

Part 2. System Testing

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Important Note

This chapter consists of additional checks and specifications for diagnosing faults within the fuel injection and ignition systems. The following procedures should only be attempted by mechanics or persons with a good understanding of electrical components and circuits.

To diagnose fuel and engine management problems in the minimum amount of time it is important not to overlook the obvious and complete tasks in a logical order. If unsure of the vehicle, the best place to start is with a compression test which is then followed with a complete tune-up as described in Engine (chapter 4).

Next it is most important to check fuel pressure and the injector circuit as described in Part 1 of this chapter.

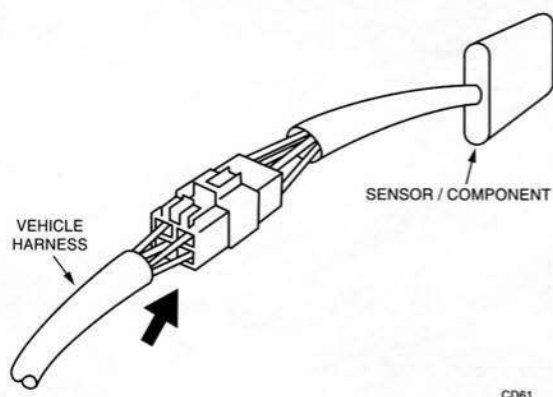


Trying to diagnose an engine with poor compression or incorrect fuel pressure can cause misleading results.

Read the Service Precautions and Procedures heading in Part 1 of this chapter prior to carrying out repair procedures in this part.



Reduce the fuel system pressure as described in Part 1 of this chapter before disconnecting any fuel lines.



Large arrow indicates how insets used in this manual are viewed, unless otherwise stated.

Specifications

Inlet air temperature sensor resistances:

Mechanical type air flow meter —

At - 10°C	10 – 20 k/ohms
At 0°C	4 – 7 k/ohms
At 20°C	2 – 3 k/ohms
At 40°C	0.9 – 1.3 k/ohms
At 60°C	0.4 – 0.7 k/ohms
At 80°C	0.2 – 0.4 k/ohms

Hot wire air flow sensor —

At - 20°C	13.6 – 18.4 k/ohms
At 20°C	2.2 – 2.7 k/ohms
At 60°C	0.5 – 0.7 k/ohms
At 80°C	0.2 – 0.4 k/ohms

Coolant temperature sensor resistances:

At - 10°C	10 – 20 k/ohms
At 0°C	4 – 7 k/ohms
At 20°C	2 – 3 k/ohms
At 40°C	0.9 – 1.3 k/ohms
At 60°C	0.4 – 0.7 k/ohms
At 80°C	0.2 – 0.4 k/ohms

Cam angle sensor resistance:

Up to 50°C	0.835 – 1.4 k/ohms
From 50°C	1.060 – 1.645 k/ohms

Crank angle sensor:

Resistance —	
Up to 50°C	1.630 – 2.740 k/ohms
From 50°C	2.065 – 3.225 k/ohms

Idle speed control valve resistance:

Up to 50°C	17.0 – 24.5 ohms
From 50°C	21.5 – 28.5 ohms

Knock sensor resistance

(minimum) 1 M/ohm or higher

Throttle position sensor resistance:

VTA & E2 —	
Throttle valve closed	0.28 – 6.4 k/ohms
Throttle valve fully open	2.0 – 11.6 k/ohms

VC & E2 2.7 – 7.7 k/ohms

Oxygen sensor heater element resistance 11 – 16 ohms

CO adjuster resistance 4 – 6 k/ohms

Fuel cut return rpm 1 500 rpm

Secondary speed sensor resistance 560 – 680 ohms

ECU VOLTAGES

Terminal +B, ECU power supply, ignition On Battery V

Terminal BATT, ECU constant power supply:

At all times Battery V

Terminal VTA, TPS signal:

Throttle fully closed 0.3 – 1.0 V

Throttle fully opened 2.7 – 5.2 V

Terminal VC, TPS power supply,

with ignition On 4.5 – 5.5 V

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Terminal VG, air flow rate, P or N range, with A/C Off	1.1 – 1.5 V
Terminal FPR1, circuit opening relay:	
Ignition On	Battery V
Engine running	0 V
Terminal #10, injector 1	Battery V
Terminal #20, injector 2	Battery V
Terminal #30, injector 3	Battery V
Terminal #40, injector 4	Battery V
Terminal #50, injector 5	Battery V
Terminal #60, injector 6	Battery V
Terminal THA, inlet air temperature sensor signal:	
Inlet air temperature at 20°C	0.5 – 3.4 V
Terminal THW, coolant temperature sensor signal:	
Coolant temperature at 80°C	0.2 – 1.0 V
Terminal STA, start signal:	
Engine cranking	Battery V
Terminal IGT1, igniter control signal:	
¹ Engine cranking or idling	Fluctuates 0.1 – 4.5 V
Terminal IGT2, igniter control circuit:	
¹ Engine cranking or idling	Fluctuates 0.1 – 4.5 V
Terminal IGT3, igniter control circuit:	
¹ Engine cranking or idling	Fluctuates 0.1 – 4.5 V
Terminal IGF, ignition feedback signal	
Ignition On	5 V
¹ Engine running	Fluctuates 0.1 – 4.5 V
Terminal RSC, idle speed control	
(ISC) valve open signal	Battery V
Terminal RSO, idle speed control	
(ISC) valve close signal	Battery V
Terminal W, Check Engine warning lamp:	
Warning lamp extinguished	Battery V
Warning lamp illuminated	Less than 3 V
Terminal ACT, air conditioning signal:	
A/C On	Above 5 V
A/C Off	Less than 2 V
Terminal AC1, air conditioning signal:	
A/C On	Less than 2 V
A/C Off	Battery V
Terminal NSW, inhibitor switch input, ignition in the Start position:	
In P or N range	Less than 3 V
Any other position	Battery V
Terminal KNK 1 and KNK 2, knock sensor signals	See text
Terminal SPD, speed sensor signal:	
Slowly rotating propeller shaft	Fluctuates 0 – 4.5 V
¹ Terminal NE+, crank angle sensor	Fluctuates
¹ Terminal G, cam angle sensor	Fluctuates

¹ These voltage fluctuations can only be checked with an oscilloscope.

Self Diagnosis

The ECU self diagnosis function is very useful in locating system faults, particularly intermittent problems. The fault codes indicate a malfunction in a particular circuit and do not necessarily mean that the component is faulty. The entire circuit — connectors, wiring and the component should be checked to determine the cause of the fault. If a fault is intermittent, check for loose or dirty connections, especially earth points.

Self diagnosis does not comprehensively cover all circuits of the engine management system, and therefore should always be

used in conjunction with the test procedures described later to accurately locate faults.

When the ECU detects a fault, the Check Engine warning lamp will illuminate while the fault is present. The fault code is retained in the ECU memory, with the exception of code 43 until power is disconnected from the ECU.

