

11

Specifications

Basic engine data

Engine

Number of cylinders	8
Cylinder arrangement	90 degree included angle 'V'
Cycle	Four stroke
Induction system	Turbocharged and charge cooled
Combustion system	Direct injection
Nominal bore	135 mm (5.315 in)
Stroke	152 mm (5.984 in)
Compression ratio	14.5:1
Cubic capacity	17,4 litres (1062 in ³)
Firing order	A1, B1, B2, A3, B3, A2, A4, B4
Tappet clearances (hot or cold)	
Engines before build line number 8281 (4B 27377 8281 V):	
Inlet	0,4 (0.016 in)
Exhaust	0,5 (0.020 in)
Engines from build line number 8281 (4B 27377 8281 V):	
Inlet	0,2 (0.008 in)
Exhaust	0,5 (0.020 in)
Direction of rotation	Clockwise: view on front (fan end)
Injection timing	As stamped on engine data plate
Rated power output	325 to 480 kW
Maximum rated speed	1800 rev/min
Dry weight of engine (Approximate)	TAG2A Electropak: 1725 kg
	TAG3A and TAG4 Electropaks: 1823 kg
	Engine only: 1550 kg

Recommended applied torques

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 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, lock 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 - thin nut	50	37
Pulley - thick nut	95	70
Auxiliary drive shaft		
Flange nut, M22 (32 mm A/F)	300	220
Camshafts		
Screws for camshaft gears	40	30
Countersunk head screws for thrust plate	70	52
Compressor		
Drive gear nut	150	111
Connecting rods		
Big end bearing nuts - round headed bolts	60	44
Big end bearing nuts - 'D' headed bolts	70	52
Coolant gallery		
Setscrews and nuts	23	17
Crankcase		
Main bearing cap bolts	488	360
Side bolts for main bearing cap	177	130
Oil feed grub screws in cylinder vee	12	9
Crankshaft		
Bolts for pulley and attachments	95	70
Cylinder heads		
Bolts, cylinder head to crankcase (M15)	240	177
	(and a further 90°)	
Bolts, cylinder head to crankcase (M14) (fitted to early engines)	240	177
Bolts in inlet ports of cylinder heads	200	148
Bolts and studs, rocker box to cylinder head	46	34
Cap screws, rocker box to cylinder head	35	26
Bolts, rocker box cover to rocker box	23	17
Lock nut, adjustment screw, bridge piece	40	30
Lock nut, adjustment screw, tappet	40	30
Locking screw for position of rocker oil hole	28	21

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Pedestal rocker cover

To remove and to fit

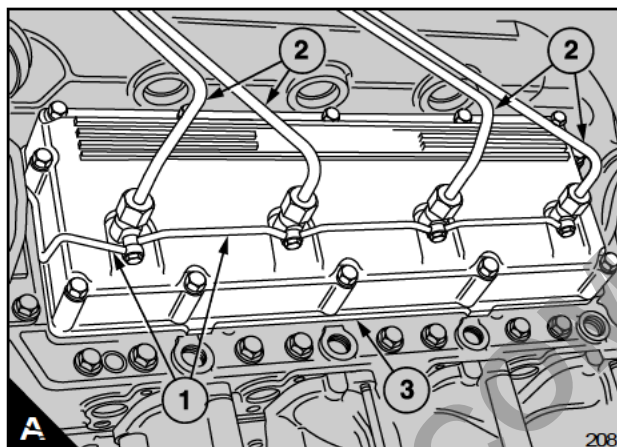
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To remove

