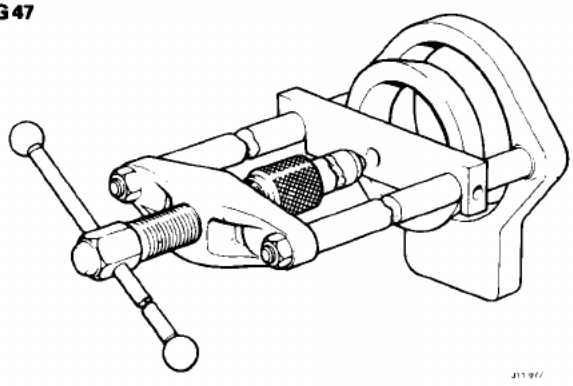
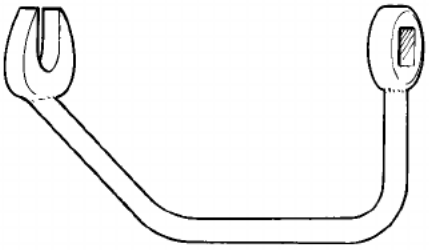
MANUAL GEARBOX – SECTION 37 – continued

18G 47



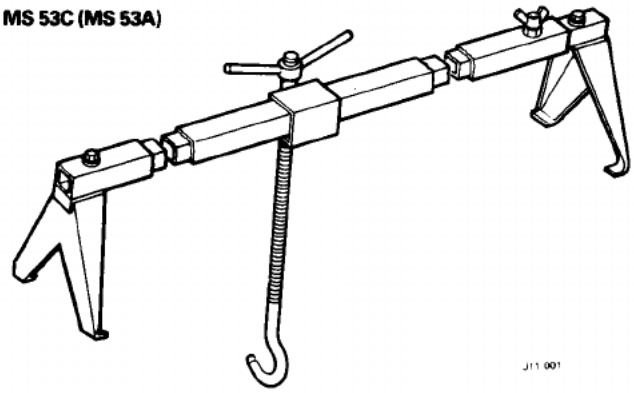
Multi-purpose handpress

#ST1136



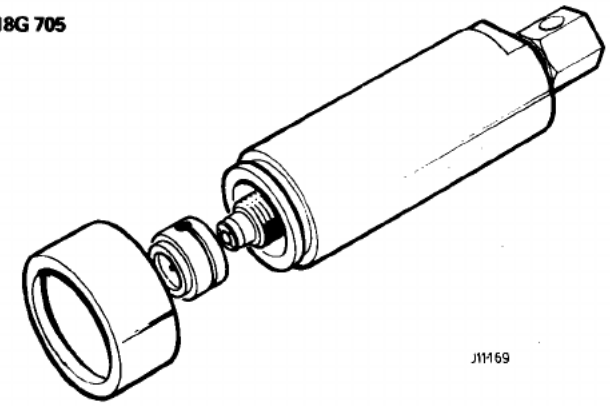
Offset spanner

MS 53C (MS 53A)



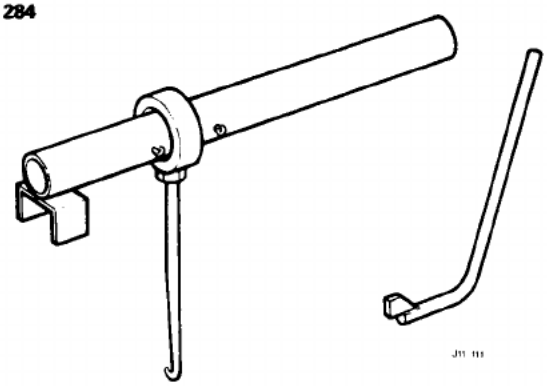
Engine support bracket

18G 705



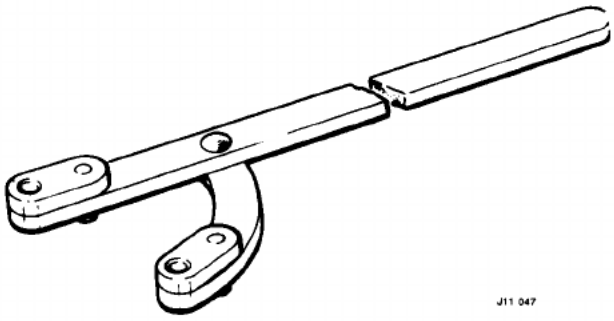
Remover bearing race centre

18G 284



Impulse extractor

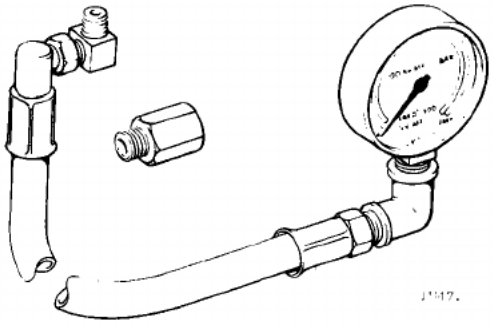
18G 1205



Propellor shaft flange wrench

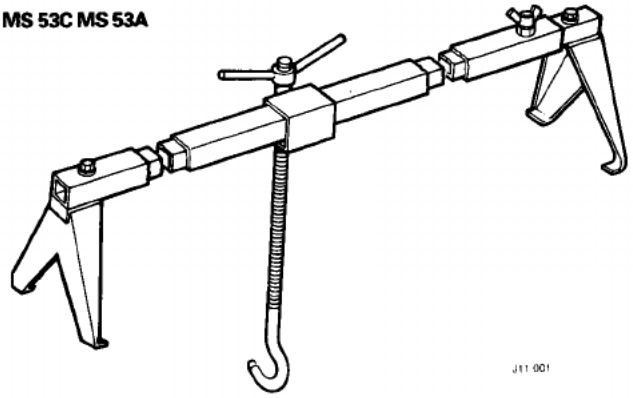
AUTOMATIC TRANSMISSION – BORG-WARNER MODEL 66 – SECTION 44BW

CBW 1C



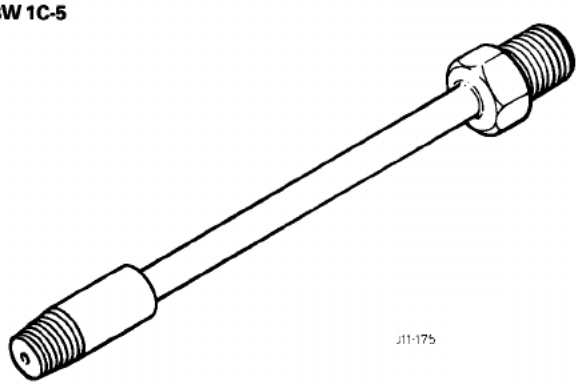
Hydraulic pressure test equipment

MS 53C MS 53A



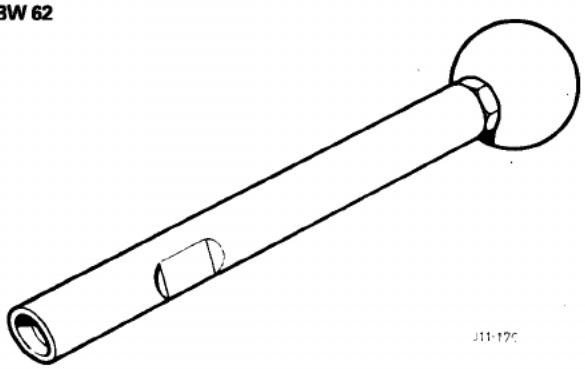
Engine support bracket

CBW 1C-5



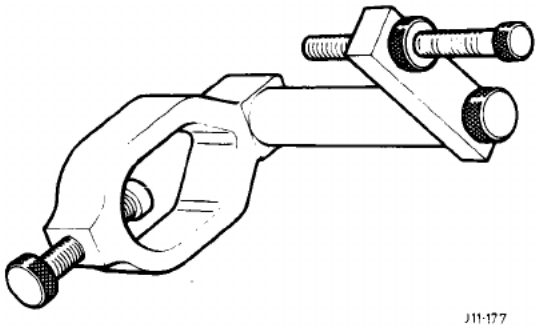
Adaptor – pressure test

CBW 62



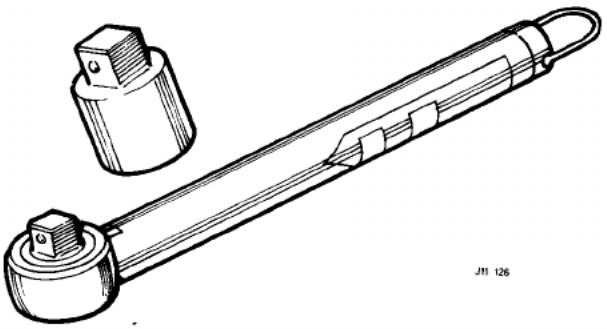
Remover – throttle cable mounting seal

CBW 87



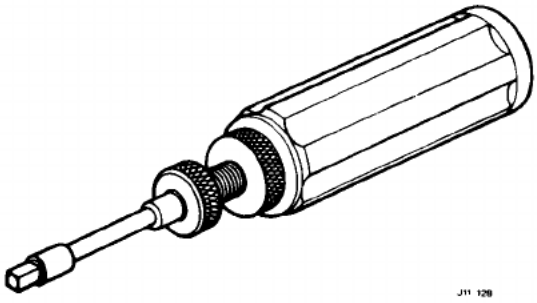
End float checking gauge

CBW 547B-30 (CBW 547B-75)



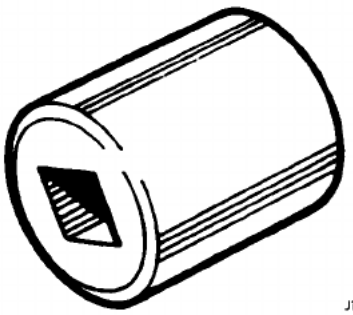
Tension wrench

18G 681



Torque screwdriver

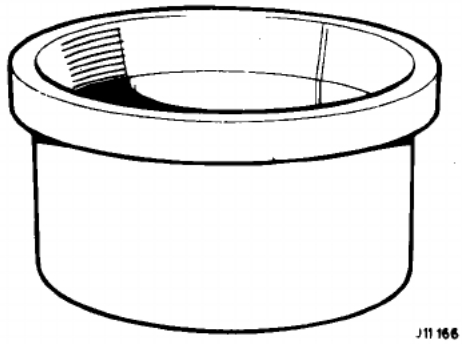
CBW 547-50-2A



Rear servo adjuster adaptor

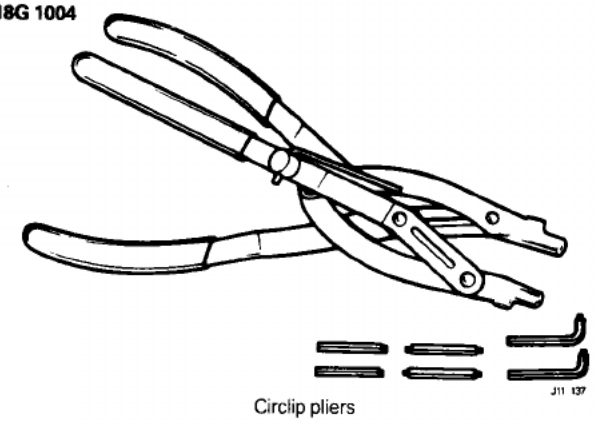
AUTOMATIC TRANSMISSION – BORG-WARNER MODEL 66 – SECTION 44BW Continued

18G 702



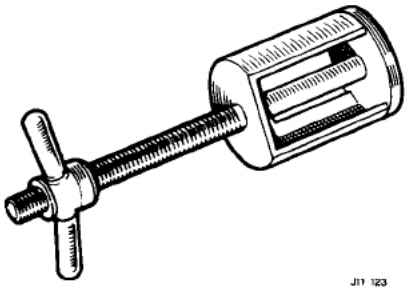
Replacer rear clutch piston

18G 1004



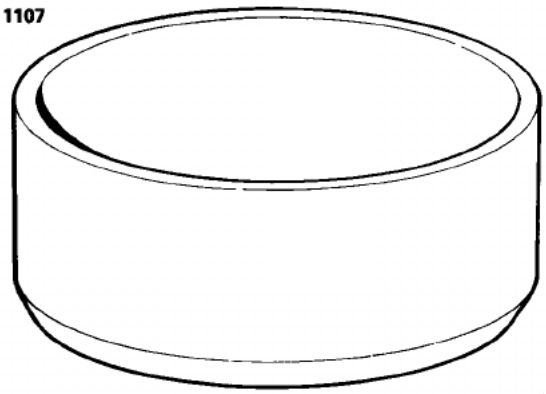
Circlip pliers

18G 1016 (JD 107)



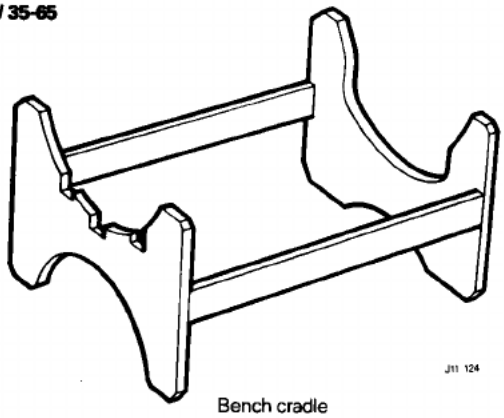
Clutch spring compressor

18G 1107



Replacer – front clutch piston

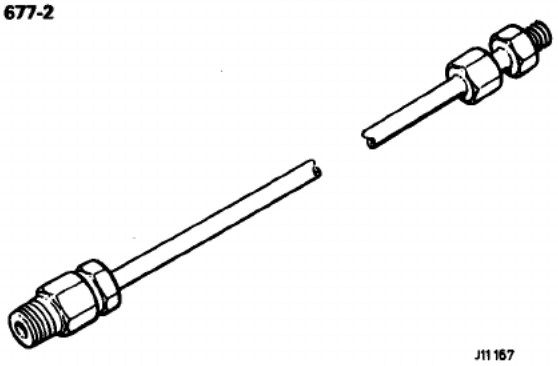
CBW 35-65



Bench cradle

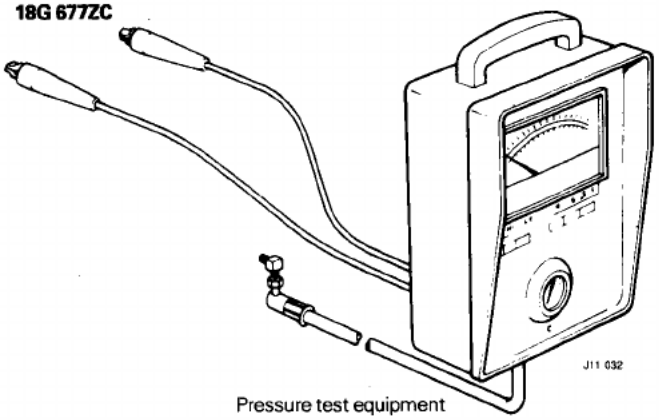
AUTOMATIC TRANSMISSION – GM 400 – SECTION 44GM

18G 677-2



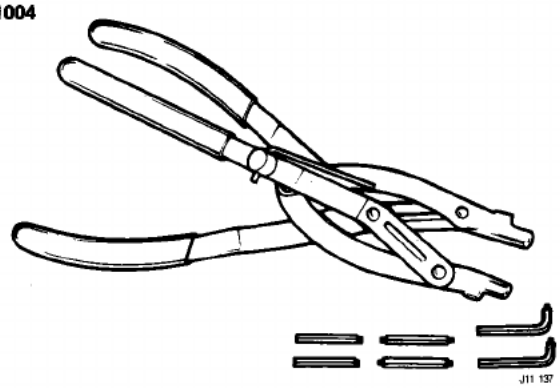
Adaptor set

18G 677ZC



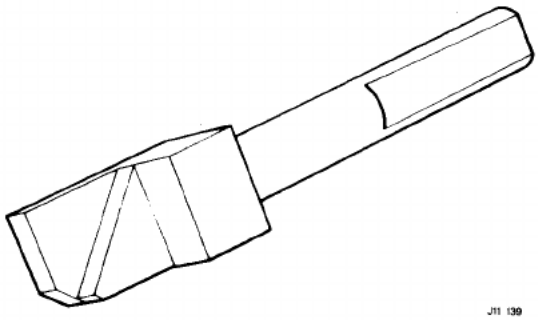
Pressure test equipment

18G 1004



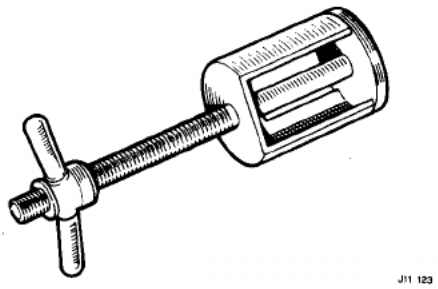
Circlip pliers

18G 1004J



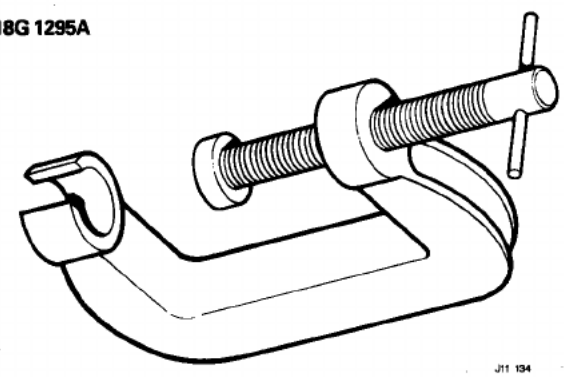
Points for 18G.1004

18G 1016 (JD 107)



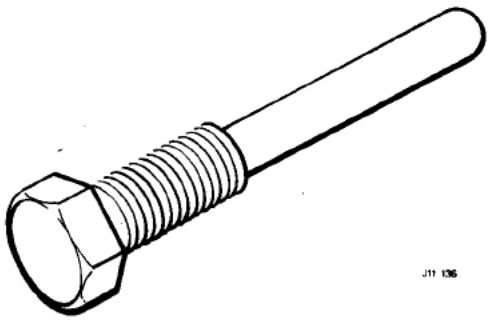
Clutch spring compressor

18G 1295A



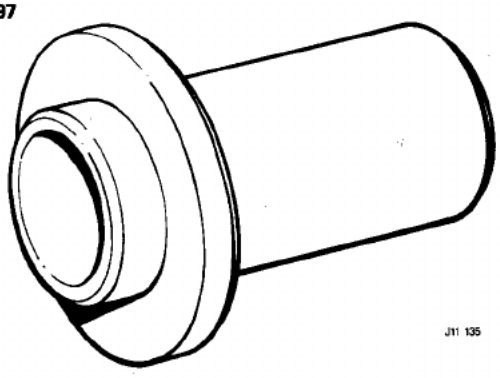
Compressor piston accumulator control valve

18G 1296A



Extractor bolt oil pump

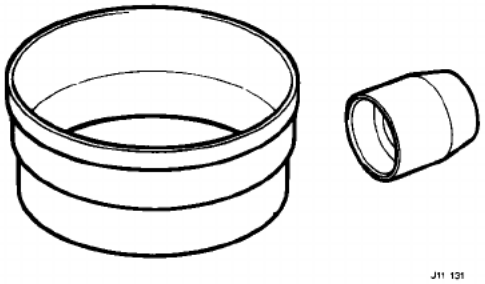
18G 1297



Replacer oil pump and rear extractor oil seals

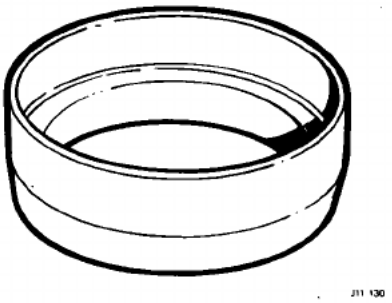
AUTOMATIC TRANSMISSION – GM 400 – SECTION 44GM Continued

18G 1298



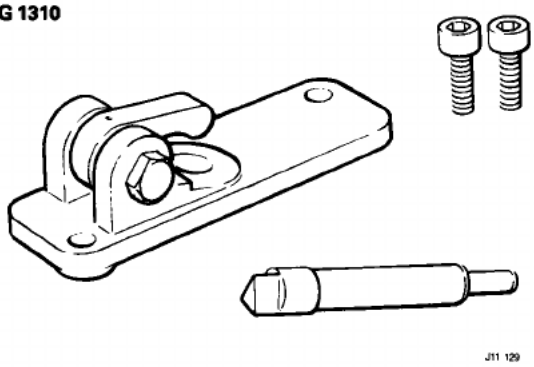
Forward and intermediate clutch piston replacer seal protector inner

18G 1309



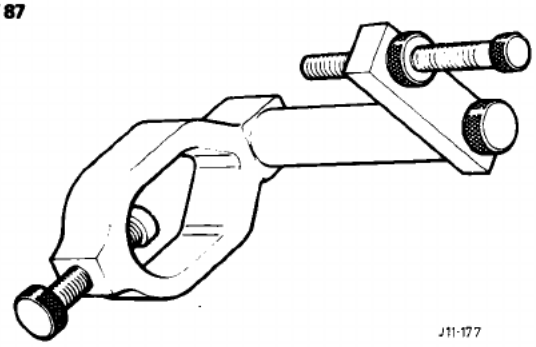
Intermediate clutch inner seal protection sleeve

18G 1310



Band application pin selection gauge

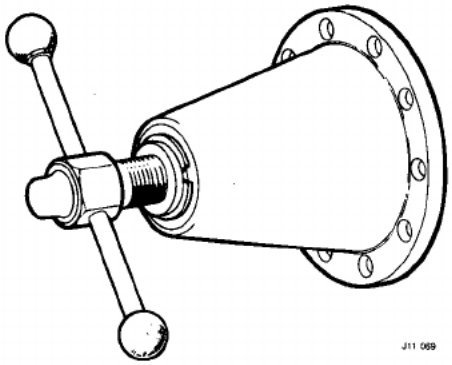
CBW 87



End float checking gauge

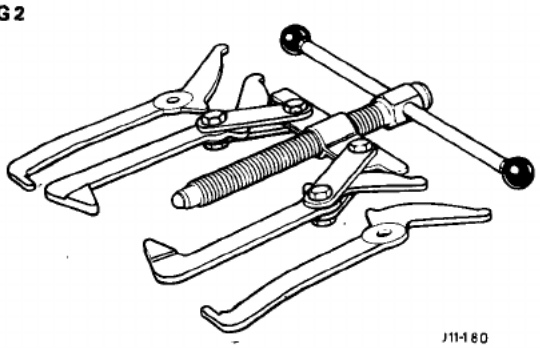
DRIVE SHAFT AND PROPELLER SHAFTS – SECTION 47

JD 1D



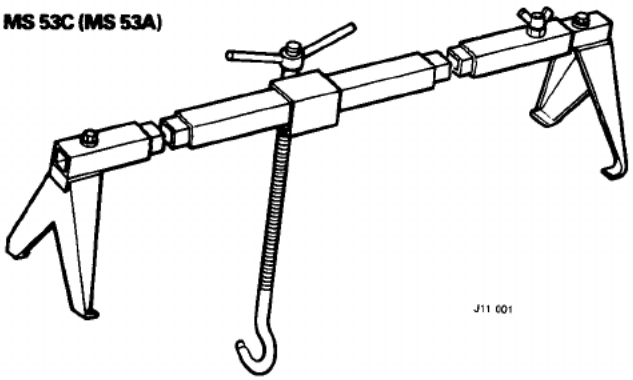
Hub remover

18G 2



Two legged puller

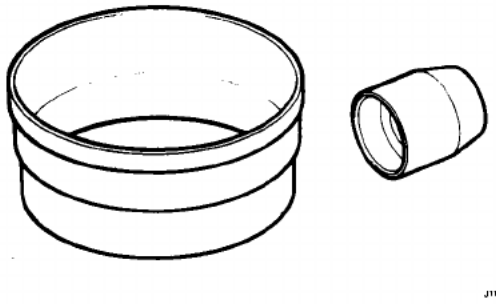
MS 53C (MS 53A)



Engine support bracket

FINAL DRIVE – SECTION 51

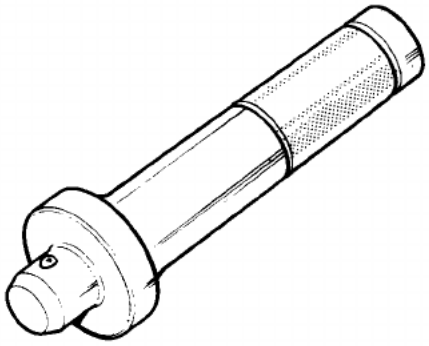
18G 120 5



J11 131

Flange holder

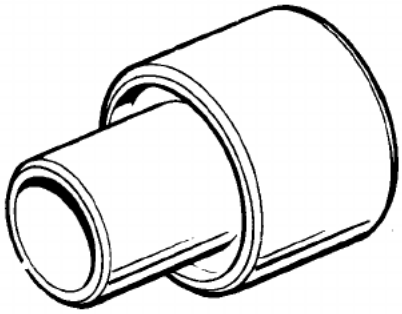
18G 134 (MS550, SL550)



Driver handle

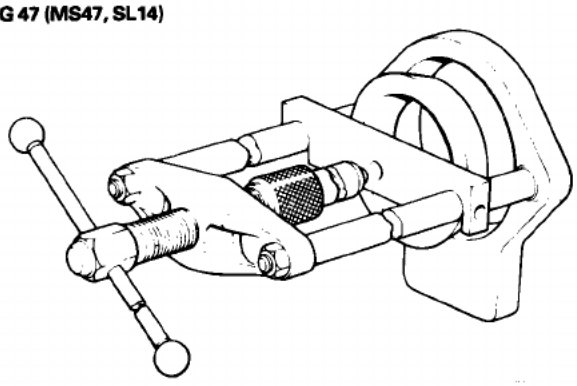
J11 023

SL 550-1



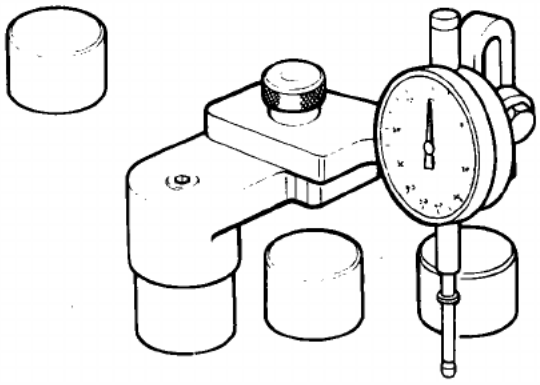
Replacer differential bearing cone

18G 47 (MS47, SL14)



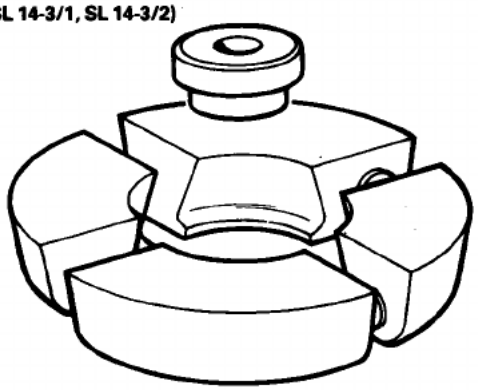
Hand press

SL3



J11 144

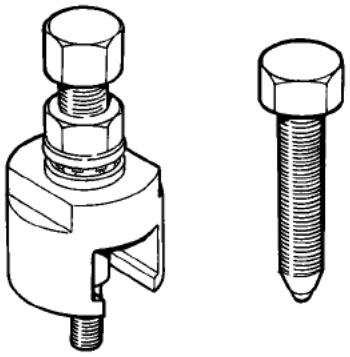
SL 14-3 (SL 14-3/1, SL 14-3/2)



Adaptor/remover differential bearing cone

J11 145

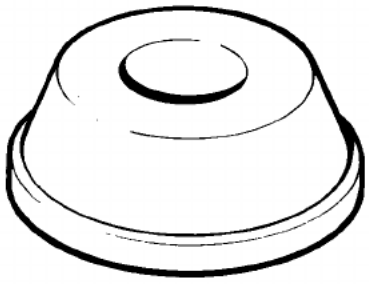
SL 4HA



Pinion height setting button

J11-182

SL 550-9

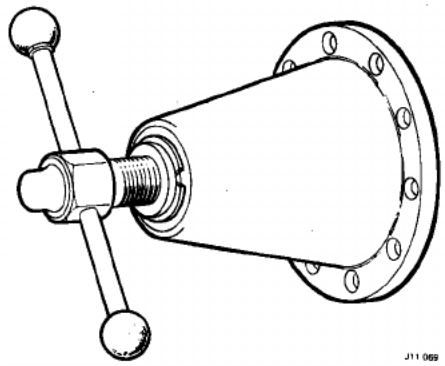


J11 150

Adaptor/replacer – drive pinion inner bearing cup

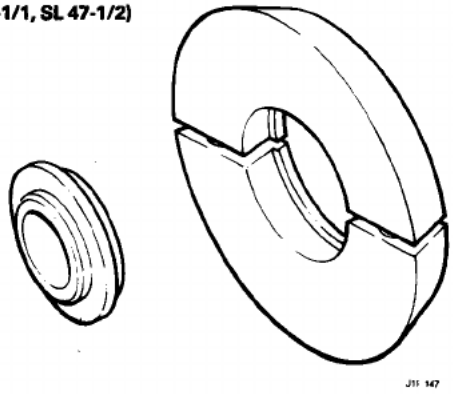
FINAL DRIVE – SECTION 51 Continued

SL 550-8



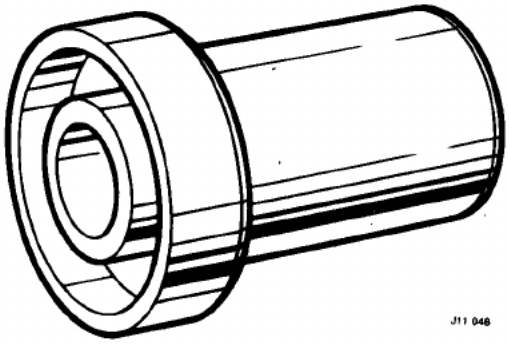
Adaptor/replacer – drive pinion outer bearing cup

SL 47-1 (SL 47-1/1, SL 47-1/2)



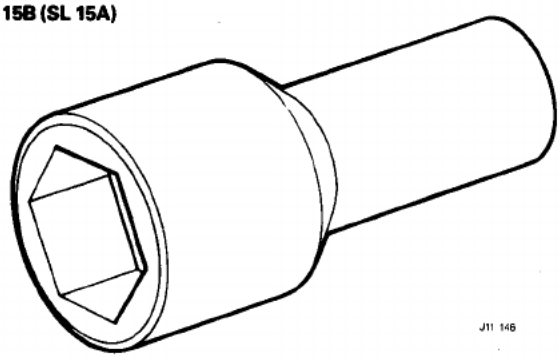
Pinion bearing cone remover/adaptor

18G 1428A



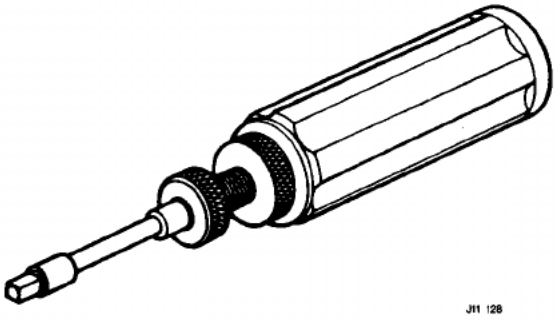
Rear oil seal replacer

SL 15B (SL 15A)



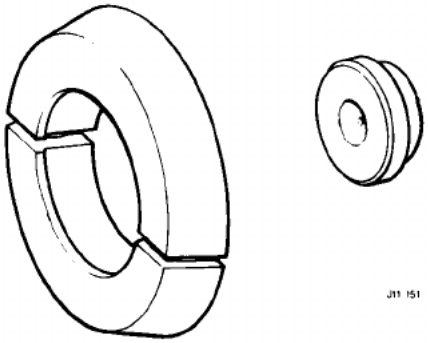
Remover/replacer drive shaft bearing cone

18G 681 (CBW 548)



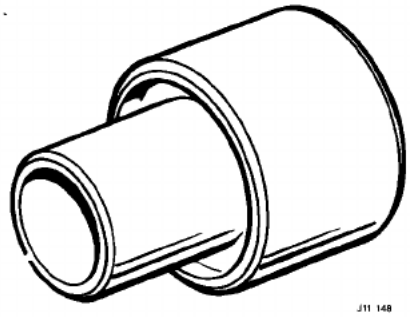
Torque driver

SL 47-3, (SL 47-3/1)



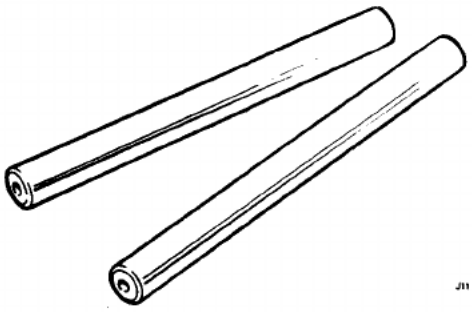
Output shaft outer bearing remover/replacer

SL 47-3/2



Output shaft outer bearing replacer

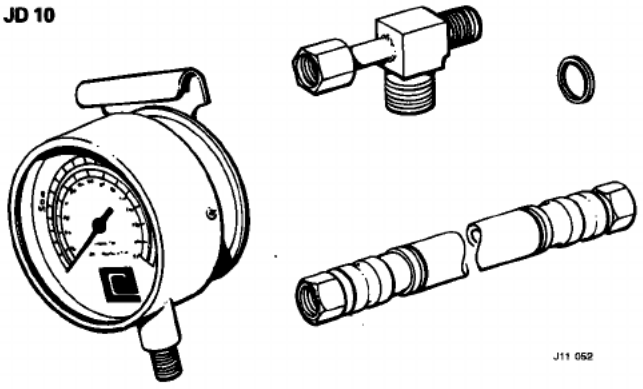
JD 14



Dummy shaft

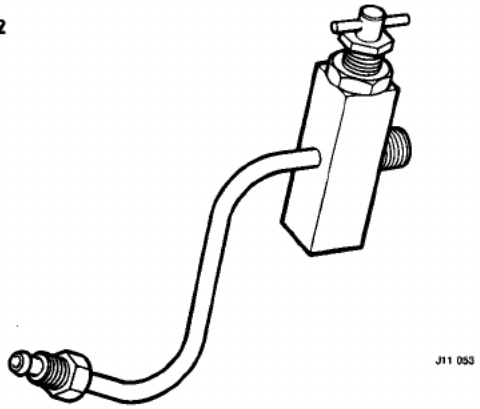
STEERING – SECTION 57

JD 10



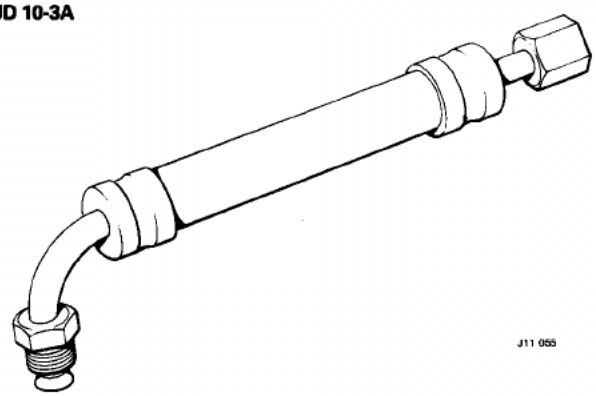
Power steering test set

JD 10-2



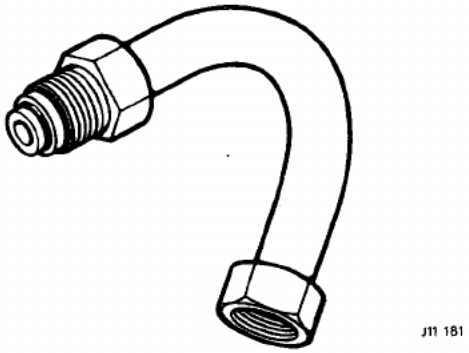
Adaptor – hydraulic pressure test

JD 10-3A



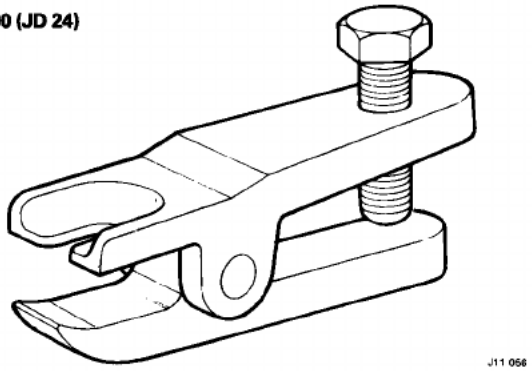
Adaptor – power steering

JD 10-4A



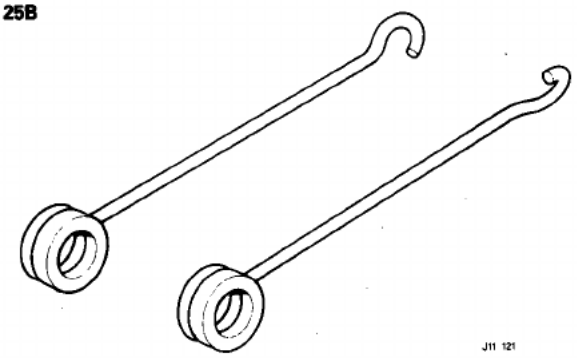
Adaptor hydraulic pressure test

JD 100 (JD 24)



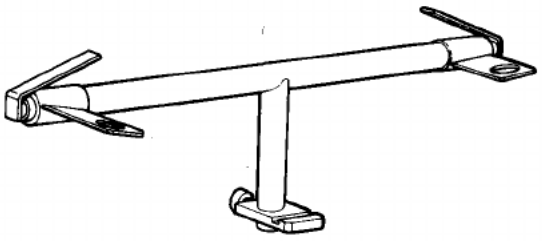
Steering joint taper separator

JD 25B



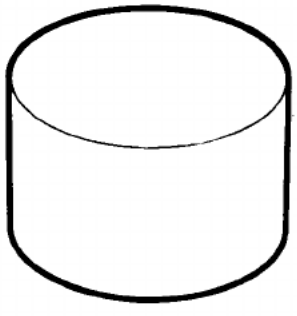
Rear camber setting links

JD 36A



Steering rack checking fixture

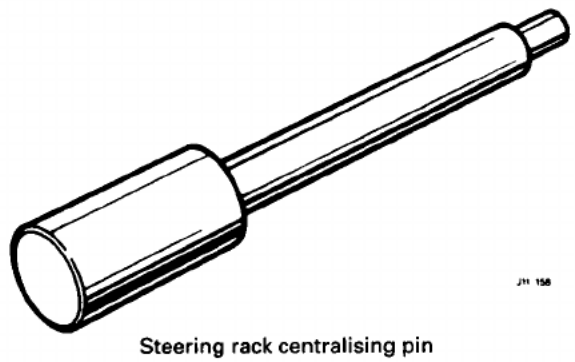
18G 1326



Remover/replacer pulley power steering pump

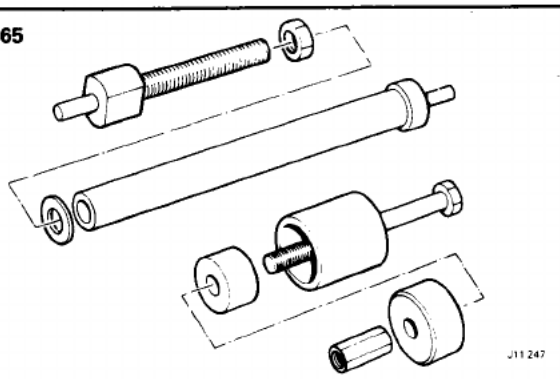
STEERING – SECTION 57 Continued

JD 117 (18G 1466)



Steering rack centralising pin

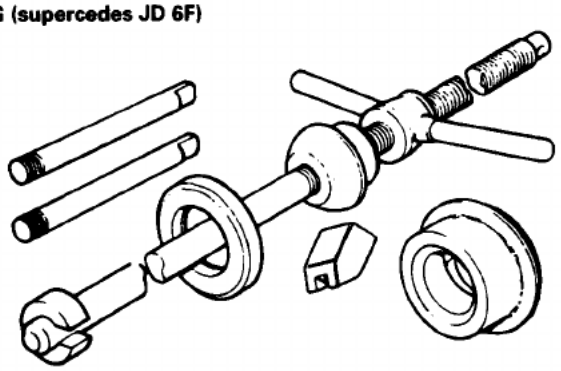
JD 165



Steering rack mounting bush replacement

FRONT SUSPENSION – SECTION 60

JD 6G (supercedes JD 6F)

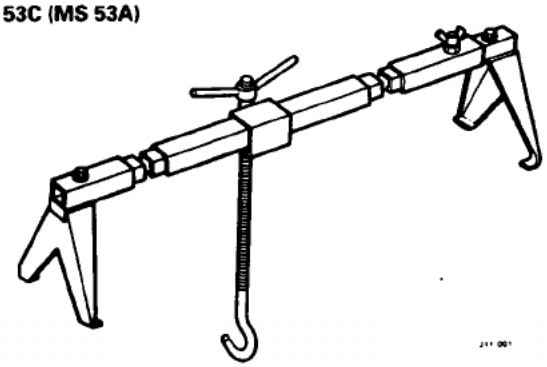


Front coil spring compressor

JD 100 (JD 24)

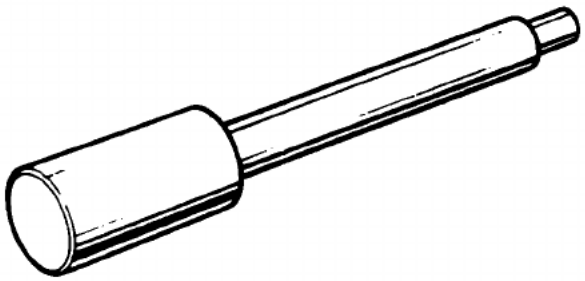
Steering joint taper separator

MS 53C (MS 53A)



Engine support bracket

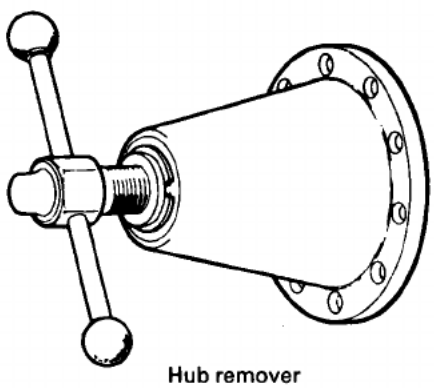
JD 117 (18G 1466)



Steering rack centralising pin

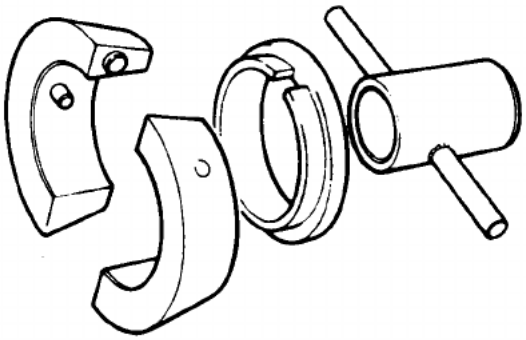
REAR SUSPENSION – SECTION 64

JD 1D



Hub remover

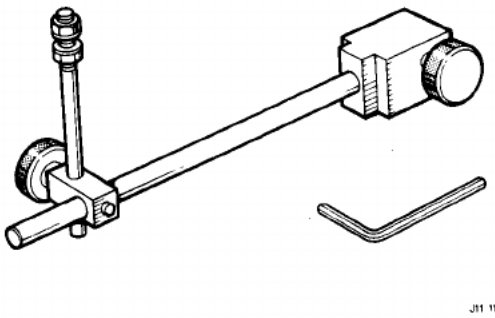
JD 11B



Adaptor dismantler dampers spring unit

REAR SUSPENSION – SECTION 64 Continued

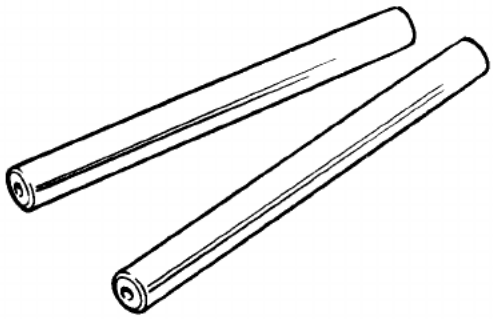
JD 13B (JD 13A)



J11 119

Rear hub end-float gauge

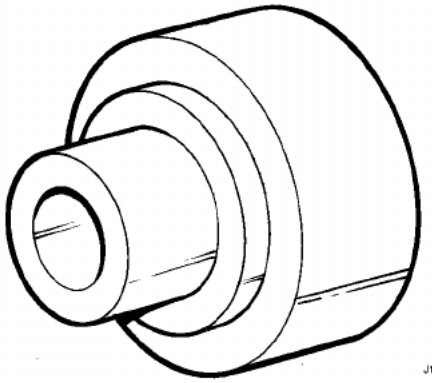
JD 14



J11 118

Rear wishbone pivot dummy shaft

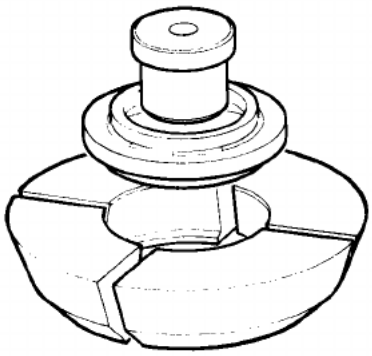
JD 15



J11 070

Replacer – rear hub master spacer and bearing

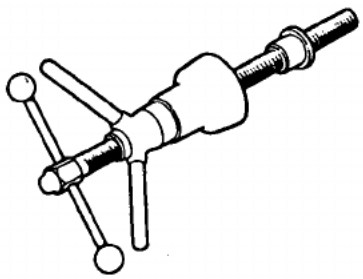
JD 16C



J11 117

Remover/replacer – rear hub outer bearing cone

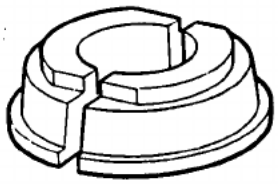
JD 20A



J11 161

Bearing remover – main tool

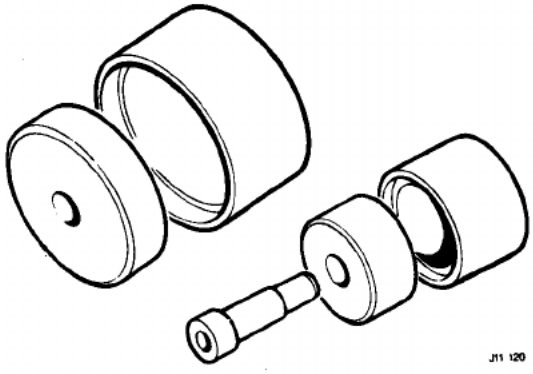
JD 20A-1A (JD 20A-1)



J11 162

Rear hub inner and outer cups remover/replacer adaptor

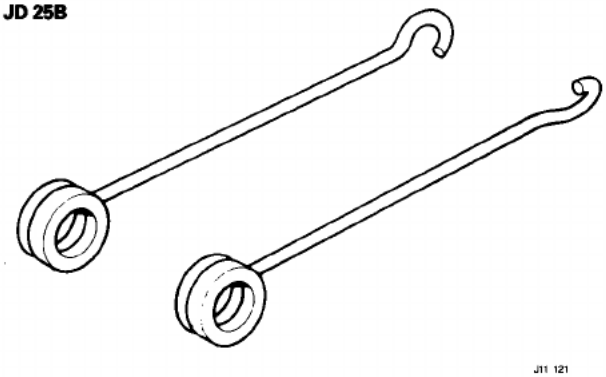
JD 21



J11 120

Torque arm bush remover/replacer

JD 25B



J11 121

Rear camber setting links

Refitting

Fit the camshaft shell bearings.
Fit the camshaft in the bearings so that the keyway in the front flange is uppermost.
Fit the bearing caps to their respective positions and fit 'D' washers, spring washers and nuts.
Tighten down the bearing caps evenly, commencing with the centre cap.
Tighten the nuts (3, Fig. 5) to correct torque.
Align camshaft using timing gauge C 3993.
Locate the camshaft sprocket on the camshaft and ensure that the 'fit' holes line up. Fit one bolt on the lock plate.

NOTE: If all the preceding instructions have been followed, valve timing will be correct.

Rotate the engine and fit remaining bolts to the camshaft sprocket. Turn up the tabs.
Using tool JD 2B, tension the top timing chain until slight flexibility remains in the chain on both outer sides of the camshaft sprockets. The chain MUST NOT be dead tight.
Check the tappet adjustment.
Securely tighten the locknut.
Replace the camshaft covers and breather housing.

CAMSHAFT BEARINGS (Complete set)

Remove and refit **12.13.13**

Follow the procedure detailed under 'Camshaft—Remove and refit—12.13.02 or 12.13.03', above.

CRANKSHAFT DAMPER AND PULLEY

Remove and refit **12.21.01**

Removing

Remove the central bolt securing the Torquatrol unit and fan to the water pump pulley; collect the washer and remove the unit.
Remove the steering pump belt, compressor belt (on cars fitted with air conditioning only) and alternator belt.
Knock back the locking tabs (1, Fig. 6) at the pulley bolts, turning the crankshaft to improve access to the tabs.

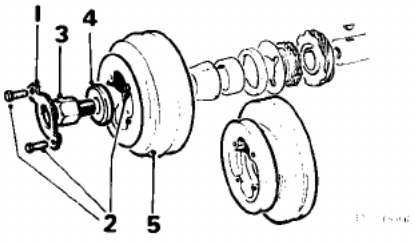


Fig. 6

Remove the four bolts (2, Fig. 6) securing the crankshaft pulley to the torsional damper. Recover the locking ring and remove the outlet pulleys.
Remove the large bolt (3, Fig. 6) securing the torsional damper and recover the large plain washer (4, Fig. 6).
Strike the damper (5, Fig. 6) with a hide mallet and remove it from the crankshaft.

Inspection

Examine the rubber portions of the damper for signs of deterioration and, if necessary, fit a new damper.
Examine the pulley and damper grooves for wear. Drive belts must not bottom in the grooves.

Refitting

Reverse the removal operations, fitting new tab washers and tightening the bolts to the correct torque.
Correctly tension the drive belts.

CRANKSHAFT FRONT OIL SEAL

Remove and refit **12.21.14**

Removing

Remove the crankshaft damper and pulley.
If the cone (1, Fig. 7) has not drawn clear with the torsional damper, prise the slot open and draw it from the crankshaft. Recover the Woodruff key.
Remove the oil sump.
Draw the distance piece from the crankshaft and discard.
Prise the oil seal (2, Fig. 7) from the front timing cover recess, taking great care not to damage the surface of the crankshaft or the oil seal recess.
Remove oil flinger, if fitted, by cutting into the notches.

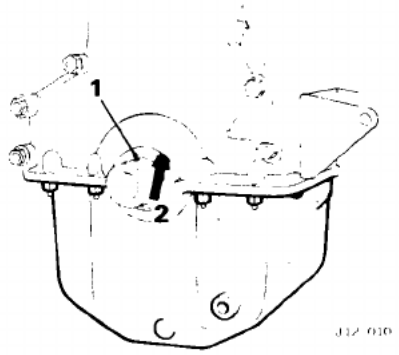


Fig. 7

Refitting

Fit a new oil seal dry, as supplied and locate it in the timing cover recess, open side inwards.
Check the 'O' ring seal in the new distance piece, lubricate with clean engine oil and fit distance piece onto crankshaft.
Fit the oil sump.
Fit the Woodruff key in the crankshaft and fit the cone.
Fit the crankshaft damper and pulley.

MAIN BEARINGS

Remove and refit (set) — Engine in situ **12.21.39**

Removing

Remove the oil pump and pipes (1, Fig. 8).

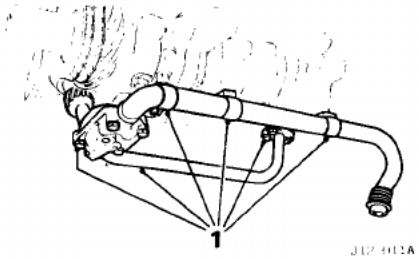


Fig. 8

Withdraw the bolts (1, Fig. 9) securing the rear main bearing cap and discard the washers.
Note the corresponding numbers (2, Fig. 9) on the bearing cap and crankcase.
Withdraw the upper half of the bearing shell.
Liberally coat the replacement bearing shells with clean engine oil and locate in the crankcase and bearing cap. Ensure that the lugs on the bearing shell locate correctly.
Secure the bearing cap using bolts and a new flat washer.
Tighten the bolts to the correct torque.
Repeat operations to renew shells on the four intermediate main bearing caps. Continue by removing the bolts securing the centre main bearing cap. Discard the bearing shells and thrust washers.

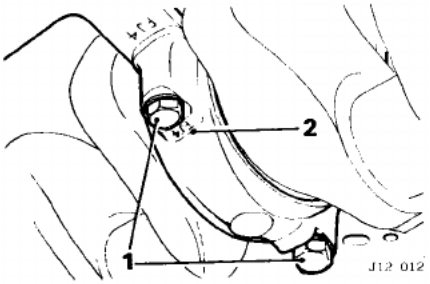


Fig. 9

Liberally coat the replacement bearing shells and two new thrust washers with clean engine oil and locate the shells in the crankcase and bearing cap. Ensure that the lugs on the bearing shell locate correctly.

continued

Locate the thrust washers (1, Fig. 10) on either side of the bearing cap, white metal side outwards, and secure the cap using bolts and new flat washers.
Tighten the bolts (2, Fig. 10) to the correct torque.
Set the crankshaft to T.D.C. No. 6 cylinder (front) firing, and remove distributor cap.
Remove the setscrew and remove the distributor.

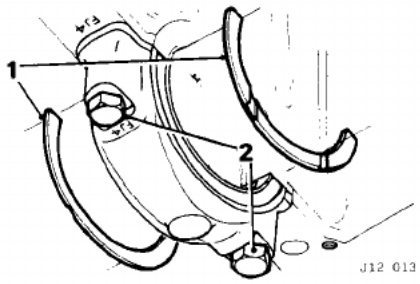


Fig. 10

Remove the bolts (1, Fig. 11) securing the front main bearing cap and manoeuvre the cap clear. Discard the bearing shells.

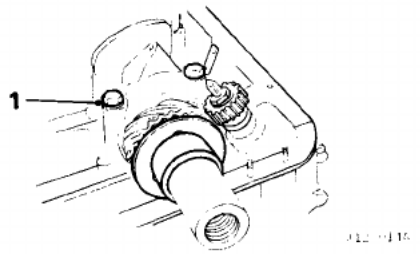


Fig. 11

Refitting

Liberally coat the replacement bearing shells with clean engine oil and locate the shells in the crankcase and bearing cap.
Ensure that the lugs on the bearing shell locate correctly.
Secure the bearing cap, using the bolts and new flat washers.
Tighten the bolts to the correct torque.
Refit the oil pump and pipes (1, Fig. 8).

