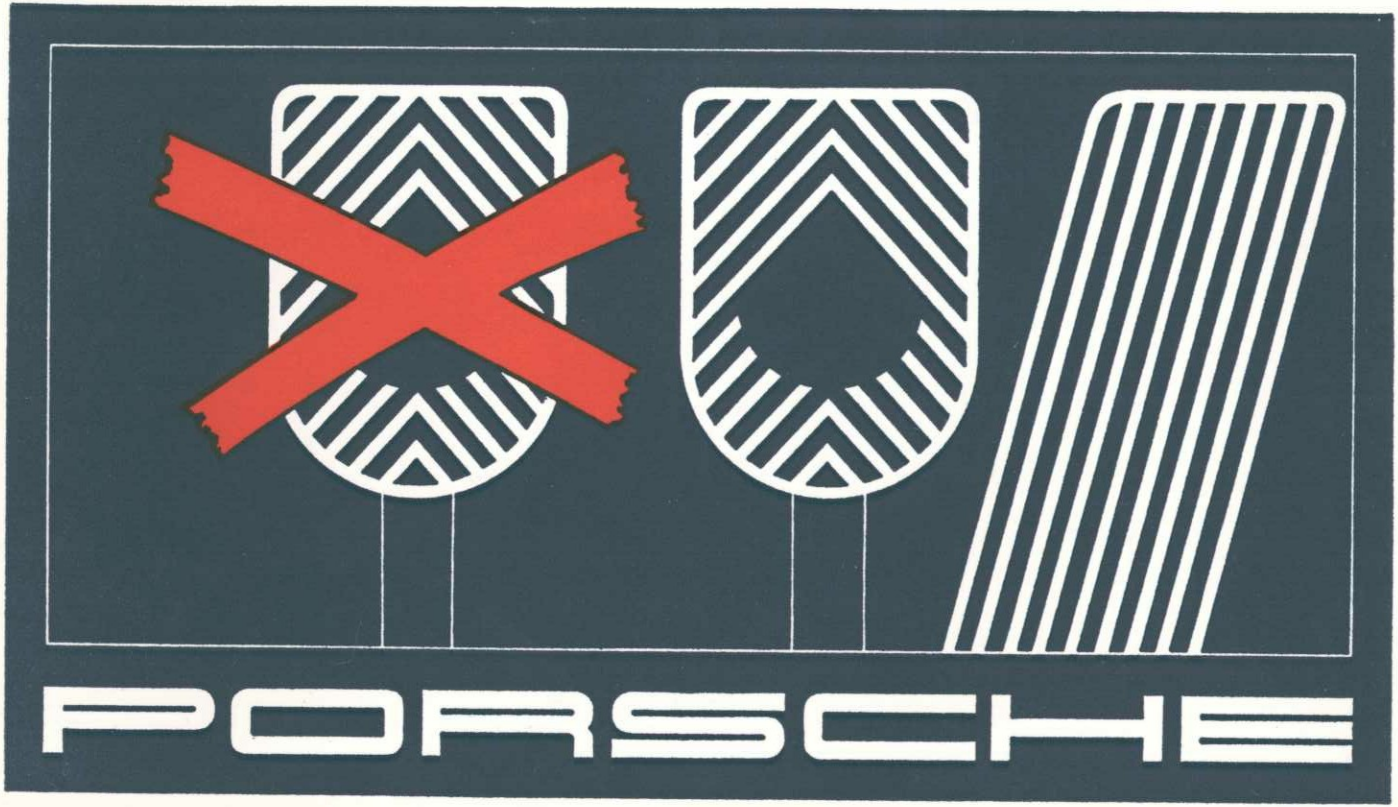
Driving with SPORTOMATIC



Annex
to Driver's Manual

If you are just about to test drive
your newly acquired Porsche
you'll have little time for reading
involved technical manuals.

For this reason we have compiled
this small pamphlet for your convenience
and suggest that you

First – Read the few pages entitled
Introduction to Your First Sportomatic
before driving away!

Then – Closely study the entire pamphlet
at your earliest opportunity
so that you may fully enjoy
the many virtues of the Sportomatic.

We wish you many happy times in your
Porsche

Where Driving Is At It's Best!

Introduction to Your First Sportomatic

First of all, it is very important that you become accustomed to two things:

There is no clutch pedal. Make sure that your left foot does not depress the brake pedal by mistake when shifting gears.

Hold the gearshift lever only when you are just about to shift a gear. As soon as that has been done, let go of the lever otherwise the automatic clutch will remain disengaged and the engine will race.

But let's talk about driving:

1. Move gearshift lever into neutral (set parking brake).
2. Turn the ignition on and start engine.
3. Take foot off the throttle and move gearshift lever into "D" for all normal purposes; when starting on inclines, shift into "L".
4. Accelerate slowly and release the handbrake – the car will begin to move.
5. Watch the tachometer and when having reached the maximum permissible engine speed, at the latest, shift into next higher gear. Gear position "D" however, will suffice for any and all city driving situations.

Shift pattern in gearshift knob Fig. 1

P = Park
R = Reserve
L = Low
D = Drive
D 3 = Drive 3
D 4 = Drive 4

6. On open stretches, shift gears as accustomed to although gear "L" will be needed only on steep inclines.

7. When stopping briefly, such as for traffic lights or in congested traffic, the gear speed can remain engaged and one needs only to depress the accelerator to drive away.

8. When making brief stops with the gear engaged, keep your foot on the brake pedal since otherwise the car will creep slowly forward.

9. When parking the car, shift into "P" which will block the rear wheels. Secure the vehicle additionally by setting the hand brake.

The above hints were provided for a brief introduction. Presented below is additional information which deals with driving techniques and technical details of the Sportomatic.

Driving with the Sportomatic

As you have noticed, the engine cannot be stalled when driving away or when braking. This is due to the application of a hydraulic torque converter and, consequently, the absence of solid mechanical connections between the engine and transmission. When the throttle is applied, the power flow to the rear wheels is initiated and continues to increase smoothly along with the speed of the engine as long as a gear is engaged.

At idling speed, practically no torque is transmitted through the torque converter unit.

Operating the Gearshift Lever

Since the power flow cannot be interrupted in the torque converter at higher engine speeds, an automatically actuated clutch has been provided between the torque converter and the transmission to positively disengage the engine when gears are being shifted.

When the gearshift lever is touched, a switch closes an electric circuit and the transmission clutch is disengaged by pneumatic means. For this reason, do not touch the gearshift lever as long as the throttle pedal is depressed; this would cause the engine to race. Having shifted the desired gear, let go of the gearshift lever to allow the automatic clutch to engage.

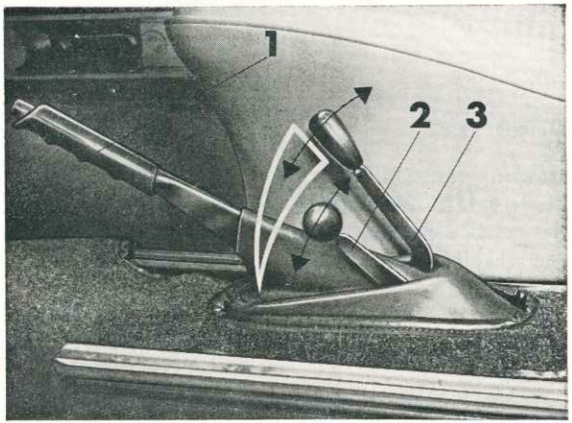
Note:

Do not misuse the clutch when driving away by raising the engine speed and keeping one hand on the gearshift lever while waiting for a traffic light to change, with the intention of moving on by letting the lever go. This procedure does not improve the acceleration time and, on the other hand, will definitely ruin the clutch.

The engine will not stall even if driving away in gear position D 3 or D 4. However, this practice is not recommended since the car accelerates slower when higher starting gears are selected.

Hand Throttle

The hand throttle sets engine idling speed. When the engine is still cold and tends to stall in traffic, such as at traffic lights, pull the lever up to bring engine rpm to a smooth level. The car may be driven with the hand throttle set as mentioned above, however, if at the next stop you notice that it is taking more brake pedal pressure to keep the car from creeping forward, decrease the idle rpm by pushing the hand throttle lever down as necessary.



① Handbrake lever
② Hand throttle lever
③ Heater control lever

Fig. 2

Should the Engine Stall

despite the above precautions, always first shift into neutral before attempting to restart with a key. The engine can be started only when the gearshift lever is in neutral or parking position since the starting circuit is interrupted when other gears are engaged.

Braking or Stopping

If traffic forces you to slow down or stop, you may comply by taking the foot off the throttle or by applying brakes. If necessary under certain conditions, you may use the engine braking power for that purpose. Whichever the case may have been, it is not necessary to shift into neutral when making a brief stop with the intention of moving on. It is however recommended to keep one foot on the brake pedal to prevent a forward creeping, especially when the hand throttle has been pulled up.

To drive on, all that is necessary is stepping on the throttle pedal. You may keep in mind that acceleration is quicker in the lower gears. With a few exceptions, it is recommended to use position "D" for driving away from a stop.

