

PHILIPS

dynalite 

Controls

Technology Overview

This publication is an overview of traditional lighting control technologies that represent the majority of globally installed indoor systems.

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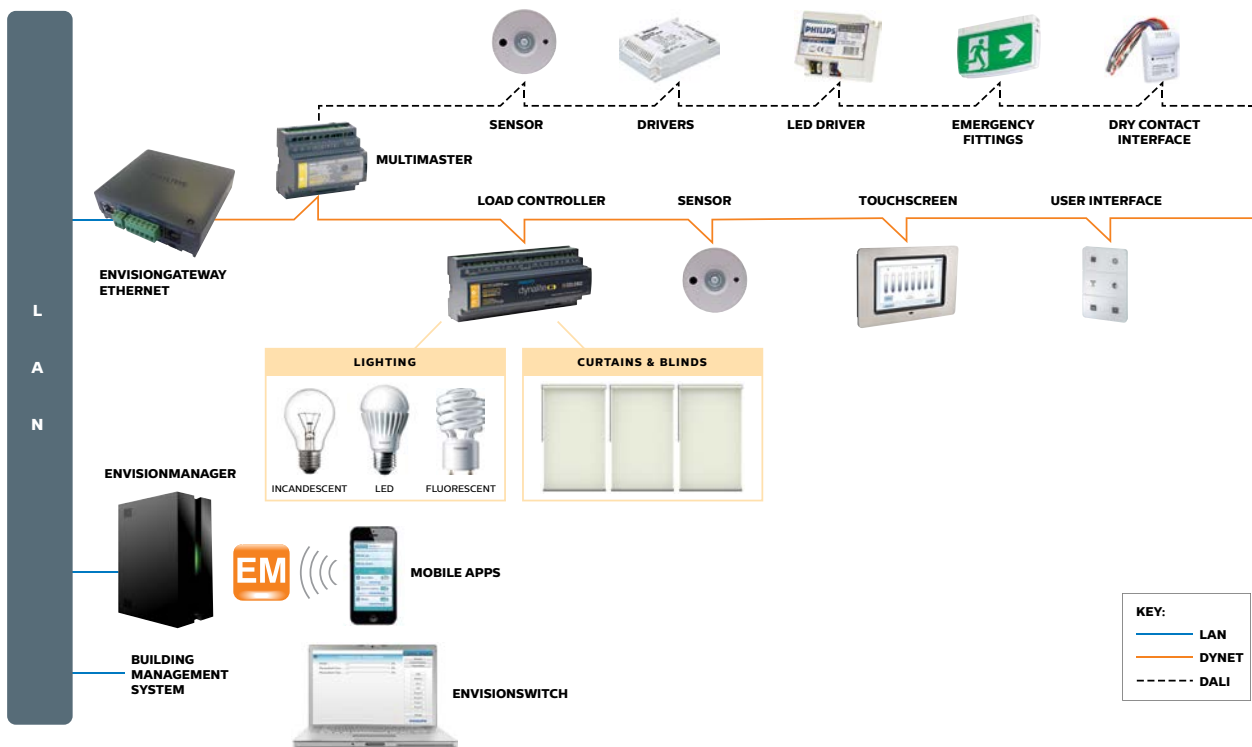
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Control Principles

System Structure

The Philips Dyalite system is a scalable control platform that connects a range of intelligent devices to form a complete control solution. Commands and status information are passed to all devices over an RS485 or Ethernet network using the event-based DyNet protocol. Philips Dyalite control devices include an integrated microprocessor and internal non-volatile memory. This allows each device to store its own configuration data, handle processing requirements for its assigned features and functions, and remember some of its previous states. All device configurations are programmed through the EnvisionSuite series of commissioning, monitoring and control software.



The system's distributed architecture offers excellent reliability and usability and provides flexible control of lighting and other building automation systems.

The range of Philips Dyalite control products includes user interfaces (UIs), integration devices and load controllers. The UI range includes:

- Control keypads
- LCD touchscreens
- timeclocks
- sensors
- mobile apps
- desktop software

Integration devices allow third-party systems to interact with the Philips Dynalite system over a wide range of protocols. This allows the systems to work together to perform tasks, so that end users don't need to interact with each individual system.

Philips Dynalite has developed an extensive range of controllers to work with many different types of loads. There are a variety of input/output types, combinations and load ratings. Load controllers listen constantly to network messages from DyNet and only respond to command messages that relate to the controller's specific addressing configuration. Control associations are established between user interfaces, integration devices and load controllers using straightforward addressing and command techniques within the DyNet protocol.

Device Addressing

Physical

Physical addressing is used primarily during the testing and commissioning stage to configure DyNet devices. It is also used for physical, location-specific parameters such as circuit breaker trip signalling. DyNet uses the device type, box number and physical channel numbers to identify each lighting circuit.

Logical

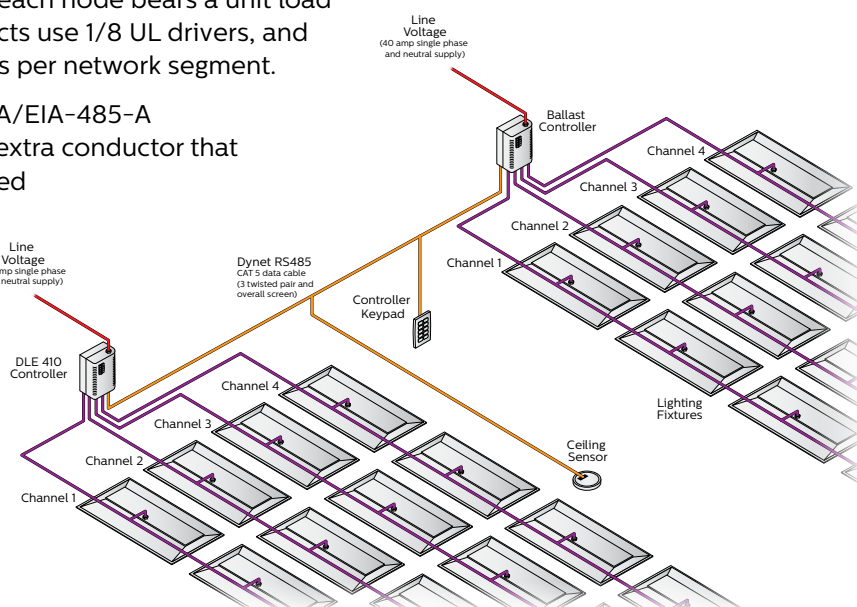
Logical addressing is used in day-to-day operation of the lighting system. Lighting circuits and control panels are configured to areas independent of the physical device they are connected to. DyNet uses the area number, logical channel number and join value to identify lighting points.

Physical Network

DyNet uses industry-standard RS485 data transmission, as detailed in the TIA/EIA-485-A specification, with some variations. For more information on the TIA/EIA-485-A specification, refer to <http://www.tiaonline.org/>.

The TIA/EIA-485-A specification defines a unit load (UL) and declares that an RS485 driver must be able to drive 32 ULs. This means that an RS485 network supports 32 nodes when each node bears a unit load on the line. Philips Dynalite products use 1/8 UL drivers, and support approximately 160 devices per network segment.

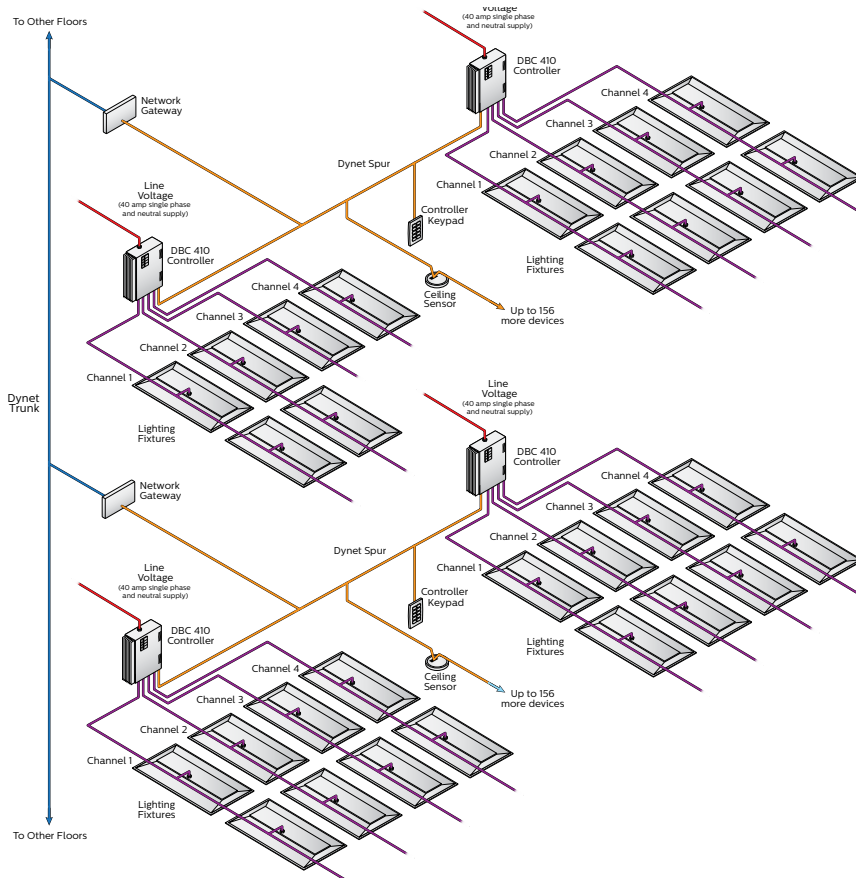
An important variation from the TIA/EIA-485-A specification is the addition of an extra conductor that carries a DC supply that is generated by an integral power supply contained within all mains-powered gateways and load control devices. This is used to power network devices that are not connected to mains power, such as motion detectors, wall-mounted control user interfaces and timeclocks.



