An introduction to the

Philips Dynalite control system

PHILIPS

dynalite

Index

Philips Dynalite – the organisation

Philips Dynalite designs and manufactures energy management technology for lighting control and building automation applications. Developed as a solution for large-scale projects, Philips Dynalite's distributed intelligence methodology is equally suited to small-scale installations. As a market segment leader, Philips Dynalite's reputation extends worldwide, exporting to over fifty countries around the globe.

DyNet – the network protocol

DyNet is a communications protocol that operates on an RS485 four-wire network. It was developed by Philips Dynalite to control lighting and is also used to interface, at both high and low levels, to HVAC (heating, ventilation, air-conditioning), security, fire detection systems, access control, blinds, motors and other electrical loads in a building. A DyNet network may also be integrated as part of other control systems such as a Building Management System (BMS) or Audio Visual (AV) Control System.

DLight – the software

DLight is a Windows[1] compatible software application used to configure a DyNet network. It provides commissioning (set-up), diagnostics, maintenance and end-user master control facilities. It is a powerful end-user tool for on-site personnel.

Range – the products

Philips Dynalite manufactures products under the Philips Dynalite, Dimtek, DLight, Minder & Ecolinx trademarks. The comprehensive range of load controllers fall into six broad categories;

- Leading Edge Phase Control Dimmers (DLE)
- Trailing Edge Phase Control Dimmers (DTE)
- Relay Controllers (DRC)
- Ballast Controllers (DBC)
- Multipurpose Controllers (DMC)
- Light Emitting Diode Controllers (DLEDC)

[1] Windows is a restered trademark of Microsoft Corporation

The system

Engineering philosophy

In a typical load controller, the box is fed with a single or three-phase mains supply. The supply then usually travels through a thermal magnetic circuit breaker for sub-circuit protection, then through the controlling device (either a dimmer or a relay), then directly out to the load. The relay or dimmer is controlled by a microprocessor contained in the load controller. The DyNet network, which links all load controllers and peripheral devices, features distributed intelligence - ie. every device on the network stores in it's memory everything it needs to know in order to operate. The benefit of this is that total failure associated with centralised processors is eliminated.

Specifically, a load controller knows;

1 – It's own **address**

2 – The **name** of each of it's physical channels

3 – The **area** or room that each channel is in

4 – The output level of each preset **scene**

5 – Other **setup** and **configuration** information

For example, a four-channel load controller would contain the following information;

Channel	Name	Area	Preset 1	Preset 2	Preset 3	Preset 4
1	Wall Washers	2 (Boardroom)	100%	40%	50%	0%
2	Table Downlights	2 (Boardroom)	0%	100%	0%	100%
3	Desk Lighting	3 (Reception)	100%	50%	20%	0%
4	Fluorescent Troffers	4 (Hallway)	100%	70%	40%	0%

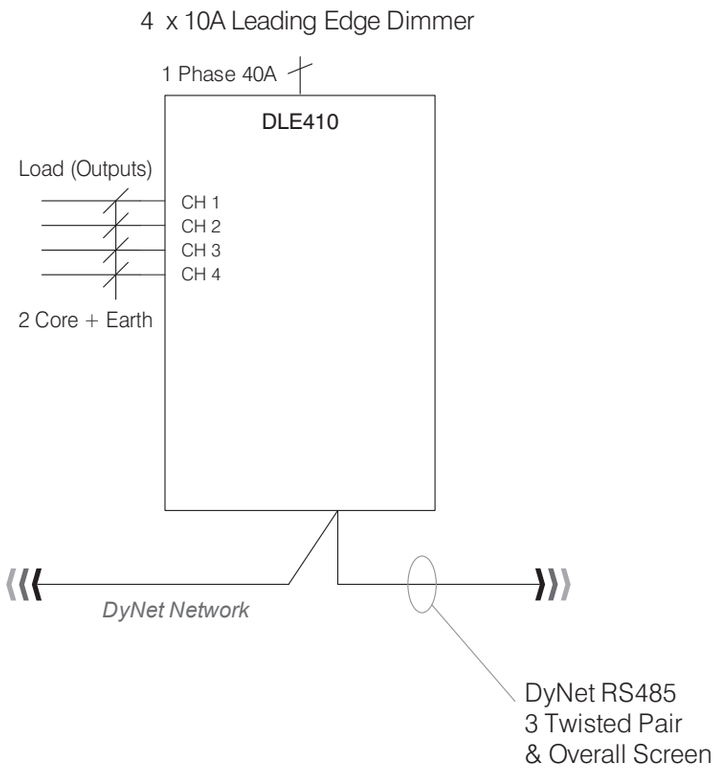

Figure 01 > Wiring connections for a four channel load controller

User control panel

The simplest form of control is to include a user control panel to turn lights on to a preset scene.

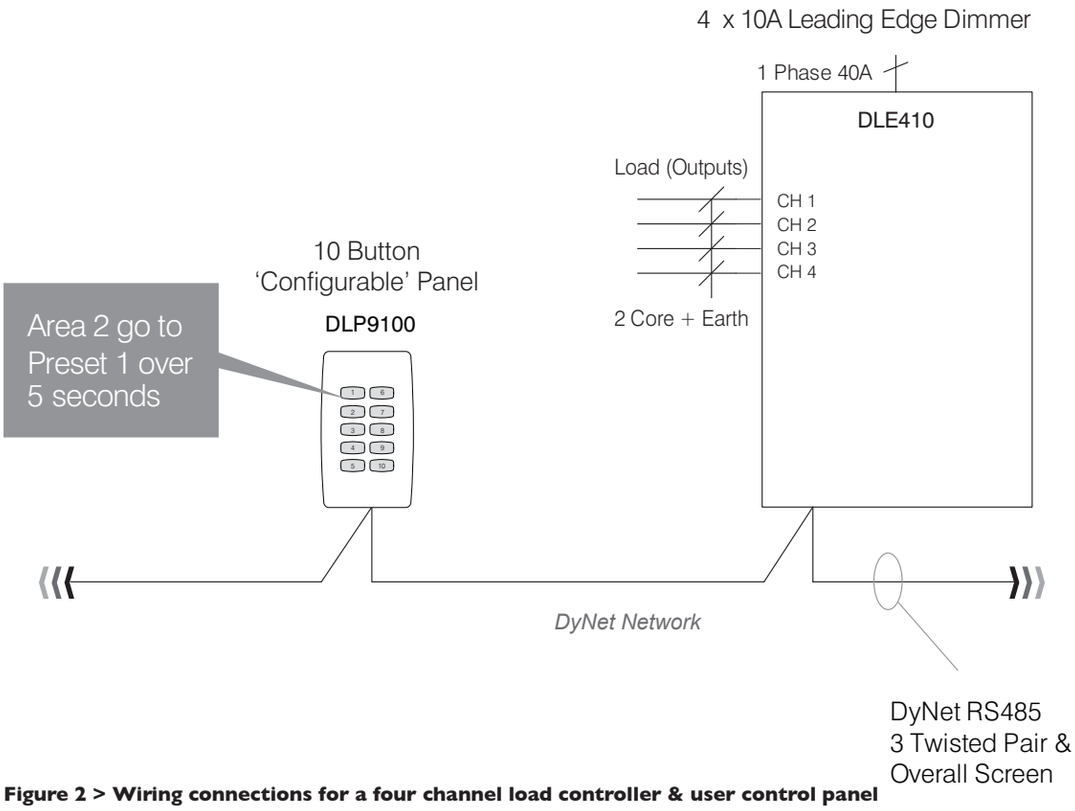

Figure 2 > Wiring connections for a four channel load controller & user control panel

Similar to a load controller, each control panel stores in it's memory everything in needs to know in order to operate. When a button is pressed on the control panel, the panel sends out a message across the network, For example, 'Area 2 go to Preset 1 over 5 seconds'. All devices on the network listen to the message. The load controller in the diagram would listen to the message, and respond as follows;

Channel	Name	Area	Response
1	Wall Washers	2 (Boardroom)	Ch 1 is in Area 2 and would fade from current level to 100% over five seconds
2	Table Downlights	2 (Boardroom)	Ch 2 is in Area 2 and would fade from current level to 0% over five seconds
3	Desk Lighting	3 (Reception)	Ch 3 is in Area 3 and would ignore the message
4	Fluorescent Troffers	4 (Hallway)	Ch 4 is in Area 4 and would ignore the message

Note that this is the simplest form of control. Philips Dynalite's sophisticated user control panels are capable of more advanced functionality, such as;

1 **Sequential Logic ::** programmed with scripts which perform a sequence of events. For example, 'do' this, 'wait', then 'do' this.

