

Computerized Engine Controls

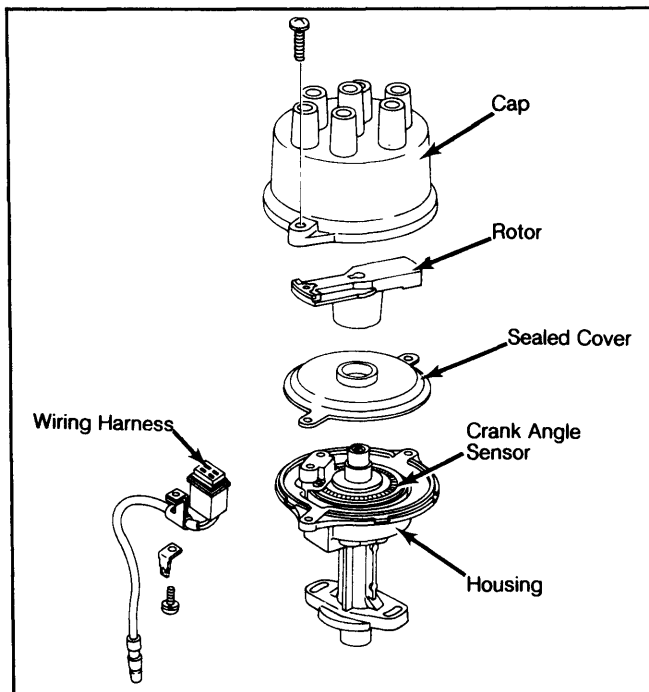
DATSUN/NISSAN ELECTRONIC CONCENTRATED ENGINE CONTROL

DESCRIPTION

The Electronic Concentrated Engine Control System (ECCS) is a computerized emission, ignition and fuel control system used on 280ZX models.

The system uses a unique Hitachi distributor, that has no reluctor, pick-up coil, pulse generator or ignitor. A crankshaft angle sensor, built into the distributor, replaces the conventional electronic ignition components in the distributor. See Fig. 1.

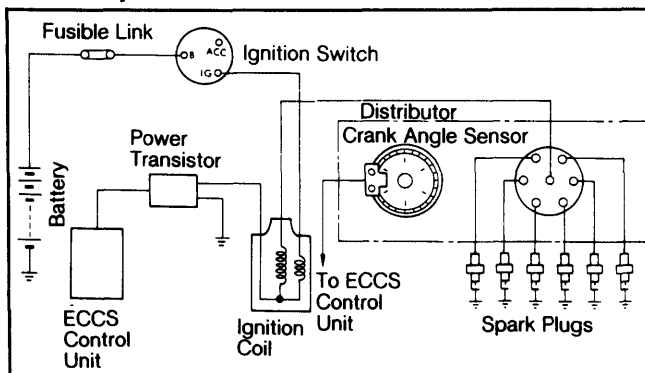
Fig. 1: Exploded View of Hitachi ECCS Distributor



A crankshaft angle sensor, replaces conventional electronic ignition components.

The ignition portion of the system also includes an ignition coil, with an externally-mounted power transistor. The transistor acts as a switch that permits or prohibits current flow through the coil. See Fig. 2.

Fig. 2: Schematic of Ignition System Portion of ECCS System



A single ECCS control unit monitors a variety of sensors, air conditioning switch, air flow meter, air temperature sensor, barometric pressure sensor, crank-

shaft angle sensor, cylinder head temperature sensor, detonation sensor, oxygen sensor, park/neutral switch, throttle valve switch, and vehicle speed sensor.

The computer processes information from these sensors and controls these engine functions: EGR operation, engine idle speed, fuel injectors, fuel pump operation, ignition timing and dwell.

OPERATION

ECCS CONTROL UNIT

The control unit is located on driver's side kick panel. It is not serviceable and should not be opened. A monitor lamp is provided in lower side of unit, so system operation can be checked. The control unit contains memory and logic circuits, that enable it to interpret sensor inputs and control different engine systems.

ENGINE SENSORS

Air Flow Meter & Temperature Sensor

The air flow meter measures incoming air, so fuel mixture can be determined and injection time can be controlled by ECCS control unit. It is a standard AFC flow meter, but incorporates a temperature sensor which is also used for ECCS input. The sensor cannot be serviced separately.

