Chapter T

Transmission

Section

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Chapter T

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The dates quoted below refer to the issue date of individual pages within this chapter.

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Chapter T

Issue record sheet 2

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Section T1

Introduction

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Section T1

Introduction

The torque converter transmission is a fully automatic unit, consisting primarily of a three-element hydraulic torque converter and a compound planetary gear train. Three multiple-disc clutches, two roller clutch units (one roller clutch and one sprag clutch from serial numbers 79-RR-3015, 79-RS-2730 and onwards; also all 80-RC transmissions) and two friction bands provide the elements which are required to obtain the desired functions of the gear train.

A name plate is fitted to the right-hand side of the transmission, toward the centre of the case. The serial number is prefixed by either the letters RS, RR or RC and the year in numerals.

The torque converter, clutches and rollers connect the engine to the planetary gears with the aid of pressurised transmission fluid. Three forward gears and reverse are provided. When necessary, the torque converter will supplement the gears by multiplying engine torque.

The torque converter is of welded steel construction and cannot be dismantled. The unit is made up of two vaned sections which face each other across a fluid filled housing. The pump half of the converter is connected to the engine and the turbine half is connected to the transmission.

When the engine is running the converter pump rotates and throws fluid against the turbine, causing the turbine to rotate. The fluid then returns to the pump in a circular flow and continues this cycle as long as the engine is running.

The converter also has a smaller vaned section, called a stator, which directs the fluid back to the pump through smaller openings at greater speed. The speeded-up fluid imparts additional force to the engine driven converter pump, thus multiplying engine torque.

A hydraulic system pressurised by an internal/external gear type of pump provides the working pressure required to operate the friction elements and automatic controls.

The external control connections to the transmission are:

An electric gear change actuator, connecting rod and levers. The actuator responds to an electrical signal from a switch on the steering column, then moves the gear change lever on the transmission to the required position.

Engine vacuum which operates a vacuum modulator unit.

12 volt electrical signals to operate an electrical detent solenoid.

Gear or torque ratios of the transmissions are

First	-	2.5:1
Second	-	1.5:1
Third	-	1.0:1
Reverse	-	2.0:1

Each gear ratio can be multiplied by as much as two, depending upon the slip speed of the converter pump and turbine.

A vacuum modulator is used to automatically sense engine torque input to the transmission. The vacuum modulator transmits this signal to the pressure regulator which controls main line pressure, so that all the torque requirements of the trans-mission are met and the correct gear change spacing is obtained at all throttle openings.

The detent solenoid is activated by a micro-switch assembly which is mounted to the toeboard, beneath the accelerator pedal. When the pedal is in the kickdown position, the micro-switch is closed; the solenoid in the transmission is then activated and a down-change will occur at speeds below 113 k.p.h. (70 m.p.h.). At lower speeds a down-change will occur at smaller throttle openings with-out the aid of the micro-switch assembly, or the solenoid.

The heat exchanger for the transmission fluid is situated in the bottom of the radiator matrix (see Fig. T1). The fluid system incorporates an intake pipe and strainer assembly. An internal by-pass permits increased flow during cold operation when the oil is heavier.

The transmission quadrant has six selector positions which enable the driver to control the operation of the transmission under varying driving conditions. The six selector positions appear in the following sequence, from left to right; 'P' - Park 'R' - Reverse, 'N' - Neutral, 'D' - Drive, 'I' - Inter mediate and 'L' - Low. The engine can only be started in the Park and Neutral positions.

'P' - Park position positively locks the output shaft to the transmission case by means of a locking pawl and prevents the car from rolling either back-ward or forward when parked on a steep incline.

'R' - Reverse enables the car to operate in a reverse direction.

'N' - Neutral enables the engine to be started and run without the car moving.

'D' - Drive is used for all normal driving conditions and maximum economy. Drive range has three gear ratios, from starting to direct drive. Forced down-changes are available for safe and rapid over-taking, by fully depressing the accelerator pedal.

'I' - Intermediate adds new performance for congested traffic conditions or hilly terrain. This range has the same starting ratio as 'D', but prevents the transmission from changing above second gear; acceleration is retained when extra performance is required.

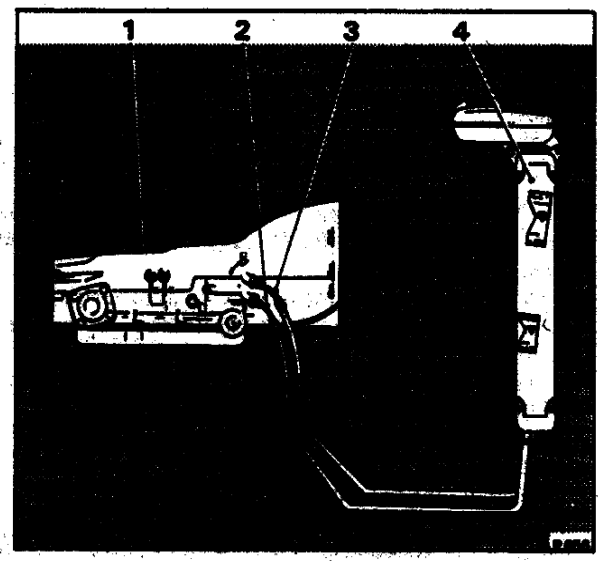

Fig. T1 Heat exchanger system
1 Transmission
2 Transmission fluid to heat exchanger
3 Transmission fluid from heat exchanger
4 Coolant radiator with heat exchanger in bottom tank

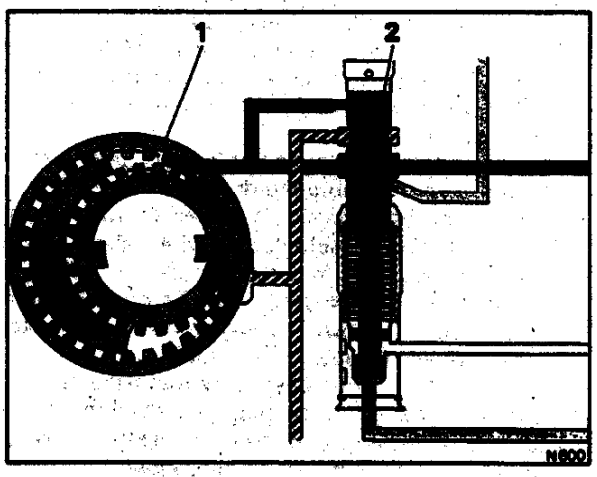

Fig. T2 Pressure control
1 Transmission oil pump
2 Pressure regulator valve train

Main line pressure
Intake pressure
Converter pressure
Modulator pressure

The engine can be used to assist braking in this Range.

'L' - Low range permits operation at a lower gear ratio and should be used when maximum torque multiplication is required or, when descending a steep gradient. When the selector lever is moved from Drive to Low at normal road speeds, the transmission will change to second gear and remain in second gear until the speed of the car is reduced to the normal 2-1 down-change speed. The transmission will then change down to first gear and remain in first gear regardless of car speed or engine revolutions, until the selector lever is moved into either the Drive or the Intermediate position.

Hydraulic system

Pressure control

The transmission is controlled automatically by a hydraulic system (see Fig. T2). Hydraulic pressure is supplied by the transmission oil pump, which is engine driven.

Main line oil pressure is controlled by a pressure regulator valve train which is located in the pump and by the vacuum modulator which is connected to engine vacuum.

The pressure regulator controls main line oil pressure automatically, in response to a pressure signal from a modulator valve, in such a manner, that the torque requirements of the transmission clutches are met and correct gearchange spacing is obtained at all throttle openings.

To control line pressure, a modulator pressure is used. This pressure varies in the same manner as torque input to the transmission. Since the torque input to the clutches is the product of engine torque and converter ratio, modulator pressure must compensate for changes in either or both of these.

To meet these requirements, modulator pressure is regulated by engine vacuum, which is an indicator of engine torque and carburetter throttle opening. It will decrease as the car speed increases to compensate for the changing converter torque ratio.

Vacuum modulator assembly

The engine vacuum signal is received by the vacuum modulator (see Fig. T3), which comprises an evacuated metal bellows, a diaphragm and two springs. The assembly is so arranged that the bellows and external spring apply a force that acts on the modulator valve so that it increases modulator pressure. Engine vacuum and an internal spring oppose the bellows and external spring to control modulator pressure.

To reduce the effect of altitude on change points, the effective area of the diaphragm is different than that of the bellows. Atmospheric pressure acts on the resulting differential area to reduce modulator pressure.

Governor assembly

The speed of the car is signalled to the transmission

by a governor which is driven by the transmission output shaft. The governor is comprised basically of a valve body, a regulator valve and flyweights.

Centrifugal force causes the flyweights to act on the regulator valve. The valve then regulates a pressure signal which increases with road speed.

Governor pressure acts on the modulator valve to cause modulator pressure to decrease as the speed of the car increases.

Operation of valves and hydraulic control units

Line pressure regulator

The line pressure regulator valve regulates line pressure according to pump speed and engine torque.

Manual valve

The manual valve establishes the range in which the transmission is to operate as selected by the driver through the selector switch and the gear change actuator.

Governor assembly

The governor assembly generates an oil pressure that is sensitive to the speed of the car and which increases as the car speed increases.

Governor pressure is used to control the change points and to regulate modulator pressure.

Vacuum modulator valve

The vacuum modulator valve provides modulator pressure which senses engine torque and car speed. It is used to vary the change points, according to throttle opening, by opposing governor oil on the shift valves and also to raise line pressure proportional to engine torque.

1-2 shift valve

This valve controls the speeds at which the 1-2 and 2-1 changes occur.

1-2 regulator valve

The 1-2 regulator valve regulates modulator pressure to a proportional pressure and tends to hold the 1-2 shift valve in the down-change position.

1-2 detent valve

The 1-2 detent valve senses regulated modulator pressure which tends to hold the 1-2 shift valve in the down-changed position and provides an area for detent pressure for 2-1 detent changes.

2-3 shift valve

This valve controls the speeds at which the 2-3 and 3-2 changes occur.

2-3 modulator valve

The 2-3 modulator valve is sensitive to modulator pressure and applies a variable force on the 2-3 shift valve which tends to hold the 2-3 shift valve in the down-changed position.

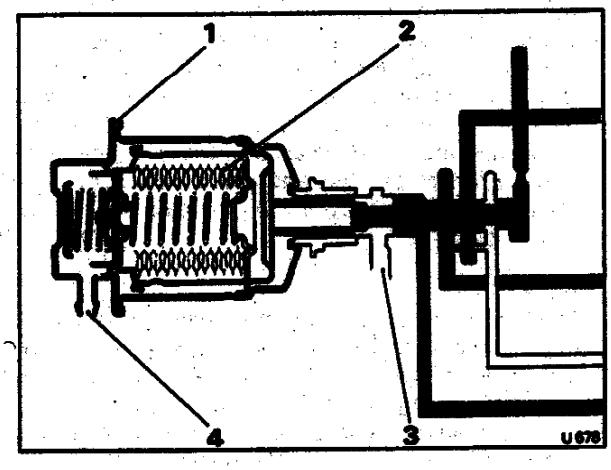

Fig. T3 Vacuum modulator assembly

1 Diaphragm
2 Aneroid bellows
3 Exhaust
4 Engine vacuum

Main line pressure
Governor pressure
Modulator pressure

3-2 valve

The 3-2 valve prevents modulator pressure from acting on the shift valves after the direct clutch has been applied. This allows fairly heavy throttle operation in third gear without effecting a down-change. In third gear, detent pressure or modulator pressure above 6,1 kgf.sq.cm. (87 lbf.sq.in.) can be directed to the shift valves to provide the necessary force to effect the down-change.

