PART 1

CONTENTS

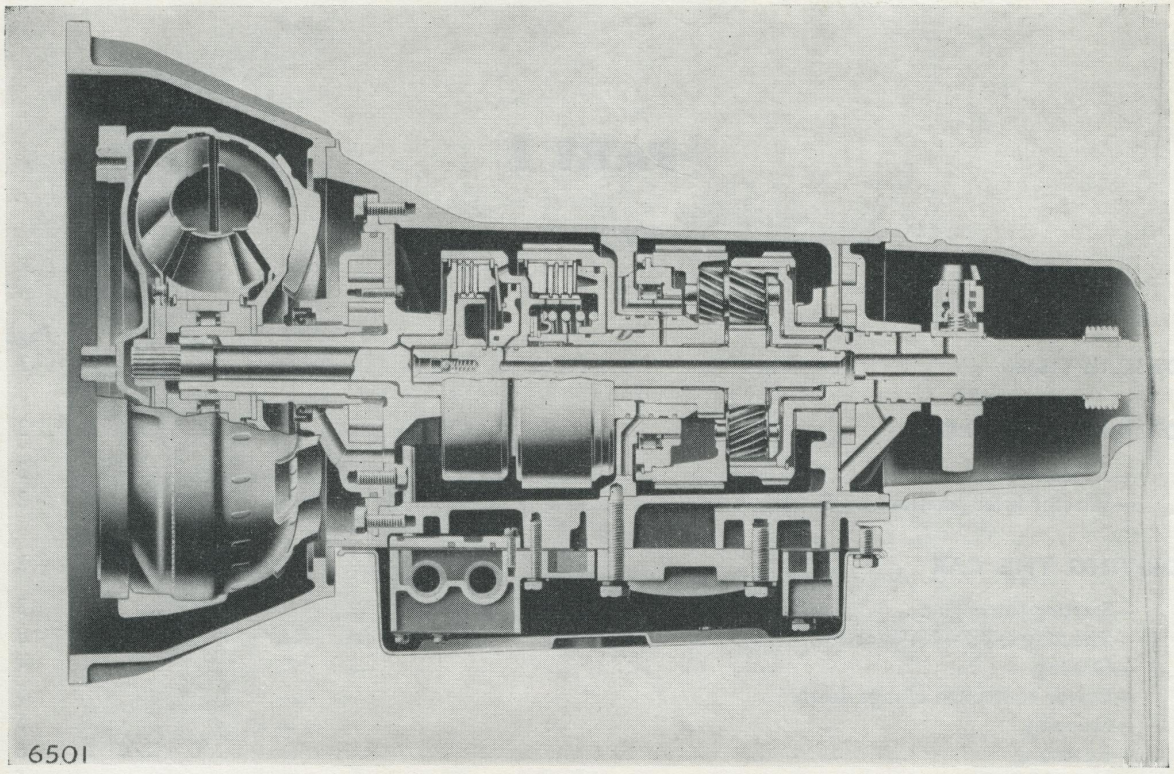


Fig. 1. *Sectional view of transmission with 9½ ins. converter*

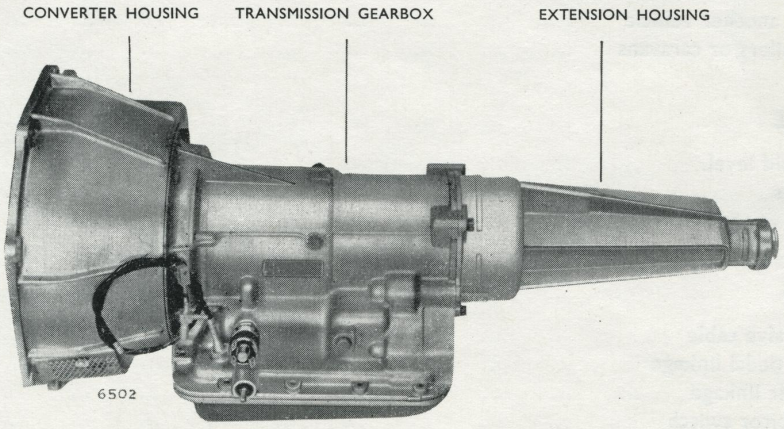


Fig. 2. *Installation components*

DESCRIPTION

The 35 Automatic Transmission consists of two main components, as shown in Fig. 1.

These are:—

1. A three-element hydrokinetic torque converter coupling capable of torque multiplication at an infinitely variable rate between 2:1 and 1:1.
2. A torque/speed responsive and hydraulically operated gearbox comprising a planetary gear set providing three forward ratios and reverse.

The combination of a hydrokinetic converter coupling and a three speed planetary gear permits maximum utilization of engine power.

The transmission gearbox is used in conjunction with 9½ ins. (24 cms) dia. converter. The unit offers the following outstanding advantages:

1. Light weight and minimum installation dimensions.
2. Fluid drive in all gears, making the transmission eminently suited to 4-cylinder engines and providing extreme flexibility at low road speed in the 1:1 mechanical gear ratio.
3. Manual overriding control for engagement of the reduction gears, with corresponding engine braking in each gear.
4. Simplicity of construction to provide easy servicing.

DRIVING CONTROLS

The Model 35 Automatic Transmission eliminates the clutch pedal and gear lever. This considerably simplifies driving as under normal conditions there remain only the accelerator and brake pedals to operate.

After starting from rest, gear changes are carried out automatically by the transmission in accordance with road speed and the requirements of the driver.

Selector lever

Fig. 3 shows the two types of selector lever used with this automatic transmission. The lever positions in both cases are marked L-D-N-R-P.

Steering column mounted selector lever (see Fig. 3)
This selector lever is situated to the left of the steering column on right-hand drive cars, and on the right of the steering column on left-hand drive cars. The lever positions, L-D-N-R-P are shown by a pointer on a quadrant, mounted above the steering column.

Floor mounted selector lever (see Fig. 3)
This selector lever is situated centrally on the floor, in a position similar to a short floor gear change lever. The L-D-N-R-P positions are marked on either side of the cover below the lever.

