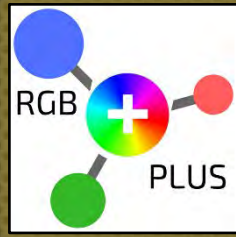# NETWORK DATA BOX+ USER GUIDE #1

RGB-NDB+

SETTING UP ARTNET & DDP

Presented by

Minleon International

Your provider of leading edge LED lighting products

NDB+ with MeanWell HRP power supply in a weatherproof box

NDB+ USER GUIDE
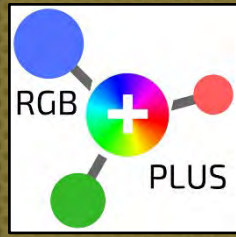## TABLE OF CONTENTS
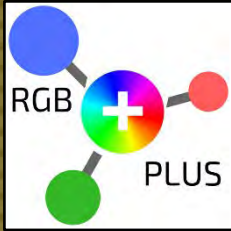
An NDB+ has 16 RGB-LED output ports

1. RUNS FULLY SEQUENCED RGB LIGHT SHOWS & INSTALLATIONS VIA PC OR CUSTOM LIGHT DESK USING INDUSTRY STANDARD SACN/E1.31 & ART-NET SEQUENCING SOFTWARE: SUCH AS MADRIX, RESOLUME, X-LIGHTS, MOSAIC, LIMBIC MEDIA'S AURORA, AMONG MANY OTHERS.

2. DON'T DO YOUR OWN SEQUENCING?—ALSO WORKS WITH MINLEON'S NETWORK EFFECTS CONTROLLER (DDP PROTOCOL)—NO PC NEEDED

   - 23 BUILT-IN 2-D EFFECTS

   - LIGHT SHOW MODE

   - SD CARD DRIVE FILE PLAYER & AUDIO PLAYER

   - TRIGGER EFFECTS LIVE VIA DMX

- USED IN MEGA-TREES, GRIDS, CANOPIES, CHANDELIERS & TUNNELS

- COMPLETELY SCALABLE AND FLEXIBLE (VIA THIRD PARTY NETWORK SWITCH)

In this basic sketch, Art-Net can be substituted for Minleon's NEC (power supply not shown)
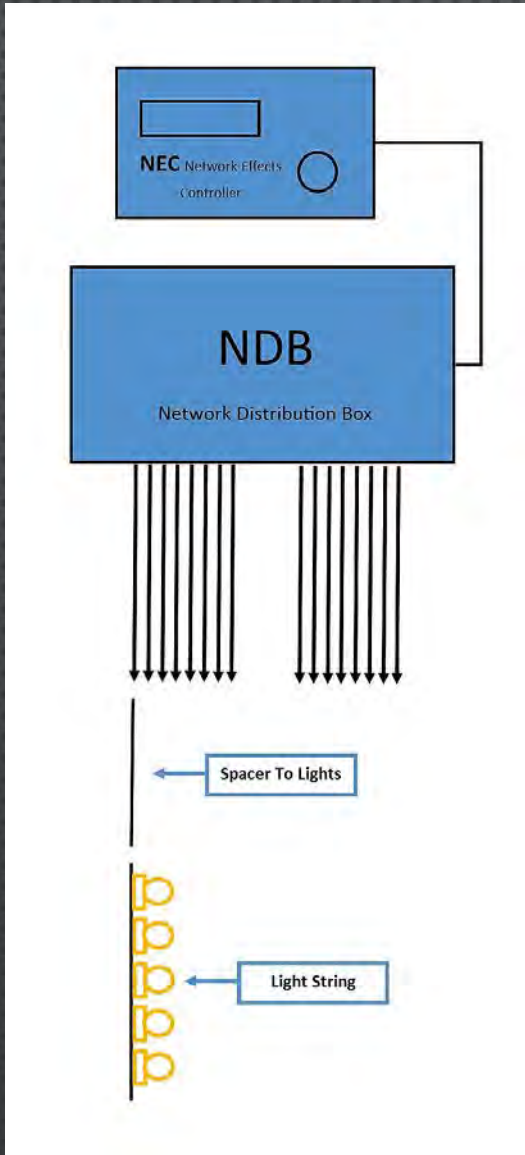

- DISTRIBUTES 12VDC POWER & SEQUENCING DATA (VIA ETHERNET) TO LIGHT STRINGS

- CONNECT MULTIPLE NDB+'S (AND NDB'S) TO A NETWORK VIA THIRD PARTY NETWORK SWITCH

- 1530 MAXIMUM LIGHTS PER NDB WHEN USING ART-NET/

   INDIVIDUALLY CONTROL 1600 VIA DDP (MINLEON NEC)*

- COMPATIBLE WITH MINLEON SMART-T'S, TO ADD MULTIPLE STRINGS TO A SINGLE OUTPUT (AND IN TURN SAVING CABLING)

- 16 LIGHT STRING OUTPUTS

- 40-AMP; 12-24VDC MAX POWER INPUT (TO DATE ONLY RGB DOMES RUN ON 24 VDC IN PLUS LINE)

