IMPORT SERVICE

Emission Overview: Nissan 6

As cars have become more complicated, their emission control systems have become more integrated. Gone are the days when a backyarder could "re-engineer" his car by disabling various parts of the emission control system to make it run more to his liking. Very often, one system must rely on the proper operation of many others if it is to operate properly.

The introduction of fuel injection brought this situation to a head. Instead of having several independent systems to handle emissions, fuel delivery, cold starting, and so on, all of these functions were integrated into one self-contained system. In recent years, some fuel injection systems have even been refined to a point where they are called engine management systems.

The fuel injection system used on the in-line six-cylinder Nissan 280ZX and Maxima is not quite that technologically advanced, but definitely qualifies as an earlier version of an integrated system. It is a version of the L-Jetronic system originally developed by

Bosch. The photographs were taken of a 1983 280ZX. Maxima models are very similar. The 280ZX uses an injector cooling fan because of its hotter underhood temperatures. Operation of this fan is controlled by a sensor mounted next to the thermo-time switch in the thermostat housing.

The EFI wiring harness on these cars can be the source of many problems. When component testing, always take voltage and resistance readings both at the component and at the main control unit connector. If there's a big difference in the readings, then you know the message sent by the sensors may not be the same message received by the control unit. Check the harness for problems before looking anywhere else.

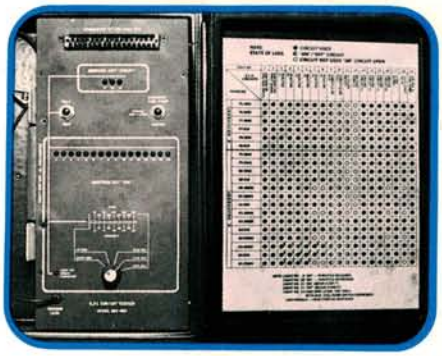
Special areas to watch for problems include:

- Harness connectors below the air flow meter.
- Corrosion damage to the harness below the washer bottle on Maximas.
- Corrosion damage to the harness under the driver's side carpeting on Maximas.
- Crimped shunt connections used at various points in the harness. Any moisture that gets into the harness will eventually open up these poorly protected connections. These can be the source of really frustrating intermittent problems.
- All harness-to-component connectors. Most are not very weather resistant. Corrosion buildup over the years can increase resistance readings significantly.
- EFI grounds and power supply leads. This system must have a steady power supply and clean grounds to operate properly.

—By Karl Seyfert

1

Terminals at this connector may corrode and cause false readings to the ECU. Remove the connector and check each terminal. Don't get tricked into thinking that you have a bad ECU. They very seldom fail of their own accord. Make sure the connector is fully seated when reinstalled.

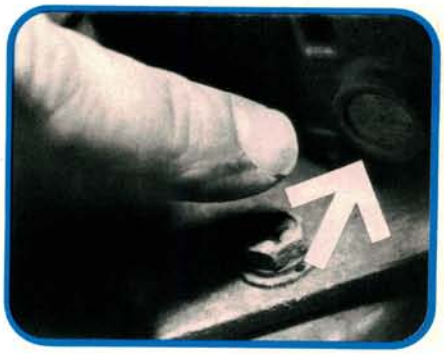


2

The ECU has no self-diagnostic capabilities. Testing of the EFI wiring and components can be done through the use of a volt-ohmmeter or with a dedicated tester such as the one shown. The LED mounted in the side of the ECU is used for monitoring oxygen sensor operation only. The eight inputs to the ECU follow.

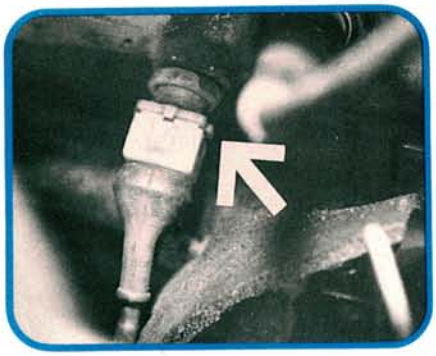
3

The air flow meter is the main ECU input. It measures the amount of intake air through a potentiometer attached to an air flap valve. An internal air temperature sensor measures inlet air temperature. The ECU provides a richer injector signal during cold operation based on this sensor's signal.



4

CO adjustment is made by changing the amount of bypass air through a passage in the air flow meter. A concealment plug must be removed to access the adjusting screw. On most models, the air flow meter must be removed to get to the plug. Use care when drilling to avoid damaging the adjusting screw.

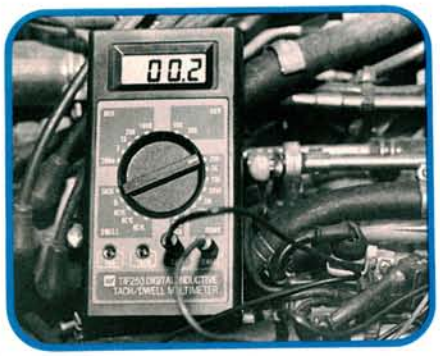


5

The head temperature sensor sends resistance readings to the ECU. It contains a thermistor that lowers its resistance as temperature increases. After engine warm up, this sensor should have no effect on injector operation. See January 1989 **Tech Tips** for temperature sensor simulator plans.