Barometric Pressure Sensor

This sensor is built into the ECCS control unit and cannot be serviced separately. It allows the control unit to compensate for altitude changes.

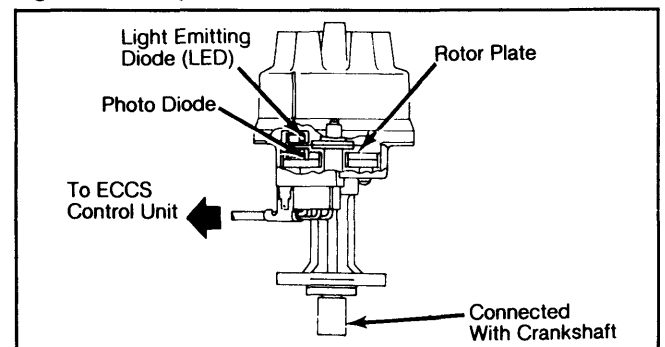
Crankshaft Angle Sensor

The signal rotor plate in the distributor, rotates with the distributor shaft. It has 360 slits at 1° intervals around its outer circumference. These provide the 1° signal necessary to control engine RPM and ignition timing. The signal rotor plate also has an additional 6 slits (nearer center of ring) at 60° intervals to detect crank angle — the position of each piston.

The crankshaft angle sensor, which is built into the distributor, has 2 diodes and a wave-forming circuit. See Fig. 3. When the signal rotor plate passes the space between the light emitting diode (LED) and photo diode, the slit to the signal rotor plate alternately cuts through the light which is sent to the photo diode from the LED.

This causes an alternative voltage, which is converted into an on-off pulse by the wave-forming circuit and sent to the control unit.

