Workshop Manual for V8.510, V8.540 & TV8.540 Diesel Engines

(For V8.510 engines, commencing engine number 510U2000)

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This publication is written for world wide use. In territories where legal requirements govern engine smoke emission, noise, safety factors etc., then all instructions, data and dimensions given must be applied in such a way that, after servicing (preventive maintenance) or repairing the engine, it does not contravene the local regulations when in use.

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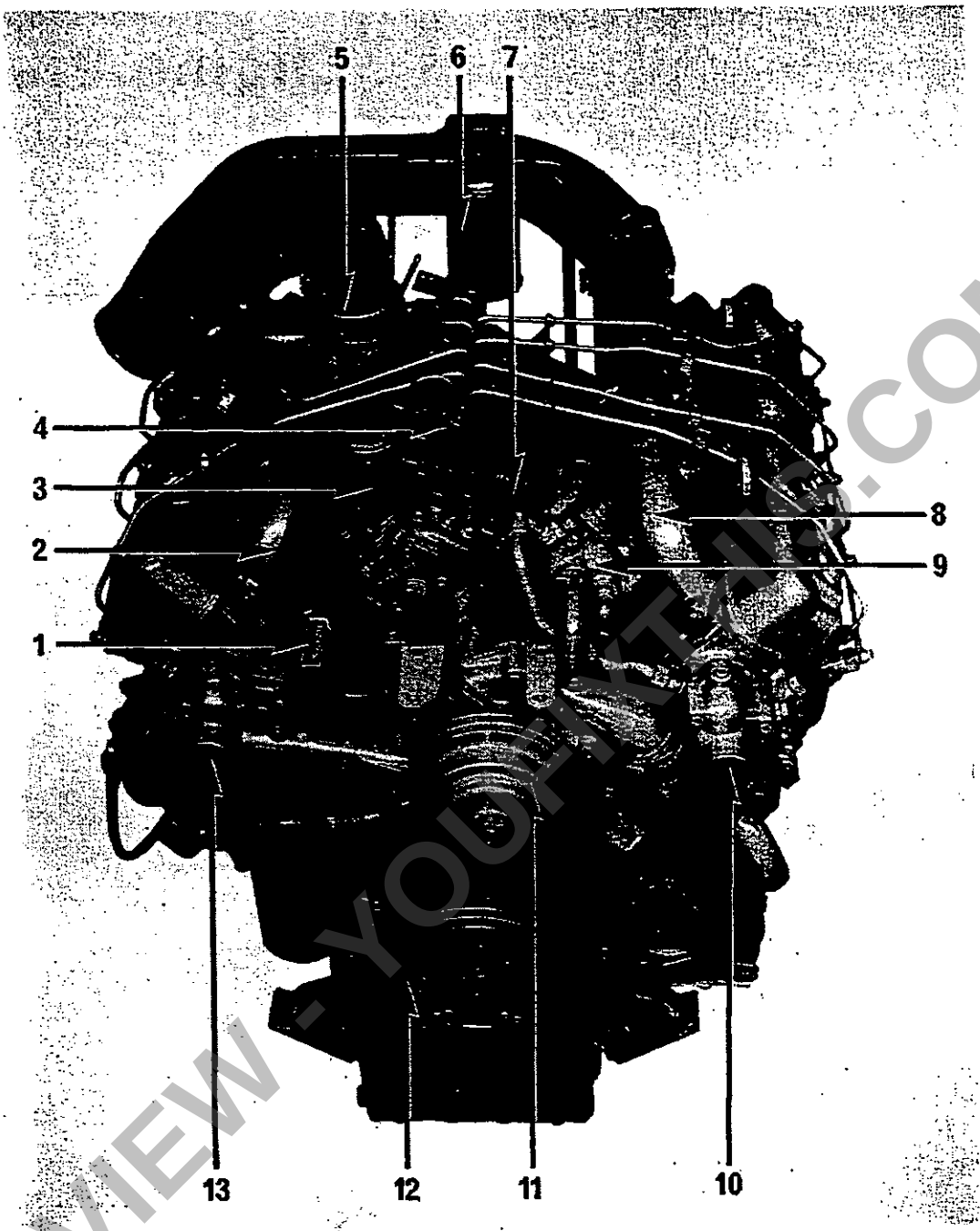
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A1

VIEW OF TOP FRONT OF NATURALLY ASPIRATED ENGINE

1 Engine Number Location
2 Inlet Manifold (Right Hand)
3 Lubricating Oil Filter
4 Fuel Injection Pump
5 Engine Breather
6 Fuel Filter
7 Fuel Lift Pump
8 Inlet Manifold (Left Hand)
9 Compressor
10 Water Outlet (Left Hand)
11 Water Pump Pulley
12 Crankshaft Pulley
13 Water Outlet (Right Hand)

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Recommended Torque Tensions

The securing arrangement for a component part may vary according to application or because of design alteration therefore, before fitment, determine the correct torque value for the particular size or type of securing arrangement used. The following figures will apply with the components lightly oiled before assembly.

