

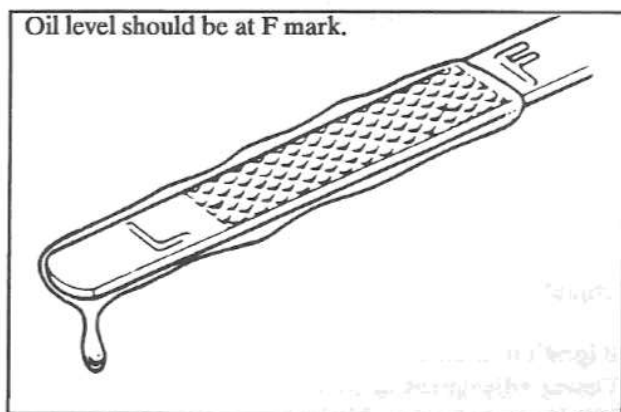
ENGINE TUNE-UP & MAINTENANCE

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ENGINE TUNE-UP & MAINTENANCE

CHECK OIL LEVEL.

The oil level should be between the L & F marks on the level gauge. Inspect for leakage, and fill oil up to the "F" mark if level is low.



Oil Capacity

V6

VR - Oil pan capacity (less filter): 3.8 litres

VS - Oil pan capacity (less filter): 4.0 litres

Oil filter Capacity: 0.3 litre

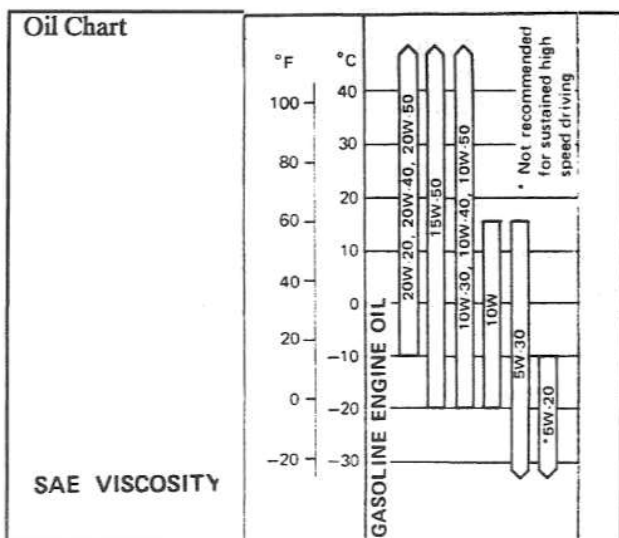
V8

Oil pan capacity (less filter): 4.8 litres

Oil Filter Capacity: 0.3 litres

LUBRICATION

The recommended oil quality should be used, as vehicles under go extreme conditions, therefore the engine must be correctly lubricated at all times.



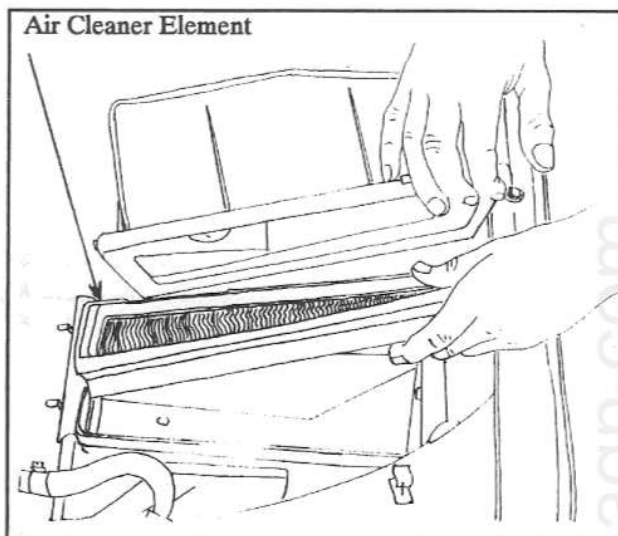
Oil Quality

Oil quality SF or SG Engine Oil

AIR FILTER

Remove

1. Disconnect air filter lower housing upper housing snap clips.



2. Remove air filter element.

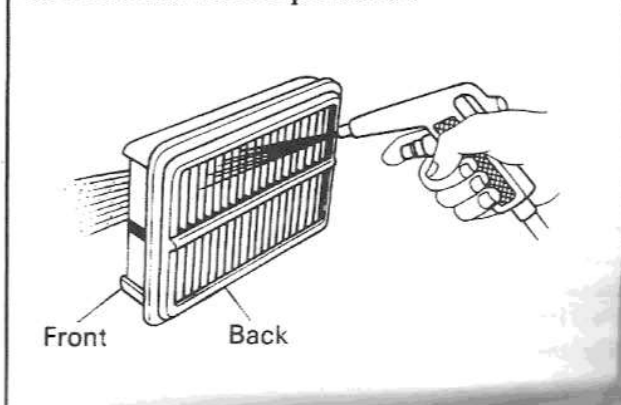
Install

1. Fit the new or cleaned air filter element into air filter housing.
2. Replace the clips on the air filter housing.

INSPECT AIR FILTER

- (a) Inspect the air cleaner element to ensure it is not excessively damaged, dirty or oily.

Clean the filter with compressed air.



(b) Clean the filter element with compressed air. First clean the inside thoroughly, then clean the outside of the element.

Inspection of High Tension Lead.

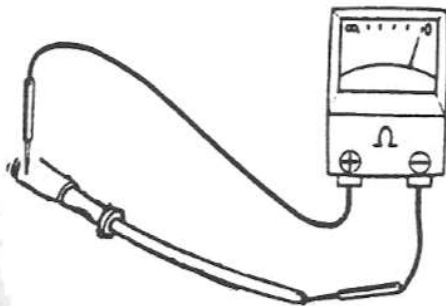
1. Carefully Remove High Tension Lead by Rubber Boot from Spark Plugs.

* Pulling on or bending the cords may damage the conductor inside.

2. Examine Resistance of High Tension Lead with Distributor Cap.

Check that the resistance does not exceed the maximum using an ohmmeter.

Maximum resistance: 25 k ohms / lead.



Maximum resistance: 25 k ohms / lead

Inspect the terminals, and replace the high tension lead and/or distributor cap if more than maximum specified.

OIL FILTER

* The oil filter should be changed every 10,000 Kilometers or 6 months whichever ever occurs first, the filter is a replacement type and can not be serviced.

Replacement

1. Unscrew oil filter with a suitable oil filter wrench, then remove taking care not to spill oil.

Unscrew oil filter with a suitable oil filter wrench, then remove and discard



2. Fit a new seal to oil filter, it should be located in the groove on the top of the filter.

3. Screw filter onto oil filter moulding. Once the filter starts to feel firm tighten another 3/4 of a turn.

4. Add 0.3 litre of specified oil.

Specified Oil

SF or SG Engine Oil

5. Check oil level, then start engine, check for oil leaks around the oil filter.

6. If a minor leak tighten the oil filter another 1/3 of a turn.

If a major leak check the seal is correctly located into seal groove, or check the filter has been installed correctly.

COMPRESSION CHECK

Use a screw in type of compression tester gauge, as these are much more accurate than the testers which are held against the spark plug hole.

1. Engine must be at normal operating temperature.

2. Remove all of the spark plugs.

3. Install the compression tester into No 1 spark plug hole, the tester unit must be screwed in firmly.

* Aluminium heads are quite soft, so care must be taken not to cross thread the compression tester into the head.

4. Remove the start relay (and fuel inj relay if V6) from near the battery housing.

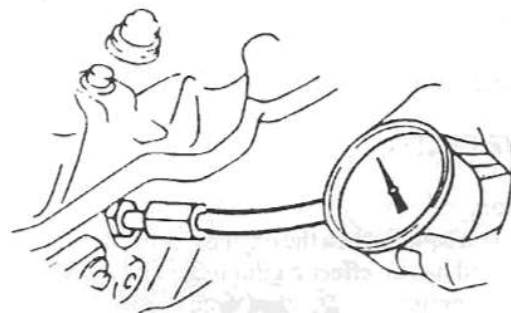
5. Have an assistant hold the accelerator down to the floor.

6. Crank the engine over several times on the starter motor and record the highest test.

7. Repeat this test on all cylinders.

The readings should be similar (variation no more than 70kPa) and each cylinder not less than 689kPa

Read compression gauge indication, read compression test results below.



Compression Test Results

EVEN PRESSURE ON ALL CYLINDERS Even pressure on all cylinders after several cranks of the engine on the starter motor. This would be expected from an engine in good state of repair.

LOW BUT IMPROVES WITH OIL. Low compression with the first compression test, however after adding a

table spoon of oil through the spark plug hole the test reading is vastly improved. This would indicate worn rings.

LOW DOES NOT IMPROVE WITH OIL This would indicate either broken rings on faulty valves.

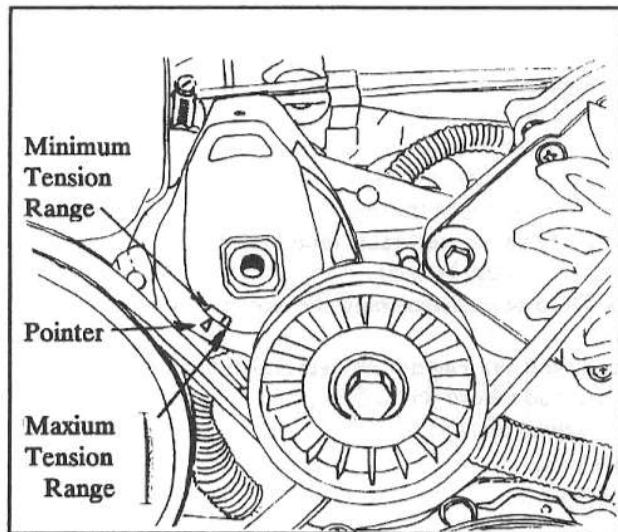
TWO CYLINDRES GIVE LOW READING EVEN WITH OIL OTHERS OK. This would indicate a faulty head gasket or warped head.

V6 - REPLACE DRIVE BELT and ADJUST BELT TENSION

1. Loosen the locknut on the automatic adjusting idler pulley mounting stud and turning the stud, relieve the tension on the drive belt.

2. Remove the belt if belt is to be removed.

3. Install new drive belt (if applicable) on crankshaft,



alternator, power steering, air conditioner and water pump pulleys.

4. Adjust belt, turn the automatic adjuster idler pulley mounting stud to adjust tension.

5. Check belt wear reference marks on tensioner. Install a new belt if tension is not within reference marks.

V8 DRIVE BELTS

Inspection

* Some belt squeal when the engine is started or stopped is normal and has no effect on durability of drive belt.

Visual Inspection

* Condition of the belt is best judged by twisting the belt so as to see the "V" surfaces.

Stages of Belt Wear:

1. **NEW BELT:** Cracks or chunks.
2. **MODERATELY USED BELT:** Few cracks; some wear on surfaces. Replacement not required.
3. **SEVERELY USED BELT:** Several cracks per inch. Should be replaced before chunking occurs.

Frayed Belt



Glazed Belt surface and cracking



4. FAILED BELT: Separation of belt material from backing (chunking). Replace belt immediately.

ALTERNATOR WATER PUMP.

NEW BELT DEFLECTION (mm) 7-8

USED BELT DEFLECTION (mm) 9-10

POWER STEERING PUMP

NEW BELT DEFLECTION (mm) 8-9

USED BELT DEFLECTION (mm) 10-11

AIRCONDITIONING

NEW BELT DEFLECTION (mm) 8-9

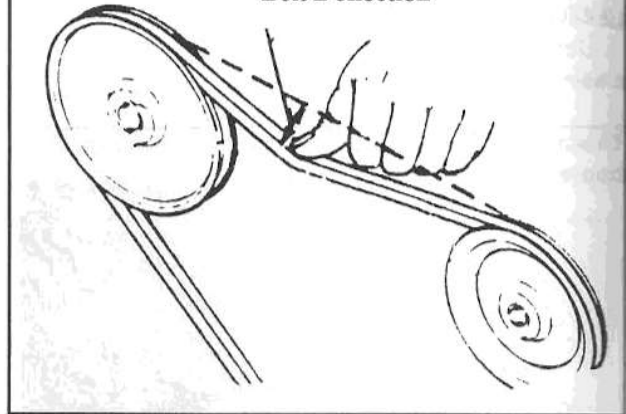
USED BELT DEFLECTION (mm) 10-11

To adjust the tension, loosen alternator mounting bolts and adjusting arm pivot bolt. Then turn adjusting nut on alternator upper mounting bolt to achieve correct tension.

Tighten mounting bolts and adjusting arm pivot bolt.

Apply a thumb pressure of 100n (10kg) to the mid-point of the longest convenient span of belt.

Belt Deflection



Replacement

Release tension of the belts by loosening the alternator, air conditioner, power steering pump adjustment bolts. Remove drive belts from drive pulleys. Replace belts, taking care the belts are fitted correctly. Tension belt by adjusting and tightening alternator, air conditioner belt has a idler pulley and adjusting bolt.

COOLING SYSTEM

Coolant Reservoir.



Fill supply tank to "FULL/MAX" mark.

Top-up or refill of Coolant

1. Remove coolant cap / radiator cap and fill cooling system with specified coolant mixture.

Coolant Specification: e.g.

V6 Engines: HN 2043 Eg. Tectaloy plus +

V8 Engines: HN 2043 Eg. Tectaloy plus +

* Do not combine different types of anti-freeze or corrosion inhibitors as they may be incompatible. If a different type has been used in the cooling system rinse the system with clean water.

2. Turn the heater control to maximum heat, this will help disperse any air trapped in the heater.

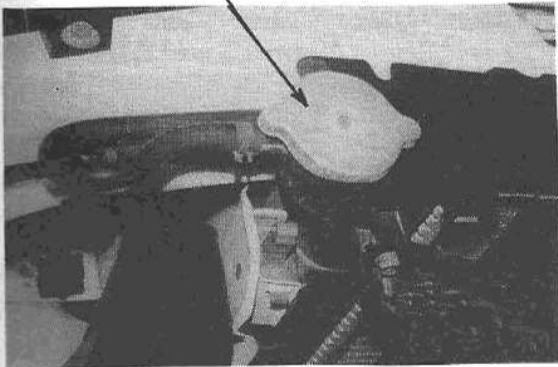
3. The engine coolant will need the coolant bleed plug removed to allow the air trapped to be released from the engine. The bleed plug is located in the V6 outlet pipe.

After the air has been dispersed from the system refit the bleed plug, and continue to fill the cooling system.

4. Fill the radiator, replace the radiator cap.

5. Run the engine until it reaches operating temperature, allow the engine to cool, release the radiator cap this will also help remove any air locks in the system.

Radiator Cap



*Loosen the air bleed plug, if air is present allow air to escape from the system, after the air has been dispersed retighten the bleed plug.

6. Top-up system with specified coolant if required.

INSPECT VALVE CLEARANCE

Six cylinder and V8's have non adjustable rocker arm assemblies.

BATTERY INSPECTION**TESTING BATTERY ELECTROLYTE (ACID)**

A hydrometer should be used to determine the specific gravity of battery electrolyte. The reading obtained indicates amount of unused sulphuric acid remaining in electrolyte and state of charge of battery.

The reading obtained will vary in relation to the temperature of the electrolyte. As the temperature rises the density of the electrolyte decreases and the specific gravity falls. As the temperature falls the density increases and the specific gravity rises.

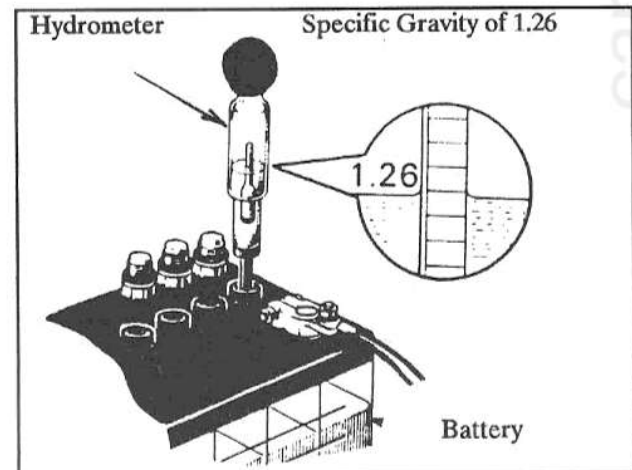
USING THE HYDROMETER

1. Liquid level of battery cell should be at normal height and electrolyte should be thoroughly mixed with any battery water which may have just been added by charging battery before taking hydrometer readings.

2. Draw electrolyte in and out of hydrometer barrel several times to bring temperature of hydrometer float to that of the acid in the cell.

3. Draw sufficient electrolyte into hydrometer barrel with the pressure bulb fully expanded to lift float so that it does not touch the sides, bottom or top of barrel.

4. Read the hydrometer with the hydrometer in a vertical position.

**TEST RESULT INDICATIONS**

Electrolyte specific gravity	Battery Charge Level.
1.240 to 1.260	100%
1.210 to 1.240	75%
1.180 to 1.210	50%
Below 1.130	Completely discharged.

A battery should be charged if the specific gravity is less than 1.210.

If there is more than 0.25 specific gravity variation between cells then a fault is most likely with the battery itself.

If battery charge is low and battery is serviceable, check alternator operation and all electrical connections.

BATTERY CHARGING

WARNING: When batteries are being charged explosive gas mixture forms beneath the cover of each cell.

* Do not smoke near batteries on charge or which have recently been charged.

* Do not break live circuit at terminals of batteries on charge. A spark will occur where the live circuit is broken. Keep all open flames away from battery.

NB: Fast charging will provide sufficient charge after one hour to enable the battery and alternator to carry electrical load however, whenever possible, slow charging is preferable.

INSPECTION OF SPARK PLUGS. V6 & V8

1. Clean and Inspect Spark Plugs.

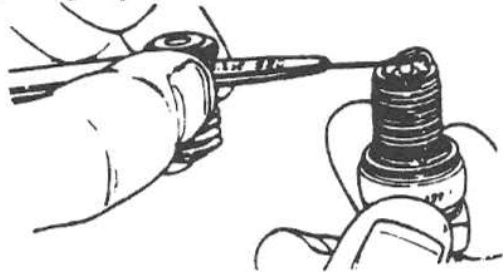
(a) Clean the spark plugs using a spark plug cleaner or wire brush.

