

DALIcontrol Application Note

Warehouses

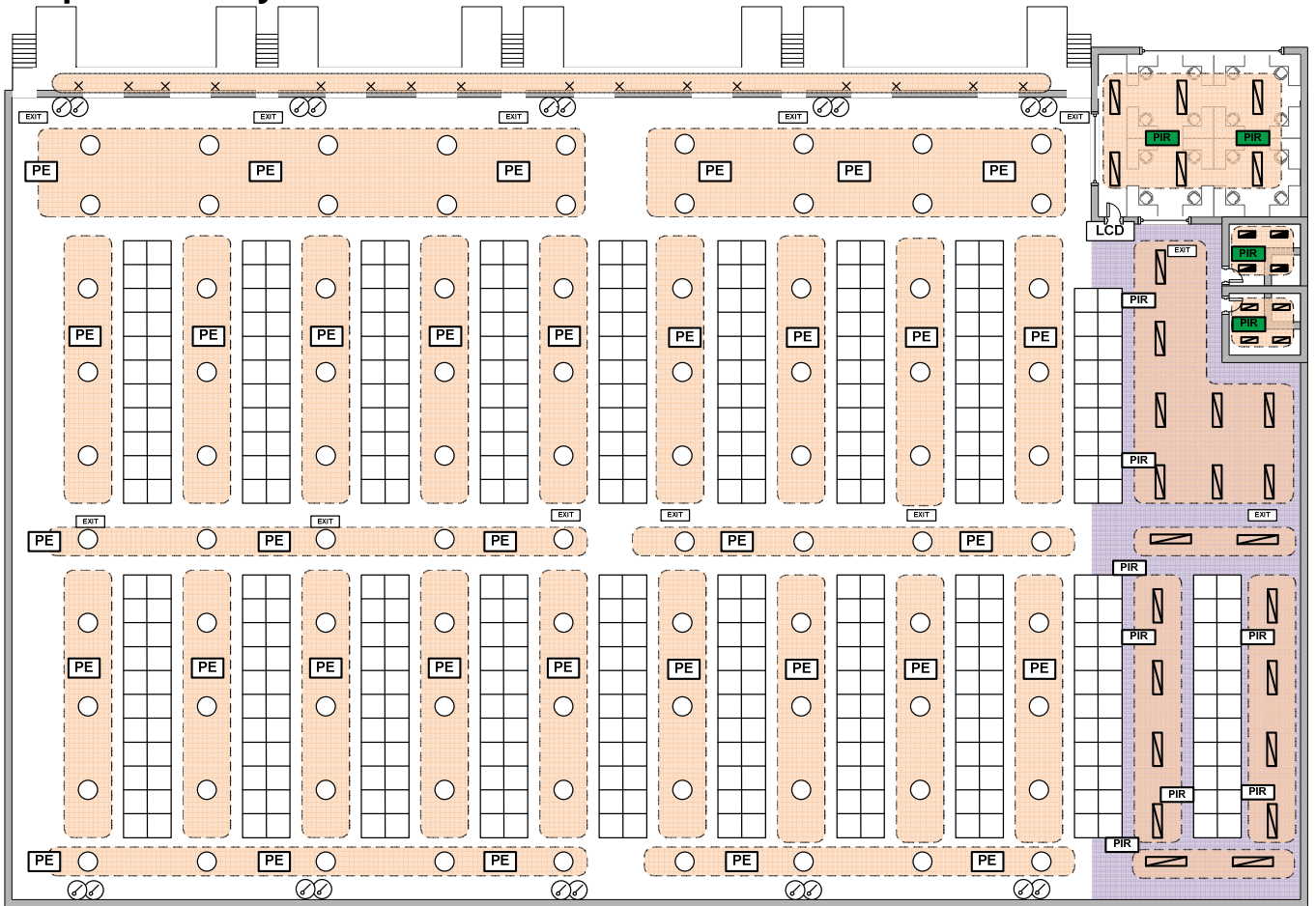
Overview

Adequate lighting is an important requirement for large open spaces in warehouses and distribution centres, as it facilitates productivity, quality control and safety. Older warehouses typically use high or low bay lighting fixtures with high intensity discharge (HID) lamps. HID lamps with magnetic ballasts have a warm-up time and an extended re-strike time, resulting in the inability to provide full output instantaneously. For this reason, it is common for the lighting control system in these warehouses to be defaulted to “ON” for all lights, and only to switch “OFF” at the end of working hours.

