

Owner's Manual



Multiplex to DMX-512 Protocol Translator

MODEL NUMBER 642512

DMX-tools? by

REGULATORY COMPLIANCE

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not used and installed in accordance with the instructions, may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the unit on and off, the user is encouraged to try to correct the interference by one or more of the following measures:

- ?? Reorient or relocate the receiving antenna.
- ?? Increase the separation between the equipment and the receiver.
- ?? Connect the equipment to an outlet on a different circuit from that to which the receiver is connected.
- ?? Consult the dealer or an experienced radio/TV technician for help.

The user is cautioned that changes and modifications made to this equipment without the approval of the manufacturer could void the user's authority to operate the equipment. In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment.

SAFETY INSTRUCTIONS

CAUTION: To reduce the risk of electrical shock, do not remove the cover. No user-serviceable parts inside; refer servicing to qualified service personnel.

WARNING: To reduce the risk of fire or electrical shock, do not expose this device to rain or moisture.

WARNING: To avoid damage to DMX-512 equipment, NEVER connect it directly to multiplex equipment. Multiplex signal levels are up to 6 times those used for DMX-512 and WILL cause damage.

Dear Customer,

Multiplex remote control systems use a single twisted pair, usually standard microphone cable, to send control signals to several dimmers or relays using analog time-division multiplexing. NSI Microplex, James Lighting MUX-64 and Lightronics LMX are examples. Some systems can put as many as 128 channels on one cable.

In 1986, the U.S. Institute of Theater Technology (USITT) published the specification for a new dimmer control protocol called DMX-512. DMX-512 also sends the controls as low-voltage signals over a single twisted pair, but it uses digital signals, which are more resistant to electrical noise and can handle more data; control for up to 512 channels can pass over a single cable. In 1990, the standard was revised, relaxing some of the timing requirements and making it easier to manufacture compliant equipment.

As an industry standard, DMX-512 allows controllers, dimmers and effects from any manufacturer to work with those from any other manufacturer. Many companies now manufacture DMX-512 dimmers and controllers. Almost all moving-light effects use DMX-512.

This poses a problem for anyone wanting to upgrade an existing multiplex system. Adding new DMX-512 effects means adding a DMX-512 controller. In itself this isn't bad, because of the larger number of control channels and because, with many companies in the DMX-512 market, competition has pushed prices pretty low. However, moving the existing lights to the DMX controller meant replacing all the multiplex dimmers with DMX dimmers, a costly proposition even though DMX dimmers are usually less expensive than similar multiplex units.

It's a proposition I had to face as a concert sound-and-lighting contractor. When I upgraded my concert system, I lived with two controllers, a James Model 916 for my 32 channels of multiplex dimmers and an American DJ "DMX Operator" for my moving-light effects. Having separate controllers for the dimmers and the moving effects made it difficult to choreograph a decent light show but I couldn't afford to replace a couple thousand dollars-worth of dimmers all at once.

Because my background is in electronic engineering, I decided to do something about it. I designed my *DMX-lator I* to let me operate my multiplex dimmers, as well as my moving-light effects, from my American DJ "DMX Operator" controller.

In my life as a punk-rock sound guy, I have an AOL profile page where I mentioned that I was doing the *DMX-lator I*. The very next day, I received an e-mail asking why I didn't go the other way, allowing a multiplex controller to operate DMX-512 effects. Well, I designed the *DMX-lator I* to solve my own problem. I had already invested in a DMX-512 controller, and it was much more powerful than my multiplex

unit. But I could see his point, so as soon as I had the *DMX-lator I* prototype working, I started on the design for the *DMX-lator II*.

The *DMX-lator II* translates up to 64 channels of multiplex control to DMX-512. If the multiplex controller handles fewer than 64 channels, it will only translate what it receives – it will not turn a 16-channel controller into a 64-channel controller. If the multiplex controller handles more than 64 channels, it will only translate the first 64, a limitation of the microcontroller that's doing the translating.

Before offering it for sale, I tested it with my James Lighting model 916 controller and a Lightronics model FC-816 controller, operating a pair of American DJ "PocketScan" DMX effects. Since those early days I've tested it with NSI, Sunn and ETA controllers as well. ETA timing is slightly different, but the firmware has been upgraded, able to detect and compensate for the difference. The current revision of firmware also features an improved digital filter algorithm, making it the most reliable mux-to-dmx translator I could design. I hope you're as pleased with it as I am.

dmx-tools@ameritech.net

February 28, 2003

Addressing

Whether it's DMX-512 or multiplex, each dimmer, relay pack or effect has an address (some have several). It's how one associates a device on stage to a fader or switch on the controller. The DMX-512 protocol allows up to 512, but the *DMX-lator II* only generates signals for the first 64. Few multiplex controllers provide more than 64 channels and limiting the *DMX-lator II* to 64 allowed me to use a less-expensive microprocessor in the design. It also allowed me to maintain a high refresh rate, making the DMX-512 output respond more quickly to changes in the multiplex data. It is, however, necessary to keep the DMX-512 device addresses in the range actually produced by the multiplex controller or the range 1-64, whichever is lower.

