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DESCRIPTION

TORQUE CONVERTER

The torque converter is of the three element, single phase type. The three elements are: Impeller, connected to the engine crankshaft; Turbine, connected to the gearbox input shaft, and Stator, mounted on a one-way clutch on the stator support projecting from the gearbox case. The converter provides torque multiplication of from 1:1 to 2:1 and the speed range during which this multiplication is obtained varies with the accelerator position.

GEAR SET

The planetary gear set consists of two sun gears, two sets of pinions, a pinion carrier and a ring gear.

Power enters the gear set via the two sun gears, the forward sun gear driving in forward gears, the reverse sun gear driving in reverse gear. The ring gear, attached to the output shaft, is the driven gear. The planet wheels connect driving and driven gears, two sets of planet wheels being used in forward gears and one set in reverse.

The planet carrier locates the planet wheels relative to sun and ring gears, also serving as a reaction member.

CLUTCHES

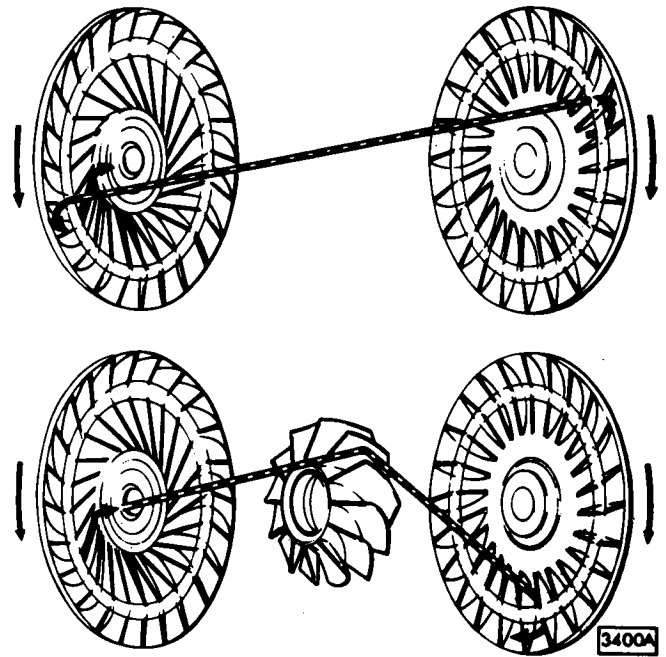
The gearbox input shaft is connected to the torque converter turbine at the front end and is therefore known as the turbine shaft. The rear end of the shaft is connected to the front and rear clutches, (the clutches are of the multi disc type operated by hydraulic pressure). Engagement of the front clutch connects the turbine shaft to the forward sun gear. Engagement of the rear clutch connects the turbine shaft to the reverse sun gear.

BRAKE BANDS

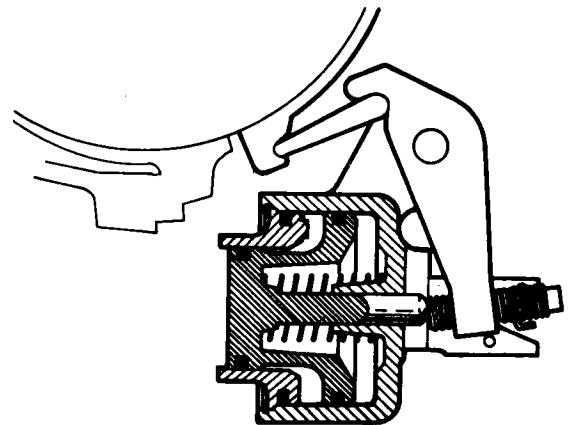
The brake bands operated by hydraulic servos, are used to hold drive train components stationary in order to obtain low, intermediate and reverse gears. The front band is clamped around the rear clutch outer drum to hold the reverse sun gear stationary. The rear band is clamped around the planet carrier to hold the planet carrier stationary.

ONE WAY CLUTCH

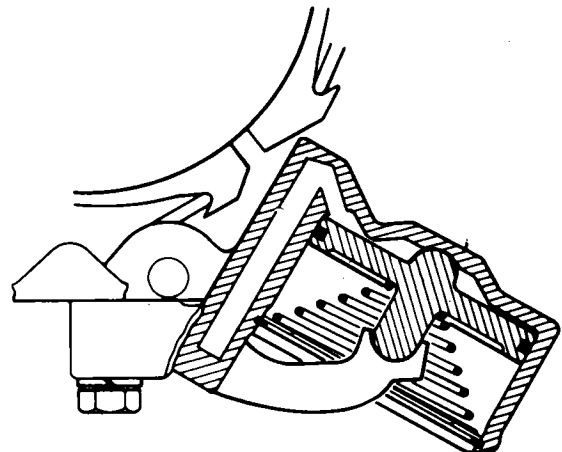
The "one-way" clutch is situated between the planet carrier and the gearbox case. Rotation of the planet carrier against engine direction is prevented so providing the reaction member for low gear (drive). Rotation of the planet carrier in engine direction is allowed (free-wheeling) providing smooth changes from low to intermediate and intermediate to low gears.



Torque converter – principle of operation



Front servo operation



Rear servo operation



MECHANICAL POWER FLOWS

Neutral and Park

In neutral the front and rear clutches are off, and no power is transmitted from the converter to the gear set. The front and rear bands are also released. In 'P' the Rear Servo circuit is pressurised while the engine is running, so that the rear band is applied.

First Gear ('D' selected)

The front clutch is applied, connecting the converter to the forward sun gear. The one-way clutch is in operation, preventing the planet carrier from rotating anti-clockwise. When the vehicle is coasting the one-way clutch over-runs and the gear set freewheels.

First Gear ('1' selected)

The front clutch is applied, connecting the converter to the forward sun gear. The rear band is applied, holding the planet carrier stationary. The reverse sun gear rotates freely in the opposite direction to the forward sun gear.

Second Gear ('2' or 'D' selected)

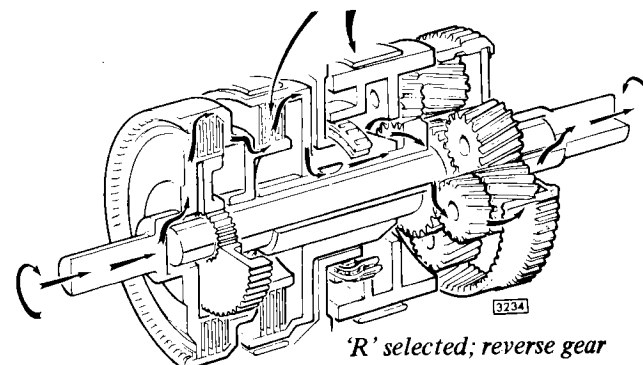
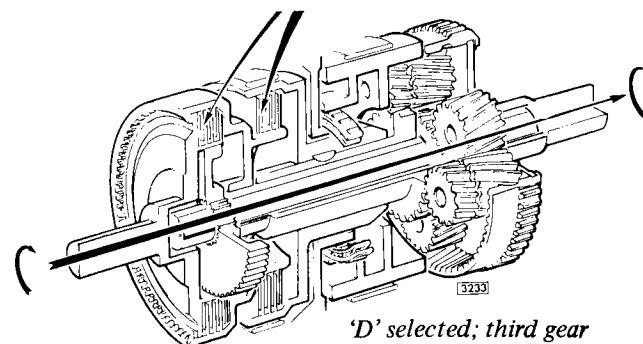
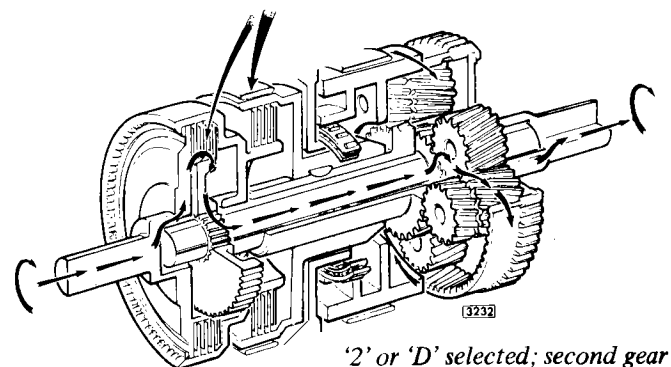
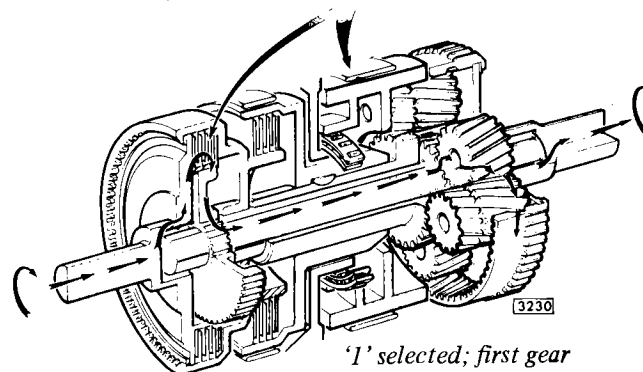
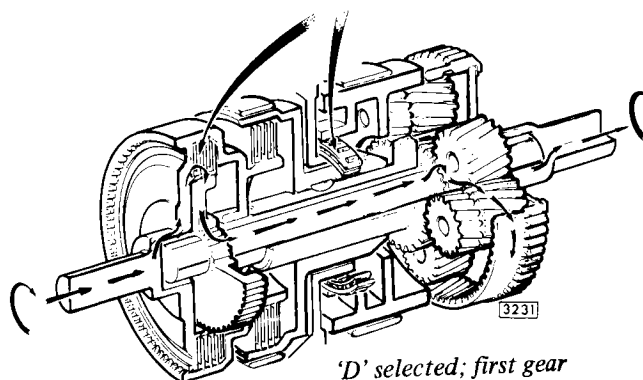
Again the front clutch is applied, connecting the converter to the forward sun gear. The front band is applied, holding the reverse sun gear stationary.

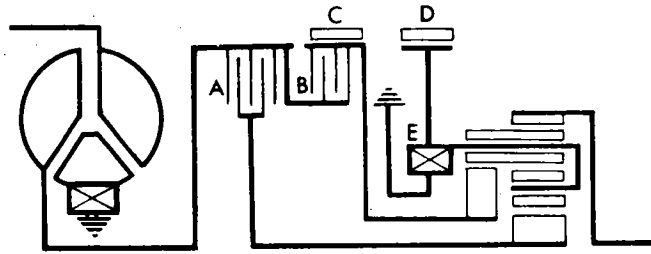
Third Gear ('D' selected)

Again the front clutch is applied, connecting the converter to the forward sun gear. The rear clutch is applied, connecting the converter also to the reverse sun gear; thus both sun gears are locked together and the gear set rotates as a unit, providing a ratio of 1:1.

Reverse Gear ('R' selected)

The rear clutch is applied, connecting the converter to the reverse sun gear. The rear band is applied, holding the planet carrier stationary.





	A	B	C	D	E
1 (first gear)	●			●	
D(first gear)	●				●
2&D(sec.gr.)	●		●		
D(third gear)	●	●			
R(rev.gear)		●		●	

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Clutch and band application chart

