

AW 6 Speed FWD

Presented by
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ATRA Powertrain Expo 2009

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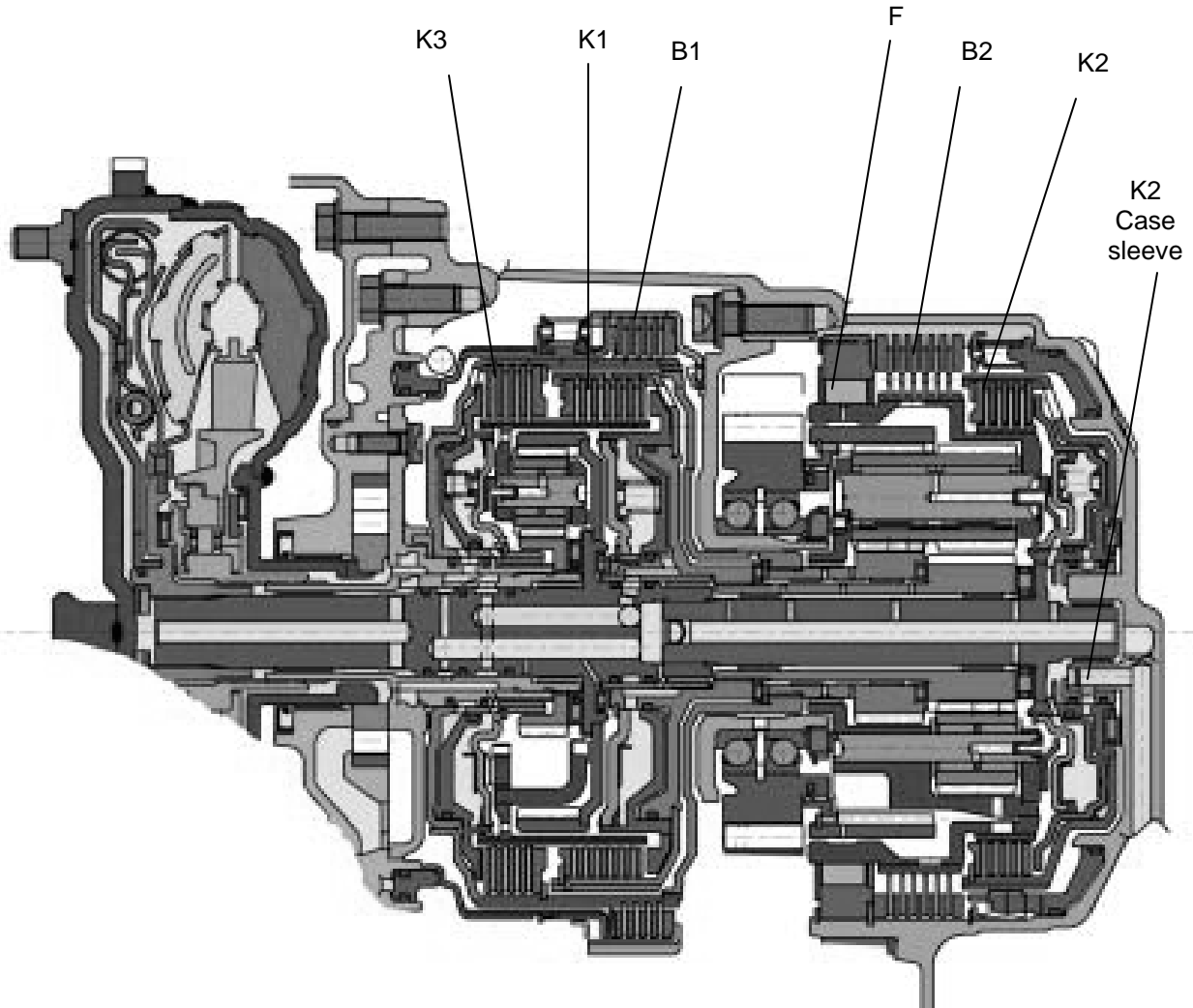
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AW6 FWD & RWD TECHNICAL FEATURES

- AW55-50 was designed in '98 and went into production in '99. Torque capacity of 330 N.m.
- AW/TF-60 was designed in '02 along with the rear wheel drive unit, the TR-60SN. Both units use similar power flow & control. TF-60 went into production in the '03 Beetle (09G) with torque capacity of 280N.m. The later 09K has 400N.m. and 09M has a 450 N.m. torque capacity.
- Skip shift scheduling controls 4 clutches simultaneously. The units have the ability and programming for 2-4; 4-6 upshifts and 6-2, 2-1; 5-3, 3-1, 4-2 and 2-1 downshifts. This is accomplished by designing a compact hydraulic circuit that remains pre-charged.
- Each clutch apply or release is controlled by one solenoid and valve circuit.
- The control pressure curve of each circuit is affected by the adjustment screw on the end of the bore opposite the solenoid. That feature is combined with fast adapts and CAN feedback.
- Software has been reduced by 45% over 5 speed and parts by 27% with a gain of 5% fuel economy.
- TF-80SC utilizes a brake band, TF-60SN uses a B1 clutch. The oil transfer grooves in the band drum are critical to the timing for apply and to reduce heat. The double wrapped band has special oil grooves to reduce heat.
- Temperature sensor is extremely critical to proper shift strategy and adaption! TCM has 3 distinct temperature modes of operation.
 1. TCC apply & normal clutch apply release strategy.
 2. Stage 1: 127°C (260°F) shifts become later and TCC remains applied longer.
 3. Stage 2: Engine torque reduction.

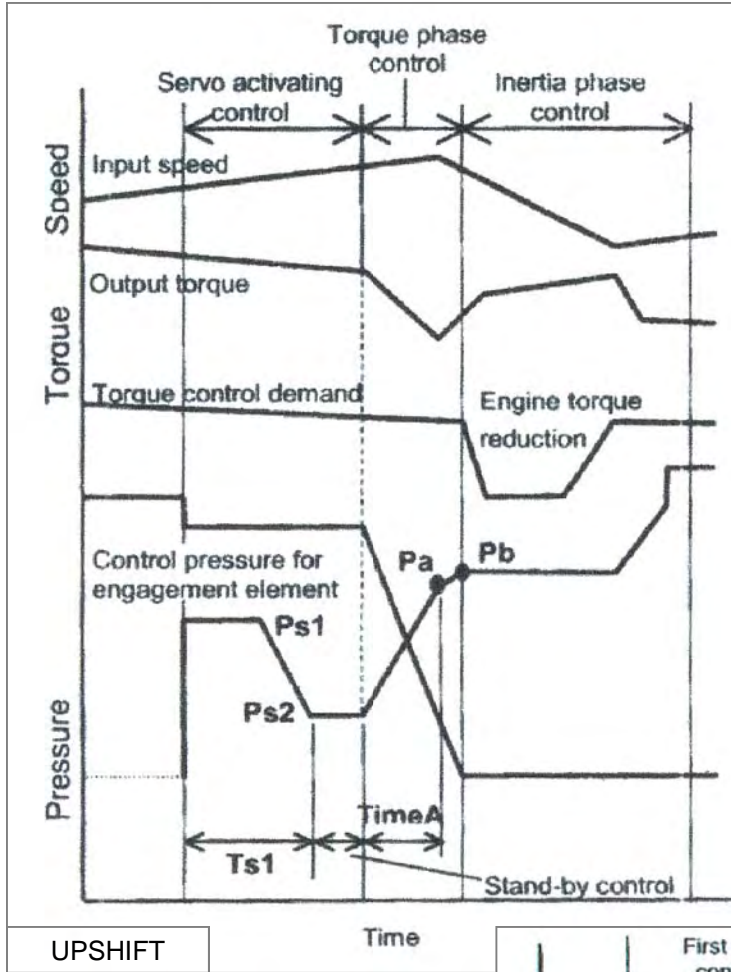
SOLENOID POWERFLOW										AW6 FWD			
RANGE	SOLENOID						CLUTCH			BRAKE		O.W.C	
	SSC SLC1	SSD SLC2	SSE SLC3	SSF SLB1	SSA S1	SSB S2	C-1	C-2	C-3	B-1 BAND	B-2 CLUTCH		
FORD/VOLVO/PSA	N92#5	N282#9	N90#3	N283#10	N88	N89	K-1	K-2	K-3	B-1 Clutch	B-2 CLUTCH	F-1	
V.W.													
P	X	X	X	X									
R	X	X		X				X			X		
N	X	X	X	X									
Neutral Control	X			X			X			X		X	
D S	1ST	X	X	X	Z	Z	X				Z	X	
	2ND		X				X			X			
	3RD		X		X	Cy	X		X				
	4TH			X	Cy	Cy	X	X					
	5TH	X			X	Cy		X	X				
	6TH	X		X		Cy	Cy		X	X			
	SSC & SSE solenoids have residual clutch pressure feeding back to the opposing clutch control vale												
X = ON			=OFF			Z =ON DURING ENGINE BRAKING			Cy=CYCLED				
Solenoid for Clutch	C-1	C-2	C-3	B-1									
RESISTANCE-OHMS	4.0-8.0	4.0-8.0	4.0-8.0	4.0-8.0	10-16	10-16	Linear solenoids operate at 300Hz.						
Solenoid Flow	N.O	N.O.	N.O.	N.O.	N.C	N.C	N91/TCC/SLU is N.C.; N93/EPC/SLT is N.O						



AF-40 - B1 is a Band

TF-60SN - B1 is a Clutch

- Clutch piston travel is critical and set by selective flange/snap rings.
- Split band has a print mark between the straps near the anchor. If the print mark is worn away, band should be replaced. The C3 clutch drum onto which the B1 band applies, has a special surface finish and should not be altered. The B1 band should be pre-soaked with the correct fluid for 2 hours.
- Faced clutch plates have a print mark. OE suggests if the print mark is not legible the friction plate should be replaced and a new pre-soaked friction installed.

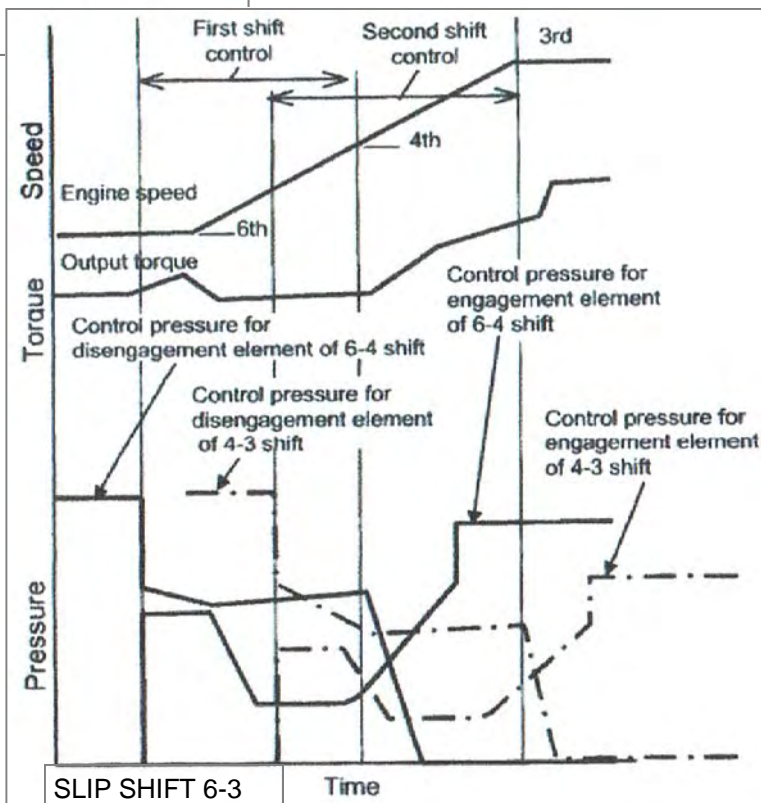


- Servo Actuating:**
- Reduces gear shift lag by priming circuit.
 - Uses temperature & pressure to adjust.
 - Accurately times end of piston stroke.

- Torque Phase:**
- CAN & adaptive strategy timing apply & release of exhausting clutch.

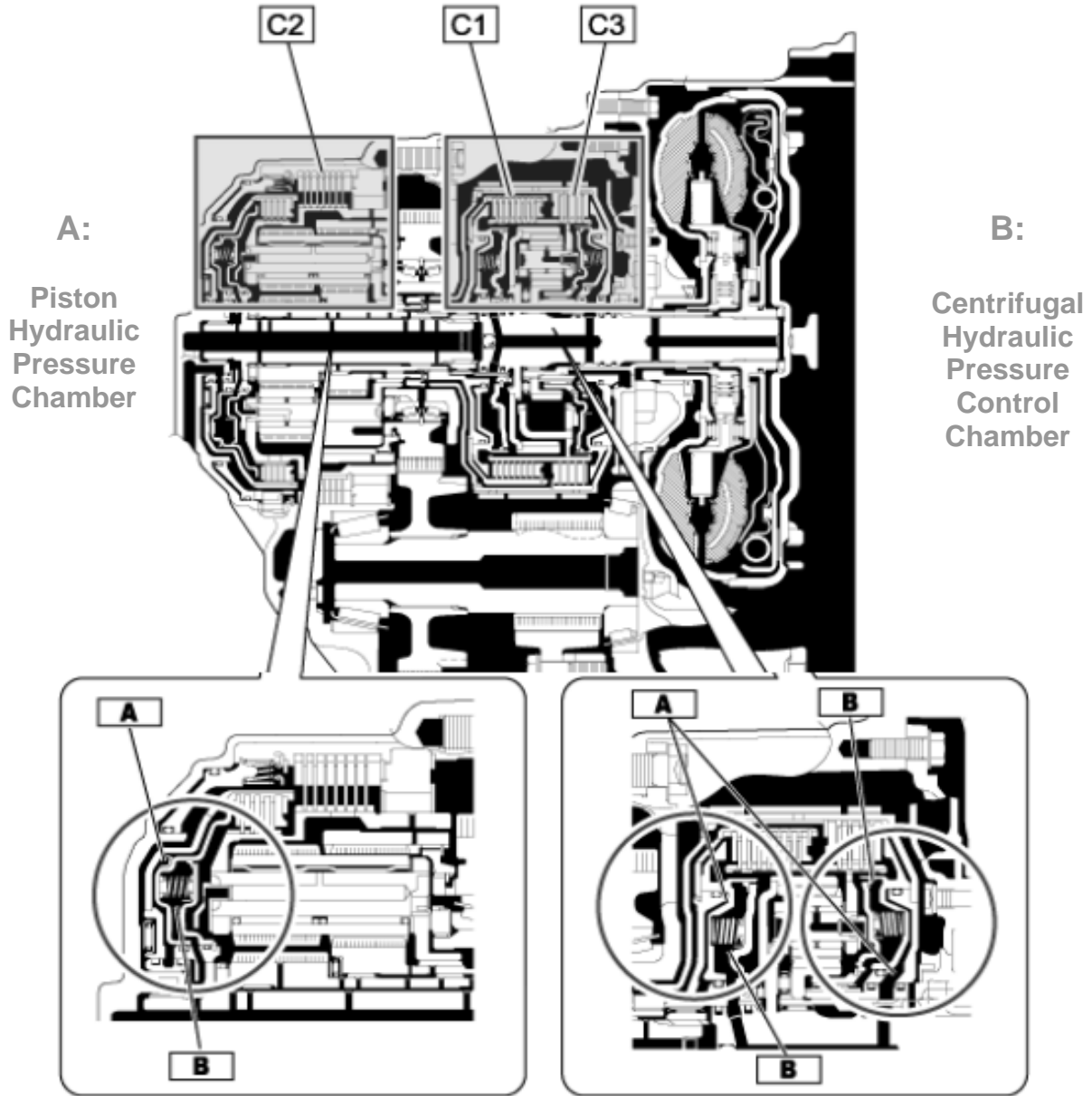
- Inertia Phase:**
- After initial apply, RPM vs. torque vs. slippage is monitored. Pressure is adjusted to eliminate the slip at the end of the shift.

UPSHIFT



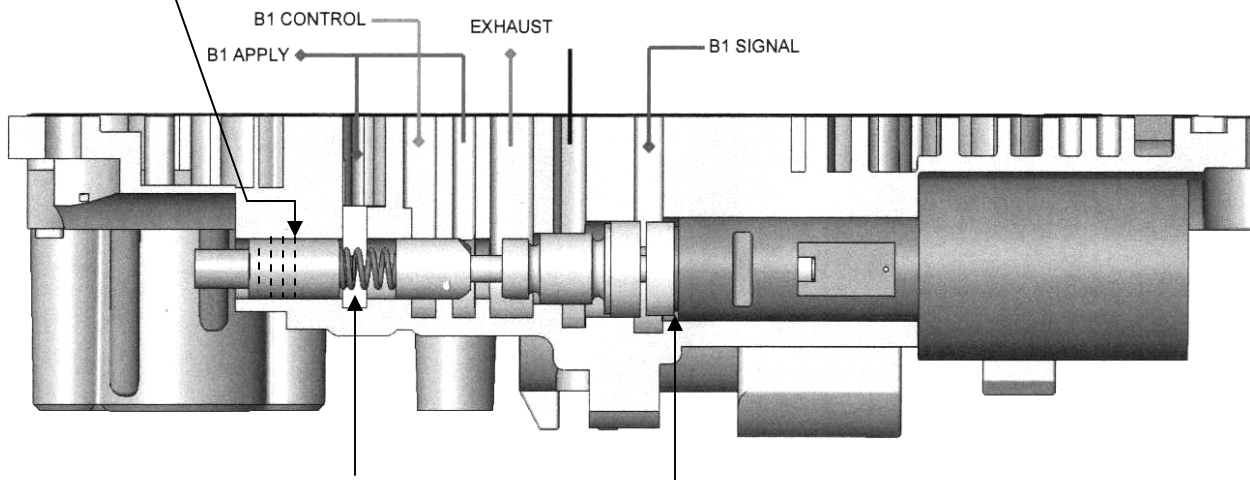
- Skip Shift:**
- Four elements controlled
 - Controls the apply & release to reduce overlap without bind or flare.

A balance area opposes clutch apply pistons. These are fed from lubrication oil. The valve body damper/accumulators pre-charge all circuits.



Clutch Piston Stroke (use selective flanges)	
C-1 = 1.2 to 1.4mm	2.8-3.5mm
C-2 = .045 to .065mm	2.5-3.2mm
C-3 = 0.6 to 0.8mm	2.8-3.5mm
B-2 = 1.2 to 1.4mm	47-53mm

Adjuster:
By sealing this with Loctite or
cutting o-ring groove.
Both the vacuum test and clutch
control improve.



Vacuum Test Example

3"=Poor	7"=Poor
12"=Normal	11"=Normal
14-18" =Post repair	14-18"=Post repair

Refer to vacuum test locations on all covers.