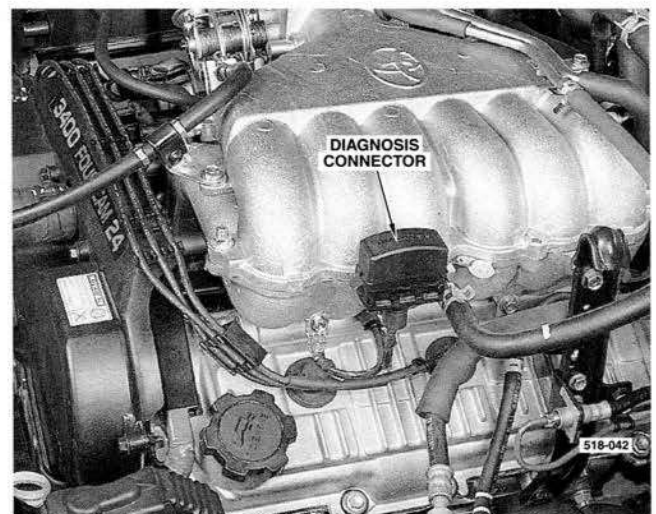
There are two self diagnosis modes, normal mode and test mode. Normal mode is used when checking for fault codes that are in memory or are currently present. Test mode has greater sensitivity and is used for locating faults in some circuits while road testing the vehicle. Test mode diagnosis on late model vehicles requires the use of specialist equipment.

FAULT CODES

- | | |
|----|--|
| 12 | Engine speed (RPM) signal (cam angle sensor) |
| 13 | Engine speed (RPM) signal (cam angle sensor) |
| 14 | Ignition signal |
| 16 | A/T control failure (renew the ECU) |
| 21 | Oxygen sensor (if equipped) |
| 22 | Coolant temperature sensor |
| 24 | Inlet air temperature sensor |
| 25 | Air/fuel ratio lean (oxygen sensor models) |
| 31 | Air flow meter/sensor |
| 33 | Idle speed control valve |
| 41 | Throttle position sensor |
| 42 | Vehicle speed sensor |
| 43 | Starter signal |
| 52 | LH knock sensor |
| 53 | Knock sensor control signal |
| 55 | RH knock sensor |
| 61 | Secondary speed sensor (automatic models) |

Normal Mode

- 1 Ensure that the battery is fully charged and that the engine is at operating temperature.
- 2 Ensure that the throttle is fully closed.
- 3 Place the transmission in Neutral and turn all accessories off.
- 4 Switch the ignition On, but do not start the engine.



Location of the diagnosis connector. The terminal identification is inside the cover.

- 5 On early model vehicles, bridge terminals TE1 and E1 on the engine compartment diagnosis connector, using a split pin or paper clip.
- 6 On late model vehicles, bridge terminals TC and E1 on the engine compartment diagnosis connector, using a split pin or paper clip.



Late model vehicles have a second diagnosis connector inside the vehicle located beneath the driver side lower dash panel. Fault codes can also be extracted from this connector by bridging terminals 4 and 13.

- 7 Read the codes by counting the number of flashes of the Check Engine lamp. The code numbers are displayed as sets of flashes separated by a 2.5 second pause. Each set comprises a series of 0.5 second flashes, a 2.5 second pause and a further series of 0.5 second flashes. The first series in the set represents tens, the second series represents units. Example: Code 12 would be shown as one 0.5 second flash, a 1.5 second pause and two 0.5 second flashes.



The warning lamp in the sub fuel tank gauge will also flash when the diagnosis mode is engaged. Where fitted, the cruise control lamp, ABS warning lamp and on some models, the second select or ECT warning lamp will also flash. If there are no faults in any of these systems, all lamps should flash at the same time.

- 8 If more than one fault is in memory, the codes will be grouped in numerical order starting from the lowest number with each code separated by a 2.5 second pause. The group will repeat after a 4.5 second pause.
- 9 The Check Engine lamp will flash continuously at 0.26 second intervals (approximately twice per second) if no faults are in memory.

Test Mode

Test mode diagnosis is only possible on early model vehicles. To carry out test mode diagnosis on late model vehicles, dedicated test equipment is required.

- 1 Ensure that the battery is fully charged and that the engine is at operating temperature.
- 2 Ensure that the throttle is fully closed.
- 3 Place the transmission in Neutral and turn all accessories off.
- 4 Ensure that the ignition is Off.
- 5 Bridge terminals TE2 and E1 of the engine compartment diagnosis connector, using a split pin or paper clip and switch the ignition On. The Check Engine lamp should flash to indicate Test Mode.
- 6 Road test the vehicle and simulate the conditions when the fault has previously occurred. The Check Engine lamp will illuminate if a fault is detected, with the exception of code 31.
- 7 Stop the vehicle, switch the ignition On with TE2 and E1 still connected, bridge terminals TE1 and E1 on the diagnosis connector. Read the fault codes as previously described.
- 8 Remove the bridge wires from the diagnosis connector.

CLEARING CODES

- 1 Switch the ignition Off.
- 2 Remove the EFI fuse for 30 seconds.
- 3 Road test the vehicle and check that no fault codes are set.

CONFIRMING CODES

The code/s should be confirmed prior to further diagnosis.

- 1 Clear the codes.
- 2 Road test the vehicle and recheck the codes.
- 3 If the same code is not set, an intermittent fault is indicated. Check all wiring in the relevant circuits for clean and secure connections.

DIAGNOSIS CIRCUIT CHECK

- 1 With the ignition On, confirm that the Check Engine lamp illuminates. If the lamp does not illuminate, check the 10 amp Gauge fuse.
- 2 Start the engine and confirm that the Check Engine lamp extinguishes. If the lamp remains illuminated, check for fault codes. If there are no fault codes, check the wiring for a short to earth between the ECU terminal W, the diagnosis connector terminal W and the instrument cluster.

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COMPONENT AND SYSTEM TESTS

TACHOMETER CONNECTION

Connect an inductive pickup tachometer to a high tension lead. If an inductive pickup tachometer is not available, connect the positive lead of the conventional tachometer to terminal IG – of the engine compartment diagnosis connector. Set the tachometer to 2 cycle operation or halve the indicated reading when using an inductive pickup tachometer.