- A Front Clutch
- B Rear Clutch
- C Front Band
- D Rear Band
- E One Way Clutch

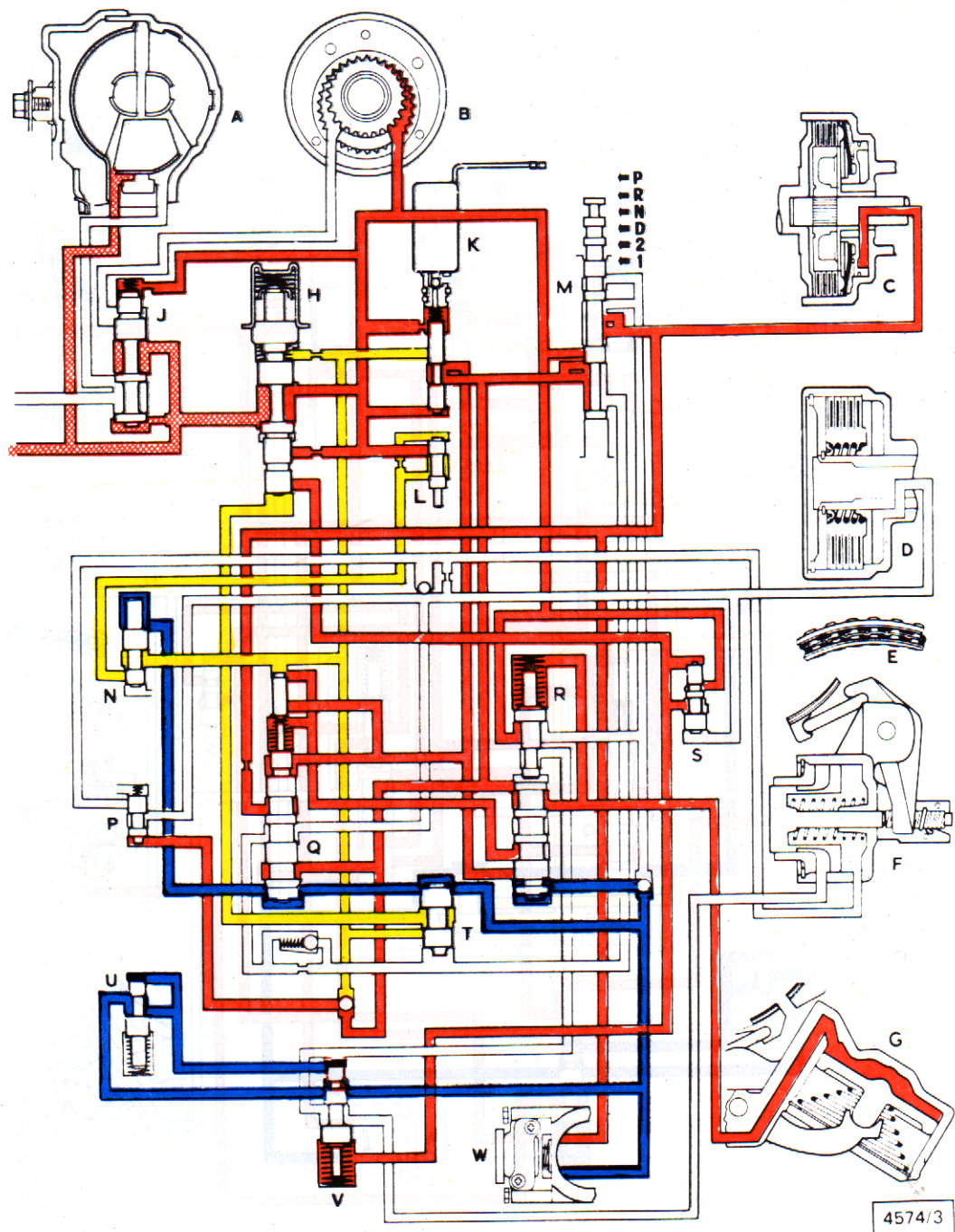
KEY TO COMPONENTS SHOWN ON HYDRAULIC CHARTS

- | | |
|-----------------------|-------------------------------------|
| A Torque Converter | M Manual Valve |
| B Pump | N Governor Modulator Valve |
| C Front Clutch | P Orifice Control Valve |
| D Rear Clutch | Q 2-3 Shift Valve |
| E One-Way Clutch | R 1-2 Shift Valve |
| F Front Servo | S Servo Regulator Timer |
| G Rear Servo | T Throttle Modulator Cut-Back Valve |
| H Primary Regulator | U Modulator Valve |
| J Secondary Regulator | V Servo Regulator |
| K Downshift Valve | W Governor |
| L Throttle Valve | |



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

With the engine running, the pump supplies fluid to the primary regulator which regulates line pressure. Spill from the primary regulator supplies the torque converter and lubrication requirements. This supply is regulated by the secondary regulator. The line pressure supplied to the manual valve is blocked by a land on the valve so that neither governor, clutches or servos are energised. Line pressure at the throttle valve is converted to throttle pressure, dependant on manifold depression, i.e. throttle pedal position.

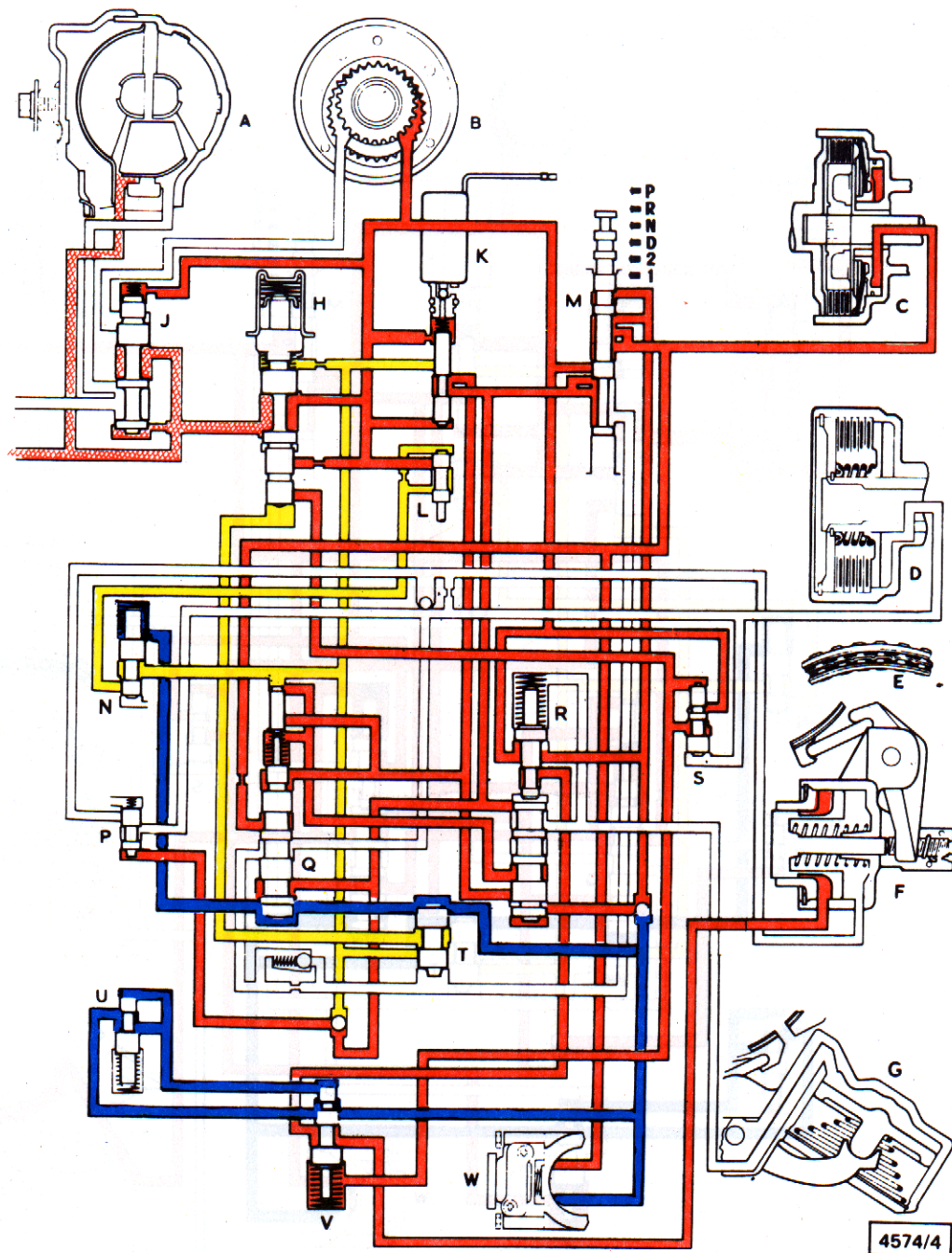


HYDRAULIC OPERATION IN 'D' (FIRST GEAR)

Movement of the manual valve to the 'D' position opens the front clutch and governor to line pressure. No other component is required to engage first gear. Line pressure is supplied to the top of the secondary regulator to control converter pressure. Throttle pressure is applied to the top and bottom of the primary regulator to modulate line pressure in the interests of shift quality.

HYDRAULIC OPERATION IN '1' (FIRST GEAR)

Application of the front clutch and rear servo are required in '1' (Manual) selection. The rear band is applied to provide engine braking. Line pressure applied to the lands of the 1-2 shift valve opposes governor pressure. There is, therefore, no upshift and the transmission remains in '1' (Low) ratio.

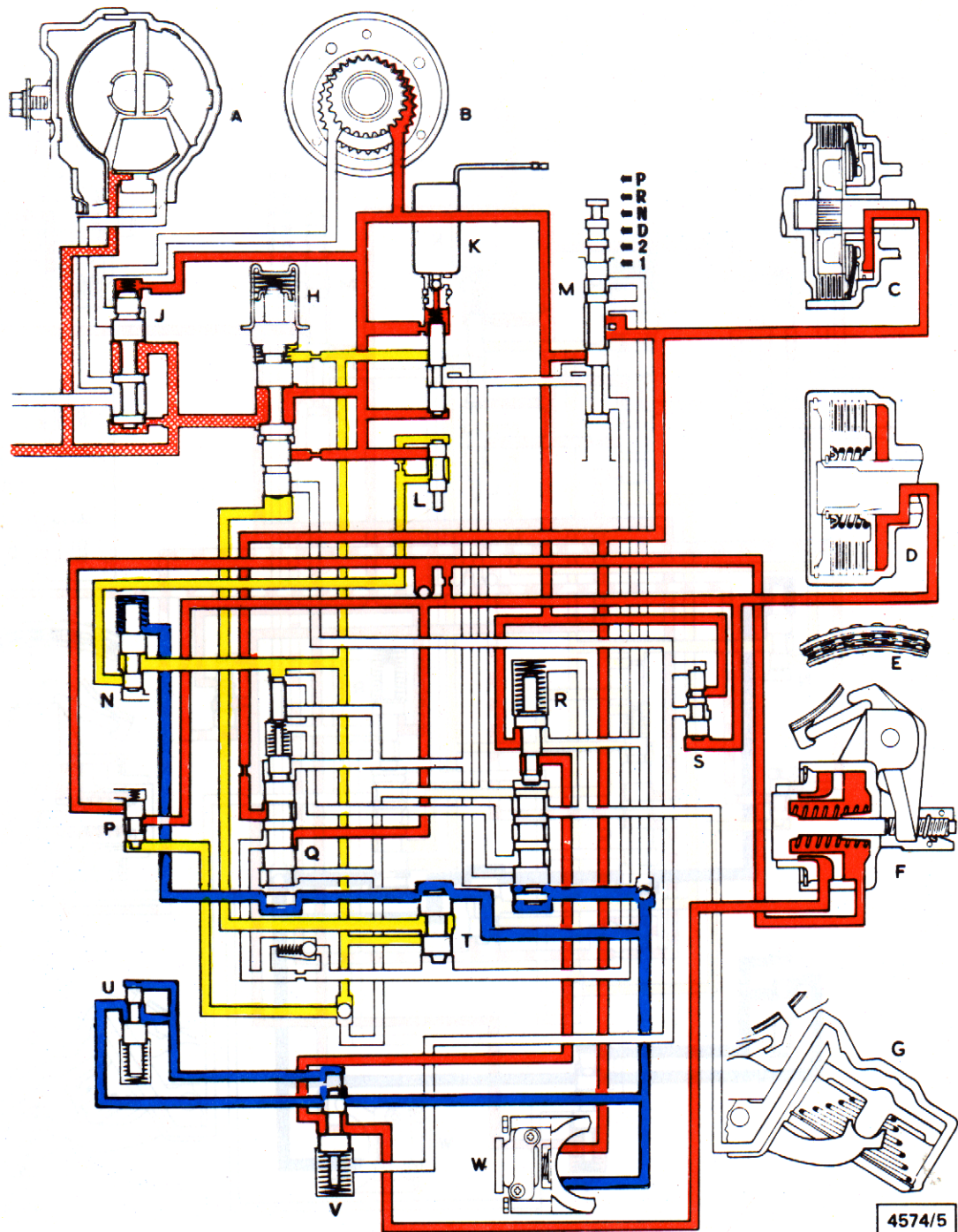


HYDRAULIC OPERATION IN 'D' (SECOND GEAR)

Increasing road speed results in a corresponding increase in governor pressure which will move the 1-2 shift valve to the 2nd gear position. The exact speed at which this change takes place is dependent upon the throttle pressure opposing governor pressure at the 1-2 shift valve. With the 1-2 shift valve in the 2nd gear position, the line to the front servo apply side, through the servo regulator, is open to line pressure and the front band is applied.

