AUTOMATIC TRANSMISSION

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E23AA--

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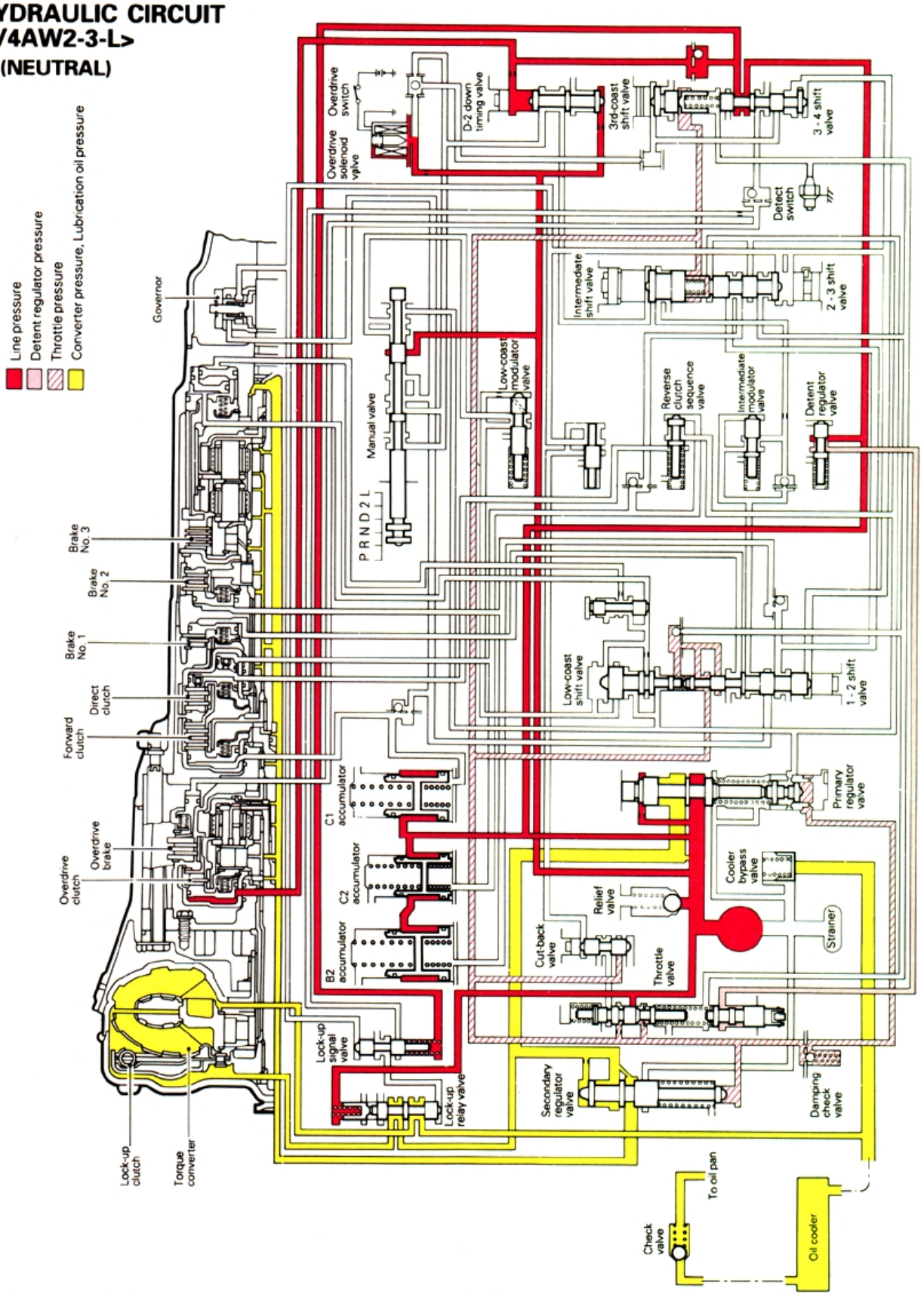
GENERAL INFORMATION

E23BAAL

TRA0238

HYDRAULIC CIRCUIT <V4AW2-3-L>

N (NEUTRAL)



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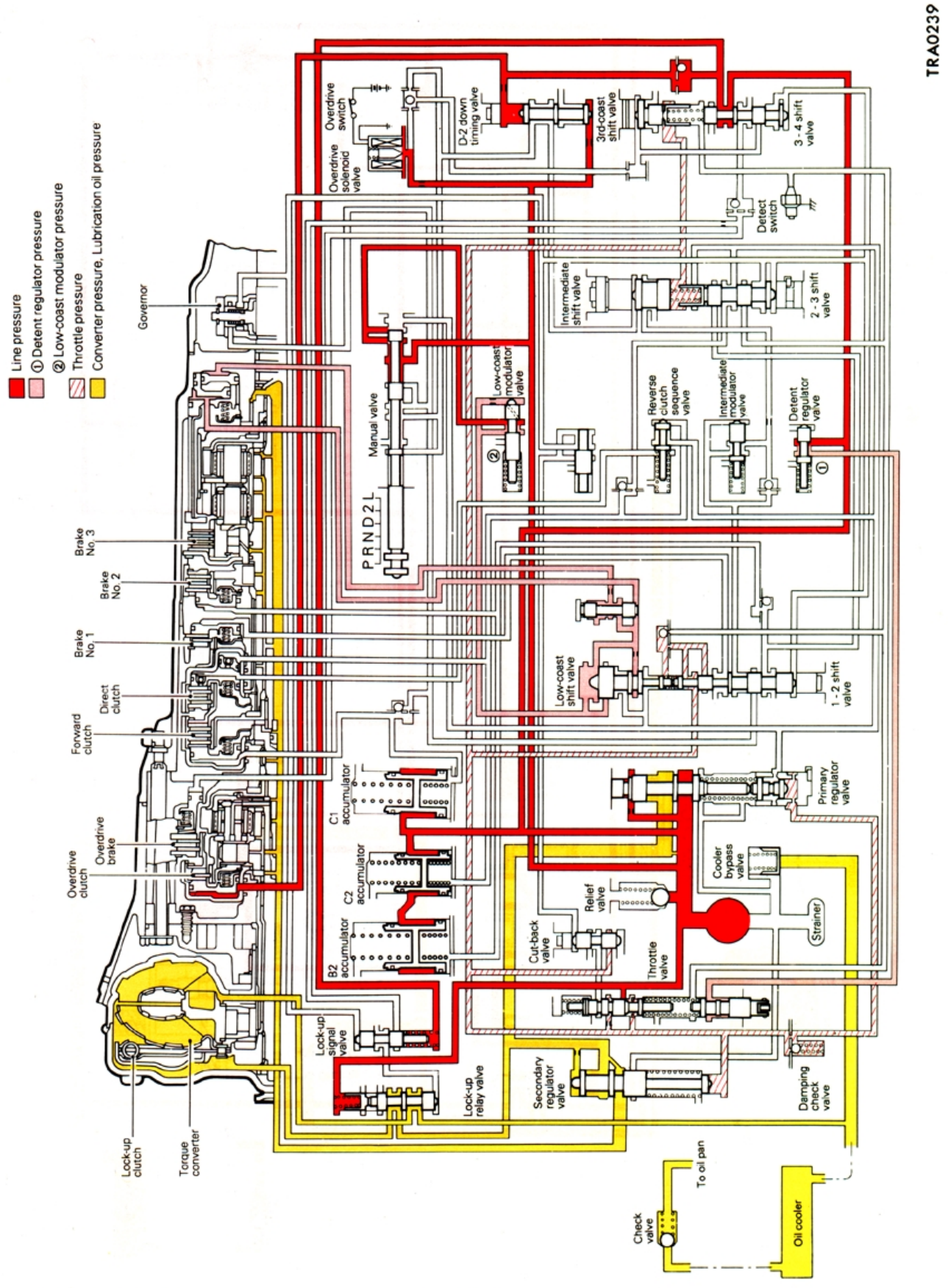
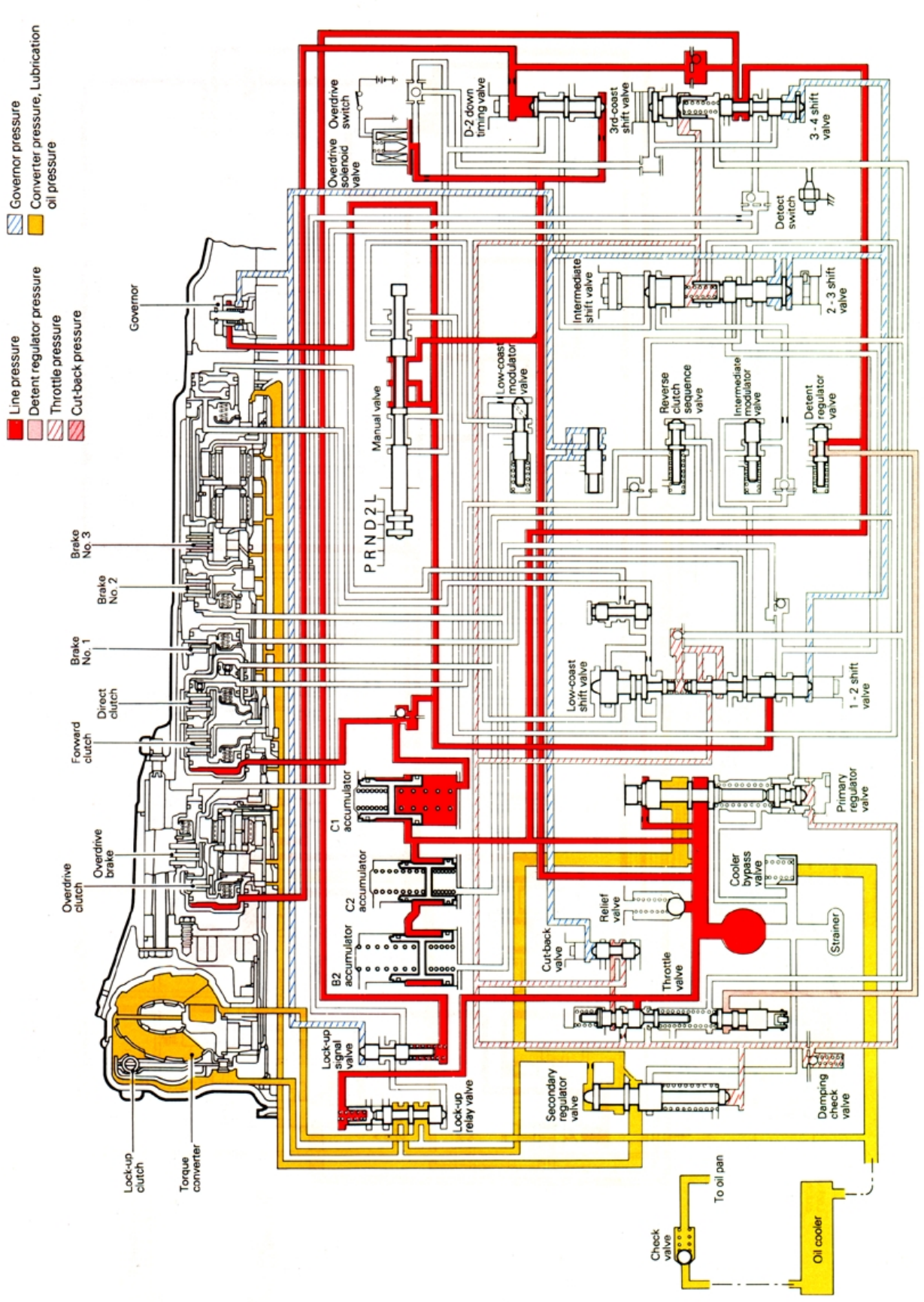


D-1 (DRIVE 1ST)



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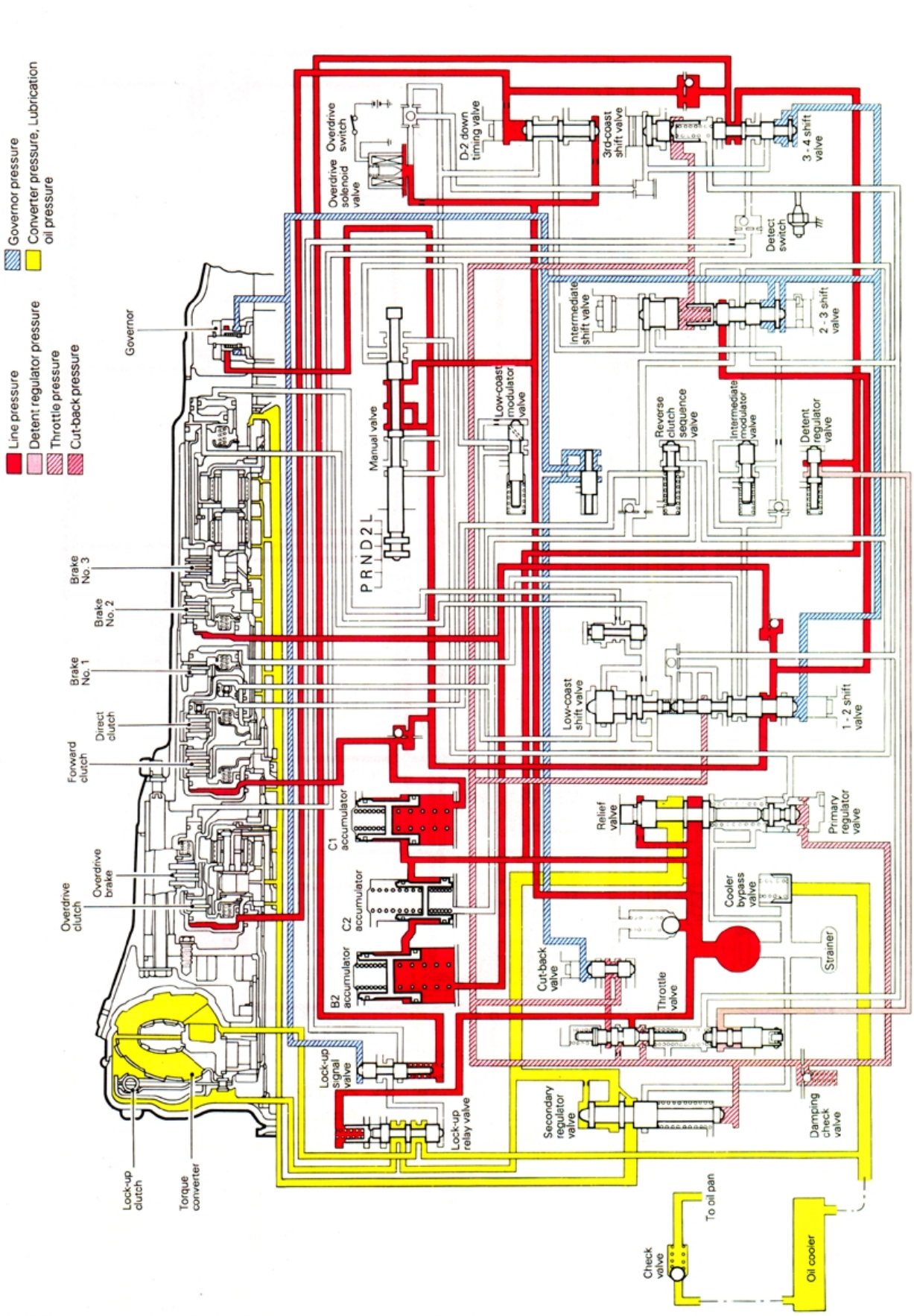

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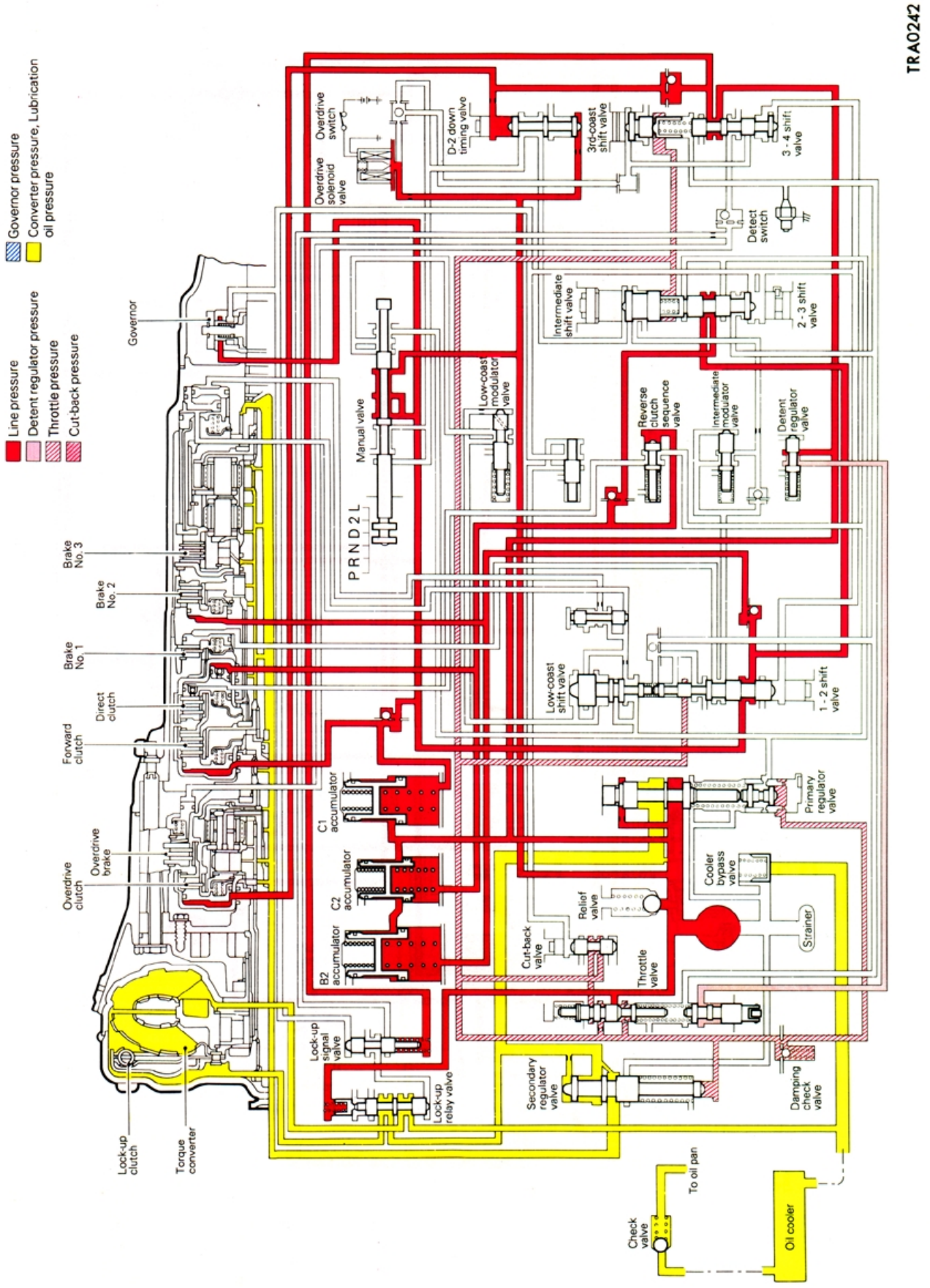
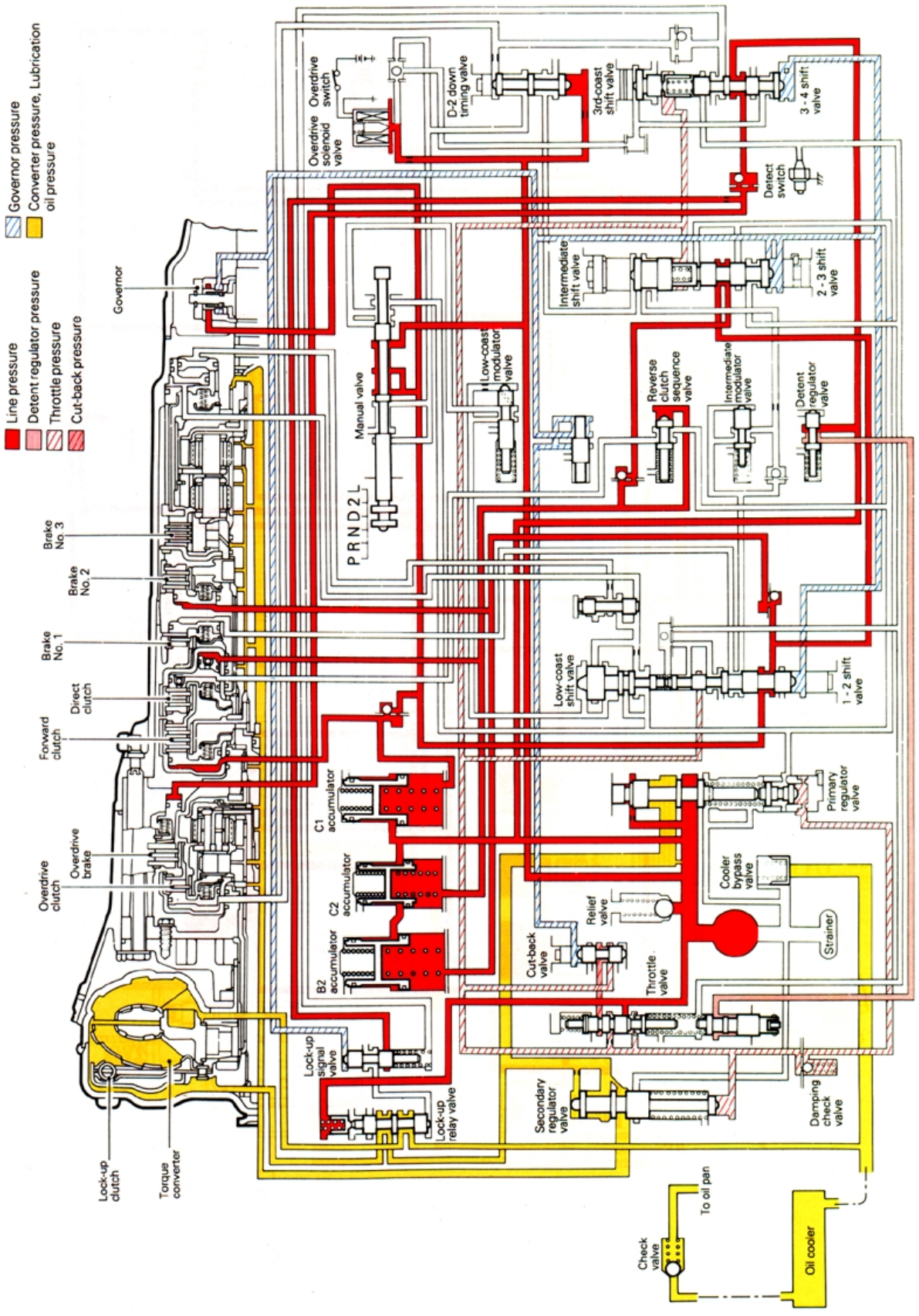