   - 20-AMP MAX TO EACH SIDE OF NDB

   - POWER MUST BE BALANCED ON EACH SIDE IF RUNNING OVER 600 RGB'S

   - RECOMMENDED TO RUN AT 80-90% CAPACITY

* NOTE: THESE NUMBERS ARE ACHIEVED WITH BULB SPACING OF 4-INCHES AND POWER INJECTIONS. IT IS RECOMMENDED TO RUN NDB'S AT NO MORE THAN 90% THIS LOAD WITH GREATER BULB SPACINGS. LIMIT RUNS TO ABOUT 125 LIGHTS OR 100 FEET FROM THE NDB OUTPUT TO THE FINAL RGB.
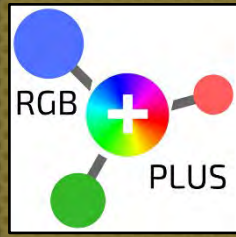
NEW OPTION! 4-port NDB+ w/ power supply & dry box (same functionality as NDB+)

- HOT-PLUG LIGHT STRINGS, WITH NDB+ POWERED

- 3-FUNCTION, EXTERNAL RESET SWITCH (MORE ON SLIDE 20)

- E1.31 SUPPORT (UNICAST ONLY)

- ARTNET4 SYNCH SUPPORT

- USER INTERFACE (UI) ACCESSIBLE AFTER LIGHT SHOW STOPS

- UPDATE FIRMWARE VIA UI

- REVERSE LIGHTS ON A STRING

- INPUT POWER 12-24 VDC

- INJECT POWER MID-RUN VIA POWER T+ & 5-AMP PSU (POWER T'S ARE NOT COMPATIBLE WITH LEGACY/GEN2 RGB NDB)

- 8-PORT MODE (INCREASE LIGHT COUNT PER PORT FROM 230 TO 460)

- NEW VERSION: 4-PORT NDB+ W/ POWER SUPPLY & DRY BOX (PICTURED AT LEFT)

- NEW RGB-PLUS LINE TWIST-AND-LOCK CONNECTORS
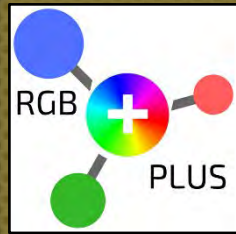
| Control	
Input	up to 16 universes
Outputs	16
Max Lights across all Outputs	1600
Max Lights w/o power injections	approx. 1200
Max Lights per Output	460 in 8-port mode w/ inline power injections * (230 in 16-port mode)
Max Lights per Output w/o power injection	approx. 125L or 100-feet, whichever comes first
Max Smart T's per Output	20
External Interface	1 x RJ45 port
Protocols	ArtNet, E1.31 (unicast), DDP
Default IP Address	10.0.0.100
Hard Reset Button	yes, on top, 3-function
Firmware Updates from Web Interface	yes, via ethernet
Reverse Output Sequence	yes, optional

Electrical & Safety	
PSU Included	no
Input Power	12-24 VDC
Max current	20 Amps per side
Fuse Type (per output)	5-Amp ATM
*Inline power injection	via Minleon Power T+'s & RGB-5A, 12VDC PSU
Certifications	UL listed, IP 24
Dimensions	
Box dimensions	4.0 x 5 .25 x 1.375 inches
Output cable length	10.5 inches
Weight	1.2 lb.
Housing	polycarbonate
Mounting Option	yes, screw holes
Operating Temperature	Neg -10 to +50 Cel. / Neg -14 to +122 Far.

Specifications as of March 2018 and are subject to change.

RGB + PLUS
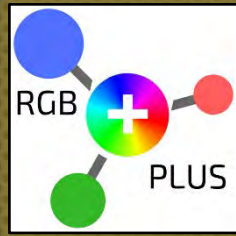
12VDC, 20 to 40Amp PSU

Right, side view

- POWERED BY A 12VDC, 20-AMP TO 40-AMP TRANSFORMER, CONNECTED ON BOTH SIDES OF NDB—WE RECOMMEND *MEANWELL HRP 12VDC SERIES*

