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# 1. AISIN General

## 1.1 Introduction

This book will cover following AISIN models.

AW03 series: AW03-72L (Mechanical type), AW03-72LE, and AW03-II

AW30 series: AW30-43LE, AW30-40LE

Above transmission models have been installed on following vehicles,

AW03 series:

Townace, Liteace, Dina, Toyoace, Kijang, Tuv (Toyota), Pajero, Delica, Freeca (Mitsubishi), Panther (Isuzu), Escudo, Grand Escudo (Suzuki), Roadster (Mazda), Porter, Starex, Terracan (Hyundai), Grace, Sportage, Pregio, Wide Bongo, Retona (Kia)

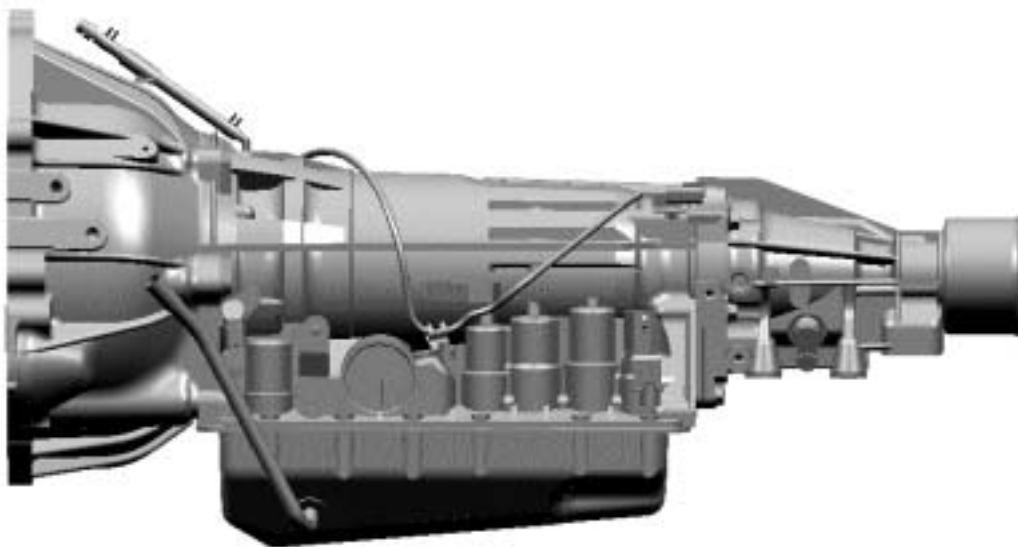
→ A microcomputer was used to optimize the shift schedule and lock-up clutch engagement, for advanced drivability and improved fuel economy.

AW30 series:

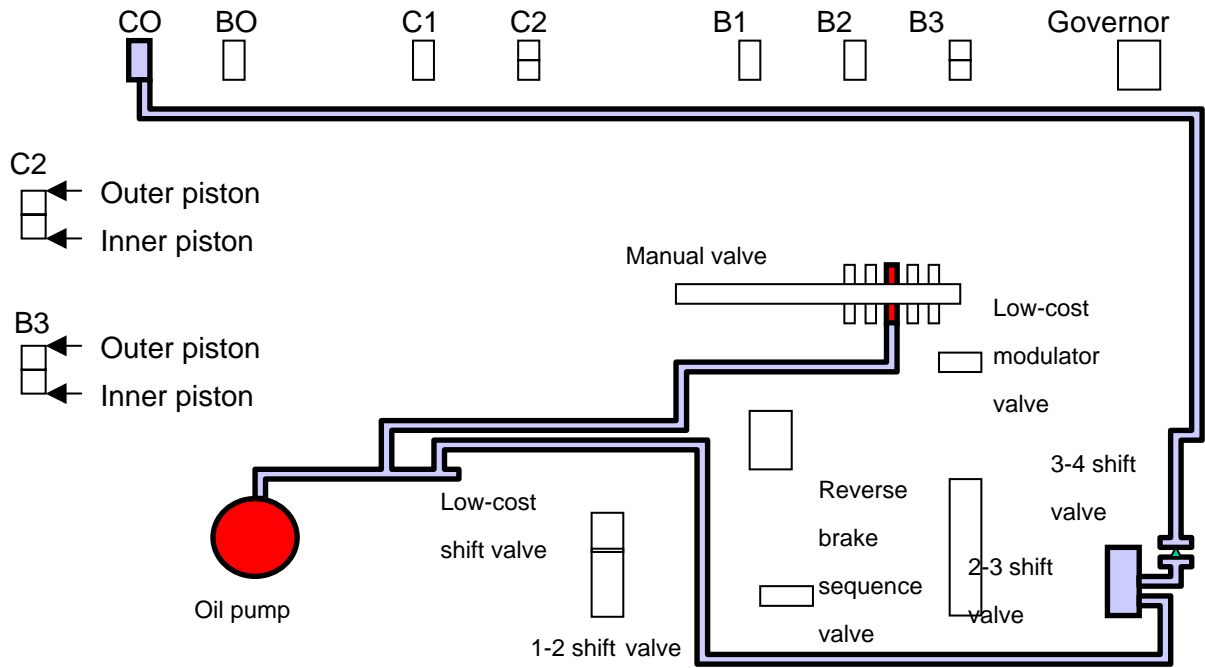
Century, Aristo, Crown, Markii, Verossa, Supra, Hiace, Hilux, Tandra, Sequoia, Tuv (Toyota), Pajero, Forte, Challenger (Mitsubishi), Pup, Elf, Bighorn, Mu (Isuzu), Escude (Suzuki), Starex, Terracan Libero (SR) (Hyundai), Sorrento, Enterprise (Kia)

→ Torque capacity increased by 1.5 times than AW03 series A/T to meet improved engine power.

