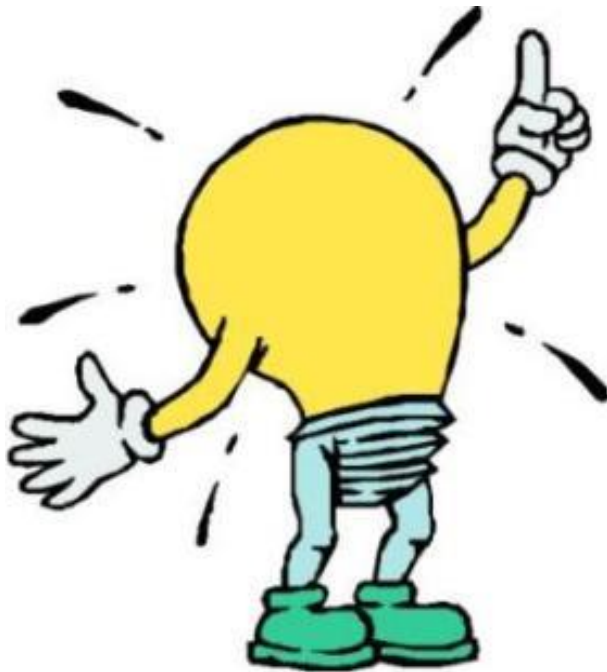


# Illumination of Lights

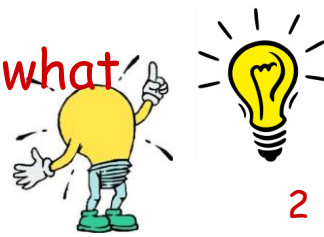


Mark "Zman" Zemruski



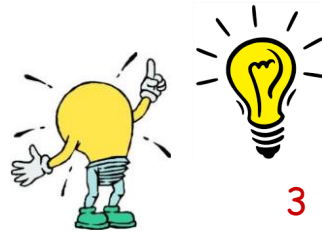
# Who am I

- Mark Zembruski - "Zman" on all Christmas Forums
  - My one claim to fame in our community that most do not know:
    - I originated the tag line. "I have the **C.L.A.P.**, do you?"
      - Christmas **L**ight **A**ddiction **P**rogram
  - One of the central organizers of **C.L.A.P.** in the PacNW, regional decorating gathering
    - Christmas **L**ight **A**ddiction **P**rogram, for those with **C.L.A.P.**!
  - Yeah OK so what.....
  - Decorating since I was 20
  - Self admitted gadget geek, weekend warrior, learner of all trades, mastering NONE of them.....
  - Decided to start growing in 2003
  - Approx **125,000** Lights (98% LED)
  - Approx **530+** channels of AC Light Animation
  - **9600** Channels of **RGB** Pixel Animation - 47 E1.31 Universes
  - One traditional DMX Universe
  - Generally I do nothing "original" in my display, I enhance what I steal, er, borrow.....



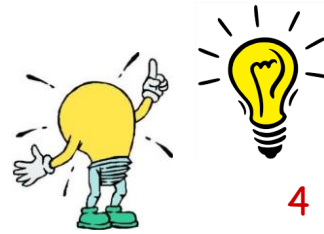
# Topics

- Overview
- Sizing / Styles (Alpha-Numeric)
- Incandescents
- LEDs
- Strobes
- Floods
- **RGB**
- Specialty
- Summary / Insight



# Overview

- In a Display, many, many lighting options are available to the decorator
- Lighting spectrum can range from easy to challenging
- Having some basic info will allow for better choices when it comes to spending your time and \$\$



# Sizing / Styles (Alpha - Numeric)

- **M - C - G?**

- **M = Mini** (a.k.a. "fairy" lights)

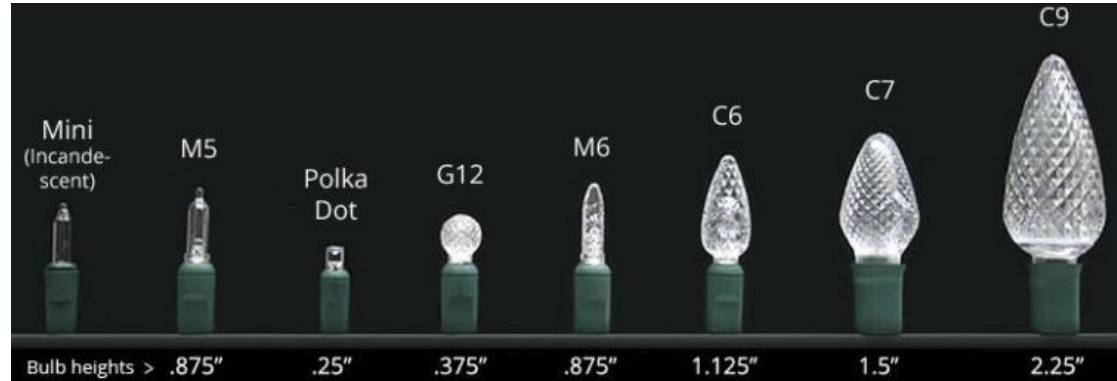
- Mini, M5, M6

- **C = Cone**

- C6, C7, C9

- **G = Globe**

- G12, G20, G40



- **Number meaning**

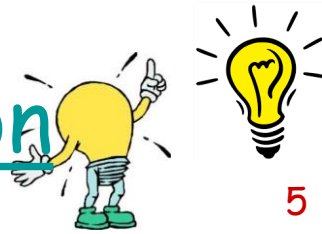
- "C's" Reference to 8<sup>ths</sup> of an inch

- I.e. - C7 = 7/8ths Diameter etc...

