PISTONS AND CONNECTING RODS

To Remove

Remove cylinder head (Refer to Sub-section A 231).

Remove sump (Refer to Sub-section A 221).

Remove the top ridge of cylinder bores before removing piston from cylinder block. Keep tops of the pistons covered during this operation.

Pistons and connecting rod must be removed from top of cylinder block. Rotate crankshaft so that each connecting rod is centred in the cylinder bore.

Remove the two nuts securing the big end cap. Remove cap.

Note: Identify each cap and bearings with their respective piston and connecting rod for re-assembly. Caps and connecting rods are numbered.

Push piston and connecting rod upwards through the bore, taking care not to damage the bore.

To Dismantle

Special Tools

Gudgeon pin remover/ replacer C3724

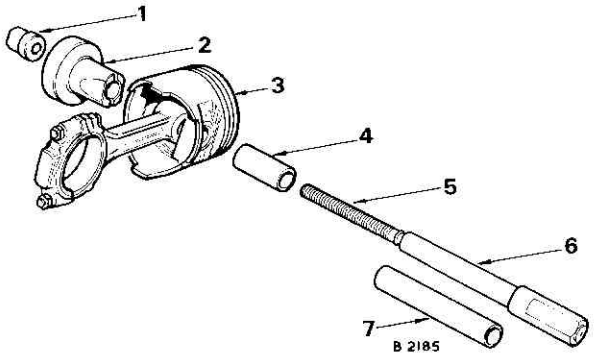
Remove the piston rings from the piston.

Arrange Tool C3724 for removal of gudgeon pin (Fig. 1).

Install pilot on main screw.

Position screw through gudgeon pin.

Position anvil over thread of main screw with small end of anvil against piston boss. Spring must be removed from anvil.

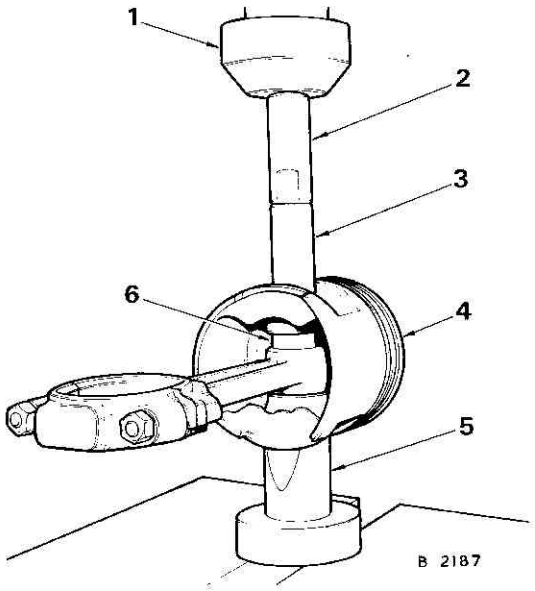


1. NUT
2. ANVIL
3. PISTON
4. PILOT
5. MAIN SCREW
6. SMALL GUIDE
7. LARGE GUIDE

Fig. 1 *Tool arrangement for removing gudgeon pin*

Screw nut loosely on main screw and place assembly on a suitable press (Fig. 2). Press gudgeon pin out of connecting rod. Immediately the gudgeon pin is free from the connecting rod, stop the press to prevent damage to bottom of anvil.

Remove tool from piston.