1-2 accumulator valve

The 1-2 accumulator valve is sensitive to modulator oil and regulates drive oil to a proportionally smaller value. The pressure increases as modulator pressure increases and is used to control the engagement of the intermediate clutch.

Detent valve

The detent valve moves when line oil is exhausted from the end of the valve when the detent solenoid is energised. As a result, detent oil is directed to the 1-2 and 2-3 modulator valves and allows the detent regulator valve to regulate.

Detent regulator valve

When the detent valve moves, the detent regulator is freed and allows drive oil to enter the detent passage at a regulated pressure of 4,9 kgf.sq.cm. (70 lbf.sq.in.). Detent oil will also flow into the modulator passages which lead to the shift valves. Low oil moves the detent regulator to accept drive oil, allowing drive oil to enter the modulator and detent passages.

Rear servo and accumulator assembly
The rear servo applies the rear band for engine braking in Low range 1st.gear. It also applies the rear band in Reverse to hold the reaction carrier to provide the reverse gear ratio.

During the 1-2 up-change in Drive and Intermediate ranges the servo acts as an accumulator for the intermediate clutch oil to provide a smooth up-change.

Front servo
The front servo applies the front band to provide engine braking in 2nd.gear in Low and Intermediate ranges. It is used also as an accumulator for direct clutch oil during the application of the direct clutch and in conjuntion with a series of check balls which control orifices, is part of the timing for the release of the direct clutch.

To prevent the application of the front band in Neutral, Drive or Reverse ranges, oil is directed from the manual valve to the release side of the servo piston.

In 'D' range, the servo release oil from the manual valve is used to charge the servo in preparation for the application of the direct clutch.

Direct clutch oil is directed to the front servo accumulator piston where spring force plus direct clutch pressure, stroke the piston up against the force of the servo release oil. This lowers the clutch apply pressure for a smooth engagement.

The release of the direct clutch and the exhausting of the front servo accumulator is slowed down by three check balls and three orifices. This permits a smooth return of the drive load to the intermediate roller clutch and also allows the engine r.p.m. to increase during a detent 3-2 down-change in preparation for the lower gear ratio, which results in a smooth change and better acceleration.

The position of the shift valves in each range and gear, and the various oil passages which are used are shown in Figures T4 to T12. The operation of the valves when each gear is selected is described in the following paragraphs.

Drive and Intermediate - First gear

Power flow
Forward clutch - applied. Direct clutch - released. Intermediate clutch - released. Roller clutch - effective. Front band - released. Intermediate roller clutch - ineffective. Rear band - released.

With the selector lever in either Drive or Intermediate range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear clockwise. (Converter torque ratio is approximately 2 : 1 at stall.)

Clockwise motion of the rear internal gear causes the rear pinions to turn clockwise to drive the sun gear anti-clockwise. In turn, the sun gear drives the front pinions clockwise, thus turning the front internal gear, output carrier, and output shaft clockwise in a reduction ratio of approximately 2.5 : 1. Reaction of the front pinions against the front internal gear is taken by reaction carrier and roller clutch assembly to the transmission case. (Approximate stall ratio - 5 : 1.)

Oil flow
When the selector lever is moved to either Drive or Intermediate position, the manual valve is repositioned to allow line pressure to enter the drive circuit. Drive oil then flows to the following (see Fig. T4):
Forward clutch
1-2 Shift valve
Governor assembly
1–2 Accumulator valve
Detent regulator valve

Basic control
Drive oil is directed to the forward clutch where it acts on two areas of the clutch piston to apply the forward clutch. The first, or inner area, is fed through an unrestricted passage. The outer area is fed through an orifice to ensure a smooth change into Drive.

Drive oil at the governor assembly is regulated to a variable pressure. This pressure increases with car speed and acts against the ends of the 1-2 and 2-3 shift valves and an area on the modulator valve.

Drive oil is regulated also to another variable pressure at the 1-2 accumulator valve. This pressure is controlled by modulator oil and is directed to the rear servo. 1-2 accumulator oil at the rear servo acts on the accumulator piston.

In addition, to maintain the lower pressure in the 1-2 accumulator passage, the 1-2 accumulator valve intermittently uncovers the Low oil passage and oil is exhausted at the manual valve.

Summary
The converter is filled. The forward clutch is applied. The transmission is in first gear.

Drive - Second gear

Power flow
Forward clutch - applied. Direct clutch - released. Intermediate clutch - applied. Roller clutch - ineffective. Front band - released. Intermediate roller clutch - effective. Rear band - released.

In second gear the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun gear against anti-clockwise rotation. Turbine torque through the forward clutch is then applied clockwise through the mainshaft to the rear internal gear.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5 : 1.

Note
Further reduction is possible at low speeds, due to the torque multiplication provided by the converter.

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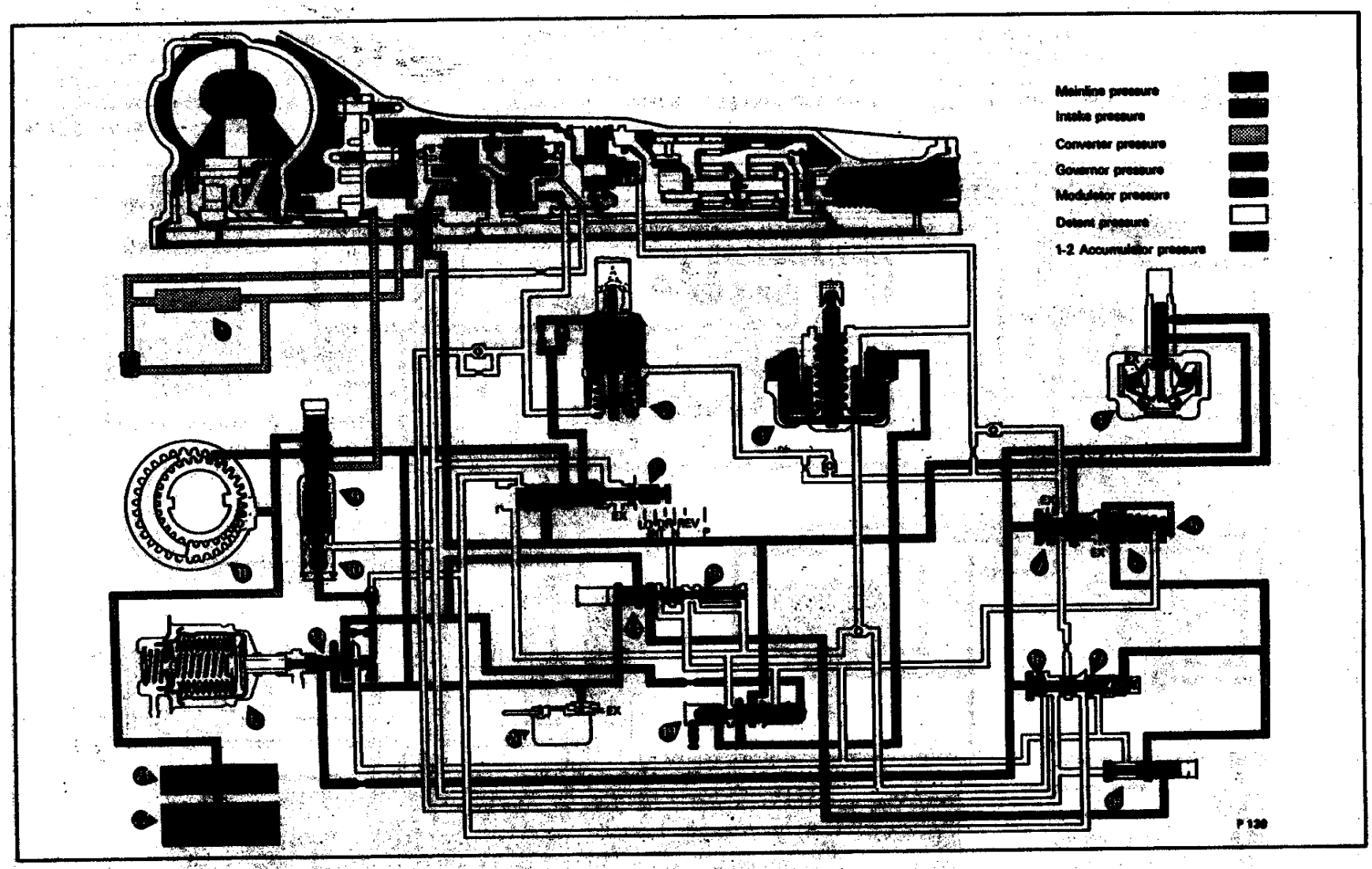

