TRANSMISSION SPECIFICS

VALVE BODY COMPONENTS

Valve body electrical components consist of:

Pressure Regulator solenoids (EDS). Controlled by a Pulse Width Modulated (PWM) control signal from the TCM provides an adjustable positioning of the valve. The variable position makes these valves suitable for varying control pressures.

Pressure Regulator valves are used for:
- Maintaining operating pressures
- Gradual TC Clutch lock up control
- Overlap shift control (system specific)
- Band Brake Activation (system specific)

Magnetic Valve (Shift) Solenoids (MV). Controlled by a switched (on/off) power or ground signal from the TCM. The valves have two positions open or closed. Some are normally open and close when activated and some are normally closed and open when activated.

MV solenoids are for:
- Controlling shift valve position
- ON/OFF control of TC lock up clutch
- Reverse Lock Out protection (early systems)
- Band Brake Activation (system specific)
- Shift lock control

Input (Turbine) and output Speed Sensors. Analog inductive sensors that produce an A/C sine wave similar to an ABS/ASC wheel speed sensor. The signal frequency is proportional to the rotation speed of the monitored component. The speed sensors are used to monitor clutch slip for plausibility and shift points as well as maintaining adaptive hydraulic pressures.

Transmission Oil Temperature Sensor: NTC resistor provides a variable voltage drop proportional to transmission oil temperature. For most systems, the NTC is soldered into the oil temp circuit of the wiring harness located in the transmission oil sump. The A5S 360R transmission contains a replaceable NTC plug in resistor probe that is clipped to a bracket and immersed in oil in the sump.

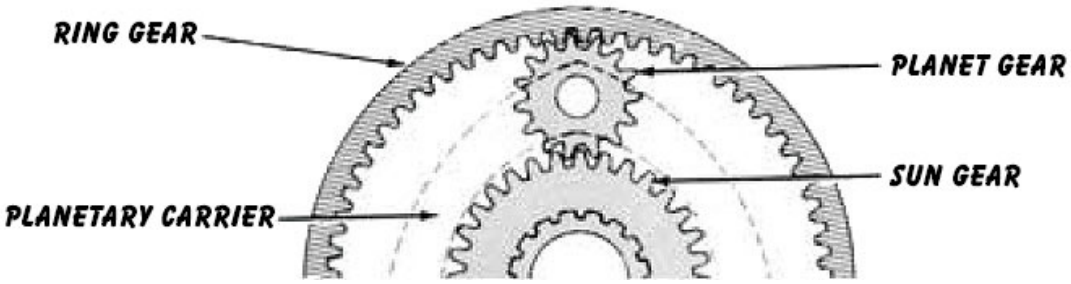
These components are monitored statically and dynamically by the TCM and will set specific fault codes if the sensor or it's circuit becomes impaired. However, the components **and their circuits to the TCM** can be simultaneously checked during diagnosis. The following pages provide specific locations of the components within the transmissions.

TRANSMISSION POWERFLOW

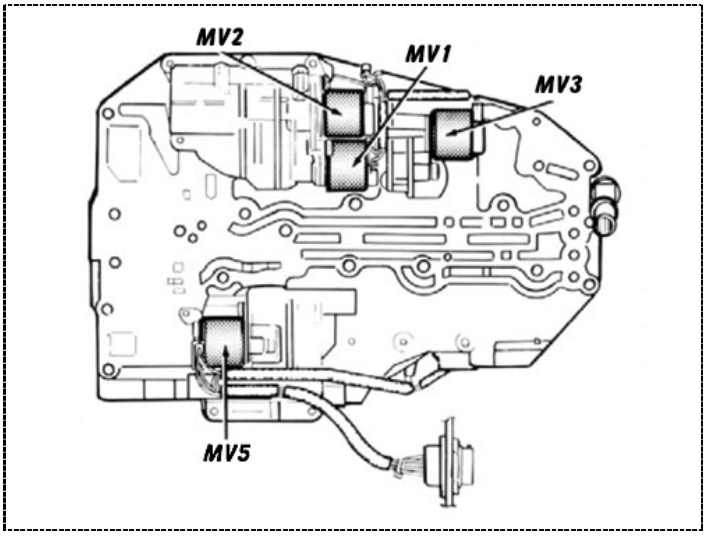
The TCM controls the hydraulic valve body by activating specific electrical solenoids and pressure regulators. The component locations within a transmission in relation to activation of shift components (multi plate clutches and brakes, band brakes, freewheels) control and direct the powerflow through the planetary gearset(s) providing various output ratios.

By design, each transmission manages powerflow uniquely with a common goal of providing progressive output ratios.

Visual explanation of a Planetary Gear Set power flow schematics



At first glance the representation of a transmissions internal components is confusing. Understanding the powerflow through the transmission is explained by a powerflow schematic. Powerflow schematics are simple line drawings of the upper half of the transmission showing engine drive torque input, torque converter powerflow, clutches, brakes freewheels and the planetary gearset(s) to output. The illustrations below will help in understanding the schematics.



