

ELECTRIC COOLING FANS

Figure 1 below shows my recommended method for adding an electric cooling fan to your car. It has both a manual and an automatic mode of operation. In the automatic mode, the fan will only run when the thermostat is on *AND* the ignition key is in the "run" or "start" position. In the manual mode, the fan can be operated with the key switch on or off, and the thermostat is bypassed.

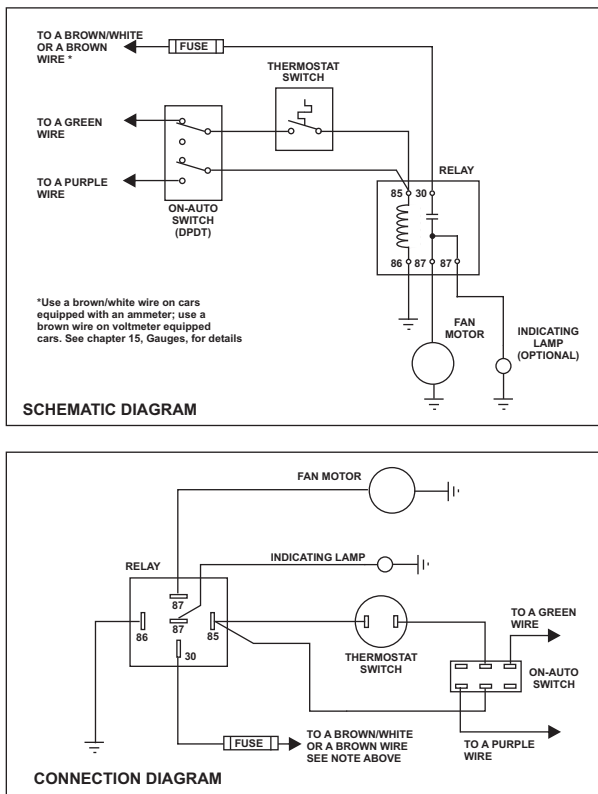


FIGURE 1:

INSTRUCTIONS AND PROCEDURES

1. The relay can be mounted anywhere that is convenient. The only criteria that is of any concern (other than protection from physical damage) is the **TOTAL** length of wire from the brown (or brown/white) wire to the relay and then from the relay to the fan motor. This length should be kept short, but as long as you use the proper size wire, it is not really important (assuming you don't intend to mount the relay in the trunk!). In my car, I bought a relay with a metal mounting tab, bent the tab and mounted the relay under one of the screws that fasten the existing relays to the bracket under the hood. See **photo 1**, page 143, for details.

2. Connect pin 30 of the relay to a brown/white wire in a car with an ammeter (this is so that the ammeter will read correctly), or to a brown wire in a car with a voltmeter. The wire I've shown as a brown wire should be connected directly to the battery if your car has a voltmeter. If you have an earlier model with an ammeter, connect the wire I've shown as brown/white to the alternator side of the ammeter if you wish to have the ammeter read correctly. See chapter 15, Gauges, for details on this.

3. The fuse in the lead to the brown (or brown/white) wire **MUST** be placed as close to the connection to the brown (or brown/white) wire as possible. If you do this, the remainder of the wire will be protected, and routing becomes less critical. **HINT:** If you detest un-necessary splices as much as I do, you might try this trick. I buy heavy duty in-line fuse holders from the auto parts store and modify them to suit my purpose. I cut the leads off to about an inch and strip off all the insulation. Next, I remove the fuse contacts, and the wire, from the holder. I place the contacts in a vise and spread the wire strands out in a fan shape. Using a pair of needle nose pliers, I pull the center strand out of the crimp on the contact. After a few of the center strands are removed, the rest come out easily. Once all the wires are removed, I spread the crimp just a little, and insert the end of the wire I wish to use and recrimp, followed by soldering. This way, I get an in-line fuse holder with the correct color coded wires, and each wire long enough to reach the rest of the circuit without splices.

4. The wires used from the brown (or brown/white) wire to the relay and from the relay to the fan should be sized to carry the rated current of the fan with a little margin. I would use 12 gauge -- good for 20 amps -- unless you are using a real horse of a fan.

5. The fuse **MUST BE NO LARGER** than the current rating of the wires used in 4). See chapter 7, Fuses, for details.

6. If you wish to use the optional indicating light, you will have to use the same size wire for the light as you use for the fan motor to ensure that it is properly fused (or add a second fuse in the wire to the light, sized to suit the wire gauge. This fuse will have to be sized not larger than the current rating of the wire, and placed as close to the relay as possible). If you prefer, you could connect the indicating lamp to terminal 85, along with the other two wires. This way, no special precautions are required, other than listed in 8) below. Wired this way, the light will tell you that the fan is "supposed" to be on, but not that it is

actually running. The fuse could be blown and you would still get an ON indication, even though the fan is not powered.