Fig. T4 Drive range - 1st gear

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

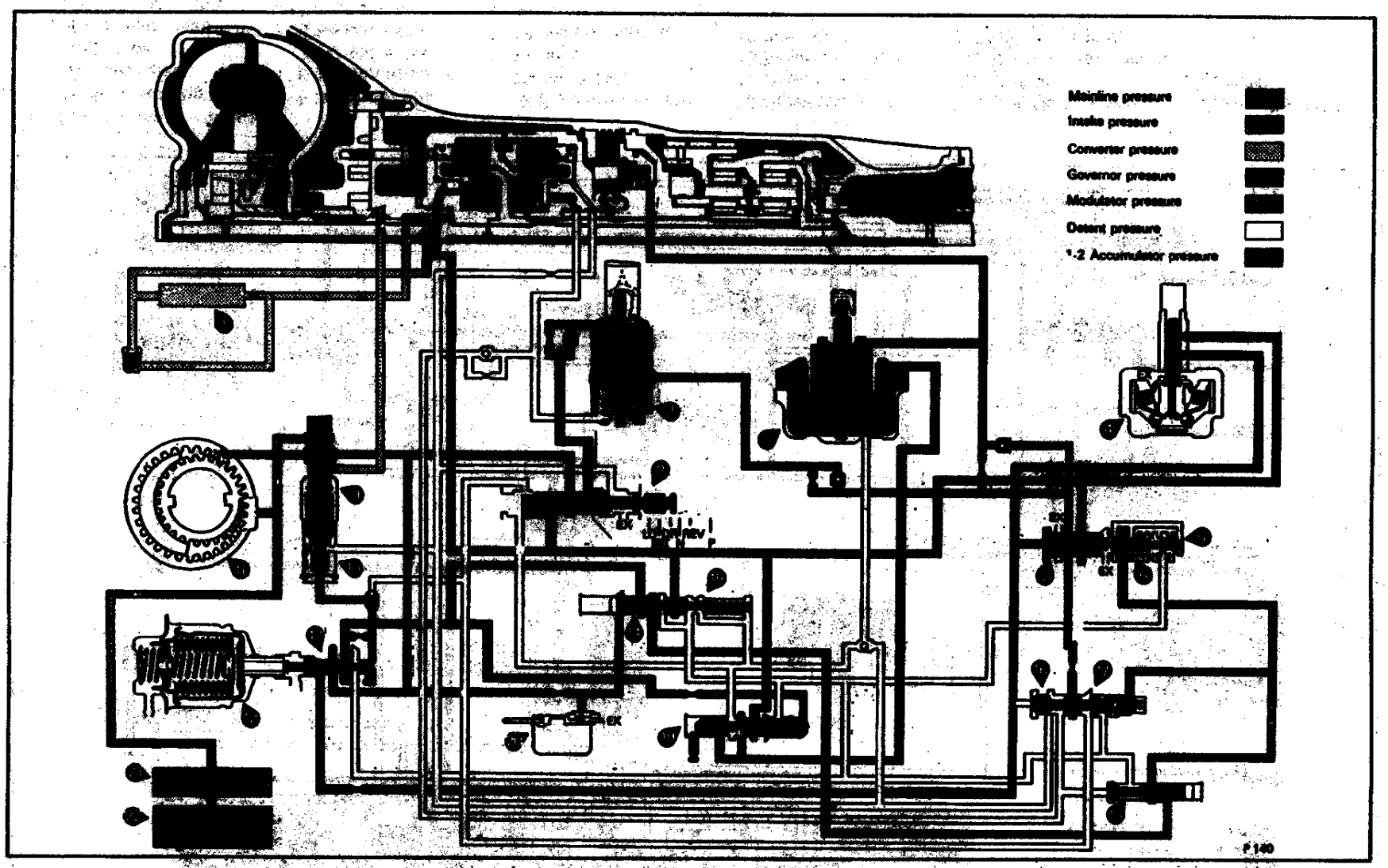

Fig. T5 Drive range - 2nd gear

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

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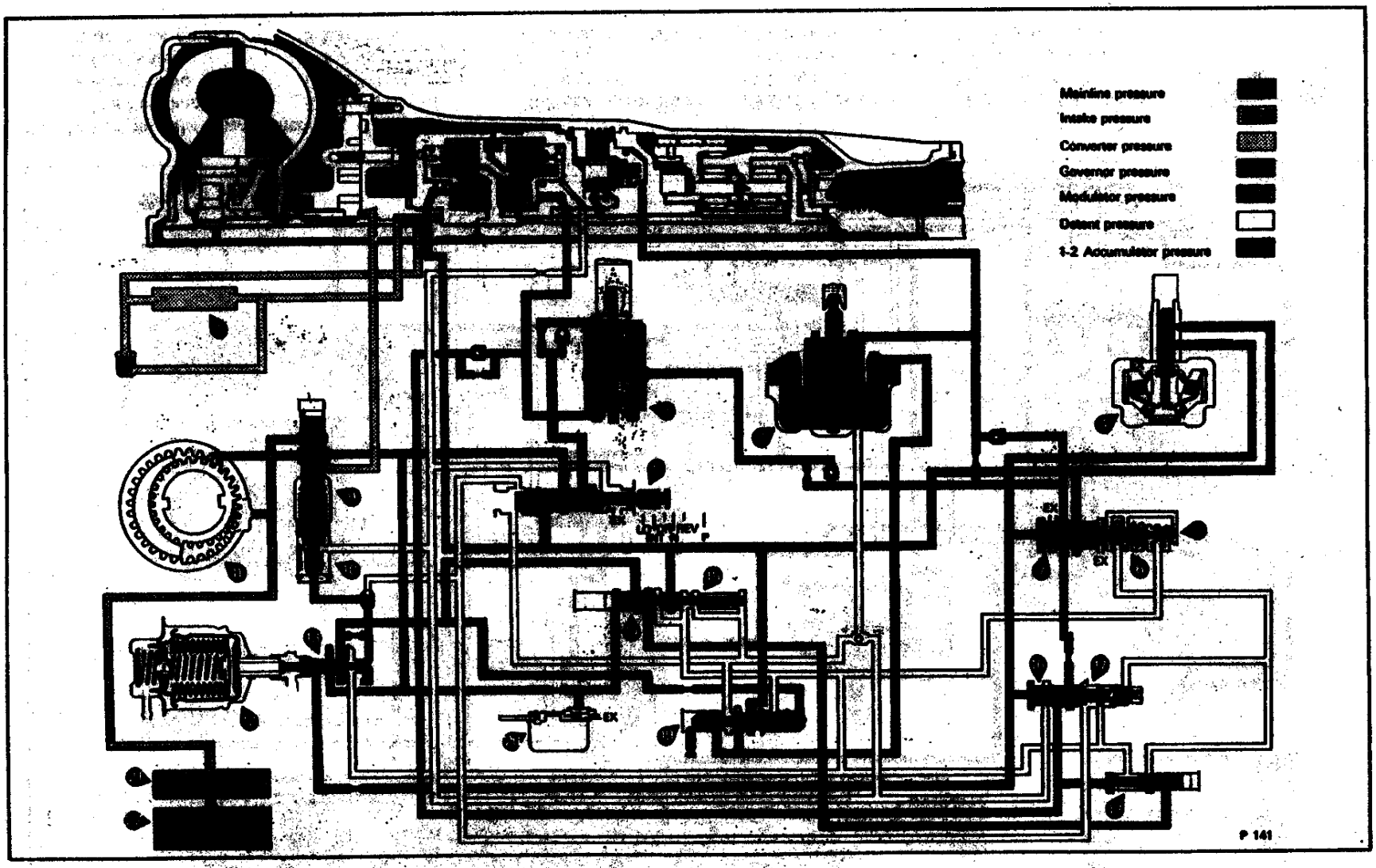

Fig. T6 Drive range - 3rd gear

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

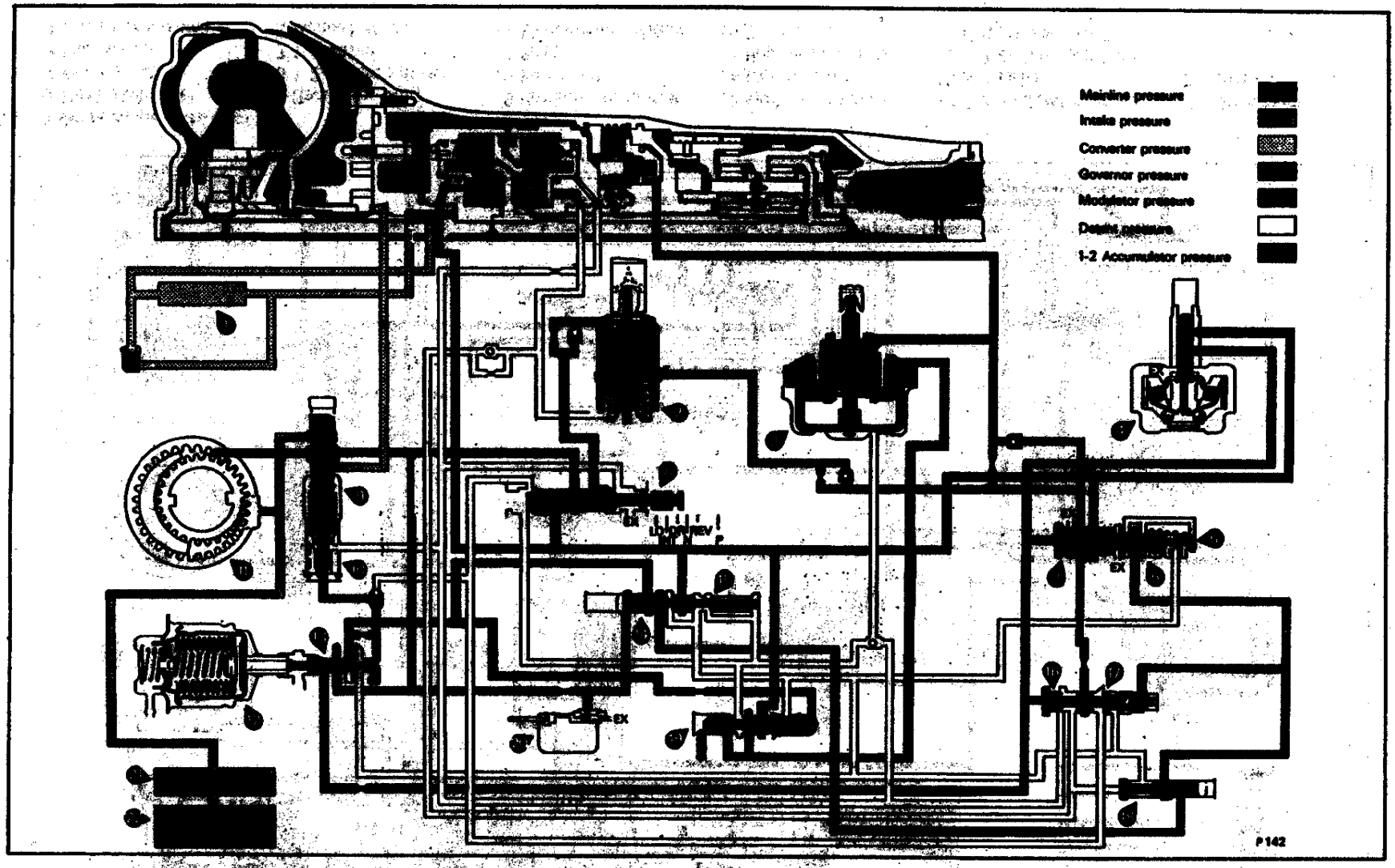

Fig. T7 Part throttle down - change

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

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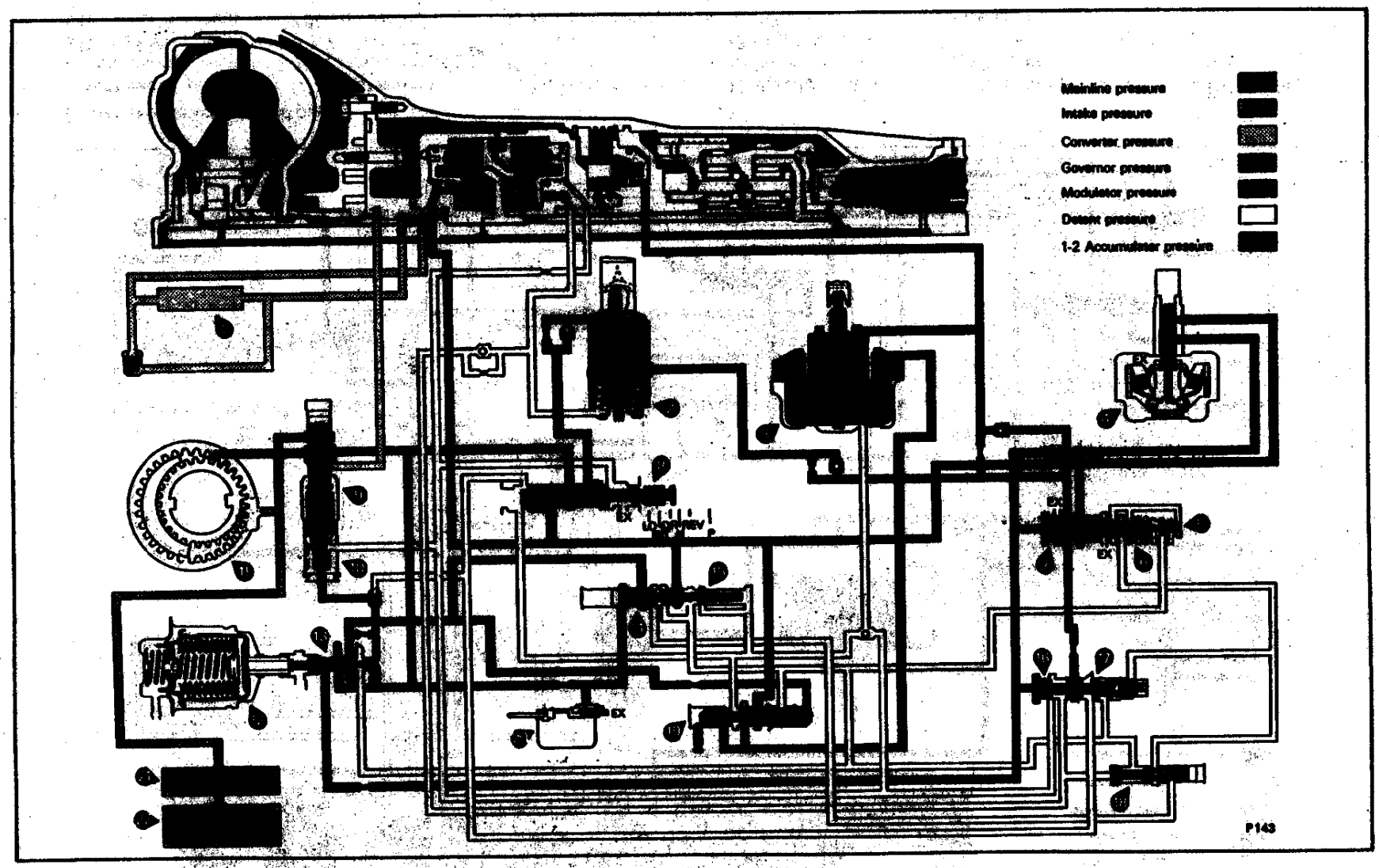