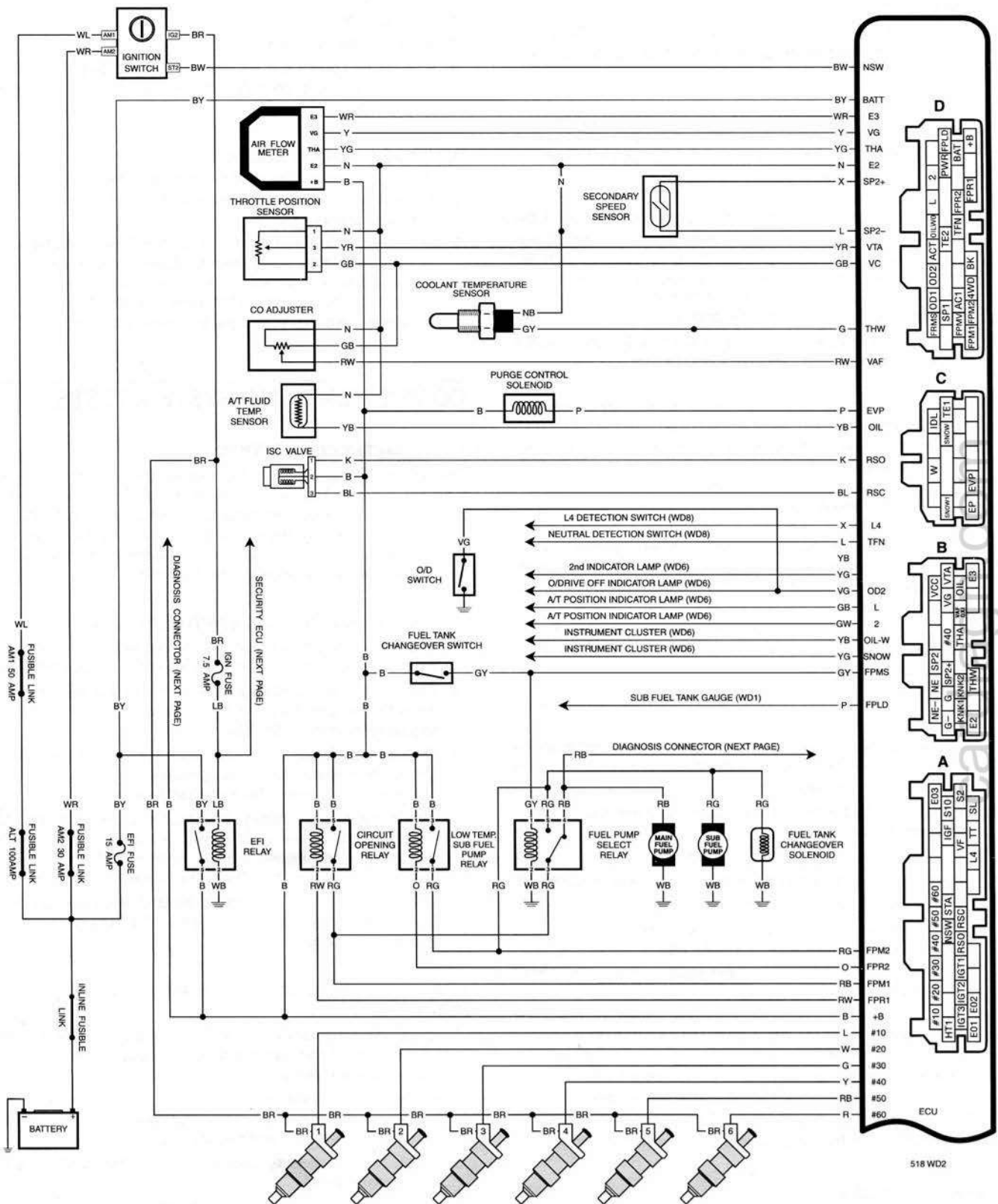
ECU POWER SUPPLY AND EARTH CIRCUITS

- 1 Check that battery voltage is available at the ECU terminal BATT at all times. If the voltage is not correct, check the EFI fuse.
- 2 Check that battery voltage is available at the ECU terminal +B with the ignition On. If the voltage is not correct, check the EFI relay and the EFI fuse.
- 3 On late models also check that battery voltage is available at the IGSW terminal of the ECU, with the ignition On. If the voltage is not correct, check the IGN fuse.
- 4 Check that battery voltage is available at the NSW terminal of the ECU with the ignition key in the Start position. On automatic transmission models, ensure that the transmission is in Park or Neutral. Check the ST fuse if necessary.
- 5 Check for continuity to earth at the ECU terminals EO1, EO2, EO3 and E1 on early models, or at the EO1, EO2 and E1 terminals on late models.

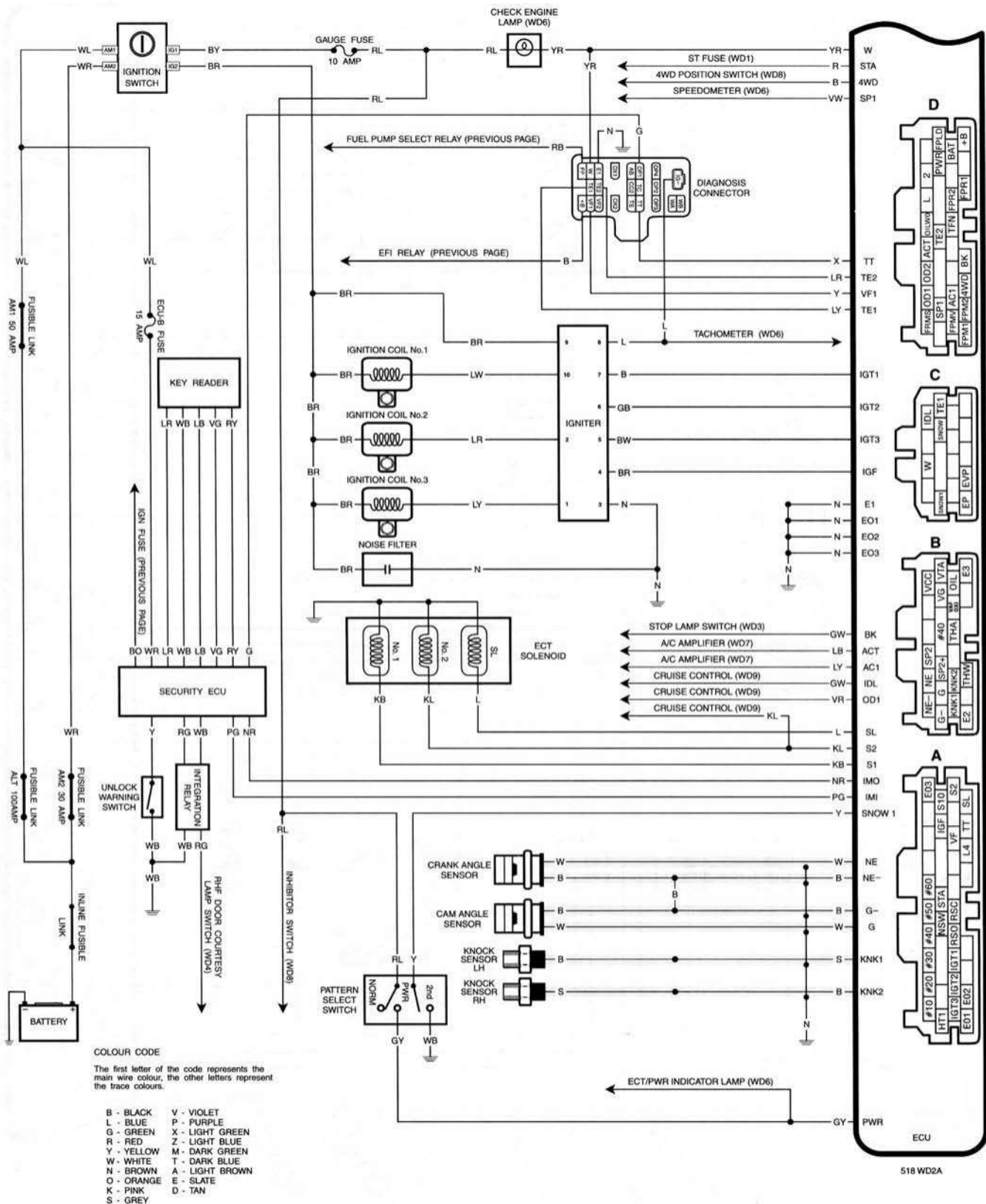
ENGINE SPEED SIGNAL — CAM ANGLE SENSOR (CODE 12)

