User Guide

Network Protocol Converter
Software Revision 3.10 and above
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Overview

Network Protocol Converter

The Network Protocol Converter by Leviton’s Lighting Control Division provides exceptional convenience and flexibility as an interface for remote devices, displays, and networking of theatrical and architectural control devices. The Network Protocol Converter (NPC) is installed as a node on an Ethernet network communicating using the ColorNet 2.0 and TCP/IP protocols. The Network Protocol Converter when combined with other network devices supporting ColorNet 2.0 system allows for the following types of devices to communicate over the ColorNet network:

- ColorNet 2.0 Enabled Control Consoles (Innovator)
- i Series Dimmer Racks
- Hand Held Focus Remotes
- Dimension D8000/D4200 Architectural Control Stations

Figure 1: NPC Product Line XP, DHV and DLR
Currently there are three models of the NPC available each of which support the following interfaces:

<table>
<thead>
<tr>
<th>Model</th>
<th>DMX Inputs</th>
<th>DMX Outputs</th>
<th>Handheld Remote</th>
<th>Keyboard</th>
<th>Video Outputs</th>
<th>LunaNet Lan’s</th>
<th>Memory Cards</th>
<th>Analog Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>XP</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>DHV</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>DLR</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

To facilitate communication between these devices your NPC allows you to:

- Create quick port to network patches
- Create quick network to port patches
- Patch channels from the network to channels on a port
- Patch channels from a port to channels on the network
- View video displays produced by other ColorNet enabled equipment

Although the concepts, routines, and functions for installation and configuration are similar for all three models, this manual is specifically tailored for the DLR model.

**Definitions**

Here are some common words you will find in this manual which may require a little more definition.

**Channel** – A channel usually refers to an individual unit of control on the Luma-Net network. However the phrase channel sometimes is used to reference an individual DMX address or a fader on a control device or theatrical console. If you pay careful attention, you will be able to determine the meaning by it’s context.
**ColorNet** – ColorNet is Leviton’s network protocol used to carry lighting control signals over Ethernet wiring using TCP/IP. For additional information on ColorNet see the appendices to this document.

**DMX** – A digital multiplexed control protocol used to control lighting devices like dimmers, effects, and automated lighting.

**DMX Universe** – A DMX universe is a virtual or physical group of 512 DMX addresses. In the physical world, a DMX universe represents a DMX input or output from a source of control like a control console or NPC. In the virtual world, like on the ColorNet network, a DMX universe is just simply a common group of 512 DMX channels. All DMX signals on the ColorNet network belong to a virtual DMX Universe.

**Ethernet** – Ethernet is a networking term which describes the physical devices and equipment used to inter-connect networking equipment. When a network is referenced as an ‘Ethernet network’ it describes a certain set of components used to interconnect computing equipment.

**IP Address** – An IP address is a way to reference a particular node on a network which speaks the TCP/IP protocol. The IP address can be user defined and set via the software for the device. All IP addresses on the same network must only reference one node.

**LC-Net**– Leviton’s "can" based network which carries data for some of our architectural products.

**Lighting Group** – Lighting Groups are used to delineate groups of Luma-Net channels which operate together (within the same room) when using room separate/combine Luma-Net functions.

**Luma-Net** – Leviton’s RS-485 based network which carries control data for our architectural stations.
**MAC Address** – a unique network address which identifies a piece of networking hardware to be used on an Ethernet network. The MAC address of a device can not be changed.

**TCP/IP** – is a networking protocol or rather suite of protocols commonly used on Ethernet networks and the internet. **TCP** is an acronym for Transmission Control Protocol and **IP** is an acronym for Internet Protocol.
Part 1- Initial Set-up & Basic Configuration

This section of the manual will cover the installation and basic configuration of the NPC. There are (4) steps required to make your NPC work:

1. Physical Installation
2. Set General & Network Settings
3. Set Device Connections
4. Create Basic Patches

Until these steps are complete, your NPC will not be operational. For advanced configuration of the NPC, please reference Part 2 of this guide.

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Physical Connections

The information in this chapter identifies and describes all of the physical connections to, controls, and indicators of the NPC.

The images below show the front and side views of the NPC. They are designed to give you an overview of the physical attributes to the NPC. Use numbered callouts to cross reference with the legend/descriptions below.

![Figure 2: NPC DLR 1/0 Reference Diagram](image)

1) **Power Input and Indicator:** This LED will be lit if the NPC is receiving DC input power. Plug the supplied DC Power supply into this port to supply power to the NPC. The NPC requires a +12-24VDC, and has a load of 800mA excluding any external loads like Luma-Net stations or analog devices. The NPC is supplied with a 12VDC, 2.5A power supply.

2) **DMX512 Indicators:** Each DMX512 input and output LED indicators will light green to show activity on their respective ports.

3) **Ethernet Ports:** Ethernet ports used for connection to a ColorNet 2.0 TCP/IP Ethernet network.
4) **Luma-Net and Sapphire-Net Indicators:** Show status of the Luma-Net ports.

5) **DMX512 Output Port:** Output a standard DMX512 control signal from the ColorNet network.

6) **DMX512 Input Port:** Any device that supplies a DMX512 signal can be connected to these ports. The dimmer information contained within the DMX512 signal can be patched to any location on the ColorNet network or directly to an output port.

7) **Cover:** Reversible cover for surface mount applications.

8) **RS-232-** Luma-Net Programming Port.

9) **Luma-Net Port:** This ports are used to connect Luma-Net or Sapphire-Net control networks to the NPC.

**Power:** Accepts +12-24v DC Input power. NPC uses 3/4A, Luma-Net run 20A max total power consumption not to exceed 2.75 A. Inline Luma-Net power supplies can be used if more power is needed.
Installation

The installation and physical connections to the NPC should be pretty straightforward and for many may be self-explanatory. However, here is a brief explanation of the required steps and any important notes.

Physical Installation & Power

The NPC DLR has a variety of installation options which you can choose depending on your particular needs. *First*, it can either be used in table top applications or permanently installed surface mount applications. *Second*, you can either use the internal terminations or external terminations. And *Third*, the cover can be installed in two orientations to either hide or make available the external receptacles.