1. PRESS
2. MAIN SCREW
3. PILOT
4. PISTON
5. ANVIL
6. GUDGEON PIN

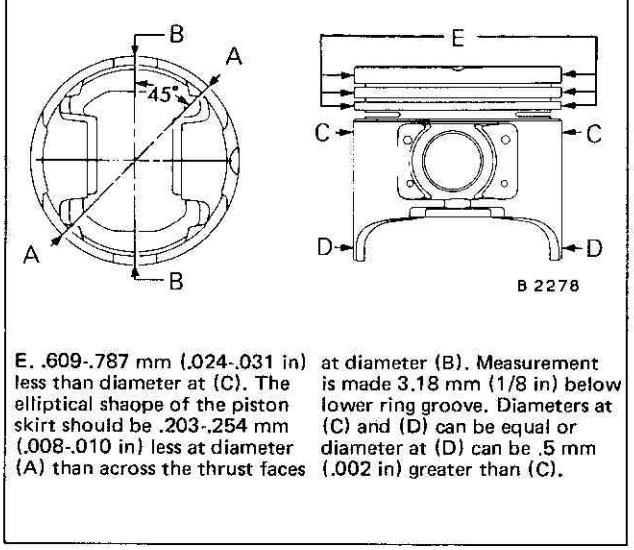
Fig. 2 *Removing gudgeon pin*

Inspection and Overhaul

Clean off all carbon deposits taking care not to use any implement which could damage pistons. Clear piston ring grooves.

Check pistons for scoring or fracture. Pistons are available in different grades and the grade is marked on the piston crown during manufacture. The grade is also stamped on the cylinder block distributor mounting. Grades and sizes available will be found in Data.

The pistons are cam ground so that the diameter at the gudgeon boss is less than its diameter across the thrust face. This allows for expansion under normal operating conditions. The expansion forces the gudgeon bosses away from each other, and the piston assumes a more round shape. Inspect pistons for taper and elliptical shape before they are fitted into cylinder bores (Fig. 3).



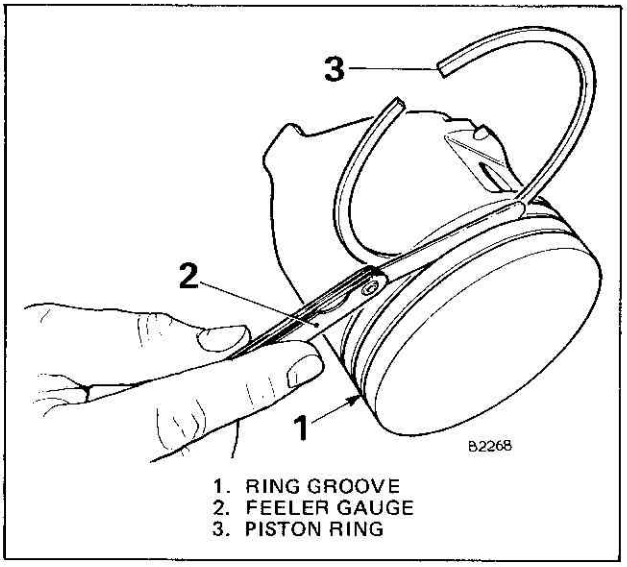
E. .609-.787 mm (.024-.031 in) less than diameter at (C). The elliptical shaope of the piston skirt should be .203-.254 mm (.008-.010 in) less at diameter (A) than across the thrust faces at diameter (B). Measurement is made 3.18 mm (1/8 in) below lower ring groove. Diameters at (C) and (D) can be equal or diameter at (D) can be .5 mm (.002 in) greater than (C).

Fig. 3 *Piston measurements*

Check piston ring as follows:—

Position the rings a short distance down the cylinder bore and locate squarely by carefully pushing a piston up the bore. Measure the gap with a feeler gauge and check that it is within the limits shown in 'Data'.

Check piston ring grooves by measuring the clearance of new rings in the grooves (Fig. 4). If the clearance is outside the limits shown in 'Data' new pistons must be fitted.



1. RING GROOVE
2. FEELER GAUGE
3. PISTON RING

Fig. 4 *Measuring piston ring side clearance*

Check connecting rod alignment with an aligning tool.

Examine big end shell bearings for wear or damage.

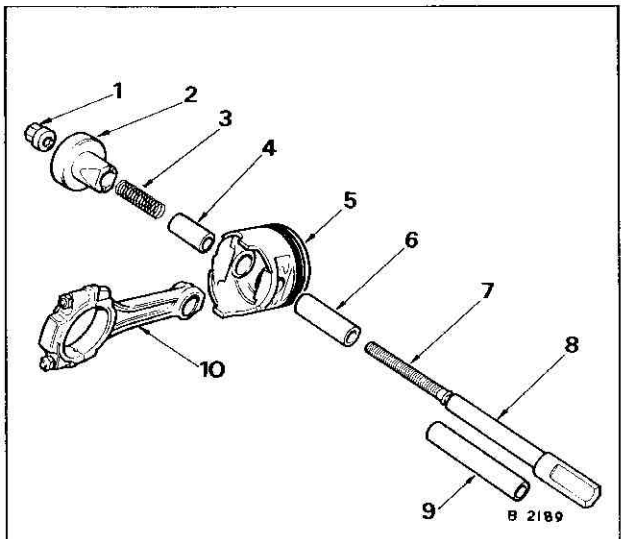
If new piston rings are fitted the cylinder bores must be deglazed.

