

Digital and Open

Moving Lighting Controls into the 21st Century

We moved into the 21st Century over 17 years ago. We can ask “Alexa” to play us songs, lock the doors and order pizza. Everywhere you go people are talking about “the Internet of Things”. You carry a computer in your pocket more powerful than the computers that sent people to the moon! So why are we still clinging to analog, 20th Century technology when it comes to lighting?

I often hear people defend the use of 0-10v systems with phrases like: “It’s proven technology, it’s rock solid and it works!” And all of that is true, just as all of that was true for the car I drove in High School a gold, ‘73 Plymouth Valiant. Sure it only had an AM radio, no A/C and did I mention it was gold? But it started every morning and got me where I needed to go. But do I still drive it?

In the course of my lifetime we’ve moved from an analog world to a digital world. The move from analog lighting to digital lighting is through DALI.

What is DALI?

DALI (Digital Addressable Lighting Interface) is a communication standard designed specifically for lighting. DALI defines how each component in a lighting control system communicates. DALI is also an “Open” standard. Why is that important? As an open standard any manufacturer can create devices that communicate using DALI. For example a DALI driver from one manufacturer will work with control stations, sensors, etc. from any other manufacturer using DALI.

Why is DALI not more common in the North America?

Well actually it’s very common! But first you need to understand how the lighting control industry evolved here in North America versus how it evolved in Europe.

The giants got the wheels turning

In the ‘90’s there was no requirement for lighting control for energy savings. Installation of lighting controls in commercial buildings was based on common sense not code compliance. At that time the leader in lighting controls in North America was GE and the leader in Europe was Phillips. During that time GE had their very successful TLC system based on their rock solid RR7 relay. Pretty soon everyone was coming out with a relay panel based system. From small start ups like LC&D and PCI to established dimming companies like Lutron.

Meanwhile in Europe, Phillips along with several other European manufactures formed Activity Group DALI a consortium to develop a standard communication protocol for lighting controls.

So in North America, companies were busy trying to develop unique systems and technologies in an attempt to out do their competitors. In Europe they were busy collaborating on the development of a common standard. Was one approach better than the other? Not necessarily. Some great technology and great systems came out of both approaches.

Into the Present

Energy codes are in place, utility incentives towards green technology are abundant and the strive towards LEED certification has created the demand for smarter, more flexible buildings that can not only be optimized for today's tenet but reconfigured on the fly for tomorrows.

While 0-10v may have gotten you to a LEED Silver certificate 5 years ago, it isn't going to help you reconfigure the building for the tenet moving in tomorrow.

Back to the Future

Lighting control manufacturers have recognized the trends and have realized that they need to develop more up to date digital systems. There seemed to be two choices, adopt DALI or create their own proprietary protocol. But old habits die hard! The urge to create proprietary systems is strong and the idea of locking a building owner in with your product is compelling. So while some companies developed advanced communication protocols from scratch others found an easier way; start with DALI and then tweak it so that it only works with their components. Thankfully there were also some manufacturers here in North America that did choose to use the unaltered DALI protocol for their systems.

So today DALI is in use in systems all over North America. Some use the true open protocol other are using a proprietary version but underneath it all it's still DALI.

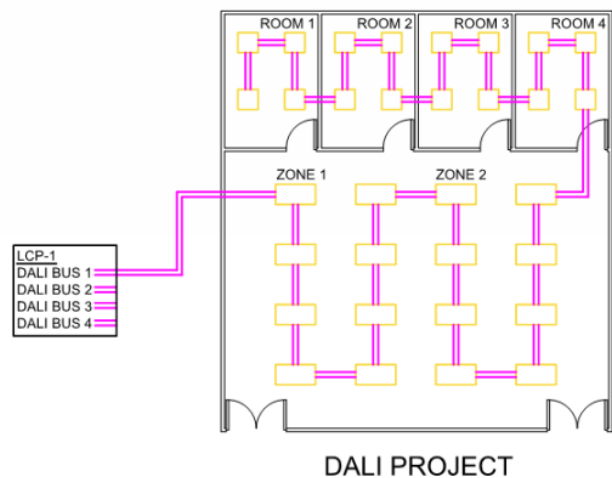
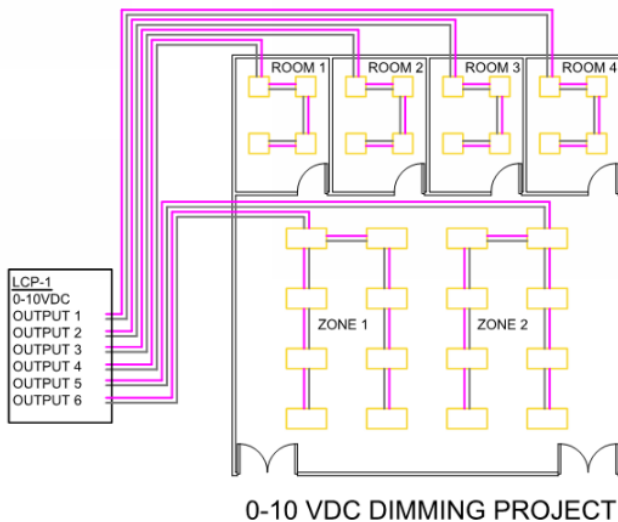
Advantages of DALI over 0-10v

