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Warranty and Disclaimer

Warranty

 Northlight Systems warrants this product against defects in materials and workmanship for a period of 1 year.

Returns Policy
 If there is a defect, we will repair or replace the product at out discretion.

We offer a full refund on the purchase price if returned in original, unused and "like new", condition in less than 30 days.
 Return the product with a description of the problem. Free repairs are for defective parts or workmanship only.
 Repairs due to improper hookup, over voltage, short circuits, physical damage etc., will be charged to the customer.

Disclaimer of Liability

 Northlight Systems is not responsible for any special, incidental, or consequential damages resulting for any breach of warranty, or any legal theory, including lost profits, downtime, goodwill, damage to or replacement of equipment or property, and any costs associated with the use of Northlight Systems products described herein.
  Northlight Systems has a policy of continually improving our products as new technology becomes available. Northlight Systems reserves the right to make changes and improvements to the specifications of this equipment at any time without notice.
  Northlight Systems has made every attempt to ensure that the information in this document is accurate and complete. Northlight Systems assumes no liability for any damages that result from the use of this manual or the equipment it documents. Northlight Systems reserves the right to make changes to this document at any time without notice.

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8 Channel, Relay output board

Features

- Allows DMX512 digital protocol to control 8 Relays.
- Relays included on board.
- Mini DIP switch address all 512 channels.
- Accepts AC or DC power.

SPECS

Input Signal:
Northlight RELAY board accepts DMX512 protocol, current and legacy versions. RDM is ignored.

Output:
Output is 8 Relays capable of 10 Amps @ 120 VAC on the normally open contacts and 5 Amps @ 120 VAC on the Normally closed contacts

Screw terminals provided for Normally open and normally closed configuration.

Address switch:
Mini DIP switches on board or panel mount.

Power requirements:
 12 AC @ 450 mA. Max.
 15 to 24 volts DC @ 450 mA max.

LED Indicators:
Green DMX signal present LED.
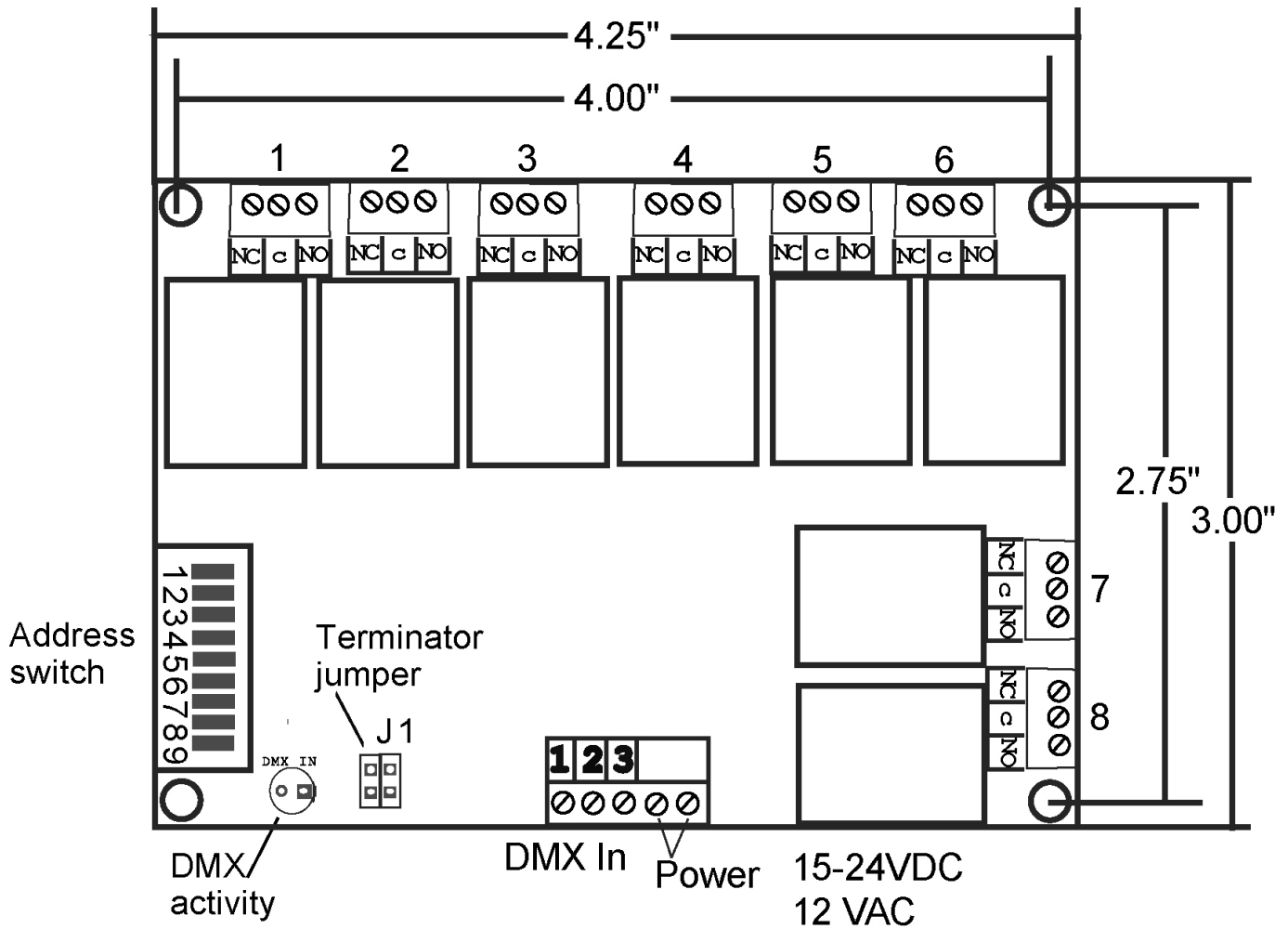
Board connections:
 All connections are made with mini screw terminals. See drawing for connector locations.

