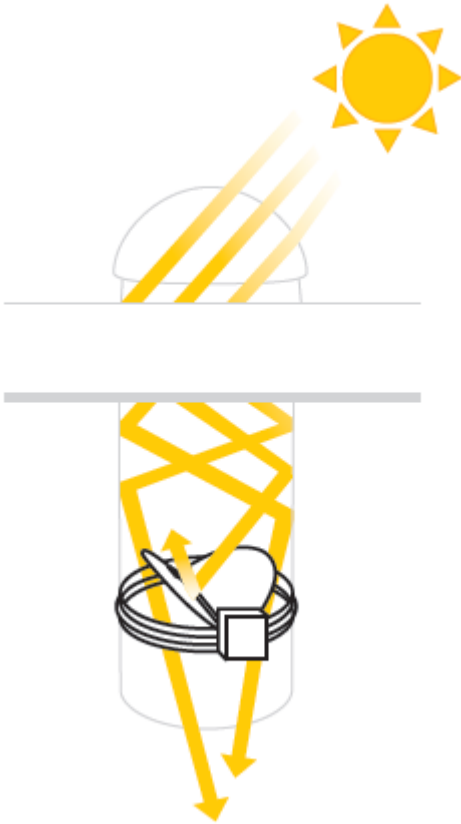




SOLATUBE®

Innovation in Daylighting™

Solatube® Daylight Dimmer™ Integration Guide



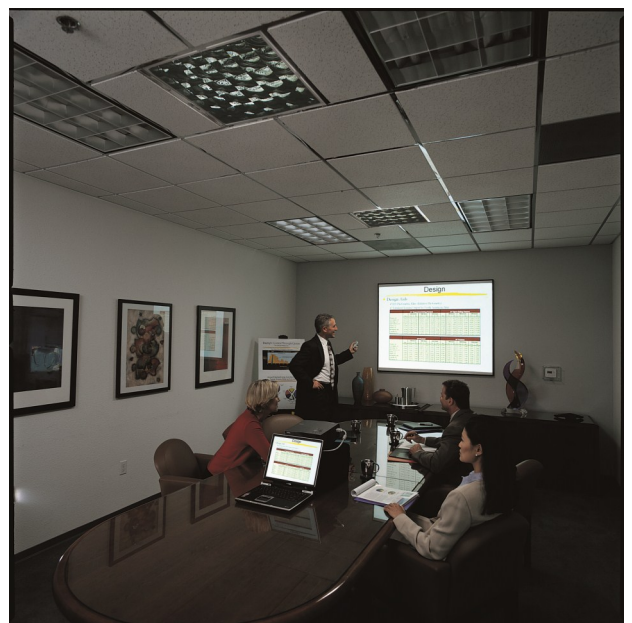
Overview

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.



Solatube Daylight Dimmer Integration Guide

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ENGINEERING SOLUTIONS

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

2010

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1. WIRING DIAGRAM

A. WALL PLATE CONTROL:

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

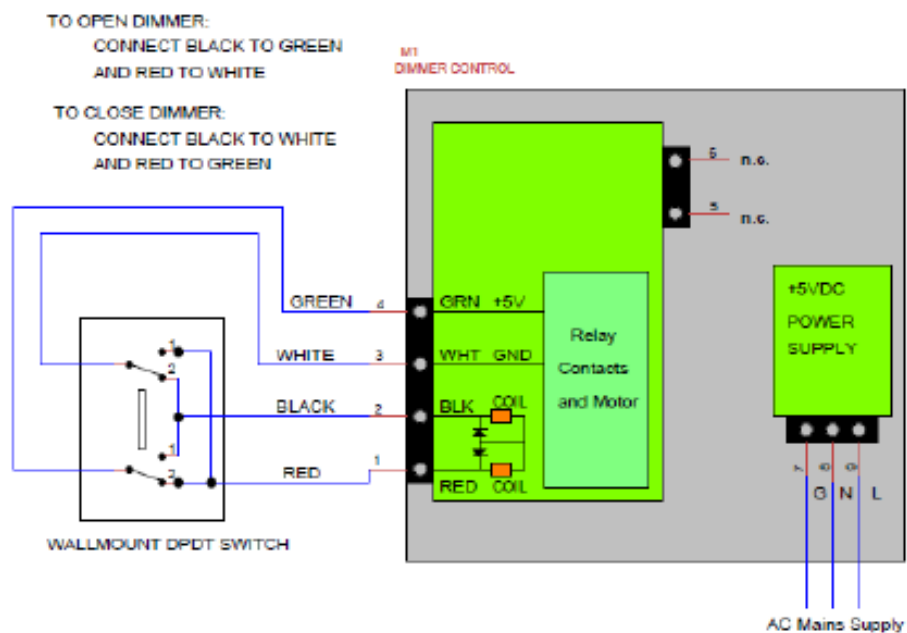


Figure 1 Wallplate Installation of Dimmer Control.

