

11

Specifications

Basic engine data

Engine

Number of cylinder	6
Cylinder arrangement	In-line
Cycle	Four stroke
Induction system	
191 kW (256 bhp) to	
272kW (365 bhp) versions	Turbocharged
287 kW (385 bhp) to	
368 kW (494 bhp) versions	Turbocharged and charge cooled
Combustion system	Direct injection
Nominal bore	130,17 mm (5.125 in)
Stroke	152,4 mm (6.00 in)
Cubic capacity	12,17 litres (742.64 in ³)
Compression ratio	
TAG1, 2, 3 and TWG	15.9:1
TTAG	15:1
2006-12TA1, 2 and 3	17.8:1
Firing order	1, 4, 2, 6, 3, 5
No.1 cylinder is at the front (fan end)	
Direction of rotation	Clockwise: view on front (fan end)
Tappet clearances (cold)	
Inlet	0,25 mm (0.010 in)
Exhaust	0,50 mm (0.020 in)
Injection timing	As stamped on engine data plate
Dry weight of engine (approximate)	Engine only: Typical electropak:
TG1, TG1A, TG2, TG2A	1118 kg (2465 lb) 1180 kg (2601 lb)
TAG, TAG2	1231 kg (2714 lb) 1365 kg (3009 lb)
TWG, TWG2	1138 kg (2509 lb) 1216 kg (2681 lb)
TTAG	1325 kg (2921 lb) 1459 kg (3217 lb)
Industrial Open Power Units:	
12TA1, 12TA2, 12TA3	1255 kg (2767 lb) - includes radiator, alternator and starter motor

Recommended specific applied torques

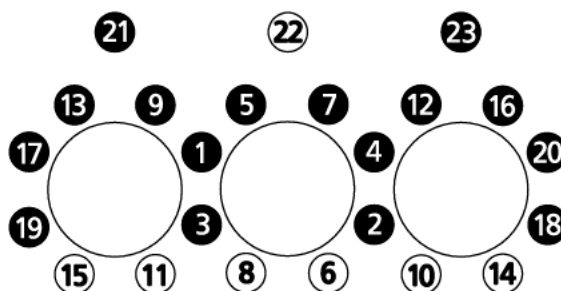
Caution: The torque loads listed below apply to threads in an oil wet condition, unless the use of thread locking compound is recommended.

Application of a torque load specification is NOT enough to ensure that the relevant components are retained securely as an assembly. It is important to conform also to the recommendations for assembly and, if given, the sequence in which the bolts or nuts must be tightened. This information is given in the relevant section of this publication.

If a bolt or nut is retained with a locking washer, locking plate or split pin, the specification for a torque load can be exceeded, if necessary, by the MINIMUM amount that is needed for correct assembly.

	Nm	lbf ft
Alternator pulley nut		
Prestolite	95	7-
CAV 5	54	40
CAV 7	88	65
Camshafts		
Thrustplate setbolts/capscrews	54	40
Drive gear setbolts	61	45
Compressor - single cylinder model		
Drive gear nut	176	13
Compressor - twin cylinder model		
Drive gear nut	200 to 250	148 to 184
Connecting rods		
Big end bearing bolts and nuts	217	160
Coolant pump		
Pulley retaining screws (low-mounted pump)	24	18
Cylinder heads		
Initial tightening of all bolts and nuts	136	100
Intermediate tightening of all bolts and nuts	204	150
Final tightening at positions 1 to 23 in black circles ONLY	+40 degrees	

Caution: The drilled bolt, which is identified by the word "OIL" stamped on its head for early engines and by a recess in its head for later engines, MUST be fitted at position 22. The old and new drilled bolts are interchangeable. Certain early engines have a stud fitted at position 22 and require a nut and washer.