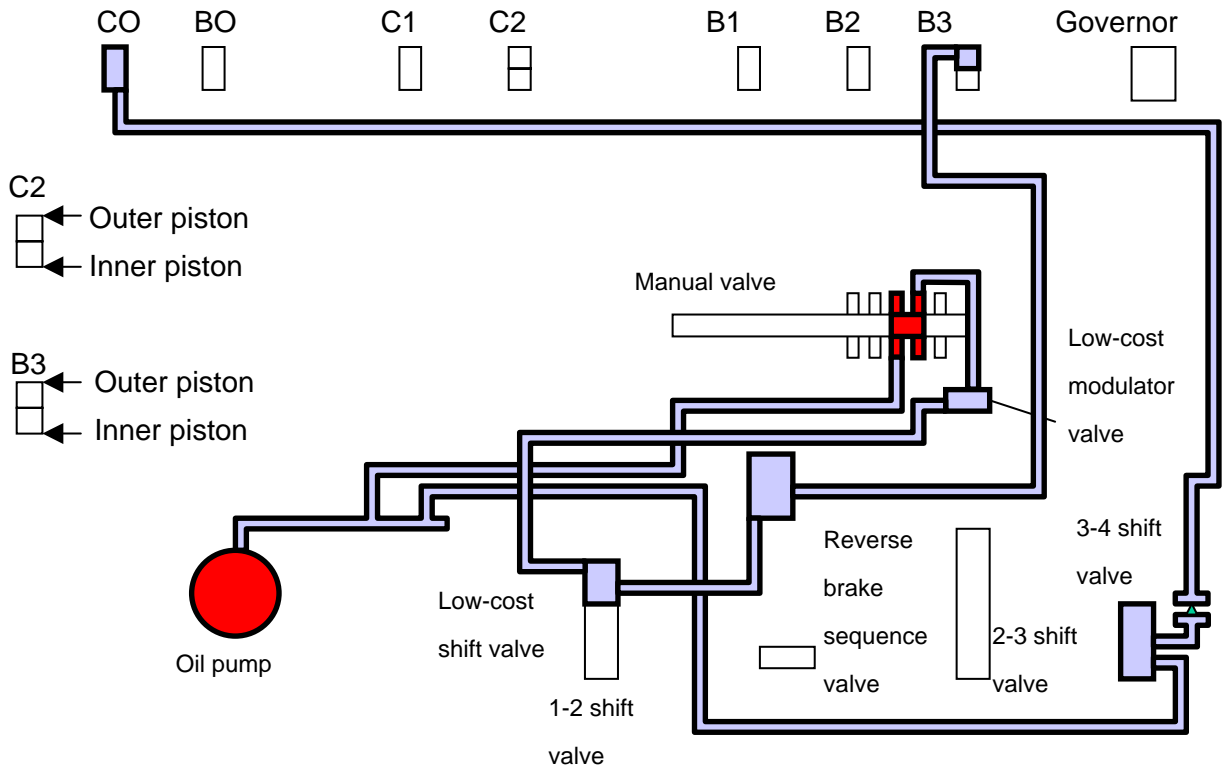
→ Use of a total control system integrated with the engine for intelligent control of engine torque and clutch hydraulic pressure when changing gears, this results in significant improvement of shift quality.