City Traffic

Start the engine and set engine rpm by moving the hand throttle lever as necessary. Move gearshift lever into position "D", release the hand brake, and drive away by stepping on the throttle pedal. The throttle pedal and brake pedal are the only controls necessary for driving in city traffic since the gear position "D" is fully adequate for coping with any imaginable city driving condition. The same applies to

Convoys, Congested or Slow Traffic Streams

The Sportomatic allows you to cope with congested traffic by keeping both hands on the steering wheel. There is no need for shifting gears or operating a clutch since the hydraulic torque converter progressively transfers engine torque and speed, automatically adapting itself to the given traffic situation.

Open Highways

Gear positions D 3 and D 4 are best suited for this type of driving. As soon as you have left the city traffic areas, shift into the above gear positions. Bear in mind that acceleration is better in the lower gear positions and downshift as may be required.

Backing Up

Shift into "R" and depress throttle.

Shunting

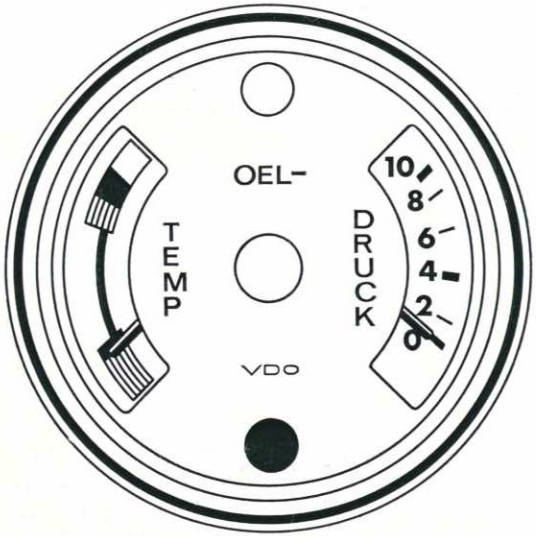
When parking or shunting into position, shift into "L" or "R" as required and slowly depress the accelerator pedal. Work foot brake at the same time to effect small corrections or control creeping when in neutral.

Parking

When parking your Porsche, first switch the ignition off and shift into "P", which will block the rear wheels. Set handbrake for added safety.

Mountain Driving

When climbing steep hills and especially when first starting off, shift into "L", even if you are forced to drive behind slower cars at low speed on less steeper inclines. In normal driving, when traversing mountain passes at brisque speeds, the "D" position certainly can be used. When starting uphill, you can keep the car from rolling back by depressing the brake pedal with your left foot.



Engine oil temperature gauge Fig. 3

Normally the hydraulic torque converter adapts itself very well to the aspect of terrain inclinations versus torque transfer.

However, in extremely unfavorable cases the oil in the torque converter can heat up considerably sending the oil temperature pointer into the red part of the dial.

If the oil temperature continues to rise, a warning lamp will light up. All that normally is necessary to bring the oil temperature down is shifting into the next lower gear, permitting you to drive on without delay. Should the warning light not go out shortly after, it will be necessary to shift down again to the next lower gear. This applies not only to mountain driving but to all traffic situations. When driving down-hill, shift into the same gear that was needed to drive up.

Quick Driving

is better yet with the Sportomatic. The hydraulic torque converter progressively stretches the mechanical gear ratios of each gear speed and permits the optimum in exploitation of engine power. You can throw the speeds of the 4-speed transmission to your heart's content, for acceleration or for braking, rapidly yet softly. Seasoned drivers will appreciate having the left foot completely free for braking.

Observe the tachometer and shift into the next higher gear when reaching maximum engine rpm – at the latest.

Winter Driving

Basically, special winterization is not required. Since the entire oil supply comes from the engine oil tank, the torque converter automatically receives the right oil viscotity for the given season.

The Sportomatic has many virtues as well when it comes to winter driving. As a result of its functions in the torque converter, the engine oil reaches operating temperature faster.

Driving away on snow or ice is much easier due to the soft and even transfer of power to the rear wheels. In difficult cases, gears D 3 or D 4 may be used to ensure velvet-smooth action. In general, when driving on slick roads it is best to select a gear speed which fits the road speed of the vehicle while still providing sufficient engine braking power. Should one-sided wheelspin occur when driving away, it is possible to provide a certain amount of limiting slip action by carefully tightening the handbrake lever (press lock button in) and, thus, diverting the torque to the standing wheel.

When the Battery Goes on the Blink...

It does not happen very often today, but it does happen occasionally that the battery is found too weak to start the engine. Here are a few hints on how to tow-start the car:

When towing your Sportomatic-equipped Porsche, the power transfer is reversed from that of driving away. It is therefore necessary to bring the torque converter to the speed required for transfering the torque needed for starting the engine in this reversed process. For this purpose, proceed as follows:

1. Turn the ignition on
2. Pull the hand throttle lever up
3. Shift into "L"
4. Tow car at approx . 35 kmh (20 mph) and apply throttle. This speed is sufficient to turn the engine crankshaft.

   Caution

   Keep left foot on brake pedal to prevent a rear-end collision when the engine starts with higher speed due to hand throttle setting.

5. As soon as the engine has started, continue to drive if so possible. Otherwise shift into neutral and allow engine to warm up.

Towing

Should towing of your Porsche be necessary for some reason, you need only to shift into neutral. Without any limitations concerning towing speed or distance you may tow the car to the next Porsche shop. However, acquaint yourself with the local traffic code pertaining to this operation.

Maintenance and Adjustments

Maintenance Schedule

Vehicles with the Sportomatic are subject to the supplementary maintenance plan shown below

At Odometer Reading of 6000 miles	Work Required	then every
X	Check clutch free play, readjust if necessary	6000 miles
X	Check control valve adjustment, readjust if necessary	6000 miles
X	Clean air filter in control valve	6000 miles
X	Clean contracts in gearshift lever switch, readjust if necessary	6000 miles

Please Note:

Maintenance and repairs of the Sportomatic require not only the necessary know-how but also special tools and equipment.

We therefore strongly suggest that all work of this nature be performed only by an authorized Porsche service representative.

Checking Clutch Free Play (power train installed)

1. Raise car.
2. Push the throttle linkage cross-shaft at the transmission towards full-throttle position so that the vacuum actuator is depressurized, and with the left hand push clutch intermediate lever towards the rear wheel. A free play of at least $^1/_4$" or 5 mm must be felt at the intermediate lever. If there is less clearance than stated above, the power train must be removed and a basic clutch adjustment accomplished Clutch free play at basic setting is $^1/_2$"(10–12 mm).

Basic Adjustment of Clutch Free Play

1. Remove power train.
2. Remove cotter key from pin connecting actuating rod and intermediate lever, remove pin.
3. Pull the actuating rod in the direction away from the vacuum actuator as far as possible, and push the intermediate lever towards the vacuum actuator. In this position, the actuator rod clevis must be so adjusted that the clevis pin bore extends $^1/_2$" (10–12 mm) beyond the pin bore in the intermediate lever. (See distance A in Fig. 4.)

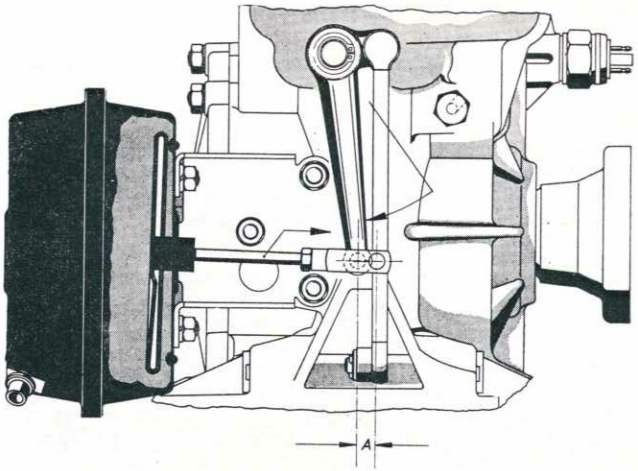


Fig. 4

4. Reinstall power train. (Prior to reinstallation it is necessary to check the plunger adjustment of the control valve, readjusting if necessary.)

Checking Disengagement of Transmission Clutch

It must be possible to shift into reverse without clashing the gears when the engine is running at idle speed.

Adjusting Control Valve

Proper adjustment of the control linkage and engine idle speed is a prerequisite for this work.

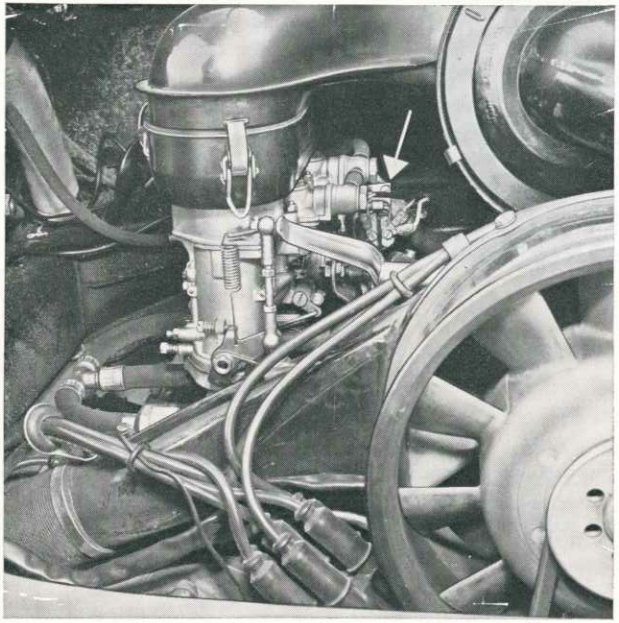


Fig. 5

a. Upshifting on Acceleration

1. A clearance of 1.5 mm (.06") must be had between the control valve plunger and the drag spring above the cam.

It should be noted that this adjustment is made with the cam in fully returned position.

