



LED lighting is becoming more widely used and are set to become the dominant light source of the future.

All LED lamps need an associated driver unit to limit the current driving the LED. Some newer lamps integrate the driver into the base of the lamp but many use a separate driver unit. There are two types of LED drivers;

1) Constant current, generally used for high wattage LEDs where the LEDs are wired in series.

2) Constant voltage where low wattage LEDs are wired in parallel.

The following list shows the different control options available from Rako.

1. Constant current single channel.
2. Constant current three channel.
3. Constant voltage single channel.
4. Constant voltage three/four channel.
5. 0-10v/DSI/DLI (for drivers requiring a control signal).
6. DMX (for drivers requiring a DMX control input).
7. Mains dimmed.
8. Non dimmed switching
9. Mains dimmed low voltage MR16 lamps.

With modules designed for 3 colour LEDs the raise/lower buttons act as cycle start/stop buttons controlling a scrolling cycle through the 4 colours assigned to each of the scene buttons.

**CONTROL METHOD 1** - Rako's wireless constant current RLED45CC1 module is fed from a power supply adequate for the required forward voltage and power (max 48V and 45W). The RLED45CC1 has selectable current outputs to suit the LEDs being controlled.

Options – 350mA, 500mA, 600mA, 700mA and 1000mA

Up to 45V forward voltage and 45w power.

**CONTROL METHOD 2** - Rako's constant current 3 channel 20w/channel driver is designed to control 3 colour RGB LED fittings.

The module works in conjunction with a DC power supply between 12-48v and up to 60w.

The different colours are wired in series to a maximum of 12 and not exceeding 12w on any one channel.

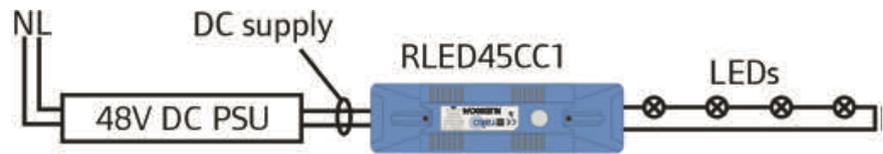
**CONTROL METHOD 3** - Dimming constant voltage single channel

up to:

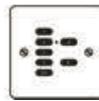
150W @ 12V or

300W @24V

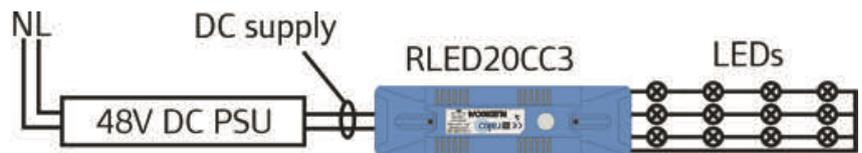
Light fittings using constant voltage LEDs generally use a standard DC power supply. These power supplies have a fixed output and Rako's RLED receiver fits between the power supply and the LEDs.



Single channel constant current 45W LED dimmer



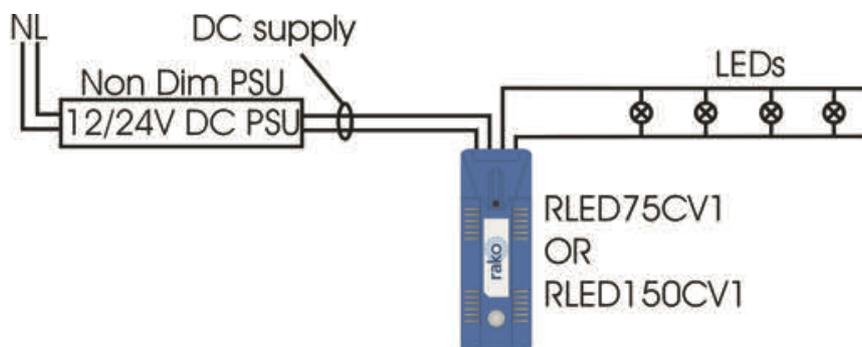
Controlled from Rako wireless panel or wired system via Rako Bridge



3 channel RGB constant current 20w/channel LED dimmer



Controlled from Rako wireless panel or wired system via Rako Bridge



**CONTROL METHOD 4** - Dimming constant voltage 3 or 4 channel fittings up to

30W per channel @ 12V or

60W per channel @ 24V

This version is the same as control method 3 but designed to control 3 colour RGB or 4 colour RGBW fittings

Note: Slave modules are available for use when loadings exceed the capacity of one RLED30CV4 module. Slaves should be used in preference to multiple RLED30CV4 modules to keep colour cycling effects in sync.

