



Bicolor Luminaire Controller

Model: ELED2-BCL

Configuration Guide

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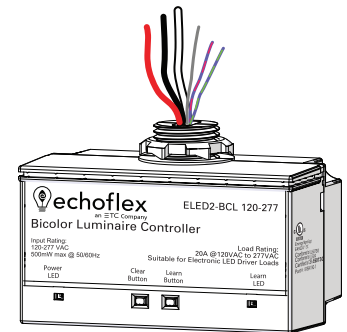
Introduction

The Bicolor Luminaire Controller, model ELED2-BCL, is a wireless lighting controller designed for horticultural spaces/areas where intensity and blended correlated color temperature (CCT) control are required.

The ELED2-BCL creates a range of desired lighting effects based on manual switch action, ambient light levels, and timeclock or gateway commands for a single LED fixture or an entire zone. It modulates light intensity and blends cool and warm LEDs to provide the desired CCT output. The controller is suitable for any scale of horticultural application, from a living plant wall to a commercial-size growing operation; one controller supports up to three Fotono luminaires, by RAYN Growing Systems (see rayngrowingsystems.com).

The ELED2-BCL has an integral relay and two robust 0–10 V outputs that allow it to control dimmable light and LED color temperature levels. Outputs are for connecting zones or fixtures to provide the intensity and CCT control. Output 1 is identified by the violet/red striped wire, and output 2 is identified by the violet/green striped wire.

Three linking channels are for assigning remote devices to affect the controller's operation. The first linking channel is for devices affecting intensity, the second channel is for devices affecting the CCT. The third channel is for assigning Open Loop CCT set points. The channels are identified by different LED colors that display when the controller is in link mode, see [Blink Indications on page 14](#).



Daylighting control of fixture intensity can be quickly setup in either an open or closed loop scenario. The factory defaults defined for the ELED2-BCL are energy code compliant.

Echoflex ELED products include preset functionality that allows spaces to be lit with lighting scenes. Presets can be activated from scene stations, wireless timeclocks, or gateways and include values for intensity and color temperature. The lockout feature allows timeclocks to schedule a controller's response to specific sensors or stations.

Document Conventions

Echoflex's user documentation is designed for print or electronic use. Cross-references highlighted in this document are links to the referenced section of the guide.

Configuration parameters are emphasized in *italics*. Switch actions (ON/OFF) and dimmer events (lights ON/OFF) are emphasized in ALL CAPS. Buttons are emphasized in **[Bold Bracket]**.

This document uses the following conventions to draw your attention to important information.



Note: *Notes are helpful hints and information that is supplemental to the main text.*

All Echoflex documents are available for free download from our website: echoflexsolutions.com. Please email comments about this manual to: TechComm@etcconnect.com.

Help from Technical Services

If you are having difficulties that are not addressed by this document, contact Echoflex support at service@echoflexsolutions.com or the main website at echoflexsolutions.com. If none of these resources are sufficient, contact Technical Services directly at the office identified below.

When calling for help, take these steps first:

- Prepare a detailed description of the problem
- Go near the equipment for troubleshooting
- Find your notification number if you have called in previously

Technical Services

3031 Pleasant View Road
Middleton, WI 53562
800-775-4382 (USA, toll-free)
+1-608 831-4116
service@echoflexsolutions.com

Control Features

Blended Effects

The ELED2-BCL controls light intensity and CCT. By connecting the low voltage outputs to a fixture's internal channels for cool and warm LEDs, it modulates both outputs to attain the desired light level. By driving each output separately, the controller also has control over how cool or warm the fixture output becomes.

Dim-to-Warm

Dim-to-Warm operates if at least one switch station is linked to the intensity channel and nothing is linked to the color temperature channel. The color temperature moves according to the change in light intensity. An increase in intensity also moves color temperature to cooler. A decrease in intensity moves color temperature to warmer. Dim-to-warm mode operates with daylight sensors, regular switches, and gateways linked to the intensity channel.

Explicit Color Control

With a switch station linked to the color temperature channel, Explicit Color Control provides manual control over a fixture's color temperature. By pressing the paddle on the station, you can set a color level and modulate output as required. Press and hold ON increases color temperature to cooler; Press and hold OFF decreases color temperature to warmer. A quick tap on the button bumps color temperature up or down incrementally. A gateway command can also be linked to the color temperature channel allowing other devices to control the fixture's color temperature.

Automated Color Tuning

Automated Color Tuning requires a color temperature sensor like the Echoflex TAP-41 photo sensor linked to the color temperature channel. The ELED2-BCL compares its CCT set point to the value from the space provided by the sensor and increases the fixture's color temperature to the set point.



