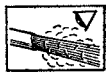
Section Aa

THE ENGINE

The information given in this Section refers specifically to the Sprite (Mk. IV) and Midget (Mk. III) and must be used in conjunction with Section A.

† These operations must be followed by an exhaust emission check 

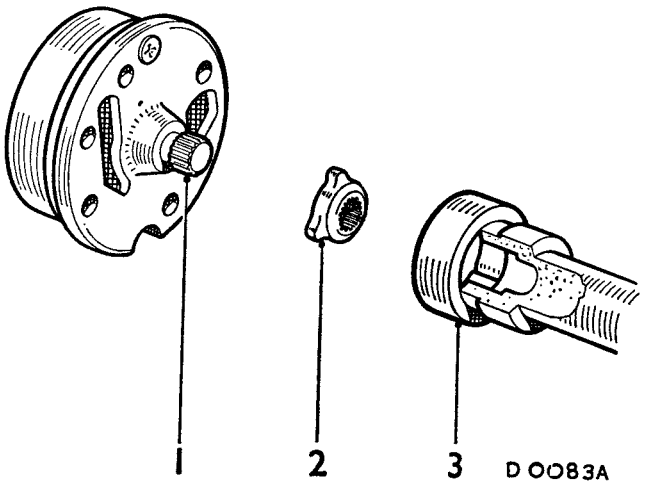


Fig. Aa.1

The oil pump drive, showing the correct position for the early-type driving flange

1. Oil pump drive shaft. 2. Driving flange. 3. Camshaft.

Section Aa.1

OIL PUMP

Removing

(1) Remove the engine (Section Aa.9).

(2) Remove the clutch assembly, flywheel, and the engine back plate (Section A.20).

(3) Unscrew the oil pump retaining screws and withdraw the pump.

Dismantling

(4) Refer to Section A.5 for the instruction covering the Concentric or Hobourn-Eaton pumps.

Refitting

(5) Follow the instructions given in Section A.5, noting that the early-type oil pump driving flange, which has offset drive lugs, is fitted with these lugs facing the oil pump. The driving lugs are centralized on later types.

Section Aa.2

ROCKER SHAFT ASSEMBLY

Removing and refitting

(1) Follow the instructions in Section A.6.

Dismantling and reassembling

(2) Carry out the instructions in Section A.6, noting that the six distance pieces are fitted; one to each side of the two outer rockers, and one to the bracket side of the two middle rockers.

Section Aa.3

VALVES

Removing

(1) Remove the cylinder head (Section A.12).

(2) Using tool 18G 45 compress the valve springs, remove the cotters, valve spring cups, springs, and valve spring seats.

(3) Remove the valve oil seal (inlet valves only—later engines), and withdraw the valves, marking them for reassembly in their original positions.

Refitting

(4) Fit each valve into its respective guide, followed by the spring seat (where fitted); then slide an oil seal down each inlet valve stem and fit it over the valve guide. Do not refit an oil seal to any of the exhaust valves, even if seals had originally been fitted.

(5) Fit the spring seat, springs, and spring cups.

(6) Compress the springs using tool 18G 45 and fit the cotters.

Section Aa.4

VALVE SEAT INSERTS

If the valve seats cannot be restored by the recutting process (Section A.15), machine out the seatings to the dimensions given in Fig. Aa.3 and press special inserts into the cylinder head. Each insert must have an interference fit of ·0025 to ·0045 in. (·063 to ·11 mm.).

After fitting, grind or machine the new seating to the dimensions given in Fig. Aa.3, and rifle out the insert to the contour of the port. Normal valve-grinding may be necessary to ensure efficient valve seating.

NOTE.—It is not possible to fit both an inlet and an exhaust valve seat insert in any one cylinder.

Section Aa.5

CAMSHAFT

Removing

(1) Drain the sump and remove the engine (Section Aa.9).

