

What's a Turn Signal Flasher?

The turn signal flasher (sometimes called “flasher relay”) is a switching device in your vehicle that is responsible for making your turn vehicle's turn signal lights flash. Except for special cases, the flasher is also responsible for making an audible clicking sound. The flasher may also directly or indirectly drive the dash-board turn-signal indicator (pilot light).

Where is the flasher in my car?

That really depends on my car. Very modern cars don't even have a flasher, instead it's all part of the car's on-board computer. But most cars have the flasher mounted either under the dash, or in the interior cabin fuse box panel (most cars have fuses under the hood as well as near the dash).

What about hazard lights?

Most vehicles use the same flasher for turn-signals as well as hazard lights, but some cars have one flasher *each*. To figure out if this is the case, you can remove whatever flasher you find and see if one or the other function is still working.

How is a flasher wired?

Using the simple 2-prong flasher as an example: One prong of the flasher (usually labeled **X**) is connected to the car's battery through a fuse (and possibly through the car's ignition switch). The other prong (**L**) is connected to the turn signal switch. If the turn signal switch is in the center position, no electricity flows. Once the turn signal switch is set to left (or right), the electricity flows through the turn-signal switch and into the bulbs (front/rear), and through the bulb to ground.

Additional prongs (beyond the 2nd) may be for ground, hazard, power or pilot circuitry, the details depend on the specific flasher model.

What's a Pilot circuit (P-Prong) ?

Some vehicles have in-dash bulbs that flash with the turn signal to indicate that the turn-signals are on. These are called Pilot Lights. If your vehicle has ONE pilot light that is shared for left/right, then the flasher needs a pilot circuit. It is simply a third prong on the flasher that is connected to the bulb in the dash. If your car has TWO pilot bulbs (one for left, another for right) in the dash, then the flasher does not need a pilot circuit: The two bulbs are wired in parallel (connected like) the turn signal bulbs: The left pilot to the left turn signal bulbs, the right pilot to the right turn-signal bulbs.

What's a Solid State flasher ?

A solid-state flasher has no moving parts inside. A solid-state flasher is, by definition, an *electronic* flasher (see below). A solid-state flasher, having no moving parts, usually does NOT make a clicking sounds (but still causes your turn-signals to cycle on/off). Also, solid state flashers are usually *not* capable of switching high currents (compared to a thermal flasher or a non-solid-state electronic flasher, and they may also “die” if there is a short-circuit. The main advantage of solid state flashers is that they have a much longer life, and they don't “wear out” with use: For vehicles where the flasher or hazard light is used a lot more than in a regular vehicle application, a solid-state flasher

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is a good idea. For example, a construction vehicle that has the hazard lights flashing for hours should use a solid-state flasher.

What's a *Thermal* vs. *Electronic* flasher?

The first flashers were *thermal* flashers (and they're still in use today).

A **thermal** flasher uses *heat* generated by the flow of electricity through the flasher to control the on/off timing cycle: As electricity flows through the flasher, a heating wire wrapped around a bi-metal switch inside the flasher heats this bimetal, causing it to bend "out of shape" and open the circuit, thereby interrupting the flow of electricity. Since no electricity flows through the heating wire, the bimetal cools down and returns to the original shape, eventually closing the circuit. This will cause electricity to flow again, and the cycle starts again, resulting in constant on/off flashing. The metal strip is constructed to "snap" as it bends back and forth, causing the clicking sound.

If you think about the above a little bit, try to imagine what happens when all your turn-signal bulbs are blown out: Without a functioning bulb, no electricity flows, so the heating wire does not heat, the bimetal doesn't bend, and the flasher will not click.

Here's another scenario: What if only the FRONT bulb (or only the rear bulb) is working? The amount of electricity that flows is LESS than what the flasher was designed for. The heating wire will heat up a lot SLOWER, so the flashing cycle will be a lot longer. To the driver, this will appear as SLOW flashing

Here's another scenario: Assume your car battery is on its last leg, or the alternator isn't charging properly, or you're drawing a lot of power running a 50 gigawatt stereo system in your car: The result is fluctuating voltage. As the voltage goes up, the heating wire will heat quicker (conversely, low voltage results in slow heating), causing your flash cycle rate to depend on those factors.

Finally, **thermal flashers do not work if you replace your regular (incandescent) bulbs with LED bulbs**: The amount of electricity used by LED bulbs is so small that the heating wire doesn't even warm up. The bi-metal switch will not bend and will not open the circuit. The symptom is that you (a) don't hear any clicking and (b) that your LED bulbs will stay on all the time.

This is where **electronic** flashers come in: They use an electronic, transistorized circuit (instead of the heating wire) to control the cycle-time. No bi-metal switch is used, instead the electronic circuit drives an internal relay (which switches the electricity on/off and creates a clicking sound). The flash rate is constant.

Some electronic flashers also come with "Lamp Out" warning circuitry. With a Lamp-Out warning, the flasher detects if a bulb has blown out (and sometimes even detects if ALL bulbs have blown out). Flashers with Lamp Out warning will start to flash very fast to alert the driver. You've probably been behind a car where the rear turn-signal flashes very fast: There's a good chance that the front turn signal bulb on that side is blown.