CAMSHAFT COVERS AND SEALS

Remove and refit **12.29.42**

Removing

Disconnect the battery.
Disconnect the plug leads.
Cars fitted with air conditioning only

WARNING: On no account must any portion of the air conditioning system be disconnected by anyone other than a qualified refrigeration engineer. Blindness can result if the gas contained within the system comes into contact with the eyes.

Depressurise the fuel system.
Release the inlet and outlet petrol pipe union nuts at the fuel cooler. Plug the inlet petrol pipe to prevent fuel syphon.
On 3.4 litre cars only, detach the hot air duct (1, Fig. 12) early models only.

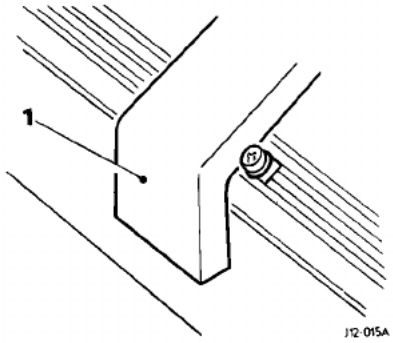


Fig. 12

Remove the 11 nuts and one screw (1, Fig. 13) securing the cover to the head. Remove the cover.
Detach the gasket (2, Fig. 13) from the cover and prise the cover seal (3, Fig. 13) from the head. Clean the joint surfaces of the cover and head.

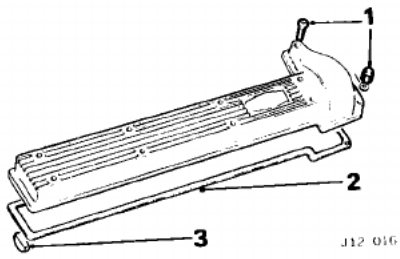


Fig. 13

Refitting

Smear the camshaft cover seal (3, Fig. 13) with sealant and replace it in the head.
Fit a new gasket to the head and replace the cover; tighten the attachment nuts and screw, to the figure quoted in the data sheet.
Replace the hot air duct on 3.4 litre cars only.
Refit the petrol pipes to the fuel cooler and replace the cooler on air-conditioned cars.
Reconnect the plug leads, reconnect the battery.

CONNECTING ROD BEARINGS

Remove and refit (set) — Engine in situ **12.17.16**

Removing

Remove the oil sump.
Turn the engine until one big-end bearing is at bottom dead centre.
Remove the connecting rod cap, noting that corresponding cylinder numbers on the connecting rod and cap are on the same side (1, Fig. 14).
Lift the connecting rod from the crank pin and withdraw the bearing shells (2, Fig. 14).

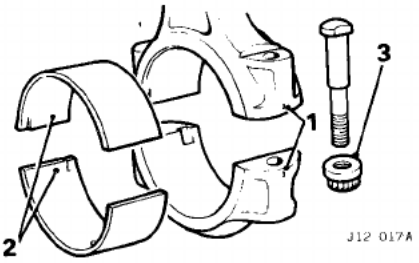


Fig. 14

Inspection

Check the crank pin for signs of overheating, scoring or transfer of bearing metal. If the crank pin is suspect in any way, the engine must be removed and the crankshaft rectified, or renewed as necessary.

Refitting

Liberally coat the replacement bearing shells with clean engine oil and locate in the connecting rod and cap.
Secure the connecting rod cap, ensuring that the marks coincide.
Tighten the connecting rod nuts (3, Fig. 14) to the correct torque.
Repeat operations to change bearings on the remaining five journals, then replace the oil sump.

TAPPETS

Adjust **12.29.48**

Service tool: Valve timing gauge C 3993

CAUTION: If checking valve clearances with the cylinder head removed from the engine, the camshafts must be fitted and checked one at a time. If one camshaft is rotated while the other is in position, fouling is likely between inlet and exhaust valves.

If necessary remove the camshaft covers.
Rotate the camshafts and record the clearance between the back of each cam in turn, and the respective tappet, using a feeler gauge as shown (1, Fig. 15). Clearance to be as detailed in group 05. If adjustment is necessary, proceed with operations below as appropriate.

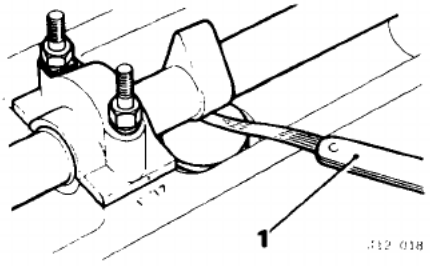


Fig. 15

If the cylinder head is on the engine, before removing the last securing bolt, rotate the engine until the valve timing gauge C 3993 can be located in the front flange of each camshaft (1, Fig. 16)
If necessary, disconnect the sprockets from the camshafts.

CAUTION: Do not rotate the engine while the camshaft sprockets are disconnected.

When the cylinder head is on the engine and the camshaft sprockets disconnected, ensure that no piston is at T.D.C. otherwise valve/piston fouling could occur.

Remove the camshaft bearing caps (2, Fig. 16) and lift the camshaft clear.

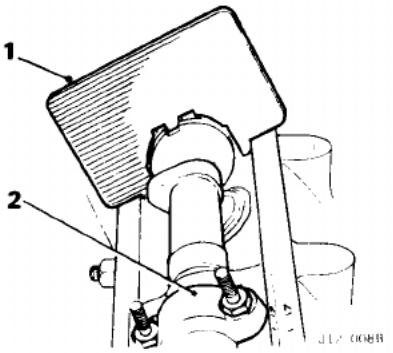


Fig. 16

Remove each tappet, taking careful note of its location. Remove and check the adjusting pad.
NOTE: Subtract the appropriate valve clearance from the dimension obtained above and select suitable adjusting pads which equal this new dimension. Adjusting pads are available rising in 0,03 mm (0.001 in) sizes from 2,16 to 2,79 mm (0.085 to 0.110 in) and are etched on the surface with a letter 'A' to 'Z', each letter indicating an increase in size of 0,03 mm (0.001 in).
Fit selected adjusting pads and fit the tappets.
Fit the camshaft bearing caps and nuts.

NOTE: If the cylinder head is on the engine, locate the camshaft using gauge C 3993 before tightening the bearing cap nuts.
Tighten the bearing cap nuts to the correct torque.
Connect the camshaft sprockets.
Refit the camshaft covers.

OIL FILTER ASSEMBLY

Remove and refit **12.60.01**

Removing

From beneath the car disconnect the oil pressure switch lead. Separate the filter housing from the pipe to the sump by releasing the two hose clips (1, Fig. 17). Catch any spilled oil.
Release the nut (2, Fig. 17) connecting the camshaft oil feed to the filter housing.
Unscrew and withdraw the four setscrews (3, Fig. 17) securing the filter housing to the crankcase casting.
Withdraw the filter and housing.
Remove and discard the gasket (4, Fig. 17).
Detach the canister (5, Fig. 17) and thoroughly clean the housing.

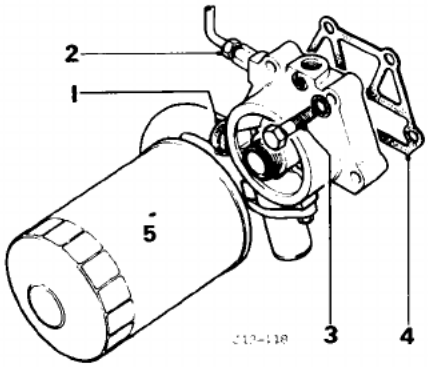


Fig. 17

Refitting

Fit a new gasket and reverse above operations as appropriate.
Fit a new canister, smearing the seal with engine oil and screwing the canister into place by hand only.
Run the engine and check for oil leaks.
Check the oil level, and top up as necessary.

OIL PRESSURE SWITCH

Remove and refit **12.60.50**

See 88.25.08/2.

OIL PRESSURE RELIEF VALVE

Remove and refit **12.60.56**

Removing

From beneath the car, remove the two set bolts (1, Fig. 18) securing the relief valve to the filter head and withdraw the cap (2, Fig. 18), spring (3, Fig. 18), and valve (4, Fig. 18). Collect washer (5, Fig. 18) from the cap.

Refitting

Fit a new 'O' ring (6, Fig. 18) to the valve body and replace in the filter head. Insert the valve and spring, place the washer in the cap and refit to the filter head.

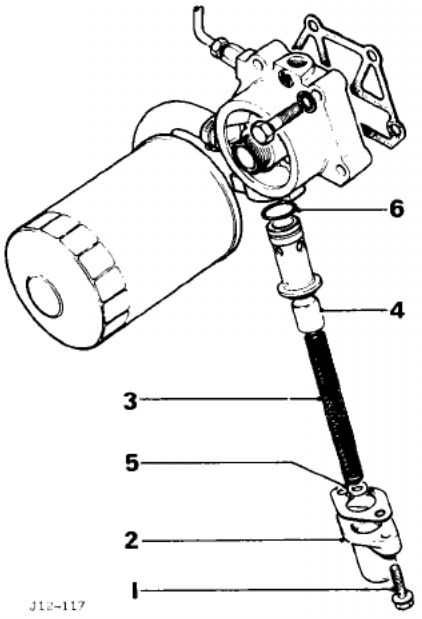


Fig. 18

CAMSHAFT OIL FEED PIPE

Remove and refit **12.60.83**

Removing

Remove the union nut (1, Fig. 19) at the oil filter housing.
Remove the banjo bolts (2, Fig. 19) at the rear of each camshaft.
Manoeuvre the oil feed pipe clear.
Thoroughly clean out the pipe.

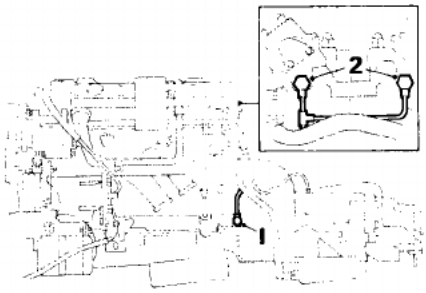


Fig. 19

Refitting

Ensure that the copper seals are in good condition and refit the banjo bolts.

TIMING CHAIN

Adjust **12.65.44**

Service tool: Timing chain adjuster tool JD 2B

Release the clip (1, Fig. 20) securing the crankcase breather pipe to the breather.
Remove the dome head nuts (2, Fig. 20) securing the breather housing. Note the position of the clips and brackets fitted.

continued

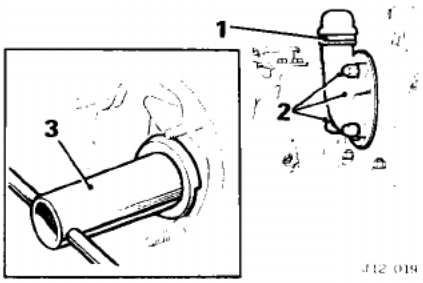


Fig. 20

Withdraw the breather housing and filter gauze.
Slacken the locknut and use tool JD 2B (3, Fig. 20) to tension the top chain. Rotate the tool in an anti-clockwise direction and DO NOT use undue force.
Tighten the locknut and refit the breather housing and all brackets and clips removed.

ENGINE MOUNTING—FRONT SET

Remove and refit **12.45.04**

Removing

Remove the air cleaner assembly.
Remove the nuts from above and below the rubber mounting pads on both sides of the engine (1, Fig. 21).
Carefully raise the engine, using a trolley jack with a wooden block between the jack head and the sump, to release the weight from the mountings.

NOTE: Avoid fouling the fan and cowl

Remove the bolts (2, Fig. 21) securing the mounting brackets to the engine and withdraw the mounting brackets.
Collect the packing pieces and lift out the rubber mountings.

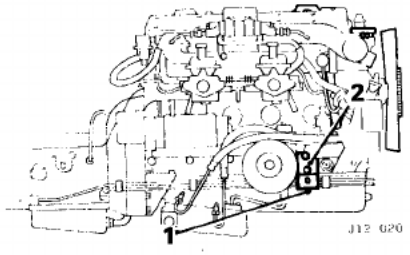


Fig. 21

Refitting

Place replacement mountings in position on the chassis brackets, fitting the insulator between the rubber and the beam on R.H. mountings on 3.4 litre cars only. Replace the spring washers and nuts; tighten the nuts by hand only.

Replace the mounting brackets on the engine, fitting new insulator pads between the brackets and rubber mountings; fit two insulators between the bracket and the rubber mounting on 3.4 litre air-conditioned cars only. Replace the plain washer and Cleveloc nuts, but do not tighten the nuts. Lower the jack.
Tighten the attachment bolts and nuts at the brackets to the correct torque and finally tighten the mounting nuts.
Replace the air cleaner.

ENGINE MOUNTING—REAR SPRING

Remove and refit **12.45.26**

Service tool: Engine support tool MS 53(A)

Removing

Disconnect the battery.
Position service tool MS 53(A) (1, Fig. 22) across the rear engine lifting eye (2) and set the hook to support the engine.

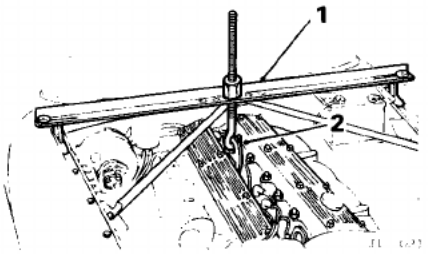


Fig. 22

Jack up the front of the car and place it on two stands.
Disconnect the intermediate exhaust pipe (1, Fig. 23) from the down pipe, remove the sealing olive. Remove the tie plate between the transmission and sump.
Place the jack (2, Fig. 23) with a suitable wooden block under the mounting plate and remove the four setscrews (3, Fig. 23) and washers; lower the jack and remove the rear mounting assembly; collect the spacers and remove the spring.

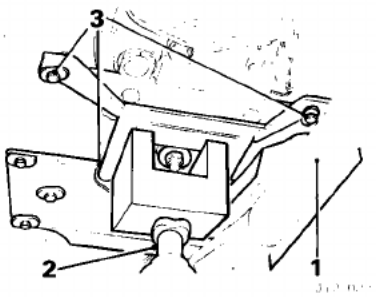


Fig. 23

Refitting

Fit the spring and inner spacers to the mounting assembly and raise it into position on the jack; fit the rear spacers, place washers on the setscrews, insert and tighten.
Lower the jack.
Fit the centre spacer and replace the tie plate.
Reconnect the exhaust pipe, using sealant at the joints; remove the car from the stands and remove tool MS 53(A).

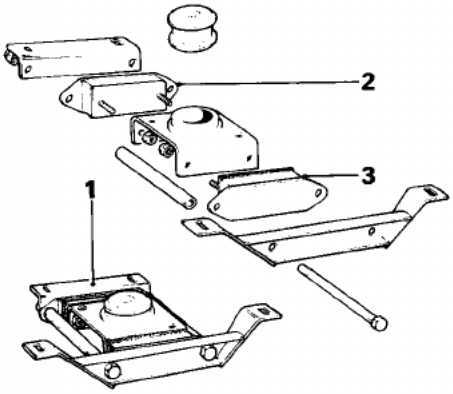


Fig. 24

ENGINE MOUNTING—REAR—FRONT AND REAR RUBBERS

Remove and refit **12.45.24**
12.45.25

Detach the mounting (1, Fig. 24) as above, and dismantle to release the front and rear rubbers (2 and 3, Fig. 24).

CYLINDER HEAD

Remove and refit **12.29.11**

Service tools: Top timing chain adjuster tool JD 2B; valve timing gauge C 3993

Removing

Depressurize the fuel injection system on 4.2 litre cars and drain the cooling system, retaining the coolant for refill.
Detach the wiring and air-conditioning system pipes (if fitted) from the valance to dash ties, remove the bolts at valances, slacken the bolts at dash and swing the ties across the car. Disconnect the coolant hoses.

WARNING: Do not disconnect any refrigerant hoses. Blindness can result if the gas contained within the system comes into contact with the eyes.

Remove the camshaft covers and seals.
Remove the dome headed nuts securing the breather housing, detach the hose and remove the housing.
Remove the bolt securing dipstick tube from model 66 automatic transmission to the inlet manifold.

Detach the down-pipes from the exhaust manifolds.
Disconnect and plug the fuel hoses from the fuel cooler, if fitted.
Disconnect the h.t. leads and remove the harness from the head; separate the temperature transmitter lead and detach the earth lead from the manifold.
Remove the air cleaner, detach the air-flow meter hoses and remove the meter; remove the air cleaner and detach the fuel hoses on 3.4 litre cars; disconnect the throttle and kick-down cables.
Disconnect the heater pipes and remove the camshaft oil feed pipes by detaching the banjo bolts at the rear of the head.
Jack up the front of the car and place it on two stands.
Turn the crankshaft until the two camshaft timing notches are below the camshafts, then remove the two accessible bolts (1, Fig. 26) from each camshaft flange; turn the crank through one complete revolution and release the remaining bolts, but leave one bolt in position in each flange.
Slacken the locknut on the idler sprocket shaft.

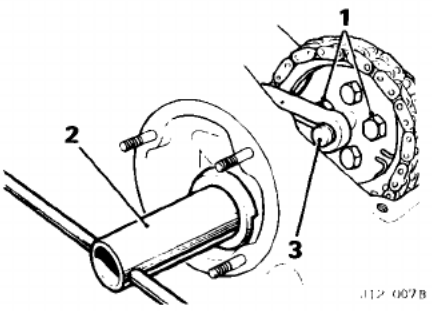


Fig. 26

Use service tool JD 2B (2, Fig. 26) to slacken top timing chain tension by pressing on to serrated adjuster plate and rotating the tool in a clockwise direction.
Remove the remaining bolts.

CAUTION: The engine MUST NOT be rotated while the camshaft sprockets are disconnected and the cylinder head is in place.

Draw the sprockets from the camshafts and slide the sprockets up the support brackets (3, Fig. 26).

NOTE: Mark 'fit' holes in the adjuster plates.

Remove the fourteen cylinder head domed nuts and six nuts securing the front of the cylinder head, working out from the centre. Recover the two lifting brackets.
Lower the vehicle from the stands and carefully lift the cylinder head assembly from the cylinder block.

NOTE: As the valves in the fully open position protrude below the cylinder head joint face, the cylinder head **must not** be placed joint face downwards directly on a flat surface; support the cylinder head on wooden blocks, one at each end.

Thoroughly clean the joint faces of the cylinder head and block.

Refitting

Fit a new gasket, dry, on the cylinder block ensuring that the side marked 'TOP' is uppermost.
Ensure that No. 6 cylinder (front) is at T.D.C. position, with the distributor rotor arm pointing approximately forward along the engine.
Rotate the camshafts until the timing gauge

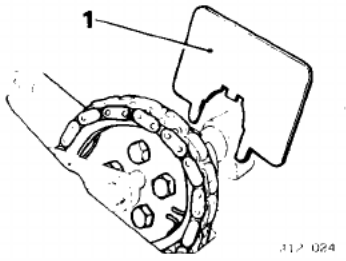


Fig. 27

C 3993 (1, Fig. 27) can be located in the slots in the front flanges.

CAUTION: Ensure that the inlet and exhaust valves do not foul each other.

Lower the cylinder head into position on the cylinder block.
Fit the spark plug lead bracket and lifting brackets to appropriate cylinder head studs.
Place the washers on the cylinder head studs and fit the fourteen large cylinder head domed nuts.
Fit six nuts and washers to secure the forward end of the cylinder head.

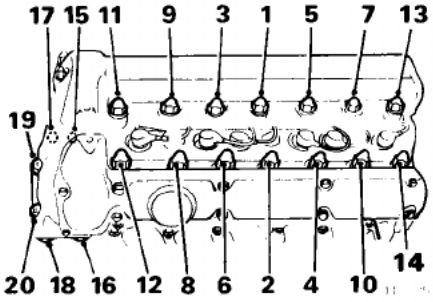


Fig. 28

Tighten the large nuts, in the order shown in Fig. 28, to the correct torque.
Fully tighten the six small nuts.

CAUTION: Do not rotate the engine or camshaft until the camshaft sprockets have been connected.

Locate the sprockets on the camshaft flanges and ensure that both holes in each flange are in alignment with the 'fit' holes in the adjuster plates.

NOTE: If necessary, remove the circlip, disengage the serrations and re-position the adjuster plate as necessary. Refit the circlip.

Secure each adjuster plate to the camshaft, using two bolts and lockplates.
Rotate the engine until the remaining holes on each camshaft are accessible and fit the bolts. Turn up the tabs.
Tension the timing chain by using service tool JD 2B rotated in an anti-clockwise direction. See Fig. 29.

NOTE: When correctly tensioned there should be slight flexibility on both outer sides of the chain.

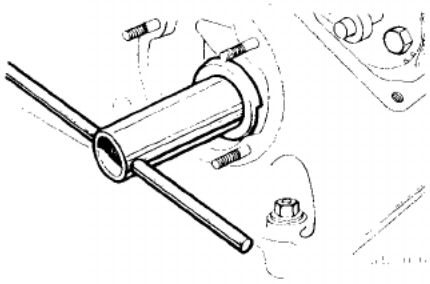


Fig. 29

Securely tighten the locknut.
Ensure that No. 6 cylinder is at T.D.C. firing (with the pointer opposite 'O' on the timing scale) and re-check the position of the camshafts using gauge C 3993.
Reverse the removal operations as appropriate, to complete the reassembly.
Re-check ignition timing as appropriate.
Carry out an exhaust emission check where required by legislation.

CYLINDER HEAD GASKET

Remove and refit **12.29.02**

Removing

Follow the procedure given for removal of the cylinder head (12.29.11). Check the cylinder head and the faces of the cylinder block and liners for damage that caused, or was the result of, gasket failure; rectify as necessary.

OIL SUMP

Remove and refit **12.60.44**

Removing

Remove the front suspension.
Drain engine oil.
Remove the two nuts and lock washers securing the oil return pipe.
Remove the nuts, bolts and washers securing the transmission oil cooler pipe clips — cars fitted with automatic transmission only.
Remove the setscrews and lock washers (1, Fig. 30) and four nuts and lock washers (2, Fig. 30) securing the oil sump.

continued

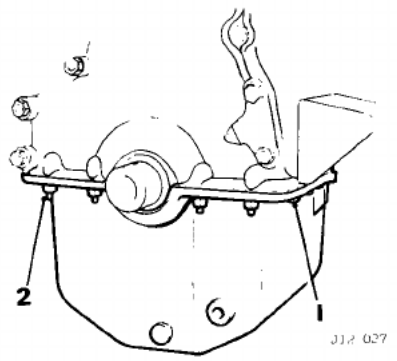


Fig. 30

Remove the four setscrews and washers (1, Fig. 31) securing the intake strainer box. Clean out the sump pan and strainer.
Thoroughly clean all traces of gaskets and seals from the sump, taking great care not to damage the alloy surfaces.
Thoroughly clean the mating surface of the cylinder block

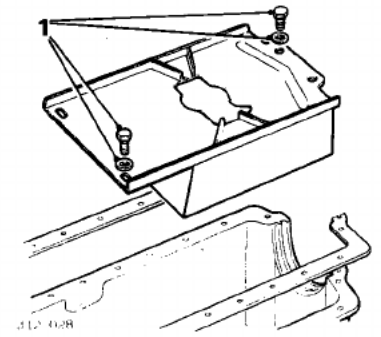


Fig. 31

Refitting

Fit the strainer box and secure using four set-screws and lock washers.
Ensure that the 'O' ring seal is fitted to the oil return pipe.
Fit the new oil seal dry, as supplied and locate in groove in the sump. **DO NOT** trim the ends, but press the seal into the groove until the ends are flush.
Apply RTV sealant compound to both sides of the sump face at the seal aperture joint.
Lightly grease the new gaskets and locate on the sump.
Offer the sump into position and secure it using twenty-six setscrews — short setscrew at front right-hand corner — four nuts and spring washers torque tightening to 20 Nm (15 lbf.ft.)

NOTE:

a. Ensure that the oil return pipe locates in the sump. Secure using two nuts and lock washers.
b. Ensure that the front oil seal locates correctly in the groove.
c. Locate the transmission oil cooler pipe brackets on the relevant setscrews — cars fitted with automatic transmission only.

Refit the front suspension.
Pour 8,25 litres (14.5 Imp. pints) of recommended oil into the engine.
Run the engine, check the oil level, and adjust as necessary.

OIL PICK-UP STRAINER

Remove and refit **12.60.20**

Removing

Remove the oil sump.
Remove the four setscrews and spring washers (1, Fig. 31) securing the strainer box.

Clean

Wash the suction strainer gauze in clean paraffin or petrol, and dry thoroughly. Clean out the sump.

Refitting

Secure the strainer box in position, using four setscrews and spring washers.
Refit the oil sump.

OIL PUMP

Remove and refit **12.60.26**

Removing

Remove the oil sump.
Detach the suction and delivery pipe clips (1, Fig. 32) from the brackets.
Knock back the tabs and remove the setscrews (2, Fig. 32) securing the delivery pipe.
Pull both pipes from the oil pump.
Knock back the tabs and remove the setscrews (3, Fig. 32) securing the oil pump.
Recover the pipe bracket and drive coupling (4, Fig. 32).

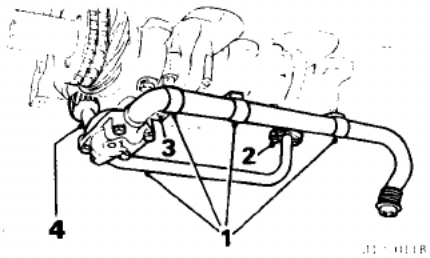


Fig. 32

Refitting

Check the condition of the 'O' ring seals and, if necessary, fit new ones.
Locate the drive coupling on the oil pump and secure the pump using three setscrews, tab washer and pipe bracket. Turn up the tabs.
Fit the delivery pipe on a new gasket, turn up the tabs.
Locate the suction pipe and secure the clips to the brackets. Ensure that the pipe intake is on the centre line of the engine.
Refit the oil sump.

ENGINE AND GEARBOX ASSEMBLY

Remove and refit **12.37.01**

Service tools: Engine support tool MS 53(A); lifting eye C 37851

Removing

Remove the bonnet.
Drain the coolant and conserve for refill.
Drain the oil from the engine.
Detach the radiator hoses and remove the radiator and lower cowl.
Remove R.H. harness cover from the inner wing and disconnect the headlamps at the snap connectors.
Detach the hoses from the valance to bulkhead ties, remove the bolts to valances and slacken the bolts to bulkhead, swing the ties across the car.
Detach the fuel pipes from the cooler (if fitted) and plug them, detach the fuel feed from the carburetters on 3.4 litre cars.
Detach the wiring from the compressor; remove the belt and support the detached compressor alongside the engine. DO NOT SEPARATE REFRIGERANT HOSES FROM THE COMPRESSOR.
Detach the wiring from the alternator.
Disconnect the exhaust down-pipes from the manifolds.
Remove the engine earth lead.
Separate the transmission oil cooler from the valance.
Remove the air cleaner.
Disconnect the air-flow meter wiring and remove the air-flow meter and bracket on 4.2 litre cars.
Disconnect and plug the fuel supply pipe.
Remove the power steering pump from the engine (do not disconnect the hoses) and tie to adjacent wheel arch valance.
Disconnect the wiring, hoses, vacuum pipes and throttle cable from the engine.
Disconnect the injector harness, earth lead and starter lead.
Lift the fresh air intake out of position and remove the heater hose and water valve.
Fit engine support tool MS 53(A) and jack up the front of the car; place it on two stands.
Remove rear and intermediate heat shields.
Detach the tie from between the sump and transmission.
Place the head of the trolley jack under the rear engine mounting and raise it to release the load from the mounting; remove the four bolts and detach the mounting. Collect the spacers.
Remove the four bolts securing the propeller shaft to drive flange, disconnect the shaft and speedometer drive from the gearbox; detach the selector control. Lift the car and remove the stands.
Detach the front lifting eye from the two R.H. studs and replace with lifting eye C 37851, secured by head nuts on the second row of studs from the front of the engine; engage lifting tackle with eye.
Place the trolley jack, with a suitable wooden block on the head, under the gearbox.

Remove the securing nuts from both forward engine mountings.
Carefully raise the engine on the jack and lifting tackle and move it forward to clear the rack housing, then lower the jack slightly and hoist the engine clear of the body.

Refitting

Lower the engine and gearbox into the car; position the trolley jack under the car with a wooden block on the head.
Carefully lower the unit, and locate the gearbox on the trolley jack head; move the unit back (observing clearance of steering rack housing) and align engine to mountings.
Insert the correct packing pieces at the front mountings, fit and tighten the mounting nuts.
Fit engine support tool MS 53(A) and withdraw the lifting tackle.
Remove the lifting eye C 37851 and replace the standard lifting eye.
Remove the jack from under the gearbox, jack up the front of the car and place it on two stands.
Reconnect the speedometer drive, gear selector and propeller shaft.
Raise the rear mounting into position on the jack, insert spacers and secure in position with four bolts.
Fit the sump to the gearbox tie, replace the intermediate and rear heat shields, lower the car from the stands and detach the support tool.
Replace the detached items by reversing the removal sequence; replace or renew the coolant, refill the engine sump and check the fluid levels in power steering and brake reservoirs, and transmission. Bleed the clutch on manual transmission cars.
Replace the bonnet and check emissions where required.

TIMING COVER

Remove and refit **12.65.01**

Removing

Remove the engine and gearbox assembly.
Remove the gearbox from the engine and place the engine on an approved engine stand.
Remove the cylinder head, using operations from Cylinder head—remove and refit —12.29.11 as appropriate.
Remove the water pump.
Remove the crankcase breather.
Remove the torsional damper (1, Fig. 36), cone (2, Fig. 36) and crankshaft Woodruff key.
Remove the timing gear cover (3, Fig. 36) and recover the timing pointer (4, Fig. 36).
Recover the distance piece (5, Fig. 36) and front oil seal (6, Fig. 36).

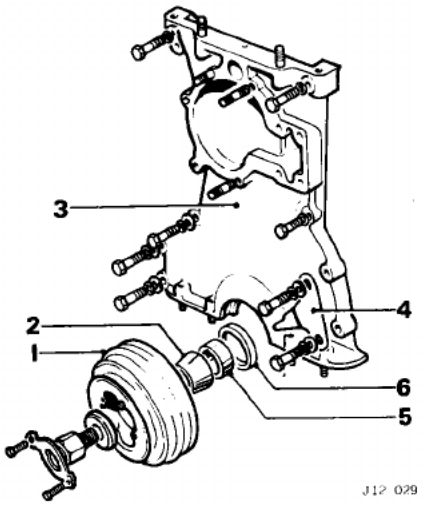


Fig. 36

Refitting

Thoroughly clean all mating faces, taking care not to damage the alloy casting.
Reverse the removal operations, using new gaskets, 'O' rings and seals.

TIMING CHAINS

Remove and refit **12.65.14**

Removing

Remove the timing cover.
Remove the oil thrower (1, Fig. 37—if fitted) from the crankshaft.

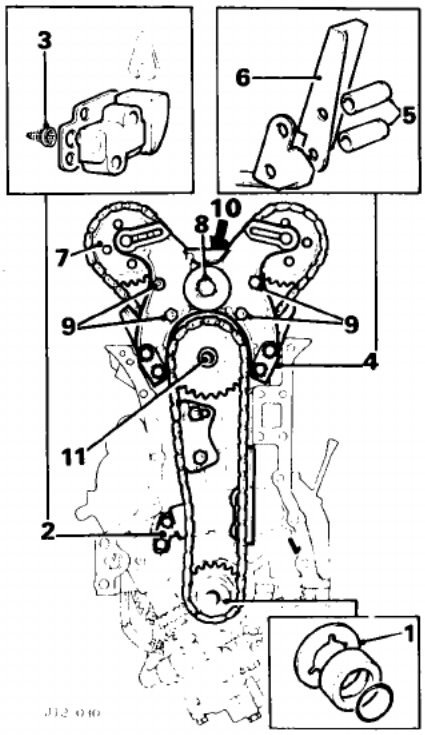


Fig. 37

Remove the setscrews (2, Fig. 37) securing the bottom timing chain tensioner and chain guides. Recover the conical filter (3, Fig. 37) behind tensioner.
Slacken the four setscrews and shakeproof washers (4, Fig. 37) securing the top timing chain assembly. Do not remove the setscrews at this stage.
Withdraw the crankshaft timing sprocket and chain assembly. Recover the distance pieces (5, Fig. 37), top timing chain dampers (6, Fig. 37) and top timing chain retainer.
Disengage the camshaft sprockets (7, Fig. 37) from the top chain.
Remove the nut and serrated washer (8, Fig. 37) from the idler shaft and withdraw the serrated plate, plunger and spring.
Remove the four nuts and serrated washers (9, Fig. 37) securing the front mounting bracket to the rear mounting bracket.
Separate the brackets.
Remove the timing chains from the intermediate and idler sprockets.
Draw the idler shaft (10, Fig. 37), idler sprocket and bush from the rear mounting bracket.
Remove the circlip and press the intermediate shaft from the rear mounting bracket. Recover the intermediate sprockets, bush and shim.

Inspection

Examine the timing chains for signs of damage or wear.
Examine all sprockets for signs of damage or wear.
Examine all dampers and the chain tensioner for signs of damage or excessive wear.
Examine the idler sprocket bush and intermediate sprocket bush for signs of wear.

NOTE: If the timing chains or sprockets show signs of excessive wear or are damaged in any way, all sprockets and the chains should be renewed.

Refitting

Fit the eccentric idler shaft (1, Fig. 38) to the hole in the front mounting bracket.
Fit the spring and plunger (2, Fig. 38) in the bracket and locate the serrated plate (3, Fig. 38) on the shaft. Loosely secure using serrated washer and nut (4, Fig. 38).
Fit the idler sprocket (5, Fig. 38) (21 teeth) to the idler shaft.
Fit the intermediate sprocket (6, Fig 38), large gear forward, on the intermediate shaft; fit shim in rear mounting bracket, ensuring that the roll-pin engages in the slot, and retain the shaft with the circlip.
Locate the top timing chain (longer) on the small intermediate sprocket, and lower timing chain on the large sprocket.
Loop the top chain beneath the idler sprocket and secure the top mounting bracket to the rear mounting bracket using four nuts and serrated washers (7, Fig. 38).
Fit four long setscrews (8, Fig. 38) and spring washers to the front mounting bracket and fit

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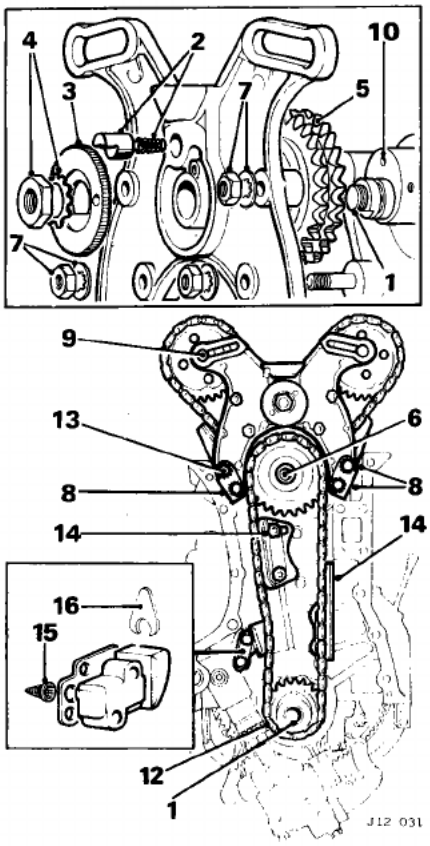


Fig. 38

the dampers, chain support plate and distance pieces to the setscrews.
Equalize the loops of the top timing chain, and locate the camshaft sprockets in the loops (9, Fig. 38).
Rotate the eccentric idler shaft (10, Fig. 38) to lift the idler sprocket to the highest position between the camshaft sprockets.
Ensure that the Woodruff key is fitted to the crankshaft.
Locate the crankshaft sprocket (11, Fig. 38) on the shaft, but do not slide it fully home at this stage.
Loop the bottom timing chain (12, Fig. 38) beneath the crankshaft sprocket, tap the sprocket fully home and locate the assembly.
Tighten the four setscrews (13, Fig. 38) to retain the assembly.
Fit the bottom timing chain guides (14, Fig. 38) but do not tighten the setscrews at this stage.
Fit the conical filter (15, Fig. 38) in the hole in the cylinder block.
Screw the slipper into the tensioner until the dimension of 3,2 mm (0.125 in) exists between slipper and body.
Locate the tensioner on shims as necessary to ensure that the slipper runs central on the chain and secure using two setscrews and lockplate.
Place slip gauge or distance card (16, Fig. 38) supplied with new tensioner between slipper and body of tensioner to maintain dimension of 3,2 mm (0.125 in) and adjust the intermediate damper to touch the chain. Tighten the setscrews and turn up tabs of the lockplate.
Remove the slip gauge and top chain or the tensioner slipper to release the ratchet.
Position the oil thrower on the crankshaft.
Refit the timing cover.

TIMING CHAIN TENSIONER

Remove and refit **12.65.28**

Removing

Remove the timing cover.
Remove the setscrews and locking plate securing the tensioner. Recover the tensioner and shim (1, Fig. 39).
Remove the conical filter (2, Fig. 39) from the cylinder block.

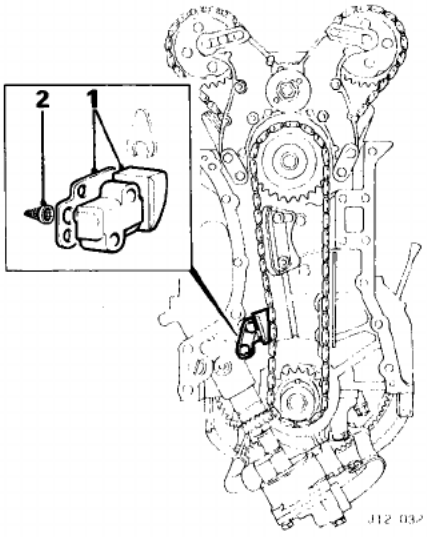


Fig. 39

Refitting

Thoroughly clean the conical filter and fit to the cylinder block.
Screw the slipper into the tensioner and fit the distance card supplied with new tensioner or 3,2 mm (0.125 in) slip gauge between the slipper and body.
Locate the tensioner on shims as necessary to ensure that the slipper runs central on the chain and secure it using two setscrews and lockplate.
Slacken the setscrews securing the intermediate damper and set it into light contact with the chain. Tighten the screws and re-lock.
Remove the slip gauge and tap the chain or tensioner slipper to release the ratchet.

FLYWHEEL

Remove and refit **12.53.07**

Removing

Remove the clutch assembly.
Knock down the locking plate tabs and remove ten bolts (1, Fig. 40).

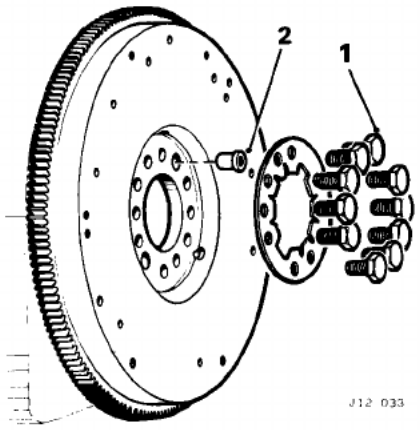


Fig. 40

Remove the flywheel from the crankshaft, using drawbolts through the dowels (2, Fig. 40).

NOTE: On later vehicles dowels are not fitted

Refitting

Locate the dowels where fitted in the crankshaft and tap them fully home through the flywheel.
Fit the locking plate and secure the flywheel using ten bolts. Tighten to the correct torque.
Turn up the tabs.
Refit the clutch assembly.

DRIVE PLATE

Remove and refit **12.53.13**

Removing

Remove the torque converter.
Knock down the locking plate tabs and remove ten bolts (1, Fig. 41).
Remove the drive plate from the crankshaft using drawbolts through the dowels (2, Fig. 41).

NOTE: On later vehicles dowels are not fitted.

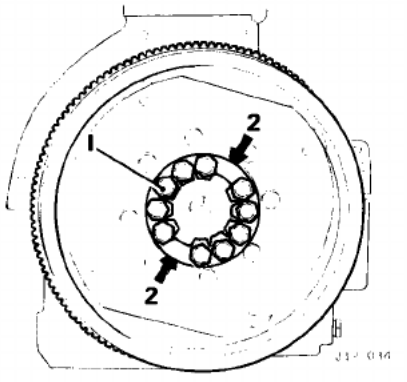


Fig. 41

Refitting

Locate the dowels where fitted in the crankshaft and tap them fully home through the drive plate.
Fit the locking plate and secure the drive plate, using ten bolts. Tighten to the correct torque.
Turn up the tabs.
Refit the torque converter.

PISTON AND CONNECTING ROD

Remove and refit—engine set **12.17.01**

Service tool: Piston ring clamp 18G 55A

Removing

Remove the engine and gearbox assembly.
Remove the gearbox and place the engine on an approved engine stand.
Remove the cylinder head.
Remove the oil sump.
Remove the nuts (1, Fig. 42) from the connecting rod bolts.
Remove the connecting rod cap (2, Fig. 42), noting corresponding cylinder numbers (3, Fig. 42) on the connecting rod and cap. Number 1 cylinder at rear of engine.

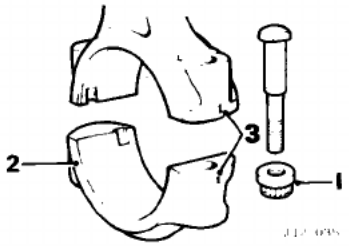


Fig. 42

Remove the connecting rod bolt (4, Fig. 42) and withdraw the piston and connecting rod from the top of the cylinder bore.
Repeat operations to remove pistons on each cylinder, then continue with piston refitting.

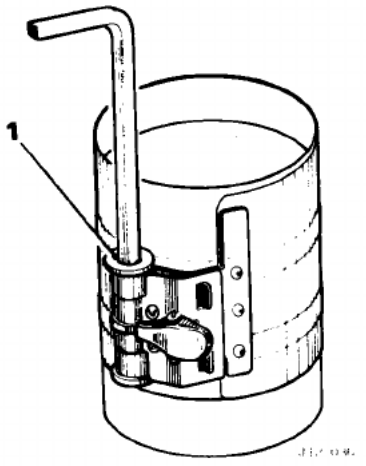


Fig. 43

Refitting

NOTE: If the original pistons and connecting rods are being fitted, they must be replaced in the cylinder bore from which they were removed.
If new pistons and connecting rods are being fitted they should be stamped with the number of the bore in which they are to be installed. Number 1 cylinder is at the rear of the engine. Fit service tool 18G 55A (1, Fig. 43) to a piston, and fully compress the piston rings.
Enter the piston into the cylinder bore, ensuring that stamped 'FRONT' on the piston is towards the front of the engine.
Fit bearing shells to connecting rod and cap, liberally coating them with clean engine oil.
Fit cap to connecting rod, ensuring that the cylinder numbers stamped on each part are on the same side.
Tighten the connecting rod nuts to the correct torque.
Repeat for each cylinder in turn.
Refit the oil sump.
Refit the cylinder head.
Refit the engine and gearbox assembly.

PISTON AND CONNECTING ROD

Overhaul **12.17.10**

NOTE: Pistons are supplied complete with gudgeon pins. As pins and pistons are matched assemblies it is not permissible to interchange component parts.

Overhaul

Remove the piston and connecting rods.
Remove the circlips.
Push the gudgeon pin out of the piston.
Withdraw the connecting rod.

Refitting

Fit the gudgeon pin (1, Fig. 44) in the piston.

CAUTION: Connecting rods must be refitted to pistons in such a way that when installed in the engine the word 'FRONT' on the piston crown faces the front of the engine and the chamfer on the big-end eye faces the crank pin radius.

Align the small-end (2, Fig. 44) with the end of the gudgeon pin and push the pin home.
Use new circlips (3, Fig. 44) to retain the gudgeon pin.

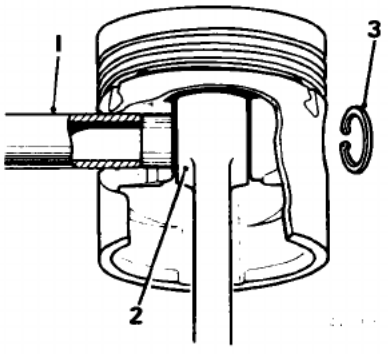


Fig. 44

NOTE: The gudgeon pin is a push fit in the piston at 20°C (68°F). Fit will vary with ambient temperature.

Three piston rings are fitted, as follows:

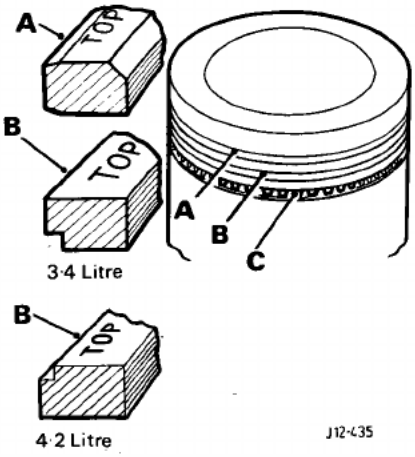


Fig. 45

A. Top ring—compression.
B. Second ring—compression.
C. Bottom ring—oil control.

Both top and second rings have tapered peripheries and are marked 'TOP' to ensure correct fitting. In addition, the top ring has a chrome plated periphery and is also cargraph coated. This coating is coloured RED and must not be removed. The bottom ring consists of an expander sandwiched between two rails.
Check the piston ring gap in the bore. Push the ring to a point midway down the bore, check that the ring is square and measure the gap—see Engine Data.
Fit the bottom ring ensuring that the expander ends are not overlapping.
Fit the second and top rings ensuring that they are fitted the correct way up.
Position the rings so that the gaps are staggered around the periphery of the piston.
Check the side clearance of the rings in the piston groove—see Engine Data.
Check the connecting rods for alignment on a suitable jig.
Check the bore of the small-end bush—see Engine Data.

CAUTION: If the small-end bush is worn beyond acceptable limits, a service exchange connecting rod must be fitted. It is NOT advisable to renew the bushes as specialized equipment is needed to hone the bushes to finished size. Refit the pistons and connecting rods.

CYLINDER HEAD

Overhaul **12.29.19**

Service tools: Valve spring compressor JD 6118C; valve timing gauge C 3993

Remove the cylinder head.

Dismantling

Remove the inlet and exhaust manifolds from the cylinder head. Discard the gasket and thoroughly clean the mating faces, taking great care not to damage the castings.

continued

Remove the four bearing caps from each camshaft. Note the mating marks (1, Fig. 46) on each bearing cap.
Lift out the camshafts.
Withdraw the tappets and lay them out in order to ensure the correct replacement.
Remove the adjusting pads from each valve stem, and place them with their respective tappets.

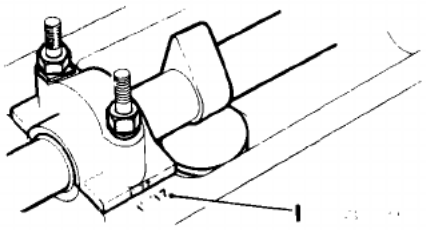


Fig. 46

A. 31 mm (1¼ in)
B. 31 mm (1¼ in)
C. 96 mm ($3\frac{25}{32}$ in)
D. 111 mm ($4\frac{3}{8}$ in)
E. 152 mm (6 in)
F. 76 mm (3 in)
G. 203 in (8 in)

Make up a wooden block to the dimensions given (Fig. 47) and use it to support the valves.

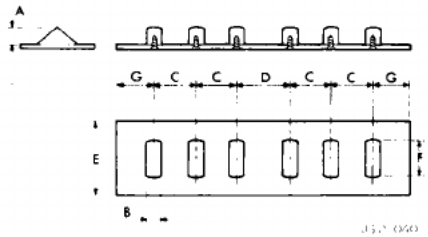


Fig. 47

Compress the valve spring using service tool JD 6118C and extract the cotters, see Fig. 48. Remove the collars, valve springs and spring seats. Repeat for the remaining five cylinders.

NOTE:
a. Remove the oil seal from the stem of the inlet valves before removing the spring seat.
b. Valves are numbered and must be replaced in original locations, No. 1 cylinder being at the flywheel end of the engine.

Remove all traces of carbon from the combustion chambers and deposits from the induction and exhaust ports. Great care must be taken to avoid damaging the head, use worn emery cloth and paraffin only.

Valve guides
Check the clearance between the valve guide and stem, this should be 0,025 to 0,10 mm (0.001 to 0.004 in). When removing a worn guide, care must be taken to identify each individual guide to its bore in the cylinder head. Replacement guides are available in the three following sizes, and have identification grooves machined in the shank as noted below.

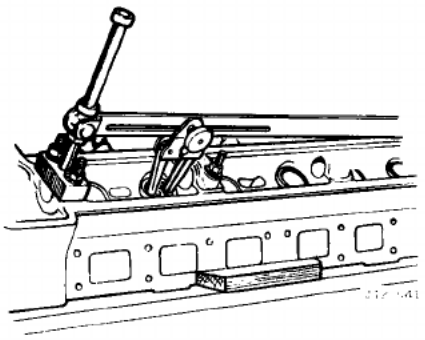


Fig. 48

NOTE: Valve guides, when fitted during initial engine assembly, are to the following dimensions and may be fitted in mixed form.

Standard (no identification)
12,73 to 12,75 mm (0.501 to 0.502 in).
1st oversize (one machined groove)
12,78 to 12,80 mm (0.503 to 0.504 in).
2nd oversize (two machined grooves)
12,85 to 12,88 mm (0.506 to 0.507 in).
3rd oversize (three machined grooves)
12,98 to 13,00 mm (0.511 to 0.512 in).

When new guides are to be fitted, they should always be one size larger than the old guide. Standard and 1st oversize valve guides may be replaced in the following manner:
Immerse the head in boiling water for 30 minutes.
Using a piloted drift, drive the guide out of the head from the combustion chamber end.
Coat the new valve guide with graphite grease and refit the circlip.
Heat the cylinder head.
Using a piloted drift, drive in the guide (1, Fig. 49) from the top until the circlip is seated in the groove.

CAUTION: This procedure is not recommended owing to the difficulty of establishing truth with the centre of the valve seat; it should not be attempted unless comprehensive machine shop facilities are available. A replacement cylinder head should be considered as an alternative.

NOTE: If a 2nd oversize guide is to be replaced the cylinder head bore must be reamed to the following dimension.
12,95 mm + 0,012 mm—0,005 mm (0.510 + 0.0005 in—0,0002 in).

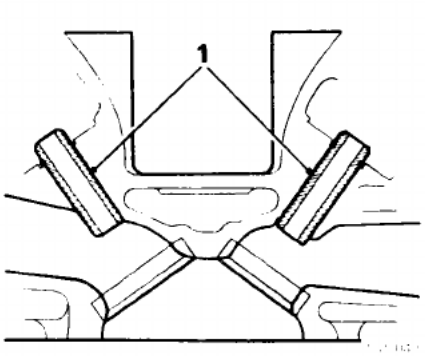


Fig. 49

Valve seats
Examine the valve seats for pitting or excess wear. If the seats are damaged past reclamation by approved refacing procedures, the seat inserts may be replaced.

CAUTION: This procedure is not recommended owing to the difficulty of removing the old valve seat and the risk of damage to the cylinder head; it should not be attempted unless comprehensive machine shop facilities are available. A replacement cylinder head should be considered as an alternative.

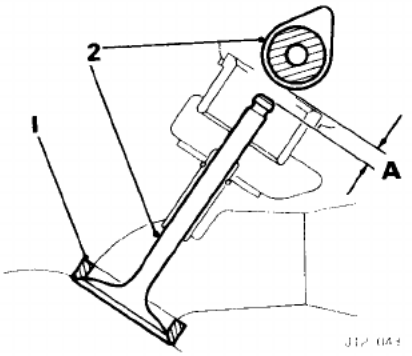


Fig. 50

Remove the inserts by machining, leaving approximately 0,25 mm (0.010 in) of metal which can easily be removed by hand without damaging the cylinder head.
Measure the diameter of the insert recess in the cylinder head.
Grind down outside diameter of the new insert to a dimension 0,08 mm (0.003 in) larger than the insert recess.
Heat the cylinder head for half an hour from cold at a temperature of 150°C (300°F).
Fit the insert (1, Fig. 50) ensuring that it beds evenly in the recess.
Renew or reface valves as necessary.
Correct valve seat angles are:

Inlet	Exhaust
44½ degrees	44½ degrees

Valves
Check the valve stems for distortion or wear, renew the valves with stems worn in excess of 0,08 mm (0.003 in), see section 05 book 1.
Using a suitable suction tool, grind the valves into their respective seats.
If new valve inserts have been fitted, the clearance 'A' between valve stem and cam (2, Fig. 50) must be checked; this should be 8,13 mm (0.320 in) plus the valve clearance. The dimension must be taken between the valve stem and the back of the cam. Should this dimension not be obtained, metal must be ground from the valve seat of the insert.

NOTE: Only suitable grinding equipment should be used.

Tappet guides
Examine the tappets and tappet guides for wear. The diametrical clearance between the tappet and tappet guide should be 0,02 to 0,05 mm (0.0008 to 0.0019 in).

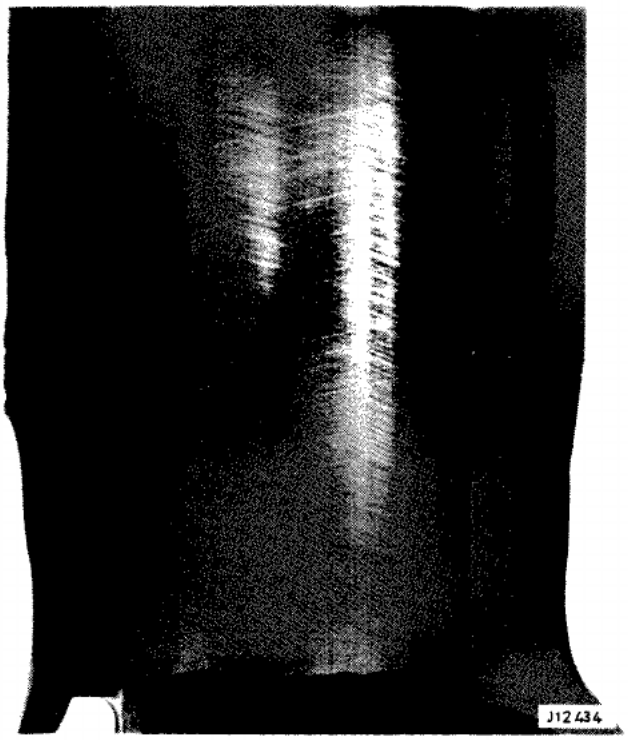
This method has been developed and evaluated on Service cylinder blocks, and when strictly adhered to, will produce the required bore finish.

