DMX Repeater Pro   User's Guide

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For Firmware Versions 1.4.0 and higher

Suite 103, 1439 - 17 Avenue S.E.
Calgary, AB, T2G 1J9
Canada

Phone: **(403) 243-8110**
Fax: **(403) 287-1281**

E-mail: support@pathwayconnect.com
www.pathwayconnect.com

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OVERVIEW

This manual describes the function and configuration options for the Pathway Connectivity *DMX Repeater Pro* with firmware versions of 1.4.0 or higher. Some features and menu choices described below are not found in earlier firmware. Firmware is not currently upgradeable by the end user.

The DMX512 entertainment lighting control protocol is accepted throughout the world as the standard for interoperability between equipment supplied by most manufacturers. RDM, or Remote Device Management, is a recent enhancement to the DMX standard that provides two-way communication between controllers (such as consoles) and devices (such as scrollers and moving lights).

The *DMX Repeater Pro* provides three distinct operating personalities to configure one dedicated input port and eight input/output ports, to allow tailoring to the user's specific DMX network needs. DMX tester functions and RDM discovery and device management are also integrated.

- **Splitter:** One incoming DMX data stream is repeated by eight output ports, allowing a "star" topology to be created. Bi-directional RDM communication is supported on all ports and is customizable on a port-by-port basis. All ports are fully isolated.
- **Merger:** Two streams of DMX are merged on a highest-takes-precedence (HTP) basis, and repeated by the remaining output ports.
- **Hub:** Often console input connections are daisy-chained together, creating an illegal DMX configuration, and the potential for errors. In Hub mode, the *DMX Repeater Pro* automatically routes signals from up to 9 input locations to up to 8 outputs without breaking any rules and while maintaining DMX signal integrity.
- **DMX Monitor and Console:** A bar graph and numeric display gives a quick indication of incoming DMX levels. DMX output can be generated directly from the front panel to check downstream devices, replacing the need for a separate tester. Both features are indispensable tools for troubleshooting.
- **RDM Discovery and Management:** All RDM-enabled devices can be detected and identified from the front panel display and keypad. Management of DMX start addresses, personalities and other device-dependent attributes can be done from the same user interface. The *DMX Repeater Pro* is discoverable and configurable as an RDM device, as well as providing the functions of an in-line controller.

MODELS DESCRIBED

This manual describes installation and operation procedures for the following current and discontinued models, using operating firmware of version 1.4.0 or higher:

Current Models: 9114, 9115, 9116, 9117, 9118
Discontinued Models: 9104, 9105, 9106

INSTALLATION

The *DMX Repeater Pro* is intended for desktop use or for mounting in a standard 19" equipment rack, using the rack ears included.

Truss-mount adaptors (#9003) and wall-mount kits (#9002) are also available.

The *DMX Repeater Pro* is intended for installation in a dry, indoor location. Operating conditions: -10°C - 40°C (14°F to 104°F). 10%-90% relative humidity, non-condensing.

Warning: The AC socket outlet shall be installed near the equipment and shall be easily accessible.

Warning: This equipment relies upon building installation primary overcurrent protection.

Warning: Except for the IEC chassis plug marked for AC input, all ports on the *DMX Repeater Pro* are intended for low voltage data lines only. The 250 volt fault protection is not intended as primary personal protection. Attaching anything other than low voltage sources to the data ports may result in severe equipment damage, and personal injury or death.

PROTOCOLS SUPPORTED

DMX512 – The most widely used protocol for controlling lighting and effects equipment, DMX512 was the first digital multiplex standard. The DMX signal is simplex, or unidirectional. The standard connector type is 5-pin XLR. Since its inception in 1986, there have been two revisions: USITT DMX512/1990 and the newer ANSI E1.11 DMX512-A version. The *DMX Repeater Pro* is designed to work seamlessly with these and all manufacturer-specific variants of the protocol.

RDM – A recent addition to the DMX512 protocol is ANSI E1.20 RDM (Remote Device Management). A separate optional standard, it interleaves a get-and-set command structure into the basic DMX data stream. RDM is a half-duplex, bi-directional protocol that requires DMX ports to transmit as well as receive. Uses include remote device addressing and status reporting. The *DMX Repeater Pro* supports RDM on all ports.

STARTUP DISPLAYS

Plug in the power cord. There is no on/off switch. The internal power supply will automatically sense and accommodate any voltage/frequency from 100-240VAC and 50/60 Hz. The front panel liquid-crystal display (LCD) and the keypad will illuminate. Once boot up is completed, the display will cycle through the three main status displays.

```
▲DMX Input      ▲
▼512 Channels   ▼
```

```
▲Port ABCDEFGH ▲
```

```
▲RDM            ▲
▼0 messages     ▼
```

DMX Status: The first display shows DMX activity and the number of current input channels detected. Some controllers transmit less than a full universe of 512. If there is no DMX present, the display will read 'DMX Input – Inactive'.

RDM Status: The second display shows RDM activity and the number of RDM messages since power was last cycled on the Repeater Pro. In some modes, the screen will read "RDM Disabled".

Port Status: The last display shows the port-by-port customization for handling DMX and RDM signal packets.

For full explanations of the displays, see "Status and Monitoring".

SETTING BASIC PERSONALITIES

The *DMX Repeater Pro* operates in one of three basic personalities. Individual ports can be further customized, as described in "Port Customization Options" below. Certain DMX parameters and the LCD backlight can also be modified. RDM discovery and DMX troubleshooting are described in "DMX Monitor and Console" and "RDM Discovery".

Navigation

The functions for the *DMX Repeater Pro* are configured using the menu keypad to the right of the LCD.
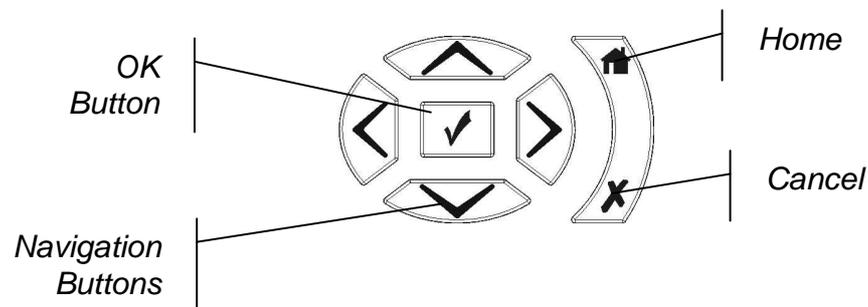
During configuration, the rear illumination of each push button changes, providing a contextual aid to the user. Only those buttons that will do something are backlit. Generally, the up/down buttons are used to cycle through menus and the OK button is used to accept choices.

Selecting a Personality

To begin, press the Home button. The screen will read "Pathway DMX Repeater Pro" and the OK button will light up green. Press the up/down arrows to cycle through the following screens: "Discover

RDM Devices", "DMX Monitor and Console", "Status Information" and "Repeater Configuration".

When "Repeater Configuration" appears, press the check-mark to select. Press the up/down arrows until this screen appears:

```
▲Personality    ▲
▼RDM Splitter   ▼
```

Press the check-mark to select, then the up/down arrows to choose from "RDM Splitter", "DMX Merger" and "DMX Hub", which will appear on the lower line. Use the check-mark to accept the personality you require. Setting a basic personality will clear any port-by-port customization.

Personality Descriptions

RDM Splitter: A one-in/eight-out opto-splitter with RDM functionality enabled on all ports. This is the factory default personality.

RDM can be disabled on a port-by-port basis to accommodate some older equipment that may misinterpret RDM requests as DMX level changes. See "Port Customization Options".

DMX Merger: A one-in/eight-out or two-in/seven out merger/opto-splitter with RDM disabled on all ports.

While in this personality, the Repeater Pro scans ports A through H for active DMX. If found, the second DMX source will be merged with the primary "DMX IN" signal on a highest-takes-precedence basis. Also see "More on DMX Merger Mode".

RDM discovery and commands will not work on ports that are merging DMX due to timing constraints in the RDM protocol.

DMX Hub: A nine-in/eight-out switcher. The *DMX Repeater Pro* scans each port in turn (including the primary input port "DMX IN") until a DMX source is found. It then reconfigures all other ports (except the primary input port) as outputs and routes the DMX signal to them. If DMX signal is lost, the Repeater Pro will begin the scanning process all over again.

This personality allows one console to be moved easily between multiple input locations without use of extension cables or patch bays, or alternately to allow a back-up to rapidly take over from a failing primary console.

In DMX Hub mode, active signal appearing at the "DMX IN" port will take immediate priority over any other active signal.

Also see "More on DMX Hub Mode".

Other Settings

Other global parameters available from the "Repeater Configuration" screen are the keypad lock, DMX hold time, DMX speed and the backlight brightness.

Keypad Lock: This function provides basic security only. While the keypad is locked, it is possible to scroll through menus to determine current settings but any attempt to alter them will result in a "Keypad Locked" message.

