Automatic Back–up Lights for Fairmont MT Motorcars.

by Kenneth Huffines

Some motorcars have two sets of head and taillights—one set for forward movement, one for reverse. Choosing which lights are on is usually done with one or two switches. This how–to will describe a way to have the lights automatically switch from forward to reverse. I have this modification on my Fairmont MT-19 and it's worked perfectly for over three years. You can probably adapt it to other makes and models as well.

The heart of the system consists of a lever–type microswitch that is activated when the transmission's direction lever is placed in reverse. The switch causes a relay to activate, turning off the forward lights and turning on the reverse lights. When the direction lever is in neutral (or forward), the microswitch is released and the relay releases, returning the lights to the normal forward set.

We'll also be adding a second relay that is activated by the factory "lights" switch on the motorcar's control panel. This switch takes the load off the lights switch and provides power to any roof–mounted beacons or strobes which stay lit regardless of the motorcar's direction.

A word on the relays—while it's possible to avoid them, it puts the whole lighting load on the switches. Most switches do not handle DC current very well and are subject to failure, especially as more lights are added. The automotive–type relays we'll be using are inexpensive, small, easily mounted, and excellent for switching heavy DC currents. They are perfect for today's motorcar.

Before we start I should explain that the wiring diagram shows my car's lighting system. I have three headlights and four taillights for forward motion. For reverse I have one headlight and one taillight. I also have a beacon that's on whenever the headlight switch is on. Your motorcar may have a different number of lights and may not have a beacon (or strobe). So if you don't have the same number of lights, don't panic, just adjust as needed. Whether that means crossing lights off the diagram or adding lights to your speeder is up to you.

It's also worth mentioning I have brake lights front and rear. They all light upon brake application and are not switched for the motorcar's direction. So far this hasn't confused anybody, and I've even had operators ahead of me comment they like knowing I'm on the brakes as I come up behind them.

For this project you'll need two relays, their matching sockets, and one lever–type microswitch. A terminal block (a.k.a. terminal strip) makes wiring easier. I suggest you add a fuse to the circuit. We'll be using the original lights switch on the motorcar's control panel. Most of the parts are available from All Electronics Corporation or other electronic supply houses. I like All because they're inexpensive and have a low minimum order. Their drawback is, as a surplus house, the inventory sells out. It's possible the specified parts may be unavailable by the time you place your order, but chances are they will have something similar. Because All's sources change (or you use another supplier) and each manufacturer has their own way of marking parts, details for switches and relays are given so you will understand how to compensate if you get something slightly different.

All Electronics Corp.
P.O. Box 567
Van Nuys CA 91408,
(toll free) 888-826-5432.

Chances are you'll have to bend the microswitchs lever to fine–tune. (I had to bend mine quite a bit.) The goal is to have the switch toggle when the transmission is in reverse without smashing the switch's lever against its body (which may break the switch or bend the lever out of adjustment). The switch lever should not touch the direction lever when in neutral or forward.

The relays can mount anywhere using 6–32 hardware. The terminal block should be close by (use 4–40 hardware). All my electrical components are mounted on an aluminum plate on the left side of the engine tunnel. Mount the relays and terminal block close together and you won't have to splice extra wires from the relay sockets. Jumpers between sections of the terminal block can be 14–gauge wire.

The wires that carry high current need to be large and are indicated on the wiring diagram. Skimping on wire size will cause a voltage drop, resulting in hot wires and dim lights. Wires with no size indicated can be 18–gauge. The relay sockets use 14–gauge for the contacts, if you extend those wires be sure to use the same size (or larger).

The normally closed contact of the headlight relay is not used. Cap that wire with a butt spice, wire nut, or good electrical tape to keep it from shorting out on something.

Don't forget to fuse the circuit. Choose whatever style fuse your motorcar already uses. To get the amperage, add up the number of watts in the lighting circuit and divide by 12, then choose the next highest rated fuse. Any automotive supply house carries fuse holders and fuses. (Or you can use a circuit breaker.) The supply side should go to a good source of 12 volts. On my motorcar, this was the positive post of the ammeter (before I completely rewired the car, anyway).

Circuit verification and Troubleshooting

Double–check the wiring before restoring power. Hopefully everything will work right away. If not, start troubleshooting by insuring the lights switch on the control panel makes the headlight relay energize. The relay should click, and you might feel it if you have a finger on it. If the relay is not working, check the wiring from the battery through the fuse, lights switch, and the relay coil. If you have instrument backlights, they should turn on with the lights switch, verifying power is getting through the switch.

