

# STROBE TROUBLESHOOTING GUIDE

## Theory of how strobe technology works:

There are basically three components to a strobe system. These consist of the electronic power supply, the Xenon flash tube and a three conductor shielded cable.

The Xenon flash tubes used in Whelen products come in various shapes and sizes. The principal by which they operate are much the same. The envelope that contains the Xenon gas is made of hardened glass. Touching the glass with your fingers will not harm it, but Whelen recommends using clean hands or clean gloves to install the tubes. Around the glass envelope is a wire wrap. This wire wrap is energized to approximately 7000 volts by means of a trigger transformer in the base of the flashtube or attached to the rear of a strobe lighthouse. This is usually a small black box that is open to the air in older strobe units or sealed inside with silicon or similar sealant in newer units. The 7kv pulse causes the atoms of Xenon to align, once this occurs the 450-600 Volts generated by the strobe power supply conducts from anode (+) to cathode (-) through metal material at either end of the strobe flashtube.

**WARNING!** – Reversed polarity of the input power for just an instant will permanently damage the power supply. This damage is sometimes not immediately apparent, but will cause a failure in time. The reversed polarity destroys a protective diode in the power supply, causing self-destruction from over-heating of the power supply.

Whelen power supplies are protected against a short or open circuit on the output. In either case, Whelen's power supplies will effectively turn themselves off when subjected to a shorted output or a Xenon flash tube that refuses to fire.

**WARNING!** – Strobe light power supplies are meant to be used, not remain in an inactive state. Use them at all times this improves their proper functioning. Any strobe light power supply that has been out of service for long period of time is subject to failure because the electrolytic condenser loses the polarity formation. A strobe light power supply not having been used for one year or longer is vulnerable to failure. In this case it is recommended you disconnect all flash tubes and start operating the system on a voltage this is reduced 25% for 10-15 minutes before putting the power supply into normal service. This will prevent overheating of the condenser while they reform. If the power supply, after a long period of non-use is operated at full voltage immediately, there is an excellent possibility that the condenser will become overheated and fail.

**WARNING!** - LET POWER SUPPLY STAND 5-10 MINUTES BEFORE TROUBLESHOOTING  
(PLEASE BE AWARE A STROBE TESTER IS AVAILABLE FROM WHELEN ENGINEERING)

Unhook power supply from power source and let stand for 5-10 minutes to allow power to bleed off capacitors before attempting any troubleshooting. Even after 5-10 minutes, care should be taken when handling components as electrical shock can result.

Although the numbers are small all strobe connectors are numbered, in addition, the White colored AMP connectors have a raised ridge over the #1 position to identify the location of that position. In many cases the Red, Black and White wires are substituted with other colors. While wire color is not important, pin placement at either end of the strobe extension cable is very important.

## POWER SUPPLY TEST PROCEDURES:

### STEP #1

Determine if the trouble is in the flash tube or the power supply. A normal operating power supply emits an audible tone. If no audible tone is heard – Determine if there is a proper input voltage at the power supply and determine if you have a proper ground to the chassis of the vehicle. If this test is positive go to step #2.

### STEP #2

Clear all possible shorts at the power supply and check the power supply operationally by marking and disconnecting all output cables from the power supply outlets and connect an operating strobe head assembly or a Strobe Check Unit (Whelen Part # TESTER) directly to the power supply outlet. Apply the required voltage to the power supply input. If the tube functions normally, look for the following problems in the inter-connecting cable or cables.

## **CONTINUITY CHECKS:**

**Check for malfunctions in the inter-connecting cables:** If pins 1 & 3 are reversed or if there is a short between pins 1 & 2 of the inter-connecting cable, the power supply will be rendered non-operable until the short is cleared. A short of this type will not cause any permanent damage to the power supply. But a discharge of the condenser across pins 1 & 3 will destroy the trigger circuit in the power supply.

Check for continuity between the connectors of each interconnecting cable.

