PART 3

CONTENTS

FAULT DIAGNOSIS

KNOWN FAULT(S)

When a known fault or faults exist as described under the heading "Fault" in the adjacent Quick Reference Fault Diagnosis Chart, this chart should be used to find the cause(s).

UNKNOWN FAULT(S) OR ROUTINE TESTING

If the fault or faults are not clearly defined, or if the vehicle has to be given a routine check, the Road Test and Systematic Diagnosis procedure given on Page 4 onwards should be used.

QUICK REFERENCE FAULT DIAGNOSIS CHART KEY

Example of use:

Fault—Bumpy engagement of D—first fault given in chart.
Items 1 to 7, given as D B d f c O Q in the chart key, are checked in this letter order.

Preliminary Adjustment Faults

A. Fluid level insufficient.

B. Downshift valve cable incorrectly assembled or adjusted.

C. Manual linkage incorrectly assembled or adjusted.

D. Incorrect engine idling speed.

E. Incorrect front band adjustment.

F. Incorrect rear band adjustment.

Hydraulic control faults

a. Oil tubes missing or not installed correctly.

b. Sealing rings missing or broken.

c. Valve body assembly screws missing or not correctly tightened.

d. Primary regulator valve sticking.

e. Secondary regulator valve sticking.

f. Throttle valve sticking.

g. Modulator valve sticking.

h. Governor valve sticking, leaking or incorrectly assembled

I. Orifice control valve sticking.

m. 1-2 shift valve sticking.

n. 2-3 shift valve sticking.

p. 2–3 shift valve plunger sticking.

q. Converter "out" check valve missing or sticking.

s. Pump check valve missing or sticking.

Mechanical Faults

N. Front clutch slipping due to worn plates or faulty parts.

O. Front clutch seized or plates distorted.

P. Rear clutch slipping due to worn plates or faulty check valve in piston.

Q. Rear clutch seized or plates distorted.

R. Front band slipping due to faulty servo, broken or worn band.

S. Rear band slipping due to faulty servo, broken or worn band.

T. One-way clutch slipping or incorrectly installed.

U. One-way clutch seized.

V. Input shaft broken.

W. Front pump drive tangs on converter hub broken

X. Front pump worn.

Y. Rear pump worn or drive key broken.

Z. Converter blading and/or one-way clutch failed.

QUICK-REFERENCE FAULT DIAGNOSIS CHART
NUMBERS INDICATE THE RECOMMENDED SEQUENCE OF FAULT INVESTIGATION

For use of chart key—see previous page

Fault	Preliminary adjustment faults						Hydraulic Control faults												Mechanical faults											
	A	B	C	D	E	F	a	b	c	d	e	f	g	h	I	m	n	p	q	s	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Engagement of R, D, or L																																	
Bumpy	.	2	.	1	.	.	.	.	5	3	.	4	.	.	.	.	.	.	.	.	.	6	.	7	.	.	.	.	.	.	.	.	.	.
Delayed	1	.	2	3	.	.	4	7	6	5	.	.	.	.	.	.	.	.	13	8	9	.	10	.	.	11	.	.	.	.	12	.	.
None	1	.	2	.	.	.	3	4	5	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7	8	9	.	10
Take off																																	
None forward	.	.	1	.	.	.	.	3	2	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	5	.	.	.	.	.	.
None reverse	.	.	1	.	.	2	7	6	5	.	.	.	.	.	3	4	.	.	.	.	.	.	9	.	.	8	.	.	.	.	.	.	.
Seizure reverse	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
No Neutral	.	.	1	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.
Upshifts																																	
No. 1-2	.	.	1	.	2	.	8	9	10	.	.	6	7	3	.	4	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.
No. 2-3	.	.	1	.	.	.	8	9	10	.	.	6	7	2	.	.	3	4	.	.	.	.	5	.	.	.	.	.	.	.	.	.	.
Above normal shift speeds	.	1	.	.	.	.	.	8	9	10	.	2	7	3	.	4	5	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Below normal shift speeds	.	1	.	.	.	.	.	5	6	.	.	2	.	3	.	.	.	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Upshift quality																																	
Slip 1-2	1	2	3	.	4	.	8	9	10	6	.	7	.	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.
Slip 2-3	1	2	3	.	4	.	9	10	11	7	.	8	.	.	.	.	.	.	.	.	.	.	5	.	6	.	.	.	.	.	.	.	.
Rough 1-2	.	1	.	.	2	.	.	.	10	3	.	4	5	6	.	.	.	.	.	.	9	.	.	.	.	.	7	8	.	.	.	.	.
Rough 2-3	.	1	.	.	2	.	.	.	6	3	.	4	.	.	.	.	.	.	.	.	.	.	.	5	.	.	.	.	.	.	.	.	.
Seizure 1-2	.	.	.	.	.	1	.	5	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	3	4	.	.	.	.	.
Seizure 2-3	.	.	.	.	1	.	2	3	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Downshifts																																	
No. 2-1	.	1	.	.	.	.	.	.	.	.	.	.	.	3	.	2	.	.	.	.	.	.	.	.	.	4	.	.	.	.	.	.	.
No. 3-2	.	1	.	.	.	.	.	.	.	.	.	.	.	3	.	2	.	.	.	.	.	.	.	4	5	.	.	.	.	.	.	.	.
Involuntary high speed 3-2	1	.	.	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.
Above normal shift speeds	.	1	.	.	.	.	.	5	6	.	.	4	.	2	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Below normal shift speeds	.	1	.	.	.	.	.	5	6	.	.	4	.	2	.	7	8	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Downshift quality																																	
Slip 2-1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Slip 3-2	.	.	.	.	1	.	6	7	8	4	.	5	.	.	3	.	.	.	.	.	.	.	9	.	2	.	.	.	.	.	.	.	.
Rough 2-1	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	.	.	1	.	.	.	.	.	.
Rough 3-2	.	.	.	.	1	.	.	.	5	3	.	4	.	.	2	.	.	.	.	.	.	.	6	7	8	.	.	.	.	.	.	.	.
Line Pressure																																	
Low, idling	1	.	2	3	.	.	6	8	5	4	.	.	.	.	.	.	.	.	.	7	.	.	.	.	.	.	.	.	9	.	.	.	.
High, idling	.	1	.	2	.	.	.	.	.	3	5	4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Low at stall	1	2	.	.	.	.	6	8	7	3	.	5	4	9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	10	.	.
High at stall	.	.	.	.	.	.	.	.	4	1	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Stall speed																																	
Below 1000	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Over 2000	1	.	2	.	.	3	4	5	6	7	.	.	.	.	.	.	.	.	.	.	8	.	9	.	.	10	11	.	12	.	.	.	13
No push start	1	.	2	.	6	5	8	9	10	11	.	.	.	.	.	.	.	.	.	3	7	.	.	.	.	.	.	.	12	.	.	4	.
Overheating	1	.	.	.	2	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4