To Re-assemble

Measure gudgeon pin fit in the piston. It should be a sliding fit in piston at 21.1°C (70°F). Gudgeon pins are supplied in standard sizes only.

Lubricate piston and connecting rod gudgeon pin holes.

Arrange Tool C3724 for installation of gudgeon pin (Fig. 5).



1. NUT
2. ANVIL
3. SPRING
4. PILOT
5. PISTON
6. GUDGEON PIN
7. MAIN SCREW
8. SMALL GUIDE
9. LARGE GUIDE
10. CONNECTING ROD

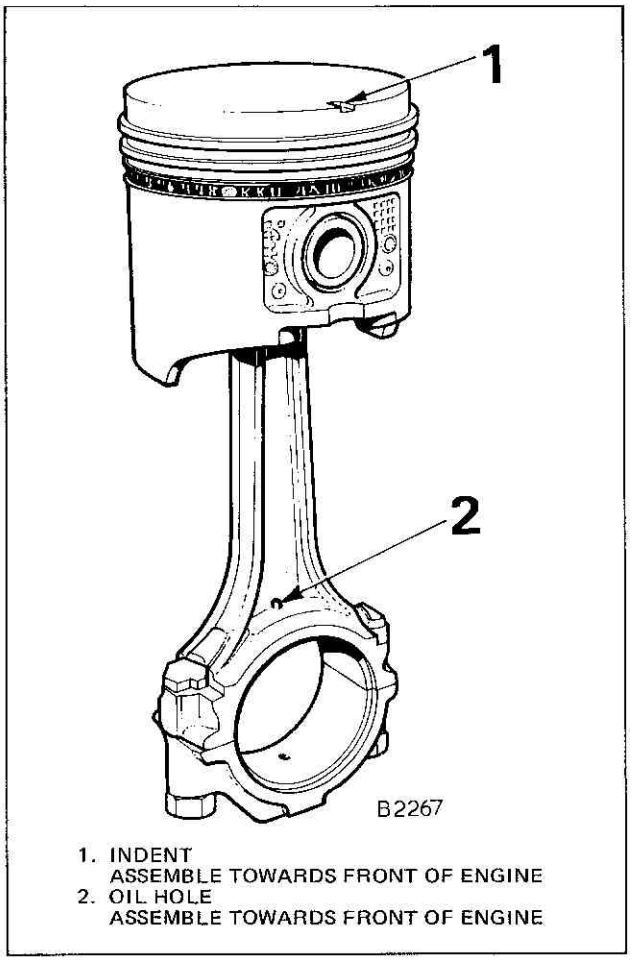
Fig. 5 *Tool arrangement for installing gudgeon pin*

Install spring inside the pilot and position spring and pilot in the anvil.

Install gudgeon pin over main screw.

Place piston, with "Notch" up, over the pilot so that pilot extends through piston gudgeon pin hole.

Position connecting rod over the pilot which extends through piston hole. The oil hole in connecting rod must be as shown in Fig. 6.



1. INDENT
   ASSEMBLE TOWARDS FRONT OF ENGINE
2. OIL HOLE
   ASSEMBLE TOWARDS FRONT OF ENGINE

Fig. 6 *Position of connecting rod oil hole*

Install main screw and gudgeon pin in piston then screw nut on main screw to hold assembly together. Place assembly on a press (Fig. 7).

