



**AN INSTALLER'S GUIDE TO...
24VDC PIXEL
MANAGEMENT**



**Presented by
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**Your provider of leading-
edge LED lighting products**

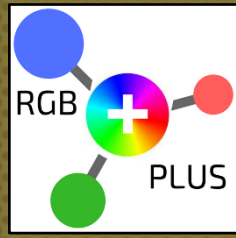
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Last update: June 2021



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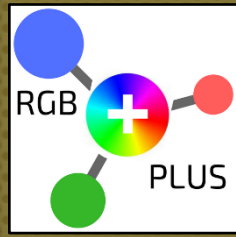
24Vdc pixels are new to Minleon's RGB+ product line in 2019—prompted by the market demands for longer pixel runs & fewer power injections. This tutorial will introduce guidelines for 24Vdc RGB-LED's, which differ from the power & data management guidelines of Minleon's 12Vdc pixels.



1. 24VDC PRODUCT LINE / SPECS
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 - CONTROLLERS
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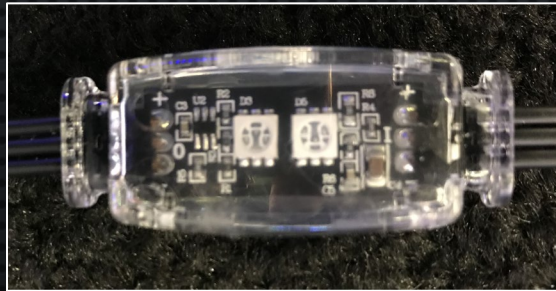
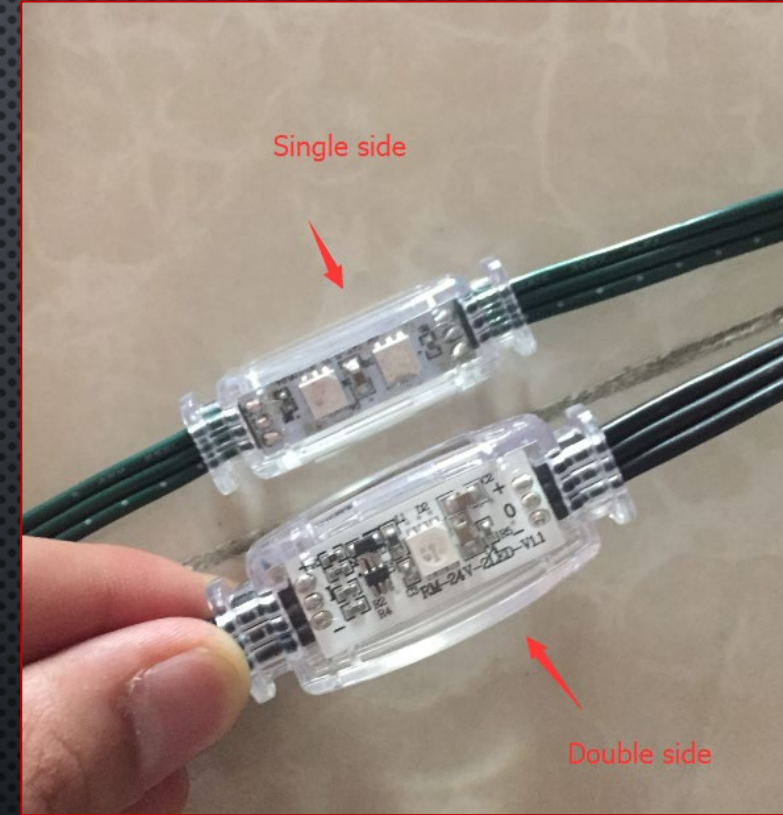


24VDC PIXEL MANAGEMENT LIGHT STRINGS & SPECS



24VDC RGB+ PIXEL SKU'S

ITEM #	Description	Power Draw (current)	Max lights per String	Max lights per 3-Amp / 4 A power injection*
RGB+C9-24v (C7, G20, etc.)	Single-sided, 1 LED	0.015 Amps	200	180 / 200
RGB+PEB180-24v	Single-sided, 2 LED	0.015 Amps	200	180 / 200
RGB+PEB360-2-24v	Double-sided, 2 LED	0.015 Amps	200	180 / 200
RGB+PEB360-4-24v	Double-sided, 4 LED	0.022 Amps	150	125 / 150
RGB+Dome	Single-sided, 5 LED	0.022 Amps	150	125 / 150

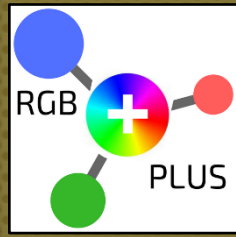


At left RGB+Dome; above 4-LED Pebble

*BASED ON <=12" BULB SPACING/PITCH & ACCOUNTING FOR VOLTAGE DROP.
VARIATIONS DUE TO DIFFERENT POWER SUPPLY AMPERAGE.