ROAD TEST AND SYSTEMATIC DIAGNOSIS

ROAD TEST PROCEDURE

This is used in conjunction with Road Test Diagnosis Chart on Page 5.

It is important to gain as much information as possible on the precise nature of any fault. If possible, go out in the car with the driver and get him to demonstrate the fault.

The following road test procedure should be completely carried out, as there may be more than one fault.

Before road test check fluid level (see Part 1, page 6) and ensure that transmission is free from fluid leaks. Also check downshift cable and throttle linkage adjustment (see Part 1, pages 9 and 10).

Test No.

1. Check that starter will operate only with the selector in P and N and that the reverse light (when fitted) operates only in R.

2. Apply brakes and, with engine at normal idling speed, select N-D, N-L, N-R. Transmission engagement should be felt in each position selected.

3. Check engine stall speed with transmission in L and R. Check for slip or clutch squawk. Correct, and incorrect stall speeds, and reasons for the latter, are given in the Data Section. The stall speed test is described on page 7 under Converter Diagnosis.

   Note.—Do not stall for longer than 10 seconds or transmission will overheat.

4. With the transmission at normal running temperature, select D. Release brakes and accelerate with minimum throttle opening. Check for 1-2 and 2-3 shifts.

   Note.—At minimum throttle openings, the shifts may be difficult to detect. Confirmation that the transmission is in third gear may be obtained by selecting L, when a 3-2 downshift should be felt.

5. At just over 30 m.p.h. (48 k.p.h.), select N, switch off ignition and let car coast. At 30 m.p.h. (48 k.p.h.) switch on ignition and select D. Engine should start through the rear wheels, indicating that the rear oil pump of the transmission is operating.

6. (a) Stop and restart using full throttle acceleration, i.e. accelerator to the "Hard spot". Check for 1-2 and 2-3 shifts according to table of "Gear shift speeds" given in the Data Section.

   (b) At 25 m.p.h. (40 k.p.h.) in 3rd gear, depress accelerator to full throttle position. Car should accelerate in 3rd gear and should not downshift to 2nd.

   (c) At 30 m.p.h. (48 k.p.h.) in 3rd gear, depress accelerator to the kickdown position, i.e. through the "Hard spot". Transmission should downshift to 2nd gear.

   (d) At 15 m.p.h. (24 k.p.h.) in 3rd gear, depress accelerator to the kickdown position. Transmission should downshift to 1st gear.

7. (a) Stop and restart using forced throttle acceleration (i.e. accelerator through the "Hard spot"). Check for 1-2 and 2-3 shifts according to table of "Gear shift speeds" given in the Data Section.

   (b) At 40 m.p.h. (64 k.p.h.) in 3rd gear release accelerator and select L. Check for 3-2 downshift and engine braking. Check for roll-out (overrun) 2-1 downshift and engine braking.

8. Stop and with L still engaged, release brakes and, using full throttle, accelerate to 20 m.p.h. (32 k.p.h.). Check for no slip or clutch squawk and no upshifts.

9. Stop and select R. Release brakes and reverse using full throttle if possible. Check for no slip or clutch squawk.

10. Stop on brakes facing downhill on gradient and select P. Release brakes and check that the parking pawl will hold the car. Re-apply brakes before disengaging the parking pawl. Repeat with car facing uphill. Check that the selector is trapped by the gate in P.