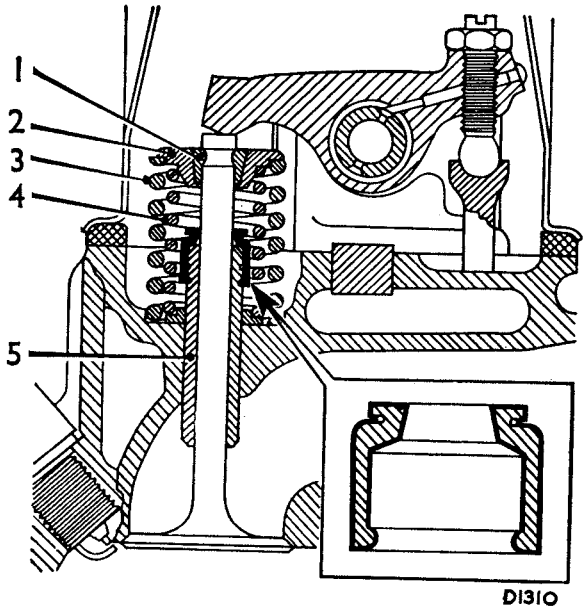


Fig. Aa.2

The valve components assembled. (The inlet valve oil seal is shown inset)

1. Split cotters. 2. Retaining cup. 3. Outer spring. 4. Inner spring. 5. Valve guide.

(2) Remove the rocker shaft assembly and the push-rods (Section A.6).
(3) Remove the timing cover and gears (Section A.22 and A.23).
(4) Remove the distributor assembly (Section A.19).
(5) Remove the sump.
(6) Remove the camshaft locating plate.
(7) Invert the engine, to allow the tappets to fall clear of the camshaft, withdraw the camshaft rotating it slowly to assist disengagement of the distributor drive. The oil pump drive flange may come away with the camshaft as it is withdrawn, if so it must be refitted (drive lug side towards the oil pump) to the oil pump drive shaft.

Refitting

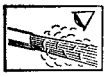
(8) Reverse the removal procedure in (1) to (9) noting the following points:
   (*a*) Ensure that the oil pump driving flange is correctly positioned on the pump drive shaft.
   (*b*) Rotate the camshaft slowly when refitting to assist engagement of the oil pump drive flange.
   (*c*) Fit the camshaft locating plate with its white-metal side towards the camshaft.

Camshaft bearing liners

(9) Refer to Section A.25 for removal, refitting, and reaming instructions.

Section Aa.6

TAPPETS



Removing

(1) Remove the camshaft (Section Aa.5).
(2) With the camshaft removed the tappets may be withdrawn from the cylinder block using a magnet or alternatively, turn the engine upright and allow the tappets to slide out under their own weight. Label the tappets to ensure correct reassembly in their original positions.

Section Aa.7

PISTONS AND CONNECTING RODS

Removing

Connecting rods

(1) Remove the cylinder head (Section A.12).
(2) Drain and remove the sump.
(3) Unscrew the connecting rod cap bolts, remove the caps with their bearing halves, and withdraw the connecting rods and pistons from the top of the cylinder bores. The connecting rods and caps should be marked to ensure refitting in their original positions.

Pistons

The gudgeon pin is a press fit to the connecting rod small-end. The interference fit of the pin in the small-end retains the gudgeon pin in its correct relative position and

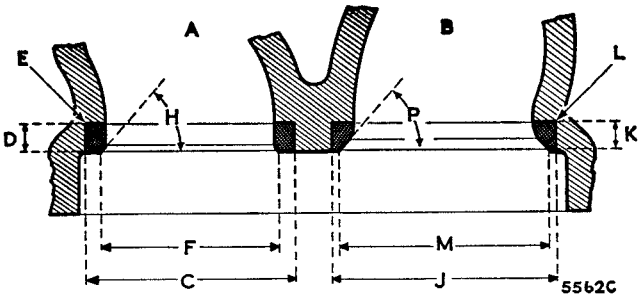


Fig. Aa.3

Valve seat machining dimensions

	Exhaust (A)		*Inlet* (B)
C.	1·2505 to 1·2515 in. (26·048 to 26·073 mm.).	J.	1·3805 to 1·3815 in. (35·063 to 35·088 mm.).
D.	·186 to ·188 in. (4·72 to 4·77 mm.).	K.	·186 to ·188 in. (4·72 to 4·77 mm.).
E.	Maximum radius ·015 in. (·38 mm.).	L.	Maximum radius ·015 in. (·38 mm.).
F.	1·144 to 1·164 in. (29·046 to 29·554 mm.).	M.	1·2995 to 1·3195 in. (32·89 to 33·38 mm.).
H.	45°.	P.	45°.

the piston bosses form the pin bearing surfaces. It is therefore essential that the specified interference fit (see **'GENERAL DATA'**) is maintained.

To remove the gudgeon pin Service tool 18G 1002 must be used to avoid crushing or distorting the piston.

