help desk

DALI: Trials & Tribulations | By Wayne Howell

Ten years ago, DALI was not a lighting control protocol that regularly came up on my radar. DMX512 was king and DALI was perceived as a cheap solution for switching fluorescent lamps.

Today, my company, Artistic Licence, ships the same quantity of DMX512 and DALI infrastructure products. So what changed? The answer can be simply put as 'convergence'. We have seen the commercial and retail markets converging with the feature and theatrical markets. It is now perfectly normal for a theatre to want to control their DALI house lights from the lighting console. Equally, a corporate foyer with DALI controlled lights may well need to take control of a DMX512 fixture.

From a technology perspective this is all very 'do-able'. What has not kept pace is knowledge and education for specifiers and installers. It is fair to say that our support desk sees a much higher level of DALI questions compared to DMX512 - and the questions seem to repeat. This article distils the regular questions and hopefully will provide a cheat-sheet for installers and specifiers . . .

POWER

The single biggest cause of confusion with DALI is the bus power supply. DALI controllers can be thought of as similar to volt-free relays. The controller is sending data by repeatedly shorting the two wires together. Absolutely no data will travel over those wires unless someone connects a voltage, and this is the purpose of the bus power supply. It is a 16V DC power supply designed with a special current limiting circuit. A DALI circuit must have a bus power supply connected somewhere. There are no exceptions - it will not work otherwise. The good news is that the bus power supply can be attached anywhere on the DALI circuit. It may even be built in to the DALI controller - so you need to check the user guide.

When looking at a system drawing for a DALI installation, expect to see three categories of power supply. There should be power for the fixtures. There should be a DALI bus power supply. And there should be a power supply for the DALI controller.

Sometimes these are merged together, but if you count fewer than three power supply categories - be sure you know why!

CONVERSION

The next most frequent support issue is usually phrased something like: "The fades seem awfully steppy . . ."
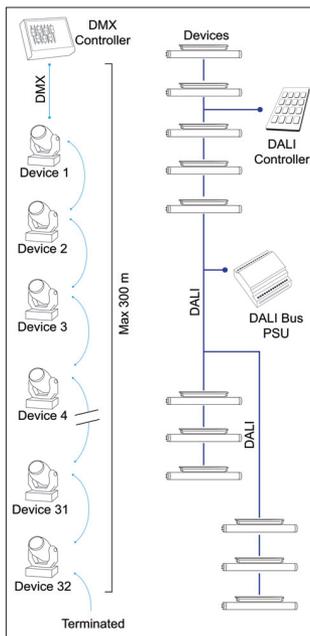
DALI is over 200 times slower than DMX512. It was not designed for subtle, real-time colour mixing. If you try to make a simplistic conversion from DMX512 to DALI and run big colour wave effects, it will look rubbish!

That is not to say you can't link DMX and DALI, you certainly can. But it requires some planning. DALI has some clever addressing modes called groups. Each DALI circuit has 16 groups and they can be controlled fairly quickly. When converting DMX512 to DALI, think in terms of either broadcast or group addressing.

COMMISSIONING

The phrase that sends shivers through our support team is "So what is commissioning then"?

Each DALI circuit can contain up to 64 fixtures. These fixtures will be supplied by the manufacturer in an 'un-commissioned' state. Commissioning is the process by which each of these fixtures is assigned a number in the range 1-64 (the so-called 'short-address'). This short-address is used by the controller to individually control each fixture.

In almost all situations, you will need to commission the DALI fixtures before the controller can do anything. The commissioning process is not complex, simply connect a commissioning tool to the DALI circuit and press the button.

There is one situation where commissioning is not essential: if the DALI controller does not need individual control and all the fixtures are to be controlled as a group. In this situation, the controller can operate in broadcast mode and commissioning is not needed.

CABLE & POLARITY

The cable used for DALI is not specialist - you can use mains cable. The maximum distance is 300m but the gauge of the cable needs to increase as distance increases. Using $1.5mm^2$ will cover most situations.

DALI is polarity independent. The two wires can be connected either way around.

ADDRESSING MODES

I mentioned the DALI group addressing modes earlier, but it is useful to have an overview of DALI addressing when designing an installation. For those familiar with DMX512: *DALI is totally different*. DMX512 is a streaming protocol, which means that all 512 channels are continuously refreshed. DALI is a vector protocol which means that commands are sent to a fixture when a change occurs. DALI has four different methods of sending data to the 64 fixtures that can be connected to a DALI circuit, as follows . . .

Scene: It is important to understand that the designers of DALI viewed it as a system where commands would be issued and fixtures would respond. Scene control underlines this concept. Each fixture can be programmed to hold levels for up to 16 different scenes. The controller can then trigger replay of those scenes with variable fade rates. This is the most effective DALI addressing mode as it requires very little bandwidth.

Broadcast: DALI evolved out of earlier and simpler protocols. Broadcast addressing is how those earlier protocols (such as DSI) worked. Essentially, all fixtures will follow each other. This doesn't give much artistic freedom, but is very useful when you just want to set the level of all fixtures in one room. It is very bandwidth efficient and so provides very responsive control.

Channel: This allows the controller to set the level of each of the 64 possible fixtures individually. This is a very bandwidth-intensive process and trying to use this for real-time effects will almost certainly not give good results.

Group: All of the 64 fixtures can be allocated to any of the 16 possible groups. This provides a good compromise between Broadcast and Channel addressing. This is the mode most widely used when using DALI for dynamic real time effects.

SUMMARY

Artistic Licence has written a DALI Guide which covers the above in more detail. It can be downloaded from the link below . . . ⊗

📍 //tinyurl.com/the-dali-guide

DMX Controller · Devices · DALI Controller · DALI Bus PSU · Max 300 m · DMX · DALI · Device 1 · Device 2 · Device 3 · Device 4 · Device 31 · Device 32 · Terminated

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