CEL-200 / DTD-2

Lighting Control System

CBM ÉCLAIRAGE LIGHTING

User's Manual V4.1

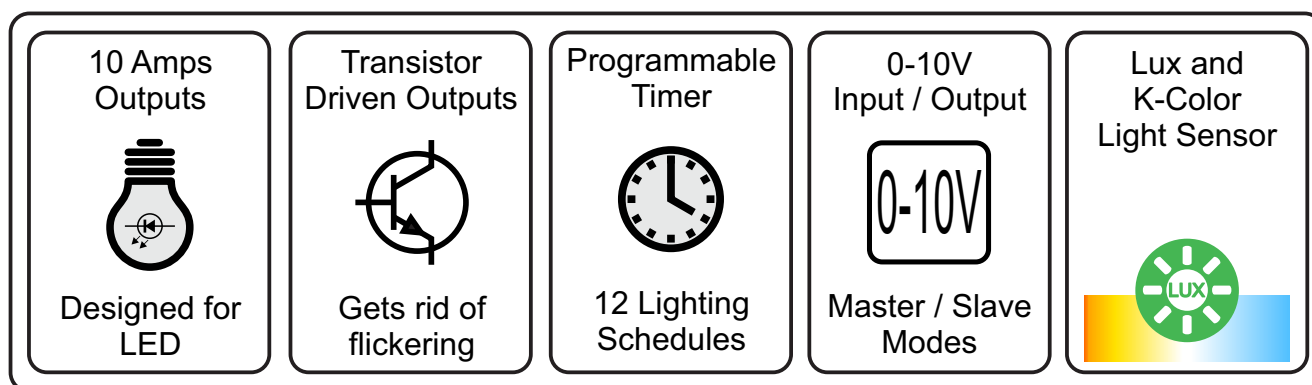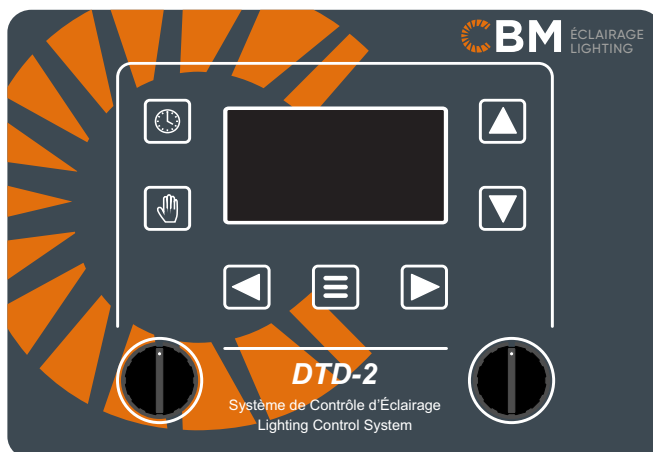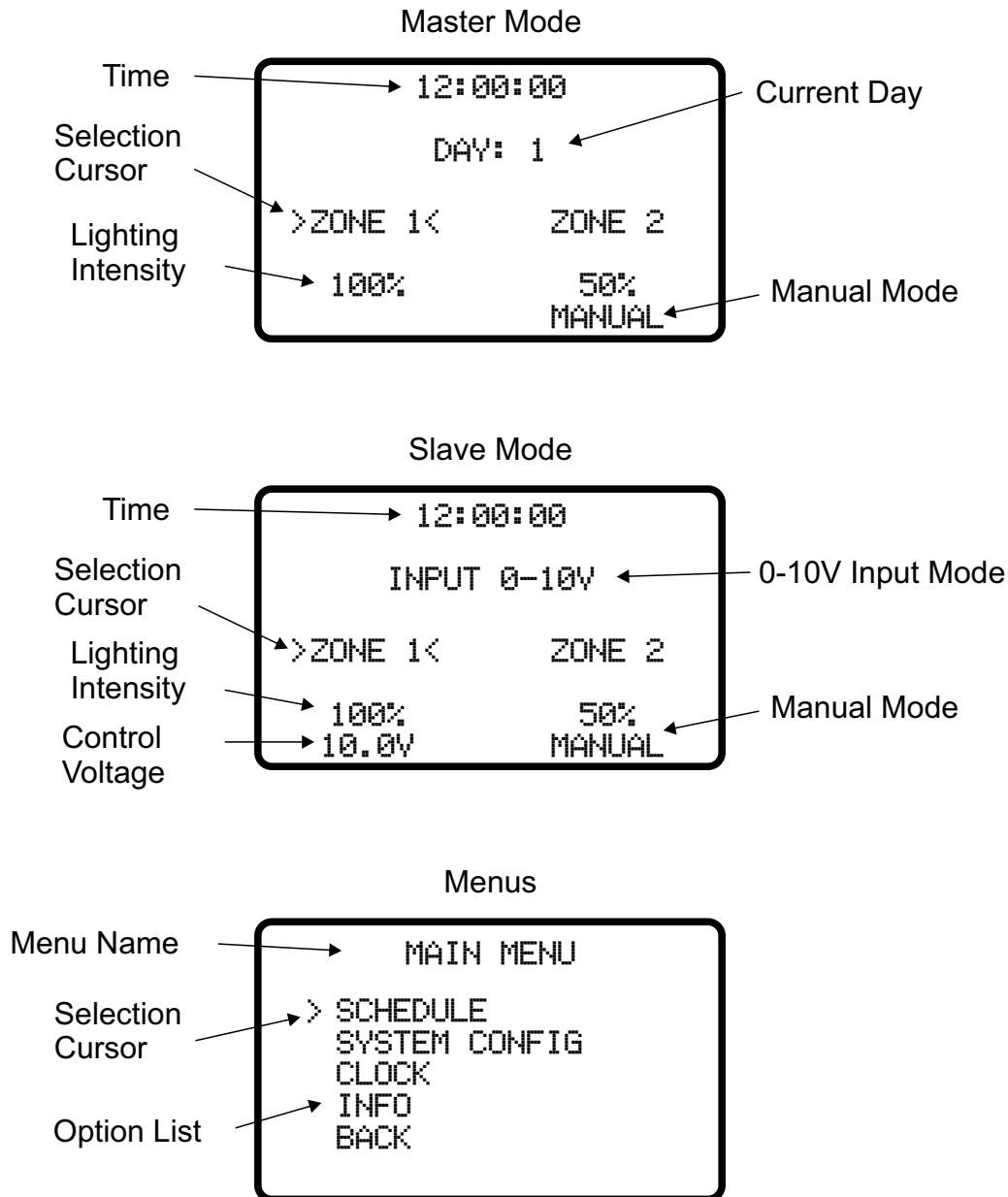| 10 Amps Outputs	Transistor Driven Outputs	Programmable Timer	0-10V Input / Output	Lux and K-Color Light Sensor
Designed for LED	Gets rid of flickering	12 Lighting Schedules	Master / Slave Modes	