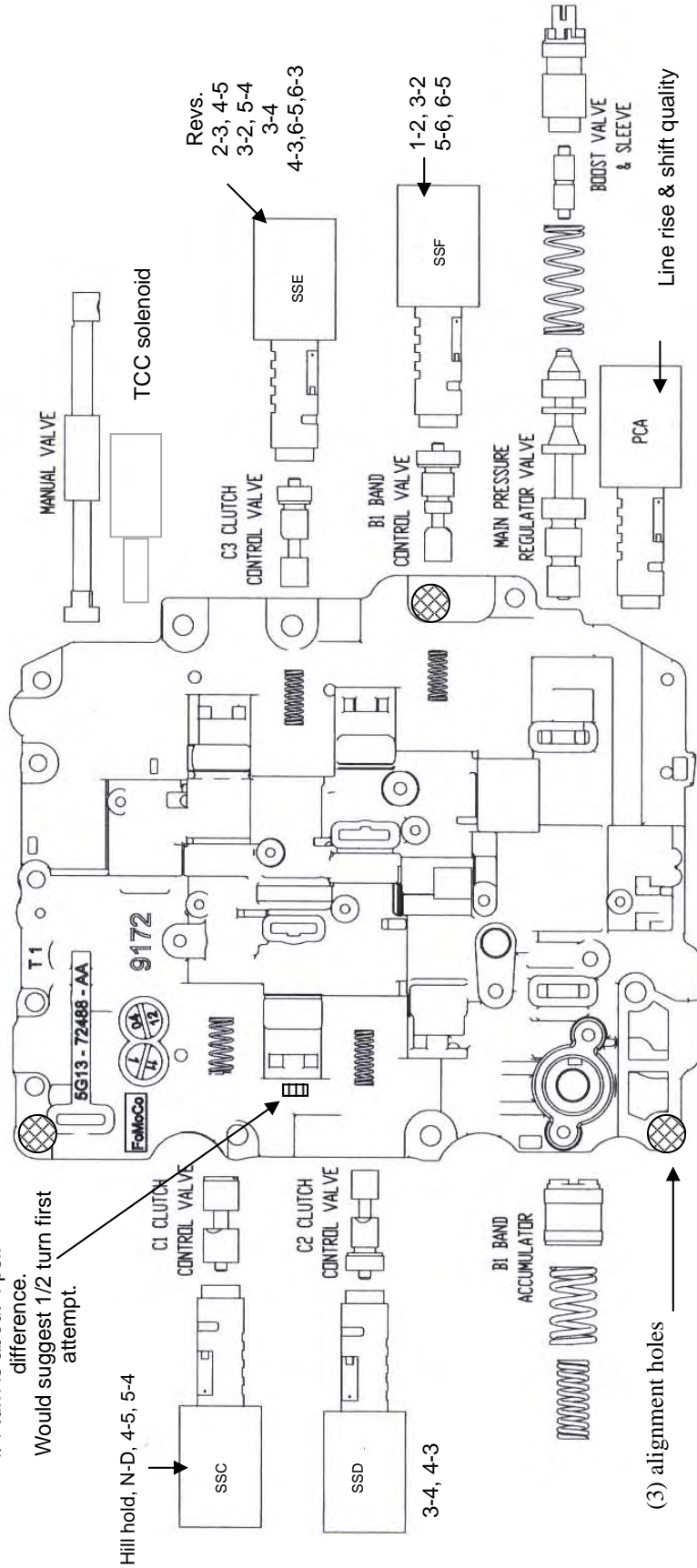
You Can Alter Drive-ability by adjusting clutch pressure control on ALL AW6!

FORD-MAZDA PICTURED HERE
 (Use other Illustrations and application chart on pg. 3 to match AW6 Design)

EXAMPLE:

C-3 adjuster: Turn screw outward to increase C-3 clutch pressure.
 1/4 turn is about 4 psi.
 Would suggest 1/2 turn first attempt.

Increasing clutch pressure will reduce slip during upshift.
 Increasing pressure will slow clutch exhaust during release.



Remember! Clutch overlap requires timing or adjustment of the apply and/or the releasing clutches. Always measure the adjuster or note the turns to regain OE, if required.

Tips Regarding Clutch Control Adjustment 09G

When adjusted properly:

- Hill hold will not allow vehicle to roll back nor move forward with foot off accelerator.
- Smooth engagement into Fwd-Revs. Not more than 1.5 second delay or double bump into reverse.

To Isolate proper drive-ability & shift quality:

- Suggest graphing engine RPM & transmission ISS #182. When correct, they follow each other with slight delay/lower ISS.
- Flare & harsh shifts show up on graphs as spikes or square wave shift transitions.
- Drive monitoring TCC slip RPM. Verify TCC stages: off, on, modulated slip mode.
- When K-3 is too far out of adjustment, a cut-loose will occur on 2-3 or harsh 3-2 downshifts. It is likely the B-1 will have to be adjusted at the same time.
- Drive and adjust in city driving conditions first. Once acceptable, drive it harder with elevated upshifts and coast down.

Testing on hydraulic test stand.

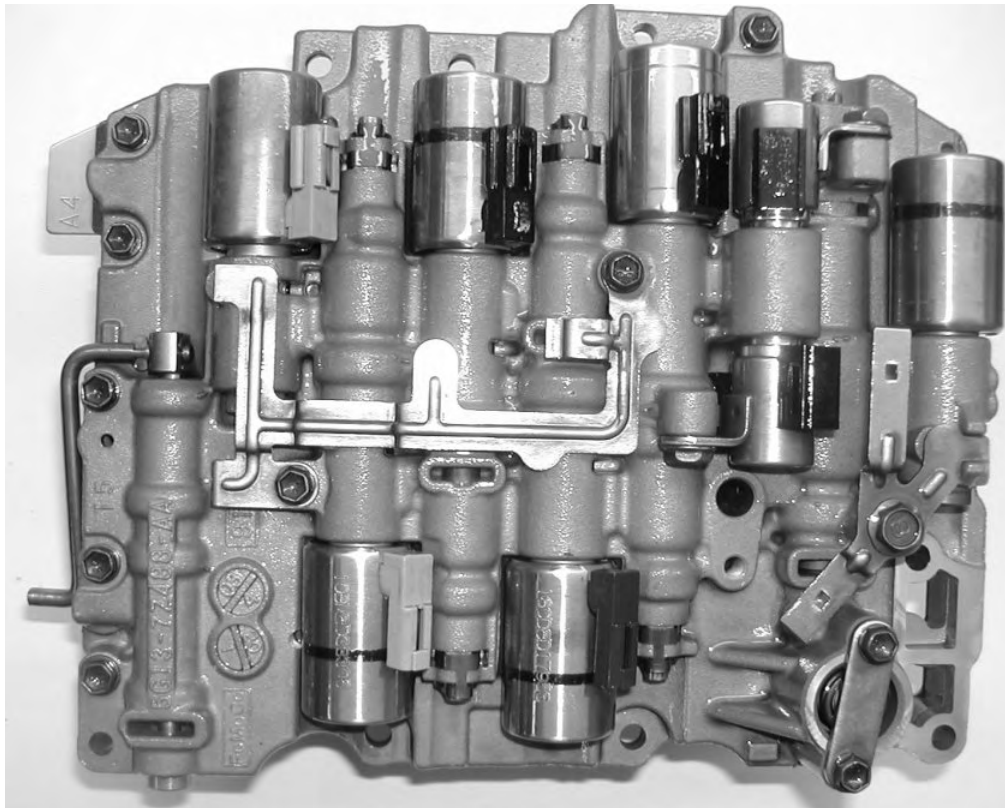
- Strongly suggest the solenoid cover with control valves be tested independent of the rest of the valve body.
- Compare OE duty % and clutch control output, then adjust your rebuild to match.

IDENTIFICATION OF VALVE BODY CORES

AF/AWF-21; TF-81SC; AW6A-EL					
FORD			LINCOLN		
Year	Vehicle	Engine	Year	Vehicle	Engine
05-07	Five Hundred	3.0L	07-09	MKX, MKZ	3.5L
06-09	Fusion	3.0L	06-07	Zephyr	3.0L

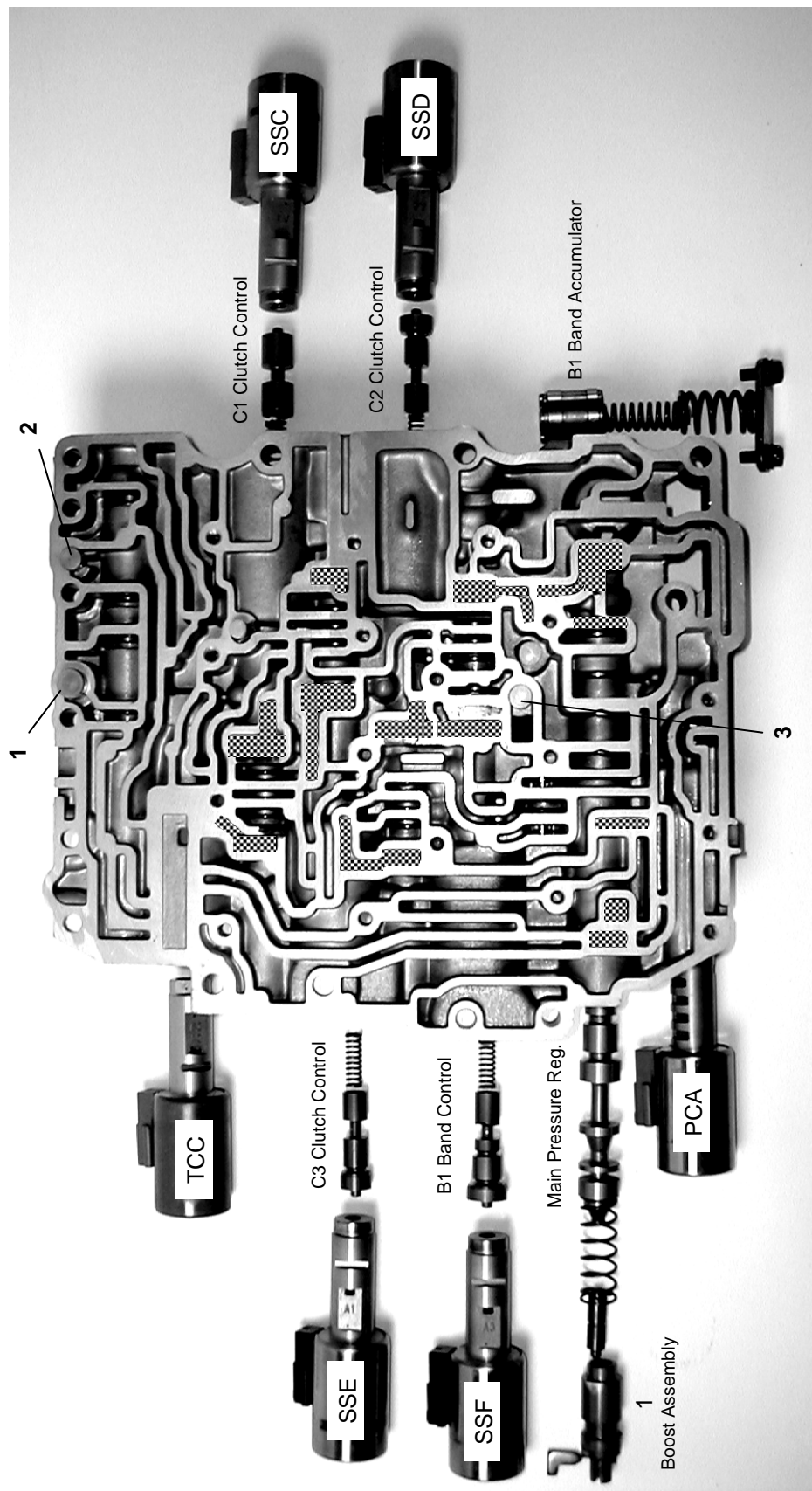
LAND ROVER			MERCURY		
07	Freelander II	1.8/2.5L	06-09	Milan	3.0L
07	LR2	3.2L	05-07	Montego	3.0L

MAZDA		
07-08	CX7	2.3L
07-08	CX9	3.5L
06-07	6S	3.0L

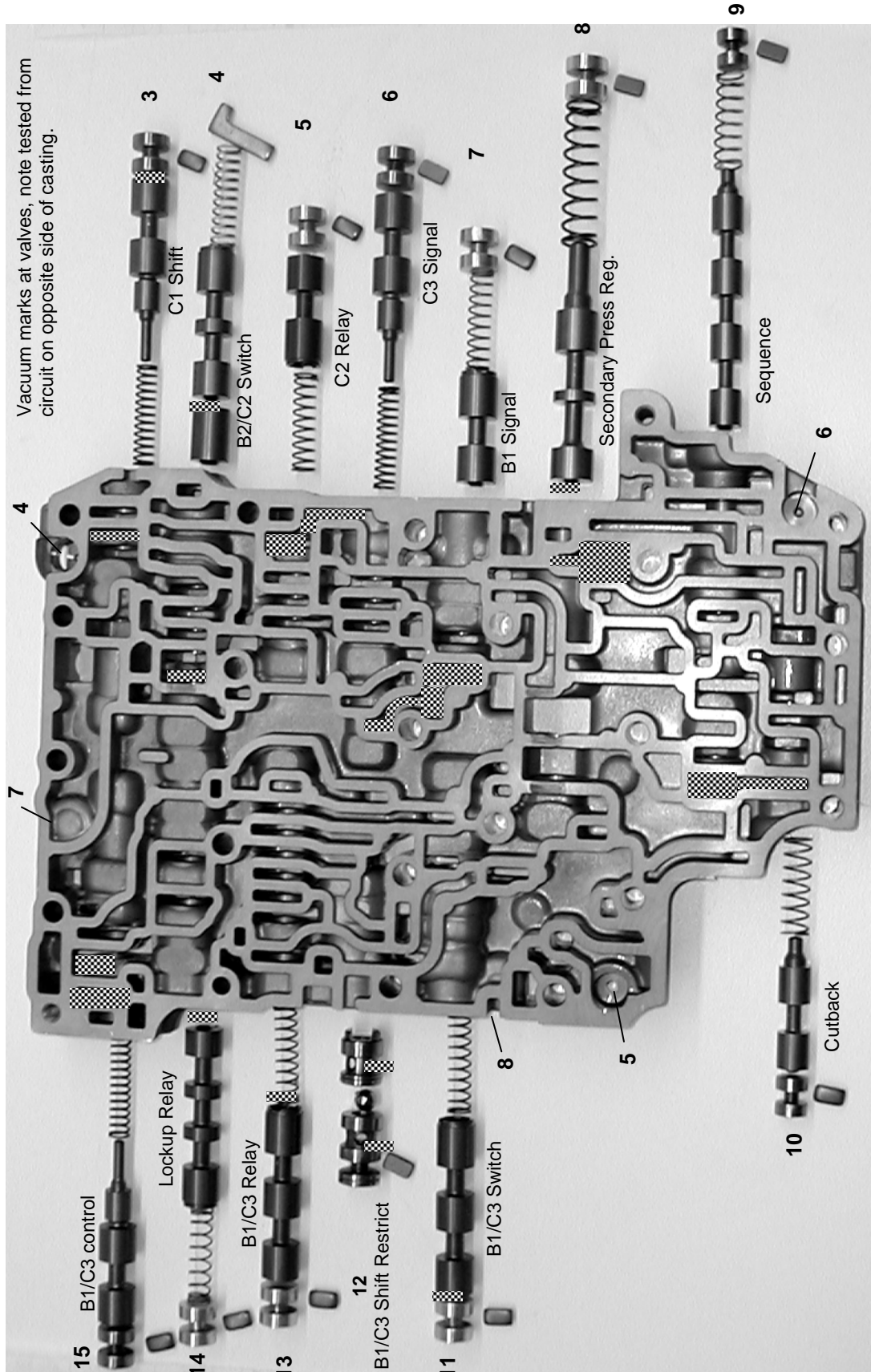


Side mount valve body & pan.