Physical Dimensions

3.00"H X 4.25"W +/- .10"

The **DMX input** pin numbers correspond to the XLR pin numbers.

The DMX gnd is signal ground – not earth ground, do not connect to earth ground.

Using the Relay board

Ground

The signal ground connector is the common signal ground – not earth ground. Do not connect to earth ground.

DMX512 In

The DMX input pin numbers correspond to the XLR pin numbers.

Pin 1 is signal ground, not earth ground
Pin 2 is DMX512 -
Pin 3 is DMX512 +

Setting the address for DMX512

Set the starting address to the first in a group of 8.
The address is entered on the DIP switches in standard binary code starting with 1. See the chart of all 512, address switch positions at the back of this manual.
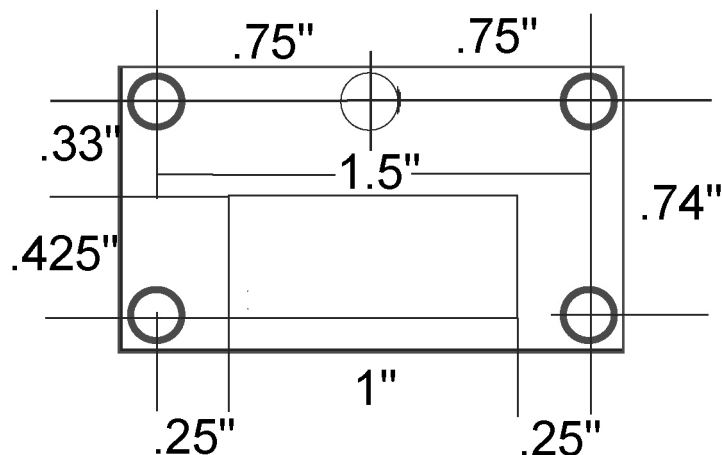For DMX512, the address can be up 512.

Address Switch

The mini DIP switch, individual switches are numbered 1 – 9, left to right.

Drill guide for the Panel mount Mini DIP switch.

Switch opening .425"H X 1"W
LED - drill 1/8"

.75"   .75"

.33"

1.5"

.74"

.425"

1"

.25"   .25"

Using the configuration jumper

There is 1 configuration jumper on the board.

J1 – Determines the output in the event of DMX signal loss.

Open(no jumper) - When the DMX signal is lost, the output will be zero.

Closed(jumper in place) – When the DMX signal is lost the board will hold and continue to output the last valid data.

Using the relays

The relays used are Single Pole Double Throw standard relays. Rated at 10 Amps for the normally open terminals and 5 Amps on the normally closed terminals.
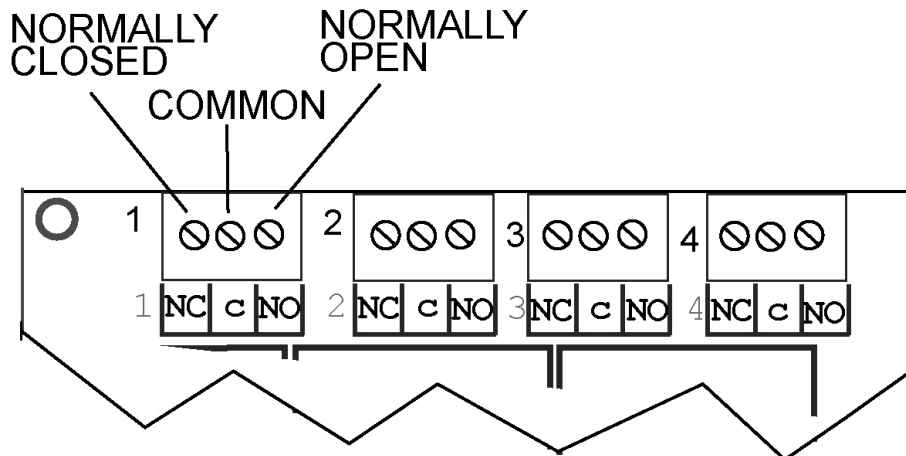
The screw terminals provide access to the common, normally open and normally closed terminals.

