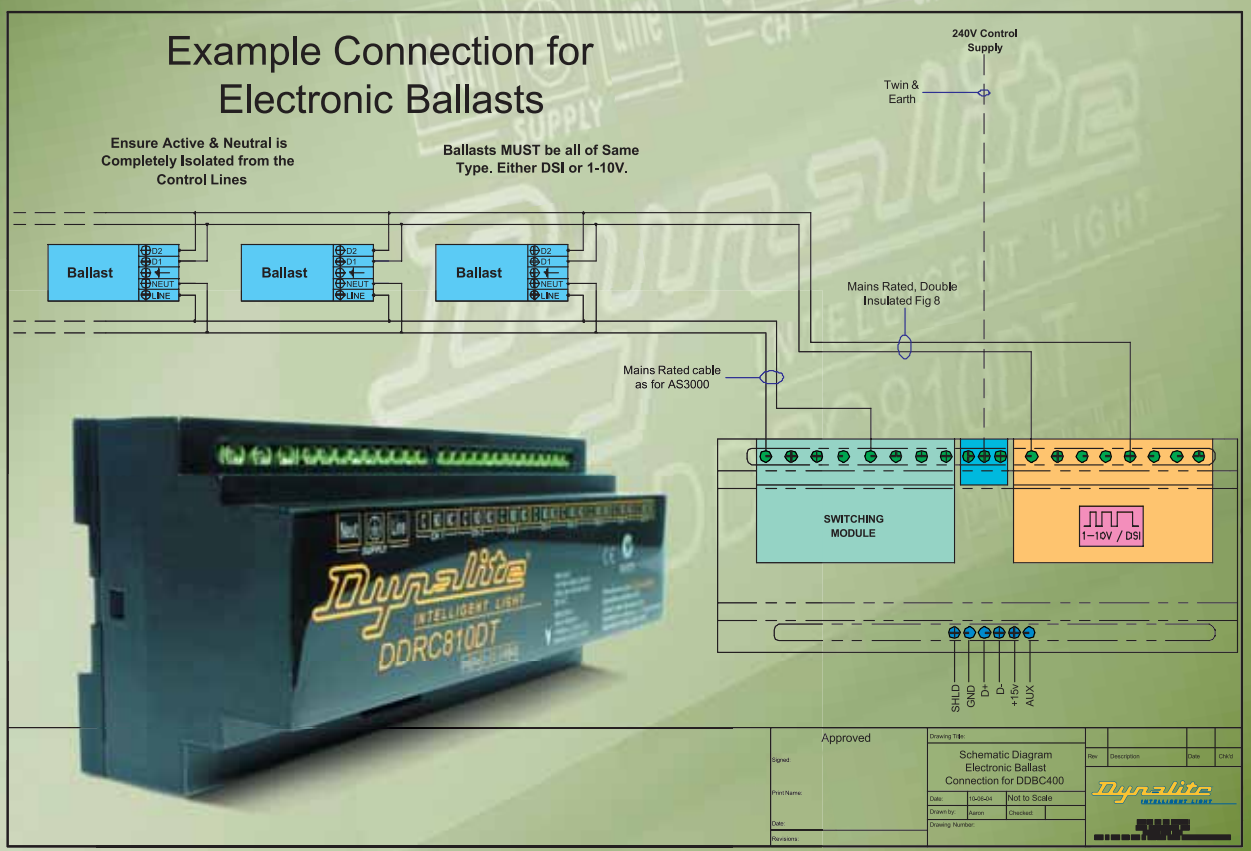
ASK HARRY



Dimming 101

Turning down the lights might seem fairly basic but there are some important considerations in choosing a system. **Harry Simidis** explains.

Generally there are three mainstream types of fluorescent dimming technologies.

These are the legacy analogue 1-10V, the proprietary Tridonic digital signal interface (DSI) and the most recent 'open' digital addressable lighting interface (DALI).

In addition, there are local area type dimming technologies such as SwitchDim from Tridonic and SlimDim from Concord Lighting.

The purpose of this article is to clarify the differences between these technologies and not to necessarily promote one over the other. No doubt there will be more dimming technologies not mentioned here.

The above dimming technologies are explained with reference to their use with lighting control systems such as Dynalite, C-Bus and iCONTROL.

As the name suggests, the first method of dimming fluorescent lamps uses an analogue voltage between 1V and 10V DC to control the light output of a dimmable ballast from zero to 100%.

Each group of ballasts to be dimmed together must be connected in parallel to a pair of control wires, in addition to the mains supply. The control wires carry the analogue signal for that group.

