

# DALIcontrol Application Note

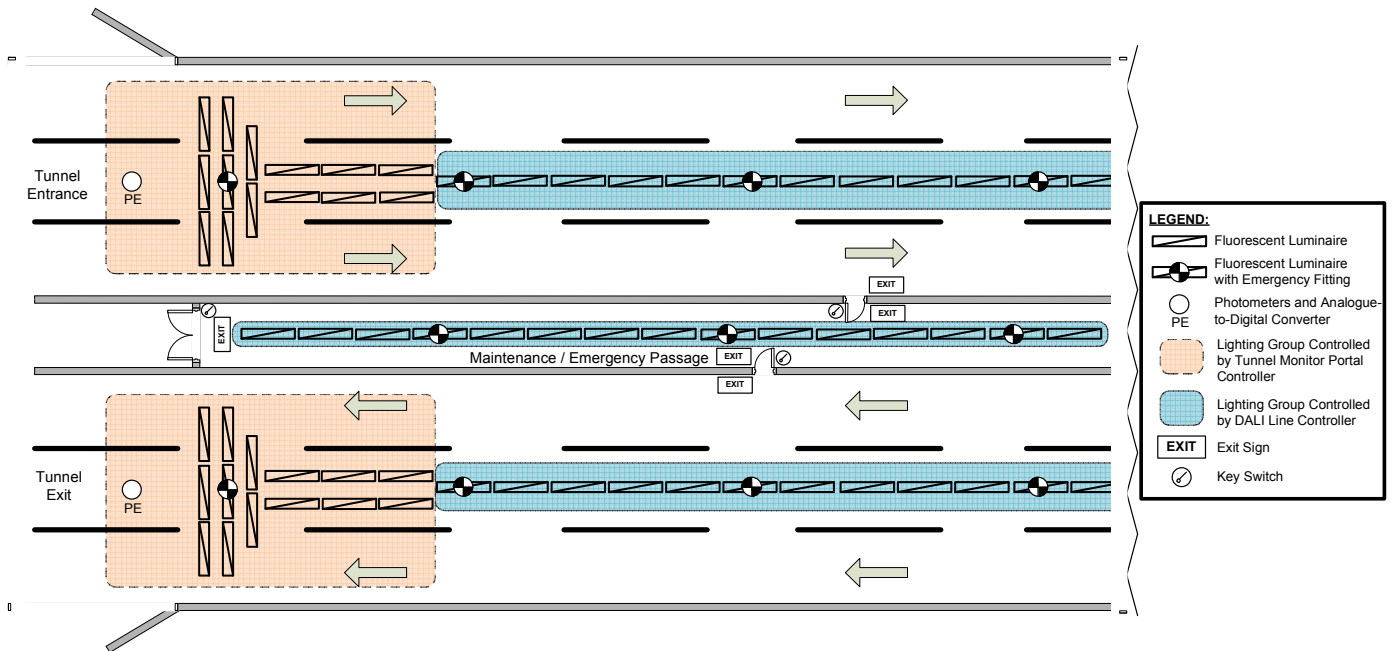
## Tunnels and Underpasses

### Overview

Lighting and safety are two of the major concerns when considering the design of tunnels and underpasses. Improvement in lighting quality provides greater driving pleasure for drivers and a safe passage of journey.

Modern lighting control technology in tunnels and underpasses must have the ability to adapt itself to the ambient light available as drivers enter or leave the portals. To eliminate the uncomfortable feeling of enclosed spaces, the illumination levels within tunnels are usually higher than street lighting for open roads. Lighting layouts in lateral continuous rows give a homogenous light distribution and avoid flickering as drivers travel through; at the same time creates a directional optical effect. Emergency luminaires are also fitted at all emergency exits, call sites and escape exits. Achieving a high level of energy efficiency through the ability to set light outputs at different levels coupled with the capability of light fittings providing feedback to the central monitoring system are the strengths of the DALIcontrol system.

## Example Area Layout & Features



### Features:

- DALI Fluorescent Luminaire
- DALI Fluorescent Luminaire with Emergency Fitting
- Photometers and Analogue-to-Digital Converter (by others)
- Override Switch
- DALI Emergency Exit Signs
- Reed Switches (to be mounted on exit doors to maintenance / emergency passage) or Emergency Exit System

## Control Strategy – Tunnels and Underpasses

- **Central Monitoring (Server Computer)**

A front end computer located in the communications or control room and connected to the tunnel's DALIcontrol system allows the traffic controller to have a centralised control of the DALI lights. Lamps status, fault reports and emergency lamp testing can be initiated via this front end computer. The DALIcontrol system can be easily integrated with Supervisory Control and Data Acquisition (SCADA) systems using the optional DALIcontrol Tunnel Monitor OPC server.

- **Override Switch**

Override switches can be fitted along the tunnel's maintenance or emergency passage. To assist in testing of the luminaires, maintenance personnel can manually cycle through the unique light level scenes with every press of the override switch. Override switches can also be set up to toggle MAX/OFF the DALI fittings in the maintenance or emergency passage when maintenance work is required. At other times, the luminaires in the passage can be OFF. The override key switches will only function during "Normal Operation" profile and will be disabled during the "Emergency" profile. The use of DALIcontrol 30mech rotary knob or up/down button can provide the user with a more intuitive dimming control.

