Leprecon®

Lighting for Professionals

VX and MX Dimmer User's Manual

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1. General Description

The Leprecon VX and MX Dimmers are designed to meet the demanding requirements of the lighting industry. Emphasis was placed on designing a system that is flexible, reliable, and serviceable. The latest digital technology, combined with a modular design, bring a new level of performance and ease of use to portable and permanent dimming systems.

Because of the many custom features available on VX / MX systems, the features described in this manual may not cover all available options of the dimmer.

1.1. Standard Features:

- Modular Dimming & Control Electronics

Dimmer and control electronics can be serviced from the front panel, without removing the dimmer from the rack or enclosure.

- DMX Control Input

Digital control electronics using a patented circuit allows simultaneous DMX-512 and analog control input, with a highest-takes-precedence logic. Parallel input and output for DMX 512 allows daisy-chaining racks together in one system. DMX start address switches allow the dimmers to be assigned to start receiving data at any of the 512 addresses.

Full digital control electronics provides accurate dimmer output tracking from channel to channel, eliminating any variance in output levels when multiple dimmer channels are patched together.

- Analog Control Input

Two 8 pin Jones type male plugs are provided for 0-10 DC analog control. Control cable and pin connections are compatible with other Leprecon dimmers.

- Channel Breakers

The circuit breakers used in the VX and MX dimmers are fast response magnetic breakers. The quality of the breaker contributes to the reliable operation of the dimmer pack, even when shorted lamps or cables are plugged into the dimmer. The front panel toggle also allows the breaker to be used as a switch for the dimmer channel.

- Fan Cooling

Two fans are used in the VX and MX dimmers to keep the electronics at a safe operating temperature. The fans are controlled by a thermostat to keep fan noise to a minimum. When the pack is lightly loaded, the fans turn at a slower rate, and are accelerated to full speed when the temperature inside the pack increases.

- Programmable non-dim operation (VX Model only)

Any of the channels on the pack can be set for non-dim operation. The information, once set, is stored in the pack memory and is retained permanently.

2. Installation Options

The VX/ and MX dimmers can be shipped with user installed hardware for the intended application. If your order included either Rack mount or Stand-alone kits, the hardware is included in the package for the dimmer.

2.1. Rack Mount Kit

The Rack mount kit, CAE # 90-04-0012, for the VX and MX dimmers include the following items;

1) Rack mount ears	2 pcs.	20-2710
2) Rear support bracket	2 pcs.	20-2725
3) Screw, 6-32 x 1/2"	4 pcs	16-2112
4) Screw, 8-32 x 3/8"	6 pcs	16-3105

To install rack ears, simply screw the brackets to the left and right side of the dimmer. Use the larger #8 screws provided, and tighten securely.

The Rear support brackets attach to the back of the dimmer, using the screws that fasten the backpanel to the sides. Locate and remove these #6 screws, two on each side. Discard the original screws, and attach the rear support bracket with the new longer screws supplied.

Warning: Do not use screws longer than those provided for attaching hardware. Longer screws may contact live parts inside the dimmer and present a shock hazard.

2.2. Stand Alone Kit

For applications when the dimmer is not rack mounted, accessory handles and feet may be installed. The VX / MX Standalone Kit, CAE # 90-04-0011, contains these parts:

1) Handles	2 pcs.	18-1034
2) Screw, #8-32 x 3/8"	6 pcs	16-3012
3) Lockwasher, #8 split ring	10 pcs.	16-3802
3) Rubber Foot	4 pcs.	18-3012
4) Screw, #8-32 x 1/2"	4 pcs.	16-3014

To attach the handles, locate the three holes in each side provided for the handles. Use the six shorter #8 screws with the lockwashers to attach the handles. Tighten the screws securely.

The rubber feet attach to the bottom side of the dimmer with the longer #8 screws. Tighten the screws securely.

Warning: Do not use screws longer than those provided for attaching hardware. Longer screws may contact live parts inside the dimmer and present a shock hazard.

2.2.1. Power Input

The VX and MX dimmers are designed as a component for use in large, high-power stage lighting systems. It is the responsibility of the user to understand and properly follow guidelines and regulations for the use of equipment of this type. It is beyond the scope of this manual to fully explain all requirements and implications of connecting and operating dimming systems in general and Leprecon VX / MX systems specifically.

