



Technical Service Information

O1M Technicians Guide

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Technical Service Information

VOLKSWAGEN "01M" PRELIMINARY INFORMATION

The "01M" designated transaxle, shown in Figure 1, first appeared in the 1995 model year and was used in a wide variety of the Volkswagen car lines along with various engine combinations, including the 2.8L V6 engine, as shown in the chart below.

The "01M" transaxle is a 4 speed unit, with 4th gear being overdrive, and is equipped with a clutch in the torque converter. Refer to the chart in Figure 1 for the internal components that are applied in each of the four forward gear ranges. Notice that it has only one freewheel device for 1st gear.

"01M" MODEL USAGE CHART		
<i>Vehicle</i>	<i>Years</i>	<i>Engine Size</i>
<i>Cabrio</i>	<i>1995-2001</i>	<i>2.0L (L4)</i>
<i>Beetle</i>	<i>1998-2001</i>	<i>1.8L (L4), 2.0L (L4), 1.9L Diesel</i>
<i>Golf</i>	<i>1995-2001</i>	<i>1.8L (L4), 2.0L (L4), 1.9L Diesel</i>
<i>GTI</i>	<i>1999-2001</i>	<i>1.8L (L4), 2.8L (V6)</i>
<i>Jetta</i>	<i>1995-2001</i>	<i>1.8L (L4), 2.0L (L4), 1.9L Diesel, 2.8L (V6)</i>
<i>Passat</i>	<i>1995-1997</i>	<i>2.0L (L4), 2.8L (V6)</i>

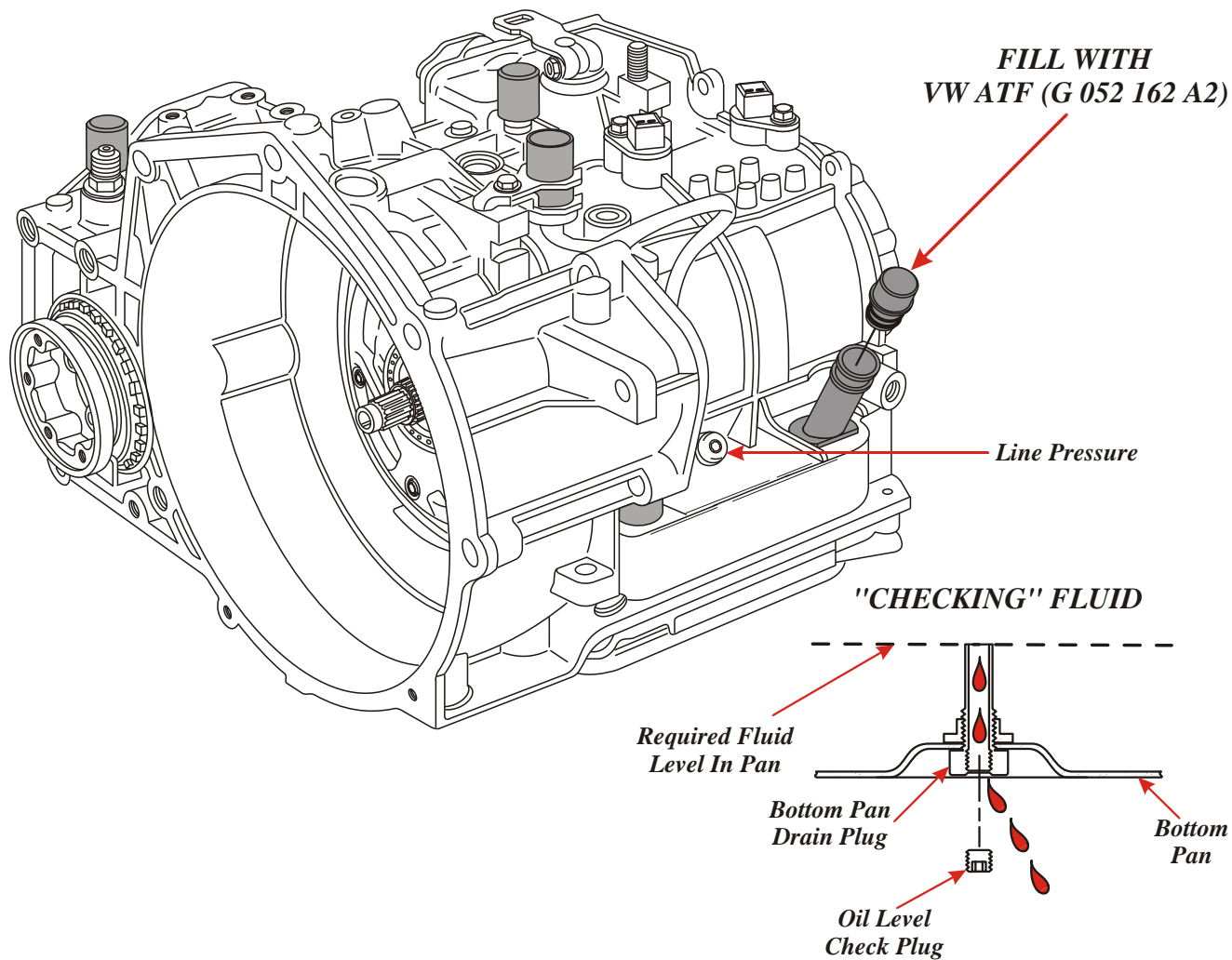
The "01M" transaxle is totally electronic controlled and uses a Electronic Control Unit (ECU) to control shift points, apply and release of the torque converter clutch, and line pressure control. This is done using seven solenoids located on the valve body. The solenoid pattern for each gear and the description of operation is provided for you in Figure 2. Electrical signals from various sensors provide information to the ECU about vehicle speed, throttle position, engine coolant temperature, transaxle fluid temperature, gear range selected, converter turbine speed, engine load and engine speed. The ECU uses this information to determine the precise moment to upshift or downshift, apply or release the TCC and what fluid pressures are needed to apply the components.

If for any reason the entire electronic control system of the transaxle becomes disabled, or the ECU detects a problem with one of the various sensors that stores a trouble code, all of the solenoids will be de-energized (Turned OFF). This "Safety Mode" operating state of the solenoids forces the transaxle to operate in 3rd gear when the selector lever is in the "Drive" range. We have provided you with an internal wire schematic and case connector pin identification in Figure 3, and a chart in Figure 4 to check the resistance of the solenoids and fluid temperature sensor. Refer to Figure 5 to check solenoid mechanical operation on the bench.

Figures 6, 7 and 8 will provide you with exploded views of the valve body and all valve body components along with the names of each valve. The names of the valves are ATSG interpretations of the valves functions, not Volkswagens. Figure 9 will provide you with the valve body spring specifications that we observed in the valve body that was used for the illustrations, and may be different in the various models. Refer to Figures 10 and 11 for the checkball locations in this unit and Figure 12 for air checks.



VOLKSWAGEN "01M"



COMPONENT APPLICATION CHART							
RANGE	"K-1" CLUT	"K-2" CLUT	"K-3" CLUT	"B-1" BRAK	"B-2" BRAK	LOW SPRG	CONV CLUT
<i>Park</i>					<i>ON</i>		
<i>Reverse</i>		<i>ON</i>		<i>ON</i>			
<i>Neutral</i>							
<i>Dr-1st</i>	<i>ON</i>					<i>HOLD</i>	**
<i>Dr-2nd</i>	<i>ON</i>				<i>ON</i>		**
<i>Dr-3rd</i>	<i>ON</i>		<i>ON</i>				**
<i>Dr-4th</i>			<i>ON</i>		<i>ON</i>		**
<i>Man-1st</i>	<i>ON</i>			<i>ON</i>			

** Converter Clutch may be on depending on throttle position and vehicle speed.

Figure 1



VOLKSWAGEN "01M" SOLENOID APPLY CHART

<i>RANGE SELECTED</i>	<i>EV-1 (N88)</i>	<i>EV-2 (N89)</i>	<i>EV-3 (N90)</i>	<i>EV-4 (N91)</i>	<i>EV-5 (N92)</i>	<i>EV-6 (N93)</i>	<i>EV-7 (N94)</i>
<i>PARK/NEUTRAL</i>	<i>ON</i>		<i>ON</i>			<i>ON***</i>	
<i>REVERSE</i>			<i>ON</i>		<i>ON**</i>	<i>ON***</i>	
<i>DRIVE - 1ST</i>			<i>ON</i>	<i>ON*</i>	<i>ON**</i>	<i>ON***</i>	
<i>DRIVE - 2ND</i>		<i>ON</i>	<i>ON</i>	<i>ON*</i>	<i>ON**</i>	<i>ON***</i>	
<i>DRIVE - 3RD</i>				<i>ON*</i>	<i>ON**</i>	<i>ON***</i>	<i>ON</i>
<i>DRIVE - 4TH</i>	<i>ON</i>	<i>ON</i>		<i>ON*</i>	<i>ON**</i>	<i>ON***</i>	<i>ON</i>

DESCRIPTION OF SOLENOID OPERATION

EV-1 (N88) This solenoid feeds the K-1 clutch when it is de-energized (Off), and feeds the B-1 brake when it is energized (On), in Park, Neutral and 4th.

EV-2 (N89) This solenoid is energized in 2nd and 4th to apply the B-2 brake.

EV-3 (N90) This solenoid controls the K-3 clutch

**EV-4 (N91) This PWM solenoid applies the converter clutch when it is energized (On) and is dependent on engine temp, vehicle speed and throttle position.*

***EV-5 (N92) This solenoid is energized (On) during every shift, to drop line pressure, and orifices the apply oil to each clutch pack during the shift to provide smoother shifts. After the shift is completed, the solenoid is de-energized (Off).*

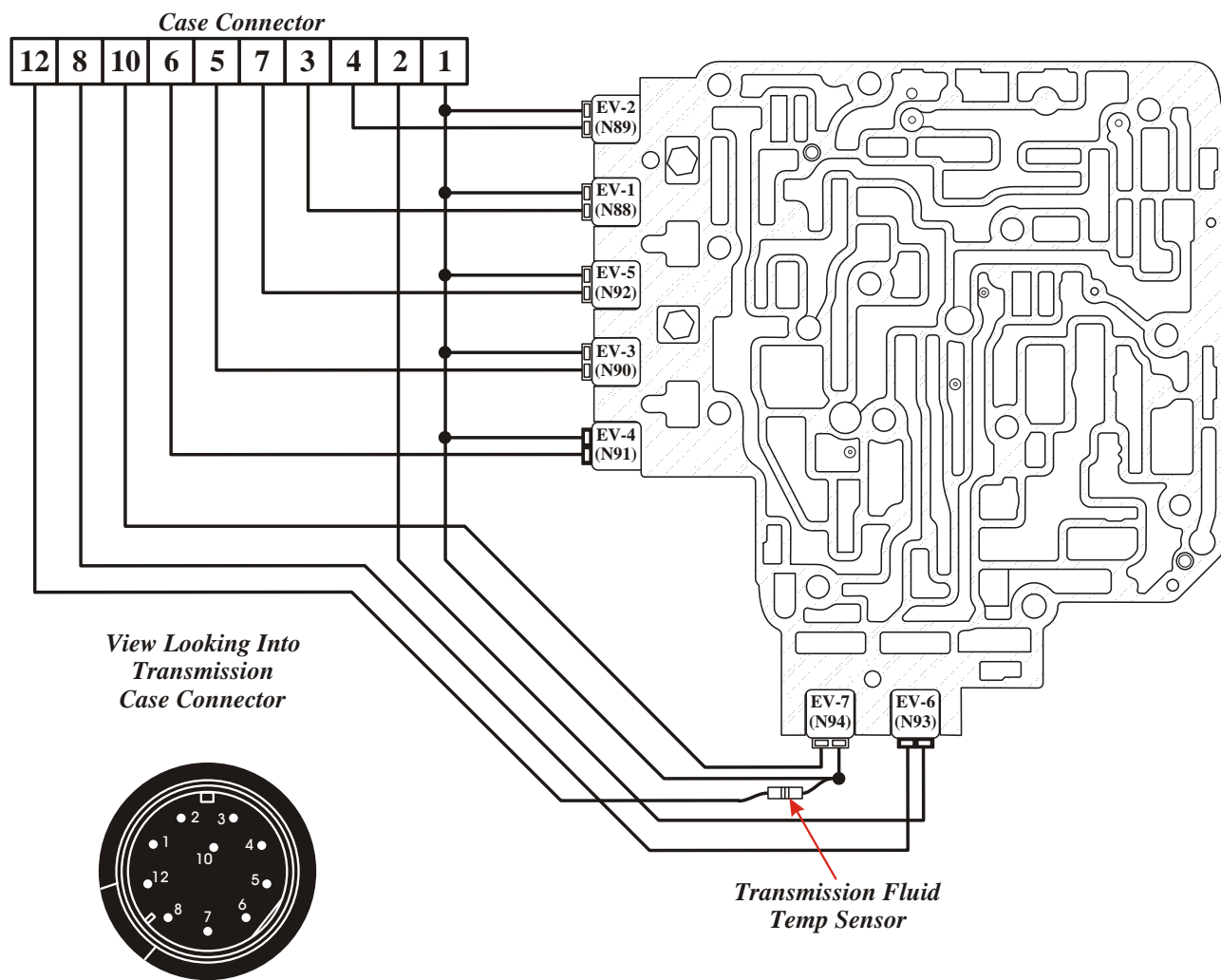
****EV-6 (N93) This PWM solenoid controls main line pressure anytime the engine is running. This is a Pulse Width Modulated signal that varies with engine load and throttle position. When the solenoid is de-energized (Off) pressure goes to maximum.*

EV-7 (N94) This solenoid controls the apply oil to the B-2 brake, to provide smoother shifts into 4th gear. It will also be energized (On) momentarily during the 2-3 shift.

Figure 2



CASE CONNECTOR PIN FUNCTIONS



*View Looking Into
Transmission
Case Connector*

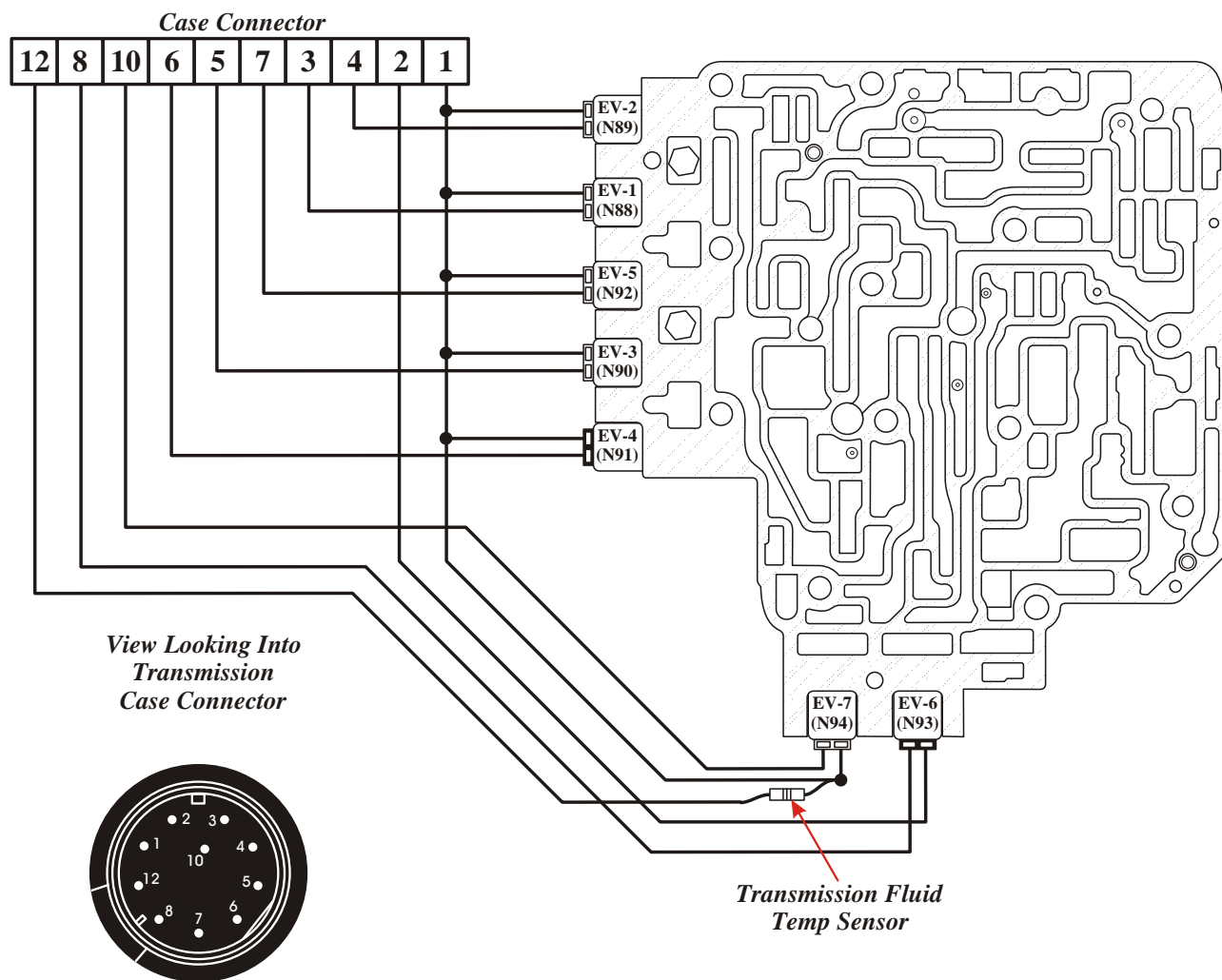
*Transmission Fluid
Temp Sensor*

<i>Pin No.</i>	<i>Pin Function</i>
1	<i>Voltage supply to Solenoids EV-1, 2, 3, 4, 5, 7 and ATF Sensor.</i>
2	<i>Voltage supply to Solenoid EV-6.</i>
3	<i>Ground signal to Solenoid EV-1.</i>
4	<i>Ground signal to Solenoid EV-2.</i>
5	<i>Ground signal to Solenoid EV-3.</i>
6	<i>Ground signal to Solenoid EV-4.</i>
7	<i>Ground signal to Solenoid EV-5.</i>
8	<i>Ground signal to Solenoid EV-6.</i>
10	<i>Ground signal to Solenoid EV-7.</i>
12	<i>Fluid Temp Sensor signal return (Resistor In Ribbon).</i>

Figure 3



INTERNAL COMPONENT RESISTANCE CHART

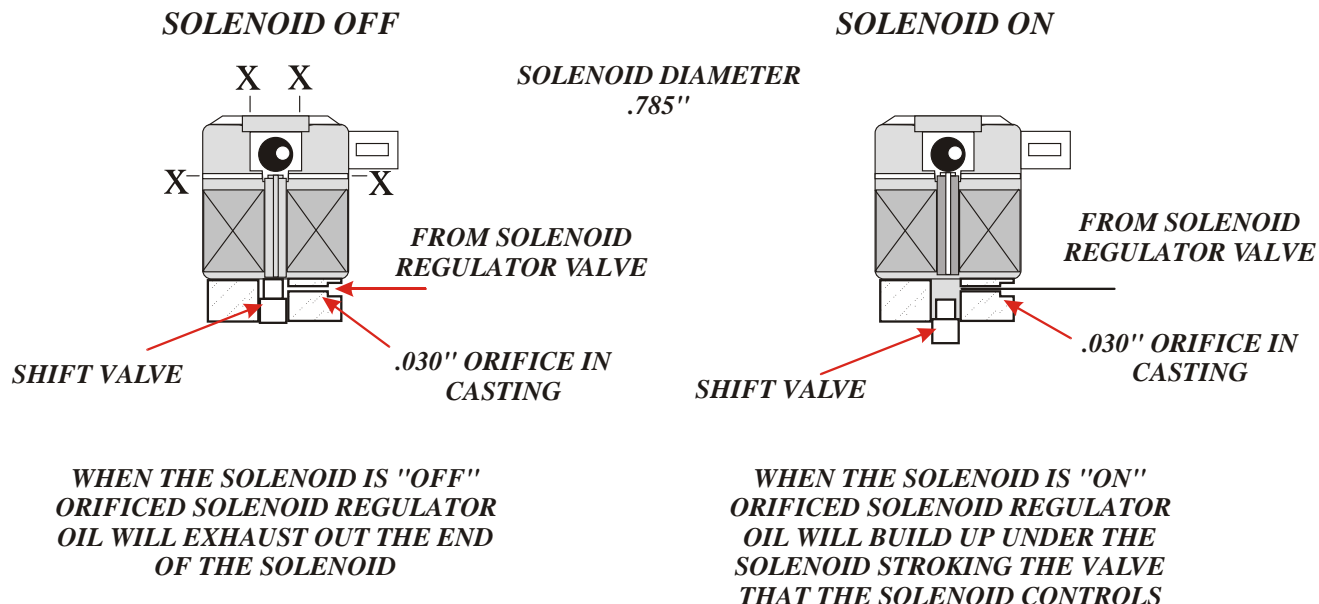


<i>Component</i>	<i>Pin No's.</i>	<i>Resistance @ 20°C (72°F)</i>
<i>Solenoid EV-1 (N88)</i>	<i>1 And 3</i>	<i>55-65 Ohms</i>
<i>Solenoid EV-2 (N89)</i>	<i>1 And 4</i>	<i>55-65 Ohms</i>
<i>Solenoid EV-3 (N90)</i>	<i>1 And 5</i>	<i>55-65 Ohms</i>
<i>Solenoid EV-4 (N91)</i>	<i>1 And 6</i>	<i>4.5-5.1 Ohms</i>
<i>Solenoid EV-5 (N92)</i>	<i>1 And 7</i>	<i>55-65 Ohms</i>
<i>Solenoid EV-6 (N93)</i>	<i>2 And 8</i>	<i>4.5-5.1 Ohms</i>
<i>Solenoid EV-7 (N94)</i>	<i>1 And 10</i>	<i>55-65 Ohms</i>
<i>TFT Sensor</i>	<i>1 And 12</i>	<i>190k-200k Ohms</i>