Securing Items	Screw Size U.N.F.	lbf ft	Nm	kgf m
Cylinder Head Setscrews /Nuts (V8.510/V8.540) ...	7/16	125	169	17,3
Cylinder Head (Scant Shank) Setcrews/Nuts with gasket 3681H401 (V8.510/V8.540)	7/16	135	183	18,7
Cylinder Head (Straight Shank) Setscrews/Nuts with washers and gasket 3681H401 (V8.540) ...	7/16	155	210	21,4
Cylinder Head Setscrews/Nuts (TV8.540)	7/16	155	210	21,4
Rocker Shaft Bracket Setscrews/Nuts	3/8	36	49	5,0
Big End Setscrews (V8.510)	7/16	95	129	13,2
Big End Setscrews (V8.540/TV8.540)	7/16	105	142	14,5
Main Bearing Cap Setscrews	3/8	210	285	29,0
Main Bearing Cap Transverse Setscrews ("S" range)	1/2	75	102	10,4
Main Bearing Cap Transverse Setscrews ("W" range)	1/2	100	136	13,8
Main Bearing Cap Transverse Setscrews	7/16	50	68	6,9
Crankshaft Balance Weight Setscrews	1/2	85	115	11,8
Crankshaft Balance Weight Studs	1/2	25	34	3,5
Crankshaft Balance Weight Nuts	1/2	80	108	11,1
Fuel Injection Pump Gear Setscrews	3/8	30	41	4,1
Fuel Injection Pump Gear Nuts	5/16	20	27	2,8
Fuel Injection Pump Gear Setscrews	5/16	16	22	2,2
*Fuel Injection Pump Gear Capscrews (With Washers)...	5/16	21	28	2,9
(With Plate) ...	5/16	28	38	3,9
Fuel Injection Pump Gear Capscrews (DP 15 Pump) ...	3/8	35	47	4,8
Fuel Injection Pump Gear Capscrews (MW Pump) ...	3/8	37	50	5,1
Fuel Pump Drive Shaft Thrustplate Setscrews (DP 15)...	1/4	7	9,5	1,0
Fuel Pump Adaptor Shaft Setscrews	5/16	15	20	2,1
Fuel Pump Adaptor Shaft Nuts	5/16	21	28	2,9
Camshaft Gear Setscrews (Part Threaded)	5/16	21	28	2,9
(Fully Threaded)	3/8	30	41	4,1
(Waisted)	3/8	40	54	5,5
Camshaft Thrust Plate Setscrews	1/2	12	16	1,7
Crankshaft/Camshaft Idler Gear Hub Setscrews ...	3/8	30	41	4,1
Crankshaft/Camshaft Idler Gear Hub Nuts (Nyloc) ...	3/8	30	41	4,1
Crankshaft/Camshaft Idler Gear Hub Nuts (Philidas) ...	3/8	24	33	3,3
Crankshaft/Oil Pump Idler Gear Hub Setscrews ...	5/16	19	26	2,6
Camshaft/Fuel Pump Drive Idler Gear Hub Nuts (Alternative Drive — CAV In-Line Pump) ...	3/8	24	33	3,3
Camshaft/Fuel Pump Idler Gear Hub Setscrews (DP15 or Bosch Fuel Pumps)	3/8	30	41	4,1
Piston Cooling Oil Control Valve (TV8.540)	7/8	15	20	2,1
Piston Cooling Jet Setscrews (TV8.540)	5/16	9	12	1,2
Crankshaft Pulley Retaining Setscrew	7/8	300	407	41,5
Crankshaft Pulley Retaining Setscrews (3) (Cadmium Plated)	7/16	65	88	9,0
Crankshaft Pulley Retaining Setscrews (3) (Phosphated)	7/16	92	125	12,7
Flywheel Setscrews	1/2	80	108	11,1
Water Pump Pulley Retaining Setscrew	1/2	40	54	5,5
Water Pump Pulley Retaining Nut	7/8	70	95	9,7
Atomiser Securing Nuts	5/16	12	16	1,7
Lubricating Oil Filter Bowl Securing Setscrew ..		10	14	1,4
High Pressure Fuel Pipe Nuts	12 x 1,5 mm	15	20	2,1

*A hardened plate is fitted under the fuel pump gear retaining capscrews of later V8 510 engines which replaces the plain and spring washers formerly fitted. New type capscrews are also fitted and the torque loading on the capscrews has been increased. Where a tachometer drive adaptor is fitted to the V8.510 fuel pump gear, the adaptor, washers and capscrews have been replaced by a hardened adaptor with new capscrews without washers and the higher torque loading should be used for this later arrangement. On no account should the washers be removed or the higher torque used on the earlier V8.510 gear securing arrangement.