The screw terminals are arranged as follows:

C – common terminal
NC – Normally closed
NO – normally open

NORMALLY CLOSED   NORMALLY OPEN

COMMON

1   NC c NO   2   NC c NO   3 NC c NO   4 NC c NO

Setting up the DMX connectors

The current DMX512 standards suggest one to provide passive loop through connectors.

The specific description is below:

**Secondary data link - passive loop through ports**

Devices containing two DMX512 ports, one for receive and one for transmit, …, shall provide a direct passive link for all pins between the two ports.

Equipment designers are encouraged to provide passive loop through on Pins 4 and 5 whenever possible, even if not required.

The drawing below shows a typical installation.
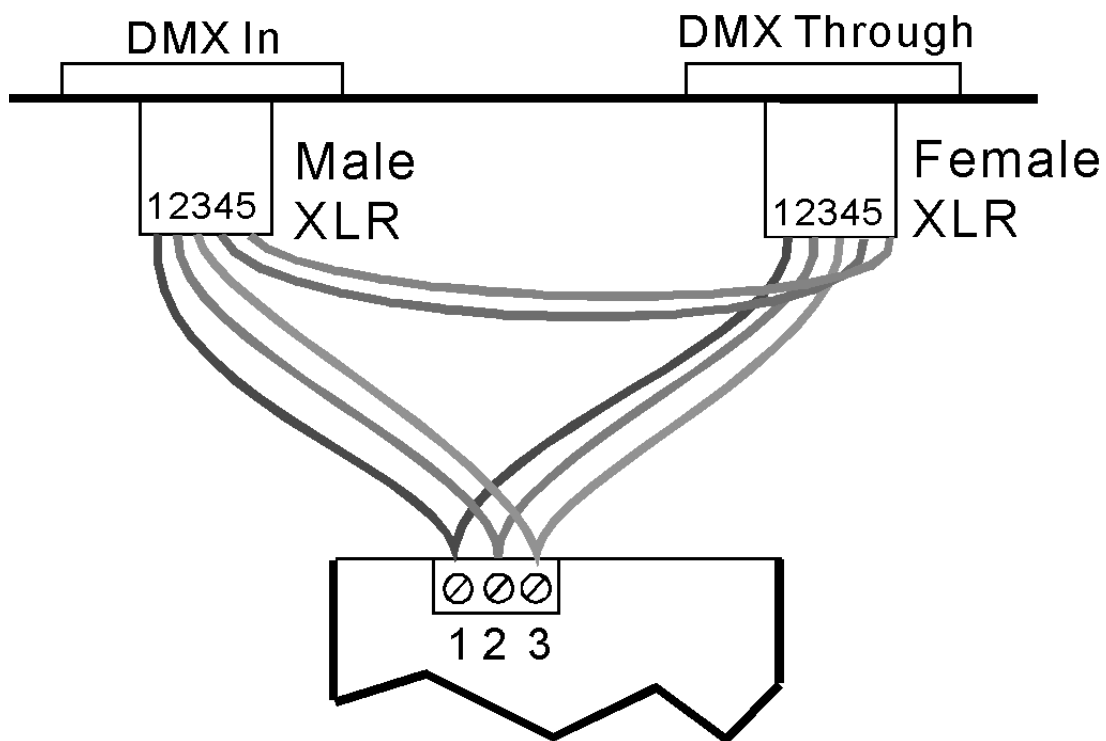
Typical hook up
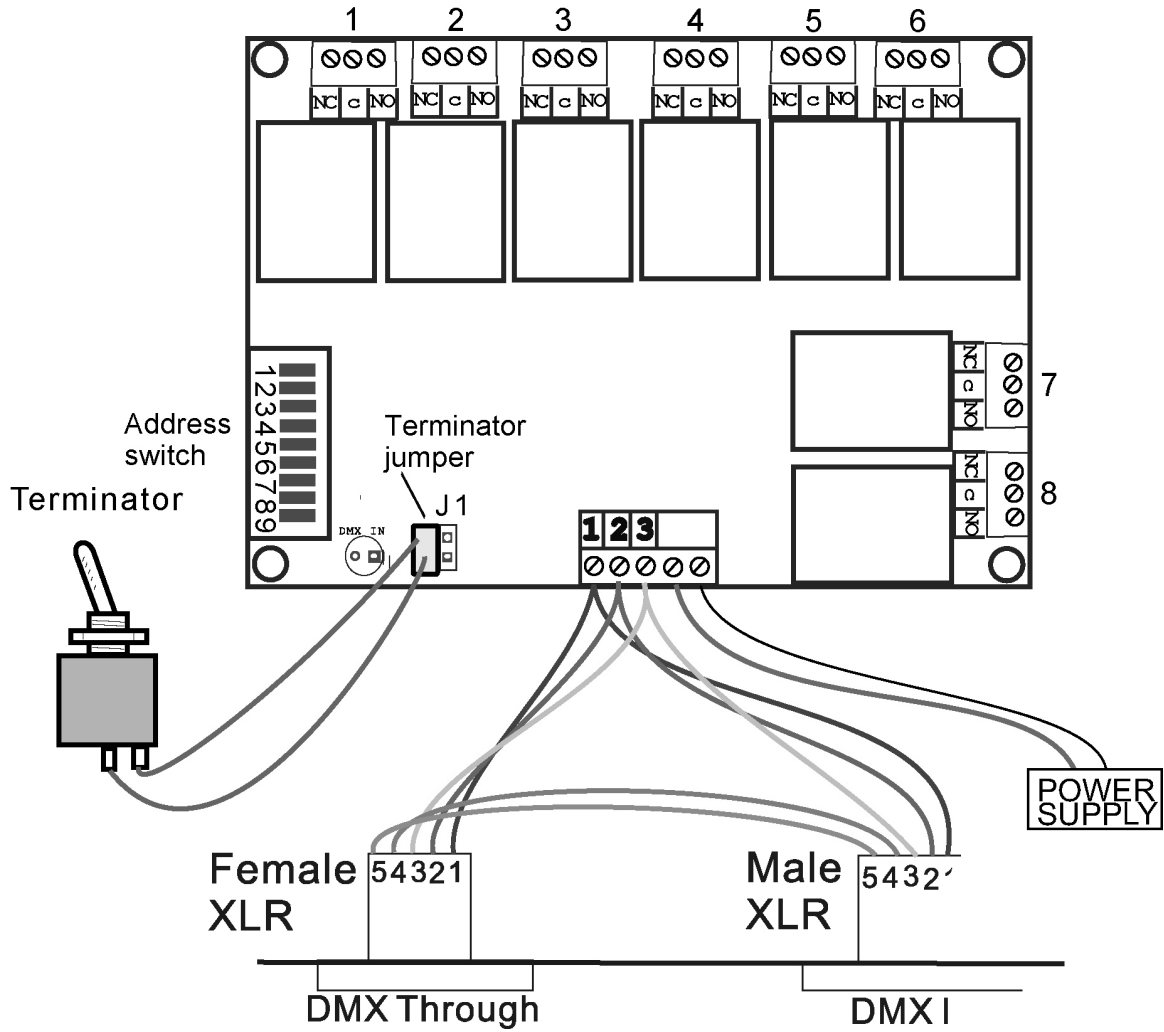
Termination