Selector lever positions

Lock-up
This selector lever position is used when it is desired to prevent the transmission from changing out of first gear (low) or second gear (intermediate); this may be advantageous when travelling over rough or wet ground, icy roads or when descending steep hills using the engine as a brake. This is explained further under use of L-Lock-up on page 5.

D-Drive
This position is used for all normal driving conditions. The transmission starts in first (low) gear and automatically changes up or down at suitable road speeds or according to the position of the accelerator pedal.

N-Neutral
In this selector position no power is transmitted to the rear wheels.

R-Reverse
This position is used for reversing.

P-Park
This also provides a neutral condition but locks the transmission so that the car rear wheels cannot rotate. It is used when it is necessary to leave the vehicle "in gear".
P-Park must only be engaged when the car is stationary. It should not be used if there is a possibility of the car being "shunted" by other drivers attempting to remove their vehicles under crowded parking conditions.
The P-Park position, must be used whenever carrying out running or tuning adjustments.

DRIVING THE CAR

Starting the engine

The correct method of starting the engine is given in the owner's handbook.
The handbrake or footbrake should be applied firmly.
The combined starter and ignition switch can only be operated when the selector lever is in the N or P positions. It must not operate in any other position. Should the engine stop the selector lever must be returned to the N or P position before attempting to restart. P must not be engaged while the vehicle is moving.

Note.—Always select P and apply the handbrake before attempting to start the engine by means of a starting handle, or by operating the solenoid under the bonnet, should this be possible.

Selecting L-D-N-R or P

Do not select P or R while the car is moving.
Do not select D, L or R with the engine running above idling speed.
With the engine running and the car stationary never move the selector lever without applying the handbrake or footbrake.

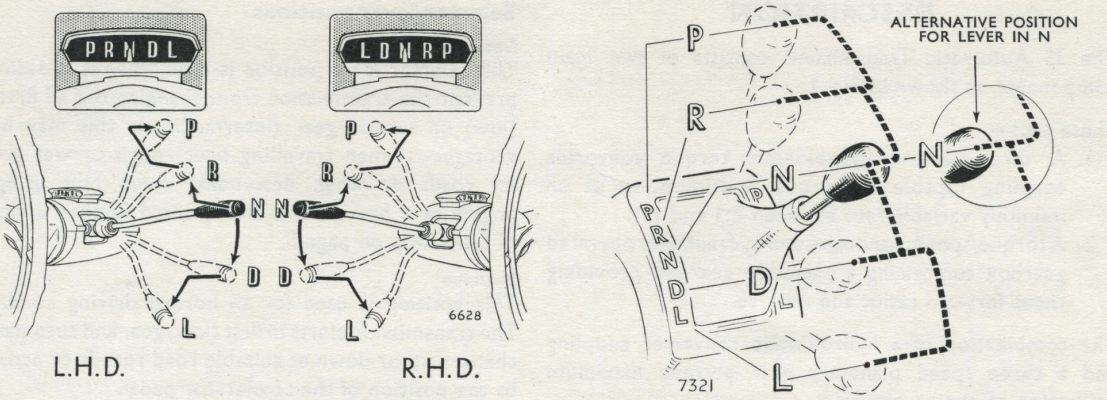


Fig. 3. *Selector lever movements on steering column and floor mounted levers*

If selection of D, L or R is made above idling speed excessive "creep" will occur when the brakes are released. This is further explained on page 5 under "Controlling the car when manoeuvring".

Using steering column mounted selector lever (see Fig. 3)

This selector lever may be moved freely between N and D but if L, R or P are needed the lever must be lifted towards the steering wheel before it can be moved to engage any one of these positions, or disengage P.

Using floor mounted selector lever (see Fig. 3)

The selector lever is spring loaded sideways so that it always moves over to the left-hand side of the car, when released.

Fig. 3 shows the lever movement required to engage any one of the L-D-N-R or P positions. This is easily memorised as follows:—

Position Required	*Lever Movement from N Position*
D	Move the lever backwards until it can be moved to the left into the D position——or ——move it to the right, just far enough to allow it to move backwards into the D position (see Fig. 3).
R	Move the lever to the right, enough to allow it to move forward, and then to the left into the R position.
P	Move the lever to the right, and forward as far as possible. Then move it to the left into the P position.
L	Move the lever backwards as far as the D position. Then move it over to the right and backwards as far as possible, and to the left into the L position.
N from **D**	Move lever to the right, enough to allow it to be moved forward into the N position.
N from **P** or **R**	Move lever to the right and backwards into the N position.
N from **L**	Move the lever to the right and then forward keeping it to the right until a stop is felt. Then move it slightly to the left and forward into the N position.

Driving

Starting from rest is always smooth even when it is necessary to depress the accelerator pedal beyond the normal start-off position. This is due to the fluid drive in the Torque Converter.

Careful control of the accelerator pedal is necessary on slippery roads and to obtain the best fuel consumption.

With the engine idling, move the selector lever to the D position, or R position if reverse is required.

Release the handbrake and depress the accelerator pedal. In D the car will move off in first (low) gear and automatically change up to second (intermediate) and third (high) gear as speed is increased. As speed is decreased automatic changing down occurs. With the selector in the D position minimum accelerator pedal movement will provide low speed gear changes for moderate acceleration.

For increased acceleration, the accelerator pedal is depressed down to its "hard spot", which causes up changes to occur at higher road speeds than under part throttle driving.

For maximum acceleration the pedal is depressed through its "hard spot". This is called "forced throttle" and causes up changes to occur at the maximum change up speeds.

The "hard spot" will be felt at seven eighths of the accelerator pedal travel.

Driver controlled change down
Provided the car speed is below the maximum speed attainable in first (low) or second (intermediate) gears an immediate change down can be obtained by fully depressing the accelerator pedal through its "hard spot".

This method of obtaining a change down will be found very useful and easy to carry out when more pulling power or acceleration is needed.