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Fault Finding Chart

Fault	Possible Cause
Low cranking speed.	1, 2, 3, 4.
Will not start	5, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 31, 32, 33.
Difficult starting	5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 24, 29, 31, 32, 33.
Lack of power	8, 9, 10, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 31, 32, 33, 60, 62, 63.
Misfiring	8, 9, 10, 12, 13, 14, 16, 18, 19, 20, 25, 26, 28, 29, 30, 32.
Excessive fuel consumption	11, 13, 14, 16, 18, 19, 20, 22, 23, 24, 25, 27, 28, 29, 31, 32, 33, 63.
Black exhaust	11, 13, 14, 16, 18, 19, 20, 22, 24, 25, 27, 28, 29, 31, 32, 33, 60, 63.
Blue/white exhaust	4, 16, 18, 19, 20, 25, 27, 31, 33, 34, 35, 45, 56, 61.
Low oil pressure	4, 36, 37, 38, 39, 40, 42, 43, 44, 58.
Knocking	9, 14, 16, 18, 19, 22, 26, 28, 29, 31, 33, 35, 36, 45, 46, 59.
Erratic running	7, 8, 9, 10, 11, 12, 13, 14, 16, 20, 21, 23, 26, 28, 29, 30, 33, 35, 45, 59.
Vibration	13, 14, 20, 23, 25, 26, 29, 30, 33, 45, 47, 48, 49.
High oil pressure	4, 38, 41.
Overheating	11, 13, 14, 16, 18, 19, 24, 25, 45, 50, 51, 52, 53, 54, 57.
Excessive crankcase pressure	25, 31, 33, 34, 45, 55.
Poor compression	11, 19, 25, 28, 29, 31, 32, 33, 34, 46, 59.
Starts and stops	10, 11, 12.

Key to Fault Finding Chart

1. Battery capacity low.
2. Bad electrical connections.
3. Faulty starter motor.
4. Incorrect grade of lubricating oil.
5. Low cranking speed.
6. Fuel tank empty.
7. Faulty stop control operation.
8. Blocked fuel feed pipe.
9. Faulty fuel lift pump.
10. Choked fuel filter.
11. Restriction in air cleaner or induction system.
12. Air in fuel system.
13. Faulty fuel injection pump.
14. Faulty atomisers or incorrect type.
15. Incorrect use of cold start equipment.
16. Faulty cold starting equipment.
17. Broken fuel injection pump drive.
18. Incorrect fuel pump timing.
19. Incorrect valve timing.
20. Poor compression.
21. Blocked fuel tank vent.
22. Incorrect type or grade of fuel.
23. Sticking throttle or restricted movement.
24. Exhaust pipe restriction.
25. Cylinder head gasket leaking.
26. Overheating.
27. Cold running.
28. Incorrect tappet adjustment.
29. Sticking valves.
30. Incorrect high pressure pipes.
31. Worn cylinder bores.
32. Pitted valves and seats.
33. Broken, worn or sticking piston ring/s.
34. Worn valve stems and guides.
35. Overfull air cleaner or use of incorrect grade of oil.
36. Worn or damaged bearings.
37. Insufficient oil in sump.
38. Inaccurate gauge.
39. Oil pump worn.
40. Pressure relief valve sticking open.
41. Pressure relief valve sticking closed.
42. Broken relief valve spring.
43. Faulty suction pipe.
44. Choked oil filter.
45. Piston seizure/pick up.
46. Incorrect piston height.
47. Damaged fan.
48. Faulty engine mounting (Housing).
49. Incorrectly aligned flywheel housing, or flywheel.
50. Faulty thermostat.
51. Restriction in water jacket.
52. Loose fan belt.
53. Choked radiator.
54. Faulty water pump.
55. Choked breather pipe or breather.
56. Damaged valve stem oil seals.
57. Coolant level too low.
58. Blocked sump strainer.
59. Broken valve spring.
60. Damaged or dirty turbocharger impeller.
61. Leaking turbocharger oil seals.
62. Leaking boost control pipe.
63. Leaking induction system (turbocharged engines).

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CYLINDER HEAD—E.2

To Remove a Cylinder Head

Drain cooling system.

Remove high pressure fuel pipes, mark pipes to facilitate correct replacement and blank off pump outlets and atomisers.

Disconnect water outlet hose and water temperature gauge connection.

Disconnect water by-pass hose and compressor pipe, where fitted, from water outlet elbow.

Disconnect hose between air cleaner and inlet manifold and remove compressor air inlet pipe, where necessary. Where necessary, remove inlet manifold crossover pipe.

Remove breather assembly, where fitted.

Remove inlet and exhaust manifolds.

Remove breather pipe, where fitted.

If necessary, disconnect dipstick tube.

Disconnect fuel leak-off pipes and remove atomisers and washers.

Disconnect rocker shaft oil feed pipe (1, Fig. E.1).

