CONTENTS

LIST OF COMPONENTS

1. Converter securing bolt
2. Stoneguard
3. Converter housing
4. Rear oil seal
5. Rear extension housing
6. Gasket
7. Transmission case
8. Governor feed, lubrication and return pipes
9. Stoneguard
10. Converter

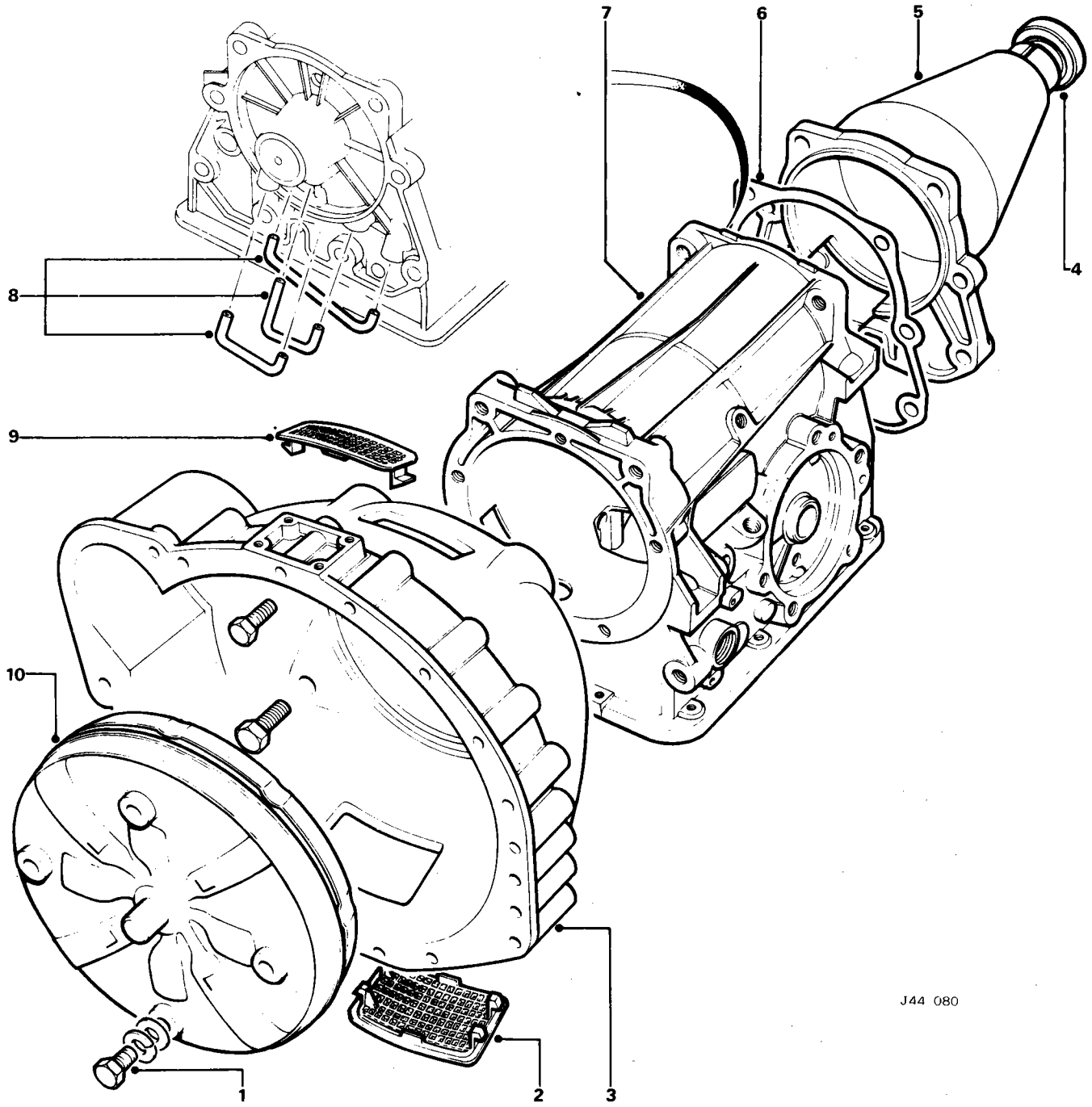


Fig. 1

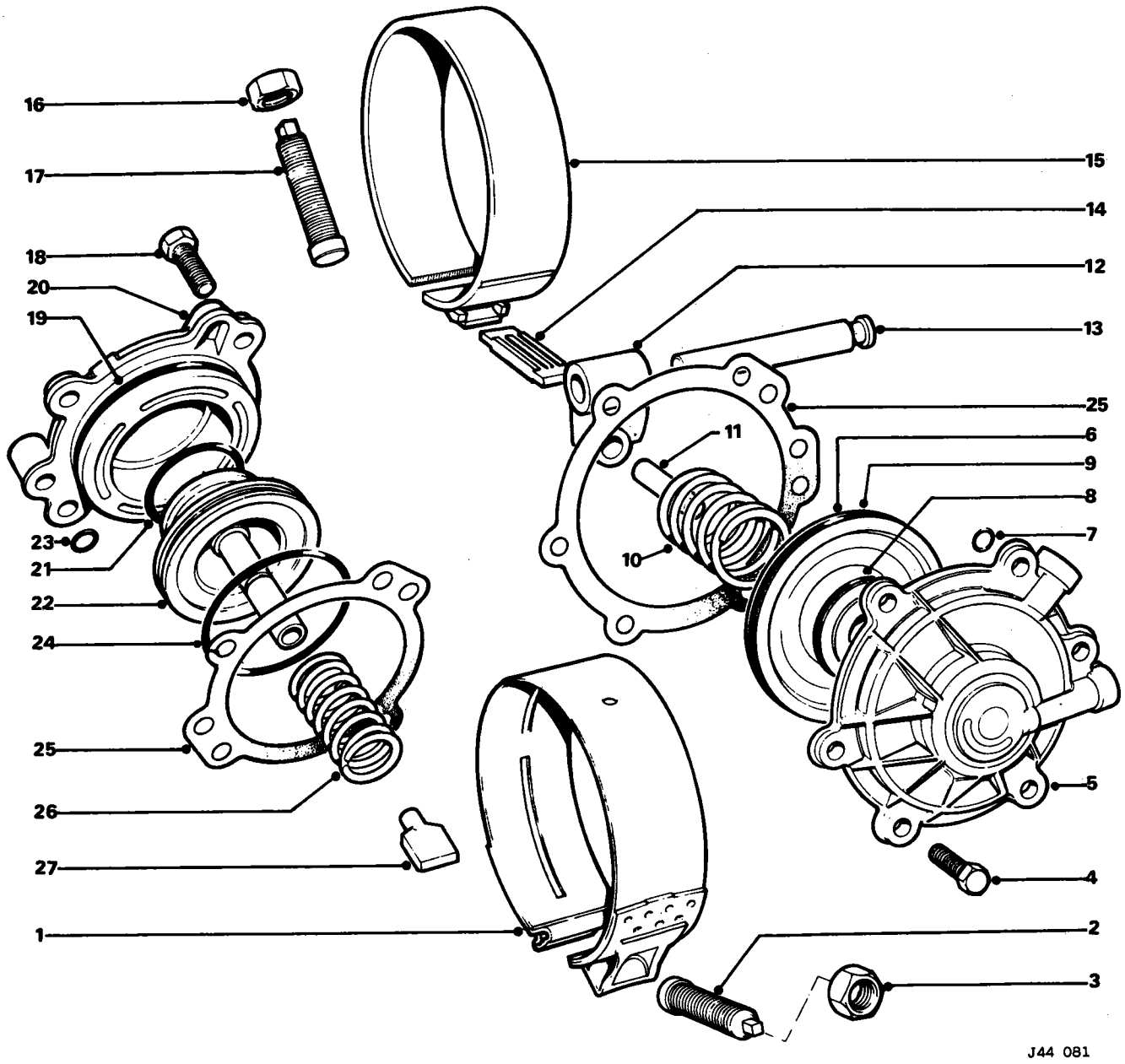


Fig. 2

LIST OF COMPONENTS

1. Front brake band
2. Adjusting screw
3. Locknut
4. Cover securing bolt
5. Rear servo cover
6. Piston
7. 'O' ring
8. Piston sealing ring
9. Piston sealing ring
10. Piston return spring
11. Operating rod
12. Fulcrum
13. Fulcrum pin
14. Brake band strut
15. Rear brake band
16. Locknut
17. Adjusting screw
18. Cover securing bolt
19. 'O' ring
20. Front servo cover
21. Piston sealing ring
22. Piston
23. 'O' ring
24. Piston sealing ring
25. Gasket
26. Piston return spring
27. Brake band strut

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 2.3 : 1 and the speed range during which this multiplication is obtained varies with the accelerator position.

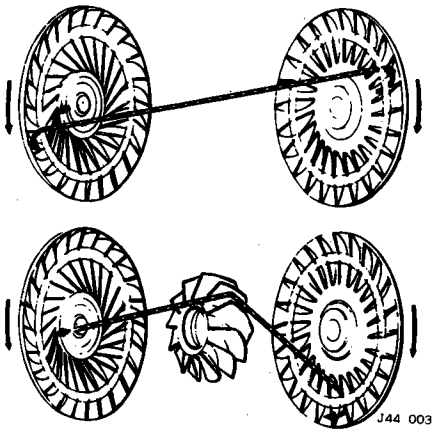


Fig. 3

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 and the gearbox 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.

MECHANICAL POWER FLOWS

Neutral and Park

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

First gear ('D') selected

The front clutch is applied, connecting converter to the forward sun gear. The one-way

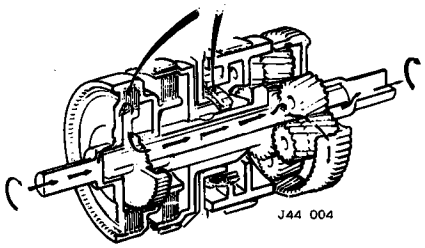


Fig. 4

clutch is in operation, preventing the planet carrier from rotating anti-clockwise. When the vehicle is coasting, the one-way clutch overruns and the gear set free-wheels.

First gear ('1' selected)

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

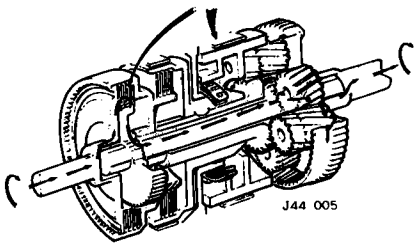


Fig. 5

Planet pinions drive ring gear, and reverse sun gear rotates freely in the opposite direction to the forward sun gear.

Second gear ('D', '2' or '1' selected)

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

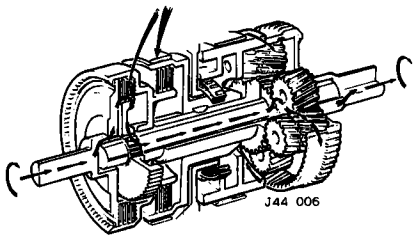


Fig. 6

is applied, holding the reverse sun gear stationary. Combined rotation of planet pinions and carrier drive the ring gear.

Third gear ('D' selected)

Again the front clutch is applied, connecting converter to forward sun gear. The rear clutch is applied, connecting the converter also to the

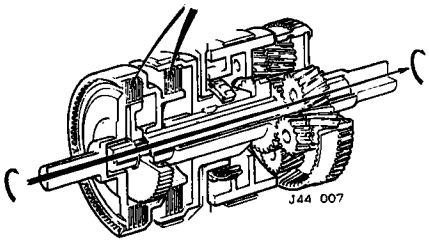


Fig. 7

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 converter to reverse sun gear. The rear band is

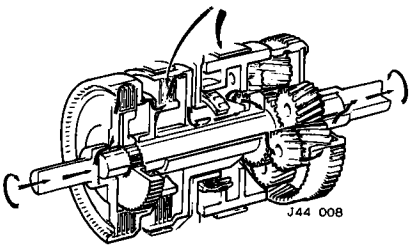


Fig. 8

applied, holding planet carrier stationary. Planet pinions drive ring gear in an opposite direction to engine rotation.

IDENTIFICATION

The Model 66 Automatic Gearbox was introduced on the Series III 6-cylinder Jaguar and Daimler Cars.

The two initial production transmissions were:

1. 066L transmission for use with the Jaguar XJ6 4.2. This can be identified by the yellow name-plate which will have 'Model 66' and the number 6066 in raised, polished figures.
2. 067H transmission for use with the Jaguar XJ6 3.4. This can be identified by the golden brown name-plate which will have 'Model 66' and the number 6067 in raised, polished figures.

Listed below are some of the improvements and modifications which have been built into this transmission.

CONVERTER

The Model 66 converter turbine hub has an increased spline size to take the larger input shaft.

The stator one-way clutch inner race has a revised profile and increase in hardness.

A Torrington race has been introduced into the impeller side of the stator.

The impeller blades have a rib formed in them to give added strength; this will be introduced into all 11 in torque converters.

Six impeller blades are welded in two places, equally spaced, to the impeller shell, again giving added strength.

The blower ring has been deleted on Model 66 converters, and the converter mounting bosses will be CO_2-welded to the front cover.

PUMP

A groove has been added to the pump/converter bush to improve lubrication of the bush. The groove stops short of the front edge of the bush (oil seal side) to prevent the oil seal being swamped.

A tin/aluminium pump drive gear bush, has also been introduced.

The new stator support will have an increased diameter bush to accommodate the increased diameter input shaft.

A large pump suction tube has been introduced to ensure that the end of the tube is immersed in oil under all conditions.

INPUT SHAFT AND FRONT CLUTCH ASSEMBLY

An increased diameter input shaft is being introduced on the Model 66 transmission.

REAR CLUTCH AND FRONT DRUM ASSEMBLY

To improve the lubrication path to the rear clutch and front band, changes have been made to this assembly. They are:

The rear clutch piston face (clutch plate side) will have four slots at right angles to one another to improve the oil flow from the inside diameter to outside diameter of the clutch pack.

The four wide grooves on the inside diameter of the front drum (steel clutch plate splines area) have been deepened to enable more oil flow around the plates.

Between the outside and inside diameter of the front drum, so that they line up with the four deepened grooves, four holes have been drilled to enable an oil feed to the front band to be maintained.

The rearmost lubrication groove between the three sealing ring grooves of the front drum has been deepened and the holes size increased in order to improve the oil flow.

The lubrication feed hole in the reverse sun gear has been increased in diameter.

ONE-WAY CLUTCH ASSEMBLY

An uprated 1st speed one-way clutch assembly has been introduced which will have 30 sprags instead of the 24 sprags on existing assemblies.

The centre support of the transmission has an increased diameter rear clutch and lubrication drillings.

CARRIER ASSEMBLY

An improved lubrication oil-flow has been achieved by introducing a wider bush into the carrier cover which has opposing helical oil grooves.

Non-crowned, shaved, short pinions have been introduced. In order to improve their durability, these pinions have no identification groove.

OUTPUT SHAFT

The lubrication hole in the output shaft has an increased diameter on Model 66 transmissions.

MAINCASE AND SERVOS

The front clutch and governor feed hole in the rear of the maincase has been increased to 5,0 mm.

The rear servo piston and cover have been strengthened.

OIL-PAN

In order to improve cooling and to ensure that the pump suction pipe is at all times below the fluid level a deep oil-pan is being used on the transmission.

VALVE BLOCK

An adjustable cam bracket is fitted.

A transmission oil filter spacer is being used on the transmission now that a deep oil-pan is employed.

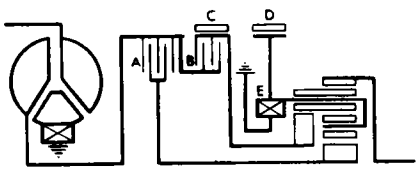
MISCELLANEOUS

A 5 mm spirol pin, secured by a split pin in the transmission cross-shaft is now fitted.

With the deep oil-pan, as fitted to the Model 66, the total fluid capacity, from dry, is approximately 7,9 litres (14 pints; 17 U.S. pints).

CLUTCH AND BAND APPLICATION CHART

A. Front clutch
B. Rear clutch
C. Front band
D. Rear band
E. One-way clutch



	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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KEY TO COMPONENTS SHOWN ON HYDRAULIC CHARTS

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

KEY TO HYDRAULIC CHART COLOUR CODE

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

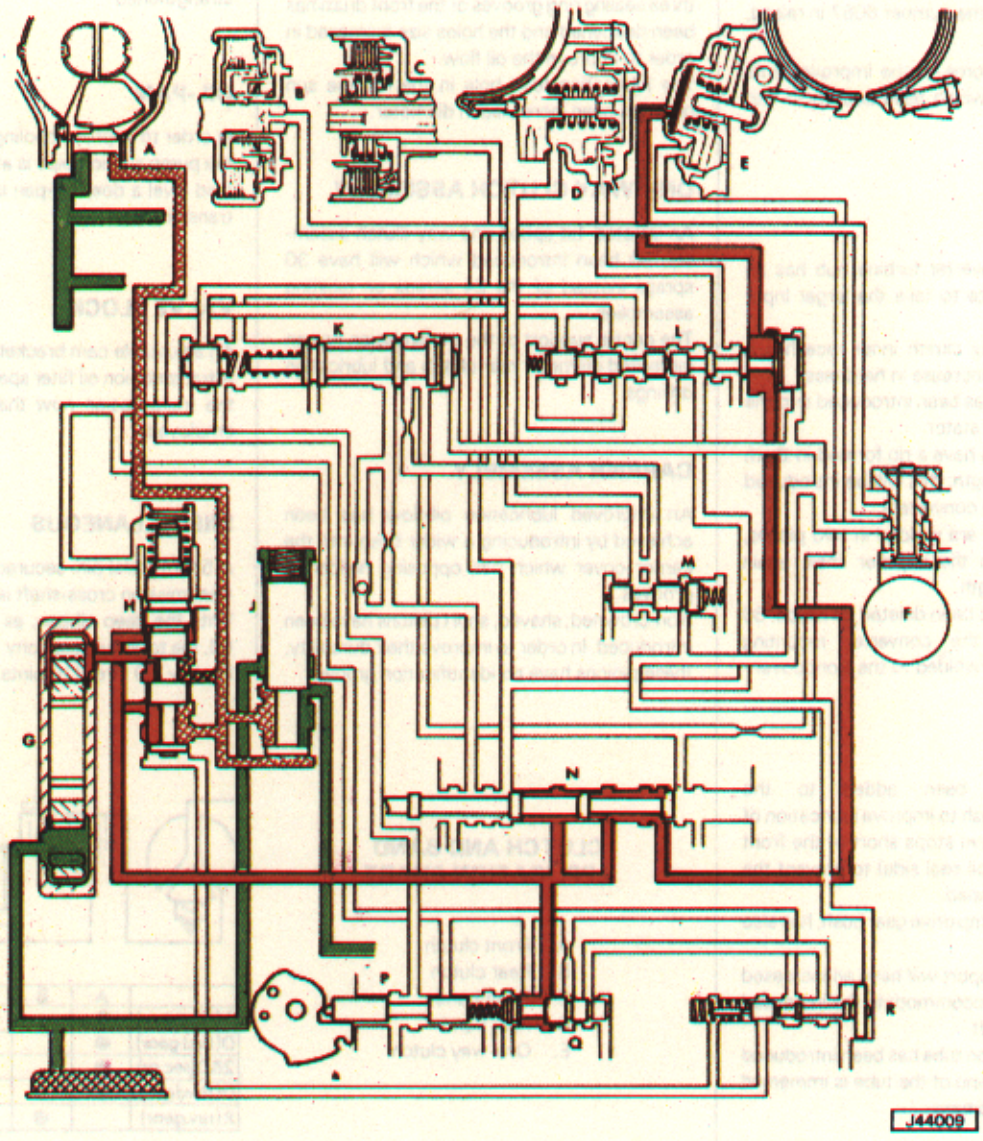

Fig. 9

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

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

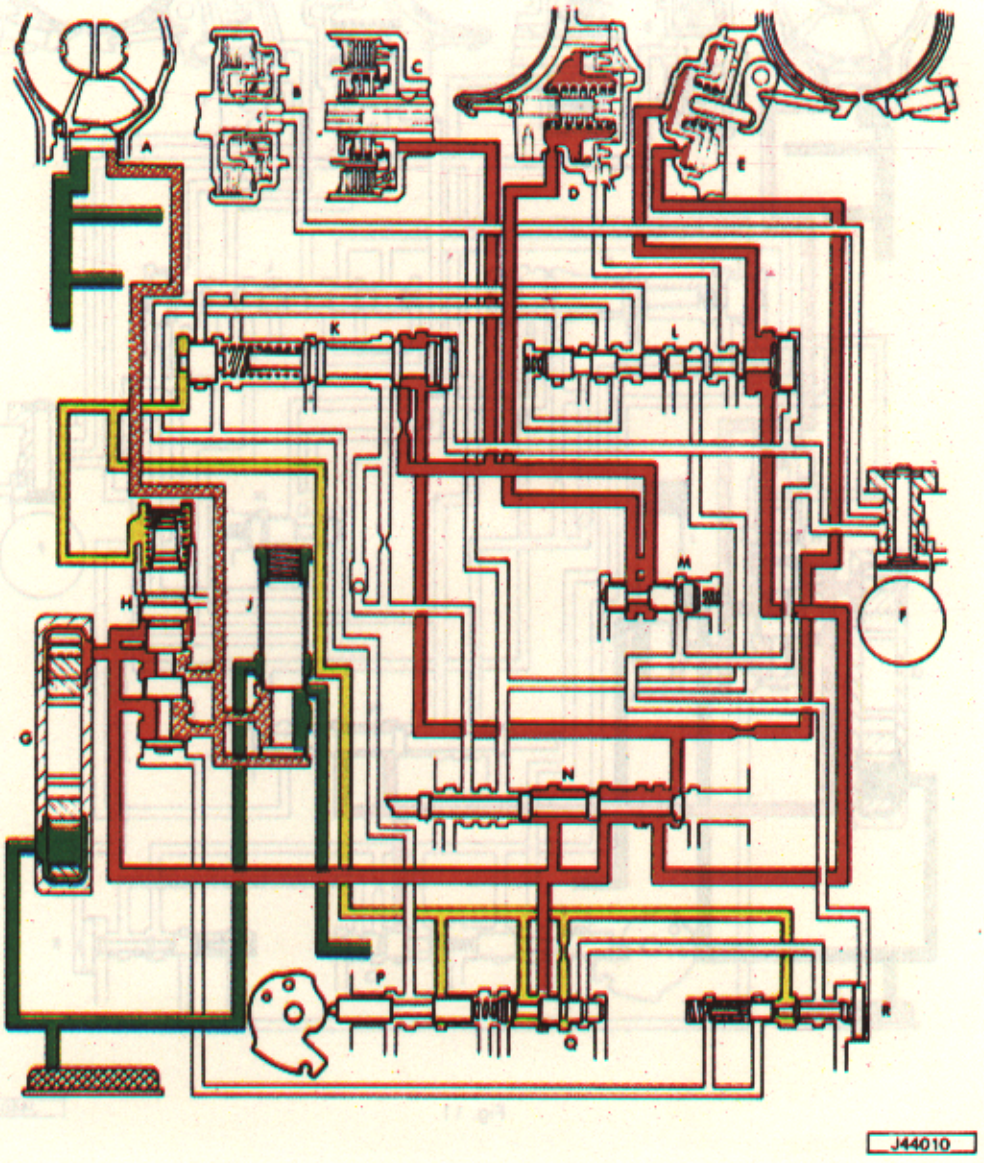

Fig. 10

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

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

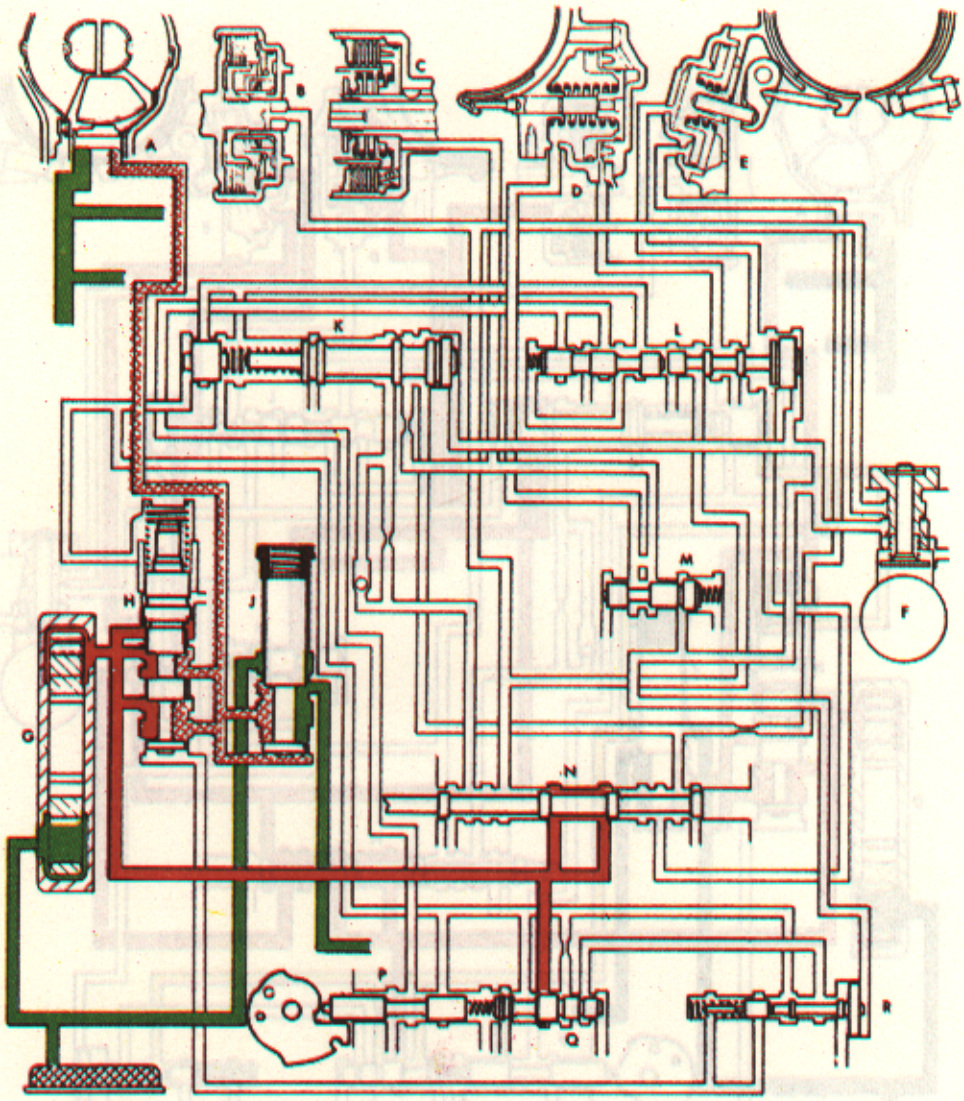

Fig. 11 J44011

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

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

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

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

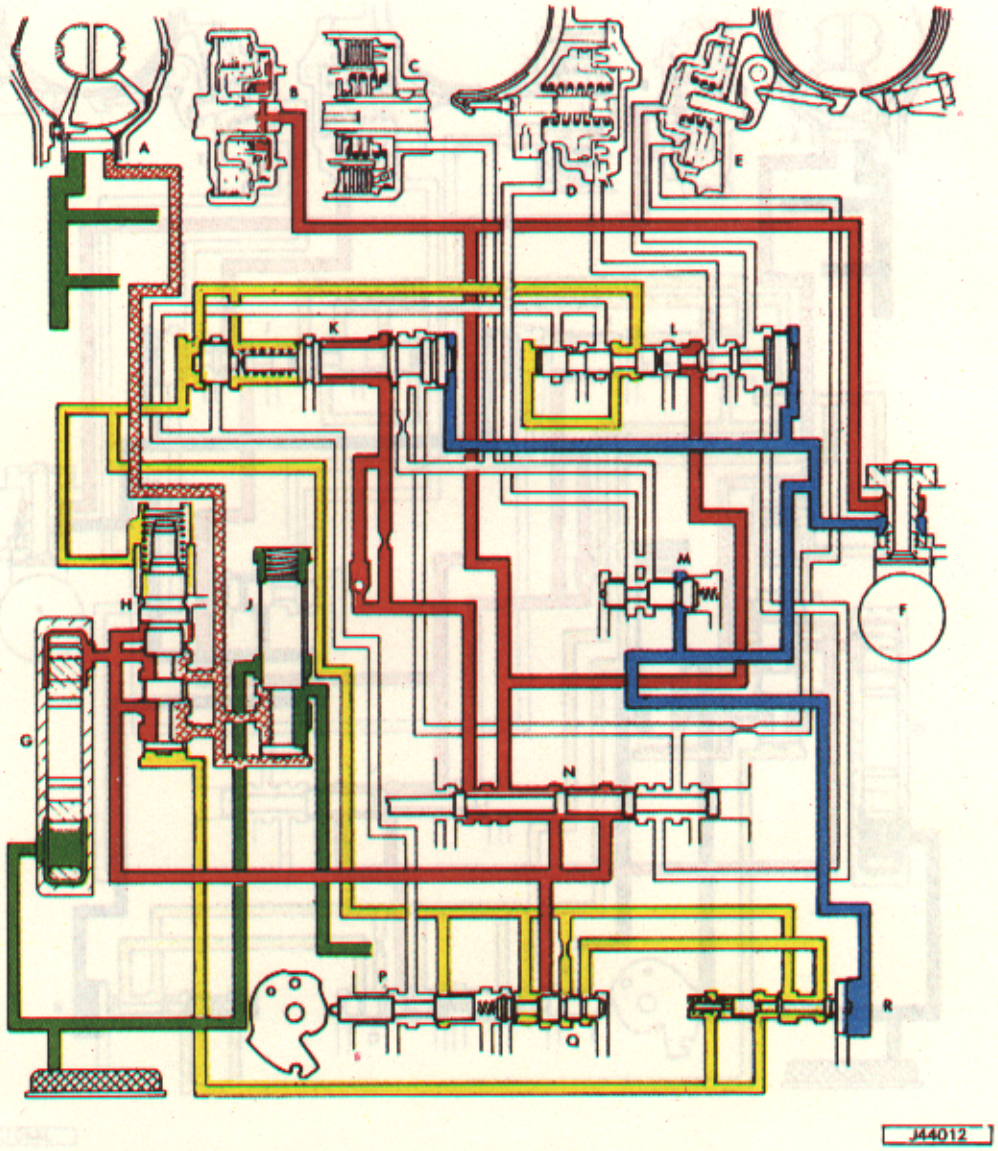

Fig. 12

HYDRAULIC OPERATION IN 'D' (FIRST GEAR)

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

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

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

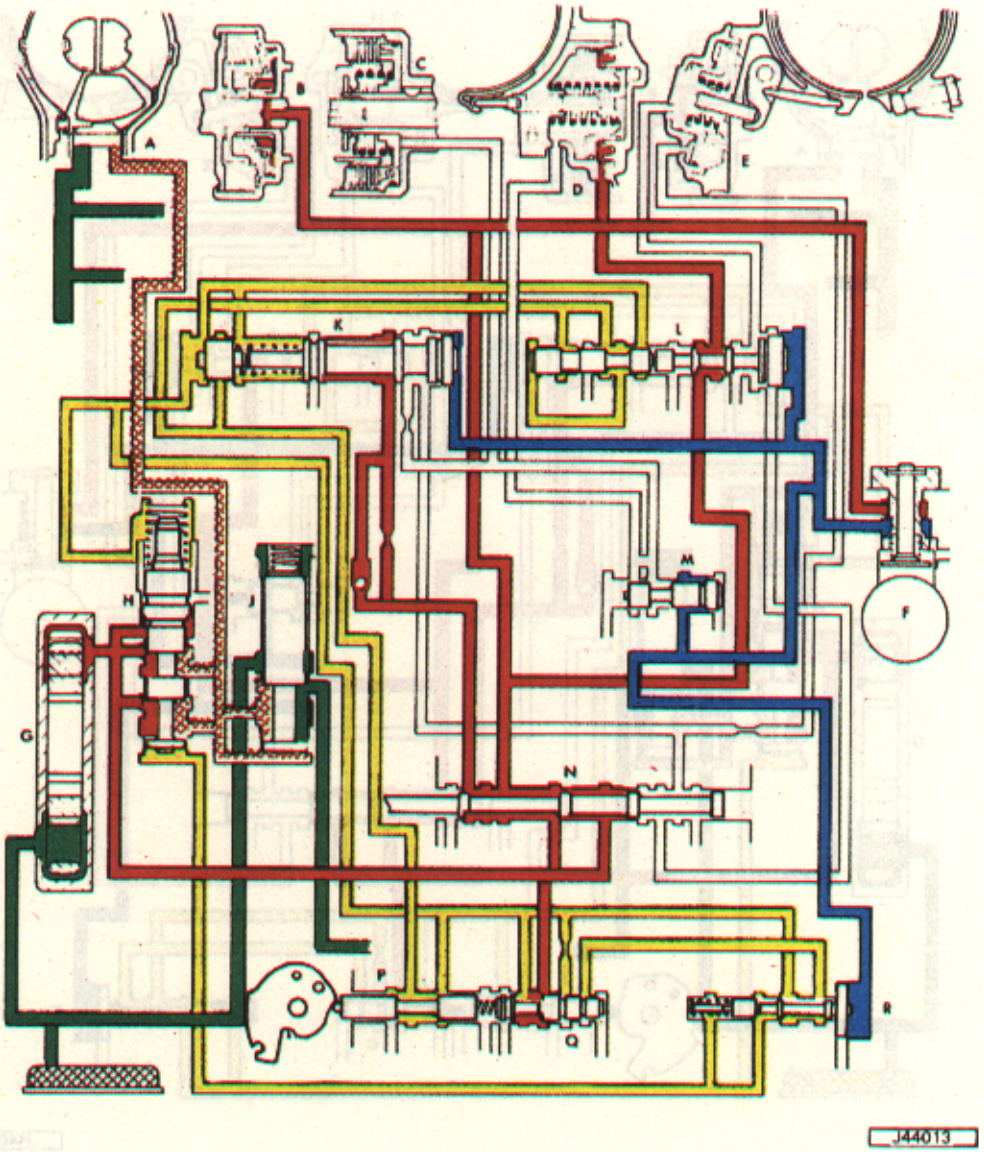

Fig. 13

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

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

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

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

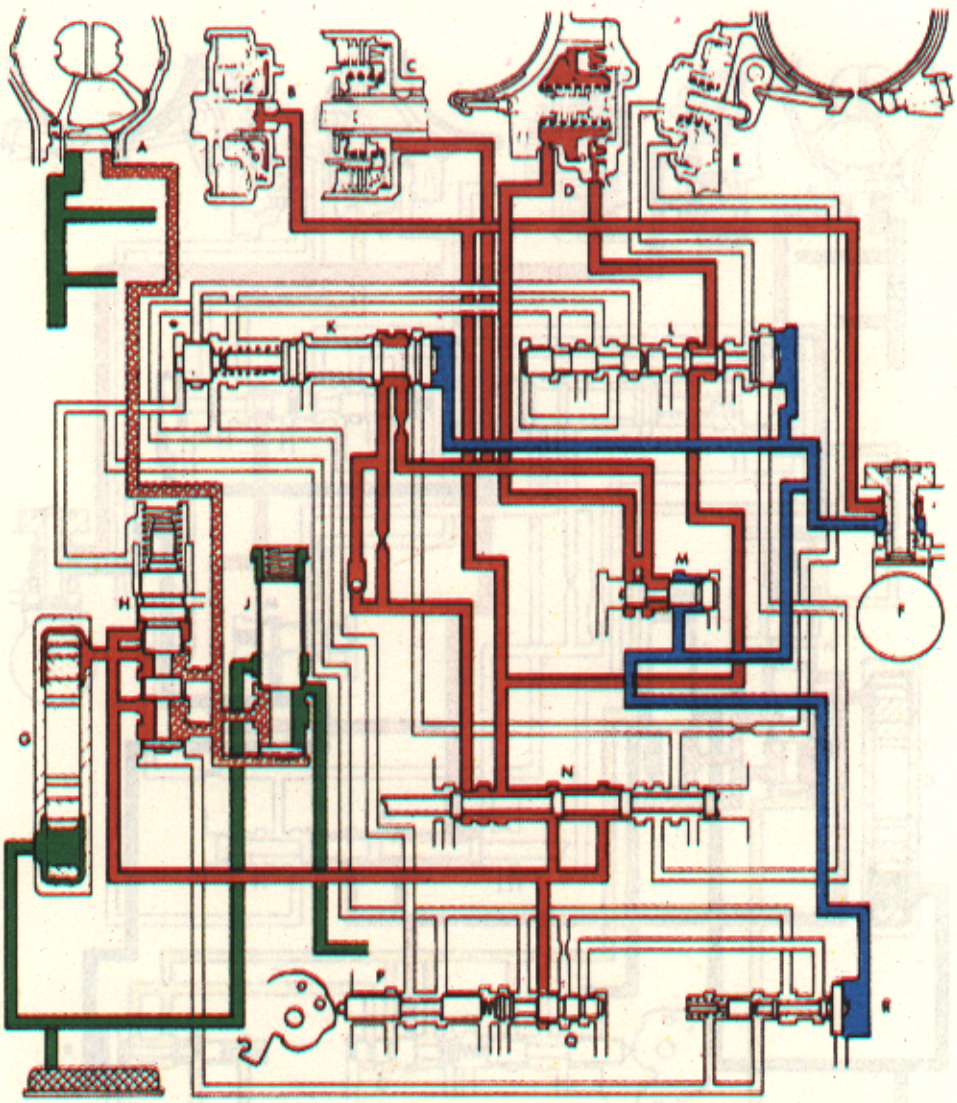

Fig. 14

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

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

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

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

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

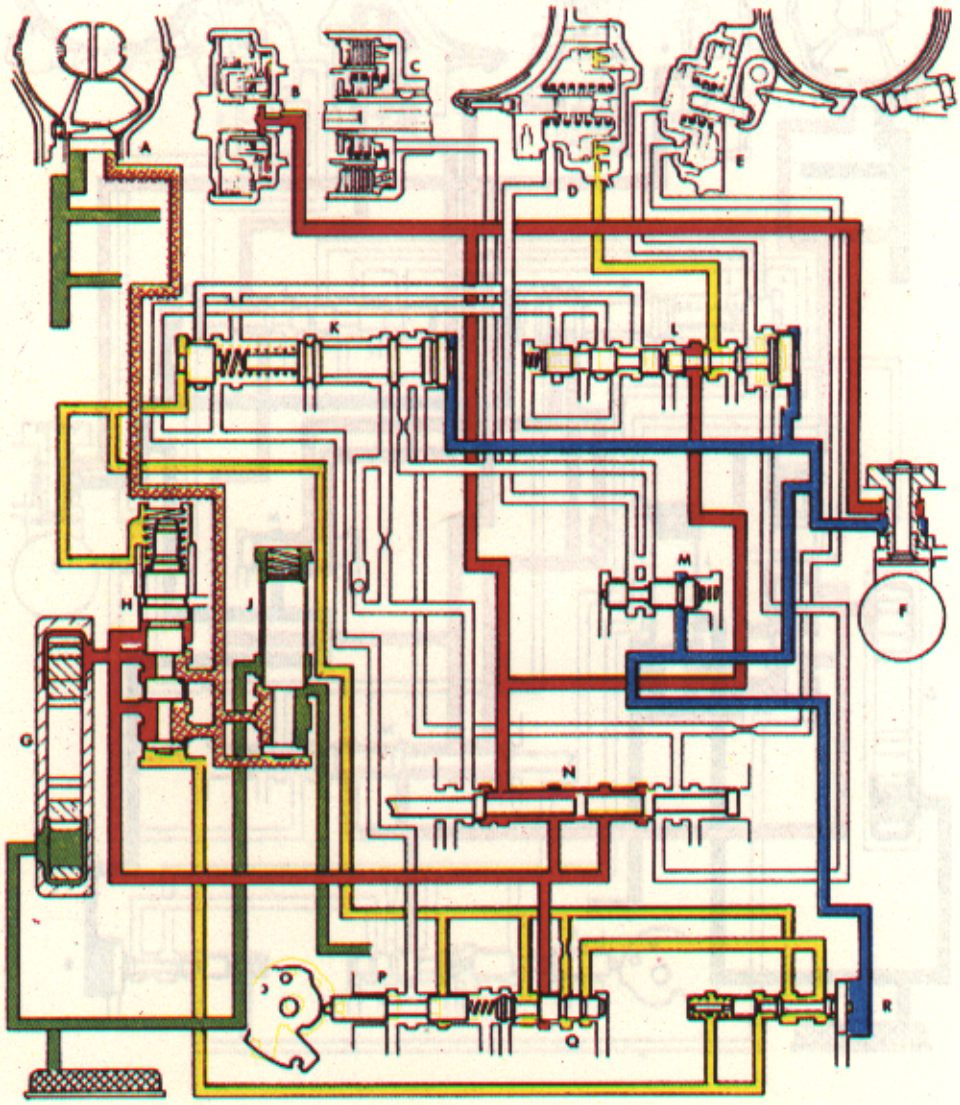

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Fig. 15

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

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

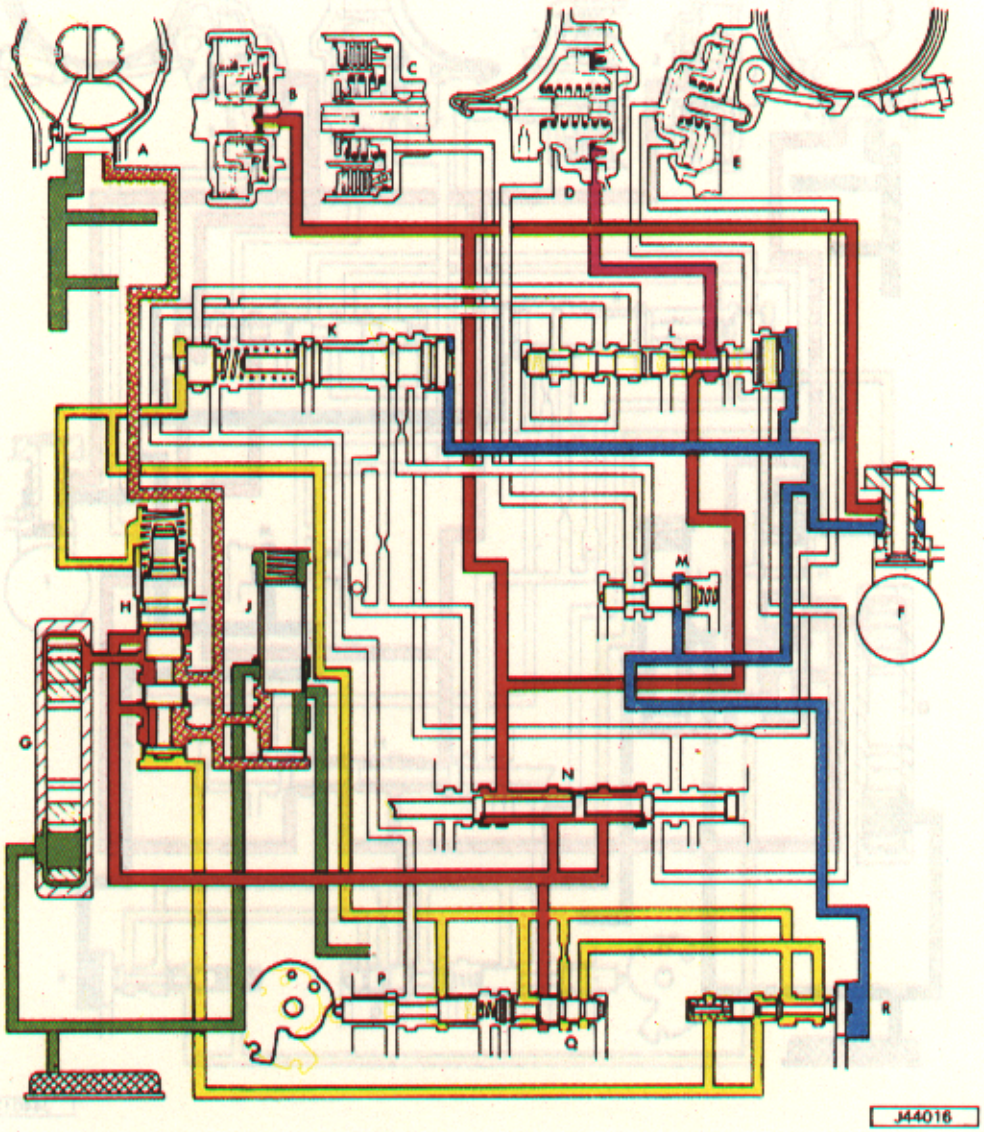

Fig. 16

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

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

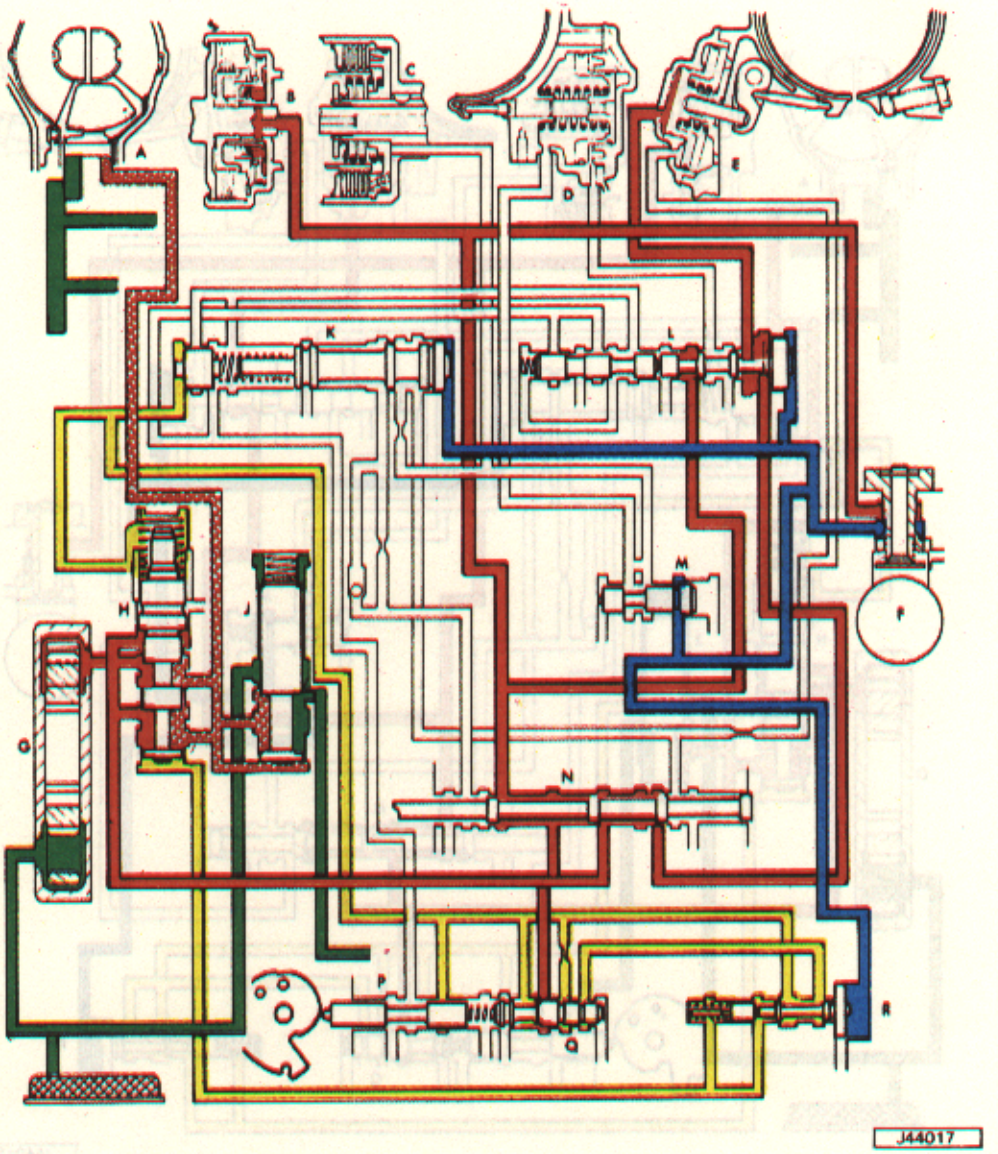

Fig. 17

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

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

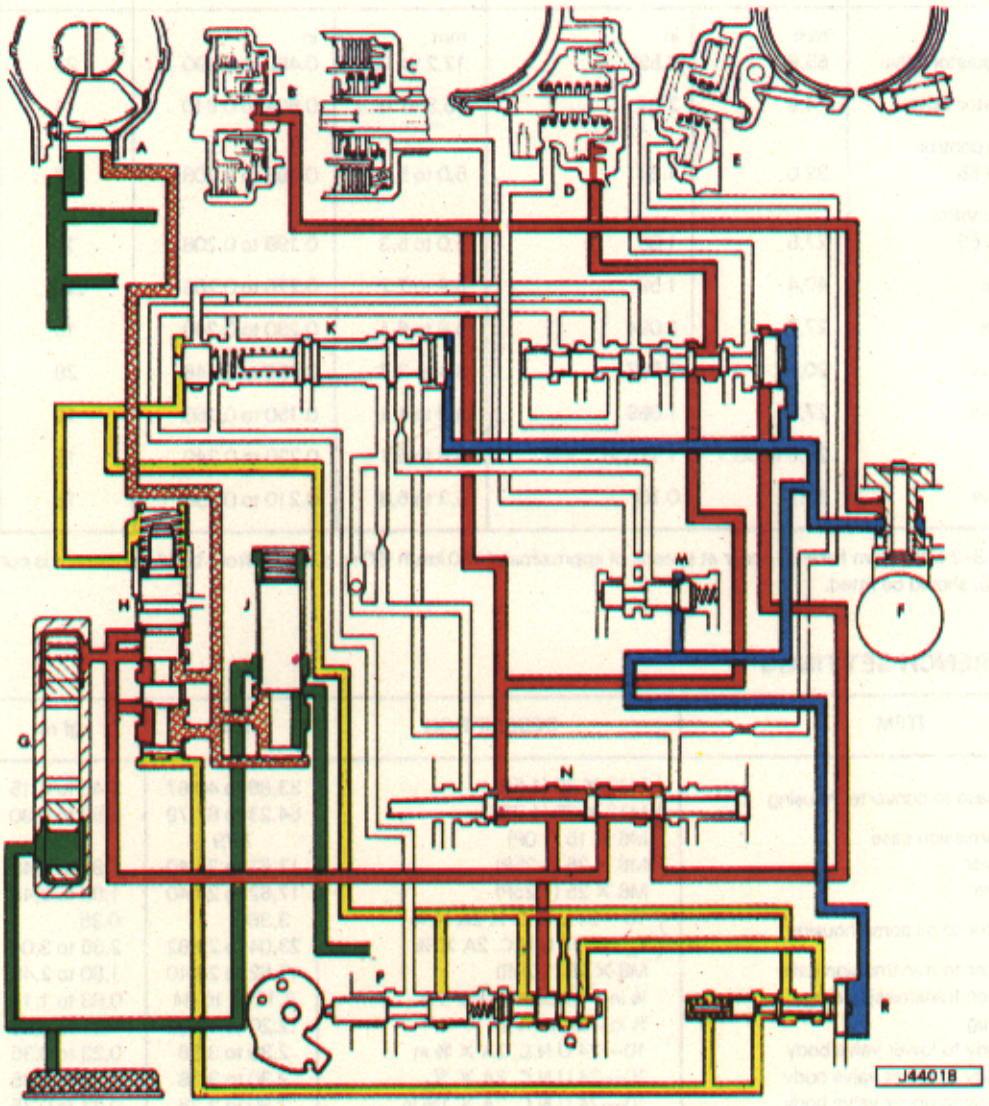

Fig. 18

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

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

VALVE SPRING IDENTIFICATION

The following spring identification table is given to assist in identifying valve springs when overhaul work is being carried out. When valve block is dismantled, springs should be compared with dimensions given. Any spring which is distorted or coil bound **must** be replaced.

DESCRIPTION	LENGTH		DIAMETER		NUMBER OF COILS	COLOUR
	mm	in	mm	in		
Secondary regulator valve	65,8	2.593	12,2 to 12,4	0.480 to 0.490	23	Blue
Primary regulator valve	74,6	2.94	15,3 to 15,5	0.604 to 0.610	14	Blue
*Servo orifice control valve—Model 65	32,0	1.281	5,0 to 5,3	0.198 to 0.208	17	Yellow
Servo orifice control valve—Model 66	27,5	1.08	5,0 to 5,3	0.198 to 0.208	17	Yellow
2–3 shift valve	40,4	1.59	6,9 to 7,2	0.275 to 0.285	22.5	Yellow
1–2 shift valve	27,7	1.094	5,8 to 6,1	0.230 to 0.240	13	Plain
Downshift valve	20,5	0.807	3,4 to 3,7	0.136 to 0.146	28	Yellow
Modulator valve	27,1	1.069	3,8 to 4,1	0.150 to 0.160	19	Plain
Throttle valve	29,8 to 30,1	1.175 to 1.185	5,8 to 6,1	0.230 to 0.240	18	Green
Dump ball valve	17,7	0.70	5,3 to 5,8	0.210 to 0.230	16	Plain or white

***NOTE:** Should 3–2 kick-down flare-up occur at speeds of approximately 80 km/h (50 m.p.h.) and front band adjustment is correct, the shorter spring (Model 66), should be fitted.

TORQUE WRENCH SETTINGS

SECTION 44

ITEM	DESCRIPTION	Nm	kgf m	lbf ft
Transmission case to converter housing	M10 X 30 (1.5P)	33,89 to 40,67	3,46 to 4,15	25 to 30
	M12 X 30 (1.75P)	54,23 to 67,79	5,53 to 6,90	40 to 50
Oil pan to transmission case	M6 X 15 (1.0P)	7,79	0,80	5.75
Front servo cover	M8 X 25 (1.25P)	17,62 to 24,40	1,80 to 2,48	13 to 18
Rear servo cover	M8 X 25 (1.25P)	17,62 to 24,40	1,80 to 2,48	13 to 18
Oil pump adaptor to oil pump housing	10—24 U.N.C. X 2A X 5/8	3,38	0,35	2.5
	5/16 in—18 U.N.C. 2A X 7/8	23,04 to 29,82	2,35 to 3,04	17 to 22
Oil pump adaptor to transmission case	M8 X 25 (1.25P)	17,62 to 24,40	1,80 to 2,48	13 to 18
Pressure point on transmission case	1/8 in—27 Dryseal N.P.T.F.	8,13 to 10,84	0,83 to 1,11	6 to 8
Oil pan drain plug	3/8 in—24 X 3/8 in	12,20 to 16,26	1,24 to 1,66	9 to 12
Upper valve body to lower valve body	10—24 U.N.C. 2A X 5/8 in	2,30 to 3,38	0,23 to 0,35	1.7 to 2.5
Lower valve body to upper valve body	10—24 U.N.C. 2A X 15/16	2,30 to 3,38	0,23 to 0,35	1.7 to 2.5
Lower valve body to upper valve body	10—24 U.N.C. 2A X 1 3/8 in	2,30 to 3,38	0,23 to 0,35	1.7 to 2.5
Suction tube assembly to lower valve body	10—24 U.N.C. 2A X 3/8 in	2,30 to 3,38	0,23 to 0,35	1.7 to 2.5
Oil tube plate to lower valve body	10—24 U.N.C. 2A X 5/8 in	2,30 to 3,38	0,23 to 0,35	1.7 to 2.5
	10—24 U.N.C. 2A X 15/16 in	2,30 to 3,38	0,23 to 0,35	1.7 to 2.5
End plate to lower valve body	10—24 U.N.C. 2A X 5/8 in	2,30 to 3,38	0,23 to 0,35	1.7 to 2.5
End plate to upper valve body	10—24 U.N.C. 2A X 3/8 in	2,30 to 3,38	0,23 to 0,35	1.7 to 2.5
Lower valve body to transmission case	1/4 in—20 U.N.C. 2A X 1 1/4 in	6,77 to 10,84	0,69 to 1,11	5 to 8
Lower valve body to cam bracket	No. 10 U.N.F. bolt	2,71 to 4,74	0,27 to 0,48	2 to 3.5
Tube location plate	M5 bolt (0.8P)	2,30 to 2,71	0,23 to 0,27	1.7 to 2.0
Detent spring to lower valve body		2,30 to 2,71	0,23 to 0,27	1.7 to 2.0
Servo adjusting screw locknuts	9/16 in U.N.C. nut	40,67 to 54,23	4,15 to 5,55	30 to 40
Oil cooler connector	1/4 in N.P.T.F.	27,11 to 29,82	2,77 to 3,04	20 to 22
Extension housing to case	7/16 in U.N.F. bolt	54,23 to 67,79	5,55 to 6,90	40 to 50
Extension housing to case	7/16 in U.N.C.	40,67 to 67,79	4,15 to 6,90	30 to 50
Inhibitor switch to main case	No. 10 U.N.C. bolt	5,42 to 6,77	0,55 to 0,69	4 to 5
Park cam plate to main case	M6 bolt (1.0P)	6,77 to 10,84	0,69 to 1,11	5 to 8
Coupling flange nut	M20 nut (1.5P)	98,02 to 117,68	10,0 to 12,0	72,3 to 86,8
Governor retainer	M24 bolt	20,33 to 24,40	2,07 to 2,49	15 to 18
Coupling flange	5/8 in U.N.C. nut	77,57 to 81,34	7,60 to 8,29	55 to 60
Centre support fixing	3/8 in U.N.C. bolt	13,55 to 20,33	1,38 to 2,07	10 to 15
Connector	1/2 in U.N.S. nut	13,55 to 16,26	1,38 to 1,66	10 to 12
Coupling flange	1/2 in U.N.F. bolt	54,23 to 67,79	5,55 to 6,90	40 to 50
Dipstick tube attachment	7/8 in U.N.S. nut	37,96 to 43,38	3,87 to 4,42	28 to 32

GEAR-CHANGE SPEEDS

	LIGHT THROTTLE		FULL THROTTLE		KICK DOWN		DOWN SHIFT	ROLL OUT
	1—2	2—3	1—2	2—3	3—2	3—1	3—2*	2—1
3,4 litre								
k.p.h.	11 to 16	25 to 29	55 to 60	96 to 106	96 to 105	55 to 60	70 to 74	8 to 11
m.p.h.	7 to 10	16 to 18	34 to 38	60 to 66	60 to 65	34 to 37	44 to 46	5 to 7
3.54:1 axle								
4,2 litre								
k.p.h.	13 to 19	21 to 29	66 to 82	117 to 130	101 to 117	40 to 56	51 to 67	8 to 16
m.p.h.	8 to 12	13 to 18	41 to 51	73 to 81	63 to 73	25 to 35	32 to 42	5 to 10
3,31:1 axle								
4,2 litre								
k.p.h.	13 to 19	21 to 30	67 to 85	120 to 134	104 to 120	42 to 59	53 to 69	8 to 16
m.p.h.	8 to 12	13 to 19	42 to 53	75 to 84	65 to 75	26 to 37	33 to 43	5 to 10
3.07:1 axle								
4,2 litre								
k.p.h.	14 to 19	21 to 30	67 to 85	120 to 136	104 to 120	42 to 59	53 to 69	8 to 16
m.p.h.	9 to 12	13 to 19	42 to 53	75 to 85	65 to 75	26 to 37	33 to 43	5 to 10
3.058:1 axle								
4,2 litre								
k.p.h.	14 to 21	22 to 32	72 to 90	128 to 144	110 to 128	45 to 62	56 to 74	8 to 18
m.p.h.	9 to 13	14 to 20	45 to 56	80 to 90	69 to 80	28 to 39	35 to 46	5 to 11
2.88:1 axle								

* Part throttle kick down

NOTE: The figures in these tables are theoretical and actual figures may vary slightly from those quoted due to such factors as tyre wear, pressures, etc.

CAUTION

Ensure that when the downshift cable is disconnected from the throttle linkage the crimp stop gap must be reset to achieve correct gearbox pressures. If there is no crimp fitted to the cable, the gearbox pressures must be reset using the appropriate special equipment. Failure to carry out the above procedure could lead to a rapid deterioration of gearbox condition.

GENERAL DATA

Gear train end-float		0,21 to 0,73 mm	0.008 to 0.029 in
Pinion end-float		0,25 to 0,51 mm	0.010 to 0.020 in
Minimum clutch plate coning		0,25 mm	0.010 in
Thrust washer sizes: Standard		1,72 mm	0.068 in
Alternative		2,03 mm	0.080 in
Control pressure		4,2 to 6,33 kgf/cm^2	60 to 90 lbf/in^2
Stall speed (normal)		1,950 to 2,100 rev/min	
Cooling capacity of oil cooler	up to VIN 352906	2,8 Kw	
	from VIN 352906	5,3 Kw	

ROAD TEST AND FAULT DIAGNOSIS

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

1. Fluid level.
2. Engine idle speed.
3. Manual lever adjustment.

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 (kick-down) 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 kick-down shift third gear to second gear.
8. Check for kick-down shift second gear to first gear.
9. Check for kick-down shift third gear to first gear.
10. Check for 'roll-out' down-shift with minimum throttle, second gear to first gear.
11. Check for part throttle down-shift, 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 list headed 'TRANSMISSION FAULT KEY'.