Controlling such ballasts means not only sending the 1V DC analogue signal down the control line but also isolating the power to that group of ballasts.

Hence, each 1-10V fluorescent group must

be wired for extra low voltage connection through a mains-rated 'figure eight' style wire, in addition to power cables that supply the mains current for operation.

It is necessary to use mains-rated figure eight signal wire, as the dimming ballasts usually have functional rather than physical isolation from mains (ie: non-optical isolation).

It's important to mention at this point that the other analogue technology is 0-10V, which represents zero to 100% light output. However, this is used more in the controls space, whereas 1-10V is used in lighting control.

Attention must be given to selection of suitable ballasts and compatible dimmer/ballast controllers. Figure 1 illustrates the wiring for this type of dimming, using a typical ballast controller.

It shows separate connections for extra low voltage and mains wiring. The lighting control system is then made to open the designated relay channel for that 1-10V group when the 0V signal is sent.

In this particular example, the necessary relay channel and signal channel reside on the same controller. Although extremely useful this is not mandatory, as the relay channel could reside anywhere on the system.

The DSI protocol was created in 1991 by the Austrian company Tridonic ATCO and is based on an eight-bit asynchronous serial command string transmitted at 1200bps. The protocol uses a single byte to communicate the lighting level (0-255) and could be considered as the precursor to DALI.

The wiring for DSI is similar to that for 1-10V, the difference being the non-requirement for power isolation to the ballast group being controlled, as a level of 0 will turn the lamp off. Some DSI ballasts can consume standby power as high as 7VAR.

In a residential application, this total standby power consumption is negligible. However, in a commercial installation with many hundreds of such ballasts, the standby power consumption can be substantial, and a dedicated relay power isolation channel (as in the 1-10V instance) is advisable.

Hence, the wiring for DSI ballasts would look identical to the accompanying diagram with the option of the included relay channel. Each DSI ballast in the installation must still be connected to mains power.

DALI is an open protocol developed as a successor to DSI. By definition, each DALI network, or 'universe', can have up to 64 addressable DALI ballasts, sensors or other DALI-based components.

The network transmission speed is the same as DSI, at 1200bps. The primary advantage of DALI above all other fluorescent dimming technologies is its ability to address individual ballasts on the same universe.

DALI allows for only 64 ballasts per universe, but larger networks are realised

	1-10V	DSI	DALI
Cost	Least expensive dimming ballasts	Slightly more expensive than 1-10V dimming ballasts	More expensive than DSI ballasts
Protocol	Analogue	Digital	Digital
Communication	One way	One way (although the spec does allow for ballast failure status feedback)	Two way
Wiring	One signal pair required for each stand-alone fluorescent group along with a dedicated relay channel for power isolation	One signal pair required, energy management relay channel recommended on larger installations	One signal pair required for up to 64 ballasts, energy management relay channel recommended on larger installations
Addressing	All ballasts connected to the one signal pair are controlled as a single group	All ballasts connected to the one signal pair are controlled as a single group	Each ballast connected to the same universe is individually addressable
Ballast replacement	Simple	Simple	Simple – with right lighting control system gateway and software

"Information should be obtained from your lighting control system vendor or control systems consultant, before deciding on the best protocol for the application in question," says Control Freq director Harry Simidis.

through gateways. Examples of gateways are the Dynalite DDBC320-DALI (with built-in energy management relays) and the winDIM@net system by Tridonic, using the Beckoff IP-DALI gateway.

Again, the standby current consumed by these ballasts is worthy of attention when there are many hundreds of them, if not thousands. The more environment friendly control system gateways incorporate energy management relays for complete power isolation when the lights are all off.

Another powerful feature of DALI is its ability for two-way communication between DALI components and gateway or controller.

This feedback includes such invaluable information as ballast run-time and operating status. A good lighting control system will implement these facilities and allow access to this information through the gateway.

There are many reasons to implement DALI using a broader lighting control system.

One of the main benefits is the easier maintenance of DALI ballasts and their replacement when necessary. Ordinarily, you can't just replace a DALI ballast as you would a DSI or 1-10V dimmable ballast, because the new ballast needs to have the identical 'short address' of the one it's replacing.

Unless stringent records and documentation are maintained, this can become quite a severe problem in very large installations over the normal course of ballast operation. Good lighting control systems allow the operator to auto-enumerate the universe on ballast replacement, making the process easier.

In summary, the table below shows the main features of each protocol as a comparison. More information should be obtained from your lighting control system vendor or control systems consultant, before deciding on the best protocol for the application in question. ■

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