If you have any doubts of your ability to specify, safely connect and use high-voltage, high-powered equipment, please employ a qualified electrician.

3. VX and MX Power Requirements

3.1. VX / MX 2400 Power requirements

The VX2400 and MX2400 with the standard Terminal Power inlet requires 80 amps per leg of 3 phase power. Because of the neutral currents that can occur with phase control dimmers, the neutral must be capable of carrying 150% of the current of a single leg, or 120 amps. Two screw terminals are provided for double neutral wires to meet this requirement. It is recommended that the safety ground be equal to the capacity of the hot legs, or 80 amps.

The Leprecon VX / MX dimmer systems are primarily designed for three phase, four wire with ground power systems. Because of the variation in service from location to location, and the possibility of improper connection, it is strongly suggested that the service is checked for proper voltage with a meter before the dimmers are connected.

The VX and MX 2400 consists of twelve circuits of twenty amps each. Nominal line voltage is 115 VAC at 60 Hz. Special order models are available for 50 Hz and 230 volt operation.

3.2. VX / MX 1200 Power requirements

The VX1200 and MX1200 with the standard Terminal Power inlet requires 40 amps per leg of 3 phase power. Because of the neutral currents that can occur with phase control dimmers, the neutral must be capable of carrying 150% of the current of a single leg, or 60 amps. It is recommended that the safety ground be equal to the capacity of the hot legs, or 40 amps.

The VX and MX 1200 consists of twelve circuits of ten amps each. Nominal line voltage is 115 VAC at 60 Hz. Special order models are available for 50 Hz and 230 volt operation.

3.3. Over voltage Protection and Power Indicator

The VX and MX dimmer system uses a modular control card for each 12 channel dimmer. This control card incorporates over voltage detection and shutdown to protect the dimmer electronics and lamp loads from destruction.

The control card features three green LED's for power indication. These indicators show that each phase is connected and within normal limits. If all three LED's are not lighted, power is not applied, is out of range, or a fault is present in the system.

The internal protection takes effect at 140 volts AC. Voltages of this level or above will light the red Over voltage LED on the power supply drawer front panel, and disable all dimmer control.

Input from a controller or from the channel Test switches will be ignored, and no voltage will be output from any dimmer channels. As soon as the applied voltage is reduced to a safe level, the Over voltage LED will be quenched, and the dimmer will begin to operate normally.

3.4. Temp LED and Fan Control

Each channel of the VX / MX rack system has its own temperature sensor. If a problem occurs that causes a channel to overheat, the entire dimmer shuts down until a normal temperature is reached. This overtemp shutdown is indicated by lighting the red Temp LED.

VX / MX racks are cooled by temperature controlled fans mounted in each 12 channel section. The same temperature sensor that is used for thermal shutoff also determines the fan speed. This arrangement allows for the lowest possible noise level from the cooling fans while still providing proper cooling for the hottest module. Noticeable airflow and fan noise will only occur when the dimmer is loaded and channels are turned on long enough for the internal temperature to start to rise.

3.5. Connection to Terminal Power Inlet

The most common power input connector for the Leprecon VX or MX 2400 dimmer is the Terminal Power inlet. This option provides an insulated terminal strip with 7 screw connections for 3 phase power. The block is labeled to identify the three power phases (X Y Z), neutral connections and a safety ground. Because of the large neutral current that can exist in phase control systems, two screw terminals are supplied for neutral connection.

It remains the responsibility of the user to determine the correct cable type to properly connect dimmer racks, and the need for overcurrent protection in the power supplied to the dimmer system.
For more information, see the appendix of this manual.

4. Control Input

4.1. DMX 512

All Leprecon VX and MX dimmers are compatible with DMX 512. To connect the dimmer to a DMX controller, simply use a standard DMX cable and plug the two devices together. A parallel wired female connector is supplied to allow output to additional dimmers or other devices.

4.1.1. DMX Indicators and controls

The VX / MX Control card located at the top of the pack contains the electronics needed to decode the digital DMX signal, and translate that information into signals to control 12 dimmer channels. On the front panel are the indicators and controls for DMX inputs.