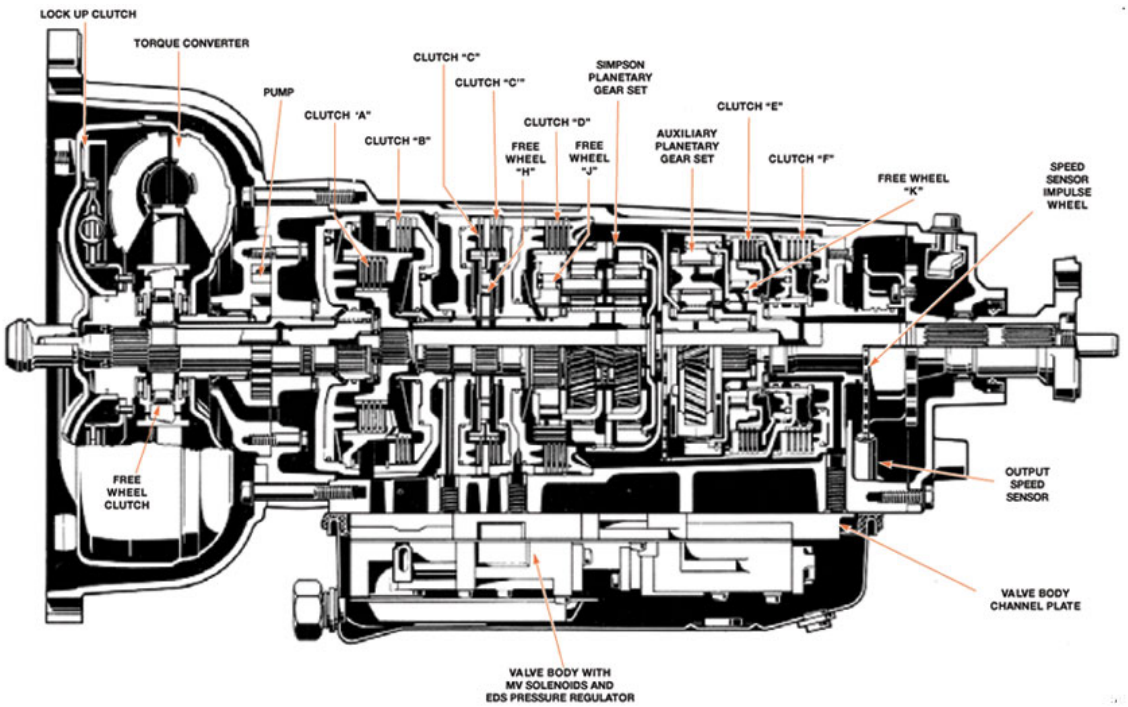
4HP 24 E9

Specifications for MV solenoids: Values @ 20° C temperature
MV1 = 25 to 46Ω
MV2 = 25 to 46Ω
MV3 = Converter Lock-up Solenoid 25 to 46Ω
MV5 = Pressure Regulator Solenoid 5 to 10Ω

GEAR APPLICATION CHART

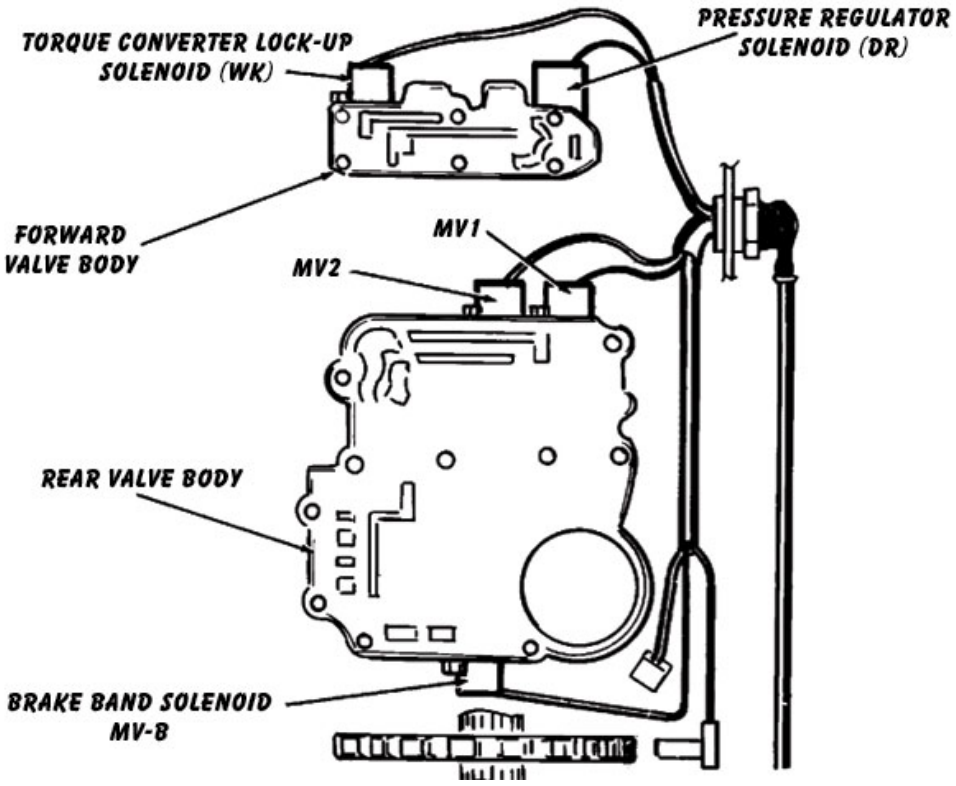
4HP 24 (E9)													
GEAR	MV'S			MULTIPLATE CLUTCHES		MULTIPLATE BRAKES					FREEWHEELS		
	1	2	3	A	B	C'	C	D	E	F	J	H	K
P													
R					X			X	X				X
N													
D1		X		X					X				X
D2	X	X		X		X	X		X			X	X
D3	X			X	X		X		X				X
D4			(X)	X	X		X			X			
Man, 1		X		X				X	X		X		X

X = active (x) = TC LOCK UP - greater than 55 mph.