A common problem with DMX systems is improper termination.
A simple terminator consists of a 120 Ohm resistor connected across pins 2-3 of the DMX signal

The decoder provides an on board terminator using standard square pin connectors on .10" centers.

A toggle switch can be placed across the terminals for convenient front panel terminator selection.

The termination resistor should only be in when the decoder is the last device on the DMX link.

In the drawing on the right, note the leads are offset to one side.

There is no specific orientation of the connector on the PC board.

The latest version of the DMX512 specifies that the terminator switch should be labeled "In" and "Out".

Terminator In

Terminator Out
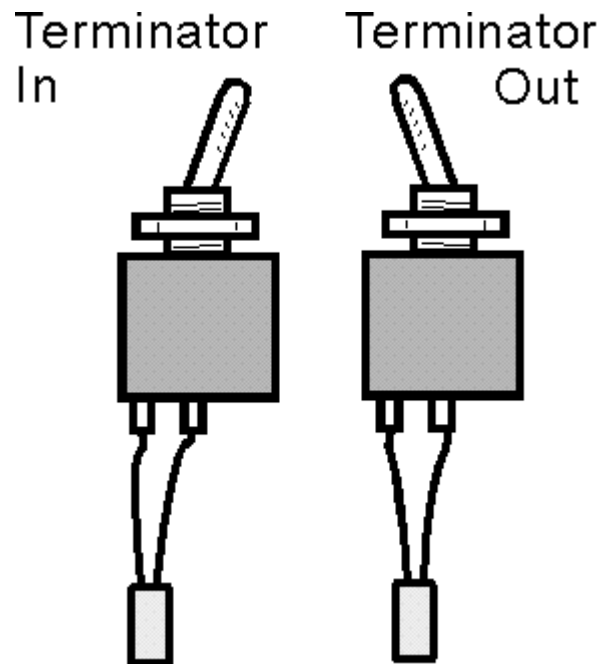
Trouble shooting

Basically the board is plug and play. When all connections are properly made, the relays will respond to the DMX signal and analog switches.

Signal Ground/common: On the board, there is NO connection between chassis/earth ground and Signal/common ground. Do not install one.
On the DMX data cable, there is NO connection between the shield/XLR shell earth ground and the signal/common ground. Do not connect these together.

