

FUNCTION : AMN8 / ATN8 TYPE AUTOMATIC GEARBOX

N.B. : (*) According to version.

The automatic gearbox consists of several functions which reduce fuel consumption and ensure smooth gear changes.

1. Lock-up and slip control

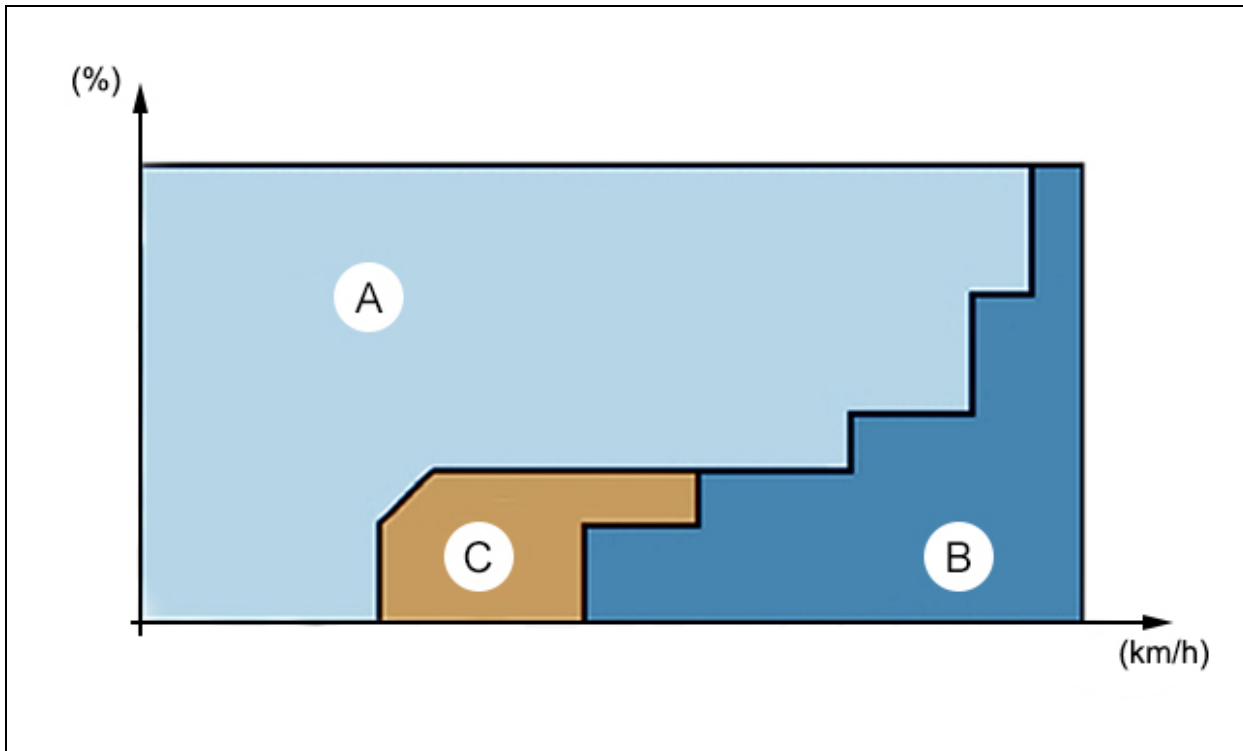


Figure : D4EAE0HD

(%) : Opening of the motorised throttle (As a percentage).

(km/h) : Vehicle speed (In km/h).

"A" Lock-up deactivated.

"B" Lock-up activated.

"C" Slip range.

The torque converter lock-up is controlled according to the following parameters :

- Engine speed
- Opening of the motorised throttle
- Vehicle speed
- Automatic gearbox output speed

The slip point is detected according to the following parameters :

- Engine speed
- Opening of the motorised throttle
- Vehicle speed
- Automatic gearbox output speed
- Automatic gearbox input speed

Control of the torque converter lock-up and management of the slip point are performed by the lock-up control solenoid (SLU).

The lock-up control solenoid (SLU) is controlled linearly.

1.1. Lock-up control solenoid (SLU) fully controlled

When the lock-up control solenoid (SLU) is fully controlled, the lock-up clutch in the torque converter is activated and connects the turbine and the impeller.

At this point, the engine and the automatic gearbox are coupled, the output engine power is connected directly to the automatic gearbox, eliminating any loss of transmission and improving fuel economy.

1.2. Lock-up control solenoid (SLU) partially controlled

When the lock-up control solenoid (SLU) is partially controlled, the lock-up clutch in the torque converter is operated outside the lock-up range.

The lock-up clutch slides without being fully coupled, which increases the transmission performance and improves fuel economy.

2. Control of the neutral position with the gear lever in position "D" or "R"

When the vehicle is stopped with the gear lever in position "D" or position "R", the gearbox is placed in the neutral position when the lock-up clutch is released.

By reducing the loss due to resistance of the torque converter, the load exerted on the engine is lightened, fuel economy is improved and power train vibration at idle is reduced.