**CONTROL METHOD 5** - Dimming drivers requiring control signal.

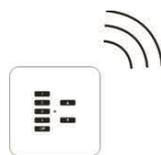
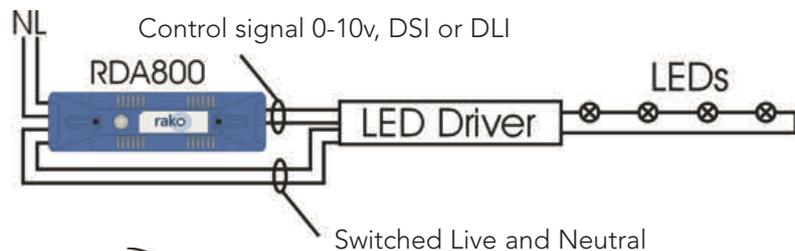
A number of LED drivers can be dimmed via a control signal, either 0-10V analogue or DSI/DLI. In addition to the mains wiring a control pair is required between controller and driver. Each output on a RAK-4F or RDA800 can be selected to provide any of the three options.



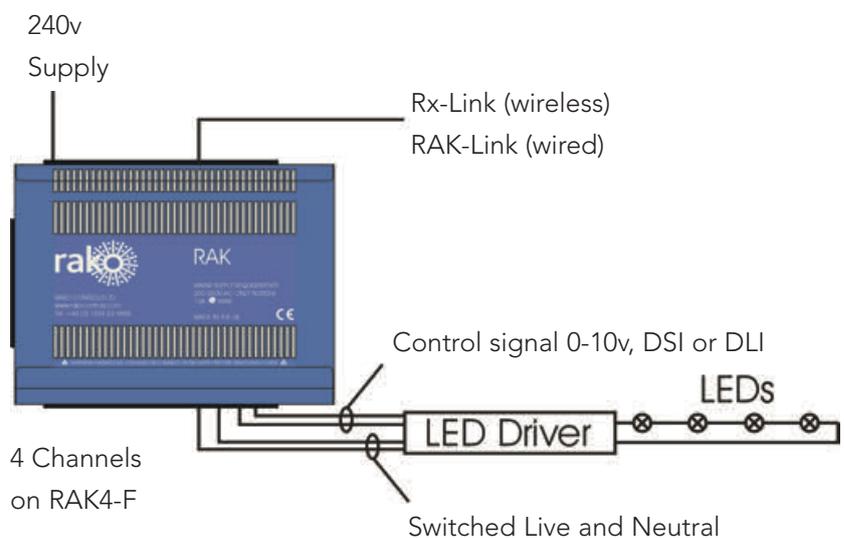
3 or 4 channel RGB constant voltage 30w/channel LED dimmer



