



Power Injection

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Light Up Ohio 2018

What is the Power Injection?

It's a method of adding voltage to an existing path or flow of electricity to make up for the loss of voltage drop.

Why do I need Power Injection?

- **When the display prop is at full level of color (white) and it's nice and bright at the beginning of the string of lights but dim or pinkish color at the end of the string.**
- **Sting of lights flickers or gets stuck on from mid string to the end and the only way to get them off is to unplug them from the power. *****

*** This could also be a bad pixel causing this.

Is it necessary to Inject Power?

- That is up to each of you.
- How many lights are on the display prop?
- How is the display prop string of lights laid out and wired?
- Can you lower the brightness of the prop to save injecting power?
- Use a multi-meter to measure the voltage at the beginning and end of the string of lights to determine the ending voltage is out of range of minimum voltage needed for lights to work.

Is it necessary to Inject Power?

Personally, I build my props to handle 100% brightness.

Do I run show at 100%? Nope.

So why do I build it handle 100%.

My power supplies run 24x7 during display season. If a stray bit of dirty data get in the signal of the lights and the lights turn on 100% during off hours. I want to make sure my props are safe and will not cause a melt down or any other issues.

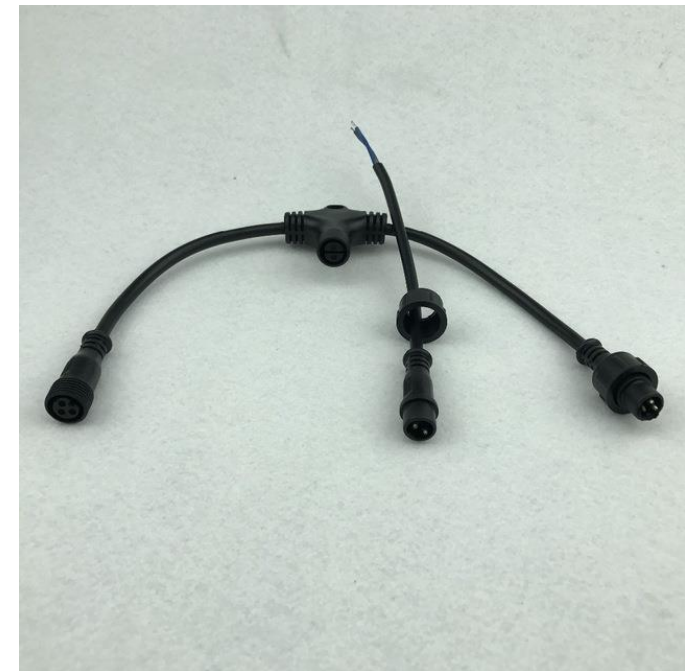
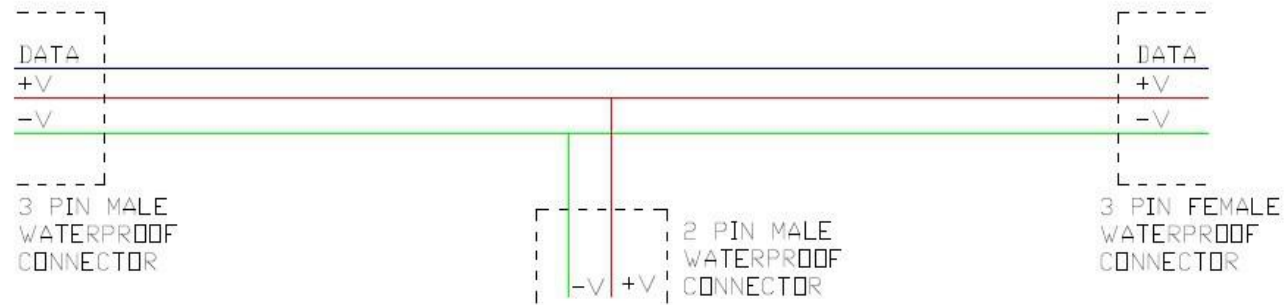
How do I Power Injection?

In theory, it's pretty simple.

- You use a larger gauge wire (both + and -) being supplied by the same power supply and tie the + together and – together farther down the string of lights.
- This tie point may be in the middle and/or the end.
- It may require multiple tie points.

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Where do I Power Injection?

This is the \$100,000 question.

Some people say.....

- **Every 50 for 5v pixels and 100 for 12v. (more or less)**
- **I don't inject, I just turn down the brightness until the flicker goes away.**
- **I inject power only in the middle of the string. Voltage runs in both direction.**
- **There is no right or wrong answer!!**

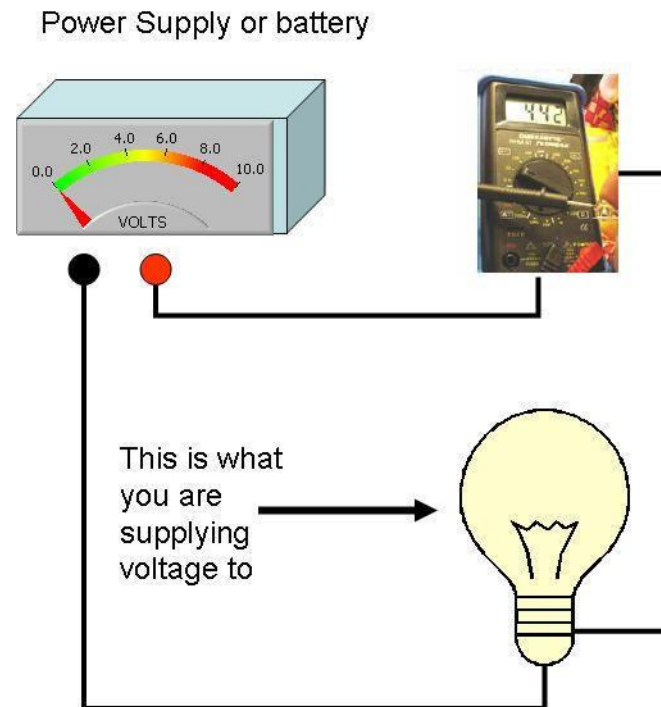
What size wire do I need?

