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Precision Lighting System

Haunt Lighting Design

Maximizing Impact of What Your Audience Sees (and Doesn't See)

Presented by Quan Gan, President of Darklight

Topics

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- Stage Lighting Principles
- Show Control
- LED Systems
- Examples & Tips
- Q&A Session

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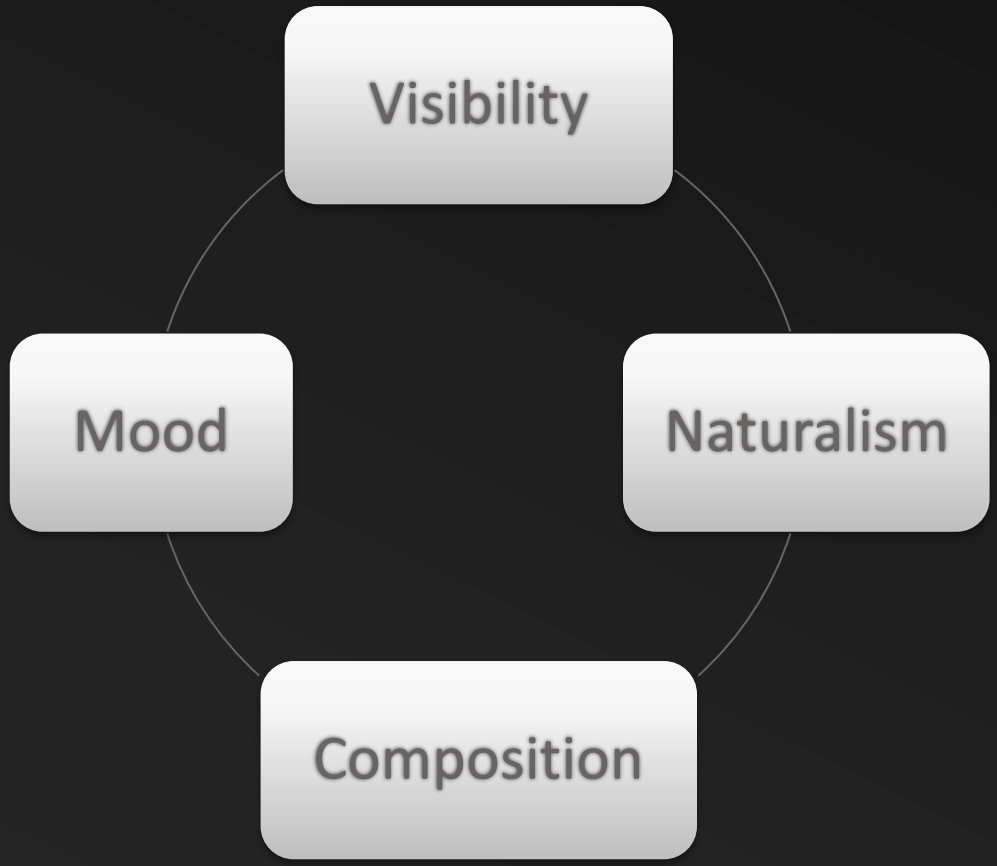
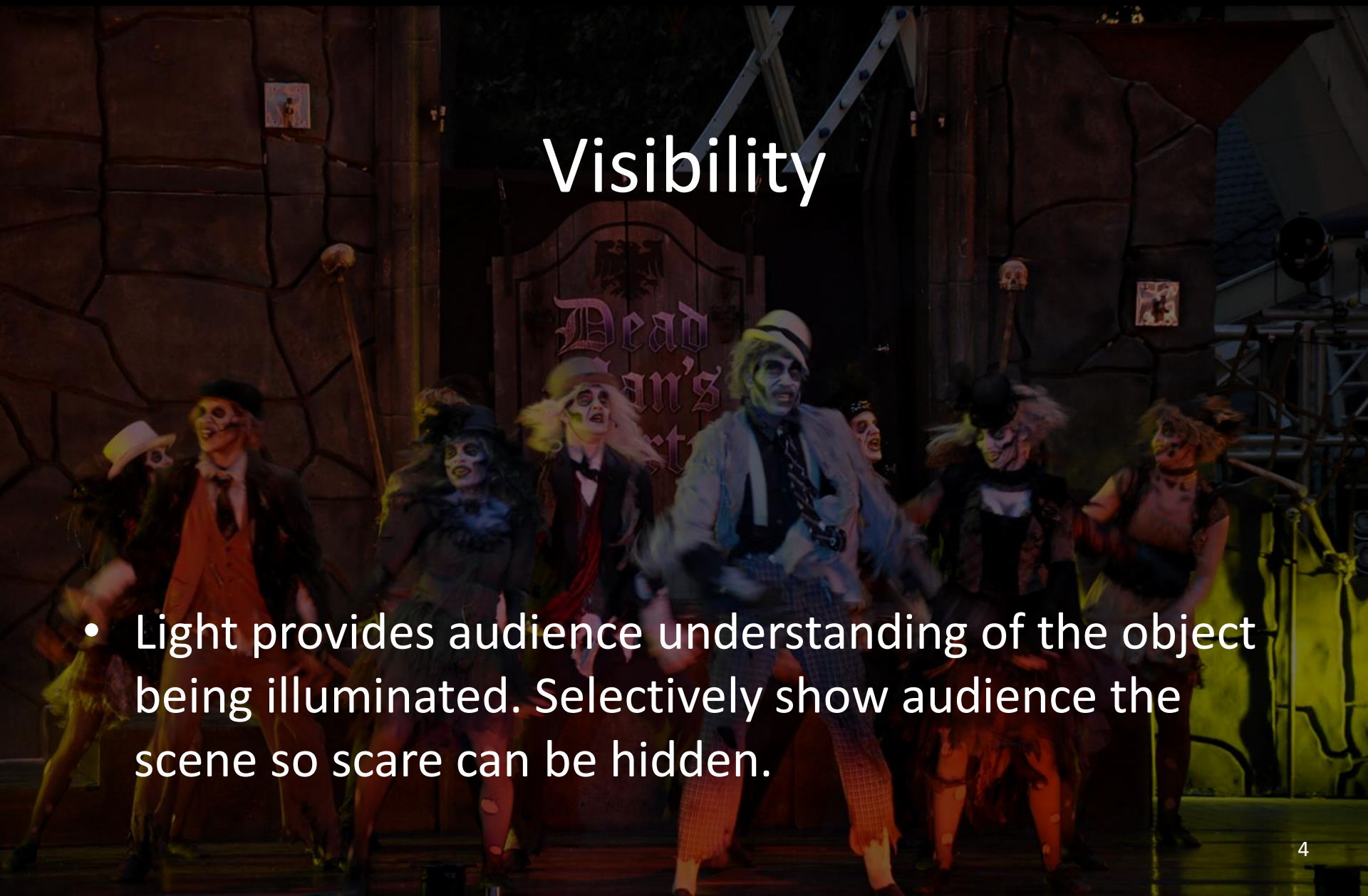
Stage Lighting Principles