B. PC CONTROL:

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

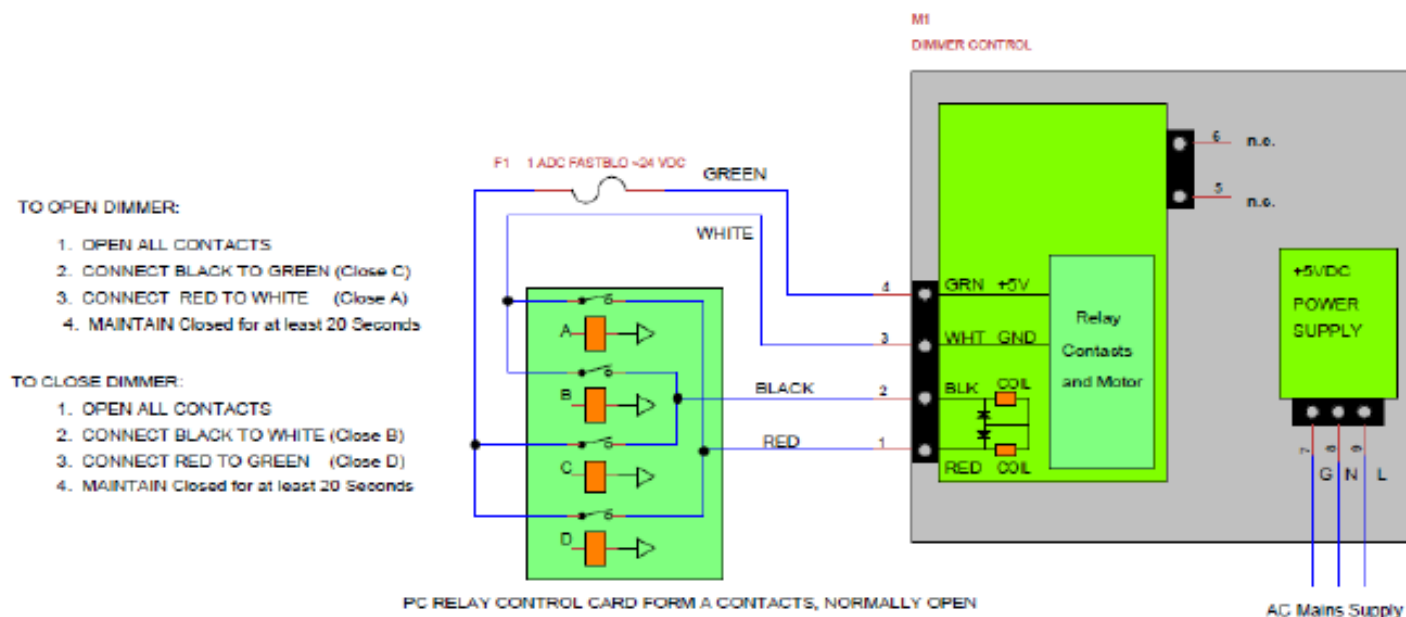


Figure 2 PC Control Installation of Dimmer Control.

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.

Nominal voltage V_{nom}	5	VDC
Minimum voltage to operate	4.25	VDC
Maximum voltage	11.4	VDC
Release / reset voltage Minimum	1.0	VDC
Expected coil current at 5.0 VDC	25	mA DC +/- 10%

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] == [0000, 1010, 0101] == [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.

RELAY COIL LOGIC STATE A	RELAY COIL LOGIC STATE B	RELAY COIL LOGIC STATE C	RELAY COIL LOGIC STATE D	DIMMER DRIVE STATE	MAXIMUM DIMMER DRIVE CURRENT	DIMMER DRIVE VOLTAGE
0	0	0	0	STANDBY	0	0
0	0	0	1	STANDBY	0	0
0	0	1	0	STANDBY	0	0
0	0	1	1	STANDBY	0	0
0	1	0	0	STANDBY	0	0
0	1	0	1	CLOSE	-100 mA	-5V
0	1	1	0	ILLEGAL STATE		
0	1	1	1	ILLEGAL STATE		
1	0	0	0	STANDBY	0	0
1	0	0	1	ILLEGAL STATE		
1	0	1	0	OPEN	100 mA	+5V
1	0	1	1	ILLEGAL STATE		
1	1	0	0	STANDBY	0	0
1	1	0	1	ILLEGAL STATE		
1	1	1	0	ILLEGAL STATE		
1	1	1	1	ILLEGAL STATE		

Table 2 PC Relay States.

Solatube Daylight Dimmer Integration Guide

Approved Partners

Cooper

Contact info:

Michael Lunn
Product Manager
203 Cooper Circle
Peachtree City, GA. 20369
P: 770-486-4328
C: 802-233-1701
F: 800-954-7016
www.coopercontrol.com

Douglas Lighting Controls

Contact info:

Brad Stevenson
Southwestern Sales Manager
Fountain Valley, CA
P: 949-466-8889
F: 949-203-6248
www.douglaslightingcontrol.com

Encelium Lighting Controls

Contact info:

68 Leek Crescent, Unit A
Richmond Hill, ON L4B 1H1, Canada
24 Hour Technical Support
P: 1-800-805-9363
Sales Support
P: 1-888-362-3548
E: support@encelium.com
www.encelium.com/support

Fifth Light Technology

Contact info:

INFO@FIFTHLIGHT.CA
7-1155 North Service Rd. W.
Oakville, ON L6M 3E3, Canada
1-866-323-0097
P: 905-469-2142
F: 905-469-2144
www.fifthlight.com

Lighting Control & Design, Acuity Brands Inc.