**NOTE**
Observe clearances as required for proper device operation. Front panel access for local configuration and visual status indication, and rear access for connections. Be sure to leave enough room for the connector!

Physical Installation

If the NPC DLR is to be used in a portable scenario or mounted to a surface to which the DLR could cause damage, simply install the supplied rubber feet to the bottom of the unit, one in each corner. If the NPC DLR is to be permanently installed in a surface mounted fashion, locate an area on your wall or other surface suitable for the device and clear of obstructions, then use the keyholes on the back to attach the device to the surface. Use screws suitable for your particular application (*see figure 3 following*).
Cover Installation Options

Although the orientation of the cover is perhaps the last thing you will need to address, it is important to recognize and plan for the options early on. The cover can be installed in two fashions, either making all exterior receptacles visible or hiding them.

Figure 4: DLR Front Cover
If you will be using the **external terminations**, install the cover such that the external receptacles are visible.

*Figure 5: DLR Open Cover Terminations*
If you will be using the **internal terminations**, install the cover such that the external receptacles are hidden (reference figure 4-6). Make sure that you insert the cover tabs into the cover tab insertion holes on the front of the device.

![Figure 6: DLR Cover Tabs](image-url)
Terminations

Reference the diagram and charts below for termination location of terminations for both internal and external termination methods.

Figure 7: Internal Terminations
**Figure 8: External Terminations**

<table>
<thead>
<tr>
<th>DMX Pinout</th>
<th>Function</th>
<th>Pair</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Common</td>
<td>1</td>
<td>Blue/White</td>
</tr>
<tr>
<td>2</td>
<td>Data 1-</td>
<td>1</td>
<td>Black</td>
</tr>
<tr>
<td>3</td>
<td>Data 1+</td>
<td>1</td>
<td>Red</td>
</tr>
<tr>
<td>4</td>
<td>Data 2-</td>
<td>2</td>
<td>Black</td>
</tr>
<tr>
<td>5</td>
<td>Data 2+</td>
<td>2</td>
<td>White</td>
</tr>
</tbody>
</table>

* Ref. silkscreen on PC Board for particular internal terminations.

**Luma-Net**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Function</th>
<th>Pair</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rem +</td>
<td>1</td>
<td>White/Blue</td>
</tr>
<tr>
<td>2</td>
<td>Rem -</td>
<td>1</td>
<td>Blue/White</td>
</tr>
<tr>
<td>3</td>
<td>Common</td>
<td>-</td>
<td>Black</td>
</tr>
<tr>
<td>4</td>
<td>Term</td>
<td>2</td>
<td>Red</td>
</tr>
<tr>
<td>5</td>
<td>N/C</td>
<td>2</td>
<td>N/C</td>
</tr>
</tbody>
</table>

*Ref. silkscreen on PC Board for particular internal terminations.*

Note: pair 42 has no connections.

Note: 2.5 A Max

*Ref. silkscreen on PC Board for particular internal terminations.*

To network HUB (if direct to device, use crossover cable).

To PC serial port
The NPC DLR has a feature unique to this model of NPC in that it allows default factory configuration to be restored upon power up, regardless of any changes which have been made. Additionally, there are many configuration changes which are prohibited when this feature is enabled.

To enable this feature, jumper P4 should be "ON". That means a jumper connects the two pins on the header labeled as "P4" (see figure 10).
The default settings create the following patches:

- LUMA-NET INPUT → ColorNet Universe #1
- DMX INPUT → ColorNet Universe #1
- ColorNet Universe #1 → DMX OUTPUT

Luma-Net respond to level query: Yes (effective release 3.11)
Relay Group Data: No
Status Message Broadcast: No
Broadcast Receive: Yes
Time & Date Broadcast: No
Operating Mode: Send & Receive
DHCP for IP Address: Yes

To disable this feature and allow for custom configurations, jumper P4 should be in the "OFF" position. That means that the jumper does not connect the two pins on the header labeled as "P4" (see figure 10).
System Status Check

Make your final power connections and apply power. At this point in time, your NPC should be operational. There’s a bit of configuration which must still be done, but all your connections are made. To checkout the system, observe the LED’s on the front of the unit.

Figure 11: Successful Status of LED

- Lit LED indicates power OK.
- Luma-Net active LED lit indicates Luma-Net OK. (Or Sapphire-Net)
- DMX active LED’s only lit when actually transmitting or receiving DMX data (subject to configuration).
- Flashing LED indicates active data on network.
Part 2: Wrapping Up

This section of the manual will show you the basic procedural steps to advanced configuration without spending anytime explaining the "why’s" of what you are doing.

The way to configure the NPC DLR is via a PC connected to the network, using the telnet program. Telnet is provided with all copies of Microsoft Windows and many other operating systems. It is assumed that you are using a Microsoft Windows system. In order to use the Telnet program, you must first know the IP address of the NPC to which you are connecting.

Obtaining the IP Address of your DLR

If you do not already know the IP address of your NPC DLR, you can retrieve it by performing the following steps:

Step 1 Obtain the LumaEdit software by retrieving the disk you received with your system, or downloading from our website (www.colortran.com) under the "Downloads" section.

Step 2 Start the software, and perform the steps necessary to do an "NPC Search" (reference the program help files).

Step 3 If you’re connected to the network to which your NPC resides, after a few seconds the program should report all connected NPC’s. Yours is guaranteed to be on the list.

Now that you have the IP address, this information can be used throughout the rest of the procedures in this manual.

NOTE

Both the connected PC and the NPC must be on the same "subnet" in order to connect to the NPC. If it’s just your NPC and computer connected to the network, use an IP address for the computer of 100.0.0.1 and a subnet (or subnet mask) of 255.0.0.0. If there are other devices or a DHCP server on your network, contact your network administrator.
The rest of the procedures in section will be quick short examples on some common configuration tasks.

