Overview
The Solatube Daylight Dimmer Integration Guide contains solutions developed by lighting control manufacturers to control the Solatube Daylight Dimmer. The Solatube Daylight Dimmer is an open platform which allows complete integration with lighting control systems for Open/Close operation, allowing scene and time clock based control of daylight delivery.

All solutions provided in this guide have been developed by the lighting control manufacturer with supporting diagrams and approved for use with the Solatube Daylight Dimmer. This guide only supports the specific lighting control models named in this document, any revisions or changes will require further evaluation by Solatube International prior to authorization of any new components.

Warranty information and technical support of all non-Solatube components will be provided by the lighting control manufacturer. Any questions regarding non-Solatube components should be directed to the controls manufacturer.

For more information, please contact your Solatube account representative.
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DAYLIGHT DIMMER
APPLICATION SCHEMATIC Rev 05.doc

Luminaire Technical Assistance for SOLATUBE Corporation

1-27-10

By

Mike Lindberg, MSEE

NOTE: REVISIONS made to data file

DAYLIGHT DIMMER REVISION tasks per SOW 9701-76.doc
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1. WIRING DIAGRAM

A. WALL PLATE CONTROL:

Wire the DIMMER CONTROL MODULE to the WALLMOUNT DPDT SWITCH per Figure 1.

![Wiring Diagram](image)

Figure 1 Wallplate Installation of Dimmer Control.
B. **PC CONTROL:**

Wire the DIMMER CONTROL Module to the PC RELAY CONTROL CARD per Figure 2.

![Diagram showing PC Control Installation of Dimmer Control](image)

Figure 2 PC Control Installation of Dimmer Control.

Table 1 provides electrical characteristics at terminals 3 and 4 for operating the Dimmer Control. These take into account the DIMMER CONTROL internal relay coil and steering diode characteristics. The PC Relay control card relay contacts must be capable of switching at least 25 mA DC at 5V.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
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<tbody>
<tr>
<td>Nominal voltage Vnom</td>
<td>5</td>
</tr>
<tr>
<td>Minimum voltage to operate</td>
<td>4.25</td>
</tr>
<tr>
<td>Maximum voltage</td>
<td>11.4</td>
</tr>
<tr>
<td>Release / reset voltage Minimum</td>
<td>1.0</td>
</tr>
<tr>
<td>Expected coil current at 5.0 VDC</td>
<td>25 mA DC +/- 10%</td>
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</table>

Table 1 Relay Coil electrical specifications.
Not all PC relay cards are alike. Table 2 lists relay states required to operate the dimmer in the 4 x Form A relay contact configuration of Figure 2. Illegal states are capable of shorting the +5V power supply and must be avoided. Depending on the individual installation, the conventions OPEN and CLOSE may need to be reversed, and this should be tested and corrected if necessary as part of the installation. It is recommended that for simplicity, only the following states be permitted:

\[(ABCD) \Rightarrow [0000, 1010, 0101] \Rightarrow [STANDBY, OPEN, CLOSE]\]

**IMPORTANT:** Any OPEN or CLOSE MODE must be maintained for at least 20 seconds to give the Dimmer Motors sufficient time to complete the OPEN or CLOSE operations.

**NOTE:** STANDBY logic states will result in zero relay current and are therefore desirable as a default logic state, from an efficiency point of view.

**CAUTION:** Use relay cards with Normally Open contacts ONLY. Failure to implement this specification may result in hazardous operation or damaged equipment and / or wiring.

**CAUTION:** Always open all relay contacts [ABCD] to [0000] (electrically OPEN) states (STANDBY MODE) before changing between operational OPEN or CLOSE MODES in order to avoid Illegal logic MODES, even if transient, which might result in a short circuit across the +5V Power Supply rails. Failure to avoid this condition may result in hazardous operation or damaged equipment and / or wiring.

**CAUTION:** Ensure that wiring conductors equivalent to at least 22 Gauge copper wire are used. Failure to implement this specification may result in hazardous operation or damaged equipment and / or wiring.

**CAUTION:** Ensure that fuse F1 is provided of nominal 1 Ampere Fast Blow capacity and capable of safely interrupting at least 24 VDC at 1 Amp. Failure to implement this specification may result in hazardous operation or damaged equipment and / or wiring.