- "G's" Reference to Millimeters

- I.e. - G40 = 40mm etc....

- **Great reference site for information**



# Sizing / Styles

- Lights per string 25 - 35 - 50 - 75 - 100 - 150 light strings
  - Depending on Technology
- Conical, Wide Angle, 5mm, Polka Dot?
- LED vs Incandescent comparison

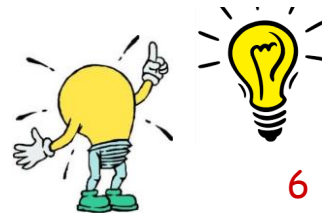
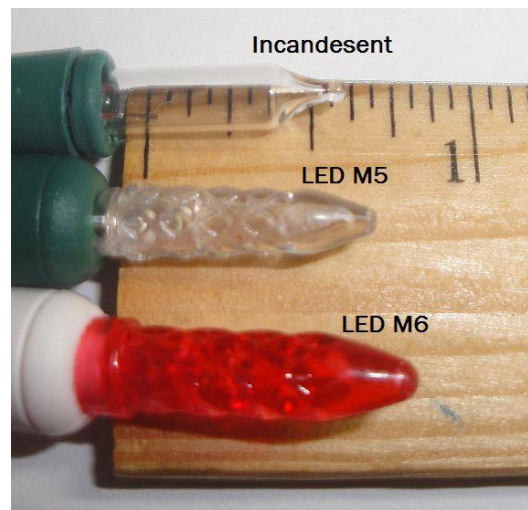
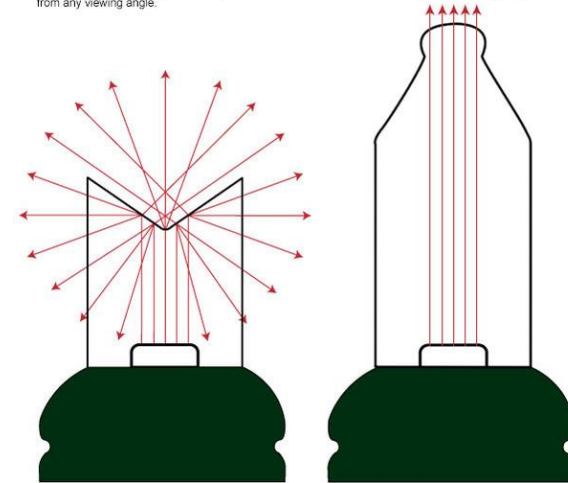


**Wide Angle Polka Dot LEDs**

Patented cone design refracts light from LED light source, making it appear equally brilliant from any viewing angle.

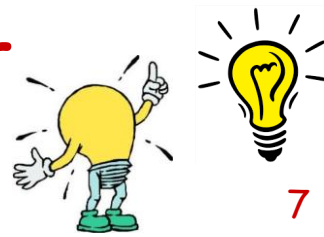
**Standard LEDs**

Standard LEDs appear bright only when pointed directly at you.



# Incandescents

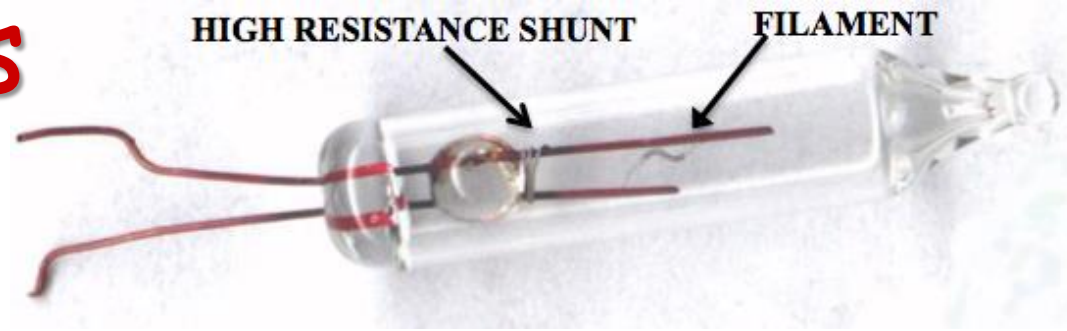
- Where lighting began
- 25 - 35 - 50 - 100 - 150 light strings
- Depending on # of lights on a string, bulbs will be different voltages
  - 2.5V, 3.5V, 5V, 6V, 12V
  - *Ensure you match voltage to string when replacing (120 / # of lights on a string)*
- Most flexible light in a display
  - "Trees", Landscape/Architectural features, Wraps, Wireframes, Silhouettes, Arches etc...
- **GKI Bethlehem** best on the market



# Incandescents

## Basics

- Anatomy of bulb
- Reference [Here](#) & Fix [Here](#)



### HOW TO SPOT A PROBLEMATIC BULB



NORMAL  
BULB



BENT  
WIRE

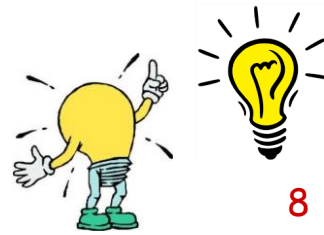


MISSING  
WIRE



BURNED  
OUT

Not all burnt out bulbs look like this. Some working bulbs will be dark as well. That bulb is burning hotter and is destined to fail... soon