Rocker pedestal bolts	41	30
Tappet screw lock nuts	41	30
Rocker cover stud (apply Loctite 270 to thread before fitting to pedestal)	16.3	12
Rocker cover nuts	10.8	8
Fuel injector sleeves	33	24

12

Cylinder head assembly

Rocker cover

To remove and to fit

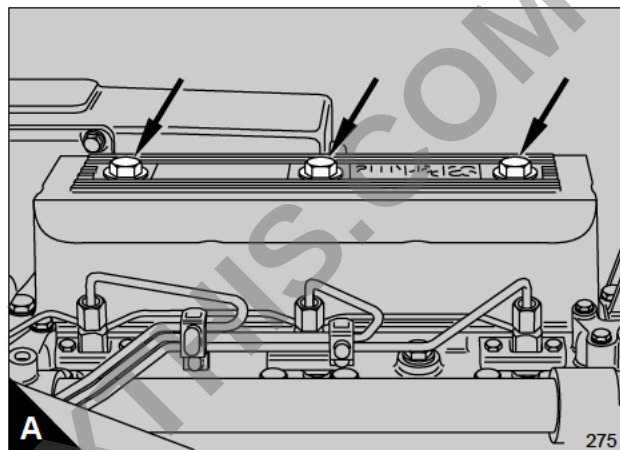
12-1

To remove

- 1 Remove the three cap nuts (A) from the top of the cover.
- 2 The cover and joint can now be removed. For certain engines it may be necessary to first remove the air ducting between the turbocharger and the inlet manifold.

To fit

- 1 Remove the joint from the rocker cover and clean the two corresponding faces of the cover and cylinder head.
- 2 Fit a new joint to the rocker cover and, ensuring that it is correctly located within the slots in the cover, secure it to the cover with a suitable adhesive. Place the cover in position on the head.
- 3 Secure the cover with the three cap nuts and check that the joint has not moved. Tighten the cap nuts evenly to a torque of 11 Nm (8 lbf ft). Do NOT overtighten.