The green LED labeled "signal" is lighted whenever a DMX signal is being received. This indicates that the controller, cable and DMX input to the VX / MX dimmer system are functional.

The three thumbwheel switches labeled "Start Address" are used to select the board channels that the dimmer will respond to. For instance, a switch setting of 001 will assign dimmer channel 1

to the board control channel 1. Setting the switches to 13 will cause the first dimmer channel to follow board control channel 13. This would be the case when a second 12 channel VX / MX is used as part of a larger system.

The control electronics is programmed to ignore changes to the address thumbwheels until the switches have stopped changing. For this reason, it will require a moment for the dimmer to accept a new address after the switches have been changed

The LED labeled "Match" will light when a DMX channel equal to the switch setting is received. For example, if the Start Address switches on the Control drawer are set to 500, and the console is only outputting 256 DMX channels, the Match LED will not light, and no dimmer channels can be turned on.

4.1.2. Setting Non-dim channels - VX Model Only

Non-dim channels switch from full off to full on without any intermediate dimming. This can be useful for connecting devices that do not dim well, such as some types of motors or transformer controlled fixtures.

There are two ways to set a channel on-dim channel:

1) Set a single channel by setting the DMX code shown below, and press 'enter'.

DMX	Function
801	Channel 1 Non-dim
802	Channel 2 Non-dim
803	Channel 3 Non-dim
804	Channel 4 Non-dim
805	Channel 5 Non-dim
806	Channel 6 Non-dim
807	Channel 7 Non-dim
808	Channel 8 Non-dim
809	Channel 9 Non-dim
810	Channel 10 Non-dim
811	Channel 11 Non-dim
812	Channel 12 Non-dim

To reset all channels back to normal operation:
Set 899 on the thumbwheel and press 'enter' or 'reset'.

2) Set several channels at once.

- Connect a functioning console to the VX dimmer.
- Set the DMX address to 800.
- Channels with levels above 10% will be programmed as non-dim. The settings are memorized when 'enter is pressed.

To reset all channels back to normal operation:
Setting 899 and pressing 'enter' or 'reset' clears all non-dim channels.

4.2. Analog control input

The VX and MX control electronics also accepts analog control signals. The DC level needed for full output is factory set at 10 volts, but can be readjusted in the range of 5 to 24 volts DC.

The analog control connectors are 8 pin male Jones type. The pin connections are shown below:

Connector	Pin	Function
1	1	Channel 1
1	2	Channel 2
1	3	Channel 3
1	4	Channel 4
1	5	Channel 5
1	6	Channel 6
1	7	Not Used
1	8	Control Common
2	1	Channel 7
2	2	Channel 8
2	3	Channel 9
2	4	Channel 10
2	5	Channel 11
2	6	Channel 12
2	7	Not Used
2	8	Control Common

5. Dimmer Circuit Controls and Indicators

Each dimmer chassis contains twelve independent dimmer circuits, each with the following controls:

5.1. Circuit Breaker

The channel breaker is the first line of defense against shorted lamps or load circuits. A special type of magnetic breaker has been chosen for the VX and MX systems. This breaker allows only a fraction of the energy to pass through the system in the case of a short in the load or load wiring as compared to conventional magnetic breakers. The performance of this breaker contributes to the reliability of the system.

In the VX and MX 2400, current in excess of 20 amps in any single output will cause the channel breaker to trip. In the VX and MX 1200 the maximum is 10 amps, and the VX 3000* is 27 amps. The breaker toggle will flip to the left, indicated on the front of the breaker as "OFF". If a breaker trips, it is an indication of a problem on that load circuit. Reset the breaker only after finding and fixing the fault that created the overload. Resetting the breaker repeatedly with a shorted output stresses the breaker, the dimmer channel and load wiring.

Channel breakers can also be used to turn off a single circuit. Pushing the breaker toggle handle to the "OFF" position will disconnect power to the dimmer circuit and load.

*VX 3000 no longer available

5.2. Test Switch

The proper connection and operation of the dimmer circuits can be tested without a control console by using the Test switch. Pushing in the Test switch will turn on the dimmer channel to allow lamps and load patching to be verified. Push the "Test" switch again to return it to the out position, and turn the channel off again.

