Lighting System **CHEATSHEET**

Wire Table

WIRE TABLE					
WIRE SIZE	MAX WATTS	80% WATT LOAD	RATED AMPS	80% AMP LOAD	CABLE CONSTANT
18 gauge	96 W	76 W	8 A	6.3 A	1380
16 gauge	120 W	96 W	10 A	8 A	2200
14 gauge	180 W	144 W	15 A	12 A	3500
12 gauge	240 W	192 W	20 A	16 A	7500
10 gauge	360 W	288 W	25 A	24 A	11920

Voltage Drop Formula

$$VD = \frac{(L \times W)}{WC} \times 2$$

EXAMPLE: Using 12 gauge

$$1.6V = \frac{(100' \times 60W)}{7500} \times 2$$

WIRE CONSTANT CHART	
18 gauge	1380
16 gauge	2200
14 gauge	3500
12 gauge	7500
10 gauge	11920
08 gauge	18960

Watts vs Volt-Amps & Max Cable Run X VA/Watts Table

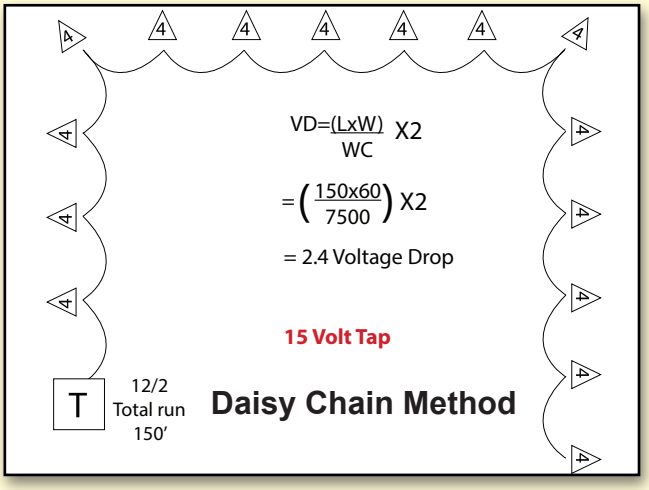
Wattage is a measure of energy consumption, which is used by utilities to determine electricity costs. Watt ratings should be used to calculate the load on a transformer when using halogen lamps only.

Volt-Amps are a measure of the total load on the cable when using LED fixtures or lamps. This measurement includes to watts associated with the fixture/lamp, and the watts associated with the LED driver in the fixture/lamp. Volt-Amps should always be used to calculate the load on a transformer when using LED fixtures or lamps, and are typically available on the manufacturers website.

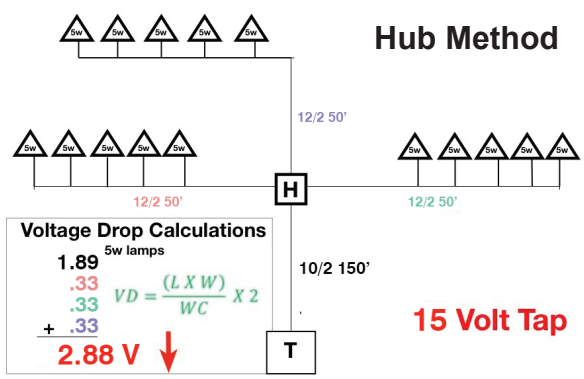
Max Cable Run X VA/Watts Table

Feet X VA/Watts	12V Single Tap Transformer	Multi Tap (12V-15V) Transformer
0-10,000	12/2 Cable	12/2 Cable
10,000-16,000	10/2 Cable	12/2 Cable
16,000-25,000	8/2 Cable	10/2 Cable
25,000 +	Will require 2 home runs	

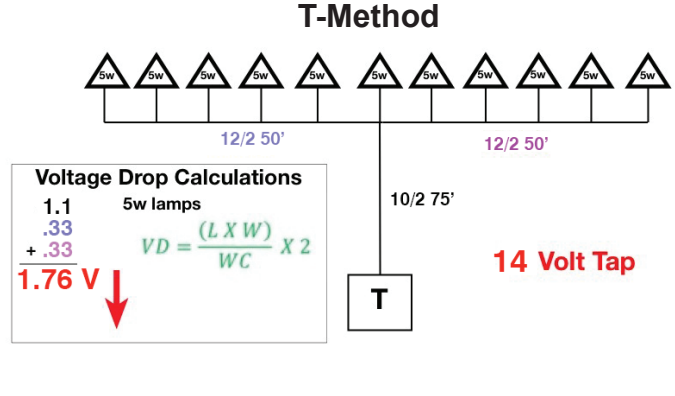
Cable Run Methods



Hub Method



T-Method



Trouble Shooting GUIDE

I. All lights are out.
   1. Check 120v outlet & breaker at main panel.
   2. Check breaker and/or fuses at transformer.
   3. Check terminal/cable home run connections.
   4. Check timer & photocell – bypass each separately.
   5. Long shot – all lamps are burned out.
   6. If there is an issue w/ 1-5, fix, reset or replace.

II. GFI or breaker keeps tripping, or fuse keeps blowing.
   1. Check total watts and/or amps, could be overloaded.
   2. Check for shorts in field cabling.
      a. Disconnect all home runs.
      b. Connect 1 at a time to test.
   3. Check all connections at hubs, tees, fixtures.

III. An entire cable home run is out.
   1. Check terminal/cable home run connections.
   2. Check voltage at fixtures on the run.
      a. No voltage – there is a break in cable somewhere.
      b. Low voltage & cable is hot – there's a short, check connections.
   3. Long shot – all lamps are burned out.

IV. Other common system failure circumstances.
   1. Wrong size fuse.
   2. Bad fuse/breaker.
   3. Old lamps.
   4. Bad socket in fixture.
   5. Loose cable connection in system.
   6. Cut cable in system.

CRITICAL 3 CHECK OFF LIST

I. Use clamp on multimeter to check total amps at the transformer. Make sure not to exceed maximum amps listed on transformer label or specifications.

II. Use clamp on multimeter to check total amps on home run cables near connection point to transformer terminal. Make sure not to exceed 80% of maximum cable amp rating (16 amps for 12/2 lighting cable).

III. Use multimeter to check voltage at tees, hubs or far-away fixtures, to ensure they are in acceptable ranges. Tees or Hubs should be 12-15 volts, fixtures 9-15 volts (for LED).

Design Tips and Lamp Selections (by Lamp Style)

MR16 - 30° (vary wattage for desired lumen output)
Narrow Trees
Narrow Shrubs
Wall Washing Columns
Statues
Focal Points
Multiple fixtures on wide trees
(common fixture types are up lights & down lights)

MR16 – 60° (vary wattage for desired lumen output
Wide Trees
Wide Shrubs
Grazing Large Structures
Sign Lighting
Moonlighting
(common fixture types are up lights, down lights & well lights)

G4 – most common is T3 (vary wattage for desired lumen output)
Path Lighting
Area Lighting
Washing Walls
Step & Rail Lighting
Underwater Lighting
(common used in path lights, wall washers & other confined space fixtures)

PAR36 – (vary beam spreads and wattage for desired coverage and lumen output)
Large Trees
Grazing Large Structures
Tall Columns
Focal Points
Large Signs
Commercial Applications
(Most commonly used in Well Lights)