(4) Retain the hexagonal body (8) of Service tool 18G 1002 in a vice with the cut-out (10) uppermost (see Fig. Aa.4).
(5) Screw the large nut (1) back until it is flush with the end of the centre screw (9), push the screw and nut forward until the nut contacts the thrust race (2).
(6) Slide the parallel sleeve (3), short length diameter first, on to the centre screw up to the shoulder.
(7) Place the piston assembly on the centre screw, then fit the remove/replacer bush (5), longest diameter portion towards the piston.
(8) Screw the stop nut (6) onto the centre screw and adjust it until there is approximately $\frac{1}{32}$ in. (·8 mm.) end-play in the whole assembly, ensuring that the parallel sleeve and the remover/replacer bush are correctly located in the gudgeon pin bores on both sides of the piston.
(9) Lock the stop nut securely in position with the lock screw (7).
(10) Check that the curved face of the body is clean, then slide the piston assembly carefully into position against the curved face. Check that the piston rings are over the cut-out in the tool body.
(11) Screw the large nut (1) up to the thrust race (2).
(12) Hold the lock screw (7), not the stop nut, with a spanner, and turn the large nut (1) until the gudgeon pin is withdrawn from the piston.

Refitting

Pistons

(13) Remove the large nut (1) of Service tool 18G 1002, and pull the centre screw out a few inches as shown in Fig. Aa.5.

(14) Slide the parallel sleeve (3), longest length diameter portion first, on to the centre screw up to the shoulder.

(15) Place the piston on the connecting rod small end up to the undercut (11).

(16) Smear the gudgeon pin with thin oil and slide it over the centre screw and into the piston bore up to the face of the connecting rod.

(17) Slide the remover/replacer brush, short spigot towards the gudgeon pin, on to the centre screw.

(18) Screw the stop nut (6) onto the centre screw, adjust the nut to give $\frac{1}{32}$ in. (·8 mm.) end-play, and lock the nut securely in position with the lock screw (7).

the piston skirt. Under no circumstances must the flange be allowed to contact the piston.

If the torque wrench has not broken throughout the pull the fit of the gudgeon pin to the connecting rod is not acceptable and necessitates the renewal of components.

It is essential that the large nut and the centre screw of the tool is kept well lubricated with thin engine oil, to avoid excessive friction which may result in a false torque wrench reaction.

(23) Check that the piston pivots freely on the pin, and is also free to slide sideways. Should this not be so, wash the assembly in fuel or paraffin (kerosene), lubricate the gudgeon pin with neat Acheson's

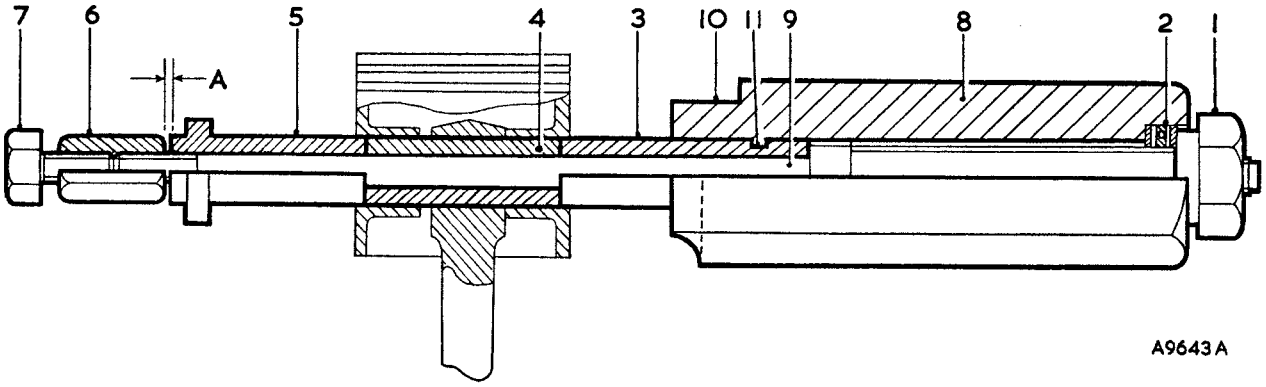


Fig. Aa.4

Service tool 18G 1002 *in position to remove the gudgeon pin*

1. Large nut.
2. Thrust race.
3. Parallel sleeve.
4. Gudgeon pin.
5. Remover/replacer bush.
6. Stop nut.
7. Lock screw.
8. Body.
9. Centre screw.
10. Cut-out.
11. Undercut.