- 1 Disconnect the cam angle sensor wiring connector, located at the front of the upper timing belt cover, adjacent to the power steering pump.
- 2 Measure the resistance between the terminals of the cam angle sensor connector. Renew the cam angle sensor if the resistance is not to Specifications.
- 3 If the resistance is to Specifications, connect the wiring connector securely.
- 4 Backprobe the terminals of the cam angle sensor wiring connector and check that the multimeter reads between 5.7 – 5.8 Hz with the engine idling at operating temperature.

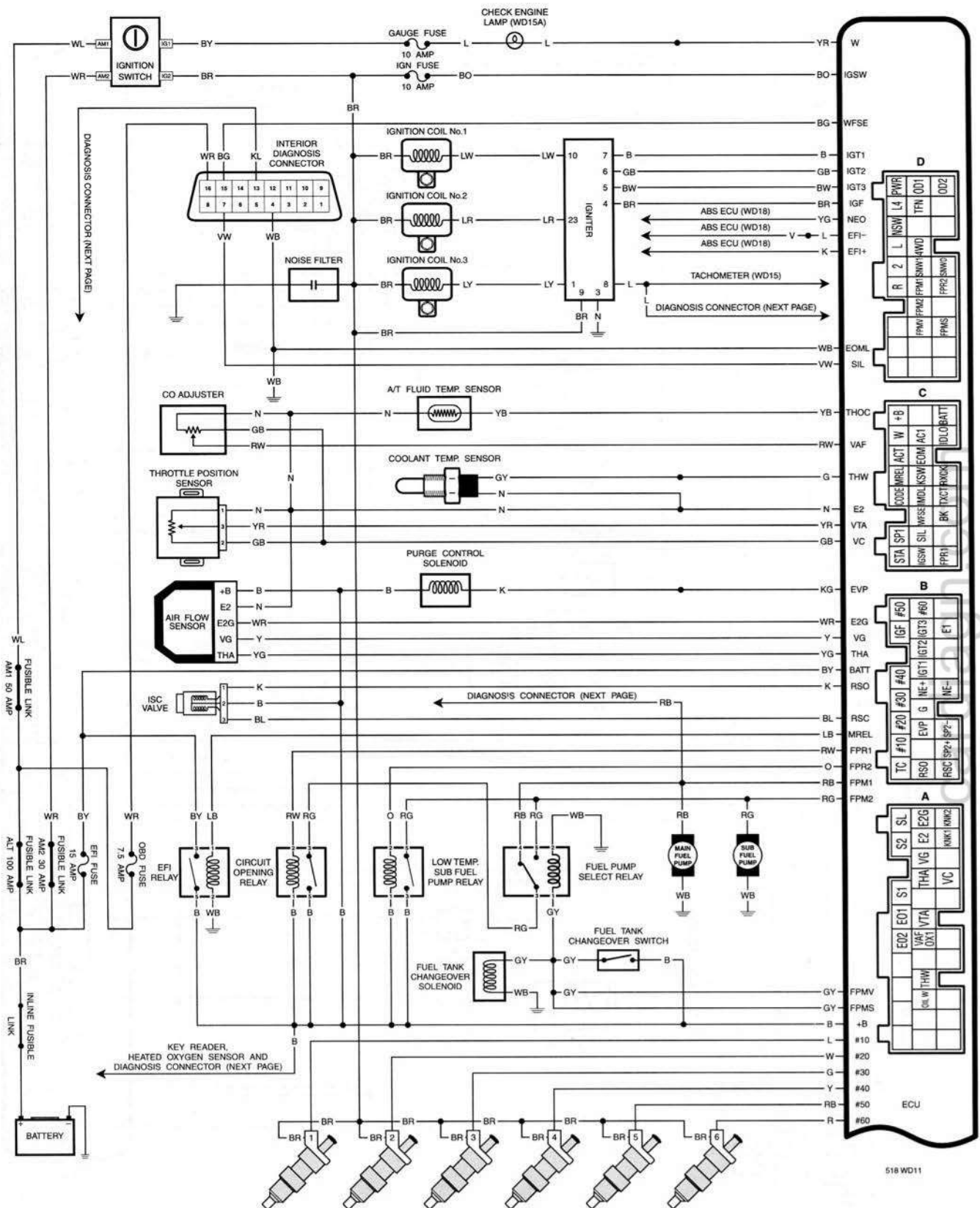
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Fuel and engine management system circuit diagram. Early models.


Fuel and engine management system circuit diagram. Early models.

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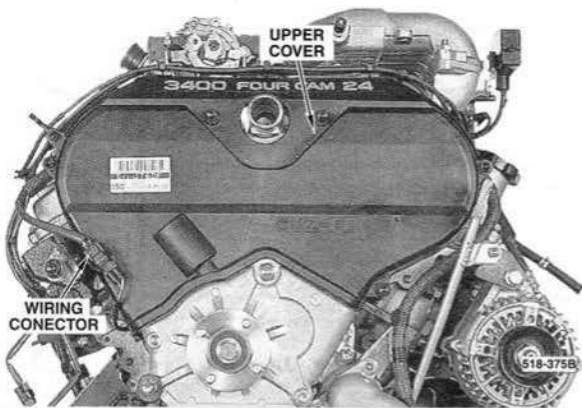


Fuel and engine management system circuit diagram. Late models.



Fuel and engine management system circuit diagram. Late models.

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Location of the cam angle sensor wiring connector.

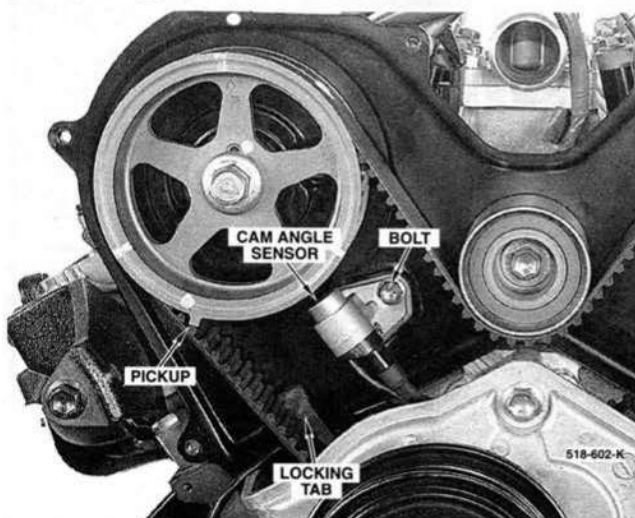


Ensure that the test leads are clear of the engine drive belts and fan.