The keypad lock can also be invoked by pressing and holding the Cancel key until the display reports "Keypad Locked" and the up/down arrows are backlit red. To unlock the keypad, press and hold the Cancel key until the displays reports the keypad is unlocked.

DMX Hold Time: This option determines how long the *DMX Repeater Pro* will hold its 'last look' in the event of loss of DMX signal. The choices are 0 seconds, 30 seconds, 1 minute, 5 minutes and Forever. The factory setting is 0 seconds.

Be careful how you use hold time. While it can save a show when someone kicks the DMX cable out of the wall, it can have an undesirable outcome if you shut down a console without running down the grand master first, since the levels that were present prior to shutdown will be maintained.

DMX Speed: The speed option specifies the refresh rate or how often the 'dimmer' levels are updated. The maximum DMX refresh rate is about 44 Hertz (Hz), but some equipment behaves erratically at that rate. The DMX Repeater Pro can operate at three different refresh rates: slow (34 Hz), medium (39Hz), fast (44 Hz). The factory setting is fast.

LCD Backlight. Use the up\down arrows to set the desired level of backlight and the check-mark to accept. The factory setting is full. The backlight does not dim itself after a period of idleness.

PORT CUSTOMIZATION OPTIONS

While setting the personality and global parameters, you will have scrolled past several screens that look like this:

```
▲Port x Source  ▲
▼Input (RDM)    ▼
```

where *x* is a letter between A and H, referring to a DMX/RDM port on the *DMX Repeater Pro*. These are the **Port Options** screens. Use the check-mark to select the desired port and the up/down arrows to cycle through the four customization options.

Customization is done on a port-by-port basis and results are dependent on the basic personality in effect.

Input (RDM): This is the factory setting. The port is patched to the "DMX IN" port on the *Repeater Pro* and is enabled to pass RDM packets. In DMX Merger mode, this option re-enables RDM by patching the I/O port to the primary "DMX IN" port and disabling the merge function. In Hub mode, the port is patched to "DMX IN" and will ignore signal from any other port (effectively disabling it).

Disabled: In all modes, the port will ignore all signals.

Filter/Merge: In RDM Splitter mode and DMX Hub mode, disables RDM on the selected port. It has no effect in DMX Merge mode.

Hub A thru H: In RDM Splitter mode, this option disables the port.
In DMX Merger mode, this option changes the selected port to a DMX input. The *DMX Repeater Pro* will merge, on an HTP basis, DMX from the selected port with the DMX signal arriving at "DMX IN". Although more than one port can be selected as a secondary source, only one port at a time will be merged with the primary input source. If multiple ports are customized, the active port will be selected using the same rules as DMX Hub mode.

In DMX Hub mode, selecting a port forces the DMX Repeater Pro to switch signal sources, but only if DMX is active at the new port and it has a higher letter (e.g. C is higher than D).

For example, the primary console is plugged into Port A, but has crashed. The *DMX Repeater Pro* has automatically switched to the back-up console in Port B. Once the primary console is up again, if you go to the Port A options screen and reselect "Hub A thru H" (hit

the check-mark so it flashes, then again to accept), the Repeater Pro will switch control back to Port A – without having to unplug any cables or cycle power on the back-up console.

However, this technique will not work to force the Repeater to switch to the back-up signal on Port B as long as there is active signal coming from the primary console on Port A.

DMX MONITOR AND CONSOLE

The *DMX Repeater Pro* supplies comprehensive information on the DMX signal path and status, through the "DMX Monitor and Console" and through the start-up display screens.

DMX Monitor and Console provides two essential tools for troubleshooting signal problems. From the start-up displays, press Home, then the up\down arrows to reach "DMX Monitor and Console". Press the check-mark to select. The LCD screen will look similar to this:

The **DMX Monitor** provides approximations of the DMX input levels for channels 1 to 8 on the upper line and for channels 9 to 16 on the lower. In this example channels 1 and 9 are on at about 100%, channels 2 and 4 are at about 50%, channel 6 is off, and so on. Use the up/down arrows to scroll through all 512 channels.

By using the left/right arrow keys, you can highlight a channel and see its numeric level on the right hand side of the screen. The upper number is the decimal value between 0 and 255. The lower number is the same value shown in hexadecimal format. Levels can easily be compared against console or controller sources.

The **Console** function sends a DMX level to all output ports, allowing an independent check on downstream or end devices. Use the left/right arrows to highlight the desired channel on the display and press the check mark to select it. The level information on the right hand side will blink. Use the up/down arrows to change the channel's level. Check if the end device is reacting accordingly.