4HP 24 E9 Cut Away View

A5S 310/270R
VALVE BODY COMPONENTS



MAIN PRESSURE REGULATOR

RESISTANCE @ 3.5 - 6.0 Ohms
20°C +/- 5°C

RESISTANCE @ 4.0 - 7.0 Ohms
80°C +/- 5°C

SHIFT SOLENOIDS: MV 1 & MV 2

RESISTANCE @ 17.0 - 20.0 Ohms
20°C +/- 5°C

RESISTANCE @ 21.0 - 24.5 Ohms
80°C +/- 5°C

BAND BRAKE REGULATOR

RESISTANCE @ 9.0 - 12.0 Ohms
20°C +/- 5°C

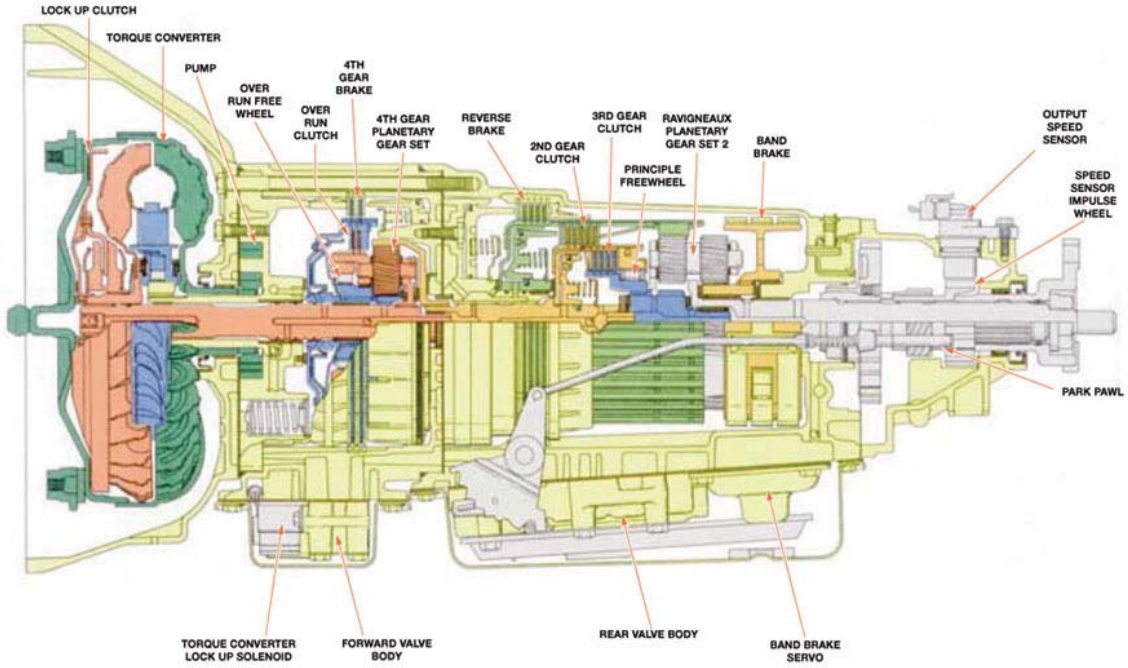
RESISTANCE @ 11.5 - 14.5 Ohms
80°C +/- 5°C

A4S 310/270R - POWER FLOW SCHEMATIC

GEAR APPLICATION CHART

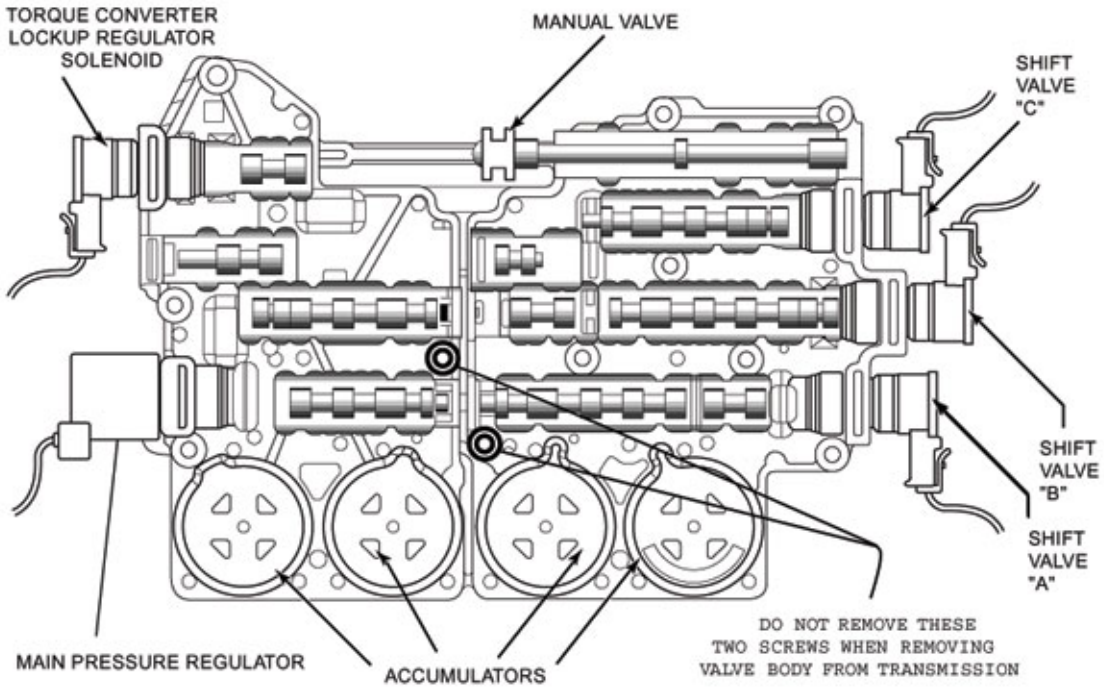
A4S 310/270R												
GEAR	SOLENOIDS (MV'S & EDS)				CLUTCHES & BRAKES						FREE WHEELS	
	1	2	BB	TC	OVERUN CLUTCH	C-2 (BRAKE)	C-3 (CLUTCH)	C-4 (BRAKE)	B (BAND BRAKE)	R-C (BRAKE)	Principle	Over run
P		X			X					X	LD	LD
R		X			X	X					LD	LD
N		X			X							
D1		X	X		X				X		LD	LD
D2	X	X	X		X	X			X		LD	FW
D3	X			(x)	X	X	X					LD
D4				(x)		X	X	X				
Man, 1		X	X		X		X		X		LD	LD

X = active (x) = TC LOCK UP - PROGRAM DEPENDENT
Freewheels: LD = locked in drive, FW = free wheeling



A5S 360R (GM 5)

VALVE BODY COMPONENTS



MAIN PRESSURE REGULATOR
Resistance @: (temperature will affect resistances)(Readings at +/- 7%)
20°C = 4Ω
90°C = 5.2Ω

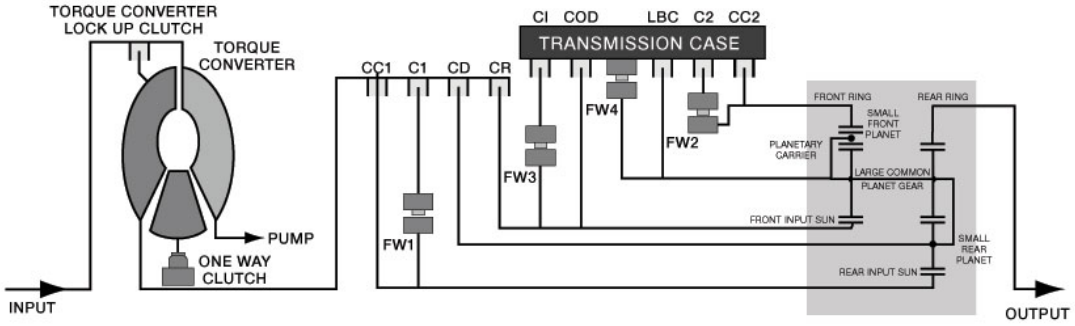
TORQUE CONVERTER REGULATOR –TCC
Resistance @: (temperature will affect resistances)(Readings at +/- 7%)
20°C = 10Ω
90°C = 12.7Ω