HYDRAULIC OPERATION IN '2' (SECOND GEAR)

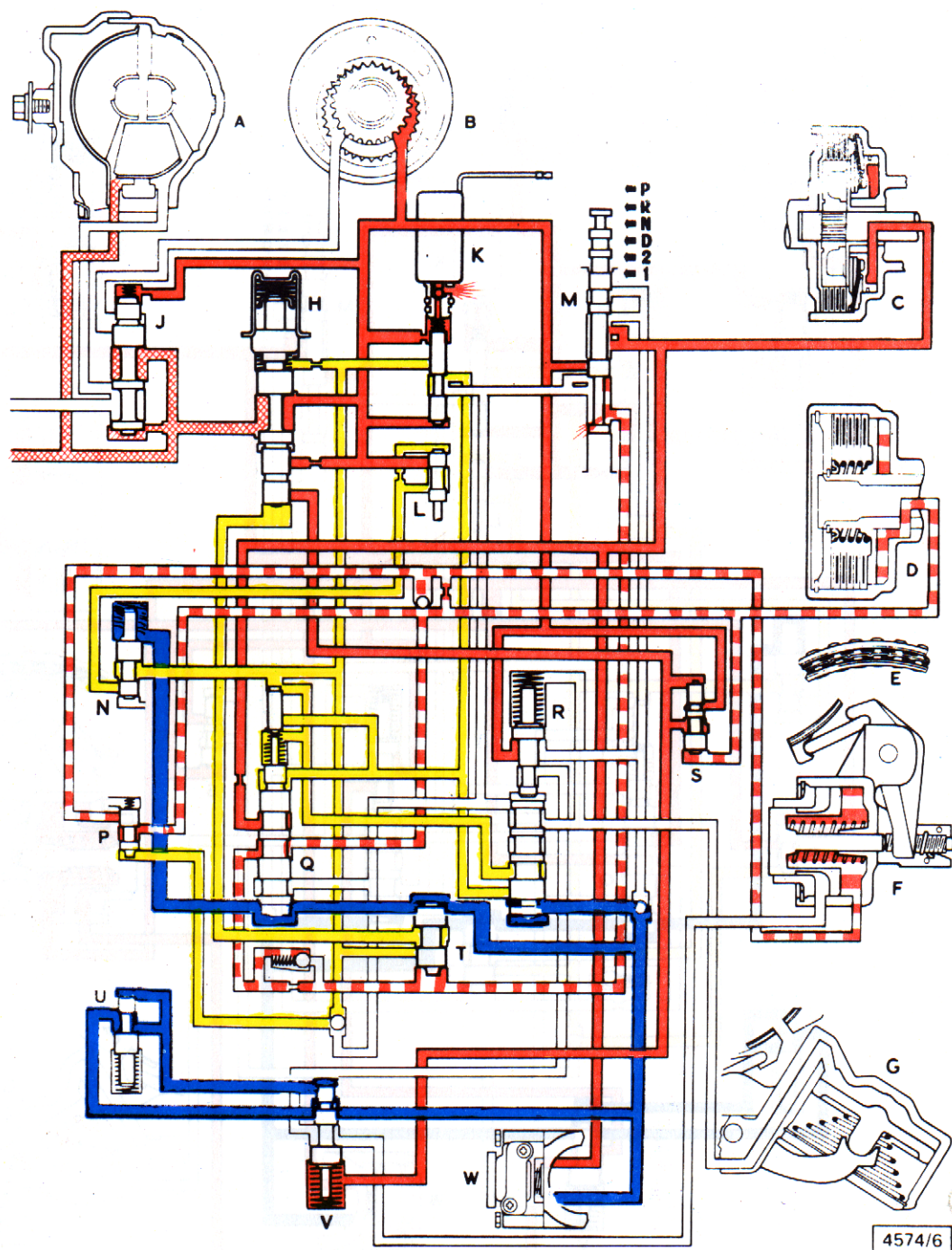
Once '2' (Manual) is engaged, there are no upshifts or downshifts. If either are required, a change to '1' (Manual) or 'D' must be made. Movement of the manual valve to the '2' (Manual) position allows line pressure to flow to a ball valve where it closes the governor line and introduces line pressure to the base of the 1-2 shift valve to retain it in the '2' (Intermediate) ratio.



HYDRAULIC OPERATION IN 'D' (THIRD GEAR)

In order to change to third gear, the front band must be released and the rear clutch applied. With the movement of the 2-3 shift valve to the third gear position the line to the front servo release and the rear clutch are open to line pressure.

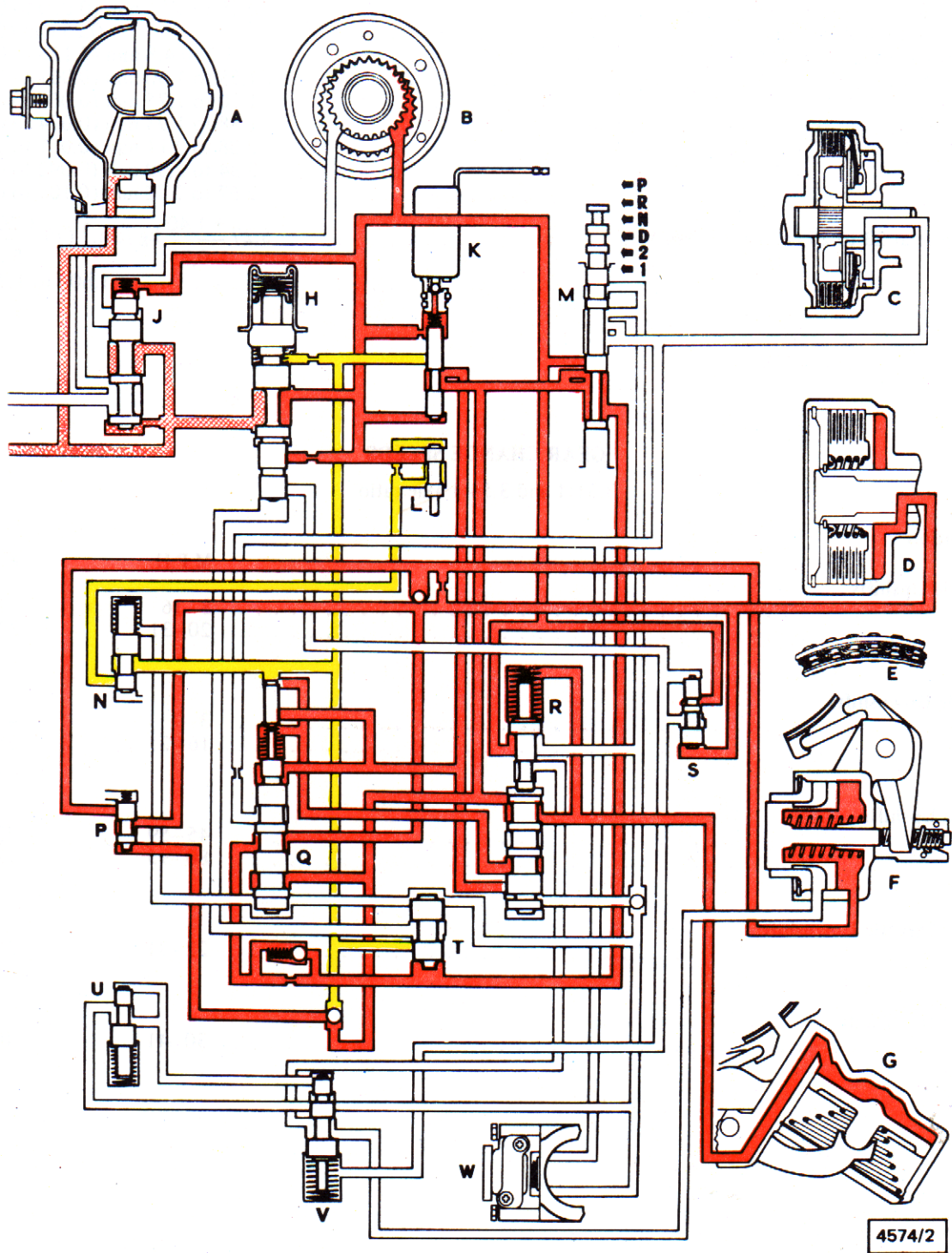
The lines now supplied with line pressure are the front clutch, rear clutch, front servo apply and front servo release. As the front servo release has a greater area than the apply side, the front band is released, therefore the front and rear clutches remain applied.



HYDRAULIC OPERATION IN 'D' (THIRD GEAR TO SECOND GEAR) KICKDOWN

Depression of the accelerator to the kickdown position actuates the kickdown switch to energise the kickdown solenoid at the valve block. With the solenoid energised, the plunger is lifted, allowing line pressure to escape past the ball valve. This sudden pressure drop allows the line

pressure at the base of the downshift valve to move the valve upwards so introducing extra modulated throttle pressure to the 2-3 shift valve. This extra pressure opposing governor pressure at the 2-3 shift valve assists in overcoming governor pressure so returning the shift valve to the 2nd gear position.



HYDRAULIC OPERATION IN 'R

Movement of the manual valve to the reverse position closes the lines to the front clutch and governor. The rear clutch and rear servo are energised so reversing the direction of rotation of the output shaft. As the front servo release and

rear clutch are interconnected, the front servo release will also be energised. This has no effect on the operation of reverse gear.

GENERAL DATA

Gear Train End Float	0,20 to 1,12 mm (0.008 to 0.044 in.)
Pinion End Float	0,25 to 0,51 mm (0.010 to 0.020 in.)
Minimum Rear Clutch Plate Coning	0,25 mm (0.010 in.)
One Way Clutch Spring to Lever Clearance	3,2 to 4,8 mm (0.125 to 0.188 in.)
Thrust Washer Sizes	1,55 to 1,60 mm (0.061 to 0.063 in.)
	1,70 to 1,75 mm (0.067 to 0.069 in.)
	1,88 to 1,93 mm (0.074 to 0.076 in.)
	2,08 to 2,11 mm (0.081 to 0.083 in.)
	2,34 to 2,39 mm (0.092 to 0.094 in.)
	2,67 to 2,72 mm (0.105 to 0.107 in.)
Control Pressure at 23 to 25 cm (9 to 10 in.) Hg	$5,27 \frac{+1,40}{-0,35}$ kg./cm. ² ($75 \frac{+20}{-5}$ lb./in. ²)
Stall speed	1,600 to 1,700 r.p.m.

GEAR CHANGE SPEEDS

3.31:1 and 3.54:1 axle ratio

Throttle position	M.P.H.	K.P.H.
**Light Throttle Upshifts		
1 - 2	8-16	12-25
2 - 3	20-31	32-49
Shut Throttle Downshifts		
2 - 1	3-7	4-11
3 - 2	16-21	25-33
Full Throttle Upshifts		
1 - 2	45-59	72-95
2 - 3	80-95	128-152
Manual Shut Throttle Downshift		
3 - 1	22-31	35-49
Part Throttle Downshift		
Obtainable up to	30-41	48-66**



ROAD TEST AND FAULT DIAGNOSIS 44.00.00

The following points should be checked before proceeding with the road test.

1. Fluid level.
2. Engine idle speed.
3. Manual lever adjustment.
4. Manifold vacuum of 23 to 25 cm. (9 to 10 in.) Hg.

ROAD TEST

The road speed figures for the tests listed below are to be found under "GENERAL DATA — GEAR CHANGE SPEEDS".

Road testing should follow the complete sequence detailed below. Transmission should be at normal working temperature, i.e. after being driven on road or rollers.

1. With brakes applied and engine idling, move selector from:—

'N' to 'R'

'N' to 'D'

'N' to '2'

'N' to '1'

Engagement should be felt with each selection.

2. Check stall speed.
3. Select 'D', accelerate with minimum throttle opening and check speed of first gear to second gear shift.
4. Continue with minimum throttle and check speed of second gear to third gear shift.
5. Select 'D', accelerate with maximum throttle opening (kickdown) and check speed of first gear to second gear shift.
6. Continue with maximum throttle and check speed of second gear to third gear shift.
7. Check for kickdown shift third gear to second gear.
8. Check for kickdown shift second gear to first gear.
9. Check for kickdown shift third gear to first gear.
10. Check for "roll-out" downshift with minimum throttle, second gear to first gear.
11. Check for part throttle downshift, third gear to second gear

Should a fault be apparent during road test, first identify the problem from the list printed in the Fault Diagnosis Chart. The reference numbers shown opposite each fault may be translated by reference to the page headed "Transmission Fault Key".

