Planning and Installation Guide

Fifth Light

Fifth Light System

COOPER Lighting Solutions

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1.1 – About the Fifth Light System

Fifth Light is a distributed lighting control system that can be tailored to meet all commercial applications. It can be scaled from a single lighting control panel for a small building to multiple interconnected panels for larger applications involving one or more buildings.

Fifth Light has the following advantages:

- **A digital and addressable system** – Unlike a traditional low voltage (0-10V) lighting control system, a digital and addressable system allows users to make changes to the lighting control strategies without having to make any changes to the wiring.
- **DALI end devices and input devices** – With the Fifth Light system all end devices communicate via the DALI bus. This reduces the implementation cost by 30% compared to proprietary based digital and addressable systems and by 50% compared to a traditional low voltage 0-10V lighting control system. The end user is also not restricted to a single manufacturer. They can purchase their DALI devices from all DALI compliant devices manufacturers.
- **Rich portfolio of standard based and proprietary interfaces** – Fifth Light interfaces include BACNet/IP, Modbus TCP (input only), XML, Mechonet and Somfy. These interfaces allow users to easily integrate Fifth Light with other third party systems such as building automation, shade control, and A/V control systems.
- **Web-based Lighting Management Software application** – Users can interact with the Fifth Light system from any computing device using a browser such as Internet Explorer or Chrome. There are no add-ons to be installed on the client machine.

1.2 – About DALI

Digital Addressable Lighting Interface (DALI) is an IEC standard that guarantees the interchangeability of dimmable ballasts from various manufacturers. This gives planners, luminaire manufacturers, building owners, installers and end-users the flexibility to choose from multiple sources.

Analog control systems will eventually be replaced by DALI because of its flexibility and ease of installation. Any product, regardless of the manufacturer, marked with the DALI logo can be installed in a lighting system without the worry of compatibility issues.

Not only does DALI have the advantage of interoperability, it can also communicate on the same 2-wire cable. Daisy chain and spurs are allowed. The control devices can be powered from the same 2-wire DALI cables that carry the communication information. There are no special requirements for the wiring of data cables and there is no need to install termination resistors to protect them against reflections.

The following table describes the DALI functional roles and the Fifth Light components that support them.

DALI Functional Device	Description	Fifth Light Component
DALI Application Controller	The control units supply the logic coordination between sensors, switch panels and DALI operating equipment. This can be done through a stand-alone unit or by an interface which receives commands from a master system.	Local Controller (located within each Lighting Control Panel)
DALI Control Gear	Control gear usually contains the power control circuit to drive lamps, or some other type of output such as on/off switching or 1 to 10 V analogue signals.	DALI Ballasts, DALI LED Drivers, DALI Field Relays, DALI-DACs, DALI Phase Dimmer
DALI Control Device	Control devices can provide information to other control devices (such as light intensity information), and can send commands to control gear. Input devices are a type or a part of a control device that provides some information to the system, such as a button press or movement detection	DALI Wallstations, DALI Multi-Sensors, DALI Power Pack etc
DALI Bus Power Supply	This is necessary to allow both communications on the bus, as well as to power any bus-powered devices. The bus power supply does not need to be a separate unit	The DBC incorporates a DALI power supply within each DALI channel.

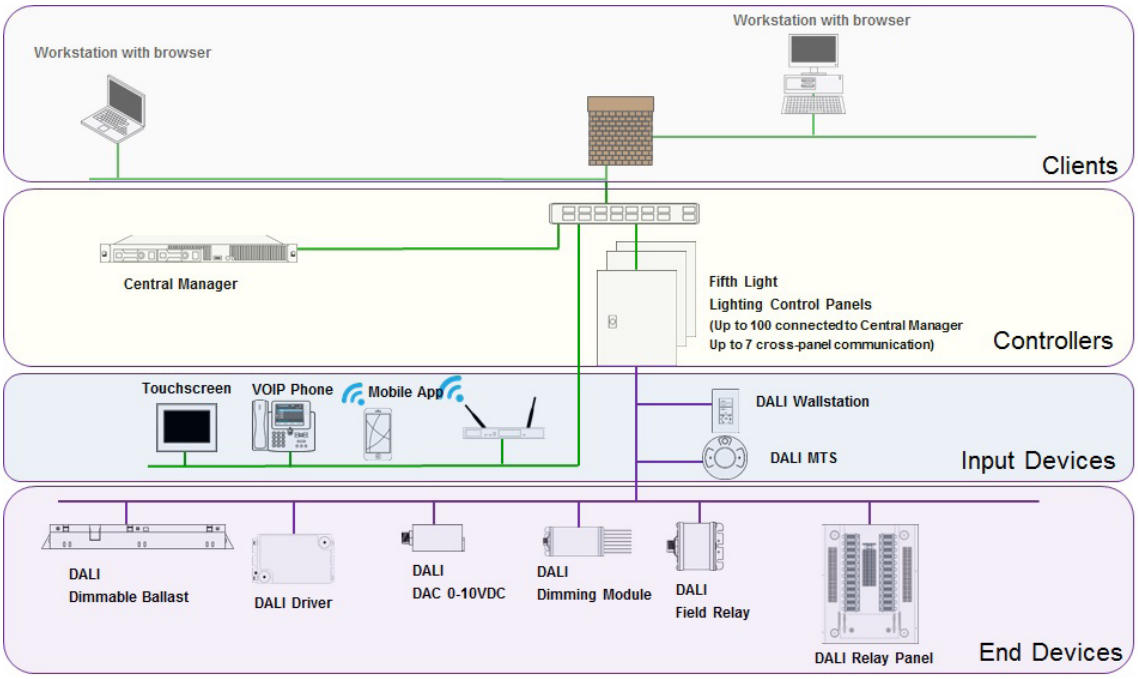
1.3 – Fifth Light System Overview

1.3.1 – System Architecture

The Fifth Light system is composed of four types of devices:

- **End Device:** A DALI Device that directly controls the voltage to the lighting load. This is typically a driver, ballast, relay or other load control device. A shade is also considered as an end device.
- **Input Device:** A device that issues a signal to the system to control a lighting load. This may be a DALI device such as a DALI wallstation, sensor, contact closure, analog input or an input from a device such as a mobile phone, VoIP, or Touchscreen.
- **Controllers:** Devices that manage signals and control the DALI Bus commands. These may be local controllers within the Lighting Control Panels, or a Central Manager that ties multiple local controllers into a centralized system.
- **Software & Integration Interfaces:** The Lighting Management Software used to access the system. Integration options may also be selected at time of order for interface to additional systems.