The control is in the neutral position "N" :

- When the gear lever is in position "D", the clutch "C1" is controlled separately by a linear solenoid
- When the gear lever is in position "R", the clutch "C3" is controlled separately by a linear solenoid
- When the vehicle is stopped on a gradient, with the control "N" (in neutral position) and the gear lever in position "D", no idling force is generated

In this case, the brake B1 permits safe starting of the vehicle by preventing it from rolling backwards.

N.B. : The control of the neutral position only functions when the engine is warm. The control of the neutral position does not function on very steep gradients.

3. Reverse gear inhibiting control

When the vehicle is moving at a speed of more than 4 km/h, moving the gear lever from position "N" to position "R" does not engage reverse gear. This is to prevent the wheels locking.

When the reverse gear inhibiting control is activated, the gearbox selects position "N" and releases the clutches.

4. Automatic gear change control

When the automatic gearbox is operating in automatic mode :

- The gear position change control solenoids (SC2), (SC3) and (SC4) are activated or deactivated according to the gear selected by the installed software
- The line pressure control solenoids (SL1), (SL2), (SL3), (SL4), (SL5) and (SL6) operate linearly according to the vehicle speed information, motorised throttle opening (air mixer) and vehicle braking

Position of the gear change lever	Solenoid valve						clutches				Brake		Free wheel clutch			
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"P" (Car park)	-	-	-	-	-	Δ	○	-	-	-	-	-	-	-	Δ	-
"R" (Reverse gear)	-	-	○	-	-	○	○	○	○	-	-	○	-	-	○	-
"N" (Neutral)	-	-	-	-	-	Δ	-	○	○	-	-	-	-	-	Δ	-
"N", "R" (Neutral, Reverse gear)	-	-	-	-	-	-	-	○	○	-	-	-	-	-	-	-
"D" (First vehicle speed below 20 km/h)	○	-	-	-	-	Δ	-	-	○	○	-	-	-	-	Δ	Δ
"D" (First vehicle speed above 20 km/h)	○	-	-	-	-	-	-	-	○	○	-	-	-	-	-	○

"D" (First gear with engine brake)	O	-	-	-	-	O	-	-	-	O	O	-	-	-	-	O	O
"D" (Neutral position control)	Δ	-	-	-	Δ	-	-	-	O	Δ	-	-	-	Δ	-	O	
"D" (Second gear)	O	-	-	-	O	-	-	-	O	O	-	-	-	O	-	-	
"D" (Third gear)	O	-	O	-	-	-	-	-	O	O	-	O	-	-	-	-	
"D" (Fourth gear)	O	-	-	O	-	-	-	-	O	O	-	-	O	-	-	-	
"D" (Fifth gear)	O	O	-	-	-	-	-	-	O	O	O	-	-	-	-	-	
"D" (Sixth gear)	-	O	-	O	-	-	-	-	O	-	O	-	O	-	-	-	
"D" (Seventh gear)	-	O	O	-	-	-	-	-	O	-	O	O	-	-	-	-	
"D" (Eighth gear)	-	O	-	-	O	-	-	-	O	-	O	-	-	O	-	-	

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"Δ" Solenoids/clutches/Brakes/clutches with free wheel controlled at medium pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.1. Gear lever in position "D" - First gear