24VDC PIXEL MANAGEMENT CONTROLLERS & SPECS



All Minleon RGB+Controllers & accessories (T-Ways, spacer cables, etc.) have a voltage range of 12-24Vdc*. We simply need to match the voltage of the power supply/transformer with the voltage of the lights.

*PRO TIP: To maintain a UL listing, swap out the 5A fuses on an NDB+ you purchased for 12V pixels, with 4A fuses rated for 24Vdc input.

24VDC RGB+CONTROLLER SKU'S

ITEM #	Description
RGB+NDB	Voltage range: 5-24Vdc
RGB+NDB4-24v	Ships with 24Vdc/6.3A psu (& dry box); board has range of 12-24V
RGB+UNICORN-24v	Commercial LoRa wireless, build-in 24Vdc/ 4.38A psu
RGB+WEC	Voltage range: 5-24Vdc
RGB+MC	Voltage range: 12-24Vdc
RGB+NEC	Ships with 7.5-12Vdc psu, powered separately from the lights (controls all RGB+ pixels via NDB+ despite voltage)



RGB+NDB

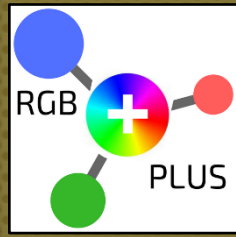
RGB+WEC



*The RGB+NEC is powered by 12v, but commands 24v pixel via the NDB+.



24VDC PIXEL MANAGEMENT POWER SUPPLIES & SPECS



24VDC RGB+ POWER SUPPLY/TRANSFORMER SKU'S



Above, 3A power injector. At right, third-party HRP-450-24.

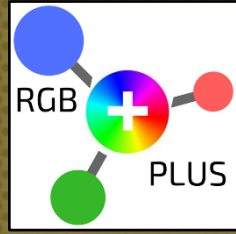


ITEM #	Description	Approx. # of 24V 2-LED Pixels*
RGB+2.5A-24v	To power WEC+, MC+, or inline with Power T+, IP65	120
RGB+3A-24v	To power WEC+, MC+, or inline with Power T, IP65	180
RGB+4A-24V	To power WEC+, MC+, or inline with Power T, IP65	200
RGB+6.3A-24V	MEAN WELL 6.3A/24V IP65 – ships with RGB+NDB4	375
RGB+14.6A-24V	MEAN WELL 14.6A /24V (LRS-350-24) IP20 to wire to NDB+	875
RGB+25A-24V	MEAN WELL 25A /24V IP20 - to wire to NDB+	1300
HRP-450-24 (3 rd party item)	MEAN WELL 18.8A/24v - to wire to NDB+	1100

*BASED ON <=12" BULB SPACING/PITCH & 90% CAPACITY TO ACCT. FOR VOLTAGE DROP.



24V PIXEL MANAGEMENT POWER INJECTORS: THE POWER T



**Minleon
Power T+**



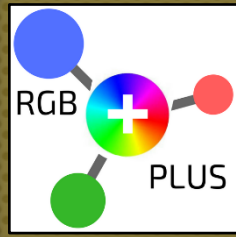
Remember to always Isolate Power in your Light Design—Never Cross Voltage

CARELESS PLACEMENT OF POWER IS A COMMON REASON FOR FAILURE IN RGB SYSTEMS. MINLEON RGB LIGHTS & CONTROLLERS CAN BE DAMAGED IF THEY RECEIVE POWER FEEDING IN BOTH FORWARD AND BACKWARD DIRECTIONS SIMULTANEOUSLY. THIS MAY NOT OCCUR IMMEDIATELY, BUT OVER TIME THIS WILL INTERFERE WITH THE DATA FLOW, COMPROMISE THE LIFE SPAN OF THE PRODUCTS & VOID THE MANUFACTURE'S WARRANTY.

- **Power T's (RGB+PT)** isolate power in one direction through the female end at the Top of the T-Way—and block power from traveling through the T from the male connection
- Power must always be injected from the bottom of the Power T, or it will be damaged &/or malfunction, and not be warranted
- Be aware—Injecting power with a **Basic T** will send power in both directions

PRO TIP: Power T's can be use to Block Power on a run, even when not injecting new power.