TRANSMISSION FAULT KEY

ACTIONS	
1	Check fluid level.
2	Check manual selector/adjustment.
3	Reduce engine idle speed.
4	Check down-shift throttle cable/adjustment. If pressure cannot be corrected, dismantle and clean valve bodies. For low pressure also check strainer, alloy suction pipe, 'O' ring and pump.
5	Check front brake band adjustment.
6	Check rear brake band adjustment.
7	Check front servo seals and fit of pipes.
8	Check rear servo seals and fit of pipe.
9	Examine front clutch, support housing and forward sun gear shaft seals.
10	Check rear clutch feed pipe.
11	Strip valve bodies and clean.
12	Strip governor valve and clean.
13	Examine output shaft rings and governor pressure tube seals.
14	Check front brake band for wear.
15	Check rear brake band for wear.
16	Adjust/examine parking pawl, linkage, and gear.
17	Renew one-way clutch.
18	Examine pump gears and converter nose bush.
19	Strip and examine gear train.
20	Replace torque converter.
21	Examine rear clutch and sealing rings.
22	Test inhibitor switch, circuit, and check for operation.
23	Check one-way clutch (possibly fitted backwards).
24	Ball check valve in forward sun gear shaft faulty, no detriment to performance.

FAULT DIAGNOSIS

STATIONARY TEST FINDINGS	ACTION
Starter will not operate in 'P' or 'N' or operates in all positions	22
Faulty operation of reverse lights	22
Excessive bump on engagement of 'D', '1' and 'R'	3, 4
Drives in 'N' also giving judder or no drive in 'R' depending on degree of front clutch seizure	2, 9
STALL TEST FINDINGS	
Stall test shows over 2 100 rev/min (transmission slip), with possible squawk in '1' and 'R'	4
a. only in '1'	9
b. only in 'R'	6, 8, 10, 21, 15
Stall test shows under 1 300 rev/min (slipping stator)	20
DRIVING TEST FINDINGS	
Selection faults	
Incorrect selection of all positions except 'P'	2
Parking pawl does not hold vehicle	16
Ratio faults	
No drive in 'D', '2', '1' or 'R' but 'P' operates	1, 2, 4
No drive in 'D', '2' or '1'	12, 13, 9
No drive in 'D' 1st ratio	17
No drive in '1' and transmission binding during shift from '1' to 'D'	23
No second ratio	5, 7, 11
No D3 (Reverse indicating rear clutch normal)	11
Drag in 'D'	6
Drag in 'D', '1' and reverse	5
No engine braking in '1' and no drive in reverse ratio	6, 8, 15
Moves off in 2nd ratio in 'D' and '1' and no drive in reverse or engine braking in '1'	11
Shift point faults	
Incorrect or erratic 'kick-down' and/or light throttle shift points	4,12, 13
1–2 shift only incorrect	11
2–3 shifts only incorrect	11
No up-shifts	12, 13
Lack of 'up-shifts' and no reverse ratio	11
Moves off with possible transmission slip	12
Reduced maximum speed in all ratios, more so in 'D', and severe converter overheating	20
Shift quality faults	
Bumpy and possibly delayed shifts	4
Slip (engine 'flare-up') shifting into and out of second ratio	5, 7, 11, 14
Slip (engine 'flare-up') on 2–3 and 3–2 shifts*	10, 11, 21
Noise faults	
Whining noise from converter area, continuous whenever the engine is running	18
Irregular (possibly grating) noises from gearbox but not in 'D'	19
Whine from converter, for short period following engine starting after vehicle has been standing for, say, not less than 12 hours	24

* See Note on page 44–17.

DOWN-SHIFT CABLE

Remove and refit **44.15.01**

Service tool: Down-shift cable remover tool CBW 62

Removing

Unscrew the union nut (1, Fig. 19), withdraw the dipstick tube; drain and discard fluid.
Remove the bolts and plain washers (2, Fig. 19) securing oil pan to transmission case.
Lower the oil pan (3, Fig. 19) remove and discard the gasket.

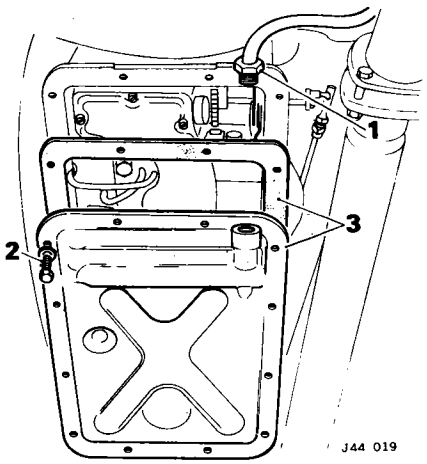

Fig. 19

Disconnect cable from cam.
Position cable remover tool CBW 62 on plastic ferrule, push the tool upwards until the ferrule, together with the cable is pressed out of the transmission case.
Remove the split pin, washer and clevis pin (1, Fig. 20) securing clevis to throttle linkage; discard the split pin.
Slacken the locknut (2, Fig. 20), withdraw down-shift cable.

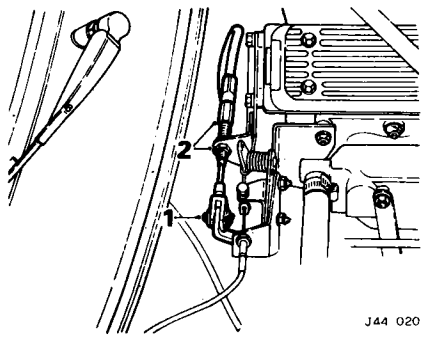

Fig. 20

Refitting

If old cable is being refitted, renew the 'O' ring on ferrule.
Lubricate the ferrule with clean transmission fluid.

CAUTION: Do not lubricate the inner cable.

Press the ferrule into the gearcase; connect cable to cam.
Connect clevis to throttle linkage; use a new split pin.
With the accelerator pedal released and the throttle levers resting on the idle speed screws, adjust the cable until the heel of the down-shift cam just makes contact with the down-shift valve.
With the accelerator pedal depressed, check that the lobe of the cam fully depresses the down-shift valve.
Refit the oil pan, smear the new gasket with grease.
Tighten bolts by diagonal selection to the specified torque figure.

CAUTION: Due to the method of construction it is not possible to completely drain the transmission fluid, and this should be taken into account when the transmission is being refilled.

Fill the transmission to the 'MAX' mark on the dipstick.
Apply the handbrake and select 'P' position.
Run the engine until it reaches normal operating temperature.
With the engine still running, withdraw the dipstick (1, Fig. 21), wipe clean and replace.
Immediately withdraw the dipstick and note the reading on the 'HOT' side of the dipstick (2, Fig. 21).
If necessary, add fluid to bring the level on the dipstick to 'MAX' (3, Fig. 21).

NOTE: The difference between the 'MAX' and 'MIN' marks on the dipstick represents approximately 0,75 litre (1½ pints, 2 U.S. pints).

Carry out the down-shift cable pressure check, see 44.30.03.

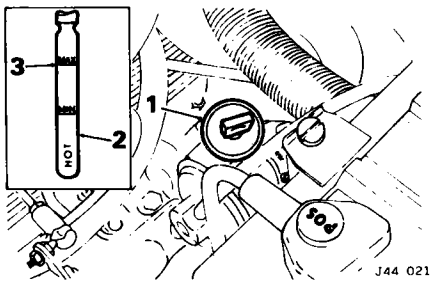

Fig. 21

GEAR SELECTOR CABLE

Remove and refit **44.15.08**

Removing

This operation requires the removal of the centre console side casing, details of which are to be found in Section 76.

Place the quadrant selector lever in '1'.
Unscrew the gear selector knob (1, Fig. 22).
Remove the four nuts (2, Fig. 22) securing the selector indicator assembly; withdraw the indicator assembly over the selector lever (3, Fig. 22).
Remove the split pin and washer (4, Fig. 22) securing the cable to selector lever; detach the cable (5, Fig. 22).
Unscrew the front locknut (6, Fig. 22) securing the cable to abutment bracket.
Lift the carpet from left-hand side of transmission tunnel.
Remove the screws (7, Fig. 22) securing the cable shroud to the transmission tunnel; withdraw the shroud.
Withdraw the cable from the abutment bracket.

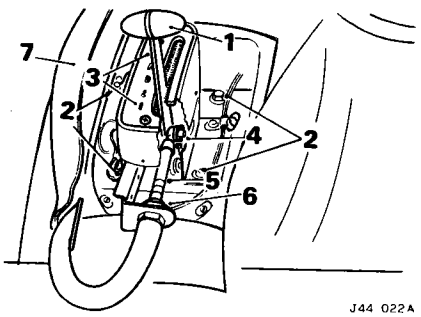

Fig. 22

Remove the screws securing the access panel to the transmission tunnel.
Withdraw the panel; clean off old sealing compound.
Ensure that the gearbox selector lever is in '1'.
Remove the nut securing the selector cable to the gearbox selector lever; detach the cable.
Remove the bolt and spring washer (1, Fig. 23) securing the trunnion block.
Withdraw the cable (2, Fig. 23).

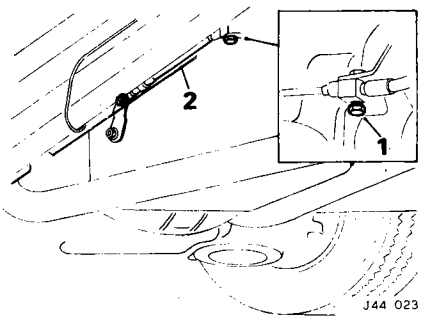

Fig. 23

Refitting

Refit the cable and position the selector lever in '1'.

Refit the panel, shroud and carpet.

CAUTION: Seal the access panel and the hole in the shroud with a suitable sealing compound.

Fit the front locknut (1, Fig. 24) to the cable but do not tighten at this stage.

Ensure that the gearbox selector and quadrant selector levers are in '1'

Adjust the front (1, Fig. 24) and rear (2, Fig. 24) locknuts until the cable can be connected to the quadrant lever without either quadrant or gearbox lever being disturbed.

Tighten the locknuts, secure the cable with a new split pin (3, Fig. 24).

Refit the selector indicator assembly and gear knob.

Place the selector lever in 'P' and replace the console as detailed in 76.25.01.

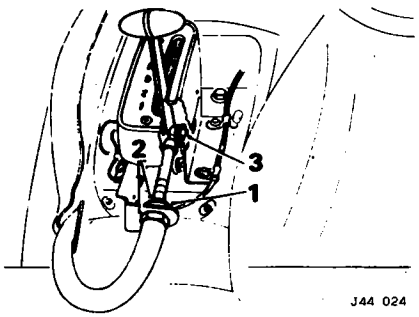

Fig. 24

STARTER INHIBITOR SWITCH

Check and adjust **44.15.18**

Adjusting

Disconnect the battery.

Unscrew the gear selector knob (1, Fig. 25).

Remove the three screws securing the gear selector surround panel, do not disconnect the window switches. Slightly displace the panel to obtain access to the cigar lighter terminals.

Note the fitted position of the cigar lighter terminals, before disconnecting.

Remove four nuts securing the selector indicator assembly and remove the assembly.

Detach the feed cable (2, Fig. 25) from the inhibitor switch.

Connect a test lamp and battery (3, Fig. 25) in series with the switch.

NOTE: Switch is in the earthed position.

Place selector lever (6, Fig. 25) in 'N' position.

Slacken the locknuts (5, Fig. 25) securing the switch and adjust the position of the switch until the lamp lights.

Tighten the locknuts, check that the lamp remains on with the lever in 'P' position and is off with the lever in drive position.

Remove the battery and test lamp, reconnect the feed cable to the switch.

Refit the selector indicator assembly.

Reconnect the cigar lighter and refit the gear selector surround panel.

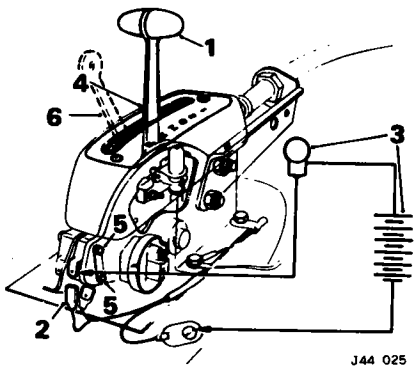

Fig. 25

Refit the gear selector knob and reconnect the battery.

Check operation of the window switches and cigar lighter.

TRANSMISSION UNIT

Remove and refit **44.20.01**

Includes:

Torque converter—remove and refit **44.17.07**

Torque converter housing—remove and refit **44.17.01**

Service tools: Engine support bracket MS 53A, transmission unit lift.

Removing

Drive the vehicle onto a ramp and disconnect the battery.

Remove the dipstick from the dipstick tube; remove the bolt securing the dipstick tube to the manifold.

Remove the bolts securing the upper fan cowl to the lower fan cowl. Slacken the bolts securing the cowl bracket to the radiator, to facilitate the removal of the top cowl.

Remove and discard the split pin securing the kick-down cable to the throttle bell-crank, withdraw the clevis pin and washer; slacken the locknut and disconnect the cable.

Raise the ramp.

Undo the union nut securing the dipstick tube to the transmission unit sump pan. Remove the dipstick tube; plug the ends to prevent the ingress of dirt. Drain and discard the transmission fluid.

Disconnect the exhaust intermediate pipe from the down-pipe, remove the olive. Remove the exhaust heat shields from the floor pan.

Position the transmission unit lift under the transmission unit, and take the weight. Secure the transmission unit to the lift.

Remove the bolts securing the crash plate to the transmission case studs, undo the nut securing the crash plate to the rear mounting spigot bolt.

Remove the bolts, spacers and washers securing the rear engine mounting to the floor pan.

Remove the bolts securing the propeller shaft tunnel spreader plate to the floor pan.

Chock the front wheels.

Using a ramp jack raise the rear wheels. This will enable the propeller shaft to be rotated and the propeller shaft to output flange fixings removed.

Move the propeller shaft clear of the output flange.

Lower the transmission unit lift to the position required for transmission unit removal; DO NOT REMOVE the transmission unit at this stage.

CAUTION: Take care not to damage the water heater valve.

Position the engine support bracket, MS 53A, and locate the hook to the engine rear lifting eye. Turn the adjusting nut to take the weight of the engine (Fig. 26).

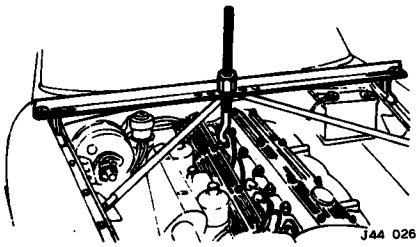

Fig. 26

Lower the ramp jack under rear of car.

Remove the rubber pad from the top of the transmission unit.

Remove the nut securing the selector lever bell-crank to the cross-shaft and remove the bell-crank.

Remove the bolt securing the selector cable trunnion to the mounting bracket.

Remove the bolts securing the tie-plate to the engine sump pan and transmission converter housing front cover-plate and remove the cover-plate.

Rotate the engine until a torque converter securing bolt is accessible; knock back the lock tab and remove the bolt; repeat this procedure for the three remaining torque converter securing bolts.

Remove and discard the tab washers.

Remove the bolt and washer securing the breather pipe clip.

Remove the screw securing the oil cooler pipe clamp plate to the sump bracket.

Disconnect the oil cooler and breather pipes from the transmission casing; plug or tape broken connections to prevent the ingress of dirt.

Disconnect the speedometer cable from the drive pinion (early models).

For later models fitted with electronic speedometer disconnect 2 pin connector only.

Disconnect the cables from the starter motor and solenoid.

Ensure that the transmission unit is secured to the unit lift and that the platform is at the correct angle.

Remove the nuts, bolts and washers securing the torque converter housing tp the cylinder block; withdraw the starter motor and spacer.

Withdraw the transmission unit lift rearwards and lower.

Remove the torque converter from the input shaft.

Remove the bolts and washers securing the torque converter housing to the transmission case.

continued

Refitting

Refit the torque converter housing to the transmission case and tighten the securing bolts to the correct torque.
Refit the torque converter to the input shaft, ensuring that the drive dogs are correctly engaged.
Position and secure the transmission unit onto the transmission unit lift platform.
Position the rubber pad on the top of the transmission unit.
Manoeuvre the unit lift into position and raise to correctly position the transmission unit.
Refit the bolts securing the torque converter housing to the engine; do not tighten until the starter motor and spacer have been fitted.
Align the torque converter to drive plate fixing holes, fit the bolts, with new tab washers; DO NOT tighten until all four bolts are fitted. Bend over the tab washers.
Reconnect the cables to the starter motor and solenoid.
Refit the oil cooler pipes to the transmission unit, and refit clamp plate.
Refit the breather pipe.
Refit the converter front cover, and the tie-plate between the engine sump pan and the converter housing.
Raise the rear of the vehicle, using a ramp jack, to allow the propeller shaft to be refitted to the output flange; secure with the bits and new self-locking nuts.
Refit the gear selector bell-crank to the cross-shaft, fit and tighten the nut to secure.
Align the gear selector lever trunnion to the mounting plate; fit and tighten the bolt to secure.
Reconnect the speedometer cable to the drive pinion, tighten the knurled nut (early models).
On later models connect 2 pin electrical connector.
Raise the unit, refit the propeller shaft tunnel spreader plate, the exhaust heat shield, and the rear engine mounting.
Refit the crash plate, tighten the nuts securing the plate to the transmission case studs and spigot bolt.
Release the transmission unit from the unit lift and lower the lift. Remove the unit lift and engine support bracket MS 53A from the car.
Lower and remove the ramp jack from the rear of the car.
Refit the intermediate exhaust pipe, smear the sealing olive with 'Fire Gum'. Fit and tighten the flange bolts.
Refit the dipstick tube to the oil pan and tighten the union nut.
Lower the ramp.
Refit the dipstick tube securing bolt to the manifold.
Refit the upper fan cowl.
Reconnect the kick-down cable, secure using a new split pin and adjust as described in operation 44.30.03.
Refill the transmission—refer to 44.24.02.
Road test the car.

TRANSMISSION ASSEMBLY

NOTE: WHERE ANY BENCHWORK IS UNDERTAKEN CBW-35-65 BENCH CRADLE MUST BE USED.

Overhaul 44.20.06

Service tools: Mainshaft end-float gauge CBW 87; circlip pliers 18G 1004; clutch spring compressor 18G 1016; torque screwdriver 18G 631; screwdriver bit adaptors CBW 547A-50-2A; torque wrench CBW 547 B-75; rear clutch piston replacer 18G 702; front clutch piston replacer 18G 107; kick-down cable ferrule remover CBW 62; bench cradle CBW-35-65.

CAUTION: Only Gamlen 265 or Rochem Electrosol Quick Dry Solvent should be used for cleaning transmission components.

NOTE: The numbers on the pictures refer to the sequencial numbering on the L.H.S. of the text.

Dismantling

1. Remove the torque converter housing, see 44.17.07.
2. Thoroughly clean the exterior of the gearcase.
3. Remove the dipstick tube and breather assembly; drain the fluid from the gearbox.
4. Invert the transmission.
5. Position the selector lever in 'P' (Park) (Fig. 27).
6. Remove the speedometer driven gear housing together with the driven gear, remove and discard the 'O' ring (Fig. 27).
7. Remove the bolt and plain washer securing the output flange; withdraw the flange (Fig. 27).
8. Note the fitted position of the bolts, stud bolts and spacers. Remove the bolts, stud bolts, plain washers and spacers securing the rear extension housing to the transmission case (Fig. 27).

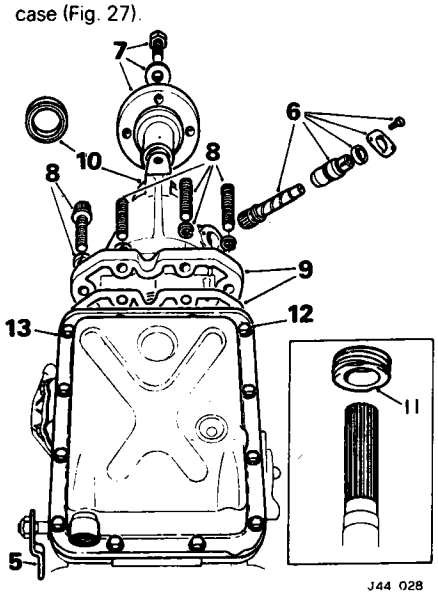

Fig. 27

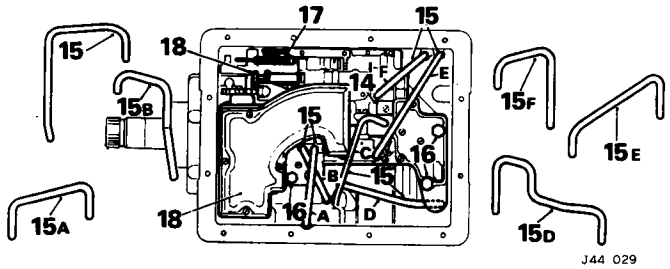

Fig. 28

9. Withdraw the rear extension housing, remove and discard the gasket (Fig. 27).
10. Remove and discard the oil seal (Fig. 27).
11. Slide the speedometer drive gear off the output shaft (Fig. 27).
12. Remove the bolts and spring washers securing the oil pan to the transmission case (Fig. 27).
13. Lift off the oil pan; remove and discard the gasket (Fig. 27).
14. Remove the magnet from the valve block (Fig. 28).
15. Note the fitted positions of the oil tubes (Fig. 28) and using a suitable screwdriver, carefully lever the tubes, with the exception of tube 15D, out of the transmission.
16. Remove the bolts and spring washers securing the valve block (Fig. 28), noting that the shortest bolt is fitted at the front of the valve block.
17. Disconnect the kick-down cable from the cam (Fig. 28).
18. Lift off the valve block (Fig. 28), taking care that the manual valve is not displaced; remove tube 15D as described in operation 15.

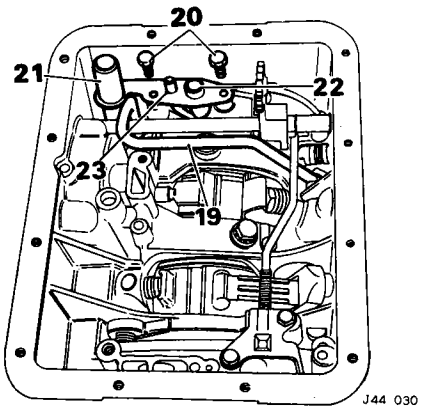

Fig. 29

19. Carefully lever the oil cooler tube from the transmission (Fig. 29).
20. Remove the bolts (Fig. 29) retaining oil tube retaining plate; withdraw the plate.

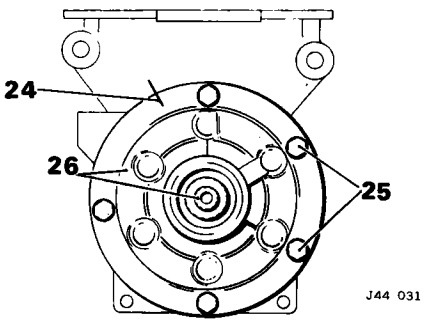

Fig. 30

21. Using suitable long-nosed pliers, withdraw the pump inlet tube; remove and discard the 'O' ring (Fig. 29).
22. Withdraw the pump outlet pipe (Fig. 29).
23. Withdraw the converter feed tube (Fig. 29).
24. Scribe alignment marks on the transmission case and oil pump (Fig. 30).
25. Remove the bolts and wave washers securing the oil pump to the transmission case (Fig. 30).
26. Support the stator tube and withdraw the oil pump (Fig. 30).
27. Take care when withdrawing the pump that the stator tube is not displaced.
28. Remove and discard the gasket.
29. Remove and discard the bronze thrust washer.
30. Remove the plug and spring washer securing the governor on the output shaft (Fig. 31).

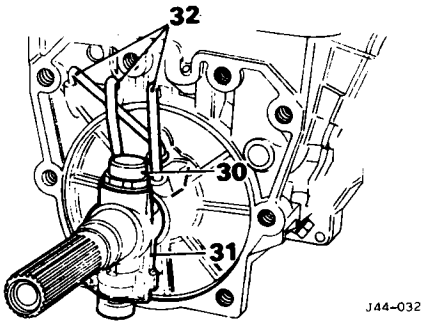

Fig. 31

31. Note the fitted position of the governor; slide the governor off the output shaft (Fig. 31).
32. Carefully lever the governor feed tube, governor return tube and lubrication tube out of the transmission case (Fig. 31).
33. Slacken the locknut and unscrew the front brake band adjuster screw; recover brake band strut (Fig. 32).

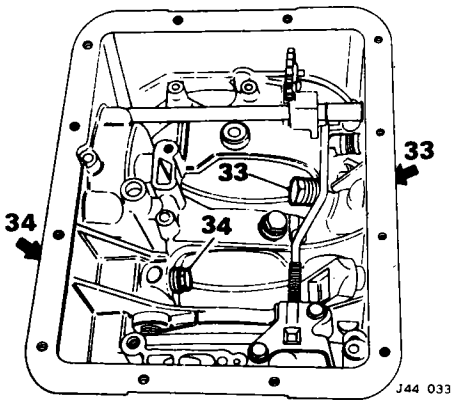

Fig. 32

34. Slacken the locknut and unscrew the rear brake band adjuster screw; recover the brake band strut (Fig. 32).
35. Withdraw the front clutch assembly together with the input shaft (Fig. 33).
36. Remove the steel backing washer and the bronze thrust washer; discard the thrust washer (Fig. 33).
37. Withdraw the rear clutch assembly; remove and discard the sealing rings (Fig. 33).

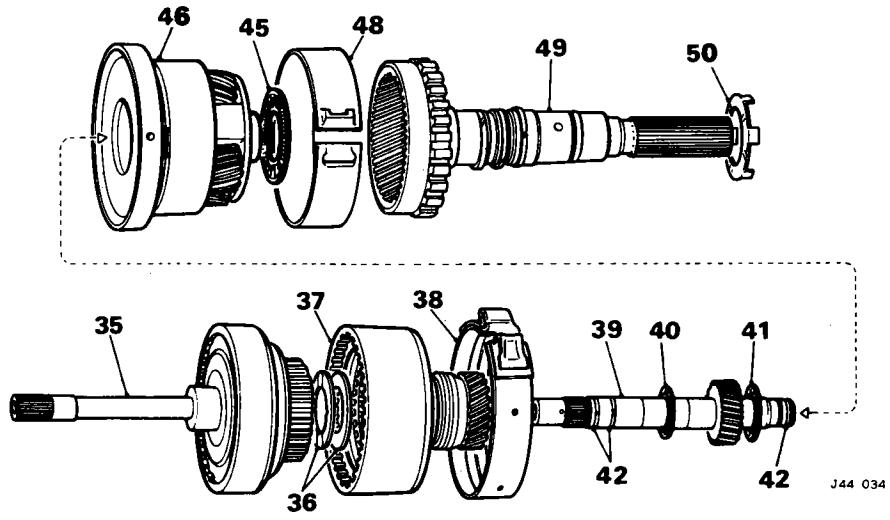

Fig. 33

38. Note the fitted position of the front brake band; compress and withdraw the brake band (Fig. 33).
39. Withdraw the forward sun gear shaft (Fig. 33).
40. Remove the small needle-roller bearing from the input end of the shaft (Fig. 33).
41. Recover the flanged backing washer and large needle-roller bearing from the output end of the shaft (Fig. 33).

NOTE: These components may remain in the sun gear assembly but should still be removed.

42. Remove and discard the two sintered metal sealing rings from the input end and one fibre sealing ring from the output end of the shaft (Fig. 33).
43. Remove the bolts and lock washers securing the centre support.
44. Push the output shaft forwards to displace the centre support and sun gear assembly.
45. Withdraw the centre support and planet carrier from the transmission case; remove the needle-roller bearing from the input end of the planet carrier assembly (Fig. 33).
46. Separate the centre support from the sun-gear assembly (Fig. 33).
47. Pull the output shaft rearwards.
48. Note the fitted position of the rear brake band; compress and withdraw the brake band (Fig. 33).
49. Withdraw the output shaft and ring gear assembly (Fig. 33).

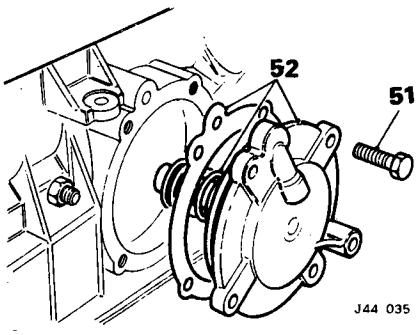

Fig. 34

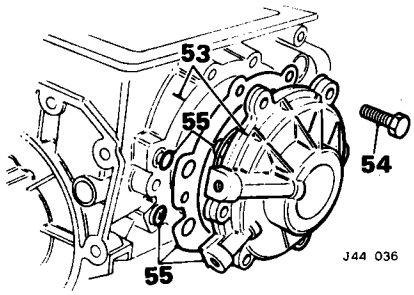

Fig. 35

50. Remove and discard the bronze thrust washer (Fig. 33).
51. Remove the bolts securing the front servo to transmission case (Fig. 34).
52. Withdraw the front servo, operating rod and spring; remove and discard the gasket (Fig. 34).
53. Scribe alignment marks on the rear servo and transmission case (Fig. 35).
54. Remove the bolts securing the rear servo to the transmission case (Fig. 35).
55. Withdraw the rear servo together with operating rod and spring; remove and discard the 'O' rings and gasket (Fig. 35).
56. Remove the bolts securing the plate retaining parking brake pawl and rear servo operating lever pivot pin; remove the plate (Fig. 36).
57. Withdraw the pivot pin and rear servo operating lever (Fig. 36).

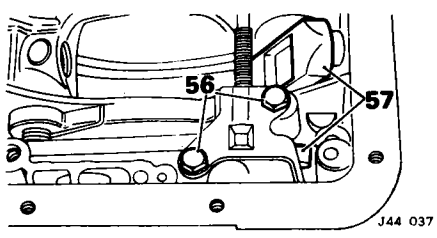

Fig. 36

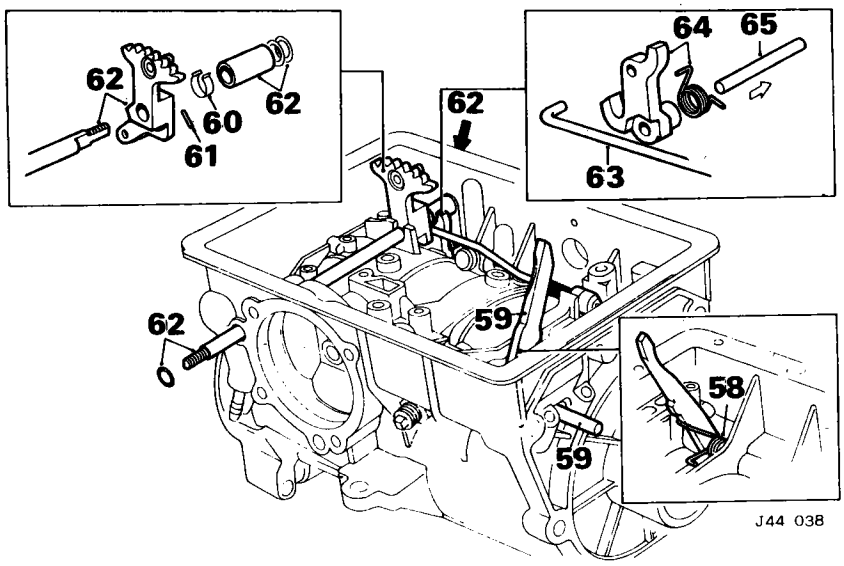

Fig. 37

If it is found necessary to dismantle parking pawl assembly, carry out items 58 to 65 inclusive.

58. Note the fitted position of the parking pawl torsion spring; release the spring from the pawl (Fig. 37).
59. Withdraw the parking pawl pivot pin, collect the pawl and torsion spring (Fig. 37).
60. Release the clip locating manual valve lever (Fig. 37).
61. Withdraw the pin locating the manual valve lever (Fig. 37).
62. Withdraw detent shaft, collect manual valve lever, spacer and plain washers; remove and discard 'O' ring and oil seal (Fig. 37).
63. Release parking brake rod assembly from parking pawl (Fig. 37).
64. Note fitted position of parking brake rod operating lever and torsion spring, release spring from lever (Fig. 37).
65. Using suitable punch, drive out operating lever pivot pin; withdraw lever and spring (Fig. 37).

If it is found necessary to remove kick-down cable assembly, carry out items 66 and 67.

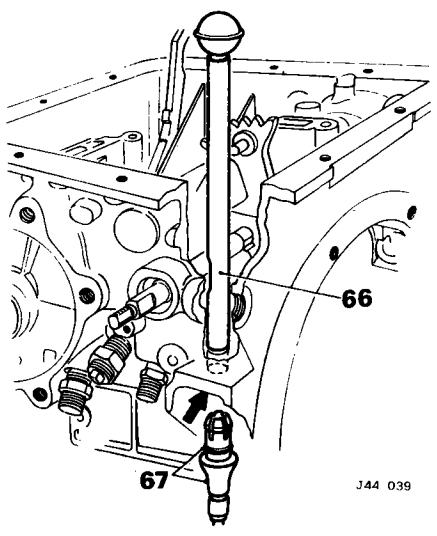

Fig. 38

66. Using Service tool CBW 62, compress lugs of the cable retaining plug (Fig. 38).
67. Withdraw the kick-down cable assembly; remove and discard the 'O' ring (Fig. 38).

CAUTION: It is not possible to remove retaining plug from the kick-down cable assembly and if lugs are broken, cable assembly must be renewed.

VALVE BLOCK

Overhaul **44-40-04**

CAUTION: Ensure that all working surfaces are clean. Use only lint-free cloth and clean transmission fluid for lubricating.

Dismantling

68. Withdraw the manual valve (Fig. 39).
69. Remove the screws securing the suction tube assembly to the lower valve body (Fig. 39).
70. Lift off the tube assembly; remove and discard the gasket (Fig. 39).
71. Remove the six upper valve body securing screws from the lower valve body (Fig. 39).
72. Invert the valve body and remove the four screws securing the upper valve body and cam (Fig. 39) mounting arm; remove the mounting arm (Fig. 39).
73. Extract the down-shift valve and spring (Fig. 39).
74. Lift off the upper valve body (Fig. 39).
75. Remove the screws securing both end plates to the upper valve body; carefully remove the end plates (Fig. 39).
76. Extract the spring, 1-2 shift valve and plunger (Fig. 39).
77. Extract the 2-3 shift valve, spring and plunger (Fig. 39).
78. Remove the eight screws securing the collector plate to the lower valve body; lift off the collector plate (Fig. 39).
79. Slacken, but do not remove the four screws securing the governor line plate (Fig. 39).
80. Hold the separator plate in contact with the valve body, remove the governor line plate securing screws and lift off the governor line plate (Fig. 39).
81. Note the fitted position of the ball valve and carefully slide the separator plate off the valve body (Fig. 39).

CAUTION: The ball valve is spring loaded; ensure that the ball is not displaced during this operation.

82. Remove the ball valve; extract the spring (Fig. 39).
83. Note the fitted position of the check valve (if fitted), remove the valve (Fig. 39).
84. Withdraw the retainer, extract the spring and servo orifice control valve (Fig. 39).
85. Withdraw the retaining pin, extract the plug, modulator valve and spring (Fig. 39).
86. Withdraw the throttle valve spring retainer (Fig. 39).
87. Withdraw the throttle valve retainer (Fig. 39).
88. Extract the spring and throttle valve (Fig. 39).
89. Remove the screw securing the detent spring and roller assembly, detach the assembly; collect the spacer (Fig. 39).

NOTE: The roller arm may be peened to valve body. If so, swing the arm clear of the screws securing the regulator valve retaining plate.

90. Remove the screws securing the regulator valve retaining plate; remove the plate slowly until the spring loading is no longer felt (Fig. 39).
91. Extract the spring, sleeve and primary regulator valve (Fig. 39).
92. Extract the spring and secondary regulator valve (Fig. 39).

Inspection

93. Check the springs with the data shown in spring identification table, see page 44—19; renew springs which are distorted or shorter than the specified length.
94. Check all valves for burrs or scoring. Check that valves move freely in valve bodies.

CAUTION: In the event of valves and/or valve bodies being damaged, valve block assembly must be renewed.

Reassembling

Reverse instructions 68 to 92, ensure that all components are scrupulously clean and that tightening torque figures are adhered to.

CAUTION: A new gasket must be used when refitting the suction tube assembly.

PLANET CARRIER

CAUTION: No overhaul of the planet carrier is possible. In the event of any of the following defects being discovered, the planet carrier assembly must be renewed.

Inspection

95. Check gear teeth for chipping or scoring; light scoring may be disregarded (Fig. 40).
96. Check that end-float of gears is not excessive and that gears turn smoothly when spun by hand.
97. Check the bush for scores or evidence of metal transfer (Fig. 40).

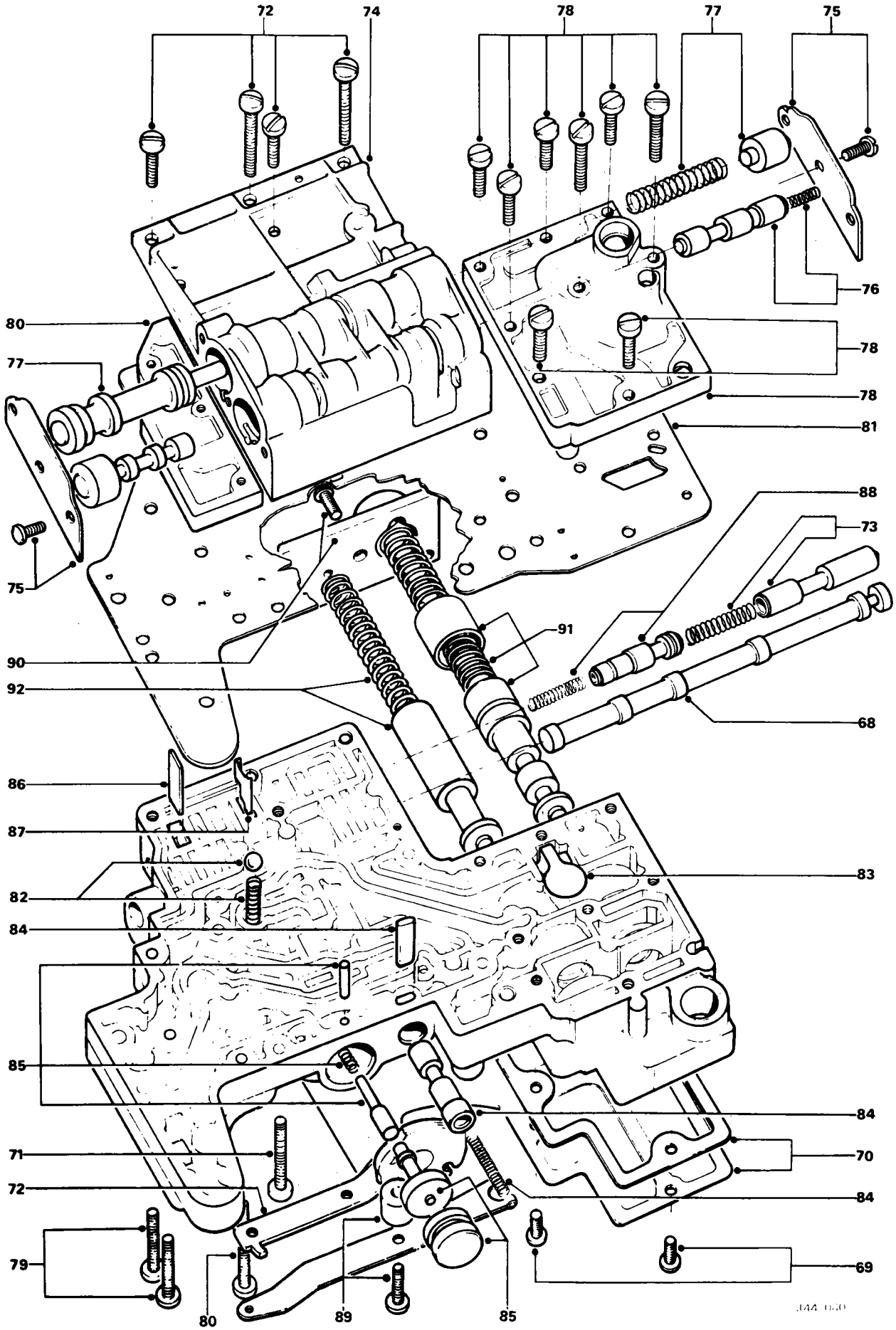
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Fig. 39

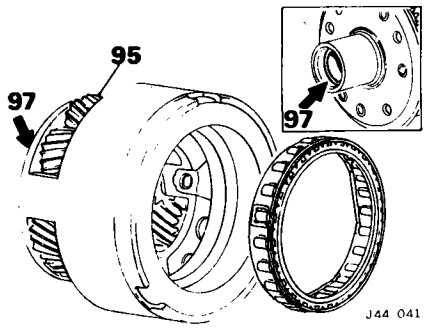


Fig. 40

ONE-WAY CLUTCH

CAUTION: No overhaul of the one-way clutch is possible. In the event of any of the following defects being discovered, the one-way clutch must be renewed.

Dismantling

98. Note the fitted position of the one-way clutch.
99. Withdraw the clutch from the planet carrier (Fig. 41).

Inspection

100. Check the sprag faces for flat spots indicating wear (Fig. 41).
101. Check the sprag cage for flat spots indicating wear (Fig. 41).

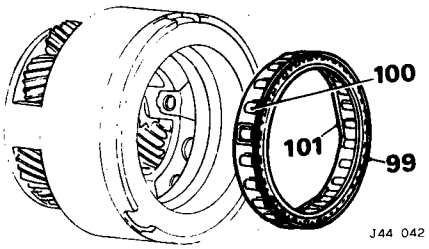


Fig. 41

Reassembling

102. Push the one-way clutch into the planet carrier, ensure that the lip faces outwards and that the clutch is fully seated in the recess.

FORWARD SUN GEAR SHAFT

Inspection

103. Check the drillings in the shaft for obstruction; clear with compressd air only (Fig. 42).
104. Check the splines, sealing ring grooves and gear teeth for burrs or signs of damage; renew if damaged (Fig. 42). Minor burrs may, however, be removed with a very fine abrasive.
105. Examine the large and small needle-roller bearings; renew if either show signs of wear or damage.

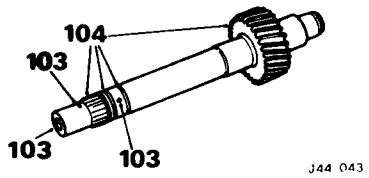


Fig. 42

REAR CLUTCH

Overhaul

Dismantling

106. Place the rear clutch assembly over the central spindle of the clutch spring compressor 18G 1016 reverse the sun gear down (Fig. 43).
107. Fit spring compressor over spindle (Fig. 43).
108. Compress the spring and remove the snap-ring (Fig. 43).
109. Slowly release the pressure and remove the compressor.
110. Remove the retainer and spring.
111. Remove the snap-ring retaining pressure plate (Fig. 44).
112. Remove the pressure plate (Fig. 44).
113. Remove the inner and outer clutch plates (Fig. 44).

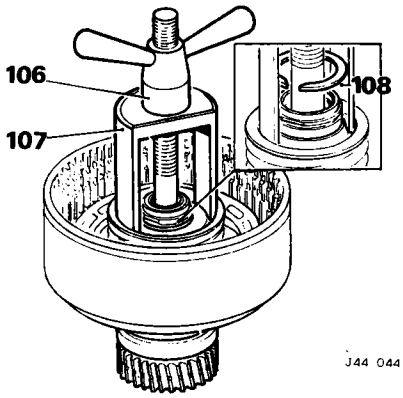


Fig. 43

NOTE: Five outer and five inner clutch plates are fitted.

114. Remove the piston by applying air pressure to the supply hole in the clutch housing pedestal (Fig. 44).
115. Remove and discard the piston seal (Fig. 44).

Inspection

116. Check clutch drum and bearing surfaces for scores or burrs; replace drum if damaged (Fig. 44).
117. Check the fluid passage for obstructions, clear passages with compressed air only.
118. Inspect the piston check valve for free operation.
119. Check the clutch release spring for distortion; renew if distorted.
120. Check the inner clutch plates for flatness and that facings are undamaged.
121. Check that coning on outer clutch plates is not less than 0,25 mm (0.010 in) (Fig. 45).
122. Check the outer clutch plates for scores or burrs; renew if damaged. Minor scores or burrs may, however, be removed with a very fine abrasive.

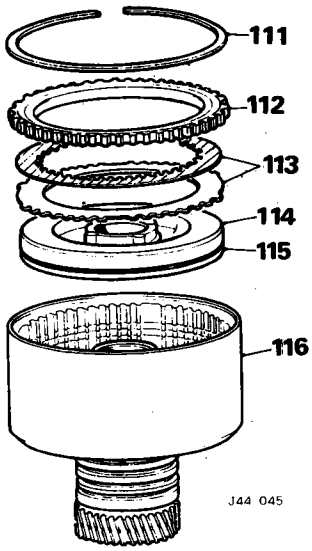


Fig. 44

123. Check needle bearings and bush in clutch housing for signs of wear, scores or evidence of metal transfer. If damaged the clutch hub must be renewed.

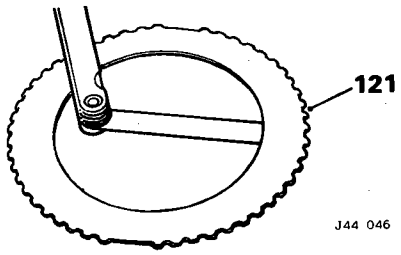


Fig. 45

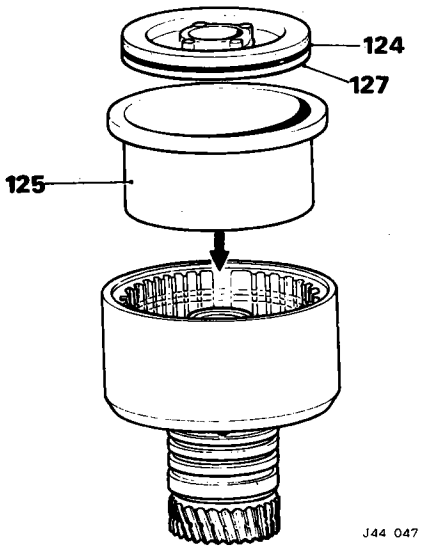


Fig. 46

Reassembling

124. Smear the new piston seal with petroleum jelly and fit to the piston (Fig. 46).
125. Position the rear clutch piston replacer tool 18G 702 in the clutch drum (Fig. 46).
126. Lubricate the piston and replacer tool with clean transmission fluid.
127. Install the piston; remove the tool.
128. Reverse operations 106 to 113.

CAUTION: Outer clutch plates must be assembled with cones facing in same direction.

129. Smear the large needle bearing with petroleum jelly and position it on output end of forward sun gear shaft (Fig. 47).
130. Position the backing washer, flange leading in planet carrier (Fig. 47).
131. Insert the forward sun gear shaft in the planet carrier; fit new fibre sealing ring on output end of shaft (Fig. 47).
132. Position the centre support in the planet carrier (Fig. 47).

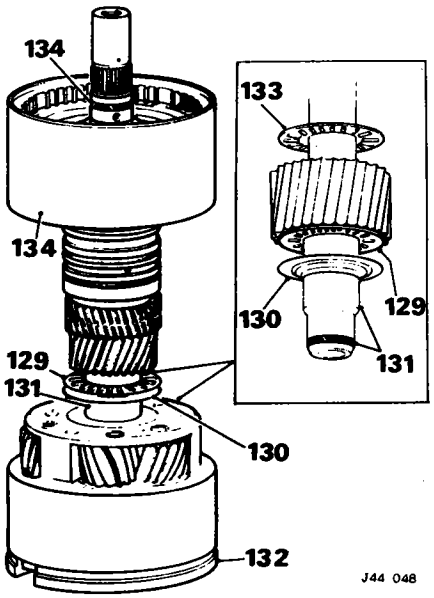


Fig. 47

133. Smear the small needle-roller bearing with petroleum jelly and position it on the forward sun gear shaft (Fig. 47).
134. Position the rear clutch assembly on the forward sun gear shaft; fit new sintered sealing rings on the input end of the shaft (Fig. 47). Ensure that gaps in sealing rings are staggered.

CAUTION: Do not remove the rear clutch assembly and forward sun gear shaft from the planet carrier.

FRONT CLUTCH

Overhaul

Dismantling

135. Remove the snap-ring and withdraw the turbine shaft (Fig. 48)
136. Remove and discard the bronze thrust washer (Fig. 48).
137. Remove the clutch hub (Fig. 48).
138. Remove the inner and outer clutch plates and ring gear (Fig. 48).

NOTE: Four outer and five inner clutch plates are fitted.

139. Remove the snap-ring and diaphragm (Fig. 48).
140. Remove the piston by applying air pressure to the supply hole in the clutch housing pedestal (Fig. 48).

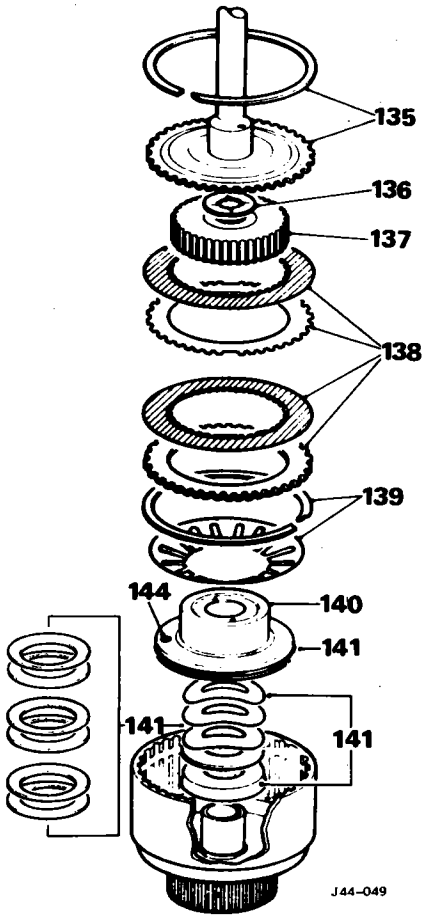


Fig. 48

141. Remove the plain and Belleville washers; remove and discard the seal and 'O' ring (Fig. 48).

NOTE: On later cars, six Belleville washers are used, with no plain washer.

Inspection

142. Check the clutch drum and bearing surfaces for scores or burrs; replace the drum if damaged.
143. Check the fluid passages for obstruction; clear passages with compressed air only.
144. Inspect the piston check valve for free operation (Fig. 48).
145. Check the clutch release diaphragm for cracks or distortion; renew if damaged.
146. Check the inner clutch plates for flatness and that the facings are undamaged.

NOTE: There is no coning on the clutch plates.

147. Check outer clutch plates for flatness, scores or burrs, renew if damaged. Minor scores or burrs may, however, be removed with a very fine abrasive.
148. Check the bush in the turbine shaft for scores or evidence of metal transfer. If damaged, the turbine shaft must be renewed.

Reassembling

149. Smear the new 'O' ring with petroleum jelly and fit to the piston (Fig. 49).

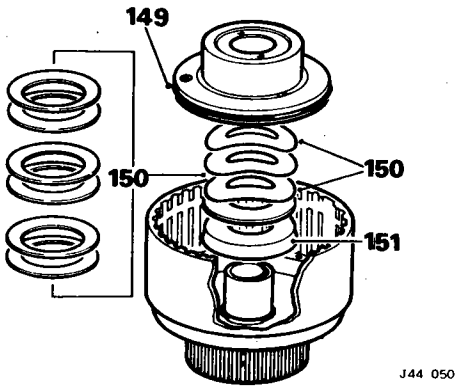


Fig. 49

150. Position the Belleville and plain washers in the piston (Fig. 49), retain the washers with a smear of petroleum jelly.

NOTE: Later cars are fitted with six Belleville washers and no plain washers. Replace these in three opposing pairs, the inner diameters of the washers in each pair being in contact. This washer arrangement may be used to replace the earlier assembly, but if this is done the plain washer originally fitted must be discarded.

151. Soak the new oil seal in clean transmission fluid and insert in the piston (Fig. 49).

NOTE: Open end of seal faces outwards.

152. Position the front clutch piston replacer tool 18G 1107 in the clutch drum (Fig. 50).
153. Lubricate the piston and replacer tool with clean transmission fluid.
154. Install the piston (Fig. 50); remove the tool.

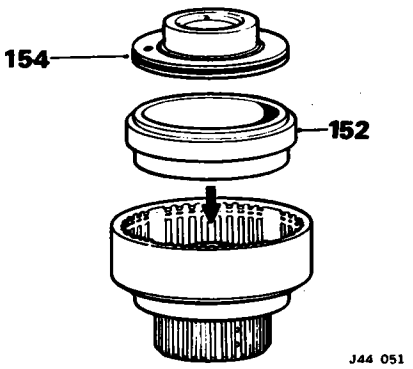


Fig. 50

155. Fit the release diaphragm (Fig. 51).
156. Fit the snap-ring (Fig. 51); ensure that the ring is correctly seated in the groove.
157. Fit the steel backing washer and new bronze thrust washer on the forward sun gear shaft (Fig. 51); ensure that the backing washer is seated correctly.
158. Ensure that the gaps in the sealing rings on the input end of the forward sun gear shaft are staggered (Fig. 51).
159. Check to ensure that the teeth of the rear clutch inner plates are in alignment.
160. Carefully lower the front clutch hub and piston assembly over the shaft and into rear clutch (Fig. 51).

continued

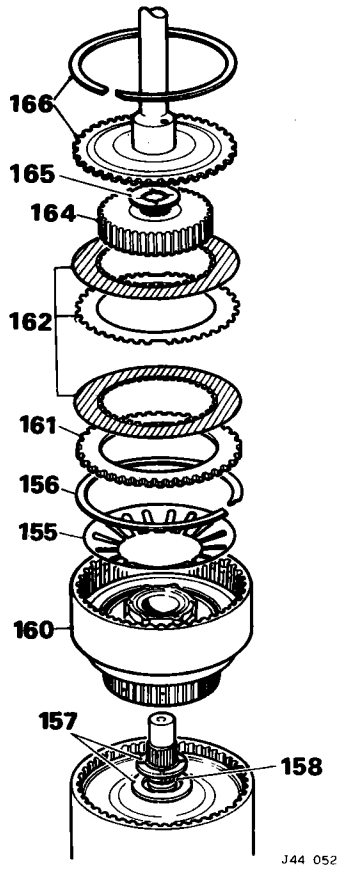


Fig. 51

NOTE: To facilitate engagement of gear with the rear clutch plates, the front clutch should be moved backwards and forwards slightly.

161. Fit the ring gear (Fig. 51).
162. Position the inner and outer clutch plates in the clutch drum (Fig. 51).

NOTE: For identification purposes, two pairs of teeth at 180° have been omitted on the outer clutch plates.

163. Check to ensure that the teeth of the inner clutch plates are in alignment.
164. Fit the clutch hub; ensure that the hub fully engages all clutch plates (Fig. 51).
165. Position the new bronze thrust washer in the recess in the clutch hub (Fig. 51).
166. Fit the turbine shaft and the snap-ring; ensure that the snap-ring is correctly seated in groove (Fig. 51).

CAUTION: On no account should the front and rear clutch assemblies be separated as damage to the sealing rings on the forward sun gear shaft will result.

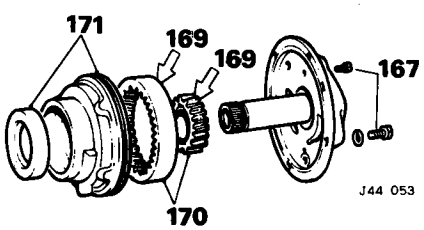


Fig. 52

PUMP

Overhaul

Dismantling

167. Remove the bolts, screw and spring washers securing the pump adaptor to the pump body (Fig. 52).
168. Hold the pump body and using a hide mallet, gently tap the converter tube.

CAUTION: Take care that the gears are not displaced when the adaptor and body separate.

169. Mark the mating surfaces of the gears with die marker. **DO NOT** use a punch or scriber (Fig. 52).
170. Remove the gears from the pump body (Fig. 52).
171. Remove and discard the 'O' ring and oil seal (Fig. 52).

Inspection

172. Check the bearing surfaces, gears, splines and bushes for damage or wear. Should any component show signs of damage, etc., the oil pump assembly must be renewed.

Reassembling

173. Soak the new oil seal in clean transmission fluid and press carefully into the pump body; ensure that the seal is squarely seated.
174. Soak the new 'O' ring in clean transmission fluid and position in the groove in the periphery of the pump body.
175. Reverse operations 167 to 170 ensuring that reference marks on gears, adaptor and body are in alignment.
176. Progressively tighten the bolts to a torque of 35 kgf m (2.5 lbf ft).

FRONT SERVO

Overhaul

Dismantling

177. Remove the piston return spring (Fig. 53).
178. Withdraw the piston from the servo body; remove and discard the 'O' rings (Fig. 53).

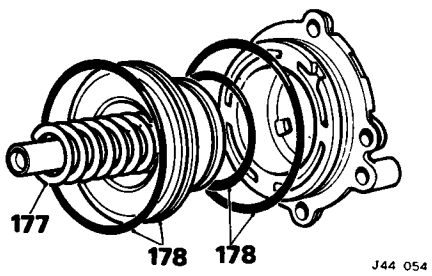


Fig. 53

Inspection

179. Check the return spring for distortion; renew if necessary. Check fluid passage for obstruction; clear the passage with compressed air only.

Reassembling

Reverse operations 177 and 178; coat the new 'O' rings with petroleum jelly prior to fitting.

REAR SERVO

Overhaul

Dismantling

180. Withdraw the piston from the servo body; remove and discard the 'O' rings (Fig. 54).

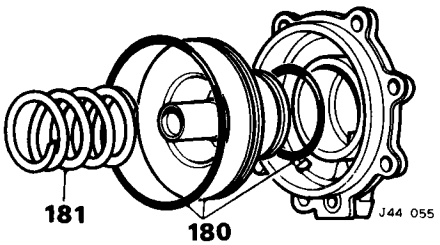


Fig. 54

Inspection

181. Check the return spring removed during operation 55 for distortion; renew, if necessary (Fig. 54).
182. Check the fluid passages for obstruction; clear the passages with compressed air only.

Reassembling

Reverse operation 180; coat the new 'O' rings with petroleum jelly prior to fitting.

GOVERNOR

Overhaul

Dismantling

183. Depress the governor weight stem to expose the circlip.
184. Remove the circlip and weight, discard the circlip (Fig. 55).
185. Withdraw the stem, spring and valve from the governor body (Fig. 55).

Inspection

186. Check all components for signs of damage and additionally, check the spring for distortion. In the event of any component being found unsatisfactory, governor assembly must be removed.

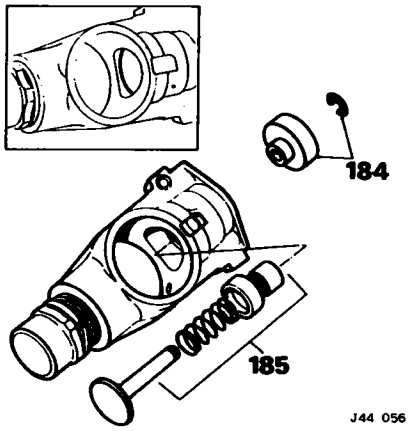


Fig. 55

Reassembling

187. Reverse operations 183 to 185; use a new circlip.
188. Check the weight stem for free movement.

CAUTION: If the weight stem shows signs of sticking, the governor assembly must be renewed.

BRAKE BANDS

Inspection

189. Check the front and rear brake bands for damage or distortion.
190. Check the linings for uneven or excess wear.

CAUTION: Bands must be renewed if any of the defects detailed above are apparent or if doubt exists as to their condition.

OUTPUT SHAFT AND RING GEAR

Overhaul

Dismantling

191. Remove and discard the sealing rings from the output shaft (Fig. 56).
192. Remove the snap-ring retaining the output shaft; withdraw the shaft (Fig. 56).

Inspection

193. Check the drillings in the output shaft for obstruction; clear with compressed air only.
194. Check the splines, sealing ring grooves and gear teeth for burrs or signs of damage; renew if damaged. Minor burrs may, however, be removed with a very fine abrasive.
195. Check bush for scores or evidence of metal transfer. Should damage be evident, output shaft must be renewed.

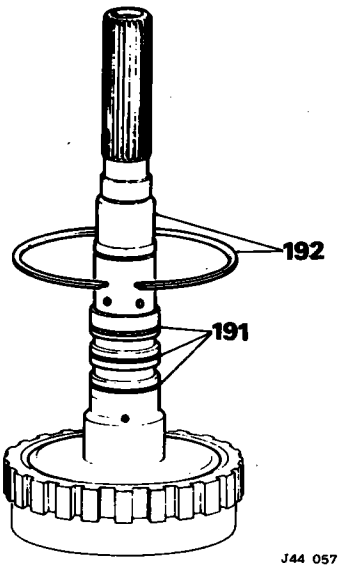


Fig. 56

Reassembling

Reverse operations 191 and 192.