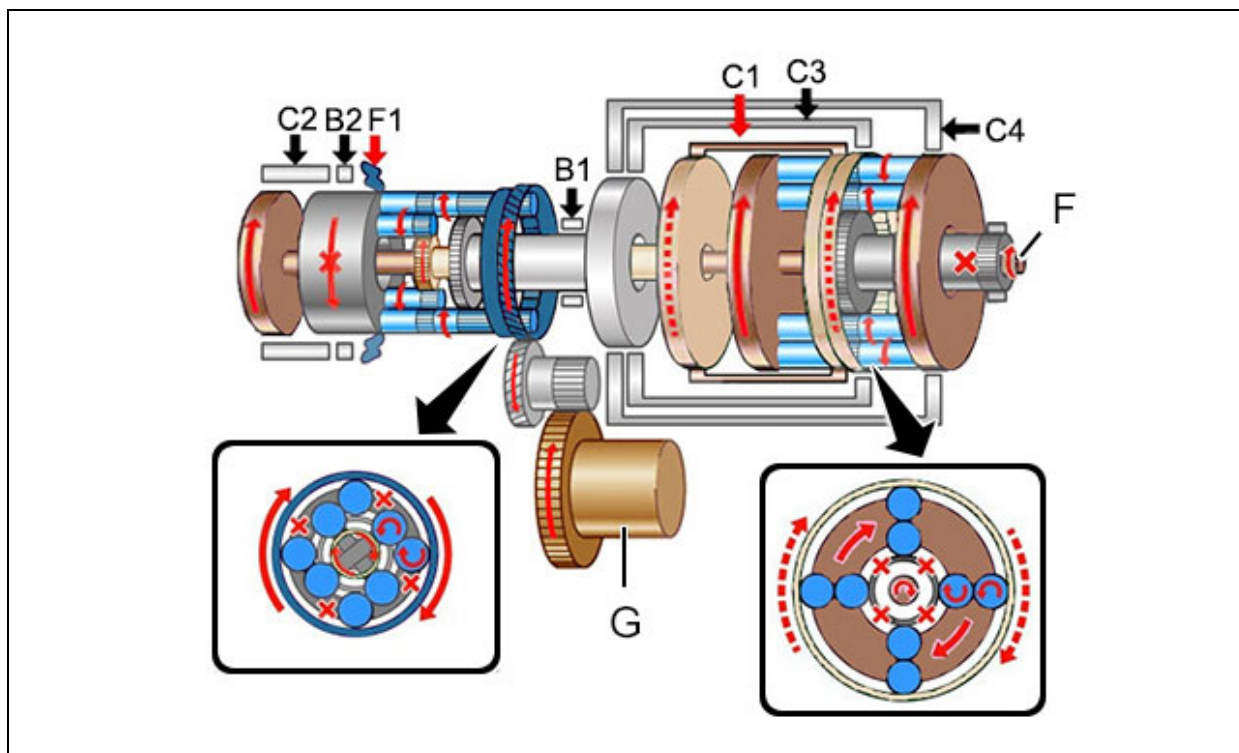


Figure : D4EAE0ID

"F" Input shaft.

"G" differential.

Position of the gear change lever	Solenoid valve										clutches				Brake		Free wheel clutch
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1	
"D" (First vehicle speed below 20 km/h)	O	-	-	-	-	Δ	-	-	O	O	-	-	-	-	Δ	Δ	
"D" (First vehicle speed above 20 km/h)	O	-	-	-	-	-	-	-	O	O	-	-	-	-	-	O	

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"Δ" Solenoids/clutches/Brakes/clutches with free wheel controlled at medium pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.2. Gear lever in position "D" - First gear with engine brake

Position of the gear change lever	Solenoid valve									clutches				Brake		Free wheel clutch
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"D" (First gear with engine brake)	O	-	-	-	-	O	-	-	O	O	-	-	-	-	O	O

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

When the engine brake is activated, the driving force is transmitted from the tyres.

Considering that the anticlockwise rotation of the rear sun gear carrier is locked by the free wheel clutch (F1), try to turn it clockwise and the brake (B2) is activated, the rear sun gear carrier is locked and the kinetic energy is transmitted from the tyres to the engine.

4.3. Gear lever in position "D" - Second gear

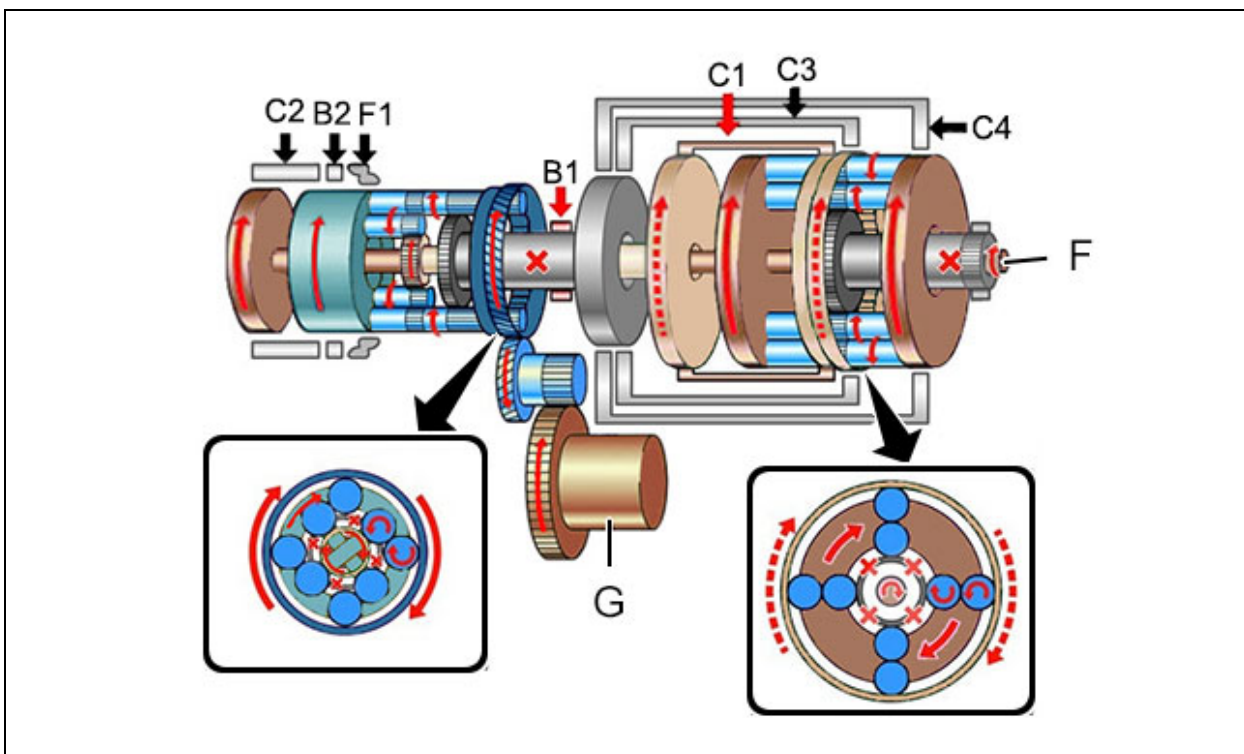


Figure : D4EAEOJD

"F" Input shaft.