Contact info:

Technical Support
P: 800-345-4448
P: 323-226-0000
F: 323-226-1000
www.lightingcontrols.com

Lutron

Contact info:

24/7 Technical Support Hotline
Lutron Electronics Co., INC.
7200 Suter Road
Coopersburg, PA. 18036-1299
P: 1-800-523-9466
www.lutron.com

Watt Stopper

Contact info:

Technical Support Center
1947 K Ave Bldg. D Suite 100
Plano, TX. 75074
P: 800-879-8585
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

Catalog #		Type	
Project			
Comments			
Prepared by		Date	



Solatube® Daylight Dimmer shown above. (Provided by others)

Overview

The TLC-24 is a device that connected 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.

Catalog #	Description
TLC-24	Tubular Lighting Controller

www.coopercontrol.com

203 Cooper Circle
Peachtree City, GA 30269
P: 800-553-3879
F: 800-954-7016

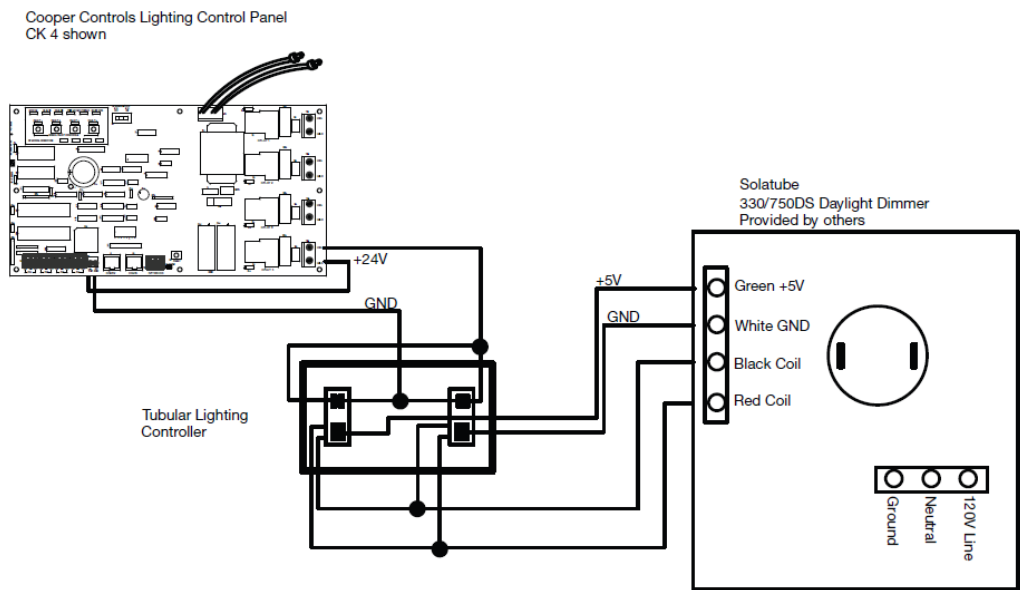
COOPER Controls

Lighting Control Panels - Accessories

Cooper Controls

Wiring Diagrams

TLC-24, Tubular Lighting Controller



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.

www.coopercontrol.com
203 Cooper Circle, Peachtree City, GA 30269
P: 800-553-3879 F: 800-954-7016

Cooper Controls, Greengate, Novitas, Yes Box, PCI Lighting Control Systems, VisionTouch, VisionSwitch, MicroSite, Digis, ControlKeeper, LineKeeper, AnalogKeeper, TrackKeeper, IntelliRelay, DemandKeeper, NeoSwitch, Revio, and Ineo are valuable trademarks of Cooper Industries in the U.S. and other countries. You are not permitted to use Cooper Trademarks without the prior written consent of Cooper Industries.

ACC110132

COOPER Controls



TLC-24

General information

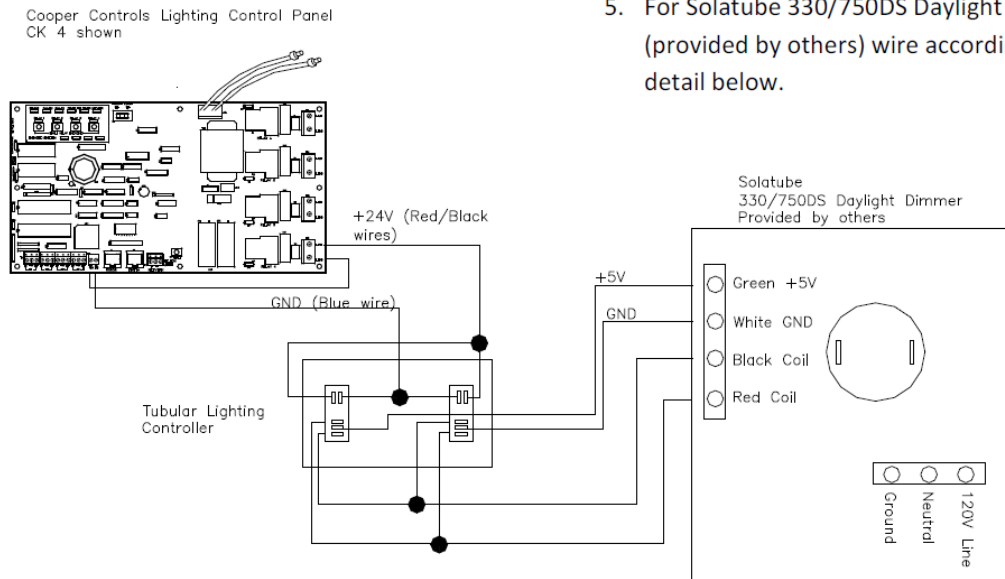
The TLC-24 is a device that connected to a relay in a Greengate relay panel and provides Open/Close control for a Tubular Lighting System or Shade System. This allows the closure of a relay to signal the closing of a Tubular Lighting Device or Shade.