Fig. 3: Cutaway View of ECCS Distributor

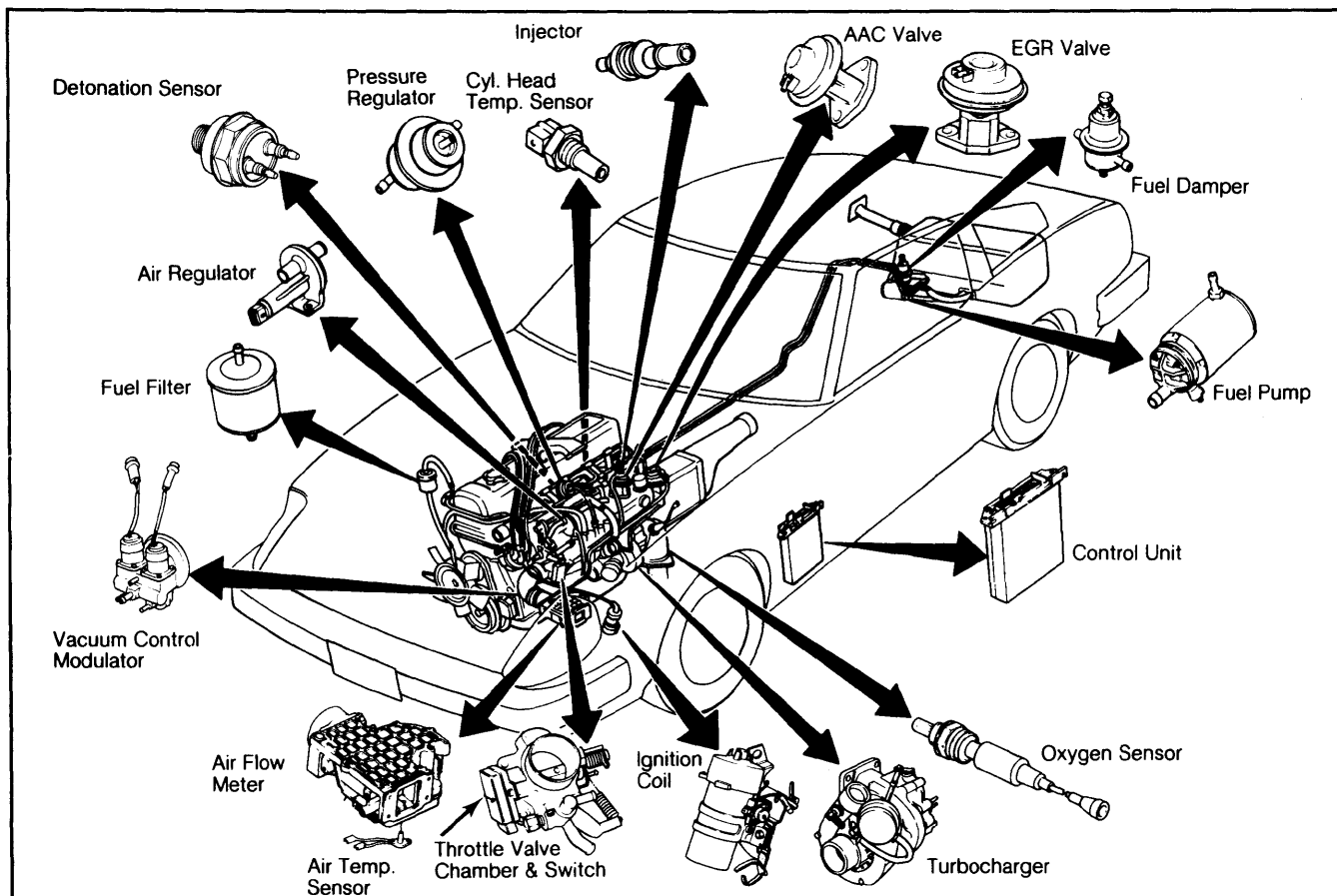


Crankshaft angle sensor is built into distributor.

Computerized Engine Controls

DATSUN/NISSAN ELECTRONIC CONCENTRATED ENGINE CONTROL (Cont.)

Fig. 4: Location of Datsun/Nissan 280ZX Turbo ECCS Components



Cylinder Head Temperature Sensor

The cylinder head temperature sensor is located in the right rear corner of the head. It provides a varying resistance measurement as cylinder head temperature changes.

Detonation Sensor

The detonation sensor is located near the oil dipstick, and sends a signal when "knocking" occurs. The control unit modifies ignition timing to reduce detonation.

Oxygen Sensor

This component measures the amount of unburned oxygen in the exhaust and provides a voltage signal, which is used to adjust fuel mixture (amount of injection time).

Throttle Valve Switch

The throttle valve switch is open when the throttle is being moved and closed when the engine is idling. The switch also contains a set of full throttle contacts, but these are not used in this system.

ENGINE CONTROLS

EGR Operation

Exhaust gas recirculation is controlled by the ECCS. A signal is sent to the vacuum control modulator, which provides a regulated vacuum supply to open the EGR valve.

EGR operation is affected by cylinder head temperature, throttle valve position, and ignition switch position. Recirculation only takes place when the engine is

operating above idle, with cylinder head temperature between 135-239°F (57-115°C).

Engine Idle Speed

Auxiliary Air Control (AAC) valve is used to control idle speed. Valve is operated by a vacuum signal from vacuum control modulator. It works much like an EGR valve does.

It allows extra air into throttle chamber, which increases idle speed. Control unit monitors speed with crankshaft angle sensor, and continually corrects idle speed by operating vacuum control modulator.

Fuel Injection

The control unit determines how long voltage is provided to each injector. The injection time will determine how much fuel is injected. *For more information, see the appropriate Bosch AFC Fuel Injection article in FUEL SYSTEMS Section.*

Fuel Pump

The ECCS control unit operates electric fuel pump. When ignition is turned to "ON" or "START" position, the fuel pump operates. If ignition is on and no signal is received from crank sensor 120° pick-up for more than 1 second, the fuel pump stops.

It will operate for 5 seconds before engine is cranked, and will then stop if engine is not cranked over at 20 RPM or more.