FAULT DIAGNOSIS

Problem	Checks in Vehicle	Checks on Bench
Engagements		
Harsh	A1, A3, A4, A5, M2, V1, V2, V3, V4	T4 (in reverse only)
Soft or delayed	M1, A2, A3, A4, A5, V1, V2, V3, V9	T14
None in all Positions	V16, M1, A2, V2, C3	T9, T10, C2
No forward		
in 1 position	V16, M1, A2, V1, V2	T1, T4, T7, T14
in 2 position	V16, M1, A2, T16, T13, V1, V2, V10	T1, T4, T14
in D position	V16, M1, A2, V1, V2, A5	T1, T4, T7, T14
in all positions	V16, M1, A2, V1, V2	C2, T9, T10, T14
No reverse	V16, M1, A2, A5, T15, T6, V1, V5, V6	T2, T3, T14
Jumps in forward	A2, A3, A4, A5	T4, T7
Jumps in reverse	A2, A3, A4, A5	T2, T3
No neutral	A2, V1, V16	T2
Upshifts		
No 1-2	M1, A2, A4, G1, T5, T13, T16, V1, V2, V4, V5	T14
No 2-3	M1, A2, G1, T13, V1, V2, V4, V5, V6	T3, T14
Shift points too high	A1, A2, M2, G1, V1, V2, V4, V5, V8, V12, V14	T14
Shift points too low	A1, M3, G1, M4, V1, V5, V6, V12, V14	T14
Upshift Quality		
1-2 slips or runs-up	M1, A1, A2, M3, G1, T13, V1, V2, V4, V9, V10, V5	T10, T5, T14
2-3 slips or runs-up	M1, A1, A2, A4, M3, G1, T13, V1, V2, V4, V5, V6, V9, V10, V12	T10, T5, T14
1-2 harsh	A1, A2, A4, A5, M2, V1, V2, V3, V4, V5, V9	T1, T7, T8
2-3 harsh	A1, A2, A4, M2, V1, V2, V4, V9	T4
1-2 ties-up or grabs	A4, A5, V1, V5, T16	T4, T7, T8
2-3 ties-up or grabs	A2, A4, T13, V17, T15	



AUTOMATIC TRANSMISSION

FAULT DIAGNOSIS—continued

Problem	Checks in Vehicle	Checks on Bench
Downshifts		
No 2-1	A1, A2, A6, M3, M4, G1, V1, V5, V14	T7
No 3-2	A1, A2, A6, M4, G1, V1, V6, V14, T13	T4
Shift points too high	A1, A2, M2, G1, V1, V4, V5, V6, V12	T14
Shift points too low	A1, A2, M3, G1, V1, V4, V5, V6, V12	T14
Downshift Quality		
2-1 slides	T5, A1, A2, A4, T13, G1, V1, V2, V4, V9, V11	T7
3-2 slides	A1, A2, A4, T13, G1, V1, V2, V4, V9, V11, T5	
2-1 harsh	A1, A2, A4, A5, M2, V1, V2, V3, V4, V9	T1, T7, T14
3-2 harsh	A1, A2, A4, G1, V1, V2, V3, V4, V9	T3, T4
Reverse		
Slips or chatters	M1, A1, A2, A5, T6, V1, V2, V4, V10	T14, T2, T3
Line Pressure		
Low idle	M1, A1, A2, A3, T13, V1, V2, G1	T10, T14
High idle	A1, M2, V1, V2, V3, V4	
Low stall	M1, A1, M3, M4, T13, G1, V1, V2, V4, V14	T10
High stall	A1, V1, V2, V3	
Stall speed		
Too low (200 R.P.M. or more below)		C1
Too high (200 R.P.M. or more above)	M1, A1, A2, A4, T13, V1, V4	T14, T1, T3, T6, T7, T9, T10
Others		
Transmission overheats	M1, A4, A5, V2, V3, M5, T13, V1	T1, T2, T3, T4, T5, T6, T7, T10, T14
Drag in neutral	A2, A3	T2, T4
Poor Acceleration	M1, V2, V3	C1
Noisy in neutral	V13	T2, T4, V15
Noisy in park	V13, V15	T10
Noisy in all gears	V13, C3, V15	T10, C1, C2
Noisy during coast (30-20 M.P.H.)		T12
Park brake does not hold	A2, T11	
Ties up in 1 or low	A4, T15, T13, V1	T4, T14
Ties up in 2 or intermediate ratio D or 2 selected	A5, T16, A2, V1	T4, T14, T8
Ties up in direct drive	A5, T16, A2, V1, A4, T15, T12	T17, T14, T8
Poor acceleration	M6, A1, A2, A4, M1, T15, T16, V1, V2	C1, T10, T14
Oil out breather	T18, M1, G1, T13, V1	T14
Oil out fill tube	T18, M1, G1, T13, M7	T14



TRANSMISSION FAULT KEY

Adjustments

- A1 Vacuum control adjustment.
- A2 Manual control adjustment.
- A3 Engine idle speed.
- A4 Front band adjustment.
- A5 Rear band adjustment.
- A6 Kickdown switch adjustment.

Miscellaneous

- M1 Fluid level.
- M2 Vacuum leak.
- M3 Vacuum line restricted.
- M4 Broken kickdown wire or blown fuse.
- M5 Oil cooler, lines and connections.
- M6 Engine tune-up.
- M7 Breather plugged.

Converter

- C1 Converter blading or one-way clutch failed.
- C2 Pump drive tangs on converter hub broken.
- C3 Broken converter drive plate.

Governor

- G1 Governor, sticking, leaking or incorrectly assembled.

Transmission

- T1 Front clutch slipping due to worn or faulty parts.
- T2 Front clutch seized or plates distorted.
- T3 Rear clutch slipping due to worn plates or faulty parts.
- T4 Rear clutch seized or plates distorted.
- T5 Front band slipping due to a faulty servo, broken or worn band.

- T6 Rear band slipping due to a faulty servo, broken or worn band.
- T7 One-way clutch slipping or incorrectly installed.
- T8 One-way clutch seized.
- T9 Broken input shaft.
- T10 Front pump worn or defective.
- T11 Parking linkage.
- T12 Planetary assembly.
- T13 Oil tubes missing or broken.
- T14 Sealing rings missing or broken and other oil leaks.
- T15 Front bank locked in the applied condition.
- T16 Rear band locked in the applied condition.
- T17 Rear clutch piston ball check leaking.
- T18 Dipstick length.

Valve Body

- V1 Valve body improperly assembled or screws missing.
- V2 Primary valve sticking.
- V3 Secondary valve sticking.
- V4 Throttle valve sticking.
- V5 1-2 shift valve sticking.
- V6 2-3 shift valve sticking.
- V7 Governor modulator valve sticking.
- V8 Throttle modulator valve sticking.
- V9 Cutback valve sticking.
- V10 Servo regulator valve sticking.
- V11 Orifice control valve sticking.
- V12 2-3 shift valve plug sticking.
- V13 Regulator valve buzz.
- V14 Defective solenoid.
- V15 Dirty oil Screen.
- V16 Manual valve not connected to shift control.
- V17 Ball check valve stuck.

STARTER INHIBITOR SWITCH

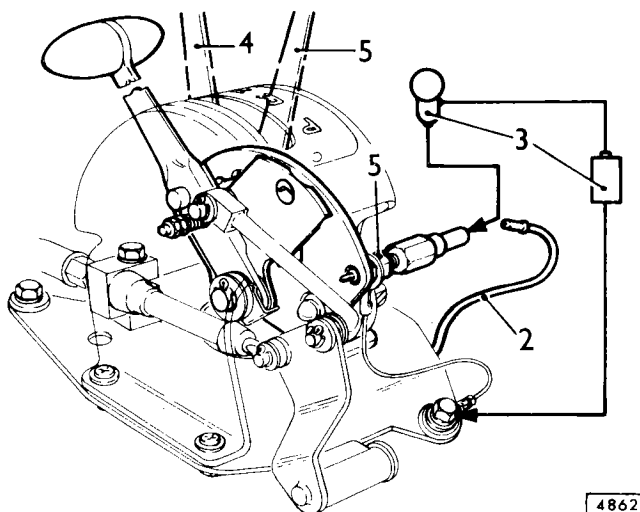
Check and adjust

44.15.18

1. Remove console — 76.25.01.
2. Detach cable from switch.
3. Connect a test lamp and battery in series with switch.

NOTE: Switch is in earthed circuit.

4. Place selector lever in 'N' position.
5. Release switch locknuts and adjust switch until lamp lights. Tighten locknuts, check that lamp remains on with lever in 'P' position and is switched off in the drive positions.
6. Remove battery and test lamp, reconnect feed cable to switch.
7. Refit selector cover, knob and console.



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STARTER INHIBITOR SWITCH

Remove and refit

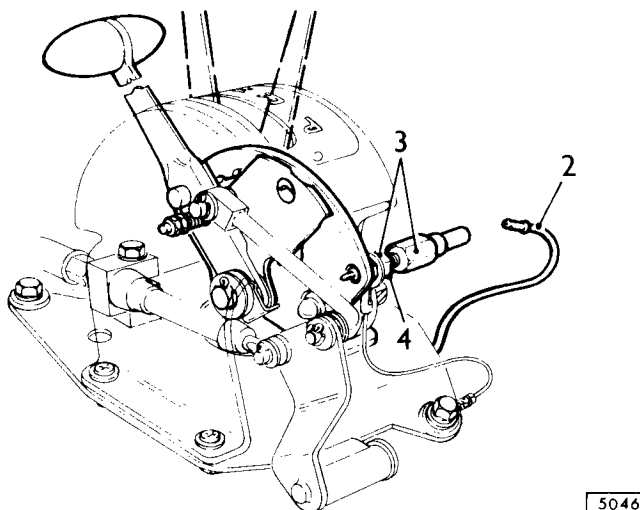
44.15.19

Removing

1. Remove console 76.25.01.
2. Detach cable from switch.
3. Release locknut and remove switch.

Refitting

4. Fit locknut to new switch.
5. Fit switch to bracket and adjust 44.15.18.
6. Refit console.



5046

CONVERTOR HOUSING

Remove and refit

44.17.01

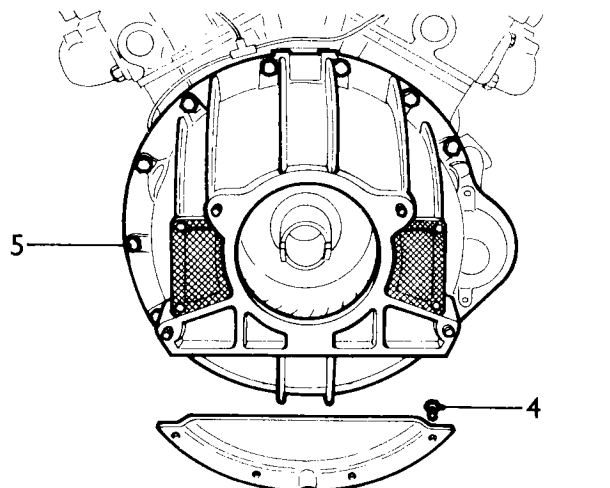
Removing

1. Remove engine 12.37.01.
2. Remove transmission unit — 44.20.01.
3. Remove starter motor.
4. Remove four setscrews and washers and detach front cover from housing.
5. Withdraw eight bolts and washers and remove housing.

NOTE: Two bolts are shorter than remaining six, check location for reference when refitting.

Refitting

Reverse operations 1 to 5.



5055

CONVERTOR

Remove and refit

44.17.07

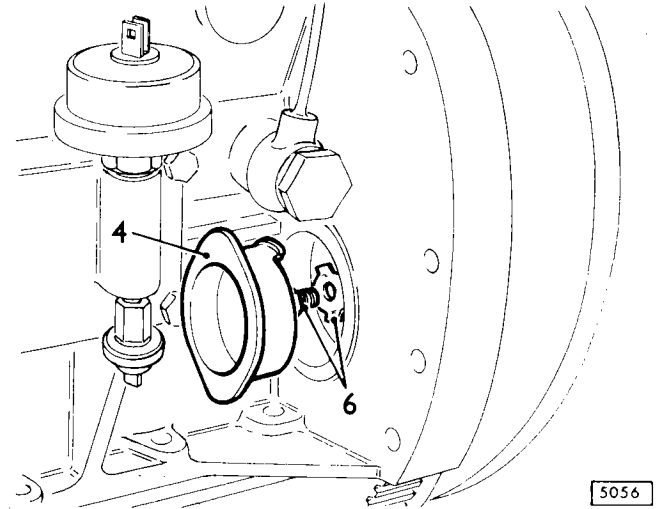
Removing

1. Remove engine 12.37.01.
2. Remove transmission unit 44.20.01.
3. Remove convertor housing 44.17.01.
4. Remove rubber plug from left hand rear of cylinder block.
5. Rotate engine until one of the four setscrews securing the convertor to the flywheel is opposite the aperture.
6. Knock back the tab washer and remove the setscrew.
7. Rotate engine until the remaining three setscrews are in turn accessible. Remove setscrews.
8. Remove convertor.

Refitting

Reverse operations 1 to 8.

CAUTION: The convertor is a sealed unit and if faulty must be renewed.



TRANSMISSION UNIT

Remove and refit

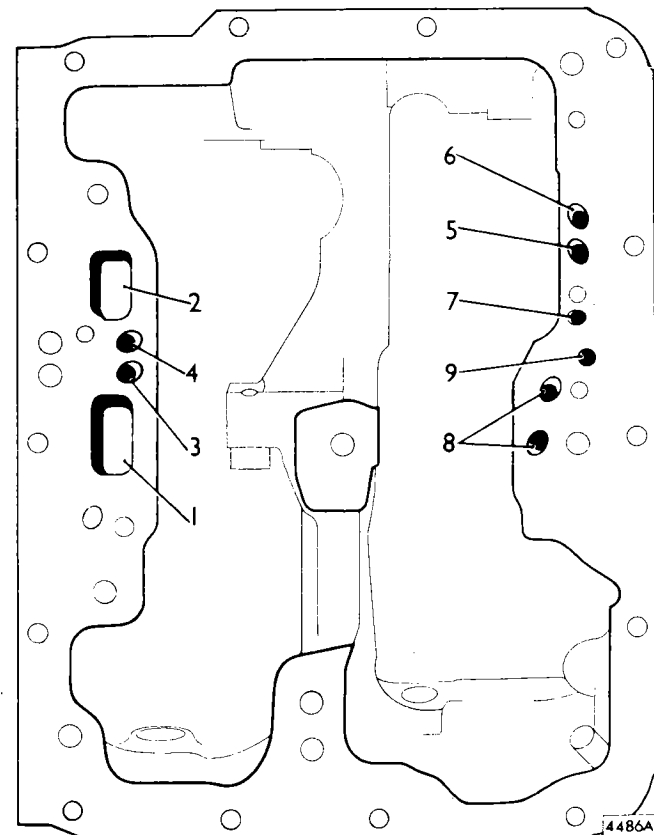
44.20.01

Removing

1. Remove engine 12.37.01.
2. Disconnect oil filler tube at oil pan union and drain oil.
3. Remove four nuts and lock washers securing unit to convertor housing.
4. Withdraw unit.

Refitting

Reverse operations 1 to 3. Check that convertor and unit shaft splines are in alignment, force must not be used to engage units.



TRANSMISSION ASSEMBLY

Overhaul

44.20.06

Service Tools

CBW.34, CBW.548, CBW.548-2, CBW.548-2A, CBW.33, CWG.35, CBW.547A-50, CBW.37A, CWG.37, 7066, CWG.41, CWG.42, CBW.548, CBW.548-1.

General

Air Checks

In order to ascertain the condition of piston and shaft seals the front (7) and rear (5) clutches may be tested with air pressure before dismantling. The same test may be carried out after assembly.

- | | |
|----------------------|------------------------------------|
| 1. Pump inlet. | 6. Governor outlet. |
| 2. Pump outlet. | 7. Front clutch and governor feed. |
| 3. Converter feed. | 8. Rear servo feed. |
| 4. Converter outlet. | 9. Lubrication. |
| 5. Rear clutch feed. | |



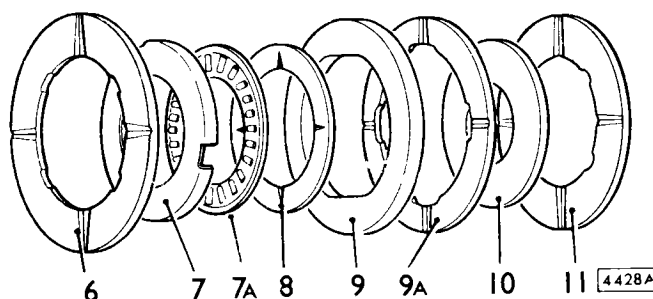
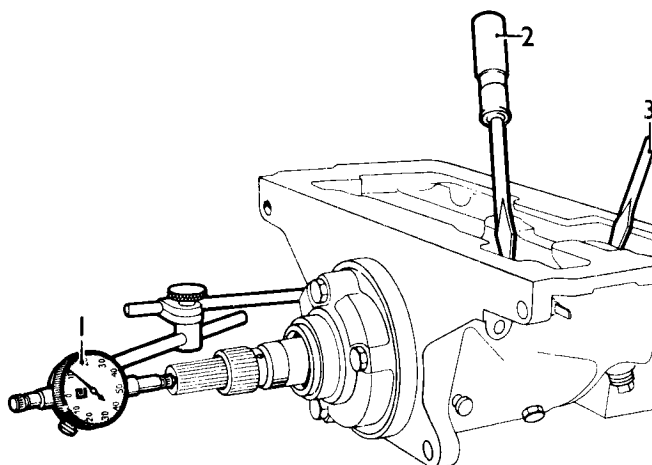
AUTOMATIC TRANSMISSION

Checking the transmission end-float before dismantling is essential to ascertain the condition of the worn parts.

1. Assemble a dial gauge (Tool No. CBW.33) to the gearbox case with the stylus touching the end of the turbine shaft.
2. Insert a lever between the front clutch and the front wall of the gear case. Ease the gear train to the rear and zero the gauge.
3. Insert the lever between the ring gear, and rear clutch housing and ease the gear train forward noting the final gauge reading.
4. End-float limits are:-
.20 mm (.008 in.) to 1.01 mm (.040 in.)
5. End-float adjustment is by a selective washer, indicated below, when rebuilding.

CAUTION: Failure to obtain specified end-float by replacing thrust washer (6) will necessitate replacing all washers (6-11).

6. Bronze faced — thrust washer — selective — situated between output shaft and planet carrier.
7. Steel backing washer.
- 7A. Needle thrust washer, situated between planet carrier, backing washer (7) and forward sun gear.
8. Bronze faced thrust washer, situated between forward and reverse sun gears.
9. Steel support washer.
- 9A. Bronze faced thrust washer. Internal flats on steel washer. Located on rear clutch centre pillar. Situated between rear and front clutches.
10. Non-metallic thrust washer. Situated between front clutch hub and turbine shaft flange.
11. Bronze faced thrust washer. Situated between turbine shaft flange and inner face of gear case.



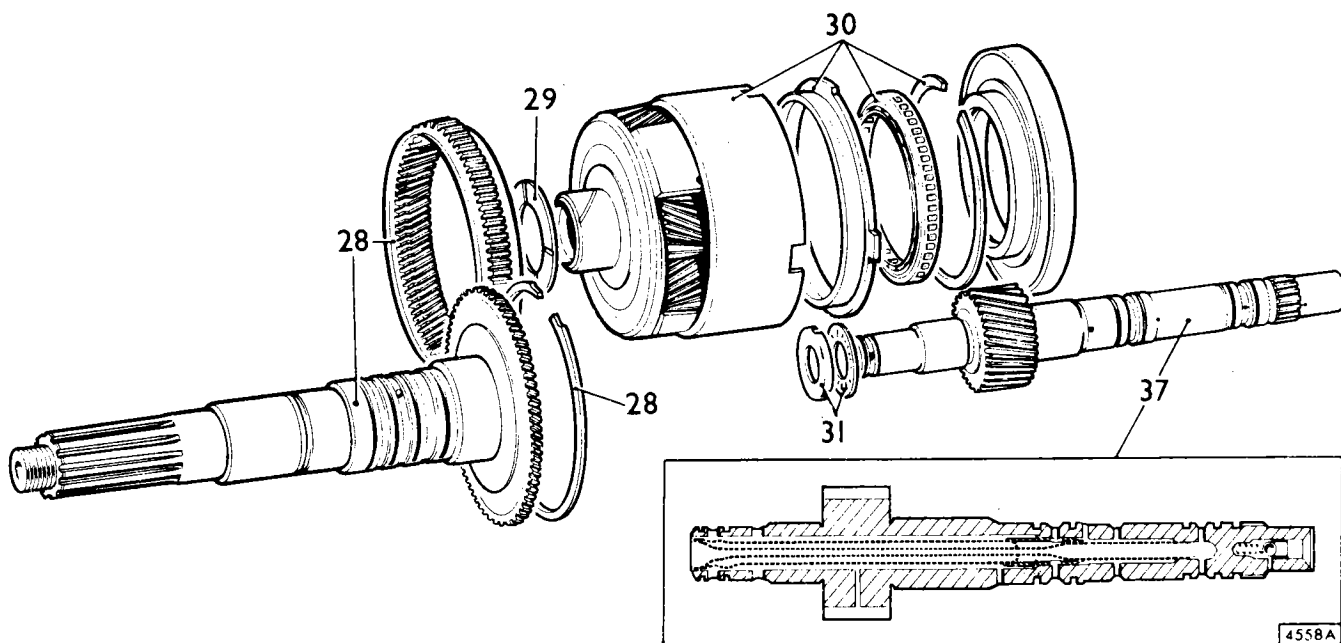
AVAILABLE SELECTIVE WASHER SIZES

MM.	IN.
1,55 – 1,60	.061 – .063
1,70 – 1,75	.067 – .069
1,88 – 1,93	.074 – .076
2,06 – 2,11	.081 – .083
2,34 – 2,39	.092 – .094
2,67 – 2,72	.105 – .107

Dismantling

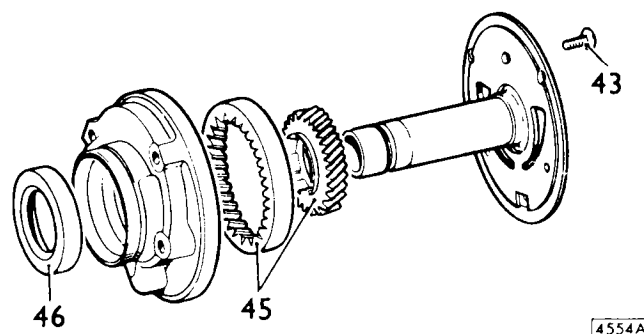
12. Thoroughly clean transmission exterior.
13. Invert transmission and place in suitable stand (Service tool No. CWG.35).
14. Remove sump and discard gasket.
15. Remove magnet from rear servo mounting bolt.
16. Unscrew vacuum control unit from gear case and remove push-rod, discard 'O' ring.
17. Disconnect solenoid cable from connector, compress lugs and push out connector, discard 'O' ring.
18. Slacken off front and rear band adjustments.
19. Loosen front servo mounting bolts to permit the valve body to be removed from the servo tubes.
20. Remove the six valve body retaining bolts and withdraw the valve body.
21. Remove front servo mounting bolts, lift out front servo and strut.
22. Remove rear servo mounting bolts, lift out rear servo and struts.

23. Remove coupling, remove cover, discard gasket and oil seal.
24. Remove speedometer drive gear.
25. Remove securing bolts and tap extension housing with a soft hammer to withdraw complete with bearing.
26. Remove governor retaining circlip, slide governor off output shaft and remove drive ball.
27. Withdraw rear adaptor and discard gasket.
28. Hold rear clutch drum steady and withdraw output shaft and ring gear assembly.
29. Remove selective thrust washer.
30. Holding forward sun gear shaft forward, withdraw planet carrier with sprag clutch, taking care to clear sealing rings.
31. Remove needle thrust bearing and backing washer.
32. Withdraw front pump mounting bolts and remove pump. Tap lightly with a soft hammer to free if necessary.
33. Note position of rear band for reassembly, i.e. depression in boss to adjusting screw. Compress band, pull to rear and withdraw it from case.
34. Remove both centre support bolts. Holding forward sun gear shaft and pushing turbine shaft to the rear, remove front clutch, rear clutch and centre support as a unit. Do not allow units to separate at this stage.
35. Remove centre support from clutch units.
36. Remove front band, noting position fitted.
37. Check fluid passages in forward sun gear shaft for obstructions or leakage.



The clutch units as removed from the gear case are assembled together with the forward sun gear shaft. To facilitate removal and replacement of the clutches without damage to the sealing rings, a suitable stand is required, e.g. the planet carrier may be used for this purpose. If the forward sun gear shaft is to be held in a vice, **soft jaws must be used**.

38. Insert rear end of forward sun gear shaft in stand.
39. Holding input shaft, carefully lift front clutch assembly clear of forward sun gear shaft.
40. Remove both steel and bronze thrust washers from rear clutch pedestal.
41. Lift rear clutch off forward sun gear shaft.
42. Remove bronze thrust washer.
43. Remove locking screw, separate pump halves.
44. Mark mating faces with die-marker.
45. Remove gears.
46. Remove oil seal and discard.



VALVE BLOCK

Overhaul

CAUTION: The working area for the following operations should be cleaned thoroughly. Use only lint free cloth.

If valves or assemblies are to be stored after cleaning and servicing they should be liberally lubricated.

Dismantled valve blocks should be stored in transmission fluid if possible.

Dismantling

47. Remove three pan headed screws and three ¼ UNC x 2.25 in (57 mm) bolts and detach filter screen.
48. Remove five ¼ UNC x 2.25 in. (57 mm) and one ¼ UNC x 2.125 in. (54 mm) bolts.
49. Invert assembly and remove upper valve body and separator plate.
50. Remove 2-3 shift ball-valve and spring.
51. Invert valve body and retrieve three ball valves.
52. Remove retaining pin and extract plug, secondary regulator valve and spring.
53. Remove spring retainer, seat and spring. Extract plug sleeve, primary regulator valve and spring.
54. Remove retaining pin, and extract plug, governor modulator valve and spring.
55. Remove retaining pin, extract plug, spring and servo regulator.
56. Remove retaining pin, extract plug and spring and 1-2 shift valve.
57. Remove retaining pin, extract plug, 2-3 shift valve and spring.
58. Remove four No.10 UNC x .375 in. (9,5 mm) cheese headed screws and detach lower valve body end plate.
59. Extract modulator valve and spring.
60. Extract throttle modulator cut back valve.
61. Extract 1-2 shift valve.
62. Extract 2-3 shift valve and spring.
63. Remove solenoid from upper valve body by rotating **180°. ** Extract spring and downshift valve.
64. Extract manual valve.
65. Remove three No.10 UNF x .375 in. (9,5 mm) cheese headed screws and upper valve body end plate.
66. Extract orifice control valve and spring.
67. Extract servo regulator timer.
68. Extract throttle valve.

