

Tunable White Dimming Controller ELED2

Programming Guide



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Document Conventions

This document includes the following conventions to draw attention to important information.



Note: *Notes are helpful hints or information that supplement the main content.*

Echoflex's user documentation is designed for print or electronic use. Benefits to using the electronic format include using the table of contents to jump to a desired page by clicking on the heading or using word search to find a specific topic.

Cross references highlighted in this document are links to the referenced section of the guide.

Configuration parameters are emphasized throughout the guides content in *italics*. Additionally, button and switch actions (ON/OFF) and relay events (lights ON/OFF) are emphasized throughout this guide in ALL CAPS.

This guide is available for free download from Echoflex Solutions website: www.echoflexsolutions.com

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Table of Contents

Document Conventions.....	2
Introduction	
Tunable-White LED Applications	2
Dim-to-Warm Operation.....	2
Explicit Color Control Operation	2
Automated Color Tuning Operation	3
Characterized Color Tuning Operation.....	3
Overview	
Radio Communications	4
Dimming Output	4
Tunable-white Output.....	5
Near-Cross Relay Technology	5
Radio Range Confirmation	5
Switch Station Operation.....	6
Dimming Functions.....	6
Color Tuning Functions	6
Timed Switches	6
Occupancy Based Lighting Applications	7
Grace Timer.....	7
Dual Technology Occupancy Sensors.....	7
Occupancy Sensors and Partial-ON	7
Occupancy Sensors and Partial-OFF.....	8
Occupancy Sensors with Switches	8
Daylight Harvesting Application	9
Daylighting Control Override.....	9
Closed Loop Daylighting Control	9
Open Loop Control.....	10
Tunable-white Control	12
Closed Loop Control of Tunable-white	12
Open Loop Control of Tunable-white	12

Controller Button Interface

Linking the First Switch	13
LEARN button	13
CLEAR button	14
Power LED and Learn LED	14
Disabling the User Interface LEDs	14

Configuring the Controller

Simple Tap™ Instructions	16
Enable/Disable the Repeater Function	17
Enable/Disable the Status Telegram	17
Setting Partial-ON.....	17
Setting Partial-OFF	18
Set the Occupancy Sensor Auto-OFF timer	19
Save State.....	19
Set the Closed Loop Daylighting Set Point	20
Set the Open Loop Daylighting Set Point	20
Set the CCT Closed Loop Set Point	21

Appendix A

LED Blink Codes and Operation	22
-------------------------------------	----

Appendix B

Status Feedback Telegram - Dimming Channel	24
Status Feedback Telegram - Tunable-white Channel.....	25

Agency Listings and Regulatory Statements..... 26

Safety	26
Energy Code Compliance	26
Safety Standards Load Ratings.....	26

Introduction

The ELED2 is a wireless lighting controller providing two 0-10V output channels. Channel one is for dimming intensity control and channel two is for tunable-white color control.

Channel one is referred to as the dimming channel throughout this document. The dimming output is the purple wire with red stripe. The dimming channel uses a red LED to indicate linked devices.

Channel two is referred to as the tunable-white channel throughout this document. The tunable-white output is the purple wire with green stripe. The tunable-white channel uses a green LED to indicate linked devices.

When a set point for the tunable-white channel is being provided by another device such as a gateway or outdoor correlated color temperature (CCT) sensor, a blue LED will indicate the linked devices.

The ELED2 is designed for open office spaces, classrooms, boardrooms, and conference rooms where intensity and tunable-white color temperature control are required. The controller operates lights intensity and tunable-white color, based on occupancy state, manual switch action, ambient light levels and gateway commands - implemented through either scheduled events or network overrides. Built-in intuitive application control begins with automating lights on and off through occupancy control when only occupancy sensors are linked. Daylighting control of fixture intensity can be quickly setup in either open or close loop scenarios. Energy code compliance is defined within factory defaults including occupancy partial on and partial off requirements.

Tunable-White LED Applications

The ELED2 supports a number of applications for control of tunable-white fixtures.

Dim-to-Warm Operation

This mode is operational when you have at least one switch station linked to the dimming channel and no devices linked to the tunable-white channel or set point input. The light intensity channel and tunable-white channel will track up and down together in this mode. As a user fades the lights up, the fixture color will increase towards a cooler temperature. When fading the lights down, the fixture color will increase towards a warmer temperature.

Dim-to-warm mode will operate with occupancy sensors, daylight sensors and gateways when linked to the dimming channel.

Explicit Color Control Operation

When you have a switch station linked to the tunable-white channel it will provide manual control over the fixtures color temperature output. This allows users to set a color level manually and have it maintained or modulate the color by pressing the ON or OFF buttons on the station. Pressing the ON or OFF paddle will ramp the color up (cooler) or down (warmer). A quick click on the button will "bump" the output up or down a small amount.

