

Service Bulletin

Please remove issue 3 of General Service Bulletin 175 dated January 2006 and put this in its place.
New information has been added.

General

175 Issue 4

Fracture split connecting rods

September 2006

Conversion to fracture split connecting rods

There has been a change on certain engines from the serrated and flat face connecting rods to fracture split connecting rods.

Fracture split connecting rods have advantages over standard connecting rod designs:

- 1 Fracture split connecting rods have a greater surface contact area between connecting rod and cap.
- 2 The split process produces rough but accurately matched surfaces that improve connecting rod bottom end strength.
- 3 The fasteners are off-centre so that the cap cannot be incorrectly fitted to the connecting rod.

Warning! Butt face and serrated connecting rods must use torque tightening sequence only. Do not use the torque and angle procedure as used in fracture split connecting rods. Ref to relevant workshop manual. If the incorrect procedure is used it may cause death or personal injury.

Cautions:

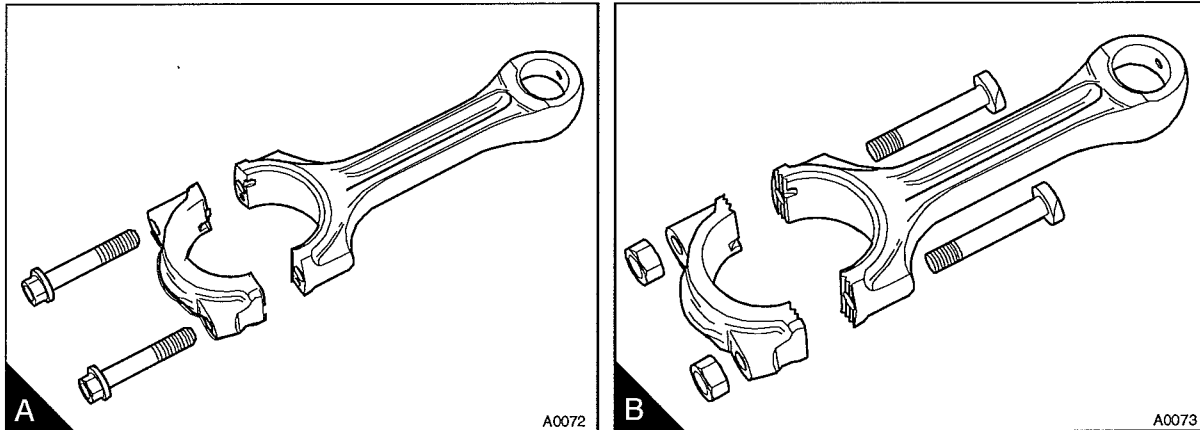
- *When the big end cap is removed for the first time, a small amount of metal may fall away from around the setscrew holes (maximum particle size is 1 x 3 x 5 mm (0.39 x 0.117 x 0.195 in). This may happen each time the big end caps are removed, care is required when the connecting rods are fitted in the engine as the particles may fall into the engine.*
- *Do not stamp or punch a fracture split connecting rod as it may cause damage.*
- *The fasteners for fracture split connecting rods must only be set to the final value once. If a fracture split connecting rod has been removed the fasteners have been set to the final value, then the fasteners must be renewed.*
- *Flat butt face and serrated connecting rods are designed only to have a torque tightening sequence applied to the fasteners. Do not use fracture split connecting rod sequence in order to tighten the fasteners. Ref to the relevant workshop manual or Perkins dealer/distributor.*

Note: It is acceptable to have all types connecting rods in the same engine

Flat butt face and serrated connecting rods

- (A) Flat butt face connecting rod
- (B) Serrated connecting rod

This is two of the four types of connecting rods that can possible be found in a engine.