Figure 4



**EV1 (N88), EV2 (N89), EV3 (N90), EV5 (N92) AND EV7 (N94)
SOLENOID CHECK AND OPERATION**



**EV4 (N91) AND EV6 (N93)
SOLENOID CHECK AND OPERATION**

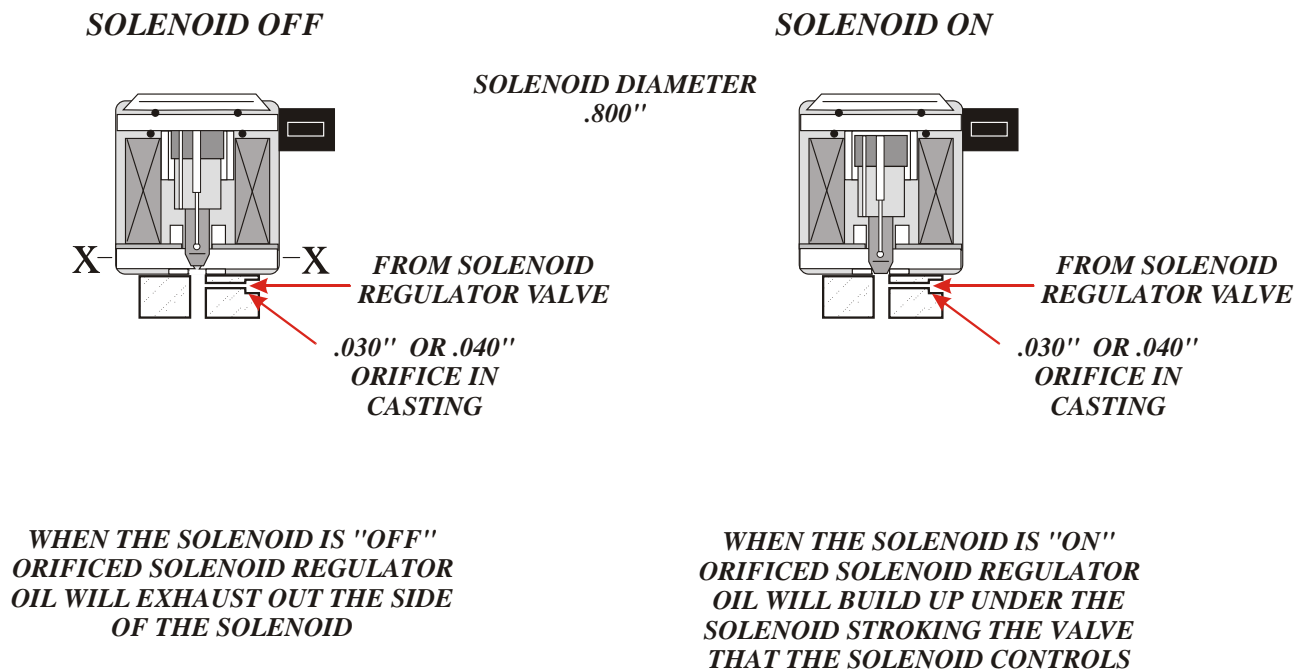


Figure 5



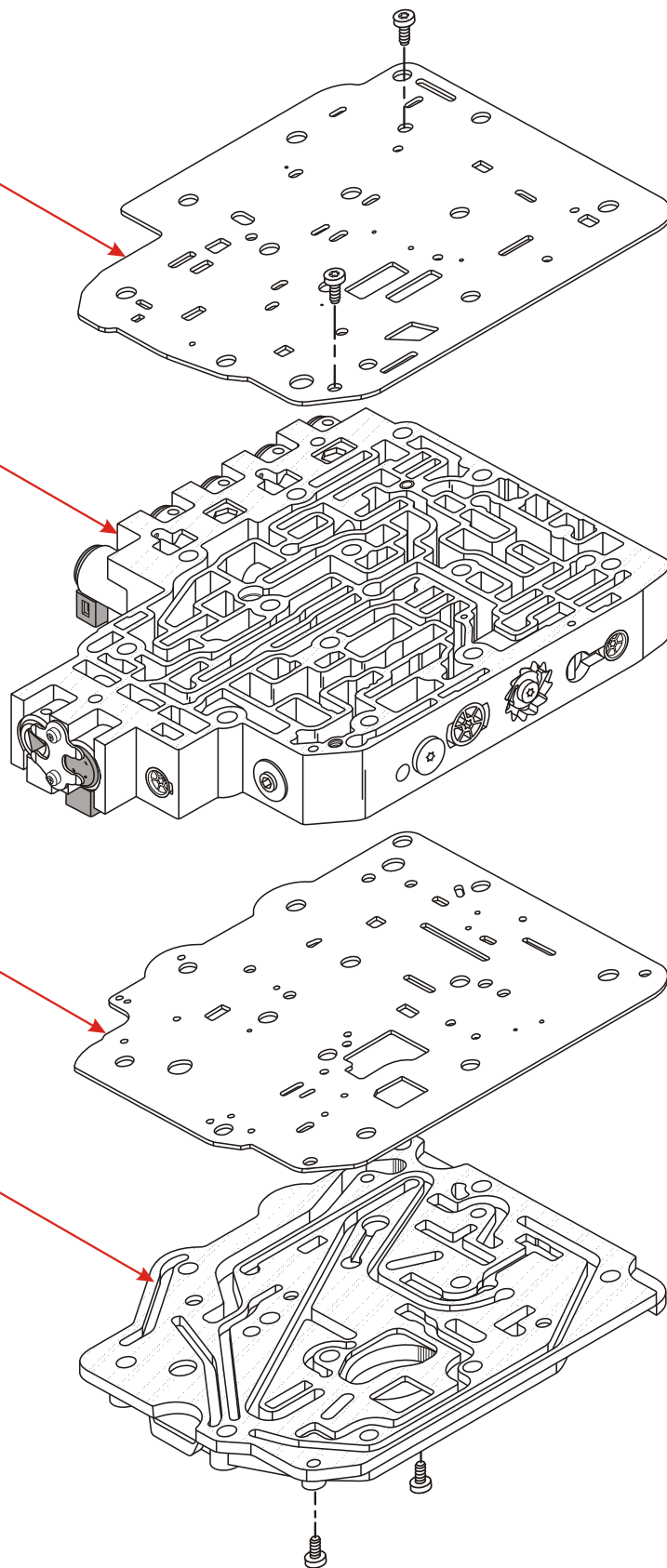
AUDI AND VOLKSWAGEN 01M VALVE BODY

*Upper valve body
Spacer Plate*

*Main Valve Body
Assembly*

*Lower valve body
Spacer Plate*

Channel Plate

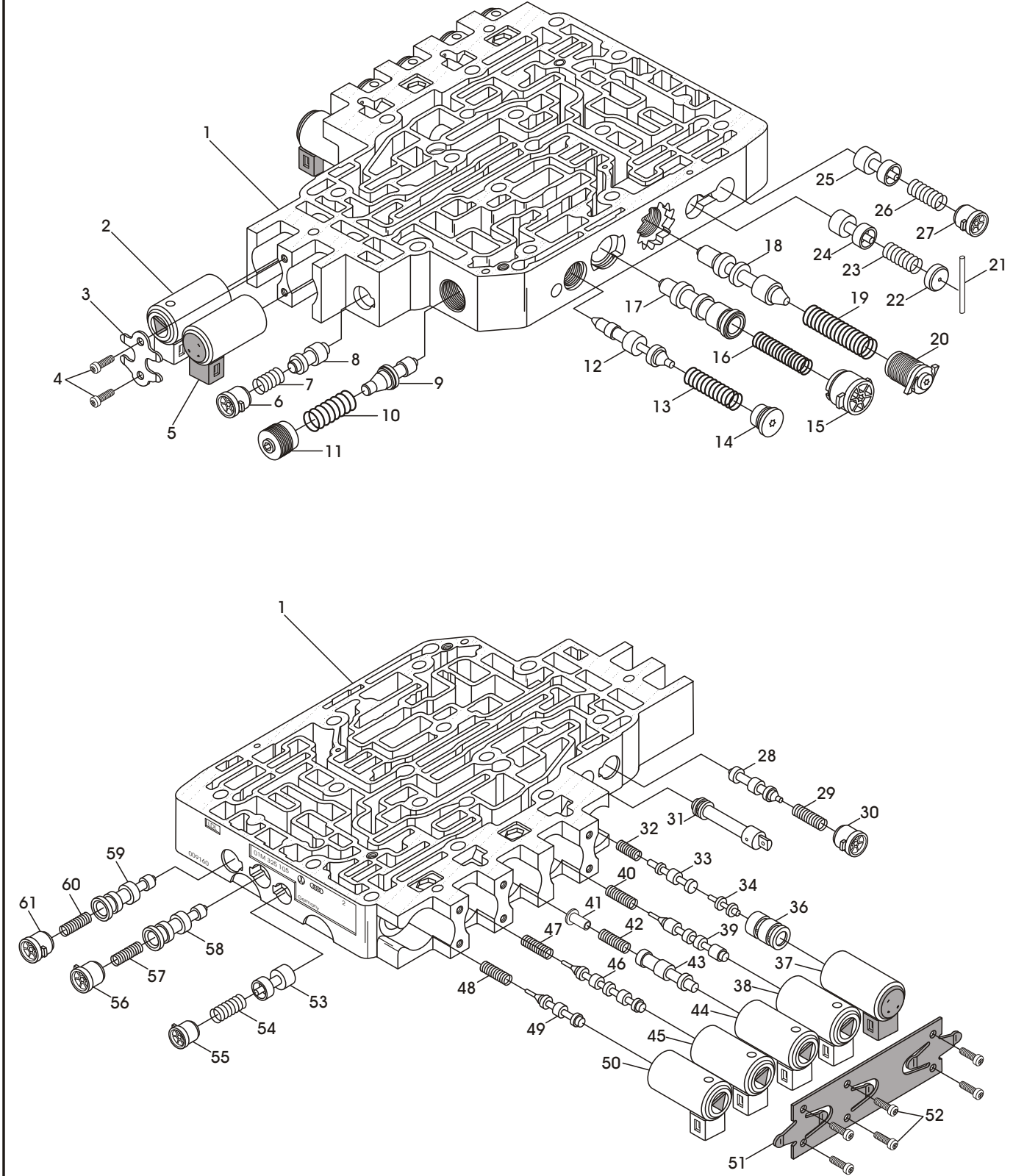


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Figure 6



**AUDI AND VOLKSWAGEN 01M VALVE BODY
EXPLODED VIEW**



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Figure 7



Technical Service Information

- | | |
|---|---|
| 1. MAIN VALVE BODY CASTING | 32. CONVERTER CLUTCH APPLY VALVE SPRING (SEE SPRING SPEC) |
| 2. EV-7 SOLENOID (N94) | 33. CONVERTER CLUTCH APPLY VALVE |
| 3. SOLENOID RETAINING BRACKET | 34. CONVERTER CLUTCH CONTROL VALVE |
| 4. SOLENOID RETAINING BRACKET BOLTS | 36. CONVERTER CLUTCH CONTROL VALVE SLEEVE |
| 5. EV-6 SOLENOID (N93) | 37. EV-4 SOLENOID, CONVERTER CLUTCH (N91) |
| 6. MANUAL 1ST LOCKING VALVE RETAINER (YELLOW) | 38. EV-3 SOLENOID (N90) |
| 7. MANUAL 1ST LOCKING VALVE SPRING (SEE SPRING SPEC) | 39. K-3 SHIFT VALVE |
| 8. MANUAL 1ST LOCKING VALVE | 40. K-3 SHIFT VALVE SPRING (SEE SPRING SPEC) |
| 9. SOLENOID REGULATOR VALVE | 41. B-1 APPLY VALVE SPRING SEAT |
| 10. SOLENOID REGULATOR VALVE SPRING (SEE SPRING SPEC) | 42. B-1 APPLY VALVE SPRING (SEE SPRING SPEC) |
| 11. SOLENOID REGULATOR VALVE RETAINER | 43. B-1 APPLY VALVE |
| 12. CONVERTER REGULATOR VALVE | 44. EV-5 SOLENOID (N92) |
| 13. CONVERTER REGULATOR VALVE SPRING (SEE SPRING SPEC) | 45. EV-1 SOLENOID (N88) |
| 14. CONVERTER REGULATOR VALVE RETAINER | 46. K-1/B-1 SHIFT VALVE |
| 15. MAIN PRESSURE REGULATOR VALVE RETAINER (BROWN) | 47. K-1/B-1 SHIFT VALVE SPRING (SEE SPRING SPEC) |
| 16. MAIN PRESSURE REG. VALVE SPRING (SEE SPRING SPEC) | 48. B-2 SHIFT VALVE SPRING (SEE SPRING SPEC) |
| 17. MAIN PRESSURE REGULATOR VALVE | 49. B-2 SHIFT VALVE |
| 18. BOOST PRESSURE REGULATOR VALVE | 50. EV-2 SOLENOID (N89) |
| 19. BOOST PRESSURE REG. VALVE SPRING (SEE SPRING SPEC) | 51. SOLENOID RETAINING BRACKET |
| 20. BOOST PRESSURE REGULATOR RETAINER (ADJUSTABLE) | 52. SOLENOID RETAINING BRACKET BOLTS (6) |
| 21. K-3 REGULATOR VALVE RETAINING PIN | 53. B-2 REGULATOR VALVE |
| 22. K-3 REGULATOR VALVE BORE PLUG | 54. B-2 REGULATOR VALVE SPRING (SEE SPRING SPEC) |
| 23. K-3 REGULATOR VALVE SPRING (SEE SPRING SPEC) | 55. B-2 REGULATOR VALVE RETAINER (BLACK) |
| 24. K-3 REGULATOR VALVE | 56. K-1 CONTROL VALVE RETAINER (BROWN) |
| 25. K-1 REGULATOR VALVE | 57. K-1 CONTROL VALVE SPRING (SEE SPRING SPEC) |
| 26. K-1 REGULATOR VALVE SPRING (SEE SPRING SPEC) | 58. K-1 CONTROL VALVE |
| 27. K-1 REGULATOR VALVE RETAINER (YELLOW) | 59. 2-3 TIMING VALVE |
| 28. MANUAL 1ST/K-3 LOCKOUT VALVE | 60. 2-3 TIMING VALVE SPRING (SEE SPRING SPEC) |
| 29. MANUAL 1ST/K-3 LOCKOUT VALVE SPRING (SEE SPRING SPEC) | 61. 2-3 TIMING VALVE RETAINER (WHITE) |
| 30. MANUAL 1ST/K-3 LOCKOUT RETAINER (YELLOW) | |
| 31. MANUAL VALVE | |

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Figure 8



VOLKSWAGEN "01M" SPRING SPECIFICATIONS

Main Valve Body

"Back Side"

"Front Side"

SPRING ILLUSTRATION NO. 7:
FREE LENGTH = .728"
SPRING DIAMETER = .352"
WIRE DIAMETER = .029"

SPRING ILLUSTRATION NO. 29:
FREE LENGTH = .987"
SPRING DIAMETER = .280"
WIRE DIAMETER = .027"

SPRING ILLUSTRATION NO. 10:
FREE LENGTH = 1.295"
SPRING DIAMETER = .454"
WIRE DIAMETER = .039"

SPRING ILLUSTRATION NO. 32:
FREE LENGTH = .600"
SPRING DIAMETER = .219"
WIRE DIAMETER = .020"

SPRING ILLUSTRATION NO. 13:
FREE LENGTH = 1.235"
SPRING DIAMETER = .330"
WIRE DIAMETER = .037"

SPRING ILLUSTRATION NO. 40:
FREE LENGTH = .973"
SPRING DIAMETER = .280"
WIRE DIAMETER = .027"

SPRING ILLUSTRATION NO. 16:
FREE LENGTH = 1.385"
SPRING DIAMETER = .410"
WIRE DIAMETER = .035"

SPRING ILLUSTRATION NO. 42:
FREE LENGTH = .973"
SPRING DIAMETER = .280"
WIRE DIAMETER = .027"

SPRING ILLUSTRATION NO. 19:
FREE LENGTH = 1.460"
SPRING DIAMETER = .357"
WIRE DIAMETER = .039"

SPRING ILLUSTRATION NO. 47:
FREE LENGTH = .973"
SPRING DIAMETER = .280"
WIRE DIAMETER = .027"

SPRING ILLUSTRATION NO. 23:
FREE LENGTH = 1.090"
SPRING DIAMETER = .352"
WIRE DIAMETER = .029"

SPRING ILLUSTRATION NO. 48:
FREE LENGTH = .973"
SPRING DIAMETER = .280"
WIRE DIAMETER = .027"

SPRING ILLUSTRATION NO. 26:
FREE LENGTH = 1.090"
SPRING DIAMETER = .352"
WIRE DIAMETER = .029"

SPRING ILLUSTRATION NO. 54:
FREE LENGTH = 1.075"
SPRING DIAMETER = .352"
WIRE DIAMETER = .029"

SPRING ILLUSTRATION NO. 57:
FREE LENGTH = .968"
SPRING DIAMETER = .280"
WIRE DIAMETER = .027"

SPRING ILLUSTRATION NO. 60:
FREE LENGTH = .915"
SPRING DIAMETER = .280"
WIRE DIAMETER = .027"

Figure 9



**VALVE BODY UPPER SIDE
CHECKBALL LOCATIONS**

*7mm (.275")
Diameter
With Retainer*



*6mm (.236")
Diameter
Not used in
all models*

①

*6mm (.236")
Diameter
Not used in
all models*

③

*7mm (.275")
Diameter
(Some Models
Have Retainer)*



*Retaining Pin
Length = 1.061"
Diameter = .085"*

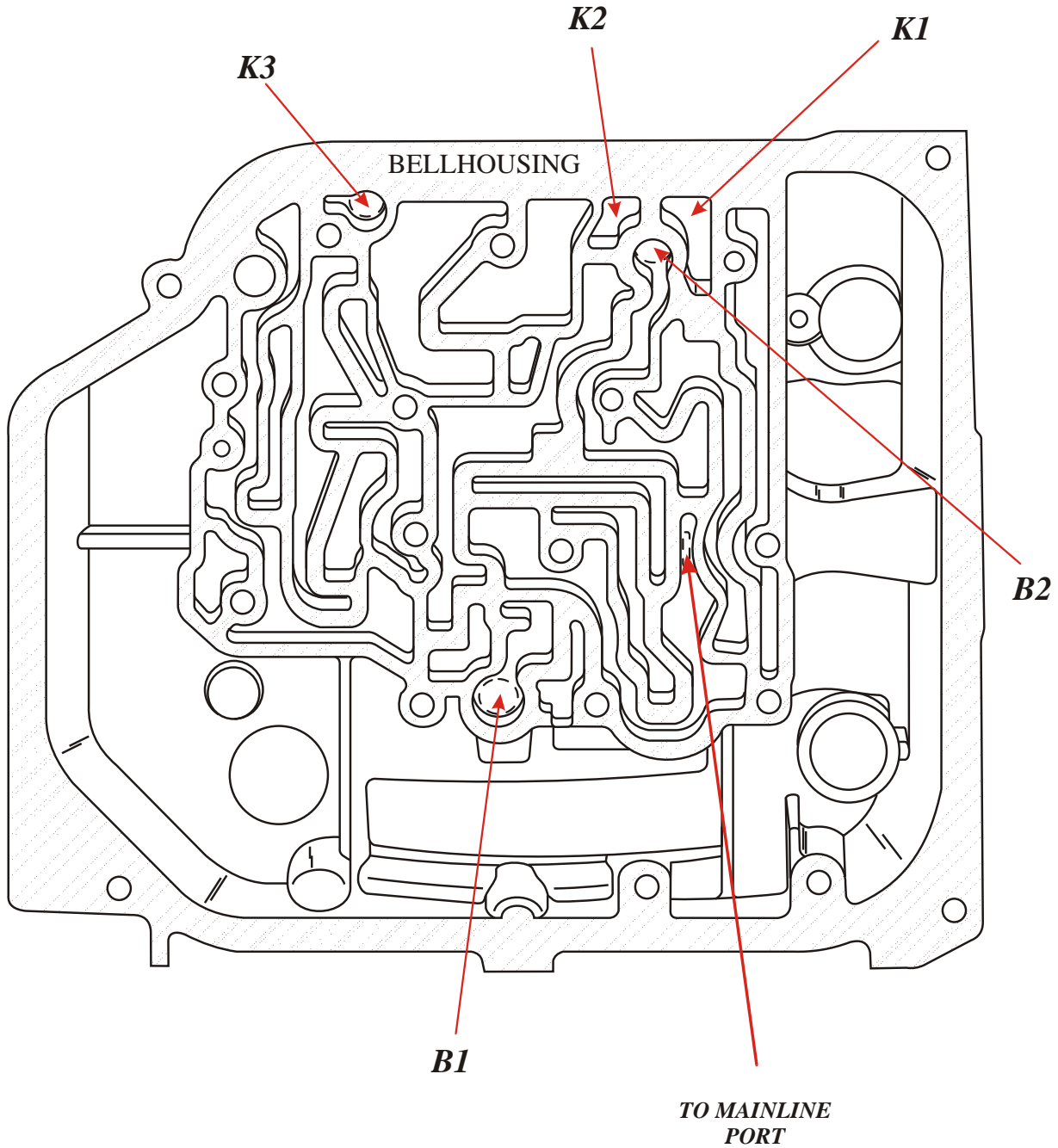
NOTE: *there should be only One 6mm
checkball, in one location or the other.*

