ChristmasExpo

Curtain Strobes

Prep – Use – Xenon Repair

Mark “Zman” Zembruski

ChristmasExpo

Disclaimer

This is by no means a complete reference guide on this subject. Material contained within is based on the sole experience of the presenter along with research and input from peers within the Holiday Lighting Community.

Working on, and around electronic circuits can be very dangerous. Some of the procedures contained within can be hazardous to your health if not managed properly. Author cannot be held responsible, take the appropriate pre-cautions outlined in the material.

The presenter is by no means an electronic guru, I do what works for me, and may not be the most appropriate methodology, and is always willing to listen to a higher authority on the subject matter.

Depending on use, your mileage may vary.

Strobe – Agenda

- Strobe Types
- Application
- Preparation
- Xenon Electrical
- Xenon Strobe Repair
- Miscellaneous Information
- Resources
- References

ChristmasExpo

Strobe - Types

- LED
  - C7 & C9 Base
- Xenon
  - C7 & C9 Base
- Zap

Lenses are available in multiple colors

ChristmasExpo

Strobe - Application

- Random Fire for the ***"WOW!"*** effect
  - Use for emphasis in sequences
  - String in Trees (Real, Mega, Z, Minis)
  - Hang in bushes
  - String in, around, and from display items
  - On house, roof and gutters
  - Staked in lawns
- Used for Controlled Effect
  - Strobe Chase
    - Requires additional mods and some DIY components. Check Christmas In Kent for another How-To:
      - http://www.christmasinkent.com/howto/HowToChaseStrobes.htm/
    - Santa Runway Lights
    - On top of Mini Trees
    - Railroad Crossing

ChristmasExpo

Strobe - Application

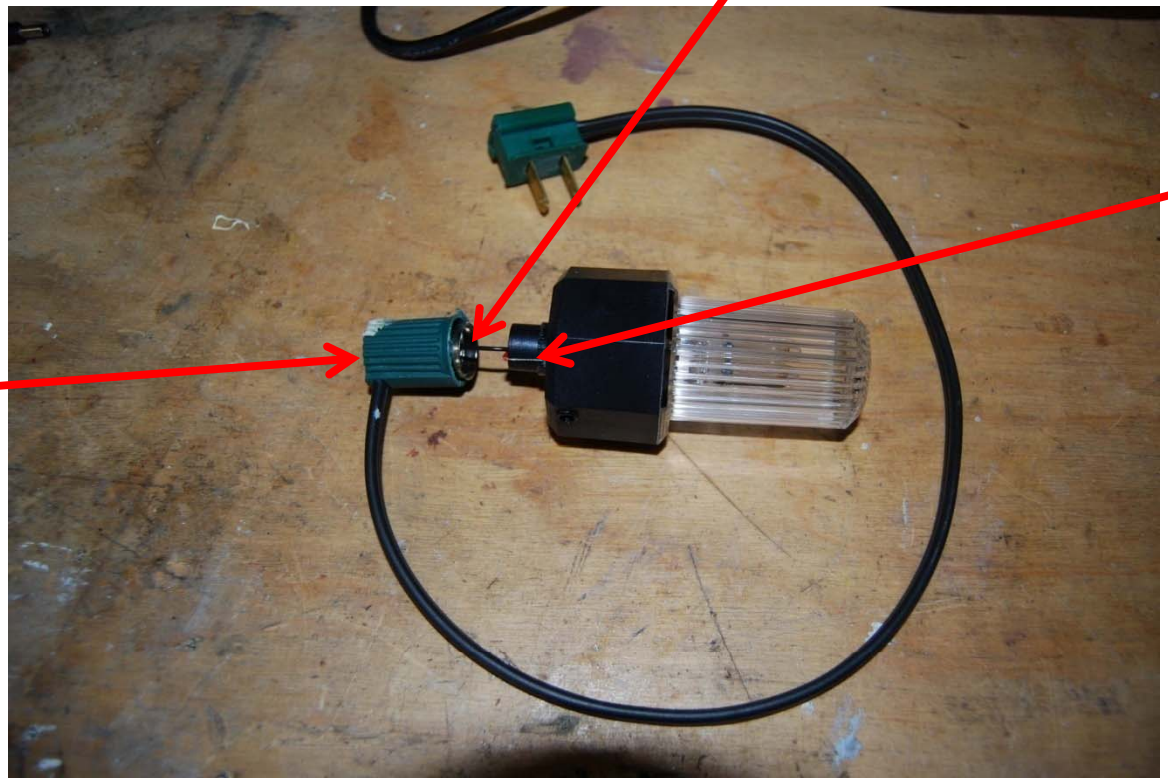
- Strobe orientation
  - Xenon – unidirectional – Up, down, sideways
  - LEDs – more directional best viewed straight on
    - Newer units are mounting LEDs higher in the lense
- Strobe frequency
  - LED will strobe 1 – 2 times per second
  - Xenon will strobe 1 - 5 times per second
    - Strobe dependent, check with Vendor
  - Zap will strobe on command (once) OR:
    - They can be used up for massive strobing flash effect
- Strobe Stringers
  - Buy pre-fabed stringers
    - Avail in C7 & C9 bases, 6” – 12” – 18” (typical)
    - White, black, green, brown
    - Specific socket count or unlimited by the spool
  - Custom made
    - Using SPT1 – SPT2 – SPT3
      - Using C7 or C9 Vampire Sockets