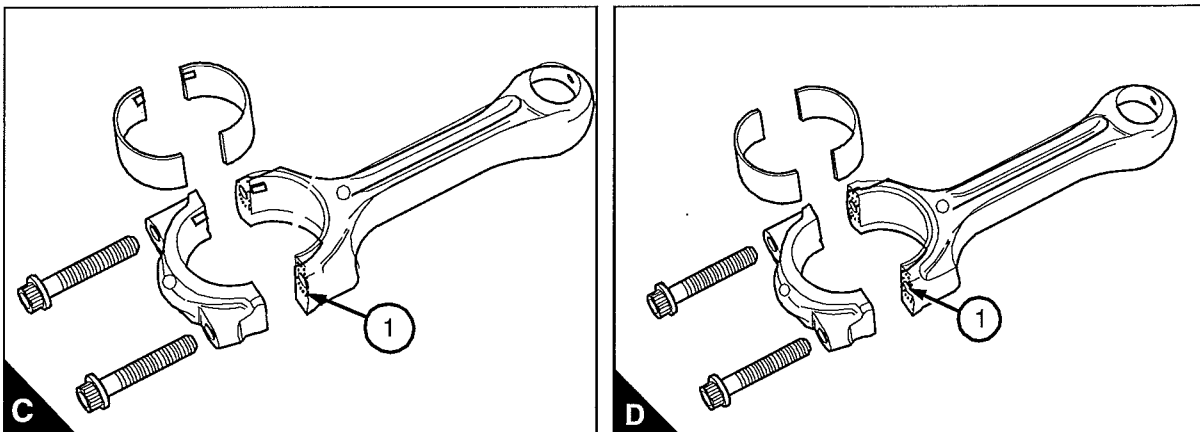
Fracture split connecting rods

There are two types of fracture split connecting rods.

(C1) Type fracture split connecting rod have locating tags. Ref to Parts Marketing Bulletin 672 for further information.

The other type of connecting rod is also a fracture split connecting rod (D1) but this type has no locating tags.

Note: When tightening any of the four types of connecting rods refer to the relevent workshop manual or Perkins dealer/distributor.



Factory built engines have started the conversion to fracture split connecting rods.

From engine cut in numbers:

- 1000 Series 4 cylinder engine number AH-----U523962J (AB, AC, AE and AH)
- New 1000 Series 4 cylinder engine number AK-----U284278J (AF, AJ, AK, AL, AM, AP, AQ and AT)
- New 1000 Series 4.42 engine number AS-----U558116J (AR and AS)
- 1000 Series 6 cylinder engine number -----U801518J (YB, YC, YD YE and YA)
- New 1000 Series 6 cylinder engine number -----U801518J (YF, YG, YH, YJ and YK)
- 1100 Series 6 cylinder engine number VK-----U090154J. (VK)

How to remove a connecting rod assembly.**Notes:**

- Engines that are factory built do not have cylinder number etched, on to either the connecting rod, or onto the big end cap. If you remove the caps from fracture split connecting rods then the caps and connecting rods must be suitably marked so that each cap can be returned to the correct connecting rod and to the correct cylinder.
- New replacement piston or fracture split connecting rods should also be suitably marked with the correct number.
 - 1 Remove the piston / connecting rod assembly from the cylinder block.
 - 2 Remove the connecting rod from the piston.
 - 3 Identify and record the grade length of the removed connecting rod.
 - 4 Discard the fasteners for the connecting rod assembly.
 - 5 Refer to the relevant engine workshop manual

The fractured-split connecting rod cap tightening procedure is by torque and angle. Previous design of connecting rod in the same engine should be tightened in accordance with the torque value given in the relevant workshop manual. It is very important to use the correct tightening procedure. Failure to do so could result in major engine failure.

Note: If in doubt, please contact your nearest Dealer/Distributor.

Final assembly of the fractured split connecting rod.

Until final assembly, connecting rod fasteners should not be torqued beyond 20 Nm (15 lb ft) 2.0 Kgf m. After all checks are completed, tighten the fasteners to 70 Nm (52 lb ft) 7.1 Kgf m. The fasteners must be tightened a further 120°.

Rotate the crankshaft by hand to ensure that the piston/connecting rod assembly rotates freely.

Note: The fasteners for fractured split connecting rods must only be set to their final value once. Therefore if a fractured split connecting rod has to be removed for any reason after the fasteners have been set to their final value, then the fasteners must be renewed.

To fit a fracture split connecting rod complete with a finished small end bush.

Note: Fracture split connecting rods are available as a complete assembly with a finished small end bush and should be fitted to the piston and the crank pin as follows:

Cautions:

- *A new fracture split connecting rod and cap is supplied by Perkins as an assembly with the fasteners set to a torque of 20 Nm (15 lbf ft) 2,0 kgf m. The cap must not be separated from the rod, and the fasteners must not be left loose for any length of time since the quality of the fracture split surfaces will be damaged by surface dirt and corrosion. Always keep the cap and the connecting rod as an assembly with the fasteners set to a torque of 20 Nm (15 lbf ft) 2,0 kgf m until they are assembled in the engine.*
- *All factory built turbocharged engines have a different shell bearing fitted to the cap than the connecting rod. Ensure that the relevant shell bearings are kept with the correct cap or connecting rod.*
- *Fracture split connecting rods and caps have a forging mark (A1) on their front face. Ensure that the connecting rod is fitted to the piston so that the mark is on the same side as the "Front" mark or arrow on the piston. There may be no reference to this connecting rod forging mark in the relevant engine workshop manual.*