Example: *The CCT set point is 3500 K and the sensor reports a value of 3200 K. The controller will adjust the CCT output driving the fixture's output towards the desired set point.*

Automated Color Tuning can also use a dynamic CCT set point input linked to a gateway command or outdoor color temperature sensor like the Echoflex FLS-41 sensor to set the desired color temperature within the space and track outdoor color temperature values.

Characterized Color Tuning

Characterized Color Tuning modulates the color temperature 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 CCT set point channel and the output will adjust to this value based on the fixture's defined specifications. This operation does require the fixture's characterized specifications for the 0–10 V channel be defined with the controller's configuration.



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

Configuration Options

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

In addition to blended LED operations, the controller will perform the following common lighting control applications:

- 0–10 V dimming of LED fixtures
- 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, timeclocks, or gateways
- Building Systems support with gateway commands

This document describes the controller's features and explains how to use and configure them with Simple Tap. Some features can only be configured using Garibaldi Pro software.



Note: For information about Garibaldi Pro software or pre-commissioning services that provide complete system solutions (linked and configured), contact Echoflex. Garibaldi Pro software is available for download from the Echoflex website at echoflexsolutions.com.

Simple Tap Instructions

Simple Tap is a manual method of changing individual settings one at a time. There are no tools required, simply use your finger to activate the sensors and standard switches linked to the controller. The tap in Simple Tap means a quick press on a sensor's **[Teach]** button and/or a switch's ON/OFF.



Note: Echoflex scene stations cannot be used to configure settings with Simple Tap.

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

Radio Communications

The ELED2-BCL controller is equipped with a 902 MHz radio capable of transmitting and receiving wireless messages. The controller supports single-hop and dual-hop message repeating and controller status broadcast.

Repeater Function

The repeater function repeats received messages if:

- The message has not been repeated previously
- In the case of dual-hop repeating, the messages have been repeated previously only once

If single-hop or dual-hop repeating is needed, the repeater function can be enabled/disabled using Simple Tap instructions.

1. Press and hold the **[Clear]** button on the controller.
2. 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 Power and Learn LEDs blink the corresponding number of **[Learn]** button presses.

Status Message

The controller can broadcast a message per EEP: A5-11-01 Status Feedback Message. A message broadcasts every 100 seconds. The status message can be enabled/disabled using Simple Tap instructions.

1. Press and hold the **[Learn]** button on the controller.
2. Tap the **[Clear]** button once to **disable**, twice to **enable**.
3. Release the **[Learn]** button. The Power and Learn LEDs blink the corresponding number of **[Clear]** button presses.

Dimming Intensity

The controller's dimming output provides linear, proportional dimming control of a dimming driver or ballast.

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

Garibaldi Pro software is required to configure the maximum and minimum levels and to disable dimming output for immediate control.

Blended LED Control

The controller provides linear, proportional control of a fixture's cool and warm LED output. The maximum and minimum CCT level of the fixture can be saved in the controller's configuration settings. The maximum and minimum levels of the output can be configured using Garibaldi Pro software.

Near-Cross Technology

The controller monitors the AC voltage waveform to prevent carbon build-up on contacts and ensure long relay life. The relay will open or close only when the waveform is close to zero.

Switch Operation

The controller operates with single, dual-paddle wall, wave, and hand-held Echoflex switches as well as button station transmitters including the Multi-Button Interface (MBI) Switch Station. Garibaldi Pro software is required to configure all fade control settings.

- Press **[ON]** to fade the lights to the last manually set dimming level.
- Double-press **[ON]** to quickly fade the lights to the *output maximum level*.
- Press **[OFF]** to fade the lights to the *output minimum level* and then turn lights off.
- Double-press **[OFF]** to quickly fade and turn the lights off.

Echoflex switches can also be used as dimmers when *dimming output* is enabled.

- Press and hold **[ON]** to fade to the maximum dimming level.
- Press and hold **[OFF]** to fade to the minimum dimming level.

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

Multi-Scene Station Buttons

The layout of buttons for the Multi-Scene Station (MSS) differs according to the MSS model. Buttons have the following effects when they are included in a model's layout.

- **[ON]** turns lights on and fades to the last manually set dimming level.
- **[OFF]** fades lights to the minimum dimming level and then turns them off.
- **[COOL LIGHT]** adjusts light temperature to cooler level.
- **[WARM LIGHT]** adjusts light temperature to warmer level.
- **[Up Arrow]** fades lights to maximum dimming level.
- **[Down Arrow]** fades lights to minimum dimming level.
- **[SCENE X]** recalls a configured scene setting.