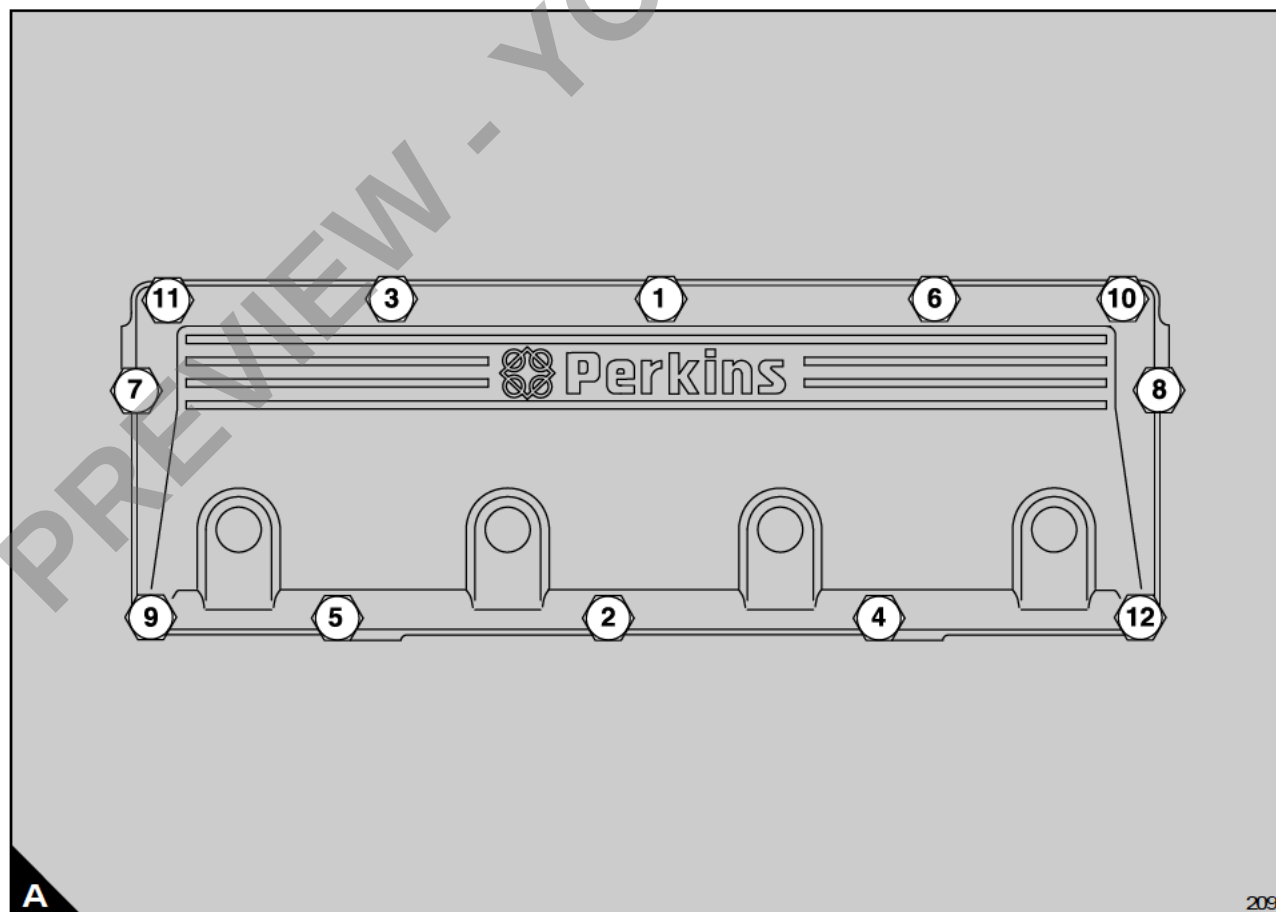
- 1 Disconnect the batteries.
- 2 Release the banjo connection bolts from the fuel injectors and remove the leak-off fuel pipes (A1).
- 3 Disconnect and remove the relevant high pressure fuel pipes (A2).
- 4 Remove the 12 bolts which retain the pedestal rocker cover (A3) and remove carefully the cover.