Fig. T8 Detent down - change

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

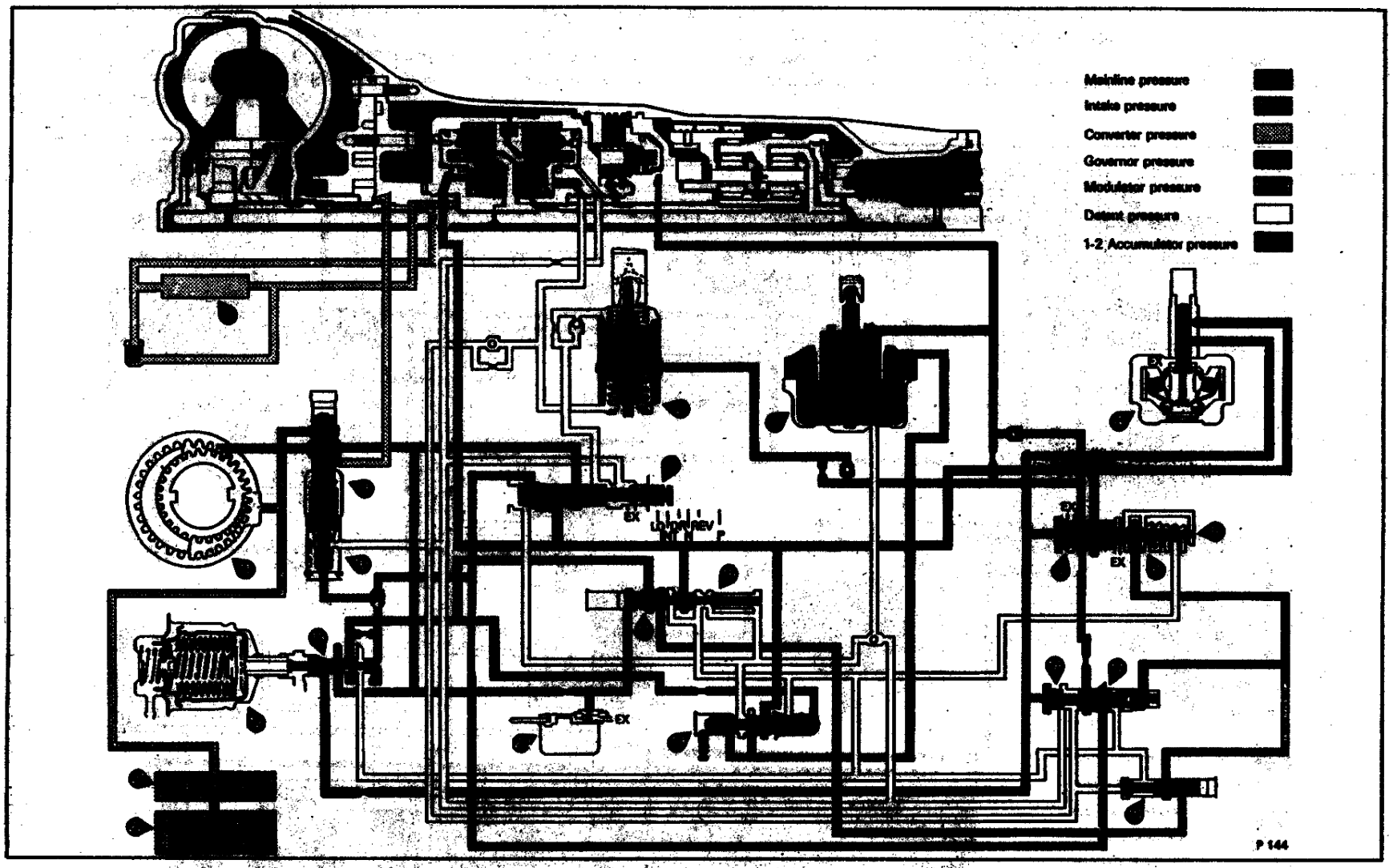

Fig. T9 Intermediate range - 2nd gear

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

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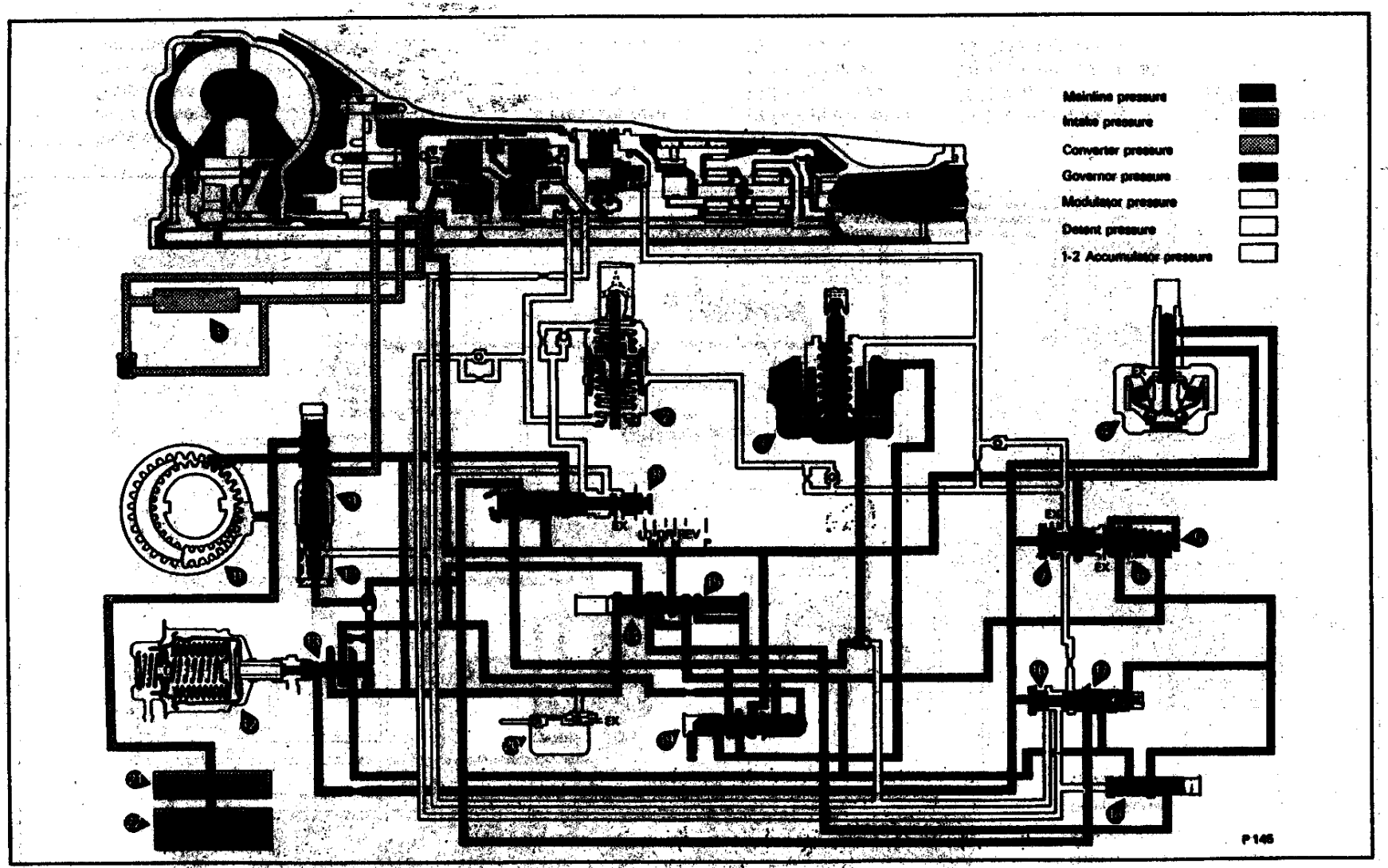