'A' = $\frac{1}{32}$ in. (·8 mm.).

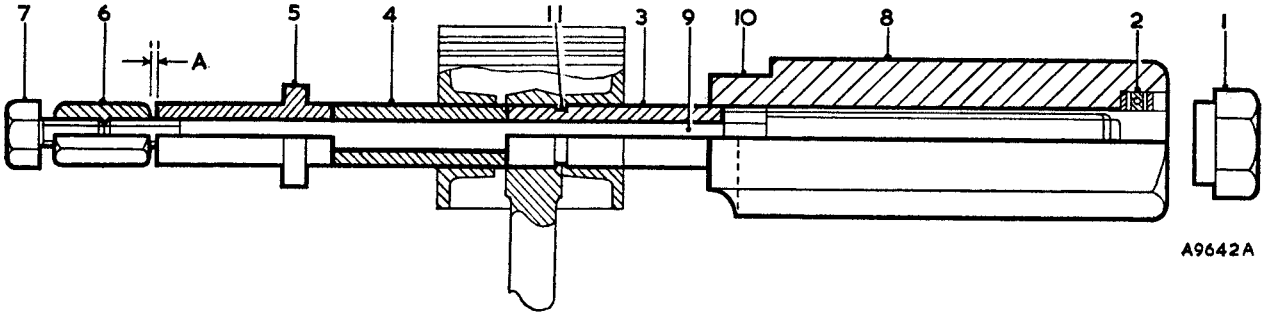


Fig. Aa.5

Service tool 18G 1002 *in position to refit the gudgeon pin*

(19) Check that the curved face of the body is clean, then slide the piston into position against the curved face. Check that the piston rings are over the cut-out in the tool body.

(20) Screw the large nut onto the centre screw until it contacts the thrust race (2).

(21) Set the torque wrench 18G 537 to 16 lb. ft. (2·21 kg. m.). This represents the minimum load for an acceptable fit.

(22) Using Service tool 18G 587 with the torque wrench on the large nut (1), and holding the lock screw (7) with a suitable spanner, turn the large nut to pull the gudgeon pin until the flange of the remover/replacer bush (5) is $\frac{1}{32}$ in. (·8 mm.) from

Colloids 'oil dag' and recheck. If stiffness persists, dismantle the assembly and check for ingrained dirt or damage.

(24) When the assembly is satisfactory, check the piston and connecting rod for alignment and, lubricate the gudgeon pin with Acheson's Colloids 'oil dag' before refitting to the engine.

Connecting rods

(25) Reverse the removal procedure in (1) to (3) noting the following points.

(*a*) Stagger the piston ring gaps at 90° to each other. For oil control rings see Section A.35. Compress the piston rings using Service tool 18G 55A.

(*b*) Ensure that each connecting rod and piston is refitted in to original bore, the correct way round.

(*c*) Check that the big-end bearings are correctly located in the connecting rods and caps. Check that the self-locking nuts lock to the stud threads efficiently. If in doubt fit new nuts. Tighten the bearing cap nuts to the torque figure given in **'GENERAL DATA'.**

NOTE.—The big-end bearings are offset on the connecting rods, the rods should be fitted so that the bearings of Nos. 1 and 3 are offset towards the rear of the engine, and the bearings of Nos. 2 and 4 are offset towards the front (see Fig. Aa.6).

Section Aa.8

PISTON SIZES AND CYLINDER BORES

In addition to the standard pistons there are also two oversize pistons available for service purposes.

Oversize pistons are marked with the actual oversize dimension enclosed in an ellipse, and are suitable for a bore oversize to standard by the same dimension.

The piston markings indicate the actual bore size to which they must be fitted, the requisite running clearance being allowed for in the machining.

Pistons are available in the sizes indicated in the table.

Piston marking	*Suitable bore size*	*Metric equivalent*
STANDARD	2·7803 to 2·7800 in.	70·622 to 70·615 mm.
OVERSIZE		
+·010 in. (·254 mm.)	2·7903 to 2·7900 in.	70·876 to 70·869 mm.
+·020 in. (·508 mm.)	2·8003 to 2·8000 in.	71·13 to 71·123 mm.

Section Aa.9

ENGINE

Removing

(1) Remove the bonnet (Section R.2).
(2) Disconnect the earth lead from the battery.
(3) Drain the cooling system (Section C.3), the engine sump (Section A.1), and the gearbox (Section F.1).
(4) Remove the radiator (Section C.5).
(5) Unscrew the two through-bolts from both air cleaners and remove the air cleaners.
(6) Disconnect the inlet and outlet heater hoses from the heater unit.
(7) Disconnect the petrol feed pipe from its connection on the front carburetter, and disconnect the choke cable from the mixture control lever.
(8) Release the clamp securing the exhaust pipe to the manifold and lower the pipe.

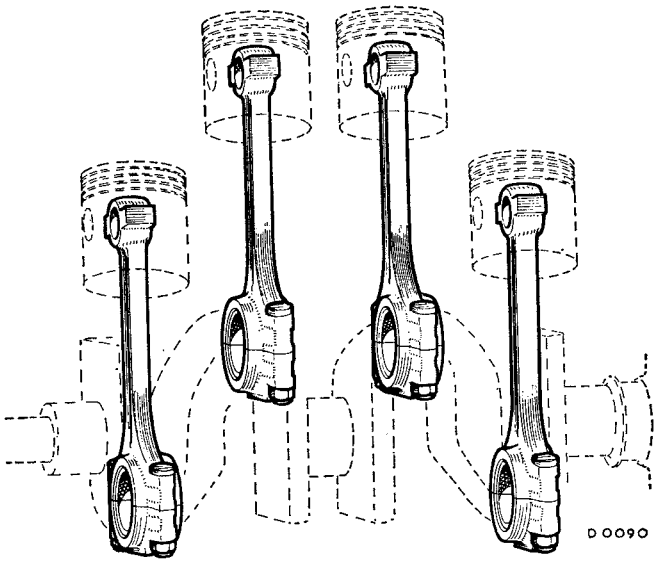


Fig. Aa.6

The correct assembly of the connecting rods and pistons to the crankshaft

(9) Disconnect the throttle cable from the accelerator pedal cross-shaft and pull the cable through the engine bulkhead.
(10) Disconnect the cables from the dynamo and oil filter and the low-tension cables from the coil and distributor.
(11) Detach the high-tension cables from the sparking plugs and coil and remove the distributor cap.
(12) Disconnect the cable from its connection on the starter, and disconnect the oil pressure gauge pipe from the cylinder block union.
(13) Remove the carpet covering the gearbox tunnel, remove the screws securing the gear lever aperture cover and remove the cover.
(14) Unscrew the plug in the change speed tower and withdraw the damper spring and plunger.
(15) Unscrew the three screws securing the gear lever retaining plate and lift out the lever complete with retaining plate.
(16) Remove the gearbox rear mounting bolts from the sides of the gearbox tunnel.
(17) Remove the clutch slave cylinder securing bolts, and withdraw the cylinder from its push-rod.
(18) Disconnect the speedometer cable from the gearbox.
(19) Remove the two gearbox mounting bolts fitted through the under frame.
(20) Mark the propeller shaft rear universal joint flange and the rear axle flange, to assist correct reassembly, remove the flange securing bolts, disconnect the propeller shaft, and withdraw it rearwards out of engagement with the gearbox shaft.
(21) Take the weight of the engine on a crane, remove the three bolts securing the left-hand engine mounting to the body and the two nuts securing the right-hand engine mounting to the engine front plate.

(22) Ease the engine and gearbox assembly forward until the gearbox remote control is clear of the tunnel and then tilt the assembly and lift it from the car.

Refitting

(23) Lower the assembly into the car with the lifting sling positioned at the front of the engine. Transfer the sling position to the rear of the engine, raise the gearbox and enter the remote control into the tunnel.

(24) With access through the gear lever aperture in the tunnel, enter the propeller shaft coupling onto the gearbox shaft splines.

(25) Push the assembly back into its correct position and fit the two gearbox rear mounting bolts.

(26) Reverse the operations in (1) to (15) and (17) to (21), then refill the engine and gearbox with a recommended oil. Refill the cooling system.

Section Aa.10

CYLINDER LINERS

Follow the instructions given in Section A.30, using pilot adaptors to the dimensions given in Fig. Aa.7, and machining the bores of the cylinder block and the cylinder liners to the dimensions given in the table below.