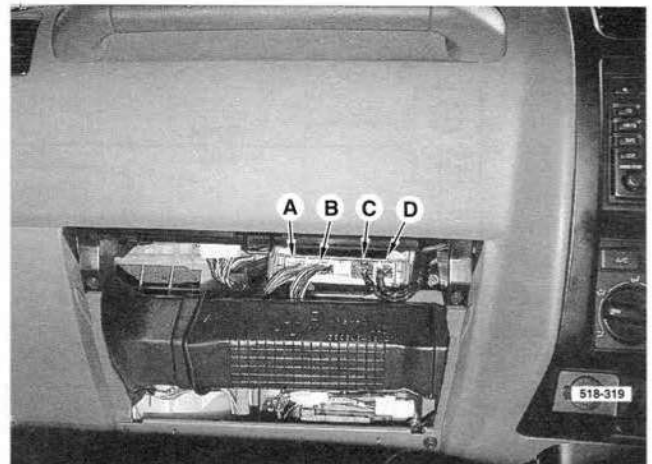
- 5 Remove the upper timing belt cover and check that the pickup portion of the camshaft drive sprocket is not damaged. Renew the cam angle sensor if the frequency is not as specified in step 4 and no fault can be found with the drive sprocket.
- 6 If no fault can be found with the sensor or the drive sprocket, remove the glove compartment retaining screws and withdraw the glove compartment. Remove the glove compartment roof panel retaining screws and withdraw the roof panel.
- 7 Disconnect connector B from the ECU and check the wiring between the sensor and the ECU for continuity and shorts to earth. Also check that the connectors are making secure contact with the ECU and the cam angle sensor.
- 8 Check the ECU power supply and earth circuits and clear the fault codes. If the fault code resets, renew the ECU.

ENGINE SPEED SIGNAL — CRANK ANGLE SENSOR (CODE 13)

- 1 Raise the front of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.



Location of the cam angle sensor.



Location of the ECU wiring connectors. Refer to wiring diagrams in this chapter for the terminal identification.

- 2 Disconnect the crank angle sensor wiring connector, located on the left hand side of the crankshaft pulley.
- 3 Measure the resistance between the terminals of the crank angle sensor. Renew the crank angle sensor if the resistance is not to Specifications.
- 4 If the resistance is to Specifications, connect the wiring connector securely.
- 5 Backprobe the terminals of the crank angle sensor wiring connector and check that the multimeter reads between 380 – 400 Hz with the engine idling at operating temperature.



Ensure that the test leads are clear of the engine drive belts.

- 6 Remove the glove compartment retaining screws and withdraw the glove compartment. Remove the glove compartment roof panel retaining screws and withdraw the roof panel.
- 7 Disconnect connector B from the ECU and check the wiring between the sensor and the ECU for continuity and shorts to earth. Also check that the connectors are making secure contact with the ECU and the crank angle sensor.
- 8 Check the ECU power supply and earth circuits and clear the fault codes. If the fault code resets, renew the ECU.

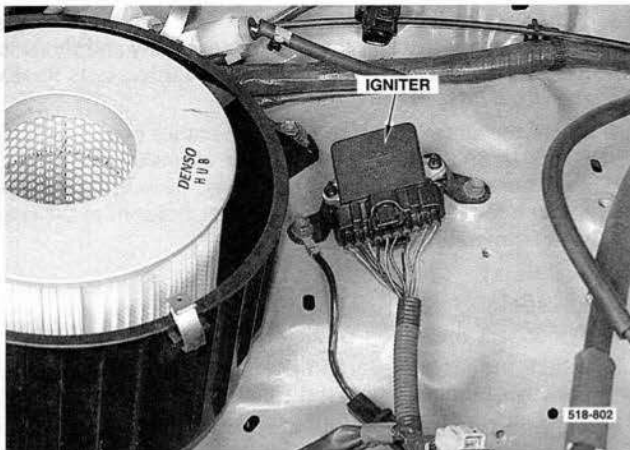
IGNITION SIGNAL (CODE 14)

- 1 Disconnect the wiring connector from the igniter, located adjacent to the air cleaner.
- 2 With the ignition On, check for battery voltage at terminal 9 (black/red wire) of the igniter wiring connector. If battery voltage is not available, check the wiring between the igniter and the ignition switch. Rectify the open circuit in the wiring.



The terminal numbers are on the bottom of the connector.

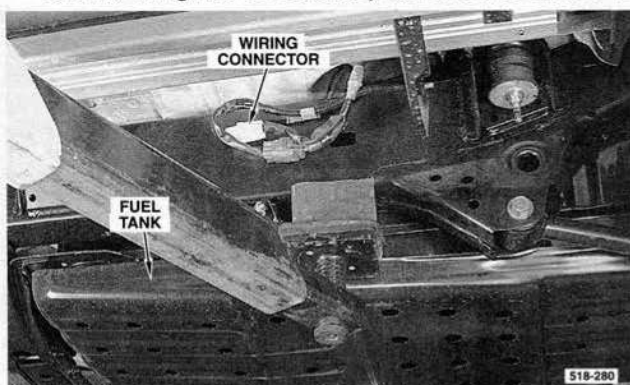
- 3 Check for continuity to earth at terminal 3 (brown wire). Repair the open circuit if necessary. Connect the wiring to the igniter.
- 4 Backprobe terminal 4 (black/red wire) of the igniter wiring connector and check that there is approximately 40 Hz avail-



Location of the igniter. The terminal identification is printed on the connector.

able with the engine idling at operating temperature. If the Hz reading is not as specified, check the wiring between the ECU and the igniter for continuity and shorts to earth. If no fault can be found, renew the igniter.

- 5 Backprobe terminal 5 (black/white wire) of the igniter wiring connector and check that there is approximately 8 – 12 Hz available with the engine idling at operating temperature. Repeat this check at terminal 6 (green/black wire) and terminal 7 (black wire). The Hz readings taken at the three ignition control terminals should all be the same. If the reading is lower on one of these terminals, check the wiring between the ignition control terminal with the low reading and the ECU. If no fault can be found, a problem is indicated in either the ECU or the igniter. Substitute the igniter with a known good unit and repeat step 4. Renew faulty components as necessary.
- 6 Disconnect the white sub fuel tank pump wiring connector from the left hand chassis rail. With the engine running on the main fuel tank, switch to the sub fuel tank and allow the engine to stall, depressurising the fuel system.
- 7 Disconnect the primary wires from each ignition coil.
- 8 Backprobe terminal 1 (blue/yellow wire) of the igniter wiring connector and check that there is approximately 9 – 12 Hz while cranking the engine. Repeat this check at terminal 2 (blue/red wire) and terminal 10 (blue/white wire). The Hz readings taken at the three coil trigger terminals should all be the same. If the igniter Hz readings are all within Specifications, clear the codes. If is not as specified, check the wiring between the ECU and the igniter for continuity and shorts to earth. If no



Location of the sub fuel tank pump wiring connector.

fault can be found, a fault with the ECU is indicated. Check the ECU power supply and earth circuits.