 PWJE9086

D-4 (DRIVE 4TH)
LOCK-UP CLUTCH : OFF

TRA0243



D-4 (DRIVE 4TH)
LOCK-UP CLUTCH : ON

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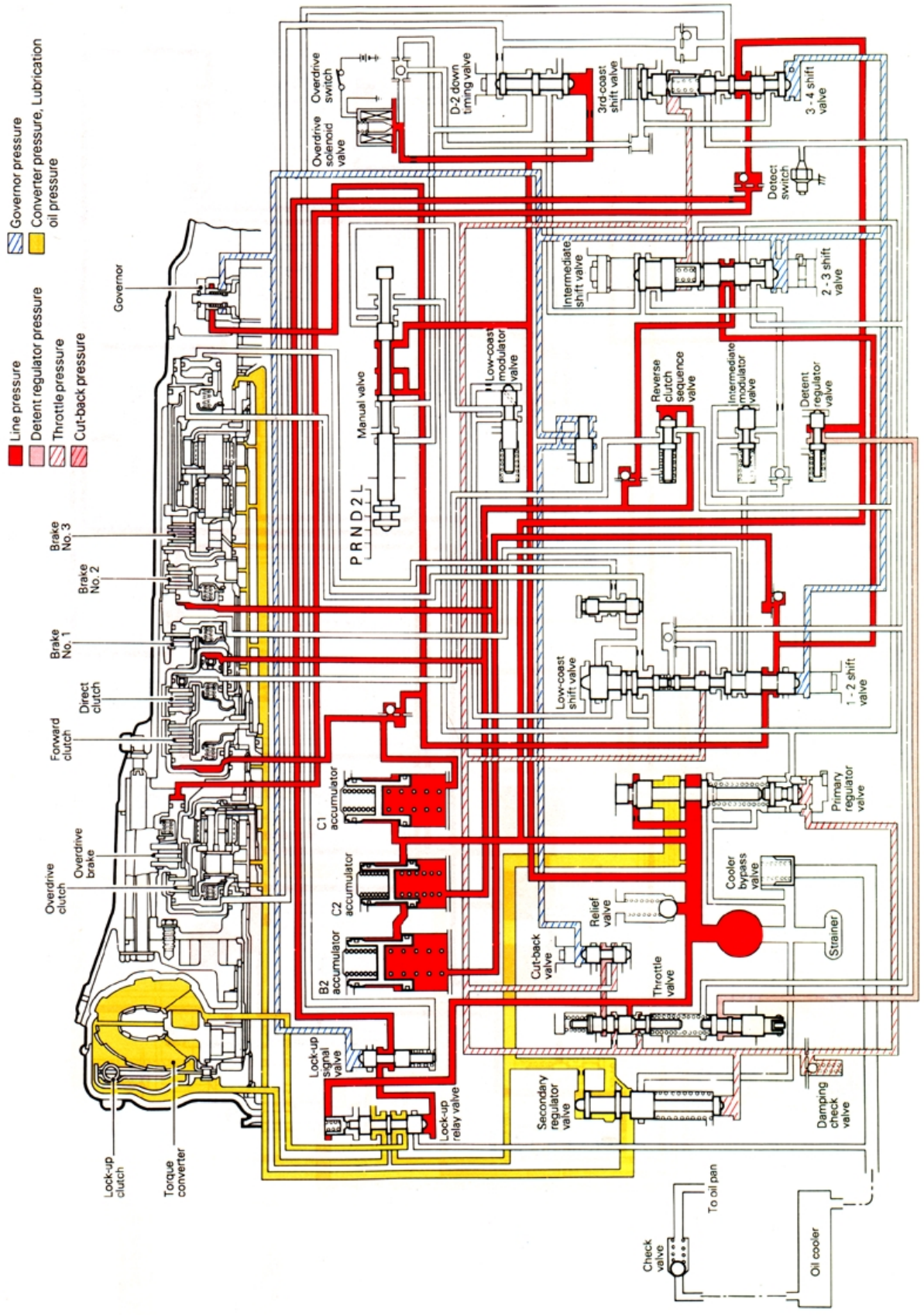
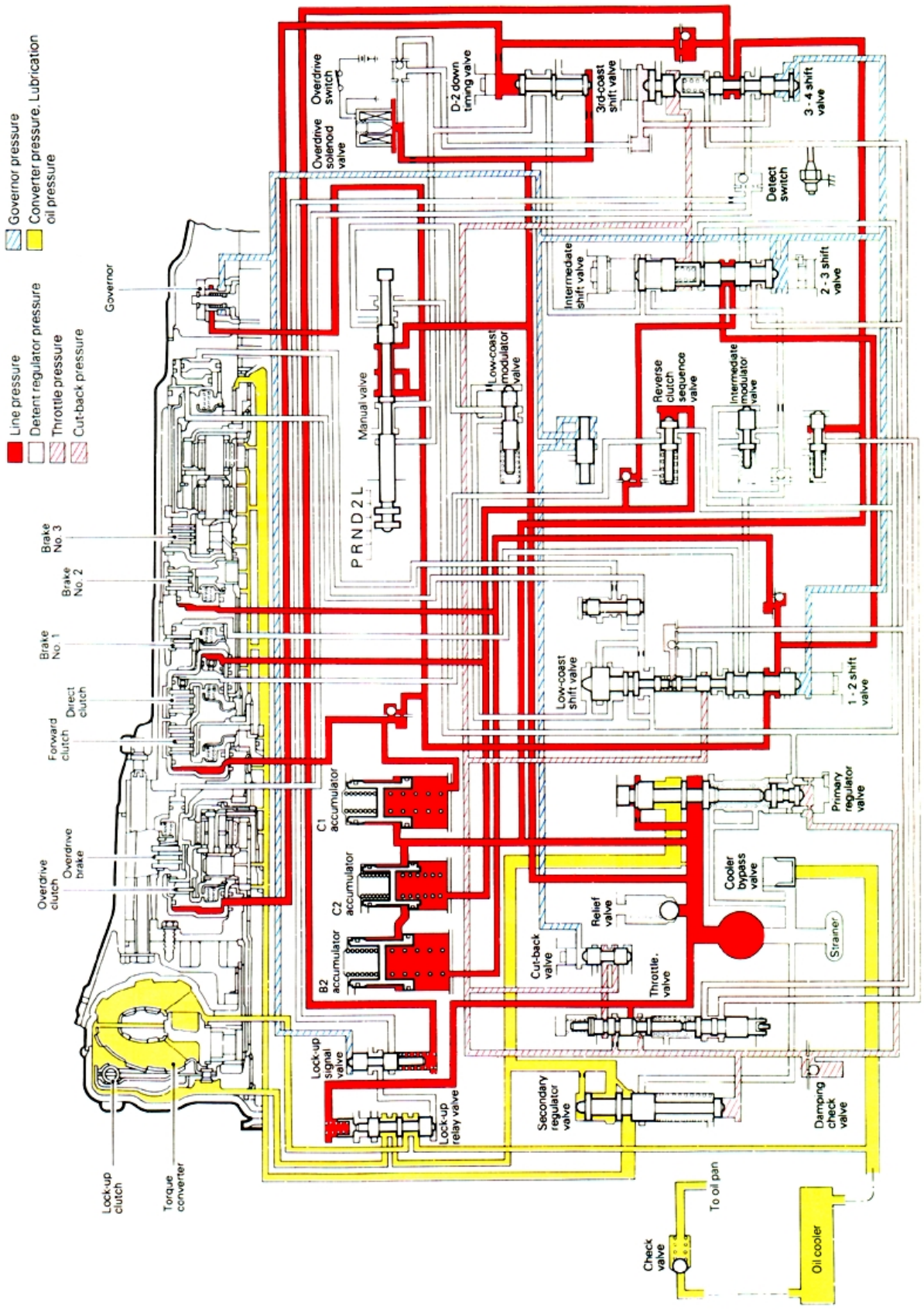


D-K/D (DRIVE KICK DOWN)

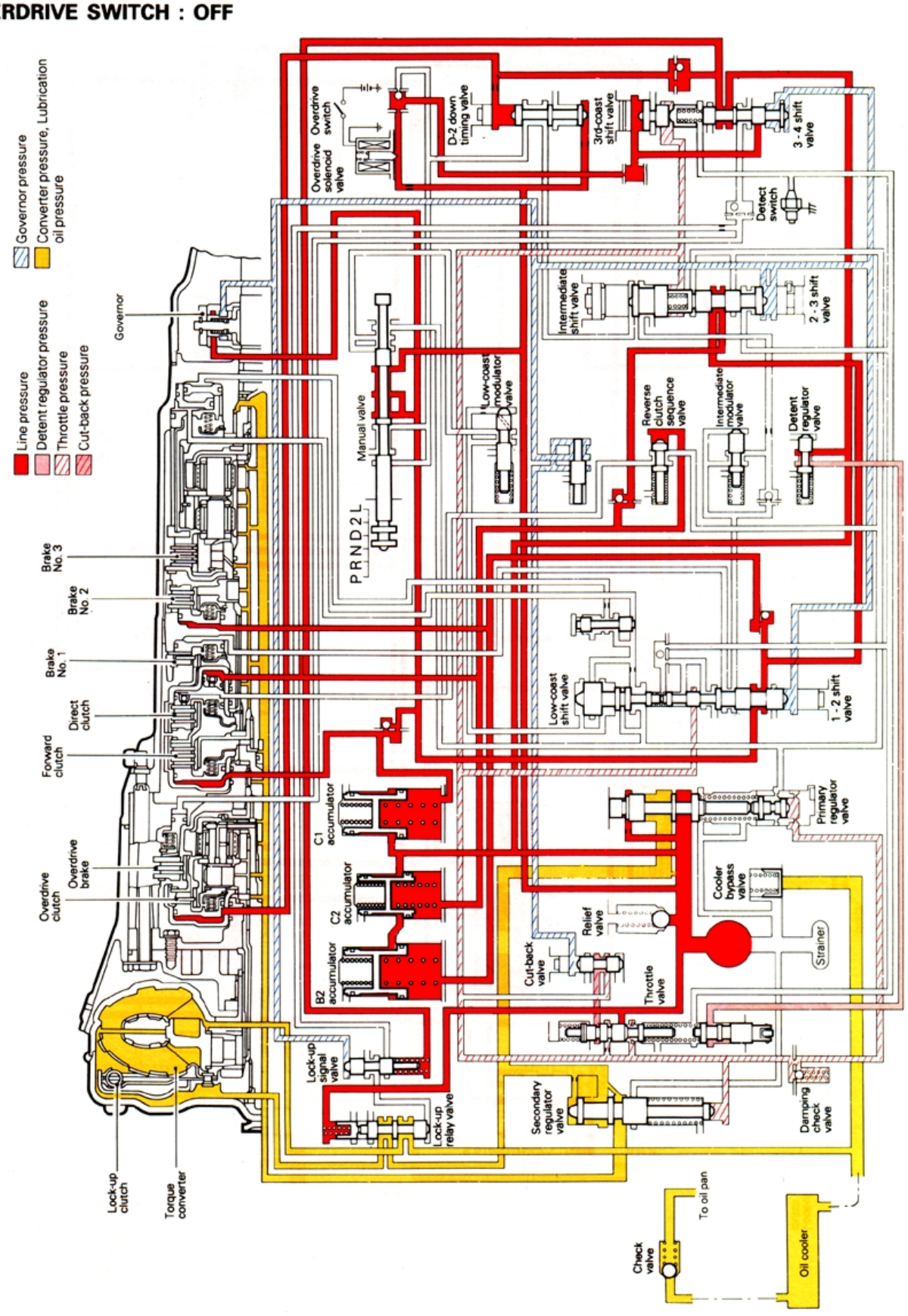
4TH ➡ 3RD

TRA0245



D-3 (DRIVE 3RD)

OVERDRIVE SWITCH : OFF



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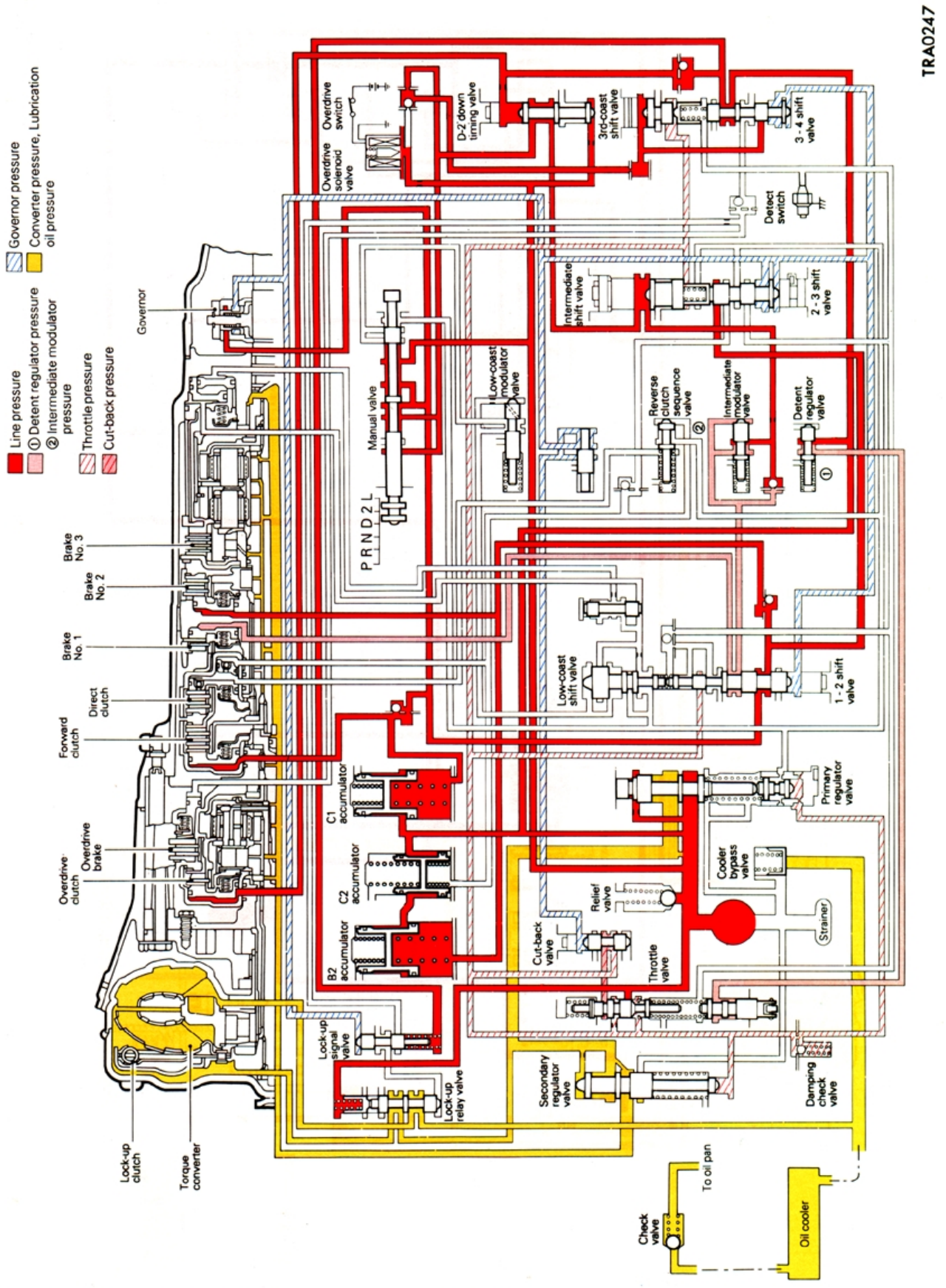

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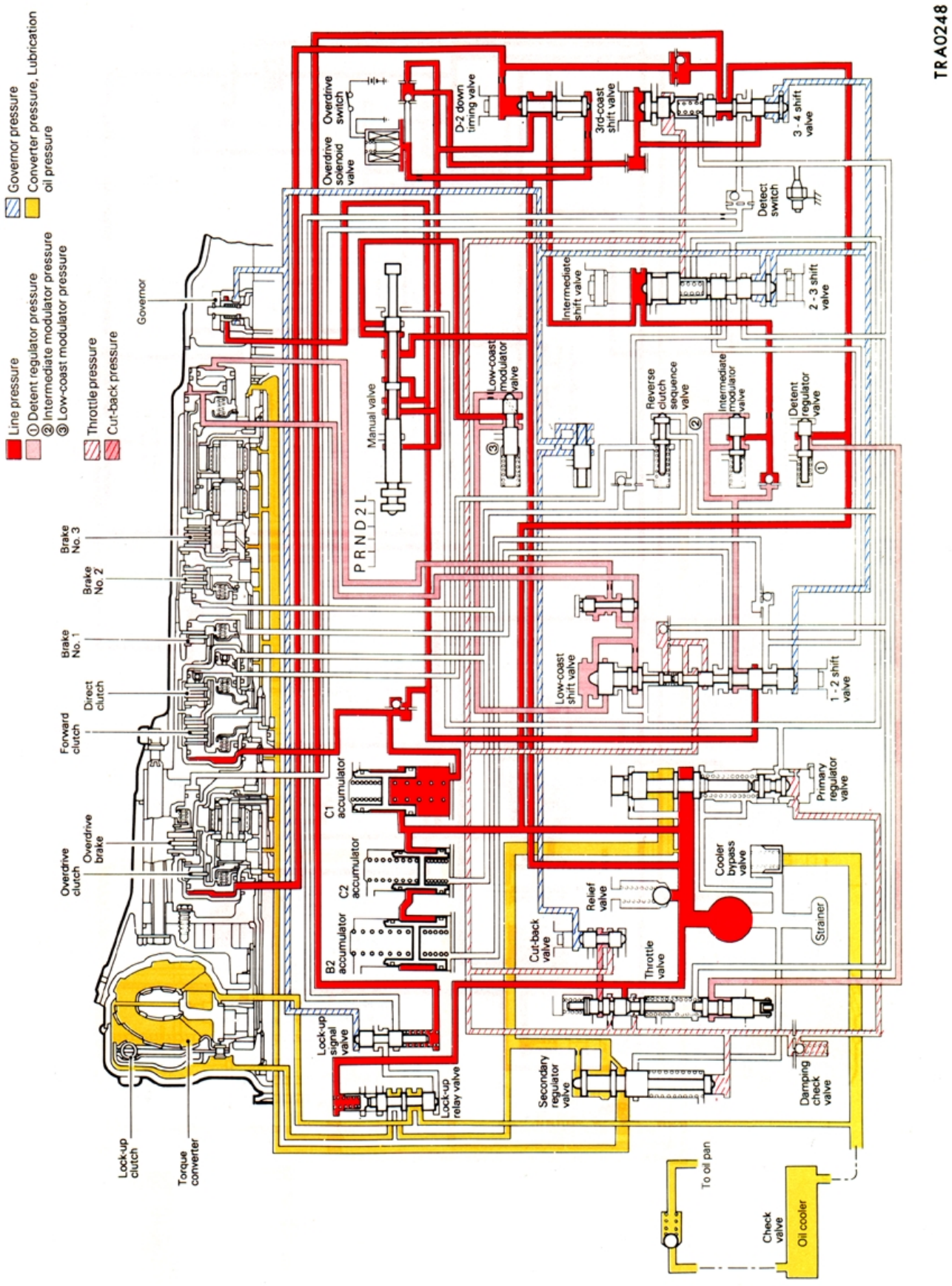

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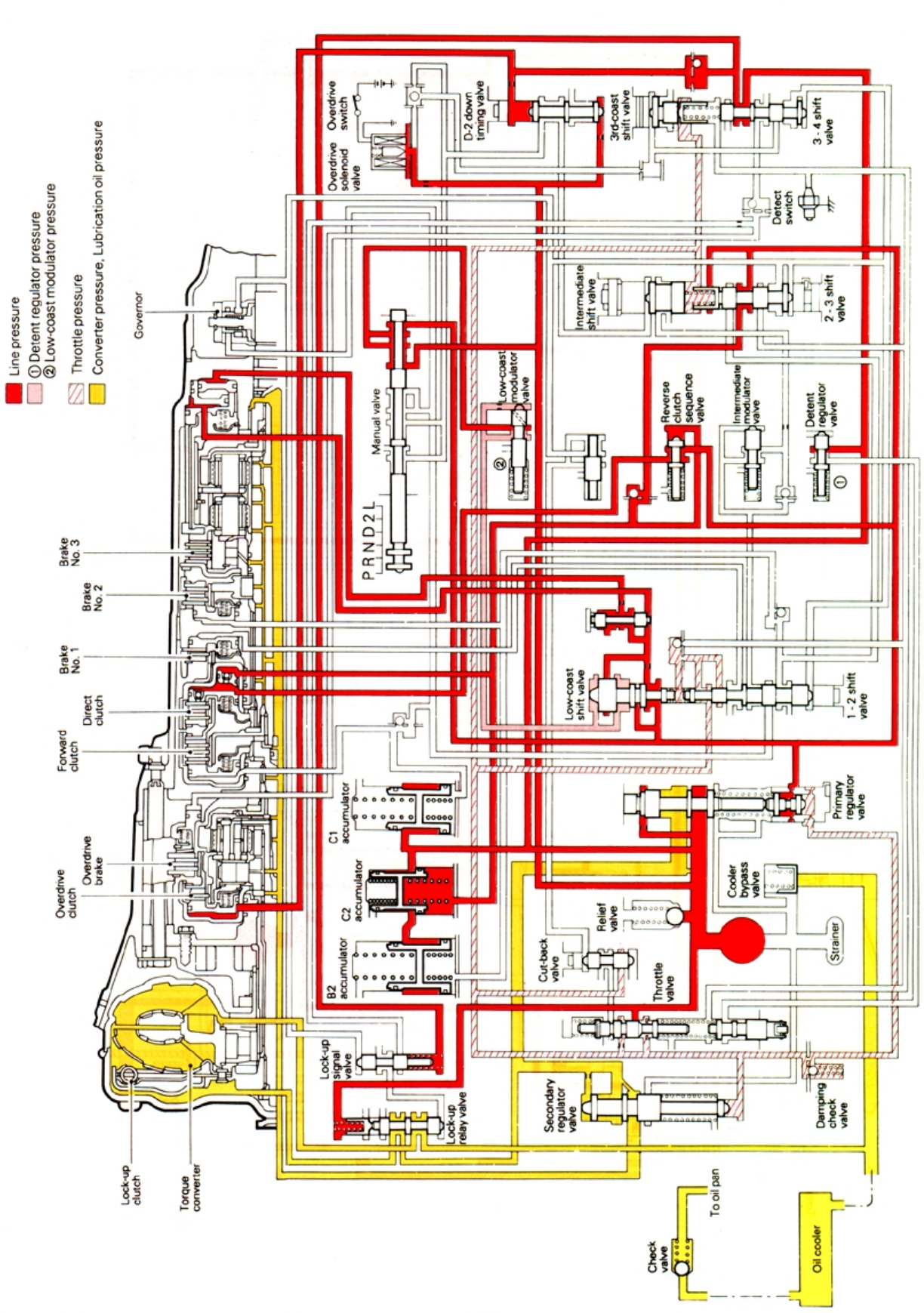

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HYDRAULIC CIRCUIT <V4AW2-3-Q>

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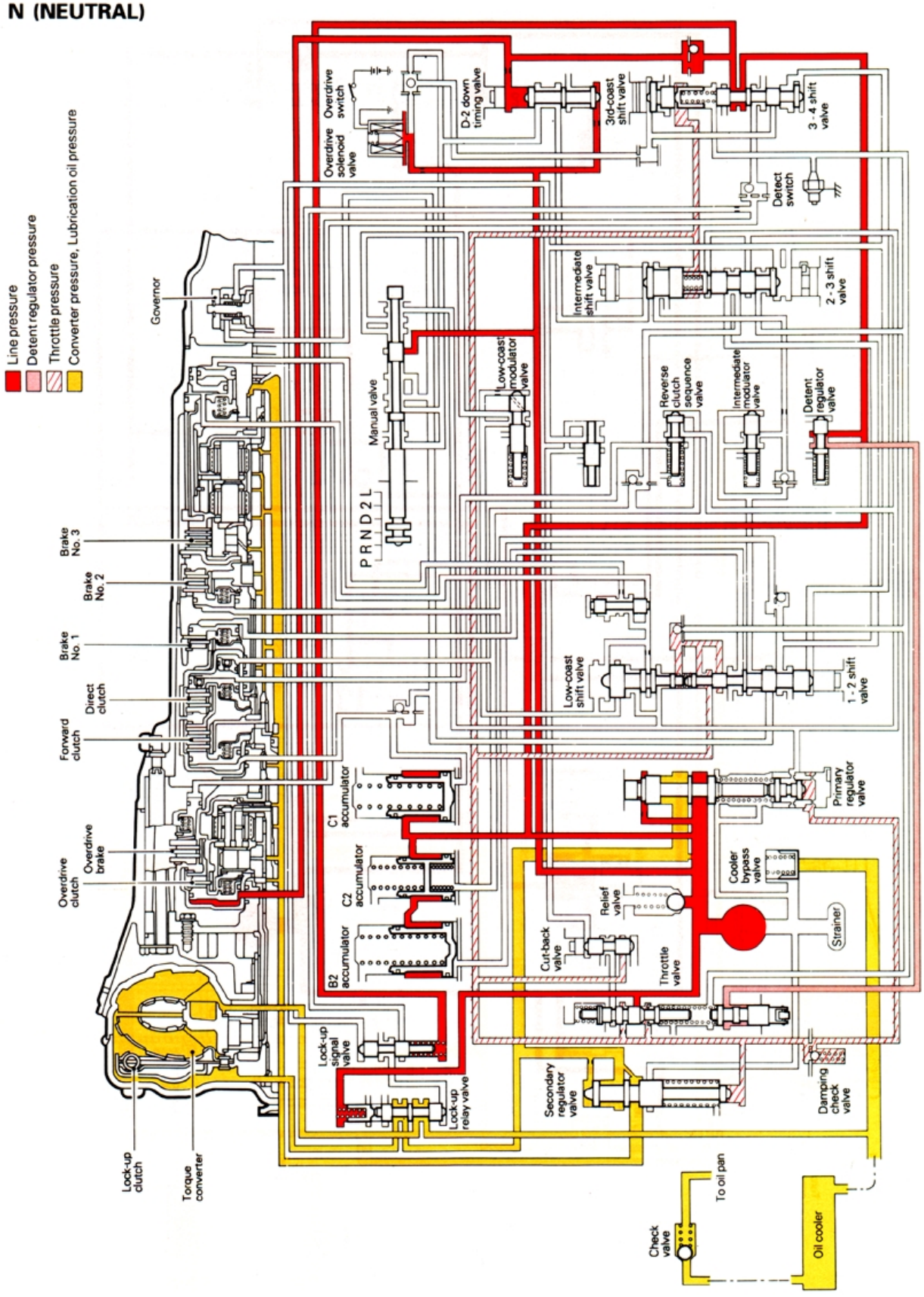