NTC TEMP SENSOR
-30°C = 52594Ω
100°C = 178Ω

SHIFT SOLENOIDS: A - B - C
20°C = 16Ω
70° = 19.1Ω

SPEED SENSORS
20°C = 405Ω
Note! Above resistance may vary as much as 15%

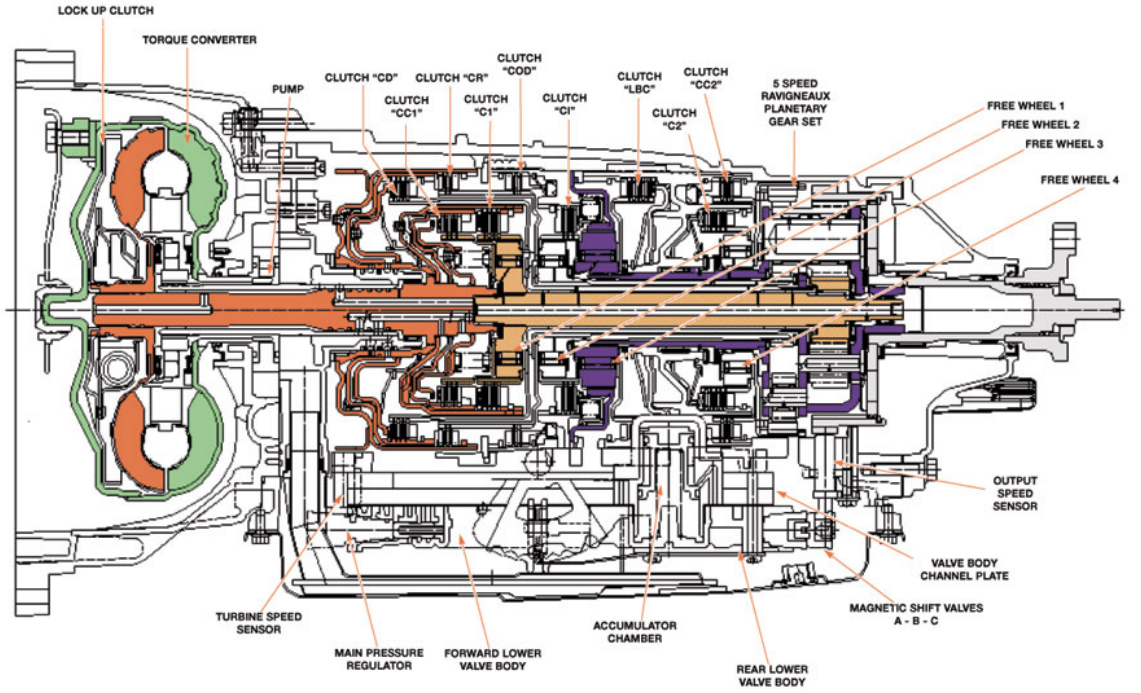
A5S 360R (GM 5) Powerflow Schematics:



Range	Gear	Ratio	Clutches									Free Wheels				Solenoids			
			C1	C2	CI	CD	COD	CC1	LBC	CC2	CR	1	2	3	4	A	B	C	TCC
D/4/3/2	1	3.45:1	X					X	X			X			X	OFF	ON	ON	NO
	2	2.21:1	X	X				X		X		X	X			ON	ON	ON	NO
D/4/3	3	1.59:1	X	X	X		X	X				X		X		ON	OFF	ON	Y/N
D/4	4	1.00:1	X	X	X	X		X				X				OFF	OFF	ON	Y/N
D	5	0.76:1	X	X	X	X	X									OFF	OFF	OFF	Y/N
P/N	/	/														OFF	ON	OFF	
R	R	-3.16:1							X		X					OFF	ON	OFF	NO

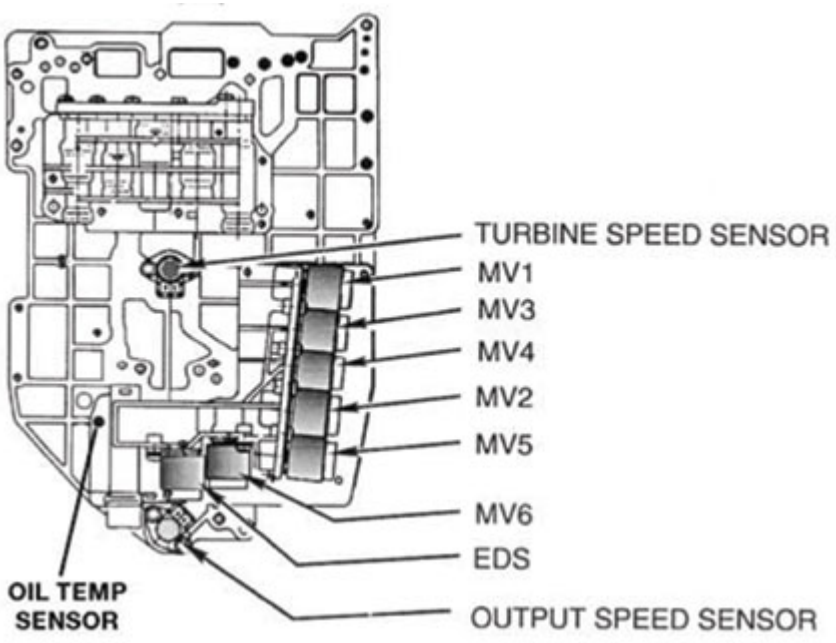
Planetary Gearset “Input - Reaction - Output” Chart

