Motorcycle Headlight Flasher

Retrofit accessory makes motorcycles more visible to other traffic to reduce accidents

By James H. Brown

As more and more cars are on the road, motorcyclists are increasingly exposed to being hit head-on or by a vehicle sharply moving in front of them from another lane. Such risk is especially great at night, even with a headlight shining, probably because the cycle's silhouette is relatively small.

To capture other drivers' attention, a headlight flasher can be used when traffic gets heavy. The one presented here can change a headlight's constant-on operation at the flip of a switch to causing the light to flash about 1.5 times per second. Another switch toggle, and the cyclist restores the constant-on headlight mode.

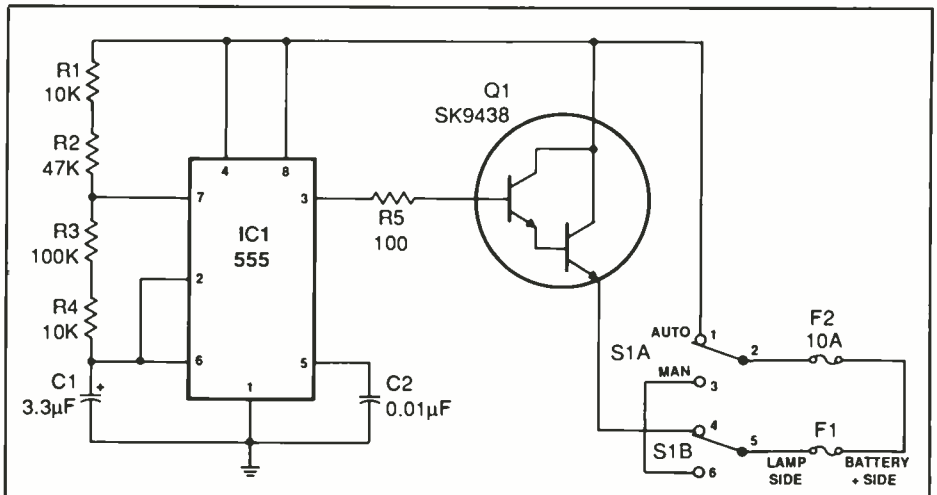
About the Circuit

Shown in Fig. 1 is the complete schematic diagram of the Motorcycle Headlight Flasher circuit. The main elements in this circuit are 555 timer *IC1* and SK9438 power Darlington transistor *Q1*. The timer is configured to operate as an astable oscillator at a frequency of approximately 1.5 Hz. Duty cycle or on time of the oscillator is roughly 0.25 second, which is also the on-time of the motorcycle's headlight during each oscillator cycle. The project can be operated either manually or automatically, depending on the position to which switch *S1* is set.

The Flasher connects to the "hot" or + side of the motorcycle's electrical system across a blown (or otherwise open) fuse, identified in Fig. 1 as *F1*, via the toggles at lugs 2 and 5 of *S1A* and *S1B*. The circuit is completed to chassis ground via a separate wire. This arrangement makes it easy to install the Headlight Flasher without requiring you to modify your motorcycle's headlight wiring harness. Simply pull out the good headlight fuse and replace it with an open fuse, making sure the toggle side of *S1A* and fuse *F2* are across the + 12-volt bus.

With *S1* set to AUTO (automatic), drive power for the motorcycle's headlight is through *Q1*, which is turned on and off as the square-wave output signal from pin 3 of *IC1* toggles from approximately + 5 volts to ground.

Setting *S1* to MANUAL completes the return side of the headlight circuit to the positive (+) side of the motorcycle's electrical system and keeps the headlight on continuously.



PARTS LIST

Semiconductors
Q1—SK9438 or equivalent Darlington power transistor
IC1—555 timer

Capacitor
C1—3.3-µF, 25-volt tantalum
C2—0.01-µF, 50-volt ceramic disc

Resistors (¼-watt, 5% tolerance)
R1,R4—10,000 ohms
R2—47,000 ohms
R3—100,000 ohms
R5—100 ohms

Miscellaneous
F1—Fuse holder in motorcycle's headlight circuit and blown fuse (see text)
F2—In-line fuse holder or chassis-mount fuse block
S1—Heavy-duty dpdt switch (Radio Shack Cat. No. 275-652 or similar)
Printed-circuit board or perforated board with holes on 0.1-inch centers and suitable soldering or Wire Wrap hardware; suitable enclosure (see text); heat sink for Q1; socket for IC1; ½-inch spacers; stranded hookup wire; solder; etc.

Fig. 1. Complete schematic diagram of project.

Construction

Because of the simplicity of its circuitry, this is a very easy project to build. With nothing critical about component layout, you can use any traditional construction technique that suits you. If you wish to fabricate a printed-circuit board, use the actual-size etching-and-drilling guide shown in Fig. 2. Alternatively, you can use perforated board that has holes on 0.1-inch centers and suitable Wire Wrap or soldering hardware to build the circuit. Regardless of the wiring techniques chosen, it is a good idea to use a socket for the 555 Timer Chip.