(b) Examine the spark plugs for electrode wear, thread damage and insulator damage. Replace the plugs if a problem is found.

2. Adjust Electrode Gap.

Bend the outer electrode carefully to obtain the correct electrode gap.

Spark Plug Gap : - V6 1.5mm - V8 1.0mm



Bend the outer electrode carefully to obtain the correct electrode gap.

V6 Correct electrode gap: 1.5 mm

V8 Correct electrode gap: 1.0 mm

3. Spark plug type.

V6 Specified Spark Plug: R44LTS6

V8 Specified Spark Plug: CR42LTS

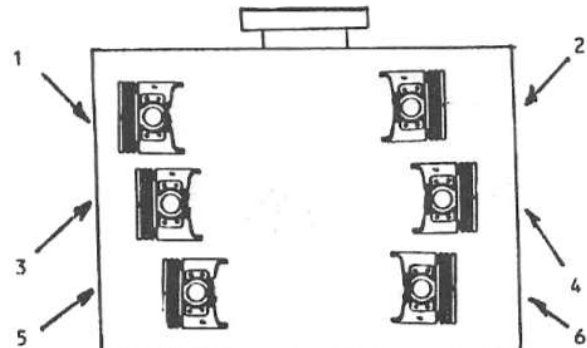
4. Torque plug to correct specification.

Spark Plug Torque specification: 14-20Nm

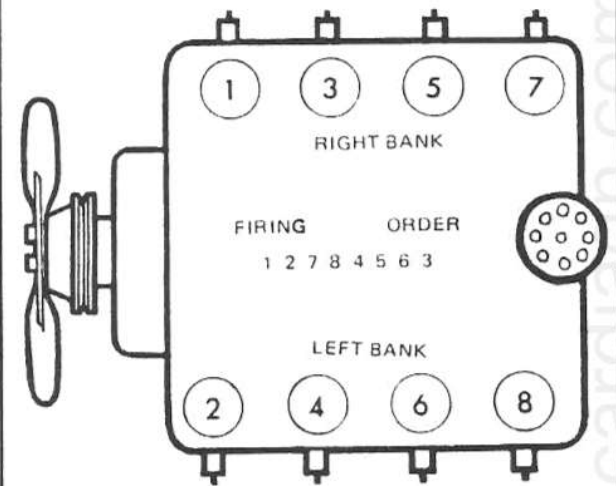
FIRING ORDER

The firing order for the 6 cylinder engines is 1-6-5-4-3-2 and the firing order for V8 engines is 1-2-7-8-4-5-6-3.

The firing order for the 6 cylinder engines is 1-6-5-4-3-2



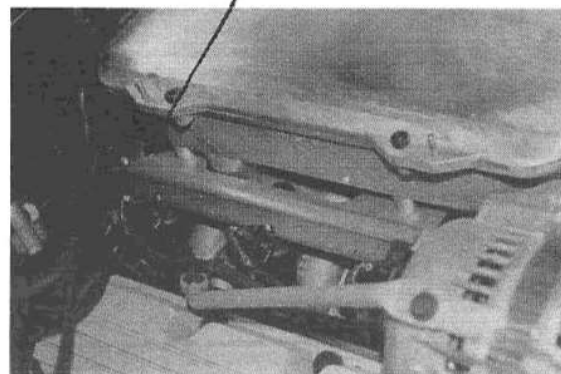
V8 Engine Firing Order is 1-2-7-8-4-5-6-3.



FUEL SYSTEM PRESSURE TEST

1. Remove the Fuel Pump fuse from the fuse holder near the battery. Start engine and idle engine until the engine runs out of fuel.

Fuel Pressure regulator



2. Install fuel pressure gauge at the fuel rail inlet connection, this is located near the throttle body adaptor.

3. Replace the fuel pump fuse and turn the ignition on, this will activate the fuel pump. Check that the pressure in the fuel line is within the specification.

Specified Fuel Pressure: 280 - 320 kPa

4. Lower fuel pressure as described above in item No1 and remove fuel pressure gauge.

5. Reinstall fuel line.

6. Check for fuel leaks.

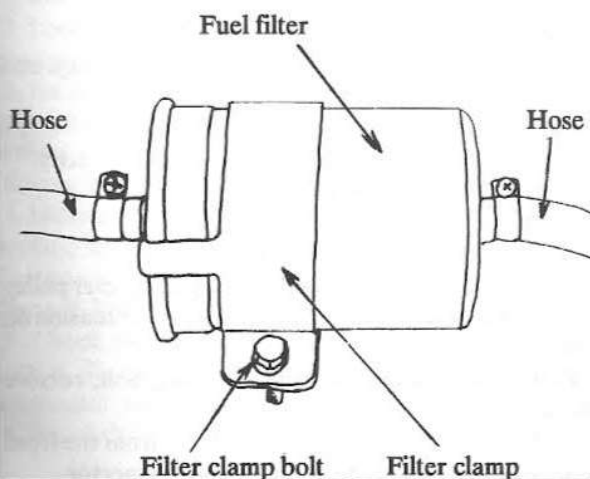
FUEL FILTER

Remove

1. Remove the Fuel Pump fuse from the fuse holder near the battery. Start engine and idle engine until the engine runs out of fuel.

2. Remove the fuel filter hose clamps and hoses from the filter. On vehicles with IRS, the fuel filter is located next

Remove the fuel filter clamp and hoses from the filter



to the underbody forward of the fuel tank. The filter is located in a different position for vehicles with the standard five link rear suspension. The filter is bolted to the floor pan at the rear of the car in front of the rear axle. Utilities have the filter is at the rear of the fuel tank.

3. Remove the fuel filter clamp bolt and remove filter, take care as the filter will be full of fuel.

Install

1. Install filter with arrow pointing in the direction of the fuel flow, tighten filter clamp bolt.

2. Install hoses to filter. Tighten hose clamps.

3. Replace the fuel pump fuse, turn ignition on to pressurise the fuel system, turn ignition off, check for fuel leaks.

4. Test drive vehicle.

FUEL PRESSURE REGULATOR

Remove

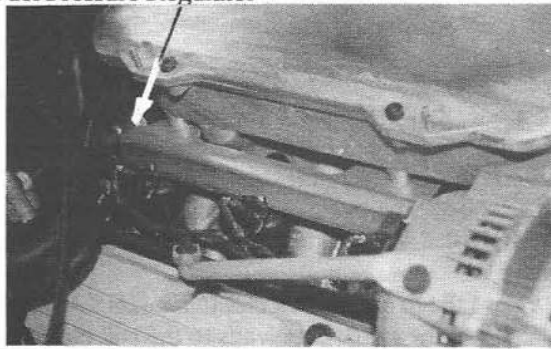
1. Remove the Fuel Pump fuse from the fuse holder near the battery. Start engine and idle engine until the engine runs out of fuel.

2. Loosen the the clamps on the vacuum and fuel return hoses.

Fuel Pump Fuse



Fuel Pressure Regulator



3. Remove both hoses from the fuel regulator.

4. Loosen the lock nut from the regulator to the fuel rail and remove the fuel regulator.

Install

1. Install fuel regulator and new seal to the fuel rail, tighten the lock nut.

2. Connect both vacuum and fuel return hose to the regulator with hose clamps in place.

3. Tighten the hose clamps on both of the vacuum and fuel return hoses

4. Replace fuel pump fuse, turn ignition on to pressurise system and check for any fuel leaks around the fuel regulator.

V6 IGNITION

TIMING ADJUSTMENT

The ignition timing can not be adjusted, how ever it is monitored by the Direct Fire Ignition (DFI). There is a minor adjustment for the crankshaft sensor, this is obtain clearance between the sensor disc attached to the crankshaft and the electronic sensor attached to front of the engine, this has no effect on the timing of the ignition.

CHECK EST IGNITION TIMING

Electronic Spark Timing (EST) spark advance is adjusted by the ECM (electronic control modual) to 10

Coils and DFI modual

Coil assemblies



Ignition modual situated under coils

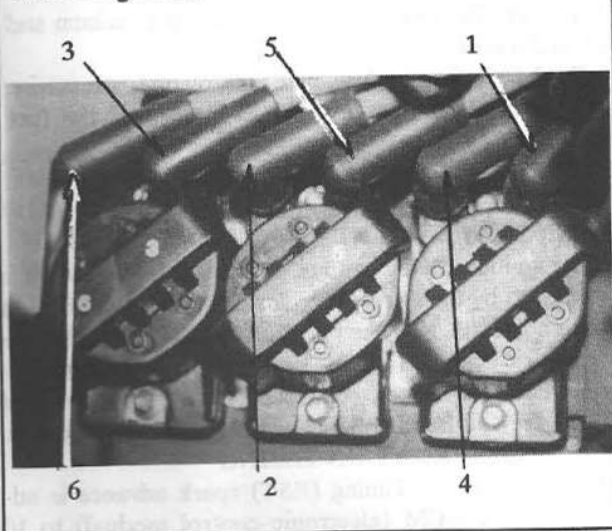
degrees. To carry out this test the ECM must be in diagnostic mode, that is the test terminal on the ALDL earthed. If the engine is operating at approximately 1750 RPM and the ALDL terminal is earthed the RPM should decrease.

DFI MODULE - IGNITION MODUAL**Remove**

1. Remove the harness connector to modual.
2. V6: Label the spark plug leads to the coil block and remove.

V6: Coil block has the terminals numbered, identify the leads if required and remove.

3. Remove coil block by removing the attaching screws disconnect the wires underneath the coils.
4. Remove module assembly.

Coil Firing Order**Install**

1. Install modual assembly
2. Carefully install coils onto module and tighten attaching screws to specified torque.

Coil Attachingr Screws: 4-5 Nm.

3. Connect spark plug leads to correct spark plugs and coil.

Firing Order: 1 - 6 - 5 - 4 - 3 - 2

4. Reconnect electrical harness to DFI modual.

IGNITION COILS**Remove**

1. V6 Label the spark plug leads to the coil block and remove.

V6 Coil block has the terminals numbered, identify the leads if required and remove.

2. Remove coil block by removing the attaching screws disconnect the wires underneath the coils.

Install

1. Carefully reconnect the labelled wires to the underneath of the coils, install coils onto module and tighten attaching screws to specified torque.

Coil Attachingr Screws: 4-5 Nm.

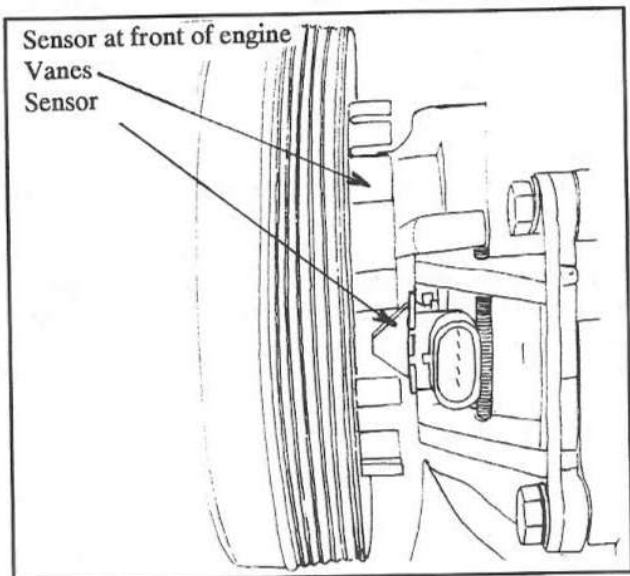
2. Connect spark plug leads to correct spark plugs and coil.

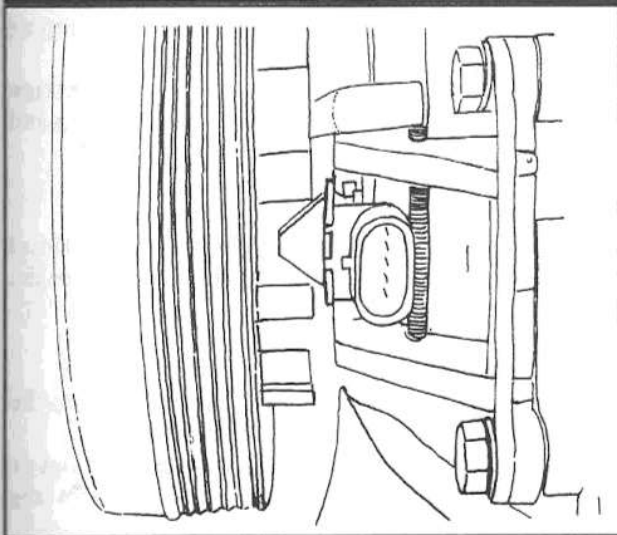
Firing Order: 1 - 6 - 5 - 4 - 3 - 2

3. Start engine and ensure engine operates correctly.

CRANKSHAFT SENSOR V6**Remove**

1. Disconnect battery earth lead.
2. Loosen the bolt on the automatic adjusting idler pulley mounting stud and turning the stud, relieve the tension on the drive belt.
3. Remove crankshaft balancer attaching bolt, remove balancer.
4. With a small bar pry the sensor shield from the front cover studs and remove electrical wiring connector.
5. Remove crankshaft sensor bracket bolts and remove assemblies.



**Install**

1. Connect the crankshaft sensor assembly onto front cover dowel pin and install, but do not fully tighten attaching studs.

2. Loosen sensor bracket bolt to allow sensor to move in mounting bracket.

3. Install sensor, it may require a sensor adjusting tool to help achieve the correct air gap. Tighten sensor bracket to front cover attaching studs to specification.

Sensor Bracket front Cover Studs: 25 - 35 Nm.

4. Move sensor in or out so that vanes are in the correct position with sufficient air gap, fit wiring connector. Tighten sensor clamping bolt to specification.

Sensor Bolt: 3 - 5 Nm

5. Check that the sensor and vanes do not make any contact, if contact is made because of damage to any component, replace that component.

6. Install drive belt and earth cable, test drive vehicle.

V8 IGNITION**TIMING ADJUSTMENT****IMPORTANT**

The initial timing adjustment of the distributor must be correct for the ECM to give the correct adjustment to the ignition timing while the engine is running.

INITIAL TIMING

1. With the engine idling at normal operating temperature, earth the ALDL test terminal.

2. Check the timing with timing light to ensure that the timing is at specified timing setting.

Specified Timing: 10 degrees BTDC

3. If timing is not correct, loosen the distributor bolt to adjust. Turn distributor to achieve specified timing.

4. Tighten the distributor bolt and recheck timing.

5. Remove the earth wire connected to ALDL terminal.

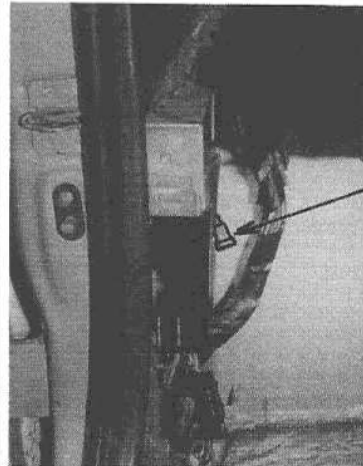
CHECK EST IGNITION TIMING

Electronic Spark Timing (EST) spark advance is adjusted by the ECM (electronic control modual) to 10

degrees. To carry out this test the ECM must be in diagnostic mode, that is the test terminal on the ALDL earthed. If the engine is operating at approximately 1750

ECM (electronic control modual)

Located behind left side front kick panel



Assembly Line Diagnostic Link (ALDL)

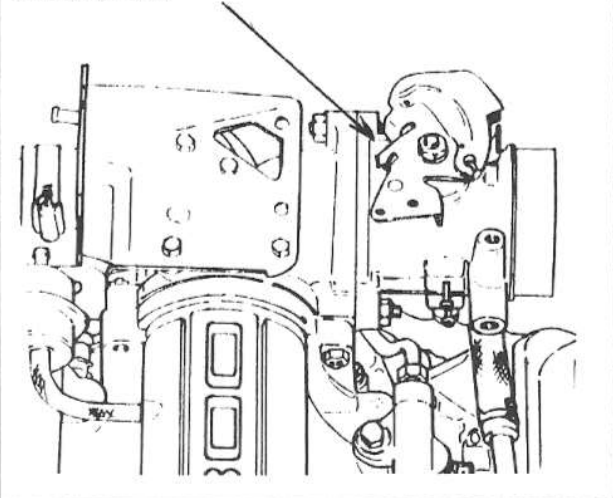


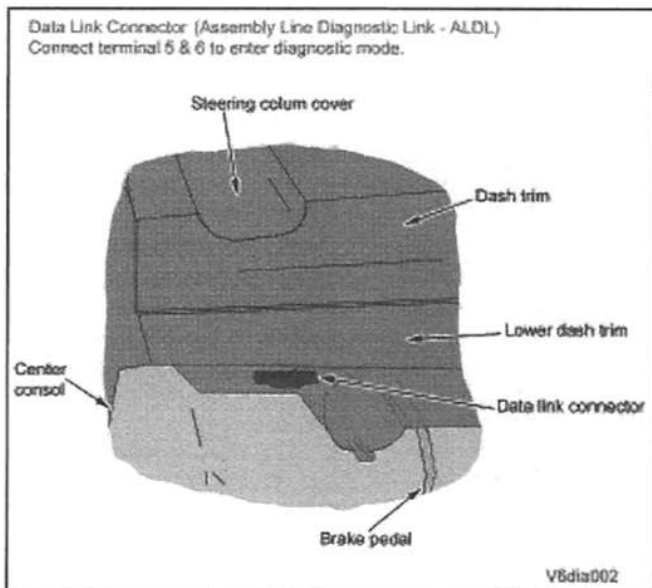
ALDL diagnostic "test" terminal - White and Black wire
RPM and the ALDL terminal is earthed the RPM should decrease.

THROTTLE ADJUSTMENTS**Throttle Stop Screw**

The throttle stop screw should never be adjusted under normal conditions, only adjust if damaged due to an accident, changing over of throttle plate assembly or diagnostic code procedure.

Throttle Screw



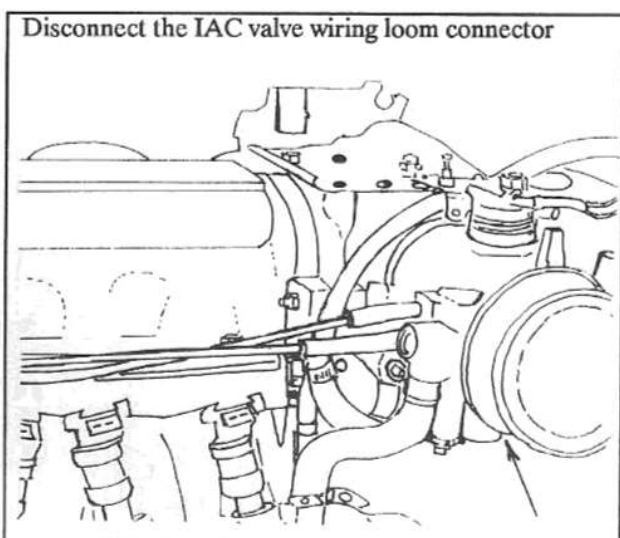


The throttle stop screw sets the base idle rpm, while the IAC valve adjusts idle rpm due to engine and running variations.

Adjust

1. Engine at normal running temperature.
2. All sensors and vacuum hoses must be fitted properly.
3. Disconnect the IAC valve wiring loom connector, earth the test terminal on the ALDL.
4. Connect a tachometer to engine if one is not fitted, use brown tachometer wire connector, located behind front left strut.
5. Remove plastic protection cap.
6. Start engine and allow to idle, turn throttle stop screw to adjust rpm at less than IAC controlled rpm. IAC controlled rpm is 750 +/- 50 rpm.

Idle RPM specification (without IAC) 500-550 rpm



7. Stop engine, connect IAC wiring loom. Start engine check idle rpm for specification.

IAC controlled RPM 700-800 rpm

8. Stop engine replace throttle stop screw plastic cap and remove tachometer if one was temporarily fitted.

FUEL MIXTURE

CO Levels are monitored from the ECM. If the CO level is to be tested with a CO unit, it can not be used after the catalytic converter.

Method with CO Meter

1. Visually Inspect E.F.I. system

(a) Check for loose screws or a loose mounting to the manifold.

(b) Check for wear in the linkage, missing snap rings or excessive looseness in the throttle shaft. Correct any problems found.

2. Initial Conditions:

- (a) Air cleaner installed.
- (b) Normal operating coolant temperature.
- (c) All accessories switched off.
- (d) All vacuum lines connected.
- (e) Ignition timing set correctly.
- (f) Transmission in the "N" range.
- (g) CO meter operating normally.

3. Check Idle Speed.

- (a) Start the engine.
- (b) Using a CO meter to measure the CO concentration in the exhaust before the catalytic converter.

Idle speed:

V6 700-800
V8 700-800

4. Inspect CO Concentration.

- (a) Check that the CO meter is properly calibrated.
- (b) Race the engine 30-60 seconds at about 2,000 rpm before measuring concentration.
- (c) Wait 1-3 minutes after racing the engine to allow the concentration to stabilize.

Idle CO concentration:

V6 0.5%-1.0%
V8 0.5%-1.0%

Idle speed RPM Tune-up details on sticker located on left strut tower under bonnet.



CO PROBLEM SOLVING:**1) Rough Idle - CO Normal:****Causes:**

- * Faulty ignition:
 - Fouled, shorted or improperly gapped plugs
 - Open or crossed ignition wires
- * Leaky exhaust valves
- * Leaky cylinder

2) Rough Idle (fluctuating HC reading) - CO Low:**Causes:**

- * Vacuum leak:
 - Vacuum hose
 - Intake manifold
 - PCV line

3) Rough Idle (black smoke from exhaust) - CO High:**Causes:****Restricted air filter****Plugged PCV valve**

- * Faulty Fuel Injection System:

the ECM must be removed. The ECM is a small complicated computer located behind the kick panel in the front passenger side.

Electrical connections are developing into a major problem with vehicle break downs. Therefore check that all connections including battery connections are clean and making good electrical contact.

As the ECM is very sensitive to electrical fluctuations, therefore always have the ignition system turned off before disconnecting any wiring looms at the ECM. For the reason just described electrical welding should never be carried out to the vehicle or any trailer etc attached to the vehicle while the battery earth cable is still connected to the battery.

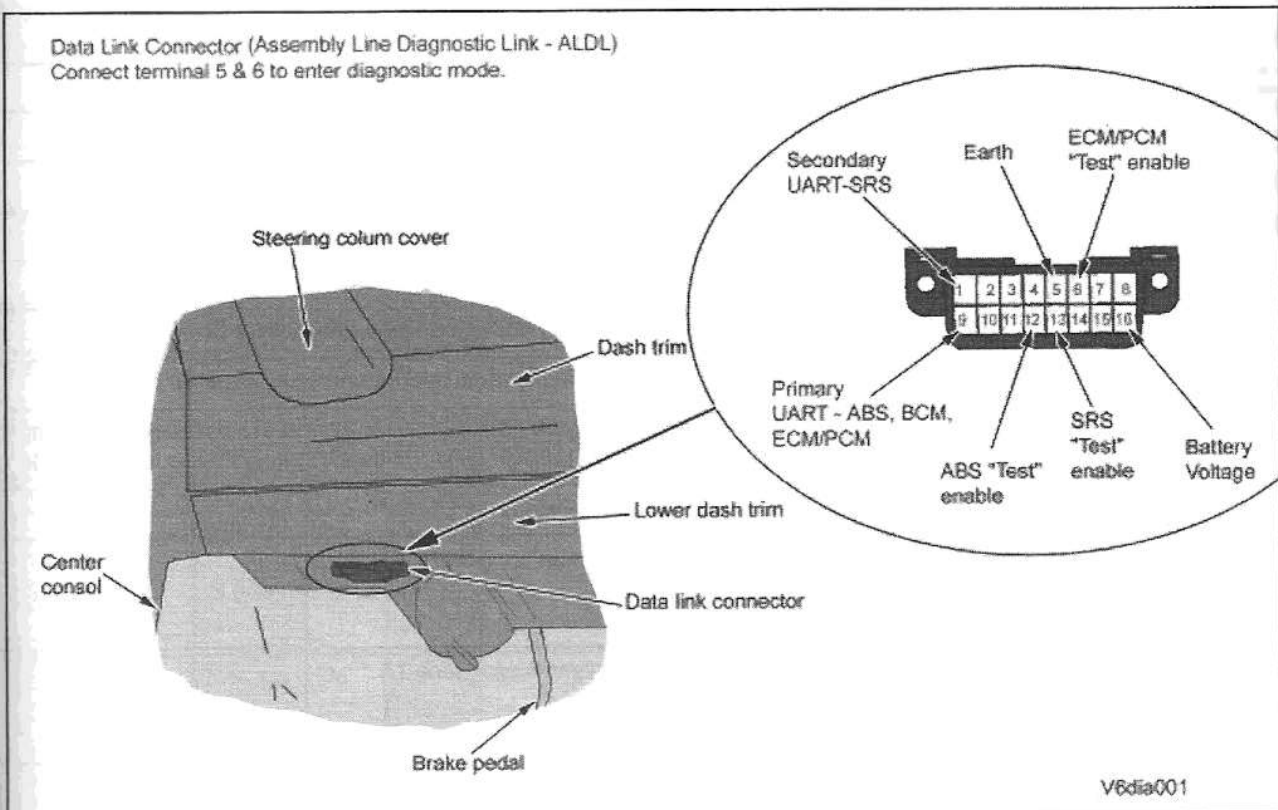
Most voltmeters are now digital type, while carrying out any tests or problem solving it necessary to use a digital voltmeter, a sensitive volt meter that can be adjusted to read milli amps is required. If using a test light make sure the light is a low powered unit to obtain an accurate result.

The ECM has the ability to diagnosis information from the various sensors on the engine. If the ECM diagnosis a fault, the driver is notified by the "Engine!" light flashing a code. If a fault occurs and the light stays on for more than 10 seconds it is recommended that the driver has the fault checked.

If the ECM diagnosis a fault the fault is stored in the ECM for 20 ignition on and starts of the engine. However the ECM will loose codes stored, if the power supply is removed from the ECM. This can be done by disconnect-

Problem Diagnosis:

The battery earth cable must be disconnected from the battery before any sensors or the Electronic Control Module ECM is removed or disconnected. If a vehicle has been painted and the paint is to be cured in a paint oven



ing the battery for 10 seconds or more, or removing the "eng comp" fusible link for 10 seconds or more.

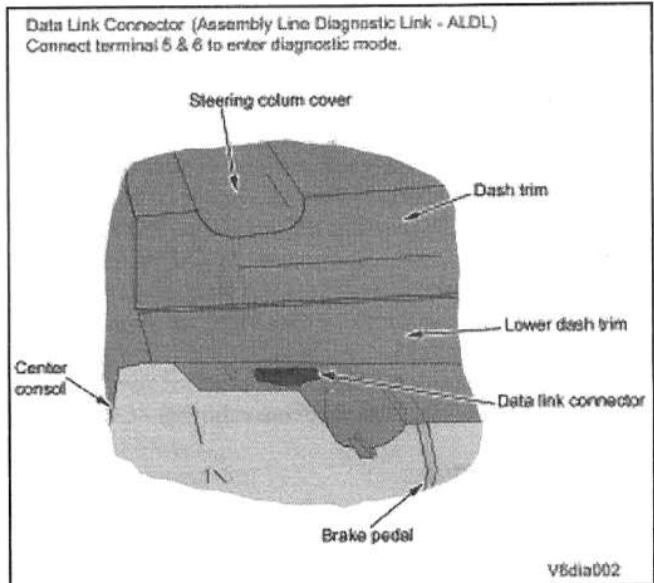
Fault codes stored by the ECM can be interpreted by two methods

1. The ECM will flash the code via the "Engine!" light. As an example, earth the ALDL test terminal and turn the ignition on, code 12 will flash, which is a code to let the operator know that there are no problem codes stored. Code 12 is one flash, light off, two more flashes, this is repeated three times then a gap of a few seconds with the light off and repeated.

2. A commercially available tester such a Tech1 can be connected to the ALDL connector. To read this follow the instructions of the tester manufacturer.

The diagnostic Link connector is located on the lower section of the dash trim, behind the steering wheel.

As the problem codes are flashing the ECM powers various relays to stop other problem codes from entering the ECM.



DIAGNOSTIC CHARTS

Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes/N	Code or Light	VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul))
Diagnostic circuit	No	On	No	Code 12	
	No	On	No	Code 55	Check ECM/PCM giving false code information code 55
	No	On	No		Check diagnostic circuit to earth
	No	On	No		Faulty ECM/PCM
	No	On	No	Light off	Check No "Engine!" light problem
	No	On	No	Light on	See next line
	Yes	On	No	No flash	Check "Engine!" light will not flash problem
	Yes	On	No	Code 12	Not a faulty code, see Engine turns over but will not start
	Yes	On	No	Code 41	Check Engine turns over but no start, code 41
	Yes	On	No	Code 12 & others	Check codes other than code 12 that are flashing, if present, code 55 1st then code 51, then 41, then lowest number code
	Yes	On	Yes		Start engine via ALDL for service run
	Yes	On	Yes	Flashing once per second	Fuel system operating OK
	Yes	On	Yes	Flashing once per 2.5 second	See oxygen sensor code 13
	Yes	On	Yes	Mostly off	See fuel mixture code 44 lean mixture
	Yes	On	Yes	Mostly on	See fuel mixture code 45 rich exhaust

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes/No	Code or Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul))
No "Engine!" light	No	Off	No	Off	Check fuse No's 10 & 25 plus fusible links
	No	On	No	Off	If other warning lights are off check for an electrical short or printed circuit fault
	No	On	No	Off	Use a test light between earth and brown/white ALDL connector. Test light off, check fuse No 10 and pink & pink/black circuit. Test light on, repair circuit 419 brown/white ECM to ALDL & "check engine"
	No	On	No	On	Use a test light between earth and A6/C1 circuit 39 (Pink or Pink /Black) ALDL connector. "Engine!" light off, repair circuit 39. "Engine!" light ON go to next line
	No	On	No	On	Use a test light between earth and B1 & C16/D1 ALDL connector. "Engine!" light off, repair circuit 480 red/black C16/D1 & B1. "Engine!" light ON, next line
	No	On	No	On	Use a test light between earth and A6/C1 ALDL connector. "Check Engine" light on, check test light between earth and A12/C2, D1/C3, D2, D3, D6, D10 ALDL connector, if OK, check all ECM connectors, if OK turn ignition off and replace ECM unit. "Engine!" light OFF go to next line
	No	On	No	Off or On	Use a test light between earth and Pink/Black ALDL connector. "Engine!" light on or off, repair circuit 39 pink or pink/black (check for bad connections). [CARS WITH ANTI-THEFT "Engine!" light ON go to next line]
	No	On	No	On	Use a test light between earth and A6/C1 ALDL connector. "Engine!" light off, repair pink circuit 39 and/or pink black 39 connector to 439 .5 meter from ECM. "Engine!" light ON repair anti-theft system.
"Engine!" on but will not FLASH	No	On	No	On	Turn ignition off and remove ECM electrical looms from ECM, turn ignition ON go to next line.
	No	On	No	On	Repair 419 brown/white ECM/PCM to ALDL & check light
	No	Off	No	Off	Turn ignition off remove ECM/PCM and fully install the ECM/PCM to the vehicle, turn ignition on go to next line.
	Yes	On	No	On	Check for codes (code 12 means no faults have been detected).
	Yes	On	No	On	Will not flash. Use a test light between earth and A9/D6 ALDL connector. "Engine!" light flashes, repair circuit 451 white/black to ECM/PCM. OR ALDL earth connection. "Engine!" light ON but still will not flash go to next line.
	No	On	No	On	No flash replace ECM/PCM unit but not the Mem-cal(PROM). Use a jumper wire between ALDL connector B to A. "Check Engine" light on and flashes, check for codes (code 12 means no faults have been detected) light still does not flash go to next line.
	No	On	No	On	Replace Mem-cal(PROM) unit "Engine!" light on & flashes, check for codes (code 12 means no faults have been detected)

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Engine will not start but turns over					Test "Diagnostic Circuit" check for codes 31 or 46 if so check these codes.
	No	On	No		Disconnect all fuel injection electrical connections. Connect a test light to the two terminals of one fuel injector. Do not short terminals. Test light on repair short to earth on circuit 467 light blue and 1467 grey. Test light off go to next line.
	No	Off	No		Using a test light connect violet wire ALDL to earth, Turn ignition light off for 15 seconds, then back on. Test light either on or off but does not change, repair fuel pump electrical circuit. Test light on for 2-3 seconds then off go to next line
	No	On	No		Use a spark tester on each spark plug lead, check for result. No spark or poor spark repair ignition system. Good spark on all plugs go to next line for a basic fuel test.
	No	On	No		Depressurise fuel system (remove fuel pump fuse-in engine compartment - crank engine for 20 seconds). Connect fuel pressure gauge to fuel line (passenger side) as it connects to fuel rail, turn ignition on pressure should be 230-315kPa and remain constant after pump stops. If insufficient pressure check fuel system. If pressure OK see next line.
	No	Off	No		Disconnect all fuel injection electrical connections. Connect a test light to the two terminals of each fuel injector loom in turn. Do not short terminals to each other or earth. Turn engine over on starter, check test light. Test light on- no flash, check for faulty circuits 481 red & 467 light blue or 1467 grey to injectors, check resistance on each injector, more than 12ohms replace ECM/PCM unit, resistance less than 12ohms replace injector & ECM/PCM. Test light flashing - carry out following checks Valve timing, Compression test, Faulty fuel, Coolant sensor resistance, Spark plugs, TPS electrical circuit, disconnect MAP sensor if starts check sensor operation. Test light off - see next line.
	No	On	No		Disconnect all fuel injection electrical connections. Earth a test light to each terminal of each fuel injector loom in turn. Test light OFF with both terminals of injector loom: Remove EFI relay, test with test light circuit 480 (red/black wire) and circuit 39 (pink wire). If only one circuit is active, check ENG INJ fusible link, repair inactive circuit. Test light ON with both terminals of injector loom: Repair circuits 467 / 1467 ECM C15 / 16 light blue / grey. Test light On one terminal of injector loom only: See next line
	No	On	No		Use test light connect D16/C15 and D15/C16 ECM/PCM to earth: Test light ON with both terminals - connect digital voltmeter to C13/C5 ECM/PCM: Less than 3 volts check faulty connection on ECM/PCM B5/D15 if OK replace ECM/PCM. More than 3 volts, check TPS. Test light ON with one terminal only-repair circuits 467/1467

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Fuel Pump Electrical	No	No	No		Check F/pump fuse in engine compartment, if blown replace, turn ignition on, check fuel pump operation. If pump not operating, disconnect fuel pump connectors. Use a test light connect circuit 120 (violet wire) to + battery lead: Test light on: Repair faulty circuit 120 (violet wire). Test light off: Remove oil pressure switch & Fuel pump relay, replace fuse, turn ignition on check fuse, if fuse OK check faulty fuel pump, fuel pump relay or faulty oil pressure switch. If fuse blown again circuit orange wire 240 has short.
	No	On	No		If fuse not blown, use a test light connect ALDL violet wire to earth, turn ignition on while observing test light: Light on - Disconnect oil pressure switch, if light goes out replace oil switch, if light is still on disconnect fuel pump relay and light still on, faulty circuit 120 (violet wire), light goes off check circuit 465 green/white or replace fuel pump relay. Light off - See next column. Test light on for 2-3 seconds then off - See down two columns.
	No	On	No		Connect a test light from black wire at fuel pump relay to battery 12 volts + lead, check test light: Test light on - faulty circuit 240, repair. Test light off - Turn ignition off for 30 seconds. Connect a test light from violet wire (120) at fuel pump relay to earth, turn ignition on, check test light: Test light on for 2-3 seconds fuel pump OK repair circuit 120. Test light off did not flash, replace fuel pump relay try to start engine if engine does not start repair circuit violet 120 and or orange 240, replace oil pressure switch, also see next column.
	No	On	No		Test light on for 2-3 seconds then off - Jumper ALDL pink and violet wires with ignition on, check fuel pump operating. If not repair circuit 120, fuel pump earth or replace fuel pump. If operating check fuel pressure system.
Fuel Pressure Check	No	No	No		Use a test light between circuit 120 (violet wire) ALDL and earth, turn ignition on check. Test Light on or off no flash see Fuel Pump Electrical above. Test Light on for 2-3 seconds then off - Jumper wire 12 volts to ALDL test terminal. Pump not operating see Fuel Pump Electrical above. Pump operating, remove jumper wire, ignition off, check fuel pressure described earlier, see below.
	No	Yes	No		Pressure 230-315kPa, remain constant after pump stops. *Insufficient pressure, check fuel lines, fuel filter, fuel pump. *If pressure OK but declines after pump stops, either a leaking supply or delivery pipe OR faulty fuel pressure regulator. *If pressure OK, most likely faulty fuel pressure regulator. *If pressure LOW but holds pressure - check for fuel restriction such as pinched fuel lines or partly blocked filters. *If pressure HIGH but holds pressure - blocked fuel line to pressure regulator and pressure regulator and fuel tank OR faulty pressure regulator.

Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Test Light or Voltmeter	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Idle Air Control (IAC) Circuit	No	On	Yes		Air conditioner off note engine RPM in Neutral turn engine off disconnect IAC electrical connector repeat above check RPM. If RPM is the same, see next row. If RPM increases, engine off, reconnect IAC, start engine RPM as first reading, IAC is OK. If RPM is the same as the second RPM reading (increased) see next row.
	Yes	On	No		Connect a sensitive test light to each IAC loom terminal and earth for 5-6 seconds check result next 3 rows.
	Yes	On		Off	Faulty circuit, repair. and retest. If circuits OK, test IAC coil terminals A-B & C-D ideally above 40ohms, if not replace IAC valve and retest, if resistance OK check for faulty ECM connections if alright replace ECM.
	Yes	On		On	Remove electrical connections to ECM/PCM, ignition on, light still on check for short to circuit, light not on check terminals or replace IAC valve.
	Yes	On		Flashing	Check IAC terminals if OK replace IAC valve
MAP Sensor Black or Green --	No Insert	On	No	Voltmeter Reading	Jumper a + wire to C terminal of MAP sensor, connect sensitive voltmeter between A & B terminals check voltage.
	No	On	No	3.0-5.5v	Voltage should be 3.0 - 5.5 volts. If not replace MAP sensor. If OK apply 30-35kPa vacuum to MAP sensor hose, voltage should drop by 1.5 - 2.5 volts, if not replace MAP sensor.
Automatic Trans Park/Neutral Switch	No	On	No		With the electrical loom connection disconnected at Park/Neutral switch, check loom connection to earth for 12+ volts.
	No	On	No	Not 12+v	Not 12+ volts: Connect voltmeter to circuit B10 (grey wire) and earth at ECM, if 12+ repair B10 circuit, if not 12+ replace ECM.
	No	On	No	12+v	Yes 12+ volts: Reconnect switch loom connector, backprobe switch terminal for 12+ volts to earth, trans lever in park. If not 12+ volts check switch earth, if OK replace switch. If 12+ volts move trans lever into gear, should be 0 or very low volts if not replace switch.
TPS Sensor Circuit	No	On	No	Voltmeter Reading	Connect (backprobe) a voltmeter to ECM/PCM C13/C5 and earth
	No	On	No	2.5+v	If 2.5+v disconnect TPS sensor check voltage again. 0.0-1.0v, faulty circuit 452 (black/yellow) or faulty TPS sensor. 1.0+v faulty circuit 417 (blue).
	No	On	No	1.3 - 2.5v	Check throttle stop screw, recheck voltmeter. If still 1.3 - 2.5v faulty TPS sensor. If 0.2 - 2.5v see next row.
	No	On	No	0.2 - 1.2v	Check voltmeter while opening throttle (slowly press on accelerator) voltage should slowly increase, if not replace TPS, if voltage does not go over 4.0v replace TPS.

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Test Code or Problem	Ignition On / Off	Engine running Yes / No	Test Light or Voltmeter	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Ignition Check	On	Yes		Connect a spark plug tester to all spark plugs in turn. If no spark with only one or two check and replace spark plug lead or coil block or DFI modul. If no spark disconnect tachometer wire (brown), if no connector go to next line, check for spark as at plugs. If spark, check for short in Tachometer wire or faulty tachometer, if no spark go to next line.
	On	No	Test Light 12+V	Remove Bosch DFI modul connector, with test red (P ter.) wire to 12+ to check pink wire is earthed, if no light faulty earth, if OK replace connector. Jumper wire, back probe red wire (P ter.) & white/black wire(N ter.). Jumper wire, back probe grey/red wire(M ter.) to earth. Back probe light blue/white (H ter.) with test light to 12 volts. Turn engine over 360 degrees by hand, if no flash of test light, repair circuits from crank sensor to DFI modul, if OK go to next line.
	On	No	Test Light	Remove Bosch DFI modul connector. Jumper wire, back probe red wire(P ter.) & white/black wire(N ter.). Jumper wire, back probe grey/red wire(M ter.) to earth. Back probe blue/yellow (G ter.) with test light to 12 volts. Turn engine over 360 degrees by hand, if no flash of test light, repair circuits from crank sensor to DFI modul or replace crank sensor. If light flashes turn ignition off, check crank sensor for foreign matter or damage also check prongs of disc behind crank shaft balancer. If OK remove jumper wires and test light, reconnect DFI loom connector.
	On	No	Test Light	Remove wires from top of coil block, separate coil block from DFI modul, remove all wires from bottom of coil block except blue wires. Connect test light between blue wire and each of the three -black/blue-black/yellow-black/green wires one at a time at base of coil block, crank engine over, does light flash on each wire? If no on any one wire replace DFI modul. If light flashes on all three connections go to next line.
	Off	No		Use an ohmmeter to check primary and secondary coil resistance of coil block. Primary connections are at the base of coil block that is, between black/yellow & blue, black/green & blue black/blue & blue. Secondary coil resistance is tested between the two terminals for each of the three coils. Primary resistance should be between 0.3 - 1.5 ohms, secondary resistance should be between 5,000 - 7,000 ohms.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Oxygen Sensor Code 13 1 flash 1.5sec off 3 quick flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 13 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, with a wire earth the sensor (violet) wire, after 10 seconds check the Check Engine light. If it turns off check ALDL terminal D6 & earth if OK, replace faulty sensor (may be damaged due leaded fuel). If "Engine!" light does not turn off check the wires ECM/PCM (D7/C14) to sensor (violet) & ECM/PCM (D6 /C13) to earth, if faulty repair, otherwise replace ECM/PCM.
Coolant Sensor Code 14 1 flash 1.2sec off 4 quick flashes 3 sec off repeat	No	Off	No		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on check sensor for loose terminal connections. If light flashing go to next line.
	Yes	Yes	No	Code 14	Disconnect sensor, check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if OK connect sensor loom and back probe if same result could be faulty ECM. If under 4 volts check sensor wires (yellow and yellow/black) for short if no fault in wires, faulty ECM/PCM.
Coolant Sensor Code 15 1 flash 1.2sec off 5 quick flashes 3 sec off repeat	No	Off	No		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing go to next line.
	Yes	Yes	No	Code 15	Disconnect sensor check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if alright connect sensor loom and back probe if same result could be faulty ECM/PCM. If under 4 volts check sensor wires (yellow and yellow/black) for short if no fault in wires, faulty ECM/PCM.
Manifold Air Temp Sensor Code 23 or (25) 2 flash 1.2sec off 3 (5) flashes 3 sec off repeat	No	Yes	Yes		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing code 23 or code 25 go to next line.
	Yes	Yes	No	Code 23 or Code 25	Disconnect sensor, check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if alright connect sensor loom & back probe if same result faulty ECM. If under 4 volts check sensor wires (brown and black) for short if not, faulty ECM/PCM.

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Throttle Position Sensor. Code 21 2 flash 1.2sec off 1 flash 3 sec off repeat	No	Yes	Yes	Inspect light	Run engine until at operating temp or "Engine!" light comes on. Turn engine off, leave ignition off, for 15sec, earth test terminal, ignition on, start engine & running for 1-2 minutes or until "Engine!" is on. If engine starts and if no light, check sensor for loose terminal connections. If light flashing or engine will not start go to next line.
	Yes	On	No	code 21 or code 22	If other codes, take note and check codes later, turn ignition off for 15sec to clear codes, remove wires from TPS, and repeat this line. If code 21 turn ignition off, disconnect ECM/PCM, go to next line. If code 22 go down 2 rows.
	No	On	No		Test the disconnected ECM/PCM loom at circuit C13/C5 (blue wire to TPS) with a voltmeter. Over 1 volt, faulty circuit, repair. Under 1 volt either short between blue and grey wires or terminals or faulty ECM/PCM.
	No	On	No		Using a test light connect black/yellow wire at TPS to 12 + V. If no, light faulty circuit in black/yellow wire or faulty ECM/PCM. If light, faulty TPS, replace.
Throttle Position Sensor. Code 22 2 flash 1.2sec off 2 flash 3 sec off repeat	No	On	Yes	Inspect light	Run engine until at operating temp or "Engine!" light comes on. Turn engine off, leave ignition off, for 15sec, earth test terminal, ignition on, start engine & running for 1-2 minutes or until "Engine!" is on. If engine starts and if no light, check sensor for loose terminal connections. If light flashing, or on or engine will not start go to next line.
	Yes	On	No	Code 22	If other codes, take note and check codes later, turn ignition off for 15sec to clear codes, remove wires from TPS, start engine, with a wire short blue and grey wire at TPS end of loom, idle engine for 15 seconds, turn engine off.
	Yes	On	No	Code 21 and 22	With wire shorting blue and grey wire still in place. Faulty TPS, replace TPS sensor.
	Yes	On	No	Code 22 and no code 21	Using a voltmeter check (remove shorting wire between blue and grey wire) voltage between grey and black/yellow wires. Below 4 volts, unplug MAP sensor, check voltage again. Over 4 volts faulty MAP sensor. Under 4 volts faulty grey wire circuit, grey wire terminals, or ECM/PCM.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Speed Sensor Code 24 2 flashes 1.2 sec off 4 quick flashes 3 sec off repeat.	No	On	No		If speedometer does not operate check wiring loom to instrument cluster including earth. Use a voltmeter back probe ECM/PCM terminal A10/B5 or B6 to earth, roll vehicle on garage floor at walking pace, check voltage. If vehicle fitted with a trip computer go to next row then return to this row next paragraph. Voltage fluctuating 1-10 volts, system OK, check terminals. Voltage over 10 volts either short in yellow/black wire between ECM/PCM and speedometer or faulty speedometer. Voltage under 1 volt, either short in yellow/black wire between ECM/PCM and speedometer, faulty speedometer or faulty ECM/PCM, check and replace faulty item.
	No	Off	No		Push finger on trip computer "reset" button and keep pressure on the button, ignition on, finger off reset button. If trip computer has fail message, faulty trip computer replace If no message, ignition off. Push finger on trip computer "reset" button and keep pressure on the button, start vehicle, finger off reset button, drive slowly forward, the trip computer should indicate the speed of the vehicle, if does the trip computer is OK go back to the above row as previously indicated. If not, faulty trip computer, repair or replace.
MAP Sensor Code 33 and (34) 3 flashes 1.2 sec off 3 (4) quick flashes 3 sec off repeat.	No	On	Yes		Idle engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light. If on which code? 33 (go down one row), 34 (go down two rows). If no light restart engine, jab accelerator with RPM to 3000, ignition off, ignition on, inspect "Engine!" light, if not on check sensor for loose terminal connections. If code 34 go to next line
	Yes	On	No	Code 34	If light flashing code 34 check the vacuum hose from the intake manifold to MAP sensor, hose is working correctly, check the black wire circuit between the ECM/PCM and sensor, if OK replace MAP sensor.
	Yes	On	No	Code 33	Switch ignition off, idle engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light code 33. Back probe sensor wire at ECM/PCM terminal C11/C10 (light green wire) to earth with a volt meter note voltage, less than 1 volt-faulty ECM/PCM, more than 1 volt-faulty It green wire.
	Yes	On	No	Code 34	Switch ignition off, disconnect earth to ALDL test terminal, short wires light green and grey at sensor together, idle engine until "Engine!" light comes on inspect for code. Code 33 faulty sensor. Code 34, remove short between light green and grey wires, check voltage between grey and black wires. 4-6volts short in grey or light green wire or faulty ECM/PCM. Below 4-6 volts disconnect the TPS sensor wiring loom, recheck voltage, still below 4-6 volts either a short in grey or light green wire or faulty ECM/PCM, if 4-6volts faulty TPS.

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Code 41 Engine No Start 4 flashes 1.5 sec off 1 flash 3 sec off	No	On	No	----	Use a spark tester on each spark plug lead, check for result. No spark or poor spark, repair ignition system. Good spark on all plugs go to next line. Poor or no spark on some of the leads see "Engine will not start but turns over" problem.
	No	Off	No	----	Remove wiring looms from ECM/PCM, ignition on, back probe ECM/PCM terminal B5/D14 (white/violet) to earth, check voltage. Over 10 volts or under 1 volt, turn engine over on starter, if voltage vary between over 10 and under 1, check for loose B5/D14 terminal or faulty ECM/PCM, if voltage does not vary replace DFI ignition modul. If voltage not over 10 volts or under 1 volt either faulty white/violet circuit or DFI ignition modul.
Code 42 EST - Electric Spark Timing 4 flashes 1.5 sec off 2 flash 3 sec off repeat	No	On	Yes	Inspect light code 42	Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing, ignition off disconnect ECM wiring looms, go to next line.
	No	On	No	code 42	Using an ohmmeter test resistance between D4/D11 white & earth. Over 500 ohms white wire circuit has a loose connection, faulty or DFI ignition module faulty. Under 500 ohms use a test light, back probe D5/D14 (black/tan) terminal and 12+v, check for light. Light on: Disconnect loom from ECM/PCM to DFI ignition module at ignition modul, if light now off, faulty DFI ignition module, if light still on black/tan wire has earth short. Light off: Recheck ohms between D4/D11 white and earth as above, with test light still connected. Ohms over 5000 ohms, remove testing equipment, test for code 42 as in above row. If no code flashing there must have been a loose connection. If code 42 flashing, faulty ECM/PCM. Ohms under 500 ohms, checking ohmmeter, disconnect Bosch ignition loom connector from ECM/PCM, check resistance, if higher check for faulty black/tan circuit or faulty Bosch ignition modul, if not higher resistance white wire has an earth short.
Lean Fuel Mix Code 44 4 flashes 1.2sec off 4 flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 44 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, start engine and run at 1700RPM for 45 sec. Light off for min of 30-40 sec check violet wire for a earth short or faulty ECM/pCM. If check engine light flashing every 2.5 seconds most likely faulty oxygen sensor clean sensor and runtest again, but check the following, leaded fuel in tank, MAP sensor faulty, leaking exhaust manifold gaskets, faulty fuel pump.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Rich Fuel Mix Code 45 4 flashes 1.2sec off 5 flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 45 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, with a wire earth the sensor (violet) wire, start engine and run at 1750 RPM for 30 sec, check light. Flashing as before 2.5 times per second, either faulty earth connection to engine from ECM/PCM (terminal D6/C13 black wire) or faulty ECM/PCM. Light off for min of 30-40 sec, check the following, Fuel injector leaking, MAP sensor faulty, faulty fuel pump, leaded fuel in fuel tank, Coolant sensor system faulty, TPS sensor sytem faulty, MAT sensor system faulty, Back pressure from carbon cannister.
Faulty Mem-Cal Code 51 5 flashes 1.2 sec off 1 flash off 3 sec repeat	Yes	On	Yes	Code 51	Check that the PROM terminals are clean, looms connected properly to the ECM and PCM and the ECM/PCM units properly located in body brackets.
ECM giving faulse code information Code 55 5 flashes 1.2 sec off 5 flash off 3 sec repeat	No	On	No	Code 55	Still flashing code 55, disconnect looms to ECM/PCM. Test white/black from ALDL, blue wire from TPS sensor, brown from MAT sensor, light green from MAP sensor and yellow from coolant sensor circuits to ECM/PCM for + current. If current found repair and retest for code 55. If no current found Faulty ECM/PCM. Light on no flash see next line.
	Yes	On	No		Engine must be at operating temp before this test, now inspect if "Engine!" light comes on. No "Engine!" light inspect for loose terminal connections. If code 55 flashing, faulty ECM/PCM.

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes/N	Code or Light	VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Diagnostic circuit	No	On	No	Code 12	
	No	On	No	Code 55	Check ECM / PCM giving false code information code 55
	No	On	No		Check diagnostic circuit to earth
	No	On	No		Faulty ECM / PCM
	No	On	No	Light off	Check No "Engine!" light problem
	No	On	No	Light on	See next line
	Yes	On	No	No flash	Check "Engine!" light will not flash problem
	Yes	On	No	Code 12	Not a faulty code, see Engine turns over but will not start
	Yes	On	No	Code 41	Check Engine turns over but no start, code 41
	Yes	On	No	Code 12 & others	Check codes other than code 12 that are flashing, if present, code 55 1st then code 51, then 41, then lowest number code
	Yes	On	Yes		Start engine via ALDL for service run
	Yes	On	Yes	Flashing once per second	Fuel system operating OK
	Yes	On	Yes	Flashing once per 2.5 second	See oxygen sensor code 13
	Yes	On	Yes	Mostly off	See fuel mixture code 44 lean mixture
	Yes	On	Yes	Mostly on	See fuel mixture code 45 rich exhaust

Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes/N	Code or Light	
"Engine!" light	No	Off	No	Off	Check fuse No 10 & fusible links
	No	On	No	Off	If other warning lights are off check for an electrical short or printed circuit fault
	No	On	No	Off	Use a test light between earth and brown/white ALDL connector. Test light off, check fuse No 10 and pink & pink/black circuit. Test light on, repair circuit 419 brown/white ECM/PCM to ALDL & "Engine!" light
	No	On	No	On	Use a test light between earth and A5/A7 ALDL connector. "Engine!" light off, repair circuit 419 brown/white A5/A7 terminal to ECM/PCM. "Engine!" light ON go to next line
	No	On	No	On	Use a test light between earth and C16/D1 ALDL connector. "Engine!" light off, repair circuit 480 red/black C16/D1. "Engine!" light ON, next line
	No	On	No	On	Use a test light between earth and A6/C1 ALDL connector. "Engine!" light on, check test light between earth and A12/D6, D1/C3, D2/C2, D3, D6, D10 ALDL connector, if OK, check all ECM connectors, if OK turn ignition off & replace ECM/PCM unit. "Engine!" light OFF go to next line
	No	On	No	Off or On	Use a test light between earth and Pink ALDL connector. "Engine!" light on or off, repair circuit 439 pink (check for bad connections at connectors). [CARS WITH ANTI-THEFT "Engine!" light ON go to next line]
	No	On	No	On	Use a test light between earth and A6/C1 ALDL connector. "Engine!" light off, repair pink circuit 1439 and/or 1439 connector to 439 .5 meter from ECM/PCM. "Engine!" light ON repair anti-theft system.
"Engine!" light on but will not FLASH	No	On	No	On	Turn ignition off and remove ECM/PCM electrical looms from ECM/PCM, turn ignition ON go to next line.
	No	On	No	On	Repair 419 brown/white ECM/PCM to ALDL & check light
	No	Off	No	Off	Turn ignition off remove ECM/PCM and fully reinstall ECM/PCM's to vehicle, turn ignition on go to next line.
	Yes	On	No	On	Check for codes (code 12 means no faults have been detected).
	Yes	On	No	On	Will not flash. Use a test light between earth and A9/D6 ALDL connector. "Engine!" light flashes, repair circuit 451 white/black to ECM/PCM. OR ALDL earth connection. "Engine!" light ON but still will not flash go to next line.
	No	On	No	On	No flash replace ECM/PCM unit but not the Mem-cal(PROM). Use a jumper wire between ALDL connector B to A. "Engine!" light on and flashes, check for codes (code 12 means no faults have been detected) light still does not flash go to next line.
	No	On	No	On	Replace Mem-cal unit "Engine!" light on and flashes, check for codes (code 12 means no faults have been detected)

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Engine will not start but turns over					Test "Diagnostic Circuit" check for code 41 No engine turn over pulses while turning over.
	No	On	No		Disconnect all fuel injection electrical connections. Connect a test light to the two terminals of one injector. Do not short terminals to each other or earth. Test light on, repair short to earth on circuitS 467 light blue or 1467 grey ECM/PCM ter. D15/ C15 & D16/C16 to injector. Test light off, next line.
					Using a test light connect violet wire ALDL to earth, Turn ignition light off for 15 seconds, then back on. Test light either on or off but does not change, repair fuel pump electrical circuit. Test light on for 2-3 seconds then off go to next line
	No	On	No		Use a spark tester on each spark plug lead, check for result. No spark or poor spark repair ignition system. Good spark on all plugs go to next line for a basic fuel test.
					Depressurise fuel system (remove fuel pump fuse-in engine compartment - crank engine for 20 seconds). Connect fuel pressure gauge to fuel line (passenger side) as it connects to fuel rail, turn ignition on pressure should be 230-315kPa and remain constant after pump stops. If insufficient pressure check fuel system. If pressure OK see next line.
	No				Disconnect all fuel injection electrical connections. Connect a test light to the two terminals of each fuel injector loom in turn. Do not short terminals to each other or earth. Turn engine over on starter, check test light. Test light on - no flash, check for faulty circuit 481 red injectors to EFI relay, or 467or1467 light blue or grey ECM /PCM ter. D15\C15 & D16/C16 to injectors, check resistance on each injector, over 12ohms replace ECM/PCM unit, resistance under 12ohms replace injector and ECM/PCM unit. Test light flashing - carry out following checks Valve timing, Compression test, Faulty fuel, Coolant sensor resistance, Spark plugs, TPS electrical circuit, disconnect MAP sensor if starts check sensor operation. Test light off - see next line.
	No	On			Disconnect all fuel injection electrical connections. Earth a test light to each terminal of each fuel injector loom in turn. Test light OFF with both terminals of injector loom: Remove EFI relay, test with test light circuit 480 (red/black wire) and circuit 39 (pink black wire). If only one circuit is active, check ENG INJ fusible link, repair inactive circuit. Test light ON with both terminals of injector loom: Repair electrical circuit 467/1467, light blue/grey ECM/PCM ter. D15/C15 & D16/C16 to fuel injectors. Test light On one terminal of injector loom only: See next line
	No	On			Using a test light connect D15/C15 and D16/D16 ECM/PCM to earth: Test light ON with both terminals - connect digital voltmeter to C13/C5 ECM/PCM: Less than 3 volts check faulty connection on ECM/PCM B5/D14 if OK replace ECM/PCM. More then 3 volts, check TPS. Test light ON with one terminal only - Repair circuit 467 or 1467, light blue or grey ECM/PCM ter. D15/C15 & D16/C16 to fuel injectors

Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Fuel Pump Electrical	No	No	No		Check F/pump fuse in engine compartment, if blown replace, turn ignition on, check fuel pump operation. If pump not operating, disconnect fuel pump connectors. Use a test light connect circuit 120 (violet wire) to + battery lead: Test light on: Repair faulty circuit 120 (violet wire). Test light off: Remove oil pressure switch & Fuel pump relay, replace fuse, turn ignition on check fuse, if fuse OK check faulty fuel pump, fuel pump relay or faulty oil pressure switch. If fuse blown again circuit orange wire 240 has short.
					If fuse not blown, use a test light connect ALDL violet wire to earth, turn ignition on while observing test light: Light on - Disconnect oil pressure switch, if light goes out replace oil switch, if light is still on disconnect fuel pump relay and light still on, faulty circuit 120 (violet wire), light goes off check circuit 465 green/white or replace fuel pump relay. Light off - See next column. Test light on for 2-3 seconds then off -See down two columns.
	No	On	No		Connect a test light from black wire at fuel pump relay to battery 12 volts + lead, check test light: Test light on - faulty circuit 240, repair. Test light off - Turn ignition off for 30 seconds. Connect a test light from violet wire (120) at fuel pump relay to earth, turn ignition on, check test light: Test light on for 2-3 seconds fuel pump OK repair circuit 120. Test light off did not flash, replace fuel pump relay try to start engine if engine does not start repair circuit violet 120 and or orange 240, replace oil pressure switch, also see next column.
					Test light on for 2-3 seconds then off - Jumper ALDL pink and violet wires with ignition on, check fuel pump operating. If not repair circuit 120, fuel pump earth or replace fuel pump If operating check fuel pressure system.
Fuel Pressure Check	No	No	No		Use a test light between circuit 120 (violet wire) ALDL and earth, turn ignition on check. Test Light on or off no flash see Fuel Pump Electrical above. Test Light on for 2-3 seconds then off - Jumper wire 12 volts to ALDL test terminal. Pump not operating see Fuel Pump Electrical above. Pump operating, remove jumper wire, ignition off, check fuel pressure described earlier, see below.
	No	Yes	No		Pressure 230-315kPa, remain constant after pump stops. *Insufficient pressure, check fuel lines, fuel filter, fuel pump. *If pressure OK but declines after pump stops, either a leaking supply or delivery pipe OR faulty fuel pressure regulator. *If pressure OK, most likely faulty fuel pressure regulator. *If pressure LOW but holds pressure - check for fuel restriction such as pinched fuel lines or partly blocked filters. *If pressure HIGH but holds pressure - blocked fuel line to pressure regulator and pressure regulator and fuel tank OR faulty pressure regulator.

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Test Light or Voltmeter	Result or Action VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Idle Air Control (IAC) Circuit	No	On	Yes		Air conditioner off not engine RPM in Neutral turn engine off disconnect IAC electrical connector repeat above check RPM. If RPM is the same, see next row. If RPM increases, engine off, reconnect IAC, start engine RPM as first reading, IAC is OK. If RPM is the same as the second RPM reading (increased) see next row.
	Yes	On	No		Connect a sensitive test light to each IAC loom terminal and earth for 5-6 seconds check result next 3 rows.
	Yes	On		Off	Faulty circuit, repair. and retest. If circuits OK, test IAC coil terminals A-B & C-D ideally above 30ohms, if not replace IAC valve and retest, if resistance OK check for faulty ECM/PCM connections if alright replace ECM/PCM.
	Yes	On		On	Remove electrical connections to ECM/PCM, ignition on, light still on check for short to circuit, light not on check terminals or replace IAC valve.
	Yes	On		Flashing	Check IAC terminals if OK replace IAC valve
MAP Sensor	No	On	No	Voltmeter Reading	Jumper a + wire to C terminal of MAP sensor, connect sensitive voltmeter between A & B terminals check voltage.
	No	On	No	3.0-5.5v	Voltage should be 3.0 - 5.5 volts. If not replace MAP sensor. If OK apply 30-35kPa vacuum to MAP sensor hose, voltage should drop by 1.5 - 2.5 volts, if not replace MAP sensor.
Transmission Electrical Wiring Check	No	Off	No	Ohmmeter 20-40 ohm 20-40 ohm 20-40 ohm 20-40 ohm 2.9-4. ohm 3.5-8. ohm	Disconnect transmission PCM connector use digital ohmmeter Red wire 1020 to light green wire 1222 - Shift solenoid 1-2 Red wire 1020 to yellow/black wire 1223 - Shift solenoid 2-3 Red wire 1020 to white/green wire 897 - Shift solenoid 3-2 Red wire 1020 to grey/red wire 422 - Torque conv solenoid Green wire 455 to black/yellow wire 1227 - Fluid temp sensor Purple wire 1228 to light blue wire 1229 - Fluid pressure If resistance is not as specified check wiring of trans internally, if OK check each unit, replace as necessary.
TPS Sensor Circuit	No	On	No	Voltmeter Reading	Connect (backprobe) a voltmeter to ECM C13 and earth
	No	On	No	2.5 + v	If 2.5 + v disconnect TPS sensor check voltage again. 0.0-1.0v, faulty circuit 452 (black/yellow) or faulty TPS sensor. 1.0 + v faulty circuit 417 (blue).
	No	On	No	1.3 - 2.5v	Check throttle stop screw, recheck voltmeter. If still 1.3 - 2.5v faulty TPS sensor. If 0.2 - 2.5v see next row.
	No	On	No	0.2 - 1.2v	Check voltmeter while opening throttle (slowly press on accelerator) voltage should slowly increase, if not replace TPS, if voltage does not go over 4.0v replace TPS.

Test Code or Problem	Ignition On / Off	Engine running Yes / No	Test Light or Voltmeter	Result or Action VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Ignition Check	On	Yes		Connect a spark plug tester to all spark plugs in turn. If no spark with only one or two check and replace spark plug lead or distributor cap. If no spark disconnect tachometer wire (brown), if no connector go to next line, check for spark as at plugs. If spark, check for short in Tachometer wire or faulty tachometer, if no spark go to next line.
	On	No	Test Light 12+V	Remove Bosch ignition modual connector, test black wire to 12+ to check black wire is earthed, if no light faulty earth, if OK replace connector. Back probe red (ignition, injectors & ECM/PCM - ALDL) if no light repair circuit, if OK check brown wire from Ignition modual (Tachometer-turn engine over, check for flashing) to earth, if not active repair circuit, if OK go to next line.
	On	No	Test Light	Test Tachometer wire at tachometer or main wire going to tachometer after connection with wire form coil to 12+V (turn engine over, check for flashing). If flashing check distributor rotor, cap & cap-coil wire, if OK replace coil, if no flash go to next line.
	On	No	Test Light	Using two jumper wires at the Bosch ignition modual 6 wire connector, one jumper wire connect red to white/black, one wire connect black to grey/red, test (use a low watt test light otherwise you can damage Hall contacting mechanism in distributor) light blue/white to 12+V, turn over engine check for flashing. - No flashing check white/black, light/blue and grey/red replace if faulty, if not faulty replace Hall contacts in distributor. - Flashing replace Bosch ignition module.

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Oxygen Sensor Code 13 1 flash 1.5sec off 3 quick flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 13 intermittent, check for loose terminals.
CHECK FOR: Restricted gas flow : crushed exhaust pipe, faulty muffler, faulty catalytic converter, out of tune engine.	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, with a wire earth the sensor (violet) wire, after 10 seconds check the Check Engine light. If it turns off check ALDL terminal D6 and earth if OK, replace faulty sensor (sensor may be damaged due leaded fuel). If "Engine!" light does not turn off check wires ECM/PCM D7/C14 to sensor violet & ECM/PCM D6/C13 to earth, if faulty repair, otherwise replace ECM/PCM
Coolant Sensor Code 14[15] 1 flash 1.2sec off 4[5] quick flash 3 sec off repeat	No	Off	No		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on check sensor for loose terminal connections. If light flashing go to next line.
CHECK FOR: Over heated engine.	Yes	Yes	No	Code 14	Disconnect sensor check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if OK connect sensor loom and back probe if same result could be faulty ECM/PCM. If under 4 volts check sensor wires (yellow and yellow/black) for short if no fault in wires, faulty ECM/PCM.
Coolant Sensor Code 15 1 flash 1.2sec off 5 quick flashes 3 sec off repeat	No	Off	No		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing go to next line.
	Yes	Yes	No	Code 15	Disconnect sensor check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if OK connect sensor loom and back probe if same result could be faulty ECM/PCM. If under 4 volts check sensor wires (yellow and yellow/black) for short if no fault in wires, faulty ECM/PCM.
Manifold Air Temp Sensor Code 23 or (25) 2 flash 1.2sec off 3 (5) flashes 3 sec off repeat	No	Yes	Yes		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing code 23 or code 25 go to next line.
	Yes	Yes	No	Code 23 or Code 25	Disconnect sensor check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if OK connect sensor loom and back probe if same result faulty ECM/PCM. If under 4 volts check sensor wires (brown and black) for short if no fault in wires, faulty ECM/PCM.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul))
Throttle Position Sensor. Code 21 2 flash 1.2sec off 1 flash 3 sec off repeat	No	Yes	Yes	Inspect light	Run engine until at operating temp or "Engine!" light comes on. Turn engine off, leave ignition off, for 15sec, earth test terminal, ignition on, start engine & running for 1-2 minutes or until "Engine!" is on. If engine starts and if no light, check sensor for loose terminal connections. If light flashing or engine will not start go to next line.
	Yes	On	No	code 21 or code 22	If other codes, take note and check codes later, turn ignition off for 15sec to clear codes, remove wires from TPS, and repeat this line. If code 21 turn ignition off, disconnect ECM/PCM, go to next line. If code 22 go down 2 rows.
	No	On	No		Test the disconnected ECM/PCM loom at circuit C13/C5 (blue wire to TPS) with a voltmeter. Over 1 volt, faulty circuit, repair. Under 1 volt either short between blue and grey wires or terminals or faulty ECM/PCM.
	No	On	No		Using a test light connect black/yellow wire at TPS to 12+ V. If no, light faulty circuit in black/yellow wire. If light, faulty TPS, replace.
Throttle Position Sensor. Code 22 2 flash 1.2sec off 2 flash 3 sec off repeat	No	On	Yes	Inspect light	Run engine until at operating temp or "Engine!" light comes on. Turn engine off, leave ignition off, for 15sec, earth test terminal, ignition on, start engine & running for 1-2 minutes or until "Engine!" is on. If engine starts and if no light, check sensor for loose terminal connections. If light flashing, or on or engine will not start go to next line.
CHECK FOR: Trottle or cruise control cables jammed or seized	Yes	On	No	Code 22	If other codes, take note and check codes later, turn ignition off for 15sec to clear codes, remove wires from TPS, start engine, with a wire short blue and grey wire at TPS end of loom, idle engine for 15 seconds, turn engine off.
	Yes	On	No	Code 21 and 22	With wire shorting blue and grey wire still in place. Faulty TPS, replace TPS sensor.
	Yes	On	No	Code 22 and no code 21	Using a voltmeter check (remove shorting wire between blue and grey wire) voltage between grey and black/yellow wires. Below 4 volts, unplug MAP sensor, check voltage again. Over 4 volts faulty MAP sensor. Under 4 volts faulty grey wire circuit, grey wire terminals, or ECM/PCM.

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Speed Sensor Code 24 2 flashes 1.2 sec off 4 quick flashes 3 sec off repeat.	No	On	No		If speedometer does not operate check wiring loom to instrument cluster including earth. Use a voltmeter back probe ECM/PCM terminal A10/B5B6 to earth, roll vehicle on garage floor at walking pace, check voltage. If vehicle fitted with a trip computer go to next row then return to this row next paragraph. Voltage fluctuating 1-10 volts, system OK, check terminals. Voltage over 10 volts either short in brown yellow/blue white wire between ECM/PCM and speedometer or faulty speedometer. Voltage under 1 volt, either short in brown yellow /tan wire between ECM and speedometer, faulty speedometer or faulty ECM, check and replace faulty item.
	No	Off	No		Push finger on trip computer "reset" button and keep pressure on the button, ignition on, finger off reset button. If trip computer has fail message, faulty trip computer replace If no message, ignition off. Push finger on trip computer "reset" button and keep pressure on the button, start vehicle, finger off reset button, drive slowly forward, the trip computer should indicate the speed of the vehicle, if does the trip computer is OK go back to the above row as previously indicated. If not, faulty trip computer, repair or replace.
Manifold Air Pressure Sensor Code 33 and (34) 3 flashes 1.2 sec off 3 (4) quick flashes 3 sec off repeat.	No	On	Yes		Idle engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light. If on which code? 33 (go down one row), 34 (go down two rows). If no light restart engine, jab accelerator with RPM to 3000, ignition off, ignition on, inspect "Engine!" light, if not on check sensor for loose terminal connections. If code 34 go to next line
	Yes	On	No	Code 34	If light flashing code 34 check the vacuum hose from the intake manifold to MAP sensor, hose is working correctly, check the black wire circuit between the ECM/PCM and sensor, if OK replace MAP sensor.
	Yes	On	No	Code 33	Turn ignition off, idle engine to operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light code 33. Back probe sensor wire at ECM/PCM terminal C11/C10 (light green wire) to earth with a volt meter note voltage less than 1 volt, faulty ECM/PCM, over 1 volt faulty light green circuit wire replace
	Yes	On	No	Code 34	Switch ignition off, disconnect earth to ALDL test terminal, short wires light green and grey at sensor together, idle engine until "Engine!" light comes on inspect for code. Code 33 faulty sensor. Code 34, remove short between light green-grey wires, check voltage between grey and black wires:-4-6volts short in grey or light green wire or faulty ECM/PCM. Below 4-6 volts disconnect TPS sensor wiring loom, recheck voltage, still below 4-6 volts either a short in grey or light green wire or faulty ECM/PCM, if 4-6volts faulty TPS.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V8 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Code 41 Engine No Start 4 flashes 1.5 sec off 1 flash 3 sec off	No	On	No	----	Use a spark tester on each spark plug lead, check for result. No spark or poor spark, repair ignition system. Good spark on all plugs go to next line. Poor or no spark on some of the leads see "Engine will not start but turns over" problem.
	No	Off	No	----	Remove wiring looms from ECM/PCM, ignition on, back probe ECM terminal B5/D14 (white/violet) to earth, check voltage. Over 3 volts or under 1 volt, turn engine over on starter, if voltage vary between over 3 and under 1, check for loose B5/D14 terminal or faulty ECM/PCM, if voltage does not vary replace Bosch ignition modual. If voltage not over 3 volts or under 1 volt either faulty white/violet circuit or bosch ignition modual.
Code 42 EST - Electric Spark Timing 4 flashes 1.5 sec off 2 flash 3 sec off repeat	No	On	Yes	Inspect light code 42	Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing, ignition off disconnect ECM wiring looms, go to next line.
	No	On	No	code 42	Using an ohmmeter test resisatance between D4/D11 & earth. Over 500 ohms white wire circuit has a loose connection, faulty or Bosch ignition modual faulty. Under 500 ohms use a test light, back probe D5/D12 (black/tan) terminal and 12+v, check for light. Light on: Disconnect loom from ECM/PCM to Bosch ignition modual at ignition modual, if light now off, faulty Bosch ignition modual, if light still on black/tan wire has earth short Light off: Recheck ohms between D4/D11 and earth as above, with test light still connected. Ohms over 5000 ohms, remove testing equipment, test for code 42 as in above row. If no code flashing there must have been a loose connection. If code 42 flashing, faulty ECM/PCM. Ohms under 500 ohms, while observing ohmmeter, disconnect Bosch ignition loom connector from ECM, check resistance, if higher check for faultly black/tan circuit or faulty Bosch ignition modual, if not higher resistance white wire has an earth short.
Lean Fuel Mix Code 44	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 44 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, start engine and run at 1700RPM for 45 sec. Light off for min of 30-40 sec check violet wire for a earth short or faulty ECM/PCM. If check engine light flashing every 2.5 seconds most likley faulty oxygen sensor clean sensor and runtest again, but check the following, leaded fuel in tank, MAP sensor faulty, leaking exhaust manifold gaskets, faulty fuel pump.

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes/N	Code or Light	VS Vehicle V6 Engine
Diagnostic circuit	No	On	No	Code 12	
	No	On	No	Code 55	Check PCM giving false code information code 55
	No	On	No		Check diagnostic circuit to earth
	No	On	No		Faulty PCM
	No	On	No	Light off	Check No "Engine!" light problem
	No	On	No	Light on	See next line
	Yes	On	No	No flash	Check "Engine!" light will not flash problem
	Yes	On	No	Code 12	Not a faulty code, see Engine turns over but will not start
	Yes	On	No	Code 41	Check Engine turns over but no start, code 41
	Yes	On	No	Code 12 & others	Check codes other than code 12 that are flashing, if present, code 55 1st then code 51, then 41, then lowest number code
	Yes	On	Yes		Start engine via ALDL for service run
	Yes	On	Yes	Flashing once per second	Fuel system operating OK
	Yes	On	Yes	Flashing once per 2.5 second	See oxygen sensor code 13
	Yes	On	Yes	Mostly off	See fuel mixture code 44 lean mixture
	Yes	On	Yes	Mostly on	See fuel mixture code 45 rich exhaust

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes/N	Code or Light	VS Vehicle V6 Engine
No "Engine!" light	No	Off	No	Off	Check fuse No's 10 & 25 plus fusible links
	No	On	No	Off	If other warning lights are off check for an electrical short or printed circuit fault
	No	On	No	Off	Use a test light between earth and brown/white ALDL connector. Test light off, check fuse No 10 and pink & pink/black circuit. Test light on, repair circuit 419 brown/white ECM to ALDL & "check engine"
	No	On	No	On	Use a test light between earth and A4 circuit 39 (Pink or Pink /Black) ALDL connector. "Engine!" light off, repair circuit 39. "Engine!" light ON go to next line
	No	On	No	On	Use a test light between earth and A8 & B8 ALDL connector. "Engine!" light off, repair circuit 480 red/black A8 and B8. "Engine!" light ON, next line
	No	On	No	On	Use a test light between earth and A4 ALDL connector. "Check Engine" light on, check test light between earth and A1, A2, B1, B2, ALDL connector, if OK, check all PCM connectors, if OK turn ignition off and replace PCM unit. "Engine!" light OFF go to next line
	No	On	No	Off or On	Use a test light between earth and Pink/Black ALDL connector. "Engine!" light on or off, repair circuit 39 pink or pink/black (check for bad connections). [CARS WITH ANTI-THEFT "Engine!" light ON go to next line]
	No	On	No	On	Use a test light between earth and A6/C1 ALDL connector. "Engine!" light off, repair pink circuit 39 and/or pink black 39 connector to 439 .5 meter from ECM. "Engine!" light ON repair anti-theft system.
"Engine!" on but will not FLASH	No	On	No	On	Turn ignition off and remove PCM electrical looms from PCM, turn ignition ON go to next line.
	No	On	No	On	Repair 419 brown/white PCM to ALDL & check light
	No	Off	No	Off	Turn ignition off remove PCM and fully install the PCM to the vehicle, turn ignition on go to next line.
	Yes	On	No	On	Check for codes (code 12 means no faults have been detected).
	Yes	On	No	On	Will not flash. Use a test light between earth and B3 ALDL connector. "Engine!" light flashes, repair circuit 451 white/black to PCM. OR ALDL earth connection. "Engine!" light ON but still will not flash go to next line.
	No	On	No	On	No flash replace ECM/PCM unit but not the Mem-cal(PROM). Use a jumper wire between ALDL connector B to A. "Check Engine" light on and flashes, check for codes (code 12 means no faults have been detected) light still does not flash go to next line.
	No	On	No	On	Replace Mem-cal(PROM) unit "Engine!" light on & flashes, check for codes (code 12 means no faults have been detected)

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VS Vehicle V6 Engine
Engine will not start but turns over					Test "Diagnostic Circuit" check for codes 31 or 46 if so check these codes.
	No	On	No		Disconnect all fuel injection electrical connections. Connect a test light to the two terminals of one fuel injector. Do not short to earth. Crank engine! Test light off go to next line.
	No	Off	No		Using a test light connect violet wire ALDL to earth, Turn ignition light off for 15 seconds, then back on. Test light either on or off but does not change, repair fuel pump electrical circuit. Test light on for 2-3 seconds then off go to next line.
	No	On	No		Use a spark tester on each spark plug lead, check for result. No spark or poor spark repair ignition system. Good spark on all plugs go to next line for a basic fuel test.
	No	On	No		Depressurise fuel system (remove fuel pump fuse-in engine compartment - crank engine for 20 seconds). Connect fuel pressure gauge to fuel line (passenger side) as it connects to fuel rail, turn ignition on pressure should be 230-315kPa and remain constant after pump stops. If insufficient pressure check fuel system. If pressure OK see next line.
	No	Off	No		Disconnect all fuel injection electrical connections. Connect a test light to the two terminals of each fuel injector loom in turn. Do not short terminals to each other or earth. Turn engine over on starter, check test light. Test light on- no flash, check for faulty circuits 481 red & injector: 1- 841 blue, 2- 842 green, 3- 843 violet, 4- 844 brown/yellow, 5- 845 grey, 6- 846 yellow to injectors, check resistance on each injector, more than 12.2ohms replace PCM unit, resistance less than 11.8ohms replace injector & PCM. Test light flashing - carry out following checks Valve timing, Compression test, Faulty fuel, Coolant sensor resistance, Spark plugs, TPS electrical circuit, disconnect MAP sensor if starts check sensor operation. Test light off - see next line.
	No	On	No		Disconnect all fuel injection electrical connections. Earth a test light to each terminal of each fuel injector loom in turn. Test light OFF with both terminals of injector loom: Remove EFI relay, test with test light circuit 480 (red/black wire) and circuit 39 (pink/black wire). If only one circuit is active, check ENG INJ fusible link, repair inactive circuit. Test light ON with both terminals of injector loom: Repair faulty circuit injector: 1- 841 blue, 2- 842 green, 3- 843 violet, 4- 844 brown/yellow, 5- 845 grey, 6- 846 yellow. Test light On one terminal of injector loom only: See next line
	No	On	No		Use test light connect F2, E3, E2, F1, E4, F3 of PCM to earth: Test light ON all terminals - connect digital voltmeter to B11 PCM: Less than 3 volts check faulty connection on PCM D12 if OK replace PCM. More than 3 volts, check TPS. Test light ON with one terminal only-repair circuits 467/1467

Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VR Vehicle V6 Engine ECM (Electrical Control Modul / PCM (Powertrain Control Modul)
Fuel Pump Electrical	No	No	No		Check F/pump fuse in engine compartment, if blown replace, turn ignition on, check fuel pump operation. If pump not operating, disconnect fuel pump connectors. Use a test light connect circuit 120 (violet wire) to + battery lead: Test light on: Repair faulty circuit 120 (violet wire). Test light off: Remove oil pressure switch & Fuel pump relay, replace fuse, turn ignition on check fuse, if fuse OK check faulty fuel pump, fuel pump relay or faulty oil pressure switch. If fuse blown again circuit orange wire 240 has short.
	No	On	No		If fuse not blown, use a test light connect ALDL violet wire to earth, turn ignition on while observing test light: Light on - Disconnect oil pressure switch, if light goes out replace oil switch, if light is still on disconnect fuel pump relay and light still on, faulty circuit 120 (violet wire), light goes off check circuit 465 green/white or replace fuel pump relay. Light off - See next column. Test light on for 2-3 seconds then off -See down two columns.
	No	On	No		Connect a test light from black wire at fuel pump relay to battery 12 volts + lead, check test light: Test light on - faulty circuit 240, repair. Test light off - Turn ignition off for 30 seconds. Connect a test light from violet wire (120) at fuel pump relay to earth, turn ignition on, check test light: Test light on for 2-3 seconds fuel pump OK repair circuit 120. Test light off did not flash, replace fuel pump relay try to start engine if engine does not start repair circuit violet 120 and or orange 240, replace oil pressure switch, also see next column.
	No	On	No		Test light on for 2-3 seconds then off - Jumper ALDL pink and violet wires with ignition on, check fuel pump operating. If not repair circuit 120, fuel pump earth or replace fuel pump. If operating check fuel pressure system.
Fuel Pressure Check	No	No	No		Use a test light between circuit 120 (violet wire) ALDL and earth, turn ignition on check. Test Light on or off no flash see Fuel Pump Electrical above. Test Light on for 2-3 seconds then off - Jumper wire 12 volts to ALDL test terminal. Pump not operating see Fuel Pump Electrical above. Pump operating, remove jumper wire, ignition off, check fuel pressure described earlier, see below.
	No	Yes	No		Pressure 230-315kPa, remain constant after pump stops. *Insufficient pressure, check fuel lines, fuel filter, fuel pump. *If pressure OK but declines after pump stops, either a leaking supply or delivery pipe OR faulty fuel pressure regulator. *If pressure OK, most likely faulty fuel pressure regulator. *If pressure LOW but holds pressure - check for fuel restriction such as pinched fuel lines or partly blocked filters. *If pressure HIGH but holds pressure - blocked fuel line to pressure regulator and pressure regulator and fuel tank OR faulty pressure regulator.

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Test Light or Voltmeter	Result or Action VS Vehicle V6 Engine
Idle Air Control (IAC) Circuit	No	On	Yes		Air conditioner off not engine RPM in Neutral turn engine off disconnect IAC electrical connector repeat above check RPM. If RPM is the same, see next row. If RPM increases, engine off, reconnect IAC, start engine RPM as first reading, IAC is OK. If RPM is the same as the second RPM reading (increased) see next row.
	Yes	On	No		Connect a sensitive test light to each IAC loom terminal and earth for 5-6 seconds check result next 3 rows.
	Yes	On		Off	Faulty circuit, repair. and retest. If circuits OK, test IAC coil terminals A-B & C-D ideally above 30ohms, if not replace IAC valve and retest, if resistance OK check for faulty PCM connections if alright replace PCM.
	Yes	On		On	Remove electrical connections to PCM, ignition on, light still on check for short to circuit, light not on check terminals or replace IAC valve.
	Yes	On		Flashing	Check IAC terminals if OK replace IAC valve
MAF Sensor Circuit	No	On	No	On Test Light	Disconnect sensor connector, test MAF terminals C(pink/blue) & B(black) for + reading if not replace MAF. Disconnect sensor, connect light to C (pink/blue 339) & earth. Light OK go to next line. No light repair wire 339 or fuse 12.
	No	On	No	On Volt Metere	Disconnect sensor connector, test MAF terminals A(brown/white) & B(black) for + reading if not replace MAF. Disconnect sensor, test C(pink/blue339) & B (black 150) check for 10V, if not repair B (black 150). Test A (brown/white 792) to earth, check for 4-6 volts. Not 4-6 volts repair 792 check 792, if not 4 volts replace PCM. Yes 4-6 volts check for loose connections.
Transmission Electrical Wiring Check	No	Off	No	Ohmmeter 20-40 ohm 20-40 ohm 20-40 ohm 20-40 ohm 20-40 ohm 2.9-4. ohm 3.5-8. ohm	Disconnect transmission connector, use digital ohmmeter Red wire 1020 to light green wire 1222 - Shift solenoid 1-2 Red wire 1020 to yellow wire 1223 - Shift solenoid 2-3 Red wire 1020 to white wire 897 - Shift solenoid 3-2 Red wire 1020 to black wire 418 - Torque con PWM solenoid Red wire 1020 to black wire 422 - Torque conv solenoid Green wire 455 to brown wire 1227 - Fluid temp sensor Purple wire 1228 to light blue wire 1229 - Fluid pressure If resistance is not as specified check wiring of trans internally, if OK check each unit, replace as necessary.
TPS Sensor Circuit	No	On	No	Voltmeter Reading	Connect (backprobe) a voltmeter to PCM B11 and earth
	No	On	No	2.5 + v	If 2.5 + v disconnect TPS sensor check voltage again. 0.0-1.0v, faulty circuit 452 (black/yellow) or faulty TPS sensor. !.0 + v faulty circuit 417 (blue).
	No	On	No	1.3 - 2.5v	Check throttle stop screw, recheck voltmeter. If still 1.3 - 2.5v faulty TPS sensor. If 0.2 - 2.5v see next row.
	No	On	No	0.2 - 1.2v	Check voltmeter while opening throttle (slowly press on accelerator) voltage should slowly increase, if not replace TPS, if voltage does not go over 4.0v replace TPS.

Test Code or Problem	Ignition On / Off	Engine running Yes / No	Test Light or Voltmeter	Result or Action	VS Vehicle V6 Engine
Ignition Check	On	Yes		Connect a spark plug tester to all spark plugs in turn. If no spark with only one or two check and replace spark plug lead or coil block or DFI modual. If no spark disconnect tachometer wire (brown), if no connector go to next line, check for spark as at plugs. If spark, check for short in Tachometer wire or faulty tachometer, if no spark go to next line.	
	On	No	Test Light 12+V	Remove Bosch DFI modual connector, with test red (P ter.) wire to 12+ to check pink wire is earthed, if no light faulty earth, if OK replace connector. Jumper wire, back probe red wire (P ter.) & white/black wire(N ter.). Jumper wire, back probe grey/red wire(M ter.) to earth. Back probe light blue/white (H ter.) with test light to 12 volts. Turn engine over 360 degrees by hand, if no flash of test light, repair circuits from crank sensor to DFI modual, if OK go to next line.	
	On	No	Test Light	Remove Bosch DFI modual connector. Jumper wire, back probe red wire(P ter.) & white/black wire(N ter.). Jumper wire, back probe grey/red wire(M ter.) to earth. Back probe blue/yellow (G ter.) with test light to 12 volts. Turn engine over 360 degrees by hand, if no flash of test light, repair circuits from crank sensor to DFI modual or replace crank sensor. If light flashes turn ignition off, check crank sensor for foreign matter or damage also check prongs of disc behind crnank shaft balancer. If OK remove jumper wires and test light, reconnect DFI loom connector.	
	On	No	Test Light	Remove wires from top of coil block, seperate coil block from DFI modual, remove all wires from bottom of coil block except blue wires. Connect test light between blue wire and each of the three -black/blue-black/yellow-black/green wires one at a time at base of coil block, crank engine over, does light flash on each wire? If no on any one wire replace DFI modual. If light flashes on all three connections go to next line.	
	Off	No		Use an ohmmeter to check primary and secondary coil resistance of coil block. Primary connections are at the base of coil block that is, between black/yellow & blue, black/green & blue black/blue & blue. Secondary coil resistance is tested between the two terminals for each of the three coils. Primary resistance should be between 0.3 - 1.5 ohms, secondary resistance should be between 5,000 - 7,000 ohms.	