Changing down by this method is known as "kickdown".

Stopping the car
To stop the car release the accelerator pedal and apply the brakes. For stops of long duration, and ALWAYS WHEN LEAVING THE CAR UNATTENDED move the selector lever to the N position and apply the handbrake, or to the P position after coming to rest if it is desired to leave the car "in gear".

Reversing
With the engine idling and the car stationary move the selector lever to the R position. Depressing the accelerator pedal will then cause the car to move in the reverse direction. On releasing the accelerator pedal, engine braking is available.

Use of L-lock-up
In this selector position the transmission will remain in first (low) gear, providing maximum engine braking, if selection is made before moving off from rest or at road speeds below 5 m.p.h. (8 k.p.h.).

If L is selected when the transmission is in third (high) gear an immediate change down to second (intermediate) will occur at road speeds above approximately 5 m.p.h. (8 k.p.h.) and the transmission will remain in the second (intermediate) gear to provide moderate engine braking on releasing the accelerator pedal. When the speed is reduced to below approximately 5 m.p.h. (8 k.p.h.), the transmission will automatically change down to first (low) gear and remain in this gear providing maximum engine braking. If first (low) gear is required earlier, it may be obtained when the speed is reduced to 20 m.p.h. (32 k.p.h.) or below by momentarily fully depressing the accelerator through the "hard spot".

L should not be selected above 50 m.p.h. (80 k.p.h.) except in cases of emergency.

The L position can be used as a means of manually obtaining second (intermediate) gear without resorting to a "kickdown".

Holding the car on a hill
Should the car have to halt when climbing a hill, it can be held stationary for short periods, while the engine is running by keeping the accelerator pedal just far enough down to prevent the car from moving backwards or forwards.

If the car has to be left on a gradient the P position should always be selected, making sure that the parking pawl engages to prevent the car from moving.

Driving away on a hill
To drive away on an up gradient apply the footbrake with the left foot (or if preferred use the handbrake), move the selector lever to D, or R position, depress the accelerator pedal with the right foot and slowly release the footbrake (or handbrake). This allows a very smooth take off without any chance of the car running downhill.

NEVER move the selector lever from the P position without applying the footbrake (or handbrake) as movement from P releases the transmission parking pawl and leaves the car free to roll.

GENERAL INFORMATION

Obtaining manually controlled gear changes
Manual control of the gear changes can be obtained by using the following simple procedure. There are no objections against manually controlling the gear changes but fuel economy is likely to be adversely affected.

First (low) gear
Select L and drive away in first (low) gear until the desired change up speed is reached.

Second (intermediate) gear
Select D and immediately return lever to the L position. This obtains second (intermediate) gear and prevents automatic changing out of this gear.

Third (high) gear
Select D. This will give a change up into third (high) gear.

Change down to second (intermediate) gear or first (low) gear
Select L as described under "Use of L-lock-up".

Emergency starting
Emergency starts, due to a flat battery etc., may be made by tow or push starting. The car should be allowed to reach a speed of approx. 25 m.p.h. (40 k.p.h.) with the selector in the N position.

The ignition should then be switched on, the choke control set as required and L selected, to enable the engine to be started. While tow starting care must be taken to avoid colliding with the towing vehicle.

Controlling car when manoeuvring
With D, L or R selected, and the engine idling—as with all transmissions of this type—the car will creep forward or backwards, particularly when the choke is in the fully rich or fast idle position.

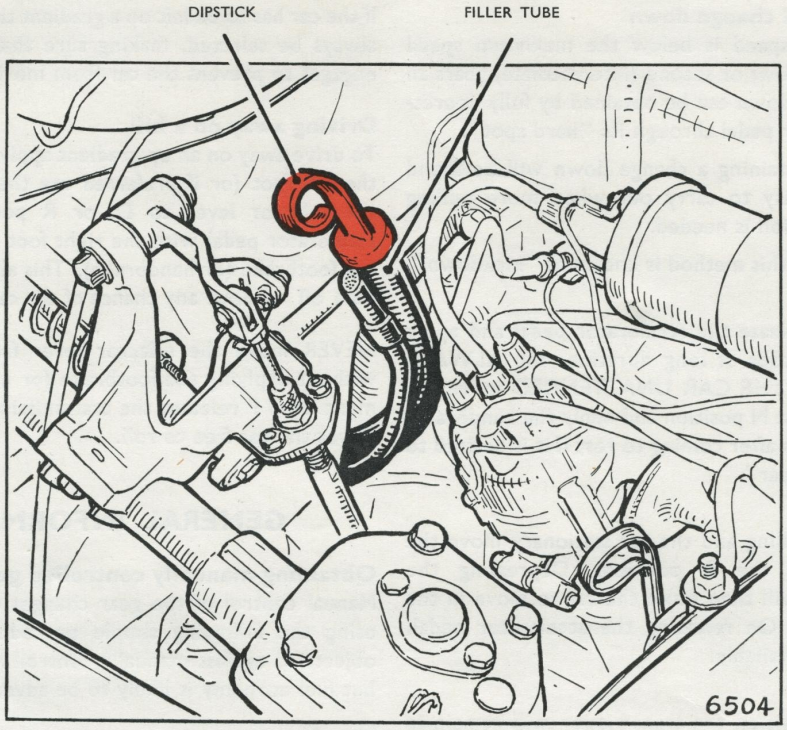


Fig. 4. *Gearbox dipstick and filler tube under bonnet*

For this reason the driver will find it more convenient when manoeuvring in confined areas, to use the left foot on the brake pedal, and, using this pedal in conjunction with or without the accelerator pedal, a high degree of control is obtained.

When the car is brought to rest in traffic, or to allow passengers to alight quickly with one of the driving ranges selected, it is necessary to keep the foot brake applied. This will prevent the car from moving forward and avoid the possibility of accidents particularly if the accelerator is depressed inadvertently. Whenever appropriate select P.