Note that the conductors carrying the DC supply have both wires in the pair paralleled. This minimizes voltage drop on long cable runs. A terminal strip is provided on devices for data cable termination. Devices have an RJ12 connector as an additional connection for commissioning. Some DIN-rail load controllers support two RJ12 connectors for faster termination between load controllers within the distribution board.

Sites that require more than 160 devices, such as multi-story buildings, have a network segment for each floor called a spur. Multiple spurs are joined together via a central trunk, which is often installed in a riser to link all floors together. Alternatively, the spurs can be connected via Ethernet using the building's existing IT infrastructure.

Each spur can run off the trunk as an independent sub-network that does not require any additional network communication. With each of these sub-networks connected together by bridges on the trunk, the entire system can work together seamlessly using site-wide network messages. Typically the trunk is connected to head-end software or a building management system (BMS) so there is full access to all the components on the network.



DyNet Protocol Properties

	DyNet 1 (Spur)	DyNet 2 (Trunk)
Packet length:	8 bytes	12 to 1024 bytes
Integrity checking:	8 bit Fletcher checksum	16 bit Fletcher checksum
Baud rate:	9600 (default) to 115200 baud (device dependent)	9600 to 115200 baud
Data word format:	8 bit data, 1 start bit, 1 stop bit, no parity (8N1)	8 bit data, 1 start bit, 1 stop bit, no parity (8N1)
Message tracking:	Source and destination network addresses embedded in each packet	Source and destination network addresses embedded in each packet
Logical areas:	255	65534, 0 = all areas
Logical channels per area	255	65534, 0 = all channels
Logical presets per area:	255	65519 editable, 16 predefined
Fade times per message:	0 to 21.45 hours in 20 ms steps	0 to 21.45 hours in 20 ms steps
Logical channels per device:	255	65534, 0 = all channels
Physical device types:	255	255
Physical box numbers per device type:	255	65535

Programmable Logic Control

All Philips Dynalite devices incorporate programmable arithmetic and sequential/conditional logic control. You can use EnvisionProject to create scripted tasks within any device. Tasks can be triggered from within a device or from another device on the network.

Tasks are often used in applications where a single input or UI action needs to control multiple areas or multiple functions. An example would be a 'Welcome' function on an entrance/lobby control UI. When activated, the task issues a sequence of area preset commands to illuminate the entrance and an access path through the building.

Default Behavior

Philips Dynalite devices are pre-programmed for out-of-the-box operation. Philips Dynalite load controllers (dimmers) are set to provide full output to the load as the default, regardless of if the network is connected.

When the network is connected, a button press on any UI controls all the dimmers by default.

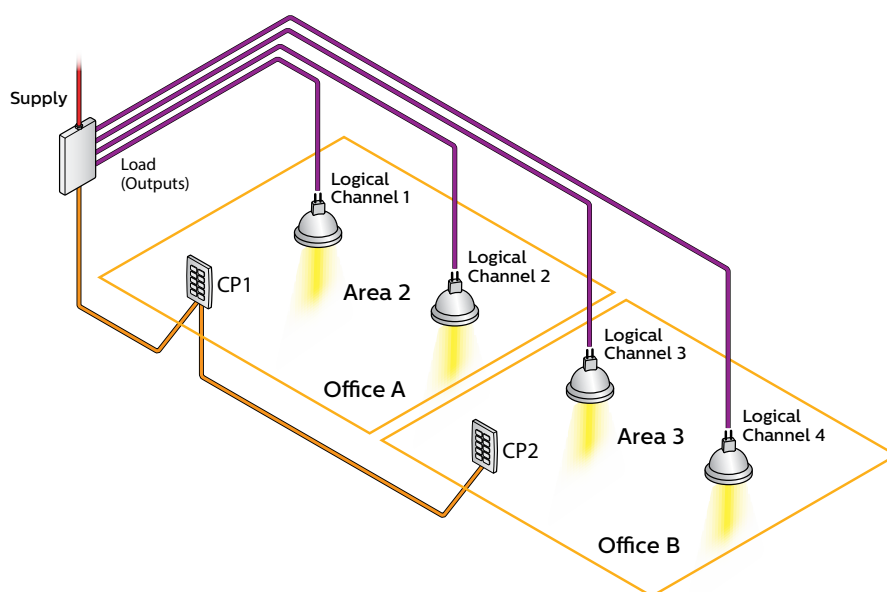
The following preset scenes are factory-programmed into every control keypad:

Button	Preset	Light level	Button	Preset	Light level
1	Preset 1	100% (On)	5	Preset 5	80%
2	Preset 2	70%	6	Preset 6	60%
3	Preset 3	40%	7	Preset 7	50%
4	Preset 4	0% (Off)	8	Preset 8	20%

Associating lighting groups to controllers

Load controller output channels and control keypad buttons are generally assigned to logical areas, enabling channels to be grouped and controlled together regardless of their physical connections or location. This allows one-touch control of groups of lights over the DyNet network, such as switching or dimming all perimeter downlights in a room at once from a single button press.

In the example below, a dimmer controller handles lighting circuits in two rooms, with input from a control UI in each room. The lighting circuits and UI in Office A are assigned to Area 2 while the circuits and UI in Office B are assigned to Area 3. (Area 1 is reserved for installation/diagnostic use.) This allows independent control of multiple rooms connected to the same controller.



Grouping multiple individual control channels into different areas is essential in installations involving a large number of areas and channels. This saves time and work compared to systems in which every device must be addressed and configured separately.

Associating user interfaces with controllers

Every network device on the DyNet network can listen to any network message. If a user interface receives a network message that is related to any of the logical areas to which its buttons are assigned, it automatically updates the button indicators with the new lighting scene. This network architecture makes the DyNet system very efficient, as a single network message can change the lighting levels across multiple load controllers and update the indicator status of multiple user interfaces.

Once connected to the network and discovered in EP, a UI can be associated to any logical area, and the button assignment uses that area's default presets. This logical association is completely independent of the UI's physical location.

In addition to this default behavior, other commands can be assigned in EP to any or all of a control panel's individual button functions, ranging from simple preset messages controlling other logical areas on the network to complex scripted sequences and conditional operations.

Flexible Control Options

Join/Area Link

The Philips Dynalite system allows the logical linking and separation of areas for flexible automated control in applications where partitions or removable walls are used, such as hotel ballrooms or adjoined office meeting rooms. When the partition is closed, each room is controlled by its own UI. When the partition is opened, the Dynalite system logically links the two physical areas, and UIs in both rooms jointly control the entire combined space. The transition between joined and unjoined can be triggered automatically by a dry contact reed switch in the removable wall.

Preset Scenes

Preset scenes instantly recall multiple channel levels. This is also known as scene setting. A practical example of preset use would be a hotel function room that uses predetermined lighting scenes for breakfast, lunch and dinner. These scenes can be saved and then recalled at the touch of a button and/or automatically from a network timeclock. A long fade time between scenes can also be set, ensuring a smooth, comfortable transition from one scene to the next with no disruption to occupants' comfort.

The Philips Dynalite system can be controlled in several different ways, depending on the application requirements. Area Preset and Channel Level network messages can change the output of the load controller.

Area Preset network messages affect all channels that are assigned to the respective logical area, allowing for much simpler commissioning. Preset control is ideally suited to any application where a large number of channels are to be controlled at once.