Gear	Input	Reaction	Output	Ratio
First	Rear Input Sun Gear	Planetary Carrier	Rear Ring Gear	3.45:1
Second	Rear Input Sun Gear	Front Ring Gear	Rear Ring Gear	2.21:1
Third	Rear Input Sun Gear	Front Input Sun Gear	Rear Ring Gear	1.59:1
Fourth	Rear Input Sun Gear & Planetary Carrier	None	Rear Ring Gear	1.00:1
Fifth	Planetary Carrier	Front Input Sun	Rear Ring Gear	0,76:1
Reverse	Front Input Sun Gear	Planetary Carrier	Rear Ring Gear	-3.16:1



A5S 310Z

VALVE BODY COMPONENTS



A5S 310Z Valve Body Resistance Nominal Values:

Resistances @ 20°C

Output Speed Sensor = 325Ω - +/- 40Ω
Input Speed Sensor = 325Ω - +/- 40Ω
NTC Sensor:
820Ω @ 0°C
962Ω @ 20°C
1118Ω @ 40°C
1289Ω @ 60°C

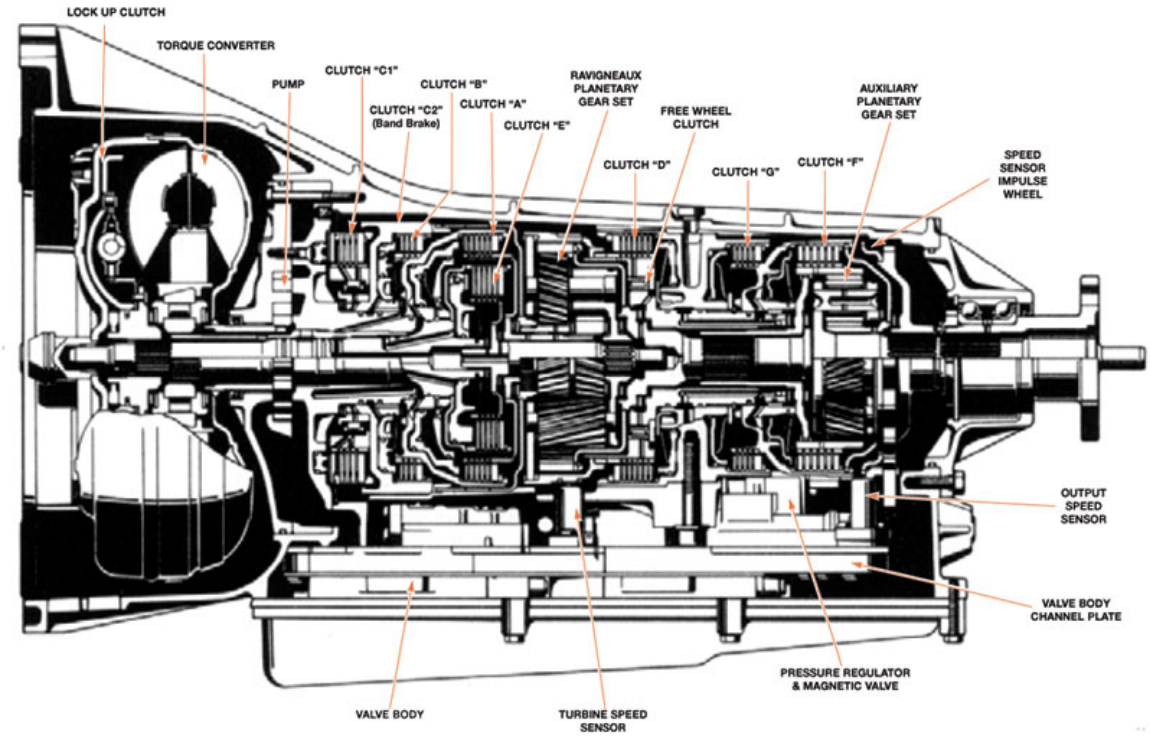
EDS1 = 5.9Ω - +/- 5Ω
MV1 = 28Ω
MV2 = 28Ω
MV3 = 28Ω
MV4 = 28Ω
MV5 = 28Ω
MV6 = 28Ω

Above **MV Solenoid** resistance values may vary up to 2Ω, dependant on temperatures!

GEAR APPLICATION CHART

A5S 310Z																
GEAR	SOLENOID VALVES (MV'S)						CLUTCH			BRAKES					FREE WHEELS	
	1	2	3	4	5	6	A	B	E	C1	C2	D	G	F	1	2
P	X	X	X											X		
R	X	X						X				X	X			
N	X	X	X											X		
D1	X	X	X				X						X			
D2		X	X				X			X	X		X		X	
D3			X	X-			X			X	X			X		
D4						(X)	X		X	XFW				X		X
D5	X				X-	(X)			X	XFW	X			X		
2nd, 1	X	X														