If the Hz reading is lower on one or more cylinders, but within Specifications in step 5, renew the igniter.

- 9 Connect the wiring to each ignition coil and the sub fuel tank pump white wiring connector.

OXYGEN SENSOR (CODES 21, 25) — IF EQUIPPED



If a CO adjuster is fitted, no oxygen sensor is used

The oxygen sensor produces a voltage ranging from 0.1 volts, for a lean mixture to approximately 0.9 volts for a rich mixture. An engine running at operating temperature and in good mechanical condition should have an oxygen sensor voltage ranging between 0.1 – 0.9 volts.

The ECU supplies the oxygen sensor signal input wire with a bias voltage of 0.45 volts, however when checked with a 10 megaohm digital voltmeter, which most digital voltmeters are, the bias voltage reading will read at approximately 0.35 volts.

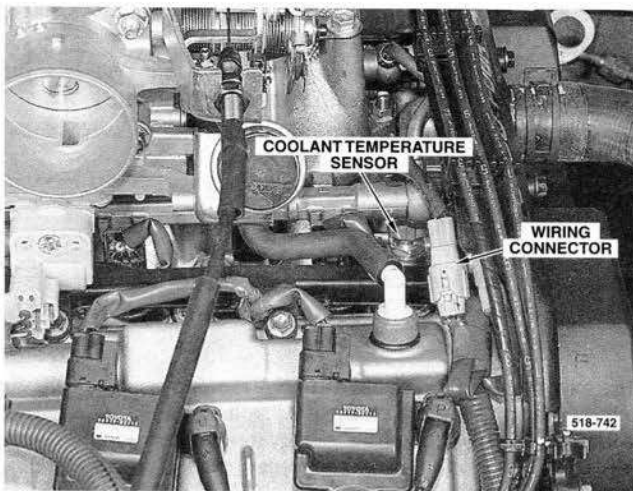
Before proceeding with the following fault code test procedures, ensure that the faulty oxygen sensor is tight in the engine pipe, that the wiring connections are secure, and that the vent holes at the top of the sensor are not obstructed. If a fault is found, rectify it, clear the fault codes and test drive the vehicle before proceeding.

If code 21 or 25 are set with other fault codes, rectify the cause of the other fault codes before proceeding.

- 1 Check the wiring for continuity between the ECU terminal OX1 and the oxygen sensor.
- 2 Check for continuity to earth at oxygen sensor harness connector terminal E1.
- 3 Measure the heater element resistance between the oxygen sensor black wire and green/yellow wire. Renew the oxygen sensor if the resistance is not to Specifications.
- 4 Ensure that the oxygen sensor wiring is securely connected and run the engine until normal operating temperature is reached.
- 5 Connect a voltmeter between the ECU terminals OX1 and E1.
- 6 Run the engine at approximately 2 500 rpm for approximately 90 seconds to bring the oxygen sensor to operating temperature.
- 7 Run the engine at 2 500 rpm and check that the voltmeter reading fluctuates evenly between 0.1 and 0.9 volts, indicating correct operation of the oxygen sensor and the ECU.
- 8 If the voltage does not fall below 0.35 volts, a rich mixture is indicated. Check the following possible causes:
 High fuel pressure
 Coolant temperature sensor
 Leaking injectors
 Inlet air temperature sensor
 Throttle position sensor.
- 9 If the voltage does not rise above 0.55 volts, a lean mixture is indicated. Check the following possible causes:
 Low fuel pressure.
 Vacuum leaks
 Blocked or faulty injectors
 Ignition system
 If no fault can be found with these systems, renew the oxygen sensor.

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Coolant temperature sensor location.

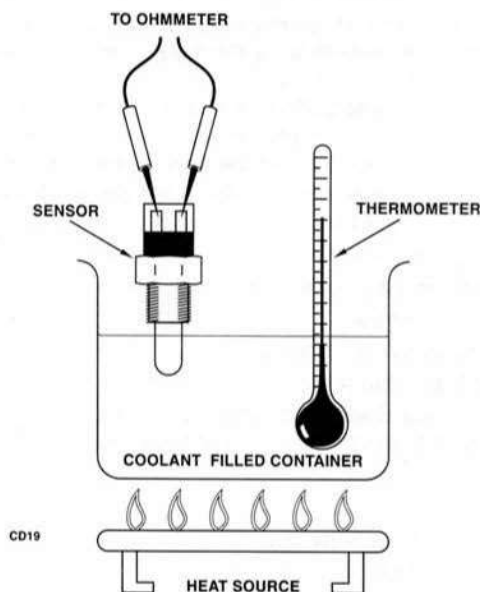
COOLANT TEMPERATURE SENSOR (CODE 22)

- 1 Disconnect the coolant temperature sensor wiring connector.
- 2 Switch the ignition On and check that 5 volts is available between the harness connector terminals.
- 3 If the voltage is not correct, check the wiring between the harness connector and the ECU for continuity and shorts to earth. Check the ECU power supply and earth circuits. Renew the ECU if no fault can be found.
- 4 Remove the coolant temperature sensor and check that the resistance between the terminals is to Specifications.

INLET AIR TEMPERATURE SENSOR (CODE 24)

Early Models

- 1 Disconnect the wiring from the air flow meter.
- 2 Switch the ignition On and check that 5 volts is available between the harness connector terminals THA and E2.



Testing the coolant temperature sensor.

- 3 If the voltage is not correct, check the wiring between the harness connector and the ECU for continuity and shorts to earth. Check the ECU power supply and earth circuits. Renew the ECU if no fault can be found.
- 4 Check the air temperature sensor resistance between terminals THA and E2 while heating the air inside the air flow meter using a heat gun or hair dryer. Renew the air flow meter if the resistances are not to Specifications at the relevant temperature.

Late Models

- 1 Disconnect the wiring connector from the air flow sensor.
- 2 Switch the ignition On and check that 5 volts is available between terminals THA and E2 of the harness connector.
- 3 If the voltage is not correct, check the wiring between the harness connector and the ECU for continuity and shorts to earth. Check the ECU power supply and earth circuits. Renew the ECU if no fault can be found.
- 4 Check the air temperature sensor resistance between terminals THA and E2 while heating the air inside the air flow sensor using a heat gun or hair dryer. Renew the air flow sensor if the resistances are not to Specifications at the relevant temperature.

