



EnNet 5  
System Design  
and  
Installation Guide

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## EnNet 5 System Overview

EnNet 5 is the latest addition to the EN family of DMX-512 distribution products. It provides simplified cost effective DMX-512 distribution over inexpensive and readily available “Cat 5” network cable. The 300 ft cable length limitation of “Cat 5” networks does not apply to EnNet 5 systems. The system consists of a power supply, input receptacles (may be by others), output receptacles and accessories. Its features include:

- Up to eight cable runs can connect devices to the power supply providing maximum flexibility in field installation. All inputs must be on the same cable run.
- Provides optical isolation protecting the network and connected devices from damaging line voltage.
- Does not require costly individual home-run wiring for each device.
- Each device has a removable terminal strip and a jumper pin for line termination which eliminates field terminating resistors.
- Each system provides a fully terminated RS-485 network.
- EnNet input receptacles provide network status LED at each input or the dimming system manufacturer may provide all the input receptacles and one output for connection to the EnNet power supply.
- Each outlet provides pristine DMX-512 for up to 32 field devices (moving lights, scrollers, etc.).
- EnNet is field proven with thousands of units operating successfully.
- Every device includes network status LED indicator.

## Advantages of a Permanently Terminated Network

DMX-512 uses the EIA/TIA RS-485 wiring scheme. RS-485 provides for up to 32 nodes (transmitters or receivers) on a single linear bus. The linear bus is a single cable run with connected transmitters and receivers that is terminated at each end with a 120-ohm (nominal) resistor between data + and data -. Only very short “T” type connections are permitted under the standard.

Theater technicians have learned through experience that DMX-512 is very robust and continues to work even with significant rule abuse. However, the unfortunate result of not following the rules is a network that is more prone to unpredictable operation and is difficult to troubleshoot. Permanent systems should be designed to ensure building wiring is compliant and properly terminated. Traditionally this has been done with DMX splitters and combiners in a hub and spoke design that is very costly to install. Non-compliant networks are sometimes installed to reduce costs.

EnNet insures an economical design where the permanent building wiring is a fully compliant terminated network to protect data integrity. Optical isolation at each receptacle protects both the network and all connected devices. Each output receptacle provides an isolated DMX bus which can drive up to 30 devices (scrollers, moving lights, etc.) This DMX bus between receivers (scrollers, moving lights, etc.) is isolated from the backbone and the cable length is minimized. Shorter cable length provides greater immunity from field termination errors.

## Overview of System Components

Each EnNet system consist of a power supply, input module(s), output module(s) and accessories connected together with “Cat 5” ethernet cable The power supply becomes the “hub” of the system from which all cables runs (up to 8) emanate. The power supply includes optical isolation allowing input receptacles by others to be safely connected into the en network. The “daisy chain” wiring scheme allows multiple devices to be on a single run of cable. In very simple systems a single cable run may be used for all devices. This eliminates costly “home runs” for each outlet.

### Power Supply

The power supply provides power for all EnNet devices. The PS-1 is an economical power supply that plugs into a standard 120VAC outlet and includes a terminal strip for mounting in a box provided by the installer. The PS-2 includes isolation to allow multiple cable runs from the power supply (up to two for input devices and eight for output devices.) It is also available in a rack mount version. All power supplies can support up to 32 devices depending on configuration.

### Input Receptacle

The input receptacle includes a status LED and is mounted in a 1-gang faceplate. It allows DMX sources (consoles, etc.) to be connected to the network and provides optical isolation. The recessed LED mounting allows the Input Receptacle to be used in plates by others that do not have a hole for the LED.

### Output Receptacle

Each output receptacle provides optical isolation and includes a status LED. The receptacle mounts in a faceplate and provides DMX data for up to 30 DMX controlled devices. The LED is recessed allowing the output receptacle to be used in plates by others that do not have a hole for the LED.

### Isolation Module

The isolation output module has multiple functions. It acts as a “repeater” creating two independent data buses. It also allows up to 4 DMX output connectors that are in wiring devices (connector strips, etc.) to be optically isolate from and connected to the network. It may be mounted on top to a connector strip or in a 4 11/16” square deep electrical backbox. The PS-24 and PS-48 include isolation module(s) mounted in the power supply.

### Wallplates and Miscellaneous Connectors

Standard DMX In and DMX Out wallplates are stocked. Custom wallplates including many types of specialized connectors are also available on special order to complete any installation. EnNet devices may also be mounted in plates provided by others. A hole for the status LED is not required.