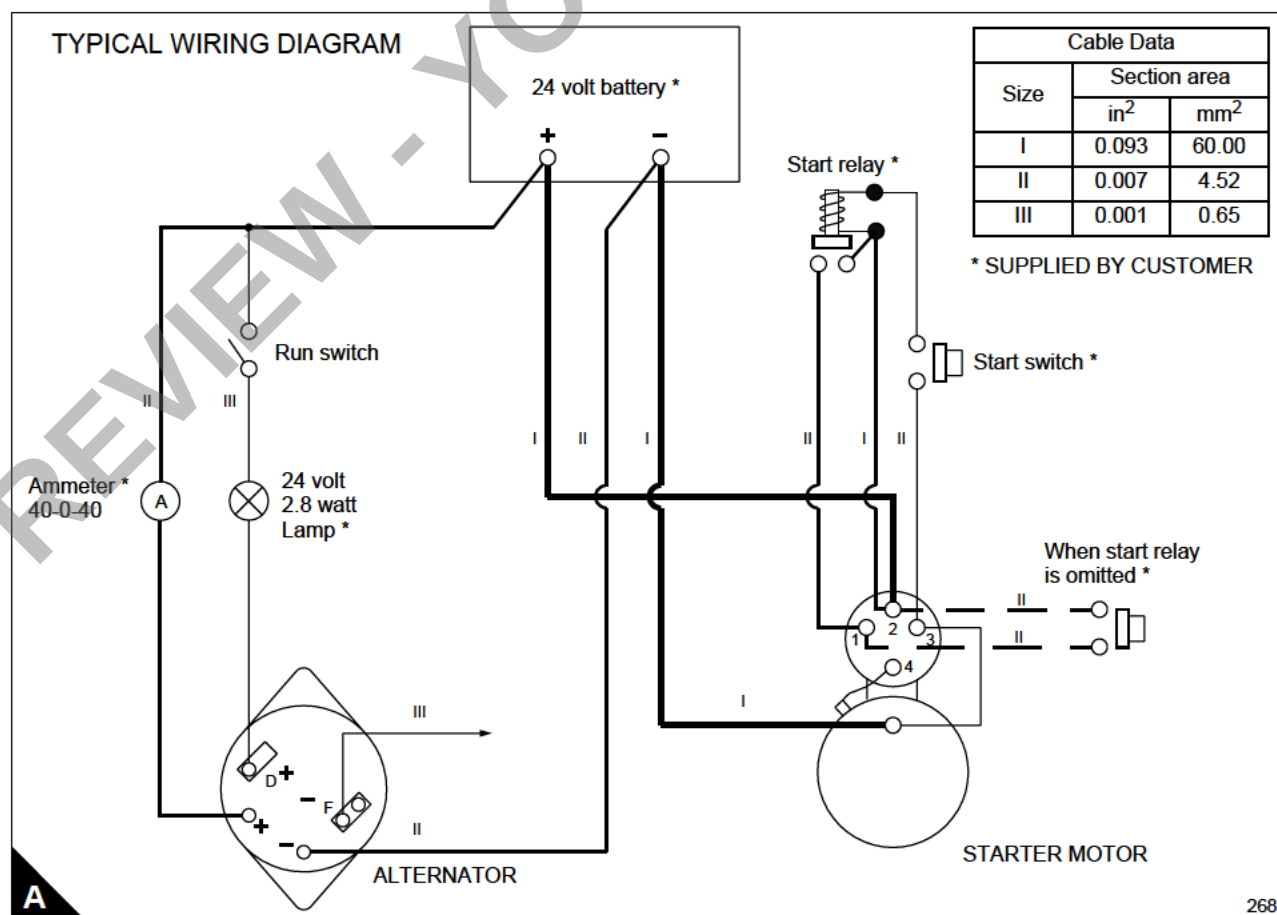
23

Electrical equipment

General description

The electrical components of the engine consist of an alternator, a starter motor and an engine stop solenoid. Certain engines may be fitted with warning/shut-down switches. One of many types of alternator may be fitted to the engine, but only one type of starter motor is utilised.

A typical wiring diagram for a 2000 series engine is shown (A).



Contents

10 General information

Introduction	11
New 2000 Series engines	11
Cylinder bore identification	11
Engine identification	12
General safety precautions	13
Safety	14
Engine lift equipment	14
Asbestos joints	14
Dangers from used engine oils	15
Environmental protection	15
Viton seals	15
Practical information	16

11 Specifications

Basic engine data	19
Recommended specific applied torques	22
Recommended nominal applied torques	24

12 Cylinder head assembly

Rocker cover

12-1 To remove and to fit	25
---------------------------------	----

Rocker assembly

12-2 To remove and to fit	26
---------------------------------	----

Tappet clearances

12-3 To check and to adjust	27
-----------------------------------	----

Cylinder head

12-4 To remove and to fit	28
12-5 Procedure for retightening of the cylinder head bolts	31
12-6 To dismantle and to assemble	32
12-7 To clean and to inspect the cylinder head	34
12-8 To renew a valve spring with the cylinder head installed	34
12-9 To correct a valve seat	35
12-10 To remove a valve seat insert	36
12-11 To fit a valve seat insert	36
12-12 To inspect the valve guides	37
12-13 To renew a valve guide	37

Valves, valve springs and valve rotators

12-14 To remove and to fit	38
12-15 To clean and to inspect	38

Fuel injector sleeves

12-16 To remove and to fit	39
----------------------------------	----

Push rods

12-17 To remove and to fit	41
12-18 To inspect	41

Fits and clearances - Rocker assemblies	42
--	-----------

Fits and clearances - Cylinder heads and valve assemblies	43
--	-----------

13 Piston and connecting rod assembly

General description	45
----------------------------------	-----------

Piston and connecting rod assembly

13-1 To remove and to fit	47
13-2 To dismantle and to assemble	49

12

11 Renew the sealing rings (A) in the coolant rail/thermostat housing and fit the assembly.

12 Fit the fuel filter assembly.

13 Remove any blanking plugs or caps and fit the injectors. Tighten the clamping bolts to a torque of 10,8 Nm (8.0 lbf ft).

14 Fit the fuel spill pipes using new washers with the banjo bolts.

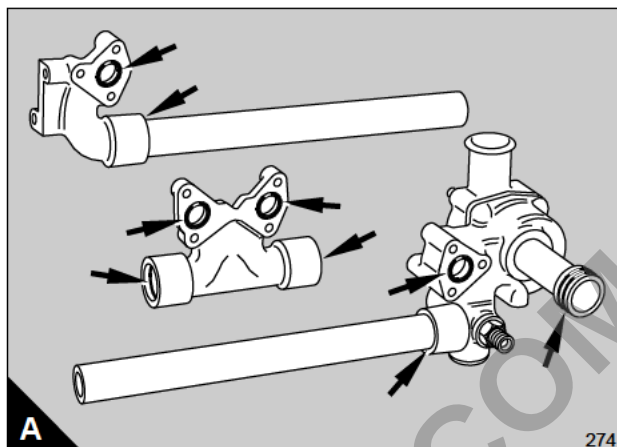
15 Remove the blanking covers from the fuel injection pump and fit the high-pressure fuel pipes as a complete set. Do NOT allow the pipes to become bent. Tighten the nuts to a torque of 25 Nm (18.5 lbf ft).