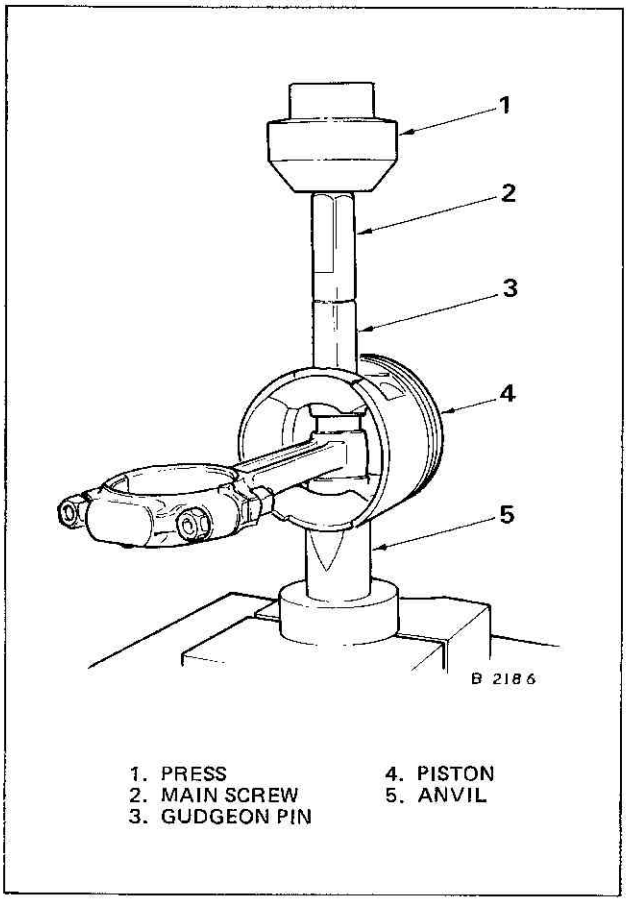


Fig. 7 *Installing gudgeon pin*

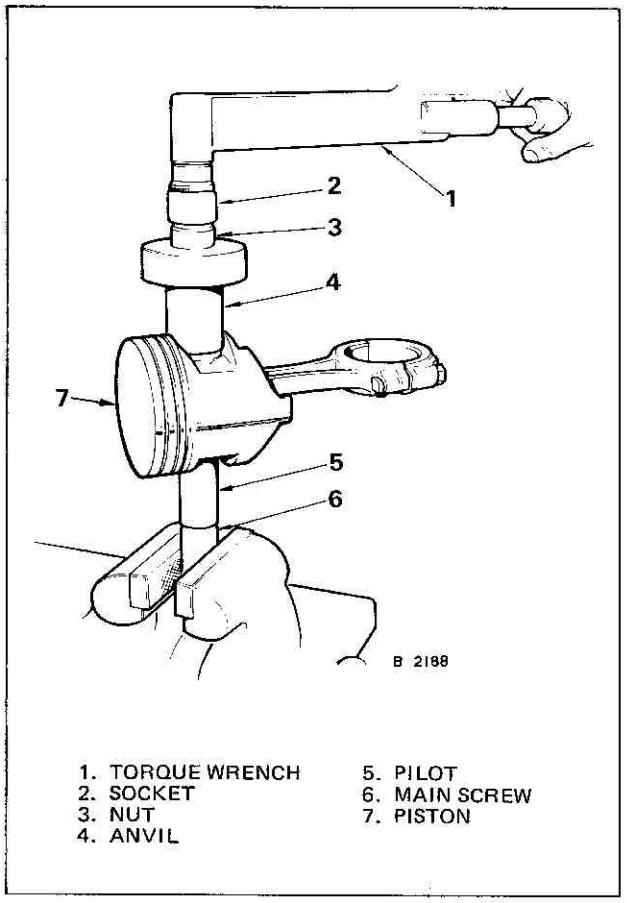


Fig. 8 *Testing fit of gudgeon pin in connecting rod*

Press gudgeon pin in the piston until pin bottoms on pilot, properly positioning pin in connecting rod.

Remove tool and arrange tool parts and piston assembly in a vice as shown in Fig. 8 for measuring pin fit.

Attach torque wrench to nut and torque up to 20 Nm (15 lbf. ft.). If connecting rod moves downward on the gudgeon pin, reject this connecting rod and gudgeon pin combination. Install a new connecting rod and repeat the installation and testing procedure.

If the connecting rod does not move under 20 Nm (15 lbf. ft.), piston and connecting rod interferance is satisfactory.

