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Designers Lighting Forum

Interoperable Digital Lighting Systems

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Learning Objectives

At the end of this course, participants will be able to:

1. Recognize the value of specifying standardized digital lighting systems for plug-and-play interoperability.
2. Understand the improved performance of D4i digital control versus analog control in lighting systems.
3. Realize the expanded capabilities of components in digital lighting systems.
4. Learn how specifying Zhaga-D4i certified products future proofs your digital lighting and control installations and opens the market with multiple vendor product availability.

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AGENDA

Introductions

Digital Lighting Systems – Value Proposition

Standards for Interoperability

DALI-2 and D4i Digital Control

Expanded Component Capability

Certified Products

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ZHAGA Consortium

DALI Alliance

INTRODUCTIONS

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ZHAGA CONSORTIUM

ZHAGA Consortium

An open global industry consortium with >450 members from the lighting industry that aims to standardize interfaces of components of LED luminaires, including LED light engines, LED modules, LED arrays, holders, LED drivers, connectors and sensing/communication modules.

ZHAGA Regular Member

22 Regular Members

ZHAGA Associate Member

140 Associate Members

ZHAGA Community Member

330 Community Members

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DALI Alliance

DALI ALLIANCE

The DALI Alliance (also known as the Digital Illumination Interface Alliance, or DiiA) is the global industry organization for DALI lighting control.

We are an **open, global consortium** of lighting companies, and our main aim is to grow the market for lighting-control solutions based on the standardized **Digital Addressable Lighting Interface (DALI)** protocol.

34 Regular Members
260 Associate Members
50 Community Members

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DIGITAL LIGHTING SYSTEMS – VALUE PROPOSITION

Learning objective 1:

Recognize the value of specifying standardized digital lighting systems for plug-and-play interoperability.

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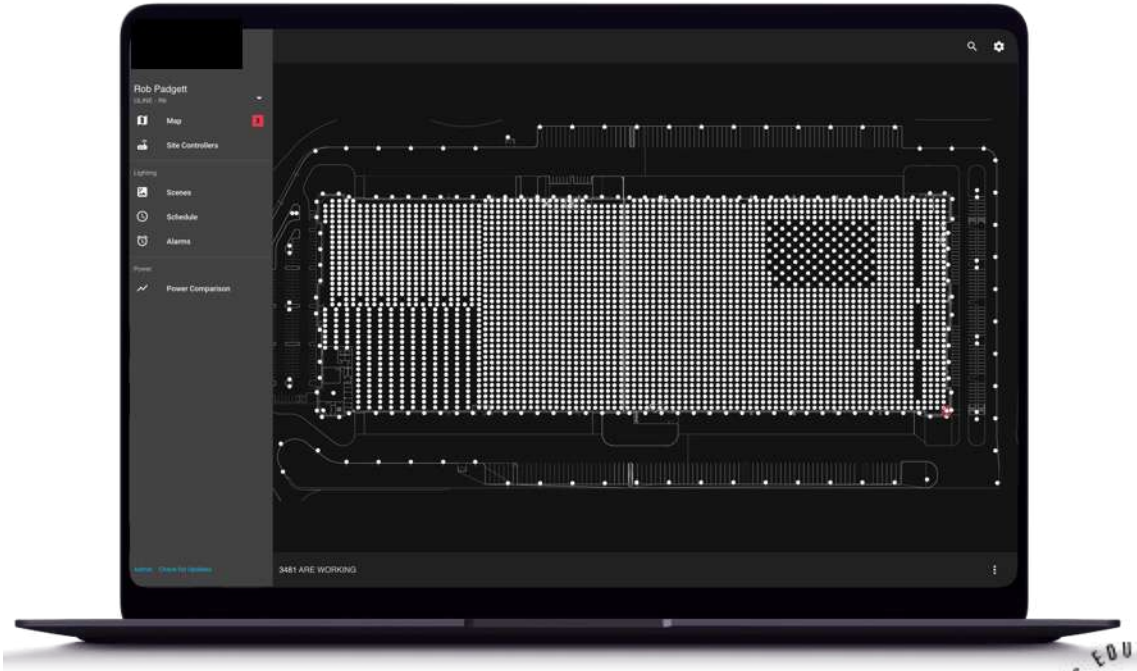
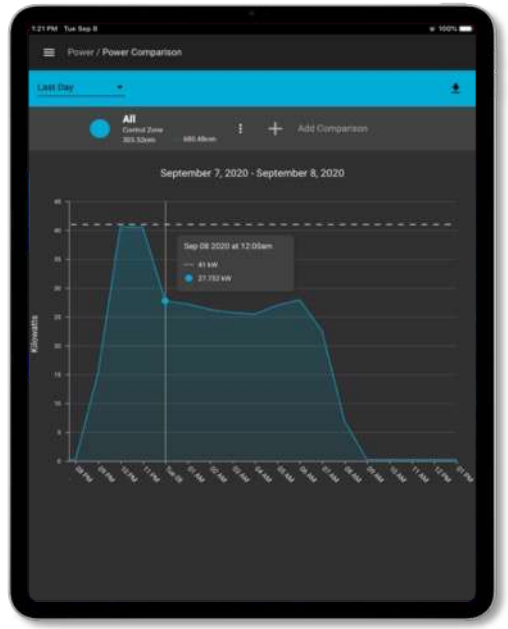
D4i Brings the Information that lives on the DALI-2/D4i LED Driver Front and Center

Asset Info, Power Info, Power Saving Strategies, Temperature, Voltage Spikes, and Diagnostics





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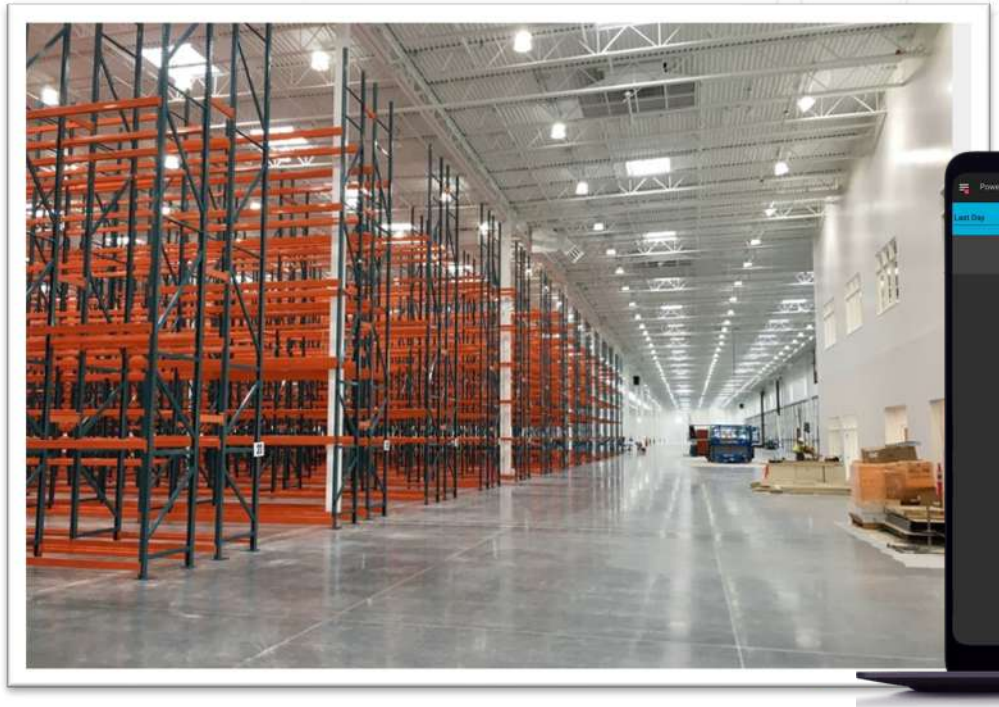
COMPLETE CONTROL

- Zoning
- Task Tuning
- Flexible Schedules

ENERGY SAVINGS

- Daylight Harvesting
- High-end Trim
- Scenes and Lighting Behaviors



ASSET MANAGEMENT

- LED DRIVER MODEL
- LUMINAIRE MAKE MODEL
- DATE CODE WHEN MADE
- HW & SW VERSIONS

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CODE COMPLIANCE

- TITLE 24 2022
- ASHRAE 90.1 2022
- IECC 2021

DLC COMPLIANCE

- ENERGY REPORTING
- CYBER SECURITY
- SCHEULING

UTILITY REBATES

- ENERGY VALIDATION

MONITORING

- Fault Detection
- Notifications
- Power and Cost
- Power Saving Strategies

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STANDARDS FOR INTEROPERABILITY

Learning objective 1:

Recognize the value of specifying standardized digital lighting systems for plug-and-play interoperability.

- Standards – General
- Standards supporting lighting controls
- Lighting control standards – Analog
- Lighting control standards – Digital
- Interoperability – Digital vs Analog

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STANDARDS – GENERAL

Standards: *voluntary*, established norm or requirement. A standard is usually a formal published document, based on consensus among interested parties, that establishes uniform engineering or technical criteria, methods, processes and practices.

Regulations: *mandatory* technical specifications, which may include standards or conformity assessment procedures. Regulations are created in legislative acts by national, state or regional governmental authorities.

Interoperability: A luminaire component is considered interoperable when it can be combined with (an)other interoperable component(s) and function as intended.[1]

Examples

- SI units of measurement: Length – meter (m); Mass – kilogram (kg); Time – second (s); Electrical current – ampere (A)
- Computer keyboard QWERTY layout
- Lamp fitting standard (Edison base/socket) – An *interface* standard
- GSM/CDMA/LTE protocol for cell phones
- National or regional currencies ($, €, ¥, £, …)

[1] Zhaga Consortium white paper

STANDARDS – GENERAL

Global technologies require international standards

Technical barriers to trade (TBT) are removed

- Standards form the building blocks of national economies and international trade. New markets are opened for economic growth.
- International standards form the essence of the World Trade Organization's (WTO) Agreement on TBT.

Standards influence everything

- Compatibility reduces costs through use of common parts, specifications and methods.
- Enable eco-systems of interoperable products providing multiple vendor options for specifiers.
- Our expectations for product performance are so common, we do not notice the underlying standards, unless they are absent!
  - *Worldwide incompatibility of electrical plugs and receptacles*
  - *Baltimore 1904 fire: Hoses of fire fighters from neighboring cities did not fit hydrants in Baltimore*

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STANDARDS SUPPORTING LIGHTING CONTROL

Zhaga

- Zhaga Book 18 (IEC PAS 63421[1]) *Smart interface between outdoor luminaires and sensing/communication modules*
- Zhaga Book 20 (IEC PAS 63422[1]) *Smart interface between indoor luminaires and sensing/communication modules*

DALI Alliance

- DALI-2 (IEC 62386 series[1]) *Digital addressable lighting interface – LED drivers, Application controllers, Input devices, Bus Power Supplies*
- D4i (*IEC 62386-251, -252, -253 in progress*[1]) *Digital addressable lighting interface – Luminaire data, Energy data, Diagnostics data*

ANSI

- ANSI C136.41 *Interface between an External Locking Type Control Device and Ballast or Driver*
- ANSI C136.58 *Luminaire Four-Pin Extension Module and Receptacle*
- ANSI C137.1 *Lighting Systems – 0-10V Dimming Interface for LED Drivers, Fluorescent Ballasts, and Controls*
- ANSI C137.4 *Lighting Systems – Interoperability of LED Drivers and Other Connected Devices Via the Digital Addressable Lighting Interface*

NEMA

- NEMA LS 20000 *Physical Interface of Luminaire Integrated Control Devices*

1 Global standardization in cooperation with IEC

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STANDARDS SUPPORTING LIGHTING CONTROL

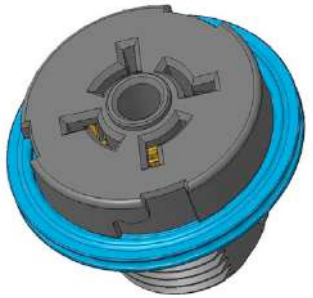
Zhaga Book 18 Ed 2.0 (November 2019)

- High IP rating for outdoor use
- Gasket ensures locking and provides ingress protection
- Twist-lock coupling
- Mechanical stop withstands 5.0 Nm torque
- Locking ramp feature: Un-mating torque > 1 Nm
- Four low voltage contacts (+24 V AUX Power Supply, DA-, DA+)
- DALI – Part 351 *Luminaire-mounted Control Devices* communication between LED drivers and lighting control modules