- In non-linear designs, often the best method to inject power is to add a powered NDB to the network



24V PIXEL MANAGEMENT VOLTAGE DROP

Both the **Length of Wire** & the **Number of RGB's** in a strand must be accounted for when deciding the placement & amperage of power supplies.

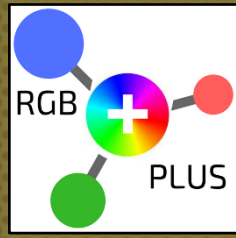


**ACCOUNT FOR VOLTAGE DROP ACROSS DISTANCE—INJECT
POWER EVERY 180-200 LIGHTS OR 180-200-FEET,
WHICHEVER COMES FIRST**

- IN GENERAL, WE CAN RUN MORE PIXELS (BULBS) PER STRING EFFICIENTLY WITH SHORTER & TIGHTER PIXEL SPACING
- DESIGNS WITH BULB SPACING GREATER THAN 12-INCHES SHOULD BE LIMITED TO ~180-FEET (INCLUDING SPACER CABLES) WITH A 3AMP POWER INJECTION BEFORE TERMINATING OR INJECTING ADDITIONAL POWER
- WHEN IN DOUBT, MEASURE END-OF-LINE VOLTAGE (MORE ON NEXT SLIDE)



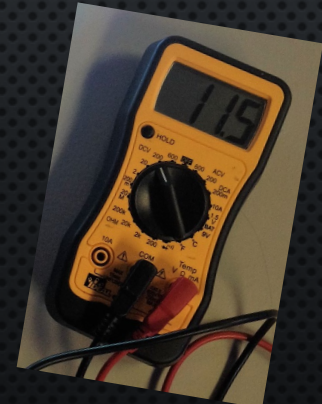
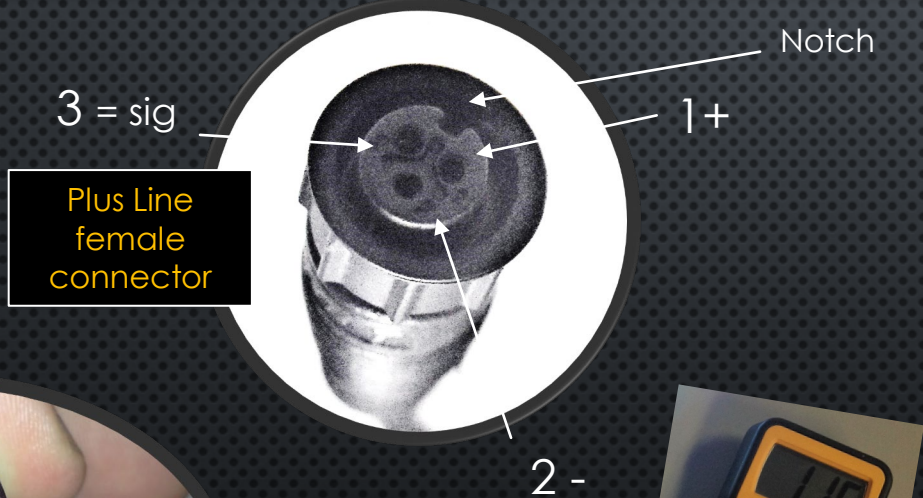
24VDC PIXEL MANAGEMENT MEASURING VOLTAGE



When testing voltage with a Volt Meter, look for the Positive (+), Negative (-) and Data Signal (S) stamps on the connectors. These are visible on all light strings & accessories.

In the RGB Plus Line PIN 1 IS + VCC, PIN 2 IS - GND, PIN 3 IS SIGNAL

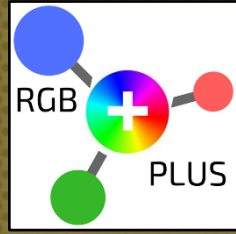
USE A VOLT METER TO MEASURE THE POWER DRAW AT THE END OF EACH RUN



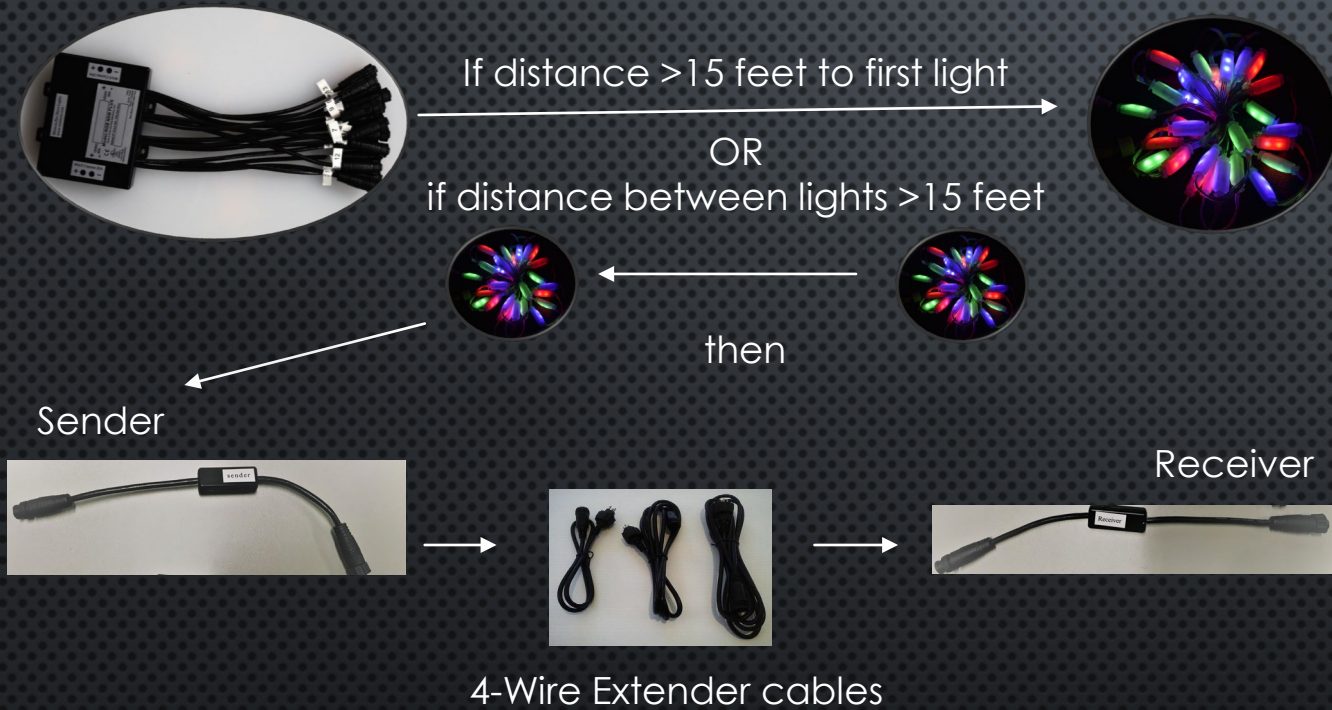
- TO RUN 24V PIXELS EFFICIENTLY, THE REMAINING VOLTAGE AT THE END OF A RUN SHOULD BE 10 VDC WHEN SET TO PURE/COOL WHITE & 100% INTENSITY
- KEEP IN MIND THAT A SIMPLE 10-FOOT SPACER CABLE AT THE BEGINNING OF YOUR LIGHT RUN COULD REDUCE THE VOLTAGE AT THE END OF THE RUN BY 0.50 VOLTS
- LOG THE VOLTAGE AT KEY POINTS IN YOUR DESIGN IN YOUR WIRING DIAGRAM—THIS WILL HELP IN TROUBLESHOOTING, ESP. WITH LARGE &/OR COMPLICATED CUSTOM DESIGNS



24V PIXEL MANAGEMENT DATA CONSIDERATIONS



MAINTAIN EFFICIENT DATA – KEEP THE DISTANCE FROM THE CONTROLLER TO THE FIRST LIGHT AT ~15-FEET OR ADD DATA BOOSTERS & 4-WIRE EXTENDERS



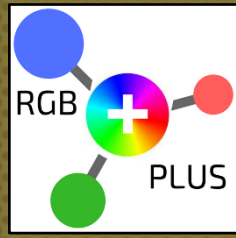
- IF THE DISTANCE BETWEEN THE CONTROLLER AND FIRST SET OF LIGHTS IS GREATER THAN 15 FEET, OR THE DISTANCE BETWEEN ANY CONSECUTIVE LIGHTS IN YOUR LIGHT DESIGN IS GREATER THAN 15 FEET, YOU MUST CONNECT **DATA BOOSTERS (RGB+SR—SENDER/RECEIVER CARDS)***
- WITH **DATA BOOSTERS, 4-WIRE EXTENDERS & POWER INJECTION**, CONTROLLERS CAN BE CONNECTED UP TO 300 FEET AWAY FROM LIGHTS

***NOTE:** 15-FEET IS CONSERVATIVE. WITH HIGH CHANNEL COUNTS & DISTANCES, WE RECOMMEND 20-FOOT, 4-WIRE SPACER; WITH SHORTER BULB SPACING & SMALLER CHANNEL COUNTS, A 3-WIRE MAY SUFFICE AT 20-FEET. CUSTOM DESIGNS SHOULD ALWAYS BE TESTED FOR EFFICIENCY FIRST.

