

Computers and Control Systems: Symptom Related Diagnostic Procedures

Part 1 of 4

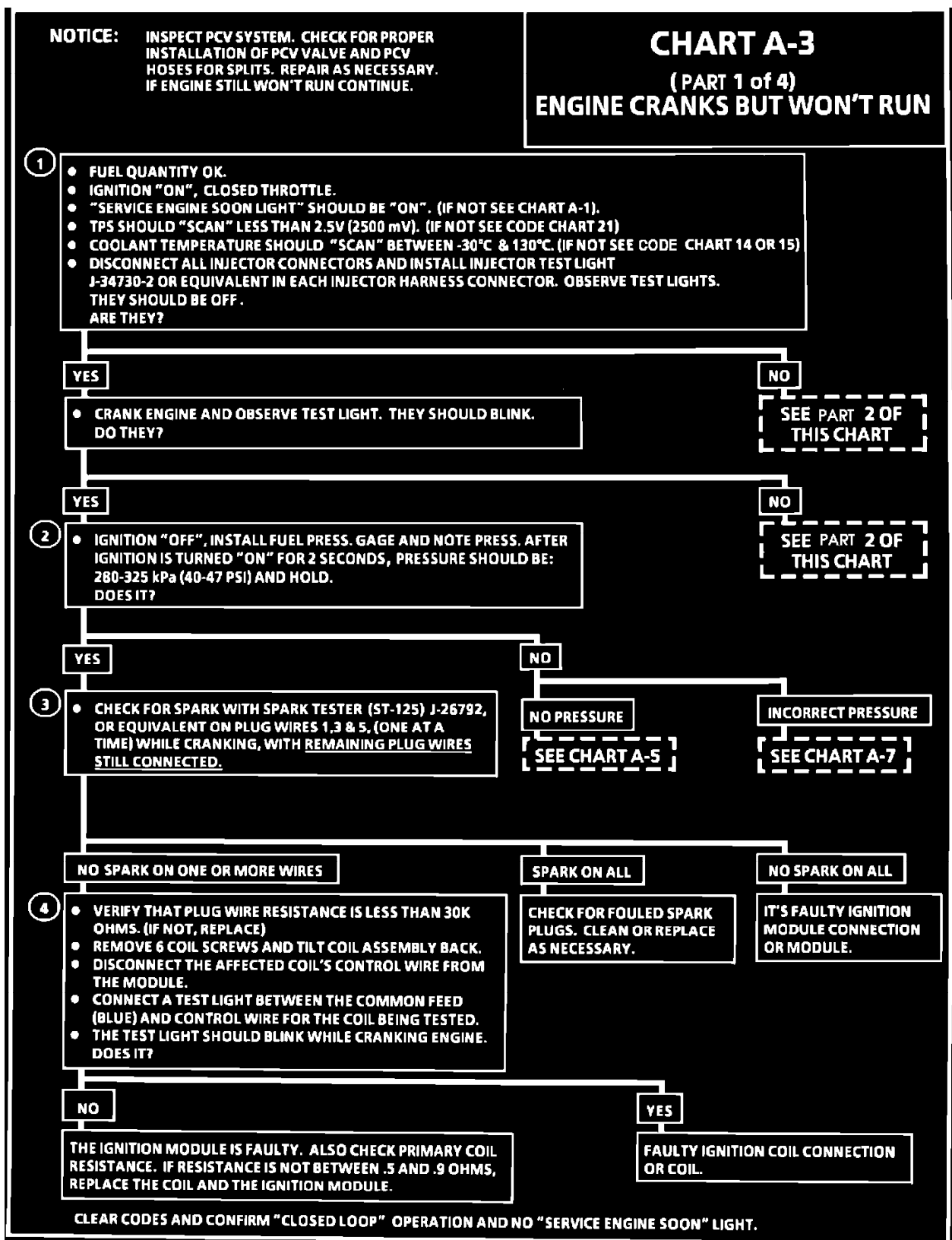


Chart A-3 (Part 1 Of 4)