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V6 Engine
Oxygen Sensor Code 13 1 flash 1.5sec off 3 quick flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 13 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, with a wire earth the sensor (violet) wire, after 10 seconds check the Check Engine light. If it turns off check ALDL terminal D14 & earth if OK, replace faulty sensor (may be damaged due leaded fuel). If "Engine!" light does not turn off check the wires PCM (D13) to sensor (violet) & PCM (D13) to earth, if faulty repair, otherwise replace PCM.
Coolant Sensor Code 14 1 flash 1.2sec off 4 quick flashes 3 sec off repeat	No	Off	No		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on check sensor for loose terminal connections. If light flashing go to next line.
	Yes	Yes	No	Code 14	Disconnect sensor, check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if OK connect sensor loom and back probe if same result could be faulty PCM. If under 4 volts check sensor wires (yellow and yellow/black) for short if no fault in wires, faulty PCM.
Coolant Sensor Code 15 1 flash 1.2sec off 5 quick flashes 3 sec off repeat	No	Off	No		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing go to next line.
	Yes	Yes	No	Code 15	Disconnect sensor check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if alright connect sensor loom and back probe if same result could be faulty PCM. If under 4 volts check sensor wires (yellow and yellow/black) for short if no fault in wires, faulty PCM.
Manifold Air Temp Sensor Code 23 or (25) 2 flash 1.2sec off 3 (5) flashes 3 sec off repeat	No	Yes	Yes		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing code 23 or code 25 go to next line.
	Yes	Yes	No	Code 23 or Code 25	Disconnect sensor, check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if alright connect sensor loom & back probe if same result faulty PCM. If under 4 volts check sensor wires (brown and black) for short if not, faulty PCM.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V6 Engine
Throttle Position Sensor. Code 21 2 flash 1.2sec off 1 flash 3 sec off repeat	No	Yes	Yes	Inspect light	Run engine until at operating temp or "Engine!" light comes on. Turn engine off, leave ignition off, for 15sec, earth test terminal, ignition on, start engine & running for 1-2 minutes or until "Engine!" is on. If engine starts and if no light, check sensor for loose terminal connections. If light flashing or engine will not start go to next line.
	Yes	On	No	code 21 or code 22	If other codes, take note and check codes later, turn ignition off for 15sec to clear codes, remove wires from TPS, and repeat this line. If code 21 turn ignition off, disconnect PCM, go to next line. If code 22 go down 2 rows.
	No	On	No		Test the disconnected PCM loom at circuit B11 (blue wire to TPS) with a voltmeter. Over 1 volt, faulty circuit, repair. Under 1 volt either short between blue and grey wires or terminals or faulty PCM.
	No	On	No		Using a test light connect black/yellow wire at TPS to 12+V. If no, light faulty circuit in black/yellow wire or faulty PCM. If light, faulty TPS, replace.
Throttle Position Sensor. Code 22 2 flash 1.2sec off 2 flash 3 sec off repeat	No	On	Yes	Inspect light	Run engine until at operating temp or "Engine!" light comes on. Turn engine off, leave ignition off, for 15sec, earth test terminal, ignition on, start engine & running for 1-2 minutes or until "Engine!" is on. If engine starts and if no light, check sensor for loose terminal connections. If light flashing, or on or engine will not start go to next line.
	Yes	On	No	Code 22	If other codes, take note and check codes later, turn ignition off for 15sec to clear codes, remove wires from TPS, start engine, with a wire short blue and grey wire at TPS end of loom, idle engine for 15 seconds, turn engine off.
	Yes	On	No	Code 21 and 22	With wire shorting blue and grey wire still in place. Faulty TPS, replace TPS sensor.
	Yes	On	No	Code 22 and no code 21	Using a voltmeter check (remove shorting wire between blue and grey wire) voltage between grey and black/yellow wires. Below 4 volts, unplug MAP sensor, check voltage again. Over 4 volts faulty MAP sensor. Under 4 volts faulty grey wire circuit, grey wire terminals, or PCM.

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V6 Engine
Speed Sensor Code 24 2 flashes 1.2 sec off 4 quick flashes 3 sec off repeat.	No	On	No		If speedometer does not operate check wiring loom to instrument cluster including earth. Use a voltmeter back probe PCM terminal C6 or D5 to earth, roll vehicle on garage floor at walking pace, check voltage. If vehicle fitted with a trip computer go to next row then return to this row next paragraph. Voltage fluctuating 1-10 volts, system OK, check terminals. Voltage over 10 volts either short in yellow/black wire between PCM and speedometer or faulty speedometer. Voltage under 1 volt, either short in yellow/black wire between PCM and speedometer, faulty speedometer or faulty PCM, check and replace faulty item.
	No	Off	No		Push finger on trip computer "reset" button and keep pressure on the button, ignition on, finger off reset button. If trip computer has fail message, faulty trip computer replace If no message, ignition off. Push finger on trip computer "reset" button and keep pressure on the button, start vehicle, finger off reset button, drive slowly forward, the trip computer should indicate the speed of the vehicle, if does the trip computer is OK go back to the above row as previously indicated. If not, faulty trip computer, repair or replace.
MAF Sensor Code 32 3 flashes 1.2 sec off 2 quick flashes 3 sec off repeat.	No	On	Yes		Idle engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light. Does code 32 flash? If no light restart engine, jab accelerator with RPM to 3000, ignition off, ignition on, inspect "Engine!" light, if not on check sensor for loose terminal connections. If code 32 go to next line
	Yes	On	No	Test Light	Disconnect sensor, connect light to C (pink/blue 339) & earth. Light OK go to next line. No light repair wire 339 or fuse 12.
	Yes	On	No	Volt Meter	Disconnect sensor, test C (pink/blue 339) & B (black 150) check for 10V, if not repair B (black 150). Test A (brown/white 792) to earth, check for 4-6 volts. Not 4-6 volts check A (792 brown/white) if faulty repair, if not faulty replace PCM. Yes 4-6 volts check for loose connections.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VR Vehicle V6 Engine
Code 41 Engine No Start 4 flashes 1.5 sec off 1 flash 3 sec off	No	On	No	----	Use a spark tester on each spark plug lead, check for result. No spark or poor spark, repair ignition system. Good spark on all plugs go to next line. Poor or no spark on some of the leads see "Engine will not start but turns over" problem.
	No	Off	No	----	Remove wiring looms from PCM, ignition on, back probe PCM terminal D12 (white/violet) to earth, check voltage. Over 10 volts or under 1 volt, turn engine over on starter, if voltage vary between over 10 and under 1, check for loose D12 terminal or faulty PCM, if voltage does not vary replace DFI ignition modal. If voltage not over 10 volts or under 1 volt either faulty white/violet circuit or DFI ignition modal.
Code 42 EST - Electric Spark Timing 4 flashes 1.5 sec off 2 flash 3 sec off repeat	No	On	Yes	Inspect light code 42	Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing, ignition off disconnect PCM wiring looms, go to next line.
	No	On	No	code 42	Using an ohmmeter test resistance between D10 white & earth. Over 500 ohms white wire circuit has a loose connection, faulty or DFI ignition module faulty. Under 500 ohms use a test light, back probe D9 (black/tan) terminal and 12+v, check for light. Light on: Disconnect loom from PCM to DFI ignition module at ignition modal, if light now off, faulty DFI ignition module, if light still on black/tan wire has earth short Light off: Recheck ohms between D10 white and earth as above, with test light still connected. Ohms over 5000 ohms, remove testing equipment, test for code 42 as in above row. If no code flashing there must have been a loose connection. If code 42 flashing, faulty PCM. Ohms under 500 ohms, checking ohmmeter, disconnect Bosch ignition loom connector from PCM, check resistance, if higher check for faulty black/tan circuit or faulty Bosch ignition modal, if not higher resistance white wire has an earth short.
Lean Fuel Mix Code 44 4 flashes 1.2sec off 4 flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 44 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, start engine and run at 1700RPM for 45 sec. Light off for min of 30-40 sec check violet wire for a earth short or faulty PCM. If check engine light flashing every 2.5 seconds most likely faulty oxygen sensor clean sensor and runtest again, but check the following, leaded fuel in tank, MAP sensor faulty, leaking exhaust manifold gaskets, faulty fuel pump.

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V6 Engine
Rich Fuel Mix Code 45 4 flashes 1.2sec off 5 flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 45 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, with a wire earth the sensor (violet) wire, start engine and run at 1750 RPM for 30 sec, check light. Flashing as before 2.5 times per second, either faulty earth connection to engine from PCM (terminal D14 black wire) or faulty PCM. Light off for min of 30-40 sec, check the following, Fuel injector leaking, MAP sensor faulty, faulty fuel pump, leaded fuel in fuel tank, Coolant sensor system faulty, TPS sensor sytem faulty, MAT sensor system faulty, Back pressure from carbon cannister.
Faulty PROM Code 51 5 flashes 1.2 sec off 1 flash off 3 sec repeat	Yes	On	Yes	Code 51	Check that the PROM terminals are clean, looms connected properly to the PCM and the PCM units properly located in body brackets.
PCM giving faulse code information Code 55 5 flashes 1.2 sec off 5 flash off 3 sec repeat	No	On	No	Code 55	Still flashing code 55, disconnect looms to PCM. Test white/black from ALDL, blue wire from TPS sensor, brown from MAT sensor, light green from MAP sensor and yellow from coolant sensor circuits to PCM for + current. If current found repair and retest for code 55. If no current found Faulty PCM. Light on no flash see next line.
	Yes	On	No		Engine must be at operating temp before this test, now inspect if "Engine!" light comes on. No "Engine!" light inspect for loose terminal connections. If code 55 flashing, faulty PCM.

Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes/N	Code or Light	VS Vehicle V8 Engine
Diagnostic circuit	No	On	No	Code 12	
	No	On	No	Code 55	Check PCM giving false code information code 55
	No	On	No		Check diagnostic circuit to earth
	No	On	No		Faulty PCM
	No	On	No	Light off	Check No "Engine!" light problem
	No	On	No	Light on	See next line
	Yes	On	No	No flash	Check "Engine!" light will not flash problem
	Yes	On	No	Code 12	Not a faulty code, see Engine turns over but will not start
	Yes	On	No	Code 41	Check Engine turns over but no start, code 41
	Yes	On	No	Code 12 & others	Check codes other than code 12 that are flashing, if present, code 55 1st then code 51, then 41, then lowest number code
	Yes	On	Yes		Start engine via ALDL for service run
	Yes	On	Yes	Flashing once per second	Fuel system operating OK
	Yes	On	Yes	Flashing once per 2.5 second	See oxygen sensor code 13
	Yes	On	Yes	Mostly off	See fuel mixture code 44 lean mixture
	Yes	On	Yes	Mostly on	See fuel mixture code 45 rich exhaust

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VS Vehicle V8 Engine
"Engine!" light	No	Off	No	Off	Check fuse No 10 & fusible links
	No	On	No	Off	If other warning lights are off check for an electrical short or printed circuit fault
	No	On	No	Off	Use a test light between earth and brown/white ALDL connector. Test light off, check fuse No 10 and pink & pink/black circuit. Test light on, repair circuit 419 brown/white PCM to ALDL & "Engine!" light
	No	On	No	On	Use a test light between earth and F5 ALDL connector. "Engine!" light off, repair circuit 419 brown/white F5 terminal to PCM. "Engine!" light ON go to next line
	No	On	No	On	Use a test light between earth and A8 & B8 ALDL connector. "Engine!" light off, repair circuit 480 red/black A8 & B8. "Engine!" light ON, next line
	No	On	No	On	Use a test light between earth and A4 ALDL connector. "Engine!" light on, check test light between earth and A1, A2, B1, B2 ALDL connector, if OK, check all PCM connectors, if OK turn ignition off & replace PCM unit. "Engine!" light OFF go to next line
	No	On	No	Off or On	Use a test light between earth and Pink ALDL connector. "Engine!" light on or off, repair circuit 439 pink (check for bad connections at connectors). [CARS WITH ANTI-THEFT "Engine!" light ON go to next line]
	No	On	No	On	Use a test light between earth and A4 ALDL connector. "Engine!" light off, repair pink circuit 1439 and/or 1439 connector to 439 .5 meter from PCM. "Engine!" light ON repair anti-theft system.
"Engine!" light on but will not FLASH	No	On	No	On	Turn ignition off and remove PCM electrical looms from PCM, turn ignition ON go to next line.
	No	On	No	On	Repair 419 brown/white PCM to ALDL & check light
	No	Off	No	Off	Turn ignition off remove PCM and fully reinstall PCM's to vehicle, turn ignition on go to next line.
	Yes	On	No	On	Check for codes (code 12 means no faults have been detected).
	Yes	On	No	On	Will not flash. Use a test light between earth and A9/D6 ALDL connector. "Engine!" light flashes, repair circuit 451 white/black to PCM. OR ALDL earth connection. "Engine!" light ON but still will not flash go to next line.
	No	On	No	On	No flash replace PCM unit but not the Mem-cal(PROM). Use a jumper wire between ALDL connector B to A. "Engine!" light on and flashes, check for codes (code 12 means no faults have been detected) light still does not flash go to next line.
	No	On	No	On	Replace PROM (Mem-cal) unit "Engine!" light on & flashes, check for codes (code 12 means no faults have been detected)

Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VS Vehicle V8 Engine
Engine will not start but turns over					Test "Diagnostic Circuit" check for code 41 No engine turn over pulses while turning over.
	No	On	No		Disconnect all fuel injection electrical connections. Connect a test light to the two terminals of one injector. Do not short terminals to each other or earth. Test light on, repair short to earth on circuitS 467 light blue or 1467 grey PCM ter. C15 & C16 to injector. Test light off, next line.
					Using a test light connect violet wire ALDL to earth, Turn ignition light off for 15 seconds, then back on. Test light either on or off but does not change, repair fuel pump electrical circuit. Test light on for 2-3 seconds then off go to next line
	No	On	No		Use a spark tester on each spark plug lead, check for result. No spark or poor spark repair ignition system. Good spark on all plugs go to next line for a basic fuel test.
					Depressurise fuel system (remove fuel pump fuse-in engine compartment - crank engine for 20 seconds). Connect fuel pressure gauge to fuel line (passenger side) as it connects to fuel rail, turn ignition on pressure should be 230-315kPa and remain constant after pump stops. If insufficient pressure check fuel system. If pressure OK see next line.
	No				Disconnect all fuel injection electrical connections. Connect a test light to the two terminals of each fuel injector loom in turn. Do not short terminals to each other or earth. Turn engine over on starter, check test light. Test light on - no flash, check for faulty circuit 481 red injectors to EFI relay, or 467or1467 light blue or grey PCM ter. C15 & C16 to injectors, check resistance on each injector, over 12ohms replace PCM unit, resistance under 12ohms replace injector and PCM unit. Test light flashing - carry out following checks Valve timing, Compression test, Faulty fuel, Coolant sensor resistance, Spark plugs, TPS electrical circuit, disconnect MAP sensor if starts check sensor operation. Test light off - see next line.
	No	On			Disconnect all fuel injection electrical connections. Earth a test light to each terminal of each fuel injector loom in turn. Test light OFF with both terminals of injector loom: Remove EFI relay, test with test light circuit 480 (red/black wire) and circuit 39 (pink black wire). If only one circuit is active, check ENG INJ fusible link, repair inactive circuit. Test light ON with both terminals of injector loom: Repair electrical circuit 467/1467, light blue/grey PCM ter. C15 & C16 to fuel injectors. Test light On one terminal of injector loom only: See next line
	No	On			Using a test light connect C15 and C16 PCM to earth: Test light ON with both terminals - connect digital voltmeter to C5 PCM: Less than 3 volts check faulty connection on PCM D14 if OK replace PCM. More then 3 volts, check TPS. Test light ON with one terminal only - Repair circuit 467 or 1467, light blue or grey PCM ter. C15 & C16 to fuel injectors

TUNE-UP & MAINTENANCE

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Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Code or Light	Result or Action VS Vehicle V8 Engine
Fuel Pump Electrical	No	No	No		Check F/pump fuse in engine compartment, if blown replace, turn ignition on, check fuel pump operation. If pump not operating, disconnect fuel pump connectors. Use a test light connect circuit 120 (violet wire) to + battery lead: Test light on: Repair faulty circuit 120 (violet wire). Test light off: Remove oil pressure switch & Fuel pump relay, replace fuse, turn ignition on check fuse, if fuse OK check faulty fuel pump, fuel pump relay or faulty oil pressure switch. If fuse blown again circuit orange wire 240 has short.
					If fuse not blown, use a test light connect ALDL violet wire to earth, turn ignition on while observing test light: Light on - Disconnect oil pressure switch, if light goes out replace oil switch, if light is still on disconnect fuel pump relay and light still on, faulty circuit 120 (violet wire), light goes off check circuit 465 green/white or replace fuel pump relay. Light off - See next column. Test light on for 2-3 seconds then off -See down two columns.
	No	On	No		Connect a test light from black wire at fuel pump relay to battery 12 volts + lead, check test light: Test light on - faulty circuit 240, repair. Test light off - Turn ignition off for 30 seconds. Connect a test light from violet wire (120) at fuel pump relay to earth, turn ignition on, check test light: Test light on for 2-3 seconds fuel pump OK repair circuit 120. Test light off did not flash, replace fuel pump relay try to start engine if engine does not start repair circuit violet 120 and or orange 240, replace oil pressure switch, also see next column.
					Test light on for 2-3 seconds then off - Jumper ALDL pink and violet wires with ignition on, check fuel pump operating. If not repair circuit 120, fuel pump earth or replace fuel pump If operating check fuel pressure system.
Fuel Pressure Check	No	No	No		Use a test light between circuit 120 (violet wire) ALDL and earth, turn ignition on check. Test Light on or off no flash see Fuel Pump Electrical above. Test Light on for 2-3 seconds then off - Jumper wire 12 volts to ALDL test terminal. Pump not operating see Fuel Pump Electrical above. Pump operating, remove jumper wire, ignition off, check fuel pressure described earlier, see below.
	No	Yes	No		Pressure 230-315kPa, remain constant after pump stops. *Insufficient pressure, check fuel lines, fuel filter, fuel pump. *If pressure OK but declines after pump stops, either a leaking supply or delivery pipe OR faulty fuel pressure regulator. *If pressure OK, most likely faulty fuel pressure regulator. *If pressure LOW but holds pressure - check for fuel restriction such as pinched fuel lines or partly blocked filters. *If pressure HIGH but holds pressure - blocked fuel line to pressure regulator and pressure regulator and fuel tank OR faulty pressure regulator.