A gateway command can also be linked to the tunable-white channel allowing other devices to control the fixture color.

Automated Color Tuning Operation

Similar to explicit color control operation, this operating mode has the addition of using a color temperature sensor (like the Echoflex TAP-41 sensor) to provide feedback from the controlled space. The controller compares the sensor value to a CCT set point and modulates the color-tuning channel to drive the sensor value towards the set point.

example: The sensor reports a value of 3200K. The set point is 3500K. The controllers tunable-white output will increase slowly until the sensor value is within range of 3500 K.

Further functionality of this operating mode is the option to include a dynamic set point. By linking a gateway command or outdoor color temperature sensor (like the Echoflex FLS-41 sensor) to the set point input, the desired color temperature within the space can track outdoor color temperature values or be driven by time-of-day schedules.

Characterized Color Tuning Operation

This operating mode will modulate the tunable-white channel based on the set point value. As in the automated tuning operation, a gateway command or outdoor color temperature sensor can be linked to the set point input and the output will adjust to this value based on the fixtures defined specifications. This operation does require the fixtures characterized specifications for the 0-10V channel be defined with the controllers configuration.

example: A fixture is used that maps a range of 3200K-6000K across the 1-10V range. These values are pre-commissioned with the ELED2 at the factory. The color-tunable channel modulates based on the value provided by a linked FLS-41 sensor on the set point value

Overview

The ELED2 is a complete stand-alone lighting controller requiring only remote linked devices to provide input on light level, color temperature, occupancy state and switch operation.

In addition to the aforementioned tunable-white color operations, the controller will perform the following common lighting control applications:

- 0-10V dimming of LED fixtures
- Vacancy Sensor Mode - partial OFF or fully OFF
- Occupancy Sensor Mode - partial ON or fully ON
- Wall Switch Station- ON/OFF, manual adjustment of dim level and timed switch
- Daylight Harvesting - open loop or closed loop
- Demand Response - sets a temporary hard limit to the maximum dimming output
- Scheduling via interfaces or gateways
- Building Systems support with gateway commands

Radio Communications

The ELED2 is a wireless device capable of transmitting and receiving messages.

The radio operates at a frequency of 902 MHz and conforms to FCC and IC requirements for transmitting devices.

The controller supports the following features with no loss of normal functionality:

- Message repeating, single and dual hop
- Controller status broadcast

Dimming Output

The controller has a 0-10V dimming output providing linear, proportional dimming control of a dimming driver or ballast. The maximum and minimum levels of the output can be configured using Garibaldi software.

- *Maximum dimming level* - the high level trim of the dimming output, set to 100% by default

- *Minimum dimming level* - the low level trim of the dimming output, set to 10% by default

Tunable-white Output

The controller has a 0-10V tunable-white output providing linear, proportional control of a color tuning LED driver. The maximum and minimum levels of the output can be configured using Garibaldi software.

- *CCT Output maximum level* - the high level trim of the CCT output, set to 100% by default
- *CCT Output minimum level* - the low level trim of the CCT output, set to 10% by default

Near-Cross Relay Technology

The ELED2 monitors the AC voltage waveform so it operates the relay, either open or closed, when the waveform is close to zero. This prevents carbon build-up on the relay contacts ensuring the controller will continue to provide trouble-free operation for years.

Radio Range Confirmation

The ELED-2 controllers includes patent pending technology that works with all Echoflex sensors equipped with the range confirmation feature to provide visual feedback of a linked sensors signal strength for optimal sensor placement.

To evaluate the radio signal strength, the sensor must be also support the test and be linked to the controller. Check the sensors documentation to find out if it supports radio range confirmation testing. Do not have any repeaters in the controllers vicinity enabled during the test.

The range confirmation test is invoked at the sensor and sends unique telegrams to the controller. The controller will evaluate the signal strength from the sensor and send back a unique telegram containing the strongest signal value received. This value is displayed at the sensor using color LEDs.

Consult the sensor installation guide for more details.

Switch Station Operation



Note: *The parameters discussed in this section are configurable. Refer to [Configuring the Controller](#) for more details on accessing these parameters.*

The controller operates with single and dual-paddle wall, wave, multi-button and hand-held Echoflex switches.

Dimming Functions

Link a switch station to the dimming channel. A quick press ON action activates the relay closed (lights on) and the linked dimming output will ramp to the last manually set dim level for that output. A quick double-press ON will fade up to maximum dimming level and accelerate the fade period to ½ second. A quick press OFF action will fade the lights down to the minimum dimming level and then open the relay (lights off). A quick double-press OFF will accelerate the fade period to ½ second.

