on the zone.
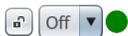
7. Save and send settings.

## Choose Relay Type

| Name | AKA | Cmded Value | Sensed Status | Status Visible via BACnet | Lock | | Action | | Relay Type | | Ch Assignment |
|------|-----|-------------|---------------|---------------------------|------|---|--------|---|------------|---|---------------|
| RO-01-01 | | | | ☐ BV:1100101 LOAD_STATUS_1100101 | 🔓 | Off ▼ | Normally Open | ▼ | Three Wire | ▼ | Channel B |
| RO-01-02 | | | | ☐ BV:1100102 LOAD_STATUS_1100102 | 🔓 | Off ▼ | Normally Open | ▼ | Three Wire | ▼ | None |

1. Certain Blue Ridge Technologies products allow configuration of the relay drivers to allow for two wire or three wire control. Before configuring the relay type, contact Blue Ridge Technologies Technical Support to ensure relay compatibility.

2. From the Relay Type drop down list chose either Two Wire or Three Wire as appropriate for your installed relay.

    1. A Two Wire relay, such as the Douglas WR-6161, a Two Wire type with no load status available.

    2. A Three Wire relay, such as the GE RR7, is a Three Wire type with no load status available.

    3. A Five Wire relay, such as the GE RR9, is a Three Wire type with two wires dedicated to load status.
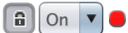
3. Save and send settings.
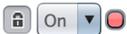

## Control Lock Settings

Lock

🔓 Off ▼ 🟢

While Essentials is connected, a circular 'traffic light' indicator will appear on the right side of the *Lock* settings column. If the indicator is green, the lock settings of that output on the remote device agree with those on screen in Essentials.

Lock

🔒 On ▼ 🔴

If the indicator is red, the local on screen settings and the remote lock settings disagree. They either disagree about whether the output is locked in the first place (i.e. the padlock). Or, if locked, what it is locked to.

🔒 On ▼ 🔴

To 'fix' this disagreement, simply click the red indicator and the on screen lock settings will be pushed to the remote device, followed by the indicator turning green and an on screen confirmation of a successful send.
As noted elsewhere, *Lock* is a powerful diagnostic tool. *Lock* **disables** all BACnet and occupant control of the output and may not be disabled outside of Essentials. Use *Lock* with care, being sure to *Unlock* when finished.


## Configure Relay Outputs with Adjustable Load Status

| Name | AKA | Cmded Value | Sensed Status | Status Visible via BACnet | Lock | | Action | | Ch Assignment |
|------|-----|-------------|---------------|---------------------------|------|---|--------|---|---------------|
| RO-01-01 | | | | ☐ BV:1100101 LOAD_STATUS_1100101 | 🔓 | Off ▼ | Normally Open | ▼ | Example Ch |

LS Threshold: ●————————
18W  40W  120W 240W 600W

In certain specialized cases, an operator may want to change the threshold that determines whether the current load on a relay counts as ON or OFF.
This advanced feature is recommended only for those operators whose needs are not met by the default threshold.
To underscore this, the feature is not visible unless the option has been enabled in the "Tools" menu like so:

✓ Show Load Status Threshold
  Email Tech Support
  Preferences

Additionally, the I/O Module(s) on which the Relays reside must be running sufficiently modern firmware.

RE04 & RO04: version 6 or higher
RE224 & RO224: version 4 or higher

If the option is selected in "Tools", and the I/O Module in question has not yet been connected to, meaning its firmware version is as yet unknown, the configuration slider will still appear, giving the benefit of the doubt and making offline system authoring more convenient.
If however, when Essentials connects to the system at a later time, the I/O Module's firmware version is not recent enough, then the threshold slider will disappear for that Module thereafter, as it is not applicable.

If the above conditions for Adjustable Load Status Threshold are met, then while Essentials is connected, a circular 'traffic light' indicator will appear to the right side of the *LS Threshold* settings row. If the indicator is green, the LS Threshold setting of that Relay on the remote device agrees with the on-screen slider in Essentials. If not, the indicator will be red and the remote device's threshold setting will be displayed. At that point an operator may either click the red light to push the local setting out to the remote, or adjust the local slider to the displayed remote setting so that the two will be in agreement, in both cases returning the indicator to green.
The local setting, if different, will also be pushed out to the remote during the larger, Send Settings operation.

# I/O : Digital Outputs

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

*Digital Outputs* allows custom naming, displays the commanded-value of the output, enables locking, shows agreement of remote lock settings with that of Essentials, allows adjustment of the digital output's contact action, and provides a quick link to the channel into which the digital output been grouped.

## What do you want to do?

Configure Digital Outputs
Control Lock Settings

## Configure Digital Outputs

| Name | AKA | Cmded Value | Lock | Action | Ch Assignment |
|------|-----|-------------|------|--------|---------------|
| DO-02-01 | [　　　　] | | 🔓 [Off ▼] | [Normally Open ▼] | Z-01:Ch-2 |
| DO-02-02 | [　　　　] | | 🔓 [Off ▼] | [Normally Open ▼] | None |

1. The *Name* field provides a consistent means for keeping track of I/O across Essentials. The default *Name* format is as follows: (Output Type—I/O Module Address (00=Control Module)—Output Number). The *Name* is used throughout Essentials when referring to the output. For example, the name DO-02-01 parses as the following: DO=Digital Output, 02=I/O Module Address 2, and 01=Output Number 1.

2. If desired, add an *AKA* label to the DO. It provides an additional, memorable label to more readily distinguish between DOs. If present, the *AKA* label will accompany the *Name* field in Channels and dropdown lists.

3. Make note of the *Cmded Value* column. When connected to a controller, *Cmded Value* displays the current logical state to which the DO has been commanded (ON or OFF).

4. Use *Lock* to set and lock a digital output to the specified logical state (ON or OFF). A *Lock* setting's physical state will be determined by the mapping based on the digital output's *Action* configuration. To enable or disable the *Lock* select the padlock icon. Please note *Lock* is a powerful diagnostic tool. *Lock* **disables** all BACnet and occupant control of the output and may not be disabled outside of Essentials. Use *Lock* with care, being sure to *Unlock* when finished.

5. Make a selection in the *Action* column to determine how the physical state of the digital output maps to its logical interpretation. The default is Normally Open, and is most commonly seen. This means that the digital output is logically OFF when open and logically ON when closed. Conversely, if Normally Closed is chosen it will mean that the digital output is logically OFF when closed and logically ON when open.

6. The *Ch Assignment* column displays the name of the channel that the relay has been placed. The name can be clicked upon to visit the logical tree location and panel for that channel. If the digital output is not in a channel the label will read None. If the author has made the channel and zone the empty string then the name label will be auto generated as Z-xx:Ch-y, where xx is the zone number and y the channel number on the zone.
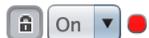
7. Save and send settings.
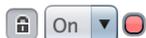
## Control Lock Settings

Lock

🔓 [Off ▼] 🟢

While Essentials is connected, a circular 'traffic light' indicator will appear on the right side of the *Lock* settings column. If the indicator is green, the lock settings of that output on the remote device agree with those on screen in Essentials.

Lock

🔒 [On ▼] 🔴

If the indicator is red, the local on screen settings and the remote lock settings disagree. They either disagree about whether the output is locked in the first place (i.e. the padlock). Or, if locked, what it is locked to.

🔒 [On ▼] 🔴

To 'fix' this disagreement, simply click the red indicator and the on screen lock settings will be pushed to the remote device, followed by the indicator turning green and an on screen confirmation of a successful send.
As noted elsewhere, *Lock* is a powerful diagnostic tool. *Lock* **disables** all BACnet and occupant control of the output and may not be disabled outside of Essentials. Use *Lock* with care, being sure to *Unlock* when finished.

# I/O : Analog Outputs

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

*Analog Outputs* send a specified voltage anywhere from 0 to 10Vdc to a light source. The detail panel allows custom naming, displays the commanded-to position of the analog output, enables locking at a specific voltage, shows agreement of remote lock settings with that of Essentials, allows adjustment of the minimum and maximum voltage supported by output supports, and provides a quick link to the channel into which the analog output has been placed.

## What do you want to do?

Configure Analog Outputs
Control Lock Settings

## Configure Analog Outputs

| Name | AKA | Cmded Value | Lock | Range (Volts) | | Ch Assignment |
|---|---|---|---|---|---|---|
| AO–01–01 | | | 🔓 0 | Min: 0 | Max: 10 | Channel A |
| AO–01–02 | | | 🔓 0 | Min: 0 | Max: 10 | None |

1. The *Name* field provides a consistent means for keeping track of I/O across Essentials. The default *Name* format is as follows: (Output Type—I/O Module Address (00=Control Module)—Output Number). The *Name* is used throughout Essentials when referring to the output. For example, the name AO-02-01 parses as the following: AO=Analog Output, 02=I/O Module Address 2, and 01=Output Number 1.

2. If desired, add an *AKA* label to the AO. It provides an additional, memorable label to more readily distinguish between AOs. If present, the *AKA* label will accompany the *Name* field in Channels and dropdown lists.

3. Make note of the *Cmded Value* column. When connected to a controller, *Cmded Value* displays the current output voltage (0-10Vdc) in 1 Volt increments.

4. Use *Lock* to set an analog output to the specified voltage (0-10Vdc). To enable or disable the *Lock*, select the pad lock icon. Please note *Lock* is a powerful diagnostic tool. *Lock* **disables** all BACnet and occupant control of the output and may not be disabled outside of Essentials. Use *Lock* with care.

5. Use *Range* to set *Min* and *Max* voltage range limits on the analog output to suit hardware capability. Analog output trim adjustments for control strategies such as lumen maintenance are performed in the Analog Output Assignment section.

6. The *Ch Assignment* column displays the name of the channel into which the analog output has been placed. The name can be clicked upon to visit the logical tree location and panel for that channel. If the analog output is not in a channel the label will read None. If the author has made the channel and zone the empty string then the name label will be auto generated as Z-xx:Ch-y, where xx is the zone number and y the channel number on the zone.

7. Save and send settings.

## Control Lock Settings

Lock

🔓 0 🟢

While Essentials is connected, a circular 'traffic light' indicator will appear on the right side of the *Lock* settings column. If the indicator is green, the lock settings of that output on the remote device agree with those on screen in Essentials.

Lock

🔒 0 🔴

If the indicator is red, the local on screen settings and the remote lock settings disagree. They either disagree about whether the output is locked in the first place (i.e. the padlock). Or, if locked, what voltage it is locked to.

🔒 0 🔴

To 'fix' this disagreement, simply click the red indicator and the on screen lock settings will be pushed to the remote device, followed by the indicator turning green and an on screen confirmation of a successful send.
As noted elsewhere, *Lock* is a powerful diagnostic tool. *Lock* **disables** all BACnet and occupant control of the output and may not be disabled outside of Essentials. Use *Lock* with care, being sure to *Unlock* when finished.

# I/O : Tri-State Outputs

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

*Tri-State Outputs* allows custom naming and adjustment of full stroke time.