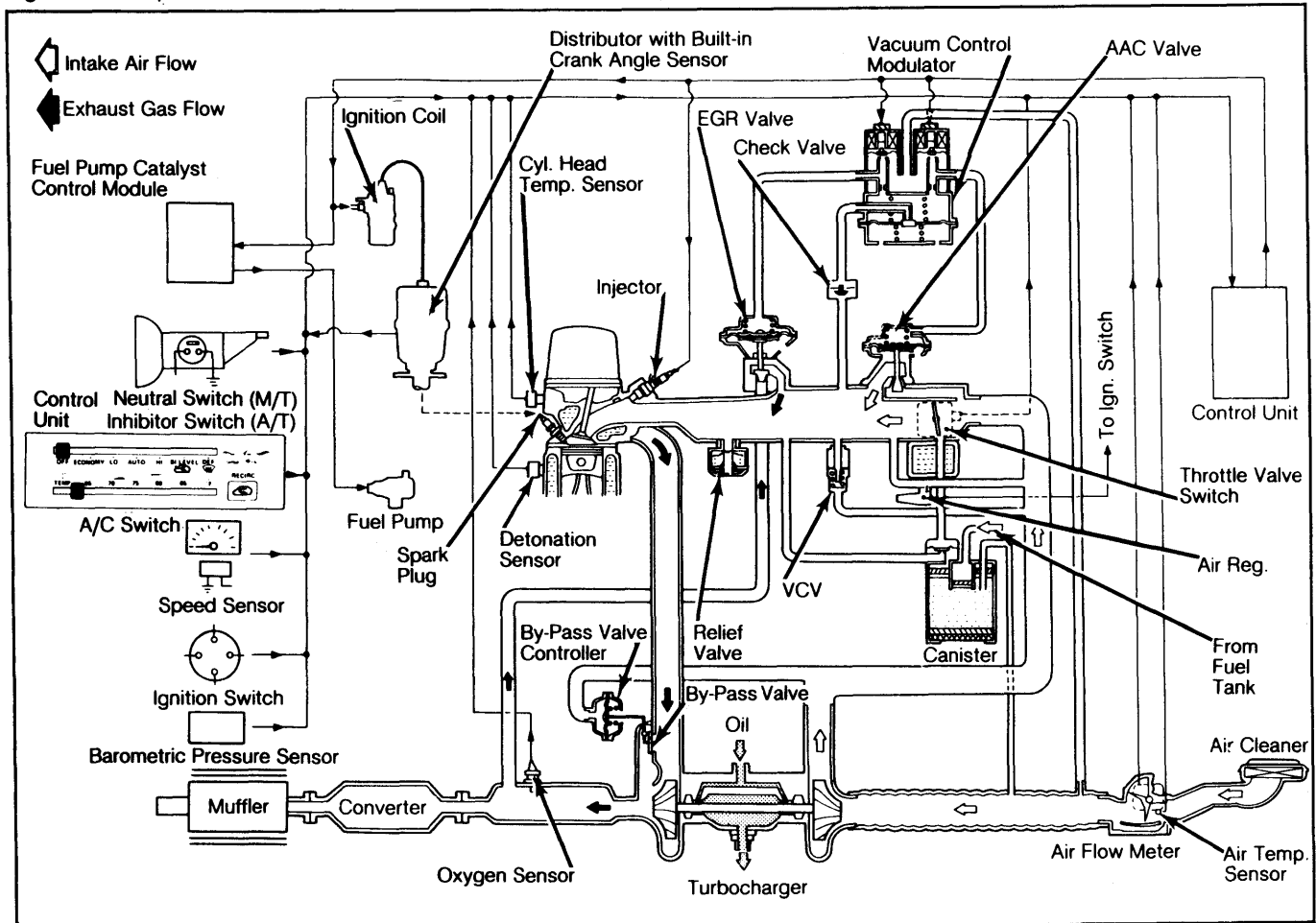
Ignition Timing

The ECCS control unit uses sensor input to determine correct timing. It sends a signal to a power

Computerized Engine Controls

DATSUN/NISSAN ELECTRONIC CONCENTRATED ENGINE CONTROL (Cont.)

Fig. 5: Datsun/Nissan 280ZX ECCS Schematic & Vacuum Diagram



transistor located on the coil, permitting current to flow through coil. Timing is advanced and retarded by control unit, based on sensor input, built-in programming, and detonation sensor signals.

TESTING

NOTE: The Datsun/Nissan ECCS system requires a special tester (Datsun/Nissan ECCS Analyzer — J28835) to be fully diagnosed. However, some checks of individual components may be made, using standard test equipment.

CAUTION: Be sure ignition switch is off when disconnecting connectors from control unit. While testing, be careful not to bend any pins, and do not touch more than 1 pin at a time with meter lead. Meter or control unit could be damaged.