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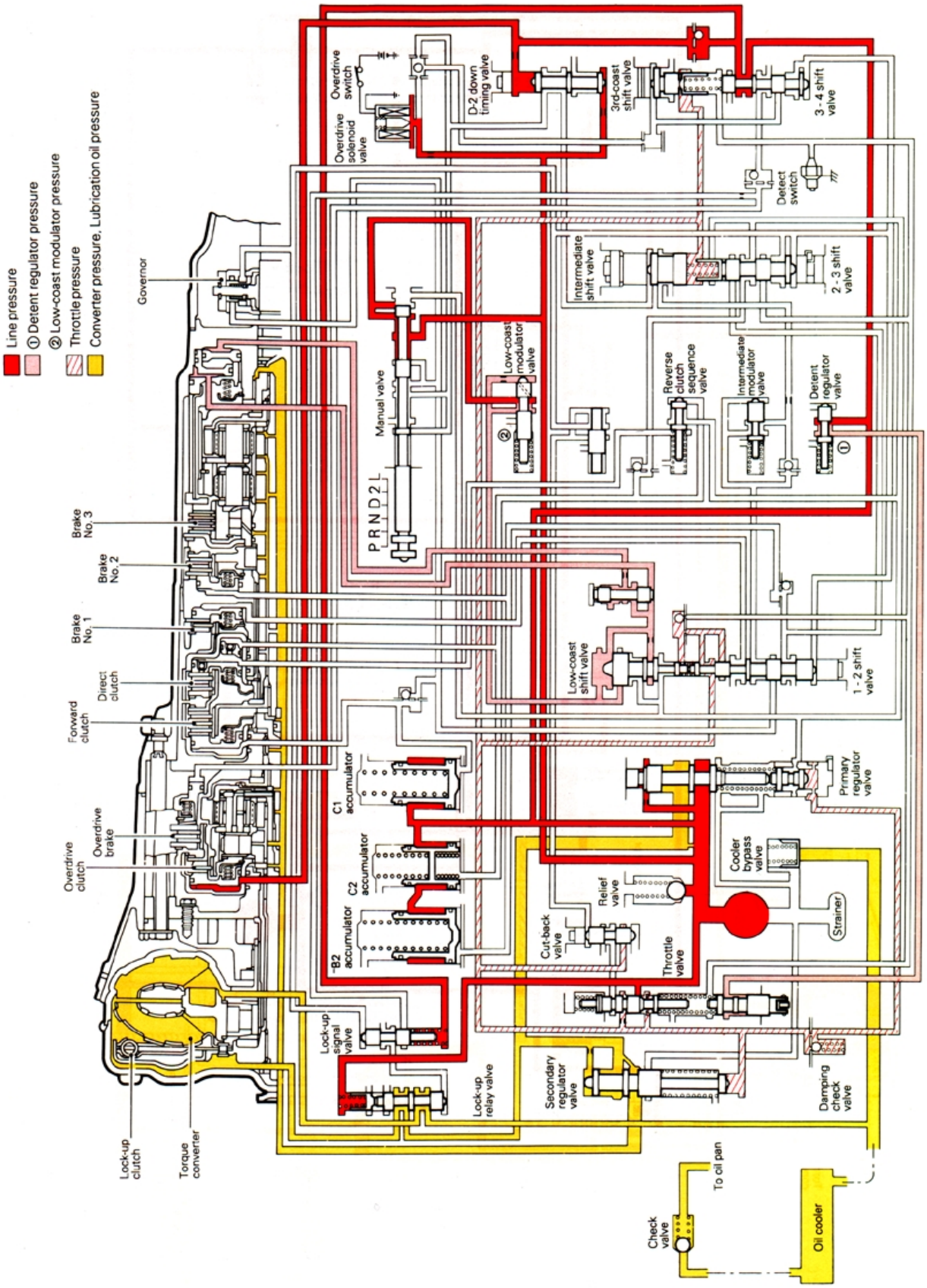

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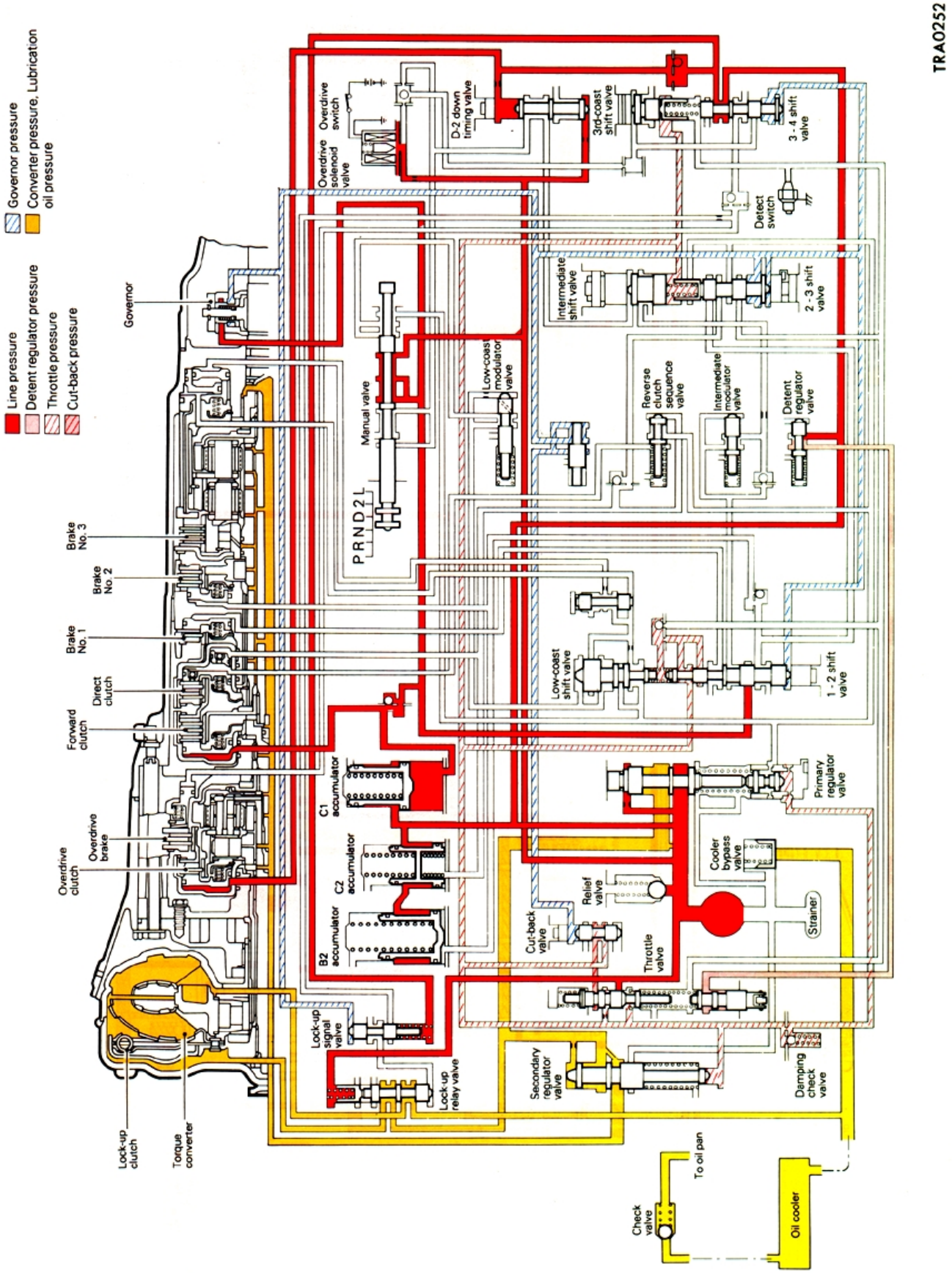

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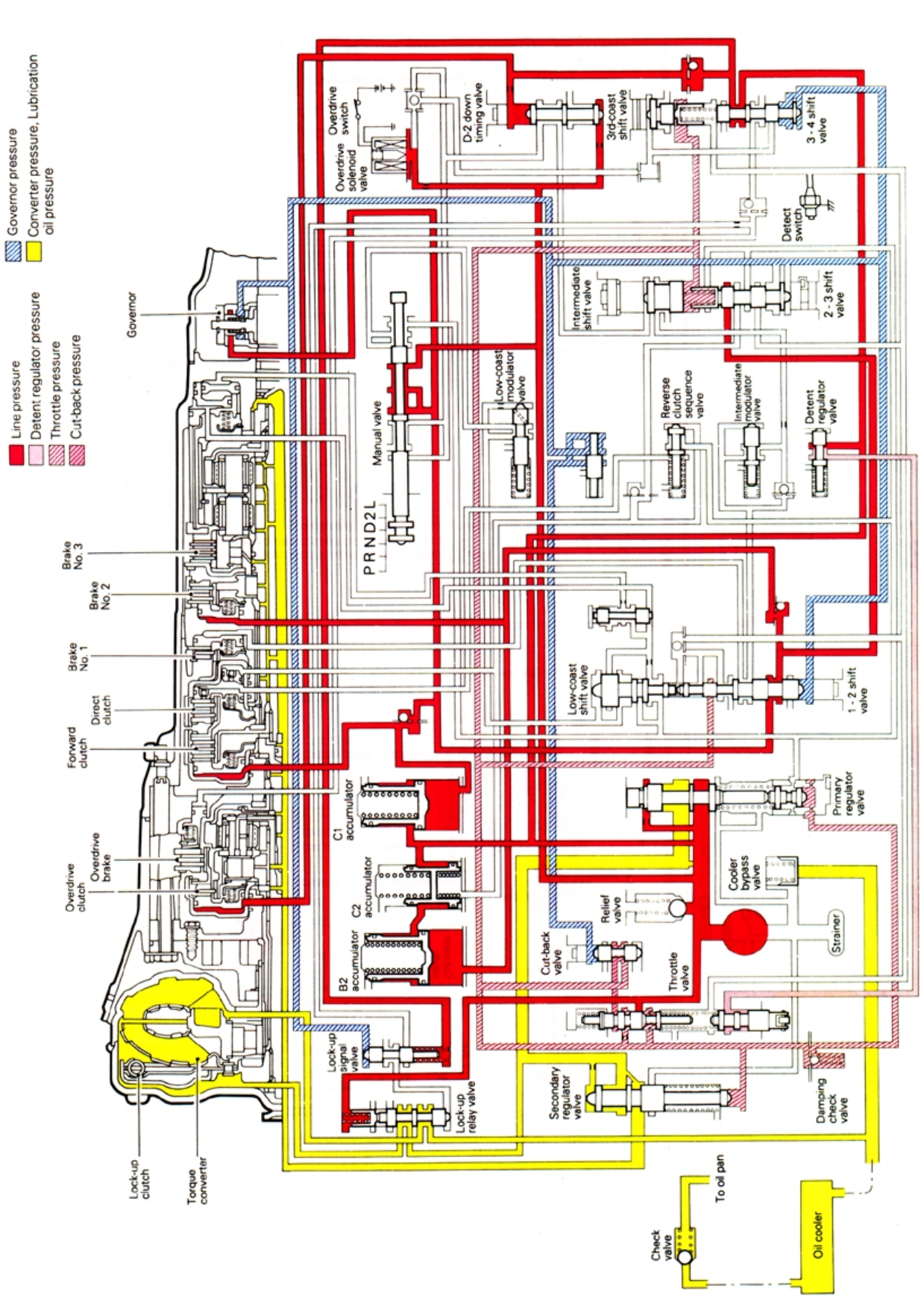

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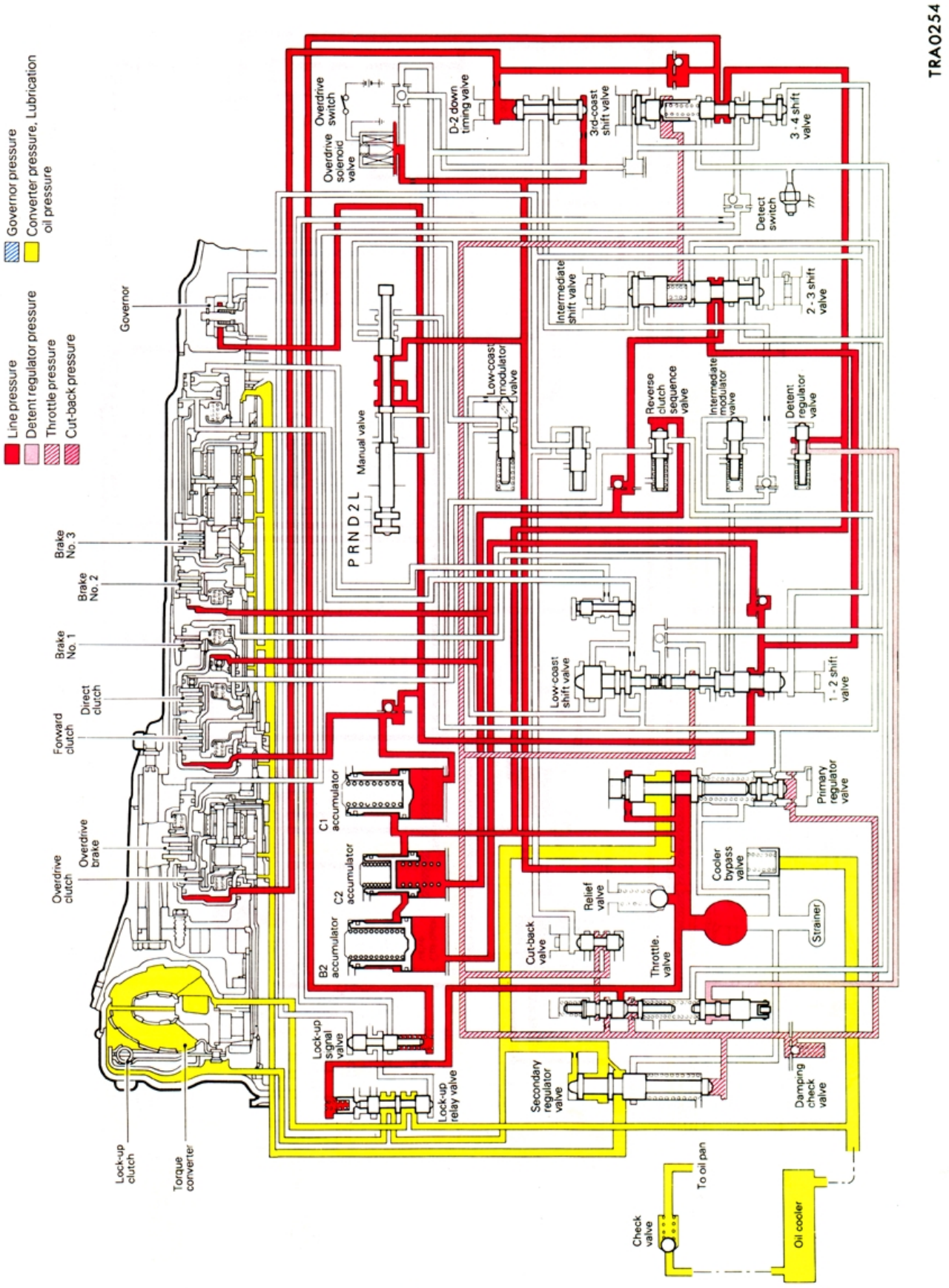

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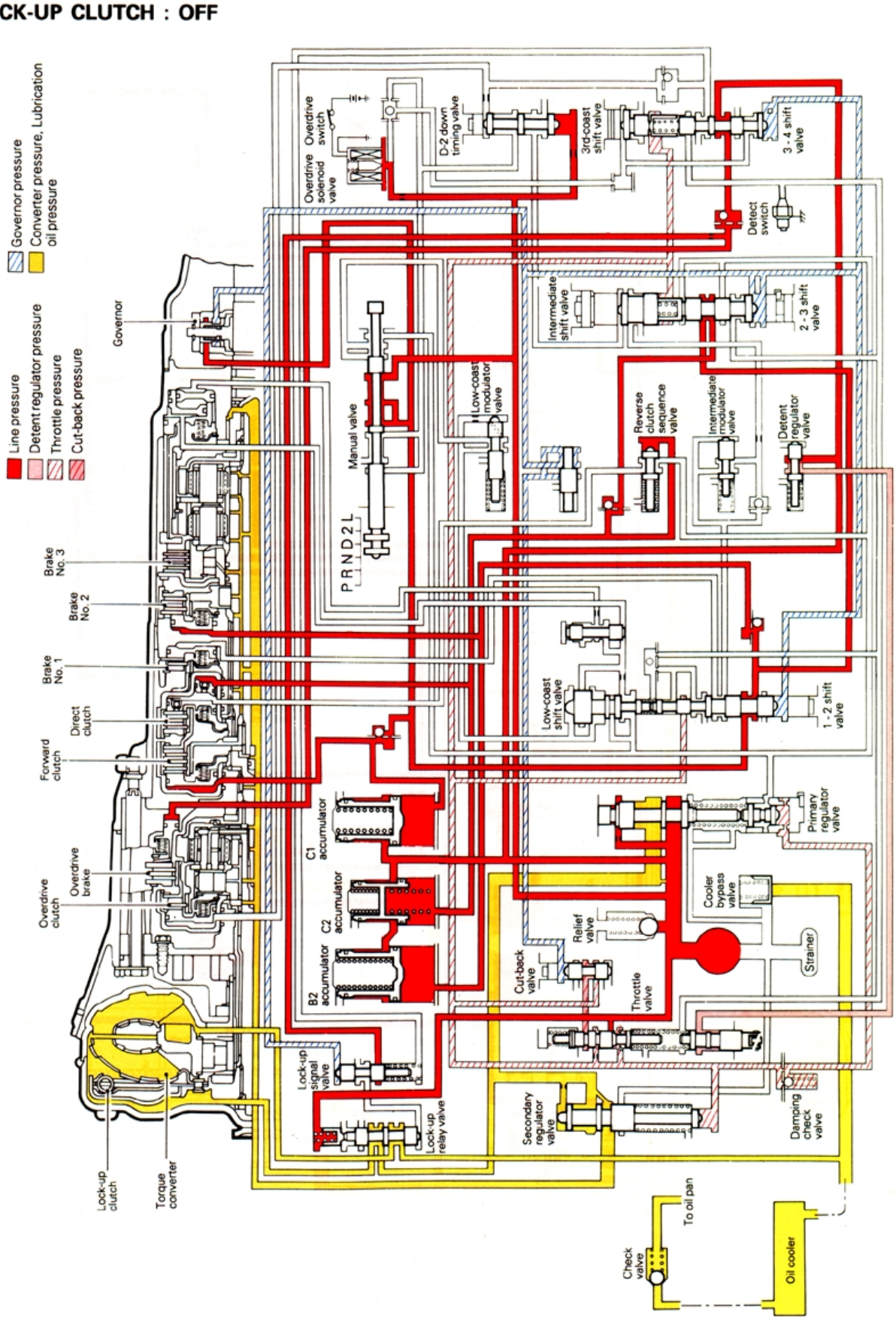

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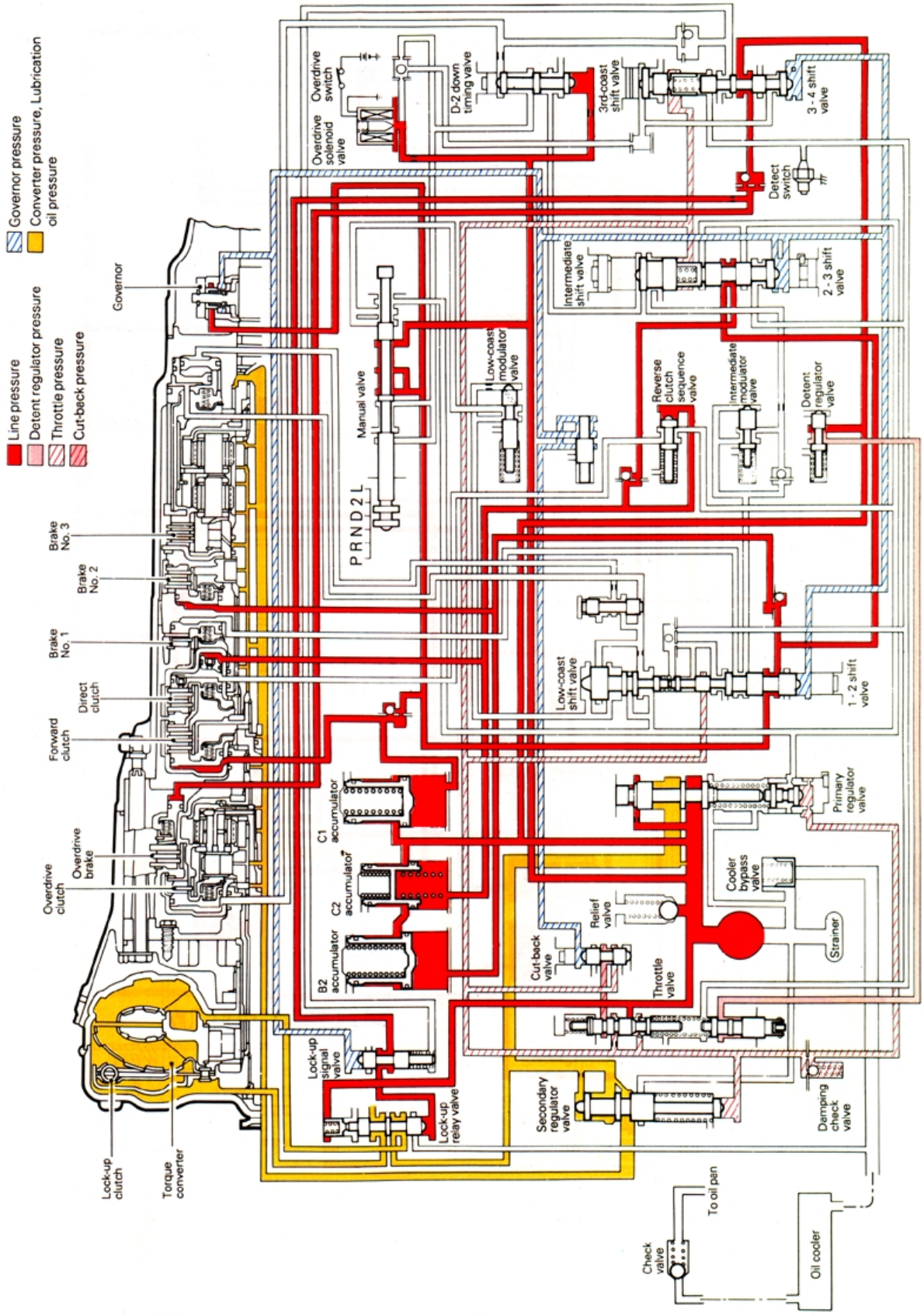
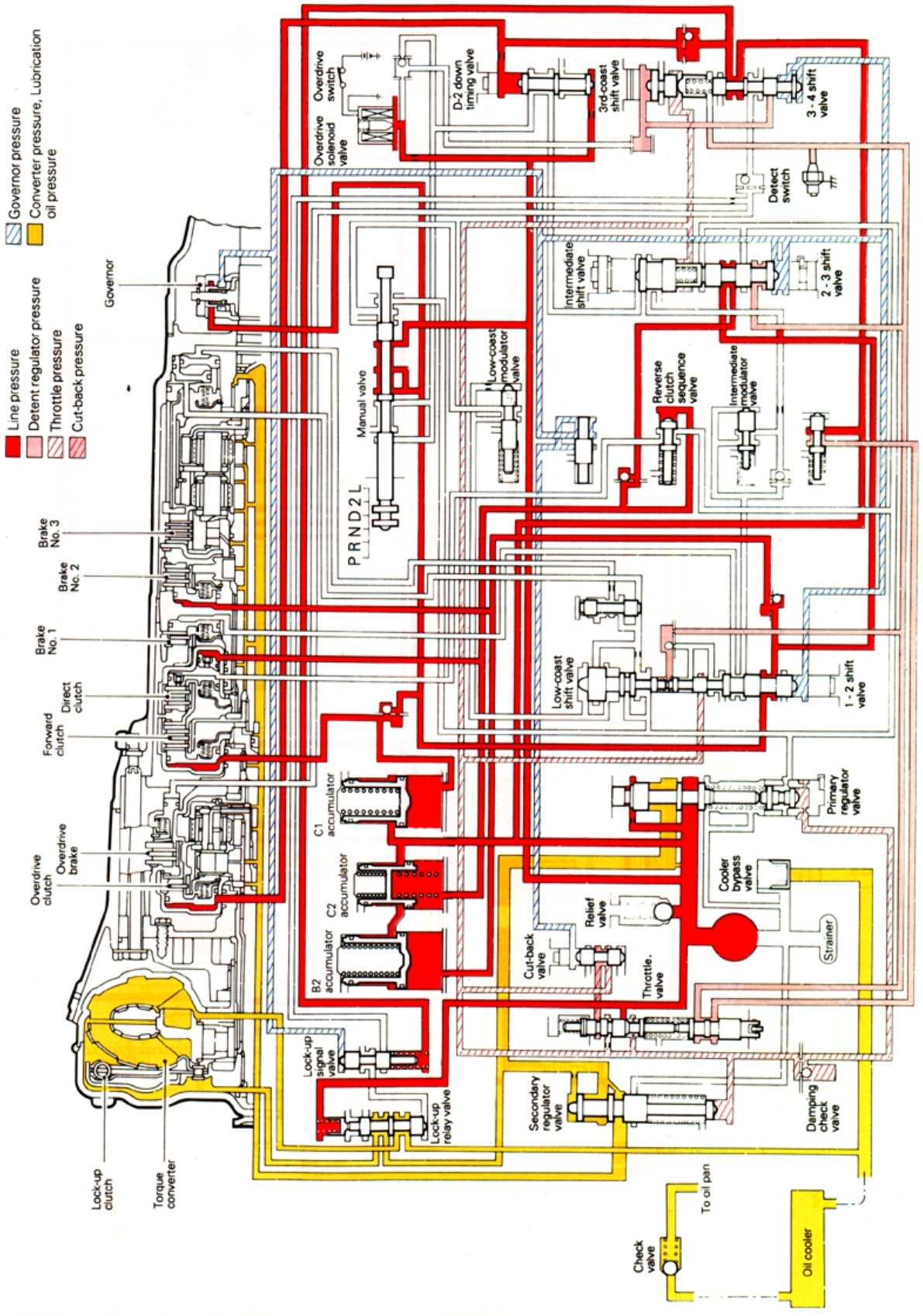


D-K/D (DRIVE KICK DOWN)