The following picture illustrates the Fifth Light system architecture:



1.3.2 – End Device Overview

1.3.2.1 – DALI Ballasts

The DALI ballast allows the Fifth Light system to individually control (on/off/dim) fluorescent lights. The ballasts also communicate key parameters to the Fifth Light system such as the status of the ballast and the lamp(s) being controlled by the ballast. Cooper Lighting Solutions offers Powered by Fifth Light DALI ballasts (T8, T5, T5HO, TT5 and CFL), which have been tested and qualified with the Fifth Light system.

1.3.2.2 – DALI Drivers

The DALI driver allows the Fifth Light system to individually control (on/off/dim) LED lights. The LED drivers also communicate key parameters to the Fifth Light system such as the status of the driver and the lamps being controlled. Cooper Lighting Solutions offers Powered by Fifth Light DALI drivers that have been tested and qualified with the Fifth Light system.

Important Note: The current DALI compliance process relies on the manufacturer to perform its own testing to validate their devices. This self-certification may lead to potential interoperability issues caused by misinterpretation of the standard by the various manufacturers. To provide piece of mind to customers and minimize such risks, Cooper Lighting Solutions has decided to perform comprehensive testing on DALI devices as a value-added service to ensure reliable DALI communication between these third-party DALI ballasts and drivers and the Fifth Light system.

With the upcoming introduction of Edition 2 of the IEC 62386 by DALI-AG, the organization responsible for DALI logo licensing, manufacturers will be required to test their devices through a third party test-house or using a pre-approved DALI test platform. This will help alleviate interoperability issues encountered with some DALI Edition 1 devices.

Please refer to the "Fifth Light DALI Verified Devices" application notes for a list of verified DALI ballasts and drivers.

1.3.2.3 – DALI Field Relay

The DALI Field Relay can be used to interface with loads that do not require independent control but have to respond to on/off input commands. The DALI Field Relay is typically used to control loads where ballast and driver compatibility is an issue.

1.3.2.4 – DALI Relay Panel

Large quantities of DALI Field relays may be ordered in a DALI Relay Panel.

Note: DALI Relay panels do not have an internal microprocessor and are not a standalone product.

1.3.2.5 – DALI Digital to Analog Converter (DAC)

The DALI DAC is a DALI to 0-10V dimmer interface. Loads that do not offer direct DALI drivers or ballasts can still be integrated if a 0-10V driver or ballast is available. In addition, for sites that require UL924 certification for emergency lighting, the DALI DAC is UL924 listed.

1.3.2.6 – DALI Dimming Module

The DALI Dimming Module is a DALI to forward phase dimmable load interface. This module allows control over forward phase dimmable loads including incandescent and MLV. Other load types should be qualified after testing. The DALI dimming module does not contain a relay to switch a load off at lowest light output.

1.3.3 – Input Devices

1.3.3.1 – DALI Multi-Sensor

The DALI Multi-Sensor combines a passive infrared occupancy and daylight sensor in one package. The DALI Multi-sensor is available in a 600 or 1200 square foot occupancy sensing pattern when mounted at the preferred mounting height of 8-10 feet.

1.3.3.2 – DALI Wallstation

DALI Wallstations are available in multiple configurations ranging from one to six buttons with options for Raise/Lower/On and different button sizes. Each button can be assigned specific actions from the Lighting Management Software. The DALI wallstation is connected to and powered from the DALI bus with no additional wiring required.

1.3.3.3 – Touchscreen

The Fifth Light Touchscreen allows users to send override commands, activate scenes and control individual or groups of fixtures in 10% increments. The Touchscreen is not a DALI device. It will connect to the Fifth Light system via Ethernet and communicate using TCP.

1.3.3.4 – Mobile Device Lighting Software

The Fifth Light system allows users to control lighting devices from their iPhone and iPod Touch thanks to the iBuilding app which can be downloaded from the Apple Store. The application can be used to send overrides, activate lighting scenes, control individual or groups of fixtures in 1% increments.

1.3.3.5 – Cisco VoIP Telephone Software

The Fifth Light system allows for Cisco VoIP phones to show lighting control screens directly on the phone display. Like the Touchscreen, users can use the VoIP Telephone Software to send overrides and activate lighting scenes, control individual or groups of fixtures in 10% increments.

1.3.3.6 – Digital or Analog Inputs

Sites may wish to connect low voltage devices to the Fifth Light system such as a low voltage keypad or photocell. The Fifth Light Lighting Control Panel has the option to include Digital and Analog Inputs cards. Most commonly, the digital input cards are used to interface with third party low voltage occupancy sensors while the analog input cards are typically used for analog photocell devices.

The Digital and Analog Input cards support the following respectively:

- Outputs of 24 VDC to digital input (contact closure) devices
- 0-10V Analog support.

1.3.3.7 – DALI Powerpack

The DALI Powerpack provides power to low voltage sensors and the communications required to send data to the Fifth Light system. The Powerpack is ideal for open spaces requiring two or more low voltage occupancy sensors as it eliminates the need to run low voltage wiring back to the Lighting Control Panel.