CAUTION: Ensure that the gaps in the sealing rings are staggered.

GEAR CASE

Inspection

196. Remove oil cooler return union together with non-return valve assembly (if fitted) (Fig. 57).
197. By means of a piece of thin wire, check the operation of the ball valve. The valve should operate smoothly and seat fully. Check the bush in the gear case for scores, burrs or transfer of metal (Fig. 57).

NOTE: Smear threads of union with Loctite Grade AV before refitting.

198. Reverse operations 56 to 65 as applicable, lightly smearing the manual lever shaft and its bore in the servo housing with lithium-based grease.

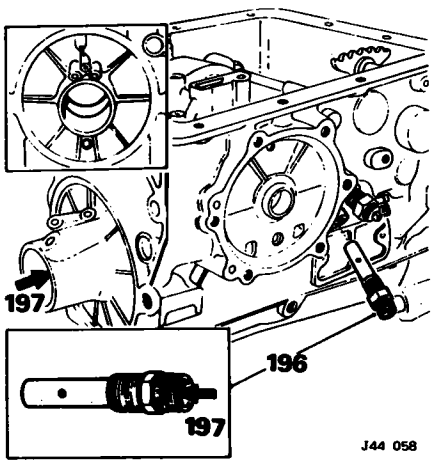


Fig. 57

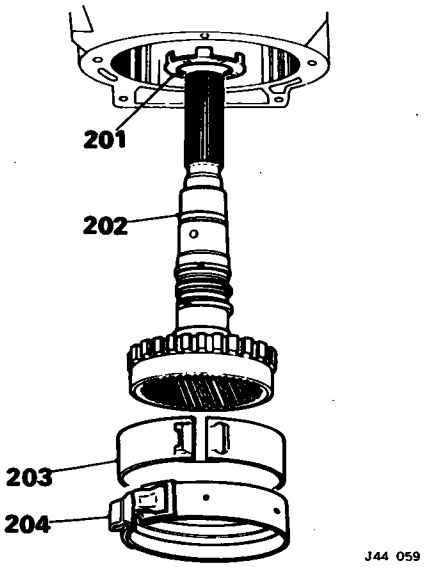


Fig. 58

TRANSMISSION ASSEMBLY

Reassembling

199. If the kickdown cable was removed, smear the new 'O' ring with petroleum jelly; position the 'O' ring on retaining plug.
200. Pass the cable into the gearcase and push the retaining plug fully home. Ensure that the lugs of the retaining plug are correctly located in the gearcase.
201. Smear the large bronze thrust washer with petroleum jelly and position the thrust washer, lugs leading, in the gearcase. Ensure that the lugs on the thrust washer are located on the gearcase (Fig. 58).
202. Fit the output shaft and ring gear assembly, taking care that the thrust washer is not displaced (Fig. 58).
203. Position the rear brake band in the gearcase (Fig. 58).
204. Position the front brake band in the gearcase (Fig. 58).
205. Rotate the centre support until the oil holes in outer periphery of support will be in approximate alignment with the oil holes in the transmission case when the clutch assemblies are fitted.
206. Hold the front and rear clutch assemblies firmly together and checking the alignment between the oil holes in the centre support and the gearcase enter the assembly into the gearcase through the rear aperture.

CAUTION: On no account allow clutch assemblies to separate as this will cause damage to the sealing rings on the forward sun gear shaft.

207. Ensure that the planet carrier gears are fully engaged with the output shaft ring gear.
208. Rotate the centre support, ensuring that the alignment of the oil holes is correct, until the securing bolts and lockwashers can be fitted. Tighten the securing bolts evenly.
209. Position the new bronze thrust washer on the oil pump; ensure that the lugs on the washer face towards the pump (Fig. 59).

continued

NOTE: This thrust washer is selective and determines the amount of gear train end-float. Two thrust washers of different thickness are available and experience has shown that if the thinner of the two washers is selected, the correct end-float is usually obtained. It is recommended therefore that this washer be used.

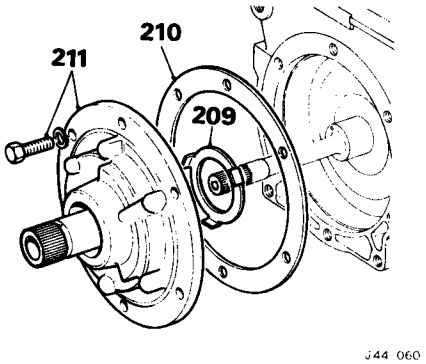


Fig. 59

210. Smear the new oil pump gasket with grease, position the gasket on the oil pump (Fig. 59).
211. Fit the oil pump ensuring that the stator tube is not displaced. **Do not** tighten the oil pump securing bolts at this stage (Fig. 59).
212. Position the new 'O' ring on the oil pump inlet tube; smear the 'O' ring with clean transmission fluid.
213. Fit the oil pump inlet and outlet tubes; also the converter feed tube. Ensure that the tubes are correctly seated (Fig. 60).

NOTE: The oil pump may be rotated slightly to achieve this.

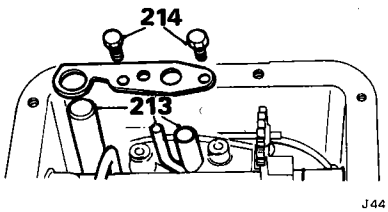


Fig. 60

214. Fit the oil tube retaining plate; tighten the bolts to a torque of 0,24 kgf m (1.75 lbf ft) (Fig. 60).
215. Tighten the oil pump securing bolts by diagonal selection to a torque of 2,63 kgf m (19 lbf ft).
216. Fit the governor feed tube, governor return tube and lubrication tube into the transmission case; ensure that the tubes are correctly seated (Fig. 61).

CAUTION: Do not use undue force when pushing the tubes into the oil holes.

217. Slide governor onto the output shaft, fit the plug and spring washer, ensure that the plug enters BLIND hole in output shaft. Tighten the plug to 2,28 kgf m (16.5 lbf ft) (Fig. 61).
218. Slide the speedometer drive gear onto the output shaft (Fig. 62).
219. Coat the new oil seal with clean transmission fluid; press the seal into the recess in the extension case. Ensure that the seal is correctly seated (Fig. 62).

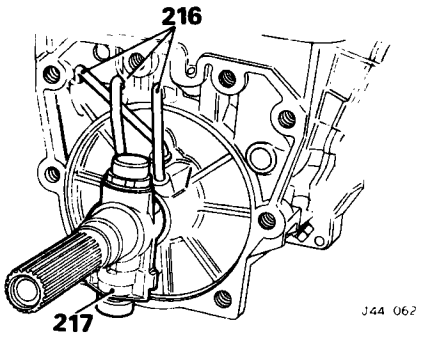


Fig. 61

220. Smear the new extension case gasket with grease, position the gasket on the extension case ensuring that the holes in the gasket and case are in alignment (Fig. 62).
221. Fit the extension case ensuring that the splines of the output shaft do not damage the oil seal and that the extension case does not foul the oil pipes (Fig. 62).

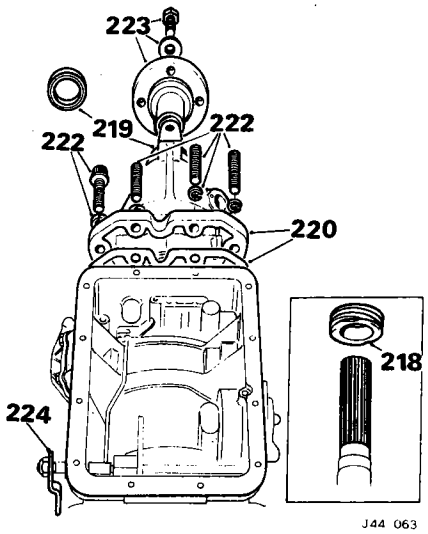


Fig. 62

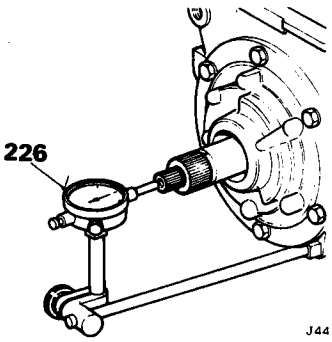


Fig. 63

222. Fit the bolts, stud bolts, washers and spacers (Fig. 62). Tighten the bolts by diagonal selection to a torque of 5,88 kgf m (42.5 lbf ft).
223. Slide the output flange onto the output shaft; fit the plain washer and nut. Do not tighten the nut at this stage (Fig. 62).
224. Move the selector lever until the parking pawl engages with the ring gear (Fig. 62).
225. Tighten the output flange securing bolt to a torque of 5,53 to 6,90 kgf m (40 to 50 lbf ft).
226. Assemble end-float gauge CBW 87 to the gearcase with the stylus contacting the end of the turbine shaft (Fig. 63).

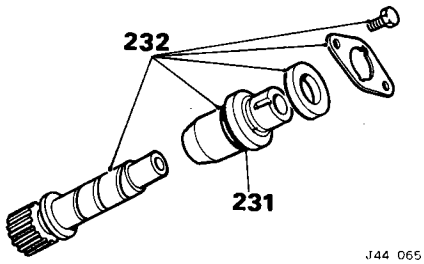


Fig. 64

227. Insert a suitable lever between the front clutch and the front of the gearcase. Ease the gear train to the rear of the gearcase and zero end-float gauge.
228. Insert the lever between the ring gear and rear clutch; ease the gear train to the front of the gearcase.
229. Note the reading on the gauge which should be between 0,20 mm and 0,73 mm (0.008 and 0.029 in).

CAUTION: If end-float exceeds 0,73 mm (0.029 in), reverse operations 217 to 225 and 209 to 215. Fit alternative thrust washer and repeat operations 209 to 215 and 217 to 229.

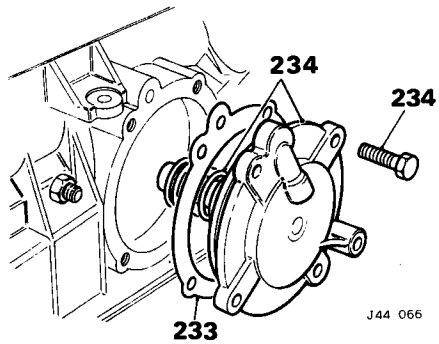
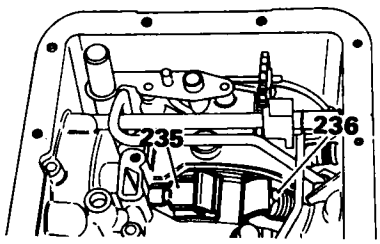


Fig. 65

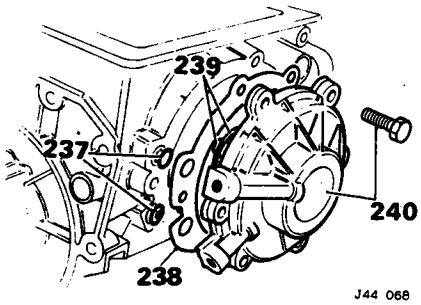
230. Remove end-float gauge.
231. Smear the new 'O' ring with petroleum jelly, position the 'O' ring in the groove in the speedometer driven gear shaft (Fig. 64).
232. Fit the speedometer driven gear; ensure that the driven gear meshes with the drive gear; do not overtighten the securing bolts (Fig. 64).
233. Smear the new front servo gasket with grease, position the gasket on the servo body (Fig. 65).
234. Fit the front servo and spring (Fig. 65). Tighten the bolts by diagonal selection to a torque of 2,63 kgf m (19 lbf ft).
235. Position the front brake band strut in the gearcase. Ensure the spigot on the strut is located in the detent in the servo rod and that the brake band is correctly positioned (Fig. 66).
236. Screw in the front brake band adjusting screw until contact is made with the brake band. Do not tighten the locknut at this stage (Fig. 66).



J44 067

Fig. 66

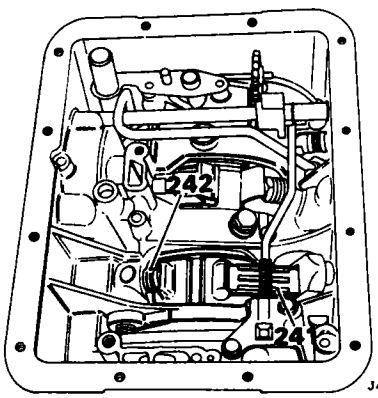
237. Smear the new 'O' rings with clean transmission oil; position the 'O' rings in the rear servo body oil holes (Fig. 67).
238. Smear the new rear servo gasket with grease, position the gasket on the servo body (Fig. 67).
239. Position the servo operating rod and spring in the servo (Fig. 67).
240. Fit the servo assembly ensuring that the operating rod is located in the detent in the operating lever. Do not tighten the securing bolts at this stage (Fig. 67).



J44 068

Fig. 67

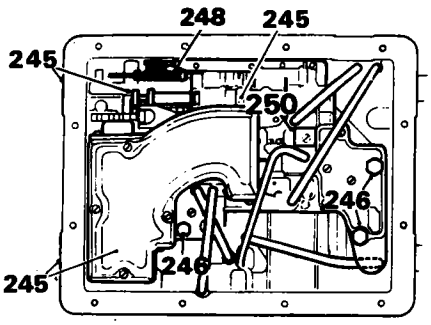
241. Position the rear brake band strut in the gearcase; ensure that the brake band is correctly positioned (Fig. 68).
242. Screw in the rear brake band adjusting screw until contact is made with the brake band. Do not overtighten the locknut at this stage (Fig. 68).



J44 069

Fig. 68

243. Tighten rear servo securing bolts by diagonal selection to a torque of 2,63 kgf m (19 lbf ft).
244. Fit tube 15D; do not use undue force.
245. Position the valve block in the transmission case, ensure that the spigot on the detent lever is located in the groove in the manual valve and that the valve body fits on the oil tubes (Fig. 69).



J44 070

Fig. 69

246. Fit the valve block securing bolts noting that the shortest bolt is fitted at the front of the valve block (Fig. 69).
247. Tighten the valve block securing bolts to a torque of 0,93 kgf m (6.75 lbf ft).
248. Connect the kick-down cable to the cam (Fig. 69).
249. Fit the oil tubes; see operation 15. Do not use undue force when fitting the tubes.
250. Position the magnet on the valve block in the position shown.
251. Smear the new oil pan gasket with grease; position the gasket on the gearcase.
252. Fit the oil pan; tighten the bolts by diagonal selection to a torque of 0,80 kgf m (5.75 lbf ft).
253. Reverse operations 1, 3 and 4, but do not fill the gearbox with fluid.
254. Tighten the front and rear brake band adjusting screws to a torque of 0,7 kgf m (5 lbf ft), and then back off the screws three-quarters of a turn.
255. Tighten each adjusting screw locknut to a torque of 4,8 kgf m (35 lbf ft).

CAUTION: Ensure the screws do not move during this operation.

REAR EXTENSION HOUSING

Remove and refit **44.20.15**

Service tool: Torque wrench CBW 547 B-75; engine support tool MS 53A

Removing

Disconnect the battery.
Position service tool MS 53A across rear engine lifting eye and set the hook to support the engine.
Remove the nut at the centre of the mounting and recover the plain washer. Remove the nuts and washers securing the forward end of the tie-plate to the rear of the transmission casing.
Remove the fastenings securing the heat shield. Locate the jack to support the mounting plate and release the four setscrews and washers.
Lower the jack and remove the mounting plate. Recover the spring washers, spacers and rubber rings.
Remove the screws securing the intermediate heat shield; withdraw the shield.
Remove the screws securing the rear heat shield to the rear engine mounting support plate. Remove the six bolts and special washers securing the rear engine mounting support plate to the floor pan.
Remove the bolts and special washers securing the rear engine mounting support plate to the transmission tunnel.
Remove the self-locking nuts and bolts securing the propeller shaft to the gearbox output flange; swing the propeller shaft to one side.

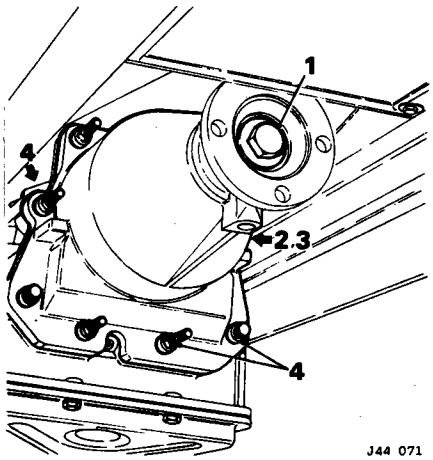
NOTE: This operation will be greatly facilitated if one rear wheel (both wheels if 'Powr-Lok' differential is fitted) is raised and the gear selector placed in 'N' (Neutral), thereby enabling the propeller shaft to be rotated.

WARNING: Chock both front wheels to prevent the vehicle moving

Using engine support tool lower the rear of the engine slightly.

CAUTION: Ensure that the engine does not foul the heater water valve.

Place the selector lever in 'P' (Park).
Remove the bolt and plain washer (1, Fig. 70) securing the gearbox output flange; withdraw the flange.



J44 071

Fig. 70

Disconnect the speedometer right-angle drive (early models).
On later models slacken knurled nut securing transducer and withdraw from speedometer drive retaining plate.
Remove the bolts (2, Fig. 70) securing the speedometer drive retaining plate; withdraw the plate.
Withdraw the speedometer driven gear (3, Fig. 70); remove and discard the 'O' ring.
Remove the bolt securing the selector cable trunnion to the mounting bracket.
Note the fitted position of the stud bolts, bolts and nuts (4, Fig. 70). Remove these fixings, withdraw the trunnion mounting bracket and remove two further stud bolts and spacers.
Withdraw the rear extension; remove and discard the gasket.
Prise the oil seal out of the rear extension housing; discard the oil seal.

continued

Refitting

Lightly score the oil seal recess in the rear extension housing.
Smear the new oil seal with clean transmission fluid and gently tap the seal into the recess. Ensure that the seal is fully seated.
Using a new gasket, refit the extension housing. Tighten the fixing to the specified torque figure.
Refit the selector cable, reconnect the speedometer cable transducer using a new 'O' ring on the speedometer driven gear.
Refit the output flange.
Refit the rear engine mounting after replacing any rubber rings which are damaged.
Run the engine until it reaches normal operating temperature.
With the engine still running, withdraw the dipstick, wipe it clean and replace it.
Immediately withdraw the dipstick and note the reading on the 'HOT' side of the dipstick. If necessary, add fluid to bring the level on the dipstick to 'MAX'.

NOTE: The difference between the 'MAX' and 'MIN' marks on the dipstick represents approximately 0,75 litre (1½ pints, 2 U.S. pints).

REAR EXTENSION HOUSING OIL SEAL

Remove and refit **44.20.18**

Removing

WARNING: Chock both front wheels to prevent the vehicle moving.

Service tool: Torque wrench CBW 547 B-75; engine support tool MS 53A

Disconnect the battery.
Position service tool MS 53 (A) across the rear engine lifting eye and set the hook to support the engine.
Remove the nut at the centre of the mounting and recover the plain washer. Remove the nuts and washers securing the forward end of the tie-plate to the rear of the transmission casing.
Remove the fastenings securing the heat shield. Locate the jack to support the mounting plate and release the four setscrews and washers.
Lower the jack and remove the mounting plate.
Recover the spring washers, spacers and rubber rings.
Remove the locknuts from the bolts securing the forward and rear brackets of the mounting, and recover the spacing tubes.
Remove the locknuts securing the mounting rubbers to centre bracket.
Remove the screw securing the intermediate heat shield; withdraw the shield.
Remove the screws securing the rear heat shield to the rear engine mounting support plate.
Remove the six bolts and special washers securing the rear engine mounting support plate to the floor pan.
Remove the bolts and special washers securing the rear engine mounting support plate to the transmission tunnel.
Remove the self-locking nuts and bolts securing the propeller shaft to the gearbox output flange; swing the propeller shaft to one side.

NOTE: This operation will be greatly facilitated if one rear wheel (both wheels if 'Powr-Lok' differential is fitted) is raised and the gear selector placed in 'N' (Neutral), thereby enabling the propeller shaft to be rotated.

Using engine support tool, lower rear of engine slightly.

CAUTION: Ensure that the engine does not foul the heater water valve.

Place the selector lever in 'P' (Park).
Remove the bolt and plain washer (1, Fig. 71) securing the gearbox output flange (2, Fig. 71); withdraw the flange.
Prise the oil seal (3, Fig. 71) out of the rear extension housing, discard the seal.

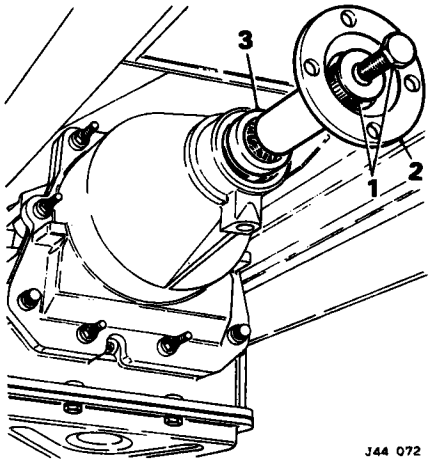


Fig. 71

Refitting

Lightly score the oil seal recess in the rear extension housing.
Smear the new oil seal with clean transmission fluid and gently tap the seal into the recess. Ensure that the seal is fully seated.

GOVERNOR

Remove and refit **44.22.01**

Removing

Prior to carrying out the following operation, the rear extension will have to be removed, see operation 44.20.15.
Slide the speedometer drive gear off the output shaft.
Position the selector lever in 'N' (Neutral). If necessary, rotate the output shaft to gain access to the governor securing plug.
Note the fitted position of the governor and remove the plug and spring washer (1, Fig. 72) securing the governor to the output shaft.
Slide the governor (2, Fig. 72) off the output shaft.

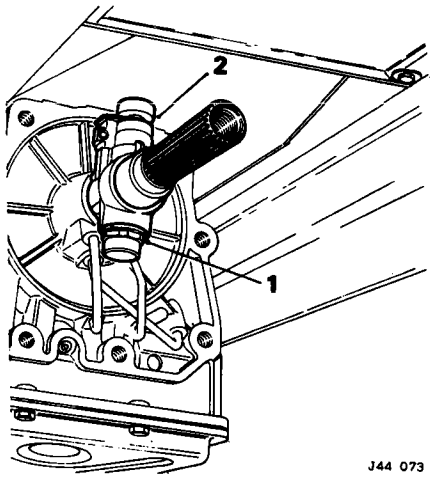


Fig. 72

Refitting

Slide the governor onto the output shaft, noting the location of the blind hole in the shaft.
Fit the governor securing plug and spring washer, ensure that the domed end of the plug enters the blind hole in the output shaft.
Tighten the plug to the specified torque.
Slide the speedometer drive gear onto the output shaft.
Refit the rear extension housing.

CAUTION: Always fit a new rear seal.

LUBRICATION SYSTEM

Drain and refill **44.24.02**

CAUTION: Due to the method of construction, it is not possible to completely drain the transmission fluid, and this should be taken into account when the transmission is being filled. As it should only be necessary to carry out the following operations preparatory to carrying out work on the transmission which will involve removal of oil pan, the following procedure should be followed.

Draining

Unscrew the union nut, withdraw the dipstick tube (1, Fig. 73), drain and discard the fluid.
Remove the bolts and plain washers (2, Fig. 73) securing the oil pan to the transmission case.
Lower the oil pan, remove and discard the gasket (3, Fig. 73).
Allow the fluid to drain and using a new gasket coated with grease, refit the oil pan.
Tighten the securing bolts by diagonal selection and reconnect the dipstick tube.
Refill the transmission with fluid to the 'MAX' mark on the dipstick.

Apply the handbrake and select 'P' position.
Run the engine until it reaches normal operating temperature.
With the engine still running, withdraw the dipstick (1, Fig. 74), wipe it clean and replace it.
Immediately withdraw the dipstick and note the reading on the 'HOT' side of the dipstick.
If necessary, add fluid to bring the level on the dipstick to 'MAX'.

NOTE: The difference between the 'MAX' (3, Fig. 74) and 'MIN' (2, Fig. 74) marks on the dipstick represents approximately 0,75 litre (1½ pints, 2 U.S. pints).

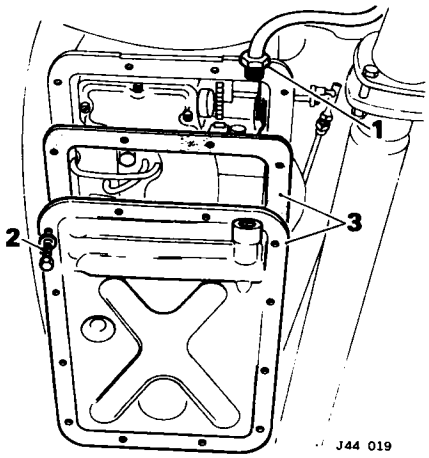


Fig. 73

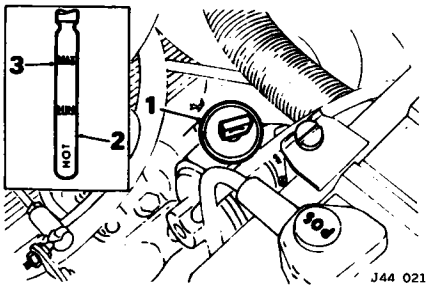


Fig. 74

OIL PAN

Remove and refit **44.24.04**
Including filter
Remove and refit **44.24.07**

Removing

Unscrew the union nut (1, Fig. 73), withdraw the dipstick tube; drain and discard the fluid.
Remove the bolts and plain washers (2, Fig. 73) securing the oil pan to the transmission case.
Lower the oil pan, remove and discard gasket (3, Fig. 73).

NOTE: If the filter is to be removed, carry out the following:

Remove the screws (1, Fig. 75) securing the suction tube to the valve block.
Lower the suction tube (2, Fig. 75), remove and discard the gasket, extract the filter.

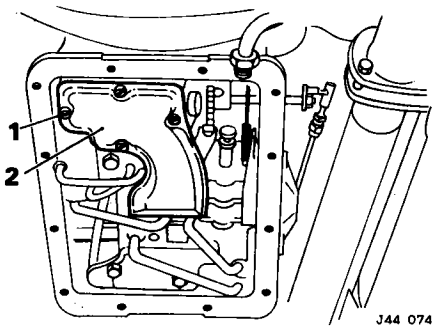


Fig. 75

Smear a new gasket with clean transmission fluid, refit the filter and suction tube.
Having refitted the filter, proceed as follows: smear a new gasket with grease and refit the oil pan.
Tighten the bolts by diagonal selection and refit the dipstick tube.
Fill the transmission with fluid to the 'MAX' marks on the dipstick.
Apply the handbrake and select 'P' position.
Run the engine until it reaches normal operating temperature.
With the engine still running, withdraw the dipstick, wipe it clean and replace it.
Immediately withdraw the dipstick and note the reading on the 'HOT' side of the dipstick.
If necessary, add fluid to bring the level on the dipstick to 'MAX'.

NOTE: The difference between the 'MAX' and 'MIN' marks on the dipstick represents approximately 0,75 litre (1½ pints, 2 U.S. pints).

DOWN-SHIFT CABLE

Pressure check and adjust 44.30.03

Service tools: Pressure gauge CBW 1C; gearbox adaptor CBW 1C-5.

Check engine tune, i.e. cylinder compressions, spark plugs, ignition timing, carburetters.
Using a suitable Allen key, remove the blanking plug (1, Fig. 76) from the gearcase.

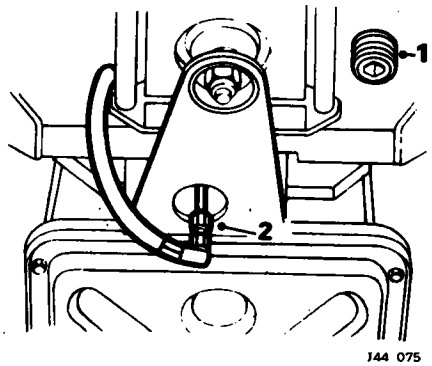


Fig. 76

CAUTION: On later cars, a bracket is fitted between the gearbox and the rear mounting. Access to the blanking plug is through the hole in the bracket and under no circumstances may the bracket be removed.

Connect the pressure gauge to the gearbox, using appropriate adaptor.

CAUTION: Do not overtighten adaptor.

Taking care to ensure that the hose is kept clear of the exhaust system, route the hose around the outside of the car and into the passenger's window.
Run the engine until it reaches normal operating temperature.
Chock the wheels and apply hand- and footbrakes.
Select 'D'; pressure gauge should read 3,85 to 5,3 kgf/cm² (55 to 75 lbf/in²) at idling speed.
Increase engine speed by 500 rev/min.

New engines:
Gauge should read 5,3 to 8,1 kgf/cm² (75 to 115 lbf/in²). The lower figure must not exceed 5,3 kgf/cm² (75 lbf/in²).

Run-in engines:
Gauge should read 5,3 to 6,9 kgf/cm² (75 to 100 lbf/in²). The lower figure must not exceed 5,3 kgf/cm² (75 lbf/in²).

If above readings are not obtained, proceed as follows:

WARNING: Engine must be switched off and selector lever in 'N' before carrying out adjustment.

Slacken the locknut (1, Fig. 77) on the downshift cable. By means of abutment nut (2, Fig. 77) on the outer cable, adjust the length of the cable to alter the pressure.

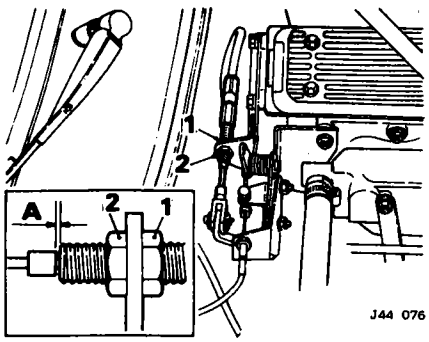


Fig. 77

NOTE: Increasing the length of the cable causes an increase in pressure; decreasing the length of the cable causes a decrease in pressure. The ferrule crimped on the inner cable should be between 0,51 and 0,76 mm (0.020 and 0.030 in.) from the threaded portion of the outer cable (dimension 'A' Fig. 77).

When the pressure is correct, tighten the locknut.
Remove the pressure gauge and adaptor, refit the blanking plug and, if necessary, top-up the transmission fluid.

CAUTION: Do not overtighten the plug.

Road-test the car as detailed on page 44.13.

FRONT BRAKE BAND

Adjust **44.30.07**

Service tools: Torque wrench CBW 547 B-75; adaptor CBW 547-50-2A

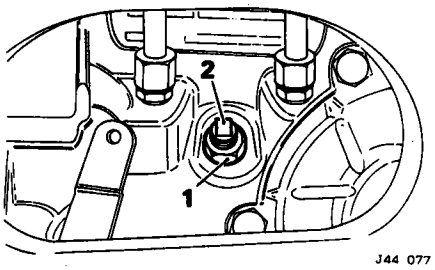


Fig. 78

Remove the self-locking nut securing the selector lever to the selector shaft; withdraw the lever.
Slacken the locknut (1, Fig. 78) securing the brake band adjuster screw.
Slacken the adjuster screw (2, Fig. 78) two or three turns.
Using torque wrench CBW 547 B-75, suitable ⅜ in drive straight extension and adaptor CBW 547-50-2A, tighten the brake band adjuster screw to a torque of 0,80 kgf m (5 lbf ft) and then back off the screw two and one half flats.
Tighten the locknut to a torque of 4,8 kgf m (35 lbf ft).

CAUTION: Ensure the adjuster screw does not turn during this operation.

REAR BRAKE BAND

Adjust **44.30.10**

Service tools: Torque wrench CBW 547 B-75; adaptor CBW 547A-50-2A

Slacken the locknut (1, Fig. 79) securing the brake band adjuster screw.
Slacken the adjuster screw (2, Fig. 79) two or three turns.

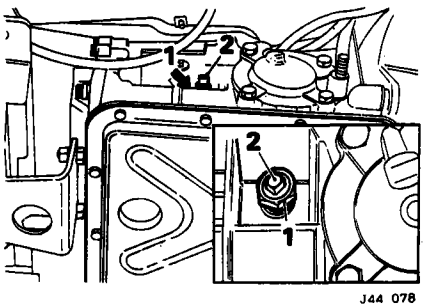


Fig. 79

Using torque wrench CBW 547 B-75 and adaptor CBW 547A-50-2A, tighten the brake band adjuster screw to a torque of 0,80 kgf m (5 lbf ft) and then back off the screw two and one half flats.
Tighten the locknut to a torque of 4,8 kgf m (35 lbf ft).

CAUTION: Ensure that the adjuster screw does not turn during this operation.

STALL SPEED

Test **44.30.13**

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

Stall speed is maximum engine revolutions recorded whilst driving the impeller against the 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.

Apply handbrake.
Apply footbrake.
Start engine.
Select 'D'.
Fully depress accelerator.
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.

Rev/min	Condition indicated
Under 1300	Stator free wheel slip
1950 to 2100	Normal
Over 2,500	Clutch slip

FRONT SERVO

Remove and refit **44.34.07**

Service tools: Torque wrench CBW 547 B-75; adaptor CBW 547A-50-2A

Removing

Position the selector lever in 'P'
Remove bolts (1, Fig. 80) securing the servo to the transmission case.
Withdraw the servo (2, Fig. 80) together with the push-rod and spring.
Remove and discard the gasket (3, Fig. 80).

NOTE: If the front servo is to be overhauled, carry out operation 44.20.06, instructions 177 to 179.

Refitting

Smear a new gasket with grease, position the gasket on the servo body.
Position the brake band strut in the transmission case, ensuring that the strut is correctly located on the brake band.

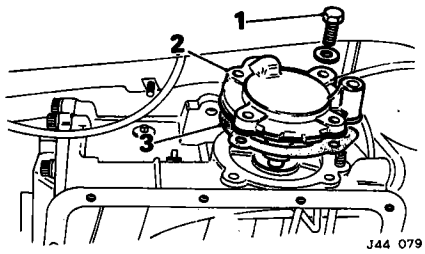


Fig. 80

Insert the servo push-rod and spring in the transmission, ensuring that the spigot on the brake band strut is located in the hole in the push-rod.
Position the servo on the transmission case, ensuring that the push-rod and spring are correctly located.
Fit and tighten the servo securing bolts by diagonal selection to the specified torque figure.
Top up the transmission fluid to the 'MAX' mark on the dipstick.
Run the engine until until it reaches normal operating temperature.
With the engine still running, withdraw the dipstick (1, Fig. 81), wipe it clean and replace it.
Immediately withdraw the dipstick and note the reading on the 'HOT' (2, Fig. 81) side of the dipstick. If necessary, add fluid to bring the level on the dipstick to 'MAX' (3, Fig. 81).

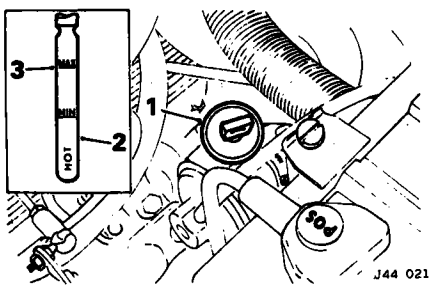


Fig. 81

NOTE: The difference between the 'MAX' (3, Fig. 81) and 'MIN' marks on the dipstick represents approximately 0,75 litre (1½ pints, 2 U.S. pints).

Remove the self-locking nut securing the selector lever to the selector shaft; withdraw the lever.
Slacken the locknut securing the brake band adjuster screw.
Slacken the adjuster screw two or three turns.
Using torque wrench CBW 547 B-75, suitable ⅜ in drive straight extension and adaptor CBW 547A-50-2A, tighten the brake band adjuster screw to a torque of 0,80 kgf m (5 lbf ft) and then back off the screw three-quarters of a turn.
Tighten the locknut to a torque of 4,8 kgf m (35 lbf ft).

CAUTION: Ensure the adjuster screw does not turn during this operation.

REAR SERVO

Remove and refit **44.34.13**

Service tools: Torque wrench CBW 547 B-75; adaptor CBW 547A-50-2A

Removing

Remove nuts, bolt and washers securing intermediate exhaust pipe to front pipe.
Separate the intermediate pipe from the front pipe; remove the sealing olive.
Remove the screws and special washers securing the left-hand heat shield to the body; withdraw the heat shield.
Remove the self-locking nut securing the selector lever to the selector shaft; withdraw the lever and selector cable assembly. Mark the relative position of rear servo body (1, Fig.82) to transmission case.
Remove the bolts (2, Fig. 82) securing the servo to the transmission case, withdraw the servo, push-rod and spring.
Remove and discard the gasket and two 'O' rings (3, Fig. 82).

NOTE: If the rear servo is to be overhauled, carry out operation 44.20.06, items 180 to 182.

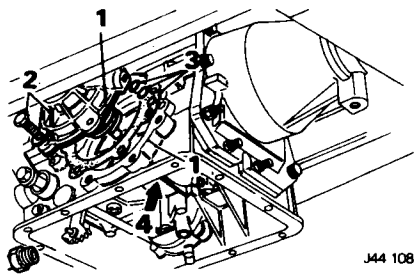


Fig. 82

Refitting

Smear new 'O' rings with clean transmission fluid, position an 'O' ring in each recess in the servo body.
Smear a new gasket with grease, position the gasket on the servo body.
Refit the selector lever to the shaft.
Refit the left-hand heat shield; smear sealing olive with 'Firegum' before refitting.
Top up the transmission with fluid to the 'MAX' mark on the dipstick.
Run the engine until it reaches normal operating temperature.

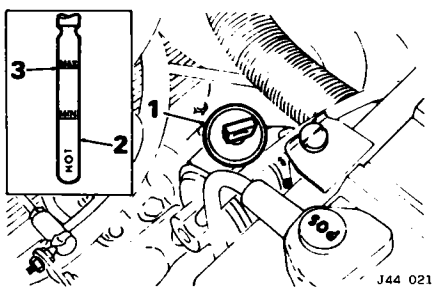


Fig. 83

With engine still running, withdraw the dipstick (1, Fig. 83), wipe it clean and replace it.
Immediately withdraw the dipstick and note the reading on the 'HOT' side of the dipstick (2, Fig. 83). If necessary, add fluid to bring the level on the dipstick to 'MAX' (3, Fig. 83).

NOTE: The difference between the 'MAX and 'MIN' marks on the dipstick represents approximately 0,75 litre (1½ pints, 2 U.S. pints).

Slacken the locknut securing brake band adjuster screw.
Slacken the adjuster screw two or three turns.
Using torque wrench CBW 547 B-75, and adaptor CBW 547A-50-2A, tighten the brake band adjuster screw to a torque of 0,80 kgf m (5 lbf ft) and then back off the screw three-quarters of a turn. Tighten the locknut to a torque of 4,8 kgf m (35 lbf ft).

CAUTION: Ensure that adjuster screw does not turn during this operation.

VALVE BLOCK

Remove and refit **44.40.01**

Service tool: Torque wrench CBW 547 B-75

Removing

Position the selector lever in 'P' (Park).
Unscrew the union nut (1, Fig. 84), withdraw the dipstick tube; drain and discard the fluid.

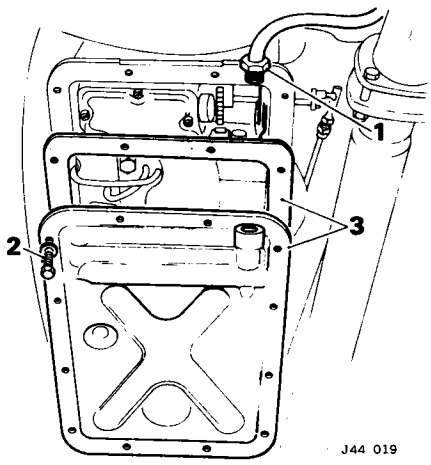


Fig. 84

Remove the bolts and plain washers (2, Fig. 84) securing the oil pan to the transmission case.
Lower the oil pan (3, Fig. 84), remove and discard the gasket.
Disconnect the kick-down cable from the cam.
Note the fitted position of the oil tubes (see operation 44.20.06, item 15) and using a suitable screwdriver, lever tubes out of the transmission.
Note the fitted position of the magnet; withdraw the magnet.
Remove the bolts securing the valve block to the transmission, noting that the shortest bolt is fitted at the front.
Pull the valve block downwards, ensuring that the manual valve is not displaced

CAUTION: Extreme care must be taken to ensure that the action of removal does not damage the converter feed, pump feed or pump outlet pipes.

NOTE: If the valve block is to be overhauled, carry out operation 44.20.06, items 68 to 94.

Refitting

Ensure that the converter feed, pump feed and pump outlet pipes are not damaged; push each pipe upwards to ensure correct location is maintained.
Locate the valve block in the transmission case ensuring that the tubes are correctly located in the valve block.

NOTE: The valve block may be tapped gently with a hide mallet to ensure correct location is obtained.

Ensure that the spigot on the detent lever engages with the groove machined in the manual valve.
Refit the valve block securing bolts, ensuring that the shortest bolt is fitted at the front.
Reconnect the kick-down cable to the cam.
Smear a new oil pan gasket with grease and refit the oil pan. Tighten the securing bolts by diagonal selection.
Refit the dipstick tube and fill the transmission with fluid to the 'MAX' mark on the dipstick.
Run the engine until it reaches normal operating temperature.

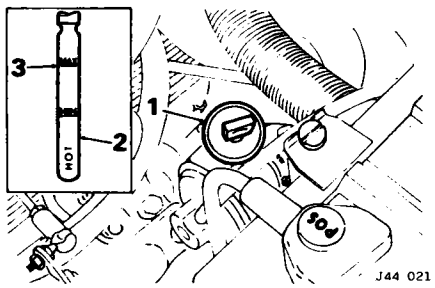


Fig. 85

With the engine still running, withdraw the dipstick (1, Fig. 85), wipe it clean and replace it.
Immediately withdraw the dipstick and note the reading on the 'HOT' side of the dipstick (2, Fig. 85). If necessary, add fluid to bring the level on the dipstick to 'MAX' (3, Fig. 85).

NOTE: The difference between the 'MAX' and 'MIN' marks on the dipstick represents approximately 0,75 litre (1½ pints, 2 US pints).

CONTENTS

1. Converter pump
2. Pump assembly
3. Forward clutch
4. Direct clutch
5. Front band
6. Intermediate clutch
7. Intermediate sprag
8. Centre support
9. Low roller clutch
10. Rear band
11. Output carrier and internal gear
12. Output shaft
13. Sun gear
14. Speedometer driven gear
15. Rear internal gear
16. Reaction carrier
17. Sun gear shaft
18. Detent solenoid
19. Main shaft
20. Control valve
21. Filter assembly
22. Manual shaft
23. Stator
24. Turbine
25. Turbine shaft
26. Stator shaft
27. Stator roller clutch

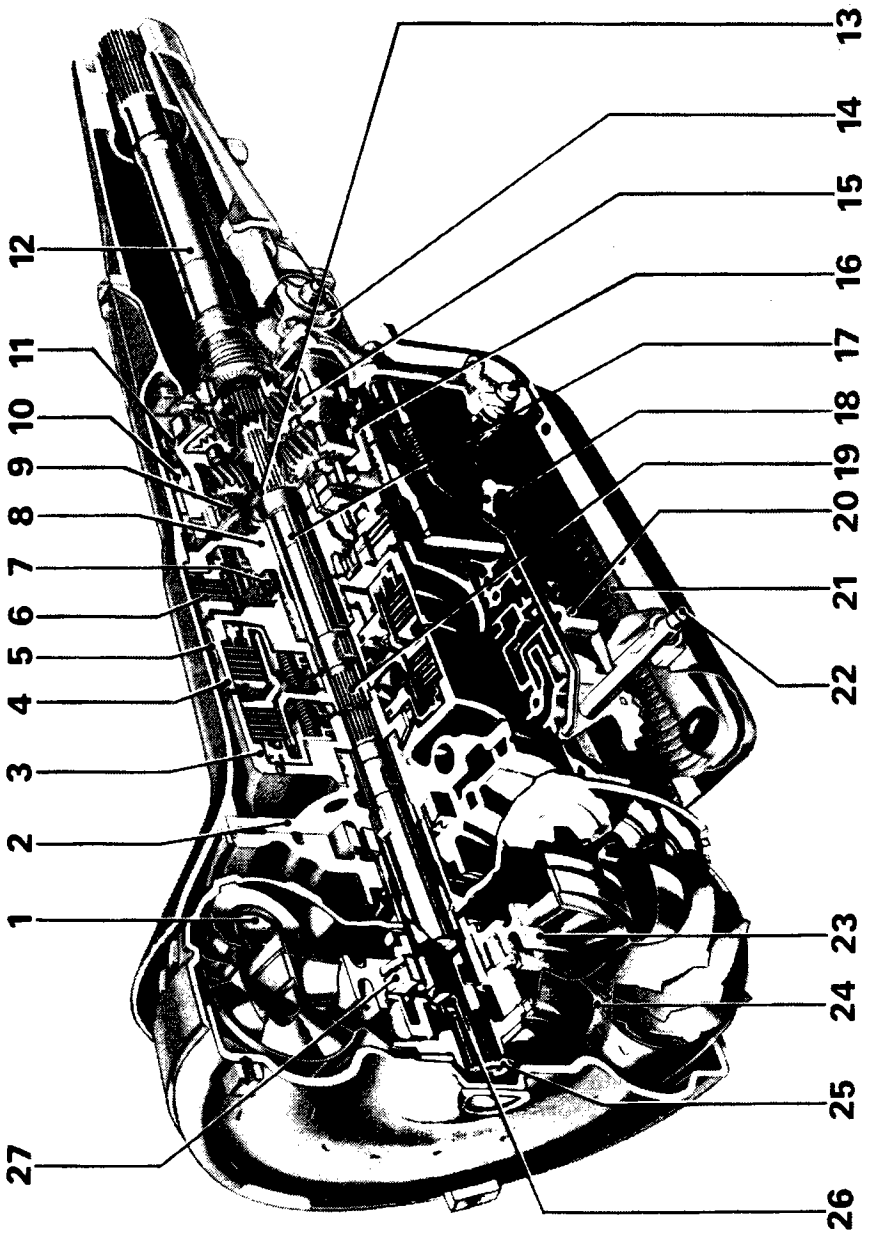


Fig. 1

DESCRIPTION

The GM 400 Hydramatic transmission is fully automatic and consists of a three-element-type torque converter and a compound epicyclic planetary gear set.

Three multiple disc clutches, two one-way clutches and two brake bands provide the friction elements required to obtain the necessary gear ratios.

The torque converter couples the engine power to the transmission and hydraulically provides additional torque multiplication when the engine and transmission are subjected to high loads.

The compound planetary gear set provides three forward ratios and one reverse. Gear-changing is fully automatic relative to vehicle and engine speed and engine torque input. A vacuum modulator is used to automatically sense engine torque input to the transmission. Engine torque sensed by the modulator is transmitted to the pressure regulator, thus ensuring that the correct gear-shifts are obtained at the relevant throttle positions. Gear or torque ratios of the transmission are as follows:

First 2.48 : 1
Second 1.48 : 1
Third 1.1 : 1
Reverse 2.07 : 1

The gear selection quadrant has six positions 'P', 'R', 'N', 'D', '2', '1'.

An easily recognizable feature on cars fitted with this transmission is the increased length of selector lever travel between 'P' and 'R'.

'P' Park enables the transmission output shaft to be locked, thereby preventing movement of the vehicle, 'P' **must not** be engaged whilst the vehicle is in motion. The engine can be started in this position.

'R' Enables the vehicle to be driven in the reverse direction.

'N' Neutral position, enables the engine to be started and run without driving the transmission.

'D' Drive for all normal driving conditions and maximum economy. It has three gear ratios. Forced down-shifts are available for safe and rapid acceleration by quickly depressing the accelerator pedal to the full throttle position.

'2' '2' has the same starting ratio as 'D' but prevents the transmission changing up from second gear, thereby retaining this gear for acceleration and engine braking. '2' can be selected at any road speed, as there is no safety override.

'1' '1' first gear ratio can be selected at any speed from 'D' or '2' but the transmission will shift to second gear and will remain in this gear until the vehicle speed is reduced sufficiently to allow first gear to be engaged.

GLOSSARY OF TERMS

1 ACCUMULATOR

Controls shift quality by delaying the full drive pressure applied to a clutch or band.

2 MANUAL VALVE

The main line fluid pressure distributing valve, directing fluid to all main components.

3 GOVERNOR ASSEMBLY

Responsible for timing the gear-changes in accordance with output shaft speed.

4 VACUUM MODULATOR VALVE

The vacuum modulator valve, activated by manifold vacuum, senses engine torque. The modulator ensures that the correct gear-shifts are obtained at relevant throttle positions.

Pressure from the modulator is applied to the 1–2 shift valve, compensating governor pressure, and to the pressure regulator valve in order to vary line pressure.

Governor pressure directed to the modulator reduces line pressure at high road speeds, when engine torque is minimal, thereby making it unnecessary for high pump output and resulting in a greater fuel economy for the unit.

5 PRESSURE REGULATOR

Controls main line pressure.

6 1–2 SHIFT VALVE

Controls the 1–2 and 2–3 shift patterns.

7 1–2 REGULATOR VALVE

Regulates modulator pressure to a proportional pressure and tends to hold the 1–2 shift valve in the down-shift position.

8 1–2 DETENT VALVE

This valve serves regulated modulator pressure and tends to hold the 1–2 shift valve in the down position shift and provides an area for detent pressure for 2–1 detent changes.

9 2–3 MODULATOR VALVE

This valve is sensitive to modulator pressure and applies a variable force on the 2–3 shift valve, tending to hold the valve in the down position.

10 3–2 VALVE

This prevents modulator pressure from acting on the shift valves after the direct clutch has been applied, thereby preventing a down-shift from third gear should wide throttle openings be used. If detent or modulator pressure rises above 6,5 kgf/cm² (92 lbf/in²) however, this pressure will then be directed to the shift valves to effect a down-shift.

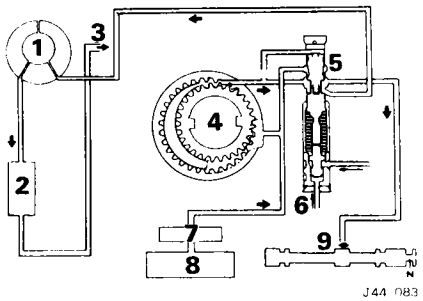


Fig. 2

1. Torque converter
2. Oil cooler
3. Oil to transmission
4. Oil pump
5. Pressure regulator valve
6. From modulator or throttle valve
7. Oil filter
8. Oil sump
9. Manual valve

***CAUTION:** Only Gamlen 265 or Rochem Electrical Quick Dry Solvent should be used for cleaning transmission components.*

CLUTCH AND BAND APPLICATION CHART

Selector position	Forward Clutch	Direct Clutch	Front Band	Intermediate Clutch	Intermediate Clutch	Clutch	Rear Band
Park — Neutral							
Drive 1	●					●	
D 2	●			●	●		
3	●	●		●			
Intermediate							
2 1st	●					●	
2nd	●		●	●	●		
Lock-up							
1 1st	●					●	●
Reverse		●					●

CLUTCH PLATE IDENTIFICATION

	Forward Clutch		Direct Clutch		Intermediate Clutch	
	Pressure Plates	Friction Plates	Pressure Plates	Friction Plates	Pressure Plates	Friction Plates
Flat	5	5	5	5	3	—
Waved	—	—	—	—	—	3
Dished	1	—	1	—	—	—

NOTE: The direct clutch has one plate of 2,2 mm (0.091 in) thickness, the other four being of 1,9 mm (0.077 in) thickness.

SHIFT SPEEDS

NOTE: The figures in the following table refer only to the following:

1. All cars with a 3.31:1 final drive ratio.
2. Cars with a final drive ratio of 3.07:1 prior to transmission No. 79ZA2411.

All are pre HE vehicles.

For HE vehicles see page 44—34.

Light Throttle		Full Throttle		Full Throttle Kick-down		Kick-down		Down-shift		Roll Out	
1-2	2-3	1-2	2-3	1-2	2-3	3-2	3-1	Manual 2-1	PTKD* 3-2	3-2	2-1
5-10 m.p.h.	10-20 m.p.h.	45 ± 5 m.p.h.	60 ± 5 m.p.h.	55 ± 5 m.p.h.	85 ± 5 m.p.h.	80 ± 5 m.p.h.	28-35 m.p.h.	13-18 m.p.h.	40-50 m.p.h.	8-12 m.p.h.	3-8 m.p.h.
8-16 km/h	16-32 km/h	72 ± 8 km/h	96 ± 8 km/h	88 ± 8 km/h	136 ± 8 km/h	128 ± 8 km/h	43-56 km/h	21-29 km/h	64-80 km/h	13-19 km/h	5-13 km/h

*PTKD = Part Throttle Kick-down

NOTE: The figures in the following table refer only to cars with a final drive ratio of 3.07:1 built from transmission No. 79ZA2411 and are pre HE vehicles — for HE vehicles see page 44—34.

Light Throttle		Full Throttle		Full Throttle Kick-down		Kick-down		Down-shift		Roll Out	
1–2	2–3	1–2	2–3	1–2	2–3	3–2	3–1	Manual 2–1	PTKD* 3–2	3–2	2–1
5–12 m.p.h.	12–20 m.p.h.	40–50 m.p.h.	50–70 m.p.h.	50–60 m.p.h.	80–95 m.p.h.	70–85 m.p.h.	28–38 m.p.h.	13–18 m.p.h.	40–50 m.p.h.	8–12 m.p.h.	3–8 m.p.h.
8–19 km/h	19–32 km/h	64–80 km/h	80–113 km/h	80–96 km/h	129–153 km/h	113–137 km/h	45–62 km/h	21–29 km/h	64–80 km/h	13–19 km/h	5–13 km/h

*PTKD = Part Throttle Kick-down

VALVE SPRING IDENTIFICATION FOR PRE HE VEHICLES

VALVE SPRING IDENTIFICATION CHART				
Function	**Colour**	**Free Length**	**No. of Coils**	**Outside Diameter**
1–2 accumulator valve	Dark Green	1.648 in	12.5	0.480 in
Pressure regulator	Light Blue	3.343 in	13	0.845 in
Front servo piston	Natural	1.129 in	4	1.257 in
Rear accumulator	Yellow	2.230 in	8.5	1.130 in
Governor	Dark Green	0.933 in	9.5	0.316 in
	Red	0.987 in	8.5	0.306 in
1–2 regulator	Pink	0.936 in	13.5	0.241 in
2–3 valve	Red	1.491 in	17.5	0.328 in
2–3 valve	Gold	1.555 in	18.5	0.326 in
3–2 valve	Green	2.017 in	16.5	0.400 in
Front accumulator piston	Natural	2.927 in	8.5	1.260 in
Detent regulator	Green	2.735 in	26.5	0.340 in

For HE vehicles see page 44—34.

TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	Nm	kgf m	lbf ft
Control valve unit to case	¼ in dia. X 20	10.84	1,1	8
Governor cover to case	5/16 in dia. X 18	24.40	2,49	18
Line pressure plug	⅛ in dia. pipe	13.55	1,38	10
Manual shaft to detent lever	⅜ in dia. X 24	24.40	2,49	18
Parking pawl bracket	5/16 in dia. X 18	24.40	2,49	18
Pump body to cover	5/16 in dia. X 18	24.40	2,49	18
Pump to case	5/16 in dia. X 18	24.40	2,49	18
Rear extension	⅜ in dia. X 16	31.18	3,18	23
Rear servo cover	5/16 in dia. X 18	24.40	2,49	18
Solenoid to case	¼ in dia. X 20	16.26	1,66	12
Speedometer drive shaft nut	¼ in dia. X 28	13.55	1,38	10
Sump	5/16 in dia. X 18	16.26	1,66	12
Vacuum modulation retainer to case	5/16 in dia X 18	24.40	2,49	18

SERVICE TOOLS

18G 677-2	Adaptor Pressure Take-Off
18G 1295	Piston Accumulator Control Valve Compressor
18G 1296	Front Pump Remover Screws
18G 1297	Front Pump and Tailshaft Oil Seal Replacer
18G 1298	Forward and Direct Clutch Piston Replacer Inner and Outer Protection Sleeve
18G 1309	Intermediate Clutch Inner Seal Protection Sleeve
18G 1310	Band Application Pin Selection Gauge
18G 677 ZC	Pressure Test Equipment
18G 1016	Clutch Spring Compressor
18G 1004	Circlip Pliers
18G 1004 J	Circlip Pliers Points
CBW 87	End-float Checking Gauge

TRANSMISSION FLUID LEVEL

Check

Ensure that the transmission is at normal operating temperature by either:

a. Running the vehicle on a rolling road utilizing all the gear positions until fluid reaches a temperature of 80°C, or
b. Conducting a road test of at least 24 km (15 miles).

CAUTION: Engine temperature is no indication of transmission temperature.

Check that the vehicle is on level ground.
Firmly apply the hand- and footbrakes, and run the engine at a maximum speed of 750 rev/min for several minutes. To ensure that the valve block is primed, slowly move the selector lever through all the gear positions.
With the engine still running, engage 'P' (Park) and withdraw the dipstick. Wipe it clean with a lint-free cloth and replace it.
Immediately remove the dipstick again, and note the level indicated on the 'HOT' scale. It should be between the 'MAX' and 'MIN' marks.
Carefully top up the fluid to the correct level, using only a Dexron 2D type fluid. Take care not to overfill.

RECOMMENDED TRANSMISSION FLUID

Dexron 2D type fluid only should be used, which must not be mixed with other transmission fluids.

NOTE: Dexron 2D Fluid is red in colour.

Fluid quantity

Transmission completely dry, but a quantity of fluid still remains in the torque converter; fill with approximately 9,12 litres (16 pints).

Fluid condition

Any moisture in the transmission fluid will cause the transmission seals to swell and will also soften friction material. If this fault is found early, the leak repaired and the fluid changed, no overhaul is needed unless there are obvious defects in the operation of the transmission.

Varnished fluid

This gives the fluid a dark brownish colour. If fluid is varnished through age or overheating, then it will have a pronounced brown colour.
Once varnish starts forming it builds up on all the valves, servos, clutches, etc., and causes sticking and hardening of the seals. Eventually it will clog the filter, and pump pressure will drop. When this happens the torque converter will not fill and there will be insufficient pressure for the clutch or band to hold torque, hence the transmission will not operate.
An evaluation of the degree of varnish will decide whether an overhaul is required or just a fluid change.

Low fluid level

This can result in the pump drawing air along with the fluid, thereby making fluid spongy and compressible due to air bubbles. This can result in delayed engagement or lack of drive, slipping gear-shifts or clutch burn-outs.
Another possible fault is pump wear or governor malfunction indicated by a buzzing noise emanating from the output shaft.

High fluid level

This can cause foaming and overheating of the transmission fluid resulting in the same faults occurring as in low fluid level. Overheating causes rapid oxidation of the fluid, leading to varnish formation.

'D' DRIVE RANGE

Position the selector lever in 'D' and accelerate from rest; check speed of 1–2 and 2–3 shifts.
A part throttle down-shift, 3–2 should be available at road speeds up to approximately 72 km/h (45 m.p.h.) as throttle is opened *progressively*. Care should be taken when checking this that transmission is not 'kicked down'.
At full throttle kick-down, a down-shift into 2nd or 1st gear, depending upon road speed, should occur.
As the vehicle speed decreases, the 3–2 and 2–1 shifts should occur at speeds below 16 km/h (10 m.p.h.).
There is no engine braking in 1st or 2nd gears in this range.
Line pressure at a constant road speed/throttle opening should be 4,3 kgf/cm² (60 lbf/in²).
Line pressure during acceleration should be 7,8 to 10,5 kgf/cm² (110 to 150 lbf/in²).

'2' INTERMEDIATE RANGE

Position the selector in '2' and accelerate the car from rest; check speed of 1–2 shift.

NOTE: At no time should transmission shift into '3'.

At full throttle kick-down, a down-shift into 1st gear, at the appropriate road speed, should occur. As the car speed decreases, transmission should shift from 2 to 1 at the appropriate road speed.

NOTE: The 1–2 shift in the '2' intermediate range is somewhat firmer than in 'D'; this is normal.

Line pressure should remain steady at 10,5 kgf/cm² (150 lbf/in²).

'1' LOW RANGE

Position the selector lever in '1' and accelerate the car from rest; there should be no up-shift from '1' with the selector lever in this position.

NOTE: An up-shift to second gear will occur at an engine speed of approximately 6200 rev/min, but it is not necessary to check this.

'2nd' GEAR—OVERRUN BRAKING

Position the selector lever in 'D' and with vehicle speed at approximately 56 km/h (35 m.p.h.), closed throttle, move the selector lever to '2'. The transmission should immediately shift into '2'. There should also be an increase in engine rev/min coupled with engine braking.

Line pressure should rise from approximately 4,9 kgf/cm² (70 lbf/in²) to approximately 10,5 kgf/cm² (150 lbf/in²) as down-shift occurs.

'1st' GEAR—OVERRUN BRAKING

Position the selector lever in '2' and with vehicle speed at approximately 48 to 64 km/h (30 to 40 m.p.h.), closed throttle, move the selector lever to '1'. A down-shift from '2' to '1' should occur when the vehicle speed falls to between 64 and 32 km/h (40 and 20 m.p.h.). The 2–1 down-shift at closed throttle will be accompanied by an increase in engine rev/min coupled with engine braking.