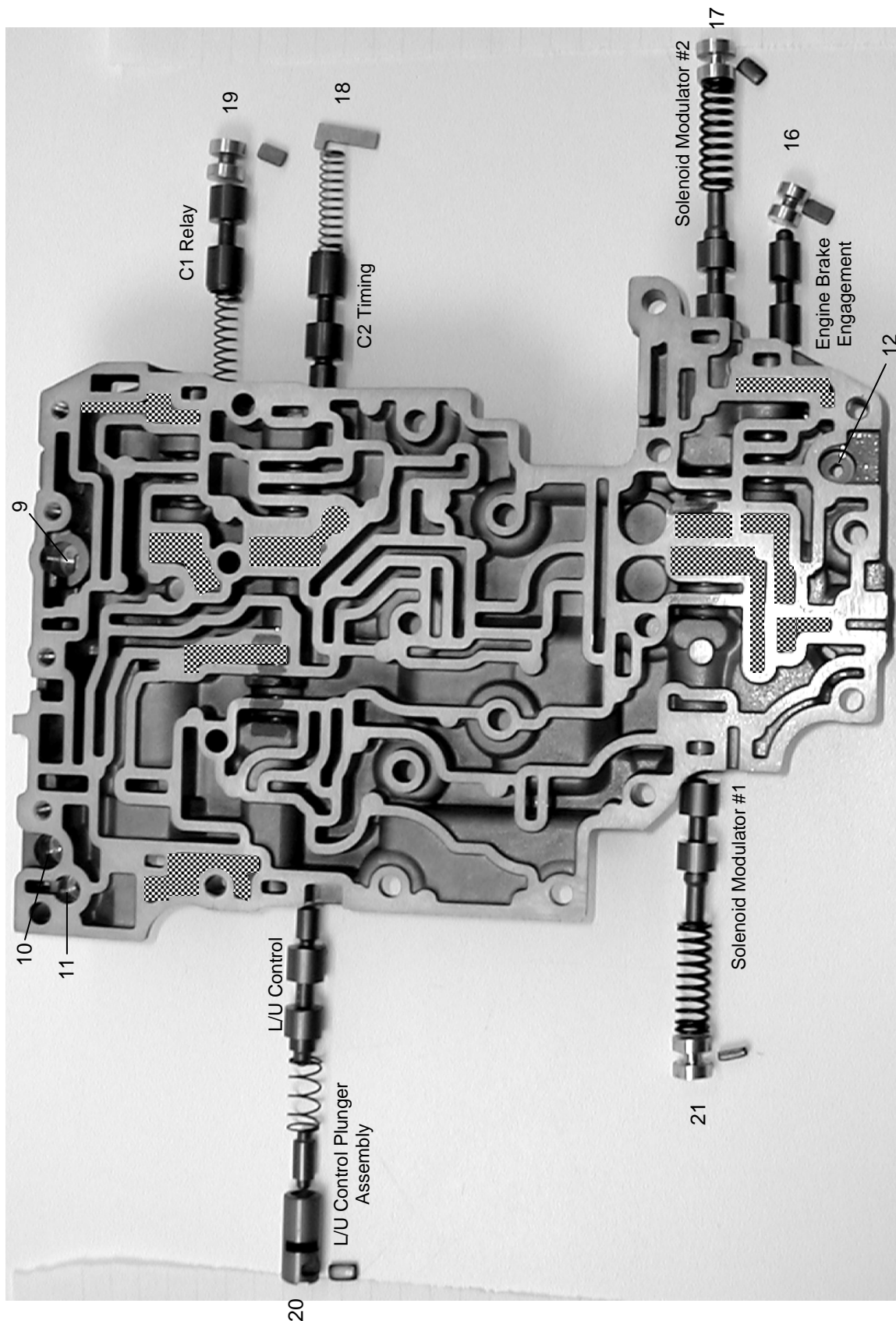
Ford/Mazda-Front Cover



Ford/Mazda Middle Casting -Front Side

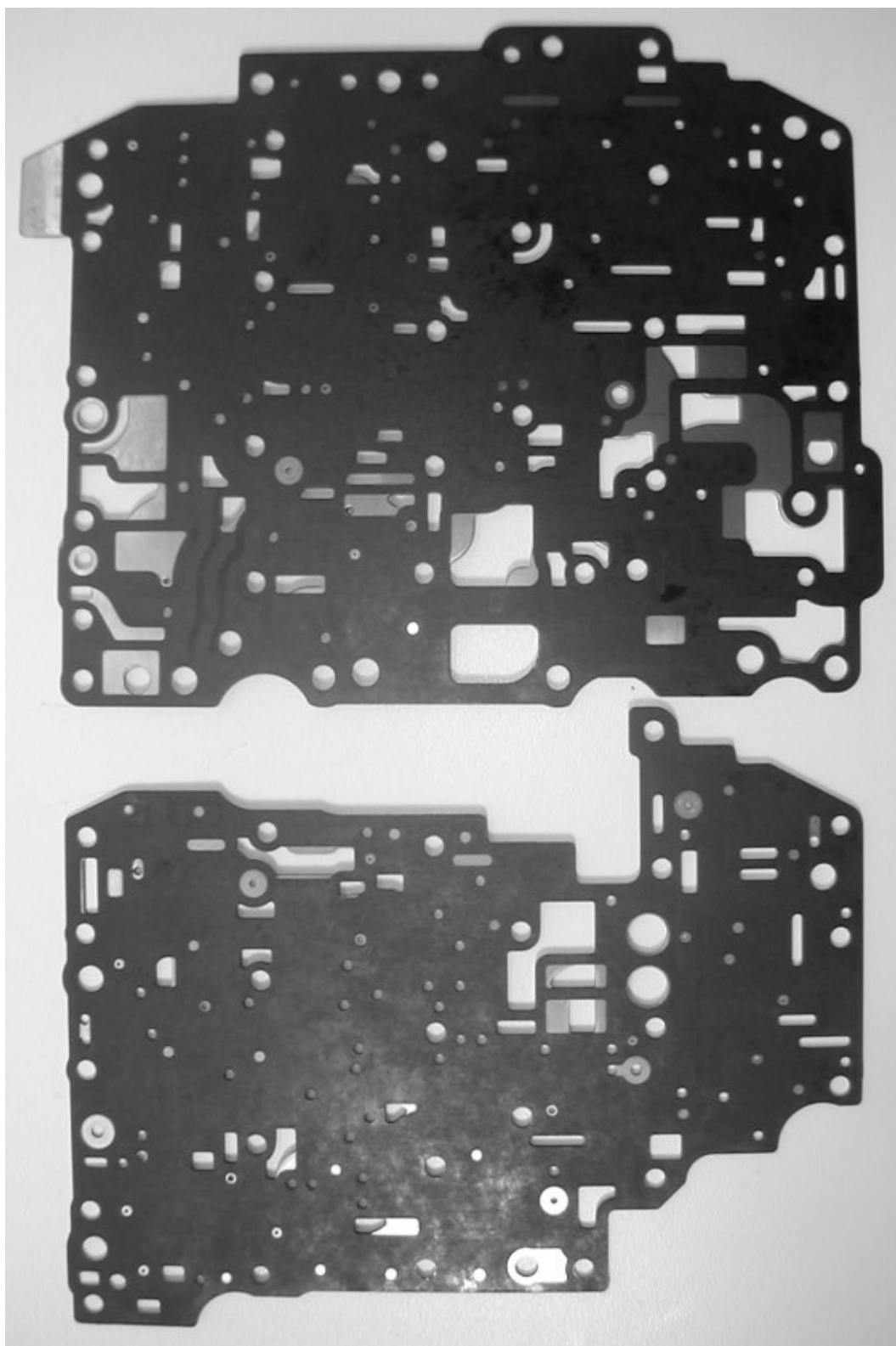


Ford/Mazda Rear Cover, Front Side



AW 6 SPEED FWD

FORD/MAZDA



AW 6 SPEED FWD

FORD AW6 SPRING I.D.					
Bore #	Identification	Color	Wire dia.	Spring OD	Free Length
SOLENOID/FRONT COVER					
1	Main Pressure regulator	Plain	.047"	.541"	1.472"
	SSD-C2	Plain	.032"	.253"	.740"
	SSC-C1	Pink	.032"	.324"	.762"
	SSE-C3	Plain	.032"	.253"	.740"
	SSF-B1	Blue	.030"	.253"	.675"
	Accumulator inner	Lt. blue	.061"	.430"	1.089"
	Accumulator outer	Plain	.082"	.631"	1.085"
	Relief. 0.392 diameter	White	.023"	.249"	.593"
	Relief.314 dia. x2	Orange	.014"	.161"	.368"
MIDDLE CASTING					
3	C1 Shift	Lt. brown	.026"	.252"	1.126"
4	B2/C2 Switch	White	.028"	.297"	1.131"
5	C2 Relay	Pink	.024"	.275"	1.071"
6	C3 Signal	Lt. brown	.026"	.252"	1.126"
7	B1 Signal	Pink	.024"	.275"	1.075"
8	Secondary regulator	Plain	.039"	.413"	1.582"
9	Sequence	White	.026"	.325"	1.038"
10	Cut back	White	.026"	.325"	1.038"
11	B1-C3 Switch	Pink	.024"	.275"	1.074"
12	B1-C3 Check ball				
13	B1-C3 Relay	Pink	.024"	.275"	1.074"
14	Lock-up Relay	Lt green	.020"	.275"	1.054"
15	B1-C3 Control	Lt brown	.026"	.252"	1.126"
REAR CASTING					
16	Engine brake				
17	Solenoid modulator 2	Plain	.052"	.389"	1.207"
18	C2 Timing	White	.028"	.295"	1.130"
19	C1 Relay	Pink	.024"	.271"	1.075"
20	Lock-up Control	Plain	.026"	.382"	.781"
21	Solenoid modulator 1	Plain	.050"	.389"	1.207"
	(4 lower accumulator)				
(Inch x 25.4=mm)					
	Accumulator diameter .627"	Red	.040"	.308"	.921"
		Red	.061"	.479"	.923"
	Accumulator diameter .627"	Red	.040"	.308"	.921"
		Red	.061"	.479"	.923"
	Accumulator diameter .785"	Lt. blue	.062"	.430"	1.090"
		Plain	.080"	.630"	1.088"
	Accumulator diameter .785"	Lt. blue	.062"	.430"	1.090"
		Plain	.080"	.630"	1.088"
	Large accumulator end diameter .942"	Plain		.0772"	3.045"
	Upper Accumulator dia.785"	Plain	.080"	.635"	1.085"
		Blue	.060"	.428"	1.085"
	Lower Accumulator diameter .785"	Green	.053"	.416"	1.056"
		Green	.076"	.618"	1.045"

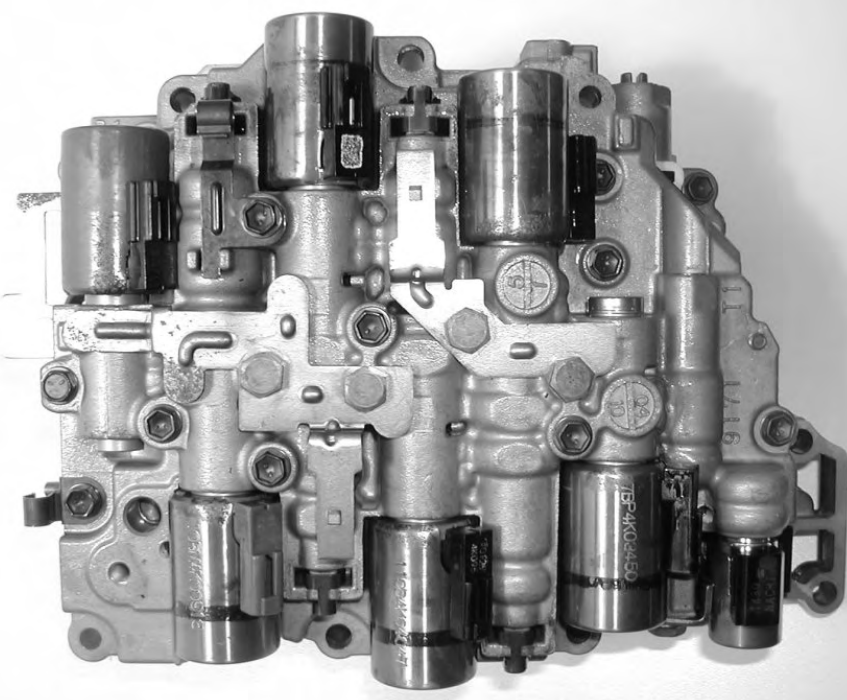
TF-81SC FORD/MAZDA

VALVE RELIEF CUP & SPRING REFERENCE			
Valve #	Relief Cups & Springs Specification	Valve #	Relief Cups & Springs Specification
1	.392" O.D. White .247" O.D. .022" wire .597" free length 10.5 coils	7 Opposite side	TEE relief No color .370" O.D. .050" wire .427" free length 3.2 coils
2	.312" O.D. Orange .161" O.D. .015" wire .371" free length 8.5 coils	8 Opposite side	.392" O.D. No color .203" O.D. .018" wire .448" free length 9 coils
3	.312" O.D. Orange .161" O.D. .015" wire .371" free length 8.5 coils	9	.393" O.D. White .247" O.D. .022" wire .597" free length 10.5 coils
4	.392" O.D. White .246" O.D. .025" wire .600 free length 10.5 coils	10	.393" O.D. White .247" O.D. .022" wire .597" free length 10.5 coils
5	.392 O.D. Light Blue .250" O.D. .040" wire .548" free length 6.0 coils	11	.312" O.D. Orange .162" O.D. .014" wire .365" free length 8.5 coils
6	.392" O.D. Orange .250" O.D. .034" wire .620" free length 7 coils	12	.393" O.D. White .247" O.D. .022" wire .597" free length 10.5 coils

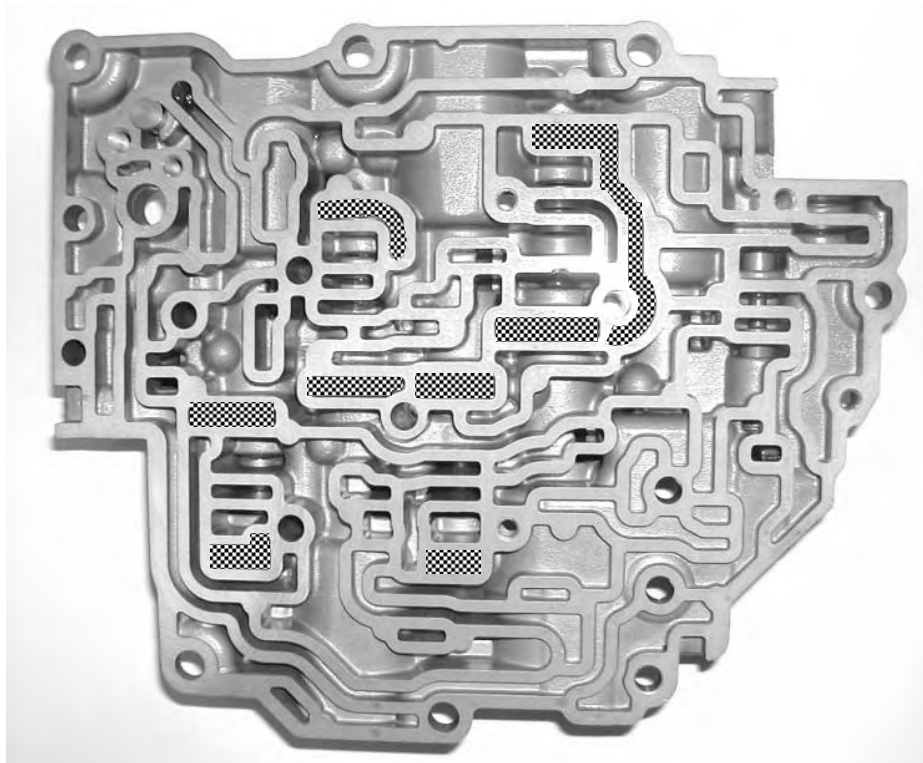
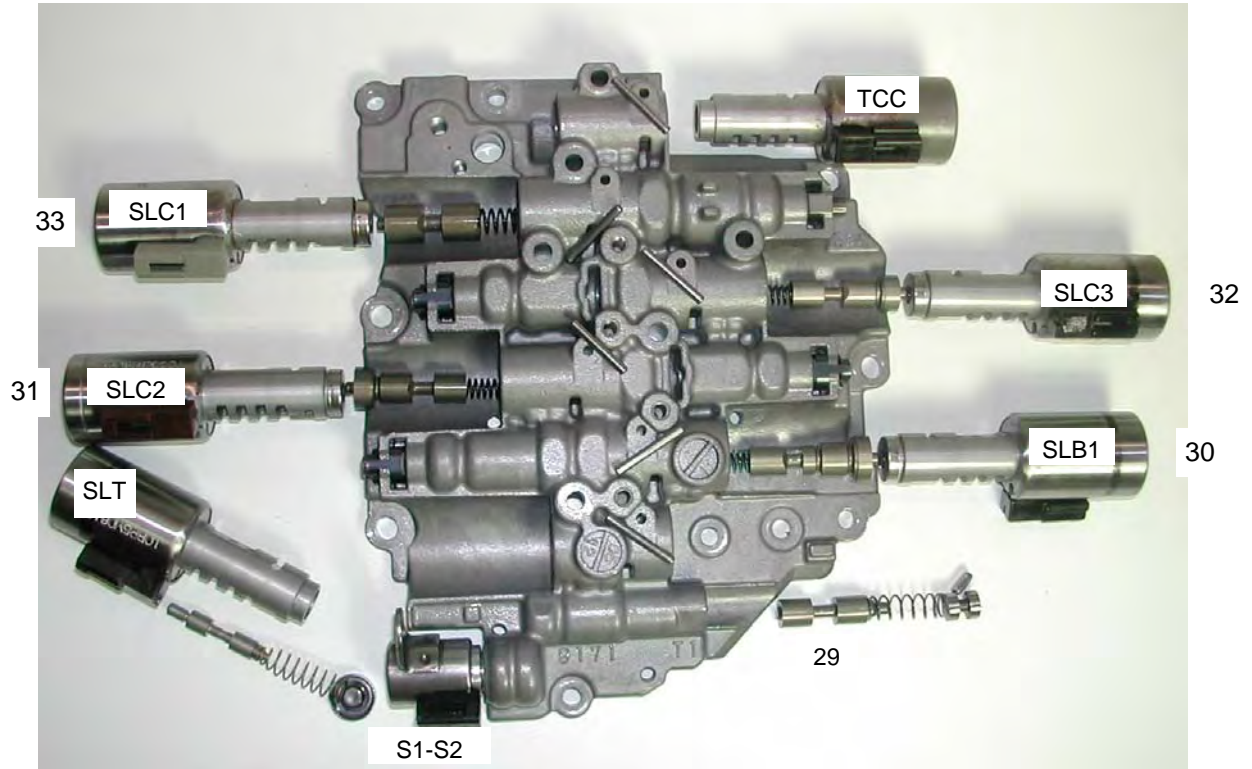
IDENTIFICATION OF VALVE BODY CORES

AF40/AM6; AW TF-80SC

VOLVO			CITROEN		
Year	Vehicle	Engine	Year	Vehicle	Engine
07-09	XC90	3.2L	06-07	C4	
06-09	XC90	4.4L	06 on	C5	1.8/2.0L 2.2dsl
08-09	XC70	3.2L	05-07	C6	
09	XC60	3.0L	05-07	C8	
07-09	580	3.2L	02 on	Synergie Transit	
07-09	580	4.4L			
			OPEL		
SAAB			06-07	Vectra C	2.2/3.2L
06-07	9-3	2.0/2.8L	05-07	Zafira	2.2L
			06-07	Axtra G	2.0/2.2L
PEUGEOT					
06-07	607	2.2/2.9L	FIAT		
07	407		06-07	Croma	
06-07	307	1.7/2.2L			

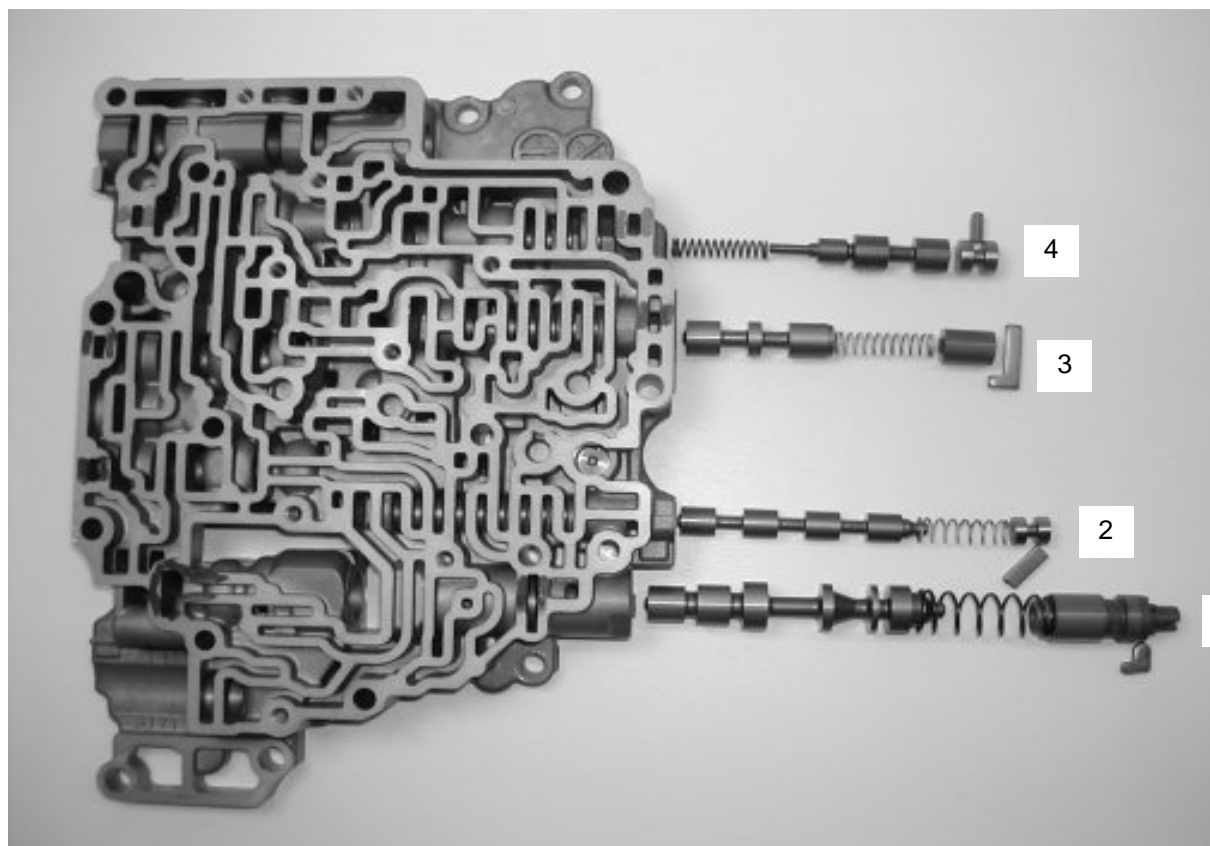


TF-80SC; AF-40/AM6



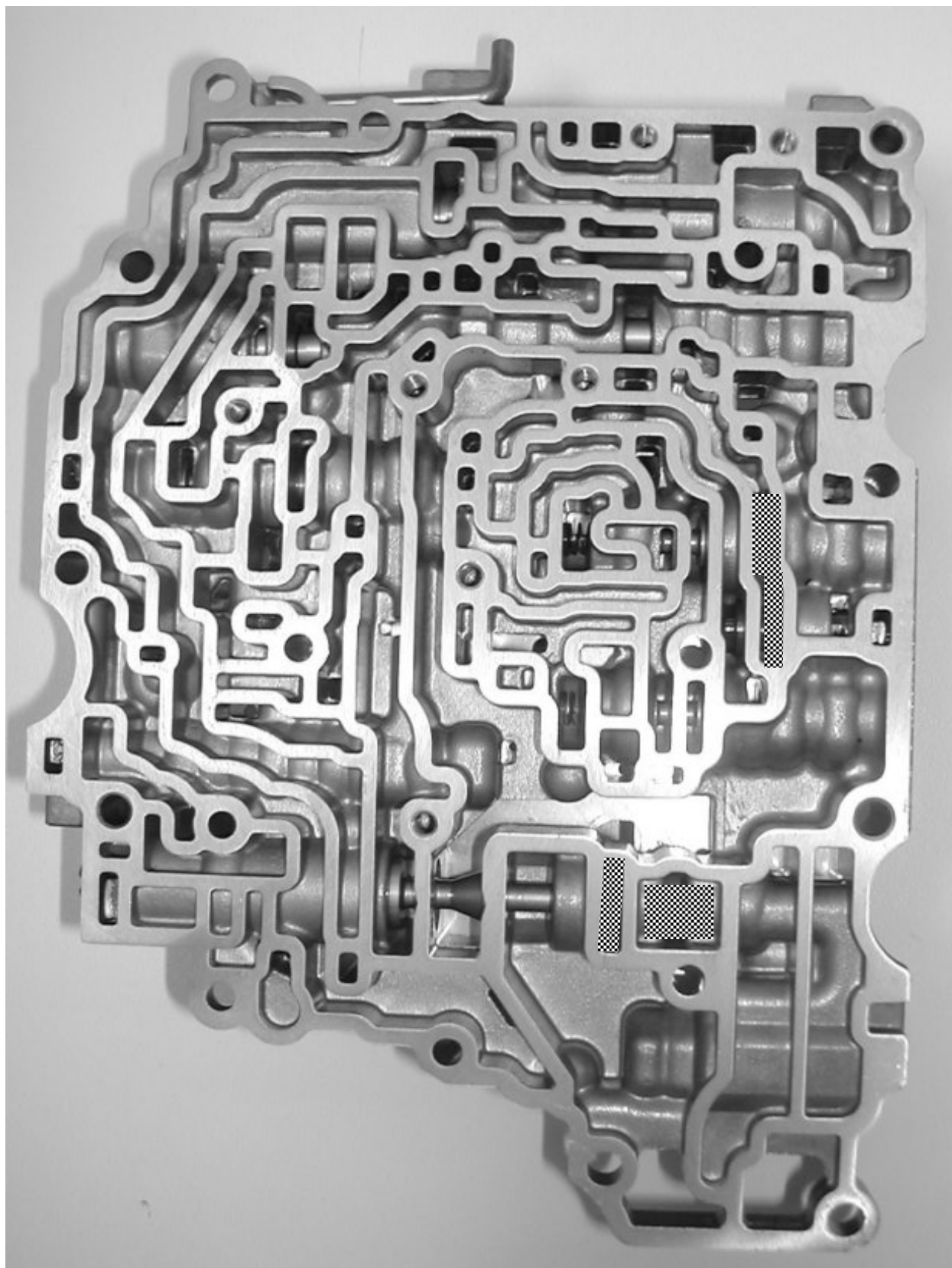
Ports in middle check control valve to solenoid. Outside ports check control valve to adjuster.
Don't be surprised at 5" or less on a vacuum test!