Warning! If a high-pressure fuel pipe becomes bent, its structure will be damaged and it may become split during use.

16 Fit the air ducting between the turbocharger and the induction manifold/charge cooler.

17 Refill the cooling system to the correct level.

Caution: When a cylinder head had been removed and fitted, its bolts and nut must be retightened to the correct torque figures and the tappet clearances checked after the first 500 to 1 000 km. See operation 12-5. This operation does NOT apply to New 2000 Series engines - engines from build line number 91880 onward.



14

Crankshaft assembly

General description

The crankshaft is forged from chrome-molybdenum steel. It is dynamically balanced, and all bearing surfaces are nitride-hardened and lapped to size. The rear flange is machined to form a spigot location for the flywheel and is drilled to accept the flywheel bolts.

Drillings in the crankshaft permit oil transfer to the seven main bearings.

A drilling from each journal conveys oil to an adjacent crankpin, which incorporates an oil reservoir with a detachable plug. This plug is fitted with an 'O' ring and is secured by a spring clip.

Crankshafts fitted after July 1995, have a new arrangement of oil passageways which removes the need for oil reservoirs. These new crankshafts are therefore not fitted with oil reservoir plugs.

If, during overhaul, the oil reservoir plugs are removed from the earlier crankshaft, the plugs **MUST** be refitted before the engine is run.

Crankshaft end float is controlled by steel-backed lead bronze thrust washers, fitted either side of the centre main bearing. The lower half of the washer has a tang which locates in a slot machined in the bearing cap.

The nose of the crankshaft carries the oil pump drive gear and the main pinion, and is splined to receive the hub to which the damper and pulley are attached.

The main crankshaft oil seals are of lip type design. The rear oil seal is fitted directly into the flywheel housing and forms a seal around the rear flange of the crankshaft. For earlier engines the oil seal is carried in a housing which is bolted to the rear of the crankcase. The front oil seal is fitted in the wheelcase and forms a seal around the crankshaft hub. Both seals are supplied with a plastic insert for fitting purposes.

16

When a new liner is fitted and the protrusion check is satisfactory, etch its position number on the top face (A2) of the liner adjacent to the large coolant port. Do NOT mark the flange face (A1).

9 When the protrusion check for the cylinder liners is satisfactory, remove the liners and ensure that the seats are clean and have been degreased.

10 Fit the cylinder liners, operation 16-4.

11 Rotate the build stand until the engine is almost horizontal. Assemble the pistons and connecting rods as detailed in section 13 and clean the bores of the cylinder liners. Before each piston assembly is fitted, turn the crankshaft until the appropriate journal is at its lowest position. Clean the journal and lubricate with clean engine oil.

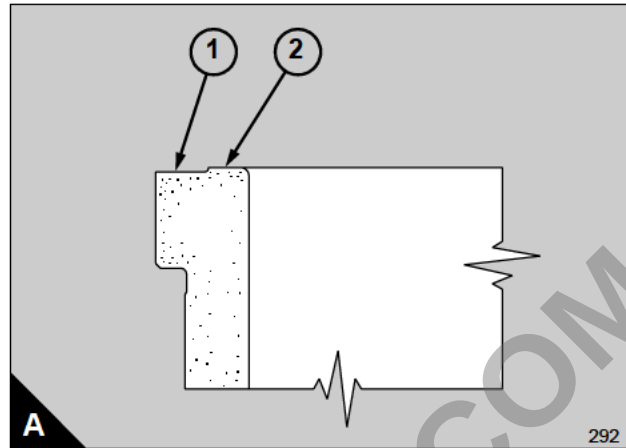
12 Fit the upper half of the big end bearing to the connecting rod, ensuring that the location tang is correctly fitted. Lubricate the bearing with clean engine oil. Enter the piston/connecting rod assembly through the compression sleeve tool, 21825 784, into the bore with the 'FRONT' marking on the piston crown to the front of the engine. Guide the rod carefully onto the crank pin.