11. On return from test run re-check fluid level.

ROAD TEST DIAGNOSIS CHART

(To be used in conjunction with Road test procedure)

Test	Fault	Action
1	Starter will not operate in P or N	19
	Starter operates in all selector positions	20
2	Excessive bump on engagement of D, L or R	4–3
3	If stall speed higher than specified:	
	(a) with slip and squawk in L	1–2–3–13–11
	(b) with slip and squawk in R	1–2–3–13–12
	If stall speed lower than specified: check engine performance	
	If stall speed more than 600 r.p.m. lower than specified	21
4	No drive in D. (If normal in L, omit 11 and 13; if no drive in D, L or R add 17)	1–2–3–13–11–16
	Delayed or no 1–2 shift	3–14–13–5–6
	Slip on 1–2 shift	2–3–5–6–7–13
	Delayed or no 2–3 shift. (If normal in R, omit 12)	3–14–13–5–6–12
	Slip or engine run-up on 2–3 shift	2–3–5–13–12
	Bumpy gear shifts	3
	Drag in D2 and D3	8
	Drag or binding on 2–3 shift	5–6
5	Engine will not start through rear wheels	22
6a	Slip and squawk or judder on full throttle take-off in D	1–2–3–13–11
	Loss of performance and overheating in D3 (seized stator)	21
	Continue as for test 4 above	
b	Transmission downshifts too easily	3
c and d	Transmission will not downshift	3–13–14

7a	As test 6a above	
b	No 3–2 downshift or engine braking	1–5–6–7–12
	No 2–1 downshift or engine braking	8–9–10
8	Slip and squawk or judder on take-off in L	1–2–3–13–11
	Transmission upshifts	1
9	Slip and squawk or judder on take-off in R	1–2–3–13–12
	Slip but no judder on take-off in R. (If engine braking available in L1, omit 8–9–10.)	1–2–3–8–9–10
	Drag in R	5
	No drive in R. (If engine braking available in L1, omit 8–9–10)	1–2–3–8–13–9–10–12
10	No Park	1–15

Miscellaneous:

Screech or whine, increasing with engine speed	17
Grinding or grating noise from gearbox	18
Knocking noise from torque converter area	23
At high speeds in D3, transmission downshifts to D2 and immediately back to D3	12

Road test diagnosis action list

1. Check manual linkage adjustment.
2. Check fluid level.
3. Check adjustment of downshift valve cable using line pressure gauge and tachometer—also check that full throttle opening is obtained and that "Hard spot" is felt when the accelerator pedal is fully depressed.
4. Reduce engine idling speed.
5. Check front band adjustment.
6. Check front servo seals and fit of tubes.
7. Check front band for wear.
8. Check rear band adjustment.
9. Check rear servo seal and fit of tubes.
10. Check rear band for wear.
11. Examine front clutch and seals, also forward sun gear shaft sealing rings. Verify that cup plug in driven shaft is not leaking or disloged.
12. Examine rear clutch, check reed valve, and seals. Check fit of tubes.
13. Strip valve bodies and clean.
14. Strip governor valve and clean.
15. Examine parking pawl, gear and internal linkage.
16. Examine one-way clutch.
17. Strip and examine front pump and drive tangs.
18. Strip and examine gear train.
19. Adjust starter inhibitor switch inwards.
20. Adjust starter inhibitor switch outwards.
21. Replace torque converter.
22. Check rear pump drive pin.
23. Examine torque converter drive plate for cracks or failure.

CONVERTER DIAGNOSIS

1. If the general vehicle performance is below standard, check the converter stall speed as described after para. 4 with an accurate tachometer by applying maximum pressure on the foot brake pedal, selecting Lock-up and depressing the accelerator. See General Data for reading to be expected when the engine is not developing its full power.
2. Inability to start on steep gradients combined with poor acceleration from rest indicates that the converter stator one-way clutch is slipping or that the stator support is fractured. This condition permits the stator to rotate in an opposite direction to the turbine and torque multiplication cannot occur. Check the stall speed and, if it is below that specified, the converter assembly must be replaced. See General Data for stall speed if one-way clutch is slipping.
3. Below standard acceleration in third gear above 30 m.p.h. (48 k.p.h.) combined with a substantially reduced maximum speed, indicates that the stator one-way clutch has locked in the engaged condition. The stator will then not rotate with the turbine and impeller, therefore the fluid flywheel phase of the converter performance cannot occur. This condition will also be indicated by excessive overheating of the transmission, although the stall speed will remain as normal. The converter assembly must be replaced and the gearbox examined for signs of overheating.
4. Stall speed, higher than that specified, indicates that the converter is not receiving its required fluid supply or that slip is occurring in the clutches of the automatic gearbox.