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Figure 11

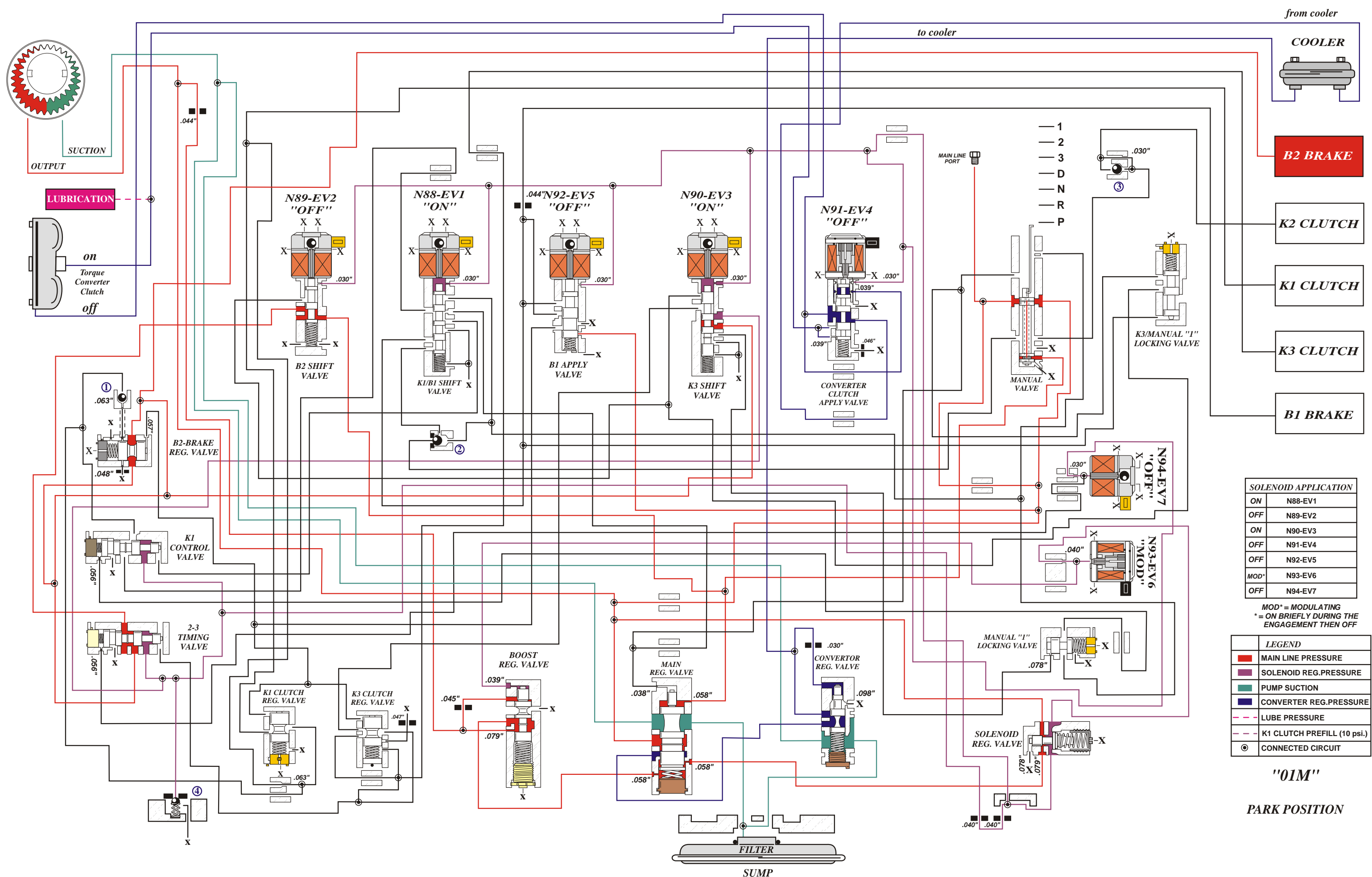


CASE PASSAGES FOR AIRCHECKS



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Figure 12



SOLENOID APPLICATION

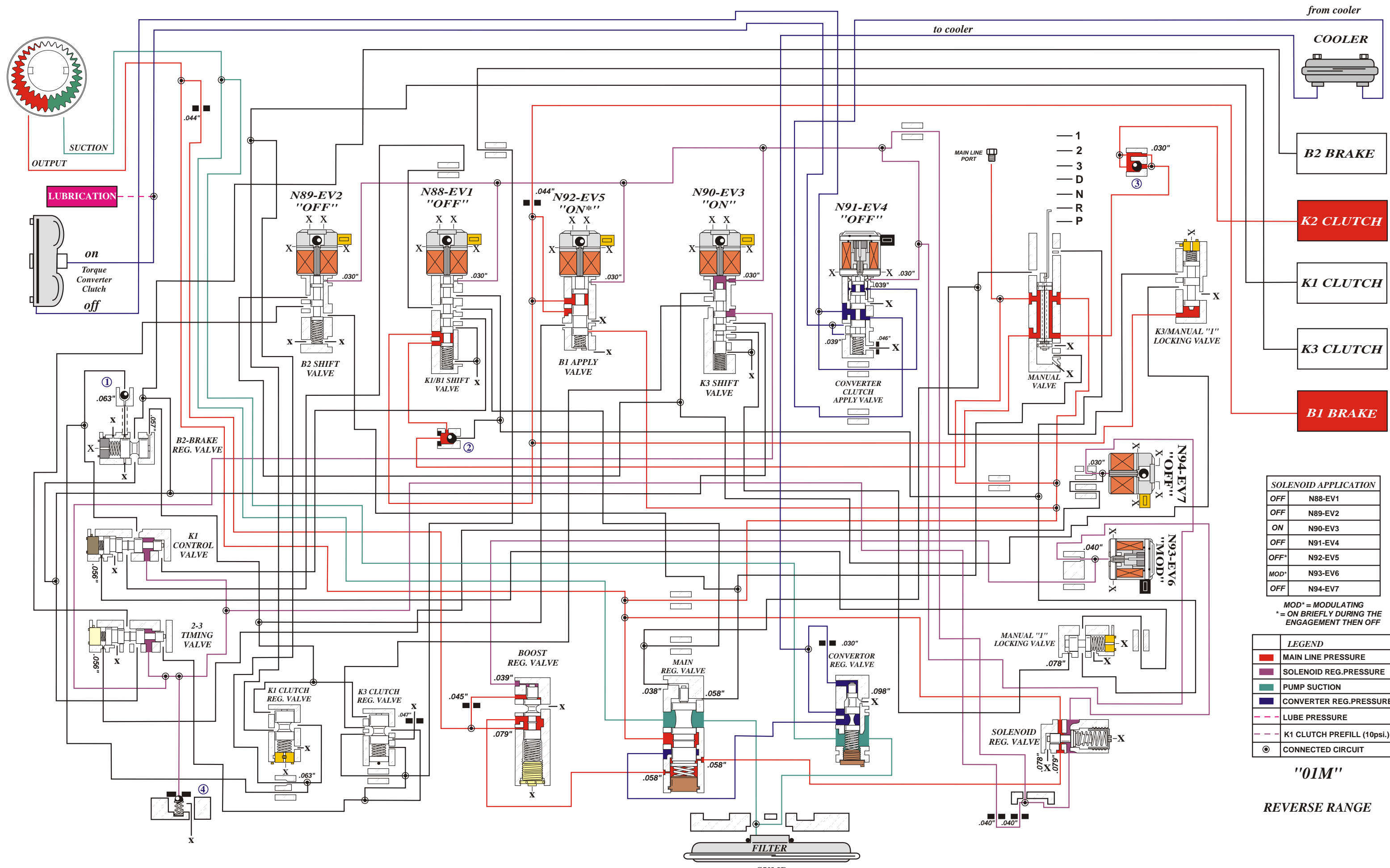
ON	N88-EV1
OFF	N89-EV2
ON	N90-EV3
OFF	N91-EV4
OFF	N92-EV5
MOD*	N93-EV6
OFF	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND

█	MAIN LINE PRESSURE
█	SOLENOID REG. PRESSURE
█	PUMP SUCTION
█	CONVERTER REG. PRESSURE
█	LUBE PRESSURE
---	K1 CLUTCH PREFILL (10 psi.)
⊙	CONNECTED CIRCUIT

"01M"
PARK POSITION



SOLENOID APPLICATION

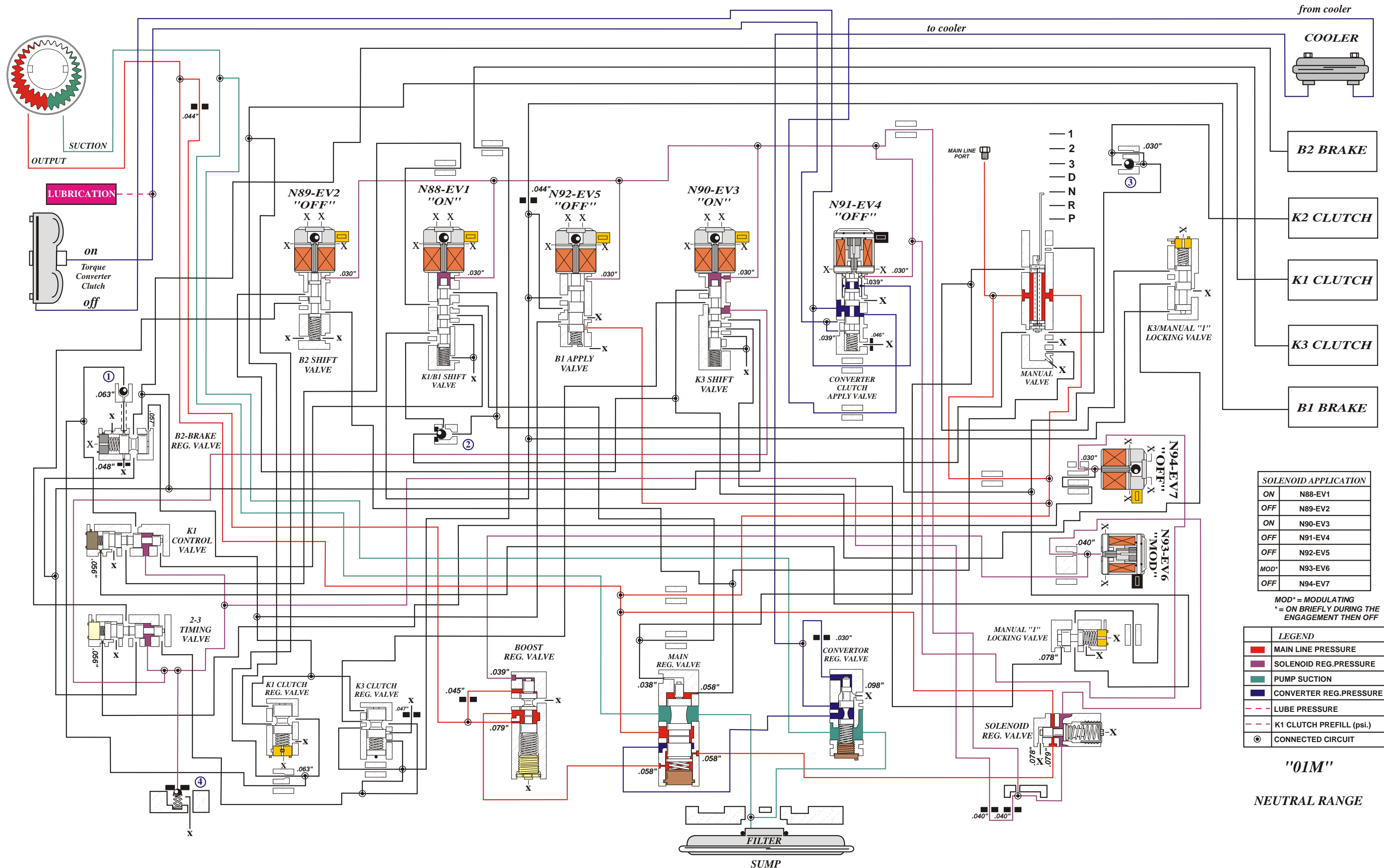
OFF	N88-EV1
OFF	N89-EV2
ON	N90-EV3
OFF	N91-EV4
OFF*	N92-EV5
MOD*	N93-EV6
OFF	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND

■	MAIN LINE PRESSURE
■	SOLENOID REG.PRESSURE
■	PUMP SUCTION
■	CONVERTER REG.PRESSURE
---	LUBE PRESSURE
---	K1 CLUTCH PREFILL (10psi.)
⊙	CONNECTED CIRCUIT

"01M"
 REVERSE RANGE



SOLENOID APPLICATION

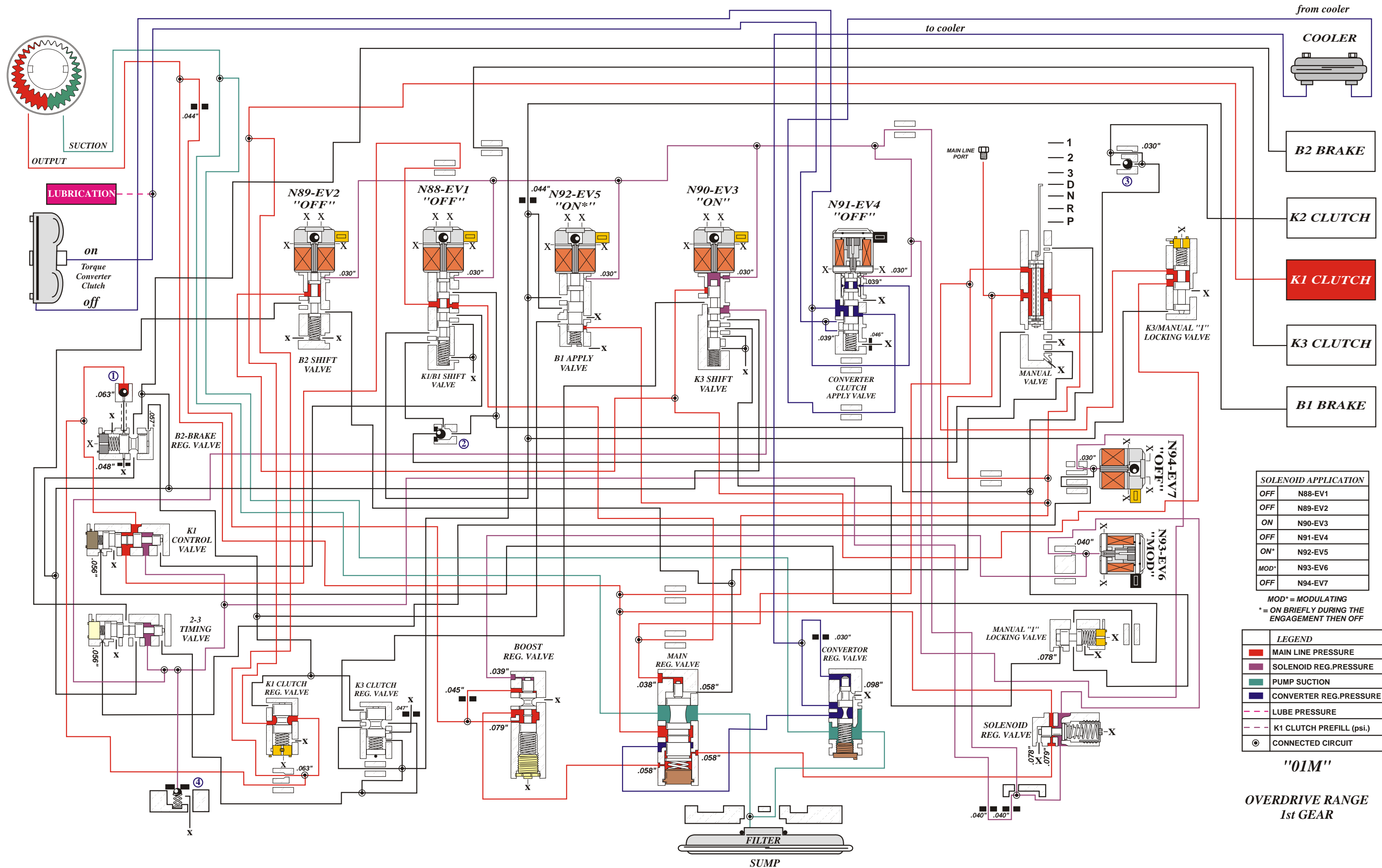
ON	N88-EV1
OFF	N89-EV2
ON	N90-EV3
OFF	N91-EV4
OFF	N92-EV5
MOD*	N93-EV6
OFF	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND

█	MAIN LINE PRESSURE
█	SOLENOID REG. PRESSURE
█	PUMP SUCTION
█	CONVERTER REG. PRESSURE
---	LUBE PRESSURE
---	K1 CLUTCH PREFILL (psi.)
⊙	CONNECTED CIRCUIT

"01M"
 NEUTRAL RANGE

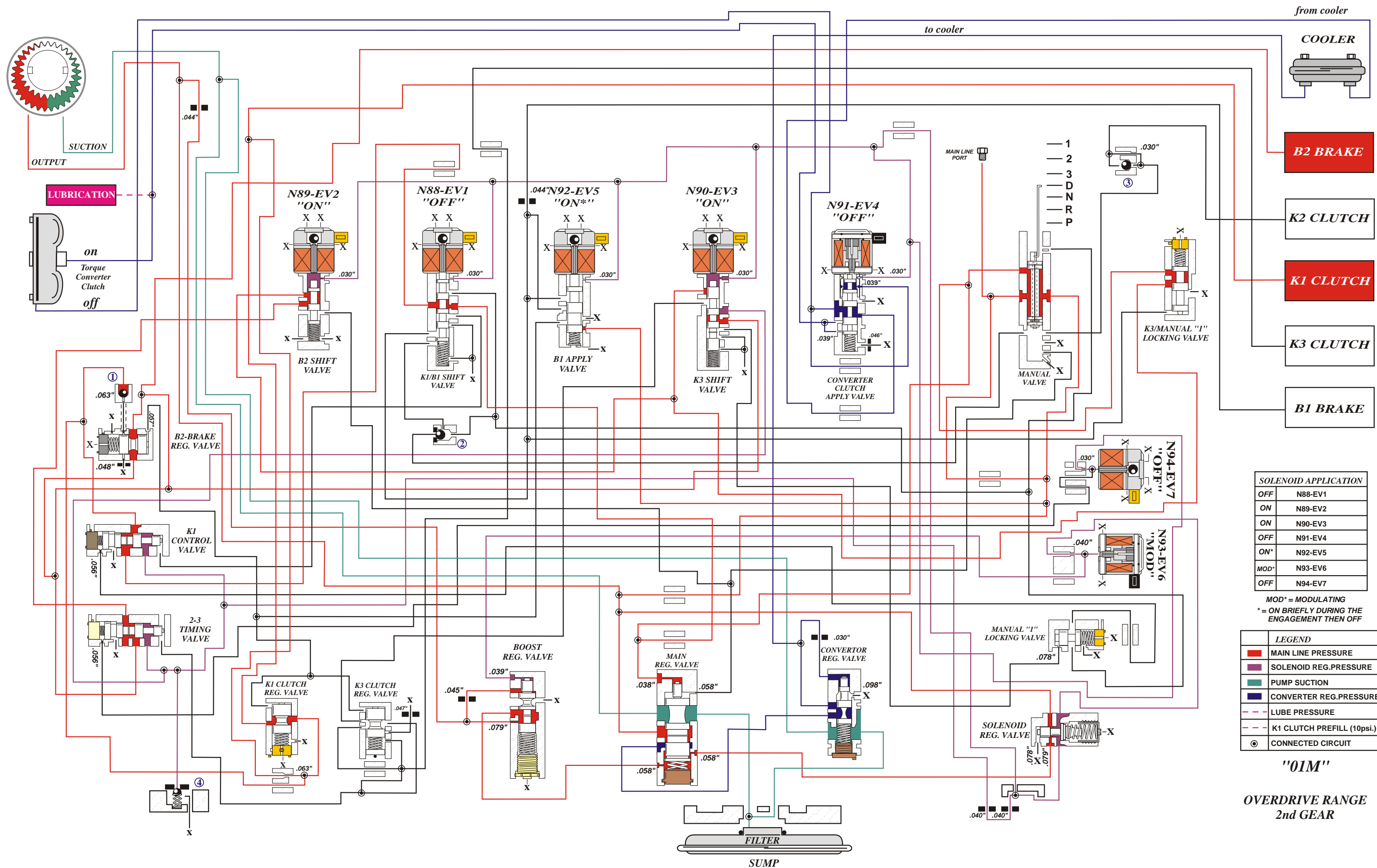


SOLENOID APPLICATION	
OFF	N88-EV1
OFF	N89-EV2
ON	N90-EV3
OFF	N91-EV4
ON*	N92-EV5
MOD*	N93-EV6
OFF	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND	
█	MAIN LINE PRESSURE
█	SOLENOID REG. PRESSURE
█	PUMP SUCTION
█	CONVERTOR REG. PRESSURE
---	LUBE PRESSURE
---	K1 CLUTCH PREFILL (psi.)
⊙	CONNECTED CIRCUIT

"01M"
 OVERDRIVE RANGE
 1st GEAR

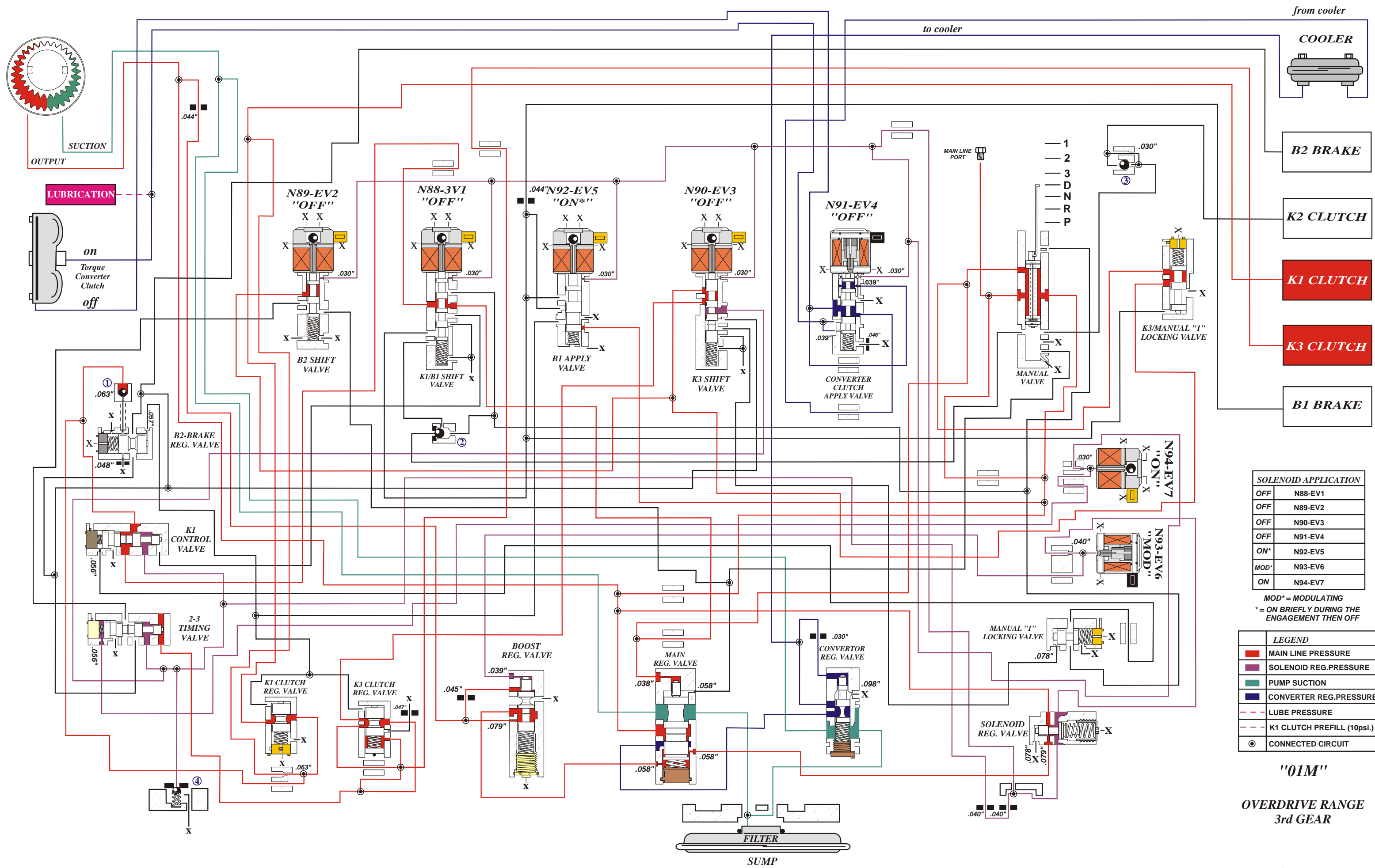


SOLENOID APPLICATION	
OFF	N88-EV1
ON	N89-EV2
ON	N90-EV3
OFF	N91-EV4
ON*	N92-EV5
MOD*	N93-EV6
OFF	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND	
█	MAIN LINE PRESSURE
█	SOLENOID REG. PRESSURE
█	PUMP SUCTION
█	CONVERTOR REG. PRESSURE
█	LUBE PRESSURE
- - -	K1 CLUTCH PREFILL (10psi.)
⊙	CONNECTED CIRCUIT