Remove rocker covers, rocker shafts and push rods. Ensure that, when the TV8.540 rocker shaft assemblies are removed, the small caps fitted to the top of the valve stems do not stick to the rocker levers. After the rocker assemblies have been removed, remove the valve stem caps.

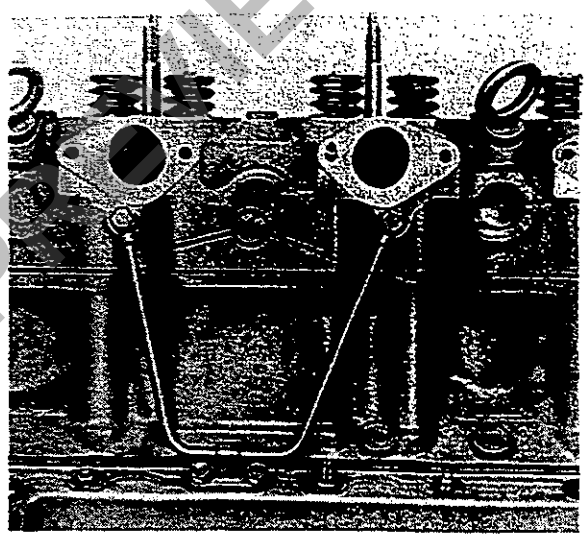
Remove cylinder head securing setscrews and nuts in reverse order to tightening sequence (Fig. E.4).

Remove head and place on a flat surface, preferably wooden.

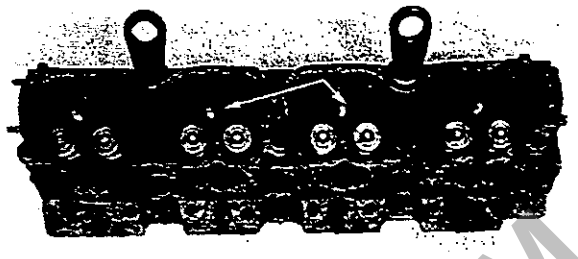
To Fit a Cylinder Head

Ensure that head and cylinder bores are clean and that oil drillings in cylinder head (Fig. E.2) are clear.

Apply a very light and even coating of Perkins (Hylomar) Jointing Compound to both sides of cylinder head gaskets other than part number 3681H401. Gasket



E1



E2

3681H401 should be fitted without jointing compound. Place gasket in position with word "TOP" uppermost.

Place cylinder head in position ensuring that gasket is not displaced.

Lightly oil threads of cylinder head securing studs and setscrews and locate nuts and setscrews in position. The cylinder head securing arrangement is shown in Fig. E.3. On earlier V8.510 engines, the outermost row consists of studs and nuts.

Progressively tighten the cylinder head setscrews and nuts, in the order given in Fig. E4, to the torque given on Page B.3. The tightening torque may vary with the type of setscrews and gasket fitted. The shank of the earlier "scant shank" setscrew fitted to V8.510 and V8.540 engines is smaller than the outside diameter of the thread and these setscrews also have a recess in the top of the head.

Replace push rods and rocker assemblies. Tighten rocker shaft bracket setscrews/nuts to torque given on Page B.3. On engines where rocker shaft nuts are extended to provide locations for rocker cover securing setscrews, fit these nuts with chamfer uppermost.

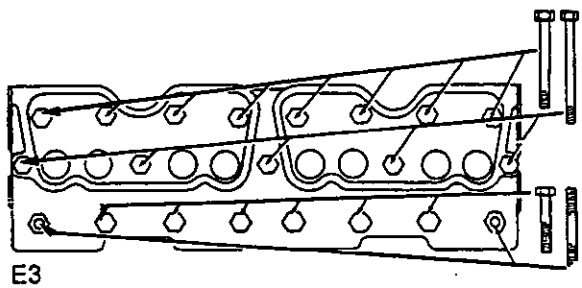
Set valve tip clearances as detailed on Page E.3.

Refit rocker covers.

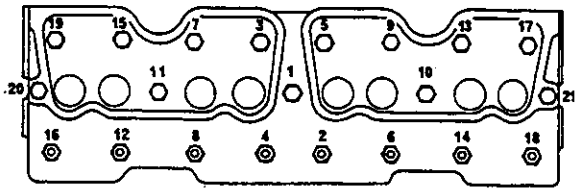
Reconnect dipstick tube, where necessary

Refit breather pipe, where fitted.

Refit inlet and exhaust manifolds. Ensure that inlet manifold to cylinder head corrugated joints are fitted dry, other type inlet manifold to head joints should be coated on



E3



E4

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The following information is given as a general guide towards the servicing of the electrical equipment fitted to the engine, but this can vary on different applications, in which case, the procedures laid down by the manufacturer of the application may have to be followed.

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A typical charging system using a C.A.V. AC524 or AC7B Alternator is depicted in the schematic drawing R.1.