Controlled from Rako wireless panel or wired system via Rako Bridge

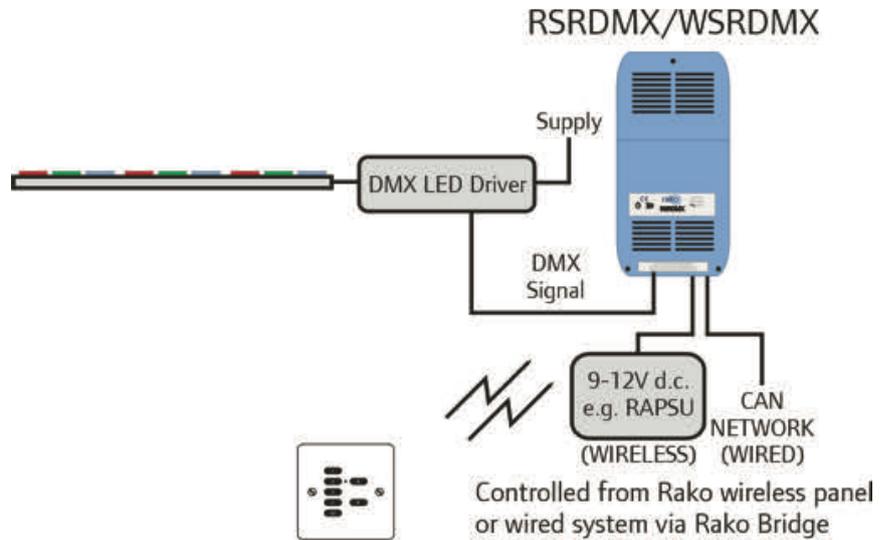


Controlled from Rako wireless panel or wired system via Rako bridge



### CONTROL METHOD 6 - DMX controlling DMX LED driver.

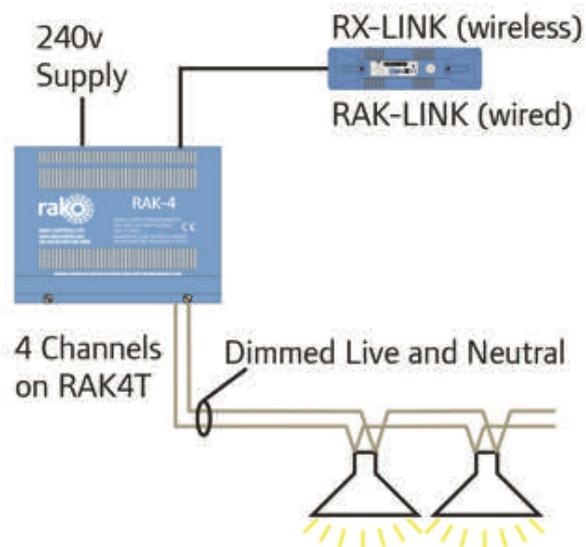
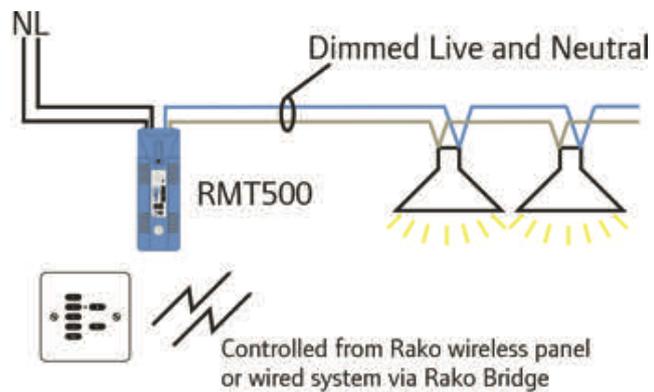
Many fittings with three colour LEDs use a driver that requires theatrical control method called DMX. Rako's RSRDMX (wireless) or WSRDMX (wired) units control up to 16 channels of DMX.



### CONTROL METHOD 7 - Mains dimming.

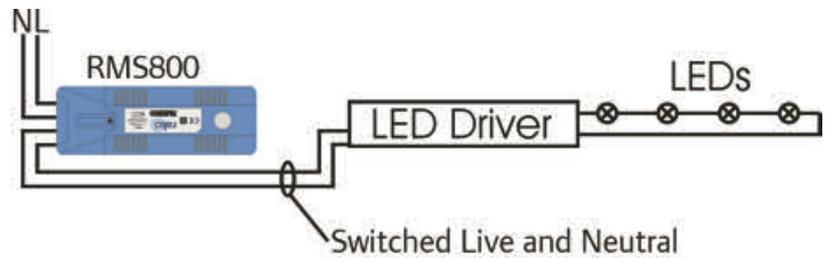
LED fittings designed to work from conventional mains dimming (typically GU10 type) can be controlled using Rako dimmer modules. In the majority of cases these lamps perform better using trailing edge dimmers such as the RMT500, RMT1200 and RAK4T dimmers. There are a small number of these lamp types that perform better when dimmed with leading edge dimmers such as the RML series dimmers or RAK4L. The performance of this style of lamp varies considerably, both depending on the manufacturer and wattage. Rako tests any lamps sent as samples and the results are documented on our dedicated website: [leds.rakocontrols.com](http://leds.rakocontrols.com)

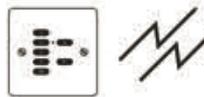
It should be noted that due to the way in which these LED lamps take their power during the mains cycle many require a significant de-rating factor to be applied when calculating a suitably sized dimmer. In some cases these may be as high as 10x (i.e. 500w dimmer rating 50w of nominal lamp load).