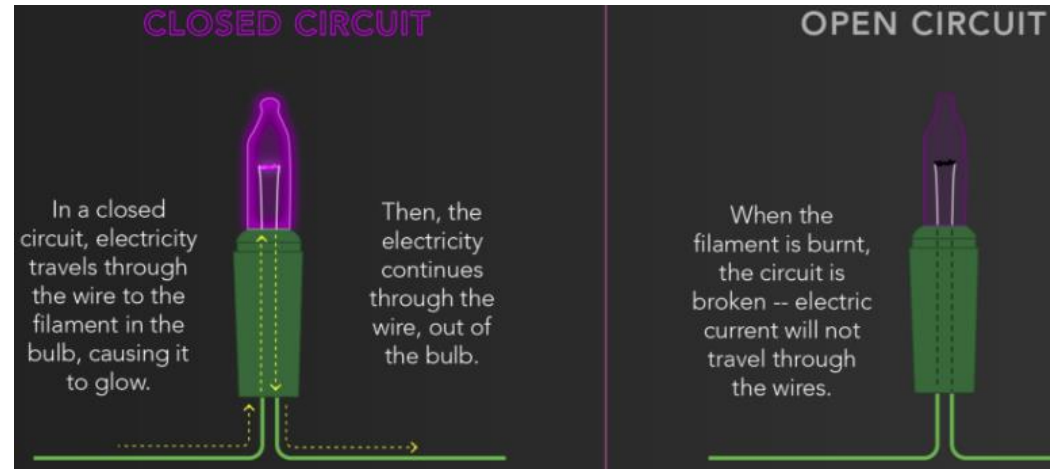




# Incandescents

## Basics

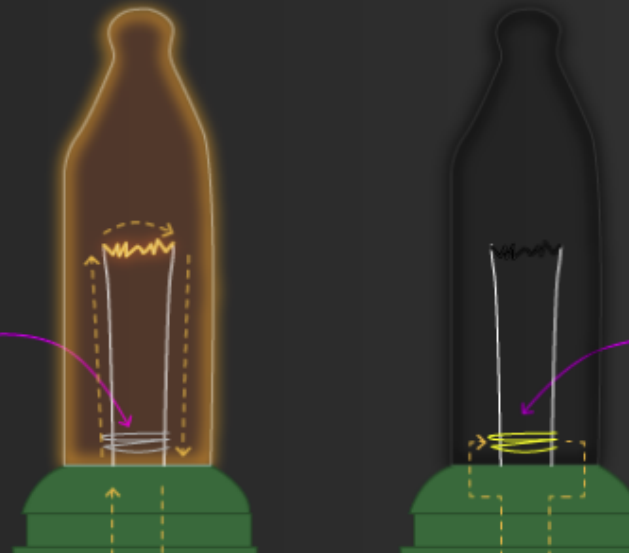
- Burnt out bulbs or strings



## THE SHUNT WIRE

A shunt wire is an additional wire that allows electric current to continue, even after a filament burns out.

Shunt wire

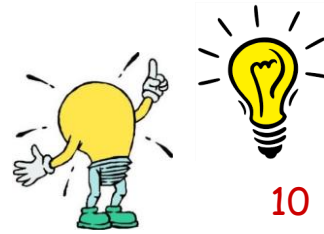
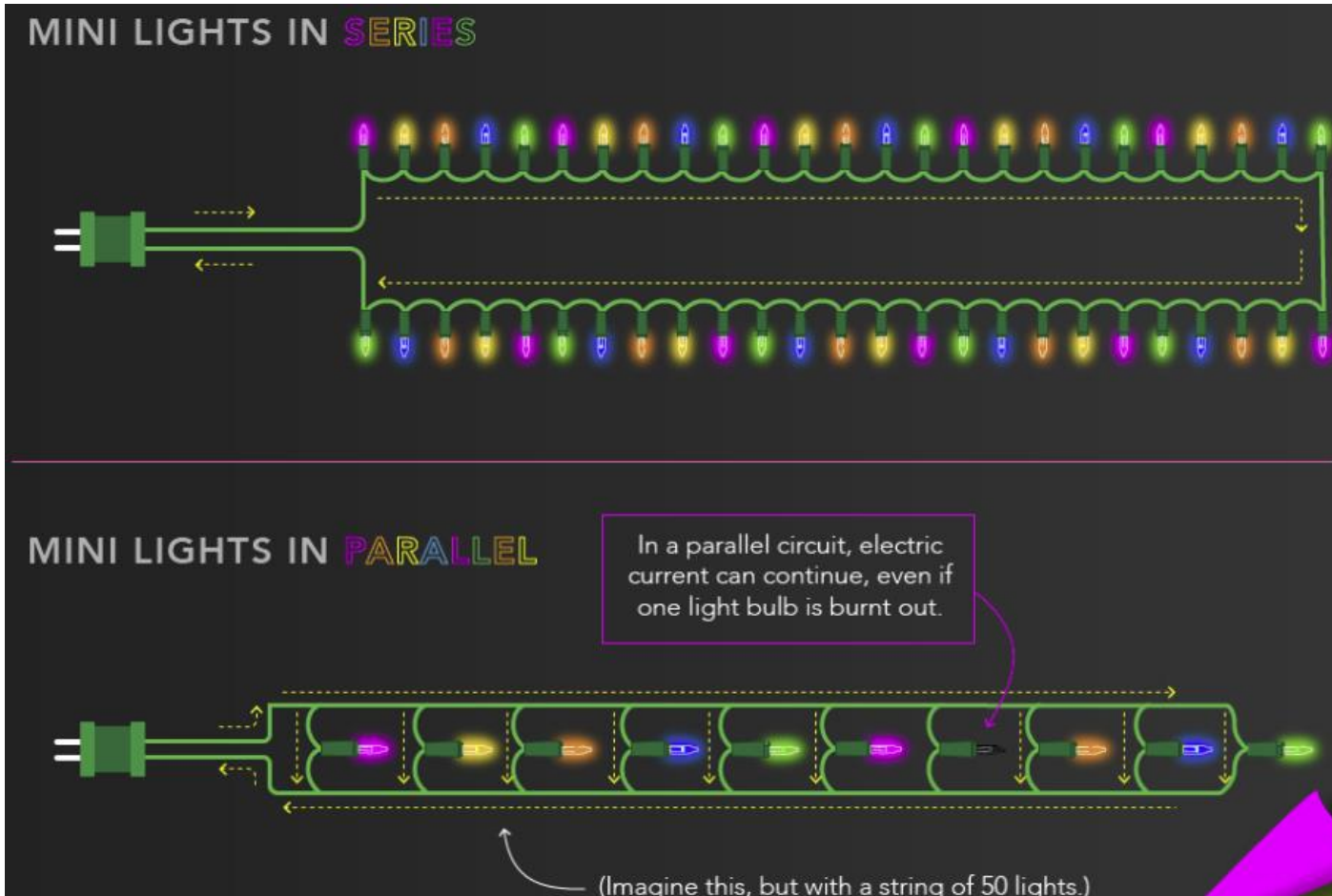