- CAT 5 NETWORK CABLE CONNECTS NDB DIRECTLY TO THE RJ45 NETWORK OUTPUT OF A COMPUTER, NEC OR ARTNET CONSOLE

- SPACERS, SMART T'S OR LIGHTS ARE CONNECTED BEGINNING WITH PIGTAIL OUTPUT #1
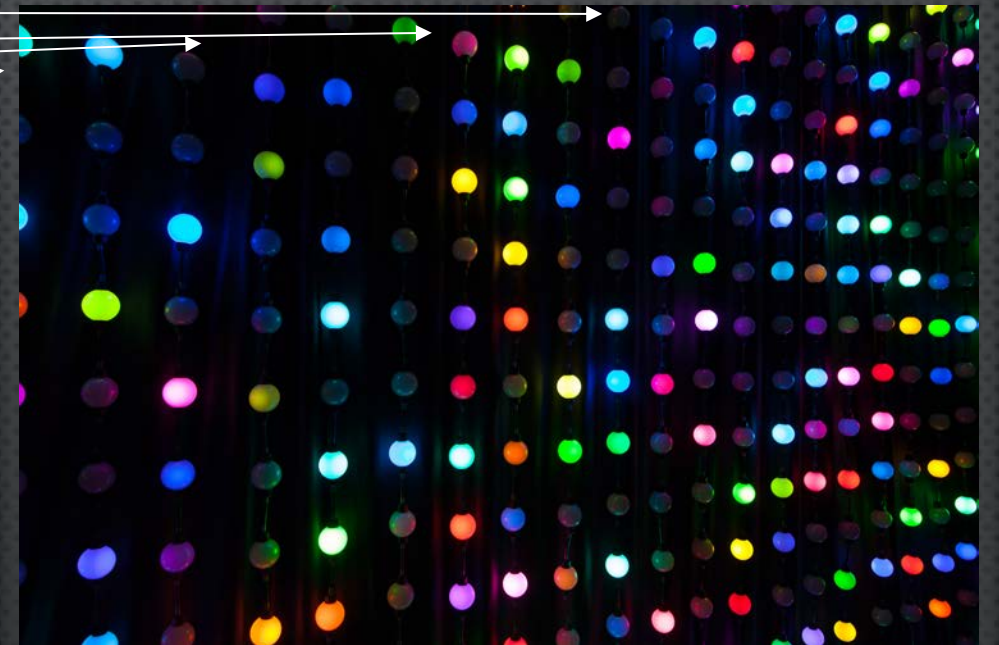
- ADD STRINGS IN NUMERICAL ORDER

First 4 NDB Outputs

CAT 5 network cable to RJ45 jack
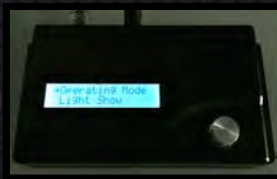
Left, side view

Computer, Minleon NEC or Art Net console

7
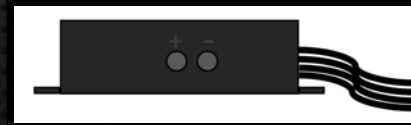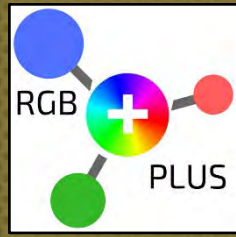
Network Switch

Computer, Minleon NEC or Art Net console
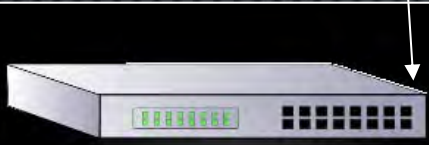
CAT 5 network cables to RJ45 jack

- Multiple NDB+'s can be connected through a standard 100MB network switch*

- each controller must have its own Individual IP address configured

- Each NDB+ requires its own power supply

*Pro Tip: If RGB design is outdoors, a proper temperature-rated, third party CAT 5 cable & Network Switch is recommended—an example is EtherWan #43008 (pictured below).

10.0.0.101

10.0.0.102

10.0.0.103

Lights

Lights

Lights

43008

EtherWAN

CAT 5 "Network" output to NDB or Network Switch

Operating Mode
→File Player

SD/HC Drive

7.5-12 VDC, 1.5-Amp power input (included)

- Minleon's Network-Effects Controller (NEC) can send data to up to 8000 RGB's*

- Send data to up to 16 NDB/NDB+'s*

- Onboard Audio WAV file player with output jack

- SD/HC card slot to access user-generated (.BIN) lighting data & (.WAV) audio files

- Network port to send lighting data to NDB's, Net Switches, and to synchronize with other NEC's

- Single DMX port (2 RJ45 jacks) for sending DMX lighting data or receiving DMX commands

- Show Controller (NEC-UI) add on, allows wireless, remote access to the DDP Effects Player & includes a Calendar Format Scheduler

* 8000 RGB's was achieved with bulb spacing of 4-inches. It is recommended to run NEC's at 80% this load with greater bulb spacings, esp. when using the .WAV audio player. In most cases, multiple NEC's can work together to reach the channel count you desire.

For more details please reference the *Network Effects Controller – Overview tutorial.*

9

MINLEON'S NEC CAN AUTO-CONFIGURE NDB+'S IN ITS UTILITY MODE*. CHOOSING THIS OPTION, ALL OUTPUTS ARE ASSIGNED THE SAME VALUES.

BUT IN ORDER TO SET CUSTOM VALUES FOR EACH OUTPUT, OR TO CONFIGURE FOR ART-NET, WE MUST FIRST SET UP THE IP4 NETWORK ADDRESS ON YOUR COMPUTER'S NETWORK INTERFACE TO BE ON A SIMILAR IP RANGE AND SUBNET THAT THE NDB+ CONTROLLER SHIPS WITH.

Must have similar IP Address & Subnet range

IP4 RECOMMENDED SETTINGS
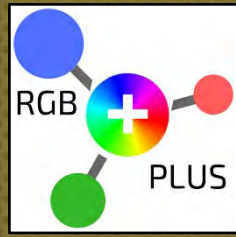
- IP ADDRESS: 10.0.0.10
- SUBNET MASK: 255.255.255.0
- DEFAULT GATEWAY: 10.0.0.1

NDB CONTROLLER DEFAULT SETTING

- IP ADDRESS: 10.0.0.100
- SUBNET MASK: 255.255.255.0
- DEFAULT GATEWAY: 10.0.0.1

*For more details on Auto-Configuration, please reference the
NEC/NDB Network Configuration Guide tutorial.