Cooper Lighting Solutions has modified its Greengate sensors so that when connected to the DALI Powerpack they would blink in commissioning mode allowing installers to easily identify sensors connected to a specific DALI Powerpack. As such Cooper Lighting Solutions recommends using the Greengate low voltage sensors with the DALI Powerpack.

1.3.4 – Controllers

There are two different types of controllers in the Fifth Light architecture; the Local Controller within the Local Controller and the Central Manager.

1.3.4.1 – Local Controller

The Local Controller is an embedded device that controls all DALI devices, digital/analog input/output devices and shades connected to it. The Local Controller is located in the Lighting Control Panel and communicates to the DALI devices via the DALI cards, the low voltage devices via digital and analog IO cards and third party interfaces via the IP network.

The Local Controller hosts the Zone Control Application (ZCA) and the Master Control Application (MCA). The Zone Control Application (ZCA) manages the light level based on configured schedules, daylight level, occupancy status and manual commands sent via a wallstation. The Master Control Application (MCA) allows users to configure and manage the system via a web-based user interface. The MCA is enabled when the local controller is operating in a standalone mode and disabled when the local controller is operating in a distributed mode.

1.3.4.2 – Central Manager

The Central Manager acts as a system wide historian and global database that holds the system's event journal, system configuration files and interfaces used to interact with third-party applications. The third-party interfaces include BACnet, Web services (XML), Cisco® VoIP, MechoSystems, Somfy® and Embedia.

The Central Manager is required for facilities requiring more than one LCP. In addition to hosting 3rd party interfaces, system database and logs, the Central Manager hosts the MCA which allows users to manage their Fifth Light system via the web-based interface. Any changes made from the Central Manager are then synchronized with each local controller on the system. If changes are made at the local controller, they will be captured in real-time by the Central Manager.

1.3.4.3 – Virtual Central Manager

The Fifth Light Virtual Central Manager is a virtualization-ready application tested and certified for a virtual environment powered by VMWare® software. The virtualization-ready application provides the same functions as the Central Manager.

1.3.4.4 – Lighting Management Software

Every Fifth Light system comes with Lighting Management Software. The LMS is installed on the Central Manager and the Local Controller and allows users to manage their lighting system through an easy to use web interface (compatible with Chrome and Internet Explorer) by:

- Controlling lights on an individual or group basis
- Programming lights' schedules, wallstations' buttons, occupancy and daylight sensors's properties, load shedding and partitioned space light strategies
- Managing users and roles
- Monitoring the health of devices connected to the system, i.e. ballasts/drivers, lamps, sensors, wallstations

1.3.4.5 – Interfaces

1.3.4.5.1 – DALI Interface

The DALI Interface is used to exchange data between the Local Controller and the DALI devices. The DALI devices are connected to a DALI bus which is terminated at the Fifth Light DALI Bus Cards which are contained with the DALI Bus Chassis. A DALI Bus Chassis (DBC) houses 8 DALI bus cards, 1 USB communication card and 1 power supply card. Each DALI bus card can support up to 64 DALI devices. The DALI bus card allows data exchange between the connected DALI devices and the USB communication card. Each DALI bus card includes LED diagnostics indicators and commissioning DIP Switch. The USB communication card allows data exchanges between the DALI devices connected to all 8 DALI Bus cards and the Local Controller. The power supply card provides power to the DALI Bus and DALI Bus cards housed in the DBC.

1.3.4.5.2 – Modbus TCP Interface

The Modbus TCP interface is used to exchange data between the Local Controller and the low voltage devices connected to the system via digital and analog Input/Output (IO) cards connected to a Modbus coupler. The digital/analog IO cards are used to send/receive signals from the digital devices such as low voltage sensors and keypads. The IO cards communicate with the local controller via its Modbus TCP interface and the Modbus coupler that the cards are connected to.

1.3.4.5.3 – BACnet Interface

The BACnet Integration Module may be purchased with a Fifth Light system. The catalogue numbers include a line item to indicate that the customer will be using the BACnet integration. This will ensure that the site has the proper hardware to support the connections.

BACnet Integration has the following characteristics:

- Allow for integration with a BACnet compatible building automation system using BACnet/IP
- Runs with full functionality on the Central Manager, or with limited point counts on an individual LCP's Local Controller (Professional Model only)
- Automatically maps lighting control points to BACnet points
- Read daylight sensor status
- Read occupancy sensor status
- Read/write lighting load and scene control (On/Off/Dimming)
- Read the operational status of an individual DALI device or lamp status
- Read workpoints real-time calculated power consumption

1.3.4.5.4 – XML Interface

XML or Web Services, allow for integration of many types of systems with the Fifth Light architecture. Often used for A/V, Fire, and Security integration, the Fifth Light XML Module allows for easy integration using simple HTTP commands.

The catalogue numbers include a line item to indicate that the customer will be using XML integration to ensure that the site has the proper hardware to support the connections. Once XML integration is activated, a WSDL document will be provided.

XML Integration has the following characteristics:

- Supports RESTful, SOAP/XML Web Services
- Central Manager required for operation
- Provides for:
  - Scene and zone status and control
  - Ballast/Driver, lamp status and light level set
  - Occupancy and daylight sensor status
  - Power value reporting

1.3.4.6 – MechoSystem Interface

The Shade Integration Module allows control and management of 3rd party blinds and shades with the Lighting Management Software. Shade Integration is dependent on the shade manufacturer, includes contact closure, Ethernet, BACnet/IP or Modbus TCP (for Beckhoff Modbus Coupler only).