If the relay works but the beacon does not, check the wiring from the fuse to the relay's common contact and out through the normally open contact to the beacon.

If the headlight relay is working, move on to the forward / reverse relay. Goosing the reverse switch should cause the relay to energize. If not, follow the wiring from the headlight switch, through the reverse switch, and to the relay coil. Possible trouble could be miswiring the reverse switch.

When both relays are working check the front and rear of the motorcar to insure the front headlights and rear taillights are on with the shift lever in neutral. Now move the lever into reverse and check for rear headlight and front taillight. Problems here will be wiring errors at the terminal block or relay contacts.

Microswitch and Relay Details

The microswitch in the parts list is single pole, double throw (SPDT). Be sure to use the contacts that close when the lever is depressed: common ("C" or "COM") and normally open ("NO"). See figure 4. The switch terminals are often marked.

The relays are usually marked with a diagram, referring to the terminals with (usually standardized) numbers. Figure 5 shows the current offering from All. Terminals 85 and 86 are the coil. Terminal 87 is the normally open contact, 87d is the normally closed, and 30 is the common. "Normally" means "with power off." The coil is not polar

Also needed is a small piece of flat metal stock, wire of various gauges, 4–40 and 6–32 screws, nuts, and lock washers, and the usual assortment of butt splices and .250 or .187 fast–on and #6 fork terminals that are in every handyman's electrical kit. Tools you need are basic: drill and bits, hacksaw, wire crimping tool, screwdrivers, and wrenches. Total cost will be under $40.

Circuit operation

See Figure 1 for the wiring diagram. Power feeds through the fuse to the original lights switch and to the contacts of the headlight relay. The lights switch turns on the headlight relay, switching power to the roof–mounted beacon (or strobe) and to the forward/reverse relay. Power for the backlights (should you have them) on the Ammeter and Oil Pressure Gauge comes directly through the headlight switch, simplifying wiring a bit as the switch and the gauges are close to each other.

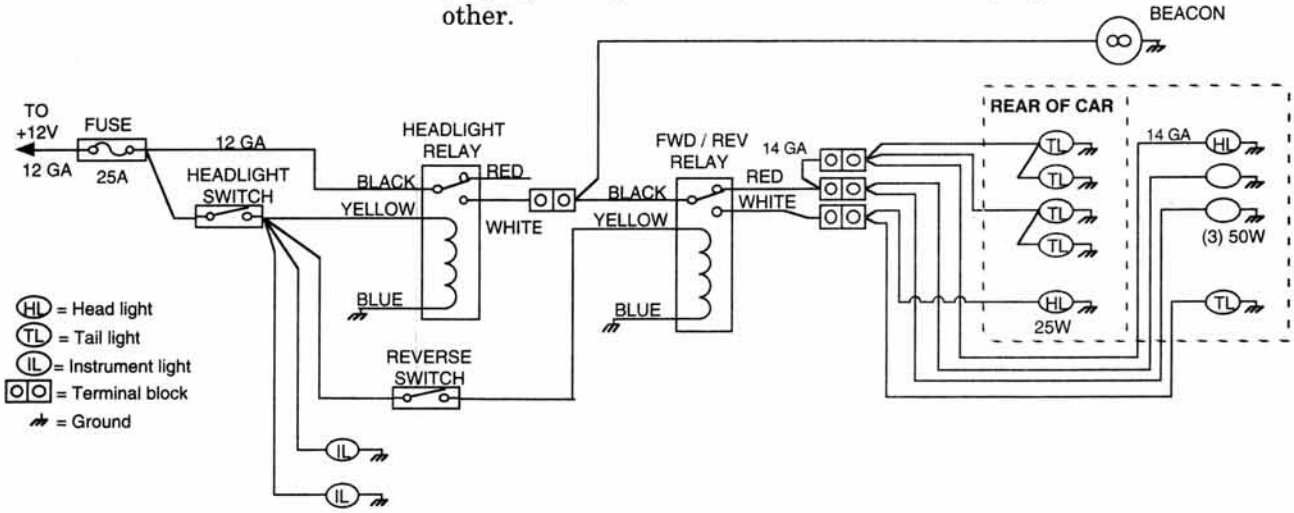


Figure 1 - Wiring Diagram

The forward/reverse relay determines which set of lights are on. It is triggered by a microswitch that detects when the transmission's direction lever is in reverse. The output of this relay is routed to a terminal block which serves to distribute power to the head and taillights.

