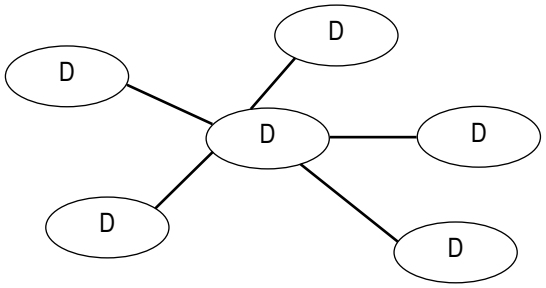
## DALI - Cabling, Bus & Electrical

In terms of cabling and topology, there are distinct differences between DMX and DALI.

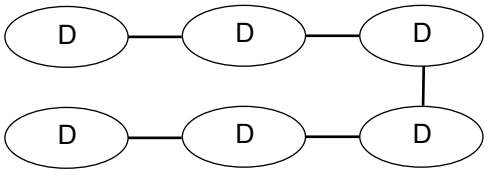
### DALI Topology

While DMX is cabled on a strict daisy chain system, DALI is a simple bus that can go in different directions and split into branches.

DALI allows many different kinds of cabling schemes, although for traceability it is always recommended that a logical approach is taken. Below are two example of cabling approaches that can be used ("D" represents Device).




**Star Connections**




**Serial Type**

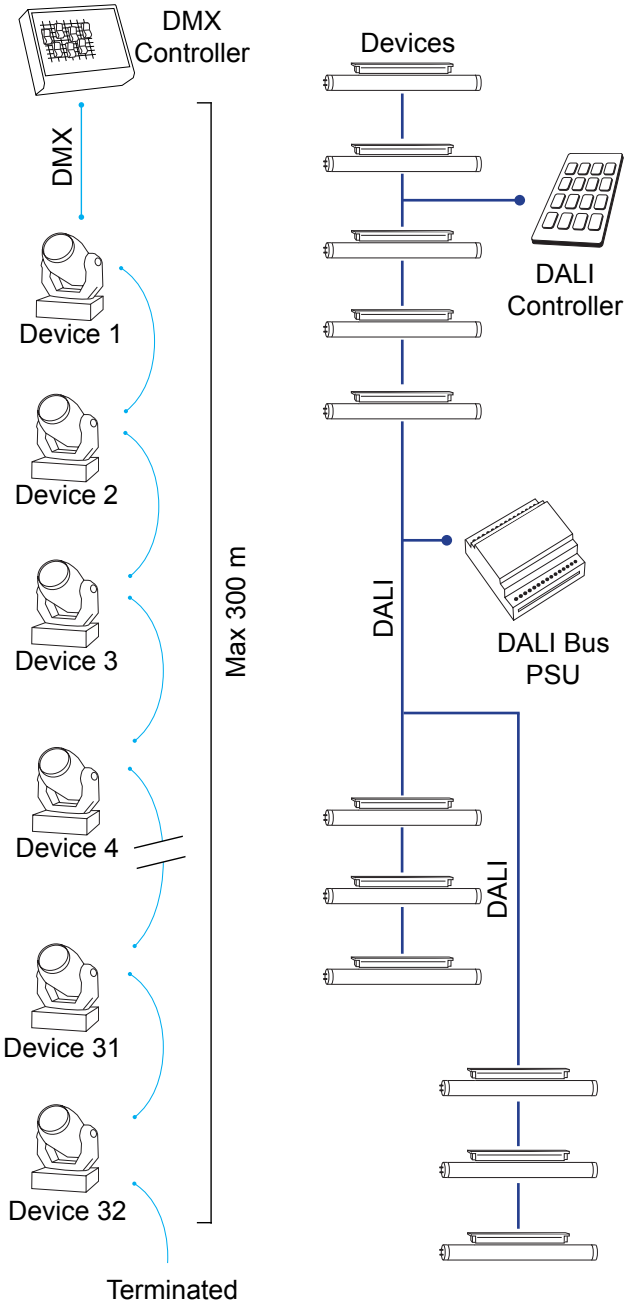
### Cable Type

Standard 2-core cable of minimum gauge 1.5 $mm^2$ is recommended. The total cabling distance should be limited to 300 m.

The total device current consumption should not exceed 250 mA. The voltage drop must not exceed 2V anywhere on the system.

To minimise voltage drop on the cable, the DALI Bus PSU can be installed at the middle of the system so the cable is split into two equal lengths (see figure opposite).

**Comparison of DMX and DALI systems**




### Polarity

DALI specifies polarity-free installation. This makes installation easier because the control cables do not need any kind of identification (the two cores can be put into any terminal). On the majority of equipment the terminals are identified with the same text.

## DALI Bus PSU

In the DALI specification, power and data are carried on the same pair of wires.

Electrically, the voltage on the line is toggled at high speed between low (logic level '0') and high (logic level '1') to achieve data communication.

Unlike DMX, the DALI controller does not have to provide the voltage on the line, so an external DALI Bus PSU is generally required (unless the controller has an integrated PSU). Artistic Licence offers Rail-PSU-D4, a four-circuit power supply. The DALI specification requires that the DALI PSU should provide a voltage of 16V and is current-limited at 250mA.

To achieve the logic levels of '0' and '1' the transmitting device (controller or fixture) will short the DALI lines together creating a logic low level – '0'. When it is not shorted the logic level will be high – '1'. The advantages are:

1. It allows greater flexibility in the wiring of the system as the PSU can be at the centre of the subnet to minimise voltage drop. It might not be possible to put the controller at the centre.
2. The arrangement can reduce voltage drop.
3. Sensors can be powered from the DALI line.

Without the power supply, there is no communication as the DALI devices interpret this as a fault condition and go into a fault state.

To achieve the flexibility in the wiring specification, the voltage used for communication needs to be higher than other protocols to compensate for the voltage drop that might occur.

The DALI specification states;

- High Logic Value shall be 16V (9.5V to 22.5V DC)
- Low Logic Value shall be 0V (-4.5V to +4.5V DC)
- A 2V difference is allowed between PSU and end of cable
- The nominal voltage is 16V

**Complete DALI system with electrical wiring**