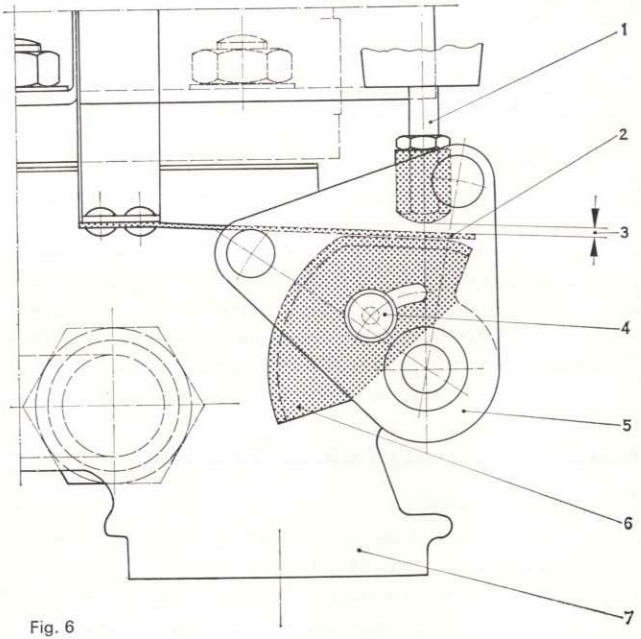


Fig. 6

1 Control valve plunger
2 Drag spring
3 Clearance of 1.5 mm
4 Allen bolt
5 Throttle cross-shaft
6 Cam disc
7 Intake manifold

2. Place a 3 mm thick (.12") sheetmetal shim under the left idle speed stop screw (open the throttle) and adjust the cam so that the drag spring just begins to touch the control valve plunger. (In idle throttle position, the initially adjusted clearance of 1.5 mm between the plunger and drag spring can be changed although a minimum clearance of 1.0 mm (.04") must be maintained.) A 3 mm Allen wrench is needed for adjusting the cam disc.

b. Downshifting on Deceleration (braking)

Proper adjustment of the deceleration downshift phase can be determined only under actual driving conditions or with the vehicle placed on a roller test stand while performing the downshift.

A rough guide for determining proper adjustment in a standing vehicle can be as follows: Set handbrake, allow engine to idle, engage a gear. From the instant when the gearshift lever is released to the perceptible impact of engagement, the time lag should be 0.3–0.5 seconds.

Checking under actual driving conditions:

Drive at 4500 rpm in "D" position, take foot off throttle and downshift into "L". The clutch engagement now should take place without a time lag although the rear wheels should not lock in the process. This adjustment can be accomplished in any way suiting the owner.

Clean Control Valve Air Cleaner

Unscrew air cleaner and wash in cleaning solvent. Do not wet the filter with oil.

Correcting the Deceleration Downshift Phase Adjustment

1. Remove air cleaners.
2. Remove plastic cover from above the adjusting screw at the control valve.
3. Turn the self-locking adjusting screw with a screwdriver in or out.
   a. When turning the adjusting screw in (clockwise), a softer and delayed clutch engagement is effected.
   b. When turning the adjusting screw out (counter-clockwise), a harder and more instantenous clutch engagement is effected.

   Caution: Turn the adjusting screw by no more than $^1/_4$ to $^1/_2$ turns at a time so that the setting is not changed excessively.
4. Reinstall the plastic cover above the adjusting screw in the control valve; reinstall air cleaners.

Control Switch in Gearshift Lever

The control switch contacts in the gearshift lever must have a clearance of 0.3–0.4 mm when the gearshift lever is in neutral position. The adjustment can be corrected by bending the outer contact arms. Dirty or pitted contacts should be cleaned or, if necessary, the control switch replaced.

Labricating Oil

The oil brand and manner of chacking the oil level remain unchanged:

Summer = Premium brand HD oil, SAE 30
Winter = Premium brand HD oil, SAE 20

Oil level in Sportomatic-equipped engines also is checked when the engine is running, either by means of the gauge or the dipstick. Make sure that the torque converter is filled with oil and ander pressure when checking the oil level. If in doubt (such as upon completion of reassembly), we advise to disconnect the oil return line (torque converter to oil tank) at the oil tank and see if the oil is flowing through.

Together with the oil contained in the torque converter and the connecting line, the total amount of oil in the system is approx. 12 US quarts (11 ltr.). Only the regular amount of 10 US qts (9 ltr.) need be filled when changing the engine oil.

The oil change intervals remain unchanged.

1 Control switch
2 Pin
3 Gearshift lower part
4 Stop collar
5 Ball
6 Pressure spring
7 Contact gap 0.3–0.4 mm
8 Switch fixed in place through snap-fit in pin
9 Lightly lubricate internal parts at reassembly

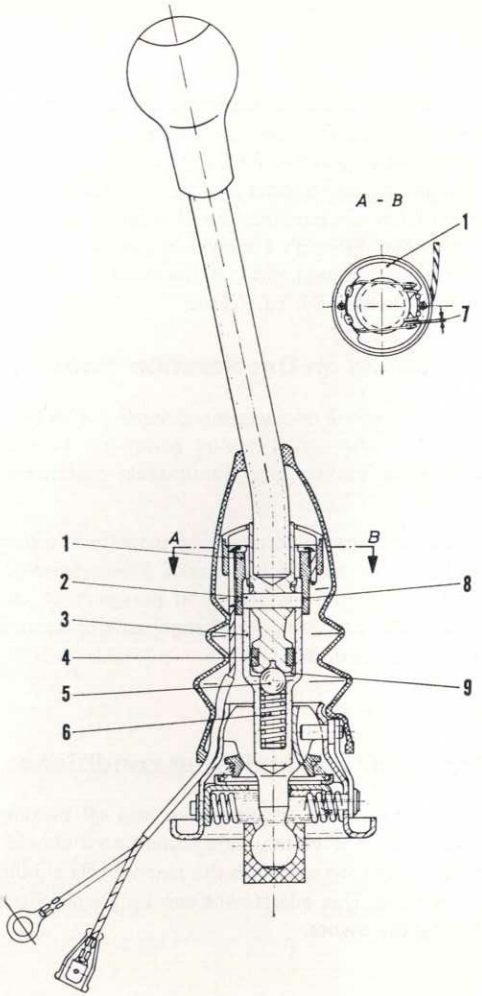


Fig. 7

Sportomatic Function Description

The Torque Converter

When air is blown against a fan, it will spin. If an electric fan is placed in front of a free-wheeling fan, the latter will spin, increasing its speed as the flow of air increases.

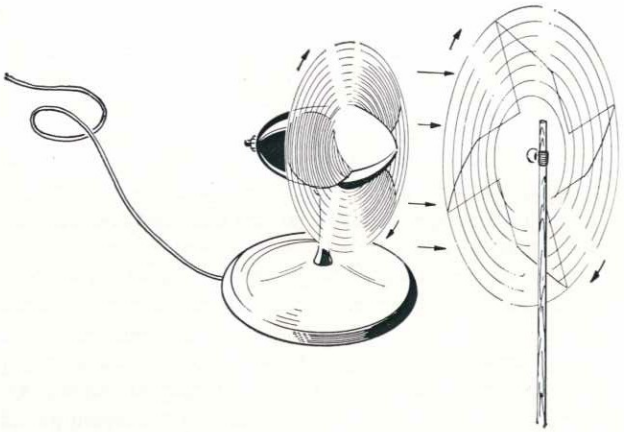


Fig. 8

Shown in the above illustration is torque transfer by means of air. If the air were replaced with oil, and the two fans with finned tori, the assembly would represent a basic fluid coupling, although the torque transfer in a fluid coupling takes place in a closed housing.

Fluid coupling

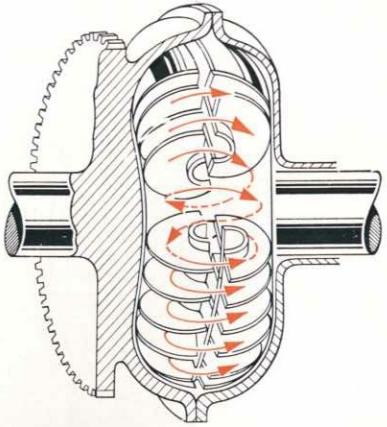
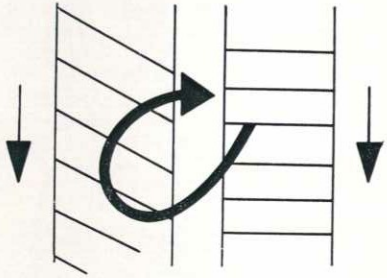


Fig. 9



Oil circulation in a fluid coupling (schematically) Fig. 10

However, a fluid coupling of this type cannot multiply the torque, only pass it on at the 1:1 ratio at its best.

