DOUG FLEENOR DESIGN

Two Port Ethernet to DMX512 Interface Configuration & Owner's Manual

model: NODE2

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Product description

NODE2 is an Ethernet to DMX512 bridging device. It accepts Streaming ACN (ANSI E1.31), Artistic License's Art-Net and other protocols including draft sACN, KiNeT (ColorKinetics) and ShowNet (Strand Lighting). There are two fully isolated DMX512 ports. NODE2 may be ordered with two inputs, one input and one output, or two outputs.

Each DMX512 port has a two-digit LED display and up/down buttons to select the universe number for the associated port. The decimal point LED on each display is the DMX512 signal present indicator.

History. NODE2 was developed for a large hotel's ballroom and conference center. The events department wanted a DMX512 distribution system that would allow them to plug a console into any of the venue's input wall plates, and route that signal to any of the output wall plates. They specified the Doug Fleenor Design Router-Router, however they needed 20 inputs and Rotor-Router maxed out at 12. Doug Fleenor Design worked with the hotel planners to meet their any-input-to-any-output goal; NODE2 is the result. In this hotel's application each NODE2 has one input and one output. The input number is fixed, and the output number is selectable. Event staff plug the console into any NODE2 and note the input (universe) number. At any other NODE2, the staff sets the output to that number to access that DMX512 signal.

The factory default configuration covers most applications. The front panel allows DMX512 universe selection for sACN (E1.31). An internal web interface (accessed with a computer and web browser) is used for additional configuration changes.

NODE2 is powered by PoE (Power over Ethernet). It fits in a North American two-gang wall box with a minimum depth of 2.125 inches.

Environmental

Operating temperature: 0-40º C (32-104° F)
Operating humidity: 10-90% non-condensing
Indoor use only.

Electrical requirements

Power Over Ethernet (PoE), 802.3af. 3 Watts.

Cabling

A single Category 5 (or higher) cable carries power and data for NODE2 through a standard RJ-45 jack on the rear of the unit. An Ethernet switch which supplies PoE, or a PoE injector, is required. Standard Ethernet installation practices must be observed (like 100 meter maximum cable length).

Jumper settings

Five configuration jumpers are located on the rear of NODE2. Jumpers should be set prior to installation. Jumper functions are described in the table below.

Jumper	Installed function	Removed function
JP1	Front panel displays turn off after 30 seconds of inactivity	Front panel displays are always on
JP2	Port A up/down buttons operate normally	Port A buttons are locked out
JP3	Port B up/down buttons operate normally	Port B buttons are locked out
JP4	Normal operation	Restore factory default settings
JP5	Normal operation	Force into boot loader mode

Jumper settings are only read during power up. If a jumper position is changed, power must be cycled for the change to take effect.

Mounting

NODE2 can be mounted in many standard two-gang electrical boxes. A deep box (minimum 2.125 inches) is required for the electronics and to allow space for the network connection. Raco model 683SP is an example of such a box.

Care must be taken to ensure that no part of the electronics are touching the box. Do NOT attempt to install NODE2 while power is applied as even momentary electrical contact with the box will destroy a powered unit.

Powering

NODE2 is powered using Power Over Ethernet (PoE). This simplifies installation by allowing the installer to pull a single CAT5 (or higher) cable to NODE2. The cable provides power and Ethernet signals. A PoE switch or a PoE power injector must be used to provide power to NODE2. The diagrams below illustrate both methods of powering NODE2.