10

Step 2

Step 3

Step 4

Step 5

Step 1

Using Windows

1. Right click on the 'LAN' connection and select 'open network and sharing center'.

2. Select the 'network connection' where the NDB+ is connected.

3. Click on the 'properties' tab.

4. Double click on 'Internet Protocol Version 4 (TCP/IPv4)' to bring up the 'IP properties box'.

5. Manually set:

   - IP Address: 10.0.0.10

   - Subnet mask: 255.255.255.0

   - Default Gateway: 10.0.0.1

6. Click OK

Note: Your PC should now be able to access the 10.0.0.10 network that the NDB Controller is on. Remember, you may not have internet access due to the IP address change.

11

RGB
PLUS

NDB+ Config
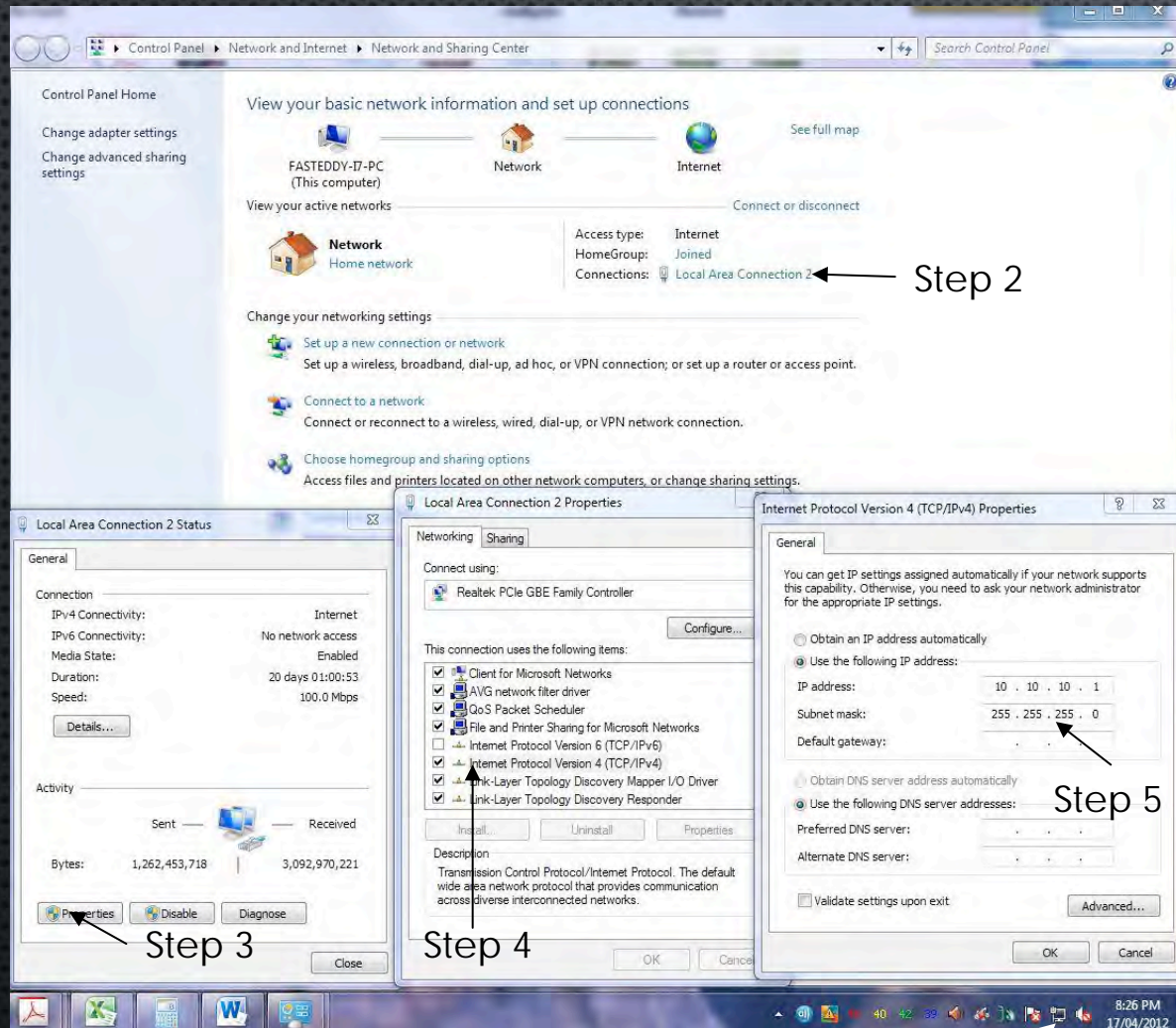
← C ⓘ 10.0.0.100

NDB+ v1.44

IP:	10	0	0	100
NetMask:	255	255	255	0
Gateway:	10	0	0	1

Protocol: ● DDP   ☐ Art-Net   ☐ E1.31 (unicast)

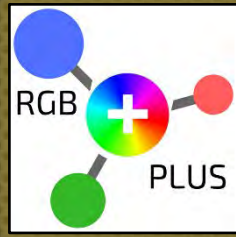Changes above this line require a save and reboot to take effect.