ANSI C136.58 – 2019

- Harmonized adoption of the Zhaga luminaire four-pin extension module and receptacle.
- Small footprint of the receptacle supports the miniaturization trend of LED luminaires.
- Performance testing

Receptacle



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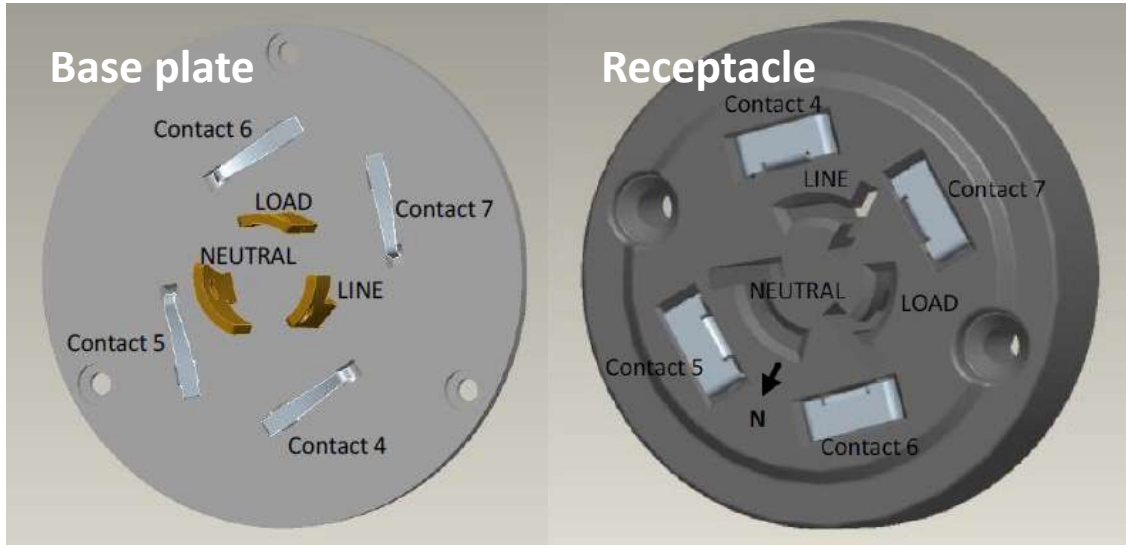
STANDARDS SUPPORTING LIGHTING CONTROL

ANSI C136.41 – 2021

- Interface between an external locking type control and a luminaire for roadway and area lighting equipment
- High IP rating for outdoor use
- Twist-lock coupling
- Mains voltage – 3 central contacts
- Supports higher power control devices
- Low voltage – 4 peripheral contacts
- Supports a DALI D4i interface
- 20 pin configurations



Zhaga Book 18 Ed 3.0 (April 2021)

- Harmonized adoption of ANSI C136.41 “NEMA” interface
- 1 configuration – **modified type D6 contact designation** from C136.41-2021
- DALI D4i interface required
- Certified interoperability

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STANDARDS SUPPORTING LIGHTING CONTROL

Electrical and Communication – Zhaga Book 18 Ed 3.0 Pin Assignments

Modified Type D6 Contact Designation C136.41-202X
Main power (Pins 1, 2 & 3: Line, Neutral and Load)
    Rated for > 1800 VA
DALI communication (Pins 4 & 5)
Aux power supply +24 VDC (Pin 6)
Disconnected (Pin 7)

Contacts	Assignment
LINE	Mains - line
NEUTRAL	Mains – neutral
LOAD	Load
4	DA+ (Positive pole for the DALI communication and power)
5	DA- (Negative pole for the DALI communication and power) GND for +24 V AUX Power Supply
6	+24 V AUX Power Supply
7	Not connected[1]

[1] *In ANSI C136.41 this pin is designated as "Logic Detect".*

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STANDARDS SUPPORTING LIGHTING CONTROL

Zhaga Book 18 Ed 3.0 (April 2021)

Smart City – Vision for lighting controls

- Hybrid architecture “NEMA” and Zhaga receptacles available on the same luminaire

Control

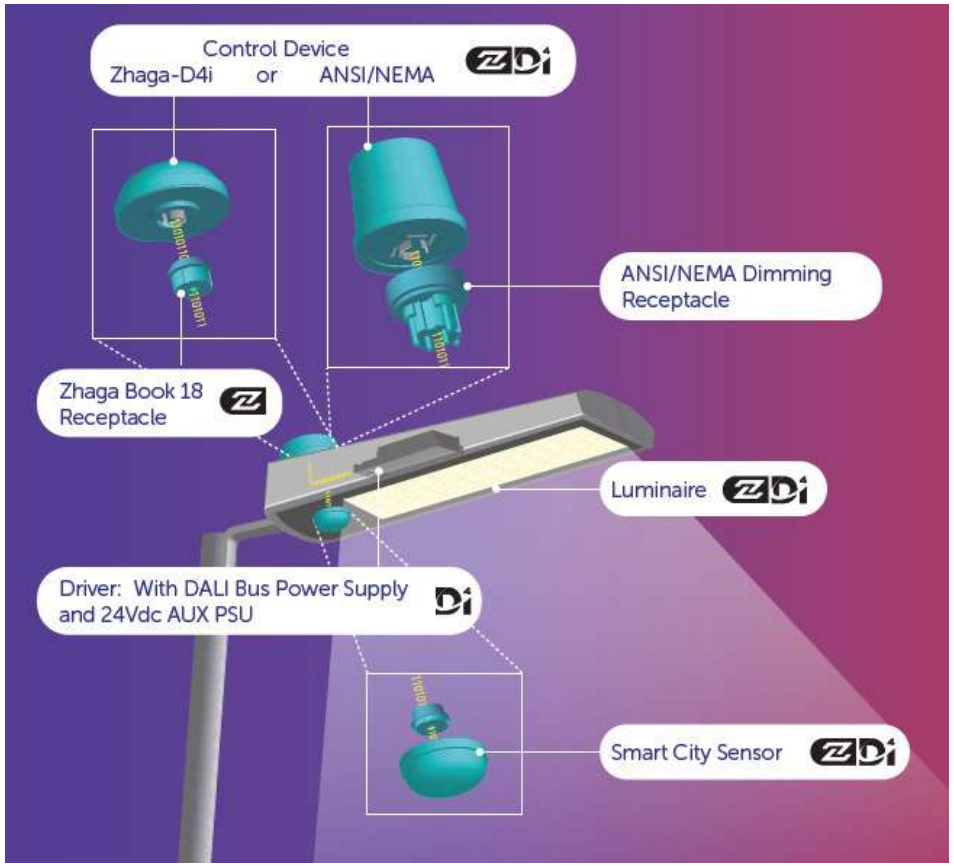
- Power
- ON/OFF operation
- Dimming function

Add networking…

- Connection to IoT
- City-wide communication
- Energy usage monitoring/reporting

Add sensors…

- Environmental sensing (weather, air quality, smoke)
- Area security monitoring (surveillance cameras, noise detection)
- Vehicular and pedestrian traffic detection
- Emergency response
- Parking space assistance



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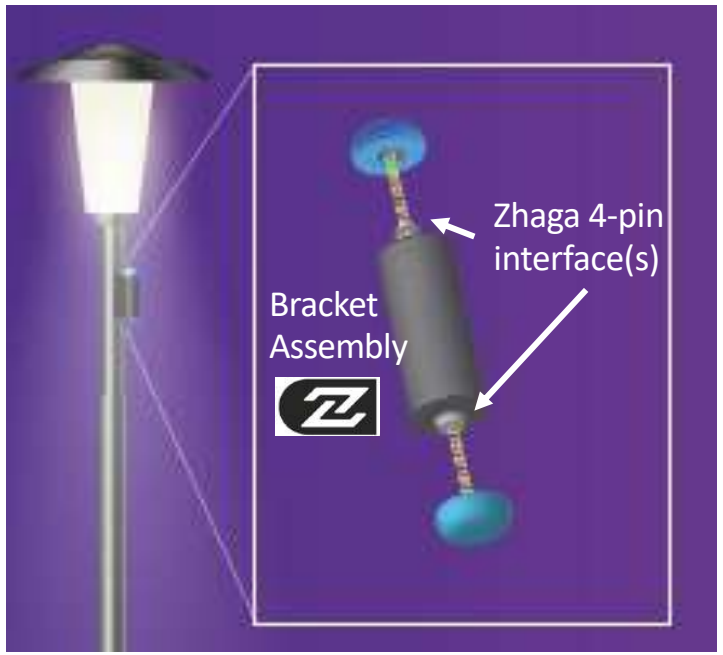
STANDARDS SUPPORTING LIGHTING CONTROL

Zhaga Book 18 Ed 4.0 (coming soon; Book 18 Ed 3.0 is published)

- Decorative and heritage luminaires need mounting surfaces for lighting controls
- Pole mounted bracket assembly
- One or two Zhaga 4-pin interfaces
- The specification addresses installation and the long cables needed to connect the bracket assembly and luminaire including surge protection and the DALI timings.



Sneak preview!

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STANDARDS SUPPORTING LIGHTING CONTROL

Zhaga Book 20 Ed 1.2 (May 2022)

Smart Building – Vision for lighting controls

Control

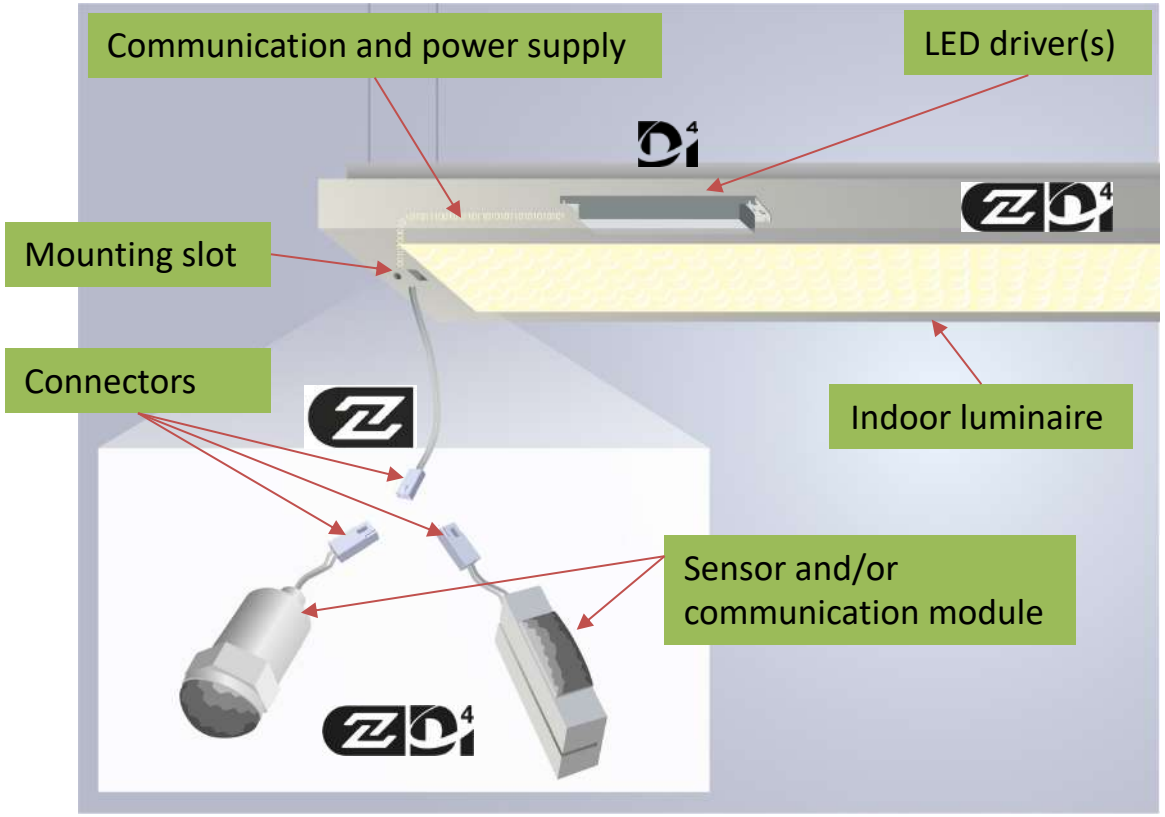
- Power
- ON/OFF operation
- Dimming function

Add networking…

- Building CMS
- Energy monitoring and reporting
- Illumination control (spectrum, scenes, etc.)