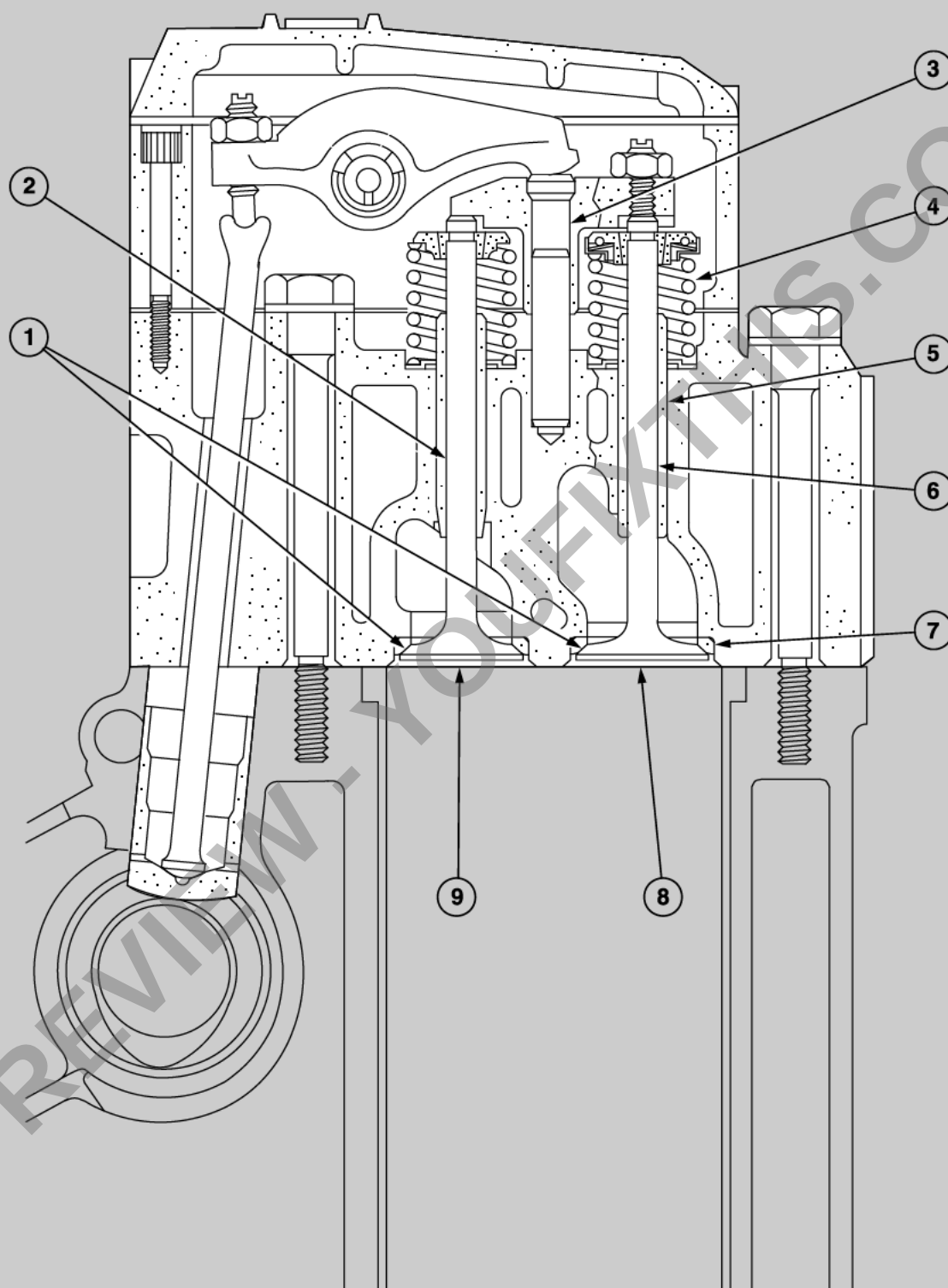
To fit

- 1 Fit a new joint onto the cylinder head and fit the pedestal rocker cover. Fit the bolts, complete with plain and spring washers, through the pedestal rocker cover and into the cylinder head. Use the sequence given (B) and tighten lightly all of the bolts evenly and gradually, then use the same sequence (B) and tighten the bolts to a torque of 23 Nm (17 lbf ft).



2 Before they are fitted, all fuel pipes must be inspected for cracks or other damage and, if necessary, renewed. Fit all other components which were removed in the reverse sequence to their removal and connect the batteries.





Note: Inlet and exhaust valves are shown under the same bridge piece

A

352

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Electrical equipment

General description

The batteries are charged by a circuit of 30 ampere capacity. Technical data for the electrical equipment is given in section 11A.

One of two types of alternator is fitted to the engine: a Butec Type A13 alternator, together with a Butec Type R1 voltage regulator; or a Butec Type A3024 alternator which has an integral voltage regulator.