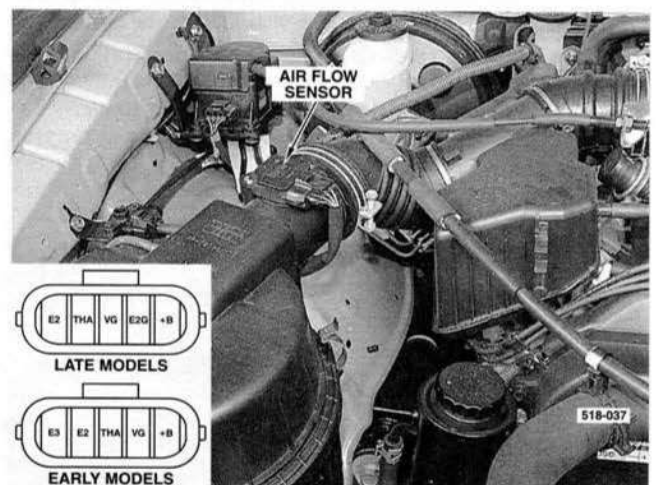
AIR FLOW METER/SENSOR (CODE 31)

Early Models — Mechanical Type

- 1 Disconnect the wiring connector from the air flow meter and check that there is battery voltage available at terminal +B with the ignition On. If battery voltage is not available, check the wiring between the air flow meter and the EFI relay.
- 2 Remove the air flow meter from the vehicle and check the resistance between E2 and THA terminals while slowly moving the inner core from rest to the wide open position. If the ohmmeter indicates an open circuit at any time, while moving the inner core, renew the air flow meter.

Late Models — Hot Wire Type

- 1 Disconnect the wiring connector from the air flow sensor and turn the ignition On. Check that there is battery voltage at terminal +B. If necessary, check the wiring between the EFI relay and the air flow sensor wiring connector.



Late model air flow sensor location. Insets show terminal identification for both early and late models.

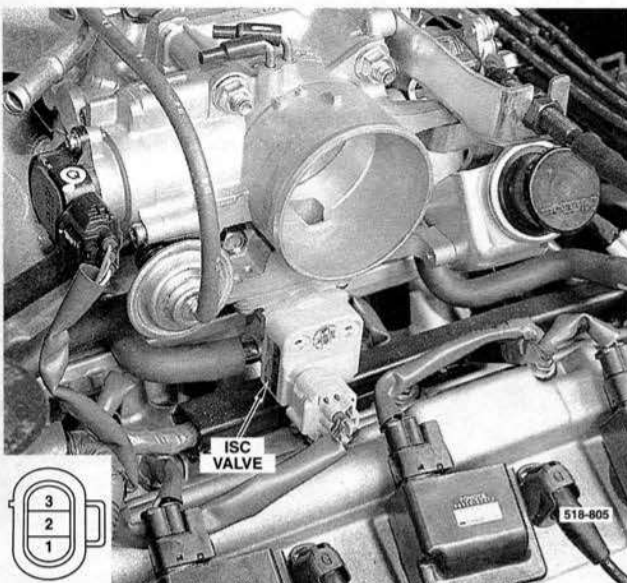
- 2 Measure the resistance between terminal E2G and earth. If the resistance is more than 1 ohm, check the connections and the wiring between the air flow sensor and the ECU. Also check the ECU power supply and earth circuits. If no fault can be found, renew the ECU.
- 3 With the engine running in Park or Neutral and all accessories Off, backprobe terminal VG and E2 of the air flow sensor connector and check that the voltage is between 1.1 – 1.5 volts.
- 4 If the voltage is not correct, check the wiring between the ECU and the air flow sensor. If no fault can be found, renew the air flow sensor.

IDLE SPEED CONTROL (ISC) VALVE (CODE 33)

Prior to proceeding with finding the cause of code 33, ensure that the throttle valve bore and ports are clean. If necessary, clean the throttle body, using a carburettor cleaner or another suitable solvent.

i Remove the TPS, the fast idle air valve and the dashpot from the throttle body prior to cleaning with solvent.

- 1 Disconnect the wiring connector from the ISC valve.
- 2 With the ignition On, check that battery voltage is available at terminal 2 of the ISC wiring connector. If necessary, check the wiring between the EFI relay and the ISC valve wiring connector.
- 3 Check the resistance between the ISC valve terminals 1 and 3. Renew the ISC valve if the resistances are not to Specifications.
- 4 Check the wiring for continuity and shorts to earth between the ECU and the ISC valve.
- 5 To test the ISC valve, remove the fast idle air valve from the throttle body and connect the 2 terminal to the positive terminal of a 12 volt battery. Connect the negative lead to terminal 1 and check that the valve port opens. Connect the negative lead to terminal 3 and check that the port closes. Renew the fast idle air valve if necessary.



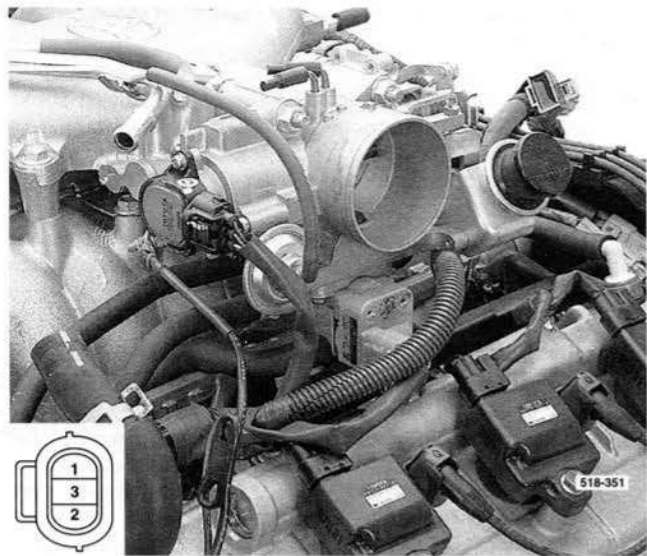
Location of the idle speed control (ISC) valve. Inset shows the terminal identification.

THROTTLE POSITION SENSOR (CODE 41)

- 1 Disconnect the wiring from the throttle position sensor and check for 5 volts between terminals 1 and 2 of the TPS wiring connector with the ignition On. If the voltage is not as specified, check the wiring between the sensor and the ECU for continuity and shorts to earth. Check the ECU power supply and earth circuits. If no fault can be found, renew the ECU.
- 2 Connect the wiring to the TPS and backprobe the centre terminal of the TPS wiring connector.
- 3 With the ignition On, check the voltage as the throttle is slowly opened to full throttle.

The voltage should be 0.3 – 1.0 volt with the throttle closed, and should increase to approximately 2.7 – 5.2 volts with the throttle opened fully.

Renew the TPS if the voltage does not increase smoothly in relationship to the throttle movement or the voltmeter shows an open circuit at any time as the throttle is opened.



Throttle position sensor location. Inset shows the terminal identification.