## What do you want to do?

Configure Tri-State Outputs

## Configure Tri-State Outputs

| Name | AKA | Stroke Time |
|------|-----|-------------|
| **TS–01–01** | | 30 |
| **TS–01–02** | | 30 |

1. The *Name* field provides a consistent means for keeping track of I/O across Essentials. The default *Name* format is as follows: (Output Type—I/O Module Address—Output Number). The *Name* is used throughout Essentials when referring to the output. For example, the name TS-02-01 parses as the following: TS=Tri-State Output, 02=I/O Module Address 2, and 01=Output Number 1.

2. If desired, add an *AKA* label to the Tri-State Output. It provides an additional, memorable label to more readily distinguish between Tri-State Outputs. If present, the *AKA* label will accompany the *Name* field in Channels and dropdown lists.

3. The *Stroke Time* is the number of seconds it takes for the tri-state output to travel completely between its two endpoints. The permissible range is 1-120 seconds.

4. Save and send settings.

# Station: Station Settings

## Blue Ridge Technologies® | Essentials Help

### Overview

A *Station* is a capacitive touch interface that acts like a switch or set of switches that allow a user to directly control a channel or group of channels manually. Stations models range from single button on and off switch, to a more advanced faceplates featuring light dimming and preset capabilities. Stations are wired to the Control Module via a CANbus network.

### What do you want to do?

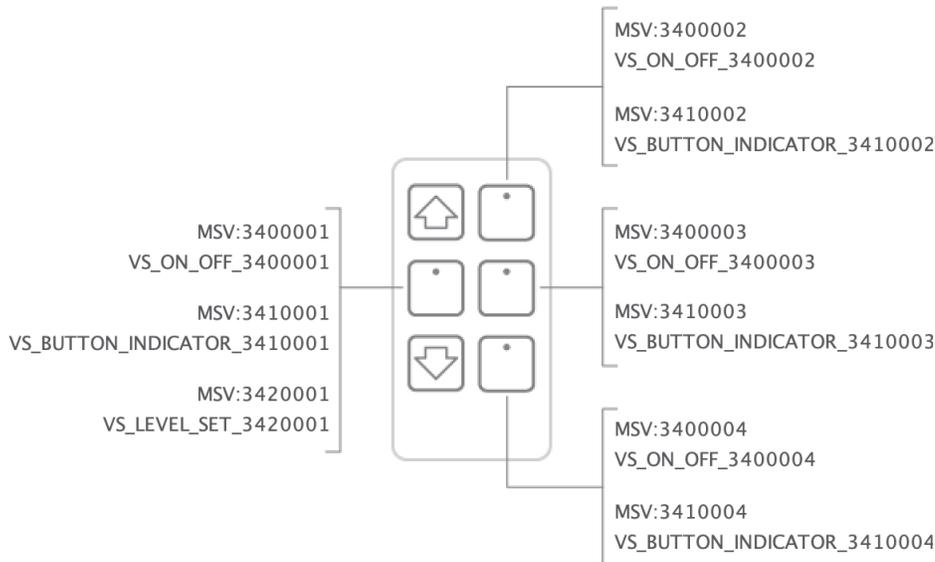Configure a Station
CANbus Notifications

### Configure a Station

*Station Settings* configures a station's communication and hardware characteristics.

Station Type: CTS3PR ▼   Is Version 1: ☐

Address: 0 ▼

Virtual: ☑

Night Light Enabled: ☐

MSV:3400002
VS_ON_OFF_3400002

MSV:3410002
VS_BUTTON_INDICATOR_3410002

MSV:3400001
VS_ON_OFF_3400001

MSV:3410001
VS_BUTTON_INDICATOR_3410001

MSV:3420001
VS_LEVEL_SET_3420001

MSV:3400003
VS_ON_OFF_3400003

MSV:3410003
VS_BUTTON_INDICATOR_3410003

MSV:3400004
VS_ON_OFF_3400004

MSV:3410004
VS_BUTTON_INDICATOR_3410004

1. Select a *Type* to define the station's hardware and capabilities in Essentials. The selected *Type* must match the physical hardware installed on the CANbus Network.

    Once the selected station type has been assigned to a channel, further changing of the station type will cause those channel assignments to be removed from all the assigned channels.

2. The *"Is Version 1"* checkbox is used if the station is an original Version 1 model. Both Version 1 and Version 2 are similar in faceplate appearance. However, Version 2 is distinguished by its metal frame, thin profile, and absence of an enclosing plastic box.

3. Select a station *Address*. This defines a station's identity on the CANbus network. The *Address* in Essentials must match the *Address* dip switch settings on the physical station. Each Station should have a unique *Address* on the CANbus network segment, relative to other stations. Stations' address range begins at 0 with the upper limit determined by the Control Module type.

    1. Note one: Even though the CANbus wiring for a given Control Module is shared by two classes of device, Stations and I/O Modules, their respective address spaces are distinct from one another. For example, one may set a Station at Address 1, and this does not preclude then setting an I/O Module at its Address 1. Since the I/O Modules' address space is separate it will not interfere with either devices' communications.

    2. Note two: If there will be a *Three-way* or *Four-way* switch arrangement, this counts as one station on the network and each actual station should be given the same address at each location. This will allow all of the stations to control the same functions and react in the correct manner as an ensemble.

4. A *Virtual* Station replicates physical Stations virtually in BACnet. Enable the *Virtual* check box to expose the Station's ON/OFF controls, button indicators, and level set functions as BACnet Multi State Values (MSV). Possible values are as follows:

    1. ON/OFF (Read/Write): [1] Toggle, [2] ON, and [3] OFF

2. Button Indicator (Read Only): [1] OFF, [2] ON, and [3] Flash
3. Level Set (Read/Write): [1-100] percentage of light output and [101-110] incremental changes of -5% to 5% .
   For example, to set the light level to an absolute percentage, such as 40%, write a value of 40 to the MSV's present value. To change the light level in a relative fashion, for instance to decrement the light level by 3%, write a value of 103 to the MSV's present value.

5. *Night Light Enabled* configures a station to have its indicator LEDs emit a soft light when the LED would otherwise represent a logical off. The light is less bright than when the LED indicator is on, but still sufficient to help find the station in an otherwise darkened space. This feature is useful for illuminating the station in low light situations.

6. Save and send settings.

## CANbus Notifications

Notification of CANbus issues are available to aid in operation and diagnostics of Stations for all but Version 1 station models.

1. Loss of CANbus communication will result in all LEDs on the Station repeatedly flashing three times quickly followed by a short pause. This will indicate that the CANbus has accumulated enough errors to consider the CANbus to be unusable. Once enough messages have been successfully sent, the errors will be cleared and the three blinks will stop. There are a few conditions that may cause this to happen.

   - The End-of-Lines are not terminated and causing the communications to fail.
   - There could be a loose wiring connection to the Station.
   - There may be a short in the communication cable.

2. If the Station does not receive communication from the Control Module, all of the LEDs on the station will flash two times quickly followed by a pause and then repeat the pattern. There are a few things that may cause this blinking to happen.

   - The Control Module may not be powered on.
   - The Control Module may not be wired correctly to the CANbus.
   - If the Control Module is running firmware version older than 3.0.0 and its system settings tell it not to expect any devices on the CANbus, it will not be attempt any communication on the CANbus, including a 'heartbeat' message.

# Zone: Control Module Assignment and Standalone

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Control Module Assignment* binds a Zone to a Control Module and BACnet client.

*Standalone* permits a Zone and its Channels to operate without need for a Mode Source (i.e. Run Command or Schedule.)

**Controller**

**CM Assignment** ⊘  [ CM:01 (CM32TD), My CM Name ▼ ]    CM:01 (CM32TD)

**Standalone Zone** ☐

## What do you want to do?

Assign a Control Module to a Zone
Select Standalone Zone choice

## Assign a Control Module to a Zone

**Controller**

**CM Assignment** ⊘  [ CM:01 (CM32TD), My CM Name ▼ ]    CM:01 (CM32TD)

1. Every Zone and its Channels must reside on a Control Module. When a new Zone is added it will be bound by default to the lowest MS/TP MAC addressed Control Module with zone availability. This can be changed by choosing a different Control Module from the dropdown combobox.
   This establishes the relationship between the Control Module and the Zone it controls. Attempts to further change this binding after Channels have been added to the Zone will result in a warning and the loss of those channels if proceeded with.

   To the right of the binding choice is the name of the Control Module as a clickable link that will display the Control Module's detail panel on the Physical Tree.

2. Save and send settings.

## Select Standalone Zone choice

**Standalone Zone** ☑

1. Every Zone has the option of the being a *Standalone* Zone.

   If this box is checked, the Zone and any of its subsidiary Channels will be in Standalone Mode.
   Standalone Mode can be defined as follows. The Zone is in Occupied Mode permanently. There is no Unoccupied Mode. As such, Mode Sources, such as Run Command and Schedule are irrelevant and will disappear at the Zone view. (Similarly, Fallback Timer Duration disappears from the Zone since it too is no longer applicable as part of a Mode Source strategy.)
   Within the Zone's Channels, all settings for Unoccupied Mode disappear, as well as all settings for Transitions between Occupied and Unoccupied Mode. Additionally, the radio button panel for Mode Source selection is removed
   Settings particular to Occupied Mode remain, though with most references to 'Mode' removed since everything is within Standalone now.
   In this set up Channels will be not be turned On or Off via Mode transitions, because there are no transitions.
   Rather, the Channel's Status is driven by occupant interaction events, such as Station Button presses, Occupancy Sensor triggerings, or timer expirations (e.g. Override, Vacancy).

2. Save and send settings.

# Zone: Run Command

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

*Run Command* offers an option for exposing the Zone's Run Command as a commandable BACnet Binary Value (BV) Point. And if exposed, controlling the point from Essentials.

## What do you want to do?

Expose a Zone's Run Command for BACnet Client Discovery
Control a Zone's Exposed Run Command

## Expose a Zone's Run Command for BACnet Client Discovery

☐ **Run Command**
   ☑ BV:3000100
      RUN_COMMAND_3000100

1. Select the *BACnet* checkbox.

2. Save and send settings.

## Control a Zone's Exposed Run Command

☐ **Run Command**
   ☑ BV:3000100
      RUN_COMMAND_3000100      Write [ NULL ▼ ] @ Priority [ 16 ▼ ] [ Send ]

| | | | | | | | | Priority | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pres. Value | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | Rel. Default |
| 1 | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | NULL | 1 |

If the Run Command has been exposed on BACnet, and Essentials is connected to the system, then the above additional interface will appear. It displays the current present value of the Binary Value (BV), as well as the contents of its priority array and its relinquish default property. Additionally, an operator can alter the present value from Essentials by selecting a value and a priority and pressing send.

Priorities 1 through 16 can be written with the values 0 (OFF), 1 (ON), or NULL. The relinquish default, a special 'backstop' property, can be written to with only 0 (OFF) or 1 (ON). NULL is not permitted for this property. This ensures that the present value always has a definite, non-NULL value.

Every time the priority array is written to, the present value is recalculated as follows: Starting with priority 1, the highest priority, and moving left to right, take the first non-NULL value encountered and make it the present value. If all priorities are NULL, as in the above graphic, then the value of the relinquish default is used.
Since non-NULL values at higher priorities will 'block' or take precedence over lower priorities, it is considered a BACnet 'best practice' to use the lowest priorities available to accomplish a desired behavior. This leaves the maximum headroom for any future design changes that might need to utilize additional priorities. In practice, we suggest using priority 16 in most cases unless there is a compelling need otherwise.