Pin 1 to Pin 1 (RED Wire - Anode) (+)  
Pin 2 to Pin 2 (BLACK Wire – Ground) (-)  
Pin 3 to Pin 3 (WHITE Wire – Trigger)

Pin 2 & 3, Black & White wire, at the flash tube is across the primary of the flash tube, which is approximately 1 ohm. Reversing these wires will discharge the flash tube current through the primary burning up the trigger transformer primary. Pins 1 & 2, Red & Black wire, is across the flash tube. Most flash tubes are polarized. Reversing the input will contaminate the Xenon atmosphere, causing early flash tube failure.

Check for shorts between Pins 1 and 2, 1 and 3, and 2 and 3 of the inter-connecting cable.

Check for shorts from Pins 1, 2 and 3 to Vehicle Ground.

## **RED & BLACK WIRE REVERSED: PINS 1 & 2**

If the Red and Black wires are reversed the tube fires backwards becoming extremely darkened contaminating the gas. The blackening can occur in about 15-20 minutes and the tube will fail. Failure to hook up tubes properly can void tube warranty.

## **BLACK AND WHITE WIRES REVERSED: PINS 2 & 3**

If the Black and White Wires are reversed the tube can operate for a much longer time, approx 4-10 hours. This is the most common reversal of wiring and can be very deceiving when trouble shooting strobe systems. Failure to hook up tubes properly can void tube warranty.

## **PHOTO-SENSITIVE:**

A Xenon flash tube can be very photo sensitive. One will flash normally when exposed to an external light source, but may become very hard to fire when subject to darkness.

## **STROBE TUBE AGE:**

Tubes can become hard firing with age, or when exposed to very high temperatures. A hard firing tube will sometimes operate with the engine running but will fail when operated on a low battery due to voltage changes.

## **STROBE TUBE LEAKAGE:**

Tubes can develop a leak through eggshelling of the glass, or a leak can develop around the seal of the wire to the glass. This is caused by hot and cold cycling during normal operation of the system.

## **SELF-IONIZATION:**

Self-ionization is a condition where the flashtube fires and the Xenon gas remains ignited until the unit is turned off or the high voltage drops low enough for the gas to extinguish itself. You can usually tell this by tube(s) glowing blue continuously. This will render the entire system non-operational. This condition most likely occurs when the input voltage is highest. You can check this by turning the system off and then turning the system back on – Generally the system will operate normally for a few flashes before going back into self-ionization and beginning to glow again. This condition also may happen in older units as the storage capacitor deteriorates. It is important to note that self-ionization can happen when replacing an earlier power supply with a more recent power supply.

## **CHECKING A QUESTIONABLE STROBE TUBE:**

To check a questionable strobe tube, install it in a system and apply 10vdc to a 14vdc system or 22vdc to a 28vdc system. If the tube will operate at the reduced voltage it has a great deal of life left in it.

## **INSTALLING ONE NEW TUBE INTO A MULTI-HEAD STROBE LIGHT SYSTEM:**

Installing one new flash tube in any multi-head strobe light system, will sometimes cause the remaining old flash tubes (which appeared to be operating normally) to misfire or skip. This signifies that the old flash tube is nearing the end of its service life.

## **STRANGE FLASH PATTERNS OR SKIPPED FLASH PATTERNS:**

When strobe power supplies are designed to operate at optimal line voltage levels. You will sometimes find that the flash pattern becomes intermittent when the line voltage drops below the battery charging voltage of your electrical system.

## **RFI and EMI PROBLEMS: (Radio Noise)**

When Engineering strobe light power supplies are designed with a low pass filter built in to keep R.F.I. and E.M.I. down to a minimum, but sometimes you will experience interference in your radios from your strobe light system. Most Always, this is an installation problem, not a strobe light power supply problem.

The strobe light power supply should acquire its power from a low impedance source, such as the alternator or generator end of the electrical buss. Historically, the rotating beacon or strobe light circuit breaker is added on the electrical buss at the opposite end, with the radio in between the strobe breaker and the low impedance end of the electrical buss. Any noise generated by the strobe light power supply will be transmitted into the radio through the A+ input lead to the radio. Most of the new radio equipment manufactured today has inadequate input filtering and any noise on the electrical buss is amplified in the radio and produced through the speaker and or head phones LOUD and CLEAR.