1.3.4.7 – Lighting Control Panel

Fifth Light's Lighting Control Panel (LCP) is used to control and operate all lighting devices using Digital Addressable Lighting Interface (DALI) and low voltage analog signals. It houses the local controller, lighting management software and various types of lighting interface modules.

1.4 – Supported Fifth Light System protocols

The following field protocols are supported:

- DALI Standards
- BACNet/IP
- Modbus TCP (for Beckhoff Modbus Coupler only)
- XML
- IEEE 802.3 Fast and Gigabit Ethernet

1.5 – Supported network topologies

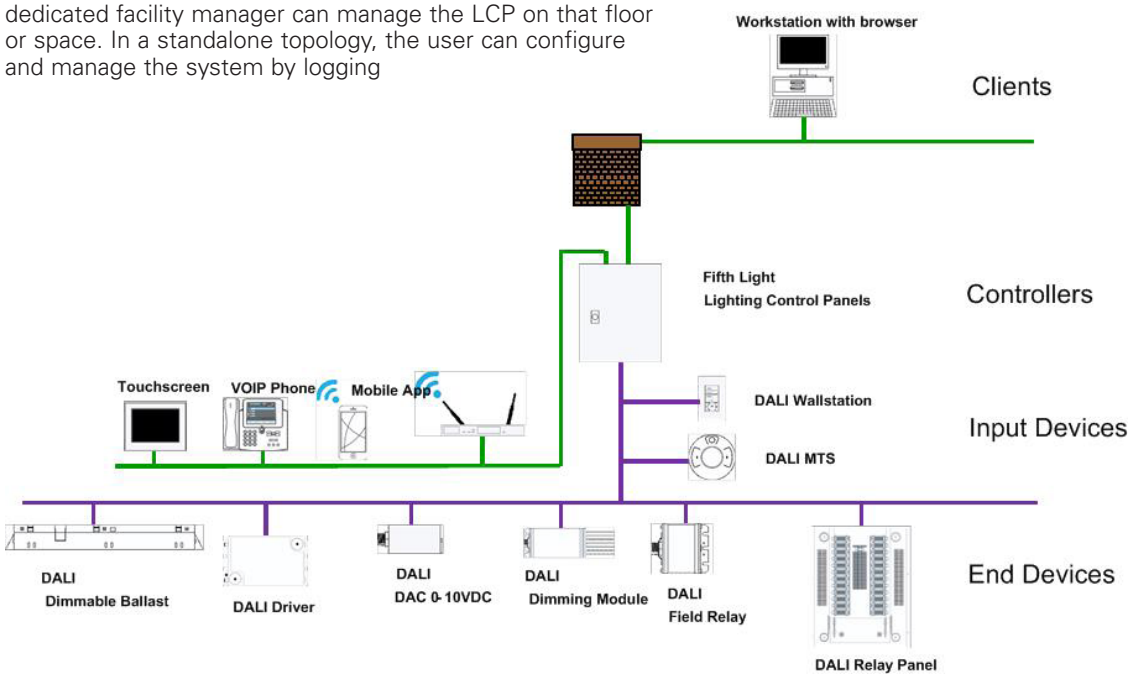
There are two types of system topologies available for the Fifth Light System:

- A system composed of one or many standalone Lighting Control Panels
- A large system composed of several Lighting Control Panels and a Central Manager or Virtual Central Manager interconnected with each on a dedicated or shared IP network.

Important Note: For the remainder of this document we will use the term Central Manager to refer to the Central Manager and Virtual Central Manager.

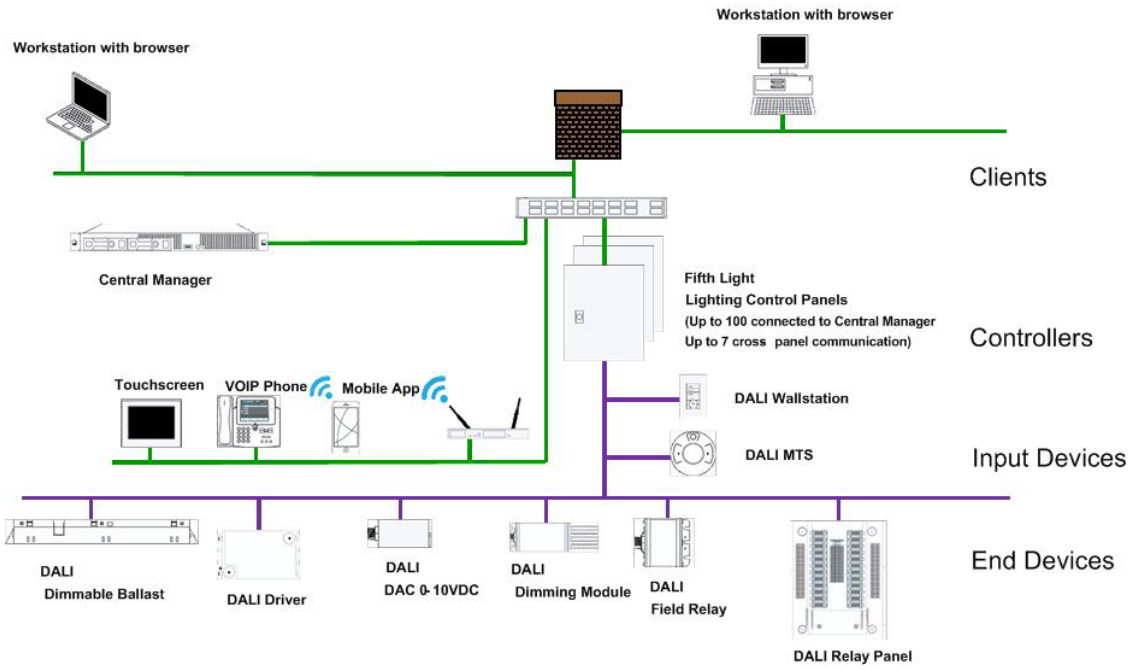
1.5.1 – Planning a small size Fifth Light system