Driving car out of mud, sand or snow

In order to rock the car backwards and forwards until it is possible to obtain a good rear wheel grip, either backwards or forwards, hold the selector lever upwards towards the steering wheel, and alternately engage the D and R selector positions with the accelerator pedal slightly depressed.

Towing—by another vehicle

Providing the transmission is operating satisfactorily, the car may be towed in N. The fluid level must be correct.

If the transmission is defective the propellor shaft should be removed and the rear end of the transmission sealed off to prevent entry of dust, mud or water. Alternatively, the car can be towed with the rear wheels lifted.

Towing—trailers or caravans

The maximum towing capacity is 17 cwt. (863 kgs).

MAINTENANCE

Transmission fluid

The transmission is factory filled with the correct transmission fluid.

PERIODIC ROUTINE FLUID CHANGES ARE NOT REQUIRED.

The recommended fluid for topping up is given in the Data Section.

The correct fluid must be used, because, in addition to lubricating the gearbox, the fluid is used to operate the automatic hydraulic control system, and torque converter. Fluid additives MUST NOT BE USED.

After topping up the gearbox, the fluid level must be carefully checked as described under "Checking fluid level".

Checking fluid level

The filler tube with breather and dipstick is located under the bonnet just forward of the bulkhead, as shown in Fig. 4.

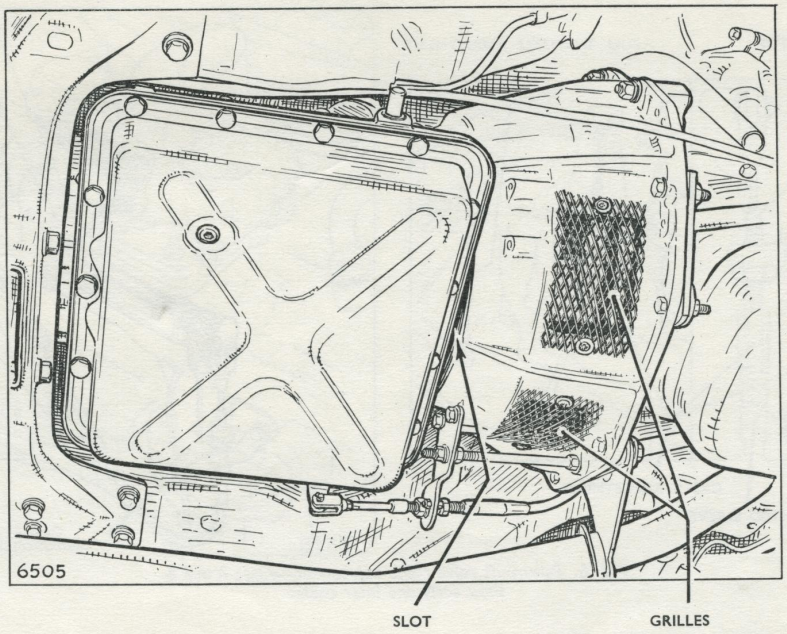


Fig. 5. *Fluid pan, slots and grilles which have to be kept clear of mud or underseal*

The fluid level should be checked every 3,000 miles (4,800 km).

When checking the fluid level, or topping up, extreme care must be taken to prevent the entry of dust or other matter into the transmission filler tube.

Fluid containers used for filling must be really clean.

Checking should be carried out on a level surface after the transmission has reached its normal running temperature which is after about 5 miles (8 km) of driving. Select P and allow the engine to idle for two minutes; with the engine still idling in P, remove and wipe the dipstick with clean non-fluffy rag or clean paper, insert and withdraw the dipstick immediately.

If necessary top up with the recommended fluid to bring the level to the "HIGH" mark while the engine is still idling with P selected. DO NOT OVERFILL.

The difference between the "LOW" and "HIGH" marks on the dipstick is 1 imperial pint (1·2 American Pints or ·56 litres).

When, for instance after repair, it is necessary to check the fluid with the transmission cold, readings must also be taken with the engine idling in P as previously described. In this case the level must not be less than $\frac{3}{8}$" (9·5 mm) below the "HIGH" mark, otherwise it will be high when hot.

Frequent need for topping up indicates leakage which should be rectified immediately to prevent damage to the transmission.

Fluid changes

These are not required.

Cooling

The transmission is cooled by air admitted through slots in the front of the transmission case and directed over the converter. The circulated air passes through two stone guard grilles on the bottom of the converter housing.

The slots and grilles, and transmission fluid pan shown in Fig. 5 must not be covered with underseal and should be cleared of any accumulated mud or dust during the routine maintenance of the car, especially when operating under adverse conditions in very hot territories.

On cars which are frequently used on unmade roads, the transmission oil pan must not be allowed to remain caked in mud as the dry mud can act as a heat insulator.