## Setting the IP Address

**Procedure: Setting the IP Address or Configuring the NPC to use DHCP**

**Step 1** From the Main Menu, navigate to "General Set-up", then Press [ESC] -OR- just press [D] from the main menu.

**Step 2** Use [UP] [DOWN] to navigate to the hard-coded IP address.

**Step 3** Enter your desired IP address field -OR-, if DHCP is desired

**Step 4** Use [UP] [DOWN] to Navigate to the DHCP for IP address field.

**Step 5** Use [TAB] to set the value to yes.

**Step 6** Press [ESC] once to exit then press [ESC] a second time when requested to confirm the save.

**Procedure: Enabling the power loss memory restore feature**

Used to determine the behavior of the NPC upon power loss and restore. If set to yes, NPC will periodically memorize the current look. Then, upon power failure, will restore the look. If set to no, this feature is not enabled.

**Step 1** Select "General Setup" from the main menu.

**Step 2** Use [UP] [DOWN] to navigate to "Luma-Net" levels non-volatile save.

**Step 3** Use [TAB] to set the setting to "YES".

**Step 4** Press [ESC] once to exit then press [ESC] a second time when requested to confirm the save.
Procedure: Creating a quick local port to ColorNet patch

**Step 1** Select "DMX Universe Numbers" from the main menu.

**Step 2** Use [UP] [DOWN] to navigate to the desired local input port.

**Step 3** Enter in the desired ColorNet Universes.

**Step 4** Press [ESC] once to exit then press [ESC] a second time when requested to confirm the save.

Procedure: Creating a quick ColorNet to local port patch

**Step 1** From the Main Menu, select "DMX Universe Numbers".

**Step 2** Use [UP] [DOWN] to navigate to the desired local output port.

**Step 3** Enter the desired ColorNet Universes.

**Step 4** Press [ESC] once to exit then press [ESC] a second time when requested to confirm the save.

Procedure: Enable Luma-Net Dimmer Read Back

This is necessary to enable connected Luma-Net to devices to snap shot" channel levels.

**Step 1** From the Luma-Net Operations screen use [UP] [DOWN] to navigate to the NPC setup option and press [ESC].

**Step 2** Use [UP] [DOWN] to navigate to the "Respond to Level Querey" setting.

**Step 3** Use [TAB] to change the setting to "YES".

**Step 4** Press [ESC] once to exit then press [ESC] a second time when requested to confirm the save.
This section of the manual covers all advanced configuration options and operation of the NPC.

Configuration of the NPC can be as simple or as complex as you need it to be. Every installation is unique with its own requirements so to tell you how to explicitly configure your unit for your environment would be inappropriate. Instead we show you all of the configuration options and parameters so that once you understand how the NPC works, you’ll be able to take advantage of it’s powerful features.

All configuration of the NPC DLR is via the telnet interface. Henceforth, for all configuration, we assume that you already have a PC connected to the network and know what the IP address of the NPC you wish to configure. For information on obtaining your IP address, please see page 19, "Obtaining your IP Address". For additional instructions on telnet use, see the chapter on "Configuring by Telnet" starting on page 51.

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Main Menu

This chapter outlines all options off of the main menu and the configuration and/or actions which can be achieved upon their selection. A more in depth discussion of each option and its usage can be found later in this manual.

Figure 12: NPC Main Menu

NOTE
If the Main Menu is not visible when you approach the NPC, pressing the [ESC] button will toggle between the default display and the main menu.

The available options on this menu are as follows:

Exit menu – This option will clear the screen of the Main Menu and begin displaying the selected default display, or a Trace screen if no default has been defined.

Device connections – is used to set which physical ports will accept or send data and show which connections the NPC believes to have connected devices.
**DMX512 universe numbers** – this is a quick way to set some universe based patches.

**General setup** – from this screen you can set the general, network, and identification settings for this NPC.

**Patching** – this is where you define what data is routed to all of the input/output connections on this NPC.

**Channel options** – allows you to define what happens upon loss or competition among input signals

**Lighting Groups** – Lighting groups are used to define the groups of Luma-Net channels which operate together or apart in a room separate/combine scenario.

**Luma-Net A/B Operations** – sets up Luma-Net network addressing information and provides Luma-Net diagnostic information.

**Event Log** – For use by tech services when troubleshooting problems.

**Select Telnet Display** – Allows you to define what screen displays on the NPC Telnet display other than the main menu.
General Setup

The General Setup screen is where you define most of the basic information which is required for operation.

Figure 13: General Setup

A. Host Name

The Host name is a means of identifying the NPC node in a human way. The host name can be any text up to 12 characters long and should not contain any spaces. Although not a requirement at this time, it is recommended that each host name be unique. When inventorying the network with the LumaEdit configuration application, or viewing remote devices, each NPC will display both its IP address and its host name.

B. Current Network Settings

This section displays which Ethernet ports are active. For each active port, the NPC also shows the current IP and MAC address of the NPC. The MAC address is factory set and is not user changeable. A MAC address is a means of identifying a particular piece of networking hardware which is guaranteed to be unique—even across different manufacturers.
C. IP Address Assignment Method

The concept of the IP address is significant because this address is what allows the software of all networking devices on the ColorNet network the ability to uniquely identify this device. On a TCP/IP Ethernet network, each device must have its own unique IP address. No two devices may share the same address. (see appendix on TCP/IP Ethernet Networking for more information)

These fields allow you to determine how the NPC gets its IP address. There are three methods by which an NPC can get its IP addresses assigned:

1. Hard coding the address,
2. DHCP,
3. NPC Auto-Addressing Algorithm

IP Address Assignment: Hard Coding the Address

Hard coded IP addresses should be used when you know exactly what you want the IP address of the NPC to be.

Procedure: To use a hard coded IP Address:

Step 1 From the general setup screen, navigate to the hard-coded IP address field

Step 2 Enter your desired IP address

Step 3 Verify that the DHCP for IP address setting is set to no. If not,
   a. Use the arrow keys to navigate to the DHCP for IP address setting
   b. Use [TAB] to select NO

Step 4 Press [ESC] to initiate a return to the main menu and [ESC] again to save changes.