By guiding the oil stream through the vanes of the stator, it is possible to have the returning oil enter the driving torus at such an angle as to actually result in a torque gain in proportion with the speed of the tori.

The illustrations show the main components of the torque converter:

1. The drive torus, or pump.
2. The driven torus, or turbine.
3. The stator, or reaction member.

The pump, turbine, and stator are contained in a closed housing filled with pressurized oil. Transfering the power is inertia of the oil which circulates from the pump to the turbine to the stator and back to the pump in a closed circuit.

The vanes of the pump torus, which is driven by the engine, force the oil against the vanes in the turbine torus. This causes the turbine torus to rotate. As the oil leaves the turbine, it flows into the stator whose obliquely positioned vanes guide it into the pump at the most advantageous angle, thus actually pushing the driving torus. A free-wheeling unit supports the stator on the stationary transmission housing and prevents a counter-rotation of the stator in relation to the pump and turbine. As a result, the action of the stator multiplies the torque which flows from the pump to the turbine. The torque multiplication is greatest when the vehicle is about to move on from standstill, dropping progressively to the 1 : 1 ratio as the car gains speed.

Fig. 11

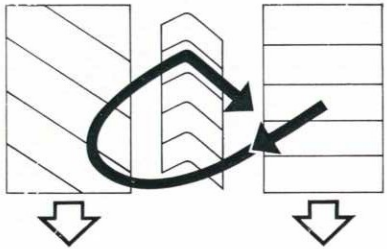


Fig. 12

When the engine speeds up and turns the drive torus faster than the speed of the driven torus, the stator causes a torque multiplication which results in increased power delivery to the rear wheels.

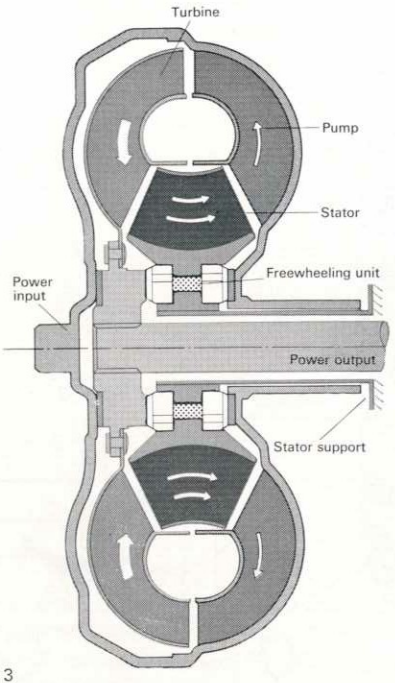
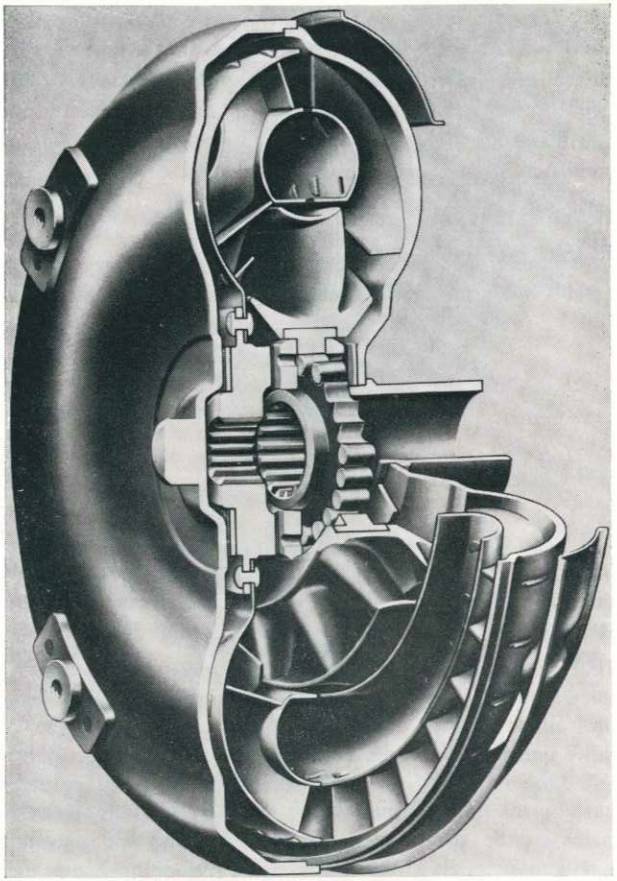


Fig. 13



Torque converter cut-away

Fig. 14

The torque multiplication increases in proportion with increasing difference in speed between the pump and turbine. However, this condition is relatively short as the speed of both tori becomes almost same, thus nullifying the torque multiplication process and reverting the torque converter to the function of a normal fluid coupling; the stator then freely runs along with the two tori.

To permit shifting the gears in the transmission, means had to be provided for interrupting the flow of power from the engine and torque converter on one side to the transmission on the other. Since it is not possible to interrupt the power flow in the torque converter at high speed, a mechanical clutch was installed between the converter and transmission. The clutch is actuated by a vacuum servo unit which is connected to the induction manifold in the engine. A valve controls the flow of vacuum between the intakte manifold and the servo unit.

Since the vacuum is very weak under full throttle conditions, and there being none when the engine is not running, a vacuum reservoir has been provided and permits a multiple actuation of the clutch during low vacuum periods.

A switch in the gerashift lever actuates a control valve as soon as the gearshift lever is touched by hand.

Torque converter with dry clutch

Fig. 15

Function Schematics

Schematic of Clutch Disengagement in Neutral Position of Gearshift Lever

(Engine running)

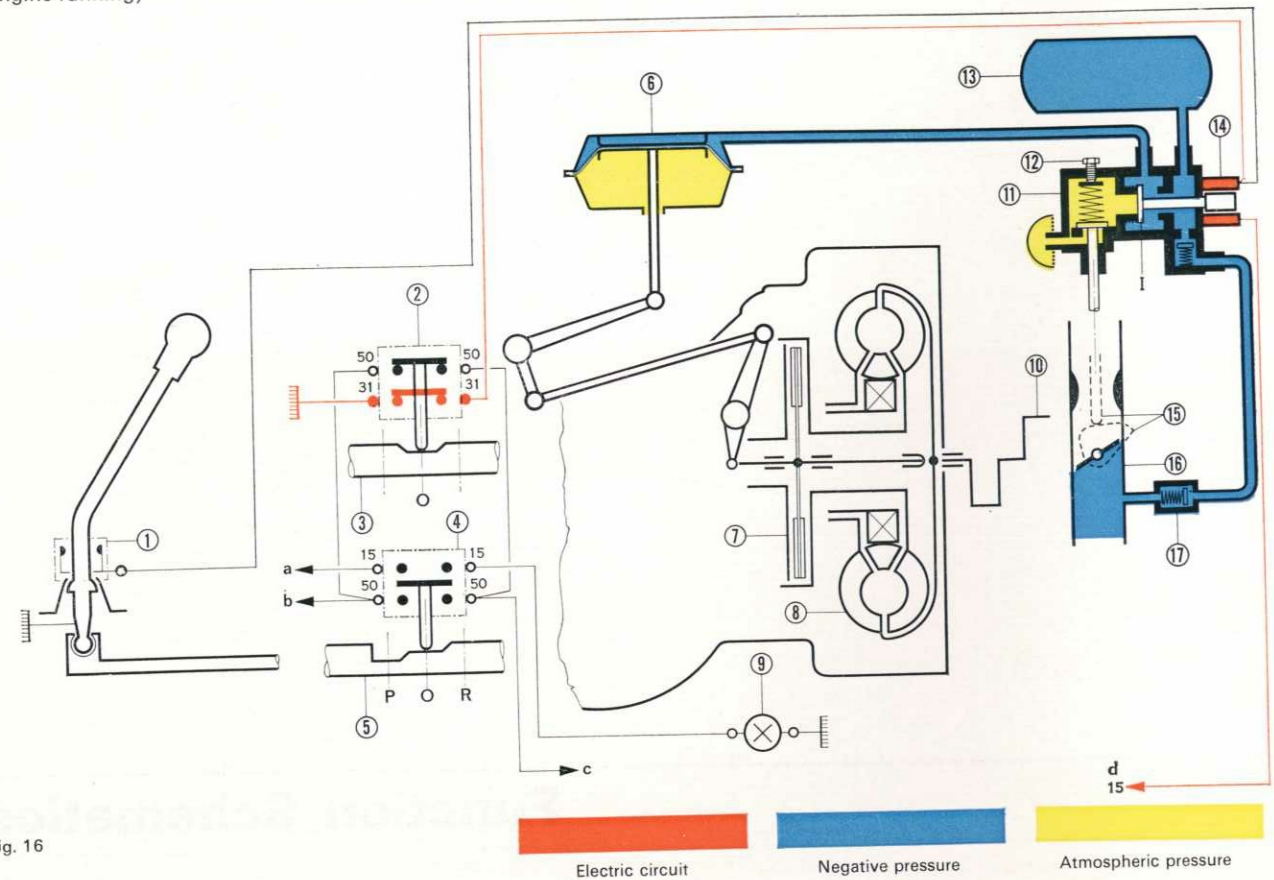


Fig. 16

Clutch Disengagement in Neutral Position of Gearshift Lever

The bypass swith (2) at the inner shift rod closes the circuit to the solenoid (14) of control valve (11) while the gearshift lever is in neutral position. The solenoid opens the main valve (I), which connects the vacuum reservoir (13) with the vacuum actuator or servo motor, thus depressurizing the upper part of the actuator. As a result, atmospheric pressure in the lower part of the actuator is able to move the piston in the vacuum actuator (6) upwards and so disengage the transmission clutch (7) through a system of linkages.