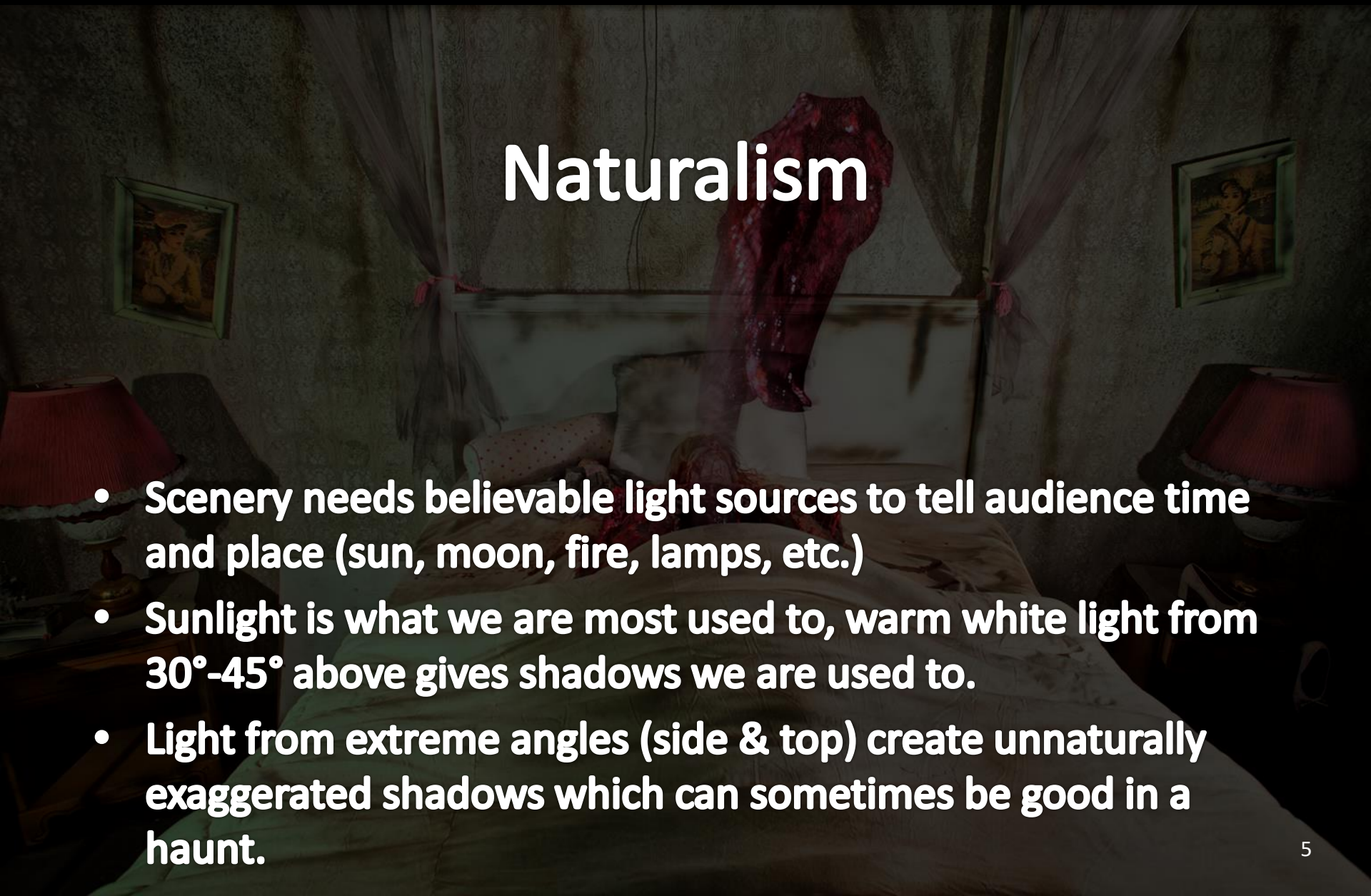
Purpose of lighting is to provide a sense of





Visibility

- Light provides audience understanding of the object being illuminated. Selectively show audience the scene so scare can be hidden.



Naturalism

- **Scenery needs believable light sources to tell audience time and place (sun, moon, fire, lamps, etc.)**
- **Sunlight is what we are most used to, warm white light from 30°-45° above gives shadows we are used to.**
- **Light from extreme angles (side & top) create unnaturally exaggerated shadows which can sometimes be good in a haunt.**

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Composition

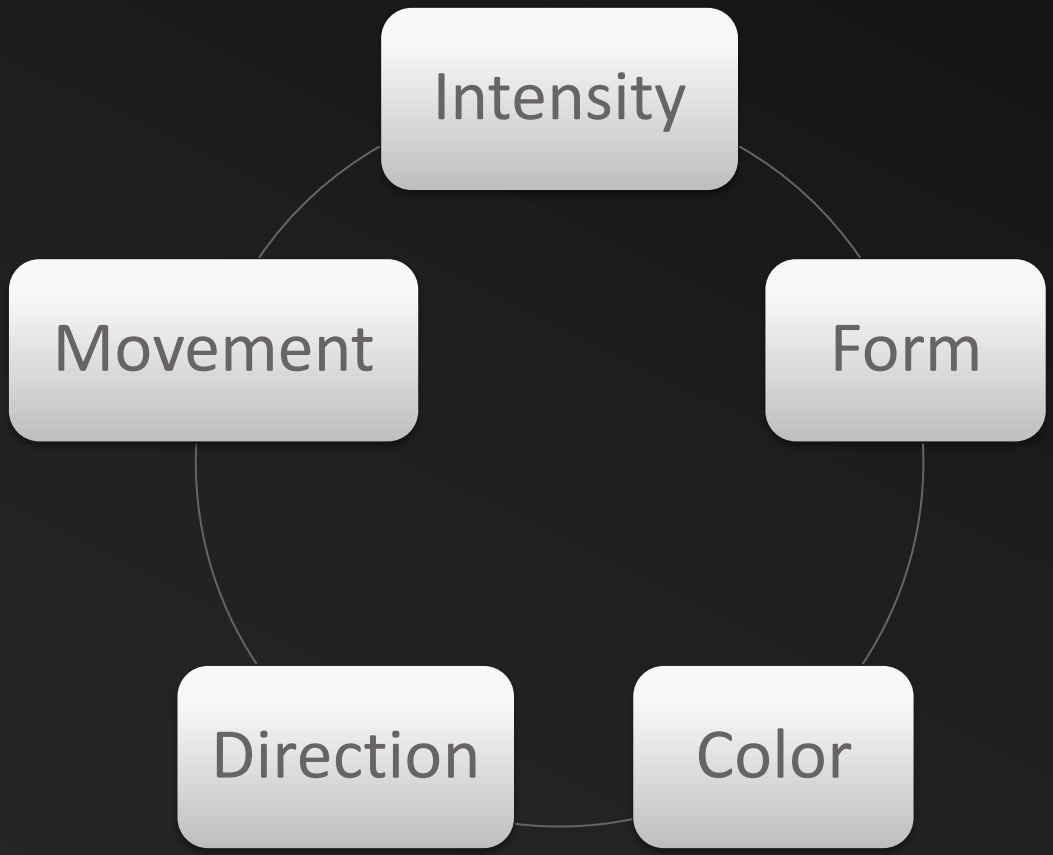
- **Focal objects**
- **Key light - one**
  - **brightest source and provides focal point and strong shadows**
- **Fill light - several**
  - **dimmer, diffused light to soften/fill in shadows**
- **Back light**
  - **can also be used to illuminate behind object to create more depth, separating it from background.**

