

# NDB+ Network Distribution Box Manual

26-June-2019

NDB+ version 2.1

## Description

The NDB+ distributes power and data to RGB lights connected to its output ports. There is a 16-port version and a 4-port version. The NDB+ supports input data from an ethernet connection with various protocol support, and multiple types of RGB driver chips on its outputs.

## Network Connection

The network connection is a standard ethernet Cat5 RJ45 socket. It supports 10 or 100 megabit ethernet at full or half-duplex. The NDB supports the industry standard Art-Net 4 protocol (not all functions), E1.31 in unicast mode only, and the [Distributed Display Protocol\(DDP\)](#).

## Power

The NDB accepts 7-24vdc on its power input terminals (5v is also possible by changing internal jumpers, contact the factory for more info). Most Minleon products require 12v, some new lights may use 24v. The output ports to the lights will receive the same voltage as you place on the input. The data signal wire on the output ports is always at 5vdc.

Reversing polarity may destroy the device and possibly any light strings connected to it! There are power inputs on both sides of the case that are internally connected. Each side connection can handle 20A, so if you need over that, split the incoming power to both sides of the case. Power should come from a single power supply even when splitting between the inputs, or from specially designed load-sharing power supplies.

For the most common Minleon RGB+ 12v lights, power can be calculated as approximately 0.028A times the number of lights connected to the NDB. For example, 1000 lights times 0.028A would require a 12vdc, 28A power supply. You may need to check the datasheet for specific lights to calculate this.

Each output is protected by an internal ATM type fuse. If a fuse blows, a RED LED will light up to indicate which output fuse is bad, and this LED is visible through the plastic case. However, this LED will only illuminate when you try to attach a light string to that specific output (it will not show when no lights are connected).

## Reset Switch

The Reset Switch is located in a small hole on the side of the NDB. It has 3 modes of operation. Pressing it for less than 1 second causes an NDB reboot (this could be used to exit Test Lights mode or to reset light strings after adding or removing some). Pressing it for 1-5 seconds will reset the IP address info to the factory default (useful if you forgot its address) but won't change any specific light or port configurations. Pressing it for more than 5 seconds will reset everything including the IP address to the factory defaults.

## Configuration

Configuration is done via a simple web interface. The NDB+ ships with a default IP address of 10.0.0.100 and netmask 255.255.255.0, and support for the DDP protocol.

To configure the NDB you will need to plug your computer and the NDB into a standard ethernet hub or switch (or connect them directly). Set your computer's IP4 address to something like 10.0.0.10 (or anything but 100) and netmask 255.255.255.0. The Gateway setting can be set to 10.0.0.1. Then use a web browser and connect to <http://10.0.0.100>.

If all is ok, the NDB Config page will appear. Make changes on this page and then hit the SAVE button at the bottom to make them permanent.

**Note: The web configuration page is only available after NDB power up or reset, and before the first Art-Net or DDP data packet arrives. The web server is shut down if data arrives, but will be re-enabled if no data is received for 5 seconds.**

From this page you can change your IP address, Netmask and default Gateway. You can also select the data protocol. If you make changes to any of these items, you will need to power-cycle or reset the NDB for those changes (like IP address) to take effect. If you change your IP address or NetMask you should write them down on the outside of the NDB, as there is no simple way to query the NDB for those items or discover what they are. Each NDB on your network needs to have its own unique IP address. If you use network 10.0.0. we suggest numbering the WSNDs as .101, .102, .103, etc.

## Chip Selection

The next section on the config page lets you select the type of RGB chip used by your lights (it must be the same type for all lights on the NDB). If you are using the Minleon RGB+ product line this is already the default selection (RGB+) and you are done with this section.

You can use other chips by selecting the specific chip type if it is listed. For chips not listed that use a similar data signal, you can hand-modify the parameters on the lines below. T0H is the high time for a 0 bit, T1H is the high time for a 1 bit, Tbit is the total time for a bit, and Treset is the time between data frames. You will need to check the datasheet for the particular chip you are using to set these values correctly, or consult with the factory for help.

Besides picking the correct chip timing, you must specify the correct type of data conversion to use, which depends on the type of chip and LEDs. This specifies how input light values from the network are converted to output light values to the chips. The following table shows the possible options. Each letter on the Input column refers to one 8-bit channel of data (the bit size refers to each color value).

Input from Net	Output to Chip	Description
RGB	RGB (16bit)	8-bit RGB input to gamma scaled 16-bit RGB output
RGB	RGBW (16bit)	8-bit RGB input to gamma scaled 16-bit RGBW output (W selected automatically when R=G=B)
RGBW	RGBW (16bit)	8-bit RGBW input to gamma scaled 16-bit RGBW output
W	WWW (16bit)	8-bit W input to gamma scaled 16-bit WWW output
RGB	RGB	8-bit RGB input to 8-bit RGB output
RGB	GRB	8-bit RGB input to 8-bit GRB output
RGB	RGBW	8-bit RGB input to 8-bit RGBW output (W selected automatically when R=G=B)
RGBW	RGBW	8-bit RGBW input to 8-bit RGBW output
W	WWW	8-bit W input to 8-bit WWW output

A Repeat option is also available, it is set to zero to disable it. If specified, it tells how many lights of data from the network input to repeat to the output for each string. For example. If you set it to 1, then only 1 light value from the input will be used to specify the color of all lights on a string. That would let you control each strings color with only 1 input value. If you set to 3, then 3 color values of input data would be repeated for all the lights on a string. The number of bytes (channels) used for an input color value depends on the type of conversion selected.