2 **Conditional Logic ::** programmed with conditional logic - ie. 'if' this, then 'do' that.

Timeclock

Another common method is scheduled event control using a timeclock.

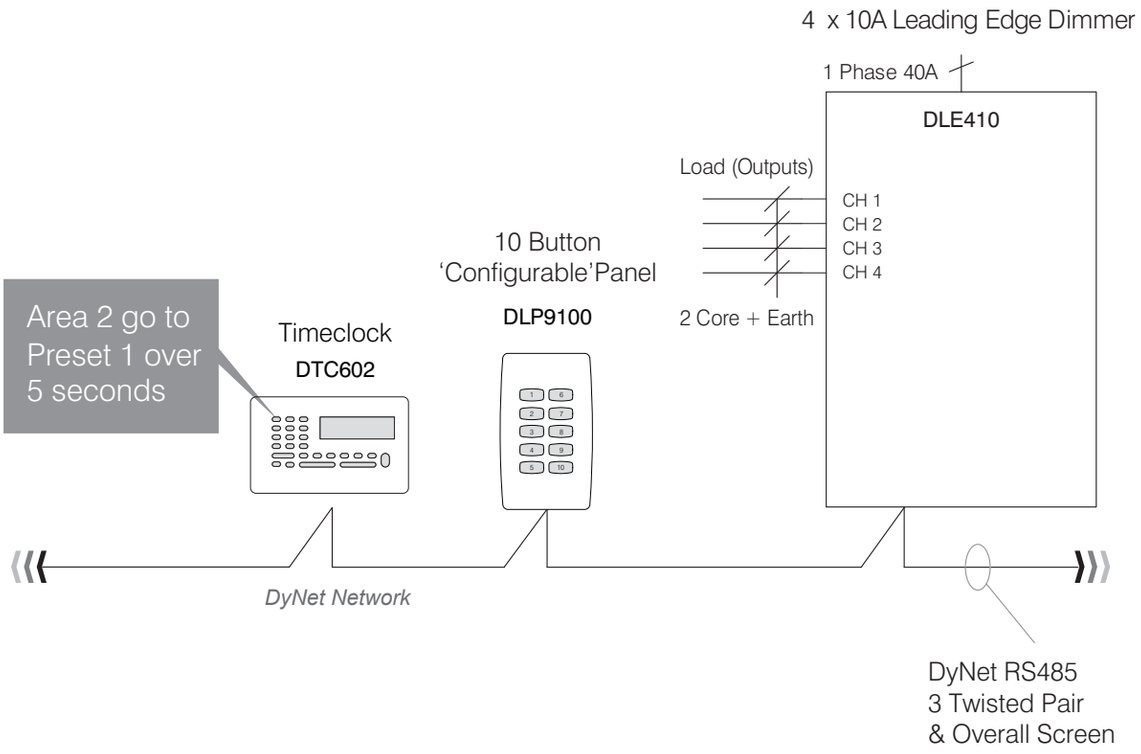

Figure 03 > Wiring connections for a four channel load controller, user control panel & timeclock

The timeclock is also an intelligent device and stores events and tasks in it's memory. Events can be triggered by time of day, sunrise or sunset, on a specific day of the week, or on a specific date. In the simple event as described previously, the timeclock works in much the same way as a control panel does. Instead of pressing a button to send a message, the timeclock simulates a button press at a pre-programmed time. It sends out a message across the network, such as 'Area 2 go to Preset 1 over 5 seconds' and all devices on the network listen to the message. The load controller in the diagram would listen to the message and respond in exactly the same way as described previously.

Note that initiating the event as described above is the simplest form of control. The timeclock also offers more advanced functionality, such as an event that triggers a task. A task may contain high level sequenctial and conditional logic. Sequential logic involves a number of processes separated by time delays to be undertaken. Conditional logic follows the thought process of 'if' a condition exists, then 'do' the following.

An event can be thought of as a one-shot function,
For example, 'Area 2 go to Preset 1 over 5 seconds'.
A task can be thought of as a macro, ie. a script is run.

Basics of designing a lighting control system

Designing a lighting control system is relatively easy. Remember, you can contact your Philips Dynalite dealer at any time for assistance in the design process.

List all of the lighting loads

Separate all of the lighting loads into groups that will form individual load circuits or channels. Calculate the total current load of each lighting circuit. It may be useful to list lighting circuits in a table.

Cct	Description	Type	Qty	Individual Load	Total Load	De-Rating Factor	Corrected Load	Reference Load
C1	Wall Washers	50W ELV with electronic transformer	9	0.22A	1.98A	0.9	2.20A	D1-1
C2	Table Downlights	50W ELV with electronic transformer	10	0.22A	2.20A	0.9	2.44A	D1-2
C3	Screen Downlights	50W ELV with electronic transformer	3	0.22A	0.66A	0.9	0.73A	D1-3
C4	Main Troffers	2 x 28W T5 fluorescent with electronic ballast	6	0.24A	1.44A	0.9	1.60A	D1-5
C5	Troffers near screen	2 x 28W T5 fluorescent with electronic ballast	2	0.24A	0.48A	0.9	0.53A	D1-6

The individual columns of the lighting schedule are defined as follows;

Circuit (Cct): Give each lighting circuit a unique name. Tip: in large projects, use letters that have a meaning ie. BR1-1 = Boardroom #1, Circuit #1

Description: Describe what the lighting circuit does

Individual Load: Current draw of individual lamp at mains voltage (Watts/Mains Voltage)

Qty: Number of light fittings in each circuit

Total Load: Total current draw of lamps (qty x individual load)

De-Rating Factor: Compensation for any inefficiencies found in transformers etc. (See Load Compatibility Technical Note for more information).

Corrected Load: Actual load corrected for inefficiencies

Reference: Once you have decided which controller to use, assign each individual channel to a specific dimmer channel ie. Lighting Circuit C1 is connected to D1-1 Dimmer Box # 1, Channel # 1

Refer to the Philips Dynalite Controller Selection Guide to determine the appropriate controller. For this application, the DMC810GL Multipurpose Load Controller has the capacity to control both incandescent and fluorescent lighting loads to the required load capacity for this application (see DMC810GL data sheet for more information).

Ref.	Part No	Description	Location
D1	DMC810GL	Multipurpose Load Controller	DBC.1
CP1	DLP950	5 Button Configurable Panel (4 presets & off)	Boardroom

Deciding which control panels to use

In order to control the lights, input units are required. The most common and simplest are user control panels. These work in much the same manner as individual light switches, except that each individual button can be programmed to perform a variety of tasks.

