

EcoSystem™ Digital Ballast | Installation Guide



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1

Before You Get Started: Important Information About EcoSystem™ Ballasts

This section of the installation guide includes important topics that a fixture manufacturer or an electrical contractor needs to know before installing and wiring an EcoSystem dimming ballast. Read this section carefully before proceeding to the installation steps beginning on page 9.

What is EcoSystem?

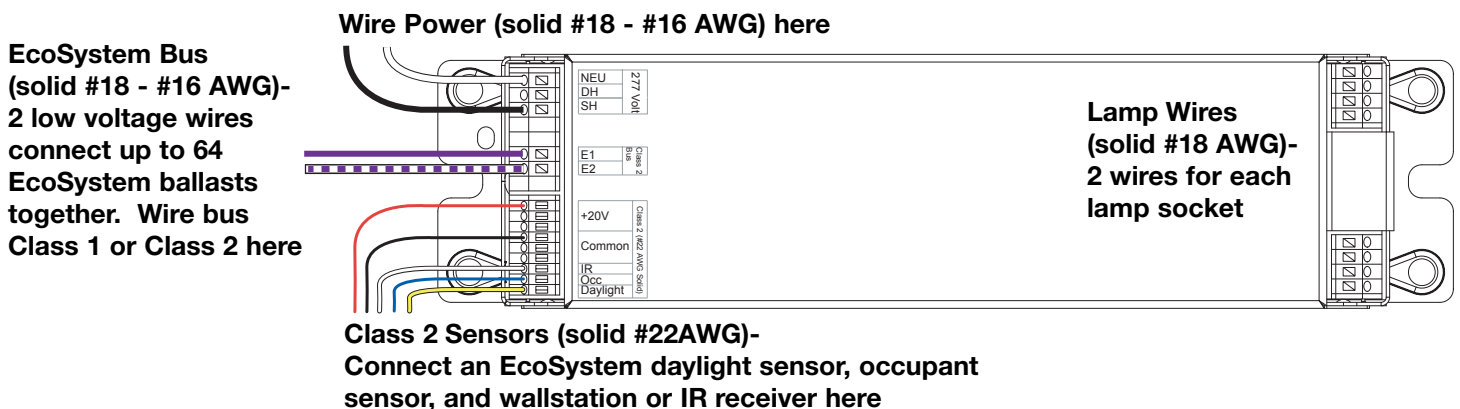
Lutron's EcoSystem lighting network starts with one simple but essential building block—the EcoSystem dimming ballast—which replaces the non-dim ballast in a fixture. A variety of sensors or wallstations are connected directly to the ballast to create an efficient lighting control system. All of this can be accomplished on an individual ballast or up to 64 ballasts connected together - allowing sensors to have single or multiple zone control.

EcoSystem Ballasts

EcoSystem ballasts are available for many voltages and lamp types, please consult Lutron. If a ballast is not available for direct control via the EcoSystem Bus, a standard Lutron dimming ballast can be connected using a Ballast Module.

EcoSystem Ballast Wiring Snapshot

EcoSystem ballasts require power, like non-dim ballasts, and also receive low voltage control inputs from the EcoSystem Bus and sensors. Use this guide for ballast wiring details. A wiring summary is shown below:

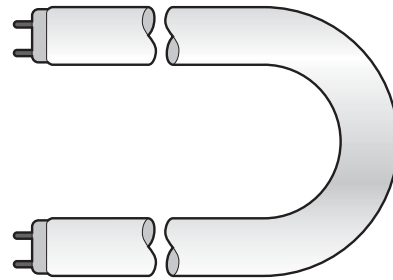


Lamp Types

EcoSystem T8 ballasts may be used with either linear or U-bend T8 lamps. T5 ballasts may only be used with linear T5 lamps.



T8/T5 linear lamps are straight with two pins at either end.



T8 U-bend lamps have a "U" shape and two pins at either end.

Seasoning New Lamps

Consult lamp manufacturer for lamp seasoning requirements prior to dimming.

To season lamps perform one of the following:

- Operate new lamps at full output continuously.
- Remove lamps from another (non-dimmed) area; re-install in dimming area.
- Use a seasoning station to build an inventory of properly seasoned lamps.

Rapid-Start Lamp Sockets

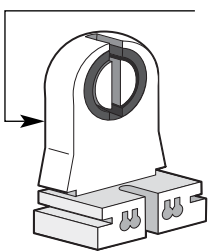
EcoSystem ballasts require rapid-start lamp sockets. Lutron recommends sockets that meet IEC 60400. Lutron recommends a rotary locking variety, with metal contacts that make firm contact with the lamp pins. The slide-in or knife-edge varieties can also be used.

Backing material of the socket should be the same material as the rest of the socket body, and should not deform with over-insertion of wires or lamp changes. For detailed specifications on sockets, refer to *Application Note #122: Lampholders and Lampholder Installation for Fluorescent Dimming*.



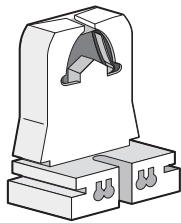
CAUTION:

Using EcoSystem ballasts with instant-start sockets may damage the ballasts.

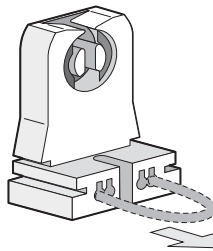


Back **MUST** not be flexible material.

Rapid-start
(rotary locking variety)



Rapid-start
(slide-in variety)



Rapid-start
(knife-edge variety)

A jumper may have been installed for instant-start applications. This jumper must be removed.