The various components are :—

1 Two 12V Batteries.

2 Starter Solenoid.

3 Starter Motor—C.A.V. type SL5.

4 Ammeter

5 Auxiliary Equipment and Starter Switch.

6 Alternator C.A.V. type AC524.

7 Alternator C.A.V. type AC7B.

8 Alternator Warning Lamp 2.8W or 300 ohm 5 watt resistor.

9 Regulator type 440A.

10 Thermostart Relay (Optional).

11 Two 12V Thermostarts (Optional).

ALTERNATORS

General Precautions

The diodes in alternators function as one way valves and the transistors in the regulator operate as fast switches. Both are accurate and very sensitive. They do not wear and never need attention or adjustment, but, because they are sensitive to voltage changes and high temperatures, the following precautions are vital to prevent their destruction :—

1 **Never** disconnect the battery whilst the alternator is running. This will cause a voltage surge in the system, damaging diodes and transistors.

2 **Never** disconnect any electrical lead without first stopping the alternator and turning all switches to the "OFF" position.

3 **Always** identify a lead to its correct terminal before disconnection. A short circuit or reversed polarity will destroy diodes and transistors.

4 **Never** connect a battery into the system without checking for correct polarity **and** correct voltage.

5 **Never** "flash" connections to check for current flow. No matter how brief the "flash", the transistors may be destroyed.

6 **Never** experiment to try to adjust or repair the system unless you have had training on alternators and you have the correct test equipment and technical data.

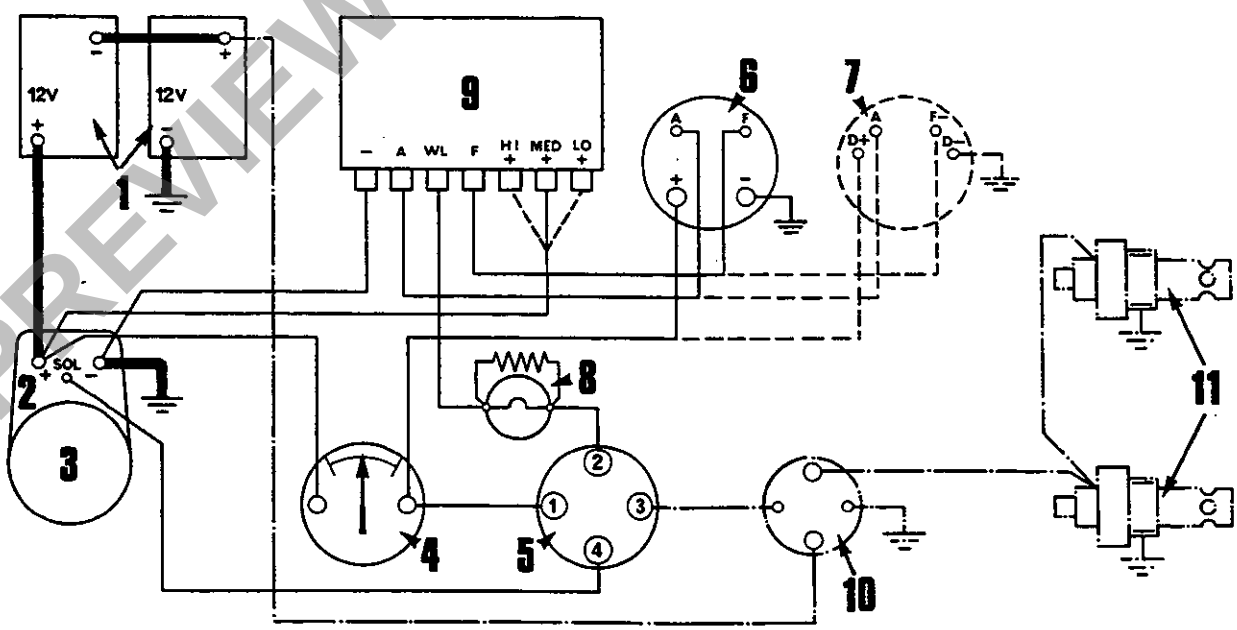
7 **Never** earth the field circuit.

8 **Never** run the alternator on an open circuit.

9 **Never** attempt to polarise an alternator.

10 **When** using a battery charger, disconnect the battery cables.

11 **Never** apply a battery voltage direct to the regulator or alternator field terminals as this will damage the transistors.