Add sensors…

- Presence sensing
- Daylight harvesting
- Security
- Emergency response
- Hazard detection



Publicly available… Check out the video:
https://youtu.be/qAF4FymbUJw

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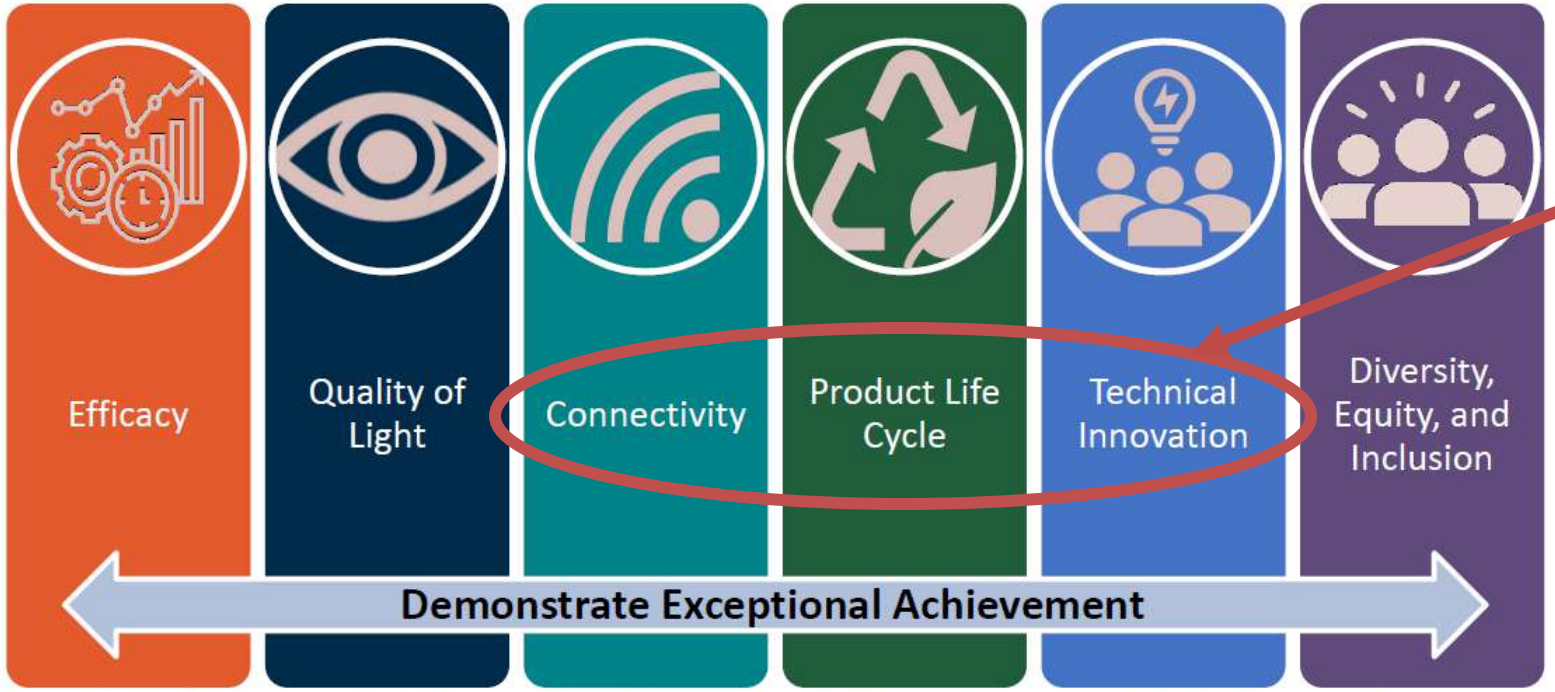
STANDARDS SUPPORTING LIGHTING CONTROL

U.S. Department of Energy – L-Prize competition



Zhaga-D4i

Figure 1: The L-Prize aims for interoperable lighting systems that demonstrate exceptional achievement across six distinct categories.

STANDARDS SUPPORTING LIGHTING CONTROL

U.S. Department of Energy – L-Prize competition

Contest	Winners	Prizes
Concept Phase (complete)	4 were awarded	$20,000 per winner
Prototype Phase	Up to 6	$2 million pool
Manufacturing and Installation Phase	Up to 4	$10 million pool

You are here!!

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STANDARDS SUPPORTING LIGHTING CONTROL

U.S. Department of Energy – L-Prize competition

Zhaga Book 20 Ed 1.2 (May 2022) and DALI D4i data and control

Use certified Zhaga-D4i products for a winning lighting control project!!

Standards-Based Sensor Port and Connector	A Zhaga Book 20 or NEMA EM1 compliant sensor port with pre-wired connections to the D4i driver.
Minimum Requirement(s) Luminaires must incorporate a standardized sensor receptacle aperture with physical shape and minimum keep-out area dimensions in compliance with Zhaga Book 20 or NEMA LS 20000-2021 shapes RR1, RR2, CC1, CC3, or EM1. The sensor receptacle must be pre-wired with a Zhaga Book 20 compliant 2-wire connection to the DALI-bus terminals of the D4i driver. See supplemental testing guidance (below) for important additional information about this requirement.	

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STANDARDS SUPPORTING LIGHTING CONTROL

Mechanical Interfaces

Zhaga Book 20 Ed 1.2 (May 2022) – 5 shape categories

- R44x17 rectangular (44x17 mm) (~1.7 x 0.7 in)
  → modules with small volumes and indifferent orientation
- R60x22 rectangular (60x22 mm) (~2.4 x 0.9 in)
  → modules requiring more volume and surface, e.g., gas detectors or complex presence detectors

- C22-T1A round (Ø 22 mm) (~0.9 in)
  → modules as already widely used in the field, adjustable orientation, minimum surface
- C22-T1B round (Ø 22 mm) (~0.9 in)
  → modules as already widely used in the field, adjustable orientation, larger lenses

- C22-T2 L-shaped round (Ø 22 mm) (~0.9 in)
  → L-shaped modules enable ultra-flat luminaire designs

NEMA LS 20000-2021

- 13 shapes: Rectangular; cylindrical; offset rectangle, cylinder; ovoid, ovoid
- Overlapping specifications are harmonized with Zhaga Book 20

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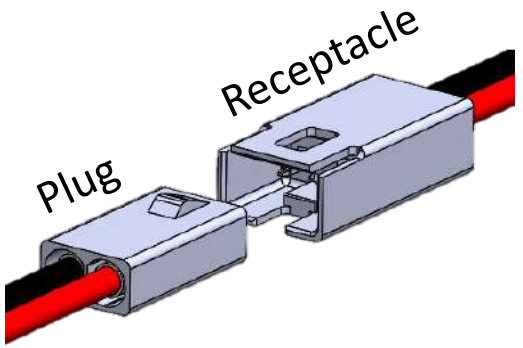
STANDARDS SUPPORTING LIGHTING CONTROL

Connector Interface

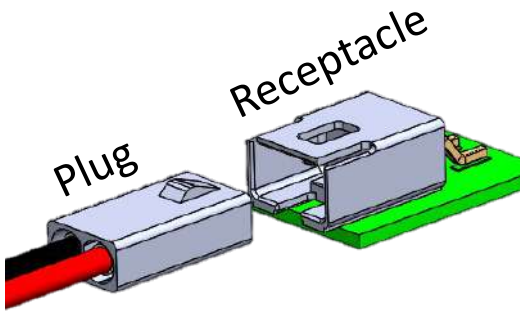
Zhaga Book 20 Ed 1.2 (May 2022)

Features

- Two position plug and receptacle interface
  - *Easy to use separable connection provides reliable DALI connectivity*
- Poka Yoke features prevent incorrect mating.
  - *Enables connection with polarity ensured*
- Connector provides finger proof protection
  - *Housing provides touch proof protection for separable contacts*
- Plug & play functionality can be installed by a generalist
  - *Does not require a specialist to upgrade luminaire functionality*
- Integrated latch feature provides 5N minimum retention when mated
  - *Slim profile latch ensures that connectors remain intact over its lifetime*



Wire-to-wire



Wire-to-board

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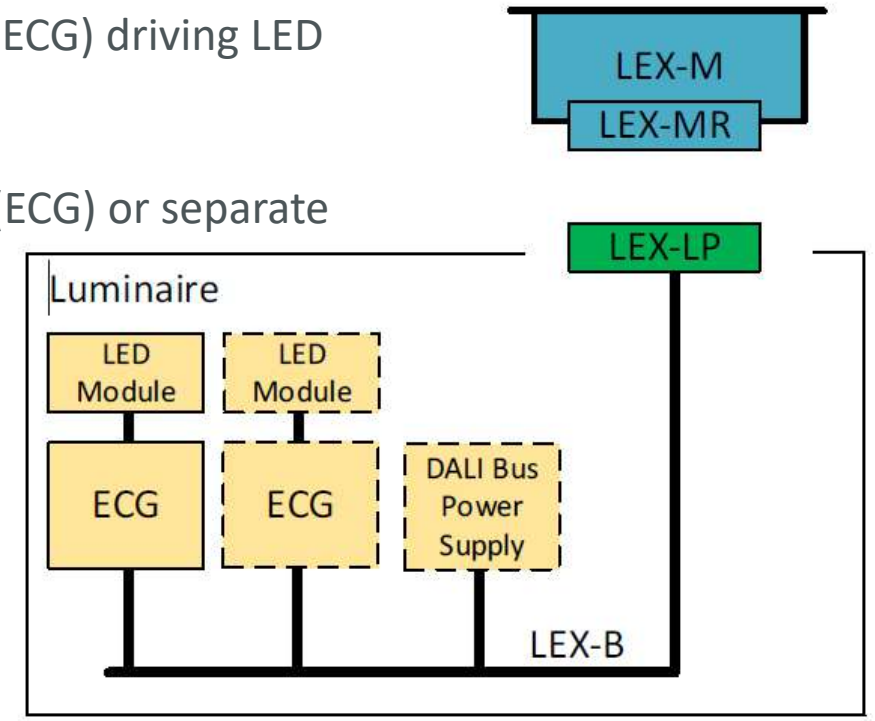
STANDARDS SUPPORTING LIGHTING CONTROL

Electrical & Communication Interface

Zhaga Book 20 Ed 1.2 – Luminaire Features

- One to four Electronic Control Gear (ECG) driving LED modules
- LEX Luminaire Plug
- DALI bus power supply – integrated (ECG) or separate
- Plug-and-Play Interoperability
- Optional multiple sections

Luminaire Extension (LEX)



LEX Module

LEX Module Receptacle

LEX Luminaire Plug

Electronic Control Gear (Drivers)

LEX Bus (cable)

In edition 1.2 of the specification, the system is restricted to Luminaires without internal DALI application controllers or input devices and to Luminaires that do not have provisions for connection to an external DALI bus.

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LIGHTING CONTROL STANDARDS – ANALOG

ANSI C137.1 – 2022

- Standard specifies the 0-10 volt control interface method and performance requirements for dimmable LED drivers, fluorescent ballasts and dimming control units where output power is adjustable between minimum/off and maximum via a control input signal.