**- Neutral Fluid Flow**

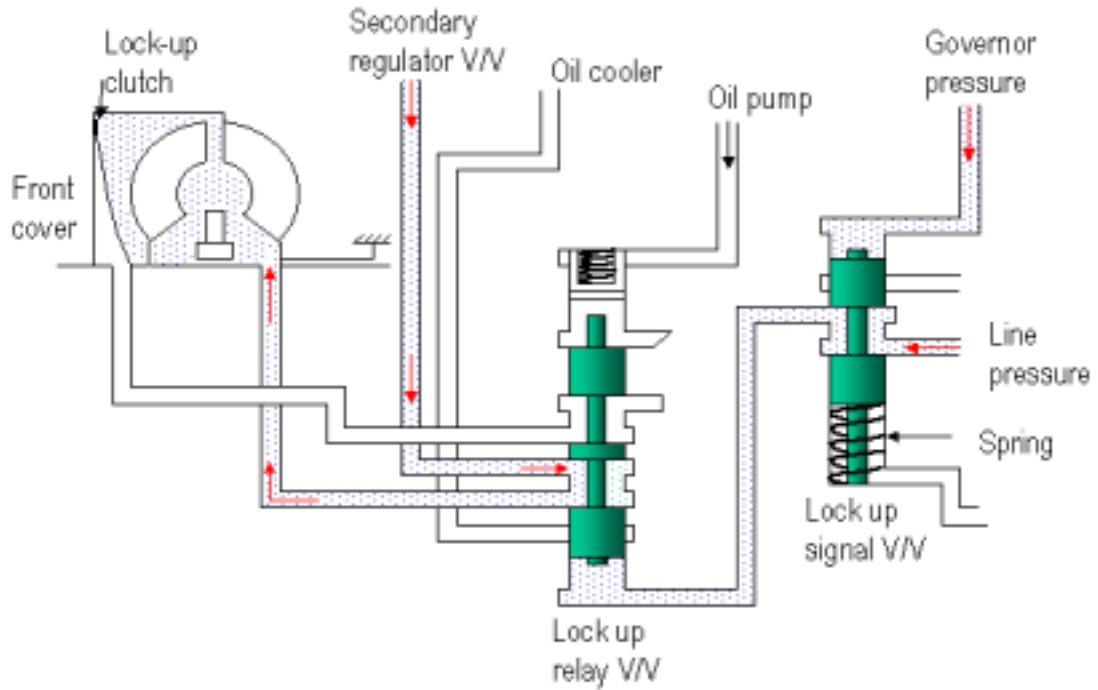


**- Parking Fluid Flow**

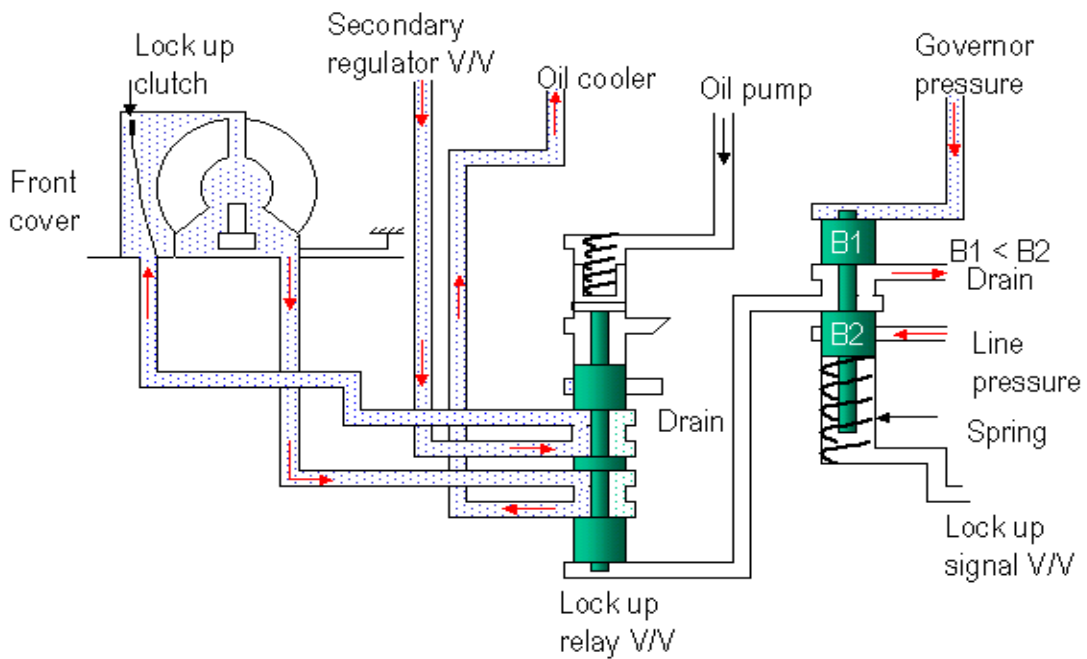


### 2.3.5. Lock-up clutch

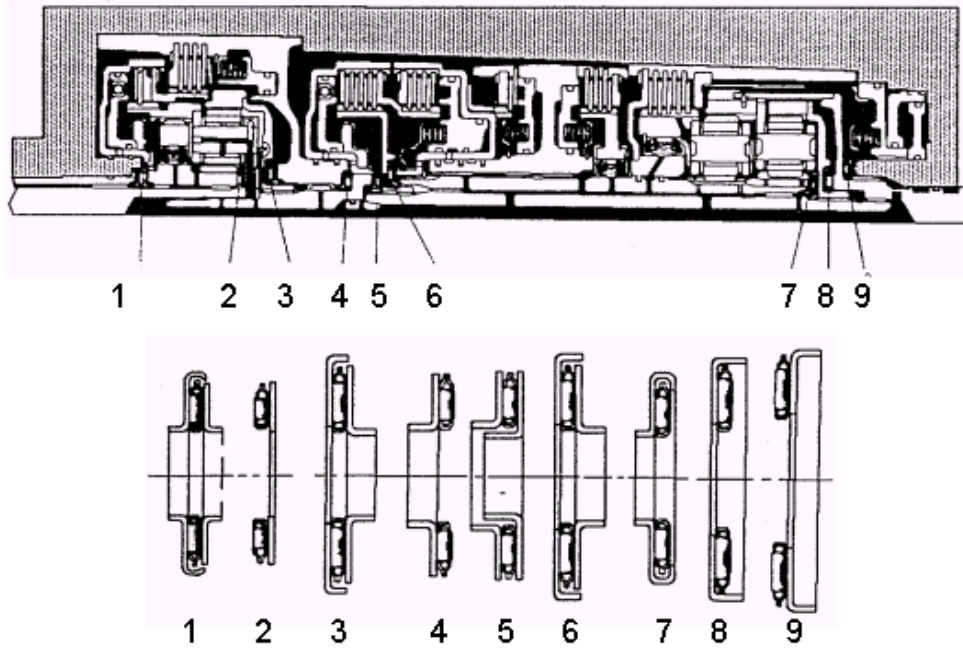
- Engaged



- Disengaged



### 3.3.4. Thrust Bearing & Race



### 3.3.5. Operating chart for each gear

Range	C0	C1	C2		B0	B1	B2	B3		F0	F1	F2
			IP	OP				IP	OP			
P(parking)	O											
R(reverse)	O		O	O				O	O	O		
N(neutral)	O											
D	1st.	O	O							O		OX
	2nd.	O	O				O			O	OX	
	3rd.	O	O	O			O			O		
	O/D		O	O		O	O					
2	1st.	O	O							O		OX
	2nd.	O	O				O	O		O	O	
	3rd.	O	O	O			O			O		
L	1st.	O	O					O	O	O		O
	2nd.	O	O				O	O		O	O	

