NDBPRO Manual

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NDBPRO version 1.3

Description

The NDBPRO distributes power and data to RGB lights connected to its 8 output ports. The NDBPRO supports input data from ethernet connections or WIFI with various protocol support, and multiple types of RGB driver chips on its outputs. The NDBPRO also contains built-in 2D effects and test functions.

Mounting

The NDBPRO is designed to be weather resistant when mounted vertically such as on a wall, with the wires pointing down. In a dry location it can be mounted in any direction. The small holes on the front above the power and network jacks can be used to secure wires using cable ties. The NDBPRO also has matching mounting holes with a MeanWell HLG-320 power supply.

Network Connections

The NDBPRO contains an internal 3-port network switch. One port is connected internally to the NDB and the other 2 ports are external jacks. The network connections are standard ethernet Cat5 RJ45 sockets. They support 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). You can use either port or you can daisy chain multiple NDBs together using both ports. Daisy chaining will simplify wiring but will reduce reliability, as each NDB in the chain will need to be powered up and working in order for further NDBs to receive data. The Yellow LEDs on the network jacks show network activity.

Wifi

The NDBPRO also contains an internal Wifi device with an externally connected antenna. Wifi can be use for controlling, monitoring and data reception. The Wifi device can be setup as an Access Point or as a client on a Wifi network. If you don't want to use Wifi, or want to remove the antenna, you should set the Wifi function to Off.

Power

The NDB accepts 7-24vdc on its power input terminal (5v is also possible by changing internal jumpers, contact the factory for more info). The output ports to the lights will receive the same voltage as you place on the input, so it must match the specifications for the lights. The data signal wire on the output ports is always at 5vdc. The power connector is rated for 32A maximum.

Reversing polarity may destroy the device and possibly any light strings connected to it!

For the most common 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. For UL ratings the fuse should be a maximum of 5A when using 12V or less, or 4A when using 24V. If you need to open the case to replace a fuse it will require a 2.5mm hex bit.

Reset Switch

The Reset Switch is located in a small hole next to the power connector. It has 3 modes of operation. Pressing it for 1-4 seconds will reset the Wifi settings to factory default. Pressing for 4-8 seconds will reset the Network settings to factory default, and pressing for more than 8 seconds will reset everything to factory defaults.

Web Interface

Configuration is done via a web interface. The NDBPRO ships with a default IP address of 10.0.0.100 and netmask 255.255.255.0 on the network interface. On Wifi, it defaults as an Access Point with the name of NDBPRO-xxxx, an address of 192.168.2.2 and netmask of 255.255.255.0, and supports DHCP for clients connecting to it.

To configure the NDB via ethernet cable, 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.

To configure via Wifi, find and connect to the SSID NDBPRO-xxxx (xxxx is a unique number for each NDB). Then enter http://192.168.2.2 into a web browser.

If all is ok, the NDBPRO main page will appear.

Configuration is done on the NDBPRO, OUTPUTS, and NETWORK pages, and effects are controlled from the COLORS, EFFECTS and SHOWS pages.

NDBPRO page

The top line shows the software version number, and at the bottom of the page you can upload new software releases when they are available. Also near the top of the page you can enter a descriptive name for the NDB to help identify it. The FUSE section shows status of all the output fuses.

The POWER section shows current readings, and the highs and lows (since last power up). The 3.3v and 5v readings are for internal voltage regulators, if they turn red there could be an internal hardware problem. The input voltage reading shows the voltage coming in the main power jack. Supply current is how many amps are being used by both the lights and the internal NDB circuitry. Power is just current times voltage. The values in this section are averaged over a few seconds and only updated every few seconds.

The SWITCH section shows the status of the internal network switch along with various packet counts. It may be helpful for debugging network issues.

NETWORK Page

From this page you can change your IP address, Netmask and default Gateway for both interfaces. 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. Each NDB on your network needs to have its own unique IP address. If you use network 10.0.0. we suggest numbering the NDBs as .101, .102, .103, etc.

OUTPUTS page

This page lets you select the chip type, network protocols, and output port settings.