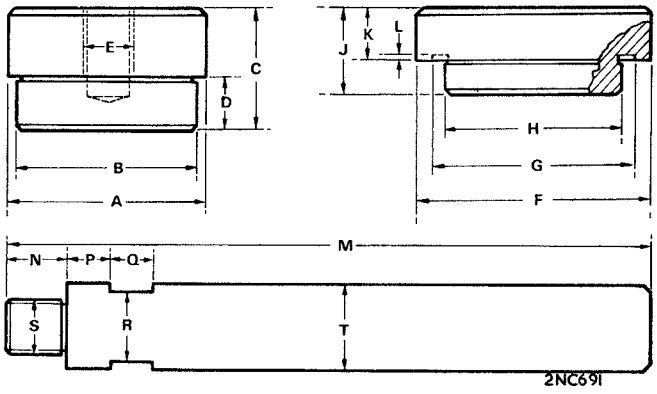


Fig. Aa.7

Cylinder liner pilots should be made to the above dimensions from case-hardening steel, and case hardened. The pilot extension should be made from 55-ton hardening and tempering steel, hardened in oil and then tempered at 550° C. (1,020° F.)

Pressing-out pilot:
- A. 2·778 in. $\pm \frac{\cdot 005}{\cdot 000}$ in. (70·55 $\pm \frac{\cdot 13}{\cdot 00}$ mm.).
- B. 2·859 $\pm \frac{\cdot 000}{\cdot 005}$ in. (72·63 $\pm \frac{\cdot 00}{\cdot 13}$ mm.).
- C. 1·75 in. (44·5 mm.).
- D. ·75 in. (19 mm.).
- E. $\frac{3}{4}$ in. B.S.W. thread.

Pressing-in pilot:
- F. 3·312 in. (84·14 mm.).
- G. 2·906 in. (73·8 mm.).
- H. 2·753 $\pm \frac{\cdot 000}{\cdot 005}$ in. (69·93 $\pm \frac{\cdot 00}{\cdot 13}$ mm.).
- J. 1·25 in. (31·75 mm.).
- K. ·75 in. (19 mm.).
- L. ·015 in. (·38 mm.).

Pilot extension: Dimensions as given in Fig. A.20.

Engine type	*Liner Part No.*	*Machine bores of cylinder block to this dimension before fitting liner*	*Outside diameter of liner*	*Interference fit of liner in cylinder block bore*	*Machine liner bore to this dimension after fitting*
1275 c.c.	AEG 428	2·8750 to 2·8755 in. (73·025 to 73·038 mm.)	2·8775 to 2·87825 in. (73·088 to 73·108 mm.)	·002 to ·00325 in. (·05 to ·08 mm.)	2·7800 to 2·7815 in. (70·612 to 70·650 mm.)

Section Ab

THE ENGINE (EMISSION CONTROL)

The information given in this Section refers specifically to service operations on, or affected by equipment fitted to the Sprite Mk. IV and Midget Mk. III in conformity with local and territorial requirements, and must be used in conjunction with Section A and Section Aa.

Section Ab.1

CRANKSHAFT PULLEY

Removing

(1) Remove the radiator and return pipe as described in Section C.5.
(2) Slacken the air pump mounting bolts and remove the air pump drive belt.
(3) Slacken the dynamo mounting bolts and remove the fan belt.
(4) Unscrew the four fan and pulley retaining screws and remove the fan and pulley.
(5) Remove the three bolts securing the right-hand engine mounting to the body.
(6) Remove the two mounting stud nuts from the left-hand engine mounting.
(7) Unscrew the three exhaust pipe flange bolts and detach the pipe from the manifold.
(8) Raise the front of the engine just sufficiently to allow the crankshaft pulley to be withdrawn over the body cross-member.
(9) Knock back the lock washer tag on the pulley retaining bolt.
(10) Using tool 18G 98 A remove the pulley retaining bolt.
(11) Carefully withdraw the pulley from the crankshaft.

Refitting

(12) Reverse the removing procedure in (1) to (11), refill the cooling system.

Section Ab.2

TIMING COVER

Removing

(1) Remove the crankshaft pulley as described in Section Ab.1.
(2) Disconnect the crankcase breather pipe from the oil separator.
(3) Remove the timing cover securing screws and withdraw the cover.

Inspection

(4) Inspect the oil seal in the cover; renew the seal if there are signs of wear or deterioration using tool 18G 134 with adaptor 18G 134 BD.

Refitting

(5) Reverse the removing procedure in (1) to (3) using tool 18G 1044 to centralize the oil seal on the crankshaft, refill the cooling system.