Lock-up solenoid valve "on"; operating at the "overdrive" range

\*\* OX ; O (Driving), X(Coast down)

### 3.5.6. Kick down mode control

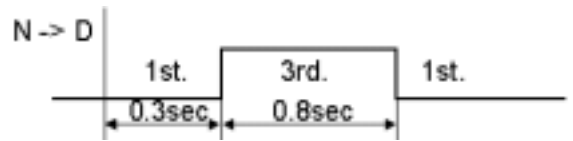
This control is to do KICK-DOWN when throttle opening is more than 93%.

### 3.5.7. Squat control (\*\*Except AU)

When the shift lever is shifted from “N” to “D”, the Squat Control operation that temporarily shifts to 3rd. gear to reduce shift shock and squat vehicle.

< Condition >

- Vehicle speed \* 7Km/h
- Throttle opening = 0%
- Inhibitor S/W is not in N, 2 & L.
- Water temperature S/W Off
- Brake S/W \*Off\*

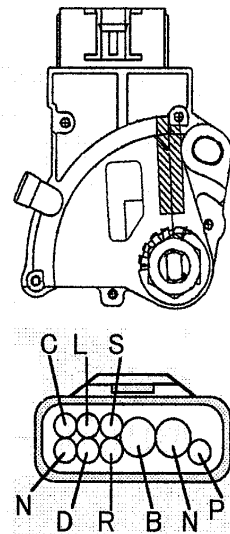


### 3.5.8. Sensors & Actuators

#### - Neutral start switch

Neutral start switch communicates the information that which range includes shift lever of A/T to TCM by combination of a terminal.

Range	Starter		Position						
	B	N	C	P	R	N	D	2	L
P	—		—						
R			—	—	—				
N	—		—	—	—	—			
D			—	—	—	—	—		
2			—	—	—	—	—	—	
L			—	—	—	—	—	—	—
Polarity	+	-	+	-	-	-	-	-	-



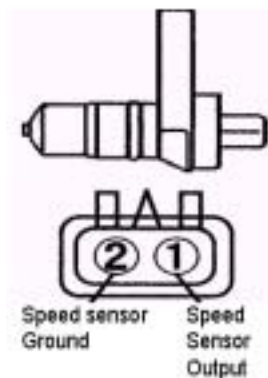
#### - Speed sensor

Speed sensor detects a turn number of magnet of rotor sensor installed in output shaft, and communicates to TCM as a signal.

Resistance: 560 680w (20 )

#### - Speedometer driven gear

When output shaft (drive gear) rotates once time, driven gear rotates 6\20 (different by model of a car), and speedometer driven gear communicates the signal to TCM as assistance speed sensor signal



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## 4.4 Control System

### 4.4.1. Select pattern

Select pattern displays the current shift range according the driver's selection when driver selects it manually.

#### - Parking (P)

- No activating elements and engine power is not transmitted.
- Engine start is possible.
- Mechanically fix the parking mechanism.

#### - Reverse (R)

- Back up lamp is illuminated at the reverse range.
- Engine start is impossible.

#### - Neutral (N)

- Engine start is possible.
- Engine power is not transmitted.

#### - Driving (D)

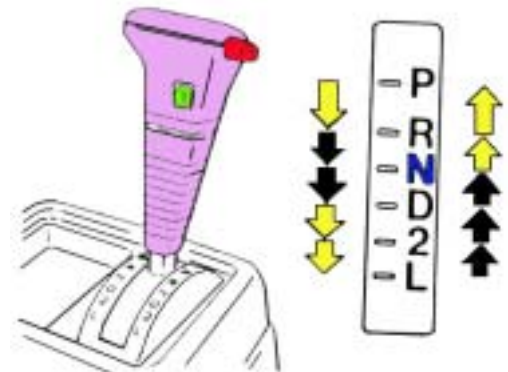
- Automatically shifted by TPS and vehicle speed.
- Vehicle starts with 1st gear and it is hold with 3rd gear at engine idle condition.  
(This reduces creep effects)
- Kick-down is available when the acceleration is 85% or more for sufficient driving power.
- Engine brake is not available at the 'D' range 1st gear.

#### - 2<sup>nd</sup> Range (2)

- 1st, 2nd, 3rd gear is automatically shifted. 3rd gear is shifted by not opening ratio of TPS but the rotating speed of transfer drive gear.
- 1st gear is selected when the engine is idle or the vehicle starts.
- Engine brake is not available and it is used at the icy road.
- If '2' range is selected during driving with 4th gear, the downshift is performed automatically up to 2nd gear through 3rd gear according to the mapping data.