Output	Smart-Ts	Lights/String	Reverse?	Starting Slot
1	0	10	☐	1
2	0	10	☐	31
3	0	10	☐	61
4	0	10	☐	91
5	0	10	☐	121
6	0	10	☐	151
7	0	10	☐	181
8	0	10	☐	211
9	0	10	☐	241
10	0	10	☐	271
11	0	10	☐	301
12	0	10	☐	331
13	0	10	☐	361
14	0	10	☐	391
15	0	10	☐	421
16	0	10	☐	451

Set unused ports to zero Lights.
When using Smart-Ts, the number of Lights/String on all ports must be the same (or zero).
Auto-Fill from Output 1 down

- TYPE 10.0.0.100 IN YOUR WEB BROWSER

- THE NDB+'S BLUE CONFIGURATION SCREEN SHOULD APPEAR (SEE GRAPHIC)

- BEGIN TO SET UP THE NETWORK CONFIGURATION, UNIVERSES & OUTPUTS

- YOU ALSO HAVE THE ABILITY TO TEST THE LIGHTING WITHOUT THE NEED FOR SOFTWARE

NOTE: *THE WEB CONFIGURATION PAGE IS AVAILABLE AFTER NDB POWER UP OR RESET, AND BEFORE THE FIRST ARTNET 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.*

12

1. IP: Set the desired IP address for the NDB+ controller. Remember, each controller should have a unique IP address.

2. NetMask: This must be the same as what your computer 'subnet mask' is set to.

3. Gateway: Set to be the same as the 'default gateway' that is used in your computer's network configuration.

4. Protocol: Choose between industry standard Art-Net, E1.31 (unicast) or DDP*

   *DDP is a proprietary protocol that runs Minleon's Network Effects Controller (NEC), built-in effects.

Pro Tip: Write the IP address you choose for each NDB directly on its face.

OUTPUT ASSIGNMENTS

NOW WE WILL LINK THE UNIVERSE AND CHANNELS TO THE OUTPUT.

1. OUTPUTS: 16- OR 8-PORT MODE (16 = 230 MAX L/OUTPUT; 8-PORT = 460 MAX L/OUTPUT)

2. ARTNET UNIVERSES: THIS IS THE UNIVERSE RANGE THAT THE NDB+ CONTROLLER IS SET TO WORK WITH. SPECIFIES WHICH BLOCK OF 16 UNIVERSES WILL BE RECEIVED BY THE NDB.*

3. OUTPUT: THE PHYSICAL OUTPUT (NDB+ PIGTAIL) THAT THE LIGHTS ARE CONNECTED TO.

4. SMART T'S: THE NUMBER OF SMART T'S THAT ARE CONNECTED PER OUTPUT (IF ANY, MORE ON SLIDE 18)

5. LIGHTS/STRING: THE AMOUNT OF LIGHTS CONNECTED PER STRING OR T.

6. REVERSE: MAKES THE LAST LIGHT ON THAT OUTPUT, THE FIRST, AND SO ON, UNTIL THE FIRST LIGHT IS LAST (ADDRESS)

7. 16-BIT UNIV: SEE #2 ABOVE

8. THE CHANNEL NUMBER IS THEN RELATIVE TO THE FIRST UNIVERSE YOU PICKED. SO IF YOU SET THE ARTNET UNIVERSE TO 30, IT RECEIVES UNIVERSE 30-35, AND THEN STARTING SLOT #1 WOULD BE UNIVERSE 30, CHANNEL 1.

Fields with Blue background are automatically calculated by the web interface

9. AUTO-FILL: WILL AUTOMATICALLY FILL ALL THE OUTPUTS BASED ON OUTPUT 1 SETTINGS.

10. TEST LIGHTS: THIS ENABLES A WHITE TEST PATTERN THAT STARTS AT THE FIRST CONFIGURED OUTPUT AND FINISHES AT THE LAST CONFIGURED OUTPUT.

11. SAVE AND REBOOT: WHEN YOU HAVE COMPLETED YOUR CONFIGURATION YOU MUST SAVE AND THEN REBOOT THE CONTROLLER FOR THE SETTINGS TO REGISTER.

THE STARTING SLOT NUMBER SPECIFIES WHICH PART OF THE INCOMING DATA STREAM GETS SENT TO THE LIGHTS ON EACH OUTPUT PORT.
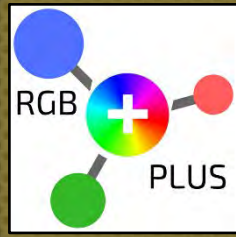
- THE STARTING SLOT BEGINS AT 1

- WITH THE DDP PROTOCOL, THE NDB ACCEPTS UP TO 4800 (1600 LIGHTS TIMES 3 RGB BYTES PER LIGHT) BYTES OF DATA—EVERY 3 BYTES SPECIFIES A RED, GREEN AND BLUE COLOR VALUE FOR A LIGHT

- STARTING SLOT 1 IS THE DATA FOR THE FIRST LIGHT, SLOT 4 FOR THE SECOND LIGHT, 7 FOR THE THIRD LIGHT, & SO ON

PRO TIP: MULTIPLE OUTPUTS CAN HAVE THE SAME STARTING SLOT IF YOU WANT TO DUPLICATE THE SAME LIGHT DATA TO THE SAME OUTPUTS.