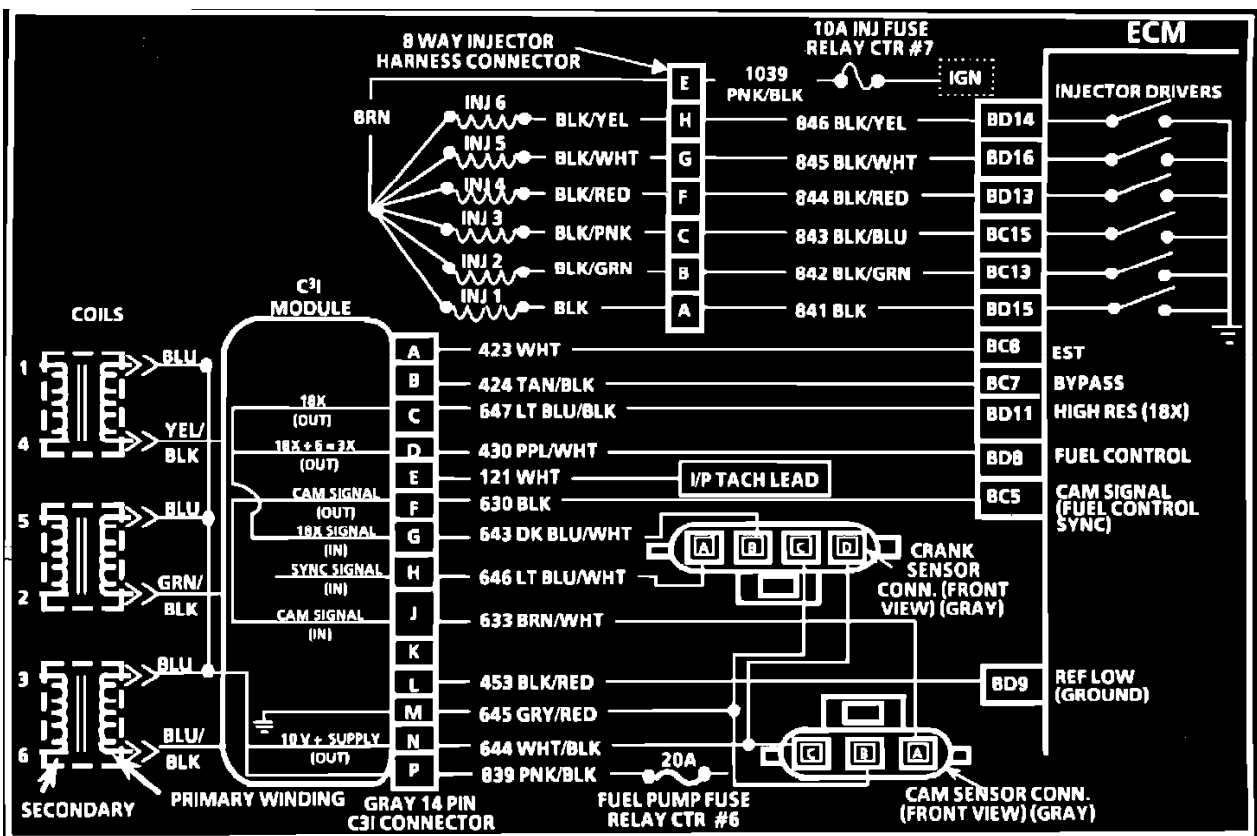


Chart A-3 Wiring Diagram

CIRCUIT DESCRIPTION:

The C3I ignition system uses a waste spark method of spark distribution. In this type of ignition system, the ignition module triggers the correct coil pair, based on both signals from the crankshaft sensor, resulting in both spark plugs firing at the same time. One cylinder is on the compression cycle, while the other one is on the exhaust cycle, resulting in a lower energy requirement to fire the spark plug on the exhaust cycle. The remaining high voltage is used to fire the spark plug on the compression cycle.

During cranking, the ignition module monitors the dual crank sensor sync signal. The sync signal is used to determine the correct cylinder pair to spark first. After the sync signal has been processed by the ignition module, it sends a fuel control reference pulse to the ECM. When the ECM receives this pulse, it will command all six injectors to open for one shot of fuel in all cylinders. After the priming, the injectors are left off for the next six fuel control reference pulses from the ignition module. This allows each cylinder a chance to use the fuel from the priming shot. During this waiting period, a cam pulse will have been received by the ECM. Now the ECM begins to operate the injectors sequentially, based on true camshaft position. However, if the cam signal is not present at start-up a Code 41 will set and the ECM will start sequential fuel delivery in any old random pattern. There is a 1 chance in 6 that fuel delivery will be correct. The sync signal is used only by the ignition module. It is used for spark synchronization at start-up only and not passed on to the ECM.

TEST DESCRIPTION Numbers below refer to circled numbers on the diagnostic chart.

1. This step verifies that "SERVICE ENGINE SOON" light operation, throttle position sensor, and coolant sensor signals are normal. A blinking injector test light verifies that the ECM is monitoring the fuel control signal and attempting to activate the injectors.
2. The crank sensor has been verified as functioning properly, as is evident by the blinking injector test light. A fuel pressure test at this point will separate the diagnostic path into either a fuel related fault or ignition system malfunction.
3. By testing for spark on plug leads 1, 3, and 5, each ignition coil's ability to produce at least 25,000 volts is verified. If the engine starts and runs for several seconds and dies repeatedly, consider this to be no spark on all.
4. By testing the problem coil's control circuit with a test light, a determination can be made as to the problem coil being faulty or the module's internal driver for that coil being the source of the complaint.