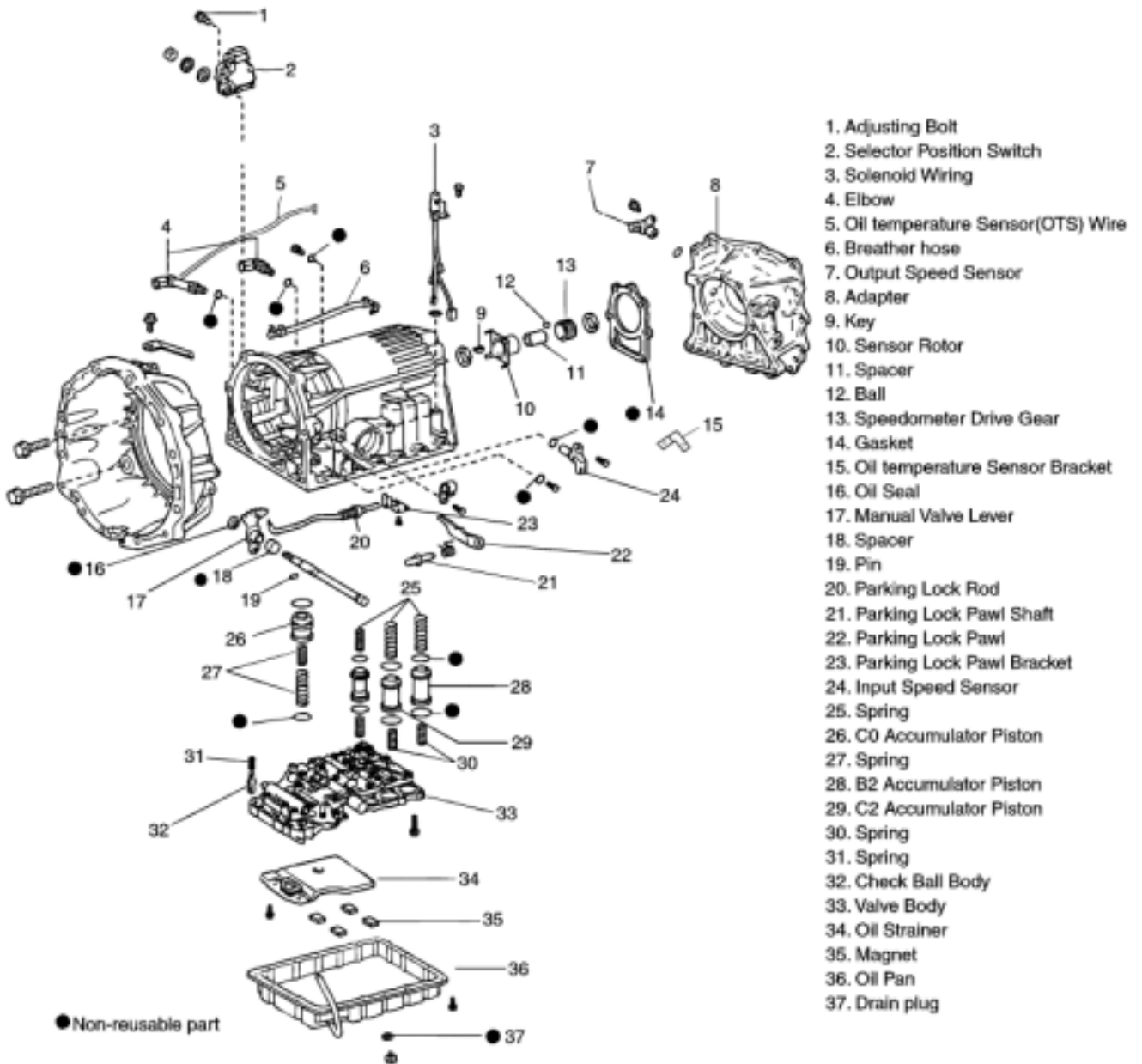
#### - Lock-up (L)

- Down shifted from 2nd gear to 1st gear and up-shift is prohibited. (1st gear holding)
- Vehicle starts with 1st gear and engine brake is available.
- If 'L' range is selected during driving with 4th gear, the downshift is performed automatically up to 1st gear through 3rd and 2nd gear according to the mapping data.
- It is used at the continuous downhill road.





- Structure

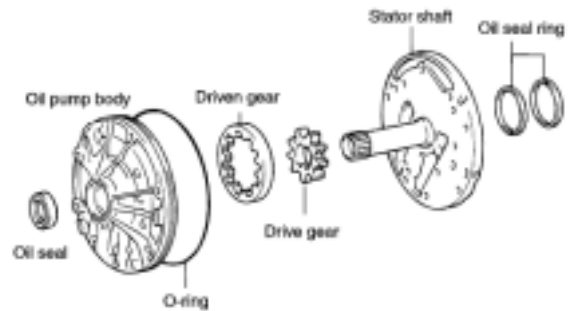


## 5.4 Hydraulic Control System

Based on the hydraulic pressure created by the oil pump, TCM sends signals to solenoid and hydraulic control system governs the hydraulic pressure acting on the torque converter, planetary gear, clutches and brakes in accordance with the vehicle driving conditions.