The mapping from multiplex address to DMX-512 address is fixed. Multiplex channel 1 becomes DMX channel 1, multiplex channel 2 becomes DMX channel 2 and so on.

Note that assigning addresses to DMX-512 devices does not remove those addresses from the multiplex side. This allows you to operate a DMX dimmer and a multiplex dimmer from the same fader at the same time, if you so desire.

Connections

DMX-512 was originally specified to use 5-pin XLR connectors. Some manufacturers use 3-pin XLR connectors in cases where the second, return channel is not being used. The *DMX-lator I* uses this 3-pin variation, both for compatibility with the inexpensive American DJ controller and fixtures I use and because multiplex has no way to handle a return channel (and, honestly, because PCB-mounted 5-pin XLR connectors are much more expensive). If your DMX-512 gear requires the 5-pin connectors, 3-pin to 5-pin and 5-pin to 3-pin adapters are readily available. Instructions for building your own adapters are included in appendix A.

DMX-512 signals are fast, so DMX-512 lines must be terminated for reliable operation. This simply means placing a resistor across the two signal leads at the end of the line farthest from the controller. The resistor value must be close to the characteristic impedance of the cable being used – for standard microphone cable, 110-120 ohms. Instructions for building your own terminator are included in appendix B.

All the various multiplex protocols the *DMX-lator I* was designed for use 3-pin XLR connectors on standard microphone cable. Multiplex lines should not be terminated.

The *DMX-lator II* can be placed anywhere in the DMX-512 string, appearing to the controller as a 64-channel dimmer-pack. In normal operation power is supplied by the multiplex dimmers. However, a connector is provided for an optional wall-mount power supply (order part number 6425128), allowing the *DMX-lator II* to be used in the absence of any multiplex dimmers.

The *DMX-lator II* is always the first device in the multiplex chain, effectively acting as the multiplex controller.

Be absolutely certain that you have the DMX-512 and multiplex connectors in the right places before powering up any multiplex dimmers. Connecting a multiplex dimmer to the DMX-512 output will probably damage the *DMX-lator II*. Connecting any DMX-512 device directly to the multiplex string will probably damage the DMX device.

Mounting

Included with the *DMX-lator II* is a strip of gum-backed Velcro? . A matching strip is pre-applied to the back of the *DMX-lator II*. The *DMX-lator II* may be mounted in any position. In cases where the *DMX-lator II* is mounted somewhere in the rigging, on a lighting truss or tree, it may

be useful to position it such that the “ALIVE” LED is visible from the ground.

Operation

Once the cables have been connected, there are no further actions required of the user specific to the *DMX-lator I*. The *DMX-lator I* is powered by the dimmers on the multiplex side. It turns on and off with them.

Maintenance

The *DMX-lator II* should require no user maintenance beyond periodic dusting. If further cleaning is required, surfaces may be wiped with a damp (not wet) cloth. The use of solvents or abrasive cleaners should be avoided.

Troubleshooting

Most problems can be traced to either improper address-switch settings on one or more of the DMX-512 devices, faulty cables or failure to properly terminate DMX-512 lines.

A Tip On Moving-Light Effects

Most moving-light effects use several fader channels. For example, my American DJ “PocketScan” effects need seven channels each. Running two of them on my James Lighting model 916, with 16 fader channels, would be a problem – I’d have two faders left for dimmers.

But the 916 and some competitive controllers have a nice feature called “soft-patch.” Soft-patch allows you to map output channels to different faders. On the 916, you can actually map multiple output channels to a single fader – while it only has 16 fader channels (and 16 switch channels), it can generate 64 output channels. By mapping the shutter, speed, gobo, color and laser channels of all the PocketScan effects to the same faders, I can conserve channels.

In my test setup, output channel 1 is mapped as normal, to fader channel 1. It’s the pan control for the left PocketScan. Likewise, output channel 2 is mapped to fader channel 2. It’s the tilt control for the left PocketScan. Output channel 3 is mapped to fader channel 5, via soft-patch. It’s the color wheel for the left PocketScan. Output channel 4 is mapped to fader channel 6. It’s the gobo selection for the left PocketScan. Output channel 5 is the shutter control, mapped to fader 7. Output channel 6, the pan/tilt speed control, is fader channel 8. Output channel 7 is the laser control, mapped to fader channel 9.

Output channel 8 is the pan control for the right PocketScan. It's mapped, via soft-patch, to fader channel 3. Output channel 9, the tilt control for the right PocketScan, is mapped to fader channel 4. Output channel 10 is the color wheel for the right PocketScan. It's mapped to fader channel 5, along with the color wheel from the left PocketScan. Output channel 11, the right gobo selection, is mapped to fader channel 6, sharing it with the left gobo selection, and so on... output 12 to fader 7, output 13 to fader 8 and output 14 to fader 9.

The result is that I've used 9 fader channels to control 14 output channels, leaving 7 to control dimmers (plus 16 on/off channels to control relays). The two PocketScans select color and gobo in unison, open, close and strobe the shutter at the same time and turn the laser on and off or strobe it at the same time. Their mirrors move at the same speed. But their mirrors move independently... a major key to choreographing a good moving-light show.