TF80SC; AF-40/AM6



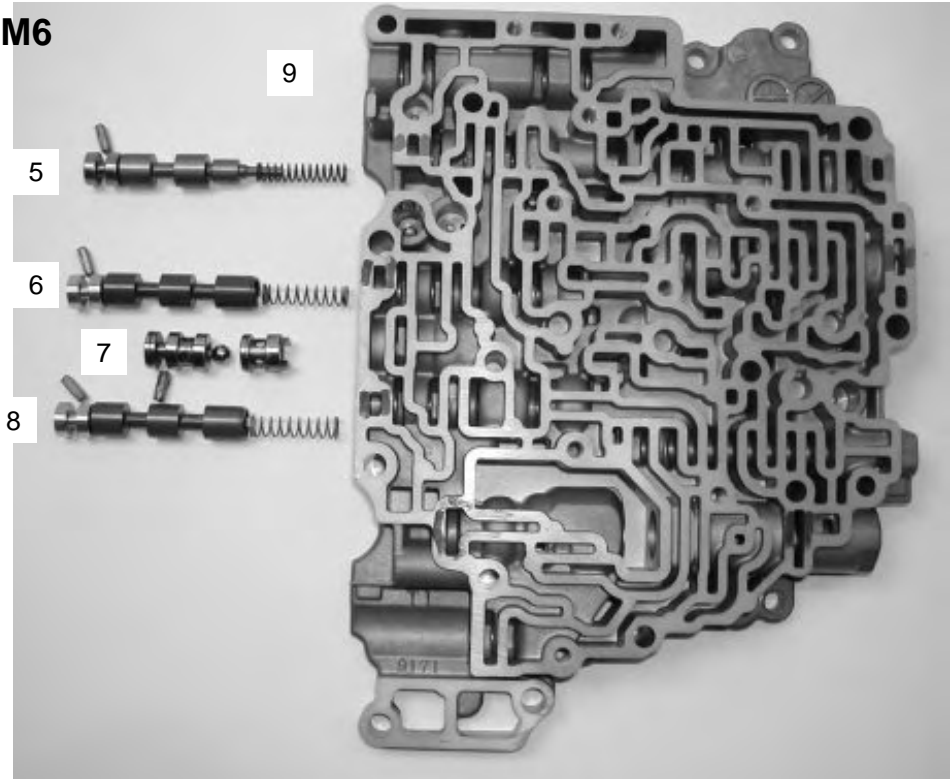
AW 6 SPEED FWD

TF-80SC; AF-40/AM6



AW 6 SPEED FWD

TF-80SC; AF-40/AM6

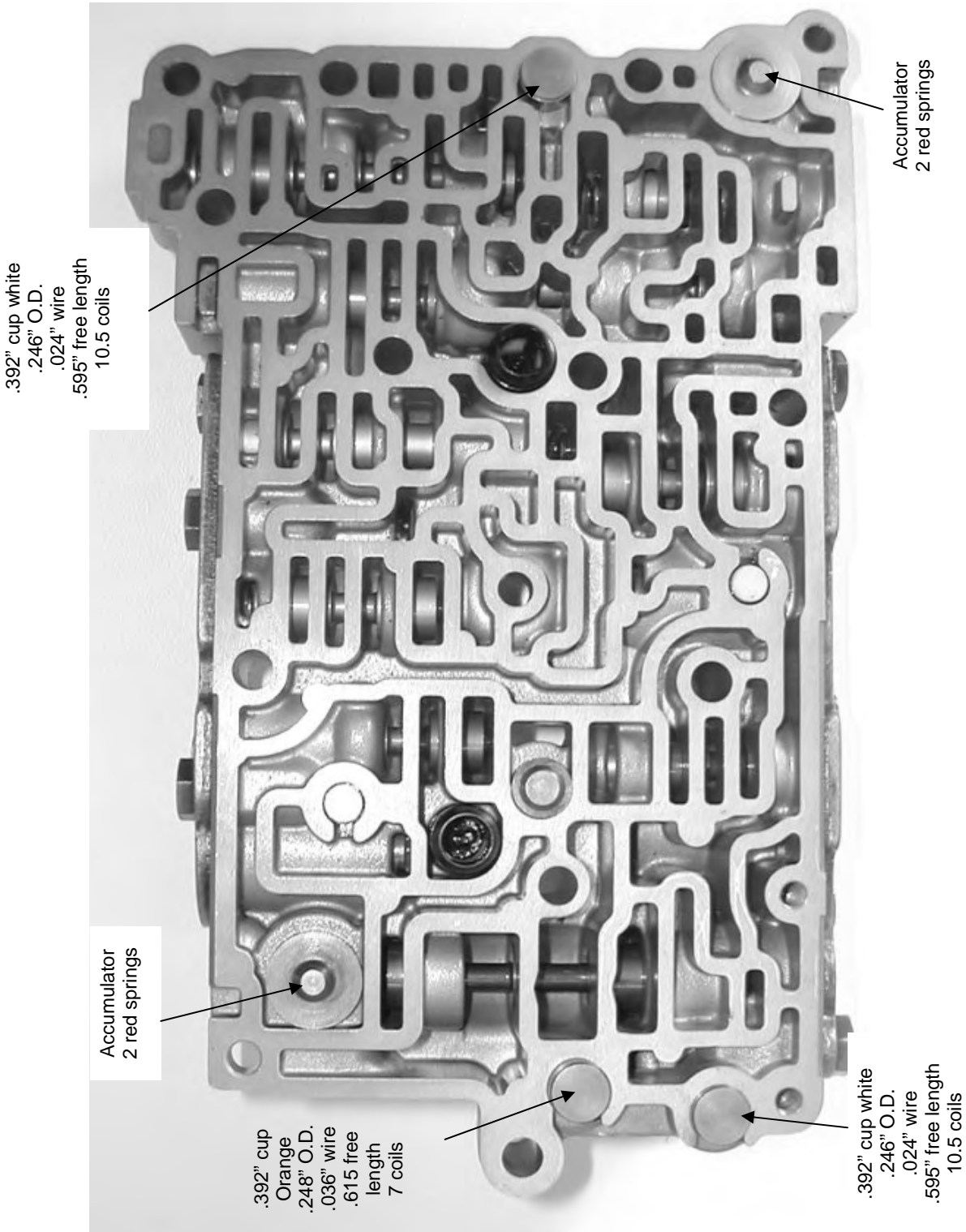


.392" cup white
.246" O.D.
.024" wire
.595" free length
10.5 coils

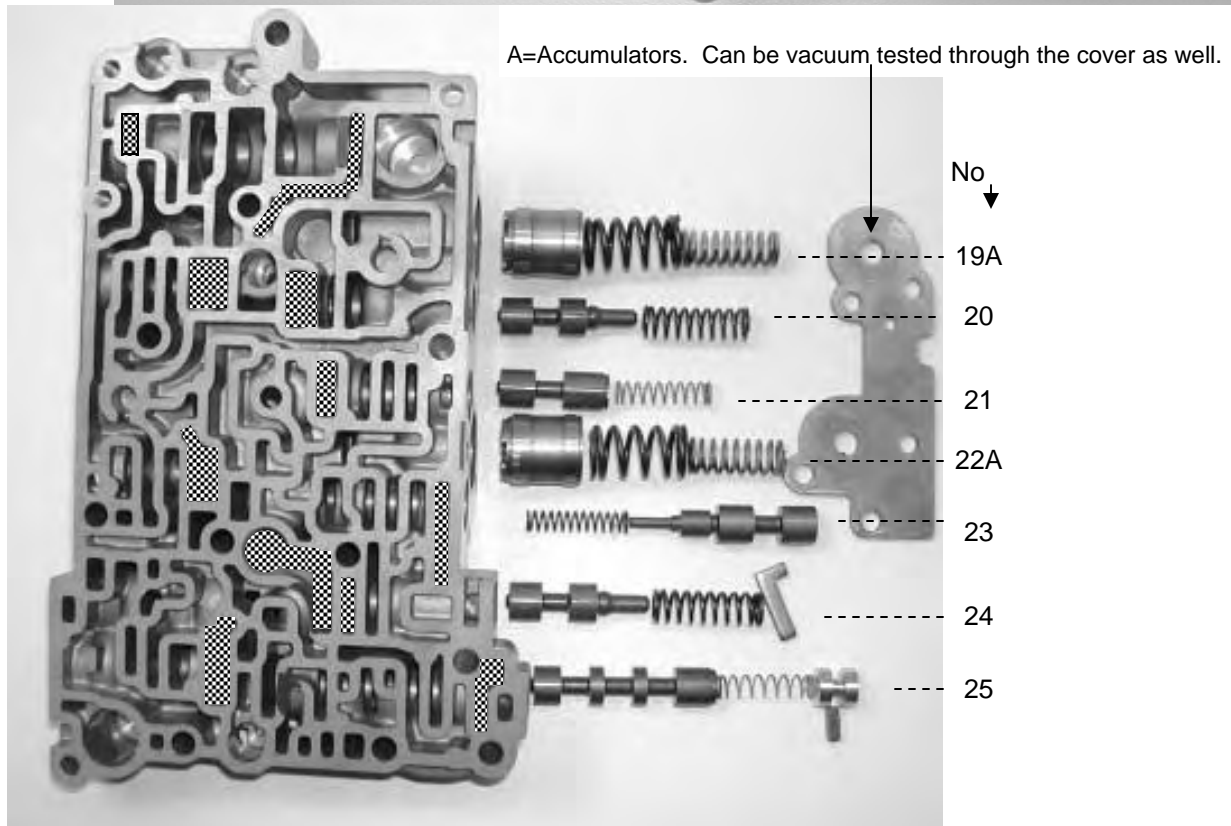
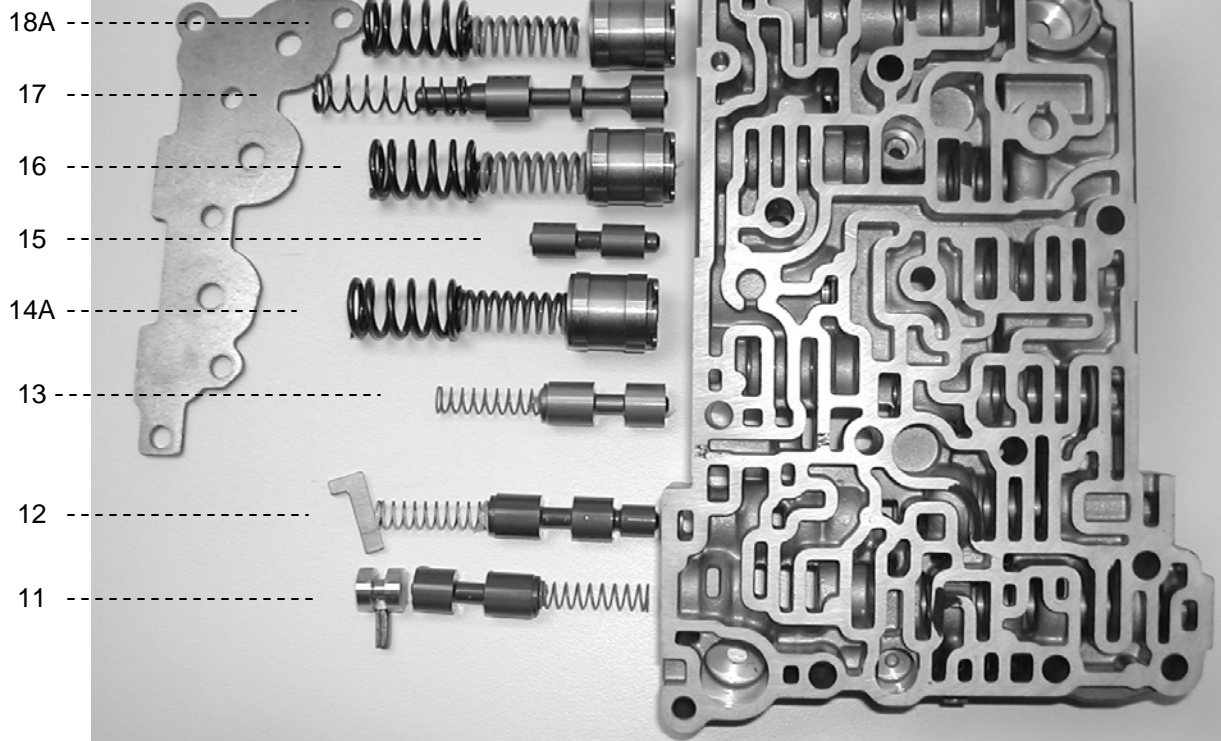
.312" cup red
.160" O.D.
.015" WIRE
.374" free length
9 coils