7. When you connect to the green and the purple wires, you can use *ANY* Green or *ANY* Purple wire you find, whichever of these wires is most convenient for you to connect to. Same for the Brown (or Brown/White) wire.

8. Use at least 14 gauge wire for the connections to the green and purple wires, and you won't need to use a fuse in these leads, as the green and purple wires are already fused.

9. You **MUST** use a DPDT switch; otherwise, if you have the switch in the ON position and the thermostat switch comes on, the effect is the same as having the ignition key on. In this instance, power would be back-fed from the purple wire through the two switches and then back to the green wire. Since the green wire is connected to the ignition switch, all the loads fed from the ignition switch via the green wires would be powered. By using a DPDT switch, wired as shown, the green wire is disconnected from the thermostat switch when the DPDT switch is in the ON position.

10. There is a problem with the labeling of terminals on relays. They are not consistent in how the 87 terminals are labeled. If you buy a relay with four terminals, there is no problem, but if you buy one with five terminals, the "center" terminal may be labeled 87, or 87a or 87b, depending on who makes it. Sometimes the center terminal, regardless of its label, is a "normally closed" or NC, contact i.e., connected to terminal 30 when the relay is OFF, and disconnected when the relay is ON. The only way to be sure is to look at the diagram on the side of the relay case to see that both the center and the other 87 (or 87a or 87b) terminal are closed only when the relay is energized. Luckily, it is very rare to find a relay with the center terminal as a NC in an auto parts store (I have to special order them, and about half the time, I get the wrong ones!). See chapter 9, Switches, Relays, and Solenoids, for details on this.

11. If you buy a relay with four terminals, and still wish to use the optional indicating light, just connect the wire to the light to the same terminal (87) as the fan motor. The same requirements in 6) still apply.

12. The physical configuration of the DPDT switch as shown in the connection diagram is not important -- only that it looks like that shown when the wiring is completed. Wired one way, the fan will be ON with the switch handle in the down position: wired the other way, the fan will be ON with the switch handle in the up position.

14. If you buy the ON-AUTO switch at an auto parts store, it will almost certainly have three positions - ON-OFF-AUTO. If the third position is undesirable, you will have to go to an electronics store, such as Radio Shack. The

only problem with this is that their switches usually don't suit an automobile very well, from an esthetics standpoint. You might want to hide it under the dash somewhere.

OPTIONAL CIRCUIT

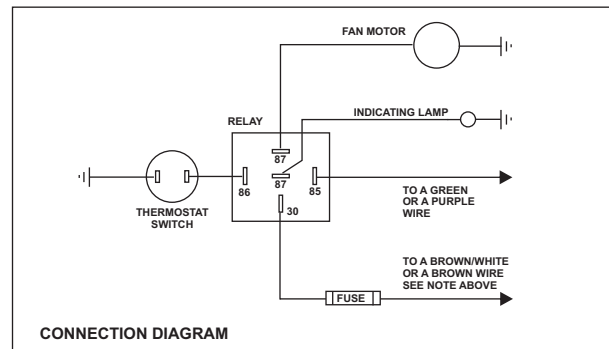
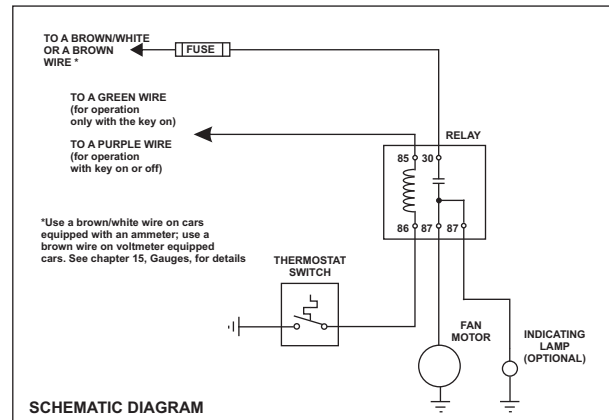


FIGURE 2: these two diagrams are for installations where the fan has no manual override control.

You may prefer not to use the manual-auto switch, but just wire the fan relay directly to the thermostat, as shown in **Figure 2** above. This method may be necessary if you are using one of the thermostats that screw directly into the engine block or radiator. In this case, the body of the thermostat is grounded, so the manual/auto scheme won't work.

The general procedures and cautions mentioned above also apply to this circuit, except you can use a smaller wire from the relay to the thermostat. This wire only carries the small relay coil current, and grounds the relay to operate. Should this wire short to ground, the only side effect is to operate the relay, turning on the fan - not a serious problem.