To use a hard coded address, simply enter a valid and unique IP address into the hard-coded IP address field. A hard coded IP address is used at all times when a hard coded IP address is defined and the DHCP for IP address field is set to NO.
IP Address Assignment: DHCP

If you have a DHCP server on your network, you can allow it to assign your IP addresses. This will ensure that there are no IP address conflicts on your network. For this to take place, simply leave the hard-coded IP address alone and set the DHCP for IP address field to yes. When the DHCP for IP address field is set to yes, it does not matter what the hard-coded IP address is set to. Upon boot-up, the NPC looks for a DHCP server. If one is found, it gets an IP address lease. If one is not found, it defaults to the hard-coded IP address or the auto assignment algorithm.

IP Address Assignment: Automatic by NPC

The final method by which your NPC can get an IP address is with the NPC auto-addressing algorithm. The auto-addressing is guaranteed to assign unique addresses when ONLY Leviton LCD ColorNet 2.0 products exist on the network. That is to say that if ethernet products from other manufacturers are used, IP address duplication may occur rendering the network inoperative.

Summary of Settings

- If DHCP= YES and DHCP server IS found, the DHCP server will return an IP address.
- IF DHCP= YES and DHCP server IS NOT found, hard coded IP address is used.
- IF DHCP= NO or DHCP server IS NOT found and hard coded address is set to an IP address, the hard coded address is use.
- IF DHCP= NO or DHCP server IS NOT found and hard coded address has 0’s in the right most octet(s), the auto-assignment algorithm is used.

The first, leftmost number of the IP address is not allowed to be zero. If the NPC detects a zero is recorded in that position, it will default to 100 when the NPC generates the actual IP address.
D. Automatic return for default video

By setting this function to **yes**, the video monitor will be switched to the default screen after 5 minutes of inactivity. The default screen is set under the “select video 1(2)” display options on the main menu. See this section of the manual for additional information. With this option set to “no,” the default display is only recalled upon power up.

E. Date, Time, & Location

These settings allow you to set some basic environmental information.

The **Date and Time** set the current date and time. If you have a network time server on your network, or have direct access to the internet, you can set it’s IP address in the **Network Time Server** field and the NPC will use this information to override the local settings.

*The Network Time Server is a device used on IP Ethernet networks which gets it time from an authoritative source of time and then allows other devices to set their time from it. An authoritative source of time is simply a computer on the network which has the current date and time AND this information is guaranteed to be correct within a reasonable and predictable margin of error. Traditionally, an authoritative source is defined as a first or second tier time server. The first tier servers have usually a Radio Wave receiver which receives a broadcast of the Greenwich Mean Time and Julian date information. These servers then in turn have a Network Time Server connected to the internet running multiple time service protocols. The second tier servers then set their time from the first tier servers. It’s recommend that all Third Tier servers and other clients set their time from the second tier servers so as not to over burden the first tier servers. A third tier is usually a network time server on your local network. The NPC uses the NTP network time protocol. If you have an NTP server on your local network, set the IP address to this server. If you don’t but the NPC does have access to the internet, you can allow it to set it’s time from a second tier server. In this case, use the factory default setting of 204.34.198.41 which points to the*
 authoritative time source at the Naval Observatory at Falcon AFB, Colorado. If neither of these conditions exist, than just make sure the local Date and Time settings are correct.

**Time Zone** sets the time zone for the system astronomical time clock.

**The Daylight saving time** setting can either be set to automatic US, automatic Europe, +1 hour, or none.

**Location** defines the longitude and latitude of the NPC for use by the systems astronomical time clock.

**F. LUMA-NET levels non-volatile save**
This setting is used to determine the action upon a restored power condition after power is lost for one reason or another.
When set to yes, the NPC will periodically save the current channel levels as set by the incoming Luma-Net and DMX signal. Then, if the NPC loses power for one reason or another, upon the restoration of power, the NPC automatically recalls the last saved look.

- **no** – this setting defeats the save option.
- **yes** – this setting enables the option.
- **clear** – this setting clears the non-volatile memory on board the NPC.

**G. DMX levels percent or hex**
The setting changes the scale of displayed information between percent, 0-100, and hexadecimal, 00-FF (0-255 in decimal). To display levels in hex, change this setting to hex, and to display in percent/decimal notation, set it to percent. This setting can effect more than just DMX levels.
Levels, which are affected by this setting, are all DMX levels, Luma-Net levels, and Luma-Net address settings.
Unless a qualified user is performing some very specific debugging of a system, leave this value set to percent; it is much easier to comprehend.
H. DMX non-significant level change

When two controllers, which control the same channels, are operating in a "take control" manner, (when two controlling device control the same channel and the last device with a change takes control over the previous device regardless of the level of change) this setting defines how much of a change the last device must make before the take control occurs. This is necessary because some sources, like DMX, tend to flutter. You don’t want a flutter resulting in a 1/10% change to cause a take control to occur. This could result in erratic behavior. This setting prevents this from becoming an issue by defining the amount of change required for take control to occur.

I. Configuration Protection

When NPC’s are permanently installed, you might want to restrict access to those who can make configuration changes. To enable this feature, set the Configuration change field to locked. Then, when prompted, enter a password. Next time you need to make configuration changes, you must enter this password into the password field before attempting to save changes.

NOTE

The default password used for FTP access can be changed by setting the password on this screen to anything other than 0000. When the password here is not 0000, that is also the password for FTP. (Make sure configuration change is set to ‘locked’).
DEVICE CONNECTIONS

This page allows you to view the connection status of every port on the NPC and on some can manually enable or disable the port. An enabled device/port is said to be active and a disabled or non-existent device/port is said to be inactive.

![Device Connections](image)

**Figure 14: Device Connections**

From the main menu, use the arrow keys to highlight the item “**device connections**.” Pressing the [ESC] button will bring up the display shown in figure 4.3. This display shows the status of inputs and outputs of this NPC. To make changes, simply use the arrow keys to move the cursor to the desired item. Then, use [TAB] buttons to cycle through the available options. The available options are listed below.