"01M"
 OVERDRIVE RANGE
 2nd GEAR

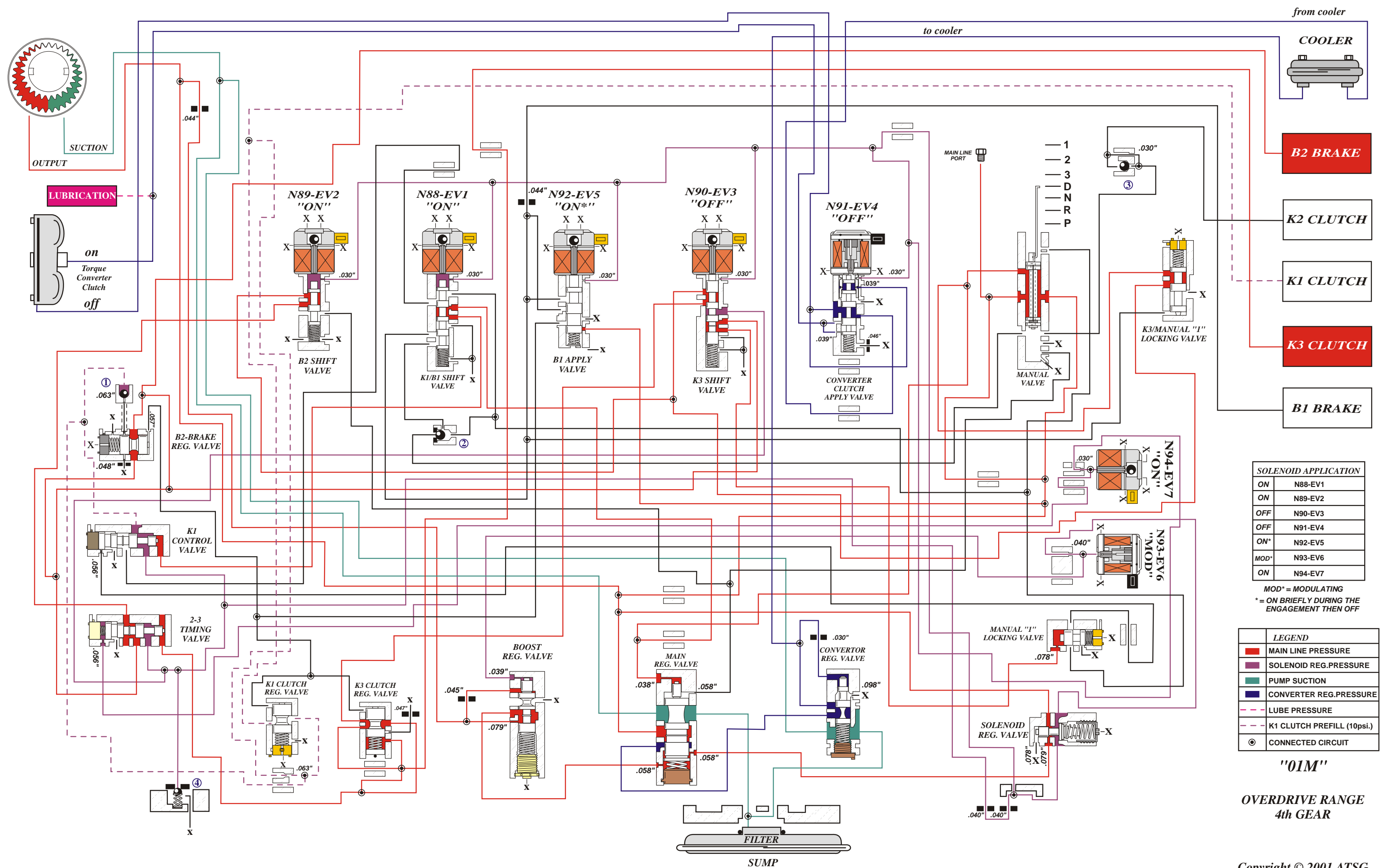


SOLENOID APPLICATION	
OFF	N88-EV1
OFF	N89-EV2
OFF	N90-EV3
OFF	N91-EV4
ON*	N92-EV5
MOD*	N93-EV6
ON	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND	
█	MAIN LINE PRESSURE
█	SOLENOID REG. PRESSURE
█	PUMP SUCTION
█	CONVERTER REG. PRESSURE
█	LUBE PRESSURE
- - -	K1 CLUTCH PREFILL (10psi.)
⊙	CONNECTED CIRCUIT

"01M"
OVERDRIVE RANGE
3rd GEAR

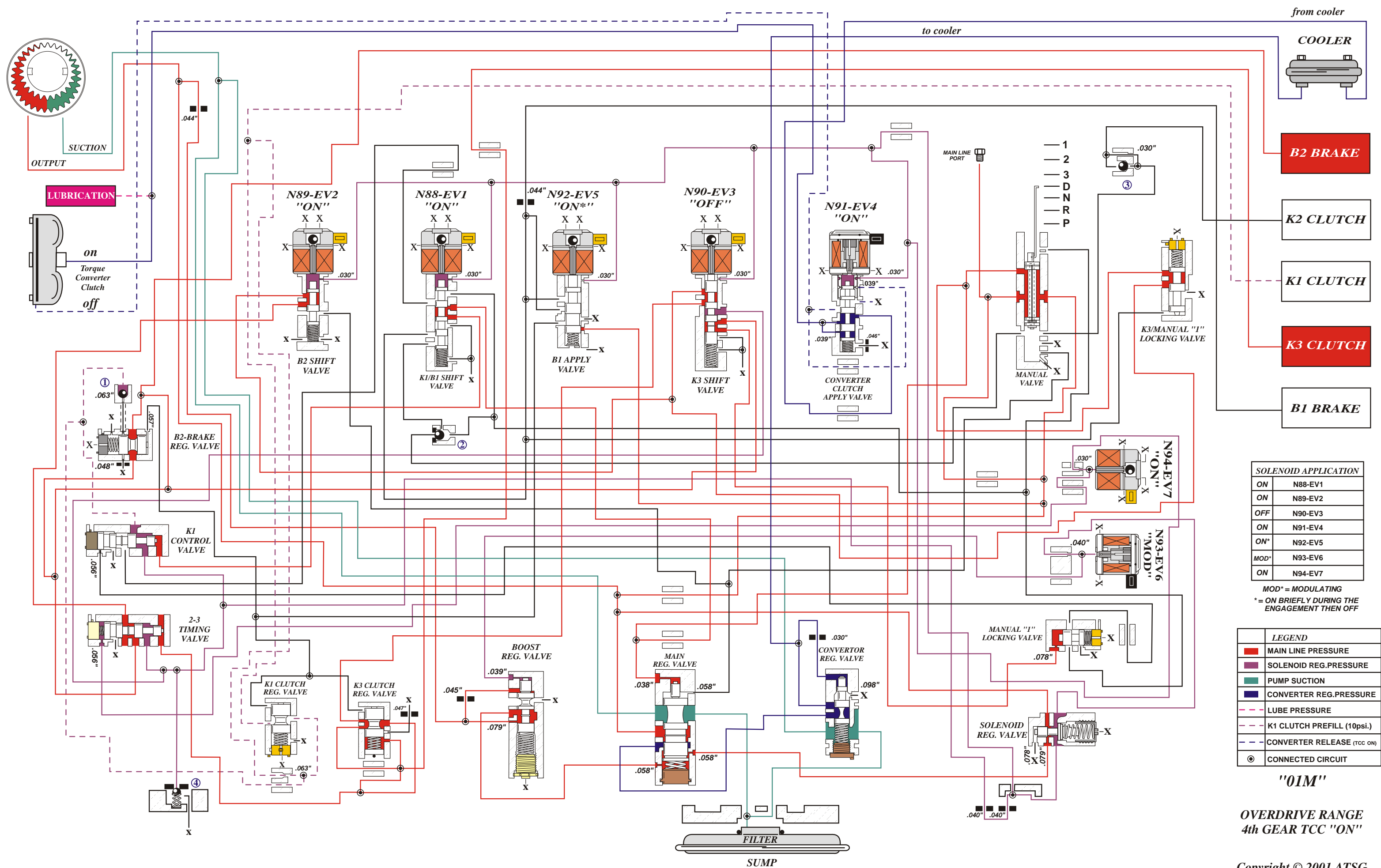


SOLENOID APPLICATION	
ON	N88-EV1
ON	N89-EV2
OFF	N90-EV3
OFF	N91-EV4
ON*	N92-EV5
MOD*	N93-EV6
ON	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND	
█	MAIN LINE PRESSURE
█	SOLENOID REG.PRESSURE
█	PUMP SUCTION
█	CONVERTER REG.PRESSURE
---	LUBE PRESSURE
---	K1 CLUTCH PREFILL (10psi.)
⊙	CONNECTED CIRCUIT

"01M"
 OVERDRIVE RANGE
 4th GEAR

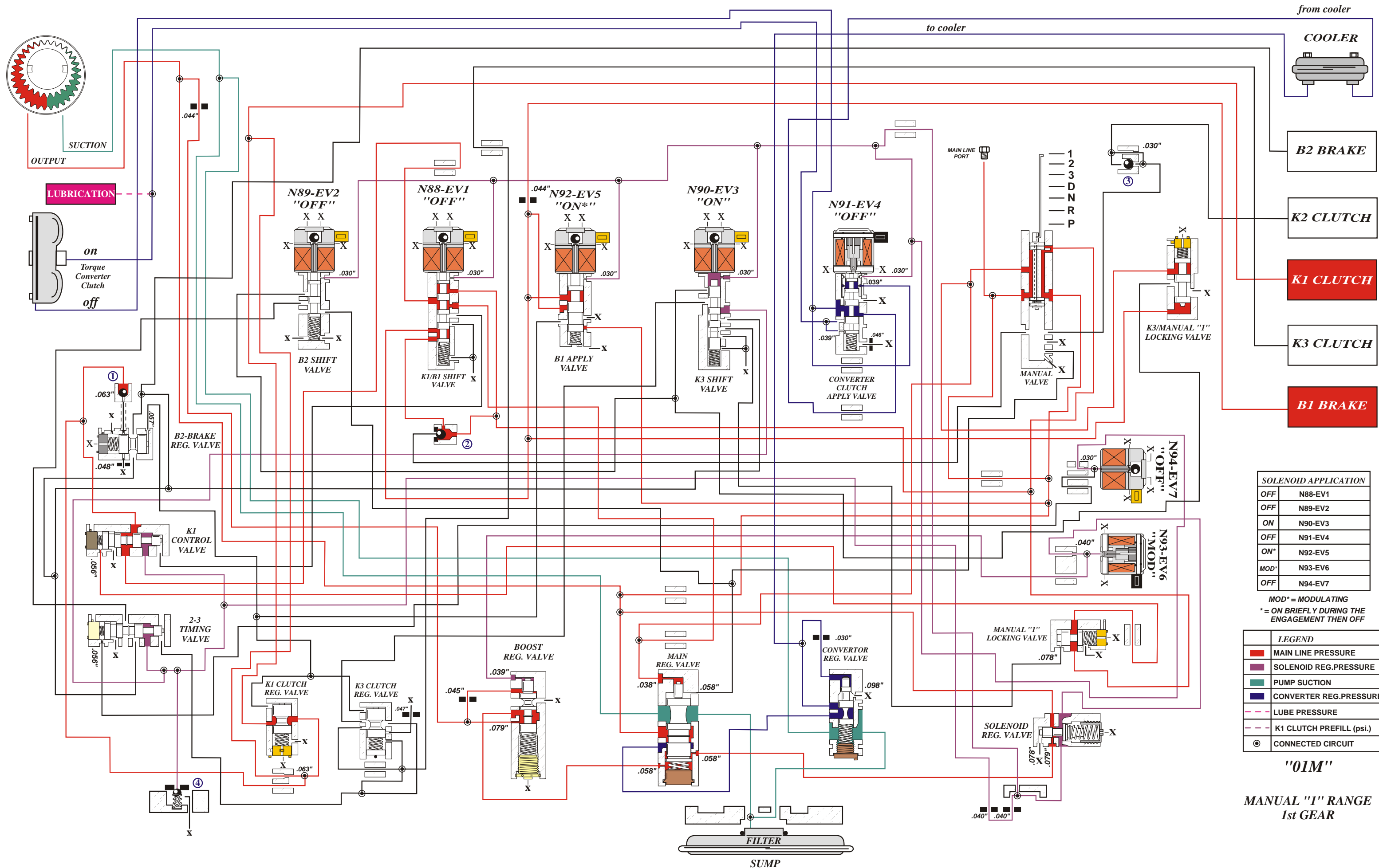


SOLENOID APPLICATION	
ON	N88-EV1
ON	N89-EV2
OFF	N90-EV3
ON	N91-EV4
ON*	N92-EV5
MOD*	N93-EV6
ON	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND	
█	MAIN LINE PRESSURE
█	SOLENOID REG.PRESSURE
█	PUMP SUCTION
█	CONVERTER REG.PRESSURE
█	LUBE PRESSURE
- - -	K1 CLUTCH PREFILL (10psi.)
- - -	CONVERTER RELEASE (TCC ON)
⊙	CONNECTED CIRCUIT

"01M"
 OVERDRIVE RANGE
 4th GEAR TCC "ON"



SOLENOID APPLICATION

OFF	N88-EV1
OFF	N89-EV2
ON	N90-EV3
OFF	N91-EV4
ON*	N92-EV5
MOD*	N93-EV6
OFF	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND

■	MAIN LINE PRESSURE
■	SOLENOID REG.PRESSURE
■	PUMP SUCTION
■	CONVERTER REG.PRESSURE
---	LUBE PRESSURE
---	K1 CLUTCH PREFILL (psi.)
⊙	CONNECTED CIRCUIT

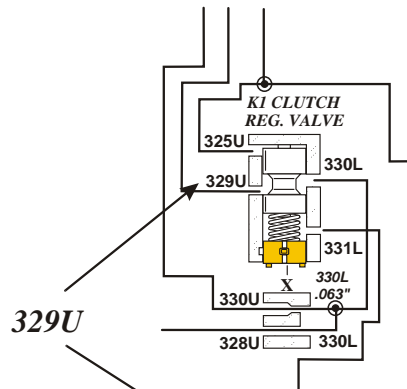
"01M"
MANUAL "I" RANGE
1st GEAR



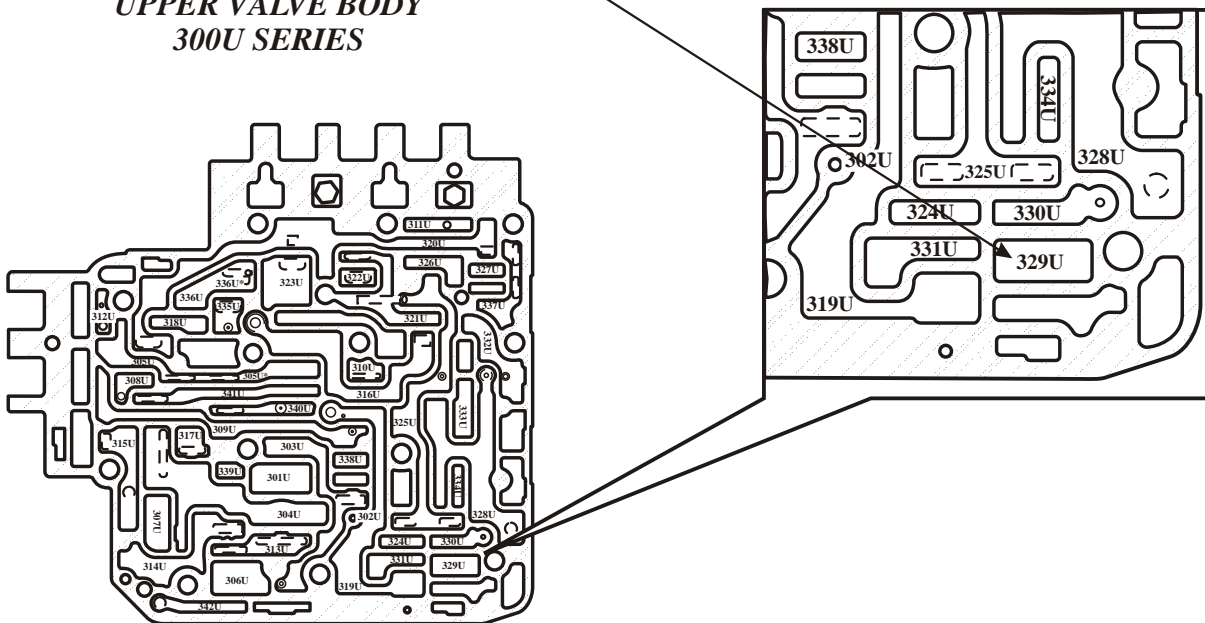
Technical Service Information

VALVE BODY MAPPING

PARTIAL HYDRAULIC SCHEMATIC FOR KI CLUTCH REGULATOR VALVE



UPPER VALVE BODY 300U SERIES



HOW TO USE THIS MANUAL:

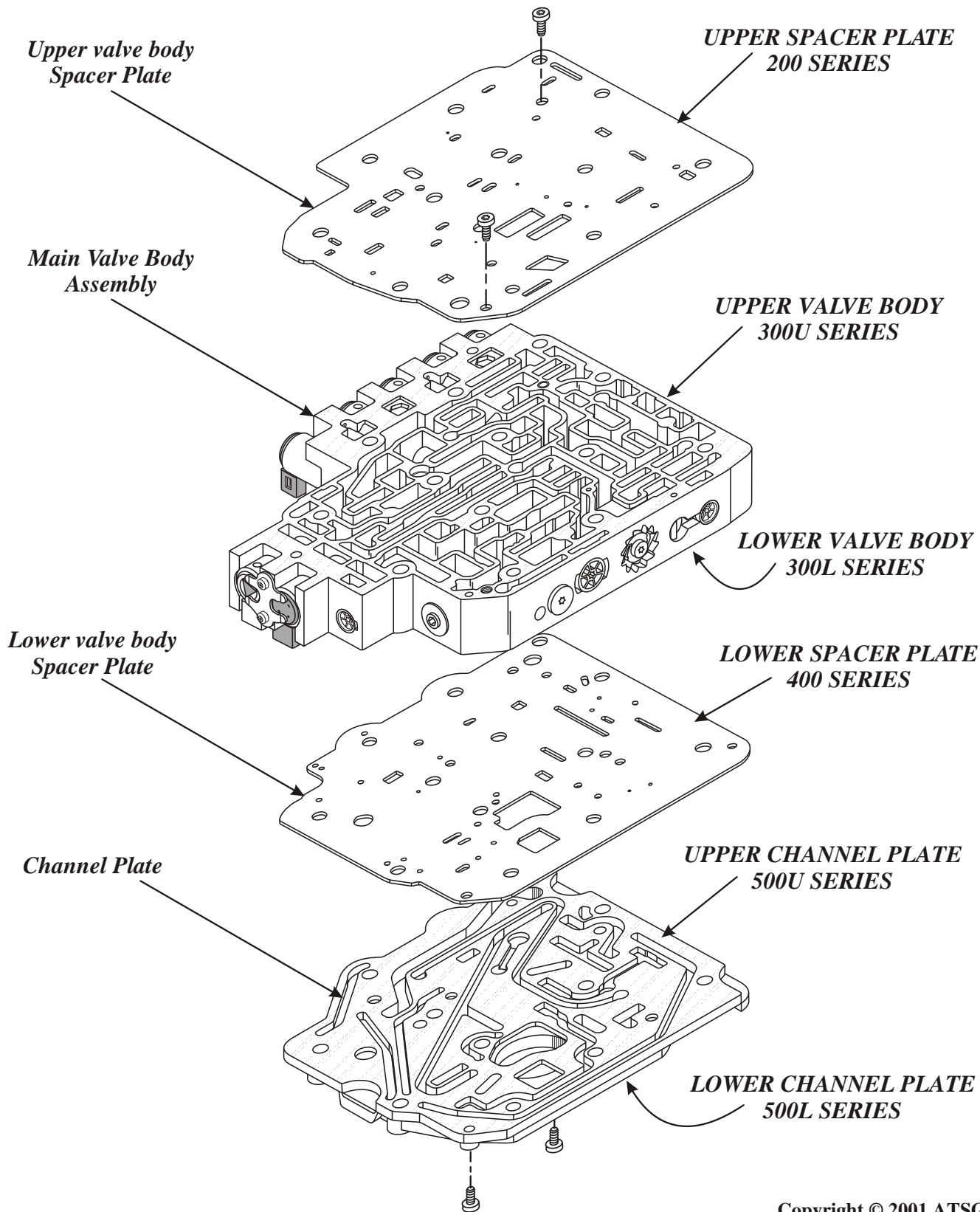
All castings and spacer plates have been numbered so they can be identified in an oil circuit diagram. **Example:** 329U passage is located in the Upper valve body (300U series). This passage can now be located in the partial oil circuit diagram shown above. Spacer plate orifice sizes and locations are also identified in the oil circuit diagram labeled Valve body Mapping.