CONFIGURING FOR ARTNET:

- ONLY THE FIRST 510 BYTES OF EACH UNIVERSE ARE USED (FOR 170 LIGHTS)—THE LAST 2 BYTES ARE IGNORED

- UP TO 9 CONSECUTIVE UNIVERSES OF 510 BYTES OF ARTNET DATA ARE APPENDED TOGETHER INTO AN INTERNAL BUFFER—THE STARTING SLOT SPECIFIES THE POSITION WITHIN THAT BUFFER
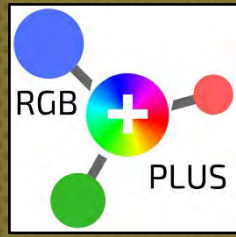
FOR EXAMPLE, SPECIFYING A STARTING SLOT OF 511 WOULD MEAN THE FIRST LIGHT DATA FROM THE SECOND UNIVERSE,

- SLOT 514 THE SECOND LIGHT OF THE SECOND UNIVERSE,

- SLOT 1021 WOULD BE THE FIRST LIGHT OF UNIVERSE 3, ETC.

IN THIS WAY, DATA FOR A PARTICULAR NDB OUTPUT CAN SPAN MORE THAN A SINGLE ARTNET UNIVERSE.

RGB PLUS

100 lights off one NDB+ output are often divided amongst Smart T's & connected as a harness in this fashion.
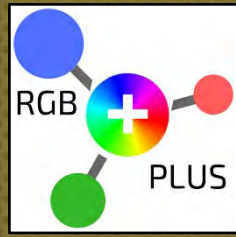
This is common in RGB grids & chandeliers.

Smart T+'s will only output lights via the BOTTOM of the T, not the side.

SMART-T'S ARE EXCLUSIVE TO MINLEON NDB+, WI-FI CONTROLLER (WEC+) & NETWORK EFFECTS CONTROLLER (NEC) SYSTEMS.

- LIGHT STRINGS WILL RUN *INDEPENDENT OF EACH OTHER*—NOT IN PARALLEL

- REDUCES CABLING BY ADDING MULTIPLE STRINGS TO A SINGLE NDB OUTPUT

- THIS LEVEL OF FLEXIBILITY IS BECOMING IMPERATIVE IN THE LIGHT DESIGN INDUSTRY

- SET THE NUMBER OF "T'S PER OUTPUT" ON THE NDB CONFIGURATION PAGE (*IF YOU WERE USING 6 SMART T'S PER OUTPUT THEN YOU WOULD SET THIS TO 6.*)

- MAX SMART T'S PER OUTPUT IS 20

PLEASE NOTE: WHEN USING SMART T+'S, THE NUMBER OF LIGHTS/STRING ON ALL PORTS MUST BE SET TO THE SAME VALUE (OR ZERO). IF SOME RUNS ARE SHORTER, USE THE HIGHER VALUE. HARNESS' MUST ALSO BE EQUAL VALUE. IF ONE IS UNEQUAL, MAKING IT SMALLER & SAVE IT FOR LAST.
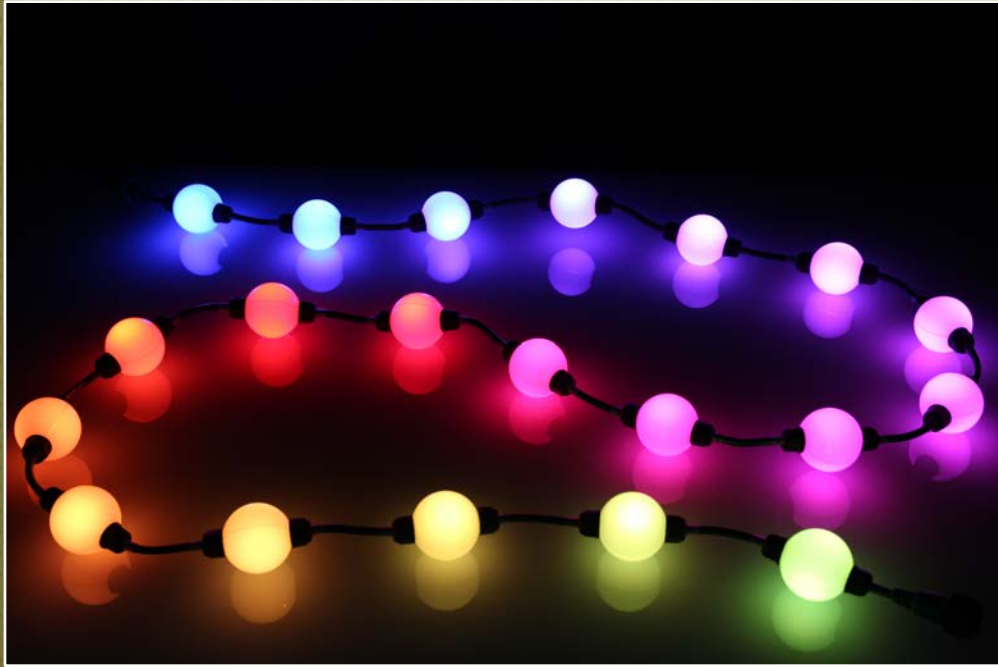
LIGHTS/STRING