The CEL-200 offers two 10 Amps lighting outputs compatible with American and European standards (120V / 240V, 50Hz / 60Hz) allowing you to control 2 lighting zones independently or 1 lighting zone with bi-colored lights from a simple Kelvin color set point. This lighting control system is specially designed for LED type lamps. The transistor driven output technology eliminates annoying flickering of LED lamps, as seen with traditional TRIAC based dimmers.

How to use the CEL-200:

The interface is composed of an LCD display, three buttons below the display for menu access, two buttons to the right of the display to adjust the different settings and two buttons to the left of the display for selecting the operating mode and two multifunction rotary encoders.

Depending on the operating mode, the main screen of the CEL-200 may look like this:

Master Mode

Time → `12:00:00` ← Current Day

Selection Cursor

Lighting Intensity

`DAY: 1`

`>ZONE 1<      ZONE 2`

`100%         50%`

`MANUAL` ← Manual Mode

Slave Mode

Time → `12:00:00`

Selection Cursor

Lighting Intensity

Control Voltage

`INPUT 0-10V` ← 0-10V Input Mode

`>ZONE 1<      ZONE 2`

`100%         50%`

`10.0V      MANUAL` ← Manual Mode

Menus

Menu Name → `MAIN MENU`

Selection Cursor

Option List

`> SCHEDULE`
`SYSTEM CONFIG`
`CLOCK`
`INFO`
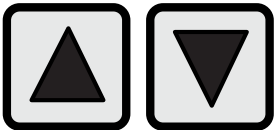`BACK`

CEL-200 Buttons:

Menu

Press this button on the main screen to open the main menu. In a menu, press to activate the selected menu item.
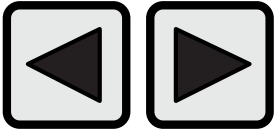
Left/ Right Arrows

These arrows move the selection cursor.
On the clock adjustment screen, they adjust the current day.

Up / Down Arrows

On the main screen in manual mode, press to adjust the selected zone's light level.
In a menu, press to adjust the value of the selected parameter.

Manual

On the main screen, press to switch the selected zone into manual mode. The screen shows a flashing "Manual" to indicate that the manual mode is active for that zone.

Timer

On the main screen, press to switch the selected zone to automatic timer mode. In master mode, the schedule is resumed. In slave mode, the system uses the 0-10V input voltage to control lighting.
On the clock adjust screen, press to reset current day to 0.
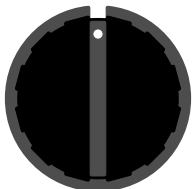
Multifunction Rotary Buttons (Optional)

On the main screen, press to toggle manual mode. Turn to adjust lighting level. Left button for zone 1, right button for zone 2.
In a menu, turn to move the selection cursor. Press to activate the selected menu item.
On the clock adjust screen, turn the left button to adjust hours and the right button to adjust minutes.
On the schedule programming screen, turn to move and press to activate the cursor. The cursor moves to the value that can be adjusted, if so. Turn to adjust the value and press to move the cursor back.

CEL-200 Menus and Settings:

System Config:

Language: (Fr / En)
Selects the system language, in french (fr) or in english (en)

Mode: (Master / Slave)
Selects the operating mode. In master mode, the system controls the light outputs according to the programmed schedule. In slave mode, the light outputs level is set according to the 0-10V input voltage.

Contrast:
Adjusts the LCD display contrast. low value = very light, high value = very dark. A contrast of 10 to 16 should be optimal for this LCD display model.

Brightness: (30% - 100%)
The brightness of the LCD backlighting.

Manual Timer: (0 - 60 minutes)
The number of minutes before manual mode reverts back to automatic mode. In case the user forgets to turn the system back to automatic mode, this security function guarantees that the automatic mode will become active after this amount of time. Set to 0 to deactivate this function.

Chromatic Mode: (Yes / No) - (Optional)
Chromatic mode allows to control bi-colored lights.

Kelvin at x%: (2000K - 7000K) - (Optional)
The Kelvin set point according to the voltage of the 0-10V input in slave mode when chromatic mode is on. Lets you adjust Kelvin values for different light level.

Clock Menu:
Lets you adjust the time and rearing day. Use the up / down arrows or the multifunction rotary buttons to adjust the time. Use the left / right arrows to adjust the rearing day. Press the timer button to reset the rearing day to 0.

Info Menu:
This screen shows system information, like the software version and the frequency detected by the CEL-200 (50 - 60 Hz). This information can be useful for troubleshooting purposes.

Schedule Menu:

This is where you can edit your lighting schedule. The schedule is made up of up to 12 periods that will automatically switch in sequence as days go by. Each period is repeated for a number of days before switching to the next. Periods are divided into steps. Up to 24 steps can be programmed for each period.

First select the zone for which you want to edit the schedule, then the following screen is shown:

```
┌─────────────────────────────────┐
│         EDIT SCHEDULE           │
│                                 │
│ > PERIOD: 1/2                   │
│   DAYS: 3/10                    │
│   EDIT PERIOD                   │
│   ADD PERIOD                    │
│   DELETE PERIOD                 │
│   BACK                          │
└─────────────────────────────────┘
```

Period: The first number is the selected period. The second number is the total number of periods in the schedule.