Fig. T10 Low range - 1st gear

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

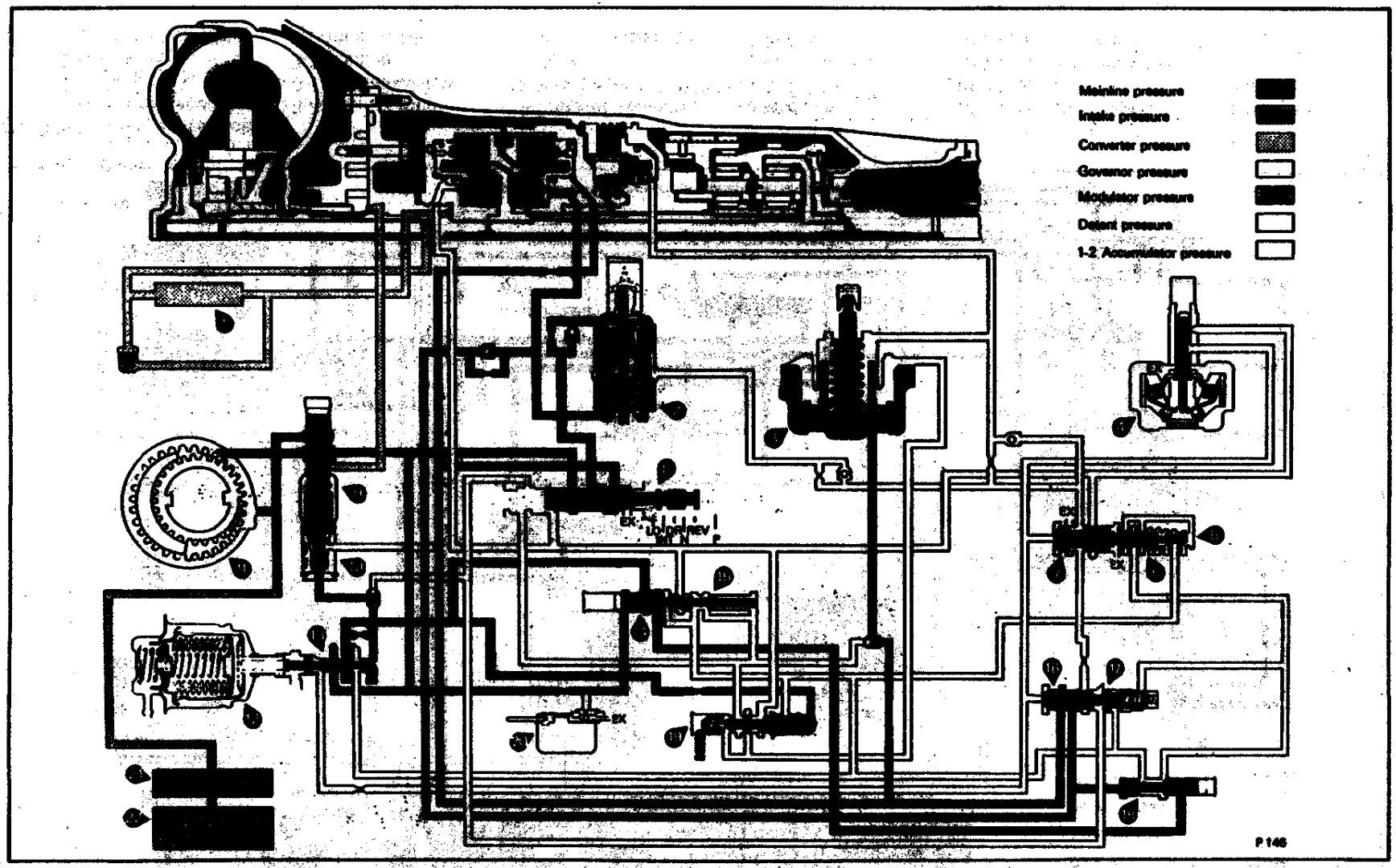

Fig. T11 Reverse

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

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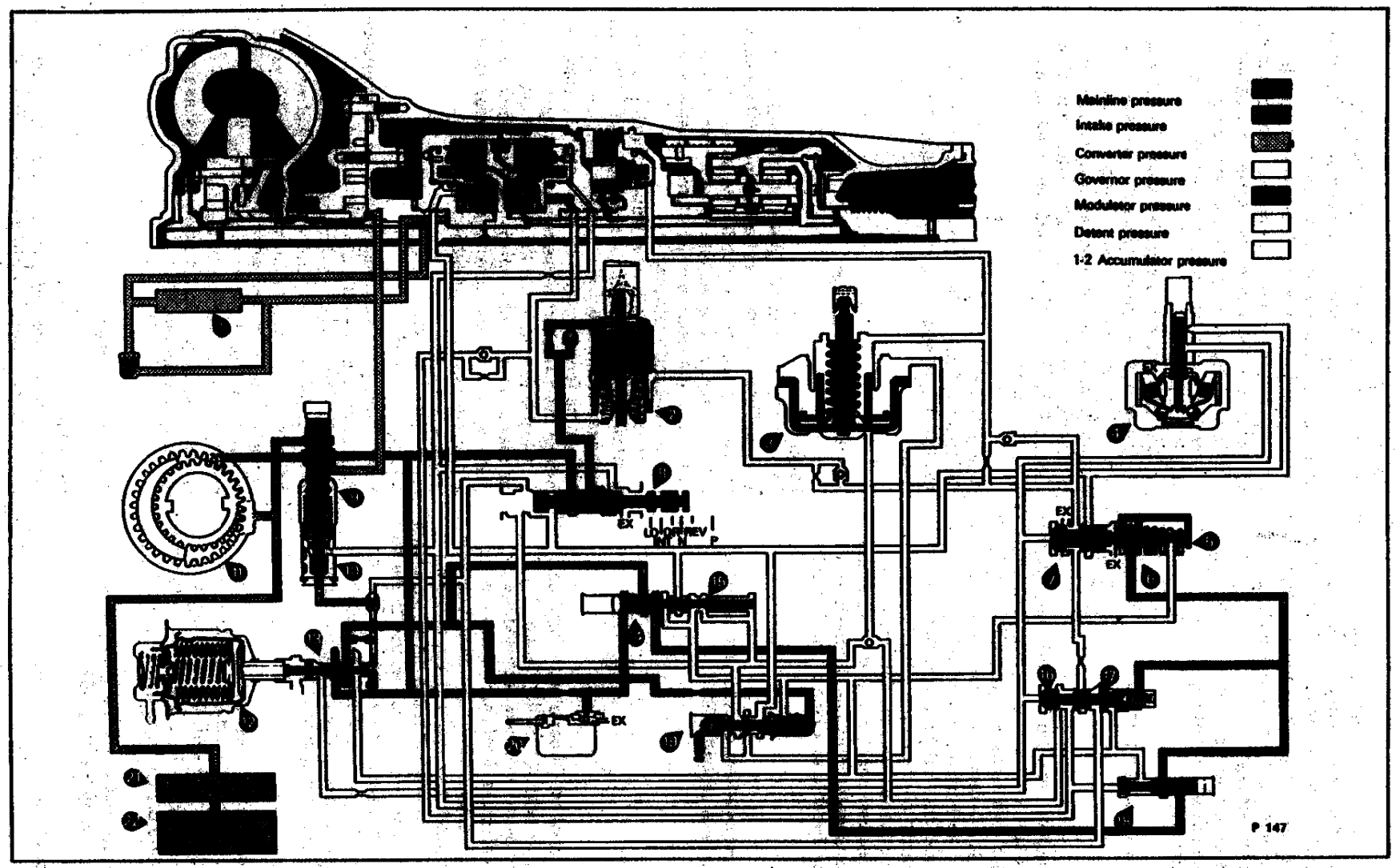

Fig. T12 Neutral - Engine running

1 Heat exchanger
2 Front servo
3 Rear servo
4 Governor assembly
5 Regulator plug
6 1-2 detent valve
7 1-2 valve
8 Manual valve
9 Pressure regulator
10 Boost valve
11 Pump
12 Vacuum modulator
13 Modulator valve
14 Detent valve
15 Regulator valve
16 2-3 valve
17 2-3 modulator valve
18 3-2 valve
19 1-2 accumulator valve
20 Detent solenoid
21 Oil strainer
22 Sump

Oil flow
As the car speed and the governor pressure increases, the force of governor oil acting on the 1-2 shift valve will overcome the force of regulated modulator oil pressure. This allows the 1-2 shift valve to open, permitting drive oil to enter the intermediate clutch passage.

Intermediate clutch oil from the 1-2 shift valve is directed to the following (see Fig. T5):
Intermediate clutch
Rear servo
Front servo and accumulator pistons
2-3 Shift valve

Basic control
Intermediate clutch oil from the 1-2 shift valve seats a one-way check ball and flows through an orifice to the intermediate clutch piston to apply the intermediate clutch. At the same time, intermediate clutch oil moves the accumulator piston against the 1-2 accumulator oil and accumulator spring to maintain lower pressure in the clutch during a 1-2 shift for a smooth clutch application. Intermediate clutch oil seats a second one-way check ball and flows to the front servo and accumulator pistons. Intermediate clutch oil is also directed to a land of the 2-3 shift valve.

Summary
The forward and intermediate clutches are applied. The transmission is in second gear.

Drive - Third gear

Power flow
Forward clutch - applied. Direct clutch - applied. Intermediate clutch - applied. Roller clutch - ineffective. Front band - released. Intermediate roller clutch - ineffective. Rear band - released.

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

Oil flow
As car speed and governor pressure increase, the force of governor oil acting on the 2-3 shift valve overcomes the force of 2-3 shift valve spring and modulator oil. This allows the 2-3 shift valve to move, feeding intermediate clutch oil to the direct clutch passage.

Direct clutch oil from the 2-3 shift valve is directed to the following (see Fig. T6):
Direct clutch
Front accumulator piston
3-2 Valve

Basic control
Direct clutch oil from the 2-3 shift valve flows past a one-way check valve to the inner area of the direct clutch piston to apply the direct clutch. Simultaneously, direct clutch oil is fed to the front accumulator piston. Pressure of the direct clutch oil, combined with the accumulator spring, moves the accumulator and servo pistons against servo oil. This acts as an accumulator for a smooth direct clutch application.

Direct clutch oil is supplied also to the 3-2 valve to move the valve against modulator pressure. This cuts off modulator oil to the 1-2 regulator and 2-3 modulator valves and allows the transmission to utilize the torque multiplying characteristics of the converter during medium throttle operation without down-changing.

Summary
The forward, intermediate and direct clutches are applied. The transmission is in third gear (direct drive).

Part throttle down-change

Power flow
Forward clutch - applied. Direct clutch - released in second. Direct clutch - applied in third. Intermediate clutch - applied. Roller clutch - ineffective. Front band - released. Intermediate roller clutch - effective in second. Intermediate roller clutch - ineffective in third. Rear band - released.

In second gear, the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun gear against anti-clockwise rotation. Turbine torque through the forward clutch is then applied clockwise through the mainshaft to the rear internal gear.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output shaft and output carrier to turn clockwise in a reduction ratio of approximately 1.5 : 1.

Oil flow
A part throttle 3-2 down-change can be accomplished below approximately 53 k.p.h. (33 m.p.h.) by depressing the accelerator far enough to raise modulator pressure to approximately 6.1 kgf.sq.cm. (87 lbf.sq.in.). Modulator pressure and the 3-2 valve spring will move the 3-2 valve against direct clutch oil and allow modulator oil to act on the 2-3 modulator valve. This moves the 2-3 valve train against governor oil and changes the transmission to second gear (see Fig. T7).

Detent down-change

Power flow
Forward clutch - applied. Direct clutch - released in second. Direct clutch - applied in third. Intermediate

clutch - applied. Roller clutch - ineffective. Front band - released. Intermediate roller clutch - effective in second. Intermediate roller clutch - ineffective in third. Rear band - released.

In second gear, the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun gear against anti-clockwise rotation. Turbine torque through the forward clutch is then applied clockwise through the mainshaft to the rear internal gear.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5 : 1.

Oil flow

While operating at speeds below approximately 113 k.p.h. (70 m.p.h.) a forced or detent 3-2 down-change is possible. The down-change is effected by depressing the accelerator pedal so that the kick-down button is depressed and the kick-down switch actuates the detent solenoid. The detent solenoid opens an orifice that allows line oil at the detent valve to be exhausted, thus permitting the detent regulator valve to operate. Line oil acting on the detent valve and solenoid is supplied by a small orifice.

Drive oil on the detent regulator valve is then regulated to a pressure of approximately 4,9 kgf.sq. cm. (70 lbf.sq.in.) and called detent oil. Detent oil is then routed to the following (see Fig. T8):

Modulator passage
1-2 Regulator valve
2-3 Modulator valve
3-2 Valve
1-2 Primary accumulator valve
Vacuum modulator valve

Detent oil in the modulator passage and at the 2-3 modulator valve will close the 2-3 shift valve, changing the transmission to second gear.

A detent 2-1 down-change can also be accomplished below approximately 32 k.p.h. (20 m.p.h.) because detent oil is directed to the 1-2 regulator valve. This allows detent oil to act on the 1-2 regulator, and 1-2 detent valve to close the 1-2 shift valve, changing the transmission to first gear.

Detent oil is directed also to the modulator valve to prevent modulator pressure from regulating below 4,9 kgf.sq.cm (70 lbf.sq.in.) at high speeds or at high altitudes.

Intermediate - Second gear

Power flow

Forward clutch - applied. Direct clutch - released. Intermediate clutch - applied. Roller clutch - ineffective. Front band - applied. Intermediate roller clutch - effective. Rear band - released.

In second gear, the intermediate clutch is applied to allow the intermediate roller clutch to hold the sun gear against anti-clockwise rotation. Turbine torque through the forward clutch is now applied clockwise through the mainshaft to the rear internal gear.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.5 : 1.

In second gear, engine braking is provided by the front band as it holds the sun gear fixed. Without the band applied, the sun gear would overrun the intermediate roller clutch.

Oil flow

When the selector lever is in Intermediate range, intermediate oil from the manual valve is directed to the following (see Fig. T9):

Pressure boost valve
2-3 Shift valve

Intermediate oil at the boost valve will increase line pressure to 10,5 kgf.sq.cm. (150 lbf.sq.in.). This increased intermediate oil pressure at the 2-3 shift valve will close the 2-3 shift valve, regardless of car speed.

For engine braking the front band is applied by exhausting servo oil at the manual valve. This allows intermediate clutch oil, acting on the servo piston, to move the piston and apply the front band. Once the transmission is in second gear - Intermediate range, it cannot change to third gear regardless of car speed.

Summary

The forward and intermediate clutches and front band are applied. The transmission is in second gear - Intermediate range.

Low range - First gear

Power flow

Forward clutch - applied. Direct clutch - released. Intermediate clutch - released. Roller clutch - effective. Front band - released. Intermediate roller clutch - ineffective. Rear band - applied.

With the selector lever in Low range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear clockwise. (Converter torque ratio is approximately 2.0 : 1 at stall)

Clockwise motion of the rear internal gear causes the rear pinions to turn clockwise to drive the sun gear anti-clockwise. In turn, the sun gear drives the front pinions clockwise, thus turning the front internal gear, output carrier and output shaft clockwise in a reduction ratio of approximately 2.5 : 1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and roller clutch assembly to the transmission case. (Total stall ratio is approximately 5 : 1)

Downhill or overrun braking is provided in Low range by applying the rear band as this prevents the reaction carrier from overrunning the roller clutch.

Oil flow
Maximum downhill braking can be attained at speeds below 64 k.p.h. (40 m.p.h.) with the selector lever in Low position as this directs Low oil from the manual valve to the following (see Fig. T10):
Rear servo
1-2 Accumulator valve
Detent regulator valve
1-2 Shift valve

Basic control
Low oil flows past a check ball to the apply side of the rear servo piston and to the 1-2 accumulator valve to raise the 1-2 accumulator oil to line pressure for a smooth band application.

Low oil acts on the detent regulator valve. Combined with the detent spring, Low oil holds the detent valve against line oil acting on the detent valve, causing drive oil to flow through the detent regulator valve into the detent and modulator passages. Modulator and detent oil at line pressure acting on the 1-2 regulator and 1-2 detent valve overcomes governor oil and Low oil on the 1-2 shift valve at any vehicle speed below approximately 64 k.p.h. (40 m.p.h.) and the transmission will change to first gear.

In first gear - Low range, the transmission cannot up-change to second gear regardless of car or engine speed.

Summary
The forward clutch and rear band are applied. The transmission is in first gear - Low range.

Reverse

Power flow
Forward clutch - released. Direct clutch - applied. Intermediate clutch - released. Roller clutch - ineffective. Front band - released. Intermediate roller clutch - ineffective. Rear band - applied.

In Reverse, the direct clutch is applied to direct turbine torque to the sun gear shaft and sun gear. The rear band is also applied, holding the reaction carrier.

Clockwise torque to the sun gear causes the front pinions and front internal gear to turn anti-clockwise in reduction. The front internal gear is connected directly to the output shaft, thus providing the reverse output gear ratio approximately 2 : 1. The reverse torque multiplication at stall (converter and gear ratios) is approximately 4 : 1.

Oil flow
When the selector lever is moved to the Reverse position, the manual valve is repositioned to allow oil at line pressure to enter the reverse circuit. Reverse oil then flows to the following (see Fig. T11):
Direct clutch
2-3 Shift valve
Rear servo piston
Pressure boost valve

Basic control
Reverse oil from the manual valve flows to the large area of the direct clutch piston and to the 2-3 shift valve. From the 2-3 shift valve, it enters the direct clutch passage and is directed to the small area of the direct clutch piston to apply the direct clutch.

Reverse oil flows to the rear servo and acts on the servo piston to apply the rear band. Reverse oil acts also on the pressure boost valve to boost line pressure.

Summary
The direct clutch and the rear band are applied. The transmission is in Reverse.

Park or Neutral - Engine running

Power flow
Forward clutch - released. Direct clutch - released. Intermediate clutch - released. Roller clutch - ineffective. Front band - released. Intermediate roller clutch - ineffective. Rear band - released.

In Neutral or Park no bands or clutches are applied therefore no power is transmitted.

Oil flow
Whenever the engine is running at idle with the selector lever in 'P' or 'N', oil from the pump is directed to the following (see Fig. T12):

Pressure regulator valve	Manual valve
Torque converter	Detent valve
Oil cooler	Detent solenoid
Oil cooler by-pass valve	Vacuum modulator valve
Lubrication system	Front servo (Neutral only)

Cooling and lubrication
Oil flows from the pump to the pressure regulator valve which regulates pump pressure. When the pump output exceeds the demand of line pressure, oil from the pressure regulator is directed to the converter feed passage to fill the converter. Oil from the converter is directed to the transmission heat exchanger by-pass valve. Oil from the heat exchanger is directed to the transmission lubrication system.

The heat exchanger by-pass valve permits oil to be fed directly from the converter to the lubrication circuits if the heat exchanger becomes restricted.
Line pressure acts on the following:
Manual valve
Detent valve
Detent solenoid
Modulator valve

Line pressure at the modulator valve is regulated to a pressure called modulator oil, which acts on the pressure boost valve, 1-2 accumulator and primary valves, and passes through the detent valve and the 3-2 valve to the 1-2 and 2-3 valve trains.

Summary
The torque converter is filled, and all clutches and bands are released. The transmission is in Neutral.

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Section T2

Servicing

Careful and regular maintenance of the transmission is necessary to ensure maximum reliability; the following table gives the recommended servicing periods.

Servicing periods

Essential maintenance	Period
Check the fluid level	After first 5 000 kilometres (3 000 miles) then every 10 000 kilometres (6 000 miles)
Change transmission fluid	20 000 kilometres (12 000 miles)
Change transmission fluid and fit a new intake strainer. Renew 'O' ring on intake pipe and fit a new seal to bore of intake strainer	40 000 kilometres (24 000 miles)
Additional maintenance	**Period**
Lubricate control linkage. Road test for satisfactory performance	Every 10 000 kilometres (6 000 miles)

It is absolutely essential that great attention be paid to cleanliness whenever the interior of the transmission is exposed and when work is being carried out on a particular unit belonging to the transmission. The smallest particle of dirt in the oil may interfere with the correct operation of the valves, particularly in the control valve unit.

Fluid level - To check and top-up

The fluid level in the torque converter transmission can be checked accurately only when the car is standing on a level surface, the engine is running and the transmission fluid is at normal operating temperature, approximately 77°C. (170°F.).

As an initial check, the fluid level may be checked after starting from cold, running the engine for 3 to 4 minutes when the fluid level should be approximately 4 cm. (1.5 in.) below the 'MAX' mark on the dipstick.

A further check should then be carried out as follows.

1. Drive the car for approximately 32 kilometres (20 miles). This will ensure that the transmission has reached normal operating temperature.
2. Position the car on a level surface, firmly apply the parking brake and select 'Park' postion, with the gear range selector lever.
3. Remove the gear change actuator thermal cut-out from the main fuseboard to ensure against accidental gear selection.
4. Run the engine at fast idle speed for approximately 3 minutes, then reduce to slow idle; check the fluid level.
5. With the engine running, add fluid as required to bring to the required level, 'MAX' mark on the dipstick.

Note

Do not overfill.

6. Replace the gear change actuator thermal cut-out in the fuseboard.

For a complete list of the lubricants currently approved for use in this transmission refer to Chapter D.

Transmission dipstick and filler tube

The transmission dipstick and filler tube are situated on the right-hand side of the engine, close to the bulkhead, and the word GEARBOX is stamped on the top of the dipstick (see Fig. T13).

To drain the sump and renew the intake strainer

1. Position the car on a ramp.
2. Place a clean container, minimum capacity 3 litres (5 Imp. pints, 6 U.S. pints) under the nut which secures the filler tube to the side of the sump (see Fig. T14).
3. Withdraw the transmission dipstick from inside the engine compartment, and slacken the setscrews securing the filler tube clip to the cylinder head.
4. Slacken the nut securing the dipstick filler tube to the right-hand side of the transmission sump; withdraw and move to one side the filler tube and drain the fluid into the container. Discard the 'O' ring (if fitted) from the filler tube connection.
5. Remove the setscrews securing the sump.
6. Remove the sump and discard the gasket.
7. Drain the remainder of the fluid from the sump.
8. Clean the sump with paraffin and dry with compressed air.
9. Unscrew and remove the stepped bolt securing the intake pipe and strainer assembly to the transmission casing; remove the strainer assembly.
10. Discard the intake strainer but retain the intake

pipe which connects the strainer to the casing.
11. Fit a new rubber 'O' ring onto the intake pipe, lubricate the 'O' ring with transmission fluid.

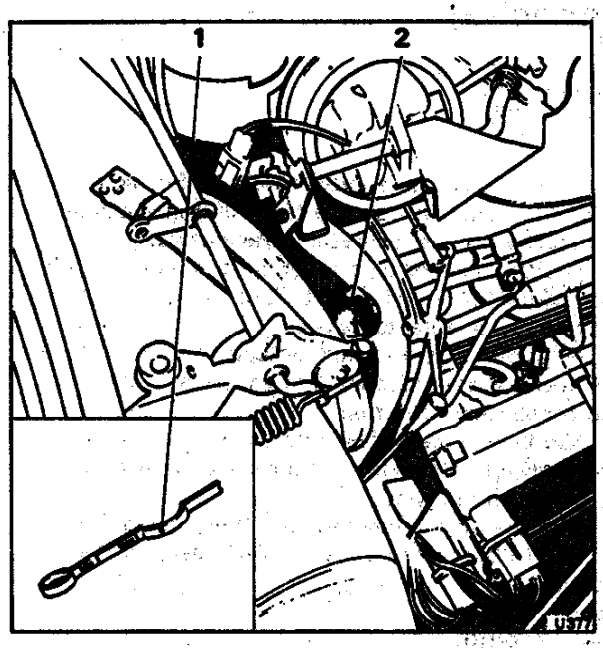

Fig. T13 Checking the oil level
1 Minimum and Maximum oil level marks
2 Transmission oil dipstick

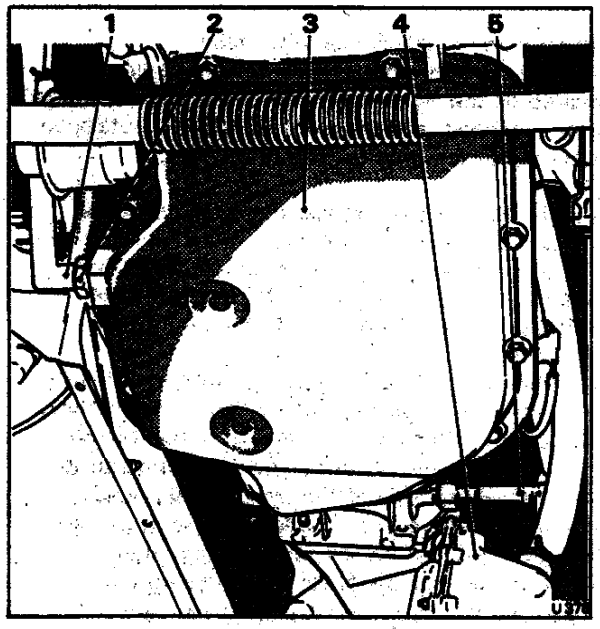

Fig. T14 Transmission sump
1 Fluid filler tube
2 Fluid drain point
3 Sump
4 Gear change actuator
5 Electronic impulse transmitter

12. Ensure a new rubber seal is fitted to the bore in the new intake strainer then fit the strainer to the intake pipe and secure the strainer with the stepped bolt.
13. Fit the sump, using a new gasket. Torque tighten the setscrews (refer to Chapter P).
14. Fit the oil filler tube and tighten the nut; tighten the filler tube securing clip to the cylinder head.
15. Add 4½ litres (8 Imp. pints, 9½ U.S. pints) of an approved fluid (see Chapter D) to the sump, pouring the fluid down the dipstick filler tube.

Note
When draining the sump but not renewing the intake strainer, add only 2,8 litres (5 Imp. pints, 6 U.S. pints).

16. Place the gear range selector lever in the 'Park' position, and run the engine at fast idle speed for approximately 1½ minutes.
17. Reduce the engine speed to slow idle and check the fluid level; this should be approximately 16 mm. (0.625 in.) below the 'MIN' mark on the dipstick when the transmission is cold, i.e. 20°C. (68°F.) or below. If necessary add sufficient fluid to bring the fluid level to 16 mm. (0.625 in.) below the 'MIN' mark on the dipstick.

Note
Do not overfill, as foaming may occur when the fluid warms up. If the fluid level is too low, especially when cold, complete loss of drive may result after quick stops. Extremely low fluid levels will result in damage to the transmission.
18. Finally, check the transmission fluid level is correct (see Fluid level - To check and top-up, operations 1 to 6 inclusive).