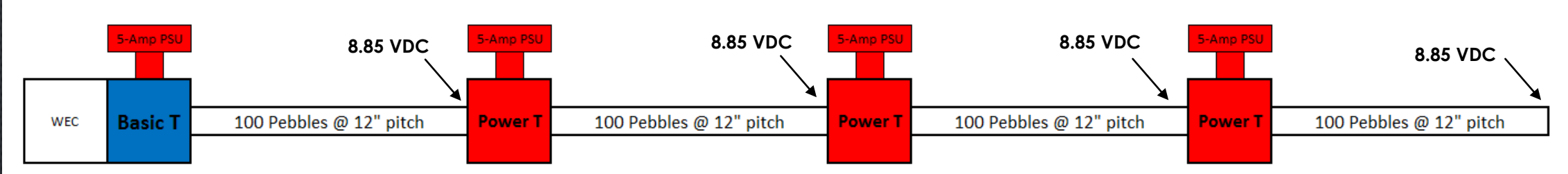
PRO TIP: If running 100-feet of 4-wire cable or more, inject power with a Power T right off the Receiver.



24V PIXEL MANAGEMENT DRAFT A WIRING DIAGRAM



If you aren't available to be on-site to troubleshoot, a well-drafted, pre-installation wiring diagram can be indispensable

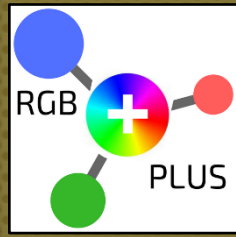


- FOR INSTALLATION, TROUBLESHOOTING & TRAINING PURPOSES, AN ACCURATE WIRING DIAGRAM CAN SAVE TIME, MONEY & REPUTATIONS
- CHARTING THE TYPE OF LIGHTS, BULB SPACING, THE SIZE & LOCATION OF POWER SUPPLIES & ACCESSORIES, ALONG WITH THE DISTANCES BETWEEN EACH WILL GREATLY EXPEDITE POTENTIAL SERVICE CALLS TO THE MANUFACTURER
- BE SURE TO INCLUDE ANY THIRD PARTY ARTNET CONTROLS OR NETWORKING GEAR IN THE DIAGRAM—THOUGH MINLEON CANNOT GUARANTEE SUPPORT FOR THIRD PARTY COMPONENTS & INTEGRATION, WE CAN RECOMMEND BEST PRACTICES
- RECORDING VOLTAGE READINGS AT THE END OF EACH LINE, OR RGB RUN, BEST HELPS LONG-TERM, PERMANENT INSTALLATIONS

NOTE: MINLEON USA WILL HELP WITH YOUR WIRING DIAGRAM IN THE DESIGN PHASE, IF YOU AS A LICENSED DISTRIBUTOR OR INSTALLER TAKE THE FIRST SHOT AT A PROPER LAYOUT.



24V PIXEL MANAGEMENT LAYOUT OPTIONS



LINEAR RUN – SINGLE POWER SOURCE

- A SINGLE RUN OF PEBBLE LIGHTS CONNECTED TO THE CONTROLLER & 3-AMP POWER SUPPLY. *180 lights/180 feet, recommended.*

Note: Generally speaking, adding a 5-foot lead spacer will subtract 0.2 VDC by the end of the line & a 10-foot lead, 0.4 VDC due to voltage drop across distance.