Stall speed test

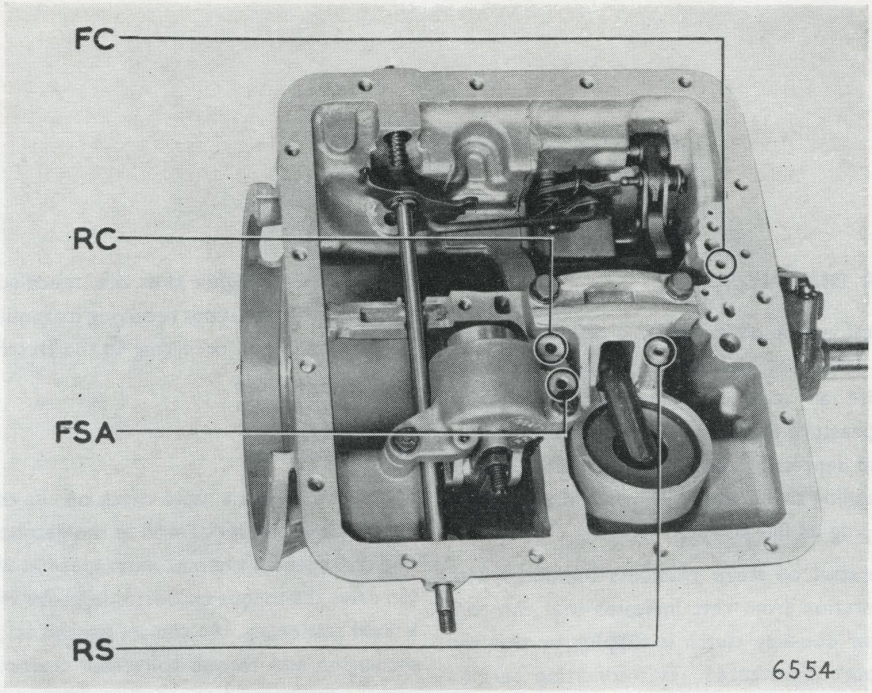
This test provides a rapid check on the correct functioning of the converter as well as the gearbox.

The stall speed is the maximum speed at which the engine can drive the torque converter impeller while the turbine is held stationary. As the stall speed is dependent both on engine and torque converter characteristics, it will vary with the condition of the engine as well as with the condition of the transmission. It will be necessary, therefore, to determine the condition of the engine in order to correctly interpret a low stall speed. To obtain the stall speed, connect an accurate tachometer to the engine and place it where it can easily be read from the driver's seat. Allow the engine and the transmission to attain normal working temperature, set the hand brake, chock the wheels, and apply the foot brake. Select 'L' or 'R' and fully depress the accelerator. Note the reading on the revolution indicator.

Note.—To avoid overheating, the period of stall test must not exceed 10 seconds.

Service Notes

The torque converters are sealed by welding and serviced by replacement only. No drain plug is provided.



FC —FRONT CLUTCH
PC —REAR CLUTCH
FSA—FRONT SERVO APPLY
RS —REAR SERVO

Fig. 1. *Air pressure check points*

AIR PRESSURE CHECKS (see Fig. 1)

Air pressure checks can be made on the gearbox assembly to determine whether the clutches and brake bands are operating. These checks can be made with the transmission in the car or on the bench with a high pressure air line. In either event, drain the fluid from the gearbox, and remove the oil pan as well as the valve bodies assembly with oil tubes.

The air used must be clean and dry.

Front clutch and governor feed

Apply air pressure to the passage (5) at FC of the transmission case rear wall see Fig. 1. Listen for a thump, indicating that the clutch is functioning; on the bench also verify by rotating the input shaft with air pressure applied Keep air pressure applied for several seconds to check for leaks in the circuit.

If the extension housing has been removed, rotate the output shaft so that the governor weight will be at the bottom of the assembly. Verify that the weight moves inwards with air pressure applied.

Rear clutch

Apply air pressure to the passage (15) of the transmission case web. This is shown as RC in Fig. 1. On the bench, verify by turning the input shaft that the clutch is functioning. Keep air pressure applied for several seconds to check for leaks. Then listen for a thump indicating that the clutch is releasing.

Front servo

Apply air pressure to the apply tube location immediately adjacent to the rear retaining bolt. This is shown as FSA in Fig. 1. Observe the movement of the piston pin.

Rear servo

Apply air pressure to the tube location of the servo body shown as RS in Fig. 1. Observe the movement of the servo lever.

Conclusions

if the clutch and bands operate satisfactorily with air pressure, faulty operating of the transmission must be due to malfunction of the hydraulic control system. The valve bodies assembly must then be dismantled, cleaned inspected and re-assembled.

FSR—FRONT SERVO RELEASE
FSA—FRONT SERVO APPLY
RC —REAR CLUTCH
RS —REAR SERVO

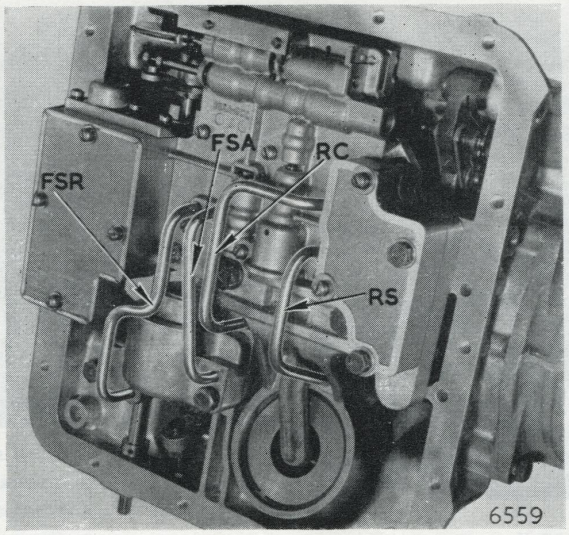


Fig. 2. *Location of oil tubes*

REMOVAL AND REPLACEMENT OF UNITS

VALVE BODIES ASSEMBLY

The complete valve bodies assembly in which all the hydraulic automatic control valves operate can be very easily changed as a complete unit. A very high standard of cleanliness must be observed and a torque spanner used when tightening all bolts.