.392 TEE pink
.350" O.D.
.042" wire
.680" free length
4.5 coils

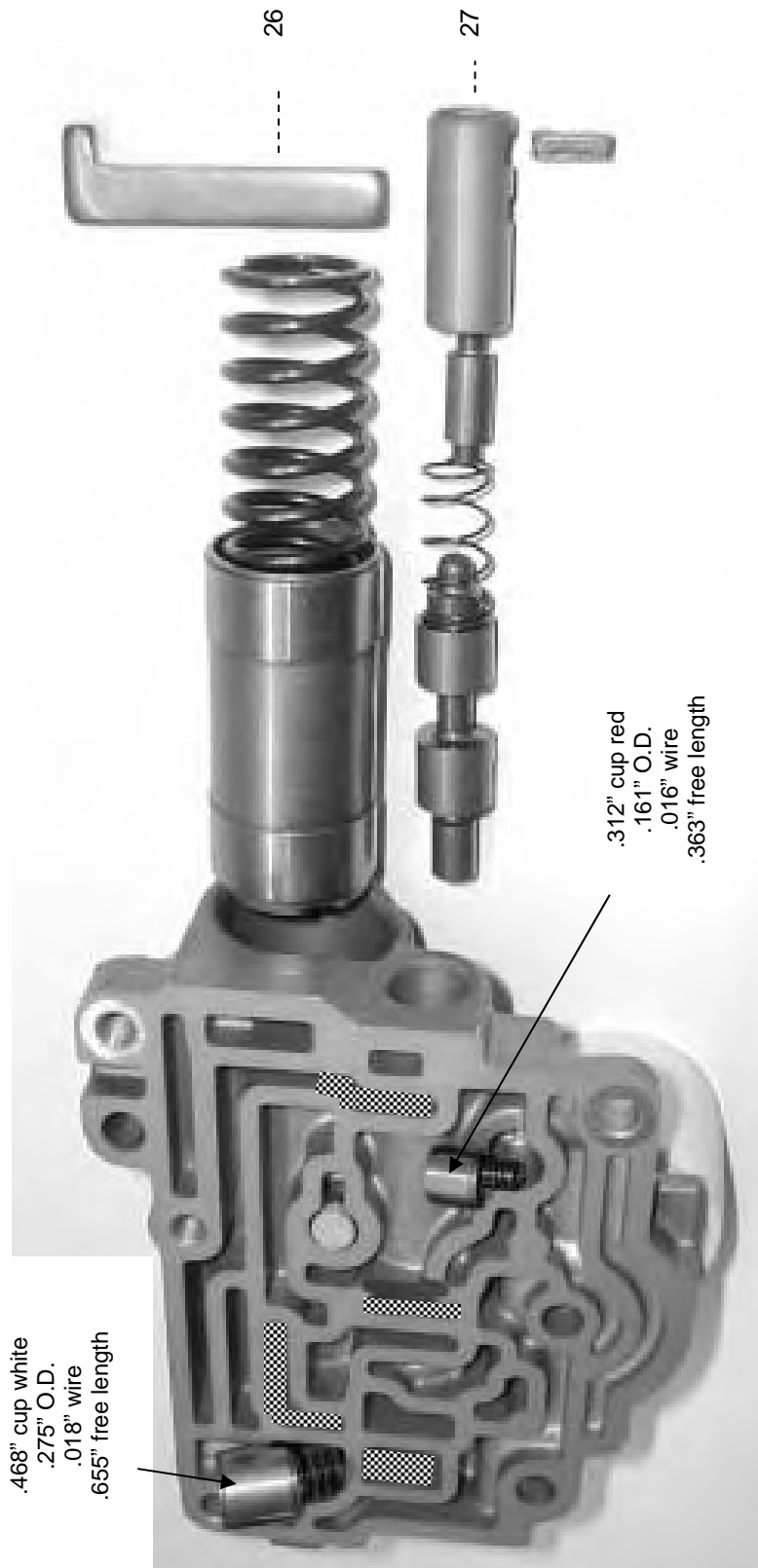
TF-80SC; AF-40/AM6



TF-80SC ; AF-40/AM6

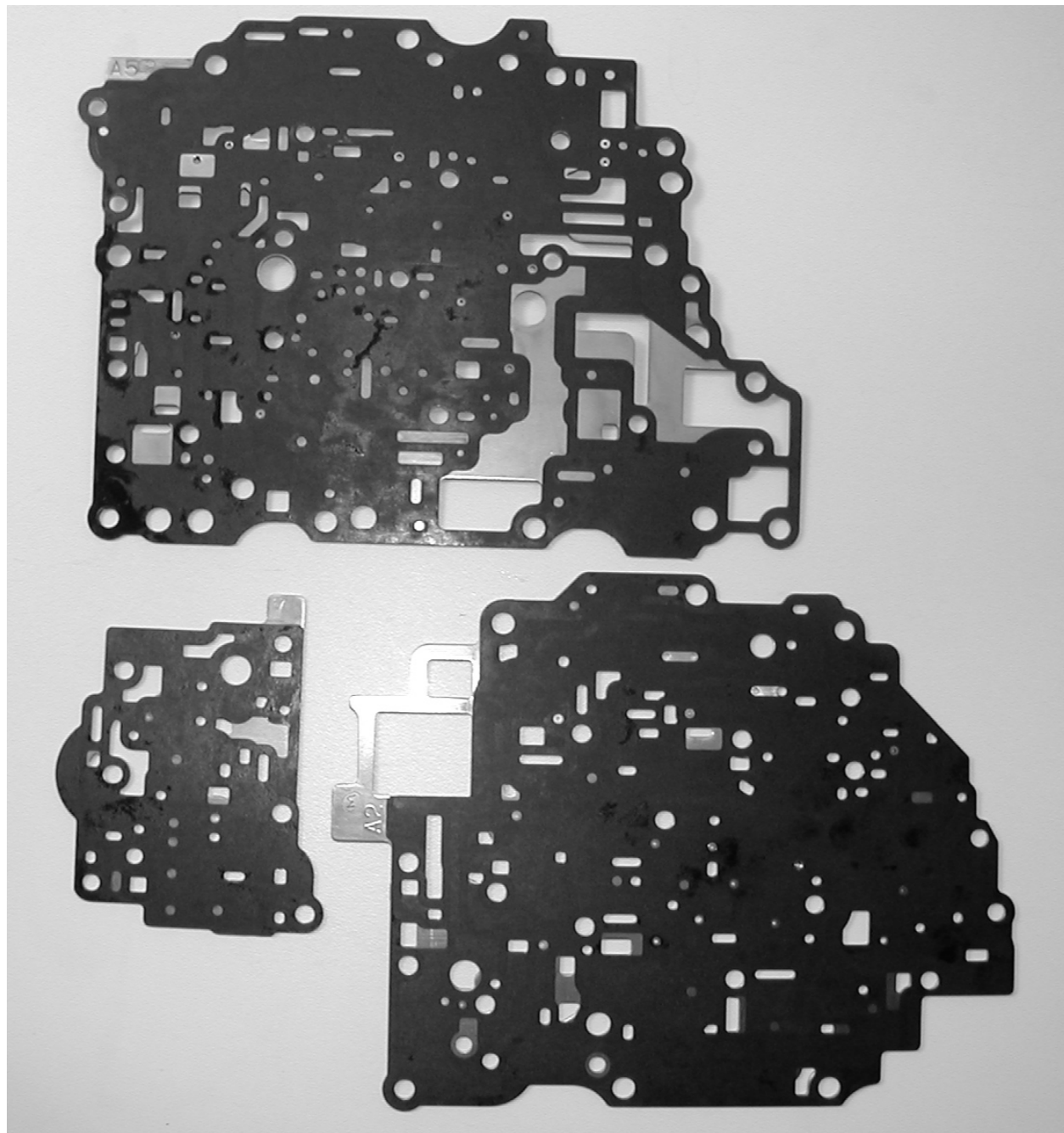


TF-80SC; AF-40/AM6



AW 6 SPEED FWD

TF-80SC; AF-40/AM6



AW 6 SPEED FWD

VOLVO AW 6 SPEED SPRING I.D.					
Bore #	Identification	Color	Wire dia	Spring OD	Free Length
MIDDLE CASTING					
1	Main pressure regulator	Plain	.050"	.551"	1.495"
2	Sequence valve	Lg. blue	.028"	.326"	1.021"
3	B2/C2 Switch	White	.030"	.299"	1.127"
4	C1 Shift	Red	.028"	.254"	1.100"
5	B1/C3 Control	Orange	.028"	.255"	1.131"
6	B1/C3 Relay	Pink	.026"	.278"	1.055"
7	B1/C3 Check ball				
8	B1/C3 Switch Valve	Pink	.026"	.281"	1.075"
9	Manual Valve				
REAR BODY WITH 1 ACCUMULATOR					
26	Accumulator C1	Plain	.087"	.771"	3.051"
27	Lock-up control	Plain	.028"	.382"	.800"
TOP COVER WITH SOLENOIDS					
29	Cut back	Lt. blue	.028"	.322"	1.015"
30	SLB1-B1 Control	Plain	.034"	.258"	.739"
31	SLC2-C2 Control	Blue	.032"	.258"	.663"
32	SLC3-C3 Control	Plain	.034"	.258"	.739"
33	SLC1-C1 Control	Pink	.034"	.327"	.752"
REAR CASTING WITH ACCUMULATORS & END PLATES					
11	C2 Relay	Pink	.026"	.283"	1.064"
12	C2 Timing	White	.029"	.298"	1.132"
13	B1 Signal	Pink	.026"	.280"	1.071"
14	Accumulator Outer	Plain	.083"	.633"	1.094"
	Accumulator Inner	White	.063"	.433"	1.089"
15	Engine brake engagement	No spring			
16	Accumulator				
17	Secondary Regulator	Plain	.041"	.416"	1.595"
18	Accumulator Inner	Plain	.083"	.633"	1.094"
19	Accumulator Outer	White	.063"	.433"	1.089"
20	Solenoid Modulator	Plain	.052"	.393"	1.195"
21	Relay Valve	Pink	.027"	.279"	1.069"
22	Accumulator Outer	Green	.079"	.618"	1.040"
	Accumulator Inner	Green	.055"	.414"	1.068"
23	Shift Valve	Orange	.029"	.254"	1.130"
24	Solenoid modulator	Plain	.052"	.393"	1.200"
25	TCC Lock up relay	Lt. green	.023"	.273"	1.025"
Note: Valve terminology may differ!					

IDENTIFICATION OF VALVE BODY CORES

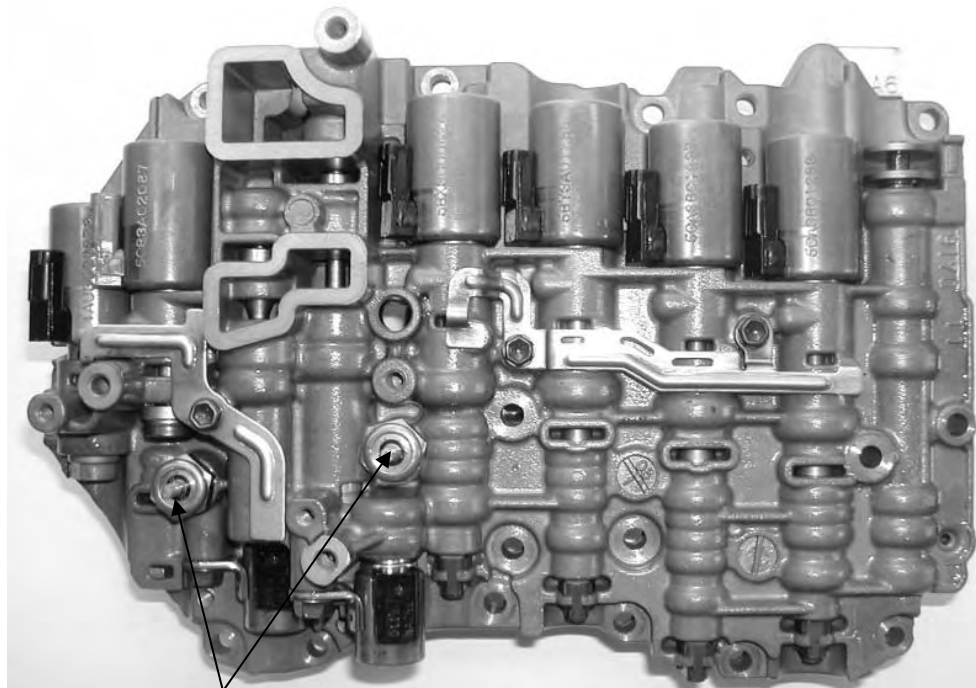
TF-60SN, 09G, 09M, 09K

V.W.			AUDI		
Year	Vehicle	Engine	Year	Vehicle	Engine
07	Eos	2.5L	03-06	A3	2.0/3.2L
06-07	Golf	1.9L dsl	06-07	A4	2.0/3.2L
06-07	Golf	2.5L	04-06	Avant, S4	4.2L
06	GTI	2.0L	03-06	TT	1.8/3.0L
05-06	Jetta	1.9L dsl			
05-06	Jetta	2.5L	SEAT		
03-07	Multi-van	2.5/3.2L	06-07	Altea	
03	Beetle	1.8/1.9L	06-07	Leon	
06-07	Passat	2.0/3.6L	05-07	Toledo	
06-07	Polo				
05-07	Touran		BMW		
04	Transporter		06-07	Mini's	1.6L

There are external & case mounted cooler designs!

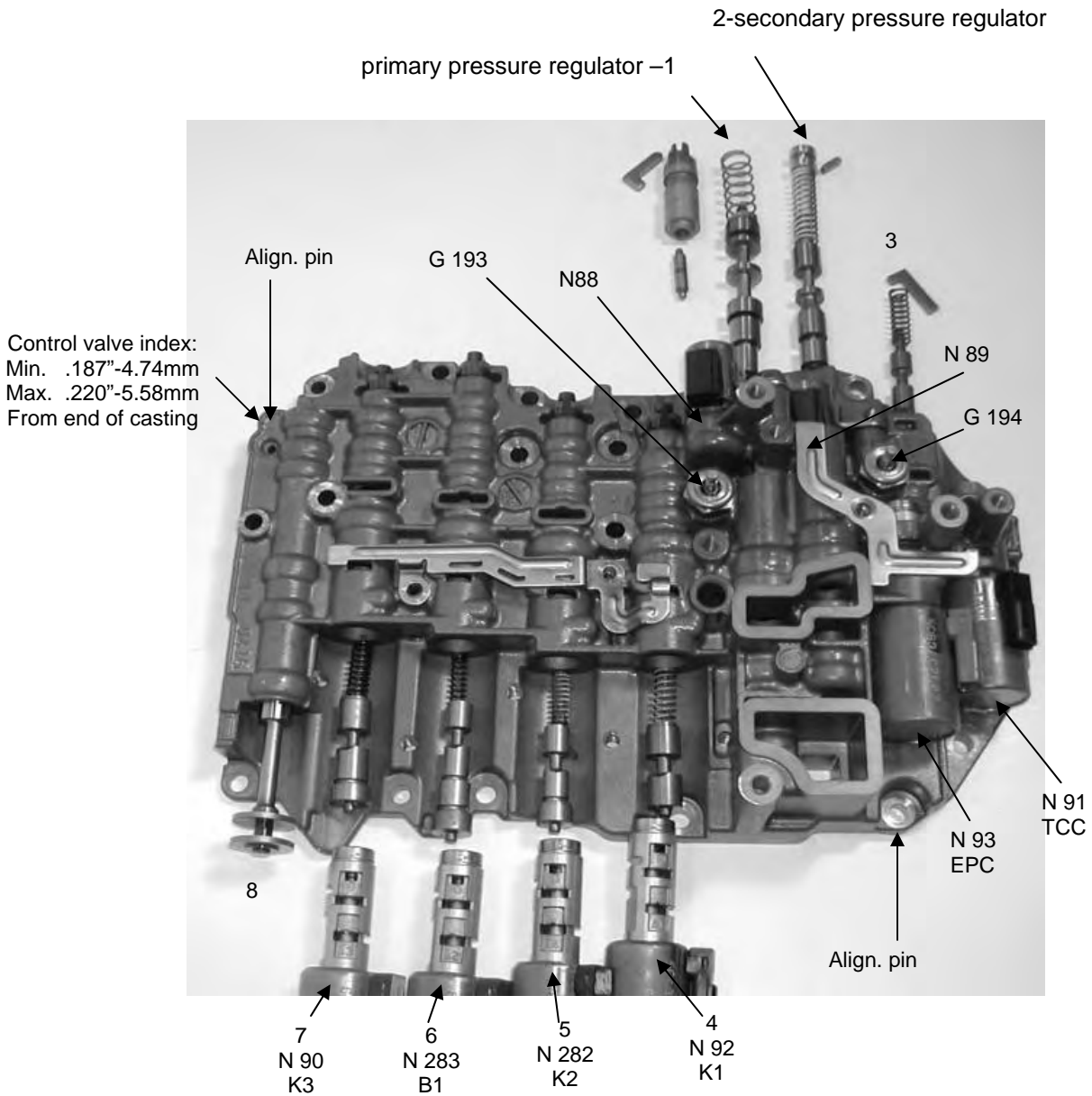
The separator plate must match the type of cooler. A7/A6 plate code is case mounted.

F0 is external cooler.



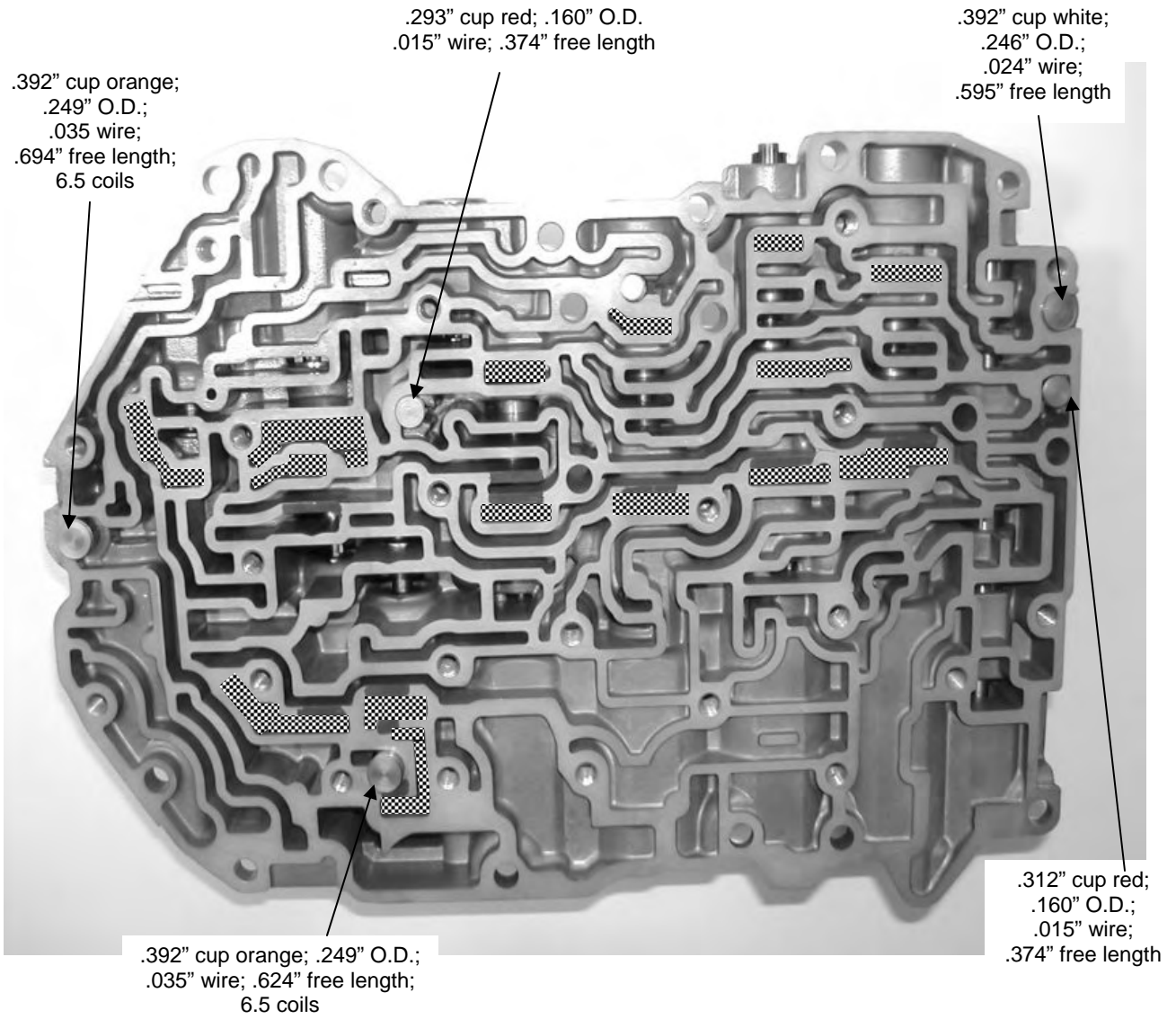
Pressure switches used until '04.

TF-60SN




Use 2 alignment pins of .238" diameter

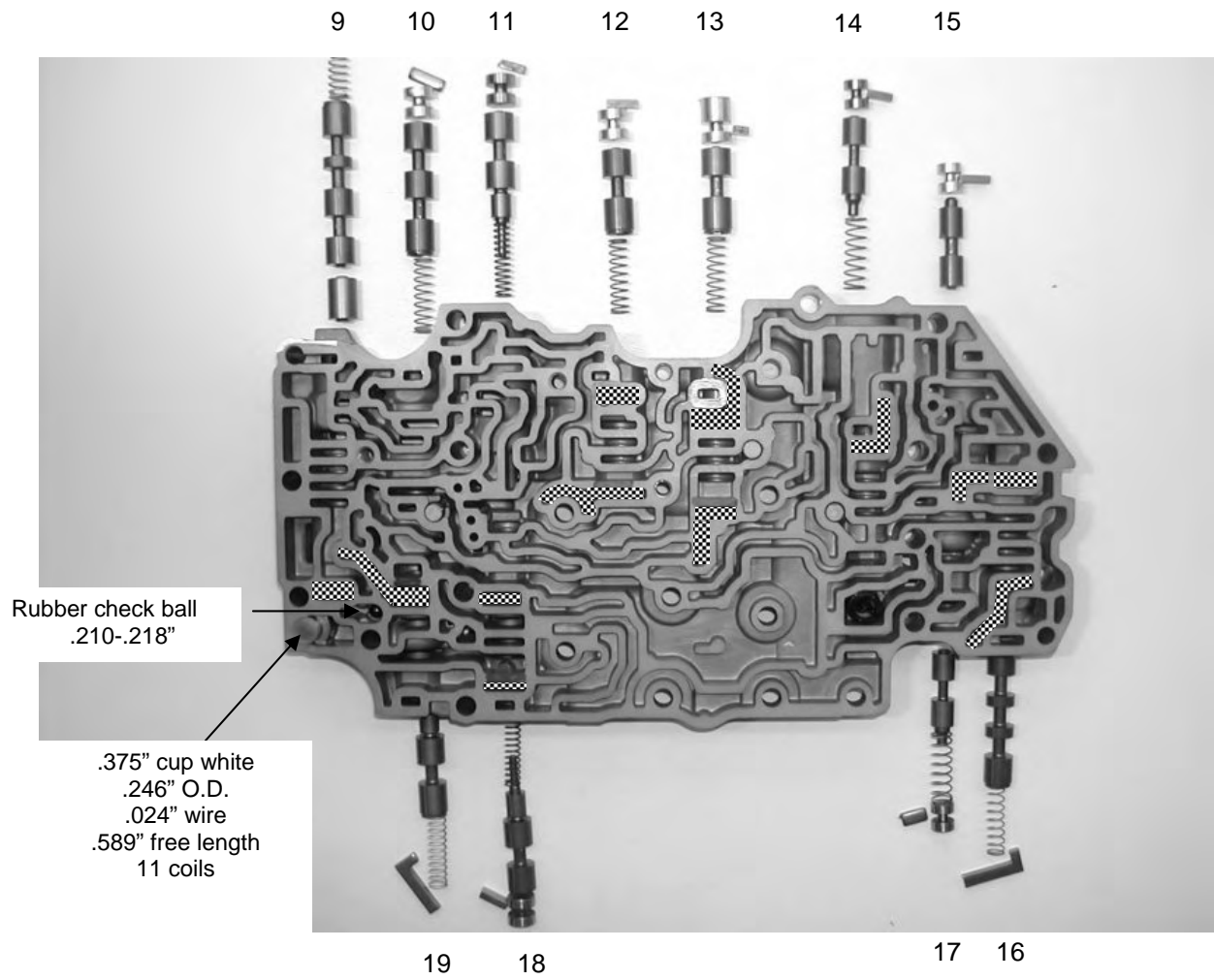
TF-60SN

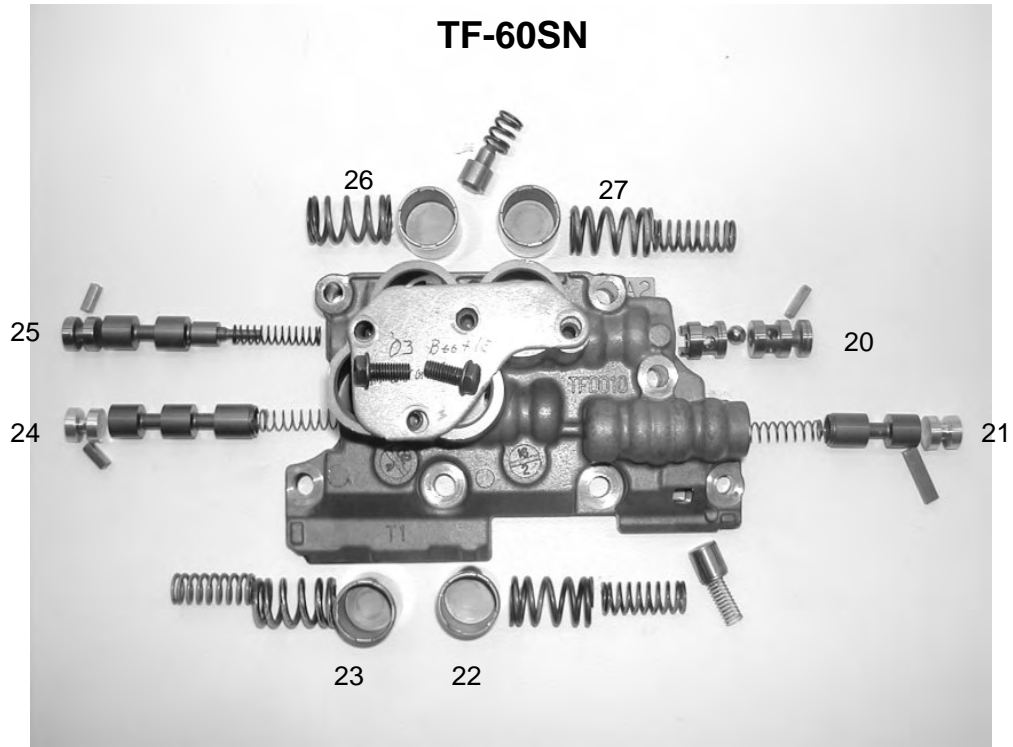


Relief is not in all TF60 units.
No hole in plate=no relief.