Section Ab.3

ENGINE

Removing

(1) Remove the bonnet (Section R.2).
(2) Disconnect the battery.
(3) Drain the cooling system (Section C.3) and the gearbox (Section F.1).
(4) Remove the radiator and bottom return pipe (Section C.5).
(5) Remove both carburetter air cleaners.
(6) Disconnect the petrol feed pipe and choke cable from the carburetters.
(7) Disconnect the inlet and outlet hoses from the heater unit, and the carbon canister hoses from the carburetter and the rocker cover.
(8) Unscrew the three exhaust pipe flange bolts and detach the pipe from the manifold.
(9) Disconnect the throttle cable from the accelerator pedal cross-shaft and pull the cable through the engine bulkhead.
(10) Disconnect the cables from the dynamo/alternator, and the low tension cable from the distributor.
(11) Detach the high tension cables from the sparking plugs and coil and remove the distributor cap.
(12) Disconnect the cable from the starter.
(13) Disconnect the oil pressure gauge pipe from the cylinder block union.
(14) Unscrew the gland nut and withdraw the temperature gauge sensing bulb from the cylinder head.
(15) Remove the carpet covering the gearbox tunnel, remove the screws securing the gear lever aperture cover and remove the cover.
(16) Unscrew the plug in the change speed tower and withdraw the damper spring and plunger.
(17) Unscrew the three screws securing the gear lever retaining plate and lift out the lever complete with retaining plate.
(18) Remove the gearbox rear mounting bolts from the sides of the gearbox tunnel.
(19) Disconnect the reverse light switch wiring at the snap connectors on the side of the gearbox.
(20) Remove the clutch slave cylinder securing bolts and withdraw the cylinder from its push-rod. Note that the earthing strap is fitted under the head of the lower slave cylinder bolt.
(21) Disconnect the speedometer cable from the gearbox and release the cable from its clip on the engine rear plate.
(22) Remove the two gearbox mounting bolts fitted through the under frame.
(23) Mark the propeller shaft rear universal joint and the rear axle flange to assist correct refitting, remove the flange securing bolts, disconnect the propeller shaft, and withdraw it rearwards out of engagement with the gearbox.
(24) Take the weight of the engine on a crane, remove the three bolts securing the right-hand engine mounting to the body and the two nuts securing the left-hand engine mounting to the engine front plate.
(25) Ease the engine and gearbox forward until the gearbox remote control is clear of the tunnel, then tilt the assembly and lift it from the car.

Refitting

(26) Lower the assembly into the car with the lifting sling positioned at the front of the engine.

(27) Transfer the sling position to the rear of the engine, raise the gearbox and enter the remote control into the tunnel.
(28) With access through the gear lever aperture, enter the propeller shaft coupling onto the gearbox shaft splines.
(29) Push the assembly back into its correct position and fit the two gearbox rear mounting bolts.
(20) Reverse the operations in (1) to (17) and (19) to (24), refill the gearbox with a recommended lubricant and refill the cooling system.

Section Ab.4

INLET AND EXHAUST MANIFOLD

Removing

(1) Disconnect the battery.
(2) Remove the air cleaners as detailed in Section D.6.
(3) Disconnect the mixture control, fuel delivery hose, engine breather pipe and the float chamber vent pipe from the carburetters.
(4) Release the three throttle return springs from the levers on the carburetter linkage.
(5) Remove the four nuts securing the carburetters to the inlet manifold and withdraw the carburetters, at the same time disconnecting the throttle interconnecting spindle from the carburetter linkage.
(6) Remove the two bolts and nuts securing the carburetter heat shield to its steady clips. Withdraw the carburetter distance pieces, and the heat shield complete with accelerator cable from the manifold.
(7) Disconnect the ignition vacuum advance pipe from the union on the inlet manifold and unscrew the union from the manifold to release the heater water pipe.
(8) Disconnect the sensing hose from the gulp valve and the gulp valve hose from the inlet manifold.
(9) Remove the nuts securing the exhaust pipe to the manifold flange.
(10) Remove the nuts securing the inlet and exhaust manifold to the cylinder head. Withdraw the gulp valve, inlet manifold and exhaust manifold.

Refitting

(11) Reverse the procedure in (1) to (10), ensuring that the mixture control has $\frac{1}{16}$ in. (1·5 mm.) free movement before it commences to operate the carburetter cam levers.