To remove (see Figs. 2 to 5)

Place car on ramp, or over a clean pit.

Clean transmission sump and transmission case immediately above sump joint face.

Remove sump drain plug with a $\frac{1}{4}$" Allen key ($\frac{1}{4}$" across flats of hexagon) and drain off fluid into a clean container capable of holding 12 pints (6·8 litres).

Remove sump and the four steel connecting oil pipes shown in Fig. 2. These pipes are a firm fit into their respective holes and may have to be levered out with a suitable bar.

Disconnect downshift valve cam operating cable by rotating the cam enough to allow the cable end to be released (see Fig. 3).

OPERATING CABLE

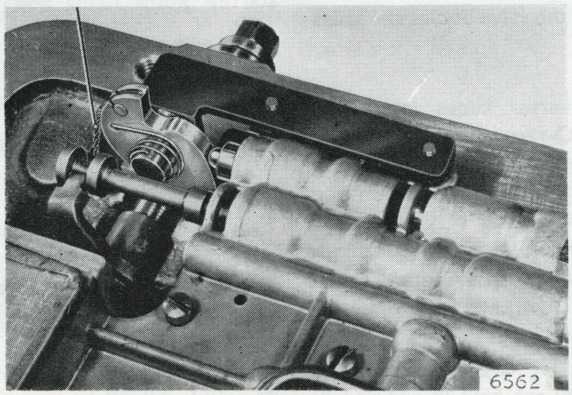
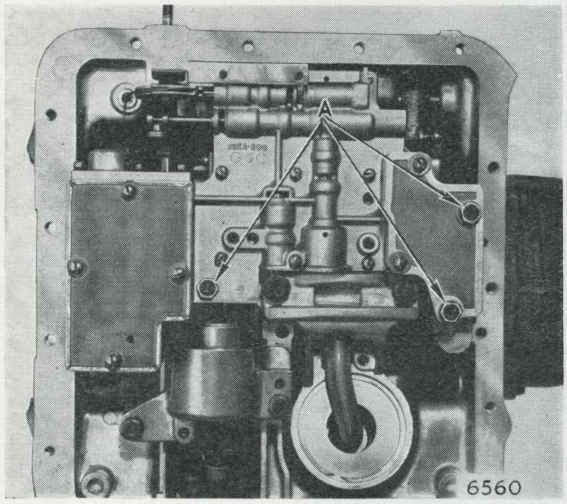
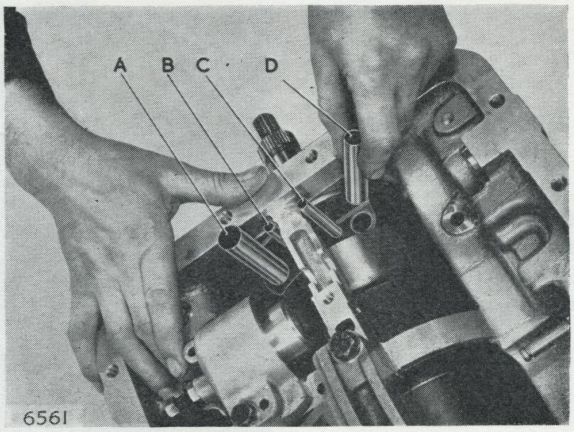


Fig. 3. *Downshift cable and cam*



A — FIXING BOLTS

Fig. 4. *Valve bodies assembly fixing bolts*



A—FRONT PUMP INLET
B—CONVERTER "OUT"
C—CONVERTER "IN"
D—FRONT PUMP OUTLET

Fig. 5. *Location of oil tubes, front of gearbox*

Remove:—
2 bolts with flat and spring washers $\frac{1}{4}$"—20×1$\frac{1}{4}$" ($\frac{7}{16}$ AF socket).

1 bolt and spring washer $\frac{1}{4}$"—20×2" ($\frac{7}{16}$ AF socket).

The bolt positions are shown by the letter (A) in Fig. 4.

Lift off valve bodies assembly clear from the oil tubes at the front end of gearbox.

Note.—O-ring location on collar type front pump suction tube A. See Fig. 5.

To refit
NO GASKET is used between the valve bodies and transmission case.

Install front pump and converter tubes into pump adaptor, having checked the O-ring of the front pump inlet tube, and place valve bodies assembly in position. Make sure that it seats correctly on the transmission case. Fit and **tighten the three retaining screws with a torque spanner to the correct tightening torque** given in the Data Section under Torque Chart. Do not overtighten. Connect cable to downshift valve cam.

Replace oil pipes as shown in Fig. 5. These may need driving lightly into place. They are held in position by the sump.

Thoroughly clean sump.

Replace sump using a new gasket and tighten its fixing bolts with a torque spanner to the correct tightening torque given in the Data Section.

Refill transmission through the filler tube using a funnel fitted with a gauze. Check fluid level as described in Part 1 under MAINTENANCE and top up if necessary. It is important not to overfill.

DOWNSHIFT VALVE CABLE

To remove
Disconnect at attachment points on carburettor and top starter motor fixing bolt.

Drain and remove oil pan.

Disconnect cable from downshift valve operating cam.

Unscrew cable from gearbox housing.