When the filament burns out, electric current travels through the shunt wire -- this allows the rest of your lights to remain on, even if one bulb burns out.



# Incandescents

- Wiring Schematics

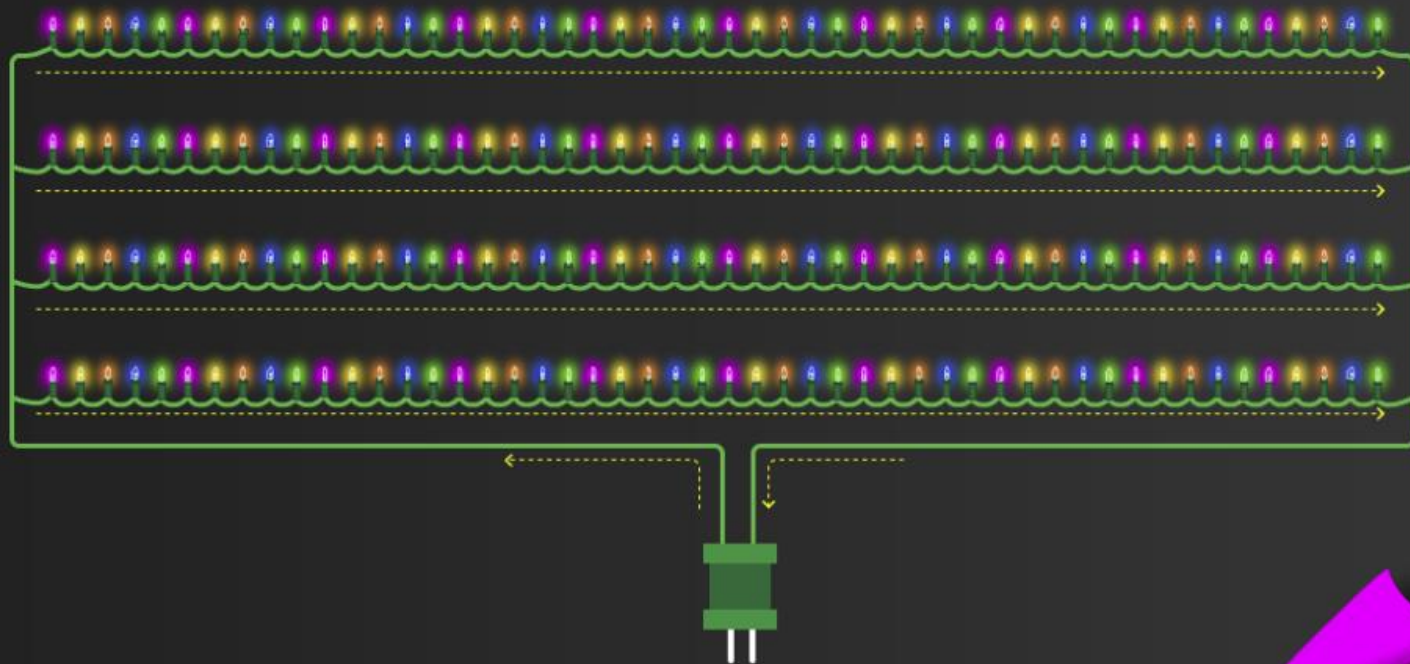


# Incandescents

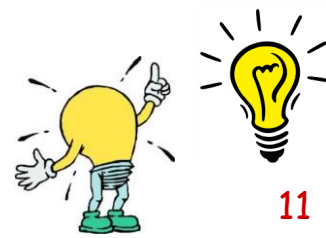
- Wiring Schematic - More than 50  
- I.e. 150ct Iccicle Strings

## MINI LIGHTS IN SERIES-PARALLEL

Strings of mini lights that have more than 50 lights are actually **multiple series circuits wired in parallel**.