The following standalone topology is recommended for spaces where a single Lighting Control Panel will suffice. It is also used for facilities with multiple floors/spaces where a dedicated facility manager can manage the LCP on that floor or space. In a standalone topology, the user can configure and manage the system by logging



1.5.2 – Planning for a large Fifth Light system

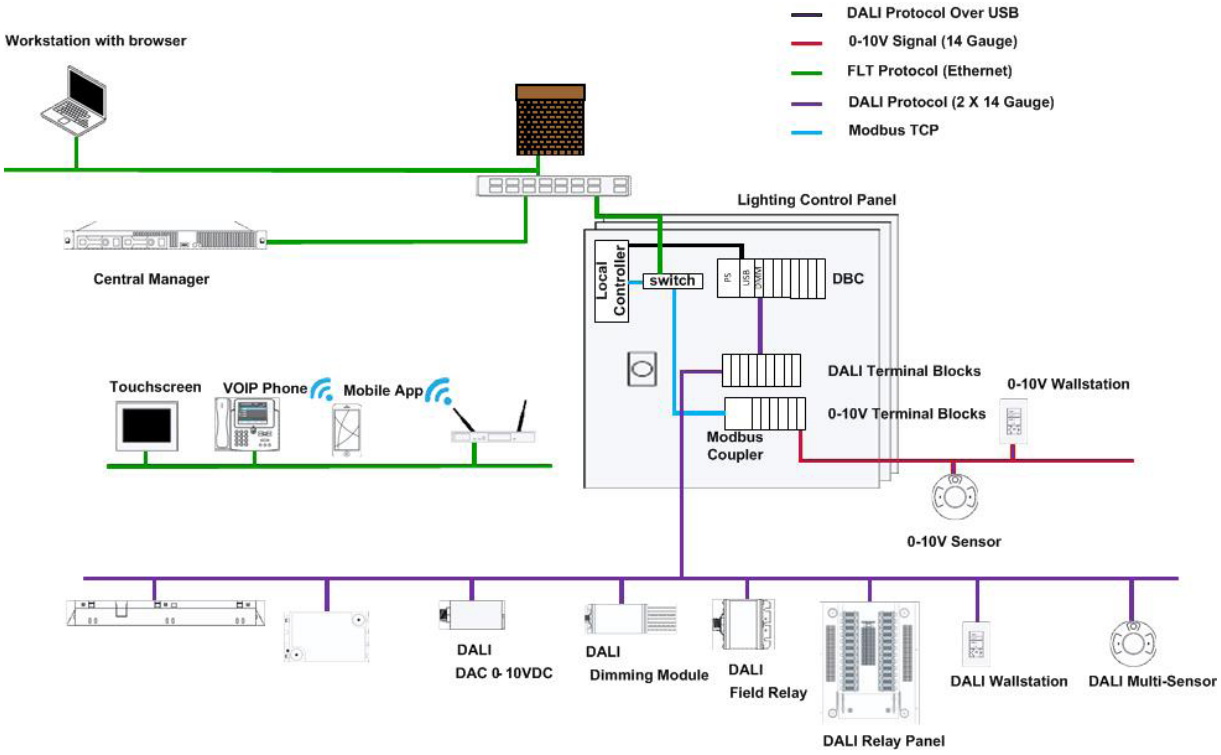
Larger systems have interconnected Lighting Control Panels with a Central Manager. Users configure and manage the system by logging into the Lighting Management Software running on the Central Manager.



2 – Plan and Design a Fifth Light System

2.1 – Data Flow

The following figure illustrates the data flow between end devices, input devices, controllers, computing devices and third-party systems.



DALI devices communicate over a pair of wires (bus) using the DALI standard. The DALI buses are terminated in terminal blocks installed in the Lighting Control Panel. The terminal blocks are connected to the DALI Master Modules (cards) located in the DALI Bus Chassis. There are one (1) to four (4) DBCs located in a LCP. The DBC communicates with the Local Controller via USB.

The Fifth Light system supports low voltage (0-10V) devices. Each low voltage device communicates with the system over a dedicated stranded-copper twisted-pair 18AWG cable that is terminated at the low voltage digital cards located within the LCP. The cards are connected to a Modbus coupler which translates the 0-10V signals into Modbus protocol. The data is sent to the local controller via Modbus TCP.

The communication between the Fifth Light local controllers and Central Manager is handled via Ethernet over CAT5/5e unshielded twisted pair (UTP) cables using proprietary protocol.

2.2 – Planning for Fifth Light Network

2.2.1 – Network planning

Cooper Lighting Solutions recommends having a dedicated local network for the lighting control systems. This can be achieved via a dedicated LAN or Virtual LAN.

If the Fifth Light system needs to communicate with the BMS via BACnet, then both the BMS and the Fifth Light system need to be on the same subnet.

2.2.2 – IP Addressing

The Fifth Light Local Controller, Central Manager and Modbus Coupler rely on static IP addresses. Unique IP addresses that are part of the same subnet must be assigned to each of these devices for normal operation.

For instance a Lighting Control Panel with a local controller and Modbus Coupler such as the LCPB-08DALI-08DI00AI-ST model will require 2 IP addresses. However, the model LCPB-08DALI-00DI00AI-ST will require a single IP address as there is no Modbus Coupler in this LCP model.

2.2.3 – Performance planning

To ensure sub 500 milliseconds latency/response when changing the light levels, the network shall provide at least 1 Mbps.

2.2.4 – Network Switch

A managed layer 2 network switch with VLAN support is required to connect the Lighting Control Panels with the Central Manager. The layer 2 network switch is typically provided by a third party.

The following models are examples of such switches: HP1820 series or Netgear M4100 series.

2.2.5 – QoS

The Fifth Light system does not require any Quality of Service.

2.2.6 – Multicast

The current version of the Fifth Light system does not currently use multi-casting for distributing status information between local controllers. However, Cooper Lighting Solutions is planning to use multi-casting in future releases to improve the performance of the system. As such, we recommend to plan for future multi-casting communication.

2.2.7 – Time Synchronization

The time synchronization is provided automatically by the Central Manager's CentOS. The local controllers' operating system will sync their time with the Central Manager. Additionally, the Central Manager can be set to sync its time with a NTP server located on the network.

2.2.8 – Remote Access

Remote access to the lighting control network is often used to perform:

- Remote control from home after normal hours or for emergency situations.
- Remote support by Cooper Lighting Solutions specialist.

The client machine typically connects to the corporate WAN via a VPN client tunnel. Authentication occurs when the client's VPN connection is established with the corporate VPN server. Once authenticated, the client can connect to the Central Manager and the administrator can use various tools to update or maintain the system.

2.2.9 – Connecting to the business network

Cooper Lighting Solutions recommends that the lighting control network and business network be kept separate. The traffic on these two networks is different:

- Internet access, FTP, email and remote access will typically be permitted on the business network but not on the lighting control network or building management network
- Rigorous change control procedures for network equipment, configuration, and software changes may not be in place on the business network.
- The lighting control traffic is not permitted on the business network as it could be intercepted. Security and performance problems on the business network are not to affect the lighting control operations.

Ideally, there should be no direct communication between the lighting control network and the business network. Practical considerations often mean that a connection is required between the two for remote monitoring or troubleshooting. However such a connection represents a significant security risk and therefore careful consideration must be given to the design of the lighting control network. As such, Cooper Lighting Solutions recommends keeping the two networks separate.

2.3 – Planning for Fifth Light security

2.3.1 – About Fifth Light security

The following section explains the security features that are supported by the Fifth Light system. Following these guidelines will ensure that the system is secure. Cooper Lighting Solutions is continuously improving on security using available technologies.

2.3.1.1 – Embedded firewall

The Fifth Light Local Controller supports an embedded firewall that inspects the incoming and outgoing data packets and limits access to and from the local controller. The following table shows the list of ports that are available for incoming/outgoing data packets.

#	TCP/ UDP	CSU	LC	Listener	Extra Listener settings	Comments
22	TCP	Y	Y	sshd		Remote connection
80	TCP	Y	Y			Forward to port 127.0.0.1:8080
123	UDP	Y	N	ntpd	Accept connections only from subnet where NUC are.	Network Time protocol

*Table Continued on next page

#	TCP/ UDP	CSU	NUC	Listener	Extra Listener settings	Comments
5432	TCP	Y	Y	postgresql	Configured to accept from a specific IP range based on the assigned IP.	App firewall can be adjusted to accept connections from specific hosts and etc.
8001/8002	TCP	Y	Y	ZC		MCA<->ZCA status updates
8080	TCP	Y	Y*	Jboss		*' jboss is disabled when a Central Manager is installed.
9001/9002	TCP	Y	Y	ZC		Touchscreen
9003	TCP	N	Y	ZC		ZCA<->ZCA updates
10000	TCP/ UDP	Y	Y	Webmin		UDP required for CM UDP/TCP required for LC
47808	TCP/ UDP	Y*	Y	ZC		BACnet/IP communication. Note: Does not need to be opened on the Central Manager, unless communication configured through the Central Manager

2.3.1.2 – Manual addressing

All DALI devices are manually addressed at the device and controller level. The association between a device and the associated unit in the system is achieved manually. This process eliminates the possibility of having a rogue device on the network. This mechanism is secured since it requires the user to have physical access to the device to be addressed and add it to the system.

2.3.1.3 – VLAN tagging

Cooper Lighting Solutions recommends enabling and using VLAN to separate the data traffic between the lighting control and other systems installed on the building automation network. A single VLAN is required to allow logical separation of services that use the lighting control network.

In addition to traffic isolation backend and different quality of service levels may be provisioned based on VLANs.

2.3.1.4 – CentOS Security Updates

The Lighting Management Software relies on the CentOS operating system. With each Lighting Management Software release, Cooper Lighting Solutions includes the most updated CentOS release with the latest security patches. Please refer to the Lighting Management Software specification sheet for the version of the CentOS installed on the Central Manager and Local Controller.

2.3.1.5 – User account policies and settings

User accounts are managed through the LMS. Fifth Light user account management is not integrated with Windows Active Directory.

There are four types of user roles defined in the LMS:

- Super admin
- System administrator
- Facility Manager
- Tenant
- Guest

Users defined as super admin, system administrator, facility manager and tenants can create user accounts with the same or lower user roles.

As a general rule you must:

- Review user accounts on a regular basis.
- Disable or delete all unused accounts.
- Disable all guest accounts.
- Do not use a shared account if individual accountability is required.

2.3.1.6 – Lighting Control Panel and Central Manager Physical Access

System security is further enhanced by providing physical security for the lighting control panel and central manager. Limiting those who can enter the rooms where these devices are installed is the best method. Smart or magnetic ID cards or other methods of restricting access are essential. Using locks on the LCP cabinet door and placing the central manager in a secure location are ways to prevent tampering.

3 – Deploying the Fifth Light System

3.1 – Installing the Fifth Light components

Please refer to the specification sheet for each of the following components for the installation instructions:

- Installing the Lighting Control Panel
- Installing the Central Manager
- Installing DALI Wallstation
- Installing the DALI Multi-sensor
- Installing DALI Digital to Analog Converter
- Installing DALI Field Relay
- Installing DALI Dimming Module

3.2 – Configuring the Fifth Light System

- Refer to the Lighting Management Software User Guide for configuring Fifth Light.