Color Tuning Functions

If no switch station or color temperature sensor is linked to the color temperature channel, the dimming switch will also modulate the fixture's output. See [Dim-to-Warm on page 1](#).

Linking a switch to the color temperature channel will provide manual control over the fixture's color output. Pressing ON or OFF will fade the color temperature up or down. A quick press will bump the output value a small amount. See [Explicit Color Control on page 1](#). When the color temperature output has been manually adjusted using a linked switch, this value will be recalled upon a ON event.

Timed Switches

The controller can be configured to make any linked wall switch station into a timed switch. Switching the lights ON starts the countdown timer for the configured period. One minute before the timer expires and the lights turn off, the lights blink once as a warning (flickwarn). Switching the lights ON at anytime resets the timer. Switching the lights OFF clears the timer. Garibaldi Pro software is required to configure the period for a timed switch.

RAYN Growing Systems Compatibility

RAYN Growing Systems (rayngrowingsystems.com) provide researchers and growers with technologically advanced horticultural lighting solutions. RAYN product offerings are grounded in 45 years of advancements in lighting science, LED technology, and system-wide controls developed by our parent company, ETC.

The ELED2-BCL is ideally suited to work with RAYN sensors, and is compatible with any photo sensor that supports EEP D2-14-56 or multisensor that supports EEP D2-14-5E. Linking a RAYN Photo Sensor (RPS) or RAYN Multisensor (RMS) to the intensity channel provides reliable coverage and efficiency for controlled environment agriculture (CEA) operations of any scale.

Daylight Harvesting Applications

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



Note: *The controller supports only one linked photo sensor. If using multisensors, Echoflex recommends that only one be linked to the controller.*

Daylight harvesting does not affect the operation of wall switches when the light is ON. If the light is ON, a switch can override with an OFF action or dim to below the daylighting control value.

Daylighting Control Override

The open or closed loop daylighting features can be temporarily overridden by enabling the *daylighting manual override* parameter. The override has a timer that releases the override, and once the timer expires the daylighting control resumes.

If the override is enabled on the controller, a manually controlled switch can turn lights ON and manually set the dimming level.

Garibaldi Pro software is required to configure both the *daylighting manual override timer* and *daylighting manual override enable* parameters.

Closed Loop Control

In closed loop daylighting, the sensor indirectly monitors the controlled light output from the fixtures plus some of the natural light contribution.



Note: *For closed loop control to function properly, the sensor must be installed in a location where it is significantly affected by light level changes. If not, [Open Loop Control on page 10](#) should be used.*

When the lights are on, closed loop daylighting tries to maintain a given set point level within the space. This level is specified in the *closed loop daylighting set point* parameter. The controller only adjusts the dimming output on received photo sensor messages and only when the light is ON. If the light is OFF, closed loop daylighting is ignored.



Note: *This process is best performed when there is little or no natural light; either close the blinds or complete this step at night. A photo sensor and a switch must be linked to the controller.*

To set the closed loop set point:

1. Turn the light ON.
2. Use a handheld photometer to measure the light on the task plane.
3. Use a linked switch to adjust the fixture's light level until it matches the target light level and give the sensor a moment to register the level.
4. Tap the **[Teach]** button on the mounted sensor three times to set the daylight harvesting parameters to closed loop function. The light level ramps up to full ON and then dims to OFF to acknowledge the change.
5. Move away from the sensor so your shadow does not affect the light level the sensor records.

After a pause, the light responds once again when the next message from the sensor is received and the controller returns to normal operation. The pause may take up to 150 seconds.

While maintaining the set point, the dimming output level changes an incremental amount of the output's full range with every message received from the photo sensor. The default *daylighting maximum change* is 10%, which provides a slow adjustment that does not exceed the set point.



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

The output dimming level does not change when the photo sensor level is within the *closed loop deadband* value of the *closed loop daylighting set point*.



Example: *If the controller has a set point of 100.00 $\mu\text{Mol}/\text{m}^2$ and the deadband is set to 5% (default), then the deadband would be + or - 5.00 $\mu\text{Mol}/\text{m}^2$. If the light level measured by the sensor in this example was between 95.00 and 105.00 $\mu\text{Mol}/\text{m}^2$, the controller would not change the light level. This variable is used to prevent feedback loops in the closed loop control.*