## **Output Port Settings**

The NDB has maximum limits on how many lights each output can support. For the 16-port NDB, you can select whether you want to use all 16 outputs, or only 8 outputs. The maximum number of lights possible per output is then displayed. In 8 port mode you can have twice as many lights per output as 16 port mode. The 4-port NDB does not have this selection.

The next set of lines are configuration data for each of the output ports. For outputs that you are not using, make sure to set Lights/String to zero (other parameters will then be ignored). If you are not using Smart-Ts, then you can set each output for however many lights you have connected to that output. However, if you are using Smart-T's, then the number of lights/string must be the same on all output ports (you can have different number of Smart-Ts on each port, but each String must be set for the same number of lights).

For each output you can also select the Reverse function, which will reverse the ordering of the lights on each string.

## Art-Net

Basic Art-Net version 4 protocol is supported which includes output data to strings and Synchronization functionality. When Art-Net protocol is selected you will see some Art-Net specific fields appear. The NDB+ can receive up to 16 universes of Art-Net and that data can be mapped to specific outputs. Art-Net uses a 16-bit “universe” number which really consists of 3 fields: the high-order 8-bit Network number, the next 4-bit Subnet number, and the final 4-bit Universe number. The Network number can only range from 0-127 and for smaller setups this number is often set to 0. The Subnet and Universe numbers can range from 0-15 (or 0-F in hex). Some software may display this as a single 8-bit hex number, for example 0x35 would be subnet 3 and universe 5.

You can enter the Network number and Subnet number above the output settings table. This selects which group of 16 Universes will be available to map to the individual outputs in the table below. For each output, you can then select where the first light gets its RGB data from by entering the Universe and Channel number in the table. If there is not enough RGB data in the listed Universe for a particular output then the NDB will continue to get data from the next Universe. Only the first 510 bytes of a Universe are used, the last 2 bytes are ignored.

The Starting Slot column is used for the DDP protocol and is generally shown only for informational purposes.

## E1.31

This protocol has limited support for basic functionality in unicast only mode. It is inefficient to use this protocol for high pixel count displays in multicast mode, so that is not supported. Art-Net is a more efficient protocol and if you have a choice you should always pick that over E1.31. E1.31 mode allow for a 16-bit universe number entered at the top of the table. That universe plus the next 15 universes are then available to select for the outputs. So if you select universe 100, then universes 100-115 are available for the outputs. For each output, you then enter the universe offset (0-15) from the starting universe plus the starting channel number for where the RGB data comes from. For example, if you enter the Starting Universe as 100, and then a particular output starts at Universe 5, Channel 1, this would take data starting at Universe 105 (100+5). This system lets you map a block of 16 universes to outputs and move that block by only needing to update the Starting number, and not the individual output numbers.

As with Art-Net. if there is not enough RGB data in the listed Universe for a particular output then the NDB will continue to get data from the next Universe. Only the first 510 bytes of a Universe are used, the last 2 bytes are ignored.

## Using W or RGBW input modes

If you select the W or RGBW input conversion modes, then processing of the input is different than with RGB. Since the input channel count per light would be 1 or 4 bytes, and these divide evenly by 512, then all 512 bytes of an Art-Net or E1.31 packet are used instead of the 510 bytes for RGB.

## Test Lights Function

The Test Lights function will run a quick light test by turning each light (white) in order. It repeats this test until the NDB is rebooted or reset.

## Software Upgrade

It is possible to upgrade the NDB software over the network. Download a factory supplied BIN file for your NDB to you computer. Then, at the bottom of the NDB configuration page, select that file and then click on the Upload Bin file button. The new software will be uploaded and verified, and then the NDB will upgrade itself to the new version.

## Maximum Frame Rate

The Maximum possible Frame Rate depends on the type of chip selected and the highest number of lights on an output, minus some NDB processing time. If your software sends data to the NDB faster than it can process and transmit to the lights you may see lag or glitching on the lights. In that case you can lower the output frame rate in your software until the problems disappear.

### *Tested Configurations*

Testing was done with Art-Net at standard DMX frame rates (45fps) and the RGB+ chip (16-bit) selected. Below is a list of configurations that should work with no problems at 45fps. Limits can be higher if lower frame rates or less lights/string are used. This should give you an idea of what is possible but specific configurations close to these limits may need to be tested individually.

16 output mode:

170L per output on 12 outputs (input 12 universes of 510 bytes).

125L per output on 16 outputs (input 16 universes of 510 bytes).

150L per output on 16 outputs (input 16 universes of 450 bytes).

8 output mode:

250L per output on 8 outputs (input 10 universes of 510 bytes).

340L per output on 2 outputs (input 4 universes of 510 bytes).

The 4-port NDB should have similar limits to the 8-output mode.

If an 8-bit chip is selected instead of RGB+ the limits would be a good amount higher as data can be sent to the lights twice as fast and less processing is required.