Strobe – Xenon Preparation

- ***Before using for the first time***:
  - Check them upon delivery to be sure they work
  - Make sure metal screw cap is secured to strobe base
    - Give a slight twist, if loose, use caution separating screw cap, and PCB from strobe base, wires are attached between screw cap and PCB
      - Red wire (return) may be soldered to the screw cap, or will be loose and folded over the black strobe base
      - Black wire (hot) is soldered to the screw cap "button"
      - **NOTE:** VALIDATE the wiring and note it. It may not be consistent with above
    - Apply hot glue sparingly. Ensure red wire is properly replaced, make sure hot glue is not near wire to isolate it from the metal. Firmly push screw cap straight onto black base.
  - ***(Recommended Option) -*** Spray Conformal Coating on PCB ***AND*** components/leads
    - Remove screws on bottom of strobe base, lens and PCB***:***
      - Don't forget the red and black wires
      - ***<u>If recently plugged in, refer to Strobe Repair – Perform Step 5</u>***
    - Use Painters Tape to cover the xenon bulb
    - Moderately spray both sides of the PCB, components and all, let set for 15-20 minutes, apply second coat
    - Allow to dry overnight
    - Move to next prep steps

ChristmasExpo

Example – Metal Screw base disconnected from strobe base



Red return wire folded over base, it possibly could be soldered to the screw cap

Testing Cord

Xenon Preparation - Repair

Example of Testing Cord

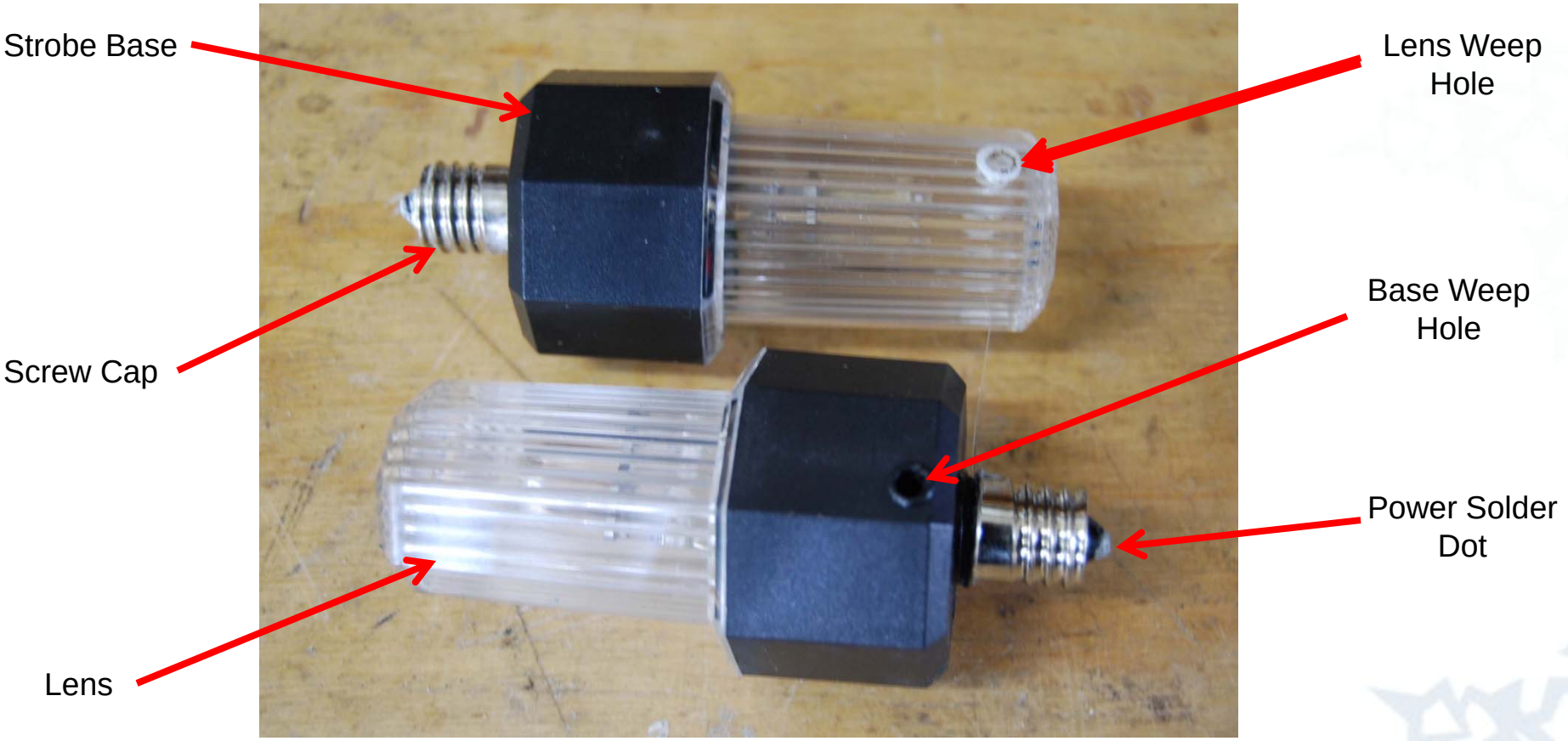
Example of disconnected Screw Cap

Example of red return wire placement

ChristmasExpo

Strobe – Xenon Preparation

- ***Before using for the first time (2)***:
  - If you have sprayed the conformal coating, do not re-assemble just yet:
  - Determine strobe orientation
    - How will it be used, lens up or lens down
  - Drill or burn (old or inexpensive solder iron) weep holes accordingly:
    - ***Lens up*** – Weep holes in black base
      - If PCB has NOT been removed, determine PCB orientation to know where the components are
      - Avoid drilling or burning too deeply to hit PCB
        - Not critical if performing with PCB removed
      - 2 holes 1/8" on opposite sides
    - ***Lens down*** – Weep holes in the lens
      - 2 holes 1/8" on opposite sides
      - Close to the chamfer at the top of the lens
    - ***Universal*** – 4 weep holes per strobe
  - Re-assemble if needed, dab silicon on screw holes to seal
- Use paint pen and put the month/year you got the strobe, or if repair was needed, note it and the part. Another method is to number your strobes and keep a Spreadsheet with this info avail. It will give you the history on your strobes as your display grows.
  - Not a bad idea to do this with your light strings as well