THIS IS THE NUMBER OF INDIVIDUAL LIGHTS PER MINLEON RGB LIGHT STRING. STRINGS BEGIN AT THE NDB+ OUTPUT OR AT EACH SMART T. IF A STRING OF LIGHTS HAS 25 LIGHTS ON IT THEN THIS SHOULD BE SET TO 25.
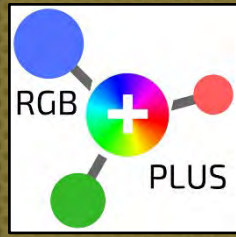
REMEMBER: THE WEB CONFIGURATION PAGE IS ONLY AVAILABLE AFTER NDB POWER UP OR RESET, AND BEFORE THE FIRST ARTNET OR DDP DATA PACKET ARRIVES. THE WEB SERVER IS SHUT DOWN IF DATA ARRIVES, BUT WILL BE RE-ENABLED IF NO DATA IS RECEIVED FOR 5 SECONDS.
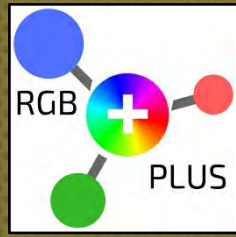
IF YOU DO NOT KNOW AN NDB'S IP ADDRESS, OR IF IT BECOMES UNRESPONSIVE, IT IS POSSIBLE TO RESET THE NDB TO FACTORY DEFAULT SETTINGS.

Re-set button

- THE RESET SWITCH IS LOCATED IN A SMALL HOLE ON THE TOP 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 TO THE FACTORY DEFAULTS.

Periodically, Minleon will release code updates to add features or fix bugs with the NDB+. These updates are housed at WWW.MINLEONUSA.COM, on the NDB+ product page as .bin and .hex files. The .bin files can be downloaded, saved and uploaded to the NDB+ at the bottom of the interface.

1. Select "Choose File" from the location you saved it

2. Select "Upload BIN file" once, and let the controller re-boot

The .Hex File can be used if you need to update the firmware direct to the PCB with a PicKit programmer. Contact us for detailed instructions, if needed.

1. The NDB+ System works best when Uni-casting the data, rather than Broadcasting. The NDB+ will respond to ArtNet Polling packets, but will only show support for the first 4 universes, due to ArtNet protocol limitations. However, you can still manually configure your lighting software to send up to 9 universes to the NDB. ArtNet 3 protocol can support up to 32767 universes.

2. When employing multiple NDB+'s, capture a screen shot of the Network Configuration Page (*at left*). Print this out and keep in the weatherproof box with the NDB+. In the event that one NDB needs a hard re-set to factory defaults or replaced, we can then manually configure this NDB, rather than re-AutoConfiguring the entire network.

3. Use the "Test Lights" feature of each NDB+ before installing in tough-to-access places to ensure functionality. This can be done with a single string attached to a single, configured NDB output. (See button at bottom left of the graphic.) If the lights work then the issue will be in the software configuration used to control the lights.

4. To figure the Maximum DDP Frame Rate possible, use the calculator here: http://www.3waylabs.com/triklits/ndbmax.html. If using ArtNet, the lights are updated at a fixed 40fps, regardless of the incoming frame rate.
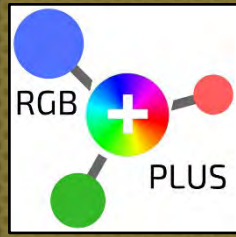
5. If a single NDB+ output will not work with any light string, check the face of the box for a RED LED shining through the black transparent case. If this light appears, the fuse for this output has blown and will need replaced. Unscrew the NDB and remove the blown 5A vampire fuse with plyers. Replace with a new 5A fuse from your local electrical or automotive store. If running a 24Vdc power supply to power RGB Domes or the new 24 Vdc Pebbles or T5 Light Tubes, UL requires a 4Amp fuse.

6. Ensure there is data being sent to the NDB controller. Notice by looking at the RJ45 socket (ethernet jack)on the NDB controller. This light should be flickering when receiving a data stream, if not, check that the software used to control the lights has the output "on" and is configured properly.

7. Label all NDB's, spacer cables & Network/Ethernet Cables on both ends. If a cable needs replaced, this will make it easier to identify.

8. Do not cable tie Data or Network Cables with Main Voltage/Power cables. This could distort the Data Signal.

9. Power all NDB's from the same power strip(s), isolated from NEC's on the network. This way we can re-cycle the power to the NDB's without cutting power to the NEC's.