"G" differential.

Position of the gear change lever	Solenoid valve									clutches				Brake		Free wheel clutch
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"D" (Second gear)	O	-	-	-	O	-	-	-	O	O	-	-	-	O	-	-

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.4. Gear lever in position "D" - Third gear

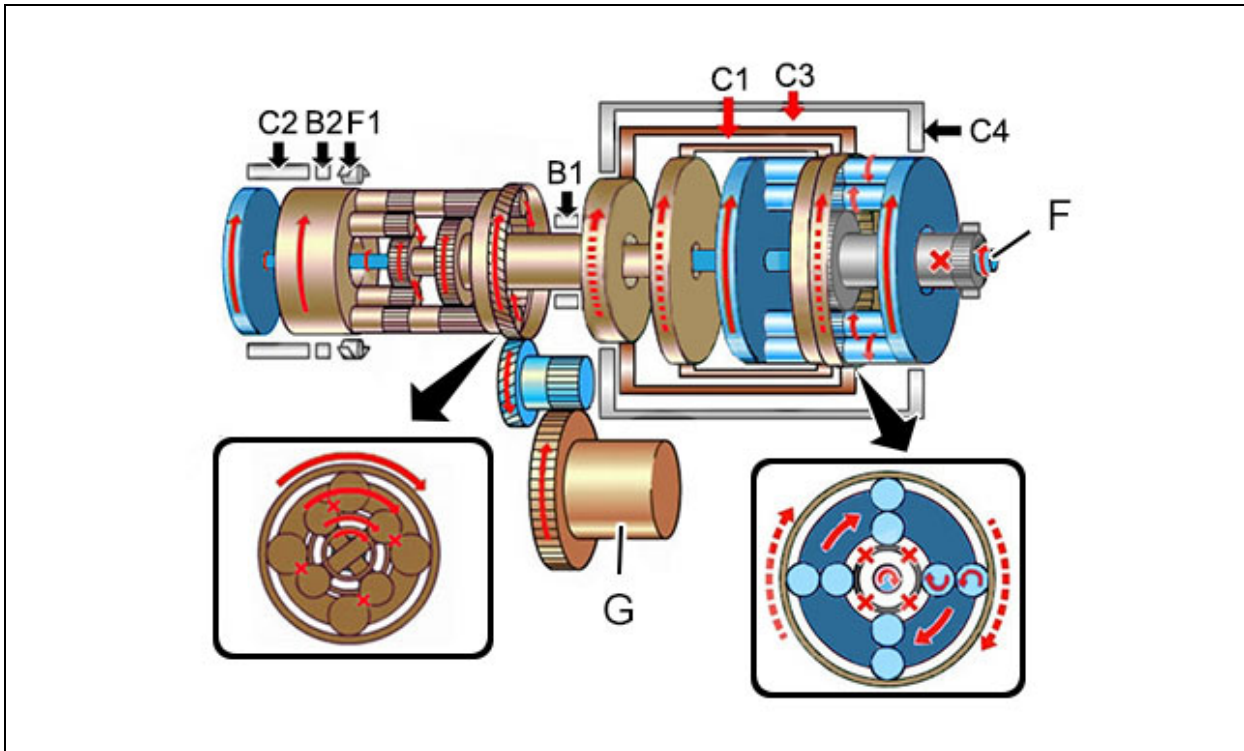


Figure : D4EAEOKD

"F" Input shaft.

"G" differential.

Position of the gear change lever	Solenoid valve									clutches				Brake		Free wheel clutch
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"D" (Third gear)	O	-	O	-	-	-	-	-	O	O	-	O	-	-	-	-

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.5. Gear lever in position "D" - Fourth gear