DIAGNOSIS & TESTING

1) Turn ignition off. Disconnect battery ground cable and disconnect wire from terminal "S" at starter motor.

2) Remove air cleaner, and position air flow meter so flap can be moved by hand from air cleaner side. Disconnect all 3 connectors at control unit.

COMPONENT TESTING

Ignition Coil

1) To check primary resistance, remove wires from positive and negative primary terminals. Set an ohmmeter in the x1 scale. Connect ohmmeter leads to positive and negative terminals. Reading should be .63-.77 ohms. If not, replace ignition coil.

2) To check secondary resistance, remove coil wire from coil tower. Set ohmmeter for x1000 scale. Attach ohmmeter leads to negative terminal and coil tower. Reading should be 7,000-8,600 ohms. If not, replace ignition coil.

Distributor

Cap insulation resistance should be more than 50,000 ohms. Also check that rotor insulation resistance exceeds 50,000 ohms. Cap carbon point length should be .39" (10 mm).

Air Conditioning Switch

1) Connect voltmeter between control unit connector terminal 22 and ground. With switch on, 12 volts should be measured.

2) With switch off, 0 volts should be measured. If not correct, check harness or replace switch.

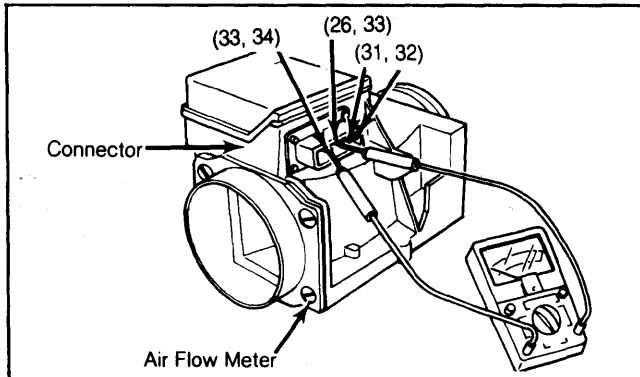
Computerized Engine Controls

DATSUN/NISSAN ELECTRONIC CONCENTRATED ENGINE CONTROL (Cont.)

Air Flow Meter

1) Connect ohmmeter across pins 26 and 33 in control unit connector and pins 33 and 34 in air flow meter connector. See Fig. 6. Resistance should be 280-400 ohms. If not, check resistance at meter. If not correct, repair harness or replace air flow meter.

Fig. 6: Air Flow Meter Test Locations



Connect ohmmeter as shown.

2) Connect ohmmeter across pins 33 and 31 in control unit connector and pins 34 and 32 in air flow meter connector. Resistance should measure any value except 0 and infinity. If not, check resistance at meter. If okay at meter, repair harness. If not, replace air flow meter.

3) Connect 1 lead of ohmmeter to ground, and other lead to connector pin 26, then 31, then 33 on control unit and connector pin 33, then 34, then 32 on air flow meter.

4) Infinite resistance should be shown in all cases. If not, repeat check at connector pins or air flow meter. Repair harness or replace meter as necessary.

5) Operate air flow meter flap by hand to ensure it moves smoothly without binding. If okay, meter is functioning properly. If not, replace air flow meter.

Air Regulator

1) Connect ohmmeter between pin 108 in control unit connector and ground. Resistance should be 25-90 ohms.

2) Connect ECCS harness connectors to control unit. Turn ignition on. Fuel pump should operate for 5 seconds. If pump is not heard, check pump relay. If pump is heard, check air regulator.

3) Start engine and pinch hose between throttle chamber and air regulator. Engine speed should decrease during warm-up, but not when engine is at operating temperature.

4) Disconnect hoses from both ends of regulator and see if flap opens. It should move smoothly. Check resistance across terminals on regulator. If continuity exists, regulator is good. If not, replace regulator.

Air Temperature Sensor

1) Connect ohmmeter across pins 30 and 33 in control unit connector and across pins 34 and 25 in air flow meter connector. With intake air temperature above 68°F (20°C), resistance should be below 2900 ohms. At temperatures below 68°F (20°C), resistance should be above 2100 ohms.

2) If resistance is not correct, repeat test at air flow meter terminals. Repair harness or replace meter as necessary. See Fig. 6.