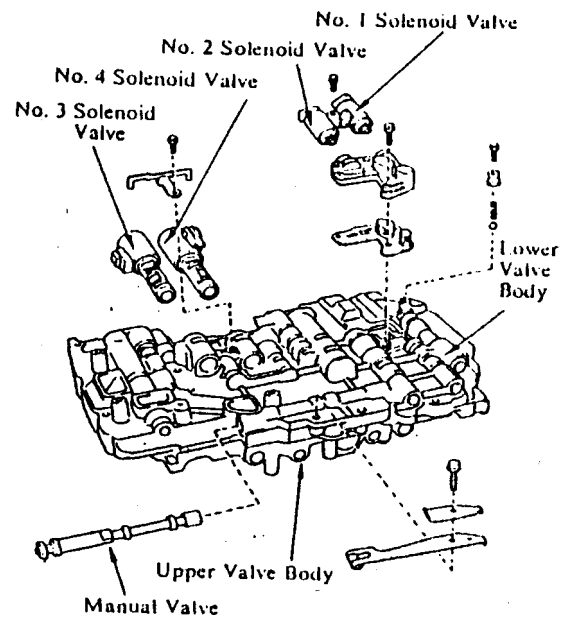
### 5.4.1. Oil pump

Operated by the impeller hub inside Torque converter, it generates oil pressure for operating components as well as lubricating planetary gear set



### 5.4.2. Valve body

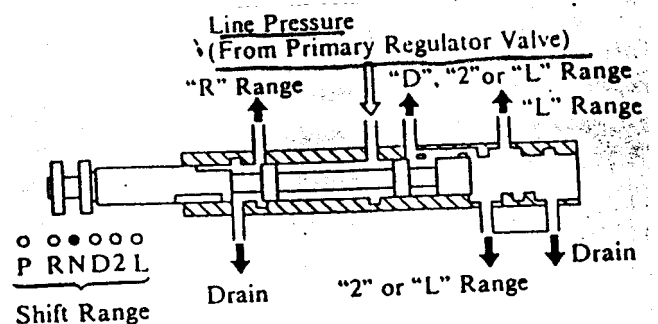
Consists of an upper body and a lower body. It controls hydraulic pressure that applies to operating components as well as changes oil paths inside valve body.



### 5.4.3. Hydraulic spool valves

#### - Manual valve

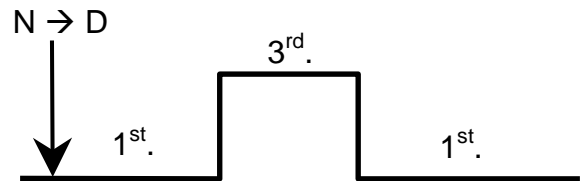
Connected to a shift lever, it changes oil path according to the shift lever position, P-R-N-D-2-L.



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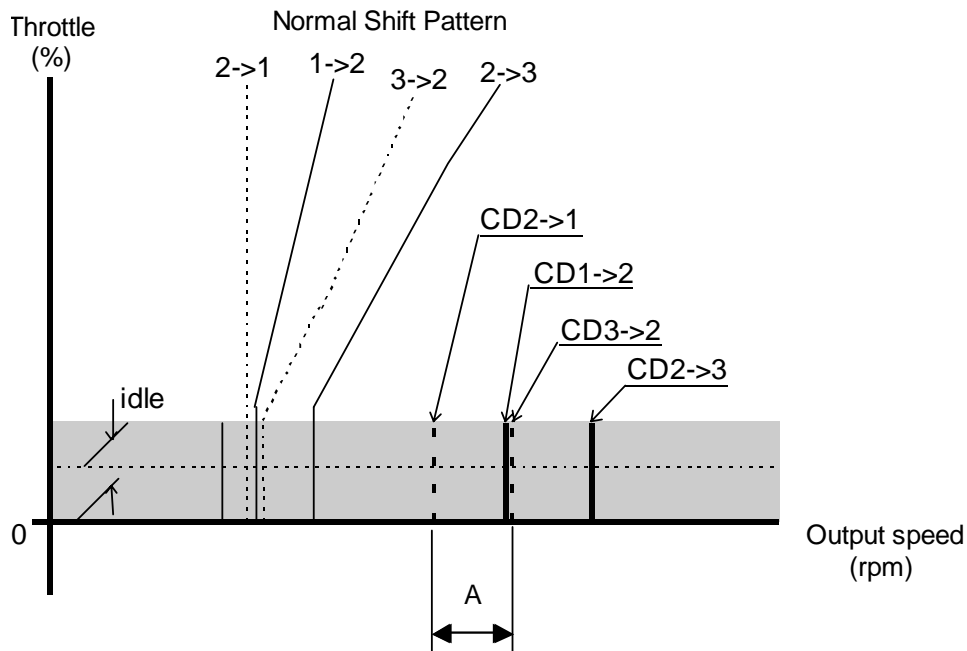
### 5.5.16 Squat control

When the shift lever is shifted from "N" to "D", the Squat control operation that temporarily shifts to 3rd gear reduce shifting shock and squatting vehicle.



### 5.5.17. Coast down control

To prevent the frequent gear shift during short time in the condition of low TPS opening ratio and to improve the shift quality such as 2->1, 3->2 at the coast down road, a special shift pattern was adopted to be operated in case of specified vehicle condition.