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Engine type	grade letter	Colour code	Gauge length (mm)	Flat butt face connecting rod	Serrated connecting rod	Fractured split connecting rod
New 1000 Series and 1100 Series 4 and 6 cylinder	F	Red	165,728/165,761			4115C311
	G	Orange	165,682/165,715			4115C312
	H	White	165,637/165,670	ZZ90186	ZZ90188	4115C313
	J	Green	165,591/165,624		ZZ90189	4115C314
	K	Purple	165,545/165,578		ZZ90190	4115C315
	L	Blue	165,499/165,532	ZZ90187	ZZ90191	4115C316
1000 Series	F	Brown	166,392/166,425	ZZ90058		4115C321
	J	Green	165,591/165,624	ZZ90146		4115C314

Note: The grade letter is only etched onto the connecting rod and not the cap.

1 Select a new connecting rod assembly of the same grade length and type as the connecting rod assembly that was removed. Ref to table 1.

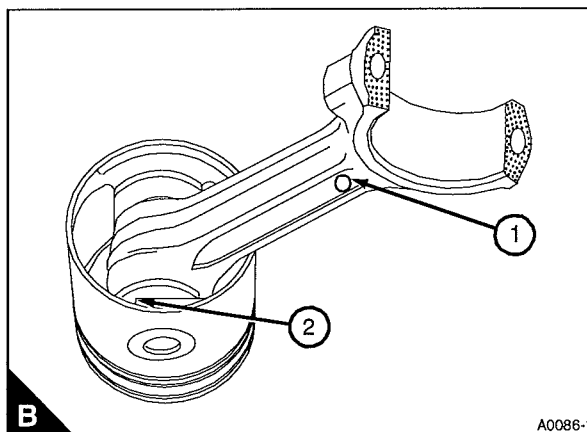
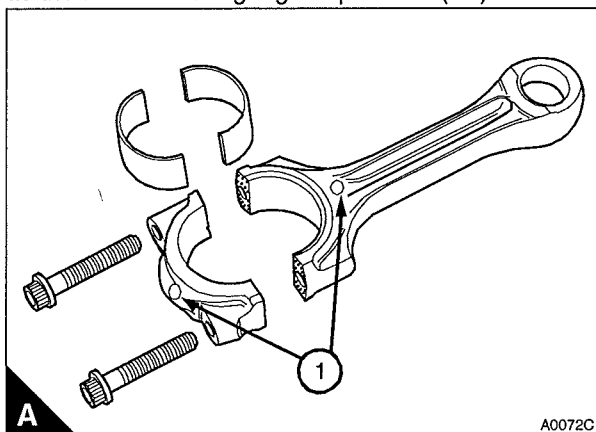
Notes:

- Engine models AB, AC, AH, YB and YC, there is one length grade of fracture split connecting rod, and one height grade of piston available.
- Engine models AF, AJ, AK, AM, AP, AQ, YF, YG, YH, YJ and YK, there are two length grades of fracture split connecting rods, and one height grade of piston available.
- Engine model AL, there are six length grades of fracture split connecting rods and one height grade of piston available.
- Engine models AD and YD, there is one length grade of fracture split rod, and six height grades of piston available.
- Engine models AE and YE, there is one length grade of fracture split connecting rod, and two height grades of piston available.
- Engine models RE, RF, RG, RH, RJ, RJ and VK, there are six length grades of fracture split connecting rods and one height grade of piston available.

2 Clean the bore of the small end bush and lubricate it with clean engine lubricating oil.

3 Fit a new circlip into the circlip groove of one of the piston gudgeon pin bosses. Ensure that the circlip is fitted correctly into the groove recess.

4 With the piston upside down, put the connecting rod in position with the forged mark (B1) on the same side as the recess in the gudgeon pin boss (B2).



5 Lubricate the gudgeon pin bosses with clean engine lubricating oil and push the gudgeon pin towards the circlip. If the gudgeon pin is a tight fit in the piston, heat the piston to 40/50 °C (104/122 °F) before the gudgeon pin is fitted.

6 Fit a new circlip into the groove in the other gudgeon pin boss. Ensure that the circlip has fitted correctly into the groove recess.

- 7 Ensure that the piston, the cylinder bore, and the crank pin are all clean.
- 8 Rotate the crankshaft until the relevant crank pin is at its lowest position.
- 9 Clean the bearing face of the connecting rod and the bearing face of the cap.