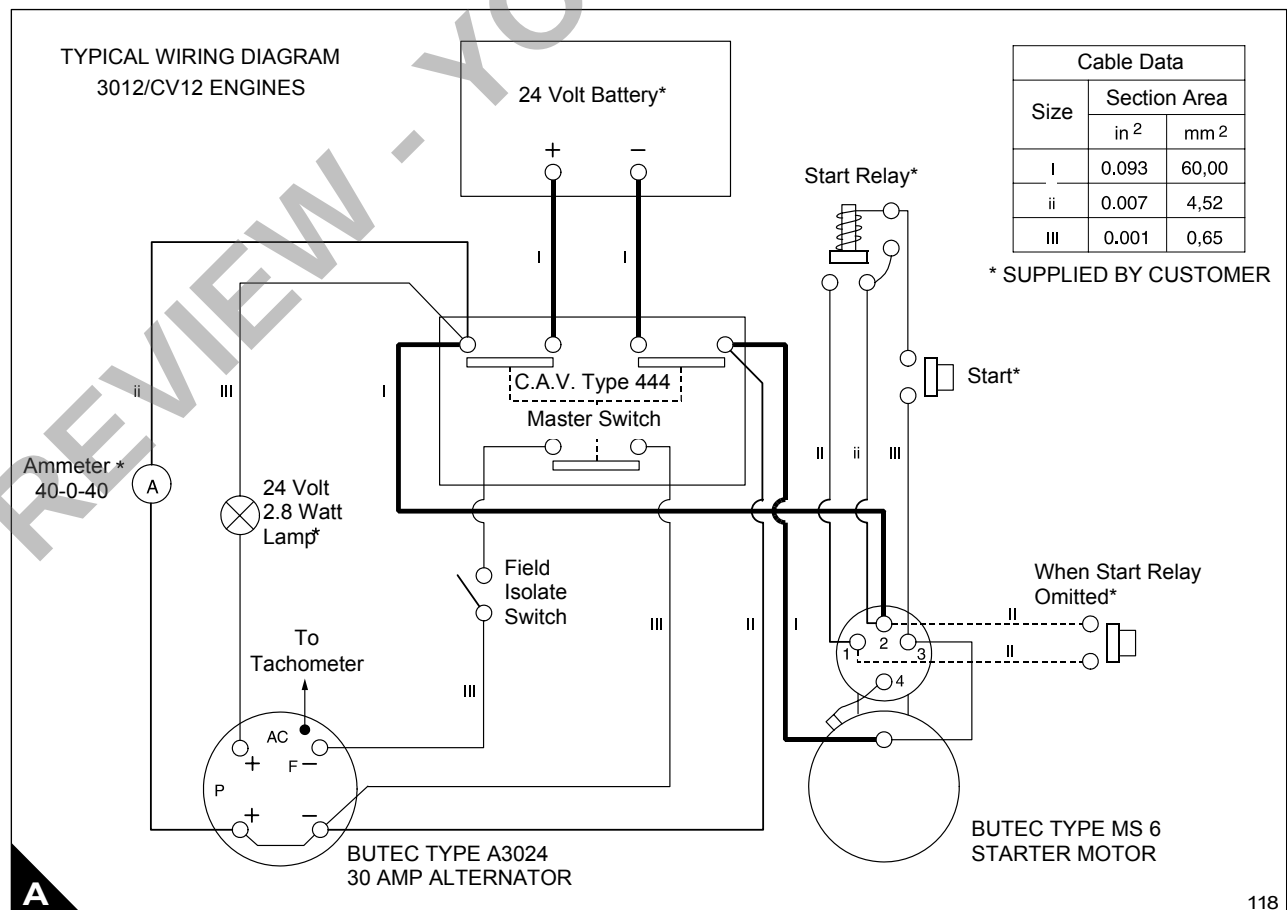
The starter motor fitted to the 3008 series engine is a Butec MS1A. Certain engines are fitted with a CAV S130L starter motor. Both types are flange mounted on the flywheel housing and engage with a standard starter ring gear which is integral with the flywheel.

On engines which are fitted with twin starter motors, CAV S130L type starter motors are used. 3008 series engines are fitted with a Synchrostart 2003 solenoid. Early engines were fitted with a CAV Type 368 solenoid unit used in the 'energised-to-run' setting.

Both types of solenoid are mounted within the 'V' of the engine and are connected directly to the stop control of the fuel injection pump assembly.

Two warning switches are included in the cooling system and the lubrication system. They give protection to the engine if the coolant temperature or the oil pressure exceed the permissible limits. Certain engines are fitted with an extra switch which gives protection to the engine if the coolant level is below a certain limit.

A typical wiring diagram for a 3008/CV8 engine is shown (A).



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Push rods

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Special tools:

Valve seat tool, 21825 841

Valve seat cutter, 21825 842

It is recommended that all the valve guides are inspected, and renewed as necessary, before the work is begun on the valve seat inserts. Ensure that the bores of the guides are within the limits given at the end of this section.

1 Inspect the inserts for erosion and cracks. If it is necessary to correct the inserts, lightly lap the faces of the valve seats and their relevant valves. To correct the faces of more badly damaged valve seats, use the valve seat tool, 21825 841, and the cutter, 21825 842, together with the relevant pilot. To use the tool, fit the guide (A) and proceed as shown (B). Ensure that the cutter is correct for the angle of the valve seat, which is given on **on page 59**. The surface finish of the valve seat will be improved if a compressed air supply is used to remove debris during this operation.