Line pressure should be approximately 10,5 kgf/cm² (150 lbf/in²) as down-shift occurs.

'R' REVERSE

Position the selector lever in 'R' and check for reverse operation.

GOVERNOR ASSEMBLY

Check

Service tools: Pressure test equipment 18G 677ZC, adaptor set 18G 677-2.

Disconnect the vacuum pipe from the modulator and fit pressure gauge to gearbox, using adaptor 18G 677-2.

CAUTION: Do not overtighten the adaptor.

Taking care to ensure that the hose is kept clear of the exhaust system, route the hose around the outside of the car and into the passenger's window.

Run the engine until transmission fluid reaches a temperature of 80°C or drive the car for at least 24 km (15 miles).

CAUTION: Engine temperature is no indication of transmission temperature.

Support the car on suitable 'wheel-free' equipment and raise the driving wheels clear of the ground.

Start the engine, select 'D', and with the brakes released, check the line pressure at 1000 rev/min; this should be approximately 11 kgf/cm² (150 lbf/in²).

Slowly increase engine speed to 3000 rev/min and check if a line pressure drop of 0,7 kgf/cm² (10 lbf/in²) occurs.

If no pressure drop occurs, inspect the governor for:

1. Sticking valve
2. Sticking weight
3. Restricted orifice in governor valve
4. Scored or cracked bore
5. Restricted feed pipe or filter

STALL SPEED

Test **44.30.13**

Service tools: Pressure test equipment 18G 677 ZC, pressure take-off adaptor 18G 677-2.

CAUTION: The test MUST NOT last longer than 10 seconds. Always allow the engine to idle for at least two minutes between tests to allow the transmission to cool down. Do not carry out more than six tests without allowing the engine to cool down for at least half an hour.

The results of this test indicate the condition of the transmission and torque converter.

Stall speed is the maximum engine revolutions recorded whilst driving the impeller against the 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.

Fit the oil pressure test equipment 18G 677 ZC and the pressure take-off adaptor to the transmission.

Chock the road wheels and firmly apply both foot- and handbrake.

Start the engine and engage 'D'. Apply full throttle and note maximum engine speed and line pressure achieved.

If transmission slip occurs, stop the engine immediately and investigate the cause.

Restart the engine and repeat the above procedure with the selector lever in 'R'.

Data

Stall speed	2100 to 2400 rev/min
Stall pressure in 'D'	9,8 to 9,9 kgf/cm² (145 to 155 lbf/in²)
Stall pressure in 'R'	15,4 to 16,8 kgf/cm² (240 to 260 lbf/in²)

Rev/min	Condition Indicated
Under 1800	Stator slip
1800 to 1900	Poor engine tune
2100 to 2400	Normal
Over 2400	Transmission slip

ROAD TEST

Service tools: Pressure test equipment 18G 677 ZC, pressure take-off adaptor 18G 677-2

Unless the fault is immediately obvious a road test should always be made to establish at first hand, preferably with the customer, what the fault symptoms are and under what conditions they occur. Experience has shown that reports of faults are not reliable and it may even be that the supposed fault is a standard feature. Check all gears, that all shifts occur, and check shift speeds and quality. The part throttle downshift should not be mistaken as being a full throttle kick-down.

Exercise great care that further damage is not done to the transmission during test, particularly if the fault may involve slipping. Try not to let the transmission slip at all; clutches and bands can burn out in seconds.

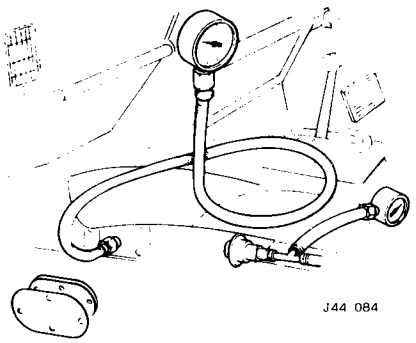
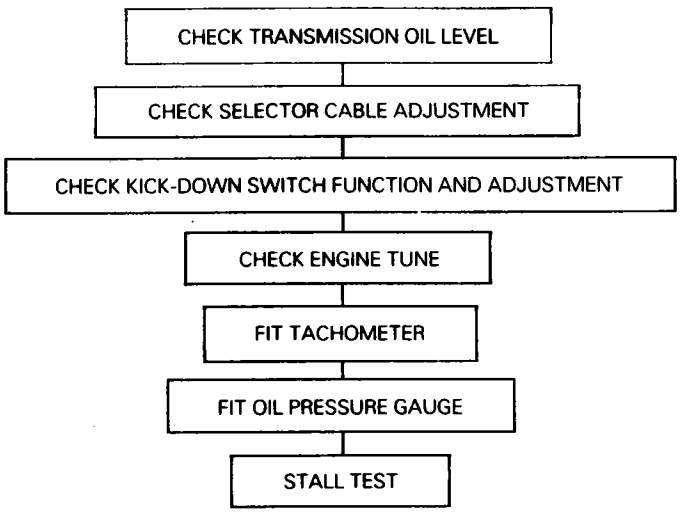


Fig. 3

FAULT-FINDING AND DIAGNOSIS

PRELIMINARY FAULT-FINDING PROCEDURE



CAUTION: Total running time for this combination must not exceed 2 minutes

	Check oil pressures in the following manner		
	Range	**Oil Pressure**	
		kgf/cm²	**lbf/in²**
1	Neutral—brakes applied—engine at 1000 rev/min	3,8 to 4,9	55 to 70
2	Drive—idle—set engine idle to specifications	4,2 to 5,9	60 to 85
3	Drive—brakes applied—engine at 1000 rev/min	*4,2 to 6,3	*60 to 90
4	2 or 1—brakes applied—engine at 1000 rev/min	9,5 to 11,2	135 to 160
5	Reverse—brakes applied—engine at 1000 rev/min	6,7 to 10,5	95 to 150
6	Drive—brakes applied—engine at 1000 rev/min—down-shift switch activated	6,3 to 7,7	90 to 100
7	Governor check, see below	Drop of 0,7 kgf/cm² or more	Drop of 10 lbf/in² or more
8	Drive—48 km/h (30 m.p.h.)—closed throttle on road, or on hoist	†3,8 to 4,9	†55 to 70

* If high line pressures are experienced, check vacuum and, if necessary, the modulator.
† Vehicle on hoist, driving wheels off ground, selector in drive, brakes released; raise speed to 3000 rev/min, close throttle and read pressure between 2000 and 1200 rev/min.

PRELIMINARY DIAGNOSTIC CHART

TRANSMISSION MALFUNCTION RELATED TO OIL PRESSURE

	1	2	3	4	5	6	7	8	
MALFUNCTION	NEUTRAL —BRAKES APPLIED 1000 REV/MIN	DRIVE— IDLE	DRIVE— BRAKES APPLIED 1000 REV/MIN	'1'— BRAKES APPLIED 1000 REV/MIN	REVERSE —BRAKES APPLIED 1000 REV/MIN	DRIVE—BRAKES APPLIED 1000 REV/MIN DOWN-SHIFT SWITCH ACTIVATED	PRESSURE DROP OCCURS WHILE ENGINE REV/MIN INCREASES FROM 1000 to 3000 REV/MIN WHEELS FREE TO MOVE*	DRIVE— 48 KM/H (30 M.P.H.) CLOSED THROTTLE	**POSSIBLE CAUSE OF MALFUNCTION**
	OIL PRESSURE	OIL PRESSURE	OIL PRESSURE	OIL PRESSURE	OIL PRESSURE	OIL PRESSURE		OIL PRESSURE	
NO 1–2 UP-SHIFT AND/OR DELAYED UP-SHIFT	Normal	Normal	Normal	Normal	Normal	Normal	0,7 kgf/cm² (10 lbf/in²) drop or more	Normal	Malfunction in control valve assembly
	Normal	Normal	Normal	Normal	Normal	Normal	Less than 0,7 kgf/cm² (10 lbf/in²) drop	Normal	Malfunction in governor or governor feed system
	Normal	High	High	Normal	Normal	Normal	Drop	High	Malfunction in detent system
	High	High	High	Normal	High	—	—	—	Malfiunction in modulator or vacuum feed system to modulator
SLIPPING—REVERSE	Normal	Normal	Normal	Normal	Low	Normal	Drop	Normal	Oil leak in feed system to the direct clutch
SLIPPING— 1st GEAR	Normal	Low to Normal	Low to Normal	Low to Normal	Normal	Low to Normal	—	Low to Normal	Oil leak in feed system to the forward clutch
DOWN-SHIFT WITH ZERO THROTTLE AND NO ENGINE BRAKING IN DRIVE	Normal	High	Normal	Normal	Normal	—	—	High	Detent wires switched
NO DETENT DOWN-SHIFTS	Normal	Normal	Normal	Normal	Normal	Low	Normal	Normal	Malfunctions in detent system

* Drive range, vacuum line disconnected from modulator.

NOTE: A dash (—) in the above chart means that the oil pressure reading has no meaning under the test condition.

LOW LINE PRESSURE

1. **LOW TRANSMISSION OIL LEVEL**

2. **MODULATOR ASSEMBLY** — Carry out 'bellows comparison check'.

3. **FILTER**
   a. Blocked or restricted.
   b. 'O' ring on intake pipe and/or grommet missing or damaged.
   c. Split or leaking intake pipe.
   d. Wrong filter assembly.

4. **PUMP**
   a. Pressure regulator or boost valve stuck.
   b. Gear clearance, damaged, worn. (Pump will become damaged if drive gear is installed backwards, or if converter pilot does not enter crankshaft freely.)
   c. Pump to case gasket wrongly positioned.
   d. Pump body and/or cover machining error or scoring of pump gear pocket.

5. **INTERNAL CIRCUIT LEAKS**
   a. Forward clutch leak. (Pressure normal in neutral and reverse — Pressure low in drive.)
      1 Check pump rings for damage.
      2 Check forward clutch seals for damage.
      3 Check turbine shaft journals for damage.
      4 Check stator shaft bushings for damage.
   b. Direct clutch leak. (Pressure normal in neutral, low, intermediate and drive — Pressure low in reverse.)
      1 Check centre support oil seal rings for damage.
      2 Check direct clutch outer seal for damage.
      3 Check rear servo and front accumulator pistons and rings for damage.

6. **CASE ASSEMBLY**
   a. Porosity in intake bore area.
   b. Check case for intermediate clutch plug leak.
   c. Low line pressure in reverse or '1'. If '1' — reverse check ball missing. This will cause no reverse and no over-run braking in '1'.

HIGH LINE PRESSURE

1. **VACUUM LEAK**
   a. Full leak, vacuum line disconnected.
   b. Partial leak in line from engine to modulator.
   c. Improper engine vacuum.
   d. Vacuum operated accessory leak (hoses, vacuum advance, etc.).

2. **DAMAGED MODULATOR**
   a. Stuck valve.
   b. Water in modulator.
   c. Not operating properly.

3. **DETENT SYSTEM**
   a. Detent switch actuated (plunger stuck) or shorted.
   b. Detent wiring shorted.
   c. Detent solenoid stuck open.
   d. Detent feed orifice in spacer plate blocked.
   e. Detent solenoid loose.
   f. Detent valve bore plug damaged.
   g. Detent regulator valve pin short.

4. **PUMP**
   a. Pressure regulator and/or boost valve stuck.
   b. Pump casting porous.
   c. Pressure boost valve installed backwards.
   d. Pressure boost bushing broken.
   e. Wrong type of pressure regulator valve.

5. **CONTROL VALVE ASSEMBLY**
   a. Control valve to spacer gasket wrongly fitted.
   b. Gaskets installed in reverse order.

BURNED CLUTCH PLATES

1. **FORWARD CLUTCH**
   a. Check ball in clutch housing damaged, stuck or missing.
   b. Clutch piston cracked, seals damaged or missing.
   c. Low line pressure.
   d. Manual valve wrongly fitted.
   e. Restricted oil feed to forward clutch. (Examples: Clutch housing to inner and outer areas not drilled, restricted or porosity in pump.)
   f. Pump cover oil seal rings missing, broken or undersize; ring groove oversize.
   g. Case valve body face not flat or porosity between channels.
   h. Manual valve bent and centre land not properly ground.

2. **INTERMEDIATE CLUTCH**
   a. Constant bleed orifice in centre support blocked.
   b. Rear accumulator piston oil ring, damaged or missing.
   c. 1–2 accumulator valve stuck in control valve assembly.
   d. Intermediate clutch piston seals damaged or missing.
   e. Centre support bolt loose.
   f. Low line pressure.
   g. Intermediate clutch plug in case missing.
   h. Case valve body face not flat or porosity between channels.
   i. Manual valve bent and centre land not properly ground.

3. **DIRECT CLUTCH**
   a. Restricted orifice in vacuum line to modulator (poor vacuum response).
   b. Check ball in direct clutch piston damaged, stuck or missing.
   c. Leaking modulator bellows.
   d. Centre support bolt loose. (Bolt may be tight in support but not holding support tightly to case.)
   e. Centre support oil rings or grooves damaged or missing.
   f. Clutch piston seals damaged or missing.
   g. Front and rear servo pistons and seals damaged.
   h. Manual valve bent and centre land damaged.
   i. Case valve body face not flat or porosity between channels.

continued

j. Intermediate sprag clutch or roller clutch installed backwards.
k. 3–2 valve, 3–2 spring or 3–2 spacer pin installed in the wrong sequence in 3–2 valve bore.
l. Incorrect combination of front servo and accumulator parts.
m. Replace intermediate clutch piston seals.

NOTE: If direct clutch plates and front band are burned, check selector cable adjustment, see 44.30.04.

OIL LEAKS

NOTE: Make sure underside of transmission is clean in order to isolate oil leaks and diagnose them correctly.

1. **TRANSMISSION OIL PAN LEAKS**

a. Attaching bolts not correctly torqued.
b. Improperly installed or damaged oil pan gasket.

2. **CASE EXTENSION LEAK**

a. Attaching bolts not correctly torqued.
b. If the rear seal is suspected:
   1 Check seal for damage or wrong installation.
   2 Check slip yoke for damage.
   3 If oil is coming out the vent hole in end of the slip yoke, inspect output shaft 'O' ring for damage.
c. Extension to case gasket or seal damaged.
d. Porous casting.

3. **CASE LEAK**

a. Filler pipe 'O' ring seal damaged or missing.
b. Modulator assembly 'O' ring seal damaged.
c. Electrical connector 'O' ring seal damaged.
d. Governor cover, gasket and bolts damaged or loose; case face damaged or porous.
e. Leak at speedometer driven gear housing or seal.
f. Manual shaft seal damaged.
g. Line pressure tap plug stripped.
h. Vent pipe (refer to item 5).
i. Porous case, or cracked at pressure plug boss.

4. **FRONT END LEAK**

a. Front seal damaged (check converter neck for nicks, etc., also for pump bushing moved forward), garter spring missing.
b. Pump attaching bolts loose. Sealing washers damaged.
c. Converter leakage.
d. Large 'O' ring pump seal damaged. Also check case bore.
e. Porous casting (pump or case).
f. Pump drainback hole blocked.

5. **OIL LEAKS FROM VENT PIPE**

a. Transmission overfilled.
b. Water in oil.
c. Filter 'O' ring damaged or improperly assembled causing oil to foam.
d. Foreign material between pump and case or between pump cover and body.
e. Case porous, pump face improperly machined.
f. Pump wrongly fitted.
g. Pump to case gasket faulty.
h. Pump breather hole blocked or missing.
i. Hole in intake pipe.
j. Check ball in forward clutch housing stuck open or missing.
k. Drainback hole in case blocked or restricted.
l. Inspect turbine shaft bushing journals and stator bushings for scoring or other faults.

6. **OIL COOLER LINES**

a. Connections at cooler loose or stripped.
b. Connections at case loose or stripped.

7. **MODULATOR ASSEMBLY**

a. Vacuum diaphragm leaking.

IMPROPER VACUUM AT MODULATOR

1. **ENGINE**

   a Engine tune.
   b Loose vacuum fittings.
   c. Vacuum operated accessory leak (hoses, vacuum advance, etc.)
   d Engine exhaust system restricted.
   e. Faulty exhaust gas recirculation (E.G.R.) valve (if fitted).

2. **VACUUM LINE TO MODULATOR**

   a Leak
   b Loose fitting
   c Restricted orifice, or incorrect orifice size.
   d. Carbon build up at modulator vacuum fitting.
   e Vacuum pipe trapped or collapsed.
   f Grease in pipe (none or delayed upshift—cold).

MODULATOR ASSEMBLY DIAGNOSTIC PROCEDURE

1 **VACUUM DIAPHRAGM LEAK CHECK**

Insert a pipe cleaner into the vacuum connector pipe as far as possible and check for the presence of transmission oil. If oil is found, replace the modulator. Transmission oil may be lost through diaphragm and burned in engine.

NOTE: Fuel or water condensation may settle in the vacuum side of the modulator. If this is found without the presence of oil the modulator should **not** be changed.

2. **ATMOSPHERIC LEAK CHECK**

Apply a liberal coating of soap solution to the vacuum connector pipe seam, the crimped upper to lower housing seam, and the threaded screw seal. Using a short piece of rubber tubing, apply air pressure to the vacuum pipe by blowing into the tube and observing for bubbles. If bubbles appear, replace the modulator.

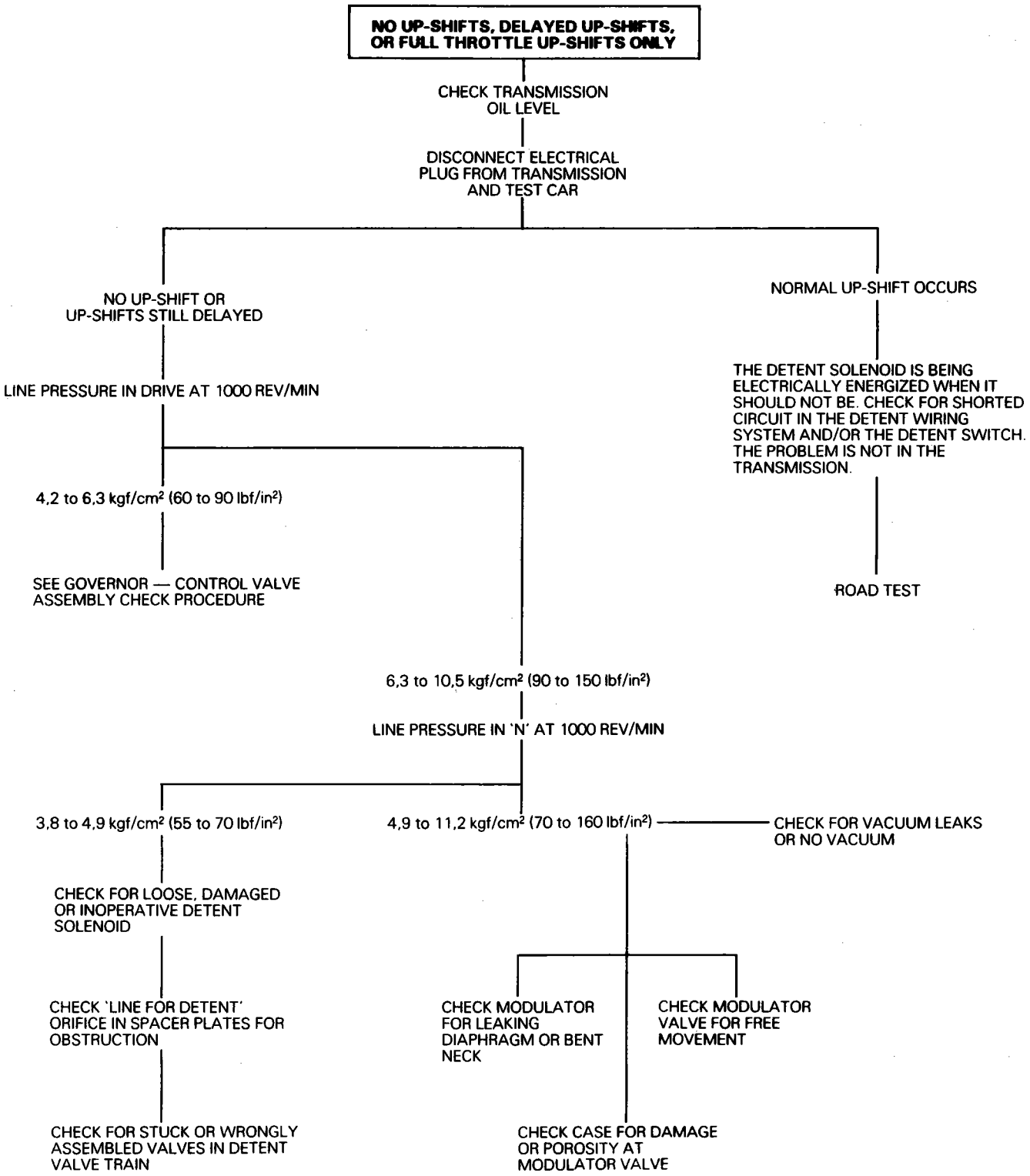
NOTE: Do not use any method other than human lung power for applying air pressure, as pressures over 0,4 kgf/cm² (6 lbf/in²) may damage the modulator.

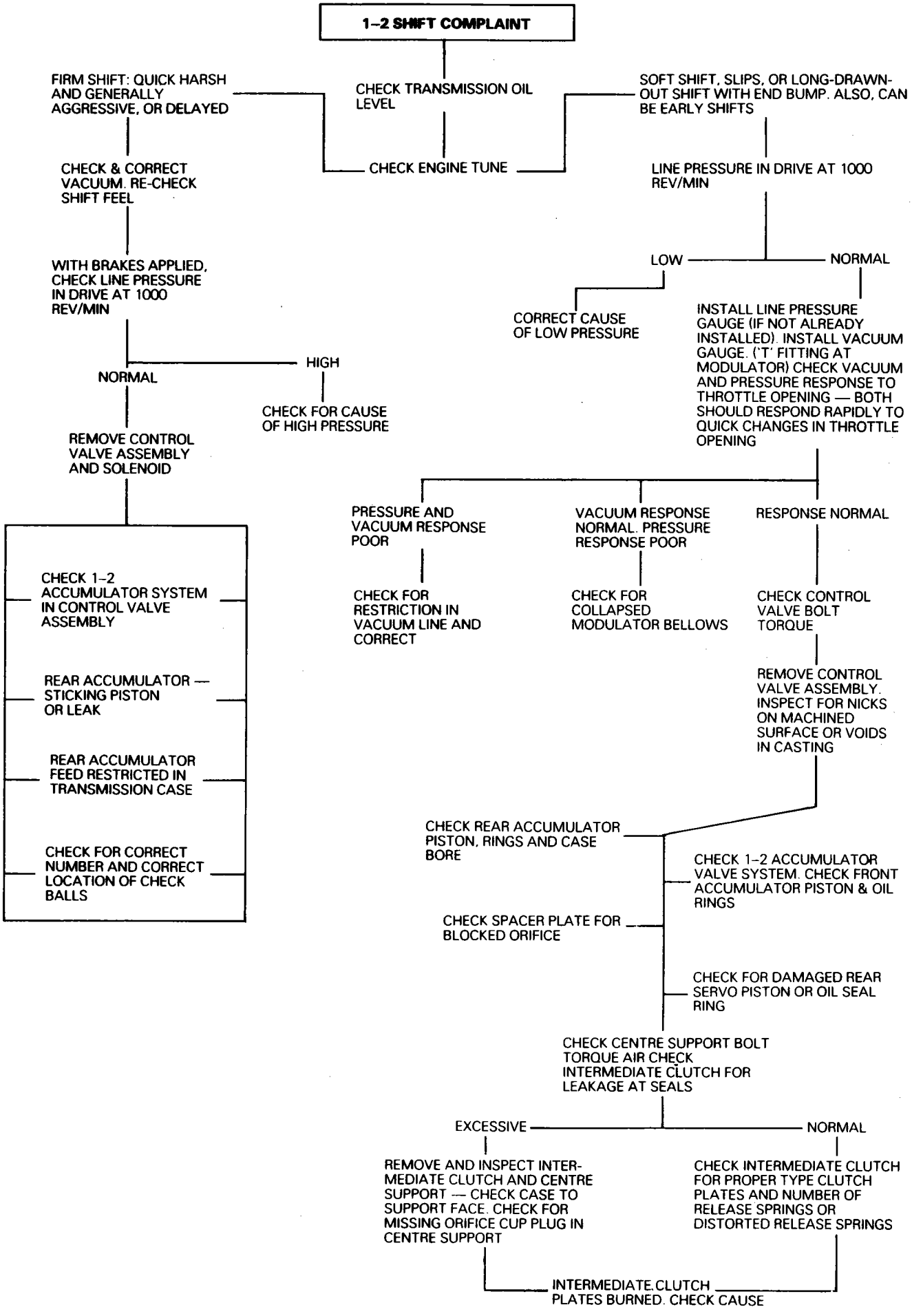
3 **BELLOWS COMPARISON CHECK**

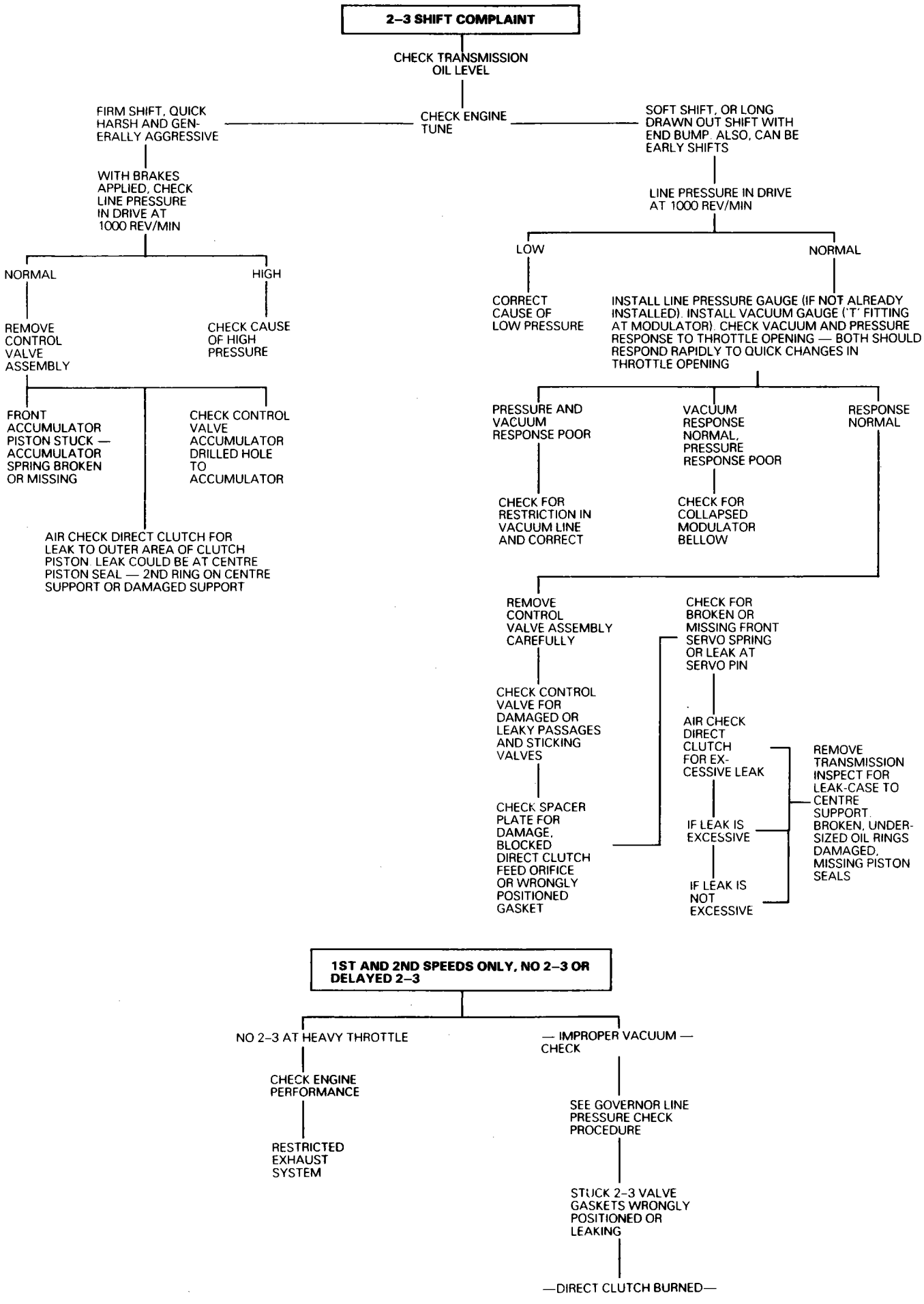
Where modulator bellows are suspect, the unit should be checked by substituting a new modulator assembly.

4 **SLEEVE ALIGNMENT CHECK**

Roll the main body of the modulator on a flat surface and observe the sleeve for concentricity to the cam. If the sleeve is concentric and the plunger is free, the modulator is acceptable.


NO UP-SHIFTS, DELAYED UP-SHIFTS, OR FULL THROTTLE UP-SHIFTS ONLY
CHECK TRANSMISSION OIL LEVEL
DISCONNECT ELECTRICAL PLUG FROM TRANSMISSION AND TEST CAR
NO UP-SHIFT OR UP-SHIFTS STILL DELAYED
NORMAL UP-SHIFT OCCURS
LINE PRESSURE IN DRIVE AT 1000 REV/MIN
THE DETENT SOLENOID IS BEING ELECTRICALLY ENERGIZED WHEN IT SHOULD NOT BE. CHECK FOR SHORTED CIRCUIT IN THE DETENT WIRING SYSTEM AND/OR THE DETENT SWITCH. THE PROBLEM IS NOT IN THE TRANSMISSION.
4,2 to 6,3 kgf/cm² (60 to 90 lbf/in²)
SEE GOVERNOR — CONTROL VALVE ASSEMBLY CHECK PROCEDURE
ROAD TEST
6,3 to 10,5 kgf/cm² (90 to 150 lbf/in²)
LINE PRESSURE IN 'N' AT 1000 REV/MIN
3,8 to 4,9 kgf/cm² (55 to 70 lbf/in²)
4,9 to 11,2 kgf/cm² (70 to 160 lbf/in²)
CHECK FOR VACUUM LEAKS OR NO VACUUM
CHECK FOR LOOSE, DAMAGED OR INOPERATIVE DETENT SOLENOID
CHECK 'LINE FOR DETENT' ORIFICE IN SPACER PLATES FOR OBSTRUCTION
CHECK MODULATOR FOR LEAKING DIAPHRAGM OR BENT NECK
CHECK MODULATOR VALVE FOR FREE MOVEMENT
CHECK FOR STUCK OR WRONGLY ASSEMBLED VALVES IN DETENT VALVE TRAIN
CHECK CASE FOR DAMAGE OR POROSITY AT MODULATOR VALVE


1–2 SHIFT COMPLAINT
CHECK TRANSMISSION OIL LEVEL
CHECK ENGINE TUNE
FIRM SHIFT: QUICK HARSH AND GENERALLY AGGRESSIVE, OR DELAYED
CHECK & CORRECT VACUUM. RE-CHECK SHIFT FEEL
WITH BRAKES APPLIED, CHECK LINE PRESSURE IN DRIVE AT 1000 REV/MIN
NORMAL
HIGH
CHECK FOR CAUSE OF HIGH PRESSURE
REMOVE CONTROL VALVE ASSEMBLY AND SOLENOID
CHECK 1–2 ACCUMULATOR SYSTEM IN CONTROL VALVE ASSEMBLY
REAR ACCUMULATOR — STICKING PISTON OR LEAK
REAR ACCUMULATOR FEED RESTRICTED IN TRANSMISSION CASE
CHECK FOR CORRECT NUMBER AND CORRECT LOCATION OF CHECK BALLS
SOFT SHIFT, SLIPS, OR LONG-DRAWN-OUT SHIFT WITH END BUMP. ALSO, CAN BE EARLY SHIFTS
LINE PRESSURE IN DRIVE AT 1000 REV/MIN
LOW
NORMAL
CORRECT CAUSE OF LOW PRESSURE
INSTALL LINE PRESSURE GAUGE (IF NOT ALREADY INSTALLED). INSTALL VACUUM GAUGE. ('T' FITTING AT MODULATOR) CHECK VACUUM AND PRESSURE RESPONSE TO THROTTLE OPENING — BOTH SHOULD RESPOND RAPIDLY TO QUICK CHANGES IN THROTTLE OPENING
PRESSURE AND VACUUM RESPONSE POOR
VACUUM RESPONSE NORMAL. PRESSURE RESPONSE POOR
RESPONSE NORMAL
CHECK FOR RESTRICTION IN VACUUM LINE AND CORRECT
CHECK FOR COLLAPSED MODULATOR BELLOWS
CHECK CONTROL VALVE BOLT TORQUE
REMOVE CONTROL VALVE ASSEMBLY. INSPECT FOR NICKS ON MACHINED SURFACE OR VOIDS IN CASTING
CHECK REAR ACCUMULATOR PISTON, RINGS AND CASE BORE
CHECK 1–2 ACCUMULATOR VALVE SYSTEM. CHECK FRONT ACCUMULATOR PISTON & OIL RINGS
CHECK SPACER PLATE FOR BLOCKED ORIFICE
CHECK FOR DAMAGED REAR SERVO PISTON OR OIL SEAL RING
CHECK CENTRE SUPPORT BOLT TORQUE AIR CHECK INTERMEDIATE CLUTCH FOR LEAKAGE AT SEALS
EXCESSIVE
NORMAL
REMOVE AND INSPECT INTER-MEDIATE CLUTCH AND CENTRE SUPPORT — CHECK CASE TO SUPPORT FACE. CHECK FOR MISSING ORIFICE CUP PLUG IN CENTRE SUPPORT
CHECK INTERMEDIATE CLUTCH FOR PROPER TYPE CLUTCH PLATES AND NUMBER OF RELEASE SPRINGS OR DISTORTED RELEASE SPRINGS
INTERMEDIATE CLUTCH PLATES BURNED. CHECK CAUSE


2–3 SHIFT COMPLAINT
CHECK TRANSMISSION OIL LEVEL
CHECK ENGINE TUNE
FIRM SHIFT, QUICK HARSH AND GENERALLY AGGRESSIVE
WITH BRAKES APPLIED, CHECK LINE PRESSURE IN DRIVE AT 1000 REV/MIN
NORMAL
HIGH
REMOVE CONTROL VALVE ASSEMBLY
CHECK CAUSE OF HIGH PRESSURE
FRONT ACCUMULATOR PISTON STUCK — ACCUMULATOR SPRING BROKEN OR MISSING
CHECK CONTROL VALVE ACCUMULATOR DRILLED HOLE TO ACCUMULATOR
AIR CHECK DIRECT CLUTCH FOR LEAK TO OUTER AREA OF CLUTCH PISTON. LEAK COULD BE AT CENTRE PISTON SEAL — 2ND RING ON CENTRE SUPPORT OR DAMAGED SUPPORT
SOFT SHIFT, OR LONG DRAWN OUT SHIFT WITH END BUMP. ALSO, CAN BE EARLY SHIFTS
LINE PRESSURE IN DRIVE AT 1000 REV/MIN
LOW
NORMAL
CORRECT CAUSE OF LOW PRESSURE
INSTALL LINE PRESSURE GAUGE (IF NOT ALREADY INSTALLED). INSTALL VACUUM GAUGE ('T' FITTING AT MODULATOR). CHECK VACUUM AND PRESSURE RESPONSE TO THROTTLE OPENING — BOTH SHOULD RESPOND RAPIDLY TO QUICK CHANGES IN THROTTLE OPENING
PRESSURE AND VACUUM RESPONSE POOR
VACUUM RESPONSE NORMAL, PRESSURE RESPONSE POOR
RESPONSE NORMAL
CHECK FOR RESTRICTION IN VACUUM LINE AND CORRECT
CHECK FOR COLLAPSED MODULATOR BELLOW
REMOVE CONTROL VALVE ASSEMBLY CAREFULLY
CHECK CONTROL VALVE FOR DAMAGED OR LEAKY PASSAGES AND STICKING VALVES
CHECK SPACER PLATE FOR DAMAGE, BLOCKED DIRECT CLUTCH FEED ORIFICE OR WRONGLY POSITIONED GASKET
CHECK FOR BROKEN OR MISSING FRONT SERVO SPRING OR LEAK AT SERVO PIN
AIR CHECK DIRECT CLUTCH FOR EXCESSIVE LEAK
IF LEAK IS EXCESSIVE
IF LEAK IS NOT EXCESSIVE
REMOVE TRANSMISSION INSPECT FOR LEAK-CASE TO CENTRE SUPPORT. BROKEN, UNDERSIZED OIL RINGS DAMAGED, MISSING PISTON SEALS
1ST AND 2ND SPEEDS ONLY, NO 2–3 OR DELAYED 2–3
NO 2–3 AT HEAVY THROTTLE
— IMPROPER VACUUM — CHECK
CHECK ENGINE PERFORMANCE
RESTRICTED EXHAUST SYSTEM
SEE GOVERNOR LINE PRESSURE CHECK PROCEDURE
STUCK 2–3 VALVE GASKETS WRONGLY POSITIONED OR LEAKING
—DIRECT CLUTCH BURNED—

NO DRIVE OR SLIPS IN DRIVE

CHECK TRANSMISSION OIL LEVEL

CHECK MANUAL LINKAGE ADJUSTMENT

LINE PRESSURE IN DRIVE AT 1000 REV/MIN

NORMAL

FORWARD CLUTCH FEED PASSAGE NOT DRILLED OR RESTRICTED

—FORWARD CLUTCH BURNED—

CHECK INTERMEDIATE ROLLER CLUTCH OR REAR ROLLER CLUTCH FOR DAMAGE OR INSTALLED BACKWARDS

IF TRANSMISSION NUMBER IS BETWEEN 842V3608 AND 842V6011 SEE PAGE 44—33.

LOW

CORRECT CAUSE OF LOW PRESSURE

NO REVERSE OR SLIPS IN REVERSE

CHECK TRANSMISSION OIL LEVEL

CHECK MANUAL LINKAGE ADJUSTMENT

LINE PRESSURE IN REVERSE AT 1000 REV/MIN

NORMAL

CONTROL VALVE ASSEMBLY

1. 2–3 VALVE TRAIN STUCK OPEN. (THIS WILL ALSO CAUSE A 1–3 UPSHIFT IN DRIVE RANGE)
2. REVERSE FEED PASSAGE—CROSS CHANNEL LEAK, POROSITY IN CASE OR VALVE BODY PASSAGE, GASKETS LEAKING.

REAR SERVO & ACCUMULATOR

1. SERVO PISTON SEAL RING DAMAGED OR MISSING.
2. SHORT BAND APPLY PIN. (THIS MAY ALSO CAUSE NO OVERRUN BRAKING OR SLIPS IN OVERRUN BRAKING '1' RANGE).
3. DAMAGED REAR SERVO PISTON OR BORE.

FORWARD CLUTCH

CLUTCH DOES NOT RELEASE (WILL ALSO CAUSE DRIVE IN NEUTRAL)

DIRECT CLUTCH BURNED

REAR BAND

BROKEN, BURNED, LOOSE LINING, APPLY PIN OR ANCHOR PINS NOT ENGAGED

CENTRE SUPPORT

OIL SEAL RINGS OR GROOVES DAMAGED OR WORN

LOW

CORRECT CAUSE

MISSES SECOND, ESPECIALLY WHEN TRANSMISSION IS AT OPERATING TEMPERATURE

The complaint is described in several ways, such as:

Misses second gear.
Transmission hunts 1–3–1.
Shifts 1–3.
Engine flare on down-shift.
Slips in second.
Goes to neutral on down-shift.
No second.

FRONT BAND AND DIRECT CLUTCH PLATES MAY BE BURNT OR WORN

REPLACE INTERMEDIATE CLUTCH PISTON SEALS

NO DETENT DOWN-SHIFTS

VEHICLE ON LIFT, IGNITION ON (ENGINE NOT OPERATING)

DISCONNECT ELECTRICAL PLUG FROM TRANSMISSION CONNECT TEST LIGHT TO 'DETENT' TERMINAL OF DISCONNECTED WIRE HARNESS & TO EARTH

DEPRESS ACCELERATOR FULLY

LIGHT ON

—DETENT SOLENOID— POOR CONNECTIONS, INOPERATIVE, SHORTED WIRE, OPEN WIRE, VALVE STUCK, ORIFICE PLUGGED

CHECK DETENT VALVE TRAIN

LIGHT OFF

—DOWNSHIFT SWITCH—
1 MALADJUSTED
2 INOPERATIVE SWITCH, CONNECTIONS. FUSE, SHORTED WIRE

NO ENGINE BRAKING — INTERMEDIATE RANGE — SECOND GEAR

—FRONT SERVO & ACCUMULATOR—
OIL RINGS AND/OR BORES LEAKING OR FRONT SERVO PISTON COCKED OR STUCK

INCORRECT COMBINATION OF FRONT SERVO AND ACCUMULATOR PARTS

—FRONT BAND—
BROKEN, BURNED (CHECK FOR CAUSE), NOT ENGAGED ON ANCHOR PIN AND/OR SERVO PIN

NO ENGINE BRAKING IN '1'

—CASE ASSEMBLY—
REVERSE CHECK BALL WRONGLY POSITIONED OR MISSING. CASE DAMAGED AT CHECK BALL AREA

—REAR SERVO—
OIL SEAL RING, BORE OR PISTON DAMAGED REAR BAND APPLY PIN SHORT, IMPROPERLY ASSEMBLED

—REAR BAND—
BROKEN, BURNED (CHECK FOR CAUSE), NOT ENGAGED ON ANCHOR PINS AND/OR SERVO PIN

NO HOLD IN PARK OR NO RELEASE FROM PARK

CHECK SELECTOR CABLE ADJUSTMENT

—INTERNAL LINKAGE—
1. PARKING BRAKE ROD ASSEMBLY. (CHECK ACTUATOR FOR CHAMFER.)
2. PARKING PAWL BROKEN, CHAMFER OMITTED.
3. PARKING BRAKE BRACKET LOOSE, BURR OR ROUGH EDGES, OR INCORRECTLY INSTALLED.
4. PARKING PAWL RETURN SPRING MISSING, BROKEN OR INCORRECTLY FITTED.

DRIVE IN NEUTRAL

CHECK SELECTOR CABLE ADJUSTMENT

—INTERNAL LINKAGE—
MANUAL VALVE DISCONNECTED OR END BROKEN, INSIDE DETENT LEVER PIN BROKEN

—PUMP ASSEMBLY—
FLUID PRESSURE LEAKING INTO FORWARD CLUTCH APPLY PASSAGE

TRANSMISSION NOISY

CAUTION: BEFORE CHECKING TRANSMISSION FOR WHAT IS BELIEVED TO BE 'TRANSMISSION NOISE', MAKE CERTAIN THE NOISE IS NOT FROM THE WATER PUMP, ALTERNATOR, AIR CONDITIONER, POWER STEERING, ETC. THESE COMPONENTS CAN BE ISOLATED BY REMOVING THE APPROPRIATE DRIVE BELT AND RUNNING THE ENGINE FOR NOT MORE THAN TWO MINUTES AT ONE TIME.

PARK, NEUTRAL AND ALL DRIVE RANGES

DURING ACCELERATION—
ANY GEAR

—PUMP CAVITATION—

OIL LEVEL LOW.
BLOCKED OR RESTRICTED FILTER.
WRONG FILTER.
INTAKE PIPE 'O' RING DAMAGED.
INTAKE PIPE SPLIT, POROSITY IN CASE INTAKE PIPE BORE.
WATER IN OIL.
POROSITY OR VOIDS IN TRANSMISSION CASE (PUMP FACE) INTAKE PORT.
PUMP TO CASE GASKET WRONGLY POSITIONED.

—PUMP ASSEMBLY—

GEARS DAMAGED.
DRIVING GEAR ASSEMBLED BACKWARDS.
CRESCENT INTERFERENCE.
BUZZING NOISE — ORIFICE CUP PLUG IN PRESSURE REGULATOR DAMAGED OR MISSING.
SEAL RINGS DAMAGED OR WORN.

—CONVERTER—

LOOSE BOLTS (CONVERTER TO DRIVE PLATE).
CONVERTER DAMAGE.
CRACKED OR BROKEN DRIVE PLATE.

SQUEAL AT LOW VEHICLE SPEEDS, ESPECIALLY AT NORMAL OPERATING TEMPERATURE

SPEEDOMETER DRIVEN GEAR SHAFT SEAL— SEAL REQUIRES LUBRICATION OR REPLACEMENT

IF SPEEDOMETER DRIVEN GEAR SHAFT APPEARS TWISTED, CHECK FOR PRESENCE OF ENGINE COOLANT IN TRANSMISSION. CHECK TRANSMISSION COOLER FOR LEAKS.

FIRST, SECOND AND/OR REVERSE

—PLANETARY GEAR SET—

1. THOROUGHLY CLEAN, DRY & INSPECT CLOSELY THE ROLLER THRUST BEARINGS AND THRUST RACES FOR PITTING OR ROUGH CONDITION.
2. INSPECT GEARS FOR DAMAGE, WEAR, PITTING AND PINIONS FOR TILT.
3. INSPECT FRONT INTERNAL GEAR FOR RING DAMAGE.

SELECTOR LEVER ASSEMBLY

Overhaul **44.15.05**

Removing

NOTE: Prior to carrying out this operation it will be necessary to remove the selector quadrant as detailed in operation 76.25.08.

Remove the nuts (1, Fig. 4) securing the indicator bulb mounting and remove the bulb mounting bracket.
Remove the circlip and circlip washer (2, Fig. 4) from the lever pivot shaft.
Remove the selector lever assembly from the car.
Remove the nuts securing the tension spring (4, Fig. 4) and remove the spring.
Remove the split pin and washers (5, Fig. 4) securing the lever to the cam plate pivot
Remove the selector lever (6, Fig. 4).
Holding the lever mounting plate in a vice, remove the screws securing the tapped block and illumination bulb bracket (7, Fig. 4) to the cam plate.

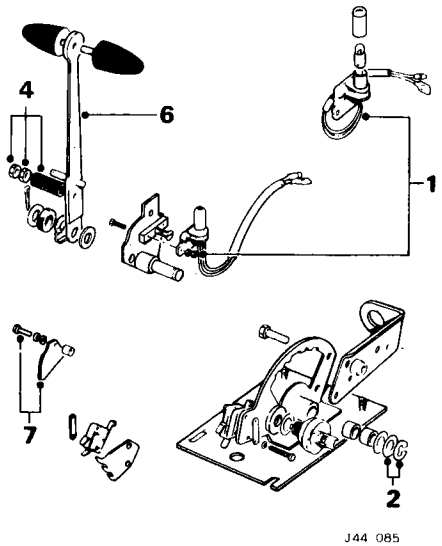


Fig. 4

Remove the tension spring screw from the tapped block and remove the block from the cam plate.
Clean all parts.

Refitting

Holding the mounting plate in a vice, refit the tapped block to the cam plate by loosely fitting the tensioning spring screw.
Align the holes of the block with those in the cam plate and fit the illumination bulb bracket without fully tightening the retaining screws.
Tighten the tensioning spring screw.
Tighten the bulb bracket screws.
Secure the tensioning spring screw with two centre dots on the mating surface of the tapped block.
Remove the mounting plate assembly from the vice.
Refit the lever to the mounting plate assembly and secure to the lever pivot with the pivot washer, washer, rubber washer, washer and split pin.
Refit the tensioning spring and spring securing nut. Reset the spring to the correct tension and refit the locknut.
Lubricate the selector lever pivot shaft.
Refit the assembly to the car.
Refit the circlip washer, shim and circlip to the lever pivot.
Refit selector quadrant, see 76.25.08.

STARTER INHIBITOR SWITCH

Check and adjust **44.15.18**

Adjusting

Disconnect the battery and unscrew the gear selector knob.
Remove the screws securing the control escutcheon; withdraw the escutcheon slightly to obtain access to the cigar lighter.
Note the fitted position of the cigar lighter and door lock and window switch terminals; detach the terminals and withdraw the escutcheon.
Remove selector indicator assembly.
Detach the feed cable from the inhibitor switch.
Connect a test lamp and battery in series with the switch.
NOTE: Switch is in earthed position. Place the selector lever in 'N' position.
Slacken the locknuts (1, Fig. 5) securing the switch and adjust position of switch until the lamp lights.

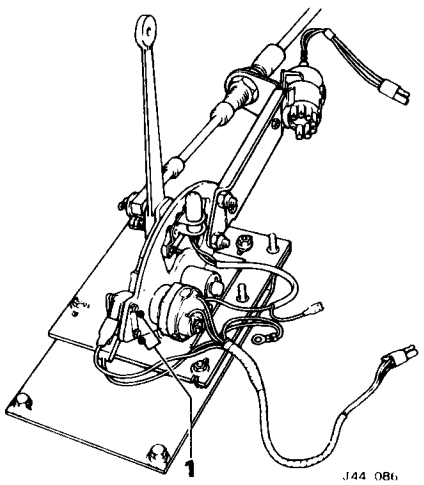


Fig. 5

Tighten the locknuts, check that lamp remains on with lever in 'P' position and is off with lever in drive position.
Remove the battery and test lamp, reconnect feed cable to switch.
Refit the selector indicator.
Refit the terminals to the cigar lighter, and window switches, refit the escutcheon.
Refit the gear selector knob, connect the battery and test the cigar lighter, door and windows switches for correct operation.

REAR EXTENSION HOUSING

Remove and refit **44.20.15**

Service tool: MS 53 A, engine support bracket

Removing

1. Drive the vehicle onto a ramp.
2. Remove the transmission dipstick.
3. Unscrew and remove the bolt securing the dipstick upper tube to the lifting eye bracket.
4. Remove the dipstick upper tube.
5. Slacken the wing stay to bulkhead securing bolt.
6. Remove the wing stay to wing securing bolts.
7. Remove the pipe to wing stay clamps.
8. Swing the wing stays away from the wings.
9. Unscrew and remove the handles from the engine lifting hooks—Tool No. MS 53 A.
10. Fit the hooks to the rear lifting eyes.
11. Fit the engine support tool.
12. Fit and tighten the handles to take the weight of the engine.
13. Raise the ramp.
14. Unscrew and remove the nuts/bolts securing the intermediate exhaust pipes, rotating the flanges for access.
15. Disconnect the exhaust pipes and remove the sealing olives.
16. Remove the intermediate heat shields.
17. Remove the rear heat shields.
18. Pull aside the exhaust pipes and secure.
19. Remove the crash bracket bolts.
20. Unscrew and remove the rear mounting centre nut.
21. Remove the spacer and crash bracket.
22. Using a suitable block of wood interposed between the jack head and the gearbox rear mounting, support the mounting plate.
23. Remove the bolts securing the rear mounting.
24. Remove the rear spacers.
25. Lower the jack.
26. Remove the mounting assembly.
27. Remove the wooden block and jack.
28. Unscrew the bolts securing the cross-member.
29. Remove the cross-member.
30. Disconnect the propeller shaft from the transmission and move the shaft clear.
31. Remove the drive flange retaining bolt, and remove the flange.
32. Remove the extension housing bolts, remove the housing and discard the gasket.

Refitting

33. Fit a new gasket to the extension housing.
34. Refit the extension housing to the transmission case, secure with the bolts.
35. Refit the drive flange and tighten retaining bolt; ensure that the propeller shaft bolts are fitted to the flange.
36. Connect the propeller shaft to the transmission drive flange.
37. Position and align the cross-member, fit and tighten the upper securing bolts.
38. Fit and tighten the lower securing bolts.
39. Place the ramp jack under the rear mountings, and locate the wooden block and mounting assembly in position, raise the jack and align the attachment holes.
40. Fit the rear spacers, fit and tighten the securing bolts.
41. Remove the jack and wooden block.
42. Fit the rear mounting spacer.
43. Fit crash bracket.
44. Fit and tighten rear mounting centre nut.
45. Fit and tighten crash bracket bolts.
46. Refit the front heat shields.
47. Untie the exhaust pipes and fit the rear heat shield.
48. Refit the intermediate heat shields.
49. Smear the exhaust sealing olives with 'Firegum', fit the olives, connect and secure the exhaust system.
50. Lower the ramp.
51. Unscrew and remove the support tool hook handles.
52. Remove the support tool, remove the hooks, fit and tighten the handles to the hooks.
53. Refit the dipstick upper tube and secure to the lifting eye bracket.
54. Reposition the wing stays and secure to the wings.
55. Tighten the wing stay/bulkhead attachment and refit the pipe clamps.
56. Fill the transmission unit with fluid and refit the dipstick.

OIL/FLUID PAN

Remove and refit **44.24.04**

Service tool: Engine support tool MS 53A

Removing

Raise vehicle on ramp or position over a pit.
Remove the vacuum capsule clamp bolt and clamp, disconnect the capsule and drain the transmission fluid into a suitable container.
Reconnect the capsule, refit the clamp and tighten the securing bolt.
Disconnect the right-hand intermediate exhaust pipe from the down pipe, remove the olive and tie system aside.
Remove the crash bracket assembly, 3 nuts and bolts.
Remove the bolts and spring washers securing the oil pan to the transmission case. Carefully lower the oil pan and allow any oil remaining in the transmission to drain.
Remove and discard the gasket; ensure that all traces of the old gasket are removed from both oil pan and transmission case.

Refitting

Position a new gasket on the oil pan, refit the oil pan.
Tighten the oil pan securing bolts by diagonal selection to the specified torque figure.
Refit the crash bracket.
Reconnect the exhaust system.
Refill the transmission and check for fluid leaks in the vicinity of the vacuum capsule.

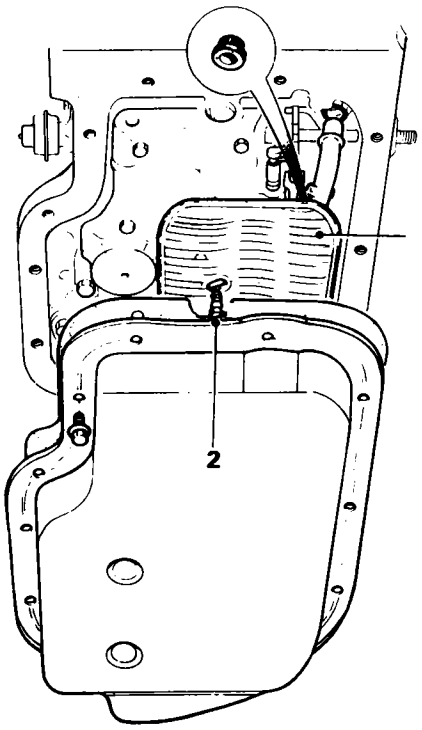


Fig. 6

OIL FILTER

Remove and refit **44.24.07**

Removing

Prior to carrying out this operation it will be necessary to remove the oil pan as detailed in operation 44.24.04.
Remove the oil filter securing bolt and lower the filter.

Refitting

Fit new filter and tighten the securing bolt.
Refit the oil pan and refill the transmission.

SELECTOR CABLE

Adjust **44.30.04**

Disconnect the battery.
Unscrew the gear selector knob.
Remove the screws securing the control escutcheon; withdraw the escutcheon slightly to gain access to the cigar lighter terminals.
Note the fitted position of cigar lighter and door lock switch terminals; detach the terminals.
Disconnect the electric window switch harnesses; withdraw the panel and escutcheon.
Slacken the locknuts (1, Fig. 7) on the outer cable abutment bracket.
Disconnect the cable from the selector lever (2, Fig. 7) below the car.
Position both selector levers in neutral (position 'N') and adjust length of cable by means of the locknuts until cable can be connected to selector lever (2, Fig. 7) without either lever moving.
Tighten the locknuts.

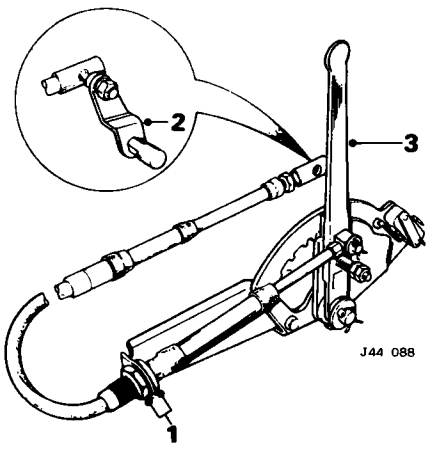


Fig. 7

NOTE: A certain amount of free play at the selector lever (3, Fig. 7) should be evident.
Re-connect the electrical harnesses, refit the control escutcheon and switch panel.
Re-connect the battery and test operation of window switches, also the cigar lighter.
Start the engine and check that there is no drive in 'P' or 'N' and that gear engagement is felt in 'D', '2' and '1'.

KICK-DOWN SWITCH

Check and adjust **44.30.12**

Switch on the ignition and check that there is current at the input terminal of the switch (1, Fig. 8) (cable colour—green).
Connect an earthed test lamp (2, Fig. 8) to the output terminal (cable colour—green/white).
Fully depress the throttle pedal.
If the test lamp fails to light, release the throttle pedal and gently depress the switch arm (3, Fig. 8).

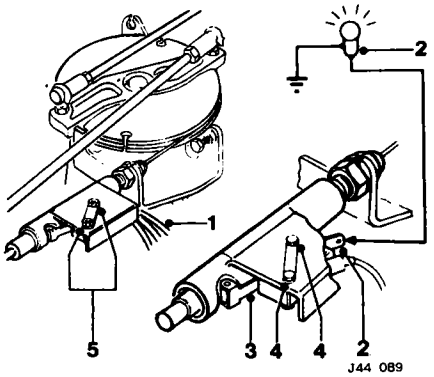


Fig. 8

If the test lamp still does not light, renew the switch (4, Fig. 8).
If, however, the lamp lights when the switch arm is depressed, slacken the securing bolts (5, Fig. 8) and move the switch towards the cable until at full throttle opening the lamp lights.
Tighten the securing bolts and re-check.

BAND APPLY PIN

Selection check **44.30.21**

Service tools: 18G 1310, band application pin selection gauge; torque wrench

Remove the fluid pan as detailed in operation 44.24.04; allow the fluid to drain.
Remove the control valve assembly and governor pipes.
Remove the six rear servo cover fixing bolts, remove the cover and gasket.
Remove the rear servo assembly from the transmission case.
Remove the servo accumulator spring.
Fit service tool 18G 1310, band apply selection gauge and gauge pin, secure with two bolts.
Tighten the two bolts, ensure that the gauge pin is free to move up and down in both the tool and the servo pin bore.
Fit a $^{9}/_{16}$ in A.F. socket to the torque wrench.
Apply a torque of 3.46 kgf m (25 lbf ft) to the hexagon nut on the gauge. Identify the land and letter on the gauge pin and select the appropriate size pin.

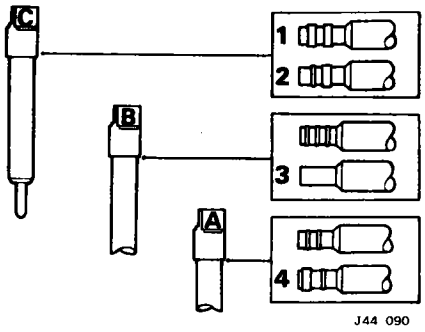


Fig. 9

NOTE: Pins 1, 2, 3 and 4 are fitted on production but are not available as spare part items.
Remove the service tool 18G 1310.
Fit the servo pin as selected in the above check.
Refit the servo accumulator spring and servo assembly.
Refit the servo cover and gasket, secure with the six bolts.
Refit the governor pipes and control valve assembly.
Refit the fluid pan and fill the transmission with fluid.

FRONT UNIT END-FLOAT

Check and adjust **44.30.22**

Service tools: CBW 87, 18G 1296

Checking

Remove the gearbox as detailed in operation 44.20.01.
Remove the torque converter.
Remove the front pump attaching bolt and seal.
Attach clock gauge CBW 33; the end-float can now be checked.
Alternatively, CBW 87 can be used, the movement of the turbine shaft being measured with feeler gauges.
Hold the output shaft forward, whilst pushing the turbine shaft rearward to its stop.
Set the dial gauge to zero.
Pull the turbine shaft forward and note the reading obtained.
Correct end-float is 0,076 to 0,610 mm (0.003 to 0.025 in).
The selective washer which controls the end-float is a phenolic resin washer located between the pump cover and the forward clutch housing.
If the end-float is not within the above limits (preferably work to a mean tolerance reading between the above), select a new washer, referring to the chart.

Thickness	Colour
1,52 to 1,63 mm (0.060 to 0.064 in)	Yellow
1,803 to 1,905 mm (0.071 to 0.075 in)	Blue
2,08 to 2,18 mm (0.082 to 0.086 in)	Red
2,36 to 2,46 mm (0.093 to 0.097 in)	Brown
2,64 to 2,74 mm (0.104 to 0.108 in)	Green
2,92 to 3,02 mm (0.015 to 0.119 in)	Black
3,20 to 3,30 mm (0.126 to 0.130 in)	Purple

NOTE: An oil-soaked washer may lead to discolouration. If necessary, measure the washer to ascertain the thickness.
To remove the pump, remove all the locating screws, removing them diagonally opposite each other.
Insert 18G 1296 into the two tapped holes in the pump body.
Apply a gradual equal force on each bolt until the pins force the pump out.
Fit the correct selective washer.
Refit the pump, securing the bolt and seal.
Tighten the locating screws by diagonal selection to avoid distortion.