**NOTE**

On all of the available connections below, the status column will indicate either active or inactive. A port is active if either the NPC detects presence of input signal on that particular port or if the NPC is generating a signal on that particular port. If the status of this port is not what you expect, first verify that your patching at the NPC is correct. In the case of an input port, verify that your input signal exists and is transmitting data. If you are still having trouble, contact tech services.
A. Enet-A
The word active or inactive is shown to indicate if the NPC detected a connected device.

B. DMX-A
The word active or inactive is shown to indicate if the NPC is receiving or outputting DMX512 data. The options for the input and output lines are either DMX512 or no device. A setting of no-device will completely disable this particular DMX input or output.

C. HH/Luma-Net A
The word active or inactive is shown to indicate whether the NPC detected a connected device. This should be set to Luma-Net or No Device.

Changing Port Assignments to:

No Device
There is significant advantage to setting any unused ports to "no device" frees up the processor for other tasks. The NPC processor is very busy answering/responding to network requests such as processing Luma-Net fade commands, patching DMX, and other responsibilities of the NPC. Setting ports to "no device" indicates to the NPC that the processor can ignore that port and move on to other tasks.

Saving Changes
When any changes are made, pressing [ESC] will display the question "save changes". Pressing [ESC] again will save the changes and exit back to the main menu. Pressing ANY other button will discard the changes and exit back to the main menu.
DMX Universe Numbers

This area of configuration is designed to give you a quick means to create and maintain some basic patches. The patches are between a physical port on your NPC and a ColorNet universe.

![DMX512 Universes](image)

Figure 15: DMX512 Universes

To assign a physical port to a ColorNet port, use the following procedure:

**Procedure: Quick Physical Port Patch**

- **Step 1** From the Main Menu, select "DMX Universe Numbers".
- **Step 2** Select the desired port.
- **Step 3** Enter new Universe Number.
- **Step 4** Repeat steps 2 and 3 as necessary.
- **Step 5** Set ports to '0' for ports you do not want patched.
**Step 6** Press [ESC] once to exit the screen, and [ESC] a second time to save changes if prompted.

**NOTE** Assigning a universe number of 0 to any of the ports is same as saying “I don’t want a patch set for this port.” This is the option you want if you either want to manually define a patch in the patching screen, or you just want to simply cut down on NPC processor or network overhead.
Patching

The patching screens are perhaps the heart of the power of the NPC. These are the screens which control the routing of all ColorNet data as it passes into and out of the NPC. As you will recall from the information in the appendices on ColorNet information, ColorNet carries DMX Universe data, handheld remote data, and video display data.

Patching is covered in two chapters. The first, which you are reading now, discusses the concept of Patching. The second, titled "Patch Manipulation", discusses the management of Patches.

For procedure used to ADD/EDIT/DELETE/CHANGE patches see page 42.

When selecting the Patching options off of the Main Menu, you will see a screen which looks similar to the following:

![Figure 16: Patching](image)

*Figure 16: Patching*
The information on this screen is a list of all of the patches which are set for this NPC. Each line represents a patch. The information on the left side of the greater than (>) sign shows the source or FROM port information. The information on the right side shows the destination or TO port information.

**Patching**

The concept of patching is very similar to old slide or plug patch. The idea then was that you had a finite number of dimmers and an infinite number of circuits. The patch you created simply connected the circuits to the dimmers.

When it comes to the NPC & ColorNet, patching is a similar concept just applied differently. Refer to the appendices for detailed information on ColorNet, but for now let's just picture ColorNet as a whole bunch of universes where each universe has 512 control channels.

The patch takes input sources attached to an NPC or coming from other control device and assigns them to a range of channels on one of the ColorNet universes. Once the patch is made, your data is on the ColorNet network.

Now...to get it off of the ColorNet network, you create an output patch. You take the data from the ColorNet network and assign it to one of the NPC output ports. Once the patch is made, your data is routed from the ColorNet Network to your device.

There are two types of patches which can be created, Devices Patches and Universe Patches.

**Device Patches**

Device Patches are patches from a local device (port) to another local device (port) or to ColorNet. An example of a device patch could be as follows:

\[\text{DMX p1 C1-512} > \text{DMX u4}\]
This patch takes channels 1-512 from incoming DMX port 1 and patches them to the ColorNet, DMX universe #4.

A second example of a device patch of a device patch could be as follows:

```
-hheld p1 > 192.168.90.116 cons p1
```

This patches the hand held remote connected to HHR port 1 (the only port) to the on line console at IP 192.168.90.116, port 1.

### Universe Patches

Universe Patches are designed to patch from ColorNet to a local device/port.

Consider the following patch:

```
-univ p12 C1-48 > DMXp3 c49
```

This patch has the effect of taking ColorNet universe #12, channels 1-48 and patching them to the local DMX output port #3, starting at channel 49 (actually destination channels 49-96, but only the starting channel is listed).

### Legend

By now you have noticed that there is a miscellany of nomenclature involved with patching. Here is a brief key which will help with your understanding. You will find that even without the key the nomenclature makes practical sense and with a little practice you will quickly become an expert.

**Types:**

- **DMX p1** -DMX Port #1. If a source, it’s an input. If a destination, an output.
- **DMX p2** -DMX Port #2. If a source, it’s an input. If a destination, an output.
- **DMX p3** -DMX Port #3. If a source, it’s an input. If a destination, an output.
- **hheld p1** -Hand Held Remote, at Port 1.
- **LN p1** -Luma-Net port 1 (also can be p2 for p2).
- **analog p1** -Analog Input, #1 (also can be p2-p16).
- **univ p1** -ColorNet Universe #1 (also p2-p256 for other universes).
**Destination Types:**

- **DMX p1** - DMX Output Port #1 (also p2 or p3).
- **LN p1** - Luma-Net port 1 or port 2
- **x.x.x.x** - an IP address of another ColorNet device
- **DMX u1** - ColorNet Universe #1, (also can be u2-u256 for other universes).
- **i-ser p1** - Indicates i Series dimmer rack, port #1.