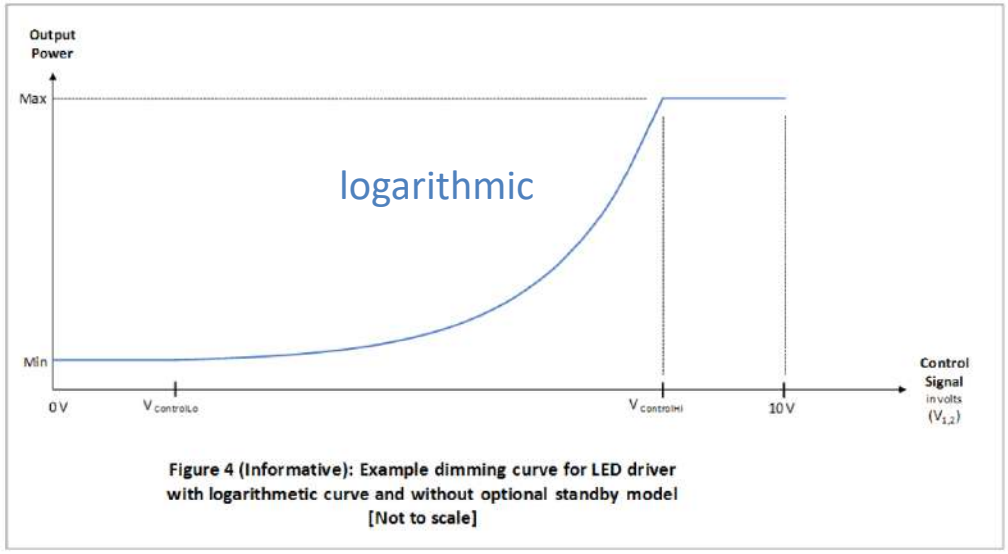

Figure 4 (Informative): Example dimming curve for LED driver with logarithmetic curve and without optional standby model [Not to scale]

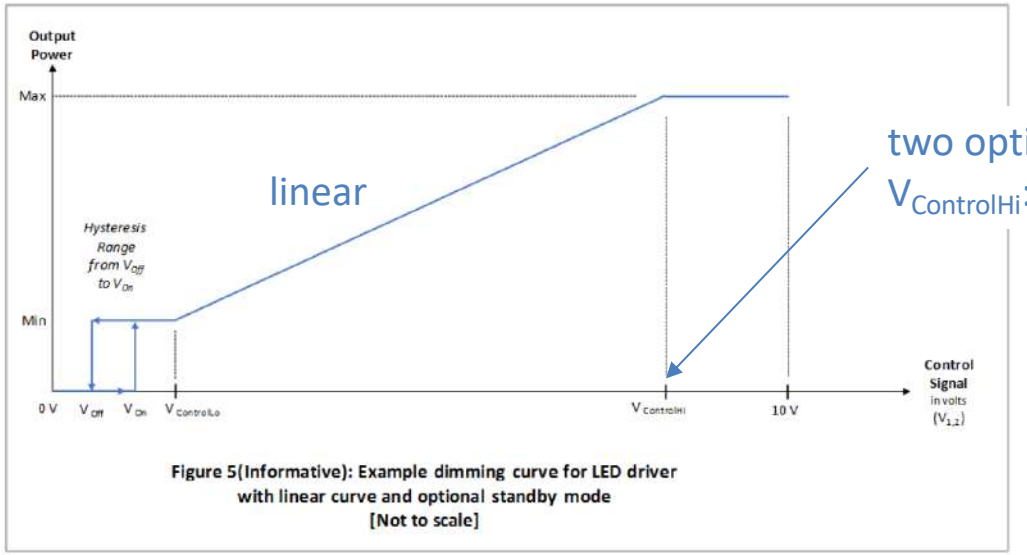

Figure 5(Informative): Example dimming curve for LED driver with linear curve and optional standby mode [Not to scale]

two options for the shape of the dimming curve: linear or logarithmic

LIGHTING CONTROL STANDARDS – ANALOG

ANSI C137.1 – 2022

- Options (excerpted notes):
  - This Standard offers two options for $V_{ControlHi}$: 8 or 9 volts. These options allow specifiers to optimize performance in a wide range of applications. Existing installations use either value of voltage. **To ensure compatibility, it is recommended to use drivers/ballasts with the same control voltage option on the same control wires.** The manufacturer may specify both values if the driver is configurable.
  - This Standard offers two options for the shape of the dimming curve: linear or logarithmic. These options allow specifiers to optimize performance in a wide range of applications. Existing installations use either type of curve. **To ensure compatibility, it is recommended to avoid mixing linear and logarithmic drivers/ballasts on the same control wires.**

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LIGHTING CONTROL STANDARDS – DIGITAL

ANSI C137.4-2021

- This standard specifies the minimum requirements for devices such as drivers, AUX power supplies, controls, sensors, luminaire mounted control devices, and communication devices **supporting a digital interface between devices**.
- This standard builds on the **digital addressable lighting interface** as specified in the IEC 62386 series of standards to specify the requirements for memory bank usage, logic signal interface, energy reporting, diagnostic information, as well as requirements for auxiliary power supplies that may be integrated into an LED driver.
- Products that are compliant with ANSI C137.4-2021 may be eligible to apply for **D4i certification**.

DiiA Specification	D4i certification requirement	Included in ANSI C137.4	
		2019	2021
LED DRIVERS			
DALI Part 150 – AUX Power Supply	Optional	✓	✓
DALI Part 250 – Integrated Bus Power Supply	Mandatory	✓	✓
DALI Part 251 – Luminaire Data (Memory Bank 1)	Mandatory	✓	✓
DALI Part 252 – Energy Data	Mandatory		✓
DALI Part 253 – Diagnostics Data	Mandatory		✓
CONTROL DEVICES			
DALI Part 351 – Luminaire-mounted control devices	Mandatory		✓

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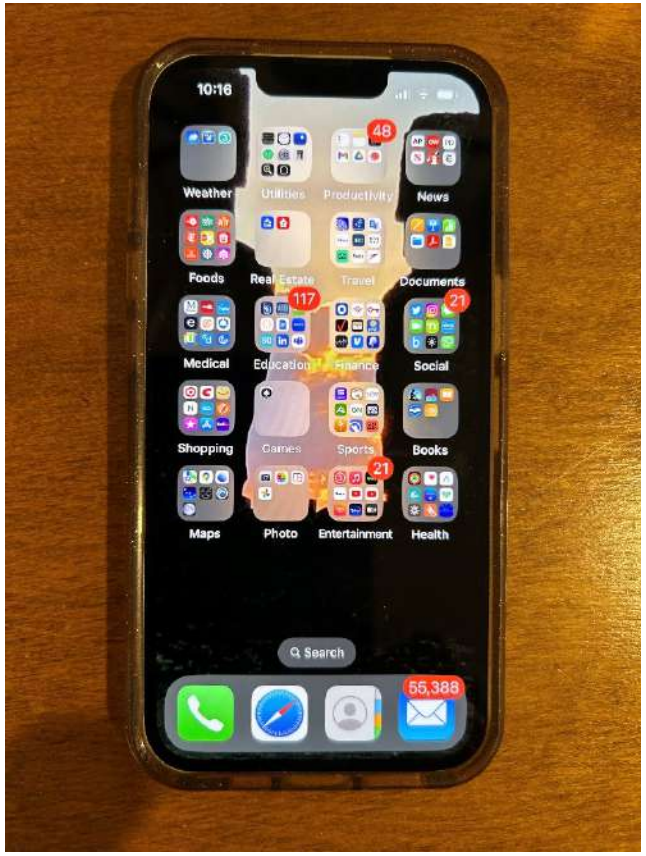
INTEROPERABILITY – DIGITAL VS ANALOG

Rotary phones are a curiosity

Willow, the cat, considers answering!!

Digital phones are common

Look at all the apps!!



INTEROPERABILITY – DIGITAL VS ANALOG

Interoperability with digital vs 0-10V

- DALI digital input is numeric, the **input signal has no uncertainty** which leads to reduced variation in the output performance.
- A 0-10V product compliant with ANSI C137.1 may have a linear or logarithmic curve and may achieve full scale at either 8- or 9-volt input signals. Installations having a mixture of LED driver characteristics will have **noticeably different performance** due to differing driver output from a common input signal.
- DALI digital input **easily communicates between different control characteristics**: dimming, color, dim-to-warm, etc. A 0-10V control system needs dedicated inputs for each control characteristic.
- DALI digital communication is **more versatile** supporting a large variety of sensor devices: presence detectors, light sensors, color sensors, etc.
- DALI digital addressing allows for setting up various **groups of luminaires** that respond together.
- DALI D4i assists in **luminaire data, energy monitoring and reporting, diagnostics and maintenance**. These features need to be provided separately in proprietary 0-10V control systems.

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DALI-2 AND D4I DIGITAL CONTROL

Learning objective 2:

Understand the improved performance of D4i digital control versus analog control in lighting systems.

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What is DALI?

- DALI- **D**igital **A**ddressable **L**ighting **I**nterface
  - Lighting control standard governed by the DALI Alliance
- Allows for control of individual fixtures, groups of fixtures, or all fixtures via DALI commands
- Can create and reconfigure lighting groups via software, instead of having to modify control wiring
- Used to control luminaires, create scenes, and store luminaire and driver data

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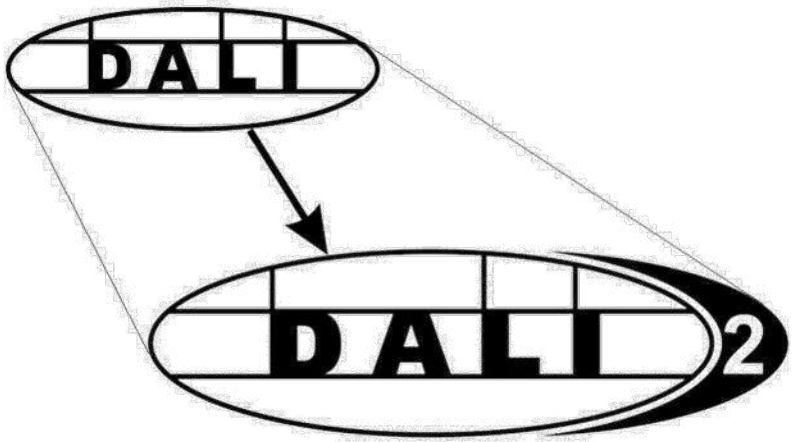
What is DALI-2?

- 2nd Generation of DALI



- DALI-2 Allows For
  - Increased interoperability
  - More stringent test protocol
  - Extended Commands

- DALI-2 requires that the certification test files be submitted to the DALI Alliance for approval
  - Fosters manufacturer accountability for adherence to DALI Standards
  - All certified DALI-2 products are found on the DALI Alliance website

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DALI and DALI-2

- DALI-2
  - DALI-2 is the certification standard for the latest version of the DALI protocol

- DALI
  - DALI is the digital communication protocol

DALI-2 Driver Requirements

- At a minimum, for LED drivers DALI-2 requires the testing and certification to the following standards:
  - DALI Part 101: Standard DALI Requirements
  - DALI Part 102: Standard Control Gear Requirements
  - DALI Part 207: DALI for LED Modules

- ***So, what is D4i?***

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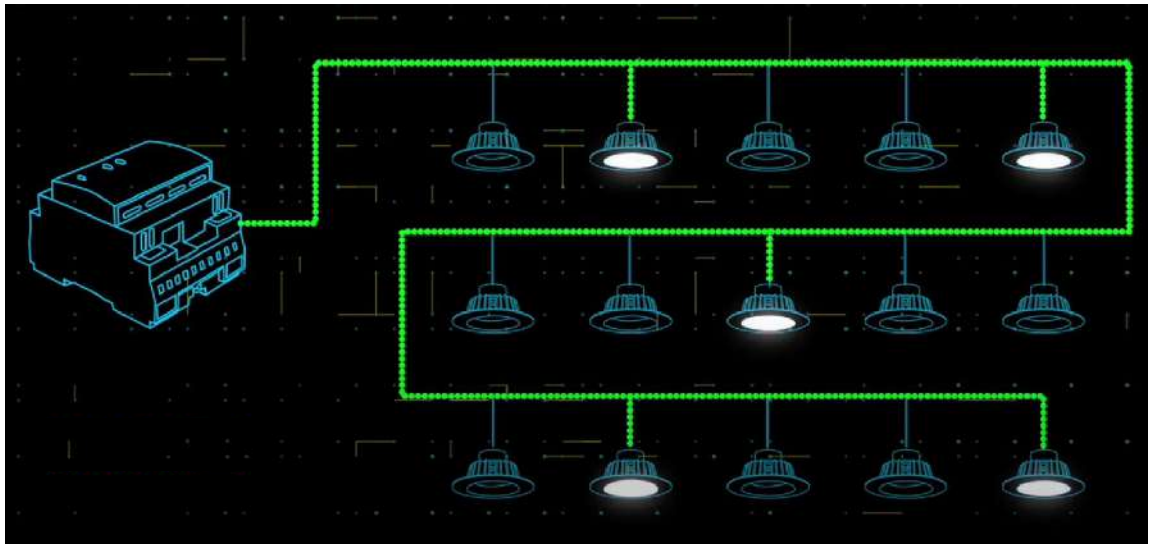
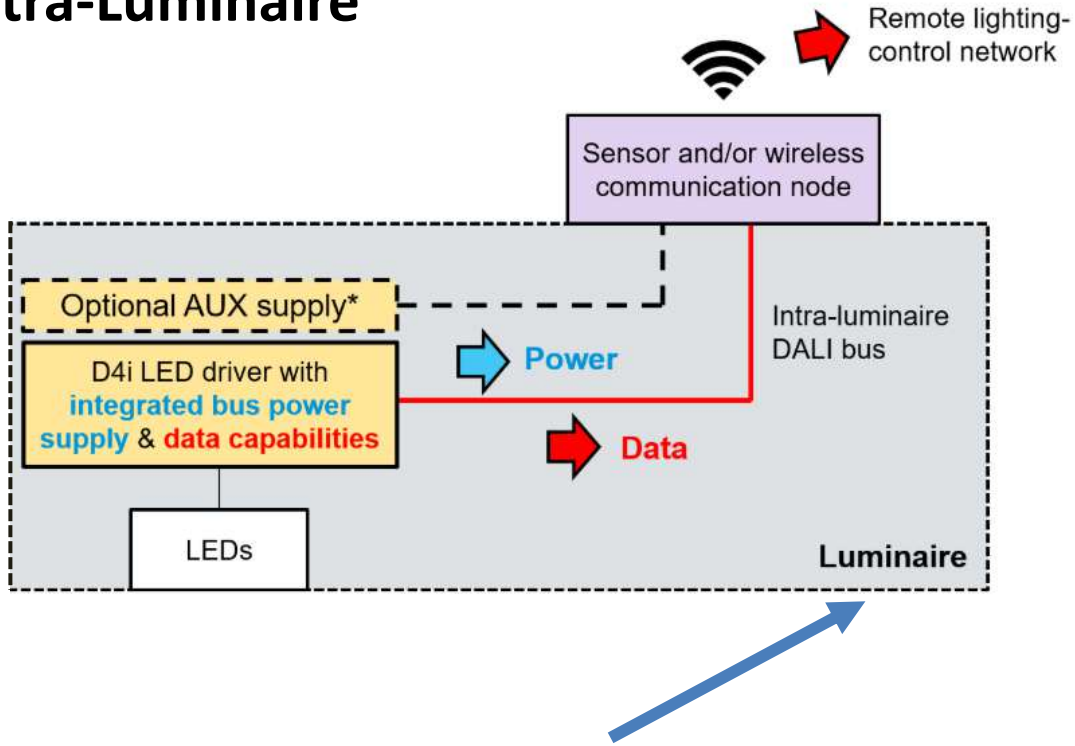
DALI-2: Applications