Termination – DMX mode If the Relay board is the last one on the DMX link a jumper for the terminating resistor can be installed on the PC board.
It is possible to "over terminate". In other words make sure there is only 1 terminator on the end of the DMX line. Some devices have internal terminators, double check the settings.

No output:

DMX512 Check the signal wires as noted above.
Be sure the address is set to a valid address. The Relay start address should not be higher than the highest address received.

Misc: Good solid connections are a must. The mini screw terminals provide good connections. However the screws can be stripped by over tightening. DMX512 signal wires should be twisted together all the way to the connector.

It is recommended that a separate power supply be used to power the Relay board. Occasionally unexpected problems can occur if power is "borrowed" from an existing source.
Small wall wart transformers with DC voltage outputs work well for this application.

Using DMX512

DMX 512 is a digital communications protocol that specifies a set of requirements for transmitting and receiving digital signals between lighting controllers and dimmers. There are 2 main components to this spec.

The Data "layer" protocol is the meaning of the bits and bytes that are transmitted. Northlight's RELAY is compliant with the full requirements of the Data Protocol. There is a certain amount of flexibility in the signal timing, Northlight's RELAY is capable of receiving data at the full data rate specified.

The other component of DMX512 is the Electrical Specifications. The hardware electrical specs are listed in EIA-485, commonly refereed to as the RS-485 specs. The RS-485 standard, specifies only the electrical characteristics of the driver and the receiver to be used at the line interface. Northlight's RELAY is compliant with RS-485. Each receiver represents less than 1 node load to the system.

RS485 is a data transmission system using balanced differential signals. That is 2 signal wires and signal ground. 3 wires are required.

Splitters/Repeaters

Isolation between the console and dimmers is sometimes required to prevent signal degradation and protect devices from damaging voltages on the control cable. Optically isolated splitters help avoid these problems.

Each DMX512 output can drive up to 32 devices. If there are more devices on the line, a "repeater" or "booster" is required.

Some cheap devices are not fully compliant and actually represent a load equivalent to 2 or more devices.

Long or improper cables, electrically noisy environment (generators, motors) and improper use of passive "Y" splitters all contribute to DMX signal degradation. A repeater/booster may help to solve these problems.

Why ask WYE?

Wye(Y) splitters are NOT recommended for DMX512 systems. Wye splitters are simply a male inline XLR connector, parallel wired to 2 female inline XLR's. While convenient, Wye splitters cause unwanted signal reflections and possible ground loops, leading to signal degradation.

The best layout for DMX systems is a Daisy chain configuration, where the signal cable jumps from one device to the next, with no branching. Each chain can have up to 32 devices on it. When using an isolated splitter, each outputs can be a separate DMX daisy chain.

Termination

A common problem with DMX systems is improper termination.

A simple terminator consists of a 120 Ohm resistor connected across pins 2-3 of the DMX signal. More complex terminators utilize voltage spike protection and bi-color LEDs to indicate signal integrity.

Terminators are an impedance matching circuit required to damp signals that "reflect " from the end of an improperly terminated cable, causing signal degradation under certain conditions.

On devices the have a DMX thru , a male XLR connector with terminating resistor connected across pins 2-3 and installed on the DMX thru connector will suffice. Some devices with isolated outputs will not use a terminator on the DMX out. These usually have an internal terminator that is selected with a switch.

Wire Type

There is a difference between microphone cable and "Data" cable. Sure you can get away with mic. cable for short runs in many situations. However on longer runs or marginal situations mic. cable will let you down. You may have random errors or the system won't work at all. It comes down to insurance. If you want to insure the most reliable DMX signal distribution you need the most appropriate wire for the job. DMX512 requires wire suitable for RS-485, there is no way to get around that.

Twisted-pair cable is the most common wire type. You can use a range of wire gauges, most frequently use 22 – 24 AWG. The characteristic impedance of the cable should be 100 to 120 Ohms.

Some other requirements are, at least 1 twisted pair plus ground and shield. It should have low capacitance and overall braid and foil shield.

Data Rate VS Cable Length

At 250K bits per second the max cable length is about 1000 ft for DMX512 in good conditions.
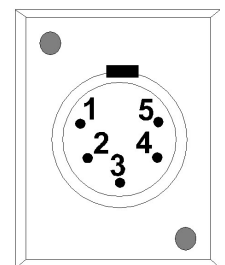
Connectors

DMX512 protocol specifies that 5 pin XLR connectors be used. Female on the transmitter and male on the receiver.

When a 3 pin XLR is used it is wired the same as the first 3 pins on the 5 pin XLR.