Echoflex switches can also be used as dimmer switches. Press and hold the ON or OFF side to modulate the dimming output up to the maximum dimming level or down to the minimum dimming level.

If a photo sensor has been linked to the dimming channel it will have control priority over manually dimming the output towards the maximum output value.

Color Tuning Functions

With no switch station or color temperature sensor linked to the tunable-white channel, the dimming switch will modulate the tunable-white output as well. See ["Dim-to-Warm Operation" on page 2](#)

Linking a switch to the tunable-white channel will provide manual control over the channel. Pressing down on the ON or OFF side will fade the tunable-white temperature up or down. A quick press will bump the output value a small amount. See ["Explicit Color Control Operation" on page 2](#).

When the tunable-color channel has been manually adjusted with a linked switch, this value will be recalled upon a ON event.

Timed Switches

The controller can be configured so any linked single or dual paddle switch to the dimming channel becomes a *timed switch*. A switch

ON closes the relay (lights on) and the timed switch timer is set. One minute before the timer expires, there will be a flick-warn (lights quick OFF then ON) to warn occupants of the pending OFF event. Once the timer expires, the relay opens (lights off). The timer can be reset at any time by pressing a linked switch ON. A switch OFF event clears the timer and turns the lights OFF. The *time period* is configurable using Garibaldi software.

Occupancy Based Lighting Applications



Note: *The parameters discussed in this section are configurable. Refer to [Configuring the Controller](#) for more details on accessing these parameters.*

Occupancy and Vacancy sensors should be linked to the dimming channel. The controller will turn the lights OFF or fade down to a preset level when there is no motion detected in the room indicated by all linked occupancy sensors.

There is a configurable *time period* that must expire first before the controller completes the vacancy action. The *occupancy auto-off timer* is set to 15 minutes by default but can be changed using [Simple Tap™ Instructions](#) or Garibaldi software.

Grace Timer

The controller includes a *grace timer* that starts counting down once the vacancy action has been activated. The *grace timer* is a short period of time allowing an occupant to return the lights to the previous occupied state (intensity and color temperature); either through motion detection or audio input in the case of dual-tech sensors.

Dual Technology Occupancy Sensors

Echoflex dual technology sensors have built-in occupancy timers that manage the transition from occupied to the vacant state. The controller should be configured to allow the dual-tech sensor control of the vacancy action by setting the controllers occupancy *auto-off timer* to 0 seconds. To change this timer, refer to the [Simple Tap™ Instructions](#).

Occupancy Sensors and Partial-ON

When only occupancy sensors are linked to the controller, the sensor will automate the lights both ON and OFF. Upon an ON event, the

dimming and tunable-white channels will adjust to the *partial-ON dimming level* (default 100%) and *partial-ON tunable-white level* (default 50%). These values are configurable to accommodate partial-ON applications using [Simple Tap™ Instructions](#) or Garibaldi software.

Occupancy Sensors and Partial-OFF

If the application requires the lights to remain ON during vacant periods but at a dimmed level (partial-OFF), the *partial-OFF dimming level* configuration property accessible using [Simple Tap™ Instructions](#) or Garibaldi software can enable this feature.

The tunable-white channel can also be set using the *partial-OFF tunable-white value*.

Occupancy Sensors with Switches

When switches and sensors are linked, the controller will assume manual-ON, auto-OFF operation referred to as *Vacancy Sensor Mode*. The controller can be configured to turn the lights ON immediately with motion (*partial-ON*) using [Simple Tap™ Instructions](#) or Garibaldi software .

When the switch is used by pressing on or off, this action will reset the *occupancy auto-off timer* and set the sensor state to occupied.

Daylight Harvesting Application



Note: *The parameters discussed in this section are configurable. Refer to [Configuring the Controller](#) for more details on accessing these parameters.*

The controller will modulate the light intensity from dimming fixtures based on the ambient light level in the room when a photo sensor is linked to the dimming channel. When daylighting is active a switch, gateway command or occupancy sensor cannot force the light level higher. However a switch, occupancy sensor or gateway command can override the light OFF or dim below the *daylighting control value*.



Note: *The controller will only allow one linked photo sensor on the dimming channel*

The daylighting control application has several configuration variables and serves two separate functions, closed loop control or open loop control:

- *Daylighting closed loop set point, dead-band, and maximum change rate*
- *Daylighting open loop maximum and minimum set points plus time period for dimming full scale range*

Daylighting Control Override

The open or closed loop daylighting features can be temporarily overridden by enabling the *daylighting override* configuration parameters. The override has a *timer* that will release the override once expired and daylighting control will resume.

When the *override* is enabled, a switch can operate the relay ON and manually set the dimming level.