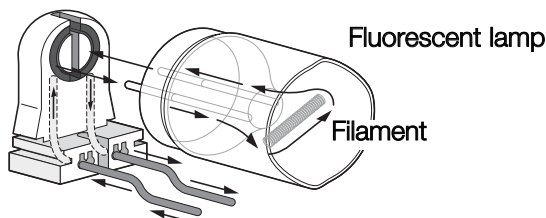


Instant-start
(do not use)

Why Rapid-Start Sockets Are Important

Dimming ballasts must access both lamp pins to heat the lamp filaments. Without heating, the lamp will fail prematurely. Good lamp pin-to-socket contact and correct wiring are required to produce flicker-free dimming and to ensure long lamp life.

T8/T5 rapid-start socket



Flow of electricity for filament heating

Ballast Wiring

Maximum Wire Lead Length

Lead lengths from a ballast to the sockets must not exceed 7 ft (2.1 m). Exceeding the maximum lead length may cause lamp flicker, improper starting, and/or reduced lamp life.

Gauge Requirements

Terminal blocks on the ballast are poke-in wire trap connectors that accept the following wire gauges:

- Mains Wiring, EcoSystem Bus, Lamp Wiring: #18 – #16 AWG (1.02 – 1.29 mm) solid
- Class 2 Sensor Wires: #22 AWG (0.635 mm) Solid

✓ *NOTE: Ballast terminals hold only one solid wire. In most cases, a wire connection to the distribution bus or EcoSystem Bus is required.*

Separating Class 1 and Class 2 Wires

The EcoSystem Bus may be connected to the ballast using Class 1 or Class 2 wiring methods. Sensors and wallstations must be wired Class 2. When using both Class 1 and Class 2 wiring methods, it is essential to Class 2 wires separate from Mains and Class 1 wires by at least 0.25" (6.35 mm). Consult all applicable national and local codes for wiring restrictions.

Ballast Temperature

Ambient Operating Temperature

Lutron ballast specifications are based on a maximum case-temperature limit. The maximum temperature varies from ballast to ballast. Lutron marks the temperature rating of a location on the ballast case defined as the calibration point. Operating the ballast within the calibration point rating ensures that the maximum case-temperature rating has not been exceeded. Exceeding this rating will void the ballast's warranty.



Example Ballast and Calibration Point

Calibration point

Calibration Point Measurement Example

1. Ballast label reads: “Calibration point temperature not to exceed 65 °C. Maximum case temperature 75 °C.”
2. Calibration point is measured and found to be 65 °C, therefore, case temp is less than 75 °C, and ballast will operate as specified.

Tips for Controlling Ballast Temperature

- DO attach the ballast to a grounded metal fixture.
- DO NOT mount the ballast on a poor thermal conductor, such as wood, plastic, etc.
- DO limit the quantity of the ballasts in an enclosed space (for instance, a cove installation or a strip fixture) so that the ballasts do not operate above the rated temperature.

Fixture Design

When designing a fixture, ensure that the calibration point and the maximum case temperature is not exceed under the worst-case expected conditions.

Control Methods

Lutron offers a variety of ways to control EcoSystem ballasts. Depending on the type of room or facility, a combination of sensors and wallstations can be used to control the fixtures.

EcoSystem Bus

The EcoSystem Bus enables you to connect a ballast to other EcoSystem ballasts and a Bus Supply to create a system of up to 64 ballasts. Any sensor or wallstation connected to an EcoSystem ballast can communicate with any or all fixtures on the EcoSystem Bus to form a subsystem. Subsystems are configured and programmed using the handheld EcoSystem Programmer.

Standard 3-Wire Control

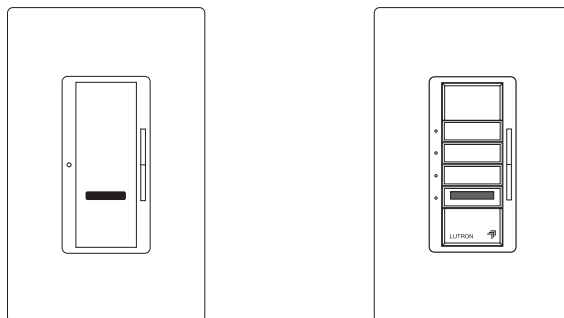
This is high voltage dimming from a traditional Lutron dimmer. Ballasts controlled by this method require three input wires: switched hot, dimmed hot, and neutral. The switched hot and neutral provide power to the ballast. The dimmed hot provides a line voltage dimming signal from the control to the ballast. EcoSystem digital inputs to the ballast (E1 and E2) must be provided as well. 3-wire dimming inputs cannot be grouped via the EcoSystem programmer, only ballasts hardwired to a 3-wire dimmer will be controlled by the 3-wire dimmer.

- ✓ *NOTE: Digital wiring and 3-wire input can be used simultaneously (for example, automatic digital control and manual control through a “local” dimmer.*

Digital Wallstations

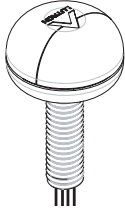
One-button wallstations enable users to manually control any fixtures on the bus for simple on/off or raise/lower control. Scene control wallstations enable users to recall different lighting scenes in multi-purpose rooms. Wallstations also operate as programming points.

- ✓ *NOTE: An IR sensor and wallstation cannot be connected to the same ballast.*



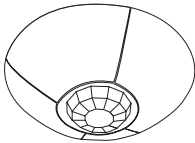
Daylight sensor

Designed to harvest natural light and maintain specific light levels in the space, the sensor automatically dims the lights when the available daylight is high or brightens the lights when the daylight is low. The sensor can control an individual fixture or a group of fixtures. In addition, the entire system can be programmed through the daylight sensor's integrated infrared receiver.



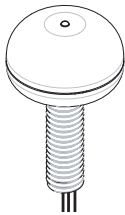
Occupant sensor

Automatically turns lights off in assigned fixtures when the space is unoccupied.



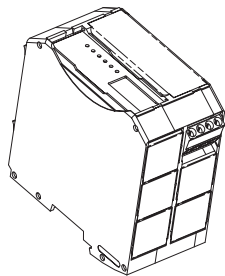
Infrared (IR) receiver

Provides personal control via an IR remote. The receiver wires directly to the ballast. It allows control an individual fixture or group of fixtures. It can be used as a programming port to program the system.