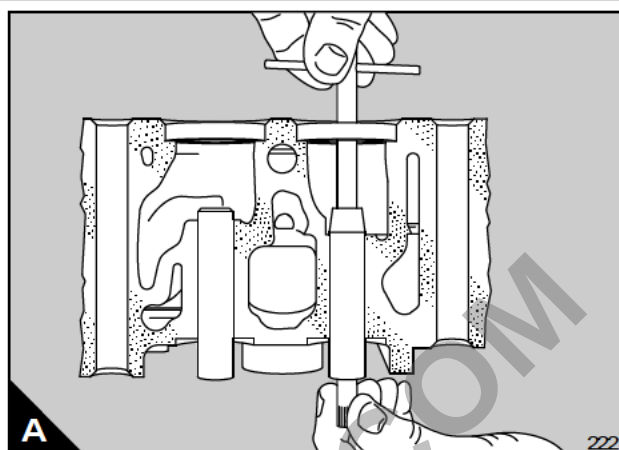
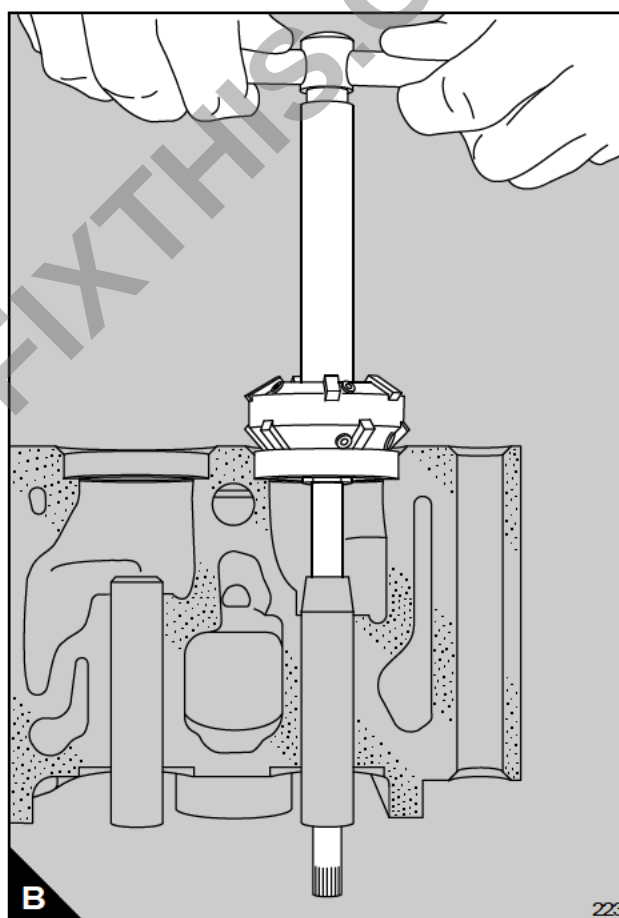
Warning! Ensure that eye protection is used during the above operation.

Caution: During the correction of a valve seat it is important to remove only the minimum amount of material.

2 After the inspection and correction of a valve seat and the relevant valve, fit the valve into the guide and check the depth of the head of the valve below the flame face. If the depth is more than the limits given **on page 59** use a new valve to check again. If the depth is then within acceptable limits, the new valve must be fitted to the valve seat when the cylinder head is assembled.

3 To ensure that the valve is fitted in its correct position, the number of the cylinder and the position of the valve must be etched above the collet groove on the valve stem. Valves must not be stamped or marked with a centre punch, because cracks may occur.

If the depth still exceeds the acceptable limits, a new valve seat insert must be fitted.