1 Gearshift lever switch
2 Bypass switch
3 Inner shift lever
4 Backup light switch and park position contact
5 Shift rod P and R
6 Vacuum actuator
7 Transmission clutch
8 Torque converter
9 Backup light
10 Crankshaft
11 Control valve
12 Adjusting screw
13 Vacuum reservoir
14 Electric solenoid
15 Cam and plunger
16 Induction manifold
17 Check valve

a Wire from Fuse 1
b Wire from ignition switch
c Wire to starter terminal 50
d Wire to intermediate fuse 8/15 Amps

Schematic of Clutch Disengagement when Shifting Gears

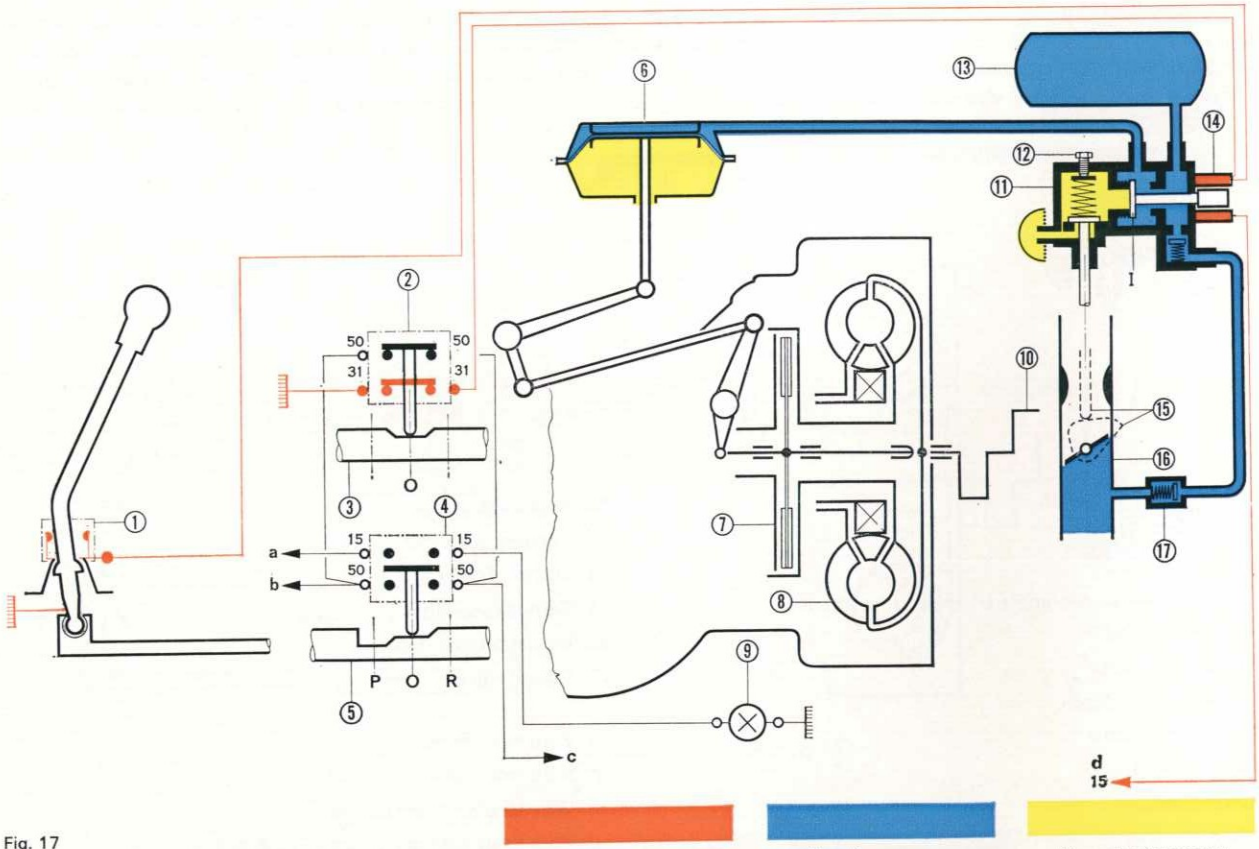


Fig. 17

Clutch Disengagement when Shifting Gears

Whenever the gearshift lever is touched while shifting gears, the gearshift lever switch (1) closes the circuit to the control valve solenoid (14). The solenoid opens the main valve (I), which connects the vacuum reservoir (13) with the vacuum actuator, thus depressurizing the upper part of the actuator. As a result, atmospheric pressure in the lower part of the actuator is able to move the piston in the vacuum actuator upwards and so disengage the transmission clutch through a system of linkages.

Shortly before the gear engages, the contacts in the bypass switch (2) open due to movement of the inner shift rod, and the electrical circuit remains closed only through the switch in the gearshift lever.

1 Gearshift lever switch
2 Bypass switch
3 Inner shift lever
4 Backup light switch and park position contact
5 Shift rod P and R
6 Vacuum actuator
7 Transmission clutch
8 Torque converter
9 Backup light
10 Crankshaft
11 Control valve
12 Adjusting screw
13 Vacuum reservoir
14 Electric solenoid
15 Cam and plunger
16 Induction manifold
17 Check valve

a Wire from Fuse 1
b Wire from ignition switch
c Wire to starter terminal 50
d Wire to intermediate fuse 8/15 Amps

Schematic of Clutch Engagement when Downshifting on Deceleration (Braking)

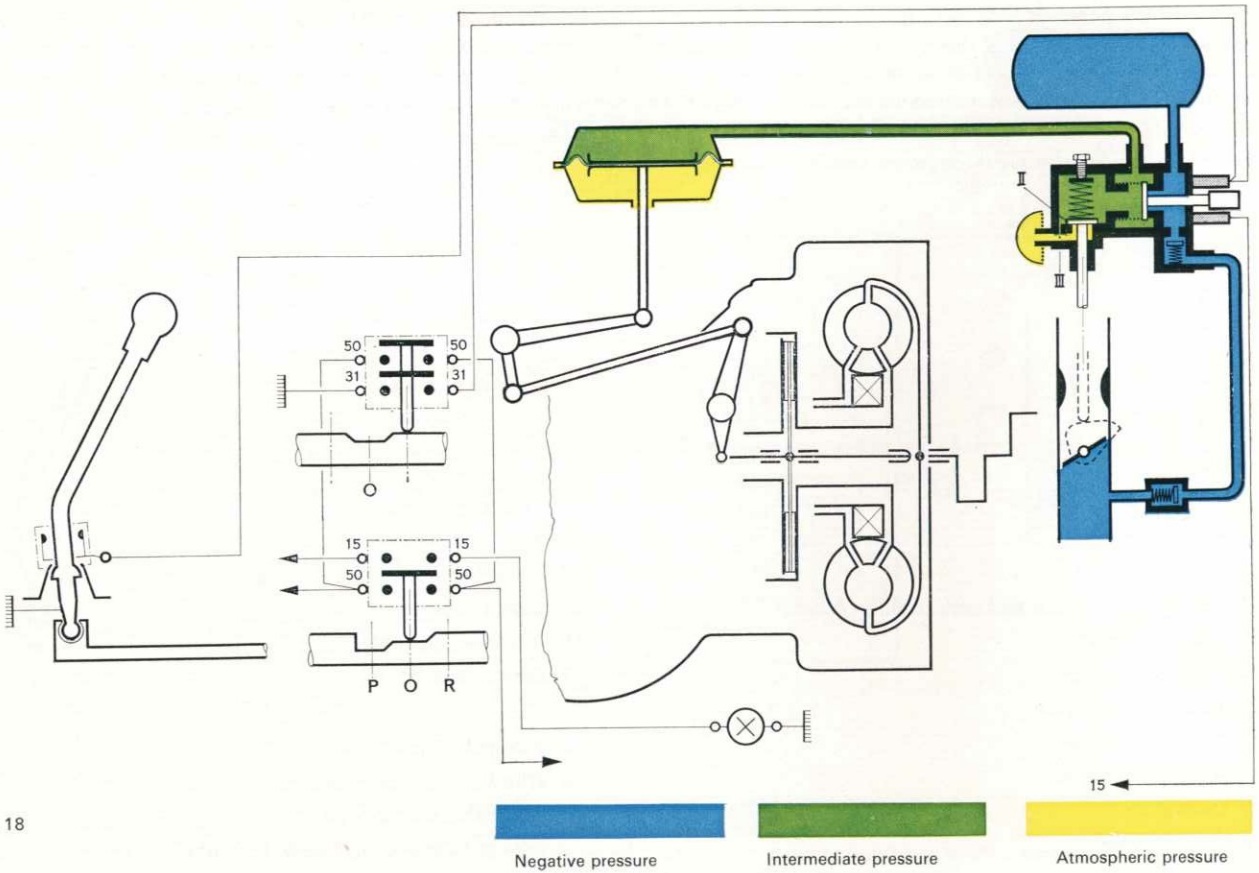


Fig. 18

Clutch Engagement when Downshifting on Deceleration (Braking)

When clutch engagement is made in connection with deceleration, or braking, of the vehicle with throttles shut, then the negative pressure between the control valve (11) and the vacuum actuator (6) is neutralized in two stages via the reduction valve (II). First, the reduction valve opens fully and reduces the negative pressure to an intermediate pressure (green). Once the reduction valve (II) has closed, the intermediate pressure is neutralized at a slower rate through small bypass orifices (III), that is, the clutch engages brisquelly with a delay of approx. 0.3 to 0.5 seconds.