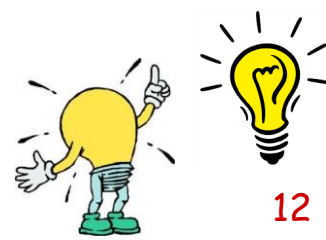


This is the reason that fixing 100 or 150ct strings requires a bulb removed from the **WORKING** sections. That isolates the problem section to fix



# Incandescents

- Pro / Con's
  - Pro - Easy to Fix
    - Buzz Box (best but \$\$)
    - Light Keeper Pro
    - Replace bad bulbs asap, added voltage weakens remaining bulbs
  - Pro - Inexpensive
    - Best to look for after Christmas markdowns in stores
  - Pro - Mix and match colors on same string
    - Great for Wireframe coloring



# Incandescents

Icicles = 3750  
Incandescent bulbs  
= ~11amps



- Pro / Con's

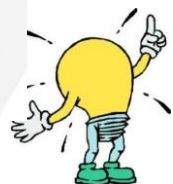
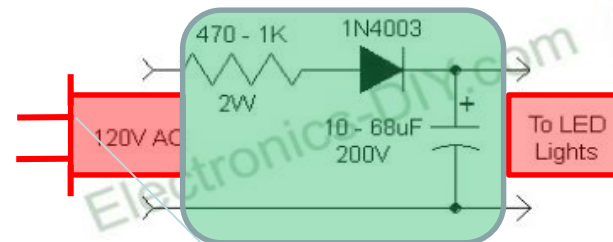
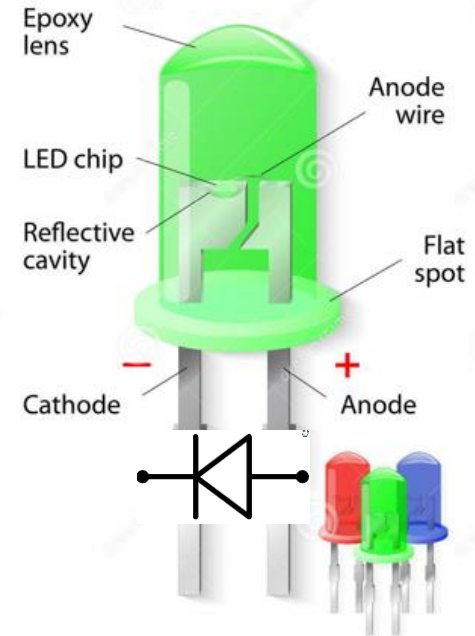
- Con - More costly for electricity
- Con - Rule of 3, connect only 3 strings together at a time
  - Unless commercially rated (6)
- Con - Government is looking to phase out all incandescents



# Light Emitting Diodes (LEDs)

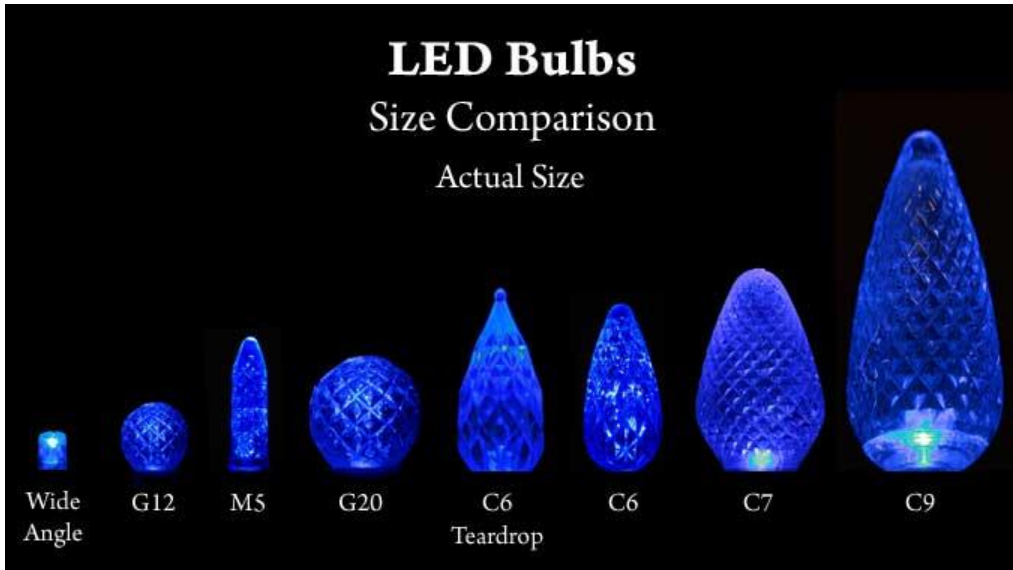
- Direct Current (DC) component
  - AC use (plug into 120V) requires rectification "warts"
  - Depending on LED string bulb count, 2-3-4 warts
    - Min 2 at plug ends
    - Internal circuit can be different from vendor to vendor

## LIGHT-EMITTING DIODE



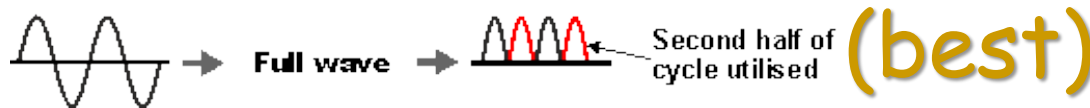
# Light Emitting Diodes (LEDs)

- Numerous bulb styles available (typical)