RGB+3A-24V psu



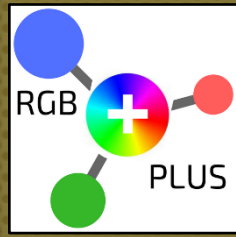
Mini-Controller or WEC w/ Basic T



~180 x 24V Pebbles ≤ 12" pitch



24V PIXEL MANAGEMENT LAYOUT OPTIONS

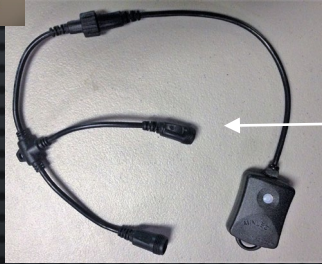


POWER INJECTORS IN A BASIC LINEAR RUN

- ~360 RGB+PEBBLES POWERED BY 2 X RGB+3A-24V POWER SUPPLIES
- THIS LAYOUT CAN BE DUPLICATED, WITH A THIRD, FOURTH (AND SO ON) POWER INJECTIONS FOR MORE LIGHTS—UP TO THE CONTROLLER'S LIMIT OF INDIVIDUAL ADDRESSES



Mini-Controller or WEC w/ Basic T



3 Amp Power



3 Amp Power Injection

~180 lights @ 12" spacing or less



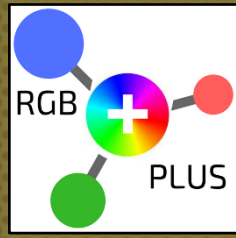
Power T

~180 more lights @ 12" spacing or less





24V PIXEL MANAGEMENT UNICORN LAYOUT

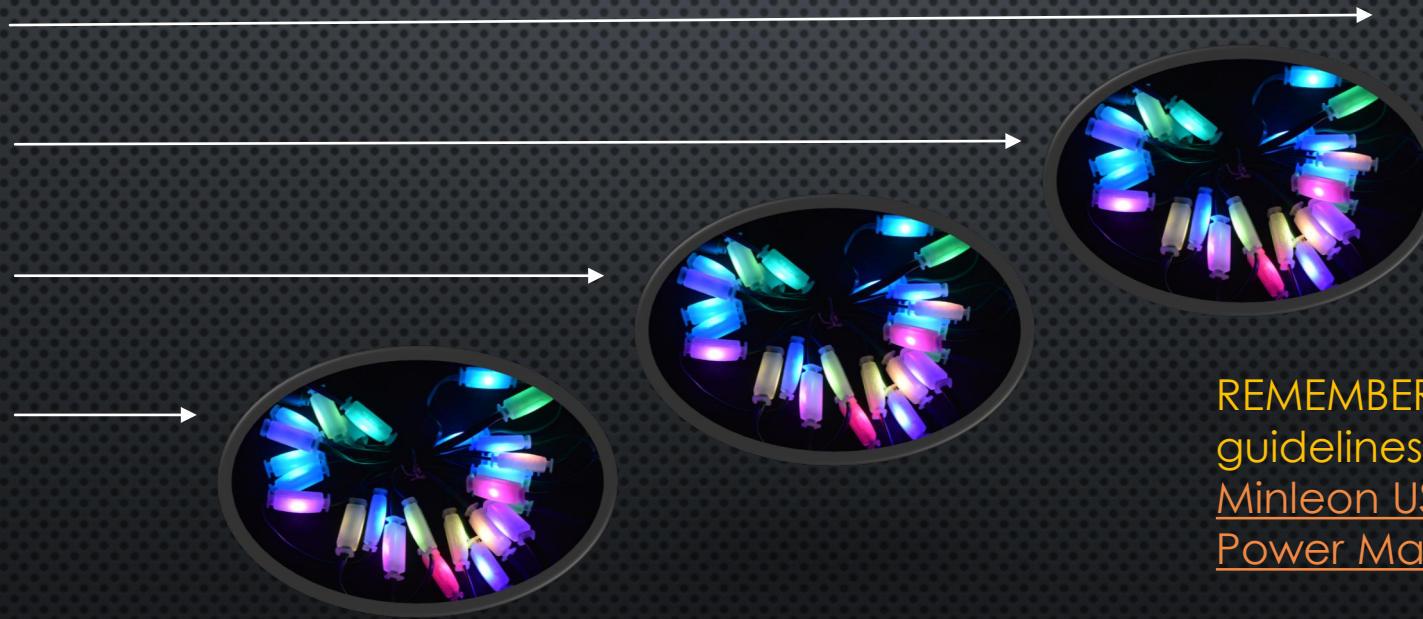


UNICORN FIELD CONTROLLER (CLOUD-BASED CONTROL)

- 2 OUTPUTS CAN MAX OUT AT 200 RGB ADDRESSES EACH WITH INTERNAL POWER; POWER INJECTIONS CAN ALLOW MAX CONTROL OF 800 RGB'S



On board, MW
CLG 4.38A /
24Vdc Power

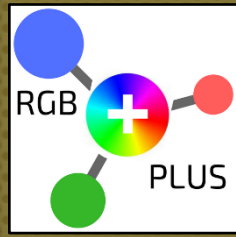


REMEMBER: Data & voltage drop guidelines still apply. Refer to [Minleon USA's Guide to Data & Power Management](#).