Installation and Wiring

Installation of a 0-10v based system is easy! You run two wires from the sensor, switch or panel outputting the 0-10v signal and then just daisy-chain them from fixture to fixture. Easy!

But believe it or not installing a DALI based system is even easier! You still just use two wires and you still daisy-chain them from fixture to fixture. But unlike 0-10v you can land either wire on either input on the driver. With 0-10v you have to make sure you land the same color wire on the same input on each and every fixture. Cross a wire and at best the system won't work and you'll have to spend extra time going back to every fixture until you find the mistake. At worst you end up replacing multiple fixtures!

If you are designing a system with more than one zone, the 0-10v system can actually be up to 60% more expensive based on the need for additional wire, conduit and 0-10v output devices.



Intelligence and Communication

0-10v based systems send one-way analog signals to the fixtures they control. The signal sent is simply a change in voltage from 0 to 10 volts. The problem starts with how each driver interrupts that signal. You could have two seemingly identical LED fixtures but with drivers produced by different manufacturers. What 2 volts means to driver A could be something totally different than what it means to driver B. One driver may go all the way to off at 0 volts while another may only dim down to 10%. If you have multiple fixture types and want all of them to dim to 50% you may have to send different 0-10v values to each type of fixture.

DALI systems send a digital commands that tells the fixture to dim to an exact percentage. DALI fixtures from different manufacturers can all be grouped together and they will all dim to exactly 50%.

In addition, because each fixture in a DALI system has a unique address you can segment out any of the fixtures that are part of the daisy-chain group and have them dim to different levels. With 0-10v every fixture in the group will receive the same command.

With DALI you get two way communication between devices. A DALI fixture will not only receive a command to dim but it can also send a conformation that it received the command and a conformation that it successfully executed the command. In addition the fixture can also report run time and report if there is any kind of failure in the fixture.

List of Advantages over 0-10V

- Simple wiring of control lines (no group formation, no polarity)
- Control of individual units (individual addressing) or groups (group addressing) is possible
- A simultaneous control of all units is possible at any time (built-in initial operation function) through broadcast addressing)
- No interference of data communication is to be expected due to the simple data structure
- Running power and signal in the same conduit is allowed
- Control device status messages (lamp fault,), (report options: all / by group / by unit)
- Automatic search of control devices
- Simple formation of groups through “flashing“ lamps
- Automatic and simultaneous dimming of all units when selecting a scene
- Logarithmic dimming behavior – matching the eye’s sensitivity
- System with assigned intelligence (every unit contains among other things the following data: individual address, group assignment, lighting scene values, fading time,)
- Operational tolerances of lamps can be stored as default values (for example for the purpose of energy savings maximum values can be set)
- Fading: adjustment of dimming speed
- Identification of unit type
- Options for emergency lighting can be chosen (selection of specific ballasts, dimming level)
- No need to switch on/off the external relay for the mains voltage (this is done by internal electronic components)

Conclusion

DALI is a globally accepted, open, digital communication protocol specifically designed for lighting. As we move into the age of the Internet of Things, embracing open communication standards will be vital to any companies success.

The age of analog and restrictive proprietary protocols is coming to an end. Open standards like DALI even the playing field, allow building owners to select the most optimal components for their needs and do not lock them in to a single vendor. The use of common communication protocols forces companies to be more innovative when it comes to product design and it puts a greater emphasis on design assistance and customer support.