Some systems require multiple network messages to affect multiple channels in an area. This can produce an undesirable 'wave' effect and increase network traffic. Philips Dynalite uses preset scenes to affect multiple load channels in one area with a single network message, which prevents this.

Channel Control

If required, channel-level commands can also be used to affect specific channels or subsections within an area. This method is typically used where individual channels must be set manually, such as in a home or small office.

The Philips Dynalite system is capable of controlling any dimmable light source, including 3-channel RGB fixtures displaying custom colors and 2-channel fixtures displaying warm white/cool white illumination.

User Interfaces (UIs)

Manual Operation

Philips Dynalite user interfaces are available in a range of styles and finishes to match any project budget or décor requirements. The range includes wall-mounted keypads, touchscreens, universal sensors, timeclocks, temperature sensors and iOS/Android apps. All user interfaces are available in European and North American formats.

Wall Keypads

Antumbra

The AntumbraButton, AntumbraTouch and AntumbraDisplay keypads feature proximity detection, light and temperature sensing, and a high degree of configurability via EnvisionProject to provide a superior level of flexibility and convenience. Subtle button LEDs, custom labeling and a halo-effect backlight enhance elegance, comfort and usability. The AntumbraDisplay includes a central screen with multiple 'pages' of dynamic text and icons. Antumbra UIs also incorporate temperature and proximity sensors.



Revolution Series

The Revolution series keypads are available in a range of standard plate finishes or custom finishes, including glass and metal. Each button can be custom-engraved with text or icons to describe its function, and the engraving is back-lit to highlight the label. An optional integrated OLED display allows fully editable text and icons to indicate the current function or system status to the user.



Classic Series

The contemporary style of the stainless steel Classic series keypads is perfectly suited to any industrial or commercial environment. These keypads are available in a wide range of standard options that include network sockets, key switches and fade sliders. Each plate and switch cap can be custom engraved. A choice of button configurations is available throughout the range.



Standard Series

The simple yet elegant Standard series keypads offer a range of plastic and metal finishes. They include LED status indicators and full integration with the DyNet network. Each plate and switch cap can be custom engraved.



Touchscreens

Touchscreens offer a greater degree of control and customization. Each touchscreen can display up to 255 pages of controls and status indicators in full color, including information from third-party devices and systems connected to the DyNet network. Controls can be overlaid on selected backgrounds, such as floor plans, and the screen fascia can be matched to the Revolution range or customized to site requirements.



Apps

The DynamicTouch (iOS) and EnvisionTouch (iOS and Android) apps connect to DyNet over Wi-Fi. They are ideal for intelligent homes and commercial control applications. Intuitive and customizable controls work seamlessly with third-party devices connected to the DyNet network.



Automated Operation

These interfaces automatically react to the environment to trigger changes in the system.

Sensors

Philips Dynalite multifunction sensors combine motion detection – passive infrared and/or ultrasonic – with light level regulation and infrared (IR) reception. The system uses temperature sensors to report on and control third-party HVAC systems.

Timeclocks

A network timeclock triggers tasks and events based on the time of the day; day of the week, month, or year; or astronomical events, such as sunrise or sunset. This ensures optimal energy efficiency, user comfort and operating conditions. Timeclocks can be programmed with a variety of tasks, ranging from after-hours HVAC control to fine-tuning of sensor functionality.

Management Software (EnvisionSuite)

EnvisionProject

EnvisionProject (EP) is the programming and commissioning software package used to access to the full capabilities of the Philips Dynalite installation. It is intended for use only by users who are trained in its operation. Settings for a project are made using icon-driven menus, wizards, pre-programmed templates and adjustable settings. These can be tailored for each project, saved and replicated across other sites as needed.

EnvisionManager

EnvisionManager (EM) handles control, monitoring and maintenance of Philips Dynalite systems for facility managers. It is able to integrate seamlessly with building management systems to support the needs of a fully integrated building.

The commissioning process in EP creates a configuration file that becomes the basis for EM. This enables the commissioning engineer to focus on setting up the tailored interface to best match end-users' needs.

EM can identify luminaires approaching the end of their lamp life or that have already failed, as well as failed drivers and other faults on the system. This means that facilities management can replace DALI ballasts using EM without needing additional tools or training.

The alerts overview provides notifications and a summary of current alerts on the system with details on the state of each item. This helps building/facilities managers prioritize and address maintenance activities, both planned and unplanned.



Load Controllers

Load controllers drive the circuits that control the color of, switch, and dim lighting channels. They receive instructions from the DyNet network and adjust their controlled outputs as required. Load controllers contain all the internal components – power supply, communication ports, output drivers and microprocessor – needed to operate the connected lighting groups for which they are responsible. All channel naming information, channel addressing, logical area addressing and channel scene lighting levels are stored within the load controller. This distributed intelligence architecture ensures that there is no single point of failure and that each load controller is directly responsible for all its required functionality.

Philips Dyalite supports a range of load controllers – in DIN-rail and wall box configurations – to cater for a variety of lighting group sizes, source types and control scenarios. All load controllers communicate over DyNet.

This section contains more information about each controller type.

Relay Controllers

Relay controllers are used wherever simple on/off switching is required. Relays can switch a variety of loads, ranging from individual low-voltage lighting fixtures to warehouse/arena lighting and other load types.

Philips Dyalite relay controllers have been designed to cope with the high inrush current demands of lighting loads. Philips Dyalite also offers relay controllers that are capable of powering bi-directional motors, such as those used for blinds and curtains, and include low-voltage and dry contact interfaces for connecting to third-party devices and systems.

Phase Cut Controllers (Leading/Trailing Edge Dimming)

The Philips Dyalite range includes controllers for both leading edge (LE) and trailing-edge (TE) dimming. To ensure optimal performance, the correct control type must be properly matched to the lamp.

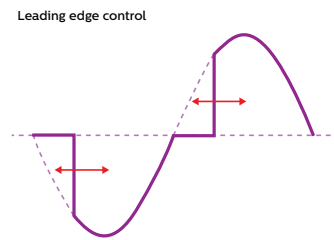
All Philips Dyalite phase cut dimmers use a range of features to reduce LED lamp flickering. Philips Dyalite prevents instability through the use of the most advanced supply parameter detection techniques, compensation algorithms and output driving electronics tuned for the modern demands of LED lighting.

Phase-cut dimming is the modification of the mains supply in order to regulate the power supplied to the lamps. This is achieved by ‘chopping out’ a varying section of each power cycle depending on the required dimming level. This method requires real-time measurement and detection of the mains supply. In order to do this, the dimmer unit must be able to accurately determine the 0 V crossover point without being affected by line noise. This is because the 0 V crossover point is what the dimmer bases its calculations on when driving the output channel.

To accommodate different lamps on the market, two types of phase-cut dimming controllers are available: leading edge and trailing edge.

Leading Edge

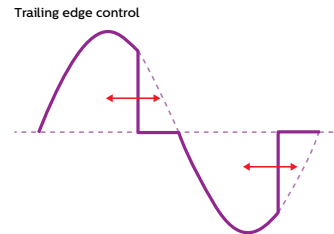
For leading-edge (forward phase) dimming, the supply is stopped from the 0 V crossover point until the power remaining in the phase is correct for the desired dimming level. At this point, the dimmer switches the supply back on and allows it to flow.



Trailing Edge

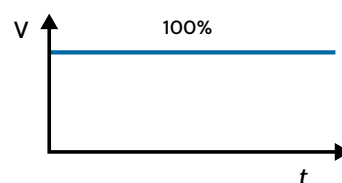
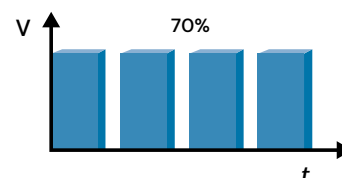
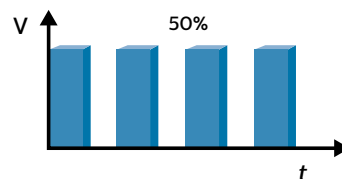
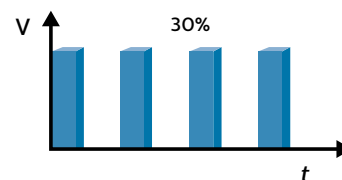
For trailing-edge (reverse phase) dimming, the supply flows through from the 0 V crossover point until the correct power is reached for the desired dimming level. At this point, the dimmer switches off the supply.

Note: Trailing edge controllers can be used on mains-voltage filament lamps and on most other electronic drivers, but not on iron core drivers. Philips Dynalite trailing-edge dimmers can detect when they are connected to highly inductive load and are designed to revert to switching mode to protect the dimmer circuit.