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**Table 2 PC Relay States.**

<table>
<thead>
<tr>
<th>RELAY</th>
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<tr>
<td>B</td>
<td>C</td>
<td>D</td>
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</table>
Solatube Daylight Dimmer Integration Guide

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F: 323-226-1000
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F: 972-422-1311
www.wattstopper.com
Cooper Controls

TLC-24, Tubular Lighting Controller

- Single relay control of Tubular Lighting System (by others)
- Single relay Open/Close shade control
- Assists with LEED credits
- Automatic photosensor control
- Scene and time based control
- Automatic damper control for dark sky initiative
- Reduce electric and HVAC costs

Specifications:

Connections: Low Voltage
Control Up To: 12 Solatube® Daylight Dimmers™ per Solatube Interface
Compatibility: All ControlKeeper lighting panels, all LiteKeeper lighting panels

Overview

The TLC-24 is a device that connects to a relay in a Greengate relay panel and provides Open/Close control for a Tubular Lighting System or Shade System. This allows the closure of a relay to signal the closing of a Tubular Lighting Device or Shade.

Installation

The TLC-24 is shipped in its own enclosure. It is recommended that the TLC-24 be mounted next to the device it is controlling but not more than 50 feet from the relay panel it is connected to.

Ordering

This is an accessory with the ControlKeeper and LiteKeeper lighting control systems. When ordering, specify the TLC24 as a separate system accessory.

<table>
<thead>
<tr>
<th>Catalog #</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>TLC-24</td>
<td>Tubular Lighting Controller</td>
</tr>
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</table>
Cooper Controls

Wiring Diagrams

TLC-24, Tubular Lighting Controller

Cooper Controls Lighting Control Panel
CK-4 shown

Tubular Lighting Controller

Solatube 330750DS Daylight Dimmer
Provided by others

Sequence of Operations:
When the Relay in the Lighting Control Panel is closed a signal is sent to close the Solatube motor.
When the Relay in the Lighting Control Panel is open a signal is sent to open the Solatube motors.
Cooper Controls

General information

The TLC-24 is a device that connects to a relay in a Greengate relay panel and provides Open/Close control for a Tubular Lighting System or Shade System. This allows the closure of a relay to signal the closing of a Tubular Lighting Device or Shade.

Mounting Information

The TLC-24 is shipped in its own enclosure. It is recommended that the TLC-24 be mounted next to the device it is controlling but not more than 50 feet from the relay panel it is connected to.

Lighting Panel Wiring Information

1. Ensure the lighting panel is powered down.
2. Connect the Red and Black wires to the load side of the control relay in the lighting panel.
3. Connect the Blue wire to the GND terminal on the lighting panel.
4. Connect a wire from the +24 Terminal of the lighting panel to the line side of the control relay.
5. For Solatube 330/750DS Daylight Dimmers (provided by others) wire according to wiring detail below.

Sequence of Operations:
When the Relay in the Lighting Control Panel is closed a signal is sent to close the Solatube motor.
When the Relay in the Lighting Control Panel is open a signal is sent to open the Solatube motor.

P/N 05-000097-00
Douglas Lighting Controls

Diagram showing wiring connections for Douglas Lighting Controls with labels for 24VAC and Solatube side connections.
Encelium Lighting Controls

ENCELIUM™ Lighting Controls

ENCIELIUM

SOLATUBE® CONTROL MODULE
SMO-70

The ENCELIUM Solatube Control Module SMO-70 facilitates tight integration of Solatube® Daylight Dimmers™ into the ENCELIUM Energy Management System.

Solatube tubular skylights allow natural light to reach spaces that would otherwise enjoy no or insufficient daylight. The added natural light provides for a more comfortable and productive work environment and permits the reduction of artificial lighting in such areas to conserve energy. During presentations it is desirable to reduce ambient light levels which may be realized by dimming artificial light and closing the tubular skylight via a Solatube Daylight Dimmer controlled by an ENCELIUM SMO-70 Solatube Control Module.

The SMO-70 control module is designed to minimize installation work, as it mounts directly to the Solatube Daylight Dimmer and its four control wires interface with color coordinated terminals on the Solatube Daylight Dimmer.

On the communication side, the SMO-70 connects via click-and-go pre-fabricated wires into the ENCELIUM GreenBus II™ network, making each Solatube Daylight Dimmer an individually controllable node in the ENCELIUM Energy Management System. The GreenBus II network is topology independent and the SMO-70 is typically wired to the closest GreenBus II node such as a luminaire or motion detector.

The integration of Solatube Daylight Dimmers into the ENCELIUM Energy Management System allows for automated control as well as manual overrides. Solatube Daylight Dimmer settings may be recalled as part of a lighting scene. Occupants of the space may manually adjust the setting via Mycon lighting controllers or via their Personal Control Software. Solatube Daylight Dimmers may also be configured and controlled centrally via the ENCELIUM Polaris 3D control software. Additionally, Solatube Daylight Dimmers may be operated on an automated schedule.