Chip Selection

This section 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 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. When you select a chip type, the proper values for the chips Timing and Conversion are filled in on the lines below. You should not change these unless you have a reason. 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

Output Port Settings

The NDB has maximum limits on how many lights each output can support and this will depend on the chip type and conversion selections. The maximum number of lights possible per output is displayed.

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.

Art-Net mode is best used as a unicast protocol. If you broadcast instead, the NDB will likely start dropping packets when more than 24 universes are sent.

E1.31

This protocol has support for basic functionality in unicast or multicast mode.   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.

If E1.31 protocol is used in multicast mode, your switches should have IGMP Snooping enabled and you should have an IGMP Querier active. Without those items, multicast is similar to broadcast and the NDB will start dropping packets when more than 24 universes are sent.

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.

Effects generation

At the bottom of the Output page, you can select the size for internally generated effects. For 2D effects you would most likely enter the number of Strings and Lights attached to the NDB. For example, if you have a grid or tree of 8 strings of 25 lights each, enter 8 x 25 to get 2D effects.   But if you have setup your 8 strings in a long linear line that is 200 lights long, then enter 1 string of 200 lights.

The built-in effects generator also supports zig-zagging light strings. For example, if you have 8 strings of 100 lights, you could run each string up 50 lights and then back down 50 lights. If you ask for effects to be generated for 16 x 50 lights, then it will assume you are zig-zagging the strings. You can do this for any number of zig-zags (ie, 5 strings of 90 lights, zigzagged 3 times, so generate effects for 15x30 lights). This feature can be used to avoid the use of Smart-Ts.

You can also select whether this NDB is an effects Master, Slave, or neither. If a Master, when you select an effect on this NDB, the selection will also be sent to and Slave NDBs.   If none, it will ignore any Master or Slave functions.

COLORS page

This page lets you select the colors used by the effects and also the overall brightness. You can select up to 5 custom colors. If you delete all the colors, then effects will use either random or rainbow colors depending on the effect. You can also select a background color which is used to fill in pixels that would normally be black for some effects.

EFFECTS page

This page lets you select effects to run, including turning them OFF, and running a light TEST. When you select an effect, various sliders may appear that let you modify the effect. You can also save the currently running effect to be the power-on effect.   When no RGB data is received (via DDP, Art-Net or E131), the currently saved effect will be run. You can save the OFF effect if you want the lights to blank instead.

SHOWS page

This page lets you set up 2 shows, or use you can just use the show entries and memories for saving and recalling favorite settings. To use it, select your effects and colors, then hit the SET button at the far right of the table to set the current effect in memory. Set a showtime as the number of seconds to run that effect for. Then select SHOW1 or SHOW2 on the Effects page to run a show.

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.

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

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

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.

API

The NDBPRO has 2 API protocols, one via DDP and one via a REST API. Both of these use JSON strings to send or receive status, configuration and control info. For details on the DDP interface see the DDP protocol specs.

For the REST API, the following functions are available:

GET status from /api/status, for example returns:

{"status":
"man":"3WL","mod":"NDBPRO","push":true,"mac":"a4:cf:12:9d:4d:c8","fuses":"ff","vin":"12.11","amp":"1.03"}}

GET or PUT configuration to /api/config, for example:

{"config":{"chip":1,"t0h":400,"t1h":850,"tbit":1260,"tres":1000,"conv":0,"ports":[{"p":0,"ts":0,"l":15,"ss":1,"rev":0},
{"p":1,"ts":0,"l":15,"ss":46,"rev":0},{"p":2,"ts":0,"l":15,"ss":91,"rev":0},{"p":3,"ts":0,"l":15,"ss":136,"rev":0},
{"p":4,"ts":0,"l":15,"ss":181,"rev":0},{"p":5,"ts":0,"l":15,"ss":226,"rev":0},{"p":6,"ts":0,"l":15,"ss":271,"rev":0},
{"p":7,"ts":0,"l":15,"ss":316,"rev":0}]}}

PUT control functions to /api/control

{"control":{"fx":"Glow","int":"100","trails":"80"}}

Please contact the factory for more details.