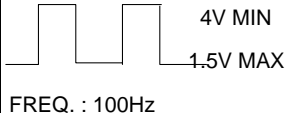

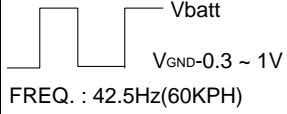


#### - Coast down control beginning condition

- 1) Brake switch is N (When the foot brake is depressed)
- 2) Engine is idle (When the accelerator pedal is not depressed)

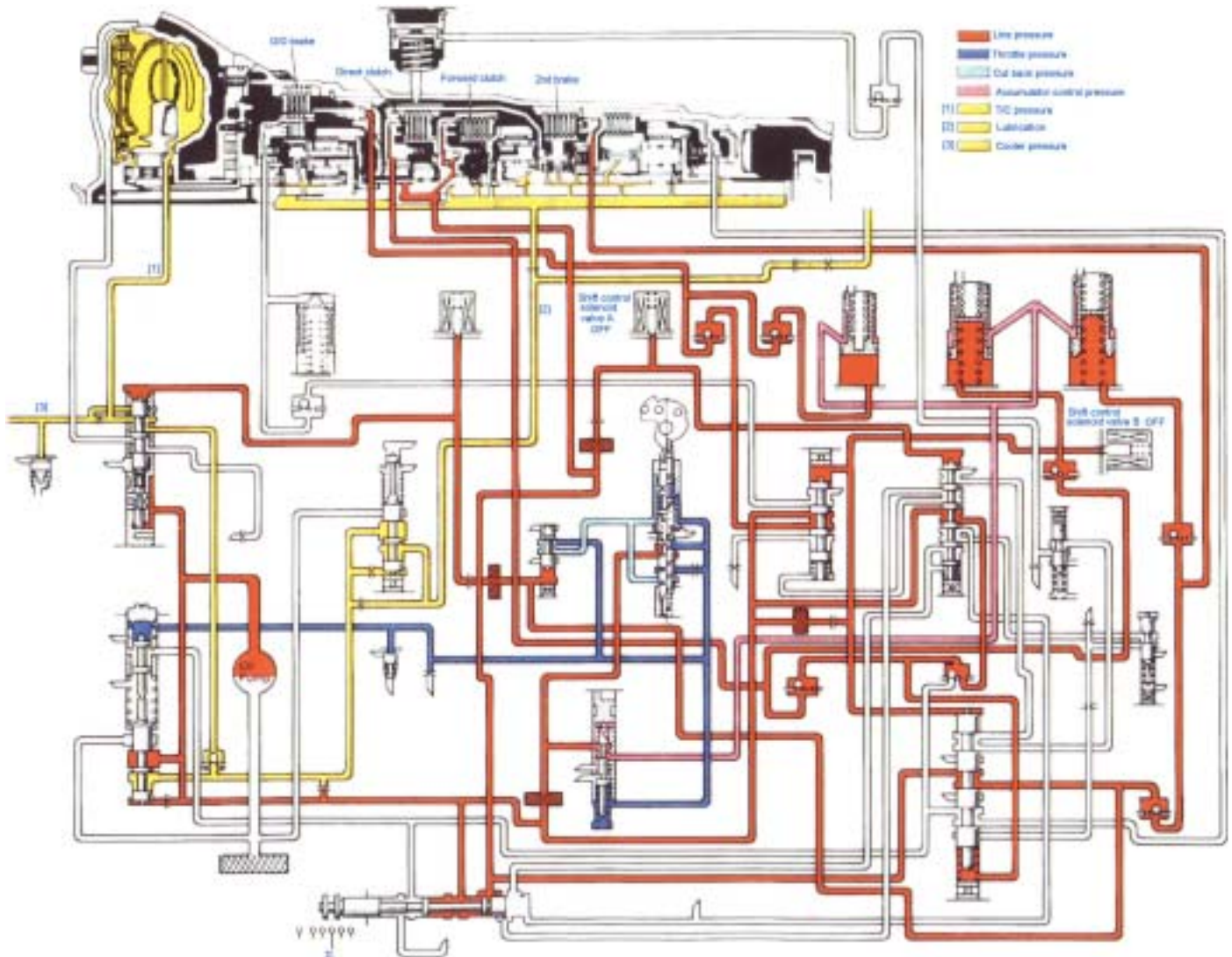
#### - Coast down control cancellation condition

- 1) After 1 second since the brake switch is OFF (To prevent hysteresis)
- 2) TPS > 0% (When the accelerator pedal is depressed). Comparing with previous shift pattern, the width 'A' was enlarged so as to prohibit the shift busy.

No	Items	Condition	Signals		Description	Remarks	
			Type	Level			
19	A12	DTC CLEAR SW	IGN OFF	DC	$V_{GND-0.3} \sim 2V$	0V	DTC CLR : GND
			IGN ON		Vbatt	10.4V	
20	A13	OIL TEMP SNSR	IGN OFF	DC	0V	0V	
			IDLE		0 5V	1.15V(After WARM UP)	
22	B9	TORQUE CONTROL	Driving	PULSE	 4V MIN 1.5V MAX FREQ. : 100Hz	HI : 4.2V LO : 0V FREQ. : 100Hz(-DUTY:20%)	
23	B10	EARTH FOR CO CYLINDER					G/LVL
24	B11	EARTH FOR VSS					G/LVL
25	B12	ENG. REVOLUTION FROM ECU	IDLE	PULSE	 4.0V MIN $V_{GND-0.3} \sim 1V$ FREQ. : ABOUT 28Hz(850rpm)		
27	B14	L4 SW	SW OFF	DC	$V_{GND-0.3} \sim 1V$	SW OFF : 5.8V	
			SW ON		$V_{batt-2V} \sim V_{batt}$	SW ON : 0V	
30	B17	OTS LAMP	LAMP OFF	DC	Vbatt	12.1V	
			LAMP ON		1.5V MAX	0V(3.15sec ON)	
31	B18	INHIBITOR SW(N)	N	DC	Vbatt	12.9V	OFF SURGE : -40.4V
			P/R/D/2/L		0.8V or less	0V	
32	B19	INHIBITOR SW(D)	D	DC	Vbatt	13.4V	
			P/R/N/2/L		0.8V or less	0V	
33	A14	POWER(IGN 1)	IGN OFF	DC	0V	0V	
			IGN ON		9V ~ 16V	12V	
34	A15	EARTH FOR POWER					
37	A18	BRAKE SW	SW OFF	DC	$V_{GND-0.3} \sim 2V$	0V	
			SW ON		$V_{batt-2.0} \sim V_{batt}$	13V	
38	A19	EARTH FOR POWER					
39	A20	EARTH FOR OTS					G/LVL
41	B21	K-LINE	In comm. (10.4Kbps)	PULSE	LOGIC "0" : $V_{batt} 20\%$ or less LOGIC "1" : $V_{batt} 80\%$ or more	0V 12.1V	
44	B24	SPEEDMETER	Driving	Hz	 $V_{batt}$ $V_{GND-0.3} \sim 1V$ FREQ. : 42.5Hz(60KPH)	HI : 11.4V LO : 0V FREQ. : 12Hz(20KPH)	
45	B25	DIAG. SW	IGN OFF	DC	0V	0V	DTC CODE OUTPUT : GND( $V_{GND-0.3} \sim 1V$ )
			IGN ON		Vbatt	10.7V	