Press the check mark again to release the channel and have it return to its previous level. The DMX Repeater Pro will not accidentally cause cueing changes with this feature.

For the **Status Screens**, use the following illustrations as reference.

DMX Status:

RDM Splitter mode: the number of source channels is shown.

```
▲DMX Input      ▲
▼512 Channels   ▼
```

DMX Merge: the number of source channels is shown for both the primary "DMX IN" port and for the secondary source, in this instance port B.

```
▲I 512 channels▲
▼B 48 channels ▼
```

Hub mode: the active source port and number of channels is shown. If the primary "DMX IN" port is active, the lower line will read "A-H inactive".

```
▲Input inactive▲
▼A 512 channels▼
```

Port Status:

The letters appearing below the Port indicate the port's customization. Many combinations are possible; the examples are generic for clarity.

```
▲Port ABCDEFGH▲
▼Src   IIIIIIII▼
```

The letter "I": Indicates the port is sourced from the primary input "DMX IN" and that RDM is enabled.

```
▲Port ABCDEFGH▲
▼Src   CCCCCCC▼
```

Letters "A" through "H": Indicates the port is in Hub mode and is sourcing its signal from the indicated port. Although several ports may be customized to act as possible inputs, only the letter of the port active as an input will be shown.

```
▲Port ABCDEFGH▲
▼Src   MMMMMMM▼
```

The letter "M": Indicates the port is in "Filter/Merge" mode and RDM is disabled. If all ports are labeled with "M", the box is acting as a simple 8-port DMX opto-splitter.

```
▲Port ABCDEFGH▲
▼Src   AMMMMMM▼
```

In this example, the Repeater is in DMX Merge mode, and port A is active as a secondary input, being merged with the normal "DMX IN" source.

```
▲Port ABCDEFGH▲
▼Src   ----XXXX▼
```

The "-": Indicates the port is in Hub Mode, but there is no signal at any input port.

The "X": Indicates the port is disabled.

RDM DISCOVERY

The *DMX Repeater Pro* provides a straight-forward interface to discover and configure RDM-enabled devices.

From the "Pathway DMX Repeater Pro" screen, press the down arrow until the screen reads "Discover RDM Devices". Press the check mark and the screen should read "Use arrows to discover." If a discovery has previously been done, the screen will go directly to showing device UIDs (Unique Identifiers).

Pressing the up or down arrow starts discovery. How long discovery lasts will depend on the number of devices on the DMX network. Once polling is finished, the screen will show the UID for the last device discovered – which may not be the device furthest away.

```
▲5043:348
▲
```

The two lines report the same UID information, with the top line being in hexadecimal and the bottom line being alphanumeric. The identifier consists of a manufacturer's ID and a device ID, typically the serial number. In the example, PC is the code for Pathway Connectivity and 840 is the serial number of the discovered device.

Press the check mark to select the shown device for identification and possible configuration. The selected device will exhibit is 'identify' behaviour, which may be a flashing LED display or some other means of calling attention to itself.

The parameters available for configuration will differ from device to device, and by manufacturer. Typical choices will be DMX address or start address, device personality, self test and reset.

Use the up/down arrows to scroll through the options. The option name will appear on the upper line, with a value on the bottom. Press the check mark and the value will flash. Use the up/down arrows to scroll through the available values and then the check mark to accept. The new value will stop flashing when the acknowledgement is received from the end device.

Press the home button once to return to the device list, and twice to exit from RDM discovery. When de-selected, the device's self-identify behaviour should stop.

MORE ON DMX HUB MODE

When hard-wiring a number of console input receptacles to a dimming or distribution system, the usual practice would be to daisy chain them to the dimmer rack or opto-splitter. While this method often works with no apparent problems, this practice is expressly forbidden by DMX rules. The problem has been that there is no realistic 'legal' alternative. The *DMX Repeater Pro* remedies this.