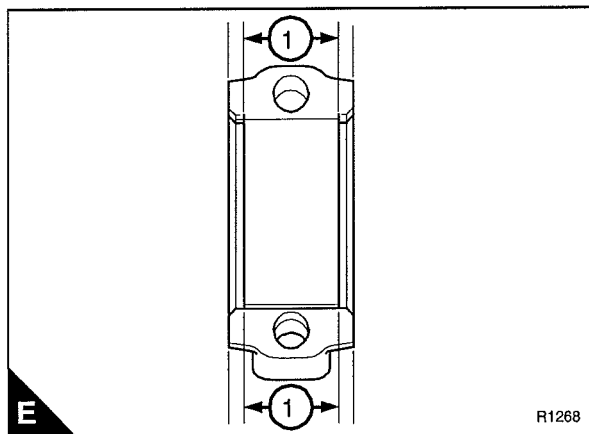
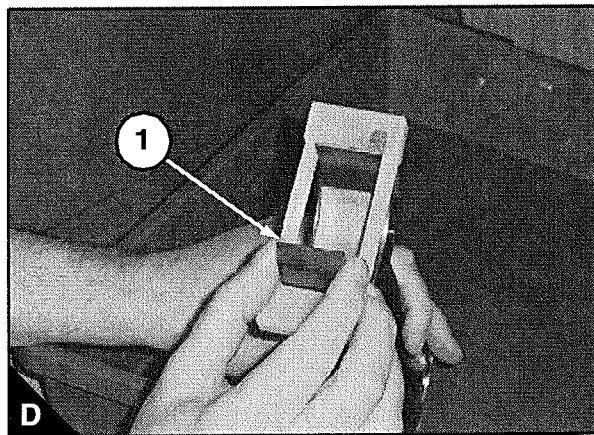
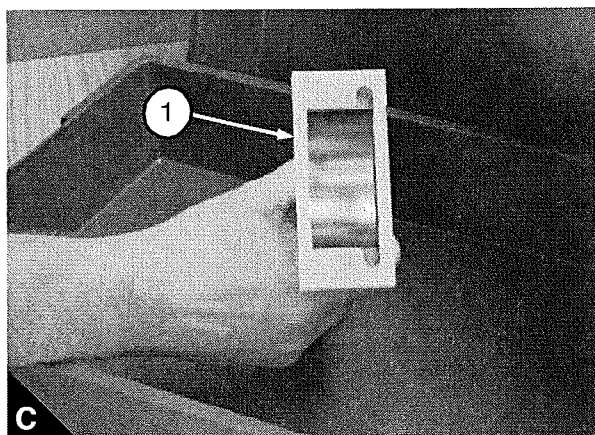
Notes:

- The shell bearings and the fractured split connecting rods do not have tags. A shell bearing alignment tool is supplied with all big end bearing kits, and must only be used with that kit, then the tool should be discarded.
- One type of fracture split connecting rod and shell bearing have tags.

10 Fit the shell bearing alignment tool (C1) onto the connecting rod or the cap.

11 Fit a new clean shell bearing (D1) into both the connecting rod and the cap.

12 Ensure that the shell bearings are correctly centralised (E1) in the connecting rod and the cap, then remove the shell bearing tool.



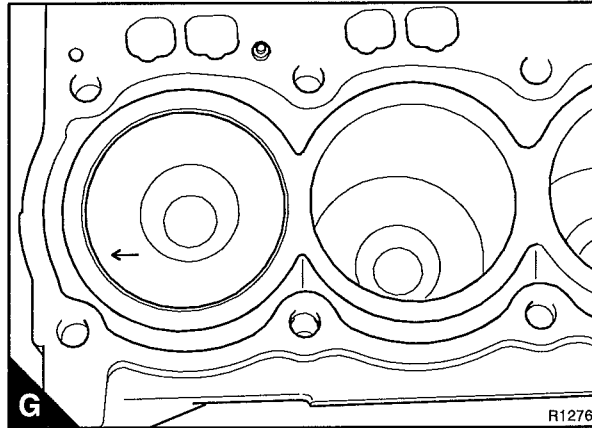
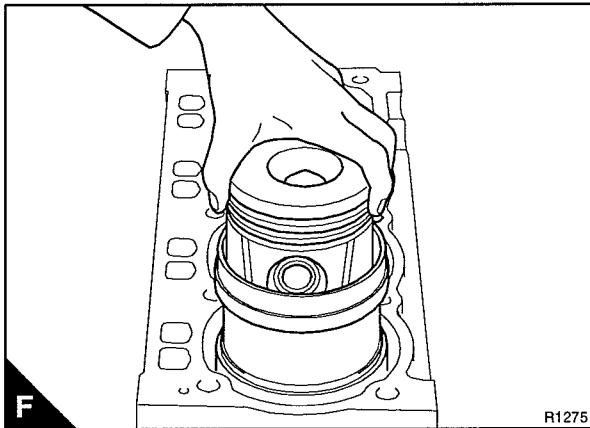
13 Lubricate the piston, cylinder bore, crank pin, and the connecting rod shell bearings with clean engine lubricating oil.

