

INSTALLATION INSTRUCTIONS

Model: **Various**
Fixture Family: **Various**
Document Description: General Installation Guide
For DMX-Controlled Luminaires

 **VISA LIGHTING**
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DMX systems are not the same as power wiring nor other low-voltage control wiring systems used in lighting such as DALI, 0-10V, or other proprietary systems. DMX is a high-speed data transmission protocol with switching frequencies approaching 200 kHz; therefore DMX systems need to be treated as high-speed transmission lines with the appropriate care given to its wiring.

While every effort has been made to include as much information as possible, this document is not a comprehensive guide to design, installation, and commissioning a DMX lighting control system. Please consult the appropriate professional(s) for additional information.

DEFINITIONS

DMX Signal: a repeating chain data output by a DMX controller, comprised of one 8-bit start code packet followed by 512 8-bit data packets. The first data packet is slot 1, the second slot 2, etc. The entire chain is repeated 44 times per second.

Device: a DMX controller, a DMX-controlled fixture, or a DMX splitter

DMX controller: a device where the DMX signal originates (sometimes called a “console”)

DMX splitter: a device that receives a DMX signal on its input, then duplicates that signal on its output(s). The input and output signals are usually isolated from each other, and the signal is “boosted” back to full voltage at each output (thereby compensating for voltage drop in long wiring runs). DMX splitters must be powered by their own mains or low-voltage supply.

DMX Fixture: a light fixture that contains a DMX decoder that receives a DMX signal and changes its behavior based on those commands. Fixtures may be equipped with both “input” and “output” connections for the DMX signal.

DMX network: ALL devices, cabling, and interconnections in a DMX controlled lighting system including the controller, fixtures, and splitters (if used)

Bus: a continuous run of daisy-chained devices, originating at the output of a DMX controller or DMX splitter. No more than 32 devices should be connected to a single bus per the DMX-512A standard.

Terminator: a 120Ω resistor installed at the end of a DMX bus to eliminate signal reflection back into the network

Channel: a DMX-controlled element within a DMX fixture. For example an RGB fixture has three channels: one each for red, green, and blue.

Address: the number of the first channel that a DMX fixture reads from the DMX signal

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Rev: B

Sheet: 1 of 8

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 When using electrical equipment, basic safety precautions should always be followed, including the following:

- Read all instructions carefully before installing and save for future use.
- Make sure all connections are in accordance with the National Electrical Code and local regulations.
- To avoid possible electric shock, be sure the power supply is turned off before servicing or installing the fixture
- Service should be performed by qualified personnel.
- These instructions may not cover all details or variations. If additional information is needed, please contact Visa Lighting.

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CABLING AND CONDUCTORS

(NOTE: See Appendix A for requirements if Category Cable ("Cat") is to be used for field wiring)

Field wiring between the the fixture and the DMX signal source (DMX controller or splitter) should be made using appropriate cable:

- EIA RS-485 approved
- 120Ω characteristic impedance
- Twisted pair conductors (one or more pairs; 2 pairs is most common)
 - Unused conductors should be properly insulated from each other and from ground.
- 24AWG, solid or stranded conductors
- Full-coverage foil shield with an uninsulated drain wire in full contact with the shield
- Listed for its installation, whether exposed, in walls (risers) or ceilings (plenums)
- Stranded wire should be tinned or ferrules should be used at connection to any terminal blocks.

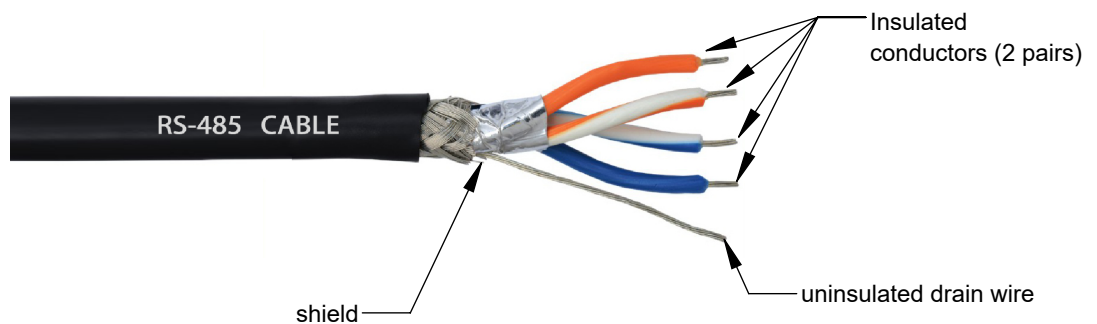


Figure 1: DMX CABLE

Appropriate cables include (but are not limited to) the following:

Plenum rated	Non-Plenum rated
Belden 82842 Belden 89842 Liberty 24-2P-P485	Belden 9842 Liberty 24-2P-485

The maximum recommended run length between a single fixture and the DMX controller or splitter where the signal originates (or is boosted in the case of a splitter) is 1,000ft including any cable length between a ceiling canopy and the fixture.

The maximum recommended bus run length between two daisy-chained DMX controlled fixtures is 300ft.

Do not use balanced audio cable, non-twisted-pair cable, unshielded cable, 2-conductor low-voltage cable, and/or 3-conductor power cable for DMX signal wiring.

Cable and conductors carrying DMX signals should not be run in close proximity with AC power cables. Line transients and other electromagnetic noise may cause interference with the DMX signal.

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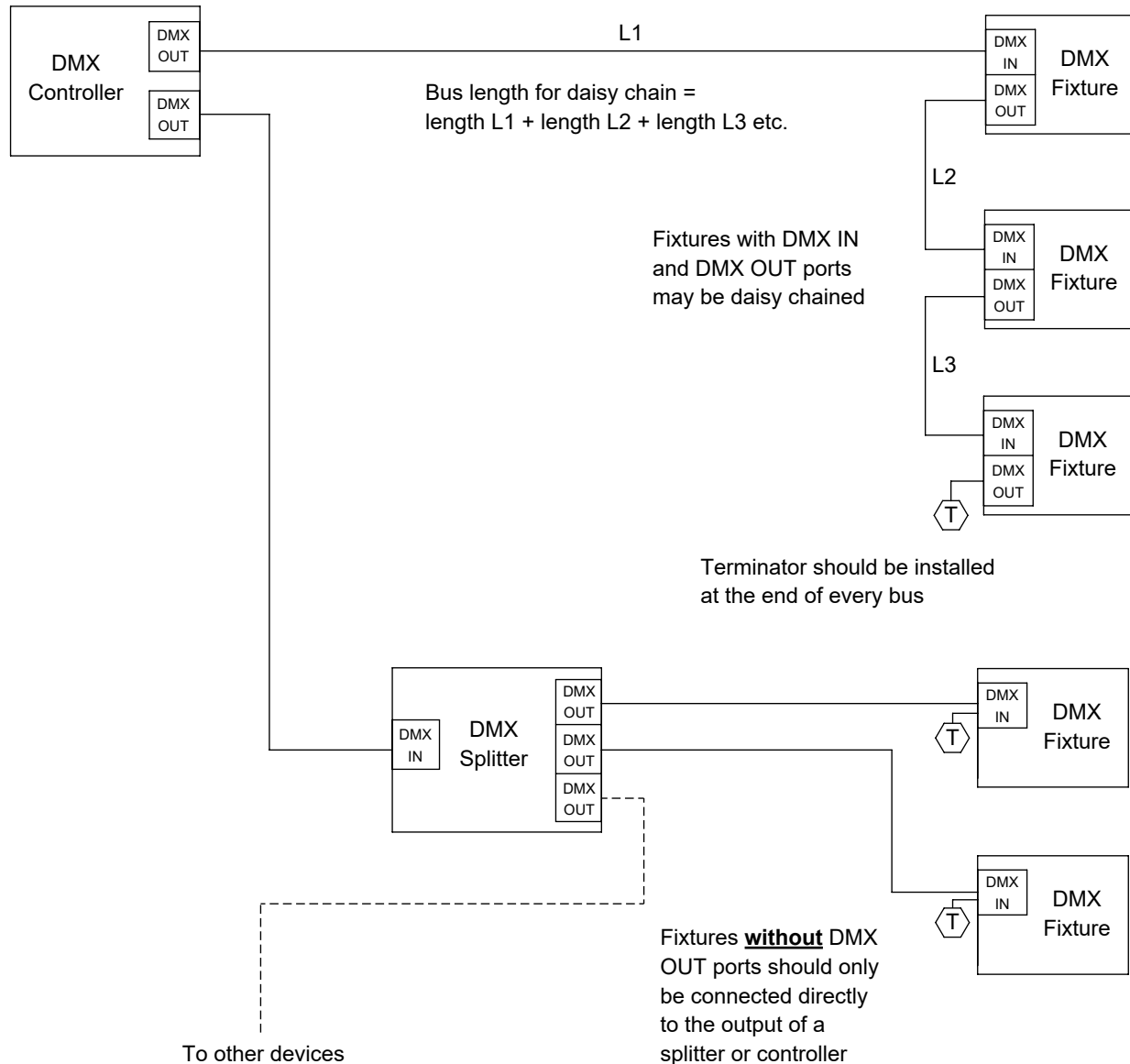
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*Figure 2: COMPLIANT DMX WIRING
 (EXAMPLE ONLY - YOUR INSTALLATION MAY DIFFER)*



T = 120Ω terminator (resistor or similar)

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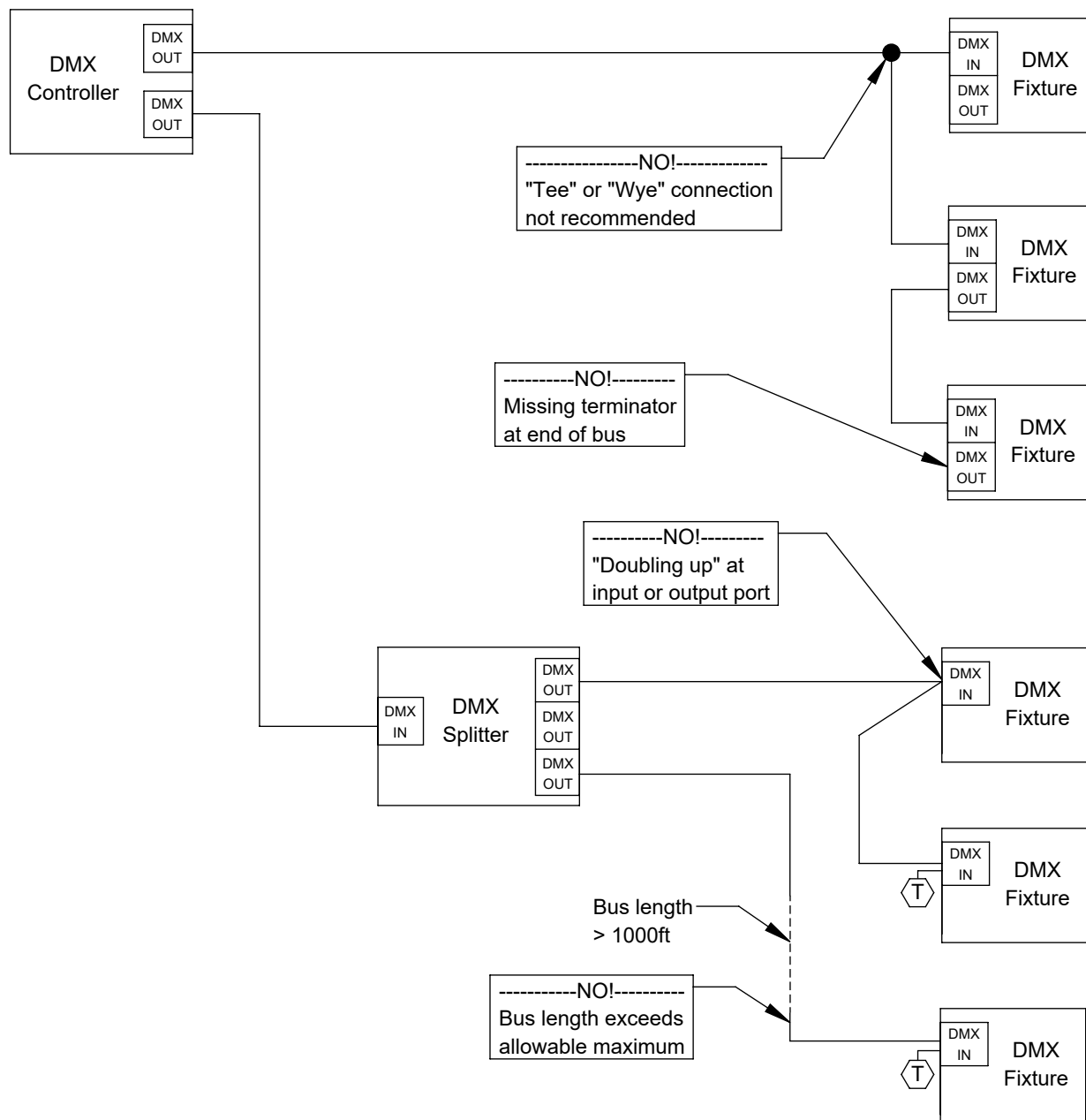
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Figure 3: DMX NETWORK WIRING MISTAKES TO AVOID



$\text{⬡T⬡} = 120\Omega$ terminator (resistor or similar)

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FIXTURE CONNECTIONS

The DMX IN terminals may be connected via field wiring to one of the following:

- An output of a DMX controller
- An output of a DMX splitter
- The DMX OUT terminals of another DMX-controlled fixture

The DMX OUT terminals may be connected via field wiring to one of the following:

- The input of a DMX splitter
- The DMX IN terminals of another DMX-controlled fixture
- A termination resistor (see "Termination" below)

Under no circumstances should the DMX control line to the fixture be connected in a wye or tee configuration to any other devices.

Handling and termination of drain wires

- The drain wire from the fixture cable should be connected to the drain wire from the DMX system cable. All drain wires should be insulated from contact with ground using shrink tubing or other appropriate methods.
- The shields of both the fixture cable and the system cable should be insulated from contact with ground. This can be achieved by adding shrink tubing or other appropriate insulation around the area where each cable's outer jacket is stripped off to expose the individual conductors.
- Failure to insulate the drain wires and shields from contact with grounded parts may cause a ground loop within the system which may lead to degraded performance.

Bus termination

All Visa Lighting fixtures have a termination resistor installed across the DMX OUT terminals of their internal DMX decoder. This resistor should be removed and discarded if the DMX OUT terminals are used to daisy-chain additional fixtures on the same DMX bus. The termination resistor should be left in place across the DMX OUT terminals of the last fixture on a DMX bus.

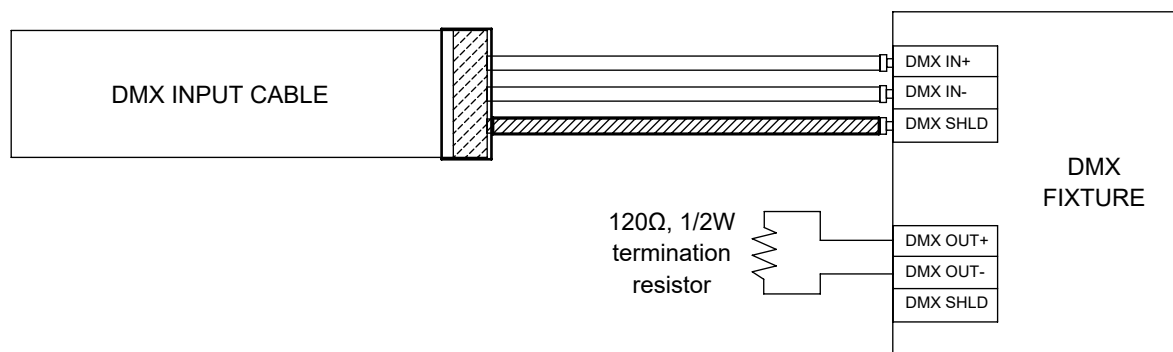


Figure 4: BUS TERMINATION

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Figure 5: DMX CABLE FIXTURE CONNECTIONS

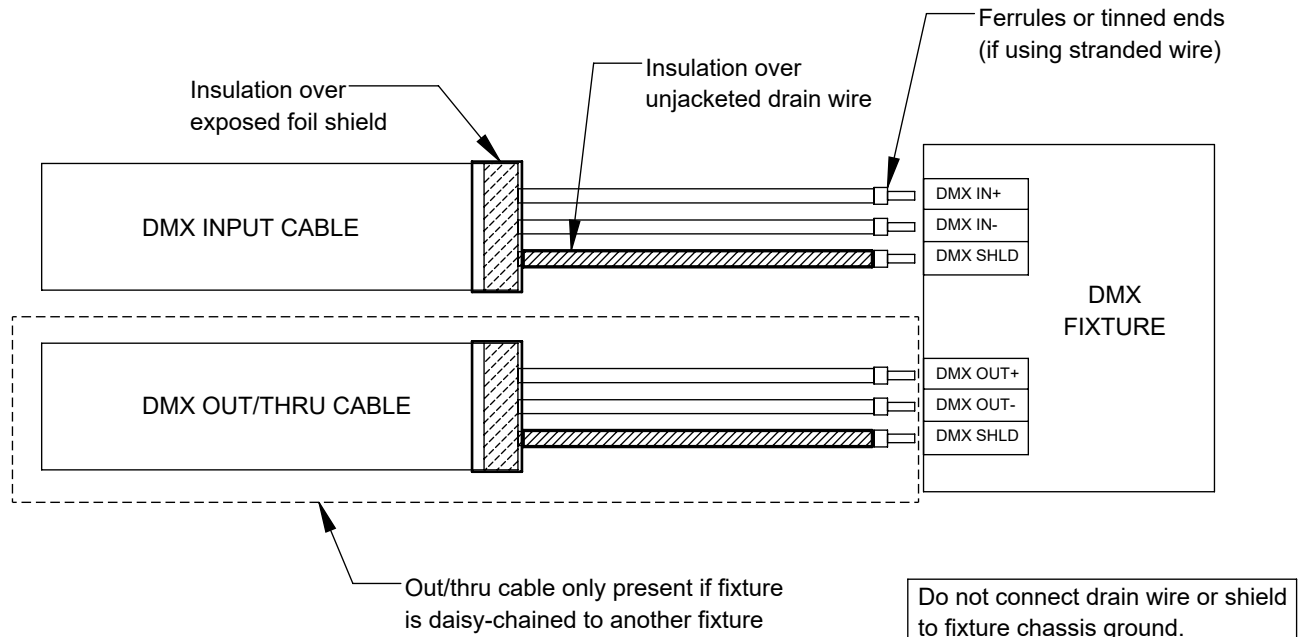
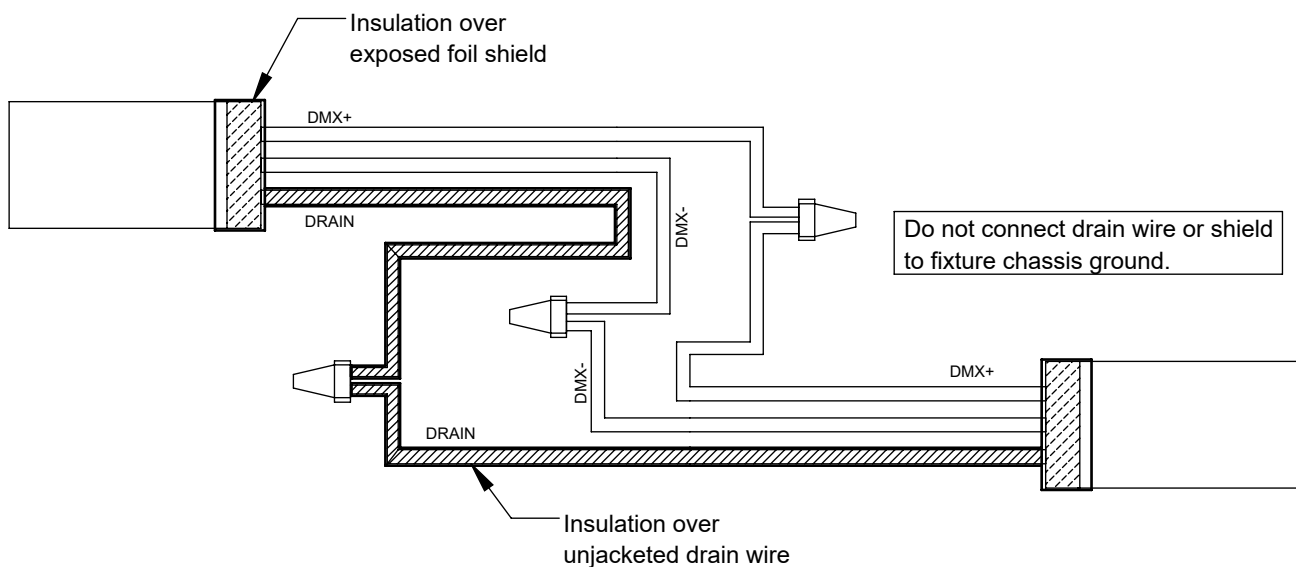


Figure 6: DMX CABLE WIRE SPLICE CONNECTIONS



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ADDRESSING

All DMX fixtures must be addressed for proper functionality. This can be done either via manual addressing at the DMX decoder within the fixture or via Remote Device Management (RDM) through the DMX control panel or suitable programmer.

All Visa Lighting fixtures are shipped configured to use RDM for addressing purposes and no changes to the DMX decoder settings are necessary if this method is used.

If RDM addressing will not be used, please see “Manual Addressing” below.

IMPORTANT: if RDM addressing is to be used, any splitters present within the DMX network must be “RDM compatible.” Standard DMX splitters do not have bi-directional communication capability and will not allow RDM addressing of fixtures connected to their output(s).