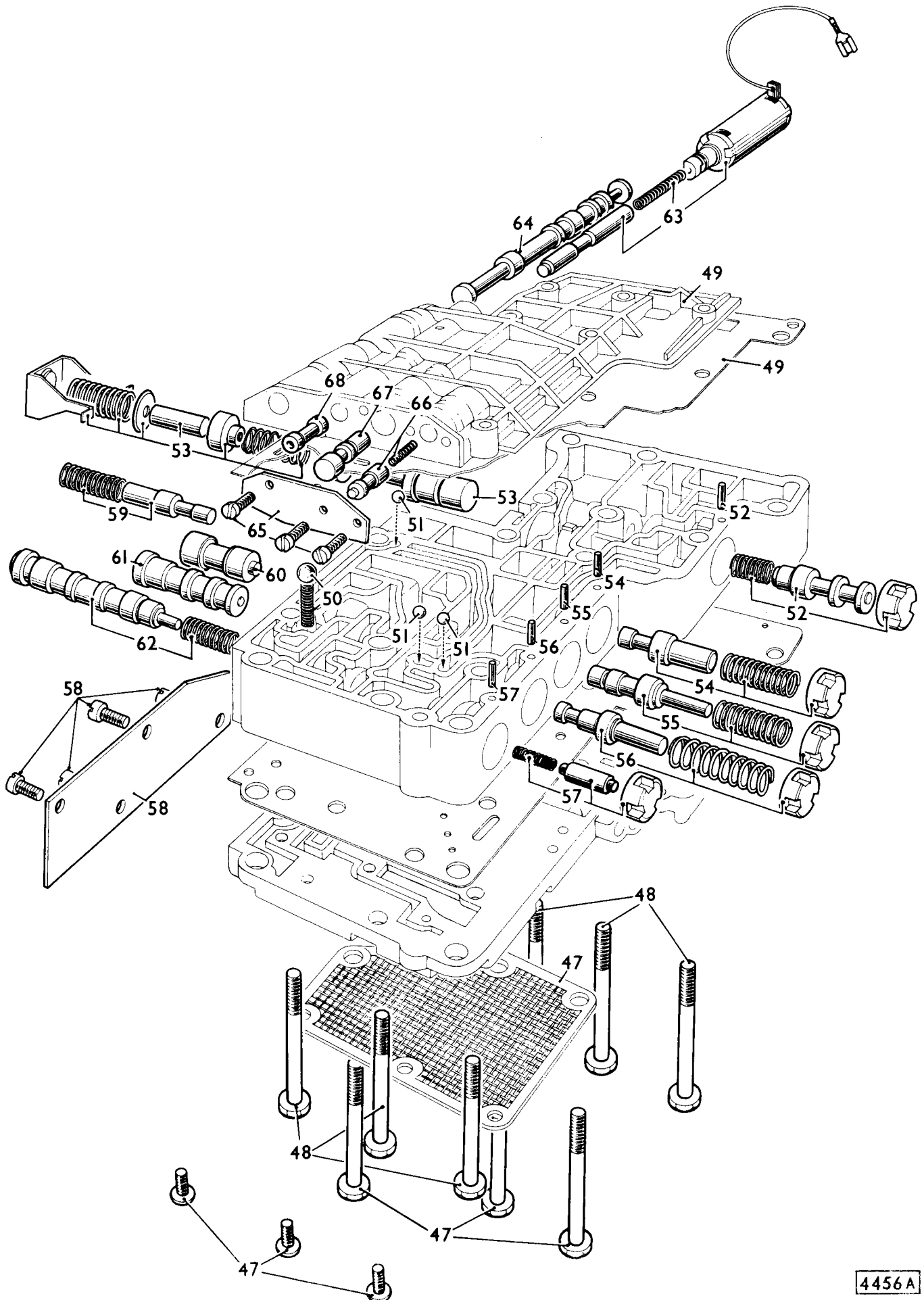
Inspection

Clean all parts thoroughly in a solvent. Do not use paraffin. Always lubricate valves with transmission fluid after cleaning. Scores and burrs may be removed from valves with a fine abrasive; do not round-off sharp edges. Check all valves for free movement in their bores.

Reassembling

Reverse operations 47 to 68.

NOTE: Tightening torque figures must be adhered to when assembling valve block. Commence tightening at centre and work outwards.



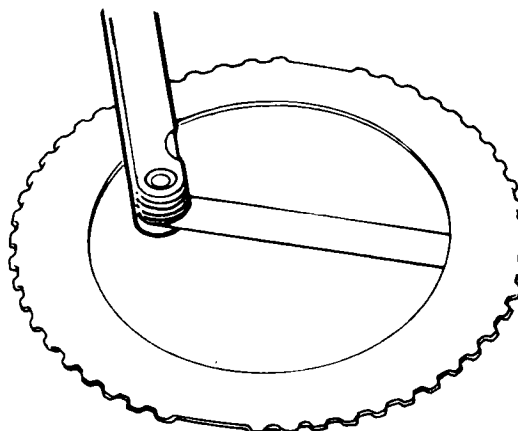
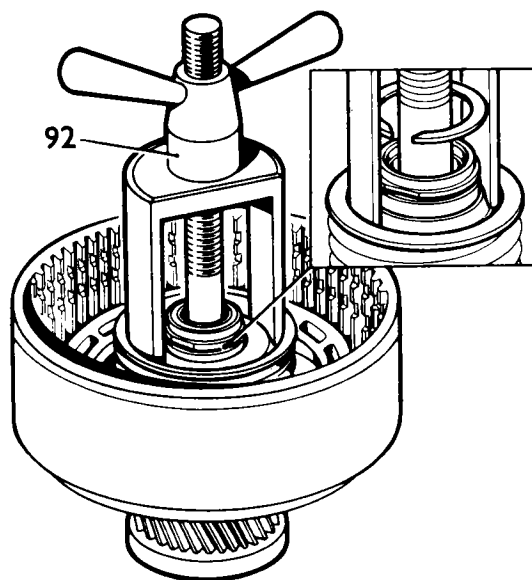
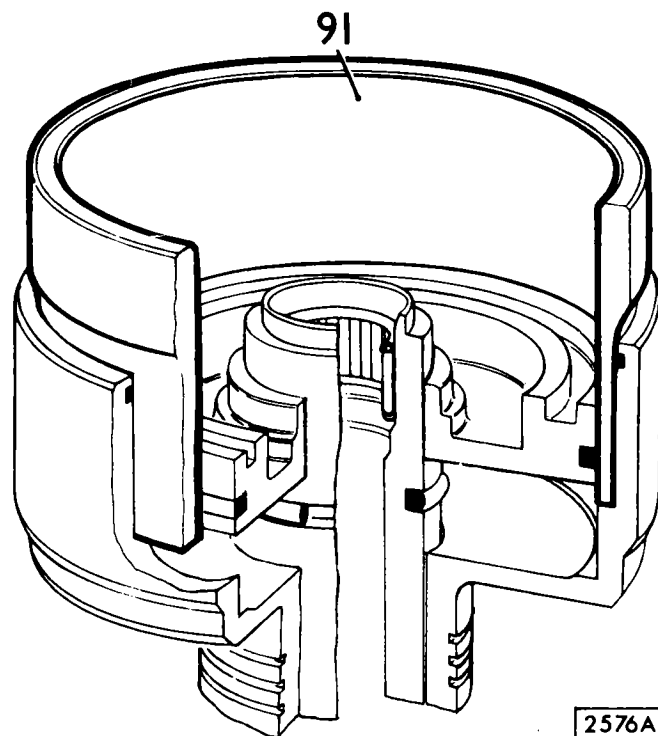
4456 A



91. Lubricate and install piston using rear clutch piston assembly sleeve, Tool No. CWG.41.
92. Using compressor Tool No. CWG.37 fit release spring retainer and circlip.
93. Fit clutch plates in alternate order, 4 external (steel) and 4 internal (friction face).

CAUTION: Check with feeler gauge that outer plates have .25 mm (.010 in.) cone. Plates must be assembled with cones facing same direction.

94. Fit pressure plate and spring ring.



FRONT CLUTCH

Overhaul

Dismantling

95. Remove circlip and turbine shaft.
96. Remove clutch hub and thrust washer.
97. Remove clutch plates.
98. Remove circlip and clutch release spring.
99. Apply air pressure to piston via oil supply hole and remove piston.
100. Remove 'O' ring from clutch housing pedestal and discard.
101. Remove piston ring and discard.

Inspection

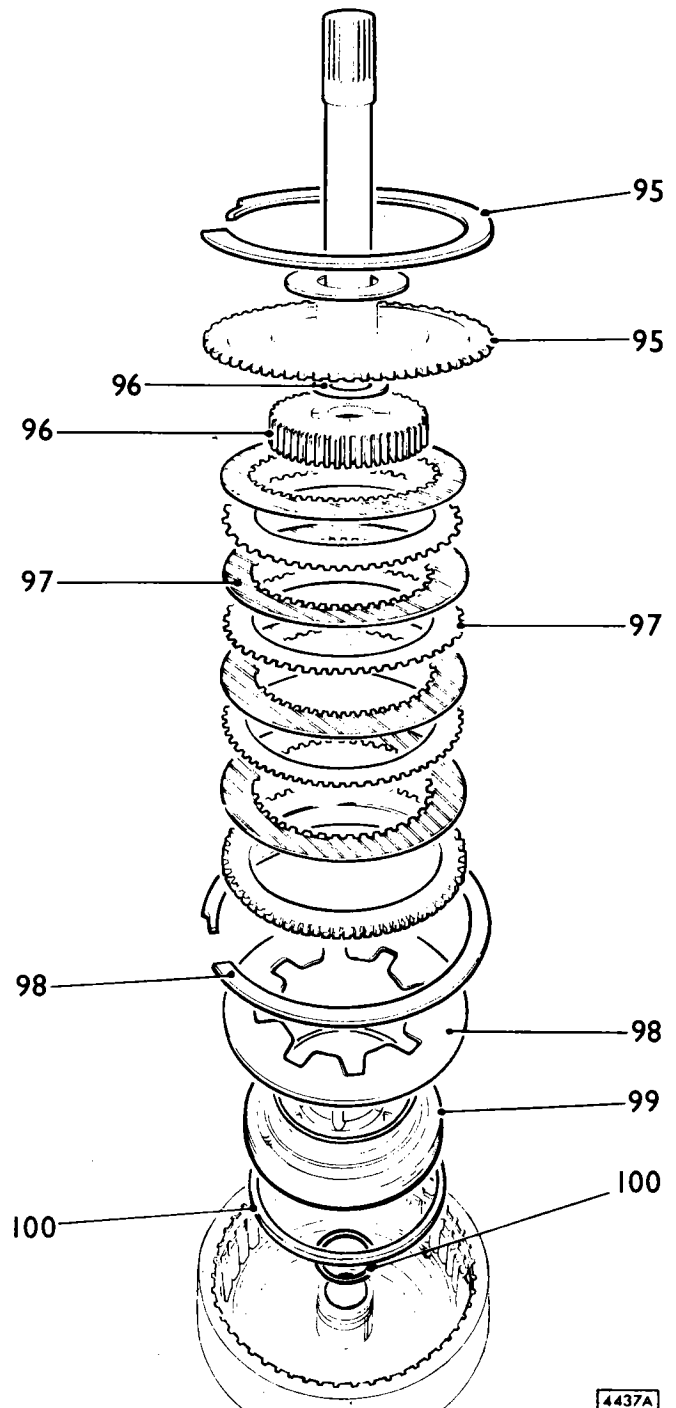
102. Check clutch drum, clutch hub, thrust and bearing surfaces for scores and burrs. Replace if damaged.
103. Check fluid passages and clean if necessary.
104. Inspect piston check valve for free operation.
105. Check clutch release spring for distortion and cracks. Discard if damaged.
106. Check clutch inner plates for flatness, facing depth and scoring.
107. Check clutch outer plates for flatness and scoring. Minor scores may be removed with a fine abrasive.

CAUTION: For identification purposes there are no teeth missing on front clutch outer plates.

Reassembling

108. Fit new 'O' ring to clutch housing pedestal and lubricate.
109. Fit new piston ring.
110. Using front clutch piston assembly sleeve Tool No. CWG.42 install piston. Lubricate sleeve and piston ring with specified transmission fluid.
111. Fit release spring and spring ring, checking that spring ring is fully seated in groove.
112. Place forward sun gear shaft and rear clutch in holder or vice (using soft jaws only).
113. Fit new sealing rings to sun gear shaft. Lubricate with petroleum jelly.
114. Carefully lower front clutch drum over shaft and sealing rings. Oscillate drum to enter into rear clutch plate splines.
115. Fit front clutch hub and pressure plate, flat sides up.
116. Fit 4 internal (friction face) and 3 external (flat steel) plates alternately.
117. Place composition washer in recess in clutch hub with petroleum jelly.
118. Fit turbine shaft and spring ring.