This live view will reflect changes made by another agent altering the point from a front-end BACnet point reader/writer while under observation by Essentials.

Finally, we note a special quality of the Run Command point that is a proprietary extension of its BACnet qualites. If any of the channels in the zone have chosen *remote with local schedule fallback* (see the Occupied Mode/Unoccupied Mode section) as their mode source, then the run command gains a timer associated with it, counting down from the last time the run command was written to. Any write to the run command tops up and restarts the countdown on this fallback timer. Any write will do, even ones that do not substanitively change the point's present value from its value prior to the write.

Examples of this strategy where the PV doesn't change due to a write could include writing NULL repeatedly at a priority higher than the highest non-NULL priority. e.g. writing NULL to priority 15 while doing the substantive changes of writing 1's and 0's at priority 16.
Alternatively, one might write the current desired present value repeatedly at the same priority at timed intervals, e.g. writing a 1 every four minutes at priority 16. In both cases, the present value itself is unchanged after the re-evaluation prompted by the write. Crucially though, the fallback timer has been topped up.

# Zone: Schedule

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

In Essentials, zones can be configured to run on a schedule that determines when lights should be on or off. Schedules can allow for any combination of times within the week, and exceptions can be added to account for any specific day or time frame that a zone may be unoccupied on a less than regular basis. For additional information on local *Schedule* implementation see the Occupied Mode/Unoccupied Mode section.

## What do you want to do?

Configure a Zone's Schedule
Expose a Zone's Schedule for BACnet Client Discovery

## Configure a Zone's Schedule



1. To configure a weekly schedule select a day, add a transition, select a time, and select a transition action (ON/OFF). A maximum of twelve transitions may be specified per day. Please note on days when no transition occurs, the local schedule will default to unoccupied.

   A midnight crossing of *ON* will require an *ON* to be sent the next morning at 12:00 AM to remain *ON*.

2. To create an exception, add an exception, add a transition, select a time, select a transition action (ON/OFF), and select one of the exception types listed below. A maximum of four exceptions with 6 transitions per exception may be specified.

   *On* : Exception occurs on specified date.

   *Beginning* : Exception applies between specified beginning and ending dates.

   *In* : Exception occurrence is specified by selecting a month and selection of days within that month.

3. Save and send settings.

## Expose Schedule for BACnet Client Discovery

☑ SCHEDULE:3100100
 SCHEDULE_3100100

1. Check the *BACnet* checkbox.

2. Save and send settings.

Note: exposure of the local schedule over BACnet is not neccessary for the zone and its channels to be driven by the schedule. It is just another means to view and edit the schedule, albeit via BACnet.

# Zone: Fallback Timer Duration

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Fallback Timer Duration* sets the length of time that needs to elapse after a write to a zone's run command, after which the local schedule will become the operative mode source for channels using the *remote with local schedule fallback* strategy.

## What do you want to do?

Set the Schedule Fallback Timer Duration

## Schedule Fallback Timer Duration

⊟ **Fallback Timer Duration** ⓘ

Schedule Fallback Timer Duration: [ 0 ⇅ ] Days  [ 0 ⇅ ] Hrs  [ 2 ⇅ ] Min

1. Type or adjust the spinners for the desired value of the fallback timer. The range is from 1 minute to 1 week (10,080 minutes.) The default is 2 minutes.

2. Save and send settings.

With this setting, any of the zone's channels which have chosen *remote with local schedule fallback* strategy (see the Occupied Mode/Unoccupied Mode section) as their mode source will be rely on this timer to determine a fallback condition.

This timer is topped up any time the zone's run command is written to, whether or not the write substantively changes the present value from what it was prior to the write. If no write is logged for the timer's duration, then the channel(s) under the fallback strategy will thereafter have their mode determined by the zone's schedule. However, any subsequent write to the run command will revert mode control back to the run command and restart the timer. Often this strategy might be employed as a redundancy measure where there is a concern about run command updates being issued in a timely manner.

# Channel: Channel Status and BACnet

**Blue Ridge Technologies® | Essentials Help**

## Overview

A *Channel Status* subsection is at the top each channel's detail pane. Settings in this section enable the status (OFF/ON) and level (%) of the channel to be read by the BACnet client. Furthermore, when connected to a system the status and attribution of the channel's condition will be displayed

## What do you want to do?

Expose Channel Status for BACnet Client Discovery
Expose Channel Level for BACnet Client Discovery

## Expose Channel Status for BACnet Client Discovery

☑ BV:2000101

    CHANNEL_STATUS_2000101

1. Check the *BACnet* checkbox. The channel status is available for exposure for all channels. It is a read-only BV, with values 0/OFF and 1/ON.

2. Save and send settings.

## Expose Channel Level for BACnet Client Discovery

☑ AV:2010101

    CHANNEL_LEVEL_2010101

1. Check the *BACnet* checkbox. The channel level will appear available for exposure only for those channels which have one or more Analog Outputs. It is a read-only AV, with values in whole numbers between 0 and 100 percent.

2. Save and send settings.

# Channel: Switches and Stations

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Switches and Stations* assigns switch and station buttons control of the channel, defines presets, and enables button lockout.

☐ Station On/Off ▼

Station: Station 1-(0) ▼    Button: Top Left ▼

Button Lockout: ☑ Disable None ▼ in Occupied Mode.

Disable None ▼ in Unoccupied Mode.

Disable None ▼ in both Modes, with Maintained Input UI-03-01 ▼

[Add] [Delete]

## What do you want to do?

Assign Switches
Assign Stations
Configure Button Lockout

## Assign Switches

To assign a switch to the channel begin by adding a switch with the *Add* button. Then select a switch type and switch input. The available switch type options are determined by the Universal Input and Line Voltage Input configuration. There are three possible switch types:

### Switch ON/OFF

☐ Switch On/Off ▼

Universal Input: UI-03-01 (1) ▼

*Universal Input* : This menu is populated with universal inputs configured as momentary ON/OFF, maintained, and change of state in the Universal Inputs section. Select a universal input to assign the switch to the channel.

### Switch ON Switch OFF

☐ Switch On Switch Off ▼

'ON' Universal Input: UI-03-04 (1) ▼    'OFF' Universal Input: UI-03-05 (1) ▼

*'ON' Universal Input* and *'OFF' Universal Input* : These menus are populated with universal inputs configured as momentary ON and momentary OFF in the Universal Inputs section. Select a universal input of each type to assign the switch to the channel. Note that both a momentary on and a momentary off switch must be designated in the Universal Inputs to have this option available.

### Line Voltage Switch

☐ Line Voltage Switch ▼

Line Voltage Input: LVI-00-01 (3) ▼

*Line Voltage Input* : Select a Line Voltage Input to assign the switch to the channel.

## Assign Stations

To assign a station to the channel begin by adding a station with the *Add* button. Then select a station type. Station type options are derived from the Station: General Settings and station position on the Physical Tree. There are three possible station types.

### ON/OFF

☐ Station On/Off ▼

Station: Station 1-(0) ▼    Button: Only ▼

*Station* : Select the desired station from within the station type. station names follow this format: Physical Tree Station Name - (Address)

*Button*: Select the desired button from the station to assign it to the channel. Buttons are identified according to their location on the station (top, bottom, middle left, bottom right, etc.). Depending on station type, a single button (only) or multiple buttons may be available.

**Raise/Lower**

☐ | Station On/Off Raise/Lower ▼

Station: | Station 2-(1) ▼    Button Set: | Only ▼

*Station* : Select the desired station from within the station type. Station names follow this format: Physical Tree Station Name - (Address)

*Button Set* : Select the desired button set from the station to assign it to the channel. Button sets have three options depending on station type, a single button set (Only) or button set left or right.

**Preset**

☐ | Station Preset ▼

Station: | Station 3-(2) ▼    Button: | Top ▼

Command Channel: | On ▼   Level: | 50 ▲▼ %   Transition: ☑ ⦿ Fade Time ◯ Ramp Rate   5 ▲▼ second(s)

*Station* : Select the desired *Station* from within the station type. *Station* names follow this format: Physical Tree Station Name - (Address)

*Button*: Select the desired button from the station to assign it to the channel. Buttons are identified according to their location on the station (top, bottom, middle left, bottom right, etc.). Depending on station type, a single button (only) or multiple buttons may be available.

Preset : Preset configuration is composed of three components:

- *Command Channel* : Select an action for the Preset button (ON/OFF).
- *Level* : If the Preset commands the channel ON, select the desired light level. This is expressed as a percentage of light output established in the Analog Output Assignment.
- *Transition* : Enable this setting to control the transition from current level to preset level upon button press. If transition is disabled the level will change instantly.
  - *Fade Time* : This regulates the transition period (1-30 seconds) until preset level is reached.
  - *Ramp Rate* : This governs the transition in percent change per second (1-100%).

## Configure Button Lockout

Button Lockout: ☑ Disable | None ▼ in Occupied Mode.

Disable | None ▼ in Unoccupied Mode.

Disable | None ▼ in both Modes, with Maintained Input | None ▼

*Button Lockout*: This allows switches and individual Station button functions to be disabled, either in a specific Mode or via a Maintained Input. Raise and lower functions cannot be locked out.
*Button Lockout* may be initiated by schedule (i.e. the Mode changes to Occupied or Unoccupied invoking the Mode based policy) or Maintained Input.
Schedule implementation allows a unique button lockout strategy for both Occupied and Unoccupied mode respectively. This is suited for public corridors, restrooms, and other applications that require limited occupant control of lighting.
Maintained Input based locking allows for the suppression of switch or button functions when the Maintained Input is ON.

There are three options for *Button Lockout*:

1. Disable *ON* functionality only.
2. Disable *OFF* functionality only.
3. Disable both *ON* and *OFF* functionality.

Note in the Maintained Input case, the option choices are greyed out until a concrete Maintained Input has been selected, as it would not be applicable otherwise.

# Channel: Relay Assignment

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Relay Assignment* establishes a relay output's relationship with the channel.

## What do you want to do?

Add or Delete a Relay
Interpret Relay Information
Configure Relay Assignment with Logical Status

## Add or Delete a Relay

| | Relay Output | Cmded Value | Sensed Status | Module |
|---|---|---|---|---|
| ☑ | My Relay [RO-01-01] ▼ | | | My RE224 Module |
| | Add   Delete | | | |

1. To add a relay, click the *Add* button. This automatically adds the next available relay.

2. Select a relay output to assign it to the current channel using the *Relay Output* drop down box.

3. To delete a relay, select the checkbox next to the appropriate relay and then click *Delete*. This allows for the removal of multiple unwanted relays from a channel at a time.

4. Save and send settings.

## Interpret Relay Information

Each relay row in the channel subsection includes several columns of additional helpful information.

○ When connected to a system the last commanded-to value of the relay is displayed.

○ When connected to a system, and if the relay supports load status, the sensed load status of the relay is displayed.

○ The name of the module on the physical tree from where the relay was sourced is displayed. Click on the name label to be taken to the detail panel of that module.