- **Reed Switches (Mounted on exit doors of maintenance and emergency passages) or Emergency Exit System**

Reed switches or emergency exit systems detect an unauthorised opening of escape doors. This input will be fed to the DALIcontrol lighting system to set all luminaires in the maintenance or emergency passage to MAX at the same time changes the functional profile within the controller to "Emergency". The light fittings will only be set to OFF after running a sequence when the emergency input signal is disabled. This will also return the system back into "Normal Operation" profile.

- **Sequences**

To ensure a person is never plunged into immediate darkness, Sequences are used to gradually reduce the amount of light before switching OFF.

- **Photometers and Analogue-to-Digital Converter**

Photometers and analogue-to-digital converters located at the entrance of the tunnel ensure that illumination in the tunnel entrances and exits is continuously changed to match the changes of external lighting – thus avoiding drivers from experiencing the hazardous "black hole" effect associated with inadequately lit road tunnels. The output of the sensors can provide a digital signal to the controller that will enable the different levels of lighting at the tunnel's entrances and exits. This feature also improves the energy efficiency of the system by not having lights remain at 100% all the time.

- **DALI Light Fittings Within The Tunnel**

Once inside the tunnel, a driver's vision will be more adaptable to lower lighting levels. The appropriate artificial lighting level can be set at a fixed intensity all the time.

## Control Strategy – Tunnels and Underpasses

- **Emergency Lighting**

All emergency and exit lights in the tunnel are required to comply with the DALI Emergency Lighting Standard and are required to be incorporated into the DALIcontrol system. This alleviates the need to wire an additional system to monitor and maintain emergency lighting. Having emergency battery backup capability in fluorescent luminaires (i.e. every 2nd, 3rd or 4th) along the tunnel will provide continuous visibility for a limited period within tunnel even during power failure. DALIcontrol software can be used to report on the status of all fittings including emergency lights.

- **DALI Ballasts**

DALI ballasts include a pre-programmed failsafe output level in the event of an overall communication failure. This will cause the DALI fittings to output at this level when the DALI communication system fails. To further conserve energy, DALI ballasts can be set to a maximum dim level of 85% with minimal impact to the ambient lux level at the same time increasing the life span of lamps.

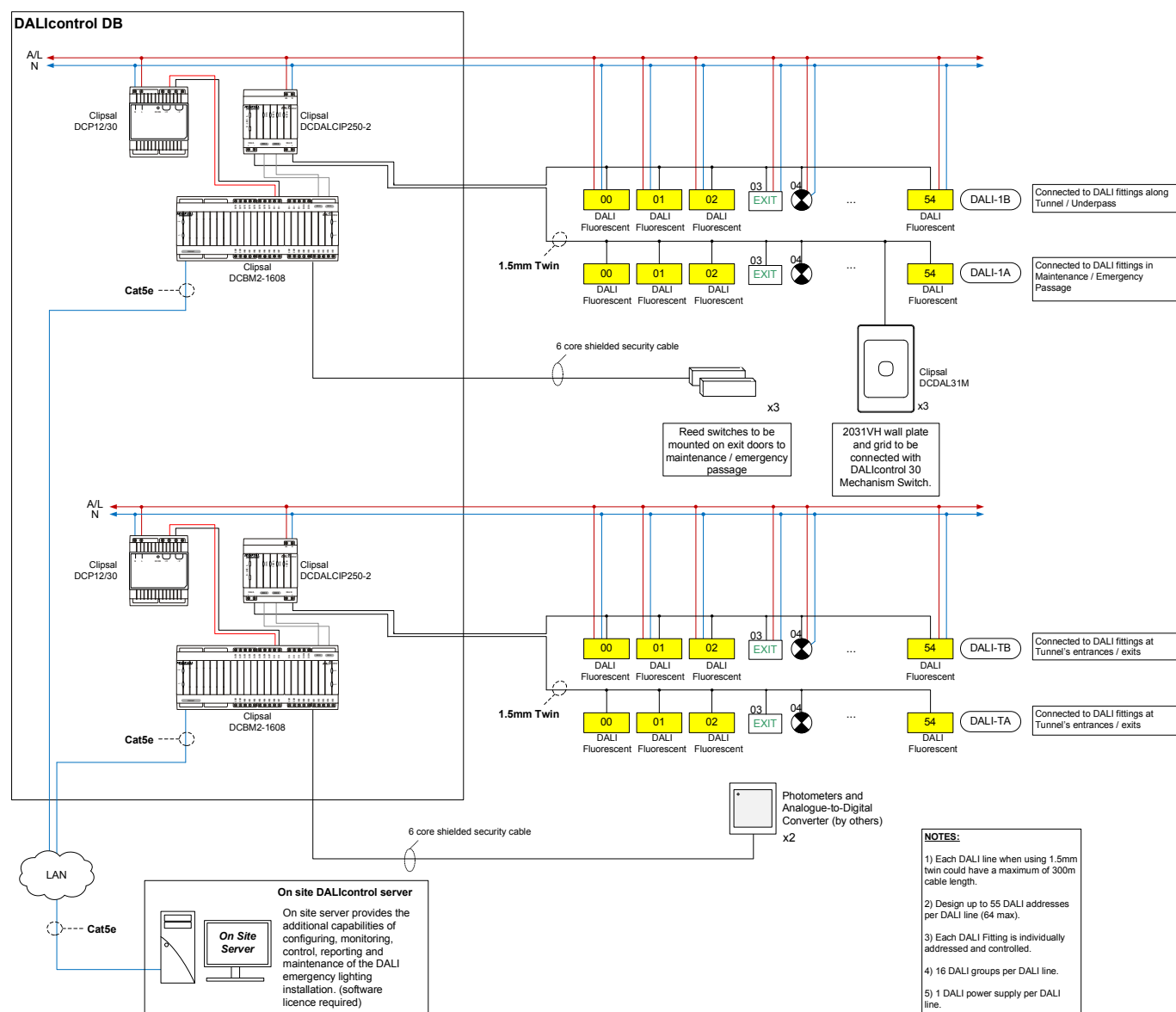
- **Distributed Intelligence - Tunnel Monitor and DALIcontrol Line Controllers**