Days: The first number is the number of days to repeat the selected period. The second number is the total number of days for the whole schedule.

Edit Period: To switch to the "Edit Period" screen.

Add Period: To add a period to the schedule. Inserts a new period after the current position. In the above example, with period 1 selected and a total of 2 periods, adding a period would insert a new period at position 2, and all the following periods would shift by one position so the old period 2 would become period 3 and so on.

Delete Period: To remove a period from the schedule. Deletes the selected period. In the above example, period 1 would be deleted and period 2 would become period 1.

Edit Period Menu

After selecting a period to edit, the following screen is shown:

```
        EDIT PERIOD
> STEP: 1/2
  TIME: 2:00
  LEVEL: 10%
  KELVIN: 2000
  ADD STEP
  DELETE STEP
  BACK
```
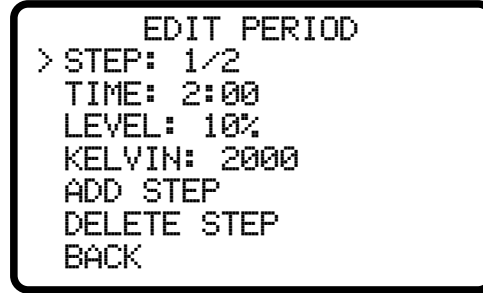
Step: The first number is the selected step. The second number is the total number of steps in this period.

Time: The time at which this step will be executed.

Level: The light level to apply for this step.

Kelvin: The color of the lighting for this step. Chromatic mode only.

Add Step: To add a step to the period. Inserts a new step after the selected step. In the above example, with step 1 selected and a total of 2 steps, adding a step would place it at position 2, shifting all following steps by 1 position so the old step 2 would become step 3 and so on.

Delete Step: To remove a step from the schedule. Deletes the selected step. In the above example, step 1 would be deleted and step 2 would become step 1.

Notes on steps time adjustment:
The time for a step cannot be adjusted past the time of the previous and next steps. If for example you have 3 steps with step 1 at 08h00 and step 3 at 18h00, step 2 cannot be adjusted earlier than 08h00 and no later than 18h00. If you want to set step 2 time at 18h30, you'll first need to set step 3 to 18h30 or later.

End of Schedule:
The last period in the schedule will repeat indefinitely, even is the number of days has been reached. Because sometimes you need to keep going for just a few more days at the end of the rearing period.

Creating your own lighting schedule

The schedule is very simple. Once you have understood these few concepts, you will be able to create any schedule of your choice.

The system checks the current time and takes the step that is just before it and the step that comes immediately after, then it calculates the light level between these two steps, and applies this value to the light output. When the clock reaches the next step, that step becomes the one just before the current time, and the cycle restarts.

By using 2 steps, there are 4 possible combinations:

Both steps are at the same time and have the same level:
This combination is useless. Nothing happens and the system carries on to the next step.

Both steps are at the same time but have different levels:
Creates an instant change in the light level, light flipping a switch.

Both steps have different times, but have the same level:
Creates a plateau, a period of time during which the lighting remains at a stable level.

Both steps have different times and different levels:
Creates a ramp where the lighting transitions from one level to another gradually.

Example:
Take for example a very common scenario where we simulate a basic sunrise / sunset. In the morning, I want my lights to turn on gradually starting at 6h00 and I want a level of 60%, 15 minutes later. Then I want my lights to turn off at 22h00 after a 5 minutes ramp.

It's done with only 4 steps :

Step 1 - Time : 6h00 / Level 0%
Step 2 - Time : 6h15 / Level 80%
Step 3 - Time : 21h55 / Level 80%
Step 4 - Time : 22h00 / Level 0%

From 6h00 to 6h15, lights go from 0% to 60% gradually (1% / 15 seconds)
From 6h15 to 21h55, lights are stable at 60%
From 21h55 to 22h00, lights go from 60% to 0% gradually (1% / 5 secondes)
From 22h00 to 6h00 the next day, lights stay off at 0%

Chromatic Mode (Optional)

With chromatic mode inactive, the system drives both zones independently according to the schedule (master mode) or the 0-10V inputs (slave mode).