Note: Refer to the relevant engine Workshop Manual for the correct piston replacer tool part number.

14 Position the piston replacer tool at the top of the relevant cylinder (F). The tool has a tapered bore to compress the piston rings when the piston and the connecting rod assembly is fitted. Ensure that the smallest end of the replacer tool bore is towards the face of the cylinder block.

Continued

15 Ensure that the forging mark (B1) is towards the front of the engine. Insert the connecting rod through the piston replacer tool and into the cylinder bore until the piston skirt is inside the piston replacer tool (F). Ensure that the piston ring gaps are 120° apart and that the arrow mark on the top of the piston (G) is towards the front of the engine.



Caution: Ensure that the connecting rod will not hit the piston cooling jet (if fitted) as the piston and the connecting rod assembly is pushed down into the cylinder bore.

16 Rotate the connecting rod slightly to ensure that the connecting rod does not hit the piston cooling jet (if fitted). Push the piston and the connecting rod assembly through the piston replacer tool (F). When the big end of the connecting rod has passed the piston cooling jet, rotate the connecting rod so that the arrow mark on top of the piston is towards the front of the engine (G). Push the piston into the cylinder bore until the connecting rod is in place on the crank pin.

17 Ensure that the forging mark on the cap is to the front of the engine and fit the cap to the connecting rod. Fit the cap / connecting rod fasteners and tighten evenly to 20 Nm (15 lbf ft) 2,0 kgf m.

18 Refer to the relevant engine Workshop Manual for instructions on how to check that the piston height is correct.

19 If the piston height is incorrect remove the piston / connecting rod assembly and replace the connecting rod with a grade higher / lower as required. Refit the piston / connecting rod assembly and check the piston height as before.

20 Repeat the assembly operation for all cylinders. Rotate the crankshaft by hand to ensure that the piston / connecting rod assembly moves freely within the bore.

21 Tighten the new fasteners to 70 Nm (52 lbf ft) 7,1 kgf m. The fasteners must then be tightened a further 120°. Rotate the crankshaft by hand to ensure that the piston / connecting rod assembly still moves freely within the bore. Ensure that the crankshaft end-float is correct, refer to the relevant Workshop Manual.

Note: The cap / connecting rod fasteners for fracture split connecting rods must only be set to their final torque once. Therefore if a fracture split connecting rod has to be removed for any reason after the cap / connecting rod fasteners have been set to their final torque value, then the cap / connecting rod fasteners must be renewed.

To remove and fit a partially finished small end bush.

1 Press out the old bush with a suitable adaptor.

Caution: Care is required when removing the old bush to ensure there is no damage to the parent bore of the connecting rod, if damaged the connecting rod must be replaced.

2 Inspect and clean the parent bore of the connecting rod.

Notes:

- The partially finished small end bushes for fractured split rods are already wedged and will require specialist press tooling to ensure that the bush is correctly aligned into the connecting rod.
- Early type fractured split connecting rods have an oil hole on the small end bore, this oil hole is removed on the latest type fractured split connecting rods.

Continued

3 For engine models AB, AC, AH, YB and YC the replacement wedged small end bush (part number 3112A006) should be reamed concentrically to a diameter of 38,117/38,136 (1.5006/1.5014).

4 For engine models AD, AE, YD and YE the replacement wedged small end bush (part number 3112A005) should be reamed concentrically to a diameter of 39,723/39,738 (1.5638/1.5644).

5 New 1000 series engines replacement wedged small end bush (part number 3112A005) must not be reamed. They require specialist equipment and personnel with the correct training to bore the small end bush to the correct height grade and the correct diameter of 39,723/39,738 (1.5638/1.5644). If specialist press tooling is not available, then a parallel small end bush (part number 3112E011) can be fitted and machined as above, but the bush must be machined wedge shaped once fitted and all sharp edges removed.

Note: For further information on inspection, height grade, refer to the relevant workshop manual.

End

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