PoE Switch
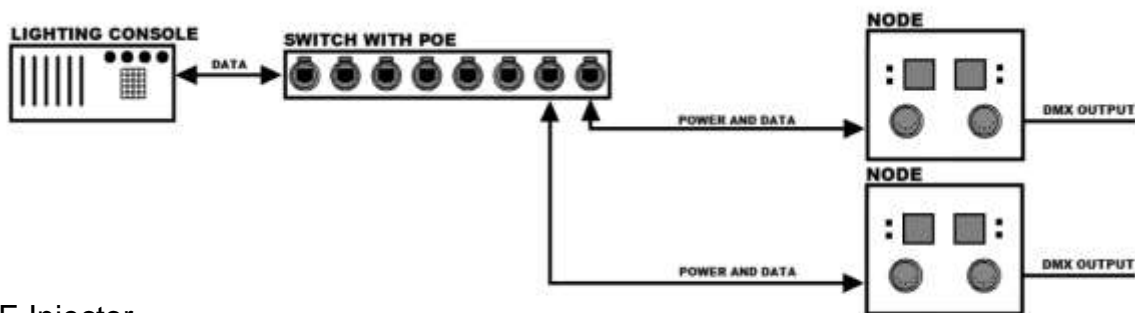
PoE Injector
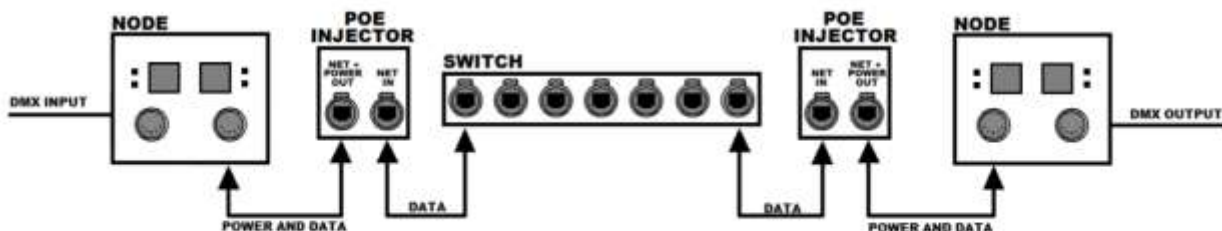
Using Node2

Node2 ships ready to go, pre-configured for sACN applications. The displays indicate the universe number associated with the connector below it (for universes 1 - 99). The UP/DOWN buttons, if not locked out, adjust the universe number. The buttons are locked when a connector is plugged in; the connector must be unplugged to adjust the universe number. If an installation prefers the universe number never be changed, a lock-out jumper can be removed during installation.

The decimal point in each LED display is the DMX512 signal indicator. It will illuminate if there is DMX512 data on the network for the selected universe.

Upon loss of DMX512 for the selected universe, Node2 will continue to transmit the last received DMX512 data for three seconds. It then disables the DMX512 line driver allowing moving lights and dimmers to reset or to let a Preset10 take control of the line.

Node2 can accommodate up to six sACN sources transmitting the same universe and will output the source with the highest priority. If two or more sources have the same priority, Node2 will merge the sources on a Highest-Takes-Precedence basis. A Node2 input will be transmitted with the default sACN priority of 100.

Network Jargon

Doug Fleenor Design strives to make our products reliable and easy to use. Computer networks, and their complexity, complicate this goal. To help our users de-mystify the network side of our Node products, Mr. Fleenor shares some of his insights.

Host. Mr. Fleenor finds this networking term misleading. To non-networking people, a host is the person that coordinates an event (or picks up the tab at a hosted bar). There is often one host, and many guests. In a computer network, the term host is used for any device connected to the network that generates or uses data; on a computer network there are many hosts (and no guests).

The term host, in computer networks, stems from the days when computers took up entire rooms or floors. Remote terminals, similar to mechanical typewriters, allowed multiple users to access the computer. The computer hosting these dumb terminals, was the host. Later these host computers were connected together to form a network, and the term host, for a computer on the network, stuck.

Node. Every device connected to a computer network is a node: Switches, hubs, routers, computers, interface devices... Mr. Fleenor likes this term, thus the name of our network interfaces. Fun fact: All hosts are nodes, but not all nodes are hosts.

Address. A unique address is required for every device on a lighting control network. sACN (and Art-Net) use IPv4 addressing which is a 32-bit number, typically written in "dot-decimal" form (four decimal numbers separated by dots) such as 10.0.1.1. There are two parts to the Address: the *network-part* and the *host-part*. To talk to each other, all devices in the network

must have the same network-part and a unique host-part. Doug Fleenor Design recommends users use Network 10 (address 10.X.X.X), which is intended for private (dedicated) networks that are not connected to the internet. Another private network number is 192.168 (address 192.168.X.X). (Author's note: sACN sends DMX512 data on network address 239.255.X.X regardless of the Node's address or mask. Thus, some aspects of a sACN network may work even if the address and/or mask do not match.)

Subnet mask. A 32-bit IPv4 address has two parts: the network-part and the host-part. The number of bits dedicated to each part varies by application and is historically represented by the subnet mask. The subnet mask is a 32-bit binary number starting with a series of ones, followed by series of zeros, such as 11111111 00000000 00000000 00000000, with ones representing network-part bits and zeros representing host-part bits. The subnet mask is typically written in dot-decimal form such as 255.0.0.0. Although the parts of the IPv4 address can be split in 31 ways, the two most common in lighting are: 8 bits for network, 24 bits for host (subnet mask 255.0.0.0) and 16 bits for each (255.255.0.0).