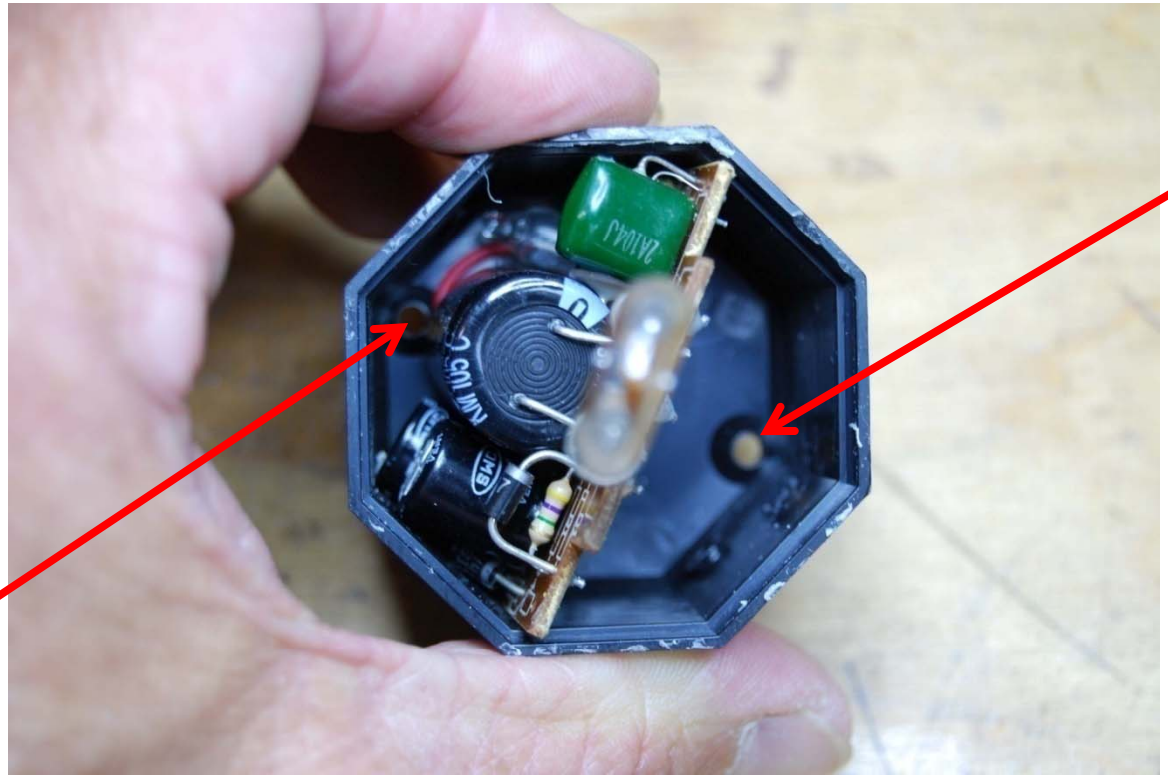


Xenon Preparation - Orientation

Example of hole locations

Define: Screw Cap, Lens and Strobe Base, Power Solder Dot

ChristmasExpo



Xenon Preparation - Repair

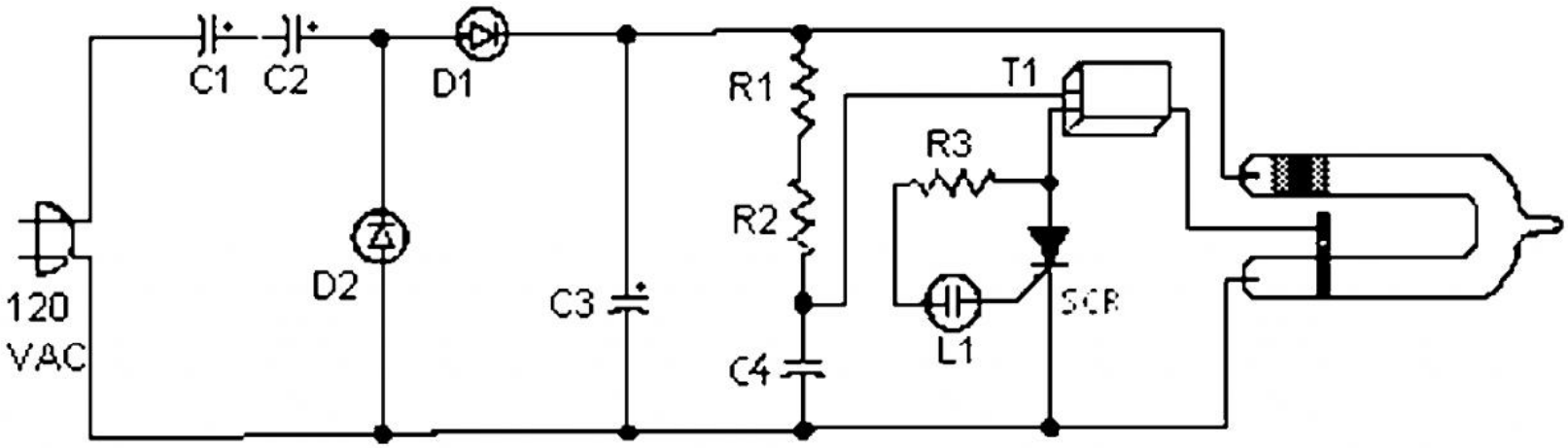
This picture represents the relationship of the PCB inside the strobe base. Note the location of the lens screws.

Strobe – Xenon Repair

- Common issues:
  - Attempting to remove strobe from light string C9 socket
    - Screw Base de-attaches from Strobe Base
      - ***DISCONNECT STRING FROM POWER SOURCE!***
      - Using finger or pencil eraser, insert into screw base to assist with removing screw base from socket.
        - **Be careful to not break wires**
      - Once removed, use hot glue as outlined in Preparation Section
  - **Most consistent issue with strobes failing is moisture!**
    - Often left to dry, they will come back to life, with no further repairs
    - Remove lens and inspect PCB
      - Make sure all parts are in tact and that there are no burn marks on PCB
    - Check all solder joints. Ensure there are no cold joints, re-solder if needed
    - Check for arcing damage or corrosion from water
      - If white powder is evident, clean with denatured alcohol, or hydrogen peroxide with a rag or toothbrush.
      - If there is trace damage, solder a jumper to fix
    - If none of the above items are evident, allow to dry completely. Test again by plugging in strobe
  - ***Strobe is still not flashing? Decision time***
    - ***If you are not comfortable handling live circuits, do not proceed with the rest of this material***
    - The following will require familiarity with basic electrical testing, soldering and unsoldering components
  - Let's orient ourselves further with the strobe circuit and parts:

Strobe – Xenon Electrical

120 volts from the AC line passes through a half wave voltage doubler consisting of 2 rectifier diodes D1,D2 and capacitors C1,C2 and C3 generating a voltage of around 330-340VDC across C3. Capacitor C4 charges through the R1, R2 resistors (timing) until it reaches the break over voltage of the neon lamp L1.The neon lamp then dumps the charge into the gate of a silicon controlled rectifier. This turns the SCR on, which takes the rest of the charge and dumps it into the primary of trigger transformer T1. This voltage is then stepped up to around 3000V at a low current which is applied to the outer envelope of the Xenon tube. This ionizes the xenon gas in the tube, forming a conductive channel which quickly discharges the main storage capacitor C3, resulting in a bright flash. The process repeats until power is removed.