Schematic of Clutch Engagement when Upshifting on Acceleration

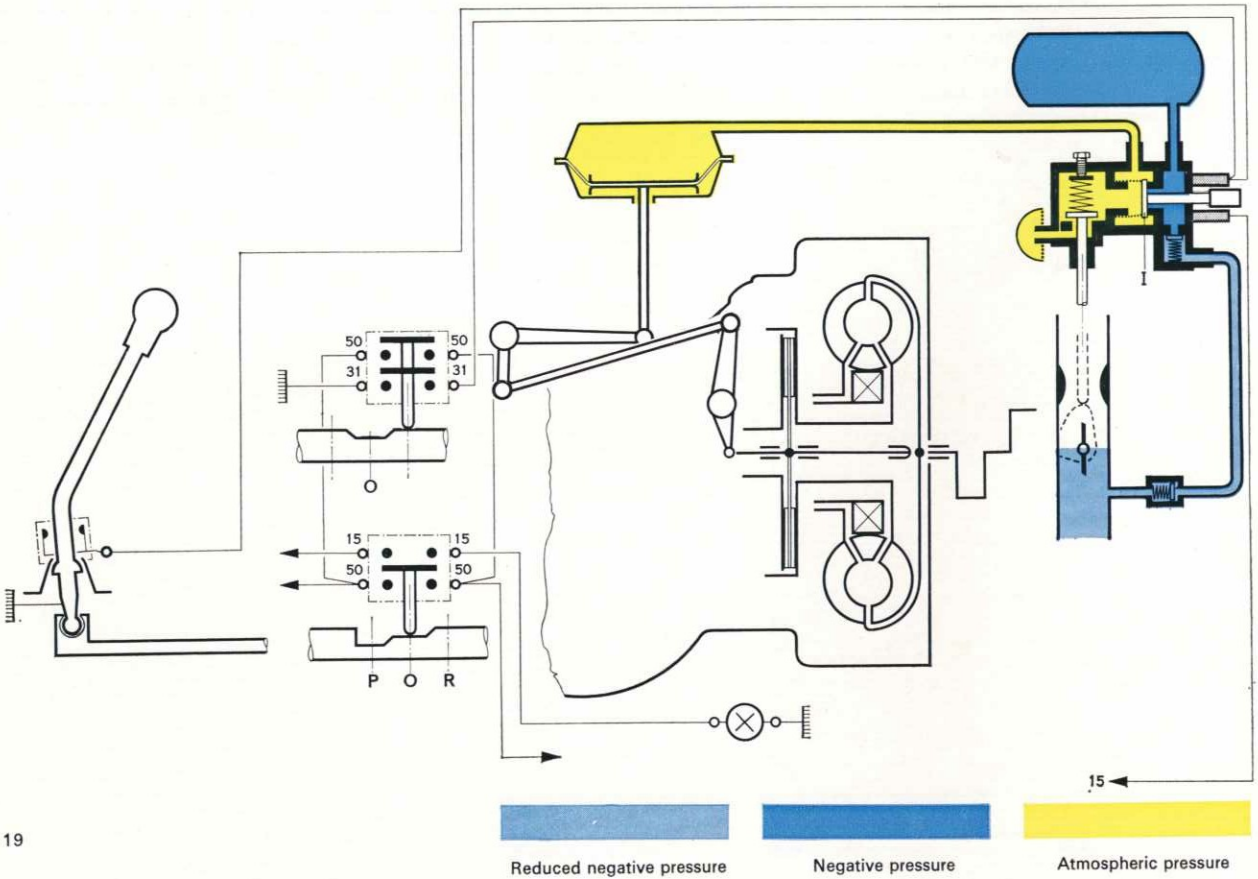


Fig. 19

Clutch Engagement when Upshifting on Acceleration

When the gearshift lever is released upon completion of a gear shift phase, the electric circuit opens in the gearshift lever switch; the main valve (I) is pressed back through atmospheric pressure and both parts of the vacuum actuator are equalized at atmospheric pressure. The clutch engagement can be sped up through instantenous releasing of the gearshift lever and immediate acceleration.

A cam installed in the throttle linkage quickly opens the reduction valve (II) by way of a plunger and results in immediate engagement of the clutch.

Schematic of the Sportomatic Oil Circuit

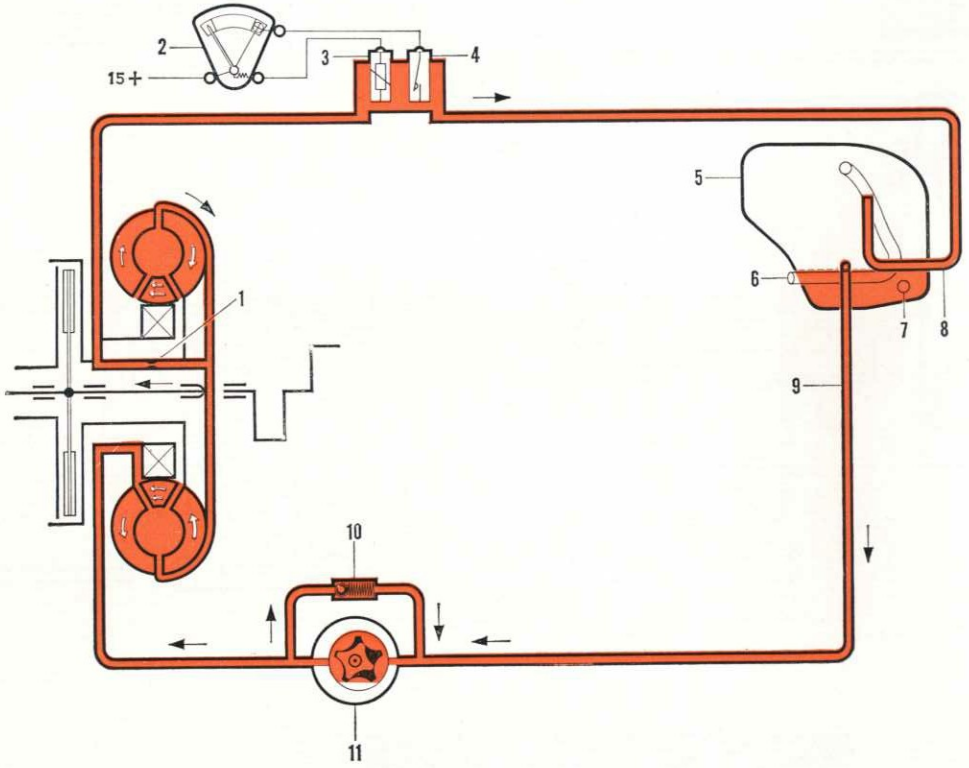


Fig. 20

The Sportomatic Oil Circuit

1 Calibrated passage in turbine shaft
2 Engine oil thermometer
3 Engine oil temperature sender
4 Temperature switch
5 Oil tank
6 Oil line from engine
7 Oil line to engine
8 Return line
9 Suction line
10 Pressure relief valve
11 Torque converter oil pump