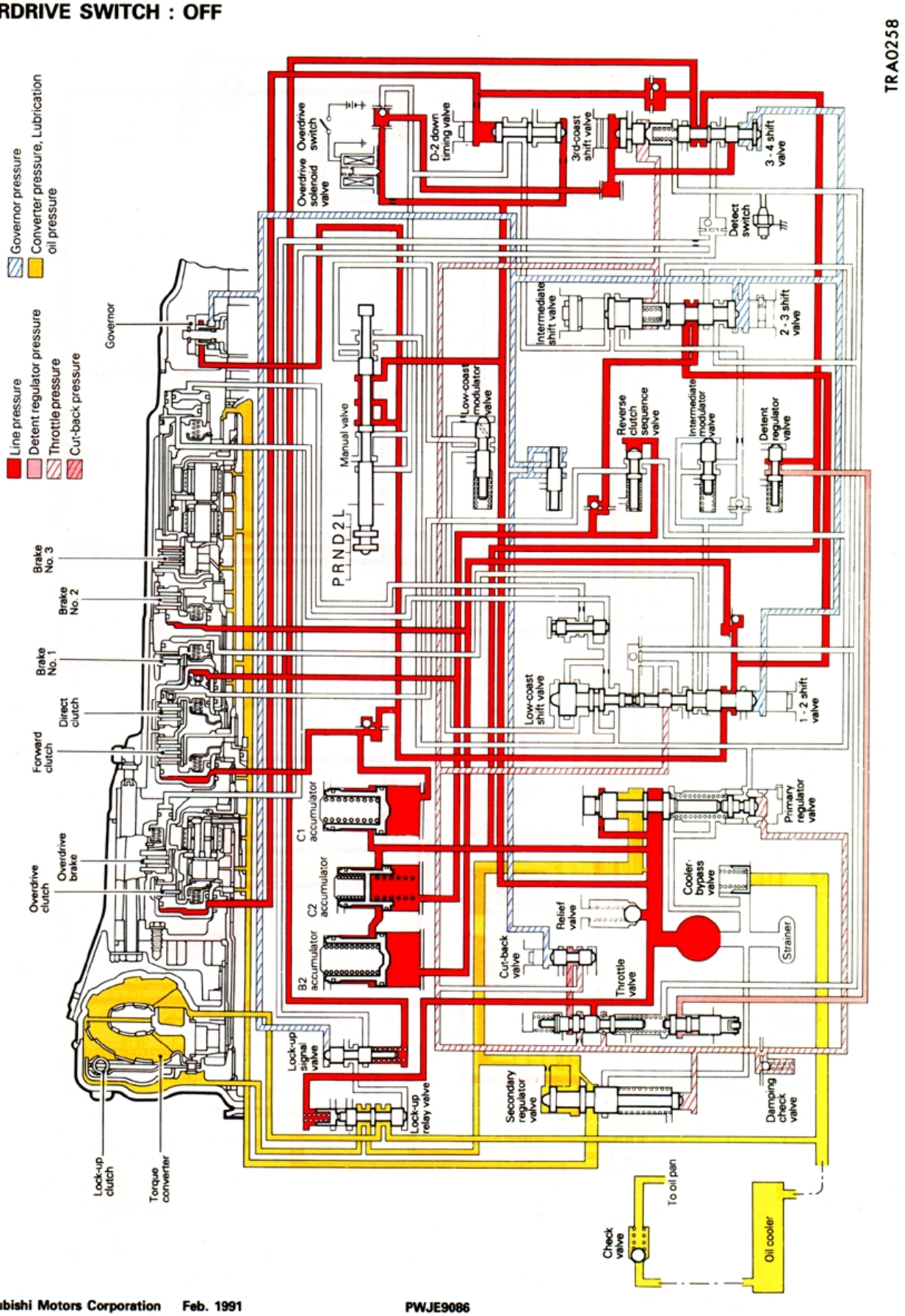
4TH ➡ 3RD

TRA0257



D-3 (DRIVE 3RD)

OVERDRIVE SWITCH : OFF



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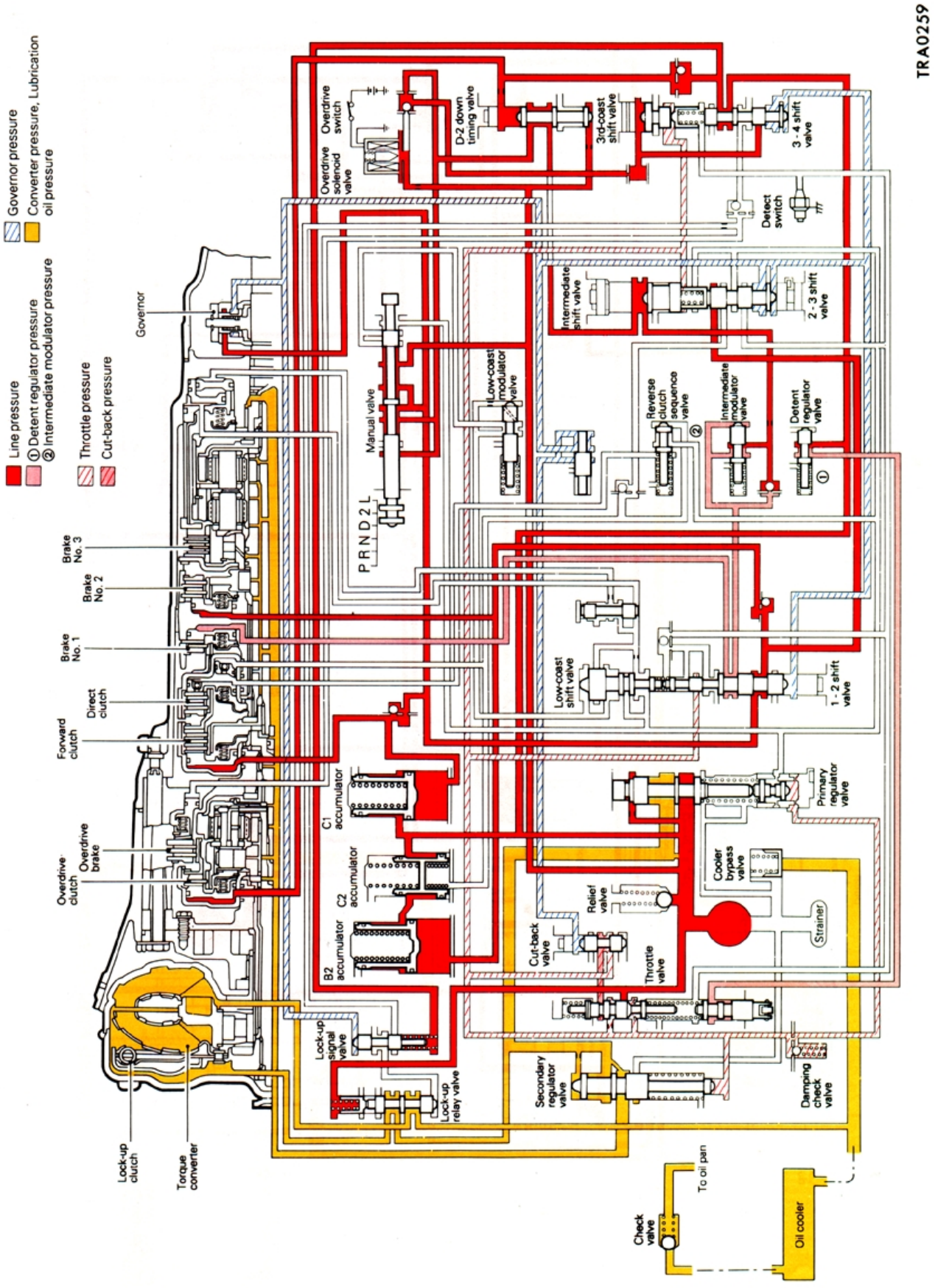

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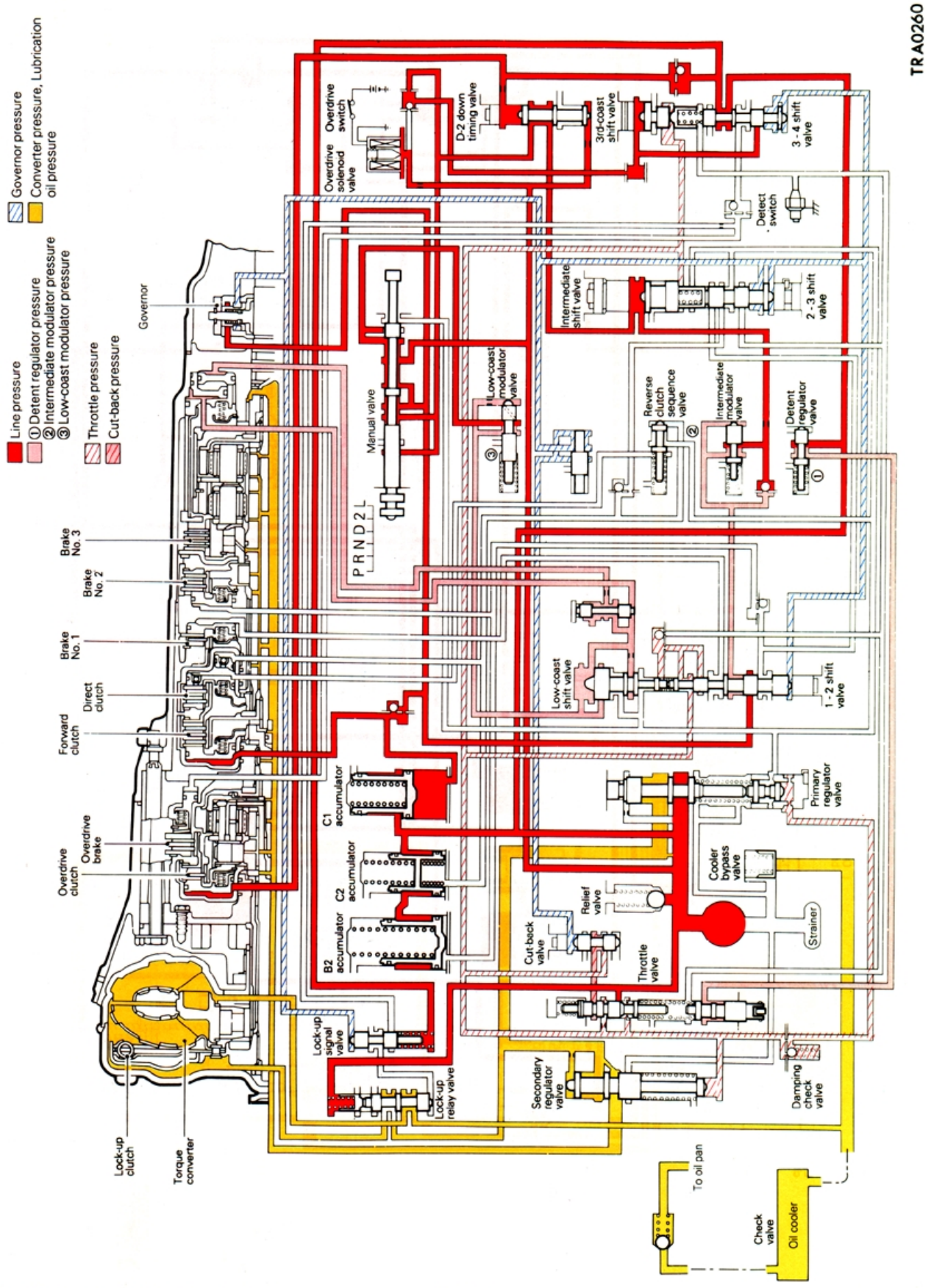

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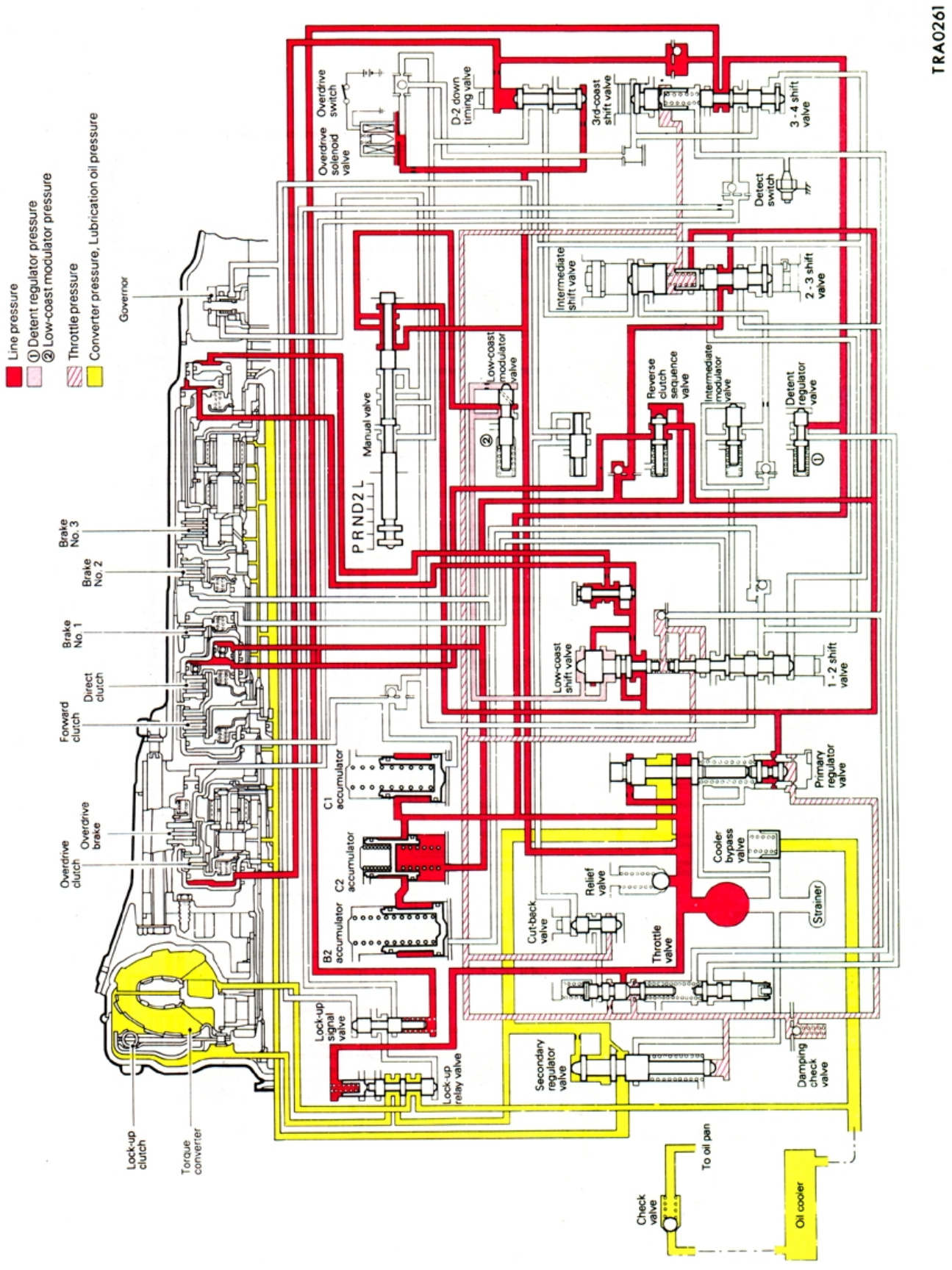

HYDRAULIC CIRCUIT <V4AW3>

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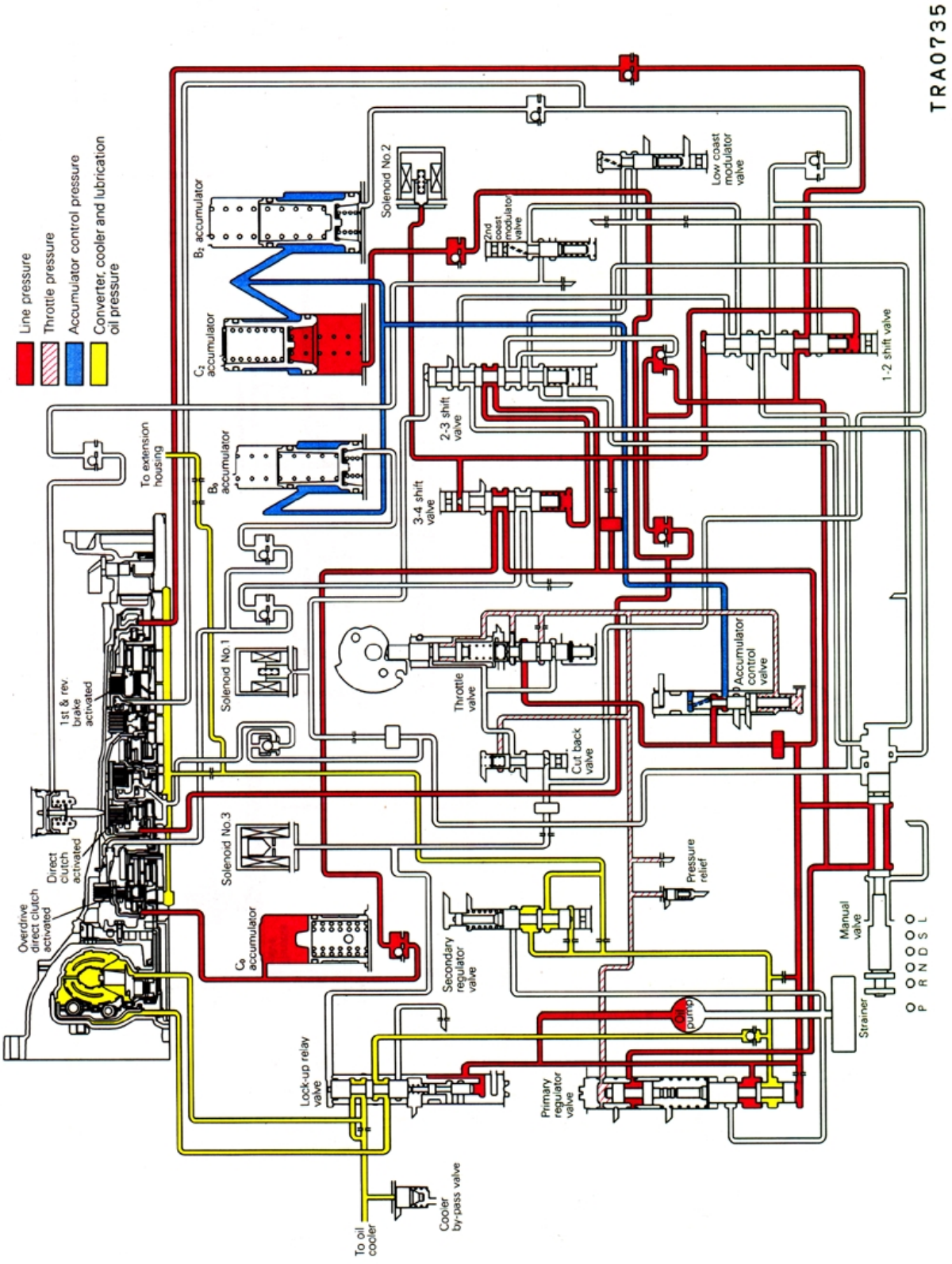

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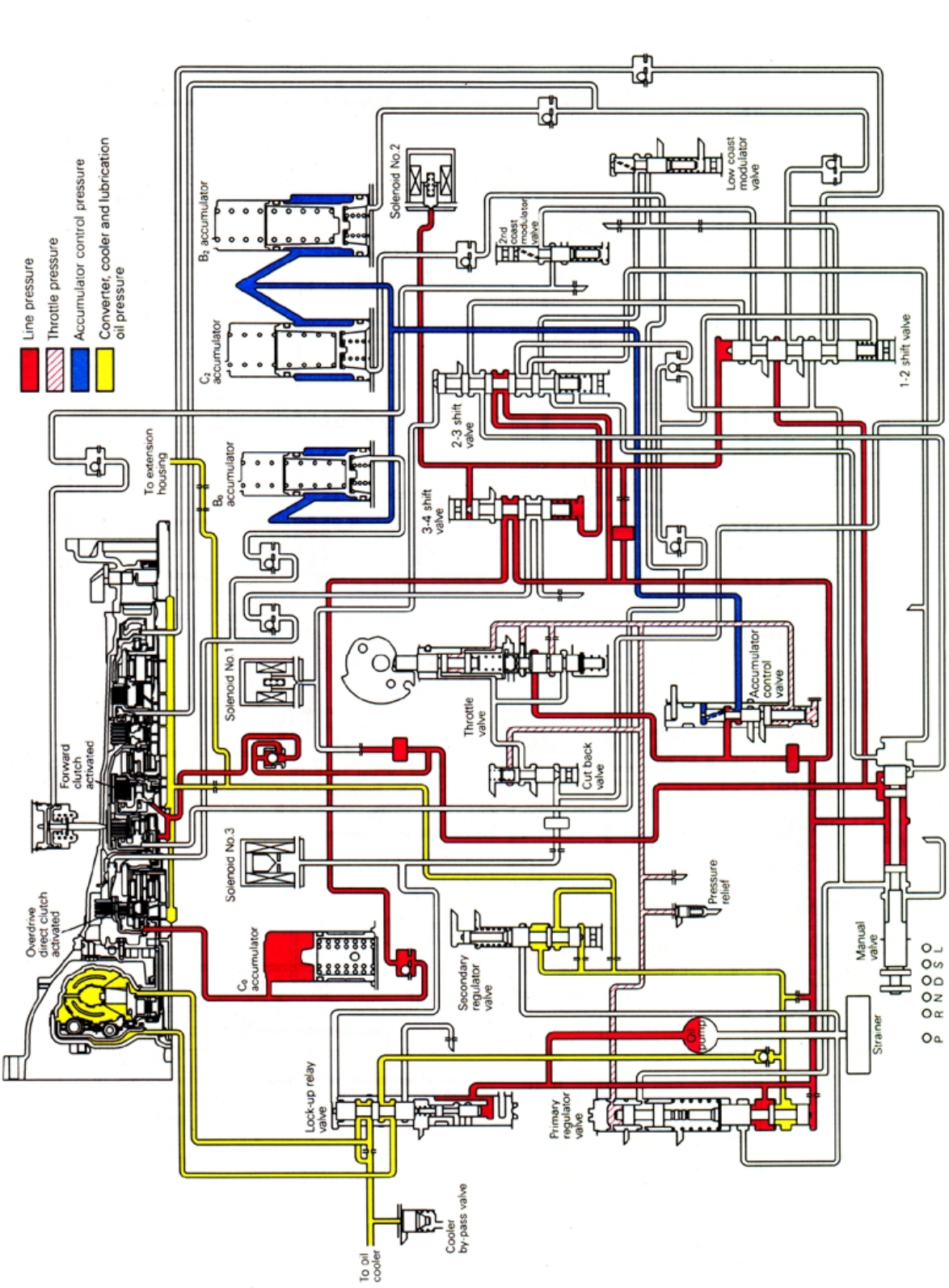

