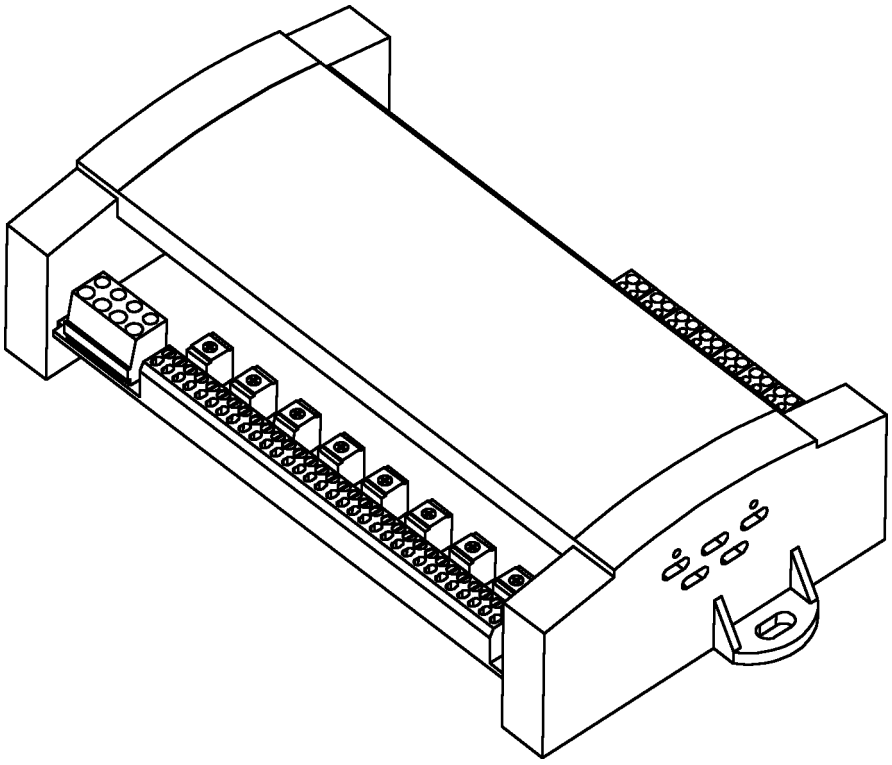
A Series® Lighting Control Panelboards

Daylight Optimization Module
Catalog No. ASRGLCDOK



Introduction

This manual provides basic overview and setup information for the Daylight Optimization Module. It includes an overview of the Daylight Optimization Module board and a typical setup.

The Daylight Optimization Module is designed to take advantage of natural sunlight and other ambient light to conserve power delivered to indoor lights. Once a setpoint light value has been established for a given bank of lights, the Daylight Optimization Module maintains that amount of light in the area. The Daylight Optimization Module uses sunlight harvesting; it measures the amount of light in an area with a photodiode and adjusts the dimming ballast to maintain the desired amount of light in the area.

Network Configuration

The Daylight Optimization Module is a subnet device of the Lighting Controller LINKnet device. Communication is via the connection from NET1 on the Daylight Optimization Module to NET2 on the Lighting Controller, as illustrated in Figure 1.

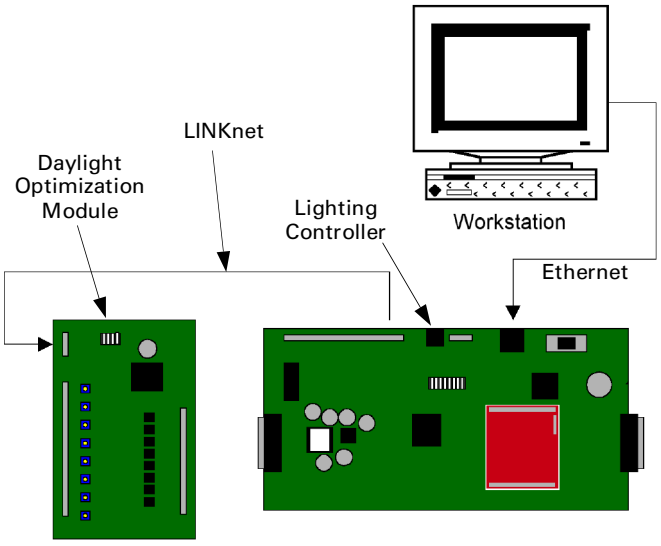


Figure 1. Lighting Controller and Daylight Optimization Module configuration.