We will assume in this article that you are wiring the project's circuit on a pc Board and direct our description of the construction procedure to this. With the board oriented as shown in Fig. 3, plug an 8-pin DIP socket into the IC1 location and solder it into place. Be careful to avoid creating solder bridges between the closely spaced copper pads on the Bottom of the Board as you solder the socket into place. Do *not* plug the 555 IC into the socket until after preliminary voltage checks have been made.

Once the socket has been installed on the board, install and solder into place the resistors and then the capacitors. Make sure that *C1* is properly polarized before soldering its leads to the pads on the bottom of the board. Double check the circuit-board assembly for correct wiring and component placement. Then plug the 555 IC into its socket. Make sure the chip is properly oriented and that no pins overhang the socket or fold under between IC and socket as you push the 555 home.

The entire project, except for *F1*, *F2* and *S1*, can be housed in any enclosure that will accommodate the circuit-board assembly, the transistor on its heat sink, and fuse *F2* in its holder. An ordinary plastic project box that has a removable aluminum panel is a good choice, as is an all-metal utility box. The metal of each provides a convenient mounting base for the transistor's heat sink and helps in dissipating heat.

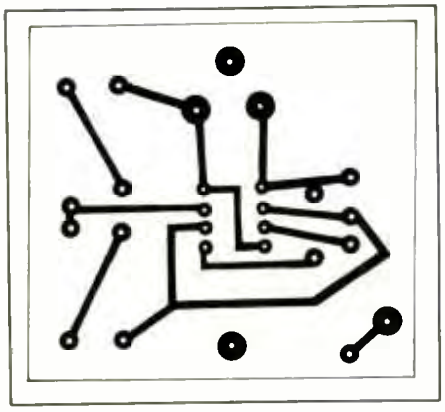


Fig. 2. Actual-size etching-and-drilling guide for fabricating a printed-circuit board for the project.

Drill mounting holes for the circuit-board assembly, the Darlington power transistor and its heat sink (and the fuse holder for *F2* if you do not use an external in-line fuse holder for it), and entry holes for the wires that go to the switch, *F1* and chassis ground. If any of these holes is drilled through a metal panel, deburr them to remove all rough edges, and line the entry hole for any wires with a small rubber grommet to protect the wires from abrasion that can cut through the insulation and cause a short circuit.

When Darlington power transistor switches on, it conducts a fairly high current that results in rapid heating. To prevent the transistor from burning up due to thermal runaway, make certain you mount it on a fairly hefty heat sink that, in turn, mounts on the outside of the enclosure. Also, make sure to electrically insulate the transistor from the heat sink with a mica or plastic spacer and shoulder fiber washers designed for this purpose. Liberally coat both sides of the insulator with thermal-transfer grease or paste before placing it between the transistor and heat sink.

Solder a 3-inch length of stranded hookup wire to a ring lug and place the lug under the head of one of the two screws that secure the transistor to the heat-sink. The wire connected to the ring lug serves as the means for connecting the transistor's collector into the circuit. Connections to the emitter (E) and base (B) pins of *Q1* are made by directly crimping and soldering 3-inch hookup wires to them and insulating the connections with small-diameter heat-shrinkable or plastic tubing.

Determine how long the interconnecting wires between the circuit-board assembly and all other components must be and cut each to length. (Note: Because of the mechanical stresses which the project will normally be subjected to on the road, all wiring except for the short link that bridges lugs 3 and 6 of the switch must be *stranded* hookup wire. After cutting each wire to length, strip ¼ inch of insulation from both ends. Tightly twist together the fine conductors at both ends of each wire and sparingly tin with solder. Use bare solid hookup wire or cut-off resistor or capacitor lead for the link between lugs 3 and 6 of the switch.)

Pre-wire the switch as shown in Fig. 3. For the connections to lug 1 of the switch, you can use either two wires that run the full length between the switch and circuit-board assembly and collector of the transistor (as shown) or run a single full-length wire from the switch to the transistor's collector and another shorter wire from here to the indicated hole in the circuit board.

Once the switch is wired, mount it in whatever location you have chosen for it on your motorcycle. Route the wires from lugs 1, 2 and 4 to where the project's enclosure will be mounted. Choose a protected location. Then pass the three wires from the switch through the holes drilled for them in the enclosure. Depending on how the wiring is done to the collector of the transistor, either plug the free end of the wire connected to