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TUNE-UP & MAINTENANCE

Test Code or Problem	ALDL test plug earthed Yes/No	Ignition On / Off	Engine running Yes / No	Test Light or Voltmeter	Result or Action VS Vehicle V8 Engine
Idle Air Control (IAC) Circuit	No	On	Yes		Air conditioner off not engine RPM in Neutral turn engine off disconnect IAC electrical connector repeat above check RPM. If RPM is the same, see next row. If RPM increases, engine off, reconnect IAC, start engine RPM as first reading, IAC is OK. If RPM is the same as the second RPM reading (increased) see next row.
	Yes	On	No		Connect a sensitive test light to each IAC loom terminal and earth for 5-6 seconds check result next 3 rows.
	Yes	On		Off	Faulty circuit, repair. and retest. If circuits OK, test IAC coil terminals A-B & C-D ideally above 30ohms, if not replace IAC valve and retest, if resistance OK check for faulty PCM connections if alright replace PCM.
	Yes	On		On	Remove electrical connections to PCM, ignition on, light still on check for short to circuit, light not on check terminals or replace IAC valve.
	Yes	On		Flashing	Check IAC terminals if OK replace IAC valve
MAP Sensor	No	On	No	Voltmeter Reading	Jumper a + wire to C terminal of MAP sensor, connect sensitive voltmeter between A & B terminals check voltage.
	No	On	No	3.0-5.5v	Voltage should be 3.0 - 5.5 volts. If not replace MAP sensor. If OK apply 30-35kPa vacuum to MAP sensor hose, voltage should drop by 1.5 - 2.5 volts, if not replace MAP sensor.
Transmission Electrical Wiring Check	No	Off	No	Ohmmeter 20-40 ohm 20-40 ohm 20-40 ohm 20-40 ohm 2.9-4. ohm 3.5-8. ohm	Disconnect transmission PCM connector use digital ohmmeter Red wire 1020 to light green wire 1222 - Shift solenoid 1-2 Red wire 1020 to yellow/black wire 1223 - Shift solenoid 2-3 Red wire 1020 to white/green wire 897 - Shift solenoid 3-2 Red wire 1020 to grey/red wire 422 - Torque conv solenoid Green wire 455 to black/yellow wire 1227 - Fluid temp sensor Purple wire 1228 to light blue wire 1229 - Fluid pressure If resistance is not as specified check wiring of trans internally, if OK check each unit, replace as necessary.
TPS Sensor Circuit	No	On	No	Voltmeter Reading	Connect (backprobe) a voltmeter to PCM C5 and earth
	No	On	No	2.5 + v	If 2.5 + v disconnect TPS sensor check voltage again. 0.0-1.0v, faulty circuit 452 (black/yellow) or faulty TPS sensor. 1.0 + v faulty circuit 417 (blue).
	No	On	No	1.3 - 2.5v	Check throttle stop screw, recheck voltmeter. If still 1.3 - 2.5v faulty TPS sensor. If 0.2 - 2.5v see next row.
	No	On	No	0.2 - 1.2v	Check voltmeter while opening throttle (slowly press on accelerator) voltage should slowly increase, if not replace TPS, if voltage does not go over 4.0v replace TPS.

TUNE-UP & MAINTENANCE

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Test Code or Problem	Ignition On / Off	Engine running Yes / No	Test Light or Voltmeter	Result or Action VS Vehicle V8 Engine
Ignition Check	On	Yes		Connect a spark plug tester to all spark plugs in turn. If no spark with only one or two check and replace spark plug lead or distributor cap. If no spark disconnect tachometer wire (brown), if no connector go to next line, check for spark as at plugs. If spark, check for short in Tachometer wire or faulty tachometer, if no spark go to next line.
	On	No	Test Light 12+V	Remove Bosch ignition modual connector, test black wire to 12+ to check black wire is earthed, if no light faulty earth, if OK replace connector. Back probe red (ignition, injectors & PCM - ALDL) if no light repair circuit, if OK check brown wire from Ignition modual (Tachometer-turn engine over, check for flashing) to earth, if not active repair circuit, if OK go to next line.
	On	No	Test Light	Test Tachometer wire at tachometer or main wire going to tachometer after connection with wire form coil to 12+V (turn engine over, check for flashing). If flashing check distributor rotor, cap & cap-coil wire, if OK replace coil, if no flash go to next line.
	On	No	Test Light	Using two jumper wires at the Bosch ignition modual 6 wire connector, one jumper wire connect red to white/black, one wire connect black to grey/red, test (use a low watt test light otherwise you can damage Hall contacting mechanism in distributor) light blue/white to 12+V, turn over engine check for flashing. - No flashing check white/black, light/blue and grey/red replace if faulty, if not faulty replace Hall contacts in distributor. - Flashing replace Bosch ignition module.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V8 Engine
Oxygen Sensor Code 13 1 flash 1.5sec off 3 quick flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 13 intermittent, check for loose terminals.
CHECK FOR: Restricted gas flow : crushed exhaust pipe, faulty muffler, faulty catalytic converter, out of tune engine.	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, with a wire earth the sensor (violet) wire, after 10 seconds check the Check Engine light. If it turns off check ALDL terminal D6 and earth if OK, replace faulty sensor (sensor may be damaged due leaded fuel). If "Engine!" light does not turn off check wires PCM /C14 to sensor violet & PCM C13 to earth, if faulty repair, otherwise replace PCM
Coolant Sensor Code 14[15] 1 flash 1.2sec off 4[5] quick flash 3 sec off repeat	No	Off	No		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on check sensor for loose terminal connections. If light flashing go to next line.
CHECK FOR: Over heated engine.	Yes	Yes	No	Code 14	Disconnect sensor check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if OK connect sensor loom and back probe if same result could be faulty PCM. If under 4 volts check sensor wires (yellow and yellow/black) for short if no fault in wires, faulty PCM.
Coolant Sensor Code 15 1 flash 1.2sec off 5 quick flashes 3 sec off repeat	No	Off	No		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing go to next line.
	Yes	Yes	No	Code 15	Disconnect sensor check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if OK connect sensor loom and back probe if same result could be faulty PCM. If under 4 volts check sensor wires (yellow and yellow/black) for short if no fault in wires, faulty PCM.
Manifold Air Temp Sensor Code 23 or (25) 2 flash 1.2sec off 3 (5) flashes 3 sec off repeat	No	Yes	Yes		Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing code 23 or code 25 go to next line.
	Yes	Yes	No	Code 23 or Code 25	Disconnect sensor check voltage between two sensor wires. If over 4 volts, check resistance of sensor, at operating temp should be 200-450ohms at room temp 2000-3000ohms, if not replace sensor, if OK connect sensor loom and back probe if same result faulty PCM. If under 4 volts check sensor wires (brown and black) for short if no fault in wires, faulty PCM.

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V8 Engine
Throttle Position Sensor. Code 21 2 flash 1.2sec off 1 flash 3 sec off repeat	No	Yes	Yes	Inspect light	Run engine until at operating temp or "Engine!" light comes on. Turn engine off, leave ignition off, for 15sec, earth test terminal, ignition on, start engine & running for 1-2 minutes or until "Engine!" is on. If engine starts and if no light, check sensor for loose terminal connections. If light flashing or engine will not start go to next line.
	Yes	On	No	code 21 or code 22	If other codes, take note and check codes later, turn ignition off for 15sec to clear codes, remove wires from TPS, and repeat this line. If code 21 turn ignition off, disconnect ECM/PCM, go to next line. If code 22 go down 2 rows.
	No	On	No		Test the disconnected PCM loom at circuit C5 (blue wire to TPS) with a voltmeter. Over 1 volt, faulty circuit, repair. Under 1 volt either short between blue and grey wires or terminals or faulty PCM.
	No	On	No		Using a test light connect black/yellow wire at TPS to 12+V. If no, light faulty circuit in black/yellow wire. If light, faulty TPS, replace.
Throttle Position Sensor. Code 22 2 flash 1.2sec off 2 flash 3 sec off repeat	No	On	Yes	Inspect light	Run engine until at operating temp or "Engine!" light comes on. Turn engine off, leave ignition off, for 15sec, earth test terminal, ignition on, start engine & running for 1-2 minutes or until "Engine!" is on. If engine starts and if no light, check sensor for loose terminal connections. If light flashing, or on or engine will not start go to next line.
CHECK FOR: Throttle or cruise control cables jammed or seized	Yes	On	No	Code 22	If other codes, take note and check codes later, turn ignition off for 15sec to clear codes, remove wires from TPS, start engine, with a wire short blue and grey wire at TPS end of loom, idle engine for 15 seconds, turn engine off.
	Yes	On	No	Code 21 and 22	With wire shorting blue and grey wire still in place. Faulty TPS, replace TPS sensor.
	Yes	On	No	Code 22 and no code 21	Using a voltmeter check (remove shorting wire between blue and grey wire) voltage between grey and black/yellow wires. Below 4 volts, unplug MAP sensor, check voltage again. Over 4 volts faulty MAP sensor. Under 4 volts faulty grey wire circuit, grey wire terminals, or PCM.

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TUNE-UP & MAINTENANCE

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V8 Engine
Speed Sensor Code 24 2 flashes 1.2 sec off 4 quick flashes 3 sec off repeat.	No	On	No		If speedometer does not operate check wiring loom to instrument cluster including earth. Use a voltmeter back probe PCM terminal B5B6 to earth, roll vehicle on garage floor at walking pace, check voltage. If vehicle fitted with a trip computer go to next row then return to this row next paragraph. Voltage fluctuating 1-10 volts, system OK, check terminals. Voltage over 10 volts either short in brown yellow/blue white wire between PCM and speedometer or faulty speedometer. Voltage under 1 volt, either short in brown yellow /tan wire between PCM and speedometer, faulty speedometer or faulty PCM, check and replace faulty item.
	No	Off	No		Push finger on trip computer "reset" button and keep pressure on the button, ignition on, finger off reset button. If trip computer has fail message, faulty trip computer replace. If no message, ignition off. Push finger on trip computer "reset" button and keep pressure on the button, start vehicle, finger off reset button, drive slowly forward, the trip computer should indicate the speed of the vehicle, if does the trip computer is OK go back to the above row as previously indicated. If not, faulty trip computer, repair or replace.
Manifold Air Pressure Sensor Code 33 and (34) 3 flashes 1.2 sec off 3 (4) quick flashes 3 sec off repeat.	No	On	Yes		Idle engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light. If on which code? 33 (go down one row), 34 (go down two rows). If no light restart engine, jab accelerator with RPM to 3000, ignition off, ignition on, inspect "Engine!" light, if not on check sensor for loose terminal connections. If code 34 go to next line
	Yes	On	No	Code 34	If light flashing code 34 check the vacuum hose from the intake manifold to MAP sensor, hose is working correctly, check the black wire circuit between the PCM and sensor, if OK replace MAP sensor.
	Yes	On	No	Code 33	Turn ignition off, idle engine to operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light code 33. Back probe sensor wire at PCM terminal C10 (light green wire) to earth with a volt meter note voltage less than 1 volt, faulty PCM, over 1 volt faulty light green circuit wire replace
	Yes	On	No	Code 34	Switch ignition off, disconnect earth to ALDL test terminal, short wires light green and grey at sensor together, idle engine until "Engine!" light comes on inspect for code. Code 33 faulty sensor. Code 34, remove short between light green-grey wires, check voltage between grey and black wires: 4-6volts short in grey or light green wire or faulty PCM. Below 4-6 volts disconnect TPS sensor wiring loom, recheck voltage, still below 4-6 volts either a short in grey or light green wire or faulty PCM, if 4-6volts faulty TPS.

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Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V8 Engine
Code 41 Engine No Start 4 flashes 1.5 sec off 1 flash 3 sec off	No	On	No	----	Use a spark tester on each spark plug lead, check for result. No spark or poor spark, repair ignition system. Good spark on all plugs go to next line. Poor or no spark on some of the leads see "Engine will not start but turns over" problem.
	No	Off	No	----	Remove wiring looms from PCM, ignition on, back probe ECM terminal D14 (white/violet) to earth, check voltage. Over 3 volts or under 1 volt, turn engine over on starter, if voltage vary between over 3 and under 1, check for loose D14 terminal or faulty PCM, if voltage does not vary replace Bosch ignition modual. If voltage not over 3 volts or under 1 volt either faulty white/violet circuit or bosch ignition modual.
Code 42 EST - Electric Spark Timing 4 flashes 1.5 sec off 2 flash 3 sec off repeat	No	On	Yes	Inspect light code 42	Run engine until at operating temp or "Engine!" light comes on. Earth test terminal, ignition on, engine not running, inspect "Engine!" light if not on, check sensor for loose terminal connections. If light flashing, ignition off disconnect ECM wiring looms, go to next line.
	No	On	No	code 42	Using an ohmmeter test resisistance between D11 & earth. Over 500 ohms white wire circuit has a loose connection, faulty or Bosch ignition modual faulty. Under 500 ohms use a test light, back probe D12 (black/tan) terminal and 12+v, check for light. Light on: Disconnect loom from PCM to Bosch ignition modual at ignition modual, if light now off, faulty Bosch ignition modual, if light still on black/tan wire has earth short Light off: Recheck ohms between D11 and earth as above, with test light still connected. Ohms over 5000 ohms, remove testing equipment, test for code 42 as in above row. If no code flashing there must have been a loose connection. If code 42 flashing, faulty PCM. Ohms under 500 ohms, while observing ohmmeter, disconnect Bosch ignition loom connector from PCM, check resistance, if higher check for faultly black/tan circuit or faulty Bosch ignition modual, if not higher resistance white wire has an earth short.
Lean Fuel Mix Code 44	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 44 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1700 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, start engine and run at 1700RPM for 45 sec. Light off for min of 30-40 sec check violet wire for a earth short or faulty PCM. If check engine light flashing every 2.5 seconds most likley faulty oxygen sensor clean sensor and runtest again, but check the following, leaded fuel in tank, MAP sensor faulty, leaking exhaust manifold gaskets, faulty fuel pump.

Test or Code	ALDL test terminal earthed Yes/No	Ignition On / Off	Engine running Yes / No	"Engine!" Light	Result or Action VS Vehicle V8 Engine
Rich Fuel Mix Code 45 4 flashes 1.2sec off 5 flashes 3 sec off repeat	Yes	On	Yes	Flash 1 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, remove earth from ALDL test terminal, recheck. Light on, turn engine off, earth ALDL test terminal, ignition on, check for code and repair. Light off and code 45 intermittent, check for loose terminals.
	Yes	On	Yes	Flash 2.5 times / sec	Engine at operating Temp and 1750 RPM for 2 minutes. Turn engine off, disconnect oxygen sensor, with a wire earth the sensor (violet) wire, start engine and run at 1750 RPM for 30 sec, check light. Flashing as before 2.5 times per second, either faulty earth connection to engine from PCM (terminal D14 black wire) or faulty PCM. Light off for min of 30-40 sec, check the following, Fuel injector leaking, MAP sensor faulty, faulty fuel pump, leaded fuel in fuel tank, Coolant sensor system faulty, TPS sensor sytem faulty, MAT sensor system faulty, Back pressure from carbon cannister.
Faulty PROM Code 51 5 flashes 1.2 sec off 1 flash off 3 sec repeat	Yes	On	Yes	Code 51	Check that the PROM terminals are clean, looms connected properly to the PCM and the PCM units properly located in body brackets.
PCM giving faulse code information Code 55 5 flashes 1.2 sec off 5 flash off 3 sec repeat	No	On	No	Code 55	Still flashing code 55, disconnect looms to PCM. Test white/black from ALDL, blue wire from TPS sensor, brown from MAT sensor, light green from MAP sensor and yellow from coolant sensor circuits to PCM for + current. If current found repair and retest for code 55. If no current found Faulty PCM. Light on no flash see next line.
	Yes	On	No		Engine must be at operating temp before this test, now inspect if "Engine!" light comes on. No "Engine!" light inspect for loose terminal connections. If code 55 flashing, faulty PCM.

MAINTENANCE CHART

Minor maintenance, every 10,000 kilometers or 3 months.

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Automatic transmission level, page 230.	☐	Light - Parking light operation, page 444.	☐
Battery inspection, page 440.	☐	Light - Turning indicator operation, page 444.	☐
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Brake fluid level, page 338.	☐	Rear axle lubricant level, page 268.	☐
Brake disc pad wear level, page 338.	☐	Rear suspension operation, page 324.	☐
Brake - Hand brake adjustment, page 349.	☐	Rear vision mirror condition, page 368/399.	☐
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Door catch operation lubricate, page 378.	☐	Steering operation, page 289.	☐
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Horn operation, page 438	☐	Windscreen demister operation, page 416.	☐
Light operation, page 445.	☐		

MAINTENANCE CHART

Major maintenance, every 40,000 kilometers or 12 months.

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Automatic transmission level, page 230.	☐	Light - Turning indicator operation, page 444.	☐
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Battery terminal inspection, page 440.	☐	Lubricate clutch cable and pivots.	☐
Boot catch operation lubricate, page 390.	☐	Oil change, page 8.	☐
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Brake fluid replace and bleed, page 338.	☐	Power steering fluid level, page 390.	☐
Brake fluid level, page 338.	☐	Rear axle lubricant level, page 268.	☐
Brake disc pad wear level, page 338.	☐	Rear suspension operation, page 324.	☐
Brake - Hand brake adjustment, page 349.	☐	Rear suspension bushes, page 334.	☐
Brake - Hand brake lining wear level, page 349.	☐	Rear vision mirror condition, page 368/399.	☐
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