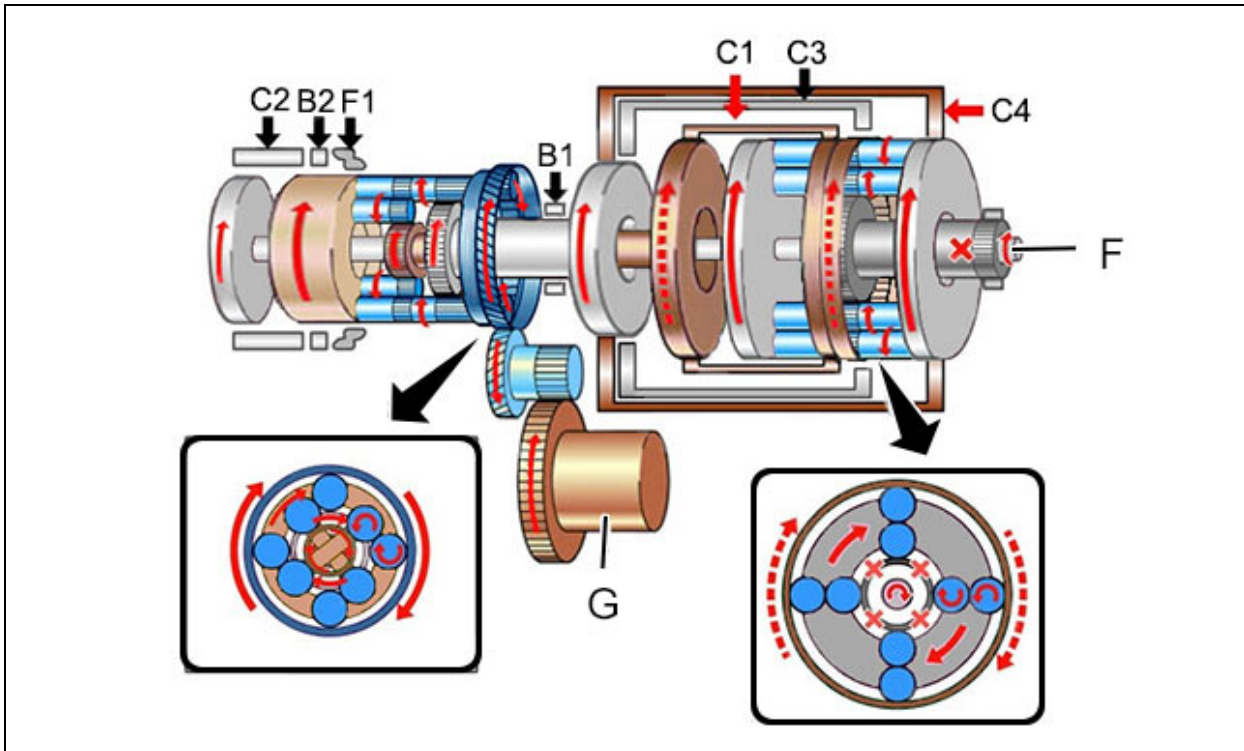


Figure : D4EAEOLD

"F" Input shaft.

"G" differential.

	Solenoid valve									clutches				Brake		Free wheel clutch
Position of the gear change lever	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"D" (Fourth gear)	O	-	-	O	-	-	-	-	O	O	-	-	O	-	-	-

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.6. Gear lever in position "D" - Fifth gear

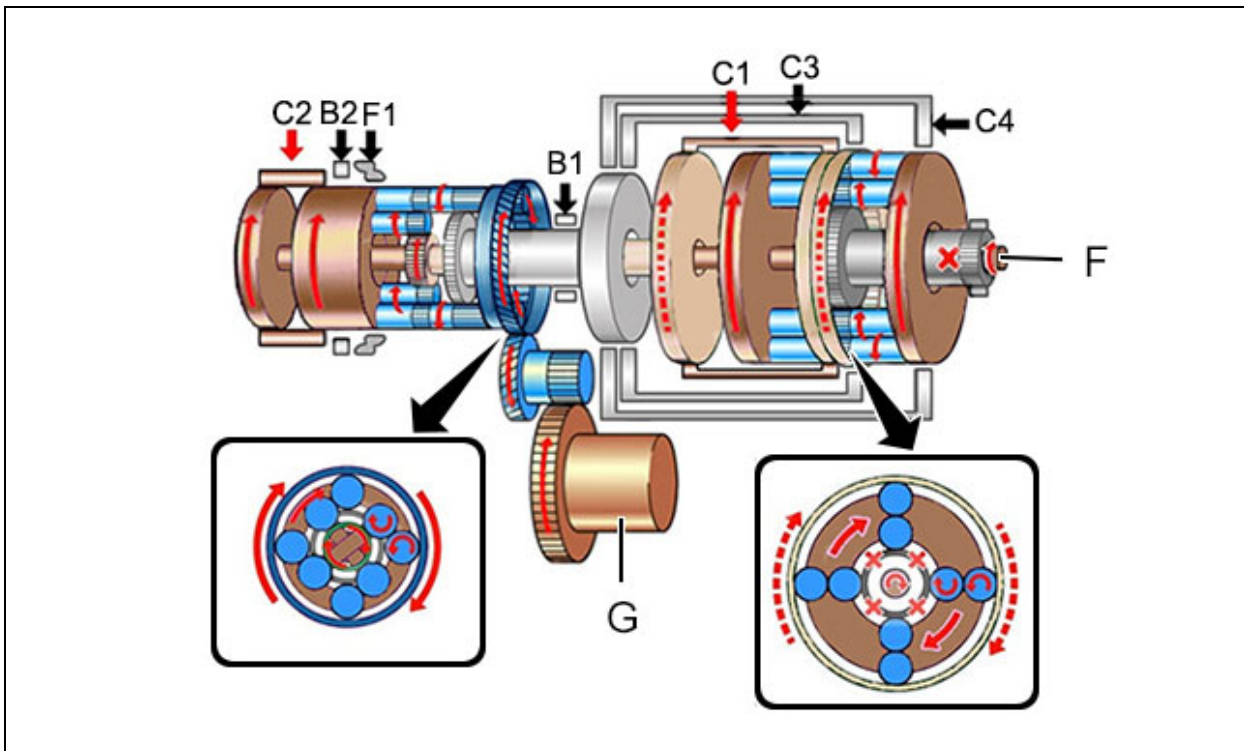


Figure : D4EAEOMD

"F" Input shaft.

"G" differential.