CAUTION: Care must be taken when removing the assembly from vice or stand not to allow the units to separate, otherwise damage to the sealing rings may result if an attempt is made to re-unite the units.



4437A

PUMP

Overhaul

Inspection

119. Check mating surfaces, bearing surfaces, gear teeth and splines for scores, burrs and wear.
120. Check fluid passages and clean if necessary.

FRONT SERVO

Overhaul

Dismantling

121. Depress piston and sleeve, remove circlip, collect spring.
122. Remove setscrew and washers.

123. Drift piston out of stop plate.
124. Withdraw stop plate from piston sleeve.
125. Remove and discard sealing rings.
126. Drift out hinge pin by tapping at opposite end to splined grooves.
127. Remove lever and adjusting screw.

NOTE: Adjusting screw has left hand thread.

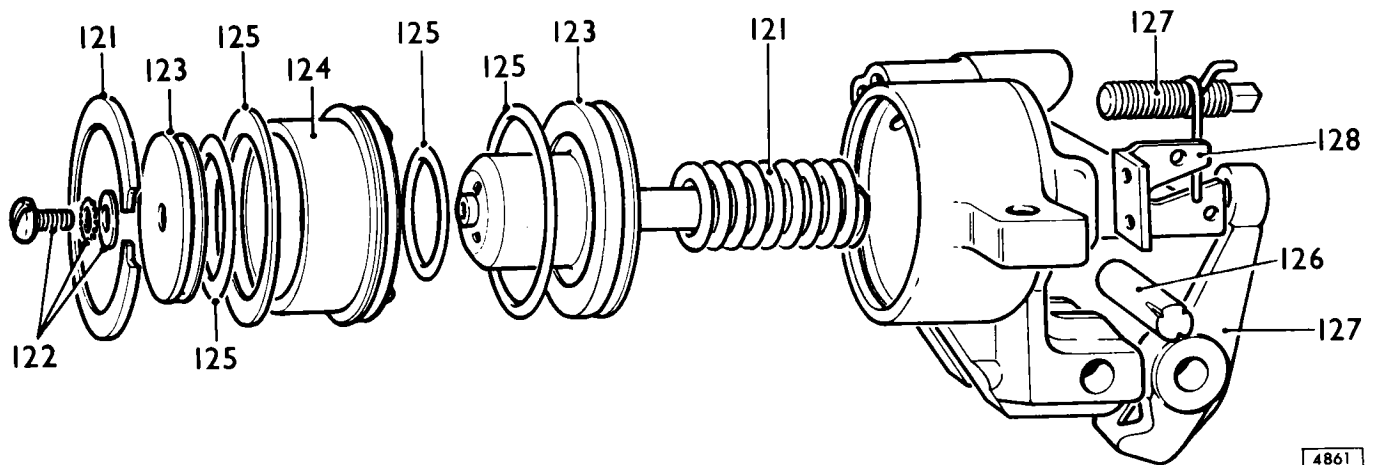
128. If removal of cam plate is required, unscrew both 15/16 in. AF, 8 mm. (5/16 in.) long bolts.

Inspection

129. Check hinge pin for tight fit in body.
130. Check piston pin for tight fit in the piston.
131. Check lever for free movement.
132. Check servo body for crack and scores.
133. Check for free movement of adjusting screw in lever.
134. Check fluid passages and clean if necessary.

Reassembling

Reverse operations 121 to 128.



REAR SERVO

Overhaul

Dismantling

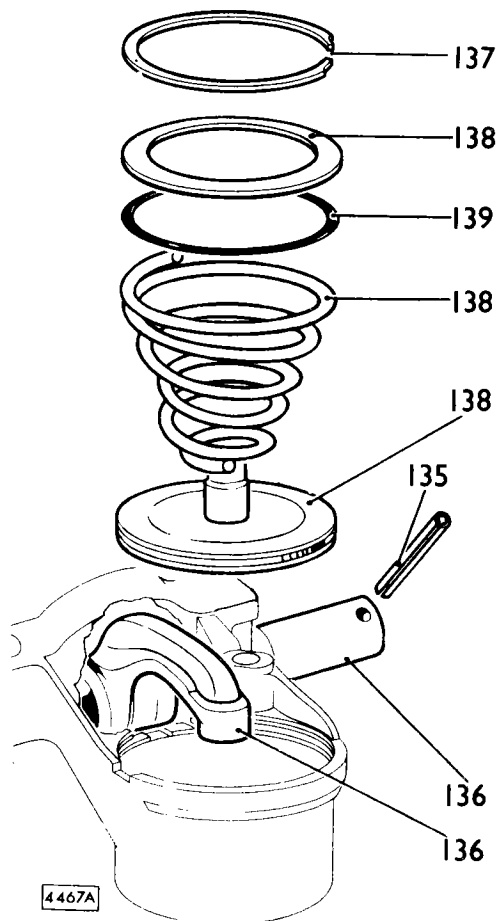
135. Drive out roll pin with 3 mm. (.125 in.) punch.
136. Remove shaft and lever.
137. Compress return spring and remove spring ring.
138. Remove steel ring return spring and piston.
139. Discard sealing ring.

Inspection

140. Check servo body for cracks and cylinder bore for scores.
141. Check fluid passages and clean if necessary.
142. Check fluid passage plug for tightness.
143. Check for spring distortion.
144. Check shaft wear.

Reassembling

Reverse operations 135 to 139; use new sealing rings.



GOVERNOR

Overhaul

Dismantling

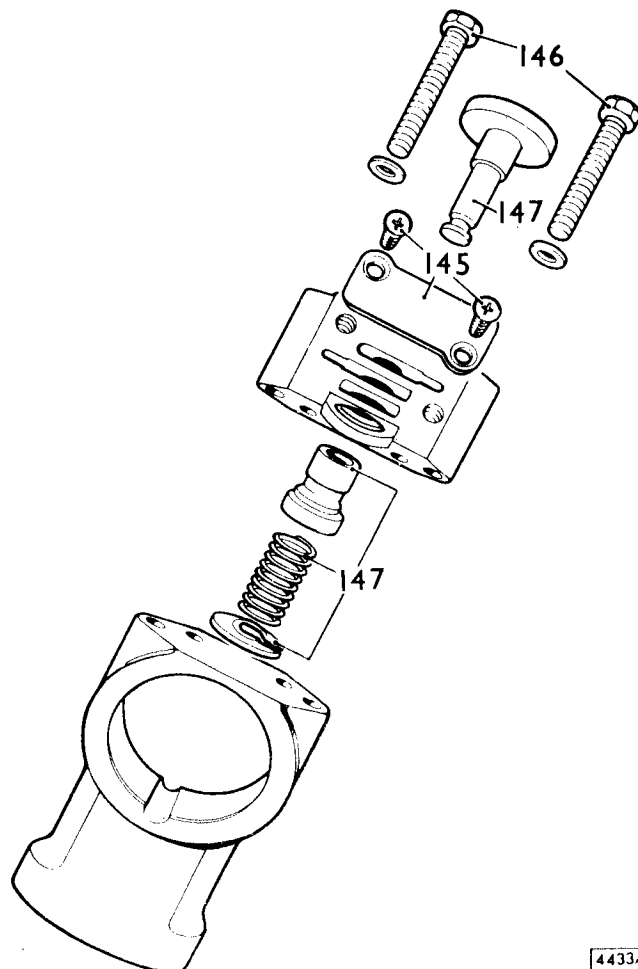
145. Remove screws and cover plate.
146. Remove governor body attaching bolts.
147. Remove retainer, spring, valve and weight.

Inspection

148. Minor scores and burrs may be removed with a very fine abrasive.
149. Replace components deeply scored or warped. Mating surfaces must be smooth and flat.
150. Check fluid passages for obstruction.
151. Check for smooth movement of the weight and valve in the assembled condition.

Reassembling

Reverse operations 145 to 147.



PARKING BRAKE PAWL ASSEMBLY**Overhaul****Dismantling**

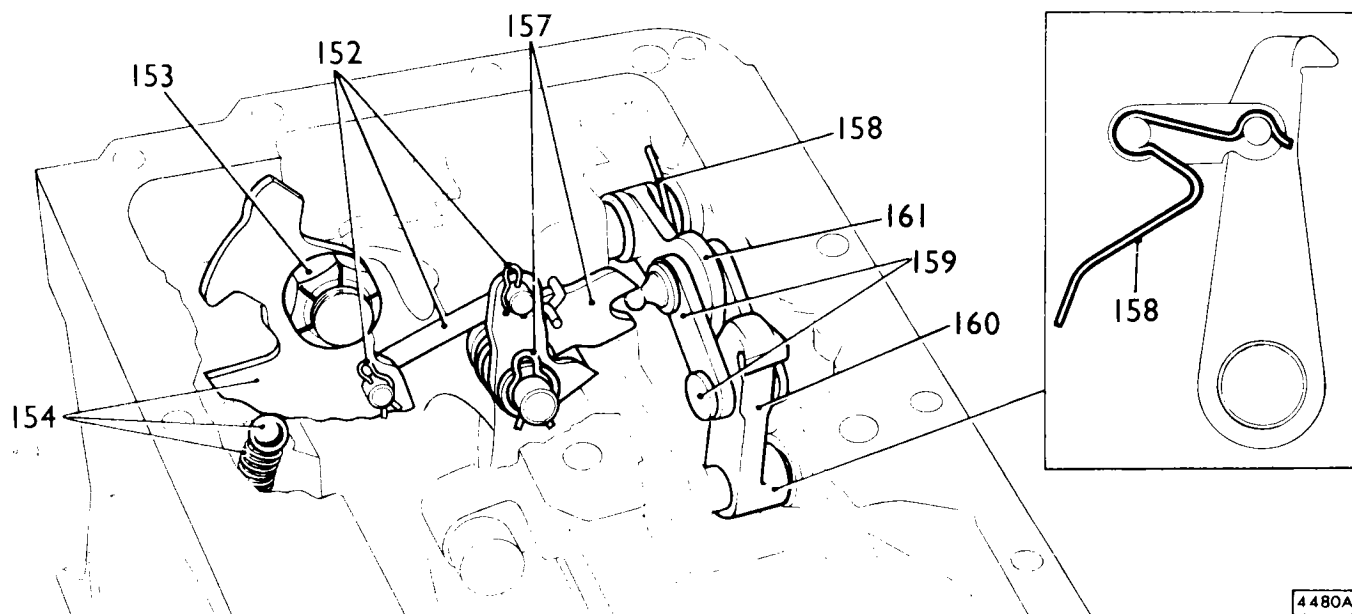
152. Withdraw retaining clips from both ends and remove link rod.
153. Remove manual lever shaft nut.
154. Remove lever detent ball and spring.
155. Remove manual lever shaft assembly.
156. Withdraw and discard seal.
157. Remove the retaining clip and torsion lever assembly.
158. Remove the combined pawl return spring and retainer clip.
159. Remove toggle link and pins.
160. Move pawl back and forth until pin protrudes, then withdraw pin and pawl.
161. Drive toggle lever towards rear case wall so driving out the plug, leaving pin free and withdraw toggle lever pivot pin and toggle lever.

Inspection

162. Check all components for wear.
163. Check springs for distortion.
164. Check pawl tooth for damage.

Reassembling

Reverse operations 152 to 161.

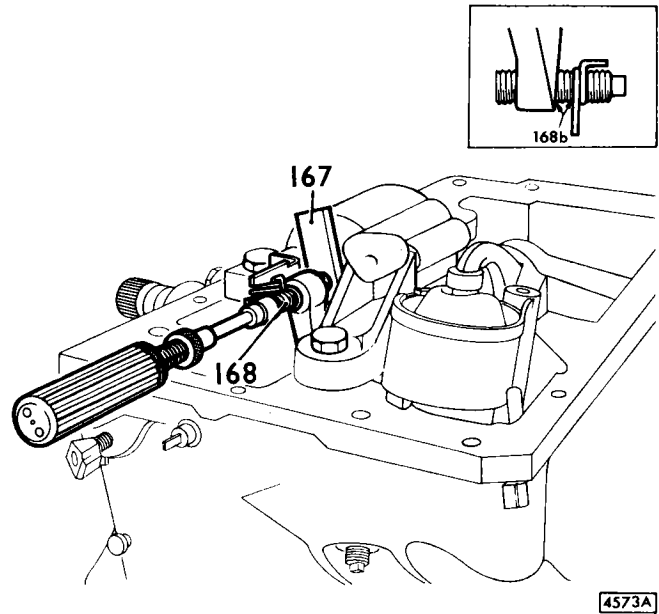


4480A

TRANSMISSION ASSEMBLY

Reassembling

165. Reverse operations 15 to 36 **and 43 to 46.**
166. Pull back on the actuating lever.
167. Insert gauge block Churchill CBW.34 between the servo piston pin and adjusting screw.
168. Tighten screw to torque setting ,12 kg.m (10 lb. ins.) noting:-
 - a) The adjusting screw has a left-hand thread.
 - b) The non-return adjusting spring is spaced 3,13 to 4,76 mm (.125 to .188 in.) from lever.
169. Refit oil pan, use new gasket.
170. Adjust rear brake band 44.30.10.
171. Refill unit with transmission fluid after refitting in car.