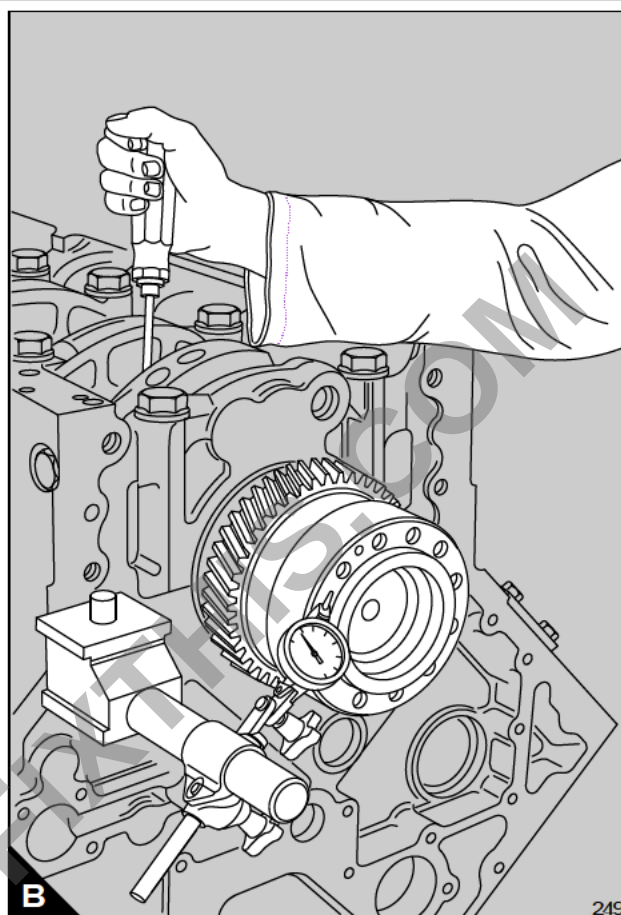
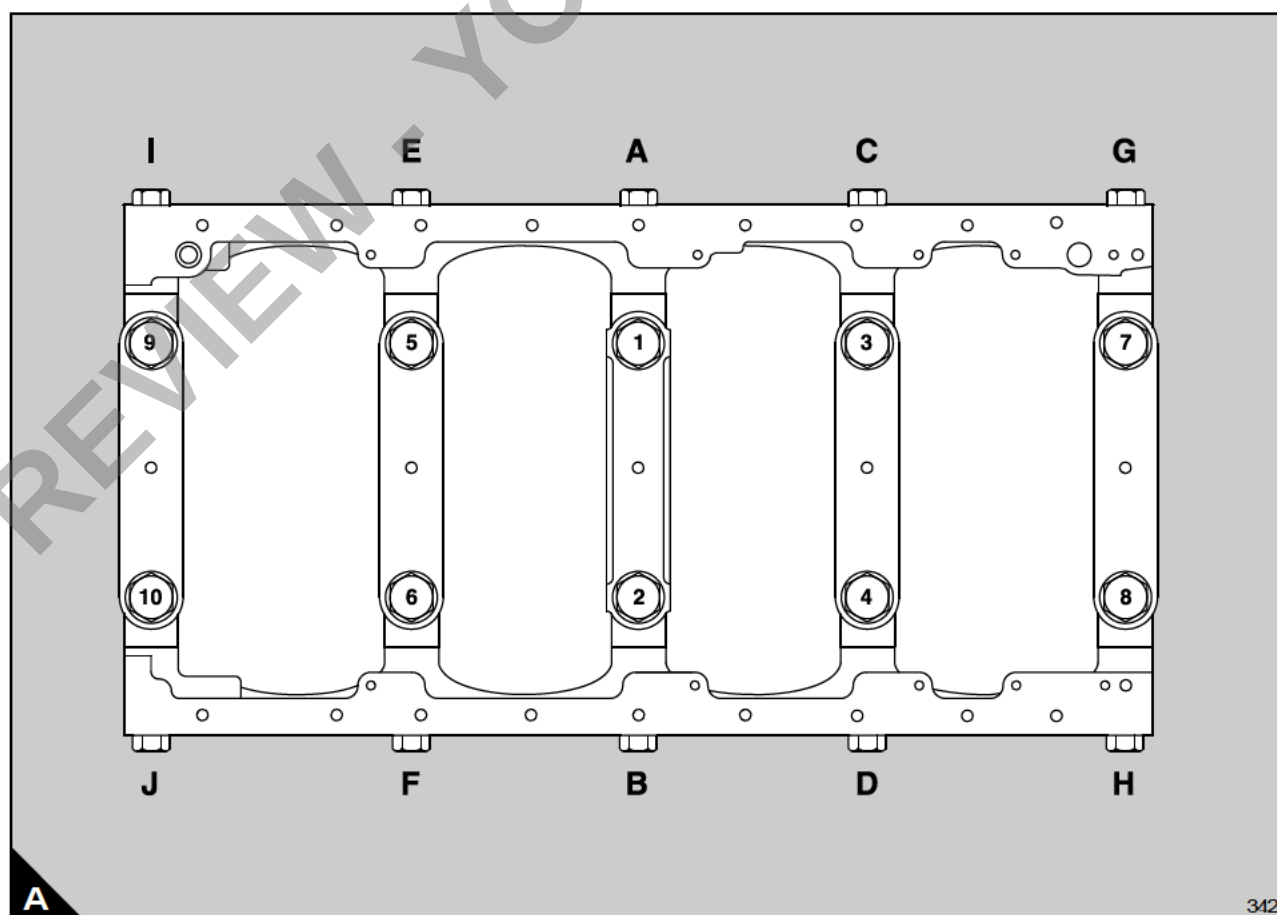
11 Tighten, in the sequence shown (A), all of the main bolts of the bearing caps to 488 Nm (360 lbf ft)

Caution: After each set of two bolts is tightened check that the crankshaft can rotate freely.

