

## Section T5

## Gearchange actuator

The electric gearchange actuator (see Figs. T20 and T21) is mounted on a bracket secured to the transmission rear extension.

When the ignition is switched on and the selector lever on the steering column is moved to one of the gear range positions, current is allowed to flow to the actuator motor via a relay.

The motor rotates and turns the wormshaft through the flexible coupling. As the worm gear rotates, the slip ring which is secured to the worm gear also rotates until an insulated slot in the slip ring is aligned with the live contact. When this position is reached, the current is cut off and the motor ceases to rotate.

The electric actuator is wired such that the transmission can be locked by moving the selector lever to the Park position, with the ignition switched either on or off. However, to move the transmission out of the Park position, the ignition has to be switched on, with the battery in a charged condition.

**Note**  
The actuator will also lock the transmission when the ignition key is removed from the switchbox.

**Gearchange electric actuator - To remove**  
The gearchange electric actuator includes a thermal cut-out. This cut-out prevents the motor from being overloaded should the gearchange linkage become obstructed and as a result, gives the impression of actuator failure.

Before removing the actuator, ensure that the controls are free and adequately lubricated, also that the actuator electrical system is sufficiently cooled for the thermal cut-out to permit the motor to operate. Press the reset button in the main fuse-board to reset the cut-out.

It is recommended that the easiest and quickest method of dealing with actuator failure, is by substituting the faulty actuator for a service exchange unit. If a service exchange unit is not obtainable proceed as follows.

1. Disconnect the negative lead from the battery.
2. Remove the split pin and clevis pin from the actuating lever on the electric actuator; disconnect the rod from the lever.
3. Unscrew and remove the 'multi-pin' plug (see Page T5 - 9). Alternatively, from inside the car, pull the carpet to one side and disconnect the electrical plug(s) from the left-hand side of the lower fascia and unclip it from the automatic air conditioning servo unit. Remove the setscrew securing the electrical cable to the transmission tunnel and also the three nuts securing the loom/breather

connection. Lower the electrical lead, plug(s), etc., down through the transmission tunnel opening.

4. Remove the three bolts which secure the actuator to the rear extension bracket, then remove the actuator.

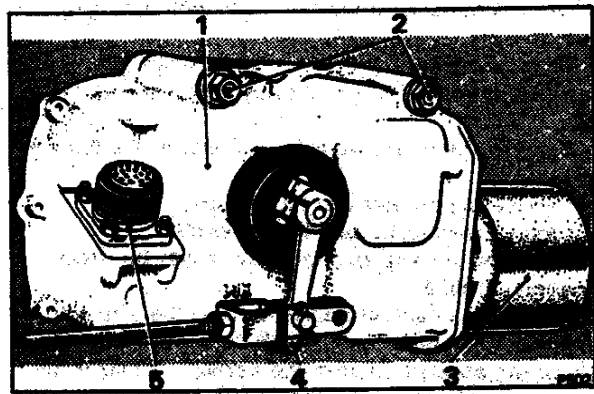


Fig. T20 Electric gearchange actuator - plug connection

- 1 Actuator casing
- 2 Actuator securing bolts
- 3 Motor cover
- 4 Actuating lever
- 5 Plug socket

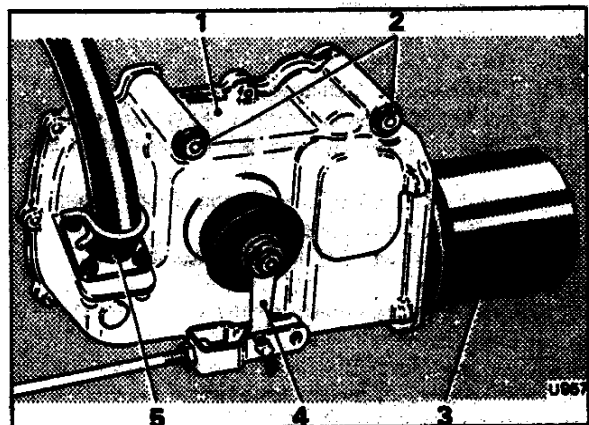


Fig. T21 Electric gearchange actuator - integral loom

- 1 Actuator casing
- 2 Actuator securing bolts
- 3 Motor cover
- 4 Actuating lever
- 5 Cable entry

**Gearchange electric actuator - To dismantle**

Cars prior to serial numbers

34573 - Silver Shadow II

34601 - Silver Wraith II

33019 - Corniche and Camargue

1. Disconnect the transmission linkage and the actuator loom plug. Remove the actuator from the car.
2. Remove the eight 2 B.A. nuts and washers and carefully withdraw the side casing.
3. Remove the  $\frac{1}{4}$  in. A/F nut and washer and withdraw the cam noting the relative position between the cam and the output lever.
4. Disconnect all terminals on the contact plate and the micro-switches.
5. Remove the four 3 B.A. nuts and withdraw the contact plate. Remove the relay connections (see Page T5 - 9).
6. Remove the nuts and bolts which secure the micro-switches and the dual relay to the contact plate.
7. Slacken the clamping bolt and remove the output lever.
8. Remove the washer and rubber boot.
9. Remove the circlip and thrust washer.
10. Withdraw the slip ring and gear assembly from the actuator case.
11. Remove the contact segments from the slip ring.
12. Remove the three  $\frac{1}{4}$  in. A/F setscrews from the side of the actuator casing and carefully remove the motor assembly and drive collars. Remove the sealing ring from the actuator case.
13. Remove the internal circlip holding the bearing into the case and push the wormshaft and bearings out of the casing.
14. Remove the loom socket from the actuator casing.

**Gearchange electric actuator - To dismantle**

Cars from serial numbers

34573 - Silver Shadow II

34601 - Silver Wraith II

33019 - Corniche and Camargue

1. Disconnect the transmission linkage and the actuator loom plug(s). Remove the actuator from the car.
2. Remove the eight 2 B.A. nuts and washers and carefully withdraw the side casing.
3. Remove the  $\frac{1}{4}$  in. A/F nut and washer and withdraw the cam.
4. Disconnect all terminals on the contact plate and micro-switches.
5. Remove the four 3 B.A. nuts and washers and withdraw the contact plate. Remove the relay connections (see Page T5 - 9).
6. Remove the nuts and bolts which secure the micro-switches, relay mounting bracket, relays and motor cable connection posts.
7. Remove the securing setscrew and washer and withdraw the output lever.
8. Withdraw the washer and the rubber boot.
9. Remove the circlip and thrust washer.

10. Withdraw the slip ring and gear assembly from the actuator case.

11. Remove the contact segments from the slip ring.

12. Remove the three  $\frac{1}{4}$  in. A/F setscrews and washers from the side of the actuator casing and remove the motor assembly and drive coupling.

Remove the sealing ring from the actuator case.

13. Remove the internal circlip holding the wormshaft; push the wormshaft and bearings out of the casing.

14. Carefully cut and remove the tie wrap from around the electrical wiring.

15. Remove the securing clips from around both ends of the conduit; withdraw the conduit from the cast elbows.

16. With a small diameter shaft, push out the electrical leads from the loom plug. Collect the loom plug, conduit elbow (tunnel connection), securing clips and conduit.

17. Fasten together the electrical cables with tape and pull them back through the cable exit of the actuator casing.

**Gearchange electric actuator - To inspect**

1. Examine the magnesium casing for cracks or other damage.
2. Ensure that the joint faces are clean and free from burrs.
3. Examine the driving dog slot for excessive wear, also the mating shaft on the drive end of the motor armature shaft. The dog should be an easy sliding fit on the shaft but without excessive side play (see Page T5 - 9).
4. Examine the general condition of the plug(s) assembly.
5. Ensure that no strands of wire are broken where they enter the pins. In the event of the plug being considered unserviceable, it is recommended that the whole assembly be renewed. Special crimping tools and Cannon insert tools are required for assembly purposes and unless these are available the work should not be attempted.
6. Examine the eight spring contacts for security on the insulated base.

Care must be exercised when handling the assembled base plate so that the contacts and the relays are not damaged.

7. Check the height of the contacts from the base plate. The contact point should be approximately 12.32 mm. (0.485 in.) from the contact (lower) side of the base. If excessive wear has occurred on the contact points the base assembly should be renewed.

8. If the dual relay assembly is faulty, it is recommended that a new assembly be fitted. The relays are precision units and are accurately set to give the correct operating times. The spring-loaded adjusting screw is set during the initial build of the relay and the setting should not be altered (see Page T5 - 9).

9. Ensure that the terminals and the terminal blocks are secure on the insulated base.

10. Examine the general condition of the wiring.
11. If the components are satisfactory, retain them with adhesive tape until they are required for final assembly.
12. Check the tightness of the four 5 B.A. screws which secure the slip ring assembly to the shaft.
13. Ensure that a 0,64 mm. (0.025 in.) air gap exists on each side of the silver plated segments which are secured to the slip ring.
14. Ensure that the edges of the slip ring around the air gap are free from burrs.
15. Examine the slip ring face for signs of tracking. This should not normally occur but, if signs of tracking are found, the slip ring assembly must be renewed.
16. Examine the teeth on the worm gear and the worm for damage or uneven wear.
17. Examine the bearing bores in the main casing for signs of fretting. The bearing should be a light push fit in the casing. Reject the casing if the push fit cannot be obtained.
18. Examine for wear, the bush which supports the output shaft. The shaft should be a running fit in the bush, without excessive clearance i.e. the shaft should not rock in the bush.

#### Actuator socket and cable assembly

1. Inspect the cables where they enter the plug(s).
2. Ensure that no corrosion exists and that none of the individual cable strands are broken.

#### Actuator casing

1. Inspect all the sealing faces and the actuator casing and the side cover.
2. Remove all traces of sealing joint and sealing compound.

#### Wormwheel

1. Inspect the wormwheel for abnormal wear of the teeth.

#### Wormshaft bearing

1. Inspect the bearings for undue wear or signs of roughness when rotated.

#### Micro-switch contacts - To set

1. Remove the low tension cable from the ignition coil, switch on the ignition and check that the actuator will select all six gear stations correctly.
2. Move the gear selector lever to 'D' and fit the micro-switch cam to the actuator output shaft. When tightening the  $\frac{1}{4}$  in. A/F nut, the torque reaction should be taken by gripping the output lever such that the tightening force is not absorbed by the nylon teeth of the wormwheel.
3. Move the gear range selector lever to the Park position.
4. Locate the two micro-switches (Neutral start and Height control switches).

Move the switches towards the peak of the cam until the switch plungers are in the centre of the peak and are depressed to within 0,51 mm. (0.020 in.)

of the switch body as shown in Figure T26. When both switches are in the correct position, tighten the mounting bolts.

5. Repeat this procedure on the left-hand micro-switches keeping the switch body on the Reverse micro-switch parallel to the bottom micro-switch body.
6. Select Reverse gear and check that all three switches are clear of the cams.
7. Select Neutral and ensure that the right-hand pair of switch plungers are correctly depressed and that the Reverse micro-switch is clear of the cam.
8. Switch off the ignition and fit the coil low tension cable.
9. Remove the actuator from the car and fit the casing side cover, painting both sides of the new gasket provided with a suitable jointing compound. Fit the actuator to the transmission, connecting the loom plug and the actuator linkage.

#### Gearchange electric actuator - To assemble

Cars prior to serial numbers

34573 - Silver Shadow II

34601 - Silver Wraith II

33019 - Corniche and Camargue

1. Press the output shaft bearing into the actuator casing. The bearing should be fitted such that it is slightly proud on both the inside and outside of the casing.

#### Note

This bearing is an oil retaining type and should not be soaked in any solvent.

2. Fit the wormshaft bearings to the wormshaft ensuring that the bearings are adequately lubricated with Retinax 'A' grease.

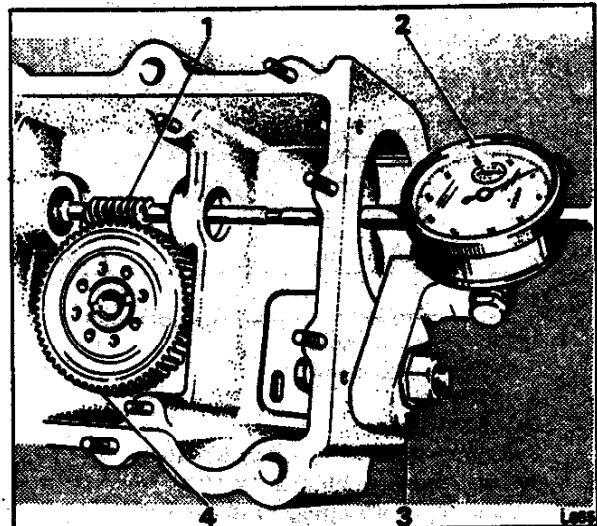


Fig. T22 Checking wormshaft end-float

- 1 Wormshaft
- 2 Dial indicator gauge
- 3 Gauge arm
- 4 Slave gear

3. Assemble the wormshaft and bearings into the actuator case. The bearings must be a slide fit in the casing bores. Adjust the end-float of the wormshaft to between 0,005 mm. and 0,012 mm. (0.002 in. and 0.005 in.) using a suitable thickness of packing washer. Fit the circlip.

4. Fit new contact segments to the slip ring. Ensure that the edges of the segments are free from burrs.

5. Fit the slip ring and gear assembly into the main bush checking that the shaft is a slide fit in the bush.

Lubricate the gear teeth with Retinax 'A' grease. Use only the minimum amount of grease.

6. Fit the thrust washer and circlip to the output shaft.

7. Fit the rubber gaiter, washer and output lever to the shaft. Noting the position of the output lever.

8. Check that the wormshaft rotates freely. Rotate the wormshaft until the open circuit sections of the slip ring are at 90° to the wormshaft and the flat side of the 'D' section of the output shaft inner end is uppermost.

9. Fit the splined collar and coupling onto the wormshaft.

10. Fit the new sealing ring to the groove in the

case and pass the motor cables through the hole.  
11. Mate the splined collar on the motor shaft with the nylon coupling.

12. Fit the three 7/8 in. A/F motor mounting bolts.

13. Check that the wormshaft is free to rotate.

14. Fit the dual relay provided to the new contact assembly and check the tightness of the 5 B.A. terminal screws on the contact assembly.

#### Note

This dual relay is a precision component and its internal settings can easily be upset by maltreatment.

15. Loosely fit the micro-switches to the contact plate assembly. Ensure that the spring washers are fitted under the heads of the long 6 B.A. screws in the slotted holes or under the nuts adjacent to the contact plate in the plain holes.

16. Loosely fit the contact plate assembly into the casing. Taking care not to damage the relay assembly, guide the motor feed wires between the casing and the indentation in the contact base plate.

17. Fit the four 3 B.A. nuts and washers to the contact plate and connect the motor feed cables and the suppressor across the relay mounting bolts as shown in Figure T23. All slack in the motor cables should be taken up by rotating the eyelets about the terminal posts.

18. View the layout of the contacts onto the slip ring through the elongated hole in the contact plate and ensure that there is a minimum of 1,27 mm. (0,050 in.) between adjacent contacts. Also ensure that there is approximately 1,58 mm. (0,062 in.) from either the edge of the segments or the counter-sinkings for the retaining screws.

19. Fit the rubber gasket and socket assembly, guiding the cables through the casing and the aperture in the contact plate.

The socket should be fitted so that the locating tong adjacent to pin A is uppermost on the sloping mounting face of the casing.

20. Fit all cables to their respective connections in accordance with Figures T23 and T24.

The longer cables to the contact plate should be fitted first, followed by the shorter cables and finally the micro-switch and motor connections.

It is recommended that the wires are put into their respective positions before attachment. Also, when making connections to the 5 B.A. terminal screws on the contact plate extreme care should be used when fitting the terminal securing nuts. If these are tightened excessively the first nut on the terminal will be loosened resulting in a poor connection.

21. Fit the actuator onto the gearbox mounting bracket, fit the loom plug to the actuator and connect the linkage.

#### Gearchange electric actuator - To assemble

Cars from serial numbers

34573 - Silver Shadow II

34601 - Silver Wraith II

33019 - Corniche and Camargue

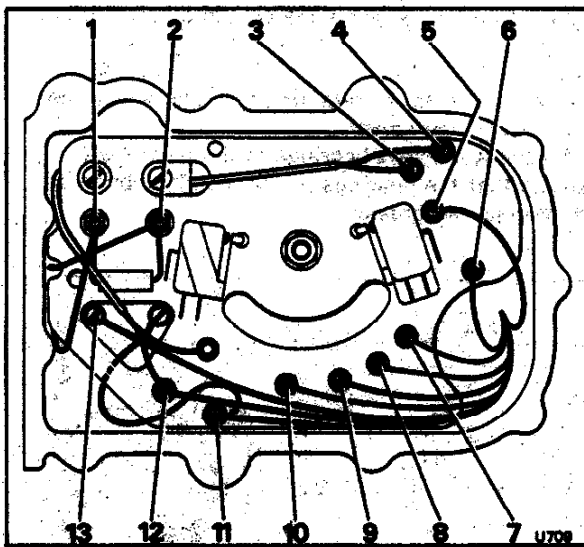


Fig. T23 Cable connections - plug type actuator

- 1 Blue/green to motor
- 2 Red/green to motor
- 3 Red to relay
- 4 Red to relay
- 5 Black/brown from plug to terminal P
- 6 Black/red from plug to terminal R
- 7 Black/blue from plug to terminal N
- 8 Black/green from plug to terminal D
- 9 Black/yellow from plug to terminal I
- 10 Black/white from plug to terminal L
- 11 Black from plug to earth terminal
- 12 Black/slate from plug to ignition terminal
- 13 Brown/black from plug to relay

1. Fit the main output shaft bearing into the actuator casing. The bearing should be fitted such that it is slightly proud on both the inside and outside of the casing.
2. Inspect the inside edge of the cable entry hole and ensure that it is free from burrs and sharp edges.
3. Check the gear form on the wormshaft is free from burrs and that no foreign particles are trapped between the gear teeth.
4. Fit the bearings to the wormshaft ensuring they are lubricated with Retinax 'A' grease. These should be a push fit.
5. Assemble the wormshaft and bearings into the actuator case. The bearings must be a push fit in the casing bores; on no account should they require a hammer load to assemble them.
6. Adjust the end-float of the wormshaft to between 0,005 mm. and 0,012 mm. (0.002 in. and 0.005 in.) using a suitable washer. Fit the circlip. Check the end-float onto the end of the shaft using a dial gauge (see Fig. T22).
7. Check the gear form on the nylon gear is good and free from blow holes and burrs. Check that the shaft bearing area is free from burrs.
8. Fit the nylon gear onto the output shaft using four 5 B.A. screws so that the holes used are at the end of the 'double D' machined flats.
9. Fit the silver plated segments onto the slip ring base. The corners of the segments must be completely free from burrs.
10. Fit the slip ring assembly onto the output shaft assembly, using four 5 B.A. screws and washers. Check the tightness of the 5 B.A. screws after the initial tightening as the nylon tends to settle slightly after the initial compression.

**Note**

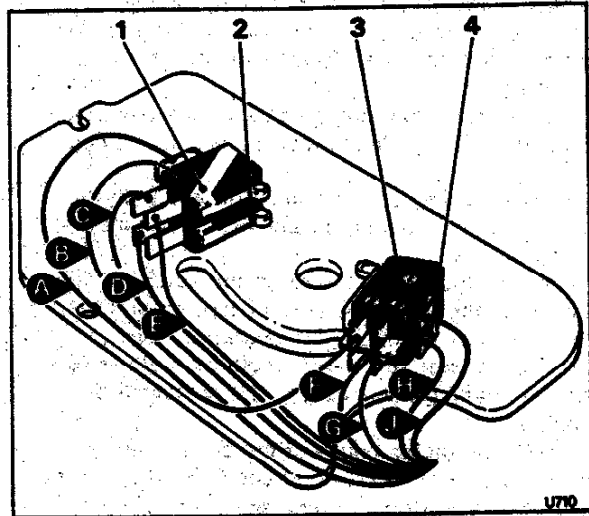
It is essential that the slip ring runs true to the main output shaft.

11. Ensure that both the shaft bearing surface and the inside of the porous bronze bush are clean. Do not clean the bronze bush with any degreasing agent.
12. Fit the main output shaft and slip ring assembly into the bush. This should slide in and no attempt should be made to force it into position.
13. Lift out the shaft and check it has received a smear of oil from the porous bronze bush. Lubricate the nylon gear with Retinax 'A' grease and then fit the assembly into the casing.
14. Fit a bronze washer onto the outside of the shaft and then fit the circlip.

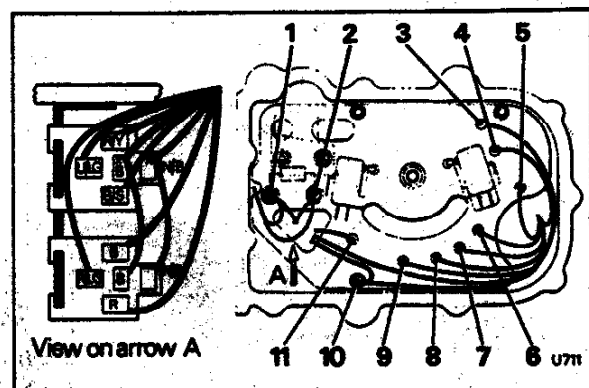
**Note**

Ensure the wormshaft can turn freely and rotate the assembly until the slip ring open circuit sections are approximately at 90° to the wormshaft, and the flat side of the 'D' on the shaft is uppermost.

15. Fit the rubber gaiter to the outside of the casing and over the shaft. Then fit a bronze washer, connecting shaft, securing setscrew and washer.
16. Fit the nylon coupling onto the driving dog of the wormshaft (see Page T5 - 9).
17. Seat the 'O' ring in its groove in the actuator

**Fig. T24 Micro-switch connections - All cars**

- 1 Reverse micro-switch
- 2 Hood micro-switch
- 3 Height control switch
- 4 Neutral start switch
- A Green/yellow
- B Blue/brown
- C White/brown
- D Brown/slate
- E Green/blue
- F Black
- G White/red
- H White/yellow
- J Light green/green

**Fig. T25 Cable connections - Integral loom actuator**

- 1 Red/green to motor
- 2 Blue/green to motor
- 3 Red to loom
- 4 Black/brown to loom
- 5 Black/red to loom
- 6 Black/blue to loom
- 7 Black/green to loom
- 8 Black/yellow to loom
- 9 Black/white to loom
- 10 Black to earth terminal
- 11 Red/yellow to relay

casing and pass the motor feed wires through the hole in the casing. Mate the nylon coupling on the wormshaft with the motor shaft and hold the motor in position.

18. Fit the three mounting setscrews and washers and tighten evenly. Check that the wormshaft can be rotated easily.

19. Fit the sealing gasket and outlet elbow to the cable exit of the casing; secure with four nuts and spring washers.

20. Feed the loom cables through the actuator casing from the inside. A strip of tape around the cable ends may assist in this operation. Pull the loom through until sufficient length of cable is left inside the casing to connect to the contact plate assembly.

21. Check the inside edges of the conduit elbow (tunnel connection) are free of burrs. Feed the loom through the conduit and elbow; push the conduit over the cable exit connection of the casing and the conduit elbow, secure both ends with spring clips. Remove the tape from the cable ends; connect the cables into the 20-way plug (see Fig. T27).

22. At the inside of the actuator casing fit a tie wrap to the loom at the cable exit. This should be passed through the centre of the loom and then wrapped around the loom 1½ times and fixed tightly. The position of the tie wrap must be such that when the actuator is suspended by the loom, the tie wrap takes the load and no electrical connections are under stress.

23. Connect the electrical connections to the relays on the underneath of the contact plate assembly (see Page T5 - 9). Fit a tie wrap around the cables

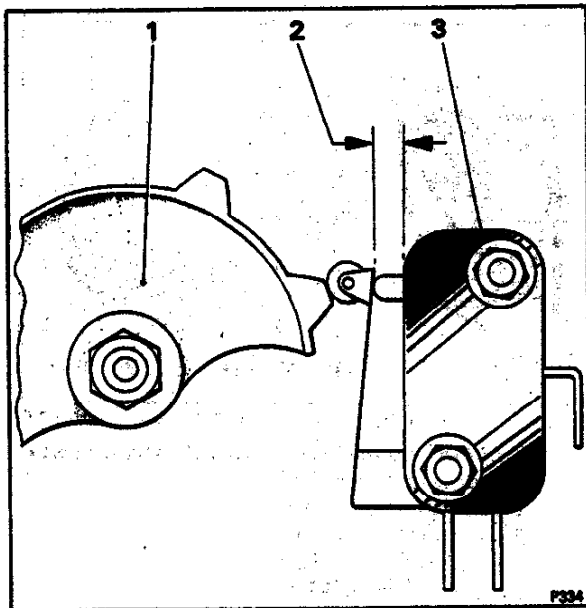


Fig. T26 Adjustment of micro-switches

- 1 Cam
- 2 Gap 0,51 mm. (0.020 in.)
- 3 Micro-switch

and bracket to avoid a foul between the wires and motor shaft.

24. Loosely fit the contact plate assembly into the casing, taking care not to damage the relay assembly. Guide the motor feed wires between the casing and the indentation in the contact plate tufnol base.

25. Fit the four 3 B.A. nuts and washers, tightening them evenly.

26. View the layout of the contacts onto the slip ring through the elongated hole in the contact plate, and ensure that there is a minimum of 1,27 mm.

(0.050 in.) between adjacent contacts. Also, ensure that there is approximately 1,58 mm. (0.062 in.) from either the edge of the segments or the countersinks for the retaining screws.

27. Fit the electrical connections, starting with the longest connections on the contact base first,

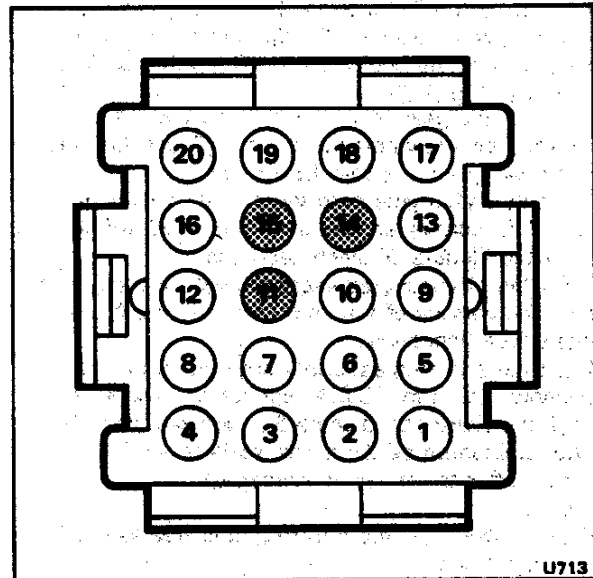


Fig. T27 20-way plug connections

- 1 Black/white
- 2 Black/yellow
- 3 Black/green
- 4 Black/blue
- 5 Brown/black
- 6 Black/red
- 7 Black/brown
- 8 Black/slate
- 9 Light green/green
- 10 Green/black
- 11 Not used
- 12 Black
- 13 Green/blue
- 14 Not used
- 15 Not used
- 16 Blue/brown
- 17 White/brown
- 18 White/red
- 19 White/yellow
- 20 Brown/slate

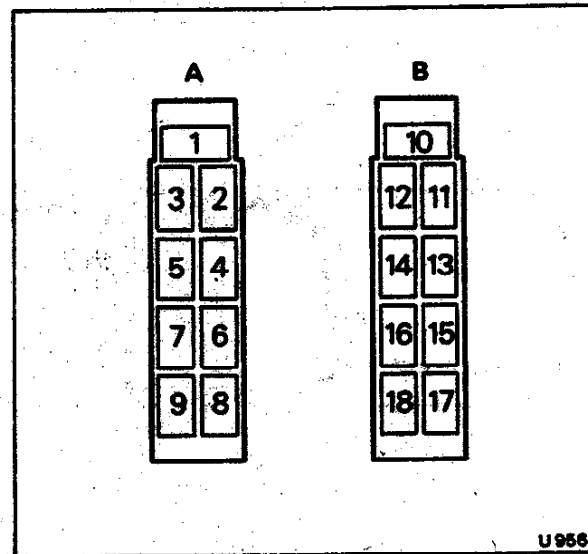
progressing to the shorter wires and then finally the micro-switches, suppressor and motor terminations (see Figs. T24 and T25).

28. Fit the casing lid, with its gasket painted with Wellseal on both sides. Tighten down using nuts and spring washers.

29. Fit the rubber boot over the motor. A smear of grease inside the leading edge of the boot assists the fitting. Retain the boot onto the motor using a wire clip, which, while needing reasonable tightening should not be allowed to cut into the rubber.

#### Modified electrical connections (loom plug)

The 20-way plug has been superseded by two 9-way plugs (see Page T5 - 9). Therefore the main distribution loom has also been modified. The cable connections for the plugs are as shown in Figure T28.



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#### Gearchange actuator motor - To dismantle

1. Using a suitable puller remove the drive gear from the motor. Alternatively, tap out the driving pin (see Page T5 - 9).
2. Unscrew and withdraw the two bolts securing the motor housing, remove the housing.
3. Remove the armature from the end plate.

#### Gearchange actuator motor - To inspect

1. Examine the magnets for any damage, cracks or fractures.
2. Examine the brushes for wear; fit new brushes if necessary.
3. Examine the armature commutator for wear or damage, if scored polish with fine emery cloth. If the score marks are heavy and cannot be removed with light polishing, fit a new armature.
4. After polishing carefully clean the commutator slots to remove particles of carbon.
5. Examine the bearing bushes for wear, replace if necessary.
6. Examine the armature shaft for wear on the bearing diameter.

#### Gearchange actuator motor - To assemble

Assemble the actuator motor (see Figs. T29 and T30) by reversing the procedure given for dismantling. Test the motor after assembly, if the current consumption exceeds 7.5 amps. the armature has an electrical fault and should be renewed.

#### Gearchange electric actuator - To fit

1. Fit the actuator to the rear extension of the transmission.
2. Torque tighten the bolts (see Chapter P).
3. Fit the 'multi-pin' plug and tighten the knurled nut (see Page T5 - 9). Alternatively, feed the plug end of the wiring loom through the hole in the transmission tunnel. Secure the elbow to the tunnel ensuring that a new gasket is fitted. Feed the wiring loom behind the automatic air conditioning servo

Fig. T28 Modified loom plug connections

A

- 1 Brown/black
- 2 Black/red
- 3 Black/brown
- 4 Black/green
- 5 Black/blue
- 6 Black/white
- 7 Black/yellow
- 8 Black
- 9 Black/slate

B

- 10 Green/black
- 11 Not used
- 12 Light green/green
- 13 Green/blue
- 14 White/brown
- 15 White/yellow
- 16 White/red
- 17 Brown/slate
- 18 Blue/brown

unit clips and connect the electrical plug(s).

4. Connect the linkage.
5. Connect the battery.

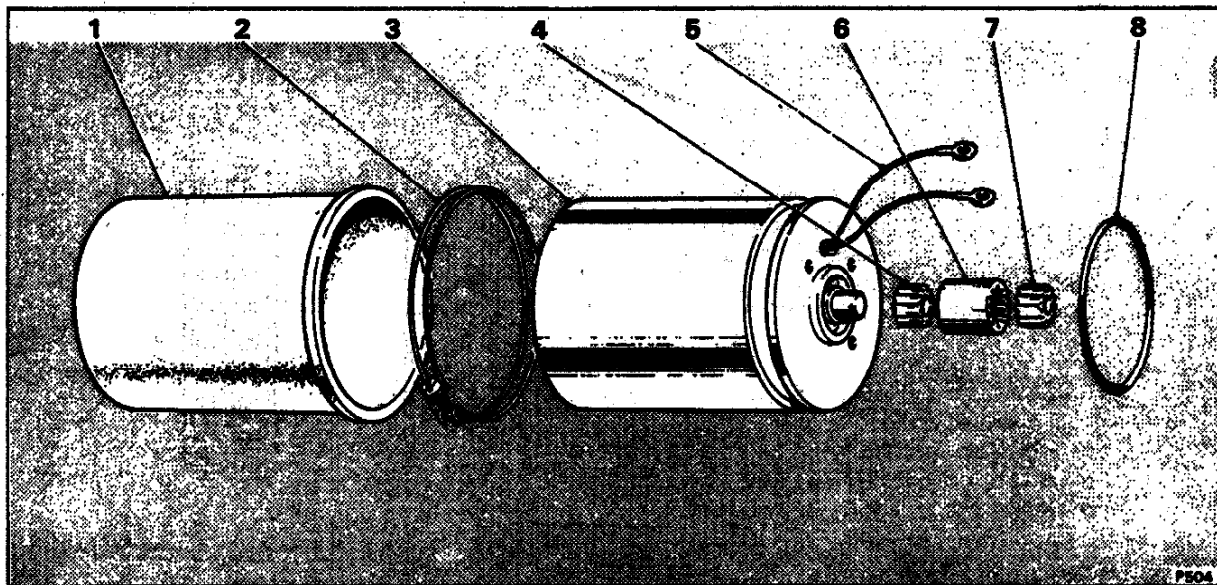


Fig. T29 Gearchange actuator motor - splined coupling

- 1 Motor cover
- 2 Motor cover securing clip
- 3 Motor
- 4 Motor splined drive
- 5 Motor flying leads
- 6 Coupling (splined)
- 7 Wormshaft splined drive
- 8 'O' ring

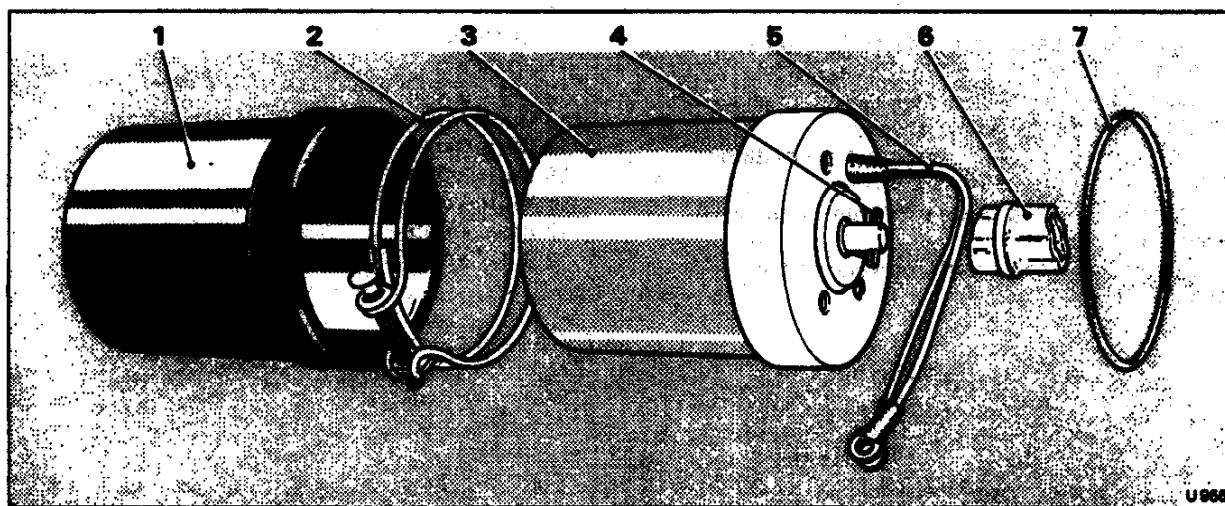


Fig. T30 Gearchange actuator motor - pin coupling

- 1 Motor cover
- 2 Motor cover securing clip
- 3 Motor
- 4 Motor pin drive
- 5 Motor flying leads
- 6 Motor drive coupling
- 7 'O' ring

**Modifications to gear change actuator****Electrical connections with integral loom**

From car serial numbers

34573 - Silver Shadow II

34601 - Silver Wraith II

33019 - Corniche and Camargue

**Motor to actuator coupling simplified**

From car serial numbers

Silver Shadow II - SRX 34573, SRH 34578, SRH 34583,  
SRH 34591, SRH 34592, SRH 34595, SRH 34599 and  
onwards.

Silver Wraith II - LRX 34469, LRX 34470 and onwards.

Corniche - CRG 34319, DRG 34322, DRG 34327 and  
onwards.

Camargue - JRX 32181 and onwards.

**Electrical relays - Lucas part replaced by two Bosch  
'mini-relays'**

From car serial numbers

Silver Shadow II - SRH 36618, SRH 36638, SRK 36674,  
SRX 36676, SRK 36822, SRK 36825, SRH 36830, SRK  
36832 and onwards.Silver Wraith II - LRX 36425, LRX 36436, LRX 36493,  
LRH 36572, LRH 36574, LRK 36705, LRX 36709, LRK  
36712, LRH 36718 and onwards.Corniche - DRK 50045, CRX 50047, CRX 50050 and  
onwards.

Camargue - JRX 32716 and onwards.

**Modified electrical connections between actuator  
and main distribution loom**Two 9-way plugs replace one 20-way plug from the  
following car serial numbers.**Silver Shadow II, Silver Wraith II and Bentley T2**

Right-hand drive

SBH 0040836, LRH 0040839 and onwards

Left-hand drive

LRX 36632, LRL 39197, LRL 39282, LRL 39351,  
SRL 39760, SRL 39914, SRL 39939, SRL 39944,  
SRX 39949, SRX 39953, SRK 39957, SRL 39959,  
SRX 39962, SRL 39964, SRL 39976, SRX 39981 and  
onwards.**Corniche**CRH 0050482, DBL 50508C, CRH 0050521 and  
onwards.**Camargue**

JRX 50576 and onwards

## Section T6

## Transmission - To remove and fit

## Transmission - To remove

1. Drive the car onto a ramp.
2. Ensure that both front road wheels and one rear road wheel are suitably 'chocked' to prevent the car moving.
3. Switch on the ignition and select Neutral position with the gearchange selector lever. This ensures that the transmission and propeller shaft are not locked in the Park position.
4. Switch off the ignition and remove the gearchange thermal cut-out from the fuseboard.
5. Disconnect the battery.
6. Jack up the 'un-chocked' rear road wheel to enable the propeller shaft to be rotated.
7. Disconnect and remove the propeller shaft (see

Chapter F).

8. Lower the rear road wheel and suitably 'chock'.
9. Raise the bonnet.
10. Drain the transmission fluid (see Section T2).
11. Remove the dipstick and filler tube, together with the vacuum modulator pipe. Blank off the hole in the sump to prevent any remaining transmission fluid from running out as the transmission is removed. Discard the 'O' ring (if fitted) from the filler tube connection.
12. Disconnect the speedometer electronic impulse transmitter electrical connections, noting the cable colours to assist when fitting. Slacken and remove the transmitter retaining nut and withdraw the transmitter.

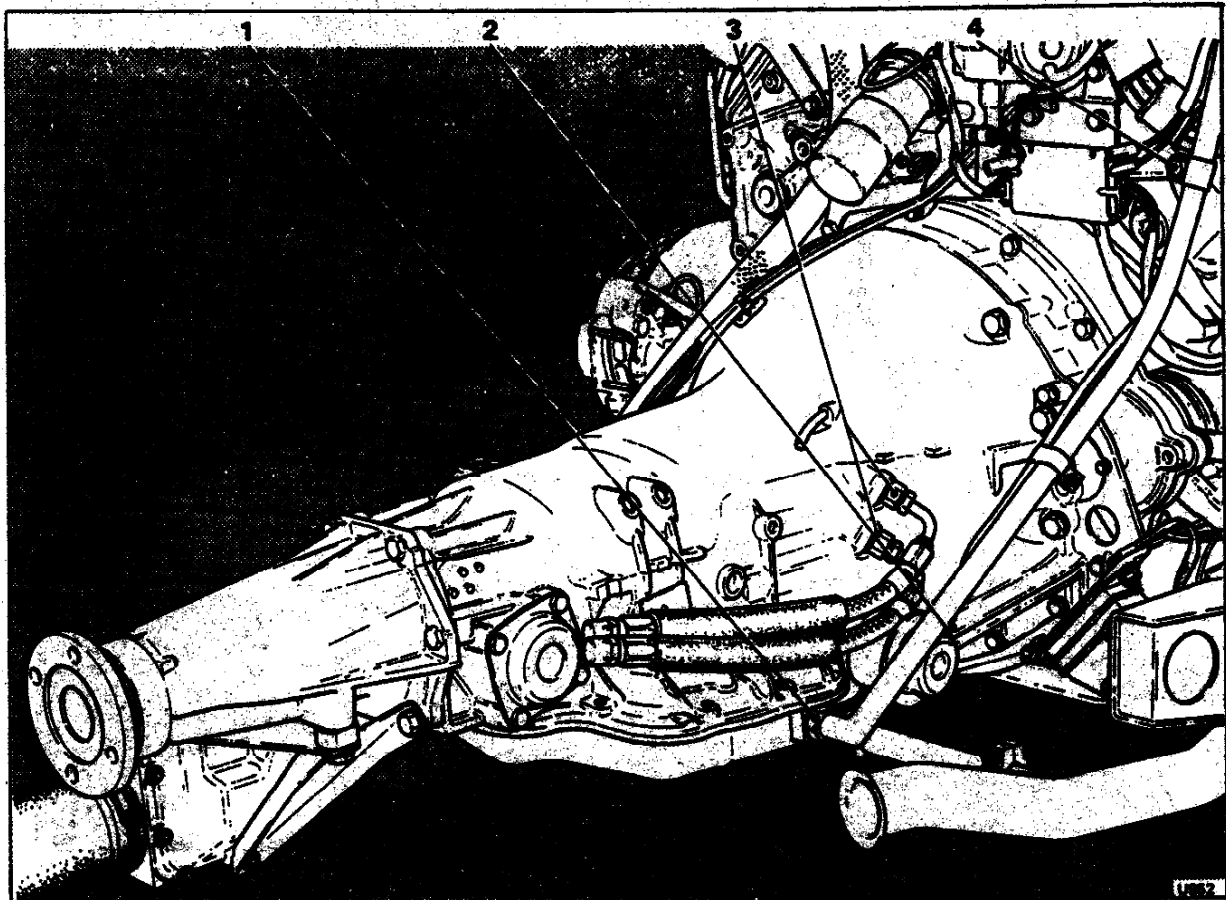


Fig. T31 Transmission disconnecting points - Right-hand side

- 1 Fluid drain point
- 2 Modulator pipe

- 3 Transmission oil cooler pipe connections
- 4 Dipstick/filler tube clip

13. Disconnect the top gear switch and detent solenoid electrical connections.

14. Remove the gearchange actuator electrical connections (see Section T5).

15. Disconnect the operating rod from the side of the transmission case.

16. Remove the bolts securing the gearchange actuator to the rear extension; remove the actuator.

**Note**

Operations 15 and 16 are only required to assist the handling of the transmission.

17. Remove the right-hand front silencer/catalytic converter and fire shield (if fitted).

18. Remove the front balance/E.G.R. balance pipe (if fitted).

19. On cars conforming to a 1980 Californian specification, remove the front section of the exhaust system (see Chapter Q).

20. On left-hand drive cars remove the throttle linkage cross-shaft.

21. Disconnect the two transmission fluid flexible pipes leading to and from the heat exchanger situated in the engine coolant radiator. The pipes

should be disconnected where the flexible pipe joins the solid metal pipe.

**Note**

There may be a small quantity of transmission fluid in the pipes which will drain out when the pipes are disconnected therefore, ensure a suitable container is available.

22. Remove the setscrews which secure the front cover plate and bell housing bottom cover; remove the plate and cover.

23. Scribe correlation marks onto the converter and flexplate, then remove the setscrews which secure the engine flexplate to the torque converter.

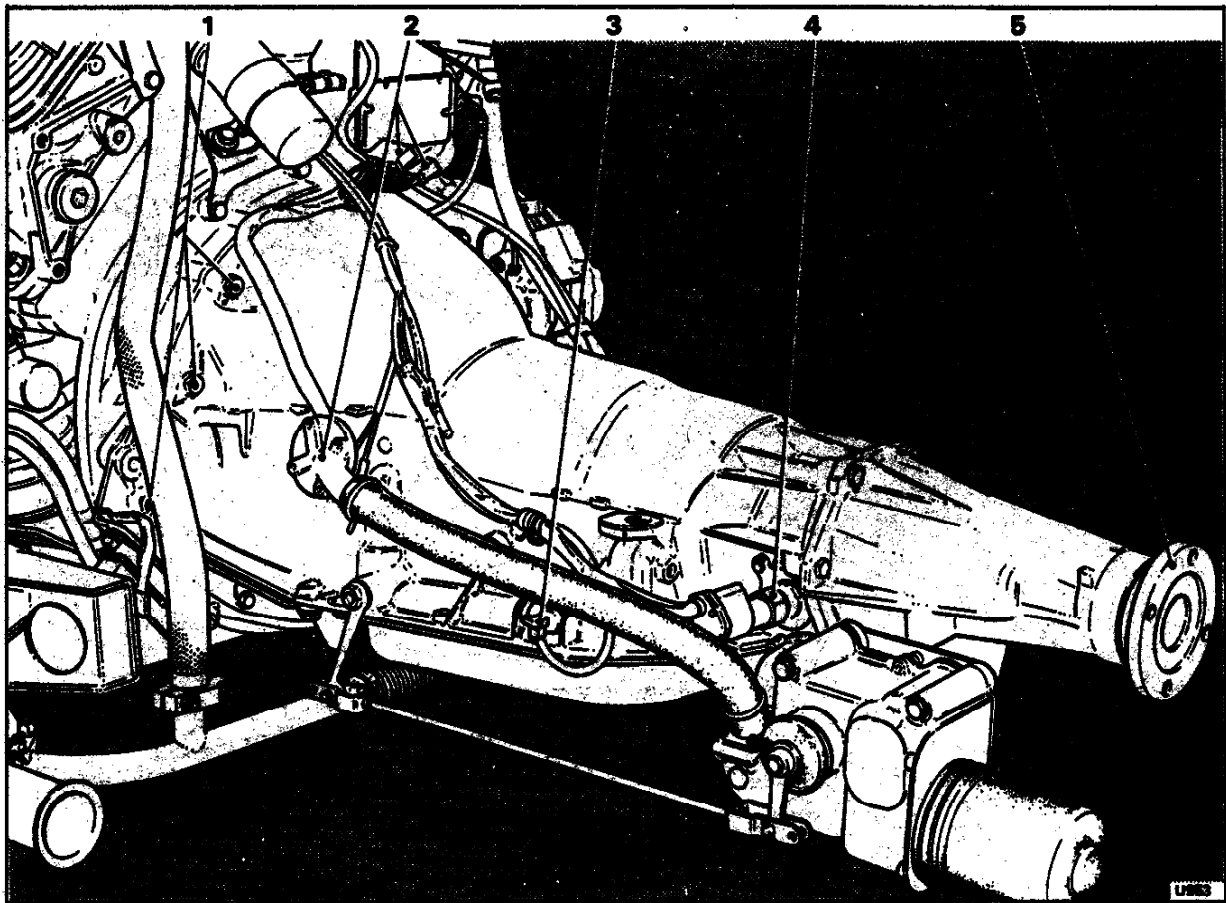
**Note**

Take care not to damage the flexplate or starter ring when turning the torque converter to gain access to the setscrews.

24. Using a suitable platform to fit around the transmission sump, support the transmission with the aid of a trolley jack and extension.

25. Unscrew the setscrews which secure the transmission to the adapter.

26. Carefully move the transmission towards the



**Fig. T82 Transmission disconnecting points - Left-hand side**

1 Transmission securing setscrews

2 Gearchange actuator connections

3 Top gear switch/detent solenoid connections

4 Electronic impulse transmitter

5 Coupling flange

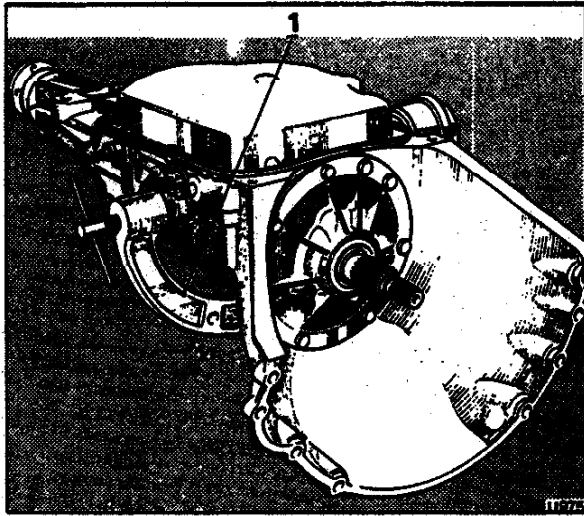


Fig. T33 Transmission in holding fixture  
1 Holding fixture

rear of the car until the dowels in the transmission are clear of the mounting plate.

27. Fit the retaining clamp RH 7952 (J-21366) to prevent the converter from becoming disengaged from the transmission.

**Note**

The retaining clamp must be used, otherwise the converter may fall as the transmission is being removed.

28. Lower the jack until the transmission is clear of the body, then remove the transmission from beneath the car.

29. If overhaul work is to be carried out, remove the retaining clamp and withdraw the converter.

**Note**

A converter containing oil weighs approximately 22,68 kg. (50 lbs.).

30. Fit the transmission into the holding fixture RH 7955 (J-8783) as shown in Figure T33.

**Transmission - To fit**

Fit the transmission by reversing the procedure given for removal, noting the following points.

1. Ensure the mating faces of the transmission and the mounting plate are clean and free from damage.
2. Torque tighten the various nuts, bolts, setscrews, etc. to the figures quoted in Chapter P.
3. A liberal coating of Retinax 'A' grease should be applied all over the converter pilot spigot prior to fitting the converter.
4. Rotate the converter until the correlation marks (scribed on during removal) are aligned and then fit the setscrews. Do not lever on the starter ring when rotating the converter.
5. If a new transmission is being fitted, the heavy spot marked on the rear face of the flexplate by a radial line of either white or yellow paint must be positioned as close as possible to the light spot (white letter L) on the converter.

6. After completion of the fitting operation, fill the transmission with fluid (see Section T2).
7. Finally, road test the car for satisfactory operation.

## Section T7

## Torque converter

The torque converter serves two primary functions. It acts as a fluid coupling to transmit engine torque smoothly to the transmission. It also multiplies the engine torque when additional performance is required.

The torque converter comprises three basic elements; a pump, a turbine and a stator (see Fig. T34).

The converter cover is welded to the pump to seal all three members in an oil filled housing. An engine driven flexplate bolts directly onto the converter cover so that the converter pump is mechanically connected to the engine and turns whenever the engine rotates.

When the engine is running and the converter pump is rotating, oil is picked up at the centre of the pump and discharged at the rim, between the pump blades.

The pump shell and blades are designed so that the oil leaves the pump rotating clockwise, towards the turbine blades. As the oil strikes the turbine blades, it causes the turbine to rotate.

When the engine is idling, the converter pump rotates slowly and the force of oil is not sufficient to rotate the turbine with any efficiency. This situation enables the car to stand in gear with the engine slowly idling. As the engine throttle is opened, the pump speed increases and the force of oil striking the turbine causes it to transmit torque to the gear train. After the oil has imparted its force to the turbine, the oil follows the contour of the turbine shell and blades, leaving the centre of the turbine, and rotating anti-clockwise.

Because the turbine member has absorbed the force required to reverse the direction of the clockwise rotating oil it now has greater torque than is being delivered by the engine.

To prevent the anti-clockwise spinning oil from striking the pump blades at an angle that would hinder its rotation, a stator assembly is interposed between the pump and the turbine. The purpose of the stator is to redirect the oil returning from the turbine so that its direction is altered to suit that of the pump.

The energy of the oil is then used to assist the engine in turning the pump. This increases the force of the oil driving the turbine and as a result, multiplies the torque.

The force of oil flowing from the turbine to the stator blades tends to rotate the stator anti-clockwise. However, a clutch on which the stator is mounted, prevents this.

As both turbine and car speeds increase, the

direction of the oil leaving the turbine changes. The oil flows clockwise against the rear side of the stator vanes. If the stator was fixed, the flow of oil would be impeded, but the clutch allows the stator to rotate on its shaft. Once the stator becomes inactive there is no further torque multiplication and the converter functions as a fluid coupling at a ratio of 1:1.

## Torque converter - To remove

1. Remove the transmission as described in Section T6.

## Note

Do not forget to fit the Converter Holding Clamp RH 7952 (J-21366) otherwise the converter may fall when the transmission is removed.

2. Position a drip tray underneath the converter.  
3. Remove the converter retaining clamp from the

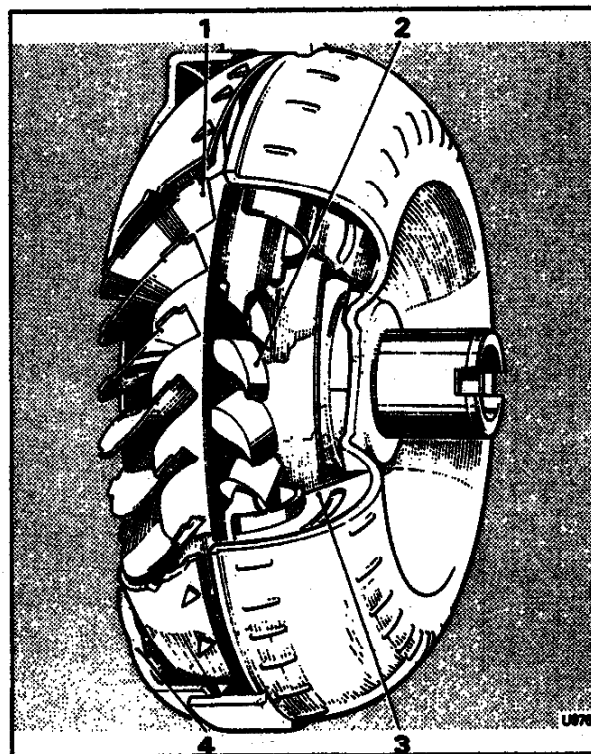


Fig. T34 Torque converter - Cut-away view

- 1 Turbine
- 2 Stator
- 3 Pump
- 4 Converter cover

bell housing end of the transmission casing; remove the converter.

**Caution**

The converter and oil weigh approximately 22,68 kg. (50 lbs.) and care should be taken when removing it to ensure that it is not dropped or damaged.

**Torque converter - To inspect**

After removing the torque converter from the transmission visually inspect as follows.

1. Examine the converter for signs of damage.
2. Examine the neck of the converter for wear.
3. Examine the pump drive slots for wear.

For a more detailed procedure of inspection refer to Section T21-Fault Diagnosis.

**Torque converter - To fit**

1. Fit the converter to the transmission, ensuring that the driving slots engage with the tangs in the transmission oil pump.
2. Fit the converter holding clamp RH 7952 (J-21366).

**1979 Transmissions**

Changes have been made to the threads of the three setscrew holes in the torque converter from UNC to Metric. Either converter may be fitted, therefore, a careful check of the threads must be made before fitting it to the transmission.

The Metric setscrews are identified by a letter M on the head.

Section T8

Vacuum modulator and valve

The vacuum modulator is secured to the right-hand side of the transmission case and is connected by a pipe to the engine induction system. The modulator consists of a metal case which encloses an evacuated metal bellows, a diaphragm and two springs. These components are arranged so that when fitted, the bellows and an external spring apply a force that acts on the modulator valve to increase modulator pressure. Engine vacuum and an internal spring act in the opposite direction to decrease modulator pressure.

To reduce the effect of altitude on shift points, the effective area of the diaphragm is different than that of the bellows. Atmospheric pressure acts on the resulting differential area to reduce modulator pressure.

The vacuum modulator fitted to a transmission can vary dependent upon 'model year' and original build specification of the car. It is therefore, of utmost importance to ensure that the correct parts are fitted to a transmission should replacement parts be required.

To identify the modulator check the prefix letters of the transmission i.e. RS, RR or RC.

A restrictor is fitted at the bottom of the modulator pipe and an error in assembly at this point could result in a blocked signal line especially on cars fitted with full emission control systems.

Modulator pressure is directed to the 1-2 regulator valve which regulates modulator pressure to a lesser pressure which is proportional to modulator pressure. This tends to keep the 1-2 shift valve in the closed or down-change position. Modulator pressure is directed also to the 2-3 modulator valve to apply a variable pressure proportional to modulator pressure. This tends to hold the 2-3 shift valve in the closed, or down-change position. As a result, the gearchange points can be delayed to take place at higher road speeds with heavy throttle application (see Fig. T35).

Main line oil pressure is controlled in Drive range so that it will vary with torque input to the transmission. Since torque input is a product of engine torque and converter ratio, modulator pressure

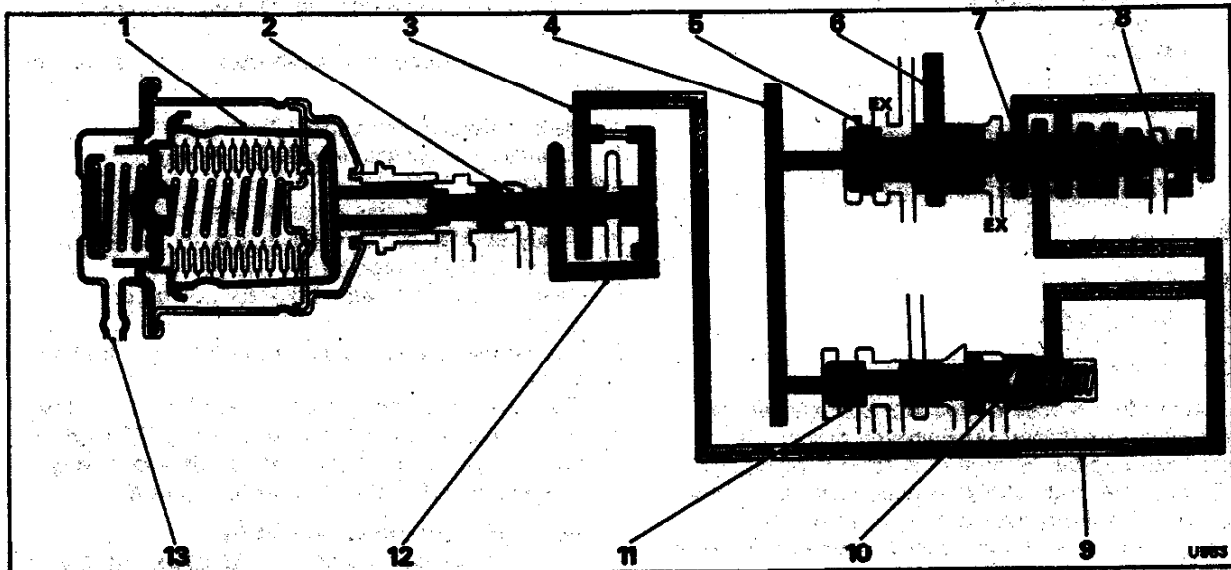


Fig. T35 Vacuum modulator and valve showing modulator pressure

- |                    |                    |                        |
|--------------------|--------------------|------------------------|
| 1 Vacuum modulator | 6 Drive oil        | 10 2-3 modulator valve |
| 2 Modulator valve  | 7 1-2 detent valve | 11 2-3 valve           |
| 3 Modulator oil    | 8 Regulator valve  | 12 Line oil            |
| 4 Governor oil     | 9 Modulator oil    | 13 Vacuum connection   |
| 5 1-2 valve        |                    |                        |

Drive or Line oil
  Governor oil
  Modulator oil

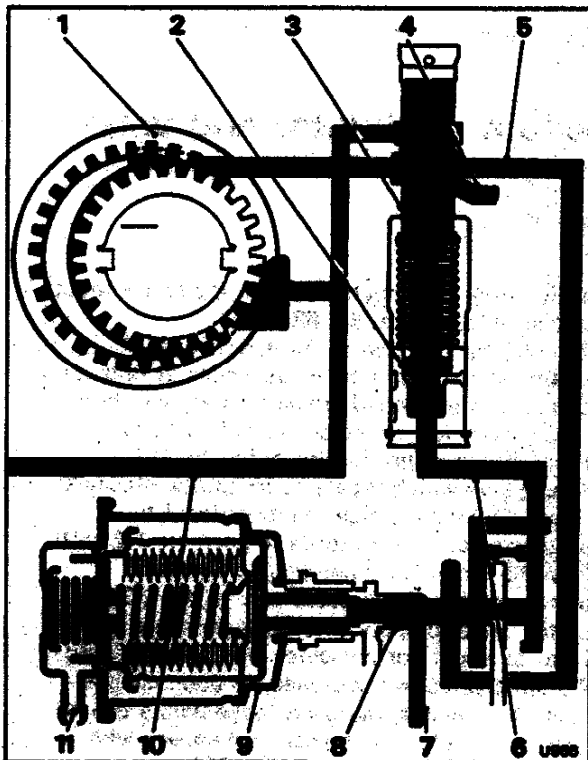


Fig. T36 Vacuum modulator and valve showing line pressure control

- 1 Pump assembly
- 2 Boost valve
- 3 Regulator valve
- 4 Converter passage
- 5 Line oil
- 6 Modulator oil
- 7 Governor oil
- 8 Modulator valve
- 9 Vacuum modulator assembly
- 10 Intake oil
- 11 Vacuum connection

- Line oil
- Governor oil
- Modulator oil
- Intake oil

is directed to a pressure regulator boost valve, to adjust main line (pump) pressure for changes in either engine torque or converter ratio (see Fig. T36).

To regulate modulator pressure and in turn, line pressure, with the converter torque ratio that decreases as car speed increases, governor pressure is directed to the modulator valve to reduce modulator pressure with increases in car speed. In this way, line pressure is regulated to vary with torque input to the transmission for smooth changes with sufficient capacity for both heavy and light acceleration.

**Vacuum modulator and valve - To remove**  
The vacuum modulator can be removed from the

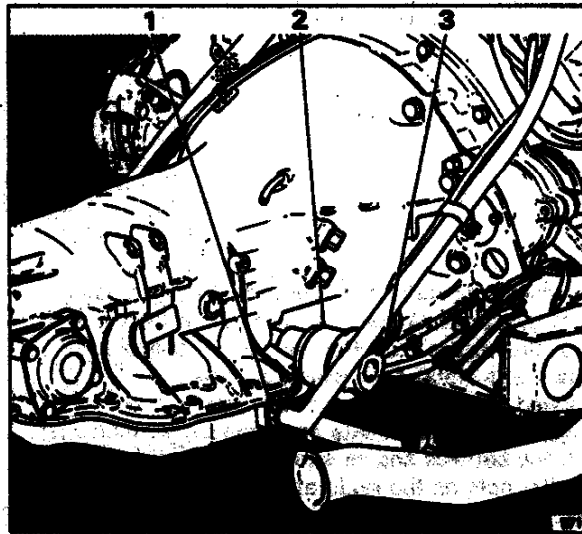


Fig. T37 Vacuum modulator and vacuum pipe

- 1 Fluid drain point
- 2 Vacuum modulator
- 3 Vacuum pipe

transmission without removing the transmission from the car. The following instructions apply whether or not the transmission has been removed:

1. Place a drip tray beneath the vacuum modulator.
2. Disconnect the vacuum pipe at the modulator end if the transmission is in the car (see Fig. T37).
3. Remove the setscrew and retainer which secure the modulator to the transmission.
4. Remove the modulator and 'O' ring; discard the 'O' ring.
5. Remove the modulator valve from the transmission case.

**Vacuum modulator and valve - To inspect**

1. Examine the vacuum modulator for signs of distortion.
2. Examine the 'O' ring seat for damage.
3. Apply suction to the vacuum tube on the modulator and check for leakage.
4. Examine the modulator valve for scores or damage.
5. Ensure that the valve will move freely in its bore in the case.
6. Examine the modulator for damaged bellows. The modulator plunger is under approximately 7.25 kgf. (16 lbf.) pressure. If the bellows are damaged, very little pressure will be applied to the plunger.

**Vacuum modulator and valve - To fit**

1. Fit the valve into the bore in the case with the stem outward.
2. Fit a new 'O' ring to the modulator.
3. Fit the modulator to the case with the vacuum pipe connection toward the front of the car.
4. Fit the retainer together with the retaining setscrew and torque tighten to the figures quoted in Chapter P.
5. Connect the vacuum pipe.

Section T9

Governor assembly

The governor assembly (see Fig. T38) fits into the rear of the transmission casing on the right-hand side and is driven by a gear on the transmission output shaft.

The car speed signal to the transmission is supplied by this governor.

The assembly comprises a regulating valve, two primary weights, two secondary weights, secondary springs, body and driven gear. The weights are arranged so that only the secondary weights act on the valve. The primary weights contribute to the secondary weights through the secondary springs.

Slight changes in output shaft r.p.m. at low speeds result in small governor pressure changes.

The primary weights add additional force to the secondary weights to obtain greater changes in pressure as road speed and output shaft r.p.m. increase. As the primary weights move out at higher car speeds they reach a stop and no longer become effective. From this point, the secondary weights and springs only are used to apply pressure on the governor valve.

Drive oil pressure is fed to the governor where it is regulated by the governor and gives an oil pressure that is proportional to car road speed.

To initiate the gear change from first to second, governor oil pressure is directed to the end of the 1-2 shift valve where it acts against spring pressure which is holding the valve in the down-change (closed) position (see Fig. T39).

As the road speed of the car and subsequently the governor oil pressure increases sufficiently to overcome the spring resistance, the 1-2 shift valve moves, allowing drive oil to flow into the intermediate clutch passage and through an orifice to apply the intermediate clutch. This makes the intermediate clutch effective which moves the transmission into second gear. Further increases in road speed and governor pressure will cause the transmission to change into third gear when governor pressure overcomes the 2-3 shift valve spring pressure.

Governor pressure is directed also to the modulator valve to regulate modulator pressure as described in Section TB.

Governor lubrication is provided by a flat in the governor sleeve which allows oil to pass to the moving parts of the governor.

**Governor assembly - To remove**

The governor assembly can be removed from the transmission whether the transmission is fitted to the car or not.

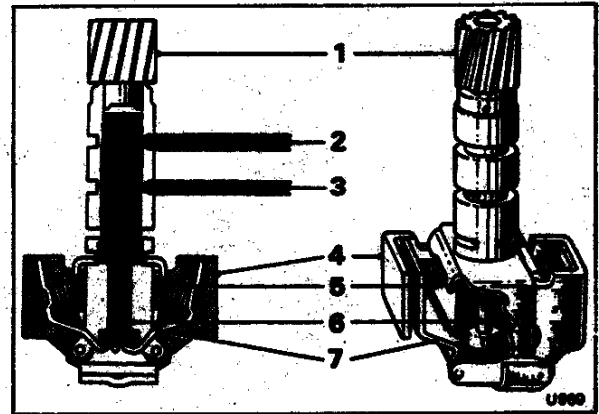


Fig. T38 Governor assembly

- 1 Driven gear
- 2 Drive oil
- 3 Governor oil
- 4 Primary weight
- 5 Spring
- 6 Valve
- 7 Secondary weight

- Drive oil
- Governor oil

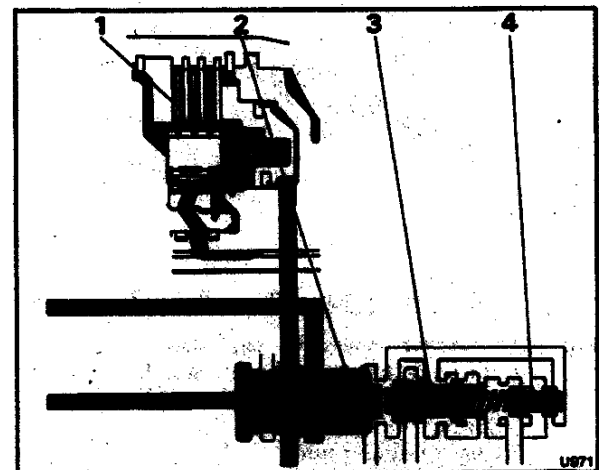


Fig. T39 Governor oil acting on the 1-2 shift valve

- 1 Intermediate clutch
- 2 1-2 valve
- 3 1-2 detent valve
- 4 Regulator valve

- Drive and Intermediate clutch oil
- Governor oil

1. Position a drip tray beneath the governor cover plate.
2. Remove the four setscrews which secure the

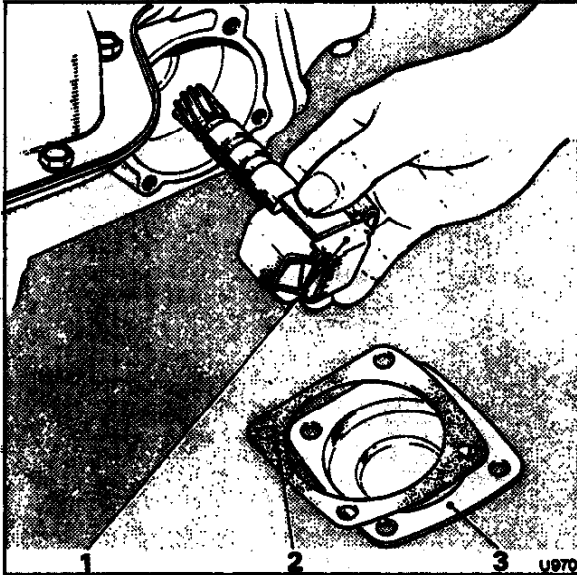


Fig. T40 Removing the governor assembly

- 1 Governor
- 2 Gasket
- 3 Cover plate

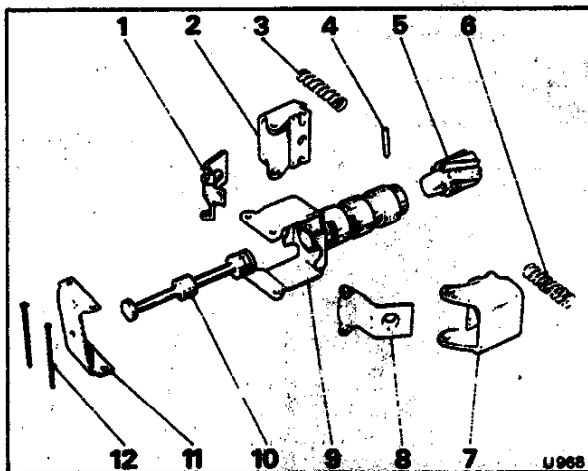


Fig. T41 Governor assembly - exploded

- 1 Spring retainer (secondary weight)
- 2 Weight (primary)
- 3 Spring
- 4 Gear retaining pin
- 5 Driven gear
- 6 Spring
- 7 Weight (primary)
- 8 Spring retainer (secondary weight)
- 9 Sleeve and carrier assembly
- 10 Valve
- 11 Thrust cap
- 12 Retaining pins

plate to the case; remove the plate and discard the gasket.

3. Withdraw the governor assembly from the case (see Fig. T40).

Possible causes of governor binding or locking are the pipes to the control valve unit. These may have been fitted too deep into the transmission case, so entering the governor bore.

Therefore, if difficulties are experienced when removing the governor assembly, withdraw the pipes approximately 3,17 mm. (0.125 in.).

#### Governor assembly - To dismantle

All the governor assembly components, with the exception of the driven gear, are selectively assembled and each assembly is calibrated. Therefore, it is recommended that if the governor assembly becomes unserviceable, it be renewed as an assembly. If the driven gear is damaged, it can be renewed separately.

It is necessary to dismantle the governor assembly in order to renew the driven gear. Dismantling may be necessary also to thoroughly clean the governor should dirt cause it to malfunction. In such cases proceed as follows:

1. Cut off one end of each of the governor weight retaining pins.
2. Remove the pins, thrust cap, governor weights and springs (see Fig. T41). The weights are interchangeable and need not be marked for identification.
3. Carefully remove the governor valve from the sleeve.

#### Governor assembly - To inspect

1. Wash all the components in clean paraffin, then dry them with compressed air.
2. Examine the governor sleeve for scores or burrs.
3. Ensure that the governor sleeve will slide freely into its bore in the transmission casing.
4. Examine the valve for scores and burrs.
5. Ensure that the valve will slide freely in the governor sleeve bore.
6. Examine the driven gear for damage. Ensure that the gear is secure on the shaft.
7. Examine the springs for damage or distortion.
8. Ensure that the weights operate freely in their retainers.
9. Check the valve opening at inlet and exhaust; the minimum is 0,51 mm. (0.020 in.).
10. Hold the governor as shown in Figures T42 and T43 when carrying out this check.

#### Governor driven gear - To renew

1. Drive out the gear retaining pin using a hammer and drift (see Fig. T44).
2. Support the governor sleeve on two 2,77 mm. (0.109 in.) thick plates inserted in the exhaust slots in the sleeve.
3. Position the plates on the bed of a press with provision for the gear to pass through, then, using a long drift, press the gear out of the sleeve.
4. Thoroughly clean the governor sleeve to remove

any swarf which may be present from the original gear assembly operation.

**Note**

Ensure that the new gear is the correct one for the transmission casing in which it is to be fitted.

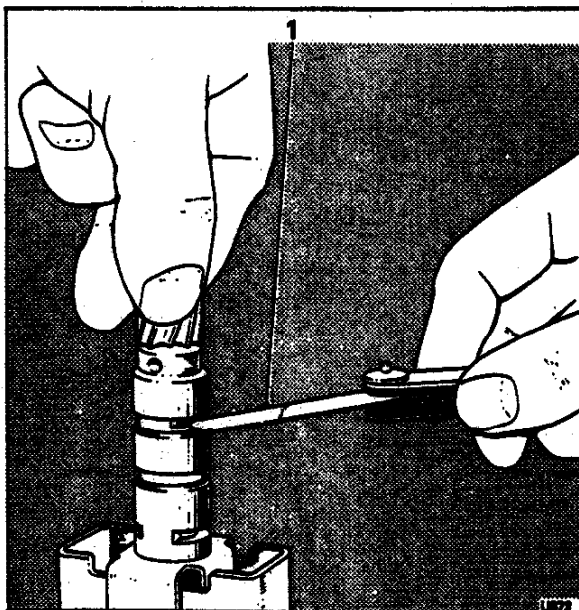
5. Support the governor sleeve on the two 2,77 mm. (0.109 in.) plates.
6. Position the new gear in the sleeve then, using a suitable drift, press the gear into the sleeve until it is nearly seated.
7. Carefully remove any swarf which may have shaved off the gear hub, then, press the gear down until it abuts the sleeve.
8. Mark the position of a new hole on the sleeve at 90° to the original hole, then using a drill of 3,17 mm. (0.125 in.) diameter, drill a new hole through the sleeve and gear.
9. Fit the gear retaining pin.
10. Thoroughly wash the gear and sleeve assembly in clean paraffin and dry with compressed air.

**Governor assembly - To assemble**

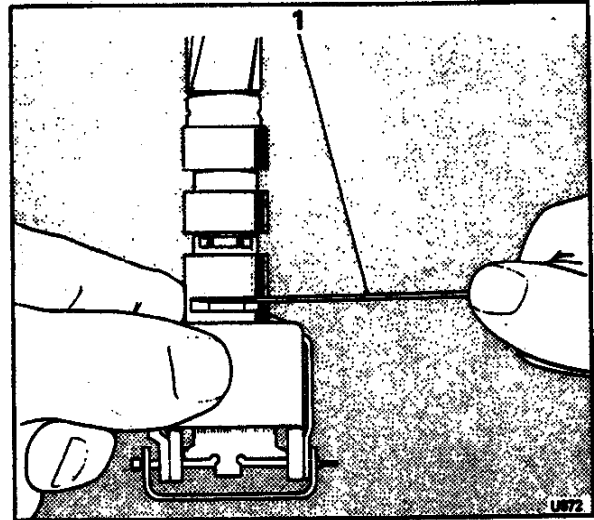
1. Lightly oil the valve then fit it into the governor sleeve.
2. Fit the governor weights, springs and thrust cap onto the governor sleeve.
3. Align the pin holes in the thrust cap, governor weight assemblies and governor sleeve.
4. Fit new pins and crimp both ends of the pins.
5. Ensure that the governor weights are free to operate on the pins and check that the valve moves freely in the sleeve bore.

**Governor assembly - To fit**

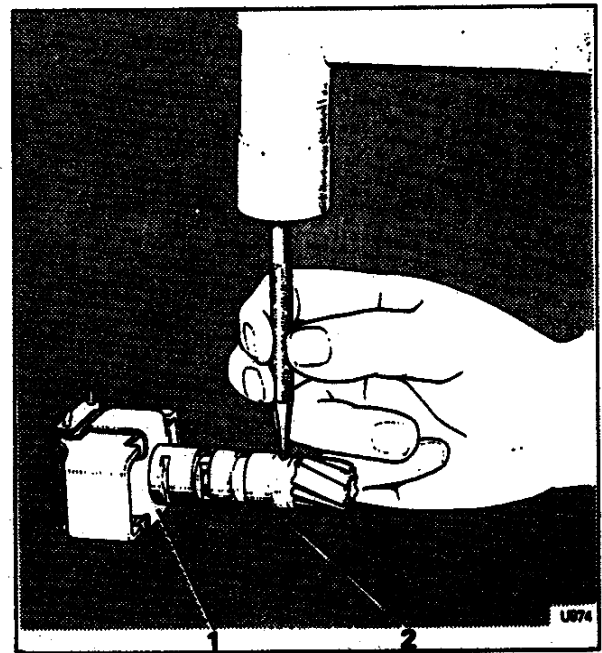
1. Lightly lubricate the governor sleeve and gear



**Fig. T42 Check valve opening (inlet)**  
1 0,51 mm.(0.020 in.) feeler gauge



**Fig. T43 Check valve opening (exhaust)**  
1 0,51 mm.(0.020 in.) feeler gauge



**Fig. T44 Removing governor driven gear retaining pin**  
1 Governor assembly  
2 Gear retaining pin

then fit the governor assembly into the transmission case.

2. Fit the cover, together with a new gasket.
3. Fit the four setscrews and torque tighten (see Chapter P).
4. When installing the governor assembly ensure that a clearance of approximately 6,35 mm. (0.250 in.) is maintained between the governor pipes and transmission case, at a point 25,40 mm. (1 in.) from the right angle bend of the pipes.

## Section T10

**Speedometer drive**

The speedometer drive is secured to the left-hand side of the transmission main casing by a setscrew and retainer. It is driven by a gear on the transmission output shaft at a ratio of 43:19.

**Speedometer drive - To remove**

1. Slacken and withdraw the hexagon nut securing the electronic impulse transmitter to the speedometer drive assembly.
2. Remove the setscrew and retainer; then withdraw the speedometer drive. Discard the 'O' ring.

**Speedometer drive - To dismantle**

1. Hold the gear between soft jaws in a vice.
2. Remove the split pin. Then, remove the nut and washer securing the gear to the drive-shaft.
3. Tap the gear off the shaft using a soft-headed mallet.
4. Utilizing the two machined flats on the oil seal housing, hold the housing between soft jaws in a vice. Then, unscrew the two halves of the assembly.
5. Withdraw the drive-shaft.

**Speedometer drive - To inspect**

1. Wash all the dismantled parts in clean paraffin.
2. Examine the gear teeth for damage or excessive wear.
3. Examine the squared end of the shaft for cracking.
4. Examine the threads on the oil seal retainer for damage.
5. If the oil seal is to be renewed it should be pressed out of the housing using a suitable drift.
6. Examine the drive-shaft for burrs or sharp edges which may damage the oil seal during assembly.

**Speedometer drive - To assemble**

To assemble the speedometer drive, reverse the procedure given for dismantling noting the following points.

1. Torque tighten the castellated nut to the figures quoted in Chapter P; then tighten the nut to the nearest split pin hole.
2. Fit a new split pin.
3. Lightly lubricate the drive-shaft before passing it through the oil seal.
4. Ensure that the body and the seal housing are screwed tightly together.
5. Check the drive-shaft end-float; there should be a minimum of 0.38 mm. (0.015 in.).

**Speedometer drive - To fit**

1. Fit a new 'O' ring to the groove in the speedo-

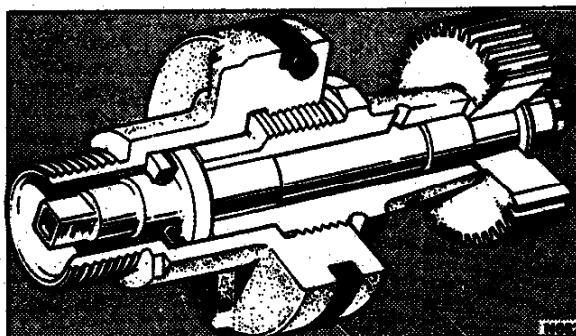


Fig. T45 Speedometer drive

meter drive housing.

2. Lightly lubricate the 'O' ring to ease the fitting of the speedometer drive; fit the drive to the case.
3. Fit the retainer and setscrew.

Two sizes of setscrews may be fitted dependent upon the year of manufacture of the torque converter transmission.

Torque tighten to the figures quoted in Chapter P.

4. Connect the electronic impulse transmitter.

## Section T11

## Sump and intake strainer

**Sump - To remove****Transmission fitted in the car**

1. Position the car on a ramp and raise to a suitable working height.
2. Place a clean container with a minimum capacity of 3 litres (5 Imp. pints, 6 U.S. pints) under the sleeve nut which secures the dipstick filler tube to the side of the sump.
3. Withdraw the transmission dipstick. Slacken the setscrew securing the filler tube clip to the cylinder head.
4. Release the nut securing the dipstick filler tube; withdraw the filler tube and move to one side, draining the fluid into the container. Discard the 'O' ring (if fitted) from the filler tube connection.
5. Remove the setscrews securing the sump.
6. Remove the sump and discard the gasket.
7. Drain the remainder of the fluid from the sump.
8. Clean the sump with paraffin and dry with compressed air.

**Transmission removed from the car**

1. Position the transmission in the holding fixture RH 7955 (J-8763) with the sump upwards.
2. Carry out Operations 5 to 8 inclusive as described with the transmission fitted in the car.

**Sump - To fit**

To fit the sump reverse the procedure given for removal noting the following.

1. Ensure a new gasket is fitted.
2. Torque tighten the setscrews to the figures quoted in Chapter P.
3. When filling the transmission with fluid refer to Section T2.

**Note**

The amount of fluid added depends on whether the intake strainer has been removed.

**Intake strainer - To remove**

1. Remove the sump.
2. Unscrew and remove the stepped bolt securing the intake strainer to the valve body assembly.
3. Remove the intake strainer assembly.
4. Discard the intake strainer and the 'O' ring from the intake pipe.

**Intake strainer - To fit**

1. Fit a new 'O' ring onto the intake pipe. Lubricate the 'O' ring with transmission fluid.
2. Ensure a new rubber seal is fitted to the bore in the new intake strainer, then fit the intake pipe into the strainer.

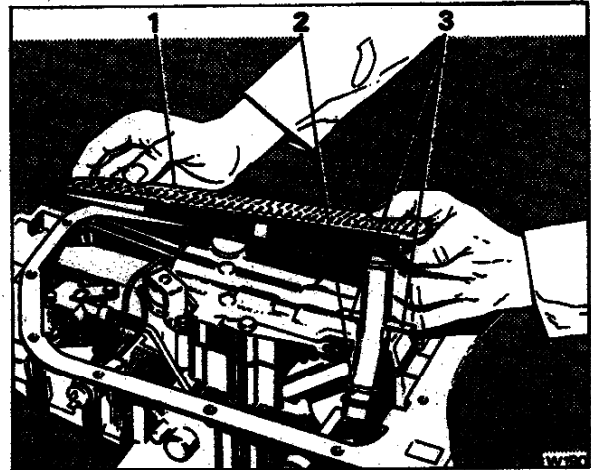


Fig. T46 Removing intake pipe and strainer assembly

- 1 Strainer assembly
- 2 Intake pipe with 'O' ring
- 3 Location tabs

3. Fit the strainer assembly into the transmission case; secure with the stepped bolt. Torque tighten to the figures quoted in Chapter P.
4. Fit the sump and fill with fluid. When filling the transmission with fluid refer to Section T2.

## Section T12

## Control valve unit

The control valve unit comprises a cast iron body containing shift valves and regulator valves that control the gear changes. The unit is secured to an oil spacer (guide) plate on the bottom face of the transmission.

**Drive range**

When the selector lever on the steering column is moved to 'D', the actuator moves the manual valve (through levers and rods) to allow main line oil pressure to be delivered to the forward clutch (see Fig. T47). With the forward clutch applied, mechanical connection between the turbine shaft and the mainshaft is provided. The Low roller assembly becomes effective as the result of power flow through the compound planetary gear arrangement and the transmission is in first gear.

As the speed of the car increases, first gear is no longer suitable and an up-change to second is required.

To initiate the change from first to second, governor pressure (see Section T9) is directed to the end of the 1-2 shift valve. As the car speed increases, governor pressure moves the valve to allow drive oil to apply the intermediate clutch. This makes the intermediate clutch effective and the transmission changes into second gear.

The change to third gear is controlled by the 2-3 shift valve. The operation of the 2-3 shift valve is similar to that of the 1-2 shift valve. Springs acting on the valve tend to hold the valve closed against governor pressure. When the speed of the car is sufficient, the 2-3 shift valve opens and allows intermediate clutch oil to apply the direct clutch. The transmission then moves into third (top) gear. Oil pressure to the direct clutch piston is applied only to a small inner area of the piston in third gear.

**Down-change**

When the accelerator pedal is released and the car is allowed to decelerate to a stop, the down-changes will occur automatically as the valve springs overcome the diminishing governor pressure.

**Delayed up-change**

If the hydraulic system was as basic as previously described, the gear change points would always occur at the same road speeds. When accelerating under heavy loads or when maximum performance is required, it is desirable to have the change points occurring at higher road speeds. To achieve this, a modulator valve is used (see Section T8).

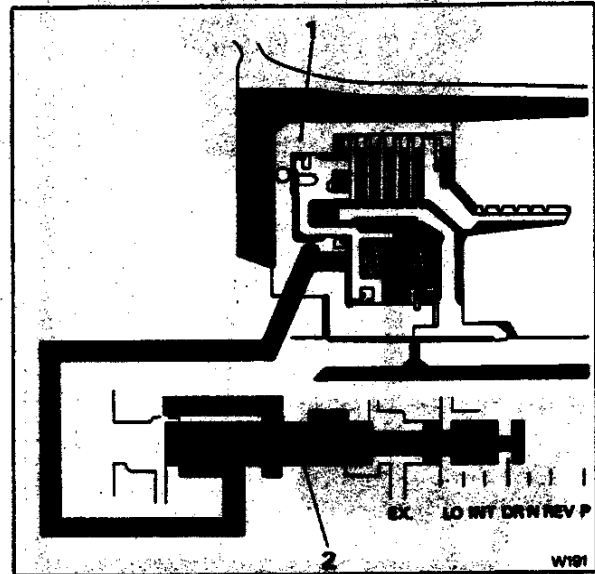


Fig. T47 Manual valve and forward clutch

- 1 Forward clutch
- 2 Manual valve

■ Line oil

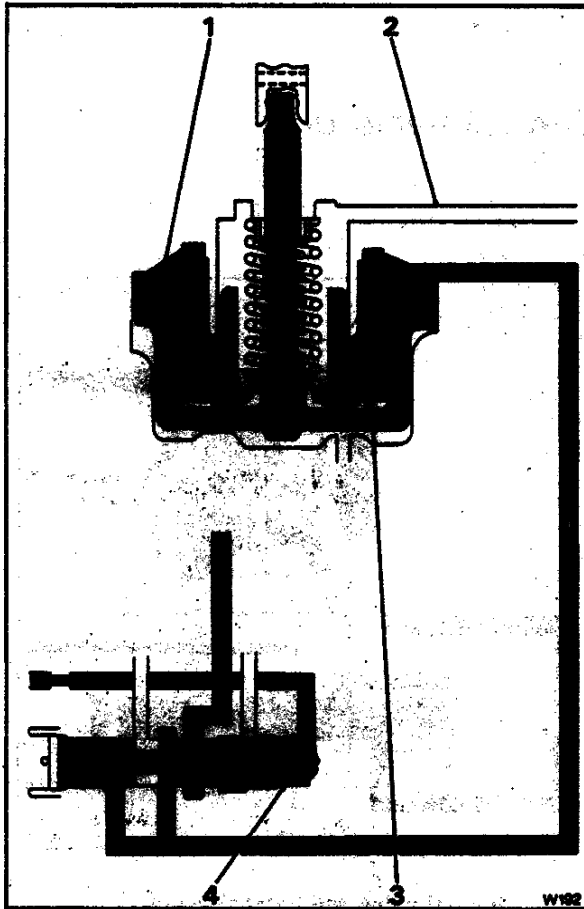
**Clutch application control**

To introduce gearchange 'feel', and to ensure long clutch plate life, the clutch apply pressure is regulated to suit throttle application (see Fig. T48). The intermediate clutch is controlled according to the throttle opening as follows.




Line pressure is varied by the modulator.

A 1-2 accumulator valve train provides a variable accumulator pressure to cushion the clutch application. The 1-2 accumulator valve train is supplied with drive oil and is controlled by modulator pressure. During light throttle application, drive oil is reduced to a low accumulator pressure. During heavy throttle applications, accumulator pressure approaches full main pressure. Accumulator pressure is made to act on one side of the rear accumulator piston in the rear servo (see Section T13). In first gear, the accumulator piston is stroked to its lower position to prepare it for the change to second gear.

When the 1-2 shift valve opens, intermediate clutch apply oil is also directed to the rear servo accumulator piston, stroking the piston against the 1-2 accumulator oil and the accumulator spring



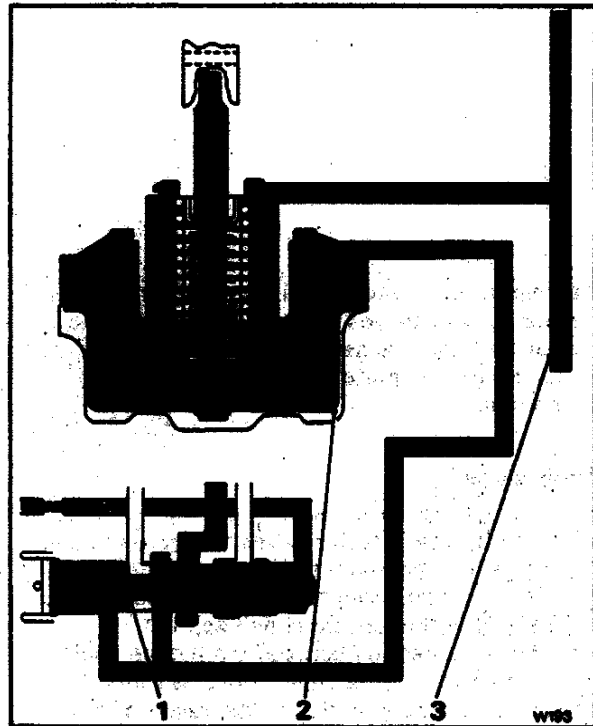
**Fig. T48 Rear servo accumulator piston - Prior to 1-2 up-change**  
 1 Servo piston  
 2 Intermediate clutch passage  
 3 Accumulator piston  
 4 1-2 accumulator valve

-  Drive oil
-  Modulator oil
-  1-2 accumulator oil




(see Fig. T49). This action absorbs a small amount of the intermediate clutch apply oil and permits the clutch apply time and pressure to be controlled for the correct gear change feel.

The direct clutch apply rate is controlled by the front accumulator piston. Located in the control valve assembly, it is part of the front accumulator and servo piston system (see Fig. T60). In 'D' range, second gear, the accumulator is stroked against the accumulator spring by servo oil. Because servo oil is main line pressure and varies with the throttle opening, the pressure in the accumulator is varied according to the throttle opening.

When the 2-3 shift valve opens, direct clutch oil flows to the direct clutch and the front



**Fig. T49 Rear servo accumulator piston cushioning intermediate clutch application**  
 1 1-2 accumulator valve  
 2 Servo piston  
 3 Intermediate clutch passage

-  Drive and intermediate clutch oil
-  Modulator oil
-  1-2 accumulator oil

accumulator piston (see Fig. T61). Direct clutch pressure rises so that the force from it, plus the accumulator spring force, overcomes the force from the servo pressure and moves the accumulator piston to the stop on the accumulator piston pin. This in turn strokes the servo piston the same amount, allowing it to just contact the band apply washer on the servo pin. However, it will not move the pin or apply the band. The stroking of the accumulator piston absorbs an amount of direct clutch oil and permits the direct clutch to apply at a controlled rate for a smooth 2-3 change.

**3-2 valve operation**

To take full advantage of the torque converter's ability to multiply torque when required, a 3-2 valve is used. This valve permits the accelerator to be depressed for moderate acceleration at low speeds in third gear without causing the transmission to change down. This allows the torque converter to sense the changes in engine speed and thus provide additional converter ratio for improved performance.

The 3-2 valve system is such that it will permit a 3-2 down-change during moderate to heavy acceleration when modulator pressure reaches approximately 7,59 kgf/sq.cm. (108 lbf/sq.in.) (see Fig. T52). Modulated oil pressure, plus the 3-2 spring pressure, will move the 3-2 valve against the force of direct clutch oil allowing modulator pressure to be directed to the 2-3 modulator valve. Modulator oil can then close the 2-3 valve train against governor pressure causing the part throttle 3-2 down-change.

#### Forced down-change (kick-down)

At road speeds below approximately 113 k.p.h. (70 m.p.h.) a detent (forced) down-change can be obtained by depressing the accelerator pedal. When the accelerator pedal is fully depressed, the detent valve train takes over from the modulator as the change-point controller.

Main line oil is fed through a small orifice to one end of the detent valve. During normal operation, the port at the orifice end of the valve is sealed by the valve in the detent solenoid assembly. Line pressure thus holds the detent valve in an inoperative or normal position (see Fig. T53).

When the throttle is wide open, an electric micro-switch is closed, energising the detent solenoid. This opens an exhaust port at the solenoid causing a pressure drop on the end of the detent valve. The detent valve is moved by the detent valve regulator valve spring and allows the detent regulator to regulate detent-oil to a fixed pressure of approximately 4,92 kgf/sq.cm. (70 lbf/sq.in.).

When the detent valve moves, detent oil is allowed to flow into both the modulator and the detent oil passages to the shift valve trains. The points at which up-changes will then occur is controlled by detent pressure in the modulator passages. Detent down-changes are controlled by detent pressure in the detent passages. These change points are fixed at relatively high speeds by the constant oil pressure.

Detent pressure directed to the 1-2 regulator valve makes a detent 2-1 change available at car speeds below approximately 32 k.p.h. (20 m.p.h.).

To preserve the clutch linings during 1-2 up-changes under full throttle conditions, detent oil is directed to the 1-2 accumulator valve to increase 1-2 accumulator pressure (see Fig. T54).

Detent oil is also directed to the modulator valve to prevent modulator pressure from falling below 4,92 kgf/sq.cm. (70 lbf/sq.in.). This prevents main line pressure from falling below approximately 7,36 kgf/sq.cm. (105 lbf/sq.in.) regardless of altitude or car speed.

#### Intermediate range

When the selector lever is moved to the intermediate '1' position, the manual valve is moved to uncover a passage which will allow intermediate range oil to act on the 2-3 shift valve. Intermediate oil pressure

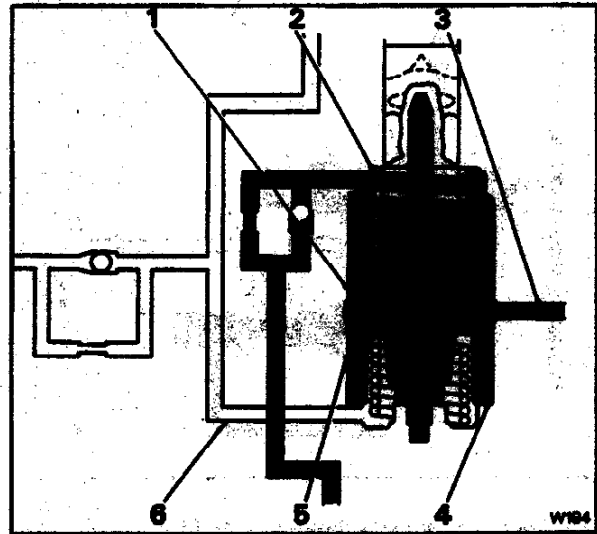


Fig. T50 Front servo accumulator piston - Prior to 2-3 up-change

- 1 Servo piston
- 2 Case
- 3 Intermediate clutch passage
- 4 Accumulator piston
- 5 Valve body
- 6 Direct clutch oil passage

■ Servo and intermediate clutch oil

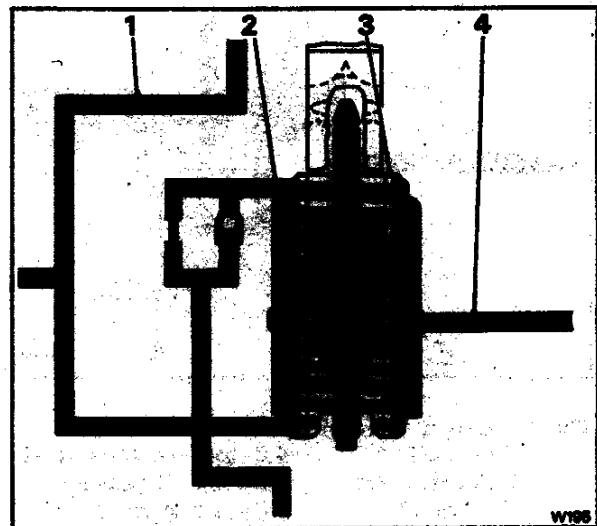


Fig. T51 Front servo accumulator piston cushioning direct clutch application

- 1 Direct clutch oil
- 2 Servo oil
- 3 Accumulator housing
- 4 Intermediate clutch oil

■ Direct clutch, front servo and intermediate clutch oil

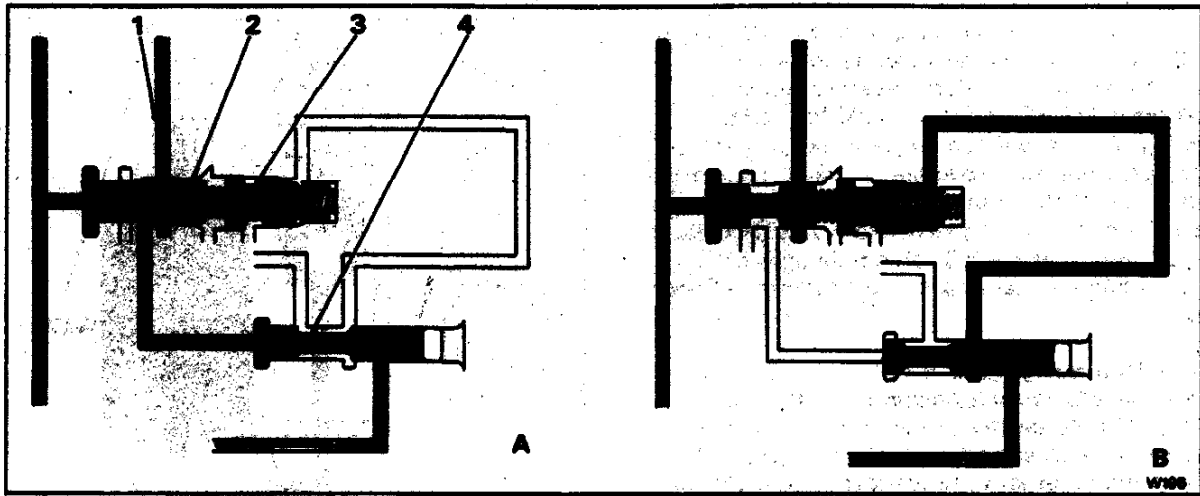


Fig. T52 Part throttle down-change (3-2)

- 1 Intermediate clutch oil
- 2 2-3 valve
- 3 2-3 modulator valve
- 4 3-2 valve

- A Valves in 3rd gear position, modulator pressure below approximately 7,59 kgf/sq.cm. (108 lbf/sq.in.)
- B Part throttle down-change valves in 2nd gear position, modulator pressure above 7,59 kgf/sq.cm. (108 lbf/sq.in.)

- Intermediate clutch and direct clutch oil
- Governor oil
- Modulator oil

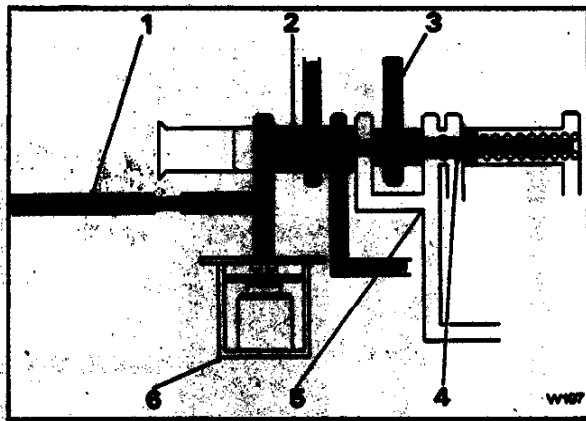


Fig. T53 Detent valve closed

- 1 Line oil
- 2 Detent valve
- 3 Drive oil
- 4 Detent regulator valve
- 5 Detent oil passage
- 6 Detent solenoid

- Line and drive oil
- Modulator oil

on the 2-3 shift valve will cause the valve to move and the transmission will change down, regardless of car speeds (see Fig. T55).

To provide overrun engine braking, the front band

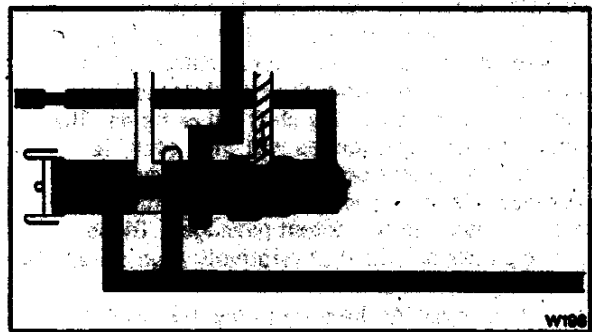


Fig. T54 1-2 Accumulator valve

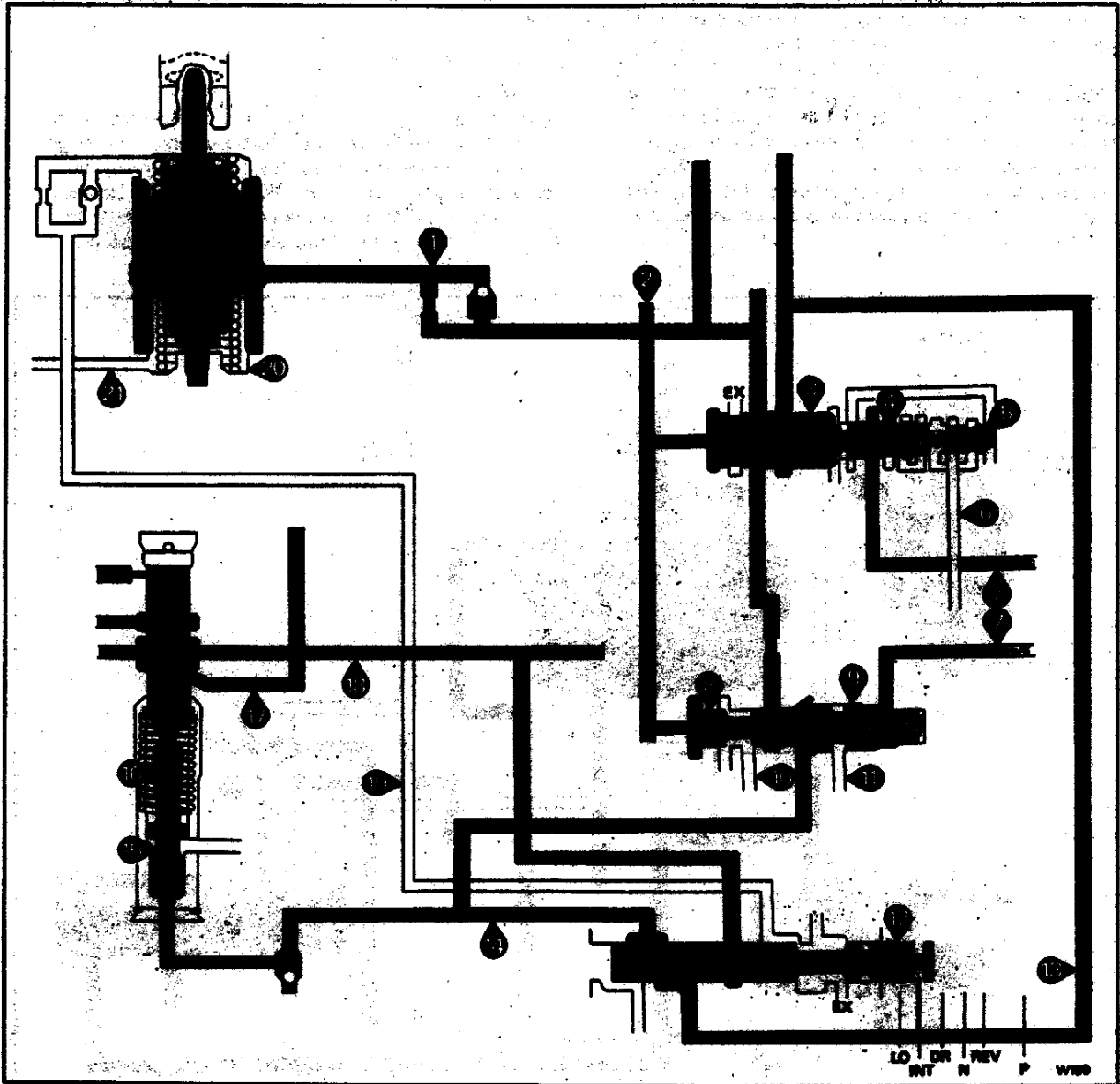
- Drive oil
- Modulator oil
- 1-2 accumulator oil
- Detent oil

is applied by the front servo. Intermediate clutch oil flows to the apply side of the servo piston. An orifice is incorporated in the flow path to ensure a smooth piston movement and band application. Intermediate range oil is directed to a check ball which allows the oil to enter the modulator passage leading to the pressure regulator boost valve. The

resultant increase of pressure on the end of the boost valve raises main line pressure to 10,55 kgf/sq.cm. (150 lbf/sq.in.) and provides sufficient holding forces for overrun engine braking.

**Low range**

When the selector lever is moved to the 'L' range position, the manual valve is moved to allow Low range oil to flow to the detent regulator valve and



**Fig. T55 Valves - Intermediate range - 2nd gear**

- |                           |                          |                             |
|---------------------------|--------------------------|-----------------------------|
| 1 Intermediate clutch oil | 8 2-3 valve              | 15 Boost valve              |
| 2 Governor oil            | 9 2-3 modulator valve    | 16 Pressure regulator valve |
| 3 1-2 valve               | 10 Direct clutch passage | 17 Converter oil            |
| 4 1-2 detent valve        | 11 Detent passage        | 18 Line oil                 |
| 5 Regulator valve         | 12 Manual valve          | 19 Servo oil passage        |
| 6 Detent passage          | 13 Drive oil             | 20 Front servo              |
| 7 Modulator oil           | 14 Intermediate oil      | 21 Direct clutch passage    |

■ Main line oil

■ Governor oil

■ Modulator oil

spacer pin. The spring behind the regulator valve then moves the regulator and detent valves to the opposite end of the valve bore. Low range oil then prevents the regulator valve from regulating and drive oil passes through the hole in the regulator valve into the detent and modulator passages at a Low range pressure of 10,55 kgf/sq.cm. (150 lbf/sq.in.). As a result of this, the 1-2 shift valve will move to cause a down-change at road speeds below approximately 84 k.p.h. (40 m.p.h.) and will prevent an up-change, regardless of the speed of the car.

When the 1-2 shift valve closes, the exhausting intermediate clutch oil lifts two check balls off their seats to enable the front band and the intermediate clutch to release quickly (see Fig. T66).

To provide overrun engine braking, the rear band is applied by directing Low range oil pressure to the rear servo.

Low range oil is directed to the 1-2 accumulator valve during Low range operation to raise 1-2 accumulator pressure to line pressure. The increased pressure, directed to the rear servo accumulator piston, resists servo apply pressure. This slows down the application of the rear band to enable a smooth change to be obtained during manual change to Low range, first gear, or for a 2-1 change in Low range.

**Reverse**

When Reverse 'R' is selected, the manual valve is moved to allow Drive, Intermediate, and Low range oil to be exhausted, and allows main line oil to enter the reverse passages (see Fig. T67). Reverse oil pressure is directed from the manual valve to the large outer area of the direct clutch piston and

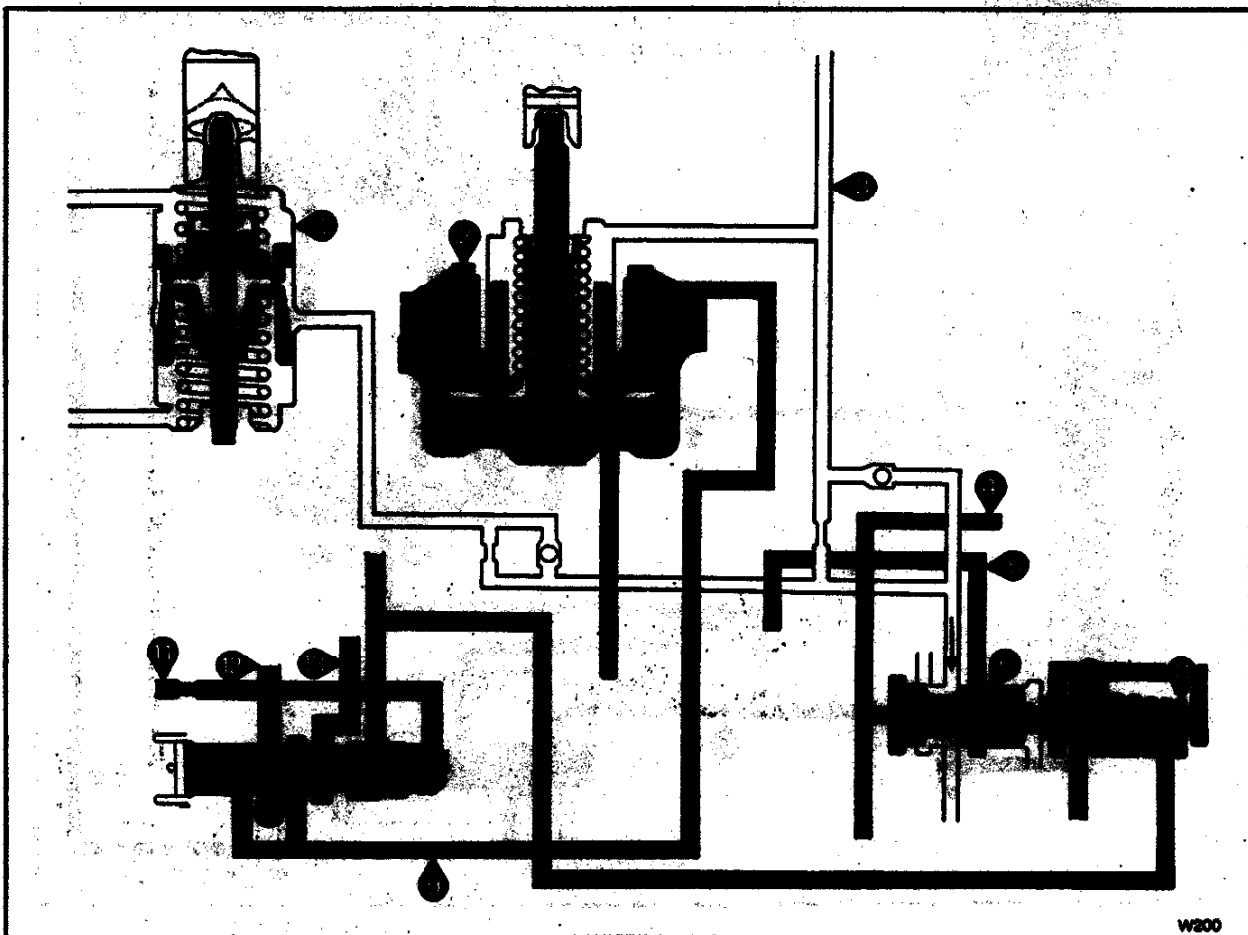


Fig. T66 Low range - 1st gear - rear band applied

- |                               |                       |                          |
|-------------------------------|-----------------------|--------------------------|
| 1 Front servo                 | 6 1-2 valve           | 10 1-2 accumulator valve |
| 2 Rear servo                  | 7 1-2 detent valve    | 11 Modulator oil         |
| 3 Intermediate clutch passage | 8 Regulator valve     | 12 Low oil               |
| 4 Governor oil                | 9 1-2 accumulator oil | 13 Drive oil             |
| 5 Drive oil                   |                       |                          |

■ Main line oil

■ Governor oil

to the 2-3 shift valve where it enters the direct clutch exhaust port. Reverse oil then flows past the 2-3 shift valve, which is in the down-change position, and enters the third gear direct clutch apply passage. This passage directs reverse oil pressure to the small inner area of the direct clutch piston. With oil pressure on both inner and outer positions of the piston, the clutch applies. Reverse oil pressure is also directed to a check ball which allows oil to enter the same passage to the rear servo apply piston that Low range oil occupied in Low range; this applies the rear band. To ensure adequate oil pressure for the torque requirements in Reverse, reverse oil pressure is directed to the

pressure boost valve which increases line pressure to a maximum of approximately 18.28 kgf/sq.cm. (260 lbf/sq.in.).

**Control valve unit - To remove**

**Note**

Before removing the control valve unit from a transmission installed in a vehicle, take extreme care, as the front servo piston and related parts may fall from the transmission due to the normal freeness of the 'Teflon' oil sealing rings.

The control valve unit may be removed with the transmission in the car. The oil must be drained

Printed in England

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October 1980

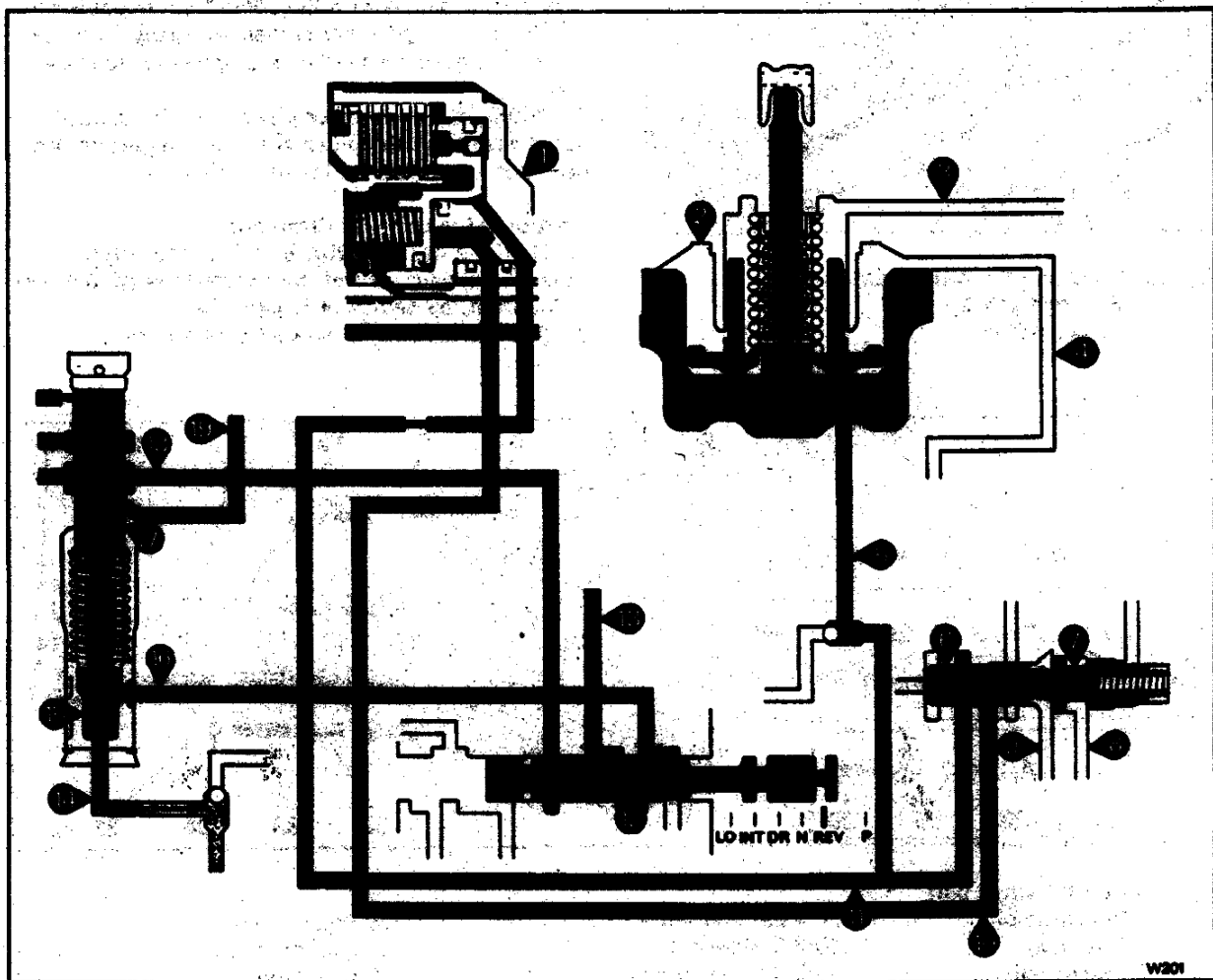


Fig. T67 Reverse - rear band applied

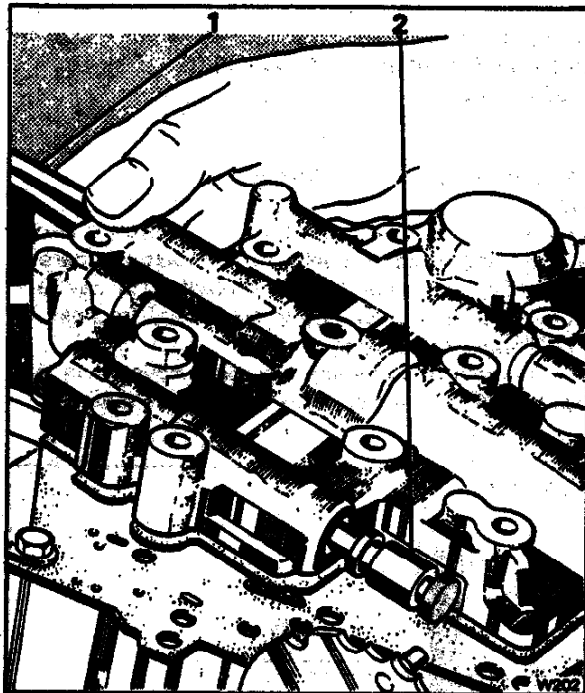
- |                               |                            |                             |
|-------------------------------|----------------------------|-----------------------------|
| 1 Direct clutch               | 8 Detent oil passage       | 14 Modulator oil            |
| 2 Rear servo                  | 9 Intermediate oil passage | 15 Boost valve              |
| 3 Intermediate clutch passage | 10 Direct clutch oil       | 16 Reverse oil              |
| 4 1-2 accumulator passage     | 11 Reverse oil             | 17 Pressure regulator valve |
| 5 Reverse oil                 | 12 Manual valve            | 18 Line oil                 |
| 6 2-3 valve                   | 13 Servo oil               | 19 Converter oil            |
| 7 2-3 modulator valve         |                            |                             |

 Modulator or intermediate oil

 Main line oil

TSD 4300

W201



**Fig. T58 Removing the control valve unit**  
 1 Governor pipes  
 2 Manual valve

and the sump removed to gain access to the control valve unit.

1. Unscrew the setscrew which secures the detent spring and roller assembly. Remove the spring and roller assembly.

2. Remove the setscrews that secure the control valve unit to the transmission case.

Do not remove the solenoid securing screws, as the solenoid holds the spacer (guide) plate and gasket in position, therefore, keeping the check balls in their correct positions.

3. Remove the control valve unit, together with the two governor pipes (see Fig. T58).

**Caution**

Ensure that the manual valve does not slide out of its bore. Take care to retain the front servo piston, should it come out with the control valve assembly.

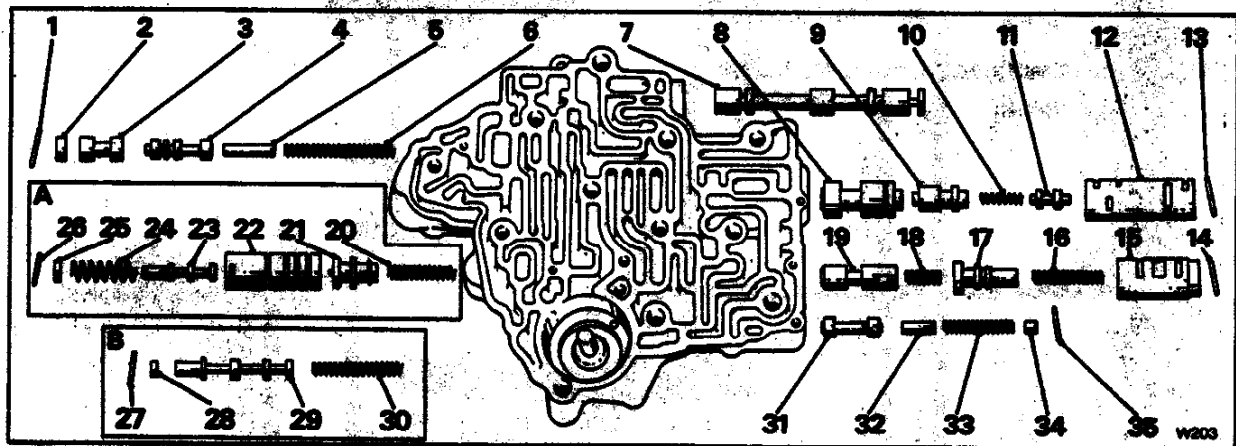
Remove the governor screen assembly from the end of the governor feed pipe or governor feed pipe hole.

4. Withdraw the governor pipes from the control valve assembly; the pipes are interchangeable and need not be marked for identification.

**Control valve unit - To dismantle**

1. Hold the control valve unit with the cored passages uppermost and the accumulator piston bore to the front, as shown in Figure T59.

2. Remove the manual valve from its bore.



**Fig. T59 Control valve unit**

- |                          |                                     |                           |
|--------------------------|-------------------------------------|---------------------------|
| 1 Retaining pin          | 14 Retaining pin                    | 26 Retaining pin          |
| 2 Bore plug              | 15 2-3 sleeve                       | 27 Retaining pin          |
| 3 Detent valve           | 16 2-3 valve spring                 | 28 Bore plug              |
| 4 Detent regulator valve | 17 2-3 modulator valve              | 29 1-2 accumulator valve  |
| 5 Spacer                 | 18 3-2 intermediate spring          | 30 1-2 accumulator spring |
| 6 Detent spring          | 19 2-3 valve                        | 31 3-2 valve              |
| 7 Manual valve           | 20 1-2 accumulator primary spring   | 32 Spacer                 |
| 8 1-2 valve              | 21 1-2 accumulator primary valve    | 33 3-2 spring             |
| 9 1-2 detent valve       | 22 1-2 accumulator sleeve           | 34 Bore plug              |
| 10 1-2 regulator spring  | 23 1-2 accumulator secondary valve  | 35 Retaining pin          |
| 11 1-2 regulator valve   | 24 1-2 accumulator secondary spring | A RR and RS models        |
| 12 1-2 sleeve            | 25 Bore plug                        | B RC model                |
| 13 Retaining pin         |                                     |                           |

3. Fit the control valve accumulator installing tool (J-21885) onto the accumulator piston.
4. Compress the accumulator piston and remove the 'E' ring container.
5. Remove the accumulator control valve and spring.
6. Remove the retaining pin, 1-2 sleeve, regulator valve and spring from the upper right-hand bore.
7. Remove the 1-2 detent valve and the 1-2 valve.
8. Remove the retaining pin, 2-3 valve spring, 2-3 sleeve, 2-3 modulator valve and the 3-2 intermediate spring from the middle right-hand bore.
9. Remove the 2-3 shift valve.
10. Remove the retaining pin, bore plug, 2-3 spring together with the spacer and the 3-2 valve from the lower bore.
11. Remove the retaining pin and bore plug from the upper left-hand bore, adjacent to the manual valve bore.
12. Remove the detent valve, detent regulator valve, spring and spacer.
13. Ensure that the 1-2 accumulator valve in the remaining bore is free, by moving the valve against the spring.
14. Remove the 1-2 accumulator valve retaining pin from the machined surface of the valve body; remove the plug.
- 15.(a) RR and RS transmissions
  - (i) Remove the 1-2 accumulator secondary spring and 1-2 valve.
  - (ii) Remove the 1-2 accumulator sleeve, 1-2 primary valve and spring.
- 15.(b) RC transmissions
  - (i) Remove the 1-2 accumulator valve and spring.

#### Control valve unit - To inspect

1. Wash the control valve unit body, valves and the remainder of the parts in Genkrene. Do not allow the valves to knock together as this may cause burrs, or damage to the shoulders of the valves.
2. Examine all valves and sleeves to ensure that they are free from dirt. Any burrs should be carefully removed with a fine stone, or fine emery paper slightly moistened with oil. Do not round-off the shoulders of the valves.
3. When satisfactory, wash the parts and lightly smear all valves and sleeves with clean transmission fluid.
4. All valves and sleeves should be tested in their individual bores to ensure that free movement is obtainable.
5. The valves should fall under their own weight, with perhaps a slight tapping of the valve body to assist them. During these checks, ensure that the valves and valve bores are not damaged.
6. The manual valve is the only valve that can be renewed separately. If other valves are damaged or defective, a new control valve unit must be fitted.
7. Examine the valve body for cracks or scored bores.
8. Ensure that the cored face is free from damage.

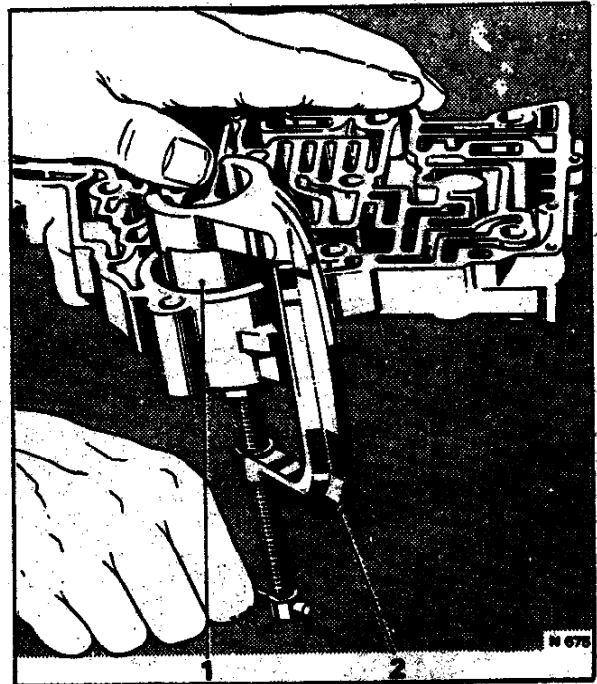


Fig. T60 Fitting the front accumulator piston and spring

- 1 Accumulator piston
- 2 Inserting tool

9. Examine all springs for collapsed or distorted coils.

#### Control valve unit - To assemble

Before commencing assembly, ensure that all springs can be positively identified. If the springs are assembled incorrectly the transmission will not function correctly. Refer to Figure T59 during assembly procedure.

1. Lightly lubricate all parts with clean transmission fluid before assembly.
2. Fit the front accumulator spring and piston into the valve body.
3. Fit the valve body accumulator installing tool (J-21885). Align the piston and spring with the bore then compress the spring and piston (see Fig. T60).
4. Secure the piston with the 'E' ring retainer.
- 5.(a) RR and RS transmissions
  - (i) Fit the 1-2 primary spring into the primary 1-2 accumulator valve.
  - (ii) Fit the spring and valve into the lower left-hand bore. Use a retaining pin to hold the valve in its position.
  - (iii) Fit the 1-2 accumulator valve into the 1-2 accumulator sleeve. Fit the sleeve into its bore.
  - (iv) Fit the bore plug and retaining pin.
- 5.(b) RC transmissions
  - (i) Fit the 1-2 accumulator primary spring and 1-2 accumulator valve.
  - (ii) Fit the bore plug and retaining pin.

6. Fit the detent spring and spacer into the next left-hand bore above.

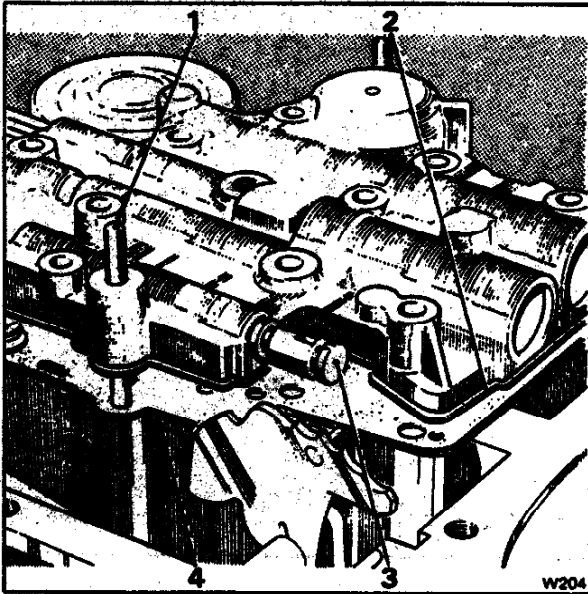


Fig. T61 Fitting the control valve unit

- 1 Guide pin
- 2 Control valve gasket
- 3 Manual valve
- 4 Spacer (guide) plate gasket

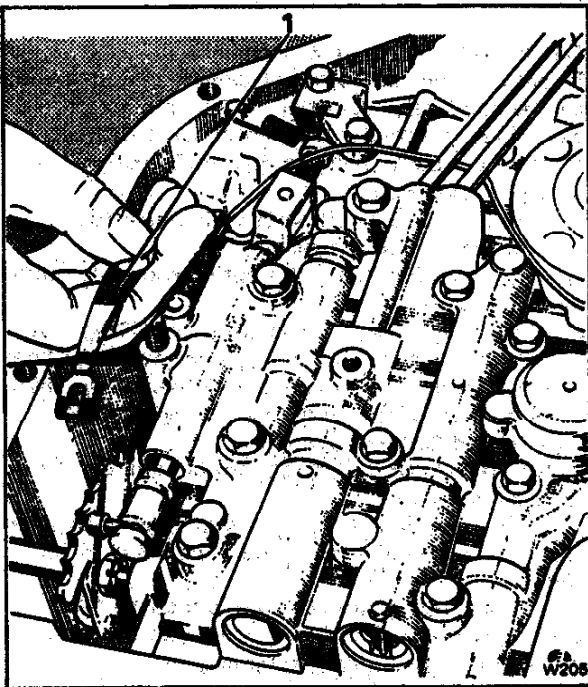


Fig. T62 Fitting the detent spring and roller

- 1 Detent spring and roller

7. Compress the spring and hold it with a small screwdriver.
8. Fit the detent regulator valve, wide land first.
9. Fit the detent valve, small land first.
10. Fit the bore plug with the hole facing the outside and fit the retaining pin. Remove the screwdriver.
11. Fit the 3-2 valve into the lower right-hand bore.
12. Fit the spacer, the 3-2 spring and bore plug with the hole facing the outside; secure with the retaining pin.
13. Fit the 2-3 shift valve, with the stem facing the outside, in the next right-hand bore above.
14. Fit the 3-2 intermediate spring.
15. Fit the 2-3 modulator valve into the sleeve, then fit both parts into the valve bore.
16. Fit the 2-3 valve spring and the retaining pin.
17. Fit the 1-2 shift valve (stem end out) into the next right-hand bore above.
18. Fit the 1-2 regulator valve (larger stem first), spring and detent valve into the sleeve. Align the spring in the bore of the detent valve. Fit the parts into the valve bore.
19. Push the sleeve inwards against spring pressure and fit the retaining pin.
20. Fit the manual valve with the detent pin groove to the right-hand side (outmost).

#### Control valve unit - To fit

1. Fit the governor pipes to the control valve unit.

#### Note

Fit the governor screen assembly, open end first into the governor feed pipe hole (hole nearest the centre of transmission).

2. Fit the front servo piston (if removed) ensuring it is correctly aligned in the bore.
3. Using two guide pins screwed into the casing, fit the control valve unit into position (see Fig. T61), with a new valve body/spacer plate gasket.
4. Ensure that the gasket and oil spacer (guide) plate are correctly positioned.

#### Note

It is important that only a gasket which is a genuine service part be used.

5. Ensure that the governor pipes are correctly aligned and the feed pipe fits over the governor screen.

6. When installing the governor assembly ensure that a clearance of approximately 6,40 mm. (0.250 in.) is maintained between the governor pipes and transmission case, at a point 25,40 mm. (1 in.) from the right-angle bend of the pipes.

Ensure that the manual valve is correctly located by the pin on the detent lever.

7. Remove the guide pins and fit the control valve unit securing setscrews; do not fit the detent spring and roller securing screw.
8. Torque tighten the securing screws (see Chapter P).
9. Fit the detent spring and roller assembly (see Fig. T62); fit the securing screw and torque tighten to the figures quoted in Chapter P.