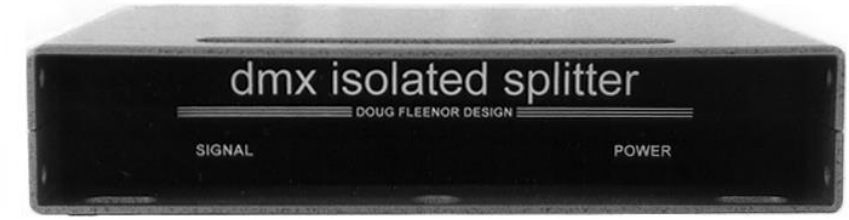
DOUG FLEENOR DESIGN

DMX512 ISOLATED SPLITTER/AMPLIFIER
OWNER'S MANUAL



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Product Description

The Splitter/Amplifier provides between one and eleven DMX512 outputs from a single DMX512 input. The outputs are electrically isolated from the input and from each other by 2500 volt optical couplers.

All models of our Splitter/Amplifier boost the signal as well as isolate it. Input levels as low as 0.2 volts are transmitted at full EIA-485 levels (about 4.5 volts).

The splitters allow the DMX signal to be split without the possibility of reflections from one signal path interfering with the signal to a device on a different path. By isolating each output, electrical noise and hazardous voltages on one output are prevented from affecting (or damaging) devices on the input or another output.

Common uses for the Splitter/Amplifier include:

- Boosting the signal level on long control runs (greater than 500 feet)
- Splitting the signal to multiple dimmer locations
- Splitting the signal between dimmers and other DMX devices (color changers, moving lights, etc.)
- Isolating two or three dimmer packs from each other.

Although this product was designed for the digital multiplex lighting control standard DMX512, the units use standard EIA-485 components. They can be used to split and isolate any single-drop uni-directional EIA-422 or EIA-485 line up to the rated data rate of 250 Kb/s.

Setup and Connections

Plug the splitter's line cord into a grounded electrical outlet. The splitter requires between 100 and 120 volts, 50 or 60 hertz. It requires less than 1/10 amp (12 Watts). It should be grounded for maximum electrical noise isolation and safety. The earth ground is connected only to the chassis. All circuitry is isolated from the chassis and the power cord's ground pin.

Plug the console or other DMX source into the Splitter/Amplifier's input connector. Connect the output(s) of the unit to the dimmers or other DMX receivers.

The splitter is normally provided with the connectors specified for DMX512:

Input = 5 pin male "XLR" style Output = 5 pin female "XLR" style

The signals on each pin are:

1 = Common
2 = Data -
3 = Data +
4 = No Connection
5 = No Connection

The unit may also be ordered with non-standard connectors such as 3 pin "XLR" style.

Note that pin 1 is common in name only. All commons are electrically isolated from each other.

Operation

The DMX512 splitter has no operator controls; it is fully automatic. It should be left plugged in at all times for automatic operation. When a DMX signal is applied to the input, it is processed by the receive circuit, isolated by the optical couplers, and retransmitted by the driver circuits. All this takes less than 1/10,000,000 of a second.

When no DMX input is present, the outputs are placed in an idle condition. This condition is defined in the DMX512 specification as Data+ line high and Data- line low.

Two indicators are provided on the front panel of the splitter. The red POWER indicator is illuminated whenever the power cord is plugged into a live outlet. The green SIGNAL indicator is illuminated whenever the Data+ and Data- lines leave their idle state. Note that the signal indicator does not necessarily indicate a valid signal, only that the line is not idle.

The signal indicator will change intensities as the levels sent to the outputs are varied. In some cases the signal indicator may be quite dim even though data is being received. The indicator will be at its lowest intensity when all dimmers are being sent to full. Try sending all dimmers to zero then look at the indicator.

Line Termination

The input of the one, three, and five output models are terminated with 120 ohm 1/2 watt resistors. This is the proper input termination for DMX512 lines. Since these models do not provide pass-through of the input DMX signal, the unit is always the last device on the line. (These unit may be customized with a feed through, in which case it must be terminated.)

The input of the eleven output model is not terminated. To properly terminate the DMX input, a 120 ohm termination plug must be plugged into on the pass-through connector.