## Configure Relay Assignments with Logical Status

| | Relay Output | Cmded Value | Sensed Status | Logical Status | Logical Status via BACnet | Module |
|---|---|---|---|---|---|---|
| ☐ | RO-01-01 ▼ | Off | Off | Off | ☑ MSV:1100101 LOGICAL_STATUS_1100101 | IOM:01 (RE224) |

For relays with load status, one can additionally opt to view their *Logical Status* both within Essentials and as a BACnet MSV point.
Logical Status is description of state arrived at by combining the Relay's Commanded-To value and its Load Status/Sensed Status. The following table provides an easy reference for the production of the logical status conditions.

| Logical Status | Commanded-To | Load Status | Logical Status MSV Value |
|---|---|---|---|
| OFF | Off | Off | 1 |
| OVERRIDE | Off | On | 2 |
| ALARM | On | Off | 3 |
| ON | On | On | 4 |
| LOCKED | Locked | N/A | 5 |

Expanding on the above table, we further describe the Logical Status terms.

OFF and ON are fairly straightforward. In these cases, the Load Status and the Commanded-to Relay setting are in agreement.

LOCKED is when the Relay has been locked on the physical side to a particular position. Locking overrides Channel and Zone logic. In this case the Load Status is a moot point.

OVERRIDE is the condition where a Relay is sensed to be carrying current even though it has been commanded to be Off. This is a noteworthy situation! It would suggest that the Relay may have been manipulated to On by hand, or that a serious electrical situation has occurred that allows current to flow across the relay.

ALARM is the condition where the Relay has been commanded On, and yet no load is sensed. This may reflect a situation that needs attention. Or, it could be the case that an item downstream of the Relay is simply not turned On, due to having its own independent switching, and thus no current is being drawn. The site operator should have enough knowledge of the circuit in question to decide whether this represents the first or second case.

In addition to the Logical Status column in the Relay Assignment there is the option to expose the Logical Status as an MSV (Multi-State-Value) BACnet point. It will be visible as a read-only MSV over BACnet with the values described in the above table. This advanced feature is not visible by default. It can be enabled in the *Tools* Menu under *Show Relay Logical Status*.

# Channel: Digital Output Assignment

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Digital Output Assignment* establishes a digital output's relationship with the channel.

## What do you want to do?

Add or Delete a Digital Output
Interpret Digital Output Information

## Add or Delete a Digital Output

| | Digital Output | Cmded Value | Module |
|---|---|---|---|
| ☑ | DO-02-02 ▼ | | My DU88 Module |

[ Add ]  [ Delete ]

1. To add a digital output, click the *Add* button. This automatically adds the next available digital output. An output must be added before beginning configuration.

2. Select a digital output to assign it to the current channel using the *Digital Output* drop down box.

3. To delete a digital output assignment, select the checkbox next to the appropriate digital output and then click *Delete*. This allows for the removal of multiple unwanted digital outputs from a channel at a time.

4. Save and send settings.

## Interpret Digital Output Information

Each relay row in the channel subsection includes several columns of additional helpful information.

- When connected to a system the last commanded-to value of the digital output is displayed.

- The name of the module on the physical tree from where the digital output was sourced is displayed. Click on the name label to be taken to the detail panel of that module.

# Channel: Analog Output Assignment

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Analog Output Assignment* establishes an analog output's relationship to the channel and enables configuration of trim limits. Trim limits allow the user to set a minimum and maximum light output amount, which is useful for lumen maintenance or to prevent a fixture from dimming fully to off. These settings apply to dimming model controllers only.

## What do you want to do?

Add or Delete an Analog Output
Interpret Analog Output Information
Adjust the Trim Level
Expose the Trim Levels for BACnet Clients

## Add or Delete an Analog Output

| | Analog Output | Cmded Value | Module |
|---|---|---|---|
| ☑ | My Analog Output [AO-01-01] ▾ | | My RE224 Module |

[ Add ]   [ Delete ]

1. To add an analog output, click the *Add* button. This automatically adds the next available analog output. An output must be added before beginning configuration.

2. Select an analog output to assign it to the current channel using the *Analog Output* drop down box.

3. To delete an analog output, select the checkbox next to the appropriate analog output and then click *Delete*. This allows for the removal of multiple unwanted analog outputs from a channel at a time.

4. Save and send settings.

## Interpret Analog Output Information

Each analog output row in the channel subsection includes two columns of additional helpful information.

- When connected to a system the last commanded-to value of the analog output is displayed.

- Additionally, the name of the module on the physical tree from where the analog output was sourced is displayed. Click on the name label to be taken to the detail panel of that module.

## Adjust the Trim Level

| | Analog Output | Cmded Value | Module | Low Trim % | High Trim % |
|---|---|---|---|---|---|
| ☑ | My Analog Output [AO-01-01] ▾ | | My RE224 Module | 0 | 100 |

1. Adjust the trim limits using *Low Trim* and *High Trim*. Ideal for lumen maintenance control strategies, trim limits restrict the range of the analog output. Limits are expressed as a percentage (0-100%) of the output's voltage range established in the Analog Outputs section.

2. Save and send settings.

## Expose the Trim Levels for BACnet Clients

Visible via BACnet

| | | |
|---|---|---|
| ☑ | MSV:1500101 | MSV:1510101 |
| | AO_LOW_TRIM_PCT_1500101 | AO_HIGH_TRIM_PCT_1510101 |

This setting is used to enable two Multi-state Value (MSV) BACnet points that correspond to the Analog Output's Trim Level percents displayed immediately to the left of these settings in the same row.

The MSV point starting with 150 sets the percentage for the Low Trim.
The MSV point starting with 151 sets the percentage for the High Trim.

These MSVs have 101 states. Each state corresponds to a percent, from 0 to 100 inclusive. So 1 = "1Pct", 2 = "2Pct", etc.. Of note: MSVs do not accept 0 as a legal value, so "0Pct" is achieved with the value 101. A point's present value determines the Trim Level for the AO. The Analog Output will be unable to cross that floor or ceiling if the channel level percentage passes it.

Enabling this pair of points via send settings will also place the choices in the AO Trim Level cells to the left of this setting at priority 16 of the corresponding BACnet point's priority array for the purposes of computing the point's present value. Any subsequent send settings will re-establish the values set in the AO Trim Level cells and clear out any non-NULL values that have been entered elsewhere in the priority array.

1. Check the Visible Via BACnet checkbox.
2. Save and send settings.

# Channel: DMX Device Assignment

**Blue Ridge Technologies® | Essentials Help**

## Overview

*DMX Device Assignment* provides configuration of BRT Lighting Channel settings. When the Control Module has been set to DMX512 Transmit mode, the behavior of any DMX channels found on DMX RX Devices that are children of the Control Module assigned to the Zone in which this Lighting Channel resides can be configured. Alternatively, if the Control Module has been set to DMX512 Receive mode, the Lighting Channel can be configured to be controlled by a transmitting remote DMX device.

⊟ **DMX Device Assignment**

☐ MyDMX RxDevice – (1) ▼

Demand Response:      Level 1 %     Level 2 %     Level 3 %
                      100 ⊕          100 ⊕          100 ⊕

DMX Channel Config:   DMX                                         Value At
                      Chan #     Description                      100% Level
                      1          Red                              0 ⊕
                      2          Green                            0 ⊕
                      3          Blue                             0 ⊕

[ Add ]   [ Delete ]

## What do you want to do?

Control Module as DMX TX Device - Lighting Channel Configuration
Control Module as DMX RX Device - Lighting Channel Configuration

## Control Module as DMX TX Device - Lighting Channel Configuration

⊟ **DMX Device Assignment**

☐ MyDMX RxDevice – (1) ▼

Demand Response:      Level 1 %     Level 2 %     Level 3 %
                      100 ⊕          100 ⊕          100 ⊕

DMX Channel Config:   DMX                                         Value At
                      Chan #     Description                      100% Level
                      1          Red                              255 ⊕
                      2          Green                            0 ⊕
                      3          Blue                             255 ⊕

[ Add ]   [ Delete ]

1. If the Zone's assigned Control Module is DMX capable and Transmit has been selected as the DMX512 Mode in the Control Module's General Settings, then the DMX Device Assignment for TX will appear in the Channel's subsection listings.

2. Press the Add button to append one of the Control Module's child DMX RX devices to the channel's outputs. Use the Combo Box Menu to select amongst the available DMX RX devices.

3. Each added DMX RX device provides configuration options for how it will perform within the Lighting Channel.
   For each DMX channel on each DMX RX device there is a configurable "Value at 100% Level" field. This represents the value, from 0-255, that will be transmitted on that DMX channel when the Lighting Channel's level is at 100%. This can be thought of as a scale factor. For instance, if one enters 255 here, then when the channel level is at 50% the corresponding DMX channel will be transmitting 128 (and similarly, 64 at 25%, and 192 at 75%.) If zero is chosen then the DMX channel will remain "Off" no matter the Channel Level %. In general, the DMX channel value will is given by rounding the following calculation to the nearest whole number: ("Value at 100% Level" × "Channel Level %") ÷ 100.

4. Across the top of each DMX RX Device Lighting Channel configuration there is a row of three demand response setting percentages. These are applicable only if Demand Response has been enabled for the enclosing Lighting Channel. These percentages are the ceiling of the Channel Level % that the DMX RX device is capped at should that Demand Response Level for energy savings be enagaged. The particluar DMX channel values that the DMX RX device's DMX channels would be commanded to in this instance are still governed by the scale factor set on each DMX channel's "Value at 100% Level" field. For example, if Level 3 Demand response was set to 90% and the DMX Channel 1, Red, was still set to 255 for "Value at 100% Level", when Level 3 demand repsonse is enganged, it would limit the DMX from ever rising above

DMX value given at 90% which is 230 ≅ (255 × 90) ÷ 100. For Channel Level percentages from 0% to 90% the DMX channel would still track the same as the example given in Step 3.

5. A final example, in the above screenshot the Red and Blue channels have been set to track out the full range of DMX channel values as the Channel Level tracks from 0% to 100%. Meanwhile, the Green DMX channel will transmit zero no matter what. In practice, this hyptoectical DMX RX device will emit a consistent purple color, growing in luminosity as the channel level rises.

6. When all DMX channels added to the channel are configured as desired along with their RX devices' Demand Response settings (if applicable), then save and send settings.

## Control Module as DMX RX Device - Lighting Channel Configuration

**System:** MySystem, **Zone:** My RX Zone, **Channel:** My RX Channel

⊞ **Switches and Stations** ?
⊞ **Relay Assignment** ?
⊞ **Analog Output Assignment** ?
⊟ **DMX Device Assignment**

DMX Base Address:  1 ▲▼

1. If the Zone's assigned Control Module is DMX capable and Receive has been selected as the DMX512 Mode in the Control Module's General Settings, then the DMX Device Assignment for RX will appear in the Channel's subsection listings.

2. Configure the DMX Base Address field. The value chosen will be the start of a three DMX channel interval that dictates how this Lighting Channel is driven from the transmitting DMX device to which the Control Module is linked.

3. Starting with the base address, the channel will be commanded over DMX as follows:

Base address: Determines whether DMX should be controlling this channel at all presently. Think of this channel as a control wire. DMX Value 0 = Channel not controlled by DMX, i.e. free to be driven by other inputs such as a Station; DMX Value 1-255 = Channel controlled by DMX. (This is necessary because under the hood the DMX protocol is a continuously repeated transmission of the values for each channel in the DMX universe. If this 'control wire channel' was not present, then from an event driven perspective it would impossible to have a channel driven by anything other than DMX exclusively. The DMX channel status and level values would appear to be re-asserting continuously, superseding any contradictory settings registered from button presses from a Station input.) When this DMX channel is 0, the values of the next two DMX channel addresses are ignored by the Lighting Channel.