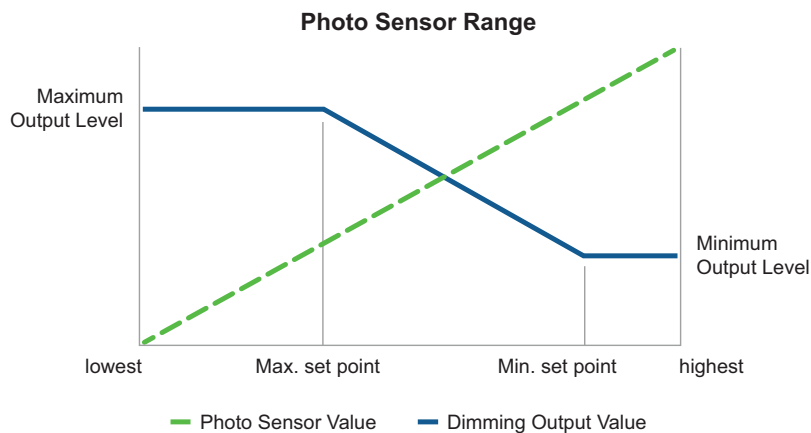
Garibaldi Pro software is required to configure both the amount of change per message and the deadband value parameters.

Open Loop Control

A sensor's default setting (open loop or closed loop) depends on what it is linked to and the daylighting operating mode setting on the controller: automatic, open loop, or closed loop. In open loop daylighting, the sensor monitors the natural light contribution. The sensor must be mounted so it 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*, dimming output is at the *maximum output level*. When the light level is above the *open loop minimum output set point*, dimming output is at the *minimum output level*.

In the diagram below, the solid line (blue) indicates dimming output. It begins lowering as the natural light level increases, dashed line (green). When the monitored light level is between the set points it modulates dimming output proportionally.



The rate that the dimming output changes is defined by the *open loop dimming rate* parameter which defines the time for dimming to go from lowest to highest or vice versa (default 65 seconds).

To set the *open loop maximum output set point* and *minimum output set point* using Simple Tap, a photo sensor must be linked to the controller.



Note: Maximum and minimum set points are measured in μMol by default. The controller also supports sensor equipment profiles measured in lux. Garibaldi Pro software is required to change the photo sensor's EEP setting to another compatible option.

Default Setting and Illuminance

For horticultural applications, photo sensors are designed to evaluate the photosynthetic photon flux density (PPFD) of the target area. PPFD is measured in micromoles per metre per second (μMol), not lux.

Sensor EEP	Daylighting Mode	Units	Closed Loop Set Point	Closed Loop Deadband	Open Loop Set Point
D2-14-56	Open loop	PPFD	500.00 μMol	25.00 μMol	200.00 μMol max 600.00 μMol min

To change the default setting:

1. Turn the light ON.
2. Tap the photo sensor **[Teach]** button three times to change the default. The light ramps up to full ON and then dims to OFF once.
 - a. If you stop and exit the menu here (after three taps), the daylighting mode is set to closed loop. The next sampled value from the sensor is used to set the closed loop set point. The deadband setting is 5% of the closed loop set point.
 - b. To set maximum and minimum open loop set points, tap the photo sensor **[Teach]** button again as indicated in the table below. The light responds by flashing the number of times you tapped to confirm the change. After five seconds it returns to normal operation.

Sensor EEP	-	1 tap	2 taps	3 taps	4 taps	5 taps
D2-14-56	Closed loop	0 200.00	100.00 400.00	200.00 600.00	300.00 800.00	400.00 1000.00

Controller Presets

Preset values are used to determine the dimming intensity and color temperature of different lighting scenes that are part of a designed solution made up of connected devices. A scene is a coordinated combination of controllers configured and grouped to light a space according to specific requirements. Groups, scenes, and event masking can be created in a Wireless TimeClock, and activated from a Wireless TimeClock or a scene station.

Echoflex controllers have 15 configurable presets (plus one reserved for OFF). Preset values can be configured and saved to a controller using Garibaldi Pro software. Presets 1 through 8 cover a graduated range of values from full ON (100%) to OFF (0%). Presets 9 through 15 are a repetition of the values 1–7 and provide the opportunity to create custom values. A default ramp time of two seconds is given for the lighting to reach the preset value.

User Interface



Note: *Garibaldi Pro software is the ideal tool to set up your project and configure settings, or even to make edits if your project has been pre-commissioned. Garibaldi Pro is available for download at echoflexsolutions.com.*

Power LED and Learn LED

Learn Button

See the relevant switch or sensor documentation for information on linking. Link mode times out after 60 seconds of inactivity.



Note: *The manual linking process can be used both to link a device to a controller and to unlink a linked device from a controller.*

Devices can be linked to a controller manually, using Garibaldi Pro, or during the Echoflex pre-commissioning process.