## System Design

EnNet was developed to be “designer and installer friendly.” The system allows multiple devices on a single cable run by using a “daisy chain” wiring topography.

### Basic System

The basic system uses the PS-1 power supply which will support up to 30 devices with one or two runs of Cat-5 cable leaving the power supply. The total cable run may not exceed 1500 feet. Each cable run is limited by the number of EnNet devices on the run. (See table page 6 for maximum number of devices on a given cable length.) Input or output modules may be located anywhere on either cable run.

### Standard System

This standard system using the PS-2 provides for 1 universe of DMX-512 and up to 30 EnNet devices. A second isolation card may be added to provide for two universes.

The power supply is located in a control rack (rackmount version) or on a wall often near the dimmers. It requires 120VAC power and a dedicated feeder is recommended.

EnNet Input devices are located at DMX sources such as the control booth, stage sides and a mid-house location. The EnNet inputs are provided in a wallplate. A system using faceplates and receptacles by the dimming system manufacturer are also an option. A single DMX line from the input receptacles terminates into a plug-in terminal on the isolation module in the power supply enclosure, one for each universe. This provides a clear line of demarcation between the dimming system provider and the EnNet DMX distribution system.

For maximum flexibility multiple universes of DMX should be provided to feed different areas of the theater such as front-of-house and stage. The only additional cost is the additional input receptacles and an isolation module. This design insures that the user will not run out of DMX addresses for moving lights, etc.

EnNet output devices should be connected to the power supply on up to eight cable runs, each not to exceed 750 ft and 15 devices.

Should your design not fit within this parameter or if bidirectional DMX support is required, please call for toll-free factory design support at 800-706-4020.

## Typical Systems

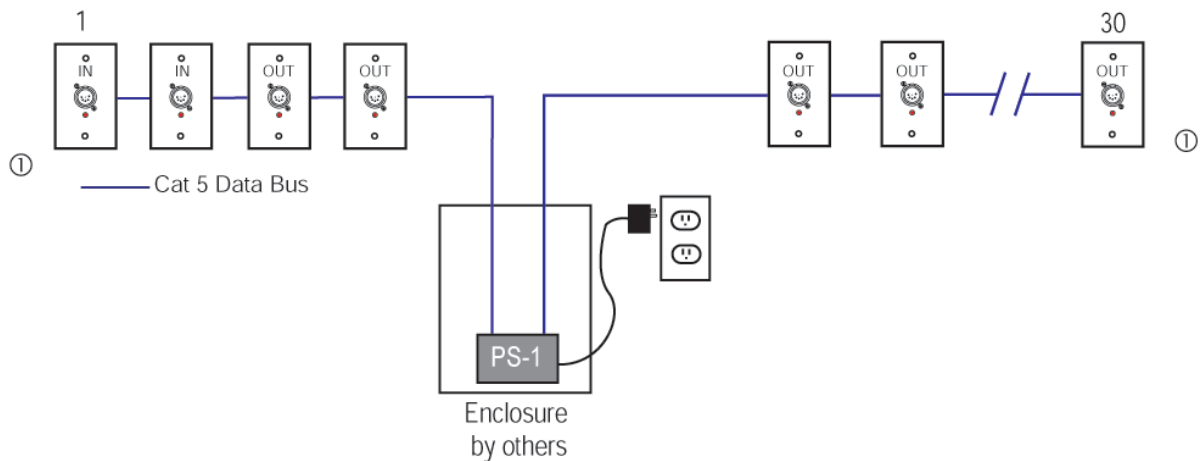
Three system one-line diagrams follow. These are typical and provide some layout guidance. There are numerous ways to design systems, as each application is unique. If you have questions, a factory system engineer is always available at 800-706-4020 to discuss your requirements.

### Typical System #1: Basic System for Distributing DMX

This system is very economical and provides one universe for distributed control of portable DMX devices (scrollers, moving lights, etc.). This system employs the PS-1 power supply and a combination of input and output receptacles located throughout the building. It supports up to a maximum of 30 devices with one or two runs from the power supply.