Base address + 1: Controls the Channel On/Off Status as follows: DMX Value 0 = Channel OFF; DMX Value 1-255 = Channel ON.

Base address + 2: Controls the Channel Level % as scaled from the range of 0-255 to the level % of 0-100. More specifically, the received DMX channel value is converted to Channel Level % as follows ("RXed DMX value" ÷ 255) × 100.

4. Save and send settings.

# Channel: Occupied / Unoccupied Mode

## Blue Ridge Technologies® | Essentials Help

## Overview

These settings regulate channel operation with regards to the Mode. The Mode is determined by the present value of either the Zone's Run Command or Schedule. The present value of those maps to the following interpretation:
Occupied Mode (Run Command/Schedule = Active/1) or Unoccupied Mode (Run Command/Schedule = Inactive/0).
Occupied Mode is the period during which people are expected to be in the building.
Unoccupied Mode is the period during which people are not expected to be in the building.
Take care not to confuse Schedule or Run Command based control with *sensed* occupancy. Sensed occupancy is when a channel's occupancy *condition* can be determined to be either occupied or unoccupied based off of an occupancy sensor, with the lights in the room configured to operate accordingly. See Occupancy Sensors for specifics on how to configure channel occupancy.

Mode Source:  ◉ Remote command   ○ Local schedule   ○ Remote with local schedule fallback
☐ MSV:3300101
OCCUNOCC_MODE_SOURCE_3300101

Transition to Occupied: ○ Manual   ◉ Auto on

Occupied Timer: ☐ On for [ 60 ] minute(s) during occupied mode.    ☐ AV:2130101  TIMER_OCC_2130101

Off Light Level: ☐ [ 0 ] %   ☐ MSV:2140101  OLL_OCC_PCT_2140101

Transition to Unoccupied:

Unoccupied Timer: ☐ On for [ 60 ] minute(s) during unoccupied mode.   ☐ AV:2120101  TIMER_UNOCC_2120101

Off Light Level: ☐ [ 0 ] %   ☐ MSV:2150101  OLL_UNOCC_PCT_2150101

Lights Off Warning: ☐ Blink Lights   ☐ Blink Station Indicators   Lights remain on for [ 5 ] minute(s) after blink.

## What do you want to do?

Configure Mode Source
Configure Transition to Occupied Mode
Configure Occupied Timer
Off Light Level-Occupied
Transition to Unoccupied Mode
Configure Unoccupied Timer
Off Light Level-Unoccupied
Lights Off Warning: Blink Lights and Blink Station Indicators

## Configure Mode Source

Mode Source: ◉ Remote command   ○ Local schedule   ○ Remote with local schedule fallback
☑ MSV:3300101
OCCUNOCC_MODE_SOURCE_3300101

1. Select one of the following mode control sources:

   - *Remote Command* : A write command from a BACnet client to the **Run Command** BACnet point will set the Occupied / Unoccupied Mode. See Run Command for specifics on the required BACnet client configuration.

   - *Local Schedule* : A BACnet Schedule object belonging to the containing Zone, residing on the control module, and informed by the onboard time and date, will set the Occupied / Unoccupied Mode. The schedule itself is optionally editable via BACNet as well as Essentials. See Schedule Settings for specifics on the required configuration.

   - *Remote with Local Schedule Fallback* : A command from a BACnet client to the **Run Command** will set the Occupied / Unoccupied Mode. If a refresh of this command is not received within the duration of the fallback timer, then the local **Schedule** object as informed by the onboard time and date will set the mode. See Run Command and Schedule Settings for specifics on the required BACnet client configuration.

2. Select the BACnet point checkbox to expose a BACnet Multi-state Value (MSV) representing the channel's mode source to the BACnet client as a writable point. This allows configuration of the mode source via BACnet. Possible values to read/write are [0] *Remote*, [1] *Local Schedule*, and [2] *Remote with Local Schedule Fallback*.

3. Save and send settings.

## Configure Transition to Occupied Mode

Transition to Occupied:  ⦿ Manual     ◯ Auto on

1. Select a setting for *Transition to Occupied*. This governs the channel's transition from Unoccupied Mode to Occupied Mode. There are two possible settings for *Transition to Occupied*:

   - *Manual ON* : When transition occurs, the channel assumes *Occupied* timer values but will require another input to transition to ON.

   - *Auto ON* : When transition occurs, the channel assumes *Occupied* timer values and comes ON automatically.

2. Save and send settings.

## Configure Occupied Timer

Occupied Timer: ☑ On for [ 60 ⏷ ] minute(s) during occupied mode.

☑ AV:2130101
TIMER_OCC_2130101

1. Select the *Occupied Timer* checkbox. This option establishes a period (1-1440 minutes, up to 24 hours) during which the channel will remain ON after an occupant uses a switch/station to command the channel, or when the channel has come ON via an Auto On transition from Unoccupied mode to Occupied Mode. Default is 60 minutes. If the timer is not enabled, the channel remains ON indefinitely in Occupied until another event turns it OFF.

2. Select the BACnet point checkbox if applicable. This exposes a BACnet Analog Value (AV) representing the *Occupied Timer* setting to the BACnet client. Possible values to read/write are [1-1440] minutes.

3. Save and send settings.

## Off Light Level-Occupied

Off Light Level: ☑ [ 25 ⏷ ] %

☑ MSV:2140101
OLL_OCC_PCT_2140101

1. Select the *Off Light Level* checkbox. This makes a channel command of OFF only set the lights to the designated % level instead of turning the relay(s) off. This can be used in areas where a certain minimum light level is required throughout occupied mode, such as emergency lighting, but when no one is present it can be lower than usual. When a channel command of ON is invoked, the level will return to the normal ON operation for that mode. The default is 0%.

2. If the *Off Light Level* enable checkbox has been selected, then an additonal checkbox becomes selectable. The rightmost checkbox offers the option to enable the *Off Light Level* percentage as a commandable MSV BACnet point. The point's default is 0% and offers whole number percentage choices from 0% to 100% inclusive.

3. Save and send settings.

This setting is similar to the "When Vacant" setting of Occupancy Sensor, except no occupancy sensor is required for this. Instead, a switch can be used to turn the channel OFF, which will just set the lights to a lower level.

## Transition to Unoccupied Mode

A transition to *Unoccupied Mode* will turn OFF the channel or begin the blink warning if it is enabled, except for one condition. If an occupancy sensor is active, signaling an occupant, the channel will remain ON.

## Configure Unoccupied Timer

Unoccupied Timer: ☑ On for [ 60 ⏷ ] minute(s) during unoccupied mode.

☑ AV:2120101
TIMER_UNOCC_2120101

1. Select the *Unoccupied Timer* checkbox. This option establishes a period (1-1440 minutes, up to 24 hours) during which the channel will remain ON after an occupant uses a switch/station to command the channel. Default is 60 minutes. If the timer is not enabled, the channel remains ON indefinitely in Unoccupied until another event turns it OFF.

2. Select the BACnet point checkbox if applicable. This exposes a BACnet Analog Value (AV) representing the *Occupied Timer* setting to the BACnet client. Possible values to read/write are [1-1440] minutes.

3. Save and send settings.

## Off Light Level-Unoccupied

Off Light Level: ☑ [ 10 ⏷ ] %

☑ MSV:2150101
OLL_UNOCC_PCT_2150101

1. Select the *Off Light Level* checkbox. This makes a channel command of OFF only set the lights to the designated % level instead of turning the relay(s) off. This can be used in areas where a certain minimum light level is required throughout unoccupied mode, such as emergency lighting, but when no one is present it can be lower than usual. When a channel command of ON is invoked, the level will return to the normal ON operation for that mode. The default is 0%.

2. If the *Off Light Level* enable checkbox has been selected, then an additonal checkbox becomes selectable. The rightmost checkbox offers the option to enable the *Off Light Level* percentage as a commandable MSV BACnet point for unoccupied mode. The point's default is 0% and offers whole number percentage choices from 0% to 100% inclusive.

3. Save and send settings.

This setting is similar to the "When Vacant" setting of Occupancy Sensor, except no occupancy sensor is required for this. Instead, a switch can be used to turn the channel OFF, which will just set the lights to a lower level.

## Lights Off Warning: Blink Lights and Blink Station Indicators

Lights Off Warning: ☑ Blink Lights ☑ Blink Station Indicators Lights remain on for [ 5 ▲▼ ] minute(s) after blink.

1. Select the *Blink Lights* and/or *Blink Station Indicators* checkboxes to enable blink alerts to the occupant about the channel going OFF imminently. This can arise out of three situations:

   - First, if the Override Timer has completed its countdown while in the current Mode in which it has been enabled.

   - Second, if the channel is ON in Occupied mode and has an impending transition to Unoccupied Mode upon which the channel will go OFF.

   - Third, if the Channel is ON in Unoccupied mode and has an impending transition to Occupied Mode and the transition policy is Manual On.

   The blink settings begin their execution at the time of the transition. The timer in this section appends itself after the relevant OFF-producing event has occurred or timer has expired. Take note that the lights then remain on for an additional time after the blink settings execute. The *remain on* timer ranges from 1 to 60 minutes, with a default of 5 minutes. The blink options are composed of two components:

   - *Blink Lights*: Blinks lights once prior to mode transition or occupied/unoccupied timer expiration.

   - *Blink Station Indicators*: Blinks station indicators continuously at mode transition or occupied/unoccupied timer expiration.

2. Save and send settings.

# Channel: Occupancy Sensor

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Occupancy Sensors* provide occupant detection for all unified lighting control platforms, using passive infrared technology or a combination of passive infrared and noise detection technology. They can be used to control the lights within that room or zone accordingly. Sensors can be assigned to channels and regulate them based on the sensors' status of occupied or unoccupied.

## What do you want to do?

Configure Sensor Input
Configure Occupied/Unoccupied Mode
Establish Grace Period

## Configure Sensor Input

**Occupancy Sensors**

☐ | UI–00–01 | ▼

[Add]  [Delete]

1. Select a *Sensor Input* to assign the sensor to the channel. Up to thirty-two sensors may be added to a single channel. This menu is populated with Universal Inputs configured as occupancy sensors in the Universal Input section, including ones defined as global from other controllers. The checkbox is used to select sensors for deletion from the channel.

2. Save and send settings.

## Configure Occupied/Unoccupied Mode

| | Enable | On Mode | Early Off | Timeout |
|---|---|---|---|---|

**Occupied Mode:** ☑  ◯ Manual On  ⦿ Auto On  ☑  `30` ⇕ minute(s)  ☑ AV:2100101 OCC_TIMER_OCC_MODE_2100101

☑ Once vacated for `15` ⇕ minute(s) set light level to `50` ⇕ % ☑ then Timeout.

**Unoccupied Mode:** ☑  ◯ Manual On  ⦿ Auto On  `30` ⇕ minute(s)  ☑ AV:2110101 OCC_TIMER_UNOCC_MODE_2110101

☑ Once vacated for `15` ⇕ minute(s) set light level to `50` ⇕ % ☑ then Timeout.