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AUDI AND VOLKSWAGEN 01M VALVE BODY

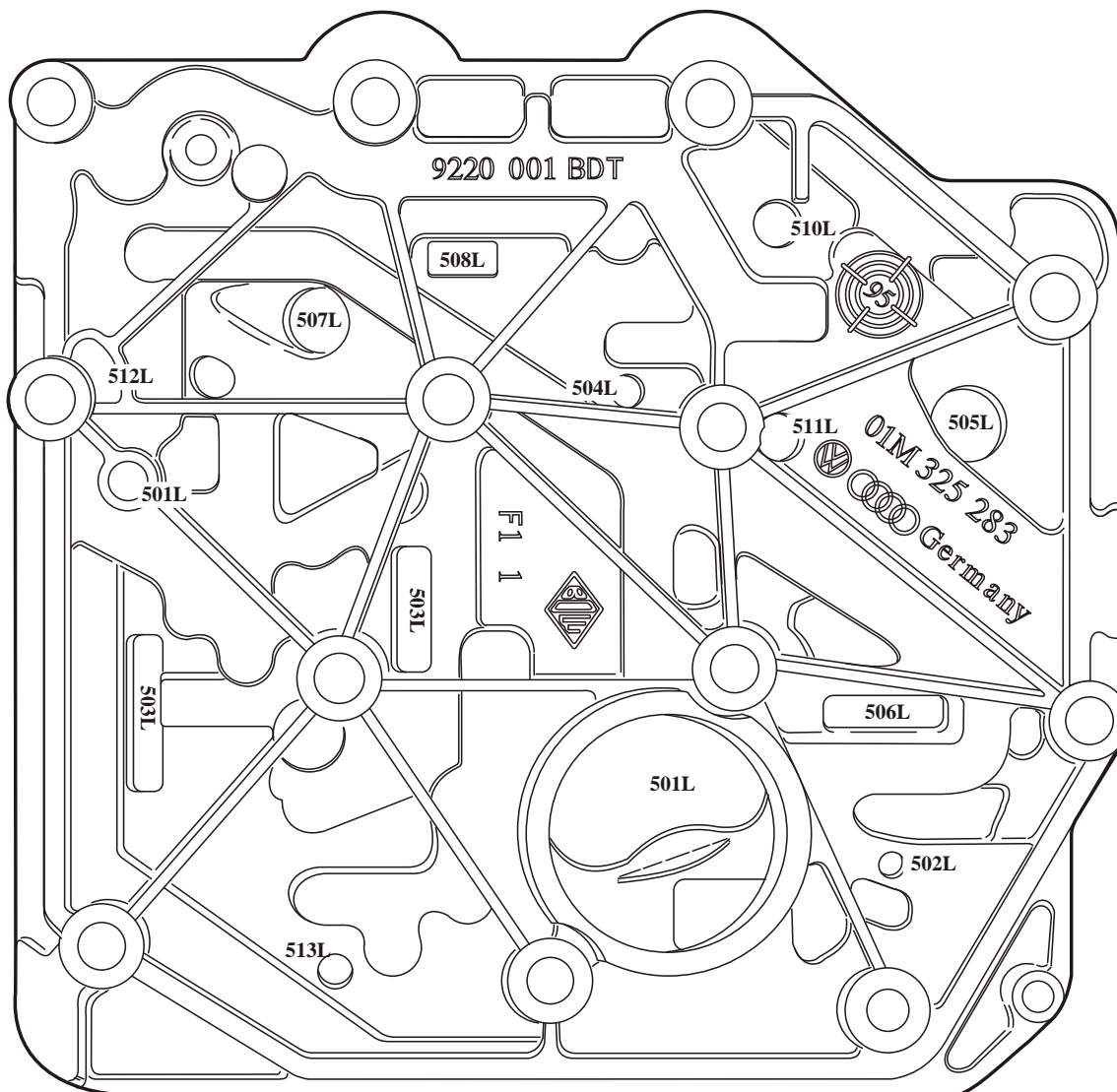
CASE PASSAGES - 100 SERIES



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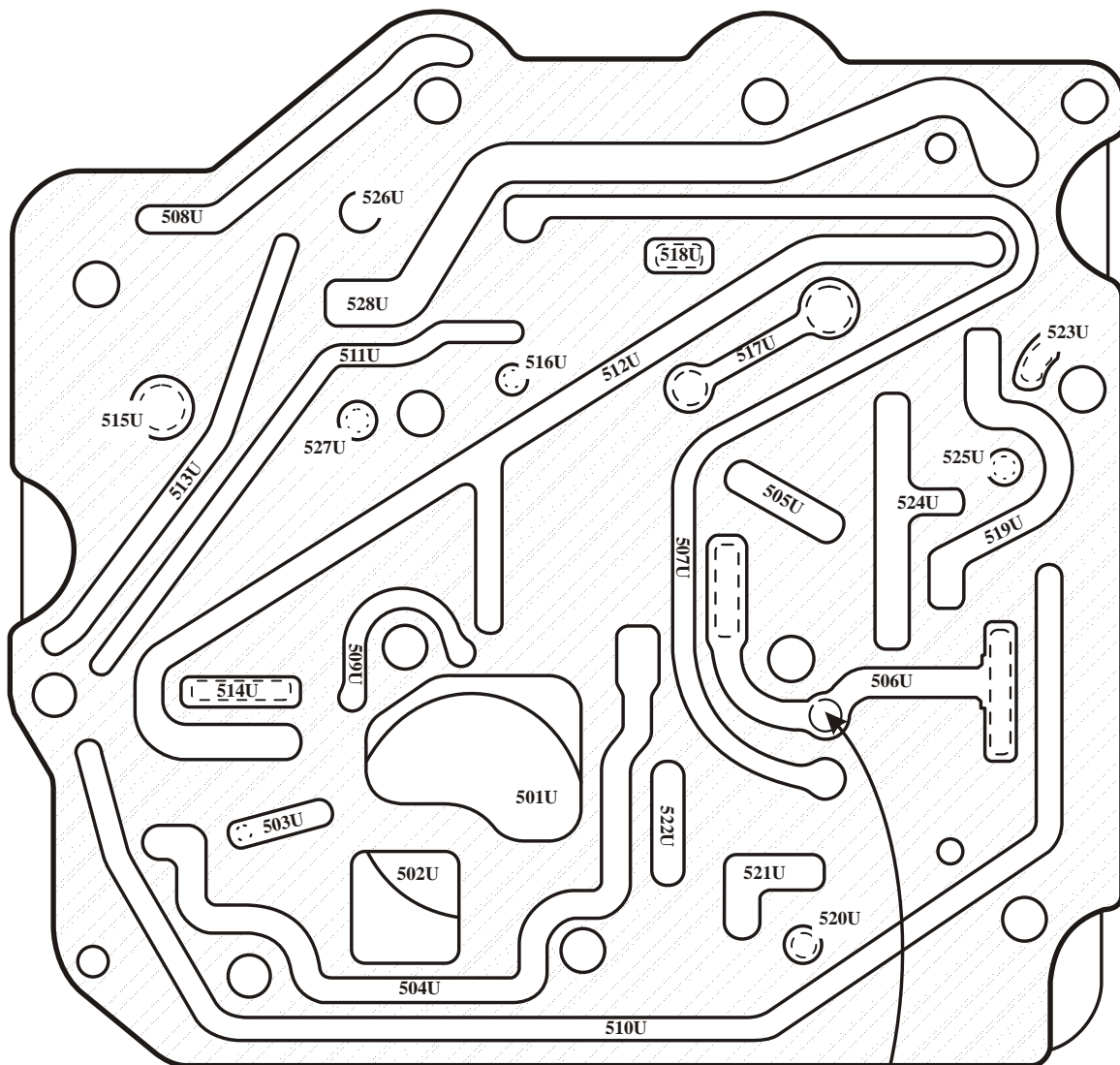
500L SERIES LOWER CHANNEL PLATE