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.



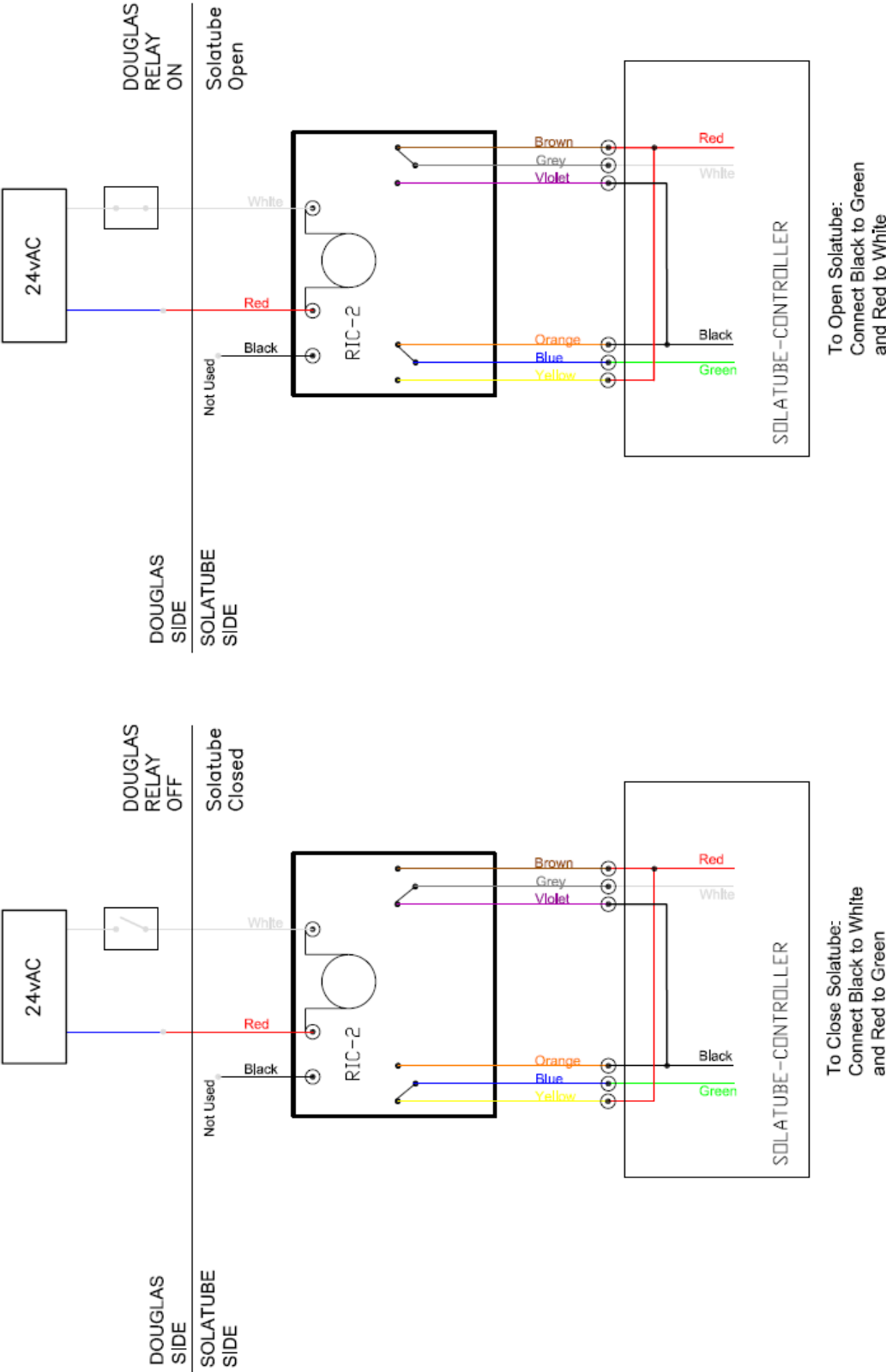
Sequence of Operations:

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 motore.

P/N 05-000097-00



Douglas Lighting Controls



Encelium Lighting Controls

ENCELIUM™ Lighting Controls

ENCELIUM

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.

