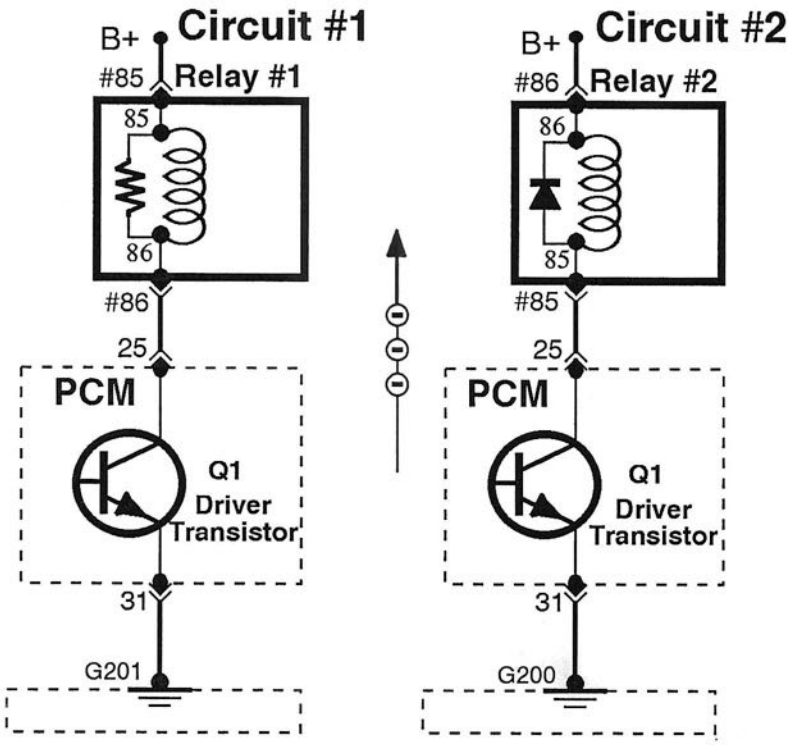
"The Hidden Danger with Relays

Introduction: Below are 2 plug-in relay circuits, Circuit #1 and Circuit #2. Both relay coil *sockets* are wired into the electrical system connecting to socket pins #85 and #86. The relay is energized "turned ON" with electron current provided by transistor, Q1, in the PCM. Direction of coil electron current through the circuit is shown going up the circuit. Relay coils create an electromagnetic field as electron current passes through the coil, which moves the relay contacts (not shown) to CLOSE. Coil current is stopped to "turn OFF" or de-energize the relay and the moving contact returns to the rest position. The collapsing coil's electromagnetic field creates a brief but powerful "energy dump" which must be dissipated with a resistor or diode across the coil, as shown below inside Relays #1 and #2. A resistor or diode across the coil protects the computer's transistor driver from the energy dump spike.

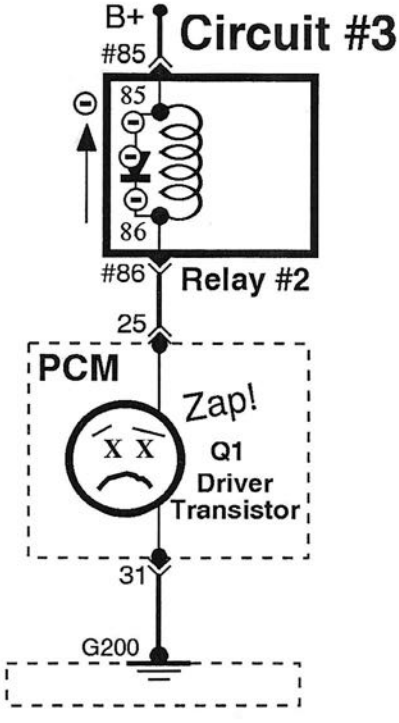


In Circuit #1: The wire harness connects wires to the relay *pin socket terminals.* Pin #85 (outside the relay) connects with B+ and Pin #86 (outside the relay) connects the coil to PCM Pin 25 for PCM relay coil control on the ground side. Always plug-in a relay with resistor suppression. Relay circuit works fine as the resistor across the coil dissipates the energy dump and protects Q1 in the PCM.

In Circuit #2: The wire harness connects wires to the relay *pin socket terminals.* Pin #86 (outside the relay) connects with B+ Pin #85 (outside the relay) connects the coil to PCM Pin 25 for PCM relay coil control on the coil ground side. Always plug-in a relay with diode suppression. Relay circuit works fine as the diode across the coil dissipates the energy dump and protects Q1.

This is the problem!!
Relay #2 (diode suppressed) CANNOT be plugged into Circuit #1 which is designed for resistor suppression.

Circuit #1 is wired for a relay with a resistor for spike suppression. Pin #85 is wired to B+, that's OK because a resistor can conduct electron current in either direction. It doesn't matter which coil socket pin, #85 or Pin #86, connects to B+ when a relay coil has resistor suppression.



Circuit #3:

In Circuit #3, a relay with diode suppression is accidentally plugged into Circuit #3 where Pin #85 connects to B+. The suppression diode draws maximum current and quickly destroys transistor Q1 in the PCM. This is because electron current, **always flows against the arrow** in a diode.

WHAT TO DO FIRST:

Before plugging in another relay with unknown spike suppression, (resistor or diode) always check the voltage at Pins 85-86. If Pin #86 in the relay socket has B+ (12.6V) it is safe to use a relay with diode suppression. If Pin #85 has B+ DO NOT PLUG IN A RELAY WITH DIODE SUPPRESSION. It will destroy the computer. A relay with resistor suppression is always OK.

Want to know more?
Veejer's 60 Lesson **"Vehicle Electronics Training Course"** has Lessons 29-30 Inductors; 32-33 Coils; 38-41 Relays; 42-60 Diodes, Transistors, Spike Voltage Suppression, Digital Electronic Circuits, Sensors.

Figure 05-2026 "The Hidden Danger With Relays