ChristmasExpo

1/4W 1M Ohm, 1% Resistor (blue) in this example.

Trigger Transformer/coil

Transistor, note flat side orientation toward neon bulb

Timing and Flash side of circuit

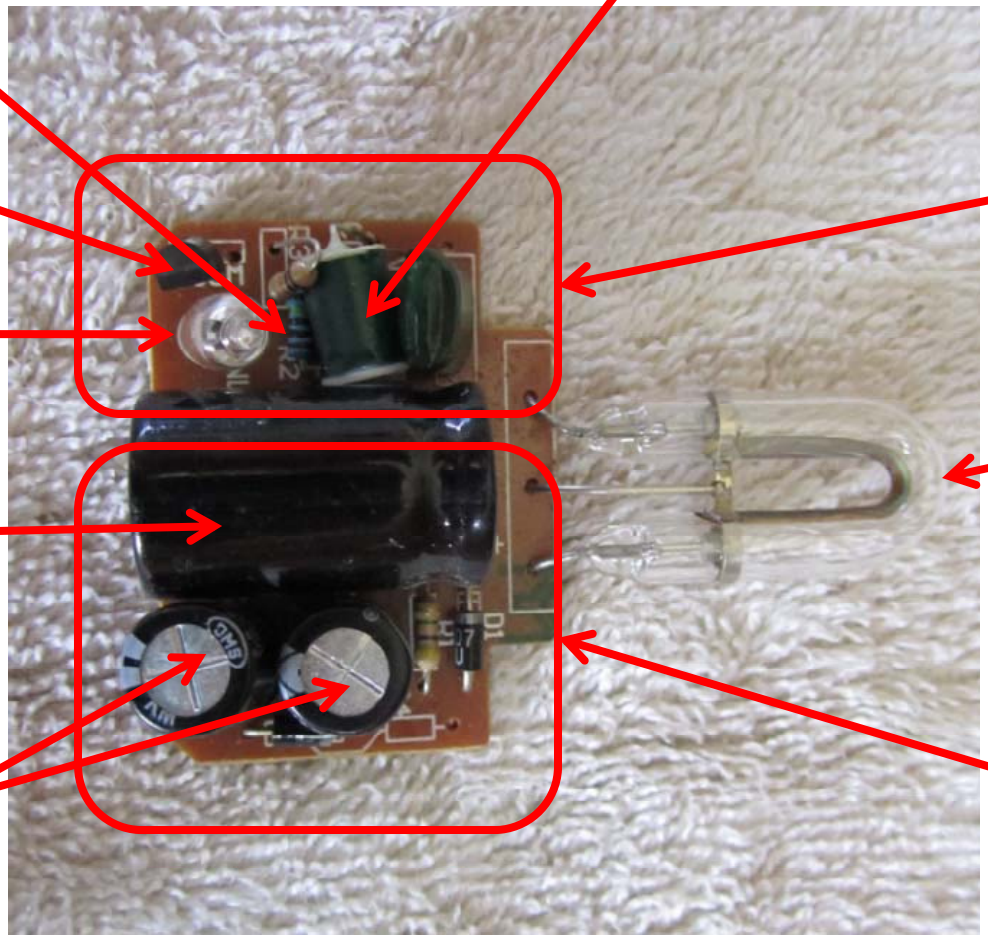
Neon Bulb

Xenon Tube, filled with Ionized gas that when charged properly give us our flash

Large 33uf, 450V capacitor

Smaller 6.8uf, 400V capacitors

Charging side of circuit



Xenon Strobe Repair

Key Part Reference - Circuit Orientation

Note: Values on the noted Caps may vary

ChristmasExpo

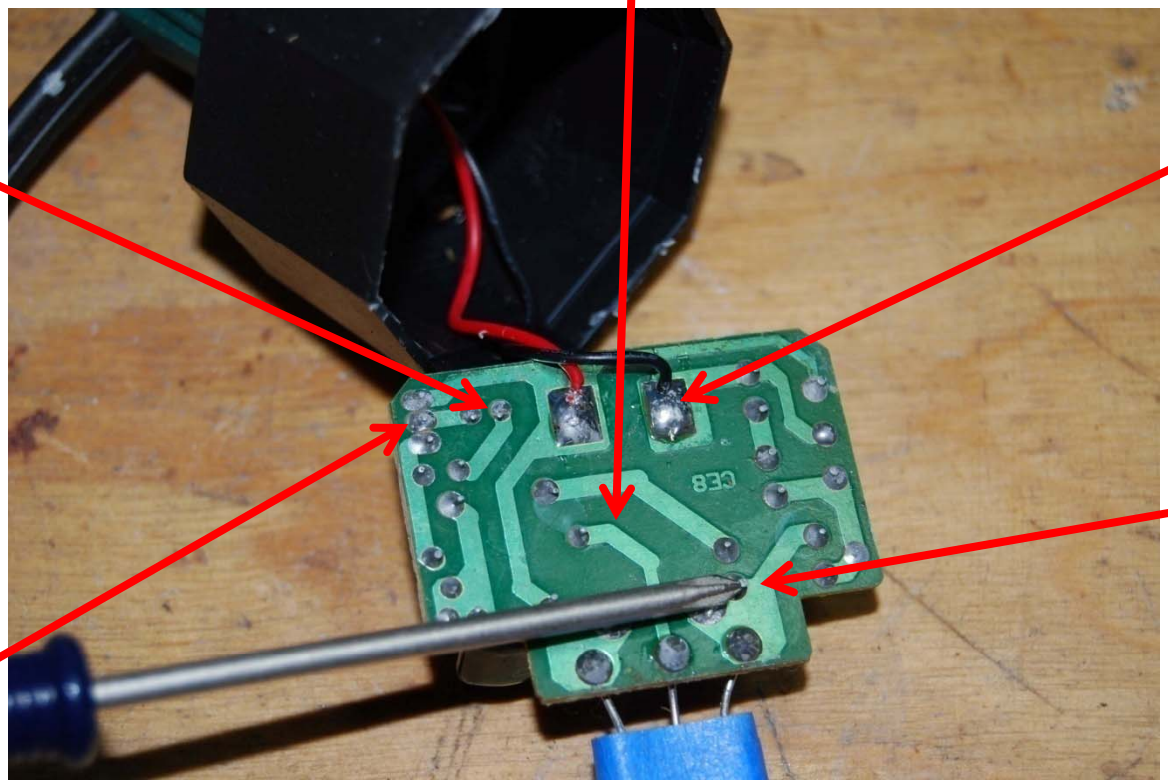
Strobe – Xenon Repair

1. The following items are suggest to work on strobes
   - Tester Cord (Slide 8)
   - Volt Meter (preferred with alligator or mini-grip probe clips
   - Soldering Iron
   - De-Soldering Iron (best to use, or de-solder braid)
   - Mini-Grabber Test Connector Patch Cords

2. Remove lens and CAREFULLY remove the PCB
   - It is OK and preferred to handle by holding the xenon bulb
   - ***If bulb handled***, clean with de-natured alcohol after repair and before using.
3. ***While plugged in***, test that there is power at the point where the base wires attach to the PCB (Slide16). Un-plug Strobe to continue:
4. If there is ***NO POWER*** inspect the wires and their *attach points* within the base and PCB. On the screw base, verify that the solder dot is clean and in tact. Refer to Step 7.
5. If there ***WAS POWER*** to the PCB, ***BEFORE PROCEEDING*****,** you must ***DISCHARGE*** the large capacitor, it's the largest cylindrical part on the PCB (Slide 16)
   - Take a screwdriver, flip over and find the capacitor pins on the back, and short them. You will get a spark. Make sure it is fully discharged. If you forget this part, the spark will SMART! (Slide 16)
   - ***This step must be done each time power is applied to PCB***, before handling. It does not damage the cap.