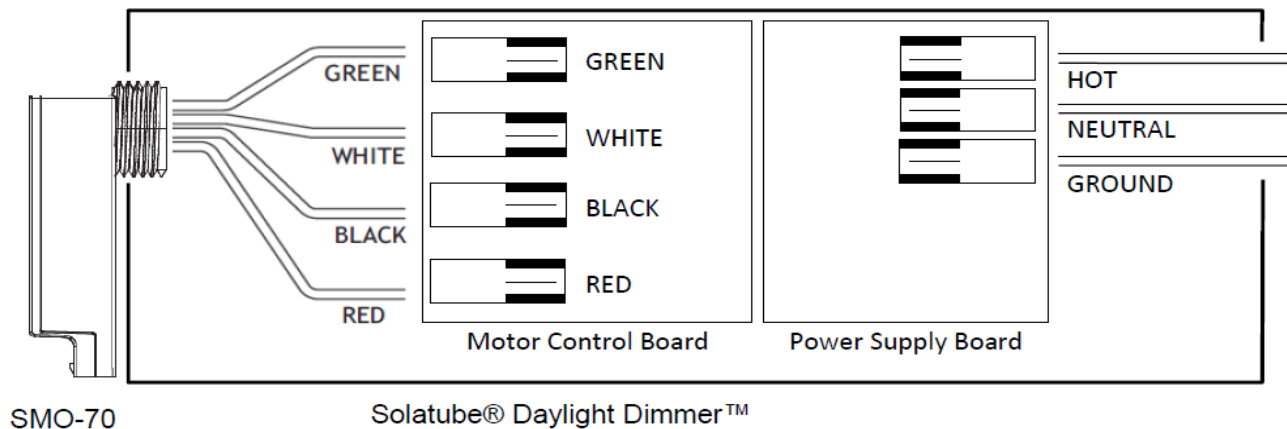
Solatube tubular skylights allow natural light to reach spaces that would otherwise enjoy no or insufficient daylight. The added natural light provides for a more comfortable and productive work environment and permits the reduction of artificial lighting in such areas to conserve energy. During presentations 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.



Encelium Lighting Controls

ENCELIUM™ Lighting Controls

ENCELIUM

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

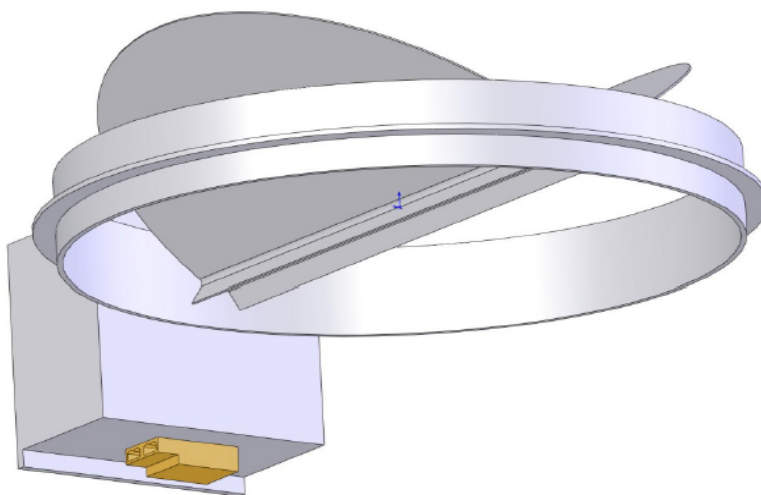
Two connectors for GreenBus II communication connection

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 SMO-70 shown mounted via spare ½" knock-out to underside of Solatube® Daylight Dimmer™