6

The throttle switch actually contains two sets of switch contacts; one for idle and the other for full throttle operation. The ECU provides additional fuel enrichment under both conditions. Fuel is cut when the ECU reads closed-throttle deceleration over a specified RPM range.

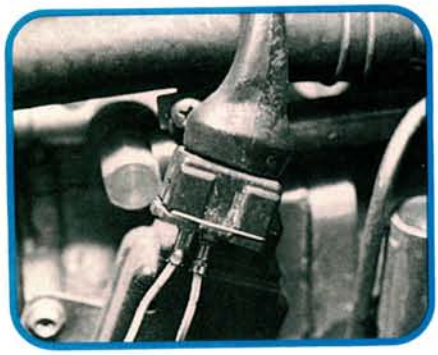


7

To adjust the throttle switch, first disconnect the switch harness connector. Attach ohmmeter leads to terminals 29 and 30. Raise the idle in neutral to 900 RPM using the accelerator pedal. The idle switch should just open at this point. At full-throttle (engine off), terminals 24 and 30 should have continuity.

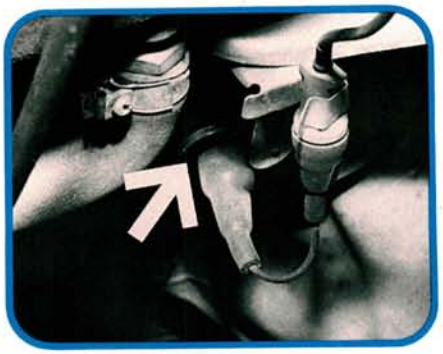
8

This throttle switch simulator from Miller Tools is installed in series with the throttle switch wiring. Throttle switch adjustments are made by using the LEDs as continuity indicators. The rocker switches are used to simulate both open and closed throttle, eliminating the need for jumper leads.



9

Consult your service manual for the CO specifications for the model you're servicing. Warm the engine up; then disconnect the throttle switch connector. Run a jumper lead between harness connectors 24 and 30. This simulates full-throttle and richens the injector signal. Adjust CO at the air flow meter to specs.



10

The LED on the ECU is used for oxygen sensor testing. Run the engine at 2000 RPM for two minutes to warm the oxygen sensor. Return to idle. The LED should flash at least 10 times in the next five seconds. A nonfunctioning oxygen sensor will cause a variety of emissions and driveability problems.

11

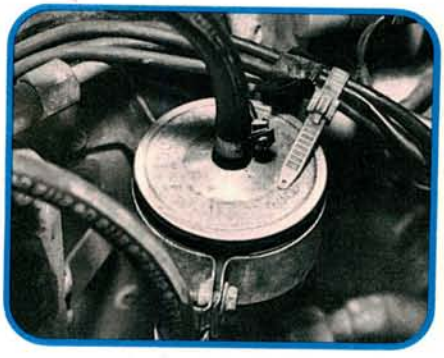
The ECU receives a signal from the ignition coil to determine engine RPM. It uses this information to control the firing of the injectors. When adjusting ignition timing, always remove this gray connector first. The ECU advances the timing electronically through this connector.

12

The last ECU sensor input comes from the ignition switch. The ECU holds the injectors open longer while receiving the start signal to aid in engine startup. The fuel pump relay and the thermo-time switch for the cold start injector are also energized by the start signal.

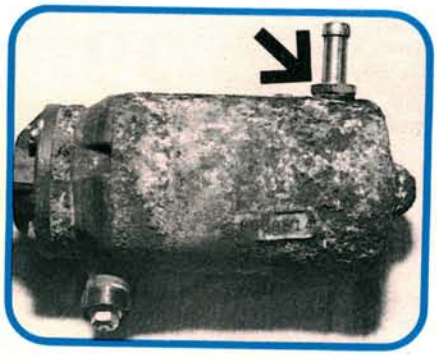
13

The injectors have positive voltage at all times through the fusible link. Some earlier models used dropping resistors to lower the voltage to the injectors and protect them from voltage surges. The ECU provides the ground for the injectors. All injectors fire together, once per engine revolution.



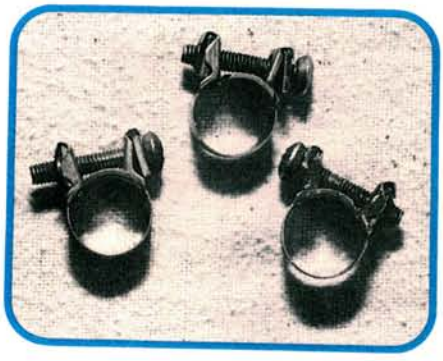
14

Because of the many, very small passages in this fuel system, fuel cleanliness is very important. The replacement interval for these filters is 30,000 miles. About half that distance is a much safer interval. The filter is mounted upstream of the pressure regulator and will affect system pressure if clogged.