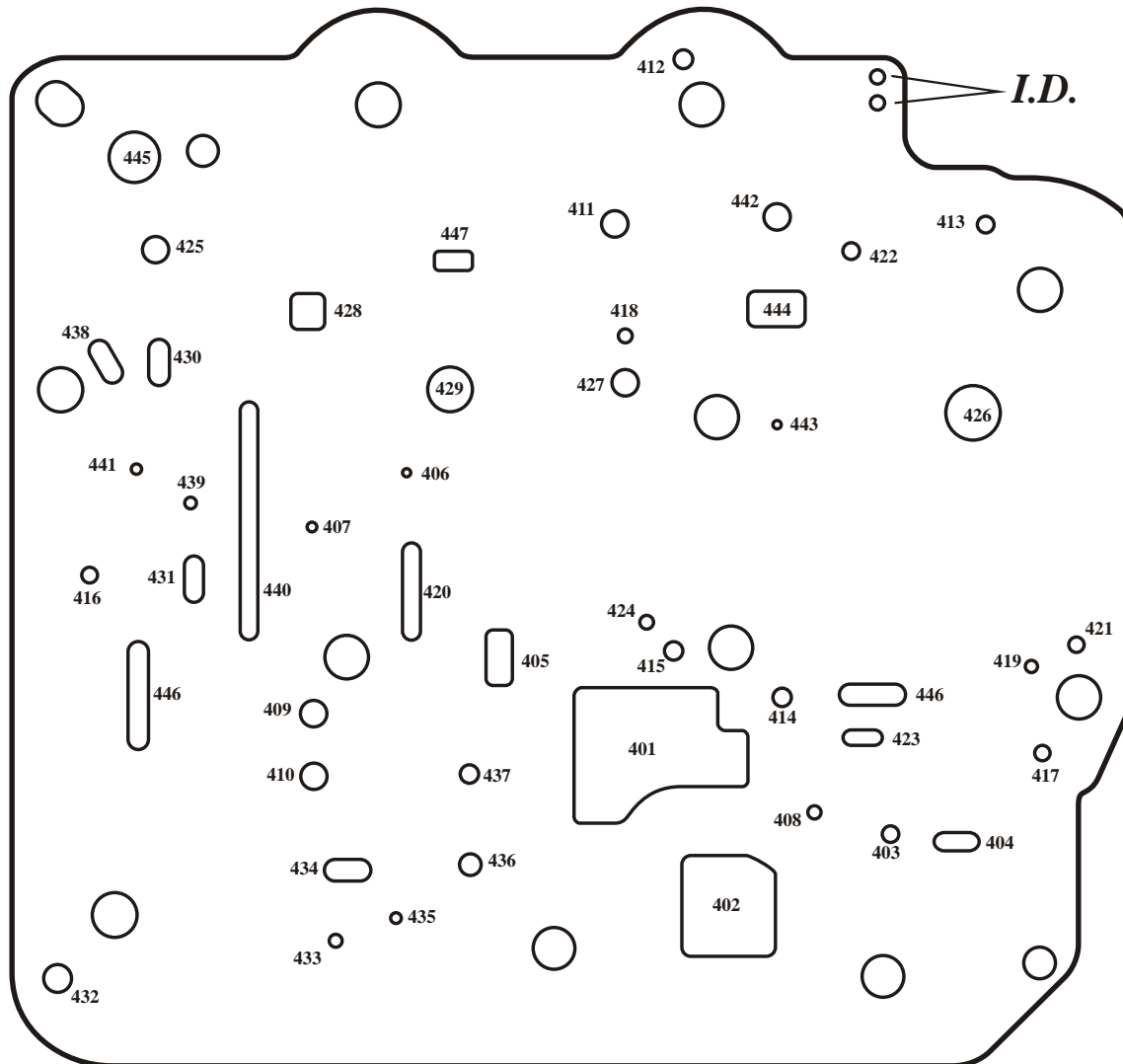
500U SERIES

UPPER CHANNEL PLATE



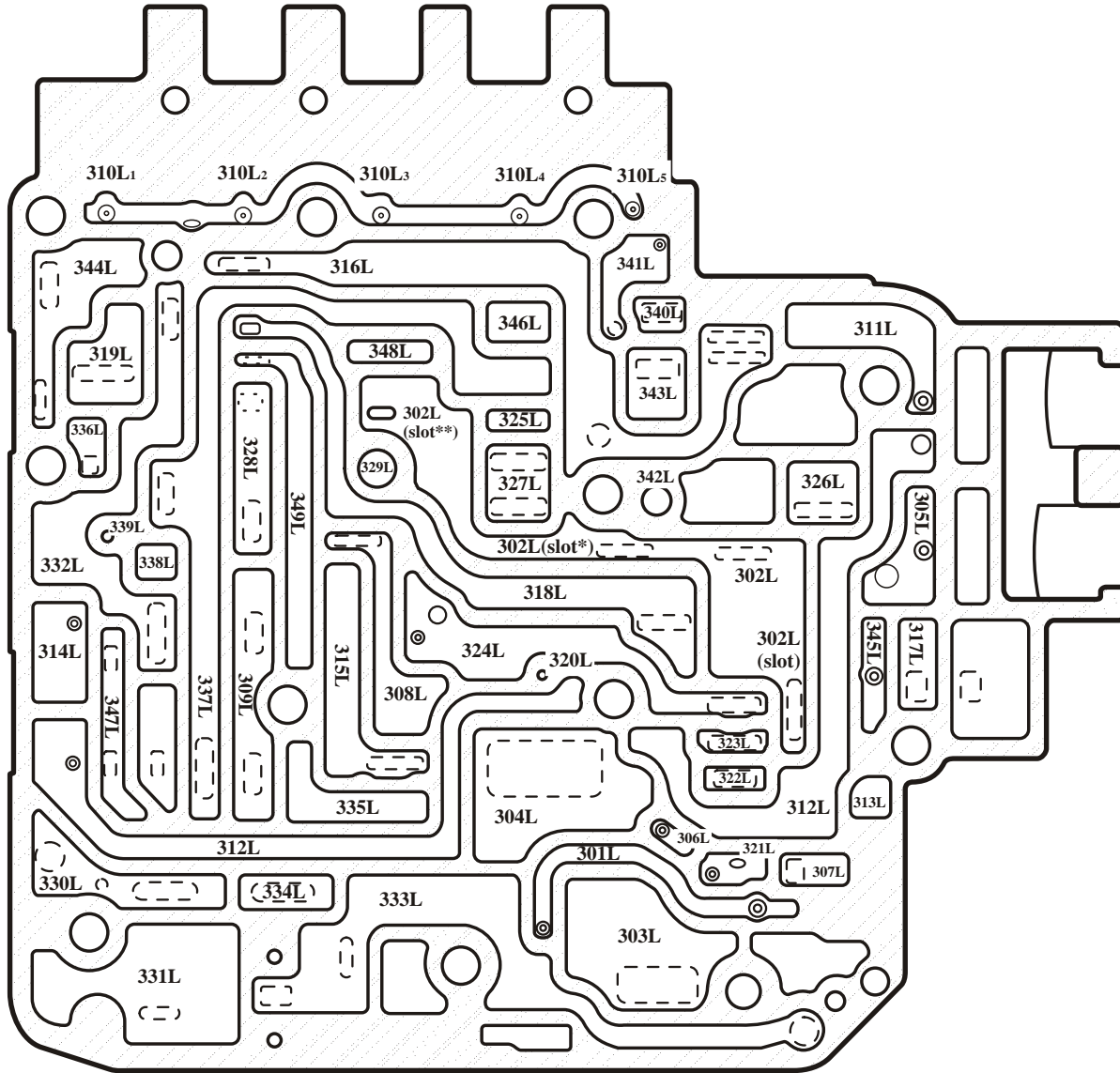


400 SERIES
LOWER SPACER PLATE



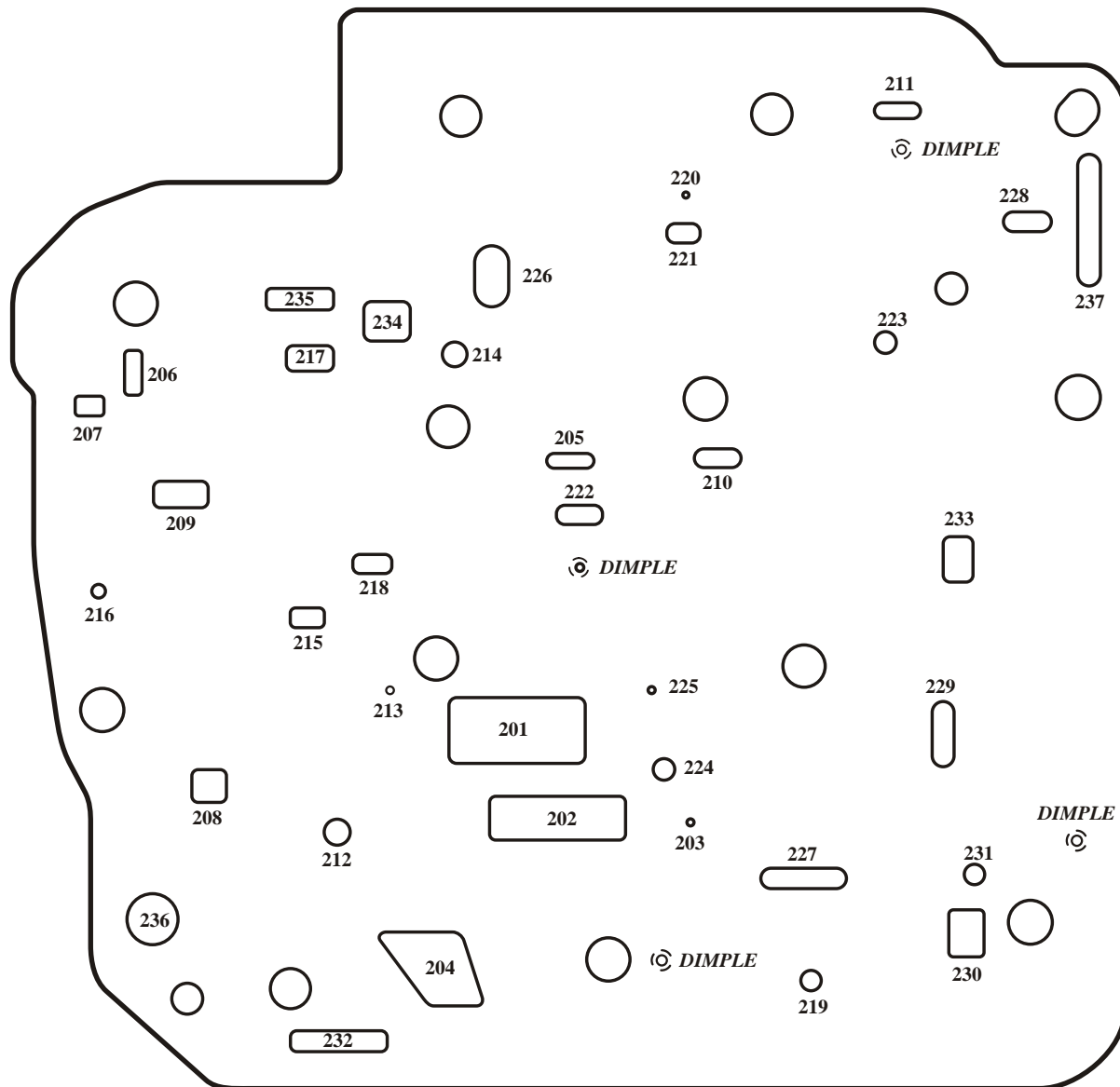


300L SERIES
LOWER VALVE BODY



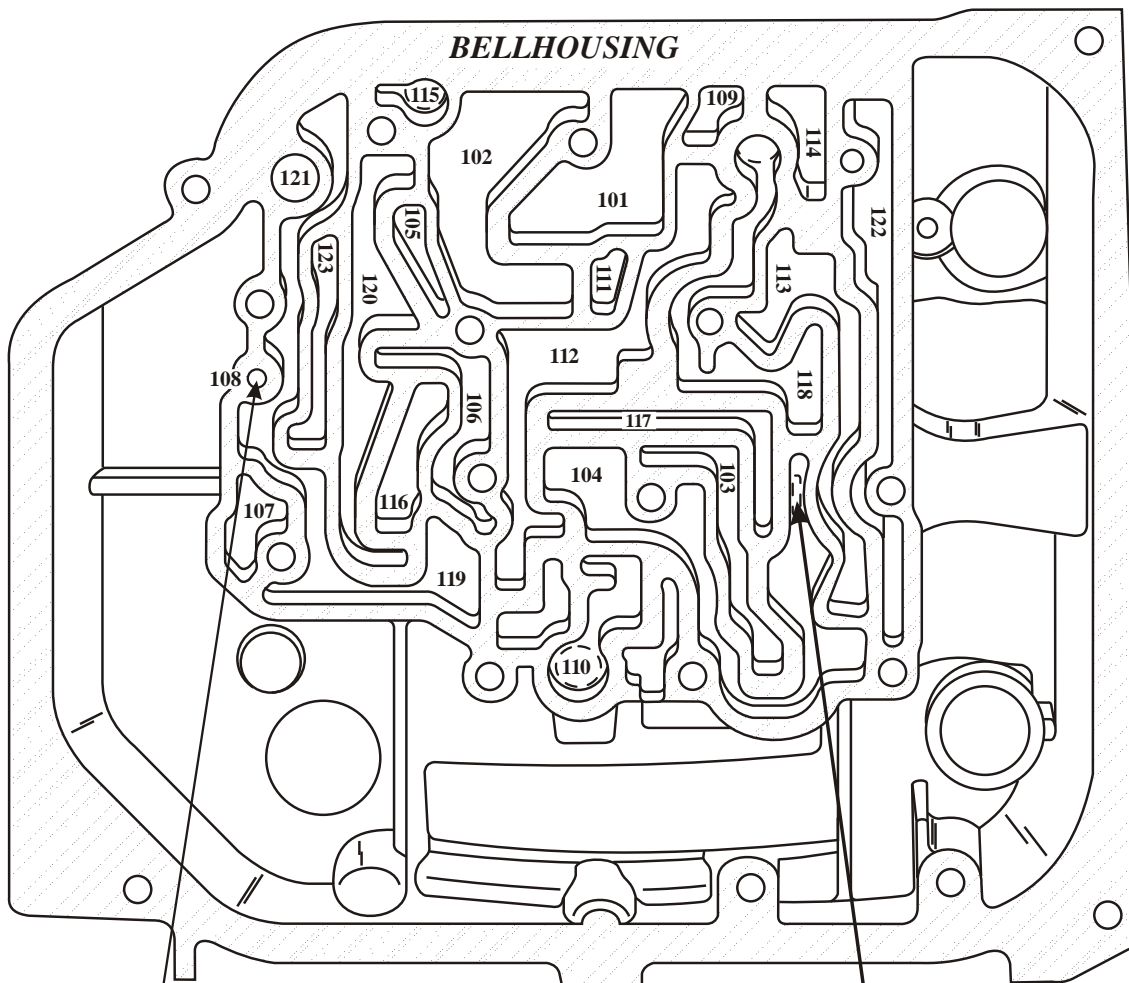


200 SERIES UPPER SPACER PLATE



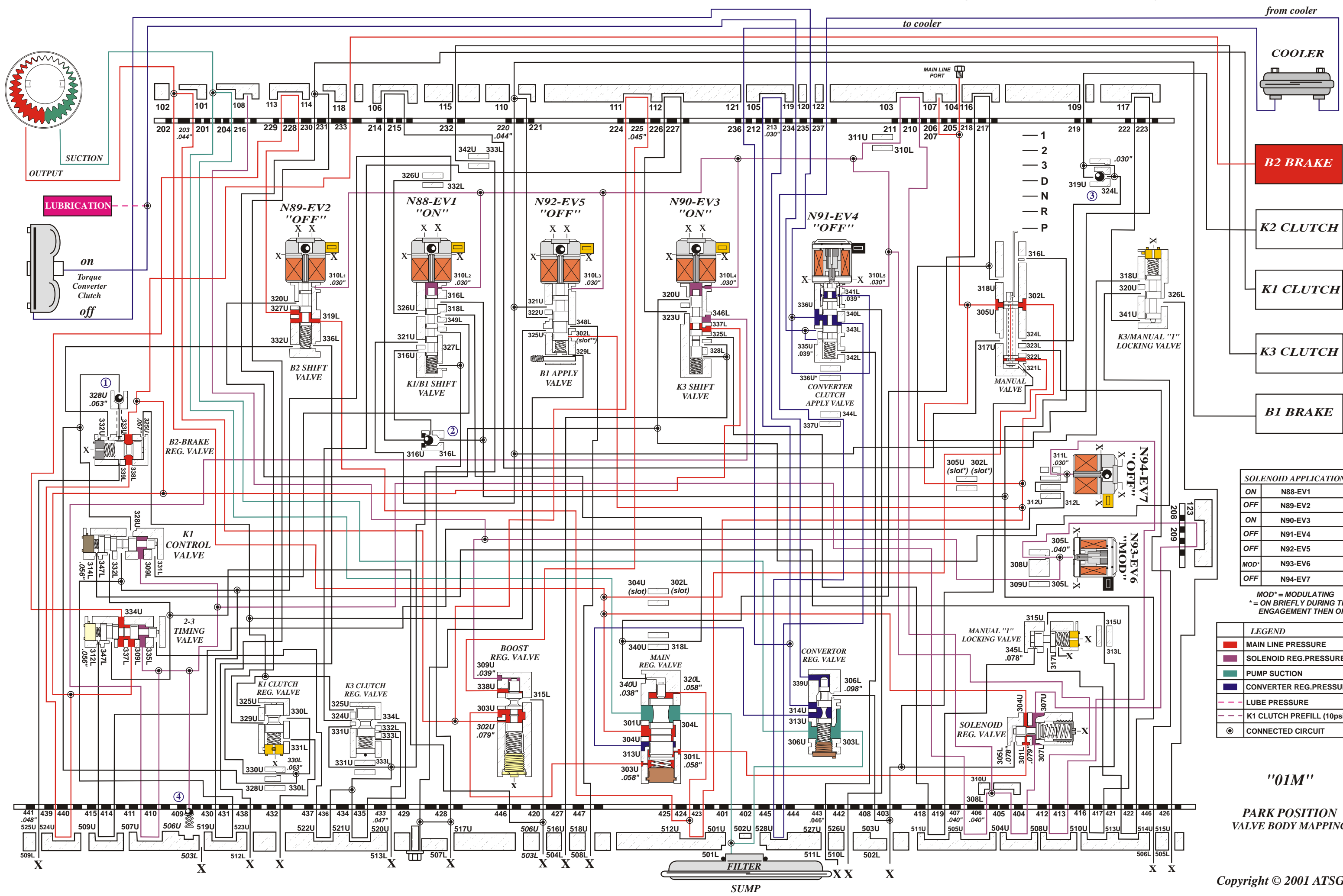


100 SERIES
CASE PASSAGES



**PASSAGE CLOSED
(COULD BE A TEST
PORT FOR N93-EV6
FROM INSIDE THE PAN)**

**TO MAINLINE
PORT**



SOLENOID APPLICATION

ON	N88-EV1
OFF	N89-EV2
ON	N90-EV3
OFF	N91-EV4
OFF	N92-EV5
MOD*	N93-EV6
OFF	N94-EV7

MOD* = MODULATING
 * = ON BRIEFLY DURING THE ENGAGEMENT THEN OFF

LEGEND

—	MAIN LINE PRESSURE
—	SOLENOID REG.PRESSURE
—	PUMP SUCTION
—	CONVERTER REG.PRESSURE
—	LUBE PRESSURE
- - -	K1 CLUTCH PREFILL (10psi.)
⊙	CONNECTED CIRCUIT

"OIM"
 PARK POSITION
 VALVE BODY MAPPING



VOLKSWAGEN / AUDI UNCONTROLLABLE HARSH 1-2 UPSHIFT

COMPLAINT: Before or after overhaul, vehicles equipped with 01M, 01N and 01P transaxles, may exhibit a harsh 1-2 upshift along with firmer than normal engagements as well as firm upshifts to 3rd and 4th.

CAUSE: The cause may be,

1. Erratic or high line pressure.
2. An electrical malfunction in the EV5 solenoid electrical circuit.
3. A Hydraulic malfunction with EV5 solenoid.

(NOTE: The EV5 solenoid is grounded on each engagement and each upshift and downshift which helps control Clutch apply Pressure for smooth engagements as shown in Figures 3 and 4.)

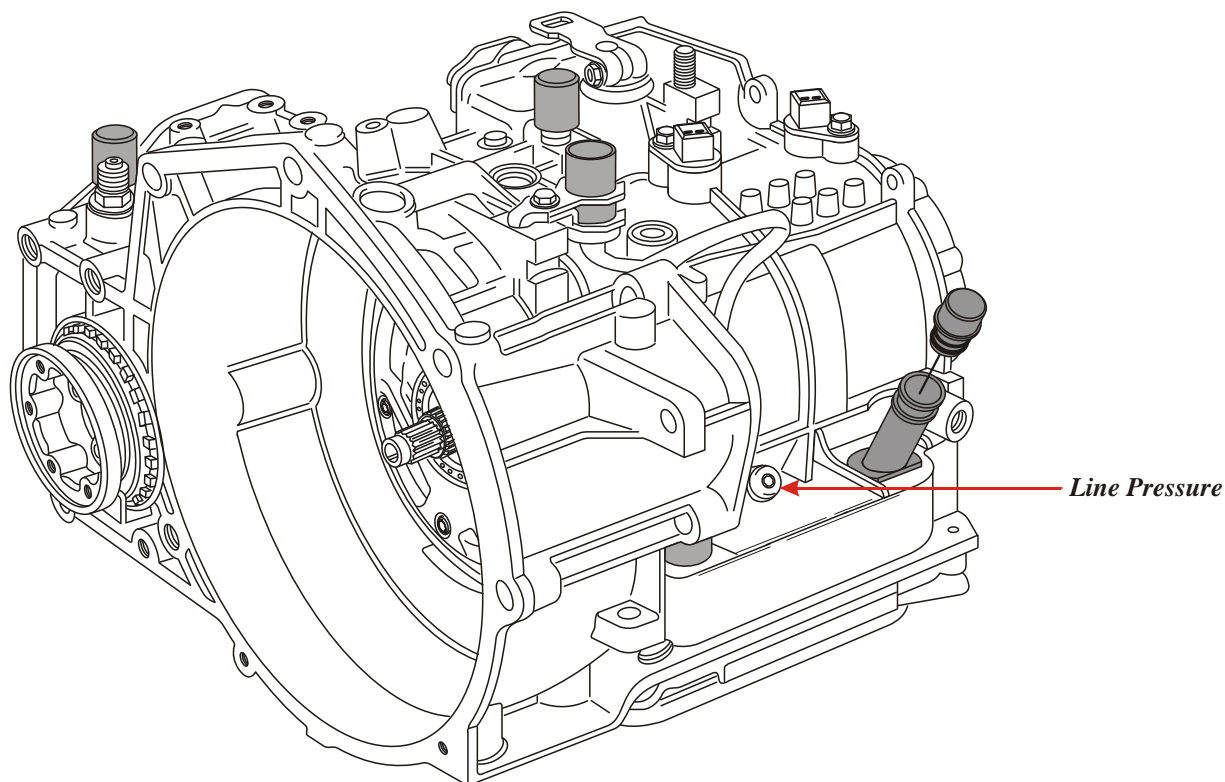
CORRECTION: To correct this condition:

1. Connect a pressure gage to the line pressure port as shown in Figure 1. Line pressure should indicate 60 psi. in the Drive position at idle and should increase to 120-150 psi. at stall. Line pressure should cut back to between 65-75 psi. on each shift. If Line pressure does not cut back on each shift, or is at 120-150 psi. at all times, or is erratic on the gage, replace the EV6 solenoid and check the Boost Regulator and Main Regulator valve to ensure they are not stuck. Refer to Figure 2 for a description of how EV6 Solenoid operates.
2. Refer to Figure 5 and locate terminal 7 at harness connector. Back probe that terminal to verify that the computer is grounding EV5 during the 1-2 upshift. If the computer is not grounding that terminal, go to STEP A. If the Computer is grounding that terminal go to STEP B.

STEP A. Connect a scan tool to the diagnostic connector and check to see if the TCM has set a trouble code 00266 (VAG) or a P0773 which are EV5 solenoid circuit faults. Repair the EV5 Solenoid circuit as needed. If the TCM has no trouble codes set and does not ground EV5 Solenoid during the 1-2 shift, the TCM may be faulty.

STEP B. Go to Correction number 3.

3. Remove EV5 Solenoid from its bore. Ensure that the B1 Apply valve, which is located below the solenoid, is not sticking in it's bore. Air check EV5 solenoid and ensure it's proper operation as shown in Figure 6. If EV5 Solenoid does not close consistently replace as needed.

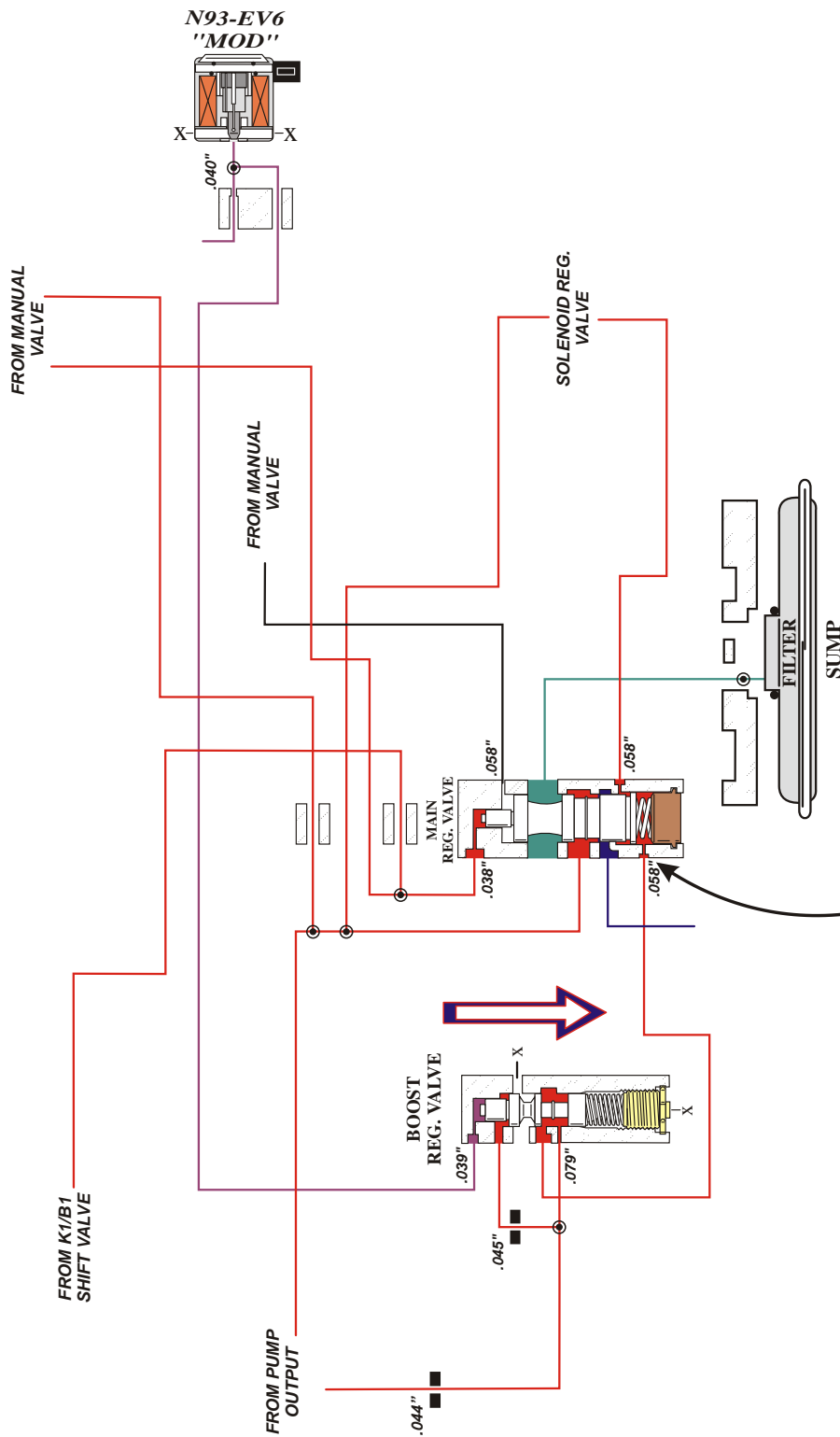
**LINE PRESSURE CHECK**

***LINE PRESSURE SHOULD INDICATE 60psi. AT IDLE IN DRIVE
LINE PRESSURE WILL INCREASE TO BETWEEN 120-150psi. AND
SHOULD CUT BACK TO 65-75 ON EACH SHIFT***

Figure 1



"01M" N93-EV6 OPERATION

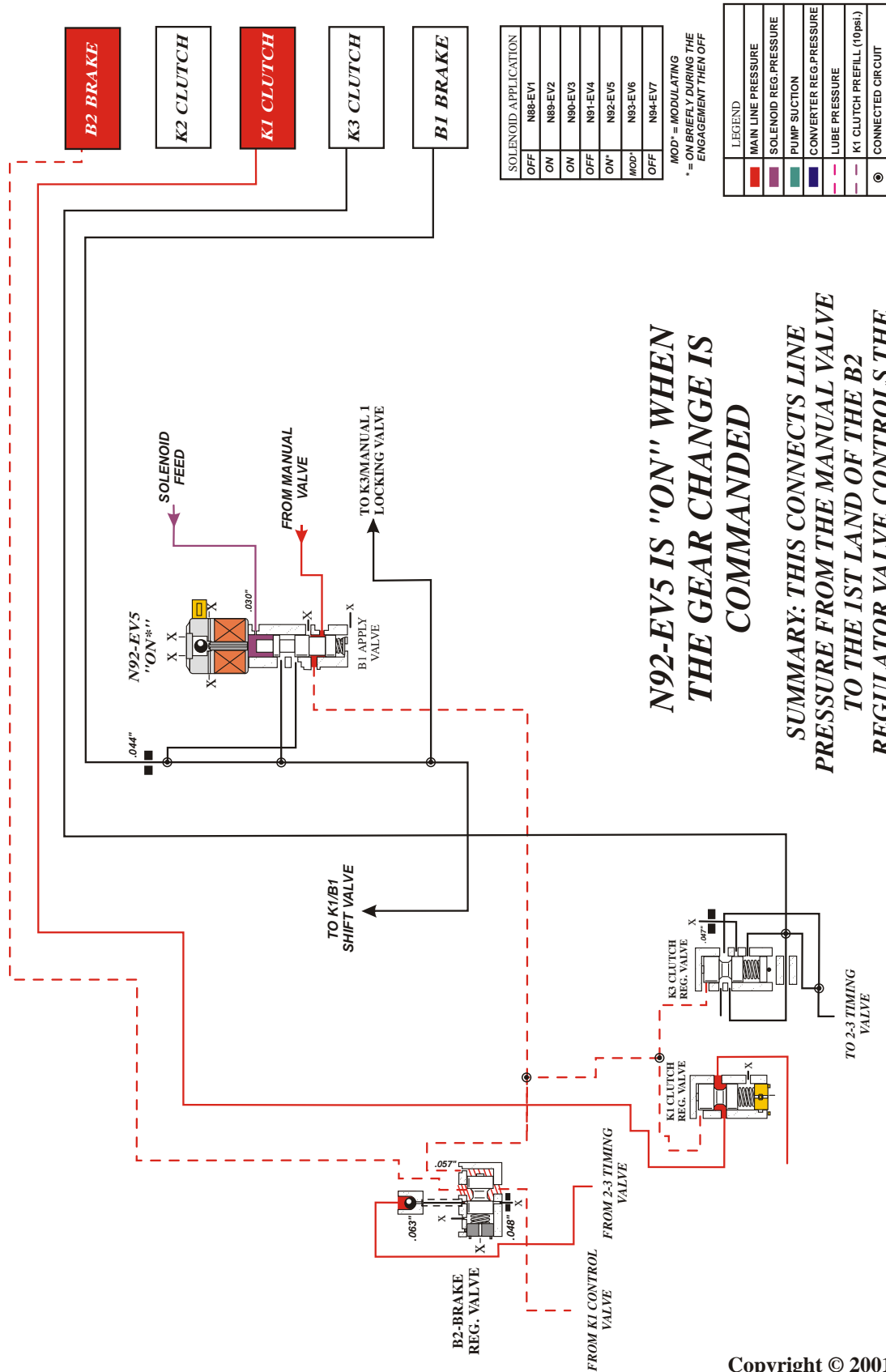


N93-EV6, WHEN MODULATING, STROKES THE BOOST REGULATOR VALVE AGAINST ITS SPRING, REDUCING THE AMOUNT OF BOOST PRESSURE ON THE SPRING SIDE OF THE MAIN REGULATOR VALVE.

Figure 2
 AUTOMATIC TRANSMISSION SERVICE GROUP



"01M" OVERDRIVE RANGE 1st to 2nd GEAR TRANSITION

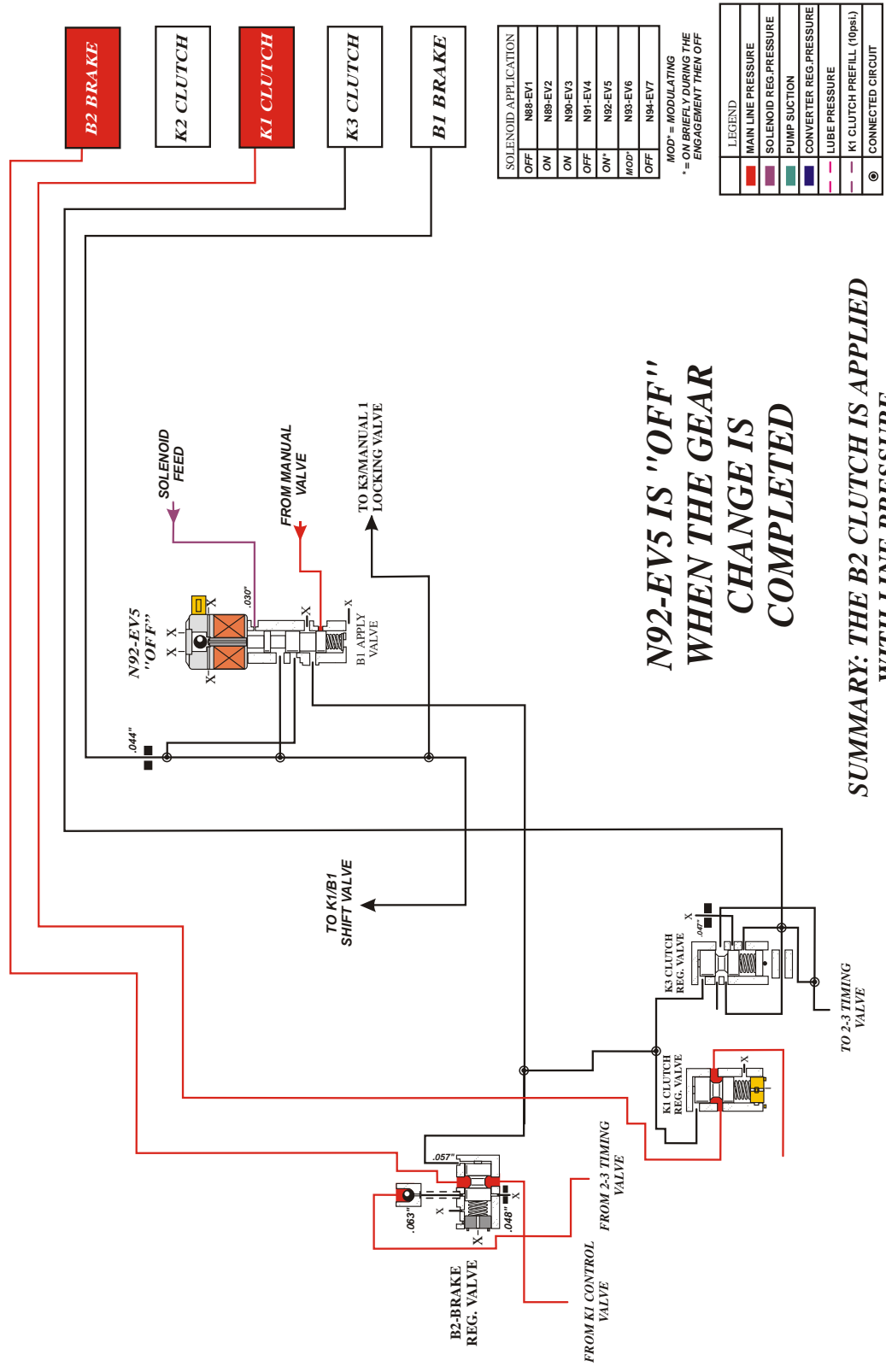


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Figure 3
 AUTOMATIC TRANSMISSION SERVICE GROUP



