

SECTION Aa

THE ENGINE

The information given in this Section refers specifically to engines fitted with automatic transmission and must be used in conjunction with Section A

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Section Aa.1

LUBRICATION

Engine/transmission oil level

- (1) Start the engine and run for 1-2 minutes. Switch off the ignition and wait for 1 minute.
- (2) Check the oil level with the dipstick and top up if necessary with the recommended oil to the 'MAX' mark on the dipstick.

Changing the engine/transmission oil

The oil should be drained at the periods recommended in the Driver's Handbook and whilst it is warm and fluid.

- (3) Remove the magnetic drain plug from the right-hand side of the transmission casing and allow the oil to drain. Clean (using non-fluffy cloth) and refit the drain plug.
- (4) Refill the engine/transmission unit with the recommended oil to the 'MAX' mark on the dipstick.
- (5) Carry out items (1) and (2).

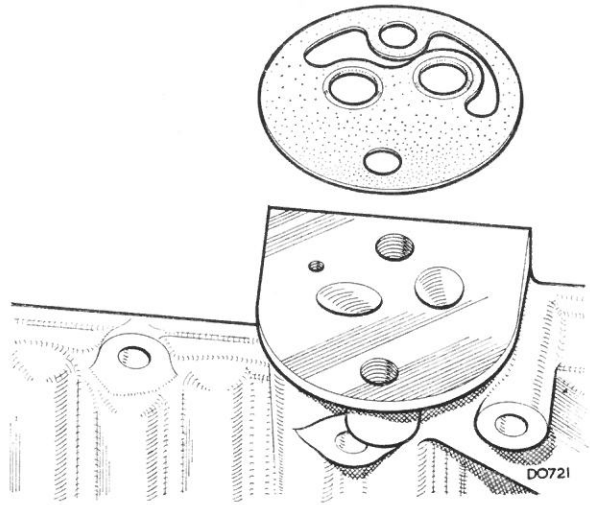


Fig. Aa.2

The correct location of the filter head to front cover joint washer

Section Aa.2

OIL FILTER

Element replacement

Removing

- (1) Remove the front left-hand grille (Fig. Aa.1).
- (2) Place a suitable container beneath the oil filter.
- (3) Unscrew the central retaining bolt and remove the bowl and element assembly.

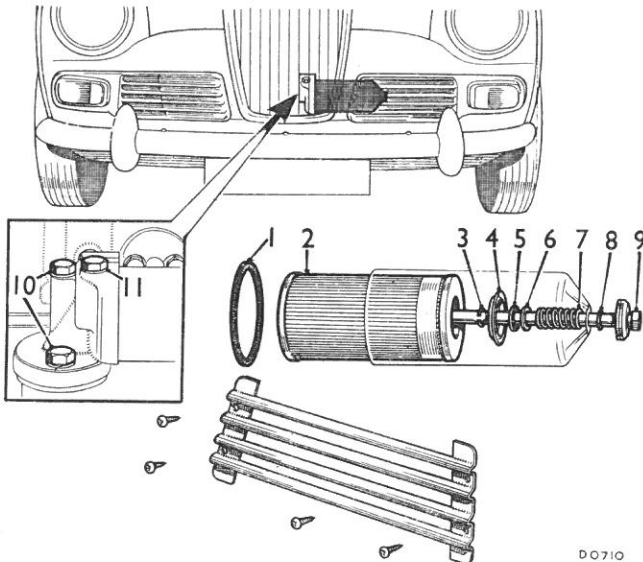


Fig. Aa.1

The location of the filter and its components, showing the grille, with (inset) the filter head

- | | |
|-----------------------|----------------------------------|
| 1. Bowl sealing ring. | 7. Spring. |
| 2. Filter element. | 8. Sealing ring. |
| 3. Circlip. | 9. Centre bolt. |
| 4. Sealing plate. | 10. Filter head retaining bolts. |
| 5. Seating washer. | 11. Oil pressure check plug. |
| 6. Steel washer. | |

Cleaning

- (4) Thoroughly clean the filter bowl with petrol (fuel) and dry off.
- (5) Wipe the filter head clean and fit a new sealing ring in the filter head recess.

Refitting

- (6) Reassemble the filter bowl with a new element and the internal components fitted in the order shown in Fig. Aa.1. Ensure that the internal seating washer is in good condition and a snug fit on the retaining bolt.
- (7) Refit the filter bowl assembly and tighten the central retaining bolt to the torque figure given in 'GENERAL DATA'.
- (8) Check for oil leakage immediately the engine is started.
- (9) Top up the engine oil level following the instructions in Section Aa.1.
- (10) Refit the front left-hand grille.

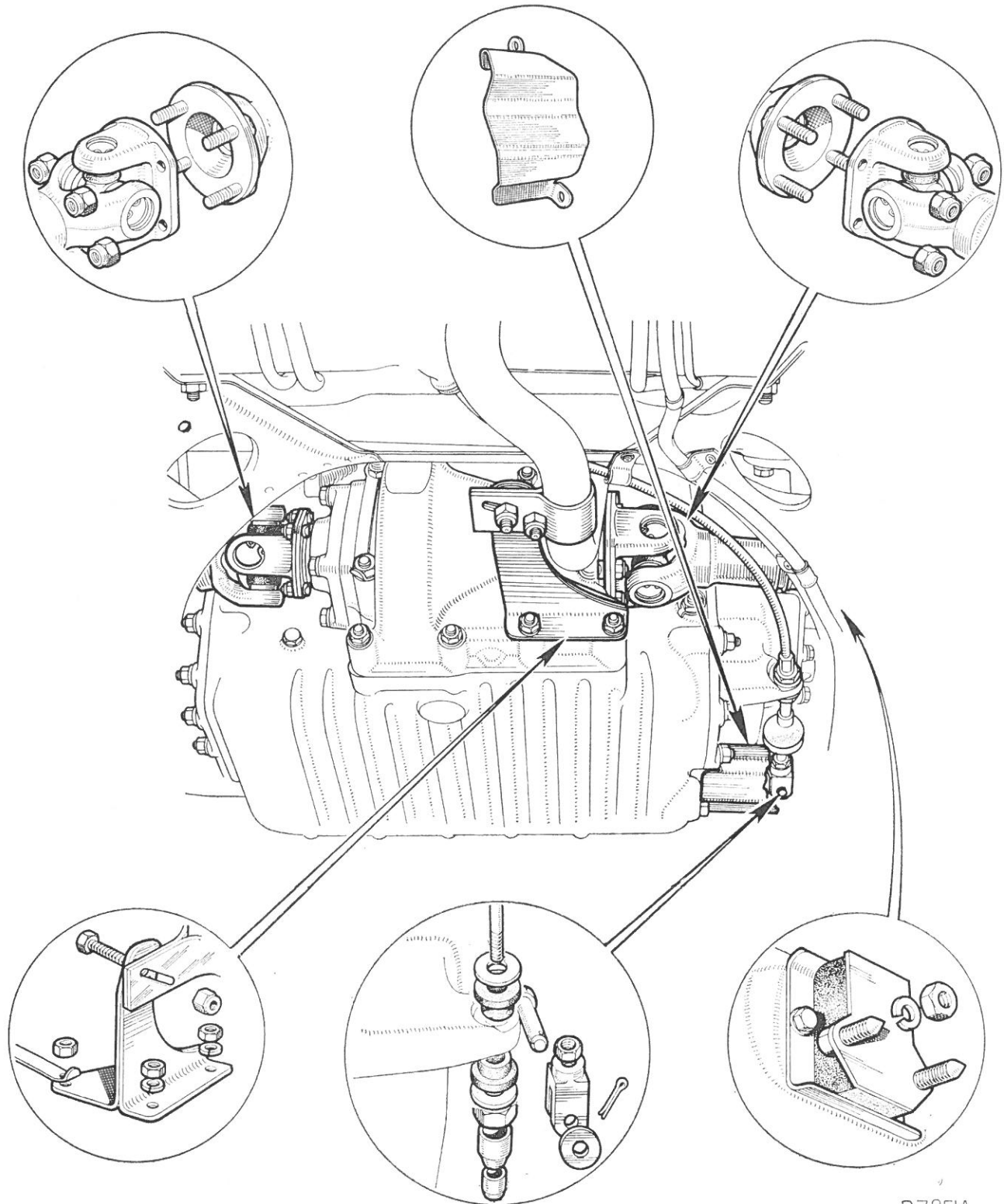
Filter head and bowl assembly

Removing

- (11) Unscrew the filter head retaining bolts and remove the assembly through the central grille aperture.

Refitting

- (12) Reverse the removal instructions, fitting a new joint washer with the correct face of the joint washer to the base of the front cover (see Fig. Aa.2). Tighten the securing bolts to the torque figure in 'GENERAL DATA'.
- (13) Carry out items (8) and (9).



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Fig. Aa.3 The main components to be disconnected or removed from below the car before removing the engine and transmission unit

Section Aa.3

ENGINE AND TRANSMISSION

Removing

- (1) Disconnect the battery earth cable and remove the bonnet.
- (2) Raise the front of the car until the wheels are free to rotate and remove the drive shaft flange securing nuts.
- (3) Remove the weather protection cover (Fig. Aa.3)

and disconnect the gear selector cable by removing the clevis pin. Slacken the yoke clamp nut and remove the yoke, nut, and rubber ferrules and sleeve. Remove the cable front adjusting nut from the outer cable and pull the cable clear of the transmission.

- (4) Remove the exhaust bracket from the final drive cover. The larger nut is secured by a locking tab (see Fig. Aa.3).

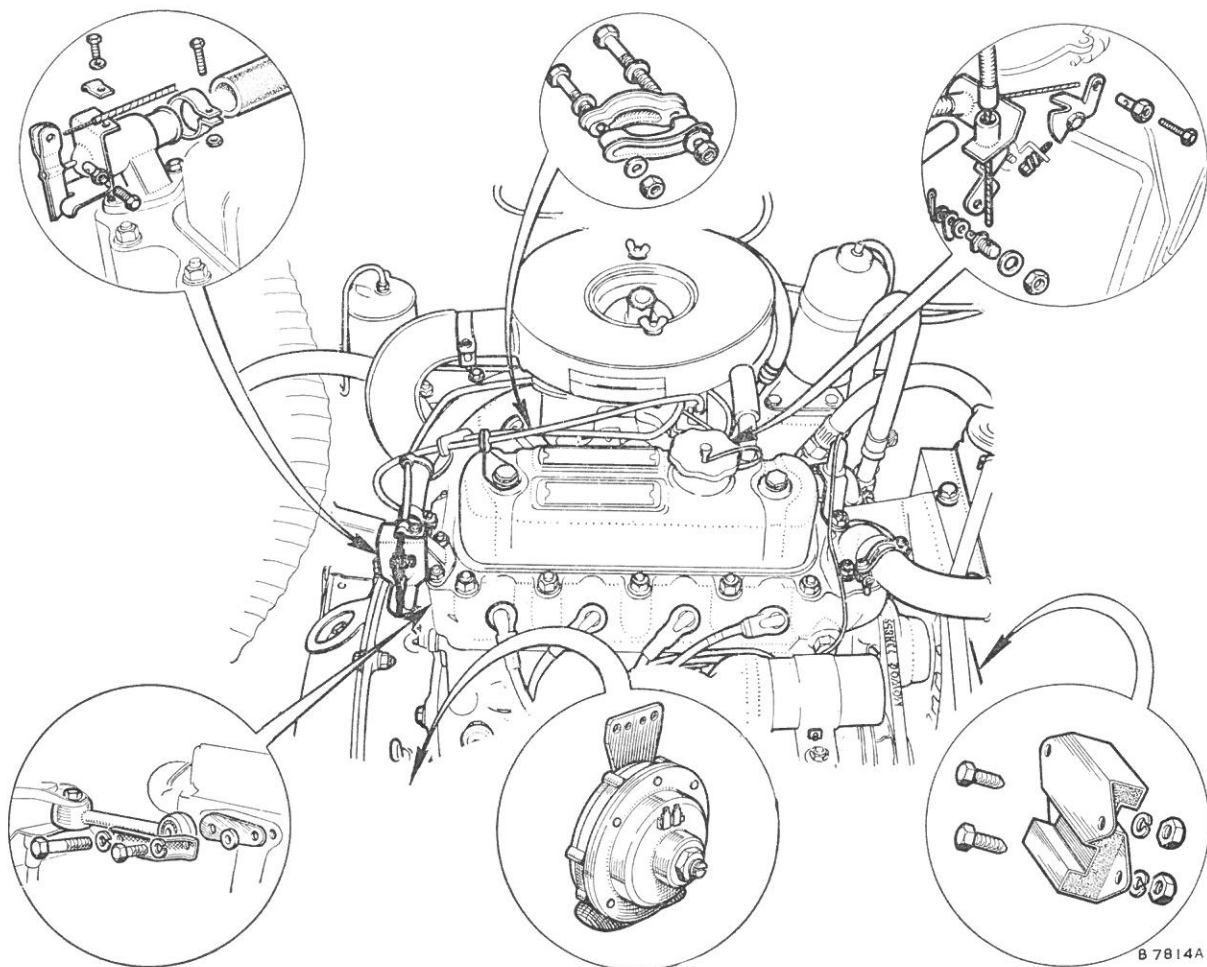


Fig. Aa.4

The main components to be disconnected or removed from above the car before removing the engine and transmission unit

- (5) Drain the cooling system as in Section C.2.
- (6) Disconnect the heater hoses and the water control valve cable. Slacken the fixing clips on the heater fresh air tube connections on the grille and the wing valance and swing the tube clear of the engine bay.

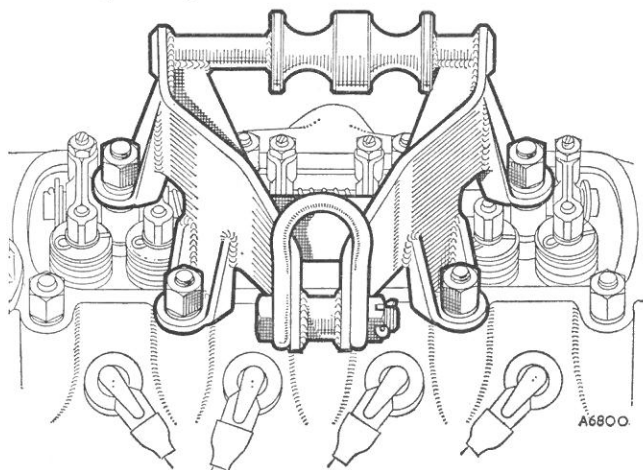


Fig. Aa.5

Use the individual front lifting eye of the attachment to give an angled lift when removing and refitting the power unit

- (7) Disconnect all electrical connections from the engine.
- (8) Remove the distributor cap.
- (9) Remove the air cleaner as in Section Da.1.
- (10) Remove the carburettor as in Section Da.2.
- (11) Disconnect the speedometer cable from the rear of the instrument.
- (12) Disconnect the oil pressure gauge hose.
- (13) Disconnect and remove the horn.
- (14) Disconnect the exhaust pipe from the manifold and secure the pipe against the bulkhead.
- (15) Disconnect the tie-rod from the cylinder block and swing the rod away from the engine.
- (16) Remove the rocker cover nuts and fit the engine lifting bracket (Fig. Aa.5)
- (17) Remove the set screws securing each engine mounting to the sub-frame.
- (18) Lift the engine sufficiently to release the drive shafts from the driving flanges, and remove the engine/transmission unit from the car.

Refitting

- (19) Reverse the removal instructions with particular attention to the following points.
- (20) Lower the engine/transmission unit to a position where the drive shafts can engage the driving flange

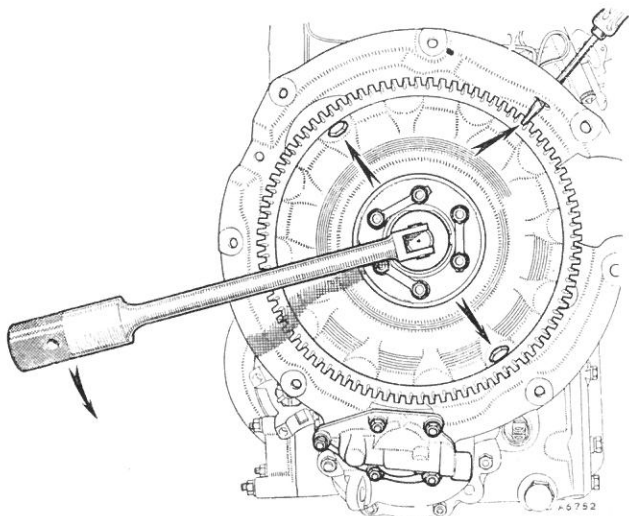


Fig. Aa.6

Removing the converter centre bolt, using Service tool 18G 587. A suitable screwdriver inserted through the converter housing to stop the converter turning, and the converter drain plugs, are indicated by arrows

studs and screw the securing nuts on approximately four threads. Lower the unit completely into the car.

- (21) Adjust the gear selector rod and cable as in Section Fa.2.
- (22) Top up the engine with oil as described in Section Aa.1.

Section Aa.4

TRANSMISSION UNIT

Removing

- (1) Remove the engine and transmission (see Section Aa.3).
- (2) Remove the radiator mounting bracket from the transmission case.

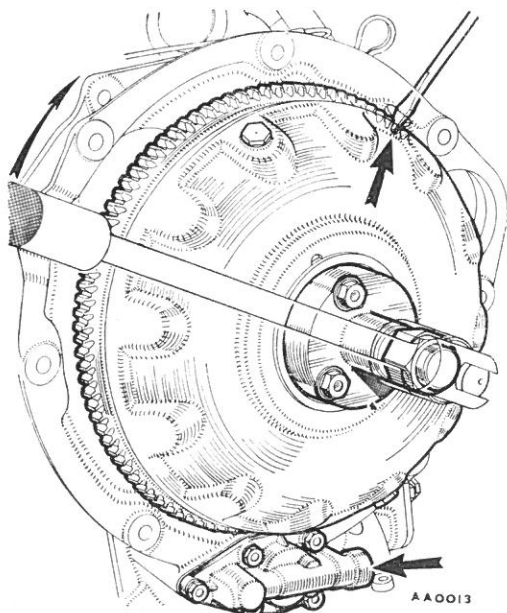


Fig. Aa.7

Removing the converter using Service tool 18G 1086. A screwdriver to stop the converter turning, and the low pressure valve, are indicated by the arrows

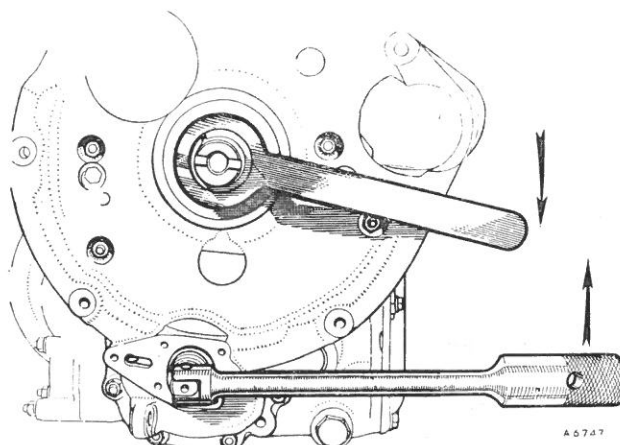


Fig. Aa.8

Using Service tool 18G 1088 to hold the converter output gear when removing the input gear nut

- (3) Remove the starter motor and converter cover.
- (4) Drain the transmission.
- (5) Knock back the lock washer on the converter centre bolt. Hold the converter from turning with a suitable screwdriver inserted through the hole in the converter housing. Using Service tool 18G 587, remove the centre bolt (Fig. Aa.6).
- (6) Knock back the locking tabs and remove three equally spaced set screws from the converter centre. Ensure that the slot in the end of the crankshaft is horizontal. Using Service tool 18G 1086 with the adaptor correctly positioned, remove the converter (Fig. Aa.7).
- (7) Remove the low-pressure valve from the converter housing.
- (8) Fit Service tool 18G 1088 onto the converter output gear and remove the input gear self-locking nut (Fig. Aa.8).

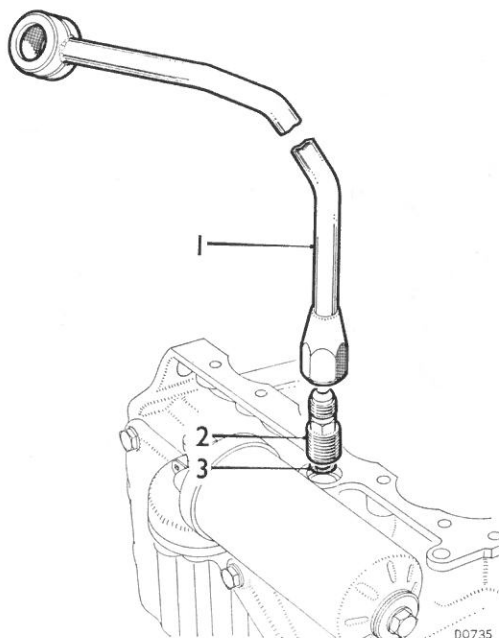


Fig. Aa.9

The engine oil feed pipe (1) and adaptor (2) with the adaptor internal 'O' ring (3)

- (9) Remove the gear change bell-crank lever clevis pin and nut and lift off the bell-crank lever. Remove the bell-crank lever pivot.
- (10) Fit the nylon protector sleeve Service tool 18G 1098 over the converter output gear.
- (11) Remove the nuts and set screws securing the converter housing to the transmission and lift away the housing.
- (12) Lever the main oil feed pipe from the transmission and oil pump.
- (13) Remove the idler gear, thrust washers, and the converter output gear assembly.
- (14) Remove the oil filter assembly and disconnect the engine oil feed pipe (Fig. Aa.9).
- (15) Remove the nuts and set screws securing the engine to the transmission and with suitable lifting equipment lift away the engine from the transmission.

Inspecting

Ensure that the oil rings fitted to the main oil pipe, oil filter, transmission to engine oil feed pipe adaptor, and the main oil strainer pipe are in perfect condition. All joint faces must be free from burrs and new joint washers should be used.

Inspect the idler gear bearings and renew if necessary, using Service tool 18G 581 to remove the bearings from the casings. Inspect the input gear bearing and renew if

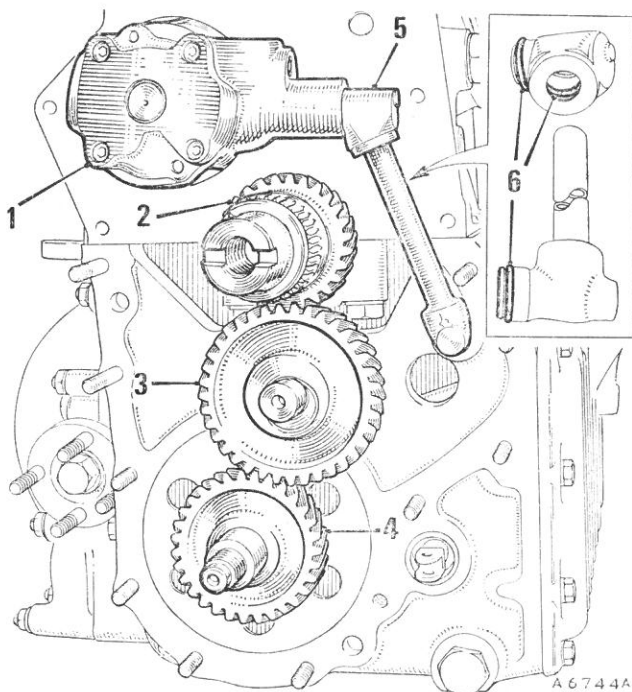


Fig. Aa.10

The converter housing removed showing:

- | | |
|---------------------------|-------------------|
| 1. Main oil pump. | 4. Input gear. |
| 2. Converter output gear. | 5. Oil feed pipe. |
| 3. Idler gear. | 6. Sealing rings. |

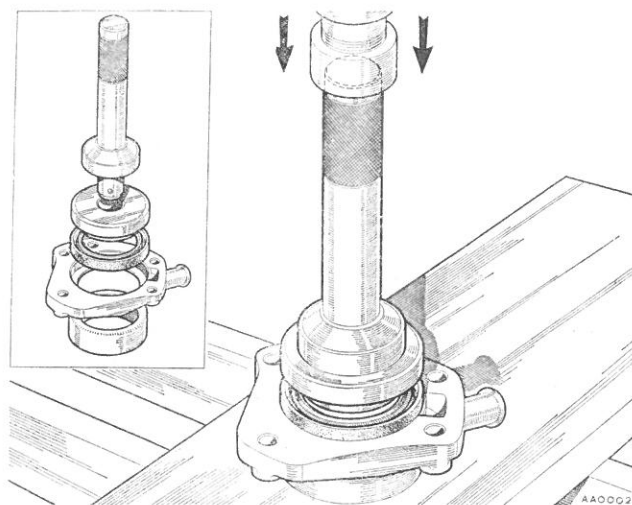


Fig. Aa.11

- Replacing the converter output gear oil seal. Pressing the seal in, using Service tools 18G 134 and adaptor 18G 134 CN, with (inset) showing exploded view●

necessary by removing the circlip and pressing the bearing from the housing.

- Check the main oil seals and renew if necessary. If it is necessary to renew the converter housing oil seal this operation is detailed in Section Aa.15. To renew the converter output gear oil seal, remove the rear case assembly and carefully remove the seal. Lubricate the new seal and press into the casing, using Service tools 18G 134 and 18G 134 CN (Fig. Aa.11).●

Refitting

- (16) Immerse the front main bearing cap moulded rubber oil seal in oil and fit with the lip facing the rear of the engine.
- (17) Fit the rubber sealing ring on to the main oil strainer pipe and fit new gaskets to the transmission case.
- (18) Lower the engine on to the transmission. Ensure that the moulded rubber seal is correctly located. Tighten the set screws and nuts as the transmission is being lowered in position.
- (19) Reconnect the transmission to engine oil feed pipe and refit the oil filter assembly (see Fig. Aa.2).
- (20) Refit the main oil pump to transmission oil pipe.
- (21) Trim off any excess transmission joint from the rear of the unit. Clean the surfaces and fit a new converter housing gasket.
- (22) Refit the converter output gear. When refitting, make certain that the correct running clearance of .0035 to .0065 in. (.089 to .165 mm.) is maintained between the inner thrust washer and the converter output gear. If the clearance is outside these limits, select and fit the appropriate washer from the size range, with the chamfered inner edge of the washer to face the crankshaft.

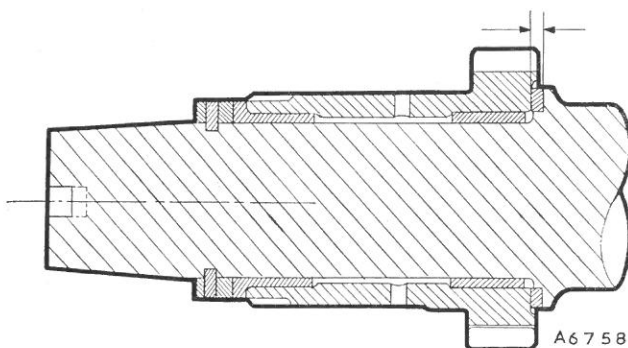


Fig. Aa.12

The converter output gear. Measure the gap indicated and fit the appropriate thrust washer

Converter output gear thrust washers

- 112 to ·114 in. (2·848 to 2·898 mm.)
- 114 to ·116 in. (2·898 to 2·949 mm.)
- 116 to ·118 in. (2·949 to 3·0 mm.)
- 118 to ·120 in. (3·0 to 3·051 mm.)

- (23) Assemble the idler gear to the transmission with a nominal washer (from the range fitted), on the transmission side of the idler gear. Assemble Service tool 18G 1089 with a dental wax washer interposed on to the converter housing side of the idler gear. To cut the holes in the wax strip, place the larger washers of 18G 1089 one on either side of the wax, opposite each other, and press together.
- (24) Place the input gear on a surface plate or onto Service tool 18G 191 A and use a dial test indicator

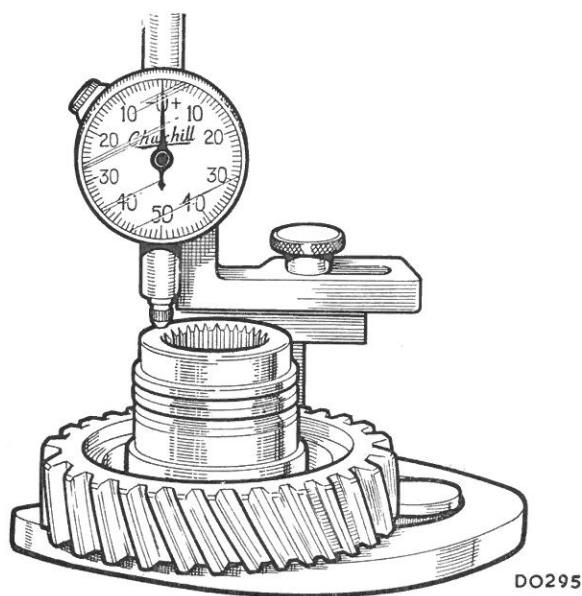


Fig. Aa.13

Using Service tools 18G 191 and 18G 191 A, with the dial test indicator set at zero

gauge, Service tool 18G 191, to take a mean reading. Set the dial gauge to zero as shown in Fig. Aa.13.

- (25) Fit Service tool adaptor 18G 1089 A over the input shaft. Use Service tool 18G 1089/1 to cut a dental wax washer, and fit the wax washer with Service tool 18G 1089/1 over the input shaft (see Fig. Aa.14).
- (26) Screw the two pilot bars of Service tool 18G 1043 into the two bottom tapped holes in the crankcase. Fit the nylon protector sleeve, Service tool 18G 1098, over the converter output gear.

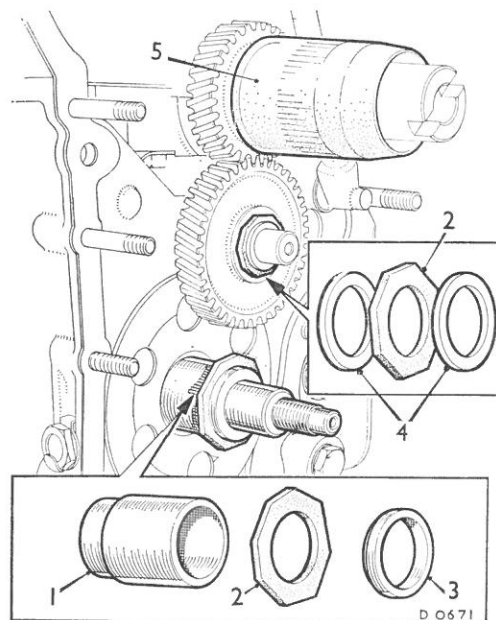


Fig. Aa.14

1. Service tool 18G 1089 A.
2. Wax washer.
3. Service tool 18G 1089/1.
4. Service tool 18G 1089 with wax washer interposed.
5. Service tool 18G 1098.

- (27) Remove the converter oil outlet pipe.
- (28) Fit a new converter housing joint washer and ensure that NO shims are sticking to the input gear bearing. Lubricate the oil seal lip, refit the housing and tighten to the torque figure given in 'GENERAL DATA'. The input shaft nut must not be fitted.
- (29) Remove the converter housing and withdraw the adaptor assembly 18G 1089 A, wax washer, and 18G 1089/1. Substitute this complete assembly for the input gear on the surface plate (see Fig. Aa.15).
- (30) Use the dial test indicator gauge, Service tool 18G 191, and measure the thickness of this assembly (see Fig. Aa.15). The mean reading obtained indicates the total thickness of shims required to eliminate end-float. To this figure add shims to the value of ·001 to ·003 in. (·025 to ·076 mm.) to give the required input bearing pre load.

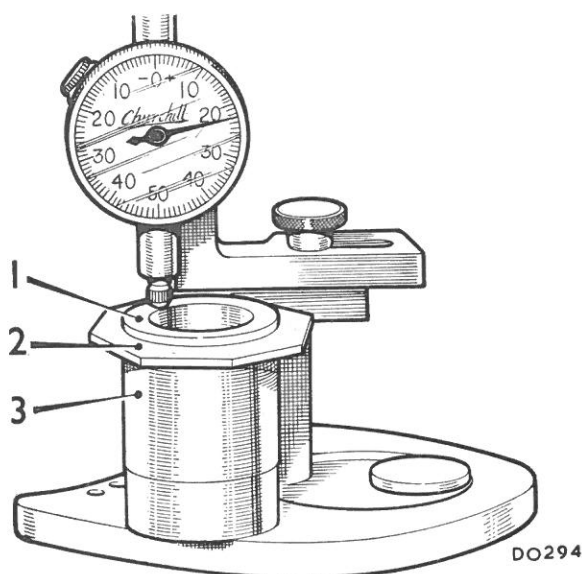


Fig. Aa.15

Measuring the adaptor assembly

1. Service tool 18G 1089/1.
2. Wax washer.
3. Service tool 18G 1089 A.

Input gear adjustment shims

- 003 in. (.076 mm.).
- 012 in. (.305 mm.).

- (31) Measure the thickness of the idler gear thrust washer plus the thickness of the Service tool 18G 1089 and its dental wax washer. From this figure subtract ·004 to ·007 in. (.102 to .178 mm.) to give the total thickness of the thrust washers to be fitted to provide the correct idler gear end-float.

Idler gear thrust washers

- 132 to ·133 in. (3.35 to 3.37 mm.)
- 134 to ·135 in. (3.40 to 3.42 mm.)
- 136 to ·137 in. (3.45 to 3.47 mm.)
- 138 to ·139 in. (3.50 to 3.53 mm.)

- (32) (a) Fit the required thickness of shims as calculated in item (30) onto the outside of the input gear (see Fig. Aa.15).
- (b) Fit one washer on each side of the idler gear (see Fig. Aa.16) as calculated in item (31).
- (33) Refit and align the converter outlet pipe.
- (34) Discard the converter housing joint washer used during operations (21) to (32). Refit the converter housing with a new joint washer, remove the pilot bars of Service tool 18G 1043 and tighten the securing nuts and set screws to the torque figures given in 'GENERAL DATA'.
- (35) Refit the input gear shaft nut and tighten to the correct torque figure (see 'GENERAL DATA'), using Service tools (18G 1088 and 18G 592).

- (36) Remove each pair of bolts in turn from the converter and fit new locking plates. Tighten the bolts to the torque figure given in 'GENERAL DATA', and tap up the locking tabs.
- (37) Lubricate the converter oil seal and refit the converter. Refit the washer (offset pegs) and the centre bolt with its lock washer. Tighten the bolt to the correct torque figure (see 'GENERAL DATA') with Service tools 18G 587 and 18G 592 and lock up the lock washer.
- (38) Refit the low pressure valve and gasket.
- (39) Refit the gear selector bell-crank lever, clevis pin, and rubber boot.
- (40) Refit the converter cover, the starter motor, and the rear engine mounting.
- (41) For refitting the engine and transmission to the car (see Section Aa.3).

Section Aa.5**EXHAUST SYSTEM****Removing**

- (1) Slacken the exhaust pipe to manifold clamp.
- (2) Release the pipe from the bracket on the final drive casing (Fig. Aa.3) and from the two locations on the rear sub-frame.

Refitting

- (3) Refit the exhaust system to the car with the intermediate and rear support clips loose to allow articulation at the manifold spherical flange.

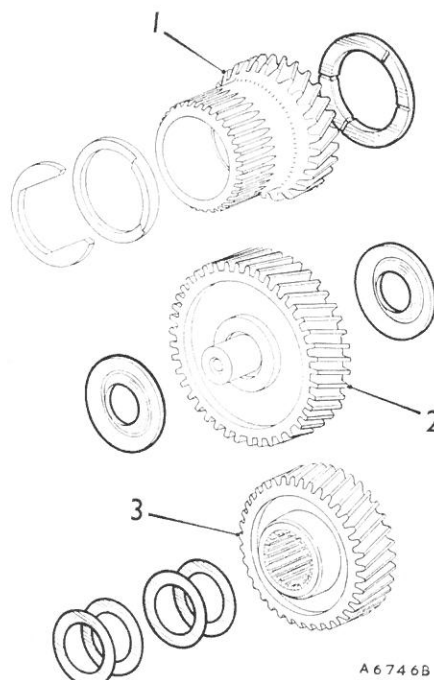


Fig. Aa.16

The converter output (1), idler (2), and input gear (3) with their respective thrust washers and shims

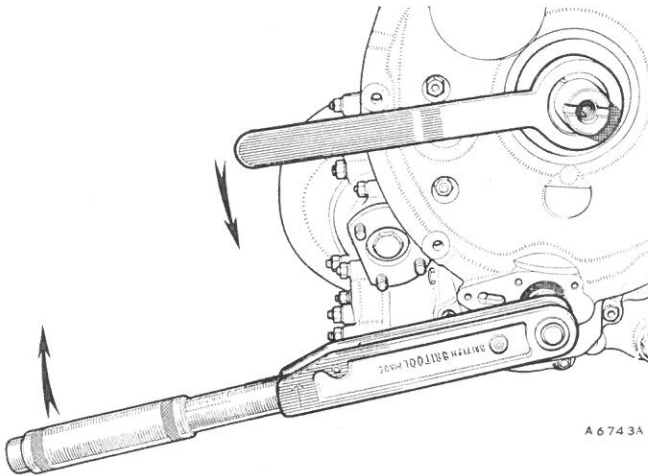


Fig. Aa.17

Using Service tools 18G 1088 to hold the converter output gear and 18G 592 to tighten the input gear nut to the correct torque figure

- (4) Align the pipe flange with the manifold, refit and tighten the manifold clamp.
- (5) Ensure correct alignment of the system and tighten the remaining fixing points.

Section Aa.6

DISTRIBUTOR DRIVING SPINDLE

Removing

- (1) Remove the distributor and driving spindle as detailed in Section A.16.

Refitting

- (2) Refitting is as described in Section A.16 with the following exceptions.
- (3) To rotate the crankshaft, insert a screwdriver through the aperture (adjacent the oil dipstick) on the converter housing, and turn the converter starter ring gear to the position described in Section A.16.
- (4) Check that the 1/4 timing mark on the converter is in line with the pointer on the converter housing (Fig. Ba.1).

Section Aa.7

VALVE TIMING

- (1) Follow the instructions given in Section A.21 with the following exceptions.
- (2) Rotate the crankshaft as described in Section Aa.6 until the 5° B.T.D.C. timing mark on the converter is opposite the pointer on the converter cover.

Section Aa.8

OIL PUMP

Removing

- (1) Remove the engine and transmission as detailed in Section Aa.3.
- (2) Remove the converter and converter housing as detailed in Section Aa.4, items (3) to (12).
- (3) Remove the pump securing screws and withdraw the pump.

Dismantling and reassembling

- (4) Follow the instructions given in Section A.24 for the Hobourn-Eaton pump.

Refitting

- (5) Reverse the removal instructions fitting new joint washers as required.

Section Aa.9

CAMSHAFT

NOTE.—Extreme care is necessary when removing the camshaft. The oil pump drive coupling may stick by oil adhesion to the camshaft and possibly fall into the transmission unit. Ensure therefore when refitting the camshaft that this drive coupling is fully located on the splined oil pump spindle.

Removing

- (1) Follow the instructions given in Section A.25 with the following exceptions.
- (2) Remove the engine and transmission as detailed in Section Aa.3.

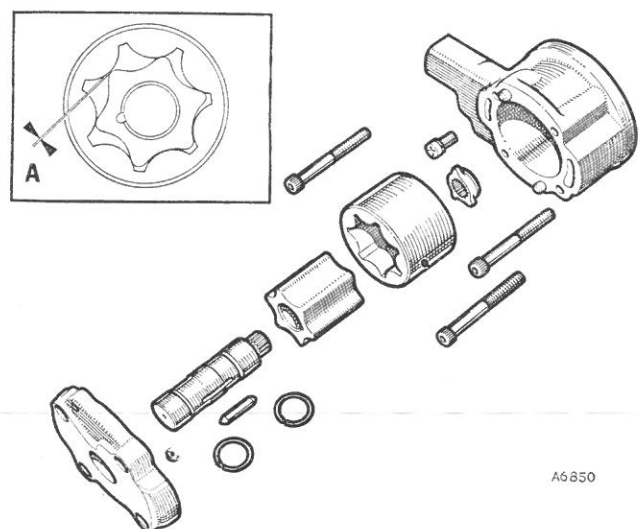


Fig. Aa.18

The oil pump components. 'A' indicates the lobe positions for checking clearances

- (3) Should the front camshaft bearing clearance be excessive, a new bearing liner must be fitted and as this will entail line-reaming after fitting, both the converter, converter housing, and the transmission unit must be removed as in Section Aa.4.
- (4) For removing, fitting, and reaming a new liner follow the instructions in Section A.37.

Refitting

- (5) Refitting is a reversal of the removal procedure given in Section A.25.

Section Aa.10

PISTONS AND CONNECTING RODS

Removing

- (1) Follow the instructions given in Section A.26 with the following exceptions.
- (2) Remove the engine and transmission unit as detailed in Section Aa.3.
- (3) Remove the converter, converter housing, and the transmission unit from the engine as detailed in Section Aa.4.

Refitting

- (4) Refitting is a reversal of the removal procedure (see Sections A.26 and Aa.3-4).

Section Aa.11

CRANKSHAFT AND MAIN BEARINGS

Removing

- (1) Follow the instructions given in Section A.29 with the following exceptions.
- (2) Remove the engine and transmission unit as detailed in Section Aa.3.
- (3) Remove the converter, converter housing, and the transmission unit from the engine as detailed in Section Aa.4.

Refitting

- (4) Follow the refitting instructions for installation of the crankshaft and bearings given in Section A.29.
- (5) Carry out the inspection and refitting of the transmission unit as detailed in Section Aa.4.

Section Aa.12

ENGINE MOUNTINGS

Removing

Left-hand mounting

- (1) Follow the instructions in Section A.35.

Right-hand mounting

- (2) Disconnect the battery earth cable.

Aa.10

- (3) Disconnect the electrical connection from the starter motor.
- (4) Disconnect the engine tie-rod from the rear of the cylinder block and the exhaust down pipe from the manifold flange.
- (5) Remove the two nuts and set screws securing the mounting to the sub-frame.
- (6) Lift the rear of the engine sufficiently to remove the securing nuts and bolts from the converter cover and the starter motor. Turn the cover slightly anti-clockwise and remove the cover complete with the engine mounting.
- (7) Unscrew the set screws to release the mounting from the cover.

Refitting

- (8) Refitting is a reversal of the removal procedure.

Section Aa.13

CONVERTER OUTPUT GEAR

Removing

- (1) Remove the engine and transmission as detailed in Section Aa.3.
- (2) Carry out the removing instructions as detailed in Section Aa.4, items (3) to (11) and (13).

Adjusting

- (3) Carry out the instruction given in Section Aa.4, item (22).

Refitting

- (4) Refitting is a reversal of the removal procedure.

Section Aa.14

CYLINDER LINERS

Follow the instructions in Section A.33 with the following exceptions.

- (1) Remove the engine and transmission from the car as detailed in Section Aa.3.
- (2) Remove the transmission unit from the engine as detailed in Section Aa.4.

Section Aa.15

●CONVERTER HOUSING OIL SEAL REPLACEMENT●

Removing

- (1) Remove the engine from the car as detailed in Section Aa.3.
- (2) Remove the starter motor and converter cover.
- (3) Remove the converter (Section Aa.4, items (5) and (6)).

- (4) Remove the old seal, using Service tool 18G 1087. Hook the tool into the oil seal groove and tap outwards on the tool, working round the seal until it is removed.

Refitting

The new seal must be fitted to the correct depth in order that the oil drain hole behind the seal remains open.

- (5) Take a depth measurement from any convenient point on the periphery of the housing bore of the front face of the housing to the undercut face (see Fig. Aa.19). This measurement will be approximately $\frac{3}{8}$ in. (9.5 mm.), but should it be more or less than this measurement this must be taken into account and either added to or subtracted from $\frac{3}{8}$ in. (9.5 mm.).

Example: If measurement is $\frac{3}{8}$ in. (9.5 mm.) fit the new seal to be flush with the front face of the converter housing. If measurement is less than $\frac{3}{8}$ in. (9.5 mm.) fit the seal proud of the face by the difference of measurement obtained.

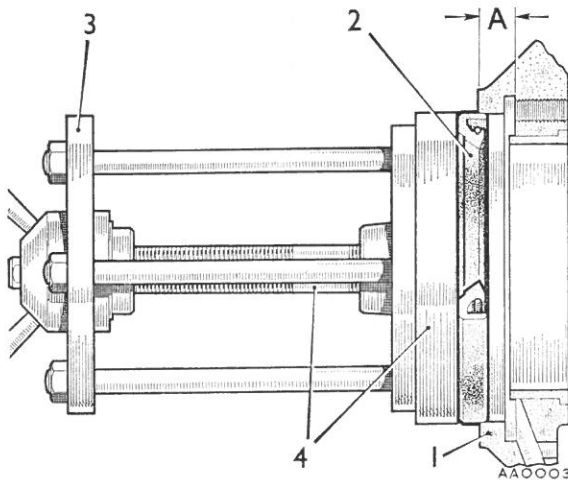


Fig. Aa.19

● A section through of fitting the converter housing oil seal. A = the depth measurement to be taken ●

- | | |
|-----------------------|---|
| 1. Converter housing. | 3. Service tool 18G 1068. |
| 2. Oil seal. | 4. Service tool adaptor set 18G 1068 A. |

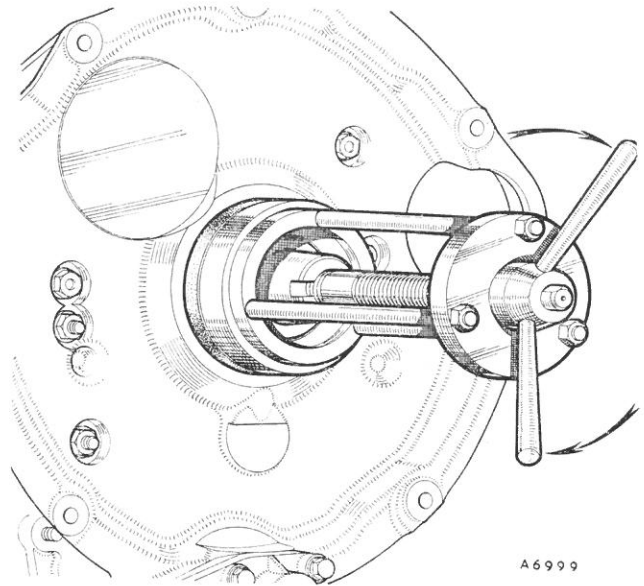


Fig. Aa.20

● Fitting the converter housing oil seal, using Service tool 18G 1068 with adaptor 18G 1068 A ●

● NOTE.—The converter housing face is not machined, therefore, the initial measurement position and that used when fitting a new seal must always be taken from the same position on the housing. ●

- (6) Screw in the short threaded end of Service tool 18G 1068 A securely into the crankshaft.
- (7) Liberally lubricate the new oil seal.
- (8) Assemble the new seal together with Service tool 18G 1068 into position (see Fig. Aa.20).
- (9) Screw in the wing nut of the tool until the seal is pressed in to the depth of the measurement (see item (5)).
- (10) The remainder is a reversal of the removing procedure.
- (11) Check and top up oil level (Section Aa.1).