Remove tool from piston assembly.

Fit oil ring expander in lower ring groove and install oil control ring as per instructions on package. Oil ring should be free in groove, but should not exceed 0.127 mm (.005 in.) side clearance.

Fit compression rings in middle and top grooves. Ensure that the markings on the ring "top or a dot" are uppermost.

To Refit

Rotate crankshaft so that connecting rod journal is on the centre of the appropriate cylinder bore.

Lubricate pistons, rings and all other parts liberally with engine oil.

Refit the big end shells to their locations.

Stagger the ring gaps as follows–With the notch on the top of the piston pointing to the front of the engine, compression ring gaps should be located on the left side of the engine and staggered about 60 degrees apart. Neither gap should line up with oil ring gaps.

Rotate oil ring expander so that ends are at right side of engine. Rotate steel rails so that gaps are approximately opposite and positioned above gudgeon pin holes.

Compress the rings with a ring compressor taking care not to change the ring positions. Locate the piston and connecting rod into the cylinder block (piston notch facing the front of engine) taking care not to damage the bores.

Tap piston down into cylinder bore, using handle of a hammer. At the same time, guide connecting rod into position on crankshaft journal.

Fit the big end caps and secure with the big end nuts torque tightened to Data figure.

Refit sump (Refer to Sub-section A 221).

Refit cylinder head (Refer to Sub-section A 231).

Measuring Connecting Rod Bearing Clearance

The journal and bearing must be dry, as the plastigage is oil soluble.

Cut a length of plastigage the width of the journal to be checked. Immerse it in hot water to soften it then lay it on the journal, lengthwise on the axis (Fig. 9).

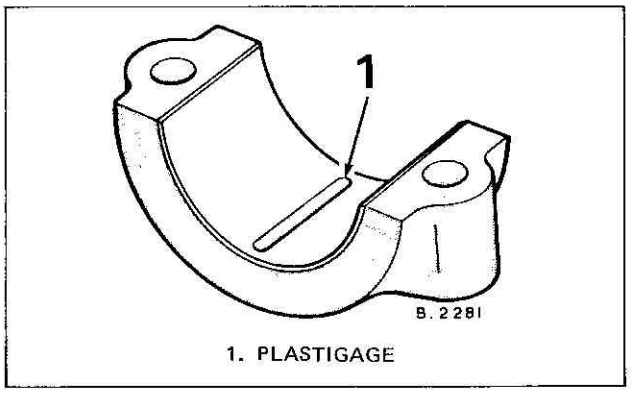


Fig. 9 *Plastigage placed in lower shell*

If the engine is on its side, retain the plastigage with a small dab of grease at each end.

Fit the connecting rod and cap with the appropriate half-shells and tighten the nuts to the specified torque.

Loosen and remove the nuts, remove the cap and connecting rod and measure the width of the crushed strip, using the graduated metric scale on the plastigage packing (Fig. 10). Check the indicated clearance against that specified in Data. New bearings should be installed if bearing clearance is not within specifications.

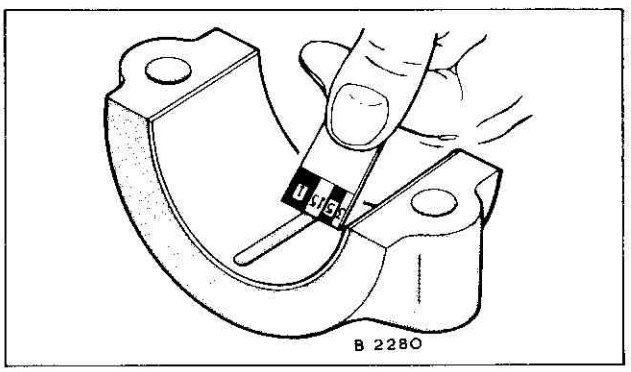


Fig. 10 *Clearance measurement*

Remove the crushed plastic from the journal, wipe it clean and oil it before assembly. Torque tighten to Data figure.

Perfect Circle plastigage is available in the United Kingdom from:–

World Radio Ltd.,
950 North Circular Road,
Cricklewood,
London NW2