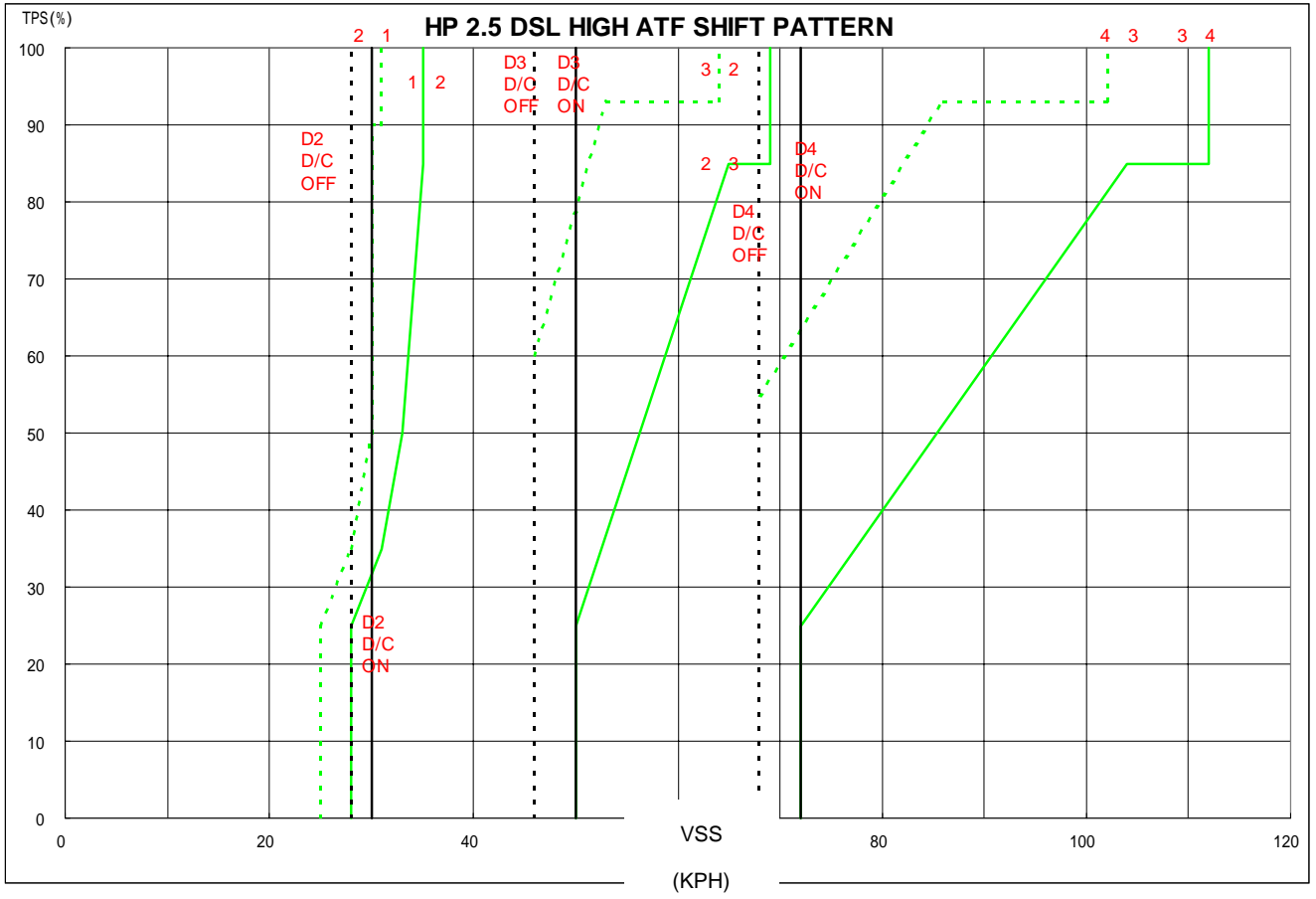
# APPENDIX

## Hydraulic pressure circuit diagram - D range 4<sup>th</sup> gear (AW30-43LE)



# APPENDIX

## Shift pattern (AW03-II): High ATF temperature mode



# APPENDIX

## Shift pattern (AW30-40LEI): HP 3.5 GSL High ATF temperature mode