Traditional



DALI bus is distributed to multiple fixtures throughout the building

Intra-Luminaire



*DALI Bus does not leave the luminaire

D4i Overview

- DALI-2 is the standard for the DALI **data bus**
- D4i is the standardized **feature set**

- ***A standardized data bus and feature set allows for the lighting controller to read back data from the driver***

- D4i Enables Smart Data capabilities
  - Standardizes what information is monitored by the driver
  - Standardizes what information is stored by the driver and, and where

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D4i Requirements

- D4i requires the testing and certification to the following standards in addition to the baseline DALI-2 certification
  - DALI Part 250: Integrated DALI Bus Supply
  - DALI Part 251: Memory Bank 1 Extension for Luminaire Data
  - DALI Part 252: Energy Reporting
  - DALI Part 253: Diagnostics and Maintenance

- DALI-2 **can** exist without D4i
- D4i **cannot** exist without DALI-2

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So, what can D4i do?

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Memory Bank 1

- Luminaire Data that can be stored in the driver by the luminaire manufacturer
- DALI Part 251 defines 16 data points that can be stored in the driver about the luminaire.
- This information is valuable for ***Informed Maintenance and Asset Management***

- Memory Bank 1
  - Luminaire Color
  - Luminaire Identification
  - Luminaire GTIN
  - Light Distribution Type
  - CCT (K)
  - Serial Number
  - Manufacturing Date Code
- Memory Bank 0 (Driver Information)
  - Driver GTIN
  - Driver Serial Number

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Power Monitoring

- Reads back the power and energy usage of the driver
- Standardized by DALI Part 252
- This data can be useful for:
  - Verifying energy savings
  - Identifying problems

- Required:
  - Active Energy
  - Active Power
- Optional
  - Apparent Energy
  - Apparent Power
  - Active Energy Load-Side
  - Active Power Load-Side

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Diagnostics and Maintenance

- Diagnostic and Maintenance Data monitored by the driver
- Standardized by DALI Part 253
- Allows for control systems to monitor luminaires for abnormalities, failure, and early signs of failure

- With advances in Artificial Intelligence, we expect control system failure prediction accuracy and lighting control optimization to continue to increase.

- What is Monitored:
  - Performance Data
  - Failure Flags
  - Failure Flag Counters
  - Lifetime Counters
  - Timers
  - Luminaire Operation Information

Integrated DALI Bus Supply & Auxiliary Supply

- DALI Bus Supplies:
  - All DALI Networks require a DALI Bus supply.
  - With DALI-2 D4i drivers, these are built into the driver.
- 24V Auxiliary Supply:
  - DALI Part 150 standardizes a 24Vdc 3W power supply.
  - This is not required by D4i, but many D4i drivers do have this feature.
  - Provides power the NLC
    - A DALI Bus supply is still required if an auxiliary supply is present.

Integrated DALI Bus Supply & Auxiliary Supply

- *Standardization of Auxiliary Supplies and the required inclusion of a DALI Bus Supply helps to make controls "Plug and Play" while also reducing system complexity*

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Value Adds of D4i

- Keep customers lights on
- Save money on maintenance
- Verify energy savings
- Asset Tracking

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To Wrap Up…..

- DALI-2:
  - Offers a standardized Data Bus

- D4i
  - Standardized Feature Set
    - ANSI C137.4 is Harmonized with D4i
  - Standardized Auxiliary Supply

- Zhaga-D4i
  - Standardized Connector

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EXPANDED COMPONENT CAPABILITY

Learning objective 3:

Realize the expanded capabilities of components in digital lighting systems.

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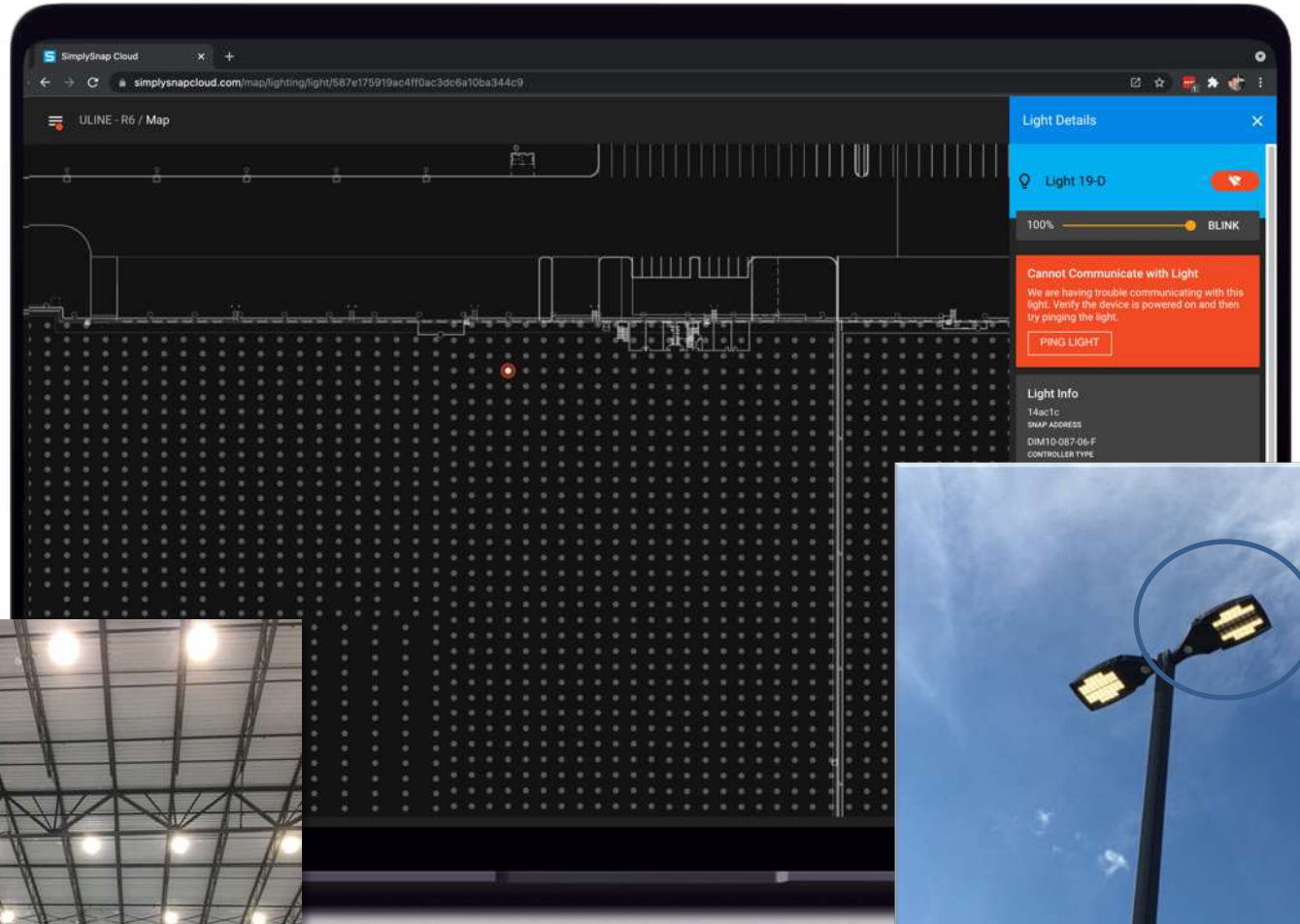
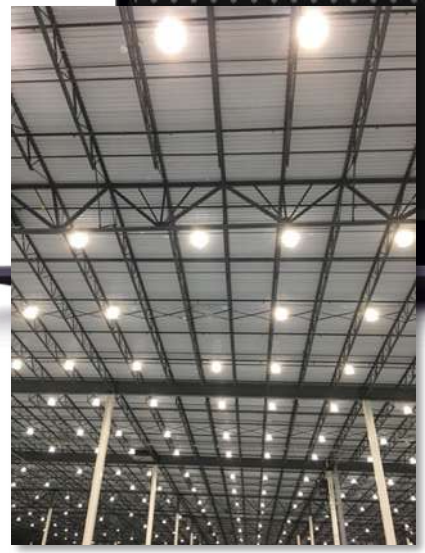
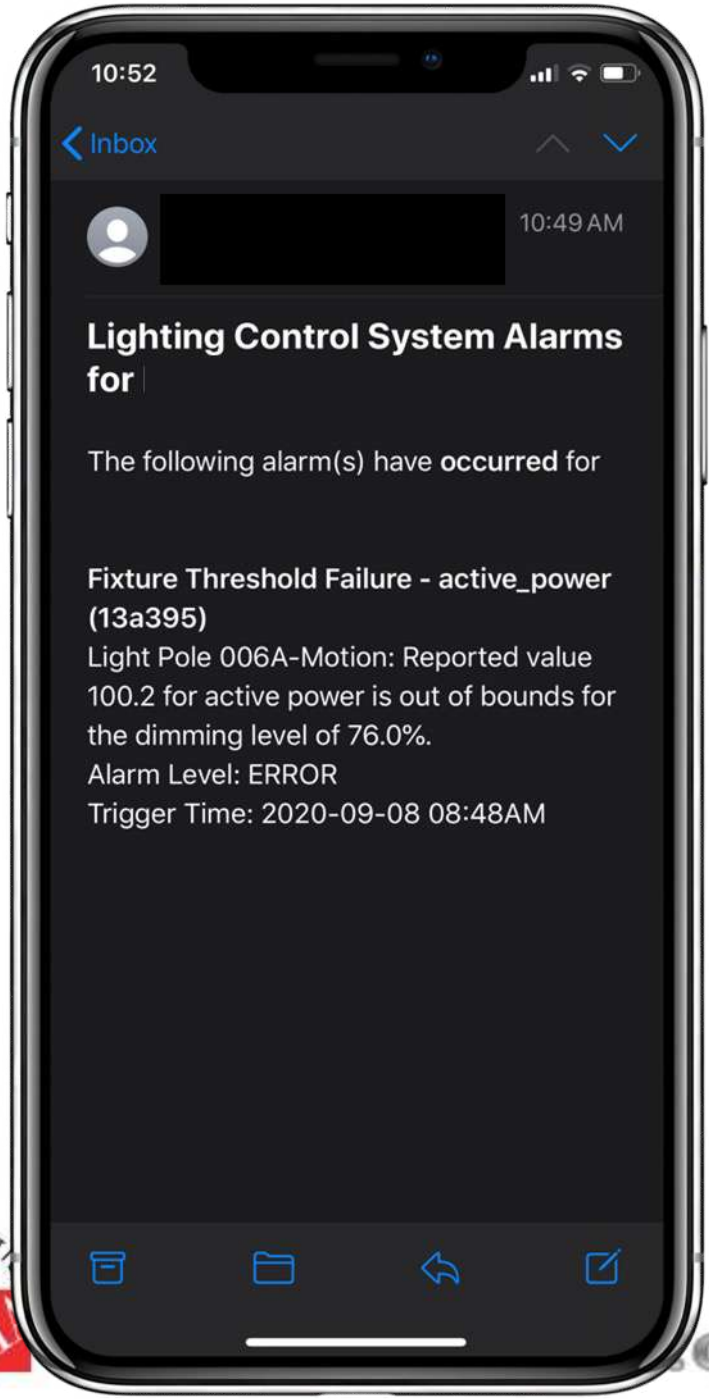
PROACTIVE MONITORING