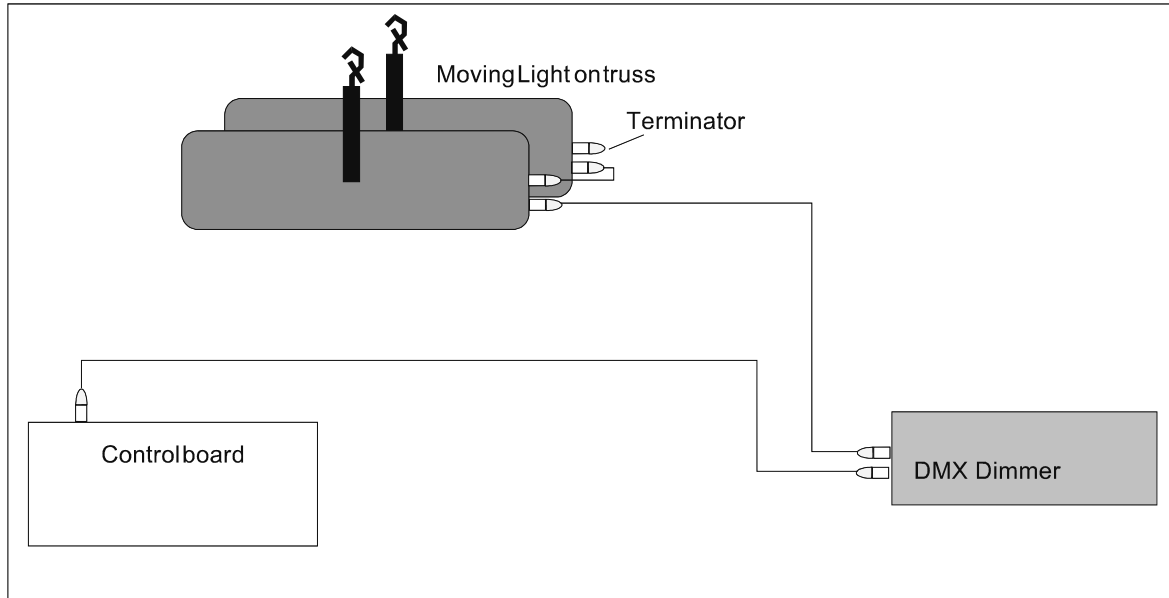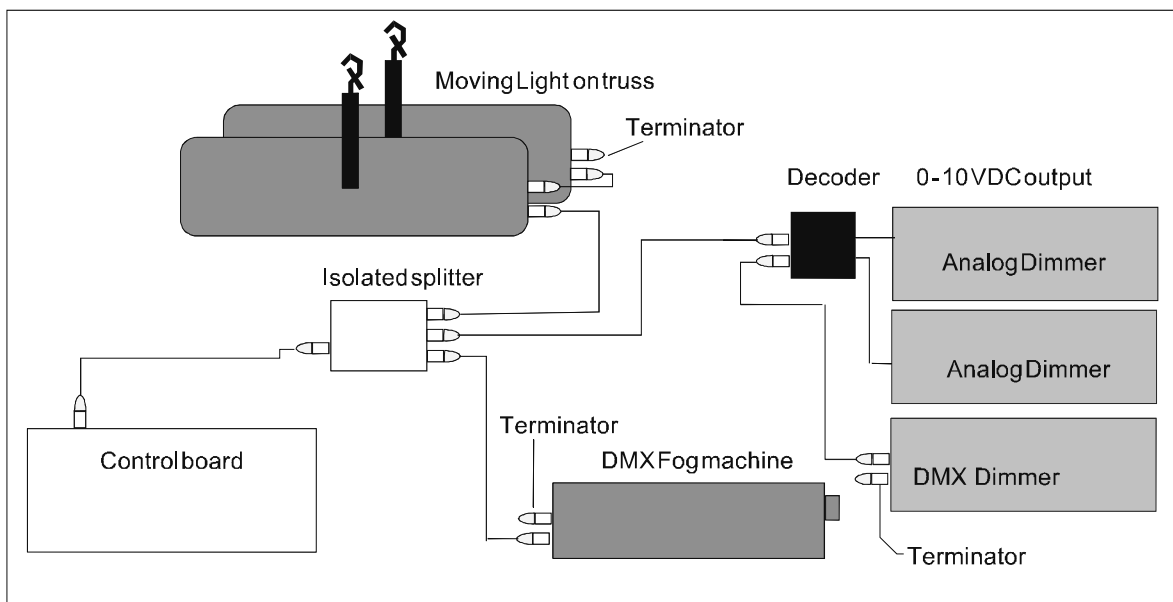| PIN	WIRE	SIGNAL
1	shield	ground/return
2	signal	data compliment (-)
3	signal	data true (+)
4	signal	spare data compliment (-)
5	signal conductor	spare data true (+)
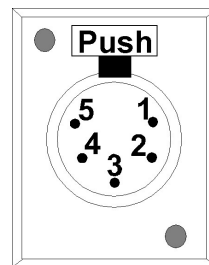
OUTPUT   INPUT

Conductors 2/3 and 4/5 should be twisted together.