**Other Nomenclature:**

- **c** - Indicates channel. C1-48 indicates channels 1-48.

That covers most of the nomenclature. You will see it referenced throughout the remainder of this chapter and in the next chapter on patch manipulation.

Let’s look at a couple of examples using the information we just learned.

From this information, we can discover that the input to DMX port #1, channels 1-512 is patched to ColorNet Universe #1.

Now, let’s look at another example,

**univ p1 c1-24 > DMX p3 c25**

This patch takes ColorNet Universe #1, channels 1-24, and patches them into the DMX output port #3 of this NPC, starting at channel 25 consequently ending at channel 48.
Patch Manipulation

To add, change, or delete patches, you access the patch menu by pressing the [ESC] button from the following menu appears:

- **Exit**: Finalize changes, return to main menu
- **Add Device Patch**: Patch from a local device
- **Add Universe Patch**: Network data sent to a universe
- **Change**: Change the highlighted patch
- **Delete**: Delete the highlighted patch
- **List**: Return to patch display

Both the “add device patch” and the “change” functions follow the same format of question and answer:

**Procedure**

- **Step 1**: first you define the input device,
- **Step 2**: then input channels,
- **Step 3**: next the destination channels and
- **Step 4**: finally then the destination

**from device**: DMX512 input P1  
**channels**: 1-512  
**into channel**: 1  
**destination**: universe

The available destinations are “universe”, “local device”, “online remote device” and “remote device”. When you have set all these fields, press the down key to get to the output device definition. What you’ll be asked depends on what patch type you want:

- **to universe**: universe number  
- **to local device**: actual local device
• **to on-line remote device:** you scroll through the choices
• **to remote device:** IP address (255.255.255.255 will mean “any”), device type, port number

The choice of output devices will depend on the input device.

The “add universe patch” allows you to patch data from the ColorNet network to a local port. The series of questions and expected answers are similar to the device patch above.

Example of typical responses:
from universe: 1
   channels: 1-512
   into channel: 1
   destination: local device
   output device: DMX512 output P1

When creating Patches, use the [Down] arrow key to move through the fields.
Channel Options

The Channel Options configuration screen is used to control the behavior of the individual channels or range of channels on a DMX universe. These settings are used to describe the effects of two scenarios, the first, what happens when a source signal is abruptly removed and secondly what behavior shall occur when two competing sources have the same destination (merging.)

Channel options can be set for each of the DMX output ports.

Figure 17: DLR Channel Options

1. DMX Output Port: This describes which Output Port the Channel Options apply to. DMX P1 references DMX Output Port DMX P2 references DMX Output Port 2 or (B), etc. Depending on your particular model of NPC, the listing of available ports may vary.

2. Channel Option Settings: This shows the particular options set for particular ranges of channels for that particular port. The first few characters depict the options for the specific numeric range of channels located adjacent to the characters. The character legend is as follows:
3. **idle drop to 0**  
   \( d = \) drop to 0  
   \( k = \) keep last level indefinitely  
Determines what happens when a DMX which was transmitting data suddenly disappears. The cause for this could be power failure (at the source, cable interruption, etc.).  
A drop to setting says that upon loss of signal, the output will immediately stop outputting DMX.  
A keep setting tells the NPC to keep the last level received indefinitely until new instructions are received.  

4. **DMX Level Precedence**  
   \( H = \) highest level takes precedence  
   \( L = \) last action takes precedence  
Determines the plan of action when two patched DMX Channel Levels are different yet patched to the same output. If level precedence is set to highest, the highest level will be the output level at all times. This option is usually considered a straight merge. If level precedence is set to last, the last action by any input determines the output level. Last action precedence is also referenced as "take control".  

5. **DMX/Luma-Net Merge Procedure**  
   \( H = \) highest level takes precedence  
   \( L = \) last action takes precedence  
Determines the precedence between all DMX levels and the Luma-Net inputs.  

**For example:**  
Channel Options as set in the above figure 17 will have the following result: DMX Output port 1 for all 512 channels will immediately drop to 0) upon loss of signal. All patched DMX source channels and all patched Luma-Net source channels will be merged in a highest channel takes precedence mode.  
DMX Output port 2, for all 512 channel, will keep levels upon loss of signal. All patched DMX source channels will be merged together in a highest takes precedence mode, however, Luma-Net will be combined with the
merged DMX in a last action takes precedence mode implicating that Luma-Net can "take control" over DMX at any point in time.

DMX Output port 3 has a combination of results depending on which channels you’re talking about. Channels 1-96 and 145-512 will drop to 0 upon loss of signal. They also merge all DMX and Luma-Net on a highest level takes precedence mode. However, channels 97-144 work differently. In this example, the levels will be kept upon loss of signal and for both DMX and Luma-Net the last action will take precedence.

**Procedure used to set these channel options:**

**Procedure: DMX Output Port 1**

**Step 1** Use **[UP][DOWN]** to get the cursor to the device field.

**Step 2** Use **[TAB]** until "DMX 512 output P1" is selected.

**Step 3** Press **[DOWN]** to advance to the next field.

**Step 4** Use **[TAB]** to set idle drop to zero to "drop"

**Step 5** Press **[DOWN]** to advance to the next field.

**Step 6** Use **[TAB]** to set DMX level precedence to high.

**Step 7** Press **[DOWN]** to advance to the next field.

**Step 8** Use **[TAB]** to set DMX/Luma-Net merge precedence to "high".

**Step 9** Press **[DOWN]** to advance to the next field.

**Step 10** Use **[TAB]** to set the start channel to 1.

**Step 11** Press **[RIGHT]** to advance past the '-' to set the end channel.

**Step 12** Use **[TAB]** to set the end channel to "512".

**Step 13** Press **[DOWN]** to complete the entry.
Step 14  Press [ESC] to save.
**Lighting Groups**

Lighting groups are used in the configuration of room separate/combine behavior. When rooms are combined, all channels within that room which are in the same group will be combined and operate together. When rooms are separated, they operate independently with each local control.