"01M" OVERDRIVE RANGE 2nd GEAR APPLICATION

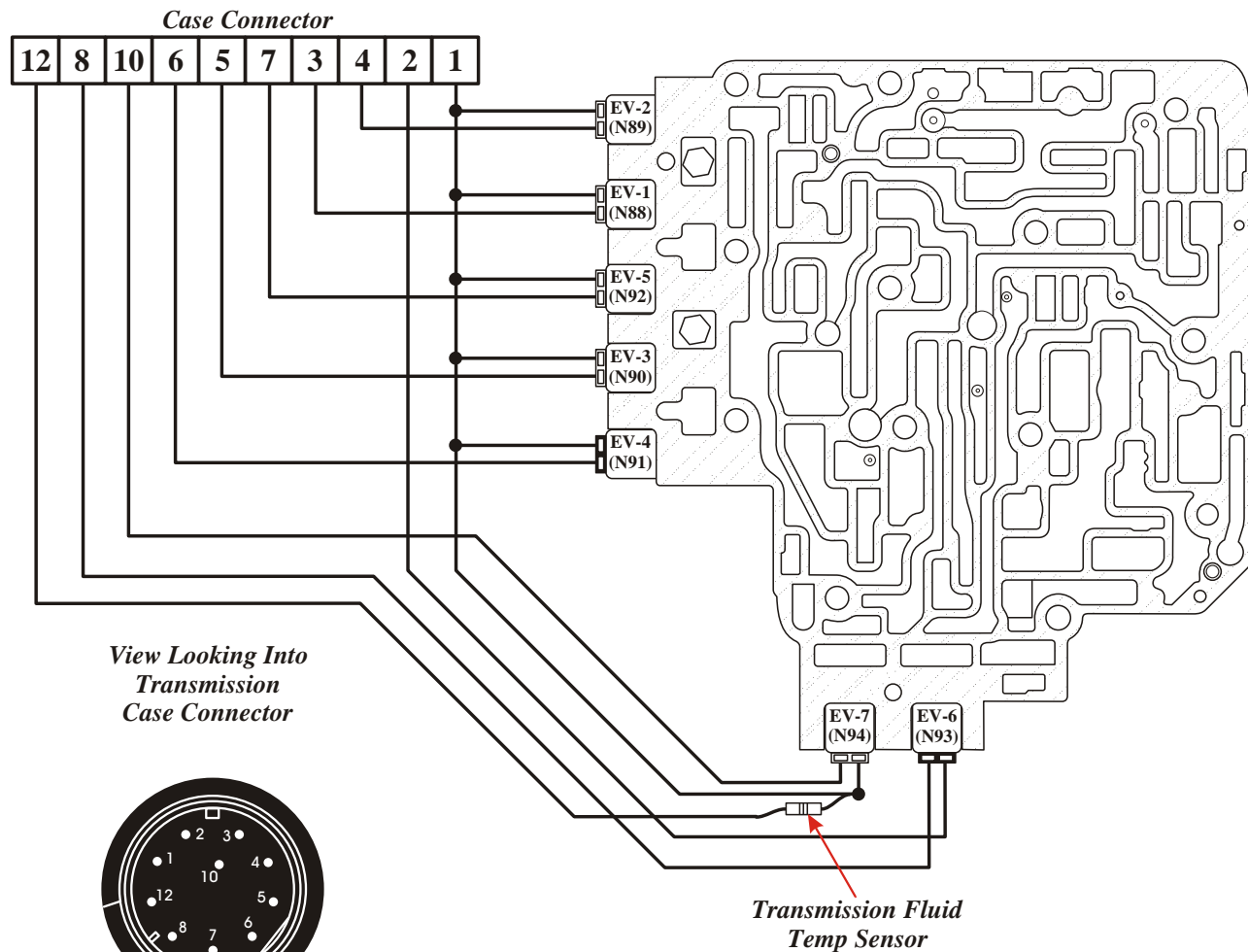


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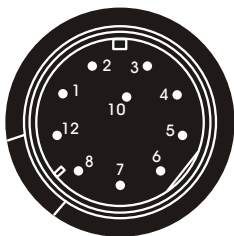
Figure 4
 AUTOMATIC TRANSMISSION SERVICE GROUP



CASE CONNECTOR PIN FUNCTIONS



*View Looking Into
Transmission
Case Connector*



*Transmission Fluid
Temp Sensor*

<i>Pin No.</i>	<i>Pin Function</i>
1	<i>Voltage supply to Solenoids EV-1, 2, 3, 4, 5, 7 and ATF Sensor.</i>
2	<i>Voltage supply to Solenoid EV-6.</i>
3	<i>Ground signal to Solenoid EV-1.</i>
4	<i>Ground signal to Solenoid EV-2.</i>
5	<i>Ground signal to Solenoid EV-3.</i>
6	<i>Ground signal to Solenoid EV-4.</i>
7	<i>Ground signal to Solenoid EV-5.</i>
8	<i>Ground signal to Solenoid EV-6.</i>
10	<i>Ground signal to Solenoid EV-7.</i>
12	<i>Fluid Temp Sensor signal return (Resistor In Ribbon).</i>

**BACK PROBE
THIS TERMINAL**

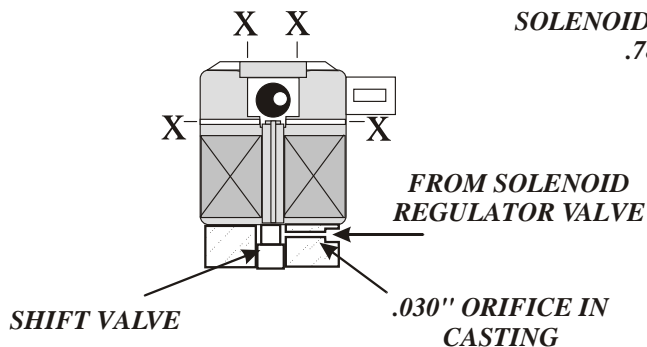


Figure 5
AUTOMATIC TRANSMISSION SERVICE GROUP



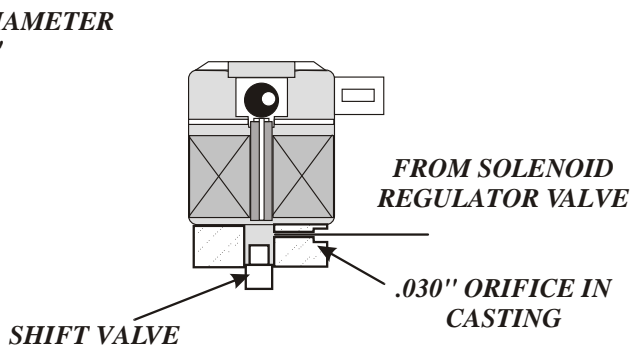
**EV1 (N88), EV2 (N89), EV3 (N90), EV5 (N92) AND EV7 (N94)
SOLENOID CHECK AND OPERATION**

SOLENOID OFF



*WHEN THE SOLENOID IS "OFF"
ORIFICED SOLENOID REGULATOR
OIL WILL EXHAUST OUT THE END
OF THE SOLENOID*

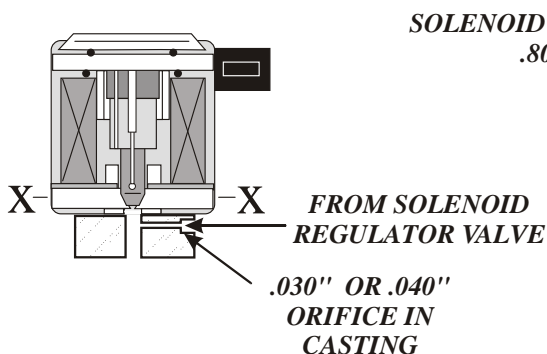
SOLENOID ON



*WHEN THE SOLENOID IS "ON"
ORIFICED SOLENOID REGULATOR
OIL WILL BUILD UP UNDER THE
SOLENOID STROKING THE VALVE
THAT THE SOLENOID CONTROLS*

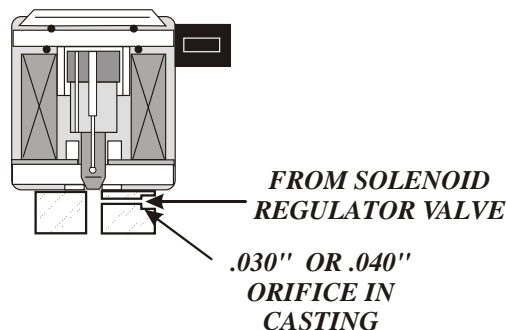
**EV4 (N91) AND EV6 (N93)
SOLENOID CHECK AND OPERATION**

SOLENOID OFF



*WHEN THE SOLENOID IS "OFF"
ORIFICED SOLENOID REGULATOR
OIL WILL EXHAUST OUT THE SIDE
OF THE SOLENOID*

SOLENOID ON



*WHEN THE SOLENOID IS "ON"
ORIFICED SOLENOID REGULATOR
OIL WILL BUILD UP UNDER THE
SOLENOID STROKING THE VALVE
THAT THE SOLENOID CONTROLS*

Figure 6



Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P

1996-2000 OBD-II CODE DEFINITIONS

COMPLAINT: When a VW/Audi vehicle is exhibiting a symptom or is in fail-safe, the technician, in many cases, is unable to communicate with the on-board diagnostics in order to retrieve codes.

CAUSE: The lack of aftermarket equipment, previously available to the technician, to allow access to vehicle on-board diagnostics such as, code retrieval, data lists and basic setting resets.

CORRECTION: With the OBD-II mandate beginning in 1996, it is possible to retrieve codes using the Generic OBD-II part of your scan tool. This will also allow access to the "freeze frame" and "pending code" categories which are diagnostic aids to help the technician retrieve codes and data.

There have also been recent developments which have made available, diagnostic tools which can communicate with VW/Audi vehicle modules which include pre-OBD-II diagnostics for codes and data.

Use the illustrations in figures 1 and 2 for diagnostic connector locations in all Volkswagen/Audi models equipped with 096, 097, 098, 01M, 01N and 01P transmissions.

Use the code definition charts in figures 3 to 12 for ECM codes for gasoline engine equipped vehicles.

Use the code definition charts in figures 13 to 15 for ECM codes for diesel engine equipped vehicles.

Use the code definition charts in figures 16 and 17 for TCM codes.



VOLKSWAGEN/AUDI 01M/01N/01P

**VOLKSWAGEN
DIAGNOSTIC CONNECTOR LOCATIONS**

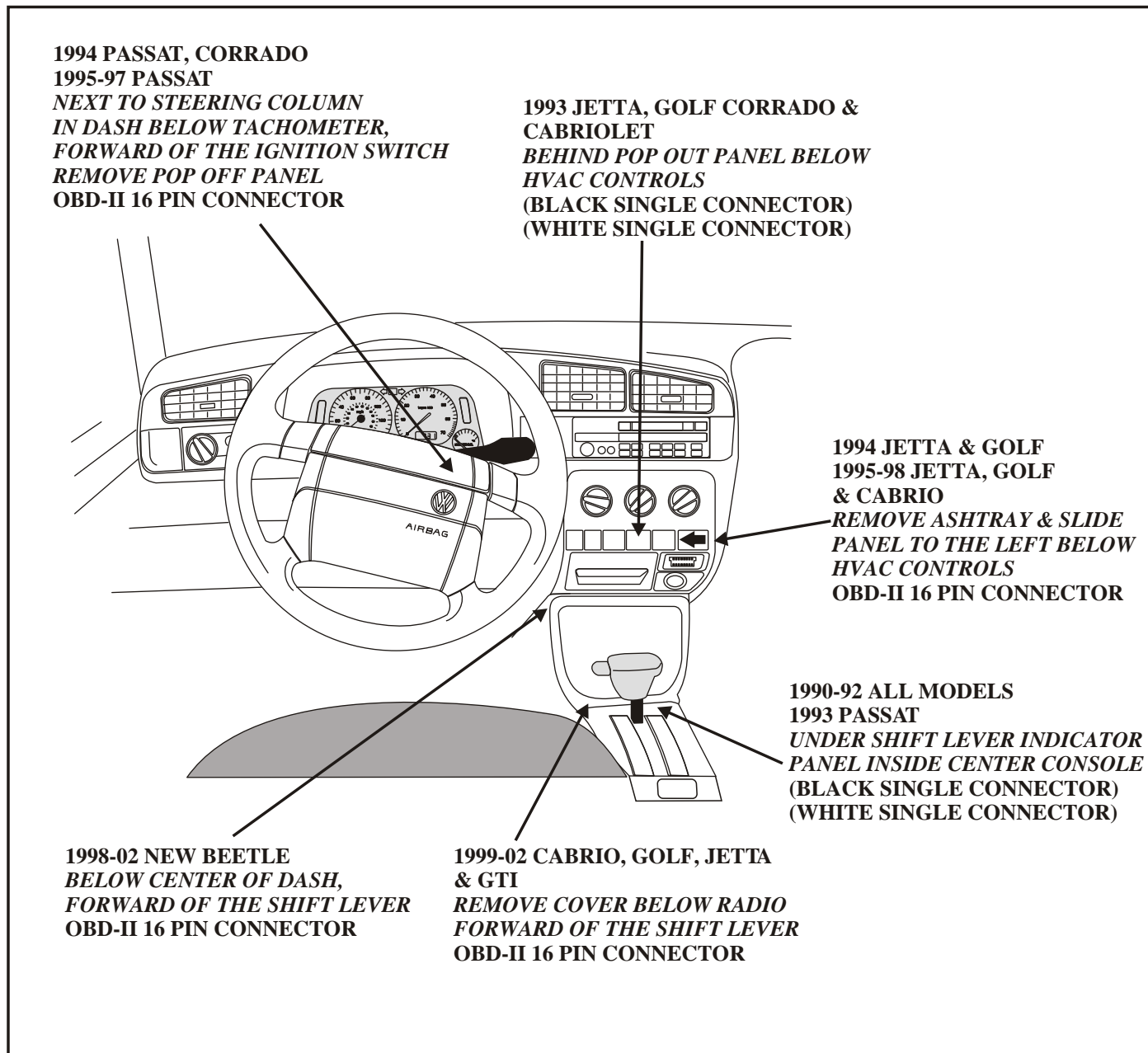


Figure 1



VOLKSWAGEN/AUDI 01M/01N/01P

**AUDI & EUROVAN
DIAGNOSTIC CONNECTOR LOCATIONS**

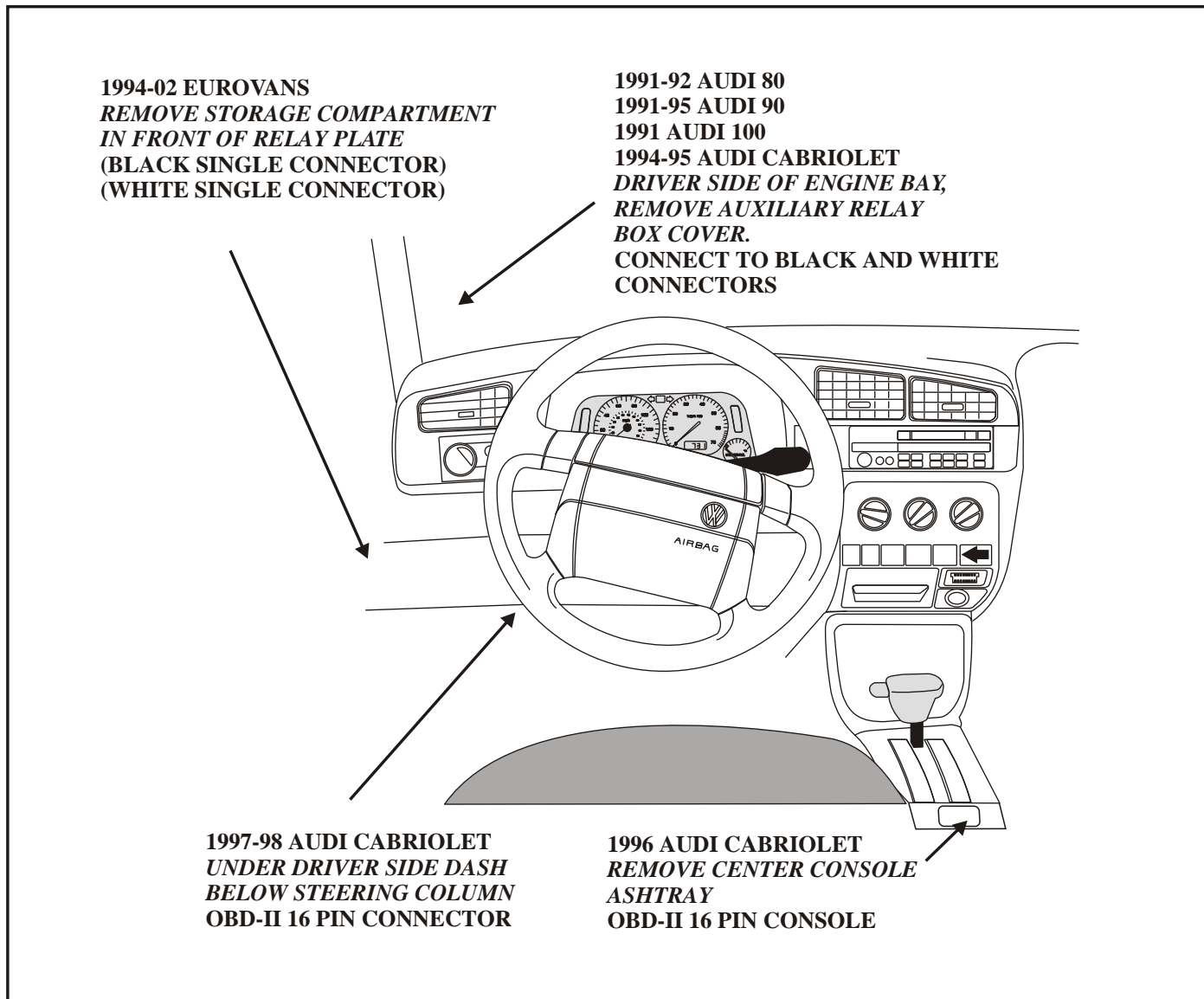


Figure 2



Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P

1996-2000 OBD-II ECM CODE DEFINITIONS

GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P0102	16486	MAF or VAF Sensor
P0103	16487	MAF or VAF Sensor
P0106	N/A	MAP or BARO Pressure Sensor
P0107	16491	BARO Pressure Sensor Circuit Low
P0108	16492	MAP or BARO Pressure Sensor
P0112	16496	IAT Sensor Circuit Input Out Of Range
P0113	16497	IAT Sensor Circuit Input Out Of Range
P0116	16500	ECT Sensor Circuit Input Out Of Range
P0117	16501	ECT Sensor Circuit Input Low
P0118	16502	ECT Sensor Circuit Input Out Of Range
P0120	16504	Throttle Position Sensor "A" Circuit Malfunction
P0121	16505	Throttle/Pedal Position Sensor Circuit Fault
P0122	16506	Throttle/Pedal Position Sensor Circuit Input Low
P0123	16507	Throttle/Pedal Position Sensor Circuit Fault
P0125	16509	Insufficient ECT Temperature For Closed Loop Fuel Control
P0130	16509	Heated Oxygen Sensor - Bank 1 Sensor 1 Circuit Fault
P0131	16515	Heated Oxygen Sensor - Bank 1 Sensor 1 Input Low
P0132	16516	Heated Oxygen Sensor - Bank 1 Sensor 1 Input High
P0133	16517	Oxygen Sensor - Bank 1 Sensor 1 Slow Response
P0134	16518	Oxygen Sensor - Bank 1 Sensor 1 No Activity
P0135	16519	Oxygen Sensor Heater - Bank 1 Sensor 1 Malfunction
P0136	16520	Oxygen Sensor - Bank 1 Sensor 2 Circuit Fault
P0137	16521	Oxygen Sensor - Bank 1 Sensor 2 Input Low
P0138	16522	Oxygen Sensor - Bank 1 Sensor 2 Input High
P0139	16523	Oxygen Sensor - Bank 1 Sensor 2 Slow Response

Figure 3



Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P

1996-2000 OBD-II ECM CODE DEFINITIONS

GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P0138	16522	Oxygen Sensor - Bank 1 Sensor 2 Input High
P0139	16523	Oxygen Sensor - Bank 1 Sensor 2 Slow Response
P0140	16524	Oxygen Sensor - Bank 1 Sensor 2 No Activity
P0141	16525	Oxygen Sensor - Bank 1 Sensor 2 Heater Circuit Malfunction
P0150	16534	Oxygen Sensor - Bank 2 Sensor 1 Circuit Malfunction
P0151	16535	Oxygen Sensor - Bank 2 Sensor 1 Input Low
P0152	16536	Oxygen Sensor - Bank 2 Sensor 1 Input High
P0153	16537	Oxygen Sensor - Bank 2 Sensor 1 No Activity
P0154	16538	Oxygen Sensor - Bank 2 Sensor 1 Slow Response
P0156	16540	Oxygen Sensor - Bank 2 Sensor 2 Circuit Malfunction
P0157	16541	Oxygen Sensor - Bank 2 Sensor 2 Input Low
P0158	16542	Oxygen Sensor - Bank 2 Sensor 2 Input High
P0160	16544	Oxygen Sensor - Bank 2 Sensor 2 No Activity
P0170	*16544	Fuel Trim Malfunction
P0171	16555	System Too Lean Bank 1
P0172	16556	System Too Rich Bank 1
P0300	16684	Random Misfire Detected
P0301	16685	Cylinder No. 1 Misfire Detected
P0302	16686	Cylinder No. 2 Misfire Detected
P0303	16687	Cylinder No. 3 Misfire Detected
P0304	16688	Cylinder No. 4 Misfire Detected
P0305	16689	Cylinder No. 5 Misfire Detected
P0306	16690	Cylinder No. 6 Misfire Detected
P0321	17705	Engine Speed Sensor Circuit Fault
P0322	16706	Engine Speed Sensor No Signal
P0327	16711	Knock Sensor No. 1 Circuit Input Low

*2.8L VR6, Engine Code AFP, GTI and Jetta Only

Figure 4

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AUTOMATIC TRANSMISSION SERVICE GROUP



VOLKSWAGEN/AUDI 01M/01N/01P
1996-2000 OBD-II ECM CODE DEFINITIONS
GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P0328	16712	Knock Sensor No. 1 Circuit Input High
P0332	16716	Knock Sensor No. 1 Circuit Input Low
P0333	16717	Knock Sensor No. 2 Circuit Input High
P0341	16575	Camshaft Position Sensor Circuit Fault
P0342	16726	Camshaft Position Sensor Circuit Input Low
P0343	16727	Camshaft Position Sensor Circuit Input High
P0411	16795	Secondary Air Injection System Incorrect Flow Detected
P0420	16804	Main Catalyst Efficiency Below Threshold
P0422	16806	Main Catalyst Efficiency Below Threshold Bank 1
P0432	16816	Main Catalyst Efficiency Below Threshold Bank 2
P0440	16824	Tank Vent System Malfunction
P0441	16825	EVAP Emission System Incorrect Purge Flow
P0442	16826	EVAP Emission System Small Leak Detected
P0445	*16839	EVAP Emission System Large Leak Detected
P0455	16839	EVAP Emission System Large Leak Detected
P0501	16885	Vehicle Speed Sensor Circuit Fault
P0506	16890	Idle RPM Too Low
P0507	16891	Idle RPM Too High
P0510	16894	Closed Throttle Position Switch Malfunction
P0560	16944	System Voltage Malfunction
P0562	16946	System Voltage Too Low
P0563	16947	System Voltage Too High
P0571	16955	Cruise/Brake Switch Circuit Malfunction
P0601	17985	ECM Check Sum Error
P0603	16987	ECM KAM Error
P0604	16988	ECM RAM Error