Encelium Lighting Controls

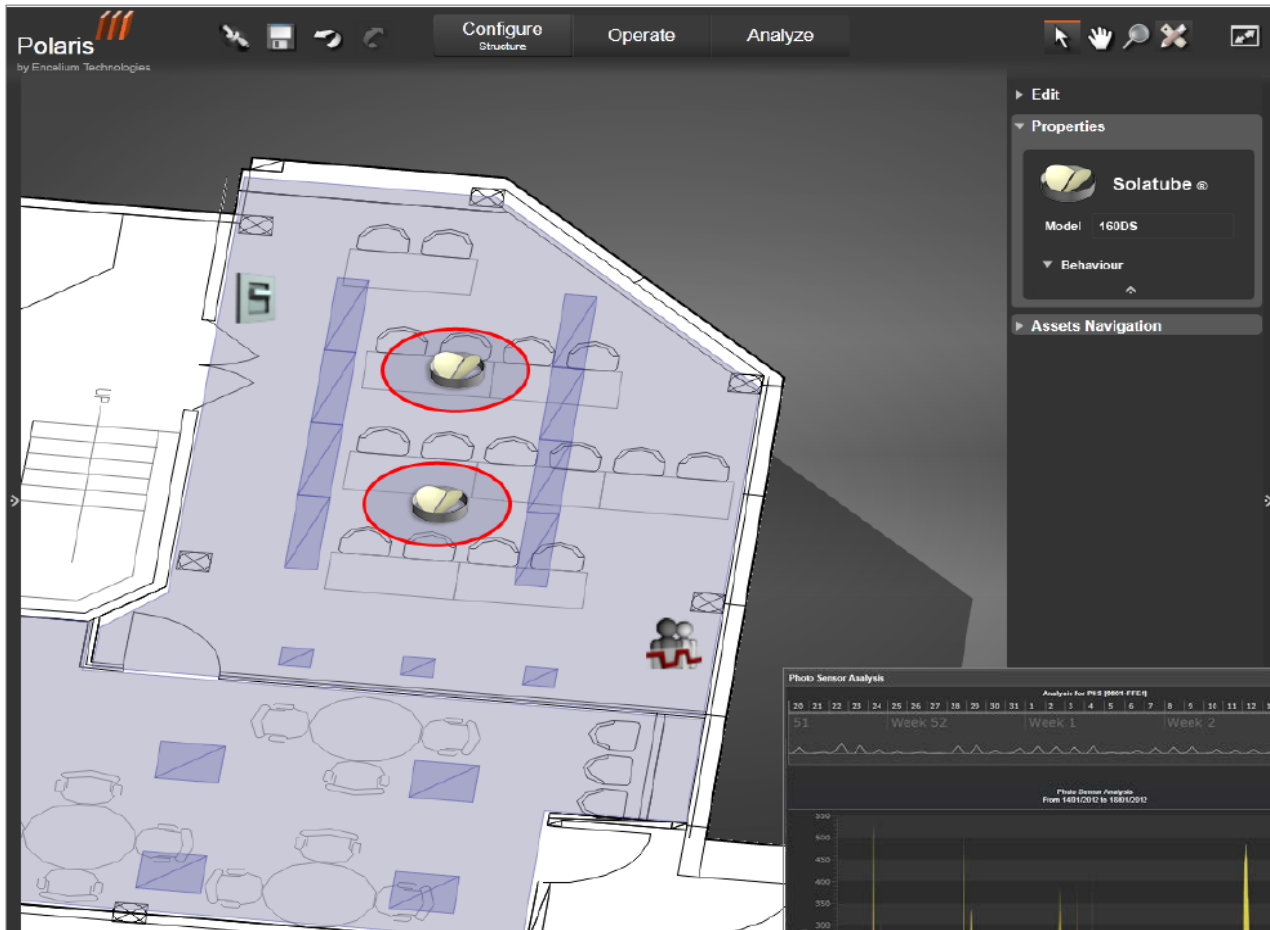
ENCELIUM™ Lighting Controls

ENCELIUM

SOLATUBE® CONTROL MODULE

SMO-70

ENCELIUM Polaris 3D™ Software



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

For support on ENCELIUM products:

USA

500 Frank W. Burr Boulevard
Floor 1, Suite 29
Teaneck, NJ 07666

CANADA

68 Leek Crescent
Unit A
Richmond Hill, ON L4B 1H1

EMAIL: support@encelium.com

WEB: www.encelium.com/service

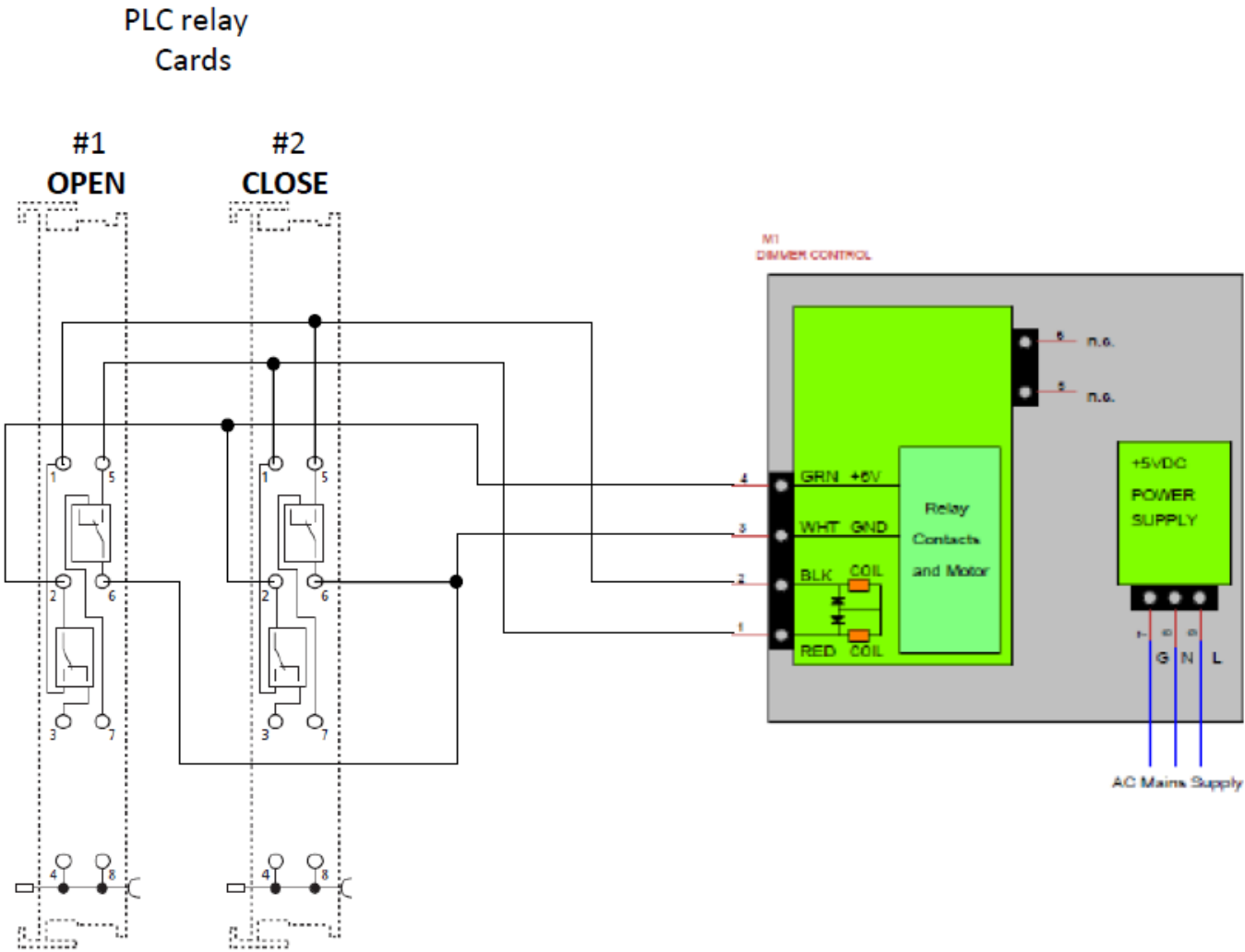
24 HR TECHNICAL SUPPORT: 1.800.805.9363

SALES SUPPORT: 1.888.362.3548

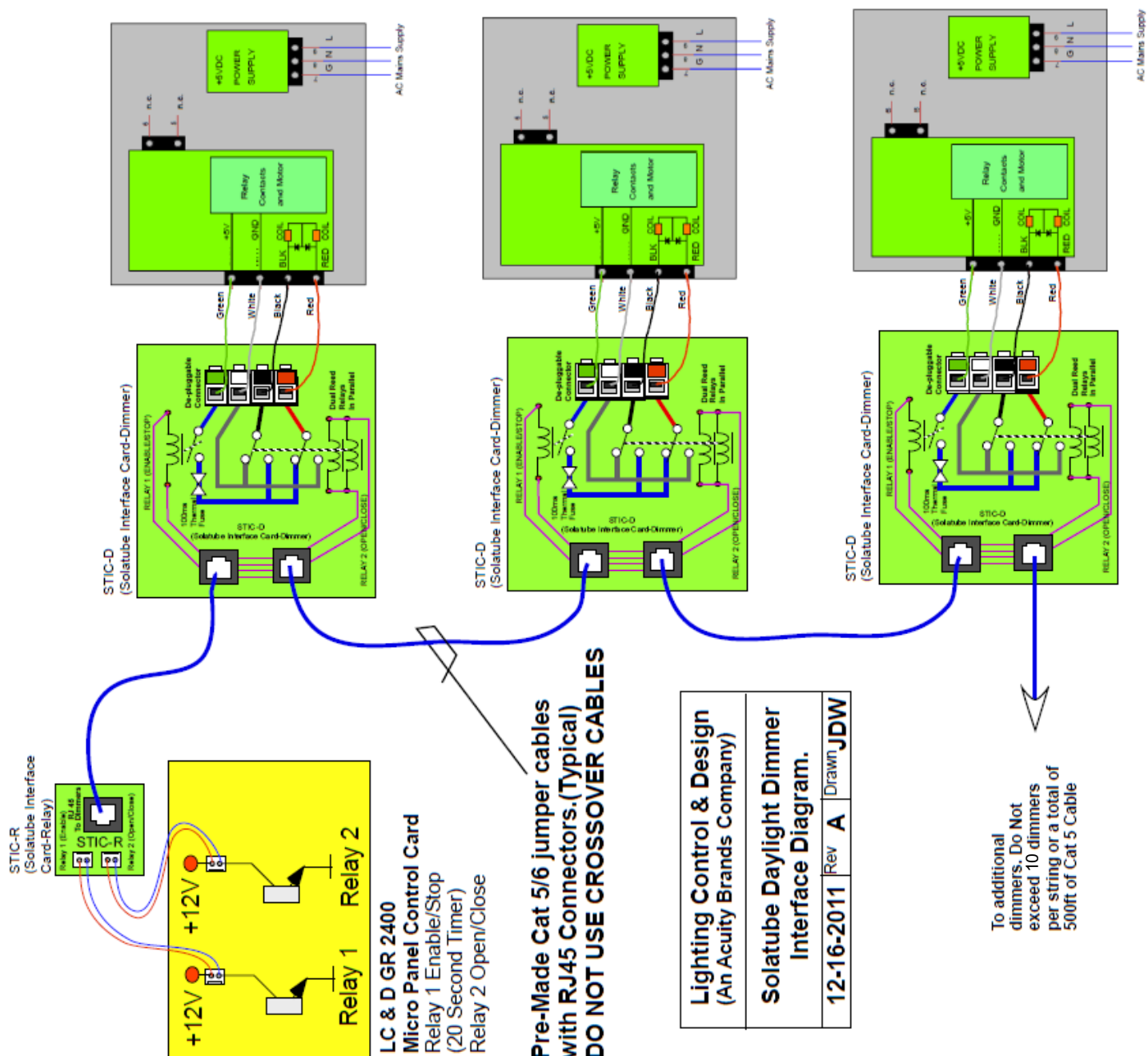
Exemplary Polaris 3D™ data analysis: Quantify the amount of daylight available in your space



Fifth Light Technology



Lighting Control & Design, Acuity Brands Inc.