REAR UNIT END-FLOAT

Check and adjust **44.30.23**

Service tool: CBW 87.

Checking

Remove the rear extension, see operation 44.20.19.
Use CBW 87 with the slide bar inserted into the side of the governor holes (governor bolt removed).
Slide the connector on CBW 87 as near the block as possible and extend the dial gauge rod out as far as possible.
Ensure that the indicator stem registers with the end of the output shaft.
Set the gauge to zero.
Move the output shaft to and fro, 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 0,076 and 0,483 mm (0.003 and 0.019 in).
The adjusting washer which controls this end-float is the steel washer with three tabs located between the thrust washer and the rear face of the transmission case. The notches on the tabs serve to identify washer thickness.
Select the correct washer from the table.

Thickness	Identification Notch
1,981 to 2,083 mm (0.008 to 0.082 in)	None
2,184 to 2,286 mm (0.086 to 0.090 in)	On side of 1 tab
2,358 to 2,489 mm (0.094 to 0.098 in)	On side of 2 tabs
2,591 to 2,692 mm (0.102 to 0.106 in)	On end of 1 tab
2,794 to 2,896 mm (0.110 to 0.114 in)	On end of 2 tabs
2,997 to 3,099 mm (0.118 to 0.122 in)	On end of 3 tabs

SPEEDOMETER DRIVE PINION

Remove and refit **44.38.04**

Removing

Raise the vehicle on a ramp.
Slacken the union connecting the speedometer cable angle drive to the pinion.
Disconnect the speedometer cable and place to one side.
Remove the pinion clamp bolt and clamp plate.
Remove the pinion assembly.
Remove the pinion from the housing.
Remove and discard the housing seals.
Clean the pinion and the housing.

Refitting

Refit new seals to the housing.
Lubricate the pinion.
Lubricate the 'O' ring seal.
Refit the pinion to the housing.
Refit the pinion assembly to the gearbox.
Refit the clamp plate and tighten the clamp bolt.
Re-connect the speedometer cable.
Re-tighten the union connecting the speedometer cable angle drive to the pinion.
Lower the vehicle on the ramp.

VALVE BODY ASSEMBLY

Remove and refit **44.40.01**

Removing

Prior to carrying out this operation it will be necessary to remove the oil pan and filter.
Reference should therefore be made to operations 44.24.04 and 44.24.07.
Disconnect the pressure switch.
Remove the bolts securing the valve body.
Remove the detent spring.
Remove the valve body assembly.
Remove and discard the gasket.

CAUTION: Front servo components may be displaced after valve block is removed so care must be taken to ensure that they are fitted correctly.

Remove the conical filter.
Remove the oil feed pipes.
Remove the front servo piston assembly.
Slacken and remove the pressure switch.
Place the valve body to one side.
Clean all the relevant parts and faces.

Refitting

Refit and tighten the pressure switch.
Lubricate the front servo piston.
Refit the servo piston assembly.
Refit the oil feed pipes.
Refit the conical oil filter.
Fit a new valve block gasket and refit the valve body assembly.
Align the oil feed pipes.
Align the front servo.
Refit the detent spring.
Refit and tighten valve body securing bolts.
Re-connect the pressure switch.
Refit the oil filter.
Refit the oil pan.

TRANSMISSION ASSEMBLY

Remove and refit **44.20.01**

Service tools: MS 53A engine support bracket, Epco V1000 Unit lift

Removing

1. Drive the vehicle onto a ramp.
2. Remove the transmission dipstick.
3. Unscrew and remove the bolt securing the dipstick upper tube to the lifting eye bracket.
4. Remove the dipstick upper tube.
5. Slacken the wing stay to bulkhead securing bolt.
6. Remove the wing stay to wing securing bolts.
7. Remove the pipe to wing stay clamps.
8. Swing the wing stays away from the wings.
9. Unscrew and remove the handles from the engine lifting hooks—Tool No. MS 53A.
10. Fit the hooks to the rear lifting eyes.
11. Fit the engine support tool.
12. Fit and tighten the handles to take the weight of the engine.
13. Raise the ramp.
14. Unscrew and remove the nuts/bolts securing the intermediate exhaust pipes, rotating the flanges for access.
15. Disconnect the exhaust pipes and remove the sealing olives.
16. Remove the intermediate heat shields.
17. Remove the rear heat shield.
18. Pull aside the exhaust pipes and secure.
19. Remove the front heat shields.
20. Unscrew and remove the rear mounting centre nut and crash bracket bolts.
21. Remove the spacer and bracket.
22. Using a suitable block of wood interposed between the jack head and the gearbox rear mounting, support the mounting plate.
23. Remove the bolts securing the rear mounting.
24. Remove the rear spacers.
25. Lower the jack.
26. Remove the mounting assembly.
27. Remove the wooden block and jack.
28. Unscrew the bolts securing the cross-member.
29. Remove the cross-member.
30. Disconnect the propeller shaft from the transmission and move the shaft clear.
31. Working from above the engine compartment, slacken the hooks—10 turns only.
32. From beneath the vehicle, disconnect the speedometer cable from the transmission.
33. Unscrew the nut securing the selector pin to the lever and disconnect the cable.
34. Unscrew the bolt securing the selector cable to the support bracket and move the cable away from the transmission.
35. Disconnect the kick-down solenoid feed-wire and remove the clamp bolt securing the feed wire to the transmission.
36. Disconnect the modulator capsule vacuum tube.
37. Remove the bolt and clamp plate securing the modulator.
38. Place a suitable receptacle under the modulator, withdraw the modulator and partially drain the transmission fluid.
39. Remove and discard the modulator 'O' ring.
40. Unscrew the cooler pipe union nuts from the unions.
41. Unscrew the bolt securing the cooler pipes bracket to the engine sump, remove the spacer.
42. Disconnect and plug the cooler pipes.
43. Unscrew the bolts/nuts securing the converter access cover (and catalysts — where fitted) and remove the cover.
44. Unscrew the bolts securing the converter to the drive plate, turning the drive plate for access.
45. Remove the bolts securing the right-hand rack gaiter heat shield and remove the heat shield (U.S.A. vehicles only).
46. Unscrew the nuts securing the right-hand catalyst (where fitted) and displace the catalyst from the manifold.
47. Remove the engine/transmission securing bolts with the exception of two lower left-hand bolts and lower starter motor securing bolt.
48. Remove the dipstick tube and reposition the tube/vacuum pipe mounting bracket along the vacuum pipe.
49. Utilizing an Epco V1000 unit lift:
a. Remove the front and rear clamps.
b. Traverse the lift under the transmissions unit.
c. Take the weight of the transmission on the lift.
d. Adjust the tilt angle and side clamps.
e. Tighten the clamps.
f. Fit the chain assembly to the right-hand arm, fit the securing peg and pass the chain over the transmission into the front arm.
g. Tighten the chain adjuster.
50. Remove the remaining bolts securing the engine/transmission and starter motor.
51. Disconnect the transmission unit from the engine, lower the unit (easing the catalyst aside — where fitted) and traverse the transmission/unit lift from beneath the vehicle.

continued

WARNING: Ensure that torque converter does not fall off when removing the transmission.

Extra operations for replacing the transmission assembly

52. Unscrew and remove the rear mounting spigot securing bolts, and remove the mounting.
53. Remove the selector cable mounting collar.
54. Unscrew and remove the cooler pipe unions.
55. Slacken the chain adjuster and release the chain from the front arm.
56. Slacken the clamp wing nuts and release the clamps.
57. Place the transmission unit aside to drain.
58. Fit the replacement transmission unit to the lift.
59. Reposition the clamps and tighten the wing nuts.
60. Refit the chain to the front arm and tighten the chain adjuster.
61. Remove all the blanking plugs from the new transmission unit.
62. Remove the converter strap from the replacement unit and fit to the displaced unit.
63. Fit and tighten the cooler pipe unions to the replacement unit.
64. Fit the selector cable collar.
65. Fit the rear mounting; fit and tighten the securing bolts.
66. Clean the relevant mounting and attachment faces.

Refitting

67. Traverse the transmission/unit lift beneath the vehicle, raise the unit into position (easing aside the catalyst — where fitted) and place the speedometer cable, selector cable, kick-down solenoid feed wire and vacuum pipe into suitable positions.
68. Align the transmission mating flange over the locating dowels.
69. Fit and tighten three lower left-hand transmission/engine securing bolts.
70. Locate the starter motor in position and fit and tighten the securing bolts.
71. Release the unit lift clamps, slacken the chain tensioner and remove the pin from the left-hand arm, release the chain from the front arm and remove the chain assembly.
72. Lower the unit lift and remove from the working area; refit the clamps to the lift.
73. Fit and tighten the remaining engine/transmission securing bolts.
74. Position the dipstick pipe clamp on the torque converter housing and fit the lower dipstick tube.
75. Connect the dipstick tube to the transmission.
76. Pull the vacuum pipe through the bracket.
77. Fit two accessible torque converter/drive plate bolts. Do not tighten.
78. Turn the drive plate, fit two further torque converter/drive plate bolts. Do not tighten.
79. Turn the drive plate, fit and tighten final two torque converter/drive plate and bolts.
80. Turn the drive plate and tighten first four bolts.
81. Fit the torque converter cover-plate (and the strap to the right-hand catalyst — where fitted).
82. Slacken the left-hand nut securing the strap to the cover and swing the strap aside.
83. Remove the blanking plugs from the cooler pipes and connect the pipes to the transmission.
84. Position the cooler pipe mounting bracket, fit the spacer and bolt and secure the bracket to the engine sump.
85. Fit a new 'O' ring to the modulator capsule and fit the modulator to the transmission unit with the clamp plate and bolt.
86. Connect the vacuum pipe to the modulator.
87. Connect the kick-down solenoid feed wire and secure to the transmission with the clamp and bolt.
88. Fit and secure the selector cable bracket to the mounting and connect the cable to the lever. Fit and tighten the selector pin securing nut.
89. Working from above the engine compartment, tighten the hook handles to raise the engine.
90. Working from beneath the vehicle, connect the propeller shaft to the transmission flange.
91. Position and align the cross-member, fit and tighten the upper securing bolts.
92. Fit and tighten the lower securing bolts.
93. Place the ramp jack under the rear mounting, and locate the wooden block and mounting assembly in position, raise the jack and align the attachment holes.
94. Fit the rear spacers, fit and tighten the securing bolts.
95. Remove the jack and wooden block.
96. Fit the rear mounting spacer and crash bracket and secure.
97. Position the right-hand catalyst (where fitted) into the manifold and secure with the nuts.
98. Secure the converter cover strap to the catalyst (where fitted).
99. Refit the rack gaiter heat shield (where fitted).
100. Refit the front heat shields.
101. Untie the exhaust pipes and fit the rear heat shield.
102. Refit the intermediate heat shields.
103. Smear the exhaust sealing olives with 'Firegum', fit the olives, connect and secure the exhaust system.
104. Lower the ramp.
105. Unscrew and remove the support tool hook handles.
106. Remove the support tool, remove the hooks, fit and tighten the handles to the hooks.
107. Refit the dipstick upper tube and secure to the lifting eye bracket.
108. Reposition the wing stays and secure to the wings.
109. Tighten the wing stay/bulkhead attachment and refit the pipe clamps.
110. Fill the transmission unit with fluid and refit the dipstick.

TRANSMISSION ASSEMBLY

Overhaul **44.20.06**

NOTE: Before commencing this operation, it is strongly recommended that the following checks are carried out and all readings noted:

Front Unit End-Float Check, see 44.30.22.
Rear Unit End-Float Check, see 44.30.23.
Rear Servo Band Apply Pin Selection Check, see 44.30.21.

CAUTION: Only Gamlen 265 or Rochem Electrical Quick Dry Solvent should be used for cleaning transmission components.

Service tools: 18G 1295 compressor piston accumulator control valve; 18G 1296 front pump remover screws; 18G 1297 front pump and tailshaft oil seal replacer; 18G 1298 forward and direct clutch piston replacer, inner and outer protection sleeve; 18G 1309 intermediate clutch inner seal protection sleeve; 18G 1310 band application pin selection gauge; 18G 677 ZC pressure test equipment; 18G 1016 clutch spring compressor; 18G 1004 circlip pliers; 18G 1004 J circlip plier points.

Dismantling

1. Remove the transmission assembly from the vehicle, see 44.20.01.
2. Thoroughly clean the transmission casing.
3. Remove the torque converter.
4. Invert transmission on to a suitable bench cradle.

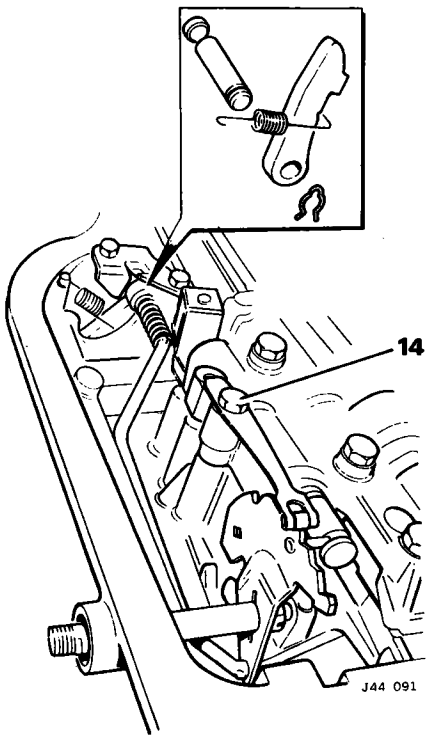


Fig. 10

5. Using a suitable flange retaining tool, undo and remove the drive flange securing bolt and remove the drive flange.
6. Remove the bolt securing the speedometer drive pinion clamp plate.
7. Remove the clamp plate and withdraw the speedometer pinion assembly.
8. Remove the four governor cover-plate securing bolts and remove the cover-plate and gasket.
9. Discard the gasket.
10. Remove the governor assembly.
11. Remove the sump bolts, sump pan and discard the gasket.
12. Remove the bolt securing the oil filter and remove the filter.
13. Remove the oil filter feed pipe.
14. Remove the bolt (Fig. 10) securing the detent spring and roller assembly to the valve block.
15. Remove the retaining bolts and withdraw the valve block with the governor pipes attached.
16. Remove the governor screen assembly from the end of the governor feed pipe, or feed pipe hole in the casing.
17. Remove the governor feed pipes from the valve block. The pipes are interchangeable.
18. Disconnect the detent solenoid wire from the case connector.
19. Depress the tabs on the case connector and remove the connector and 'O' ring. Discard the 'O' ring.
20. Remove the detent solenoid securing bolts and remove the solenoid.
21. Remove the valve block spacer plate from the casing.
22. Remove the six check balls from the transmission casing.
23. Lift the front servo piston assembly from the transmission case (Fig. 11).

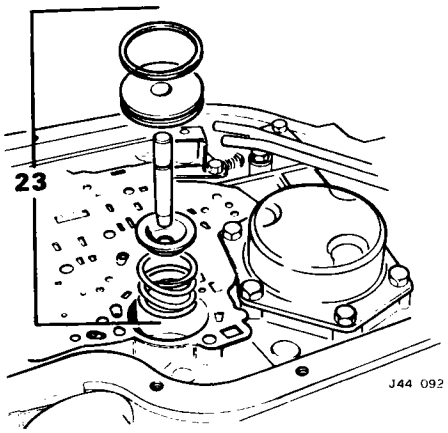


Fig. 11

24. Remove the rear servo cover retaining bolts (Fig. 12).
25. Remove the cover and gasket (Fig. 12). Discard the gasket.
26. Remove the rear servo assembly from the transmission case.
27. Remove the rear servo accumulator spring (Fig. 12).

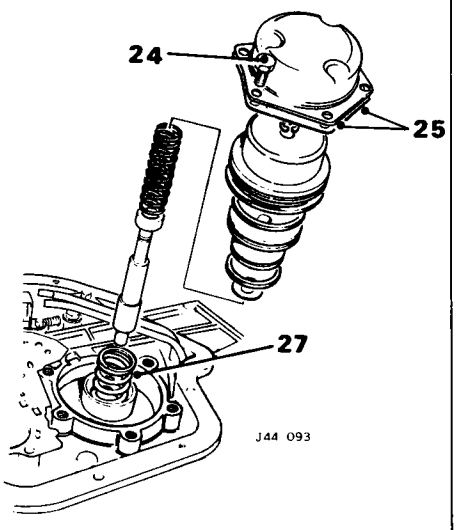


Fig. 12

28. Remove the modulator valve from the case.
29. Undo and remove the six rear extension securing bolts.
30. Remove the rear extension and gasket. Discard the gasket.
31. Turn box over.
32. Undo and remove the front pump securing bolts.
33. Insert service tools 18G 1296 into the two threaded holes in the pump body.
34. Using service tools 18G 1296, extract the pump.
35. Remove the pump assembly and discard the gasket.
36. Remove the service tools 18G 1296 from the pump body.
37. Remove the input shaft and forward clutch assembly.
38. Remove the intermediate one-way clutch assembly.
39. Remove the front band assembly.
40. Remove the intermediate clutch snap-ring.
41. Remove the intermediate clutch backing plate and clutch assembly.
42. Remove the chamfered snap-ring.
43. Undo and remove the centre support retaining peg and remove the centre support/roller clutch assembly.
44. Remove the sun gear shaft.
45. Remove the snap-ring from the bottom groove of the centre support.
46. Remove the rear brake band.
47. Remove the planet carrier assembly.
48. Remove the front internal gear ring.
49. Remove the rear thrust washer.
50. Remove the manual shaft retaining pin.
51. Release the manual shaft from the manual detent lever, remove the lever and shaft.
52. Remove the actuator rod assembly.

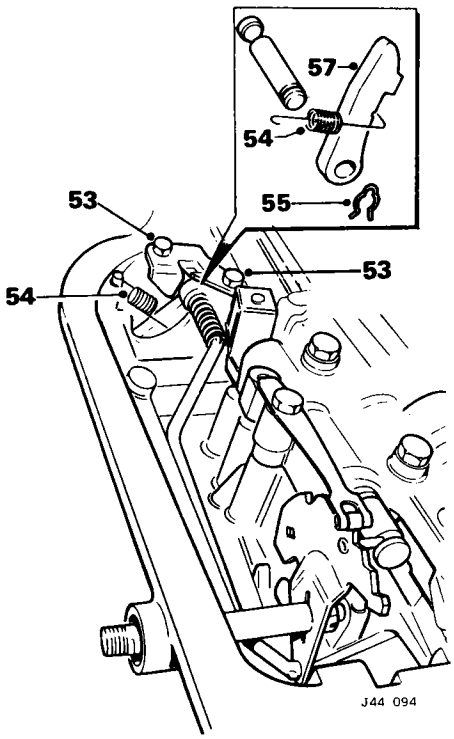


Fig. 13

53. Remove the parking pawl bracket securing bolts (Fig. 13) and remove the bracket.
54. Remove the parking pawl spring (Fig. 13).
55. Remove the spring clip (Fig. 13) securing the parking pawl to the pivot shaft.
56. Press the pivot shaft to displace the plug and remove the plug.
57. Remove the parking pawl (Fig. 13).
58. Remove the pivot shaft.
59. Remove the pressure take-off plug.
60. Remove the filter pick-up seal.
61. Remove the selector shaft seal.
62. Clean and inspect the casing.

continued

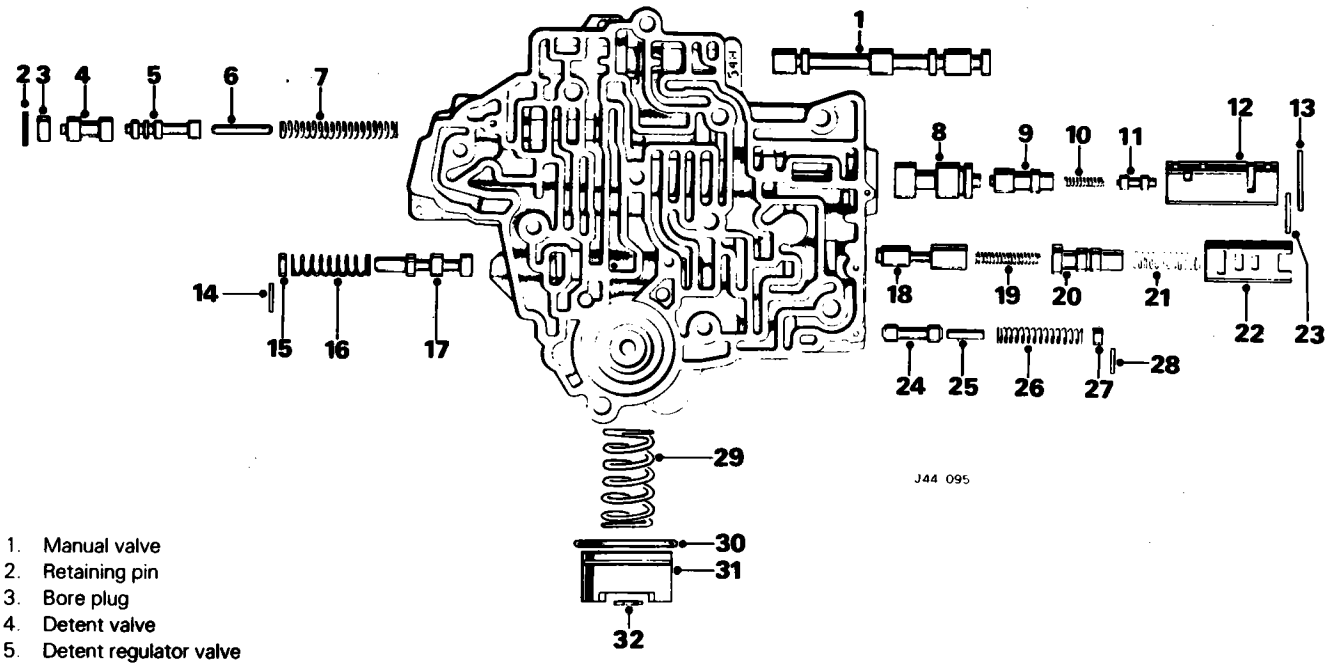


Fig. 14

1. Manual valve
2. Retaining pin
3. Bore plug
4. Detent valve
5. Detent regulator valve
6. Spacer pin
7. Detent regulator spring
8. 1–2 shift valve
9. 1–2 detent valve
10. 1–2 regulator spring
11. 1–2 regulator valve
12. 1–2 modulator bushing
13. Retaining pin
14. Grooved retaining pin
15. Bore plug
16. 1–2 accumulator secondary spring
17. 1–2 accumulator secondary valve
18. 2–3 shift valve
19. 3–2 intermediate spring
20. 2–3 modulator valve
21. 2–3 valve spring
22. 2–3 modulator bushing
23. Retaining pin
24. 3–2 valve
25. Spacer pin
26. 3–2 valve spring
27. Bore plug
28. Retaining pin
29. Accumulator spring
30. Accumulator piston oil ring
31. Accumulator piston
32. 'E'-ring retainer

VALVE BLOCK

CAUTION: During the dismantling procedure carefully identify all valves, bushes and springs, noting their relative positions.

Dismantling—see Figure 14

63. Position the valve block with the gasket face uppermost and the accumulator at the bottom. This position will be used to identify the components.
64. Remove the manual valve (1).
65. Using service tool 18G 1295, compress the accumulator piston (30) and spring (29), remove the 'E' ring retainer (32).
66. Remove the service tool, accumulator piston and spring.
67. Using a pin punch remove the 1–2 modulator bushing retaining pin (13), upper right-hand bore.
68. Remove the 1–2 modulator bushing (12), 1–2 regulator valve (11) and spring (10), 1–2 detent valve (9) and the 1–2 shift valve (8)

NOTE: The 1–2 regulator valve and spring may be inside the 1–2 modulator bushing.

69. Using a pin punch remove the 2–3 modulator bushing retaining pin (23), centre right-hand bore.
70. Remove the 2–3 modulator bushing (22), 2–3 shift valve spring (23), 2–3 modulator valve (20), 3–2 intermediate spring (19) and the 2–3 shift valve (18).
71. Using a pin punch remove the 3–2 valve retaining pin (28), lower right-hand bore.
72. Remove the bore plug (27), 3–2 valve spring (26), spacer (25) and the 3–2 valve (24).
73. Using a pin punch remove the detent valve retaining pin (2), upper left-hand bore.
74. Remove the bore plug (3), detent valve (4), detent regulator valve (5), spacer (6) and detent regulator valve spring (7).
75. Using a pair of long-nosed pliers remove the 1–2 accumulator valve retaining pin (14), lower left-hand bore.
76. Remove the bore plug (15), 1–2 accumulator spring (16) and the accumulator valve (17).

Inspection

77. Wash all components in a clean solvent. Do not allow valves to bump together, as this might cause nicks and burrs.
78. Carefully check all valves and bushings for burrs and damage. Burrs should be removed with a fine stone, taking care not to round off the shoulders of the valves.
79. Check all valves and bushings for free movement in their respective bores.
80. Check the valves housing for cracks and the bores for damage and scoring

NOTE: If any valves or bores are found to be damaged beyond repair, then a new control valve assembly must be fitted.

81. Check all the springs for distortion.
82. Check the front accumulator piston and oil ring for damage; renew as necessary.

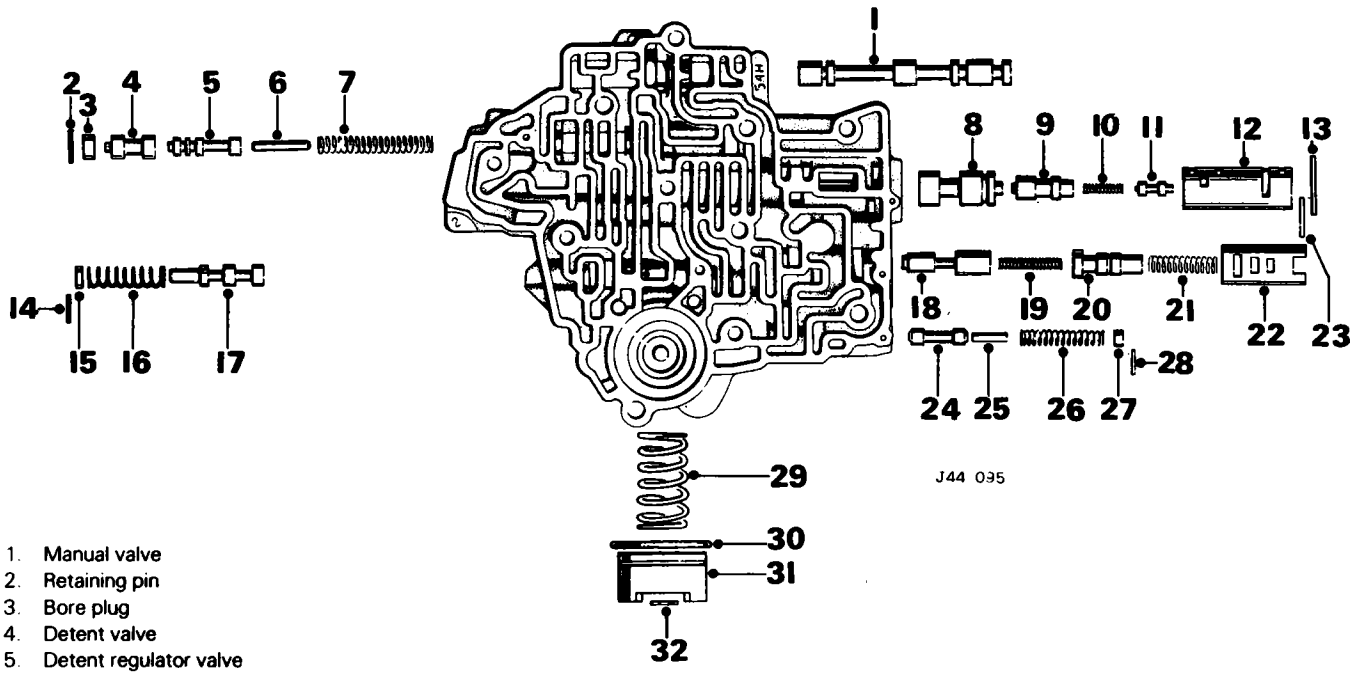


Fig. 15

1. Manual valve
2. Retaining pin
3. Bore plug
4. Detent valve
5. Detent regulator valve
6. Spacer pin
7. Detent regulator spring
8. 1–2 shift valve
9. 1–2 detent valve
10. 1–2 regulator spring
11. 1–2 regulator valve
12. 1–2 modulator bushing
13. Retaining pin
14. Grooved retaining pin
15. Bore plug
16. 1–2 accumulator secondary spring
17. 1–2 accumulator secondary valve
18. 2–3 shift valve
19. 3–2 intermediate spring
20. 2–3 modulator valve
21. 2–3 valve spring
22. 2–3 modulator bushing
23. Retaining pin
24. 3–2 valve
25. Spacer pin
26. 3–2 valve spring
27. Bore plug
28. Retaining pin
29. Accumulator spring
30. Accumulator piston oil ring
31. Accumulator piston
32. 'E'-ring retainer

Reassembling

83. Fit the accumulator spring (29) and piston (31) into the valve body.
84. Using service tool 18G 1295, squarely compress the spring and piston.

NOTE: Ensure that the piston pin is correctly aligned with the hole in the piston and the oil seal ring does not foul the lip of the bore when fitting the piston.

85. Fit the 'E' ring retainer (32) and remove the service tool.
86. Fit the 1–2 accumulator valve (17) stem end out in the lower left-hand bore.
87. Fit the 1–2 accumulator secondary spring (16) over the stem.
88. Fit the 1–2 accumulator bore plug (15) to the 1–2 accumulator bore.
89. Turn over control valve assembly and fit the grooved retaining pin (14) from the cast surface side of the body, with grooved end of pin entering the hole last.
90. Tap retaining pin in control valve housing until pin is flush with cast surface. Return control valve assembly to its original position.
91. Fit spacer (6) to detent regulator valve spring (7) and fit spring and spacer into upper left-hand bore; ensure that spring seats correctly.
92. Compress the detent regulator valve spring (7), fit the detent regulator valve (5), stem end last, and detent valve (4), band first.
93. Fit the bore plug (3), hole outermost, and secure with the retaining pin (1), from the cored side of the body.
94. Fit the 3–2 valve (24), bottom right-hand bore.
95. Fit spacer (25) to the 3-2 valve spring (26) and fit the spring and spacer, bottom right-hand bore.
96. Compress the 2–3 valve spring (21), and fit the bore plug, hole end outermost; secure with retaining pin (23), from the cored side of the body.
97. Fit the 3–2 intermediate spring (19) in the open end of the 2–3 shift valve (18), fit valve and spring to the centre right-hand bore. Ensure that the valve seats correctly.
98. Fit the 2–3 modulator valve (20), hole end first, to the 2–3 modulator bushing (22), and fit both parts to the centre right-hand bore.
99. Fit the 2–3 shift valve spring (21) into the 2–3 modulator valve (20), compress the spring and fit the retaining pin (23), from the cored side of the control valve.
100. Fit the 1–2 shift valve (8), stem end outermost ensuring that the valve seats correctly, to the upper right-hand bore.
101. Fit the 1–2 regulator valve (11), large stem first, spring (10), and the 1–2 detent valve (9), hole end first, into the 1–2 bushing (12) and fit all the components to the upper right-hand bore.
102. Compress the bushing against the spring and fit the retaining pin (13) from the cored side of the control valve body.
103. Fit the manual valve (1), with the detent pin groove to the right.

REAR SERVO ASSEMBLY

Dismantling

104. Remove the rear accumulator piston from the rear servo piston.
105. Remove the 'E' (Fig. 16) ring retaining the rear servo piston to the rear band apply pin.
106. Remove the rear servo piston and seal (Fig. 16) from the band apply pin.
107. Remove the washer, spring and retainer (Fig. 16).

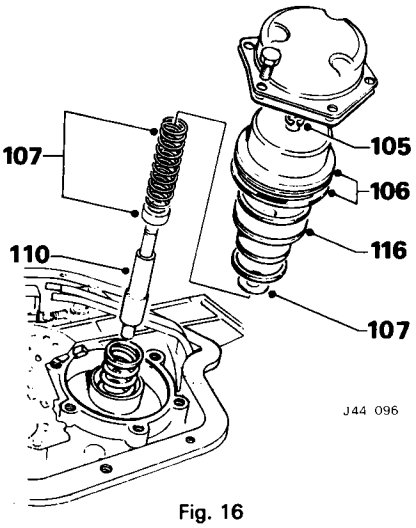


Fig. 16

Inspection

108. Check the freeness of the oil seal rings in the piston grooves. Renew as necessary.
109. Check the fit of the band apply pin in the servo piston.
110. Check the band apply pin (Fig. 16) for cracks and scoring.
111. Check that band apply pin is the correct size as determined by the pin selection check.

Reassembling

112. Fit the spring retainer, cup side towards the band apply servo pin, spring and washer to the servo pin.
113. Fit the servo piston to the pin and secure with the 'E' ring retainer.
114. Renew piston oil seals as necessary.
115. Renew accumulator piston oil seals as necessary.
116. Fit the accumulator piston (Fig. 16) into the bore of the servo piston.

FRONT SERVO ASSEMBLY

Inspection

117. Check the servo pin for damage.
118. Check the piston and oil seal ring (Fig. 17) for damaged oil ring groove, check that the oil ring is free to move.
119. Check the piston for cracks and porosity.
120. Check the fit of the servo pin (Fig. 17) to the piston.

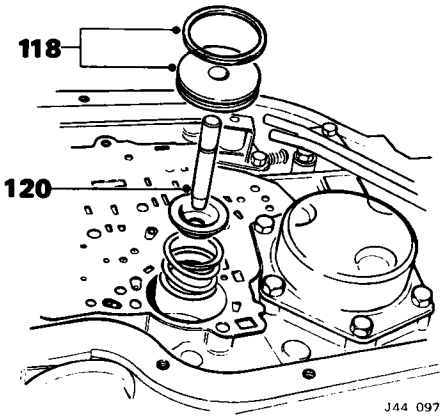


Fig. 17

Reassembling

121. Refit the parts of the front servo; ensure that the tapered end of the servo pin points through the spring and retainer; ensure that the retainer ring is in the servo pin groove.

OIL PUMP

Dismantling

122. Remove the outer seal.
123. Compress the regulator boost valve bushing against the regulator spring and remove the snap-ring (Fig. 18).

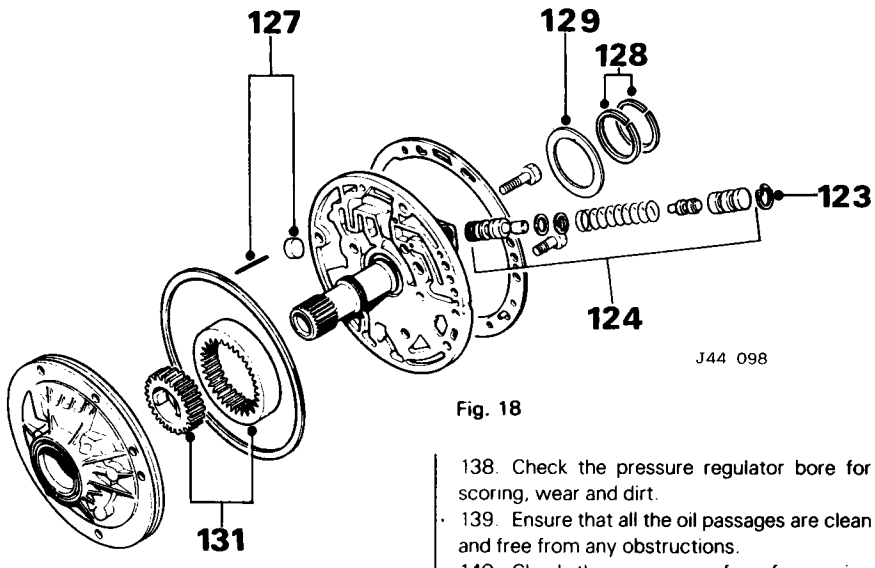


Fig. 18

124. Remove the regulator boost valve bushing, boost valve, pressure regulator spring, spring retainer regulator valve and spacer(s) (Fig 18).
125 Remove the pump body securing bolts and remove the pump cover from the body.
126. Note **fitted positions** of the oil pump drive and driven gears; it is not necessary to mark tooth to tooth relationship.
127. Remove the retaining pin and bore plug (Fig. 18) from the end of the regulator bore.
128. Remove the two oil rings (Fig. 18) from the pump cover.
129. Remove the pump to forward clutch housing thrust washer (Fig. 18).
130. Remove the front oil seal from the pump body.

Inspection — pump body

131. Check the gears for scoring, chafing and other damage (Fig. 18).
132. Position the pump gears in the pump body, lay a straight-edge over the gears and casing and check the clearance between the gears and the underside of the straight-edge. Clearance should be 0.0008 to 0.0035 in.

CAUTION: Ensure that gears are replaced the correct way round, i.e. lugs on driving gear must face away from torque converter and driven gear should be replaced in the same position as originally fitted.

133. Check the face of the pump body for scores and damage.
134. Ensure that all the oil passages are clean and free from any obstructions.
135. Check the threads in the pump body for damage.
136. Check that the pump body is flat and free from warps.

Inspection — pump cover

137. Check that the pump cover face is of uniform flatness and free from warps.
138. Check the pressure regulator bore for scoring, wear and dirt.
139. Ensure that all the oil passages are clean and free from any obstructions.
140. Check the pump gear face for scoring and damage.
141. Check the stator shaft for damaged splines or scored bushings.
142. Check the oil ring grooves for damage and wear.
143. Check the thrust washer face for wear and damage.
144. Fit the pump cover oil rings into the counterbore of the forward clutch housing and check for correct fit.
145. Ensure that the pressure regulator and boost valve operate freely.
146. Ensure that the air breather hole is free of any obstruction.

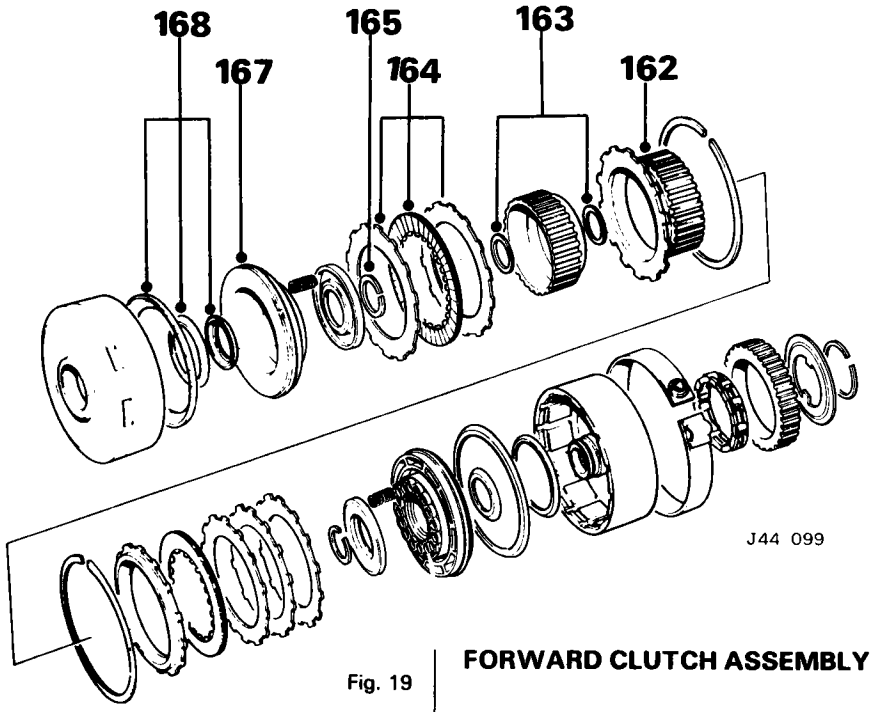


Fig. 19

Reassembling

147. Fit the pump drive and driven gears into the pump body.

CAUTION: Ensure that gears are replaced the correct way round, i.e. lugs on driving gear must face away from torque converter and driven gear should be replaced in the same position as originally fitted.

148. Fit the pressure regulator spacer(s), spring retainer and spring into the pressure regulator bore.

149. Fit the boost valve into the bushing, stem end out, and fit both parts into the pump cover by compressing the bushing against the spring.

150. Fit the retaining snap-ring.

151. Fit the pressure regulator valve from the opposite end of the bore, stem end first.

152. Fit the pressure regulator valve bore plug and retaining pin into the end of the bore.

153. Fit the front unit selective thrust washer over the pump cover delivery sleeve.

NOTE: The correct thickness was determined at the time the Front Unit End-Float Check (see 44.30.22) was carried out.

154. Fit the two oil seal rings to the pump cover.

155. Lubricate the pump gears with transmission fluid and fit the pump cover to the pump body.

156. Fit the pump securing bolts; do not tighten at this stage.

157. Using a suitable Jubilee clip around the pump assembly, tighten to align the pump cover with the pump body.

158. Fully tighten the securing bolts to 2,49 kgf m (18 lbf ft).

159. Fit a new square-cut 'O' ring to the pump.

160. Fit a new pump oil seal, using service tool 18G 1297.

FORWARD CLUTCH ASSEMBLY

Dismantling

161. Carefully secure the turbine shaft in a soft-jawed vice and remove the snap-ring securing the forward clutch housing to the direct clutch hub.

162. Remove the direct clutch hub (Fig. 19).

163. Remove the outer thrust washer, forward clutch hub and inner thrust washer (Fig. 19).

164. Remove the five composition and five steel clutch plates (Fig. 19).

165. Press the input shaft out of the forward clutch drum and using service tool 18G 1016, compress the spring retainer and remove the snap-ring (Fig. 19) securing the forward clutch piston assembly to the housing.

166. Remove the service tool 18G 1016 and withdraw the spring retainer and 16 clutch release springs.

167. Remove the forward clutch piston (Fig. 19) from the forward clutch housing.

168. Remove the seals from the piston (Fig. 19).

169. Remove the centre piston seal from the forward clutch housing and withdraw the clutch housing and turbine shaft from the vice.

Inspection

170. Check the composition-faced and steel clutch plates for signs of burning, scoring and wear.

171. Check the forward clutch hub and direct clutch hub for wear on the splines and thrust faces; ensure that the lubrication holes are not blocked.

172. Check the piston for cracks.

173. Check the clutch housing for wear, scoring and cracks.

Ensure that the oil passages are free from obstruction and that the check ball valve in the rear of the clutch drum is fitted and free to move.

174. Check the turbine shaft for cracks and distortion and the splines for damage.

175. Check the clutch release springs for signs of distortion.

Reassembling

176. Carefully secure the turbine shaft in a soft-jawed vice.

177. Lubricate new inner and outer clutch piston seals (Fig. 20) with new transmission fluid and fit the seals to the forward clutch piston, lips of seals facing away from spring pockets.

178. Fit a new centre piston seal (Fig. 20) to the forward clutch housing, lip facing upwards; lubricate with new transmission fluid.

179. Fit part of service tool 18G 1298 inner seal protector, to the forward clutch hub.

continued

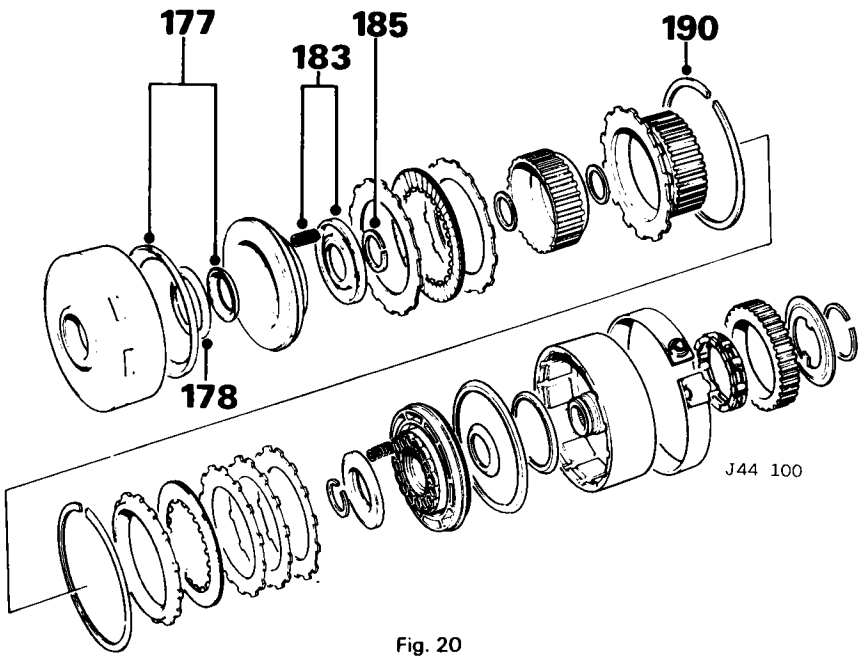


Fig. 20

180. Fit other part of service tool 18G 1298 outer seal protector, to the clutch piston, and insert assembly in forward clutch housing.
181. Fit the clutch piston by rotating it in a clockwise direction until seated.
182. Remove service tools.
183. Fit the 16 clutch release springs (Fig. 20) to the spring pockets in the clutch piston.
184. Using bench press and service tool 18G 1016 fit the spring retainer, ensuring that retainer does not foul the snap-ring groove. Refit the input shaft.
185. Fit the snap-ring (Fig. 20) and remove the service tools.
186. Ensure that the clutch release springs are correctly seated and are not leaning.
187. Fit the thrust washer to the outside face of the forward clutch hub. The bronze washer is fitted to the side of the hub which faces the forward clutch housing.
188. Fit the forward clutch hub to the forward clutch housing.
189. Fit the dished steel plate to the clutch housing. This should be fitted so that the centre portion of the plate is in contact with the piston.
Fit a steel plate followed by a friction plate. Fit alternate steel and friction plates until a total of five steel plates are in position.

NOTE: Steel plates must be 2,3 mm (0.0915 in) thick.

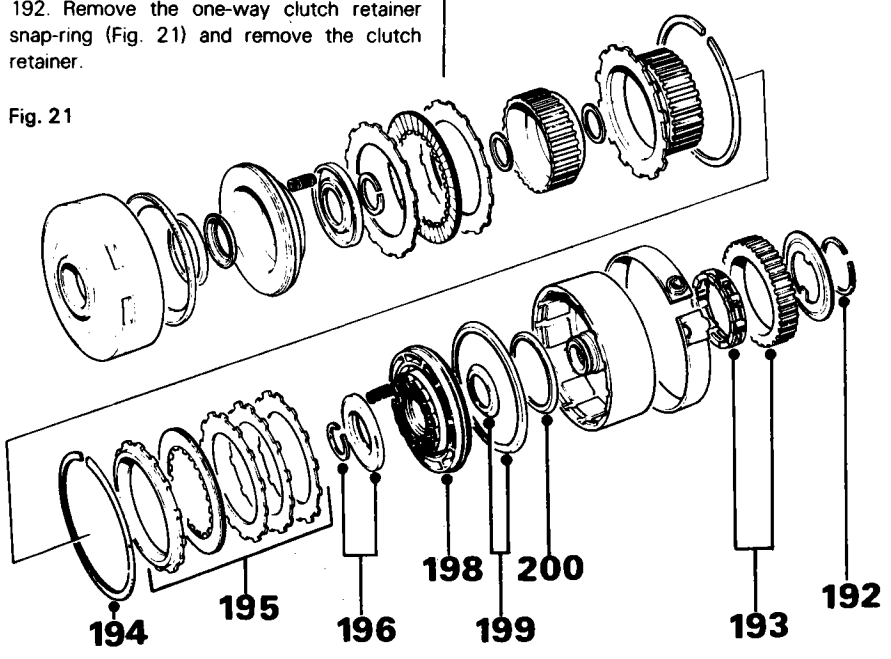
190. Fit the direct clutch hub in the forward clutch housing and secure with the snap-ring (Fig. 20).
191. Fit the forward clutch housing to the pump delivery sleeve, and applying air to the forward clutch passage in the pump, check operation of forward clutch.

DIRECT CLUTCH AND INTERMEDIATE ROLLER

Dismantling

192. Remove the one-way clutch retainer snap-ring (Fig. 21) and remove the clutch retainer.

Fig. 21



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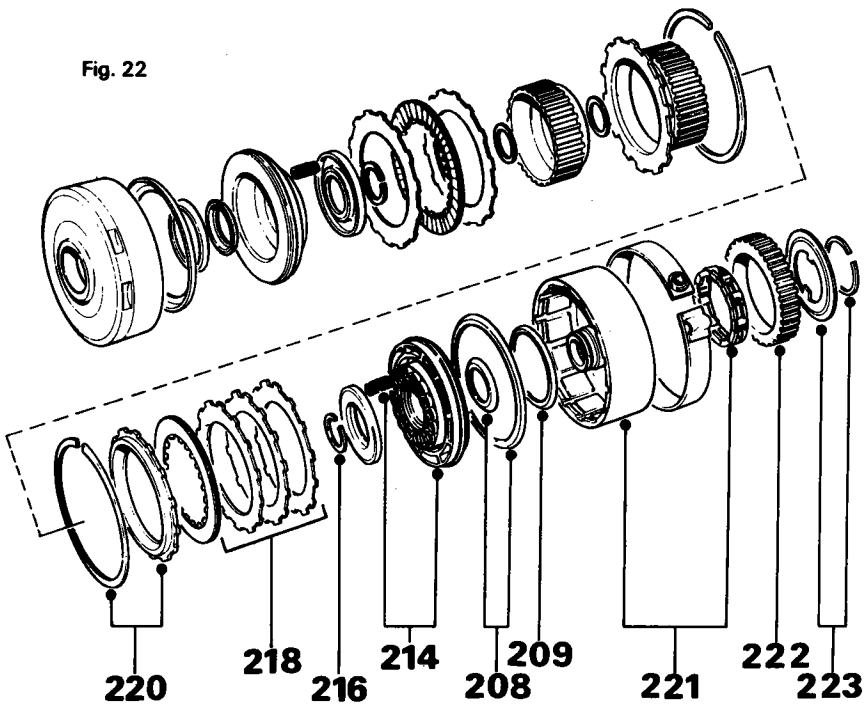
193. Remove the roller outer race and remove the roller assembly (Fig. 21).
194. Remove the snap-ring (Fig. 21) securing the direct clutch backing plate to the clutch housing.
195. Remove the direct clutch backing plate and the six composition and six steel clutch plates (Fig. 21).
196. Using service tool 18G 1016, compress the spring retainer and remove the snap-ring (Fig. 21).
197. Remove the tool, spring retainer and 14 clutch release springs.
198. Remove the direct clutch piston (Fig. 21) from the direct clutch housing.

Fig. 22



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199. Remove the seals from the piston.
200. Remove the centre piston seal (Fig. 21) from the direct clutch housing.

Inspection

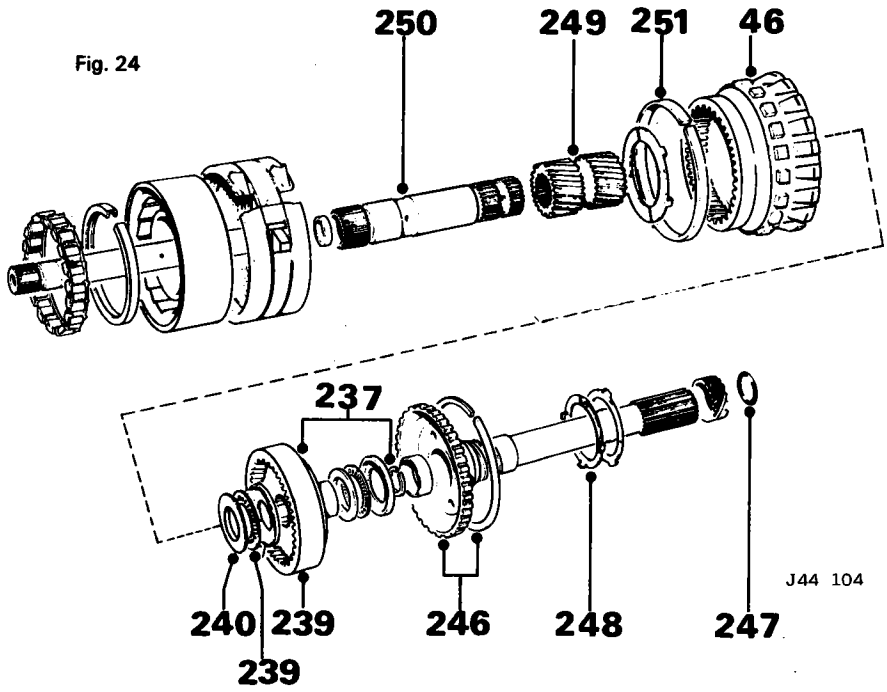
201. Check the one-way clutch for damage, wear or scoring to the locking elements, the cage, drag strip springs and races.
202. Check the direct clutch housing outer race for wear and scoring.
203. Check the direct clutch housing for cracks, wear and blocked oil passages; also check the clutch plate drive lugs for wear.
204. Check the composition-faced and steel clutch plates for signs of wear and burning.
205. Check the back plate for scratches, scoring and other damage.
206. Check the piston for cracks, ensure that the check ball operates freely.
207. Check the springs for wear and distortion.

Reassembling

208. Lubricate new inner and outer clutch piston seals (Fig. 22) with new transmission fluid, fit the seals to the piston, seal lips facing away from spring pockets.
209. Fit a new centre piston seal (Fig. 22) to the direct clutch housing, lip facing upwards, and lubricate with new transmission fluid.
210. Fit part of service tool 18G 1298 forward and direct clutch inner seal protector, over the direct clutch hub.
211. Fit other part of service tool 18G 1298 forward and direct clutch piston outer seal protector to the clutch piston and inset assembly in the direct clutch housing.
212. Fit the clutch piston by rotating it in a clockwise direction.

213. Remove service tools.
214. Fit the 14 clutch release springs to the spring pockets in the clutch piston (Fig. 22).
215. Using bench press and service tool 18G 1016, fit the spring retainer. Ensure that the retainer does not foul the snap-ring groove.
216. Fit the snap-ring (Fig. 22) and remove the service tools.
217. Ensure that the clutch springs are correctly seated and are not leaning.
218. Lubricate the clutch plates (Fig. 22) with clean transmission fluid. Note that although of the five steel plates, four are 2,0 mm (0.0775 in) and one is 2,3 mm (0.0915 in) thick, there is no special order in which they must be fitted relative to each other.
219. Fit the dished plate followed by a steel plate and then fit alternate friction and steel plates.
220. Fit the direct clutch backing plate and secure with the snap-ring (Fig. 22).
221. Fit the one way clutch assembly to the intermediate clutch inner race (Fig. 22), on the direct clutch housing.
222. Fit the intermediate clutch outer race (Fig. 22). Outer race should not turn in an anti-clockwise direction.
223. Fit the one way clutch retainer and snap-ring (Fig. 22).
224. Fit the direct clutch assembly to the centre support and check operation using compressed air.

Fig. 24

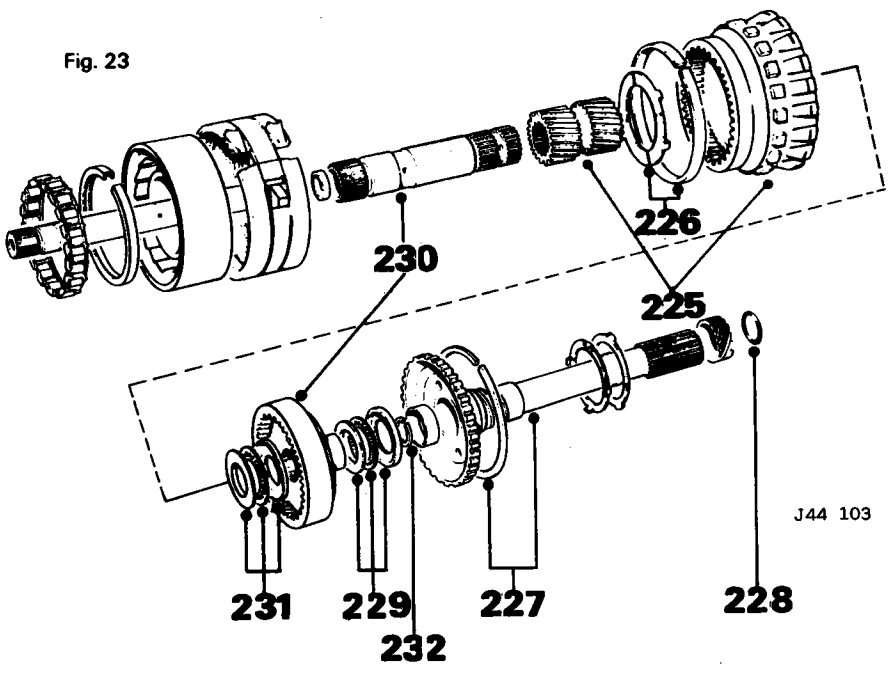


PLANET GEAR CARRIER/ OUTPUT SHAFT ASSEMBLY

Dismantling

225. Remove the sun gear from the output carrier assembly (Fig. 23).
226. Remove the reaction carrier/output carrier thrust washer (Fig. 23) and the damper ring from around the output carrier.
227. Remove the snap-ring (Fig. 23) securing the output shaft to the output carrier and remove the output shaft.
228. Remove and discard the 'O' ring (Fig. 23) from the output shaft.
229. Remove the thrust bearing and races from the rear internal gear (Fig. 23).
230. Withdraw the rear internal gear and mainshaft from the output carrier (Fig. 23).
231. Remove the thrust bearing and races from the inner face of the rear internal gear.
232. Remove the snap-ring (Fig. 23) from the end of the mainshaft and remove the rear internal gear.
233. Remove the speedometer drive gear.

Fig. 23



Inspection

234. Check the splines, 'O' ring grooves, bushes and gear teeth for burrs or signs of damage. Minor burrs can be removed with a very fine abrasive.
235. Check all oil drillings for obstructions and clear only with compressed air.
236. Examine the needle-roller assemblies, and renew if there are any signs of wear or damage.

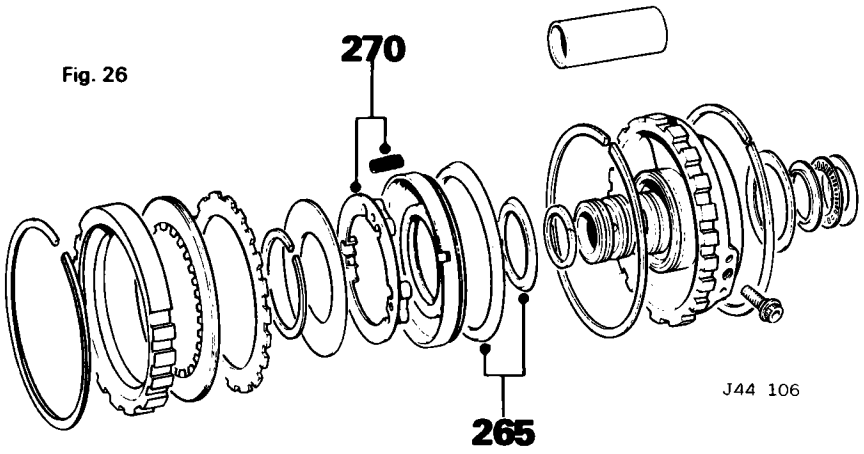
Reassembling

237. Fit the rear internal gear to the end of the mainshaft that has the snap-ring groove and fit the snap-ring (Fig. 24).
238. Fit the large diameter race, with flanged outer edge facing outwards, to the inner face of the rear internal gear.
239. Fit the thrust bearing to the race (Fig. 24).
240. Fit the small diameter race, with flanged inner edge facing inwards, to the bearing (Fig. 24).
241. Lubricate the pinion gears in the output carrier with new transmission fluid and fit the output carrier to the mainshaft, meshing the pinion gears with the rear internal gear.
242. Insert the assembly and hold the mainshaft in a soft-jawed vice. Be careful not to damage the shaft.
243. Fit the small diameter race, with flanged inner edge facing outwards, to the outer face of the rear internal gear.
244. Fit the thrust bearing to the race.
245. Fit the large diameter race, with flanged outer edge facing inwards, to the bearing.

continued

246. Fit the speedometer drive gear. Fit the output shaft into the output carrier and fit the snap-ring (Fig. 24).
247. Fit a new 'O' ring (Fig. 24), to the output shaft.
248. Fit the thrust washer to the output carrier (Fig. 24), engaging the tabs of the washer with the slots in the carrier.
249. Fit the sun gear (Fig. 24), chamfered internal diameter first.
250. Fit the sun gear shaft (Fig. 24), long splined end first.
251. Refit the damper ring round the output carrier.

Fig. 26



CENTRE SUPPORT AND INTERMEDIATE CLUTCH

Dismantling

252. Remove the four Teflon oil rings from the centre support
253. Compress the spring retainer and remove the snap-ring (Fig. 25).
254. Remove the spring retainer and the three intermediate clutch release springs (Fig. 25).
255. Remove the spring guide.
256. Remove the intermediate clutch piston from the centre support (Fig. 25).
257. Remove the seals from the clutch piston.

Inspection

258. Check the roller clutch inner race for wear or damage. Ensure that the lubrication hole is clear.
259. Check bushes for wear, scoring and chafing.
260. Check the oil ring grooves for wear or damage. Check Teflon rings for condition and renew any that are damaged.
261. Using compressed air, check oil passages and clear any obstructions.
262. Check the piston sealing surfaces for scratching and piston seal grooves for damage.
263. Check piston for cracks and seals for wear or damage.
264. Check the springs for distortion.

