Introduction to Computer Control

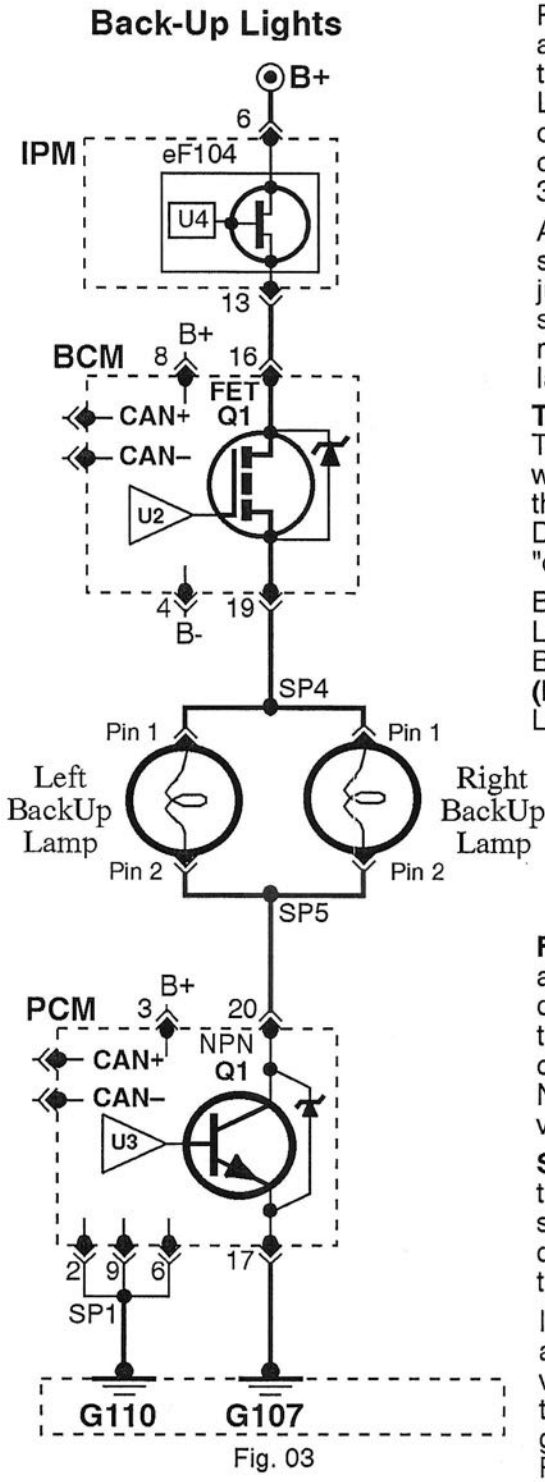

Fig. 03

Overview

Previously, in Figure 02, two mechanical switches were used to control a Lamp circuit. We discussed how easy it was to test and troubleshoot the Lamp circuit by measuring the voltage on Pin 1 and Pin 2 of the Lamp. The two voltage readings would reveal a problem affecting Lamp operation. In the schemation at the left, Figure 03, shows two on-board computers that replace the two mechanical switches in Figure 2. Figure 3 circuit is used to simulate the concept of computer control.

At the top of the schemation in Figure 03 is a "solid-state fuse." If a solid-state fuse "blows," it "opens" stopping current through the circuit just like a thermal fuse. When the circuit problem is repaired, a solid-state fuse "resets" to resume normal operation. A solid-state fuse is not replaced - the circuit problem is repaired. But that's another topic for later as car brands program their solid-state fuses differently.

Two On-Board Computers

The BCM and PCM control the two back-up lamps that operate only when the transmission is placed in REVERSE (R). No further action by the vehicle operator is necessary. When the operator shifts back to DRIVE (D) the back-up lamps turn OFF. This is the essence of "computer control." Necessary functions are programmed as needed.

BCM and PCM computers are programmed to control the Back-Up Lamps. The **BCM (Body Control Module),** is on the voltage side of the Back-up Lamps to provide B+ to the Lamps at SP4-Pin 1. The **PCM (Powertrain Control Module)**, is on the ground side off the Back-up Lamps, to provide B-, or a ground path to the Lamps at Pin SP5-2.

Same Two Voltage Tests

If the back-up lamps fail to operate in (R), perform the same two voltage tests as discussed in Figure 02, Pin 1 and Pin 2 while the transmission is in (R). These two voltage tests will indicate most problems, voltage side or ground side, with the dual Back-up Lamp circuit and lead to further tests to perform in the circuit.

First Test: Measure the voltage at Pin 1 at either lamp. It should be about 14.00V (B+) or more. If reading is low, at Pin 1 check up the circuit looking for a Vd (**V**oltage **d**rop) in the voltage side of the circuit. If there is no voltage, (0V), at Pin 1 of either lamp check for a broken wire or a blown fuse. Start tracing B+ voltage by measuring at BCM, Pin 19. No voltage at Pin 19 reveals problems with the BCM circuit. Check the voltage at BCM Pin 16 for B+. NO? Is the fuse eF104 turned OFF?

Second Test: Since 14.00V is present at Pin 1, measure the voltage on the ground side of the Lamps at Pin 2 of either lamp. The voltage should be about 0.70V if the PCM ground circuit and the PCM's Q1 driver transistor is good. A reading of 0.70V is a normal voltage drop of transistor Q1 in the PCM as it supplies electron current to the Lamps.

If the reading at Pin 2 is high or 14.0V you know to check PCM input and output circuits. Start by measuring voltage at PCM, Pin 20. B+ voltage at Pin 20 reveals problems with the PCM circuit. Next measure the voltage on PCM Pin 17. The reading should be 0.10-0.05V if the ground connection G107 is good. B+ on Pin 20 and 0V on Pin 17 of the PCM indicates a problem with the PCM's transistor circuit Q1.

SUMMARY: Troubleshooting computer circuits employs the same essential troubleshooting steps we use in simple circuits without computers. However, computers are more complex and require additional training and troubleshooting steps due to their advanced solid-state circuitry and CAN Bus communication. Our schemation used shows a solid-state fuse which protects sensitive computer circuits from a current surge. Both BCM and PCM computers show only those transistor circuits used in this circuit. If you are interested in more advanced training in solid-state electronics, our web site has full details. There is also a 60 Lesson electronics course and you can print out lessons as needed; AET Books "Advanced Electronics Training Parts 1 & 2"; "CAN Bus Troubleshooting" and other publications to help you become the "go-to-guy" for electronic circuit troubleshooting problems in your shop.

Figure 03-2026 "Introduction to Computer Control"