Mood

- lighting can make the audience FEEL the scene - reds feel hot, blues feel cold, greens feel creepy or mysterious.



Qualities of Light



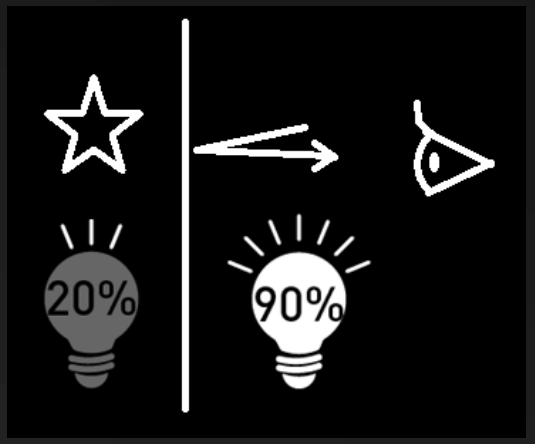
Intensity (1)

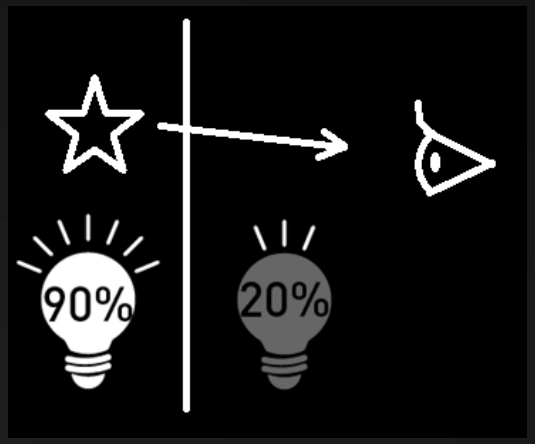
- Bright attract attention - used for distraction.
- Dark conceals - used for scare element.

- Darker = SLOWER throughput, more scary.
- Brighter = FASTER throughput, less scary.

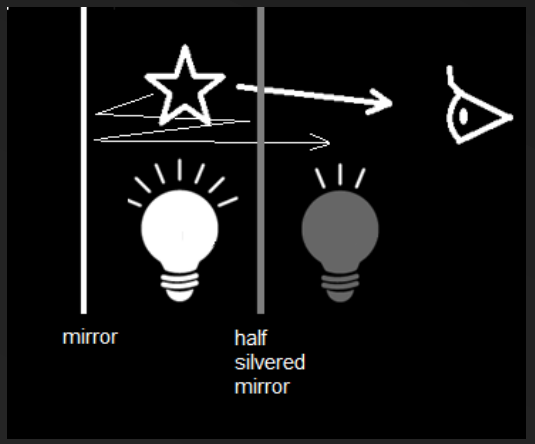
- Beware of sunlight spill during early season. Customers will see more of scenery as eyes get adjusted to darkness.
- Vary the intensity from room to room to keep guests on edge.

Intensity (2)

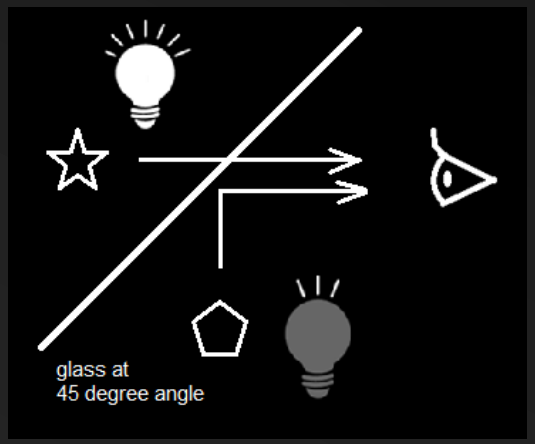




Concealing scare behind glass



Infinity mirror

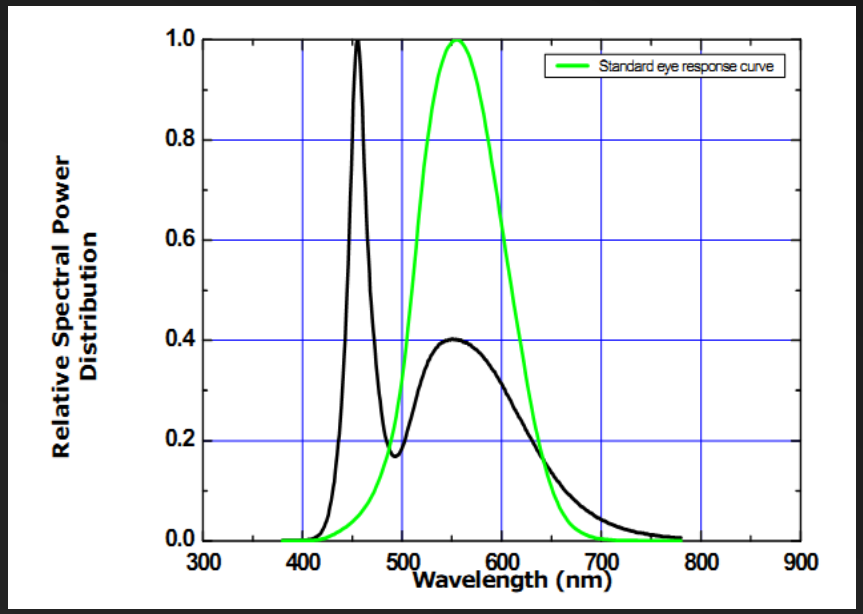


Pepper's ghost

Form

- Shape of light/shadows can enhance realism or add cool effects
  - Blackwrap taped directly onto mini LED fixtures.
  - Gobos, stained glass, reflected water