Two things you can do:

**#1** – Connect the strobe light circuit breaker to the low impedance end of the electrical buss, using a 16g jumper. Get as close to the battery as possible.

**#2** – Install additional filtering in the A+ line or provide an isolated A+ source for the radios by installing a filter choke in series with the radio input power lead and a filter adaptor to ground and reference all radios to their filter. This will also improve your entire radio system, from other line noises.

Frequently the noise is not on the A+ lead but is conducted through the ground circuit. Alternator, electric motors, fuel pumps and strobe light power supplies draw heavy current through the ground circuit of the vehicle frame. Any voltage drop in the ground circuit between the battery ground and the radio ground can look like a signal to the radios. When the speaker, head phone and microphone use the vehicle ground for return to the radios you will always experience some interference. The amount of interference depends upon how much potential difference there is between the two ground points. By isolating the audio grounds from the vehicle ground at the speaker, headphone and microphone junctions, and grounding the aforementioned with the radio at one central ground point, you can eliminate the majority of all ground inducted radio noise.

Do not parallel any audio leads with any power lead supplying energy to a noise generator: IE: Alternator, Generator, Electric Motor or DC Choppers such as Inverters and Strobe Power Supplies.

The interconnecting cable between the power supply and the strobe light head assembly radiates very little, for the output circuit of the power supply is very low impedance. They can radiate RF like an antenna if the shield is not terminated to ground. The radiation of RF energy is reduced to a minimum by properly terminating the shield at one end or the other, generally the power supply end but which ever proves the quietest ground. DO NOT TERMINATE BOTH ENDS.

When installing a strobe light system, provide a good ground and a low impedance source to the strobe light power supply. Eliminate ground loops in audio circuits by using a centrally located ground point for all audio grounds.

If you continue to experience noise related issues, please contact the Whelen Factory for additional assistance.

**STROBE CHECK II UNIT – OPERATING INSTRUCTIONS:  
WHELEN PART # TESTER – 01-0765246-00**

The Whelen Strobe Check II Unit is designed to determine the reason the strobe light system is not working properly.

It is not necessary to be an electrical engineer to do this type of trouble shooting.

The Strobe Check II Unit will only display adequate anode and trigger voltage. You can still have an open or bad discharge capacitor which will cause the strobe tube not to flash. The use of a known good tube will determine this condition if the Strobe Check II confirms proper anode voltage.

There are only two things that cause a strobe light system not to operate:

- #1 The flash tube is bad.
- #2 It is not getting anode voltage or trigger voltage to the system. Therefore, the power supply requires repairing.

The Strobe Check II Unit will determine the cause for you.

On the top of the Strobe Check II unit you will see three neon lamps. The one in the center marked ANODE will glow only if you have sufficient anode voltage from the power supply. The two neon lamps on either end are marked T1 and T2 and flash on and off when there is sufficient trigger voltage from the power supply.

To test a strobe light system, just insert the Strobe Check II unit in place of the flash tube in question. Turn on the system. If the power supply is OK the ANODE lamp will glow and the T1 or T2 lamp will flash at the strobe unit's flash rate.

To test a remote strobe light power supply. Connect either one or both cables from the Strobe Check II Unit in place of the strobe lighthouse in question. Turn on the system and check to see if the ANODE lamp is glowing and if the T1 and/or the T2 lamps are flashing.

If you have ANODE voltage and TRIGGER voltage, replace the strobe tube.

If you do not have ANODE voltage or TRIGGER voltage, check to see if you have input power to the power supply. If you have input voltage, check the power supply fuse and if fuse checks OK – Unit will need to be repaired.

Using the Strobe Check II Unit you can test cable continuity. If the Strobe Check II Unit indicates that everything is OK at the Power Supply but not at the far end of the cable, there is a defective cable or short inside the cable or connectors.