1. Select *Manual On* to prevent this channel from coming on automatically when occupancy is detected. This is typically referred to as a *Vacancy Sensor*.

2. Select *Auto On* to set this channel to come on automatically when occupancy is detected.

3. Select *Early Off* if applicable. When activated, if the occupancy sensor timeout is in progress due to vacancy and a transition to Unoccupied Mode occurs, the *Timeout* will be cancelled and the channel will turn OFF. Refer to Occupied Mode / Unoccupied Mode for more information.

4. Set a *Timeout* period. When vacancy is detected, timeout is the period (1-240 minutes) until the channel turns OFF. Default is 30 minutes.

5. Select the *BACnet* checkbox if applicable to expose a BACnet Analog Value (AV) representing occupancy sensing's timeout setting to the BACnet client. Possible values to read/write are [1-240].

6. Select the *Once Vacated* checkbox if applicable. When enabled, if the occupancy sensor detects vacancy for the designated duration (1-240 minutes), the channel will dim to the designated light level (1-100%). Defaults are 15 minutes and 50%.

7. Select the *then Timeout* checkbox if applicable. When *then Timeout* is enabled, once the channel has dimmed to the designated light level, the occupancy sensor timeout will begin and turn the channel OFF upon expiration. If this is not selected, the light will remain ON until a transition to Unoccupied occurs, or a switch is used to turn the light off.

8. Save and send settings.

## Establish Grace Period

Grace Period: ☑ Grace Period allowed for `1` ⇕ minute(s)

1. Select *Grace Period* if applicable. When enabled, the occupant has a designated period (1-60 minutes) after the channel turns OFF due to vacancy detection to make a motion to re-establish sensed occupancy and turn the channel back ON automatically. This is only available when *Manual mode* is selected. It is not applicable in *Auto mode*, as the channel would turn back ON automatically upon sensed occupancy. The default is 1 minute.

2. Save and send settings.

# Channel: Daylight Harvesting

**Blue Ridge Technologies® | Essentials Help**

## Overview

Daylight harvesting adjusts the fixture light level in response to changes in the daylight level. This achieves energy savings by decreasing the artificial light level as the daylight level increases. There are two daylight harvesting strategies from which to choose:

1. Closed Loop : The total light level, both daylight and artificial, is sensed, and the controller continually adjusts the channel's level to maintain total light at a user defined setpoint.

2. Open Loop : The daylight level is sensed and the controller adjusts the channel level in proportion. The daylight to channel level proportion is calculated according to the user defined values *Available Daylight Max* and *Available Daylight Min*.

Additionally, there are two set-point modes from which to choose:

1. Comfort Based Setpoint : While the channel is ON, the occupant sets a channel level with an up or down adjustment on a raise/lower station. Once the occupant defines a channel level, a reading from the assigned light sensor input is taken. For closed loop strategies, a total light level reading is stored as the light level to maintain. For open loop strategies, the channel level and a daylight level reading are employed by the controller to calculate the daylight to channel level proportion.

2. Fixed Setpoint : The building operator writes a channel level from a BACnet client to the BACnet analog value (AV) that defines the fixed setpoint. For closed loop strategies, the setpoint is stored as the light level to maintain. For open loop strategies, the channel level and a daylight level reading are employed by the controller to calculate the daylight to channel level proportion. The Fixed Setpoint may also be used as an initial setpoint until an installation is finished with Raise/Lower stations.

Finally, a setpoint tolerance may be defined. While the channel is ON, the controller will adjust the channel level so that it is within the tolerance.

## What do you want to do?

Enable in Occupied/Unoccupied Mode
Configure Closed Loop Daylight Harvesting
Configure Open Loop Daylight Harvesting
Determining Settings for a Room

## Enable in Occupied/Unoccupied Mode

Enable: ☑ In Occupied Mode ☑ In Unoccupied Mode

1. Select the *In Occupied Mode* and/or *In Unoccupied Mode* checkboxes to enable Daylight Harvesting in either Occupied or Unoccupied Mode or both. See Occupied Mode / Unoccupied Mode for reference to these modes.

2. Save and send settings.

## Configure Closed Loop Daylight Harvesting

Light Sensor Input: [ Sample DLH Sensor [UI-01-01] ▼ ]    –

Type: ◉ Closed Loop  ◯ Open Loop

Setpoint: [ 0 ▲▼ ] fc  ☐ AV:2200101
DAY_HARVEST_SETPT_2200101

Channel Off Level: ☐ [ 0 ▲▼ ] %

Ramp Rate: Ramp [ 1 ▲▼ ] % every [ 10 ▲▼ ] second(s) until within [ 10 ▲▼ ] % of setpoint.
☑ MSV:2210101              ☑ AV:2220101                  ☑ MSV:2230101
DLH_RAMP_STEP_PCT_2210101    DLH_RAMP_PERIOD_SECS_2220101    DLH_RAMP_AFFORD_PCT_2230101

1. Select the desired light sensor input from the drop-down list. If the desired input is missing from the list, go to Universal Inputs to configure it.

2. Select the *Closed Loop* radio button.

3. Configure the *Setpoint* in the editor. The *Setpoint* is used to guide the channel to a level where the combined total of sensed natural and artifical light will be nearly equal to the setpoint.
A *Fixed Setpoint* is used when there is no Raise/Lower station assigned to the channel. The *Fixed Setpoint* will be set initially in Essentials, and then can be optionally maintained through BACnet.
A *Comfort Based Setpoint* in contrast, will be set initially by Essentails but thereafter by the use of a Raise/Lower station. For information on Station assignments, see Channel: Switches and Stations. If setpoint maintenance over BACnet is desired, click the checkbox to enabled a writable BACnet AV point.
The units for the setpoint are determined by those chosen for UI light sensor, either foot candles (fc) or lux (lx). The setpoint's range is equal to what has been configured for light sensor in UI settings, and the default setting is the light sensor's minimum reading.

4. Enable and set the Channel Off Level percentage if desired. Channel Off Level is an additional energy saving daylight harvesting feature that works as follows. If the channel level is driven to a level at or below the Channel Off Level percentage while endeavoring to guide the light sensor reading to the setpoint, the channel's lights are shut off. Later, if the light sensor reads below the setpoint, the channel level is moved upward from the Channel Off Level and the channel's lights are turned back on.
To further clarify, the energy savings in this feature are achieved by cutting the power to the AOs by turning off the ROs supplying them. During this condition, the Channel Status will still read ON, and the Channel Level will be set at the Channel Off Level percentage. Conversely, when daylight harvesting dictates that the channel level move back above Channel Off Level threshold, the ROs are turned back ON, resupplying the AOs.

5. Adjust the daylight harvesting parameters. The ramp rate, ramp period, and affordance percentage can be used to tune daylight harvesting behavior to one's preference. The first two parameters, with defaults of 1% and 10 seconds respectively, determine how quickly the artificial light level changes in response to a change in sensed light level. The third parameter is the affordance percentage, both above and below the setpoint, where daylight harvesting may cease adjusting the artificial light level once 'close enough' to the setpoint in percentage terms. The default is 10%. These default values have been found to be effective for most operations; avoiding jarring large light changes for the occupants, while still achieving energy savings. Finally, all three of these tuning parameters may be enabled as BACnet points which allows for their further maintenance over BACnet.

6. Save and send settings.


## Configure Open Loop Daylight Harvesting

Light Sensor Input: Sample DLH Sensor [UI-01-01] ▼ _

Type: ◯ Closed Loop  ⦿ Open Loop

Available Daylight **Max**: 75 ⇕ fc

Available Daylight **Min**: 300 ⇕ fc  ☐ AV:2200101
DAY_HARVEST_SETPT_2200101

Channel Off Level: ☐ 0 ⇕ %

Ramp Rate: Ramp 1 ⇕ % every 10 ⇕ second(s) until within 10 ⇕ % of setpoint.
☑ MSV:2210101          ☑ AV:2220101          ☑ MSV:2230101
DLH_RAMP_STEP_PCT_2210101    DLH_RAMP_PERIOD_SECS_2220101    DLH_RAMP_AFFORD_PCT_2230101

1. Select the desired light sensor input from the drop-down list. If the desired input is missing from the list, go to Universal Inputs to configure it.

2. Select the *Open Loop* radio button.

3. Configure the *Available Daylight Max* and the *Available Daylight Min* fields in the editor. Together these comprise the horizontal components of two points on a line along which the channel level will be adjusted based on the light sensor's reading.
The line graph below uses the values from the configuration above. The x-axis is the light sensor reading in fc, while the y-axis is the channel level %. The graph is a concrete example to help develop an intuiton about the behavior and configuration of Open Loop daylight harvesting.

*Available Daylight Max* is the available sensed daylight when the channel is at its maximum level (i.e. 100%.)
This value should be set to the highest sensed light level at which the channel level should be 100%.
Following that logic, any sensor reading *less* than *Available Daylight Max* would imply a maintained channel level of 100%.
In the graph below, this implies that to the left of the vertical y-axis bounding the graph's left side, the blue line continues as a flat (zero-slope) line at Channel Level 100% for fc readings between 75 and 0.
On the other hand, sensor readings *greater* than *Available Daylight Max* would cause the channel level to go down as an increasing sensed natural light contribution lessens the need for an artificial light contribution from the channel.
Put yet one last way, and as offered below in Determining Settings for a Room: Open Loop Available Daylight Max Calibration, the value will often be the sensor reading recorded when it is dark outside and the channel level is dimmed up to 100%.

*Available Daylight Min*, conversely, is the available sensed daylight when the channel is at its minimum level (i.e. 0%.)
This value should be set to the lowest sensed light level at which the channel level should be 0%.
Following that logic, any reading *greater* than *Available Daylight Min* would imply channel level of 0%.
In the graph below, this implies that in the unseen continuation of the graph along the x-axis the line continues, but now as a flat (zero-slope) line at channel level 0% for fc readings from 300 and up to the sensor's maximum.
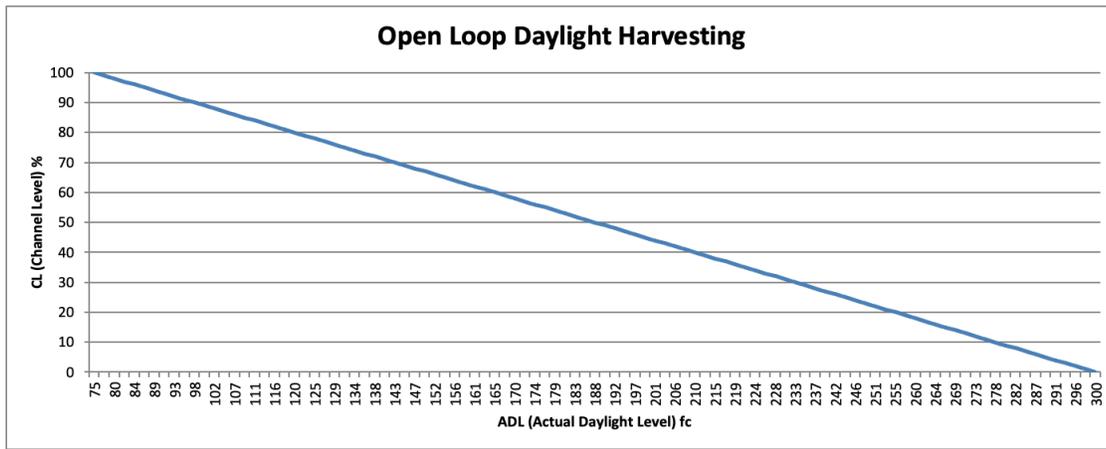On the other hand, sensor readings *less* than *Available Daylight Min* would cause the channel level to go up as a decreasing sensed natural light contribution increases the need for an artificial light contribution from the channel.