200 lights @ 12" spacing or less, max per output; 400L max per field controller, before power injection. 800L data limit.



24V PIXEL MANAGEMENT INTERMEDIATE LAYOUT OPTIONS



CENTER-OUT, LINEAR RUN

FOR A DIFFERENT LOOK, THE CONTROLLER CAN BE PLACED IN THE CENTER OF A LIGHT DESIGN WITH A BASIC T-WAY. IN THIS SCENARIO, THE DATA IS SPLIT SO THE EFFECTS WILL RUN IN PARALLEL IN BOTH DIRECTIONS. WITH CENTER-OUT LAYOUTS WE MUST TAKE EXTRA CARE NOT TO OVER-DRAW THE POWER SUPPLY. **REMEMBER 0.015 AMPS PER RGB+PEBBLE-24V.**

Pro Tips:

- Since the data is split, set the controller's light count to half the number of lights—in this example the light count would be 50.
- End-of-line volt readings will not account for division of power in Center-Out designs—we recommend running PSU's at 90% capacity.

Mini-Controller or WEC w/ Basic T



3 Amp Power



Basic T-Way



~90 RGB+Pebbles



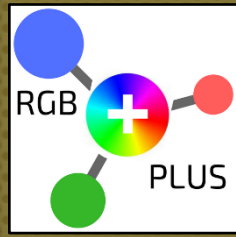
~90 RGB+Pebbles



Remember, a 10-foot lead spacer will use about 0.5 VDC (when measured at the end of the string) and will reduce the amount of RGB's we can run efficiently.



24V PIXEL MANAGEMENT INTERMEDIATE LAYOUT OPTION



40Amp max power—
hardwired to both sides
of NDB



Ethernet input
for ArtNet or
Minleon NEC

NDB+ & SMART T'S

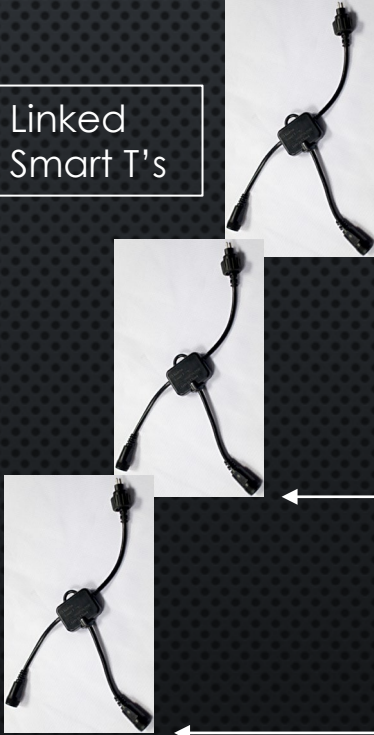
THE NETWORK DISTRIBUTION BOX (NDB) MANAGES BOTH POWER & DATA, WITH AN RJ45 ETHERNET JACK & 16 LIGHT CONNECTION PORTS.

HARNESSING 3-4 SMART T'S PER NDB OUTPUT IS THE BASIS FOR **INDIVIDUALLY CONTROLLED, RGB GRID, CHANDELIER, LIGHT-LINE TREE & MEGA-TREE DESIGNS.**

- NDB OUTPUTS DO NOT RUN IN PARALLEL & ARE CONTROLLED INDIVIDUALLY
- TO SAVE TIME & WIRING, SMART T'S CAN BE LINKED TO CONTROL MULTIPLE STRINGS INDIVIDUALLY FROM THE SAME OUTPUT, SO LONG AS WE PROPERLY MANAGE POWER

GENERAL GUIDELINES:

- WE RECOMMEND TO LIMIT THE DISTANCE FROM THE NDB OUTPUT TO THE FINAL LIGHT TO ~200-FEET WITH 24V PIXELS
- WITH A LARGER POWER SOURCE, WE CAN MAKE LONGER RUNS WHEN COMPARED TO A 3-AMP INJECTION—UP TO 200 RGB'S ON A PORT
- NEVER USE A SMART T TO INJECT POWER
- WE RECOMMEND POWERING NDB'S WITH THE *MEANWELL HRP* OR *RSP SERIES*
- REFER TO THE **NDB+ USER GUIDE** VIDEO FOR MORE INFORMATION