Warehouses today tend to incorporate natural sky light into their design. As such, it is important for the lighting control system to take advantage of this, to reduce the artificial lighting and maximise operational and energy efficiency. In addition, with new fluorescent lamps for high and low bay lighting fixtures, instantaneous switching and light dimming is now available.

DALIcontrol lighting systems are able to improve the energy efficiency further by incorporating schedules, sensors and the option to interface with security panels and air conditioning systems. By applying a pre-defined strategy, desired light levels can be met, lamp life can be extended and monitoring and maintenance of lamps can be carried out with ease. DALIcontrol is not only able to reduce energy consumption; it also helps to improve monetary savings.

Example Area Layout & Features



LEGEND:

	DALI Fluorescent Luminaire		DALIcontrol Switch Mechanism
	6.4" Colour Touch Screen		Lighting Group
	DALI Motion Detector (Dust Proof)		Flood lights with DALI Relays
	DALI Photo-Electric Sensor (Dust Proof)		Exit Sign
	DALIcontrol Multi Sensor (Indoor)		Mezzanine Area
	DALI High Bay Light with Fluorescent Fitting		

Features:

- DALI Fluorescent Luminaire
- DALI High Bay Light with Fluorescent Fitting (by others)
- DALI Photo-Electric Sensor - Dust Proof (by others)
- DALI Motion Detector – Dust Proof (by others)
- Flood Lights controlled by DALI Relays
- DALIcontrol 360Deg Multi Sensor – Indoor
- 6.4" Colour Touch Screen
- Local Zone Switching
- DALI Emergency Exit Signs
- A/C After Hours ON/OFF control
- Security Interface

Control Strategy – Warehouses

- **Zone Control**

A 6.4" colour touch screen conveniently located near the Warehouse office allows for the manual ON and OFF of lighting groups for each zone within the warehouse. It can also be programmed to control flood lights near the loading bays, main corridor and lighting within the office area.

- **DALI Key Switch Control**

High Bay Lights around the warehouse are controlled in individual groups according to their zoning. Each lighting group is capable of operating independently of each other. Key switches located on the outer walls of the warehouse provide manual ON and OFF capabilities to the aisles nearby. Cable runs for these switches are kept to a minimum and don't need to be individually run back to the distribution board.

During normal hours, the key switches will provide a manual ON and OFF to the individual aisles. After hours, when the switch is triggered to turn ON an aisle, an override sequence will be activated to set the lights to a warning level (minimum level) before switching OFF after a preset period (Refer Device Functionality Table for details). This will prevent lights from staying ON for extended hours and also ensures that a person is never plunged into immediate darkness. The use of the DALIcontrol 30mech light level sensor or motion sensor allows the sensor to be installed into the light fitting resulting in savings on installation time and enhancing the architectural aesthetics.

- **Daylight Harvesting**

Dust proof photo-electric sensors to be fitted around the warehouse to detect the ambient light level and gradually dim the fluorescent high bay light levels accordingly. This feature of gradual dimming was not possible previously with high intensity discharge (HID) lamps. However with the new fluorescent lamps available for high and low bays, maximum lighting efficiency can be achieved by incorporating this dimming capability with daylight harvesting. Fluorescent lamps are also capable of providing instantaneous full light output unlike the conventional HID lamps which require a warm-up time and an extended re-strike time (duration for lamp to cool before switching back on).