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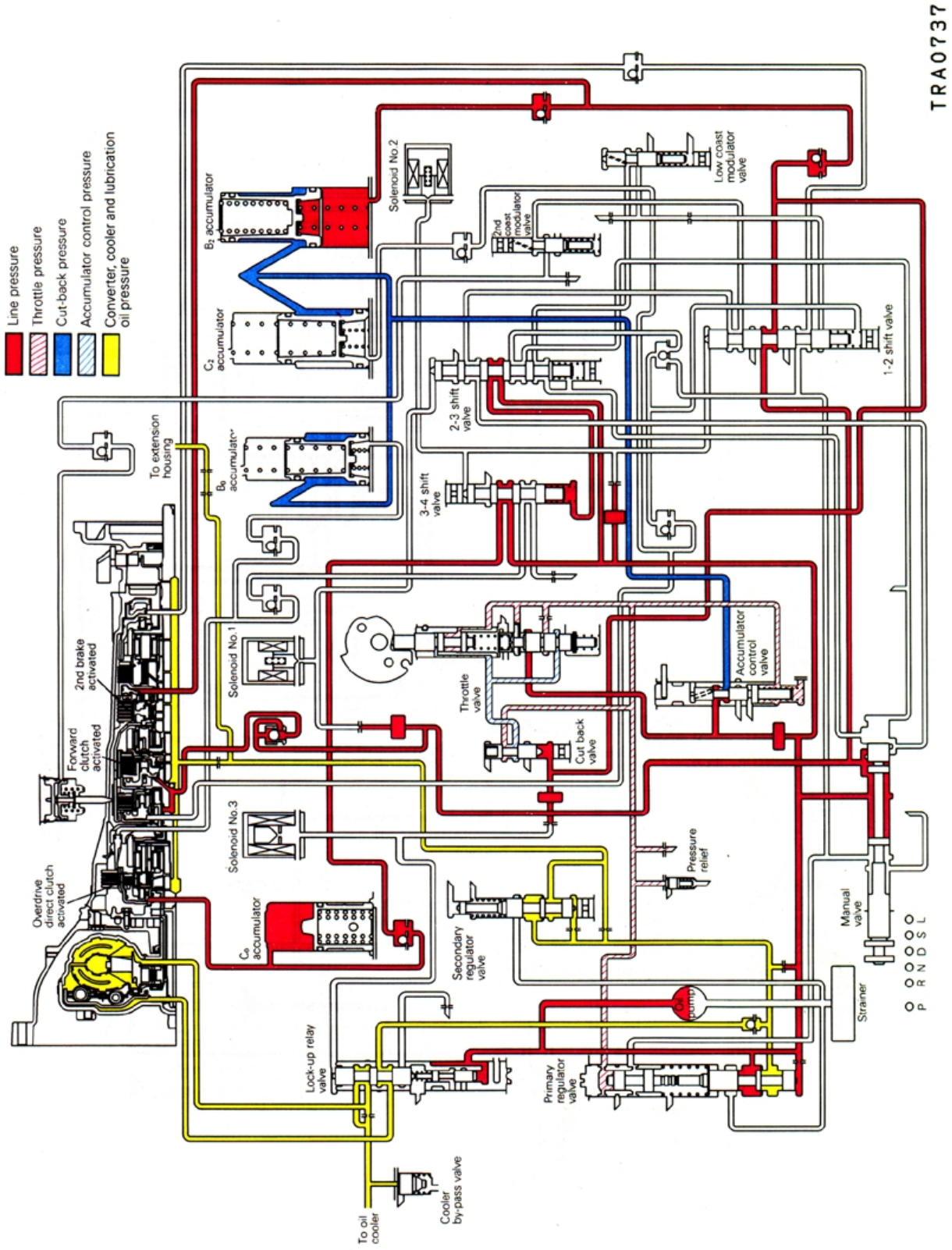
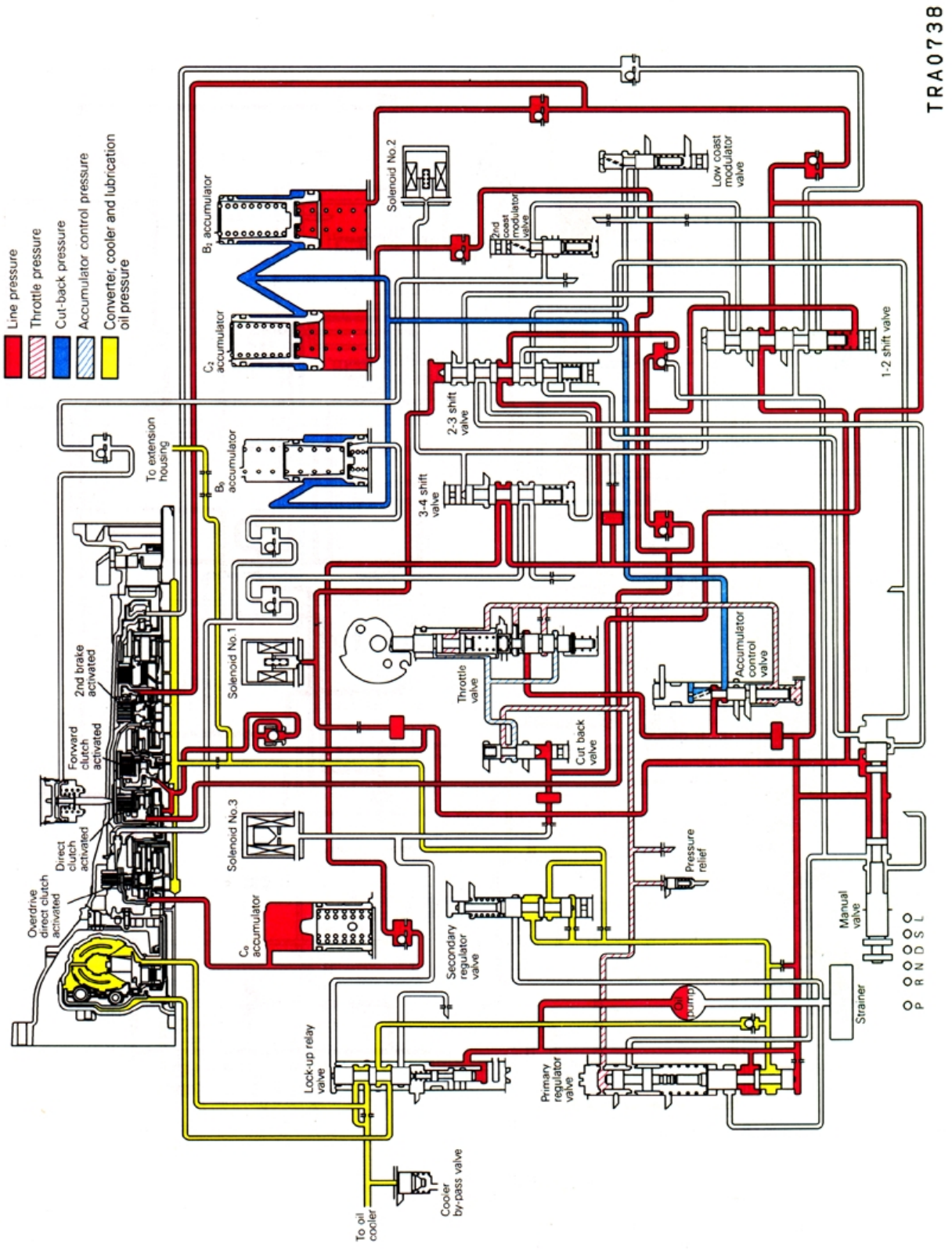


(4) D-3 (DRIVE 3RD)



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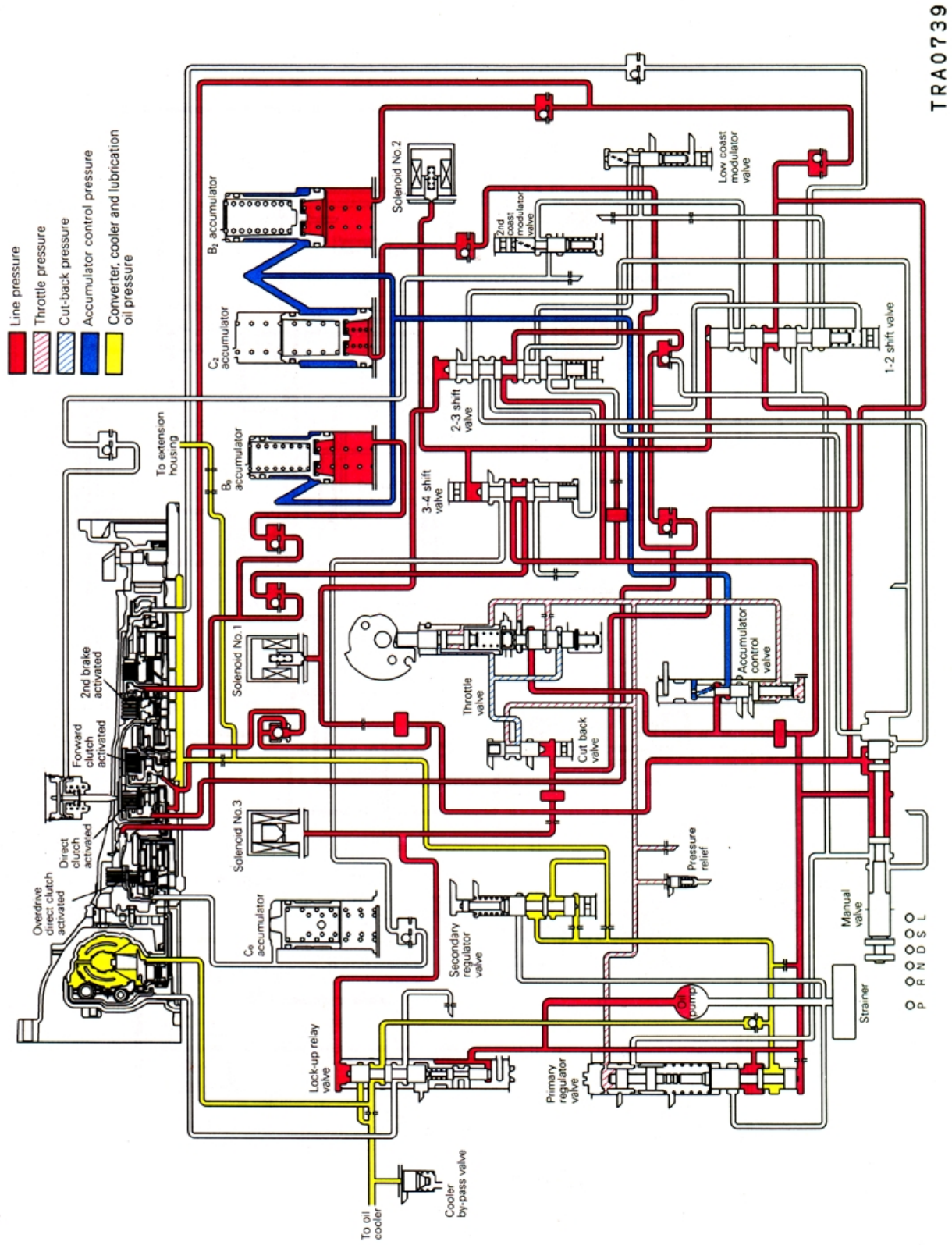
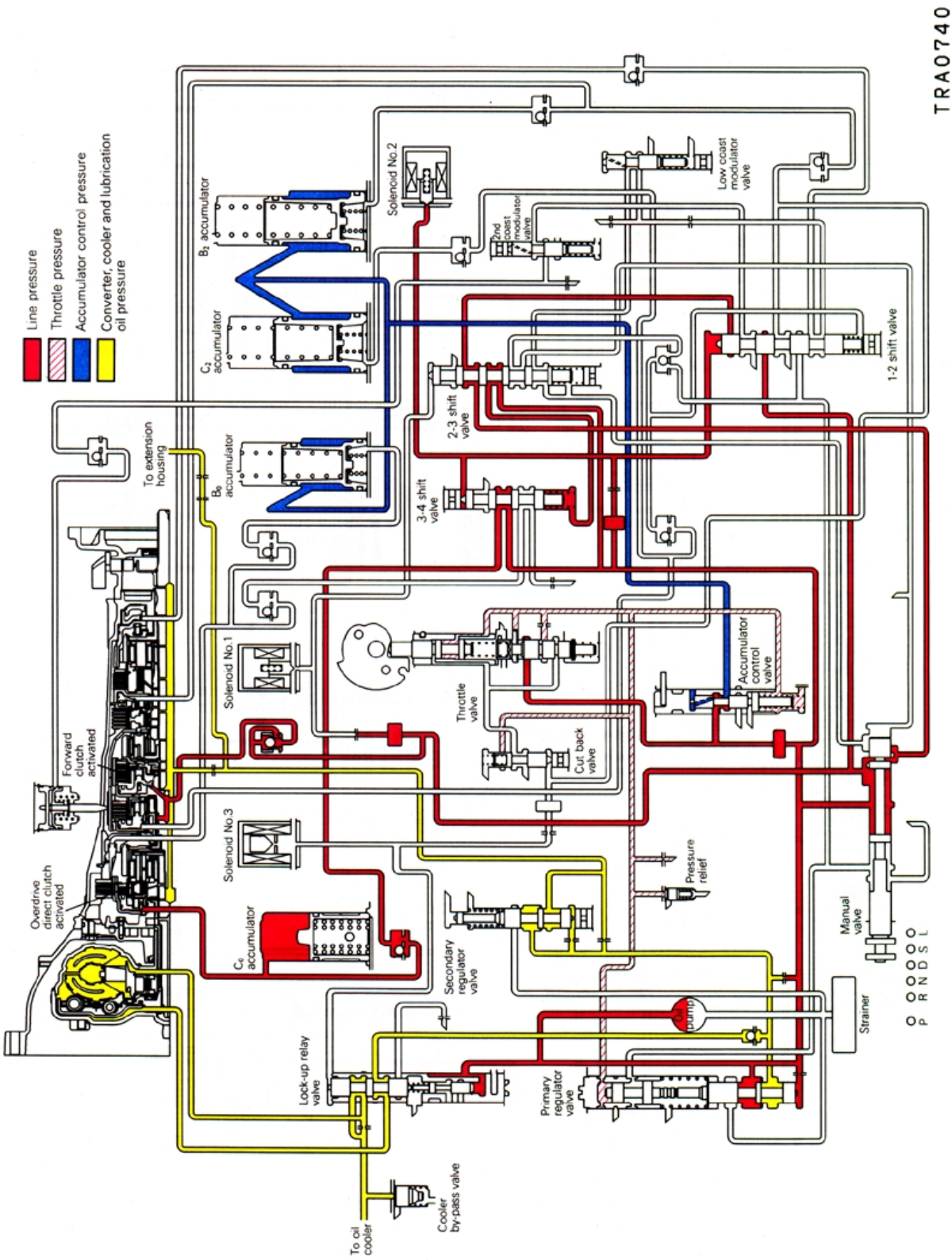


(6) 2-1 (SECOND 1ST)



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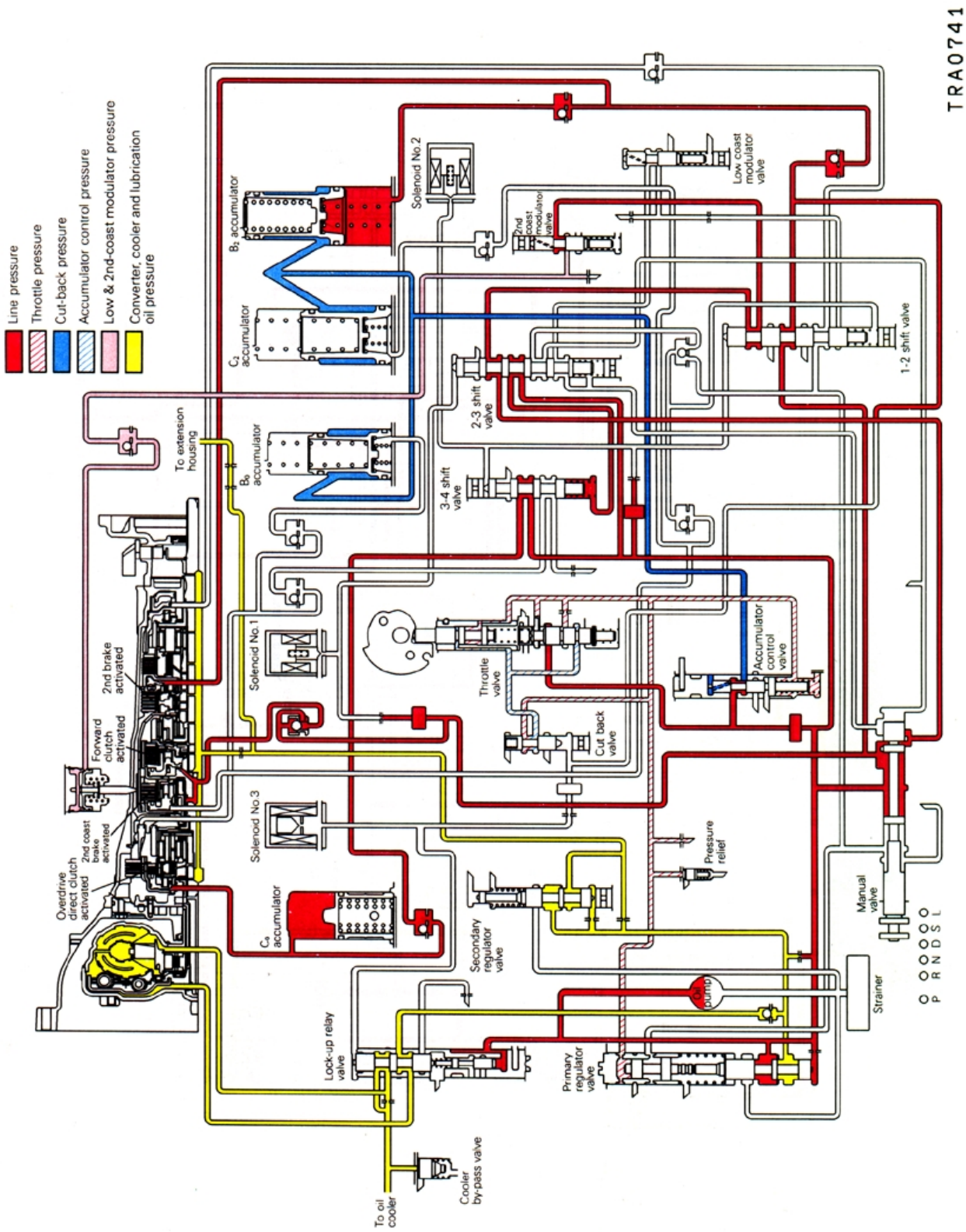
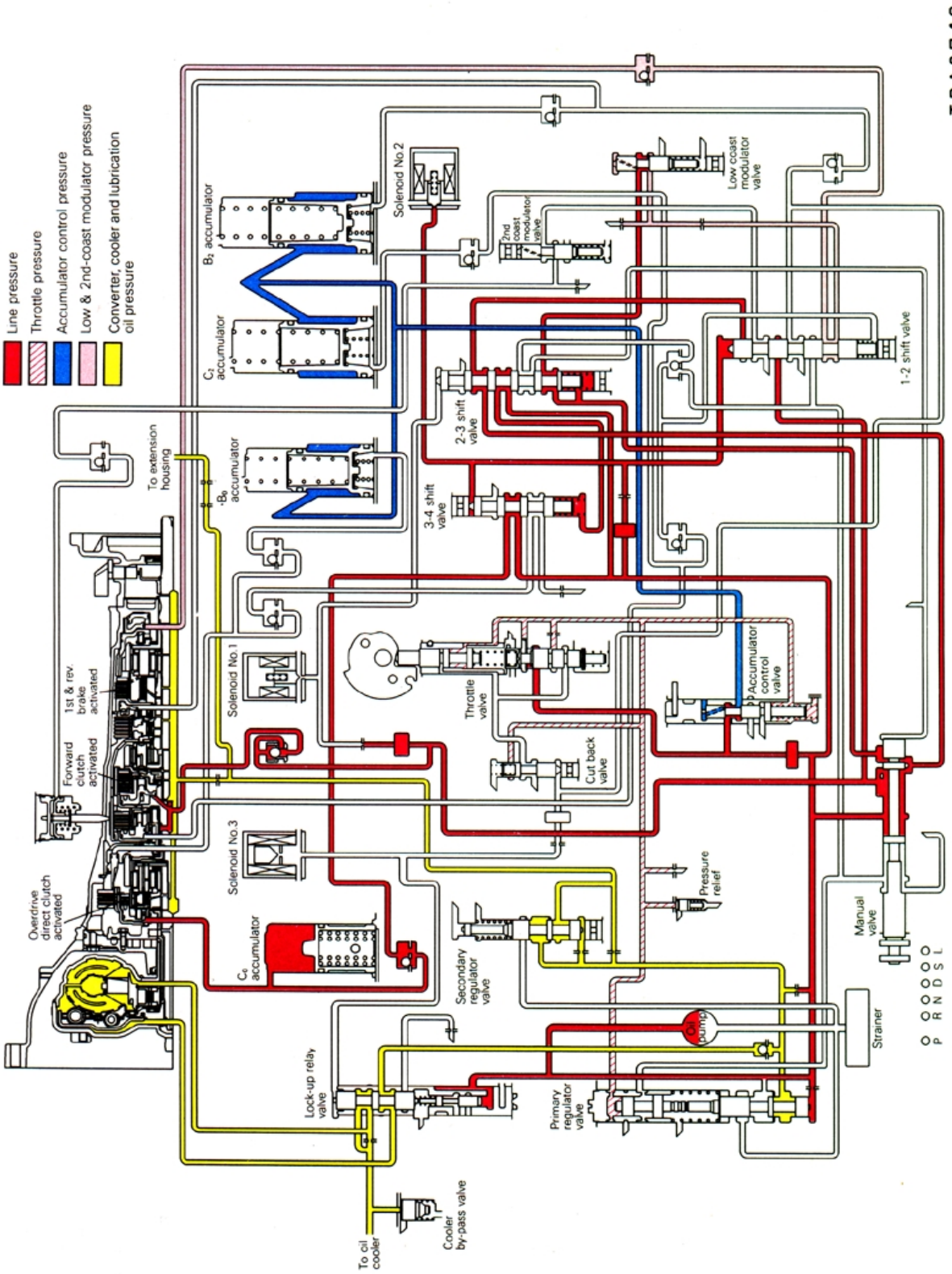


(8) L (1ST)



NOTES

NOTES

SPECIFICATIONS

TRANSMISSION MODEL TABLE

E23CF--

Transmission model	Gear ratio	Speedometer gear ratio	Vehicle model	Engine model (Engine displacement)
V4AW2-3-LFP	B	26/8	V23W, V43W	6G72–12 valve (3000–12V)
V4AW2-3-LFPL	B	26/8	V23C, V23W, V43W	6G72–12 valve (3000–12V)
V4AW2-3-QGP	A	27/8	V44W	4D56 (2500D)
V4AW2-3-QGPL	A	27/8	V44W	4D56 (2500D)
V4AW2-3-QHP	A	28/8	V44W	4D56 (2500D)
V4AW2-3-QHPL	A	28/8	V44W	4D56 (2500D)
V4AW2-7-LFP	B	26/8	V23W, V43W	6G72–12 valve (3000–12V)
V4AW2-7-LFPL	B	26/8	V23C, V23W, V43W	6G72–12 valve (3000–12V)
V4AW3-7-LI	C	29/8	V23W, V43W	6G72–24 valve (3000–24V)
V4AW3-7-LIL	C	29/8	V23C, V23W, V43W	6G72–24 valve (3000–24V)
V4AW3-7-MH	C	28/9	V25W, V45W	6G74 (3500)
V4AW3-7-MHL	C	28/9	V25W, V45W	6G74 (3500)
V4AW3-7-UI	D	29/9	V46W	4M40 (2800D)
V4AW3-7-UIL	D	29/9	V46W	4M40 (2800D)
V4AW3-7-UJ	D	30/9	V46W	4M40 (2800D)
V4AW3-7-UJL	D	30/9	V46W	4M40 (2800D)

GEAR RATIO TABLE

E23CG--

	A	B	C	D
1st	2.826	2.826	2.804	2.804
2nd	1.493	1.493	1.531	1.531
3rd	1.000	1.000	1.000	1.000
4th	0.688	0.730	0.754	0.705
Reverse	2.703	2.703	2.393	2.393

GENERAL SPECIFICATIONS

E23CA--

Items	V4AW2-3	V4AW3-7
Torque converter		
Type	3 elements, 1-step 2-phase system with lock-up clutch	3 elements, 1-step 2-phase system with lock-up clutch
One-way clutch	Sprag type	Sprag type
Transmission		
Type	4 speed full automatic	Electronically controlled 4 speed full automatic
Control elements		
Clutch	Multiple disc type 3 pairs	Multiple disc type 3 pairs
Brake	Multiple disc type 4 pairs	Multiple disc type 3 pairs
One-way clutch	Sprag type 3 pairs	Sprag type 3 pairs
Shift control method	Floor shift type	Floor shift type
Select pattern	P-R-N-D-2-L and overdrive switch	P-R-N-D-2-L and overdrive switch
Oil pump		
Type	Gear type	Gear type
Drive system	Directly coupled to engine via torque converter	Directly coupled to engine via torque converter
Hydraulic control system	Throttle opening and vehicle speed detection	Electronically controlled
Oil-cooling system	Air-cooled and water-cooled type	Air-cooled and water-cooled type
Transfer		
Type	2 speed	2 speed
Shift control method	Floor-shift type	Floor-shift type
Gear ratios		
LOW	1.925	1.925
HIGH	1.000	1.000

NOTES

SERVICE SPECIFICATIONS

E23CB--

Items	3000–12V	2500D
Stall speed (r/min)	2,100–2,400	2,100–2,400
Governor pressure kPa (kg/cm^2, psi)		
1000 r/min	140–170 (1.4–1.7, 19.9–24.2)	110–140 (1.1–1.4, 15.6–19.9)
2000 r/min	250–290 (2.5–2.9, 35.6–41.2)	220–240 (2.2–2.4, 31.3–34.1)
3200 r/min	410–470 (4.1–4.7, 58.3–66.8)	410–470 (4.1–4.7, 58.3–66.8)
Line pressure kPa (kg/cm^2, psi)		
"D" range		
When idling	520–600 (5.2–6.0, 74–85)	450–510 (4.5–5.1, 64–72.5)
During stall	1100–1300 (11–13, 156–185)	1,120–1,320 (11.2–13.2, 159.3–187.7)
"R" range		
When idling	790–910 (7.9–9.1, 112–129)	620–700 (6.2–7.0, 88.2–99.5)
During stall	1600–2000 (16–20, 228–284)	1,500–1,900 (15–19, 213.3–270.2)
Dimensions of inner cable stopper and dust cover end mm (in.)	0–1 (0–0.04)	—
Dimensions of inner cable stopper and outer cable end mm (in.)	—	34–35 (1.34–1.38)
Clearance between sleeve and selector lever end mm (in.)	18.2–18.9 (0.717–0.744)	18.2–18.9 (0.717–0.744)

Items	3000–24V, 3500	2800D
Stall speed (r/min)	2,100–2,600	2,100–2,600
Governor pressure kPa (kg/cm^2, psi)		
1000 r/min	—	—
2000 r/min	—	—
3200 r/min	—	—
Line pressure kPa (kg/cm^2, psi)		
"D" range		
When idling	430–490 (4.3–4.9, 61–70)	430–490 (4.3–4.9, 61–70)
During stall	1,140–1,390 (11.4–13.9, 162–198)	1,350–1,600 (13.5–16.0, 192–228)
"R" range		
When idling	520–620 (5.2–6.2, 74–88)	530–630 (5.3–6.3, 75–90)
During stall	1,400–1,750 (14.0–17.5, 199–249)	1,670–2,020 (16.7–20.2, 238–287)
Dimensions of inner cable stopper and dust cover end mm (in.)	0–1 (0–0.0394)	—
Dimensions of inner cable stopper and outer cable end mm (in.)	—	34–35 (1.3386–1.3780)
Clearance between sleeve and selector lever end mm (in.)	—	—

LUBRICANTS

E23CD--

Items	Specified lubricants	Quantity dm³ (U.S.qts., Imp.qts.)
Automatic transmission fluid	Dia Queen ATF SP, ATF DEXRON II or equivalent	Approx. 7.2 (7.6, 6.3): V4AW2 Approx. 8.5 (9.0, 7.5): V4AW3
Transfer oil	Hypoid gear oil API GL-4, SAE 75W-90 or 75W-85W	Approx. 2.3 (2.4, 2.0): V4AW2 Approx. 2.5 (2.6, 2.2): V4AW3
Transfer oil seal lip	Hypoid gear oil API GL-4, SAE 75W-90 or 75W-85W	As required
O-ring for oil filler pipe	Dia Queen ATF SP, ATF DEXRON II or equivalent	As required