EcoSystem Bus Supply

The EcoSystem Bus Supply powers the communication bus between devices, and is capable of supporting a network of up to 64 ballasts or ballast modules, 32 occupant sensors, a combination of 64 wall controls and infrared (IR) receivers, and 8 daylight sensors.



2

Step by Step: Installing and Wiring an EcoSystem™ Dimming Ballast

This section lists the typical workflow followed to mount and wire an EcoSystem ballast. This section also describes the procedures needed to perform each step. If you are installing a fixture that is already mounted and partially wired, you will not need to perform all of the steps.

✓ *NOTE: If you have not already done so, refer to “Before You Get Started: Important Information About EcoSystem Ballasts” on page 2.*

Typical Workflow

Listed below is the typical workflow followed to mount and wire an EcoSystem ballast.



CAUTION:

Make sure the circuit breaker to all components is turned OFF before performing any wiring.

1. Mount the ballast.
2. Wire the lamp sockets.
3. Wire the ballast to the lamp sockets.
4. Connect line voltage (distribution panel or dimmer).
5. Connect the EcoSystem Bus.
6. Connect a wallstation.
7. Connect a daylight, occupant, and/or infrared sensor.
8. Mount the lamps.
9. Test the ballast.

Refer to the following pages for detailed procedures on how to perform each step.

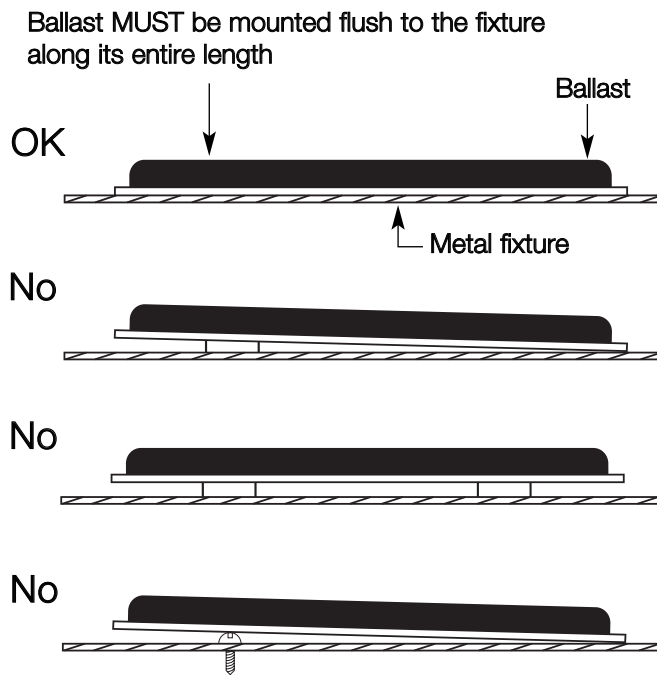
Mounting the Ballast

- ▶ **To mount the ballast in the fluorescent fixture,** use two screws to secure it to the fixture or 1 screw and a crow's foot. The ballast **MUST** be mounted flush to the fixture along its entire length.



CAUTION:

- Ballasts generate heat and must have a way to dissipate it. This is done by thermal conduction to the fixture.
- Screws, knockouts, dimples, or features that raise the ballast off the fixture (even slightly) are not acceptable since they impair the ballast's ability to dissipate heat.
- Do not mount the ballast on the fixture cover plate that holds the lamps. This mounting location is often the hottest point on the fixture.



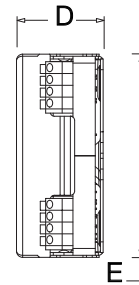
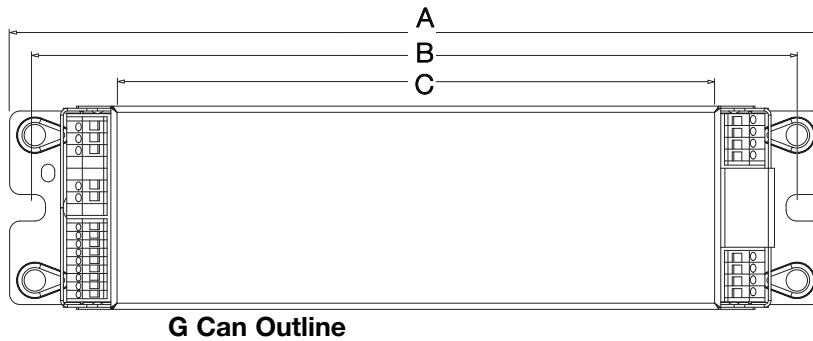
Use “star-type” screws, washers, or nuts to penetrate the paint finish on the ballast and ground both the fixture and the ballast to the earth ground. Attach both ends of the ballast to the fixture to ensure proper grounding.



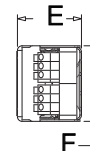
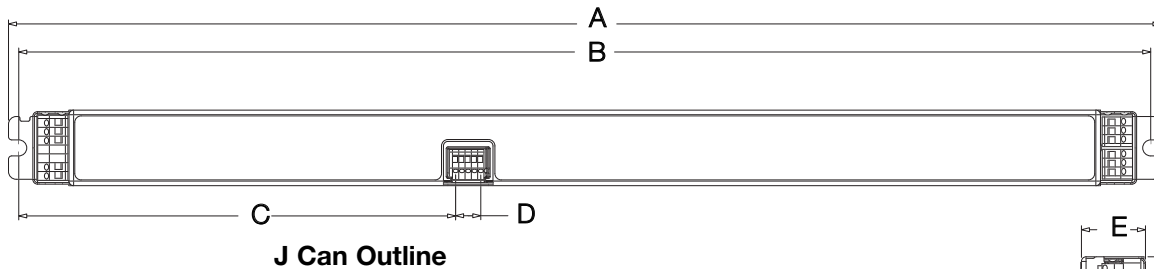
Star-type washer designed to penetrate paint finish

Ballast Dimensions

- **Two different EcoSystem Ballast Sizes are used.** Follow the guides below for mounting. “G” or “J” in the model number of the ballast (prior to the ballast voltage) indicates ballast dimensions.