Both the *daylighting override timer* and *override enable* parameters are accessible with Garibaldi software.

Closed Loop Daylighting Control

Closed loop daylighting becomes active when a photo sensor with a maximum detectable range of light less than 2500 lux is linked to the controller. Closed loop daylighting applications are defined when the sensor indirectly monitors the controlled light output from the fixtures plus some of the natural lights contribution.

When the lights are on, closed loop daylighting will try to maintain a given set point level within the space. This level is specified in

the *closed loop daylighting set point* configuration parameter. The controller only adjusts the dimming output upon received photo sensor telegrams and only when the relay is closed. If the relay is open, closed loop daylighting is ignored. The *closed loop daylighting set point* is adjustable using [Simple Tap™ Instructions](#) or Garibaldi software.

While maintaining the set point, the dimming output level will only change a small amount of the output's full range with every received photo sensor telegram. The closed loop maximum output change is set to 10% by default.



Note:

Ensure the wireless photo sensor being used has an update rate that is appropriate to indoor closed loop lighting applications. The period between consecutive telegrams should not exceed 200 seconds.

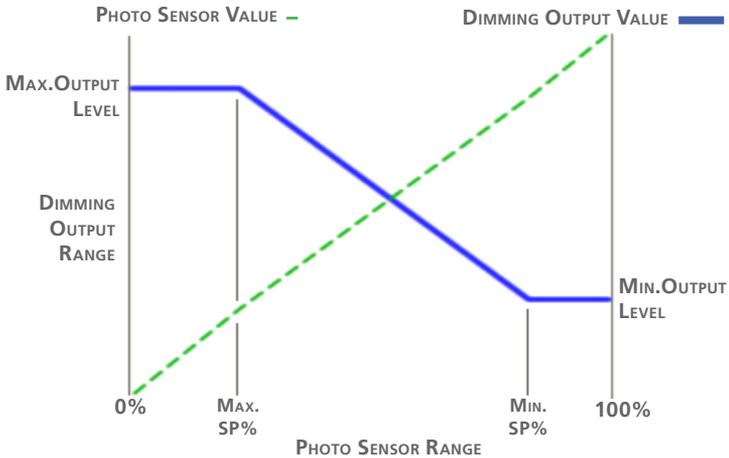
The output dimming level will not change when the photo sensor level is within (+ or -) the *closed loop dead-band value* of the *closed loop daylighting set point*. Both the *amount change per telegram* and *dead-band* are configurable parameters accessible using Garibaldi software.

Open Loop Control

Open loop daylighting becomes active when a photo sensor with a maximum detectable range of light greater than 2500 lux is linked to the controller. Open loop daylighting applications are defined when the sensor is monitoring the natural light contribution and is not affected by the controlled fixture's light output.

When the light level monitored by the photo sensor is below the *open-loop maximum output set point*, the dimming output will be at the maximum output level. When the light level is above the *open-loop minimum output set point*, the dimming output will be at the minimum output level.

In the diagram below, the bold blue line indicates the dimming output. The output will begin lowering as the natural light level increases (green dashed line). When the monitored light level is between the set points it will modulate the dimming output proportionally.



The rate the dimming output will change is defined by the configuration parameter *open loop dimming rate* which defines the time for the dimming to go from 0% to 100% or vice versa.

The *open loop maximum output set point* and *minimum output set point* are adjustable using [Simple Tap™ Instructions](#) or Garibaldi software.

Tunable-white Control

Closed Loop Control of Tunable-white

Control of the tunable-white channel can be automated by linking a correlated color temperature sensor (CCT) to the tunable-white channel. The sensor will provide a value in degrees Kelvin of the white color temperature within the space.

The controller will modulate the tunable-white channel until the sensor value is within the defined *CCT closed loop dead-band* range of the *CCT closed loop set point*.

The controller has a configuration parameter value for a saved set point plus an input for linking an external Kelvin value for set point. If a set point is provided on this input then the controller will use this value. The external source for the set point could come from a linked gateway that is adjusting the set point value based on a schedule or network override. Alternatively, this set point could also come from an outdoor CCT sensor that is monitoring outdoor white color temperature.

Refer to the [Controller Button Interface](#) to learn how to link devices to the specific channels and set point.

Open Loop Control of Tunable-white

The controller will modulate the tunable-white output when a set point value in Kelvin is provided on the set point input. The channel will modulate to the set point value based on the fixtures characterized value in Kelvin for the 1-10V output.

The fixtures range for minimum and maximum values are configuration parameters. These can be set during pre-commissioning at the factory or in-field using Echoflex's Garibaldi software tools.

example: A linked sensor on the set point channel provides a value of 3500K. The fixtures CCT minimum value is 2000K and the CCT maximum value is 6000K. The controller will output a voltage that corresponds to approximately 38% (1500K/4000K = 37.5%) of the 1-10V range or 4.35V.