R1

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Engine Data

Type	Eight cylinder, four stroke, direct injection, 90°V
Induction System (V8.510/V8.540)	Naturally Aspirated
Induction System (TV8.540)	Turbocharged
Nominal Bore	4.25 in (108 mm)*
Stroke (V8.510)	4.5 in (114,3 mm)
Stroke (V8.540/TV8.540)	4.75 in (120,7 mm)
Compression Ratio (V8.510/V8.540)	16.5 : 1
Compression Ratio (TV8.540)	15 :1
Cubic Capacity (V8.510)	510.7 in³ (8,36 litres)
Cubic Capacity (V8.540/TV8.540)	539.1 in³ (8,84 litres)
Firing Order	1, 8, 7, 5, 4, 3, 6, 2.
Lubricating Oil Pressure	40 lbf/in²(2,8 kgf/cm²) or 279kN/m² minimum at maximum engine speed amd normal operating temperature.
Valve Tip Clearances (set cold)	
V8.510/V8.540	0.010 in (0,25 mm) inlet and exhaust
TV8.540	0.010 in (0,25 mm) inlet: 0.020 in (0,50 mm) exhaust
Lubricating Oil Sump Capacity (Standard Vehicle)	27 Imperial pints (15,3 litres)
Cooling Water Capacity (Engine Only)	40 Imperial pints (22,7 litres)
Direction of Rotation	Clockwise from front

*For actual bore size, see Page B.5.

Rating Details

V8.510

Rated Output (Gross)	134 kW (180 bhp) at 2,800 rev/min
Maximum Torque	398 lbf ft (540 Nm) 55,0 kgf m at 1,650 rev/min

V8.540

Rated Output (Gross)	134 kW (180 bhp) at 2,600 rev/min
Maximum Torque	410 lbf ft (556 Nm) 56,7 kgf m at 1,650 rev/min

TV8.540

Rated Output (Gross)	175 kW (235 bhp) at 2,600 rev/min
Maximum Torque	571 lbf ft (774 Nm) 79,0 kgf m at 1,700 rev/min

Note: The above ratings are maximum and can vary according to application. For details of individual ratings, apply to Technical Services Department, Perkins Power Sales and Service Ltd., Peterborough.

De-Rating for Altitude

If a V8.510 or V8.540 engine is to operate continuously at altitudes higher than 5000 ft (1500 m), the fuel delivery should be reduced to minimise exhaust smoke and fuel consumption.

The reduced fuel delivery rate for operating at a particular altitude can be obtained through your Perkins Distributor providing that the information specified below is submitted.

Engine number, fuel injection pump type number and application into which engine is fitted.

Site barometric pressure, ambient temperature and humidity. If these are not available, specify altitude and location.

Whether or not the machine is working at a constant altitude or moving from one altitude to another.

Whether conventional gearbox or torque converter is fitted. If using a torque converter, give stall speed of transmission.

If possible, horsepower requirements of machine operating at site conditions.

Information for TV8.540 engines is available from Perkins Power Sales and Service Ltd., Peterborough.

Any alterations to fuel pump settings must be made by an authorised fuel pump specialist or Perkins Distributor.

Engine Number

The engine number is stamped on the top of the inside forward end of the right bank of the cylinder block (see Engine Views, Item 1) and should be quoted when requesting information or ordering parts.

The number consists of a combination of figures and letters. A typical engine number in the current engine numbering system is XC22656U514424E and in the earlier numbering system is 540U12929L.

Other letters can be included in the combination denoting specific information and the full engine number should be quoted in all cases.

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Preventive Maintenance

As the following preventive maintenance periods are general in application, they should be compared with the schedules specified by the manufacturer of the application to which the engine is fitted and where necessary, the shorter periods adopted. The periods are given in Miles, Hours and Months and the maintenance work should be carried out at the period that comes first in the normal operation of the vehicle or machine. On stop-start low mileage work, the hours run are more applicable than the mileage covered.

The time limits for servicing air filters and breather gauzes depend upon operating conditions and if operating under dusty or adverse conditions, the time limits given should be reduced. The correct maintenance of the air filter will greatly assist in extending the life of the engine.

Where a depression indicator is fitted, this will give a positive indication that the element needs servicing and the period given below for servicing the element can be disregarded.

It is good maintenance practice that the checking of coolant, fuel or oil leaks and the tightness of nuts, setscrews and hose clips be carried out at each servicing period.

It should be noted that the periods given are on the assumption that the fuels and lubricating oils are to the specifications given in this manual.

The lubricating oil change period is for oil to the Perkins approved specification, see Appendix. This period should be reduced if operating under dusty or adverse conditions.

V8.540/TV8.540 ENGINES ONLY

Daily or Every 8 Hours (whichever occurs first)

Check coolant level in radiator.
Check oil level in sump (with vehicle or machine standing level).
Check oil pressures (where gauge is fitted).
In extreme dust conditions, empty dust bowl of dry type air filter.

Every 12,500 Miles (20000 km) 500 Hours or 4 months (whichever occurs first)

Drain and renew engine lubricating oil.
Renew lubricating oil filter elements.
Empty dust bowl of dry type air filter.
Clean water trap.
Check drive belt tension.
Check and adjust valve tip clearances—V8.540 engines only.