Electronic Flashers Are Polarity Sensitive, they require that the flasher socket is wired correctly (see additional info below). Some flashers will "go up in smoke" if the polarity is not correct, but all electronic flashers sold by memotronics are protected against reverse polarity. More information about polarity is provided later in this document.

Not all electronic flashers are LED compatible. When purchasing an electronic flasher, make sure it states that it is LED compatible. A flasher with lamp-out warning is **NEVER** LED-compatible.

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I put LED bulbs into my car, without replacing the stock flasher, and here's what happened...

(a) Everything appears to work fine: Good for you, your stock flasher is LED-compatible (maybe), but PLEASE, for the sake of safety, test this scenario by temporarily removing the front turn signal bulb. Is your rear signal bulb still flashing (either at the normal flash rate, or faster) ? If not, you have a safety issue. Put the front bulb back and remove the rear bulb. Is the front bulb still flashing? If not, you have a safety issue. **The front/rear bulbs should flash independent of the state of the "other" bulb.**

(b) The bulbs stay on all the time: Sounds like you have a thermal flasher, or a non-LED compatible electronic flasher. You need to get an electronic LED-compatible flasher.

(c) The bulbs flash fast (hyper-flashing): Your vehicle has an electronic flasher with lamp-out circuitry. The LED bulb appears to the lamp-out circuit like a blown-out incandescent bulb, it cannot distinguish between the two, so it "goes hyper". You will have to get an LED-compatible electronic flasher (and you will lose the lamp-out feature in the process).

OK, so explain / recap that whole LED thing again?

Rule #1: A **thermal** flasher will NEVER WORK WITH LEDs. The LEDs will stay on all the time because not enough "juice" flows through the LEDs to cause the heating wire to get hot.

Rule #2: An **electronic** flasher **will** work with LEDs **only if it is LED-compatible**. Not all electronic flashers are LED compatible. If you are using an electronic flasher that is not certified LED-compatible, it **may** work if all bulbs are intact, but fail completely if a bulb goes out. That is a major safety issue, so please do NOT use a non-LED certified flasher for LED (or mixed LED/incandescent) applications.

Rule #3: When purchasing an LED-compatible flasher that uses solid-state technology instead of relays then care should be taken that the switching power capability of the flasher is appropriate to the load. This is particularly important if you're only replacing the front (or only the rear) bulbs. All LED turn signal flashers sold by memotronics are LED **and** incandescent compatible, meaning that you can use our LED flashers to run an all-LED, all-incandescent or a mixed-mode configuration.

Electronic Flashers are polarity-sensitive. Huh?

As explained earlier, a **thermal** flasher has a simply heating wire / bimetal switch to "do the magic". The wire doesn't care which direction the electricity flows, it will happily work either way. However, electronic flashers require that the power (+ 12 Volts) comes in on the X prong, and goes out the flasher on the L-prong. This requirement (that the polarity is correct) is called "polarity sensitive".



EF33RL 3-Prong Flasher
Bottom View



EF32RL 2-Prong Flasher
Bottom View

Bottom view of a 3-prong electronic LED compatible flasher model EF33RL, and a 2-prong electronic LED compatible flasher EF32RL.

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If you purchased one of our electronic flashers, and “nothing happens” with that new flasher in place, then most likely the polarity at your flasher socket is wrong. Here's how to identify this, using a volt-meter:

- (a) Remove the new flasher from the socket. Look at the bottom of the flasher, the prongs should be marked X and L.
- (b) Hold the flasher *near the socket, as if you are about to plug it back in*. That should allow you to identify the X and L terminals of the socket.
- (c) Use a volt-meter, set it to the 20V range and **put the red probe into the sockets' X terminal**, and the black probe to the car's ground. With the ignition turned on (even with the turn signal switch turned off), you should read +12 Volts on the voltmeter. If this is **not** the case, then your socket is probably wired “backwards”. To confirm this, move the red probe of the meter to the L terminal, and you'll probably find that you will read +12 Volts on the meter.
- (d) If you don't get +12 Volts on EITHER prong, then you've got a blown fuse or forgot to turn your car on !

OK, so my polarity is wrong, now what? There are two solutions...

- (a) **Rewire your socket**, this is usually fairly easy to do if your socket is “stand-alone” (i.e. not part of a huge fuse/relay block).
- (b) You can **use a wire-harness** that runs between the socket and the flasher. This is called a “polarity reversal harness” (short: “reversal harness”). It has a “plug” on one end that plugs into your existing socket, and two (or three) insulated wires that can be connected to the flasher's prongs. If you have the time (and tools), you can make this yourself using standard fast-on (spade) connectors (should be insulated connectors), alternatively you can purchase them from memotronics (part # EF2C for 2-prong flashers, or EF3C for 3-prong flashers). You can then use a mounting bracket (part # BR1) to mount the flasher near the original socket.

Keep in mind that this solution may not work if your flasher is mounted in a fuse-box with a sealed lid unless there is sufficient space to locate the flasher inside that box.

For 3-prong flashers, the socket end of the EF3C harness will need to be re-wired.



EF3C Reversal Harness – 3 Prong



EF2C Reversal Harness – 2 Prong



BR1 Flasher Mounting Bracket