To link a device:

1. Press the **[Learn]** button to activate Link mode. The Learn LED turns ON and the Power LED blinks. Do one of the following:
 - To link a wall switch, press the switch paddle ON three times.
 - To link a sensor, press the sensor's **[Teach]** button. Refer to the sensor's documentation for more information.

The Power LED remains lit for four seconds while it links the new device, then resumes toggling. You can link up to 20 devices to the controller.

Remote Linking Solution

Use the following method to link the first switch if you cannot access the **[Learn]** button on a controller that has not been pre-commissioned and you do not have Garibaldi Pro software.

This method only works if there are no switches linked to the controller. You cannot link a scene station using this method.

1. Ensure you are within wireless range of the controller and have a wireless paddle switch or a button station.
 - a. If the controller has a linked sensor, you must press the **[Teach]** button on the sensor and complete step 2 within 60 seconds.
2. Click the switch paddle ON three times, OFF three times, and ON three times quickly, for a total of nine consecutive clicks.

Clear Button

Use the **[Clear]** button to reset the controller either to its pre-commissioned state or to its factory default state.

To reset to pre-commissioned state:

1. Press and hold the **[Clear]** button until the red Power and green Learn LEDs start blinking.

To reset to factory default state:

1. Press and hold the **[Clear]** button until the red Power and green Learn LEDs start blinking, and continue to hold for 15 seconds until the LEDs stay on solid.
2. Release the **[Clear]** button. The Power LED displays solid red to indicate factory default state.

LED Display

The LEDs are enabled by default. They can be disabled by adjusting a configuration parameter using Garibaldi Pro software. If disabled, the LEDs are only lit for the configured time when a controller button is pressed, when in Link mode, or if the remote management *Action* command is used to toggle the light.

Blink Indications

The following tables describe the LED codes that identify linked devices and the LED indications that describe linking activities.

Red: Linking Channel 1 (Intensity)

Device Type	Power LED	Learn LED
Switches	1 long blink followed by short blinks that count the switches	Off
Occupancy sensors	2 long blinks followed by short blinks that count the sensors	Off
Photo sensor or Multisensors	3 long blinks followed by short blink that counts the sensor	Off
Gateways and TimeClocks	4 long blinks followed by short blinks that count the devices	Off
Demand response	5 long blinks followed by short blinks that count the devices	Off
Entry door sensors	6 long blinks followed by short blinks that count the sensors	Off
Window sensors	7 long blinks followed by short blinks that count the sensors	Off
Keycard switches	8 long blinks followed by short blinks that count the switches	Off

Green: Linking Channel 2 (Color Temperature)

Device Type	Power LED	Learn LED
Switches	1 long blink followed by short blinks that count the switches	Off
CCT sensor linked (maximum of 1)	2 long blinks followed by short blink that counts the sensor	Off
Central command	3 long blinks followed by short blinks that count the devices	Off

Blue: Linking Channel 3 (CCT Set Point)

Device Type	Power LED	Learn LED
CCT sensor linked (maximum of 1)	1 long blink followed by short blink that counts the sensor	Off
Central command	2 long blinks followed by short blinks that count the devices	Off

Linking Activities

Activity	Power LED	Learn LED	Light Response
Link mode	Blinking	On solid	Cycles ON and OFF
Store link ID	On for 4 seconds, and then blinking	On solid	ON for 4 seconds, and then cycles
Clear link ID	Off for 4 seconds, and then blinking	On solid	OFF for 4 seconds, and then cycles

Compliance

For complete regulatory compliance information, see the Echoflex Bicolor Luminaire Controller datasheet at echoflexsolutions.com.

FCC Compliance

Echoflex Bicolor Luminaire Controller

(For any FCC matters):

Echoflex Solutions, Inc.

3031 Pleasant View Road

Middleton, WI 53562

+1 (608) 831-4116

echoflexsolutions.com

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received; including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Any modifications or changes to this product not expressly approved by Electronic Theatre Controls, Inc. could void the user's authority to operate the product. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

Contains FCC ID: SZV-STM300U

ISED Compliance

This device contains a license-exempt transmitter/receiver that complies with Innovation, Science, and Economic Development Canada's license-exempt RSSs. Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Contains IC ID: RSS 210

Conformité ISDE

Cet appareil contient un émetteur/récepteur conforme aux CNR d'Innovation, Sciences et Développement économique Canada (ISDE) applicables aux appareils radio exempt de licence. Son fonctionnement est soumis aux deux conditions suivantes:

1. L'appareil ne doit pas produire d'interférences.
2. L'utilisateur de l'appareil doit accepter toute interférence, même si l'interférence est susceptible d'en compromettre le fonctionnement.

Contient ID IC: RSS 210