Position of the gear change lever	Solenoid valve									clutches				Brake		Free wheel clutch
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"D" (Fifth gear)	O	O	-	-	-	-	-	-	O	O	O	-	-	-	-	-

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.7. Gear lever in position "D" - Sixth gear

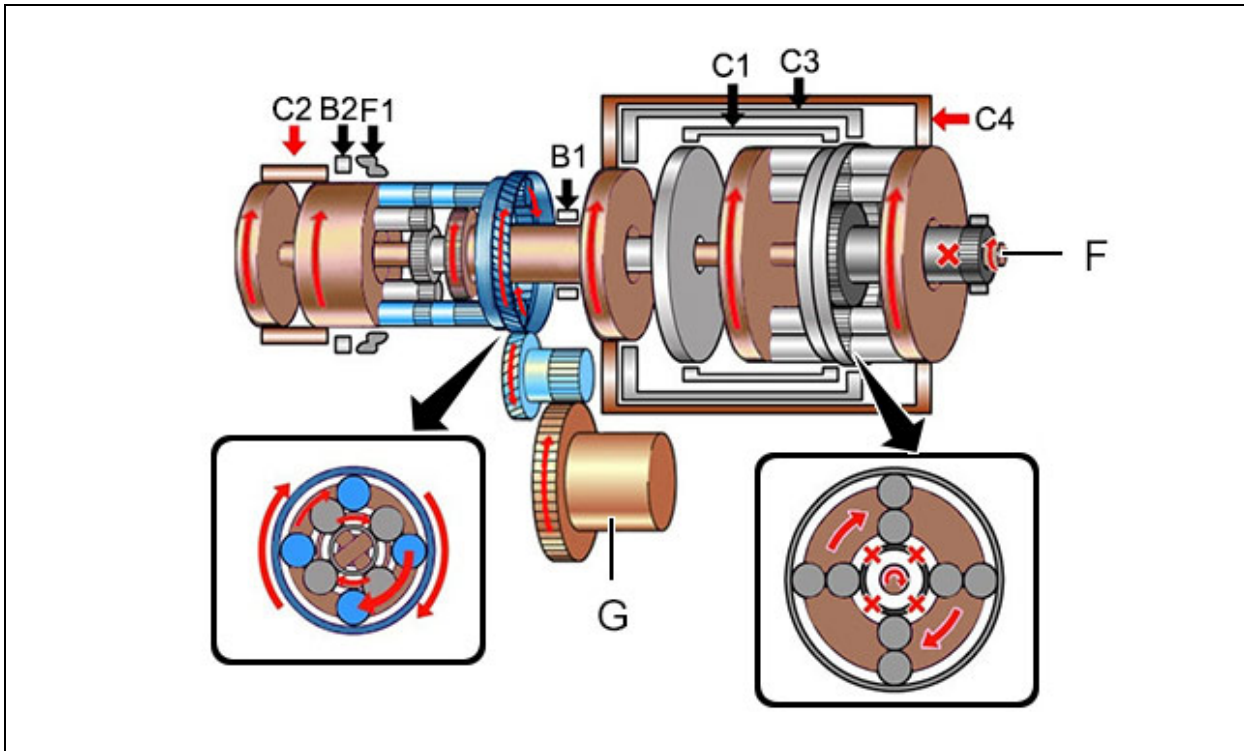


Figure : D4EAEOND

"F" Input shaft.

"G" differential.

Position of the gear change lever	Solenoid valve									clutches				Brake		Free wheel clutch
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"D" (Sixth gear)	-	O	-	O	-	-	-	-	O	-	O	-	O	-	-	-

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.8. Gear lever in position "D" - Seventh gear