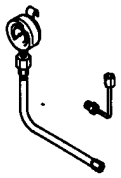
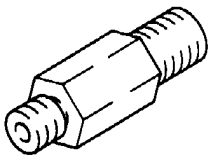
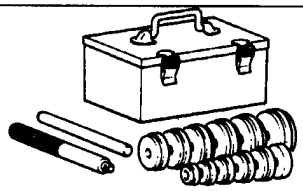
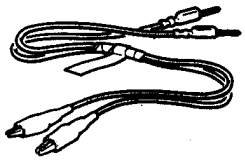
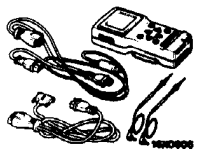
SEALANTS AND ADHESIVES

E23CE--

Items	Specified sealant and adhesive	Remarks
TRANSMISSION CONTROL		
Transfer control lever assembly gasket	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Stopper plate gasket	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Transfer control lever assembly mounting bolt	3M Stud Locking No. 4170 or equivalent	Anaerobic sealant
TRANSISSION AND TRANSFER ASSEMBLY		
Control housing gasket	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Control housing mounting bolt	3M Stud Locking No. 4170 or equivalent	Anaerobic sealant

SPECIAL TOOLS

E23DA--

Tool	Number	Name	Use
	MD998330 (includes MD9983331)	Oil pressure gauge (3,000 kPa, 30 kg/cm^2, 427 psi)	Measurement of oil pressure
	MD999563 (includes MD998331)	Oil pressure gauge (1,000 kPa, 10 kg/cm^2, 142 psi)	
	MD998920	Adapter	Connection of oil pressure gauge
	MB990925	Bearing and oil seal installer set	Installation of oil seal MB990938, MB990928 (Refer to GROUP 22–Special Tools.)
	MB991529	Diagnostic trouble code check terminal	Reading diagnostic trouble code
	MB991502	MUT-II	• Reading diagnostic trouble code • ELC-4A/T system inspection
 16X0607		ROM pack	

NOTES

TROUBLESHOOTING <V4AW2>

E23EAAK

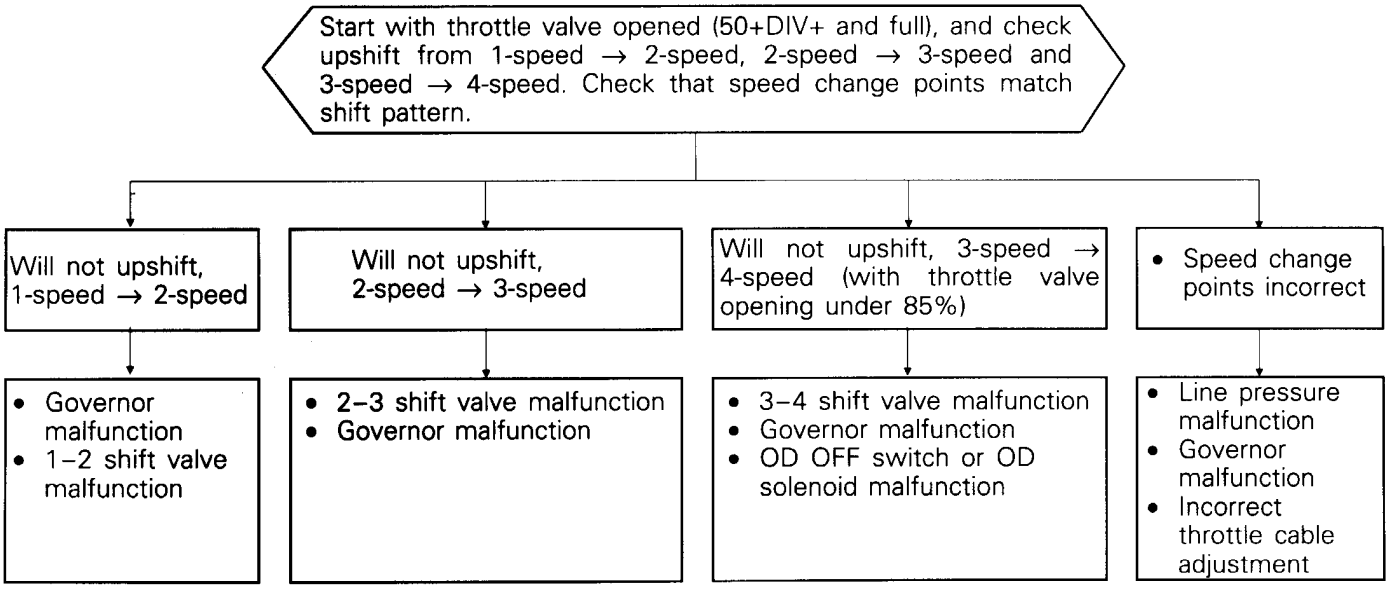
Automatic transmission malfunctions may be caused by the following conditions:
(1) Improper maintenance and adjustment
(2) Mechanical malfunctions
(3) Hydraulic malfunctions
(4) Poor engine performance

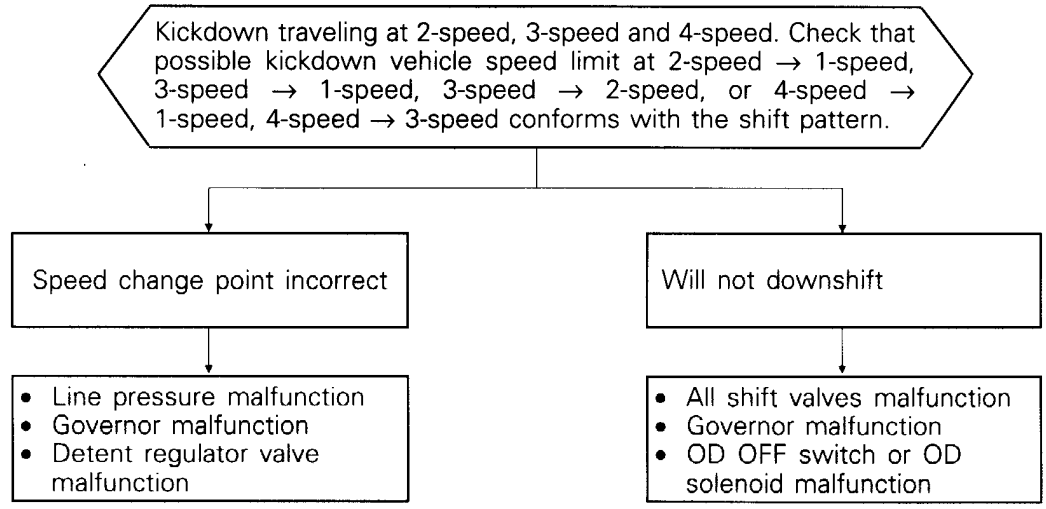
Troubleshooting in the event of any such malfunctions should begin by checking fluid level, ATF condition, manual linkage adjustment, throttle control cable adjustment and other conditions whose deviation from standards can be readily known. Then, road test shall be performed to determine whether or not the problem has been corrected or more diagnosis is necessary. If the problem still persists after these tests and corrections, hydraulic tests should be performed for further troubleshooting.

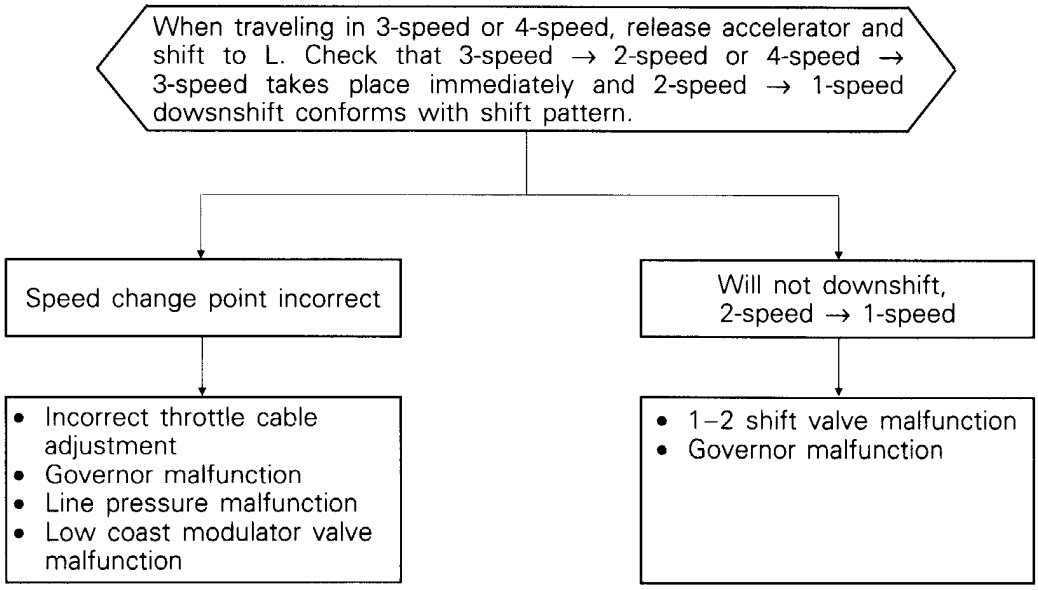
ROAD TEST

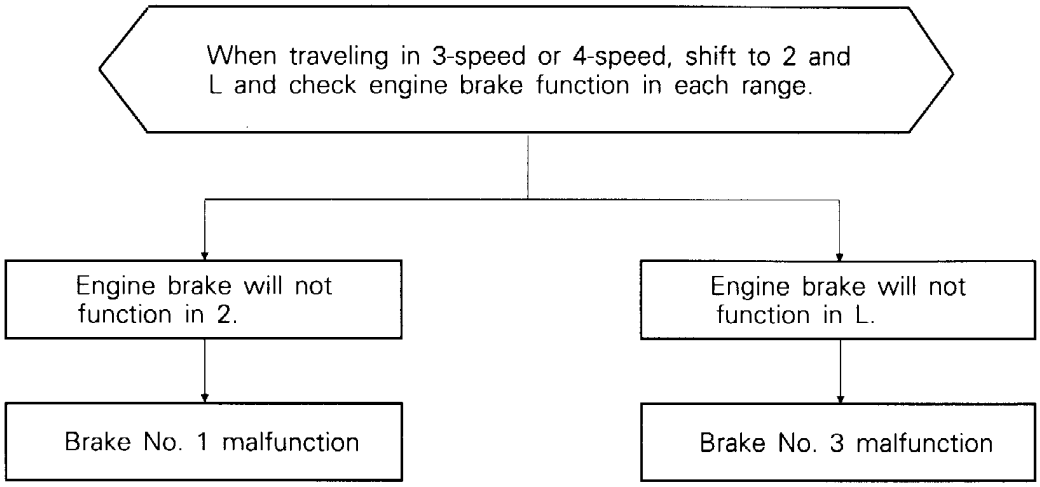
Prior to performing road test, be sure to make basic checks including check and adjustment of fluid level and condition and adjustment of the throttle cable. For road test, the transfer must be placed in the 2H (2WD-high) position. In road test, various changes such as slips in transmission and shifting conditions are checked and hence the transmission operation at each shift position must have been checked.

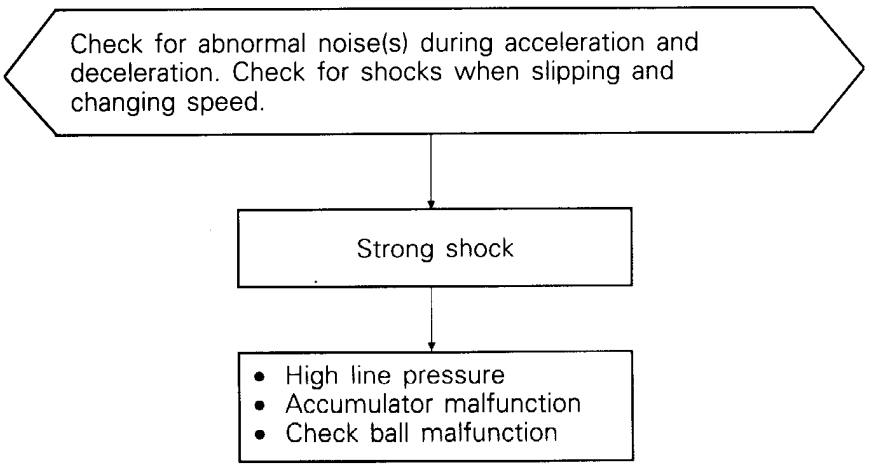
D RANGE TEST

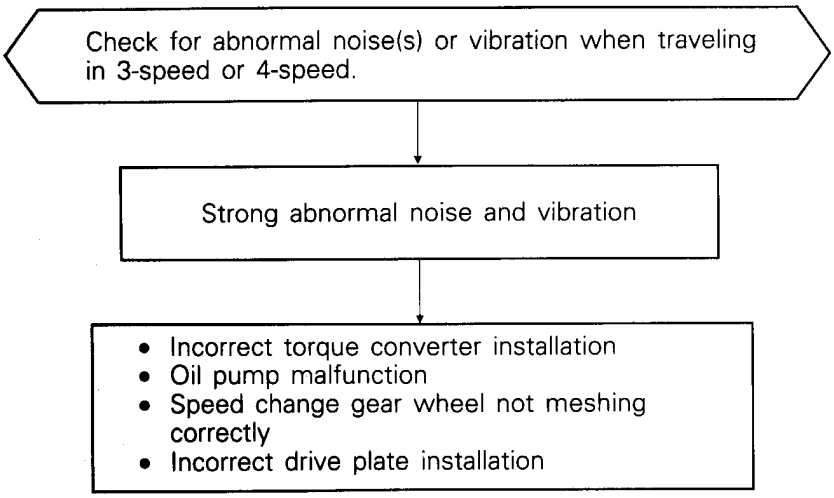




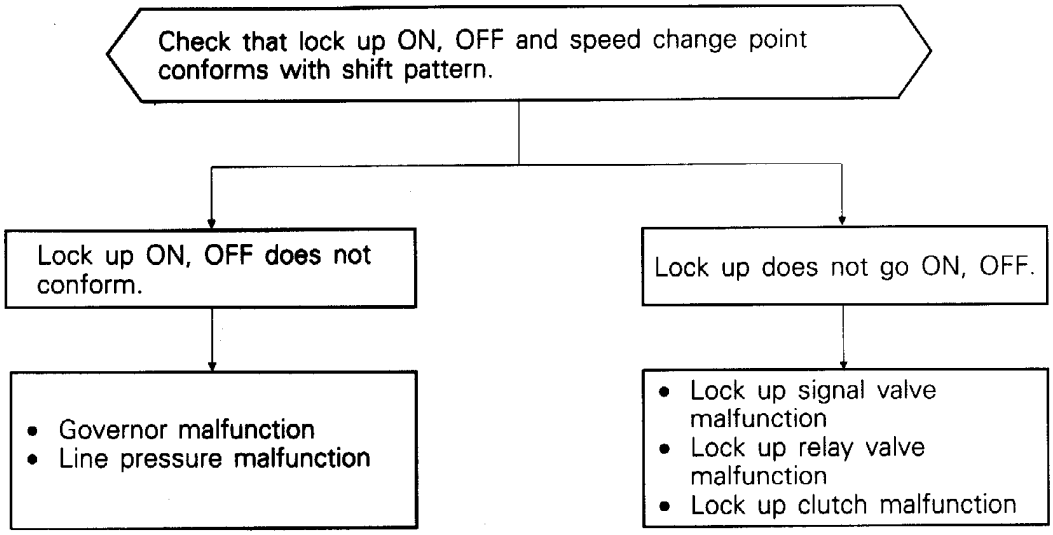






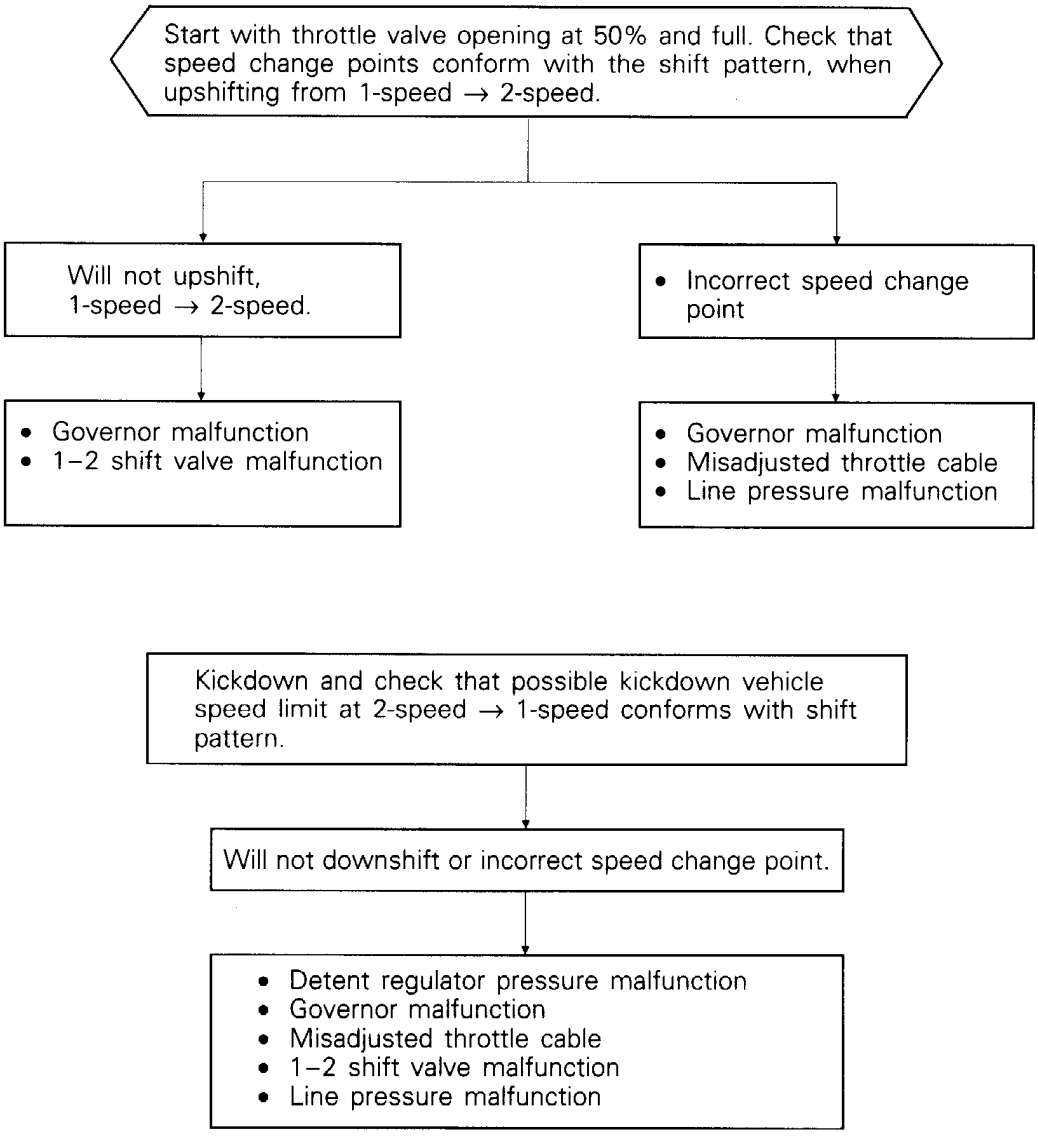


NOTE
Abnormal noises and vibrations are often caused by an unbalanced propeller shaft, differential, tyre, torque converter, engine etc. Extremely thorough inspection is therefore required.

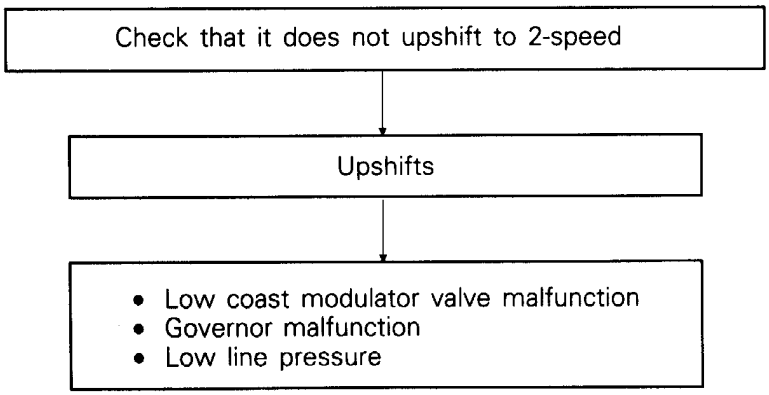


NOTE
(1) Determine the moment when lock up turns ON by decreased engine r/min or by a slight shock back and forth.
(2) Determine the moment when lock up turns OFF by increased engine r/min.
(3) Check lock up condition by pumping the accelerator slightly. If engine r/min rises in accordance with throttle valve opening size, determine that the lock up is OFF, if not, determine it ON.
(When lock up is OFF, drive power is transferred through the fluid in the torque converter and therefore, when the accelerator pedal is depressed, slipping occurs inside the torque converter with a resulting large increase in engine r/min.)