Key:
Vacuum test location 

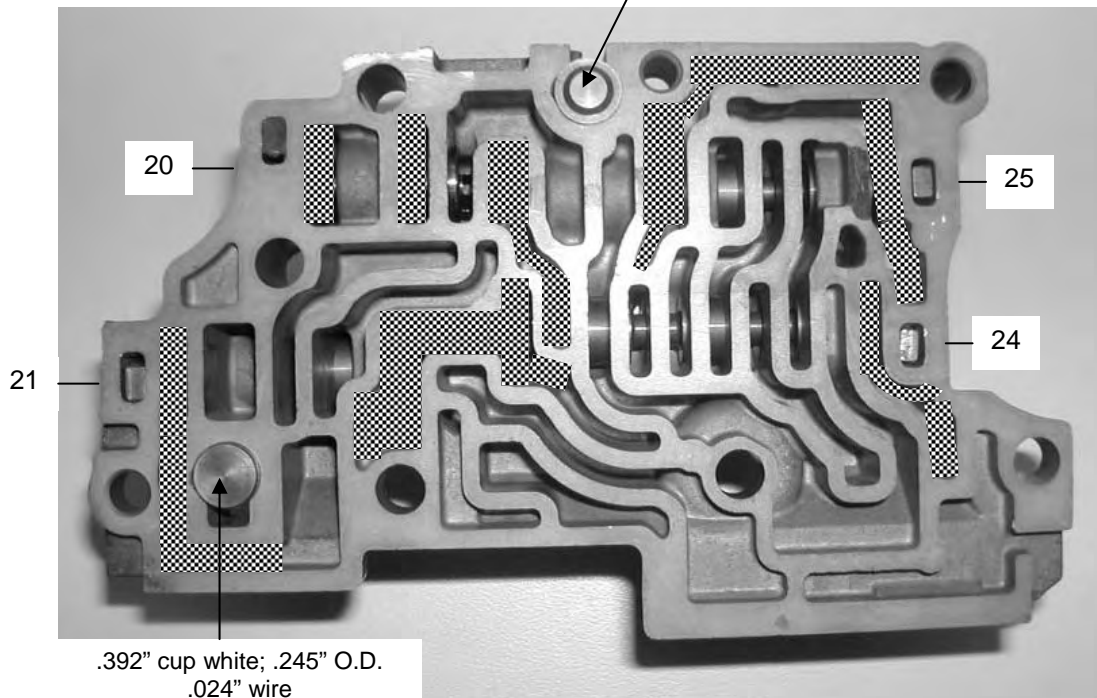
TF-60SN





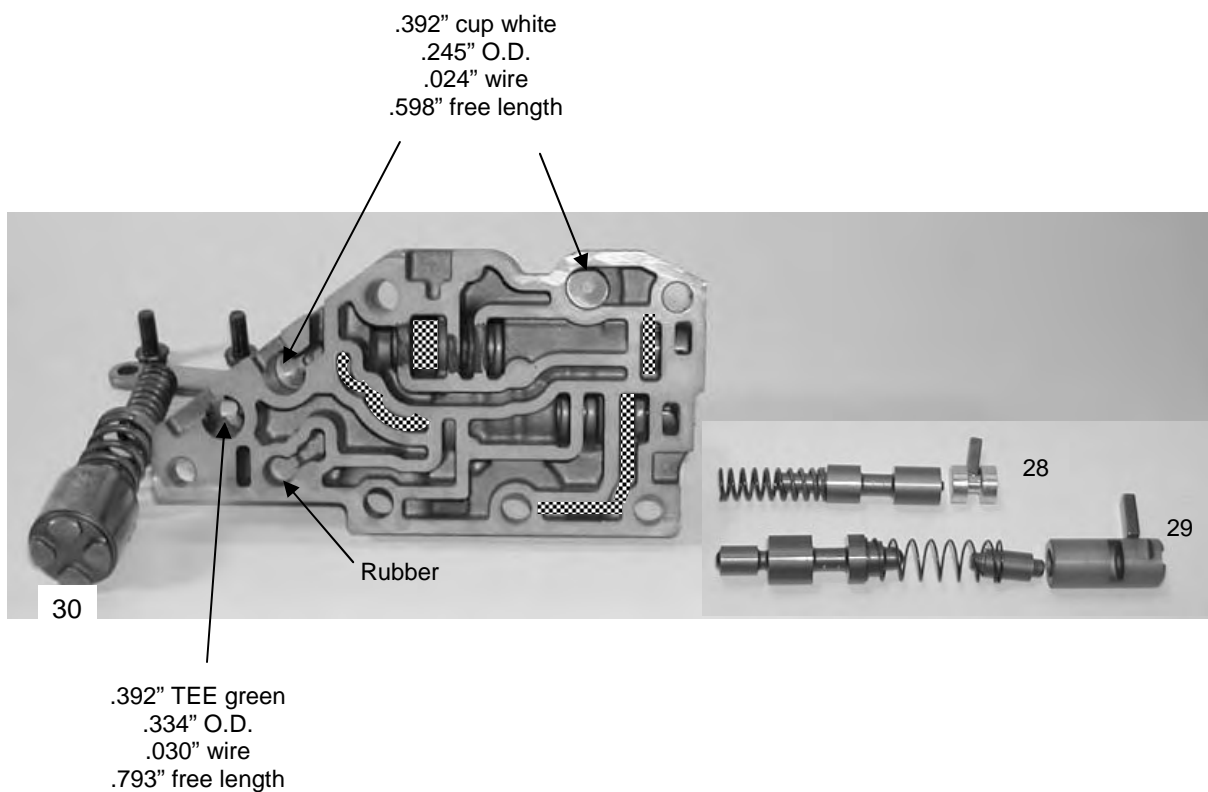
4 Accumulator pistons on back side.

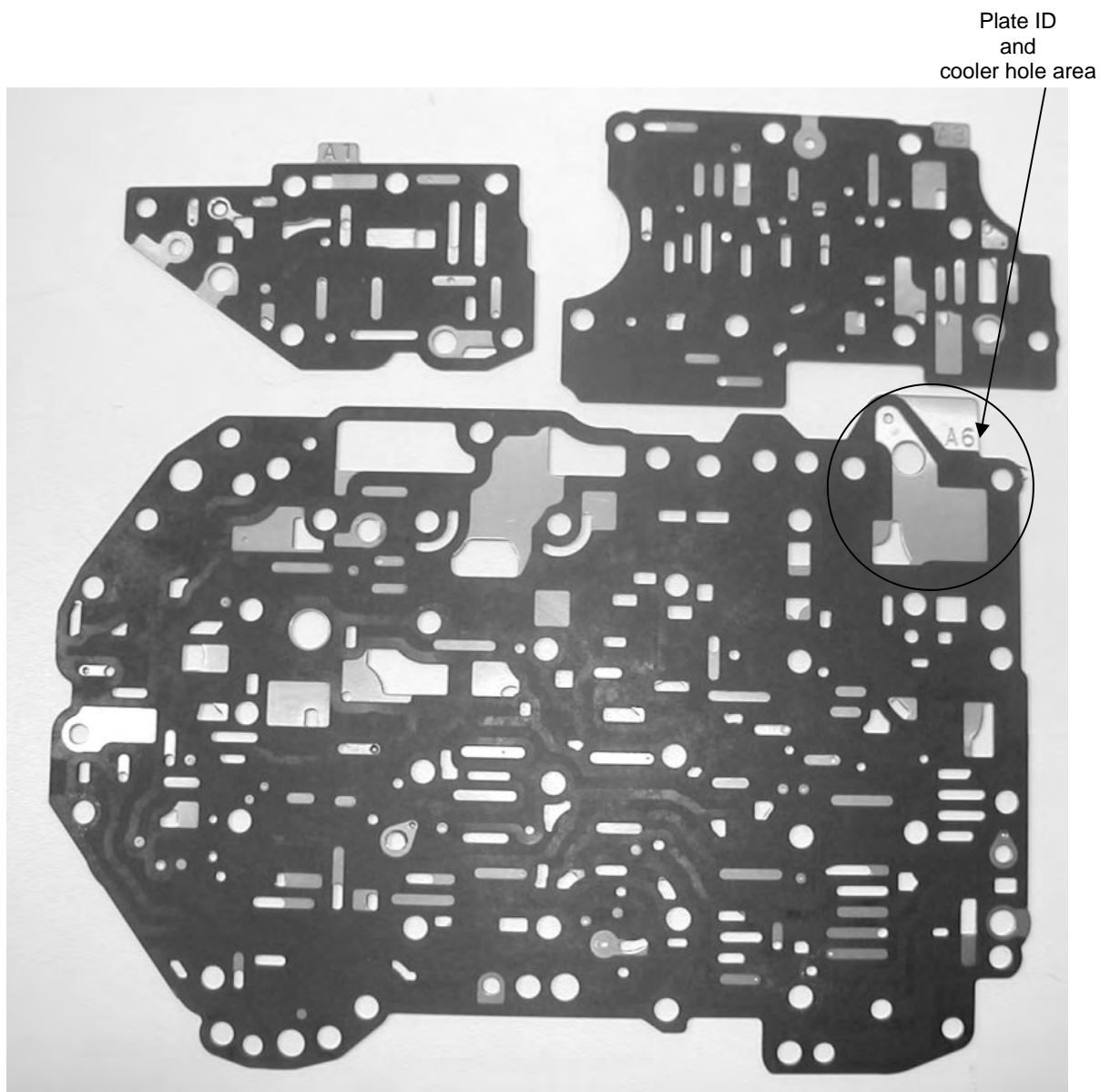
.392" TEE no color; .374" O.D.;
 .050" wire;
 .428" free length
 3 coils
 Line relief at B1/C3 control valve.



.392" cup white; .245" O.D.
 .024" wire
 .598" free length
 10.5 coils

AW 6 SPEED FWD



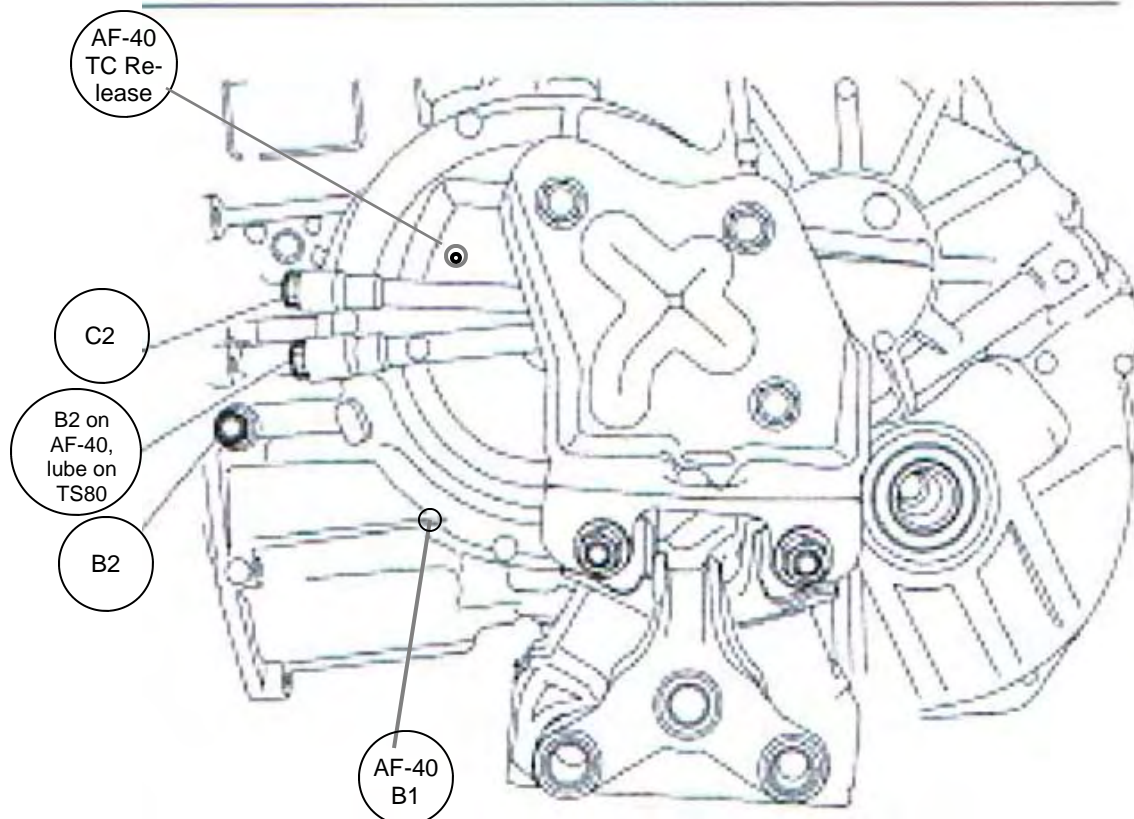
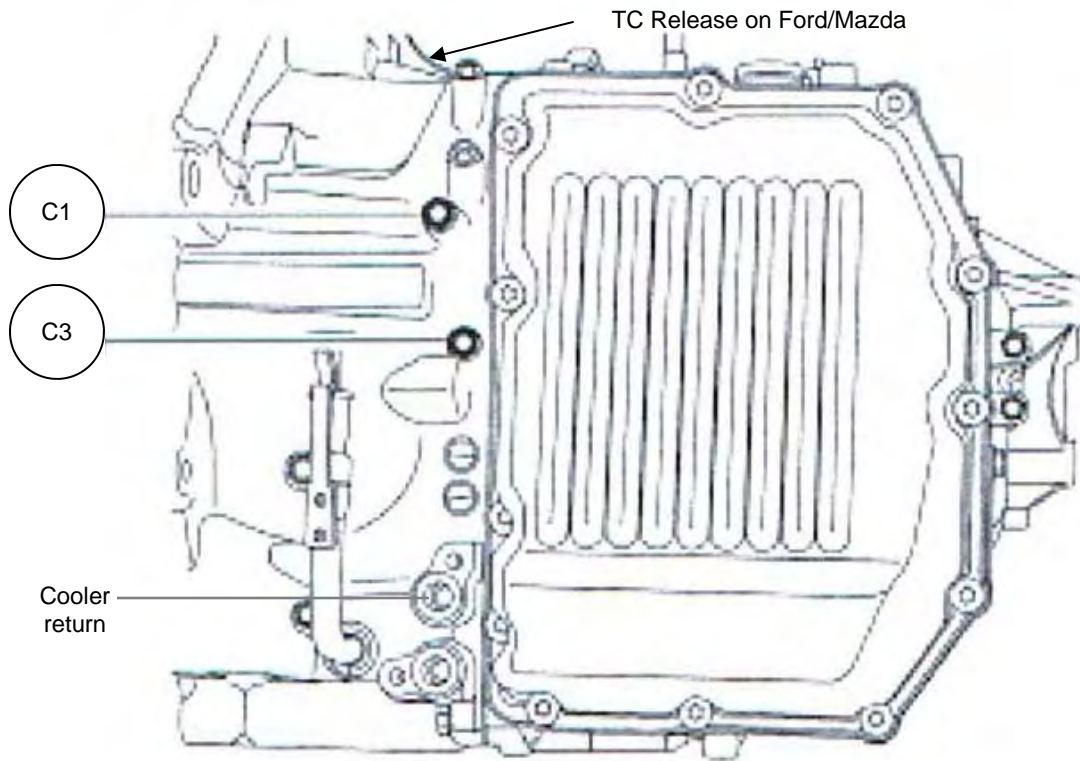


Main separator plates vary.
A6/A7 (pictured above) are used with case mounted cooler
FO code has external cooler.

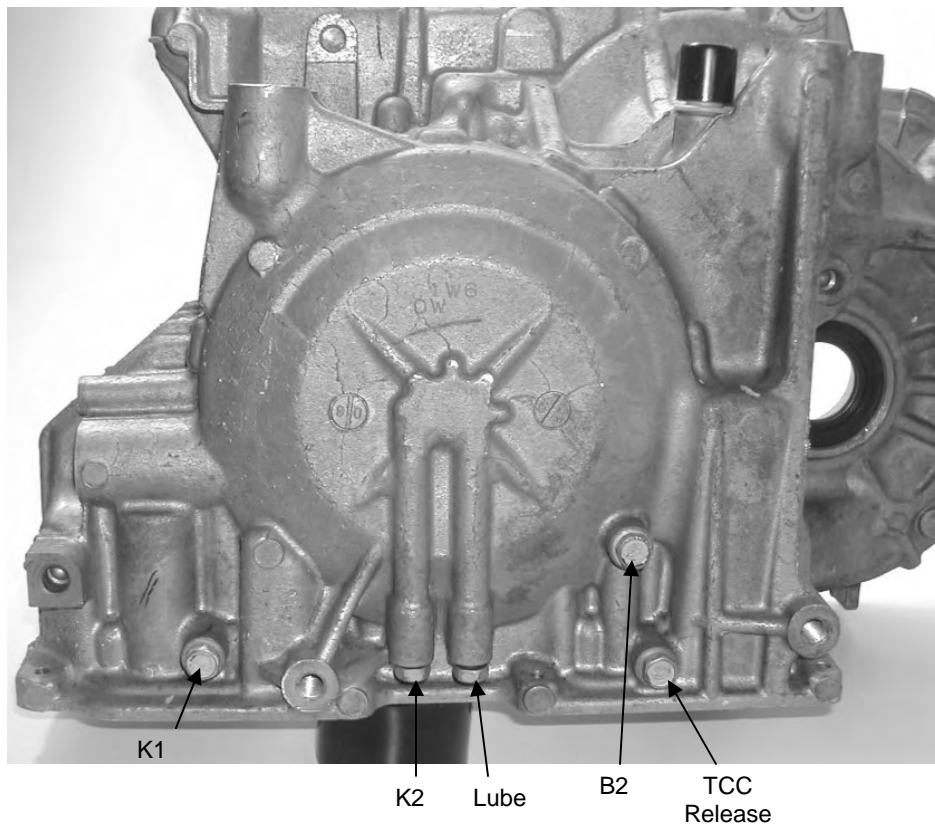
AW 6 SPEED FWD

09G AW6 SPRING I.D.					
Bore #	Identification	Color	Wire dia.	Spring OD	Free Length
SOLENOID/FRONT COVER					
1	Primary Regulator	Pink	.043"	.519"	1.450"
2	Secondary Regulator	White	.046"	.410"	1.485"
3	Solenoid Modulator #2	No color	.040"	.315"	1.00"
4	N-90 K3 Control	Pink	.036"	.325"	.800"
5	N-283 B1 Control	White	.034"	.256"	.740"
6	N-282 K2 Control	Dark Red	.034"	.250"	.746"
7	N-92 K1 Control	Dark Green	.040"	.326"	.805"
8	Manual Valve				
MIDDLE CASTING					
9	B2-C2 Switch	White	.028"	.290"	1.140"
10	B1-C3 Switch	Pink	.024"	.270"	1.080"
11	C1 Shift	Brown	.026"	.250"	1.135"
12	B1 Signal	Pink	.024"	.275"	1.075"
13	C1 Relay	Pink	.024"	.275"	1.075"
14	B2 Switch	Lt. Green	.026"	.322"	1.010"
15	Engine Brake	No Spring			
16	Lock up Relay	Lt. Green	.022"	.275"	1.010"
17	Cut back	Lt. Green	.026"	.322"	1.010"
18	C2 Signal	Brown	.026"	.250"	1.135"
19	C2 Timing	White	.028"	.290"	1.135"
UPPER/FRONT 4 ACCUMULATOR PISTON BODY					
20	Check ball				
21	B1 Signal	Pink	.024"	.278"	1.085"
22	K3 Accumulator	No/Lt. Green	.076/.053"	.621/.412"	1.050/1.055"
23	B2 Accumulator	Lt. Green/Pink	.089/.060"	.620/.400"	1.0/1.036"
24	B1-C3 Relay	Pink	.024"	.278"	1.073"
25	B1-C3 Control	Brown	.026"	.248"	1.146"
26	K1 Accumulator	No color	.076"	.620"	1.055"
27	K2 Accumulator	No color	.076/.055"	.620/.410"	1.055/1.046"
UPPER/REAR TCC CONTROL BODY					
28	Solenoid modulator	Lt. Brown			
29	TCC Control	Dk. Green			
30	Line Pressure Accumulator -				
	Sm diameter	No paint	.053"	.412"	1.058"
	Lg. diameter	No paint	.077"	.618"	1.045"
Note: Valve terminology may differ! (Inch x 25.4=mm)					