Section Ab.5

ENGINE RESTRAINT

(Midget Mk. III from Car No. G–AN5–146370)

Removing

(1) Slacken the restraint tube front nut.
(2) Remove the restraint tube rear nut and withdraw the rear plate and buffer.
(3) Remove the nut and bolt securing the restraint tube to the gearbox bracket and withdraw the restraint tube from the bracket on the rear engine mounting cross-member.
(4) Remove the distance tube, front buffer and plate from the restraint tube.

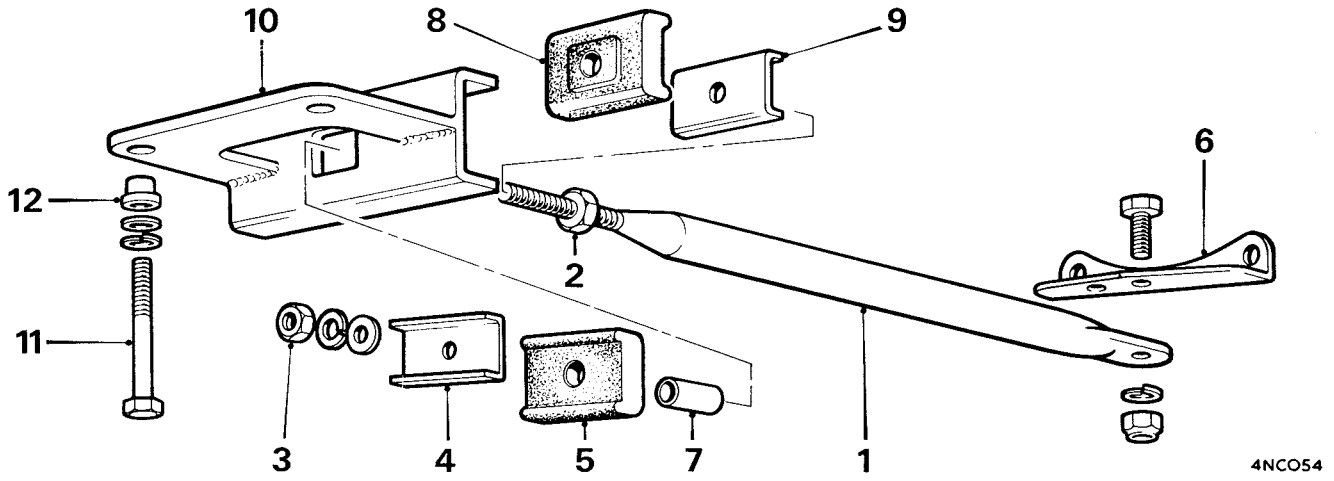


Fig. Ab.1

The engine restraint (Midget Mk. III from Car No. G–AN5–146370)

1. Engine restraint tube.
2. Front nut.
3. Rear nut.
4. Rear plate.
5. Rear buffer.
6. Gearbox bracket.
7. Distance tube.
8. Front buffer.
9. Front plate.
10. Engine mounting rear cross-member bracket.

Refitting

(5) Reverse the procedure in 1 to 4, noting the following:

(*a*) Inspect the buffers for damage and deterioration, and renew if necessary.

(*b*) Tighten the restraint tube rear nut first, then tighten the front nut.

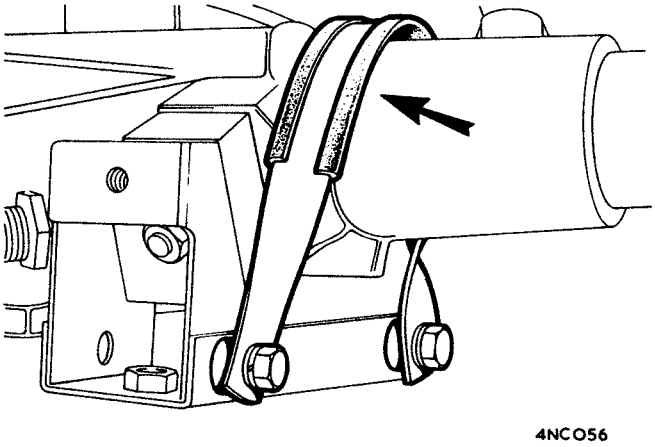


Fig. Ab.2

Showing the gearbox steady strap
(*Midget Mk. III from Car No. G–AN5–146370*)