ENGINE TUNING DATA

ENGINE

Firing order	1-3-4-2
Injection timing	13" B.T.D.C.

Timing marks:

Valve timing	Slot for peg in flywheel and TDC mark on front pulley
Injection timing	Special tool 18G 1458 inserted in D.P.S. pump
Tappet clearances inlet and exhaust	0,25 mm (0.010 in)

Valve timing

Inlet opens	16° B.T.D.C.
Inlet closes	42" A.B.D.C.
Inlet peak	103" A.T.D.C.
Exhaust opens	51" B.B.D.C.
Exhaust closes	13" A.T.D.C.
Exhaust peak	109" R.T.D.C.

Valve lift

Inlet	9,85 mm (0,388 ins)
Exhaust	10,26 mm (0.404 ins)

Maximum governed speeds

Full load	4000 r.p.m.
No load (flight speed)	4400 ± 80 r.p.m.
Idle speed	670 ± 20 r.p.m.
Dic-down time	4 seconds

DISTRIBUTOR PUMP

Make/type	CAV DPS type with boost control and two speed mechanical governor with auto advance and solenoid electrical shut-off. Tamper proof sealing on flight speed and fuel adjustment screws.
Direction of rotation	Clockwise, viewed from drive end
Advance box (two stage)	7" advance with 3" start retard
Back leakage rate 150-100 Atm:	
New nozzle	7 seconds
Original nozzle	5 seconds
Despatch nozzle	8520A290A

INJECTORS

Make/type	CAV Pintaux DES5385001
Nozzle size	BDNO/SPC 6209
Opening pressure (working pressure)	135 to 140 Atmospheres
Injector pipe type	High pressure multi-bundy
size	1,94 to 2,06 mm
length	457,2 mm (18 ins)

HEATER PLUGS

Make/type	Probe type, Champion CH63 i i volts 90 watts nominal
Time to reach operating temperature of 850°C	8 seconds

TURBO-CHARGER

Make/type	Garrett T2
Maximum boost pressure	48 cm HG (9.3 P.S.I.G.) measured at wastegate actuator "T" piece

TORQUE WRENCH SETTINGS

TURBO-CHARGER FIXINGS	Nm	lbf.ft
Stud-Turbo charger to exhaust manifold	22-28	16-21
Nut-Turbo charger to exhaust manifold	21-26	15-19
Adaptor-Oil feed to cylinder block	22-28	16-21
Adaptor-Oil drain to cylinder block	22-28	16-21
Pipc-Oil feed to turbo charger	15-22	11-16
Pipe-Oil drain	32-48	23-35
Stud-Outlet elbow to turbo charger	22-28	16-21
Nut-Outlet elbow to turbo charger	21-26	15-19
Heat shield support to inlet manifold	22-28	16-21
Stud-Exhaust manifold to cylinder head	30-40	22-30
Nut-Exhaust manifold to cylinder head	28-36	21-26
Screw-inlet and exhaust manifold to cylinder head	30-40	22-30

RECOMMENDED ENGINE OILS

The following list of recommended engine oils for temperate climates - ambient temperature range - 10°C to *35°C* should be used for oil changes and topping up. They are SHPD (Super High Performance Diesel) oils that allow a maximum of 10,000 km (6,000 miles) between oil and filter changes.

BP	Vanellus C3 Extra 15/40
CASTROL	Deusol Turbomax 15/40
MOBIL	Delvac 1400 Super 15/40
SHELL	Myrina 15/40

The following list of oils is for emergency use only if the above oils arc not available. Thcy can be used for topping-up without detriment, but if used for engine oil changing, they are limited to a maximum of 5,000 km (3,000 miles) between oil and filter changes.

BP	Vanellus C3 Multigrade 15/40
CASTROL	Dcusol RX Super 15/40
DUCKHAMS	Hypergrade 15/50
ESSO	Essolube XD-3 15/40
MOBIL	Delvac Super 15/40
PETROFINA	Fina Dilano HPD 15/40
SHELL	Rimula X 15/40
TEXACO	URSA Super Plus 15/40

Use only oils to MIL-L-2104C/D or API Service levels CD or SE/CD-15W/40 SECTION 10

MAINTENANCE SCHEDULE

The following additional maintenance is required for the turbo charged engine to that contained in thc main schedulc for the non-Turbo Charged 2.5 Litre Diesel cngine.

Every 500 km (250 miles)
- Check engine oil level

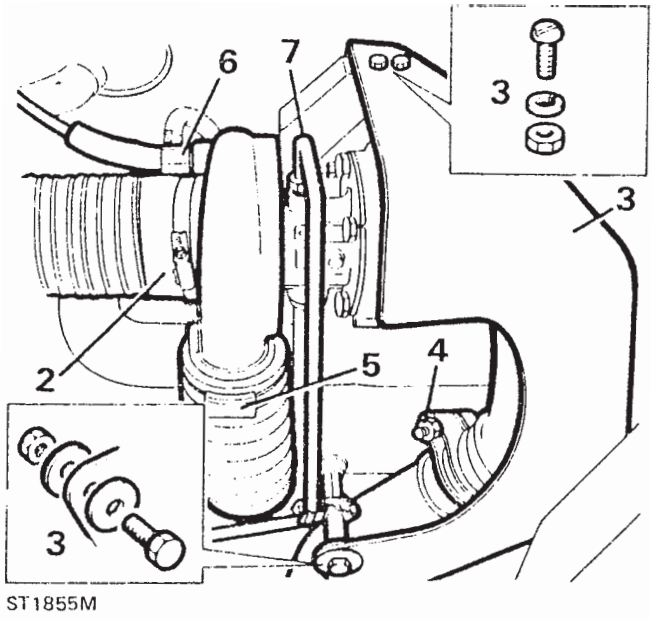
At 1,600 km (1,000 miles), 10,000 km (6,000 miles) and 20.000 km (12,000 miles) then every 20,000 km (12,000 miles)
- Check tappets, and adjust if necessary

Every 80.000 km (48,000 miles)
- Check maximum turbo-charge boost pressure.

TURBO-CHARGER

Removing

1. Remove the bonnet.
2. Remove the hose connecting the air cleaner to the turbo-charger.
3. Remove the turbo-charger heat shield fixings and remove the heat shield.
4. Release the clamp securing the turbo-charger elbow to the exhaust downpipe.
5. Remove the inlet manifold to the turbo-charger hose.
6. Disconnect the boost control hose from the turbo-charger.
7. Disconnect from the turbo-charger the lubrication inlet pipe.



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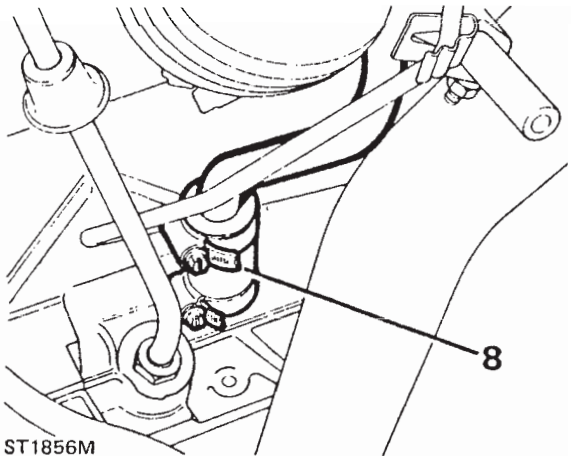
8. Disconnect, at the flexible hose, the lubrication drain pipe from the turbo-charger.



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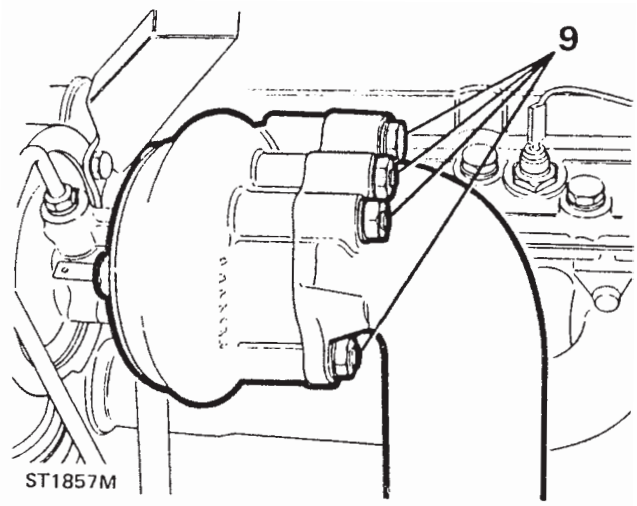
9. Remove the five nuts to release the exhaust elbow and gasket from the turbo-charger.



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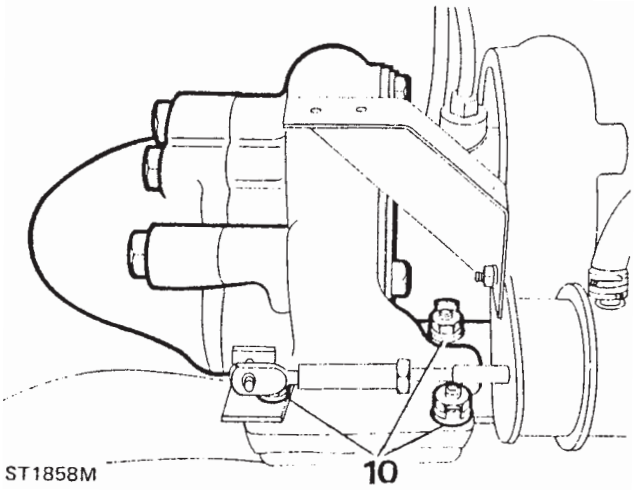
10. Release the lock tabs and remove the four nuts securing the turbo-charger to the exhaust manifold and remove the turbo-charger and gasket.



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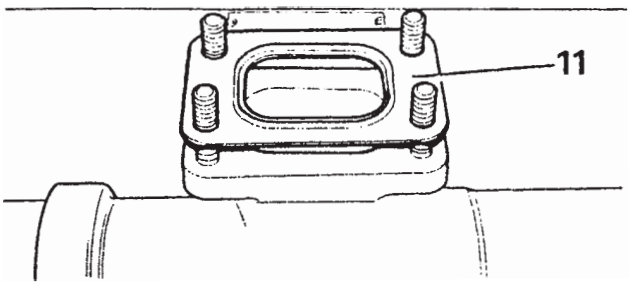
Fitting

11. Fit the raised bead side of a new gasket uppermost to the exhaust manifold and fit and secure the turbo-charger with the four nuts, tightening evenly to the correct torque and secure with lock tabs.
12. Fit the exhaust elbow, using a new gasket, to the turbo-charger and retain with the five nuts tightening evenly to the correct torque.



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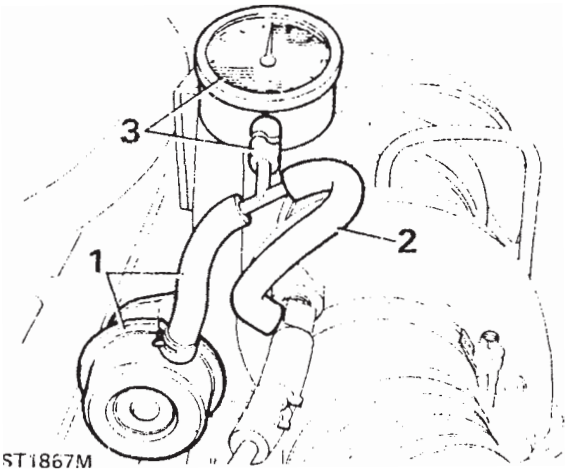
13. Fit the exhaust downpipe to the turbo-charger elbow and tighten the clamp bolt.
14. Connect the lubrication inlet pipe to the turbo-charger.
15. Fit the oil drain pipe to the flexible connection.
16. Connect the boost control pipe to the turbo-charger.
17. Fit the hose connecting the inlet manifold to turbo-charger.
18. Fit the heat shield.
19. Fit the air cleaner to turbo-charger hose.
20. Immediately prior to starting the engine release the oil inlet pipe to the turbo-charger and fill the centre housing with a recommended make and grade of engine oil and re-fit the pipe.

CHECKING TURBO-CHARGER BOOST PRESSURE

1. Disconnect, from the turbo-charger, the hose to the actuator and insert, into the free end a suitable 'T'piece.
2. Connect a short length of slave hose to the turbo-charger and connect the other end to the 'T' piece.
3. Connect a further slave hose to the third leg of the 'T' piece and the other end to a pressure gauge capable of reading in excess of *50* cm of Mercury. The pressure gauge hose must be long enough to reach into the cab of the vehicle so that the gauge can be observed by the driver or passenger.
4. Drive the vehicle in the normal manner (2,500-*3,000* r.p.m. full load) and observe the maximum pressure obtained and compare with the figure in Data Section 05.



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RENEW TURBO-CHARGER ACTUATOR

1. Remove the two screws securing actuator bracket to the turbo-charger.
2. Remove the nut and bolt securing actuator to the heat shield bracket and disconnect the hose.
3. Remove clip retaining actuator arm to the wastegate lever pin and withdraw the actuator from the engine.
4. Fit the replacement actuator with the two bolts and single nut and bolt. Tighten bolts to 12.5 to 14.0 Nm (111 to 124 in lbs).
5. Push the wastegate lever as far as possible towards the actuator and apply pressure to keep lever in this position.
6. Pressurize the replacement actuator to *57-62* cm HgG (11-12 p.s.i.g) and hold this pressure.

CAUTION: Use only the threaded rod-end to make adjustments. Forcing the entire rod in or out will change the calibration with the possibility of damaging engine over-boost.

7. Screw the rod-end in either direction until the rod end eye will locate easily over the wastegate pin and secure with retaining clip.
8. Release the calibration pressure and tighten the rod end locknut. Reconnect the hose.
9. Check the boost pressure, on the road, as described earlier. The pressure should not fall below 44 or exceed *50* cm HgG *(8.5* — 9.7 p.s.i.g.)

TURBO-CHARGER FAULT TRACING

It is important to be aware that when tracing a suspected fault in a turbo-charger that a turbo-charger cannot compensate for incorrect engine operation deficiencies in the air, or fuel intake systems, exhaust emission components or for damaged and worn engine internal parts such as valves and pistons. Before suspecting the turbo-charger, the engine should be checked against the tuning data in Section 05. Replacing a sound turbo-charger with another will not correct engine deficiencies.

Systematic fault tracing of a suspected turbo-charger failure is important for two reasons. First, it must be found what, if anything, is wrong with the turbo-charger so that it can be exchanged. Second, it must be decided what action is necessary to prevent a repeat failure.

In many cases, evidence pointing to the cause of a failure is destroyed while removing the turbo-charger from the engine. For example, if a turbo-charger failed because of a faulty installation, such as loose connections that allowed dirt to enter the compressor, this would not be evident once the turbo-charger was removed from the engine. Failure to correct the installation, such as reinstalling defective manifold flange Connections, could cause an identical failure of the replacement unit. The hose connecting the air cleaner to the compressor, which could contain dirt or harmful particles, should be cleaned or renewed if necessary.

In general, the fault tracing procedures that can be done with the least effort and in the least amount of time should be done first. Do not remove and renew the turbo-charger until the following visual checks and repairs that can be made with the turbo-charger installed, have been done. **DO NOT, UNDER ANY CIRCUMSTANCES, DISMANTLE THE TUKBO-CHARGER.**

VISUAL INSPECTION

1. Inspect all connections within the intake system. Tighten loose connections as required.
2. Replace damaged air intake components.
3. Check the connection between the compressor and the engine intake manifold.
   Tighten loose bolts as required.
4 Check exhaust system connections at turbine housing inlet and outlet flanges for oil leakage and loose connections. Tighten loose connections as required. If oil leakage exists, check the general condition of the engine.
5. Check the oil line connections at the centre housing oil inlet and outlet ports for leakage.
   Tighten loose connections as required. Start engine and recheck connections.

ENGINE PROTECTION

To prevent corrosion of the aluminium alloy engine parts it is imperative that the cooling system is filled with a solution of clean water and the correct type of anti-freeze, winter and summer, or water and inhibitor if frost precautions are not required. Never fill or top-up with water only, always add an inhibitor (Marstons SQ36) if anti-freeze is not used. NEVER use salt water with an inhibitor otherwise corrosion will occur. In certain territories where the only available water supply may have some salt content, use only clean rainwater or distilled water.

Recommended solutions

Anti-freeze Unipart Universal Anti-freeze or permanent type ethylene base, without methanol, with a suitable inhibitor for aluminium engines and engine parts.

Use one part of anti-freeze to one part water.

Inhibitor Marston Lubricants SQ36 inhibitor concentrate.

Use 100 cc of inhibitor per litre of water.

Anti-freeze can remain in the cooling system and will provide adequate protection for two years provided that the specific gravity of the coolant is checked before the onset of the second winter and topped-up with new anti-freeze as required.

Land Rovers leaving the factory have the cooling system filled with 50% of anti-freeze mixture. This gives protection against frost down to minus **47°C** (minus 53°F). Vehicles so filled can be identified by a label affixed to the windscreen and radiator.

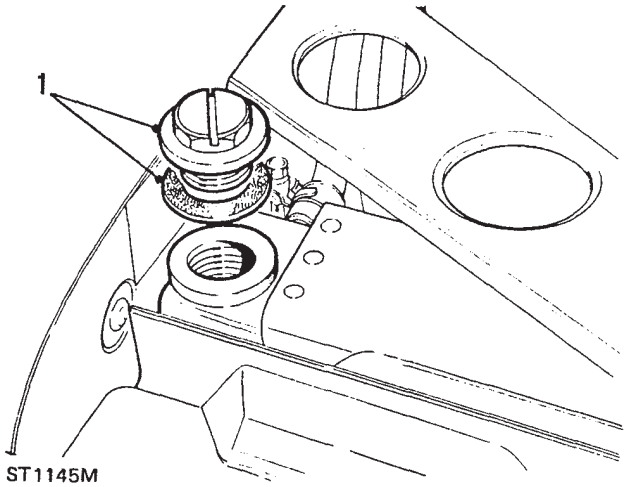
After the second winter the system should be drained and thoroughly flushed. Before adding new anti-freeze examine all joints and renew defective hoses to make sure that the system is leakproof. Inhibitor solution should be drained and flushed out and new inhibitor solution introduced every two years, or sooner where the purity of the water is questionable.

See the 'General specification data' section for protection quantities.

DRAIN AND FILL V8 ENGINE COOLING SYSTEM

WARNING: Do not remove the radiator filler cap when the engine is hot because the cooling system is pressurized and personal scalding could result.

1. Remove the radiator filler plug.



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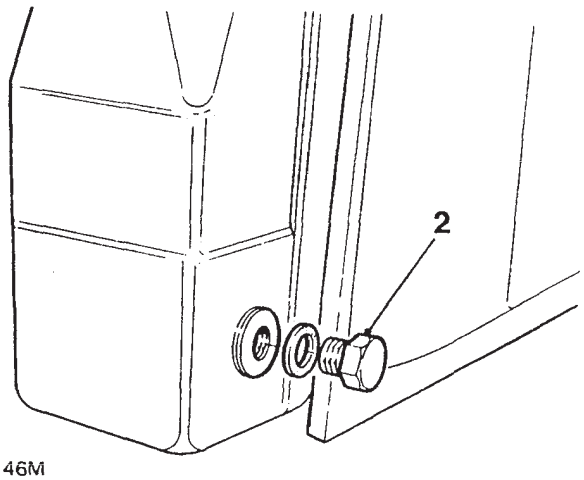
2. Remove the radiator drain plug and allow the coolant to drain, if necessary, into a suitable container. Refit the drain plug and new washer. The drain plug is situated on the left-hand side of the radiator towards the bottom facing the engine compartment.

NOTE: Disconnect bottom hose to drain on radiators without a drain plug. Connect hose after draining.



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3. Remove the engine drain plugs, one each side of the cylinder block, beneath the exhaust manifolds. Allow the coolant to drain and refit plugs and washers.