The set point input accepts links from gateway central commands (profile A5-38-08) and CCT sensors (profile D2-14-25).

When using a gateway central command, use the Basic Set Point command ID#04 to send values to the controller. Refer to the EnOcean Alliance web site for information on this command type.

Refer to the [Controller Button Interface](#) to learn how to link devices to the set point input.

Controller Button Interface

Linking the First Switch

Use this method to link the first switch. Use the learn button to link additional devices.



1. If the controller already has a sensor linked, press the TEACH button on the linked sensor and proceed to step 2 within 60 seconds.
2. Click the wireless switch paddle ON three times, OFF three times and ON three times sequentially within 5 seconds. The relay will toggle and the red POWER LED will begin a repeating blinking pattern to indicate a linked switch to the dimming channel, see the section on LED blink codes.

LEARN button

The LEARN button is used to link switches or sensors to the controller. The Learn LED and Power LED are tricolor and indicate which channel is in Learn mode. When channel 1 or the dimming channel is in learn mode, the learn LED will be red and the power LED will be toggling red. When channel 2 or the tunable-white channel is in learn mode, the learn LED will be green and the power LED will be toggling green. When the set point input is in learn mode, the learn LED will be blue and the power LED will be toggling blue.

1. Press the controller button marked LEARN for a half second. In link mode the LEARN LED will stay ON and the POWER LED will toggle every two seconds. The LEDs will be a color that correlates to the channel (Red=CH1; Green=Ch2; Blue=Set point). Press the LEARN button to scroll through the channels.
2. When linking a wall switch, press the switch paddle ON three times. If linking a sensor, press the sensor's TEACH or LINK button, refer to the sensor's documentation.



Note: *Occupancy or vacancy sensors and photo sensors should be linked to the dimming channel only*

The POWER LED will remain lit for four seconds while it links the new device. It will resume toggling allowing you to link another device up to a total of 20 devices.



Note: *Linking a switch or sensor that is already linked to a controller, will remove or unlink it from the controller.*

4. To exit link mode, press the LEARN button on the controller again to cycle through the channels. Link mode will also time out after no activity in 30 seconds.

CLEAR button

Using the CLEAR button can reload the controller to the factory pre-commissioned settings with linked devices OR it can load the factory default parameters and remove all linked devices.

- To return the controller to the **factory pre-commissioned state**, press the CLEAR button until the red POWER and green LEARN LEDs start blinking, approximately 5 seconds. Release the button and the red POWER led will begin blinking indicating the factory commissioned pre-linked devices.
- To completely CLEAR the controller back to **factory default settings** removing any linked devices, press the CLEAR button until the red POWER and green LEARN LEDs come on solid, about 15 seconds. The POWER led will stay ON solid indicating the factory default state.

Power LED and Learn LED

The Power LED provides information on the number and type of linked devices to the controller. If the controller was factory pre-commissioned, upon power up it will immediately begin blinking the POWER LED based on the type and count of linked devices. The type is indicated by long blinks followed by short blinks counting the number of devices linked. This pattern will repeat after a short pause. Refer to [LED Blink Codes and Operation in Appendix A](#).

Disabling the User Interface LEDs

The LEDs can be disabled by adjusting a configuration parameter using Garibaldi software. The variable is a timer in seconds. If disabled, the LEDs will illuminate for the configured time when either controller button is pressed, when in link mode or if the remote management Action command is used to toggle the relay.

Configuring the Controller

There are two methods of configuring parameters in the controller.

1. Simple Tap™



Note: *Simple Tap™ is a quick method of changing a parameter's setting, one at a time.*

2. Garibaldi Commissioning Software (not covered in this guide)



Note: *Contact Echoflex Solutions for more information on Garibaldi software.*

Simple Tap™ Instructions

Simple Tap™ uses the switches and sensors that are linked to the controller to set the associated configuration parameters. You must be able to access the sensor's teach button and/or the switches to perform Simple Tap™.

If the sensor is linked to multiple controllers and you do not want to make changes to all, turn the controllers relay off (lights off) to ignore the Simple Tap™ changes.

Simple Tap™ allows you to:

- *Enable/Disable the Repeater Function*
- *Enable/Disable the Status Telegram*
- *Set the Partial-ON and Partial-OFF value and Enable/Disable the Partial-ON Partial-OFF features*
- *Set the Occupancy Sensor Auto-OFF timer*
- *Set the Closed Loop Daylighting Set Point*
- *Set the Open Loop Daylighting Set Point*
- *Set the Closed Loop CCT Set Point*

Enable/Disable the Repeater Function

Enabling the repeater function will repeat received telegrams when:

- the telegram has not been previously repeated.
- in the case of dual hop repeating, have been repeated once previously

This sequence requires access to the controller. The *repeater function* can be enabled/disabled by accessing the controller's buttons and supports single and dual hop repeating.