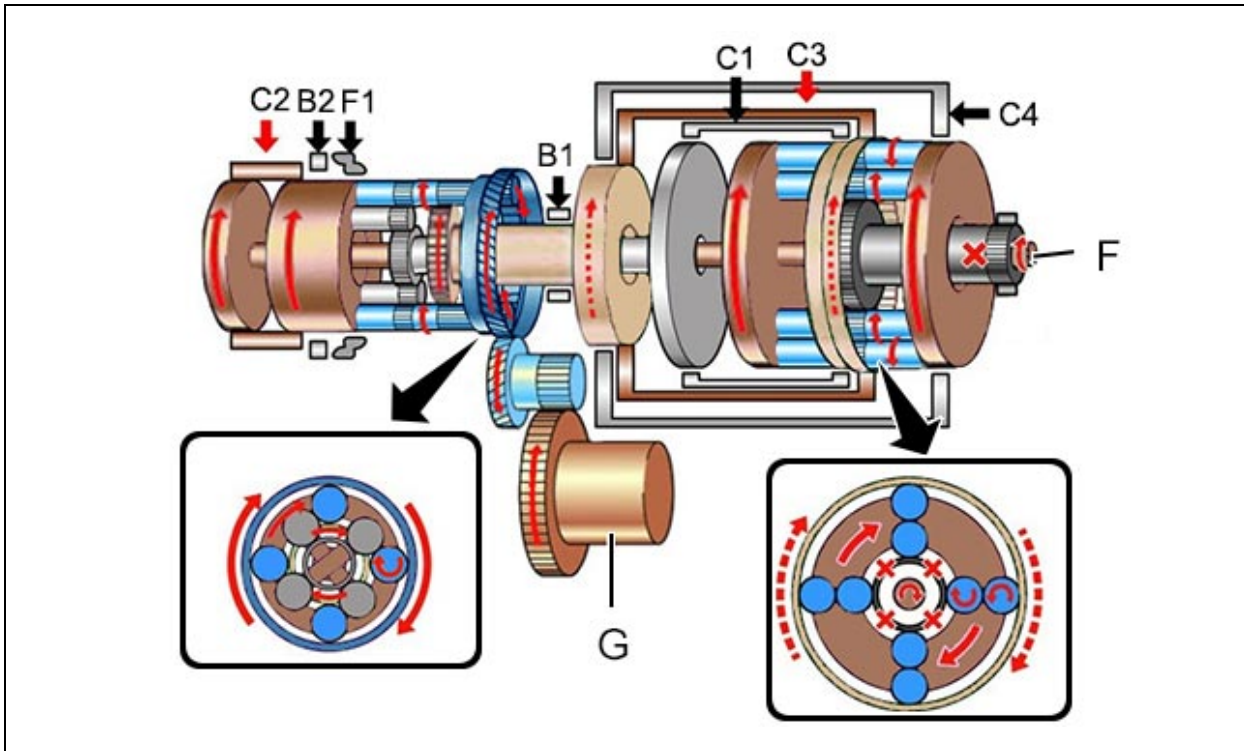


Figure : D4EAE00D

"F" Input shaft.

"G" differential.

Position of the gear change lever	Solenoid valve						clutches				Brake		Free wheel clutch			
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"D" (Seventh gear)	-	O	O	-	-	-	-	-	O	-	O	O	-	-	-	-

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.9. Gear lever in position "D" - Eighth gear

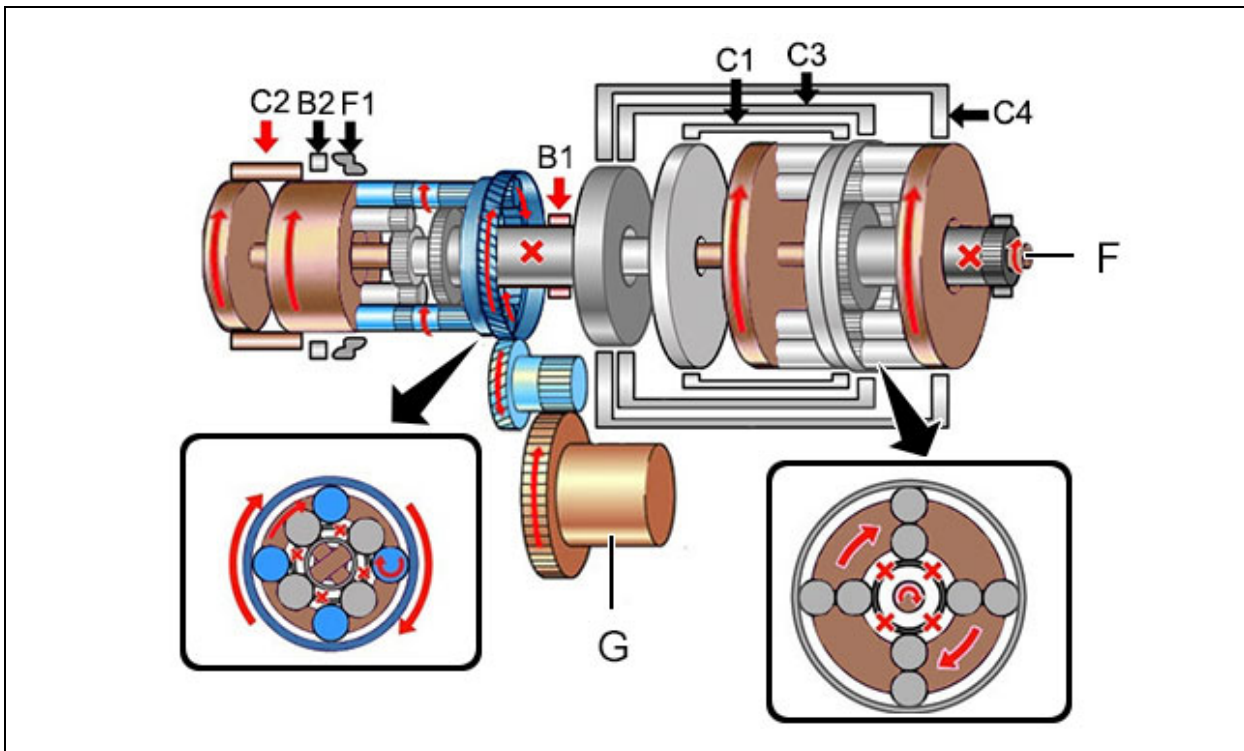


Figure : D4EAEOPD

"F" Input shaft.

"G" differential.