Each individual cable run has the following power limitations:

500 ft	30 EnNet devices
750 ft	20 EnNet devices
1000ft	10 EnNet devices
1500ft	5 EnNet devices



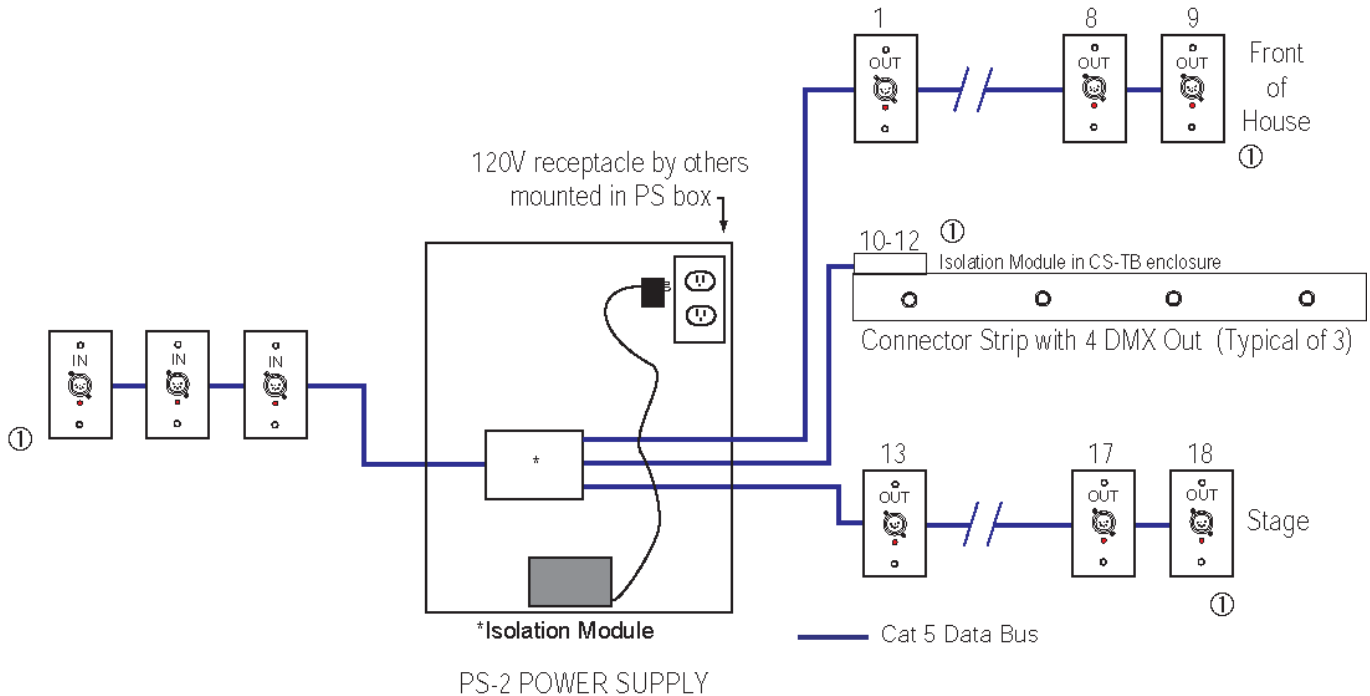
① Install terminator jumper on the device at the end of the cable run.

## Typical System #2

This system provides one universe of distributed control of portable DMX devices (scrollers, moving lights, etc.). The PS-2 includes output isolation and allows up to eight runs of cable from the power supply for output modules and up to 30 EnNet devices. The input cable run may not exceed 1500 ft and six devices. Four output connectors are provided for up to eight cable runs.

Each individual cable run has the following power limitations:

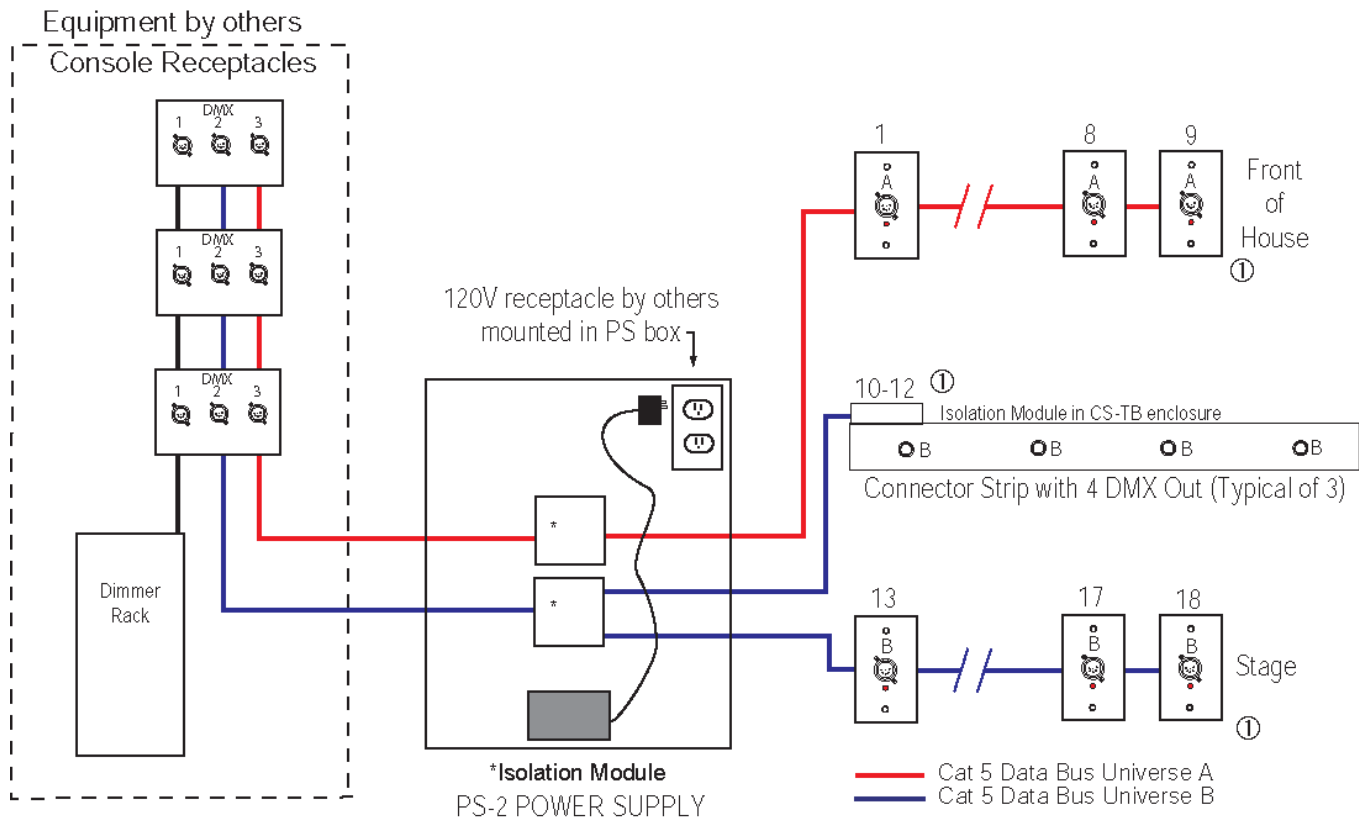
500 ft	30 EnNet devices
750 ft	20 EnNet devices
1000ft	10 EnNet devices
1500ft	5 EnNet devices



① Install terminator jumper on the device at the end of the cable run.

### Typical System #3

This example details how to interface with non-EnNet input receptacles where the inputs for DMX distribution are XLR connectors in wall plates provided by the dimming system manufacturer. This allows input stations by others while still providing optical isolation from the input and the network. The inputs are wired in a “daisy chain” configuration ending at the power supply.



① Install terminator jumper on the device at the end of the cable run.

# System Components

## Input Receptacles

Input receptacles are mounted with two screws into the 5-pin male XLR connectors and include a two-color LED located below the connector to provide status indication.

### The LED status is as follows:

**Green:** Receptacle available to receive DMX

**Yellow:** Network in use.

### Specifications

Two color LED

Optical Isolation: 240V

Terminal strip: Accepts up to 14 gauge wire

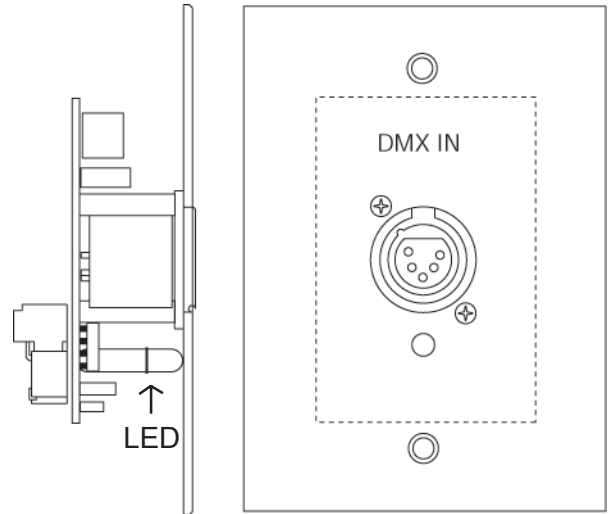
Module Dimensions: 1 15/16" w x 2 5/8" h x 1 3/8" d