When activating chromatic mode, the system switches to a single zone but adds an additional set point for Kelvins is added to the schedule (master mode) and the "Kelvin at x%" settings are used for the 0-10V inputs (slave mode).
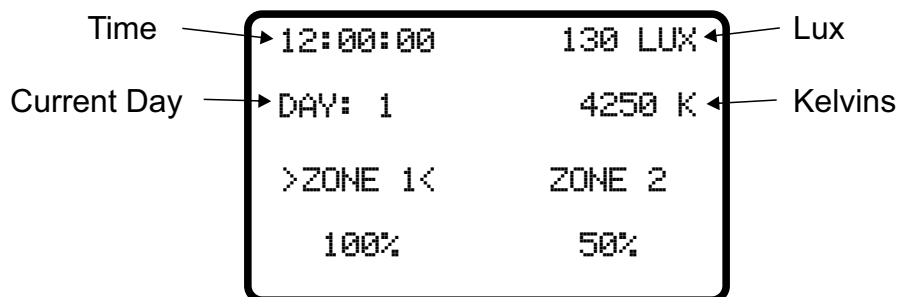
Chromatic mode is used with bi-colored lights. These lighting systems are rated with two Kelvin values, one for each color. Lights with the low Kelvin must be connected to output 1 while lights with the high Kelvin are connected to output 2.

According to the color and level set points, the CEL-200 calculates an approximation of the power to apply to each output. Many factors will affect the color rendition of your lighting. The type of luminaires used plays a significant role, as well as the external light that can infiltrate, and all the colors present inside your building will affect the color rendering of your lighting system.

The chromatic mode will perform best when used with bi-colored lights ranging from 2000K to 7000K. If you use lights with different colors, you'll have to compensate slightly to get the best results. The best way is to test the system with a light sensor that can measure the light color in Kelvins and compare the results. You can then adjust your set points accordingly.

Light Sensor (Optional)

The DLS-02 light sensor can be connected to the CEL-200 to provide continuous readings of the intensity and color of your lighting. When the sensor is connected, the main screen will display the lighting level in Lux and the lighting color in Kelvins. These values are for informational purposes only and have no effect on the control of the color or lighting level.

```
Time ————→  12:00:00        130 LUX ←——— Lux

Current Day ———→ DAY: 1       4250 K  ←——— Kelvins

                 >ZONE 1<      ZONE 2

                   100%          50%
```

Inside the CEL-200:

Fuses: An essential component for the safety of the system. Fuses protect other electronics components in the event of a short circuit. **Never use a fuse with a higher rating than what's recommended** or damage can occur to the system and to other connected equipment. If a fuse blows, check for a short circuit somewhere in the connections to the external devices or the wiring itself. A device connected to the system could be faulty.

Fuse F1: type 5x20mm, 250VAC, 500mA (Bel Fuse #5ST 500-R)
Fuses F2, F3: type 3AB, Fast Acting, 250VAC, 12A (Littelfuse #0314012)

Battery: The system is equipped with a CR2032 type 3V lithium battery. The battery is used to keep the clock running during power failures. It also powers the settings memory of the system. Removing the battery will reset all the settings.

Terminals:

~~ : Variable Lighting Power Output Load

⏚ : Ground

L1 : Main Power, 120V / 240VAC, 50/60Hz, 1Ø

L2/N : Main Neutral & Variable Lighting Power Output Neutral

0-10V Input +/- : 0-10V Input used for Slave Mode

0-10V Output +/- : 0-10V Output, in Master Mode to control a slave unit.

Minimum Adjust: This little potentiometer lets you adjust the output power at minimum intensity. Since all lights don't turn on at the same level, this adjustment allows you to get the perfect flicker free low level lighting. Switch the system to manual mode and set the intensity to 1%. Using a small screwdriver, turn the potentiometer to obtain the perfect low level lighting.