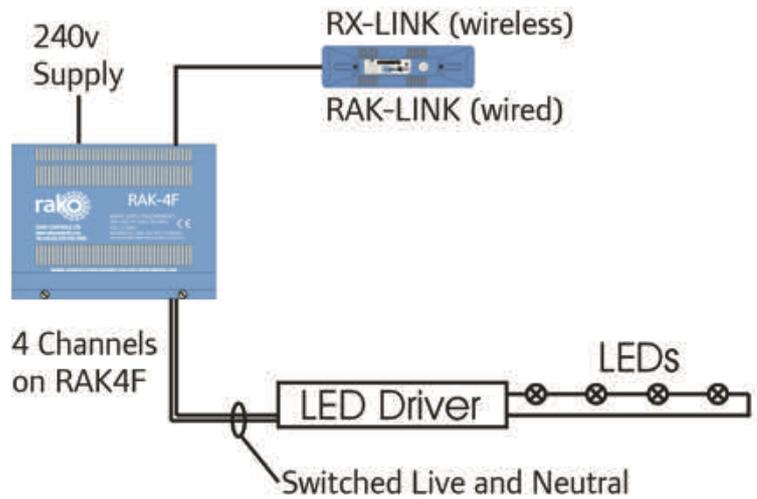


**CONTROL METHOD 8** - Non dimmed Switching.

LED fittings that have a non-dimmable driver can be controlled using Rako's RMS800 module or RAK4-T and RAK4-F rack options.



 Controlled from Rako wireless panel or wired system via Rako Bridge



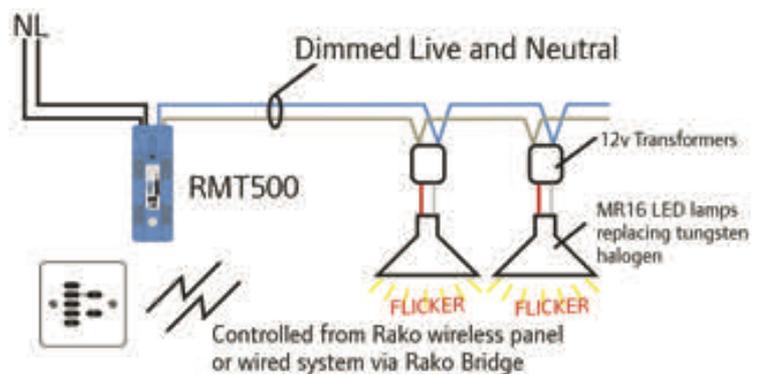
### CONTROL METHOD 9

There are two options for dimming MR16 LED lamps, which are primarily designed for replacing halogen spotlights. These lamps are designed to work with low voltage lighting transformers. Transformers designed for halogen lighting however have varying requirements for acceptable dimming, such as having minimum loadings, which are not always suitable for the low loads of LEDs. As the transformer adds another variable into the equation this method often gives poor results and is not recommended.

Method One – Mains dimmed low voltage MR16 LEDs (Not recommended)

Method Two – PWM (Pulse Width Modulation) dimming using a RAKO RLED150CV1 (Recommended). This method involves removing the original lighting transformers and directly dimming the lamps from an RLED75CV1 module. This module requires a 12V DC power supply (such as a standard Constant Voltage power supply) of an adequate power rating to be fitted in the circuit before the RLED75CV1 module, as in the diagram.

Dimming MR16 LED lamps replacing tungsten halogen with transformers (NOT RECOMMENDED as lamp transformer compatibility is too uncertain)



Alternative (RECOMMENDED) dimming MR16 LED lamps with 1 x LED Constant Voltage 12v DC Driver