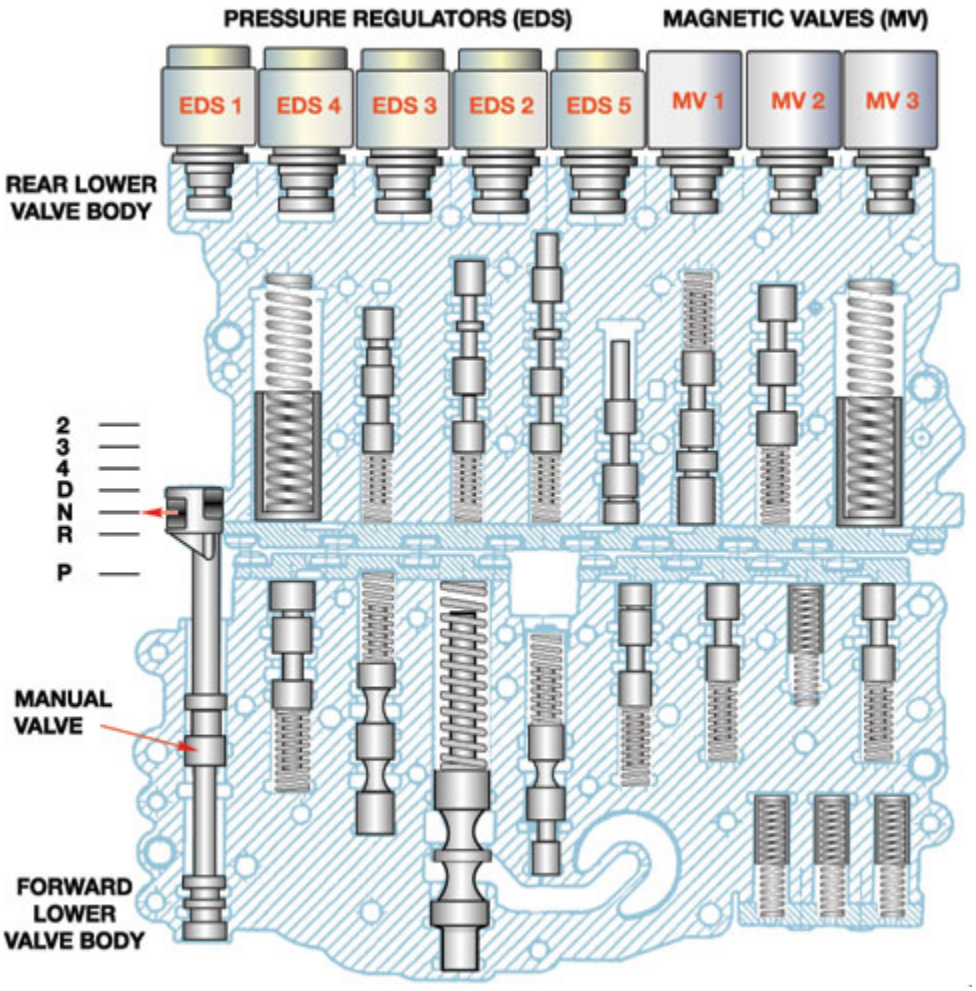
X = active (pressure build up)
- = inactive (pressure drain)
(X) = TC LOCK UP - PROGRAM DEPENDENT



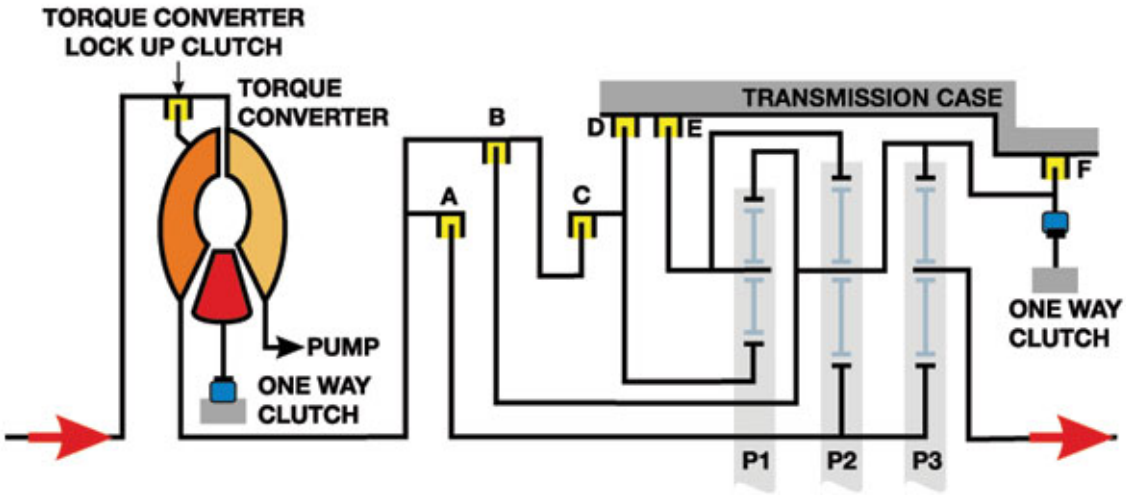
A5S 440Z

VALVE BODY COMPONENTS

COMPONENT	OUTPUT SPEED SENSOR	INPUT SPEED SENSOR	NTC TEMP SENSOR	EDS1	EDS4	EDS3	EDS2	EDS5	MV1	MV2	MV3
OHMS (@ 20°C)	325. Ω ± 40.	325. Ω ± 40.	820. Ω @ 0°C 962. Ω @ 20°C 1118. Ω @ 40°C 1289. Ω @ 60°C	5.9 Ω ± .5	6.4 Ω ± .5	6.4 Ω ± .5	6.4 Ω ± .5	6.4 Ω ± .5	28 Ω ± 2	28 Ω ± 2	28 Ω ± 2