Using the boardroom example, a user control panel would be placed at the entrance that could access the preset scenes that are programmed into the system. These scenes are 'Welcome', 'Conference', 'Presentation', 'Video Conference' and 'Off'. A five button user control panel, such as the DLP950 can be used to accommodate this. The buttons on the panel can be custom engraved using descriptive names for each preset scene. Please refer to the DLP User Control Panels data sheet for further information.

In this example, the DLP950 control panel is assigned the reference CP1 (Control Panel 1) when added to the equipment schedule.

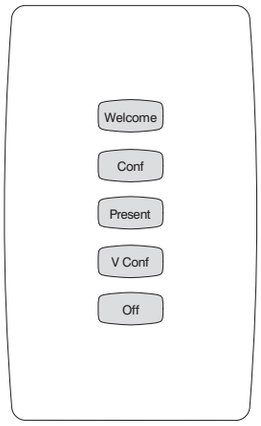

Figure 15 > DLP950 User Control Panel with custom engraving

Choosing accessories and integration tools

There are a wide variety of other accessories which will allow scheduled automatic system control, use of IR remote controls, compensation for ambient light, motion detection, Integration to AV systems or building management systems and a host of other tasks. Separate Application Notes outline instructions on how to use different accessories and interfaces. Contact your Philips Dynalite dealer for more information.

[1] Windows is a restered trademark of Microsoft Corporation

LCD touchscreen

To effectively control all lighting functions, in certain applications it may be necessary to provide many buttons on a user control panel at a single location. An LCD touchscreen is often used in these situations, as it provides an interface that can be easily configured or modified if requirements change.

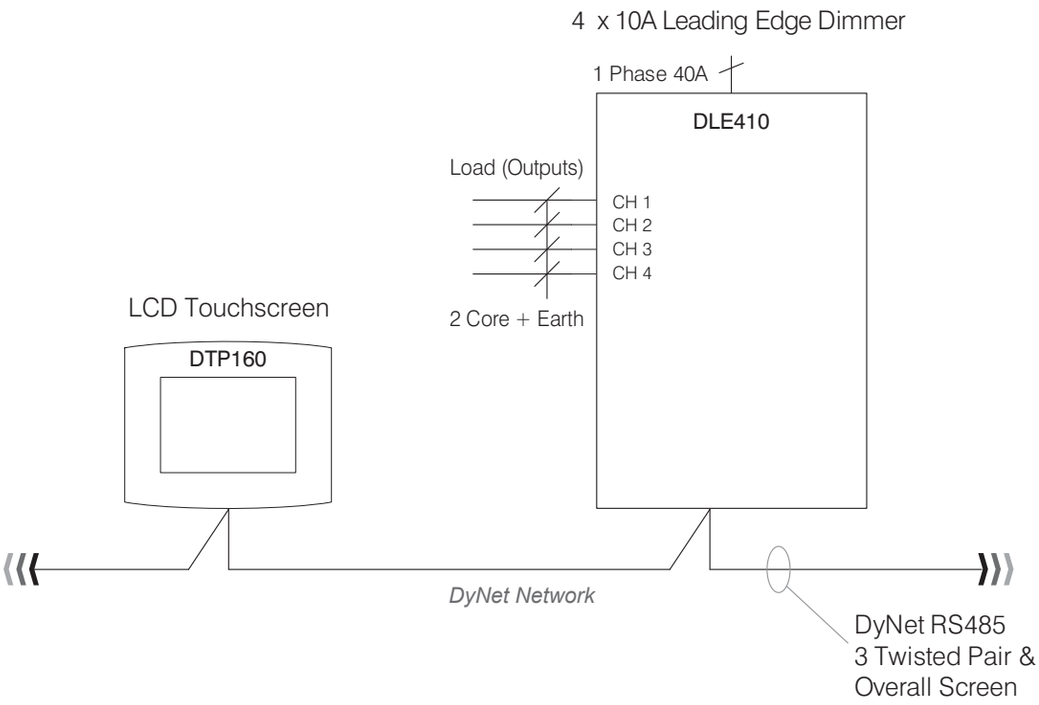

Figure 4 > Wiring connections for a four channel load controller & LCD touchscreen

The LCD touchscreen operates in a similar way to the conventional user control panel. In response to user actions, the unit will broadcast command messages across the network from presets, events and tasks stored within it's memory. The unit also provides 365 day real-time control, which operates in the same way as previously described for the timeclock.

A software configuration utility and display editor enables multiple screen page layouts to be created with a graphic device library, which includes a range of buttons, sliders, indicators and diagnostic icons. Floor plans can also be simulated on individual screen pages to assist user interpretation. Buttons on a parent screen page can be linked to a heirarchy of screen pages to represent specific areas.

Universal sensor

Another common device used on a DyNet network is the Universal Sensor, combing PIR (motion detection), PE (light level) and IR receive (remote control).

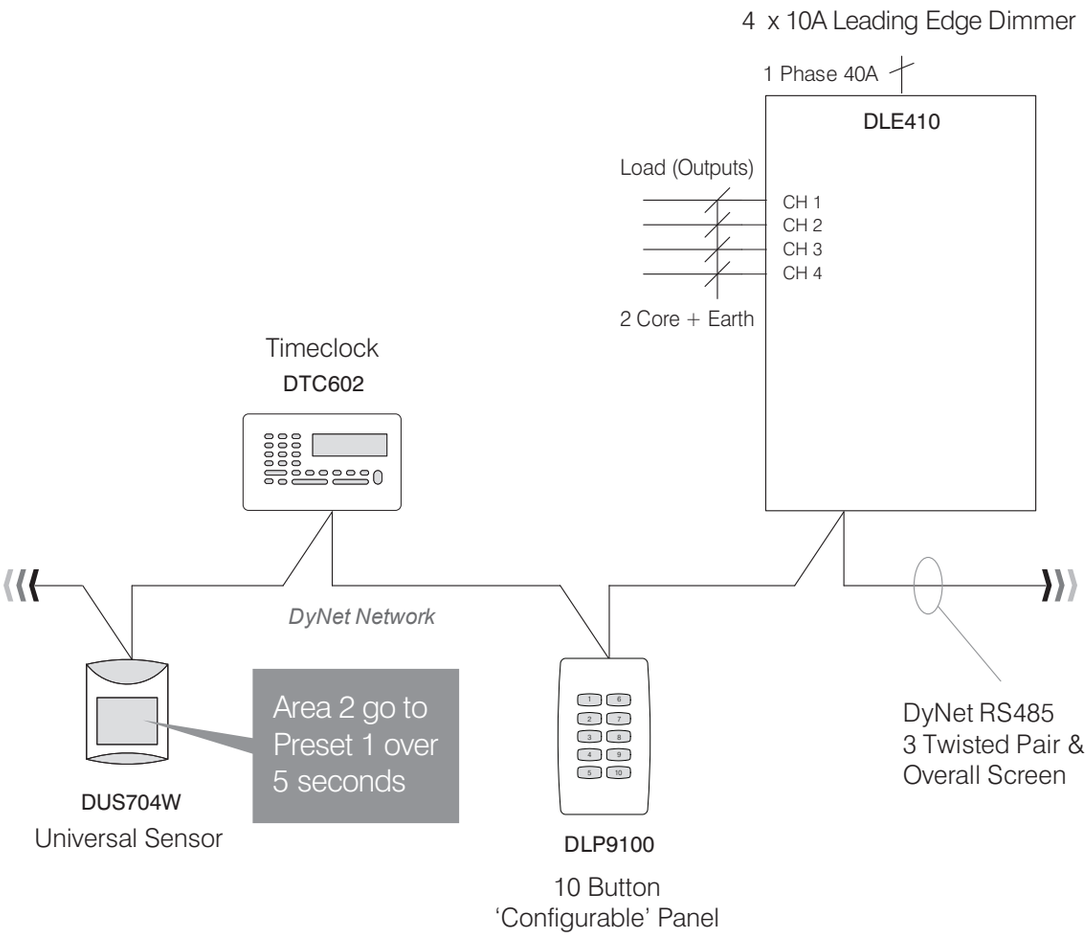

Figure 5 > Wiring connections for a four channel load controller, user control panel, timeclock & sensor

The sensor is configured using a simple drop down menu system. For example, an instruction can take the form of 'when the light level rises above 2,000 lux, take this action, or when the light level drops below this level, take another action'. The light level and motion detection functions can be configured to work together to provide conditional logic control. The sensor can be set up to change lighting levels when motion is detected, but only if the current lux level for the controlled area is below a specified value.