13 Fit the lower half of the bearing into the big end cap ensuring correct location, and lubricate with clean engine oil. Fit the bearing cap with the correlation marks aligned, ensure that the big end bolts are correctly seated and tighten the lightly oiled nuts to a torque of 217 Nm (160 lbf ft). Repeat the procedure for the remaining five assemblies.

14 Fit the six piston cooling jets, complete with new 'O' ring seals, secure each with a bolt and spring washer.

15 Rotate the build stand until the engine is upright. Turn the crankshaft until the piston is at TDC (top dead centre) and measure the clearance of the piston crown below the crankcase top face. A dial gauge, 21825 782, is obtainable for this purpose. Permissible clearance is 0,28 to 0,38 mm (0.011 to 0.015 in). If necessary, it is permissible to machine up to a maximum of 0,127 mm (0.005 in) from the piston crown. Perform the check on all pistons. Restore the 'FRONT' and other markings if they are removed during machining.

16 Fit the two rocker gear oil feed studs and the blanking plug, complete with new sealing washer, to the crankcase top face. Ensure that the feed stud oilways are clear before fitting.



Continued

- 14 Remove and discard the oil baffle (A17).
- 15 Remove the shim (A19).
- 16 Remove the thrust bearing (A20) and the thrust collar (A21).
- 17 Remove and discard the 'O' ring seal (A18).
- 18 Use circlip pliers to remove the two circlips (A14) and the journal bearing (A13) from the compressor side of the assembly. Discard the circlips and the journal bearing.
- 19 Turn the bearing housing over. Remove and discard the two circlips (A11) and the journal bearing (A10).

To assemble

Before assembly, ensure that the compressor wheel and the turbine shaft/wheel have both been individually balanced by an establishment having the relevant special equipment and knowledge. The two parts must then be assembled and balanced. During balancing, the alignment marks on the end of the shaft and the compressor wheel **MUST** be aligned.

- 1 Place the turbine housing on a flat bench with the turbine end uppermost. Fit the circlip with its bevelled edge facing upwards.

Caution: Circlips (A1) must always be fitted with the bevelled edge facing the journal bearing.

- 2 Lubricate the journal bearing and fit it into the bearing housing. Fit the second circlip with its bevelled edge facing the bearing.

- 3 Turn the turbine housing over and repeat the procedure with the other journal bearing and circlips.

- 4 Fit the heat shield.

- 5 Fit a new piston ring seal to the turbine shaft.

- 6 Use clean engine oil to lubricate the turbine shaft, then enter the shaft into the bearing housing. Adjust the piston ring seal so that the gap is opposite to the oil drain in the bearing housing.

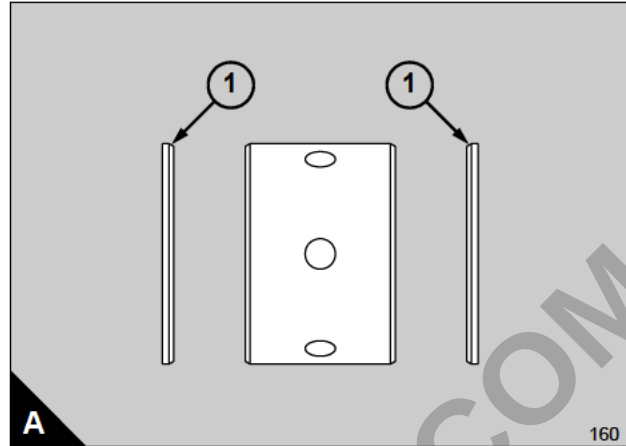
Caution: Gently press down on the turbine wheel and rotate it slightly to assist with properly locating the piston ring seal.

- 7 Support the assembly in a suitable fixture and use pliers to pull out the two roll pins by approximately 3mm (0.100 in).

Caution: Do not use excessive force with the pliers as the roll pins may collapse. If the roll pins collapse they must be renewed.