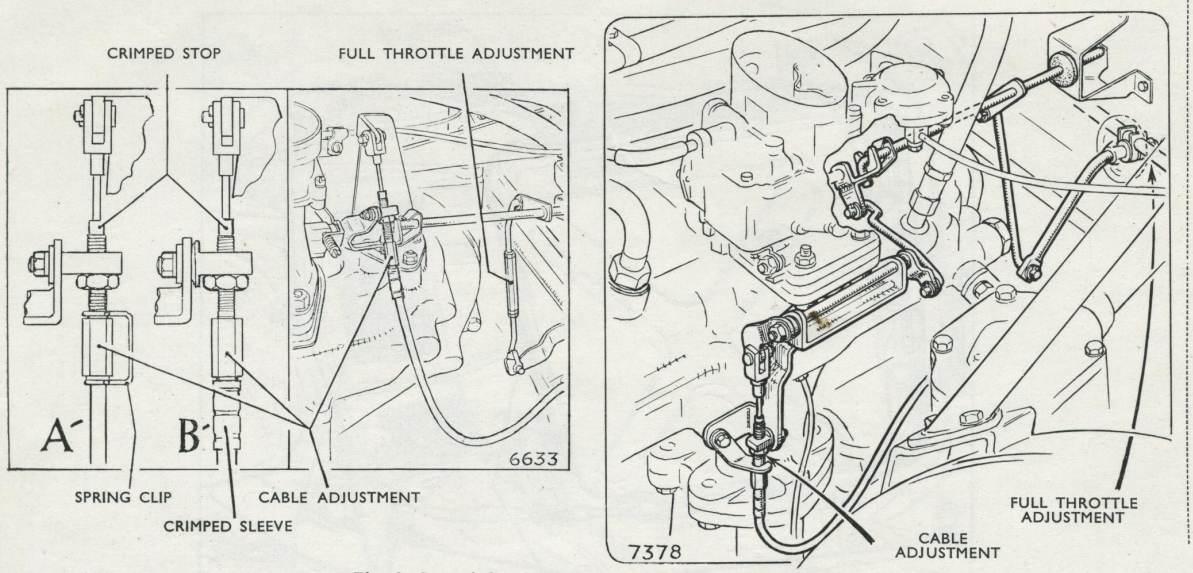


Fig. 6. *Downshift valve cable adjustment—views A and B show early and later cables*

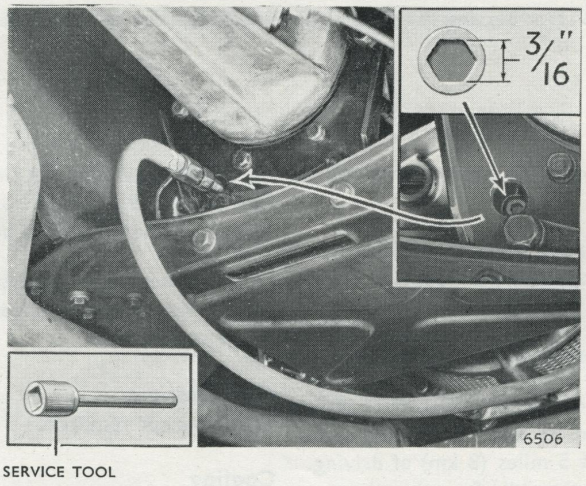


Fig. 7. *Transmission pressure take-off point and Service Tool used for plug removal*

ADJUSTMENTS

Under normal operating conditions, no periodic adjustments are required.

DOWNSHIFT VALVE CABLE (see Figs. 6 to 10)

Note:—The cable is impregnated with silicone or molybdenum disulphide lubricant and must not be oiled.

Cable differences

Cable differences are shown in the illustration A and B of Fig 6.

The early downshift valve cable has a spring wire clip fitted between the upper end of the outer cable, and its adjustment, to prevent the possibility of the outer cable coming out of its adjustment. This clip must always be used with this cable abutment, and is shown fitted correctly, in the illustration A (Fig. 6).

The later downshift valve cable has a larger outside diameter and, due to its increased stiffness, does not require the spring wire clip used on the early cable. It is shown in the illustration B of Fig. 6, and may be recognised by the crimped steel sleeve at its upper end, and the thin circular end on the cable mounting extension that is attached to the carburettor lever.

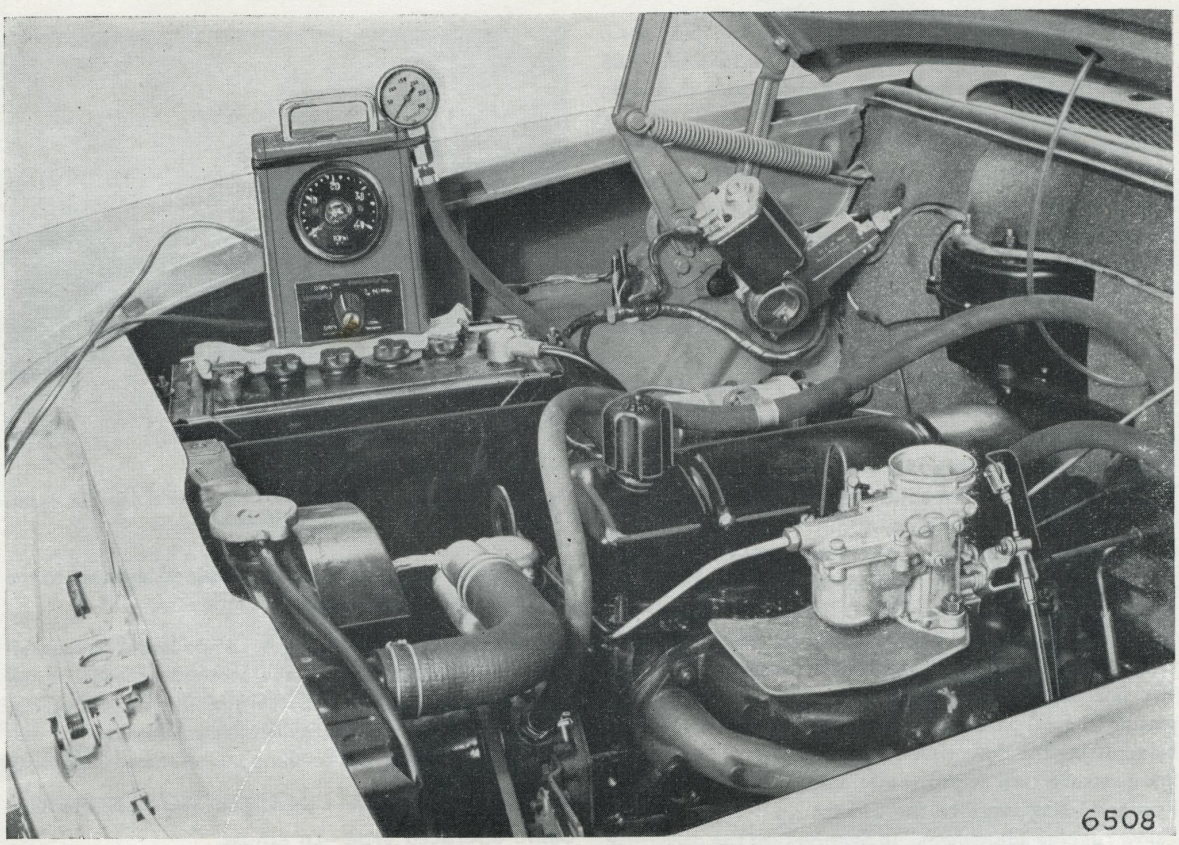


Fig. 8. *Instruments set up for checking transmission line pressure increase*

Cable adjustment

Correct adjustment of the downshift valve cable is most important for the satisfactory operation of the transmission.