10. Assign each Cluster of NDB's to it's own power breaker.

11. To prevent a 20Amp breaker from tripping, limit 5 NDB's (approx. 1000 RGB's each) per breaker. This keeps each breaker running at about 75%, with 25% headroom for potential power spikes.
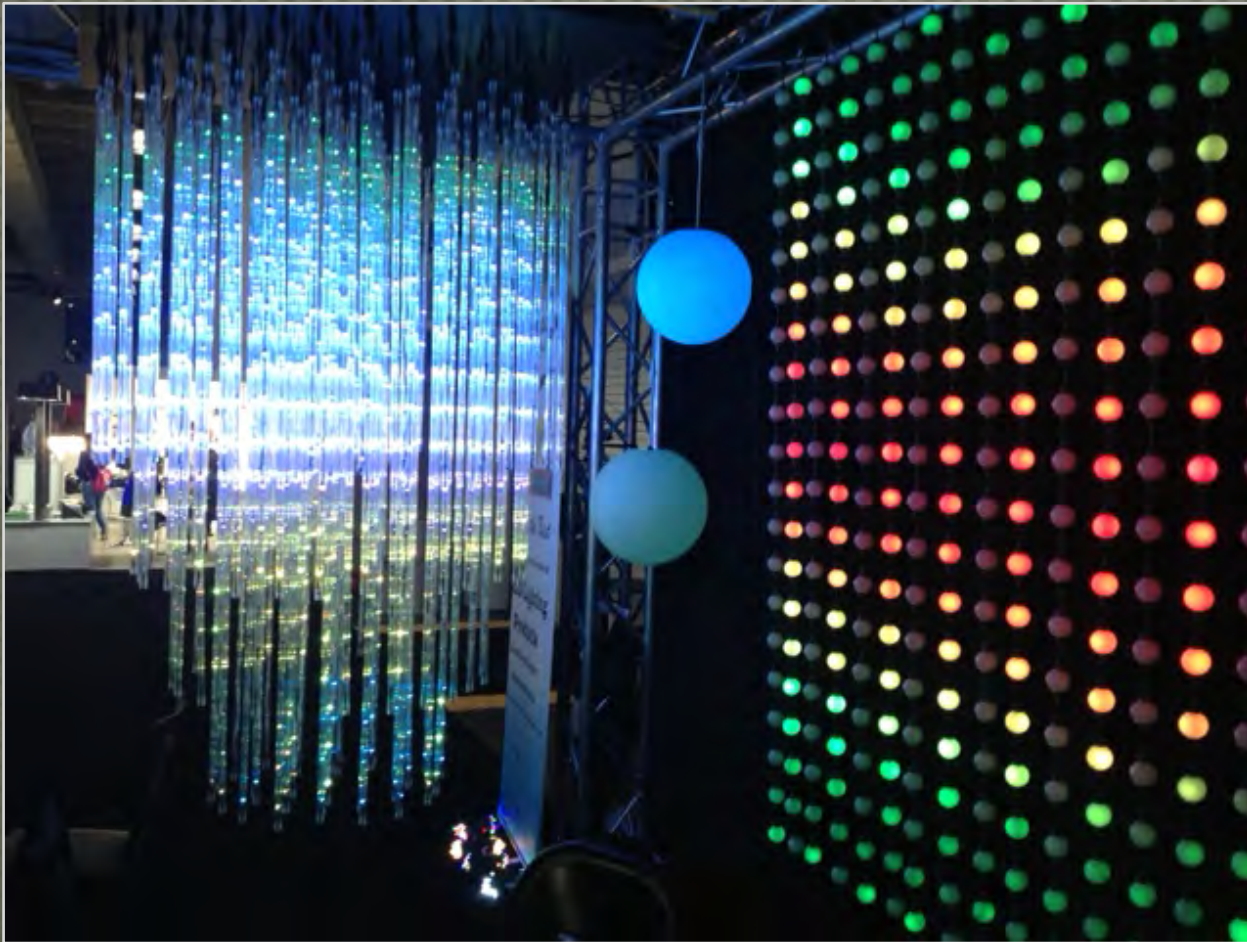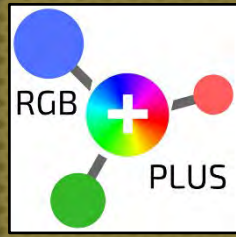
PLEASE E-MAIL

Support@MinleonUSA.com

& REFERENCE THIS PRESENTATION.
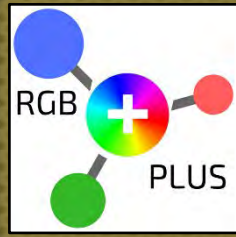
*****

WE ENCOURAGE YOU TO VIEW THESE RELATED TUTORIALS:

- POWER & DATA MANAGEMENT
- NEC/NDB NETWORK CONFIGURATION GUIDE
- NETWORK EFFECTS CONTROLLER (NEC) – OVERVIEW

*****

THANK YOU FOR YOUR INTEREST IN

MINLEON RGB's!

Videos on Facebook: Minleon USA

THIS IS A SUMMARIZED PRESENTATION ON THE OPERATION AND USE OF THE RGB PLUS LINE NETWORK DATA BOX (NDB+).

BEFORE OPERATING, PLEASE READ THE 'NDB+ USER MANUAL'

MINLEONUSA.COM/NETWORK-DATA-BOX.HTML

FOR A THOROUGH UNDERSTANDING OF ITS OPERATION AND USE.

Minleon USA
MinleonUSA.com

Mechanicsburg, PA

Minleon-Rainmin Illumination
Rainmin.com

Dongguan City, China

Soundtrack credit: Bensound