Reassembling

265. Lubricate the new inner and outer clutch piston seals with clean transmission fluid (Fig. 26).
266. Lubricate the seal grooves in the intermediate clutch piston and fit the seals to the piston, with the lips facing away from the spring guide.
267. Fit 18G 1309 intermediate clutch oil seal protector sleeve over the centre support hub, fit the intermediate clutch piston to the centre support. Ensure that it seats fully.
268. Remove service tool 18G 1309.
269. Fit the spring guide.
270. Fit the three clutch release springs, equally spaced in the holes in the spring guide (Fig. 26).
271. Fit the spring retainer and snap-ring.
272. Compress the spring retainer, ensuring that the retainer does not foul in the snap-ring groove; fit snap-ring.
273. Fit the four Teflon oil seal rings to the centre support. Ensure that the ends of the teflon rings overlap correctly.
274. Using compressed air, check the operation of the intermediate clutch. Apply air to the centre oil feed hole to activate the piston.

GEARBOX ASSEMBLY

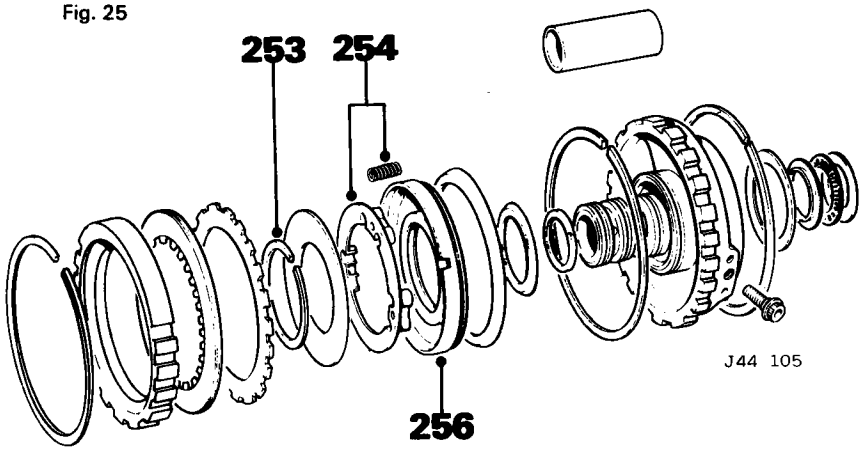
Reassembling

275. Fit the parking pawl, tooth towards the centre of the transmission case, and fit the parking pawl shaft.
276. Fit the parking pawl shaft retaining clip.
277. Tap the parking pawl shaft plug into position, using a 9,5 mm (0.375 in) diameter rod, until the pawl shaft contacts the case rib.
278. Fit the parking pawl return spring, square end to pawl.
279. Fit the parking pawl bracket and secure with the two bolts.
280. Check the rear brake band for distortion, cracks, damage to the ends of the anchor lugs and apply lugs. Also check the lining for cracks, flaking, burning and looseness.
281. Fit the rear band assembly to the transmission case, locating the band lugs with the anchor pins.
282. Fit the rear unit thrust washer, the correct size having been determined in the Rear Unit End-Float Check, see 44.30.23. Engage the lugs of the washer with the slots in the transmission case.
283. Lubricate the pinion gears in the reaction carrier with clean transmission fluid and fit the reaction carrier to the output carrier; engage the pinion gears with the front internal gear.
284. Fit the large diameter race, flanged outer edge facing outwards, to the sun gear.
285. Fit the thrust bearing to the race.
286. Fit the small diameter race, flanged inner edge facing inwards, to the thrust bearing.
287. Lubricate the reaction carrier to centre support thrust washer with petroleum jelly and fit the washer to the recess in the centre support.
288. Fit the roller clutch to the reaction carrier.
289. Fit the centre support assembly to the roller clutch in the reaction carrier.

NOTE: Ensure that the centre support to reaction carrier thrust washer is correctly positioned before fitting the centre support to the roller clutch in the reaction carrier. With the reaction carrier held, the centre support should only rotate in an anti-clockwise direction.

290. Lubricate and fit the centre support to case snap-ring with the flat face of the ring against the centre support. Ensure that the ring is correctly located in the groove and that the gap is adjacent to the front band anchor pin.

Fig. 25



291. With the transmission case held vertically, fit the gear unit, centre support and reaction carrier. Align the centre support bolt hole with the hole in the casing.
292. Fit the centre support to case bolt.
293. Check the intermediate clutch plates for scoring, wear and signs of burning.
294. Lubricate the three steel and three composition clutch plates with clean transmission fluid.
295. Fit the clutch plates commencing with a steel plate and alternate composition and steel plates.
296. Fit the intermediate clutch backing plate, flat machined face against clutch plates.
297. Fit the backing plate to case snap-ring, locate the ring gap adjacent to the front band anchor pin.
298. Re-check the Rear Unit End-Float, see 44.30.23.
299. Check the front band for cracks and distortion damage to the ends of the anchor lugs and apply lugs. Also check the lining for cracks, flaking, burning and looseness.
300. Fit the front band, aligning the band anchor hole and the band anchor pin with the apply lug facing the servo hole.
301. Fit the direct clutch housing and intermediate roller assembly. Ensure that the clutch housing hub locates on the bottom of the sun gear shaft and that the splines on the forward end of the sun gear shaft are flush with those in the direct clutch housing.
302. Fit the forward clutch hub to the direct clutch housing thrust washer, to the forward clutch hub.
303. Fit the forward clutch assembly and turbine shaft. Ensure that the end of the mainshaft locates fully in the forward clutch hub. The distance between the forward clutch and pump mounting face should be 25,4 to 31,8 mm (1.0 to 1.250 in).
304. Lubricate the turbine shaft journals and Teflon oil rings on the pump delivery sleeve.
305. Fit a new outer seal.
306. Fit a new gasket to the pump.
307. Fit the pump to the gearbox casing and secure with the bolts.
308. Re-check the Front Unit End-Float, see 44.30.22.
309. Fit a new manual shaft lip seal to the transmission case; use a 19 mm (0.75 in) diameter rod to seat the seal.
310. Fit the actuator rod to the manual detent lever from the side opposite the pin.
311. Fit the actuator rod plunger under the parking bracket and over the parking pawl.
312. Fit the manual shaft to the case, and insert through the detent lever.
313. Fit and tighten the locknut to the manual shaft.
314. Fit the retaining pin.
315. Fit a new extension housing gasket.
316. Check the 'O' ring on the output shaft for nicks and flattening, and renew as required.
317. Fit the extension housing to the case and secure with the six bolts.
318. If required, fit a new extension housing oil seal.
319. Fit the six check balls into their seat pockets in the casing.
320. Using two guide pins in the smaller diameter holes in the valve block casing, fit the control valve housing spacer plate-to-case gasket, 'C' towards case.
321. Fit the control valve spacer plate.

CAUTION: Some overhaul kits contain a solenoid gasket. This gasket MUST NOT be fitted on Jaguar/Daimler transmissions.

322. Fit the detent solenoid assembly, with the connector facing the outer edge of the casing. **Do not** tighten the bolts.
323. Fit the front servo spring and spring retainer to the casing.
324. Fit the retaining ring to the front servo pin and fit the pin to the case, tapered end to contact band.
325. Fit the servo piston to the pin.
326. Fit a new 'O' ring to the solenoid connector.
327. Fit the connector, locate lock tabs to case.
328. Connect the detent solenoid wire to the connector terminal.
329. Lubricate the rear servo inner and outer bores. Fit the rear accumulator spring.

NOTE: Ensure that the rear band apply lug aligns with the servo pin.

330. Fit the rear servo assembly, ensure proper sealing in the bore, and fit the rear servo cover and gasket. Secure with the six bolts.
331. Fit the control valve housing assembly-to-spacer gasket with letters 'VB' towards the valve block.
332. Fit the governor pipes to the control valve assembly.
333. Fit the governor screen assembly, open end first to the feed pipe hole, i.e. the hole nearest the centre of the transmission, in the casing.
334. Fit the control valve assembly and governor pipes to the transmission, carefully align the governor feed pipe with the screen. Ensure that all gaskets and spacers are correctly positioned.

NOTE: Ensure that the manual valve properly locates with the pin on the detent lever. Check that the governor pipes are located correctly.

335. Fit the securing bolts.
336. Remove the two guide pins and fit the detent roller spring assembly and remaining bolts.
337. Tighten the detent solenoid attachment screws.
338. Fit the modulator valve, stem end outermost, into the case.
339. Fit a new 'O' ring to the vacuum modulator.
340. Fit the vacuum modulator to the case.
341. Fit the modulator retainer, curved face inboard, fit and tighten the attachment bolt.
342. Fit the governor to the case.
343. Fit a new gasket, and secure the governor cover to the case with the four bolts.
344. Fit the speedometer driven gear assembly and secure with the clamp bolt.
345. Fit a new 'O' ring to the intake pipe and fit the pipe to a new filter assembly.
346. Fit the filter and pipe assembly to the casing.
347. Fit and tighten the filter retaining bolt.
348. Fit a new gasket to the oil pan and fit the pan to the casing, secure with the attaching bolts.
349. Fit the torque converter to the turbine shaft, fully engage the converter drive hub slots with the pump olive gear lugs.

SLIPPING GEARS OR NO DRIVE ON SOME 1984 BUILT GEARBOXES

Some GM 400 transmissions manufactured during 1984 may exhibit the following faults:
Slipping in all gears, loss of drive.
If either of these symptoms is evident then the unit should be dismantled and the forward clutch ring checked to ensure that it is correctly seated. If it is found that the forward clutch snap ring is incorrectly located, or not seated correctly and that some seals have also been dislodged from their seats then the reverse boost valve must be removed from the oil pump and the depth of the bore check, see Fig. 27. If this measurement exceeds 15,8 mm (⅝ in) then the valve should be replaced with Part No. AAU 6640.

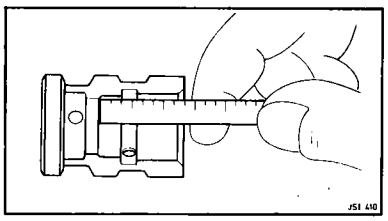


Fig. 27

The suspect transmissions are between Serial Numbers:

842V3608 - 842V6011

HE VEHICLES SHIFT SPEED DATA

NOTE: The figures in the following table refer only to HE cars with a final drive ratio of 2.88:1.

Light Throttle		Full Throttle		Full Throttle and Kick-down		Kick-down		Down-shift		Roll Out	
1–2	2–3	1–2	2–3	1–2	2–3	3–2	3–1	Manual 2–1	PTKD* 3–2	3–2	2–1
5–13 m.p.h.	11–21 m.p.h.	43–53 m.p.h.	60–90 m.p.h.	53–64 m.p.h.	91–101 m.p.h.	80–91 m.p.h.	32–43 m.p.h.	18–25 m.p.h.	43–53 m.p.h.	5–13 m.p.h.	3–9 m.p.h.
8–21 km/h	18–34 km/h	69–85 km/h	96–145 km/h	85–103 km/h	146–163 km/h	129–146 km/h	52–69 km/h	29–40 km/h	69–85 km/h	8–21 km/h	5–14 km/h

* PTKD = Part Throttle Kick-down

NOTE: The figures in the following table refer only to Canadian HE cars with a final drive ratio of 2.88:1.

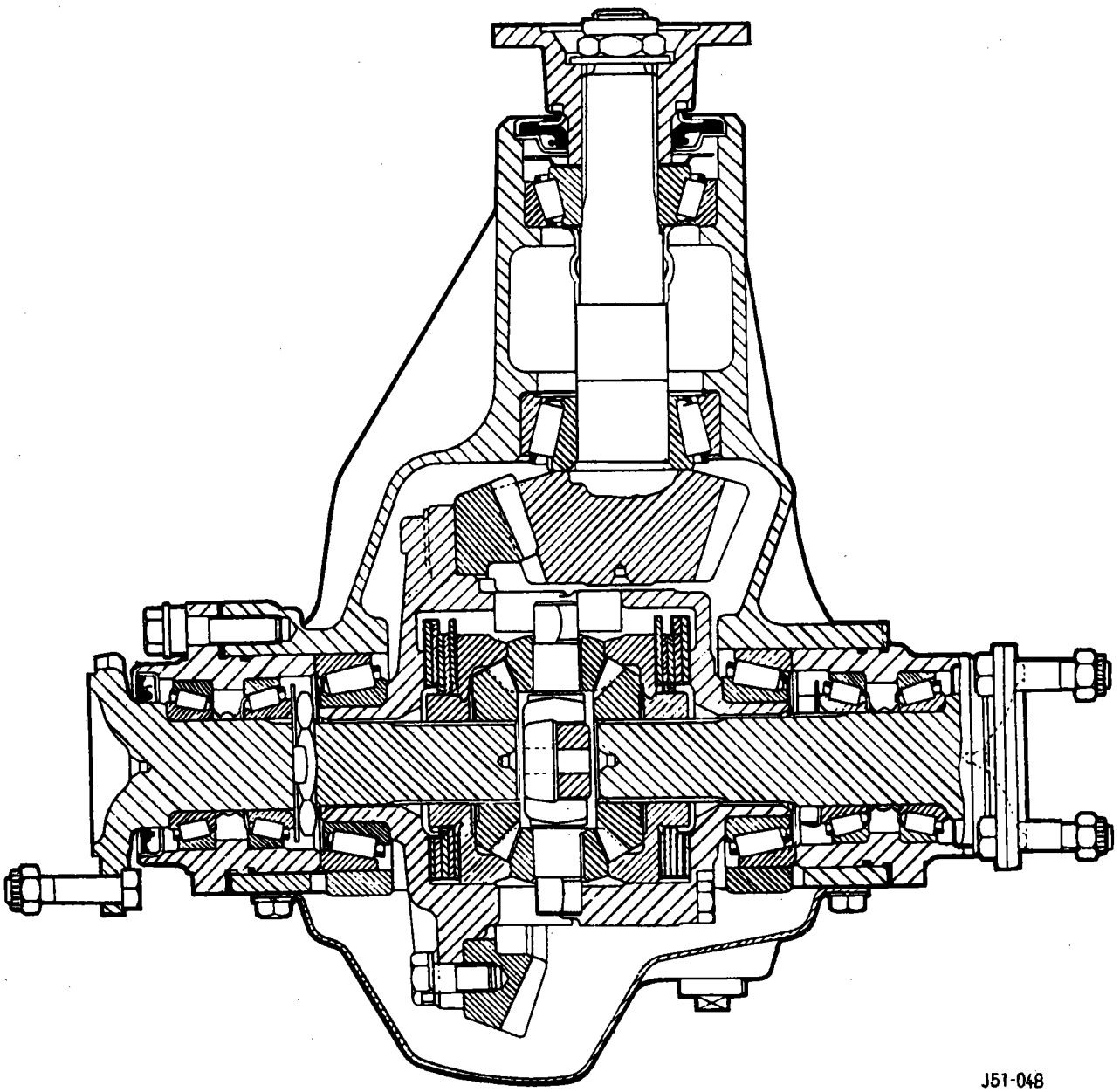
Light Throttle		Full Throttle		Full Throttle †Kick-down		Kick-down		Down-shift	Roll Out	
1–2	2–3	1–2	2–3	1–2	2–3	3–2	2–1	Manual 2–1	3–2	2–1
7–12 m.p.h.	15–22 m.p.h.	38–48 m.p.h.	67–75 m.p.h.	60–70 m.p.h.	90–100 m.p.h.	80–90 m.p.h.	40–50 m.p.h.	20–30 m.p.h.	8–12 m.p.h.	3–8 m.p.h.
11–19 km/h	24–35 km/h	61–77 km/h	107–120 km/h	96–112 km/h	144–160 km/h	128–144 km/h	64–80 km/h	32–48 km/h	13–19 km/h	5–13 km/h

NOTE: The above figures are theoretical. Actual figures may vary slightly due to such factors as tyre pressures, road conditions etc.

HE VEHICLES VALVE SPRING IDENTIFICATION

VALVE SPRING IDENTIFICATION CHART				
Function	Colour	Free Length	No. of Coils	Outside Diameter
1–2 accumulator valve	Red	1.750 in	12.5	0.470 in
Pressure regulator	Light Blue	3.343 in	13	0.845 in
Front servo piston	Natural	1.129 in	4	1.257 in
Rear accumulator	Yellow	2.230 in	8.5	1.130 in
Governor	Dark green	0.933 in	9.5	0.316 in
	Red	0.987 in	8.5	0.306 in
1–2 regulator	Pink	0.936 in	13.5	0.241 in
2–3 valve	Red	1.491 in	17.5	0.328 in
2–3 valve	Gold	1.555 in	18.5	0.326 in
3–2 valve	Yellowy Green	2.500 in	18.5	0.400 in
Front accumulator piston	Pink	2.600 in	8.5	1.260 in
Detent regulator	Green	2.735 in	26.5	0.340 in

CONTENTS



CROSS-SECTION OF THE LIMITED SLIP REAR AXLE

TORQUE WRENCH SETTINGS

Item	Spanner Size	Description	Tightening Torque		
			Nm	kgf/m	lbf/ft
Caliper mounting bracket to unit	$\frac{5}{8}$ in AF	$\frac{7}{16}$ in UNC setbolts	81,3 to 93	8,3 to 9,54	60 to 69
Differential bearing caps	$\frac{3}{4}$ in AF	$\frac{1}{2}$ in UNC setbolts	85,4 to 97	8,71 to 9,95	63 to 72
Drive pinion nut	$1\frac{1}{8}$ in AF	$\frac{3}{4}$ in UNF nut	244 to 256	24,92 to 26,34	180 to 190
Drive gear to differential flange	$\frac{5}{8}$ in AF	$\frac{7}{16}$ in UNF setbolts	102 to 118	10,78 to 12,16	77 to 88
Powr-Lok differential case	$\frac{9}{16}$ in AF	$\frac{3}{8}$ in UNC setbolts	58,3 to 67	5,95 to 6,9	43 to 50
Rear cover attachment	$\frac{1}{2}$ in AF	$\frac{5}{16}$ in UNC setbolts	20,5 to 27	2,1 to 2,76	15 to 20
Ring gear attachment	$\frac{11}{16}$ in AF	$\frac{7}{8}$ in UNF Rippbolt	136 to 151	13,8 to 15,46	100 to 111

SERVICE TOOLS

Tool No.	Description
18G 120 5	Flange Holder
18G 134 (MS 550, 550, SL 550)	Adaptor Handle
SL 550-1	Outer Pinion Cup Remover
47 (MS 47, SL 14)	Hand Press
{SL14-3/2	Differential Side Bearing Remover
{SL14-3/1	Differential Side Bearing Remover Button
{SL 3	Clock Gauge Tool
{4 HA	Pinion Height Setting Gauge
SL 550-9	Pinion Inner Bearing Cup Replacer
SL 550-8/1	Pinion Outer Bearing Cup Replacer
{SL 47-1/1	Pinion Head Bearing Remover
{SL 47-1/2	Pinion Head Bearing Replacer
18G 1428	Rear Oil Seal Replacer
SL 15A	Spanner
18G 681 CBW 548	Torque Driver
{SL 47-3/1	Output Shaft Outer Bearing Remover
{SL 47-3/2	Output Shaft Outer Bearing Replacer
JD 14	Dummy Shaft

{Items marked thus are sold as sets.

DESCRIPTION

The standard transmission unit is a Salisbury 4HU final drive, incorporating a 'Powr-Lok' differential when specified; this is identified by the letters 'PL' on a tab under a cover bolt. A Powr-Lok differential differs from a conventional bevel gear unit by the addition of plate clutches loaded by input torque to oppose rotations of the output shafts relative to the differential cage. Clutch plates are splined to the cage, and their mating discs to the output bevels; the loading between plates and disc increases with input torque due partly to the separating forces of bevels and also to the bevel pinion cross-shafts being carried on ramps instead of being positively located in the cage. Increase in output torque causes the cross-shafts to move 'up' the ramps and, by pressing plates and discs together, to 'lock' the differential; this gives the effect of a differential-less axle at maximum torque without increasing the disadvantages of this type of axle in low-torque conditions. Some low-torque stiffness, to reduce one-wheel spin on ice, is provided by forming the outer plates as Belleville washers to produce compression between plates and discs; if one wheel is held and the propeller shaft is disconnected, a torque of between 5,6 and 9,6 kgf/m (40 to 70 lbf/ft) is required to turn the other wheel.

The final drive unit is rigidly attached to a fabricated sheet steel cross-beam which is flexibly mounted to the body structure by four rubber and metal sandwich mountings. Noises coming from the vicinity of the final drive unit usually originate from incorrect meshing of drive gear and pinion, or from bearings on differential or pinion shafts developing play. Operation procedures for the correction of these noise sources are fully covered in operation 51.25.19, but a noise occurring at low speeds only, under braking, could be caused by loss of pre-load in the output shaft bearings. Bearing inspection involves the removal and renewal of an oil seal before resetting pre-load, and is covered in operation 51.20.04, while if inspection indicates that bearing renewal is advisable this is detailed in operation 51.10.22.

TO CHECK THE TOOTH CONTACT PATTERN

Sparingly paint eight or ten of the drive gear teeth with a stiff mixture of marking raddle or engineers blue. Move the painted gear teeth in mesh with the pinion until a good impression of the total contact is obtained. The result should conform with the ideal tooth contact pattern (Fig. 1).

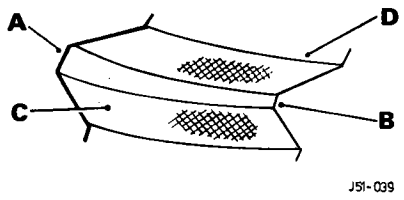


Fig. 1 Ideal tooth contact pattern.

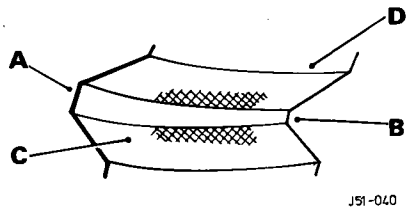


Fig. 2 High tooth contact pattern.

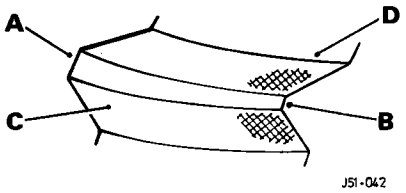


Fig. 3 Low tooth contact pattern.

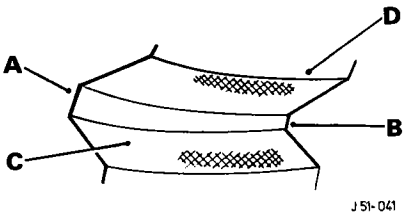


Fig. 4 Toe contact pattern.

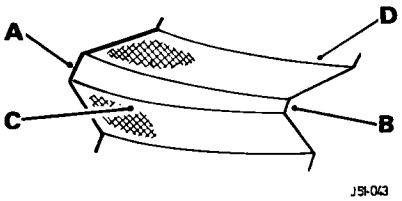


Fig. 5 Heel contact pattern.

A The HEEL is the larger outer end of the tooth.

B The TOE is the small or inner end of the tooth.

C The DRIVE side of the drive gear tooth is convex.

D The COAST side of the drive gear tooth is concave.

FAULT DIAGNOSIS

TOOTH PATTERN	REMEDY
The ideal tooth bearing impression on the drive and coast sides of the gear teeth is evenly distributed over the working depth of the tooth profile and is located nearer to the toe (small end) than the heel (large end). This type of contact permits the tooth bearing to spread towards the heel under operating conditions when allowance must be made for deflection.	———
In High Tooth Contact it will be observed that the tooth contact is heavy on the drive gear face or addendum. To rectify this condition, move the pinion deeper into mesh, that is, reduce the pinion cone setting distance, by adding shims between the pinion inner bearing cup and the housing and fitting a new collapsible spacer.	Move the drive pinion deeper into mesh. i.e. reduce the pinion cone setting.
In Low Tooth Contact it will be observed that the tooth contact is heavy on the drive gear flank or dedendum. This is the opposite condition from that shown in High Tooth Contact and is therefore corrected by moving the pinion out of mesh, that is, increase the pinion cone setting distance by removing shims from between the pinion inner bearing cup and housing and fitting a new collapsible spacer.	Move the drive pinion out of mesh. i.e. increase the pinion cone setting
Toe Contact occurs when the bearing is concentrated at the small end of the tooth.	Move the drive gear out of mesh, that is, increase backlash, by transferring shims from the drive gear side of the differential to the opposite side.
Heel Contact is indicated by the concentration of the bearing at the large end of the tooth.	Move the drive gear closer into mesh, that is, reduce backlash, by adding shims to the drive gear side of the differential and removing an equal thickness of shims from the opposite side. **NOTE: It is most important to remember when making this adjustment to correct a heel contact that sufficient backlash for satisfactory operation must be maintained. If there is insufficient backlash the gears will at least be noisy and have a greatly reduced life, whilst scoring of the tooth profile and breakage may result. Therefore, always maintain a minimum backlash requirement of 0,10 mm. (0.004 in).**

DRIVE PINION SHAFT OIL SEAL

Renew **51.20.01**

Service tools: Torque screwdriver 18G 681, Oil seal replacer 18G 1428.

Detach the four bolts (1, Fig. 6) securing propeller shaft to final drive flange; support propeller shaft rear end and clean flange and nose of final drive.

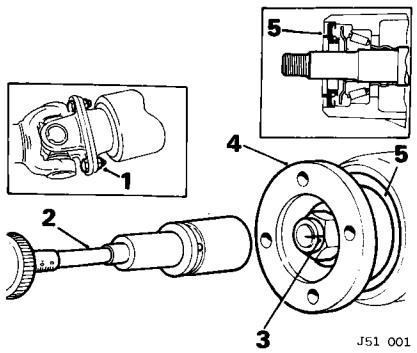


Fig. 6

Accurately measure torque required to turn flange through backlash, using torque screwdriver 18G 681 (2, Fig. 6) with a suitable adaptor and socket.

NOTE: Set screwdriver initially to 0,057 kgf/m (5 lbf/in) and increase setting progressively until torque figure is reached at which flange commences to move. Flange MUST be turned fully anti-clockwise through backlash between each check.

Mark nut and pinion shaft so that in refitting, nut may be returned to its original position on shaft (3, Fig. 6).
Unscrew nut and remove washer and place both washer and nut aside for refitting.
Draw flange (4, Fig. 6) off pinion shaft using extractor.
Prise oil seal (5, Fig. 6) out of final drive casing.

Refitting (using original bearings)

Thoroughly clean splines on pinion shaft and flange. Clean oil seal recess and coat internally with Welseal liquid sealant. Using tool No. 18G1428 tap new oil seal squarely into position with sealing lip facing to rear (1, Fig. 7).

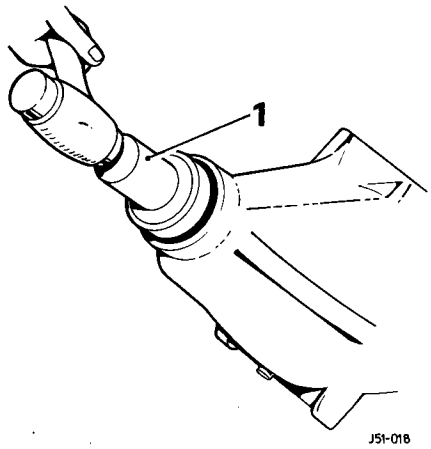


Fig. 7

Smear sealing lip with grease.
Apply grease lightly to outer two thirds of pinion shaft splines.
Lightly tap flange back on pinion shaft, using wooden mallet.
Refit washer and nut and tighten nut until it exactly reaches position previously marked.
Re-check turning torque. Torque required to turn pinion shaft through backlash should exceed by 0,7 to 1,4 kgf/m (5 to 10 lbf/in) the torque recorded earlier. If, however, torque required to turn pinion shaft exceeds 0,52 kgf/m (45 lbf/in), final drive overhaul, operation 51.25.19 MUST be carried out.
Lift propeller shaft into position, replace bolts, fit and tighten nuts to correct torque.
Check oil level in final drive unit and top up if necessary.
Remove car from ramp and road test.
If final drive is noisy, an overhaul must be carried out.

FINAL DRIVE REAR COVER GASKET

Renew **51.20.08**

Remove the fourteen $\frac{1}{2}$ in AF bolts and setscrews (1, Fig. 8) securing the bottom tie-plate to the cross-beam and inner fulcrum brackets.
Drain the oil from the final drive.
Remove the ten $\frac{1}{2}$ in AF setscrews (1, Fig. 9) and remove the rear cover (2, Fig. 9) noting the position of the identification tabs.
Clean off any gasket or sealant from the rear cover and the hypoid housing.
Smear the rear cover flange with Wellseal jointing compound and place the gasket on the casing.
Refit the rear cover and secure with the ten setscrews, prior to fitting coat the threads of the bolts with Loctite.
Refill with new oil.

NOTE: The vehicle must be on level ground before checking the oil level.

Replace the bottom tie-plate and tighten the bolts and setscrews to the correct torque.

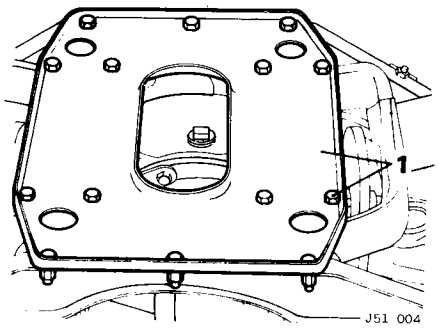


Fig. 8

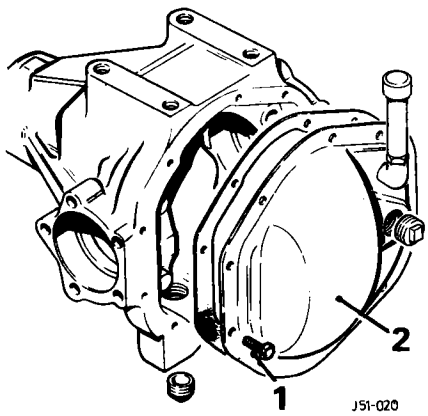


Fig. 9

OUTPUT SHAFT ASSEMBLY (One Side)

Renew **51.10.20**

To remove an output shaft it is necessary to detach the inboard end of the drive shaft, the forward attachment of the radius rod, and to remove the brake caliper and disc (1, Fig. 10).

These operations are detailed in Section 70, the Brake System.

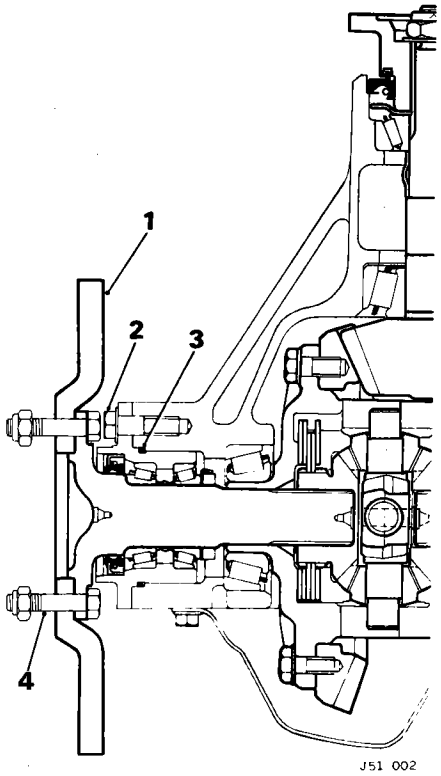


Fig. 10

Cut locking wire and remove five set bolts (2, Fig. 10) securing caliper mounting flange to final drive. Withdraw complete output shaft assembly and discard 'O' ring (3, Fig. 10).

Before fitting, ensure that four bolts (4, Fig. 10) are in position, and that new 'O' ring (3, Fig. 10) is fitted. Lightly oil splines and outside of bearing with final drive oil, insert assembly, fit bolts with spring washers, tighten to 8,4 to 9,66 kgf/m (60 to 69 lbf/ft), tightening the bolt nearest to the input flange first, and wire lock bolt heads together so that wire tension is tending to tighten bolts.

Replace brake caliper and disc as described in Brake System section; check camber angle of rear wheels, and adjust if necessary, refer to Section 64 for the correct procedure.

OUTPUT SHAFT BEARINGS

Renew **51.10.22**

Service tools: 47 Press, Torque screwdriver 18G 681, Adaptor, Spanner SL 15A or 15, Output shaft bearing remover/replacer SL 47-3/1, SL 47-3/2.

Remove output shaft assembly incorporating bearing to be removed.

Clean assembly and clamp caliper mounting bracket between suitably protected jaws of vice.

Turn down tabs of lock washer and remove nut (1, Fig. 11) from shaft, using spanner SL 15A (Fig. 12).

Remove and discard lock washer.

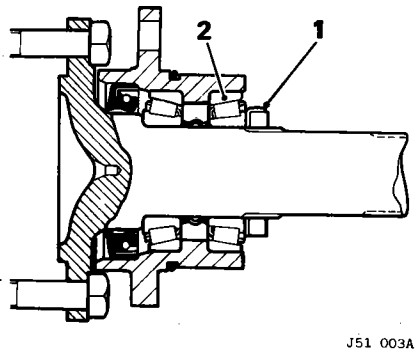


Fig. 11

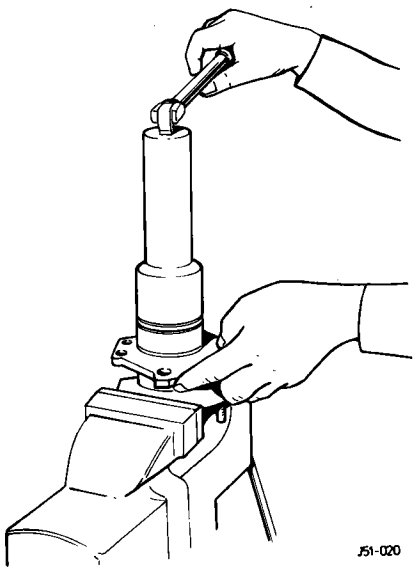


Fig. 12

Withdraw output shaft (1, Fig. 13) from caliper mounting bracket (2, Fig. 13). Collect inner bearing (3, Fig. 13) and cone. Discard collapsed spacer (4, Fig. 13).

NOTE: If outer bearing remains on shaft and pushes oil seal out of caliper mounting bracket on withdrawal, remove it from shaft using tool SL 47-3/1, 47 (1, Fig. 14).

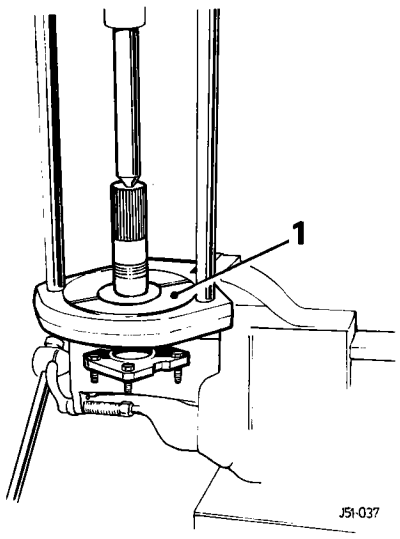


Fig. 14

Prise oil seal from caliper mounting bracket. Collect outer bearing and cone. Discard oil seal.

Using a suitable drift, gently tap bearing cups (5, Fig. 13) out of housing.

Remove caliper mounting bracket from vice and carefully clean internally.

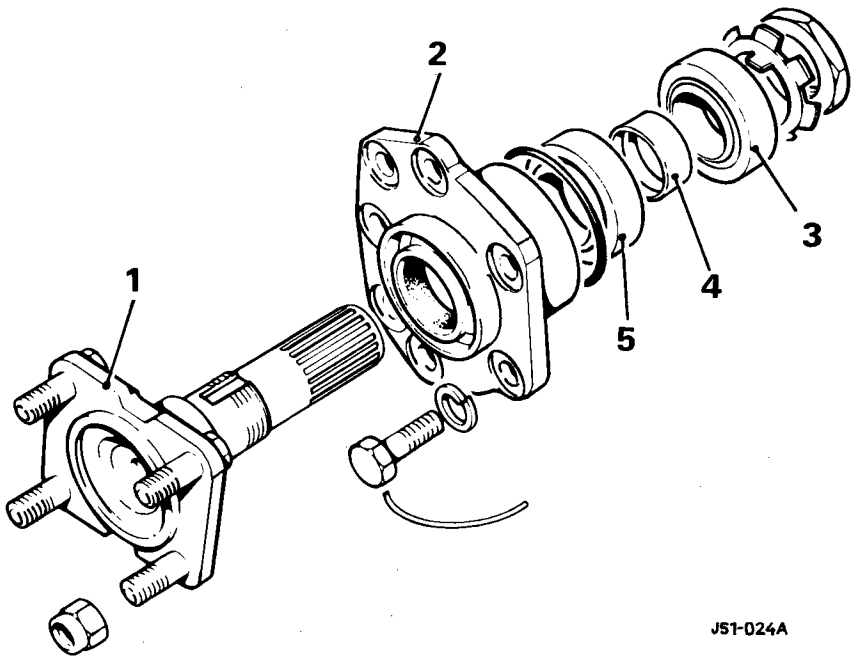


Fig. 13

NOTE: When bearings are to be renewed, always replace complete bearings. Never fit new cone and roller assemblies into used cups.

Before fitting, bearings should be lightly greased, but it is most important that at least 4 cc of hypoid oil is added to the cavity between the bearings during assembly, and that the oil seal is lubricated by packing the annular space between its sealing edges with grease. This prevents premature seal or bearing wear before oil flow begins from the axle centre.

Refitting

Press cups of replacement bearings into housing, using suitble press and adaptors to ensure that cups are pressed fully home in housing.

Place roller and cone assembly of outer bearing (already greased) in position.

Press replacement oil seal into position (1, Fig. 15) ensuring that spring-loaded sealing edge is adjacent to bearing. Load seal with grease between sealing edges.

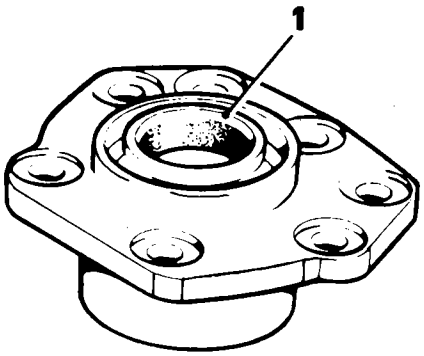


Fig. 15

Clamp caliper mounting bracket between protected jaws of vice.

Check that four special bolts for brake disc are in position in output shaft flange and enter shaft through seal and outer bearing.

Fit new collapsible spacer and fill the space between bearings with Hypoid EP 90 oil before replacing rollers and cone of inner bearing and fitting new lock washer on shaft.

Place nut on shaft, grease face next to washer and tighten finger-tight only.

Using spanner SL15A and a tommy-bar at disc attachment bolts to oppose torque, tighten nut on shaft just sufficiently to almost eliminate play from bearings. Torque required to turn shaft should be 0,14 to 0,28 kgf/m (10 to 20 lbf/in).

Further tighten nut, very slightly (not more than a thirty-second of a turn — about 5 mm ($\frac{3}{16}$ in) at perimeter of nut) and re-check torque required to turn shaft. Continue to tighten nut in very small increments, turning shaft to seat bearings and measuring torque after each increment, until correct figure is reached.

CAUTION: If torque required to turn shaft exceeds by more than 0,28 kgf/m (20 lbf/in) torque recorded in first check, it is necessary to dismantle assembly, discard collapsed spacer and rebuild with new collapsible spacer. It is not permissible to slacken back nut after collapsing spacer as bearing cones are then no longer rigidly clamped.

Turn down tab washers in two places to lock nut and remove assembly from vice. Refit output shaft assembly to final drive unit, see operation 51.10.20.

OUTPUT SHAFT OIL SEAL

Renew **51.20.04**

Service tools: 47 Press, torque screwdriver 18G 681, Adaptor, Spanner SL 15A or 15 Output shaft bearing remover/replacer SL 47-3/1, SL 47-3/2.

Remove output shaft assembly.
Clean assembly and clamp caliper mounting bracket between suitably protected jaws of vice.
Turn down tabs of lock washer (1, Fig. 16) and remove nut from shaft, using spanner SL15A (1, Fig. 17).

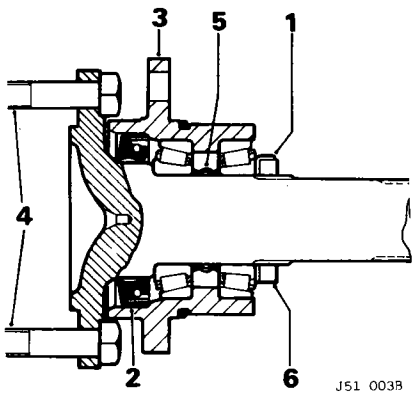


Fig. 16

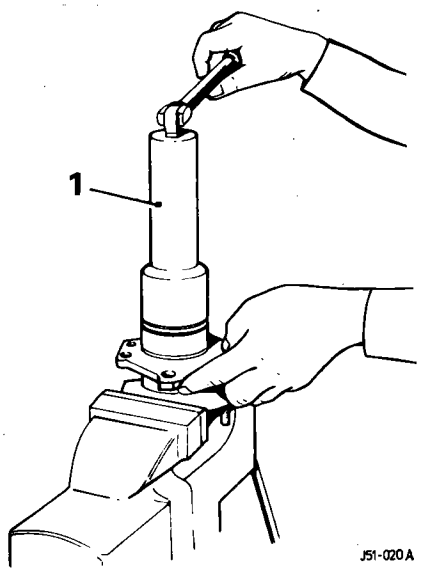


Fig. 17

Remove and discard lock washer.

Withdraw output shaft from caliper mounting bracket. Collect inner bearing and cone and mark for correct reassembly. Discard collapsed spacer.
Prise oil seal from caliper mounting bracket and discard. Collect outer bearing and cone.
Remove caliper mounting bracket from vice and thoroughly clean internally.
If outer bearing remains on shaft and pushes oil seal out of caliper mounting bracket on withdrawal, remove it from shaft using tool SL47-3/1, 47 (1, Fig. 18).

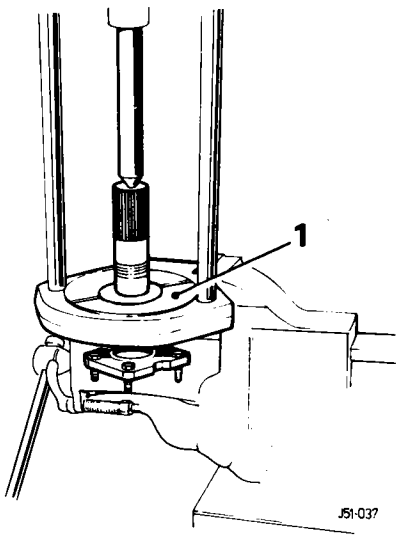


Fig. 18

NOTE: Carefully inspect taper roller bearing components before refitting. If any fault is found in either bearing, replace both complete bearings. Refer to operation 51.10.22, for full details. Never fit new cone and roller assemblies into used cups.

Before fitting, bearings should be lightly greased, but it is most important that at least 4 cc of hypoid oil is added to the cavity between the bearings during assembly, and that the oil seal (2, Fig. 16) is lubricated by packing the annular space between its sealing edges with grease. This prevents premature seal or bearing wear before oil flow begins from the axle centre.

Refitting (using original bearings)

Place roller and cone assembly of outer bearing (already greased) in position.
Press replacement oil seal into position, ensuring that spring-loaded sealing edge is adjacent to bearing. Load seal with grease between sealing edges.
Clamp caliper mounting bracket (3, Fig. 16) between protected jaws of vice.
Check that four special bolts (4, Fig. 16) for brake disc are in position in output shaft flange and enter shaft through seal and fit the outer bearing using tools SL47-3/1, SL47-3/2 (1, Fig. 19).

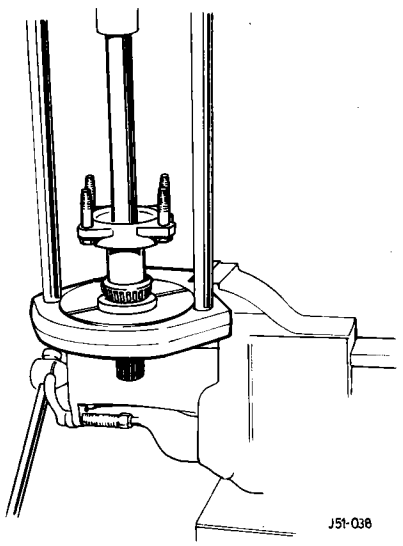


Fig. 19

Smear oil on portion of shaft in contact with seal.
Fit new collapsible spacer (5, Fig. 16) and fill the space between bearings with Hypoid EP 90 oil before replacing rollers and cone of inner bearing and fitting new lock washer on shaft.
Place nut (6, Fig. 16) on shaft, grease face next to washer and tighten finger-tight only.
Using torque screwdriver 18G 681 and adaptor check torque required to turn shaft in caliper mounting bracket against resistance of the oil seal. Record the torque.

NOTE: Set screwdriver initially to 0,05 kgf/m (4 lbf/in). Setting should then be progressively increased until torque figure is established at the point when shaft commences to turn.

Using spanner SL15A and a tommy-bar at disc attachment bolts to oppose torque, tighten nut on shaft just sufficiently to almost eliminate play from bearings. Repeat torque check. Torque required to turn shaft should be unchanged, if it has increased, slacken nut very slightly and re-check.

Further tighten nut, very slightly (not more than a thirty-second of a turn — about 5 mm ($\frac{3}{16}$ in) at perimeter of nut — and re-check torque required to turn shaft. If this torque exceeds by 0,05 to 0,10 kgf/m (4 to 8 lbf/in) the torque recorded earlier, correct bearing pre-load has been achieved, otherwise continue to tighten nut in very small increments, turning shaft to seat bearings and measuring torque after each increment, until correct figure is reached.

CAUTION: If torque required to turn shaft exceeds by more than 0,10 kgf/m (8 lbf/in) torque recorded initially, it is necessary to dismantle assembly, discard collapsed spacer and rebuild with new collapsible spacer. It is not permissible to slacken back nut after collapsing spacer as bearing cones are then no longer rigidly clamped.

Turn down tab washer in two places to lock nut and remove assembly from vice.

Refit output shaft assembly to final drive unit, refer to operation 51.10.20 for full details.

FINAL DRIVE UNIT

Renew **51.25.13**

Service tool: Dummy shaft JD 14.

The final drive unit cannot be removed from the vehicle unless it is detached as part of the rear suspension unit, removal of this item is detailed in the rear suspension section.

Drain the oil from the unit to prevent any leakage from the breather, and invert the whole assembly onto a workbench.

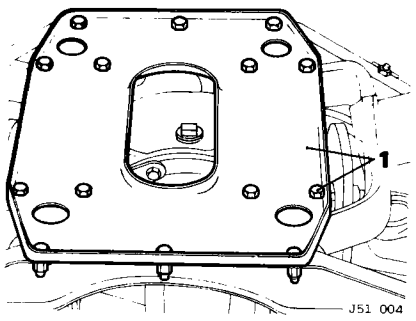


Fig. 20

Remove the fourteen $\frac{1}{2}$ in AF bolts, nuts and setscrews (1, Fig. 20) securing the bottom tie-plate to cross-beam and inner fulcrum brackets.

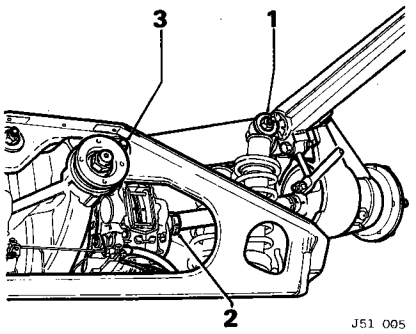


Fig. 21

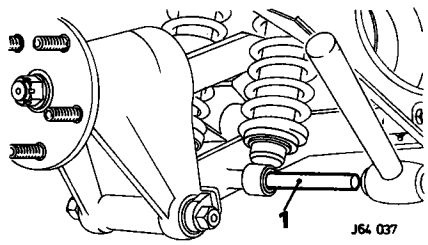


Fig. 22

Remove the $\frac{11}{16}$ in AF nuts and washers (1, Fig. 21) securing the dampers to the wishbone and drift out the retaining pins (1, Fig. 22) recover the spacers and tie-down brackets.

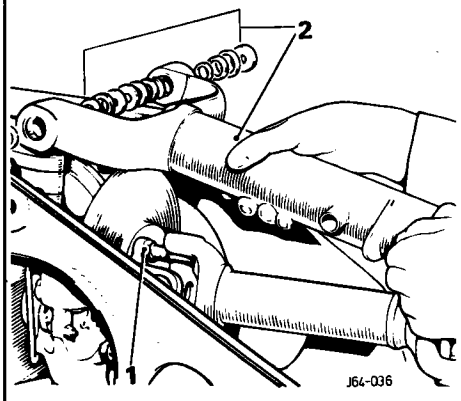


Fig. 23

Slacken the clips (2, Fig. 21) securing the inner universal joint shrouds and slide the shrouds outwards.

Remove the four $\frac{11}{16}$ in AF self locking nuts (1, Fig. 23) either side securing the drive shaft inner universal joint to the brake disc and output flange.

Remove the $\frac{3}{4}$ in AF nut (3, Fig. 21) from the inner wishbone fulcrum shaft and drift out the shaft (1, Fig. 24) collecting the spacers, seals and bearings from the wishbone pivots (2, Fig. 23).

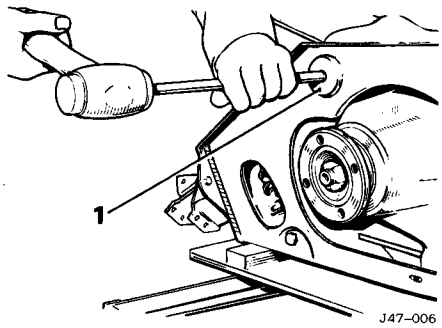


Fig. 24

Remove the drive shaft, hub and wishbone assembly from the rear suspension assembly.

Remove the camber shims from the drive shaft flange studs at the brake disc on both sides.

Remove the spacer tubes from between the lugs of the fulcrum brackets and turn the suspension assembly over on the bench.

Disconnect the brake feed pipes from the calipers, seal the ends of the pipes and the ports in the calipers. Release the brake return springs from the operating levers.

Cut the locking wire and remove the four $\frac{3}{4}$ in AF bolts (1, Fig. 25) securing the final drive to the cross-beam and lift the cross-beam off the unit (Fig. 26).

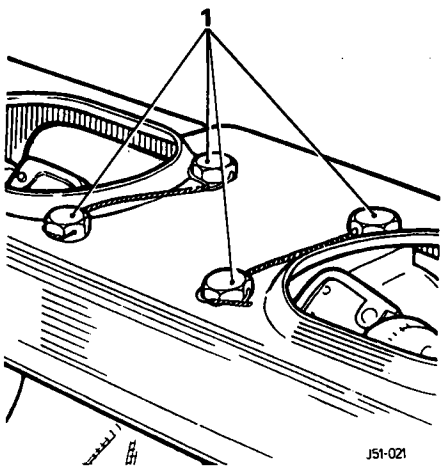


Fig. 25

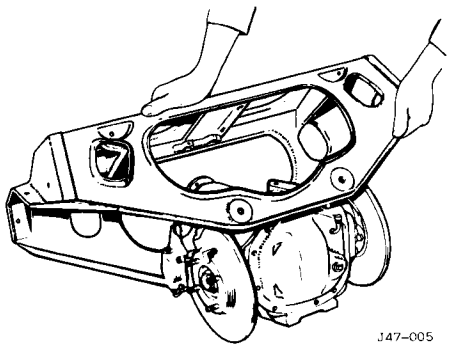


Fig. 26

Invert the unit and remove the locking wires and the $\frac{11}{16}$ in AF setscrews securing the fulcrum brackets to the final drive unit (1, Fig. 27).

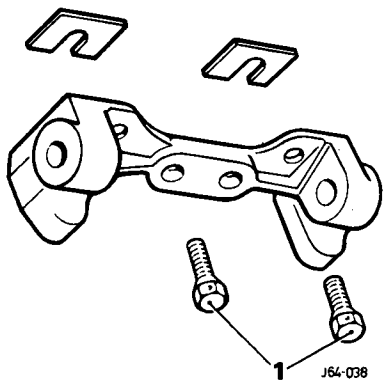


Fig. 27

Remove the brackets, noting the position and number of shims at each attachment point.

Cut the wires from the $\frac{5}{8}$ in AF caliper mounting bolts, remove the bolts and calipers (1, Fig. 28). Remove the brake discs, noting the number of shims between the discs and the flanges.

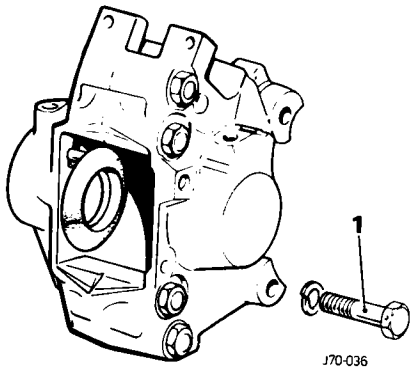


Fig. 28

Replace the shims and disc on one output shaft flange and secure with two nuts. Replace the caliper, tighten the mounting bolts and check the centering and the run out of the disc. The centering tolerance is ±0.25 mm (0.010 in), this can be rectified by transferring shims from one side of the disc to another. The disc run out should not exceed 0.15 mm (0.006 in).

Tighten the caliper bolts to a torque of 6.78 - 7.60 kgf/m 66.4 - 74.5 Nm (49 - 55 lb/ft).

Repeat the above operations on the opposite side. Remove the nuts from both discs.

Place the cross-beam over the final drive, align and replace the bolts and tighten to the correct torque and wire lock. 10.4 kgf/m, 101.68 Nm (75 lb/ft). Slacken the brake feed pipes at the centre union, unseal the brake pipes and the ports in the caliper, align and fit the pipes and tighten the unions.

Replace the handbrake lever return springs and invert the assembly on the bench. Position the fulcrum brackets against the final drive unit and locate each bracket loosely with two setscrews. Replace the shims between the fulcrum brackets and the final drive unit.

Tighten the setscrews and wire lock. Refit the camber shims to the drive shaft studs on one side. Fit the drive shaft on to the studs and loosely fit the nuts, and then tighten fully. Replace the spacer tube between the lugs of the fulcrum bracket.

Clean, inspect and grease the lower wishbone bearings, thrust washer etc. Fit new seals and offer up the wishbone fulcrum bracket lugs and locate with dummy shafts.

Tool No. JD14 (1, Fig. 29).

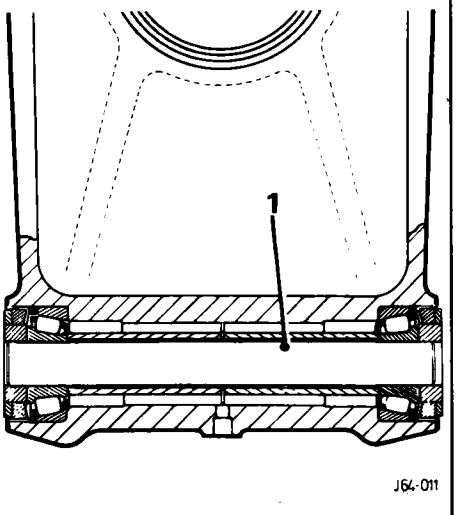


Fig. 29

Take great care not to displace any component during this operation. Drift the dummy shafts from the fulcrum bracket with the fulcrum shaft. Restrain the dummy shafts to prevent spacers or thrust washers dropping out of position.

Tighten the fulcrum shaft nuts to a torque of:

Inner 61.0 - 67.8 Nm, 6.23 - 6.91 kgf/m (45 - 50 lb/ft).

Outer 131 - 145 Nm, 13.4 - 14.8 kgf/m (97 - 107 lb/ft).

Reposition the drive shaft shroud and secure it with the clip. Line up the damper lugs with the wishbone bosses and replace the damper shaft, including the spacer and tie down bracket and tighten the nuts to a torque of 43.4 - 48.8 Nm, 4.43 - 4.97 kgf/m (32 - 36 lb/ft).

Replace the wishbone, drive shaft and damper shaft on the opposite side. Replace the bottom tie-plate and tighten the bolts and setscrews.

Replace the rear suspension unit.

Check the rear wheel camber. Bleed the brakes and fill the final drive with oil as necessary.

NOTE: Use Shell Super Spirax 90 or BP Gear Oil 1453 if new gears have been fitted; otherwise use a recommended refill or top up oil as specified in Section 09.

FINAL DRIVE UNIT

Overhaul 51.25.19

Service tools: 18G 1205, 47, SL 47-1/1, 18G 134, SL 550/1, SL 14-3/1, SL 14-3/2, SL 550-1, SL 3, 4HA, SL 550-9, SL 550-8-1, SL 47-1/1, SL 47-1/2, 18G 1428.

Dismantling

Ensure that all lubricant is drained from the unit and support the unit in a vice.

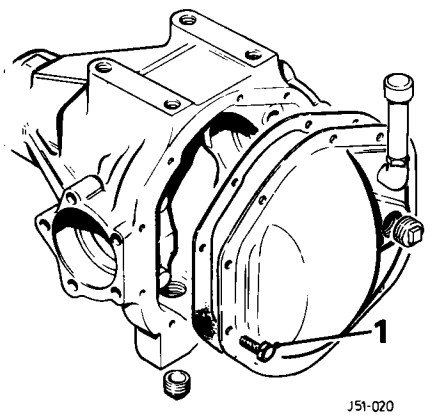


Fig. 30

Remove the ten $\frac{1}{2}$ in AF rear cover securing bolts (1, Fig. 30), the cover and the gasket.
Remove the locking wire and five $\frac{5}{8}$ in AF bolts securing the caliper mounting bracket on one side and withdraw the output shaft assembly.
Repeat for the shaft on the other side.
Remove the two $\frac{3}{4}$ in AF bolts (1, Fig. 31) securing the differential bearing cap, lift out the cap from the differential housing, repeat for the other side.

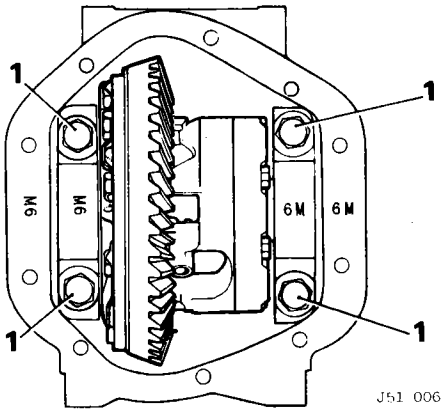


Fig. 31

Using two suitably padded levers, prise out the differential unit.
Using tool 18G 1205 (1, Fig. 32) to hold the drive flange, remove the pinion nut and washer and withdraw the flange (2, Fig. 32).

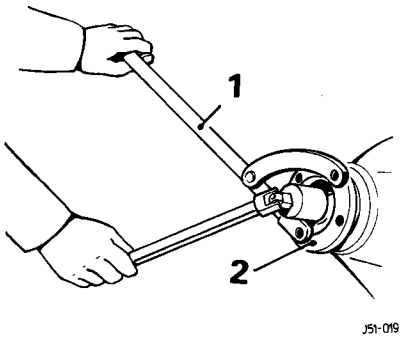


Fig. 32

Using a suitable press extract the pinion from the housing.
Using tool 18G 134 remove the oil seal, oil thrower and outer bearing cone.
Examine the inner and outer bearing cups for wear, if replacement is required extract the outer cup using tools 18G 134 and SL550/1 for inner bearing removal, carefully tap the bearing cone out with a brass punch in the cut-outs provided in the differential casing and carefully collect the shims.
Remove the pinion head bearing using tools 47 (1, Fig. 33), SL 47-1/1 (2, Fig. 33).

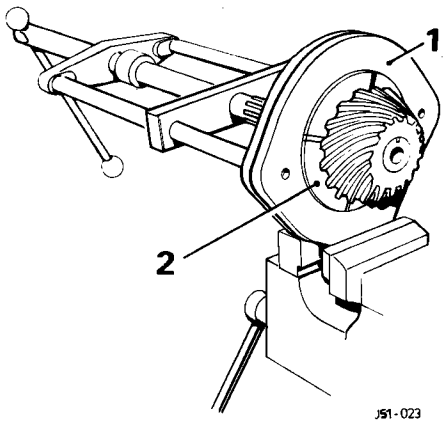


Fig. 33

Remove the differential side bearings using tool Nos. 47 (1, Fig. 34), SL 14-3/2 (2, Fig. 34) and SL 14-3/1 (3, Fig. 34), and collect the shims.