Pulse Width Modulation (PWM) Controllers

PWM is a dimming solution for directly driving LED fixtures and is especially suited to control of warm white/cool white and RGB color-changing applications. Philips Dynalite makes a range of controllers specifically for driving LED fixtures. All Philips Dynalite controllers are also DMX512 compatible and capable of driving sophisticated lighting displays.



Signal Controllers

Signal controllers use analog or digital signaling to control lighting drivers, which then switch or dim their lighting loads accordingly. Philips Dynalite controllers cater for a variety of signaling protocols, offering sophisticated and scalable control solutions.

Analog, 1-10 V

For 1-10 V lighting control systems, the load controller transmits a low voltage linear direct current (DC) signal. 1 V equates to 1-5% (minimal) lighting output; 10 V equates to 100% output.

All fittings on the same lighting group respond to the dimming instruction at the same time.

There is no error checking in this method. As any voltage induced on the control line is considered a correct signal by the fittings, the lamp cannot turn off completely using the control line alone. A relay can be controlled in parallel with the control signal to turn off the fittings completely.

The primary disadvantage of 1-10 V dimming is that you must separately isolate supply to each switched zone. Therefore, controllers range from 5 to 20 A per channel in both single and 3-phase supply. A dedicated power sub-circuit and a control pair connect to each zone of lighting. The controllers also provide the necessary mains switching relays as required in 1-10 V applications. De-rating must take into account inrush and operational current. For more information, refer to the installation guides for the fitting and the controller.

Another disadvantage of 1-10 V dimming is that the voltage drop on the control cable can affect the intensity of the lights.

The single pair data cable that controls 1-10 V drivers is also polarized. Accidental reversal of these cables to any single driver greatly reduces the dimming range of all connected drivers in the chain. If the chain is interrupted at any point, the fault-free side of the chain returns to full light output. There is no information fed back to the controller with this type of driver.

Digital Serial Interface (DSI)

For DSI, the load controller transmits a digital signal to the lamps. All fittings within one lighting group respond to the dimming instruction at the same time. As the signal is based on the Manchester code, which includes a discrete 'off' message, the lamps can be switched off through the control signal alone.

While this control protocol has been largely superseded by DALI, Philips Dynalite offers a variety of control solutions to support DSI lighting installations.

Digital Addressable Lighting Interface (DALI)

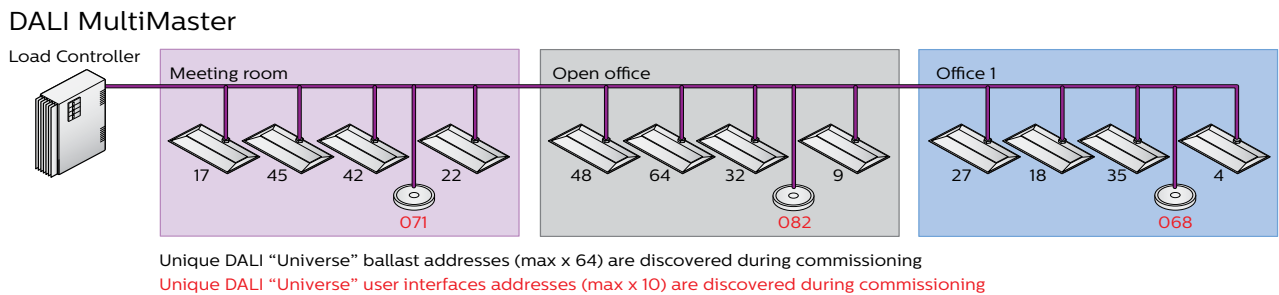
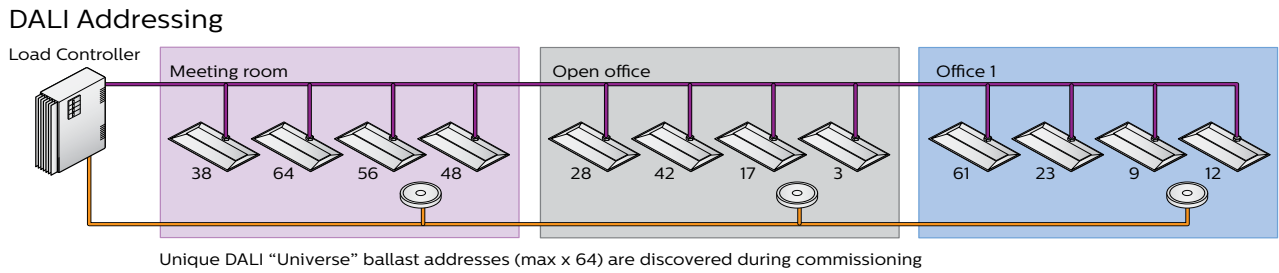
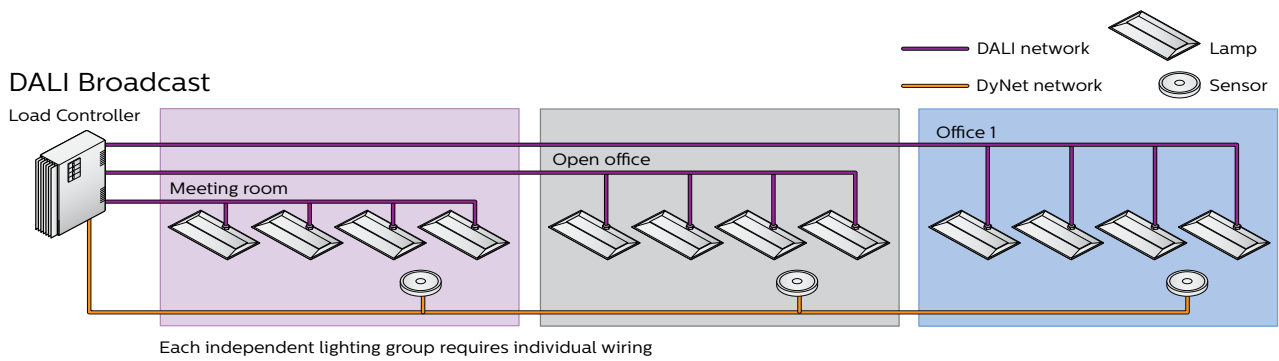
Building on the earlier DSI protocol, DALI extends the control system to each luminaire. Philips Dynalite offers a range of controllers capable of connecting DALI devices to the DyNet network, allowing full control of addressable lamps, addressable groups and broadcast groups, as well as relay-controlled power management (Green DALI) for increased energy savings.

All DALI capabilities can be accessed by our EnvisionProject commissioning software and EnvisionManager site management software, enabling detailed reporting, diagnostics and emergency lighting controls for DALI systems.

DALI distributes the control intelligence into each luminaire. This enables precise modular control when used in conjunction with appropriate Philips Dynalite systems. Each controller can communicate with a certain number of DALI 'universes,' or groups of up to 64 DALI lighting drivers. The input to these controllers is standard DyNet RS485, enabling seamless integration between the DALI devices downstream and a DyNet system upstream that could include intelligent wall-mounted control UIs, sensors and additional load controller types.

Philips Dynalite provides a MultiMaster controller that communicates to a single universe of DALI lighting drivers, sensors and UIs. This technology does not reduce the number of available DALI drivers with each additional sensor or wall mounted control UI on each bus, as it uses a different addressing method when communicating with UI devices. Refer to product data sheets for details.





DALI drivers are individually addressable, and Philips Dynalite DALI load controllers can send unique instructions about switching and luminance to each lamp, zone or universe from a single instruction. Some controllers are fully bi-directional, enabling critical status information from each luminaire to be reported to the DyNet network.

Circuit allocation and data wiring may be determined without reference to each other. The data cable is a non-polarized, two-core, mains-rated cable with a maximum network length of approximately 350 meters (1.5mm² cable).

During commissioning, up to 16 native DALI groups may be assigned. This information is stored in each DALI driver, as is the individual address, scene value and power on level. DyNet addressing can be used to create more groups, which are then mapped to specific DALI channels via the controller. Fade rates are very restricted in DALI, so they are managed by the more flexible DyNet system.

Philips Dynalite DALI load controllers can automate power supply management to the local universe by responding to the combined 'off' state of all drivers. When all lamps are dimmed to 0%, the device then electrically disconnects the active supply from the lighting group to eliminate standby power consumption by unused fixtures. This energy conservation measure can provide significant cost benefits in commercial installations where a large number of drivers are installed.

An inbuilt relay can control an external switching contactor for a multi-phase universe supply. Allow for a de-rating of at least 10%.

Load Compatibility

Load compatibility is critical when specifying lighting and corresponding control systems. This chapter deals with each of the common lamp types, associated control gear and control methods where appropriate.