Typical DMX signal routing

Simple setup

A more complicated setup. The Isolated splitter greatly simplifies cable routing and keeps individual runs short.

Northlight Systems

Address - switches	Address - switches	Address - switches	Address - switches
1 =1	64 = 7	127 = 1, 2, 3, 4, 5, 6, 7	190 = 2, 3, 4, 5, 6, 8
2 =2	65 = 1, 7	128 = 8	191 = 1, 2, 3, 4, 5, 6, 8
3 = 1, 2	66 = 2, 7	129 = 1, 8	192 = 7, 8
4 =3	67 = 1, 2, 7	130 = 2, 8	193 = 1, 7, 8,
5 = 1, 3	68 = 3, 7	131 = 1, 2, 8	194 = 2, 7, 8,
6 = 2, 3	69 = 1, 3, 7	132 = 3, 8	195 = 1, 2, 7, 8
7 = 1, 2, 3	70 = 2, 3, 7	133 = 1, 3, 8	196 = 3, 7, 8
8 = 4	71 = 1, 2, 3, 7	134 = 2, 3, 8	197 = 1, 3, 7, 8
9 = 1, 4	72 = 4, 7	135 = 1, 2, 3, 8	198 = 2, 3, 7, 8
10 = 2, 4	73 = 1, 4, 7	136 = 4, 8	199 = 1, 2, 3, 7, 8
11 = 1, 2, 4	74 = 2, 4, 7	137 = 1, 4, 8	200 = 4, 7, 8,
12 = 3, 4	75 = 1, 2, 4, 7	138 = 2, 4, 8	201 = 1, 4, 7, 8
13 = 1, 3, 4	76 = 3, 4, 7	139 = 1, 2, 4, 8	202 = 2, 4, 7, 8
14 = 2, 3, 4	77 = 1, 3, 4, 7	140 = 3, 4, 8	203 = 1, 2, 4, 7, 8
15 = 1, 2, 3, 4	78 = 2, 3, 4, 7	141 = 1, 3, 4, 8	204 = 3, 4, 7, 8
16 = 5	79 = 1, 3, 4, 7	142 = 2, 3, 4, 8	205 = 1, 3, 4, 7, 8
17 = 1, 5	80 = 5, 7	143 = 1, 2, 3, 4, 8	206 = 2, 3, 4, 7, 8
18 = 2, 5	81 = 1, 5, 7	144 = 5, 8	207 = 1, 2, 3, 4, 7, 8
19 = 1, 2, 5	82 = 2, 5, 7	145 = 1, 5, 8	208 = 5, 7, 8
20 = 3, 5	83 = 1, 2, 5, 7	146 = 2, 5, 8	209 = 1, 5, 7, 8
21 = 1, 3, 5	84 = 3, 5, 7	147 = 1, 2, 5, 8	210 = 2, 5, 7, 8
22 = 2, 3, 5	85 = 1, 3, 5, 7	148 = 3, 5, 8	211 = 1, 2, 5, 7, 8
23 = 1, 2, 3, 5	86 = 2, 3, 5, 7	149 = 1, 3, 5, 8	212 = 3, 5, 7, 8
24 = 4, 5	87 = 1, 2, 3, 5, 7	150 = 2, 3, 5, 8	213 = 1, 3, 5, 7, 8
25 = 1, 4, 5	88 = 4, 5, 7	151 = 1, 2, 3, 5, 8	214 = 2, 3, 5, 7, 8
26 = 2, 4, 5	89 = 1, 4, 5, 7	152 = 4, 5, 8	215 = 1, 2, 3, 5, 7, 8
27 = 1, 2, 4, 5	90 = 2, 4, 5, 7	153 = 1, 4, 5, 8	216 = 4, 5, 7, 8
28 = 3, 4, 5	91 = 1, 2, 4, 5, 7	154 = 2, 4, 5, 8	217 = 1, 4, 5, 7, 8
29 = 1, 3, 4, 5	92 = 3, 4, 5, 7	155 = 1, 2, 4, 5, 8	218 = 2, 4, 5, 7, 8
30 = 2, 3, 4, 5	93 = 1, 3, 4, 5, 7	156 = 3, 4, 5, 8	219 = 1, 2, 4, 5, 7, 8
31 = 1, 2, 3, 4, 5	94 = 2, 3, 4, 5, 7	157 = 1, 3, 4, 5, 8	220 = 3, 4, 5, 7, 8
32 = 6	95 = 1, 2, 3, 4, 5, 7	158 = 2, 3, 4, 5, 8	221 = 1, 3, 4, 5, 7, 8
33 = 1, 6	96 = 6, 7	159 = 1, 2, 3, 4, 5, 8	222 = 2, 3, 4, 5, 7, 8
34 = 2, 6	97 = 1, 6, 7	160 = 6, 8	223 = 1, 2, 3, 4, 5, 7, 8