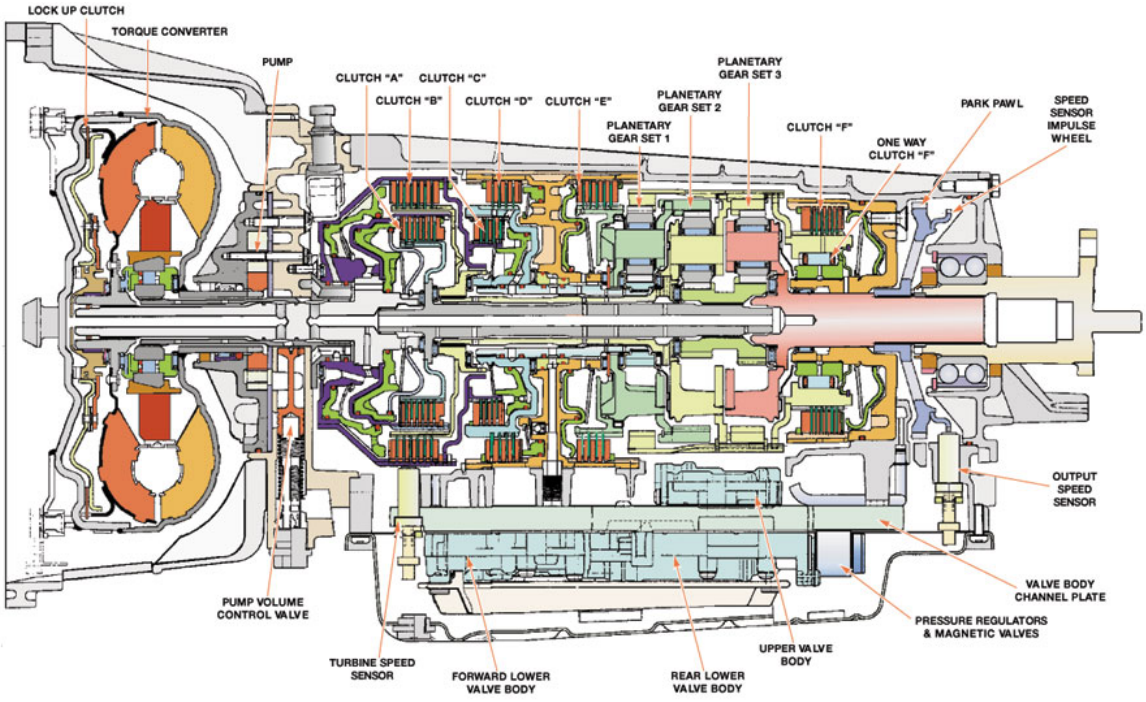
A5S 440Z - POWER FLOW SCHEMATIC



GEAR APPLICATION CHART

A5S 440 Z															
GEAR	SOLENOID VALVE LOGIC								CLUTCH LOGIC						
	SOLENOID VALVE			PRESSURE REGULATOR					CLUTCH			BRAKE			FREE-WHEEL
	1	2	3	1	2	3	4	5	A	B	C	D	E	F	
P	X		X	X	-X	X	-X	-X						X	
R		X		X	X-	X		X-			X			X	
N	X		X	X	-X	X		-X						X	
D1	X			X	X-	X		X-	X						X
D2	X	X		X		X		X	X				X		
D3		X		X	X	X			X			X			
D4		X		X			-X-		X	X					
D5				X	X		-X-			X		X			
2nd, 1	X			X	X	X		X-	X					X	X
D5-4		X		X		X			X	X		X			
L U							X								

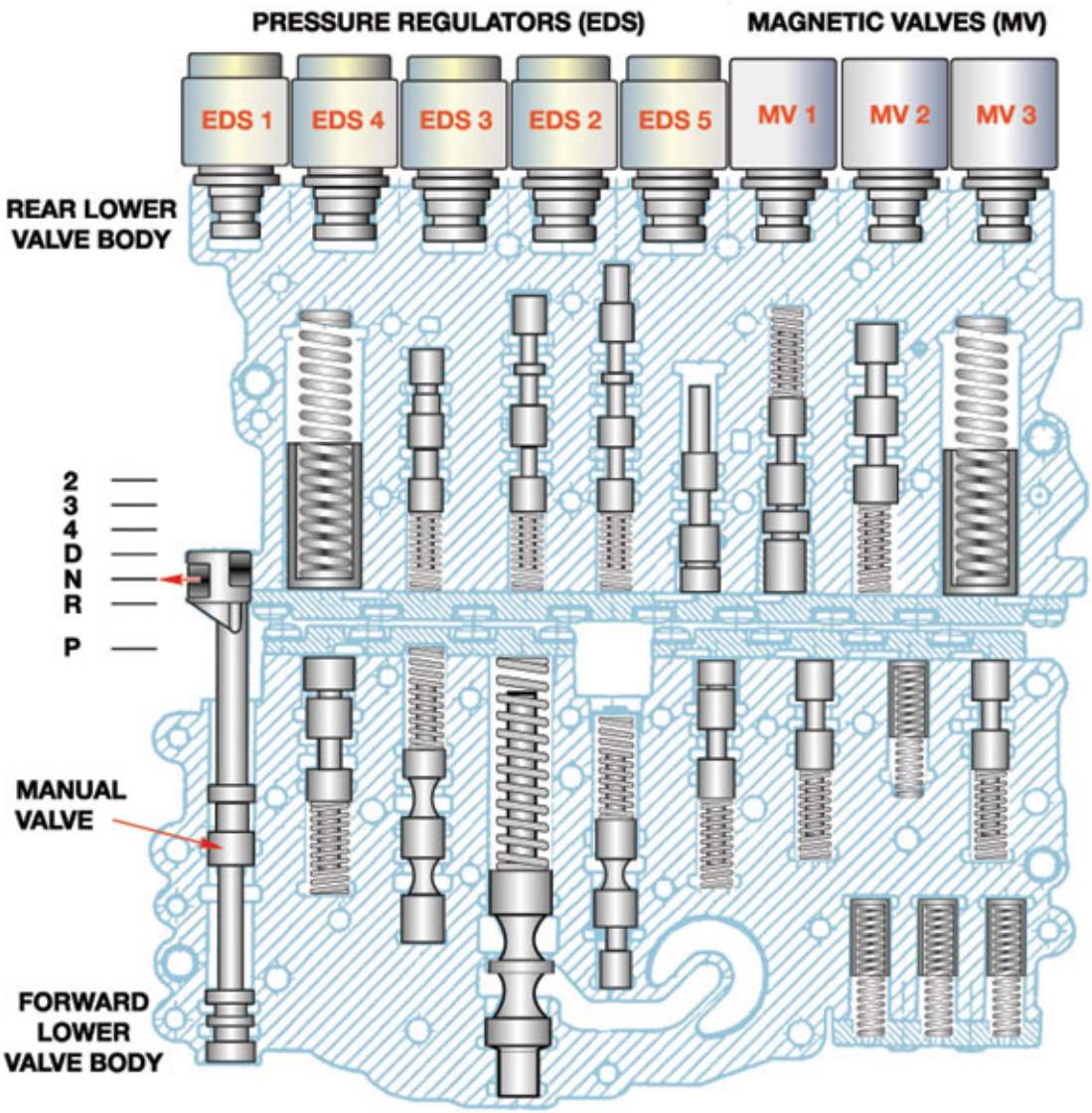
X = active (pressure build up)
- = inactive (pressure drain)