**First we need to measure the voltage of the prop at the spot of issue.
You need to figure out what the current draw is for the prop.**

How do I do that?

With a multi-meter that has an option to measure DC amperage.

Measuring DC current



1. Set your meter To "AMPS" or "DC Current"
2. Move your probes to the correct holes on the meter. This is the most common mistake- people don't realize that the wiring probes need to be different for measuring amps than they are for measuring Ohms and Voltage.
3. NOTE- Do not exceed the current rating of your meter – it will blow a fuse. Most meters can handle 10 Amps

What size wire do I need?

**First we need to measure the voltage of the prop at the spot of issue.
You need to figure out what the current draw is for the prop.
What is the length of wire needed to reach the injection point?**

With the above information visit the following website.

<http://www.calculator.net/voltage-drop-calculator.html>

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Example:

String of 100 pixels.

Power over 16 awg wire @ 50'

Current draw 3 amps @ 12v DC

Voltage Drop Calculator

Result

Voltage drop: **1.20**

Voltage drop percentage: **10.04%**

Voltage at the end: **10.8**

Please note that the result is an estimation based on normal condition. The actual voltage drop can vary depend on the condition of the wire, the conduit being used, the temperature, the connector, the frequency etc. But, in most cases, it will be very close.

Wire Material	<input type="text" value="Copper"/>
Wire Size	<input type="text" value="16 AWG (2.58 kcmil)"/>
Voltage	<input type="text" value="12"/>
Phase	<input type="text" value="DC"/>
Number of conductors	<input type="text" value="single set of conductors"/>
Distance*	<input type="text" value="50"/> <input type="text" value="feet"/>
Load current	<input type="text" value="3"/> Amps
<input type="button" value="Calculate"/>	

* Please use one-way distance to the load. Not round trip distance.

Other methods to solve voltage drop?

- **Move power supply closer to prop.**
- **Increase gauge size of wire.**
- **Increase starting voltage by turning up the voltage of the power supply.**
(Remember if other strings are attached with shorter distance of wire the voltage drop will be less causing that string of lights having too much voltage and will damage them.)
- **Use DC to DC Buck Converters**

DC to DC Buck Converters

5 Amp DC to DC



3 Amp DC to DC



3 Amp DC to DC w/Display



3 Amp DC to DC



How to use them and Why?

- **Wide range of input voltage and a solid, stable output voltage.**
- **Comes in many different voltage outputs**
- **Comes in many different sizes, shapes and options.**
- **Allows you to extend the distance from controller to prop allowing voltage drop on the wire.**

How to use them and Why?

I have 5 lantern blow mold props from 36' to 128' from controller and power all working without any issues over cat5e 22 awg copper cable.

My power supply is set to 17v

I have a J1sys pixel controller, 5 uAmps (extend data signal)

5 blow mold lantern with 76, 5v RGB ribbon pixels per lantern.

Each lantern has a 5A DC to DC buck converter to drop voltage down to 5v DC.

The buck converter accepts input voltage from 7v to 35v, steps it down to 5v DC

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Power Supply: 17v DC
Length of Cat5e wire: 128'
Current Load: 4.25 Amps
Needed Voltage: 5v DC

Voltage Drop Calculator

Result

Voltage drop: **5.85**
Voltage drop percentage: **34.44%**
Voltage at the end: **11.15**

Please note that the result is an estimation based on normal condition. The actual voltage drop can vary depend on the condition of the wire, the conduit being used, the temperature, the connector, the frequency etc. But, in most cases, it will be very close.

Wire Material	<input type="text" value="Copper"/>
Wire Size	<input type="text" value="22 AWG (0.642 kcmil)"/>
Voltage	<input type="text" value="17"/>
Phase	<input type="text" value="DC"/>
Number of conductors	<input type="text" value="3 conductors per phase in parallel"/>
Distance*	<input type="text" value="128"/> <input type="text" value="feet"/>
Load current	<input type="text" value="4.25"/> Amps
<input type="button" value="Calculate"/>	

* Please use one-way distance to the load. Not round trip distance.

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Misc Information

Convert Amps to Watts Calculator: [https://www.rapidtables.com/calc/electric/Watt to Amp Calculator.html](https://www.rapidtables.com/calc/electric/Watt_to_Amp_Calculator.html)

Voltage Drop Calculator: <http://www.calculator.net/voltage-drop-calculator.html>

Led Resistor Calculator: <http://led.linear1.org/1led.wiz>

ESPixelStick

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Questions???

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Thank You!!



Web Forums

- Australian Christmas Lighting: <http://auschristmaslighting.com/forums/>
- Do It Yourself Christmas .Com: <http://doityourselfchristmas.com/forums/>
- Do It Yourself Christmas .Org: <http://www.diychristmas.org/>
- DIY Light Animation: <http://www.diylightanimation.com>
- Falcon Christmas: <http://falconchristmas.com/forum/>