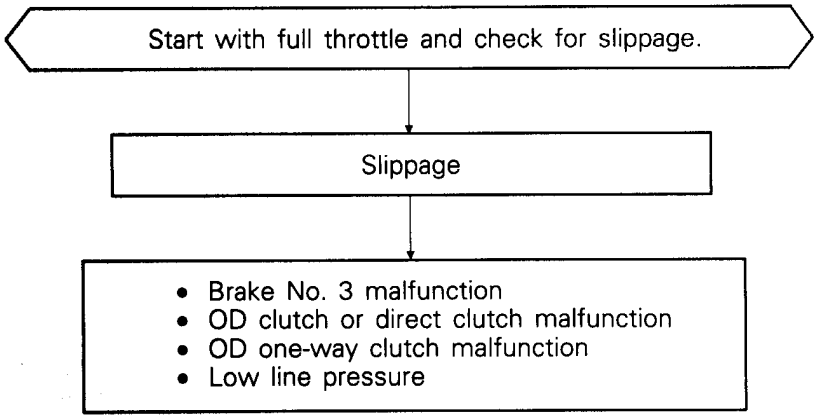
2 RANGE TEST



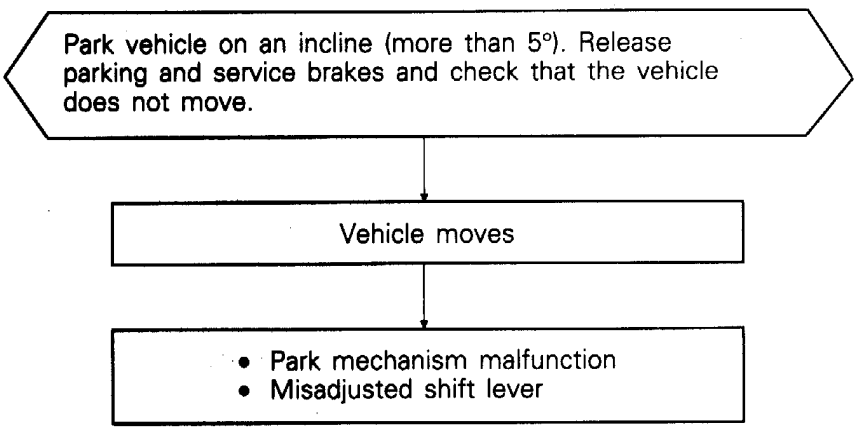
L RANGE TEST



R RANGE TEST

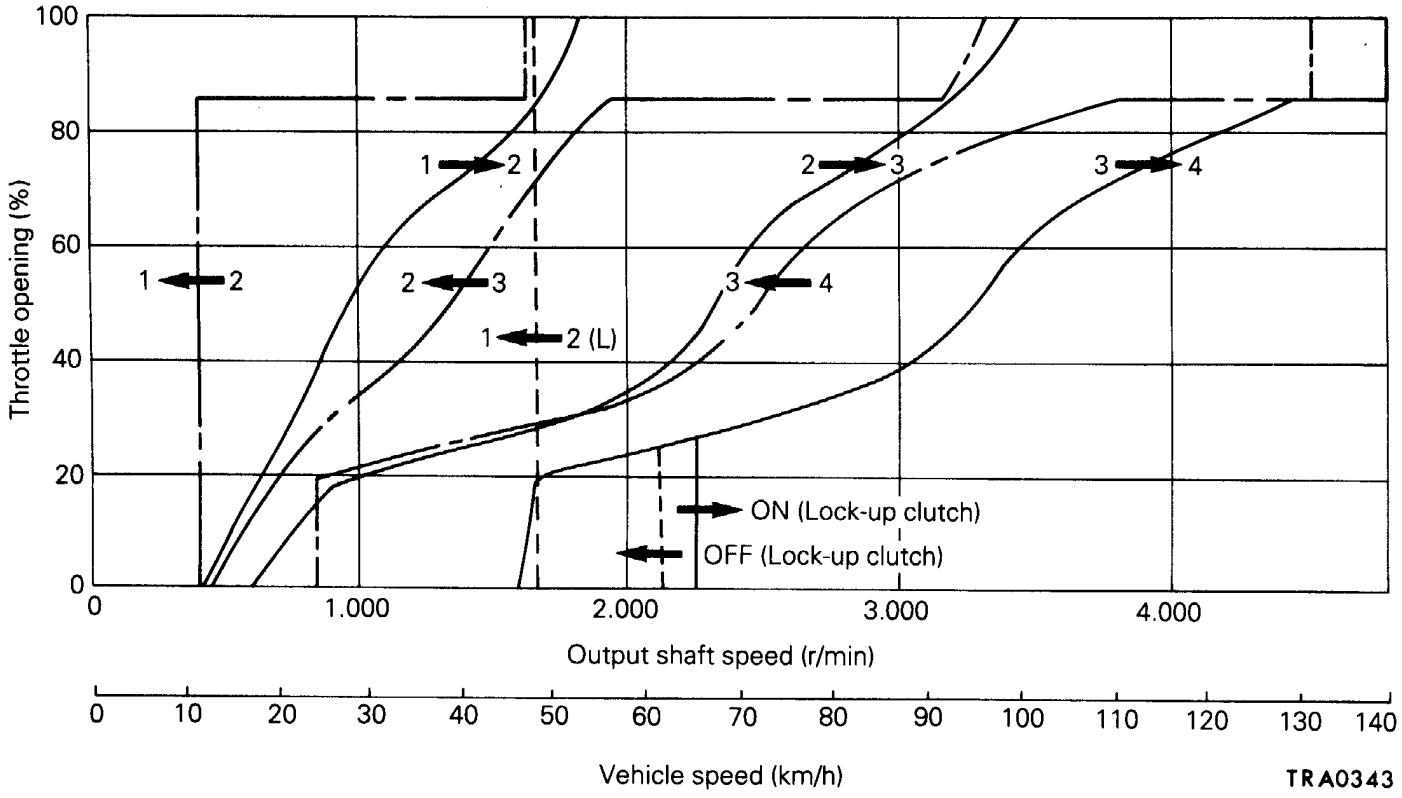


P RANGE TEST

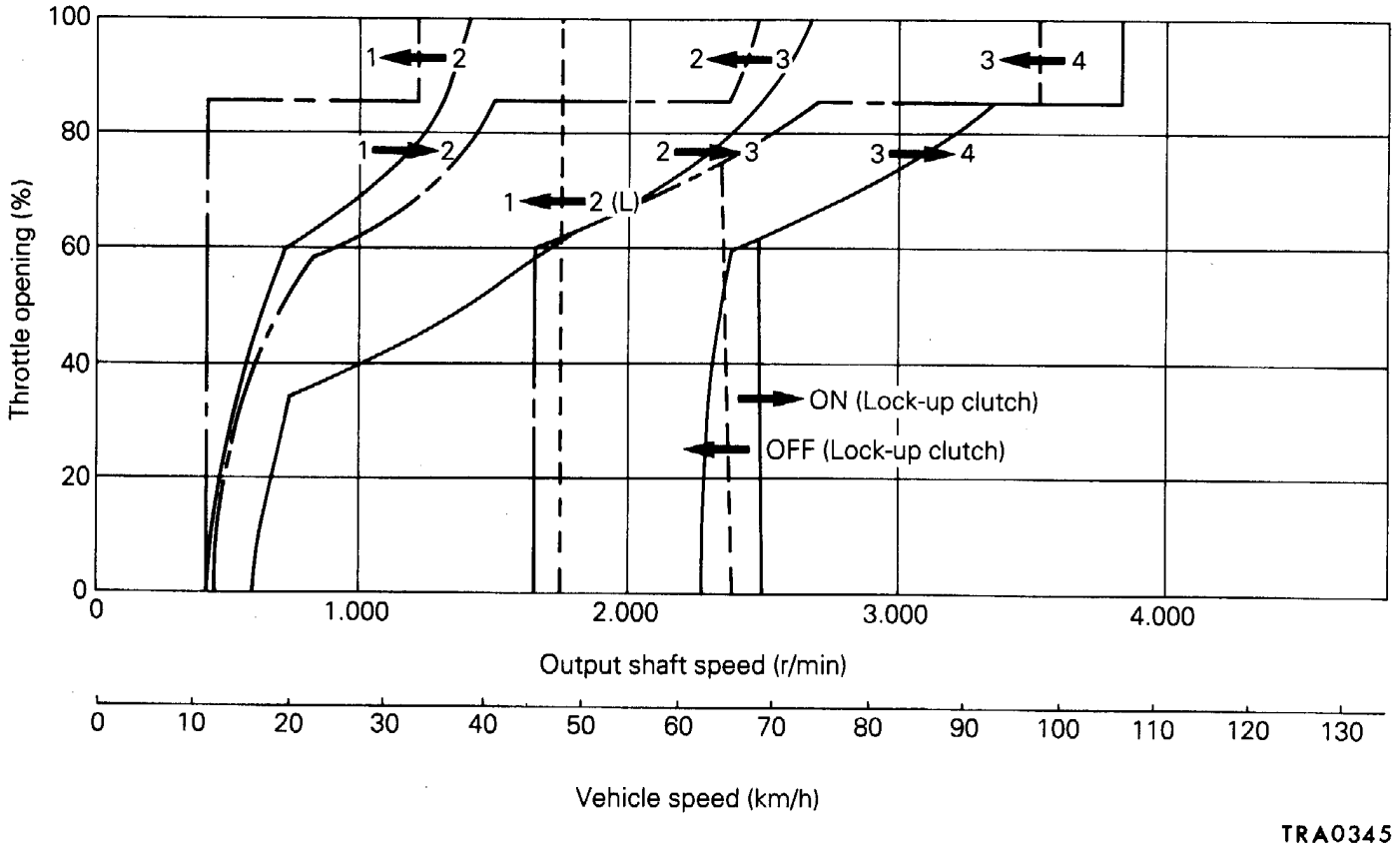


SHIFT PATTERN

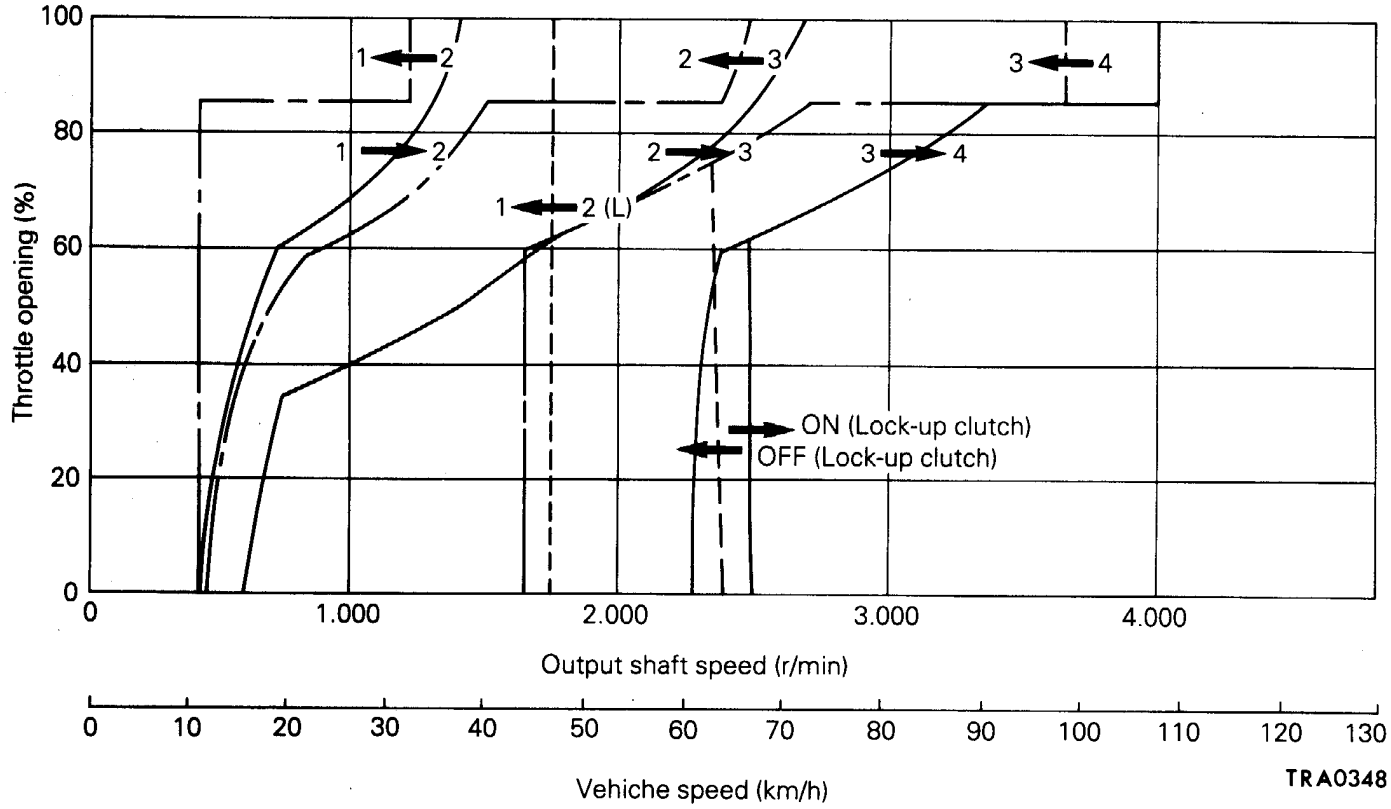
3000–12V <V4AW2-3-LFP, LFPL>



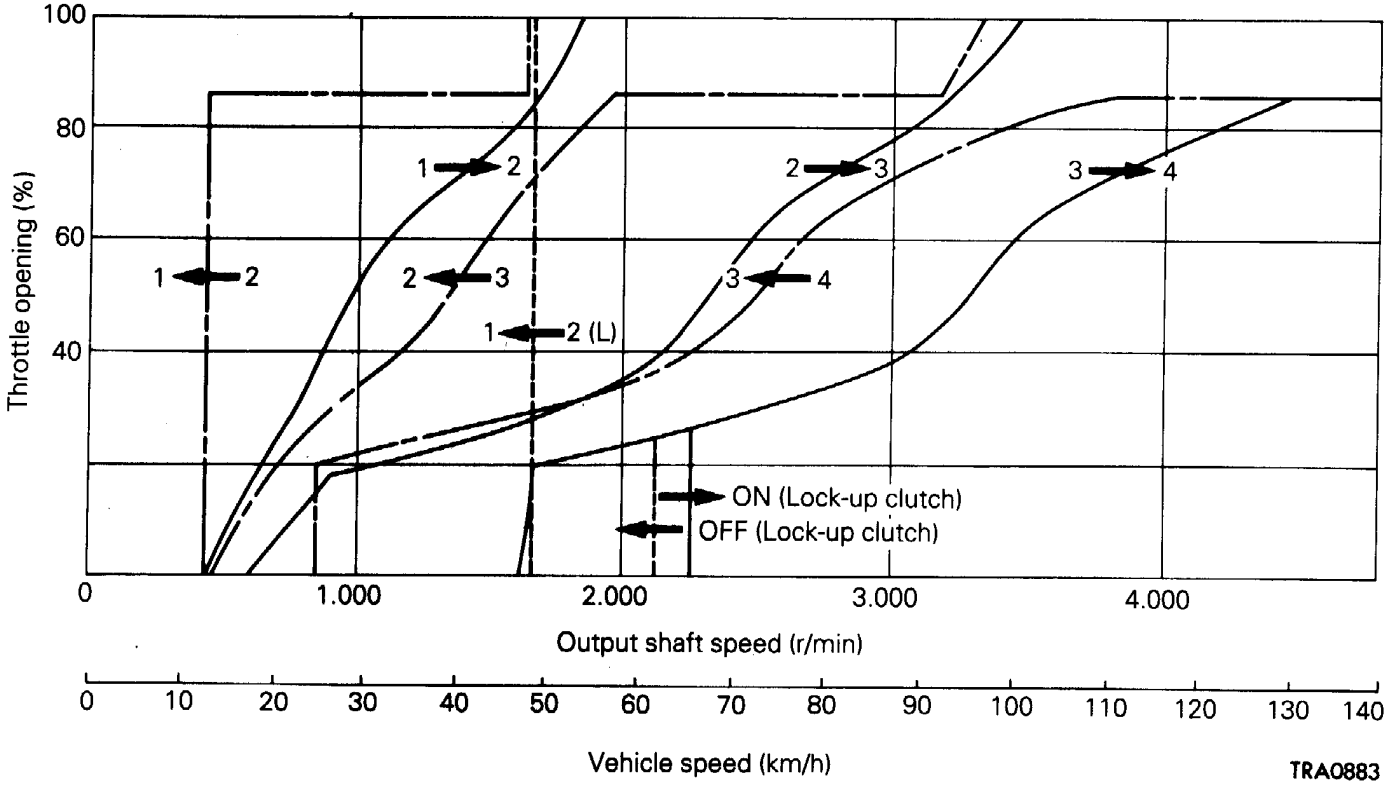
2500D <V4AW2-3-QGP, QGPL>



2500D <V4AW2-3-QHP, QHPL>



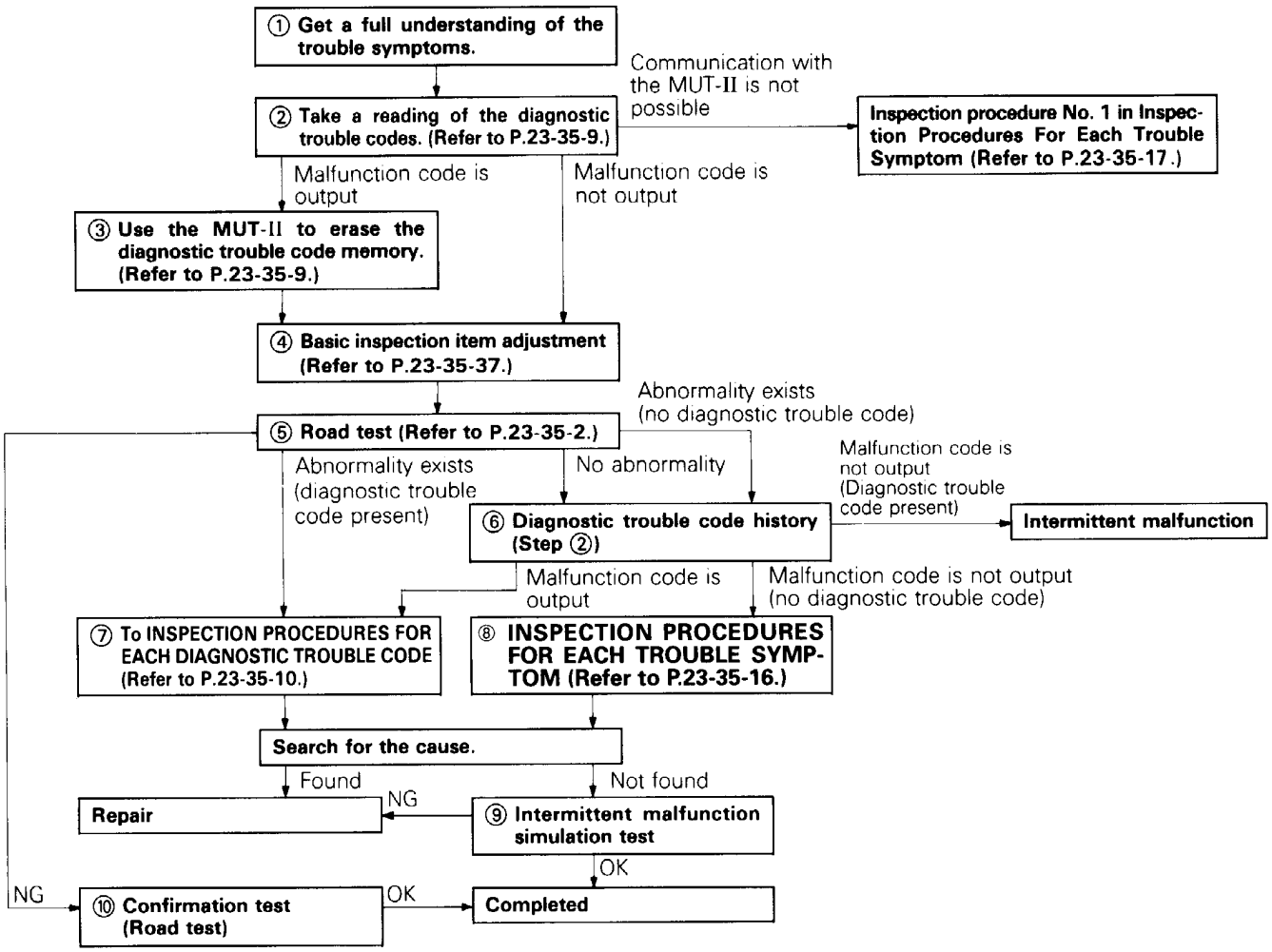
3000–12V <V4AW2-7-LFP, LFPL>



TROUBLESHOOTING <V4AW3>

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

Malfunctions of the 4 A/T system can be caused by malfunctions or incorrect adjustments of the electronic control system, hydraulic control system or A/T system or a combination of these.
Carry out troubleshooting by the following procedure in order to make effective diagnoses.



① Gain a full understanding of the conditions under which the trouble symptoms that the customer is complaining about occur, including frequency of occurrence.
② Use the MUT-II to read and make a note of the diagnostic trouble codes (including fail-safe codes). (Refer to P.23-35-9.)
③ Erase the diagnostic trouble codes in order to carry out a road test. (Refer to P.23-35-9.)
④ Carry out adjustment of the basic inspection items (ATF, TPS, inhibitor switch, manual control cable, etc.) (Refer to P.23-35-37.)
⑤ Carry out a road test. (Refer to P.23-35-2.)
Be sure to check that the basic inspection items and all diagnostic trouble codes and conditions of reoccurrence are covered during this test.
⑥ Check that the diagnostic trouble codes which were read before the road test (in step (2) above) are present.
⑦ Determine the probable cause from the Inspection Procedures For Each Diagnostic Trouble Code. (Refer to P.23-35-10.)
⑧ Determine the probable cause from the Inspection Procedures For Each Trouble Symptom. (Refer to P.23-35-16.)

⑨ Carry out a intermittent malfunction simulation test.
⑩ After repairs are completed, carry out a road test to check that the malfunction has been repaired.

ROAD TEST

(Transfer Lever position: 4H Range)

★ : MUT-II used

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page
1	Ignition switch: ON Engine: Stopped	Overdrive switch (1) ON (2) OFF	★ Data List No. 35 (1) OD (2) OD-OFF	Overdrive switch	Overdrive switch system (P.23-35-29)
		Pattern select switch (1) Power (2) Hold	★ Data List No. 36 (1) Power (2) Hold	Pattern select switch	Pattern select switch system (P.23-35-28)
		Selector lever position (1) P (2) R (3) N (4) D (5) 2 (6) L	★ Data List No. 37 (1) P, R,D (2) P, R, D (3) N (4) P, R, D (5) 2 (6) L	Inhibitor switch	Inhibitor switch system (P.23-35-27)
		Brake pedal (1) Depressed (2) Released	★ Data List No. 28 (1) OD (2) OFF	Stop lamp switch	Stop lamp switch system (P.23-35-29)
2	Ignition switch: ST Engine: Stopped	Engine starting test in P and N positions	Starting should be possible	Starting	Does not move (P.23-35-18.)
					Lockup malfunction (P.23-35-26)
3	Warming up	(1) When engine is cold	★ Data List No. 29 (1) OFF (2) ON	Engine coolant temperature switch	Engine coolant temperature switch system (P.23-35-30)
		(2) Drive for 15 minutes or more so that the ATF temperature becomes 70–90°C (158–194°F)	★ Data List No. 15 (2) 70–90°C (158–149°F)	Oil temperature sensor	Oil temperature sensor system (P. 23-35-31)

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page
4	Engine: Idle Selector lever position: N	Accelerator pedal (1) Fully closed (2) Depressed (3) Fully open (up to 2 seconds)	★ Data List No. 11 (1) 0–5% <Petrol engine> 0–20% <Diesel engine> (2) Gradually rises (1) (3) 85–100% <Petrol engine> 90–100% <Diesel engine>	TPS <Petrol engine>	Code No. 11 – TPS system (P.23-35-11)
				LPS <Diesel engine>	Code No. 11 – LPS system (P.23-35-11)
			★ Data List No. 21 (1) OFF (3) ON	Wide open throttle switch (W.O.T. switch)	Code No. 22 – W.O.T. switch system (P.23-35-12)
		Selector lever operation (1) N → D shift (2) N → R shift	Should be no abnormal shifting shocks Time lag should be within 2 seconds	Does not move	Does not move forward or reverse (P.23-35-18)
					Does not move forward only (P.23-35-19)
					Does not reverse only (P.23-35-19)
				Shock	Large shocks (P.23-35-24)
5	Engine: Idle (Vehicle stopped) Selector lever position: D Mode selection: Normal	Accelerator pedal (1) Fully closed	★ Data List No. 27 (1) 1st	Shift solenoid No. 1	Code Nos. 41, 42 – Shift control solenoid valve No. 1 system (P.23-35-14)
				Shift solenoid No. 2	Code Nos. 43, 44 – Shift control solenoid valve No. 2 system (P.23-35-15)

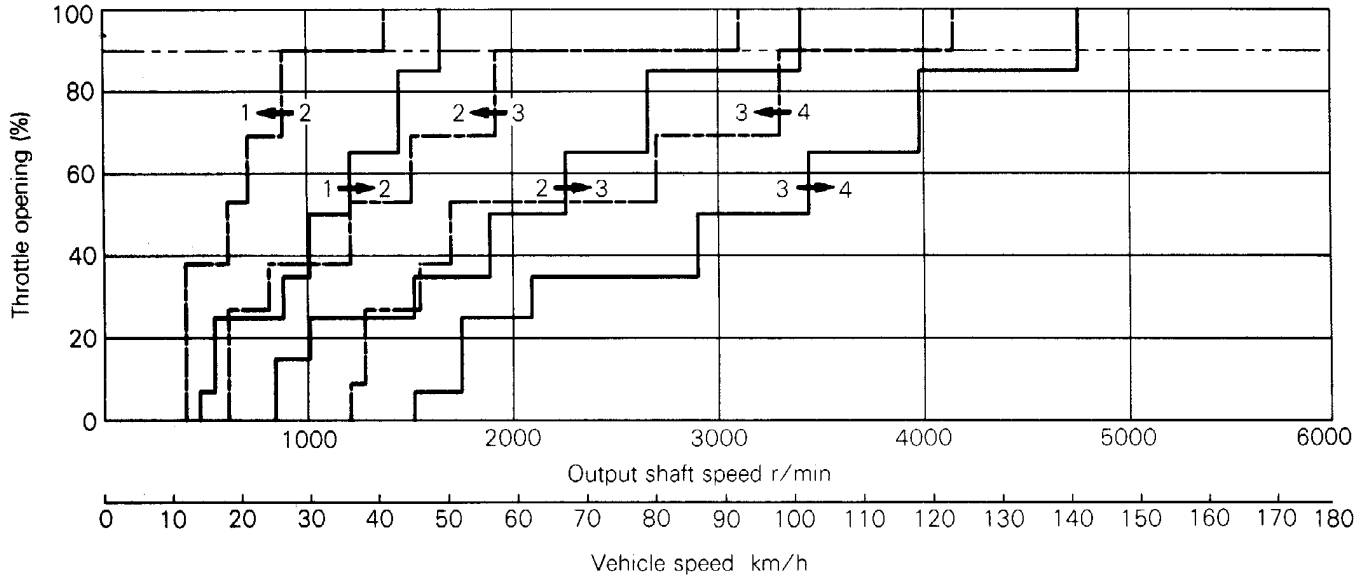
Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page
6	Selector lever position: D Mode selection: Normal Overdrive: OFF	Engine (1) Idle (Vehicle stopped) (2) Driving at 10 km/h (3) Driving at constant speed of 50 km/h (20 seconds or more) (4) Driving at constant speed of 40 km/h with selector lever in 2 range	★ Data List No. 27 (1) 1st (2) 1st (3) 3rd (4) 2nd	Shift solenoid No. 1	Code Nos. 41, 42 – Shift solenoid No. 1 system (P.23-35-14)
				Shift solenoid No. 2	Code Nos. 43, 44 – Shift solenoid No. 2 system (P.23-35-15)
			★ Data List No. 32 (1) 0 km/h (2) 7 – 13 km/h (3) 42 – 58 km/h (4) 33 – 47 km/h	A/T speed sensor	A/T speed sensor system (P.23-35-13)
			★ Data List No. 41 (2) OFF (3) OFF (4) ON	Shift solenoid No. 1	Code Nos. 41, 42 – Shift control solenoid valve No. 1 system (P.23-35-14)
			★ Data List No. 43 (2) OFF (3) ON (4) ON	Shift solenoid No. 2	Code Nos. 43, 44 – Shift control solenoid valve No. 2 system (P.23-35-15)
			★ Data List No. 47 (2) OFF (3) ON (3) Acceleration should be smooth with no abnormal vibration.	Lock-up solenoid Malfunction when shifting	Code Nos. 47, 48 – Lock-up solenoid (P.23-35-15) Shifting point abnormality (P.23-35-22)
					Slippage (vibration) (P.23-35-25)

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page
7	Selector lever position: D Mode selection: Normal Overdrive: ON	Engine (1) Driving at constant speed of 50 km/h (20 seconds or more)	★ Data List No. 27 (1) 4	Shift control solenoid valve No. 1	Code Nos. 41, 42 – Shift control solenoid valve No. 1 system (P.23-35-14)
				Shift control solenoid valve No. 2	Code Nos. 43, 44 – Shift control solenoid valve No. 2 system (P.23-35-15)
			★ Data List No. 41 (1) OFF	Shift control solenoid valve No. 1	Code Nos. 41, 42 – Shift control solenoid valve No. 1 system (P.23-35-14)
			★ Data List No. 43 (1) OFF	Shift control solenoid valve No. 2	Code Nos. 43, 44 – Shift control solenoid valve No. 2 system (P.23-35-15)
8	Selector lever position: D Mode selection: Normal Overdrive: ON ● Carry out the same test with the mode selection at POWER and HOLD also.	Monitor MUT-II data list Nos. 11, 27 and 32. (1) TPS Accelerate to 4 range at opening angle of 30%. (2) Slowly decelerate to a standstill. (3) TPS Accelerate to 4 range at opening angle of 50%. (4) At 50 km/h in 4 range, turn overdrive OFF. (5) At 50 km/h in 3 range, move selector lever to 2 range. (6) At 20 km/h in 2 range, move selector lever to L range.	(1), (2) and (3) should match the specified output shaft speed (vehicle speed), and there should be no abnormal shocks. For (4), (5) and (6), downshifting should occur immediately after moving the lever.	Malfunction when shifting	Upshifting does not occur (P.23-35-20)
					Downshifting does not occur (P.23-35-21)
					Shifting point abnormality (P.23-35-22)
					Upshifting occurs spontaneously (P.23-35-22)
					Incorrect drive gear position (P.23-35-23)
				Malfunction while driving	Large shocks (P.23-35-24)
					Slippage (vibration) (P.23-35-25)
					Lockup malfunction (P.23-35-26)
					Poor engine braking (P.23-35-26)