Position of the gear change lever	Solenoid valve									clutches				Brake		Free wheel clutch
	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"D" (Eighth gear)	-	O	-	-	O	-	-	-	O	-	O	-	-	O	-	-

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

4.10. Gear lever in position "R"

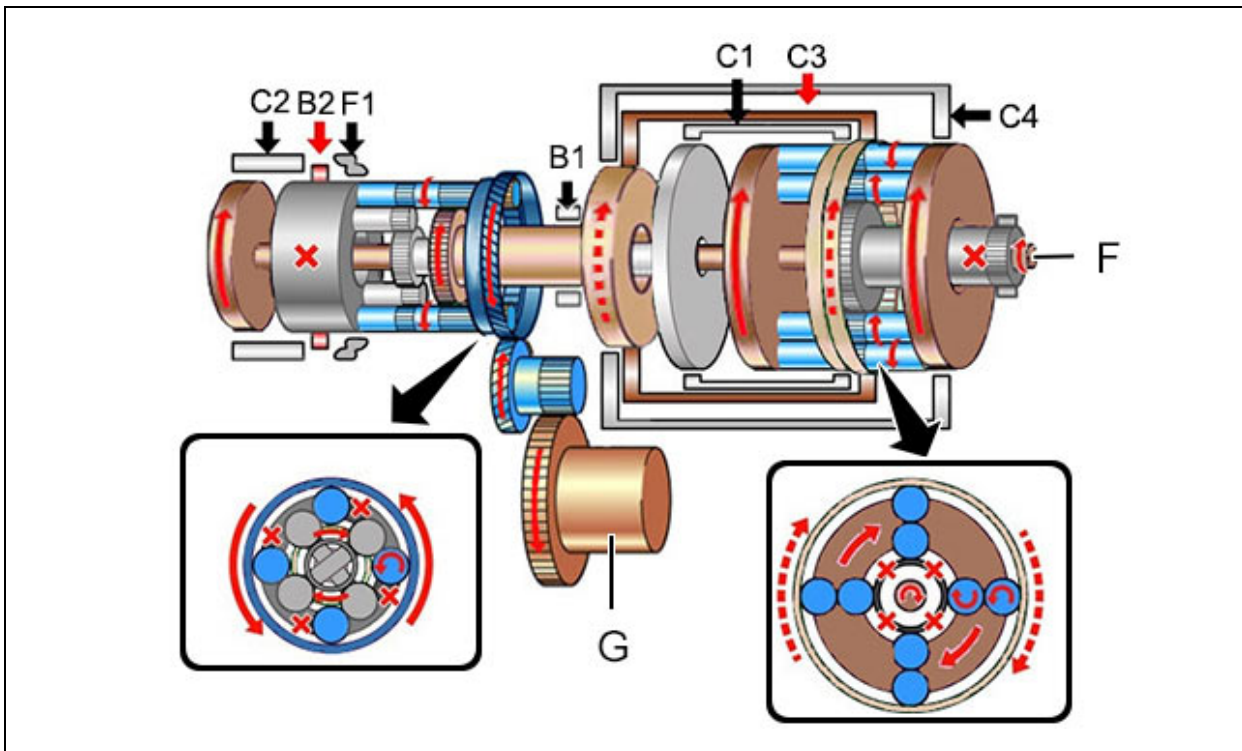


Figure : D4EAEQD

"F" Input shaft.

"G" differential.

	Solenoid valve									clutches				Brake		Free wheel clutch
Position of the gear change lever	SL1	SL2	SL3	SL4	SL5	SL6	SC2	SC3	SC4	C1	C2	C3	C4	B1	B2	F1
"R" (Reverse gear)	-	-	O	-	-	O	O	O	O	-	-	O	-	-	O	-

"O" Solenoids/clutches/Brakes/clutches with free wheel controlled at maximum pressure.

"-" Solenoids/clutches/Brakes/clutches with free wheel deactivated.

5. Manual gear change control

When the gear lever is moved from position "D" to the manual gear change position and when moving to the + position (change up) or to the - position (change down), the driver can select the gear required and obtain the same feeling of sporty driving as with a manual gearbox. However, the automatic gearbox ECU changes up automatically to prevent over-revving, or changes down if the vehicle speed drops and has a locking control.

6. Free-wheel function (Free Wheeling) (*)

The free-wheeling function enables the automatic gearbox to operate under conditions similar to the neutral position (neutral) with an engine idle speed.

The free-wheeling function keeps one clutch engaged and another clutch released, based on the speed of the vehicle :

- At speeds above 40 km/h, the clutch "C2" is engaged
- At speeds below 40 km/h, the clutch "C1" is engaged

6.1. Activation conditions

The free-wheeling function is activated if :

- The gear lever is in position "D"
- The accelerator pedal is released gently
- ECO mode is activated
- The speed of the vehicle is between 15 and 160 km/h

- Lateral acceleration is less than 5 m/s² above 30 km/h
- The engine oil temperature is between 20 and 120°C
- The gear engaged by the automatic gearbox is between second and eighth gear
- The vehicle is on a gradient of between -8 and 5%

6.2. Conditions of deactivation

The free-wheeling function is deactivated if :

- The brake pedal or accelerator pedal is pressed
- The vehicle is on a gradient of less than -8% or greater than +5%
- The vehicle speed is less than 15 km/h or more than 160 km/h
- Lateral acceleration is greater than 5 m/s² above 30 km/h
- The steering wheel gear shift control paddles are pressed
- The engine oil temperature is below 20°C or above 120°C
- When ECO mode is deactivated
- The vehicle cruise control function is activated

N.B. : The free-wheeling function can be deactivated when a FAP regeneration is required.