35 = 1, 2, 6	98 = 2, 6, 7	161 = 1, 6, 8	224 = 6, 7, 8
36 = 3, 6	99 = 1, 2, 6, 7	162 = 2, 6, 8	225 = 1, 6, 7, 8
37 = 1, 3, 6	100 = 3, 6, 7	163 = 1, 2, 6, 8	226 = 2, 6, 7, 8
38 = 2, 3, 6	101 = 1, 3, 6, 7	164 = 3, 6, 8	227 = 1, 2, 6, 7, 8
39 = 1, 2, 3, 6	102 = 2, 3, 6, 7	165 = 1, 3, 6, 8	228 = 3, 6, 7, 8
40 = 4, 6	103 = 1, 2, 3, 6, 7	166 = 2, 3, 6, 8	229 = 1, 3, 6, 7, 8
41 = 1, 4, 6	104 = 4, 6, 7	167 = 1, 2, 3, 6, 8	230 = 2, 3, 6, 7, 8
42 = 2, 4, 6	105 = 1, 4, 6, 7	168 = 4, 6, 8	231 = 1, 2, 3, 6, 7, 8
43 = 1, 2, 4, 6	106 = 2, 4, 6, 7	169 = 1, 4, 6, 8	232 = 4, 6, 7, 8
44 = 3, 4, 6,	107 = 1, 2, 4, 6, 7	170 = 2, 4, 6, 8	233 = 1, 4, 6, 7, 8
45 = 1, 3, 4, 6	108 = 3, 4, 6, 7	171 = 1, 2, 4, 6, 8	234 = 2, 4, 6, 7, 8
46 = 2, 3, 4, 6	109 = 1, 3, 4, 6, 7	172 = 3, 4, 6, 8	235 = 1, 2, 4, 6, 7, 8
47 = 1, 2, 3, 4, 6	110 = 2, 3, 4, 6, 7	173 = 1, 3, 4, 6, 8	236 = 3, 4, 6, 7, 8
48 = 5, 6	111 = 1, 2, 3, 4, 6, 7	174 = 2, 3, 4, 6, 8	237 = 1, 3, 4, 6, 7, 8
49 = 1, 5, 6	112 = 5, 6, 7	175 = 1,2, 3, 4, 6, 8	238 = 2, 3, 4, 6, 7, 8
50 = 2, 5, 6	113 = 1, 5, 6, 7	176 = 5, 6, 8	239 = 1, 2, 3, 4, 6, 7, 8
51 = 1, 2, 5, 6	114 = 2, 5, 6, 7	177 = 1, 5, 6, 8	240 = 5, 6, 7, 8
52 = 3, 5, 6	115 = 1, 2, 5, 6, 7	178 = 2, 5, 6, 8	241 = 1, 5, 6, 7, 8
53 = 1, 3, 5, 6	116 = 3, 5, 6, 7	179 = 1, 2, 5, 6, 8	242 = 2, 5, 6, 7, 8
54 = 2, 3, 5, 6	117 = 1, 3, 5, 6, 7	180 = 3, 5, 6, 8	243 = 1, 2, 5, 6, 7, 8
55 = 1, 2, 3, 5, 6	118 = 2, 3, 5, 6, 7	181 = 1, 3, 5, 6, 8	244 = 3, 5, 6, 7, 8
56 = 4, 5, 6	119 = 1, 2, 3, 5, 6, 7	182 = 2, 3, 5, 6, 8	245 = 1, 3, 5, 6, 7, 8
57 = 1, 4, 5, 6	120 = 4, 5, 6, 7	183 = 1, 2, 3, 5, 6, 8	246 = 2, 3, 5, 6, 7, 8
58 = 2, 4, 5, 6	121 = 1, 4, 5, 6, 7	184 = 4, 5, 6, 8	247 = 1, 2, 3, 5, 6, 7, 8
59 = 1, 2, 4, 5, 6	122 = 2, 4, 5, 6, 7	185 = 1, 4, 5, 6, 8	248 = 4, 5, 6, 7, 8
60 = 3, 4, 5, 6	123 = 1, 2, 4, 5, 6, 7	186 = 2, 4, 5, 6, 8	249 = 1, 4, 5, 6, 7, 8
61 = 1, 3, 4, 5, 6	124 = 3, 4, 5, 6, 7	187 = 1, 2, 4, 5, 6, 8	250 = 2, 4, 5, 6, 7, 8
62 = 2, 3, 4, 5, 6	125 = 1, 3, 4, 5, 6, 7	188 = 3, 4, 5, 6, 8	251 = 1, 2, 4, 5, 6, 7, 8
63 = 1, 2, 3, 4, 5, 6	126 = 2, 3, 4, 5, 6, 7	189 = 1, 3, 4, 5, 6, 8	252 = 3, 4, 5, 6, 7, 8

Address - switches
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322 = 2, 7, 9

Address - switches
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Address - switches
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