To refit
This is a reversal of the removal procedure.

The sump fluid level must be carefully made up to avoid overfilling as described in Part 1 of the manual under MAINTENANCE.

The cable MUST be correctly adjusted as described in Part 1 under ADJUSTMENT.

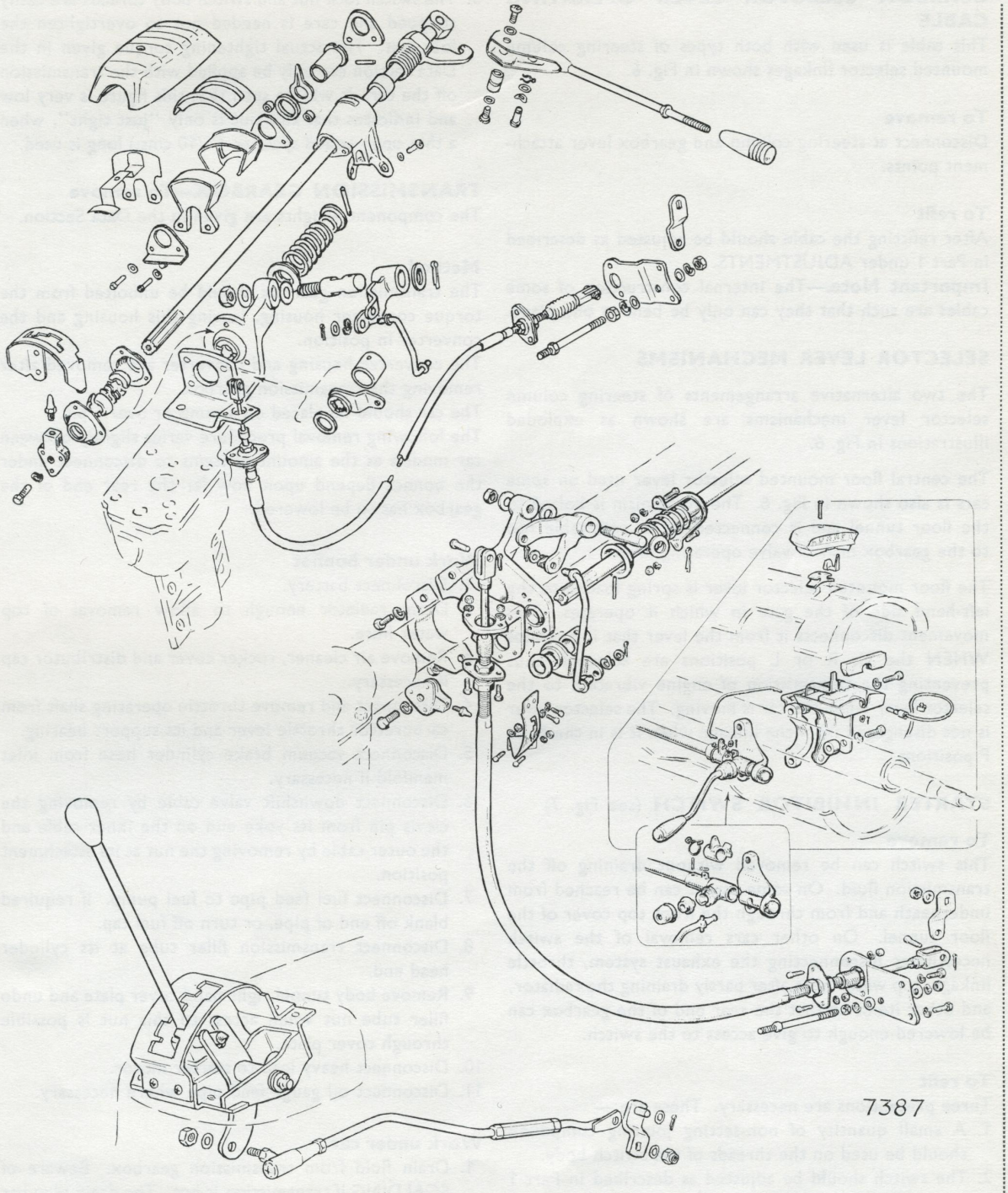


Fig. 6. *Details of alternative steering column selector lever mechanisms, and floor mounted selector lever mechanism*

GEARBOX SELECTOR LEVER OPERATING CABLE

This cable is used with both types of steering column mounted selector linkages shown in Fig. 6.

To remove

Disconnect at steering column and gearbox lever attachment points.

To refit

After refitting the cable should be adjusted as described in Part 1 under ADJUSTMENTS.

Important Note.—The internal construction of some cables are such that they can only be bent in one plane.

SELECTOR LEVER MECHANISMS

The two alternative arrangements of steering column selector lever mechanisms are shown as exploded illustrations in Fig. 6.

The central floor mounted selector lever used on some cars is also shown in Fig. 6. The mechanism is bolted to the floor tunnel and is connected by an adjustable rod to the gearbox manual valve operating lever.

The floor mounted selector lever is spring loaded to the left-hand side of the gate in which it operates. This movement disconnects it from the lever that it operates WHEN the D, R or L positions are selected, thus preventing the transmission of engine vibration to the selector lever when the car is moving. The selector lever is not disengaged from the linkage when it is in the N or P positions.