Transmission unit (dry) - To fill
The fluid capacity of the torque converter transmission, including the torque converter, is approximately 10,6 litres (18 2/3 Imp. pints, 22½ U.S. pints), but the correct level is determined by the marks on the dipstick rather than by the quantity of fluid added. It is important that the correct level be maintained. When the transmission has been overhauled or a new one fitted and a complete fill is required, including the torque converter, proceed as follows.
1. Pour approximately 6,5 litres (11½ Imp. pints, 14 U.S. pints) through the filler tube.
2. Run the engine at a fast idle speed for approximately 1½ minutes with the gear range selector lever in the 'Park' position.
3. Reduce the engine speed to slow idle and check the fluid level; if necessary, add fluid to bring the level to approximately 16 mm. (0.625 in.) below the 'MIN' mark on the dipstick when the transmission is cold 20°C. (68°F.).
4. Drive the car for approximately 32 kilometres (20 miles) then check the fluid level, top-up to the 'MAX' mark if necessary as described in Fluid level - To check and top-up.

The transmission sump should be drained every 20 000 kilometres (12 000 miles) or 12 months, whichever occurs first. Fresh fluid should be added to maintain the correct level on the dipstick.

The fluid intake system incorporates an intake strainer. This strainer should be renewed after the first 40 000 kilometres (24 000 miles) or two years, whichever occurs first. In the event of a major failure in the transmission, the strainer must be renewed.

Transmission unit - To check for leaks

Whenever the transmission has been dismantled, completely or partially, the following procedure must be observed to minimise the possibility of fluid leakage.

1. Always fit new gaskets and 'O' ring seals.
2. Use a small amount of petroleum jelly to hold a gasket in position during assembly.
3. Do not use a sealing compound (e.g. Wellseal) with a gasket.
4. Ensure that the cork and paper gaskets are not wrinkled or creased when fitted, or have shrunk or stretched during storage.
5. Ensure that the square-sectioned 'O' rings are correctly fitted and are not twisted.
6. Ensure that all mating faces are clean and free from burrs and damage.
7. Torque tighten bolts, setscrews etc., to the torque figures given in Chapter P.

When examining the transmission for leaks, determine whether the fluid originates from the transmission or the engine. The original factory fill fluid is red in colour, this assists in locating the source of leakage. If however, the colour cannot be detected in the transmission fluid, add a red aniline dye preparation to the fluid. Red dye appearing in the leaking fluid will positively identify the source of the leak.

If the fluid is known to be leaking from the transmission, examine the following areas.

Front end

It will be necessary to remove the bell housing bottom cover and the lower front cover plate in order to examine the transmission for leakage at the front end.

To correct a leak at the front end the transmission will have to be removed from the car.

1. If the pump oil seal is suspected of leaking fluid, ensure that the seal has been correctly fitted and is not damaged.

When fitting a new seal (see Section T16) ensure that the seal bore in the case is clean and that the seal garter spring is fitted. Examine the finish on the converter neck and the bearing surface in the pump body.

2. Examine the pump square-sectioned 'O' ring and the gasket for damage, renew if necessary.
3. Ensure that the rubber coated washers on the pump securing setscrews are correctly fitted and are not damaged.
4. Examine the torque converter for leakage (see Section T7).

Rear Extension

1. Examine for damage the rear extension housing oil seal.
2. Examine the finish on the sliding coupling.
3. Ensure that the gasket fitted between the joint faces has been correctly fitted and is not damaged.
4. Check the securing setscrews for correct torque tightness (see Chapter P).
5. Examine the housing for cracks or porosity.

Transmission case

1. Examine the speedometer electronic impulse transmitter drive 'O' ring and lip-type seal. Ensure that the securing setscrew is torque tightened.
2. Examine the governor cover gasket. Ensure that the setscrews are torque tightened.
3. Examine the electrical connector 'O' ring for damage.
4. Examine the parking pawl shaft 'O' ring for damage.
5. Examine the manual shaft 'O' ring for damage.
6. Examine the vacuum modulator 'O' ring for damage. Ensure the retaining setscrew is torque tightened.
7. Examine the vacuum modulator for possible damage to the diaphragm.

Note

If the transmission is found to be consistently low on fluid, check the modulator to make certain there is no split in the diaphragm. Apply suction to the vacuum tube and check for leaks. A split diaphragm would allow transmission fluid to be drawn into the engine induction manifold and vacuum line. This condition can usually be detected because the exhaust will be excessively smokey due to the transmission fluid being added to the combustion mixture.

8. Examine the sump gasket. Check the torque tightness of the securing setscrews.
9. Check the torque tightness of the main line pressure tapping plug.
10. Examine the breather pipe for damage.
11. Ensure that the transmission has not been overfilled.
12. Check for coolant in the transmission fluid.
13. Examine the case for cracks or porosity.
14. Ensure that the pump to case gasket is not incorrectly positioned.
15. Ensure that foreign matter is not between the pump and case, or between the pump cover and body.
16. Ensure that the breather hole in the pump cover is not obstructed.
17. Ensure that the 'O' ring on the filter assembly is not cut.

Heat exchanger connections
Ensure that the heat exchanger transmission fluid pipes are correctly fitted and are not damaged. Ensure that the nuts are tight.

Dipstick and filler tube
Examine the flared end of the dipstick and filler tube for cracks or damage. Examine the spherical seat in the sump. Ensure that the sleeve nut is tightened sufficiently to nip the tube securely to the sump.

Internal leaks
It will be necessary to remove the sump in order to determine the source of internal leaks.
1. Check the governor pipes for security and damage.
2. Examine the rear servo cover gasket for damage. Ensure the square sectioned 'O' ring is fitted correctly and is not damaged. Torque tighten the cover securing setscrews.
3. Examine the control valve unit assembly and oil guide plate gaskets. Check the torque tightness of the unit securing setscrews.
4. Examine the solenoid gaskets for damage. Check the torque tightness of the solenoid securing setscrews.
5. Examine the intake pipe 'O' ring for damage.
6. Check that the case valve body mounting face is not distorted.

Control joints - To lubricate
During initial assembly, the clevis pins in the control linkage are lubricated with Rocol MTS 1000 grease and should be similarly treated whenever they are removed.

When a car is being serviced, the opportunity should be taken to check the controls for correct operation and to lubricate all the control joints with a few drops of engine oil.

Manual shaft - To lubricate
As part of the normal controls maintenance procedure, it is recommended that the manual shaft be lubricated with a few drops of oil at the point where it enters the transmission case.

Section T3

Testing

Before road testing the car to check the functioning of the transmission, carry out the following checks.

The car can then be road tested, using all the selector ranges. Note when any operating faults occur. Check the gearchange pattern as follows.

1. Check the fluid level, top-up if necessary.
2. Ensure that the engine and transmission are at normal operating temperature 77°C. (170°F.).
3. Ensure that the gearchange actuator is operating satisfactorily.
4. Check the operation of the kick-down switch, adjust if necessary (see Chapter K).
5. If the oil pressure is to be checked, fit a gauge.

Gearchange pattern check

Drive range

1. Select 'D' range, then accelerate the car from standstill.
2. A 1-2 and a 2-3 up-change should occur at all throttle openings.

Note

The change points will vary according to throttle opening.

3. As the speed of the car decreases to a stop, the 3-2 and the 2-1 down-changes should occur.

Intermediate range

1. Select 'I' range.
2. Accelerate the car from standstill.
3. A 1-2 up-change should occur at all throttle openings.
4. A 2-3 up-change cannot be obtained in this range.
5. The 1-2 up-change point will vary according to throttle opening.
6. As the speed of the car decreases to a stop, the 2-1 down-change should occur.

Low range

1. Select 'L' range.
2. No up-change should occur in this range, regardless of throttle opening.

2nd. gear overrun braking

1. Select 'D' range.
2. When a speed of approximately 56 k.p.h. (35 m.p.h.) has been reached, move the selector lever to the 'I' range position.
3. The transmission should change down to 2nd gear.
4. An increase in the speed of the engine as well as an engine braking effect should be observed.
5. Line pressure should change from between 4,22/6,32 kgf/sq.cm. (60/90 lbf/sq.in.) to approximately 10,54 kgf/sq.cm. (150 lbf/sq.in.).

1st gear - downhill or overrun engine braking

1. Select 'I' range.
2. When the speed of the car is approximately 48 k.p.h. (30 m.p.h.) [ensure that it does not exceed 64 k.p.h. (40 m.p.h.)] and at constant throttle, move the selector to 'L' range.
3. An increase in engine r.p.m. and a braking effect should be noticed as the down-change occurs.

Oil pressure - To check

Before attempting to check oil pressure or to road test the car, always ensure that the level of fluid in the transmission is correct (see Section T2).

The pressure can be checked with the transmission in the car by using an oil pressure gauge coupled to the main line tapping in the left-hand side of the transmission case.

1. Clean any dirt from around the line pressure plug; remove the plug.
2. Fit the adapter RH 7914 into the main line tapping; tighten the adapter.
3. Screw a pressure gauge, capable of reading between 0 kgf/sq.cm. and 21,09 kgf/sq.cm. (0 lbf/sq.in. and 300 lbf/sq.in.) onto the adapter then position the gauge so that it can be seen from the driver's seat.
4. Connect a tachometer to the engine; this will enable the gear change points to be positively identified.
5. Drive the car until the transmission has reached normal operating temperature 77°C. (170°F.).
6. Check the fluid level, top-up if necessary.

The following checks may be carried out during road test.

Engine idle pressure check

1. Select 'D' range then drive the car at approximately 48 k.p.h. (30 m.p.h.) with the throttle eased back. The line pressure should be 4,92 kgf/sq.cm. (70 lbf/sq.in.).
2. Select 'I' range then drive the car to obtain a steady road speed 40 k.p.h. (25 m.p.h.). Line pressure should be between 10,19 kgf/sq.cm. and 10,89 kgf/sq.cm. (145 lbf/sq.in. and 155 lbf/sq.in.).

Full throttle pressure check

1. Jack up the rear of the car and position blocks so that the rear wheels are clear of the ground.

2. Disconnect the vacuum line at the induction manifold.
3. Blank off the orifice in the manifold.
4. Run the engine at fast-idle (between 800 r.p.m. and 1 000 r.p.m.) in Neutral. The oil pressure should be 10,20 kgf/sq.cm. (145 lbf/sq.in.).
5. Repeat the procedure in Reverse. Reverse pressure should be between 10,19 kgf/sq.cm. and 10,89 kgf/sq.cm. (145 lbf/sq.in. and 155 lbf/sq.in.).
6. Connect the vacuum pipe.

Towing

The car must not be towed if any mechanical damage to the transmission components is suspected, or if the torque converter transmission fluid is low.

Before towing, check the fluid level in the transmission. The level must be above the 'MAX' mark on the dipstick when the engine is not running.

Should it be necessary to tow the car, even for a short distance, a solid tow bar must be used. This is important, as without the engine running to maintain the pressure in the hydraulic systems, the efficiency of the braking systems is reduced.

If the pressure in the hydraulic systems has been exhausted by operating the footbrake pedal without the engine running, the footbrake would not stop the car. If a solid tow bar is not available, the car must be transported.

Always tow the car with the torque converter transmission in Neutral.

To select Neutral it is first necessary to insert the ignition key in the switchbox and turn it to the OFF position. Providing the battery is in a charged condition, this action will energise the gearchange actuator mechanism and Neutral can then be selected by operating the gear range selector lever. Should the battery be in a discharged condition however, turning the ignition key will not energise the gearchange mechanism and operating the gear range selector lever therefore will not activate the actuator mechanism. In this event, it will not be possible to move the transmission out of the Park position and it will be necessary to disconnect the propeller shaft before the car can be towed or transported.