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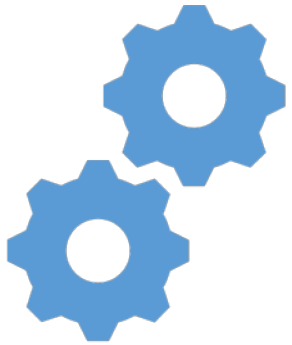
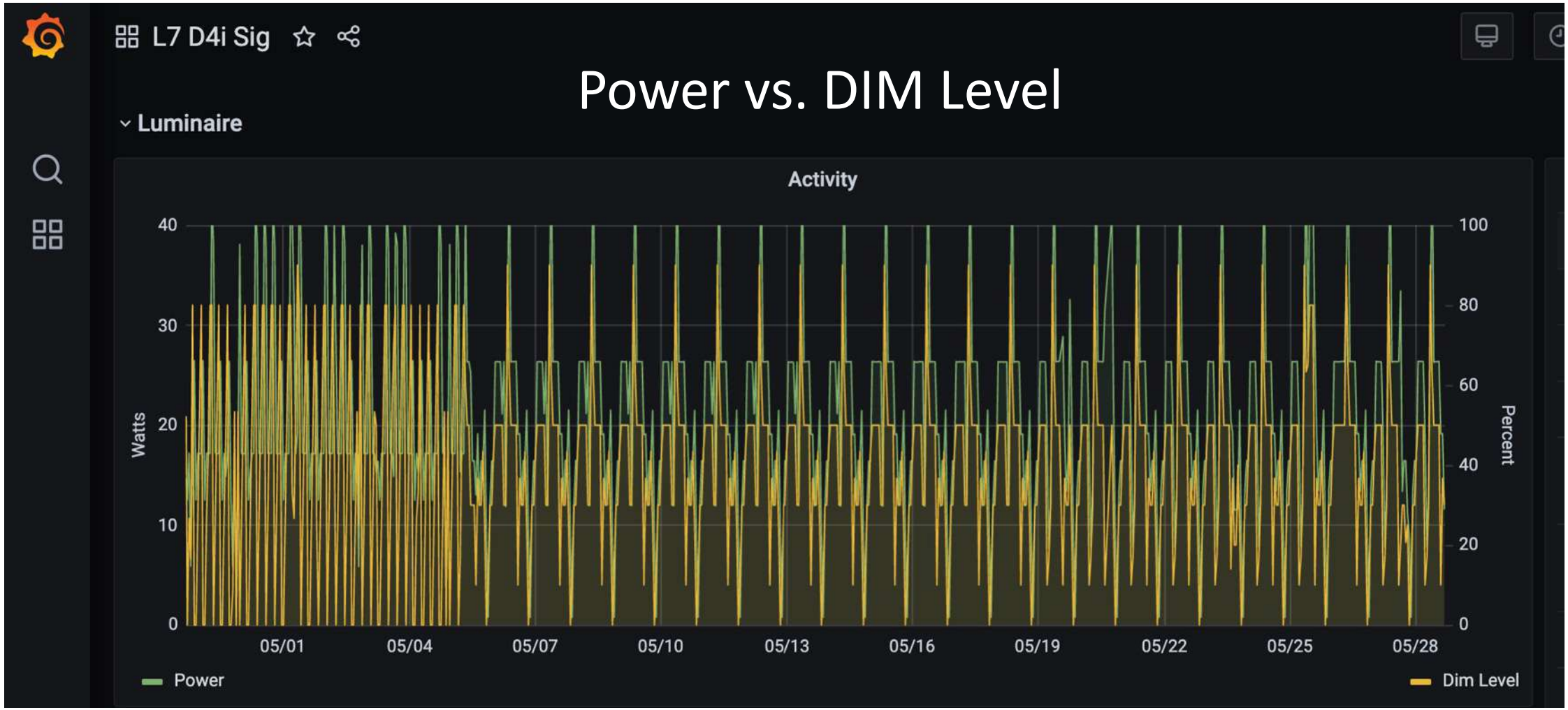
D4i DIAGNOSTICS – EXPOSING THE DATA

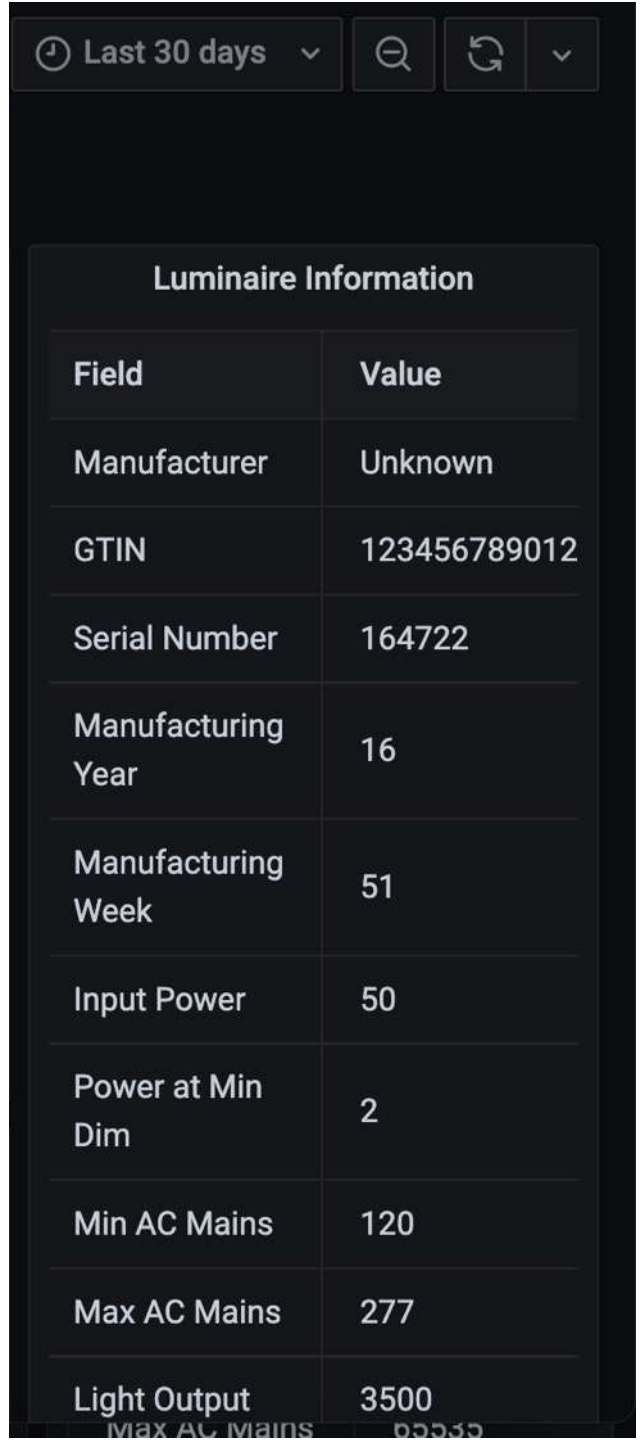


Control Gear / LED Driver Diagnostics

Light Source / LED Array Diagnostics

Power vs. DIM Level





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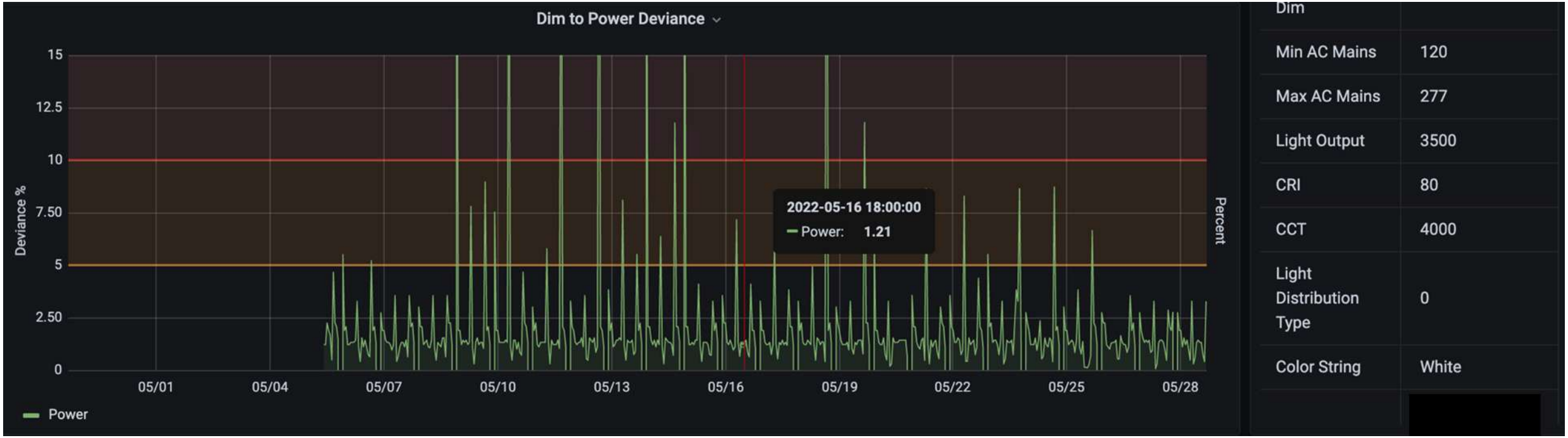
Insights

LED Driver OVER DRIVING the LED Array

Designed Operation current = 700mA

Current being applied = 1050mA



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PagerDuty

synapsewireless.pagerduty.com

Hello Michael Davidson, you have one open incident assigned to you:

INCIDENT #1009

L7 D4i SIG Dim Power Error Above 1%

View Incident

DETAILS

disposition: CRITICAL name: L7 D4i SIG Dim Power Error Above 1% path: 1 siteId: ce75783c-9006-425f-bdeb-265459b87241 state: ACTIVE timestamp: 1653826612574 triggerId: 1f492371-4d82-4322-8b91-60a42e8c8e83

STATUS

Triggered

URGENCY

↑ High

ASSIGNED TO

Michael Davidson

OPENED ON

May 29, 2022 at 7:16 AM (Central Time (US & Canada))

SERVICE

[redacted] DALI Dashboard Demo Path #1

Managed by [redacted]