4 – Integration

4.1 – BMS Integration

The Fifth Light LMS BACnet® inteface allows data exchange between Fifth Light and third-party systems that support BACnet.

The Building Automation Control Network (BACnet) is a standard communication protocol developed by the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE). BACnet allows the integration of HVAC and lighting control into Building Automation Systems (BAS).

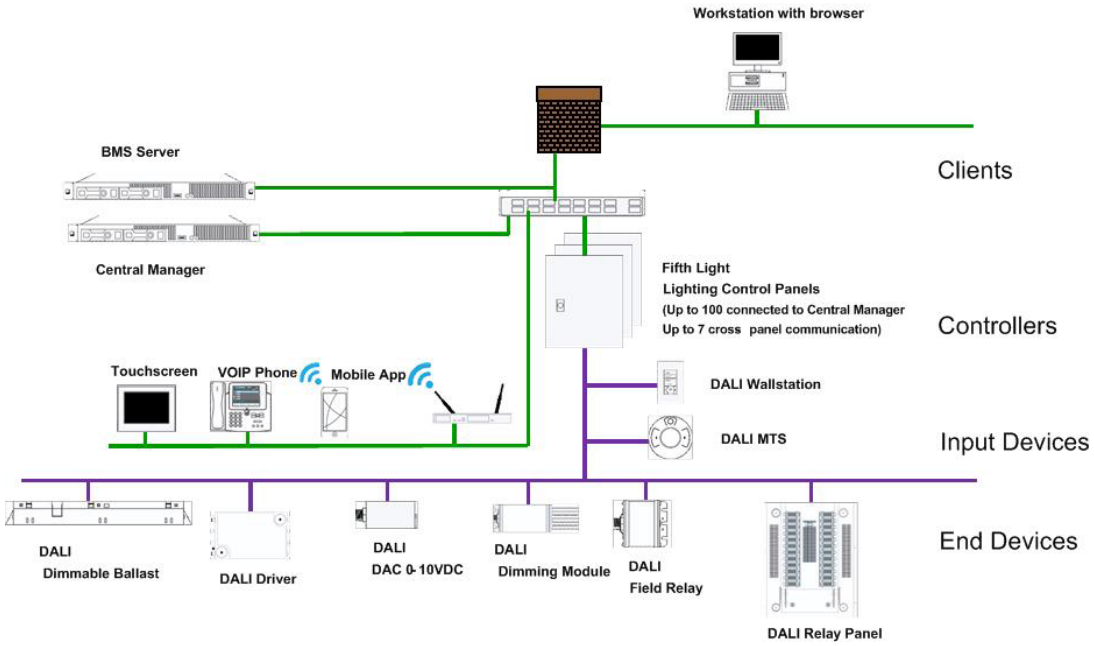
The BACnet interface runs on the Central Manager and automatically maps lighting control points to BACnet points with no additional programming or extra hardware.

Please refer to the Fifth Light BACnet specification sheet for the list of objects exposed through the BACnet interface.

4.1.1 – Network Considerations

The BMS will communicate with the Fifth Light system via the BACnet interface running on the Central Manager. The two systems will be communicating via BACnet TCP protocol. BACnet TCP requires both systems to be on the same subnet.

The following topology illustrates how the Fifth Light system communicates with the BAS.



4.1.2 – Configuring the BMS in LMS

Refer to the LMS User Manual as well as the BACnet® Interface specification sheet for more information.

4.2 – MechoSystems Integration with Wall Stations

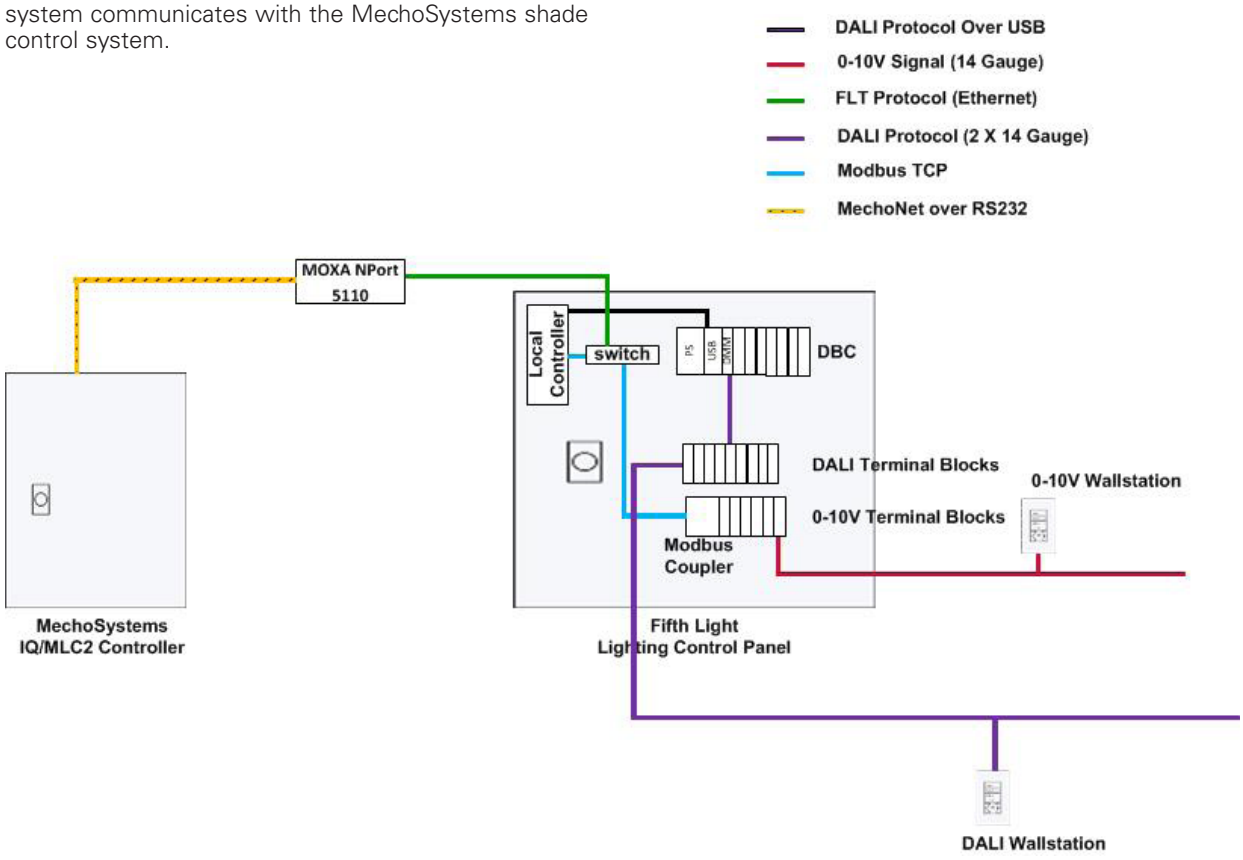
The Fifth Light system allows users to control the MechoSystems shades using DALI Wallstations with the following actions:

- UP/DOWN
- GO TO SCENE / STOP
- LMS's Personal Control Override

Note: For Personal Control Override, the levels must be set to either 0 to close and 100 to open.

4.2.1 – Network Planning

The following topology illustrates how the Fifth Light system communicates with the MechoSystems shade control system.



The Fifth Light local controller has a Mechosystem interface that allows it to send commands using Mechosystems' Mechonet protocol. The MechoSystems' IQ/MLC2 controller requires the commands to be sent via RS232. An RS232 to IP Adaptor is therefore required to make the connection between the CAT5e and RS-232 interfaces. Cooper Lighting Solutions has qualified MOXA's NPort 5110 device for this purpose.

Figure 1. Figure 1: MOXA NPort 5110

The adaptor's serial interface is connected to the Mechoshade's RS232 port as illustrated in Figure 2 while the adaptor's Ethernet interface is connected to the Ethernet port located on the LCP. In case of a multi-controller system, the NPort's Ethernet cable can be connected to the switch used to allow cross controller communication. The adaptor must be setup with the IQ/MLC2 serial properties.

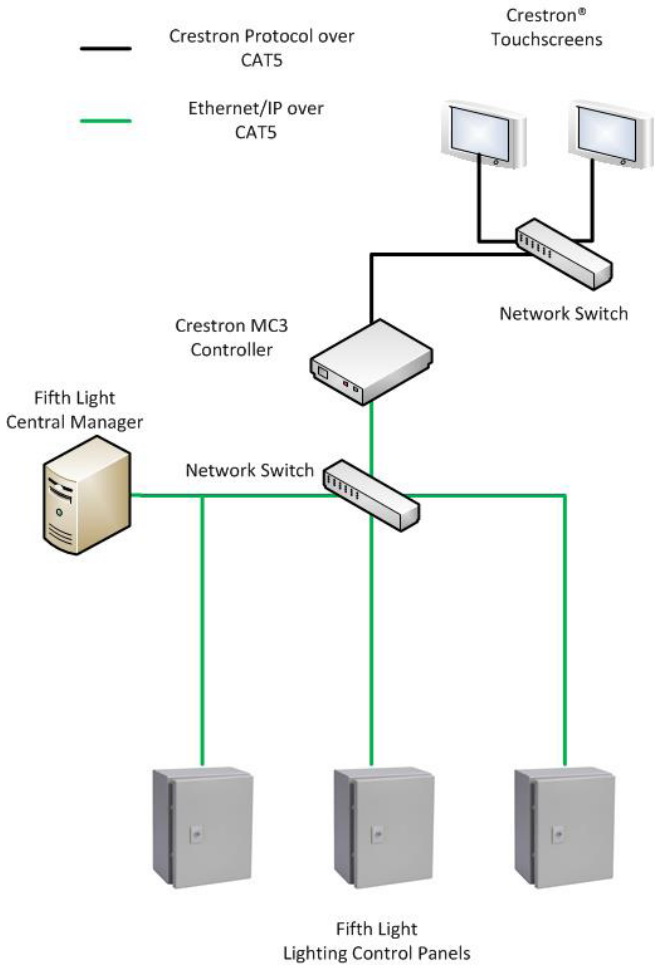
4.2.2 – Configuring the MechoSystems in LMS

Refer to the LMS Users Guide and Mechosystem Shade Integration Application Note for more information.

4.3 – A/V Integration with Creston® MC3

The Fifth Light system allows users to control lights from Crestron's touchscreen. Cooper Lighting Solutions has worked with Crestron to allow Crestron's 3-series Control System® to communicate with Cooper Lighting Solutions' Fifth Light system.

The following diagram illustrates the system topology allowing the Creston MC3 controller to send scenes and override (level) commands to the Fifth Light system:



The Crestron® MC3 controller will be using the Fifth Light Web services or HTTP interface to send its scenes and override commands. The commands are sent as HTTP strings via a continuously open TCP connection on Port 80 or through telnet to port 80. If the port is closed for any reason, the Crestron® controller will immediately try to reconnect.

When a user presses a scene or light level command, it is sent from the Crestron® touchscreen to the Crestron

MC3 controller. The Crestron system integrator than has to program the sequences required to translate the command into a HTTP string which is sent to the Fifth Light Central Manager.

4.3.1 – Configuring the Crestron integration in LMS

Refer to the Fifth Light Crestron Integration Application Note for more information.

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