TechNotes

Circadian Lighting with Elan

Converging Systems LED Lighting Controller Systems

Driver Backgrounder

Converging Systems has developed a suite of Elan field-tested drivers for its ILC-xx0 family of LED lighting controllers. The firm's IP-based communication device (e-Node) fully supports Converging Systems own CSDDP (Converging Systems Device Discovery Protocol) for the individual discovery of connected lighting controller. Converging Systems continually updates its lighting controller offerings as well as its Elan driver suite to enable installers to enjoy these new features. One such feature is **Circadian lighting** (see below).

Note: Converging Systems as a corporate policy makes available all of its device drivers for no charge to Converging Systems' dealers who are integrating the firm's hardware. Please refer to the this link for more information https://www.convergingsystems.com/inres_elan_lua.php

Although al Converging Systems are hosted on the Elan dealer website, latest drivers can always be downloaded here. http://www.convergingsystems.com/software/local_profiles_library.php#elan

Circadian Lighting

Circadian Lighting is a corollary to human circadian rhythm. Circadian rhythm is a 24-hour clock controlled by the hypothalamus, an area of the brain, that controls each person's circadian rhythm by receiving stimuli from the eyes and signaling when it is daytime and nighttime. Cooler temperatures are used in spaces when it is appropriate to promote alertness and attention. Warmer temperatures (seen when the sun is rising or setting) are used when people are waking up or falling asleep. The concept of using light to influence human circadian rhythm is a relatively new idea in the lighting industry and research continues to provide new findings. Converging Systems has mapped the chromaticity values of the sun on the Big Island of Hawaii over a course of a week (where atmospheric interference is less intense or impacted by pollution/cloud cover (one of the reasons the Mauna Kea observatory was built there). The most significant changes in the chromaticity values occur during two periods.

- The first period (which we will call "**Sunrise Circadian**" below) occurs during the three-hour period starting 30 minutes before sunrise and running for three hours thereafter (with a metric of 0 ~ 240 for that period).
- The second period (which we shall call "**Sunset Circadian**" below) occurs during the three-hour period starting 2.5-hours before sunset and running for three hours thereafter (with a metric of 240 ~ 0 for that period).

We have created this Tech Note for installers interested in experimenting and implementing Circadian Lighting from Elan platforms. You are free to modify the assumptions given above for the particulars of your installation.

Quick Steps

Step #	Test	Steps
1	Verify that at least one **e-Node** (communication device) and one or more connected **ILC-xx0** (lighting controllers) have been successfully added to your project.	-Review the detailed <u>Integration Note</u> for Elan the proper discovery and implementation of these necessary components. Within **Configurator**, select **Lighting** tab and verify that at least one communication device (CSI_enode_lighting) and one or more LED Lighting controller (devices) have been added (LED lighting controllers are auto-added using the **Discover Devices button**). In this case, two e-Nodes (and multiple devices shown by the **+** have been added.)
2	Create **four** new Services (Devices) for Circadian operation	-Click on the above **+** mark to expand available devices under the e-Node communication device. **Note**: you will be adding four Devices with the Zone/Group/Address (Z.G.N) that you wish to control. (a) <u>First Device Add</u>. Right click and select **Add New Device**, then (i) name it **Sun 0**, (ii) pick the **Scene** type, (iii) enter an **Address,** (iv) enter the command **SUN**, (iv) enter a Level of **0**, and (v) enter a Dissolve/ramp of **0** (b) <u>Second Device Add</u>. Right click and select **Add New Device**, then (i) name it **Sun 240** (full midday sun), (ii) pick

the **Scene** type, (iii) enter an **Address,** (iv) enter the command **SUN,** (iv) enter a Level of **240**, and (v) enter a Dissolve/ramp of **0**

Lighting Device: Kitchen SUN 240

Name	Kitchen SUN 240
Location	
System #	166759
Device Type	Scene
Hide Device from Scheduler	No
Address (Z.G.N)	2.1.0
Command	SUN
Level	240
Dissolve/Ramp (sec)	0