3) Connect ohmmeter between ground and pin 30 at connector. Reading should be infinity. Repeat check at air flow meter terminal and body. Repair harness or replace meter as necessary.

Control Unit Ground Circuits

Measure resistance between ground and the following control unit connector terminals: 28, 36, 107, 108, 109, 112 and 113. Continuity should be present in all cases. If not, repair harness.

Cylinder Head Temperature Sensor

1) With harness connected to sensor, measure between control unit connector pin 23 and ground. At temperatures above 68°F (20°C), resistance should be below 2900 ohms. At temperatures below 68°F (20°C), resistance should be above 2100 ohms. If not, repair harness.

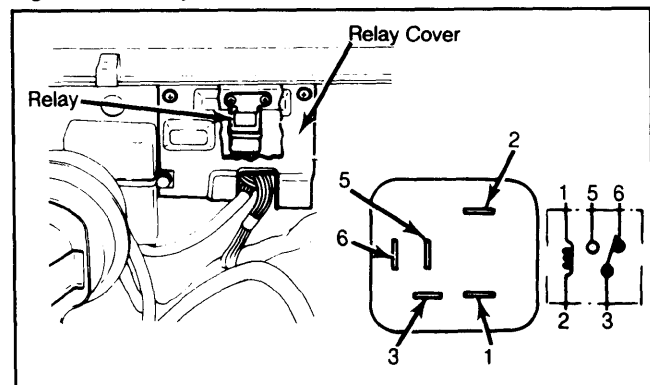
2) Remove sensor from head, and dip end of sensor into water at 68°F (20°C). Resistance should be 2100-2900 ohms across sensor terminals. Repeat test with water at 176°F (80°C). Resistance should be approximately 250-400 ohms.

EFI Relay

1) With battery cables connected and ignition on, measure voltage between control unit connector pin 35 and ground. Battery voltage should be present.

2) If not, check EFI relay operation. Relay is located under a cover in engine compartment. See Fig. 7.

Fig. 7: EFI Relay Location & Test Connections



EFI relay is located in engine compartment.

3) Continuity should exist across terminals 1 and 2 and across terminals 3 and 6. With battery voltage applied to terminals 1 and 2, continuity should exist across terminals 3 and 5, but not at 3 and 6. If not, replace relay.

Fuel Injectors

NOTE: Never turn the selecting switch of the tester to the "Ohmmeter" or "Ammeter" position during these tests, as it may burn out the injectors and circuit.

1) Connect battery ground cable. Use a voltmeter to measure between ground and the following terminals at control unit connector: 101, 102, 103, 104, 105, and 106. Battery voltage should be present at all terminals.

2) If battery voltage was not present at terminal, check the appropriate injector. Disconnect battery ground cable and remove connectors at injector.

Computerized Engine Controls

DATSUN/NISSAN ELECTRONIC CONCENTRATED ENGINE CONTROL (Cont.)

Continuity should exist across terminals on injector. If not, replace injector.

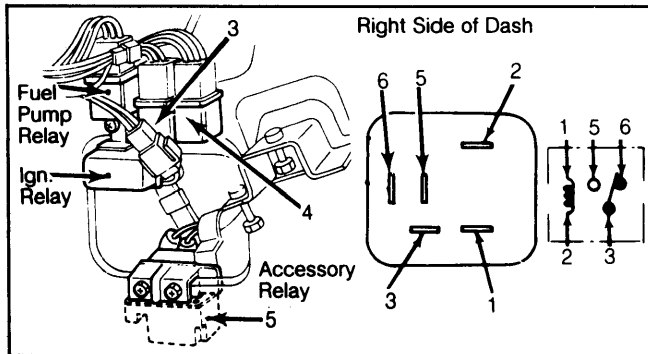
NOTE: Injector circuits are numbered according to cylinder number. For example, injector power circuit 103 goes to cylinder 3, etc.

Fuel Pump Relay

1) Fuel pump relay is mounted on right side of dashboard. Remove relay and check continuity. It should be present at terminals 1 and 2, and terminals 3 and 5.

2) With 12 volts applied to terminals 1 and 2, continuity should be present across terminals 3 and 5, but not at 3 and 6. If test is okay, check harness. If not okay, replace relay. See Fig. 8.