12 Tighten all of the side bolts, in the correct alphabetical sequence as shown (A), until a maximum torque of 177 Nm (130 lbf ft) is reached.

13 Put a dial test indicator with a magnetic base on the end face of the crankcase. Set the button of the dial test indicator on the end of the crankshaft (B). Use a lever to move the crankshaft backward and forward against the thrust washers and check the readings on the dial test indicator. Permissible end-float is 0,10 to 0,30 mm (0.004 to 0.012 in).

Turn the crankcase in the build stand until the 'A' bank cylinders are horizontal. Fit each of the connecting rods, of the 'A' bank cylinders, to their respective crank pins as follows:.



To remove and to fit

18-4

To remove

- 1 Remove the 'V' band clamp (A2) and loosen the nuts and lock plates on the manifold (A1) and the elbow (A5).
- 2 Remove the 16 bolts which retain the assembly of the exhaust manifold (A1).
- 3 Separate the sections of the exhaust manifold and withdraw the pipe (A4) from the turbocharger mounting (A3).

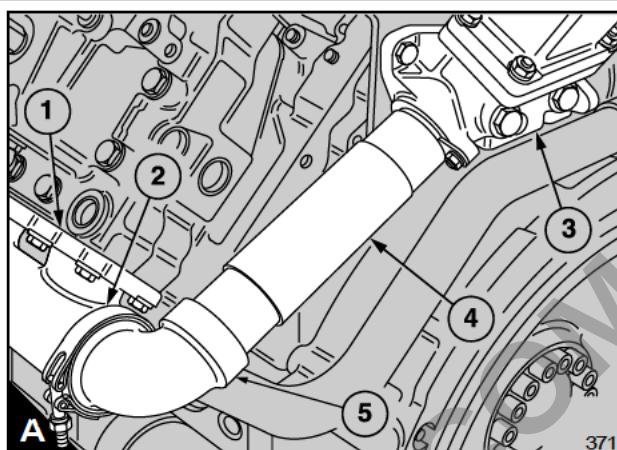
Repeat this procedure for the other exhaust manifold.

To fit

- 1 Fit the front section of the exhaust manifold, complete with its sleeve and retain it with eight bolts and plain washers. Fit the lock plate into the groove of the sleeve and retain the lock plate with a nut and plain washer.
- 2 Assemble loosely the pipe and the elbow (A5) and engage the pipe with the turbocharger mounting. Fit the rear section of the exhaust manifold over the sleeve and use a 'V' band clamp to connect the manifold and the elbow.

Note: A lubricant which operates at high temperatures such as 'Copaslip' should be applied to the threads of the 'V' band clamps and the exhaust manifold bolts to assist future removal operations.

- 3 Retain the manifold with eight bolts and plain washers. Tighten the bolts to a torque of 46 Nm (34 lbf ft), then tighten the 'V' band clamp.
 - 4 Fit the lock plate, the nut and the washer which retain the pipe at the turbocharger mounting.
- Repeat the procedure for the other exhaust manifold.



To clean and to inspect

18-5

- 1 Before the exhaust manifolds are cleaned, inspect each section for cracks and signs of leakage. Inspect thoroughly the joint faces on each exhaust manifold, the cylinder head and, if relevant, the turbocharger.
- 2 Soak the manifolds in a cleaning fluid which has been approved and remove all loosened deposits of carbon.

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11 Set the control rack to the central point of its movement, at this point the notches of the control sleeves will be in line with the tappet guides. Fit the control sleeves (A1) and ensure that, for each unit, the drive ball is engaged with the notch in the rack. Check that the rack is free to move fully.