The "Test" switch is a hard wired function at the output stage of the dimmer. For this reason, the "Test" switches will continue to operate even if the control electronics are disabled. This fail-safe feature can be very important if the control console or dimmer electronics are disabled.

5.3. Output LED

This green LED is connected to the output of the dimmer circuit. When lighted, it indicates that voltage is present at the load. Any condition that turns on the load will light the LED; Test switch on, control signal present, or dimmer malfunction. In conjunction with the other indicator, the Output LED can be used to troubleshoot system problems quickly.

5.4. No Load LED – VX Model Only

Each channel of the VX dimmer includes a "No Load" LED. When lighted it indicates a No Load condition, whereas a lamp is disconnected or burned out.

Note: No-load indication is accurate only with the control signal below 90% and the "Test" switch in the "Off" position.

6. Service and Maintenance

The VX and MX dimmer racks are designed to make troubleshooting and repair of the system fast and easy. LED indicators are used to pinpoint problems to a defective module. The suspected module can be removed without tools, and the system repaired in minutes by installing replacement parts.

6.1. Recommended Service

VX and MX dimmers, like other dense-pack dimmers, needs an unrestricted supply of fresh, cool air. The pack has been designed to operate at ambient temperatures up to 40 degrees Celsius, or about 100 degrees Fahrenheit.

6.2. Replacing modules

VX and MX dimmers are exceptionally easy to service. If a problem is suspected in a power module, the part can be replaced in a few minutes. To change a power module, follow these steps:

Warning: Removing the dimmer front panel will expose dangerous high voltage components. Do not attempt to service dimmer with power applied.

1) Disconnect power to the dimmer pack. Potentially lethal voltages are present inside the dimmer.

2) Remove the front panel. This is done by turning the four quarter-turn fasteners to the left (counterclockwise). Pull the front panel straight out.

3) Disconnect the six pin control connector from the suspect module.

4) Pull the module straight out. It will require a tug to unseat the power connector located at the back of the module.

5) Position the replacement module on the plastic guide.

6) Connect the six pin control connector.

7) Gently slide the module into place. It may be necessary to wiggle the module into alignment with the power connector. The click of the contacts mating means that the connector is completely seated.

8) Replace front panel. Gently push in the quarter turn fasteners while turning until they drop into place. Push the fasteners completely in against the spring, and turn to the right (clockwise) to lock.

7. Appendix A DMX 512 Standards

The following information is a summary of the USITT 1990 standard for dimmers and controllers. A complete copy may be obtained from:

USITT
10 W. 19th ST.
Suite 5A
New York, NY 10011-4206

The DMX 512 standard is designed as a simple, reliable system for connecting digital dimmers and controllers. The protocol allows up to 512 dimmers to be connected to a single control console. With 512 dimmers in a system, DMX 512 allows each dimmer level to be updated as fast as 44 times each second.

As far as the users of DMX equipment are concerned, three things matter more than the electrical specifications contained in the DMX description. The most important items are connectors, cable and how to wire the two ends together.

DMX 512 currently uses 3 pins of a 5 pin connector. The two unused pins are reserved for future use, some manufacturers are using these pins for communications back from the dimmer to the control console, or as a redundant data line. At this time, DMX cables are being used that only contain 3 wires. If you wish to include the capability to use the extra pins, it is suggested that you buy or make cables with all 5 pins connected.

The connectors to be used for DMX 512 are as follows:

Console end (transmitter) Female 5 pin XLR
Dimmer end (receiver) Male 5 pin XLR

The 5 pin XLR is very similar to the 3 pin connectors used for microphone cable. Some manufacturers of XLR connectors are Switchcraft, ITT Cannon, and Neutrik.

Cable type:
Shielded twisted pair approved for EIA-422/EIA-485 use. Either one pair with shield or two pair with shield may be used. Examples of such cable are:

Single pair: Belden 9841, Alpha 5271
Two pairs: Belden 9842, Alpha 5272

The Pin Designations for DMX 512 are as follows:

Pin 1 Signal common (cable shield)
Pin 2 Data 1-
Pin 3 Data 1+
Pin 4 Spare, optional Data 2-
Pin 5 Spare, optional Data 2+