One Gang Face Plate Dimensions: 2 3/4" w x 4 1/2" h

Jumper for end-of-line data termination provided

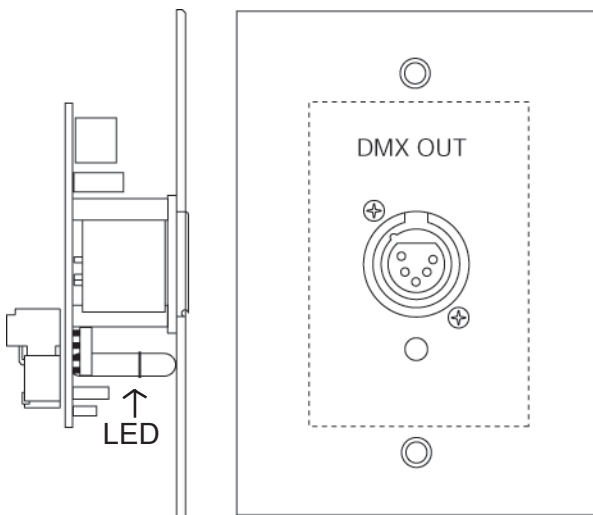
Side View

Front View



Side View

Front View



## Output Receptacles

Output receptacles are mounted with two screws into the 5-pin female XLR connectors and includes an LED to indicate active data to the device.

### Specifications

Optical Isolation: 240V

Terminal strip: Accepts up to 14 gauge wire

Module Dimensions: 1 15/16" w x 2 5/8" h x 1 3/8" d

One Gang Face Plate Dimensions: 2 3/4" w x 4 1/2" h

Jumper for end-of-line data termination provided

## Power Supply

The power supplies nominally provide power for up to 30 EnNet devices. It provides non-regulated 24VDC to power EnNet devices with integral regulation. (Note: EnNet devices will not operate on regulated DC).

Model: PS-1

Most economical

Enclosure provided by the installer

Input: 120VAC 60hz @ 120 watts

Output: 24VDC @1.5A

Model: PS-2

Surface Mounted NEMA 1 Enclosure (16" x 12" x 6")