Color (1)

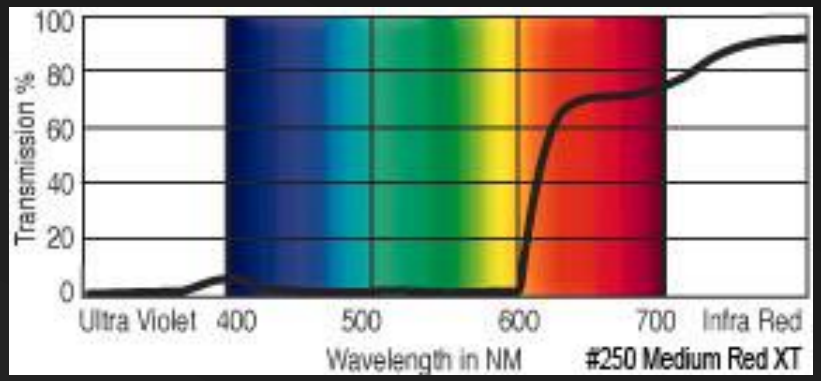


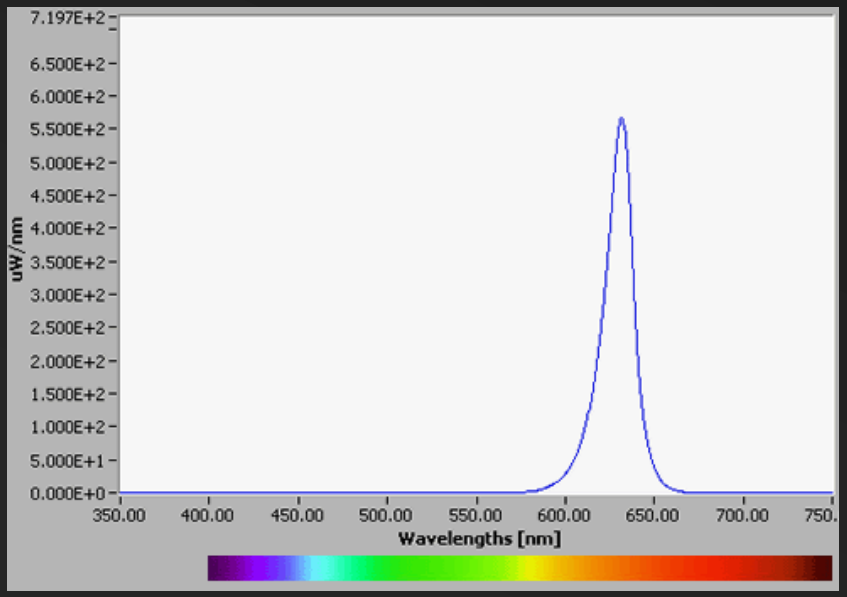
- Primary:

  Red, Green, Blue
- Secondary:

  Yellow, Magenta, Cyan

Color (2)





- Colored LEDs
  - Narrow band
  - Saturated color: surreal look
- Filtered White LEDs
  - Wider band
  - Softer color: more natural color

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Direction

- Hide your light source unless it's meant to be seen.
- Generally, point light in direction of travel.
- Overhead downward light for natural effects, low upward lighting for dramatic effects
- LED fixtures can easily be mounted to any flat surface and pointed in desired direction.

Movement

- Any change in the above 4 qualities (intensity, color, form, direction)
- Show control

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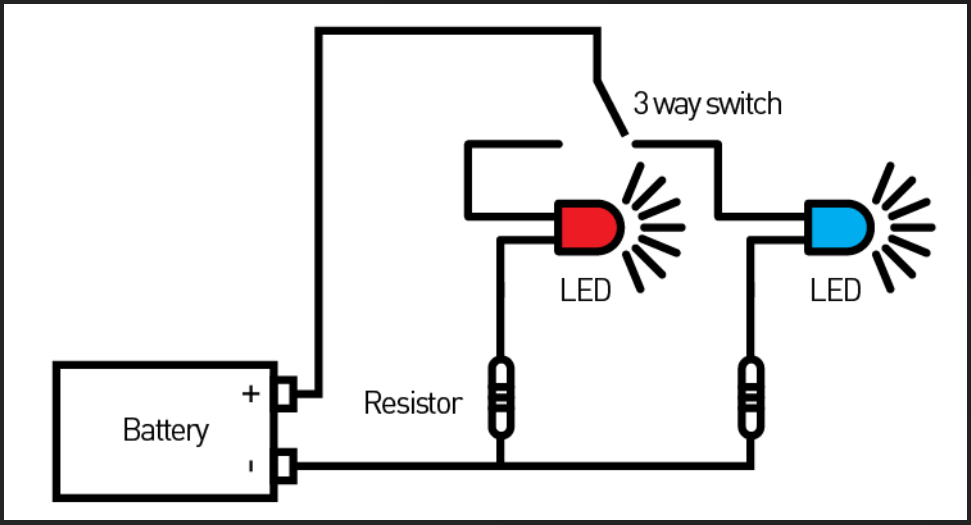
Basic: Preset Patterns

- Good for most haunt scenes – continuous play, no reset.
- DarkBox Flicker Module
  - Flicker, blink, strobe, fade, dimming
  - Set & forget
  - Multiple lights can connect to one module

DarkBox Flicker

Medium: Switches or Relays

- On/Off control of light
- Manually triggered by actor
  - Vampire example: UV/red spotlight switch
- Prop controllers with relays
  - User can record sequences for lights to blink