Normal small adjustments to the engine idling speed made with the selector lever in the N or P position do not upset the Downshift Valve Cable setting.

The possible effects of cable maladjustment are:—

Outer cable too short:—

(*a*) Clutch squawk in D or R.

(*b*) Difficulty in obtaining 3-2 kickdown at high speed.

Outer cable too long:—

(*a*) Delayed and bumpy minimum and part throttle shifts.

(*b*) 3-2 downshift at 25 m.p.h. (40 k.p.h.) occurs before full throttle position—see Roadtest Procedure in Part III.

The adjustment is normally preset by means of a crimped cable stop on the carburettor end of the inner cable. The cable must be set in the following manner:

1. Adjust engine idling speed to 500 r.p.m. with the selector lever in the D position.
2. Stop the engine (for safety reasons). Adjust the outer cable so that the stop just contacts the abutment as shown in Fig. 6.

Readjust idling speed to the correct r.p.m. given under "slow running adjustment" in Section C of the particular workshop manual.

The stop is not crimped on replacement cables.

If any of the following conditions exist,

1. The cable stop damaged, moved or loose on the cable,
2. One or more of the previously described faults occurring,
3. A new cable being fitted,
4. The carburettor or engine changed,

the cable must be adjusted by checking the transmission line pressure increase using an engine tachometer and transmission line pressure gauge as supplied in the service tool kit.

These instruments should be connected as shown in Figs. 7 and 8. When engine r.p.m. in D is increased from

500 to 1,000, line pressure should rise by 15-20 p.s.i. (1·05—1·40 kg/cm²). If rise is less than 15 p.s.i. (1·05 kg/cm²), the effective length of the outer cable should be increased by means of the adjuster shown in Fig. 6. Conversely, if rise is more than 20 p.s.i. (1·40 kg/cm²), the effective length of the outer cable should be decreased.

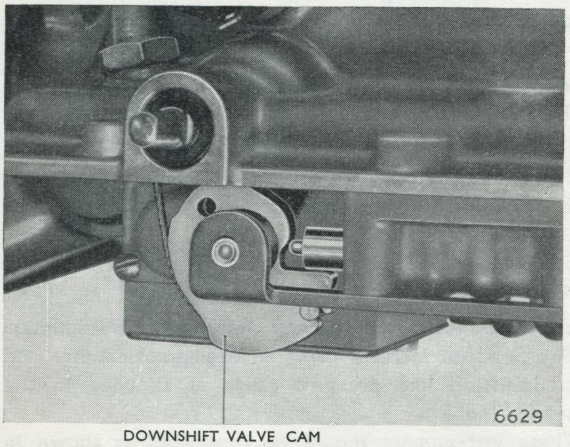
The plug in the gearbox is removed with the Churchill service tool shown in the lower inset picture in Fig. 7. When replacing the plug the service tool should be used with a torque spanner as the plug screws into aluminium. The correct tightening torque is given in the Data Section in the Torque Chart.

If a new cable is fitted this will involve removal of the oil pan. Assuming that the idling speed has been set to 500 r.p.m. with the engine HOT and that the carburettor throttle butterfly is fully open when the accelerator pedal is fully depressed, then adjustment of the cable and cam can be observed on the downshift valve itself. In the closed throttle position the cam return spring should hold the cam against the downshift valve when all cable slack is taken up as shown in Fig. 9. With the carburettor throttle butterfly fully open the lobe of the cam should fully move the downshift valve inwards as shown in Fig. 10. The final setting of the downshift cable is made after replacing the oil pan, and refilling with transmission fluid, by adjusting the downshift valve cable to give the correct line pressure rise, as previously described.

Readjust idling speed to the correct r.p.m., given under "slow running adjustment" in Section C of the particular Workshop Manual.

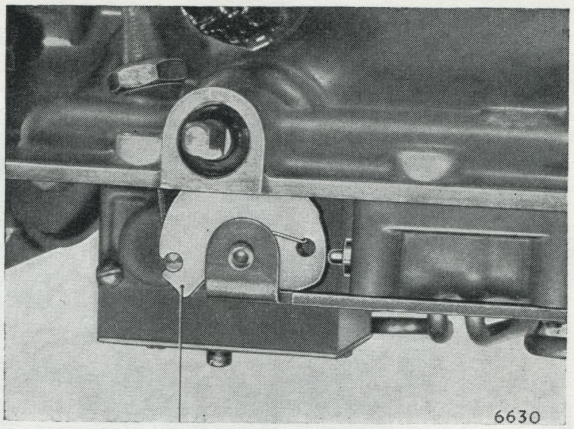
ACCELERATOR PEDAL LINKAGE FULL THROTTLE ADJUSTMENT

If the accelerator pedal shaft lever to throttle shaft lever adjustment is incorrectly set, "Forced throttle" and "Kickdown" changes will not be obtained, even when the downshift valve cable setting is correct.



DOWNSHIFT VALVE CAM

Fig. 9. *Position of downshift valve cam with carburettor throttle closed*



DOWNSHIFT VALVE CAM

Fig. 10. *Position of downshift valve cam with carburettor throttle fully open.*

The adjustment, shown in Fig. 6, should be set so that full throttle is obtained when the accelerator pedal is depressed to within 1 in. (25 mm.) of the floor covering. This ensures that the downshift valve cam passes over the "hard spot" and comes to the position shown in Fig. 10.

SELECTOR LEVER LINKAGE ADJUSTMENT

Cable operated type—to adjust

Fig. 11 shows this adjustment at the upper end of the cable. The method of adjustment is as follows.