Note: This selection only appears if Luma-Net is active in “device connections” and is used to configure as many as 255 lighting groups using as many as 255 Luma-Net channels in 255 rooms.

For example, consider the following lighting layout in a room:

Now consider the following lighting groups:

![Figure 18: Typical Room with Two Partitions](image)

This hypothetical large room can be split into three smaller rooms by closing the partitions. Lighting circuits 1,2,3,4,5 and 6, all are connected to down lights which are designed for general room lighting. The wall sconces, connected to circuits 7, 8, & 9 are
designed to warm up the walls a little bit and contribute to the visual aesthetics of the room.

Figure 19: Grouping of Control Channels

This group as illustrated in the figure above groups all of the down lights together into group #2 and all of the wall sconces together in group #1. The implication of this is that when the NPC is configured with this grouping, and the room is configured as a large room, any changes to any channel with group #1 will automatically be transferred to all other channels within the same group. The same is true for group #2.
When entered into the NPC, the groups which would achieve the desired result would be as follows:

![Image](image.png)

**Figure 20: Lighting Groups**

To add, edit, modify, connected, or separate groups, use the [ESC] button to bring up the menu which will give you the following choices:

- **Exit** – returns you to the main menu
- **Connect rooms** – allows you to select two rooms to connect
- **Separate rooms** – allows you to select two rooms to separate
- **Add channels** – allows you to add channels into a group
- **Delete channels** – allows you to remove channels from a group
- **Show** – shows you the current groupings (returns to the Lighting Groups screen)

**Procedure for Creating a group:**

1. **Step 1** Press [ESC] to bring up the menu.
2. **Step 2** Press [UP][DOWN] until "Add Channels" is selected.
3. **Step 3** Press [ESC].
4. **Step 4** Enter Group Number.
Step 5  Press [DOWN].
Step 6  Enter Room Number.
Step 7  Press [DOWN].
Step 8  Enter Channel Number.
Step 9  Press [DOWN].
Step 10 Repeat steps 1-9 for all required groups, rooms and channels.
Step 11 Select "exit" from the menu.
Step 12 Press [ESC] a second time to save changes.

NOTE  If Luma-Net Network Broadcast is enabled, all room numbers in a facility must be unique.
Event Log

The event log is for use by authorized factory technicians or as directed by technical support, when troubleshooting NPC operation.

Figure 21: Event Log
Luma-Net Operations

This selection only shows on the main menu when Luma-Net is active at the “HH/Luma-Net-A” option of “connected devices” and is used to set the address of the Luma-Net port as well as to issue commands and specific configuration parameters to the Luma-Net network from the NPC.

Figure 22: Luma-Net A Operations

The following configuration operations are available:

NPC setup – Used to configure the setup of the Luma-Net port and has the following options:

Network Address: The address of this network port. Each device requires its own unique address. The default for Luma-Net Port A is 127, and Port B is 126.

Bits per Second: Baud rate of the Luma-Net network.

Operating Mode:

Send and Receive- allows the NPC to both generate and receive Luma-Net messages.
**Receive Only:** only allows the NPC to process message received from the local Luma-Net network and not generate Luma-Net messages.

**Time and date broadcast:** Enables the periodic broadcast of the current time and date to other Luma-Net devices.

**Respond to level query:** Enables/Disables the reporting of channel levels when requested by Luma-Net devices. Used for snapshot and other reporting functions.

**Status message broadcast:** Enables the broadcasting of Luma-Net Status and Extended messages generated on the local Luma-Net ports to other NPC's located on the same ColorNet Network.

**The following maintenance/utility options are available and are for use by factory technicians:**

- **Send Query** – used to poll an address on the network as a function test.
- **Send Reset** – used for resetting a station on the network that has been replaced, reprogrammed or seems to be “hung up” on the network.
- **Send Break** – used as a troubleshooting function to reconfigure the Luma-Net network.
- **Hold Break** – used to hold the break until “released”. When this function is used the menu item will change to “release break”.
- **Press Switch** – used to “virtually” press any button on any station on the network.
- **Change Personality** – used to call up different personalities or presets residing in the network control units from the NPC.
- **Set Master/Slave** – used to set any station as master and others as slaves to this master. Great for cutting down on programming where network stations are programmed alike.
- **Simulate Fade To** – used to fade groups of channels in the network up to any intensity.
Configuration by Telnet

Telnet can be used to configure your NPC from any PC anywhere on the network. These instructions are designed to show you how to use telnet based on the Microsoft Windows telnet client.

The following instructions and screen captures are applicable for Windows 95/98/Me/NT4 and 2000. Minor variations may exist in the format of the screens. For networks with routers, you may need to contact your system administrator to insure your workstation and the NPC are able to connect.

Starting the TELNET Client

Microsoft, beginning with Windows 95 included a TELNET client as part of the operating system. To begin a TELNET session on your PC, press the START button on the Taskbar and then select RUN.

Figure 23: Windows Start Menu
The system will respond with a **RUN** dialog box. Type **TELNET** followed by the **IP** address of the NPC you wish to send or receive data with. Then press the **ENTER** key or use your mouse and click once on the **OK** button.

**Figure 24: Typical Windows Run Dialog Box**

**Figure 25: Windows Telnet Session Showing NPC Main Menu**
At this point, your PC will open a "Telnet" session. If you have entered the IP address properly and the NPC is operational, it will respond by connecting to the NPC and displaying the main menu. The keyboard works the same way in telnet as it does when connected to the front of an NPC-XP.

**Keyboard Use**

The following table shows the special keyboard functions for Telnet and keyboard.