G Can Dimensions
 A = 9.5" (241 mm)
 B = 8.9" (226 mm)
 C = 7.1" (180 mm)
 D = 1.00" (25 mm)
 E = 2.38" (60 mm)



J Can Dimensions
 A = 18.0" (457 mm)
 B = 17.68" (449 mm)
 C = 6.82" (173 mm)
 D = .39" (10 mm)
 E = 1.0" (25 mm)
 F = 1.18" (30 mm)

Wiring the Lamp Sockets

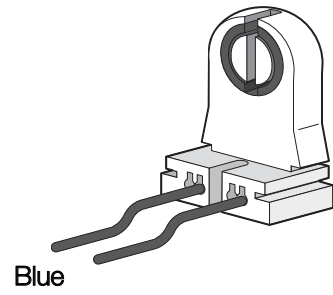
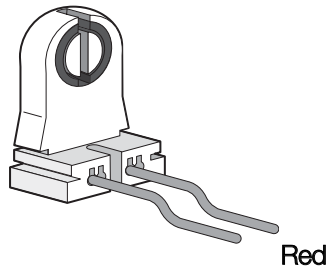
- **To wire lamp sockets,** refer to the following illustrations for one-lamp, two-lamp, three-lamp, and U-bend fixtures.



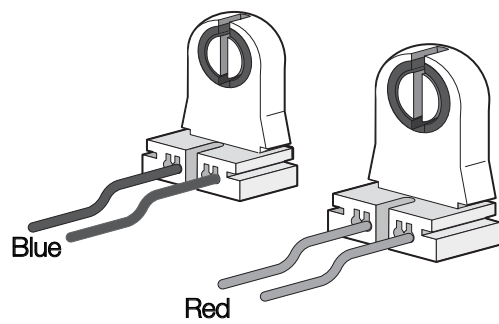
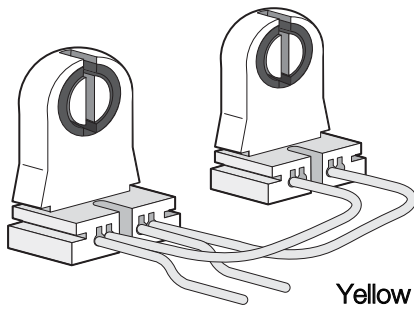
CAUTION:

- Make sure the circuit breaker to the ballast is OFF before wiring.
- Use only rapid-start rotary locking, slide-in, or knife-edge sockets.

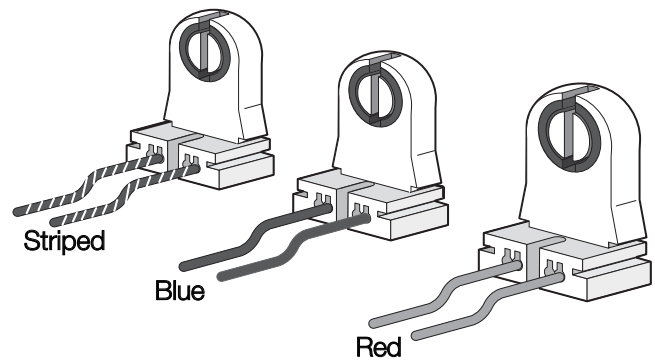
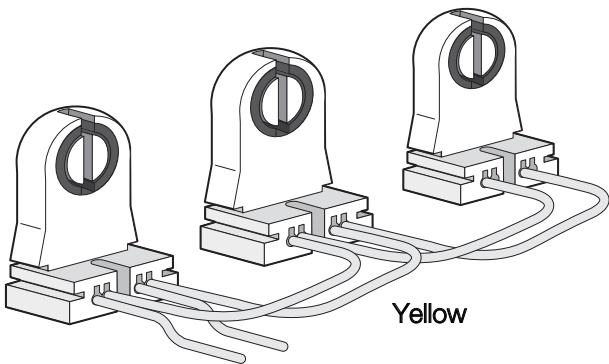
1-Lamp Socket Wiring



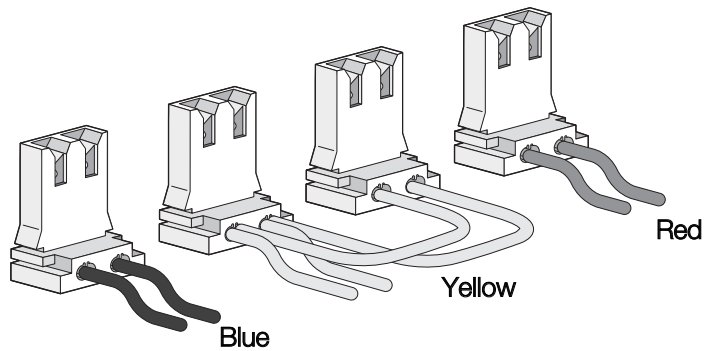
2-Lamp Socket Wiring



3-Lamp Socket Wiring



U-Bend Lamp Socket Wiring



Wiring the Ballast to the Lamp Sockets

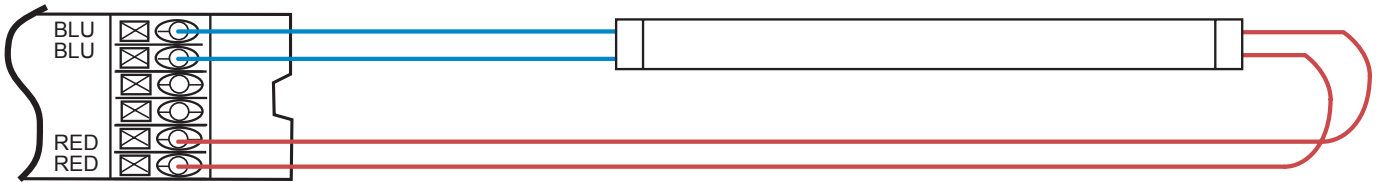
- ▶ **To wire the ballast to the lamp sockets,** refer to label on the dimming ballast. Images below are for reference only.