6. Cleaning:
   a. Remove oil gallery plugs and flush out oilways with suitable cleaning solvent. Replace plugs.
   b. Using soapy water, thoroughly brush cylinder bores AND crankcase.
   c. Brush the bores and crankcase with clean water.
   d. Wipe each bore with clean white cloth/tissue. Wipe all main bearing journals similarly.
      Repeat process until cloth/tissue can be removed clean.

CLEANLINESS CANNOT BE OVERSTRESSED

IMPORTANT

Even though excess oil consumption is diagnosed, IT MAY NOT BE NECESSARY to deglaze cylinder bores.
If there is no measurable bore wear and the cylinder walls have a surface finish as illustrated, it will only be necessary to replace pistons and/or piston rings.



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EMISSION CONTROL SYSTEM

Description 17.00.00

The emission control system fitted is designed to comply with local legislative requirements. Some or all of the following components may be fitted depending on those requirements. The description that follows refers to cars with an emission control system that complies with North American Federal Specification.

Crankcase breather system

To ensure that piston blow-by gas does not escape from the crankcase to atmosphere, a depression is maintained in the crankcase under all operating conditions. This is achieved by connecting the crankcase breather housing, located at the front of the cylinder head, to the air intake system between the air-flow meter and the throttle housing where a depression exists under all engine operating conditions.

Fuel evaporative loss control

The fuel tank venting is designed to ensure that vapours are vented through the control system even when the car is parked on an inclined surface.

A capacity limited device in the fuel tanks ensures sufficient free volume is available after filling to accommodate fuel which would otherwise be displaced as a result of high temperature rise.

Cars have a fuel tank evaporative loss control system fitted as standard equipment to meet U.S. Federal and Californian requirements.

The system operates as follows:

Interconnected tubing attached to the air vents in both fuel tanks conveys petrol vapour via a sealed storage canister to the throttle body.

The system is completely sealed. However, it is essential that routine maintenance operations detailed in this supplement are carried out by your Dealer at the specified mileage intervals.

Catalytic converters

A catalytic converter is fitted into the exhaust system in order to reduce emissions of carbon monoxide, hydrocarbons, and oxides of nitrogen.

Catalytic converter precautions

1. In order to maintain the efficiency of the emission control system it is essential to use UNLEADED gasoline only; this fuel minimizes spark plug fouling, thereby sustaining engine performance.
2. DO NOT tamper with the engine settings: they have been established to ensure that the vehicle will comply with stringent exhaust emission regulations. Incorrect engine settings could cause unusually high catalytic converter temperatures and thus result in damage to the converter and vehicle. If adjustment to the settings is considered necessary this should be performed by a British Leyland Dealer or other qualified service facility.
3. A correctly tuned engine optimizes exhaust emissions performance and fuel economy and it is recommended that the vehicle is maintained as outlined under **MAINTENANCE SUMMARY** of this manual.
4. DO NOT continue to operate the vehicle if any engine malfunction is evident; malfunctions should be rectified immediately. For instance, misfire, loss of engine performance or engine run-on may lead to unusually high catalytic converter temperature and may result in damage to the converter and car.
5. NEVER leave the vehicle unattended with the engine running.
6. The use of a catalytic converter increases exhaust system temperatures (particularly under engine malfunction); therefore do not operate or park the vehicle in areas where combustible materials such as dry grass or leaves may come into contact with the exhaust system.
7. The vehicle is designed for normal road use. Below are examples of abuse which could damage the catalytic converters and car and may lead to a dangerous condition due to excessively high catalytic converter temperatures:
   a. Competition use
   b. Off roadway use
   c. Excessive engine revolutions
   d. Overloading the vehicle
   e. Excessive towing loads
   f. Switching off the engine and coasting in gear.
8. DO NOT run the engine with either a spark plug lead disconnected or a spark plug removed.

   DO NOT use any device that requires an insert into a spark plug hole in order to generate air pressure (e.g. tyre pump, paint spray attachment, etc.), as this could also result in catalytic converter damage.
9. DO NOT push or tow the vehicle to start it; this could damage the catalytic converters. It is recommended that jumper leads are used.
10. Heavy impact on the converter casing must be avoided as it contains ceramic material which is easily damaged.

Fuel filler caps

Unleaded fuel MUST be used on catalyst-equipped cars, and labels to indicate this are displayed on the fuel gauge and the tank filler caps. The filler caps are designed to accommodate unleaded fuel pump nozzles only. The anti-surge flap prevents leaded fuel from being added to the fuel tanks because it does not open when a leaded fuel pump nozzle is entered into the filler neck up to the position of the restrictor and the pump is switched on.

Misfiring

If the engine misfires, the cause must be immediately rectified to prevent catalytic converter damage.

The emission control system fitted to this engine is designed to keep emissions within legislated limits providing ignition timing and fuel injection settings are correctly maintained and the engine is in sound mechanical condition.

It is essential that routine maintenance operations detailed in this Manual are carried out by your Dealer at the specified mileage intervals.

Exhaust Emission—Testing

In order that exhaust emissions are kept within the legislated limits an idle exhaust emission test MUST be carried out after any unscheduled service operations which might affect the emission control system.

CAUTION: CO content must not exceed 1.5% or be less than 0.5% with the electrical lead to the oxygen sensor disconnected.

It is essential that the equipment used for testing purposes is of the following type:

1. An infra-red CO exhaust gas analyser.
2. Engine and ignition diagnostic equipment.
3. Lucas 'EPITEST' fuel injection diagnostic equipment.

EXHAUST GAS RECIRCULATION (E.G.R.)

A vacuum operated E.G.R. valve (Fig. 1) meters a proportion of the exhaust gas into the intake system. The exhaust gas is diverted from the rear exhaust manifold and fed via the E.G.R. valve into the rear of the inlet manifold.

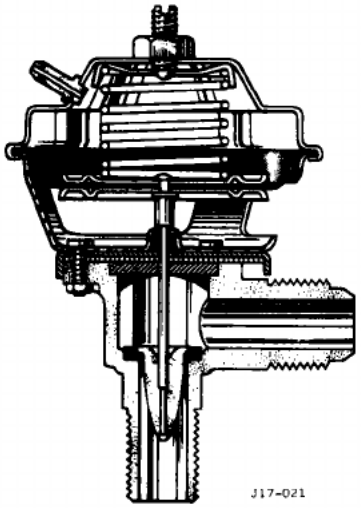


Fig. 1

The vacuum signal 81 mmHg which lifts the valve is obtained from the throttle edge port and is such that no recirculation occurs at idle. The E.G.R. valve has a shaped pintle to give the variation in gas flow required for different engine operating conditions.

THERMAL VACUUM VALVE

With the high rates of E.G.R. required to reduce emission of NO_2 following engine cold starting, it is necessary to inhibit the E.G.R. until the engine is part warm.
A thermal vacuum (Fig. 2) at the rear of water rail senses coolant temperature. The vacuum signal is switched to the E.G.R. valve when its temperature-sensitive bi-metal discs which open the valve on rising temperature (43°C) and close on a falling temperature of 33°C.

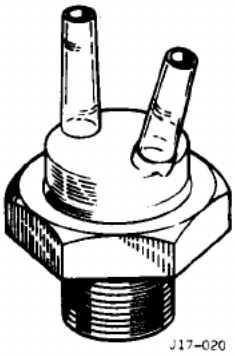


Fig. 2

Another throttle edge vacuum port operates the distributor vacuum capsule (6) rotating the base plate and relative to the reluctor. This vacuum port is positioned such that when the throttle is in the idling or near fully open there is insufficient vacuum to operate the capsule. To delay the operation of the vacuum advance capsule, a delay valve is fitted in the signal pipe between the capsule and the throttle edge port. This valve consists of sintered discs which determines the vacuum delay, and a non-return by-pass valve which allows the vacuum in the distributor capsule to dissipate immediately the signal is removed.

EMISSION CONTROL SYSTEM

Evaporative Loss

Description

Hydrocarbon emissions in the form of fuel vapour are emitted from vehicle fuel tanks (1, Fig. 3).
To prevent these emissions entering the atmosphere the fuel tanks have unvented, sealed filler caps.
The vapour is passed to a vapour storage canister (2, Fig. 3) containing activated charcoal which absorbs the vapours when the vehicle is stationary and desorbs them when the engine is running.
The desorption or purging is obtained by connecting the purge pipe from the canister to a vacuum source via a 3mm restriction located at the junction of the purge pipe and the crankcase breather pipe (3, Fig. 3).
To ensure that piston blow-by gases do not escape from the crankcase a depression is maintained in the crankcase under all operating conditions.
This is achieved by a pipe (with 6mm restriction) connecting the crankcase breather housing (at the front of the cylinder head) to a port in the throttle housing (air cleaner side) upstream of the throttle disc, such that a depression is created in the breather pipe at all times.
The depression is at minimum at closed throttle and maximum at full throttle.

Charcoal canister

The canister is mounted in the R.H. front wheel arch. Filter pads above and below the charcoal prevent the ingress of foreign matter or passage of charcoal into the purge line.
Emissions from the fuel tanks enter at the bottom of the canister and the purging air enters at the top, passing through the charcoal to the purge outlet at the top of the canister to the vacuum source.

Fuel expansion and tank venting

The fuel tanks, mounted in each rear wing, have a 10% expansion volume incorporated, obtained by limiting the amount of fuel into the tank.
A fuel filler tube extends into the tank to the required level.
A 1mm orifice (6, Fig. 3) at the top of the filler neck extension allows the expanding fuel to slowly displace the air from the tank into the venting system via the filler neck and a port in the tanks side panels to vapour separators (4, Fig. 3) in each rear screen pillar.
Condensed vapour drains back to the tanks. Excess vapour is passed to the charcoal canister via a pipe under the floor and a pressure relief valve (5, Fig. 3). The valve controls the flow of vapour.

continued

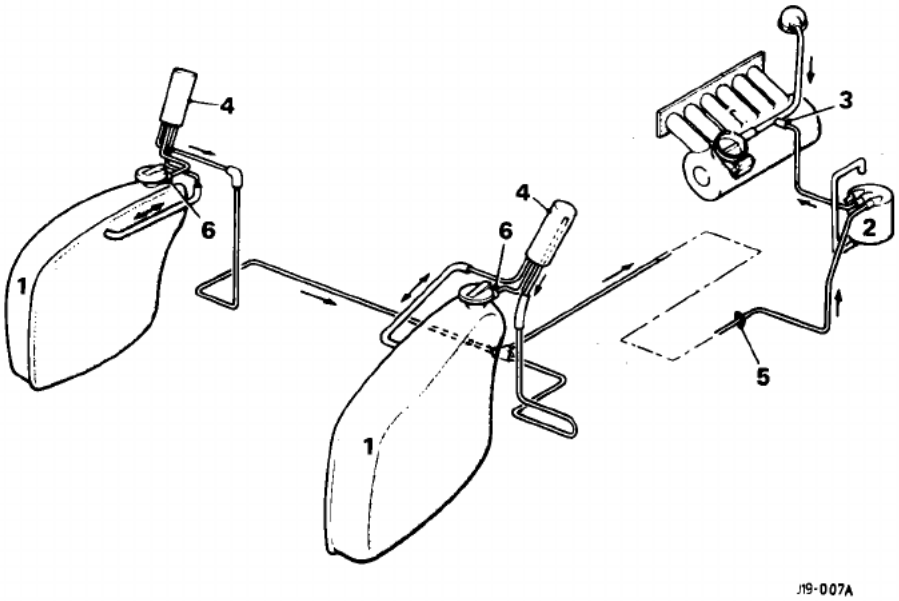


Fig. 3

When the fuel tanks are full and pressurized, to prevent fuel spillage when the filler cap is released it is necessary to lower the level of the fuel below the filler neck extension.
A domed restriction tank is sealed to the inside of the tank side panel. This tank occupies fuel space during refuelling.
To lower the fuel level fuel is allowed to flow into the restriction tank via a 2,5mm orifice.

Fuel filler cap

Each tank has a lockable fuel filler cap incorporating a pressure blow-off facility. A spring-loaded seal is mounted on the filler neck flap and seats on the filler neck face. No vacuum relief is provided. Incorporated in the filler neck is the leaded fuel restriction.

Pressure relief valve

This valve (5, Fig. 3) controls the transfer of vapour from the vapour separators to the charcoal canister (2, Fig. 3), and prevents the transfer until a pre-set pressure is exceeded.
To allow a flow to the tanks from the canister a vacuum relief is incorporated.

EMISSION TEST AND CHECKS (1979)

3.4 Cars

Anti-run-on valve check

Run engine at idle, switch off ignition, listen for operation of E.G.R. valve two to five seconds after the engine has stopped.
Restart engine and idle.
Disconnect black lead from anti-run-on valve solenoid.
Connect —ve lead from battery to anti-run-on valve solenoid.
Engine should stop immediately connection is made.
Remove lead and replace original black lead.
Switch off ignition.

XJ6 Fuel Injection with E.G.R. Valve—Australia—Check E.G.R.

Run engine at idle speed when warm after probe.
Slowly open throttle to 2000 rev/min. Observe movement of E.G.R. valve spindle.

XJ6 Fuel Injection with Catalyst and Oxygen Sensor—U.S.A./Canada/Japan

Remove exhaust manifold sample cap and fit sample pipe to manifold.
Run engine until warm (engine temperature 90). Clamp off extra air valve hose. If idle speed drops, warm up for extra five minutes. Adjust idle speed (750 rev/min) using screw in air distribution block.
Connect exhaust analyser to sample pipe.
Read off CO emission.
Refer to Book 1, Section 05 for exhaust emission CO reading. Adjust screw in air metering unit. Disconnect manifold vacuum pipe from fuel pressure regulator. Blank off pipes.
Observe CO reading. After five seconds reading should increase and after a further few seconds return to original reading.
This indicates correct operation of the oxygen sensor.

XJ6 Fuel Injection—European

Run engine at 2000 rev/min in neutral or 'N' for ten seconds. Close throttle and allow engine to idle for fifteen seconds.
Insert probe into tail pipe or connect sample pipe to manifold. Switch analyser switch to 'T' in Test (Sun-Tester EPA 75).
Read off CO 0.56 to 1.5%. If incorrect, adjust setting screw in air metering unit to achieve correct CO reading.

XJ6 Fuel Injection with Catalyst and Oxygen Sensor—USA/Canada/Japan

Switch off engine after warm-up. Remove plug from exhaust manifold sample cap and fit sample pipe to manifold. Disconnect oxygen sensor electrical lead.
Run engine at 2000 rev/min for 10 seconds in Neutral or 'N' then close throttle, allow to idle.
Connect exhaust analyser to sample pipe, switch to 'T' or Test.
Refer to Book 1, Section 05 for exhaust emission CO reading. Adjust setting screw in the air metering unit to achieve correct CO reading.
Switch off ignition, remove sample pipe from exhaust manifold. Replace plugs. Restart engine, run at 2000 rev/min, close throttle and allow idle to stabilize. Reconnect oxygen sensor lead.
Insert probe into tail pipe. Read off emission level from analyser.

LUCAS CONSTANT ENERGY IGNITION

A Lucas Constant Energy Ignition System is fitted to XJ 4.2 E.F.I. Models on Series III. The new ignition system operates by maintaining the energy stored in the coil at a constant level, allowing the output voltage to remain constant over a wide range of engine speeds. The power dissipated in both the coil and module compared with equivalent constant dwell systems is greatly reduced.

Constant energy system component description

Amplifier AB 14

The amplifier consists of a solid state electronic module housed in a aluminium case with two pre-wired leads which connect to the low tension terminals on the ignition coil.

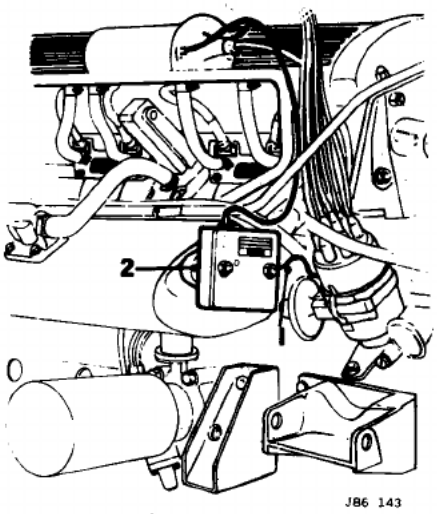


Fig. 4

Connection from the distributor pick-up module is made by an assembly of two leads inside a screening braid which plugs into a socket on the amplifier side (1, Fig. 4). The amplifier mounting is shown in (2, Fig. 4).

Distributor (45 DM)

The distributor incorporates a standard automatic advance system, anti-flash shield (1, Fig. 5), rotor arm, and cover (2, Fig. 5). The previous pick-up and module assembly is replaced by a reluctor and pick-up module (3, Fig. 5). The reluctor is a gear-like component (with as many teeth as there are cylinders) which is mounted on the distributor drive shaft.

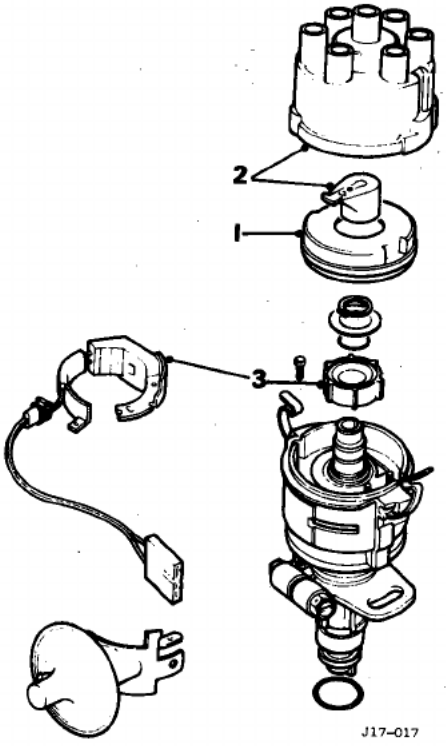


Fig. 5

The pick-up module consists of a winding around a pole-piece attached to a permanent magnet.
The distributor is pre-wired with two leads terminating in a moulded two-pin inhibited connector, which plugs into the amplifier previously described.

During normal service the air gap between the reluctor and the pick-up module does not alter and will only require re-setting if it has been tampered with. If it is necessary to adjust the gap, then it should be set so that the minimum clearance between the pick-up and the reluctor teeth is not less than 0,20 mm (0.008 in). The gap should not be set wider than 0,35 mm (0.014 in) (1, Fig. 6).

The air gap is measured between a reluctor tooth and the pick-up module and should be checked with a plastic feeler gauge. The use of a metal feeler gauge may result in a misleading gauge reading due to the pick-up module contacts being magnetic. However, their use will not affect the electical operation of the pick-up module.

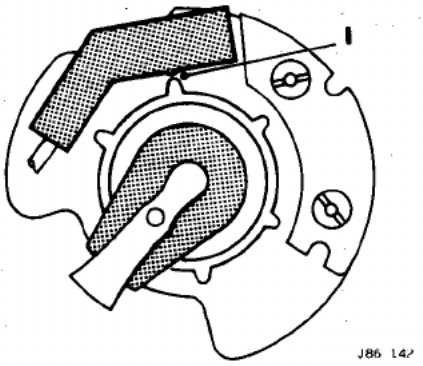


Fig. 6

FAULT FINDING PROCEDURE

SWITCH ON IGNITION

MEASURE BATTERY VOLTS

LESS THAN 11.5 VOLTS—BATTERY DISCHARGED

MORE THAN 11.5 VOLTS—BATTERY O.K.

MEASURE VOLTAGE AT COIL '+' TERMINAL SHOULD BE 1 VOLT MAX. BELOW BATTERY VOLTAGE

INCORRECT

CHECK WIRING TO/FROM IGNITION SWITCH

CORRECT

MEASURE VOLTAGE AT COIL '−' TERMINAL— SHOULD BE THE SAME AS ON THE + TERMINAL

INCORRECT

DISCONNECT WIRE TO AB14 AMPLIFIER FROM COIL '−' TERMINAL

MEASURE VOLTAGE AT COIL '−' TERMINAL

LESS THAN 2 VOLTS—COIL FAULTY

MORE THAN 2 VOLTS—AMPLIFIER FAULTY

CORRECT

DISCONNECT DISTRIBUTOR PICK COIL FROM AMPLIFIER

MEASURE PICK-UP MODULE—RESISTANCE SHOULD BE 2.2 TO 4.8 K OHMS

INCORRECT

CHANGE PICK-UP MODULE

CORRECT

RECONNECT PICK-UP MODULE TO AMPLIFIER

MEASURE VOLTAGE AT COIL '−' TERMINAL CRANK ENGINE

VOLTAGE SHOULD FALL

INCORRECT

AMPLIFIER FAULTY

CORRECT

CHECK H.T. CIRCUIT COIL SECONDARY H.T. LEADS ROTOR ARM DISTRIBUTOR COVER SPARK PLUGS

FAULT FINDING

This chart indicates the possible areas of the cause of the faults. Perform checks and remedial action shown in the order given until the fault is rectified.

Details of the checks and remedial action are given on the respective area charts.

Extra checks shown in brackets refer only to the specific condition shown in brackets after the symptom.

SYMPTOM	POSSIBLE CAUSES IN ORDER OF CHECKING
Will not start (warm engine)	B1, B2, D1, D2, A1, A13, (A5), A5, A3, A6, A7, C1, C2, C3, A20 A8, A18.
Poor or erratic idle (cold engine)	D1, D2, A1, A12, A6, (A5), A3, C4, C6, C3, C5, A10, B4, B3, B6, (A13), E1, E3, E4, E5, A21, A7, A8, A18.
Hestitation or flat spot (cold engine)	D1, D2, A1, A4, (A5), A9, A3, A6, B5, (A13), C4, C6, C3, C5, A15, B4, B3, B6, E1, E3, E4, E5, A7, A8, A18.
Excessive fuel consumption	D3, A4, A5, B5, B4, B3, B6, B8, B7, E1, E3, E4, E5, A21, A7, A19, A8, A18.
Lack of engine braking or high idle speed	A2, A16, A9, A12, A3, A13, A10, C3, B5, A14, B6.
Lack of engine power	D1, D2, A1, A4, A5, A17, A3, B5, A15, A6, C4, C6, C3, C5, B4, B3, B6, E1, E3, E4, E5, A8, A18.
Engine overheating	B7, B8, C4.
Engine cuts out or stalls (at idle)	D1, D2, A1, A7, (A12), (A5), A5, A15, (A3), B4, A6, C4, C6, C3, C5, B6, E1, E3, E4, E5, B3, A8, A18.
Engine misfires	D1, D2, A1, A5, A6, A3, C4, C6, C3, C5, A15, B4, B3, B6, E1, E3, E4, E5, A21, A8, A18.
Fuel smells	D3, A5, E4, E2, E3, E5, A15, A19, A21, A8, A18.
Engine runs on	D1, A12, A16, A10, E4, E3, B7, B8, C3, C5.
Engine knock or pinking	D1, C3, C5, B7, B8.
Arcing at plugs	C4, C6.
Lean running (low CO)	A1, A14, A4, A2, A7, D1, D2, B6, E1, E3, E4, E5, A8, A18.
Rich running (excess CO)	A5, E5, A19, A21, A8, A18.
Backfiring in exhaust	D1, D2, A1, A15, B4, B6, C3, E1, A8, A18.

ELECTRONIC FUEL INJECTION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
A1	Connections	Ensure all connector plugs are securely attached. Ensure electronic control unit (E.C.U.) multi-pin connector is fully made. Ensure all ground connections are clean and tight.
A2	Air leaks	The engine will run weak because air leaking into the manifold is not mo itored by the air-flow metering device. Ensure all hose and pipe connections are secure. Check all joints for leakage and re-make as necessary.
A3	Sticking air flap	Ensure that the air-flow meter flap moves freely. If the flap sticks, the air-flow meter should be replaced.
A4	Throttle switch	Check function of full load switch or vacuum switch.
A5	Cold start system inoperative	Check function of cold start system (see Epitest Section 3).
A6	Triggering system	Check function of triggering system (from coil).
A7	Temperature sensors	Check sensors for open and short circuit.
A8	E.C.U.	As a last resort the E.C.U. should be checked by substitution.
A9	Throttle butterfly adjustment	Reset as per operation.
A10	Throttle by-pass valve	The valve should be suitably adjusted until fault has been rectified and re-check function.
A12	Incorrect idle speed	This should be adjusted by means of the screw on the air distribution block.
A13	Auxiliary air valve inoperative	Test in accordance with operation 19.20.17.
A14	Throttle spindle leaks	Check seals, bearings and spindles for wear. Renew as required.
A15	Air cleaner blocked	Inspect element, and renew as necessary.
A16	Throttle sticking	Lubricate, check for wear and reset.
A17	Throttle inhibited	Check and remove obstructions of free movement of throttle mechanism through total travel. If no obstructions apparent, reset.
A18	Air-flow meter	As a last resort, the air-flow meter should be checked by substitution.
A19	Oxygen sensor	The oxygen sensor should be checked by substitution.
A20	Power resistors	The power resistors should be checked by substitution.
A21	Injector faults	Check function of injectors.

BASIC ENGINE CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
B1	Low battery condition	Check battery condition with hydrometer. Re-charge, clean and secure terminals, or renew as necessary. (If battery is serviceable but discharged, trace and rectify cause of flat battery, e.g. short circuit or insufficient charge from alternator.)
B2	Start system deficient	If starter fails to turn engine briskly, check engagement circuit and connections. Check and clean main starter circuit and connections.
B3	Poor compressions	Check compressions with proprietary tester. If compressions are low or uneven, check/adjust valve clearance and re-test. If compressions are still unsatisfactory remove cylinder head for further examination and rectification.
B4	Exhaust system leaking or blocked	Check, and rectify as necessary.
B5	Faults on areas of vehicle other than engine.	Check for binding brakes, slipping clutch, etc.
B6	Air leaks at inlet manifold	Check inlet manifold/cylinder head joint. Re-make with new gasket if necessary. Check manifold tappings for leaks—seal as necessary.
B7	Cooling system blocked or leaking	Flush system and check for blockage. Check hoses and connections for security and leakage. Renew as necessary. Check thermostat, and renew if faulty.
B8	Cylinder head gasket leaking.	Check cylinder block/head joint for signs of leakage. Renew gasket if necessary.

IGNITION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
C4	System deterioration	Check ignition wiring for fraying, chafing and deterioration. Check distributor cap for cracks and tracking and rotor condition. Renew leads, cap or rotor as necessary.
C5	Advance system faults	Disconnect vacuum pipes and check operation of advance mechanism against advance figures, using stroboscopic timing light. Lubricate or renew as necessary. Re-connect vacuum pipes and check operation of advance unit. Renew or secure vacuum pipes if necessary.
C6	Spark plug faults	Remove spark plugs, clean, reset gap and test on proprietary spark plug testing machine. Renew if in doubt.

FUEL SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
D1	Insufficient, incorrect or contaminated fuel	Ensure that the fuel tank has an adequate level of the correct grade of fuel. If dirt or water contamination is suspected, drain and flush the fuel tank, flush the system and renew the fuel line filter before filling with clean fuel.
D2	Fuel starvation	Check fuel pressure according to operation 19.45.12. if not satisfactory, check fuel feed pipes for leaks or blockage. Renew connectors if damaged or deteriorated. If contamination of fuel is discovered, flush fuel system and renew line filter. If necessary, renew fuel line filter, pressure regulator or fuel pump to rectify.
D3	Leaking fuel	Check fuel system for leaks and rectify as necessary. Renew any doubtful connectors.

EVAPORATIVE AND CRANKCASE VENTILATION SYSTEM CHECKS

	POSSIBLE CAUSE	CHECK AND REMEDIAL ACTION
E1	Engine oil filter cap loose or leaking	Check cap for security. Renew cap if seal is deteriorated.
E2	Fuel filler cap defective	Check seal for condition—renew if deteriorated. Check filler cap for security—rectify or renew as necessary.
E3	Restrictors missing or blocked	Check and clear or renew as necessary.
E4	Hoses blocked or leaking	Check and clear as necessary. Renew any deteriorated hoses.
E5	Charcoal canister restricted or blocked	Inspect, and renew if necessary.

ENGINE BREATHER FILTER

Remove and refit **17.10.02**

Removing

Remove the hose clip securing the rubber cover to breather housing and disconnect.
Remove the rubber cover and lift out the filter (Fig. 7).

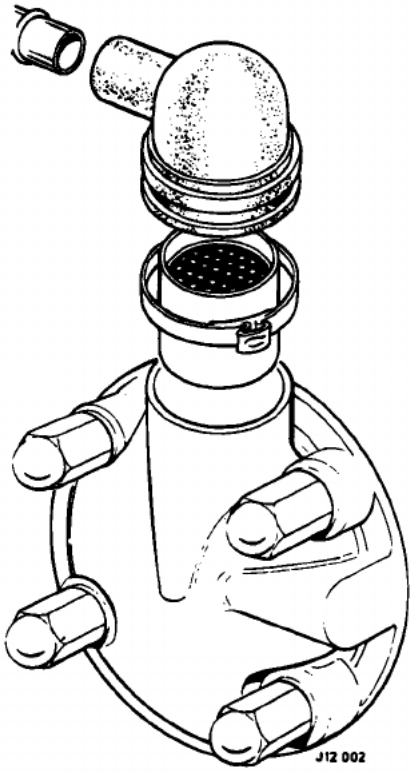


Fig. 7

Refitting

Refitting is a reversal of the above procedure.

ADSORPTION CANISTER

Remove and refit **17.15.13**

Removing

Remove the front right-hand road wheel.
Detach the pipes from the canister (1, Fig. 8).
Remove the nut, spring washer, plain washer and bolt (2, Fig. 8) securing the canister clamp to the mounting strap and withdraw the canister (3, Fig. 8).

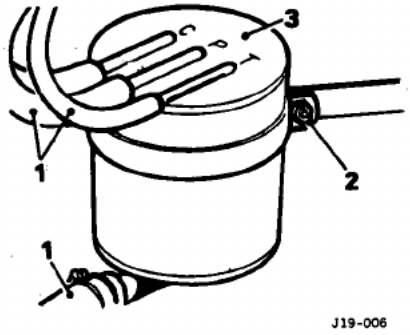


Fig. 8

Refitting

Refitting is a reversal of the above procedure.

CATALYTIC CONVERTER

Remove and refit **17.50.01**

Removing

Raise the vehicle on a ramp.
Remove the nuts, plain washers and bolts securing the flanges, separate the intermediate pipe from the down-pipe. Ensure that the intermediate pipe is adequately supported.
Remove the nuts and plain washers securing the heatshield and down-pipe to the exhaust manifolds; withdraw the heatshield.
Withdraw down-pipe/catalyst (Fig. 9).

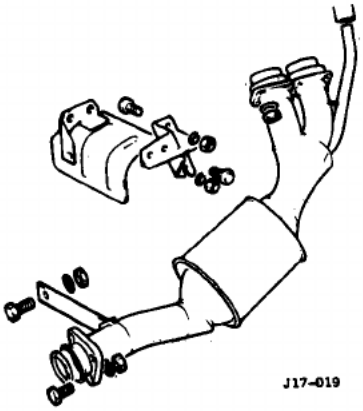


Fig. 9

Refitting

When refitting, first coat all joints with Firegum. Tighten the down-pipe and clamping flange fixings by diagonal selection to avoid distortion.

position of 'V' mark on needle guide for correct reassembly) and remove the needle guide locking screw. Discard the screw (5, Fig. 10).
Withdraw the needle with guide and spring (6, Fig. 10).
Remove the bottom cover-plate retaining screws and the spring washers and detach the cover-plate with the sealing ring (7, Fig. 10).
Only if it is essential, remove the jet adjusting screw, plug and sealing from its counterbore and withdraw screw; and 'O' ring is carried in a groove in its head (8, Fig. 10).
Remove the jet adjusting lever retaining screw. Collect the spring (9, Fig. 10).
Withdraw the jet and adjusting lever together and separate the lever from the jet (10, Fig. 10).
Unscrew and remove the float pivot spindle. Collect washers from between the pin head and carburetter body (11, Fig. 10).
Withdraw the float (12, Fig. 10).
Remove the needle valve and unscrew the valve seat (13, Fig. 10).
Unscrew the jet bearing locking nut and withdraw the jet bearing (14, Fig. 10).
Bend back the lock washer tabs and unscrew the nut retaining the throttle levers and return spring. Note location of levers and spring (15, Fig. 10).
Remove the yoke lever and the return spring (16, Fig. 10).
Remove the throttle disc retaining screws (17, Fig. 10).
Remove the slow-running adjustment grub screw, tamperproof cap, and spring clip (18, Fig. 10).
Close the throttle and mark the position of the throttle disc in relation to the carburetter flange. Do not mark the disc in the vicinity of the over-run valve. Open the throttle and carefully withdraw the disc from the throttle spindle, taking care not to damage the over-run valve (19, Fig. 10).
Withdraw the throttle spindle and remove its seals, noting the way it is fitted in relation to the carburetter body to ensure correct reassembly (20, Fig. 10).

Inspection

Examine the throttle and its bearings in the carburetter body; check for excessive play, and renew parts as necessary (21, Fig. 10).
Examine the float needle and seating for damage and excessive wear; examine the nylon body of the needle for cracks; renew both the needle and the seat if necessary (13, Fig. 10).
Examine all the rubber seals and 'O' rings for damage or deterioration; renew as necessary. The cover-plate sealing ring must be renewed.
Examine the carburetter body for cracks and damage and for security of brass connections and piston key (3, Fig. 10).
Clean inside of the suction chamber and the piston rod guide with fuel or methylated spirit (denatured alcohol) and wipe dry. Abrasives must not be used.
Examine the suction chamber and piston for damage and signs of scoring.
Check that all balls are in piston ball-race (2 rows, 6 per row).
Fit the piston into the suction chamber, without the damper and spring; hold the assembly in a horizontal position and spin the piston. The piston should spin freely in the suction chamber without any tendency to stick.

Reassembling

Fit the new seals to the carburetter body and replace the spindle. Press the seals just inside the spindle housing bosses (1, Fig. 11).
Insert the throttle disc in the spindle, ensuring that it is positioned as previously marked (2, Fig. 11).
Fit two new throttle disc retaining screws. Ensure that the throttle closes correctly before tightening the screws fully, and spread their slotted ends sufficiently to secure. Do not overspread (3, Fig. 11).
Replace the return spring, lever and yoke on throttle spindle (4, Fig. 11).
Fit the new lock washer and replace the nut on throttle spindle. Tighten to 0,43 kgf m (37 lbf in) and secure by bending over tabs (5, Fig. 11).
Replace the slow-running adjusting grub screw, with new spring clip and tamper-proof cover. DO NOT CLOSE LID OF COVER (6, Fig. 11).
Replace the jet bearing and tighten the locking nut 1,38 to 1.65 kgf m (10 to 12 lbf ft) (7, Fig. 11).
Replace the needle valve seat and refit the needle (8, Fig. 11).
Replace the float and spindle with washer and tighten to 0,07 kgf m (6 lbf in) (9, Fig. 11).

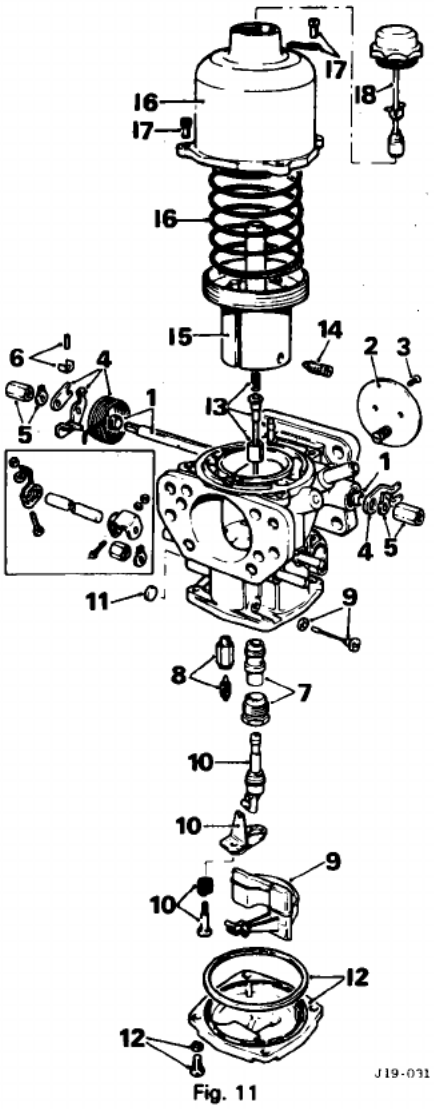


Fig. 11

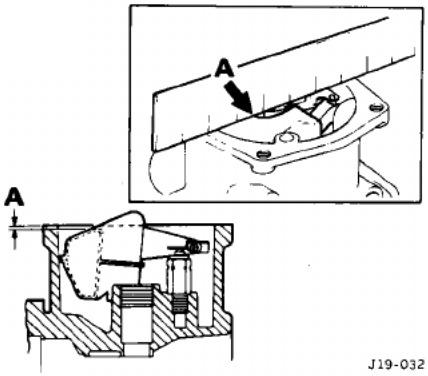


Fig. 12

Invert the carburetter so that the needle valve is held on the seat by the weight of the float. Check that the lowest point indicated on float as 'A' in illustration (Fig. 12) is 1,0 ± 0,5 mm (0.04 ± 0.02 in) below the level of the float chamber face. Adjust if necessary by carefully bending the brass arm. Check that the float pivots correctly about the spindle.
Assemble the jet and the adjusting lever and plate in position in body, engaging the forked end of the lever with the reduced diameter of the adjusting screw. Fit the retaining screw and spring, but tighten finger-tight only initially (10, Fig. 11).
Check that the jet head is free to move in the cut-out in the adjusting lever and slides easily in the jet bearing. Fully tighten the retaining screw.
If the adjusting screw has been removed, fit new 'O' ring to it and insert carefully ensuring that its reduced tip diameter engages the slot of the adjusting lever. Screw in until jet is flush with the bridge of the body, then screw in a further 3⅔ turns, to bring jet 3,0 mm (0.117 in) below bridge (11, Fig. 11).
Fit a new sealing ring to the bottom cover-plate and refit as marked. Replace the four retaining screws and spring washers and tighten the screws (12, Fig. 11).
Refit the spring to needle, ensuring that the spring is located in its groove (13, Fig. 11).
Slide the needle guide over the needle (with open end of slot adjacent to the projection in flange) and insert in the piston as previously marked.
Insert NEW needle retaining screw in the piston, position the needle guide flush with the bottom face of the piston and tighten the screw to 0,14 to 0,17 kgf m (12 to 15 lbf in) (14, Fig. 11).
Carefully replace the piston and the needle assembly in the carburetter body (15, Fig. 11).
Replace the spring on the piston, and lower the suction chamber carefully over the spring, avoiding turning the chamber as it compresses the spring (to prevent the spring from twisting the piston) (16, Fig. 11).
Fit the three screws and the identity tag (17, Fig. 11).
Insert the damper piston in bore of the piston rod using tool, press the damper retainer fully into top of rod (18, Fig. 11).
Fill the bore of the piston rod with engine oil, preferably S.A.E. 20, up to the bottom of damper retainer and tighten suction chamber cap firmly by hand.
Replace carburetters.

AUTOMATIC ENRICHMENT DEVICE (A.E.D.)

Remove and refit **19.15.38**

Removing

Disconnect the battery, the fuel inlet and overflow pipe (1, Fig. 13).
Disconnect the air delivery pipe and the mixture delivery pipe (2, Fig. 13).
Remove the bolts and spring washers securing the A.E.D. unit to mounting bracket; lift off the A.E.D. unit (3, Fig. 13).

Refitting

Reverse the above procedure, use new clips on the hot air inlet and mixture delivery pipes.

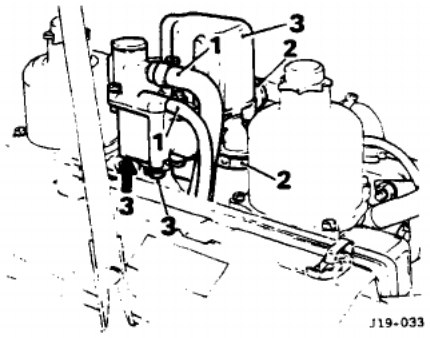


Fig. 13

DIAPHRAGM

Remove and refit **19.15.40**

Remove the A.E.D. unit (1, Fig. 14) and invert.
Remove the four screws and the spring washers securing the diaphragm cover (2, Fig. 14).
Withdraw the cover, spring, diaphragm and locating dowel (3, Fig. 14).

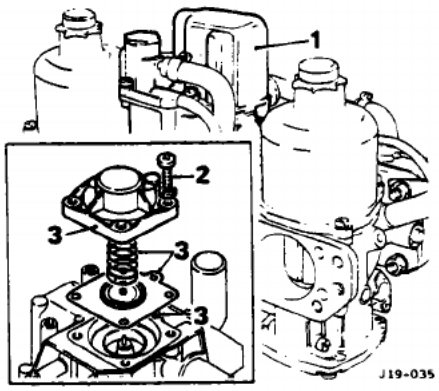


Fig. 14

Refitting

When refitting, ensure that the bore of the locating dowel is clean.
Push the dowel into the hole in the A.E.D. unit.
Locate the diaphragm on the A.E.D. unit.

NOTE: The rivet head must face toward the A.E.D. unit.

Insert the spring in the diaphragm cover.
Position diaphragm cover and spring squarely over the diaphragm, ensuring that the spring is seated in the diaphragm plate.
Push the cover down, ensuring that the locating dowel enters the hole in cover.
Refit the four securing screws and refit the A.E.D. unit.

NEEDLE VALVE

Remove and refit **19.15.42**

Removing

Remove the A.E.D. unit.
Carefully prise off the insulation cover (1, Fig. 15).
Remove the three screws and spring washers securing the float chamber cover (2, Fig. 15).
Lift off cover (3, Fig. 15).

CAUTION: Do not move cover sideways.

Remove and discard the gasket (4, Fig. 15).
Unclip the needle valve from the float arm (5, Fig. 15).

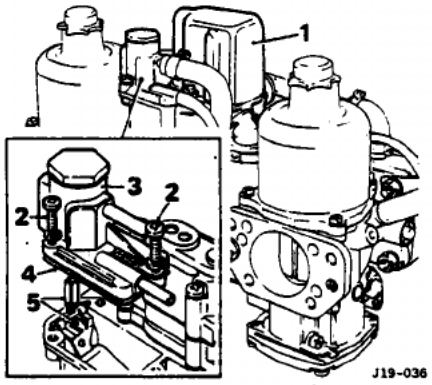


Fig. 15

Refitting

Lift float from the chamber.
Position the needle valve in the recess in the cover.
Clip the needle valve to the float arm by using a steel rule; hold the float against the cover.
Position the new gasket on the A.E.D. body—do not use jointing compound or grease.

Lower the cover on to the A.E.D. unit, ensuring that the float and needle valve are not displaced.
Ensure that the float hinge pin is correctly located before fitting the three securing screws and insulation cover. Refit the A.E.D. unit.

A.E.D. FILTER

Remove, clean and refit **19.15.43**

Disconnect the battery. See operation 86.15.20.
16).
Withdraw the filter element, wash it in petrol and dry using clean, dry compressed air (2, Fig. 16).

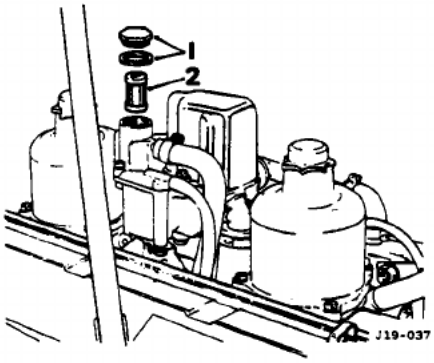


Fig. 16

HOT AIR PICK-UP UNIT

Remove and refit **19.15.44**

Slacken the clamping bolt and withdraw the air delivery pipe from the outlet tube (1, Fig. 17).
Remove the bolts securing the pick-up unit to the exhaust manifold, withdraw the pick-up unit together with the air filter (2, Fig. 17).

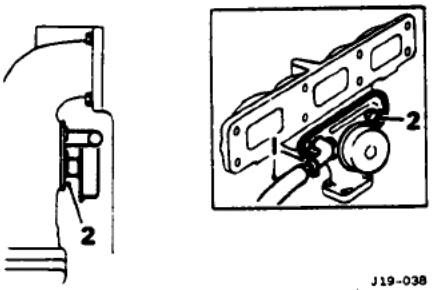


Fig. 17

HOT AIR DELIVERY PIPE

Remove and refit **19.15.45**

Slacken the clamping bolt and withdraw the air delivery pipe from the outlet tube.
Remove the nut and bolt securing the pipe clip to the support bracket.
Disconnect the delivery pipe from the A.E.D. unit.
Use a new clip to secure the delivery pipe to the A.E.D. unit when refitted.

HOT AIR FILTER

Remove, clean and refit **19.15.46**

Slacken the clamping bolt and move the filter towards the cylinder block to withdraw it (1, Fig. 18).
Wash the filter in petrol and dry with compressed air (2, Fig. 18).
Lightly oil the filter gauze with engine oil and refit.

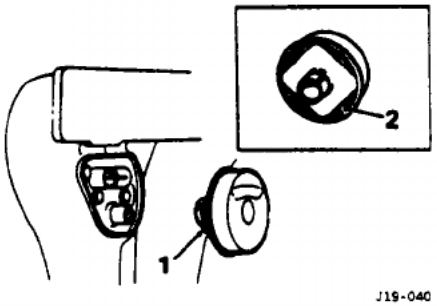


Fig. 18

THROTTLE LINKAGE

Check and adjust **19.20.05**

Fully depress the throttle pedal and ensure that the butterfly valve operating lever comes to a position just touching the operating lever stop screw (1, Fig. 19). If the lever does not touch the stop screw, and linkage was initially correctly set up, adjust as follows:
Slacken the locknuts at the outer throttle cable abutment (2, Fig. 19).
Adjust the position of the outer cable in abutment to place the inner cable under light tension but NOT to move throttle operating lever; secure the locknuts (3, Fig. 19).
Re-check adjustment as above.
Slacken locknuts on outer throttle cable and adjust position of cable in abutment so that throttle operating lever rests against back stop, yet inner cable is not slack; tighten locknuts.

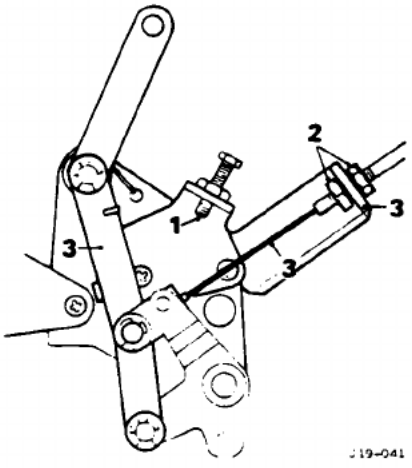


Fig. 19

Depress throttle pedal and ensure that operating lever moves to touch stop screw with pedal at end of its travel. Adjust pedal stop so that cable is not under due strain when pedal is fully depressed.
Check operation of kick-down cable (see 44.30.02—cars fitted with Model 66 automatic transmission only).

THROTTLE OPERATING ROD BUSHES

Remove and refit **19.20.10**

Remove the throttle pedal.
Remove the under-scuttle casing.
Prise the spring clips from the steering-column universal joint cover; detach the covers and padding—left-hand-drive cars only.
Remove the split pin at the top end of the operating rod (1, Fig. 20).
Disengage the sleeve and nipple from the rod (2, Fig. 20).
Remove the two self-locking nuts and draw the pedal arm from the stubs—right-hand-drive cars only.
Remove the split pin from the operating rod pivot (3, Fig. 20).
Pull the rod from the pivot. Recover the plain washer (4, Fig. 20).
When refitting, remove worn bushes and fit new ones where necessary (5, Fig. 20).

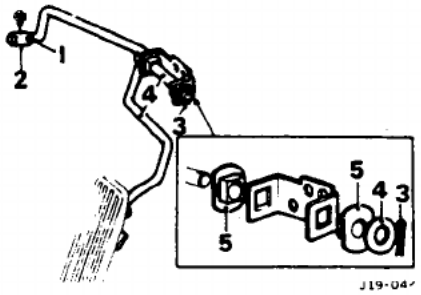


Fig. 20

FUEL PIPE ARRANGEMENT (Fig. 21) (Carburetter cars only)

Description **19.40.00**

The system utilizes two fuel pump assemblies and draws from two fuel tanks fitted in the rear wings.
When the left-hand tank is selected on the instrument panel switch, voltage is applied to the left-hand fuel pump and fuel is passed via the filter to the two carburetter float chambers.
Selection of the right-hand tank energizes the right-hand fuel pump.
The outlet non-return valve of the inoperative pump prevents fuel passing from one tank to the other.

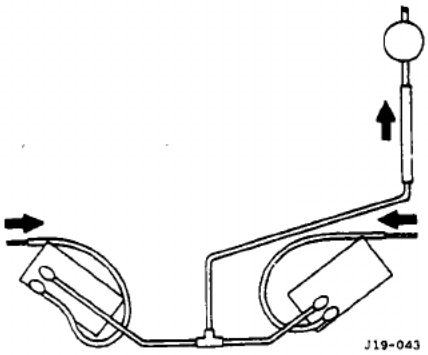


Fig. 21

Separate non-return valves are fitted in the flexible hoses near the tanks.
Air-conditioned cars are equipped with fuel coolers, attached to the hot air duct near the carburetters.
Special precautions detailed below must be taken before working on the fuel cooler.

FUEL COOLER

Remove and refit **19.40.40**

WARNING: Exposure to refrigerant gas, which is released if a refrigerant hose is detached from the cooler, can cause blindness. It is therefore essential to depressurize the air-conditioning system before disconnecting a refrigerant hose.

Fire precautions are also essential as fuel may be spilled when fuel hoses are disconnected.

Disconnect the battery.
Depressurize the air-conditioning system.
Disconnect the refrigerant inlet and outlet hoses from the cooler.
Clamp the fuel hoses.
Disconnect the fuel hoses.
Remove the two self-tapping screws and washers securing the fuel cooler. Collect the mounting clips and insulating sleeve.

After refitting, re-charge the air-conditioning system.

FUEL PUMP

Remove and refit (either side) 19.45.08

Place the car on a ramp, NOT over a pit.
Disconnect the battery.
Remove the rear wheel adjacent to the pump to be removed.
Drain the fuel tank.

WARNING: Take all due precautions against fire and explosion when draining fuel.

Remove the four screws securing the circular cover-plate to the rear vertical wall of the wheel arch. Withdraw the cover along the flexible hose (1, Fig. 22).
Disconnect the electrical leads from the pump (2, Fig. 22).
Release the hose clips and detach the flexible hose from the pump (3, Fig. 22).
Turn the locking flange anti-clockwise to release the pump and withdraw the pump and sealing washers, taking care to avoid damage to the filter as the pump is removed.
Discard the sealing washer (4, Fig. 22).
Remove all sealant from the pump, mounting flange and tank.
When refitting, ensure that the mounting faces of the pump flange and fuel tank are clean, and that the correct pump assembly is being refitted—C45442 is R.H. pump and C45443 is L.H. pump.
Fit new sealing washer and introduce the pump carefully into tank, securing in position with the locking flange.
Refit the flexible hose to the pump outlet pipe and tighten the hose clip screw to not more than 0,07 kgf m (6 lbf in).
Fit the electrical connections and smear the terminals with waterproof grease.
Replace the cover-plate and secure with the four screws.
Make good the sealing around the cover and screw leads by coating with Flintkote or similar protective covering.

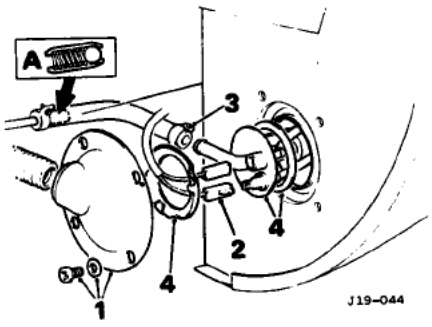


Fig. 22

NOTE: If it is found necessary to detach the forward end of the flexible hose, or to fit a new hose, it is most important that a non-return valve fitted in the forward end of the flexible hose is correctly installed. The purpose of the non-return valve is to prevent fuel from draining into the lower tank when the car is tilted, and therefore the ball must be at rear, or tank, end of fitting, as shown in illustration at 'A'.

NOTE: This type of fuel pump cannot be overhauled and must be renewed if found to be defective.

FUEL TANK

Remove and refit—either 19.55.01

Removing

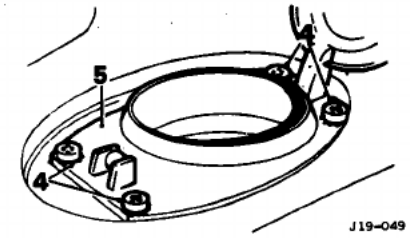
Drain the fuel tank (1, Fig. 23) and disconnect the battery.
Remove the side section of rear bumper.
Remove the cross-head screws and washers securing the rear quarter fuel tank cover (2, Fig. 23).
Remove the setscrews and nuts, spring and plain washers securing the rear quarter fuel tank cover (3, Fig. 23). Remove the cover.
Remove the self-tapping screw securing the forward end of the luggage compartment side casing. Remove the casing.
Remove the four screws and shakeproof washers securing the flange of the fuel tank filler cap (4, Fig. 23).
Taking care to avoid damaging the paintwork, prise the flange (5, Fig. 23) from the body.
Pull the vent pipe (6, Fig. 23) from the stub where applicable.
Remove the gasket and 'O' ring seal.

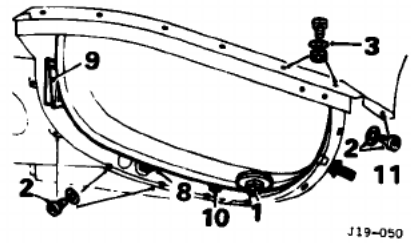
NOTE: On carburetter cars fitted with submerged fuel pumps omit above operation and reach up between rear of tank and tail/stop/flasher light units to detach leads from the fuel gauge tank unit. (Submerged pump replaces gauge unit in forward tank aperture.) Detach the leads and flexible hose from pump before withdrawing tank.

Remove the bolt, special washer and shakeproof washer at the side of the luggage boot.
Release the fuel pipe connector at the base of the tank. Separate the connection and push the pipe carefully inwards flush with the panel (8, Fig. 23).
Remove the two bolts, special washers and shakeproof washers in the silencer tunnel and recover wedges (9, Fig. 23).
Release Nyloc nut at the hanger bolt (10, Fig. 23).
Carefully lower the fuel tank, note connections and detach the cables from the tank unit (11, Fig. 23).
On cars with an evaporative control system lower tank until vent pipe (7, Fig. 23) is accessible and detach pipe from stub.

Refitting

On cars with an evaporative control system offer up the tank and attach the vent pipe to stub.
All cars
Lift the tank and connect cables to the tank unit and submerged pump where applicable.
Lift the tank and engage the hanger bolt in bracket; secure with Nyloc nut.
Fit the bolts and special shakeproof washers at the upper and forward location. Do not tighten them at this stage.
Fit the bolt, special and shakeproof washer at the rear location. Fit wedges between the fuel tank and the side panel. Do not tighten at this stage.
Fit new 'O' ring seal in the fuel tank neck.
Press vent pipe onto filler neck stub, where applicable.
Use new gasket at the petrol filler cap flange





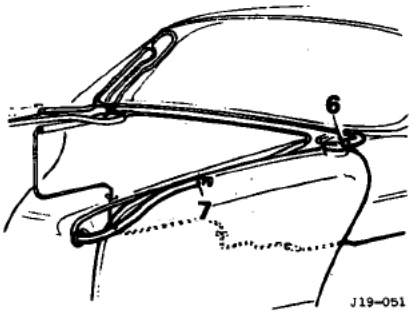


Fig. 23

and secure using the four screws and shakeproof washers.
From beneath, firmly press the fuel tank up to locate on the filler cap flange spigot and tighten the rear mounting bolt on wedges.
Secure the hanger bolt nut. Do not overtighten.
Tighten the remaining two mounting bolts.
Secure the supply pipe union to tank; connect the hose to pump on cars with submerged pumps.
Pour 2 to 3 gallons Imp. (9 to 13 litres) of specified fuel into the tank.
Connect the battery.
Switch on the ignition and select the fuel tank that has been changed.
Check to ensure that there are no leaks at the unions and that the fuel gauge registers.
Switch off the ignition.
Fit and secure the rear quarter fuel tank cover and the side section of the rear bumper.

FUEL TANK

Drain **19.55.02**

WARNING: Petrol (gasoline) must not be extracted or drained from a vehicle standing over a pit.
Petroleum or gasoline vapour is highly flammable and in confined spaces is also very explosive and toxic.
When petrol/gasoline evaporates it produces 150 times its own volume in vapour, which when diluted with air becomes an ignitable mixture. The vapour is heavier than air, and will always fall to the lowest level and it can readily be distributed throughout a workshop by air currents. Even a small spillage of petrol or gasoline is potentially very dangerous.
Extracting or draining petrol (gasoline) from a vehicle fuel tank must be carried out in a well-ventilated area, preferably outside the workshop. All forms of ignition must be extinguished or removed, any hand lamps used must be flameproof and kept clear of any spillage. The receptacle used to contain the petrol drained or extracted must be more than adequate to receive the full amount to be drained.

Open the fuel tank filler cap.
Place a suitable receptacle beneath the fuel tank drain plug.
Remove the drain plug, allow the fuel to drain.
Check the condition of the sealing washer and replace the plug. Do not overtighten.

FUEL FILLER CAP ASSEMBLY

Remove and refit **19.55.08**

Remove the four screws and shakeproof washers (1, Fig. 24) securing the flange of the fuel tank filler cap.
Taking great care to avoid damaging paintwork, prise the flange (2, Fig. 24) from the body.
Pull the vent pipe (3, Fig. 24) from the stub—evaporative loss control cars only.
Remove the gasket and 'O' ring seal.

When refitting use a new gasket and 'O' ring seal.

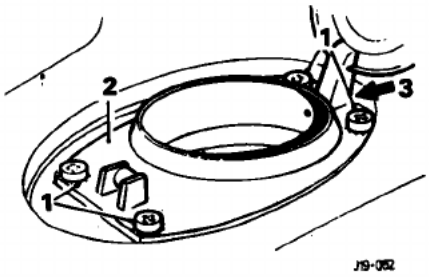


Fig. 24

FUEL FILLER LOCK

Remove and refit **19.55.09**

Open the filler cap lid.
Cover the filler hole with rag or adhesive tape.
Remove the screw and washer securing the ward to the lock barrel.
If the key is available, insert it in the lock, and press the barrel from inside to out.
If the key is not available, insert a piece of stiff wire to lift the tumblers and turn the barrel to mid position (1, Fig. 25).
Keep the barrel in this angular position and press from the lid (2, Fig. 25).

When refitting, insert the key in the barrel of the replacement lock and offer into the lid.
Remove the key (3, Fig. 25).
Secure the ward to the barrel using the screw and washer (4, Fig. 25).
Test-operate the lock and ensure that the ward turns to a position in line with, and facing, the lid catch. Unlock (5, Fig. 25).
Remove the obstruction from the filler hole and close the lid.

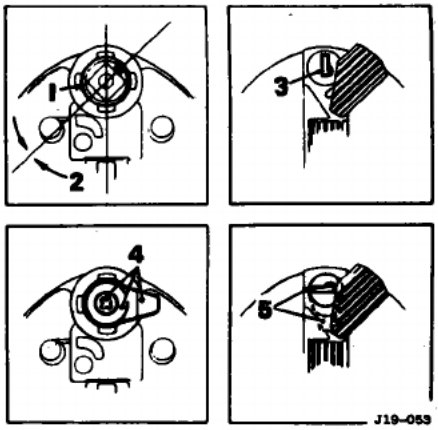


Fig. 25

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ELECTRONIC FUEL INJECTION

Description

The electronic fuel injection 'L' system can be divided into two separate systems interconnected only at the injectors.

The systems are:

1. A fuel system delivering to the injectors a constant supply of fuel at the correct pressure.
2. An electronic sensing and control system which monitors engine operating conditions of load, speed, temperature (coolant and induction air) and throttle movement. The control system then produces electrical current pulses of appropriate duration to hold open the injector solenoid valves and allow the correct quantity of fuel to flow through the nozzle for each engine cycle.

As fuel pressure is held cons ant, varying the pulse duration increases or decreases the amount of fuel passed through the injector to comply precisely with engine requirements.

Pulse duration, and therefore fuel quantity, is also modified to provide enrichment during starting and warming-up and at closed throttle, full throttle and while the throttle is actually opening.

All the injectors are simultaneously operated by the Electronic Control Unit (E.C.U.) twice per engine cycle.

The induction system is basically the same as that on a carburetted engine: tuned ram pipe, air cleaner, plenum chamber and induction ports. The air is drawn through a paper-element cleaner to a single throttle butterly valve and to individual ports for each cylinder leading off the plenum chamber. The injectors are positioned at the cylinder head end of each port so that fuel is directed at the back of each inlet valve.

Fuel system

Fuel supply

Fuel is drawn from the tanks (1, Fig. 1) at the rear of the car by a fuel pump (3, Fig. 1) via a solenoid operating change-over valve (2, Fig. 1) to a fuel rail, through an in-line filter (5, Fig. 1) and a pressure regulator (7, Fig. 1). Fuel is controlled so that the pressure drop across the injector nozzle is maintained at a constant 2,5 bars (36.25 lbf/in²). Excess fuel is returned to the tank from which it was drawn via a fuel cooler (4, Fig. 1)—on air conditioned cars only—and a solenoid-operated shut-off valve. The six fuel injectors (8, Fig. 1) are connected to the fuel rail (6, Fig. 1) and are electro-mechanically operated to inject into each inlet port. Fuel is also supplied to a cold start injector (9, Fig. 1) which is only operated during the starting of a cold engine.

SCHEMATIC DIAGRAM

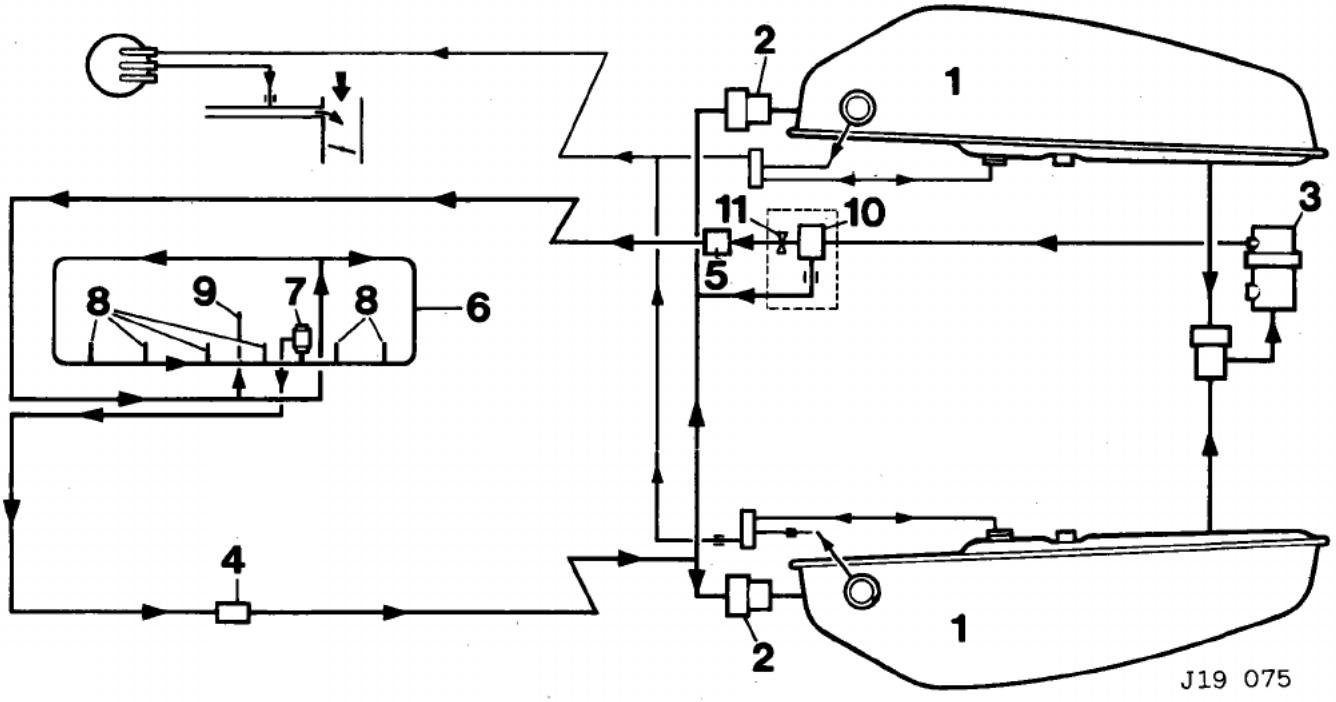

Fig. 1

1. Fuel tank
2. Change-over valve
3. Fuel pump
4. Fuel cooler
5. Fuel filter
6. Fuel rail
7. Fuel pressure regulator
8. Injectors
9. Cold start injector
10. Air bleed valve
11. Non return valve

ENGINE COMPONENT LOCATION (U.K. AND EUROPEAN)

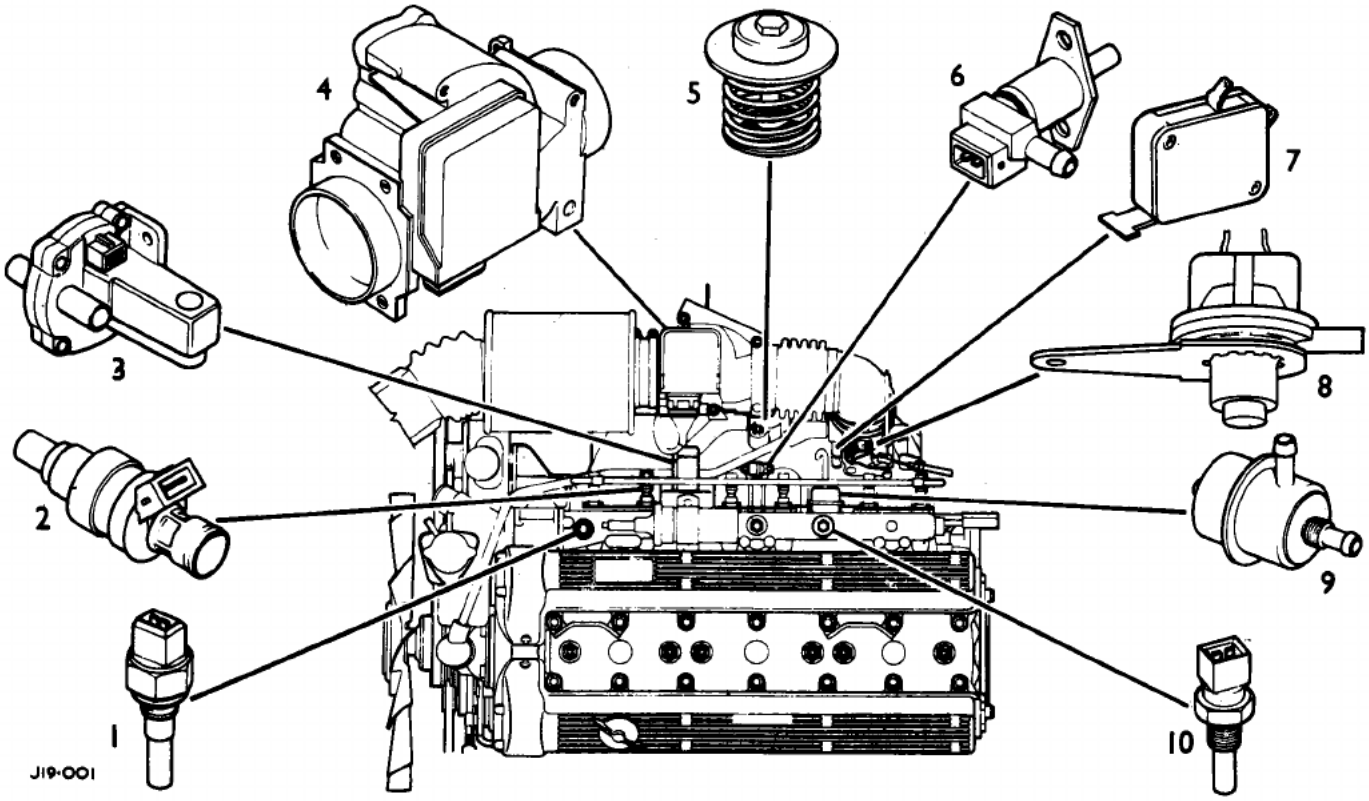

Fig. 2

1. Thermotime switch
2. Fuel injector
3. Auxiliary air valve
4. Air-flow meter
5. Over-run valve
6. Cold start injector
7. Micro-switch (automatic cars only)
8. Vacuum throttle switch
9. Fuel pressure regulator
10. Water temperature sensor

Air intake system

Air is drawn from the air cleaner through the air meter and throttle into the engine. The air passing through the air meter deflects the flap inside against a spring to a position dependent on the rate of air flow. A potentiometer connected to the flap spindle converts the flap angular position to a voltage. This voltage is transmitted to the E.C.U. as a measure of air flow.

Electronic system

The Electronic Control Unit (E.C.U.) receives information from the sensors placed about the engine. It computes the quantity of fuel required and therefore the time for which the injectors must remain open. An ignition L.T. circuit triggers all injectors simultaneously at every third spark. The injectors open twice per engine cycle, each time delivering half the fuel requirement of each cylinder.

Ballast resistor

In order to open and close the injectors a fairly high current drive is needed, about 1.5 amps per injector. The E.C.U. has an output stage designed to deliver this current, but to protect the output transistors of the E.C.U. from injector faults and short circuits there is a ballast resistor wired in series with each injector. These resistors will limit fault current to a safe value, thus protecting the E.C.U. The ballast resistors for each injector are housed in a single unit which is secured to the right-hand front engine valance by two screws.

Idle speed adjustment

The idle speed adjusting screw is located in the air distribution block and controls air flow to the extra air valve.

Auxiliary air valve

The auxiliary air valve consits of a variable orifice controlled by a bi-metal element. The unit is mounted on the water rail and also responds to coolant temperature. A heater is fitted around the bi-metal element to speed up the bi-metal response. The heater is connected in parallel with the fuel pump and so is energized as long as the engine is running.

Temperature sensors

The temperature sensor of the air being taken into the engine through the inlet manifold, and the temperature of the coolant in the cylinder block are constantly monitored. The information is fed directly to the E.C.U. The air temperature sensor has a small effect on the injector pulse width, and should be looked upon as a trimming rather than a control device. It ensures the fuel supplied is directly related to the weight of air drawn in by the engine. Therefore, as the weight (density) of the air charge increases with falling temperature, so the amount of fuel supplied is also increased to maintain optimum fuel/air ratio.
The coolant temperature sensor has a much greater degree of control although its main effect is concentrated while the engine is initially warming-up. The coolant temperature sensor operates in conjunction with the cold start system and the auxiliary air valve to form a completely automatic equivalent to a carburetter choke.

Flooding protection system

With the ignition switched on, the pump will not operate until the engine is cranked. The system prevents flooding should an injector or injectors become faulty (remain in the open position), and the ignition is left switched on.

ENGINE COMPONENT LOCATION (FEDERAL)

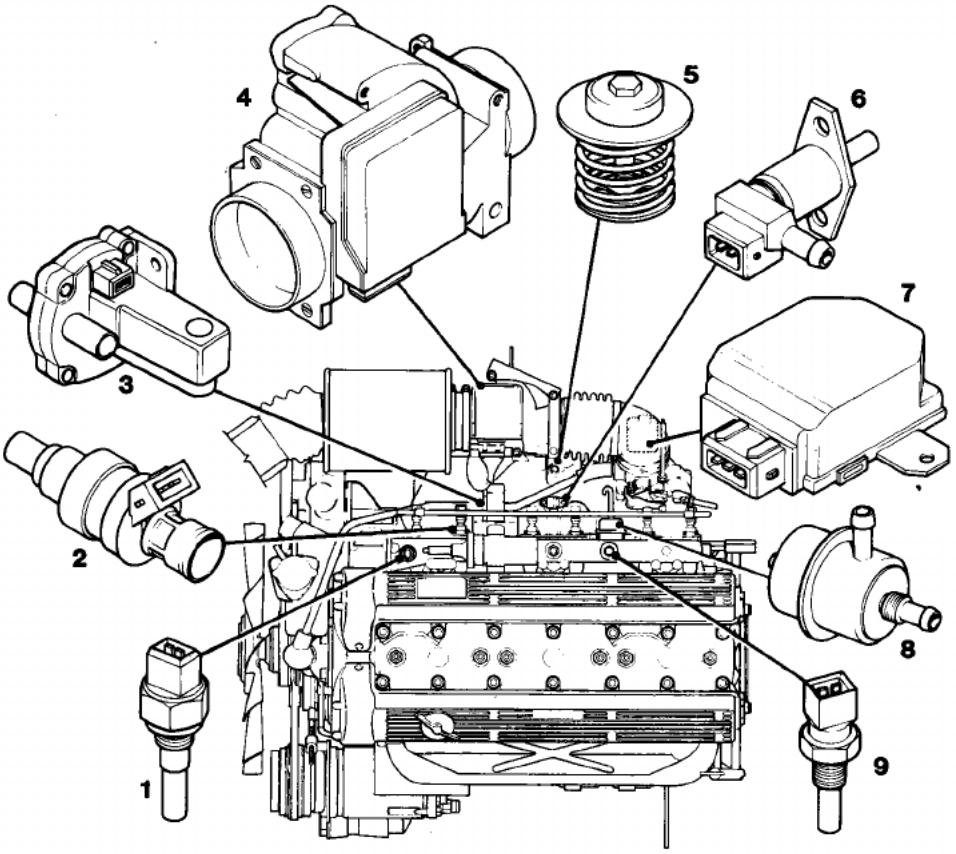

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Fig. 3

1. Thermotime switch
2. Fuel injectors
3. Auxiliary air valve
4. Air-flow meter
5. Over-run valve
6. Cold start injector
7. Throttle switch
8. Fuel pressure regulator
9. Water temperature sensor

Cranking enrichment

The E.C.U. provides an increased pulse duration during engine cranking in addition to any enrichment due to the coolant temperature sensor or the cold start injectors. The additional signal reduces slightly when cranking stops, but does not fall to normal level for a few seconds. This temporary enrichment sustains the engine during initial running.

Throttle switch (Federal)

The throttle switch mounted on the throttle spindle, signals the position of the throttle to the E.C.U.

In addition to a richer air/fuel mixture during cold starting and warm-up a slight additional amount of fuel is required during idle. The E.C.U. supplies this additional amount of fuel on European cars in response to the closed throttle contact on the throttle switch. This contact is fitted, but not used, on cars to the U.S.A. and certain other countries.

Fuel return valves are situated in the left-hand and right-hand rear wheel arches, in line with the rearmost edge of the tyres. Care must be taken when changing them as they are NOT interchangeable, side for side.

The left-hand valve has a fixing bracket spot-welded to it that prevents it being incorrectly fitted (it would contact the wheel). It has an arrow showing direction of fuel flow (towards the rear).

Vacuum full throttle switch (U.K. and European only)

A vacuum switch is fitted to the throttle cable mounting bracket wired into the full throttle enrichment circuit. This senses inlet manifold depression and switches the fuelling from the generally weak condition required for emission control or minimum fuel consumption to a richer condition necessary for maximum engine power. On cars fitted with an automatic gearbox there is an over-run fuel cut-off micro-switch mounted on one of the throttle body mounting bolts, which is mechanically operated by the throttle mechanism when the throttle is fully closed. The switch is controlled by a circuit incorporated in the E.C.U.

When the engine is over-running with the throttle in the closed position the fuel remains cut off until the engine speed falls to below 1400 rev/min.

The control unit circuit will not re-activate the fuel cut-off function until the engine speed exceeds 1470 rev/min.

Cold start

For cold starting, additional fuel is injected into the inlet manifold by the cold start injector. This is controlled by the cold start relay and Thermotime switch. The Thermotime switch senses coolant temperature, and depending on the temperature it senses, interrupts or completes the ground connection for the relay. When the starter is operated the cold start relay is energized with its circuit completed via the Thermotime switch. The Thermotime switch also limits the length of time for which the relay is energized, to a maximum of 12 seconds under conditions of extreme cold. This enrichment is in addition to that provided by the coolant temperature sensor.

If the coolant temperature is above 35°C the switch does not operate at all, no starting enrichment additional to cranking enrichment being required.

Fuel pressure regulator

The fuel pressure regulator operates to maintain a constant pressure drop across the injector nozzles. It is connected one side to a manifold depression and is operated by a spring-loaded diaphragm. Excess fuel is returned to the tank from which it was drawn via a solenoid-operated shut-off valve.

FAULT FINDING

It is assumed that the vehicle has sufficient fuel in the tanks, and that purely engine functions, e.g. ignition timing, valve timing, and the ignition as a whole are operating satisfactorily. If necessary, these functions must be checked before the fuel injection system is suspected.

Symptoms	
Will not start*	Difficult cold start
Difficult hot start	Starts but will not run
Misfires and cuts out	Runs rough
Idle speed too fast	Hunting at idle
Low power and top speed	High fuel consumption

* Before proceeding with checks, hold the throttle fully open and attempt a start. If the engine then starts and continues to run, no further action is necessary.

Possible causes in order of checking	
Battery:	Battery depleted, giving insufficient crank speed or inadequate spark. Check battery condition with hydrometer or by battery condition indicator on 'Freedom Battery'. Re-charge, clean and secure terminals, or renew as necessary.
Connections:	Ensure that all connector plugs are securely attached. Pull back rubber boot and ensure that plug is fully home. While replacing boot press cable towards socket. Ensure that Electronic Control Unit (E.C.U.) multi-pin connector is fully made. Ensure that all ground connections are clean and tight.
Ignition System:	Check ignition system as detailed in the Electrical Section.
Fuel System:	Open filler cap of fuel tank being used. Change tank being used. Check for fuel pipe failure (strong smell of fuel) and retention of in-line fuel pressure. Check inertia switch closed. If necessary, clear fuel tank vents or supply pipe.
Cold Start System:	Fault conditions could cause cold start system to be inoperative on a hot engine. If engine is either very hot, or cold, these particualr faults will cause the engine to run very rich. Check cold start system, see 19.22.32.
E.C.U.:	If the E.C.U. is faulty it is possible that injectors will be inoperative. The E.C.U. may also be responsible for any degree of incorrect fuelling. Before suspecting the E.C.U. for fuelling problems, however, all other likely components should be proved good.
Air Leaks:	Ensure that all hose and pipe connections are secure. Engine is, however, likely to start more easily with air leaks if cold, as air leaking augments that through the auxiliary air valve. A leak, or failed air valve is shown up, however, by a very high idle speed when engine is warm and air valve main passage should be closed.
Temperature Sensors:	If either sensor is short-circuited, starting improves with high engine temperature. Engine will run very weak, improving as temperature rises, but still significantly weak when fully hot. If a sensor is open-circuit, or disconnected, engine will run very rich, becoming worse as temperature rises. Engine may not run when fully hot, and will almost certainly not restart if stalled. Effect of air temperature sensor will be less marked than coolant temperature sensor.
Extra Air Distribution Block:	Check opening throttle. If engine immediately starts, unscrew idle speed adjustment, and re-check start with closed throttle. Re-set idle speed when engine hot. Check cold start. Check throttle return springs and linkage for sticking or maladjustment as a sticking throttle may have enforced incorrect idle speed adjustment on a previous occasion.
Throttle Switch:	Check operation of throttle switch. Incorrect function or sequence of switching will give this fault.
Throttle Butterfly:	Check adjustment of the throttle butterfly valve, ensure that return springs are correctly fitted, and throttle not sticking open.
Over-run Valve:	Check operation of over-run valve.
Compression:	Low compressions: a general lack of engine tune could cause this fault. Check engine timing, ignition timing, and function of ignition system complete. If necessary, check valve condition.
Idle Fuel Control Setting:	Check exhaust gas CO level. If necessary, adjust fuelling trim control in air metering unit. **CAUTION: This knob MUST NOT be moved unless correct test equipment and skilled personnel are in attendance to monitor changes made.**
Air Filters:	Remove air filter and check for choked filter element.
Throttle Linkage:	Check throttle linkage adjustment and ensure that throttle butterfly valve can be fully operated.

For further information relating to 'L' electronic fuel injection refer to the 'Lucas Epitest' operating instructions and test procedures.

FUEL SYSTEM

Depressurize 19.50.02

CAUTION: The fuel system MUST always be depressurized before disconnecting any fuel system component.

Remove the fuel pump relay socket.
Switch on and crank the engine for a few seconds.
Switch the ignition off and re-connect the pump relay socket.

INJECTORS

Description

The six injectors are mounted on the induction ram pipes so that the fuel jet is directed onto the back of each inlet valve. The injectors are solenoid-operated valves which are controlled by the E.C.U.

Remove and refit 19.60.01

Depressurize the fuel system, and then disconnect the battery.
Clamp the fuel inlet pipe adjacent to the fuel rail.
Pull the electrical connector from the injector(s) to be removed.
Remove the two setscrews securing the fuel rail to the inlet manifold.
Release the clips securing the supply rail to the return rail.
Pull the manifold pressure pipe from the inlet manifold.
Remove the six nuts and spring washers securing the injector clamps to the induction ram pipes.
Carefully lift the fuel rail complete with injectors sufficient for injectors to clear the induction ram pipes. Ensure that adequate material is to hand to absorb spilled fuel.
Suitably plug or cover the injector holes in ram pipes to prevent ingress of dirt or foreign matter.
Slacken the pipe clip(s) of injector(s) to be removed.
Note position of electrical sockets and pull injector(s) from fuel rail.
Remove two rubber sealing 'O' rings from ALL injectors.
When refitting the injectors the sealing rings MUST be renewed.

INJECTORS — SET

Injector winding check 19.60.02

Use an ohmmeter to measure the resistance value of each injector winding, which should be 2.4 ohms at 20°C (68°F).
Check for short-circuit to earth on winding by connecting ohmmeter probes between either injector terminal and injector body. Meter should read ∞ (infinity).
If any injector winding is open-circuited or short-circuited, replace the injector.

FUEL RAIL

Remove and refit 19.60.04

Depressurize the fuel system and disconnect the battery.
Pull the manifold pressure pipe from the inlet manifold.
Clamp the fuel pipe adjacent to the supply fuel rail.
Release the clips securing the return fuel rail to the supply rail and the return fuel rail to the regulator outlet hoses and fuel return pipe. Pull the hoses from the rail.
Release the clips securing the supply fuel rail to main fuel rail, cold start injector and regulator inlet hoses. Pull the hoses from the supply rail.
Remove supply and return fuel rails.
Pull electrical connectors from injectors and cold start injector.
Remove the six nuts and spring washers securing the injector clamps to the induction ram pipe.
Carefully lift the fuel rail complete with injectors from the induction ram pipes. Ensure that adequate material is to hand to absorb spilled fuel.
Suitably plug or cover the injector holes in the ram pipes to prevent the ingress of dirt or foreign matter.
Slacken the clips securing the injectors to the fuel rail stubs, pull the injectors from fuel rail.

NOTE: If necessary, transfer clips and insulation to replacement fuel rail.

When refitting fit new 'O' rings to each injector and test for leaks.

COLD START INJECTOR

Description

A cold start injector (Fig. 26) is mounted in the inlet manifold, aligned to spray a finely atomized mist of fuel towards the throttle butterfly valve. The injector is controlled by the cold start relay and the Thermotime switch and is only operative during the first few seconds of a cold engine starting cycle.

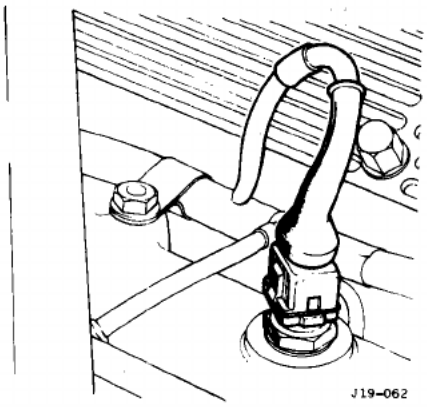

Fig. 26

Remove and refit 19.60.06

Depressurize the fuel system and disconnect the battery.
Pull the electrical connector from the injecto
Fit clamp on the supply pipe to the injecto slacken the clips and pull pipe from the injector
Remove the two setscrews securing the injector to the inlet manifold.
Check the condition of the gasket, and renew as necessary.
To test the system see operation 19.22.32, 'Cold start system — test'.

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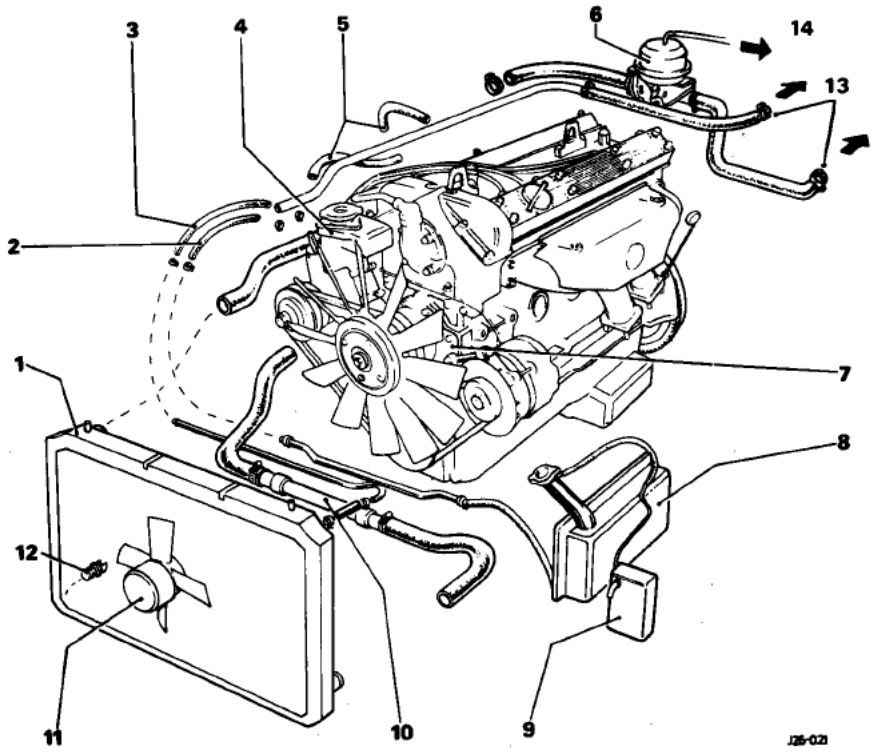

Fig. 1

1. Radiator matrix
2. Radiator vent. pipe
3. Expansion pipe
4. Header tank (Thermostat housing)
5. Fuel injection throttle housing heater pipe
6. Water control valve.
7. Water pump
8. Remote header tank
9. Atmospheric tank
10. Transmission oil cooler
11. Single or twin fan
12. Fan thermostat
13. To heater matrix
14. To vaccum control

COOLING SYSTEM

Description 26.00.00

The cooling system consists of a radiator matrix, A; a water pump, B—belt driven by the engine crankshaft; a header tank, C, and a remote header or expansion tank, D; a thermostatic valve located in the header tank is fitted to ensure a rapid warm-up from cold.

Air-conditioned cars are fitted with either single or twin electric fans, E, mounted in front of the condenser and radiator, in addition to the engine-driven fan. The electric fans are thermostatically controlled and it is possible, in very hot conditions, for them to continue to operate after the engine has been switched off. They will switch off automatically when the coolant temperature drops to 92°C. Under cold start condition coolant is forced by the water pump through the cylinder block, cylinder head, and the induction manifold to the thermostatic valve housing, C. The valve is closed and the coolant is therefore returned via a by-pass drilling, to the water pump suction inlet.

The heater matrix, K, is purged during this period by opening the heater control valve, L, at the matrix inlet and allowing pump suction to remove trapped air. The radiator has a vent pipe, M, through which, during the initial cold filling, the radiator is vented. When engine temperature rises to a predetermined level the thermostatic valve opens and allows hot coolant to flow into the top of the radiator. Full pump suction then draws coolant from the base of the radiator and starts the full cooling circuit; coolant expansion due to the rise in temperature is accommodated by the expansion tank, D, via expansion pipe, N.

Cars fitted with automatic transmission have a cooling tube, O, included in the centre section of the radiator bottom hose.

We use and recommend BP Type H21 or Union Carbide UT184 or Unipart Universal anti-freeze which should be used at the specified concentration whenever the cooling system is refilled. For topping-up purposes, only reputable brands of anti-freeze, formulated and approved for 'mixed metal' engines be used.

IMPORTANT NOTE: The concentration of anti-freeze must not be allowed to fall below the recommended strength as sediment may be formed in the cooling system by certain types of anti-freeze at low concentrates.

A 40% solution by volume in the United Kingdom (55%, U.S.A./Canada and all other countries) must be used at all times, either by topping-up or replenishing the cooling system. For maximum corrosion protection, the concentration should never be allowed to fall below 25%. Always top-up with recommended strength of anti-freeze, NEVER WITH WATER ONLY.

In countries where it is unnecessary to use anti-freeze, Marston SQ 35 Corrosion Inhibitor must be used in the cooling system in the proportion of 1 part SQ 36 to 24 parts water. CHANGE COOLANT EVERY TWO YEARS. The system should be drained, flushed and refilled with fresh anti-freeze (or Corrosion Inhibitor), mixed with 1 satchet of 'Barrs Leaks'.

An alternative coolant known as CARBUROL FORLIFE is recommended where temperatures below 10°C (14°F) are not encountered. Before Carburol Forlife is used, the coolant already present in the system must be drained out and the system flushed before filling with Carburol Forlife. Once in use the system should be topped-up with Carburol Forlife only, and a label giving this information should be affixed in an appropriate and prominent position.

TORQUE WRENCH SETTINGS

NOTE: Set the torque wrench to the mean of the figures quoted unless otherwise specified.

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Radiator to front cross-member	3/8 in U.N.F. nut	29,8 to 35,2	3,05 to 3,59	22 to 26
Retainer to radiator cross-member	5/16 in U.N.F. nut	19 to 24,4	1,94 to 2,48	14 to 18
Fan cowl upper bracket to body	1/4 in U.N.F. nut	8,1 to 9,5	0,83 to 0,96	6 to7
Expansion tank to valance	5/16 in U.N.F. nut	10,8 to 13,6	1,10 to 1,38	8 to 10
Engine oil cooler pipes	1 1/16 in U.N.S. nut	54,3 to 61	5,53 to 6,22	40 to 45
Deflector and bracket to cowl	1/4 in U.N.F. bolt	8,1 to 9,5	0,83 to 0,96	6 to 7
Lower bracket to cowl	1/4 in U.N.F. nut	6,1 to 7,5	0,62 to 0,76	4.5 to 5.5
Lower cowl bracket to body	1/4 in U.N.F. bolt	8,1 to 9,5	0,83 to 0,96	6 to 7

COOLANT

Drain and refill **26.10.01**

Draining

With the engine cold, remove the pressure cap at the expansion tank and the sealing cap at the engine header tank. Check the condition of the seals on the pressure caps, renew seals or caps.

Remove the radiator drain plug, and drain the radiator.

Remove the engine block drain plug, and drain the engine block.

Insert a water hose in the remote header tank, and regulate the flow so that the tank remains full with a minimum of overflow. Start the engine and run it at fast idle (about 1000 rev/min) until the water from the drain holes becomes clear. Stop the engine, turn off the tap and allow the system to empty.

Refilling

Refit the radiator and engine drain plugs.

Set the heater control to 'DEF' ('HIGH' non-air conditioned cars only).

Slowly pour the recommended coolant mixture into the engine header tank.

When the header tank is completely full with coolant refit the sealing cap.

Start and run engine at fast idle (1 000 rev/min) for approximately five minutes.

Switch off the engine, carefully remove the pressure cap from expansion tank, and if necessary add coolant to bring level to the base of filler neck. Refit the cap.

NOTE: It is not important if coolant is above this level as excess liquid will be ejected through the vent pipe.

When the engine is cold, remove the header tank cap to check that it is full. If not top it up and run the engine for another five minutes and check the coolant level in the header tank again, after the engine has cooled. If the tank is not full a leak has developed in the system which must be traced and rectified.

TOPPING-UP AND CHECKING COOLANT LEVEL

NOTE: This procedure must only be carried out when the engine is cold.

Remove the pressure cap from expansion tank, and if coolant is below the base of filler neck add specified coolant mixture to correct level. Refit the pressure cap.

EXPANSION TANK

Remove and refit **26.15.01**

Removing

Remove the pressure cap and sealing cap.

Remove windscreen washer reservoir and the bracket rear upper securing screw.

Disconnect the expansion pipe from the bottom of the expansion tank and the overflow pipe from the filler neck.

Remove expansion tank securing nut and bolt, carefully displace windscreen reservoir bracket, and lift the tank clear.

Refitting

Carefully displace the windscreen washer reservoir and locate the expansion tank to the inner wing.

Fit and tighten nut and bolt to secure.

Refit the expansion pipe to the bottom of expansion tank and the overflow pipe to the filler neck.

Fit and tighten the windscreen washer reservoir bracket securing screws.

Refit the washer reservoir.

Top-up cooling system.

Refit pressure cap and sealing cap.

FAN/STEERING PUMP BELT TENSION

Check and adjust **26.20.01**

Slacken the power steering pump adjuster link trunnion bolt (1, Fig. 2).
Slacken adjuster link eye-bolt (2, Fig. 2) at power-assisted steering pump and pump pivot bolt (3, Fig. 2).
Slacken the adjuster link locknut (4, Fig. 2).

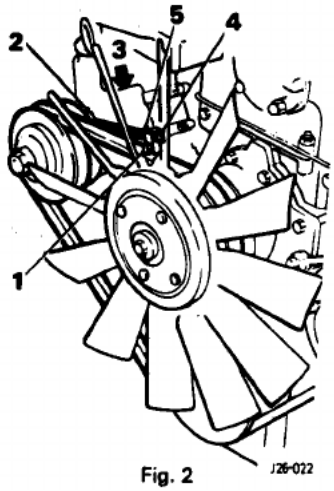

Fig. 2

Tighten the adjuster nut (5, Fig. 2), and check the tension. Deflecting force 2,9 kgf (6.4 lbf). Deflection longest run 4,3 mm (0.17 in).
Tighten the locknut.
Tighten the adjuster link trunnion bolt.
Tighten adjuster link eye-bolt and tighten pump pivot bolt nut.

FAN/STEERING PUMP BELT

Remove and refit **26.20.07**

Removing

Slacken the power steering pump adjuster link trunnion bolt (1, Fig. 2).
Slacken adjuster link eye-bolt (2, Fig. 2) at the power-assisted steering pump.
Slacken the pump pivot bolt nut (3, Fig. 2).
Slacken the adjuster link locknut (4, Fig. 2) and press the pump towards the engine.
Remove the belt.

Refitting

Manoeuvre the belt over the fan blades and pulleys.
Tighten the adjuster nut (5, Fig. 2).
Check the belt tension. Deflecting force 2,9 kgf (6.4 lbf). Deflection on longest run 4,3 mm (0.17 in).
Tighten the locknut, adjuster link trunnion bolt, adjuster link eye-bolt and pump pivot bolt nut.

FAN AND TORQUATROL UNIT

Remove and refit **26.25.19**

Removing

Remove the top fan cowl from the top rail and from the main cowl.
Restrain pulley with a suitable spanner, and remove the Torquatrol securing bolt (1, Fig. 3).

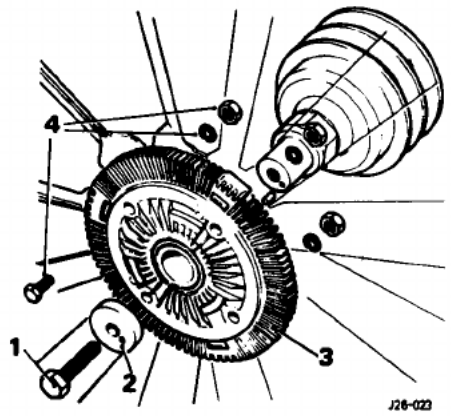

Fig. 3

Remove the pegged washer (2, Fig. 3).
Gently tap Torquatrol unit (3, Fig. 3) forward from pulley spigot and lift unit from car.
Remove nuts and bolts (4, Fig. 3) securing fan assembly.
Remove fan assembly.

Refitting

Locate fan to Torquatrol unit, secure with the nuts and bolts, lightly grease the spigot and offer Torquatrol unit on to pulley.
Secure the Torquatrol unit using the pegged washer and centre bolt.

NOTE: Ensure that the washer locates on pin in pulley spigot before tightening bolt.

Sit the top cowl to the main cowl assembly, and secure to top rail.

FAN MOTOR

Remove and refit **26.25.22**

Removing

Remove the radiator lower grille, and unclip the harness from the fan motor mounting cross-beam.
Disconnect the fan motor harness at the block connector.
Remove the cross-beam to body securing bolts, spacers and washers.
Remove the fan motor mounting frame to cross-beam securing nuts and bolts.
Displace the motor for access and remove the mounting frame to cross-beam spacing washers.
Remove the cross-beam and the fan assembly.
Remove the fan blades.
Remove the fan motor securing nuts and bolts.
Remove the fan motor and fan motor mounting rubbers.

Refitting

Fit fan motor and fan mounting rubber to frame, secure with fixing nuts and screws.
Fit and align the fan blades; secure with circlip.
Fit the fan motor assembly to vehicle.
Fit and align the mounting cross-beam.
Fit the spacers and washers to body, fit but do not tighten the cross-beam to body securing bolts.
Fit mounting rubber to cross-beam washers.
Align the mounting frame to cross-beam.
Secure with the fixing nuts and bolts.
Connect the fan motor harness block connector, and clip the harness to the cross-beam.
Tighten the cross-beam securing bolts.
Refit the radiator grille.

FAN MOTOR RELAY

Remove and refit **26.25.31**

Removing

Remove the screw securing the relay cover to the wing valance and remove the cover.
Note and disconnect the cables from the relay.
Remove the relay.

Refitting

Identify and re-connect the cables to the relay.
Refit the relay to its mounting position.
Refit the relay cover.
Fit and tighten screw to secure.

THERMOSTATIC SWITCH

Remove and refit **26.25.35**

Removing

Drain the radiator, see operation 26.10.01
Jack up vehicle and place two stands.
Note and disconnect the cables from switch.
Remove the switch.

Refitting

Fit and tighten the thermostatic switch.
Identify and connect cable to the switch.
Remove stands, lower the vehicle, and refill the radiator, see operation 26.10.01.

RADIATOR BLOCK

Cars fitted with Air Conditioning

Remove and refit **26.40.04**

WARNING: Under no circumstances must any portion of the air conditioning system be disconnected by anyone other than a qualified refrigeration engineer. Blindness can result if the gas contained within the system comes into contact with eyes.

Removing

Drain the coolant from the radiator, see operation 26.10.01.
Disconnect the battery.
Remove the bonnet.
Slacken the clips securing the top hose, bottom hose and expansion pipe to the radiator.
Disconnect the hoses from the radiator.
Unclip the cable harness from the top rail.
Remove the top rail to body and top rail to fan cowl securing nuts/bolts.
Reposition the cowl from top rail.
Remove top rail to air conditioning condenser securing bolts and remove the spacers.
Unclip the receiver/drier from top rail.
Remove the receiver/drier to top rail securing bolts and remove the spacers.
Reposition the top rail from radiator location.
Remove the air cleaner ram pipe.

Disconnect the coolant level probe.
Displace the radiator to gain access to thermostatic switch.
Note and disconnect cables from switch.
Lift radiator from car, and recover the foam rubber padding.

Refitting

Locate radiator in a position to reconnect the thermostatic switch.
Reposition the radiator into its mounting rubbers and reposition the air conditioning pipes.
Reconnect the coolant level probe.
Refit the air cleaner ram pipe.
Align the top rail to the radiator, and fit but do not tighten the securing nuts and bolts.
Fit the top rail to condenser spacers, and fit but do not tighten the securing nuts and bolts.
Locate the fan cowl to the top rail.
Fit nuts and bolts to secure.
Tighten all the nuts and bolts.
Align the receiver drier with the top rail, fit the spacers and secure the receiver drier with the fixing bolts.
Clip the air conditioning pipe and cable harness to the top rail.
Connect bottom hose, top hose, and the expansion pipe to the radiator.
Tighten hose clips.
Refill the radiator with coolant, see operation 26.10.01.
Reconnect the battery.
Refit the bonnet.

RADIATOR BLOCK

Cars fitted with Heater only

Remove and refit **26.40.04**

Removing

Drain the coolant from the radiator, see operation 26.10.01.
Disconnect the battery.
Remove the bonnet.
Slacken clips and remove the top hose, bottom hose and expansion pipe from the radiator.
Unclip the cable harness from the top rail.
Remove the top rail to body securing nuts and bolts.
Remove the top rail to fan cowl securing nuts and bolts.
Displace the cowl from the top rail, and the top rail from the radiator location.
Remove the air cleaner ram tube.
Disconnect the coolant level probe, and lift the radiator from car.
Recover the rubber foam padding.

Refitting

Fit radiator to the mounting rubbers, and reconnect the coolant level probe.
Fit and secure the air cleaner ram pipe.
Align the top rail to the radiator.
Fit but do not tighten the securing nuts and bolts.
Secure the fan cowl to top rail, and tighten all securing nuts and bolts.
Reclip the cable harness to the top rail.
Fit and secure bottom hose, top hose and expansion pipe to the radiator.
Refill the radiator with coolant, see operation 26.10.01.
Reconnect the battery.
Refit the bonnet.

THERMOSTAT

Remove and refit **26.45.01**

Removing

Partially drain the coolant from the radiator.
Disconnect the battery.
Slacken the vent pipe clips and remove the pipe from the filler neck.
Slacken the top hose clips and disconnect the hose from the filler housing.
Slacken water pump to the filler housing clip.
Remove the filler housing securing bolts (1, Fig. 4).

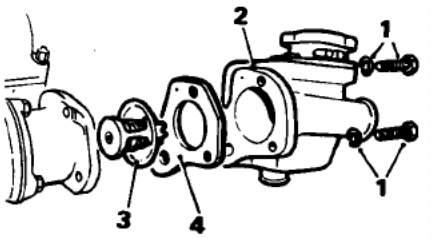

Fig. 4

Displace the engine breather pipe clip bracket and remove the spacing washer.
Carefully break the joint and remove the thermostat housing (2, Fig. 4) from the water pump hose.
Remove the thermostat (3, Fig. 4) from the thermostat housing.
Discard the old gasket (4, Fig. 4) and clean the sealing faces.
Remove all sludge or scale present.

Refitting

Refit the thermostat into the thermostat housing.
Replace the filler housing gasket and fit the filler housing.
Fit the spacing washers and align the engine breather pipe bracket.
Fit and tighten the filler housing securing bolts.
Refit the water pump to filler housing hose, top hose and vent pipe.
Tighten all the clips.
Refill the radiator with coolant, see operation 26.10.01.
Reconnect the battery.

WATER PUMP

Remove and refit **26.50.01**

Removing

Drain the coolant, see operation 26.10.01.
Remove the fan cowl and the Torquatrol assembly (Fig. 5).

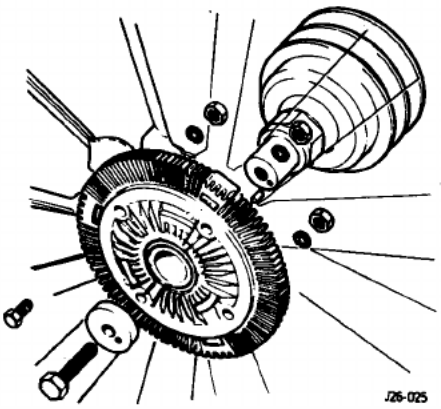

Fig. 5

Release and screw back inner locknut (1, Fig. 6) at the power-assisted steering pump adjuster trunnion.
Slacken the nut of the pivot bolt (2, Fig. 6) and slacken the bolt (3, Fig. 6) securing the adjusting link to the pump.
Slacken the bolt securing the trunnion block (4, Fig. 6) and swing the pump towards the engine.
Remove the belt.
Remove the trunnion bolt and pivot the pump away from the engine.

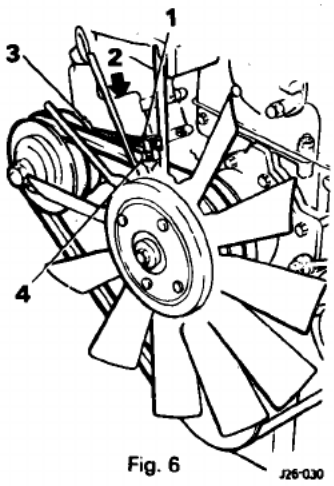

Fig. 6

Cars fitted with heater only

Slacken the alternator adjuster trunnion bolt (1, Fig. 7), remove the alternator adjuster pivot bolt (2, Fig. 7) and slacken the alternator mounting bolt (3, Fig. 7).
Pivot the alternator adjuster from the engine, and release the tension from the belt.

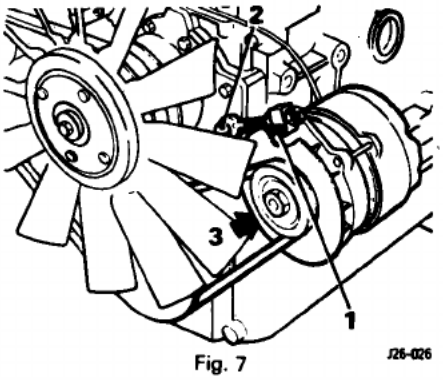

Fig. 7

Cars fitted with air conditioning
Slacken the two compressor pivot bolts on front and rear flanges.
Slacken the compressor trunnion bolt and remove the adjuster pivot bolt.
Pivot the adjuster from the water pump and release the tension from drive belt.

All cars
Disconnect the oil cooler to water pump hose at the water pump.
Disconnect the throttle housing to water pump hose at the water pump.
Loosen the clips on the heater return pipe and the filler housing hose.
Remove the nuts and bolts securing the water pump.
Disconnect the water pump hose from the pump. Displace the pump from the studs and disconnect from the filler housing. Remove the pump assembly.
Remove and discard the gasket.

Refitting

Fit a new gasket to the timing cover.
Fit the pump to the filler housing.
Locate the pump onto the timing cover, and into the water pipe hose.
Tighten the clips.
Fit and tighten securing the nuts and bolts 'by diagonal selection'.
Connect the throttle housing hose, and oil cooler hose to the water pump.

Cars fitted with air conditioning
Pivot the compressor to tighten the drive belt.
Pivot the adjuster to the water pump and fit the adjuster pivot bolt.
Adjust and check for correct drive belt tension, refer to Drive Belt Tension Data.
Tighten locknut and all bolts.

Cars fitted with heater only
Pivot the alternator and tighten the drive belt.
Pivot the adjuster towards the engine, and refit the adjuster pivot bolt.
Adjust and check for correct drive belt tension, refer to Drive Belt Tension Data.
Tighten the locknut and all the bolts.

All cars
Pivot the power-assisted steering pump towards the engine.
Fit but do not tighten the trunnion bolt.
Refit the drive belt, and adjust the nuts on the links to obtain the correct belt tension, refer to Drive Belt Tension Data.
Retighten all bolts and nuts.
Refit the Torquatrol assembly and fan cowl.
Refill the radiator with coolant, see operation 26.10.01

ADDITIONAL WORK FOR WATER PUMP RENEWAL — FEDERAL VEHICLES

Remove the air pump — 17.25.07.
Release the air conditioning compressor belt tension 82.10.01 and remove the link arm pivot bolt.
Undo and remove the air pump mounting bracket to the timing cover securing bolt.
Displace and remove the bracket spacer.

On removal of water pump securing bolts:-
Remove the air pump mounting bracket.

On refitting of the water pump securing bolts:-
Fit the air pump mounting bracket.
Fit the bracket spacer.
Fit and tighten the bracket securing bolt.
Refit the compressor link arm pivot bolt and re-adjust the belt tension.
Refit the air pump assembly.

DRIVE BELT TENSION DATA

Driving belt for	Deflection force kg	lb	Deflection mm	in
P.A.S. pump and water pump	2,9	6.4	4,3	0.17
Alternator	1,45	3.2	3,8	0.15
Compressor	2,9	6.4	4,3	0.17

WATER PUMP

Overhaul **26.50.06**

Remove water pump, see operation 26.50.01.

Dismantling

Use extractor bolt (⅜" U.N.F. X 2 in).
Slacken the locknut (1, Fig. 8) and remove the bearing lockscrew (2, Fig. 8).
Support the body of the pump on press bed. close around impeller.
Using a suitable mandrel acting against the case of bearing, press the bearing/spindle and impeller assembly (3, Fig. 8) from the body of the pump.
Press the bearing/spindle assembly from the impeller (Fig. 9).

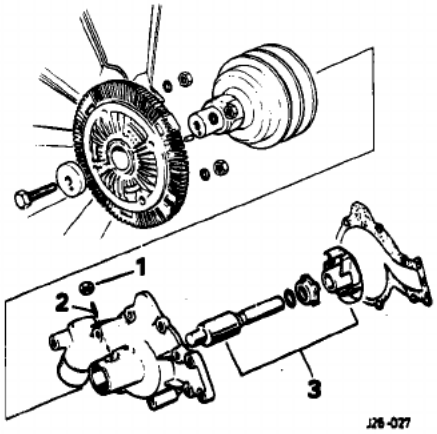

Fig. 8

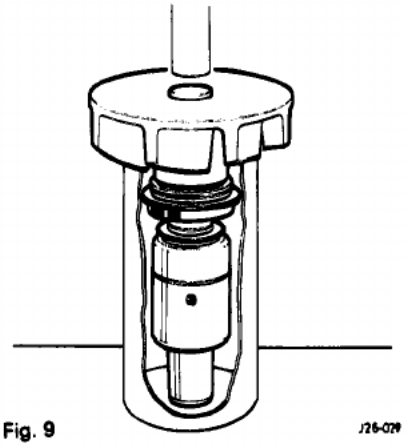

Fig. 9

Inspection

Thoroughly clean all parts of the pump except the bearing/spindle assembly in a suitable cleaning solvent.
Inspect the bearing for excessive play and remove any burrs, rust or scale from the shaft using fine emery cloth.

NOTE: Wrap the bearing in a clean cloth to prevent contamination by emery dust.

If signs of wear or corrosion are evident in bearing bore or on the face in front of the impeller, the body of the pump must be replaced.

Reassembling

Align the location hole in the bearing with the tapped hole in the pump body and press the bearing/spindle assembly into the body until the holes coincide.
Fit the bearing lockscrew and secure using the locknut.
Coat the outside of the brass seal housing with a suitable sealing compound, and fit into the recess in the pump body.
Carefully press the impeller onto the spindle until the dimension (A) shown on illustration (Fig. 10) is obtained. A = 0.381 ± 0.07 mm (0.015 ± 0.003 in)
Press pulley onto spindle, taking care to ensure that impeller is not moved from dimensions given above.
Refit the water pump, see operation 26.50.01.

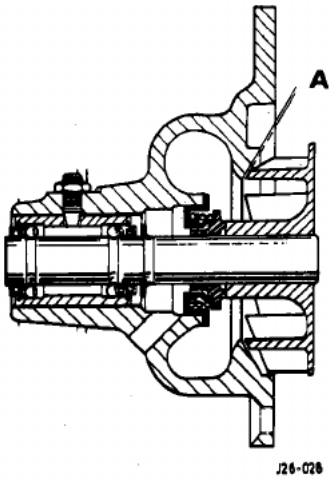

Fig. 10

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KEY TO EXHAUST SYSTEM

1. Catalyst
2. Down-pipe
3. Front silencer
4. Rear intermediate pipe
5. Front intermediate pipe
6. Tail pipe and silencer
7. Exhaust trim

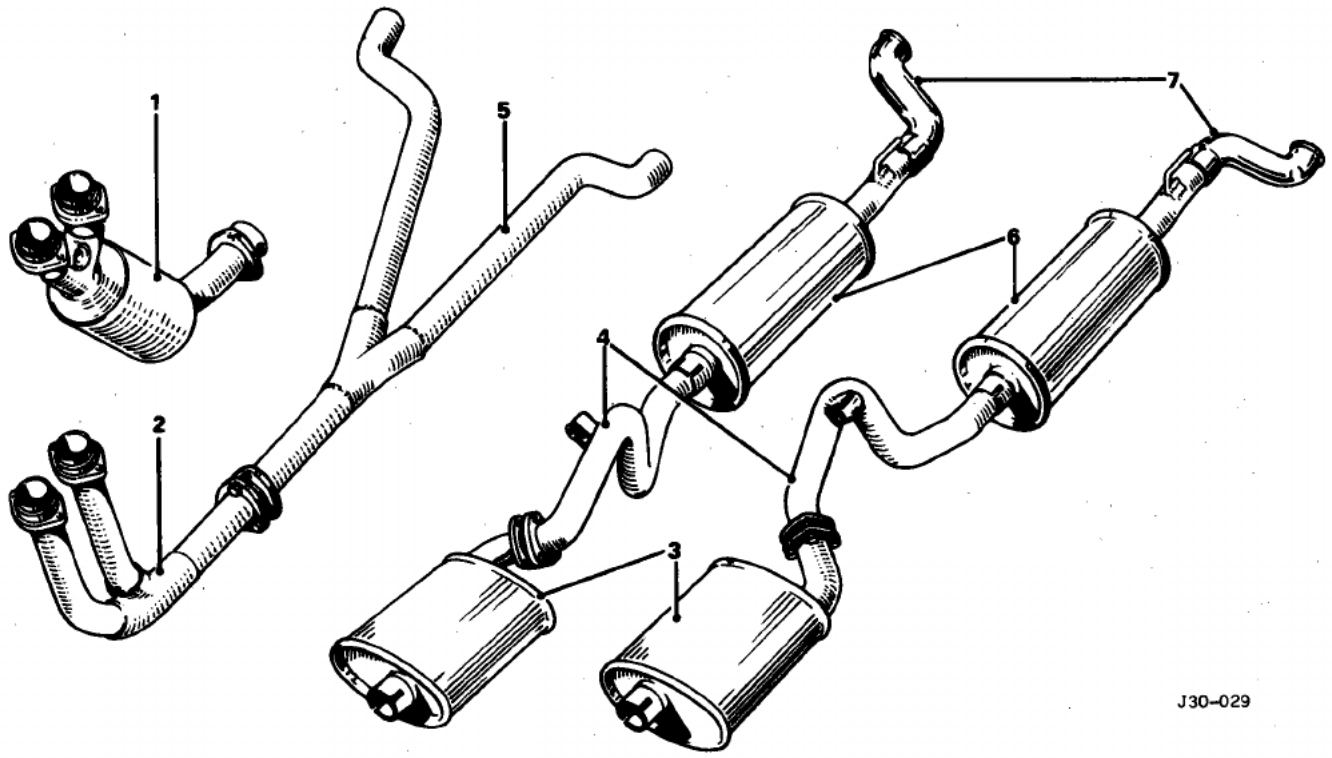

Fig. 1

EXHAUST SYSTEM COMPLETE

Remove and refit **30.10.01**

Removing

In the luggage compartment, remove the two self-locking nuts securing each rear silencer mounting (1, Fig. 2).
Remove the three nuts, bolts and washers securing the down-pipe/intermediate pipe flange (2, Fig. 2).
Release the clamp at the rear of forward silencer assembly (3, Fig. 2).
Separate the intermediate pipe and the forward silencer assemblies from the rear intermediate pipes, taking care to avoid damage to the catalyst unit, if fitted.
Release the clamp at the tail pipe and silencers and from the rear intermediate pipes (4, Fig. 2).
Draw the rear intermediate pipes rearwards from the mounting rubbers and suspension unit (5, Fig. 2).
Remove the screws and separate the trim from the tail pipe and silencers (6, Fig. 2).
Draw the tail pipe and the silencer forwards from the body (7, Fig. 2).
Remove the nuts, bolts and washers securing the heat shield at exhaust manifold/front pipe joint (8, Fig. 2).
Remove the special nuts and plain washers at each exhaust manifold and draw the front pipe downwards. Recover the heat shield brackets.

CAUTION: Take great care to avoid damaging steering rack gaiter.

Check the condition of the mounting rubbers in the rear suspension unit and mounting brackets and renew as necessary.

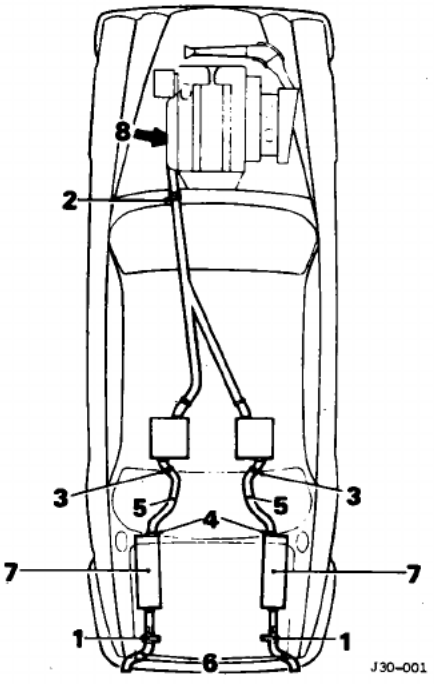

Fig. 2

Refitting

When refitting use Firegum on all joints, assemble the components completely before tightening all clamps and screws.

FRONT PIPE

Remove and refit **30.10.09**

Removing

Remove the nuts, bolts and washers securing the heat shield at exhaust manifold/front pipe joint (1, Fig. 3).
Remove the special nuts and plain washers at each exhaust manifold (2, Fig. 3).
Beneath the car remove the three nuts, bolts and washers securing front pipe/intermediate pipe flange (3, Fig. 3).
Draw the front pipe downwards and remove.

CAUTION: Take great care to avoid damaging the steering rack gaiter.

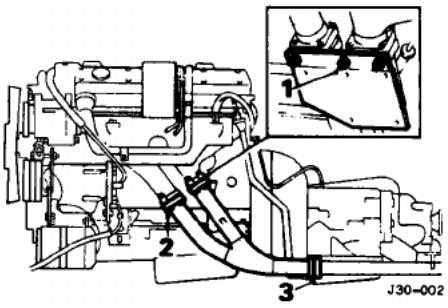

Fig. 3

Refitting

Reverse the above procedure to refit, using new seals. Apply Firegum at front pipe/intermediate pipe joint.

INTERMEDIATE PIPE

Remove and refit **30.10.11**

Removing

Remove the nuts, bolts and washers securing the flange (1, Fig. 4).
Release the clamp at the front end of both forward silencer and assemblies (2, Fig. 4).
Remove the pipe, taking care to avoid damage to catalyst unit, if fitted (3, Fig. 4).

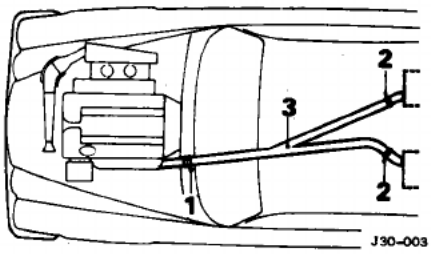

Fig. 4

Refitting

When refitting, use Firegum to seal joint to silencer and front pipe. Use new seal at front pipe/intermediate pipe flange.

SILENCER ASSEMBLY

Remove and refit
Left-hand **30.10.15**
Right-hand **30.10.16**

Removing

Remove the intermediate pipe.
Slacken the clamp and draw the silencer from the rear intermediate pipe (1, Fig. 5).

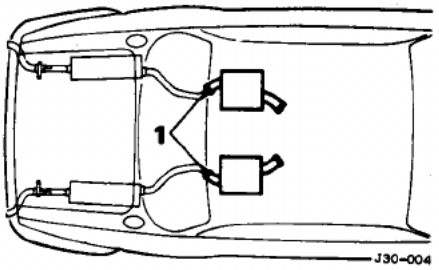

Fig. 5

Refitting

When refitting use Firegum to seal the joints.

TAIL PIPE AND SILENCER

Remove and refit
Left-hand or Right-hand **30.10.22**

Removing

Remove the Allen grub screw and separate the trim from tail pipe (1, Fig. 6).
Release the clamp to the rear intermediate pipe and separate (2, Fig. 6).
Draw the tail pipe and silencer forwards down through the tunnel to clear the mounting rubber (3, Fig. 6).
Check the condition of the mounting, and renew as necessary.

continued

Position engine support tool MS 53A across engine compartment and attach hook to rear engine lifting eye. Take the engine weight.
Disconnect the exhaust intermediate pipe at the front flange and secure pipe to one side.
Remove screws securing the intermediate heat shield to the body; withdraw heat shield.
Remove bolts securing tie plate to bell housing and sump.
Position a suitable ramp jack and wooden block (1, Fig. 17) beneath the rear engine mountings and remove the body cross-member and rear engine mounting securing bolts (2, Fig. 17).
Lower ramp jack and remove the rear engine mounting and body cross-member.

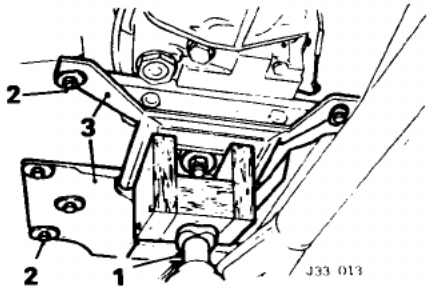

Fig. 17

Disconnect the speedometer cable from the gearbox.
Disconnect the slave cylinder from the gearbox, secure to one side.
Remove nuts, bolts and washers securing the propeller shaft to the gearbox output flange; move shaft away from flange.
Lower rear of engine using MS 53A.

CAUTION: Ensure that engine does. not damage the water valve during this operation.

Remove bolts securing the starter motor to the bell housing (2, Fig. 18); withdraw motor and secure to one side.

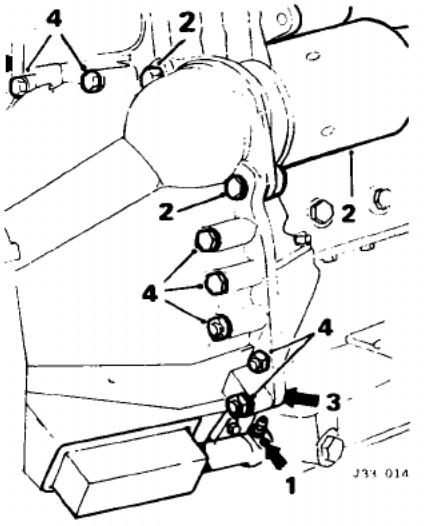

Fig. 18

Remove bolts securing the flywheel cover plate (3, Fig. 18); withdraw plate.
Disconnect reverse light wires from top of gearbox.
Position transmission hoist beneath gearbox and ensure that angle of platform matches that of the gearbox. Secure gearbox to platform.
Remove nuts, bolts and washers securing the bell housing (4, Fig. 18), noting fitted position of earth lead.
Withdraw gearbox and bell housing.

CAUTION: When a suitable hoist is not available, the gearbox may still be removed but care must be taken to ensure that the input shaft is not allowed to take the weight of the gearbox.

Recover foam pad from top of gearbox.
Mark relative positions of clutch cover to flywheel and balance weights to clutch cover (1, Fig. 19).

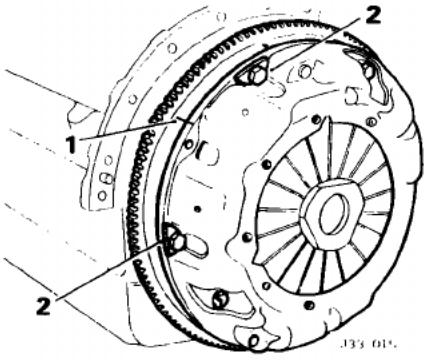

Fig. 19

Remove bolts and spring washers securing clutch cover to flywheel; (2, Fig. 19) withdraw cover together with clutch plate.
Examine flywheel face for scoring. If scoring is found to be excessive, the flywheel must be renewed.
Examine the clutch plates for oil contamination or evidence of slipping.
If oil contamination is evident, crankshaft or gearbox oil seals are suspect and should be examined and if necessary, renewed.

WARNING: Do not use compressed air to remove dust from the clutch assembly. If dust contamination is evident, wash assembly in Gamlen 265 or Rochem Electrosol quick dry solvent.

CAUTION: It is always advisable when renewing the clutch to fit a new release bearing. To do this, proceed as follows:

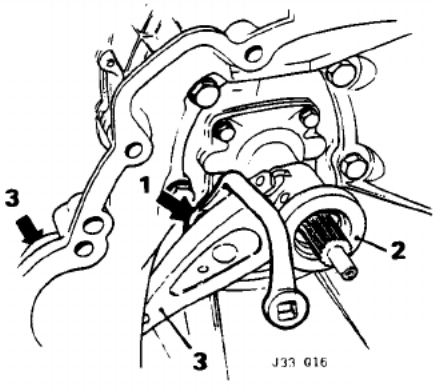

Fig. 20

Using tool ST 1136, remove the pivot bolt (1, Fig. 20) and carefully release withdrawal lever taking care not to bend the spring clip. DO NOT pull lever off the bolt. Slide release bearing (2, Fig. 20) off the input shaft. Remove the shield from over the slave cylinder and disconnect the withdrawal lever (3, Fig. 20) from the push-rod.

Refitting

Smear the input shaft with lithium based grease and fit the release bearing (1, Fig. 21). Refit the pivot bolt (2, Fig. 21).

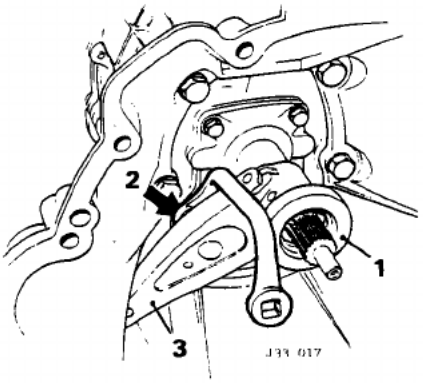

Fig. 21

Engage the lugs of the withdrawal lever in the groove of the release bearing and press withdrawal lever on to the pivot bolt.
Connect the withdrawal lever (3, Fig. 21) to the push-rod but do not fit the cover at this stage.
Position the clutch plate and cover (1, Fig. 22) on the flywheel ensuring that the reference marks made during dismantling are in alignment.

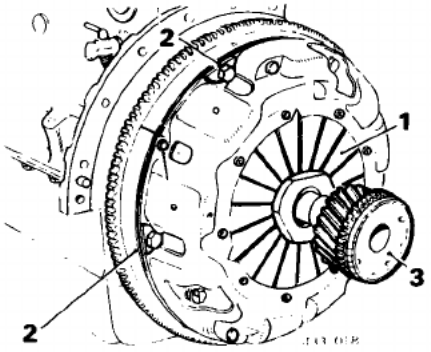

Fig. 22

Fit the balance weights, bolts and washers but do not tighten the bolts (2, Fig. 22) at this stage.
Using a dummy input shaft (3, Fig. 22), align the clutch plate ensuring that the clutch cover is correctly located.
Tighten the securing bolts by diagonal selection to the specified torque figure.
Position the foam pad on top of gearbox casing.
Refit the gearbox and bell housing, reconnect the reverse light switch and tighten the bell housing securing bolts to the specified torque figure.
Refit the starter motor.

continued

Refit the flywheel cover plate and remove the transmission hoist.
Raise engine using MS 53A or a ramp jack and wooden block (1, Fig. 23) positioned under the gearbox and re-connect the propeller shaft.
Refit slave cylinder.

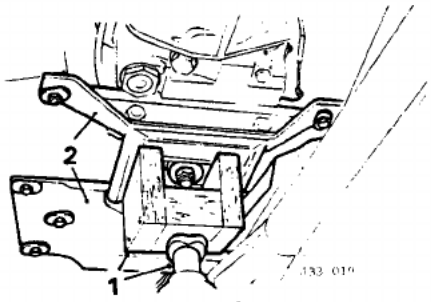

Fig. 23

CAUTION: Always use new self-locking nuts to secure the propeller shaft.

Connect the speedometer drive cable; refit the rear engine mounting and body cross-member (2, Fig. 23).
Refit the heat shield and exhaust intermediate pipe.

CAUTION: Always use a new olive, coated with 'Firegum' when refitting the exhaust pipe.

Refit the tie-plate between the oil sump and the bell housing.
Refit the flexible pipe to the slave cylinder.
Remove the engine support tool MS 53A.
Refit the gear lever gaiter (1, Fig. 24) and centre console (2, Fig. 24), followed by the gear knob (3, Fig. 24).

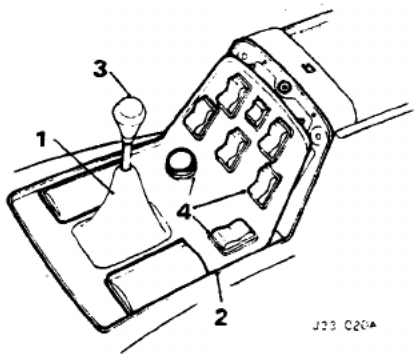

Fig. 24

Reconnect the battery and check operation of electric windows, cigar lighter and electric door locks where fitted (4, Fig. 24).
If the clutch fluid pipes were disconnected:
Remove the filler cap from the fluid reservoir and top up fluid to the correct level.

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds S.A.E. J1703/D.

Attach one end of a bleed tube (1, Fig. 25) to the slave cylinder bleed nipple.
Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.
Slacken the bleed nipple (2, Fig. 25) and pump the clutch pedal slowly up and down, pausing between each stroke.

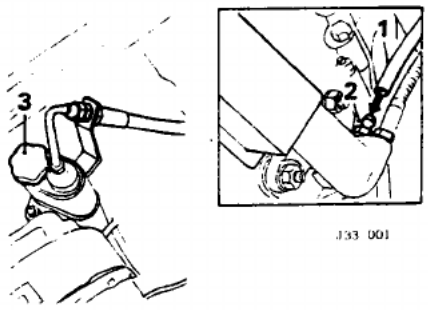

Fig. 25

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten the bleed nipple.
Top up the reservoir (3, Fig. 25) and apply working pressure to the clutch pedal for two to three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from system may be used after allowing it to stand for a few hours to allow air bubble to disperse.

MASTER CYLINDER

Overhaul 33.20.07

WARNING: Use only clean brake fluid or Girling cleaning fluid for cleaning. All traces of cleaning fluid must be removed before reassembly. All components should be lubricated with clean brake fluid and assembled using the fingers only.

Dismantling

Remove master cylinder as detailed in operation 33.20.01.
Detach rubber boot (1, Fig. 26) from end of barrel and move boot along push-rod.
Depress push-rod and remove circlip (2, Fig. 26).

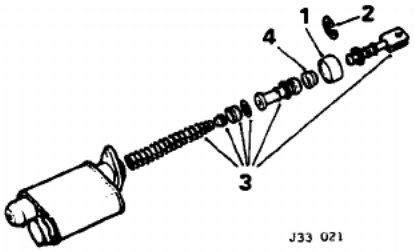

Fig 26

Withdraw push-rod, piston, piston washer, main cup, spring retainer and spring (3, Fig. 26).
Remove secondary cup (4, Fig. 26) from piston.

Inspection

Examine cylinder bore for scores.
Thoroughly wash out reservoir and ensure by-pass hole in cylinder bore is clear. Dry using compressed air or lint-free cloth.
Lubricate replacement seals with clean brake fluid.

Reassembling

If necessary, fit end plug on new gasket.
Fit spring retainer (1, Fig. 27) to small end of spring. If necessary, bend over retainer ears to secure.

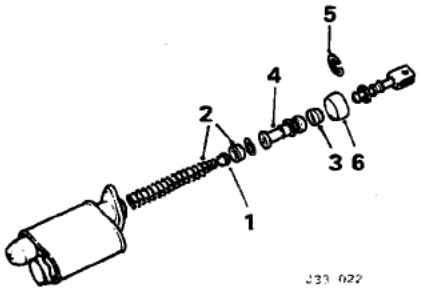

Fig. 27

Insert spring, large end leading, into cylinder bore; follow with main cup (2, Fig. 27), lip foremost. Ensure lip is not damaged on the circlip groove.
Using fingers only, stretch secondary cup (3, Fig. 27) onto piston with small end towards drilled end and groove engaging ridge.
Gently work round cup with fingers to ensure correct bedding.
Insert piston washer into bore, curved edge towards main cup.
Insert piston in bore (4, Fig. 27), drilled end foremost.
Fit rubber boot (5, Fig. 27) to push-rod.
Offer push-rod to piston and press into bore until circlip can be fitted behind push-rod stop ring.

CAUTION: It is important to ensure that circlip is correctly fitted in groove.

Locate rubber boot in groove (6, Fig. 27).

RELEASE BEARING

Remove and refit 33.25.12

To carry out this operation proceed as described in Operation 33.10.01.

SLAVE CYLINDER

Overhaul **33.35.07**

Dismantling

Prior to overhaul, the slave cylinder must be removed as detailed in Operation 33.35.01.

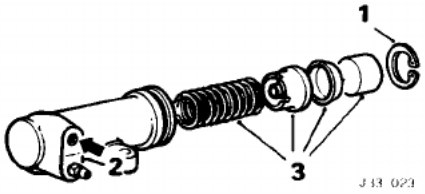

Fig. 28

Remove the circlip (1, Fig. 28) and applying low air pressure (2, Fig. 28) to the inlet port expel the piston, cup, cup filler and spring (3, Fig. 28), discard the cup.

Inspecting Components

WARNING: Use only clean brake fluid or Girling cleaning fluid for cleaning. All traces of cleaning fluid must be removed before reassembly. All components should be lubricated with clean brake fluid and assembled using the fingers only.

Examine the piston and slave cylinder bore for signs of scoring. Should scoring be evident, components must be renewed.
Examine the spring for signs of distortion and renew it if necessary.
Check that the rubber boot is not distorted or perished.

Reassembling

Press spring, cup filler, a new cup and the piston (3, Fig. 28) into the cylinder; refit the circlip (1, Fig. 28).
Check that piston moves freely and refit the cylinder as detailed in Operation 33.35.01.

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DESCRIPTION

The five-speed gearbox was introduced on the Jaguar 3.4 and 4.2 and Daimler Sovereign Series III saloons as an option to automatic transmission. The fifth gear, in effect, replaces the overdrive as fitted to the four-speed gearbox on Series II cars. Fifth gear is engaged as a normal gear. Reverse is engaged by lifting the lever and moving it as far as possible to the left then forward.

The gearbox oil capacity (from dry) is 2 litres (3½ pints, 4½ U.S. pints). To check the level, raise the car on a ramp or place it over a pit and remove the filler/level plug on the left-hand side of the box. Oil should reach the bottom of the threaded hole. If additional oil is required, S.A.E. 75W hypoid oil should be used. If this is unobtainable S.A.E. 80W hypoid oil may be used for topping-up.

No routine oil change is required but if a refill is necessary the recommended lubricant is Shell E3766 gearbox oil which is used for the initial factory fill. This oil is available under part number RTC1896. If this oil cannot be obtained it is permissible to use an S.A.E. 75W hypoid oil, but S.A.E. 80W oil should NOT be used as it will impair gear change quality.

The internal gear ratios are given in GENERAL DATA. The gearbox is recognised as the '77 mm' gearbox and is derived from the dimension between the mainshaft and the layshaft.

GENERAL DATA

5 Speed Manual Gearbox

Gearbox type	5 speed with baulk-ring synchromesh on all forward gears.
Ratios	First gear 3.321 :1
	Second gear 2.087 :1
	Third gear 1.396 :1
	Fourth gear 1.00 :1
	Fifth gear 0.883 :1
	Reverse 3.428 :1
Capacity	2 litres (3½ pints, 4½ U.S. pints)

TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Clutch lever pivot bolt	12 mm threaded pin	40,6	4,15	30
Bell housing to gearcase	12 mm bolt and setscrew	80	8,16	59
Cover plate to bell housing	8 mm bolt	20,3	2,07	15
5th gear interlock spool retainer to gearbox extension	5 mm setscrew	6,1	0,62	4.5
Output flange to mainshaft	18 mm Nyloc nut	203,4	20,74	150
Dust cap assembly to extension housing	6 mm setscrew	9,5	0,96	7
Extension and centre plate to main case	8 mm bolt	28,5	2,90	21
5th gear selector fork pivot bracket to centre plate	8 mm setscrew	28,5	2,90	21
Front cover to main case	8 mm setscrew	28,5	2,90	21
Interlock spool retainer to main case	6 mm setscrew	9,5	0,96	7
'J' coupling pin to main selector shaft	8 mm threaded pin	20,3	2,07	15
Mounting bracket	8 mm bolt and setscrew	28,5	2,90	21
Drain plug	16 mm	35	3,59	26
Oil pump body to extension	6 mm screw	9,5	0,96	7
Oil inlet access hole blanking	8 mm setscrew	20,3	2,07	15
Propeller shaft to output flange	10 mm bolt	51	5,12	37
Reverse lever mounting pin to centre plate	10 mm threaded pin	28,5	2,90	21
Reverse baulk plate to gearbox extension	6 mm bolt	9,5	0,96	7
Remote control housing to main case rear extension	8 mm setscrew	20,3	2,07	15
Speedometer cable clip to gearbox	6 mm setscrew	9,5	0,96	7
Torsion spring brackets to gearbox extension	6 mm screws	9,5	0,96	7
Torsion spring adjuster locking screw	8 mm setscrew	20,3	2,07	15

GEAR LEVER BIAS SPRING

Adjust **37.16.01**

Service tool: Engine support tool MS 53A

Adjustment

Disconnect the battery, withdraw the cigar lighter and remove the gear lever knob.
Remove the screws securing the centre console; raise the console slightly and disconnect the window and cigar lighter harnesses.
Remove the gear lever gaiter.
Position engine support tool MS 53A so that lifting hook of tool engages with the rear engine lifting eye.
Disconnect the intermediate exhaust pipe at the front.
Remove the nuts and bolts securing the gearbox crash bracket. Lower the bracket and position a jack and suitably shaped piece of wood beneath the gearbox mounting.
With the mounting supported by the jack, remove the mounting bolts.
Lower the jack and remove mounting. Using tool MS 53A, lower the rear of the engine.

CAUTION: Ensure that heater valve and clutch flexible pipe are not damaged during this operation.

Slacken abutment plate bolts.
Select 1st gear and move the gear lever as far as possible to the left.

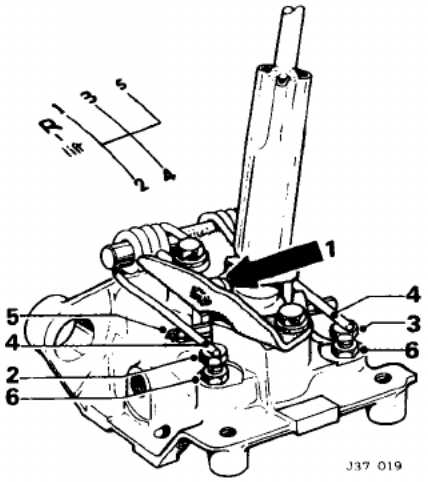

Fig. 1

Check the gap (1, Fig. 1) between the abutment and gear lever pads, the measurement should be 0,35 to 0,75 mm (0.014 to 0.030 in).
If this dimension is not obtained, slacken the location bracket securing bolt and adjust position of bracket until clearance is correct.
Slacken the locknuts (6, Fig. 1).
Select third gear, i.e., the gear lever will be eight degrees to the right of the vertical.
Adjust screws (2 and 3, Fig. 1) until each spring leg (4, Fig. 1) is approximately 0,5 mm (0.020 in) clear of the cross pin (5, Fig. 1). This will allow radial movement of the lever to take place before contact is made between cross-pin and springs.
Applying a light load, move the lever to the left and position it at the extremity of radial movement.
Adjust bolt (3, Fig. 1) until the right-hand spring just touches the cross-pin.
Now move the lever to the right and position it at the extremity of radial movement.
Adjust bolt (2, Fig. 1) until the left-hand spring just touches the cross-pin.
Screw both bolts in an equal amount until all radial movement is eliminated.
Return the lever to the neutral position then move it through the gate several times. When released, the lever should return to the 3rd/4th plane.
When adjustment is correct, tighten the locknuts (6, Fig. 1). Using tool MS 53A, raise the rear of the engine.
Position a jack and suitably shaped block of wood beneath the gearbox mounting and refit the rear engine mounting and crash bracket.
Remove the jack and tool MS 53A.
Connect the intermediate exhaust pipe; coat the olive with 'Firegum' prior to fitting.
Refit the gear lever gaiter, centre console and gear knob. Ensure full movement of gear lever.
Reconnect the battery and test electric windows and cigar lighter for correct operation.

GEAR LEVER BIAS SPRING

Remove and refit **37.16.02**

Service tool: Engine support tool MS 53A

Removing

Disconnect the battery, withdraw the cigar lighter and remove the gear lever knob.
Remove the screws securing the centre console; raise the console slightly and disconnect the electric window, and cigar lighter harnesses.
Remove the gear lever gaiter.
Position engine support tool MS 53A so that lifting eye of tool engages with the rear engine lifting eye.
Disconnect the intermediate exhaust pipe at the front.
Remove the nuts and bolts securing the gearbox crash bracket. Lower the bracket and position a jack and suitably shaped piece of wood beneath the gearbox casing.
With the gearbox supported by the jack remove the rear engine mounting.
Remove the jack and using tool MS 53A lower the rear of the engine.

CAUTION: Ensure that heater water valve and clutch flexible pipe are not damaged during this operation.

Select 4th gear, remove bias spring securing bolt followed by the spring.

Refitting

Grease the spring and mounting, refit the spring.
Fit and tighten the spring securing bolt.
Select 1st gear and move the gear lever as far as possible to the right.
Check the gap (1, Fig. 1) between the abutment and gear lever pads, the measurement should be 0,35 to 0,75 mm (0.014 to 0.030 in).
If this dimension is not obtained, slacken the location bracket securing bolt and adjust position of bracket until clearance is correct.
Slacken the locknuts (6, Fig. 1).
Select third gear i.e. the gear lever will be eight degrees to the right of the vertical.
Adjust screws (2 and 3, Fig. 1) until each spring leg (4, Fig. 1) is approximately 0,5 mm (0.020 in) clear of the cross-pin (5, Fig. 1). This will allow radial movement of the lever to take place before contact is made between cross-pin and springs.
Applying a light load, move the lever to the left and position it at the extremity of radial movement.
Adjust bolt (3, Fig. 1) until the right-hand spring just touches the cross-pin.
Now move the lever to the right and position it at the extremity of radial movement.
Adjust bolt (2, Fig. 1) until the left-hand spring just touches the cross-pin.
Screw both bolts in an equal amount until all radial movement is eliminated.
Return the lever to the neutral position then move it through the gate several times. When released, the lever should return to the 3rd/4th plane.
When adjustment is correct, tighten the locknuts (6, Fig. 1).
Using tool MS 53A, raise the rear of the engine.
Position a jack and suitably shaped block of wood beneath the gearbox casing and refit the rear engine mounting and crash bracket.
Remove the jack and tool MS 53A.
Refit the intermediate exhaust pipe; coat the olive with 'Firegum' prior to fitting.
Refit the gear lever gaiter, centre console and gear knob. Ensure full movement of gear lever.
Reconnect the battery and test electric windows and cigar lighter for correct operation.

REAR OIL SEAL

Remove and refit **37.23.01**

Service tool: Engine support tool MS 53A

Removing

Position engine support tool MS 53A so that lifting hook of tool engages with the rear engine lifting eye.
Disconnect the intermediate exhaust pipe and olive.
Remove the nuts and bolts securing the gearbox crash bracket. Lower the bracket and position a jack and suitably shaped piece of wood beneath the gearbox mounting.

continued

Lower the rear engine mounting.
Remove the intermediate heat shield.
Remove the jack followed by the propeller shaft securing bolts; swing shaft to one side.
Remove the output flange securing nut and slide flange off output shaft.
Prise the oil seal out of the gearbox casing.

Refitting

Smear the new oil seal with clean gearbox oil.
Fit the seal ensuring that it is correctly seated.
Refit the output flange; reconnect the propeller shaft.

CAUTION: Always use new self-locking nuts when refitting the propeller shaft.

Support the mounting with a jack and suitably shaped piece of wood; refit the rear engine mounting.
Remove the jack and refit the intermediate heat shield.
Reconnect the intermediate exhaust pipe; coat the olive with 'Firegum' prior to fitting.
Remove tool MS 53A.
Remove the filler/level plug and top up gearbox oil level to the bottom of the filler plug hole; refit the filler plug.

FIRST MOTION SHAFT OIL SEAL

Remove and refit **37.23.06**

Service tools: Offset spanner ST 1136

Removing

Prior to renewing the first motion shaft oil seal, it will be necessary to remove the gearbox as detailed in Operation 37.20.01.
Using tool ST 1136, unscrew and remove the clutch pivot bolt, withdrawal lever and release bearing.

CAUTION: Do not pull the withdrawal lever off the pivot bolt prior to removal

Remove the bolts and washers securing the front cover plate to the gearbox, withdraw the plate; discard the gasket.
Remove the oil seal from the front cover.

CAUTION: Ensure that the spacers for the first motion shaft and the layshaft bearings are not intermixed.

Refitting

Smear the replacement oil seal with clean gearbox oil and position the oil seal on the front cover plate with the lip of the seal facing towards the gearbox.
Fit the front cover plate, together with a new gasket, to the gearbox.
Refit the clutch pivot bolt and the release bearing; press the withdrawal lever on to the pivot bolt.
Refit the gearbox to the car, see Operation 37.20.01.
Remove the filler/lever plug and top up gearbox oil level to the bottom of the filler plug hole; refit the filler plug.

SPEEDOMETER DRIVE PINION

Remove and refit **37.25.05**

Removing

Remove the bolt and washer (1, Fig. 2) securing the clamp plate (2, Fig. 2) to the gearcase.
On later models with electronic speedometer, disconnect 2 pin connector.

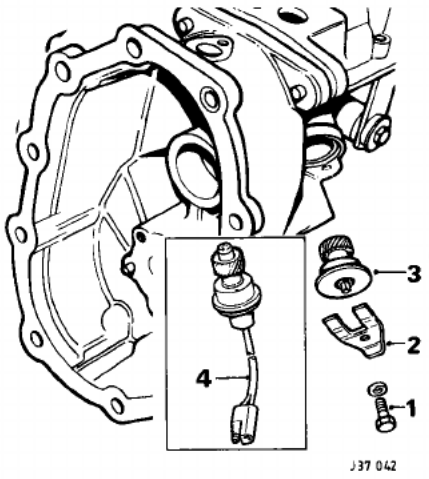

Fig. 2

Withdraw the pinion drive, transducer and cable (4, Fig. 2).
Withdraw the speedometer cable followed by the pinion housing (3, Fig. 2) (early models).
Remove the pinion from the housing; discard the 'O' ring and oil seal.

Refitting

Fit the replacement 'O' ring and oil seal, smear both components with clean gearbox oil.
Refit the pinion into the housing.
Refit the pinion housing, speedometer drive cable, drive cable, transducer and (clamp plate early models).
Connect the cable connectors (later models).

REVERSE LIGHT SWITCH

Check and adjust **37.27.02**

Disconnect the battery and remove the gear lever knob
Remove the screws securing the centre console slightly and disconnect the electric window and cigar lighter.
Remove the gear lever gaiter.
Connect a test lamp and battery to the switch and select reverse gear (Fig. 3).

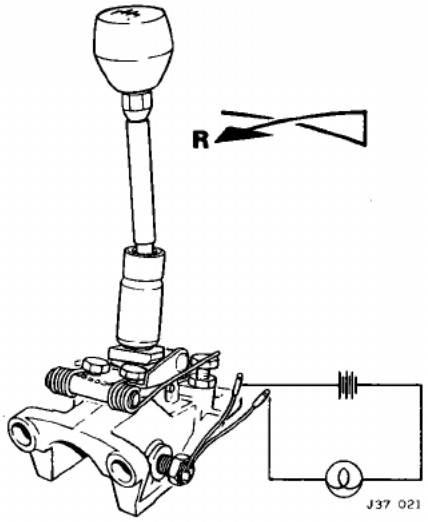

Fig. 3

Slacken the locknut and screw the switch in until the lamp lights.
Screw the switch in a further 180° and tighten the locknut.
Reconnect the battery, switch on the ignition and check that reverse lights are only illuminated when reverse gear is selected. Remove the test lamp and battery.
Switch off the ignition and disconnect the battery.
Refit the gear lever gaiter and centre console.
Reconnect the battery and test the electric windows and cigar lighter for correct operation.

GEARBOX ASSEMBLY

Remove and refit **37.20.01**

Service Tools: Engine support tool MS 53A; Tangye Epco V1000 Transmission Hoist; ST 1136 Offset spanner.

Removing

Drive the vehicle onto a ramp and disconnect the battery.
Unscrew the gear knob and withdraw the cigar lighter
Remove the screws securing the centre console and raise console slightly to gain access to the electric window.
Disconnect the harnesses at the multi-plug connectors and withdraw the console followed by the gear lever gaiter.
Place gear lever in third gear position.
Position engine support tool MS 53A across engine compartment and attach hook to rear engine lifting eye. Take the engine weight.
Disconnect the exhaust intermediate pipe at the front flange and secure pipe to one side.
Remove screws securing the heat shield to the body, withdraw the shield.
Remove bolts securing tie plate to bell housing and sump.

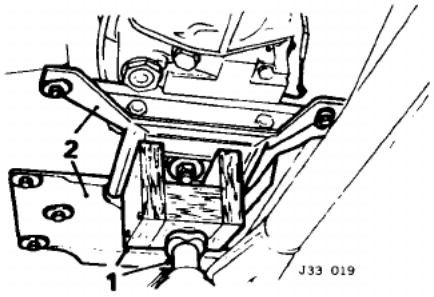

Fig. 4

Position a suitable ramp jack and wooden block (1, Fig. 4) beneath the rear engine mounting and remove the body cross member and rear engine mounting securing bolts.
Lower ramp jack and remove the rear engine mounting and body cross member (2,Fig. 4).
Disconnect the speedometer cable from the gearbox.

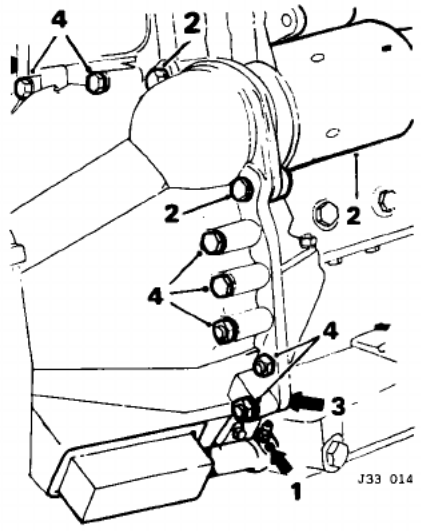

Fig. 5

Disconnect the slave cylinder from the gearbox, secure to one side.
Remove nuts, bolts and washers securing the propeller shaft to the gearbox output flange; move shaft away from flange.
Lower rear of engine using MS 53A.

CAUTION: Ensure that engine does not damage the water valve during this operation.

Remove bolts securing the starter motor to the bell housing (2, Fig. 5); withdraw motor and secure to one side.
Remove bolts securing the flywheel cover plate (3, Fig. 5); withdraw plate.
Disconnect reverse light wires from top of gearbox.
Position transmission hoist beneath gearbox and ensure that angle of platform matches that of the gearbox. Secure gearbox to platform.
Remove nuts, bolts and washers securing the bell housing (4, Fig. 5), noting fitted position of earth lead.
Withdraw gearbox and bell housing.

CAUTION: When a suitable hoist is not available the gearbox may still be removed but care must be taken to ensure that the input shaft is not allowed to take the weight of the gearbox.

Recover foam pad from top of gearbox.

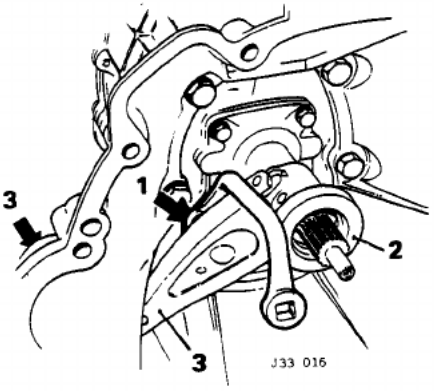

Fig. 6

Using tool ST 1136, remove the pivot bolt (1, Fig. 6) and carefully release withdrawal lever taking care not to bend the spring clip. DO NOT pull the lever off the bolt. Slide release bearing (2, Fig. 6) off the input shaft. Remove the shield from over the slave cylinder and disconnect the withdrawal lever (3, Fig. 6) from the push-rod.

Refitting

Position the bell housing on the gearcase and secure it with six bolts, plain and spring washers.
Smear the input shaft with lithium based grease and fit the release bearing. Refit the pivot bolt.
Engage the lugs of the withdrawal lever in the groove of the release bearing and press withdrawal lever onto pivot bolt.
Position the foam pad on top of gearbox casing.
Refit the gearbox and bell housing, reconnect the reverse light switch and tighten the bell housing securing bolts to the specified torque figure.
Refit the flywheel cover plate and remove the transmission hoist.
Raise engine using MS 53A or a ramp jack and wooden block positioned under the gearbox and reconnect the propeller shaft.
Refit the slave cylinder.

CAUTION: Always use new self-locking nuts to secure the propeller shaft.

Connect the speedometer drive cable; refit the rear engine mounting and body cross member.
Refit the heat shield and exhaust intermediate pipe.

CAUTION: Always use a new olive, coated with 'Firegum' when refitting the exhaust pipe.

Refit the tie-plate between the oil sump and the bell housing.
Refit the slave cylinder.
Remove the engine support tool MS 53A.
Refit the gear lever gaiter and centre console followed by the gear knob. Ensure full movement of the gear lever.
Reconnect the battery and check operation of electric windows, cigar lighter and electric door locks (where fitted).
If the slave cylinder pipes were disconnected remove the filler cap from the clutch fluid reservoir and top up fluid to the correct level.

WARNING: Only Castrol/Girling Universal Brake Fluid may be used in the clutch hydraulic system. This fluid exceeds SAE J1703/D.

Attach one end of a bleed tube to the slave cylinder bleed nipple.
Partially fill a clean container with hydraulic fluid and immerse the other end of the bleed tube in the fluid.
Slacken the bleed nipple and pump the clutch pedal slowly up and down, pausing between each stroke.

CAUTION: The fluid should be topped up after every three pedal strokes.

Pump the clutch pedal until the fluid issuing from the bleed tube is free from air bubbles; tighten the bleed nipple.
Top up the reservoir and apply working pressure to the clutch pedal for two to three minutes then examine the system for leaks.

WARNING: Do not use fluid bled from system for topping up purposes as this will contain air. If fluid has been in use for some time it should be discarded. Fresh fluid bled from system may be used after allowing it to stand for a few hours to allow air bubbles to disperse.

GEARBOX

Overhaul 37.20.04

Service tools: 47, 18G 47-1, 18G 47-5, 18G 284, 18G 284 AAH, 18G 705, 18G 705-1, 18G 1205, ST 1136

Dismantling

Place the gearbox on a bench or gearbox stand, ensuring that the oil is first drained.
Using tool ST 1136, unscrew the clutch withdrawal lever pivot bolt and remove the clutch withdrawal lever complete with the pivot bolt and release bearing slippers.
Remove the bell housing.
Remove the nut and connecting pin linking the selector shaft to the remote control shaft.
Remove the four bolts, spring and plain washers—two top, one either side—securing the remote control housing to the gear-case rear cover.
Remove the nut and plain washer securing the output flange to the mainshaft. Use tool RG 421 or 18G 1205 to prevent shaft rotation.
Withdraw the output flange.

continued

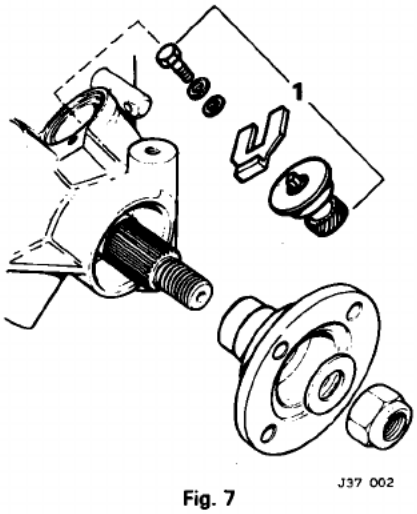

Fig. 7

Remove the speedometer driven gear and housing. (1, Fig. 7)
Remove the two bolts and spring washers securing the locating boss for the selector rear spool and withdraw the locating boss.
Remove the 10 bolts, spring and plain washers securing the rear cover to the gearcase; withdraw the rear cover.
Remove and discard the gasket.
Withdraw the oil pump drive (1, Fig. 8).

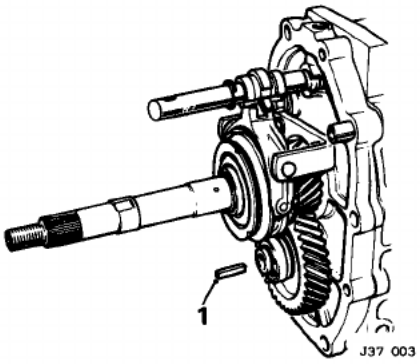

Fig. 8

Remove the 2 bolts and spring washers (1, Fig. 9) securing the fifth gear selector fork and bracket (2, Fig. 9).
Remove the circlip (3, Fig. 9) from the selector shaft.
Withdraw the fifth gear selector spool (4, Fig. 9). Note that the longer cam of the spool is fitted towards the bottom of the gearbox.

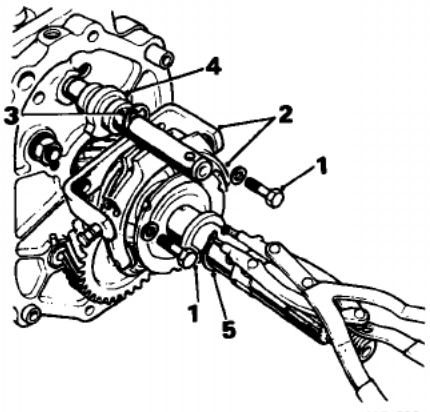

Fig. 9

Remove the circlip (5, Fig. 9) retaining the fifth gear synchromesh assembly to the mainshaft (Fig. 10).
Withdraw the synchromesh assembly, fifth gear-driven, and spacer from the mainshaft.

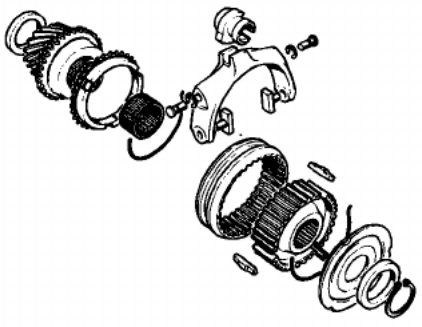

Fig. 10

Remove the circlip (1, Fig. 11) retaining the fifth gear-driving, from the layshaft.
Using tool 18G 705 and adaptors 18G 705-1 remove the fifth gear and spacer from the layshaft.

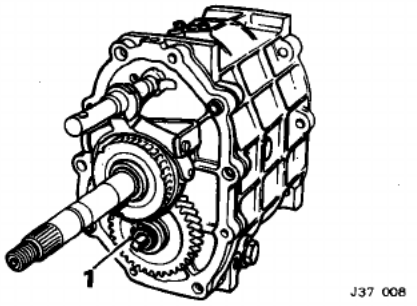

Fig. 11

Remove the front cover (1, Fig. 12).
Remove and discard the gasket.
Remove the input shaft selective washer, bearing track, (2, Fig. 12) layshaft selective washer and bearing track (3, Fig. 12) from the gearcase.

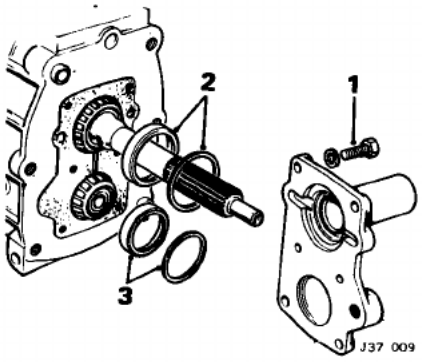

Fig. 12

Remove the two bolts and spring washers securing the locating boss for the selector shaft front spool; withdraw the locating boss.
Remove the plug, spring and ball from the centre plate.
Supporting the gearbox on the centre plate withdraw the gear-case.
Remove the input shaft and synchromesh cone.
Withdraw the layshaft cluster.
Support the centre plate complete with gears in protected vice jaws.

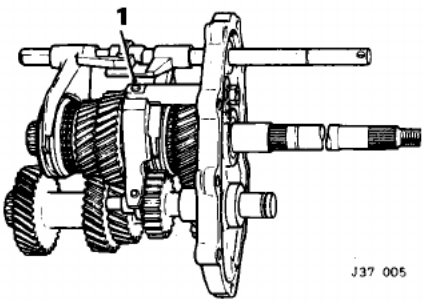

Fig. 13

Remove the reverse lever, circlip and pivot pin (1, Fig. 13).
Remove the reverse gear lever and slipper pad.
Slide the reverse shaft rearwards and withdraw the reverse gear spacer, mainshaft, selector shaft, selector shaft fork and spool in a forward direction clear of the centre plate.
Withdraw the selector fork and spool.

NOTE: The shorter cam of the spool is fitted towards the bottom of the gearbox.

If renewal of the pivot shaft and/or the centre plate is intended, remove the nut and spring washers securing the reverse gear pivot shaft and remove the pivot shaft.
If renewal of the dowels and/or centre plate is intended, remove the centre plate from the vice and extract the two dowels.

Input shaft and front cover

Using tools 47 and adaptors 18G 47-5, remove the external bearing.
Using tools 18G 284 AAH and 18G 284, withdraw the internal bearing track.
Remove and discard the oil seal from the front cover.

Layshaft

Using tools 47 and adaptors 18G 47-1, remove the layshaft bearings.

Mainshaft

Remove the pilot bearing and spacer.
Remove the 3rd and 4th speed synchronizer hub and sleeve (1, Fig. 14).
Remove the 3rd speed gear (2, Fig. 14).
Remove the circlip securing the mainshaft bearing (3, Fig. 14).
Remove the bearing, 1st gear and bush, 1st and 2nd speed hub, sleeve and synchromesh cones, and 2nd gear (4, Fig. 14).

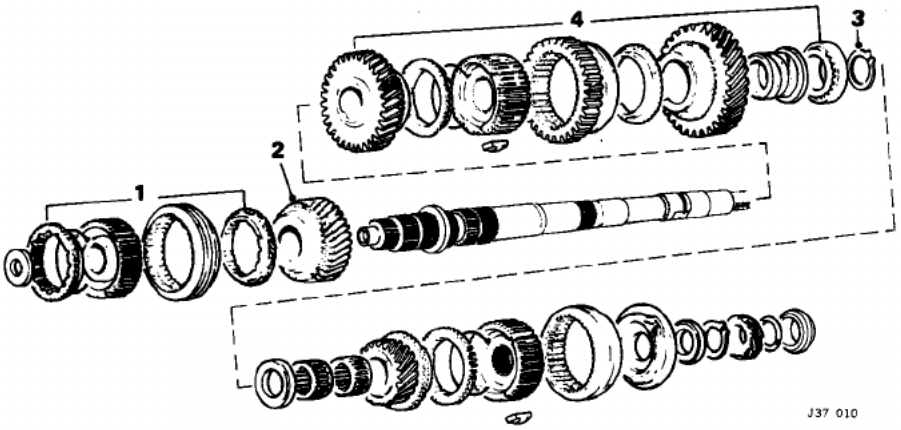

Fig. 14

Rear cover

Remove the oil seal (1, Fig. 15), bearing (2, Fig. 15), oil seal (3, Fig. 15), spacer, and speedometer gear (4, Fig. 15). Remove the oil pump drive, pump cover (5, Fig. 15) and gears (6, Fig. 15).

Thoroughly clean and examine all components; obtain new parts as necessary.

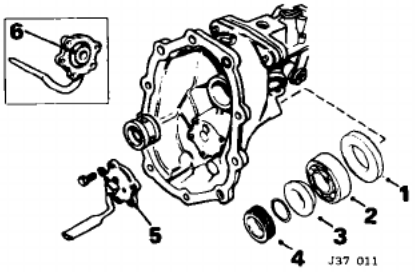

Fig. 15

Layshaft

Fit the bearings to the layshaft.

Mainshaft

Synchromesh assemblies. With the outer sleeve held, a push-through load applied to the outer face of the synchromesh hub should register 8,2–10 kgf m (18–22 lbf ft) to overcome spring detent in either direction.

Checking 1st speed bush end-float. Fit 2nd gear, 1st/2nd speed synchromesh hub and 1st gear bush to the mainshaft.

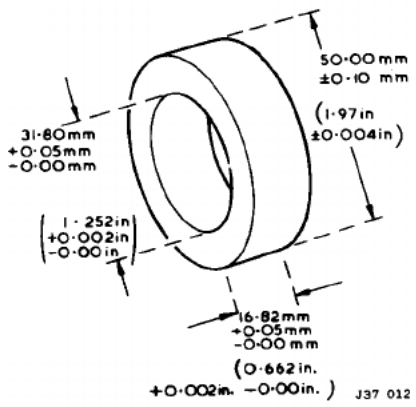

Fig. 16

Manufacture a spacer to the dimensions shown in Fig. 16 and slide the spacer on the mainshaft. This represents a slave bearing.

Using an old circlip and feeler gauges check the clearance existing between the spacer and the circlip, which should be within 0,005 to 0,055 mm (0.0002 to 0.002 in). The first speed bush is available with collars of different thickness. Select a 1st speed bush with a collar which will give the required end-float.

Remove the circlip, spacer, bush, synchromesh hub and 2nd gear from the mainshaft.

Checking 5th gear end-float. Fit the 5th gear assembly to the mainshaft, i.e. front spacer, 5th gear, synchromesh hub, rear plate and spacer. Fit an old circlip and using feeler gauges check the end-float which should be within 0,005 to 0,055 mm (0.0002 to 0.002 in). The rear spacer is available in a range of sizes. Select a rear spacer which will ensure the required clearance.

Remove the circlip spacer and 5th gear assembly.

Assembly

It is important that 1st/2nd synchromesh is assembled correctly with the short splines of inner member towards 2nd gear. Fit 2nd gear baulk ring, which is different to the other three, synchromesh hub and sleeve with the selector fork annulus to the rear of the gearbox, baulk ring 1st gear, selective bush, bearing and a new circlip (Fig. 17). When fitting the circlip care must be taken to ensure that it is not stretched beyond the minimum necessary to pass over the shaft. The internal diameter of an expanded circlip must not exceed 32,30 mm (1.272 in).

Fit 3rd gear, baulk ring, synchromesh hub and sleeve, with the longer boss of synchromesh hub to front of gearbox, to the mainshaft.

Fit the spacer and bearing to front of the mainshaft.

Fit the layshaft bearing track to the centre plate.

Fit the layshaft to the centre plate and fit the fifth gear, spacer and a new circlip. When fitting the circlip care must be taken to ensure that it is not stretched beyond the minimum necessary to obtain entry. The internal diameter of an expanded circlip must not exceed 22,5 mm (0.886 in).

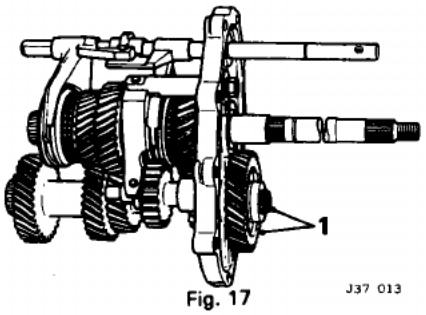

Fig. 17

Fit the mainshaft bearing track to the centre-plate.

Locate the centre plate in protected vice jaws.

Take the selector shaft complete with 1st and 2nd selector fork, front spool and 3rd and 4th selector fork and engage both forks in their respective synchromesh sleeves on the mainshaft. Simultaneously engage the selector shaft and mainshaft assemblies in the centre-plate.

Fit the spacer, 5th gear, baulk ring, synchromesh hub and sleeve end-plate, selective spacer, and a new circlip.

CAUTION: WHEN FITTING THE CIRCLIP CARE MUST BE TAKEN TO ENSURE THAT IT IS NOT STRETCHED BEYOND THE MINIMUM NECESSARY TO OBTAIN ENTRY. THE INTERNAL DIAMETER OF AN EXPANDED CIRCLIP MUST NOT EXCEED 27,63 mm (1.088 in). ENSURE THAT THE CIRCLIP IS FULLY SEATED IN THE GROOVE.

Fit the reverse gear with lip for slipper pad to front of box, front and rear spacers and the reverse shaft.

Fit the reverse lever, slipper pad, pivot pin and circlip. If a new reverse gear pivot shaft is to be fitted it is necessary to ensure that its radial location is consistent with reverse pad slipper engagement/clearance.

Radial location is determined on assembly.

Secure with spring washer and nuts, subsequently checking movement of reverse lever and ensuring slipper pad is properly engaged.

Remove the centre-plate and gear assembly from the vice and locate on a suitable stand with the front of the mainshaft uppermost.

Ensure that the reverse shaft does not slide out of position.

Fit the centre plate front gasket.

Fit the external bearing and internal bearing track to the input shaft.

Fit the input shaft to the gearcase.

Carefully slide the gearcase and input shaft into position over the gear assemblies. DO NOT USE FORCE. Ensure that the centre plate dowels and selector shaft are engaged in their respective locations.

Fit the layshaft and input shaft front bearing outer tracks.

Using slave bolts and plain washers to prevent damaging the rear face of the centre-plate, evenly draw the gearcase into position on the plate.

continued

KEY TO COMPONENTS SHOWN ON HYDRAULIC CHARTS

A. Torque converter
B. Front clutch
C. Rear clutch
D. Front servo
E. Rear servo
F. Governor
G. Pump
H. Primary regulator
J. Secondary regulator
K. 2–3 shift valve
L. 1–2 shift valve
M. Servo orifice control valve
N. Manual valve
P. Down-shift valve
Q. Throttle valve
R. Modulator valve

KEY TO HYDRAULIC CHART COLOUR CODE

Red line — Pump pressure
Red cross hatch — To torque converter
Blue line — Governor line pressure
Yellow line — Throttle valve
Green line — Pump suction

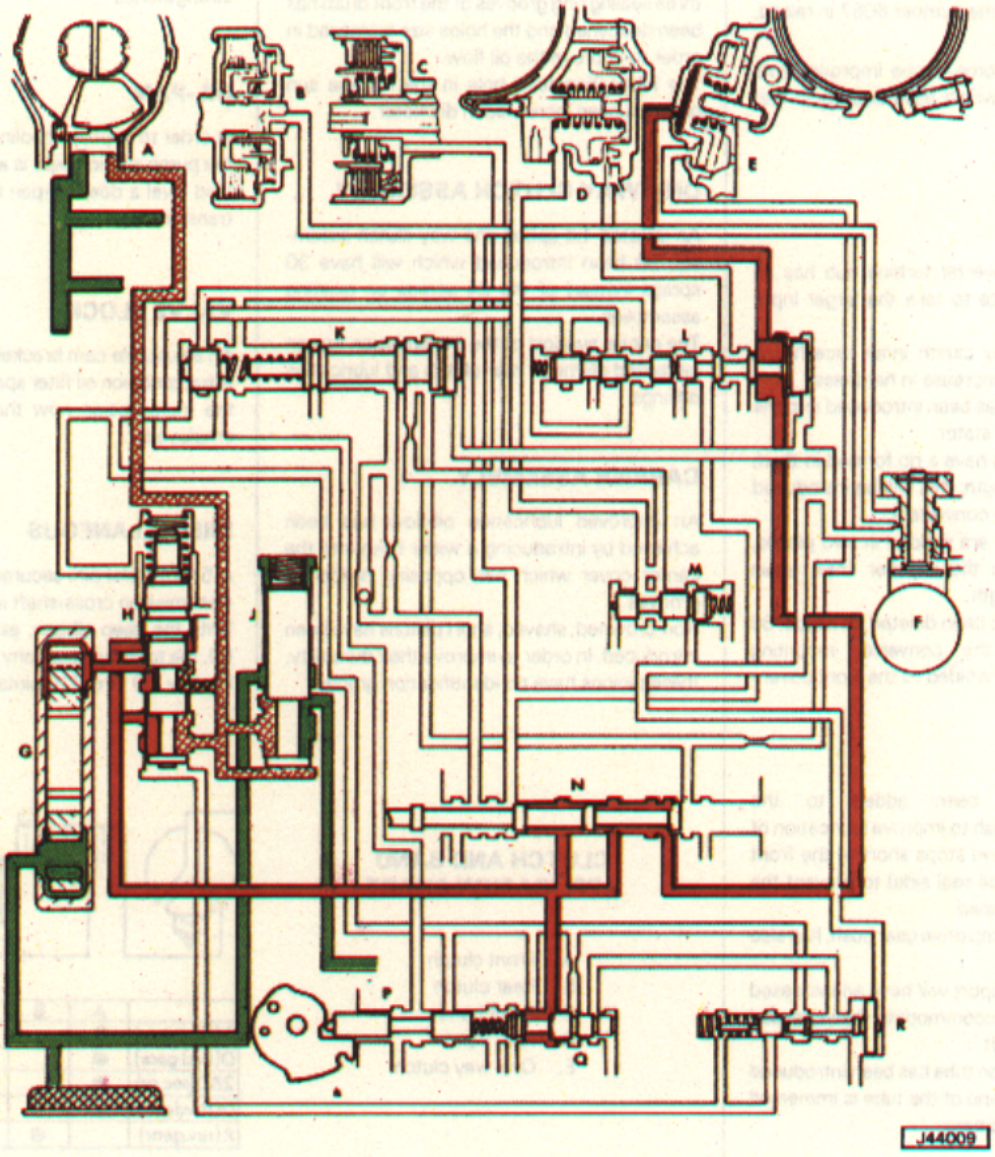

Fig. 9

HYDRAULIC OPERATION IN 'P' (PARK—Fig. 9)

Coupled to the manual valve operating lever is a linkage incorporating a pawl; movement of this lever to the 'Park' position engages the pawl with the toothed outer surface of the ring gear, so locking the output shaft to transmission case. The rear servo is energized in 'P' selection but, as both the front and rear clutches are not energized, drive is impossible and the transmission remains inoperative.

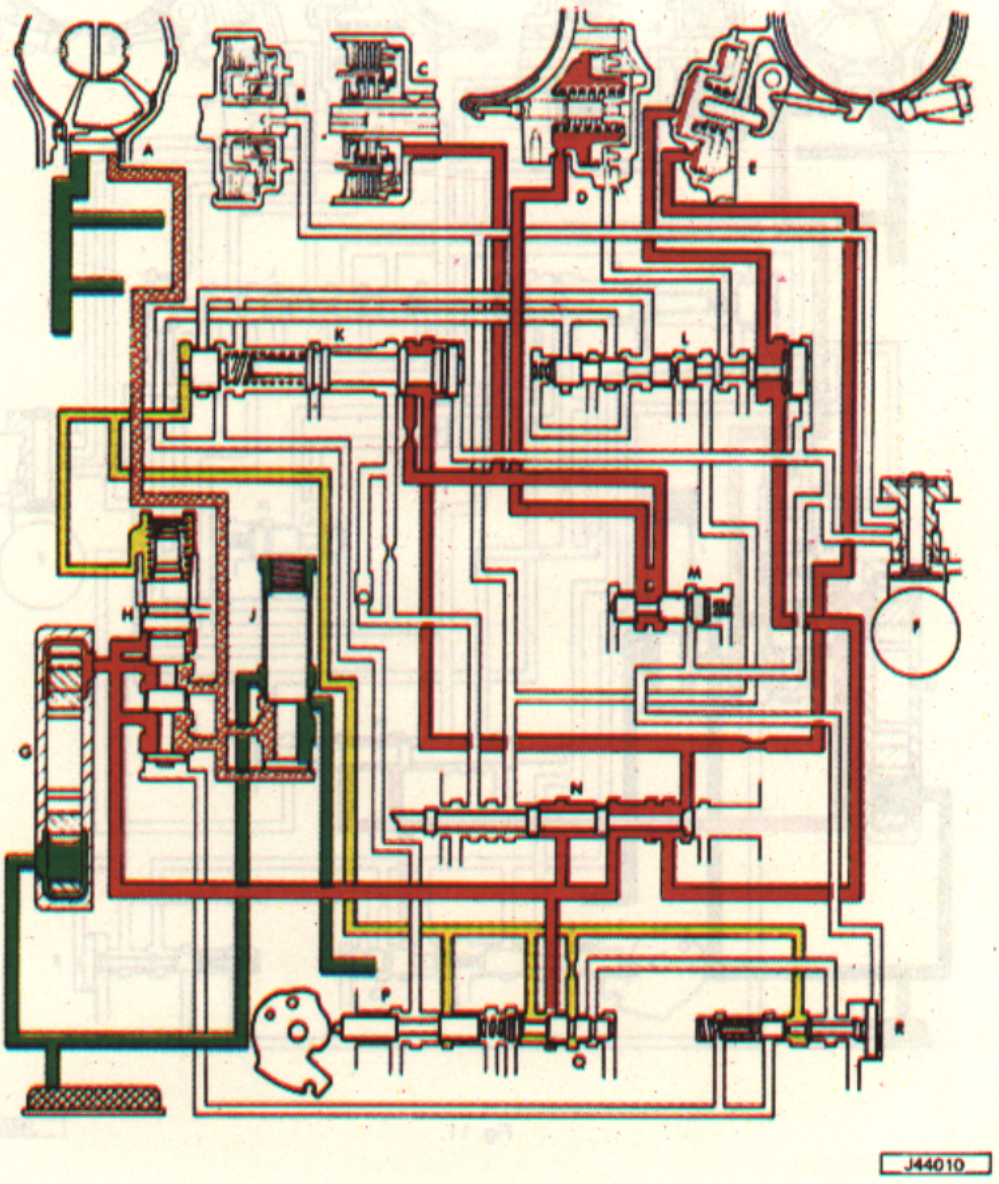

Fig. 10

HYDRAULIC OPERATION IN 'R' (REVERSE—Fig. 10)

Throttle pressure applied to spring end of primary regulator valve increases line pressure proportional to engine output. Manual valve directs line pressure through 1–2 shift valve to apply rear servo and through 2–3 shift valve to release front servo and apply rear clutch.

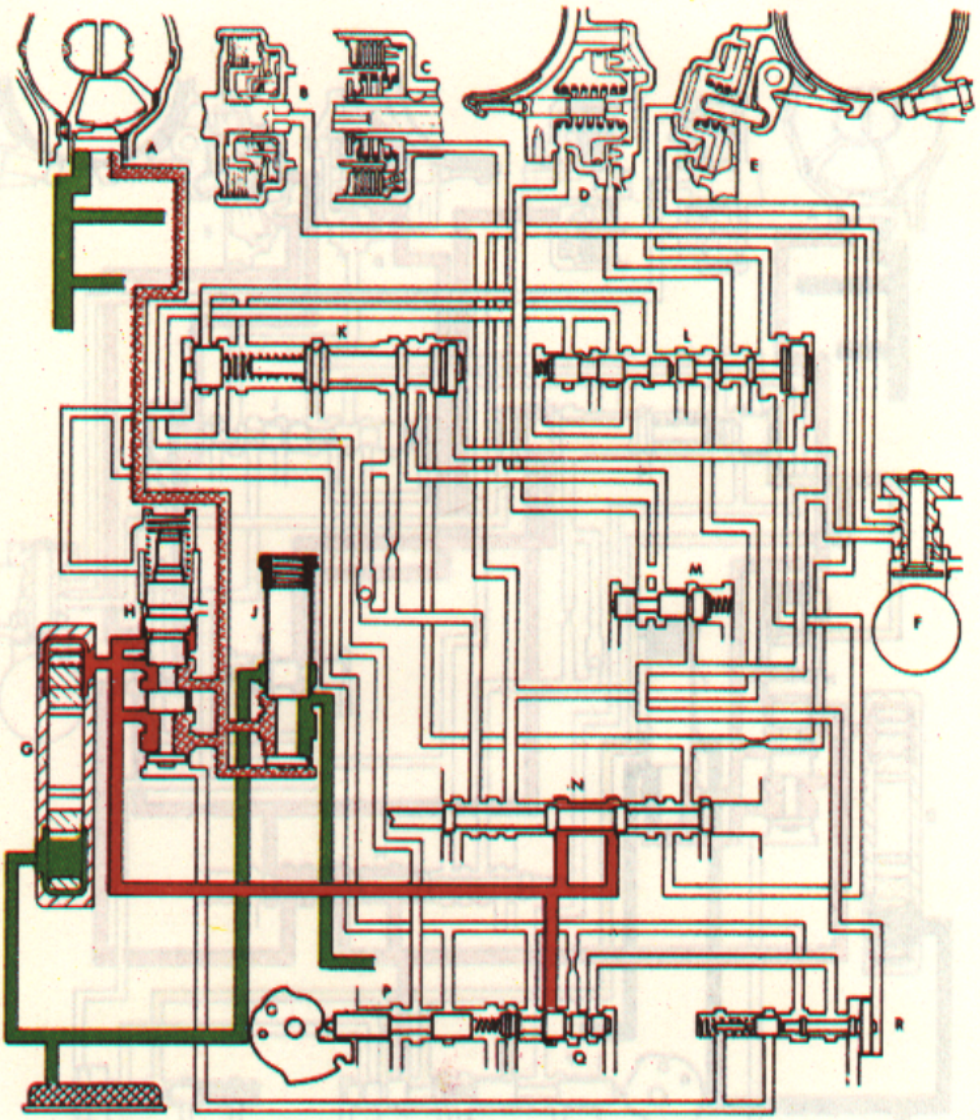

Fig. 11

J44011

HYDRAULIC OPERATION IN 'N' (NEUTRAL—Fig. 11)

With the engine running, the pump supplies fluid to the primary regulator which regulates line pressure.

Spill from the primary regulator supplies the torque converter and lubrication requirements. This supply is regulated by the secondary regulator.

The line pressure supplied to the manual and throttle valves is blocked by a land on the valves so that neither governor, clutches nor servos are energized.

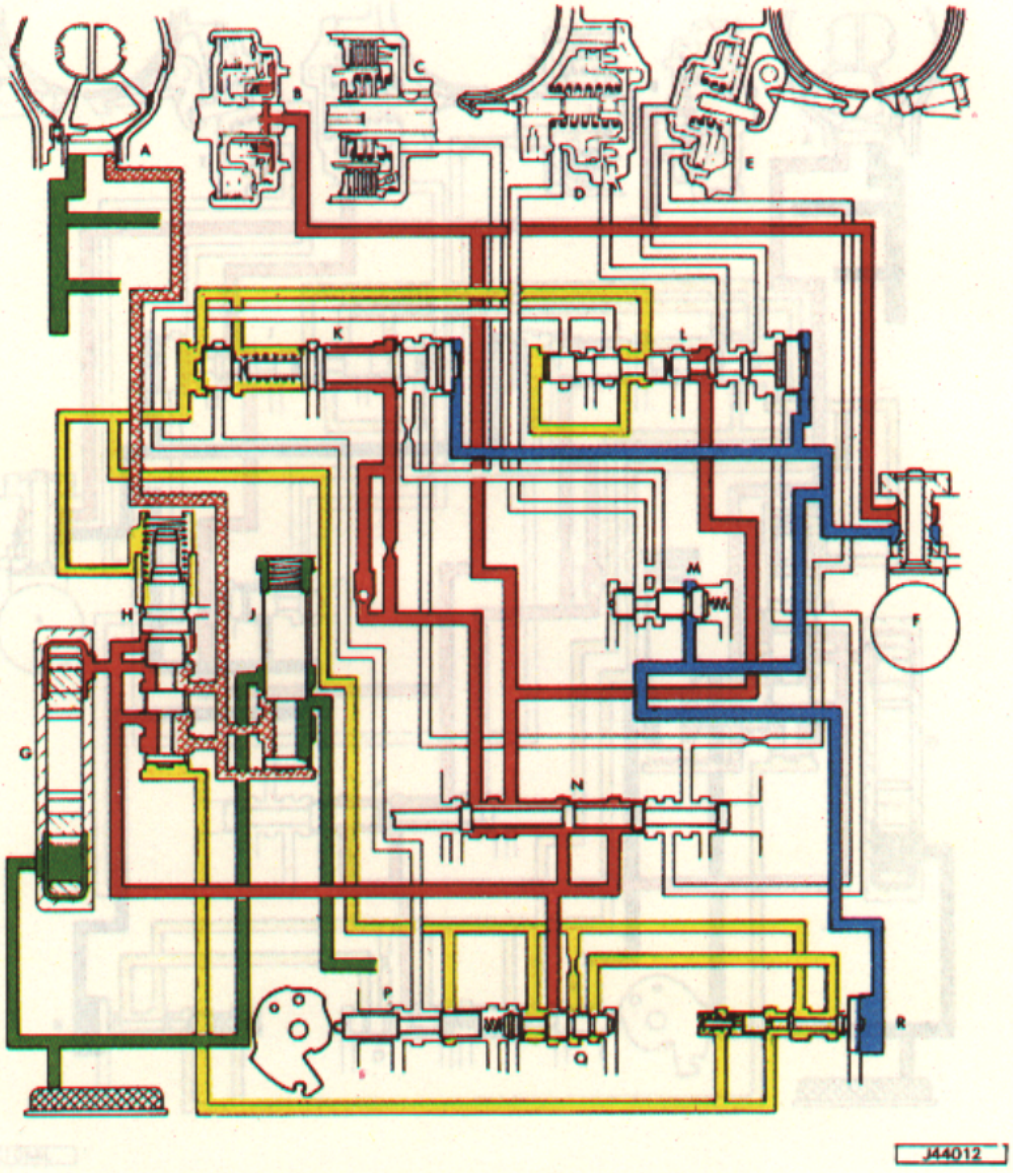

Fig. 12

HYDRAULIC OPERATION IN 'D' (FIRST GEAR)

Throttle pressure is applied to spring end of primary regulator valve. When throttle valve is in full throttle position, modulator valve plug applies regulated line pressure to other end of primary regulator valve thereby controlling shift quality.

Manual valve directs line pressure to apply front clutch thereby enabling vehicle to move off in first gear.

Manual valve also directs line pressure to governor feed and to 1–2, 2–3 shift valves for subsequent upwards gear-shifts.

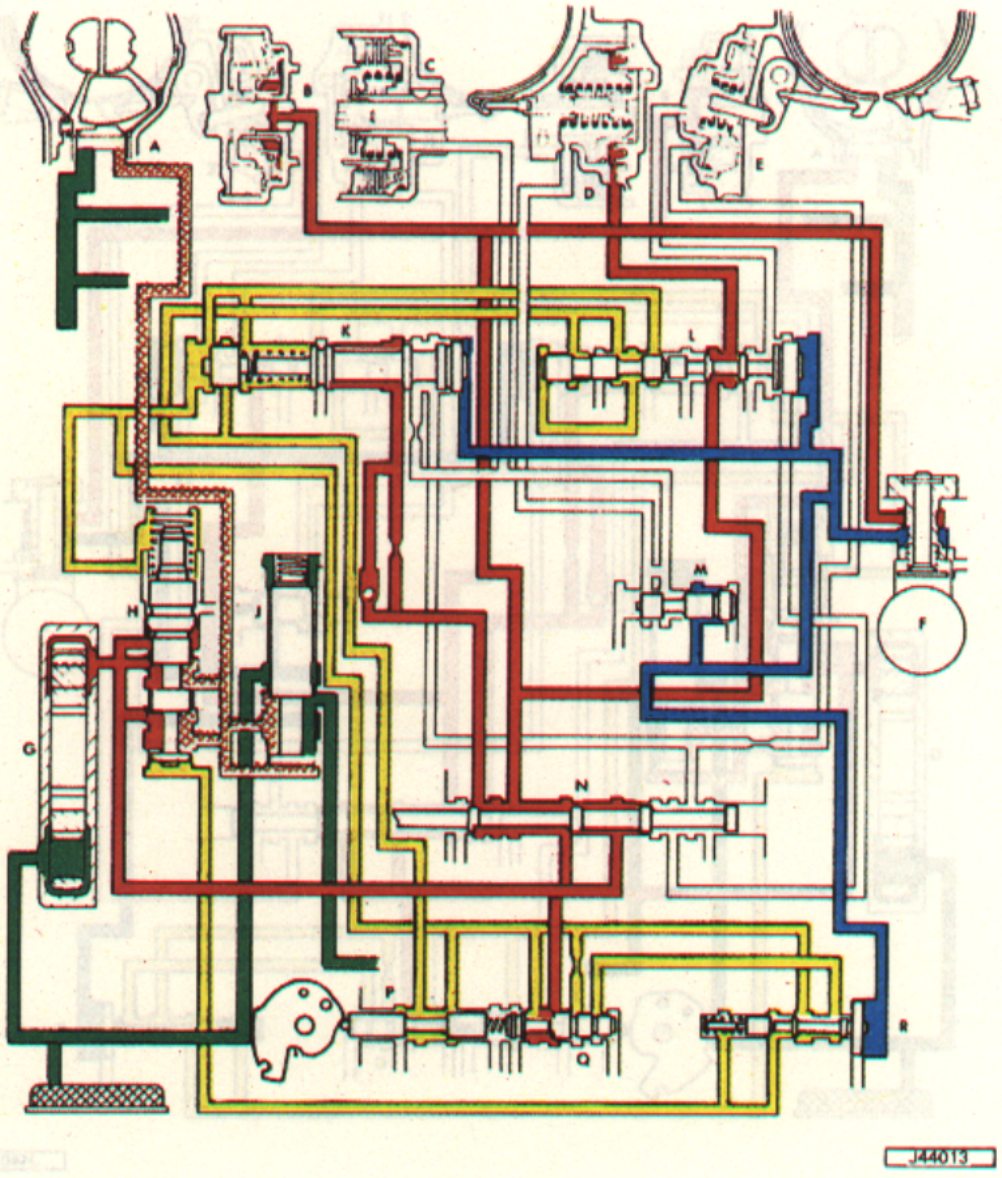

Fig. 13

HYDRAULIC OPERATION IN 'D' (SECOND GEAR—Fig. 13)

Pressure control by primary regulator valve functions as described in 'D' (First gear).

When governor pressure exceeds throttle pressure, 1–2 shift valve moves and directs line pressure to front servo which applies front brake band. Front clutch being applied, transmission operates in second gear.

When down-shift valve is in forced throttle (kick-down) position, forced throttle pressure acts upon 1–2 and 2–3 shift valves thereby delaying up-shifts or, if governor pressure is low, causes a 2–1 down-shift.

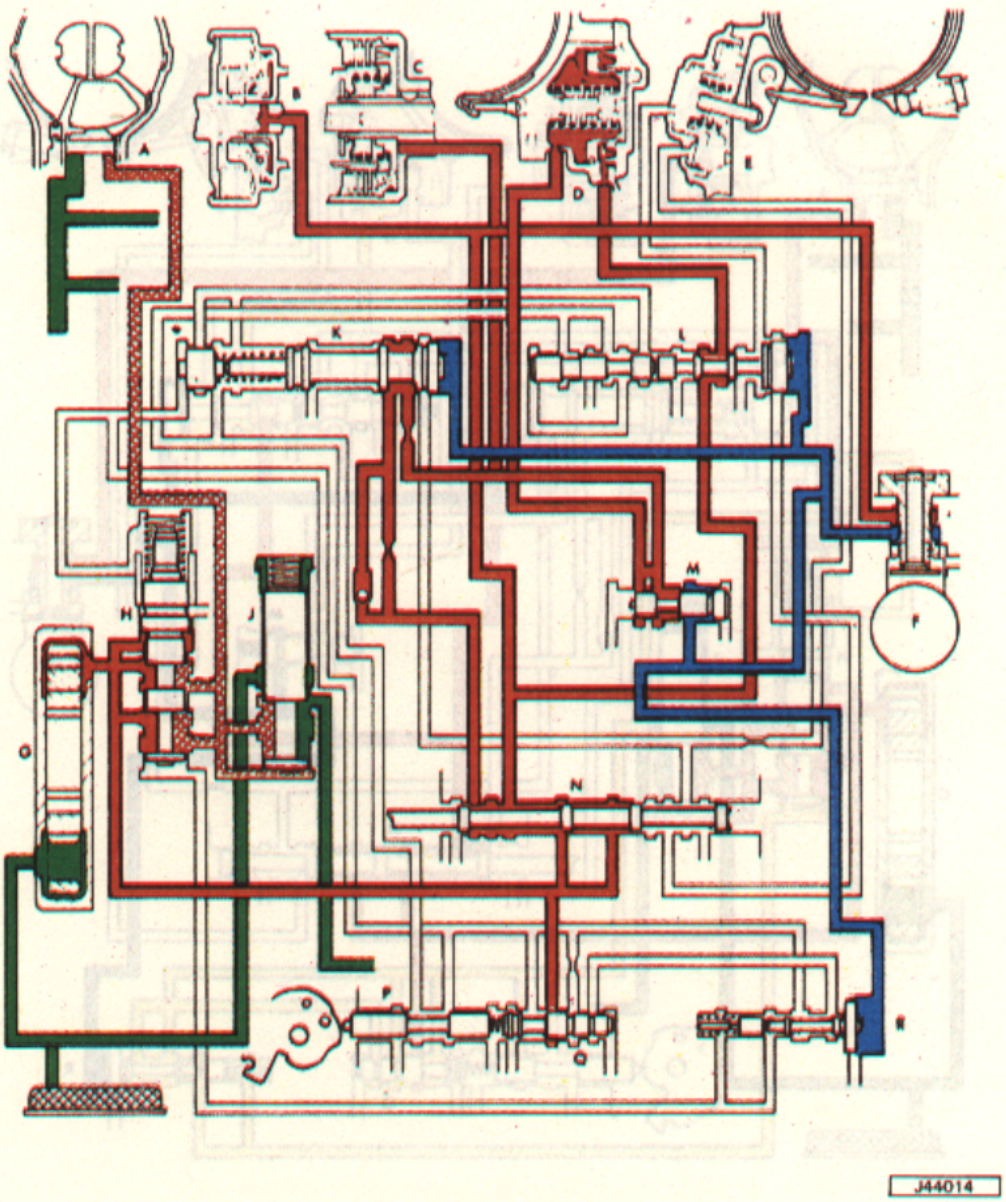

Fig. 14

HYDRAULIC OPERATION IN 'D' (THIRD GEAR—Fig. 14)

Pressure control by primary regulator valve functions as described in 'D' (First gear).

2–3 shift occurs early at light throttle or late at full throttle depending upon balance between governor and throttle pressure.

When governor pressure exceeds throttle pressure, 2–3 shift valve directs line pressure to rear clutch and also to 'release' side of front servo via servo orifice control valve.

The timed relationship between rear clutch 'apply' and front servo 'release' is dependent on governor pressure which in turn is controlled by road speed. A high governor pressure closes servo orifice control valve so directing front servo 'release' fluid through a restrictor thereby delaying front servo 'release' in relation to rear clutch 'apply'.

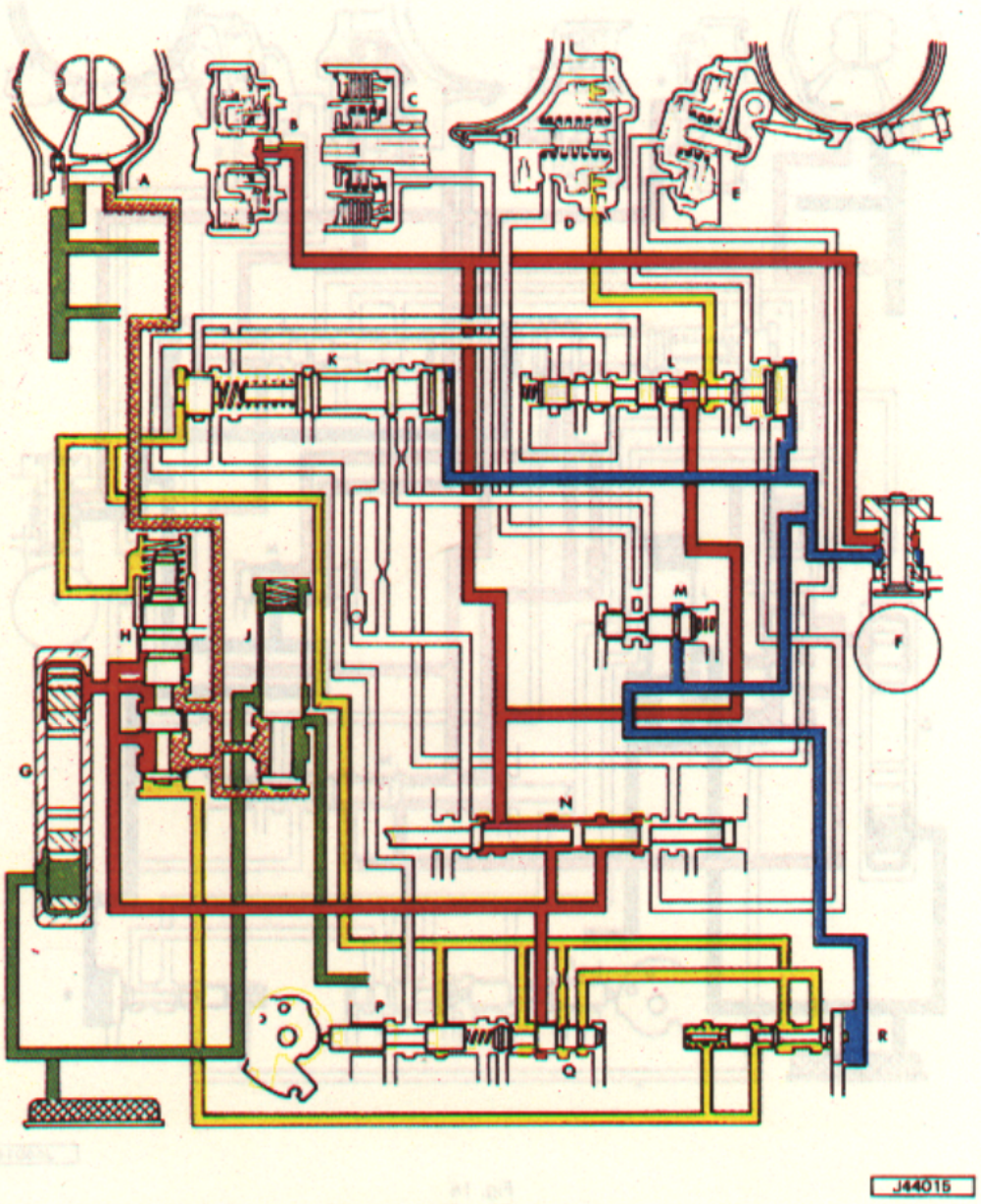

Fig. 15

HYDRAULIC OPERATION IN '2' (LOW GEAR)—Fig. 15

Pressure control by primary regulator valve functions as described in 'D' (First gear).
Front clutch is applied but as engine speed is low, governor pressure causes 1–2 shift valve to remain closed thereby blocking feed from modulator valve.

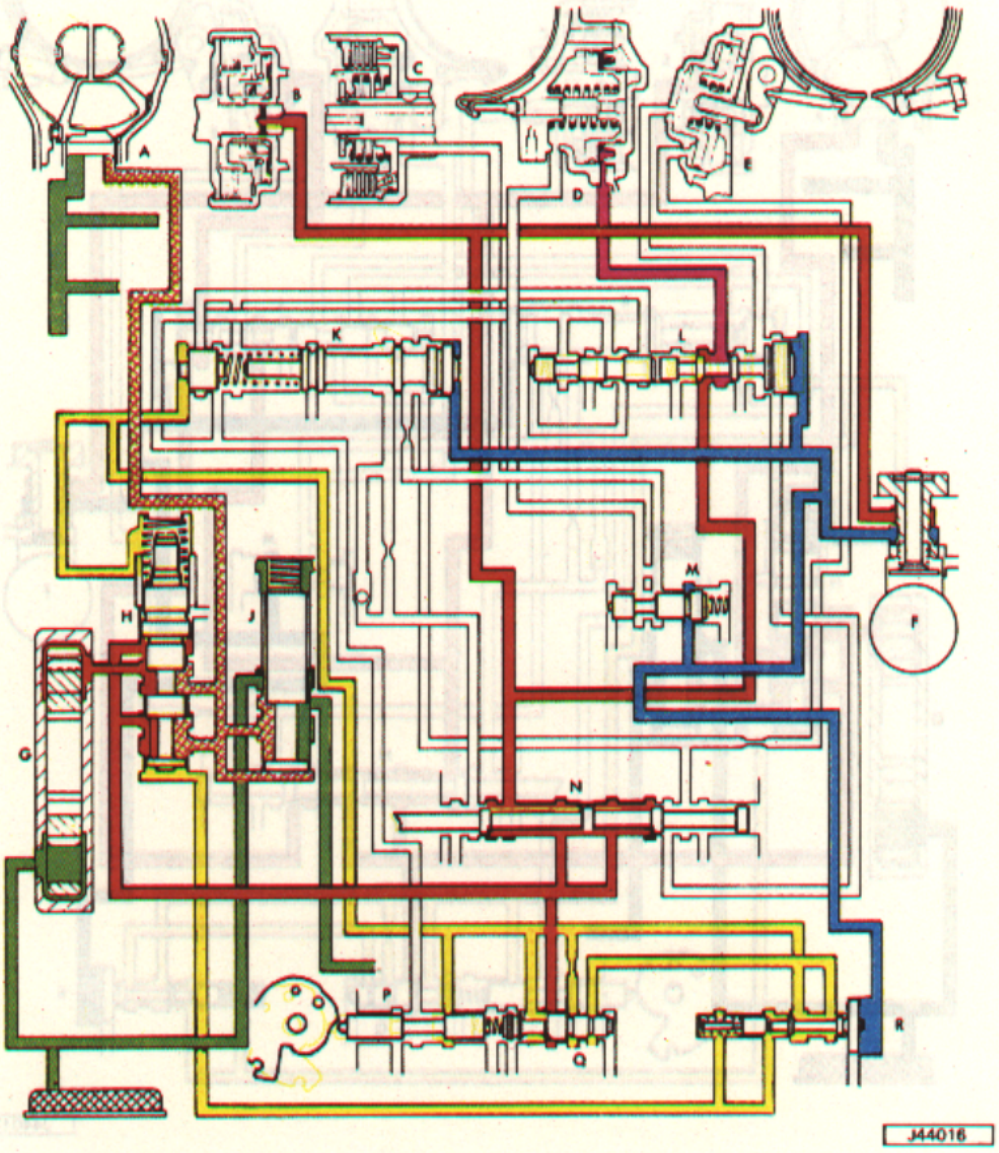

Fig. 16

HYDRAULIC OPERATION IN '2' (SECOND GEAR)—Fig. 16

Front clutch is still applied and as engine speed increases, governor pressure rises and moves 1–2 shift valve. This allows pressure from manual valve to front servo 'apply'.

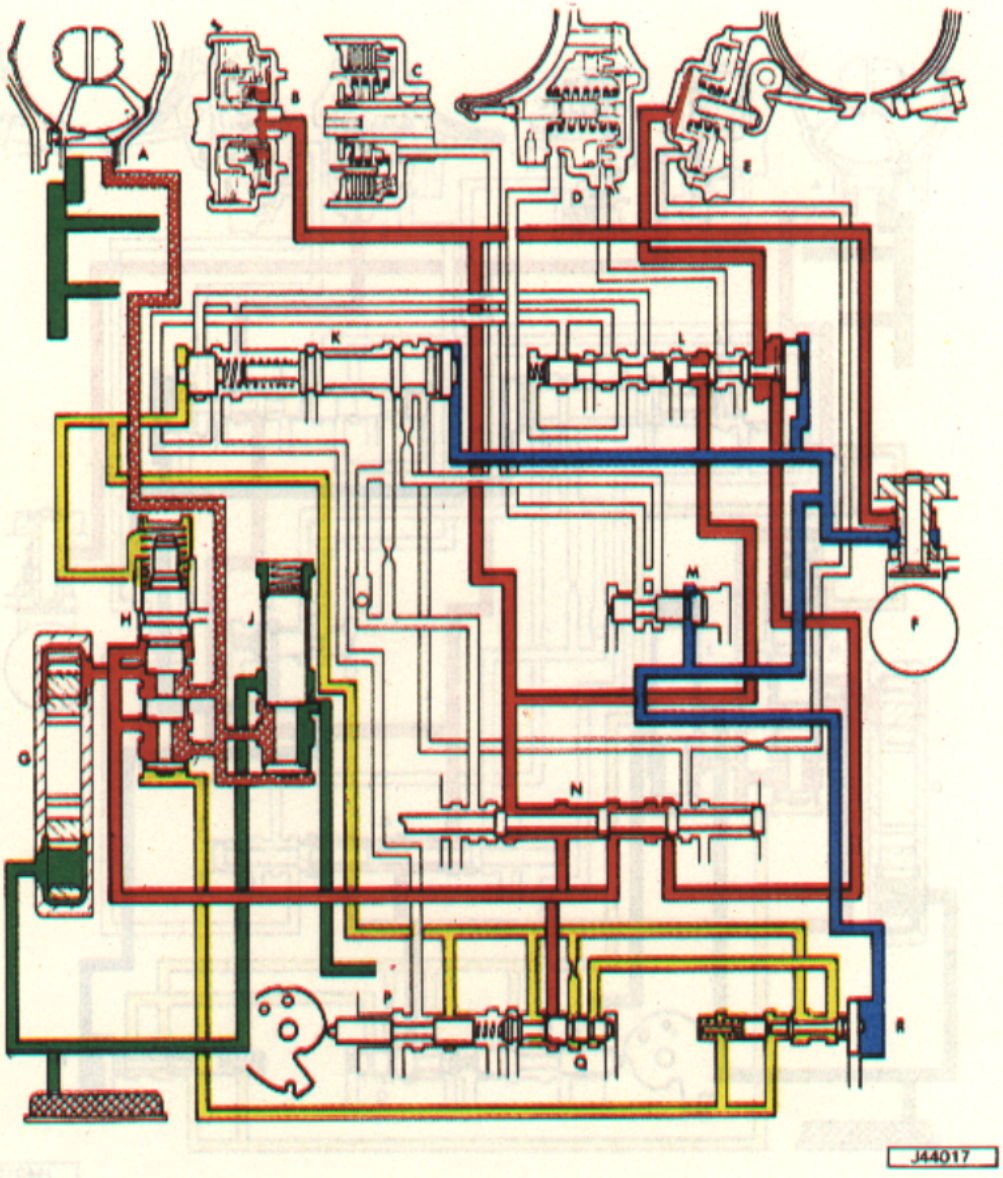

Fig. 17

HYDRAULIC OPERATION IN '1' (LOW GEAR)—Fig. 17

Pressure control by primary regulator valve functions as described in 'D' (First gear).
Manual valve directs line pressure to front clutch governor feed and 1–2 shift valve.
Pressure is also directed to enlarged end of 1–2 shift valve so opposing governor pressure and hydraulically locking the valve. Rear servo is also applied and no up-shift can occur.

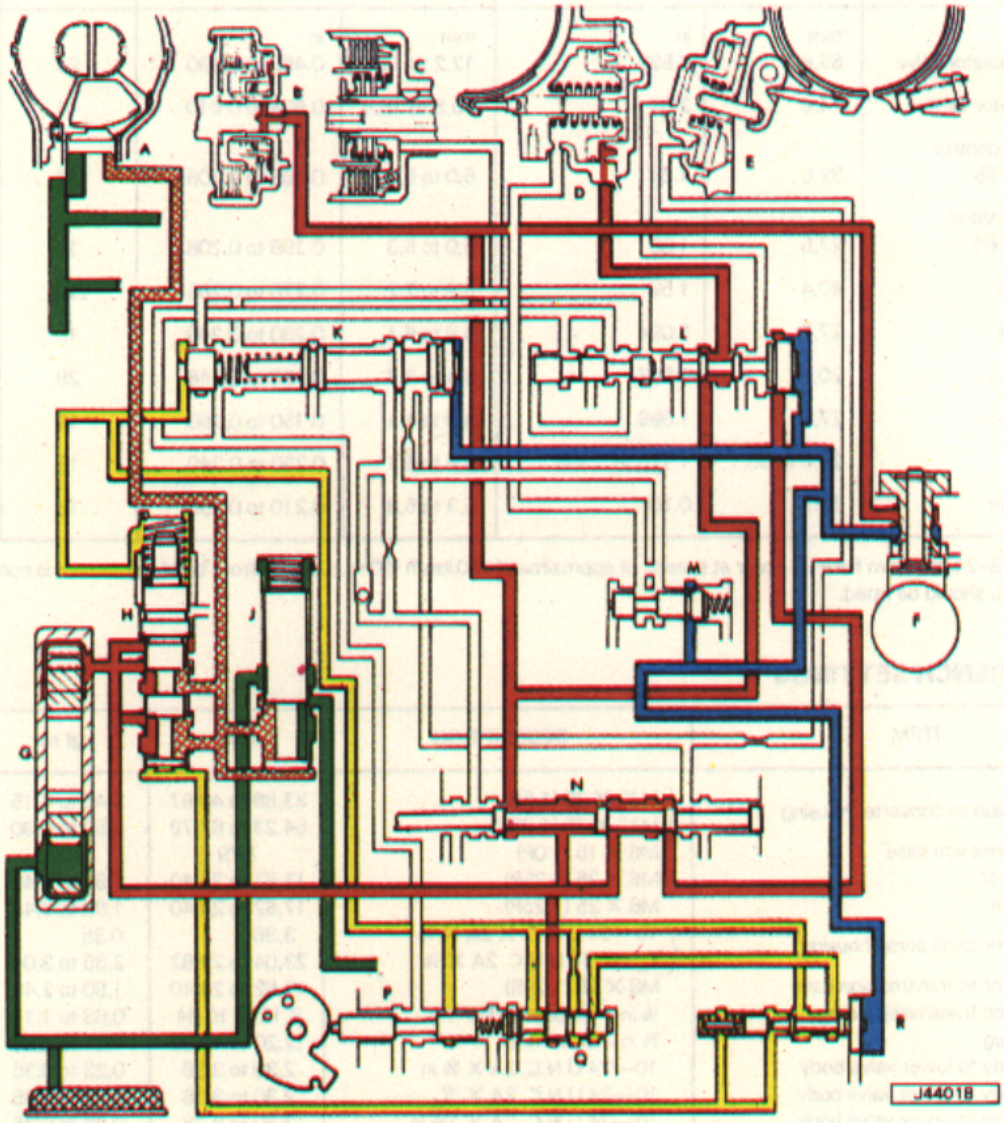

Fig. 18

HYDRAULIC OPERATION IN '1' (SECOND GEAR)—Fig. 18

When selector lever is moved to position '1' at speed, front servo is released and a down-shift from high to intermediate gear occurs. A further down-shift to low gear occurs when vehicle speed falls sufficiently.

Refitting

Position fulcrum bracket against final drive unit and locate loosely with two setscrews.
Replace shims (3, Fig. 23) between bracket and final drive unit.
Tighten mounting setscrews to correct torque and wire lock.
Replace spacer tube between lugs of fulcrum bracket.
Clean, inspect and grease wishbone bearings, thrust washer etc. Refit with new oil seals.
Offer up wishbone to fulcrum bracket lugs and locate with dummy shafts (1, Fig. 24) tool number JD 14. Take great care not to displace any components during this operation.

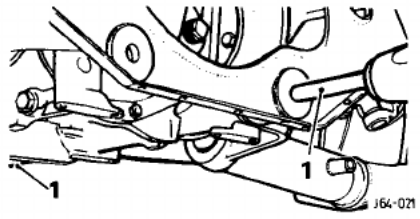

Fig. 24

Drift dummy shafts from fulcrum bracket with fulcrum shaft.
Restrain dummy shafts to prevent spacers or thrust washers dropping out of position.
Tighten fulcrum shaft nut to correct torque.
Remove wire suspending hub assembly from cross-beam.
Replace damper lower mounting shaft, refitting spacer and tie-down bracket.
Tighten nuts to correct torque.
Clean spigot on body, raise radius arm and replace bolt. Tighten to correct torque and wire-lock bolt.
Bolt anti-roll bar link to radius arm and tighten.
Replace bottom tie-plate and tighten bolts and setscrews to correct torque.
Replace road wheel.
Remove car from stands.

RADIUS ARM

Remove and refit **64.35.28**

Removing

Jack up rear of car and support on stands forward of radius arm anchor points.
Remove rear road wheel.
Remove special bolt and spring washer (1, Fig. 25) securing safety strap to body.

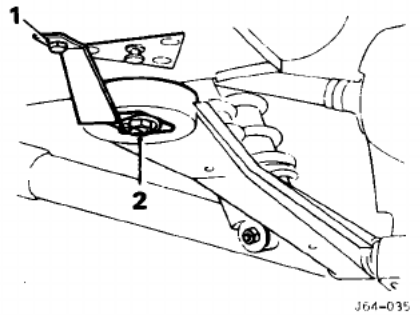

Fig. 25

Remove locking wire and bolt (2, Fig. 25) securing radius arm to body; remove safety strap.
Remove self-locking nut and flat washer (1, Fig. 26) securing forward damper assembly lower mounting pin.

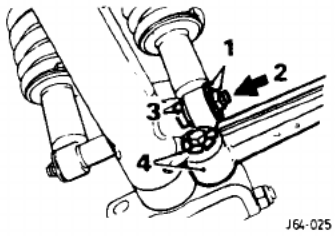

Fig. 26

Drift mounting pin to rear of wishbone clearing damper assembly mounting boss and spacer (2, Fig. 26).
Recover spacer (3, Fig. 26) and swing damper assembly to centre line of car.
Turn down tab washer and remove bolt (4, Fig. 26) securing radius arm to wishbone; remove radius arm.
Examine radius arm bushes and replace as necessary.

Refitting

NOTE: Prior to fitting radius arm to body spigot, wire brush spigot and smear with waterproof grease.

Reverse removal operations, tightening bolts and nuts to correct torque figures.
Renew locking wire and tab washer.

RADIUS ARM BUSHES

Remove and refit **64.35.29**

Service tool: **Mandrel JD 21**

Removing — See Fig. 27

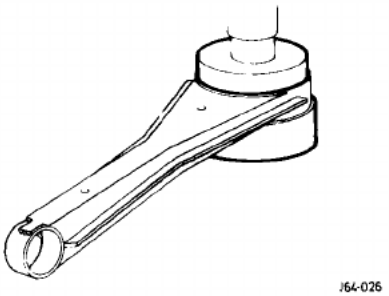

Fig. 27

Remove radius arm.
Use mandrel tool JD 21 and press front bush from housing.
Use mandrel tool JD 21 and press rear bush from housing.

Refitting

Press new bush into rear bush housing so that bush is central in radius arm.
Use mandrel and press new bush into front bush housing so that holes in bush rubber are in line with centre line of radius arm.
Press bush into radius arm until bush ring is flush with bush housing. When pressing bush, have small hole in bush core upwards.
Refit radius arm.

REAR HUB WHEEL STUDS

Remove and refit **64.15.26**

Removing

Remove rear hub and carrier assembly.
Support hub carrier and press out hub using hand press (1, Fig. 28) and suitable mandrel.

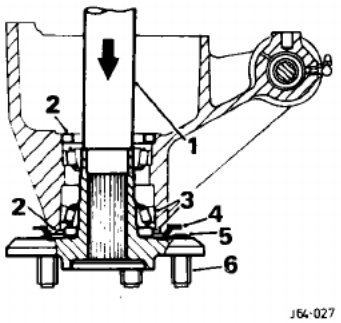

Fig. 28

Prise old oil seal (2, Fig. 28) from hub.
Draw outer bearing and oil seal track (3, Fig. 28) from hub.
Using a narrow, sharp cold chisel, open peening securing water thrower.
Remove thrower (4, Fig. 28).
Support hub, and file or grind staking from faulty stud/s (5, Fig. 28).
Unscrew stud/s (6, Fig. 28/1, Fig. 29) from hub flange.

Refitting

Screw new stud/s into hub and stake in four places to back of flange (2, Fig. 29).

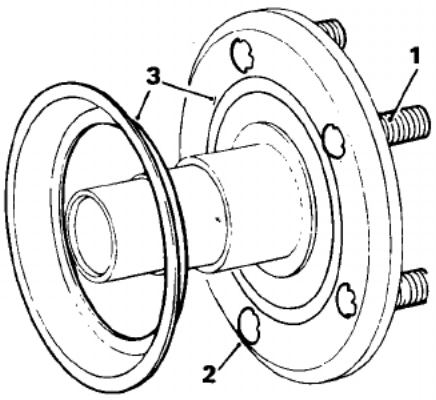

Fig. 29

continued

Fit water thrower to hub and use blunt cold chisel to peen over flange in three or four places (3, Fig. 29).
Press oil seal track and outer bearing race on to hub.
Press new outer and inner oil seals into hub.
Fit hub into hub carrier and pack with suitable grease.
Locate inner bearing over hub and press into position.
Refit rear hub and carrier assembly.

REAR SUSPENSION UNIT

Overhaul **64.25.06**

The rear suspension unit is an assembly comprising individual units, the removal, refitting and overhaul of each being covered elsewhere in this Manual.
For this reason, an overhaul procedure is not given for the rear suspension unit assembly, although it is advisable to check all bushes, fulcrum bearings and oil seals for damage or leakage whenever the unit is removed from the car.

REAR HUB AND CARRIER ASSEMBLY

Overhaul **64.15.07**

Including WISHBONE OUTER FULCRUM BEARINGS—Remove and refit 64.35.16 and REAR HUB OIL SEALS—Remove and refit 64.15.15.

Service tools: Master spacer JD 15. Dummy shaft JD 14. Press tool JD 16C. Hand press 47. Press tool JD 20A. Tool JD 20A-1. Adaptor JD 16C-1.

Dismantling

Remove rear hub and carrier assembly.
Prise out oil seal retainers (1, Fig. 30) from fulcrum shaft housing and remove seals, dummy shaft, bearings, distance tubes and shims (2, Fig. 30).

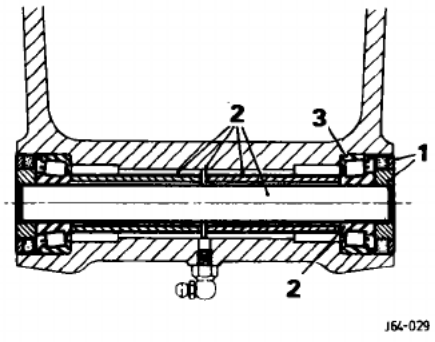

Fig. 30

Mount hub carrier in vice and drift out bearing cups (3, Fig. 30) from fulcrum shaft housing.
Transfer hub carrier to press and remove hub assembly from carrier.
Drift out inner hub bearing cup, with seal and bearing, from hub carrier.
Drift out outer bearing cup.
Fit hand press 47 with adaptors JD 16C-1 to hub and pull outer bearing from hub.
Remove oil seal track from hub shaft and clean and inspect all parts.

NOTE: When inspecting components, pay particular attention to oil seal tracks; a minute score can considerably shorten oil seal life. For further details on inspection of seals and bearings refer to 'General Fitting Instructions'.

Reassembling

Replace outer oil seal track (1, Fig. 31) on hub shaft.
Press outer bearing cone (2, Fig. 31) into position on hub shaft and grease bearing with 70 cc of Retinax 'A'.

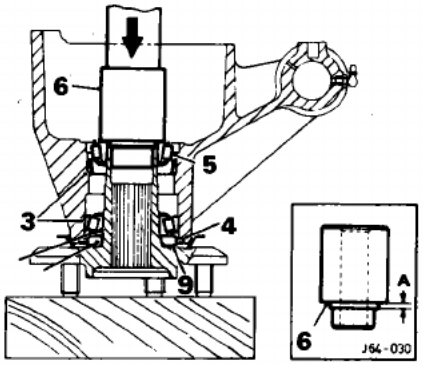

Fig. 31

Press outer and inner cups of bearings (3, Fig. 31) into hub carrier, using tool JD 20A with adaptor JD 20A-1.
Drift new outer oil seal (4, Fig. 31) into position in hub carrier and lower carrier on to hub shaft and outer bearing.
Place inner bearing (5, Fig. 31) into position for fitting.
Place master spacer JD 15 (6, Fig. 31) in position as shown and press bearing on to hub shaft.
Transfer hub and carrier assembly to vice, set up dial gauge (1, Fig. 32) and spacer (2, Fig. 32) JD 15 as shown and measure end-float, lifting carrier by using two screwdrivers (3, Fig. 32) as levers.

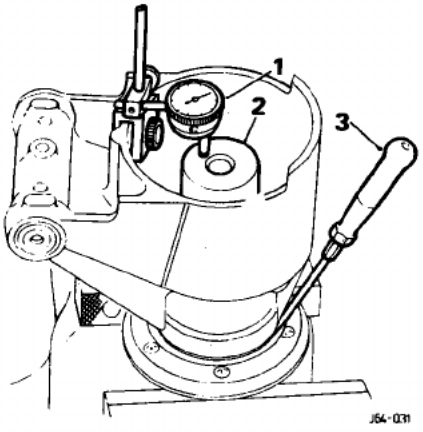

Fig. 32

Select spacer to be fitted on drive shaft.

NOTE: Master spacer has a diameter of length 'A' equivalent to a spacer of 3,81 mm (0.15 in). Calculate the spacer required to give end-float of 0,025 to 0,076 mm (0.001 to 0.003 in).
Spacers are supplied in thicknesses of 2,77 to 3,84 mm (0.109 to 0.151 in) in steps of 0,076 mm (0.003 in) and are lettered A to R (less letters I, N and O).

SPACER LETTER	THICKNESS mm	inches
A	2,77	0.109
B	2,85	0.112
C	2,92	0.115
D	3,00	0.118
E	3,07	0.121
F	3,15	0,124
G	3,23	0.127
H	3,30	0,130
J	3,38	0.133
K	3,45	0.136
L	3,53	0.139
M	3,61	0.142
P	3,68	0.145
Q	3,76	0.148
R	3,84	0.151

For example, assume end-float to be 0,66 mm (0.026 in). Subtract required nominal end-float of 0,050 mm (0.002 in) from measured end-float giving 0,61 mm (0.024 in). Since special collar is 3,81 mm (0.150 in) thick, the thickness of the spacer to be fitted will be 3,8 mm −0,61 mm, i.e. 3,20 mm (0.126 in). The nearest spacer is 3,23 mm (0.127 in) so letter G spacer should be fitted in place of special collar.
Remove adaptor and fit new inner bearing oil seal to hub carrier.
Fit fulcrum shaft bearing cups to hub carrier and insert one bearing.
Secure fulcrum shaft vertically in suitably protected jaws of vice and slide bearing in hub carrier over shaft.
Replace distance tubes and shims as removed in dismantling, adding 0,25 mm (0.010 in) extra shims. (One extra 0,076 mm (0.003 in) shim and one extra 0,178 mm (0.007 in) shim.
Fit second bearing over fulcrum shaft, remove hub assembly from vice and replace oil seal tracks outside bearings.
Place a large washer (1, Fig. 33) (e.g. inner fork thrust washer) next to one oil seal track.

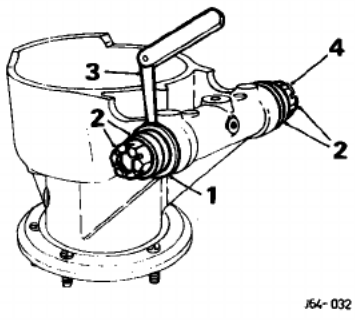

Fig. 33

Cover exposed plain length of fulcrum shaft with suitable temporary spacers, (2, Fig. 33) fit nuts and tighten to correct torque.

Apply pressure to fulcrum shaft at large washer end, turning it to settle taper rollers and using feeler gauge (3, Fig. 33) measure minimum distance between large washer and hub carrier.

Apply pressure to opposite end of fulcrum shaft (4, Fig. 33) and measure maximum distance between washer and hub carrier.

NOTE: End play of fulcrum shaft in hub carrier is now obtained by subtracting the minimum measurement from the maximum measurement.

This end play must be replaced by a pre-load of 0,05 mm (0.002 in) by removing shims, to a total thickness of 0,05 mm (0.002 in) more than the end play, from between spacer tubes:

For example;

Assume end play found to be 0,25 mm (0.010 in).

Therefore shims to the value of 0,25 + 0,05 mm = 0,30 mm (0.010 + 0.002 in = 0.012 in) must be removed to give correct pre-load.

Release nut from large washer end of fulcrum shaft and detach spacers, washer, oil seal track and bearing.

Remove one spacer tube and extract shims to thickness established to give pre-load. Replace spacer tube, pack fulcrum shaft housing with grease and replace bearing and oil seal track.

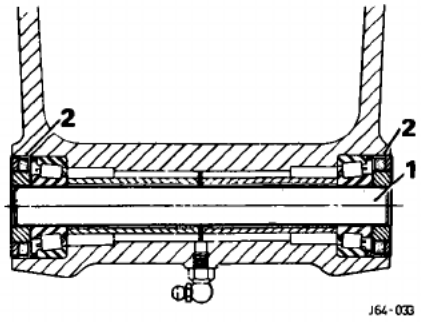

Fig. 34

Push out fulcrum shaft by inserting dummy shaft (1, Fig. 34) and detach temporary spacers from fulcrum shaft. Check that oil seal tracks are in position.

Press new oil seals (2, Fig. 34) into fulcrum shaft housings and secure with oil seal retainers.

Replace rear hub and carrier assembly, see operation 64.15.01.

REAR SUSPENSION MOUNTINGS

Inspect **64.25.00**

Drive the vehicle on to a ramp and position a ramp jack under the jacking point, in front of the rear radius arm body mounting.

Raise the ramp sufficiently to allow either the rear wheel to clear the ramp, or until the distance between the lower edge of the rear quarter valance and the ramp is 34 cm (13.5 in). **DO NOT** exceed this distance.

Visually inspect the condition of the rubber, and the rubber/metal bonding.

If the rubber shows signs of cracking, or there is unbonding of the rubber to a depth greater than 3,175 mm (0.125 in), then the mounting must be replaced.

If a visual inspection is not conclusive, insert a lever between the two 'V's of the mounting and apply pressure.

Check the rubber for cracking and the rubber/metal bonding.

Repeat the procedure for the other side.

DAMPER SAFETY 64.30.00

See page 60—10.

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DESCRIPTION

A common servo-assisted brake system is fitted to all Jaguar and Daimler Series III saloon cars. The fluid reservoir is integral with the master cylinder and is divided into two compartments, one supplying the front brakes and the other the rear brakes.

The two pipes from the master cylinder lead to each side of a Pressure Differential Warning Actuator (P.D.W.A.) in which a free piston, normally centrally located, is deflected to one side or the other if the pressure in one pipe differs from that in the second pipe.

In moving, the piston operates a switch which then completes the circuit to a warning light on the instument panel.

This warning light must also illuminate when the ignition switch is in position 3 (Start), to provide a check that the warning circuit is operating satisfactorily.

Failure to do so indicates a bulb or circuit fault. If the light remains on when the ignition switch is returned to position 2 (Ignition), then a brake fault is indicated and the car MUST NOT be driven until the fault is corrected.

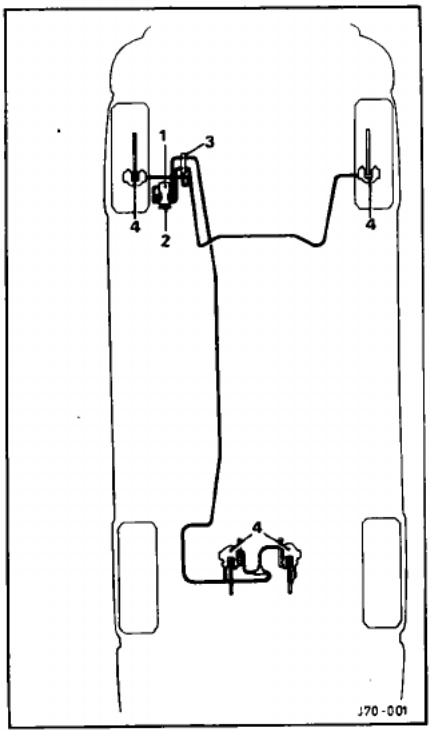


Fig. 1

KEY TO COMPONENT LOCATION

(See Fig. 1)

1. Brake fluid reservoir
2. Master cylinder
3. P.D.W.A. unit
4. Brake calipers

Two further pipes from the P.W.D.A. lead to the two front brakes and a third pipe connects with a T-piece mounted on the rear cross-member; another two pipes connect the T-piece with the two rear calipers, mounted on each side of the final drive unit.

Flexible hoses replace the pipes at each front caliper and a third hose is inserted between the front to rear pipe and the rear cross-beam.

A completely separate handbrake system operates small pads, at the rear discs, mechanically; self-adjusting mechanism maintains the correct clearance between released pads and discs and a manual adjustment is also provided. A switch mounted on the hand control completes a circuit to the handbrake warning lamp when the ignition is switched on and the handbrake is applied. It must extinguish when the handbrake is released or the ignition is switched off.

Operation of brake system (see Fig. 2)

On application of the brake pedal the servo unit, which is directly coupled to the master cylinder, transfers increased pedal pressure to the master cylinder primary piston 'A' causing the piston to move forward past the by-pass port 'P' to establish rear brake line pressure in chamber 'B'. Pressure from the primary cylinder return spring 'C' and rear brake line pressure force the secondary piston 'D' forward past the by-pass port 'P' to establish front brake line pressure in chamber 'E'.

Front and rear braking pressures enter the P.D.W.A. unit at ports 'F' and 'G', act on either end of the shuttle valve 'H' and travel to front and rear calipers via ports 'J' and 'K'. Should a fall in front or rear braking pressure occur the resultant pressure imbalance causes displacement of the shuttle valve, which in turn operates the switch 'L' and illuminates a warning light in the instrument panel. In order to reset the displaced shuttle valve the cause of fall in brake line pressure must first be established and rectified. During bleeding of the brake system which follows rectification the shuttle valve automatically resets, and extinguishes the warning light. Brake pressure entering the caliper 'M' forces the pistons 'T' out to act on the friction pads 'U' which in turn clamp the brake disc 'V'. On release of the brake pedal, brake line pressure collapses which allows the piston seals 'W' to retract the pistons into the caliper. Withdrawal of the pistons into the caliper is just sufficient for the friction pads to be in a relaxed position away from the disc. This sequence provides automatic adjustment for brake pad lining wear.

Should the brake servo unit become inoperative front and rear braking systems will still operate but at a greatly reduced brake line pressure. A divided brake fluid reservoir 'R' ensures that in the event of fluid loss to front or rear brake systems one pair of brake calipers will at all times be operative. The fluid level indicator 'S' provides visual warning to the driver should the level of fluid in the reservoir fall to an unsatisfactory level.

1983 M.Y. SPECIFICATION

Brakes — All Models

The brake system pressure differential warning actuator (P.D.W.A.) unit has been deleted.

NOTE: This deletion in no way affects the performance of the braking system as the conventional split system is retained.

All steel brake pipes on 1983 model year cars will be plastic coated. This will improve the corrosion resistance of the pipe work.

Brake Pad Material Change — All Models

A semi metallic brake pad lining was introduced from:-

VIN 354035

Identification of semi metallic pads is by the friction material code FER 3401 printed on the rear face of the material adjacent to the pad batch number.

Semi metallic pads may be used in vehicle sets as a retrospective fit on Jaguar vehicles with 4 pot caliper front brakes.

WARNING: Under no circumstances should semi metallic and non semi metallic brake pads be mixed.

Brake pads must be used in vehicle sets only.

It is therefore necessary to check lining specification **on the complete vehicle** before replacing brake pads in axle sets to ensure that mixing does not occur.

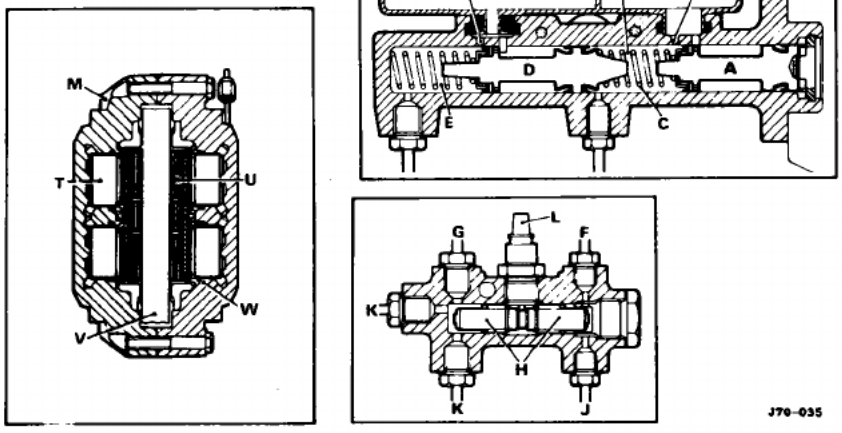


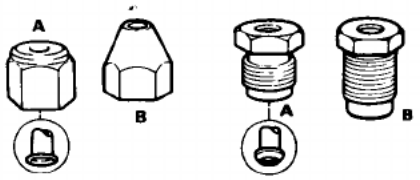
Fig. 2

Metrication

The examples shown in Figs. 3, 4 and 5 are intended as an aid to identification of brake components in metric form.

All metric pipe nuts, hose ends, unions and bleed screws are coloured black. The hexagon area of pipe nuts are indented with the letter 'M'.

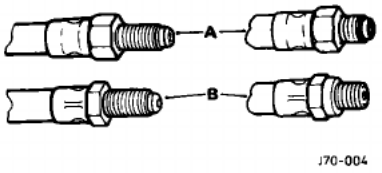
Metric and U.N.F. pipe nuts are different in shape and the female nut is always used with a trumpet flared pipe, the male nut always having a convex flared pipe.



A = Metric B = U.N.F.

Fig. 3

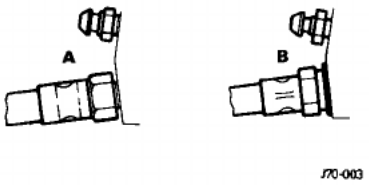
Hose ends differ slightly between metric and U.N.F.



A = Metric B = U.N.F.

Fig. 4

Copper gaskets are not used with metric hose and a gap exists between the hose end and cylinder.



A = Metric B = U.N.F.

Fig. 5

Metrication does not apply to the following brake components.

1. Rear calipers.
2. Handbrake calipers.
3. Feed pipes from rear three-way connector to rear calipers.
4. Three-way connector.

DATA

Front brakes—make and type	Girling, ventilated disc
Rear brakes—make and type	Girling, inboard disc
Handbrake—type	Mechanical, operating on rear discs
Disc diameter—front	283,8 mm (11.175 in)
—rear	263,8 mm (10.385 in)
Disc thickness—front	24,0 mm (0.945 in)
—rear	Normal 12,7 mm (0.5 in)
	Min. permissible 11,43 mm (0.45 in)
Master cylinder bore diameter	23,8 mm (0.937 in)
Hydraulic fluid specification	Castrol Girling Code 1735 (SAE J1703)
Main brake friction pad specification	Ferodo 2430 (slotted)
Handbrake friction pad specification	Mintex M68/1
Servo unit make	Girling

TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Pedal box to body	5/16 in U.N.F. bolt	14,9 to 17,6	1,53 to 1,79	11 to 13
Brake pedal pivot pin	3/8 in U.N.F. nut	19,0 to 24,4	1,94 to 2,48	14 to 18
Brake pedal lever shaft locking pin	1/4 in U.N.C. bolt	2,7 to 3,4	0,28 to 0,34	2 to 2.5
Brake reservoir to bracket	1/4 in U.N.F. nut	2,7 to 3,4	0,28 to 0,34	2 to 2.5
Hydraulic connections for 3/16 in pipes	U.N.F.	8,5 to 9,5	0,87 to 0,96	6.3 to 7
	M 12	16,3 to 19,0	1,66 to 1,94	12 to 14
	M 10 male	9,0 to 11,0	0,93 to 1,10	6.7 to 8
	M 10 female	11,0 to 13,5	1,10 to 1,38	8 to 10
Rear 3-way connection	1/4 in U.N.F. nut	8,1 to 9,5	0,83 to 0,96	6 to 7
Front and rear hoses to bracket	M 10 nut	13,6 to 16,3	1,40 to 1,65	10 to 12
Handbrake cable locknut	1/16 in X 16 U.N.F. nut	9,5 to 13,6	0,97 to 1,38	7 to 10
Handbrake switch locknut	1/4 in U.N.F. nut	4,7 to 6,1	0,48 to 0,62	3.5 to 4.5
Handbrake to body	1/4 in U.N.F. bolt	8,1 to 9,5	0,83 to 0,96	6 to 7
Relay lever pivot	3/8 in U.N.F. bolt	29,8 to 35,2	3,05 to 3,59	22 to 26
Fork end assembly	1/4 in U.N.F. nut	8,1 to 9,5	0,83 to 0,96	6 to 7
Cable guide	No. 10 U.N.F. bolt	5,4 to 6,1	0,48 to 0,62	4 to 4.5
Abutment to body	1/4 in U.N.F. bolt	8,1 to 9,5	0,83 to 0,96	6 to 7
Master cylinder to booster	M 10 nut	21,1 to 26,5	2,14 to 2,70	15.5 to 19.5
Booster to pedal box	M 8 nut	11,0 to 13,5	1,10 to 1,38	8 to 10
P.D.W.A. to body	1/4 in U.N.F. nut	8,1 to 9,5	0,83 to 0,96	6 to 7
Front double-end union to body	M 10 nut	13,6 to 16,3	1,40 to 1,65	10 to 12
Brake light switch to bracket	1/4 in U.N.F. bolt	4,7 to 6,1	0,48 to 0,62	3.5 to 4.5
Rear cable to relay lever	1/4 in U.N.F. nut	8,1 to 9.5	0,83 to 0,96	6 to 7
Brake cable support plate to body	No. 10 U.N.F. bolt	5,4 to 6,1	0,56 to 0,62	4 to 4.5
Cable guide to plate	No. 10 U.N.F. bolt	5,4 to 6,1	0,56 to 0,62	4 to 4.5
Front caliper to stub axle carrier	M 12 bolt	67,8 to 81,3	6,91 to 8,29	50 to 60
Disc shield and clamp to stub axle carrier	1/4 in U.N.F. nut	6,1 to 7,5	0,62 to 0,76	4.5 to 5.0
Rear caliper to drive unit flange	7/16 U.N.F. bolt	66,4 to 74,5	6,78 to 7,60	49 to 55
Wheels nuts	Special nuts—set spanner to	61	6,23	45

CLEANING SOLVENTS

WARNING: Never use methylated spirit (denatured alcohol) for cleaning purposes. Use only Castrol/Girling brake cleaning fluid.

Throughout the following operations absolute cleanliness must be observed to prevent grit or other foreign matter contaminating the brake system. If the system is to be flushed or cleaned through, only Girling brake cleaner must be used. Brake system components must be washed and all traces of cleaner removed before reassembly.

All brake system rubber components must be dipped in clean brake fluid and assembled using the fingers only.

BRAKE FLUID

WARNING: During operations which necessitate the handling of brake fluid, extreme care must be observed; brake fluid must not be allowed to contact the car paintwork. In instances where this has occurred the contaminated area must immediately be cleaned, using a clean cloth and white spirit. This should be followed by washing the area with clean water. Methylated spirit (denatured alcohol) must not be used to clean the contaminated area.

SYMPTOM AND DIAGNOSIS CHART FOR HYDRAULIC BRAKE SYSTEM

SYMPTOM	DIAGNOSIS	ACTION
Fade	Incorrect pads. Overloaded vehicle. Excessive braking. Old hydraulic fluid.	Replace the pads, decrease vehicle load or renew hydraulic fluid as necessary.
Spongy pedal	Air in system. Badly lined pads. Weak master cylinder mounting.	Check for air in the system, and bleed if necessary. Check the master cylinder mounting, pads and discs and replace as necessary.
Long pedal	Discs running out pushing pads back. Distorted damping shims. Misplaced dust covers.	Check that the disc run out does not exceed 0.004 in. (0,101 mm). Rotate the disc on the hub. Check the disc/hub mounting faces.
Brakes binding	Handbrake incorrectly adjusted. Seals swollen. Seized pistons. Servo faulty.	Check and adjust handbrake linkage. Check for seized pistons. Repair or replace as necessary. Refer to servo chart.
Hard pedal—poor braking	Incorrect pads. Glazed pads. Pads wet, greasy or not bedded correctly. Servo unit inoperative. Seized caliper pistons. Worn shock absorbers causing wheel bounce.	Replace the pads or if glazed, lightly rub down with rough sandpaper. Refer to Servo chart, if servo is faulty. Check caliper for damage and repair as necessary. Fit new shock absorbers.
Brakes pulling	Seized pistons. Variation in pads. Unsuitable tyres or pressures. Worn shock absorbers. Loose brakes. Greasy pads. Faulty discs, suspension or steering.	Check tyre pressures, seized pistons, greasy pads or loose brakes; then check suspension, steering and repair or replace as necessary. Fit new shock absorbers.
Fall in fluid level	Worn disc pads. External leak. Leak in servo unit.	Check the pads for wear and for hydraulic fluid leakage. Refer to Servo chart.
Disc brake squeal—pad rattle	Worn retaining pins. Worn discs. Worn pads. Broken anti-chatter spring.	Renew the retaining pins, or discs. Fit new pads, or anti-chatter spring.
Uneven or excessive pad wear	Disc corroded. Disc badly scored. Incorrect friction pads.	Check the disc for corrosion, or scoring and replace if necessary. Fit new pads with correct friction material.
Brake warning light illuminated	Fluid level low, combination valve or P.D.W.A. unit operated. Short in electrical warning circuit.	Top up reservoir. Check for leaks in system and pads for wear. Check electrical circuit.

BRAKE SYSTEM

Bleed—all round 70.25.02

Bleeding the brake system is not a routine maintenance operation and should only be necessary when air has contaminated the fluid or a part of the system has been disconnected.

Bleeding

Ensure fluid reservoir is topped up with fluid of correct specification.
Attach bleeder tube to left-hand rear bleed screw, immerse open end of tube in small jar partially filled with clean brake fluid.
Position gear selector in neutral and run engine at idling speed.
Slacken left-hand rear bleed screw.
Operate brake pedal through full stroke until fluid issuing from tube is free of air bubbles.

NOTE: The fluid level in reservoir must be checked at regular intervals and topped up as necessary.

Keep pedal fully depressed and close bleed screw.
Repeat above operations on right-hand rear brake.
Continue above operations on remaining front brakes.
Check tightness of all bleed screws and fit protective caps.
Top up reservoir as necessary.

CAUTION: Brake fluid emitted from system during above check must NOT be put back into system.

Apply normal working load to brake pedal for several minutes, if pedal moves or feels spongy further bleeding of system is required.
When pedal 'feel' is satisfactory release handbrake; brake warning light should extinguish. If warning light remains illuminated carry out the following operation:
Operate brake pedal applying heavy pedal pressure, warning light should extinguish; if light remains illuminated carry out P.D.W.A. check operation, see operation 70.25.08.

BRAKE SYSTEM

Drain and flush 70.25.17

Service tool: Brake piston retractor tool 64932392

Draining

Slacken all road wheel nuts.
Jack up front of car and place on stands.
Jack up rear of car and place on stands.
Remove all road wheels.
Attach bleeder tube to rear left-hand caliper bleed screw with open end of tube in suitable container.
Slacken bleed screw.
Operate brake pedal slowly through full stroke, until 'rear' brake section of fluid reservoir is drained and fluid ceases to issue from bleed tube.
Remove rear left-hand caliper friction pads, see operation 70.40.03.

WARNING: Do not operate brake pedal while friction pads are removed.

Using special tool 64932392, lever pistons into bores expelling remaining trapped fluid into container.
Replace friction pads.

NOTE: It is not necessary to replace retaining pins and clips at this time.

Close bleed screw.
Discard expelled fluid.
Repeat draining operations on right-hand rear and front calipers.

Flushing

Fill fluid reservoir with Castrol/Girling brake flushing fluid.
Attach bleeder tube to rear left-hand caliper bleed screw with open end of tube in container.
Slacken bleed screw.
Operate brake pedal slowly through full stroke, until clear flushing fluid issues from tube.

NOTE: The fluid level in the reservoir must be checked at regular intervals and topped up as necessary.

Closed bleed screw and operate pedal two or three times.
Repeat above bleed operations on remaining rear and front calipers.
Carry out draining operations on rear brake calipers.
Secure rear friction pads with retaining pins and clips. Repeat draining operations on front brake calipers.
Secure front friction pads with retaining pins, clips and anti-chatter springs.
Close bleed screws on front and rear calipers.
Discard expelled flushing fluid.

Refilling

Fill brake reservoir with new brake fluid of correct specification.
Bleed brakes see 70.25.02.

NOTE: Prior to closing bleed screw during the bleeding of each caliper, check that issuing brake fluid is completely free of flushing fluid.

Refit road wheels to car.
Remove stands.

PRESSURE DIFFERENTIAL WARNING ACTUATOR

Test **70.25.14**

NOTE: Overhaul of the P.D.W.A. Unit is not possible, and the following test should be carried out at intervals detailed in the Maintenance Summary.

Operational check

Ensure car is adequately chocked.
Check brake fluid level and top-up if necessary.
On cars with automatic transmission ensure gear selector lever is in 'N' neutral or 'P' (Park).
Check that with ignition on and handbrake applied 'Park Brake Warning' light is illuminated.
Run engine at idle speed and release handbrake.
Apply heavy foot pressure to brake pedal.

NOTE: The brake pedal should be fully depressed and kept fully applied throughout the following operations.

Release any brake caliper bleed nipple just sufficiently to allow fluid to be expelled, and ensure ejected fluid is collected in a jar or waste rag.
'Brake Warning' light should illuminate.
Close bleed nipple.
Release and re-apply foot pressure to brake pedal.
'Brake Warning' light should extinguish.
Switch off engine and apply handbrake.
Top-up brake fluid reservoir.
Should warning light fail to illuminate when fluid is released, repeat test operations.
A new P.D.W.A. unit is required if warning light fails to illuminate during repeat operation.

PRESSURE DIFFERENTIAL WARNING ACTUATOR

Check and reset **70.25.08**

NOTE: Before commencing check and reset procedure ensure that car is adequately chocked and cars with automatic transmission have selector lever in 'P' or 'N' position.

Release handbrake: warning light should extinguish; if light remains illuminated carry out next operation.
Check brake reservoir fluid level, top up as necessary; if warning light remains illuminated, carry out remaining operation.

Disconnect electrical connector from P.D.W.A. Switch if warning light goes out P.D.W.A. has operated; if light remains illuminated check for 'short' in brake warning electrical circuit or a sticking reservoir fluid level switch.

NOTE: If P.D.W.A. unit has operated a major defect in the brake system is indicated.

Reset

Resetting of the P.D.W.A. unit is achieved automatically during bleeding of the brake system, which should only be carried out following rectification of defects that cause shuttle valve displacement.

BRAKE SERVO

Check and test procedure **70.50.05**

The following tests on the vacuum system should only be carried out with the hydraulic braking system in a satisfactory condition.

Servo test and check

Jack up front of car and confirm one wheel turns freely. Start engine, allow vacuum to build up and apply brake pedal several times. It should be possible to rotate wheel immediately pedal is released. If brakes bind, a defect within the servo unit is indicated.
With engine running apply brake pedal several times and check operation of pedal. If response is sluggish, check condition of vacuum hoses and servo unit air filter.
Allow vacuum to build up, switch off engine and operate brake pedal, approximately two or three applications should be vacuum assisted; less indicates a leaking vacuum system or inoperative non-return valve.
Switch off engine and operate brake pedal several times to evacuate vacuum in system. Hold a light foot pressure on pedal and start engine. If servo is operating correctly, pedal will fall under existing foot pressure. If pedal remains stationary a leaking vacuum system is indicated.

HANDBRAKE CABLE

Adjust **70.35.10**

The handbrake cable adjustment linkage is situated on the underside of the floor panel below the handbrake lever.

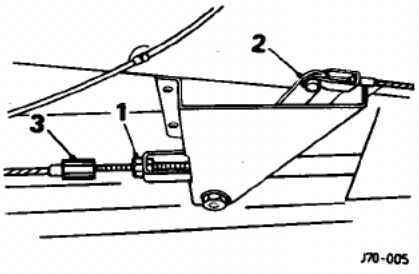


Fig. 6

To adjust, slacken the locknut (1, Fig. 6) at the forked end and remove the clevis pin (2, Fig. 6) securing the clevis to the handbrake lever.
Ensure that the levers at the calipers are in the 'Fully off' position by pressing towards the calipers.
Adjust the length of the cable by unscrewing the cable end (3, Fig. 6) to a point just short of where the caliper levers start to move.
Refit the clevis pin (2, Fig. 6) and tighten the locknut (1, Fig. 6).
Always use a new split pin to retain clevis pin.
No attempt must be made to place the cable under tension otherwise handbrake may bind.

Inspection

Clean all parts with Girling cleaning fluid and dry with lint-free cloth.
Examine piston and bore of cylinder for visible score marks and corrosion.
If doubt exists as to condition of components, replace suspect item.

Reassembling

WARNING: To help prevent damage it is essential that generous amounts of clean brake fluid are used at all stages of seal assembly.

Carefully fit inner seal of secondary piston in locating groove, ensure seal lip faces forwards.
Fit remaining seal in locating groove, ensure seal lip faces towards primary piston, i.e. in opposite direction to seal.
Fit washer, recuperating seal, spring seat and spring over forward end of secondary piston.
Carefully fit rear seal of primary piston in locating groove, ensure seal lip faces forward, i.e. away from circlip.
Fit washer, recuperating seal, spring seat and spring over forward end of primary piston.
Generously lubricate bore of master cylinder with clean brake fluid.

WARNING: Adherence to the following instruction is vitally important. Failure to comply will result in damaged piston seals.

Secure master cylinder in vice and generously lubricate piston seals in new brake fluid. Offer secondary piston assembly (5, Fig. 29) to cylinder till recuperating seal rests centrally in mouth of cylinder. Ensuring seal is not trapped, slowly rotate and rock piston assembly whilst GENTLY introducing piston into cylinder bore. Once recuperating seal enters bore of cylinder SLOWLY push piston into bore in one continuous movement.
Repeat lubrication and insertion with primary piston and spring (6, Fig. 29).
Pressing piston into bore of cylinder, fit circlip (3, Fig. 28).
Press primary piston into bore of cylinder to full extent, fit secondary piston stop pin (2, Fig. 28).
Fit sealing grommets (1, Fig. 28), master cylinder, lubricating with brake fluid.
Refit master cylinder.

PEDAL BOX

Overhaul **70.35.04**

Remove pedal box, see operation 70.35.03.

Dismantling

Carefully drift lower pivot shaft (1, Fig. 30) from pedal box, recover nylon washers from either side of lever boss (2, Fig. 30).

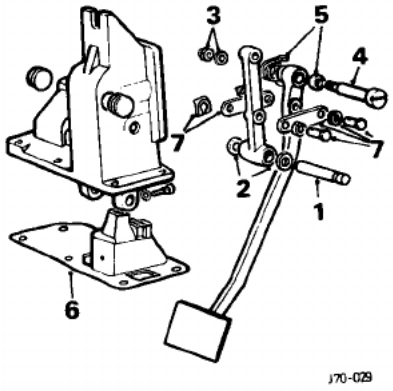


Fig. 30

Remove self-locking nut and flat washer (3, Fig. 30) securing pedal lever upper pivot shaft.
Using narrow drift, carefully remove upper pivot shaft (4, Fig. 30) from lever and pedal box.
Withdraw pedal lever assembly from box, recover nylon washers and return spring (5, Fig. 30).
Remove rubber boot (6, Fig. 30) by turning boot inside out and withdrawing over upper portion of levers.
Remove retaining clips, clevis pins and spring washers (7, Fig. 30) securing link arms to pedal levers.

Inspection

Clean all pedal lever components.
Examine pivot shafts, clevis pins, bushes and thrust washers for wear. Should doubt exist as to condition a new component must be fitted.

Reassembling

Slightly coat pivot shafts and thrust washers with grease.
Fit link arms to pedal lever, secure with clevis pins, spring washers and retaining clips (1, Fig. 31).

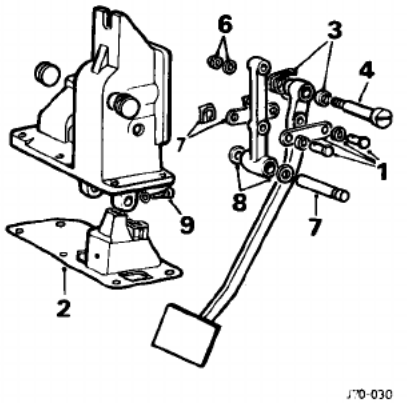


Fig. 31

Slide rubber boot (2, Fig. 31) over pedal levers, ensure that hole with side extensions fits over long pedal lever.
Position pedal lever return spring (3, Fig. 31) over extended boss of long lever, raise neck of rubber boot and locate spring hook over lever.
Position upper pivot shaft (4, Fig. 31) in one side of pedal box, enter shaft sufficient to allow nylon washer to locate on threaded portion of shaft.
Enter lever assembly into box, ensure return spring leg locates in guide channel.
Align pedal lever upper boss with upper shaft.
Enter shaft into boss, adjust nylon washer to locate over shaft.
Position second nylon washer between pedal box and extended boss of pedal lever.
Carefully push upper shaft fully home.
Position flat washer over shaft and secure with new locknut (6, Fig. 31).
Check operation of pedal lever, ensure lever operates freely.
Align small lever pivot boss with pedal box shaft mountings.
Ensuring that the groove in the lower pivot shaft aligns with the retaining pin locating hole, enter the shaft (7, Fig. 31) into the box.
Locate nylon washers (8, Fig. 31) on either side of lever boss and push pivot shaft fully home.
Align pivot shaft groove with retaining pin hole, test fit retaining pin (9, Fig. 31).
Check condition of servo/pedal box gasket and if necessary fit new gasket.
Refit pedal box.

SERVO ASSEMBLY

Overhaul **70.50.06**

The servo assembly is a sealed unit and overhaul is not possible. Should the operation of the servo unit deteriorate to an extent where braking efficiency is affected, a replacement unit must be fitted.

BRAKE CALIPER—FRONT

Overhaul **70.55.13**

Service tool: Piston clamp 18G 672

Remove front friction pads.
Remove front caliper.
Thoroughly clean caliper with Girling brake cleaner.

Dismantling

CAUTION: Under no circumstances must caliper halves be separated.

Remove spring clips (1, Fig. 32) securing piston dust covers.
Remove covers (2, Fig. 32) from pistons (3, Fig. 32).
Fit piston clamp to any half of caliper.
To expel pistons carefully feed compressed air into caliper fluid inlet port.
Remove pistons from caliper.

WARNING: Extreme care must be taken not to damage cylinder bore when extracting seals.

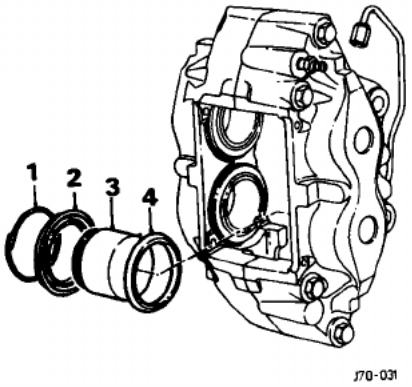


Fig. 32

Carefully prise seals (4, Fig. 32) from recess in cylinder wall.

Inspection

Using Girling brake cleaner thoroughly clean piston, cylinder bore and seal groove.
Examine piston and cylinder bore for signs of corrosion or scratches. Should doubt exist as to condition a new component must be fitted.

Assembling

Coat new seals in Girling brake disc lubricant.
Using fingers ONLY fit new seals (1, Fig. 33) to recess in cylinder bore.

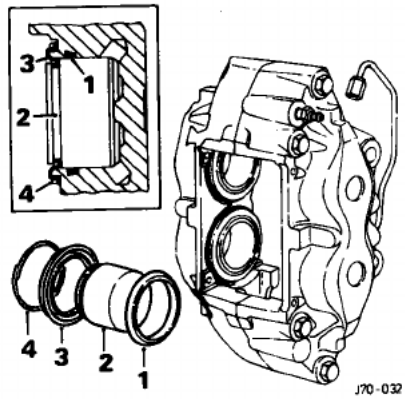


Fig. 33

Coat piston in clean disc brake lubricant.
Enter pistons (2, Fig. 33) into cylinder bores.
Fit new dust covers (3, Fig. 33) over pistons.
Push pistons fully home.
Locate dust cover over rim in caliper, secure with spring clips (4, Fig. 33).
Release piston clamp and fit to opposite half of caliper.
Repeat applicable operations on remaining two pistons.
Refit caliper to car.

BRAKE CALIPER—REAR

Overhaul **70.55.14**

Service tool: Piston clamp 18G 672

Remove rear brake caliper, see operation 70.55.03.
Thoroughly clean caliper using Girling cleaning fluid.

Dismantling

CAUTION: Under no circumstances must the caliper halves be separated.

Fit piston clamp to retain one piston in location.
Carefully feed compressed air into caliper fluid inlet port expelling one piston (3, Fig. 34).

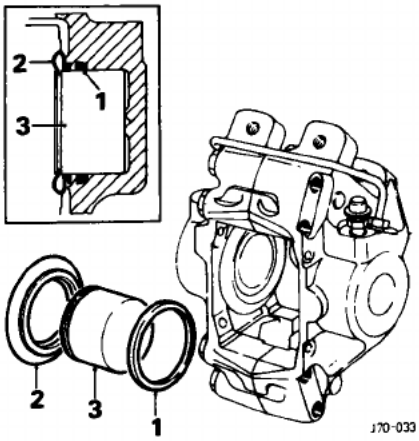


Fig. 34

Remove dust seal (2, Fig. 34) from piston and caliper cylinder bore.

WARNING: Extreme care must be taken not to damage the cylinder bore when extracting seal.

Carefully prise seal (1, Fig. 34) from recess in cylinder bore.

Inspection

Using Girling brake cleaner thoroughly clean piston, cylinder bore and seal recess.
Examine piston and cylinder for signs of corrosion or scratches. Should doubt exist as to condition, a new component must be fitted.

Assembly

Coat new seal with Girling disc brake lubricant.
Using 'fingers' ONLY fit new seal to recess in cylinder bore.
Locate dust cover in outer groove in cylinder bore.
Coat piston in clean disc brake lubricant.
Enter piston into cylinder bore through dust seal.
Locate dust seal into groove in piston.

Release piston clamp and fit to opposite side of caliper to press 'services' piston fully home.
Repeat applicable operations on remaining cylinder piston.
Remove piston clamp.
Refit rear brake caliper to car.

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ALIGNMENT CHECK

Service tool: Body alignment jig 700
Adaptors: J700-11; J700-18; J700-24; J700-35; J700-401; J700-402; J700-1148; S700-1111/2 J700-37

Data check **76.10.01**

NOTE: The datum line is established by positioning the car (unladen, correct tyre pressures and fuel tanks full) on a flat surface and rolling the car forward approximately 12 m (40 ft). The datum line being 33,3 cm (13.12 in) above ground level at front and 33,8 cm (13.31 in) at rear, each measurement being taken through the centre line of wheel hubs.

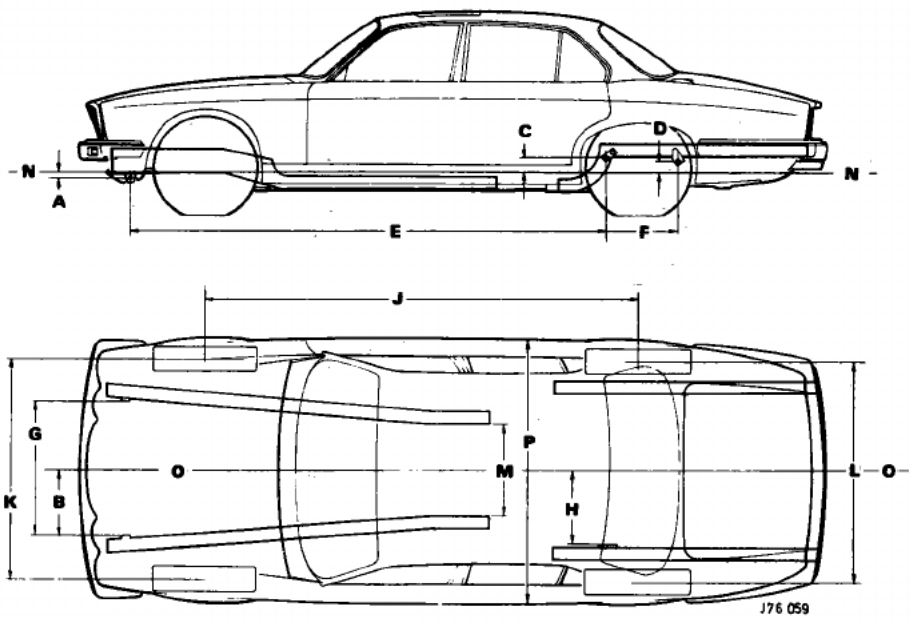

Fig. 1

SYMBOL	MEASUREMENT TAKEN FROM	cm	in
A	Front suspension mounting point to datum line	7,7	3.05
B	Inner face of front suspension mounting point to centre line of car	39,0	15.56
C	Rear suspension front lower mounting point to datum line	11,5	4.54
D	Rear suspension rear lower mounting point to datum line	11,0	4.34
E	Front suspension, front mounting point to rear suspension front lower mounting point	306,1	120.54
F	Rear suspension, front lower mounting point to rear suspension rear lower mounting point	33,05	13.06
G	Distance between inner faces of front suspension mounting points	79,4	31.12
H	Distance between inner face of rear suspension front mounting bracket and centre line of car	49,7	19.53
J	Wheelbase	288,5	112.87
K	Track (front)	147,0	58.0
L	Track (rear)	149,1	58.66
M	Distance between inner faces at rear of front chassis members	34,1	13.43
N	Horizontal datum line	—	—
O	Centre line of car	—	—
P	Overall width of car	176,3	69.6

SUN VISOR

Remove and refit **76.10.47**

Removing

Disengage the visor from the retaining clip (1, Fig. 2).
Remove the screws (2, Fig. 2) securing the visor; withdraw the visor.

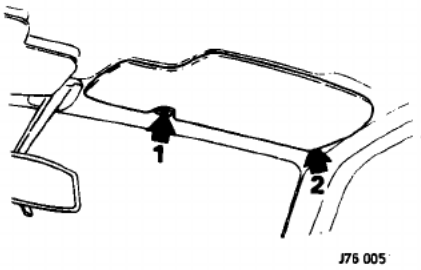

Fig. 2

Refitting

Place the visor in position and refit the retaining screws; engage the visor in the retaining clip.

INTERIOR MIRROR

Remove and refit **76.10.51**

Removing

Grasp stem of mirror and pull rearwards to disengage retaining clip.

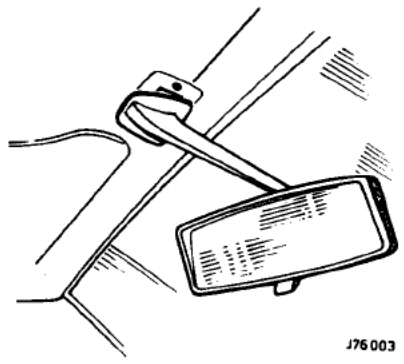

Fig. 3

Refitting

Position front of mirror stem in the mounting and strike underside of stem sharply with a rubber mallet to engage the retaining clip.

EXTERIOR MIRROR—MANUALLY OPERATED

Remove and refit **76.10.52**

Removing

Adjust the mirror until access to the retaining screws is obtained.
Remove the two screws (1, Fig. 4) securing the adjusting lever surround to the door crash roll.
Partially withdraw the surround (2, Fig. 4) complete with operating lever away from the door crash roll.
Slacken the set screws (3, Fig. 4) securing the operating lever and withdraw lever from surround.
Remove the two screws (4, Fig. 4) securing the mirror to the door.

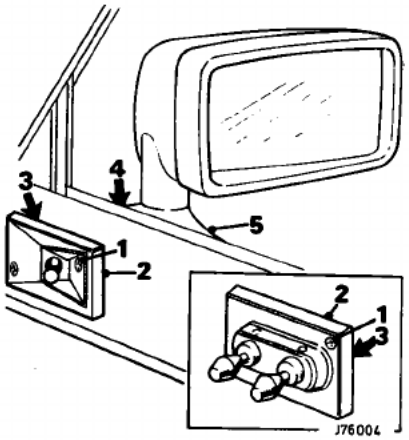

Fig. 4

Remove mirror and mounting pad (5, Fig. 4), carefully withdrawing the operating cable through the crash roll and door panel.

Refitting

Carefully feed the operating cable through the door panel and crash roll.
Refit the mirror and mounting pad.
Refit the lever to the surround and screw the assembly to the crash roll.
Test the mirror for correct operation.

EXTERIOR MIRROR—ELECTRICALLY OPERATED

Remove and refit **76.10.52**

NOTE: Prior to carrying out this operation on Vanden Plas cars it will first be necessary to remove the door arm-rest and trim casing as described in operations 76.35.22 and 76.34.01.

Removing

Adjust the mirror until access to the retaining screws is obtained.
Disconnect the battery.
Remove the two screws (1, Fig. 4) securing the adjusting lever surround to the door crash roll (door pocket—Vanden Plas).
Partially withdraw the surround (2, Fig. 4) complete with operating levers and remove the setscrews (3, Fig. 4) securing the surround to the levers.
Remove the two screws (4, Fig. 4) securing the mirror to the door.

Vanden Plas only
Carefully feed operating levers into the door.

All Cars
Remove mirror and mounting pad (5, Fig. 4), carefully withdrawing the wiring harnesses and levers through the door panel.

Refitting

Carefully feed the operating levers and harnesses through the door panel and crash roll (door pocket—Vanden Plas).
Refit the mirror and mounting pad.
Refit the liners to the surround and screw the assembly to the crash roll/door pocket.

Vanden Plas only
Refit the door trim pad and arm-rest.

All Cars
Connect the battery and test mirror for correct operation.

FRONT TRIM CASING

Remove and refit **76.13.01**

Removing

Remove the screws securing the tread plate (1, Fig. 5) to the sill; lift off the tread plate and packing piece.
Remove the underscuttle casing (2, Fig. 5) as described in operation 76.46.11.

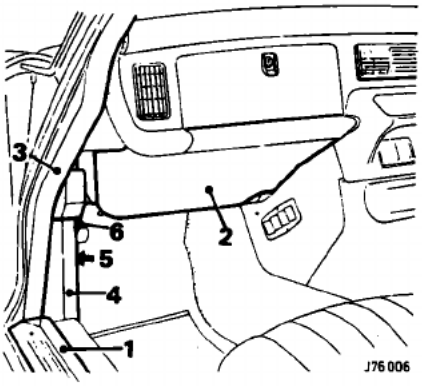

Fig. 5

Carefully prise approximately 200 mm (8.0 in) of draught welt (3, Fig. 5) off the flange adjacent to the trim casing.
Carefully peel edge of trim (4, Fig. 5) from tip of door aperture.
Remove two screws (5, Fig. 5) securing trim casing to side of footwell.
Disengage the casing from the air vent regulator control (6, Fig. 5) and withdraw casing from car.

Refitting

Coat lip of door aperture with suitable trim solution. Place trim casing in position and secure with two screws.
Fix edge of trim to lip of door aperture and clip draught welt to flange.
Refit the underscuttle casing, tread plate and packing piece.

'B' POST TRIM CASING—UPPER

Remove and refit **76.13.08**

Removing

Prise the top edge of the plastic cover from the safety belt mounting; withdraw the cover (1, Fig. 6).
Remove the bolt, washers and spacer securing the safety belt mounting to the 'B' post.
Prise the interior light lens (2, Fig. 6) from the light fitting.
Starting at the bottom, carefully prise the trim casing from the 'B' post (3, Fig. 6).

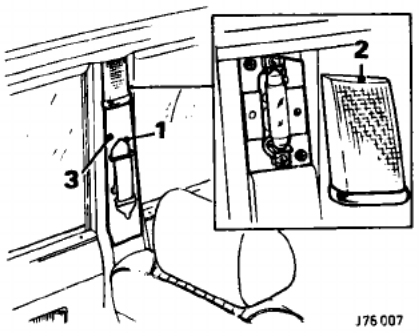

Fig. 6

Refitting

Ensure that the trim clips align with the holes in the 'B' post and refit the trim casing.
Clip the interior light lens into the light fitting.
Refit the safety belt mounting ensuring that the belt webbing is not kinked or twisted and refit the plastic cover.

'A' POST TRIM CASING AND CANT RAIL

Remove and refit **76.13.10**

Removing

Remove two screws securing the escutcheon to the end of the crash roll; withdraw escutcheon (1, Fig. 7).
Prise draught welt away from the flange to gain access to the lower edge of the cant rail.
Carefully prise chrome finishers from ends of grab handle and remove the screws securing grab handle to cant rail (2, Fig. 7).
Remove screw and metal plate securing end of cant rail to body.
Working from rear of front of car, carefully prise off cant rail (3, Fig. 7).

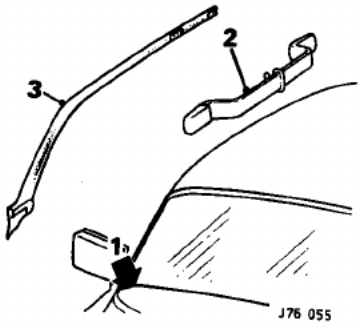

Fig. 7

Refitting

Check that trim clips and holes in body are in alignment and clip cant rail to body.
Refit screw and metal plate to secure end of cant rail.
Refit grab handle and chrome finishers.
Clip draught welt to flange and refit the escutcheon to the crash roll.

'B' POST TRIM CASING—LOWER

Remove and refit **76.13.29**

Removing

Prise plastic cover (1, Fig. 8) off lower safety belt mounting bolt.
Remove the bolt, spacer and washer (2, Fig. 8) securing the belt mounting.
Prise the top edge of the plastic cover (3, Fig. 8) from the upper safety belt mounting; withdraw the cover.
Remove the bolt, washers and spacer securing the upper mounting to the 'B' post.
Prise the draught welt (4, Fig. 8) adjacent to the trim casing off the flange and remove the safety belt retaining strap (5, Fig. 8).
Starting from the bottom, prise the casing (6, Fig. 8) off the 'B' post.
Feed the safety belt through the slot and withdraw the casing.

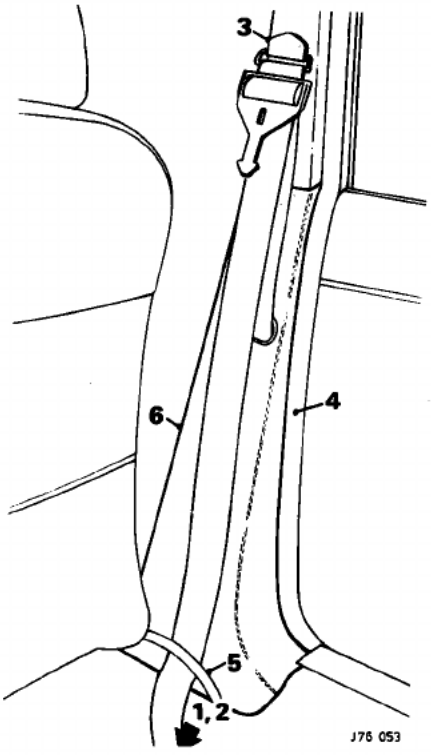

Fig. 8

Refitting

Ensuring that safety belt webbing is the correct way round, feed the belt through the slot in the trim casing.
Refit the trim casing and draught welt.
Attach the safety belt to the upper and lower mountings, refit the plastic covers and the retaining strap.

BONNET

Remove and refit **76.16.01**

Removing

Place suitable protective material on the front bumper.
Disconnect the battery and the headlamp harnesses (1, Fig. 9) at the snap connectors.
Mark the relative positions of the bonnet and hinges.
Remove the nut and bolt (2, Fig. 9) securing the stay to the bonnet.

CAUTION: The bonnet must be adequately supported after removal of the stay.

Remove the bolts, spring and plain washers (3, Fig. 9) securing the bonnet to the hinge; lift off the bonnet.

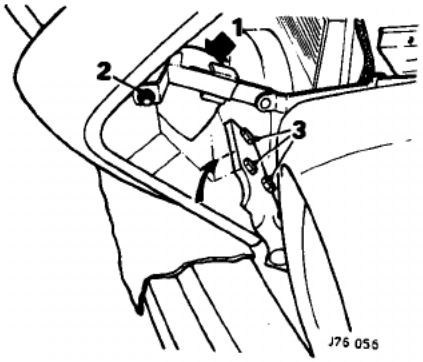

Fig. 9

Refitting

Position the bonnet on the hinges and fit but do not fully tighten the bolts, spring and plain washers.
Refit the bonnet stay and align the reference marks.
Tighten the securing bolts, close the bonnet and check fit of bonnet in aperture. If necessary, open the bonnet and reposition to obtain correct fit.

NOTE: The correct procedure for closing the bonnet is as follows:

Stand facing the front of the vehicle and grasp each end of the top of the radiator grille.
Lift front of bonnet smoothly; bonnet should now close. If difficulty is experienced however, reference should be made to operations 76.16.20 and 76.16.28.
Remove the protective covering from the front bumper.
Reconnect the headlamp harnesses and the battery; test the headlamps for correct operation.

BONNET HINGE

Remove and refit **76.16.12**

Prior to carrying out this operation it will first be necessary to remove the bonnet and bonnet

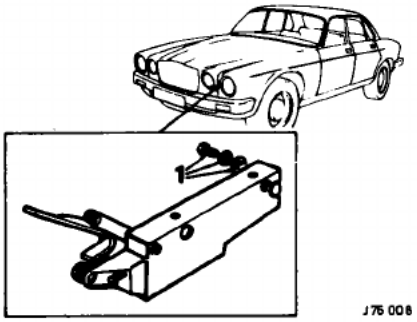

Fig. 10

assist spring(s) as detailed in operations 76.16.01 and 76.16.13.

Removing

Remove self-locking nuts, spacing washers and bolts (1, Fig. 10) securing the hinge; lift off the hinge.

Refitting

Place hinge in position and refit bolts, spacing washers and nuts.
Refit the bonnet assist spring(s) and the bonnet.

BONNET ASSIST SPRING

Remove and refit **76.16.13**

Removing

Open the bonnet and place washers of suitable thickness between the spring coils (1, Fig. 11).
Remove the bolt, spring and plain washer (2, Fig. 11) securing the spring retaining bracket to the right- or left-hand wing valance.
Remove the retaining bracket and disengage the spring from the lower bracket (3, Fig. 11).
DO NOT remove the washers from the spring unless a new spring is to be fitted.

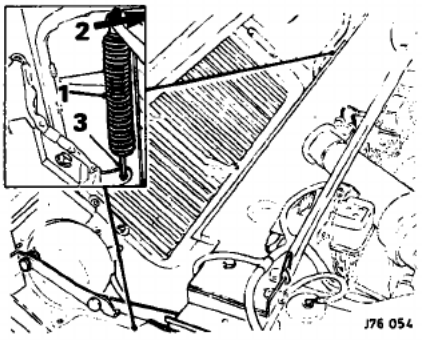

Fig. 11

Refitting

NOTE: If a new spring is to be fitted, it is advisable to pre-tension the spring by inserting washers of 1,6 mm (0.062 in) thickness between the coils of the spring.

Locate end of spring in lower bracket and refit the retaining bracket to the right-hand wing valance.
Remove the washers from the spring.

BONNET LOCK

Adjust **76.16.20**

Slacken the locknut (1, Fig. 12) at the base of the striker peg (2, Fig. 12).

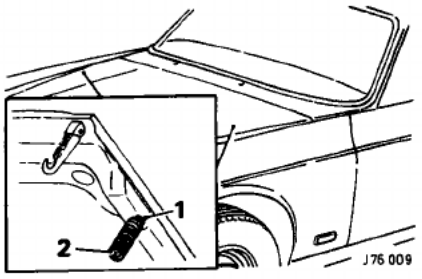

Fig. 12

Screw the peg in or out as required until, when closed, the bonnet is correctly positioned. Tighten the locknut and repeat for the other lock if necessary.

NOTE: The correct procedure for closing the bonnet is as follows:

Stand facing the front of the vehicle and grasp each end of the top of the radiator grille. Lift front of bonnet smoothly; bonnet should now close. If difficulty is experienced however, reference should be made to operations 76.16.20 and 76.16.28.

BONNET LOCK

Remove and refit **76.16.21**

Removing

Slacken the clamp bolt (1, Fig. 13) securing the operating cable to the release lever on the bonnet lock platform.
Remove the bolts (2, Fig. 13), spring and plain washers securing the lock to the mounting bracket.
Disconnect the return spring from the release lever (3, Fig. 13) and withdraw the lock assembly.

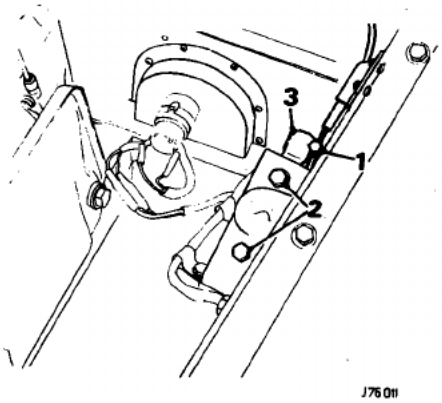

Fig. 13

Refitting

Position the lock under the mounting bracket and connect the return spring.
Bolt the lock to the mounting bracket and connect the operating cable to the release lever.
Check that when operating lever is pulled, the holes in the release lever and mounting plate are in alignment.
If holes do not align, refer to operation 76.16.28.

BONNET LOCK CONTROL CABLE

Adjust **76.16.28**

Slacken the clamp bolt (1, Fig. 14) securing the operating cable to the release lever (2, Fig. 14) and push the lever forwards.
Tighten the clamp bolt and check the operation of the lock.

NOTE: A weak return spring will impair operation of the lock and if correct operation cannot be obtained by adjustment, the spring should be renewed.

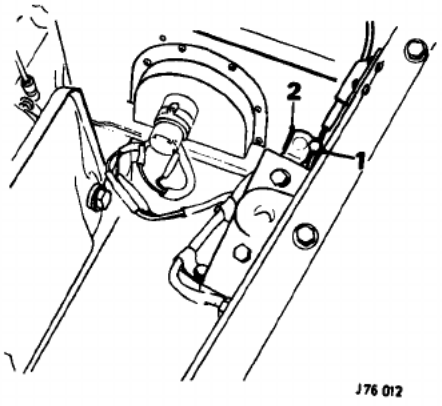

Fig. 14

After adjustment, check that when the operating lever is pulled, the holes in the release lever and mounting plate are in alignment; re-adjust as necessary.

BONNET LOCK CONTROL CABLE

Remove and refit **76.16.29**

Removing

Slacken the clamp bolt (1, Fig. 15) securing the operating cable to the release lever on the bonnet lock platform. Repeat for other side.

Long operating cable only
Remove the cable bracket from the wing valance.

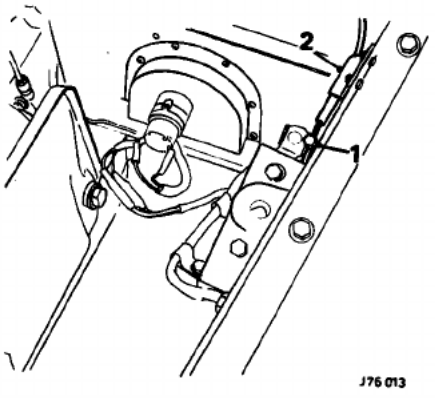

Fig. 15

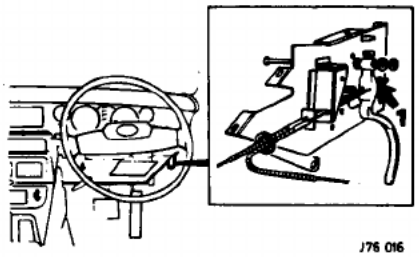

Fig. 16

Both cables

Withdraw the operating cable (1, Fig. 16) into the car; detach cables from lever.

Refitting

Ensure that clamping ends of operating cables are clean and that there are no loose strands of wire.
Feed cables through the operating lever and into the outer sleeves; pull cables taut and push operating lever forwards.

Long operating cable only
Refit the cable bracket to the wing valance.

Both cables
Connect the cables to the release levers, push the levers towards front of car and tighten the clamp bolts. Check that when operating lever is pulled, the holes in both release levers and mounting plate are in alignment. If holes do not align, refer to operation 76.16.28.

BONNET SAFETY CATCH

Remove and refit **76.16.34**

Removing

Note fitted position of the catch return spring and remove the clevis pin retainer (1, Fig. 17). Withdraw the clevis pin (2, Fig. 17) followed by the safety catch (3, Fig. 17) return spring and washers.

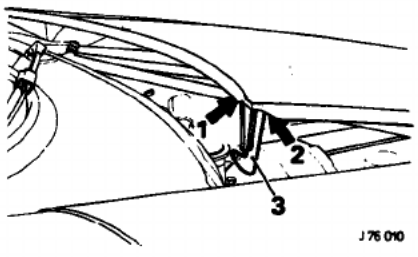

Fig. 17

Refitting

Locate the safety catch and spring in the attachment point; refit the clevis pin, washers and retainer.
Check that catch returns to the retaining position when released.

BOOT LID

Remove and refit **76.19.01**

Removing

Disconnect the battery. Carefully prise the side trim casing from the boot and disconnect the harnesses at the snap connectors (1, Fig. 18). Attach strong string to the end of each harness, release each harness from the retaining clip (2, Fig. 18).
Carefully draw each harness through the grommets and detach the strings.
Mark the relative positions of the hinges to the boot lid mounting brackets, support the lid and remove the bolts, nuts, spring and plain washers (3, Fig. 18) securing the hinge to the brackets; lift off the lid.

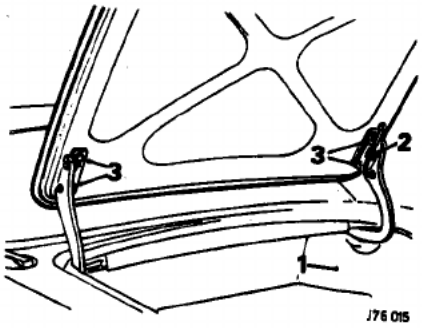

Fig. 18

Refitting

Place boot lid in position and fit, but do not fully tighten, the retaining bolts.
Align reference marks and check that boot closes with 'push effort' only and is correctly positioned in the aperture.
Adjust boot lid if necessary by means of the slots in the hinge and mounting plates.
Tighten the securing bolts fully.
Attach each harness to the drawstring and carefully pull harness into position.
Clip harnesses to boot, remove the drawstring hinges and re-make the connections.
Re-connect the battery and check all rear lights for correct operation.
Refit the boot lid trim casing.

BOOT LID SEAL

Remove and refit **76.19.06**

Removing

Remove the screws (1, Fig. 19) securing the sill cover-plate and ease seal off the flange.
Remove tape (2, Fig. 19) joining ends of seal and ease remainder of seal off the flange (3, Fig. 19).

Refitting

Connect the warning lamp harness at the snap connectors and feed connectors back into the door casing.
Position arm-rest on door and secure with the self-tapping screws.
Refit top portion of arm-rest by sliding it forwards over the two raised screws.
Refit the screw to secure upper portion of arm-rest.
Refit the warning lamp bulb and lens.
Reconnect the battery and check the warning lamp for correct operation.

REAR DOOR ARM-REST

Remove and refit—Vanden Plas only **76.34.23**

Removing

Disconnect the battery and remove the screw securing the warning lamp lens to the arm-rest.
Slide the lens rearwards and remove the warning lamp bulb (1, Fig. 39).
Remove the screw adjacent to the bulb holder securing the rear of the arm-rest to the door (2, Fig. 39).
Remove the screw from beneath front of arm-rest (3, Fig. 39) and slide top portion of arm-rest towards rear of door.
Remove screws securing arm-rest to door; withdraw arm-rest carefully, ensuring that the warning lamp harness is not disconnected as the snap connectors are pulled through the grommet.
Note fitted positions of the warning lamp and loudspeaker wiring harnesses and disconnect the leads at the snap connectors.

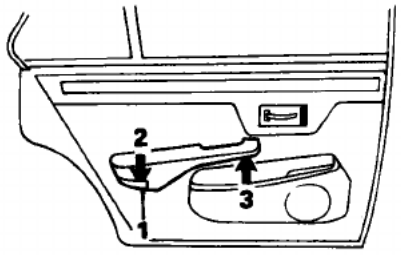

Fig. 39

Refitting

Connect the wiring harness at the snap connectors and ensuring that the grommet in the door casing is not displaced, feed snap connectors through grommet and into the door casing.
Refit the arm-rest to the door and secure with the self-tapping screws.
Refit top portion of arm-rest by sliding it forwards over the two raised screws.
Refit the screw to secure the upper portion of arm-rest.
Refit the warning lamp bulb and lens.
Reconnect the battery and check warning lamp and radio for correct operation.

DOOR LOCK

Adjust **76.37.01**

WARNING: If any of the following symptoms become evident, immediate remedial action must be taken as outlined below:

A. Door fails to fully close.
B. Door fails to open on operation of inside handle.
C. Door opens upon initial movement of inside handle.
D. Door fails to lock upon operation of inside lock lever.
E. Door fails to open with inside lock lever in unlocked position.

1. Remove door trim casing as detailed in operations 76.34.01—Front, 76.34.04—Rear.

   NOTE: When symptoms A, B or C are evident, proceed as follows:

2. Squeeze inside handle link-rod spring connector and slightly operate handle, release spring connector. Close door and check for evidence of symptoms A, B or C.
3. Continue operation 2, adjusting link-rod to left or right of spring connector until door fully closes and opens. Check that inside handle opens door when handle is three-quarters operated.

   NOTE: If symptoms D or E are evident, proceed as follows:

4. Squeeze spring connector joining lock lever link-rods, slightly operate lock lever and release spring connector. Close door and check for evidence of symptoms D or E.
5. Continue operation 4, adjusting link-rod to left or right of spring connector until door locks with lever in rear position and opens with lever in forward position.
6. Refit door trim casing.

DOOR LOCK—FRONT

Remove and refit **76.37.12**

Removing

Remove door trim casing as detailed in operation 76.34.01.
Ensure window is fully closed.
Release spring clip securing inside handle remote control rod to latch lever mechanism, detach rod from lever (1, Fig. 40).
Release spring clip securing inside lock lever remote control rod to latch lever mechanism, detach rod from lever (2, Fig. 40).
Release spring clip securing outside door handle remote control rod to latch lever mechanism, detach rod from lever (3, Fig. 40).
Release spring clip securing key lock remote control rod to latch lever mechanism, detach rod from lever (4, Fig. 40).
Remove screw securing lower section of window channel to door casing.
Remove four screws securing latch outer unit and latch mechanism to door shut face, recover latch mechanism from behind window channel (5, Fig. 40).

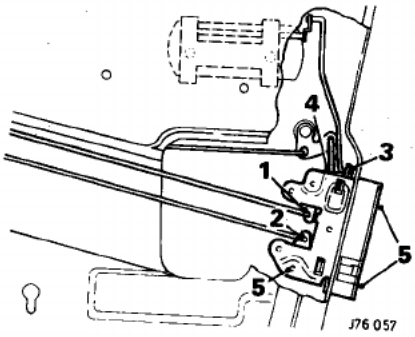

Fig. 40

Refitting

Check that inside lock lever and corresponding lever on latch mechanism are in forward position.
Ensure that latch outer unit is in open position.
Offer latch mechanism and outer unit to door shut face, secure with Phillips-head screws.
Connect inside and outside handle/lock remote control rods to latch mechanism levers, secure with retaining clips.
Check operation of inside and outside door operating mechanism in 'lock' and 'unlocked' position, adjust as detailed in operation 76.37.01.
Secure lower section of window channel to door.
Refit door trim casing.

REAR DOOR LOCK

Remove and refit **76.37.13**

Removing

Ensure that window is fully closed.
Remove rear door trim casing as detailed in operation 76.34.04.
Release spring clip securing inside handle remote control rod to latch lever mechanism, detach rod from door (1, Fig. 41).

Release spring clip securing inside lever lock remote control rod to latch lever mechanism, detach rod from lever (2, Fig. 41).
Prise child safety link from latch lever mechanism, withdraw operating link from door shut face (3, Fig. 41).
Release spring clip securing outside handle remote control rod to latch lever mechanism; detach rod from lever (4, Fig. 41).
Release spring clip securing solenoid remote control rod to latch lever mechanism, detach rod from lever (5, Fig. 41).
Remove four screws securing latch outer unit and latch mechanism to door shut face; recover latch mechanism from inside door (6, Fig. 41).

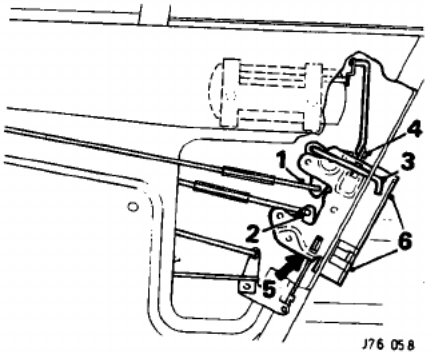

Fig. 41

Refitting

Check inside lock lever and corresponding lever on latch mechanism are in forward position.
Ensure latch outer unit is in open position.
Refit latch outer unit and mechanism to door shut face.
Connect solenoid control rod to lever.
Connect remote control rod to latch lever mechanism.
Refit child safety link and remote control mechanism.
Check door lock for correct operation in 'lock' and 'unlock' position. If adjustment is required, refer to operation 76.37.01.
Refit door trim casing.

FRONT DOOR LOCK STRIKER PLATE

Remove and refit **76.37.23**

Removing

Remove the screws (1, Fig. 42) securing the access plate to the rear of 'B–C' post; withdraw the plate.
Remove the screws (2, Fig. 42) securing striker plate to 'B–C' post; lift striker plate clear of striker.

CAUTION: Hold rear of striker assembly to prevent any components falling inside the 'B–C' post.

Withdraw striker assembly through rear of 'B–C' post.
Remove all traces of sealing compound from striker plate and 'B–C' post.

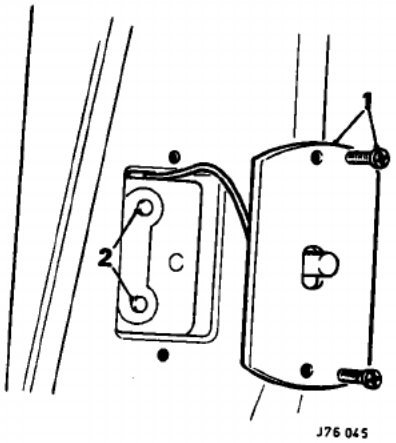

Fig. 42

Refitting

Coat rear of striker plate with suitable sealing compound.
Place striker assembly in position, refit plate and secure with the two screws; DO NOT tighten screws fully.
Close the door by pushing it firmly, open door carefully and ensuring that the striker and plate are not disturbed, tighten the striker plate securing screws.
Close door in the normal manner, door must close without undue effort and be correctly located in the aperture.
Refit the access plate to the rear of the 'BC' post.
Remove all traces of sealing compound from striker plate and 'B–C' post.

DOOR LOCK REMOTE CONTROL

Remove and refit **76.37.31**

Removing

Remove the door inside handle as detailed in operation 76.58.18.
Release spring clip (1, Fig. 43) securing remote control link to door lock, detach control rod from lock lever.

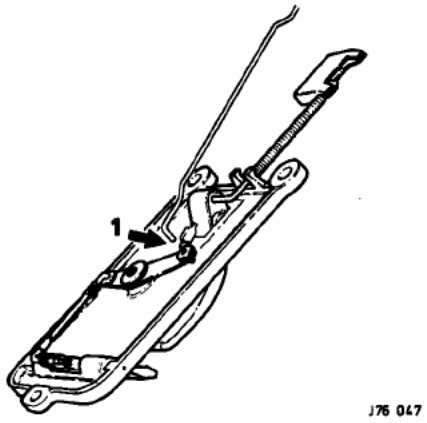

Fig. 43

Refitting

Refit remote control link and secure with spring clip.
Refit the door inside handle.

DOOR SEAL

Remove and refit **76.40.01**

Removing

Pull seal from door channel and ensure that all traces of dirt are removed from the channel.

Refitting

Coat new seal and door channel with a solution of soft-soap.
Locate corners and ends of seal in the channel, DO NOT stretch the seal.
Locate remainder of seal in channel, clean off all traces of the soft-soap solution.
Ensure that seal is perfectly dry and dust inside face of seal with french chalk.
Close door firmly, open door and check that transfer of chalk from door seal to aperture has taken place.
Where no transfer of chalk is evident, either dress the channel or adjust the striker plate.

DRIP MOULDING BEADING

Remove and refit **76.43.11**

Removing

Prise clip (1, Fig. 44) off beading.
Remove the Pop rivets securing the beading to the body flange, lift beading off the flange.

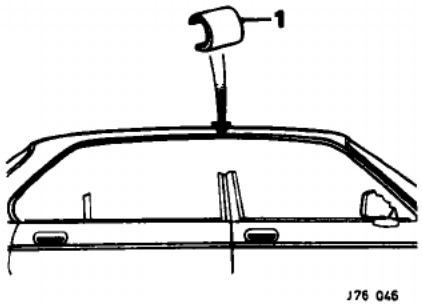

Fig. 44

Refitting

Lightly coat edge of beading with suitable sealing compound.
Locate beading on the body flange and secure with Pop rivets.
Refit the clip.
Remove all traces of sealing compound from beading and bodywork.

FASCIA PANEL

Remove and refit **76.46.01**

Removing

Remove the crash roll (1, Fig. 45) as detailed in operation 76.46.04.
Remove the driver's underscuttle casing (2, Fig. 45) as detailed in operation 76.46.11.
Remove four screws securing fascia to screen rail (3, Fig. 45).
Remove two nuts and washers securing outer ends of fascia to lower mounting brackets (4, Fig. 45).
Pull off heater and ventilation control knobs and remove the two locking rings securing the radio panel (5, Fig. 45).
Withdraw radio panel (6, Fig. 45) forward sufficient to allow access to centre tray securing screws; ensure that radio is adequately supported. Care must be taken not to damage fibre optic elements.
Remove four screws securing centre shelf to console (7, Fig. 45).
Detach temperature air sensor pipe from centre parcel tray and position tray clear of fascia.
Remove two nuts, flat washers and spring washers securing fascia to heater/air conditioning unit.
Slacken clamp screws securing ignition and light switch shrouds.
Withdraw shrouds and mounting clamps from switches, detach fibre optic from rear of shrouds and switches.
Slacken steering column upper mounting bolts. Care must be taken not to fully remove bolts.
Remove three screws securing indicator switch assembly shroud, lift off shroud.
Ease fascia panel forward and disconnect electrical block connectors feeding instruments.
Disconnect speedometer cable from rear of speedometer.
Carefully lift fascia assembly from car. It should be noted that fascia air vent ducting is removed with fascia assembly.

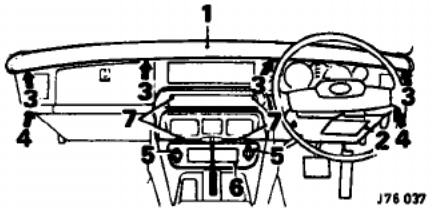

Fig. 45

Refitting

NOTE: For ease of refitting air vent ducts to demister outlets, slacken four nuts securing demister outlets to screen rail.
Position fascia in car and reconnect the speedometer and electrical harnesses.
Refit indicator switch shroud.
Tighten the upper steering column mounting bolts.
Refit ignition switch and light switch shrouds.
Refit nuts, plain and spring washers to secure fascia to heater/air conditioning unit.
Refit sensor pipe and centre parcel tray.
Refit radio panel, heater and ventilation knobs.
Fit nuts and washers to secure ends of fascia.
Fit screws to secure fascia to screen rail.
Refit underscuttle casing and crash roll.

FASCIA CRASH ROLL

Remove and refit **76.46.04**

Removing

Disconnect the battery.
Prise demister air direction vents (1, Fig. 46) from crash roll.
Remove four screws (2, Fig. 46) securing front of crash roll to screen rail.
Prise map light (3, Fig. 46) from housing in crash roll.
Remove in-car sensor.
Detach Lucar connectors (4, Fig. 46) from map light.
Lift crash roll from car.

Refitting

Position crash roll on fascia.
Refit map light and in-car sensor.

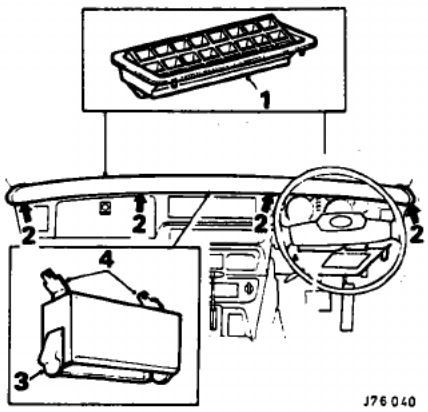

Fig. 46

Secure crash roll to fascia with four screws.
Push demister vents into crash roll.
Reconnect battery and test map light for correct operation.

PASSENGER'S UNDERSCUTTLE CASING

Remove and refit **76.46.11**

Removing

Open glovebox (1, Fig. 47).
Remove two screws (2, Fig. 47) located adjacent to glovebox lid hinges securing underscuttle casing to fascia.
Remove two screws (3, Fig. 47) securing casing and quarter panel to fascia support bracket.
Manœuvre underscuttle casing (4, Fig. 47) past footwell fresh air control, lift casing from car.
Remove quarter panel (5, Fig. 47) from car.

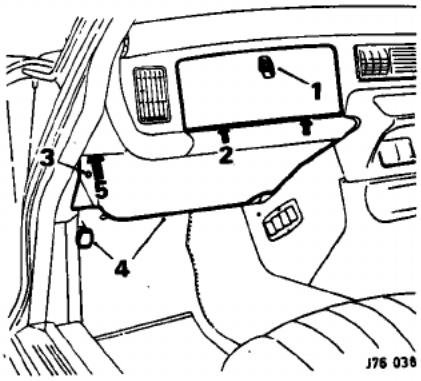

Fig. 47

Refitting

Refit quarter panel.
Manœuvre underscuttle casing past fresh air control and secure casing to fascia support with two screws.
Refit screws adjacent to glovebox hinges; close glovebox lid.

DRIVER'S UNDERSCUTTLE CASING

Remove and refit **76.46.14**

Removing

Disconnect the battery.
Unscrew locking ring (1, Fig. 48) securing speedometer trip to underscuttle casing.
Remove two screws (2, Fig. 48) securing casing and quarter panel to fascia support bracket.
Lower top of casing sufficient to allow access to rheostat.
Noting fitted position, detach leads from rheostat (3, Fig. 48).
Withdraw underscuttle casing (4, Fig. 48) and quarter panel from car.

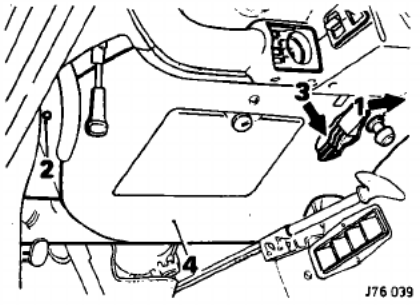

Fig. 48

Refitting

Place casing and quarter panel in car, feed speedometer trip through panel.
Reconnect the rheostat.
Secure casing and quarter panel with two screws.
Refit locking ring to secure speedometer trip cable to casing.
Reconnect the battery and check rheostat for correct operation.

GLOVEBOX LID AND LOCK

Remove and refit **76.52.02**

Removing

Remove screws securing sliding stay to fascia frame.
Remove the screws securing the glovebox lid to the frame; withdraw the lid.
Remove the six screws (1, Fig. 49) securing the tray liner to the lid; lift off the liner.
Remove the two screws (2, Fig. 49) securing the lock retaining plate.
Unscrew the retaining ring (3, Fig. 49) and withdraw the lock, lid pull and mounting plate.

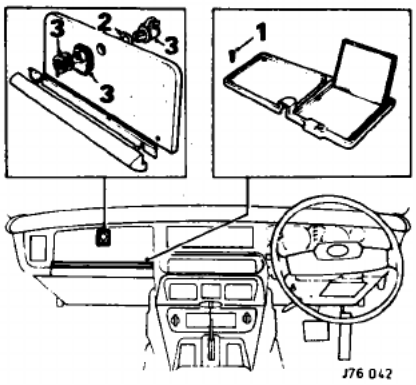

Fig. 49

Refitting

Refit the mounting plate, lid pull and lock; ensure that key aperture in lock is vertical and tighten the locking ring.
Refit the lid liner.
Place lid in position and tighten the securing screws.
Refit the sliding stay, check that lid closes properly and check lock for correct operation.

NOTE: Position of lid in fascia can be altered by repositioning the hinges on the fascia frame.

GLOVEBOX

Remove and refit **76.52.03**

Prior to carrying out this operation it will be necessary to remove the underscuttle casing as detailed in operation 76.6.11.

Removing

Remove six screws (1, Fig. 50) securing glovebox to fascia.
Remove two screws (2, Fig. 50) securing sliding bracket to fascia.
Remove glovebox (3, Fig. 50) from rear of fascia through aperture exposed by removal of underscuttle casing.

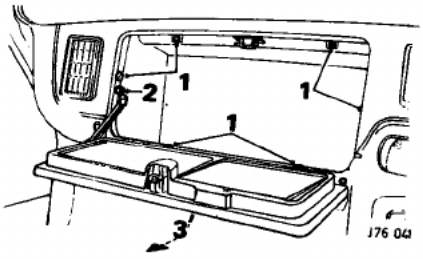

Fig. 50

Refitting

Insert glovebox into fascia through aperture in underscuttle casing.
Refit the securing screws and the sliding stay.
Refit the underscuttle casing.

RADIATOR GRILLE

Remove and refit **76.55.03**

Removing

Remove the nuts, plain and spring washers securing the grille to the bonnet.
Withdraw grille from bonnet.

Refitting

Position grille in bonnet aperture. Ensuring that grille is centralized in aperture, refit the nuts, plain and spring washers.

DOOR OUTSIDE HANDLE

Remove and refit **76.58.01**

Prior to carrying out this operation it will be necessary to remove the door trim casings as detailed in operations 76.34.01—Front or 76.34.04—Rear.

Removing

Ensure that door glass is fully closed.
Release spring clip (1, Fig. 51) securing link rod to latch lever mechanism; detach rod from lever.
Remove nuts and washers (2, Fig. 51) securing door handle surround retaining bracket (3, Fig. 51) to the door.
Withdraw surround and handle (4, Fig. 51); recover and discard the gasket.

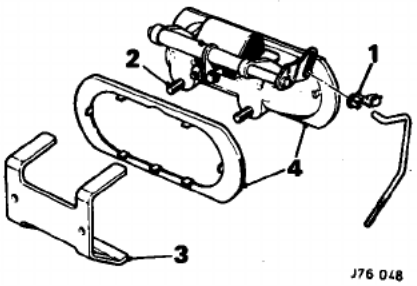

Fig. 51

Refitting

Position door handle and surround in door handle; use a new gasket.
Refit the retaining bracket.
Reconnect the link rod.
Check the door handle for correct operation and refit the door trim casing.

DOOR INSIDE HANDLE

Remove and refit **76.58.18**

Prior to carrying out this operation it will first be necessary to remove the door crash roll as detailed in operation 76.34.17.

Removing

Disconnect the long section of outer link rod at the nylon connector (1, Fig. 52).
Remove screws (2, Fig. 52) securing inside handle to door casing
Squeeze lower portion of link connector (3, Fig. 52) and slide rod and connector free of adjoining link.
Withdraw handle (4, Fig. 52) from door.

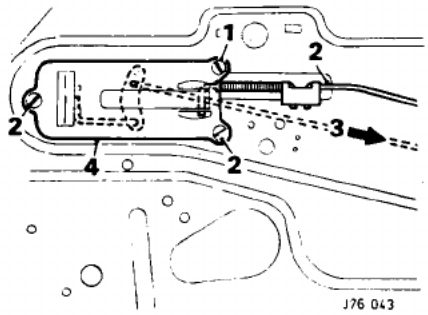

Fig. 52

Refitting

Ensure locking lever and corresponding lever on latch mechanism are in open position.
Refit handle to door.
Connect rear link.
Connect outer link at nylon connector.
Refit the door crash roll.

HEADLINING

Remove and refit **76.64.01**

Removing

WARNING: This operation should not be attempted by persons known to be allergic to glass fibre (fibreglass). Should skin areas develop a rash or if itching occurs, wash affected area with water and seek medical advice immediately. Always wear gloves, face mask and goggles when handling headlining.

NOTE: A strip of Velcro approximately 30,4 cm (12 in) long and 5 cm (2 in) wide should be used to assist in removing and refitting of headlining.

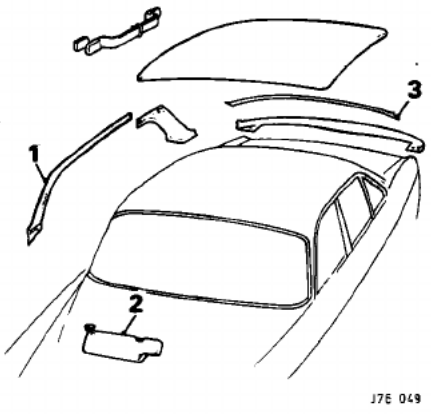

Fig. 53

Remove 'A' post cant rail trim (1, Fig. 53) as detailed in operation 76.13.10.
Remove interior mirror as detailed in operation 76.10.51.
Remove sun visors (2, Fig. 53) as detailed in operation 76.10.47
Prise back-light and windscreen upper trim panels free from roof rail (3, Fig. 53).
Attach Velcro strip to headlining.
Pull headlining forward and carefully disengage rear of headlining from locating recess.
Move headlining to right and disengage left-hand side of headlining from locating recess.
Move headlining to left, disengaging right-hand side of headlining from locating recess.
Pull headlining to rear and withdraw from car.

Refitting

CAUTION: Ensure that outer edge of headlining is of equal thickness. Thick sections must be trimmed with a sharp knife. Failure to observe this warning will result in extreme difficulty when refitting.

Fit rear right-hand corner of headlining in locating recess.
Position right-hand side of headlining in locating recess.
Attach Velcro strip to headlining.
Move headlining to rear and locate in recess.
Move headlining to left and locate in recess.
Move headlining forward and locate in screen rail.
Refit windscreen and back-light upper trim panels.
Refit sun visors, interior mirrors and cant rail trim.

CENTRE PARCEL SHELF

Remove and refit **76.67.03**

Removing

Remove the clock (1, Fig. 54) as detailed in operation 76.67.03.
Pull off the heater and ventilation controls (2, Fig. 54).
Remove the threaded locking rings securing the radio panel.
Withdraw the panel (3, Fig. 54) slightly and remove parcel shelf securing screws (4, Fig. 54).
Remove screws (5, Fig. 54) securing upper portion of shelf to fascia.
Withdraw shelf slightly and detach air sensor pipe.

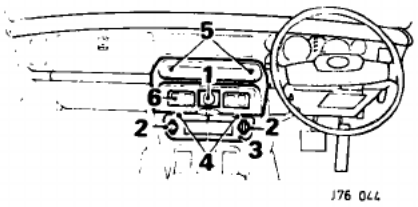

Fig. 54

Refitting

Attach air sensor pipe to parcel shelf.
Refit shelf and secure with four screws.
Refit the radio panel and control knobs.
Refit the clock.

REAR PARCEL SHELF

Remove and refit **76.67.06**

Removing

Remove rear seat cushion and squab.
Carefully prise plastic escutcheon (1, Fig. 55) from rear of inertia mechanism.

CAUTION: Ensure that disengagement of retaining lugs is gradual and that escutcheon is not hinged too far forwards.

Remove bolt, spring washer, spacer and chrome washer (2, Fig. 55) securing inertia mechanism; lift mechanism clear of parcel shelf.
Remove inertia mechanism from opposite side of parcel shelf. Carefully prise rear parcel shelf (3, Fig. 55) away from panel.

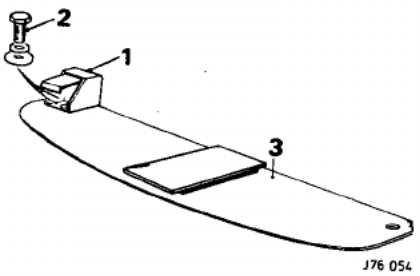

Fig. 55

Refitting

Clip parcel shelf to panel and refit the inertia reels. Road test car and check inertia mechanisms for correct operation.

FRONT ASHTRAY

Remove and refit **76.67.13**

Removing

Open ashtray cover and withdraw ash container.
Remove two screws securing ash container holder to console.
Withdraw holder and securing bracket from console.

Refitting

Slightly secure bracket with one screw to holder unit.
Fit holder and bracket to console, turn bracket securing screw, do not fully tighten.
Align unsecured portion of bracket with hole in holder. Fit remaining bracket securing screw.
Fully tighten bracket securing screws.
Fit ash container to holder.

REAR ASHTRAY

Remove and refit **76.67.14**

Removing

Open the ashtray.
Push the ashtray down against spring pressure and lift it out of the holder.

Refitting

Holding the ashtray in the horizontal position, i.e. open end facing away from the holder, push ashtray into holder against spring pressure, then raise ashtray into the open position.
Close the ashtray.

FRONT SEAT

Remove and refit **76.70.01**

Removing

Cars fitted with seat belt warning and/or electric seat height adjustment—Disconnect the battery.
Remove Phillips head screw securing front of cushion to bracket, remove bracket from underside of cushion.
Position squab in reclining position.
Raise front of cushion and pull it forward. On cars fitted with seat belt warning and/or electric height adjustment, disconnect electrical connectors fitted to underside of cushion.
Lift cushion from seat frame.
Unlock seat runners, return springs (1, Fig. 56) from forward runner supports.
Remove two nuts, spring washers and spacers (2, Fig. 56) securing front runners to mounting brackets.
Slide seat forward to full extent.
Remove nuts and spring washers (3, Fig. 56) securing rear of runners to mounting bracket.
Remove seat assembly from car.

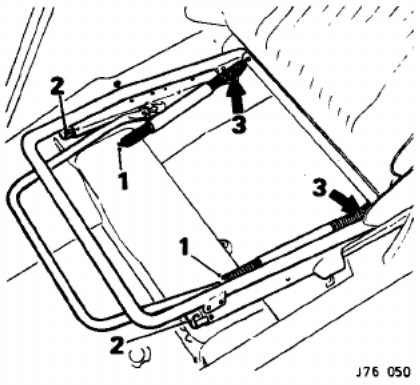

Fig. 56

Refitting

Position seat in car and fit rear retaining nuts and washers.
Re-connect wiring harnesses (if fitted).
Fit front runner retaining nuts and washers.
Connect seat return springs.
Position cushion in seat frame.
Connect seat belt warning and/or electric height adjustment wiring harness.
Secure cushion to seat frame with bracket and screw.
Connect the battery and test seat belt warning and/or electric height adjustment for correct operation.

FRONT SEAT CUSHION

Remove and refit **76.70.02**

Removing

Cars fitted with seat belt warning and/or electric seat height adjustment—Disconnect the battery.
Remove Phillips head screw securing front of cushion to bracket, remove bracket from underside of cushion.
Position squab in reclining position.
Raise front of cushion and pull it forward. On cars fitted with seat belt warning and/or electric height adjustment, disconnect electrical connectors fitted to underside of cushion.
Lift cushion from seat frame.

Refitting

Position cushion in seat frame.
Connect seat belt warning and/or electric height adjustment wiring harness.
Secure cushion to seat frame with bracket and screw.
Connect the battery and test seat belt warning and/or electric height adjustment for correct operation.

HEAD-REST

Fit **76.70.29**

Remove head-rest guide blanking plug from front seat squab.
Locate head-rest slide in guide.
Adjust head-rest to required height.

REAR SEAT CUSHION

Remove and refit **76.70.37**

Removing

Adjust front seats to fully forward position.
Remove screw either side of transmission tunnel securing cushion to seat pan cross-member.
Draw cushion forward and remove from car.

Refitting

Place cushion in seat pan and refit retaining screws.

REAR SEAT SQUAB

Remove and refit **76.70.38**

Removing

Adjust front seats to fully forward position.
Remove screw either side of transmission tunnel securing cushion to seat pan cross-member.
Draw seat forward and remove from car.
Remove two bolts and shakeproof washers securing lower section of squab to rear of seat pan.
Push squab upwards and disengage rear of squab from retaining clips.
Remove squab from car.

Refitting

Position the squab over the retaining clips and push firmly downwards.
Refit the bolts and washers to secure lower portion of squab.
Refit the seat cushion.

REAR SEAT ARM-REST

Remove and refit **76.70.39**

Removing

Adjust front seats to fully forward position.

Remove screw either side of transmission tunnel securing cushion to seat pan cross-member.
Draw seat forward and remove from car.
Remove two bolts and shakeproof washers securing lower section of squab to rear of seat pan.
Push squab upwards and disengage rear of squab from retaining clips.
Remove squab from car.
Remove four bolts and flat washers securing arm-rest to seat squab frame.
Remove six clips securing arm-rest trim to squab frame.
Withdraw arm-rest from squab.

Refitting

Position arm-rest in squab and refit the trim clips to secure trim to the frame.
Refit the bolts and washers to secure the arm-rest.
Position the squab over the retaining clips and push firmly downwards.
Refit the bolts and washers to secure lower portion of squab.
Refit the seat cushion.

FRONT SAFETY BELT

Remove and refit **76.73.10**

Prior to carrying out this operation it will be necessary to remove the lower 'B' post trim casing as detailed in operation 76.13.29.

Removing

Remove the bolt, spring and plain washers (1, Fig. 57) securing the inertia reel mechanism to the 'B' post.
Prise plastic finisher from buckle assembly securing bolt.
Remove bolt, plain washer, anchor plate and spacer (2, Fig. 57) securing buckle assembly; withdraw assembly.

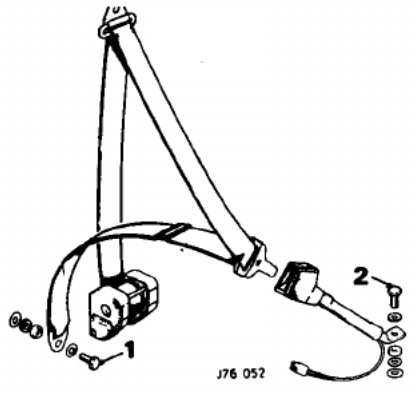

Fig. 57

Refitting

Refit the inertia reel mechanism ensuring that it is in the vertical position.
Refit the lower 'B' post trim casing.
Smear threads of buckle assembly securing bolt with Bostik Sealant; refit buckle assembly.
Road test car and check inertia mechanism for correct operation.

REAR SAFETY BELT

Remove and refit **76.73.18**

Removing

Slide front seats forward.
Remove screws securing rear seat cushion, draw cushion forward and remove from car.
Remove two bolts and shakeproof washers securing lower section of seat squabs to seat pan.
Push squab upwards and disengage rear of squab from retaining clips.
Carefully prise plastic escutcheon (1, Fig. 58) from rear of inertia mechanism.

CAUTION: Ensure that disengagement of retaining lugs is gradual and that escutcheon is not hinged too far forwards.

Remove bolt, spring washer, spacer and chrome washer (2, Fig. 58) securing inertia mechanism.
Remove bolts, plain washers and spacers securing lower mounting and buckle assemblies to the seat pan.

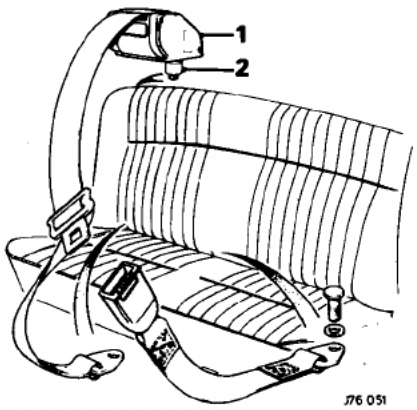

Fig. 58

Refitting

Smear threads of lower mounting buckle assembly securing bolts with Bostik Sealant; refit buckle assembly.
Refit inertia mechanism, clip plastic escutcheon to reel holder.
Refit rear seat squab and cushion.
Road test car and check inertia mechanism for correct operation.

SILL TREAD PLATE

Remove and refit **76.76.01**

Removing

Remove the screws securing the tread plate to the sill.
Lift off the tread plate and packing piece.

Refitting

Position packing piece and tread plate on sill and refit the retaining screws.

FRONT DOOR GLASS

Remove and refit **76.31.01**

Removing

Open the bonnet and disconnect the battery.
Remove the door trim casing, as detailed in Operation 76.34.01, and the front door crash rail, as detailed in Operation 76.34.17.
Remove the door outer weather strip.

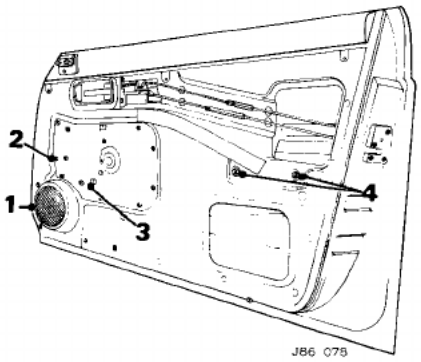

Fig. 59

Remove the door speaker (1, Fig. 59).
Remove the screws securing the window lift motor mounting plate (2, Fig. 59) and remove the stop peg (3, Fig. 59) from the mounting plate.
Remove the window lower channel securing bolts.
Remove the distance piece from the rear of the mounting plate.
Remove the regulator outer slide channel securing bolts (4, Fig. 59) and remove the channel.

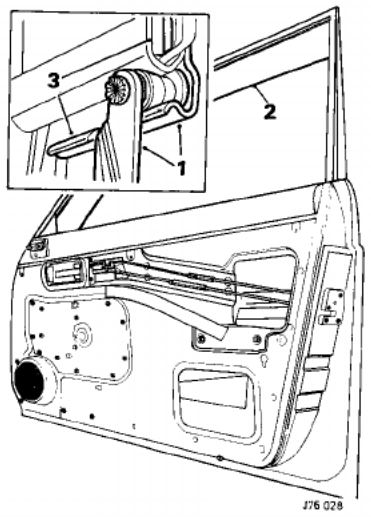

Fig. 60

Remove the motor from the mounting plate and disconnect the electrical feed cables.
Lower the motor to the bottom of the door.
Slide the door glass forward and disengage the lift motor operating arm from the guide channel (1, Fig. 60). Withdraw the glass (2, Fig. 60) from the door.
Remove the guide channel and seal (3, Fig. 60) from the door glass.

Refitting

Locate a new guide channel seal in position over the door glass.
Position the guide channel over the seal and gently tap either side of the guide until the seal and the guide are firmly secured to the door glass.
Refit the glass to the door, engage the lift motor operating arm with the guide channel.
Refit the motor to the mounting plate, reconnect the electrical feed cables.
Refit the outer slide channel and secure with the bolts.
Refit the distance piece to the rear of the mounting plate. Refit the window lower channel securing bolts.
Refit the stop peg to the mounting plate and refit the window lift motor mounting plate, secure with the screws.
Refit the door speaker, outer weather strip, front door crash rail, and door trim casing.
Reconnect battery and check operation of window lift mechanism.

WINDSCREEN — FRONT AND REAR

Remove and refit **76.81.01**
76.81.11

Description

Two different methods of direct glazing have been used on Series III Saloons.
The 'SOLBIT THERMO ELECTRICAL' method on the early cars and the 'BETASEAL' cold cure method on later cars, which is the only one now used as a service replacement.
The 'SOLBIT' method requires the use of an electrical transformer to heat wires embedded in the seal. The 'BETASEAL' method relies on the moisture in the air as a curing agent, the more humid the atmosphere the shorter the curing period.

Identification

To check which method of sealing has been used, remove the stainless steel finishers at each top corner of the screen. Carefully cut the seal and check for the end of the wire, if no wires are found, then the 'BETASEAL' method has been used.
Water leaks cannot be cured on screens employing the 'SOLBIT' method of sealing. The screen must be removed and refitted using the 'BETASEAL' process.

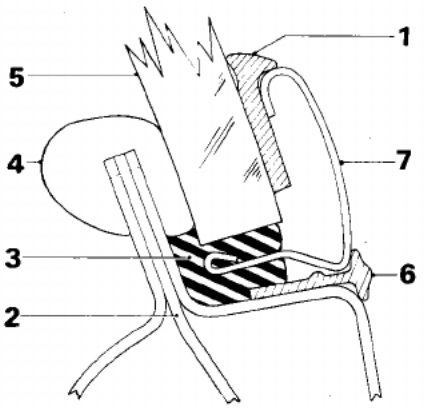

Fig. 61

1. Outer Plastic Finisher
2. Pillar
3. Solbit Sealer
4. Flange Finisher
5. Screen
6. Inner Plastic Finisher
7. Finisher

Removing

On screens fitted with the 'SOLBIT' process there are two methods of removal. One is by using a transformer to produce heat which softens the seal sufficiently for the screen to be pushed out. The other method which also is common to 'BETASEAL' is to cut through the seal using a cheese wire.

Method 1 — 'SOLBIT' only

Service Tool: Transformer, Churchill TI Pt No MS 82.

Remove the windscreen wiper arm and blade assemblies.
Apply masking tape around the windscreen aperture paying particular attention to the top corner of the roof where the 'SOLBIT' wire ends are located.
Carefully remove the black plastic finishers by pulling away from the stainless steel trim.
Damaged plastic finishers must be renewed.
Remove and discard the inner flange rubber.
Pull the 'SOLBIT' heating wires clear of the windscreen, and connect the transformer leads to the bared heating wires. Ensure that the wires do not touch.
Set the transformers to No. 2 and switch on, allow ten minutes re-heat time at 24 volts, 11.5 amps to soften the seal.
Whilst the 'SOLBIT' is being heated, fit protective covers to the front seals, cover the centre console and front carpets with paper and mask the heater defrost vents with suitable tape.
Push the front seats fully back; place a board (or plank) between the B/C posts resting on the seats, to use as a secure backrest when pushing out the screen.
When the 'SOLBIT' has softened, ease the seal away from the outside of the glass into the aperture.
Push out the screen using the feet. Sit in each front seat alternately with the feet against the screen, and the back supported by the board (or plank).

An assistant is required outside the car to receive the screen and ease away the seal.

NOTE: If the screen is to be refitted, protect it from scratches by either wrapping rags around normal working footwear, or wearing soft soled shoes.

If the screen is to be replaced with a new one, carefully cut out the stainless steel trims.
If the screen is to be refitted, place on a cloth covered table. Using a sharp knife, carefully cut out the stainless steel trims and remove the 'SOLBIT' from the glass.
Clean the screen and store safely prior to refitting.

Removing

Method 2 — 'SOLBIT' or 'BETASEAL'

Service Tool: Cheese wire with handles.

The cheese wire is supplied in the 'BETASEAL' replacement kit. One end is connected to a piece of wooden dowel 150 × 20 mm (6 in × ¾ in) for use outside the car, and the other end to a hole drilled in the blade of an old screwdriver, for use inside the car. Proprietary handles such as Gas-ex may be used as an alternative to the above.
Pierce a hole through the seal at the top right-hand corner of the windscreen (Fig. 62). Thread the wire through to an assistant inside the car and connect each end to the handles (screwdriver inside the car).

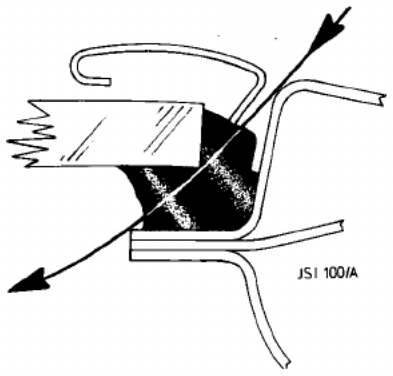

Fig. 62

Hold the outside handle approximately 150 mm (6 in) from the point where it is threaded through the screen and position the screwdriver a little distance from the same point (Fig. 63). Hold the wire taut, with the screwdriver handle close to the glass and the blade wedged into the seal for added purchase towards the inner handle, cutting with a narrow angle running parallel to the line of the seal. Reposition the inner handle (screwdriver) and repeat the procedure. **DO NOT** use short fast strokes otherwise the wire will overheat and break. Use this method for the top and sides of the screen seal.
Because of the possibility of damaging the fascia when using the wire to cut the bottom of the screen seal, it is recommended that the lower seal is released by hinging the screen carefully backwards and forwards.

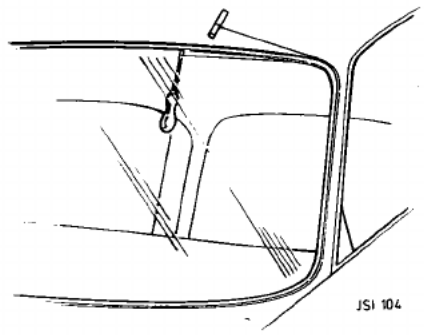

Fig. 63

If the screen is to be replaced with a new one, carefully cut out the stainless steel trims.
If the screen is to be refitted, place on a cloth covered table. Using a sharp knife carefully cut out the stainless steel trims and remove all traces of the old seal from the glass.

Body Preparation

Clean the screen aperture, any bare metal must be primed, before refitting the windscreen.
Prime using International Paints 'Double One' primer base reference number 6900 P 3000R1 and catalyst reference number 20007 0219. Mix equal quantities of primer base and catalyst, leave for 20 minutes before using. Allow between 1 to 2 hours drying time, depending on the ambient temperature.

Fitting the Windscreen

Service Tools: Rubber sucker glazing aids, Betaseal Kit.

Place a protective cover over the bonnet.
Position the support blocks, supplied in the kit, on the bottom of the windscreen aperture and rest the glass on them. Carefully centralize the glass in the aperture.
Stick two strips of masking tape, from the top of the glass, across the gap, to the body (Fig. 64). Mark the tape to facilitate correct location of the windscreen when finally fitting.

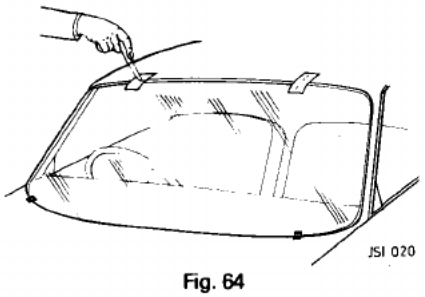

Fig. 64

Cut through the tape, between the glass and the body, and lift out the windscreen (Fig. 64).
Fit the inner rubber finisher (6, Fig. 61) to the aperture flange, with the joint at the centre of the top of the aperture.
If the original windscreen is to be re-used, it must be thoroughly cleaned and prepared using the Wipe No. 4, supplied in the kit. Wipe on using a lint free cloth and immediately wipe off with a clean dry cloth.
Remove any dust or dirt from the aperture flange with a clean dry cloth.
Shake well the two tins of primer. Apply the metal primer part number 435-46 to the flange. Apply the glass primer part number 84132-11, to a width of 10 mm, to the glass.
Allow ten minutes for the primer to dry.
Remove the bottom from the adhesive sealant cartridge.
Remove all the desiccant. If the desiccant is blue then the adhesive can be safely used, if it is pink then the shelf life of the adhesive has expired and it should be discarded and a new tube of adhesive used. Pierce the membrane, screw on the pre-cut nozzle and introduce the cartridge into the gun.
Run a continuous bead of adhesive sealant around the inside perimeter of the windscreen using the edge of the windscreen and the shape of the nozzle as a guide.
Position the support blocks on the bottom half of the aperture about 20 cm (8 in) from each corner.
Fit the windscreen in the aperture, the use of rubber sucker glazing aids will greatly assist. Line up the marks of the adhesive tapes.

NOTE: Fit the windscreen within 10 minutes of applying the adhesive sealant.

Press gently all round the edge of the windscreen to ensure perfect adhesion of the adhesive sealant to the body.
Carry out a water leak test. If a leak is found, mark the spot and dry using compressed air. Squeeze out a small amount of adhesive sealant, and smooth into the affected area with a wet spatula. Carry out another water leak test and rectification (if required).
Offer up the stainless trims to the windscreen and adjust for the best fit.
Apply a bead of adhesive sealant to the space between the windscreen and the aperture. Fit the stainless trims and the outer plastic finisher, hold in place with masking tape.
Using a soft lead pencil mark around the inside of the windscreen against the flange finisher. This will cut through any excess adhesive sealant extruded during the fitting process. When cured this excess adhesive sealant can easily be peeled away from the windscreen. Any excess adhesive sealant on the outside of the vehicle can also be removed by this method.
When the stainless trims are firm, remove the masking tape and clean the windscreen. Fit the inner plastic finisher.
Refit the wiper arms and blades.
Leave the vehicle in a humid atmosphere for at least two hours, before driving.