Fig. 8: Fuel Pump Relay Location & Test Connections



Relay is located under right side of dashboard.

Ignition Signal Circuit

1) Disconnect starter motor "S" terminal and connect battery ground cable. Turn ignition switch to "START".

2) Measure voltage between control unit connector pin 9 and ground. If battery voltage is not present, check harness and ignition coil.

Oxygen Sensor

1) Connect all wiring and battery cables. Start engine and warm to normal operating temperature. Open hood and run engine at 2000 RPM for 5 minutes.

2) If engine does not run smoothly, check air flow meter, cylinder head temperature sensor and air temperature sensor.

3) Accelerate engine several times, then check idle. If not 600-700 RPM in "D", check vacuum control modulator and idle speed control system.

NOTE: Special ECCS tester is required for idle speed system check.

4) Check timing. If not 17-23° BTDC, adjust to 20° BTDC with adjustment screw on crankshaft sensor bracket (loosen sensor bolts first).

5) Using a mirror, check that inspection lamp on bottom of control unit goes on and off more than 5 times in 10 seconds with engine running at 2000 RPM in "N".

6) If so, sensor is okay. If not, check oxygen sensor harness. If harness is okay, replace oxygen sensor.

Oxygen Sensor Harness

Disconnect harness from sensor in exhaust pipe and connect EFI harness terminal for sensor to ground with jumper wire. Measure resistance between

ground and pin 24 in control unit connector. A zero reading should be indicated. If not, repair harness.

Park/Neutral Switch

Connect battery ground cable and turn ignition on. Connect voltmeter between control unit connector pin 10 and ground. With transmission lever in "N" or "P", zero voltage should be present. If not, check harness. If harness tests good, replace switch.

Throttle Valve Switch

1) Connect ohmmeter across pins 18 and 25 in control unit connectors. With throttle depressed, no continuity should be present. With throttle released, continuity should be present. If not correct, adjust throttle switch. See Adjustments in this article.

2) Connect ohmmeter to terminal 18 and ground, then 25 and ground. See Fig. 9. An infinity reading should be indicated in either position. If not, repair short to ground in harness, or replace throttle valve switch.

Vacuum Control Modulator

1) Connect battery ground cable and turn ignition on. Measure voltage between control unit connector terminal 2 and ground. Battery voltage should be present.

2) Check for battery voltage between terminal 4 and ground. If voltage is present in both checks, modulator solenoid valves are okay. If not, disconnect both connectors at modulator.

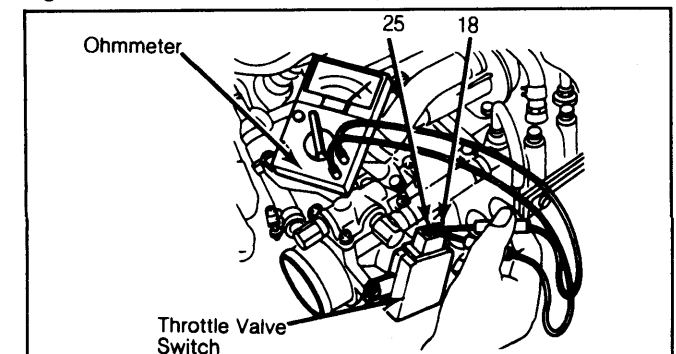
3) Check resistance between terminals for each solenoid valve on modulator. Resistance should be 40 ohms for each valve. If not, replace vacuum control modulator.

ADJUSTMENTS

THROTTLE VALVE SWITCH

Disconnect throttle valve switch connector. Connect ohmmeter across terminals 18 and 25, ensuring that continuity exists. Allow engine to run at idle, and adjust switch so continuity is lost at about 900 RPM. See Fig. 9.

Fig. 9: Throttle Valve Switch Adjustment



Connect ohmmeter across terminals as shown.

OVERHAUL

Distributor overhaul is limited to removal of the cap, rotor, sealed cover, housing and harness. Crank angle sensor cannot be disassembled. Check cap and rotor for dust, carbon deposits and cracks, before reassembly.

Computerized Engine Controls

DATSUN/NISSAN ELECTRONIC CONCENTRATED ENGINE CONTROL (Cont.)

Fig. 10: Datsun/Nissan 280ZX Turbo ECES Wiring Diagram