ESCALATION POLICY

[redacted] DALI Dashboard Demo Escalation Path #1

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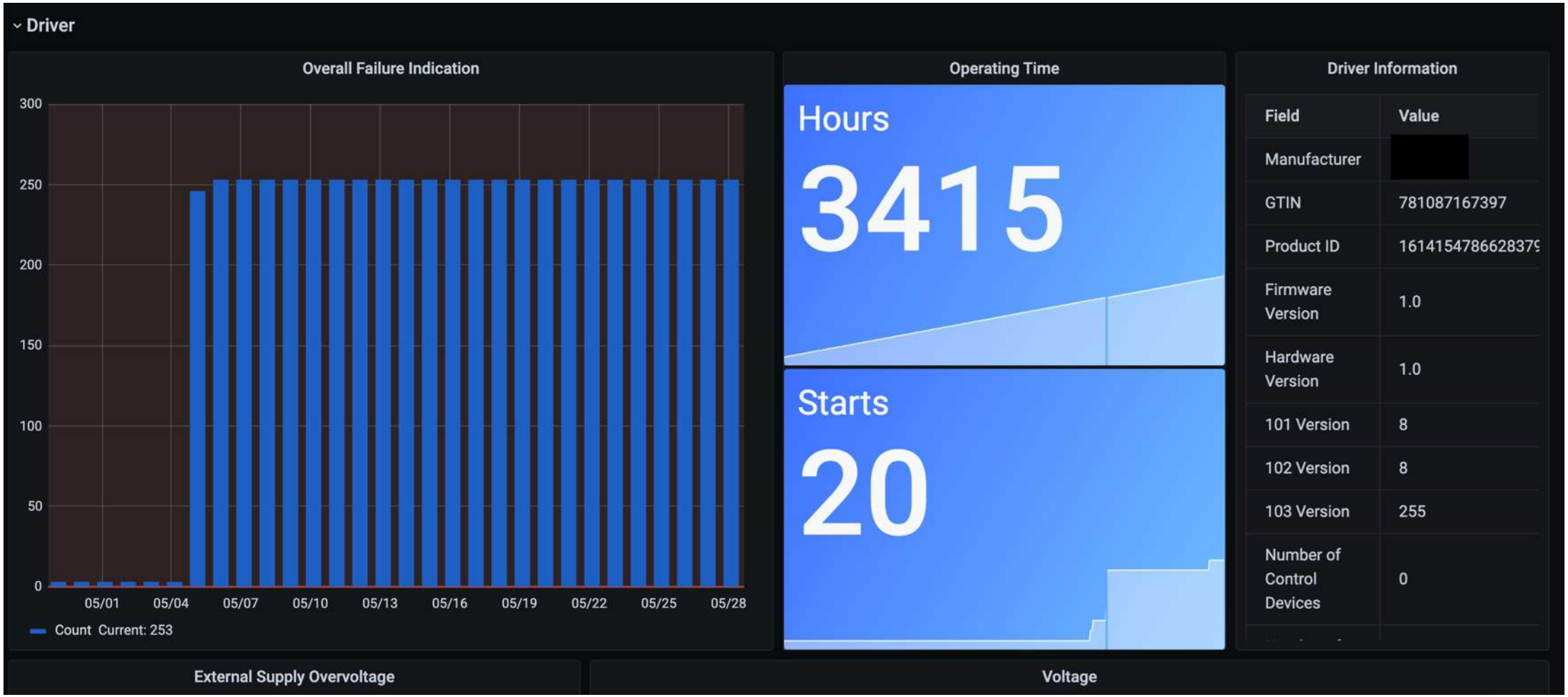
LED DRIVER STATISTICS



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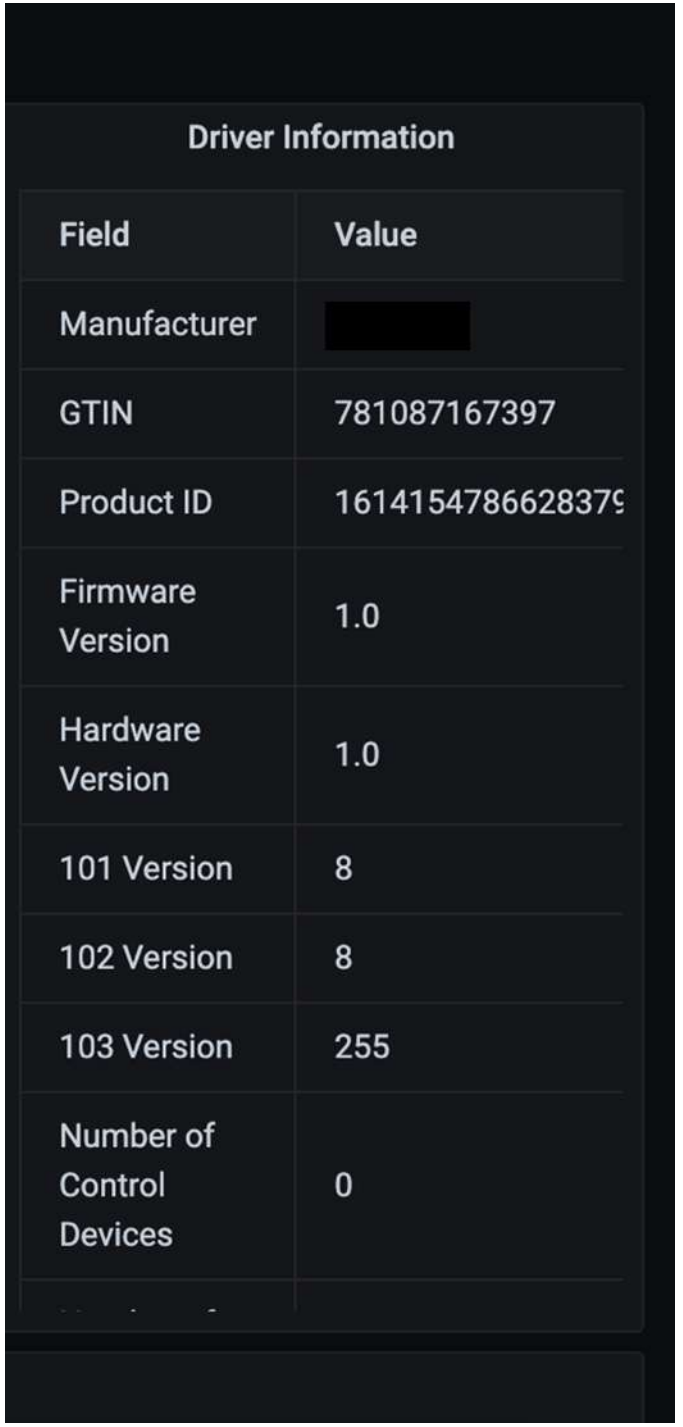
LED Driver Memory Bank 0 Asset Data



Driver Information

Field	Value
Manufacturer	[redacted]
GTIN	781087167397
Product ID	1614154786628379
Firmware Version	1.0
Hardware Version	1.0
101 Version	8
102 Version	8
103 Version	255
Number of Control Devices	0

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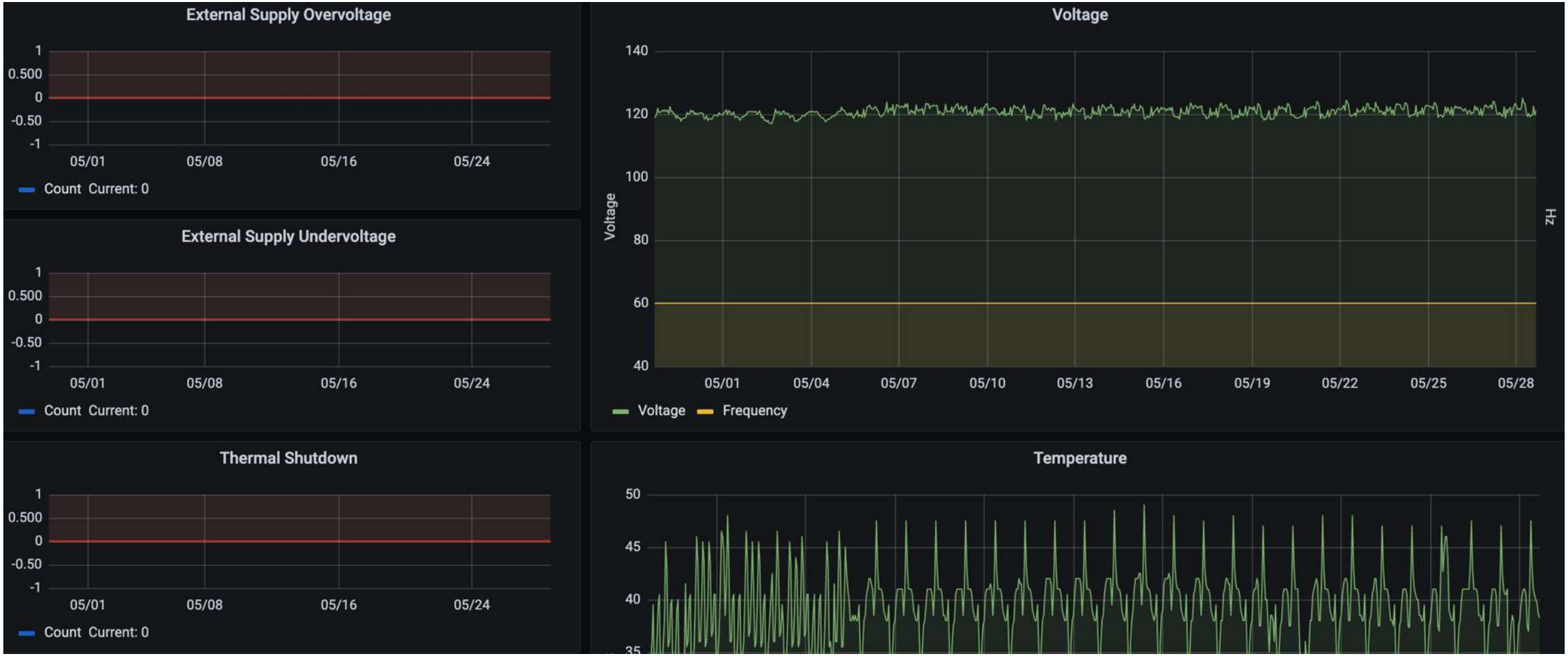
D4i LED Driver



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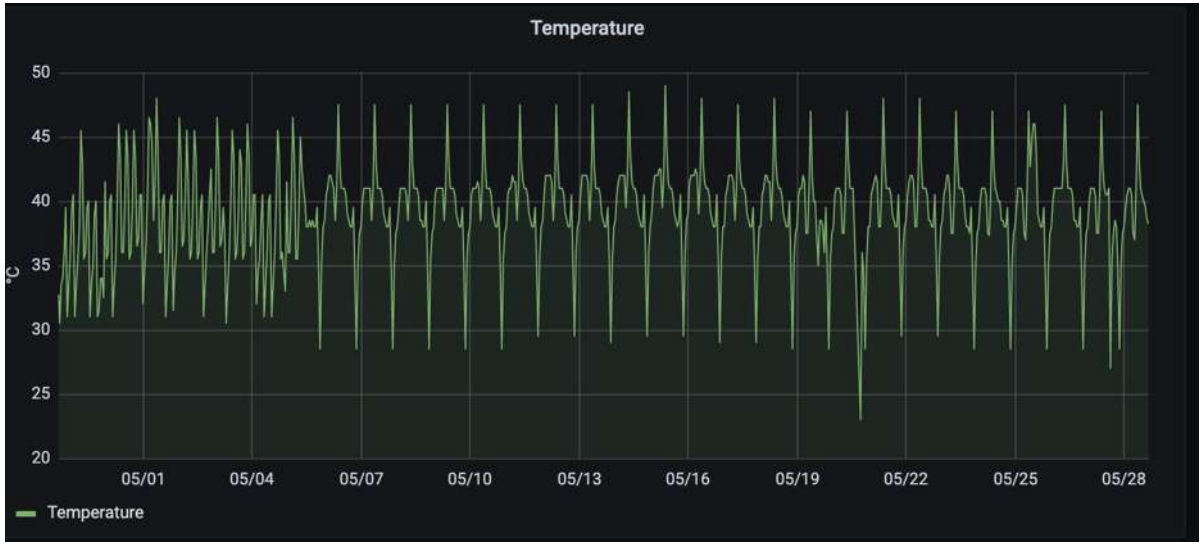
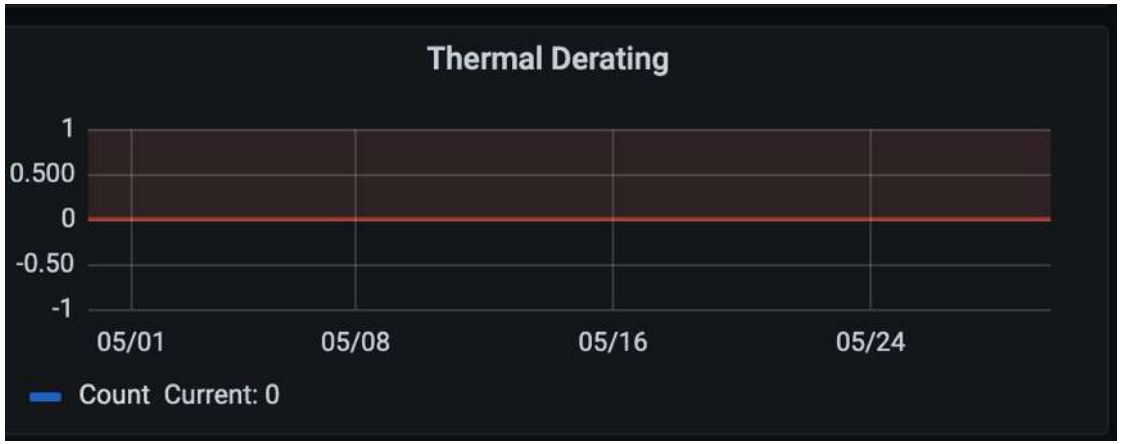
D4I LED DRIVER COUNTERS