Specifications

The dimming module has the following hardware features, as illustrated in Figure 2:

- Selectable DIP switch for the LINKnet address
- Power and communications connections
- Eight photocell inputs
- Eight input sensitivity potentiometers
- Eight 1 V to 10 V, <0.5 mA dimming ballast control outputs

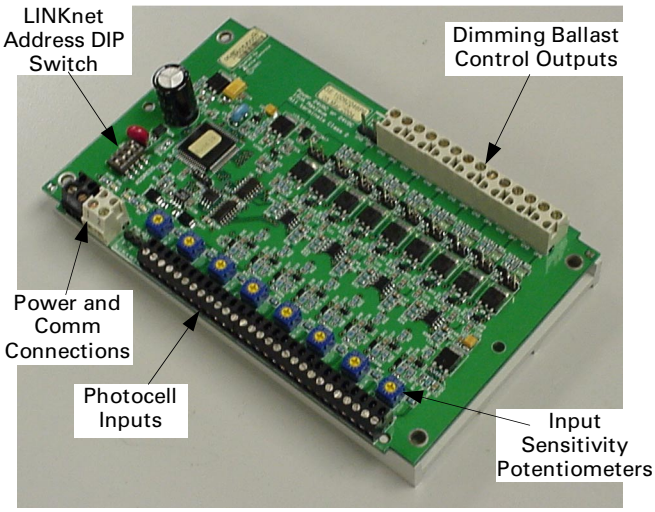


Figure 2. Daylight Optimization Module circuit board layout.

Power

The Daylight Optimization Module is a half-wave rectified device that requires a 15 VA, 24 Vac Class 2 transformer. Using a transformer to power a Daylight Optimization Module device and a full-wave rectified device could cause serious electrical damage. A single transformer should only power multiples of the same device type, without exceeding the VA rating of the transformer. When multiple devices share a transformer, always ensure a GND-to-GND connection for all devices connected to the transformer.

Communication

The Daylight Optimization Module communicates with the lighting Controller over an RS-485 subnetwork connection. A maximum of eight RS-485 subnet devices can be connected to one Lighting Controller. For correct operation, each subnet expansion module requires a unique address. To wire an RS-485 connection, use 18-gauge twisted-pair wire, which will support communication lengths of up to 4000 ft.

Addressing

Each subnet device requires a different address from any other expansion module connected to a given Lighting Controller. The valid range of addresses is 1–12, with 1 reserved as the address of the standard input expansion module and 12 as the address of the Handheld Programmer. The factory default address for the Daylight Optimization Module is 6. In the default database, dimming is set up for addresses 6 and 7. It is highly recommended that only address 6 or 7 be used for a Daylight Optimization Module.

Inputs

The Daylight Optimization Module has eight photocell inputs, connected as illustrated in Figure 3. Each input has four pins: two supply power (PWR and GND), one for the input (IP#), and the last for signal adjustment (ADJ).

The inputs on the Daylight Optimization Module are designed specifically for GE indoor photodiodes, catalog number RPESN-IN.

Figure 3. Input and output connections to the Daylight Optimization Module.

Outputs

The Daylight Optimization Module has eight 1 V to 10 V outputs, connected as illustrated in Figure 3 to dimming ballasts drawing less than 0.5 mA. Each Daylight Optimization Module output channel can sink up to 25 mA of current, supporting up to 50 dimming ballasts. A single Daylight Optimization Module can control up to 400 ballasts.