VEHICLE SPEED SENSOR (CODE 42)

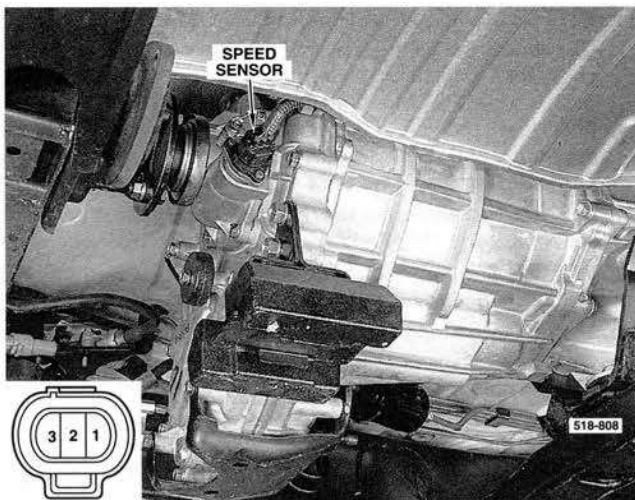
On manual transmission models, the vehicle speed sensor signal to the ECU is generated by the electronic speedometer via the primary vehicle speed sensor which is installed to the transfer case. The ECU supplies a 5 volt bias voltage which is pulsed to earth through the speedometer.

On automatic transmission models, this sensor is used as a backup and the ECU receives signals from the secondary speed sensor for transmission shift points and the control of the fuel and engine management system. Refer to the Secondary Speed Sensor (Code 61) heading for more information.

- 1 If the speedometer does not operate, proceed as follows:
 - a Raise the rear of the vehicle and support on chassis stands. Refer to General Information (chapter 1) for the positions of the jacking points.
 - b Disconnect the vehicle speed sensor wiring from the transfer case and check for 12 volts at the harness connector terminal 1 with the ignition On. If 12 volts is not available, check the Gauge fuse.
 - c Check for continuity to earth at the speed sensor harness connector terminal 2.

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Part 2



Location of the primary vehicle speed sensor. Inset shows terminal identification.

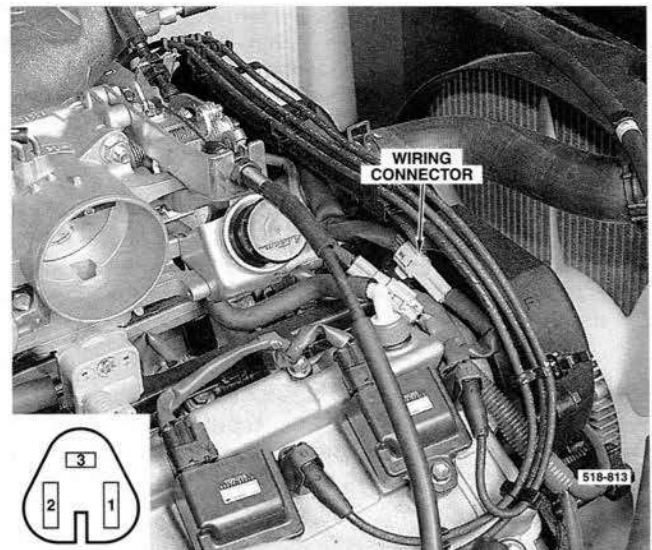
- d Check for approximately 12 volts at the speed sensor harness connector terminal 3 (blue/red). If the voltage is not correct, check the wiring for continuity and shorts to earth between the speed sensor harness connector and the instrument cluster.
- e Backprobe terminals 2 and 3 of the speed sensor connector. Rotate the propeller shaft and check that the voltage fluctuates between approximately 0 and 11 volts three times per revolution. Renew the sensor if a fault is indicated.
- 2 If the speedometer operates normally, proceed as follows:
 - a Connect a voltmeter between the ECU terminals SP2+ and SP2-. Check for a voltage fluctuation between approximately 0 and 5 volts, while turning the rear propeller shaft slowly with the ignition On. If the voltage fluctuates and the fault code remains, check the ECU power supply and earth circuits. Clear the fault codes, and if the fault code resets, renew the ECU.
 - b If the voltage remains constant at 5 volts, check the wiring between the ECU terminal SPD and the speedometer for continuity.
 - c If the wiring is not faulty and the fuel gauges, voltmeter and tachometer operate correctly, renew the speedometer. If the fuel gauges, voltmeter and tachometer do not operate, it indicates a faulty instrument cluster earth wire.

STARTER SIGNAL (CODE 43)

- 1 Check that battery voltage is available between the ECU terminals STA (early models) or terminal NSW (late models) and earth while cranking the engine.
- 2 If there is no voltage, check the ST fuse in the engine compartment fuse and relay box. If the fuse is not faulty, check the wiring between the ECU connector terminal STA/NSW and the ignition switch for continuity and shorts to earth. Also check the inhibitor switch.
- 3 Check the starter motor solenoid for high resistance and renew if necessary.

KNOCK SENSORS (CODES 52, 53, 55)

- 1 Disconnect the knock sensor wiring connector, located adjacent to the right of the rear timing belt cover.

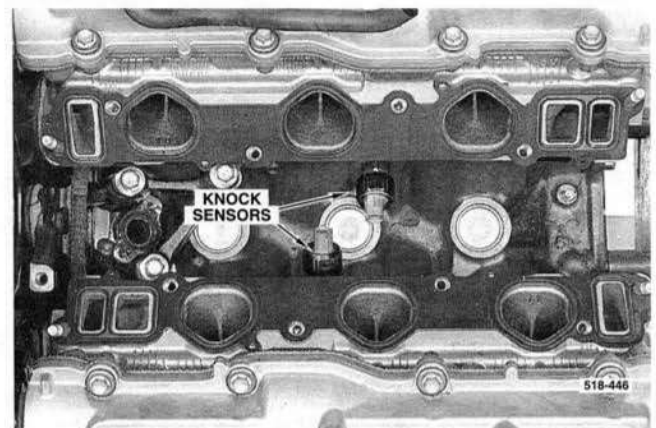


Location of the knock sensor wiring connector. Inset shows terminal identification.

- 2 Using a DC frequency meter, measure the frequency generated by the knock sensors between terminals 1, 2 and earth while gently tapping the power steering bracket with a small hammer. The frequency should be fluctuating between 2 – 50 Hz.

i Do not use terminal 3 as earth, as that terminal provides connection to the shield wire.

- 3 Using an ohmmeter, check that the resistance between terminals 1 and earth and 2 and earth is not less than 1 mega ohm. Renew the sensor(s) if necessary.
- 4 If no frequency is generated, or an open circuit is indicated, remove the inlet manifold and check the wiring to the sensors for damage, referring to Engine (chapter 4). If no fault is indicated, renew the knock sensor(s).
- 5 If the knock sensors operate correctly, check the wiring between the knock sensor wiring connector and terminals KNK 1 and KNK 2 of the ECU connector B for continuity or shorts to earth.
- 6 Check the ECU power supply and earth circuits and clear the fault codes. If the fault code resets, renew the ECU.



Inlet manifold removed showing the knock sensors.