1. Press the CLEAR button and hold
2. Quickly tap the LEARN button;
 - once to *disable repeating*
 - twice to *enable single hop repeating*
 - three times to *enable dual hop repeating*
3. Release the CLEAR button. The green LEARN and red POWER LEDs will blink the corresponding value of the LEARN button presses.

Enable/Disable the Status Telegram

The controller can broadcast a telegram per EEP: A5-11-01 *Status Feedback Telegram*. The telegram will broadcast every 100 seconds. The *status telegram* can be enabled/disabled by accessing the controller buttons.

1. Press the LEARN button and hold, quickly tap the CLEAR button once to disable, twice to enable.
2. Release the LEARN button. The green LEARN and red POWER LEDs will blink the corresponding value of the CLEAR button presses.

Setting Partial-ON

When only occupancy sensors are linked to the controller, *partial-ON* will be enabled allowing the sensor to automate the lights both ON and OFF. The dimming output for the ON action will adjust to the *partial-ON dimming level* (default 100%). The tunable-white channel will adjust to the *CCT partial-ON value* (default 50%).

To set the partial-ON levels and to enable or disable this feature follow the steps below.

1. With the light ON and using a linked switch, dim the lights

to the desired partial-ON value. Use a linked switch on the tunable-white channel to set this output value also.

2. Press the sensors TEACH Button once
3. Within 5 seconds of pressing the TEACH button click the switch ON 4 times to **enable** *partial-ON*

For *partial-ON* **disable**:

Click the switch 3 times ON followed by a single OFF

Setting Partial-OFF

When the application requires the lights to remain ON during vacant periods but at a dimmed level (partial-OFF), the *partial-OFF dimming level* is used.

To set the partial-OFF level and to enable or disable this feature follow the steps below.

1. With the light ON, and using a linked switch, dim the lights to the desired partial-OFF value
2. Press the sensors TEACH Button once
3. Within 5 seconds of pressing the TEACH button click the switch OFF 3 times followed by one ON to **enable** *partial-OFF*

For *partial-OFF* **disable**:

Click the switch OFF 4 times

Set the Occupancy Sensor Auto-OFF timer

1. With the light on, tap the occupancy sensor's TEACH button three times and the relay will blink the light once to acknowledge.
2. Tap the TEACH button again using the table below to match the desired timer period with the total button taps. After the last button press, the relay will blink the light an additional set number of times based on the setting chosen and then return to normal operation.

Simple Tap Occupancy Timer Values

Total Taps	Occ. Sensor Timer	Additional Blinks
3 taps*	0 sec.	1 blink
4 taps	5 min.	2 blinks
5 taps	10 min.	3 blinks
6 taps	15 min.	4 blinks
7 taps	20 min.	5 blinks
8 taps	25 min.	6 blinks

* uses the sensor's timer



Note:

When setting the timer to 15 minutes, the light will blink 5 times total - once on the third press then 4 more after the last button press

Save State

The controller will save its state when power is cycled. The *save state function* can be overridden with a value that will be used to recall a particular relay state, dimming output value, and tunable-white output value after a power cycle. An override enable flag and an override value can be set with Garibaldi Commissioning Software

Set the Closed Loop Daylighting Set Point

A light sensor must be linked to the dimming channel plus a switch.



Note:

This process is best performed when there is little or no natural light; either close the blinds or complete this step at night

1. With the light on and using a hand-held photometer to measure the light on the task plane, adjust the light level from the fixture using the switch until it matches the target light level.
2. Tap the light sensor's TEACH button 3 times to set the daylight harvesting parameters to closed loop function. The light will blink once to acknowledge the change.
3. Move away from the sensor so your shadow does not affect the light level the sensor records. The light will blink once again after a pause when receiving the next telegram from the sensor. The pause may take up to 150 seconds. After blinking, the controller will return to normal operation.

Set the Open Loop Daylighting Set Point

A light sensor must be linked to the controller.

This process adjusts the *open loop maximum output dimming set point* and the *open loop minimum output dimming set point*. Both set points are also configurable using Garibaldi software.



Note:

The set points are measured in percentage of the photo sensor's full scale range.

1. With the light on, tap the light sensor's TEACH button three times. The light will blink once.
2. You can tap the TEACH button again referring to the tables below to set the open loop set points. Tapping the TEACH button increments the row selected in the table.
3. The light will be blinking according to the level set to confirm the change after five seconds and return to normal operation.

