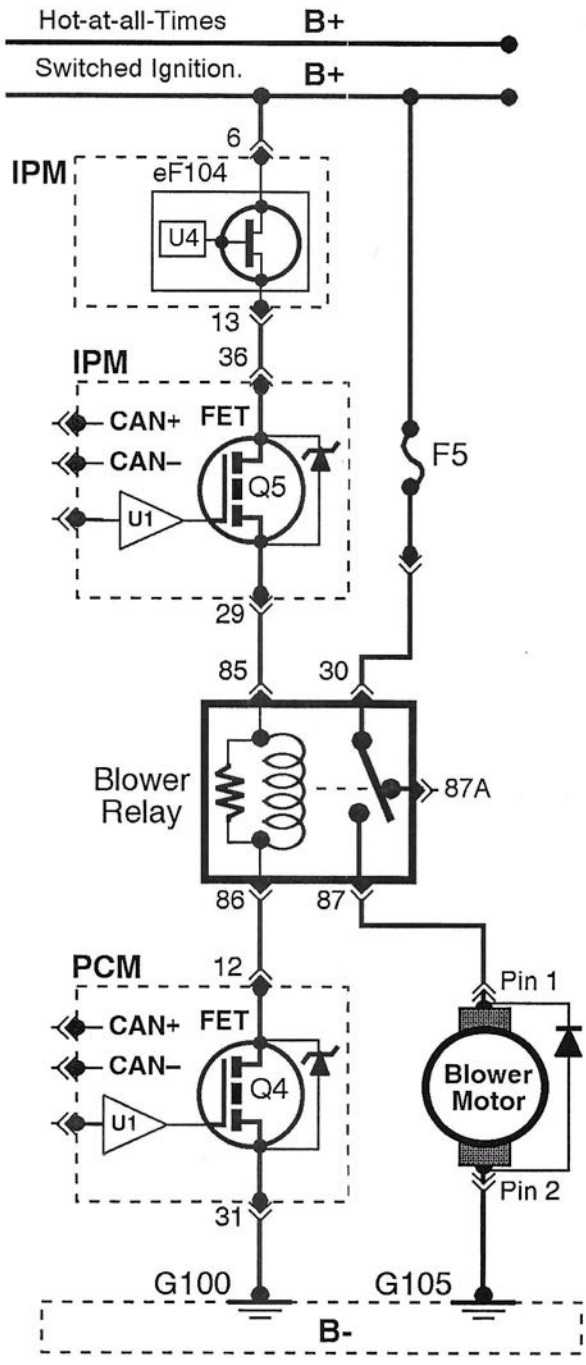
Changing Times in Electrical Systems

Overview

In the "old days," that is **B.C. Days** (**B**efore **C**omputers), electrical work centered around battery, generator and starter motor repair and/or replacement, repairing damaged wiring, replacing burned out lamps, coils, solenoids and blower motors. Most electrical prroblems could be diagnosed with a Test Light. As customers wanted more creature comfort accessories, such as heated seats, and sound systems, etc., they resulted in more complicated electrical circuits using mechanical relays. Then the alternator contributed to a new surge in vehicle technology that required diagnosis with an analog (swing-needle) VOM (volt-ohmmeter-meter). Older techs began to retire and younger ones realized they would need some additional electrical training in electrical-electronics.



Then, new car model years 1979-1981 sent shock waves through the vehicle repair industry. Vehicles came with an Engine Control Computer, known as an **ECM** (**E**ngine **C**ontrol **M**odule). This device contained sensitive solid-state (transistor) circuits. Performing electrical work was difficult enough but now technicians needed more understanding of electronics and how to use a **DMM** (**D**igital-**M**ulti-**M**eter). Technicians with electrical troubleshooting skills began to adapt. Those without electrical skills had trouble making the leap working with electronic systems.

At the left is the schemation of a Mechanical Relay wired to control a DC Motor. This circuit is an example of an advanced relay control circuit using two different on-board computers to control (operate) the relay. The **IPM** (Integrated Power Module) controls the voltage side of the relay coil. The **PCM** (Powertrain Control Module) controls the ground side of the relay coil. This is the same circuit control method used in our earlier circuit example of Fig 02, where two switches must be activated at the same time to control the load. Computers here replace manual switches.

In this circuit both the **IPM (Q5)** and the **PCM (Q4)** must operate (turn ON) at the same time to create an electron current to flow through the relay coil, located bewteen, Pin 85 and Pin 86. (Draw the path of electron current through the relay coil.) Electron current through IPM (Q5) and PCM (Q4) energizes the relay coil and causes Relay Pin 30, hard wired to B+, to move to, or contact Pin 87. When the B+ on Pin 30 connects to Pin 87, it provides B+ to operate the Blower Motor. Since the Blower Motor Pin 2 is hard wired to ground, the Blower Motor operates as long as B+ appears at Pin 87 hardwired to Blower Motor Pin1.

The schematic symbol of a relay is always shown in the de-energized, or OFF condition where Contact PIn 30 is connected to Pin 87A. When observing a relay symbol on a diagram, the technician visualizes Pin 30 moving to connect to Pin 87. When voltage is measured at Pin 87 it confirms the relay has been activated, described as "turned ON." If no voltage is found at Pin 87 when the relay is activated, it confirms there is a problem in the relay circuit.

A good technique with relay problems is to determine if the relay makes an audible sound such as a click. A "click" tells you the relay coil is operating and moving the contact to Pin 87. If the relay does not sound a "click," in a nosiy environment touch the relay and you can feel the relay click or "thump."

If the relay does not "click," measure voltage at Pin 85 and at Pin 86. Pin 85 should have about 13 volts. No or very low voltage indicates a problem with the I**PM circuit Q5**. Pin 86 should be about 0.7 volt or less. If the voltage is higher or close to B+, there is a problem with the **PCM circuit Q4**.

Even when a circuit is controlled by computers, the same intial circuit voltage checks reveal what part of the circuit has a problem. The "60 Lesson Vehicle Electronics Training Course" has extensive lessons on troubleshooting relays, coils and DC motor circuits. The two "Advanced Electronics Training" books explain how to test computer circuits and determine which computer control circuit is at fault.

Figure 04-2026
"Changing Times in Electrical Systems"