Solder side of PCB, ensure solder joints are solid, and no water corrosion

Neon Bulb Leads to short Step 12



Note the Black and Red wire termination Step 3

Screwdriver across cap pins, Step 5

Transistor leads to short for Step 11

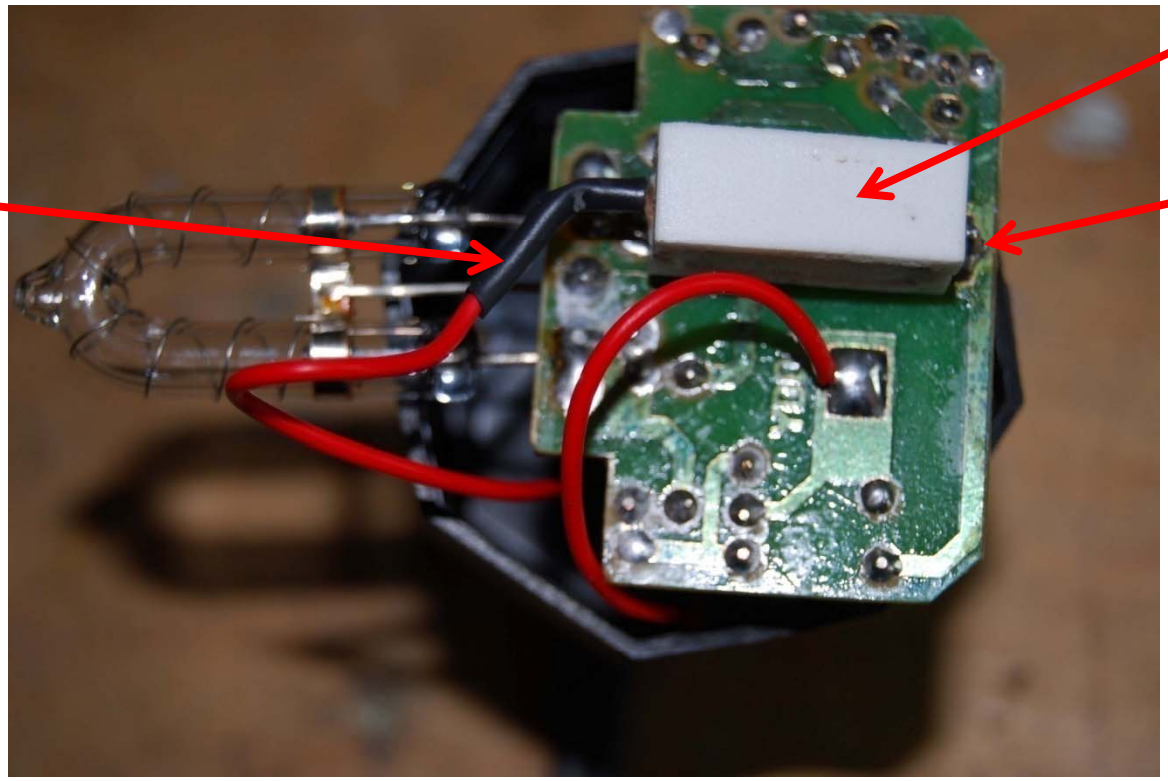
Xenon Strobe Repair

Large capacitor requiring discharge – Place insulated screw driver across the caps pins. There will be a spark. **CAUTION!! - DO NOT HANDLE an energized PCB with BOTH hands! A discharge across your body could be potentially LETHAL**. Discharge in one hand will not be pleasant. Use screwdriver technique for shorting other devices as noted in Repair Steps.

ChristmasExpo

Strobe – Xenon Repair

6. If there is ***NO*** spark on the large cap, replace it. Apply power again. If still no spark, replace the 2 smaller caps on the right side of the board. *On some strobes, there may only be only 1 small cap.* All caps are ***polarized*** and have **+** and **–** indication on the PCB, replace them properly!
7. ***Older strobes*** may have a large ceramic resistor on the back side of the PCB. It's white, you can't miss it. It's the first thing the red wire comes to from the strobe socket. Check that this is installed correctly. Check to see if the red wire is broken off of the resistor, but you won't see it because it's inside of heat shrink tube. With a meter, test from the center of the socket to the other side of the resistor. If you don't get a reading, suspect that the wire is broken inside the heat shrink and repair it. (Slide 18)
8. If you have to start replacing parts, scavenge parts from another strobe that is not working



Xenon Strobe Repair

Brick resistor example

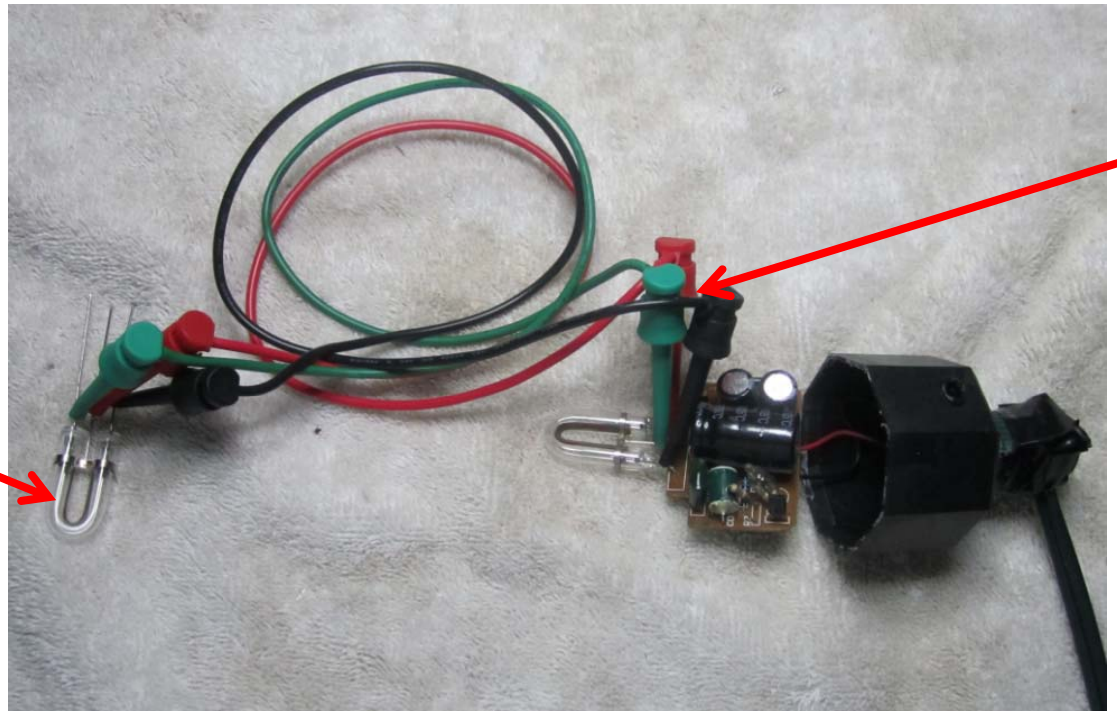
Note:

This strobe has 2 red wires. There can be many different variables on the strobes, no worries if yours does not match these pictures

ChristmasExpo

Strobe – Xenon Repair

9. With the strobe still disassembled, jumper a known good Xenon tube to the existing tube using mini-grabber test clip patch connectors (Slide 20). Plug into power. If the new strobe flashes, replace existing Xenon tube. If no strobe, disconnect test connectors from strobe go to next step
10. While powered, take a screw driver and short across 3 leads from the small transistor in the lower corner of the PCB (Slide 16). ***If the strobe flashes***, this part is faulty. Replace it, ***if Strobe does not flash*** continue:
11. Test the small neon bulb at the bottom left. When the circuit is charged, it tries to turn on, which forces the large cap to discharge, making a flash. Take a screwdriver and short the 2 legs of this bulb on the back of the PCB. Did the strobe flash? If so, replace neon bulb.



Xenon Strobe Repair

Jumpering Xenon Tube

ChristmasExpo

Strobe – Xenon Repair

12. Still nothing? Remove from power, ***discharge cap***. Check the ¼ W, 1M Ohm, 1% resistor with meter. If bad, replace with good part. (Slide 14). *Most of the time, this is the guilty part*. Keep spares on hand.
13. Still not strobing? **Decision time again:**
14. The problem most likely exists in the Trigger circuit.
    - You can continue to test/replace remaining parts. The trigger transformer is the least likely to require replacing in the circuit (Slide 14)
15. At this point, you may have a candidate for spare parts.
16. When re-assembling, after screws have been replaced, dab a bit of silicone over screw holes, allow to dry

Strobe – Miscellaneous

- Make a testing cord using SPT1 or 2, a male and C9 vampire plug and socket (Slide 8)
- Generally it is not a good idea to stare at the strobe while flashing, it emits hard UVs. Amber colored sunglasses, welding googles, or potentially covering tube during repair is highly suggested
- ***Do Not fade*** your curtain strobes
  - Pre-charging of strobes has been used as a technique to assist with randomization
  - With Xenon strobes, author has never had a problem
- Stats predict the tubes are good for ~5M flashes
- Power Consumption - Xenon
  - 1 strobe draws 6 watts
  - 20 strobes draw 1 amp
  - Note: This will not be a constant draw as they fire randomly

Strobe – Resources

- Curtain Strobe Vendors (LED & Xenon)
  - Action Lighting
    - www.actionlighting.com
  - Christmas Light Show
    - www.christmaslightshow.com
  - Creative Displays
    - www.creativedisplay.com
  - Illumimax
    - www.illumimax.com
- Replacement Xenon Bulbs
  - Xenon Flash Tube – LIT1041
    - www.bgmicro.com/
- Conformal Coating Spray
  - Fine-L-Kote - SR Silicone Conformal Coating 12oz. Aerosol - 2102-12S
    - www.all-spec.com/
- Extension cords and C7/C9 Stringers
  - Custom length How-To:
    - www.landolights.com/main/content/view/77/39/

Strobe – References

Thank you to the following contributors:

- Jeff Trykoski – www.illumimax.com
- Kevin Thomas (Wirekat) – www.christmasinkent.com
- Mike (Oldcqr) – www.landolights.com
- Pete Peters

ChristmasExpo

Thank You! For attending
Christmas Expo
Curtain Strobe Session

Copies of this Presentation can be downloaded from
www. WoodinvilleWonderland .com
Or
www. ChristmasExpo .com