Daylighting Set Points - Open Loop Dimming
Sensor Range of > 2500 lux to < 11000 lux

Taps	Max. Output SP	Min. Output SP	Light Blinks
0 taps	20%	100%	1 blinks
1 taps	30%	100%	2 blinks
2 taps	40%	100%	3 blinks
3 taps	50%	100%	4 blinks
4 taps	60%	100%	5 blinks

Daylighting Set Points - Open Loop Dimming
Sensor Range of > 11000lux

Taps	Max. Output SP	Min. Output SP	Light Blinks
0 taps	5%	30%	1 blinks
1 taps	10%	35%	2 blinks
2 taps	15%	40%	3 blinks
3 taps	20%	50%	4 blinks
4 taps	25%	55%	5 blinks

Set the CCT Closed Loop Set Point

A CCT sensor must be linked to the tunable-white channel plus a switch.



Note:

This process is best performed when there is little or no natural light; either close the blinds or complete this step at night

1. Use the switch to adjust the tunable-white temperature level from the fixture to a desirable level.
2. Tap the CCT sensor's TEACH button 3 times to set the CCT closed loop set point. The fixture will blink once to acknowledge the change.
3. Move away from the sensor so your shadow does not affect the CCT level. The fixture will blink once again after a pause when receiving the next message from the sensor. The pause may take up to 150 seconds. After blinking, the controller will return to normal operation.

This concludes the configuration directions for the controller.

Appendix A

LED Blink Codes and Operation

The tables below describe the LED activity and associated mode of the controller.

If the controller was factory pre-commissioned, upon power up it will immediately begin blinking the POWER LED based on the type and count of linked devices.

Channel 1 links are displayed with red LED blinks.

Channel 2 links are displayed with green LED blinks.

Channel 3 links are displayed with blue LED blinks.

The type is indicated by long blinks followed by short blinks counting the number of devices linked. This pattern will repeat after a short pause.

The table below describes the number of LED blinks for each device type.

Dimming - Channel 1 - RED POWER LED Blink Codes

Factory Default	ON Solid
switch(es)	1 long blink followed by short blinks counting switches
occupancy sensor(s)	2 long blinks followed by short blinks counting sensors
photo sensor(s)	3 long blinks followed by short blinks counting sensor (typical max 1)
central command	4 long blinks followed by short blinks counting devices
demand response	5 long blinks followed by short blinks counting devices

example: If the controller is in Dim-to-Warm Operation (no devices are linked to CH 2 or CH3) only the Red LED will blink.

Tunable White - Channel 2 - Green POWER LED Blink Codes

Factory Default	OFF
switch(es)	1 long blink followed by short blinks counting switches
CCT sensor linked	2 long blinks followed by short blinks counting sensors (typical max 1)
Central Command	3 long blinks followed by short blinks counting sensor ()

example: If the green LED shows Channel 2 has a switch learned, this infers Explicit Color control operation is in effect (manual control).

example: If the green LED shows a CCT sensor is linked to Channel 2 The controller compares the sensor value to a CCT set point and modulates the color-tuning channel to drive the sensor value towards the set point.

Set Point Input Channel 3 BLUE POWER LED Blink Codes

Factory Default	OFF
CCT sensor linked	1 long blinks followed by short blinks counting sensors (typical max 1)
Central Command	2 long blinks followed by short blinks counting sensor ()

example: If the blue LED shows Channel 3 has a CCT sensor or gateway linked, this infers a dynamic set point has been setup and the color temperature will be tracking the outdoor color temperature (if CCT sensor) or the color temperature will be driven by time-of-day schedules (if linked to a gateway).

Operating Mode and LED Activity

Mode	LEARN LED - Green	POWER LED Red - CH1 Green - CH 2 Blue - CH 3	Relay/Light
LINK mode	ON	Toggle	Toggle
Storing ID	ON	ON 4 sec.	ON 4 seconds
Clearing ID	ON	OFF 4 sec.	OFF 4 seconds
Factory Default	OFF	ON solid RED	ON

The LEDs can be disabled by adjusting a configuration parameter using Garibaldi software. If disabled, the LEDs will illuminate for a brief period of time when either controller button is pressed, when in link mode or if the remote management Action command is used to toggle the relay.