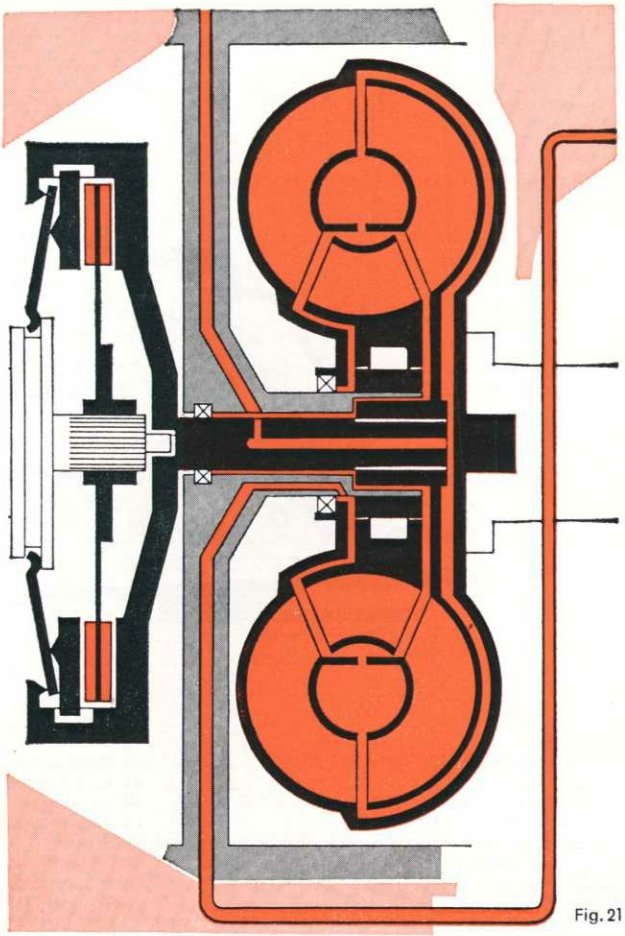
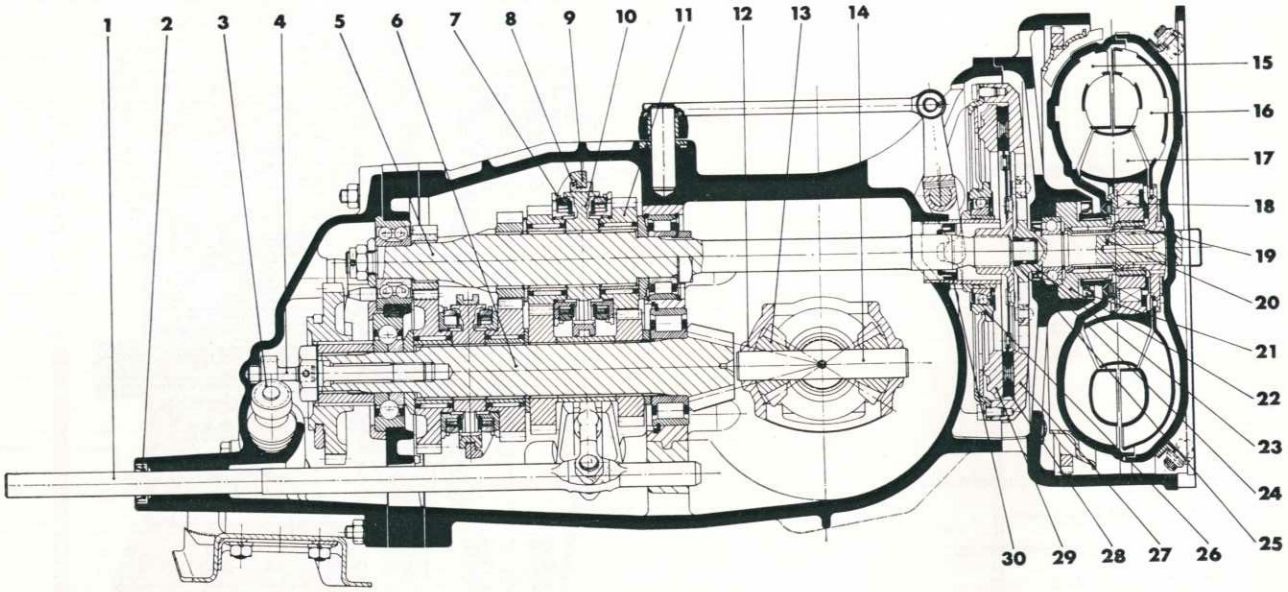


Fig. 21

Sportomatic Transmission in Cross-Section



1 Shift rod
2 Oil seal
3 Speedometer drive
4 Gear shaft
5 Input shaft
6 Pinion shaft
7 Synchronizing ring
8 Sliding sleeve
9 Shift fork
10 Spider
11 Gear 1, 4th speed
12 Differential carrier
13 Bevel spider gear
14 Spider gear shaft
15 Pump torus
16 Turbine torus
17 Stator
18 Freewheeling unit
19 Turbine torus shaft bushing
20 Metered passage in turbine shaft
21 Oil seal
22 Freewheeling unit support
23 Input needle bearing
24 Oil seal
25 O-ring
26 Clutch throwout bearing
27 Clutch carrier with turbine shaft
28 Clutch plate
29 Clutch pressure plate
30 Oil seal

Technical Data

Technical Data

The technical data shown below differ from the information given in the respective editions of the standard Driver's Manual for vehicles Type 911 T and 911E:

Power Train

Clutch	Hydromatic torque converter with automatically controlled dry clutch
Number of speeds:	Four forward, 1 reverse, 1 park
Rear axle ratio:	7 : 27 i = 3.857
Gear rations in speeds:	
Low	15 : 36
Drive	20 : 31
Drive 3 (D3)	24 : 27
Drive 4 (D4)	28 : 24

Filling capacities (engine)

approx. 12 US qts oil (11 ltr.);
at oil change 10 US qts (9 ltr);

Premium brand HD oil, acc. API specification MS Summer SAE 30, Winter SAE 10 below 5°F
SAE 20 from 5°F up to 32°F

Weights

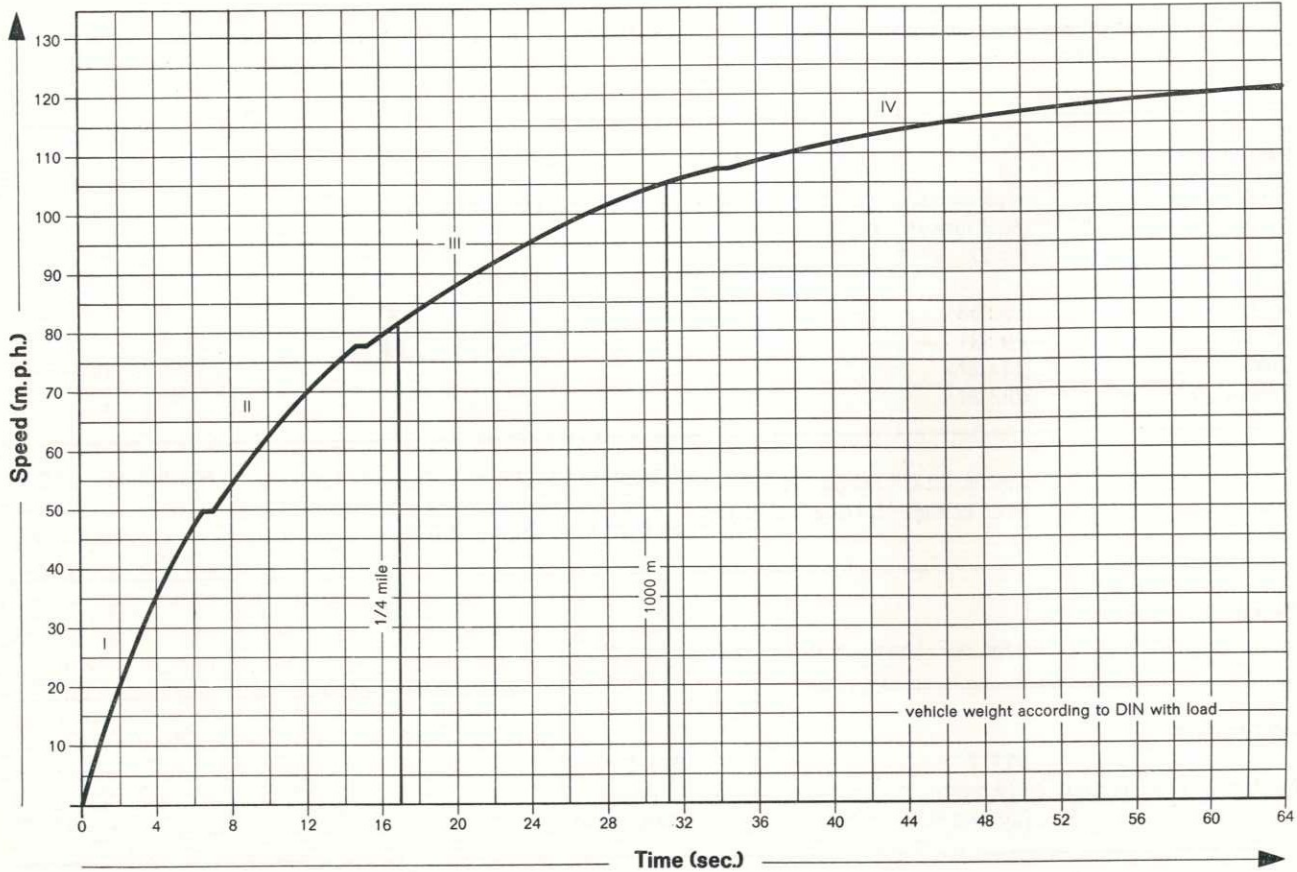
Empty weight (DIN) 2290 lbs (1035 kp)