OIL PAN

Remove and refit

44.24.04

Removing

1. Remove exhaust system 30.10.01.
2. Withdraw dipstick.
3. Unscrew union securing dipstick tube to oil pan.
4. Drain off oil and discard.
5. Remove bolts securing oil pan to transmission case.
6. Lower oil pan, remove and discard gasket.

Refitting

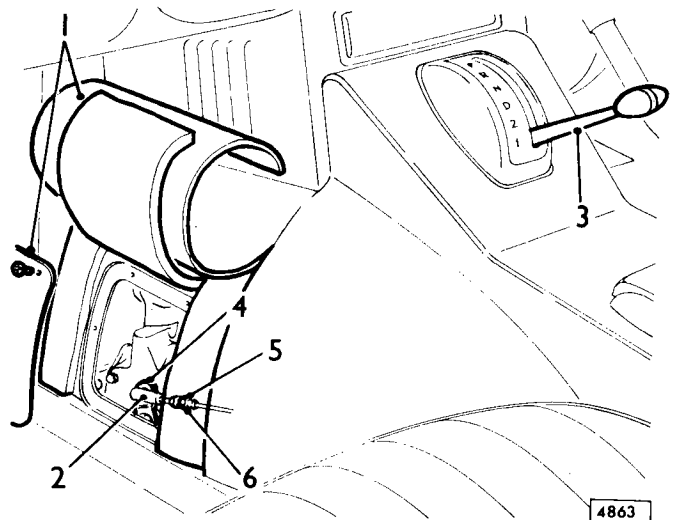
Reverse operations 1 to 6; use new oil pan gasket.

MANUAL SELECTION

Adjustment

44.30.04

1. Remove carpet and access cover on transmission tunnel.
2. Disconnect ball joint at lower end of cable.
3. Place selector lever in position '1'.
4. Operate transmission lever to full extent and allow to spring back to position '1'.
5. Adjust cable until lower ball joint will enter lever freely.
6. Tighten locknuts.



VACUUM CONTROL UNIT

Line pressure check and adjustment

44.30.05

Special tools – CBW.1A – 642

1. Check engine tune i.e. cylinder compressions, spark plugs, ignition timing.
2. Disconnect pipe from vacuum control unit. Insert 'T' piece union and reconnect pipe. Connect a vacuum gauge to centre junction.
3. Lift carpet from left hand side of gearbox housing.
4. Remove access plate.
5. Remove the 3,2 mm (.125 in.) plug at the gear case front left-hand side and connect the pressure gauge.
6. With the engine and transmission at normal running temperature select D, apply hand and foot brakes.
7. Accelerate engine until vacuum gauge reads 23-25 cm. (9-10 in.) Hg. at 1,200 r.p.m.
8. Check reading of line pressure on pressure gauge which should be:

$$5,27 \pm \frac{1,40}{-0,35} \text{ kg/cm}^2 \quad (75 \pm \frac{20}{-5} \text{ lb./in.}^2)$$

NOTE: Pressure reading below 4,9 kg/cm² (70 p.s.i.) at 1,200 r.p.m. will result in possible clutch slip and damage to the transmission.

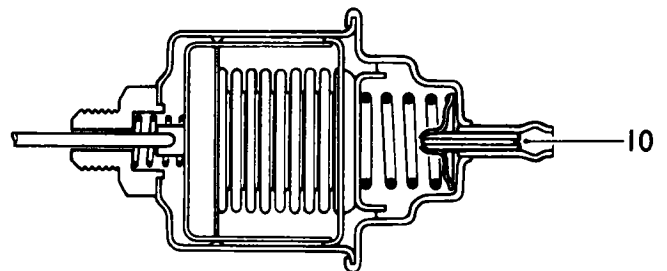
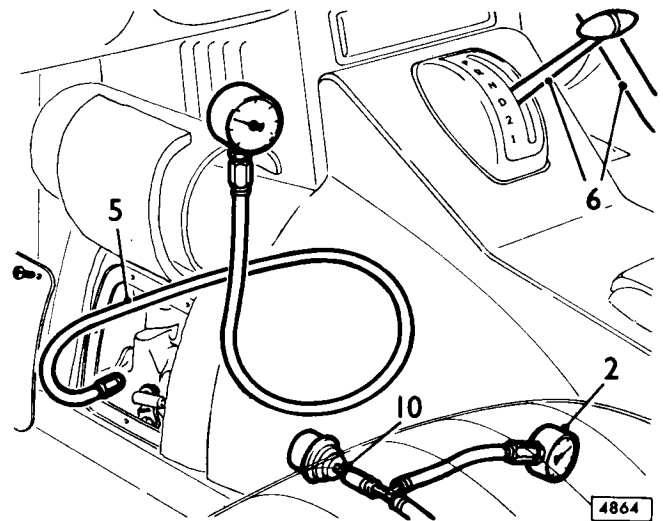
9. To gain access to the vacuum control unit control screw, remove the vacuum hose.
10. Insert screwdriver and turn clockwise to increase line pressure and anti-clockwise to decrease line pressure.

CAUTION: Approximately two full turns on the screw will vary pressure about 0,7 kg/cm² (10 lb./in.²). **THERE IS NO LOCKNUT ON THE SCREW.** Therefore, when all feel of loading on the screw has been removed, it **MUST** be turned clockwise half-a-turn to ensure contact with the servo actuating rod. If contact is not maintained, a rapid knocking noise will be evident between 600 to 800 r.p.m.

11. After each adjustment replace the vacuum hose and re-check line pressure as before.

CAUTION: To avoid over-heating of the transmission do not stall for more than 10 seconds at a time for a total of one minute in any half hour period.

12. Remove vacuum gauge, refit hose.
13. Remove pressure gauge, refit plug.
14. Refit access plate.
15. Refit carpet.



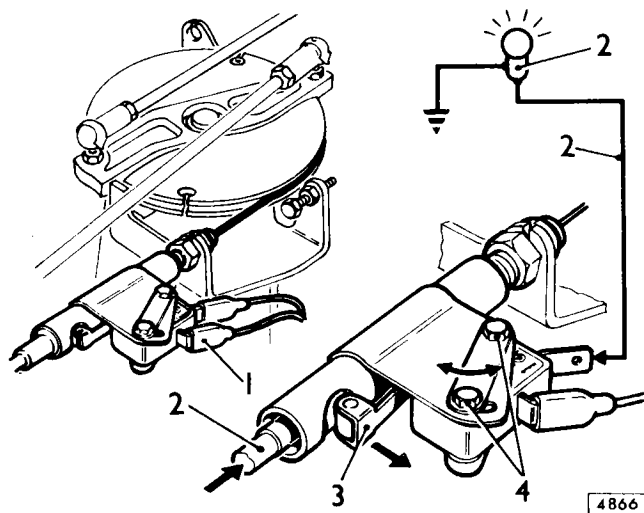
4421A

KICKDOWN SWITCH

Circuit test

44.30.09

1. Switch on ignition, check that current is available at input terminal (cable colour – green).
2. Connect earthed test lamp to output terminal. Operate switch control and observe test lamp.
3. If lamp does not illuminate, gently lift switch arm to operate switch.
Renew switch if faulty.
4. If test confirms that switch is not faulty, adjust by releasing clamping screws and moving switch towards cable abutment.
5. Lock screws and recheck.



REAR BRAKE BAND

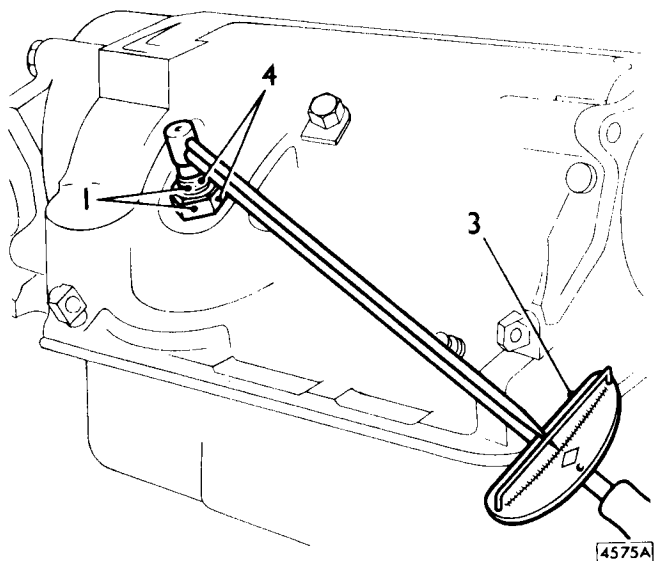
Adjustment

44.30.10

Service tools No. CBW.547A-50
CBW.547A-50-2A

1. Slacken locknut and loosen adjusting screw approximately two turns.
2. Remove dirt from threads and lubricate screw.
3. Tighten screw to 1,4 kg.m (10 lb.ft.).
4. Loosen screw 1.25 turns and tighten locknut.

CAUTION: Severe damage may result if adjusting screw is not backed off exactly 1.25 turns.

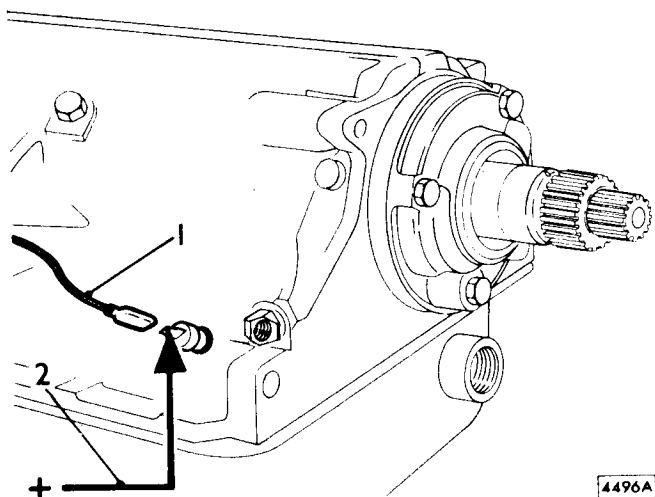


KICKDOWN SOLENOID

Test

44.30.11

1. Disconnect solenoid wire at connector.
2. With jumper lead connect battery positive to connector, momentarily.
3. Solenoid should operate with an audible click if functioning correctly.
4. Refit wire to connector.



STALL SPEED**Test****44.30.13**

The results of this test indicate condition of gearbox and converter.

Stall speed is maximum engine revolutions recorded whilst driving impeller against stationary turbine. Stall speed will vary with both engine and transmission conditions so before attempting a stall speed check, engine condition must be determined. Engine and transmission must be at normal operating temperature before commencing check.

1. Apply handbrake.
2. Apply footbrake.
3. Start engine.
4. Select 'D'.
5. Fully depress accelerator.
6. Note tachometer reading.

CAUTION: To avoid overheating of transmission do not stall for more than 10 seconds at a time or for a total of one minute in any half hour period.

R.P.M.

Under 1,000

1,600 to 1,700

Over 2,100

CONDITION INDICATED

Stator free wheel slip

Normal

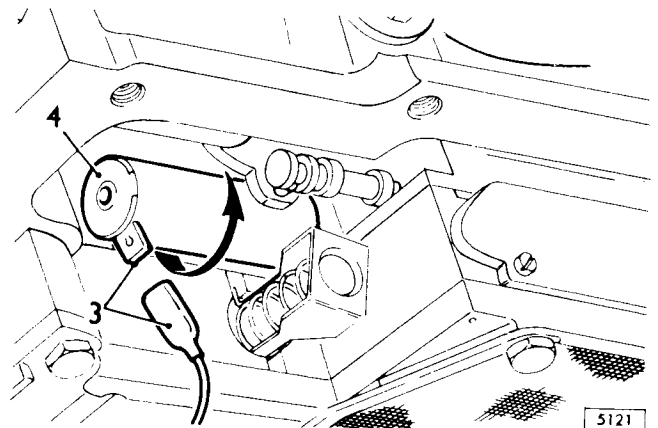
Clutch slip

KICKDOWN SOLENOID**Remove and refit****44.30.14****Removing**

1. Engage 'P' at gearshift selector.
2. Remove oil pan — 44.24.04.
3. Disconnect wire from connector.
4. Rotate solenoid through 180° and withdraw.

Refitting

Reverse operations 1 to 4.



5121