Every 25,000 Miles (40000 km) or 1,000 Hours

Renew final fuel filter element(s).
Clean or renew element of dry type air filter (if not indicated earlier).
Clean wire gauzes in engine breather.
Check and adjust valve tip clearances—TV8.540 engines only.

Every 50,000 Miles (80000 km) or 12 months (whichever occurs first)

Have the atomisers checked.

Every 62,500 Miles (100000 km) 2,000 Hours

Arrange for examination and service of proprietary equipment, i.e. Compressor/Exhauster, Starter Motor, etc.
Clean turbocharger impeller and casing.

Every 100,000 Miles (160000 km) or 4,000 Hours

Have the turbocharger checked.

V8.510 ENGINES ONLY

Daily or Every 8 Hours (whichever occurs first)

Check coolant level in radiator.
Check oil level in sump (with vehicle or machine standing level).
Check oil pressures (where gauge is fitted).
In extreme dust conditions, empty dust bowl of dry type air filter.

Every 5,000 Miles (7500 km), 250 Hours or 4 months (whichever occurs first)

Drain and renew engine lubricating oil.
Renew lubricating oil filter elements.
Check drive belt tension.
Empty dust bowl of dry type air filter.
Clean water trap.

Every 10,000 Miles (15000 km), 500 Hours or 12 months (whichever occurs first)

Renew final fuel filter element of T.A. and Industrial engines.
Check and adjust valve tip clearances (See Section E).
Clean or renew element of dry type air filter (if not indicated earlier).

Every 20,000 Miles (30000 km) or 1,000 Hours

Renew final fuel filter element of Vehicle engines.
Clean wire gauzes in engine breather and pipe between breather and cylinder head cover (where applicable).
Service atomisers.

Every 50,000 Miles (80000 km) or 2,000 Hours

Arrange for examination and service of proprietary equipment, i.e., Compressor/Exhauster, Starter Motor, etc.

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FOREWORD

This manual is designed to be of assistance to all personnel involved with the maintenance and overhaul of Perkins V8.510, V8.540 and TV8.540 engines, the information applying to all three types of engine unless specified otherwise. It does not deal with V8.510 engines built before engine numbered 510U2000.

In some instances different procedures have to be adopted depending upon the type of fuel injection pump fitted. The pump type fitted to a particular engine can be ascertained by reference to Section N.

Engines built for Massey Ferguson applications are designated AV8.510, AV8.540 and ATV8.540 and where the information differs for these particular engines, it is specified.

Overhaul of the engine or components should only be carried out by skilled personnel. To assist in overhauling the engine, the manufacturing dimensions and in some instances the wear limits are given in Section B.

When fitting setscrews into "through" holes into the interior of the engine, a suitable sealant should be used.

When left or right hand bank or side is referred to in this manual, this denotes the side looking towards the front of the engine from the rear or gearbox end, unless specified otherwise.

This publication is produced by the Technical Publications Department of Perkins Power Sales and Service Limited, and every endeavour is made to ensure that the information contained in this manual is correct at the date of publication but due to continuous developments the manufacturers reserve the right to alter this specification without notice.

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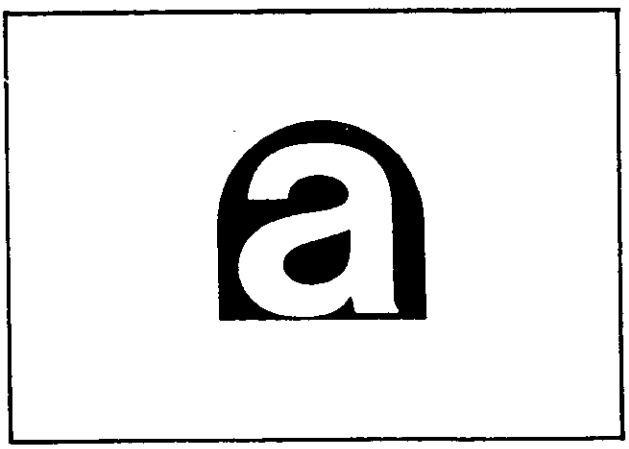
ASBESTOS JOINTS

Some joints and gaskets contain compressed asbestos fibres in a rubber compound or in a metal outer cover. The "white" asbestos (Chrysotile) which is used is a safer type of asbestos and the risk of damage to health is extremely small.

The risk of asbestos from joints occurs at their edges or if a joint is damaged when a component is removed or if a joint is removed by abrasion.