STARTER INHIBITOR SWITCH (see Fig. 7)

To remove

This switch can be removed without draining off the transmission fluid. On some cars it can be reached from underneath and from through the front top cover of the floor tunnel. On other cars removal of the switch necessitates disconnecting the exhaust system, throttle linkage, top water hose after partly draining the radiator, and other items so that the rear end of the gearbox can be lowered enough to give access to the switch.

To refit

Three precautions are necessary. These are:—

1. A small quantity of non-setting jointing compound should be used on the threads of the switch body.
2. The switch should be adjusted as described in Part 1 under ADJUSTMENTS. This is very important and ensures that the starter can only be operated in N or P positions of the selector lever, or the reverse light (if fitted) come on in the R position.
3. The switch lock nut and switch body threads are easily stripped and care is needed not to overtighten the lock nut. The actual tightening torque given in the Data Section can only be applied with the transmission off the car. It will be seen that this figure is very low and indicates that this nut is only "just tight", when a thin open ended spanner 4″ (10 cms.) long is used.

TRANSMISSION GEARBOX—To remove

The component weights are given in the Data Section.

Method

The transmission gearbox should be unbolted from the torque converter housing, leaving this housing and the converter in position.

The converter housing and converter are removed after removing the transmission gearbox.

The car should be placed on a ramp or over a pit.

The following removal procedure varies slightly between car models as the amount of items to disconnect under the bonnet depend upon how far the rear end of the gearbox has to be lowered.

Work under bonnet

1. Disconnect battery.
2. Drain radiator enough to allow removal of top water hose.
3. Remove air cleaner, rocker cover and distributor cap if necessary.
4. Disconnect and remove throttle operating shaft from carburettor throttle lever and its support bearing.
5. Disconnect vacuum brake cylinder hose from inlet manifold if necessary.
6. Disconnect downshift valve cable by removing the clevis pin from its yoke end on the inner cable and the outer cable by removing the nut at its attachment position.
7. Disconnect fuel feed pipe to fuel pump. If required blank off end of pipe, or turn off fuel tap.
8. Disconnect transmission filler tube at its cylinder head end.
9. Remove body tunnel right-hand cover plate and undo filler tube nut when access to this nut is possible through cover plate.
10. Disconnect heavy lead to starter motor.
11. Disconnect oil gauge feed pipe where necessary.

Work under car

1. Drain fluid from transmission gearbox. Beware of SCALDING if transmission is hot. The drain plug has a hollow hexagon and an Allen key $\frac{1}{4}$ in. across its hexagon flats is needed to remove this plug.

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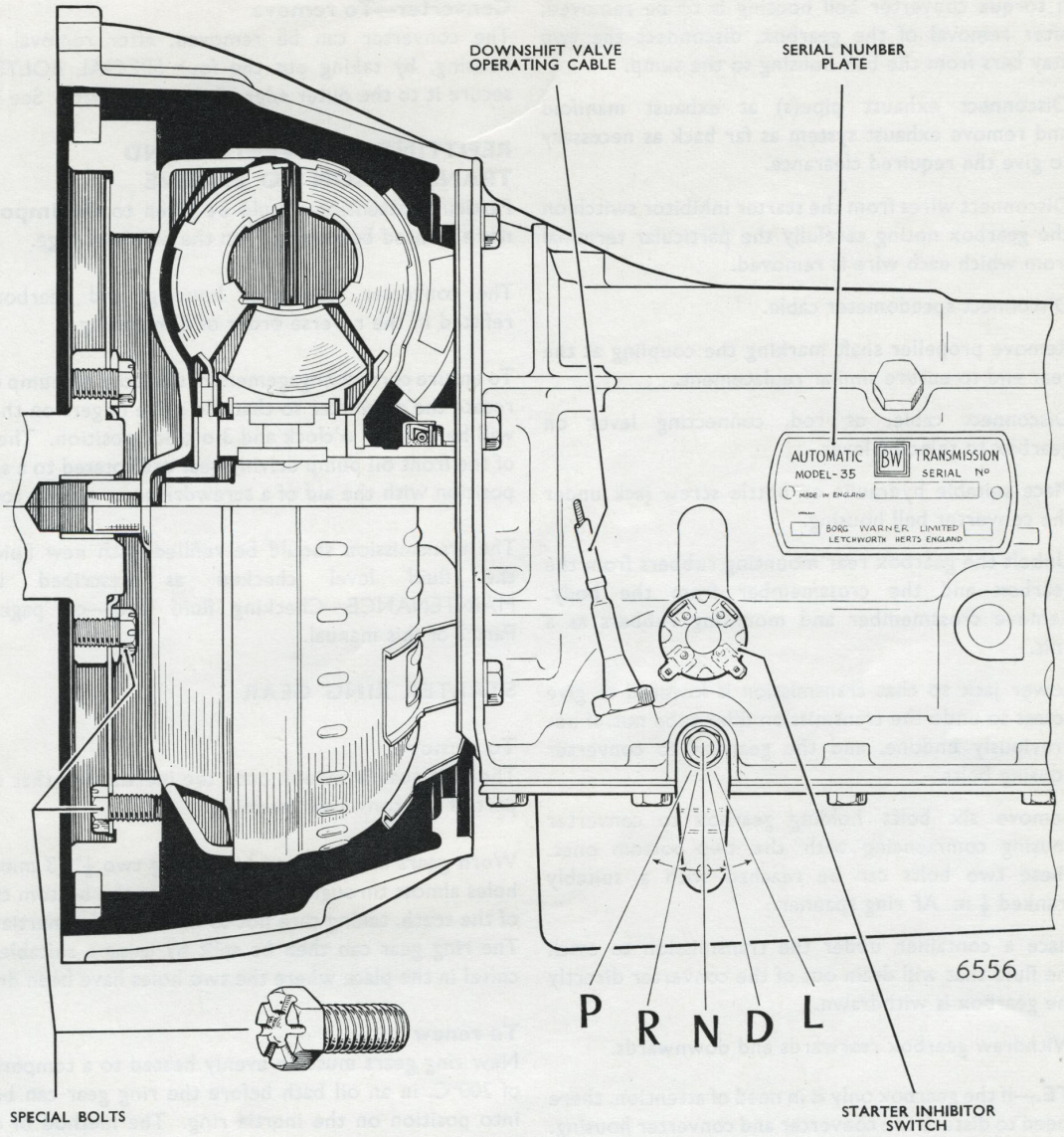