Daylight Optimization Module Configuration

Each input to the Daylight Optimization Module controls a corresponding output in a proportional-integral (PI) feedback loop. The eight inputs (IP1 to IP8) and eight outputs (OP1 to OP8) comprise the eight feedback loops on the Module.

The eight sensitivity potentiometers on the Daylight Optimization Module (indicated in Figure 2) are used to calibrate the gain of the photodiode connection to the given input channel.

Operation

This section describes the operation of the Daylight Optimization Module.

Mapping the Inputs

The Daylight Optimization Module has two types of objects, analog input (AI) and analog variable (AV). This section describes how to map the functional objects from the master device (Lighting Controller) database to the Module.

Inputs (AI601 to AI608 and AI701 to AI708) – The analog input objects are read-only and gather voltage values from a photodiode input.

Setpoint Variables (AV601 to AV608 and AV701 to AV708) – These variables define the desired amount of light for the feedback channel. The setpoint value can be edited with the Handheld Programmer.

Proportional Band (AV609 to AV616 and AV709 to AV716) *and Reset Rate* (AV617 to AV624 and AV717 to AV724) *Variables* – These variables control the proportional and integral properties of the individual proportional-integral (PI) feedback loops. These values should be treated as read-only unless you have detailed knowledge of (PI) feedback systems.

Outputs – Analog variable objects (AV625 to AV632 and AV725 to AV732) are read-only objects that display the voltage delivered to the dimming ballasts.

The ranges of objects for the first and second Daylight Optimization Module connected to a Lighting Controller are listed in Table 1 and Table 2. Object offsets for the dimming circuit are listed in Table 3.

Description	Type	BACnet Object	Modbus Register
Lighting Levels [0–100]	RO	AI601–608	Fn 4, 117–124
Lighting SP (set point) [0–100]	RW	AV601–608	—
Lighting Proportional Band [0–200?]	RO	AV609–616	—
Lighting Reset Rate (internal usage)	RO	AV617–624	—
Lighting Output (8 outputs)	RO	AV625–632	—

Table 1. Object ranges for the first Daylight Optimization Module.

Description	Type	BACnet Object	Modbus Register
Lighting Levels [0–100]	RO	AI701–708	Fn 4, 133–140
Lighting SP (set point) [0–100]	RW	AV701–708	—
Lighting Proportional Band [0–200?]	RO	AV709–716	—
Lighting Reset Rate (internal usage)	RO	AV717–724	—
Lighting Output (8 outputs)	RO	AV725–732	—

Table 2. Object ranges for the second Daylight Optimization Module.

Loop #	Input #	Setpoint AV	Proportional Band AV	Reset Rate AV	Output AV
1	1	1	9	17	25
2	2	2	10	18	26
3	3	3	11	19	27
4	4	4	12	20	28
5	5	5	13	21	29
6	6	6	14	22	30
7	7	7	15	23	31
8	8	8	16	24	32

Table 3. Object offsets for the Daylight Optimization Module dimming circuit.

Example – For Daylight Optimization Module 1 addressed as 6, the objects related to control circuit 1 are as listed in Table 4.

Loop #	Input #	Setpoint AV	Proportional Band AV	Reset Rate AV	Output AV
2	AI602	AV602	AV610	AV618	AV626

Table 4. Control circuit objects for example.

Typical Object Values

Following are descriptions of the five objects related to each feedback loop:

Analog Input (AI) – Used to collect analog-to-digital values from the photodiode input. Manually entering values into this object has no effect on the PI feedback loop.

Setpoint Analog Variable (AV) – Used to set the desired amount of light in a given area.

Proportional Band Analog Variable (AV) – The value given to the proportional component for the PI feedback loop. Incorrect values for this object could cause the output to oscillate. This value is set to 100 in the default database.

Reset Rate Analog Variable (AV) – The value given to the integral component for the PI feedback loop. Incorrect values for this object could cause the output to oscillate. This value is set to 5 in the default database.

Output Analog Variable (AV) – The voltage sent to the output. Manually entering values into this object has no effect on the PI feedback loop.

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