Includes 1 isolation module

Input: 120VAC 60hz @ 120 watts

Output: 24VDC @1.5A

Model: PS-2RM

Rack Mounted in Hinged 2U Panel

Includes 1 isolation module

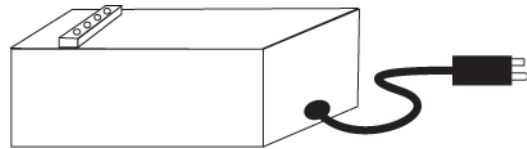
Input: 120VAC 60hz @ 120 watts

Output: 24VDC @1.5A

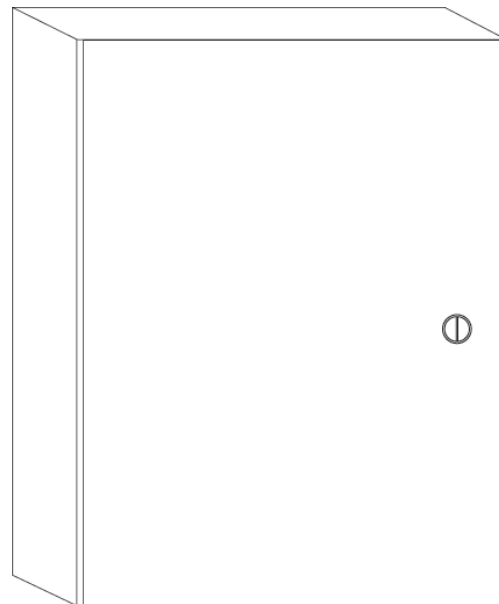


Listed

PS-1

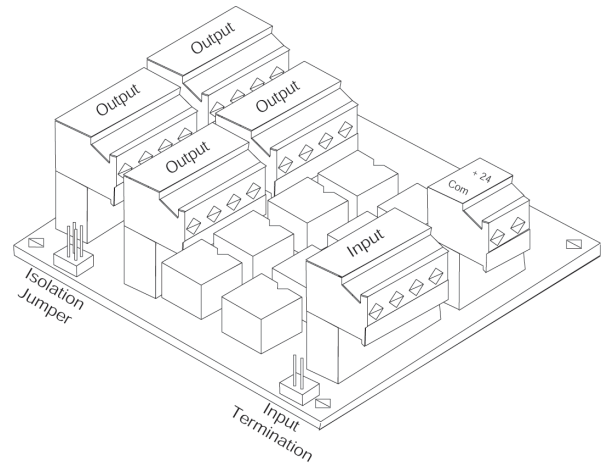


PS-2



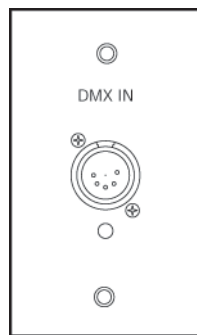
## Isolation Module

The isolation module is provided with an EnNet input and four outputs on connectorized terminals. It may be used to add four other busses of EnNet modules to a system and can be mounted in the power supply enclosure or a remote enclosure. It may also be used to feed four DMX-512 OUT receptacles in applications such as supplying connector strips that fly. Data isolation (buffering) is provided between each of the output receptacles. Optical isolation is provided between the four outputs and the input bus. There is no optical isolation between the outputs. A two-position header on the board allows the input and output commons to be connected or isolated. If additional EnNet devices are connected to the isolation output module, the jumpers should be set to the “Non Iso” setting which feeds power through to the output busses. It is used in this manner to allow the addition of two new data busses. If the module is used to feed two DMX outlets, the jumpers should be set in the “Iso” position. A header for a jumper is also provided for end-of-line data termination.

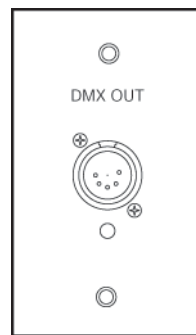


## Wallplates and Backboxes

Wallplates and surface backboxes are available for single input and output devices. If the devices are flush mounted, use 3/2" deep masonry backboxes. Custom plates and backboxes are available. Consult the factory for details.



1-gang



1-gang

## System Installation

### Selecting and Locating Components

Input receptacles should be provided at any location where DMX sources (control consoles, show controllers, and architectural control systems) are located. Output receptacles are located in areas where DMX devices (color scrollers, moving lights, etc.) are likely to be provided. Typical systems will include inputs at the control booth, mid-house and stage proscenium wall. Output receptacles are located on each electric, catwalks, and on stage.

### EnNet Data Bus and EnNet Cable

EnNet cable is “Cat 5” data cable (Belden 1583A or equal) type cable. A data bus consists of one or two runs of cable from a single isolated connector on the power supply and the combined total length must not exceed 1500’. Each cable run must be terminated at the end by putting the termination jumpers on the EnNet module.

In smaller systems one or two cable runs from the power supply are adequate. As systems grow and become more complex, more runs and length are needed. The isolation output module in the power supply enclosure solves this problem. The isolation output module provides four isolated (buffered) outputs for one universe, which may feed up to eight additional cable runs from the power supply (for output modules only).

The end of each cable run must be provided with data termination. The terminator resistors are provided on each device and are activated by installing the pin jumpers on the device. All data bus connectors are removable for ease of service and connection and have four screw terminals. The drawings on the next page illustrate how to terminate the cable.

Each individual cable run has the following power limitations:

500 ft	30 EnNet devices
750 ft	20 EnNet devices
1000ft	10 EnNet devices
1500ft	5 EnNet devices

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The end of each cable run must be provided with data termination. The terminator resistors are provided on each device and are activated by installing the pin jumpers on the device. All data bus connectors are removable for ease of service and connection and have four screw terminals.

The drawings on the next pages illustrate how to terminate the cable.

**This is a general design tool. For requirements outside these parameters, contact the factory at 800-706-4020.**

## Wiring EnNet Data Cable (Belden #1583A or equal)

The drawings below show the connections for the cable. This is standard wiring and it is used throughout the EnNet data bus. This simplifies wiring. To prepare the cable, the outer PVC jacket is stripped off, being careful not to nick the conductors. Strip each conductor, again being careful not to nick conductors, twist together as required and connect to the terminal strip.