Up to 9 DMX input receptacles can be directly connected (home run) to the *DMX Repeater Pro* when it is in Hub Mode. The drawing below shows the hub mode wiring configuration.
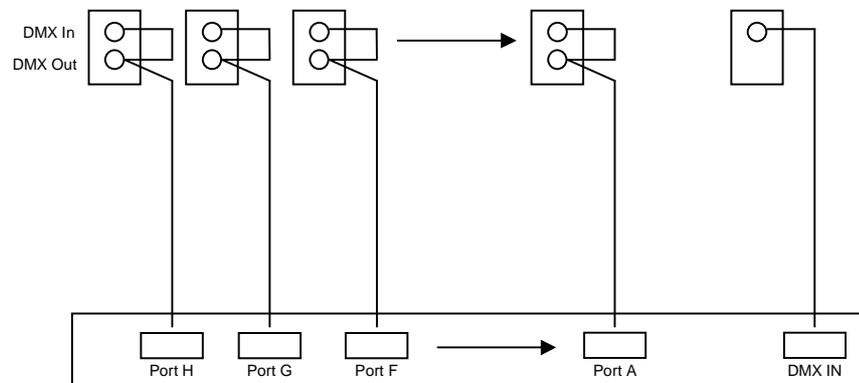
Because RDM-enabled ports can be both DMX inputs and outputs, the *DMX Repeater Pro* is capable of selecting any of the 9 ports on the unit as the splitter's primary DMX input. When in Hub Mode and DMX is not present on any port, the *DMX Repeater Pro* scans each port, listening for DMX. Each port is made an input for about $1/10^{th}$ of a second, while the other ports are disabled.

Once the *DMX Repeater Pro* discovers a valid DMX signal on a given port, all other ports on the unit are automatically configured as output ports and the DMX data is actively repeated to them. When DMX data is removed (e.g. if the console is turned off or unplugged) the *DMX Repeater Pro* will begin the scanning process again.

The ideal application for *the DMX Repeater Pro*'s 'Hub Mode' is in installations where a single console is frequently moved between different locations within a hall. Rather than use a cord patch, the *DMX Repeater Pro* will automatically connect the console wherever it's plugged in.

MORE ON DMX MERGER MODE

Often an installation requires an architectural controller and a lighting console to be active on the same DMX universe or even to simultaneously access different dimmers within the same rack. Although resolvable with a merger card, the situation can become hopelessly complicated if the secondary source must move between numerous locations. The *DMX Repeater Pro* provides an elegant, hot-patchable solution, eliminating the need for a manual DMX patch bay.

With the architectural or non-mobile controller plugged into the main "DMX IN" port, signal will be transmitted out the other eight ports, which can be hard-wired to various locations around the site.

As soon as the secondary controller is plugged into one of those locations, the *DMX Repeater Pro* will sense the new source, turn that port around and begin to transmit through the other seven ports a DMX stream that is a highest-takes-precedence merge of the two sources. The remote receptacles can wired for in/out usage, or simply wired as female outputs and a turnaround cable used between the receptacle and the controller.

The ideal application for the *DMX Repeater Pro*'s 'Merger Mode' is in installations where an architectural controller and a lighting console must speak to the same dimmers, or where a Remote Focus Unit must operate at the same time as the main lighting console.

APPENDIX A – XLR CONNECTOR PINOUTS

DMX512A

1 – Common
2 – Data –
3 – Data +
4 – Data 2 – (not used)
5 – Data 2 + (not used)
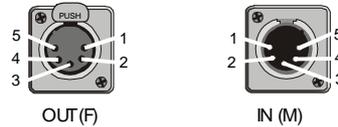
Note: Although unused under DMX512, pins 4 and 5 are connected on the *DMX Repeater Pro*, which should be taken into consideration in systems including manufacturers' proprietary signals on pins 4 and 5.

APPENDIX B – DEFAULT SETTINGS

There is no global method of returning the DMX Repeater Pro to its factory settings. If you need to manually reset the configuration, use the following as a checklist:

Personality: Repeater
DMX Hold Time: 0 seconds
DMX Speed: Fast
LCD Backlight: Full
Port x Source: Input (RDM)
        - as it is possible to configure each port separately, you will need to check that all eight are set to "I" (input) on the Port Status screen.

Note: Firmware is not currently upgradeable by the end user.

APPENDIX C – SPECIFICATIONS

Protocol Compliance: ANSI E1.11 DMX512-A and ANSI E1.20 RDM

CE, RoHS 2011/65/EU, ETL

Connectors: 1 – Male 5-pin XLR (normal input)
            8 – Female 5-pin XLR (normal output)
            or 9 – Phoenix-style 5-position terminal blocks

Protection: 2000V opto-isolation between DMX ports, 250V fault protection on DMX ports

Data Link Fuses: Self-resetting thermal fuse

Power input: Universal 100-240VAC, 50/60Hz, 0.08A maximum
Size: 432mm x 43mm x 178mm (17"W x 1.7"H x 7"D)
Weight: 2.4kg (5.2lb)
Operating Temperature: -10°C - 40°C (14° to 104°F)
Operating Humidity: 10%-90% relative humidity, non-condensing