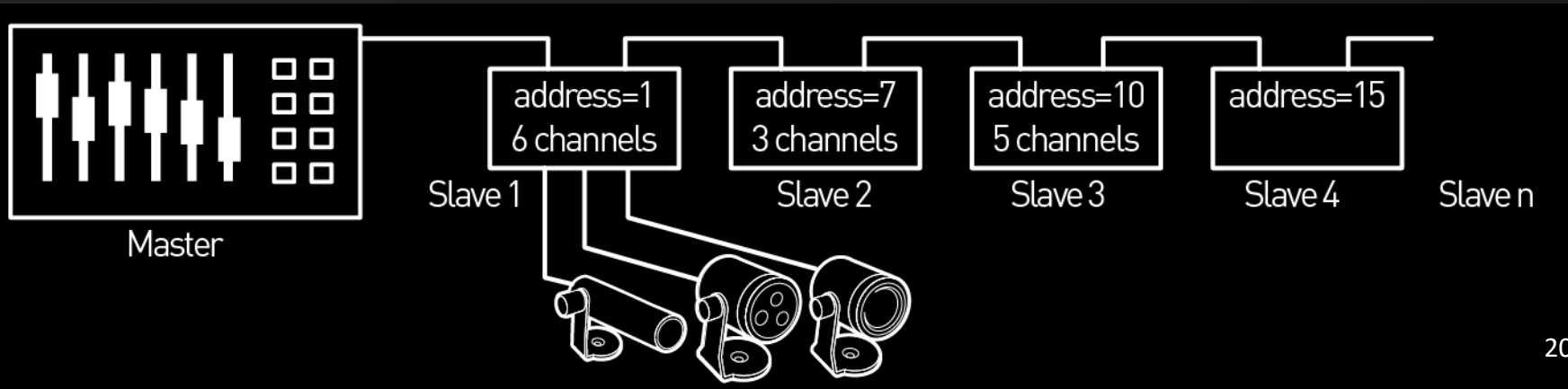
Advanced: DMX Control

- "Performance" type show sequences
- Triggered actions
- Requires reset – suitable for preshow
  - Worthwhile for longer sequences

DarkBox DMX

DMX Overview (1)

- One master device and up to 32 daisy chained slave devices
  - Slave devices: dimmers, intelligent lights, fog machines, lasers, etc.
- Master device controls up to 512 channels
  - Each channel has value 0-255, slave device interprets meaning of value
- All slave devices listen to same signal
- Slave devices are differentiated by their “start address”
- Identical slave devices with same address will behave the same



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DMX Overview (2)

- Various masters available
  - Basic: 6 channel manual control board, completely manual controls
  - Medium: 128 channel control board with memory, can build different “looks” and cycle through them automatically
  - Advanced: dedicated devices, computers, requires tech to program the show, virtually boundless creativity allowed – actions can be triggered

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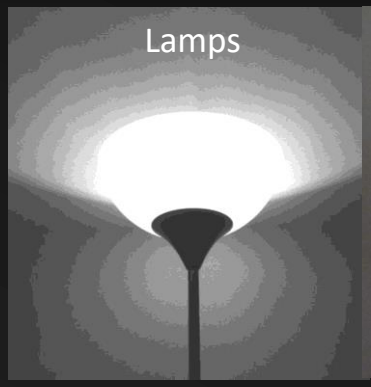
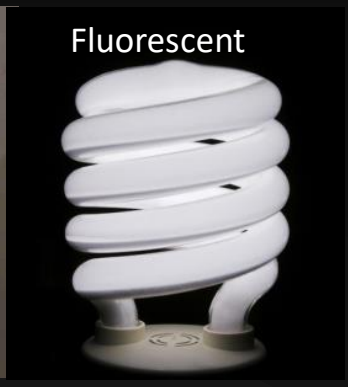
Standard lighting fixtures


Lamps

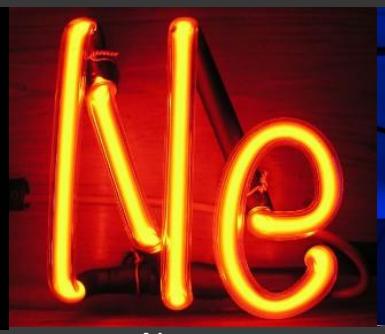

Nightlights


Flashlights


Fluorescent

Décor lighting


Christmas lights


Neon


Black light

Theatrical lighting


PAR lights


Strip


Floodlight


Spotlight

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Why LED is a perfect match for Haunts

- Small spaces

  Compact: ¼” to ½” bulbs, multi-LED fixtures comparable to standard lights
- Flammable surrounding

  Low heat: Low voltage, low current, low power: safe!
- Close contact with customers

  Durable: Doesn’t shatter, impact resistant, lifetime > 10 years!
- Modularity

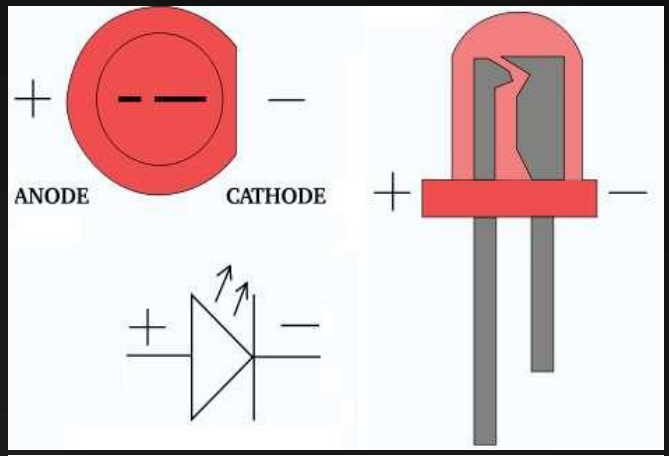
  Portable & Flexible: With right system, plug and play, all colors
- Predominantly dark

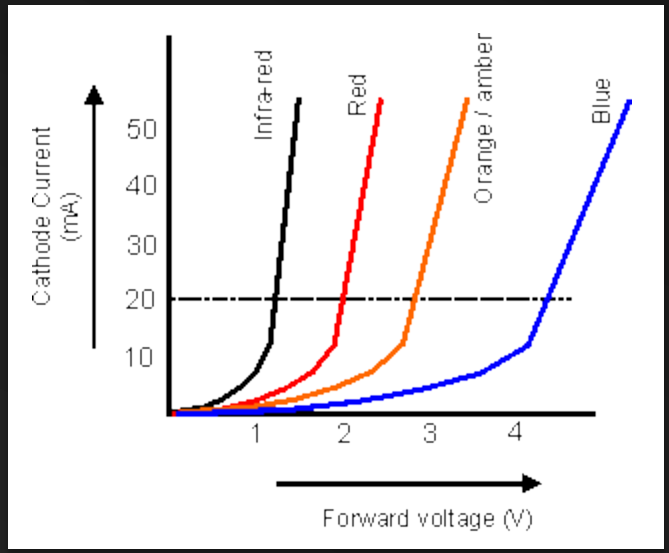
  Lights up small areas: Suitable for dark environments, directional
- Cost

  Competitive cost: low cost of energy and maintenance

LED 101 (1)

- LED = Light Emitting Diode
- Electrical one-way valve: **polarity matters**
- Anode (+): long leg, Cathode (-): short leg
- Direct Current (DC) 1.7V to 3.7V to turn on