As one can see, the line is always going to have a negative, or declining from left-to-right, slope. The greater the difference between the *Available Daylight Max* and the larger *Available Daylight Min* value, the slower the channel lights will dim as the contribution of natural light to the sensor reading increases.

The first of the two points used to define the line is thus at *(75fc, 100%)*.
The second of the two points used to define the line is thus at *(300fc, 0%)*.
*Available Daylight Min* will always be greater than *Available Daylight Max*.

**Open Loop Daylight Harvesting**

*Y-axis: CL (Channel Level) %* — 0 to 100

*X-axis: ADL (Actual Daylight Level) fc* — 75, 80, 84, 89, 93, 98, 102, 107, 111, 116, 120, 125, 129, 134, 138, 143, 147, 152, 156, 161, 165, 170, 174, 179, 183, 188, 192, 197, 201, 206, 210, 215, 219, 224, 228, 233, 237, 242, 246, 251, 255, 260, 264, 269, 273, 278, 282, 287, 291, 296, 300

4. Adjust the daylight harvesting parameters.
   The ramp rate, ramp period, and affordance percentage can be used to tune daylight harvesting behavior to one's preference. The first two parameters, with defaults of 1% and 10 seconds respectively, determine how quickly the artificial light level changes in response to a change in sensed light level. The third parameter is the affordance percentage, both above and below the setpoint, where daylight harvesting may cease adjusting the artificial light level once 'close enough' to the setpoint in percentage terms. The default is 10%. These default values have been found to be effective for most operations; avoiding jarring large light changes for the occupants, while still achieving energy savings. Finally, all three of these tuning parameters may be enabled as BACnet points which allows for their further adjustment over BACnet.

5. Save and send settings.

## Determining Settings for a Room

To determine settings for a room, the first step would be to check, with no natural daylight, the brightness of the fixtures and set the *Trim* if needed. The Trim feature of the Analog Outputs limits the min and max level to which the output may be driven.

Now that the trim is set, if a comfort based (user set) setpoint is used, the setup is complete. The user will use the Raise/Lower station to set their comfort level, and the system will maintain the level.

### Closed Loop—Setpoint determination

A *Fixed Setpoint* in a system is used when there is not a Raise/Lower station within the room.

This may be set at the same time as setting the trim, described above. To find the setpoint this way, once the trim value is found for full output, use the reading of the light sensor as the setpoint. This will maintain the lights at the full *Trimmed* level.

Alternatively, if a specific light reading is called out in the specifications, a light meter will be needed to find the setpoint.

1. The light reading should be taken at an appropriate height, such as on a desk, with the meter facing the lights.
2. Dim the lights until the meter reads the specified level.
3. After about 10 seconds, get the reading of the light sensor. This reading will be the setpoint to maintain the correct level of luminosity in the room.

### Open Loop—Available Daylight Max Calibration

To find the *Available Daylight Max* value one must find the point where the natural daylight begins to affect the room. This is best achieved with a light meter.

1. The test should be done in the morning before the natural light begins to affect the room.
2. The light reading should be taken at an appropriate height, such as on a desk, with the meter facing the lights.
3. With the lights set to the full trimmed level, get a reading from the light meter.
4. As the sun rises, watch for a change in the reading from the light meter. A change of 2-3 units should be enough.
5. Get the reading from the room's light sensor, and use this value as the Available Daylight Max value.

Thereafter, as more light filters into the room, the lights will begin to dim to maintain the appropriate level.

### Open Loop—Available Daylight Min Calibration

This is the second component of Open Loop design and will determine how steeply the channel level will dim down as the contribution from natural light increases. This value in light sensor units will always be greater than the value of *Available Daylight Max*. The greater the difference, the slower the artificial light will be dimmed as the sensor reading increases.

When the light sensor reads at this setpoint value and above, the lights will be held dimmed to 0%. One should pick the minimum light sensor value for which occupants are be comfortable with only natural light contributing to the light sensor reading.

# Channel: Light Sensor Control

**Blue Ridge Technologies® | Essentials Help**

## Overview

Light sensors provide the ability to detect a channel's ambient light level. A light sensor may be assigned to a channel to regulate its ON/OFF status based on the defined settings below.

## What do you want to do?

Configure Sensor Input
Configure Occupied/Unoccupied Mode

## Configure Sensor Input

Light Sensor Input: [ UI–00–01 ▼ ]

1. *Light Sensor Input* : This menu is populated with universal inputs configured as light sensors in the Universal Input section, including those from other controllers that are set to global. Select a sensor input to assign the sensor to the channel.

2. Save and send settings.

## Configure Occupied/Unoccupied Mode

|  | Enable | On Below |  | Off Above |  |
|---|---|---|---|---|---|
| Occupied Mode: | ✔ | 40 fc | 50 | fc, but only after 'ON' for | 5 minute(s) |
| Unoccupied Mode: | ✔ | 40 fc | 50 | fc, but only after 'ON' for | 5 minute(s) |

For Light Sensor Control to begin controlling channel behavior, the channel must be turned ON. This can be from a switch, station, schedule, run command, or occupancy sensor (collectively, occupant interaction.) Once the channel has been turned on, Light Sensor Control will turn the associated lights on and off according to its settings. If occupant interaction is used to turn the channel OFF, Light Sensor Control will be disabled until the channel is turned back ON.

When enabled, the light sensor assigned to the channel will operate according to the following selected settings:

1. Select the *Enable* checkbox for the mode(s) that you wish to configure.

2. Using the *On Below* spinner, establish a level in foot-candles or lux, based on unit configuration in Universal Inputs, at which the lights on the channel will automatically turn ON if the sensed light level falls below the given threshold. This is useful in a situation such as night time, where the ambient light level on the channel is not sufficient on its own.

3. Using the *Off Above* spinner, establish a level in foot-candles or lux, based on unit configuration in Universal Inputs, at which the lights in the room or zone will automatically turn OFF if the sensed light level exceeds the given threshold. This is useful when the daylight in the room or zone is sufficient and the lights in the room are not necessary.

4. The timer establishes a dead-zone in minutes (0-240) during which the channel will remain ON following activation via a switch, station, schedule, run command, or occupancy sensor (collectively, occupant interaction), regardless of *Off Above* settings. This is used to prevent the lights from turning directly back off in instances where they are turned on and then immediately exceed the sensor's *Off Above* threshold. The default setting is 0, which itself is a special case. If the channel is activated by occupant interaction, the sensor reading is checked before turning the channel ON. If it exceeds the *Off Above* setting, then the channel remains OFF, instead of executing a jarringly rapid on and then off. The channel's status will remain as OFF, attributed to Light Sensor Control. Light Sensor Control remains in force thereafter though. That is, if the sensor value subsequently drops below the *On Below* theshold, the channel will go ON.

5. Save and send settings.

# Channel: Demand Response

## Overview

*Demand Response* provides the tools to adminster energy consumption behavior via Essentials or a BACnet front end. Blue Ridge's implementation of Demand Response provides a Multi-state Value (MSV) BACnet Point to command the Demand Response level of the entire channel. The point itself must be enabled in order to unlock the rest of the channel's Demand response functionality.

The MSV has four possible settings: "Level 1", "Level 2", "Level 3", and "No Level".

"No Level" is the default and indicates Demand Response is not engaged. While "No Level" is engaged the channel will continue to function according to its obligations in other channel sequence sections.

"Level 1", "Level 2", and "Level 3" are, in escalating order, the stages of Demand Response. Generally, the energy savings are meant to increase with the level, meaning lower ceilings and suppressed outputs.

Manage Level: ☑ MSV:3200101 DEMAND_RESPONSE_LEVEL_3200101

| | Level 1 | Level 2 | Level 3 | Visible via BACnet | | |
|---|---|---|---|---|---|---|
| ROs & DOs suppressed: | ☐ | ☐ | ☑ | BV:3210101 CH_DMND_RESP_LVL_1_BIN_3210101 | BV:3220101 CH_DMND_RESP_LVL_2_BIN_3220101 | BV:3230101 CH_DMND_RESP_LVL_3_BIN_3230101 |
| AO ceiling: | 95 % | 85 % | 75 % | MSV:3210101 CH_DMND_RESP_LVL_1_PCT_3210101 | MSV:3220101 CH_DMND_RESP_LVL_2_PCT_3220101 | MSV:3230101 CH_DMND_RESP_LVL_3_PCT_3230101 |

## What do you want to do?

Expose Demand Response for BACnet Clients
Specify Binary Outputs' Demand Response Behavior
Expose Binary Outputs' Demand Response Behavior for BACnet Clients
Specify Analog Outputs' Demand Response Behavior
Expose Analog Outputs' Demand Response Behavior for BACnet Clients

## Expose Demand Response For BACnet Clients

Manage Level: ☑ MSV:3200101 DEMAND_RESPONSE_LEVEL_3200101

1. Check the Manage Level checkbox.

2. Refer to the Binary Outputs' Behavior section for more information on how the Demand Response level affects Relay and Digital Outputs.

3. Refer to the Analog Outputs' Behavior section for more information on how the Demand Response level affects Analog Outputs.

4. Save and send settings.

## Specify Binary Outputs' Demand Response Behavior

| | Level 1 | Level 2 | Level 3 |
|---|---|---|---|
| ROs & DOs suppressed: | ☐ | ☑ | ☑ |

These settings specify the ensemble behavior for all binary outputs within a channel. Binary outputs are Relay Outputs and Digital Outputs.

Checking the box in the column for a given level means that when Demand Response is set to that level, the Binary Outputs will be suppressed. For example, if they were ON and the level is engaged, they will be turned OFF. If they were OFF while at that level, attempts to turn them ON by other means, e.g. a Station Button Press, will have no effect on their state.

By convention, as the Demand Response level rises the energy consumption is reduced. That means if the binary outputs are suppressed at a given level, one would expect them to be suppressed at all higher Demand Response levels as well. That said, it is not expressly forbidden to do otherwise in Essentials or BACnet.

It bears mentioning that the suppression of binary outputs does not affect the channel status seen in BACnet or Essentials' Channel Status sub-panels. Demand Response is an override of a class of outputs and does not affect the overall status of the containing channel. The binary outputs will return to the status prescribed by the channel upon cessation of Demand Response.

1. Check the box in the *Level* columns for which the channel should suppress ROs and DOs.

2. Refer to the Binary Outputs' Demand Response Behavior for BACnet Clients section for more information of how the checkbox settings interact with their respective BACnet points.

3. Save and send settings.

## Expose Binary Outputs' Demand Response Behavior for BACnet Clients

Visible via BACnet

☑ BV:3210101                         BV:3220101                         BV:3230101
  CH_DMND_RESP_LVL_1_BIN_3210101 CH_DMND_RESP_LVL_2_BIN_3220101 CH_DMND_RESP_LVL_3_BIN_3230101

This setting is used to enable three Binary Value (BV) BACnet points that correspond to the Binary Outputs' Demand Response Behavior found immediately to their left.