Installation

We recommend that the installation of this controller be performed by a qualified professional.

Choosing the location:
The enclosure must be mounted on a vertical surface, in an area that will provide sufficient airflow to the heat sinks. We recommend you leave 6 inches (15 centimeters) above and below the heat sinks, free of anything that could block the flow of air through the heat sinks. If the enclosure is confined without enough air reaching through the heat sinks, they could overheat and cause some damage to the controller. As a precaution, make sure to check and remove any dust or spider webs, etc, that could reduce the airflow through the heat sinks.

Choosing Mains Voltage: The system is powered from zone 1. If you are using only one zone, you must use zone 1. Both zones can be powered from different voltages at the same time. Check the operating voltage of your lamps, and use that same voltage to power the corresponding zone. This system is designed to automatically adapt to voltages ranging from 100VAC to 260VAC, at 50Hz or 60Hz.

Warning: On a tri-phase installation, it is imperative that both zones are connected to the same phase.
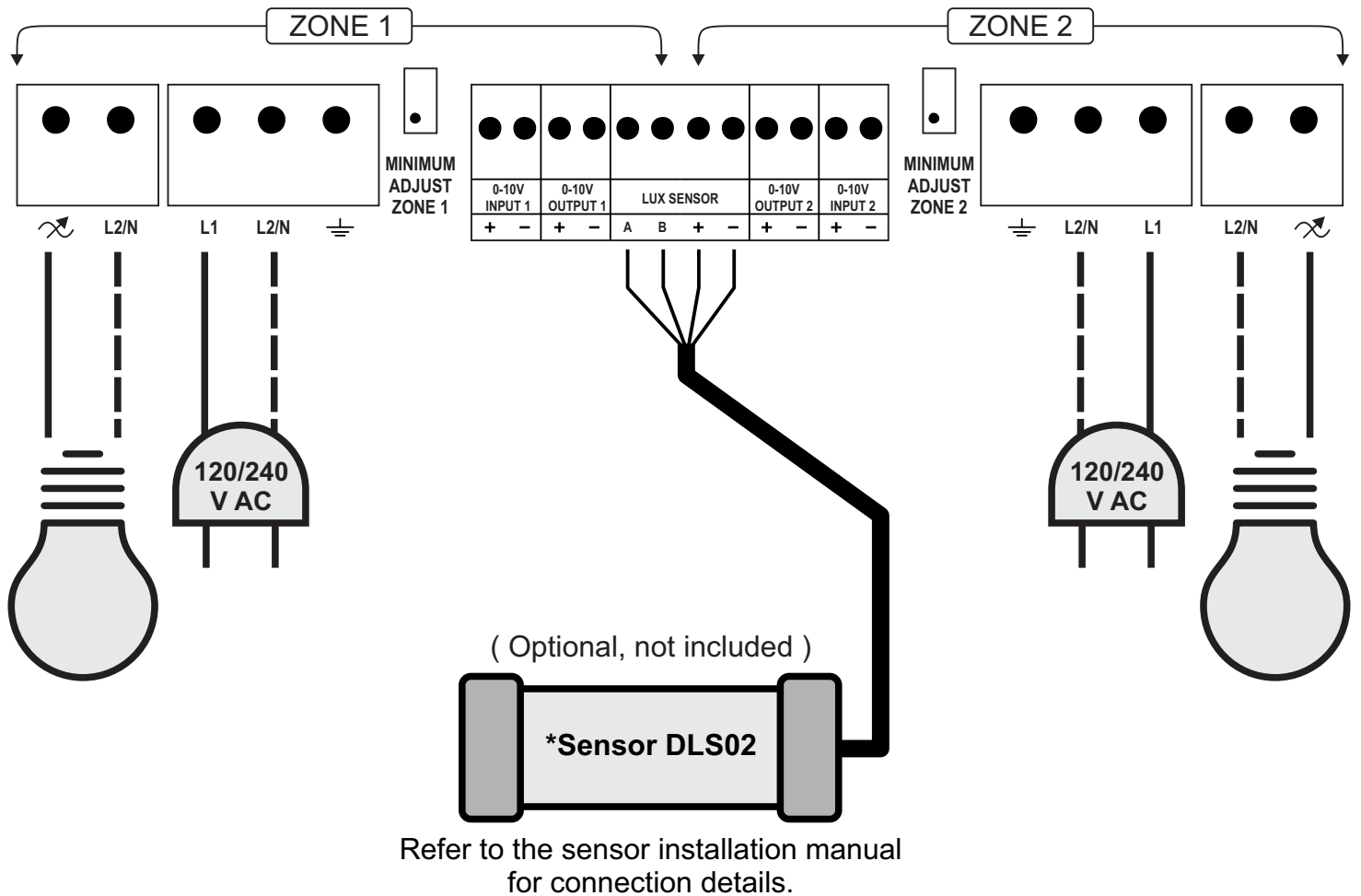
Connection of the controlled lighting system:
Each power output can provide up to 10 Amps for your lights. For higher durability, it is recommended to load the circuit to a maximum of 80% of its total capacity, or 8 amps in this case. All the lights must be connected in parallel, and are connected to the controller's power output. Don't use a neutral from the electrical panel for the lights, instead use the L2/N terminal next to the power output terminal. See wiring diagram.