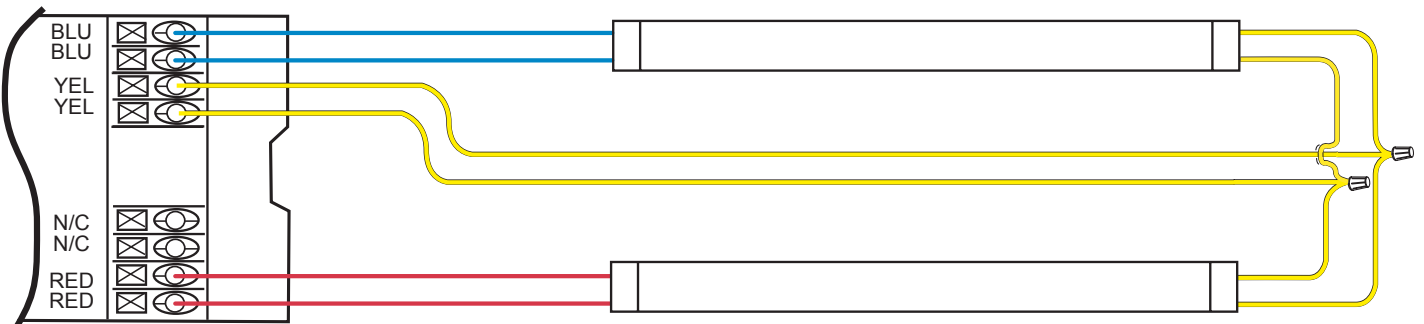
CAUTION:

- Make sure the circuit breaker to the ballast is OFF before wiring.
- Lead lengths from ballast to socket must not exceed 7 ft (2.1 m) for T8 lamps.

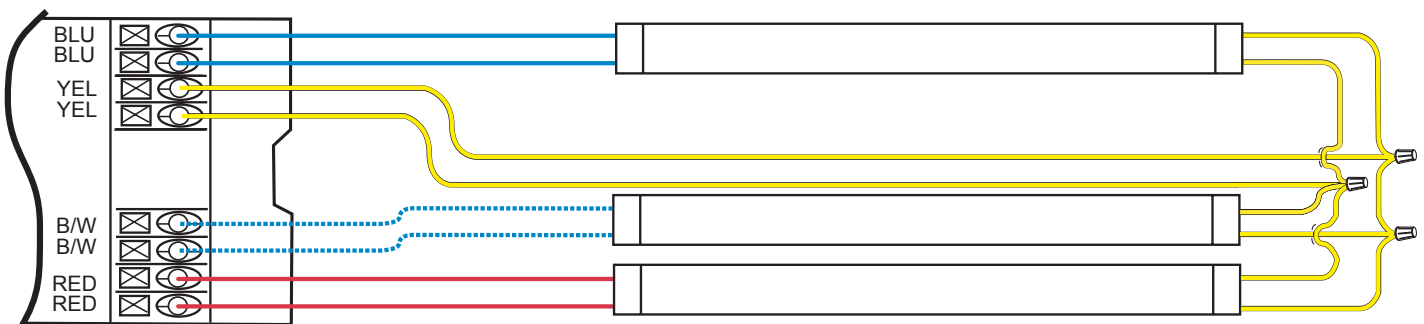
Wiring to One Lamp (J can shown)



Wiring to Two Lamps (G can shown)



Wiring to Three Lamps (G can shown)



Connecting the Line Voltage (Distribution Panel)

- ▶ **To wire the line voltage from the distribution panel**, wire the hot and neutral conductors from the distribution panel to the ballast terminals labeled HOT and NEU.

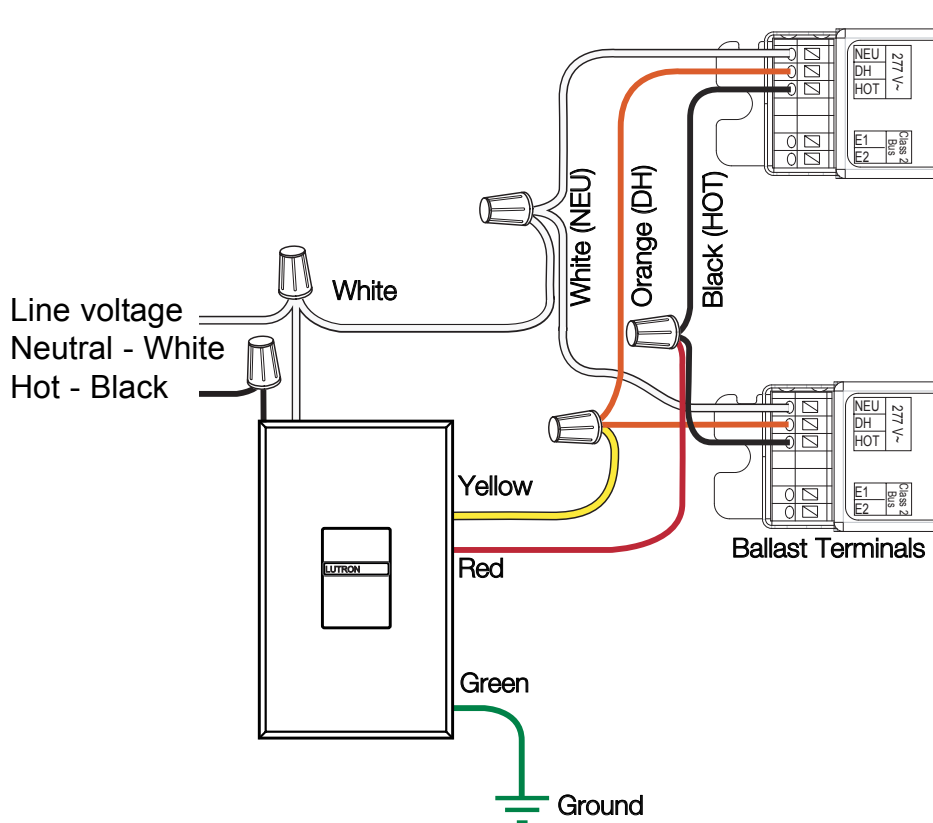
Wire color designations for line voltage terminals on the ballast are:

- White = neutral
- Black = hot (mains)

✓ *NOTE: Mains Voltage must match voltage specified on the ballast label.*

Connecting the Line Voltage (Dimmer or Dimming Panel)

- ▶ **To wire the line voltage from a dimmer or dimming panel**, wire the switched hot, dimmed hot, and neutral conductors from the dimming panel or dimmer to the ballast terminals as shown.



CAUTION:

- Make sure the circuit breaker at the distribution panel is OFF before wiring.
- The ballast terminals hold only one #18 – #16 AWG (1.02 – 1.29 mm) solid wire.

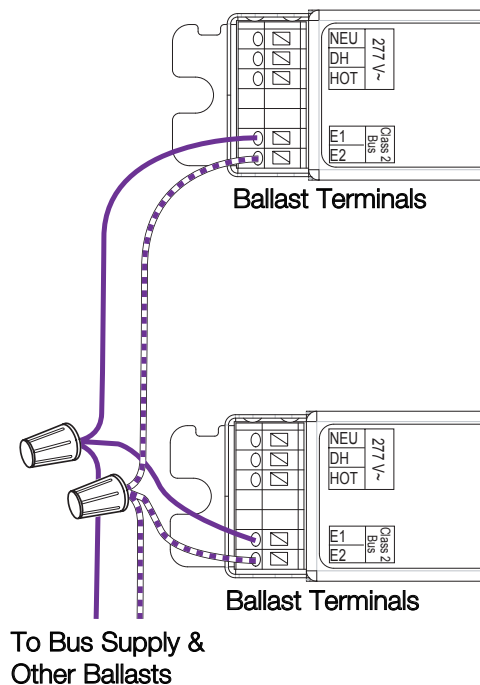
Connecting the EcoSystem Bus

► **To connect a ballast to other ballasts**, wire the EcoSystem bus as shown below. Note that:

- Bus wiring is topology-free (can be wired as daisy chain, star method, T-tap, etc).
- The power supply does not have to be located at the end of the EcoSystem bus.
- E1 and E2 wires are not polarity sensitive.
- Bus length is limited by the wire gauge used for E1 and E2 as follows:

| Wire Gauge | Maximum Bus Length |
|-------------------|--------------------|
| #12 AWG (2.05 mm) | 2,200 ft (670 m) |
| #14 AWG (1.63 mm) | 1,400 ft (470 m) |
| #16 AWG (1.29 mm) | 900 ft (270 m) |

- Consult Bus Supply installation instructions for bus wiring details.



CAUTION:

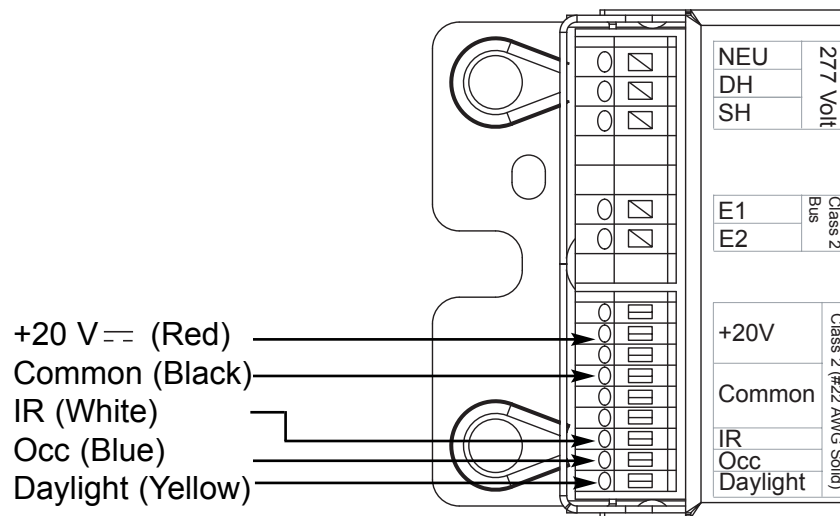
- Make sure the circuit breaker to the ballast is OFF before wiring.
- Ballast terminals hold only one #16 – #18 AWG solid wire. In most cases, a wire connection to the EcoSystem bus is required.
- Follow all applicable local and national codes.