Performance

	911 T	911 E
Maximum speed approx.	125 mph (200 km/h)	134 mph (215 km/h)

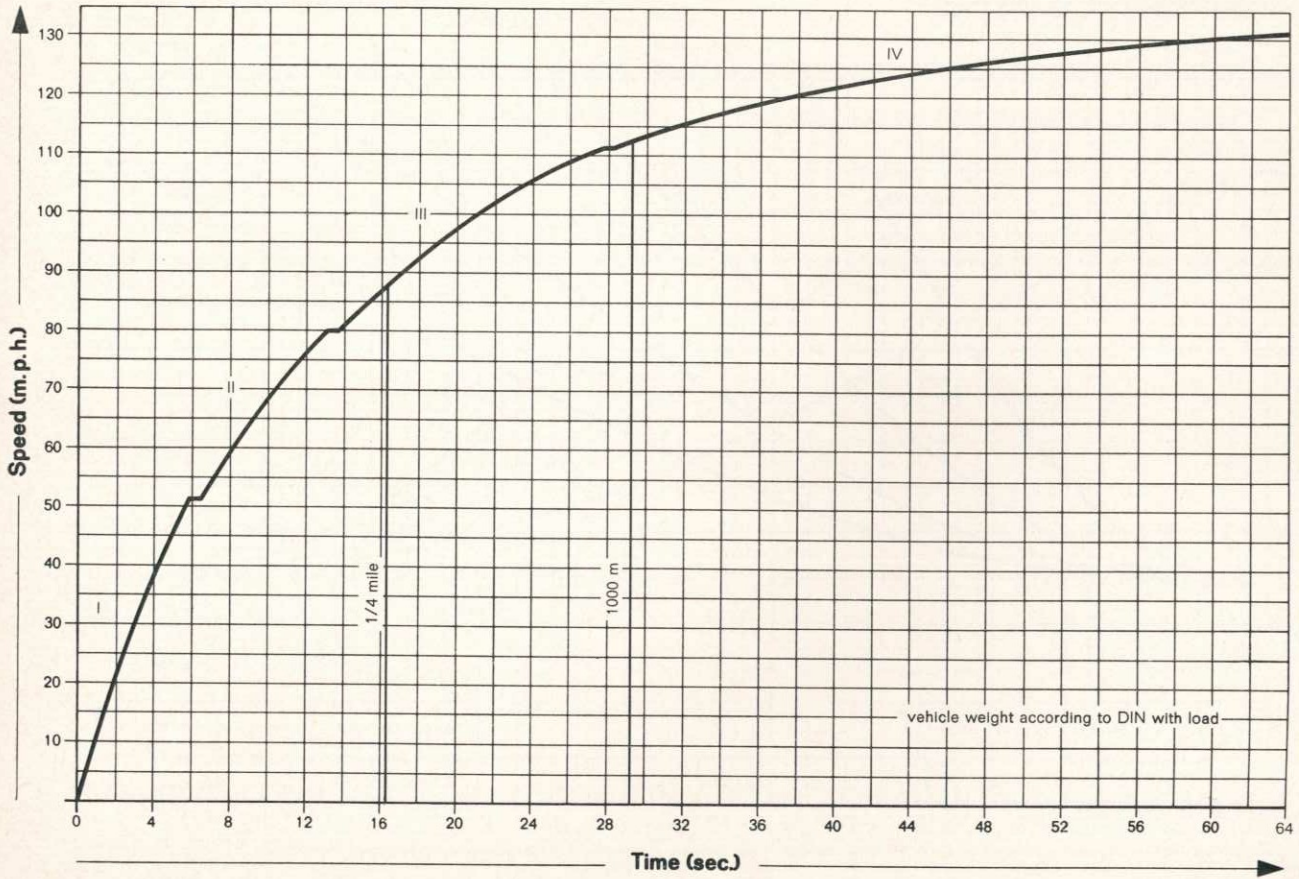
Acceleration Curve Type 911 T

SPORTOMATIC



Acceleration Curve Type 911 E

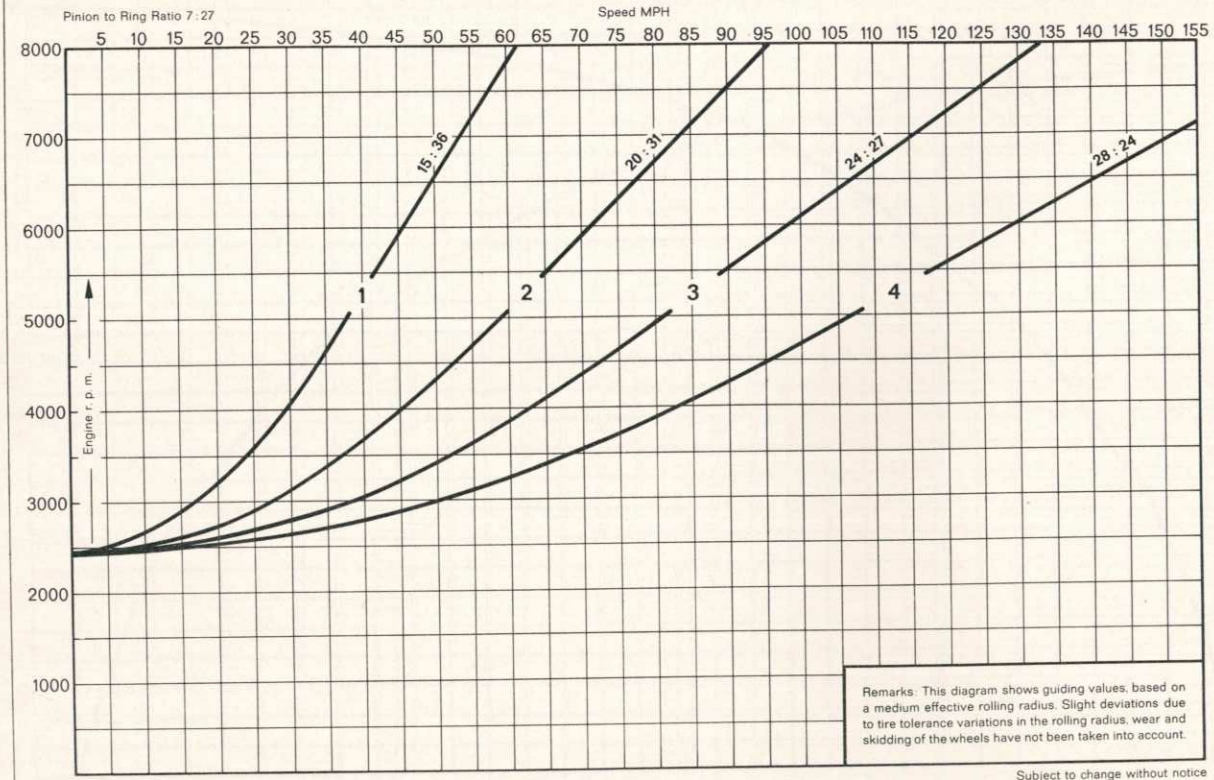
SPORTOMATIC



PORSCHE

SPORTOMATIC

Type 911 T Transmission Diagram

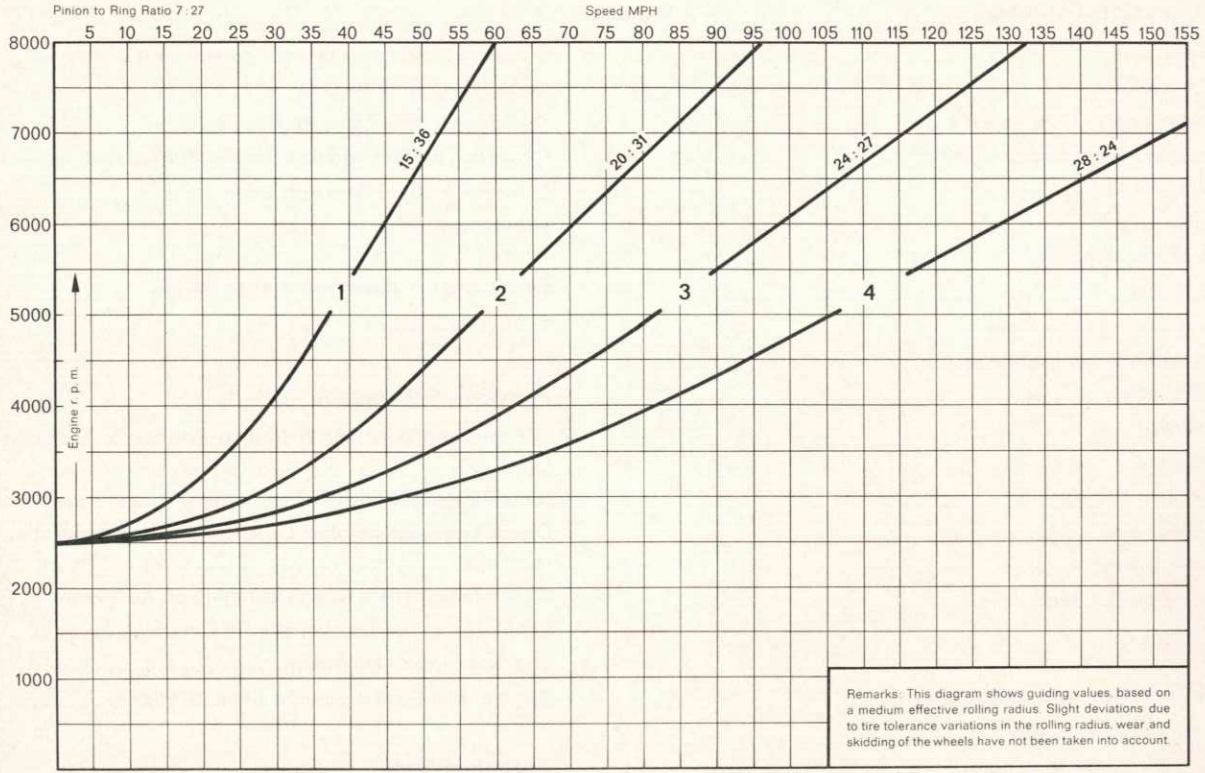


Subject to change without notice

PORSCHE

SPORTOMATIC

Type 911 E Transmission Diagram



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Index

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