Resolve Flickering LED Bulbs

Most LED flickering issue will be due to an electrical circuit issue or an electrical generating issue.

Other issues, a defective LED bulb, a bad bulb to socket contact, etc., can result in flickering.

Try the troubleshooting suggestions in this document. If these do not fix the issue, then start to suspect other causes of flickering. This article does not cover the other issues listed above.

Testing device

The troubleshooter must use an incandescent light bulb in conjunction with a voltmeter to test the circuit properly. The incandescent light bulb is used to generate a current flow. The reason for using this light bulb/voltmeter arrangement is beyond the scope of this troubleshooting document. The light bulb/voltmeter wiring diagram is shown in Figure 1.



Electrical Circuit Issue

The person doing the troubleshooting should check for a electrical circuit issue first. A person can quickly determine if electrical circuit is good.

A person cannot easily check the condition of the electrical supply. A technician uses an oscilloscope to check for fluctuations in the electrical supply.

Use this same troubleshooting method for positive or negative ground automobiles. Refer to Figure 2 while reading the troubleshooting method.

An automobile lighting circuit is comprised of a battery, voltage supply or "hot" wire, a switch, a light socket, a bulb, and a ground system.

Unlike incandescent style light bulbs, LED bulbs require a minimum voltage to operate. The minimum voltage required is the voltage <u>between the terminal in the light socket and the case of the light socket</u>. The minimum voltage is not the system voltage. Losses in the supply wiring or grounding issues can reduce the voltage between the terminal in the light socket and the case of the light socket.

An incandescent style bulb will turn on if the voltage is low, but the light will be dim.

LED bulbs require a minimum voltage to turn on. Once the LED bulbs receive this minimum voltage they will turn on. As the voltage increases the light from the incandescent bulb becomes brighter. As voltage increases the light from the LED bulb becomes more stable and is less likely to flicker.

<u>Troubleshooting step 1.</u> Test the voltage of the battery. Without the car running, connect the voltmeter probes directly to the battery terminals. A 6-volt battery should have a voltage of above 6.3 volts. A 12-volt battery should be above about 12.6 volts. If the voltage is lower than this, consider taking your car to an auto parts dealer and have them check the battery. Or try to recharge the battery and re-check the battery voltage.

<u>Troubleshooting step 2.</u> Evaluate the voltage supply to the socket. Touch the voltmeter probe to the ground terminal of the battery and then touch the second probe to the light socket terminal. This measurement provides the voltage to the bulb "voltage supply."

Figure 2 shows where to check the terminal voltage in the socket. If the socket has two terminals, check each terminal separately. Remember, your light switch has to be on and in the proper position to check the voltage at these terminals. If the voltage at these terminals is not within a few tenths of the voltage, you measured at the battery, then check all connections and correct any connection issues you may have. Tip – If the voltage is not within a few tenths of a volt of the battery voltage this is normally caused by a poor connection(s). Make sure your battery terminal and the clamp connecting the battery to the electrical system is clean, at the connection, and free from corrosion. Also check the voltage at each connector. A voltage drop normally occurs at the connectors.

<u>Troubleshooting step 3.</u> Evaluate the ground system. Copper wires and terminals comprise the voltage supply system. The voltage supply system is more dependable and less problematic than the ground system. The ground system depends on a good electrical circuit from the battery terminal to the light socket. The car body, frame, light support items, bolts, wiring, and other components comprise the ground system. While the car voltage supply is primarily copper, the ground system is primarily steel. Any one of the components in the ground system can contribute to a bad ground.

Refer to figure 2. The letters "A" through "F" correspond to connections in the ground system. There are more connections in a ground system than are show in the figure. These connections are examples for the purpose of this document.

Listed are some, <u>but not all</u>, components of a ground system for a light bulb. See Figure 2 for these letters.

- A. Light bulb socket to light bulb fixture connection,
- B. Fixture connection to fixture supporting bracket,
- C. Supporting bracket to frame rail,
- D. Frame rail to cross frame component,
- E. Connection of battery ground strap to cross frame component, and
- F. Connection of ground strap to battery at battery terminal.

A lot can go wrong with all of these connections. Normally the loss of a good connection is due to corrosion, paint, powder coating, etc. However, in modern cars the lack of connection might also be due to defective spot welds in body components. Cars with powder coated frames and powder coated components, in the ground system, tend to have more issues with grounding connections than cars with painted components. The powder coating provides a good insulation for ground connections.