Connecting Sensors and Wallstations

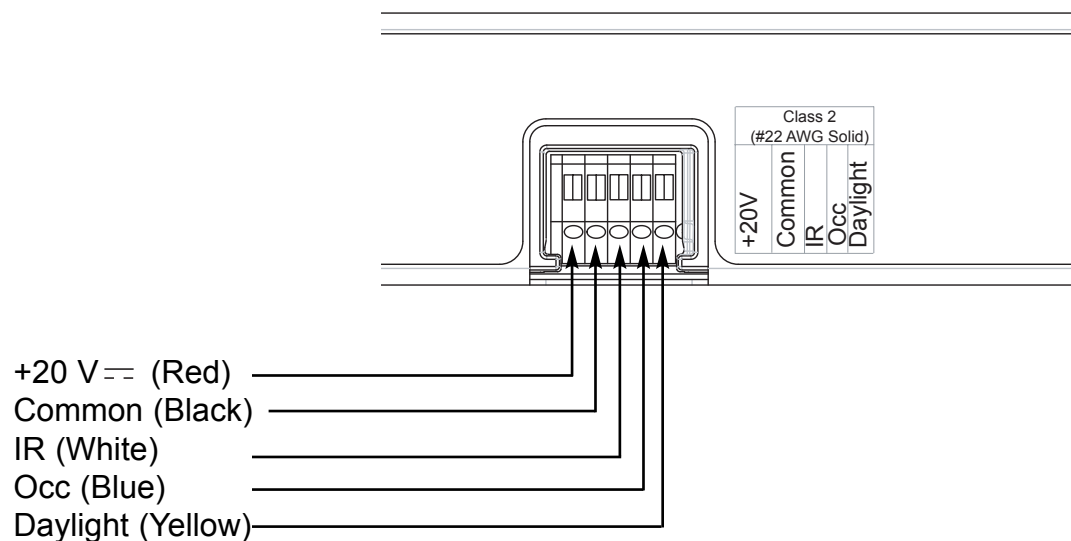
- ▶ To connect a daylight sensor, occupant sensor, wallstation and/or infrared receiver, refer to the instruction sheets provided with the devices. Diagrams for the Class 2 Sensor/Wallstation terminals are shown below.

✓ *NOTE: The ballast accepts only one infrared input (either daylight sensor, IR sensor or Wallstation).*

G Can Class 2 Sensor Terminals



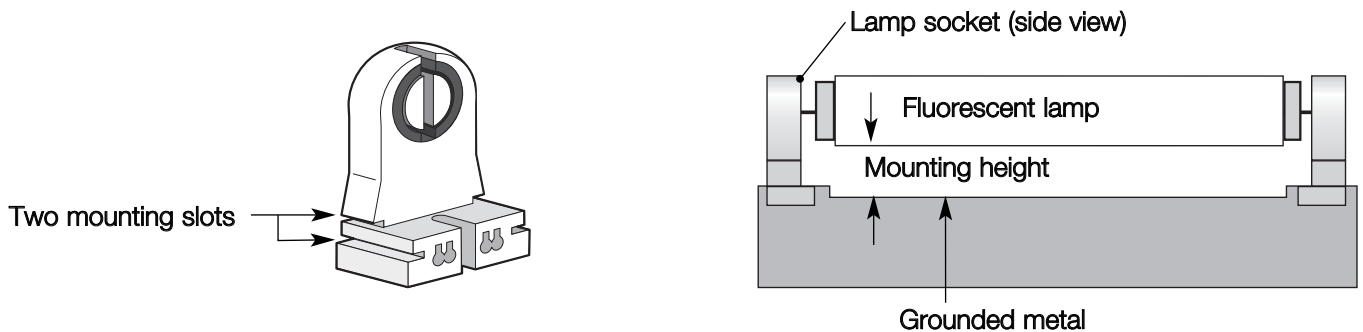
J Can Class 2 Sensor Terminals



Mounting the Lamps

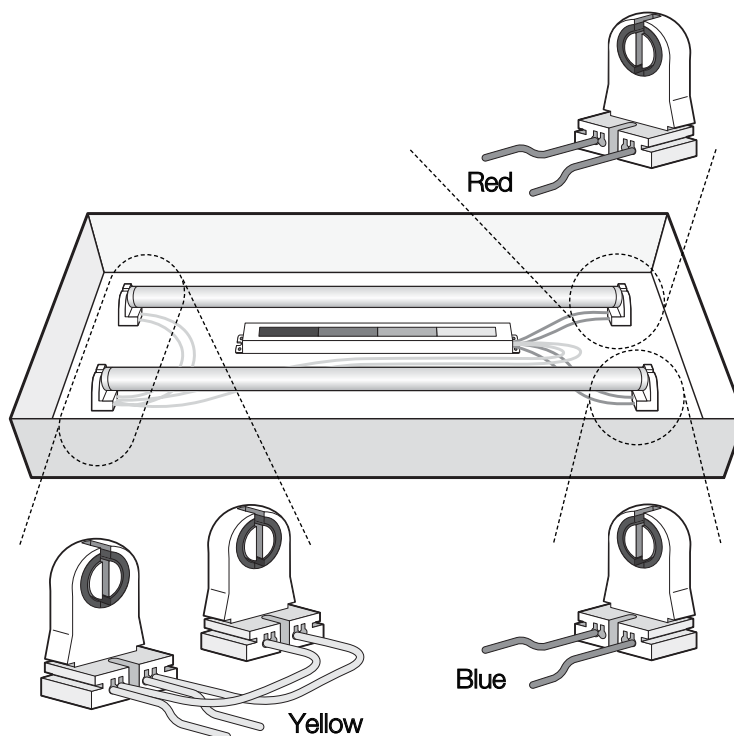
- **To mount the lamps**, use the mounting slots on the lamp sockets to keep the lamps between 1/4" and 3/4" (3.2 mm – 19.1 mm) away from the grounded metal surface of the fixture, as shown in the following illustration. Having a lamp too close to the grounded metal will not reduce lamp life but may cause a visible difference in brightness along the length of the lamp.

Rotate lamp pins to ensure good contact with the socket contacts. If not rotated properly for good connection, lamps may fail prematurely.