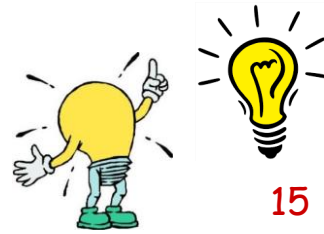


Available in  
faceted or  
smooth globes

- Half Wave vs Full Wave



- Subtle flickering vs steady



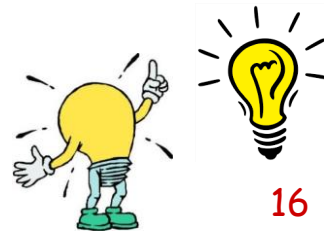
# Light Emitting Diodes (LEDs)

- Colors have different costs
- "Chip" & Globe color match



C7 & C9  
Full Wave, Half  
Wave and  
Dimmable

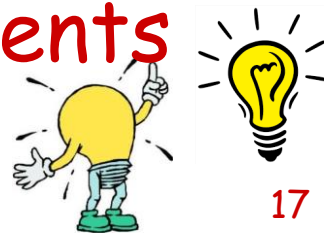
- Retro screw in for socket strings





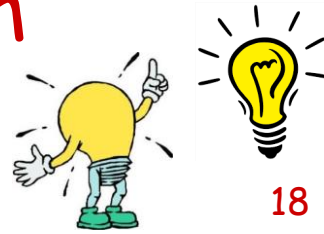
# Light Emitting Diodes (LEDs)

- Pros / Cons
  - Pro - Electrically connect numerous strings
  - Pro - More lights per 120V circuit
    - 100ct string = .047A (LED) vs .42A Incandescent
  - Pro - 20,000 hours vs 3000 hours!?
  - Pro / Con - Do not generate heat
  - Pro - Bulb globes do not fade/chip
  - Pro - More durable than incandescents



# Light Emitting Diodes (LEDs)

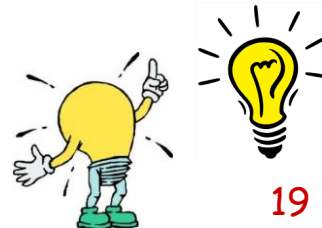
- Pros / Cons
  - Con - Cost more than incandescents
  - Con - Some do not like the look of LEDs
    - "Cartoonish"
    - Does not match "incandescent" look
  - Con - Requires added consideration for animation
    - Fades potentially require fading curves
  - Con - Color matching can vary from vendor to vendor and year to year



# Light Emitting Diodes (LEDs)

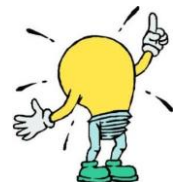
- Pros / Cons

- Con - Mixing colors for certain display elements cannot be easily done, i.e. Wireframes
- Con - "White" has many color types:
  - Pure - Cool - Sun etc...
  - Each has its own hue, ensure you know what you are getting
- Pro/Con - Fixing LEDs is a bit more difficult / time consuming
  - They CAN be fixed in numerous ways to preserve and help with ROI
  - **FYI Blue LEDs fail more than any other color over time**



# Light Emitting Diodes (LEDs)

- Purchase after Christmas in stores
- Online vendors offer much higher quality (Commercial)
  - Look for "Pre-Season" sales on forums and pages. January to April
    - Requires some semblance of a plan for following season
    - Different vendors have different pre-payment requirements
    - Great web resource for pre-season sales

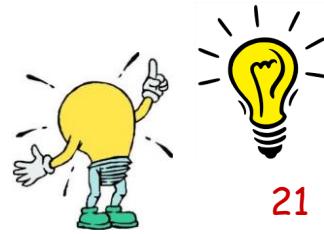


PSA:

Do not discard dead strings in  
the trash.

*RECYCLE* them

Look to stores, organized  
groups, or check your refuse  
vendor to see if they recycle



# Strobes

- Used for "WOW" or "Emphasis" effect during animation
  - Intense "POP" or "Twinkle"
- White or **COLORS**
- Multiple "Types"
  
- 5mm A.K.A. Conical
  - Typically 50ct string(s)
  - On or Off no fading
  - Requires time to randomize the strobotic effect. Typically, 1-2 seconds



# Strobes

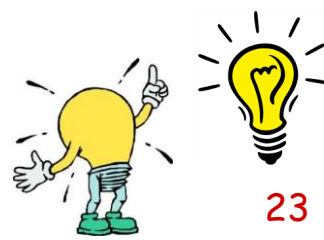
- Curtain Strobes (C9 socket)
  - LED
    - Tendency to be directional, better viewing from straight on
  - Xenon (All around best, IMHO)
  - "I" Tube vs "U" Tube
  - Depending on number of strobes on animation channel, capacitive load may be needed to stop effect
  - 20 Xenon Strobe on channel is ~1amp
  - Strobotic frequency
    - I.e. 1 - 4x per second
    - More = better effect
  - Con - Reliability suspect
  - Pro - Can be fixed/repaired
    - Fix and reference material [HERE](#)
  - Cost = \$3.50 - \$7 per Strobe



I Tube

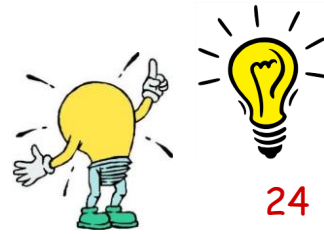


U Tube



# Strobes

- Theatrical "ZAP"
  - Typically LED or Halogen
- AC & DMX fixtures
  - AC
    - Lots of cost-effective options
    - Review specs to understand behavior, i.e. strobe vs single POP
  - DMX
    - More \$\$\$ fixtures
    - Requires DMX control
    - More precise execution options
- Great effect, most likely will require weatherproofing