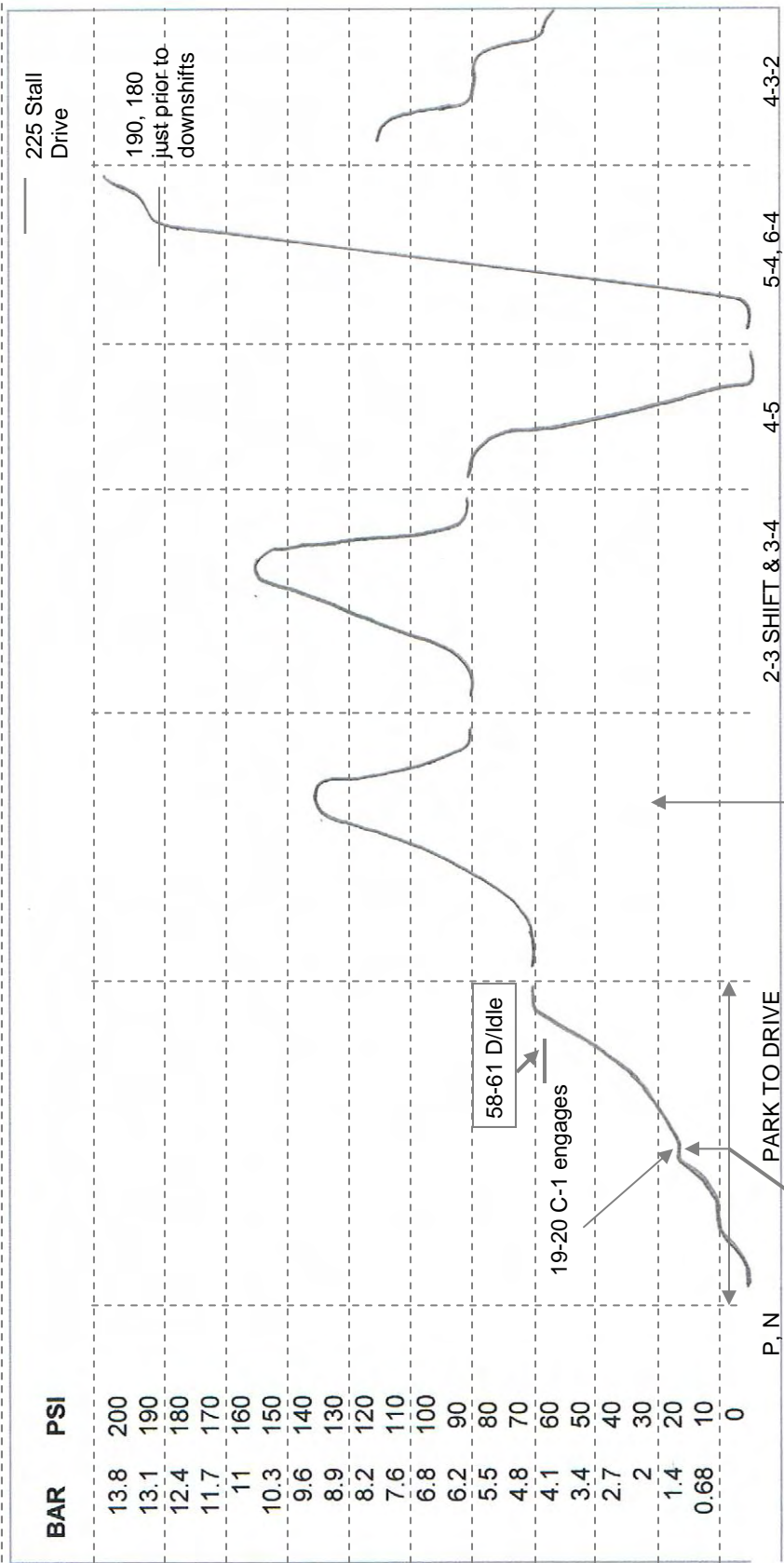
Pressure Tap Location Ford/Mazda Type Similar in location to AF-40



PRESSURE TAP IDENTIFICATION 09G

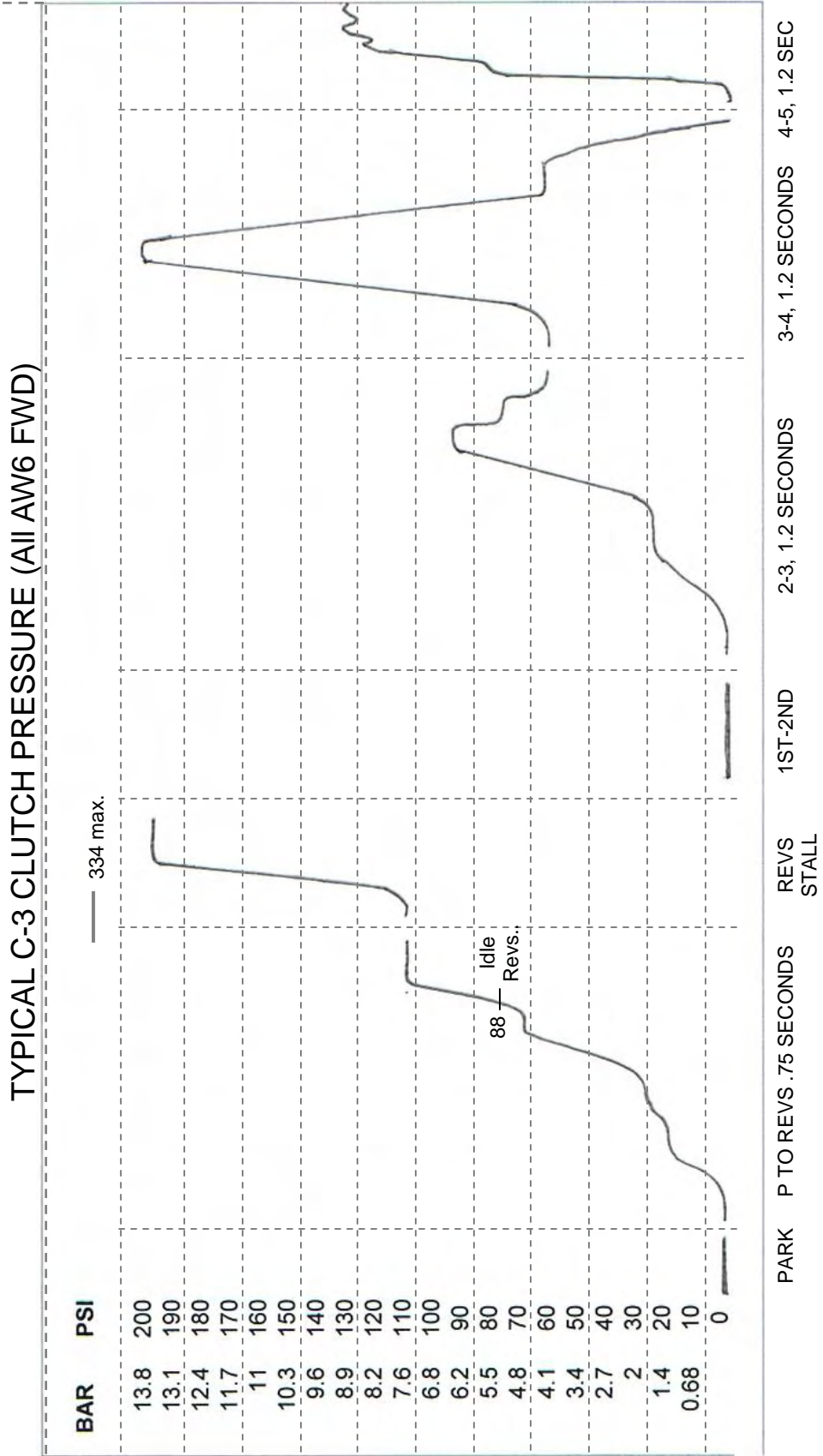


TYPICAL C-1 CLUTCH PRESSURE (Typical of all FWD AW6)



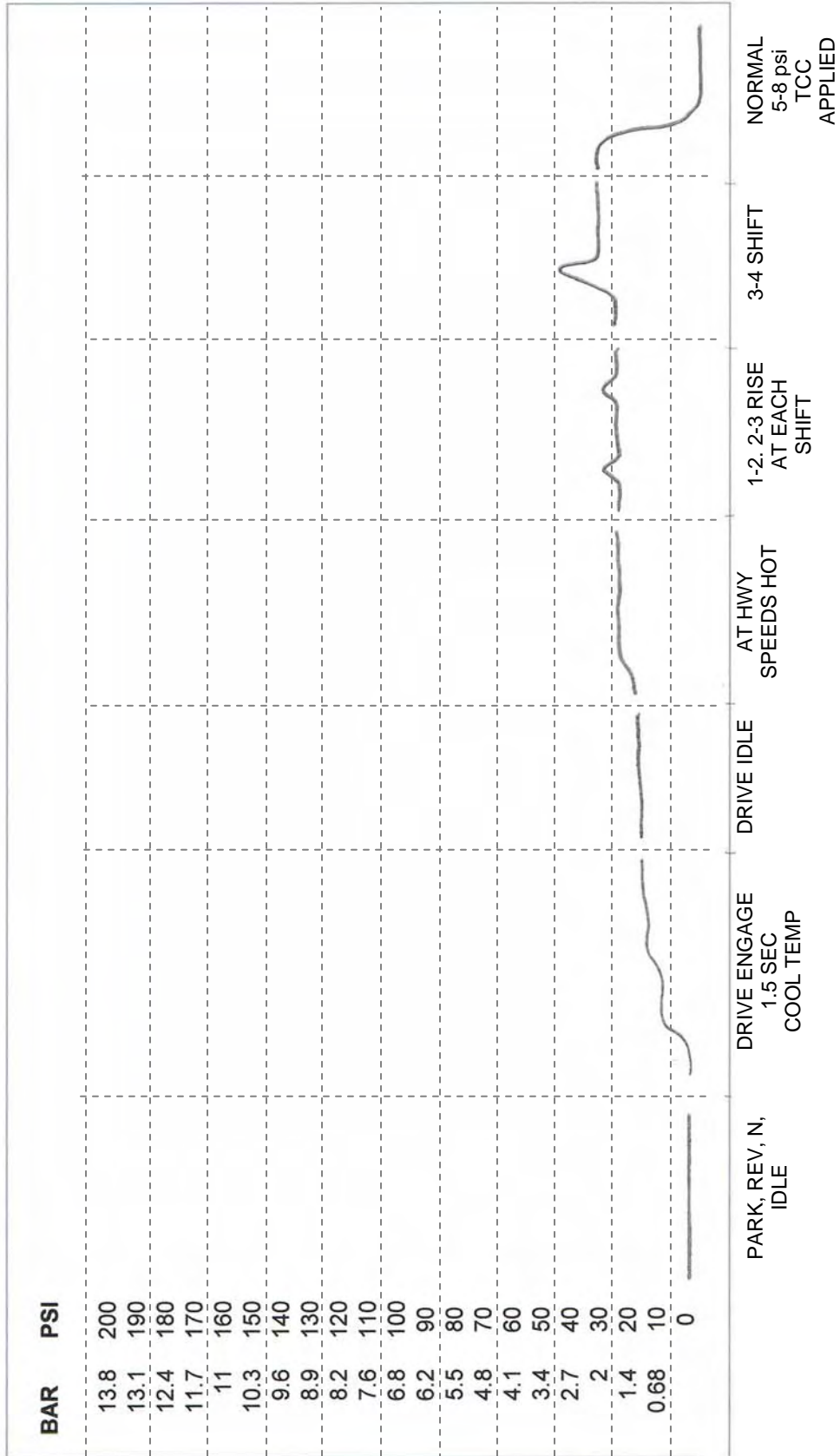
Point of Engagement, 1.2 seconds.
 Drive acceleration to 1-2 shift

Amount of line rise is torque proportionate.

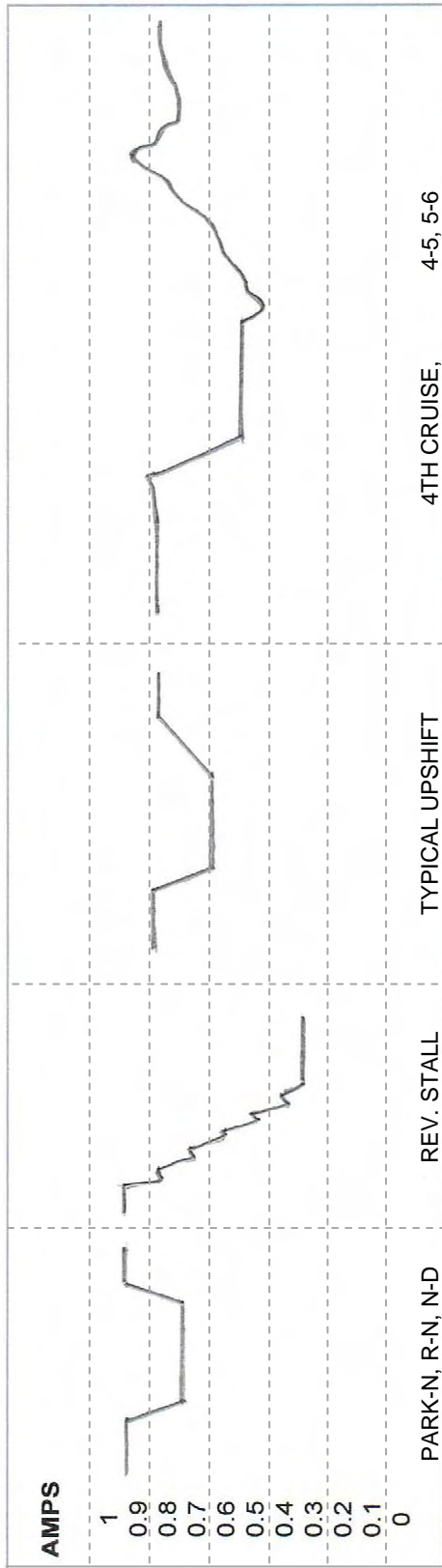


C-3 pressure spikes to approximate 170-180 on all down shifts.

AW6 TYPICAL LUBE PRESSURE

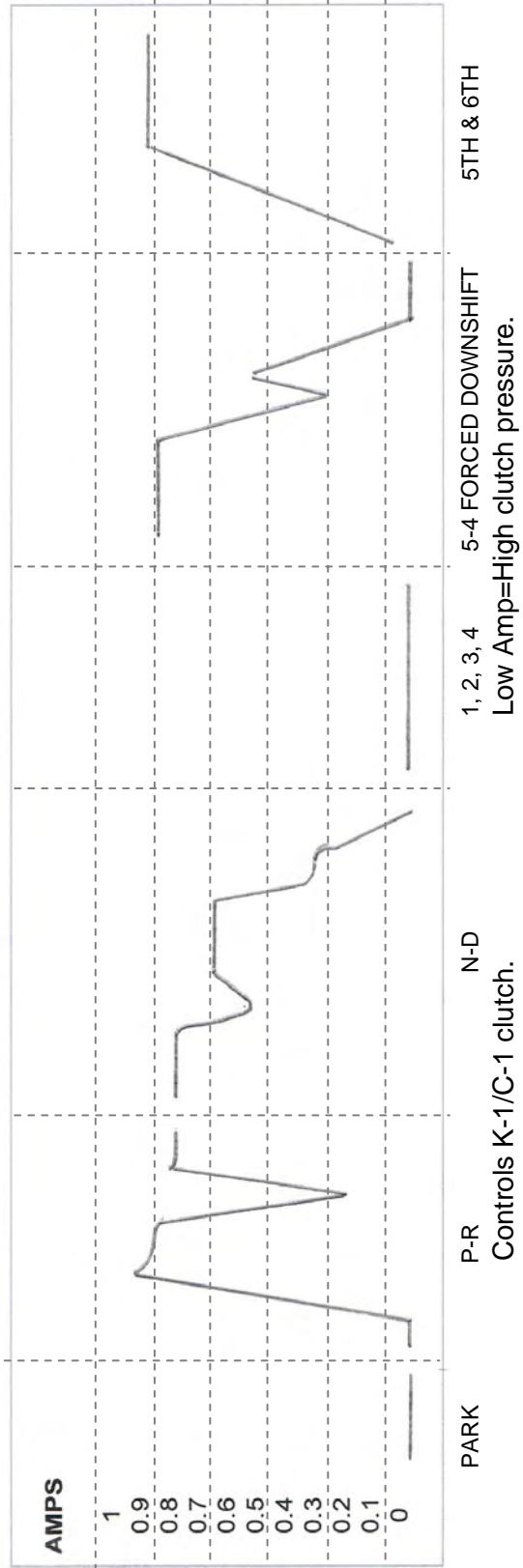


#6-N 93 EPC LINEAR SOLENOID (Typical TF-60SN)



Low amperage= High pressure or inverse proportional

#5 N92 LINEAR SOLENOID (Typical TF-60SN)



AW 6 SPEED FWD

COMMON COMPLAINTS WITH AW 6 SPEED FWD

NOTES:

Complaint:

- Harsh up or downshifts.
- TCC slip, fluid overheat
- RPM cycling at low speed or coast

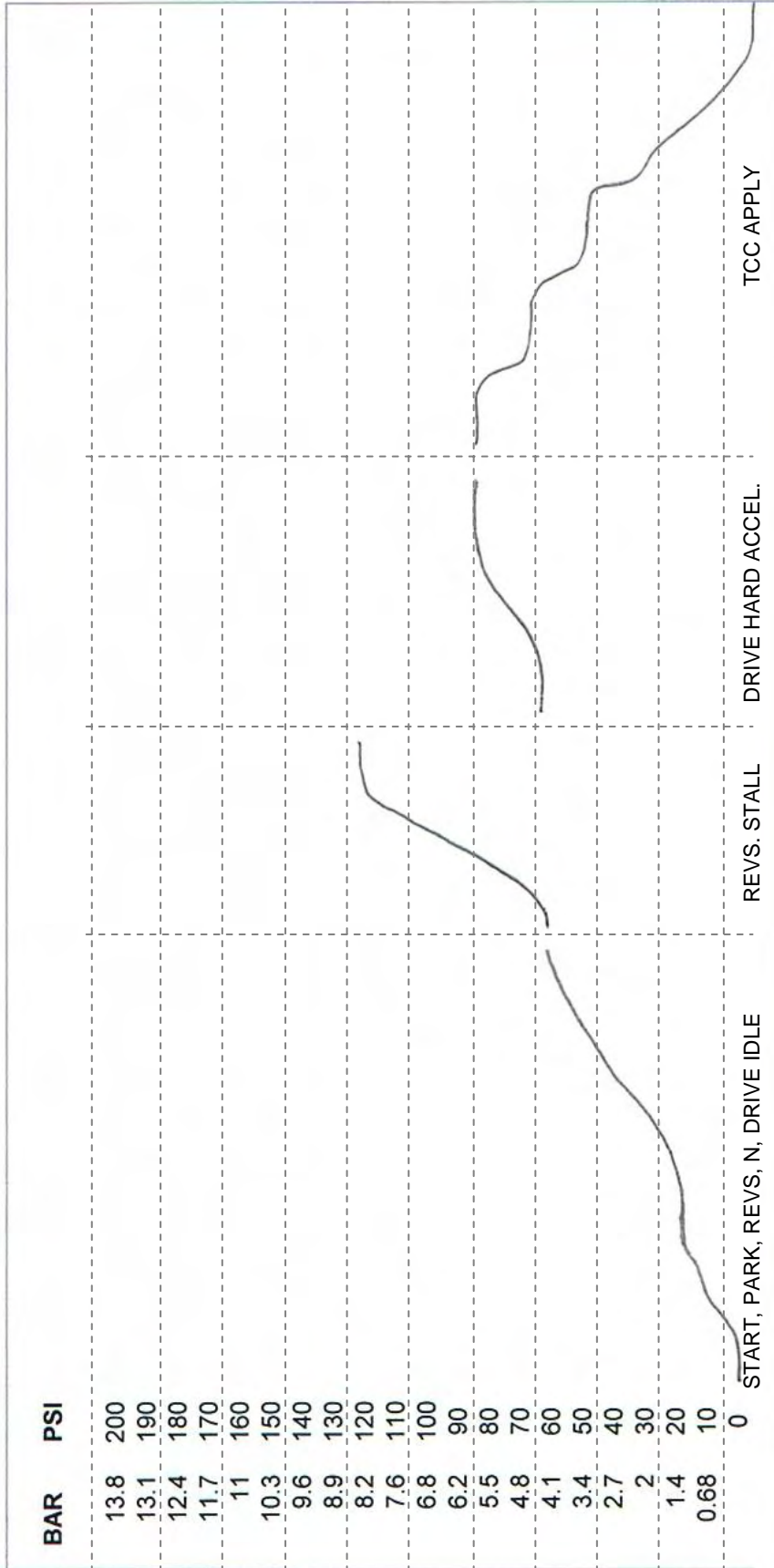
Cause:

- TCC clutch is not releasing or loss of TC modulation control.
- Torque converter clutch control valve bore worn and/or secondary regulator valve bore worn.