It is recommended that all control runs be terminated. The most important place to use termination is on a control run where the signal daisy chains from a source (console, isolator, splitter, etc.) to several receivers (dimmers, color scrollers, etc.) with hundreds of feet separating the receivers. What happens in such a case is that the signal seen by the receivers is a combination of the correct signal (sent by the console) and a delayed version of that signal which is reflected from the end of the cable. The longer the cable, and the more devices on the cable, the more the reflected signal tends to distort the initial signal. The cure (in theory) is to absorb the signal at the end of the cable so that none is reflected back up the line.

> To terminate a typical control run place a 120 Ohm resistor between the Data+ (pin 3) and Data- (pin 2) lines at the last receiver on the line.

Unused outputs on a DMX512 splitter do not need to be terminated.

Technical Details

DMX512 uses a "differential" digital signal. A differential signal is a pair of signals which are inverse from one another. That is, when one is high, the other is low. Differential signals are common in both analog processing (balanced microphone cables) and digital processing (digital communications such as EIA-485). Differential signals are used to reduce the effect of electrical noise on long cable runs. When a differential signal is processed by the receiving circuit (microphone pre-amp or EIA-485 receiver for example) the noise can be eliminated but the signal remains.

Differential signals always travel in pairs; the wires they travel on are usually twisted to insure any noise picked up is of equal magnitude on both wires. The noise must be of equal magnitude on each wire so that the receiving circuit can effectively subtract the noise and leave the signal. The pairs of signals are usually denoted by a plus (+) sign on the normal, or "hot", or "true" line and by a minus (-) sign on the inverted, or "return", or "complement" line. The differential signals on the splitter are Data+ and Data-.

DMX512 is a standard for lighting control published by the United States Institute For Theater Technology. The DMX512 standard specifies that the electrical properties of the signal comply with a standard published by the Electronic Industries Association, EIA-485 (or RS-485). Many manufacturers make integrated circuits that meet the input and output specification of EIA-485. The DMX512 Isolated Splitter/Amplifier uses a "75179" as the receiver and "75176's" as transmitters; both of which were designed specifically to meet EIA-485. Between these circuits is a "6N137" optical coupler which isolates the two circuits using a beam of light passing through a layer of glass. The "6N137" is rated to a maximum speed of 10 million bits-per-second and provides isolation to 2500 Volts.

Since the receiver and transmitters all require power, and they must be isolated, multiple 5 volt power supplies are included. Transformers, each with two secondaries, steps the 120 volt line down to 10 volts. A 1N4004 diode converts the 10 volts AC to 14 volts DC. A 330 uF capacitor filters the DC and a 7805 regulates it down to 5 volts.

Resistors are included on the input of the splitter. The one, three, and five output models have 1K pull up/down resistors on the input to insure the output goes to the idle state when no source is connected. A 120 ohm termination resistor is across the data lines to prevent reflections. On the eleven output model the 120 ohm termination resistor is absent since a pass through connector is provided to loop on to additional splitters. Also, the eleven output model uses 22K pull up/down resistors so as to not load the line.

Troubleshooting

We hope your DMX512 Isolated Splitter/Amplifier never needs service. If it does, the information presented here may be of assistance.

Access to the inside of the unit is accomplished by removing the top cover.

The input fuse is a 1/2 amp 3AG fast blow fuse.

The output drivers are 75176B devices. A 75176A will work but is not as rugged.

The input receiver is a 75179B.

The optical isolator is a 6N137.

Schematics are available from Doug Fleenor Design.

Limited Manufacturer's Warranty

Products manufactured by Doug Fleenor Design (DFD) carry a five-year parts and labor warranty against manufacturing defects. It is the customer's responsibility to return the product to DFD at the customer's expense. If covered under warranty, DFD will repair the unit and pay for return ground shipping. If a trip is necessary to the customer's site to solve a problem, the expenses of the trip must be paid by the customer.

This warranty covers manufacturing defects. It does not cover damage due to abuse, misuse, negligence, accident, alteration, or repair by other than by Doug Fleenor Design.

Most non-warranty repairs are made for a fixed $50.00 fee, plus shipping.

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