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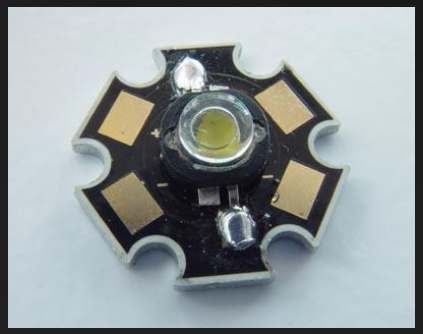
LED 101 (2)

- Point light source
- Some typical LEDs:
  - 3.4V
  - 20mA
- Single LED may not be enough
- AC/DC adapters & resistors used for compatibility
  - 120V AC (transformer steps down to 12V)
  - 12V, use resistors to limit current, provides 3.7V to each LED

20mA:70mW



350mA: 1W

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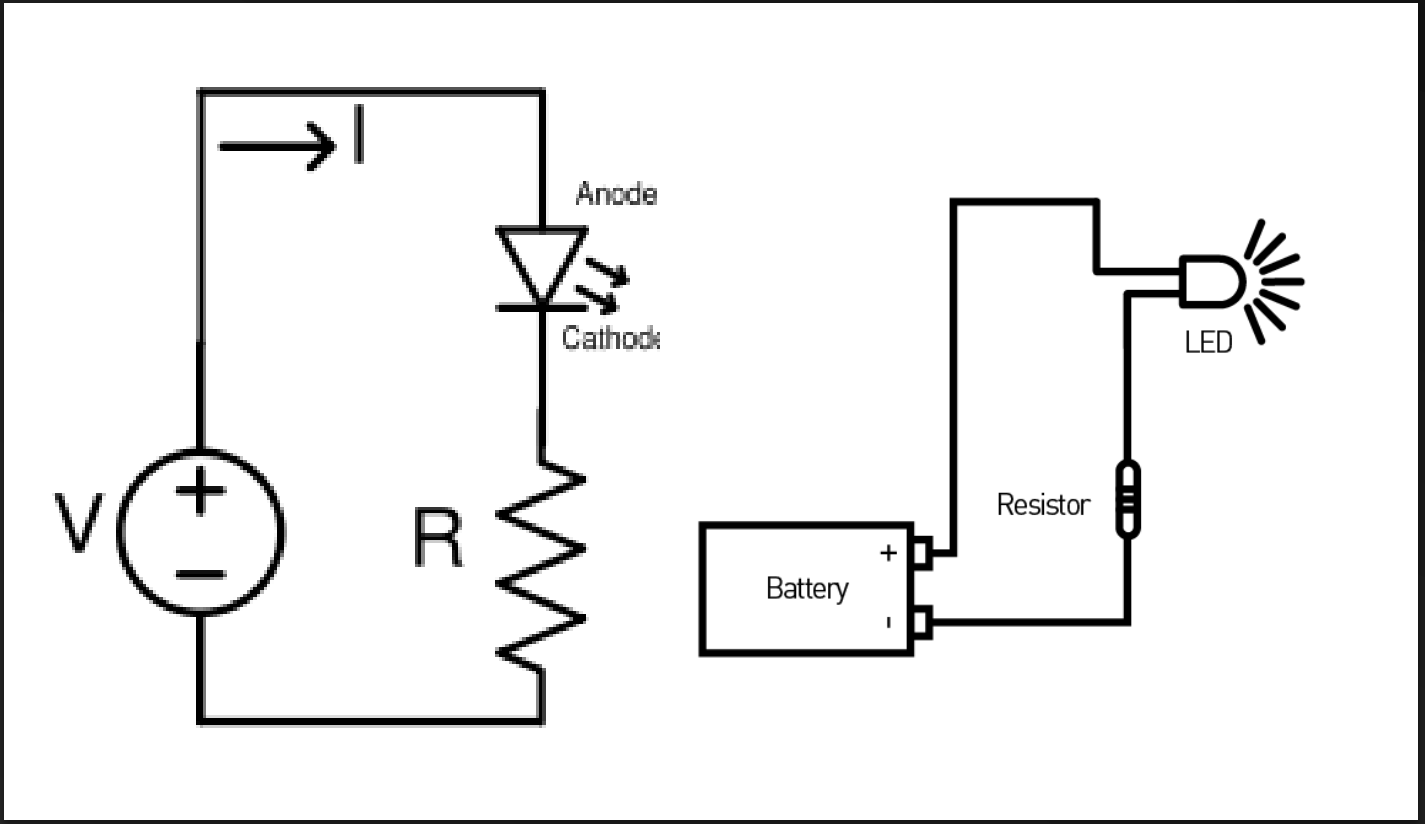
How to Light an LED