Mains Voltage Incandescent Lamps (including tungsten and tungsten-halogen)

All mains voltage incandescent lamps can be dimmed using Philips Dynalite leading and trailing edge load controllers.

Use the following equation to calculate the connected load:

$$\frac{\textit{individual lamp wattage} \times \textit{lamps in group}}{\textit{supply voltage}} = \textit{running current of the group}$$

This indicates the required size of the dimming output channel miniature circuit breakers (MCBs). A 10-20% margin is suggested to avoid any possibility of ‘nuisance tripping’ of the breakers (especially in high-temperature areas). As these are primarily resistive loads, power factor remains at unity.

When specifying the current ratings of the lighting controllers, note the inrush current of cold filament lamps. This is usually in the region of 14 to 17 times the running current, but for a split second.

Philips Dynalite protected controllers are fitted with Type C MCBs. This means that in most cases it is possible to fully load the controller with no need to take account of de-rating. Philips Dynalite phase cut dimmer controllers are also fitted with a ‘soft start’ feature to protect lamps and reduce inrush currents.

Low Voltage Tungsten-Halogen, Halogen-Xenon, and Fluorescent Lamps

This category includes burner and reflector lamps, both dichroic and metal reflector types (MR11 & MR16). A wide variety of electronic driver types are commonly available. These should be selected carefully and matched to the appropriate controller type and capacity from the Philips Dynalite range. Common driver types include:

Electronic – Leading Edge Dimmable Drivers

These drivers are for low voltage lighting applications. If there are multiple drivers on a dimmed lighting group, this can initiate a substantial current spike when the circuit is switched on due to the cumulative effect of their input capacitors.

In general, leading edge (LE) driver losses are less than those of a traditional iron-core dimmer. See the “Best Practice for Dimming Low Voltage Drivers” section for additional precautions.

Electronic – Trailing Edge Dimmable Drivers

These drivers are intended for use only with trailing edge controllers. Their suitability is documented in literature provided with the driver, or they are labeled accordingly. This style of driver is typically smaller in size, making it more suitable for track-lighting applications or decorative low-voltage lamp fittings.

Electronic – Non-Dimmable Drivers

Non-dimmable drivers cannot be connected to a dimming controller unless the controller is configured for switched output only. Otherwise, damage to the driver may occur.

Electronic – DSI/DALI/1-10V Drivers

These drivers are operated in exactly the same manner as dimmable fluorescent electronic drivers. Refer to the Best Practice for Dimming Fluorescent Lighting section for more information.

Standard Iron Core, Wire-Wound

These drivers are wound onto an iron core. Toroidal drivers are popular for building into ELV downlights due to their physical shape. They are suitable for use with leading edge (LE) dimming controllers.

Best Practice for Dimming Low Voltage Drivers

Consider the following when dimming low-voltage drivers:

- Some drivers are not suitable for dimming. Please refer to the Philips Dynalite Driver Compatibility Guide under the “Technical Support” link on the Philips Dynalite website for further information.
- For effective phase control dimming, minimum loads may apply, depending on the driver type or load characteristic of the connected lighting fixtures. Lighting circuits comprising a single low voltage fitting of 20W or less may exhibit some instability for this reason. Please refer to controller data sheets or consult a Philips Dynalite representative for advice on minimum loads.

Four-wire drivers (DALI, DSI, and 1-10V) require a pair of cables for the control signal, in addition to the mains feed. You must observe local supply regulations when wiring mains and control cables, as the control terminals on the drivers or controllers are not rated as safety extra low voltage (SELV) and are not touch-safe. Never apply mains voltage to the control signal terminals or cables.

Best Practice for Dimming Fluorescent Lighting

There are many different fluorescent lamp types available. As a general rule, lamps with four pins are dimmable. Lamps with two pins and integral starters, with a domestic bayonet (BC) base, or with an Edison screw (ES) base are not dimmable. The dimming range of these lamps depends on the fluorescent driver connected to the lamp.

In new installations or when the lamps have been changed, the new lamps should be “burnt-in” by being switched on at 100% for at least 100 hours before any attempt is made to switch off or dim them. This improves the visual dimming performance and lamp life. Check with the lamp manufacturer for specific advice.

Because lamps of different types and wattages may have different dimming curves, do not mix fixtures with different lamp types on the same dimmer channel.

LED lighting

With the increasing rate of technological development on ultra-bright LED's, luminaires using these sources are becoming more common in architectural applications. There is now an extensive range of proprietary LED fixtures available in the market. Philips Dynalite LED controllers use the widely adopted pulse width modulation (PWM) technique to regulate the brightness of LED fixtures. This technique involves altering the on time duration of a clock or square wave supply to the fittings.

LED fittings generally incorporate a number of LEDs connected in a series-parallel circuit array. Make sure that you select the right kind of controller for your circuit type, particularly when you want to use dimming.

The following circuit design attributes are used to classify an LED fitting for controller selection:

- **Mode:** This relates to how LED current is controlled. Voltage mode fittings incorporate integral current limiting devices and are designed for direct connection to a nominal supply voltage. Alternatively, current mode fittings cannot limit current and therefore must be connected to a constant current supply.
- **Rated Input:** This includes nominal supply voltage and current.
- **Configuration:** This applies to multi-channel fittings (i.e. RGB) designed for color mixing applications, and designates whether the channels are internally connected as common anode or common cathode.

Philips Dynalite has developed dedicated LED controllers that cater to a wide range of fitting design types. Mains voltage LED fittings are also available.

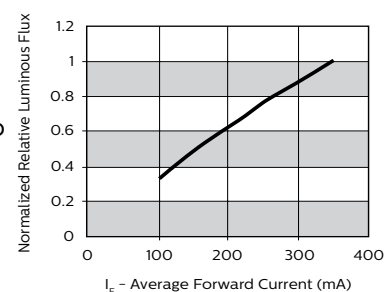
The light output level or brightness of an LED is directly proportionate to the magnitude of forward current (IF).

LEDs are designed to deliver optimum performance at their rated current. Typical nominal current ratings for LEDs used in fittings range from 20mA to 350mA. Some ultra-bright LEDs have nominal current ratings up to 1A.

The current through an LED should never exceed the device's rating. Otherwise, permanent damage may result. For this reason, take care to correctly match and configure LED controllers and fixtures.

Some mains voltage fittings include an integral regulating power supply that can produce a control input signal such as 1-10V and DALI. Philips Dynalite driver controllers may be readily used for these types of fittings in the same way as an electronically dimmable fluorescent luminaire. Mains voltage LED fittings without a control input may also be connected to a relay controller when only simple on-off control is required.

Some mains powered LED fittings are compatible with leading or trailing edge dimming technologies. Ensure that the fittings are compatible before selecting a dimmer type. Some LED fittings have a reduced dimming range and may produce a "flicker" when dimmed.



Some Philips Dynalite phase cut dimmers employ editable dimming curves to compensate for LED logarithmic dimming nature. Also a range of features reduce LED lamp flickering. To promote dimming stability, Philips Dynalite uses the most advanced supply detection techniques, compensating algorithms and output driving electronics tuned for the modern demands of LED lighting. Embedded active loads can also be used to correctly drive the dimmer output to ensure continuous smooth operation. If a unit does not support internal active load technology, an external option is available.

LED Lamp Compatibility Tables

When dimmed, LED lamps may become susceptible to a temporary or permanent flickering. Selecting the right lighting controller for the LED lamp prevents flickering. Philips Dynalite performs regular testing of its dimming controllers with Philips LED lamps and publishes the results online.

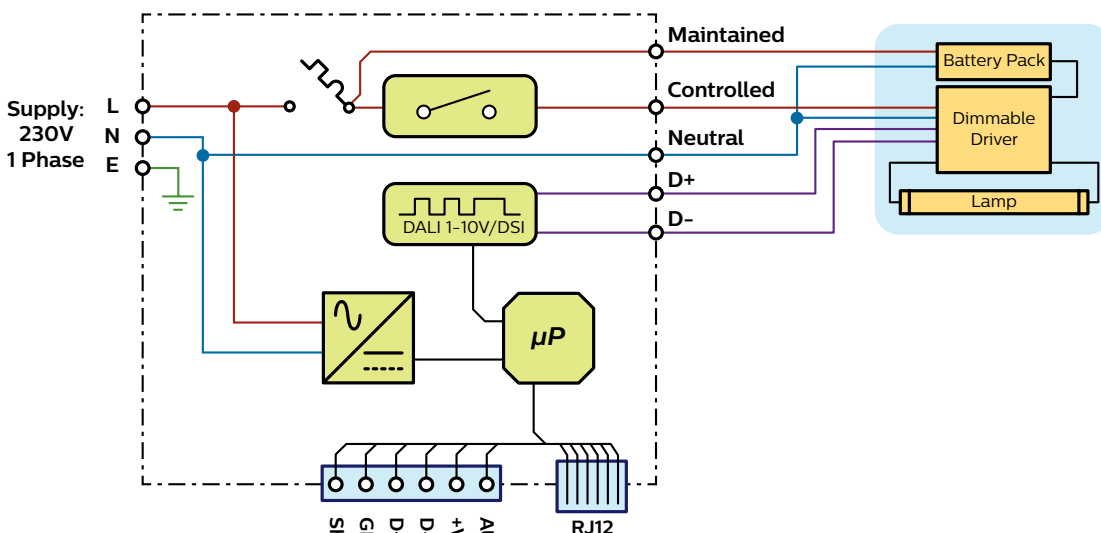
A PDF copy of the latest compatibility table is available at the link below, or by navigating to the “Technical Support / Compatibility Chart” section of the Philips Dynalite website.