*2.8L V6, Engine Code AHA, Passat Only

Figure 5

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Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P 1996-2000 OBD-II ECM CODE DEFINITIONS GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P0605	16989	ECM ROM Error
P0707	17091	Transmission Range Sensor Circuit Input Low
P0708	17092	Transmission Range Sensor Circuit Input High
P0715	17099	Turbine Speed Sensor Circuit Malfunction
P0722	17106	Output Speed Sensor Circuit No Signal
P0725	17109	Engine Speed Circuit Malfunction
P0748	17132	Pressure Control Solenoid Electrical Fault
P0753	17137	Shift Solenoid "A" Electrical Fault
P0758	17142	Shift Solenoid "B" Electrical Fault
P0763	17147	Shift Solenoid "C" Electrical Fault
P0768	17152	Shift Solenoid "D" Electrical Fault
P0773	17157	Shift Solenoid "E" Electrical Fault
P1102	17510	Heated Oxygen Sensor - Bank 1 Sensor 1 Short To Voltage
P1105	17513	Heated Oxygen Sensor - Bank 1 Sensor 1 Heater Short To Voltage
P1107	17515	Heated Oxygen Sensor - Bank 2 Sensor 1 Heater Short To Voltage
P1110	17518	Heated Oxygen Sensor - Bank 2 Sensor 2 Heater Short To Voltage
P1113	17521	Heated Oxygen Sensor 1 Heater Circuit Resistance Too High
P1115	17523	Heated Oxygen Sensor 1 Heater Circuit Short To Ground
P1116	17524	Heated Oxygen Sensor 1 Heater Circuit Open
P1117	17525	Heated Oxygen Sensor 2 Heater Circuit Short To Ground
P1118	17526	Heated Oxygen Sensor 2 Heater Circuit Open
P1127	17535	Long Term Fuel Trim Too Rich Bank 1
P1128	17536	Long Term Fuel Trim Too Lean Bank 1
P1129	17537	Long Term Fuel Trim Too Rich Bank 2
P1130	17538	Long Term Fuel Trim Too Lean Bank 2
P1136	17544	Long Term Fuel Trim Too Lean Bank 1

Figure 6

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Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P 1996-2000 OBD-II ECM CODE DEFINITIONS GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P1137	17545	Long Term Fuel Trim Too Rich Bank 1
P1138	17546	Long Term Fuel Trim Too Lean Bank 2
P1139	17547	Long Term Fuel Trim Too Rich Bank 2
P1141	17549	Load Calculation Cross Check Performance
P1171	17579	Throttle Position Potentiometer Circuit Fault
P1172	17580	Throttle Position Potentiometer Circuit Too Low
P1173	17581	Throttle Position Potentiometer Circuit Too High
P1176	17584	Heated Oxygen Sensor 2 Correction Limit Attained
P1177	17585	Heated Oxygen Sensor Correction Behind Catalyst Limit Attained Bank 2
P1196	17604	Heated Oxygen Sensor 1 Circuit Malfunction
P1197	17605	Heated Oxygen Sensor 1 Bank 2 Heater Circuit Electrical Fault
P1198	17606	Heated Oxygen Sensor 2 Bank 1 Heater Circuit Electrical Fault
P1199	17607	Heated Oxygen Sensor - Bank 2 Sensor 2 Heater Circuit Electrical Fault
P1213	17621	Cylinder No. 1 Fuel Injector Circuit Short To Voltage
P1214	17622	Cylinder No. 2 Fuel Injector Circuit Short To Voltage
P1215	17623	Cylinder No. 3 Fuel Injector Circuit Short To Voltage
P1216	17624	Cylinder No. 4 Fuel Injector Circuit Short To Voltage
P1217	17625	Cylinder No. 5 Fuel Injector Circuit Short To Voltage
P1218	17626	Cylinder No. 6 Fuel Injector Circuit Short To Voltage
P1225	17633	Cylinder No. 1 Fuel Injector Circuit Short To Ground
P1226	17634	Cylinder No. 2 Fuel Injector Circuit Short To Ground
P1227	17635	Cylinder No. 3 Fuel Injector Circuit Short To Ground
P1228	17636	Cylinder No. 4 Fuel Injector Circuit Short To Ground
P1229	17637	Cylinder No. 5 Fuel Injector Circuit Short To Ground
P1230	17638	Cylinder No. 6 Fuel Injector Circuit Short To Ground
P1237	17645	Cylinder No. 1 Fuel Injector Circuit Open

Figure 7

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Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P 1996-2000 OBD-II ECM CODE DEFINITIONS GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P1238	17646	Cylinder No. 2 Fuel Injector Circuit Open
P1239	17647	Cylinder No. 3 Fuel Injector Circuit Open
P1240	17648	Cylinder No. 4 Fuel Injector Circuit Open
P1241	17649	Cylinder No. 5 Fuel Injector Circuit Open
P1242	17650	Cylinder No. 6 Fuel Injector Circuit Open
P1250	17658	Fuel Level Too Low
P1300	17708	Fuel Related Misfire Detected
P1325	17733	Cylinder No. 1 Knock Control Limit Attained
P1326	17734	Cylinder No. 2 Knock Control Limit Attained
P1327	17735	Cylinder No. 3 Knock Control Limit Attained
P1328	17736	Cylinder No. 4 Knock Control Limit Attained
P1329	17737	Cylinder No. 5 Knock Control Limit Attained
P1330	17738	Cylinder No. 6 Knock Control Limit Attained
P1336	17744	Engine Torque Control Adaptation At Limit
P1337	17745	Camshaft Position Sensor Circuit Short To Ground
P1338	17746	Camshaft Position Sensor Circuit Short To Voltage
P1340	17748	Camshaft/Crankshaft Position Sensor Signals Out Of Sequence
P1341	17749	Ignition Coil Output Stage No. 1 Circuit Short To Ground
P1343	17751	Ignition Coil Output Stage No. 2 Circuit Short To Ground
P1345	17753	Ignition Coil Output Stage No. 3 Circuit Short To Ground
P1386	17794	ECM Internal Altitude Sensor Error
P1387	17795	ECM Internal Knock Control Circuit Error
P1391	17799	Camshaft Position Sensor No. 2 Circuit Short To Ground
P1392	17800	Camshaft Position Sensor No. 2 Circuit Open Or Short To Voltage
P1393	17801	Ignition Coil Output Stage No. 1 Circuit Malfunction
P1394	17802	Ignition Coil Output Stage No. 2 Circuit Malfunction

Figure 8

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Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P 1996-2000 OBD-II ECM CODE DEFINITIONS GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P1395	17803	Ignition Coil Output Stage No. 3 Circuit Malfunction
P1410	17818	EVAP Canister Purge Regulator Valve Short To Voltage
P1420	17828	Secondary Air Injection Control Electrical Malfunction
P1421	17829	Secondary Air Injection Circuit Short To Ground
P1422	17830	Secondary Air Injection Circuit Short To Voltage
P1424	17832	Secondary Air Injection System Leak Detected
P1425	17833	EVAP Canister Purge Regulator Valve Short To Ground
P1426	17834	EVAP Canister Purge Regulator Valve Circuit Open
P1432	17840	Secondary Air Injection Circuit Open
P1433	17841	Secondary Air Injection Pump Relay Circuit Open
P1434	17842	Secondary Air Injection Pump Relay Short To Voltage
P1435	17843	Secondary Air Injection Pump Relay Short To Ground
P1436	17844	Secondary Air Injection Pump Relay Circuit Malfunction
P1450	17858	Secondary Air Injection Solenoid Valve Circuit Short To Voltage
P1451	17859	Secondary Air Injection Solenoid Valve Circuit Short To Ground
P1452	17860	Secondary Air Injection Solenoid Valve Circuit Open
P1471	17879	EVAP Emission Leak Detection Pump Circuit Short To Voltage
P1472	17880	EVAP Emission Leak Detection Pump Circuit Short To Ground
P1473	17881	EVAP Emission Leak Detection Pump Circuit Open
P1475	17883	EVAP Emission Leak Detection Pump Circuit Malfunction
P1476	17884	EVAP Emission Leak Detection Pump System Insufficient Vacuum
P1477	17885	EVAP Emission Leak Detection Pump System Malfunction
P1478	17886	EVAP Emission Leak Detection Pump System Plugged
P1500	17908	Fuel Pump Relay Circuit Malfunction
P1501	17909	Fuel Pump Relay Circuit Short To Ground
P1502	17910	Fuel Pump Relay Circuit Short To Voltage

Figure 9

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Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P

1996-2000 OBD-II ECM CODE DEFINITIONS

GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P1505	17913	Closed Throttle Position Switch Circuit Open
P1506	17914	Closed Throttle Position Switch Circuit Short To Ground
P1512	17920	Intake Manifold Change-Over Valve Circuit Short To Voltage
P1515	17923	Intake Manifold Change-Over Valve Circuit Short To Ground
P1516	17924	Intake Manifold Change-Over Valve Circuit Open
P1519	17927	Intake Camshaft Control Malfunction Bank 1
P1522	17930	Intake Camshaft Control Malfunction Bank 2
P1539	17947	Clutch Pedal Switch Signal Implausible
P1541	17949	Fuel Pump Relay Circuit Open
P1542	17950	Throttle Actuator Potentiometer Out Of Range
P1543	17951	Throttle Actuator Potentiometer Signal Too Low
P1544	17952	Throttle Actuator Potentiometer Signal Too High
P1545	17953	Throttle Position Control Malfunction
P1546	17954	Boost Pressure Control Valve Circuit Short To Voltage
P1547	17955	Boost Pressure Control Valve Circuit Short To Ground
P1548	17956	Boost Pressure Control Valve Circuit Open
P1555	17963	Charge Pressure Upper Limit Exceeded
P1556	17964	Charge Pressure Control Negative Deviation
P1557	17965	Charge Pressure Control Positive Deviation
P1558	17966	Throttle Actuator Electrical Malfunction
P1559	17967	Idle Speed Control Adaptation Malfunction
P1560	17968	Maximum Engine Speed Exceeded
P1564	17972	Idle Speed Control Throttle Position Adaptation Malfunction
P1565	17973	Idle Speed Control Throttle Position Lower Limit Not Attained
P1568	17976	Idle Speed Control Throttle Position Mechanical Malfunction
P1569	17977	Cruise Control Switch Signal Implausible

Figure 10

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VOLKSWAGEN/AUDI 01M/01N/01P
1996-2000 OBD-II ECM CODE DEFINITIONS
GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P1580	17988	Throttle Actuator Potentiometer Signal Malfunction
P1582	17990	Idle Adaptation At Limit
P1600	18008	ECM Power Supply Voltage Malfunction
P1602	18010	ECM Voltage Low
P1603	18011	ECM Internal Malfunction
P1606	18014	Rough Road Recognition From ABS Control Module
P1611	18019	MIL Circuit/TCM Short To Ground
P1612	18020	ECM Coding Incorrect
P1613	18021	MIL Call-Up Circuit Open Or Short To Voltage
P1624	18032	MIL Request Signal Active
P1626	18034	Data Bus Communications Signal Missing From TCM
P1630	18038	Accelerator Pedal Position Sensor No. 1 Signal Too Low
P1631	18039	Accelerator Pedal Position Sensor No. 1 Signal Too High
P1633	18041	Accelerator Pedal Position Sensor No. 2 Signal Too Low
P1634	18042	Accelerator Pedal Position Sensor No. 2 Signal Too High
P1639	18047	Accelerator Pedal Position Sensor Out Of Range
P1640	18048	ECM EEPROM Error
P1648	18056	Data Bus Communication Signal Malfunction
P1649	18057	Data Bus Communications Signal Missing From ABS
P1676	18084	Electronic Power Control Indicator Light Circuit Malfunction
P1677	18085	Electronic Power Control Indicator Light Circuit Short To Voltage
P1678	18086	Electronic Power Control Indicator Light Circuit Short To Ground
P1679	18087	Electronic Power Control Indicator Light Circuit Open
P1681	18089	ECM Programming Not Finished
P1690	18098	MIL Circuit Malfunction
P1691	18099	MIL Circuit Open

Figure 11



VOLKSWAGEN/AUDI 01M/01N/01P

1996-2000 OBD-II ECM CODE DEFINITIONS

GASOLINE ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P1692	18100	MIL Circuit Short To Ground
P1693	18101	MIL Circuit Short To Voltage
P1778	18186	Solenoid EV7 Electrical Malfunction
P1780	18188	Engine Intervention Readable
P1851	18259	Data Bus Communications Signal Missing From ABS Control Module
P1854	18262	Data Bus Message Not Detected

Figure 12



Technical Service Information

VOLKSWAGEN/AUDI 01M/01N/01P 1996-2000 OBD-II ECM CODE DEFINITIONS *DIESEL ENGINES*

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P0101	00553	MAF Sensor Signal Implausible
P0116	00522	ECT Sensor Out OF Range
P0121	00777	Throttle Position Sensor Out Of Range
P0123	00777	Throttle Position Sensor Circuit Short To Voltage
P0300	01162	Random Misfire Detected
P0301	01162	Cylinder No. 1 Misfire Detected
P0302	01162	Cylinder No. 2 Misfire Detected
P0303	01162	Cylinder No. 3 Misfire Detected
P0304	01162	Cylinder No. 4 Misfire Detected
P0321	00513	Engine Speed Sensor Circuit Out Of Range
P0322	00513	Engine Speed Sensor Circuit No Activity
P0380	01050	Glow Plug Monitor
P0501	00624	Vehicle Speed Sensor Circuit Out Of Range
P0560	00532	System Voltage Malfunction
P0605	65535	ECM Failure
P1144	00553	MAF Sensor Circuit Open Or Short To Ground
P1145	00553	MAF Sensor Circuit Short To Voltage
P1146	00553	MAF Sensor Voltage Supply Too High/Low
P1155	00519	IAT Sensor Circuit Short To Voltage
P1156	00519	IAT Sensor Circuit Open Or Short To Ground
P1157	00519	IAT Sensor Voltage Supply Too High/Low
P1160	00527	IAT Sensor Circuit Short To Ground
P1161	00527	IAT Sensor Circuit Open Or Short To Voltage
P1162	00539	Fuel Temperature Sensor Circuit Short To Ground
P1163	00539	Fuel Temperature Sensor Circuit Open Or Short To Voltage
P1245	00542	Needle Lift Sensor Circuit Short To Ground

Figure 13

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VOLKSWAGEN/AUDI 01M/01N/01P
1996-2000 OBD-II ECM CODE DEFINITIONS
DIESEL ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P1246	00542	Needle Lift Sensor Signal Implausible
P1247	00522	Needle Lift Sensor Signal Open Or Short To Voltage
P1248	00550	Injection Start Control Malfunction
P1251	01269	Cold Start Injector Circuit Short To Voltage
P1252	01269	Cold Start Injector Circuit Open Or Short To Ground
P1255	00522	ECT Sensor Circuit Short To Ground
P1256	00522	ECT Sensor Circuit Short To Voltage
P1354	00765	Modulating Piston Displacement Sensor Circuit Malfunction
P1402	01265	EGR Vacuum Regulator Solenoid Valve Circuit Short To Voltage
P1403	00560	EGR System Control Difference
P1441	01265	EGR Vacuum Regulator Solenoid Valve Circuit Open Or Short To Ground
P1537	01327	Fuel Cut-Off Valve Mechanical Malfunction
P1538	01327	Fuel Cut-Off Valve Circuit Open Or Short To Ground
P1540	00624	Vehicle Speed Sensor Signal Too High
P1546	01262	Wastegate By-Pass Regulator Valve Circuit Short To Voltage
P1549	01262	Wastegate By-Pass Regulator Valve Circuit Open Or Short To Ground
P1550	00575	Intake Manifold Pressure Control Difference
P1561	01268	Quality Adjuster Control Difference
P1562	01268	Quality Adjuster Upper Limit Attained
P1563	01268	Quality Adjuster Lower Limit Attained
P1612	01044	ECM Incorrect Coding
P1616	00626	Glow Plug Indicator Light Circuit Short To Voltage
P1617	00626	Glow Plug Indicator Light Circuit Open Or Short To Ground
P1618	01266	Glow Plug Relay Circuit Short To Voltage
P1619	01266	Glow Plug Relay Circuit Open Or Short To Ground
P1626	18034	Data Bus Message From TCM Implausible

Figure 14



VOLKSWAGEN/AUDI 01M/01N/01P
1996-2000 OBD-II ECM CODE DEFINITIONS
DIESEL ENGINES

OBD-II CODE	ECM VAG CODE	CODE DEFINITIONS
P1632	00777	Throttle Position Sensor Voltage Supply Too High/Low
P1693	00750	MIL Circuit Short To Voltage
P1694	00750	MIL Circuit Open Or Short To Ground
P1851	18259	Data Bus Message From ABS Control Module Implausible
P1854	18262	Data Bus Message Not Detected

Figure 15



VOLKSWAGEN/AUDI 01M/01N/01P

1996-2000 OBD-II TCM CODE DEFINITIONS

OBD-II CODE	TCM VAG CODE	CODE DEFINITIONS
P0120	00529	Engine RPM Signal Too High
P0700	65535	Transmission Control System Malfunction (MIL Request)
P0705	00293	Multi-Function Switch Signal Implausible (Transmission Range Switch)
P0715	00297	Transmission Vehicle Speed Sensor Signal Interrupted(Sun Gear Shell Sensor)
P0722	00281	Vehicle Speed Sensor Signal Interrupted (Output Shaft Speed Sensor)
P0725	00518	Throttle Position Sensor Signal Out Of Range
P0730	00652	Final Drive Ratio Signal Incorrect/Implausible (Gear Ratio Error)
P0740	01192	Torque Converter Clutch Malfunction (TCC Slip Excessive)
P0753	00258	Solenoid Valve EV1 (A) - N88 Electrical Fault
P0758	00260	Solenoid Valve EV2 (B) - N89 Electrical Fault
P0763	00262	Solenoid Valve EV3 (C) - N90 Electrical Fault
P0768	00264	Solenoid Valve EM4 (D) - N91 Electrical Fault
P0773	00266	Solenoid Valve EV5 (E) - N92 Electrical Fault
P0748	00268	Pressure Control Solenoid EM6 - N93 Electrical Fault
P0785	00270	Solenoid Valve EV7 (7) - N94 Electrical Fault
NA	00296	Kickdown Switch Electrical Fault
NA	00300	Transaxle Fluid Temperature Sensor Unidentified Malfunction (Circuit Fault)
NA	00526	Brake Lamp Switch Circuit Fault
NA	00532	B+ Supply Voltage Insufficient
NA	00543	Maximum Engine Speed Exceeded (Neutral Condition)
P1780	00545	Interruption Of Ignition Timing Signal Between ECM And TCM
NA	00549	Fuel Consumption Signal Implausible
NA	00596	Short Circuit Between Injector Wires
NA	00638	Interruption Of Throttle Position Sensor Signal Between ECM And TCM
NA	00641	ATF Temperature Signal Too High (Transmission Overheat Protection Program)
NA	00652	Transaxle Range Controller Signal Improper (Mechanical Gear Ratio Error)

Figure 16

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VOLKSWAGEN/AUDI 01M/01N/01P

1996-2000 OBD-II TCM CODE DEFINITIONS

OBD-II CODE	TCM VAG CODE	CODE DEFINITIONS
NA	00660	Kickdown Switch/Throttle Position Sensor Signal Improper
NA	00668	B+ Supply Terminal 30 Open Or Short To Ground
NA	01044	Control Module Improperly Coded
NA	01192	Torque Converter Clutch Fault (TCC Slipping)
NA	01196	Engine/Transaxle Data Bus Signal Implausible
NA	01236	Shift Lock Solenoid Open Or Short To Ground
P1854/P1866	01312	CAN-Bus Drive Faulty No Communication (Hardware Defective Or Messages Missing)
P1850/P1855	01314	No Communication From ECM
NA	01316	No Communication From ABS Module
NA	65535	Transmission Control Module Faulty

Figure 17



VOLKSWAGEN/AUDI

MANUAL PROCEDURE FOR "RETURN TO BASIC SETTINGS"

COMPLAINT: Once a Volkswagen/Audi vehicle has been repaired, in many cases, the Transmission Module (TCM) or the Engine Control Module (ECM) does not allow proper vehicle operation.
The symptoms may be, the transmission stuck in "Failsafe" or erratic shifting accompanied by driveability complaints.

CAUSE: It is of primary importance to clear all previously stored trouble codes, this is NOT an option. It is recommended to use a scan tool or computer based program to do this. Both are available to the aftermarket. Disconnecting the battery to accomplish this is not recommended due to other systems that may be adversely effected such as radio theft codes or the vehicle 's theft deterrent system.

If no other method is available, disconnecting the battery for one minute will clear the codes.

NOTE: Some codes can be cleared on OBD-II equipped vehicles using the Generic area of the scan tool if specialty equipment is not available.

The next mandatory procedure that **MUST** be performed is the "**Return To Basic Settings**" which is the Throttle Position Sensor and Kickdown relearn settings that both the TCM and the ECM must have in order to send proper commands for engine and transmission operation.

The "**Return To Basic Settings**" **MUST** be performed if any of the following conditions exist:

1. Replacement of the ECM.
2. The engine has been changed.
3. Repair or replacement of the throttle housing.
4. Replacement or adjustment of the Throttle Position Sensor.
5. Replacement of the TCM.

CORRECTION: Use the following procedure on all VW/AUDI vehicles equipped with 096, 097,098, 01M, 01N or 01P transmissions, to manually reset the "Basic Settings":

1. **Turn the ignition "ON", Do not start the engine.**
2. **Move the gear selector lever to the "D4" position.**
3. **Depress the accelerator pedal all the way to the floor and hold it there for 30 seconds.**
Make certain the carpet or floor mat is not in the way of the pedal.
4. **After 30 seconds, move the gear selector lever back to "PARK".**
5. **Release the accelerator pedal.**
6. **Turn the ignition "OFF".**
7. **After completion of the above, drive the vehicle on the road and perform three individual upshift sequences and kickdown at light, medium and heavy throttle conditions.**

NOTE: The systems will fine tune themselves over the next 50 to 75 miles of driving.