<table>
<thead>
<tr>
<th>Front Panel</th>
<th>Telnet</th>
<th>Keyboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select</td>
<td>Esc</td>
<td>Esc</td>
</tr>
<tr>
<td>Down</td>
<td>Cursor Down</td>
<td>Cursor Down</td>
</tr>
<tr>
<td>Up</td>
<td>Cursor Up</td>
<td>Cursor Up</td>
</tr>
<tr>
<td>Next</td>
<td>Tab</td>
<td>Tab</td>
</tr>
<tr>
<td>Previous</td>
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<td>Left</td>
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</tr>
<tr>
<td>Right</td>
<td>Cursor Right</td>
<td>Cursor Right</td>
</tr>
<tr>
<td>Next / Prev</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Next / Prev</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>
File Transfer

There are three types of files which can be transferred to/from an NPC:

- NPC System Software
- NPC System Configuration
- Luma-Net Device Programming

All file transfers to/from the NPC are done with an ftp client.

Code File and Configuration File

Two of the kinds of files you can transfer to and from the NPC are: code files (extension “cod”) and configuration files (extension “dat”), using the FTP file transfer protocol.

The code file is the application code or software that makes the NPC operate.

The configuration file contains the entire NPC. Retrieving the file from an NPC allows you to backup configuration transfer the same configuration to/from multiple NPC’s or send configuration to the factory for analysis.

The NPC knows whether to send or receive a code or configuration by the extension of the file. If a file is sent or requested with a .cod extension, the firmware code is sent or received. If a file is sent or requested with a .dat, the configuration data is sent or received.

Luma-Net Files

The last kind of file you can transfer to/from your NPC is the Luma-Net configuration files. These files contain all of the programming data contained in a Luma-Net device. The determination of which devices programming is retrieved is determined by the name of the file requested. The filename follows the following format:

P[port #]L[device address].lda

For example, if a device connected to port #2, or the Luma-Net B port, with address 18 from which you wanted to retrieve configuration, you would enter the ftp command

get P2L18.lda
Real World ftp Examples

The following pages will walk you through a sample ftp session.

NOTE

The following instructions and screen captures are applicable for Windows 95/98/Me/NT4 and 2000. Minor variations may exist in the format of the screenwriter to insure your workstation and the NPC are able to connect.

Figure 26: Windows Start Menu

To begin an FTP session on your PC, press the START button on the task bar and then select RUN.
The system will respond with a **RUN** dialog box. Type FTP followed by the IP address of the NPC you wish to communicate with. Then press the **ENTER** key or use your mouse and click once on the **OK** button.

*Figure 27: Windows RUN Dialog Box*

At this point, your PC will open a "dos session" or for NT systems a "command" session. If you have entered the IP address properly and the NPC is operational, it will respond with the above prompt for a user name. The current user name for all NPC versions is **NSI**.

*Figure 28: WIN98 FTP Screen (Partial)*
### Using the FTP Client

Although FTP as a protocol supports many commands, the NPC currently only utilizes 3 of them. They are:

<table>
<thead>
<tr>
<th>Command</th>
<th>Function</th>
</tr>
</thead>
</table>
| Get     | Retrieve configuration (.dat) or firmware code (.cod) from the NPC and store it to the client’s local disk.  
\[ p[port#]L[address].lda \]  
Luma-Net Device Configuration |
| Put     | Send to the NPC configuration of firmware code from the ftp client’s disk |
| Restart | Restart |
| Del boot|          |
| Del data| Restore to standard defaults after next boot. |

In the following examples, user commands are in boldface.  
Start the client, log in.

**Procedure:**

```plaintext
ftp 100.1.1.61  
Connected to 100.1.1.61  
220 FTP server ready.  
User (100.1.1.61:(none)): NSI (or your defined password)
```
Password:
231 User name accepted.
ftp>

ftp> **delete boot**
Connection closed by remote host.

Retrieve the configuration file from the NPC and named confa.dat.
ftp> **get confa.dat**
200 OK.
150 ready to send file.
226 closing.
ftp: 11481 bytes received in 0.17 Seconds 67.54 Kbytes/sec.
ftp> **quit**
221 Goodbye.

Install a new application version from npc2.cod.
ftp> **put npc2.cod**
200 OK.
150 ready to take file.
226 closing.
ftp: 122340 bytes sent in 0.32 Seconds 382.31 Kbytes/sec.
ftp> **quit**
221 Goodbye.

The NPC will automatically initialize after this.

Get Luma-Net port A(1), station at address #2 confirmation data.
ftp> **get p1l2.lda**
2a OK
150 ready to send file
226 closing
ftp: 56 bytes sent in .08 seconds
ftp> quit
221 Goodbye
**Warranty**

Leviton Lighting Control Division of Leviton Manufacturing CO Inc., warrants this product to be free of material and workmanship defects for a period of two years after system acceptance or 26 months after shipment, whichever comes first. This warranty is limited to repair of replacement of defective equipment returned F Freight Pre-Paid to Leviton Lighting Control Division at 20497 Teton Ave., Tualatin, Oregon 97062, USA. User shall call 1-800-959-6004 and request a return authorization number to mark on the outside of the returning carton, to assure that the returned material will be properly received at Leviton. All equipment shipped back to Leviton must be properly packed to avoid shipping damage. Replacements or repaired equipment will be returned to sender freight prepaid, F.O.B. factory. Leviton is not responsible for removing or replacing equipment on the job site, and will not honor charges for such work. Leviton will not be responsible for any loss of use time or subsequent damages should any of the equipment fail during the warranty period, but agrees only to repair or replace defective equipment returned to its plant in Tualatin, Oregon. This Warranty is void on any product that has been improperly installed, overloaded, short circuited, abused, or altered in any manner. Neither the seller nor Leviton shall be liable for any injury, loss or damage, direct or consequential arising out of the use of or inability to use the equipment. This Warranty does not cover lamps, ballasts, and other equipment which is supplied or warranted directly to the user by their manufacturer. Leviton makes no warranty as to the Fitness for Purpose or other implied Warranties.

**Notice**

Although the information contained within this user guide is believed to be accurate at the time of printing, it is not guaranteed to be without fault and is subject to change without notice. Future software releases may change the features or operation of this product. For current information contact:

Leviton Lighting Control Division
Technical Services
PO Box 2210
Tualatin, Oregon 97062

Voice: (800)959-6004  Fax (503)404-5601
Internet: www.colortran.com

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Network Protocol Converter
Software Revision 3.10 and above

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