12 Turn the fuel injection pump until it is horizontal and insert the upper spring plates and the plunger springs.

13 Fit the spring compressor tool (B2), 1 688 110 027, and the pivot bar (B3), 1 683 001 003, to the housing of the fuel injection pump. For each element in sequence proceed as follows:

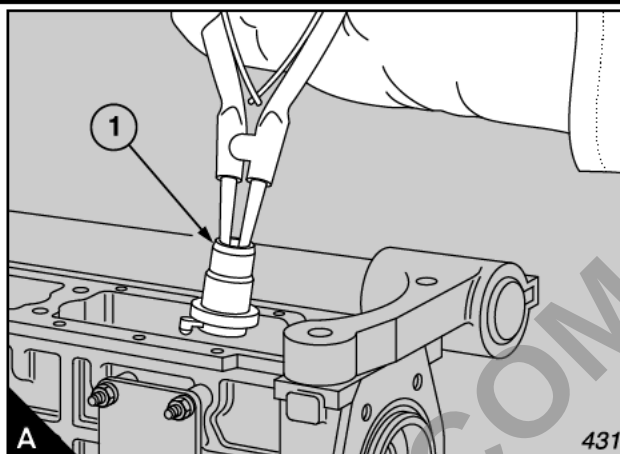
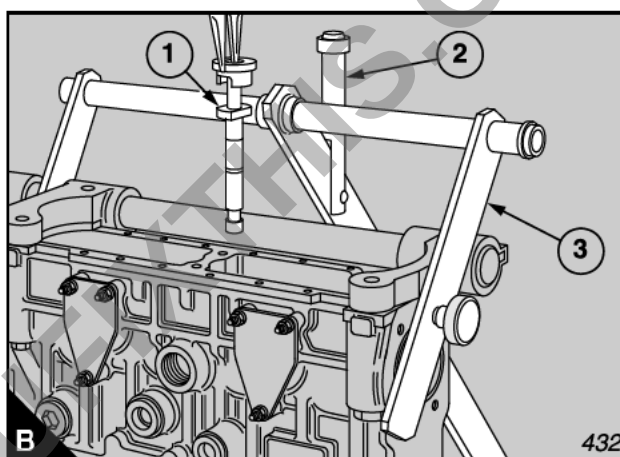
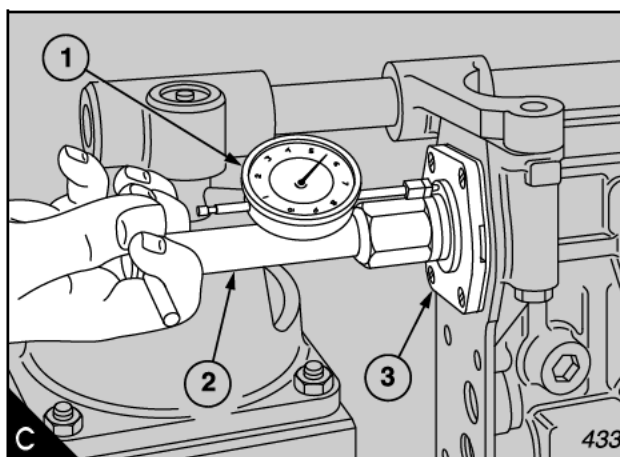
Fit the lower spring plate to its plunger and insert the assembly into its barrel with the line on the plunger toward the rack, as indicated (B1).

Assemble the tappet, compress its spring and use the holder, 1 681 115 12F, to retain it until the camshaft has been fitted. Fit the element and the guide sleeve, without the cap screw, fully into the threaded access hole. Then fit the cap screw and tighten it until the roller of the tappet is 64,2 mm (2.527 in) from the lower joint face of the pump casing.

14 Fit the governor housing and the joint washer, together with the relevant adjustment plate as found in **paragraph 1**. Enter the camshaft from the drive end and fit the centre bearing; tighten its two socket screws to a torque of 8 to 10 Nm (5 to 6.5 lbf ft). Assemble the bearing plate for the drive end with shims, but do not include the 'O' ring at this stage.

15 Measure the end-float of the camshaft as shown (C). Use the tool (C1), 0 681 440 013, fitted to the thread of the drive nut and the dial gauge (C2), 1 687 233 011. The limits are 0,02 to 0,06 mm (0.008 to 0.024 in). If the end-float is not within the limits, vary the shims under the bearing plate (C3) by the relevant amount. When the correct end-float is obtained, fit the bearing plate, complete with its 'O' ring.

16 Fit the cover plate to the base, complete with a new joint.



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Flywheel and flywheel housing

General description

The steel flywheel is fitted with a hardened starter ring. The flywheel is fastened securely to the rear face of the crankshaft by a clamp ring and 16 cap screws.

A dowel ensures that, when the flywheel is fitted, the timing marks on the flywheel are in the correct relationship to the crankshaft.

The flywheel housing is fastened to the engine by 14 bolts and spring washers, and two studs with nuts and spring washers. Certain engines have two ring dowels fitted between the crankcase and the flywheel housing.

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