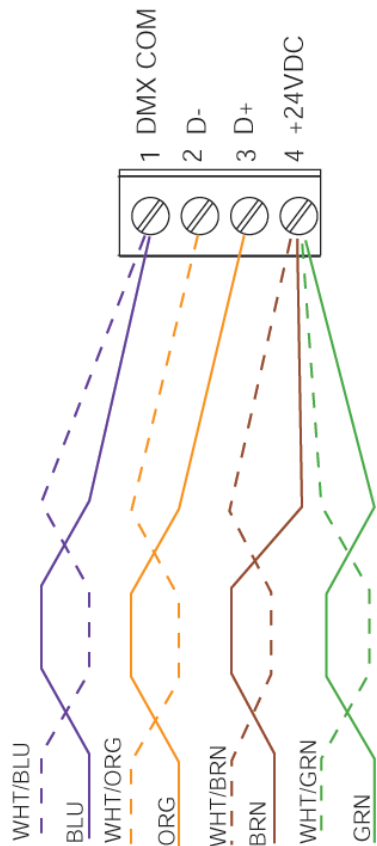
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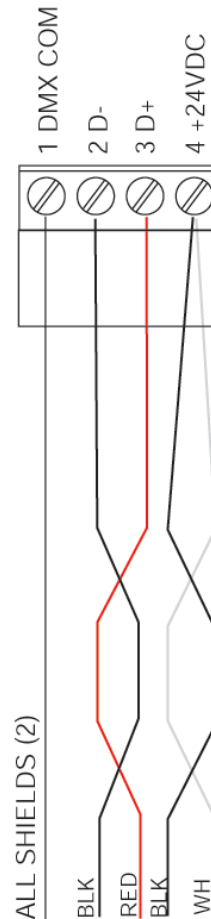
A connection drawing of Belden 9729 cable is also shown for convenience. This cable may be used but it is more expensive, not as readily available as “Cat 5” data cable and also requires more labor to terminate. Consult factory for length limitations

### WIRING DETAILS

EnNet Data Bus used in all  
EN active DMX devices



Belden 1583A

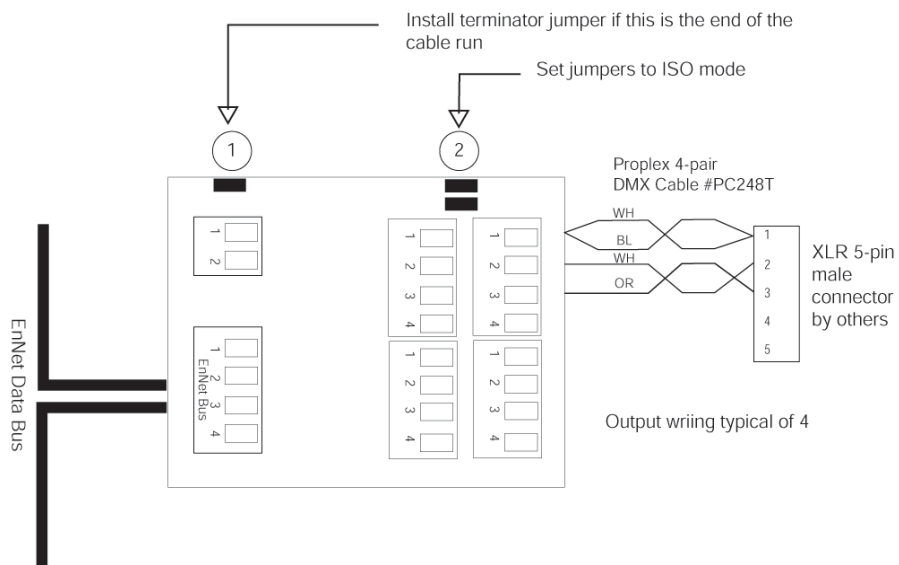


Belden 9729

## Using Isolation Output Modules for DMX on Connector Strips and Drop Boxes

To simplify DMX drops onto pipes and connectors that fly, we recommend using the isolation output module. Each isolation output module will feed four DMX output receptacles, each of which can support up to 30 DMX devices.