Again, the sensor works in much the same manner as a control panel, except that the 'virtual button press' is initiated by a change in light level, the presence or absence of motion, or by pressing a button on a remote control. The sensor will send a message across the DyNet network such as 'Area 2 go to Preset 1 over 5 seconds'. Again, all load controllers listen to the message and respond in the manner previously described.

Network bridge & gateway

Often, communication between a DyNet network and another network is required. In order to do so, a Network Bridge or Gateway is utilised.

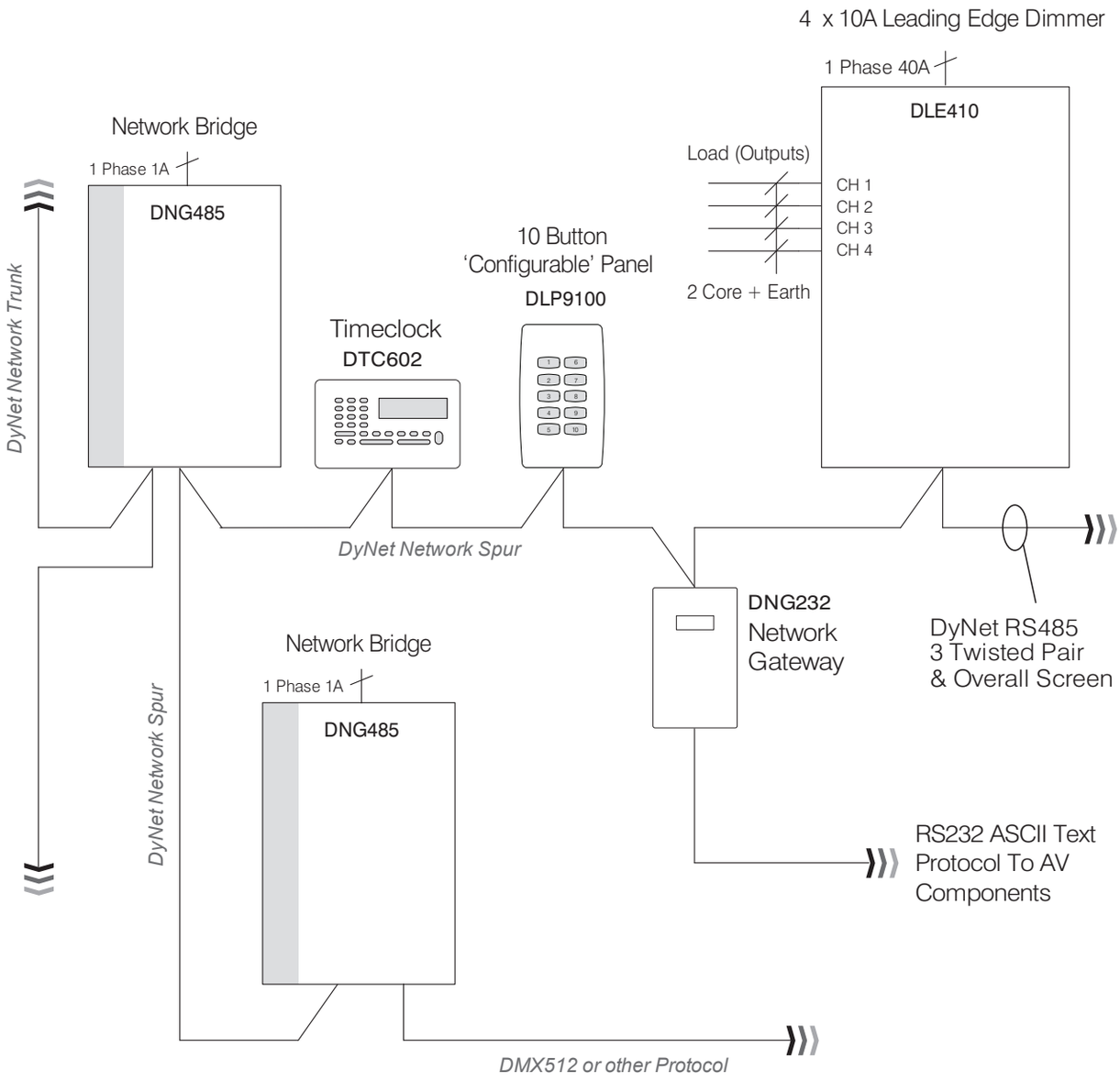

Figure 06 > Wiring connections for a Philips Dynalite system with integration to third party devices using different protocols

Bridges and gateways incorporate a processor and two network ports with isolated communications between them. The processor listens to DyNet and converts the message to a different protocol, or vice versa. Common applications are;

01. **DyNet 56K** – The standard network bridge converts DyNet at 9600 baud to DyNet at 56K baud. It also offers configurable message passing. This device is used to break large networks up into smaller sub-networks in a 'trunk and spur' topology. This has the benefit of isolating faults and facilitation of localised network traffic control to a small area.

02. **DMX512** – DMX512 is a lighting control protocol primarily used in the entertainment industry. It consists of a single transmitter, or master, and multiple slaves. The network bridge can be configured to either receive or transmit DMX512.

03. **RS232 ASCII** – The DNG-232 network gateway can receive and transmit standard or custom text strings using RS232 serial communication. Equipment with an RS232 control port, such as AV components or data projectors, can be controlled from DyNet through this device. Text commands from other systems can also be translated into DyNet messages.

PC or laptop computer

A PC or laptop can be used to configure a DyNet network using DLight application software.