Appendix B

Status Feedback Telegram - Dimming Channel

EEP:A5-11-01

Radio ID : Radio Base ID

DB_3 Illumination 0-100%, linear n=0...255

DB_2 Illumination Set Point Min. ... Max., linear n=0...255

DB_1: Dimming Output Level Min. ... Max., linear n=0...255

DB_0.BIT_7: Repeater 0b 0 disabled, 0b1 enabled

DB_0.BIT_6: Power Relay Timer 0b0 disabled

DB_0.BIT_5: Daylight Harvesting 0b0 disabled 0b1 enabled

DB_0.BIT_4: Dimming 0b1 dimming load

DB_0.BIT_3: Learn button 0b0 Teach-in telegram 0b1 Data telegram

DB_0.BIT_2: Magnet Contact 0b0

DB_0.BIT_1: Occupancy 0b0 unoccupied 0b1 occupied

DB_0.BIT_0: Power Relay 0b0 off 0b1 on

Notes:

- The Illumination field will always be 0 if no photo sensors are linked. If there is a photo sensor linked to the ELED2 the illumination field will be 0-100% of the range of the linked photo sensor, rather than 0-510lx..
- The Illumination Set Point field will always be 0 if no photo sensors are linked. The illumination set-point field will correspond to the closed-loop set point, scaled so that 0 is 0% and 255 is 100%.
- The Dimming Output Level field will be 0 if the controller is in its 'off' state; otherwise it will be the dimming output level scaled so that 0 is the minimum dimming voltage and 255 is the maximum dimming voltage.
- The Repeater bit will be 0 if the repeater is disabled, and 1 if the repeater is set to single-hop mode or dual-hop mode.
- The Power Relay Timer bit will always be 0.
- The Daylight Harvesting bit will be 1 if one or more photo sensor is linked and 0 otherwise.
- The Dimming bit will always be 1.
- The LRN bit will be 1 (except for teach messages).
- The magnet contact bit will always be 0.
- If there are any occupancy sensors linked and the controller state is occupied the Occupancy bit will be 1; otherwise it will be 0.
- If the controller is in its 'on' state the Power Relay bit will be 1, otherwise it will be 0.

Status Feedback Telegram - Tunable-white Channel

EEP:A5-11-01, adjusted

Radio ID: Derived ID (Base ID OR'd 0xFF800000 x 4)

DB_3: CCT Closed Loop Sensor Value 0-100%, linear n=0...255

DB_2: CCT Closed Loop Set Point Min. ... Max., linear n=0...255

DB_1: Tunable-white Output Level Min. ... Max., linear n=0...255

DB_0.BIT_7: Repeater 0b 0 disabled, 0b1 enabled

DB_0.BIT_6: Power Relay Timer 0b0 disabled

DB_0.BIT_5: Daylight Harvesting 0b0 disabled 0b1 enabled

DB_0.BIT_4: Dimming 0b1 dimming load

DB_0.BIT_3: Learn button 0b0 Teach-in telegram 0b1 Data telegram

DB_0.BIT_2: Magnet Contact 0b0

DB_0.BIT_1: Occupancy 0b0 unoccupied 0b1 occupied

DB_0.BIT_0: Power Relay 0b0 off 0b1 on

Notes:

- The CCT closed loop sensor field will always be 0 if no CCT sensors are linked. If there is a CCT sensor linked to the ELED2 the illumination field will be 0-100% of 2000K-6080K.
- The CCT closed loop set point field will always be 0 if no CCT sensors are linked to the tunable-white channel. The set-point field will correspond to the closed-loop set point, scaled so that 0 is 0% and 255 is 100% of the range 2000K- 6080K.
- The Tunable-white Output Level field will be 0 if the controller is in its 'off' state; otherwise it will be the tunable-white output level scaled so that 0 is the minimum voltage and 255 is the maximum voltage.
- The Repeater bit will be 0 if the repeater is disabled, and 1 if the repeater is set to single-hop mode or dual-hop mode.
- The Power Relay Timer bit will always be 0.
- The Daylight Harvesting bit will be 1 if one or more CCT sensor is linked and 0 otherwise.
- The Dimming bit will always be 1.
- The LRN bit will be 1 (except for teach messages).
- The magnet contact bit will always be 0.
- The Occupancy bit will always be 0.
- If the controller is in its 'on' state the Power Relay bit will be 1, otherwise it will be 0.

Agency Listings and Regulatory Statements

Safety

UL Listed Component
Conforms to UL Standard 60730
Conforms to UL Standard 924
Certified to CAN/CSA Std. E60730
UL 2043 Plenum rated



Energy Code Compliance

California Energy Commission Title 24
Washington State Energy Code
ASHRAE 90.1-2016
IECC 2015



FCC Part 15.231 : Contains FCC ID: SZV-STM300U
IC RSS-210FCC Part 15.231 : Contains FCC ID: SZV-STM300U
The enclosed device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(i.) this device may not cause harmful interference and
(ii.) this device must accept any interference received, including interference that may cause undesired operation.

Safety Standards Load Ratings

Electronic Ballast or LED Driver	20A @ 120 to 277VAC
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