<http://philips.to/1gk3OqY>

Emergency Lighting

Maintained Luminaires

An example of an exit or emergency luminaire is shown below. In this example, the lamps used for emergency lighting also operate under normal supply. The lamps used in these luminaires often have a dimmable driver, and can be controlled in the same way as a normal dimmable luminaire.



Maintained luminaires have two line inputs. The normal line input is connected to the controlled lighting output of the load controller. The maintained line input is connected to the load side of the load controller’s circuit breaker (also referred to as permanent power), which supplies power to charge the internal battery and to signal the lamp to turn on when the power is cut off. In this example, the maintained luminaire is also used for normal lighting. Its driver is dimmable, so signal control lines are shown.

DALI Emergency Reporting

DALI is the de facto industry standard for emergency lighting control and is fully catered for by the Philips Dynalite DALI controller range. The DALI emergency reporting feature in EnvisionManager and EnvisionProject allows users to schedule system tests and report the status of emergency drivers that are present on the DALI network. This feature puts the emergency drivers into a self-testing mode to confirm they operate correctly on battery power.

EnvisionManager allows users to:

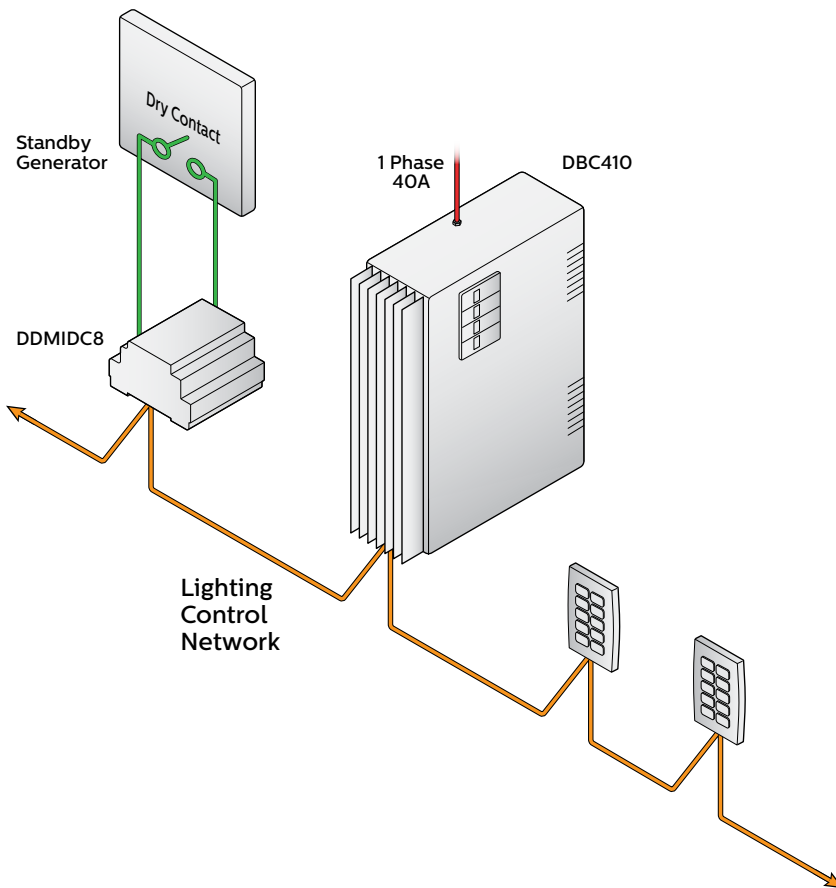
- Manage emergency fixtures
- Schedule or manually start emergency tests
- Generate emergency fixture test reports
- Query emergency test results.

Essential Supply Load Shedding

Some sites are equipped with a standby generator that starts automatically upon failure of the normal supply. After specified parameters are reached, all or part of the site is switched from the normal supply circuit to the generator output. This results in the site being re-energized 10 to 20 seconds after a normal supply failure. The standby generator is often coupled with an uninterruptible power supply (UPS), which ensures that the power doesn't drop out during the changeover period. In theory, the lighting system should operate as it would on normal supply, but in practice you may want to modify its behavior. Two common reasons for doing this are:

- The standby generator does not have the power capacity required to operate the entire site normally. In this case it is desirable to place the lighting system into a load shedding mode.
- The site should not be occupied while normal power is not available. In this case it is desirable to place the lighting system into an egress mode.

To change the operating mode, the lighting system must receive input to tell it that the generator is now online. This is typically carried out via a dry contact output that is activated when the generator is online (or sometimes via a relay that is activated when the normal supply fails), providing a dry contact signal to an input unit on the lighting control network, such as a DDMDC8 Multifunction Input Interface. Once the dry contact signal is detected, the input interface then transmits a network message along DyNet to activate the required load shedding.



Load Shed Mode

The dry contact input interface can instruct all load controllers to use a set of load shed presets instead of the normal presets. In the example below, a room has two lighting channels and a control UI that recalls four presets:

UI	Normal Presets			Load Shed Presets		
HIGH	1	CH1= 100%	CH2 = 100%	5	CH1= 60%	CH2 = 20%
MED	2	CH1= 70%	CH2 = 70%	6	CH1= 60%	CH2 = 20%
LOW	3	CH1= 40%	CH2 = 40%	7	CH1= 40%	CH2 = 20%
OFF	4	CH1= 0%	CH2 = 0%	8	CH1= 0%	CH2 = 0%

During normal operation, presets 1-4 are recalled from the control UI. In load shed mode the input interface uses a DyNet feature called 'Preset Offset', which instructs the load controllers to recall presets 5-8. This function can target a single room, a group of rooms, or the whole site. If no lights should be on in particular rooms during load shed mode, then all load shed presets are set to 0%. This method has the advantage of minimal impact on the site, as lighting levels in particular rooms are not disturbed if they are already off or at low levels.

Egress Mode

Additional requirements of the project could include locking out user interface devices such as wall mounted UIs, touchscreens, motion detectors etc., to prevent occupants from interfering with the required action and selecting a pre-defined global egress lighting preset to illuminate egress paths and reduce lighting in workspaces. This alerts occupants that something is wrong.

When normal power is restored, the input interface restores normal control functionality by sending out a follow-up network message returning the lighting control system to normal operation.

Integration

Philips Dynalite control systems integrate with third-party systems and devices – such as HVAC, security, AV, blinds and building management systems – over a variety of protocols. This feature consolidates operations for the user and empowers site managers to easily coordinate lighting and integrated services across the entire site. The following list provides an overview of the most common third-party protocols and systems.

Dry Contact/Analog

Dry contact interfaces allow low-level integration between DyNet and third-party systems for simple relay-style switching to trigger a task, event or preset.

Analog signaling (using 0-5V or 1-10V) enables a greater level of control, with up to 100 discrete voltage steps triggering required presets, dimming levels or other commands.

Input

Dry contact input can come from a variety of sources, ranging from reed switches or dedicated button keypads to third-party sensors or fire/security alarms.

Dedicated dry contact input is most commonly handled by a dry contact gateway (DPMI940), available for DyNet or DALI, which provides four fly leads for connection to multiple switches or devices. Each input can be configured to trigger a different task, event or preset. The DyNet dry contact gateway can also power and monitor compatible third-party motion sensors. This option is primarily used where Philips Dynalite sensors are not suitable, such as in exposed outdoor areas.

Philips Dynalite also includes auxiliary dry contact inputs on many of its controllers and gateways. These inputs are generally more limited in use than the dedicated gateways and require a short cable length (<10 m) to operate effectively.