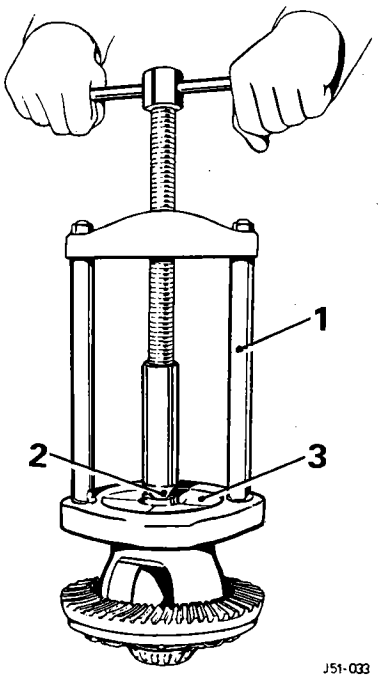


Fig. 34

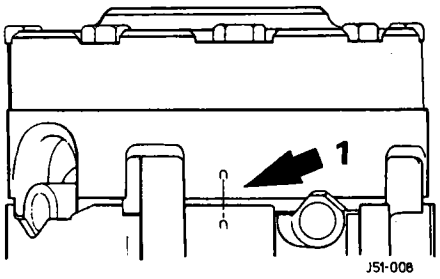


Fig. 35

Powr-Lok only
In the absence of any alignment marks (1, Fig. 35), scribe a line across both halves of differential casing to facilitate reassembly.
Remove the ten $\frac{11}{16}$ in AF crown wheel bolts (1, Fig. 36) and remove the crown wheel (2, Fig. 36).
Remove the eight $\frac{9}{16}$ in AF bolts (1, Fig. 37), securing both halves of the differential casing (2, Fig. 37).
Remove differential side ring (3, Fig. 37).
Remove pinion side gear and pinion cross-shafts complete with gears (4, Fig. 37).
Separate cross-shafts (5, Fig. 37).
Remove remaining side gear (6, Fig. 37) and ring (7, Fig. 37).
Extract the remaining clutch discs (8, Fig. 37) and plates (9, Fig. 37).

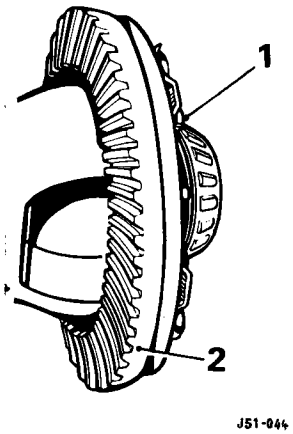


Fig. 36

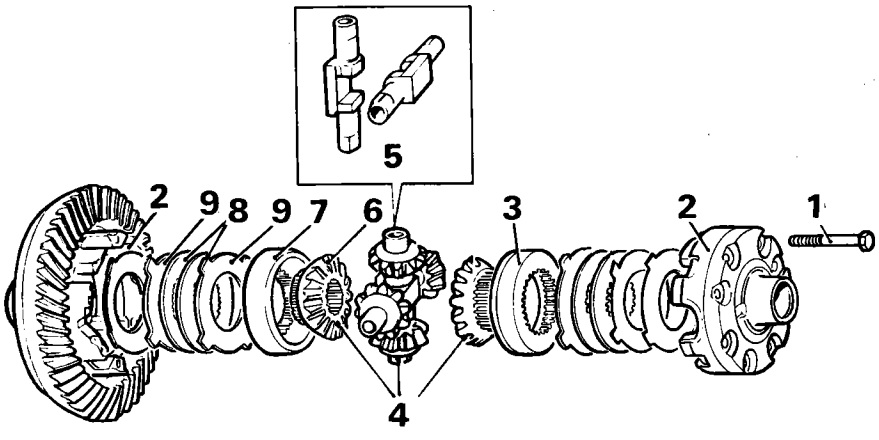


Fig. 37

Reassembling

NOTE: Before commencing assembly, check from reference numbers and letters that pinion and drive gear are a matched pair.

The same serial number must be marked on the pinion end and the outer periphery of the crown wheel (1, Fig. 38), (e.g. 7029). If these requirements are not met the unit must be exchanged.

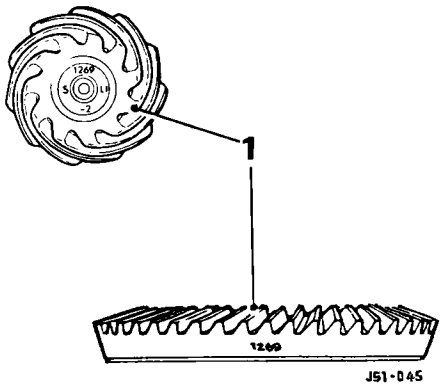


Fig. 38

Powr-Lok only

Prior to reassembly coat all plates and discs with Powr-lok oil.

Refit two Belleville clutch plates (2, Fig. 39) so that convex sides are against differential casing.

Refit clutch plates (4, Fig. 39) and discs (3, Fig. 39) as shown into each half of the casing.

Fit side ring (5, Fig. 39).

Position one side gear into ring recess (6, Fig. 39).

Fit cross-shafts.

Refit pinion mating cross-shafts complete with pinion gears ensuring that ramps on the shafts coincide with the mating ramps in the differential case (7, Fig. 39).

Assemble remaining side gear (6, Fig. 39) and ring (7, Fig. 39).

Offer up right-hand half of differential case (8, Fig. 39) to flange half in accordance with identification marks and position clutch friction plate tongues so that they align with grooves in differential case.

Assemble right-hand half to flange half of differential case using eight bolts coated with Loctite 275 but do not tighten at this stage (9, Fig. 39).

Tighten eight bolts to a torque of 6,05 to 6,9 kg/m (43 to 50 lb/ft) while drive shafts are in position (1, Fig. 40, 1, Fig. 41). With one drive shaft locked, the torque to turn the other (2, Fig. 41) should be between 40 lb/ft and 70 lb/ft. e.g. hold one shaft in vice soft jaws whilst turning the other.

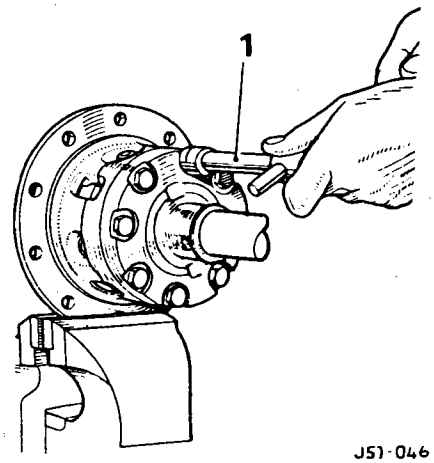


Fig. 40

NOTE: Ensure that prior to assembly the crown wheel mounting face is free from damage or burrs, particularly on the edge; should any burrs be left on the carrier they must be removed with an oil stone prior to fitment of the crown wheel.

Fit the crown wheel to the carrier diametrically using the ten bolts and tab washers, torque up the bolts to 10,78 to 12,4 kgf/m (77 to 88 lb/ft).

Thickness of shims required in the installation of the differential side bearings is determined as follows:

Fit the differential side bearings (1, Fig. 42) using tools 18G 134 (2, Fig. 42) and SL 550-1 (3, Fig 42) without the shims onto the differential case, making sure that

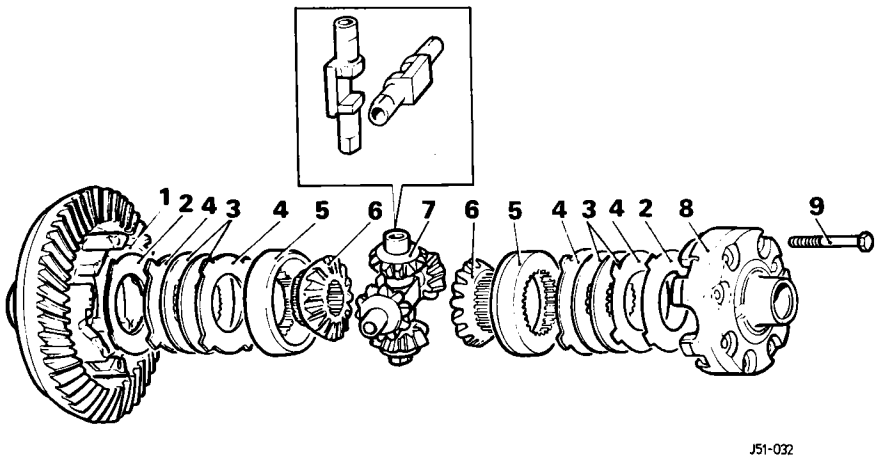


Fig. 39

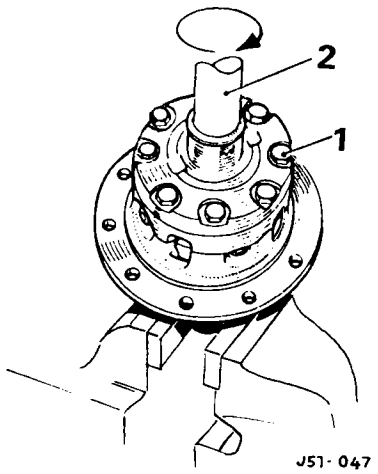


Fig. 41

the bearings and housing are perfectly clean.

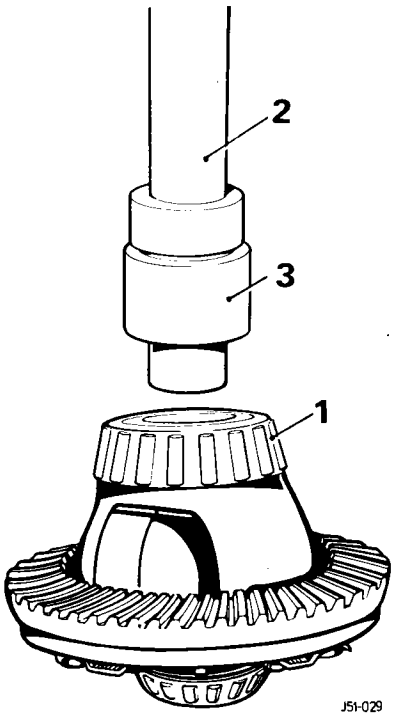


Fig. 42

Place the differential assembly with the bearings in their housing into the differential case without the pinion in position.

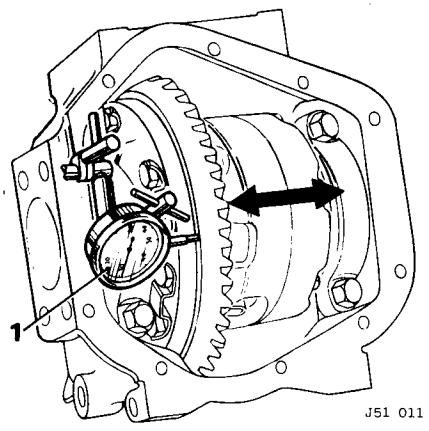


Fig. 43

Install a dial indicator gauge setting the button against the back face of the crown wheel (1, Fig. 43).

Inserting two levers between housing and the bearing cups, move the differential assembly to one side of the carrier.

Set the dial indicator to zero.

Move the assembly to the other side and record indicator reading, giving total clearance between bearings, as now assembled, and abutment faces of the gear carrier housing.

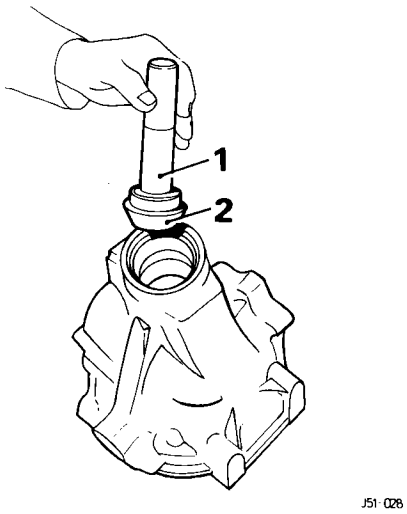


Fig. 44

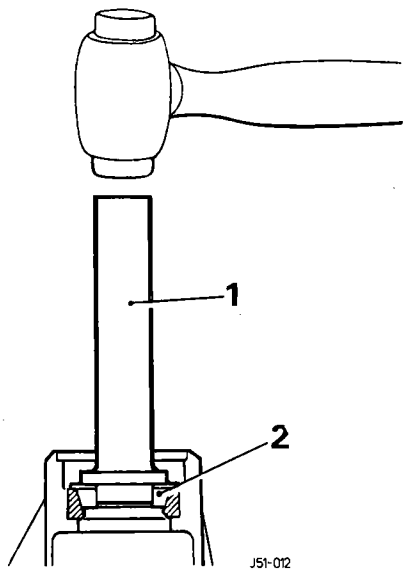


Fig. 45

Remove differential assembly from the gear carrier.

Re-install the pinion outer bearing cup using tools 18G 134 (1, Fig. 44 & 45) and SL 550-9 (2, Fig. 44 & 45).

Fit the inner bearing cup (1, Fig. 46) and shims using tools 18G 134 and SL 550-8 (2, Fig. 46).

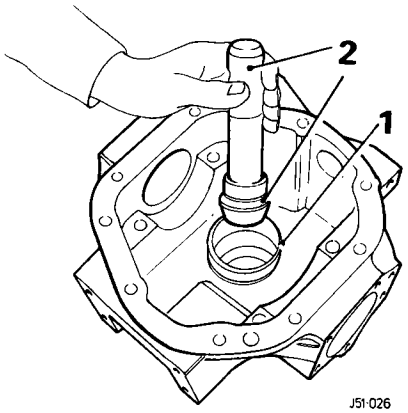


Fig. 46

Press the inner bearing cone onto the pinion using tools 47 (1, Fig. 47), SL 47-1/1 (2, Fig. 47) and SL 47-1/2 (3, Fig. 47).

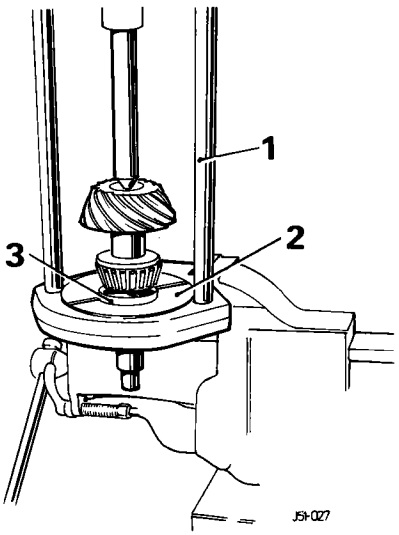


Fig. 47

NOTE: The hypoid drive pinion must be correctly adjusted before attempting further assembly, the greatest care being taken to ensure accuracy.

The correct pinion setting is marked on the ground end of the pinion. The matched assembly serial number is also marked on the periphery of the crown wheel, and care should be taken to keep similarly marked gears and pinions in their matched sets as each pair is lapped together before despatch from the factory. The letter on the left is a production code letter and has no significance relative to assembly or servicing of any axle. The letter and figure on the right refer to the tolerance on offset or pinion drop dimension, which is stamped on the cover facing of the gear carrier housing. The number at the bottom gives the cone setting distance of the pinion and may be Zero (0), Plus (+) or Minus (−). (Fig. 48).

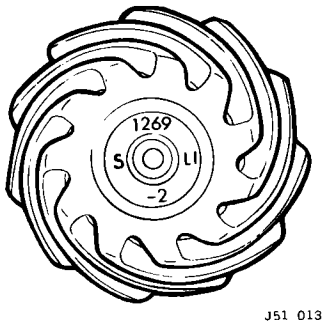


Fig. 48

When correctly adjusted a pinion marked Zero will be at the zero cone setting distance dimension which is 66,67 mm (2.625 in) (i.e. from the centre line of the gear to the face on the small end of the pinion. A pinion marked Plus two (+2) should be adjusted to the nominal (or Zero) cone setting plus 0,0508 mm (0.002 in) and a pinion marked Minus two (−2) to the cone setting distance minus 0,0508 mm (0.002 in). Thus for a pinion marked Minus two (−2) the distance from the centre of the drive gear to the face of the pinion should be 66,619 mm i.e. 66,67 - 0,0508 mm (2.623 in i.e. 2.625 - 0.002 in) and for a pinion marked Plus three (+3) the cone setting distance should be 66,746 mm (2.628 in). Place pinion, together with inner bearing cone, into gear carrier.

A Pinion drop 38,1 mm (1.5 in)

B Zero cone setting 66,67 mm (2.625 in)

C Mounting distance 108,52 mm (4.312 in)

D Centre line to bearing housing 139,57 mm (5.495 in) to 139,83 mm (5.505 in).

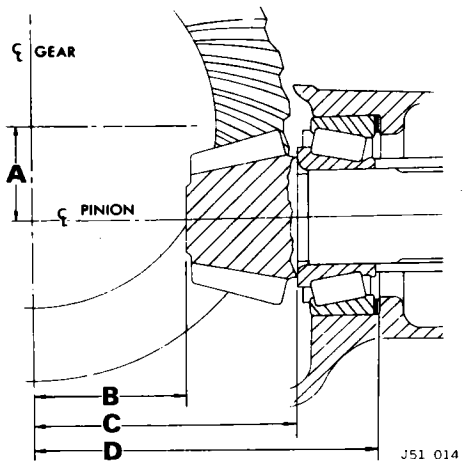


Fig. 49

Turn carrier over and support pinion with a suitable block of wood for convenience before attempting further assembly.
Fit pinion outer bearing cone, companion flange, washer and nut only, omitting the collapsible spacer, oil thrower and oil seal, and tighten nut to remove all backlash.
Check pinion setting distance by means of gauge tool SL3 (1, Fig. 50).

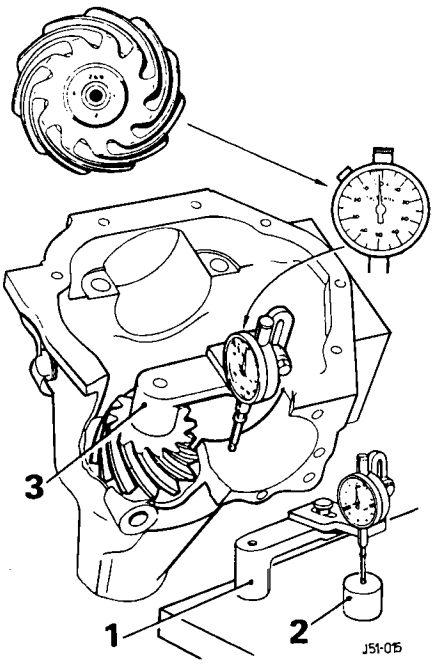


Fig. 50

Adjust bracket carrying dial indicator using 4HA setting block. For differentials with a white painted circle on the rear cover use tool no. SL3-2. (2, Fig. 50) and set dial face to zero.
Check pinion setting by taking a dial indicator reading on the differentail bearing bore with the assembly firmly seated on the ground face of the pinion (3, Fig. 50). The correct reading will be the minimum obtained; that is, when the indicator spindle is at the bottom of the bore. Slight movement of the assembly will enable the correct reading to be easily ascertained. The dial indicator shows the deviation of the pinion setting from the zero cone setting and it is important to note the direction of any such deviation as well as the magnitude.
If pinion setting is incorrect it is necessary to dismantle the pinion assembly and remove the pinion inner bearing cup. Add or remove shims as required from the pack locating the bearing cup and re-install the shim pack and bearing cup. Adjusting shims are available in thicknesses of 0,076 mm, 0,127 mm and 0,254 mm (0.003 in, 0.005 in and 0.010 in). Repeat setting operations until satisfactory result is obtained.
Extract pinion shaft from gear carrier far enough to enable the outer bearing cone to be removed from the pinion.
Fit the collapsible spacer to the pinion ensuring that it seats firmly on the machined shoulder on the pinion shaft.
Insert pinion into gear carrier.
Refit the outer bearing cone, oil thrower and using tool 18G 1428 (1, Fig. 51) fit the oil seal. Loctite the splines of the pinion shaft and fit the flange. Fit a new washer, convex face outermost. Fit, but DO NOT tighten the flange retaining nut.
Begin tightening the flange nut, stopping at frequent intervals to check the torque required to turn the pinion, using the string and spring balance, until the required torque is obtained.

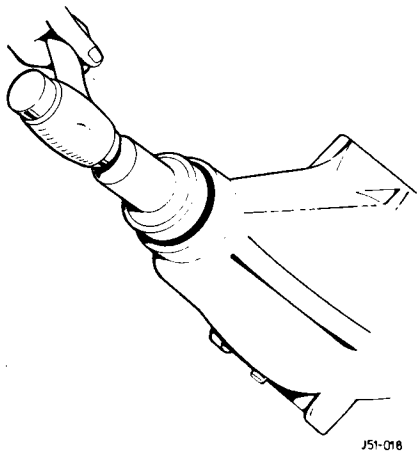


Fig. 51

The flange nut may have to be tightened to as much as 18 kgf/m (130 lbf/ft).
Torque required to turn pinion bearings and oil seal:
Old bearings — 0,20 to 0,28 kgf/m (20 to 25 lbf/in).
New bearings — 0,35 to 0,46 kgf/m (30 to 40 lbf/in).
Note the actual figure required to turn the pinion.
If the above values are exceeded a new collapsible spacer must be fitted. ON NO account must the nut be slackened off and retightened as the collapsed spacer will not then sufficiently clamp the bearing cones.
Place differential assembly complete with side bearings but less shims, in the housing. Ensure that bearings and housing are perfectly clean.
Using the shim pack previously selected, vary the shim thicknesses between each bearing cup and the carrier face to achieve a backlash of 0,15 to 0,25 mm (0.006 to 0.010 in) measured at the outer edge of the ring gear (Fig. 52)
Add an additional 0,07 mm (0.003 in) shim to each pack and carefully note from which side of the differential case the pack was removed.
Remove the bearing cups and cones from the differential case using SL 14-3/2 and SL 14-3/1.
Fit appropriate shim pack to the differential case and refit the bearing cone.
Ensure that the matching shim pack and cone are fitted to the same side of the differential housing that they were removed from.

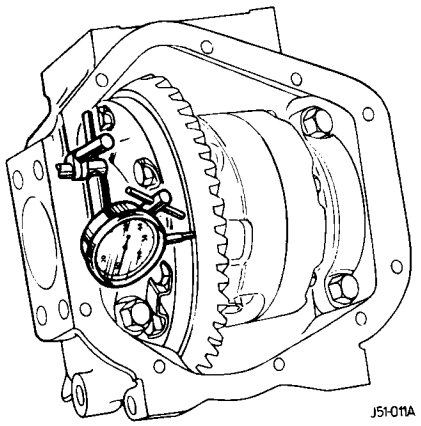


Fig. 52

Lower differential assembly into position lightly tapping the bearings home with a hide hammer.

NOTE: Ensure that gear teeth are led into mesh with those of the pinion. Careless handling at this stage may result in bruising the gear teeth. Removal of the consequent damage can only be partially successful and will result in inferior performance.

When refitting side bearing caps, ensure that position of the numerals marked on gear carrier housing face and side bearing cap coincide (1, Fig. 53).
Tighten cap bolts to a torque of 8,82 to 10,08 kg/m (63 to 72 lb/ft) (2, Fig. 53).

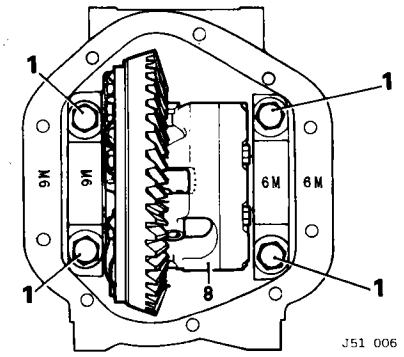
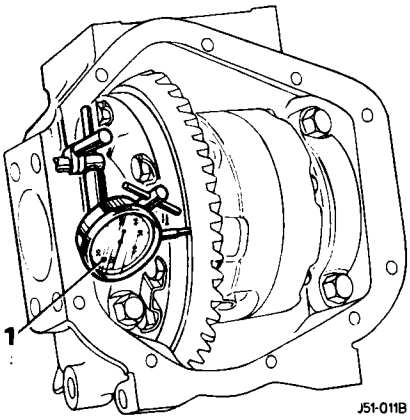


Fig. 53

Mount a dial indicator on gear carrier housing with the button against back face of gear (1, Fig. 54).



Turn pinion by hand and check run out on back face of gear. Run out should not exceed 0,13 mm (0.005 in). If run out excessive, strip the assembly and rectify by cleaning the surfaces locating the drive gear. Any burrs on these surfaces must be removed.

Remount dial indicator on gear carrier housing with button tangentially against one of drive gear teeth (1, Fig. 55).

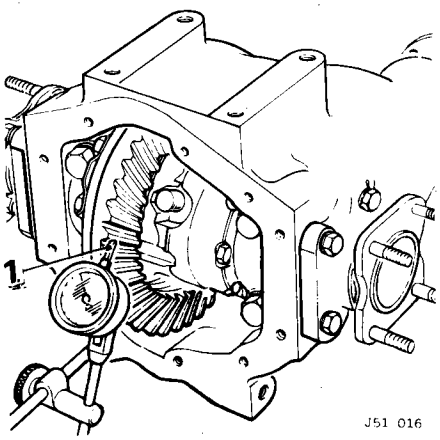


Fig. 55

Move drive gear by hand to check backlash which should be 0,15 to 0,25 mm (0.006 to 0.010 in). If backlash is not to specification, transfer the necessary shims from one side of the differential case to the other to obtain the desired setting. Check backlash in at least four positions of drive gear, ensuring that backlash is always greater than 0,15 mm (0.006 in).

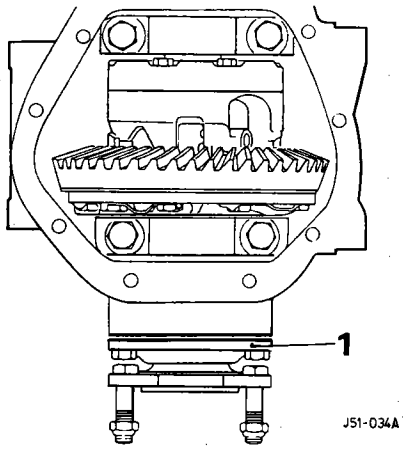


Fig. 56

Check that the torque to turn the input flange is 1,4 to 2,8 kgf/m (10 to 20 lbf/in) additional to the torque measured previously to turn the pinion (page 51-15)

Smear cover flange only with Welseal jointing compound, place gasket on final drive casing, place cover over gasket and insert two bolts to retain, coating threads with Loctite.
Replace remaining eight bolts, coating threads with Loctite and replace the tabs.
Tighten screws by diagonal selection to correct torque 2,1 to 2,8 kgf/m (15 to 20 lbf/ft).

Refit both output shaft assemblies (1, Fig. 56) and torque the bolts to 8,4 to 9,66 kgf/m (60 to 69 lbf/ft), replace the drain plug and refit the drive unit to the cross-member (1, Fig. 57).

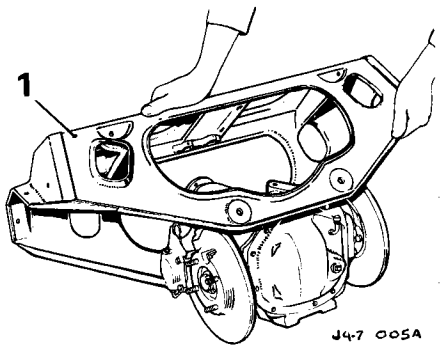


Fig. 57

Secure with bolts (1, Fig. 58) torque and lockwire (2, Fig. 58), ensuring that when lockwired, the wire is tightening the bolts.

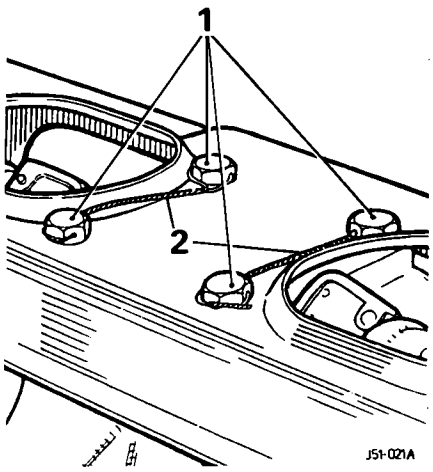


Fig. 58

After refitting the unit to the vehicle fill with new oil.

CONTENTS

TORQUE WRENCH SETTINGS

ITEM	DESCRIPTION	TIGHTENING TORQUE		
		Nm	kgf m	lbf ft
Centre bearing mounting plate to body	$\frac{5}{16}$ in U.N.F. bolts	19 to 24,4	1,94 to 2,48	14 to 18
Centre bearing to mounting plate	$\frac{5}{16}$ in U.N.F. bolts	19 to 24,4	1,94 to 2,48	14 to 18
Drive shaft to drive unit (Cleveloc)	$\frac{7}{16}$ in U.N.F. nut	66,4 to 74,5	6,78 to 7,6	49 to 55
Drive shaft to hub carrier	$\frac{3}{4}$ in U.N.F. nut	136 to 163	13,8 to 16,6	100 to 120
Propeller shaft flange bolts — Automatic gearbox	$\frac{3}{8}$ in U.N.F. bolts and nuts	36,7 to 43,4	3,74 to 4,42	27 to 32
— Manual gearbox	10 mm bolts and nuts	50	5,12	37
Rear propeller shaft to centure U.J.		36,8	3,75	27

SERVICE TOOLS

Tool No.	Description
JD1D	Hub remover

DRIVE SHAFTS AND PROPELLER SHAFT

Description

The drive shafts replace the half shafts of a conventional rear axle, and in addition serve as upper transverse members to locate the rear wheels; their inner universal joints are attached to the final drive unit by bolts which also carry the brake discs, but the brakes are not disturbed in drive shaft removal. The outer joints are integral with the hub driving shafts, and the hubs must therefore be separated from the drive shafts before they can be removed.

The propeller shaft is a two universal joint type, at the front end of which is a reverse spline fitting coupled to the gearbox and at the rear a flange bolted to the input drive flange of the final drive unit.

When fitting a propeller shaft it is essential to ensure that the universal joints operate freely; any stiffness, even in a single joint, will initiate propeller shaft vibration.

DRIVE SHAFT

Remove and refit 47.10.01

Service tool: Hub remover JD 1D.

To remove a drive shaft it is necessary to detach the hub and to swing one suspension unit aside to clear the inner joint.

Ensure that car is securely supported on stands before removing the wheel. Release clips (1, Fig. 1) and before removing nut from drive shaft in hub, slide inner shroud along shaft.

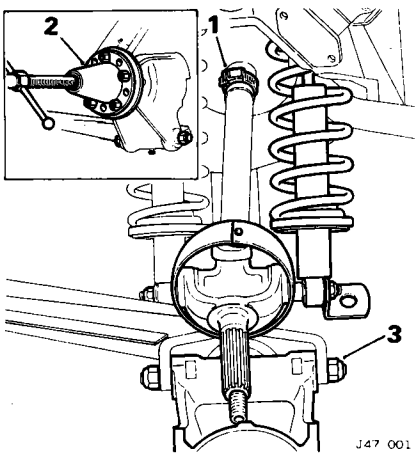


Fig. 1

Remove grease nipple from hub carrier, and using tool JD 1D (2, Fig. 1), withdraw hub from shaft. Allow the hub carrier to pivot about wishbone pin. Before detaching inner joint, release lower end of rear spring/damper unit (3, Fig. 1) and swing aside to clear joint. Collect and retain any camber setting shims fitted between inner joint and brake disc.

Refitting

Replacement drive shafts are supplied without shrouds, oil seal track or spacer; remove these items and transfer them to the new shaft. Seal shroud joints with underseal. Ensure that chamfer on oil seal track clears radius on shaft, and apply Loctite to spline before refitting hub. Tighten all nuts and bolts to the correct torque. Check and if necessary adjust hub bearing end-float and ensure that camber angles of the wheels are correct.

DRIVE SHAFT

Overhaul 47.10.08

Dismantling

Remove drive shaft.

Remove grease nipples (1, Fig. 2), place shaft in vice and remove two opposed circlips (2, Fig. 2).

NOTE: Tap bearings slightly inwards to assist removal of circlips.

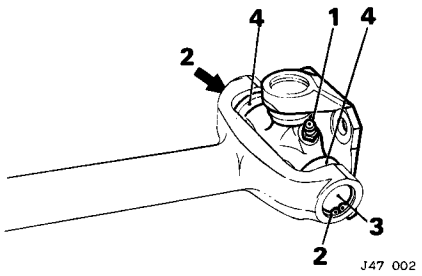


Fig. 2

Tap one bearing inwards to displace opposite bearing (3, Fig. 2).

Trap displaced bearing in vice and remove shaft and joint from bearing.

Replace shaft in vice, displace second bearing by tapping joint spider across and extract second bearing.

Remove two grease seals (4, Fig. 2).

Detach spider, with end section of shaft, from centre section of shaft.

Place end section of shaft in vice and repeat above operations.

Remove spider from end section of shaft.

Repeat above operations on opposite end of shaft.

Inspection

Wash all parts in petrol.

Check splined yoke for wear of splines.

Examine bearing races and spider journals for signs of looseness, load markings, scoring or distortion.

NOTE: Spider or bearings should not be renewed separately, as this will cause premature failure of the replacement.

It is essential that bearing races are a light drive fit in yoke trunnion.

Reassembling

Remove bearing assemblies from one replacement spider; if necessary, retain rollers in housings with petroleum jelly. Leave grease shields in position.
Fit spider to one end section of shaft.
Fit two bearings and circlips in end section trunnions. Use a soft round drift against bearing housings.
Insert spider in trunnions of centre section of shaft.
Fit two bearings and circlips in centre section trunnions.
Fit grease nipple to spider.
Repeat above operations on opposite end of drive shaft.
Grease joints with hand grease gun.
Refit drive shaft.

PROPELLER SHAFT

Remove and refit **47.15.01**

Service tools: Engine support tool MS 53A or extension jack.

Removing

To provide access, remove the exhaust heat shield where fitted.
Mark the relationship between the propeller shaft and final drive flanges, and remove the bolts securing the flanges.
Remove the bolts securing the centre bearing support plate, to the centre bearing and body.
Remove the support plate. Collect two spacers with the front bolts.
Using service tool MS 53A or, alternatively, place an extension jack under the gearbox, nut under the oil pan, take the weight off the rear engine mounting.
Separate the exhaust system at the down-pipe and intermediate pipe joints.
On cars equipped with a catalyst, slacken the nut and move the exhaust support stay to one side.
Remove the exhaust strengthening plate from the transmission case; collect two spacers and one washer.
Raise the rear of the engine/gearbox unit to reduce the loading on the mounting spring.
Remove the bolts securing the engine mounting to the tunnel closing plate, and detach the mounting plate. Collect spring, two spacers, two special washers and bump stop rubber.
Mark the relationship between the propeller shaft front flange and gearbox flange. Remove the bolts, turning the shaft to give access to each nut.
Separate the flanges and withdraw the complete propeller shaft rearwards through the transmission tunnel.

Refitting

NOTE: Before refitting the shaft, ensure that all the universal joints operate freely; a tight joint will cause vibration.
Insert the propeller shaft through the rear of the tunnel and line up the front flanges as marked.
Fit the bolts through the flanges, fit and tighten the nuts. Refer to torque wrench settings.
Replace the rear engine mounting and strengthening plate and detach the engine support tool or jack.
Replace the rear flange to final drive flange as marked, fit four bolts, fit and tighten the nuts to the correct torque.
Offer up the centre bearing support plate to the centre bearing and body structure. Insert bolts and spacers but do not fully tighten. Move the centre bearing as far as possible to the right-hand side of the tunnel and tighten the bolts.

NOTE: If propeller shaft vibration is experienced, move the centre bearing to the left in small steps until the vibration is eliminated. It is most important that the spacers which control the vertical location of the bearing are replaced as originally installed.

Replace the exhaust stay (catalyst equipped cars) and re-make exhaust flange joint using 'Firegum'.

PROPELLER SHAFT

Overhaul **47.15.10**

including:
Propeller shaft — rear — remove and refit **47.15.03**
Sliding joint and gaiter — remove and refit **47.15.08**
Centre bearing — remove and refit **47.15.33**

NOTE: The propeller shaft is supplied as a balanced unit and it is not possible to replace the front or rear shafts separately. Only the sliding joint gaiter, centre bearing, end flanges and spiders of the universal joints can be renewed.

Dismantling

Remove the propeller shaft assembly from the vehicle and place on a workbench.
Clean the assembly and mark the relationship between the centre yoke and the rear shaft.

Rear propeller shaft

To remove the rear propeller shaft, insert a suitable distance piece (e.g. a scrap nut), between the head of the bolt (1, Fig. 3) securing the centre joint yoke to the rear shaft, and the spider of the centre universal joint.
Using an open-ended spanner, unscrew the bolt (1, Fig. 3) from the rear shaft; to separate the shafts, break the Loctite adhesion between the splines and withdraw the rear shaft from the centre yoke.

Centre bearing

Using a suitable puller, remove the centre bearing from the rear propeller shaft. Engage the legs of the puller in the inner reinforcing ring of the rubber mounting.

Universal joints

To overhaul the propeller shaft universal joints, remove the snap-rings from the grooves (2, Fig. 3).

NOTE: If difficulty is encountered, tap the bearing cup (3, Fig. 3) inwards to relieve the pressure on the snap-ring.

Hold the flange yoke and tap the yoke with a soft-faced hammer. The bearing cup should gradually emerge and can be finally removed.
Alternatively, secure the propeller shaft in a vice. Using a suitable soft metal drift, drift down on a bearing cup to displace the opposite cup.
Remove the propeller shaft from the vice, hold the displaced cup in the vice and separate from the propeller shaft by pulling and twisting.
Repeat the above operations for the opposite bearing cup, and the remaining bearing cups at each end of the shaft.

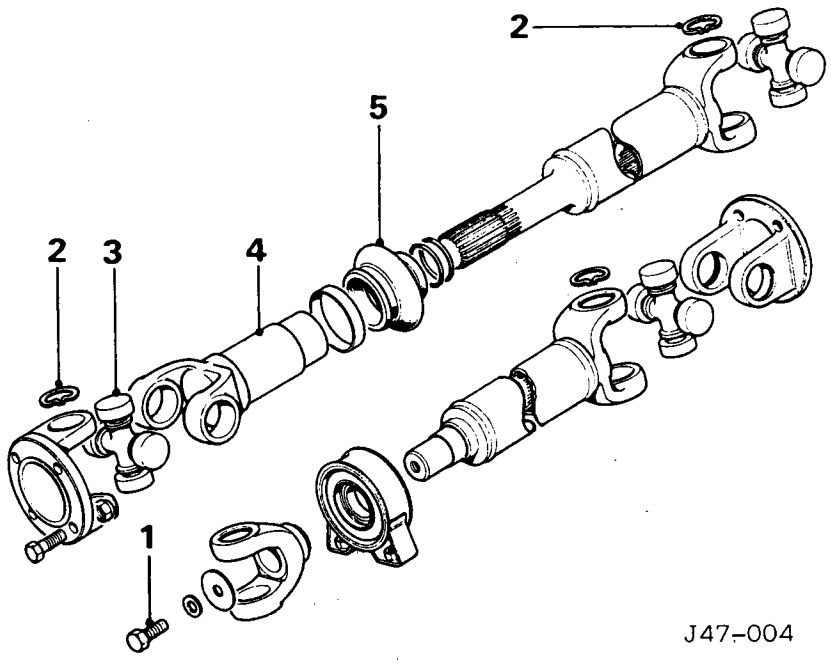


Fig. 3

Sliding joint and gaiter

To remove the gaiter from the sliding joint or the front propeller shaft, clean the gaiter and the area of the shaft adjacent to it. Ensure that the arrows are visible on the sleeve yoke and shaft (1, Fig. 4). Cut the metal and rubber rings (2, Fig. 4) securing the gaiter to the yoke and shaft, withdraw the gaiter (5, Fig. 5) along the shaft.

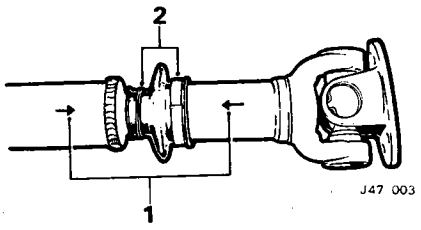


Fig. 4

Partially withdraw the sleeve yoke (4, Fig. 5) from the splined shaft and examine the splines for wear. If there is more than 0,1 mm (0.004 in) circumferential movement measured on the outside diameter of the spline, then the complete propeller shaft assembly must be renewed.
Withdraw the sleeve yoke (4, Fig. 5) from the splines shaft and remove the gaiter (5, Fig. 5).

Inspection

Carefully inspect the internal and external splines of the sliding joint. Ensure that the welch washer in the female spline is secure and leakproof.
Wash all the other components of the propeller shaft assembly in petrol, examine bearing races and spider journals for signs of looseness, load markings, scoring or distortion. Spiders or bearings should not be renewed separately, as this will cause premature failure of the replacement.
It is essential that the bearing cups (3, Fig. 5) are a light drive fit in the yoke trunnions.

Reassembling

Universal joints

Using new universal joint assemblies if necessary, insert the journal cross into the flange, tilting it to engage in the yoke bores.
Ensure that all the needle rollers are in position; fill each bearing cup one-third full of grease of the recommended type.
Fit one of the bearing cups (3, Fig. 5) in the yoke bore, and using a suitable soft metal drift, tap the bearing cup fully home.
Fit a new snap-ring (2, Fig. 5) ensuring it is correctly located in the groove.
Assemble the other spiders and bearing cups, and fit new snap-rings, to retain the bearing cups.

Sliding joint and gaiter

Lubricate the internal and external splines generously with Blended Spline Grease (ref. MNR (A) supplied by Oilene Ltd.), align the arrows and engage the male and female splines.
Ensure that a dimension of less than 185 mm (7.3 in) can be obtained between the yoke joint centre-line and the weld centre-line on the propeller shaft.
Withdraw the shaft and check for complete coverage of the splines by the lubricant.
To prevent damage to the rubber rings and gaiter wrap thin metal or plastic film over the male splines. Pass the two rubber rings over the splines, followed by the smaller end of the gaiter, place the rings over the gaiter.
Remove the protective film from the splines.
Position the metal ring clip on the gaiter, realign the splines and ease the gaiter over the sliding joint. Check that the arrows align (1, Fig. 4) and fit the sleeve yoke to the shaft.
Secure the gaiter clip.

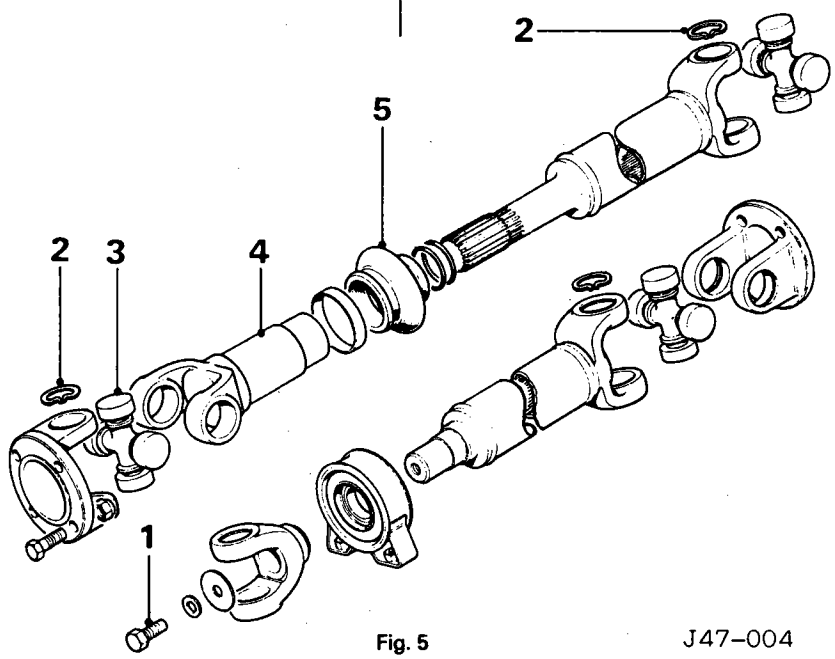


Fig. 5 J47–004

Rear propeller shaft

Coat the splines of the rear propeller shaft with Loctite grade AVV and fit to the centre joint yoke, align the marks previously made.
Fit and tighten the bolt (1, Fig. 5) secure using a new tab washer.

CONTENTS

DESCRIPTION 57.00.00

All cars are fitted with power-assisted rack and pinion steering gear, movement of the rack by the pinion being assisted by hydraulic pressure acting on a piston carried on an extension of the rack.

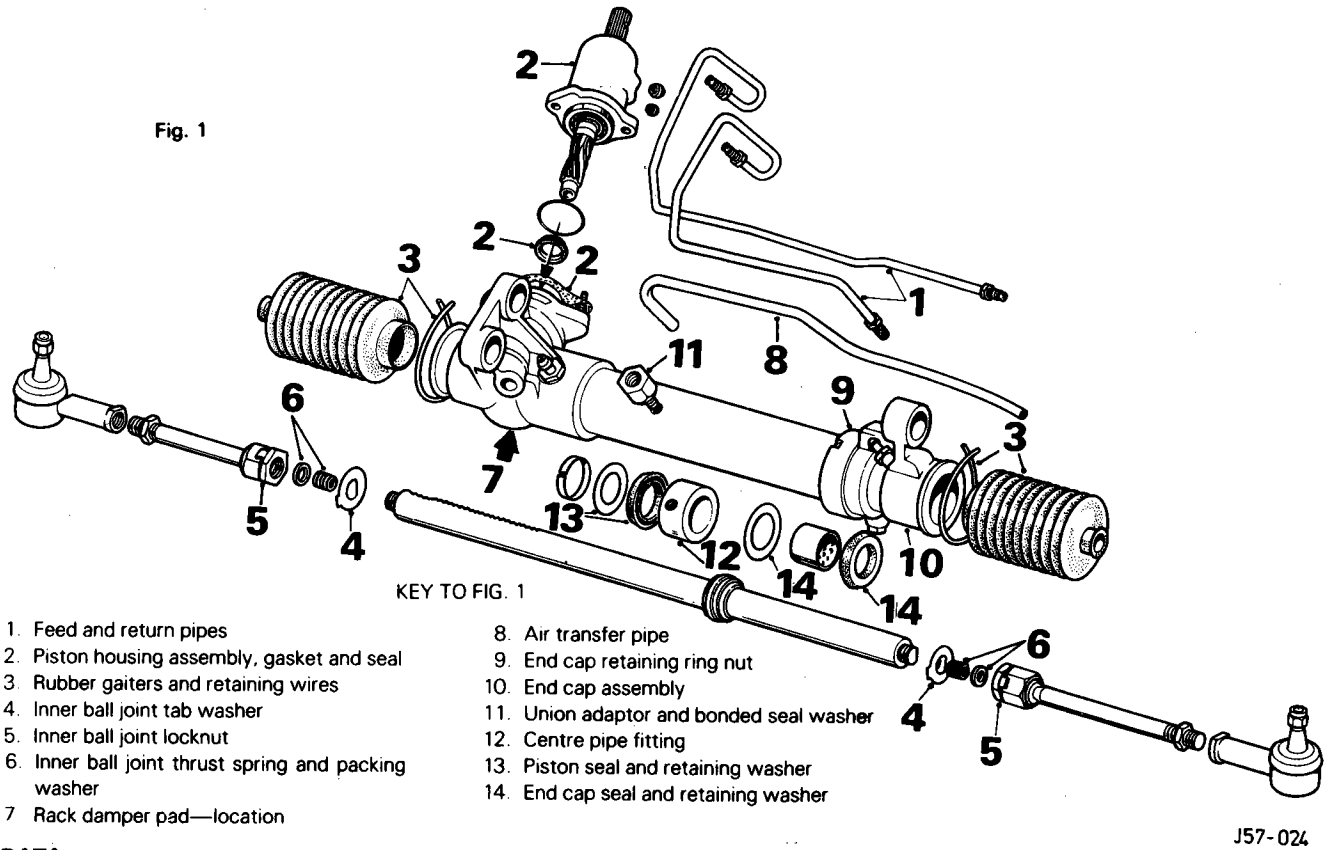
Hydraulic pressure is provided by a vane-type pump with integral reservoir, belt-driven from the engine crankshaft; steering assistance is, therefore available only while the engine is running. A control valve, located between steering column and pinion, directs hydraulic pressure to the appropriate side of the piston when the steering wheel is turned. Flow through the control valve is continuous, and when the car is travelling straight a low pressure is applied equally to each side of the piston. When the steering wheel is turned, a small torsion bar at the base of the steering column allows it to rotate a few degrees before turning the pinions, if the pinion is restrained by the rack. This rotation is used to open and close ports in the control valve so that not only is the pressure directed to one side of the pistons but also, as the torsion bar is twisted, the pressure is increased from about 2,8 kgf/cm² (40 lbf/in²) to a maximum of up to 84,4 kgf/cm² (1200 lbf/in²), the increase in pressure being proportioned to the twist in the torsion bar, and reducing to a minimum when the load in the torsion bar—from the steering wheel becomes zero.

The pressure is prevented from exceeding 84,4 kgf/cm² (1200 lbf/in²) by a flow control valve in the pump which allows some fluid to circulate internally when this pressure is reached.

Two rigid pipes connect the control valve to the rack cylinder, and two hoses run from pump to control valve. A third rigid pipe, pressed into each end fitting of the rack, balances air pressure in the two gaiters as the rack operates.

Servicing of the steering gear is confined to grease lubrication of the two outer ball-joints and the rack damper pad, topping-up the reservoir and inspection for fluid leaks, hose condition and belt wear. When checking fluid level take great care to ensure that no dirt or scraps of cloth can enter the reservoir since if they should reach the control valve the operation of the system can become affected.

Fig. 1



KEY TO FIG. 1

1. Feed and return pipes
2. Piston housing assembly, gasket and seal
3. Rubber gaiters and retaining wires
4. Inner ball joint tab washer
5. Inner ball joint locknut
6. Inner ball joint thrust spring and packing washer
7. Rack damper pad—location
8. Air transfer pipe
9. End cap retaining ring nut
10. End cap assembly
11. Union adaptor and bonded seal washer
12. Centre pipe fitting
13. Piston seal and retaining washer
14. End cap seal and retaining washer

J57-024

DATA

Castor angle: 6 cylinder cars	2¼° ± ¼° positive
12 cylinder cars	3½° ± ¼° positive
Camber angle	½° ± ¼° positive front wheels to be within ¼° of each other
Number of turns of steering wheel, lock to lock	2.75: 6 cylinder models; 3.66: V12 models
Total stroke of rack	156,5 mm (6.16 in)

Axial rack load with feed pressure of 2,11 kgf/cm² (30 lbf/in²) and pump flow of 9,45 litres/min (2.08 gal/min) at 71°C is to be 18,1 kg (40 lb) max, 13,6 kg (30 lb) min. Rack to traverse at 6 to 10 pinion rev/min in this test.

From 1983 model year all vehicles (VIN 360146)

Castor angle	3½° ± ¼° positive
Camber angle	½° ± ¼° negative
Front wheel alignment	0 to 3,18 mm (0 to ⅛ in) toe-in

Power assisted steering racks are now oil filled by the supplier with Shell Spirax EP 80 oil. This has replaced the Shell Retinax 'A' grease fill. Racks to this condition were introduced on Jaguar production at the following VIN 426768.

It is important that when investigating power steering fluid leakage, this lubricating oil is not confused with the hydraulic fluid, as under normal operating conditions a small amount of the oil will be present in the steering rack gaiters. If any oil is lost from the gaiters, then an equal amount to that lost should be added to the gaiter prior to the refitment of the gaiter clips.

It is not necessary under normal circumstances to add oil to the rack during Service, unless a complete overhaul of the rack is undertaken. The total oil capacity of the steering rack is 0,19 litres.

WARNING: It is absolutely essential that the highest standards of cleanliness are maintained in any operations involving access to components in contact with fluid, since steering assistance can be seriously affected by the presence of dirt in the system.

SYMPTOM AND DIAGNOSIS CHART

SYMPTOM	CAUSE	CURE
External oil leaks from steering rack unit.	Damaged or worn seals. Loose unions. Damaged union sealing washers.	Replace seals. Tighten unions. Replace sealing washers.
Oil leak at pump shaft.	Damaged shaft seal.	Replace shaft seal.
Oil leak at high pressure outlet union.	Loose or damaged union. Damaged pipe end.	Tighten union. Replace pipe.
Oil leak at low pressure inlet connection.	Loose or damaged hose connection.	Remove and refit or renew hose and clip.
Oil overflowing reservoir cap.	Reservoir overfull. Sticking flow control valve (closed).	Reduce level in reservoir. Remove valve, renew and refit.
Oil leak at reservoir edge.	Damaged 'O' ring.	Replace 'O' ring.
Noise from hydraulic system.	Air in system.	Bleed system, see operation 57.15.02.
Noise from pump.	Slack drive belt (squealing). Internal wear and damage.	Adjust drive belt tension, see operation 57.20.01. Overhaul pump, see operation 57.20.20.
Noise from rack (rattling).	Worn rack and pinion gears, see operation 57.10.13. Worn inner ball joints. Universal joint loose.	Adjust rack damper. Replace inner ball joints, see operation 57.55.03. Tighten clamping bolts.
Steering veering to left or right.	Unbalanced tyre pressures. Incorrect tyres fitted. Incorrect geometry. Steering unit out of trim.	Inflate to correct pressure. Fit tyres of correct specification. Reset geometry to correct specification. Replace valve and pinion assembly, see operation 57.10.19.
Heavy steering when driving.	Low tyre pressures. Tightness in steering column. Tightness in steering joints.	Inflate to correct specification. Grease or replace. Grease or renew joints.
Heavy steering when parking.	Low tyre pressures. Tightness in steering column. Tightness in steering joints. Slack drive belt (squealing). Restricted hose. Sticking flow control valve (open). Internal leaks in steering unit.	Inflate to correct specification. Grease or replace. Grease or renew joints. Adjust drive belt tension, see operation 57.20.01. Replace hose. Remove and renew valve. Replace seals.
Steering effort too light.	Valve torsion bar dowel pins worn. Valve torsion bar broken.	Replace valve assembly. Replace valve assembly.

TEST PROCEDURES 57.10.20

Control valve and pinion test

Faults developing in control valve and pinion assembly as indicated in following test or as shown under 'Symptoms and Diagnosis' will necessitate renewal of control valve and pinion. No adjustment or repair is permissible.
Check tyres, tyre pressure and steering geometry before testing.

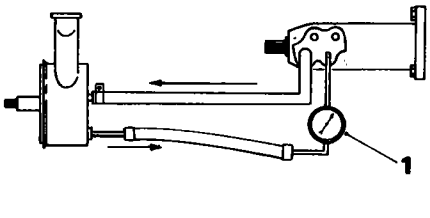


Fig. 2

Fit a 7 kgf/cm² (100 lbf/in²) pressure gauge (1, Fig. 2) in feed line from p.a.s. pump, start engine and allow to idle. Gauge should register 2,8 kgf/cm² (40 lbf/in²) approximately.
Turn steering wheel slightly to right or left.

CAUTION: Do not turn steering excessively, as this will produce high pressure resulting in irreparable damage to gauge.

Pressure should increase by an equal amount irrespective of direction of steering wheel rotation. Any unbalance will be indicated by a slight fall in pressure on either side before rising.
Stop and re-start engine and check that steering does not kick to one side.

SYSTEM TESTING 57.15.01

Service Tools: Tap JD 10-2, power steering test set JD 10, JD 10-3A, adaptor power steering JD 10-4A, adaptor hydraulic pressure test/saginaw pump metric thread.

Faults in systems can be caused by inefficiencies in the hydraulic system, see 'Symptom and Diagnosis Chart'.
The following test may be carried out without removing any components from the car. Before commencing work fluid should be checked for correct level and freedom from froth.

Pump blow off pressure

Fit pressure gauge (1, Fig. 3) reading to 100 kgf/cm² (1500 lbf/in²) in pressure line from pump.
Start engine and allow to run at idling speed.
Turn steering to full lock and continue to increase steering effort until pressure recorded on gauge ceases to rise.
Check that recorded pressure lies between 77,5 kgf/cm² and 84,4 kgf/cm² (1100 and 1200 lbf/in²).

NOTE: If pressure is below 77,5 kgf/cm² (1100 lbf/in²) at tickover, but rises to correct figure with increased engine speed the reason is a defective control valve in pump, or excessive internal leakage in rack and pinion unit. Carry out following test to establish location.

Fit tap JD 10–2 (2, Fig. 3) between pump and pressure gauge (1, Fig. 3), arranging connections as shown, so that pressure gauge is at all times connected to pump, but rack unit can be isolated from it.

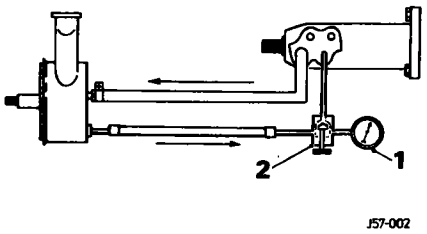


Fig. 3

With tap OPEN, start engine and allow to run at idling speed.
Turn steering to full lock.
Check that gauge reading exceeds 77,5 kgf/cm² (1100 lbf/in²).
If pressure does not reach this figure, CLOSE TAP AT ONCE, noting gauge reading as tap reaches 'OFF' position.

CAUTION: Tap must not remain closed for more than 5 seconds when engine is running.

If reading of pressure gauge increases to at least 77,5 kgf/cm² (1100 lbf/in²) when tap is turned off, leaks are confined to steering unit, which must be overhauled—see operation 57.10.07.
If pressure reading exceeds 84,4 kgf/cm² (1200 lbf/in²) remove pump discharge port, withdraw valve assembly located behind it, and inspect a small hemispherical gauze filter carried at its inner extremity, which may be found to be blocked. Clean filter by airline or other means, and replace valve and discharge port.

POWER STEERING SYSTEM

Bleed 7.15.02

Fill the reservoir to the 'full' mark on dipstick, start engine and turn steering wheel from lock to lock a few times to expel any air. Check level and top up if necessary. Use only correct fluid.

FRONT WHEEL ALIGNMENT

Check and adjust 57.65.01

Service Tool: Rack centralising pin 18G 1466.

Check

Inflate tyres to correct pressures.
Set front wheels in straight-ahead position.
Remove grease nipple from rack adjuster pad (1, Fig. 4).

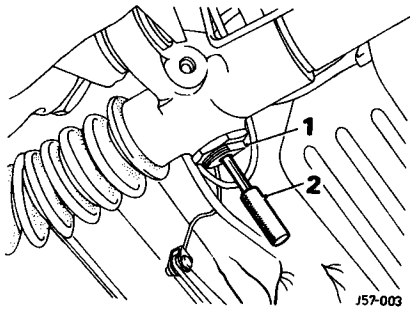


Fig. 4

Insert centralizing tool (2, Fig. 4) and adjust position of rack until reduced tip of tool enters locating hole in rack.
Check alignment by using light beam equipment or an approved track setting gauge.

NOTE: As a front wheel alignment check is called for in the Maintenance Summary, very little variation from specified figures for wheel alignment is to be expected; if, however, a discrepancy of as much as 3 mm (⅛ in) from specified limits of 1,6 mm to 1,2 mm ($\frac{1}{16}$ in to ⅛ in) toe-in is recorded, accidental damage to a steering lever may have occurred and the following check must be carried out, on both levers.

Remove steering levers.
Accurately check dimensions of each lever against those quoted in illustration (Fig. 5).
Reject for scrap and replace any lever with dimensions outside limits quoted.

WARNING: It is absolutely forbidden to attempt to rectify a rejected lever by bending.

If both steering levers are within limits, a discrepancy in alignment figures may be due to distortion of upper or lower wishbones, or end of stub axle carriers (vertical links). Dimensioned drawings of these parts for checking purposes, are given in Group 60.

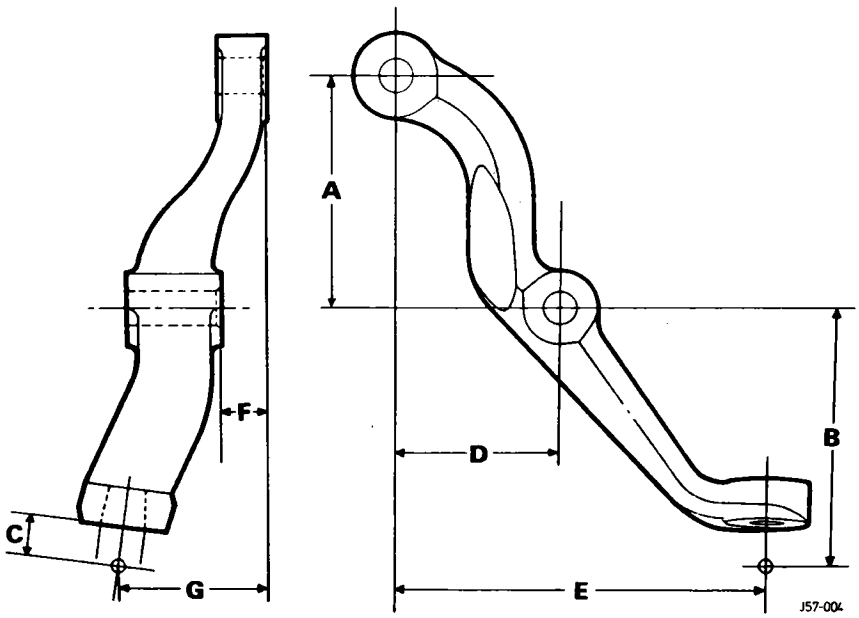


Fig. 5

DIMENSIONS—STEERING LEVER, Fig. 5

'A' 82,5 mm to 82,6 mm (3.248 in to 3.252 in)
'B' 101,85 mm to 102,36 mm (4.01 in to 4.03 in)
'C' 22,23 mm (0.875 in)
'D' 58,93 mm to 59,44 mm (2.32 in to 2.34 in)
'E' 135,38 mm to 135,89 mm (5.33 in to 5.35 in)
'F' 17,78 mm to 18,03 mm (0.70 in to 0.71 in)
'G' 54,36 mm to 54,86 mm (2.14 in to 2.16 in)

Adjust

Slacken locknuts at outer end of each tie-rod.
Release clips securing outer ends of gaiters to tie-rods.
Turn tie-rods by an equal amount until alignment of wheels is correct.
Tighten locknuts to figure quoted while holding track rod end spanner flats.
Re-check alignment.
Ensure that gaiters are not twisted and re-tighten clips.
Remove centralising tool (2, Fig. 3) and refit grease nipple.