# Floods

- White or Multi-Color
  - All types and sizes
  - Incandescent
  - Halogen
  - LED
- AC - DC (RGB) - DMX
- Wash vs Spot
  - Wash = ~120 degrees of spread
    - AC or DMX (LED)
    - Color washing walls, landscape features
    - Upwash or downwash from eaves
    - Cost varies with technology
- DMX fixtures will likely require weatherproofing



# Floods

- Wash vs Spot

- Spot = ~ 45 degrees of spread

- Highlight specific item, i.e. character or mirror ball

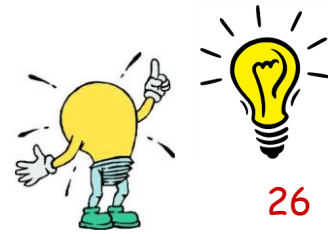
- Cost \$

- Pin Spot = ~ 25 degree of spread

- Very fine point of light on object

- 12V/Wall P/S

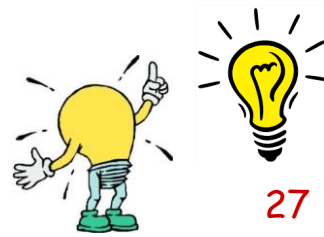
- Cost \$\$



# RGB



- Revolutionizing Displays
- Provides option to display up to 16M colors, in reality 10-12
- Commonly referred to as
  - Pixel
  - Node
  - Module
  - Strip
- Typically, 5V or 12V (24V)

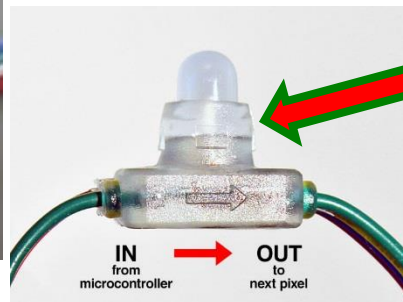


# RGB

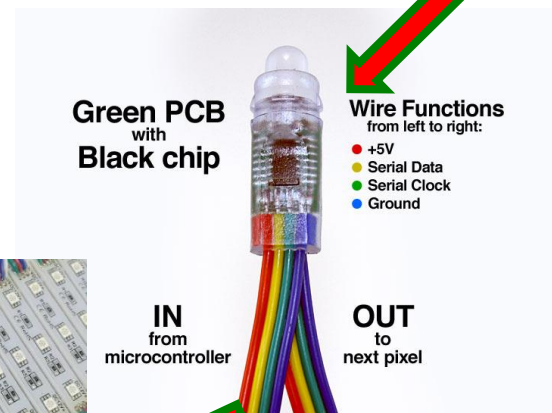
- Dumb or Smart (SPI)
- Dumb = 3 channel using DC control
  - 1 = R, 1 = G, 1 = B
  - Control entire string color
- Smart = DMX / E1.31 / ArtNet / DDP
  - Ability to singularly control individual LEDs RGB
  - Numerous Protocols available
- Dumb or Smart pixels can easily be differentiated by viewing a black chip on node



# RGB

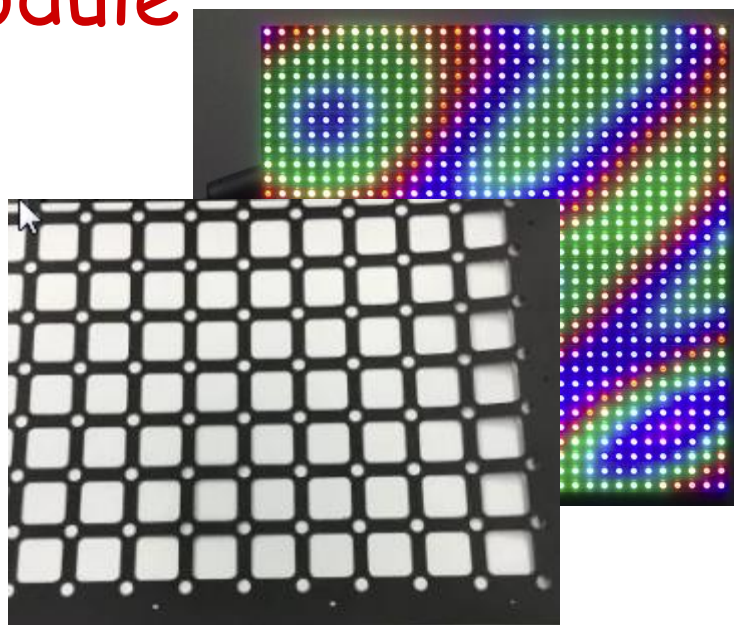
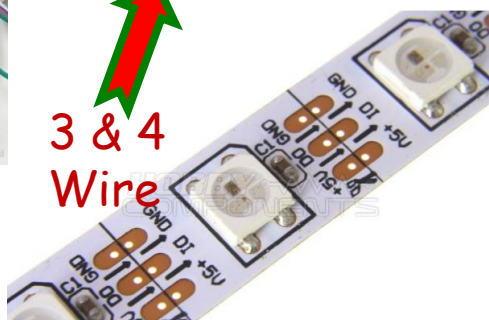
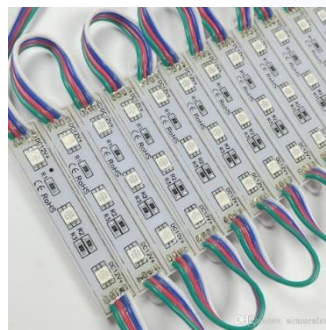