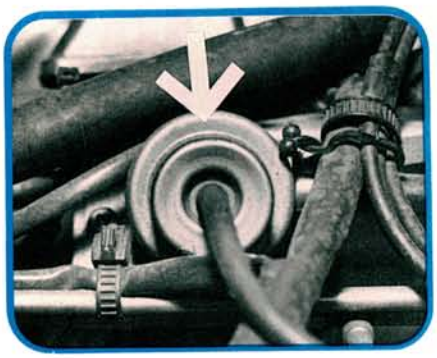
15

The internal parts of the fuel pump are surrounded by fuel for cooling. Don't attempt to bench test this pump or run it dry. An externally mounted check valve (arrow) maintains rest pressure after vehicle shutoff. This valve can be replaced separately. A failed check valve will cause hot restart problems.



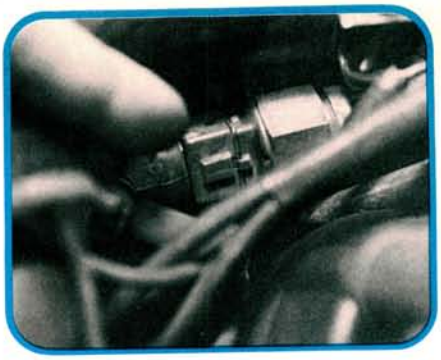
16

Loose fuel hose connections may cause fuel leaks and can also allow air to enter the system. Resting fuel pressure will also be affected. Ordinary hose clamps aren't designed to handle the system pressure and may cut the fuel hose. Use only high pressure fuel hose and clamps. Torque all clamps to 12.2 to 17.6 Nm.



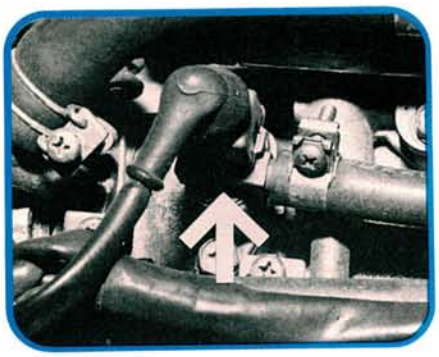
17

For proper system operation, fuel pressure must be controlled under varying conditions. Mounted on the fuel rail, the fuel pressure regulator uses a vacuum diaphragm to maintain fuel pressure at a constant 36 PSI. The regulator receives its signal from a manifold vacuum port.



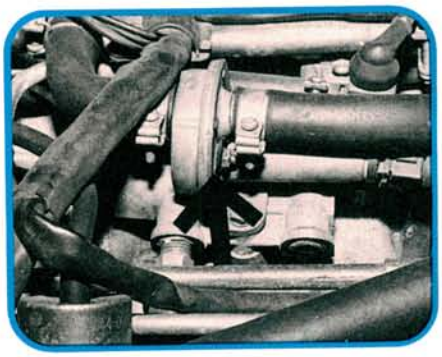
18

Mounted in the thermostat housing, the thermo-time switch controls the operation of the cold start injector. As current flows through the switch, heat is produced which causes the switch to open. This interrupts the flow of current to the cold start injector. Engine heat will also open the switch.



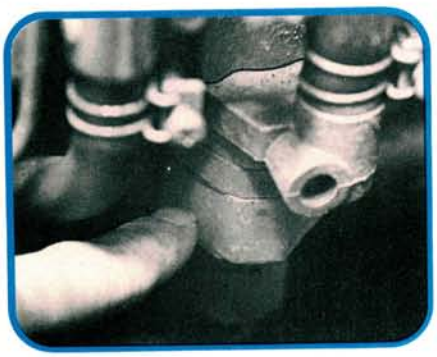
19

A cold start injector is mounted on the intake manifold ahead of the other six injectors. The valve is supplied with current only during engine cranking. The thermo-time switch limits the maximum injector-on time to 9-12 seconds at –20 degrees C (–4 degrees F). This prevents the engine from flooding if it doesn't start.



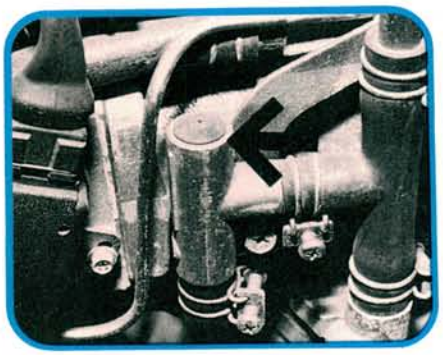
20

The auxiliary air regulator provides a fast idle during engine warm up. Air bypasses the throttle plate through the regulator. A bimetal heating element gradually closes a shutter until no bypass air is let through. The cold start injector and fast idle operate independent of the ECU.



21

For emissions purposes, a boost controlled deceleration device (what a mouthful) is used. The vacuum-actuated valve opens the intake manifold to outside air during closed-throttle deceleration. The extra air mixes with any raw fuel which may be present in the intake ports to lower hydrocarbon emissions.



22

Use this screw when adjusting idle speed. The lock-nutted screw on the throttle housing should not be moved. Make certain that the paint on the lock nut hasn't been disturbed. An unstable idle may be caused by leaks in the large hose between the air flow meter and the throttle housing.