Analog input is catered for by the low level input integrator (DDMIDC8), which has eight digital inputs and four analog inputs. Each digital input is hardware-configurable to dry contact or 0-24 V AC/DC, while the analog inputs can accept either 0-5 V or 0-10 V. The analog input settings are configured through EnvisionProject.

Output

Philips Dynalite provides output to third-party dry contact interfaces via relay controllers, which have eight to twelve outputs per device. These outputs can be programmed in EnvisionProject to be triggered by events on the DyNet network, such as button presses, motion sensor activation, timed events, or automated tasks.

Analog output is handled by any of Philips Dynalite's 0-10V-compatible signal dimming controllers. Since the signal is the same regardless of the receiving device, these controllers can just as easily be connected to dimmable lamps or to third-party systems. The controllers are configured in EnvisionProject to send the appropriate voltage signal as part of a preset or in response to any event on the DyNet network.

When connecting DyNet controllers to third-party devices, ensure that safety isolation requirements are met.

Further Information

While the principles behind dry contact and analog signaling are simple, the range of potential applications is huge. Contact your local Philips Representative directly to discuss a tailored solution to your specific requirements.

RS485 – Blind Control (Somfy)



Purpose

The DyNet to Somfy Gateway is configured to allow communication between the Dynalite system and Somfy blind control systems over RS485.

Description

The Somfy to DyNet gateway can connect to multiple Somfy motors to control up to 64 addresses. The addressing limit is shared between motor addresses and group addresses, so it is best practice to use less than 64 motors per gateway.

Somfy controllers can have up to eight addressable groups (also called device group nodes), which can be addressed by a single DyNet message.

Up-down motor control for each blind is mapped to DyNet channel levels. Area presets can also control motors by mapping them to intermediate positions and using the following preset overrides:

- Full motor preset – motor to 100%
- Off preset – motor to 0%
- Stop motor preset – motor stop

On the Somfy side of the gateway, each address corresponds to one Somfy motor, either a single motor or a group address representing a number of motors. Depending on the attached interface, multiple motors can be assigned to each channel so they act in unison.

Physical connections

The gateway has two RS485 ports. Port 1 is used for DyNet communications and power, while port 2 is connected to the Somfy controller (Data+/- and GND only).

Further Reading

For more information, please refer to the DyNet to Somfy Commissioning Guide, available from Philips Dynalite.

RS485 – DMX512

Description

DMX512 (also called DMX or Digital Multiplex) is a digital communication standard commonly used to control stage lighting and effects such as dimmers, fog machines and RGB lights. The use of DMX has also expanded into non-theatrical interior and architectural lighting.

DMX employs unidirectional communication when connected to DyNet. Note that when connected to DyNet via a gateway, DMX messages take priority over DyNet messages. DyNet communications resume after the DMX transmission is complete. If a DMX source is connected directly to a load controller, that load controller ignores all DyNet traffic except for panic and unpanic messages.

Purpose

The Philips Dynalite system caters for DyNet-to-DMX and DMX-to-DyNet device control using the following devices, which can be configured for DMX using EnvisionProject. Each controller or gateway can be configured to either receive or transmit DMX data.

Device	Receive (RX)	Transmit (TX)
All load/relay controllers and signal dimmers	Yes	No
DDMC-GRMSPLUS Hotel Room Controller	Yes	Yes
DNG485 / DDNG485 Network Gateway	Yes	Yes

NOTE: DMX uses significantly more bandwidth than DyNet for dimming control. For this reason it is advised to connect DMX controllers directly to a Philips Dynalite load controller wherever possible, rather than using a gateway, to minimize the impact on the DyNet network.

The GRMSPLUS and DNG/DDNG485 can also translate and transmit messages from DyNet to DMX, bringing the full power of DyNet automation and control to any device that accepts DMX commands.

Physical connections

DMX equipment employs a five-pin XLR connector, the first three of which are connected to the Dynalite device:

1. Signal Common/Ground
2. Data 1- (Primary Data Link)
3. Data 1+ (Primary Data Link)

On the GRMSPLUS, the 3-wire DMX cable is terminated to GND (SGND), D+ and D- on the dedicated 3-pole DMX port.

On standard 5- or 6-pole DyNet terminals, such as that found on the DDNG485, the same principle applies as above, with the remaining poles left unterminated (Shield, V_{cc} and Aux). See the relevant datasheet for more information on specific device terminals.

NOTE: To ensure compliance with the DMX standard when DyNet is used to transmit DMX messages, connect the ground (GND) terminal directly to the DMX cable shield with a wire link.

RS232

RS232 is an older standard for wired serial data communication, used in devices such as audio-visual and medical equipment.

Philips Dynalite offers a range of RS232 gateways for different applications. These gateways are highly versatile and can be customized for use with any standard RS232 device for which codes are available. Custom ASCII strings are configured with tasks in EnvisionProject during commissioning.

Due to the wide variety of manufacturers and products that use RS232, we take a proactive role in ensuring smooth integration with our gateway devices. For specific requirements or more information, please contact a Philips representative.

LonWorks

Description

LonWorks (also referred to as LON – Local Operating Network) is a networking platform created by Echelon Corporation for controlling the BMS and automating functions within buildings, such as lighting.

The DDNI-LON is a gateway between DyNet and LonWorks. The DDNI-LON supports preset control for 100 presets per area across up to 30 areas. Multiple gateways can be used together to accommodate larger or more complex DyNet networks.

Physical connections

The DDNI-LON is DIN rail-mounted. It connects to the LON network via twisted pair and to the DyNet network either via Ethernet (using an EnvisionGateway device) or RS232 (using a DTK-622-RS232 gateway).



BACnet

Purpose

The Philips Dynalite DDNG-BACnet-1000 is a network gateway that allows communication between a building management system (BMS) using the BACnet protocol and DyNet. This gateway between the two systems allows high-level communication, thereby opening up a number of integration opportunities.

The BACnet gateway allows the BMS to trigger tasks and time-based events in the Philips Dynalite system and enables the Philips Dynalite system to report back current system status.



Physical connections

The BACnet gateway can be wall- or DIN-rail-mounted. It connects to the BMS via Ethernet and to the DyNet network either via Ethernet (using an EnvisionGateway device) or RS232 (using a DTK-622-RS232 gateway).

Data Points

A data point (also referred to as a 'control point' in BACnet literature) is any single metric controlled or reported on from DyNet.

Function	Point Type	Read/Write	Points
Preset control	Logical	R/W	1 point per area
Preset Active	Logical	R/W	1 point per Preset
Fade Control	Logical	R/W	1 point per Preset
Channel Level control	Logical	R/W	1 point per channel in an area
Absolute HVAC temperature control	Logical	R/W	2 points per area (setpoint and actual temperature)
Relative HVAC temperature control	Logical	R/W	2 points per area (setpoint up/down and setpoint accumulated nudge)
Sensor light control	Physical	R	1 point per sensor in an area
DALI Ballast Status	Physical	R	1 point per ballast in an area

The BACnet gateway supports up to 1000 BACnet-addressable data points. Installations with more than 1000 points can use multiple gateways. Philips Dynalite can also supply a licensed DyNet/JACE driver to enable communication between DyNet and third-party SoftJACE server platforms.

For DALI installations where each luminaire must be controlled separately, reserve four data points per DALI luminaire, allowing for a maximum of 250 DALI drivers per 1000-point gateway when using both channel level and ballast status functions.

For non-DALI lighting, only one data point is required per area for preset control and one data point per channel for channel-level control.

Further Reading

Further information on BACnet integration can be found in the BACnet Gateway Commissioning Guide, available from Philips Dynalite.

TCP/IP (EnvisionGateway)

Purpose

The Philips Dynalite EnvisionGateway is a DIN-rail mounted Ethernet gateway that enables the integration of the Dynalite system to IP-based systems.

Physical Connections

The EnvisionGateway connects to DyNet over RS485 via its RJ12 socket or terminal strip, and to Ethernet via an RJ45 socket.

Trunk and spur topology

In a typical application, such as a high-rise office building, each floor will have its own Philips Dynalite system operating independently, referred to as a spur. On each of these floors, the network uses DyNet RS485

for communication between devices. To coordinate the different floor systems, each of the spurs can be linked together via Ethernet using EnvisionGateways. A high speed Ethernet trunk is run between the floors of the building, allowing for site-wide commands to be sent from anywhere in the system.

The trunk and spur model also caters for applications where the distance between Philips Dynalite devices exceeds the RS485 network limit, such as interconnecting separate buildings or linking control centers in a tunnel. These distances can be overcome by running fiber-optic cables between the sites and connecting them via Ethernet gateways.