Addressing via RDM:

1. Install the fixture and make field wiring connections between the fixture and the DMX controller.
2. Follow the instructions for the RDM addressing functionality of the DMX controller (if present) or an appropriate RDM addressing tool to discover and set the addresses of the fixtures on the network.

Manual addressing:

1. **NOTE:** since manual addressing requires access to internal fixture components, it is highly recommended that manual addressing be done before the product is mounted, particularly if accessibility will be limited or difficult after installation.
2. Consult the fixture-specific installation instructions for guidance on how to access the DMX controller within the fixture and how to set the DMX address (generally via DIP switches or rotary switches).

8 bit vs. 16 bit addressing

8-bit addressing is most common among DMX systems. In this scheme, each color channel within a DMX fixture will read from one DMX slot.

For example, in an 8-bit addressing system if a three-channel (RGB) DMX fixture is set to address “1,” it will read the data on slots 1, 2, and 3 for channels R, G, and B respectively and ignore the other slots in the DMX signal. Each channel has 255 brightness levels available.

16-bit addressing is less common but many modern DMX controllers have this capability. In this scheme, each color channel within a DMX fixture will read from two consecutive DMX slots. This provides more precise brightness control but cuts in half the total number of channels a DMX controller can work with. Both the controller and fixtures must have 16-bit addressing options for this to work, otherwise 8-bit addressing should be used.

For example, in a 16-bit addressing system if a 3-channel (RGB) DMX fixture set to address “1” it will read the data on slots 1 and 2 for the first (R) channel, slots 3 and 4 for the second (G) channel, and slots 5 and 6 for the third (B) channel. Each channel has 65,535 brightness levels available.

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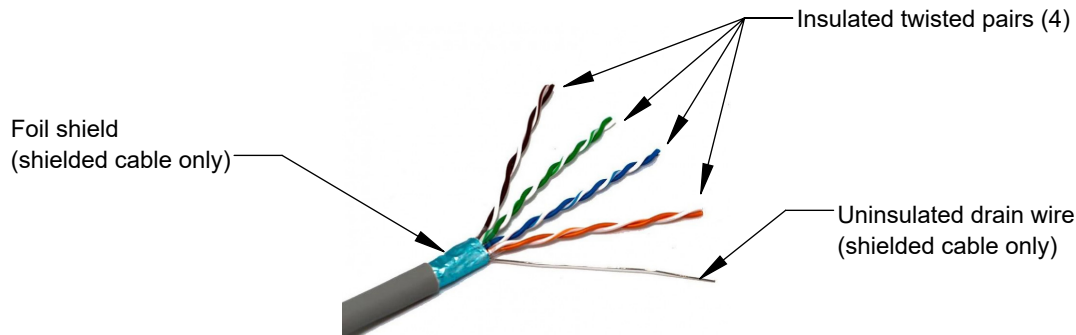
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APPENDIX A: CATEGORY ("CAT") CABLING FOR USE IN DMX FIELD WIRING

Category cable (Cat5, Cat5e, Cat6, and Cat6a, also known as "ethernet cable") is permitted for use in DMX installations per the recommendations of ESTA (Entertainment Services and Technology Association).

- A maximum total run length of 300m (1000ft) is permitted for 24AWG category cable, and 90m (300ft) for 26AWG category cable.
- Unshielded category cable (which does not have the foil shield and drain conductor present in RS-485 cable) should be protected from physical damage and care should be taken to separate it from sources of interference (such as AC wiring).
- Shielded category cable has a foil shield and may have a drain wire, and should be used if the cable must be run in free air (without protective conduit or raceway).
 - The shield/drain of shielded category cable should be connected to earth ground (NOT signal ground or "common") at the transmitter side (DMX controller end) of the wiring and that connection should be carried through the entire cable run. The drain wire and foil shield should be otherwise insulated from contact with other conductors or grounded metal.
- Typical installations will only use the Pair 1 Data(+), Pair 1 Data(-), and Pair 1 common wires when daisy-chaining between fixtures.
 - The Pair 2 wires are generally used only if DMX signal is traveling both to and from a fixture through the same cable.
- **All other rules for DMX wiring still apply as described earlier in this guide.**



ESTA Category Cable conductor color code	
Wire Color	Function
white/brown	Data link common for pair 1
orange	Pair 1 Data(-)
white/orange	Pair 1 Data(+)
brown	Data link common for pair 2
green	Pair 2 Data(-)
white/green	Pair 2 Data(+)
blue	Unassigned
white/blue	Unassigned

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