Specifications

Physical:

Weight:	11 Oz.
Dimensions:	5.25" H X 3.5" W X 1.5" D

Functional:

Ambient temperature:	0-120? F
Relative Humidity:	0-90% non-condensing
Shock and vibration:	5G

Electrical:

Power:	15VDC @ 60mA (supplied by the multiplex dimmer-pack)
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DMX-512 refresh rate:	200Hz
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Latency:	44mS (this is the worst-case delay between a change to the multiplex input and the resulting change to the DMX-512 output)
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LIMITED WARRANTY

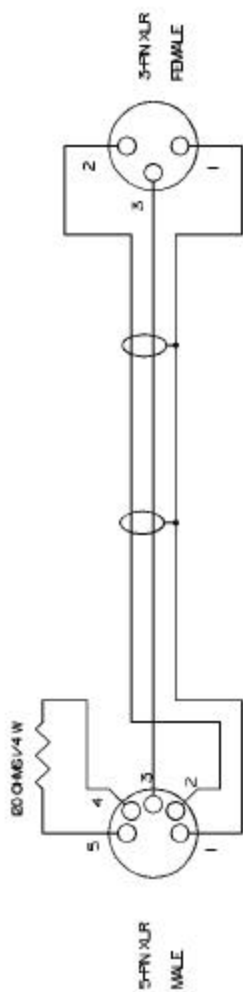
1. DMX-tools Co. warrants the *DMX-lator II* to be free from defects in design, materials or workmanship for a period of two years from the date of purchase. If any such defect occurs within the warranty period, DMX-tools Co. will, at our sole discretion, repair or replace the unit.
2. Specifically excluded from this warranty are damages/defects caused by:
 - ?? misuse, abuse, neglect or failure to install or operate the unit in accordance with the instructions given in this User's Manual.
 - ?? fire, flood, acts of God or natural disasters.
 - ?? war, revolution, riot or other armed conflict.
 - ?? use of the device as the 'ball,' 'puck', 'birdie' or 'target' in any sporting event or similar activity.
3. Any repair attempt by unauthorized persons will void this warranty.
4. This warranty applies to the original retail purchaser only.
5. Warranty service will be provided only if the returned product is accompanied by an original retail dealer's invoice or sales receipt (proof of purchase/purchase date).
6. For warranty service, the product must be returned, postage paid, in its original packaging to

**DMX-TOOLS CO.
424 FRANKLIN BLVD.
ELGIN, IL 60120-4439**

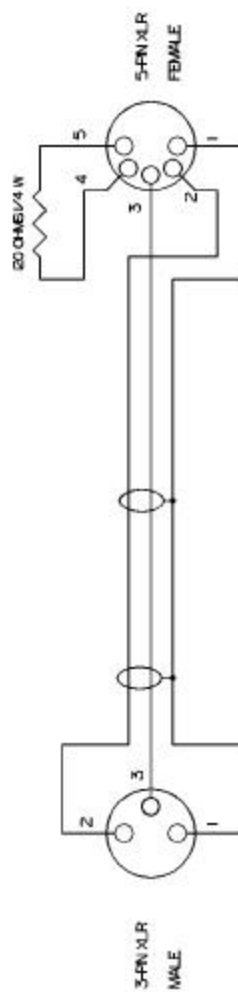
Please include a description of the fault or failure and a contact name and phone number and/or e-mail address.

7. Items meeting the above requirements for warranty service will be repaired or replaced and returned within 30 days.
8. Items not meeting the requirements for warranty service will elicit a call or e-mail to the contact name and number. You will be given the option of paying for service or having the item returned as-is.

APPENDIX A



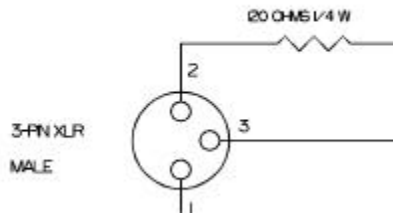
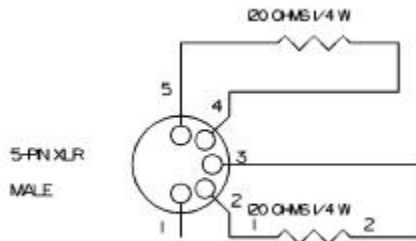
WHEN THE DEVICE UPSTREAM (CLOSER TO THE CONTROLLER)
USES THE 5-PIN DMX-512 STANDARD



WHEN THE DEVICE DOWNSTREAM (FARTHER FROM THE
CONTROLLER) USES THE 5-PIN DMX-52 STANDARD

Five-pin to three-pin XLR adapters

APPENDIX B



DMX-512 TERMINATORS

A DMX-512 terminator can be easily built into a cable-mounted male XLR connector, per the above diagrams. A terminator should be connected to the DMX OUT jack on the LAST device in the DMX-512 chain (the device furthest from the controller).

P/N 6425126

Revision D

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