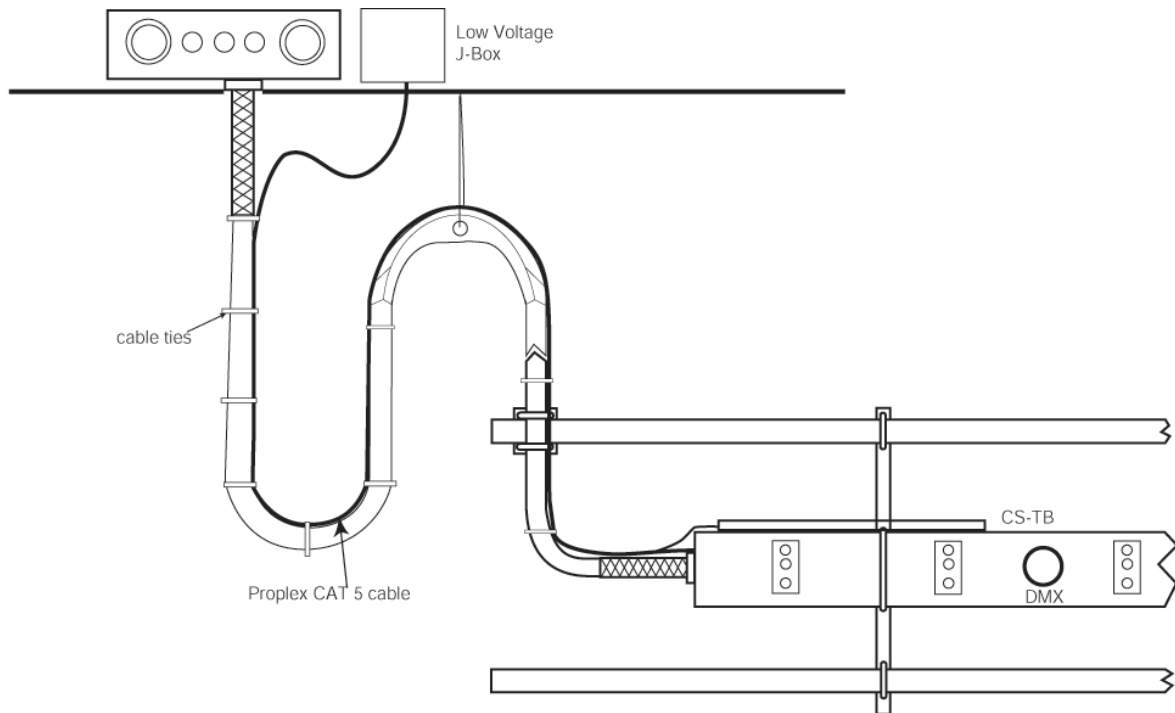
This can also be used with XLR connectors mounted in our pipe mounted drop boxes, which are available with pipe clamps or c-clamps.



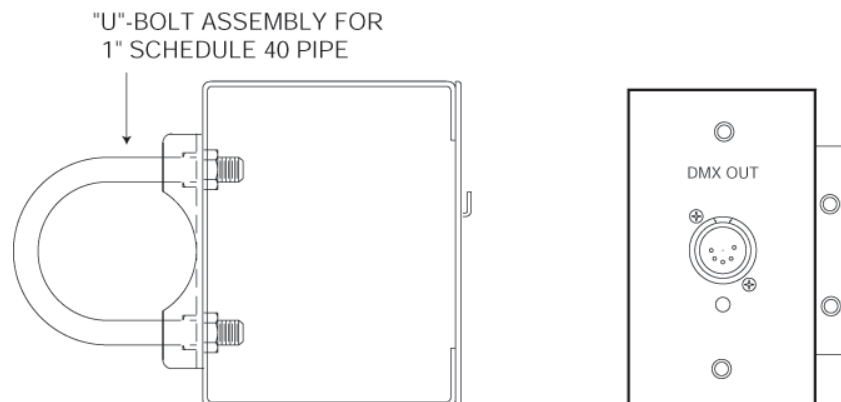
## DMX Outlets on a Connector Strip

DMX may be provided on a connector strip using passive XLR connectors provided by the connector strip manufacturer, if available. Isolation Output Modules are mounted in a grid-mounted box or the TB-CS connector strip terminal box. If the XLR connectors mounted in the connector strip are not available, surface backboxes may be mounted onto the connector strip or pipe mounted boxes may be used.

On connector strips we recommend two outlets for each universe, one located at the end and one near the center. This will support up to 60 DMX devices, which is adequate in most installations. Two standard DMX outlets are provided in the connector strip by its manufacturer. Simply connect them to the isolation output module via a rugged 4-pair "Proplex" cable between the grid mounted remote enclosure and each connector strip. The cable is connected to the SO cable with wire ties.



## Pipe Mounted Drop Boxes



## Notes