Normally, when the ignition key is removed from the switchbox, Park position is automatically engaged and the parking pawl locks the transmission. If it is required to remove the ignition key and still leave the car in Neutral for towing, this can be accomplished by first removing the gearchange actuator thermal cut-out from the fuseboard and then removing the key from the switchbox.

The car can only be towed for distances up to 80 kilometres (50 miles) and the maximum towing speed must not exceed 56 k.p.h. (35 m.p.h.). For greater distances the propeller shaft must be disconnected or the car must be transported.

Section T4

Removal of units

Removable units - Transmission in car

The following units can be removed from the transmission without the transmission being removed from the car.

The removal procedure for all the units is described in the appropriate section, with the exception of the pressure regulator valve, details of which are included in this section.

1. Gearchange actuator (see Section T5).
2. Neutral start and height control switches (see Section T5).
3. Vacuum modulator and valve (see Section T8).
4. Governor assembly (see Section T9).
5. Speedometer drive (see Section T10).
6. Sump, strainer and intake pipe (see Section T11).
7. Control valve unit (see Section T12).
8. Rear servo (see Section T13).
9. Detent solenoid, connector, control valve spacer and front servo (see Section T14).
10. Rear extension (see Section T15).
11. Control rods, levers and parking linkage (see Section T17).

Pressure regulator valve - To remove

The pressure regulator valve is a solid type (see Fig. T15) and must only be used in the pump cover with the squared pressure regulator boss (see Fig. T16).

Earlier pressure regulator valves had oil holes and an orifice cup plug (see Fig. T15). This type of regulator valve may be used to service either type of pump cover.

1. Run the car onto a ramp. Drain the oil from the sump.
2. Remove the sump as described in Section T11.
3. Withdraw the intake pipe and strainer assembly.
4. Remove and discard the intake pipe 'O' ring.
5. Remove the setscrew which secures the detent roller spring; remove the spring and roller.
6. Slacken the lock-nut which secures the detent lever to the manual shaft.
7. Remove the manual shaft pin from the case.
8. Remove the gearchange lever from the manual shaft.
9. Prise the detent lever from the manual shaft then remove the parking actuator rod and detent lever.
10. Ensure that the manual valve does not slide out of its bore in the control valve unit.
11. Push the manual shaft through the bore in the case in order to gain access to the pressure regulator valve bore.
12. Using a screwdriver or a steel rod, push the regulator boost valve sleeve against the pressure regulator spring (see Fig. T17).

Caution

The pressure regulator spring is under extreme pressure and will force the valve sleeve out of its

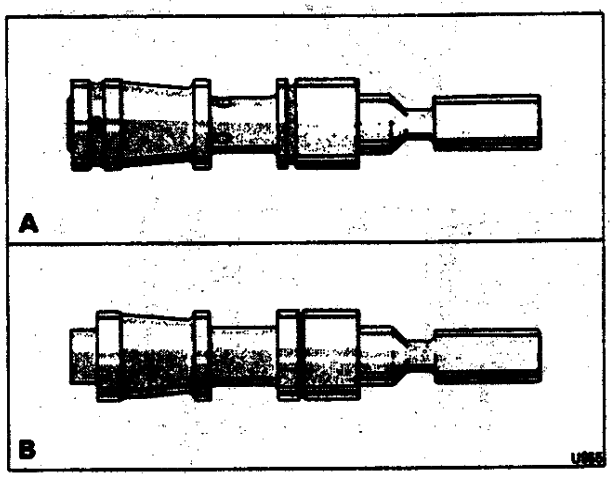

Fig. T15 Pressure regulator valve
A Early type with orifice plug
B Solid type

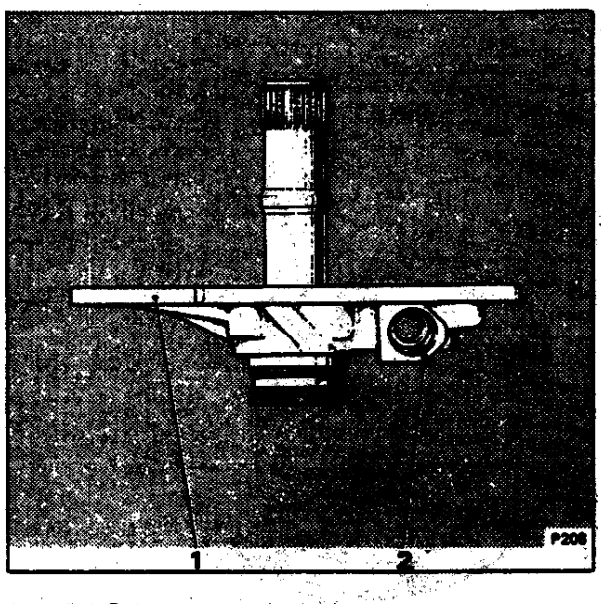

Fig. T16 Pump cover assembly
1 Pump cover
2 Pressure regulator boss

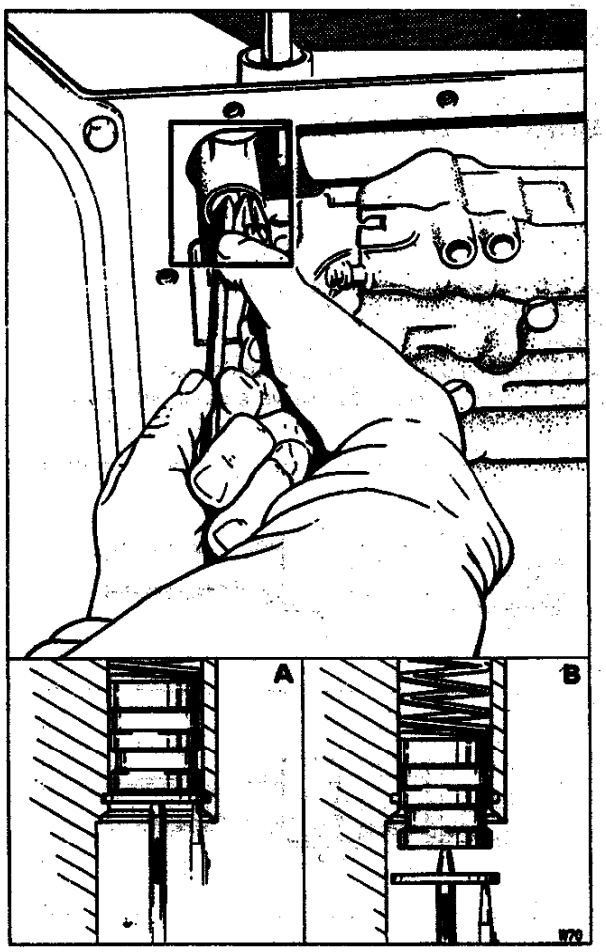

Fig. T17 Removing the pressure regulator valve
A Spring compressed
B Circlip removed

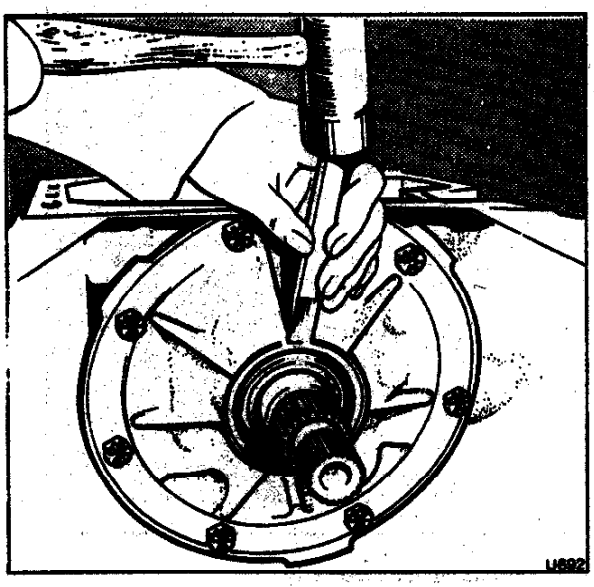

Fig. T18 Removing the oil pump seal

bore when the circlip is removed unless the sleeve is firmly held.
13. Continue to exert pressure on the valve sleeve then remove the circlip. Gradually relax the pressure on the valve sleeve until the spring pressure is released.
14. Carefully remove the regulator boost valve sleeve and valve, then withdraw the regulator spring. Take care not to drop the valves.
15. Remove the pressure regulator valve and spring retainer. Remove the spacers (if fitted).

Pressure regulator valve - To fit
Before fitting, wash and examine all parts.
1. Fit the spring retainer onto the pressure regulator spring. Fit any spacers which were previously removed.
2. Fit the pressure regulator valve, stem end first, onto the spring.
3. Fit the boost valve into the sleeve with the valve stem outward then hold together all the parts so that the pressure regulator spring is against the valve sleeve.
4. Fit the complete assembly into the pressure regulator valve bore, taking care that the parts do not fall.
5. Using a screwdriver or a steel rod, push the regulator boost valve sleeve against the regulator spring pressure until the end of the sleeve has passed beyond the circlip groove.
6. Fit the circlip then relax the pressure on the sleeve.
7. Fit the parking actuator rod and detent lever, ensuring that the rod plunger is under the parking brake bracket and over the parking pawl.
8. Slide the manual shaft into the case and through the detent lever.
9. Fit the gearchange lever.
10. Fit the lock-nut onto the manual shaft. Torque tighten the nut.
11. Ensure that the manual valve is engaging with the pin on the detent lever.
12. Retain the manual shaft with the pin. Straighten the pin to lock it into position.
13. Fit the detent spring and roller assembly;torque tighten the setscrew.
14. Fit the intake pipe and strainer assembly, also the sump as described in Section T11.
15. Top-up the transmission with an approved fluid (see Chapter D).

Oil pump seal - To renew
1. Remove the transmission from the car (see Section T6).
2. Carefully drive the point of a chisel under the lip of the seal then prise the seal out of the pump body (see Fig. T18).
3. Before fitting a new seal, ensure that the body bore is clean and free from burrs and that the garter ring is on the seal.
4. Check the finish of the converter neck and the bearing surface in the pump body.

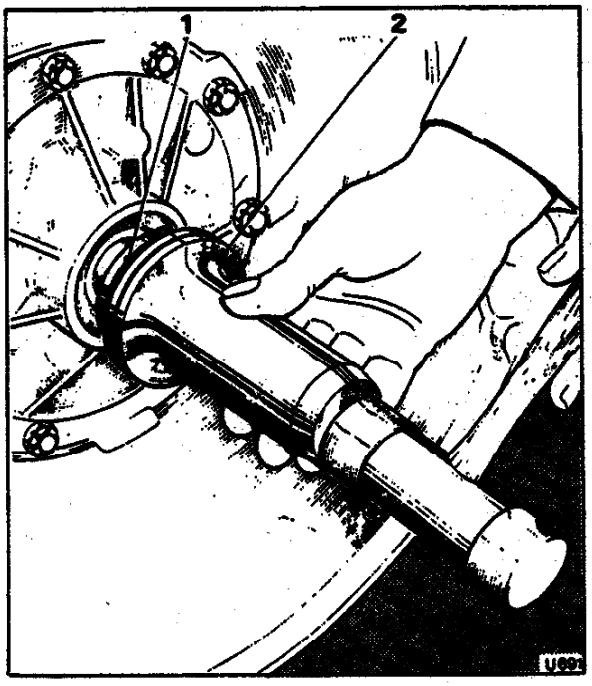

Fig. T19 Fitting the oil pump seal
1 Oil seal
2 Seal fitting tool

5. Lightly smear the outer edge of the seal case with Wellseal then fit the seal to the pump using tool RH 7953 (J-21359) as shown in Figure T19.
6. Fit the transmission to the car (see Section T6).