Basic LED Circuit

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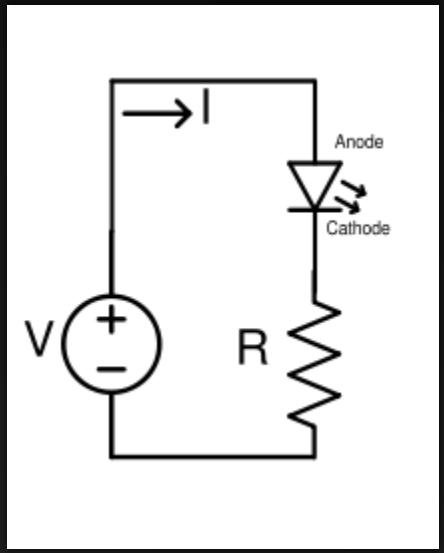
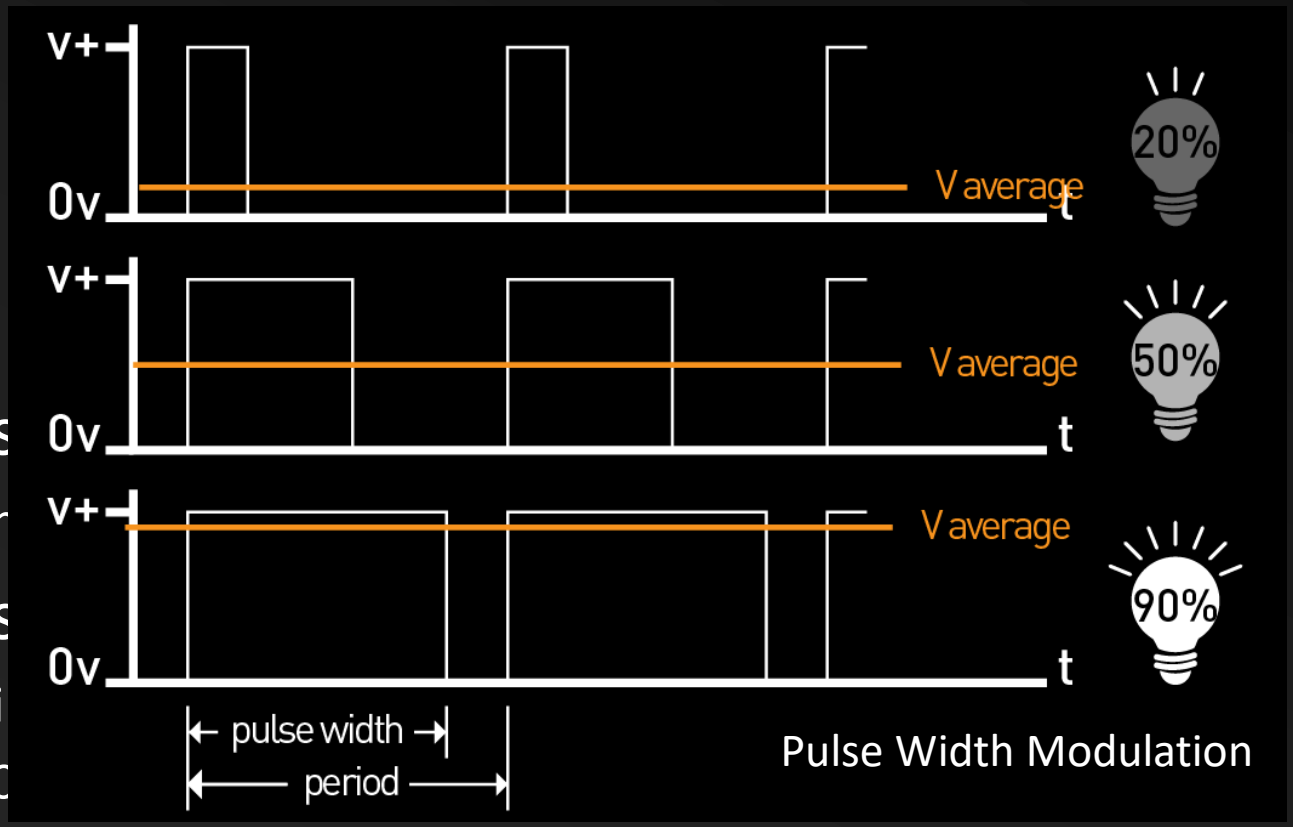
How to Light an LED

- Select DC source (12V)
- Determine LED specs from datasheet
  - Voltage drop (3.7V)
  - Maximum continuous current (20mA)
- Determine resistor needed
  - Voltage = 12V – 1.7V = 10.3V
  - Resistance = Voltage / Current (Ohm's Law)
  - Resistance = 10.3V/0.02A = 515Ω
  - Pick larger common value: 560Ω



Simple LED Circuit

Flashing & Dimming



- LEDs
  - Ar
- LEDs
  - Di
    (1C
- Brighter: more ON time than OFF time
- Darker: more OFF time than ON time

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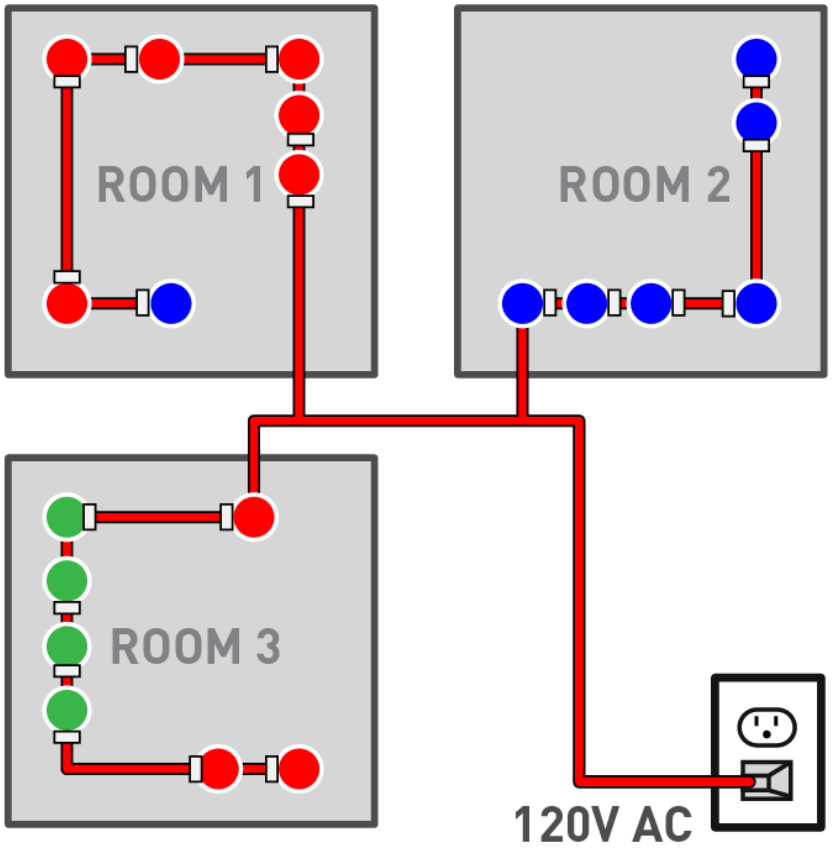
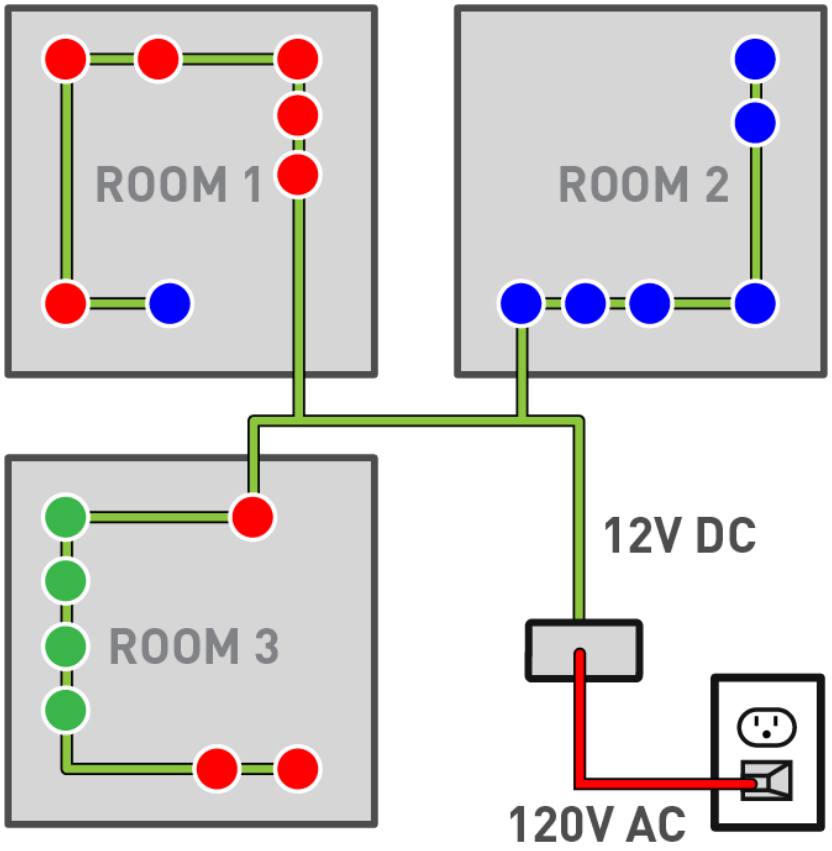
Types of LED lighting