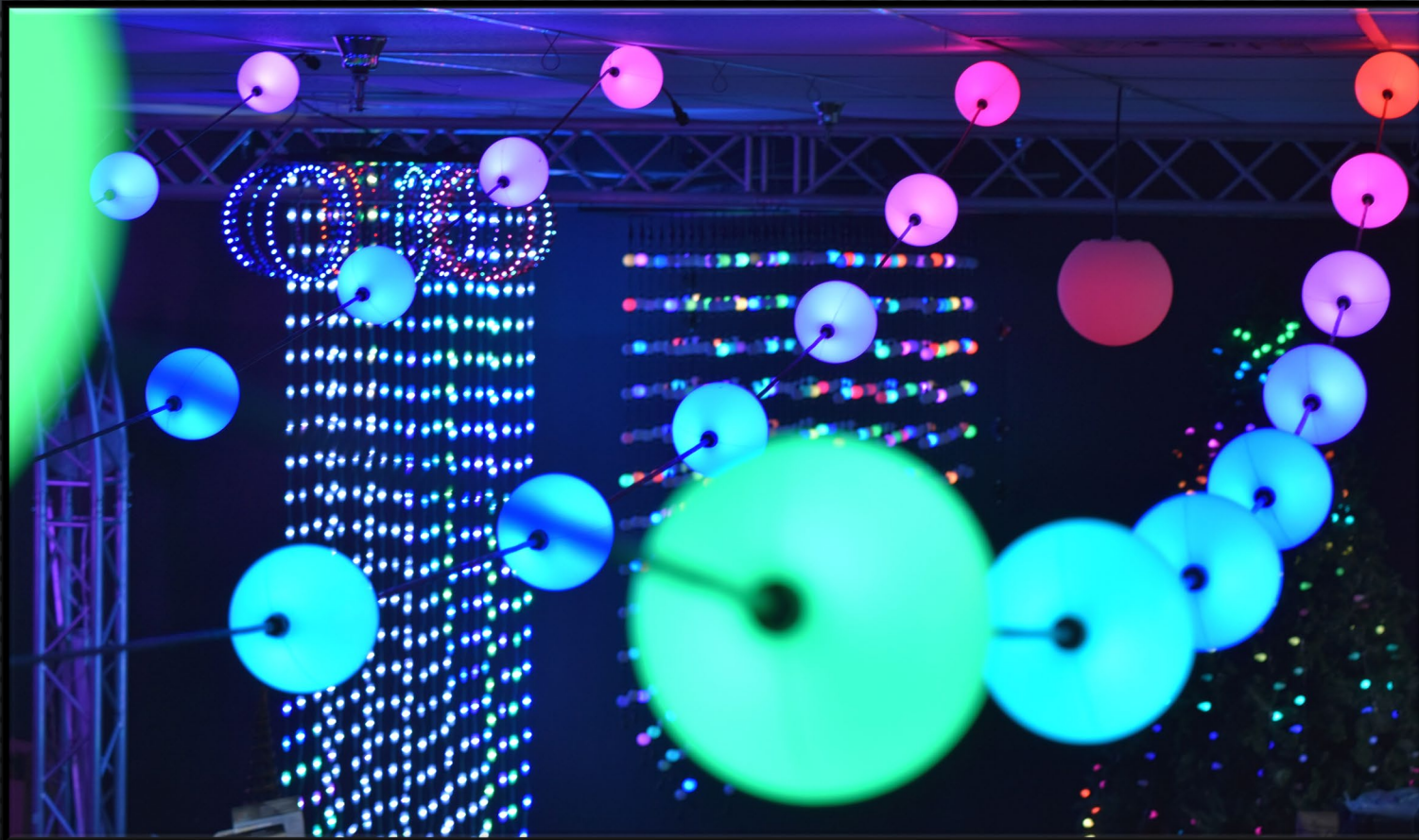
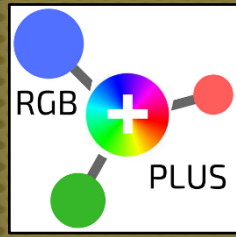
Output 1



200L Max



24V PIXEL management QUESTIONS & RESOURCES



PLEASE E-MAIL
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& REFERENCE THIS PRESENTATION.

WE ENCOURAGE YOU TO VIEW THESE
RELATED TUTORIALS:

**INSTALLER'S GUIDE TO POWER & DATA
MANAGEMENT**

RGB+LINE ACCESSORY GUIDE

NDB+ USER GUIDE

THANK YOU FOR YOUR INTEREST IN
MINLEON RGB's!



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