DHCP. The Dynamic Host Configuration Protocol is a tool used to automatically assign addresses and subnet masks. A device that runs the DHCP is called the DHCP server. Not all networks have a DHCP server, in which case the addresses and subnet masks are set manually (DFD products ship with a default address and mask that work in most applications). Note that DHCP is an app that runs on a computer, router, console, or other device on the network; it is not a separate piece of equipment.

Network Setup
NODE2 ships with default settings that will work in most applications:
>   Protocol: sACN
>   Address: 10.X.X.X (where X.X.X is unique to each unit)
>   Subnet mask: 255.0.0.0
>   DHCP: enabled

DHCP. Doug Fleenor Design recommends against using DHCP in an entertainment lighting control network; it typically adds an unnecessary level of complexity. That said, NODE2 ships with DHCP enabled in case a server is being used. NODE2 does not save DHCP assigned parameters and requests them (from the server) each time power is applied. If, upon power-up, no DHCP server is present, NODE2 will use its stored address and mask.

Changing NODE2's default settings. Editing NODE2's settings, if required, is typically done on the bench, prior to installation. Configuration can also be edited over the network but having the Node visible, and within arm's reach, is nice.

Editable setting:	Default
Device name	NODE2
Description	Use this description text to identify the unit on the network
Protocol	sACN
DHCP	Enabled
Address	10.X.X.X
Subnet mask	255.0.0.0

Port direction   Factory set for installed connectors. JP4 resets to two outputs.

NODE2'S settings are edited using its built-in web server. To access the web server, the user must attach a computer to the NODE2's network, launch a browser application (Microsoft Edge, Google Chrome, Mozilla Firefox, etc.), and point it to the NODE2. The computer's network address must match NODE2's network address.

Most computer's network cards are configured to access the internet. To access a NODE2's web server, the network configuration must be changed to match the NODE2's. Computer operating systems are constantly changing and can be customized by the user so the following steps may need massaging.

To point a Windows 10 computer to the node:
Click on the Windows icon in the lower left corner.
Click on the Settings icon (gear looking thing) that appears above the Windows icon.
Click on *Network & Internet*
Click on *Ethernet*. If *Ethernet* is not an option, hard-wired Ethernet capability may be missing.
Click *Change adapter options*

At this point you should be at >Control Panel>Network and Internet>Network Connections. Users can get to this panel in other ways, on other versions of Windows.

Click on *Ethernet*
Click on *Change settings of this connection*
In the "This connection uses the following items" window,
  click on *Internet Protocol Version 4 (TCP/IPv4)*
Click on *Properties*
Select *Use the following IP address:*
In the IP address box, enter 10.10.1.1 (unless someone changed the factory address)
  (If the NODE2's factory address has been changed, enter its address incremented by 1)
In the Subnet mask box, enter 255.0.0.0
  (If the NODE2's factory subnet mask has been changed, enter its subnet mask)

Your computer is now on the same network as the NODE2.

Launch a web browser such as Google Chrome.
In the URL box, type the NODE2's address (printed on the back of the NODE2 unless someone changed the factory address).
Press Enter.

With luck, you will see this status page displayed in your browser.

NODE2

Identify Node: ☐

Status	Network Configuration	Port A	Port B

Identification

Device Name: NODE2

Description: Use this description text to identify the unit on the network

Network Status

DHCP: Enabled

IP Address: 192.168.1.134

Subnet Mask: 255.255.255.0

MAC Address: D8:80:39:19:43:5A

Port Status

Network Protocol: Streaming ACN

Port A Direction: Output

Port A Universe: 2

Port B Direction: Output

Port B Universe: 2

General Status

Up time: 9 Seconds

Power Cycles: 11

About NODE2

Firmware Label: Full

Firmware version: 1.5

Bootware version: 1

From this page:

Checking the Identify Node box will cause NODE2's display to flash.

Clicking *Network Configuration* displays the network configuration page.

Clicking *Port A* or *Port B* displays the appropriate DMX512 configuration page.

Network configuration page:

The Device Name (up to 20 characters) and Description (up to 64 characters) are fields that can be queried and displayed by a controller, such as a console, on the network. When editing these fields it will be necessary to delete or backspace over existing text and trailing spaces.

DHCP can be enabled or disabled. To edit the factory assigned address and mask, the user must select Disabled. DHCP can then be enabled after editing, if desired. NODE2's default is Enabled, which works in most applications.