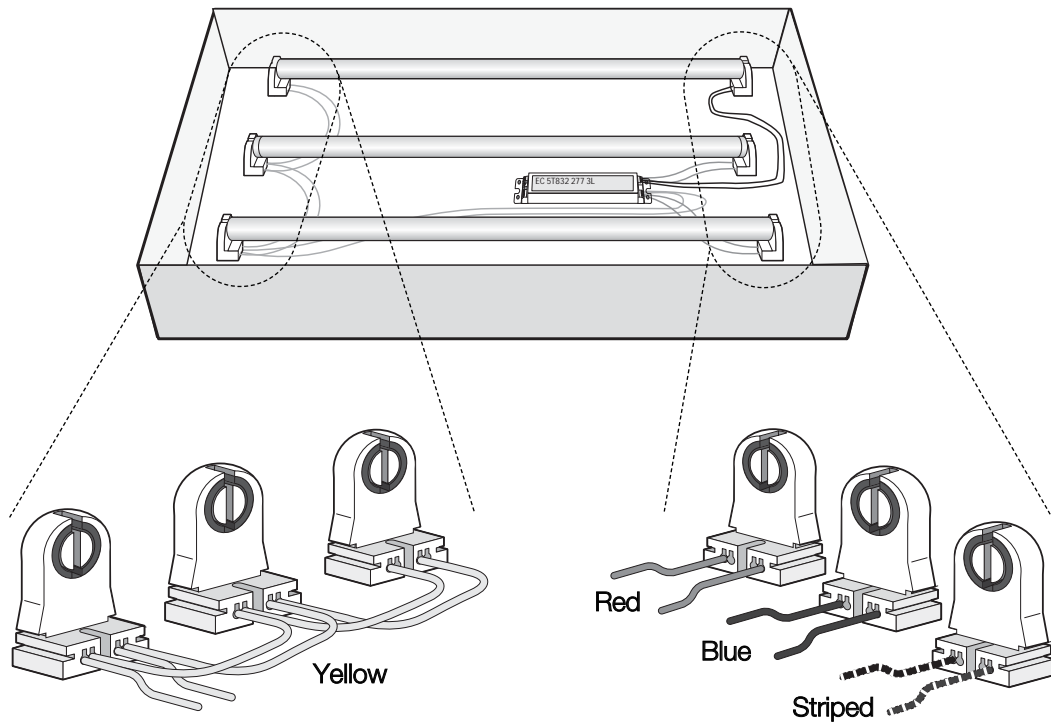


Sample Mounted and Wired Ballasts

Typical 2-Lamp Linear Fixture with Ballast Mounted in Center Trough



Typical 3-Lamp Linear Fixture with Ballast Mounted in Center Trough



Testing the Ballast

- ▶ **To check the ballast after mounting and wiring**, complete the following checklist.
- ✓ **Confirm all ballasts are properly wired**, double check all mains inputs and EcoSystem bus wires are properly terminated at the ballast. Confirm that the mains input voltage does not exceed ballast rated voltage. Terminate the EcoSystem Bus at the EcoSystem Bus Supply. If the bus is not connected, the lamps will remain at full intensity.
- ✓ **Complete installation**, confirm all fixtures and enclosures are properly closed, mounted, and grounded.
- ✓ **Power all ballasts**, all lamps should strike to full light output.
 - If any ballasts fail to strike lamps, confirm mains wiring to the ballast is correctly connected and of the appropriate voltage.
 - If lamps strike, drop out, or continue to flash, disconnect power and inspect ballast to lamp socket wiring. All wiring should match the wiring diagram on the ballast case.
- ✓ **Confirm proper dimming**, follow the instructions with the EcoSystem Bus Supply to manually override all ballast light levels to low end, off, and back to high end. If any ballasts do not react to the override commands, check EcoSystem Bus wiring and that the EcoSystem Bus Supply is powered and connected.



Notice:

Consult lamp manufacturer for lamp seasoning requirements prior to dimming

Ballast Warranty

LUTRON ELECTRONICS CO., INC.

BALLAST THREE YEAR LIMITED WARRANTY

For a period of three years from the date of shipment by Lutron, Lutron warrants each new ballast to be free from manufacturing defects. Lutron will, at its option, repair or provide a comparable replacement for any defective ballast that, in Lutron's opinion, has been installed and operated under pursuant to Lutron's product specifications and the applicable provisions of the National Electrical Code and of the Safety Standards of Underwriters Laboratories so long as Lutron is promptly notified of the defect within the three year warranty period and, if requested by Lutron, the ballast, is returned to Lutron.

This warranty is in lieu of all other express warranties and of all implied warranties, including implied warranties of merchantability and of fitness for a particular purpose. This warranty does not cover: the cost of installation, removal or reinstallation; damage resulting from misuse, abuse, or improper or incorrect repair; damage from improper wiring or installation; or incidental or consequential damages. Lutron's liability on any claim for damages arising out of or relating to the manufacture, sale, installation, delivery, or use of the ballast is limited to the purchase price of the ballast.

No Lutron agent, employee or representative has any authority to bind Lutron to any affirmation, representation or warranty concerning the ballast. Unless an affirmation, representation or warranty made by an agent, employee or representative is specifically included herein, or in standard printed materials provided by Lutron, it does not form a part of the basis of any bargain between Lutron and customer and will not in any way be enforceable by customer.

In no event will Lutron or any other seller be liable or responsible for any (i) consequential or special damages, (ii) repair work undertaken without Lutron's prior consent, (iii) ancillary equipment not furnished by Lutron which is attached to or used in connection with the ballast, all such equipment being expressly excluded from this warranty, or (iv) damage to the ballast resulting from the use of ancillary equipment not furnished by Lutron for use with the ballast.

This warranty provides specific legal rights. Other rights, which vary from state to state, may exist. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply.

Contact the Lutron Technical Support Center at the numbers provided below or your local Lutron sales representative with questions concerning the installation or operation of a covered ballast or this Warranty, or to make a warranty claim. Please provide the exact model number when calling.

USA and Canada (24 hrs/7days) Technical Support +1.800.523.9466
Other countries (8 a.m. - 8 p.m. ET) Technical Support +1.610.282.3800
<http://www.lutron.com/ecosystem>

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These products may be covered under one or more of the following U.S. patents: 6,452,344, 6,674,248, and corresponding foreign patents. U.S. and foreign patents pending.

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