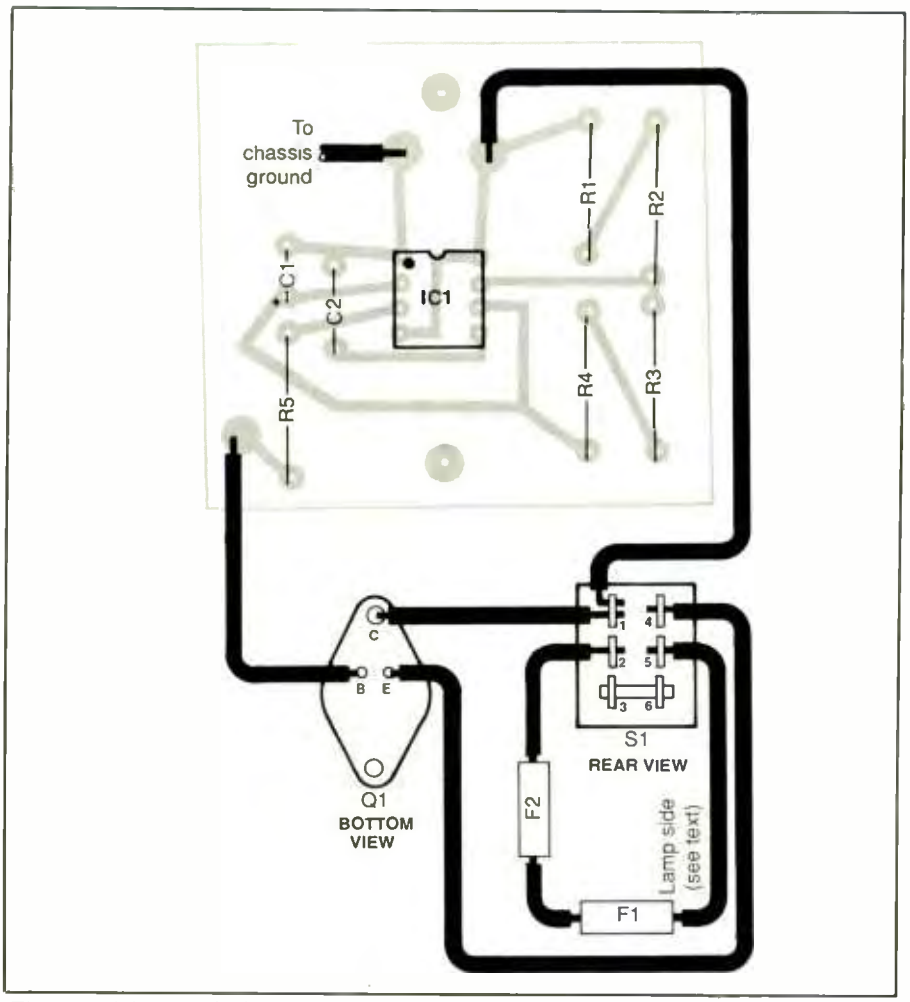


Fig. 3. Wiring guide for pc board. The switch, transistor and fuse holders mount off the board and that F1 *is actually the headlight fuse holder in your motorcycle's electrical system.*

lug 1 of the switch into the circuit-board hole labeled CHASSIS GROUND and solder into place, or crimp and solder it and a shorter wire to a ring lug and secure the lug under the head of one of the screws that mount the transistor in place on the heat sink and plug the short wire into the indicated hole and solder into place.

If you are using an internal chassis-mounted fuse holder for it, route the wire that goes to *F2* through a hole in the enclosure and crimp and solder its free end to one lug of the fuse holder. Otherwise, wire an external in-line holder for this fuse. Prepare another wire to interconnect *F2* with *F1* (the latter is the fuse that already exists in your motorcycle's headlight system). Route one end of this wire into the enclosure and crimp and solder it to the other lug of the *F1* fuse holder.

Prepare a 12-inch or so length of hookup wire as described above. Terminate one end of this wire in a No. 6 chassis lug. Feed the other end through a hole in the enclosure, plug it into the CHASSIS GROUND hole in the circuit-board and solder into place.

Remove the fuse from the headlight circuit of your motorcycle and plug it into the fuse holder inside the project. Mount the circuit-board assembly into place on the floor of the enclosure with ½-inch spacers and suitable 4-40 machine hardware, using toothed lockwashers between the screw heads and enclosure and nuts and circuit-board assembly. Then mount the project into place inside the motorcycle's fairing.

Terminate the free ends of the two remaining wires that go to *F1* in ¼ × ¾-inch strips of sheet copper. Alternatively, strip an additional ¼ inch of insulation from the ends of these wires and tin the exposed conductors with solder and hammer both flat. Wrap the copper or flattened conductors around the metal caps of a blown fuse of the same physical dimensions as the one you removed. Plug this fuse into the vacated holder on your motorcycle, making sure that the one that goes to *F2* is on the +12-volt—not the lamp—side of the cycle's fuse holder.

The easiest way to keep the project's enclosure from moving around in your motorcycle's fairing is to use VelcroR hook-and-loop strips. However, you can use metal clamps and suitable hardware if you desire a more permanent installation. If you do this, shock mount the project with a strip of foam rubber between it and the fairing.

Checkout & Use

Plug the ignition key into the motorcycle's keyswitch and turn it to the ACC (accessory) position. At this point, the motorcycle's headlight will be flashing or be on continuously. If the light is flashing, label the position of the toggle on the project's switch as AUTO and the other position as MANUAL. Obviously, if the headlight is continuously on, reverse the switch labeling, but make sure first that in the alternate position of the switch the headlight does, indeed, flash as it should.

Operation of the project is as simple as turning on your motorcycle's ignition and flipping the switch to the desired position.