CASTOR ANGLE/CAMBER ANGLE

Check and adjust **57.65.05**

Service Tools: JD 25B Suspension links. Camber and castor angle checking gauges.

CAUTION: Before checking, examine all rubber/steel bushes for deterioration or distortion. Check upper and lower wishbone ball joints for excessive play. Check shock absorbers for leaks and mountings for security.

The two operations require the vehicle to be set up in a mid-laden condition. This can be done as follows:
Ensure that the car is standing on level ground and inflate the tyres to the correct pressure; check that the standing heights are equal on both sides of the car, and the front wheels are in the straight-ahead position.
Make up two front suspension tubes to the dimensions shown (Fig. 6).

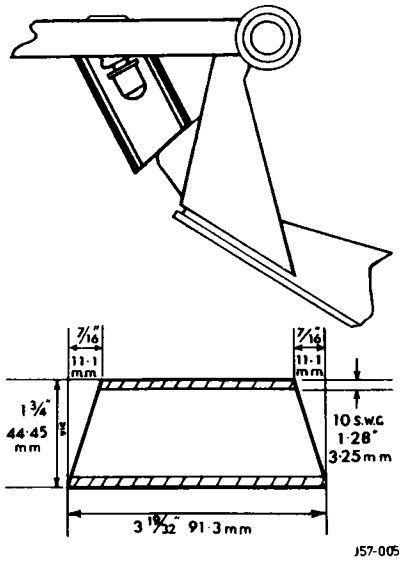


Fig. 6

Compress the front suspension and insert the setting tubes under the upper wishbones, adjacent to the rebound stop rubbers and over the brackets welded to the bottom of the 'turrets'. This locks the front suspension in the mid-laden condition.
Lock the rear suspension in the mid-laden condition using the suspension links, service tools JD 25B.
For each side, compress the suspension, pass the hooked end of service tool JD 25B through the lower hole in the rear mounting and fit the looped end over the rear pivot nut (Fig. 7).

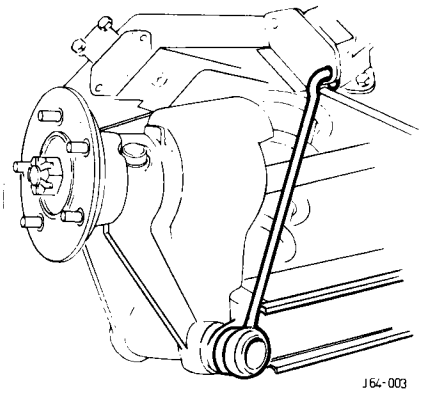


Fig. 7

Castor angle—check and adjust

Using the castor angle checking gauge, check the castor angle. Refer to the Data for correct setting.
To adjust, slacken the two bolts on each side securing the upper wishbone members to the upper ball joints.
Transpose shims, which can now be lifted out, from front to rear or vice versa, to reduce or increase the castor angle respectively (Fig. 8).

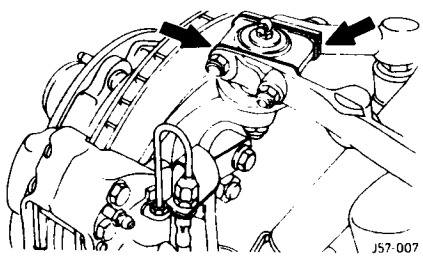


Fig. 8

Transposing one shim 1,6 mm (0.0625 in) thick will alter the castor angle by approximately ¼°.
After adjusting the castor angle to the correct figure, tighten the bolts to the correct torque. Check the front wheel alignment and adjust if necessary.

Camber angle—check and adjust

Using the camber angle checking gauge, check the camber angle. Refer to data for the correct settings.
Rotate the road wheels through 180° and re-check.
To adjust, slacken the nuts and bolts securing the upper wishbone inner pivots to the cross member turrets.
Add or remove shims between the pivot shafts and cross member turrets to reduce or increase the camber angle (Fig. 9).

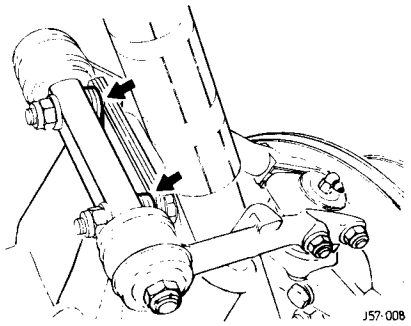


Fig. 9

Shims are available in 0,8 mm (1/32 in), 1,6 mm (1/16 in) and 3,2 mm (1/8 in) thickness. A change of 1,6 mm (1/16 in) in shim thickness will alter the camber angle by approximately ¼°.

NOTE: It is necessary to partly withdraw the bolts to change the shims, so only one bolt of a pair should be shimmed at a time. It is important that an equal thickness of shims should be changed on front and rear bolts, otherwise the castor angle will be affected.

Tighten all the bolts and nuts to the correct torque, and re-check the camber angle.
Check the front wheel alignment and adjust if necessary.

STEERING PUMP DRIVE BELT

Adjust **57.20.01**

6 cylinder models

The steering pump drive belt also drives the coolant pump, and is tensioned by a screw-type adjuster.
Slacken the pump mounting pivot bolt and adjust pivots; reset the adjuster to tension the belt so that a load of 2,9 kg (6 4 lb), applied to its mid-point between crankshaft and steering pump, deflects the belt 4,3 mm (0.17 in) (Fig. 10).
Re-tighten pivot bolts after correcting belt tension.

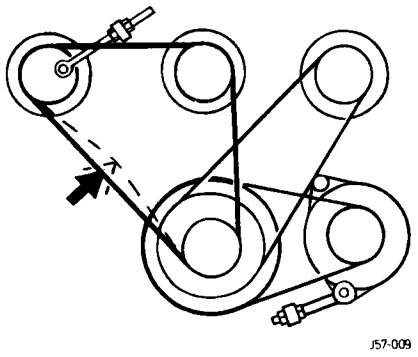


Fig. 10

12 cylinder models

Remove the left-hand air cleaner. Slacken the pump mounting pivot bolt (1, Fig. 11).

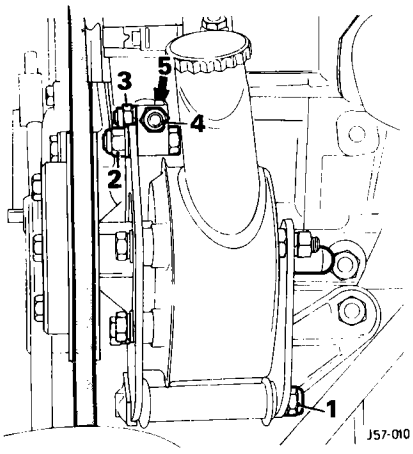


Fig. 11

Slacken the nut securing the adjusting link (2, Fig. 11) and the nut securing the trunnion block (3, Fig. 11).
Unscrew the outer trunnion locknut (4, Fig. 11).
Screw the inner trunnion locknut (5, Fig. 11) outwards to increase the belt tension or inwards, towards the engine, to reduce the tension; correct tension is such that a load of 3 kg (6.4 lb), applied to the belt's mid-point between the crankshaft and the steering pump, deflects the belt 4,0 mm (0.16 in).
Re-tighten all nuts and bolts and re-check the belt tension.

STEERING PUMP DRIVE BELT

Remove and refit **57.20.02**

6 cylinder models

A damaged belt is most easily removed by cutting it; if it is necessary to remove a complete belt, refer to the fitting instructions below.

Fitting

Slacken pump and adjuster pivots and turn adjuster nut to bring pump towards the engine; feed the belt past the fan blades (this can be done without removal of the fan cowl), place it over crankshaft, coolant pumps and steering pump pulleys and adjust.

12 cylinder models

Remove the left-hand air cleaner, and fan belt. A damaged belt is most easily removed by cutting it. If it is necessary to remove a complete belt, release and screw back the inner locknut at the pump adjuster trunnion. Slacken the pump pivot bolt, and the nut securing the adjusting link.
Slacken the nut securing the trunnion block, swing the pump towards the engine and remove the belt.
To refit, reverse the above procedure and adjust. Refit the fan belt and left-hand air cleaner.

STEERING PUMP

Remove and refit **57.20.14**

Remove cover from front of air cleaner on 6 cylinder models, and remove the left-hand air cleaner on 12 cylinder models, to improve access, detach and plug pipes; slacken pivot and trunnion bolts, then remove adjuster rod bolt to pump.
Press pump towards engine, lift belt off pulley, withdraw pivot bolt and lift pump and bracket away from engine. Detach pump from bracket.

POWER STEERING RACK

Adjust pinion clearance **57.10.13**

Service Tool: Ball joint separator JD 24

The rack should move smoothly through its full travel, and the maximum clearance between rack and pinion should not exceed 0,25 mm (0.01 in).
Clearance is measured from beneath the car by removing the grease nipple (1, Fig. 12) opposite the pinion, and detaching the nearer tie-rod from its steering arm, using tool JD 24.
Insert the stem of a dial gauge through the grease nipple hole to contact the back of the rack, and, grasping the tie-rod, pull rack away from pinion; the dial gauge will then indicate clearance. If this is excessive, release locknut (2, Fig. 12) screw in plug (3, Fig. 12) until firm resistance is felt, back off slightly, re-tighten locknut and re-check clearance.

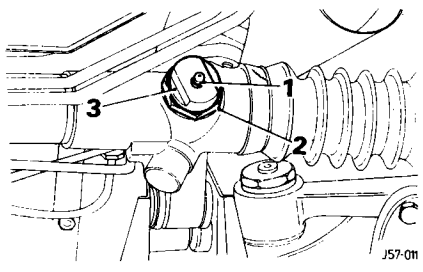


Fig. 12

continued

Move rack through its full travel; if binding occurs at any point, slightly increase clearance and re-check.
When correct minimum clearance is achieved, fully tighten locknut, replace grease nipple, secure tie-rod to steering arm and check wheel alignment.
When greasing the rack damper use **only** Lithium grease N.L.G.I. constituency No. 2.

PINION SEAL

Remove and refit **57.10.23**

This seal is accessible from beneath the car; before detaching the internal circlip and retainers which secure it (Fig. 13), thoroughly clean the end of the pinion housing, and detach the lower steering column.

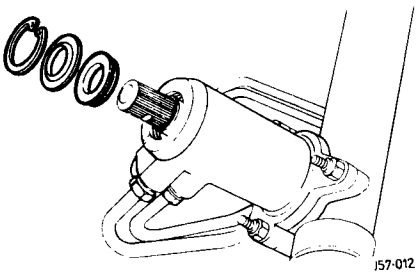


Fig. 13

CAUTION: Do not move road wheels or turn steering wheel while joint is disconnected.

STEERING RACK HOSES

Remove and refit **57.15.21 and 22**

Before removing these hoses, ensure that suitable plugs are obtained to close the orifices in pump and rack.
Remove the air cleaner, wipe clean the union nuts and the areas around them and, on L.H.D. cars, remove five clips (1, Fig. 14) securing hoses to cross-beam.

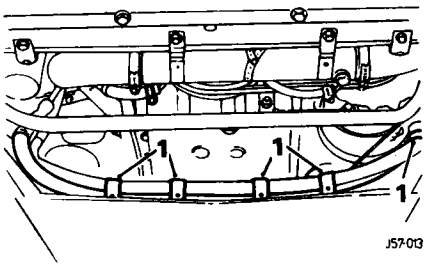


Fig. 14

Detach pipes from pump first, plugging each orifice as the pipe is withdrawn. After refitting pipes, tighten union nuts to figures quoted in Data, top up reservoir and bleed system.

TIE-ROD BALL JOINTS

Remove and refit **Outer 57.55.02**
Inner 57.55.03

Service Tool: Ball joint separator JD 24

It is necessary to detach and remove the outer ball joint before the inner joint (which is only supplied complete with its tie-rod) can be removed. The front wheel alignment must be checked after refitting either joint, as it is difficult to ensure that the length of the rod between centres is not altered.

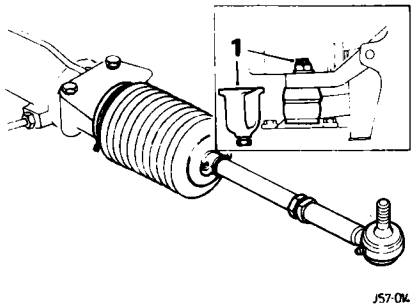


Fig. 15

After separating the outer joint, using tool JD 24 (1, Fig. 15) release the locknut, but do not run it along the thread; unscrew ball-joint from tie-rod and screw on replacement ball-joint up to the locknut; this gives an approximate location before checking wheel alignment.

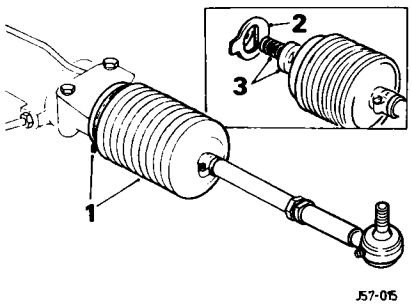


Fig. 16

To remove the inner joint and tie-rod, first detach the gaiter (1, Fig. 16) from the rack housing, knock back tab washers (2, Fig. 16) and unscrew nut securing ball joint to rack bar. Collect washers, spacer and spring (3, Fig. 16); use new tab washers when refitting joint. Coat joint with 60 gm (2 oz) of grease before replacing gaiter.
Check front wheel alignment.

STEERING LEVERS

Remove and refit **57.55.29**

Service Tool: Ball-joint separator JD 24

After detaching the ball-joint (1, Fig. 17) by use of tool JD 24, cut the locking wire (2, Fig. 17) and withdraw the two bolts (3, Fig. 17) securing the steering lever to the hub carrier.

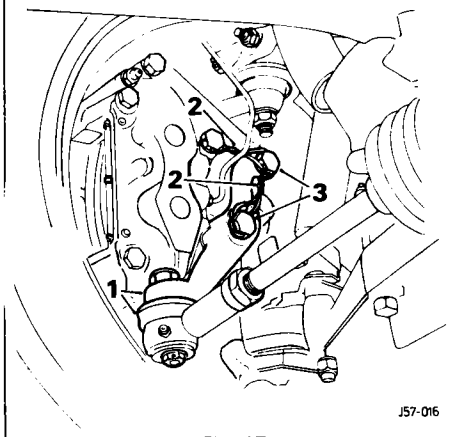


Fig. 17

When withdrawing the lever, inspect carefully for shims which may be fitted between the lever and the lugs on the hub carrier. These shims must be correctly replaced when refitting the lever.
Tighten the set-bolts to the correct torque; renew locking wire and check wheel alignment; adjust if necessary.

STEERING WHEEL

Remove and refit **57.60.01**

Removing

Centralise front wheels and mark steering wheel to record its position. Do not turn front wheels again.
Remove three screws securing lower switch cover, and detach cover.
Working from below, remove clamp bolt securing collet adaptor to steering column.
Slacken locknut of grubscrew in collet adaptor and unscrew grub screw two turns.
Withdraw steering wheel, complete with hand locknut, impact rubber, collet adaptor and shaft.

Dismantling

Unscrew two self-tapping screws from lower face of steering wheel boss and lift off padded horn contact.
Unscrew nylon nut from top of steering wheel shaft and remove it carefully. Withdrawing horn contact tube with it.
Remove self-locking nut and plain washer securing steering wheel.
Carefully draw the steering wheel from its splined shaft, collecting both halves of split cone.

continued

Reassembling

Clean thoroughly and remove any burrs with a fine file.
Lightly lubricate all enclosed metal parts with engine oil.
Reverse the dismantling procedure operations.

Refitting

Reverse the removal procedure operations, taking care to replace horn contact tube correctly, (enclosing end of contact rod), and to replace wheel in its straight-ahead position, with front wheels still centralised. Tighten grub screw finger tight, tighten its locknut and tighten clamp bolt to the correct torque.

POWER STEERING RACK GAITERS

Remove and refit **57.10.27**

It is necessary to remove the outer ball-joint from the tie-rod before a new gaiter can be fitted; when fitting the replacement, clean old grease from the inner joint and smear it with 45 to 55 g (1½ to 2 oz) of recommended grease. Do not omit a check of wheel alignment after replacing the outer ball-joint.

POWER ASSISTED STEERING (P.A.S.) UNIT

Remove and refit **57.10.01**

Service Tools: Ball joint separator JD 24, rack centralising tool 18G 1466, checking fixture JD 36A and plugs for pipe connections.

Removing

Slacken filler cap of power steering reservoir and remove pinion heat shield (12 cyl. only) with car over pit or raised on ramp, detach both hoses (1, Fig. 18) from pinion housing; collect escaping fluid in a suitable container and blank off ports and hoses.

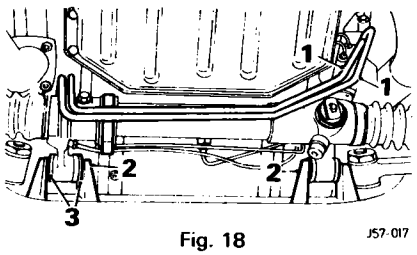


Fig. 18 J57-017

Separate ball-joints from steering arms, using tool JD 24, and release clamp bolt securing joint to pinion shaft; remove three nuts and washers (2, Fig. 18) and withdraw the rack mounting bolts, collecting washers and shims (3, Fig. 18)
Note location of all washers for reassembly, and remove rack downwards.

Refitting

When refitting rack, ensure that single rack lug is shimmed to be central between cross-beam brackets, fitting shims between metal faces of steel/rubber washers and brackets; check that a gap of 2,5 to 3,0 mm (0.10 to 0.12 in) exists between rubber faces of thrust washers and single lug, locate lower steering column coupling onto rack pinion and insert mounting bolts and ensure the bump stops are fitted to the outer edge but do not yet fully tighten nuts.
Remove jubilee clips (4, Fig. 18) securing gaiters to rack housing and pull back both gaiters from rack (1, Fig. 19).

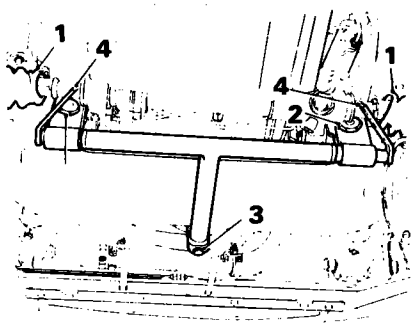


Fig. 19 J57-018

Refit track rod ends.
Locate two attachment brackets of Service tool JD 36A on two large hexagon heads (2, Fig. 19) of lower wishbone fulcrum shafts.
Release locking screw (3, Fig. 19) on forward arm of tool, and move slide until its slot engages with front weld flange of cross-beam. Tighten locking screw.
Lift two couples checking levers (4, Fig. 19) until one or both levers touch rack shaft.
Adjust position of rack, if necessary, to bring both levers into contact.
Tighten nuts of three mounting bolts to secure rack in this position.
Remove checking tool.
Replace gaiters and renew jubilee clips; refit ball joints to steering arms and secure with nyloc nuts. Remove blanking plugs and reconnect both hoses. Refit the pinch bolt and nut to the lower universal joint.
Refit pipe spaces and jubilee clips (12 cyl. only).
Refill system with recommended fluid and bleed, see operation 57.15.02.
Check wheel alignment.

NOTE: (a) It is important that distance between rubber faces of thrust washers and adjacent rack lug should in no case be less than 2,5 mm (0.1 in) to allow adequate 'rack compliance' in either direction.
(b) If a replacement rack unit is to be fitted it may be necessary to detach lower column from upper column at universal joint to obtain correct centralization of steering wheel.

CONTROL VALVE AND PINION

Remove and refit **57.10.19**

It is possible to remove this unit without removing the rack, but extreme care must be taken to prevent contaminants from entering the rack housing while the pinion is removed. The car must be placed over a pit, or raised on a ramp.
Remove the lower steering column and prise off the heatshield fitted to the pinion shaft; then thoroughly clean pinion housing and adjacent rack housing before detaching all four pipes (1, Fig. 20) from the pinion housing. Collect fluid and plug apertures.

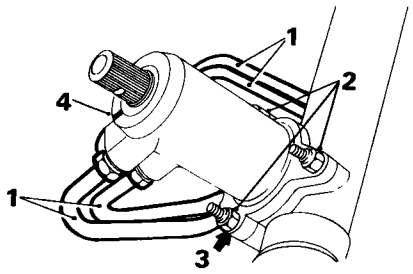


Fig. 20 J57-019

Remove three nuts (2, Fig. 20) attaching pinion housing to rack but before removing housing, release rack adjuster locknut (3, Fig. 20), screw back adjuster one turn and mark position of pinion shaft in relation to housing (4, Fig. 20).
Withdraw pinion unit; DO NOT move front wheels, or turn steering column, until unit is replaced.
When refitting, use a new gasket and ensure that relation between pinion shaft and housing is correct before connecting steering column joint.
Reset adjuster plug and bleed system.

UPPER STEERING COLUMN

Remove and refit **57.40.02**

Removing

Before removing the column, it is necessary to disconnect the battery and remove steering wheel, speedometer, tachometer and the trim panel below the upper column.
Detach the horn feed from its contact and separate three connections to disconnect switchgear.
Completely withdraw bolt securing universal joint to lower column and slacken the two setscrews screwing the lower end of the column to its mounting strut.
Release upper mountings by working through open adjustment apertures and, supporting column by hand, remove lower setscrews and withdraw column. Collect any packing and record its position. Do not use excessive force in separating joint from lower column.

continued

Refitting

No repair or adjustment of any description is permitted on upper steering columns. If damage is suspected, remove adjusting clamp, mark its position, remove universal joint and measure overall length of inner column, which must be between 547,74 and 551,04 mm (21. 565 and 21.695 in.) Any column outside these limits must be renewed; renew also in all cases of doubt. If column is to be renewed, refer to electrical section 86 for details of removal and refitting of electrical equipment.
In refitting column, check that an axial clearance of 10 mm (0.375 in) exists at lower universal joint; if less, move upper joint along column to correct it.
Check that direction indicates self-cancel correctly; if not, proceed as follows:
Detach lower switch cover by removing three screws.
Check that lower dogs on fixed portion of switch engage correctly with cutaways on outer (fixed) column, and that a dog on collet adaptor enters slot in movable section of switch.
Turn steering wheel to bring clamp bolt of column adaptor to horizontal, below axis of column; self-cancelling switch will then function correctly.
Remove steering wheel, rotate it to straight ahead position and refit to splined column with minimum of rotation. Refer to Steering Wheel remove and refit, operation 57.60.01.
Refit lower switch cover.

LOWER STEERING COLUMN

Remove and refit **57.40.05**

Removing

Place car on ramp and raise ramp.
Remove pinch bolt securing lower universal joint to pinion shaft. Collect heat shield fitted to pinion shaft.
Lower ramp.
Detach lower parcel shelf.
Remove both pinch bolts securing upper universal joint to upper and lower columns.
Release two lower mounting screws of upper column.
Release lower column from upper universal joint.
Raise ramp.
Remove lower universal joint from pinion shaft and withdraw lower column.
Lower ramp.

Refitting

No repairs are permissible. Faulty or damaged columns must be renewed. Reverse above procedure.
Check that upper column and road wheels are centralized before reconnecting splines, and tighten pinch bolt nuts to correct torque.
Ensure that a gap of 10 mm (0.375 in) exists between sections of lower universal joint.

CAUTION: Excessive force, which may damage nylon shear plugs, must not be used when withdrawing and refitting columns. Burrs on splines should be removed with a fine file.

STEERING COLUMN ADJUSTING CLAMP

Remove and refit **57.40.07**

Removing

Remove steering wheel, see operation 57.60.01.
Remove impact rubber (1, Fig. 21) from steering wheel shaft.

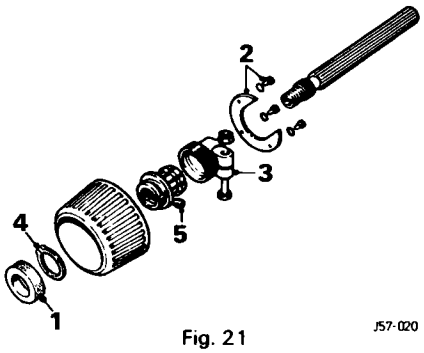


Fig. 21

Remove three small cheese head screws from beneath hand locknut, and collect retaining plate (2, Fig. 21).
Unscrew collet adaptor (3, Fig. 21) completely and remove from shaft.
Remove collet circlip (4, Fig. 21) from within upper side of hand locknut.
Withdraw hand locknut, collecting stop button (5, Fig. 21).
Slide split collet off shaft.

Refitting

Clean thoroughly and inspect all parts; remove any small burrs with a fine file.
Lightly lubricate all enclosed metal parts with engine oil.
Reverse operations for removal.

STEERING COLUMN UNIVERSAL JOINT

Remove and refit **57.40.25**

Removing

Detach lower parcel shelf.
Remove both pinch bolts (1, Fig. 22) securing upper universal joint to upper and lower columns.
Remove two lower mounting screws (2, Fig. 22) of upper column.
Remove upper universal joint from upper column, then from lower column.

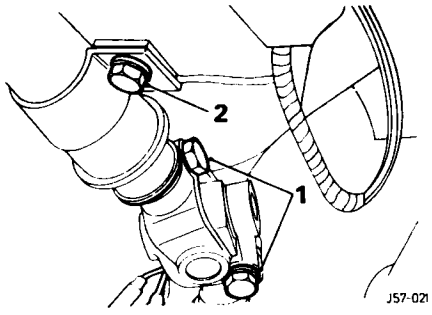


Fig. 22

Refitting

Reverse operations above. Ensure that the two universal joints are correctly aligned with each other, and tighten pinch bolt nuts to correct torque.

NOTE: Lower universal joint is integral with lower steering column and removed with it.

STEERING COLUMN—LOWER—SEAL

Remove and refit **57.40.15**

Removing

Remove upper steering column, see operation 57.40.02.
Slacken hose clip (1, Fig. 23) attaching upper sealing sleeve to lower column; remove clip and sleeve.

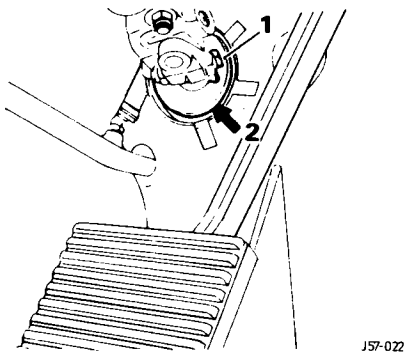


Fig. 23

Remove three setscrews (2, Fig. 23) securing gaiter retainer to bulkhead; slide gaiter, retainer and sealing sleeve up and off lower column.

Refitting

Fit assembly of sealing sleeve, gaiter and retainer over end of lower column, taking care not to damage gaiter or flanged face of sleeve.
Insert and tighten three setscrews securing retainer to bulkhead.
Carefully slide second sealing sleeve, flanged end first, over lower column as far as sealing sleeve; replace its hose clip but do not tighten.
Move second sealing sleeve approximately 6 mm (0.25 in) towards bulkhead, to pre-load it against first sleeve; secure it with its hose clip in this position.
Refit upper steering column.

STEERING COLUMN LOCK

Remove and refit 57.40.28

Removing

Remove the steering column lower shroud.
Adjust the steering wheel to maximum travel, disconnect the fibre optic strand and remove the ignition switch shroud.
Remove the shear bolts securing the lock assembly and displace the assembly from its mounting position.
Remove the screw securing the lock assembly to the switch, displace the plastic cover and remove the steering column lock.
To fit the new lock reverse the removal procedure.

NOTE: If lock is to be returned to manufacturer under warranty, include key number on material return label.

POWER STEERING RACK

Overhaul

Service Tools: Ball joint separator JD 24 + 2 in long 1/2 in UNF socket headed (grub) screw. Rack checking fixture JD 36A. Plugs for pipe connections. End housing 'C' nut remover S355. Pinion ring expansion sleeve 606602. Pinion ring compression sleeve 606603 (JD 33). Pinion housing seal saver 18G 1259. Rack centralising tool, Jaguar Part No. 12297.

Steering Rack Remove

Slacken the power steering fluid reservoir filler cap. Raise the car and support; detach both the hoses from the pinion housing. Collect the escaping fluid in a suitable container. Blank off all ports and hoses.

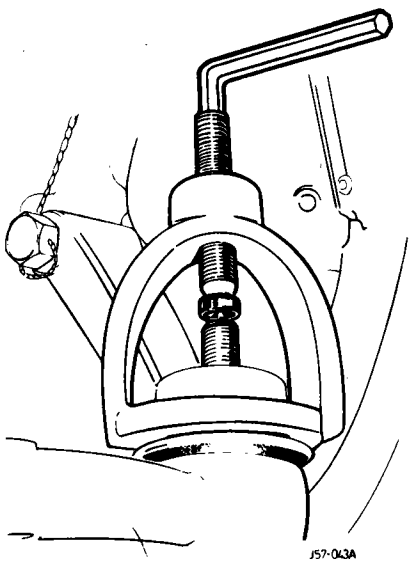


Fig 25

Separate the ball joints from the steering arms, using Service Tool JD 24 (Fig 25).

NOTE: It may be necessary to substitute a 2 in long 1/2 in UNF socket headed (grub) screw, for the existing bolt of JD 24.

Remove the pinch bolt (1, Fig 26) securing the lower steering column universal joint, to the rack pinion.

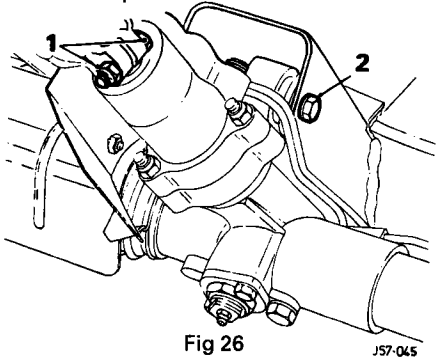


Fig 26

Remove the bolt, washer and self-locking nut, securing the steering rack top mounting (pinion side of rack assembly) (2, Fig 26), to the crossmember.
Remember both the rack bottom mounting bolts, washers and nuts, securing the steering rack to the crossmember.

CAUTION: Make a careful record of the number and position of the packing washers for refitting.

Release the steering rack from the crossmember and retrieve the packing washers.

Steering Rack Dismantle

Thoroughly clean the exterior of the steering rack.
Remove the blanking plugs from the pinion housing ports and purge any remaining fluid by turning the pinion gently from lock to lock. Centre the pinion gear and note the location of the pinchbolt groove.
Remove the rack mounting rubbers and sleeves. Release the nuts securing the feed pipes to the pinion valve housing and the rack body; remove the pipes from the rack assembly.
Remove the sealing washer from the port in the pinion end rack housing.

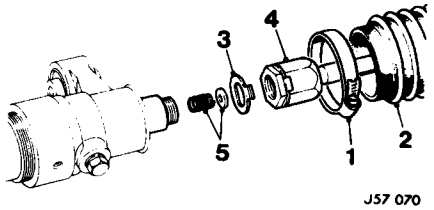


Fig 27

Make a note of their position and release the two large clips (1, Fig 27) securing the tie rod gaiters to the pinion and end housings. Pull back the gaiters (2, Fig 27) to allow access to the inner ball joint assemblies.

NOTE: Do not disturb the outer ball joints, unless replacement is necessary.

If the outer ball joints are to be renewed, measure accurately and record the total length of each tie rod, before releasing the locknuts. this will assist when re-tracking the car.

Knock back the tab washers (3, Fig 27) securing the inner ball joint assembly locknuts to the rack.

CAUTION: Do not disturb the tab washers between the locknuts and the ball pin housings.

Hold one inner ball joint assembly (4, Fig 27) with a suitable spanner and release the opposite one.
Protect the rack teeth and back of the rack; clamp the rack to enable the other inner ball joint to be released.
Unscrew the tie rod assemblies from the rack. Collect the springs and packing pieces (5, Fig 27).
Release the locknut securing the rack damper; remove the nut, threaded plug, spring and rack damper pad.

NOTE: If the rack damper adjustment is satisfactory and the rack damper assembly does not require overhauling then remove the two bolts and lift off the plate; remove the 'O' ring, spring and rack damper pad (Fig 28).

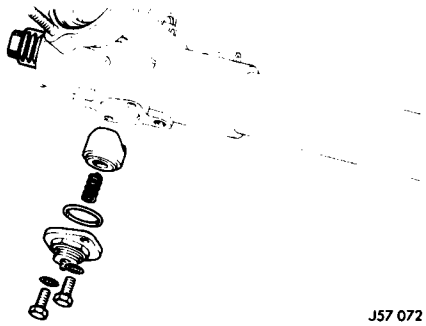


Fig 28

Pinion Valve and Housing

Remove the three self locking nuts securing the pinion and valve assembly to the pinion end rack housing. Note the relationship of the ports to the rack and remove the complete pinion and valve assembly (1, Fig 29).

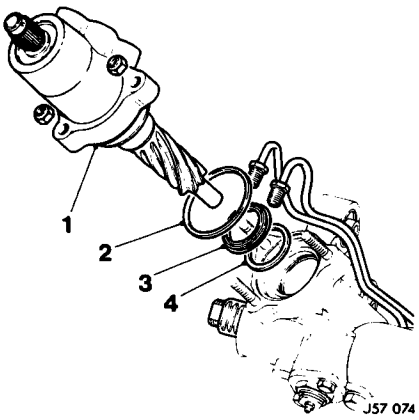


Fig 29

Remove the sealing ring (2, Fig 29) the pinion seal (3, Fig 29) and the backing washer (4, Fig 29).
Using a suitable mallet gently tap the pinion valve from the pinion valve housing.

Remove the circlip washer and ball bearing race, from the valve assembly, if a replacement is necessary.

NOTE: The pinion valve cannot be dismantled further. This item must be replaced as a complete assembly.

Port Inserts Renew

Tap a suitable thread in the bore of the insert (1, Fig 30).
Insert a setscrew (2, Fig 30) with attached nut (3, Fig 30) and distance piece (4, Fig 30).

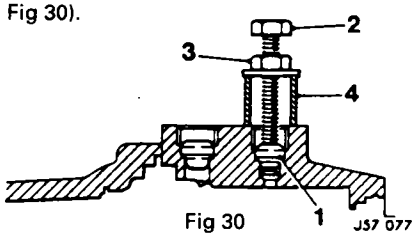


Fig 30

Tighten the nut and withdraw the insert.
Ensure that all swarf and metal particles are completely removed.
Fit a new insert into each port and tap home squarely using a soft mandrel.

End Housing

Release the small hexagon socket grub screw (1, Fig 31) in the end housing.
Using Service Tool S355, unscrew the ring nut from the end housing (2, Fig 31). Remove the end housing (3, Fig 31) from the rack tube.
Remove the air transfer pipe and sealing rings (4, Fig 31), from both the pinion and end housings.

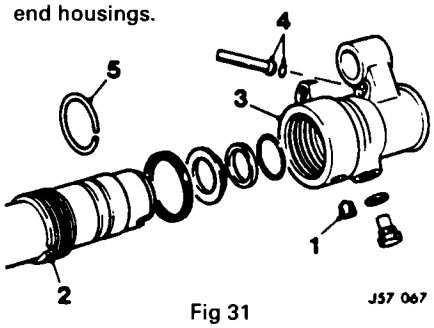


Fig 31

Rack and Inner Sleeve

Remove the hexagon socket grub screw (1, Fig 32) from the pinion end rack housing and collect the sealing washer (2, Fig 29).
Remove the rack complete with the inner sleeve (3, Fig 32) from the bore of the rack tube.

NOTE: Removal of the inner sleeve over the rack teeth will destroy the seal (6, Fig 32).

Bend up the retaining tabs on the seal cap (4, Fig 32) and remove the cap from the inner sleeve.
Remove the seal 'O' ring (5, Fig 32), seal (6, Fig 32) and split bearing (7, Fig 32).
Remove the rubber 'O' ring (8, Fig 32) and nylon washer (9, Fig 32) from the bottom of the rack tube.

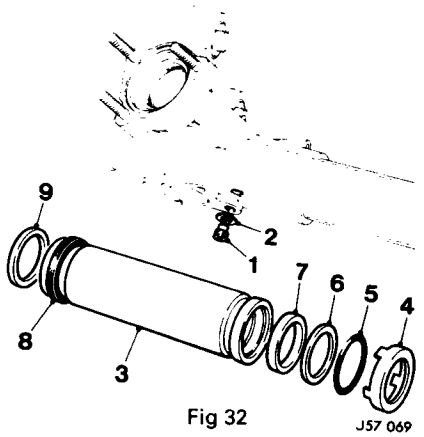


Fig 32

The piston cannot be removed from the rack but the piston ring (1, Fig 33) and the backing ring (2, Fig 33) can be renewed..

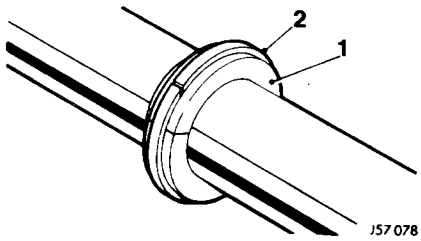


Fig 33

The rack tube cannot be removed from the plain (pinion end) rack housing, but the ring nut (2, Fig 31) and circlip (5, Fig 31) can be renewed.
Exercise caution, when removing and replacing the circlip over the ground sealing outer diameter of the rack tube.

Renewing Seals

Discard all the old seals, and the inner sleeve seal retaining cap.
Thoroughly clean and inspect each item for surface damage and wear.
For efficient sealing it is essential that all seal surfaces, lead chambers etc., are smooth, with no scratches or score marks.

Re-assembling – Inner Sleeve and Rack Bar

Fit a new backing ring and piston ring to the piston, and ensure that it moves freely in its groove.
Place a new seal retaining cap over the rack teeth, with the three tabs facing away from the piston.
Fit a new split bearing in the recess in the inner sleeve, ensure that it is seated correctly.
To protect the new inner sleeve seal from being damaged by the rack teeth; cover the rack teeth with a piece of suitable plastic adhesive tape, placed lengthways over the teeth.
Carefully slide the seal, with the recessed face towards the piston, over the tape and onto the rack bar.
Remove the tape.
Fit a new 'O' ring in its recess in the inner sleeve, ensure that it seats correctly.
Ensure that the ends of the split bearing are on the opposite side of the rack bar to the teeth and push the inner sleeve along the rack bar. Carefully push the seal up against the retaining cap and in turn, against the piston.
Ensure that the inner sleeve is square to the piston; continue pushing until the seal is fully home.
Maintain the pressure against the piston and neatly bend the three tangs into the groove on the outside of the inner sleeve, securing the retaining cap.
Apply a smear of silicone to the bore of the new square section sealing ring. Fit the nylon backing washer (9, Fig 32) and sealing ring (8, Fig 32) into the bore of the rack tube; slide them all the way down until they contact the pinion end main housing.
Assemble the rack bar, with the inner sleeve still against the piston, into the rack tube bore. Guide the piston ring into the rack tube bore. Continue sliding the rack and inner sleeve assembly into the rack tube bore, until the inner sleeve enters the sealing ring and seats firmly against the pinion end rack housing.
Look into the hexagon socket screw hole and ensure that the retaining shoulder has passed the hole. Fit the sealing washer and socket grub screw (1 & 2, Fig 32). After tightening, it should fit flush to slightly proud, stake in position.

End Housing

Remove the seal (1, Fig 34) and 'O' ring (2, Fig 34) using a suitable sharp instrument.
With a suitable soft metal drift, carefully remove the steel retaining washer (3, Fig 34).
Fit a new 'O' ring in the recess, pushing a new seal with the groove uppermost, on to the top of the 'O' ring; replace the steel retaining washer with the spigot towards the seal and press home.
Fit a new square section sealing ring (4, Fig 34) into the end housing; smear the sealing ring bore, with a silicone lubricant, to aid assembly.
Fit new air transfer pipe sealing rings (5, Fig 34) to the pinion and end housings. Fit the air transfer pipe to the pinion rack housing.

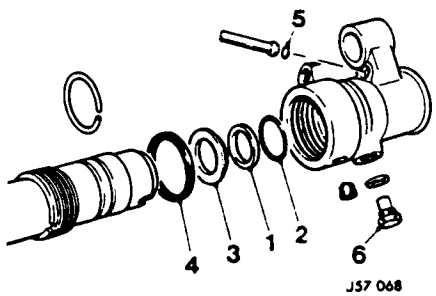


Fig 34

Pinion Valve and Housing

To remove the seals from the pinion, use a sharp knife and cut diagonally, taking care not to damage the groove ends.
Using Service Tool 606602, to expand the seals, fit one in the groove nearest to the ball bearing race. Repeat the procedure for the other three seals.
The rings can then be compressed to their original size by fitting a sleeve over them. Use 606603. If this tool is not available, then recovery will take place naturally if left for about ¾ hour.
Fit the washer and 'U' section seal, into the pinion main housing, ensure that the grooves in the seal face upwards and that the seal flange fits snugly in the groove.

Valve Housing

Using suitable circlip pliers remove the circlip (1, Fig. 35). Remove the seal retainer (2, Fig. 35) and the seal (3, Fig. 35).

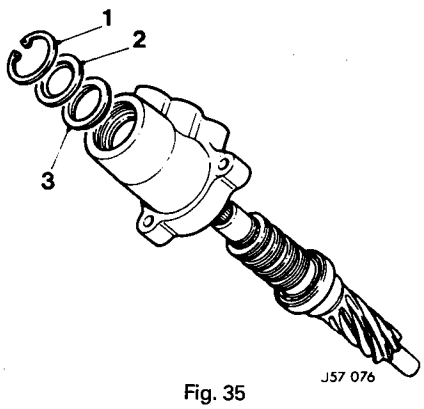


Fig. 35

Fit a new seal, grooved face downwards. Ensure that the flange sits snugly in the recess. Fit the seal retainer, with the rubber side and lip outermost. Fit the circlip, ensure that it is seated fully in the groove.
Smear the seals with a little clean power steering fluid. Fit the taper seal saver 18G 1259 over the serrations on the pinion valve, and enter the pinion valve into the pinion valve housing. Press the ball bearing race fully home.
Refit the rack damper assembly. Ensure that the threaded plug is slack. Remove the grease nipple from the plug, and centralise the rack using Service Tool 18G 1466 (Fig. 36).
Refit the pinion valve assembly to the pinion rack housing, ensure that the coupling groove in the pinion is in the correct position. Fit and tighten the three self-locking nuts.

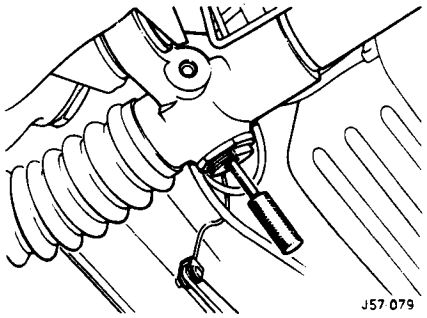


Fig. 36

Adjust the rack damper pad assembly to obtain the correct end float. Tighten the locknut and refit the grease nipple.
Fit a new sealing washer to the port in the pinion end rack housing. Fit and tighten the feed pipes to the pinion valve housing and rack body. Do not overtighten the pipe nuts as irreversible damage could be caused to the pipes.

Tie Rods

Refit the new tab washers to the rack, dished face outermost. Screw on the tie rods. Holding one ball joint and tighten the opposite ball joint (one joint should react against the other). Do not restrain the rack assembly. Secure the tab washers in four places against the spanner flats.
Regrease the ball joint areas and replace any lost from the gaiters. Each gaiter should contain 57 gms (2 oz) of grease.
Fit the gaiters and secure with the clips, ensuring that the clips are in their correct position.

Refitting the Steering Rack

Ensure that the steering wheel is set to the straight ahead position and refit the rack.
Fit the lower coupling to the pinion. Ensure that the single rack mounting lug is shimmed so that it is central between the cross-beam brackets. This is achieved by fitting shims between the faces of the steel/rubber washers and the bracket. Check that a gap of 2,5 to 3,0 mm (0.10 to 0.12 in) exists between the face of the rubber thrust washers and the single lug of the rack.
Insert the mounting bolts, fit but do not fully tighten the nuts.
Slacken the clips securing the rubber gaiters to the rack housing, pull the gaiters (1, Fig. 37) clear of the inner ball joint assemblies.
Locate the two attachment brackets of Service Tool JD 36A on the heads of the lower wishbone fulcrum shaft bolts (2, Fig. 37).

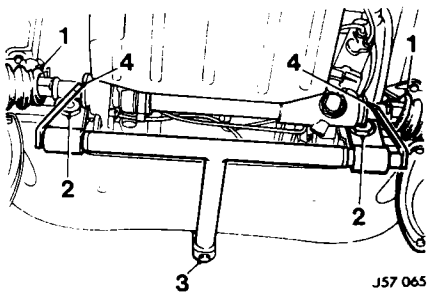


Fig. 37

Release the locking screw (3, Fig. 37) on the forward arm of the tool and position the slide so that the slot engages with the front welded flange of the cross beam. Tighten the lock screw.
Rotate the alignment legs (4, Fig. 37) of the tool until one or both rest on the rack shaft.
Adjust the position of the rack if necessary, until both legs are in contact with the rack shaft.
Tighten the nuts of the mounting bolts to secure the rack in this position. Remove Service Tool JD 36A.
Refit the rubber gaiters and secure with the clips.
Refit the ball joints to the steering arms and secure with the nyloc nuts.
Remove the blanking plugs and connect both fluid hoses to the pinion housing.
Refit the pinch bolt and nut to the lower universal coupling.
Refill the system with the recommended fluid and carry out the bleed procedure.
Check the front wheel alignment.

NOTE:

(A) It is important that the distance between the rubber faces of the thrust washers and the adjacent rack lug should in no case be less than 2,5 mm (0.1 in). This is to allow adequate 'rack' compliance in either direction.

(B) If a replacement rack unit is to be fitted it may be necessary to detach the lower column from the upper column at the universal joint, to obtain correct centralisation.

PORT INSERTS

Remove and refit 57.10.24

Removing

Tap a suitable thread in bore of seat (1, Fig 38), and insert a setscrew with attached nut, washer and distance piece.

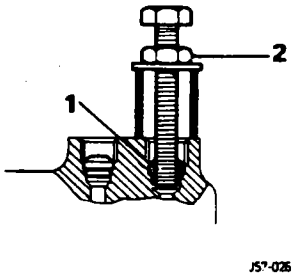


Fig 38

Tighten nut (2, Fig 38) and withdraw seat.

Refitting

Insert seat, and tap home squarely with a soft mandrel.

STEERING PUMP

Overhaul 57.20.20

Steering tool: Pulley carrier remover/replacer 18G 326.

Dismantling

Absolute cleanliness and extreme care are essential to pump overhaul, which should not be entrusted to inexperienced mechanics; if any doubt exists on the necessity for the replacement of partly worn items they should be replaced, as pump overhaul is not specified in routine maintenance.

After removing pump, detach plugs, drain and discard fluid. Remove three screws and detach pulley, clean out tapped hole in pump shaft and fit reaction screw for Saginaw–approved removal tool, 18G 1326, screwing it fully into shaft. Engage body of extractor with recessed diameter of carrier and remove carrier by tightening extractor screw.

Remove reaction screw before continuing. Detach pump from mounting bracket, remove adjuster link, thoroughly clear externally, detach outlet union and three studs (1, Fig 39) and withdraw reservoirs from body. Collect and discard 'O' rings (2, Fig 39).

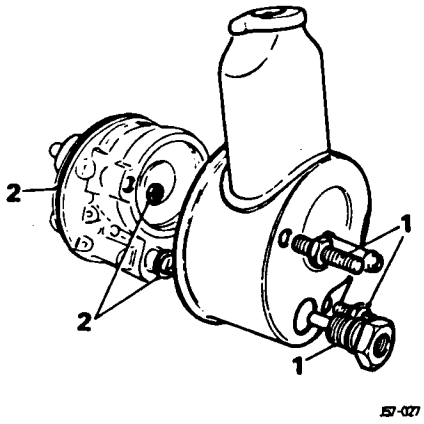


Fig 39

Insert a suitable punch (1, Fig 40) in hole in rear of pump body and dislodge spring ring. Extract ring with screwdriver (2, Fig 40) as shown.

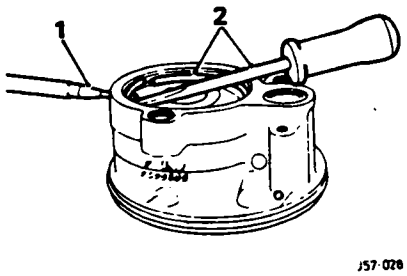


Fig 40

If end–plate (1, Fig 41) is not ejected by spring (2, Fig 41), a light tap on the casing will free it. Extract 'O' ring (3, Fig 41) and discard; unscrew flow control valve (4, Fig 41) and tap shaft (5, Fig 41) lightly through body, carrying rotor assembly with it. Extract second 'O' ring (6, Fig 41) and discard it, then carefully separate motor components.

Inspection

Clean all metal parts in solvent; do NOT immerse the new seals. Carefully inspect for wear and damage.

If necessary, light scoring may be removed from thrust and pressure plates by lapping. Reject pump ring and vanes if chatter marks or grooves are present; scuff marks and light uniform wear are acceptable. Check control valve for free movement; remove any burrs and renew valve if at all faulty. Check shaft in bush and measure external diameter of shaft at pully carrier; finally carrier internal diameter MUST provide an interference of 0,025 to 0,066 mm (0.001 to 0.0026 in) with shaft diameter.

continued

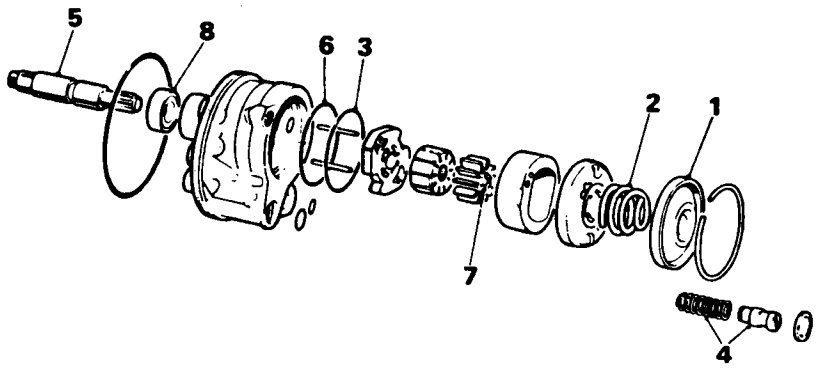


Fig 41

Remove circlip (7, Fig 41) and withdraw rotor and thrust plate from shaft; finally, extract drive shaft oil seal (8, Fig 41).

Reassembly

Fit the shaft seal into the casing, smear with petroleum jelly and insert shaft, splined end first. Replace dowel pins (1,

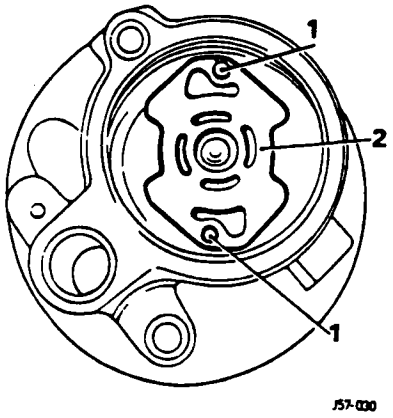


Fig 42

Fig 42) (if withdrawn from body) and fit thrust plate (2, Fig 42) over them, with ports visible. Place counterbored face of

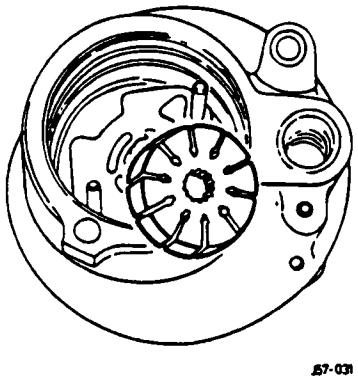


Fig 43

rotor (Fig 43) over splines, press down and fit circlip (7, Fig 41). Slide pump ring

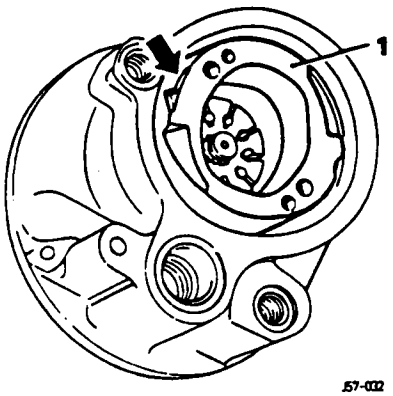


Fig 44

(1, Fig 44) over dowel pins with rotating arrow visible (arrowed Fig 44), and place vanes in rotor slots with their radiused edges outmost (Fig 45).

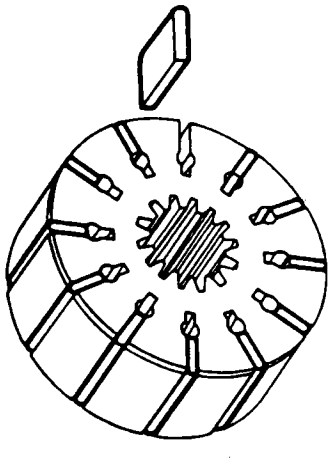


Fig 45

Smear new 'O' ring for pressure plate with petroleum jelly and insert into inner groove in casing; insert pressure plate (1, Fig 46) with its spring recess outwards;

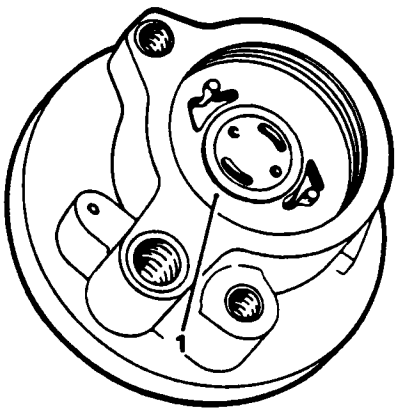


Fig 46

press firmly into 'O' ring (do not tap) fit second greased 'O' ring into outer groove, insert spring and place end plate in position with its spring ring on top. Position gap on ring away from extractor hole. Place assembly under a press and depress end plate until spring ring can be sprung into groove (Fig 47).

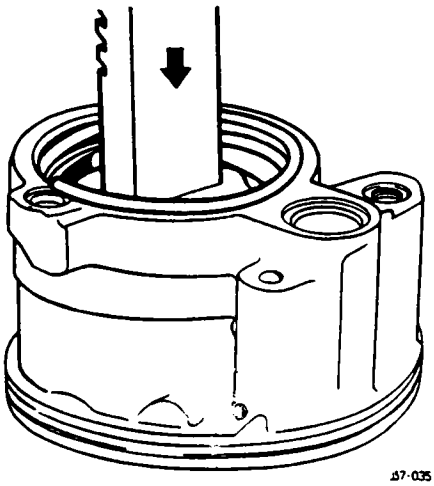


Fig. 47

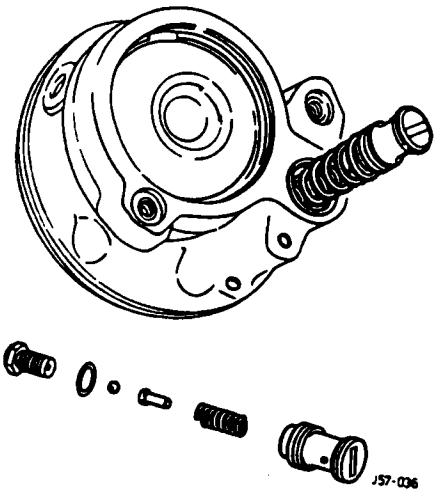


Fig 48

Reassemble control valve details and refit (Fig 48), replace reservoirs, using new 'O' rings.

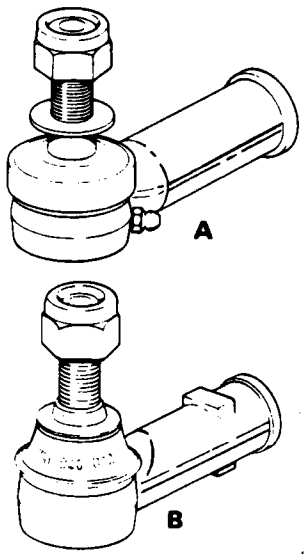
Refit pulley carrier to shaft, using tool 18G 1326. Place carrier on tool with its flange adjacent to 3/8 in UNC thread of tool. Screw this threaded stud into tapped hole in pump shaft until it bottoms then, still holding spindle of tool with spanner, screw body of installer down spindle until face of carrier is flush with end of pump shaft. Unscrew tool from pump shaft; (the tapped hole in pump shaft is provided solely to suit installation and removal tools).

After replacing pump test system.

Steering Tie Rod Ends (Track Rod Ends)

Commencing at the Vehicle Identification Numbers listed below, an alternative design of tie rod was introduced. It should be noted that the new tie rod ends are sealed and require no lubrication. A feature of the new tie rod is that there is NO SPRING LOADED FREE MOVEMENT. To avoid any confusion over the identification of these tie rod ends, the old and new types are illustrated below.

Vehicle Identification Number
345390



STEERING RACK MOUNTING BUSHES

Remove and refit 57.10.30

Service Tools: Rack mounting bush replacement tool JD 165, rack centralising pin 18G 1466.

Removing

Raise and support the front of the vehicle.
Turn the ignition key to prevent steering lock engagement.
Position adhesive tape along the top edge of the steering column upper cowl and along the steering wheel boss.
Apply and shape a small amount of plastercine to the shoulder of the steering rack centralising pin 18G 1466. This will prevent oil loss when fitted.
Remove the centralising pin access plug from the steering rack and insert the pin.
With help from another person rotate the steering wheel until the pin is fully engaged (Fig 36).
Mark the position of the steering wheel on the adhesive tape.
Remove the pin and refit the access plug.
Remove the securing nut and bolt from the steering column lower universal joint. On catalyst vehicles space is extremely confined.
Release the joint from the steering rack.
Undo and remove the rack to crossbeam lower and upper securing nuts and bolts.
Displace and remove rack heatshields as necessary.
Remove the non pinion side mounting bush to crossbeam shims and lower the rack assembly.
Remove and discard the rubber faced thrust washers of the lower mounting bushes.
Position tool body item JD 165/3 to the inside face of the mounting bush housing.
Insert the draw bolt through tool body and mounting bush.
Fit tool item JD 165/1, washer and pillar nut to the outer face of the mounting bush.
Operate tool drawing the mounting bush into the tool body (Fig 49).
Repeat procedure for the remaining bushes.

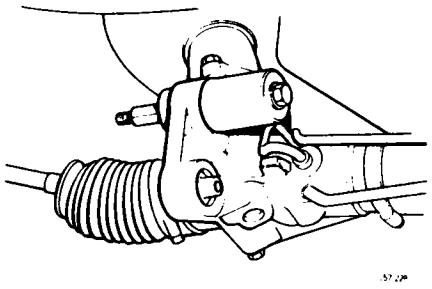


Fig 49

Refitting

Clean mounting bush housings and crossbeam mounting locations.
Position tool item JD 165/2 to the inside face of the bush housing.
Position and align mounting bush to the outside face of the bush housing.
Fit tool item JD 165/1, pass draw bolt through assembly and fit pillar nut.
Tighten draw bolt to fully seat bush into housing (Fig 50).
Repeat procedure for the remaining bushes.

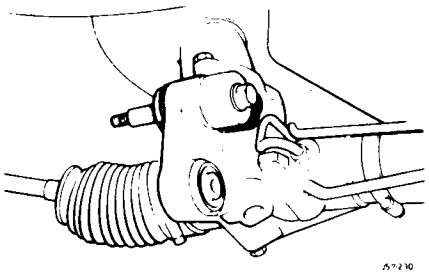


Fig 50

Fit new rubber faced thrust washers to the outer faces of the lower bushes.
Raise the rack assembly and align crossbeam mountings. Fit suitable pegs to mounting positions to hold the rack in place.
Remove peg from passengers side, fit shims as necessary between rack lower mounting bush and crossbeam. Fit but do not tighten rack mounting bolt and nut.
Remove peg from pinion side, fit but do not tighten rack mounting bolt and nut.
Fit and align rack heatshields as necessary.
Fit but do not tighten upper rack mounting bolt and nut.
Align rack assembly with crossbeam base and finally tighten securing bolts.
Reposition the steering column and steering rack centrally using the centralising pin as detailed above and engage and fully seat lower universal joint to rack spline.
Fit and tighten pinch bolt and nut.
Lower vehicle.