1. Disconnect the cable from the gearbox lever at the cable lower end.
2. Place the selector lever in the N position.
3. Place the lever on the transmission in the N position, by moving it as far forward as possible, into the P position, and then backwards two "clicks" into the N position.
4. Check adjustment of the lower end of the cable to ensure that it is in its midway position.
5. Adjust cable at its upper end, shown in Fig. 11, so that it can be reconnected to the gearbox lever.
6. Check selector operation in all five positions. The linkage must never be allowed to override the transmission detents, i.e. a definite click must be felt in each position, also check that operation of the gate is correct; that N and D are on the same level of the quadrant and that the lever has to be lifted to engage L or R and lifted higher for the P position. When in P the selector lever should be trapped so that sideways movement will not release it from the P position.

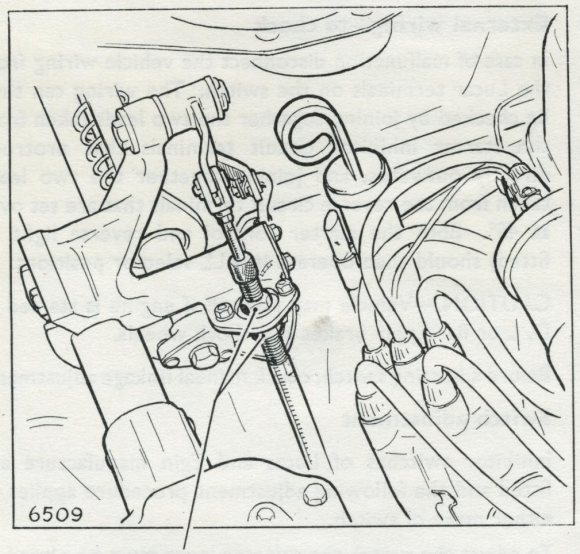


Fig. 11. *Selector cable adjustment position*

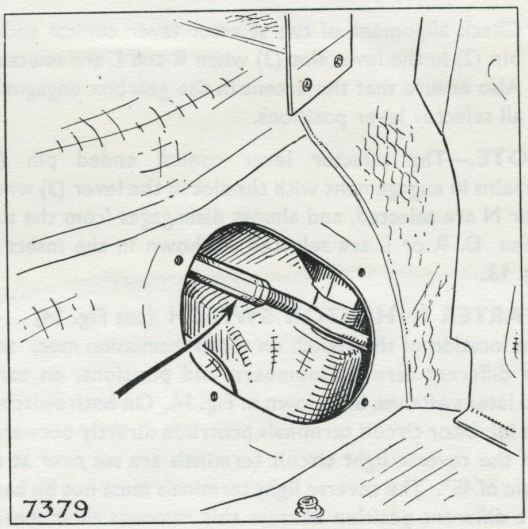


Fig. 12. *Selector rod adjustment position*

Rod operated type—to adjust

The adjustment nuts are shown in Fig. 12 and these are reached after removing their cover plate on the right-hand side of the floor tunnel. Adjustment is made as follows. (See Fig. 13)

If the lever (5) has a nut (6) at its lower end, as shown in the bottom inset of Fig. 13, the nut (6) must be checked for tightness before making this adjustment.

1. Disconnect the adjustable rod (4) from the external lever (5) on the transmission and put the lever in the D position. To do this move the lever end; to which the rod (4) is connected, as far backwards as possible into the P position, and then forward three "clicks" into the D position.
2. Put the driver's selector lever (1) into the D position.
3. Adjust operating rod (4), so that when it is replaced on the GEARBOX LEVER (5), the centre of the conical ended pin (2) on the driver's selector lever, comes central in the slot of the lever (3) into which the pin engages, when the selector lever (1) is moved to the right (see Fig. 13). The adjustment (4) has a right- and left-hand thread.
4. Tighten the adjustment lock nuts and at the same time support the rod (4) so that it is clear of the gearbox rear brake band adjustment, and also kept in correct alignment with the gearbox lever (5). The rear lock nut is reached by moving the selector lever into the L position.

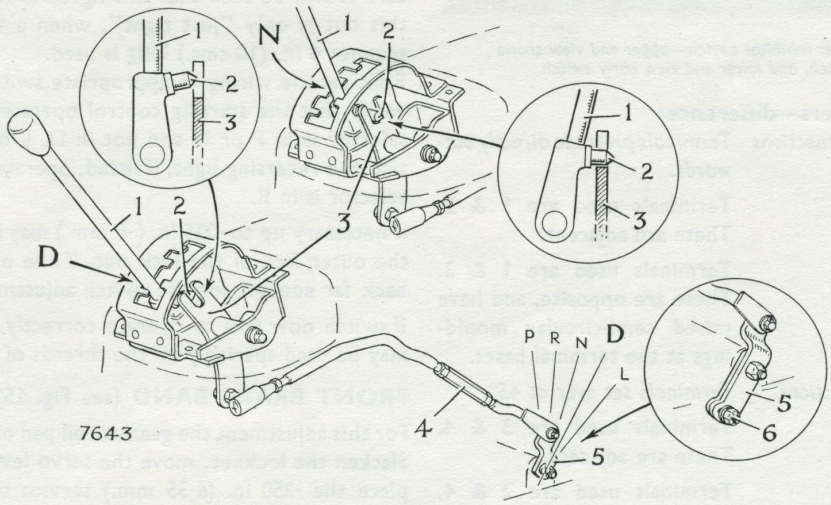


Fig. 13. *Adjustment of floor mounted selector lever rod*

5. Check alignment of the selector lever conical ended pin (2) in the lever slot (3) when R and L are selected. Also ensure that the detent in the gearbox engages in all selector lever positions.

NOTE.—The selector lever conical ended pin (2) remains in engagement with the slot in the lever (3) when P or N are selected, and almost disengages from the slot when D, R or L are selected as shown in the insets of Fig. 13.