The IP Address and Subnet Mask can be edited here (provided DHCP is disabled). Doug Fleenor Design recommends against altering the factory assigned values of 10.X.X.X and 255.0.0.0 (where X.X.X is unique).

If the user changes the IP address to 10.X.X.X, the subnet mask should be 255.0.0.0.
If the user changes the IP address to 192.168.X.X, the subnet mask should be 255.255.0.0.
Note that in the graphic above, DHCP has assigned its own address and mask.

Five Network Protocols are supported: sACN (default), Art-Net (also popular), draft sACN (some ETC products), ShowNet (some Strand products), and KiNET (some Color Kinetics products).

Remember to click Save Settings before navigating away from this page or changes will be lost.

Port configuration page:
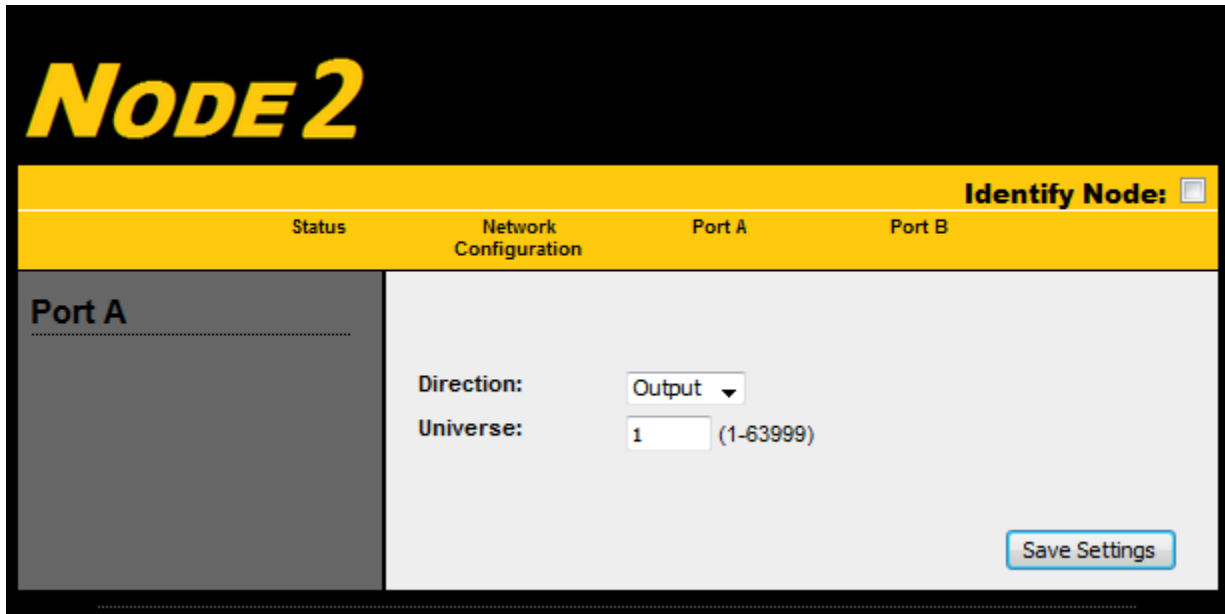
Port A is the left connector, port B is the right connector.

The direction should never need to be changed; it is assigned at the factory to match the installed hardware. A "Jumper 4" reset-to-default-values will set both ports to outputs, so if one or both connectors are inputs, the direction *will* require editing, following a JP4 reset.

The front panel UP/DOWN buttons allow access to universe numbers 1 through 99. This web page allows setting the universe number up to 63999. If the web interface is used to set a port's universe number to a value greater than 99, the display will show "- -" and the universe number cannot be changed from the front panel.

Remember to click Save Settings before navigating away from this page or changes will be lost.

Restoring default settings

To set NODE2 to its default configuration settings:
- – Remove power from the NODE2
- – Remove jumper JP4
- – Re-apply power, wait about 10 seconds
- – Remove power from the NODE2
- – Re-install jumper JP4
- – Re-apply power

The NODE2 will have DHCP enabled and the IP address will be the default as shown on the label on the back of the unit.

Factory default configures NODE2 as two DMX512 output ports. If a unit has input port(s), the port direction must be changed using the built-in web server.

Node Discovery

A utility program called Node Discovery, along with instructions, is available at http://www.dfd.com/NodeDisc.html. This Windows program assists in finding and configuring NODE2s across a network.

Limited Manufacturer's Warranty

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

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

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

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