The system allows for any number of Solatube Daylight Dimmers within a given space and allows individual as well as collective control.

![Diagram of SMO-70 and Solatube Daylight Dimmer]
Encelium Lighting Controls

ENCELIUM™ Lighting Controls

ENCCELUM

SOLATUBE® CONTROL MODULE
SMO-70

For direct connection to the Solatube® Daylight Dimmer™

- 4-conductor pigtail cable
- Wire colors match Solatube terminal block colors (green/white/black/red)
- Designed to minimize installation work on-site
- Mounts to Solatube Daylight Dimmer using ½” knock-out

Wiring Information

1. Assure line power to Solatube Daylight Dimmer is disconnected.
2. Break out spare ½” knock-out and mount SMO-70 using provided wire nut.
3. Connect SMO-70 pigtail wires per color coding to Solatube Daylight Dimmer terminal block.
4. Securely route wires with sufficient distance to AC lines.
5. Connect GreenBus II communication cable and wire to closest GreenBus II node (Luminaire, sensor or additional Solatube Daylight Dimmer).

SPECIFICATIONS

Dimensions: 1.2” W X 2.4” L X 0.65” H
Max. ambient temperature 130°F/55°C
Two connectors for GreenBus II communication connection
SMO-70 powered via GreenBus II communication bus
Rated for indoor use
Specifications subject to change without notice.
Install in accordance with all applicable national and local electrical and building codes.
Encelium Lighting Controls

ENCELIUM™ Lighting Controls

ENCELIUM

SOLATUBE® CONTROL MODULE
SMO-70

ENCELIUM Polaris 3D™ Software

Easily recognize, configure and control Solatube® Daylight Dimmers™ in your facility

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EMAIL: support@encelium.com
WEB: www.encelium.com/service
24 HR TECHNICAL SUPPORT: 1.800.805.9363
SALES SUPPORT: 1.888.362.3548

Exemplary Polaris 3D™ data analysis: Quantify the amount of daylight available in your space
Fifth Light Technology
Lutron

The purpose of this section of the application guide is to discuss the system functionality, wiring, and programming when integrating with a Lutron GRAFIK Eye® QS system.

Sequence of Operations
The light output of a Solatube shall be adjustable by using one of the Shade Group Column at the bottom left-hand side on the GRAFIK Eye® QS main unit. When the top button of the Shade Group Column is pressed, the light dimmer in the Solatube would OPEN and direct more sunlight into the space. When the bottom button is pressed, the light dimmer in the Solatube would CLOSE and reduce the amount of sunlight provided to the space. During any OPEN or CLOSE motion, when the middle button is pressed, the light dimmer in the Solatube would STOP to maintain the sunlight provided to the space. Please see below for the integration single-line diagram.

Integration Single-line Diagram
Wiring Diagram and Programming Steps

Setup:
1. Wire the application according to the wiring diagram above. For wiring details between QSE-IO and GrafikEye® QS, please refer to the installation instructions of the QSE-IO. You can download this document from Lutron.com or through this link: http://www.lutron.com/TechnicalDocumentLibrary/040209aENG.pdf.

2. On the QSE-IO, place the dip switches to Shade Output (maintained) mode. See table below:

<table>
<thead>
<tr>
<th>Shade output</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>Open 1</th>
<th>Step 1</th>
<th>Close 1</th>
<th>Open 2</th>
<th>Close 2</th>
<th>Maintained</th>
<th>Maintained (gruped 1-3, 4-5)</th>
</tr>
</thead>
</table>

Programming the GrafikEye® QS & QSE-IO:
1. On the GrafikEye® QS, make sure you have the correct button kit and faceplate for the Shade Group Column at the bottom left of the unit. Each column (up to 3) can control one zone of daylight dimmer.
2. Press and hold the top and bottom button of the Shade Group Column for 3 seconds to enter programming mode. The LEDs on the QSE-IO will turn off.
3. On the QSE-IO, tap the program button once to assign the Shade Group Column on the GrafikEye® QS to shade group 1 on the QSE-IO (LEDs 1-3 will blink).
4. On the GrafikEye® QS, press and hold the top and bottom button of the Shade Group Column for 3 seconds to exit programming mode.
5. Please follow the installation instructions of the GrafikEye® QS for steps to program other advanced functions. For example, steps to program the Solatube to be part of lighting scenes and/or part of the astronomical timeclock schedule of the GrafikEye® QS. You can download this document from Lutron.com or through this link:


For integration with other Lutron systems, please contact our 24/7 technical support hotline (1-800-523-9488).
Watt Stopper