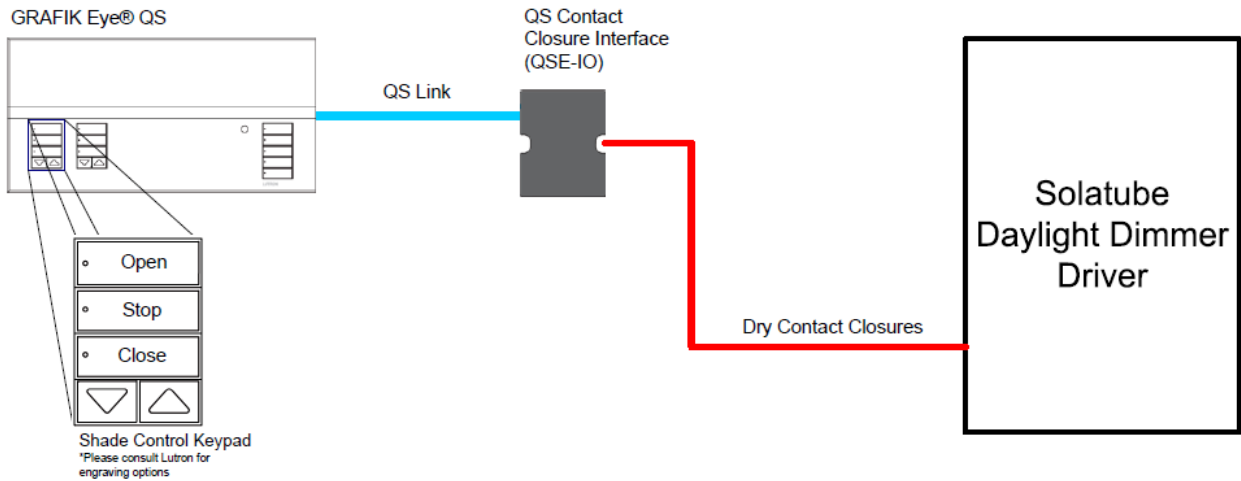
Lutron

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.

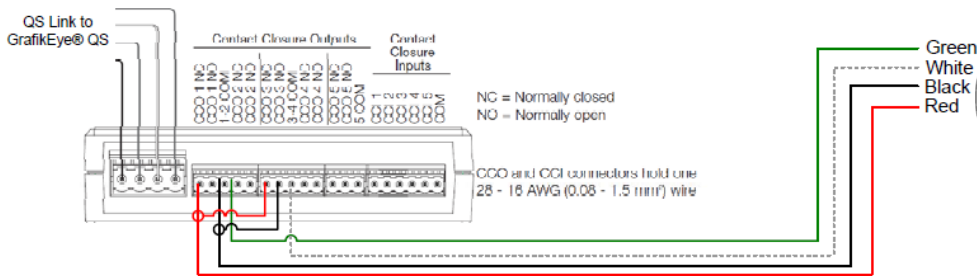
Integration Single-line Diagram



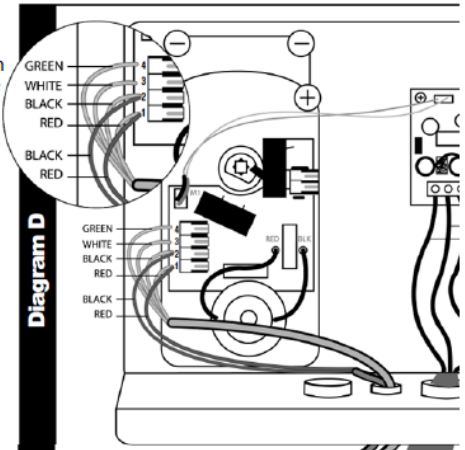
Lutron

Wiring Diagram and Programming Steps

QSE-IO Detail (Top of Unit)



Solatube Daylight Dimmer Detail



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/040245aENG.pdf>.

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

Shade output	1	2	3	4	Open 1	Stop 1	Close 1	Open 2	Close 2	Maintained or momentary	Maintained (grouped 1-3; 4-5)
	ON	ON	ON	ON							

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:

QSGRJ-xE Models: http://www.lutron.com/TechnicalDocumentLibrary/QSGRJ-xE_QSGRJ-xE_English_Install.pdf

QSGRJ-xP Models: http://www.lutron.com/TechnicalDocumentLibrary/QSGRJ-xP_QSGRJ-xP_English_Install.pdf

For integration with other Lutron systems, please contact our 24/7 technical support hotline (1-800-523-9466).

Watt Stopper