- 8 Fit the thrust collar. Ensure that the balance mark on the thrust collar is aligned with that on the shaft.

- 9 Apply a light coat of engine oil to the thrust bearing and fit it to the bearing housing.



- 10 Fit a new shim. It must be fitted with the letter 'T' facing away from the thrust bearing.

- 11 Fit the oil baffle into the housing.

- 12 Fit a new piston ring to the oil slinger. Apply a light coat of engine oil to the slinger and insert it into the oil seal plate.

- 13 Lubricate and install the 'O' ring seal.

- 14 Align the balance marks on the oil slinger with that on the end of the shaft and fit the diffuser onto the bearing housing.

- 15 Fit four new diffuser bolts and washers. Tighten the diffuser bolts in a diagonal pattern to a torque of 24,9 Nm (220 lbf in).

Caution: Tighten the bolts to the correct torque twice to ensure that all four are tightened equally.

- 16 Align the balance marks and fit the compressor wheel onto the shaft. Fit the compressor wheel lock nut (**left-hand thread**). Ensure that the nut is fitted with its flat side towards the compressor wheel. Tighten to a torque of 45,2 Nm (400 lbf in).

- 17 Secure the turbine housing in a vice or suitable fixture. Fit the bearing housing assembly to the turbine housing. Fit four new clamp plates, align the scribe marks, fit eight new bolts and tighten to a torque of 45,2 Nm (400 lbf in).

- 18 Position a dial test indicator so that its plunger is resting on the end of the shaft. Check the end float of the shaft between the extreme positions.

Total travel should be between 0,051 mm to 0,125 mm (0.002 to 0.0049 in).

- 19 Mount the dial test indicator gauge with its plunger resting on the side of the shaft above the compressor wheel and check the extreme radial travel by pushing the impeller towards and away from, in turn, the dial test indicator.

Total travel should be between 0,485 mm and 0,746 mm (0.0191 to 0.0294 in).

Continued

Note: This operation applies to both the single acting and double acting type of fuel lift pumps.

1 Perform a leakage test by blanking off the delivery connection and applying air pressure at 193 kN/m^2 (28 lbf in^2) to the suction connection, with the pump immersed in fuel oil. Check for air bubbles and at the same time, operate the pump plunger to ensure that there is no leakage from the plunger bore.

PREVIEW - YOUFIXTHIS.COM

Alternator

The alternator fitted to current engines will be rated at 55 or 70 amps, depending on application.

Each type of alternator is fitted with an integral regulator. The regulator requires no adjustment during service and is a non-repairable item.

It is not advisable to attempt repairs to the alternator. Such work requires specialist equipment and knowledge. Should alternator failure occur, operators are advised to take advantage of the Perkins service exchange scheme.

Starter motor

As specialist equipment and knowledge are necessary to overhaul the starter motor assembly, it is recommended that an exchange unit is fitted. If the equipment and expertise are available, the instructions for starter motor overhaul are given in this section.

The starter motor is a 24 volt unit, actuated by an externally mounted solenoid switch through a lever arm. The pinion assembly incorporates a positive engagement device, an overload clutch and a freewheel ratchet. It is mounted on the flywheel housing.

Operation of the starter switch energises the pull-in and hold-in coils and actuates the solenoid to move the pinion into mesh with the starter ring. Should the teeth abut, the pinion moves back against its spring load and rotates slightly until engagement occurs. The starting contacts then close in parallel with the pull-in coil, which is de-energised, and full torque is applied.

If engine resistance is excessive the pinion clutch comes into operation.

When the engine starts, the pinion is allowed to run free, in mesh with the starter ring, until the starter switch is released. The hold-in coil is then de-energised, allowing the return spring in the solenoid switch to disengage the pinion through the lever arm.

Certain engines are fitted with control switches. These are set at the factory and cannot be adjusted. Discard if faulty

PREVIEW ONLY

You're viewing 12 of 194 pages

The full manual includes:

- All 194 pages, complete
 - Searchable PDF (find any keyword)
 - No watermarks
 - Instant download
 - Print-ready quality
-

GET FULL MANUAL NOW

Perkins 2000, Perkins 2000 Workshop Manual



Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual