

## Section T13

## Rear servo

The rear servo comprises an assembly of pistons and springs. It fits onto the bottom face of the transmission casing, adjacent to the control valve unit and is secured by six setscrews. The purpose of the servo is to act as an accumulator to absorb an amount of intermediate clutch oil, thus cushioning the application of the clutch, also to apply the rear friction band in Low range and Reverse.

**Drive - Intermediate - first gear**

In first gear, Drive and Intermediate ranges, 1-2 accumulator oil is directed to the rear servo accumulator piston in preparation for the 1-2 up-change.

**Drive - Intermediate - second gear**

Intermediate clutch apply oil is directed to the rear servo accumulator piston, stroking the piston against the 1-2 accumulator oil and the accumulator spring (see Fig. T63). This action absorbs an amount of intermediate clutch apply oil and permits the intermediate clutch to apply at reduced pressure for a smooth 1-2 up-change.

**Low range - first gear**

Overrun engine braking in Low range (first gear) is provided by the rear servo which applies the rear band and prevents the reaction carrier from rotating clockwise (see Fig. T64).

The 1-2 accumulator oil is directed to the accumulator piston which attempts to prevent application of the servo. Low range oil is directed to the servo piston which, because it has a larger area, applies the rear band. Because 1-2 accumulator oil is present and is opposing the movement of the piston, the pressure applying the rear band is reduced. This provides a smooth band application.

**Low range - second gear**

In second gear the rear band is released. Intermediate clutch oil is directed to the release side of the servo piston and together with line oil in the 1-2 accumulator oil passage, balances out the Low range oil on the apply side of the servo piston (see Fig. T65). The servo release spring then strokes the servo piston to the band release position.

**Reverse**

In Reverse, the rear band is applied to hold the reaction carrier. Reverse oil is directed to the servo piston to apply the band (see Fig. T66). To ensure that the rear band will hold the reaction carrier for the reverse gear ratio, line pressure is increased. No other oil pressures are present in the servo to resist the movement of the servo piston.

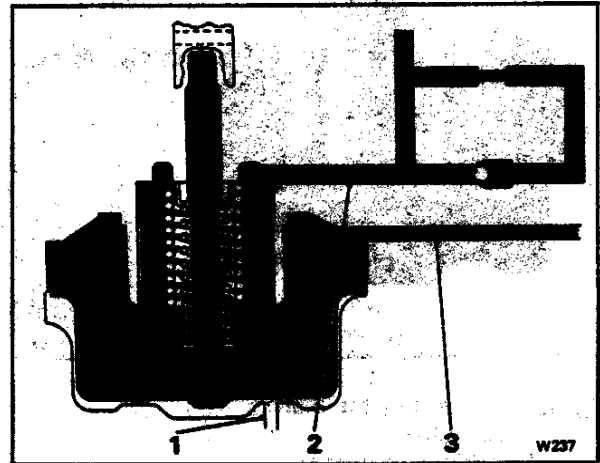


Fig. T63 Drive and Intermediate - 2nd gear

- 1 Reverse or low oil
- 2 Intermediate clutch oil
- 3 1-2 accumulator oil

■ Intermediate clutch oil  
 ■ 1-2 accumulator oil

**Rear servo - To remove**

The rear servo can be removed whether the transmission is fitted to the car or not.

1. Remove the sump (see Section T11).
2. Remove the control valve unit (see Section T12).
3. Remove the setscrews that secure the servo cover to the transmission casing.
4. Remove the cover and discard the gasket.
5. Remove the servo unit from the casing (see Fig. T67).
6. Remove the servo accumulator spring.

To ensure that the rear band is correctly adjusted when the rear servo is fitted, the apply pin must be checked as follows.

**Rear band apply pin - To select**

1. Fit the band apply pin selector gauge (J-21370-6) onto the bottom face of the transmission casing. The gauge must fit over the rear servo bore with the hexagonal nut on the side of the gauge facing the parking linkage. The smaller diameter end of the gauge pin (J-21370-5) should be positioned in the servo pin bore (see Fig. T68).
2. Secure the gauge with two suitable setscrews (e.g. rear servo cover screws) and torque tighten them to the figures quoted in Chapter P.

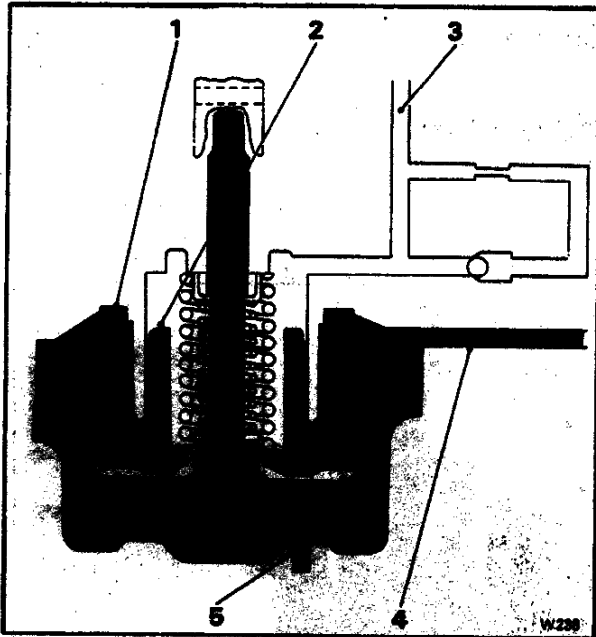


Fig. T64 Low range - 1st gear

- 1 Rear servo
- 2 Accumulator piston
- 3 Intermediate clutch passage
- 4 1-2 accumulator oil
- 5 Reverse or low oil

Low and 1-2 accumulator oil

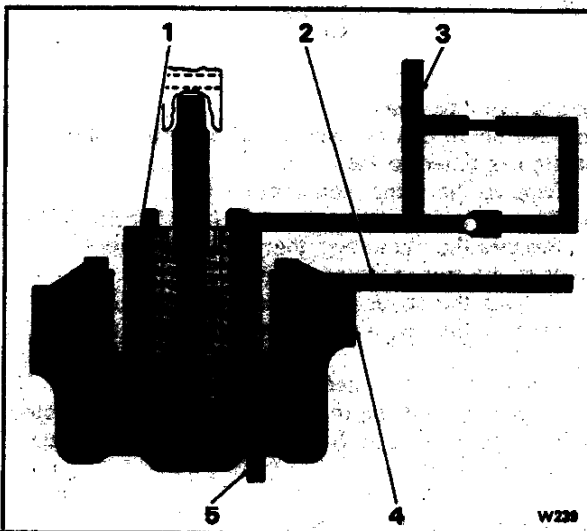


Fig. T65 Low range - 2nd gear

- 1 Accumulator piston
- 2 1-2 accumulator oil
- 3 Intermediate clutch oil
- 4 Servo piston
- 5 Reverse or low oil

Low, intermediate and 1-2 accumulator oil

3. Ensure that the stepped gauge pin moves freely in the tool and in the servo pin bore. The stepped side of the pin must face the front of the transmission case.

4. Band apply pins are available in three sizes as shown in the following chart.

Identification	Length
Three rings	Long
Two rings	Medium
One ring	Short

5. The identification ring is located on the band lug end of the pin. Selecting the correct pin is the equivalent of adjusting the rear band.

6. To determine the correct size pin to use, apply 3.46 kgf.m. (25 lbf.ft.) to the hexagonal nut on the side of the gauge (see Fig. T68). This will cause the lever on top of the gauge to depress the stepped gauge pin into the servo pin bore, simulating the actual operation of the servo.

7. Note the relationship between the steps on the gauge pin and the machined surface on the top of the gauge.

8. If the machined surface on top of the gauge is level with, or above the upper step on the gauge pin, a long (3 rings) pin is required.

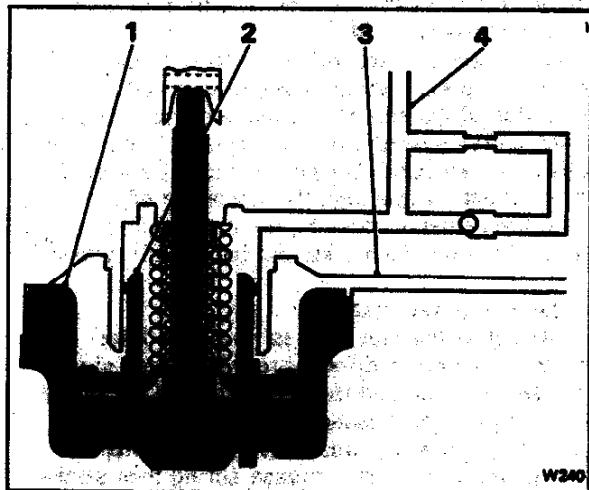


Fig. T66 Rear servo in reverse position

- 1 Servo piston
- 2 Accumulator piston
- 3 1-2 accumulator passage
- 4 Intermediate clutch passage

Reverse oil

9. If the machined surface on top of the gauge is between the upper and lower steps on the gauge pin, a medium pin (2 rings) is required.
10. If the machined surface on top of the gauge is level with, or below the lower step on the gauge pin, a short (1 ring) pin is required.
11. If a new pin is required, make a note of the size of the required pin, then remove the gauge from the transmission.

#### Rear servo - To dismantle

1. Remove the rear accumulator piston from the rear servo piston (see Fig. T69).
2. Remove the 'E' ring which retains the rear servo piston on the band apply pin.
3. Remove the rear servo piston and the seal from the band apply pin.
4. Remove the washer, spring and retainer.

#### Rear servo - To inspect

1. Check the fit of the oil sealing rings in the accumulator piston. The rings should be free to turn in the grooves.
2. Fit the accumulator piston lower oil sealing ring into its bore in the casing and check the ring-to-bore fit.
3. Check the fit of the band apply pin in each piston.
4. Examine the band apply pin for scores, cracks or the opening of drilled passages.
5. Examine the accumulator piston for an open bleed passage.
6. Ensure that the pin is the correct size as determined by the check under the heading 'Rear band apply pin - To select'.

#### Rear servo - To assemble

1. Fit the spring retainer, spring and washer onto the band apply pin.
2. Fit the servo piston onto the pin and secure it with the 'E' ring.
3. If necessary, fit a new oil seal ring onto the servo piston.
4. Fit the accumulator piston into the servo piston.  
Do not remove the teflon oil seal rings from the rear accumulator piston, unless they require replacement.

If the teflon inner oil seal ring (small diameter) requires replacement, use the aluminium oil seal ring.

The rear accumulator piston (large diameter) ring groove depth, is machined shallower to take the teflon oil seal ring. Therefore, if replacement is necessary, use only the teflon oil seal ring.

#### Rear servo - To fit

1. Using clean transmission fluid, lightly lubricate the inner and outer rear servo bores in the transmission casing.
2. Fit the servo accumulator spring into the servo inner bore.

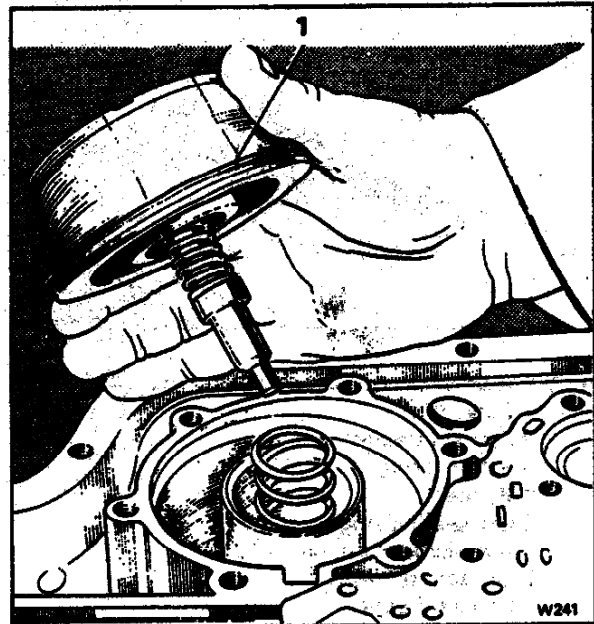


Fig. T67 Removing the rear servo  
1 Rear servo

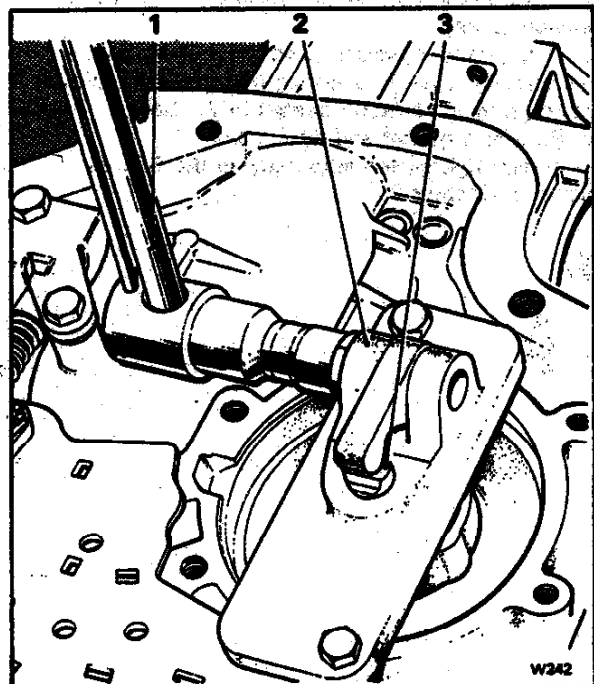
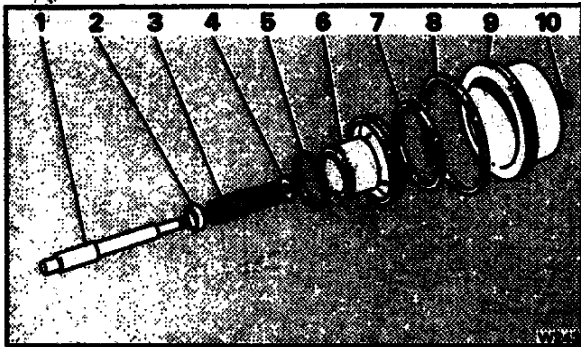


Fig. T68 Selecting the band apply pin  
1 Torque spanner  
2 Gauge  
3 Gauge pin

#### Note

Before fitting the rear servo to the casing, ensure that the rear band apply lug is aligned with the servo pin bore in the transmission casing. If the lug is not aligned, the servo will not apply the rear band.



**Fig. T69 Rear servo and accumulator - exploded**

- 1 Servo pin
- 2 Spring retainer
- 3 Servo spring
- 4 Washer
- 5 Oil sealing ring
- 6 Accumulator piston
- 7 Oil sealing ring
- 8 Servo oil seal
- 9 Servo piston
- 10 'E' ring

3. Position the rear servo assembly in the transmission casing.
4. Using hand pressure, push the servo into the transmission casing, ensuring that the servo piston sealing ring is correctly seated in the bore.
5. Fit a new gasket and fit the cover.
6. Torque tighten the setscrews to the figures quoted in Chapter P.

## Section T14

## Detent solenoid, control valve spacer and front servo

The detent solenoid is secured to the lower face of the transmission casing and is connected by a lead to a connector on the left-hand side of the transmission. When the solenoid receives a signal from a micro-switch at full throttle (kick-down button depressed) a valve is caused to move and an exhaust port is opened behind the detent valve. This allows the detent valve spring to move the detent valve and allow oil at high pressure to be fed to the shift valves to oppose governor pressure (see Section T12).

The control valve spacer fits between the control valve unit and the transmission casing and forms part of the hydraulic system which contains restrictors and check balls.

The front servo is an assembly of pistons and springs, similar to the rear servo. It fits partly in the transmission casing and partly in the control valve unit. The servo applies the front band in Intermediate range (second gear) and Low range to provide engine braking. It is used also as an accumulator for the application of the direct clutch and in conjunction with the check balls and orifices, is part of the timing for the release of the direct clutch.

**Front servo operation****Drive range - first gear**

In Drive range, servo oil from the manual valve charges the accumulator by stroking both the accumulator piston and the servo piston against the accumulator spring. This prepares the accumulator for the controlled application of the direct clutch during the 2-3 up-change. The charging of the accumulator in Drive range (first gear) also makes it possible to have a controlled 1-3 let-up change as the accumulator is prepared in first gear for direct clutch application.

Servo oil and the servo release spring prevent the application of the band in second gear (Drive range) when intermediate clutch apply oil is directed between the servo and accumulator pistons. Servo oil is also present in Reverse and Neutral.

**Drive range - second gear**

In Drive range (first and second gears), the accumulator is charged with servo oil which strokes the servo and accumulator pistons down against the accumulator spring (see Fig. T70). In second gear, intermediate clutch oil is fed between the servo and accumulator pistons but does not force them apart. This is because the force of the servo oil which

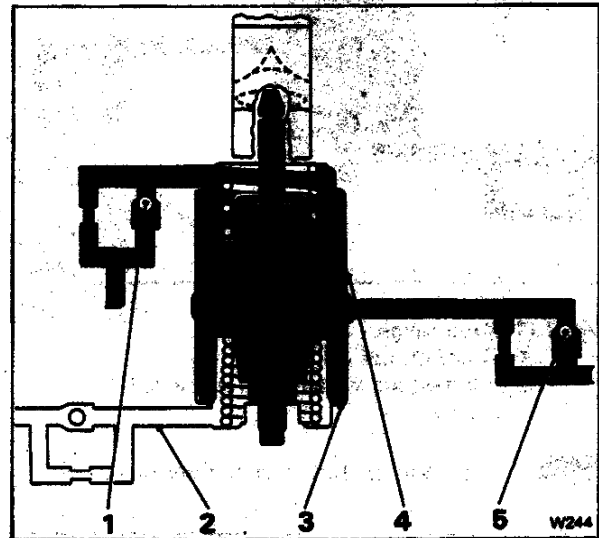


Fig. T70 Drive range - 2nd gear

- 1 Servo oil (check ball seated)
- 2 Direct clutch passage
- 3 Accumulator piston
- 4 Servo piston
- 5 Intermediate clutch oil (check ball seated)

■ Servo and intermediate clutch oil

holds the piston down is equal to the intermediate clutch oil attempting to stroke the piston up.

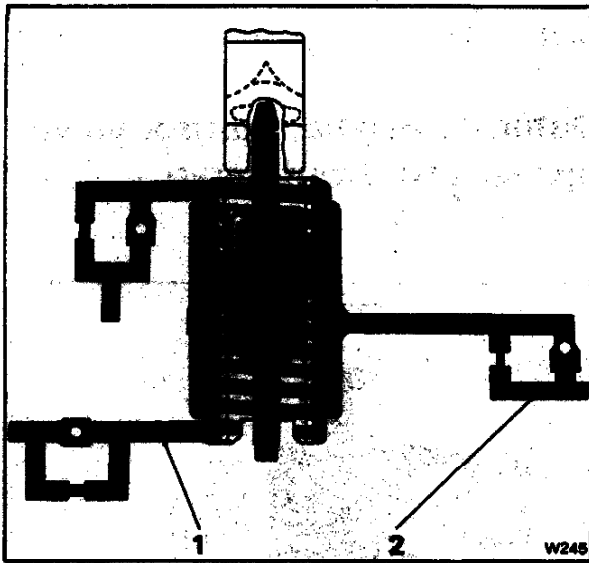
**Drive range - third gear**

When the direct clutch is applied, intermediate clutch oil pressure increases. This increased pressure, plus the accumulator spring, overcomes the servo oil pressure and the accumulator piston is moved until it reaches the stop on the pin (see Fig. T71). As the accumulator piston moves, it abuts the servo piston which moves a corresponding distance, until it contacts a retainer ring on the servo pin; it will not, however, move any further and the front band will not be applied.

As the accumulator piston moves, an amount of direct clutch oil is absorbed and this permits the direct clutch to apply at a controlled rate for a smooth 2-3 up-change.

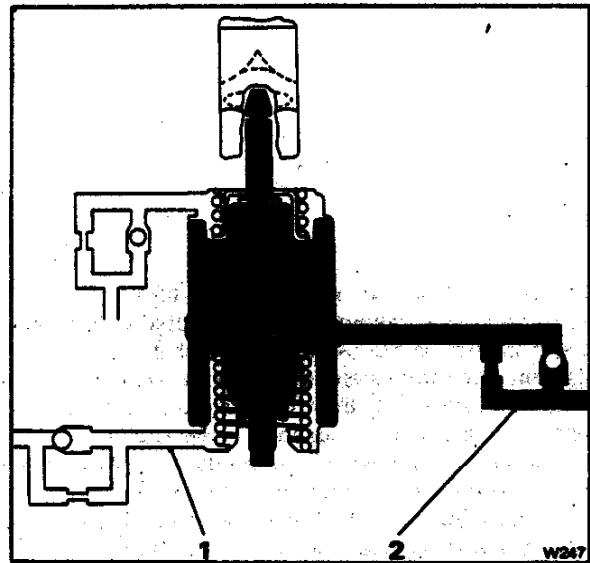
**Drive range - 3-2**

The release of the direct clutch is controlled by the front servo, two orifices and two check balls. This



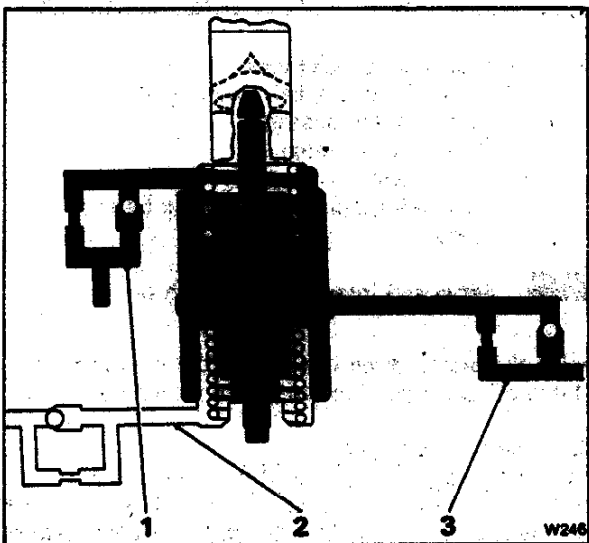
**Fig. T71 Drive range - 3rd gear**  
 1 Direct clutch oil  
 2 Intermediate clutch oil (check ball seated)

■ Direct clutch and intermediate clutch oil



**Fig. T73 Intermediate range - 2nd gear**  
 1 Direct clutch passage  
 2 Intermediate clutch oil (check ball seated)

■ intermediate clutch oil



**Fig. T72 Drive range - 3-2**  
 1 Servo oil (check ball seated)  
 2 Direct clutch passage  
 3 Intermediate clutch oil (check ball seated)

■ Servo and intermediate clutch oil

allows the driving load to be transferred smoothly to the intermediate roller/sprag.  
 The controlled release pressure allows the engine to increase its r.p.m. to suit the lower gear ratio of

second gear during detent down-changes, resulting in a smooth change with better acceleration.

During the stroking of the servo and accumulator pistons, servo oil seats a check ball and the oil must pass through a restrictor. This slows down the stroking of the pistons (see Fig. T72).

The exhausting oil from the accumulator and the direct clutch seats another check ball and the oil is forced to flow through an orifice. This controls the clutch pressure during direct clutch release.

**Intermediate range - second gear**

During a manual 3-2 down-change, intermediate clutch oil from the 1-2 shift valve seats a check ball and flows through an orifice to apply the front band (see Fig. T73). The oil which applies the band is also controlled by the stroking of the accumulator piston which is resisted by the accumulator spring and the restricted exhaust of direct clutch oil.

**Detent solenoid, control valve spacer and front servo - To remove**

These units may be removed from the transmission whether or not the transmission is fitted to the car.

1. Drain the transmission fluid and remove the sump.
2. Remove the control valve unit and governor pipes (see Section T12).
3. Disconnect the leads from the connector terminals.
4. Remove the two setscrews that secure the detent solenoid.
5. Remove the solenoid (and gasket if fitted).

6. Remove the control valve spacer plate and gasket.

**Note**

If the last operation is being carried out with the transmission in the car, lower the control valve spacer plate in a level plane so that the check balls do not fall out. Remove the check balls from the spacer plate.

7. Remove the six check balls from the cored passages in the transmission case (see Fig. T74).

8. Lift the front servo piston, retaining ring, pin, retainer and spring from the transmission case. An exploded view of the front servo is shown in Figure T76.

**Front servo - To inspect**

1. Examine the servo pin for damage.
2. Examine the oil seal ring groove in the piston for damage.
3. Ensure that the ring is free in the groove.
4. Examine the piston for cracks and other damage.
5. Check the fit of the servo pin in the piston.

**Detent solenoid, control valve spacer and front servo - To fit**

When overhauling the front servo or front accumulator piston it will be noticed that the teflon ring allows the piston to slide very freely in its bore. This is a normal characteristic of the ring and does not indicate leakage during operation.

When servicing pistons, the following points should be noted.

Only remove a teflon oil sealing ring from a piston ring groove if the ring is to be renewed.

Only renew a teflon oil sealing ring if it shows evidence of leaking during operation or visual damage.

When changing a front servo teflon oil sealing ring, renew with an aluminium sealing ring.

1. Fit two guide bolts into the transmission case.
2. Place the six check balls into the ball seat pockets in the case.

3. If the transmission is in the car, place the check balls into the ball seat pockets in the spacer plate.

**Note**

One check ball is non-functional, therefore, on RC transmissions omit one ball as shown in Figure T75.

4. Fit the control valve spacer plate to case gasket (gasket with extension for detent solenoid).
5. Fit the control valve spacer plate.
6. Fit the detent solenoid (and gasket if fitted). Do not tighten the setscrews at this time.
7. Fit the front servo spring and retainer into the bore of the transmission case.
8. Fit the retainer ring onto the front servo pin and install the pin into the case so that the tapered end contacts the forward band. Ensure that the retainer ring is installed in the servo pin groove.
9. Fit a new piston sealing ring to the servo piston, if the ring has been removed.
10. Fit the servo piston onto the band apply pin with the flat side of the piston positioned towards the

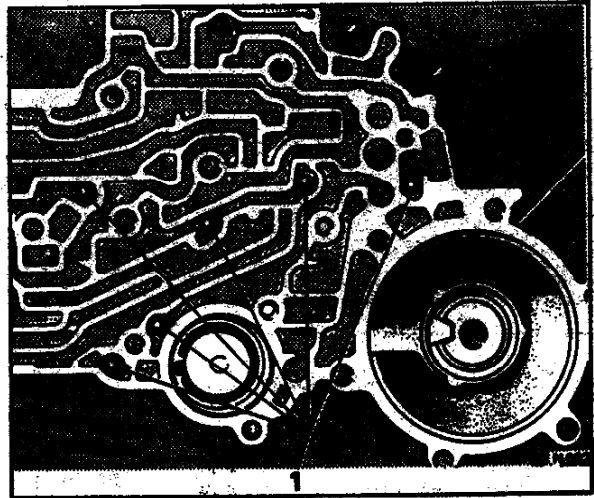


Fig. T74 Location of check balls - transmission case  
1 Check balls

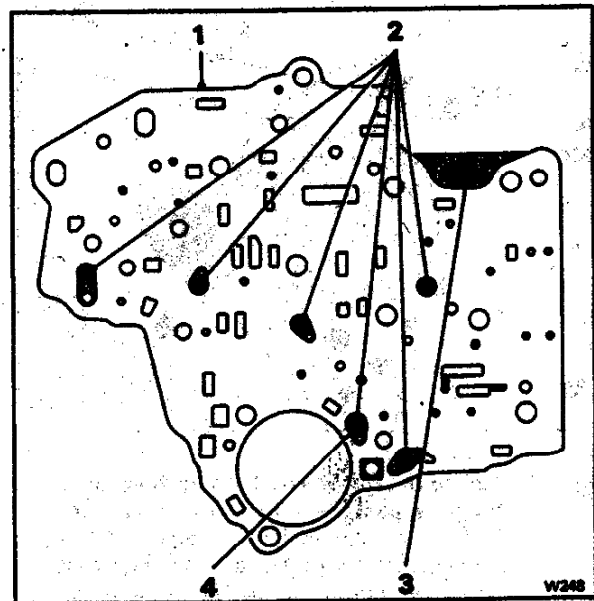
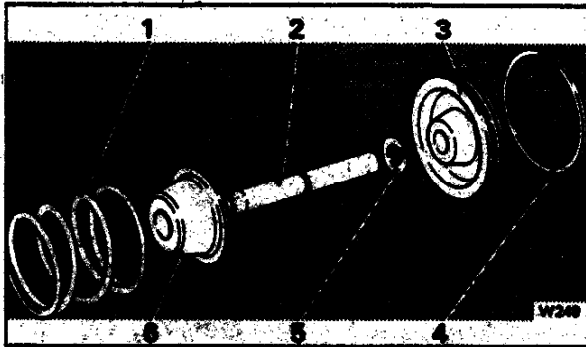


Fig. T75 Location of check balls - spacer plate  
1 Spacer plate to case gasket  
2 Check balls  
3 Spacer plate  
4 Non-functional ball (omit on RC transmissions)

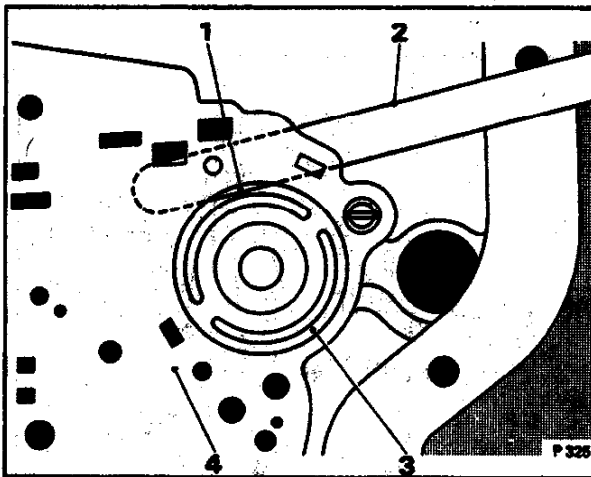
transmission sump.

If the transmission is in the car, the parts should be assembled as a group (see Fig. T76) and fitted into the servo bore. A length of straight clean feeler gauge [approximately 0.51 mm. (0.020 in.)] should be used to hold the servo assembly temporarily in position as shown in Figure T77. Withdraw the feeler gauge before tightening the control valve body set-screws.



**Fig. T76 Front servo - exploded**

- 1 Spring
- 2 Pin
- 3 Piston
- 4 Oil seal ring
- 5 Retainer ring
- 6 Spring retainer



**Fig. T77 Method of temporarily holding front servo piston in position (Transmission in car)**

- 1 Correct position of feeler gauge, allowing the accumulator piston to enter the front servo bore before the feeler gauge is withdrawn
- 2 Feeler gauge
- 3 Front servo piston
- 4 Spacer plate

11. Connect the electrical leads from the top gear switch and detent solenoid onto the connector.  
 12. Fit the control valve as described in Section T12 then torque tighten the setscrews and the detent solenoid setscrews to the figures quoted in Chapter P.

## Section T15

## Rear extension

**Rear extension - To remove**

This Section describes the procedure for removal of the rear extension when the transmission is fitted to the car.

The procedure is the same when the transmission is removed from the car except that the gearchange actuator and the propeller shaft will have been removed.

1. Remove the gearchange electric actuator as described in Section T5.
2. Remove the propeller shaft as described in Chapter F.
3. Place a drip tray beneath the rear extension.
4. Remove the coupling flange by withdrawing it from the output shaft.
5. Remove the setscrews that secure the rear extension to the transmission casing.
6. Slide the rear extension rearward and downward until it clears the output shaft.

**Caution**

Make certain that the output shaft splines do not damage the oil seal in the end of the rear extension.

7. Remove and discard the gasket from the rear extension.

**Rear extension - To inspect**

1. Examine the rear extension for cracks or damage.
2. Examine the bush for excessive wear or damage.
3. Examine the oil seal for damage.
4. If a new oil seal is to be fitted, push out the old seal using a suitable drift.
5. Ensure that the seal bore in the rear extension is clean and free from damage and that the seal drain-back port is not obstructed.
6. Lightly smear the outer edge of the new seal with Wellseal. Drive in the seal using tool RH 7953 (J-21359).

**Note**

The webbing on the seal installation tool RH 7953 (J-21359) must be undercut by approximately 3,17 mm. (0,125 in) as shown in Figure T78.

7. Ensure that the rear face of the transmission casing and the front face of the extension are clean and free from burrs.

**Rear extension - To fit**

1. Fit a new gasket onto the extension housing.
2. Carefully fit the extension casing over the output shaft until the extension abuts the rear of the transmission casing.
3. Ensure that the splines on the output shaft do not touch the oil seal in the end of the extension casing otherwise the seal lip may be damaged.

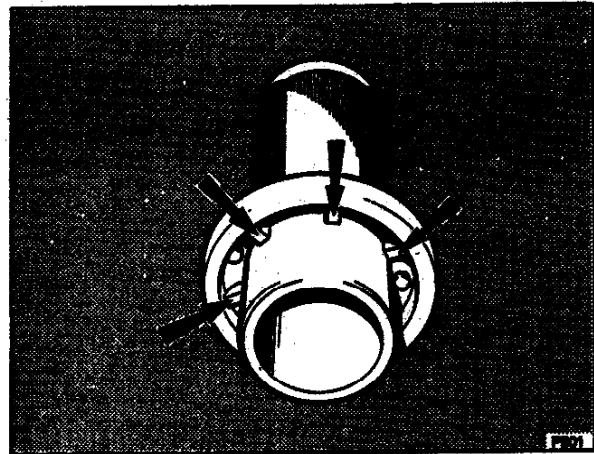


Fig. T78 Seal installation tool RH 7953 (J-21359)

4. Fit the setscrews and torque tighten them to the figures specified in Chapter P.
5. Fit the coupling flange.
6. Fit the propeller shaft.
7. Fit the electric actuator.

Section T16

Oil pump

The oil pump is an internal/external gear type which is secured to the front face of the transmission casing. Contained within the oil pump cover is an oil pressure regulator valve train. The pump is mechanically connected to the engine flex plate and operates whenever the engine is running.

As the engine flex plate rotates it turns the torque converter pump which is keyed to the inner gear of the oil pump. The inner gear turns the outer

gear which causes oil to be lifted from the transmission sump via an oil strainer.

As the gears turn, the oil is carried in pockets formed by the gear teeth, past a crescent shaped projection of the pump. Beyond the crescent, the gear teeth move closer together causing the oil to be forced out at pressure from between the teeth. At this point the oil is delivered through the pump outlet to the pressure system (see Fig. T79).

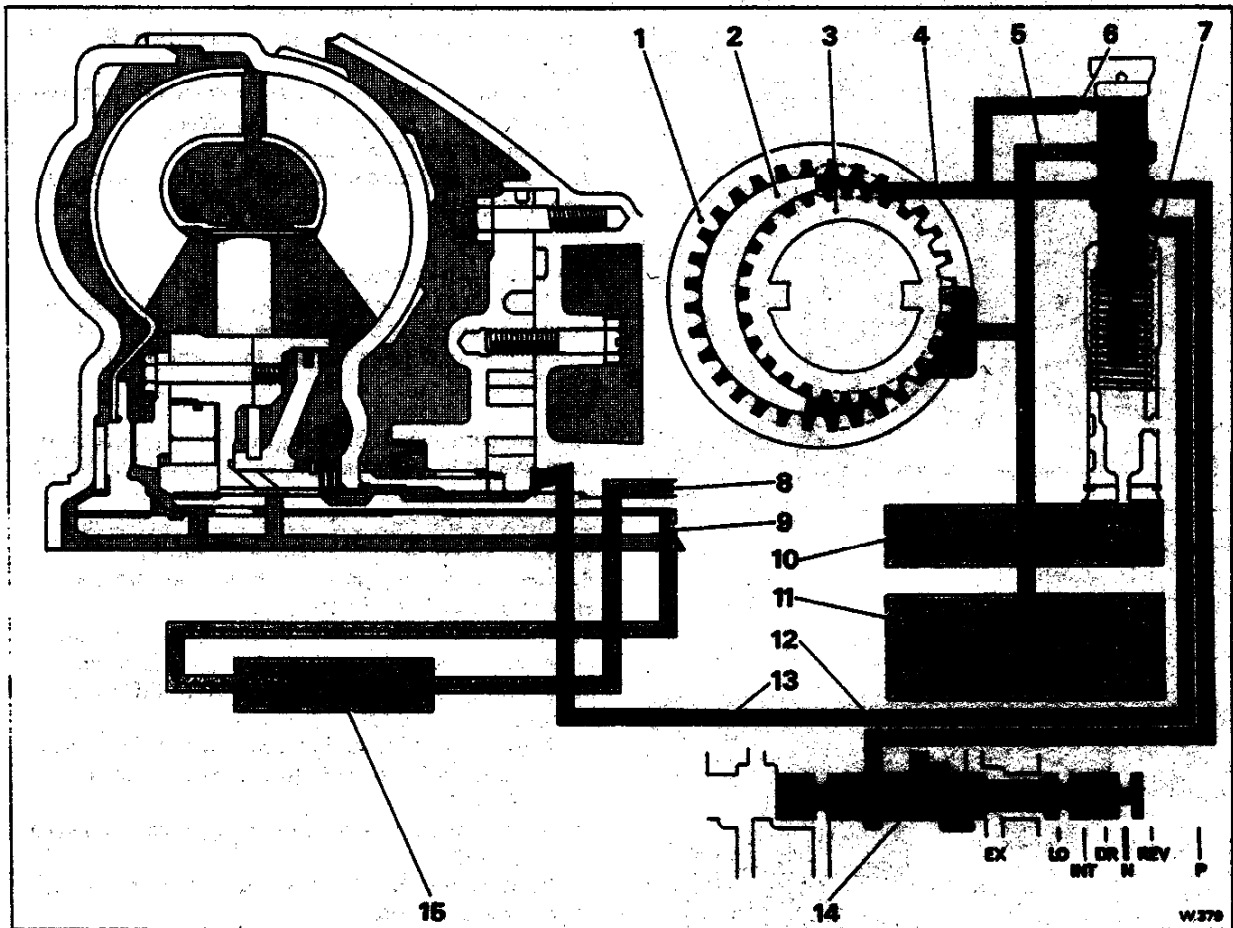


Fig. T79 Oil pump and pressure regulating system

- |                 |                            |                      |
|-----------------|----------------------------|----------------------|
| 1 Driven gear   | 8 Line pressure oil        | 11 Transmission sump |
| 2 Pump crescent | 7 Pressure regulator valve | 12 Line pressure oil |
| 3 Driving gear  | 8 Lubricating oil          | 13 Converter oil     |
| 4 Pump outlet   | 9 Converter return         | 14 Manual valve      |
| 5 Pump intake   | 10 Strainer assembly       | 15 Heat exchanger    |

Line oil
  Intake and lubricating oil

Printed in England

© Rolls-Royce Motors Limited 1980

December 1980

TSD 4200

## T16 - 2

The oil pressure is controlled by a pressure regulator valve. As the pressure builds up, the oil is directed through an orifice to the top of the pressure regulator valve. When the correct pressure is reached, the valve moves against spring pressure, opening a passage which feeds the torque converter.

When the torque converter is full, oil passes to the transmission heat exchanger by way of an external pipe. Upon leaving the heat exchanger, the oil is fed by way of a second external pipe to the transmission lubricating system.

As the pressure continues to increase from the pump, the pressure regulator valve moves further to expose a port which directs excess oil back to

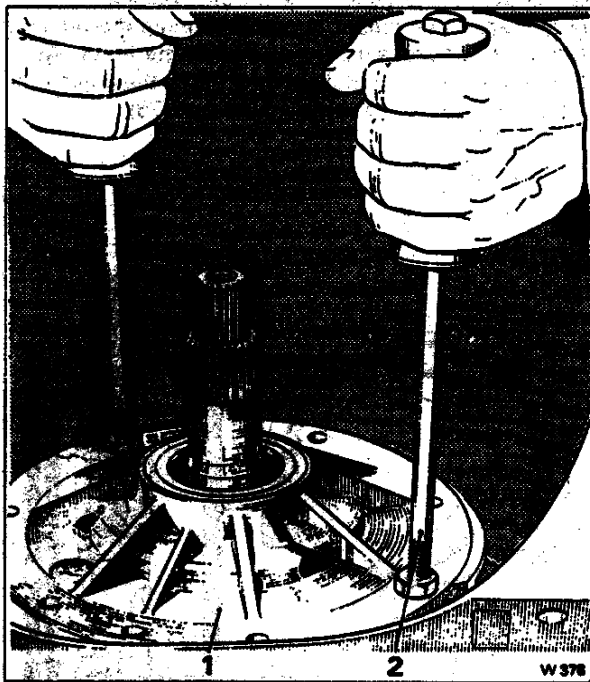


Fig. T80 Removing the oil pump

- 1 Oil pump
- 2 Slide hammer

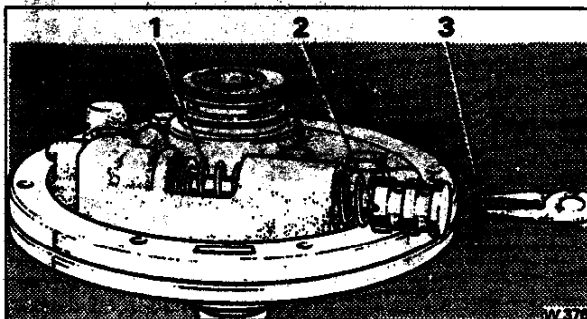


Fig. T81 Removing the regulator valve retaining circlip

- 1 Regulator valve spring
- 2 Boost valve sleeve
- 3 Circlip

the suction side of the pump. The pressure regulator valve is spring balanced to regulate line pressure at approximately 4,92 kgf/sq.cm. (70 lbf/sq.in.).

**Note**

There are two types of regulator valves, therefore, reference should be made to Section T4.

**Oil pump - To remove**

1. Remove the transmission from the car (see Section T6).
2. Remove the retaining clamp RH 7952 (J-21366) and withdraw the converter.

**Note**

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

3. Install the transmission in the holding fixture RH 7955 (J-8763) with the sump upwards.
4. Remove the pump attaching setscrews.
5. Fit the threaded slide hammers (J-7004) into the setscrew holes in the pump body.

Tighten the lock-nuts and remove the pump assembly from the transmission case (see Fig. T80).

**Note**

Operate the slide hammers simultaneously otherwise the pump will tilt and jam in the case.

6. Remove the slide hammers.
7. Remove and discard the pump to case sealing ring and gasket.

**Oil pump - To dismantle**

1. Holding the pump assembly firmly on a bench, push the regulator boost valve sleeve, against spring pressure, then remove the circlip (see Fig. T81).

**Note**

The pressure regulator spring is under pressure and care should be exercised when removing the boost valve and sleeve.

2. Remove the regulator boost valve and sleeve.
3. Remove the pressure regulator spring.
4. Remove the regulator valve, spring retainer and spacer or spacers (if fitted).
5. Remove the setscrews which secure the pump cover to the pump body. Separate the cover and body, noting that the setscrews are of differing lengths.
6. Mark the driving and driven gears to facilitate correct assembly (an indelible pen or pencil is recommended).
7. Remove the gears from the pump body as shown in Figure T82.
8. Remove the retaining pin and plug from the end of the regulator bore.
9. Remove the oil rings from the pump cover.
10. Remove the pump to forward clutch housing selective washer, noting the thickness to facilitate fitting of a new washer on assembly.

**Oil pump - To inspect**

Wash all parts in clean paraffin, then dry with compressed air.

1. Examine the pump body gear pocket and the crescent for scoring or other damage.
2. Fit the gears into the pump body, then check the end clearance as shown in Figure T83. The clearance should be between 0,02 mm. and 0,09 mm. (0.0008 in. and 0.0035 in.).
3. Examine the face of the pump body for scores and burrs.
4. Examine the oil passages for blockages and porosity.
5. Examine the threads into which the cover securing setscrews fit.
6. Check the pump cover and body faces for overall flatness.
7. Examine the pressure regulator valve bore for score marks.
8. Ensure that the pressure regulator valve and the boost valve will move freely in their respective bores.

#### Oil pump - To assemble

1. Fit the oil pump driving and driven gears into the pump body with the alignment marks (made with an indelible pen or pencil) uppermost.

#### Note

If the pump driven gear has a rectangular or triangular identification mark on one tooth, the gear should be installed with the identification mark downwards.

Fit the drive gear with the drive tangs uppermost (see Fig. T82).

2. Fit the pressure regulator spring retainer, spacer or spacers (if fitted) and spring into the pressure regulator bore (see Fig. T84).
3. Lightly lubricate the pressure regulator valve with clean transmission fluid, then fit the valve into the opposite end of the bore, stem end first.
4. Fit the pressure regulator valve end plug and retaining pin.
5. Lightly lubricate the boost valve and sleeve, then fit the valve into the sleeve (stem end out). Fit both parts into the bore in the pump cover by compressing the sleeve against the pressure regulator valve spring.
6. Retain the sleeve with the circlip.
7. Fit the two oil sealing rings to the pump cover.
8. Lubricate the pump gears with clean transmission fluid then fit the pump cover to the pump body.
9. Fit the cover securing setscrews into their original positions. Leave the setscrews finger tight.
10. Fit the pump body and cover alignment band (J-21355) around the pump assembly. Tighten the band to align the cover with the body (see Fig. T85).
11. With the band in position, tighten the pump body to cover securing setscrews to the figures quoted in Chapter P. Remove the alignment band.
12. Fit a new pump to case 'O' ring.
13. If necessary, fit a new front pump oil seal using the installing tool RH 7853 (J-21359).
14. Fit a new selective washer (pump to forward

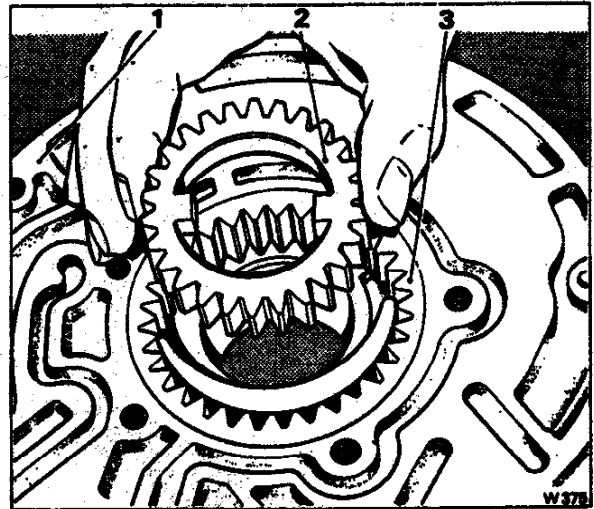


Fig. T82 Removing the pump gears

- 1 Pump body
- 2 Driving gear (tang's uppermost)
- 3 Driven gear

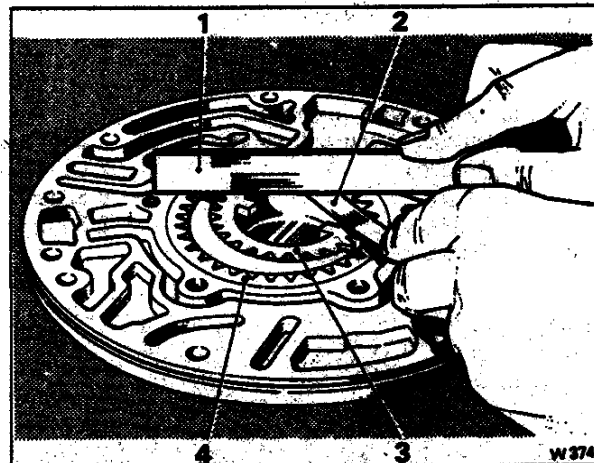


Fig. T83 Checking the gear end clearance

- 1 Straight edge
- 2 Feeler gauge
- 3 Inner (driving) gear
- 4 Outer (driven) gear

clutch housing), with a corresponding thickness to the one removed.

#### Oil pump - To fit

1. Fit a new gasket and guide pins into the transmission case.
2. Lubricate the turbine shaft journals with clean transmission fluid. Smear the seal rings on the pump delivery sleeve with petroleum jelly, ensuring that the rings are correctly located.
3. Fit the pump assembly (see Fig. T86). Ensure that new seals are fitted to the setscrews.

Do not remove the guide pins until all but two

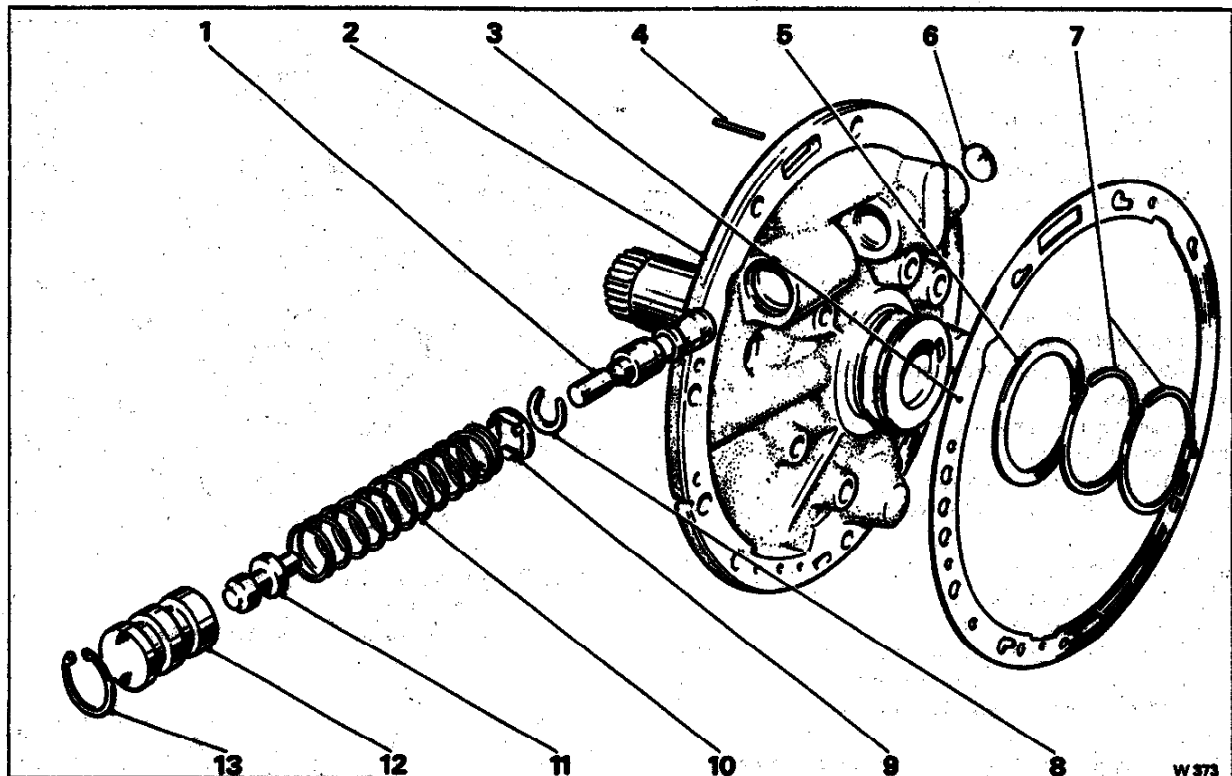


Fig. T84 Pump cover - exploded

- 1 Pressure regulator valve
- 2 Pump cover
- 3 Gasket
- 4 Retaining pin
- 5 Selective washer

- 6 Bore plug
- 7 Oil sealing rings
- 8 Spacer
- 9 Spring retainer

- 10 Pressure regulator spring
- 11 Boost valve
- 12 Sleeve
- 13 Circlip

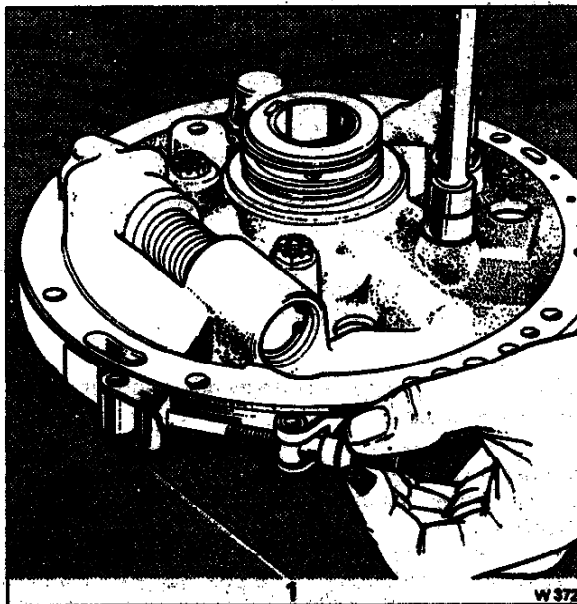


Fig. T85 Aligning the pump cover with the pump body

- 1 Alignment band

setscrews have been fitted. Leave one setscrew out to assist in checking the end-float.

4. Torque tighten the setscrews to the figures quoted in Chapter P.

#### Note

If the turbine shaft cannot be rotated as the pump is being pulled into position, it is possible that either the forward or direct clutch housings have not been correctly indexed with all the clutch plates. This condition must be corrected before the pump is finally pulled into position.

5. Check the front unit end-float as follows (see Fig. T87).

- (a) Fit a slide hammer (J-7004) into the one remaining bolt hole.
- (b) Secure a dial test indicator on the slide hammer bolt. Adjust the indicator to register against the end of the turbine shaft.
- (c) Hold the output shaft forward whilst pushing the turbine shaft rearward to its stop.
- (d) Set the dial indicator to zero.
- (e) Pull the turbine shaft forward, noting the indicator reading (shaft travel).

The end-float should be between 0.08 mm. and 0.61 mm. (0.003 in. and 0.024 in.).

If the end-float is not within the limits, select a new washer, referring to the following chart.

Thickness	Colour	Number
1,52 mm. to 1,63 mm. (0.060 in. to 0.064 in.)	Yellow	0
1,80 mm. to 1,90 mm. (0.071 in. to 0.075 in.)	Blue	1
2,08 mm. to 2,18 mm. (0.082 in. to 0.086 in.)	Red	2
2,36 mm. to 2,46 mm. (0.093 in. to 0.097 in.)	Brown	3
2,64 mm. to 2,74 mm. (0.104 in. to 0.108 in.)	Green	4
2,92 mm. to 3,02 mm. (0.115 in. to 0.119 in.)	Black	5
3,20 mm. to 3,30 mm. (0.126 in. to 0.130 in.)	Purple	6

**Note**

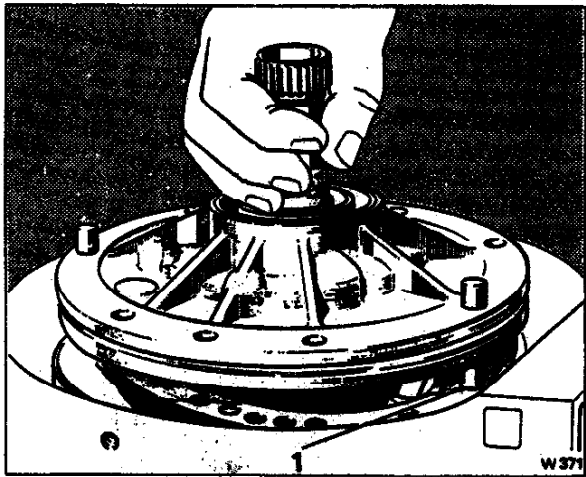
An oil soaked washer may tend to discolour. Therefore, if necessary, measure the washer to ascertain the thickness.

6. Remove the dial test indicator and slide hammer.

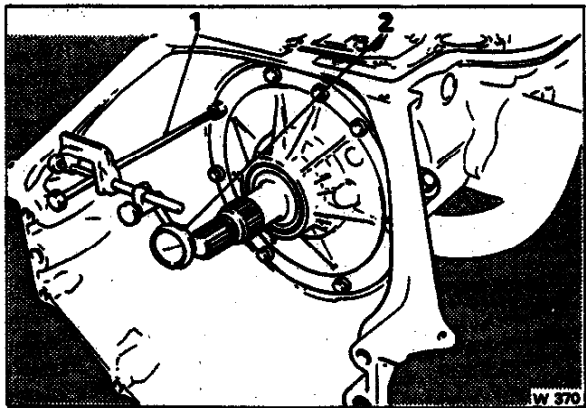
7. Fit the final pump securing setscrew and seal. Torque tighten the setscrew to the figures quoted in Chapter P.

Printed in England

© Rolls-Royce Motors Limited 1980



**Fig. T86 Fitting the oil pump**  
1 Guide pin



**Fig. T87 Checking the front unit end-float**  
1 Slide hammer bolt  
2 Dial indicator

December 1980

TSD 420\*

## Section T17

Control rods, levers  
and parking linkage

The control rods, levers and parking linkage consist of an assembly of levers and rods which are operated by the electric gearchange actuator. The detent lever is connected to the manual control valve in the control valve unit and is retained in this position by a spring-loaded detent roller (see Fig. T88).

The parking pawl actuating rod causes the parking pawl to engage the transmission whenever Park is selected. This provides a mechanical lock which will hold the car on the steepest of gradients.

When the gear range selector lever on the steering column is moved, with the ignition on, the electric actuator will move the gearchange operating lever to the required position via an adjustable rod. The gearchange operating lever is secured to the outer end of the manual shaft and the detent lever is secured to the inner end of the shaft. Therefore, the detent lever will move a corresponding distance, moving the manual control valve.

When the gear selector lever on the steering column is moved to Park, the parking-pawl actuating rod which is secured to the detent lever causes the parking pawl to engage with a gear ring on the rear unit planet carrier. The rear unit planet carrier is mechanically connected to the transmission output shaft, therefore, the shaft is prevented from rotating.

## Control rods, levers and parking linkage - To remove

1. The units may be removed from the transmission whether or not the transmission has been removed from the car.
2. If the transmission has not been removed, drain and remove the sump as described in Section T11.
3. If the gearchange electric actuator has not been removed, disconnect the gearchange operating rod by removing the split pin and clevis pin.
4. Remove the split pin and clevis pin from the opposite end of the gearchange operating rod; remove the rod.
5. Remove the lock-nut which retains the gearchange operating lever to the manual shaft; remove the lever.
6. Remove the setscrew that secures the detent spring and roller assembly to the control valve unit; remove the detent spring assembly.
7. Remove the pin which secures the manual shaft to the case.
8. Slacken the lock-nut securing the detent lever to the manual shaft.
9. Remove the detent lever from the manual shaft. Then remove the lock-nut completely.
10. Remove the parking pawl actuating rod, detent lever and manual shaft from the case.

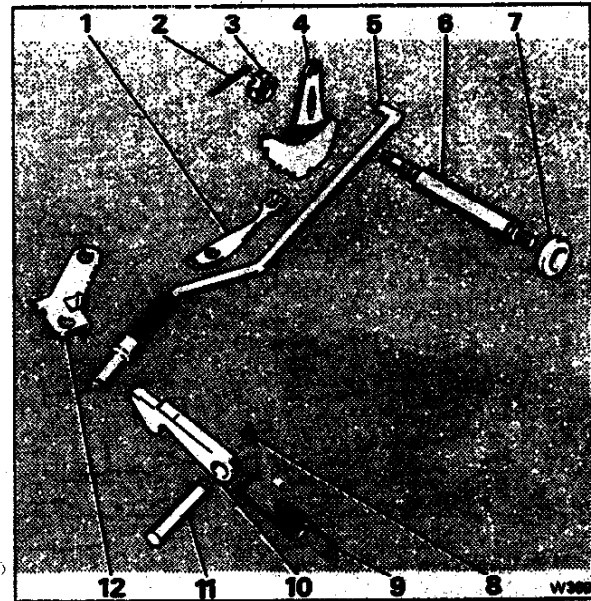


Fig. T88 Manual shaft and parking linkage - exploded

- 1 Detent roller and spring assembly
- 2 Retaining pin
- 3 Lock-nut
- 4 Detent lever
- 5 Parking pawl actuating rod
- 6 Manual shaft
- 7 Lip seal
- 8 Spring retainer
- 9 Pawl return spring
- 10 Parking pawl
- 11 Pawl shaft
- 12 Parking lock bracket

**Note**

Do not remove the manual shaft seal unless replacement is required.

11. Remove the setscrews securing the parking lock bracket; remove the bracket.

12. Remove the parking pawl return spring.

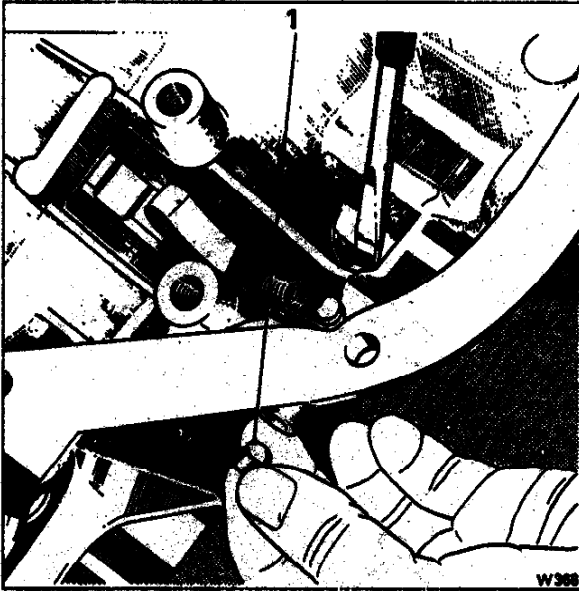
**Note**

The following operations are to be completed only if one or more of the parts involved requires replacement.

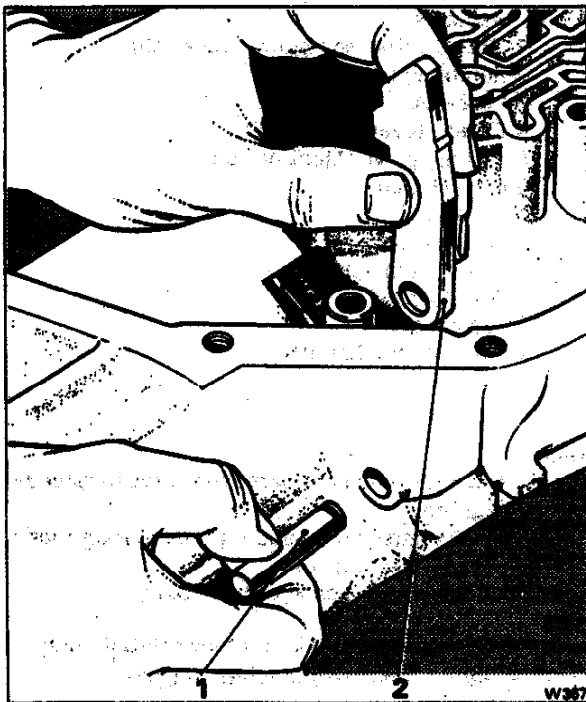
13. Remove the spring retainer from the parking pawl shaft. Remove the parking-pawl shaft cup plug by placing a screwdriver between the parking pawl shaft and the casing; levering outwards (see Fig. T89).

#### 14. Remove the parking pawl and the shaft.

**Control rods, levers and parking linkage - To inspect**  
 1. Wash all parts in clean paraffin, then dry them with compressed air.



**Fig. T89 Removing the cup plug**  
 1 Cup plug

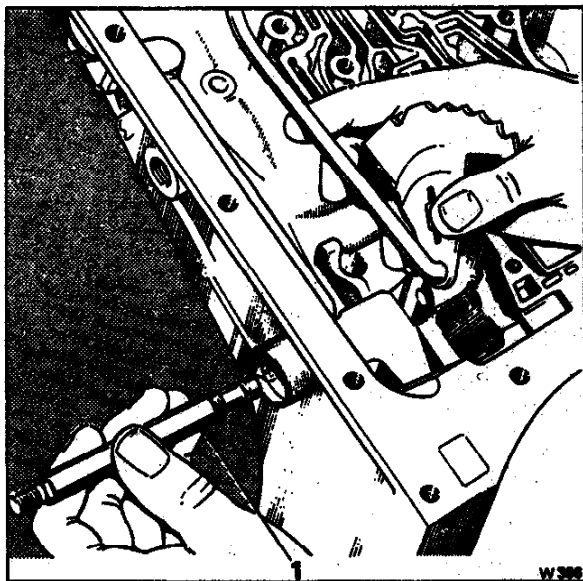


**Fig. T90 Fitting the parking pawl and shaft**  
 1 Shaft  
 2 Parking pawl

2. Examine the parking pawl actuator rod for cracks or broken spring retainer lugs.
3. Examine the actuator spring for distortion or damage. Ensure the actuator fits freely on the actuator rod.
4. Examine the parking pawl for cracks or wear.
5. Examine the manual shaft for damaged threads or shaft roughness (oil seal surface).
6. Examine the detent lever for cracks or a loose pin.
7. Examine the parking pawl shaft for damage to the retainer groove.
8. Examine the parking pawl return spring for distortion or damaged ends.
9. Examine the parking lock bracket for cracks or wear.
10. Examine the detent spring and roller assembly for cracks or damage.
11. Examine the gearchange operating rod for signs of bending.
12. Examine the jaws of the operating rod for cracks or damage.

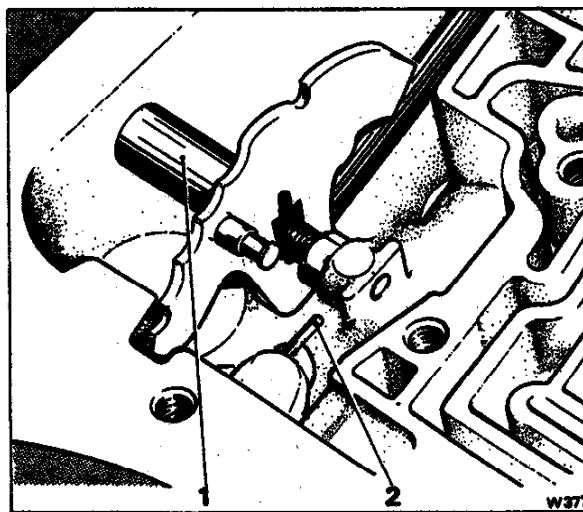
**Control rods, levers and parking linkage - To fit**

1. Fit the parking pawl with the tooth towards the centre of the transmission, then fit the parking pawl shaft (see Fig. T90).
2. Fit the parking pawl shaft retaining clip.
3. Fit the cup plug into the case, using a 9.52 mm (0.375 in.) diameter steel rod, to drive the shaft and plug into the case until the shaft bottoms on the case rib.
4. Fit the parking pawl return spring with the squared end hooked around the pawl.
5. Fit the parking lock bracket with the guides over the parking pawl. Torque tighten the setscrews to the figures quoted in Chapter P.
6. Fit the actuator rod plunger under the parking lock bracket and over the parking pawl.
7. Fit the opposite end of the actuator rod into the detent lever from the side opposite to the pin.
8. If necessary, fit a new manual shaft to case lip type seal into the case, using a 19.05 mm (0.750 in.) diameter steel rod to seat the seal.
9. Lubricate the manual shaft with Shell Retinax A grease. Fit the shaft into the case and through the detent lever (see Fig. T91).
10. Fit the lock-nut onto the manual shaft, then torque tighten the nut to the figures quoted in Chapter P.
11. Fit the retaining pin into the transmission casing, aligning it with the groove in the manual shaft (see Fig. T92).
12. Fit the detent spring and roller assembly. Torque tighten the setscrew to the figures quoted in Chapter P.
13. Fit the gearchange operating lever to the manual shaft. Fit the lock-nut and torque tighten to the figures quoted in Chapter P.
14. Fit the gearchange operating rod using the clevis pins. Lubricate the clevis pins with Rocol



**Fig. T91 Fitting the manual shaft**  
1 Manual shaft

4. Select each of the gear positions in turn on the actuator. At each position, ensure that the clevis pin will slide easily into the jaw and lever.
5. Check that the pin will slide easily into the jaw when Low is selected after Park and conversely when Park is selected after Low.
6. If, in any position the pin will not pass through the jaw and lever, adjust the length of the rod.
7. Finally, lubricate the clevis pin with Rocol MTS 1000 grease. Fit the clevis pin and secure it with a new split pin.



**Fig. T92 Fitting the manual shaft retaining pin**  
1 Manual shaft  
2 Retaining pin

MTS 1000 grease, then fit new split pins.  
15. Fit the sump (see Section T11).

**Control linkage - To check**

1. Remove the split pin and clevis pin from the gearchange operating rod, at the actuator end.
2. Select Park on the gearchange actuator. Push the lower end of the gearchange operating lever fully forward (Park position).
3. Ensure that both jaws of the operating rod slide easily about the two levers and check the clevis pin will slide into the jaw and through the lever.

## Section T18

## Turbine shaft, forward and direct clutches, sun gear shaft and front band

The turbine shaft is a splined shaft which connects the torque converter to the forward clutch.

The forward clutch comprises a housing, splined onto the turbine shaft. Steel clutch driving plates which are driven by the clutch housing. Composition faced plates which are splined onto a clutch hub and a hydraulically operated clutch piston. The mainshaft is splined into the forward clutch hub.

The direct clutch is similar in construction to the forward clutch (see Fig. T93).

The composition plates are splined to a hub which is integral with the forward clutch back plate. The steel plates are splined to a housing which in turn is splined to the sun gear shaft. The clutch is applied hydraulically by a piston housed in the direct clutch housing.

The front band is a lined steel band which is anchored to the transmission case at one end and is servo operated at the other end. The band fits around the direct clutch housing and when moved by the servo, holds the housing stationary.

Whenever the forward clutch is applied, the drive transmitted by the turbine is connected to the transmission mainshaft. When the forward clutch is released the clutch return springs push back the hydraulic piston, the plates are then released and

the connection between the converter and the mainshaft is broken. As a result, the transmission is in Neutral.

Whenever the direct clutch is applied, drive from the forward clutch is divided and follows two different paths to the gear unit (see Section T19).

By following one path, the drive continues through the forward clutch to the mainshaft and the rear gear unit internal (annulus) gear. The other path is via the forward clutch back plate, through the direct clutch to the sun gear shaft.

As the direct clutch is applied, clockwise torque from the converter causes an intermediate inner roller/sprag race to overrun the roller/sprag clutch assembly.

An illustrated summary of the power flow through the transmission is given in Section T19.

### Turbine shaft, forward and direct clutches, sun gear shaft and front band - To remove

1. Remove the transmission from the car; withdraw the converter assembly.
2. Remove the oil pump.
3. Withdraw the turbine shaft and the forward clutch from the transmission (see Fig. T94).
4. Remove the thrust washer from between the

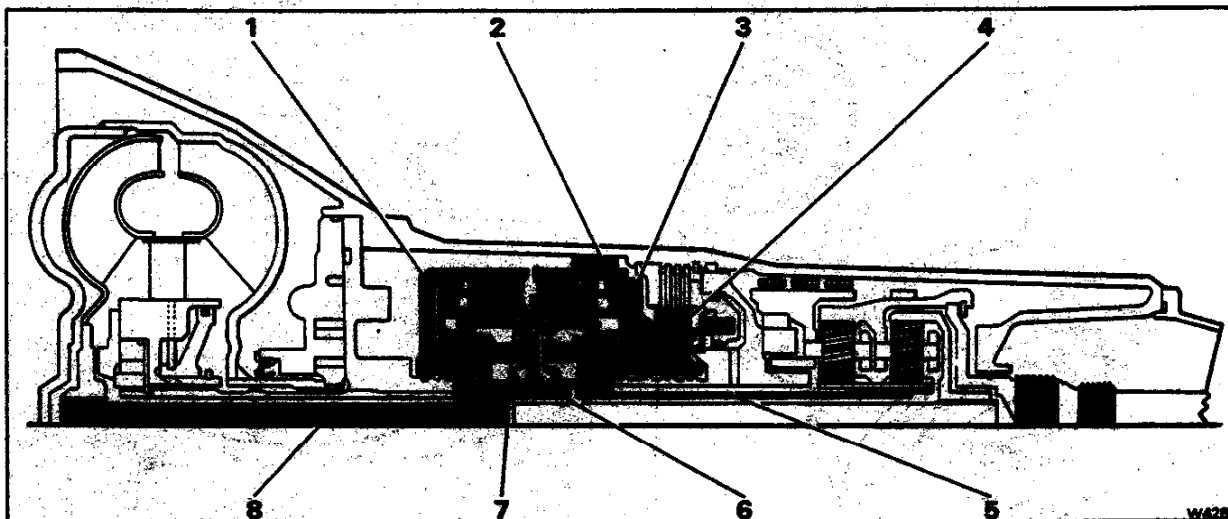


Fig. T93 Sectioned view of transmission showing forward and direct clutches

- |                          |                                    |                      |
|--------------------------|------------------------------------|----------------------|
| 1 Forward clutch housing | 4 Intermediate roller/sprag clutch | 6 Forward clutch hub |
| 2 Front band             |                                    | 7 Direct clutch hub  |
| 3 Direct clutch housing  | 5 Sun gear shaft                   | 8 Turbine shaft      |

■ Turbine shaft, forward and direct clutches, sun gear shaft and front band.

forward clutch hub and the direct clutch housing; the washer may have come out with the forward clutch.

5. Withdraw the direct clutch and intermediate roller/sprag assembly (see Fig. T95). The sun gear shaft may come out with the direct clutch assembly.
6. Remove the sun gear shaft if not previously removed.

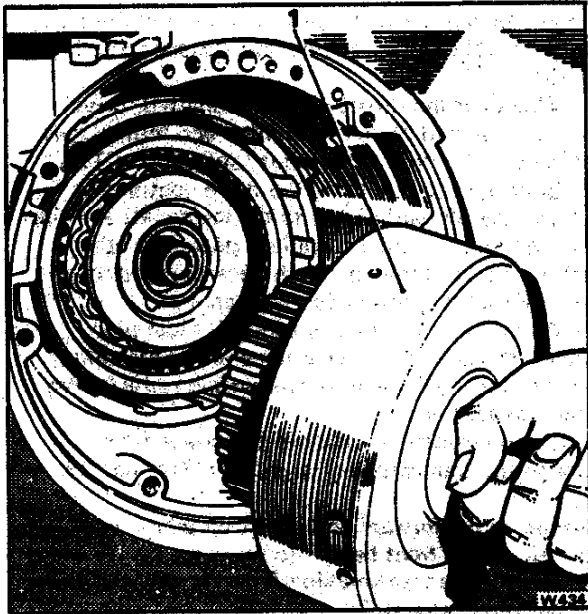


Fig. T94 Removing the forward clutch assembly  
1 Forward clutch assembly

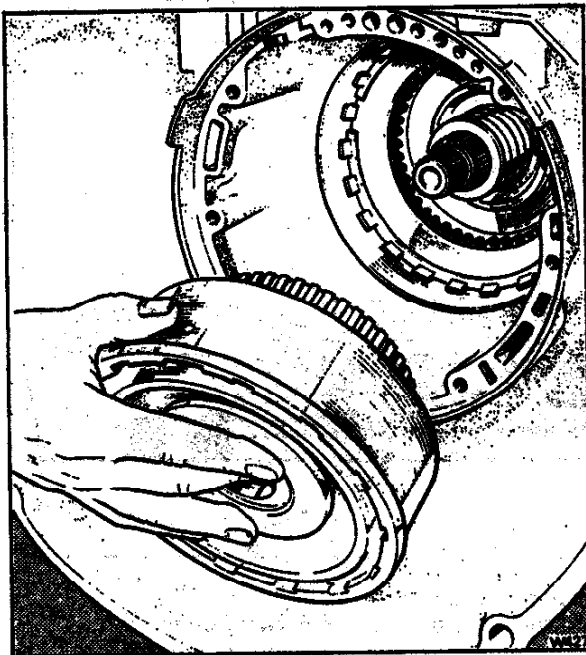


Fig. T95 Removing the direct clutch and intermediate roller/sprag assembly

7. Remove the front band.
8. Check the end-float of the rear unit; proceed as follows.

#### Rear unit end-float - To check

1. Remove the transmission rear extension housing.
2. Fit a slide hammer bolt (J-7004), or a similar suitable bolt into one of the holes in the end of the transmission case.
3. Mount a dial test indicator onto the bolt so that the indicator stem registers with the end of the output shaft (see Fig. T96).
4. Set the dial indicator to zero.
5. Move the output shaft in and out, noting the indicator reading to enable the correct end-float adjusting washer to be used when the transmission is assembled. The end-float should be between 0.18 mm. and 0.48 mm. (0.007 in. and 0.019 in.).
6. The adjusting washer which controls this end-float is a steel washer with three tabs located between the thrust washer and the rear face of the transmission case.
7. If a different washer thickness is required to bring the end-float within the specified limits, it can be selected with the aid of the following chart.

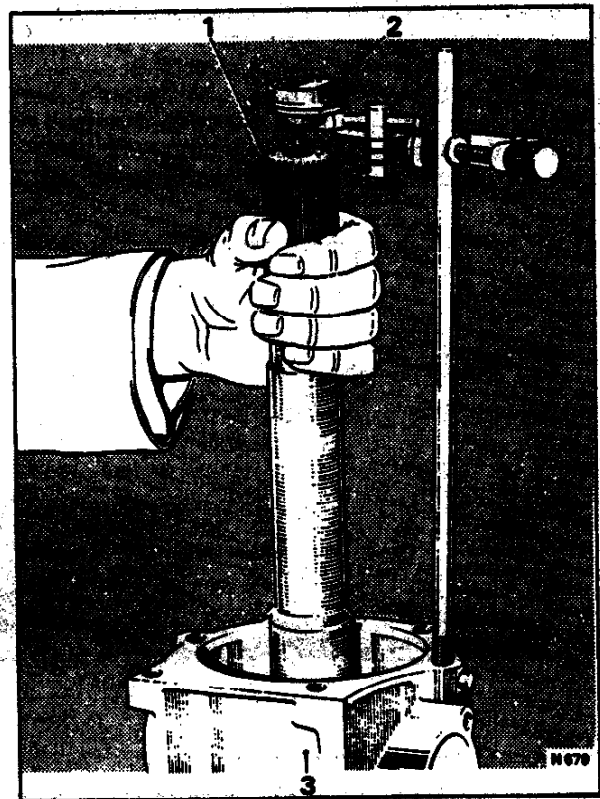


Fig. T96 Checking the rear unit end-float.  
1 Output shaft  
2 Dial indicator gauge  
3 Transmission case

Printed in England

© Rolls-Royce Motors Limited 1982

September 1982

TSD 4200

Thickness	Number
0 mm. to 0,41 mm. (0 in. to 0.016 in.)	6
0,41 mm. to 0,81 mm. (0.016 in. to 0.032 in.)	5
0,81 mm. to 1,22 mm. (0.032 in. to 0.048 in.)	4
1,22 mm. to 1,63 mm. (0.048 in. to 0.064 in.)	3
1,63 mm. to 2,03 mm. (0.064 in. to 0.080 in.)	2
2,03 mm. to 2,44 mm. (0.080 in. to 0.096 in.)	1

**Forward clutch and turbine shaft - To dismantle**

1. Remove the large snap ring which retains the direct clutch hub to the forward clutch housing. Remove the direct clutch hub.
2. Remove the forward clutch hub. Remove the thrust washers, one from each side of the hub (see Fig. T97).
3. Remove the composition and steel clutch plates. Remove the clutch apply ring.
4. Place the forward clutch on the bed of a press

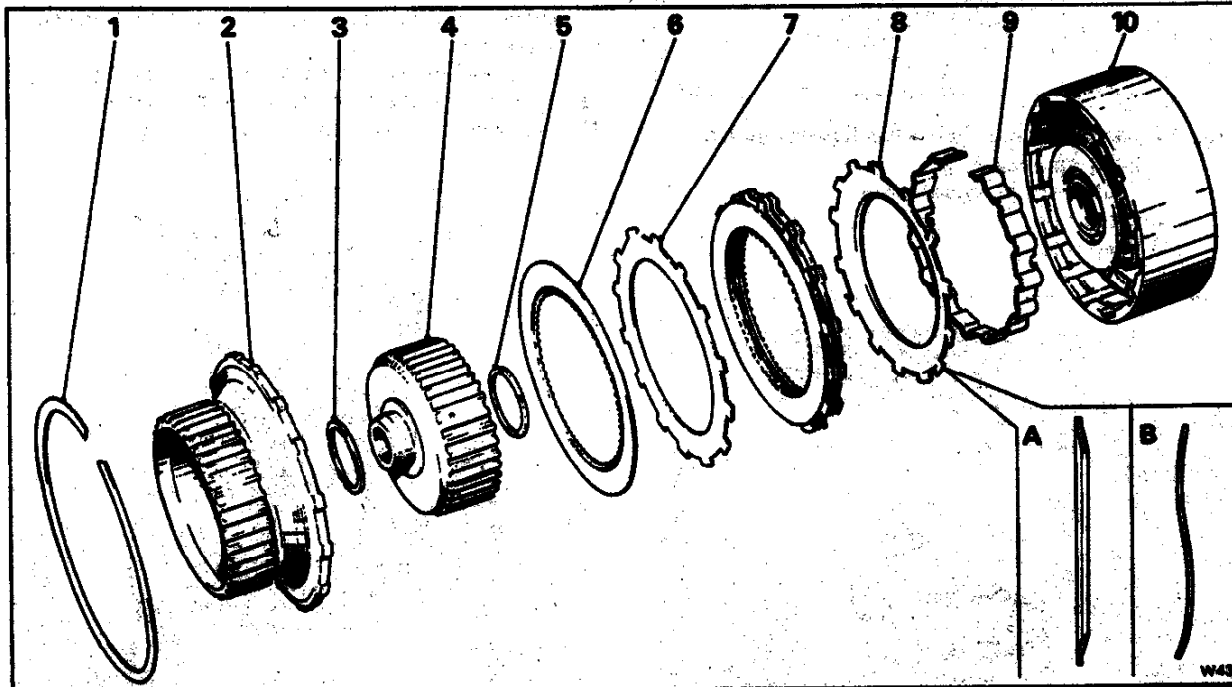
with the turbine shaft lowermost.

5. Compress the clutch return springs until the retaining snap ring is accessible. Remove the snap ring (see Fig. T98).
6. Remove the tool, then remove the spring retainer and the sixteen clutch release springs. Keep these springs separate from the direct clutch release springs.
7. Remove the piston from the clutch housing (see Fig. T99).

**Note**

The forward and direct clutch pistons are similar. Ensure that the forward clutch piston is identified during dismantling, so that it can be reassembled correctly into the forward clutch housing.

8. Remove and discard the inner and outer seals from the clutch piston.
9. Remove and discard the piston centre seal from the forward clutch housing.
10. It is not necessary to remove the turbine shaft from the forward clutch housing unless either the shaft or the housing is damaged and requires renewal. Therefore, if renewal is required proceed as follows.
11. Place the forward clutch housing on the bed of a press with the turbine shaft lowermost.
12. Using a 9,53 mm. (0.375 in.) drive extension, approximately 76,20 mm. (3.00 in.) long, or similar

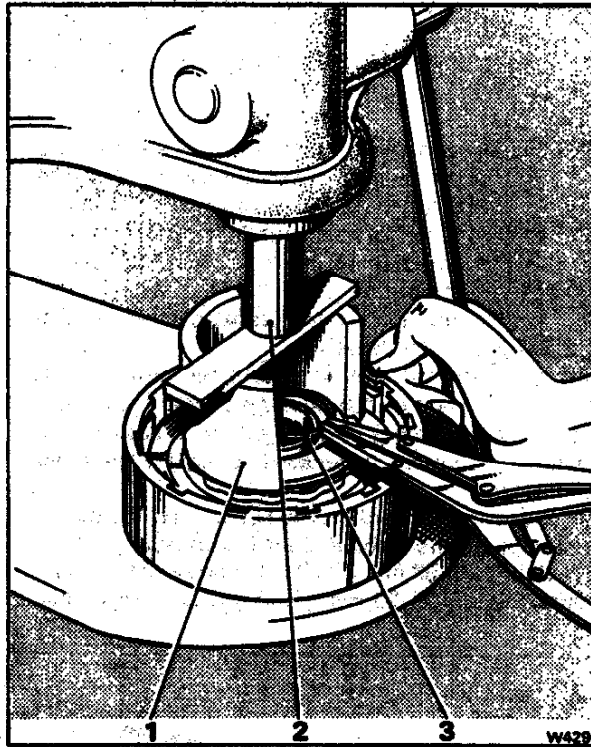


**Fig. T97 Forward clutch assembly - exploded**

- |                      |                     |                            |
|----------------------|---------------------|----------------------------|
| 1 Snap ring          | 5 Thrust washer     | 8 Waved/Dished steel plate |
| 2 Direct clutch hub  | 6 Composition plate | 9 Apply ring               |
| 3 Thrust washer      | 7 Flat steel plate  | 10 Forward clutch assembly |
| 4 Forward clutch hub |                     |                            |
- A Dished steel clutch plate - Fitted to cars produced from 1980  
 B Waved steel clutch plate - Fitted to cars produced prior to 1980

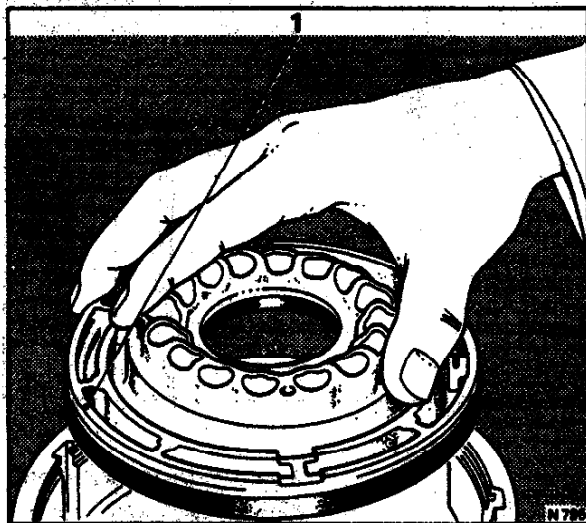
tool as a drive, press the turbine shaft out of the forward clutch housing.

**Forward clutch and turbine shaft - To inspect**  
 1. Wash all parts in clean paraffin, except the



**Fig. T98 Removing and fitting the forward clutch housing snap ring**

- 1 Clutch spring compressor
- 2 Press ram
- 3 Snap ring



**Fig. T99 Removing the forward clutch piston**  
 1 Clutch piston

composition faced clutch plates. Dry all the parts with compressed air. The composition clutch plate surfaces should be examined for:

- (a) Pitting and flaking.
- (b) Wear.
- (c) Glazing.
- (d) Cracking.
- (e) Charring.
- (f) Metal particles embedded in the lining.

If a composition plate exhibits any of the above conditions, fit new plates.

2. The steel plates should be checked for heat discoloration. If the surface is smooth and an even colour is indicated, the plates can be used again. If severe heat spot discoloration or surface scuffing is indicated, fit new plates.

3. Examine the sixteen clutch release springs for collapsed coils or signs of distortion. If any springs show these symptoms, fit sixteen new springs.

Extreme heat or burning in the area of the clutch may have caused the springs to take a heat set, if this condition is found, fit sixteen new springs.

4. Examine the clutch hubs for worn splines. Ensure that the lubrication holes are clear and that the thrust faces are not scored or damaged.

5. Examine the piston for cracks.

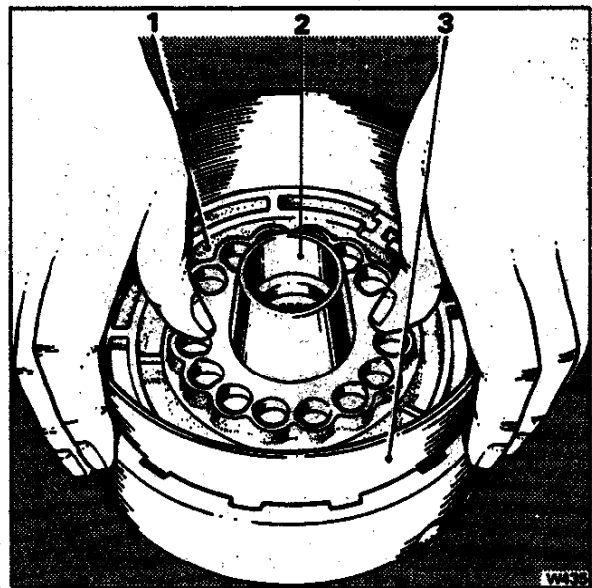
6. Examine the clutch housing for wear, scoring and open oil passages.

7. Ensure that the check ball in the clutch housing is free in its chamber.

8. Ensure that the lubrication holes in the turbine shaft are clear.

9. Examine the splines on the turbine shaft for damage and the shaft for cracks or distortion.

10. Examine the bush journals for damage.



**Fig. T100 Fitting the forward clutch piston**

- 1 Forward clutch piston
- 2 Inner seal protector
- 3 Outer seal protector

**Forward clutch and turbine shaft - To assemble** If the turbine shaft was removed from the forward clutch housing, proceed as follows.

1. Place the clutch housing on the bed of a press with the front face (flat side) uppermost.
2. Lightly lubricate the shorter splined end of the turbine shaft then, align the splines with the mating splines in the forward clutch housing. Using the press, carefully press the turbine shaft into the forward clutch housing until the shaft bottoms on the hub of the housing.

**Note**

The shaft should be started in the housing, then the pressure on the press arbor relaxed to allow the shaft to straighten itself. Repeat this step several times until it is evident that the shaft is squarely aligned with the housing. If the shaft is not started squarely, damage to the shaft or housing splines may occur.

3. Invert the forward clutch housing on the press so that the turbine shaft is downward.
4. Lubricate the new inner and outer clutch piston seals with clean transmission fluid. Lubricate the seal grooves in the piston with petroleum jelly then fit the seals with the seal lip facing away from the return spring pockets.
5. Lubricate a new piston centre seal with clean transmission fluid. Lubricate the seal groove in the forward clutch housing with petroleum jelly then fit the seal with the lip uppermost.
6. Fit the forward and direct clutch inner seal

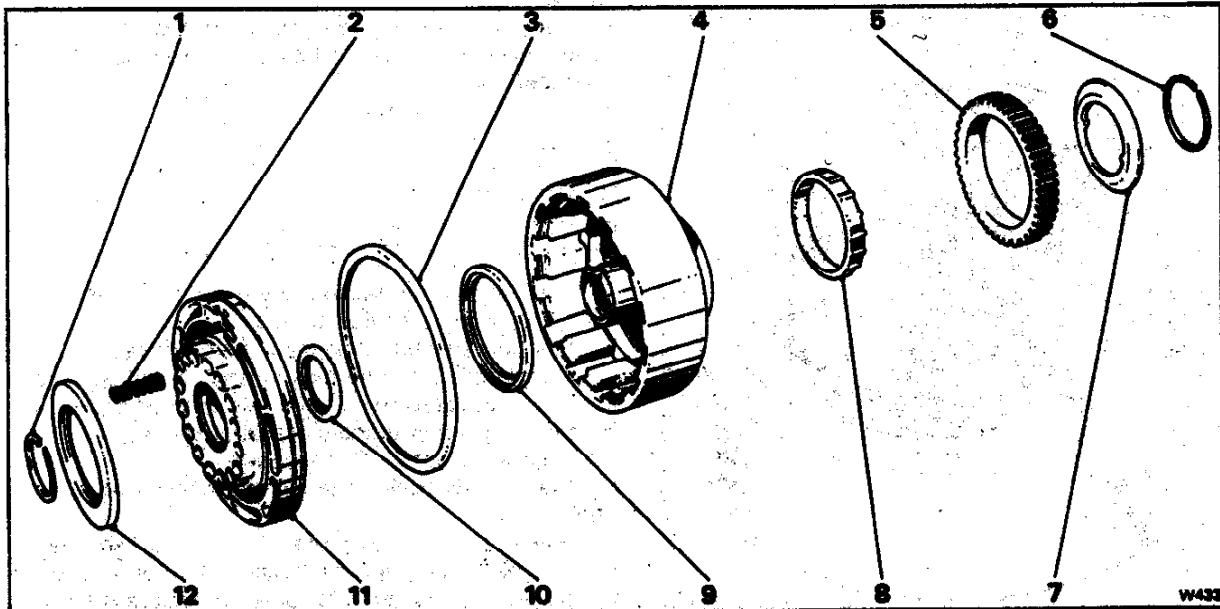
protector (J-21362) over the forward clutch hub.

7. Fit the clutch piston inside the forward and direct clutch piston seal protector (J-21409), then fit the assembly into the forward clutch housing (see Fig. T100).
8. Fit the clutch piston by rotating it clockwise until it is seated in the housing.
9. Fit the sixteen clutch release springs into the spring pockets in the clutch piston.
10. Place the clutch housing on the bed of a press with the turbine shaft lowermost.
11. Position the spring retainer on the springs.
12. Compress the springs ensuring that the retainer does not catch in the snap ring groove. Fit the snap ring then release the tension on the springs.

**Note**

Ensure that the release springs are not leaning. If necessary, push the springs into an upright position using a small screwdriver.

13. Fit the forward clutch apply ring into the clutch housing.
14. Fit the thrust washers on either side of the forward clutch hub. Retain the washers in position with petroleum jelly. Ensure the bronze washer is fitted to the side of the hub which faces the forward clutch housing.
15. Fit the forward clutch hub into the forward clutch housing.
16. Lubricate the five flat steel clutch plates, the five composition faced plates and the one dished steel clutch plate with clean transmission fluid.



**Fig. T101 Direct clutch and intermediate roller/sprag assembly - exploded**

- |                              |                                  |                           |
|------------------------------|----------------------------------|---------------------------|
| 1 Snap ring                  | 5 Intermediate clutch outer race | 8 Roller/Sprag assembly   |
| 2 Clutch release spring (14) | 6 Snap ring                      | 9 Piston centre seal      |
| 3 Piston outer seal          | 7 Roller/Sprag clutch retainer   | 10 Piston inner seal      |
| 4 Direct clutch housing      |                                  | 11 Direct clutch piston   |
|                              |                                  | 12 Clutch spring retainer |

**Note**

Cars produced from 1980 have a modification to the forward clutch. The waved steel clutch plate is superseded by a dished steel plate (see Fig. T97). Therefore, if a replacement is required, note the type of plate removed and the number of flat and composition plates to ensure the correct type is refitted.

17. Fit the clutch plates into the forward clutch housing as follows,

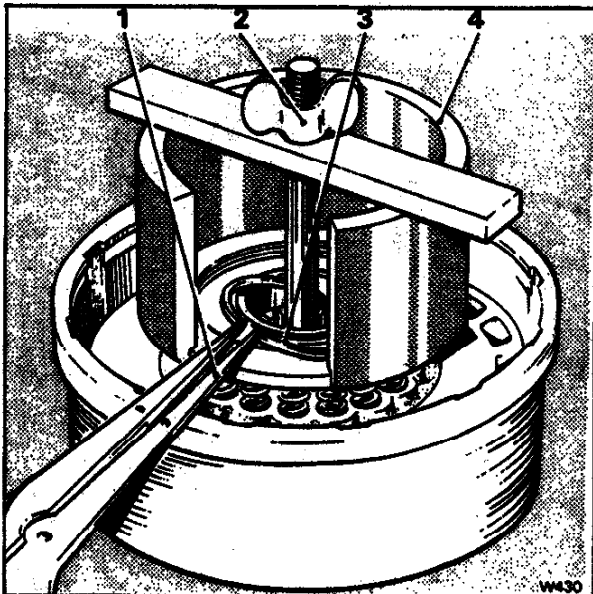
**Waved steel plate;** commence with the waved steel plate and then alternate composition (5) and flat steel plates (4), finishing with a composition plate.

**Dished steel plate;** commence with the dished steel plate with the concave side uppermost (away from the clutch piston), then alternate flat steel (5) and composition plates (5), finishing with a composition plate.

18. Fit the direct clutch hub into the forward clutch housing; fit the snap ring.

**Direct clutch and intermediate roller/sprag clutch assembly - To dismantle**

1. Remove the snap ring which retains the roller/sprag retainer.
2. Remove the retainer (see Fig. T101).
3. Remove the roller/sprag outer race, then withdraw the roller/sprag clutch assembly from the outer race.
4. Turn the unit over then remove the large snap ring which retains the direct clutch back plate in the clutch housing; remove the back plate.
5. Remove the five composition plates, four steel



**Fig. T102 Removing and fitting the direct clutch housing snap ring**

- 1 Snap ring pliers
- 2 Spring compressor
- 3 Snap ring
- 4 Compressor adapter (seated on retainer)

plates and one waved steel plate from the clutch housing. Remove the clutch apply ring.

6. Using the clutch spring compressor (J-2590), compress the clutch release springs and remove the snap ring (see Fig. T102).

7. Remove the tool and lift off the spring retainer. Remove the fourteen clutch release springs. Keep these springs separate from the forward clutch release springs.

8. Withdraw the direct clutch piston from the clutch housing.

**Note**

The forward and direct clutch pistons are similar. Ensure that the direct clutch piston is identified during dismantling so that it can be reassembled correctly into the direct clutch housing.

9. Remove and discard the piston inner and outer seals.

10. Remove and discard the piston centre seal from the direct clutch housing.

**Direct clutch, sun gear shaft and intermediate roller/sprag clutch assembly - To inspect**

1. Wash all parts in clean paraffin, except the composition faced clutch plates. Dry all the parts with compressed air.
2. Examine the roller/sprag assembly.
3. Examine the inner cam and outer race for scratches or wear.
4. Examine the clutch housing for cracks. Ensure that the oil passages are clear and look for excessive wear on the clutch plate driving lugs.
5. Examine the composition faced and steel clutch plates.
6. Composition plates should be dried with compressed air and the composition surfaces inspected for.
  - (a) Pitting and flaking.
  - (b) Wear.
  - (c) Glazing.
  - (d) Cracking.
  - (e) Charring.
  - (f) Metal particles embedded in the lining.

If a composition faced plate exhibits any of the above conditions, fit new plates.

7. Steel plates should be inspected for heat discoloration. If the surface is smooth and an even colour is indicated, the plates can be used again. If severe heat spot discoloration or surface scuffing is indicated, fit new plates.

8. Examine the back plate for scratches or other damage.

9. Examine the sun gear shaft for cracks. Examine the splines for damage, the bushes for scoring and the ground bush journals for damage. Ensure the oil feed hole is clear.

10. Examine the housing for free operation of the check ball.

11. Examine the piston for cracks.

12. Examine the fourteen springs for collapsed coils or distortion. If any of these springs requires replacement, fit sixteen new springs.

13. Examine the front friction band for wear at the anchor and apply lugs, also for the presence of metallic particles in the band lining. Examine the band lining for cracks, flaking, burning, and for the lining becoming loose.

**Direct clutch and intermediate roller/sprag clutch assembly - To assemble**

1. Lubricate new inner and outer clutch piston seals with clean transmission fluid. Lubricate the seal grooves in the direct clutch piston, then fit the seals with the lips facing away from the spring pockets.

2. Lubricate a new centre seal with clean transmission fluid. Lubricate the seal groove in the direct clutch housing, then fit the seal with the lip uppermost.

**Note**

Production built transmissions use a direct clutch housing with a check ball. If the housing requires replacement and the replacement housing does not contain a check ball, replace the direct clutch piston with the service piston which has a check ball. Either the direct clutch housing and/or the piston must contain a check ball otherwise damage may occur to the direct clutch and related parts.

3. Fit the inner seal protector (J-21362) over the direct clutch hub.

4. Fit the outer seal protector (J-21409) into the clutch housing and fit the piston, turning it clockwise as it is pushed down. Remove the tools.

5. Fit the fourteen clutch release springs into the spring pockets in the clutch piston, leaving two pockets directly opposite one another with no springs. If replacement springs are to be fitted, fit all sixteen.

6. Position the spring retainer over the springs.

7. Using the clutch spring compressor (J-2590), compress the springs ensuring that the retainer does not catch in the snap ring groove. Fit the snap ring, then remove the tool.

**Note**

Ensure that the clutch release springs are not leaning. If necessary, push the springs into an upright position using a small screwdriver.

8. Fit the direct clutch apply ring into the clutch housing.

9. Lubricate the four flat steel clutch plates, five composition faced plates and one waved steel plate with clean transmission fluid. Then fit the plates into the clutch housing (see Fig. T103). Commence with the waved steel plate and then alternate composition and steel plates.

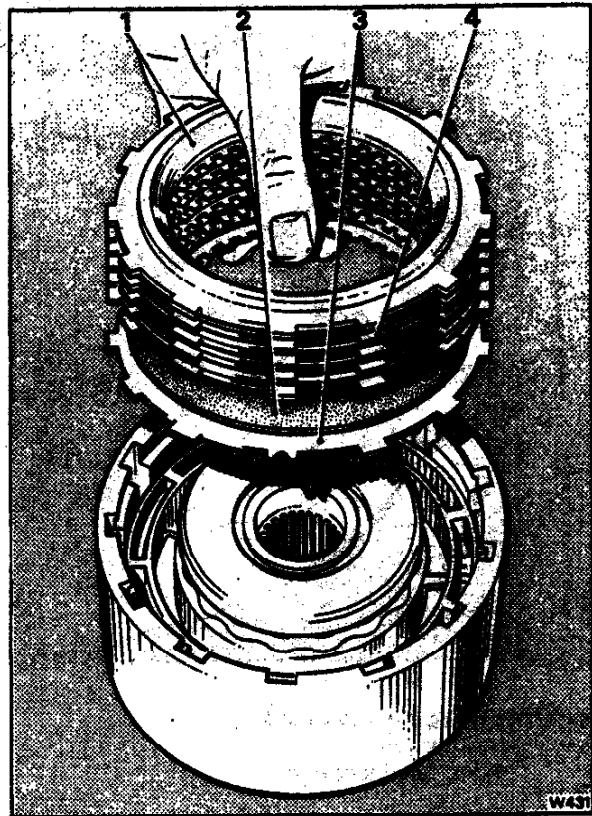
**Note**

Do not use radially grooved composition plates at this point of the assembly.

10. Fit the direct clutch backing plate over the clutch plates and fit the large snap ring.

**Note**

Install rollers that may have come out of the roller cage by compressing the energising spring with the



**Fig. T103 Fitting the direct clutch plates**

- 1 Backing plate
- 2 Composition plate (5)
- 3 Waved steel plate (1)
- 4 Flat steel plate (4)

forefinger and inserting the rollers from the outside. 11. Turn the clutch unit over and fit the roller/sprag clutch assembly onto the intermediate clutch inner cam.

12. Fit the intermediate roller/sprag outer race with a clockwise turning motion.

**Note**

When fitted, the outer race should not turn anti-clockwise.

13. Fit the roller/sprag clutch retainer (cup side down) and fit the snap ring.

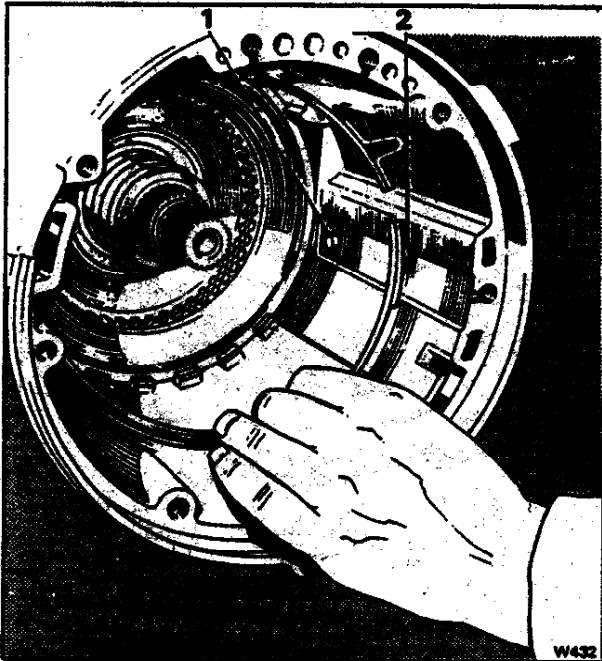
**Turbine shaft, forward and direct clutches, sun gear shaft and front band - To fit**

1. Fit the front band so that the band anchor hole fits over the band anchor pin and the band apply lug faces the servo hole (see Fig. T104).

2. Fit the sun gear shaft with the longer splined end innermost.

3. Fit the direct clutch housing and intermediate roller/sprag assembly onto the centre support as follows.

4. Ensure that the ends of the oil sealing rings on the centre support are interlocked, and that the rings are lubricated.



**Fig. T104 Fitting the front band**

- 1 Anchor pin
- 2 Front band location

5. Carefully slide the direct clutch housing onto the centre support sleeve, at the same time engage the housing internal splines with the splines on the sun gear shaft.

6. Ensure that the clutch housing hub 'bottoms' on the sun gear shaft and that the splines on the forward end of the sun gear shaft are flush with the splines in the direct clutch housing.

**Note**

It will be necessary to rotate the clutch housing to allow the roller/sprag outer race to line up with the intermediate clutch plates. If necessary, remove the direct clutch driving and driven plates to facilitate the handling of the housing.

7. Fit the bronze thrust washer onto the forward clutch hub; retain the washer in position with petroleum jelly.

8. Position the transmission horizontally in the transmission holding fixture, then fit the forward clutch assembly and the turbine shaft.

9. Ensure that the mainshaft 'bottoms' on the end of the forward clutch hub.

10. It will be necessary to rotate the clutch housing to allow the direct clutch driving hub to line up with the clutch plates in the direct clutch.

11. When the forward clutch is correctly seated it should be approximately 31,75 mm. (1.250 in.) from the oil pump face in the transmission casing.

**Note**

The missing internal splines in the forward clutch hub are lubrication passages and do not have to be aligned with any particular splines on the mainshaft.

12. Fit the oil pump.

Section T19

**Intermediate clutch, gear unit, centre support and reaction carrier**

The intermediate clutch comprises three steel plates (1 waved and 2 flat), three composition plates and an apply piston. The steel plates are slotted directly into the transmission casing and the composition plates engage in splines machined in the intermediate clutch outer race.

The compound planetary gear unit consists of an internal gear, which is splined onto the mainshaft, an output planet carrier and pinions, an output shaft which is mechanically connected to the output carrier and a sun gear which is splined onto the sun gear shaft (see Fig. T105).

The centre support is keyed and bolted to the transmission casing and forms part of the reaction carrier roller assembly. The oil delivery sleeve, which supplies oil pressure to the direct clutch and the intermediate roller is an integral part of the centre support. The support also houses the piston that applies the intermediate clutch.

The reaction carrier comprises a housing, a set of planet pinions and the outer race of the Low roller.

When the mainshaft rotates, the splined internal gear is driven clockwise. This causes the rear

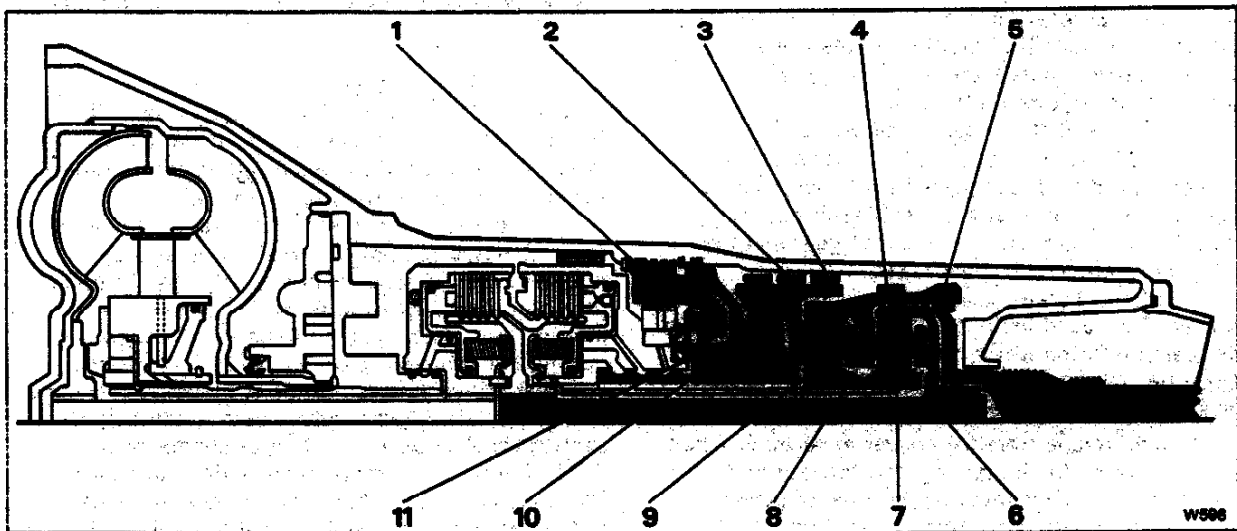
planet pinions to idle clockwise and drive the sun gear anti-clockwise.

The front and rear sun gears are integral so they turn as one. As a result, the front planet pinions also idle clockwise and drive the front internal gear clockwise.

The front internal gear is an integral part of the output carrier and is thus connected to the output shaft. This reacts with a force on the front pinions which are trying to drive the front internal gear clockwise. This reaction tends to rotate the front carrier assembly anti-clockwise instead of allowing the force to turn the internal gear and output shaft against the weight of the car.

To make the gear set effective in driving the car, a roller assembly is used to hold the carrier against anti-clockwise rotation. This roller assembly is in effect a one-way clutch which allows a rotating part to turn one way only.

The roller assembly is fitted in such a manner that its elements will lock and prevent the reaction carrier from rotating anti-clockwise. This provides the required reaction and causes the front planet pinions to drive the front internal gear and output



**Fig. T105 Sectioned view of the transmission showing the intermediate clutch and gear unit**

1 Intermediate clutch	5 Output shaft driving flange	9 Front planet pinion
2 Rear band	6 Mainshaft	10 Roller clutch assembly
3 Reaction carrier	7 Rear planet pinions	11 Centre support
4 Output carrier	8 Sun gear	

■ Intermediate clutch, gear unit, centre support and reaction carrier

shaft in reduction at a ratio of approximately 2.5:1. This gear ratio, coupled with a maximum torque converter reduction of approximately 2:1 gives an overall ratio of almost 5:1 in first gear.

As the speed of the car increases, less torque multiplication is required so that the coupling will become more efficient, therefore, it is desirable to move to a lower ratio. This is accomplished with the aid of the intermediate roller/sprag assembly, intermediate clutch and sun gear shaft.

A sprag assembly is a device having irregular shaped members wedged between inner and outer races, similar to a roller assembly. It permits a part to rotate in one direction only.

When the intermediate clutch is applied, the drive plates become locked to the reaction plates and by doing so they lock the intermediate roller/sprag outer race to the transmission case.

This, in effect, holds the clutch housing, sun gear shaft and sun gear against anti-clockwise rotation. When the sun gear is stationary, the power flow is as follows.

Converter output is transmitted clockwise through the forward clutch to the mainshaft and rear internal gear. As the rear internal gear turns clockwise, the rear pinions rotate clockwise on their pins and "walk around" the stationary sun gear. This moves the output carrier and output shaft clockwise in reduction at a ratio of approximately 1.5:1 (or second gear).

The front gear unit is not required for second gear operation. However, because the output carrier is integral with the front internal gear, the front internal gear runs clockwise in reduction. This causes the front planet pinions to run clockwise around the stationary sun gear, turning the reaction carrier clockwise. This clockwise rotation of the reaction carrier causes the rear roller assembly to overrun or to become ineffective.

As the speed of the car increases further, a lower ratio is again required. The transmission is moved to third or direct gear. This is achieved by applying the direct clutch as well as the forward clutch so that both the rear internal gear and the sun gear rotate at the same speed.

In order to obtain Reverse, a rear friction band is used. This band locks the reaction carrier against clockwise rotation which would cause the Low or rear roller to overrun. Power flow through the transmission in Reverse is as follows.

Turbine torque from the converter is transmitted to the forward clutch housing; the forward clutch is released, thus disconnecting the flow of power to the mainshaft and rear internal gear. Instead of power flowing through the forward clutch, it flows from the turbine shaft through the forward clutch housing and through the direct clutch hub to the direct clutch which is applied. This applies power to the sun gear shaft and sun gear, turning them clockwise. With the sun gear driving clockwise, the front pinions revolve anti-clockwise as idlers. This drives the front internal gear and output shaft anti-

clockwise or in a reverse direction. The overall ratio in Reverse with maximum converter ratio and gear reduction is approximately 4:1.

In Intermediate range (second gear) with the accelerator pedal released, the car will slow down, using the engine as a brake. In this situation, however, the rear wheels will drive the transmission through the output shaft and as a result, the intermediate roller/sprag would attempt to overrun. To prevent this happening the front band is applied to the direct clutch housing, holding it stationary, thus keeping the transmission in second gear to provide effective engine braking.

For even greater engine braking, the transmission can be placed into Low range. At speeds below approximately 64 k.p.h. (40 m.p.h.) the transmission will move to first gear. When the car is in first gear and the throttle is closed, the Low roller tends to overrun. When the Low/Reverse band is applied, the reaction carrier is prevented from overrunning the roller and the transmission is retained in first gear.

The following is a summary of the flow of power through the transmission in various gears.

#### Summary of power flow

##### Neutral - Engine running

Forward clutch released, direct clutch released, intermediate clutch released, low roller clutch ineffective, front band released, intermediate roller/sprag clutch ineffective, rear band released.

In Neutral, all clutches and bands are released; therefore, no power is transmitted from the torque converter turbine to the planetary gear train or output shaft.

##### Drive range - First gear

Forward clutch applied, direct clutch released, intermediate clutch released, low roller clutch effective, front band released, intermediate roller/sprag clutch ineffective, rear band released.

With the gear range selector in Drive range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear clockwise. Clockwise motion of the rear internal gear causes the pinions to turn clockwise, driving the sun gear anti-clockwise. In turn, the sun gear drives the front pinions clockwise, driving the front internal gear, output carrier and output shaft clockwise at a reduction of approximately 2.5:1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and roller clutch assembly to the transmission case. (The approximate stall ratio equals 5:1.).

##### Drive range - Second gear

Forward clutch applied, direct clutch released, intermediate clutch applied, low roller clutch ineffective, front band released, intermediate roller/sprag clutch effective, rear band released.

In second gear, the intermediate clutch is

applied to allow the intermediate roller/sprag clutch to hold the sun gear against anti-clockwise rotation. Turbine torque, through the forward clutch, is applied clockwise through the mainshaft, to the rear internal gear. Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise at a reduction ratio of approximately 1.5:1.

#### Drive range - Third gear

Forward clutch applied, direct clutch applied, intermediate clutch applied, low roller clutch ineffective, front band released, intermediate roller/sprag ineffective, rear band released.

In direct drive, engine torque is transmitted to the converter, then through the forward clutch to the mainshaft and the rear internal gear. Because the direct clutch is applied, equal power is transmitted also to the sun gear shaft and the sun gear. Since both the sun gear and the internal gears are now turning at the same speed, the planetary gear set is essentially locked and turns as one unit in direct drive at a ratio of 1:1.

#### Reverse

Forward clutch released, direct clutch applied, intermediate clutch released, low roller clutch ineffective, front band released, intermediate roller/sprag clutch ineffective, rear band applied.

In reverse, the direct clutch is applied to transmit turbine torque from the forward clutch housing to the sun gear shaft and sun gear. The rear band is applied; this prevents the reaction carrier from turning clockwise. Clockwise torque to the sun gear causes the front pinions and front internal gear to turn anti-clockwise in reduction. The front internal gear is directly connected to the output shaft, thus providing the reverse output gear ratio of approximately 2:1. The reverse torque multiplication at stall (converter and gear ratios) is approximately 4:1.

#### Intermediate clutch, gear unit, centre support and reaction carrier - To remove

Before the intermediate clutch, gear unit and their associated parts can be removed, the transmission must be removed from the car.

Remove the following units.

1. Sump, strainer and intake pipe assembly.
2. Control valve unit.
3. Rear servo.
4. Control valve spacer, check balls and front servo.
5. Oil pump.
6. Turbine shaft, forward clutch, direct clutch, sun gear shaft and front band.
7. Remove the centre support bolt from the transmission case. This is the socket-headed cap screw located in the lower face of the transmission case at the rear of the control valve unit oil passages.
8. Remove the snap ring which secures the intermediate clutch back plate.

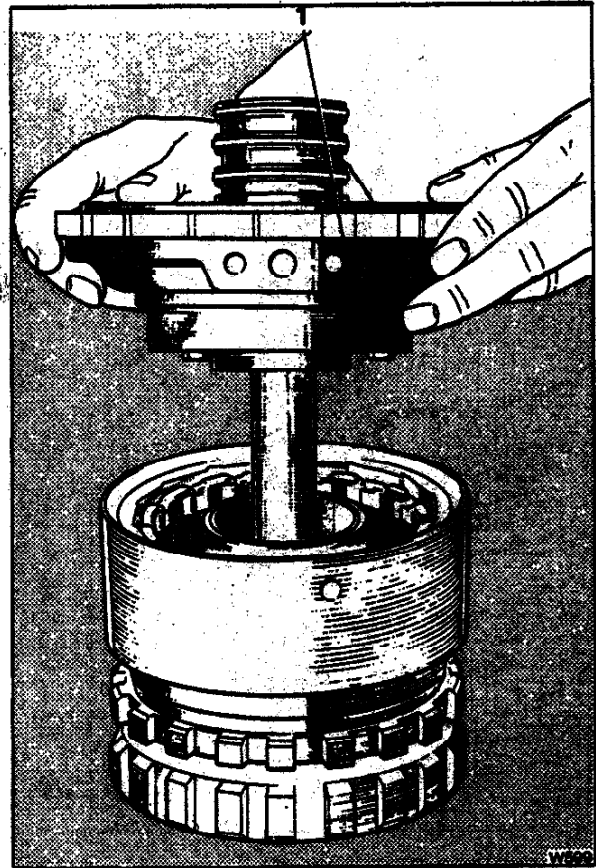
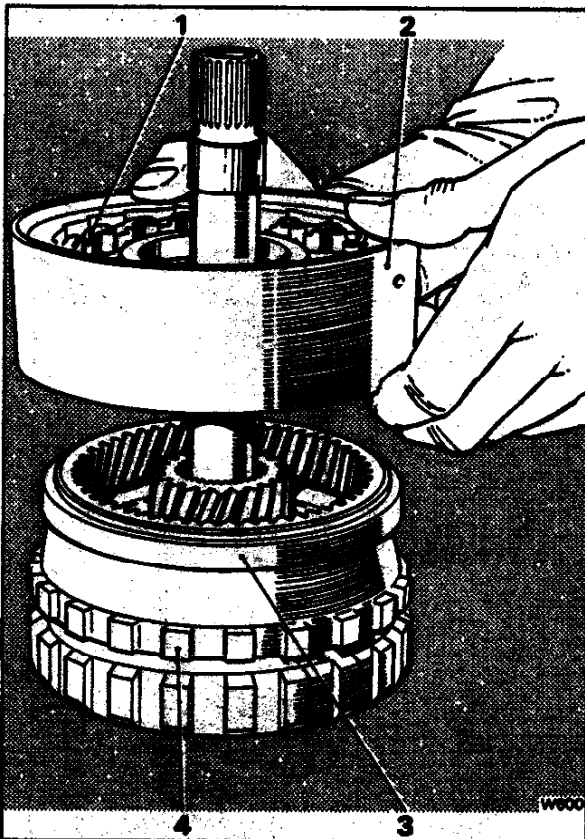


Fig. T106 Removing the centre support assembly  
1 Centre support

9. Remove the back plate then withdraw the three composition plates and the three steel plates (two flat and one waved).
10. Remove the snap ring which retains the centre support in the case.
11. Remove the complete gear unit assembly by lifting with the removal tool (J-21795) and a slide hammer (J-7004).
12. Remove the output shaft thrust washer from either the output shaft or the case.
13. Hold the gear unit assembly with the output shaft pointing down (i.e. through a suitable hole in the work bench).
14. Remove the rear unit selective washer from the transmission case.
15. Remove the support to case spacer.
16. Remove the rear band assembly. To facilitate removal, rotate the band lugs away from the pins and pull the band assembly out of the transmission case.
17. Remove the centre support assembly from the reaction carrier (see Fig. T106).
18. Withdraw the centre support to reaction carrier thrust washer.

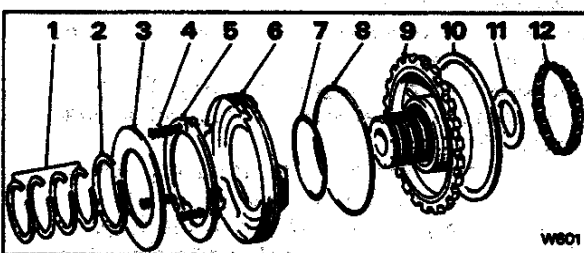
#### Note

The thrust washer and the race may have adhered to the back of the centre support. If so, remove them



**Fig. T107 Removing the reaction carrier assembly**

- 1 Roller clutch assembly
- 2 Reaction carrier
- 3 Gear ring
- 4 Output carrier



**Fig. T108 Centre support assembly - exploded**

- 1 Oil seal rings
- 2 Snap ring
- 3 Intermediate clutch spring retainer
- 4 Intermediate clutch release springs
- 5 Intermediate clutch spring guide
- 6 Intermediate clutch piston
- 7 Intermediate clutch inner seal
- 8 Intermediate clutch outer seal
- 9 Centre support assembly
- 10 Support to case spacer
- 11 Thrust washer
- 12 Roller clutch assembly

from the centre support.

19. Remove the reaction carrier and roller clutch assembly from the output carrier (see Fig. T107); remove the roller clutch assembly and spacer ring from the reaction carrier.

#### Centre support and intermediate clutch piston - To dismantle

1. Remove and discard the four oil seal rings from the centre support (see Fig. T108).
2. Remove the snap ring (see Fig. T109).
3. Remove the spring retainer and the clutch release springs.
4. Remove the intermediate clutch piston from the centre support.
5. Remove and discard the inner and outer seals from the clutch piston.

#### Note

Do not remove the three setscrews which secure the roller clutch inner race to the centre support.

#### Centre support and intermediate clutch piston - To inspect

1. Wash all parts in clean paraffin, then dry with compressed air.
2. Examine the roller clutch inner race for scratches and indentations. Ensure that the lubrication hole is clear.
3. Examine the bush for scoring or wear.
4. Ensure that the oil ring grooves are clean and are not damaged.
5. Check that the lubrication passages are clear and are not interconnected, using compressed air.
6. Examine the piston bore in the centre support for scratches or damage.
7. Examine the piston seal grooves for damage and ensure that they are clean.
8. Examine the piston for cracks or porosity.
9. Examine the springs for collapsed coils or signs of distortion. Check the spring length against that of a new spring before deciding whether to renew the complete set of springs.

#### Centre support and intermediate clutch piston - To assemble

1. Lubricate a new inner and a new outer seal with clean transmission fluid. Lubricate the seal grooves in the intermediate clutch piston and fit the seals with the lips facing away from the spring pockets.
2. Fit the intermediate clutch inner seal protector (J-21363) over the centre support hub.
3. Fit the intermediate clutch piston (see Fig. T110). Ensure that it seats fully in the centre support.
4. Fit the spring guide and the three clutch release springs into the pockets in the clutch piston.
5. Position the spring retainer centrally over the springs.
6. Compress the spring retainer, ensuring that the retainer does not catch in the snap ring groove. Fit the snap ring.
7. Fit four new oil sealing rings onto the centre support.

**Gear unit - To dismantle (see Fig. T111)**

1. Remove the centre support to sun gear races and thrust bearing. The outer race may have been removed with the centre support.
2. Remove the sun gear from the output carrier assembly.
3. Remove the reaction carrier to output carrier thrust washer and front internal gear ring.
4. Invert the gear unit on the bench so that the mainshaft is pointing downwards.
5. Remove the snap ring which retains the output shaft in the output carrier; remove the output shaft.
6. Remove the thrust bearing and races from the rear internal gear.
7. Withdraw the rear internal gear and mainshaft from the output carrier; remove the thrust bearing and races from the inner face of the rear internal gear.
8. Remove the snap ring from the end of the mainshaft, then remove the rear internal gear.

**Output shaft - To inspect**

1. Wash the output shaft in clean paraffin, then dry with compressed air.
2. Examine the bushing for wear.
3. Examine the bearing and thrust washer faces for damage.
4. Examine the governor drive gear for rough or damaged teeth.
5. Examine the splines for damage.
6. Examine the drive lugs for damage.
7. Examine the speedometer drive gear for rough or damaged teeth. If a gear is badly worn or damaged, it can be renewed as follows.

**Speedometer drive gear - To remove**

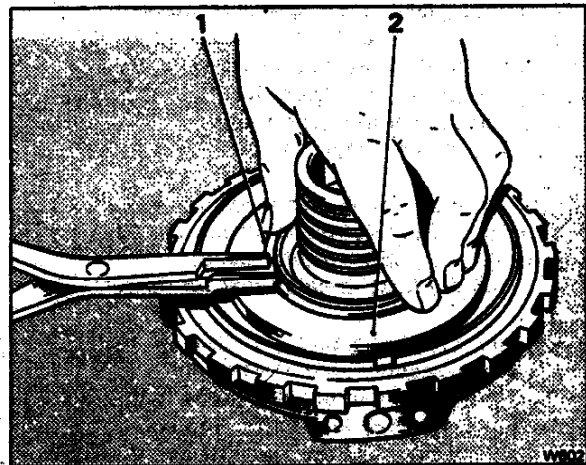
**Note**

A nylon speedometer drive gear is installed only at the factory. All replacement drive gears are manufactured from steel.

1. If a nylon gear is fitted to the shaft, depress the retaining clip and slide the gear off the output shaft (see Fig. T112).
2. If a steel gear is fitted to the shaft, install the speedometer drive gear removal tools (J-21427 and J-9578) (see Fig. T113).
3. Tighten the bolt on the puller until the gear is free on the shaft.
4. Remove the tools and the gear from the shaft.

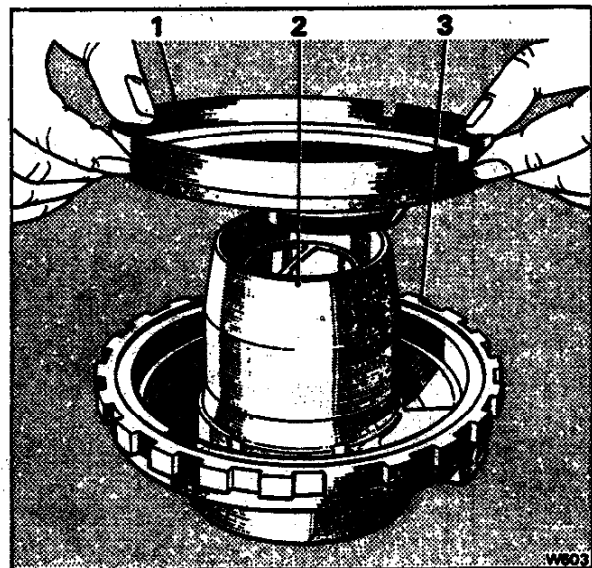
**Speedometer drive gear - To fit**

1. To fit a nylon gear, align the slot in the speedometer drive gear with the hole in the output shaft, then install the retaining clip.
2. To fit a steel gear, lightly lubricate the bore of the gear, then fit the gear over the output shaft.
3. Press the gear down the shaft using a suitable length of tube and a press, until the distance from the rear face of the gear to the end of the output shaft measures 291.31 mm. (11.469 in.) (see Fig. T114).



**Fig. T109 Removing and fitting the intermediate clutch piston snap ring**

- 1 Snap ring
- 2 Spring retainer



**Fig. T110 Fitting the intermediate clutch piston**

- 1 Intermediate clutch piston
- 2 Guide sleeve
- 3 Centre support

**Mainshaft - To inspect**

1. Wash the mainshaft in clean paraffin, then dry with compressed air.
2. Examine the shaft for cracks or distortion.
3. Examine the splines for damage.
4. Examine the ground journals for scratches or damage.
5. Examine the snap ring groove for damage.
6. Ensure the oil lubrication holes are clear.

T19 - 6

**Rear internal gear and sun gear - To inspect**

1. Wash the rear internal gear and the sun gear in clean paraffin, then dry with compressed air.
2. Examine all the gear teeth for wear or damage.
3. Examine the splines for damage.
4. Examine the gears for cracks.

**Output carrier assembly - To inspect**

1. Wash the output carrier assembly in clean paraffin, then dry with compressed air.
2. Examine the front internal gear for damaged teeth.
3. Examine the pinion gears for damage, rough bearings or excessive side movement.
4. Check the end-float of the pinions with the aid of a feeler gauge (see Fig. T115). The end-float should be between 0,23 mm. and 0,61 mm. (0.009 in. and 0.024 in.).
5. Examine the parking pawl lugs for cracks or damage.
6. Examine the splines which drive the output shaft for damage.

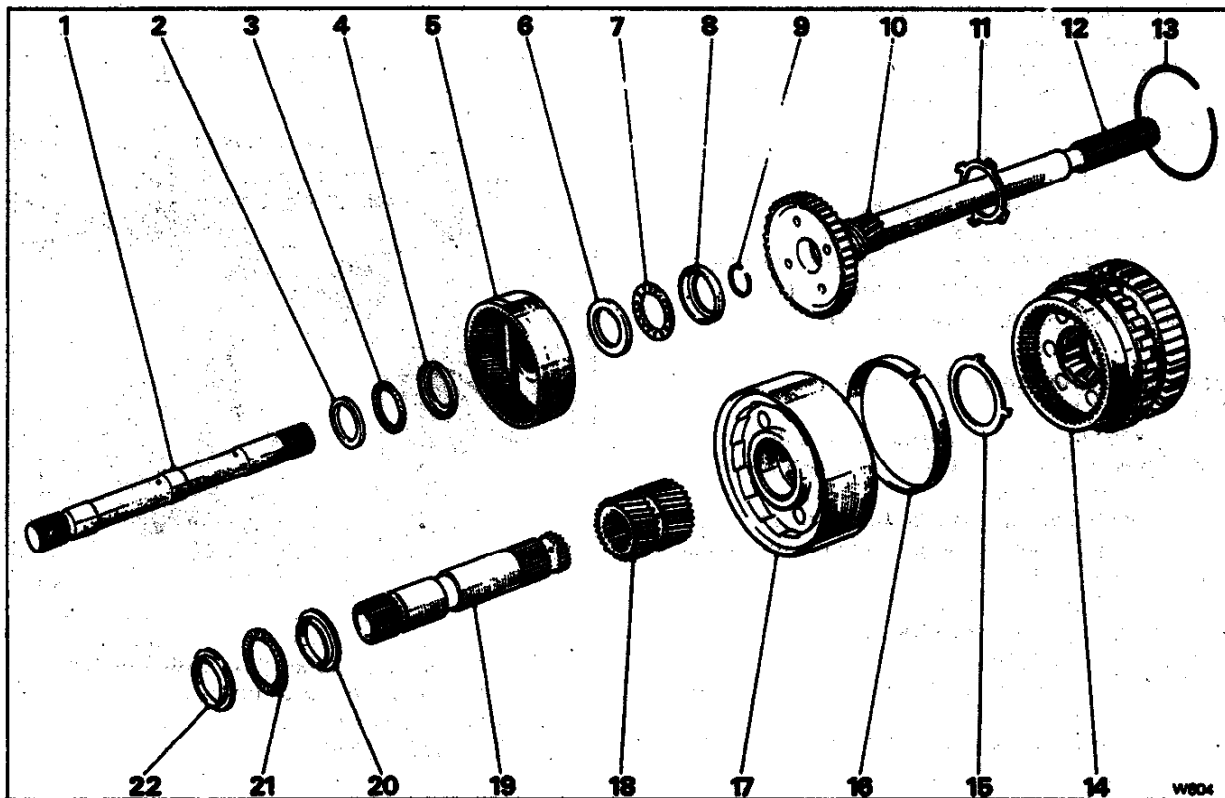
7. Examine the front internal gear ring for flaking or cracks.

**Reaction carrier assembly - To inspect**

1. Examine the surface on which the rear band applies, for signs of burning or scoring.
2. Examine the roller outer race for scoring or wear.
3. Examine the thrust washer surfaces for signs of scoring or wear.
4. Examine the bush for damage. If the bush is damaged, the carrier must be renewed.
5. Examine the pinion gears for damage, rough bearings, or excessive side movement.
6. Check the pinion end-float. This should be between 0,23 mm. and 0,61 mm. (0.009 in. and 0.024 in.).

**Pinion gears - To renew**

1. Support the carrier assembly on its front face.
2. Using a 12,70 mm. (0.50 in.) diameter drill, remove the stake marks from the end of the pinion pins. Ensure that the drill does not remove any

**Fig. T111 Gear unit - exploded**

- |                      |                             |                              |
|----------------------|-----------------------------|------------------------------|
| 1 Mainshaft          | 9 Snap ring                 | 17 Reaction carrier assembly |
| 2 I/D flanged race   | 10 Speedometer drive gear   | 18 Sun gear                  |
| 3 Thrust bearing     | 11 Thrust washer            | 19 Sun gear shaft            |
| 4 O/D flanged race   | 12 Output shaft             | 20 I/D flanged race          |
| 5 Rear internal gear | 13 Snap ring                | 21 Thrust bearing            |
| 6 I/D flanged race   | 14 Output carrier assembly  | 22 I/D flanged race          |
| 7 Thrust bearing     | 15 Thrust washer            |                              |
| 8 O/D flanged race   | 16 Front internal gear ring |                              |

metal from the carrier as this will weaken the component and could result in a cracked carrier.

3. Using a tapered punch, drive or press the pinions out of the carrier.
4. Remove the punch, gears, thrust washers and needle roller bearings.
5. Examine the pinion thrust faces in the pinion gear pockets for burrs and stone off as necessary. Thoroughly wash the carrier in clean paraffin and dry with compressed air.
6. Ensure that the new gears are clean and free from burrs, then fit the eighteen needle bearings into each pinion gear. Use petroleum jelly to retain the bearings and use a pinion pin as a guide when fitting the bearings.
7. Fit a bronze and a steel thrust washer on each side of the pinion gear, with a steel washer next to the gear. Hold the washers in place with a smear of petroleum jelly (see Fig. T116).
8. Fit the pinion gear assembly into position in the carrier, then fit a pilot pin through the rear face of the assembly to centralise and hold the parts in position.
9. Drive a new pinion pin into position from the front, rotating the pinion whilst the pin is being driven in.
10. Ensure that the headed end of the pin is flush or below the face of the carrier.
11. Secure the punch to be used for staking the pins in a bench vice, so that it can be used as an anvil.
12. Support the carrier with the head of the pin

resting on the punch, then using a chisel with a radiused end stake the opposite end of the pin in three places (see Fig. T117).

**Note**

Both ends of the pin must lie below the face of the carrier, otherwise a foul may occur between the pin and the adjacent component.

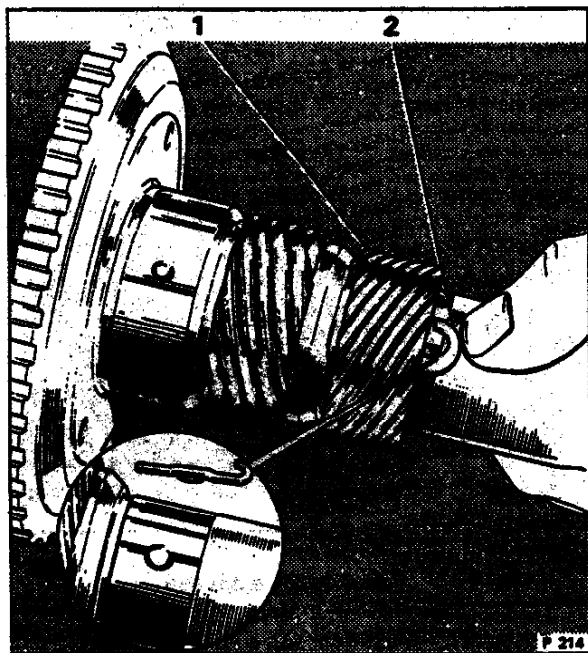
13. Repeat the procedure for the remaining pins.

**Roller clutch - To inspect**

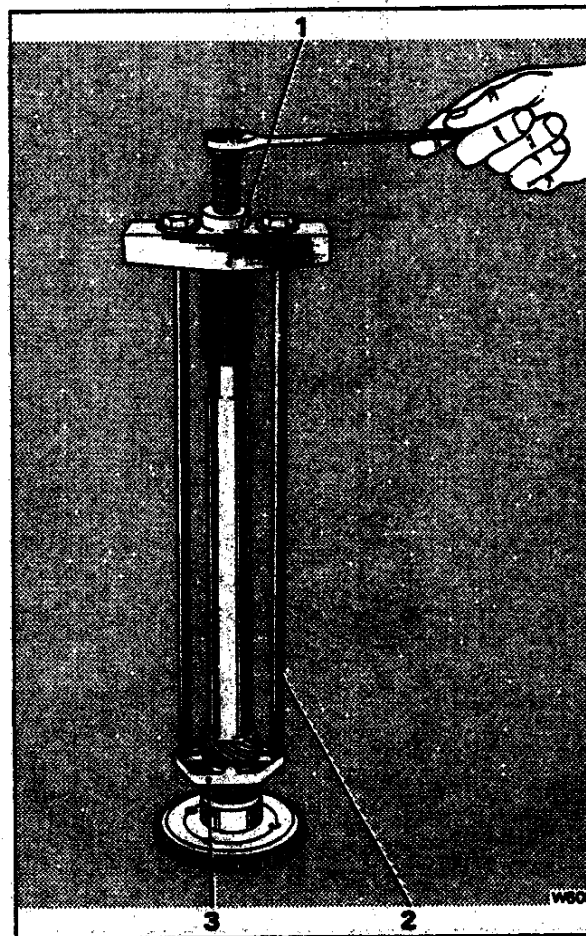
1. Wash the assembly in clean paraffin, then dry with compressed air.
2. Examine the roller clutch for damaged rollers or springs.
3. Examine the roller cage for damage.

**Intermediate clutch plates and rear band - To inspect**

1. Examine the condition of the composition faced and steel plates. Do not diagnose a composition drive plate by colour.
2. Dry composition faced plates with compressed air and inspect the composition face for.



**Fig. T112 Removing a nylon speedometer drive gear**  
 1 Nylon gear  
 2 Retaining clip



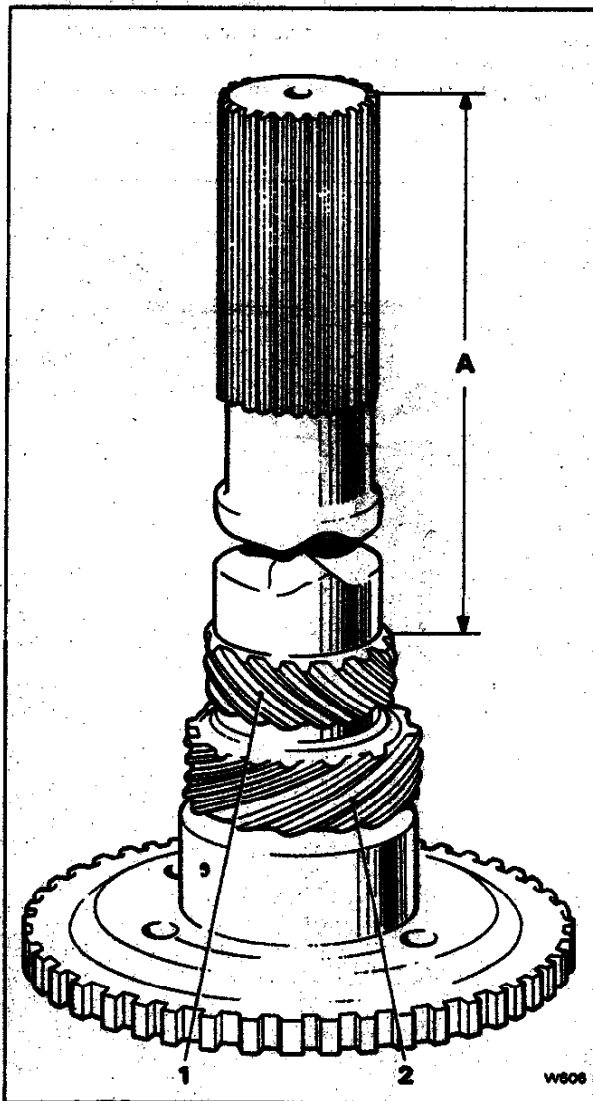
**Fig. T113 Removing a steel speedometer drive gear**  
 1 (J-9578)  
 2 Removal bolts  
 3 (J-21427)

- (a) Pitting and flaking.
  - (b) Wear.
  - (c) Glazing.
  - (d) Cracking.
  - (e) Charring.
  - (f) Metal particles embedded in the lining.
- If any of the above conditions are evident, replacement is required.
3. Wipe steel plates dry and check for heat discoloration. If the surface is smooth and an even colour is indicated, the plates should be used again. If severe heat spot discoloration or surface scuffing is indicated, the plates must be replaced.
  4. Examine the rear band for cracks or distortion.
  5. Examine the ends of the band for damage at the anchor lugs and the apply lug.

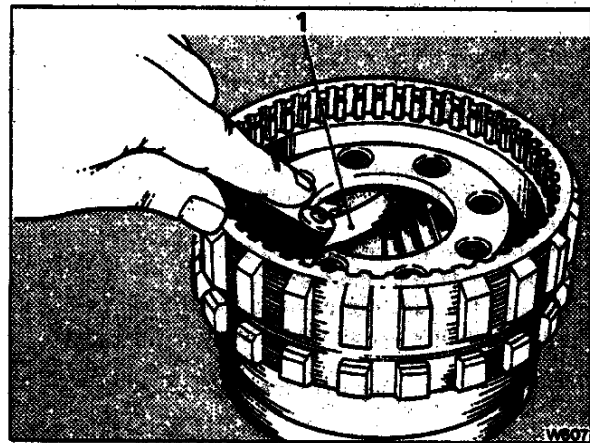
6. Examine the lining for cracks, flaking and burning.
7. Ensure that the lining is secured to the band.

**Gear unit and centre support - To assemble**

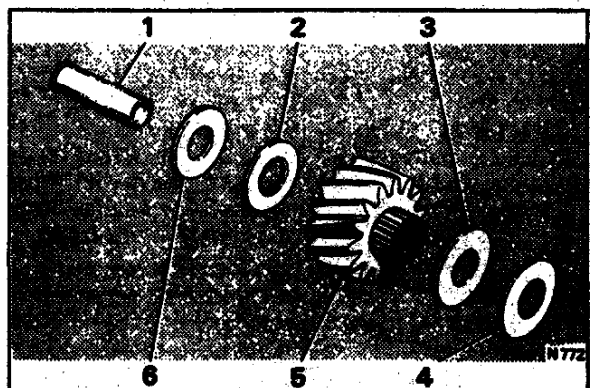
1. Ensure that all parts are clean. Lightly lubricate with clean transmission fluid all bushes, journals, gears, bearings, etc.
2. Fit the rear internal gear onto the mainshaft; fit the circlip.
3. Fit the races and thrust bearing onto the inner face of the rear internal gear, retaining them with a smear of petroleum jelly (see Fig. T118).
4. Fit the large diameter race first with the outer flange uppermost.



**Fig. T114 Speedometer driving gear - fitted**  
 1 Speedometer driving gear  
 2 Governor driving gear  
 A 291,30 mm. (11.469 in.)



**Fig. T115 Checking the output carrier pinion end-float**  
 1 0,23 mm. to 0,61 mm. (0.009 in. to 0.024 in.)



**Fig. T116 Planet pinion gear - exploded**  
 1 Pinion pin  
 2 Steel washer  
 3 Steel washer  
 4 Bronze washer  
 5 Planet pinion  
 6 Bronze washer

5. Fit the thrust bearing into the race.
  6. Fit the smaller diameter race over the bearing with the inner flange towards the bearing.
  7. Ensure that the pinion gears are adequately lubricated then fit the output carrier onto the mainshaft so that the pinion gears mesh with the rear internal gear.
  8. Position the assembly with the mainshaft pointing downwards through a hole in the bench. Take care not to damage the shaft.
  9. Fit the races and thrust bearing onto the outer face of the rear internal gear, retaining them with a smear of petroleum jelly. The small diameter (flanged I/D) race must be fitted first with the flange uppermost (see Fig. T119).
  10. Fit the thrust bearing into the race.
  11. Fit the large diameter (flanged O/D) race against the bearing with the flange cup over the bearing.
  12. Fit the output shaft into the output carrier and fit the circlip.
  13. Smear the output shaft to case metal thrust washer with petroleum jelly, then fit the washer into position.
  14. Turn the assembly over so that the output shaft points downwards.
  15. Smear the reaction carrier to output carrier thrust washer with petroleum jelly, then fit the washer into the output carrier so that the bent tabs engage in the tab pockets.
- Note**  
The factory built transmissions use a non-metal washer, however, the service replacement thrust washer is metal.
16. Fit the sun gear; ensure that the end with the chamfered inside diameter faces downwards.
  17. Fit the gear ring over the output carrier.

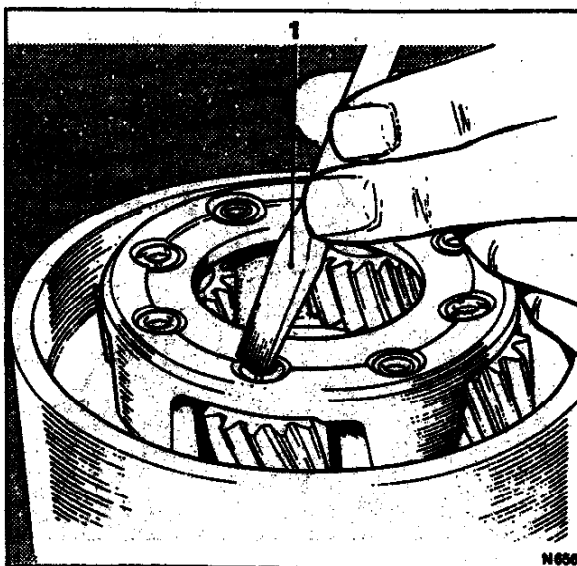


Fig. T117 Staking a pinion pin  
1 Chisel

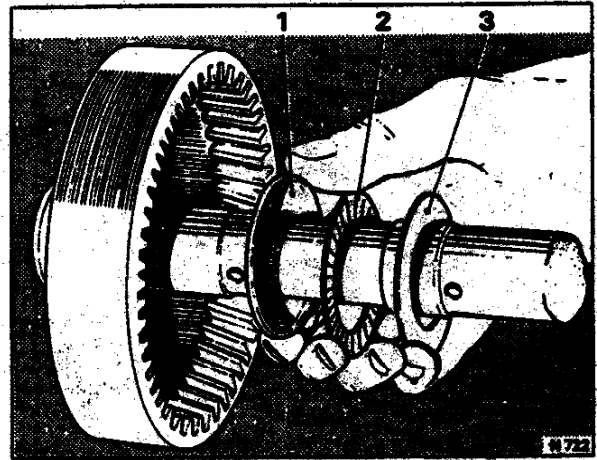


Fig. T118 Fitting the races and thrust bearing to the inner face of the rear internal gear  
1 O/D flanged race  
2 Thrust bearing  
3 I/D flanged race

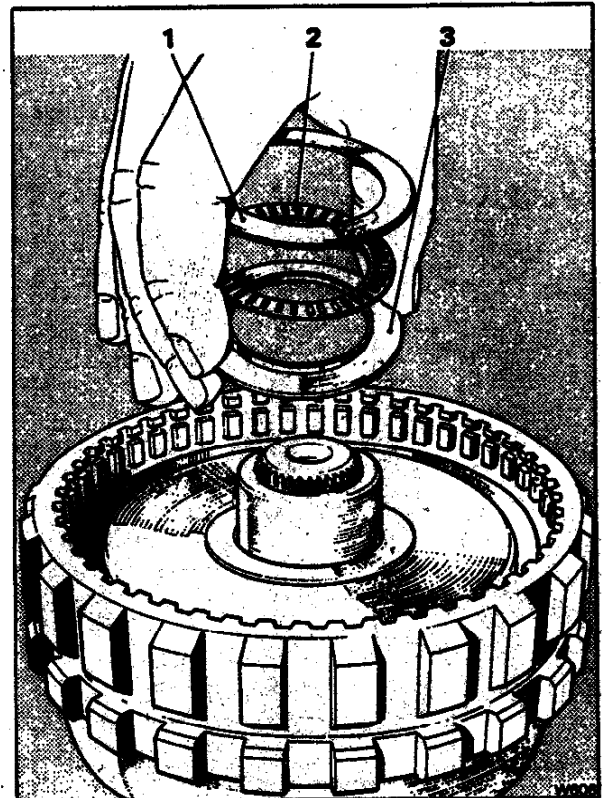


Fig. T119 Fitting the races and thrust bearing to the outer face of the rear internal gear  
1 O/D flanged race  
2 Thrust bearing  
3 I/D flanged race

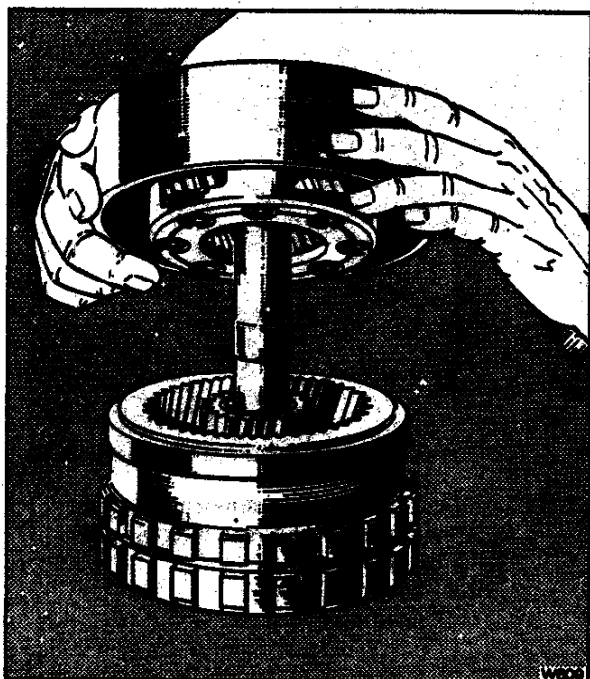


Fig. T120 Fitting the reaction carrier to the output carrier

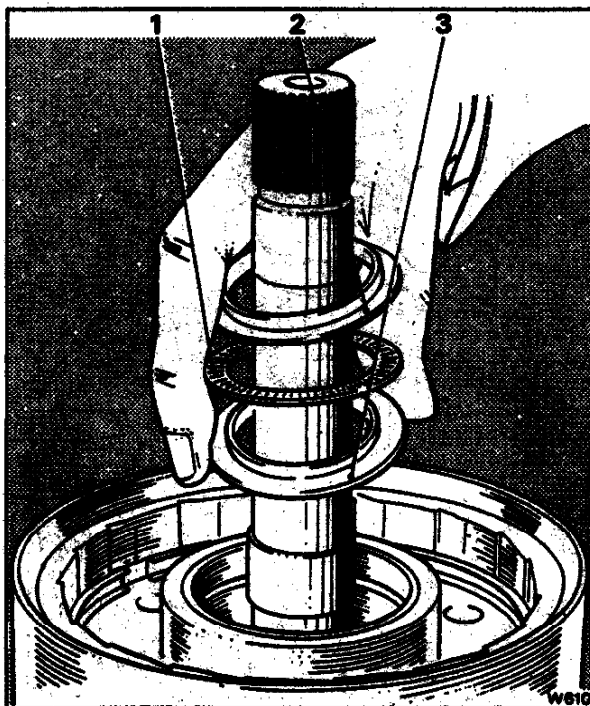


Fig. T121 Fitting the races and thrust bearing to the sun gear

- 1 Thrust bearing
- 2 I/D flanged race
- 3 I/D flanged race

18. Fit the sun gear shaft with the longest splined end first.

19. Ensure that the reaction carrier pinion gears are adequately lubricated, then fit the reaction carrier onto the output carrier as shown in Figure T120.

Mesh the pinion gears with the front internal gear.

**Note**

When a new output carrier and/or reaction carrier is being installed and the front internal gear ring prevents assembly of the carriers, replace the front internal gear ring with the service ring.

20. Smear the centre support to sun gear thrust races and bearing with petroleum jelly and fit as follows (see Fig. T121).

(a) The large outer diameter race, with the centre flange up, over the sun gear shaft.

(b) The thrust bearing onto the large race.

(c) The small diameter race, with the centre flange up.

21. Smear the centre support to reaction carrier thrust washer with petroleum jelly, then fit the washer into the recess in the centre support.

22. Fit the rollers that may have come out of the roller clutch cage, by compressing the energising spring with the forefinger and inserting the roller from the outside (see Fig. T122).

**Note**

Ensure that the energising springs are not distorted and that the curved end leaf of the springs are positioned against the rollers.

23. Fit the spacer ring and roller clutch assembly into the reaction carrier.

24. Fit the centre support assembly into the roller clutch (see Fig. T123).

**Note**

With the reaction carrier held, the centre support should turn anti-clockwise only.

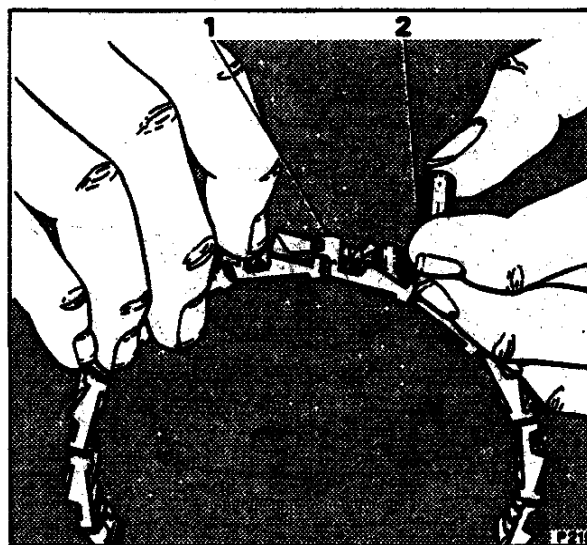


Fig. T122 Fitting a roller to the roller clutch cage

- 1 Roller clutch cage
- 2 Roller

**Intermediate clutch gear unit, centre support and reaction carrier - To fit**

1. Fit the rear band assembly into the transmission case so that the band lugs engage with the anchor pins (see Fig. T124).

2. Inspect the support to case spacer for burrs or raised edges. If necessary, remove the burrs etc. with a stone or fine emery cloth. Ensure that the spacer is clean.

3. Fit the support to case spacer against the shoulder at the bottom of the case splines and the gap adjacent to the band anchor pin.

**Note**

Do not confuse this spacer [1.02 mm. (0.040 in.) thick and with both sides flat] with either the centre support to case snap ring (one side bevelled) or the intermediate clutch backing plate to case snap ring [2.36 mm. (0.093 in.) thick with both sides flat].

4. Fit the previously selected rear unit adjusting washer (see Section T18) into the slots provided inside the rear of the transmission case. Retain the washer with a smear of petroleum jelly.

5. Fit the transmission case into the holding fixture (if it has been removed). Do not over-tighten the fixture side pivot pin as this will cause binding when the gear unit is fitted.

6. Fit the gear unit assembly into the case. Align the slots, then carefully guide the assembly into the case, making certain that the centre support bolt hole is properly aligned with the hole in the case. Ensure that the tangs on the output shaft to case thrust washer are positioned in the pockets.

7. Lubricate the centre support retaining snap ring with clean transmission fluid, then fit the snap ring into the transmission case with the bevelled side uppermost and the flat side against the centre support. Position the location gap adjacent to the front band anchor pin.

8. Fit the case to centre support bolt by placing the centre support locating tool (J-23093) into the case direct clutch passage, with the handle of the tool pointing to the right as viewed from the front of the transmission and parallel to the bell housing mounting face.

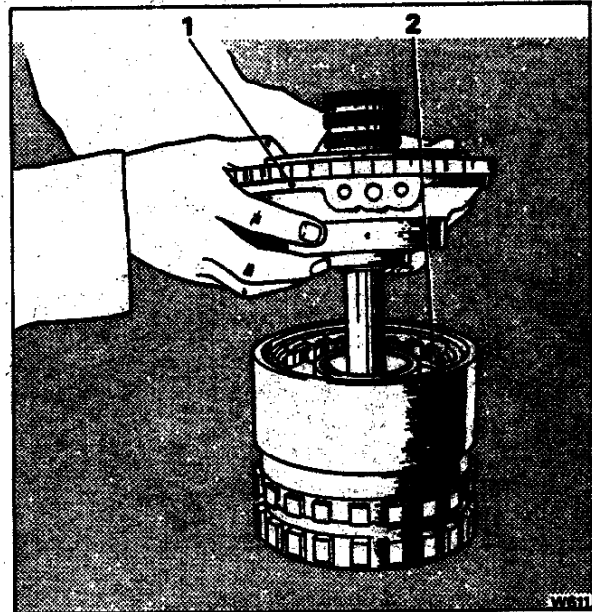
9. Apply pressure downward to the tool handle which will tend to rotate the centre support anti-clockwise as viewed from the front of the transmission.

10. While holding the centre support firmly anti-clockwise against the case splines, torque tighten the case to centre support bolt to the figures quoted in Chapter P, using a ¼ in. U.N.C. 12 point thin wall, deep socket (see Fig. T125).

**Note**

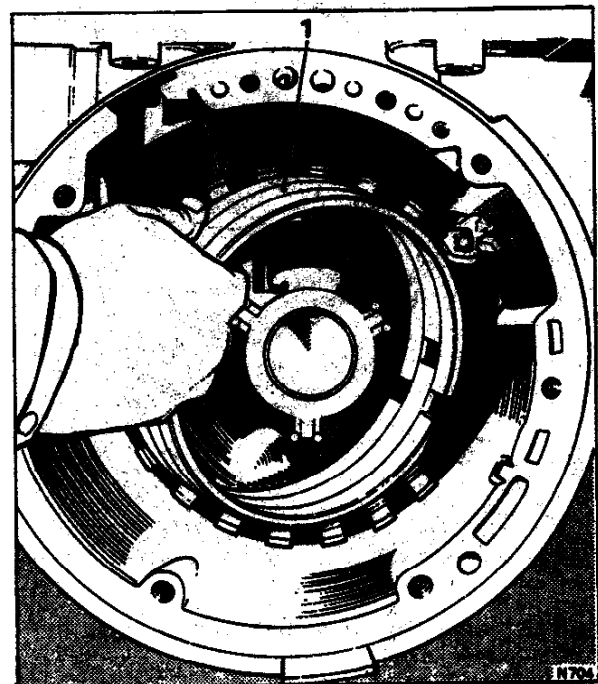
When using the locating tool, take care not to create burrs on the case valve body mounting face.

11. Lubricate the three steel (two flat and one waved) and three composition intermediate clutch plates with clean transmission fluid, then fit the clutch plates. Commence with the waved steel plate, then fit alternate composition and flat steel plates (see Fig. T126).



**Fig. T123 Fitting the centre support into the reaction carrier (roller clutch)**

- 1 Centre support
- 2 Roller clutch

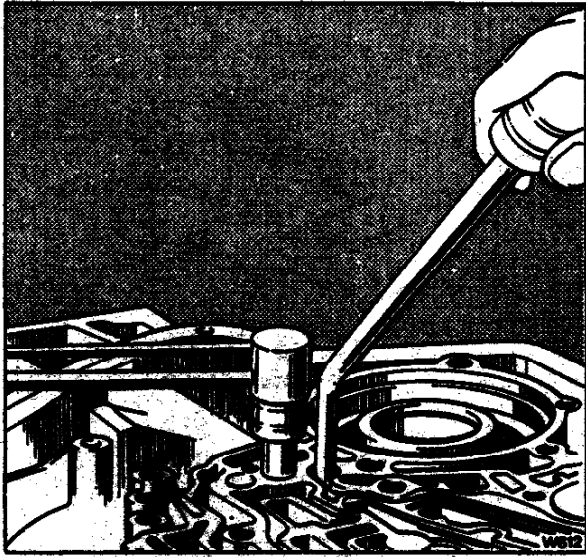


**Fig. T124 Fitting the rear band**

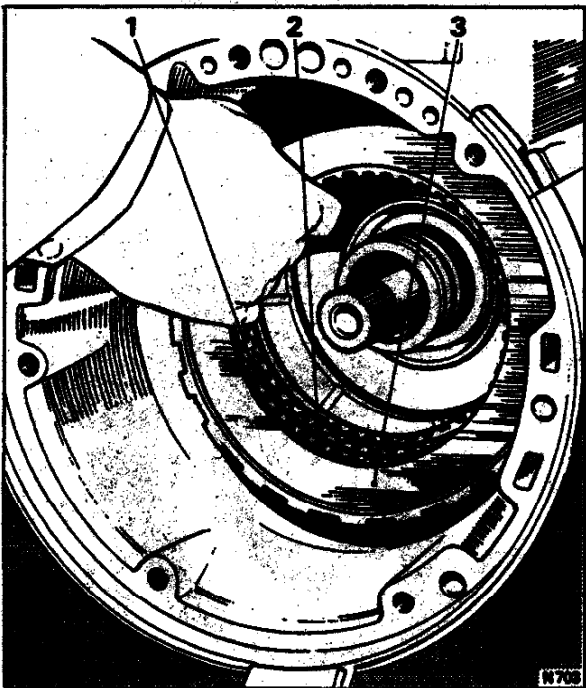
- 1 Rear band

12. Fit the intermediate clutch back plate with the ridge uppermost.

13. Fit the intermediate clutch backing plate to



**Fig. T125 Locating the centre support**



**Fig. T126 Fitting the intermediate clutch plates**

- 1 Steel plate
- 2 Composition plate
- 3 Back plate

case snap ring, ensuring that the ring gap is opposite the band anchor pin. Both sides of this snap ring are flat and it is 2,36 mm. (0.093 in.) thick.

**14. Check the rear unit end-float (see Section T18).**