Fabrication

Be sure to disconnect the battery before you start wiring. Start with the microswitch bracket shown in figure 2. The small holes are the standard pattern for this size microswitch, but you should double-check your switch in case it's different. Use 4–40 x 3/4–inch screws for the switch and don't over–tighten or you may crack the switch—it's just plastic. Use the upper left transmission cover bolt to hold the bracket. Figure 3 shows the bracket and switch installed.

Figure 2 - Switch Mounting Plate
Matl.: 1/8" aluminum or 1/16: steel.
A=1/8 dia. hole (2 places)
B=3/8" dia. hole (1 place)
Dimensions in inches.

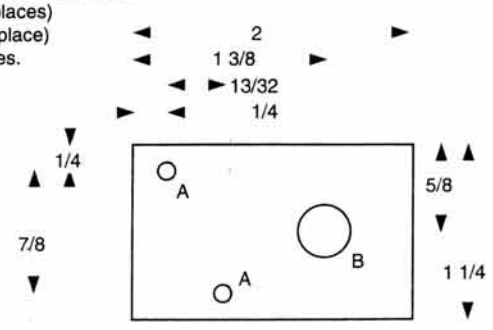
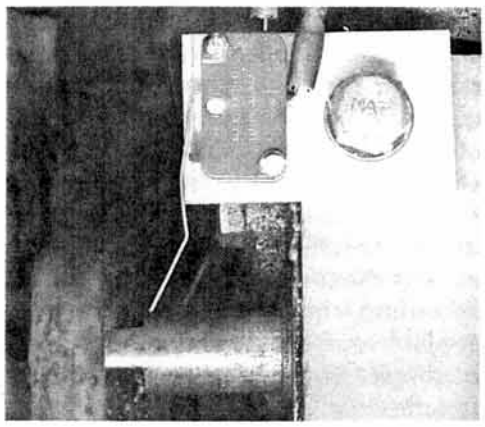


Figure 3



Microswitch and Relay Details, cont.

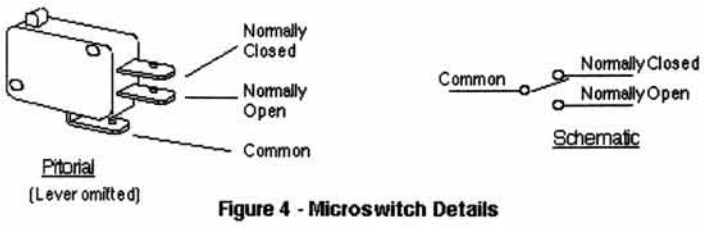


Figure 4 - Microswitch Details
(Use the Common and Normally Open ccontacts)

ity sensitive. If you get the current relay sockets, the blue and yellow wires are the coil (85 and 86), white is the normally open contact (87), red is the normally closed (87d), and black is the common contact (30). Again, you will want to check your parts against the diagram in case any of the colors or terminal numbers have changed.

Conclusion

Automating the forward/reverse light selection relieves the operator of that duty and insures the correct lights will be illuminated and as such, it improves safety.

Parts List

A piece of flat 1/8" aluminum or 1/16" steel 2" by 1 1/4" is required for the microswitch bracket.

The electrical parts are available from All Electronics Corporation, P.O. Box 567, Van Nuys CA 91408, (toll free) 888-826-5432. The part numbers given here are current as of this writing (February 2003).

Microswitch: All Electronics SMS-196 ($1.60), a single pole, double throw (SPDT) switch. If it is unavailable look for either a single pole, single throw, normally open (SPST NO) or another single pole, double throw (SPDT). Get one with the longest lever available. (The lever can always be cut down if it's too long.) Consider buying two switches just in case you break one during assembly.

Relay: All Electronics RLY-351 ($2.40), a SPDT relay rated 30 amps. A spare relay is good to have. (Check your car or truck - chances are they use this exact relay and they're a heck of a lot cheaper here than from your dealer.)

Relay Socket: All Electronics SLRY-2 ($2.00). The sockets come ready to go with wire attached.

Terminal Block: All Electronics TB-35 ($2.70) or similar. This is a 12-position block. The extra positions can be can cut off.

Fuse holder and fuse (or circuit breaker): available at your local auto parts store.