Typically 12mm in Dia



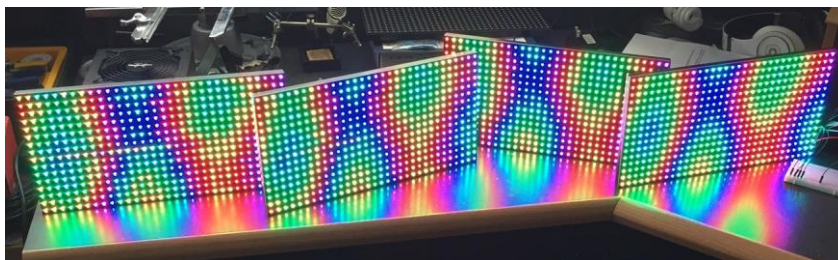
## • Many form factors

- Square
- Bullet
- 5050 module
- Strip
- Panels
- Matrix



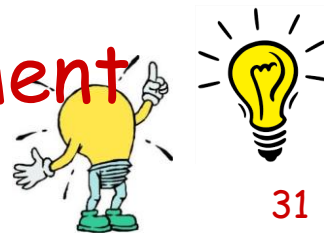
# RGB

- Trees
  - 2D / 360
- Arches
- Characters
- Silhouettes
- House Outline
- Window Wrap
- Matrix/Signs
- And More!



# RGB

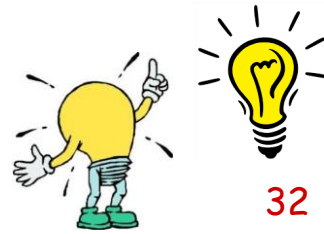
- Cost of pixels \$.25 -> \$1.75
- Available from US and China based vendors, one in Australia
- Using SPI **RGB** is an Advanced Lighting Methodology
  - It is NOT "Plug and Play"
  - Requires matching controllers and protocols
- Con - It **UP's** your logistic configuration
  - Mapping, cabling, power injection, enclosures, added networking equipment



# RGB

- Pro - You can reduce your overall light count
- Pro - Increase your color options
- Pro - (SPI) Easier to program
  - Pattern generation programs vs Timeline based tools used in AC control
- **Its NOT easier or cheaper to use**

RGB





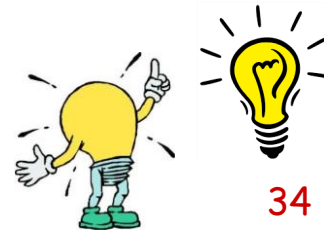
# Specialty

- Icicle Lights
  - Incandecasant - LED - RGB
  - House Outline
- Rope Light
  - LED/Incandecasant
  - Walkways
  - Wireframes
  - Wraps
- Net Lights
  - Bushes/Trees



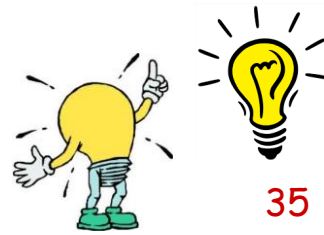
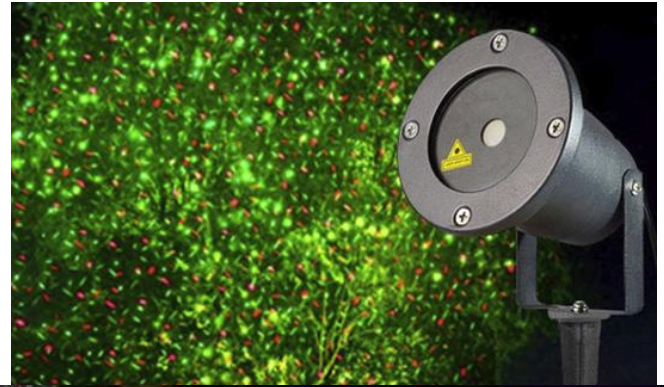
# Specialty

- Snowfall/Drip Tubes
  - Trees
  - Arched Walkways
- Moving Head Lights
  - DMX Based
  - Costly \$\$
  - Need weatherproofing
  - Great source for used equipment
- Snow/Bubble Machines
  - AC or DMX



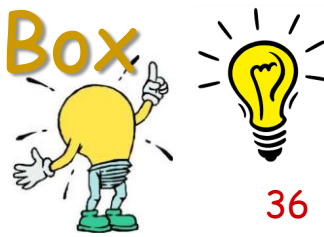
# Specialty

- Laser lights
  - Simple self contained
    - **RGB** and Patterns
    - Cover a large area
    - Need to be away from "light noise"
  - Complex DMX based
    - FAA or FDA approval
- Fog Machines
  - AC & DMX
- Bubble Lights



# Summary / Insight

- Plethora of products
  - Research before you buy
  - Cheapest is not always best
  - **Time = \$\$**
    - Both are your budget IMHO in the long-haul  
Time will surpass \$\$
- There are a lot of online decorating vendors who can provide outstanding products
  - Where ever possible generate a relationship with them, even the Big Box department managers





# Christmas Expo

Thank you for attending!  
Mark "Zman" Zembruski  
[WoodinvilleWonderland.com](http://WoodinvilleWonderland.com)  
[modec@frontier.com](mailto:modec@frontier.com)

Consider attending my other classes;

♪ Oh Christmas Tree ♪

"I Love it When a Plan Comes Together"  
Displays the A-Team Way

The *Art* and *Presentation* of a  
Christmas Display:  
The "Holy Grail"

"Fort Knox" Security for your Display