- Traditional Light Replacements
  - LED PAR-Can, LED light bulbs, LED stage lights…
  - Connects directly to 120V AC
  - Pro: bulbs are safe, low heat
  - Con: bulky, cables are still 120V AC, reliable equipment can be expensive, not water resistant
- Low Voltage Systems
  - LED spotlights
  - Pro: entire system is safe, low heat, water resistant, low voltage, easier setup
  - Con: Not designed for all applications

Traditional Cable Diagram

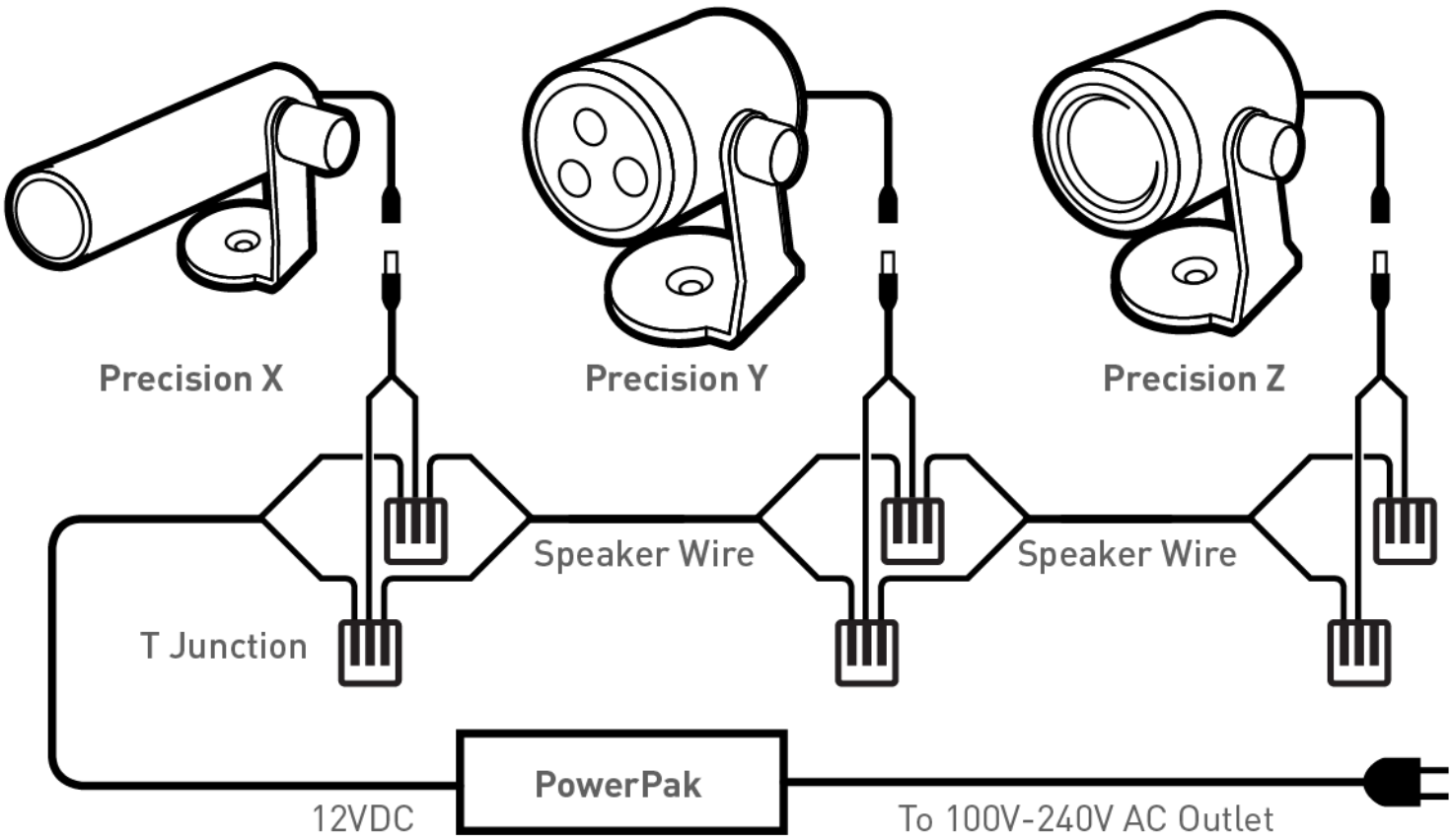


Low Voltage Cable Diagram



20 LEDs @ 20mA/LED= 400mA = 0.4A

12V Power Supply > 0.4A current output OK


Precision X
Precision Y
Precision Z
Speaker Wire
Speaker Wire
T Junction
PowerPak
12VDC
To 100V-240V AC Outlet

Wiring Notes for Typical LED Systems

- Make sure Power Supply is adequate
  - Calculate LED total current
  - If PS not enough, use more and spread load
- Long cable has resistance (reduces brightness)
  - 22AWG, < 800ft: negligible
  - Long distances: go use thicker cable, reduce distance to PS
  - Shorter distances: telephone cable is great
- Polarity matters: red to red, black to black
- Use stranded cable if possible: more flexible

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Darklight makes it simple

- Polarity doesn't matter for our LEDs
- High power LEDs have internal drivers
  - Constant brightness even with voltage sag over long wire
- Plug & play for easy reconfiguration
  - Tool-less swapping of LED fixtures
- Water resistant
- Built to handle tough environments
  - Rated for 50,000 hours

Precision X

Precision Y

Precision Z

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Winchester Mystery House

San Jose, CA

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City Museum

St. Louis, MO

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Haunted Graveyard

Bristol, CT

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Tips

- Work with set lighting
- Detailed haunts should use more natural colors: white + gel filter
- Use battery pack with LED lights to check your work as you go
- Don’t wait until last minute! Lighting is IMPORTANT!

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