- Supply Over Voltage
- Supply Under Voltage
- Thermal Shutdown


Temperature
50
45
40
35
30
25
20
°C
05/01
05/04
05/07
05/10
05/13
05/16
05/19
05/22
05/25
05/28
Temperature


Thermal Derating
1
0.500
0
-0.50
-1
05/01
05/08
05/16
05/24
Count Current: 0

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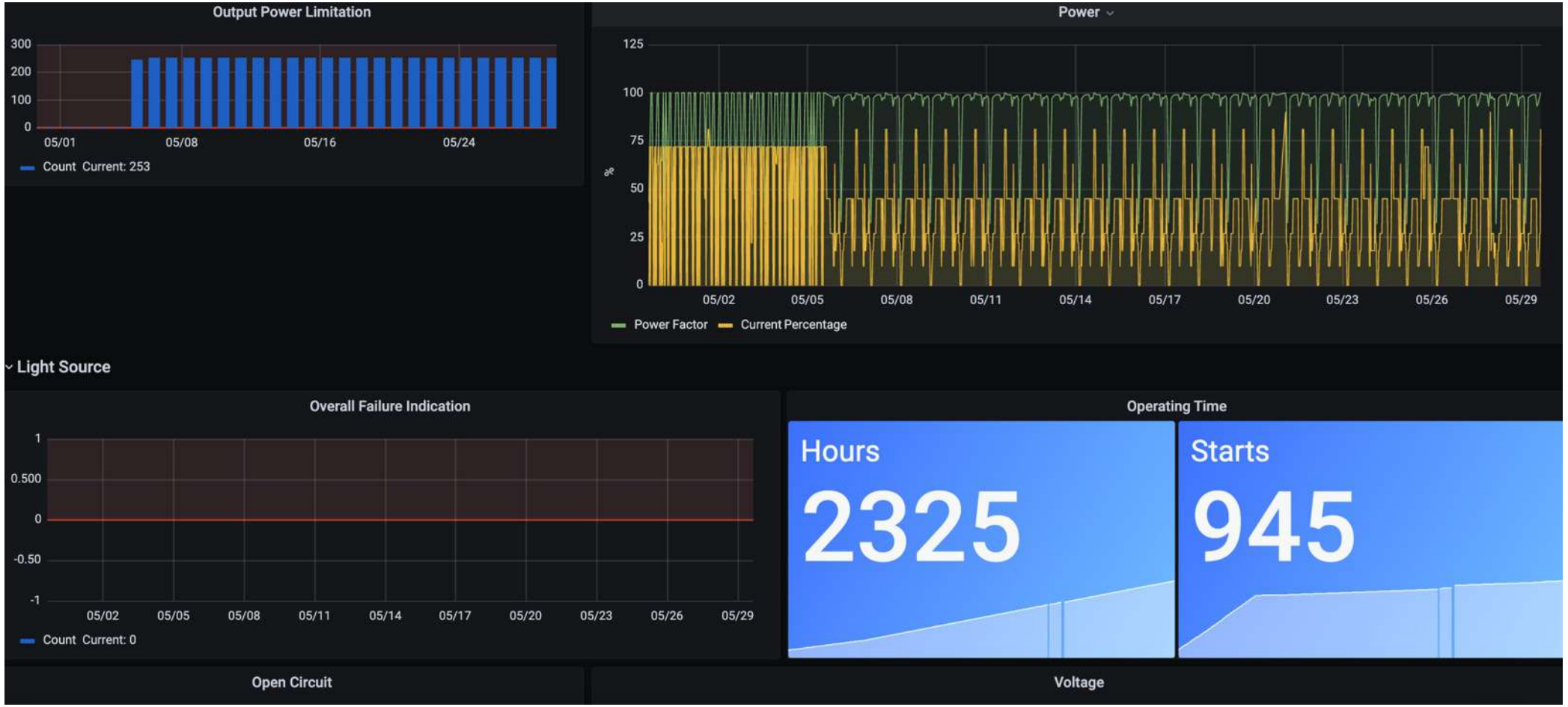
D4i Light Source / LED ARRAY Data

- LED Runtime & Starts
- Output Limits & Count



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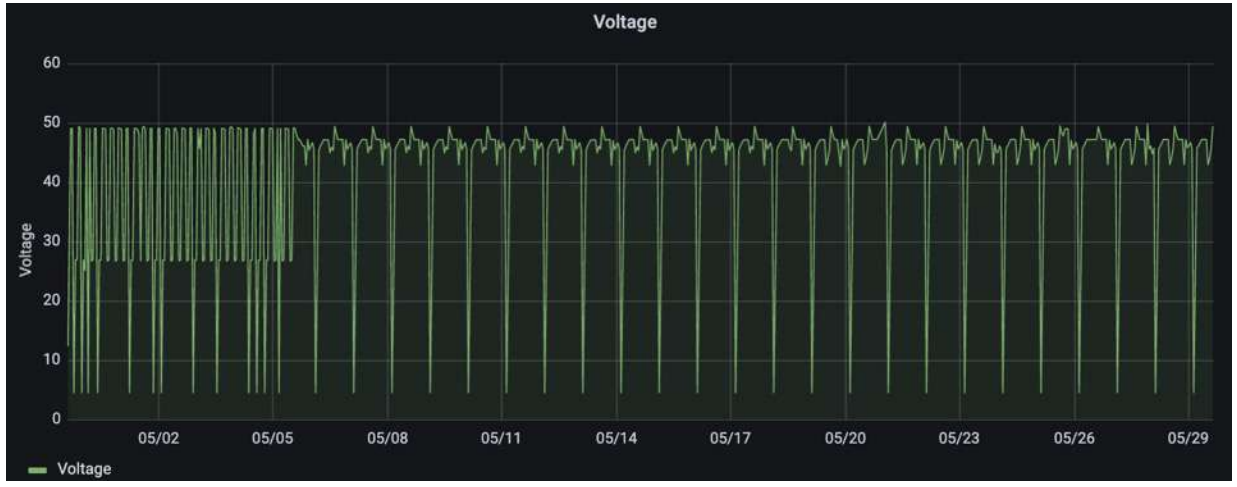
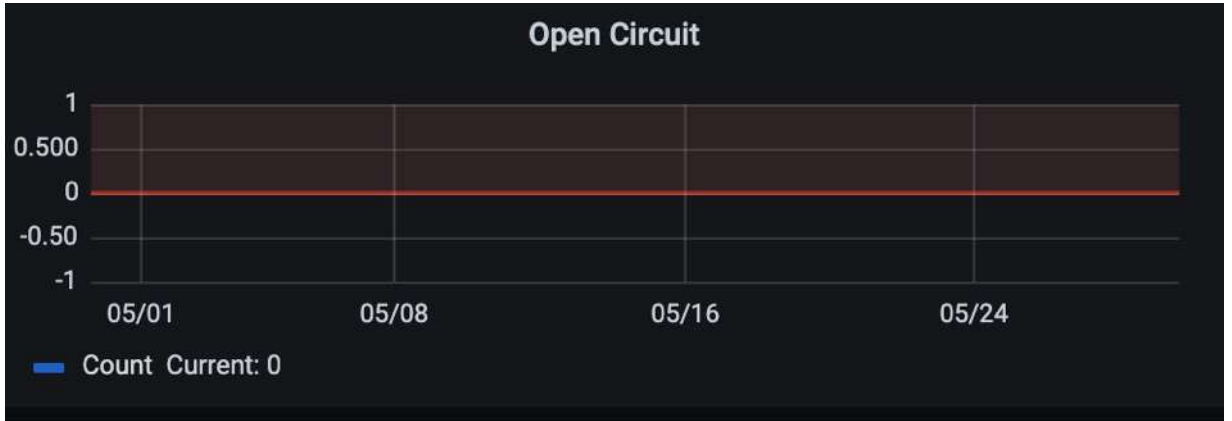
D4i LED ARRAY





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ZHAGA-D4I CERTIFIED PRODUCTS

Learning objective 4:

Learn how specifying Zhaga-D4i certified products future proofs your digital lighting and control installations and opens the market with multiple vendor product availability.

- Zhaga-D4i Certification
- Features of Zhaga-D4i Certified Products
- Benefits for Designers, Specifiers and End-users

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VALUE OF CERTIFIED PRODUCTS

Zhaga-D4i Certification

A joint program from **Zhaga** and **DALI Alliance**

- Certification of interoperable luminaires and sensing and/or communication modules

Based on complementary specifications from Zhaga and DALI Alliance

- Zhaga **Book 18** or **Book 20** plus **D4i** specifications

Product certification will allow for use of Zhaga and D4i logos

- For **luminaires, sensing or control devices** and **communication modules**
- Logos indicate **multi-vendor** product **interoperability**
- Creates a simple **plug-and-play** way of adding nodes to a luminaire
- **Simplifies** specification and tender process
- Available as an **open standard** to drive scale and innovation
- Allows selection of luminaires today that are **future proof** to the technology advances of tomorrow

Smart node interoperability

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VALUE OF CERTIFIED PRODUCTS

Zhaga and D4i Certifications

Supporting the Zhaga-D4i ecosystem are certified specific products:

LED drivers are eligible for D4i certification from DALI Alliance

Book 18 **receptacles, bases and caps** as well as Book 20 **connectors** are eligible for certification from Zhaga

Look for the logos!

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VALUE OF CERTIFIED PRODUCTS

Features of Zhaga-D4i Certified Products

Easy to add or upgrade sensors and/or communication modules:

Enables future-proof luminaires that can keep pace with rapid developments in digital networking and sensing technology.

Intra-luminaire D4i interface:

Enables bi-directional communication between sensors and/or communication modules and LED drivers using the well-established and standardized DALI protocol.

D4i drivers are smart:

Able to report operational and diagnostic data to an external network, can provide inventory-related information about luminaires.

IoT connectivity:

With a suitable wireless communication module, the luminaire can interact with an external lighting-control network and to become part of the IoT.

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VALUE OF INTEROPERABLE PRODUCTS

Benefits for Designers, Specifiers and End-users

Reduced risk and future-proofing

Zhaga-based luminaires are future-proof because light sources can be purchased from multiple suppliers.

Customer is not reliant on original supplier if maintenance and/or replacement is required.

Easier upgrades

Latest-generation technology can be adopted easily.

Luminaires are future-proofed against rapid LED technology evolution.

Avoiding installation/ specification of obsolete luminaires

Luminaires can be specified for future projects in the knowledge that a current, up-to-date LED light source can be fitted when the project is installed.

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VALUE OF INTEROPERABLE PRODUCTS

Benefits for Designers, Specifiers and End-users

Easier procurement

If maintenance or upgrades are necessary, standardized parts will be in stock from numerous suppliers.

Unprecedented flexibility

Socketable LED light sources enable tool-free interchangeability in the field. This allows different options for color temperature, CRI, and – in some cases – lumen levels

Zhaga product database

Around 225 Zhaga-D4i luminaire families by more than 50 manufacturers; 26 connectors from 7 manufacturers; control devices by 3 manufacturers: https://www.zhagastandard.org/products.html

DALI Alliance product database

Over 270 D4i certified LED drivers from 17 suppliers

https://www.dali-alliance.org/products

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THANK YOU → JOIN ZHAGA!!

Website: https://www.zhagastandard.org/

Zhaga creates interface standards for components in LED luminaires

Zhaga interface standards future proof your luminaire through interoperability for connected, serviceable and sustainable lighting

Multiple membership options available

- **Regular**
- **Associate**
- **Community**

ZHAGA Consortium

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THANK YOU → JOIN DALI!!

Website: https://www.dali-alliance.org/

The DALI Alliance is the global industry organization for DALI lighting control.

DALI: The standard for smart lighting control in the IOT era

Multiple membership options available

- **Regular**
- **Associate**
- **Community**

DALI® Alliance

CONTINUING EDUCATION AIA

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THANK YOU!

Questions?

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This concludes The American Institute of Architects Continuing Education Systems Course

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