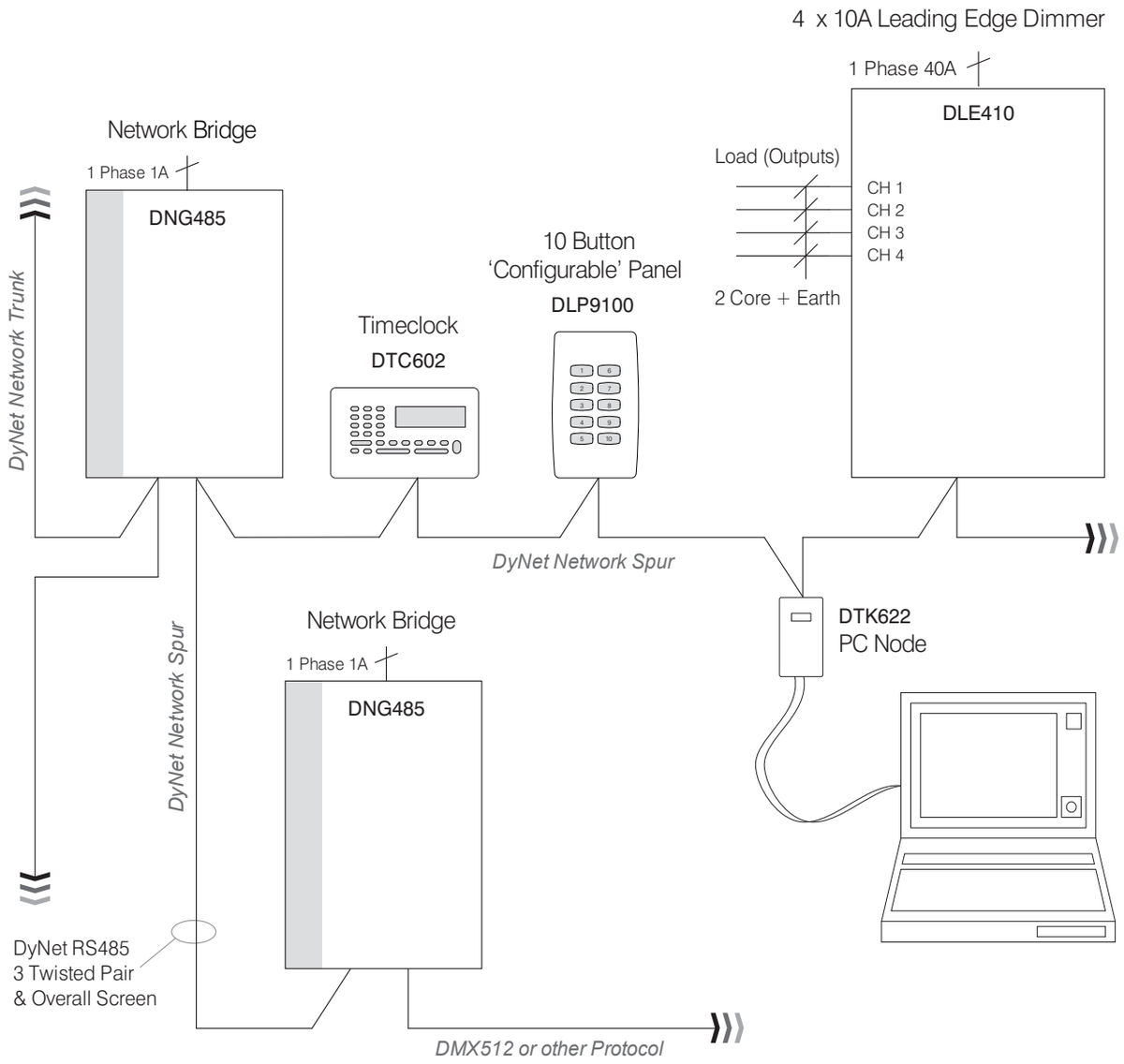

Figure 07 > Wiring connection for a PC to the DyNet system

DLight is a Windows[1] compatible application software program that is used to configure a DyNet network. It providescommissioning (set-up), diagnostics, maintenance and end-user master control facilities. The user makes changes to the configuration of devices in DLight, then downloads these changes across the DyNet network. This allows the user to keep a copy of the system configuration electronically to make future changes to the system easier, as well as to allow for troubleshooting. It is also possible to connect to the DyNet network, via a modem-link, to reconfigure, reprogram and control the DyNet system from a remote location.

Low-level integration

Another common method of control is to enable interoperability with other systems, such as security and access control. Where there are a limited number of functions controlled by either system, the most convenient method is often by way of a low-level interface through dry contact digital or 1-10V inputs and outputs, as shown below;

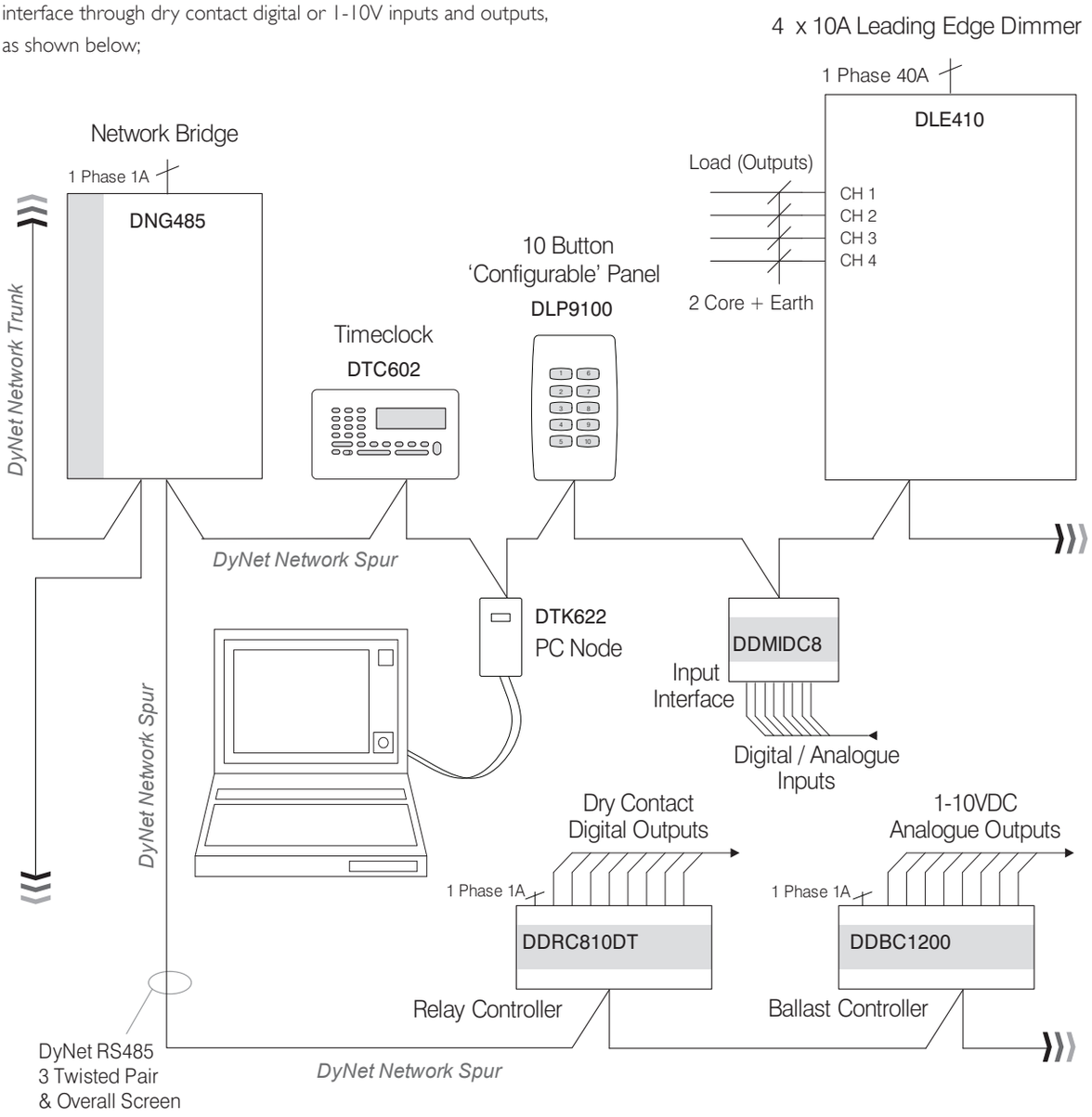

Figure 08 > Wiring connection for low-level 3rd party integration to the DyNet system

The input interface works much in the same way as a user control panel, except that the 'virtual button press' is initiated by a relay closure from the security system or any control system with a relay output, such as an alarm system. This, in a simple example, would send a message across the network such as 'Area 2 go to Preset 1 over 5 seconds'. Again, all of the load controllers in the system would listen to the message and respond as previously described. Analogue inputs can also be programmed in a similar way to directly ramp specific channels or areas up and down, or to send out a preset message at a predetermined input level.

Philips Dynalite relay and ballast controllers are used to provide dry contact digital and 1-10V analogue outputs, which can be programmed to represent the state or level of a channel or area. Much as the Philips Dynalite system can receive inputs from other systems, the outputs can be used to provide status or command information to another system.

High-level integration

In large-scale applications, Building Management Systems (BMS) will often control and monitor an extensive range of functions. High-level integration is generally used to provide a more advanced and flexible method of interfacing. It removes the limitations imposed by low-level integration, allowing an unlimited number of messages to be passed. Programmable message filtering may also be provided to enhance network security.

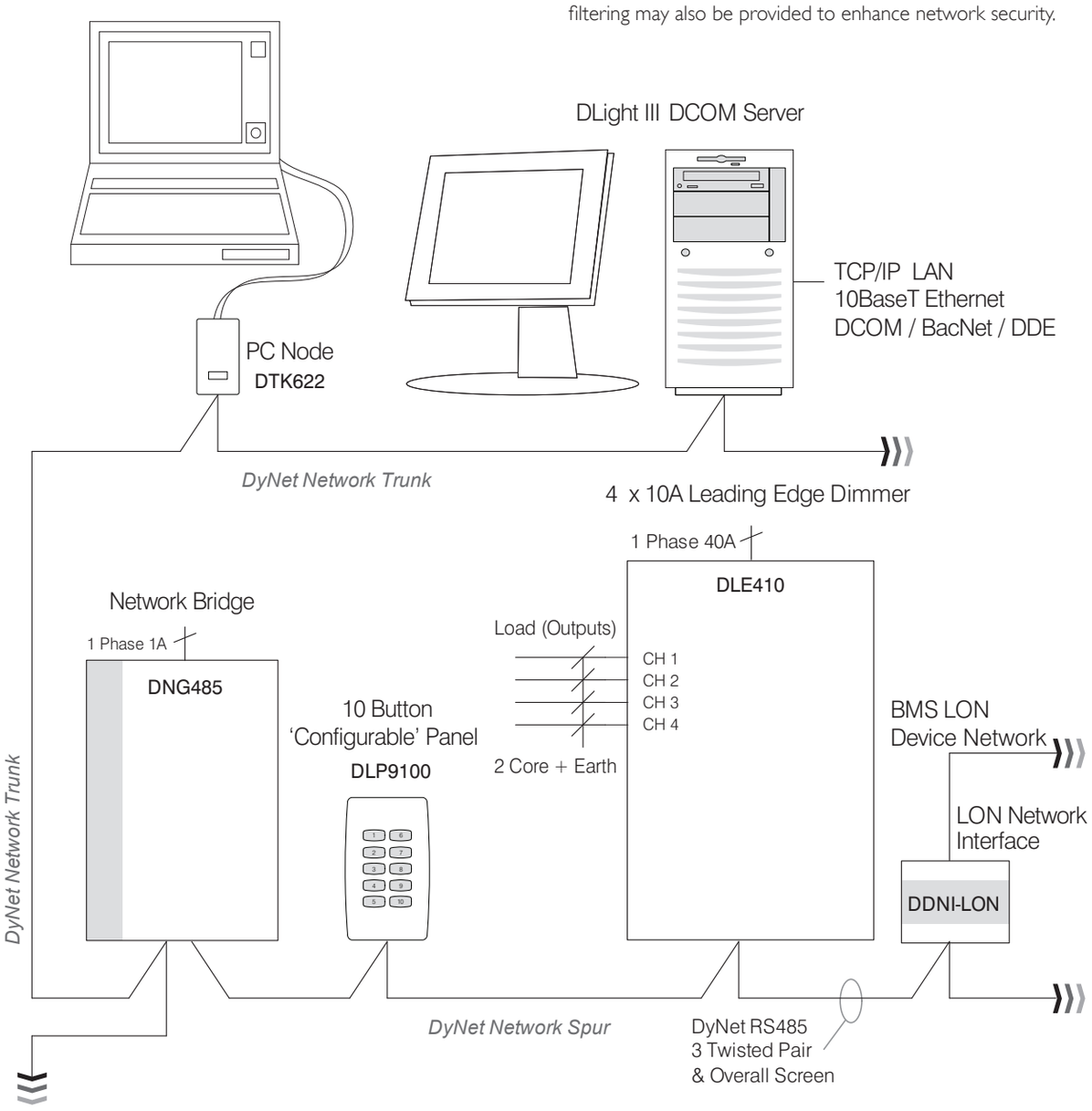

Figure 9 > Wiring connection for 3rd party Integration to the DyNet system

High-level Integration to the Philips Dynalite system can be achieved over conventional computer networks using DLight III Server software. Application software from other systems can communicate directly with DLight III Server using Microsoft's Distributed Component Object Model (DCOM) & Dynamic Data Exchange (DDE) protocol. BACnet[2] connectivity is also supported.

Generally, a BMS will incorporate a facility-wide device network for control of related equipment. There are several open protocol standards that are commonly used for these networks, one of which is LON[3]. Philips Dynalite control systems can be integrated locally to a LON device network using the DDNI-LON network interface.

Support for a range of other protocols may be currently available or under development. **Please contact your local Philips Dynalite dealer for more information.**

[2] BACnet is a registered trademark of ASHRAE

[3] LON is a registered trademark of Echelon Corporation

The Benefits

The Philips Dynalite control system offers the following advantages;

- Preset lighting control
- Distributed control and monitoring
- Reduced wiring requirements
- Sophisticated automatic and manual control
- Advanced Integration into other systems
- Reduction in energy/maintenance costs
- Ease of on-site changes

Preset lighting control allows a user to recall custom lighting level combinations or scenes used for a typical room activity at the press of a button. Distributed control and monitoring allows the user to configure a lighting control system and control all the lights from any point on the network. In addition, the user can monitor all of the system components from any point on the network or remotely, and create reports on the status of the system.

Traditionally, lighting control required that the current flow through the switch to the load. Using the DyNet system, input units are connected to output units with inexpensive twisted pair cable, that is, an RS485 cable is used to connect the user control panels to the load controller. Thus the wiring requirements are reduced as heavy conductors running from the distribution board and from the switch to the load are replaced with a straight run directly from the energy management controller to the load. When the system is connected as a network, the user has total flexibility to control all loads connected to a load controller. Security, air-conditioning, lights and other systems can be programmed to turn on and off at particular times, or with a particular signal or button press. Lighting and temperature can be controlled to vary with ambient conditions, or be based on occupancy.

By using Integration devices and network gateways, the DyNet system can be configured to work in conjunction with other systems such as audio visual and building management systems.

Cost Advantages

The Philips Dynalite control system offers real cost savings in the following ways;

- Increased lamp life – Philips Dynalite's 'soft start' and surge limiting voltage regulation technologies protect lamps from high inrush currents and power surges, thus dramatically increasing lamp life.
- Ease of installation and configuration – DyNet systems are easier to install and take less time to configure than conventional wiring systems.
- Flexibility in design – when layouts or control methods require modification, changes are carried out by simple reprogramming of the system using DLight software.
- Energy savings – by using intelligent lighting systems, natural light is harvested and supplementary lighting adjusted accordingly. This provides energy savings not only from the lighting system, but from the HVAC system also, as thermal loads are reduced.
- Scalability – the same components can be used in a single room application or in larger projects involving thousands of controlled circuits.

Advantages of Distributed Control

Devices on the DyNet network each have their own micro-processor, allowing them to communicate independently through Philips Dynalite's distributed control. In the unlikely event of a fault on the system, only the affected component ceases to operate, and all other components continue to operate as normal. There is no vulnerable central controller that can cause a system-wide failure. The system also does not require any independent power supplies to run the network or user control panels. Rather, each load controller has it's own built-in power supply that provides all of the power required to run all of the other microprocessor-driven devices on the network.

System Size

Input units, output units and network bridges can be added to increase the functionality of the system. DyNet systems with over 3,300 devices controlling over 17,000 individual circuits on a single network are not uncommon. There is no theoretical limit to the size of a complete system.

Preset lighting control

The Philips Dynalite control system allows the user to create and recall custom preset scenes for typical room or area activities. Preset scenes are programmed by adjusting the light levels for different lighting channels (lights or groups of lights connected to the same circuit, or controlled in unison) contained in an area, as shown in the diagram of the boardroom below. Once the lighting is set up in the area for an activity, the combination of lighting levels is saved as a preset scene, and the user can fade between different presets at the touch of a button. The setting of preset scenes using Philips Dynalite's DLight software is shown on the following pages.

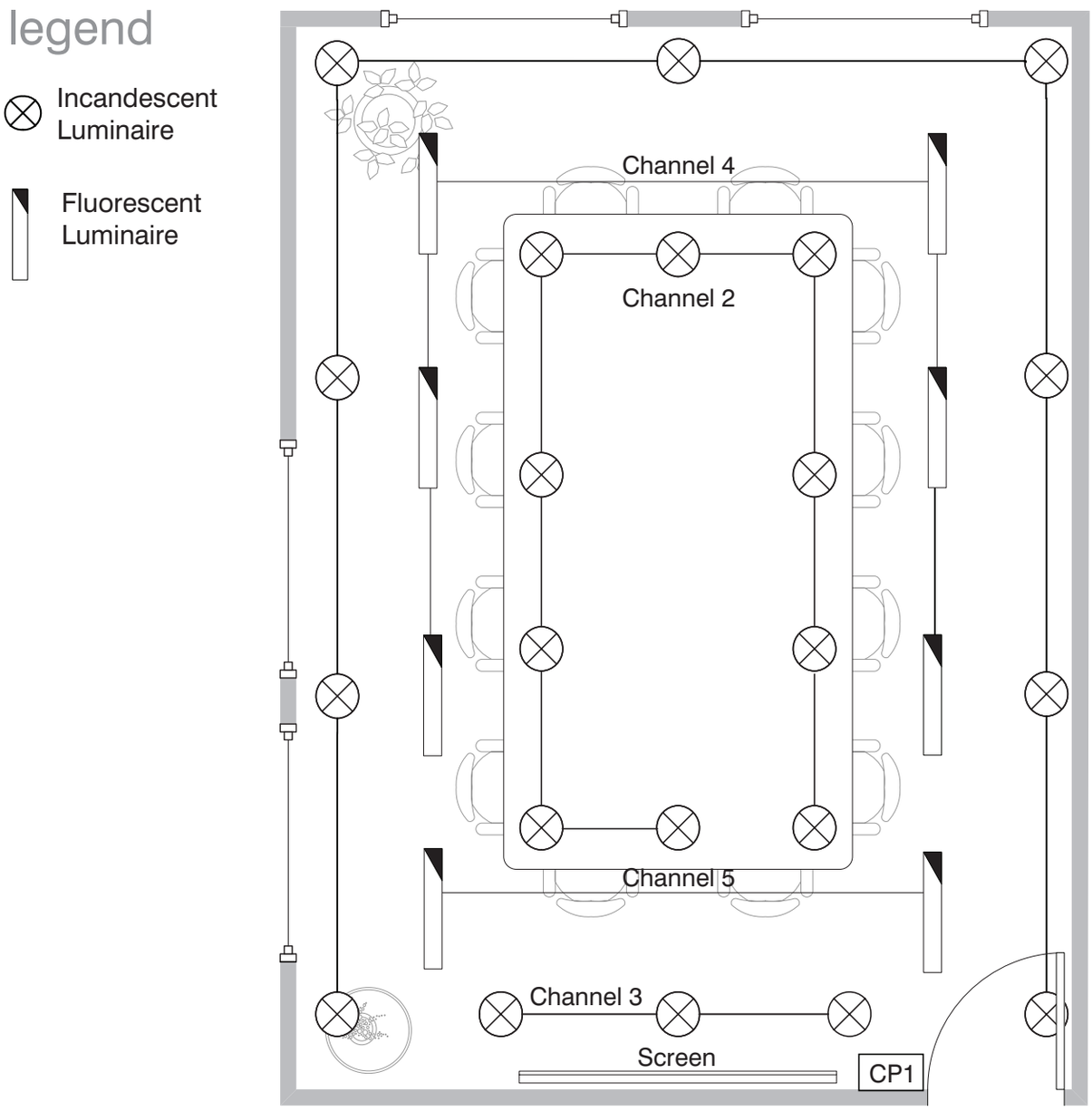

Figure 10 > Typical boardroom lighting layout

Preset 1 – welcome

The main fluorescent lighting and wall washers are set to 100% to allow participants to prepare for a meeting.

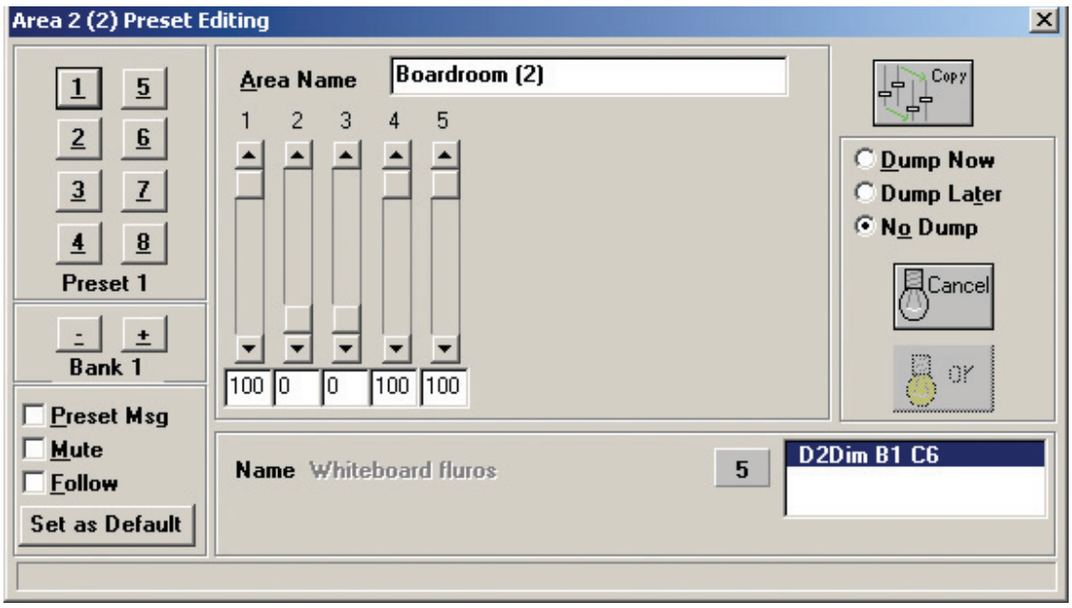

Figure 11 > Preset 1 – Welcome

Preset 2 – conference

The wall washers are dimmed and the table downlights set to full, to provide sufficient light for note taking, and supplementary room lighting turned off.

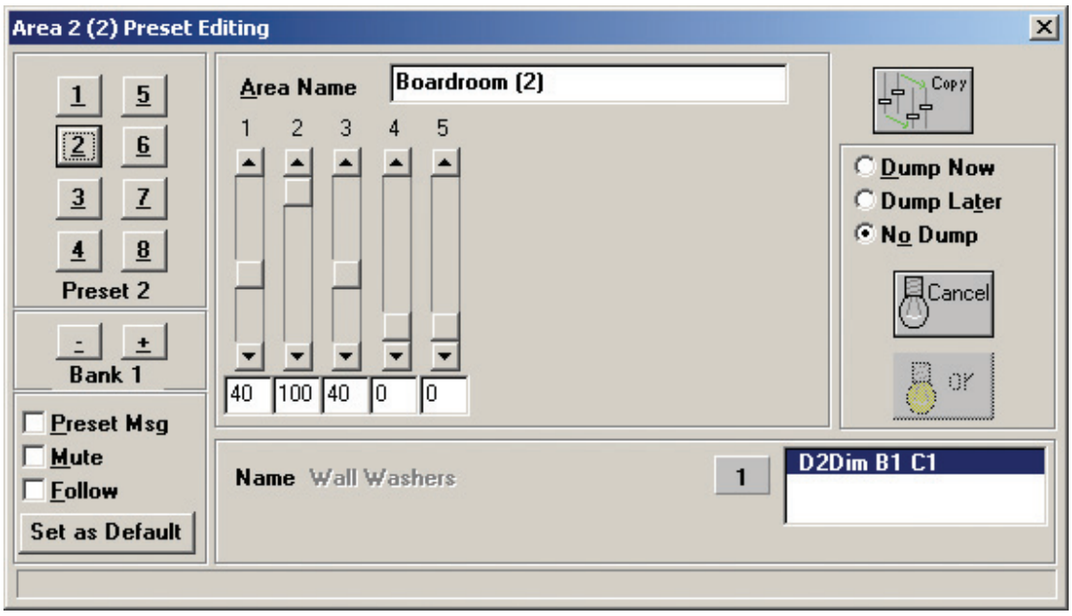

Figure 12 > Preset 2 – Conference

Preset 3 – presentation

Over table lighting is set to 30%, wall washers are set to 10% for low-level ambient lighting and whiteboard lighting is set to 100%. All fluorescents are set to 0%.

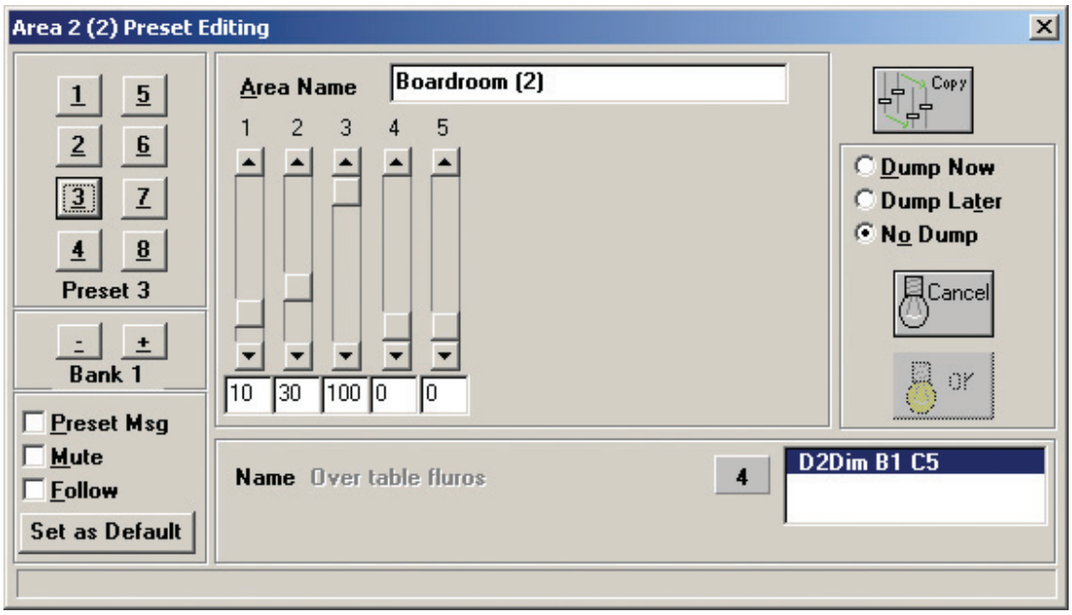

Figure 13 > Preset 3 – Presentation

Preset 4 – video conference

All lighting is set to 100%, excluding the lighting around the projection screen, which is set to 0% to gain maximum contrast.

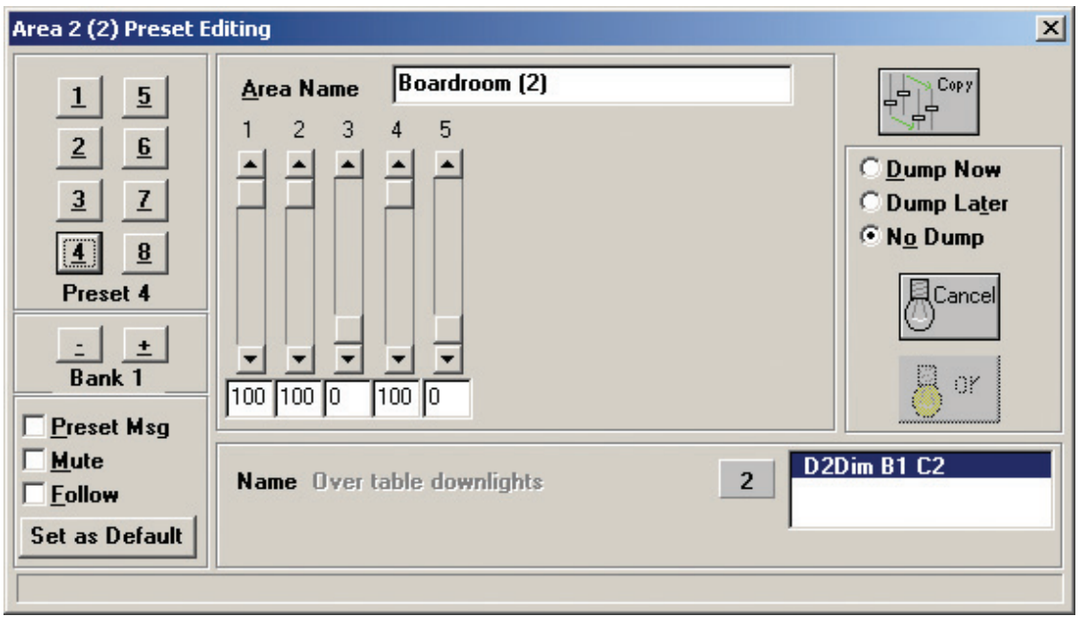

Figure 14 > Preset 4 – Video conference

For more information

Philips Dynalite
Sydney, Australia

6/691 Gardeners Road,
Mascot NSW 2020
AUSTRALIA
P: +61 (0) 2 8338 9899
T: +61 (0) 2 8338 9333
E: dynalite.info@philips.com
W: dynalite-online.com

Philips Lighting B.V.
Lighting Controls
The Netherlands HQ
E: dynalite.info@philips.com
W: dynalite.eu

Philips Electronics UK Limited
Philips Dynalite Lighting Controls
Guildford, England

Guildford Business Park
Guildford, Surrey GU2 8XH
UNITED KINGDOM
P: +44 (0) 870 608 1101
W: dynalite.eu

Sales
P: +44 (0) 148 329 8950
F: +44 (0) 148 329 8825
E: uklc.sales@philips.com

Operations
P: +44 (0) 148 329 3086
F: +44 (0) 148 329 8824
E: uklc.service@philips.com

For more information, please contact

Unit 6, 691 Gardeners Road Mascot 2020 Australia.

An Introduction to the Phiilips Dynalite Control System April 2009