18 Piston/connecting rod assembly - installation and connecting rod bearing oil clearance check

Selection of bearing shells

1 There are a number of sizes of connecting rod bearing shell produced by BMW; a standard size for use with the standard crankshaft, and oversize for use once the crankshaft journals have been reground.

2 Consult your BMW dealer for the latest information on parts availability. To be safe, always quote the diameter of the crankshaft connecting rod journals when ordering bearing shells.

3 Prior to installing the piston/ connecting rod assemblies, it is recommended that the connecting rod bearing oil clearance is checked as follows.

Connecting rod bearing oil clearance check

4 Clean the backs of the bearing shells, and the bearing locations in both the connecting rod and bearing cap.

5 Press the bearing shells into their locations, ensuring that the tab on each shell engages in the notch in the connecting rod and cap. Take care not to touch any shell's bearing surface with your fingers. If the original bearing shells are being used for the check, ensure that they are refitted in their original locations. The clearance can be checked in either of two ways.

6 One method is to install the connecting rod bearing cap to the connecting rod, using the marks made or noted on removal to ensure that they are fitted the correct way around, with the bearing shells in place. With the original cap retaining bolts correctly tightened, use an internal micrometer or vernier caliper to measure the internal diameter of each assembled pair of bearing shells. If the diameter of each corresponding crankshaft journal is measured and then subtracted from the bearing internal diameter, the result will be the connecting rod bearing oil clearance.

7 The second, and more accurate method is to use Plastigage (see Section 17).

8 Ensure that the bearing shells are correctly fitted. Place a strand of Plastigage on each (cleaned) connecting rod journal.

9 Install the (clean) piston/ connecting rod assemblies to the crankshaft, and install the connecting rod bearing caps, using the marks made or noted on removal to ensure that they are fitted the correct way around.

10 Install the original bearing cap bolts, and tighten the bolts to the specified torque in the two steps given in the Specifications. Take care not to disturb the Plastigage, nor rotate the connecting rod during the tightening sequence.

11 Disassemble the assemblies without rotating the connecting rods. Use the scale printed on the Plastigage envelope to obtain the connecting rod bearing oil clearance.

12 If the clearance is significantly different from that expected, the bearing shells may be the wrong size (or excessively worn, if the original shells are being re-used). Make sure that no dirt or oil was trapped between the bearing shells and the caps or block when the clearance was measured. If the Plastigage was wider at one end than at the other, the crankshaft journal may be tapered.

13 On completion, carefully scrape away all traces of the Plastigage material from the crankshaft and bearing shells. Use your fingernail, or some other object which is unlikely to score the bearing surfaces.

Final piston/connecting rod installation

Note:
New connecting rod cap bolts must be used when finally installing the piston/connecting rod assemblies. A piston ring compressor tool will be required for this operation.

14 Note that the following procedure assumes that the main bearing caps are in place (see Section 17).

15 Ensure that the bearing shells are correctly fitted as described earlier. If new shells are being fitted, ensure that all traces of the protective grease are cleaned off using solvent. Wipe dry the shells and connecting rods with a lint-free cloth.

16 Lubricate the cylinder bores, the pistons, and piston rings, then lay out each piston/ connecting rod assembly in its respective position.

17 Start with assembly No. 1. Make sure that the piston rings are still spaced (see Section 16), then clamp them in position with a piston ring compressor.

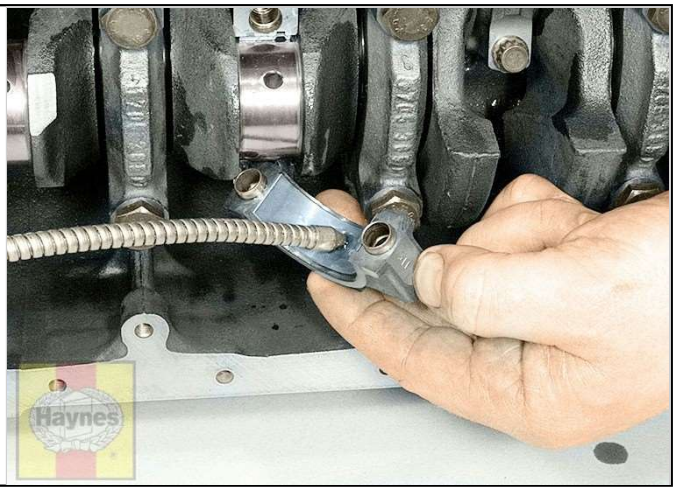
18 Insert the piston/ connecting rod assembly into the top of cylinder No. 1. Ensure that the arrow on the piston crown points towards the timing chain end of the engine, and that the identifying marks on the connecting rods and caps are positioned as noted before removal. Using a block of wood or hammer handle against the piston crown, tap the assembly into the cylinder until the piston crown is flush with the top of the cylinder **(see illustrations)** .

18.18a Insert the piston/connecting rod assembly into the top of the cylinder bore . . .

18.18b . . . then tap the assembly into the cylinder

19 Ensure that the bearing shell is still correctly installed. Liberally lubricate the connecting rod journal and both bearing shells **(see illustration)** . Taking care not to mark the cylinder bores, pull the piston/ connecting rod assembly down the bore and onto the connecting rod journal. Install the connecting rod bearing cap. Note that the bearing shell locating tabs must abut each other.

18.19 Lubricate the lower connecting rod bearing shells before fitting the caps



20 Fit new bearing cap securing bolts, then tighten the bolts evenly and progressively to the Step 1 torque setting. Once both bolts have been tightened to the Step 1 setting, angle-tighten them through the specified Step 2 angle, using a socket and extension bar. It is recommended that an angle-measuring gauge is used

during this stage of the tightening, to ensure accuracy **(see illustration)** . If a gauge is not available, use a dab of white paint to make alignment marks between the bolt and bearing cap prior to tightening; the marks can then be used to check that the bolt has been rotated sufficiently during tightening.

18.20 Using an angle-measuring gauge to tighten the connecting rod bearing cap bolts

21 Once the bearing cap bolts have been correctly tightened, rotate the crankshaft. Check that it turns freely; some stiffness is to be expected if new components have been fitted, but there should be no signs of binding or tight spots.

22 Install the remaining piston/ connecting rod assemblies in the same way.

23 Where applicable, install the oil baffle to the bottom of the cylinder block.

24 On four-cylinder engines, install the cylinder head and oil pan (see Chapter 2A).

25 On six-cylinder engines, install the cylinder head, oil pump and oil pan (see Chapter 2B).