Tunnel monitor and DALIcontrol line controllers have built-in intelligence so they can continue to run control functions even when disconnected from the main Ethernet network backbone. The controllers do not require a server to run as they have their own microprocessor and memory. Both the Tunnel monitor and DALIcontrol line controllers are firmware upgradable to ensure a long lifecycle.

## Device Functionality Table

Devices	Normal Operation Profile	Emergency Profile
Photometers and Analogue-to-Digital Converter	- Automatically triggers the associated scene when the ambient light level drops within a certain threshold	- Automatically triggers the associated scene when the ambient light level drops within a certain threshold
Override Key Switch (Test)	- Cycle through preset scenes upon each press on the key switch	- Disabled
Override Key Switch (Maintenance)	- Cycle through preset scenes upon each press on the key switch	- Disabled
Reed Switches / Emergency Exit System	- Unauthorised access detected >>run sequence ( Change profile to Emergency >> MAX to all lights within emergency passage)	- Unauthorised access mode disabled >> run sequence ( Change profile to Normal Operation >> MIN >> delay 20min >> OFF to all lights within emergency passage)

## Tunnels and Underpasses 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: 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.

## Typical Equipment

Part Number	Description	Quantity
DCBM2-1608	DCBM DALI Line Controller, 16-Input, 8-Output, 2 DALI Lines, Din Rail Mount	1
SPECIAL ORDER	Tunnel Monitor Controller, 16-Input, 8-Output, 2 DALI Lines, Din Rail Mount	1
DCP12/60	BM Power Supply, Din Rail Mount, 12V, 60W	2
DCDALCIP250	DALIcontrol Intelligent Dual Power Supply and Dual Serial Interface	2
EXITREC	Exit / Emergency Lighting, Wafer Recessed Edgelite Exit - Suits Single or Double sided applications.	5
DCDAL31M	DALIcontrol 30 Mechanism Switch	3
2031VH	Clipsal 2000 Series, Flush Surrounds and 1 Gang Grids	3
(OPTIONAL)		
DCDAL31SROKUD	DALIcontrol 30 Mechanism Rocker Up/Down Switch (Slave)	3
DCDAL31SPBUD	DALIcontrol 30 Mechanism Push Button Up/Down Switch (Slave)	3
DCDAL31SROT	DALIcontrol 30 Mechanism Rotary Knob (Slave)	3

## Third Party Integration

- **Building Management Systems (BMS)** can be integrated to the DALIcontrol system by;
  - low level contact closures to communicate a state change
  - or a 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) and Tunnel Monitor Controller.

## DCBM2-1608 Line Controller Input and Output Channel Schedule

DCBM2-1608	Channel Number	Description	Normal Operation Profile	Emergency Profile
INPUT	1	Reed Switches / Emergency Exit System	Unauthorised access detected (MAX and change profile)	Unauthorised access not detected (change profile with OFF sequence)
	2	Spare	-	-
	3	Spare	-	-
	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	Spare	-	-
	2	Spare	-	-
	3	Spare	-	-

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



## Tunnel Monitor Controller Input and Output Channel Schedule

	Channel Number	Description	Normal Operation Profile	Emergency Profile
INPUT	1	Photometers and Analogue-to-Digital Converter (entrance)	Automatically triggers the associated scene when the ambient light level drops within a certain threshold	Automatically triggers the associated scene when the ambient light level drops within a certain threshold
	2	Photometers and Analogue-to-Digital Converter (exit)	Automatically triggers the associated scene when the ambient light level drops within a certain threshold	Automatically triggers the associated scene when the ambient light level drops within a certain threshold
	3	Spare	-	-
	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	Spare	-	-

	2	Spare	-	-
	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 Partner 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, 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](http://www.clipsal.com/cablemanagement)

DALIcontrol:

[www.clipsal.com/dalicontrol](http://www.clipsal.com/dalicontrol)

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