Control Interfaces

The EnvisionGateway features an inbuilt web server, providing remote control of a site via a configurable web interface or with the EnvisionTouch/DynamicTouch apps. The remote control functionality can be used from external locations by making the gateway visible on the network. The system can be locally controlled using iOS and Android devices.

EnvisionSuite connectivity

While a PC running EnvisionProject and/or EnvisionManager can connect directly to DyNet via a USB gateway, using an Ethernet gateway enables access from anywhere on the local network, or even from a remote location via the internet or a VPN connection.

EnvisionManager can use distributed client software such as EnvisionSwitch, which provides occupants of an open plan office with control over their local environment using their PCs. It uses the existing LAN to communicate with the EnvisionManager server. When used for occupancy detection, it provides additional cost benefits by cutting the need for extra physical sensors or control UIs and reducing unnecessary lighting and HVAC operation.

Third-party integration

EnvisionGateway connect DyNet to a BMS that uses an Ethernet physical layer. However, specific implementations vary. If your BMS or protocol is not mentioned in this document, contact your local Philips representative for further information.

Further reading

Further information on the EnvisionGateway can be found in the EnvisionGateway Commissioning Guide, available from Philips Dynalite.

OPC (Open Productivity & Connectivity)

Description

OPC refers to a collection of standards maintained by the OPC Foundation for open connectivity of industrial automation devices and systems. OPC standards are used in a variety of applications, including real-time data access, alarm and event monitoring, and historical data access.

Philips Dynalite supports the OPC Data Access and OPC Alarms & Events datasets for connection between EnvisionManager and compatible building management systems or OPC clients on the same network. This connection is handled via an OPC proxy server, which can be selected in the EnvisionManager installer.



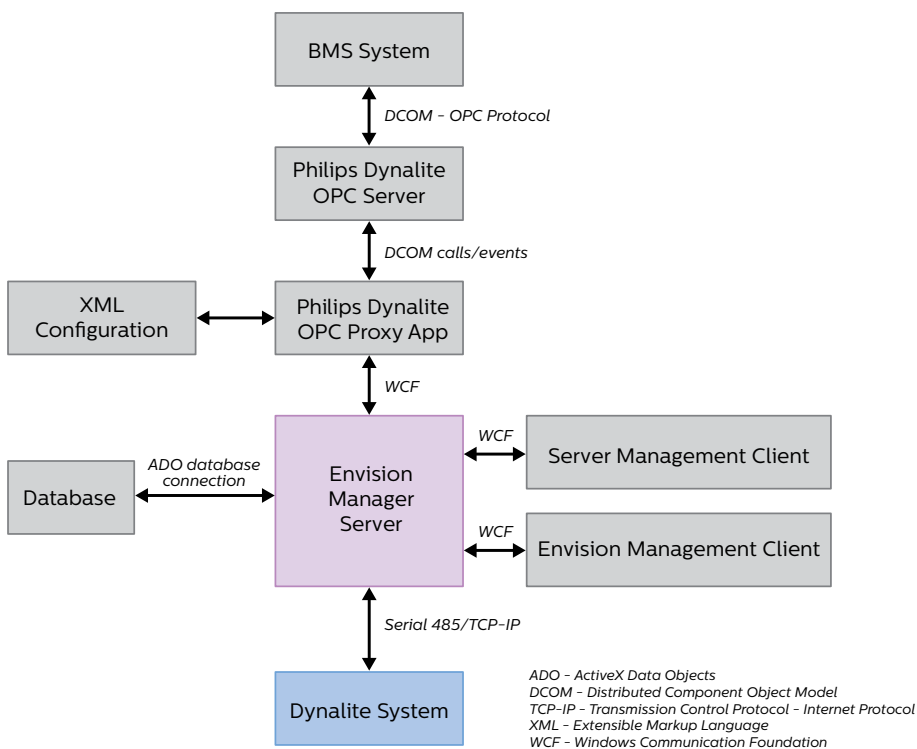
Purpose

The OPC proxy server allows a client to remotely change the preset for an area in EM, and to report on the following metrics:

- Current Preset
- Device Online/Offline
- Lux Level
- DALI Driver Status
- DALI Lamp Status
- Lamp Runtime
- Lamp Name
- Device Offline Alarm
- Driver Status Alarm
- Lamp Status Alarm

Communication model

The diagram below shows the interaction between the Dynalite system, EnvisionManager, the OPC server and proxy application, and the external BMS.



Limitations

Note that DALI MultiMaster user interface devices (sensors and dry contact switches) are not supported by the EnvisionManager OPC proxy server and are not visible to the OPC client or building management system (BMS).

Further Reading

More information on OPC integration can be found in the EnvisionManager OPC Proxy Server Commissioning Guide, available from Philips Dynalite.

Infrared

Infrared reception

Philips Dynalite sensors can be used to receive infrared (IR) signals. The DTK500 hand-held remote control can send IR codes that are received by the sensors and translated into DyNet messages. These DyNet messages can then recall a lighting scene or trigger a complex task. They can also be translated into other formats via network gateways to control third-party devices.

Infrared transmission

The DIR-TX8 IR transmitter is an 8-channel device commonly used to integrate equipment with an IR port, such as AV controllers and air conditioners, with the DyNet network. These IR transmissions can be triggered from any Philips Dynalite user interface, such as a control UI or a motion sensor. The inbuilt task engine enables multiple IR codes to be transmitted at once.

The IR transmitter uses up to four 2-channel IR emitter LEDs. Each LED is affixed to the IR window of a receiving device. Each emitter includes two IR LEDs, connected to a two-meter lead and terminated with a 3.5mm plug, which is plugged into the IR transmitter. Multiple channels allow the IR transmitter to send individual codes on each channel, which eliminates problems where different components share the same code. The IR transmitter can record and store macros that are executed in response to DyNet messages on the RS485 network.

More Information

You can load IR code data into a sensor using EnvisionProject. Most manufacturers' IR codes are freely available from Remote Central:

- www.remotecentral.com/cgi-bin/codes/

Alternatively, contact your local Philips Representative directly to discuss your specific requirements for IR integration.

KNX

Description

KNX is an open standard protocol for intelligent buildings, developed in Europe in the late 20th century. The KNX standard is supported by a large network of contractors, planners, integrators, and manufacturers around the world, and it caters for a variety of different device types. The Philips Dynalite system is compatible with KNX devices from Philips and third-party manufacturers, and devices from different manufacturers can be used in the same network.

Purpose

The DDNG-KNX gateway connects the Philips Dynalite system to a KNX system so that the systems can control each other. For example, a Dynalite system installed in a building can control multiple niche KNX applications or connect to a KNX-based building management system (BMS).

The gateway maps control commands and sensor data between the KNX and DyNet protocols and can be commissioned without the need for the KNX Association's ETS commissioning software.



Physical connections

The gateway connects to DyNet for power and data via its RS485 port, and to the KNX network over twisted pair via its KNX port.

The gateway also includes an auxiliary dry contact input switch that can be configured to perform a function on either the DyNet or KNX network.

Available datapoint types (DPTs)

The following DPTs can be mapped between the Dynalite and KNX systems:

- • 1.004 (1) – Ramp
- • 1.010 (1) – Start/Stop
- • 2.004 (2) – Ramp Control
- • 3.007 (4) – Control Dimming
- • 5.001 (8) – Scaling
- • 17.001 (8) – Scene Number
- • 7.005 (2) – Time Period in second
- • 9.001 (2) – Temperature
- • 9.005 (2) – Speed
- • 9.007 (2) – Humidity
- • 9.021 (2) – Current
- • 10.001 (2) – Time
- • 19.001 (2) – Date and Time
- • 1.003 (1) – Enable/Disable
- • 1.007 (1) – Step
- • 1.022 (1) – Scene AB
- • 2.007 (2) – Step Control
- • 3.008 (4) – Control Blinds
- • 5.004 (8) – Percent
- • 18.001 (8) – Scene Control
- • 7.007 (2) – Time Period in hour
- • 9.004 (2) – Light Level
- • 9.006 (2) – Pressure
- • 9.020 (2) – Voltage
- • 9.024 (2) – Power
- • 11.001 (2) – Date

Commissioning requirements

There are a few important points to consider before attempting Dynalite/KNX integration:

- All KNX devices (except for the DDNG-KNX gateway) must be configured using the KNX Association's ETS commissioning application. However, the DDNG-KNX gateway does require ETS to set an individual address.
- KNX group addresses, data types and commands/messages must be known in order to map them to their DyNet equivalent. Due to the complexity of KNX addressing and commissioning, you should keep detailed records of each KNX device's configuration.

Further Reading

Detailed information on the DDNG-KNX and general DyNet/KNX integration can be found in the KNX Gateway Commissioning Guide, available from Philips Dynalite.



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