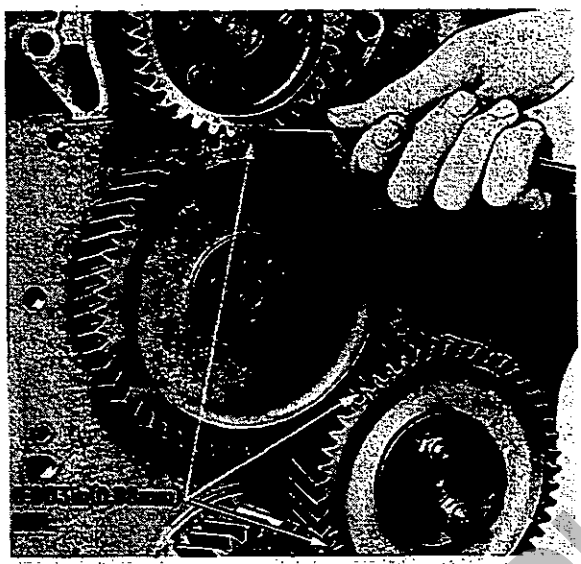
To ensure that the risk is kept to a minimum, the procedures given below must be applied when an engine which has asbestos joints is dismantled or assembled.

- Work in an area with good ventilation
- Do not smoke
- Use a hand scraper to remove the joints - do not use a rotary wire brush
- Ensure that the joint to be removed is wet with oil or water to contain loose particles
- Spray all asbestos debris with water and put it in a closed container which can be sealed for safe disposal

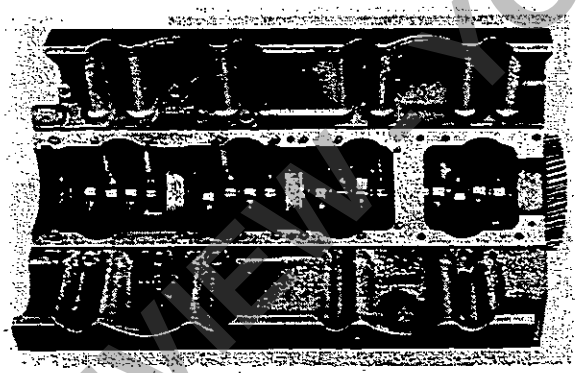


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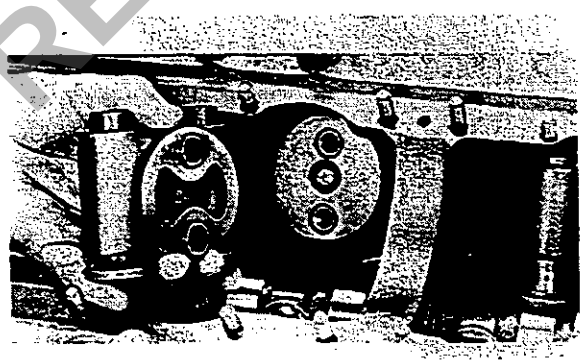
Engine No.	Camshaft Gear Setscrew			Torque lbf ft (kgf m)
	Thread, U.N.F.	Head, A/F	Type	
510U2000 to 2373	5/16	1/2 in	Part Threaded	21 (2,9)
510U2374 to 12645	3/8	9/16 in	Fully Threaded	30 (4,1)
510U12646 onwards	3/8	5/8 in	Waisted	40 (5,5)
V8.540/ TV8.540 engines	3/8	5/8 in	Waisted	40 (5,5)



J5



J6



J7

Fit idler gear (Page J.5) with marked teeth in mesh with marked teeth of camshaft and crankshaft gears.

Check that gear backlash (Fig. J.5) is at least 0.003 in (0,08 mm).

If necessary, secure rocker assemblies and reset valve tip clearances (Page E.3).

Refit timing case (Page J.2).

Check valve and fuel injection timing (Section K).

Fit lubricating oil sump and fill to correct level with oil of an approved grade.

Refit rocker covers and fuel injection pipes (Page E.3).

To Remove Camshaft

It is advisable, where possible, to position No. 1 piston at T.D.C. compression stroke (Page K.2) before commencing dismantling, in order to facilitate later reassembly.

Remove rocker assemblies and push rods.

Remove timing case (Page J.2).

Remove camshaft gear and thrust plate (3, Fig. J.3).

If possible, invert engine and carefully remove camshaft, turning camshaft as it is being withdrawn.

When engine cannot be inverted, proceed as follows:

Remove fuel filter, filter bracket and fuel pipes.

Where necessary, remove turbocharger and mounting bracket.

Remove fuel injection pump and compressor/auxiliary drive housing (Section Q).

Remove tappet cover. Tappets will now be fully visible (Fig. J.6).

Hold up tappets or remove tappet blocks, complete with tappets (Fig. J.7).

Carefully remove camshaft (Fig. J8).

To Fit Camshaft

Lightly oil camshaft and carefully enter into cylinder block.

Fit camshaft thrust plate and tighten securing setscrews to 12 lbf ft (1,7 kgf m).

Fit camshaft gear (Page J.3).

Check camshaft end float with a dial test indicator as shown in Fig. J.9. On production, end float is 0.0015/0.015 in (0,04/0,38 mm) and in service, maximum permissible worn end float is 0.020 in (0,51 mm). If necessary, renew thrust washer.

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