(c) <u>Third Device Add</u>. Right click and select **Add New Device**, then (i) name it **Sun_UP** (circadian ramp to full midday sun), (ii) pick the **Scene** type, (iii) enter an **Address,** (iv) enter the command **SUN_UP,** (iv) enter a Level of **240**, and (v) enter a Dissolve/ramp of **10800** (seconds or 3 hours)

Lighting Device: Kitchen SUN_UP

Name	Kitchen SUN_UP
Location	
System #	166773
Device Type	Scene
Hide Device from Scheduler	No
Address (Z.G.N)	2.1.0
Command	SUN_UP
Level	240
Dissolve/Ramp (sec)	10800

(d) <u>Fourth Device Add</u>. Right click and select **Add New Device**, then (i) name it **Sun_DOWN** (circadian ramp from full midday sun to dark), (ii) pick the **Scene** type, (iii) enter an **Address,** (iv) enter the command **SUN_DOWN,** (iv) enter a Level of **0**, and (v) enter a Dissolve/ramp of **10800** (seconds or 3 hours)

Lighting Device: Kitchen SUN_UP

Name	Kitchen SUN_UP
Location	
System #	166773
Device Type	Scene
Hide Device from Scheduler	No
Address (Z.G.N)	2.1.0
Command	SUN_UP
Level	240
Dissolve/Ramp (sec)	10800

3	Create two Timed Events	-Within **Event Mapper /Timed Events,** create two new events
		    • Sunrise Circadian
		    • Sunset Circadian
		-For **Sunrise Circadian**, create an event to occur 30 minutes prior to Relative Sunrise.
		
		-For **Sunrise Circadian**, create an event to occur 2.5 hours prior to Relative Sunset.

4	Program an Event Map to trigger off of Sunrise Circadian and Sunset Circadian as shown	***FOR SUNRISE CIRCADIAN***
		
		-Within **Event Mapper/Timed Events,** select the **Sunrise Circadian** Timed Event, and create a new Event Map for the **Sunrise Circadian:Timed Event** as follows:
		
		    • Add the Command create in Step 2(a) above (i.e. **SUN 0** for the ILC-xx0 that is being programmed) which kicks off our Circadian lighting event to set the Circadian level initially to **0** (midnight/dark).
		
		    • Provide .250 second delay (between commands)
		
		    • Add the Command created om Step 2(c) above (i.e. **SUN_UP** for the same ILC-xx0 that is being programmed) which start moving through the circadian pattern from dark to sunrise and then to midday sun (over a 3 hours period in our case here).

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FOR SUNSET CIRCADIAN

-Within **Event Mapper/Timed Events,** select the **Sunset Circadian** Timed Event, and create a new Event Map for the **Sunset Circadian:Timed Event** as follows:

Commands (ALL Commands will execute if Event occurs and Conditions are met)		
Sub-System	Type	Family
Switch/Dimmer: Kitchen SUN 240	On	Lighting System
Delay Execution	00:00:00:250	General System
Switch/Dimmer: Kitchen SUN_DOWN	On	Lighting System

- Add the Command create in <u>Step 2(b)</u> above (i.e. **SUN 240** for the ILC-xx0 that is being programmed) which starts this new process with sun levels to **240** (midday sun).

- Provide .250 second delay (between commands)

- Add the Command created om <u>Step 2(d)</u> above (i.e. **SUN_DOWN** for the same ILC-xx0 that is being programmed) which starts moving through the circadian pattern from midday sun through twilight and then to dark (over a 3-hours period in our case here).

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<tr><td>5</td><td>Customization Potential</td><td>

As can be seen from the above example, nearly an unlimited set of possibilities exist for
-***extending*** the day (by changing the 3-hour ramp period to a longer period
-s***hortening*** the day (by changing the 3-hour ramp period to a shorter period
-"***tricking***" the inhabitants within the space that sunrise is happening earlier (by changing the **Timed Event Daily Start Time** to an earlier period).
-"***tricking***" the inhabitants within the space that sunset is happening earlier (by changing the **Timed Event Daily Start Time** to an earlier period).

Have Fun and Find Interesting Opportunities for Circadian everywhere with Converging Systems technology.

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