STARTER INHIBITOR SWITCH (see Fig. 14)

The location of the switch on the transmission case, and the different terminal numbers, and positions, on early and later switches, are shown in Fig. 14. On both switches the inhibitor circuit terminals protrude directly outwards and the reverse light circuit terminals are set over at an angle of 45°. The reverse light terminals must not be bent to a different position because this removes their means of identification.

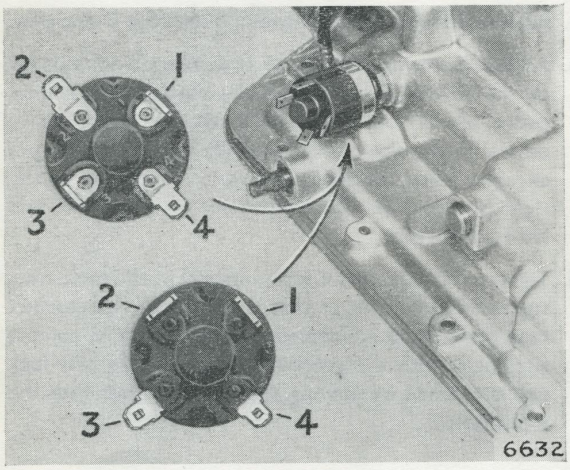


Fig. 14. *Starter inhibitor switch—upper end view shows latest switch, and lower end view early switch.*

Terminal numbers—differences

Inhibitor wiring connections	*Terminals protrude directly outwards.*
Early switch	Terminals used are 1 & 2. These are adjacent.
Later switch	Terminals used are 1 & 3. These are opposite, and have raised semi-circular mouldings at the terminal bases.
Reverse light connections	*Terminals set over at 45°.*
Early switch	Terminals used are 3 & 4. These are adjacent.
Later switch	Terminals used are 2 & 4. These are opposite.

External wiring—to check

In case of malfunction disconnect the vehicle wiring from the Lucar terminals on the switch. The wiring can then be checked by joining together the two leads taken from the starter inhibitor circuit terminals that protrude directly outwards, and joining together the two leads taken from the reverse circuit terminals that are set over at 45°. Both the starter control and reverse light (if fitted) should then operate in ALL selector positions.

CAUTION.—Vehicle may take off if engine is started in D, L or R. Apply brakes and chock wheels.

Before adjusting switch, check manual linkage adjustment.

Switch adjustment

Inhibitor switches of Lucas and Egin manufacture are fitted and the following adjustment procedure applies to either make of switch.

To adjust the switch the selector lever must be placed in the D or L position. A small battery and bulb is connected across the reverse circuit terminals. The switch is fully unscrewed and then screwed into the transmission until the test lamp just goes out. With a pencil mark the lowest point of the switch body for this position. The test lamp is then connected to the starter inhibitor circuit terminals, and the switch screwed in further until the test lamp just lights. Mark the lowest part of the switch body for this position and then turn the switch back until it is midway between the two marked positions. The lock-nut is then tightened.

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 that this nut is only "just tight", when a thin open ended spanner 4 in. (10 cms.) long is used.

Refit vehicle wiring to appropriate switch terminals and verify that the starting control operates only when the selector is in P or N and not in D, L or R. Verify also that the reversing light, if fitted, operates only when the selector is in R.

If necessary up to ·025 in. (·6 mm.) may be removed from the outer face of the lock nut, if the nut cannot screw back far enough, for the switch adjustment to be made.

If switch now fails to operate correctly, replace. Sealer may be used sparingly on the threads of the switch.

FRONT BRAKE BAND (see Fig. 15)

For this adjustment the gearbox oil pan must be removed. Slacken the locknut, move the servo lever outwards and place the ·250 in. (6·35 mm.) service tool gauge block between the adjusting screw and the servo piston pin.

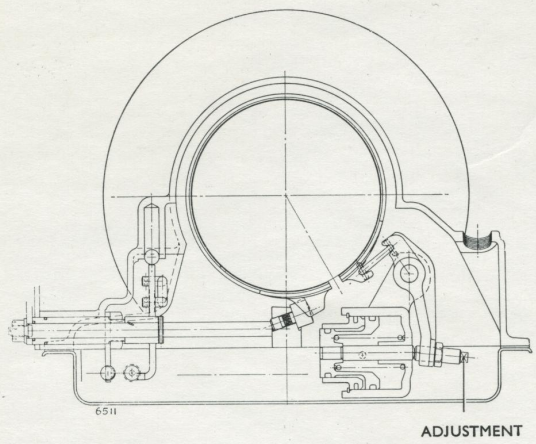


Fig. 15. *Front brake band adjustment*

Tighten the servo adjusting screw to a torque of 10 lb. inches (·12 kg.m) using the torque screwdriver with adapter from the service toolkit. Tighten the locknut and then remove gauge block.

If a gauge block is not available the adjusting screw should be tightened to the previously mentioned torque and then slackened off **exactly** four turns before tightening its locknut.

REAR BRAKE BAND (see Fig. 16)

This band has an external adjusting screw in the right-hand wall of the transmission case. Slacken the locknut and tighten the adjusting screw to a torque of 10 lb. feet (1·38 kg.m) using the torque wrench with adapter from the service toolkit. Back off the adjusting screw one turn and tighten the locknut.

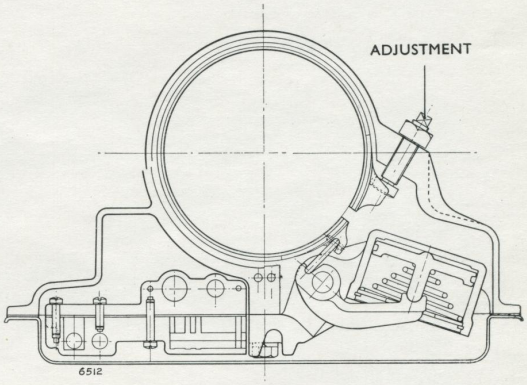


Fig. 16. *Rear brake band adjustment*