- **Motion Detectors (Dust Proof)**

Dust proof motion detectors to be mounted at the ends of individual warehouse aisles. They are used to detect the presence of people or approaching fork lift trucks and control the lighting in these aisles accordingly (Refer Device Functionality Table for details). This strategy will result in more energy savings as aisles will be lit to full brightness only when in use.

- **Sequences**

To ensure a person is never plunged into immediate darkness, sequences can be used in areas controlled by motion sensors to gradually reduce the amount of light before lighting is completely switched OFF. Lights are restored by the triggering of motion sensors or through manual control with the touch screen.

Control Strategy – Warehouses

- **Motion Sensors (Indoor)**

DALIcontrol multi sensors can be used for both motion detection and light level sensing. They are to be installed in offices and rest rooms.

During normal hours, the office and restroom lights will be switched ON by motion sensors with the arrival of the first person. During business hours, the day light harvesting feature in the sensor can be programmed to adjust the output of artificial lighting in the offices that have windows. After these hours, motion sensors can identify when the office is unoccupied and can commence an override sequence to switch off all lighting.

- Switching lighting ON by the motion sensors or touch screen during office hours enables the day light harvesting feature in the sensor. Day light harvesting can continue to operate in the sensor until after-hours is scheduled or the lighting group is manually set to OFF from the touch screen. In the restroom however during office hours and upon detection of the first person, the light can switch ON (daylight harvesting feature can be enabled where a natural light source is available).
- If the office or restroom is left unoccupied and no movement is detected for a set period of time during after hours, lighting can be configured to automatically adjust to a warning level (minimum level) before switching OFF after a preset period (Refer Device Functionality Table for details).

- **Corridor Linking**

Corridor linking can be used to keep main corridor lights ON when the office, restroom or aisles in the warehouse are occupied during the day. Once these areas are unoccupied, the corridor lighting automatically switches OFF according to the associated sequence (Refer Device Functionality Table for details).

- **Sunset and Sunrise Schedule**

The DALIcontrol line controller includes an integrated real-time clock with automatic sunset and sunrise calculation. Floodlights located at the loading bays can be controlled with sunset and sunrise schedules. Line controllers will issue an ON command during sunset and an OFF command during sunrise. Manual ON and OFF override can also be configured on the 6.4" colour touch screen.

- **Dimming of General Lighting (Fluorescent)**

Having the ability to dim fluorescent lights provides greater energy efficiency and a more suitable working environment as DALI light fittings have logarithmic dimming curve that suit the human eye. To further conserve energy and increase the lifespan of lamps, DALI ballast can be set to a maximum dim level of 85% without much compensation to the ambient lux. The use of DALIcontrol 30mech rotary knob or up/down button can provide the user with a more intuitive dimming control.

Control Strategy – Warehouses

- **Emergency Lighting**

All exit lights in the warehouse are required to comply with the DALI Emergency Lighting Standard and are required to be incorporated into the DALIcontrol system. This means there is no need to wire an additional system to monitor and maintain emergency lighting. DALIcontrol software can be used to report the status of all fittings including emergency lights.

- **Centralised Lighting Management (Server Computer - Optional)**

A front end computer located in the communications room or office can be connected to the buildings DALIcontrol system. This allows the building manager to have a centralised control of the DALI lights. Lamps status, fault reports and emergency lamp test can be initiated via this front end computer.

- **Air Conditioning (Optional)**

A high level interface to the BMS can be used (i.e BACnet, OPC) to integrate with the buildings A/C system. An input on the colour touch screen can be configured as a timer to provide manual after-hours control of the A/C to provide further energy efficiency gains.

- **Security Input (Optional)**

Dry contact cables can be connected between the relays on the security system and the input terminals on the line controller. When the opening and closing of relays occurs during various modes on the security panel, the lighting system can be set up to respond differently.

Security Modes can include:

- Armed: All lighting that are currently ON, to dim to MIN level for a fixed period then OFF.
- Disarmed: Turn ON lights along the major corridors and aisles.
- Alarm: All lighting to switch ON

- **Fire Alarm Panel (Optional)**

Dry contact cables can be connected between the relays on the fire alarm panel and the input terminals on the line controller. When the opening or closing of relays occurs during an emergency event the lighting system can be set to bring on a preset lighting scene.

Device Functionality Table

Devices	Normal Hours Operation	After Hours Operation
DALI Key Switch	- Toggle function (ON/OFF)	- Toggle function (ON/OFF) with override sequence (delay 60min >> MIN >> delay 20min >> OFF)
DALI Photo-Electric Sensors (Dust Proof)	- When light group is ON, enable daylight harvesting	- When light group is ON, enable daylight harvesting.
DALI Motion Detectors (Dust Proof)	- MAX with override sequence (delay 15min >> MIN >> delay 5min >> OFF)	- MAX with override sequence (delay 15min >> MIN >> delay 5min >> OFF) - Corridor linking when area is occupied (MAX >> delay 15min >> MIN>>delay 5min>>OFF)
DALI Multi Sensors (Office)	- MAX. When light group is ON, enable daylight harvesting	- MAX with override sequence (delay 15min >> MIN >> delay 5min >> OFF) - Corridor linking when area is occupied (MAX >> delay 15min >> MIN>>delay 5min>>OFF)
DALI Multi Sensors (Restroom)	- MAX	- MAX with override sequence (delay 15min >> MIN >> delay 5min >> OFF) - Corridor linking when area is occupied (MAX >> delay 15min >> MIN>>delay 5min>>OFF)
6.4" Colour Touch Screen	- ON and OFF lighting groups (office area, restroom, Flood lights and zones in warehouse)	- ON and OFF lighting groups (office area, restroom, Flood lights and zones in warehouse) - Option: Allow time extension to A/C (ON >> delay 30min >> OFF)

Example 6.4” Colour Touch Screen Function and Labelling



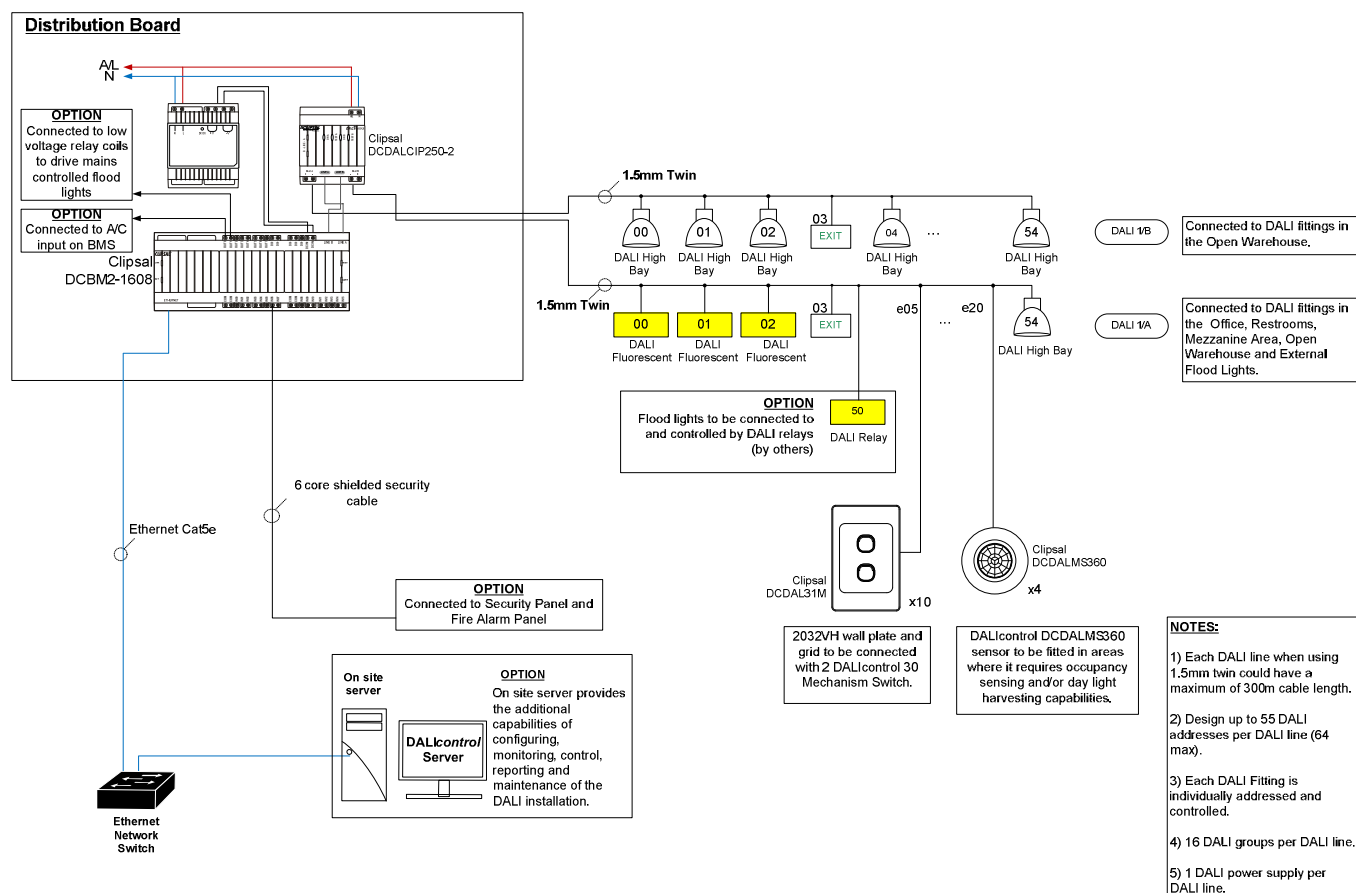
Page 1 Functions

- | | |
|-------------------------------|-------------------------------|
| Button 1: Office ON/OFF | Button 6: Mezzanine N ON/OFF |
| Button 2: A/C ON/OFF | Button 7: Corridor ON.OFF |
| Button 3: Loading Bay ON/OFF | Button 8: Warehouse NE ON/OFF |
| Button 4: Warehouse NW ON/OFF | Button 9: Warehouse SE ON/OFF |
| Button 5: Warehouse SW ON/OFF | Button 10: Mezzanine S ON/OFF |

6.4” Colour Touch Screen

*Note: Screen layouts, labelling and functionality are fully customisable to suit each project and client

Warehouses Single Line Diagram



*Note: DCBM2-1608 shown above allows for the control of 2 DALI lines with up to 128 DALI fittings. If only 1 DALI line (max 64 fittings) needs to be controlled, the DCBM1-1608 (Single line DALI control line controller) can be used.

*Note: A UDP Interface can be used for third party integration with the DALIcontrol line controller.

*Note: DCDALMS360 DALIcontrol sensor shown above is a recessed mount unit. Alternatively, a DCDAL31MOD DALIcontrol sensor fitted in surface mount 30mech holders could be used for surface mount applications.

*Note: DCDALM31M DALI control switch mechanism shown above could be added with 30mech rotary knob or up/down button to provide the user with a more intuitive dimming control.

Third Party Integration

- **Fire Alarm Control System** can be connected to the line controller to trigger the Alarm lighting scene (all lights on the evacuation path to be set to MAX level) during an emergency. This can be done with a low level interfacing between the 2 systems via a contact closure.
- **Security System** is capable of triggering different relays depending on its current status, and can be connected to the line controller to trigger various lighting scenes (Refer Control Strategy – Warehouses for details).
- **Building Management Systems (BMS) can be integrated to the DALIcontrol system by;**
 - low level contact closures to communicate a state change
 - high level interface using DALIcontrol OPC Server software
- **UDP** is a standard Ethernet protocol which can issue commands to the DALIcontrol line Controller (DCBMx-1608).

Typical Equipment

Part Number	Description	Quantity
DCBM2-1608	DCBM DALI Line Controller, 16-Input, 8-Output, 2 DALI Lines, Din Rail Mount	1
DCP12/30	BM Power Supply, Din Rail Mount, 12V, 30W	1
DCDALCIP250-2	DALIcontrol Intelligent Dual Power Supply and Dual Serial Interface	1
DCDAL31M	DALIcontrol 30 Mechanism Switch	20
DCDALMS360	DALIcontrol Digital Motion Detector, 360Deg.	4
5080CTC3	6.4" Colour Touch Screen	1
EXITREC	Exit / Emergency Lighting, Wafer Recessed Edgelite Exit - Suits Single or Double sided applications.	12
(OPTIONAL)		
2032VH	Clipsal 2000 Series, Flush Surrounds and 2 Gang Grids	10
DCDAL31MOD	DALIcontrol 30 Mechanism Sensor, 360Deg	4
DCDAL31MPE	DALIcontrol 30 Mechanism Light Level Sensor	1
DCDAL31SROKUD	DALIcontrol 30 Mechanism Rocker Up/Down Switch (Slave)	20
DCDAL31SPBUD	DALIcontrol 30 Mechanism Push Button Up/Down Switch (Slave)	20
DCDAL31SROT	DALIcontrol 30 Mechanism Rotary Knob (Slave)	20

*Note: The number of DALIcontrol 30 Mechanism Switth (DCDAL31M) may vary depending on the number of control functionalities required. As a result the kind of surround and grid plates to house them may also vary.

DCBM2-1608 Line Controller Input and Output Channel Schedule

DCBM2-1608	Channel Number	Description	Office Hour Profile	After Hour Profile
INPUT	1	Security Armed/ Disarmed Signal	Armed – Override sequence to OFF Disarmed – MAX to main Corridors	Armed – Override sequence to OFF Disarmed – MAX to main Corridors
	2	Security Alarm Signal	MAX	MAX
	3	Fire Alarm Panel	Emergency – Lighting Scene	Emergency – Lighting Scene
	4	Spare	-	-
	5	Spare	-	-
	6	Spare	-	-
	7	Spare	-	-
	8	Spare	-	-
	9	Spare	-	-
	10	Spare	-	-
	11	Spare	-	-
	12	Spare	-	-
	13	Spare	-	-
	14	Spare	-	-
	15	Spare	-	-
	16	Spare	-	-
OUTPUT	1	A/C (BMS)	MAX / OFF	Timer
	2	Relays for Flood Lights	MAX (sunset) / OFF (sunrise)	MAX (sunset) / OFF (sunrise)

	3	Spare	-	-
	4	Spare	-	-
	5	Spare	-	-
	6	Spare	-	-
	7	Spare	-	-
	8	Spare	-	-

Resource Links

For information including Product Datasheets, Installation Instructions and Downloads visit

<http://www.clipsal.com/dalicontrol>

It is recommended that a Clipsal DALIcontrol System Partner be engaged on projects involving integration for design, programming and commissioning.

Clipsal DALIcontrol System Partners have undertaken specialist training so they are equipped to provide the technical services and support to help you successfully implement a DALIcontrol lighting system.

In addition, a Clipsal DALIcontrol System Partner will provide professional detailed documentation and specifications for projects including handover training to the client.

Engaging a Clipsal DALIcontrol System Partner provides key benefits to the contractor, consultant and the end user including the manufacturers support from project design through to completion. A Clipsal DALIcontrol System Partner will also be able to educate the Building manager on how to run reports on the fittings for an installation.

A major advantage of the DALIcontrol system is the ease of installation and commissioning. The five-pin 'soft-wiring' system reduced labour costs and the distributed architecture enabled sections to be tested and commissioned ready for the tenant as each area is installed.

For further information:

Clipsal DALIcontrol M3 Soft Wiring Solutions:

www.clipsal.com/cablemanagement

DALIcontrol:

www.clipsal.com/dalicontrol

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SEAU 26925 September 2013