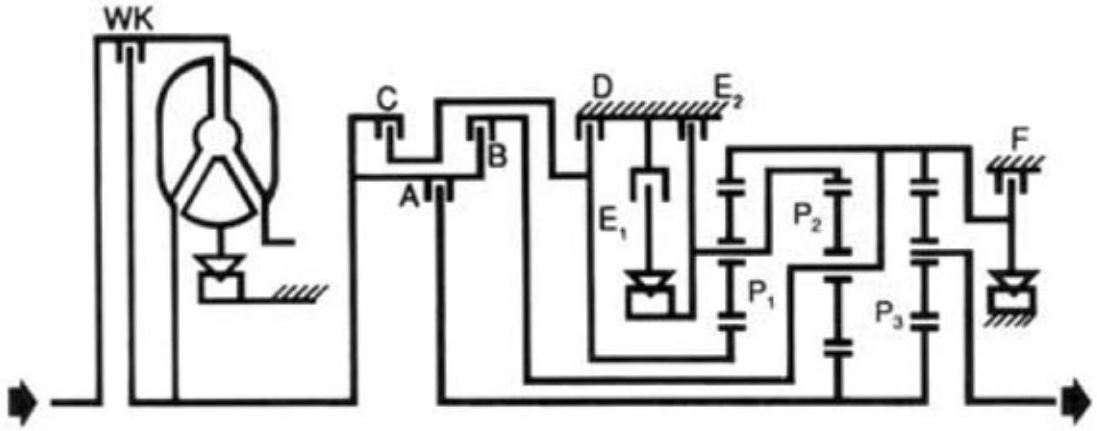
A5S 560Z

VALVE BODY COMPONENTS

COMPONENT	OUTPUT SPEED SENSOR	INPUT SPEED SENSOR	NTC TEMP SENSOR	EDS1	EDS4	EDS3	EDS2	EDS5	MV1	MV2	MV3
OHMS (@ 20°C)	325. Ω ± 40.	325. Ω ± 40.	820. Ω @ 0°C 962. Ω @ 20°C 1118. Ω @ 40°C 1289. Ω @ 60°C	5.9 Ω ± .5	6.4 Ω ± .5	6.4 Ω ± .5	6.4 Ω ± .5	6.4 Ω ± .5	28 Ω ± 2	28 Ω ± 2	28 Ω ± 2

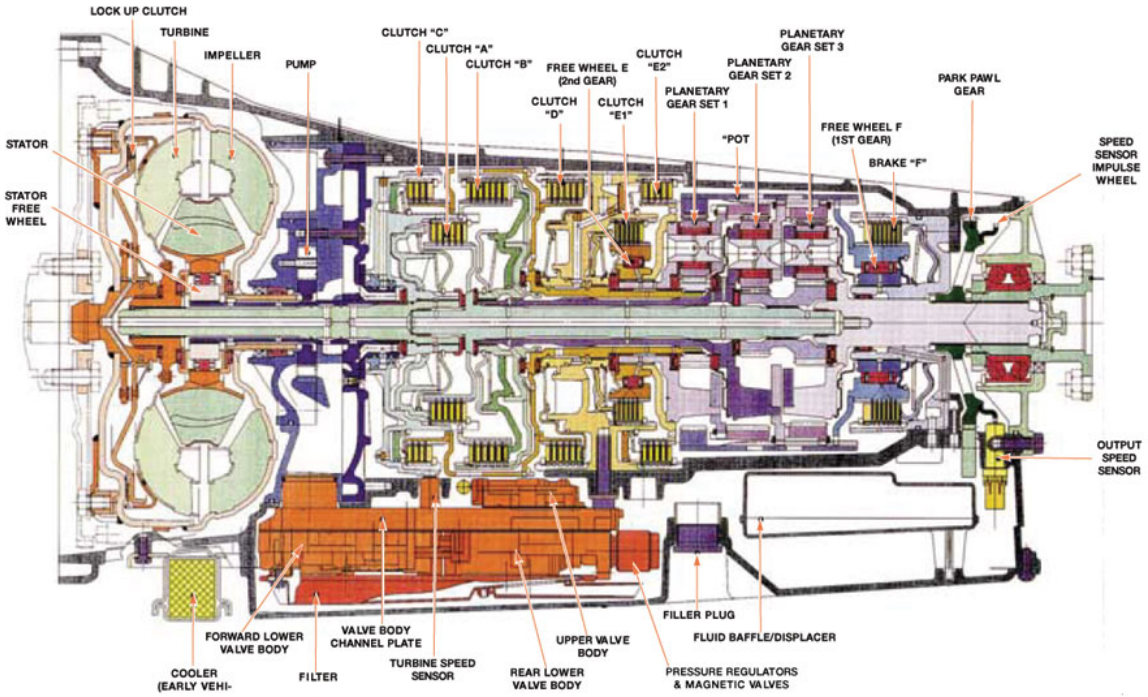


A5S 560Z - POWER FLOW SCHEMATIC



A5S 560 Z																	
GEAR	SOLENOID VALVE LOGIC								CLUTCH LOGIC								
	SOLENOID VALVE			PRESSURE REGULATOR					CLUTCH			BRAKES				FREE WHEELS	
	1	2	3	1	2	3	4	5	A	B	C	D	E 1	E2	F	F	E
P	X			X	-X	X	-X	-X							X		
R		X		X	X-	X		X-			X				X		
N	X			X	-X	X		-X							X		
D1	X			X	X-	X		X-	X							X	
D2	X	X		X		X		X	X				X	X			X
D3		X		X	X	X			X			X	X				
D4		X		X			-X-		X	X			X				
D5			-X	X	X		-X-			X		X	X				
2nd, 1	X			X	X	X		X-	X						X		

X = active (pressure build up) - = inactive (pressure drain)


LOCK UP CLUTCH
TURBINE
IMPELLER
PUMP
CLUTCH "C"
CLUTCH "A"
CLUTCH "B"
FREE WHEEL E (2nd GEAR)
CLUTCH "D"
CLUTCH "E1"
CLUTCH "E2"
PLANETARY GEAR SET 1
PLANETARY GEAR SET 2
PLANETARY GEAR SET 3
"POT
FREE WHEEL F (1ST GEAR)
BRAKE "F"
PARK PAWL GEAR
SPEED SENSOR IMPULSE WHEEL
STATOR
STATOR FREE WHEEL
OUTPUT SPEED SENSOR
FILLER PLUG
FLUID BAFFLE/DISPLACER
FORWARD LOWER VALVE BODY
VALVE BODY CHANNEL PLATE
TURBINE SPEED SENSOR
UPPER VALVE BODY
REAR LOWER VALVE BODY
PRESSURE REGULATORS & MAGNETIC VALVES
COOLER (EARLY VEHI-
FILTER