Fig. 7. *Converter attachment points to engine drive plate and gearbox external fittings*

IMPORTANT NOTE

Special bolts are used to secure the converter to the engine drive plate, and the drive plate to the engine crankshaft. If replacement bolts have to be fitted it is VITALLY IMPORTANT to use only the correct genuine replacements. **These bolts, and all others for which a torque loading is given in the Torque Chart, in the Data Section, MUST be tightened to the correct torque with a reliable torque spanner.**

2. If torque converter bell housing is to be removed, after removal of the gearbox, disconnect the two stay bars from the bell housing to the sump.
3. Disconnect exhaust pipe(s) at exhaust manifold and remove exhaust system as far back as necessary to give the required clearance.
4. Disconnect wires from the starter inhibitor switch on the gearbox noting carefully the particular terminal from which each wire is removed.
5. Disconnect speedometer cable.
6. Remove propeller shaft marking the coupling at the rear end to ensure similar replacement.
7. Disconnect cable, or rod, connecting lever on gearbox to selector lever.
8. Place suitable hydraulic or bottle screw jack under the converter bell housing.
9. Unbolt the gearbox rear mounting rubbers from the gearbox and the crossmember from the body. Remove crossmember and mounting rubbers as a unit.
10. Lower jack so that transmission is lowered to give access to undo the transmission filler tube nut, if not previously undone, and the gearbox to converter housing bolts.
11. Remove six bolts holding gearbox to converter housing commencing with the two bottom ones. These two bolts can be reached with a suitably cranked $\frac{1}{2}$ in. AF ring spanner.
12. Place a container under the transmission to catch the fluid that will drain out of the converter directly the gearbox is withdrawn.
13. Withdraw gearbox rearwards and downwards.

NOTE.—If the gearbox only is in need of attention, there is no need to disturb the converter and converter housing. If, however, the diagnosis procedure has established that the converter is at fault, or that the complete unit needs replacement, the converter housing and converter should be removed, after removing the gearbox, and re-assembled to the gearbox if the complete unit has to be changed.

Converter housing—To remove

After removing the gearbox the converter housing bolts become reasonably accessible to reach.

1. Disconnect lead to starter and remove starter.
2. Remove cover plate, and stay brackets, to cylinder block. Lift off housing.

Converter—To remove

The converter can be removed, after removal of its housing, by taking out the four SPECIAL BOLTS that secure it to the outer edge of the drive plate. See Fig. 7.

REFITTING CONVERTER AND TRANSMISSION TO ENGINE

Particular attention should be given to the **Important note** printed below Fig. 7 on the previous page.

The converter, converter housing, and gearbox are refitted in the reverse order of dismantling.

To ensure correct engagement of the front oil pump drive, rotate the converter so that the drive fingers on the hub will be in the 9 o'clock and 3 o'clock position. The slots of the front oil pump driving gear are rotated to a similar position with the aid of a screwdriver or similar tool.

The transmission should be refilled with new fluid and the fluid level checked as described under MAINTENANCE—Checking fluid level—on page 6 in Part 1 of this manual.

STARTER RING GEAR

To remove

The ring gear is shrunk onto the inertia ring that forms part of the converter assembly.

Worn gears are removed by drilling two $\frac{1}{8}$" (3 mm) dia. holes almost through the ring gear, at the bottom of one of the teeth, taking care not to drill into the inertia ring. The ring gear can then be split by using a suitable cold chisel in the place where the two holes have been drilled.

To renew

New ring gears must be evenly heated to a temperature of 200°C. in an oil bath before the ring gear can be put into position on the inertia ring. The method of doing this is explained and illustrated in Section B of the Workshop Manuals covering the cars to which this transmission is fitted. The chamfers on the ring gear teeth must come to the converter side of the inertia ring.

Ring gears are heat treated in manufacture to give long gear teeth life. New ring gears must **not be heated** by a naked flame as this may soften the gear and cause rapid gear teeth wear.

RECONDITIONED ENGINES

Reconditioned engines, built to take the 35 Borg Warner unit are available. Their use will save changing over the driving plate and spigot bush.