To troubleshoot for ground system issues, do the following. Measure the battery voltage across the terminals on the battery. Touch a voltage probe to the actual battery ground terminal. Make sure the probe and the terminal have a good connection. Then touch the other probe to the inside of the light bulb socket. See Figure 2. The voltage you read should be within a few tenths of a volt of the voltage that you read when you checked the battery voltage between battery terminals. If the voltage differs more than a few tenths of a volt of the battery voltage, start from the light bulb socket and check the components of the ground system, one-by-one with the voltmeter, until you find the issue then resolve the issue.

<u>Troubleshooting step 4.</u> After completing the above steps, touch one of the meter leads to the terminal in the light socket and touch the other lead to the inside case of the light socket. This is the voltage that is supplied to the bulb. This voltage should be within a few tenths of the battery voltage.



Here is a picture of a ground system issue. The owner had trouble getting the bulb to light. The owner used the method above to locate the problem. The issue was rust in the ground system. Once the rust was removed the issue was resolved.



Electrical Generation Issue

Antique cars came with incandescent light bulbs. These bulbs will accommodate fluctuations in the electrical supply better than LED bulbs. Incandescent light bulbs will "turn on" at a low voltage. If the voltage is low, the light from the incandescent bulbs become dimmer.

LED bulbs require a minimum voltage to "turn on". If the voltage is too low they will not glow dim and will not "turn on". Once the minimum voltage is achieved he LED bulbs will turn on. As the voltage increases, above the minimum, the LED bulbs are less susceptible to flickering. This is why LED bulbs might tend to flicker when the car is idling and stop flickering when the engine running faster than an idle. At idle the generator/alternator allows the circuit voltage to drop.

Antique cars came with generators. Based on many antique car experts, a generator will, <u>in general</u>, produce less voltage fluctuations than an alternator. <u>In general</u>, people experience less flickering after replacing an alternator with a generator.

Alternators produce voltage fluctuations that vary based on the construction of the alternator. Vendors sell alternators that produce smaller fluctuations than the alternators sold by other vendors.

Most antique cars use Delco-Remy 10 System Integrated (SI) alternators to replace the generator. The 10SI alternator was introduced in 1969 and by 1973 most GM cars and light trucks used this alternator. GM used this alternator until 1988.

Here is how to identify a 10SI alternator.





This alternator initially came with a capacitor to smooth out the voltage fluctuations. A capacitor attached to the rectifier bridge will smooth out the voltage fluctuations. People feel this capacitor was installed to reduce radio interference when using AM radios. Without the capacitor, voltage fluctuations increase.



Here is what a capacitor looks like when installed in a 10SI alternator.

This same capacitor will work in a alternator set up for 12 or 6 volts positive or negative ground.

Most alternators sold for use in antique cars do not have this capacitor. If the alternator does not have this capacitor, there is nothing to absorb the high frequency, high voltage, pulses the alternator produces. These high frequency, high voltage, pulses can confuse the voltage/current converter inside the LED bulb. The converter thinks it has produced a higher voltage than it does and will momentarily shut down. This will appear as a flickering LED bulb.

Once you have verified that you do not have electrical circuit issue, then installing one of these capacitors may reduce or eliminate the flickering. There are YouTube videos available on how to work on Delco 10SI alternators. This capacitor is easy to install. There is a trick to holding the brushes in place when doing this work. The videos show how to hold the brushes in place.

Napa, eBay, or other sources sell this capacitor. If you have a local alternator shop, you might be able to purchase one there. The same capacitor fits Delco Remy, 10SI, 12SI, 15SI, and 27SI



The blue arrow points to the Delco part number.

	Alternator Capacitor for Delco DR 10 Condition: New Quantity: 1 5 available / 12 a	osi, 12Si, 15Si, 27Si (1.5Mf) 46-1106 ad
	Price: US \$8.75	Buy another Add to cart Add to Watchlist v
	1-year accident protection plan from Allstate - \$5.99	
$\left(\right)$	A seller you've bought from	Free shipping and returns
	Pickup: Free local pickup from Mlami, Fiorida, United States. I <u>Surdistatis</u> Shipping: FREE Expedited Shipping I <u>Surdistatis</u>	

Delco Remy (original manufacturer) no longer makes this part. However, there are aftermarket replacement parts available. This is a 1.5uF capacitor. When searching for this capacitor online, look for these part numbers:

Original part was a Delco 1988873

Alternate replacement part number 46-1106

NAPA replacement part number ECH AF107