Diagnostic Procedure:

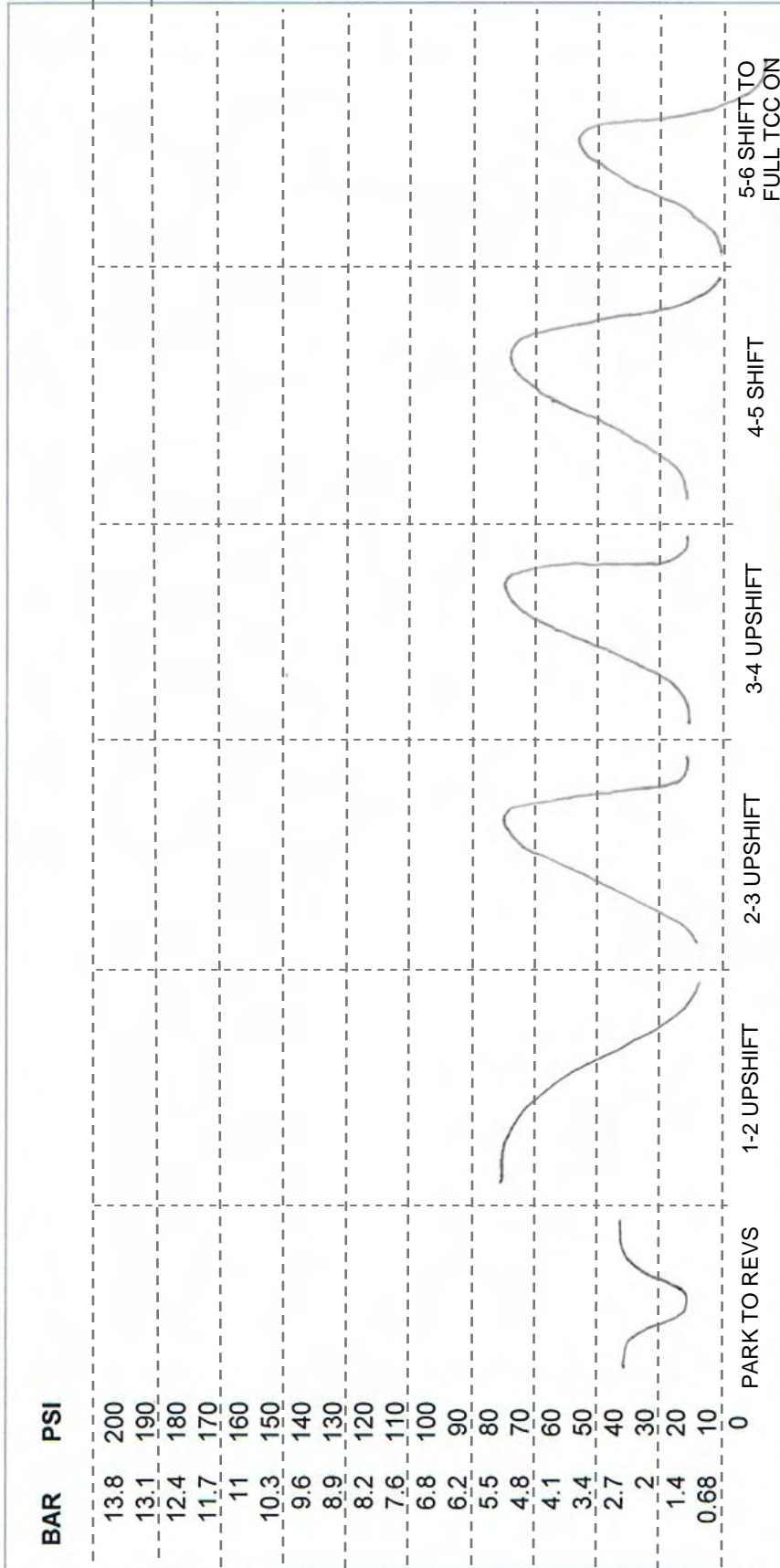
- Monitor converter release pressure to verify the clutch is being controlled. If release psi remains low (see chart) during up/down shift, the control valve is not stroking. Compare the release pressure to TCC solenoid amperage. For overheated conditions, also monitor cooler flow (see chart).

AW6 CONVERTER RELEASE PRESSURE (Typical)



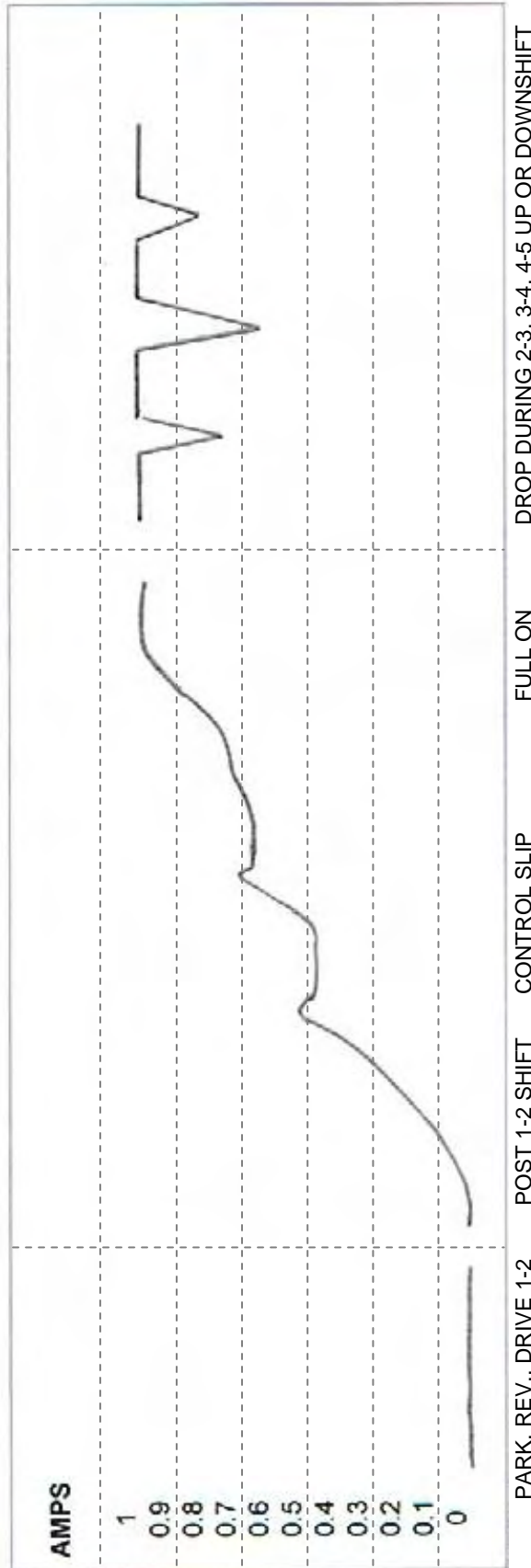
Note: Tapping release pressure is a good method to verify operation of #4-N 91 solenoid.
 TCC modulates off-on during 4-5-6 gear shifts. This tap is a method to verify TCC is affecting shift quality.
 TCC modulates on after 1-2 shift.
 TCC cut off during Tip-Tronic up & downshifts
 TCC remains on during coast down.
 If cooler release pressure is low, check fluid level!

AW6 CONVERTER RELEASE PRESSURE



TCC strategy of partial slip between upshifts.
 TCC may remain applied on coast down for engine braking.
 When converter is fully applied, release will be -0-
 All Converter apply & release flow & pressure is controlled by lock-up control valve and fed by secondary regulator valve, limiting it to 125 psi.

#4-N 91 TCC LINEAR CONTROL SOLENOID (Typical TF-60SN)



Notes: 0.2 Amp = off .9/1.0amp = full on (Example); '07 TF-60 Jetta

No modulation upon engagement into P-R or R-D; can start modulation or control strategy just after 1-2 shift.

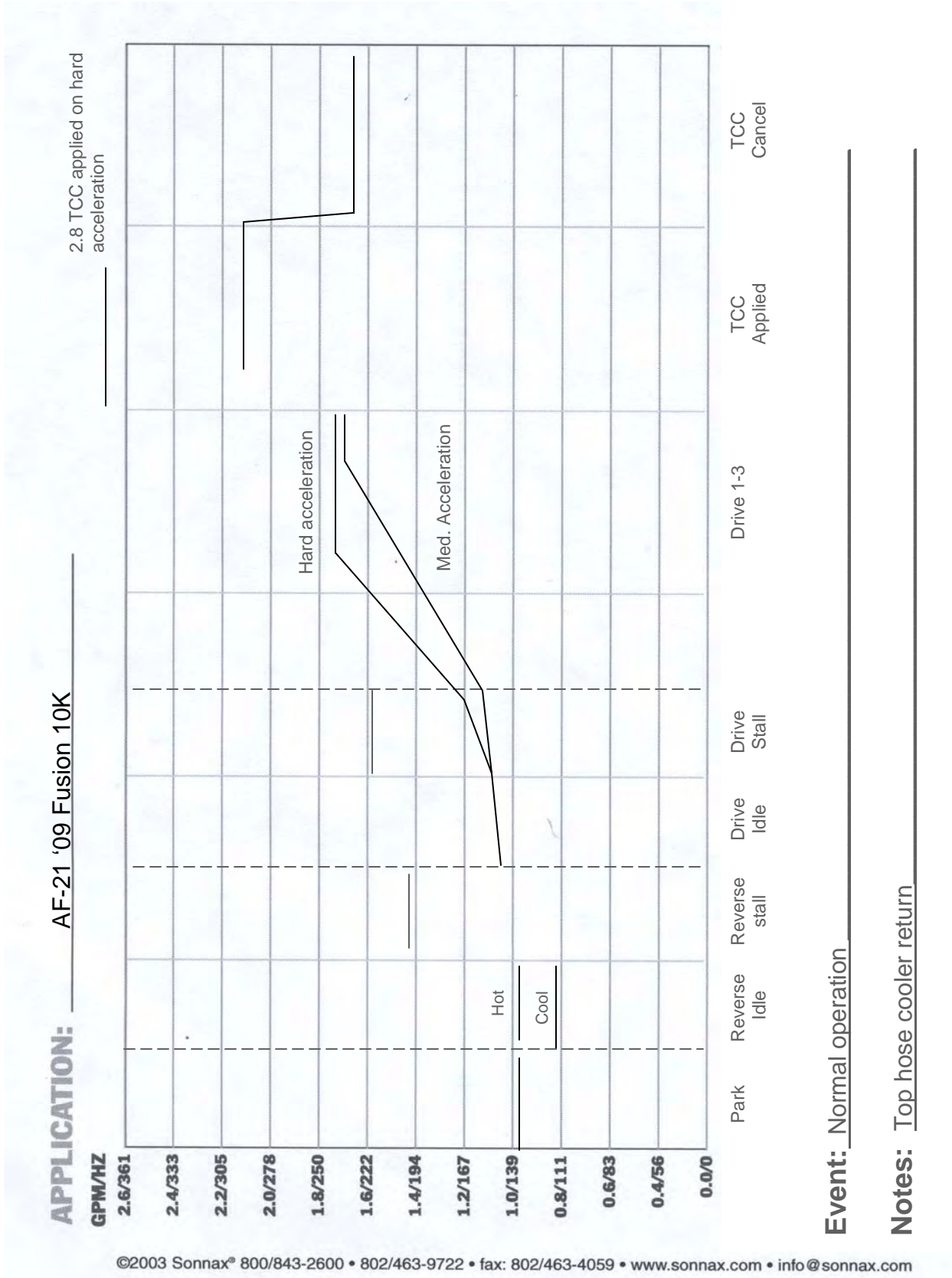
Hot continuous modulation during maneuvers of up & down shifting. Hot continuous modulation during lift throttle release.

Returns to 1.0 Amp post shift. Cut back to 0.2 (approximate) in manual Tip-Tronic control shifts.

TCC slip very active at speeds 35-50 K. Does not cancel with brake pedal.

Remains at 1.0 Amp during coast down 5, 4, 3, 2, 1 for engine braking. All linear solenoids follow N 91 Amp spike.

Suggest monitor slip RPM with amperage normal, transmission temp is 87C at 0.70 volts. Maximum stall RPM, 2785 in reverse, but stall testing is not suggested.



Complaint:

- Flare on 2-3 shift
- Harsh engagement
- Delay forward or reverse

Cause:

- Clutch control valves (at solenoid bore) are out of adjustment. Primarily K3/C3 and or B1.
- K3 valve is most active and bore wears quickly.

Correction & Diagnosis:

Must repair K3/C3 clutch control valve body, then:

- Remove oil pan and adjust clutch control valves. Always measure & record the OE position.
- To overcome a flare on 2-3, back out the K3 adjuster which increases apply psi. You may have to turn in the B1 adjuster to slow down its exhaust rate. Suggest 1/2 to 3/4 turn per test.
- Suggest use of graphing scanner to monitor engine RPM vs. ISS RPM. Should not have spikes in engine RPM during down shift. Engine RPM and ISS #182, sensors should parallel each other. If the engine RPM has spikes at the beginning of shift, clutch pressure is not high/fast enough. If the engine RPM sensor appears to be a square form or dips down during shift, there is a bind up and the opposing clutch (probably B1) may have to be adjusted as well!

Note: On the TF-60SN (VW 09G/09K/09M), the Ross-Tech performs well for this diagnosis. (www.Ross-Tech.com)

Complaint:

- Slippage or loss of 3-4, K-2 clutch failure

Cause:

- TF-60 series commonly have a cross leak under the case sleeve which feeds the K-2 clutch.

Correction:

- Replace the sleeve with an aftermarket with improved retention.

Complaint:

- Loss of lubrication
- Transmission temperature codes
- Enable of shift mode I or II

Cause:

- Incorrect valve body and separator plate for case lube design.
- Remote heat exchanger and case mounted cooler use different separator plates.

Correction:

- Install matching parts. To isolate this (prior to road test) check for cooler flow and release pressure on the lift. Refer to Sonnaflow® charts.

Complaint:

- (09M, 09G) Harsh reverse, 3rd or 5th.
- Bind up on 3-4 or 3-2.

Cause:

Damaged K-3 clutch balance piston. This piston acts as a return and accumulator counter acting upon the K-3 apply piston.

Correction:

- Need to replace the K-3 drum assembly unless pistons are available.
- Aftermarket pistons are now available with tabs to eliminate the radial piston movement.

Complaint:

- Post overhaul, flare upshifts or bumpy downshifts

Cause:

- Failure to reset adapts or relearn strategy has not been completed.

Correction:

- Reset all control modules.
- Perform a drive cycle relearn of 15 shift cycles.

Complaint:

- Fluid discoloration
- TCC clutch failure

Cause:

- Improper fluid will not control TCC clutch slip rate and dissipate heat.

Correction: Suggested fluids

- T-IV or 1161540 for Volvo
- XT-8QAW-Ford
- JW53309-Mazda
- 9986195-GM
- Mobile 1, ESSO or Castrol full synthetic are aftermarket alternatives

Complaint:

- No reverse, Loss of gear
- Low fluid level

Cause:

- Solenoid wiring may be incorrect.

VW Fill adapter:

Some VW applications use a plastic fill elbow that enters above the pan and to the left of front. The number on the part is VW AG-JP57344-02. The case could be bored to accept this fill adapter. It would require drilling the case to .517" ID (13.1mm) to a depth of .487" (12.3mm). At the base of the first bore is a stepped transition to a final bore of .412" (10.4mm)

Complaint, Cause, Correction Issues

Complaint:

- Harsh coast downshifts, harsh upshifts.

Cause:

- TCC control valve bore and sleeve wear. Bore wear reduces the hydraulic control of release pressure on the converter piston. The piston remains applied during the shift.

Correction:

- Service TCC control bore and sleeve.

Complaint:

- Flare/long upshifts, gear ratio codes, loss of gear.

Cause:

- Bore wear at a specific clutch control valve.
- Solenoid modulator valve bore worn.
- Clutch circuit, relay valve sticking.
- SL clutch control solenoid defective or contaminated.
- Main pressure regulator bore and/or boost sleeve worn.
- Incorrect fluid level.

Correction:

- Inspect and service in order of above.

Complaint:

- Delayed forward engagement

Cause:

- Valve body temperature sensor not registering properly. (Will also affect TCC apply)
- Fluid level incorrect C-1/ K-1 clutch control valve bore worn or defective solenoid.

Correction:

- Service C-1/K-1 valve and test thermal element.

Common Codes

PO 602	Control module programming error
PO 710	Oil temperature sensor
PO 715	Input revolution sensor
PO 720	Output revolution sensor
PO 729	Gear ratio 6th
PO 731	Gear ratio 1st
PO 732	Gear ratio 2nd
PO 733	Gear ratio 3rd
PO 734	Gear ratio 4th
PO 735	Gear ratio 5th
PO 736	Gear ratio reverse
PO 743	SLU Linear solenoid fault
PO 748	SLT Linear solenoid fault
PO 753	S2 solenoid fault
PO 773	S1 solenoid fault
PO 780	Unusual shift, (valve stuck)
PO 1743	TCC stuck on or off
PO 1981	SLC1 Linear solenoid fault
PO 1982	SLC2 Linear solenoid fault
PO 1983	SLC3 Linear solenoid fault
PO 1984	SLB1 Linear solenoid fault
PO U2100	Series- CAN communication errors

Relearn

Initial Relearn:

If transmission or TCM is repaired or replaced, delete the learned data and perform both Neutral and Initial Learning. If the TCM has been overwritten (reflashed), perform relearn process!

1. Warm up ATF to minimum of 66°C (151°F) and maximum of 110C (230°F).
2. Garage shift:
 - Brake applied, select N for 3 seconds.
 - Then N to D and allow engagement of C1 for 3 seconds.
 - Repeat 5 times for D-Reverse.
3. Gear shift:
 - Drive 25-35% throttle to obtain 6th gear and hold 80 Kmh. Then coast to a stop within a minimum of 60 seconds.
 - Repeat this cycle 10 times.

Note: Spec for maximum N-D engagement is 1.0, N-Rev is 1.5 sec.

Neutral Position Relearn:

1. Vehicle running in Park
2. Release & shift to Neutral
3. Verify N is recognized by TCM on dash & scanner.
4. If not recognized, adjust shifter & input Neutral gear with scan tool.