The BV point starting with 321 sets the behavior for "Level 1".
The BV point starting with 322 sets the behavior for "Level 2".
The BV point starting with 323 sets the behavior for "Level 3".

If the BV point's present value is TRUE(1) it is the equivalent of having the corresponding checkbox checked. The channel's binary outputs will be suppressed when that Demand Response level is engaged via the Demand Response Level MSV.

Enabling this set of points via send settings will also place the choices in the checkboxes to the left of this setting at priority 16 of the corresponding BACnet Point's priority array for the purposes of computing the point's present value. Any subsequent send settings will re-establish the values represented by the checkboxes (✔ == TRUE; Unchecked == FALSE) and clear out any non-NULL values that have been entered elsewhere in the priority array.

1. Check the Visible Via BACnet checkbox.

2. Save and send settings.

## Specify Analog Outputs' Demand Response Behavior

AO ceiling:   95 ⏶⏷ %   85 ⏶⏷ %   75 ⏶⏷ %

These settings specify the ensemble behavior for all Analog Outputs within a channel.

Settings the percentage of the cell in the column for a given level means that when Demand Response is set to that level, the Analog Outputs will be limited to that output percantage as a ceiling. For example, if outputs exceed the ceiling for a level and the level is engaged, they will be dimmed to that level. If they were below that ceiling while at that level, attempts to dim them above that by other means, e.g. a Station Button Press, will only take them as far as the ceiling.

By convention, as the Demand Response level rises the energy consumption is reduced. That means that if the outputs are ceilinged at a certain percentage for a given level, one would expect the ceiling to be equal or less at higher Demand Response levels. That said, it is not expressly forbidden to do otherwise in Essentials or BACnet.

It bears mentioning that the ceiling level of analog outputs does not affect the overall channel level seen in BACnet or Essentials' channel status subpanel. Demand Response is overriding the behavior of a class of outputs and does not change the level the containing channel. The analog outputs will return to the level prescribed by the channel upon cessation of Demand Response.

1. Set the percentage for the ceiling output for AOs in each Level column. The default is 100% i.e. uninhibited operation.

2. Refer to the Analog Outputs' Demand Response Behavior for BACnet Clients section for more information of how the percentage cells interact with their respective BACnet points.

3. Save and send settings.

## Expose Analog Outputs' Demand Response Behavior for BACnet Clients

☑ MSV:3210101                        MSV:3220101                        MSV:3230101
  CH_DMND_RESP_LVL_1_PCT_3210101 CH_DMND_RESP_LVL_2_PCT_3220101 CH_DMND_RESP_LVL_3_PCT_3230101

This setting is used to enable three Multi-state Value (MSV) BACnet points that correspond to the Analog Outputs' Demand Response Behavior found immediately to their left.

The MSV point starting with 321 sets the behavior for "Level 1".
The MSV point starting with 322 sets the behavior for "Level 2".
The MSV point starting with 323 sets the behavior for "Level 3".

These MSVs have 101 states. Each state corresponds to a percent, from 0 to 100 inclusive. So 1 = "1Pct", 2 = "2Pct", etc.. Of note: MSVs do not accept 0 as a legal value, so "0Pct" is achieved with the value 101. A point's present value determines the ceiling percentage for AOs at that Demand Response level. The channel's Analog Outputs will be limited to that ceiling when the Demand Response level is engaged via the Demand Response Level MSV.

Enabling this set of points via send settings will also place the choices in the AO Ceiling cells to the left of this setting at priority 16 of the corresponding BACnet point's priority array for the purposes of computing the point's present value. Any subsequent send settings will re-establish the values set in the AO Ceiling cells and clear out any non-NULL values that have been entered elsewhere in the priority array.

1. Check the Visible Via BACnet checkbox.

2. Save and send settings.

# Channel: Initial Light Level

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Initial Light Level* offers settings that determine the output level of a channel after a change to a new mode or upon being turned ON.

## What do you want to do?

Set Initial Light Level with Light Level Priority
Set Initial Light Level with Energy Savings Priority

## Set Initial Light Level with Light Level Priority

Occupied: ☑ Set initial light level to [50 ▲▼] % with [Light Level ▼] priority ☑ BV:2300102 ILL_OCC_ENABLE_2300102

Unoccupied: ☑ Set initial light level to [50 ▲▼] % with [Light Level ▼] priority ☑ BV:2310102 ILL_UNOCC_ENABLE_2310102

1. If desired, enable the *Set initial light level to __% with Light Level priority* setting. This setting can be set independently for each of Occupied Mode and Unoccupied Mode. When this setting is enabled, the channel will always turn ON at the defined initial light level with one exception:

   - If the channel is turned ON during a Grace Period, the channel will return to the previous level.

2. If desired, check the rightmost checkbox in the row to enable a commandable BV BACnet point. This point will allow for maitenance of the Enable ILL setting (the leftmost checkbox in a row) over BACnet. 1 is enable, 0 is disable, with 0 being the default, though upon send settings the point's present value will always match that of the Enable ILL checkbox for the row. The ILL priority choice and percentage remain Essentials-only parameters.

3. Save and send settings.

## Set Initial Light Level with Energy Savings Priority

Occupied: ☑ Set initial light level to [50 ▲▼] % with [Energy Savings ▼] priority ☑ BV:2300102 ILL_OCC_ENABLE_2300102

Unoccupied: ☑ Set initial light level to [50 ▲▼] % with [Energy Savings ▼] priority ☑ BV:2310102 ILL_UNOCC_ENABLE_2310102

1. If necessary, enable the *Set initial light level to __% with Energy Savings* setting. This setting can also be set independently for each of Occupied Mode and Unoccupied Mode. When this setting is enabled, the channel will turn ON at the lower level of either the last light level used before turning OFF or the initial light level chosen here.

2. If desired, check the rightmost checkbox in the row to enable a commandable BV BACnet point. This point will allow for maitenance of the Enable ILL setting (the leftmost checkbox in a row) over BACnet. 1 is enable, 0 is disable, with 0 being the default, though upon send settings the point's present value will always match that of the Enable ILL checkbox for the row. The ILL priority choice and percentage remain Essentials-only parameters.

3. Save and send settings.

# Channel: Emergency Override

**Blue Ridge Technologies® | Essentials Help**

## Overview

*Emergency Override* establishes a Maintained Input or BACnet Binary Value point relationship with the channel that will override all other settings. When a channel's emergency override is engaged the lights will be commanded to the override settings with all other options being suppressed until the override is disengaged.

None: ⚪

BACnet: ⦿ BV:3250101
EMERGENCY_OVERRIDE_3250101

Input: ⚪ Example EO Sensor [UI-02-01] ▾

Actions: ☑ Turn all relays and digital outputs  On ▾

☑ Set all analog outputs to  100 ▴▾ %

## What do you want to do?

Select BACnet Override Option
Select Maintained Input Option
Adjust Override Options

## Select BACnet Override Option

BACnet: ⦿ BV:3250101
EMERGENCY_OVERRIDE_3250101

1. To choose a BACnet Binary Value point as the Emergency Override, select the *BACnet* radio button. This will expose a BACnet Binary Value (BV) shown to the right for BACnet clients to command.

2. To remove the BACnet point from existence, select the *None* radio button.

3. Save and send settings.

## Select Maintained Input Option

Input: ⦿ Example EO Sensor [UI-02-01] ▾

1. To choose a Maintained Input as Emergency Override, click the *Input* radio button. This will allow the selection of any input that is designated as a Maintained type on the Universal Input or Digital Input sections of Modules on the Physical Tab.

2. To delete a Maintained Input Emergency Override, select the *None* radio button.

3. Save and send settings.

## Adjust Override Options

Actions: ☑ Turn all relays and digital outputs  On ▾

☑ Set all analog outputs to  100 ▴▾ %

1. To have the *Emergency Override* force the action of all assigned relays and/or digital outputs to *On* or *Off* select the check box for this and using the drop down select either On or Off.

2. To have the *Emergency Override* force all assigned analog outputs to be driven to a given percentage select this the check box, and using the spinner box, enter the value for the desired light level percentage.

3. Save and send settings.

# System: BACnet View

**Blue Ridge Technologies® | Essentials**
**Help**

## Overview

| Logical | Physical | BACnet |
|---------|----------|--------|

The *BACnet* view can be selected by choosing it in the left columnar panel.

The BACnet view will list all of the points that have been chosen for exposure over BACnet across the entire system.
These points are grouped by Control Module, and further ordered by whether they represent items from the physical tree tab (e.g. I/O, Station buttons), logical tree (e.g. Zone and Channel properties), and type (e.g. BV, AV, MSV, Schedule, etc.).
The minimum number of points for a given Control Module is 1: the BACnet Device Object representing the Control Module itself, must always be present.
The maximum number varies but can number in the hundreds for a Control Module with many I/O Modules, Stations, Zones, and Channels, where the choice has been made via checkbox to expose many points of interest.

This view provides provides a helpful consolidated listing of those exposed points, as the very simple example below demonstrates.

BACnet Points of New System: [ Export all to CSV ] ☐ Include unexposed points

Device: **CM32_DEVICE_OBJECT_1320001**, DEVICE:1320001 has 4 points [ Export to CSV ] ☐ Include unexposed points

 DEVICE:1320001, **CM32_DEVICE_OBJECT_1320001**

 BV:3000100, **RUN_COMMAND_3000100**

 BV:2000101, **CHANNEL_STATUS_2000101**

 AV:2010101, **CHANNEL_LEVEL_2010101**

Device: **CM32_DEVICE_OBJECT_1320002**, DEVICE:1320002 has 6 points [ Export to CSV ] ☐ Include unexposed points

 DEVICE:1320002, **CM32_DEVICE_OBJECT_1320002**

 BV:1400001, **IOM_CAN_STATUS_1400001**

 BV:1400002, **IOM_CAN_STATUS_1400002**

 BV:3000100, **RUN_COMMAND_3000100**

 BV:2000101, **CHANNEL_STATUS_2000101**

 AV:2010101, **CHANNEL_LEVEL_2010101**

In addition to providing a listing of the points within Essentials, the option of exporting to a CSV (comma seperated value) file is available.
This file may in turn be opened in one's preferred spreadsheet viewer (MS Excel, Google Sheets, etc.) or imported to a database.

When the "Export to CSV" button is clicked next to a given device, a CSV file named with the device object's ID number followed by the current timestamp, will be saved to the user's Desktop. The CSV file contains several additional metadata columns to help sort and identify the points further. If one checks the "Include unexposed points" box, then when clicking the Export button, in addition to what is seen already in the BACnet tab view, all latent unexposed points will be included in the generated file. There is an additional column in the exported CSV file denoting whether a given point is exposed or not. For instance, this might include all of the Zones' Schedule objects or various timers in the Channels that are not enabled by default.

Finally, one may choose "Export All", located at the top of the Panel to the right of the System's name. This action will create a CSV for each of the control modules with the naming convention described previously. It will then take all of those files and place them in a compressed .zip file on the user's Desktop named with the system file name followed by the timestamp at the time of creation.