Never connect bypass switches between the controller output and the lights, this will damage the controller. Do not plug or unplug lights to / from the controller while power is on.

External Devices:
The 0-10V inputs allow receiving a control voltage from an external master controller. The 0-10V outputs allow sending a control voltage to an external slave system. When connecting an external device, be sure to check the +/- polarity of the 0-10V connections. Also, limit the length of these connections to avoid ground loop issues and induced interference in these wires.

CEL-200 Wiring

ZONE 1 | ZONE 2

| | 0-10V INPUT 1 | 0-10V OUTPUT 1 | LUX SENSOR | 0-10V OUTPUT 2 | 0-10V INPUT 2 | |

MINIMUM ADJUST ZONE 1

MINIMUM ADJUST ZONE 2

120/240 V AC

120/240 V AC

(Optional, not included)

*Sensor DLS02

Refer to the sensor installation manual
for connection details.

Minimum Level Adjustment Procedure:
In manual mode, set the level of the zone to be adjusted to 1%.
Using a small screwdriver, adjust the corresponding potentiometer
until the desired lighting intensity is achieved for the 1% level.

For bi-color lighting with the chromatic mode:
Connect the lighting with the lowest Kelvin to output 1.
Connect the lighting with the highest Kelvin to output 2.

* To extend the light sensor cable, use Belden 9842 / 3107A
or an equivalent cable for RS-485 applications (2 twisted pairs, 120 Ohms).
It is recommended to solder the splices and cover them with heat-shrink tubing
to make the connection waterproof.

Quick Troubleshooting Guide:

Controller doesn't power on:

- Check the power supply, circuit breakers in the main panel, and ensure there is voltage at the power terminals of zone 1 on the controller.
- Check fuse F1.

Controller powers on, but the lighting doesn't:

- Check on the controller screen if the output intensity of the corresponding zone is set above 0%.

- Verify if the manual mode is working. Gradually increase the level. If the lighting turns on, your low level needs to be adjusted. Adjust your low level with the "minimum adjust" potentiometer.

If the lighting still doesn't turn on at 100% in manual mode, check fuse F2/F3 according to the zone.

If the manual mode works, but the displayed level is 0% in master mode, the issue is in your schedule programming.

If the output shows 0% in slave mode, check if the input voltage is above 0V. If the controller displays 0V at the input, measure the control voltage at the 0-10V input terminals with a multimeter. If the measured voltage is also 0V, the problem lies with the external master device or the connection between the two.

If there is a voltage at the input terminals of 0-10V, and the controller doesn't detect it, check the polarity of the connection. If the polarity is correct, the controller may be faulty.

Controller powers on, but the lighting doesn't dim:

- Check if the manual mode works. If the manual mode doesn't work, the controller may be defective.

If the manual mode works, the issue may be with the programming or an external master device, as described above.