SHIFT PATTERN

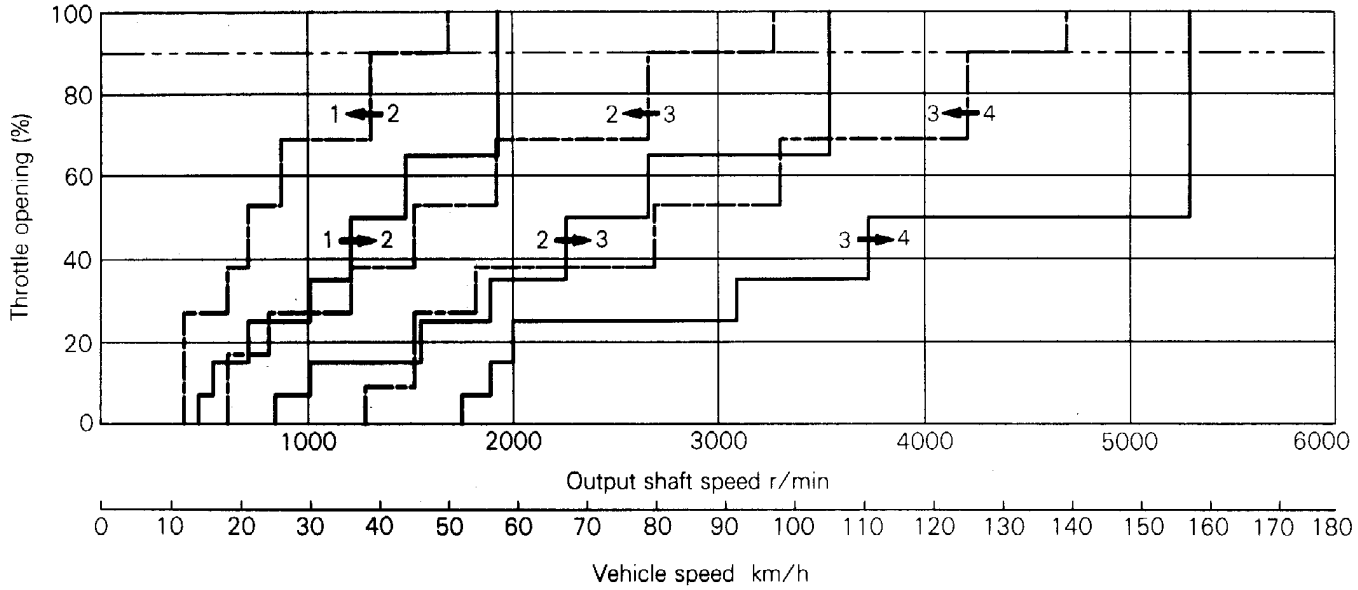
<3500>

Normal pattern



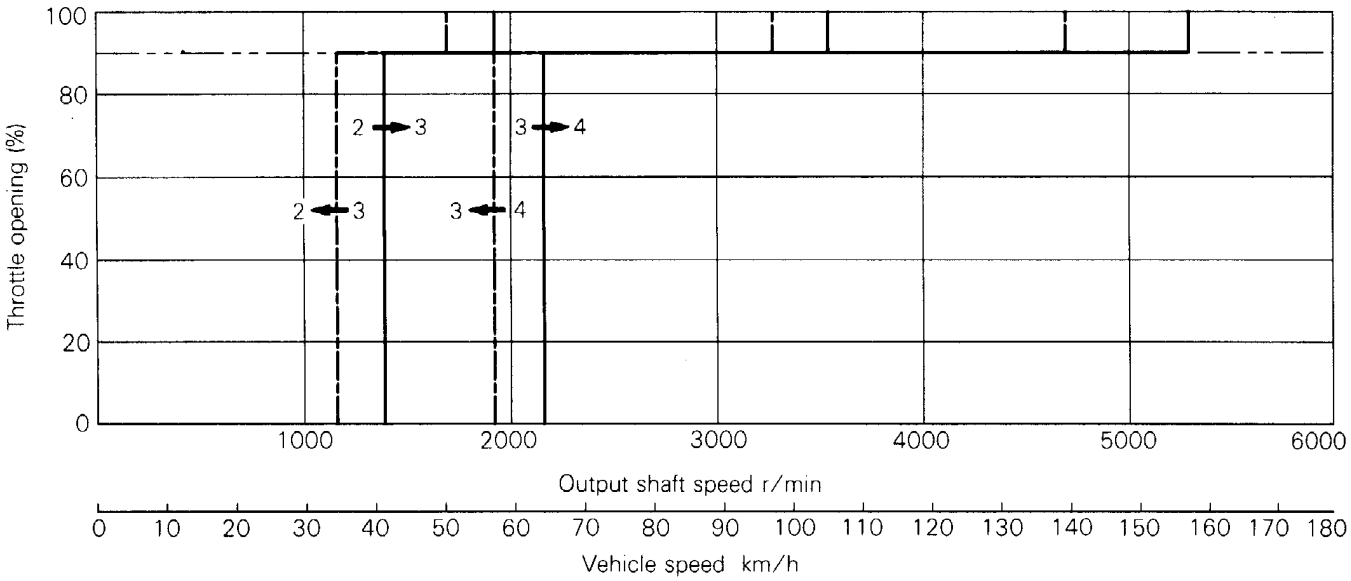
TRA0729

Power pattern



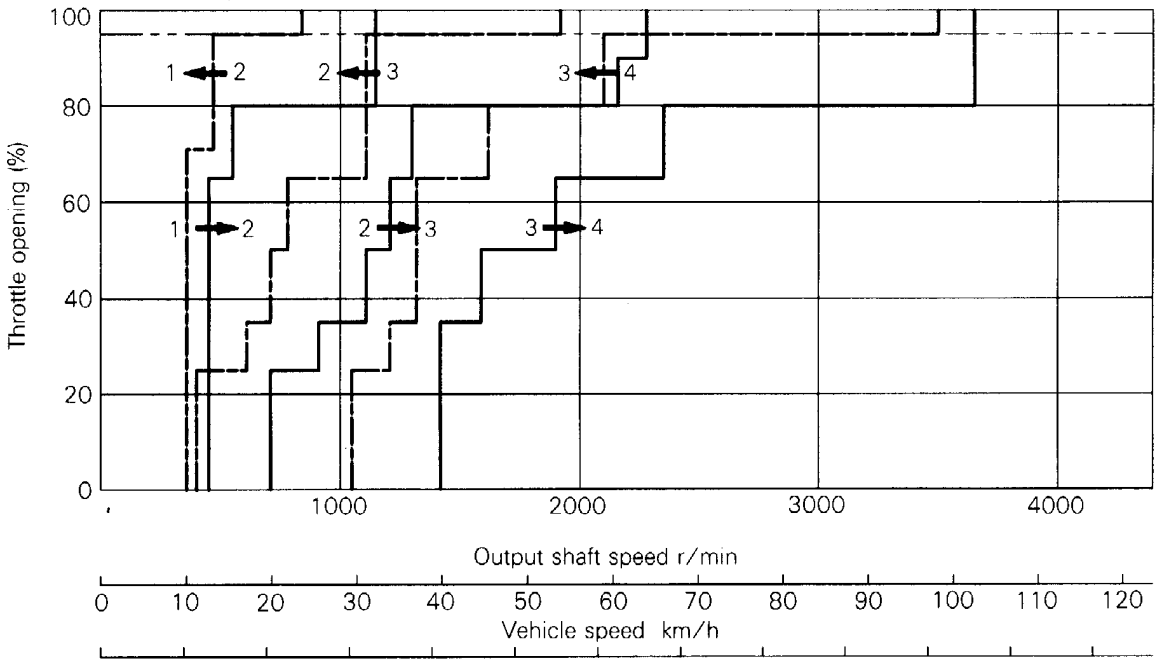
TRA0730

Hold Pattern



TRA0731

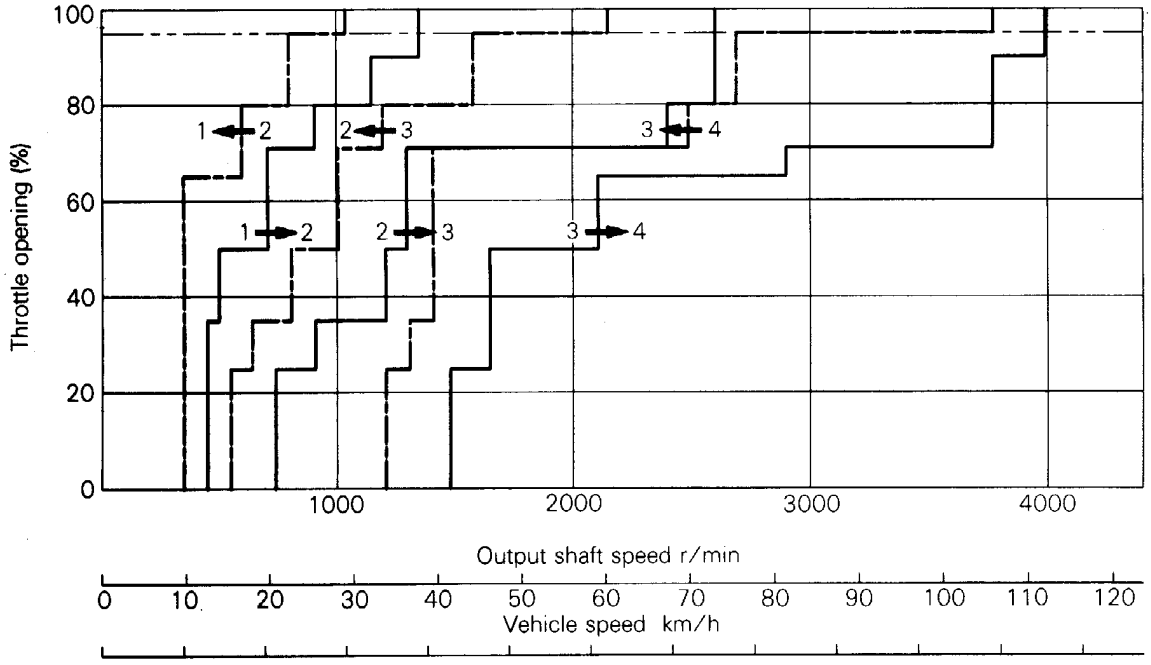
<2800D>
Normal pattern



TRA0732

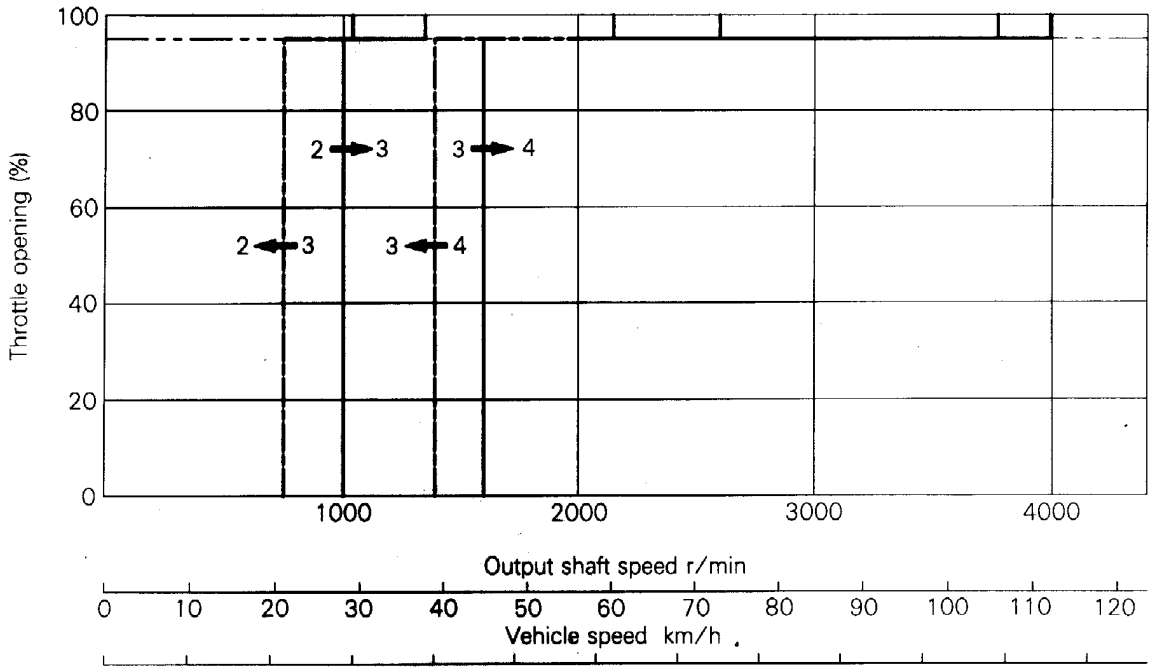
<3000–24V>

Power pattern



TRA0733

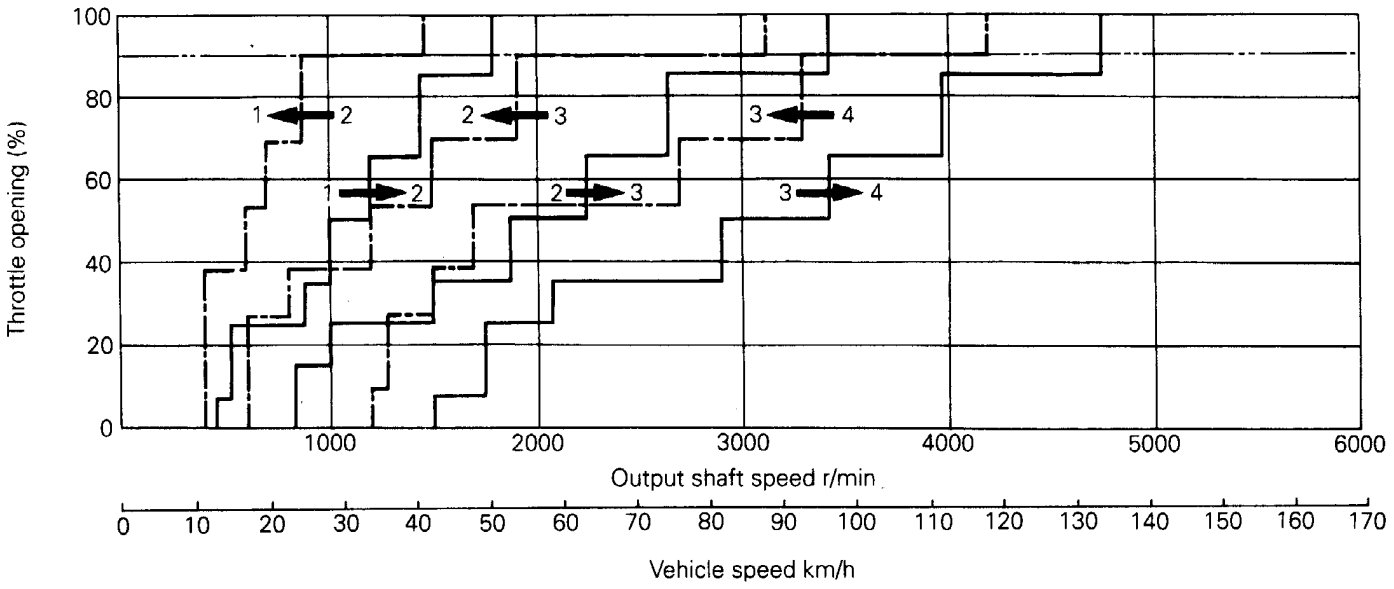
Hold pattern



TRA0734

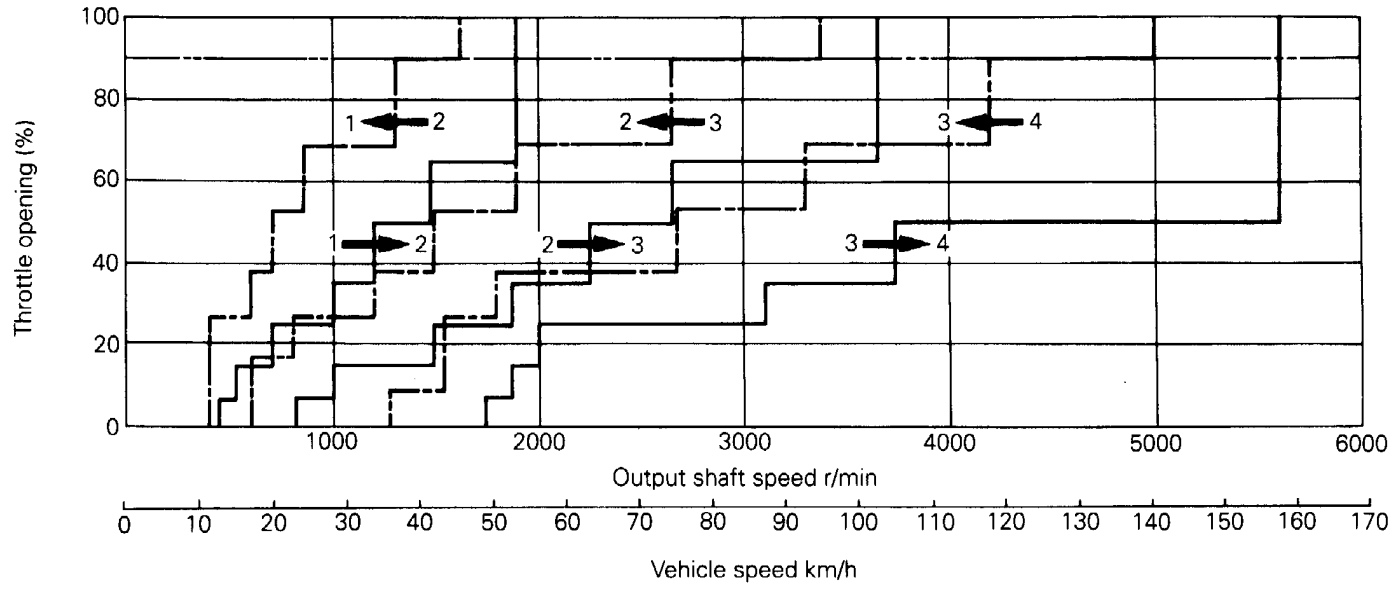
<3000–24 V>

Normal pattern



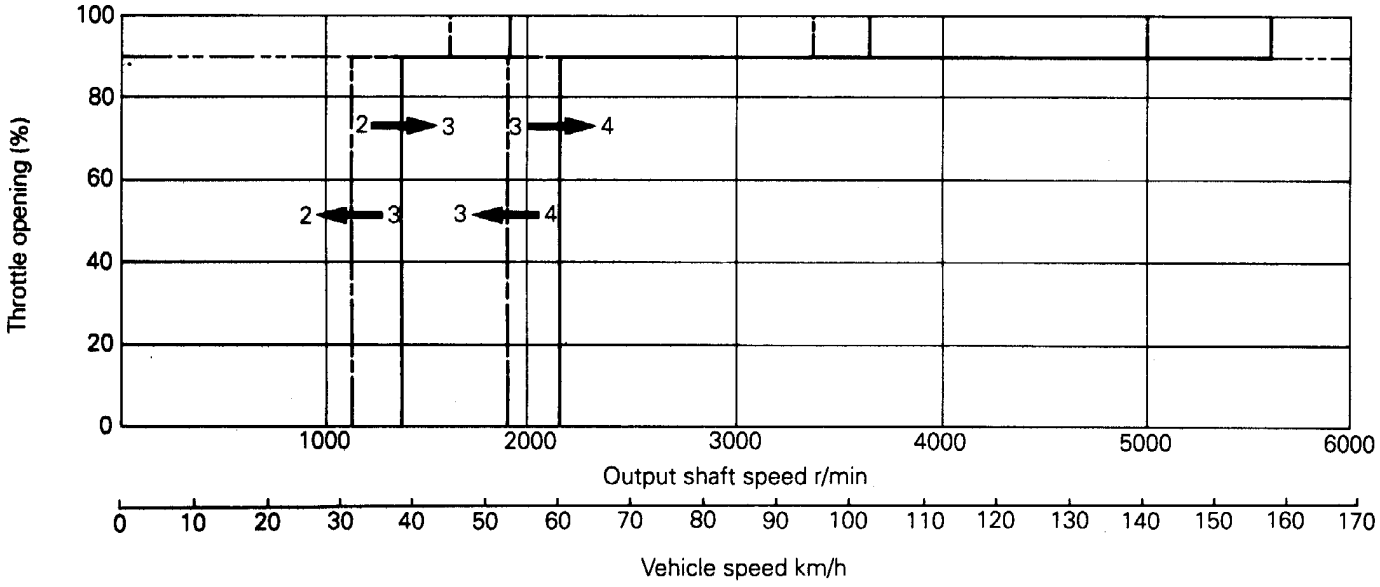
TRA0880

Power pattern



TRA0881

Hold pattern

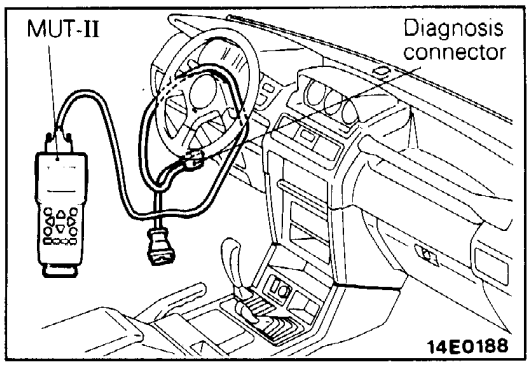


TRA0882

DIAGNOSTIC FUNCTIONS

PRECAUTIONS BEFORE SERVICE

(1) If battery voltage is low, diagnostic trouble codes will not be output. Accordingly, check the battery before carrying out inspection.
(2) If the battery is disconnected or if the engine control unit connector is disconnected, the diagnostic trouble code memory will be erased.
Accordingly, the battery should not be disconnected until reading of the diagnostic trouble codes has been completed.

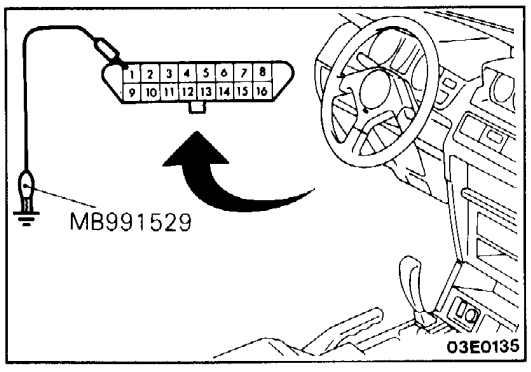


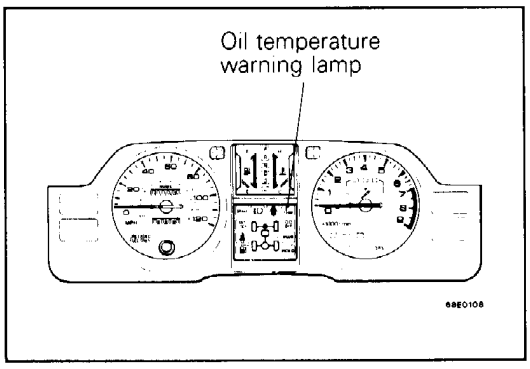
READING THE DIAGNOSTIC TROUBLE CODES

<When using the MUT-II>

Caution
Connection and disconnection of the MUT-II should always be carried out with the ignition switch in the OFF position.

(1) Connect the MUT-II to the diagnosis connector.
(2) Turn the ignition switch to ON.
(3) Take a reading of the diagnostic code output.
(4) Repair the malfunction location while referring to the Inspection Procedures For Each Diagnostic Trouble Code.
(5) Turn the ignition switch to OFF and then back to ON again.
(6) Erase the diagnostic trouble codes.
(7) Check that the diagnostic code output is normal.

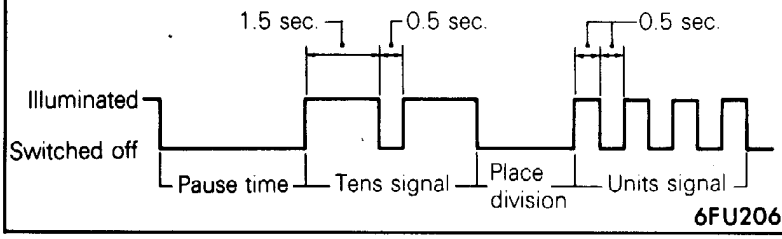
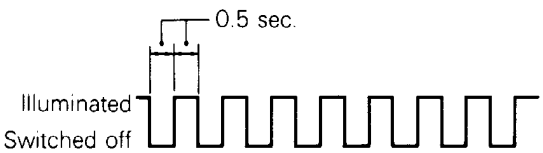




<When using the oil temperature warning lamp>

(1) Use the special tool (diagnostic trouble code check harness) to earth terminal ① of the self-diagnosis connector.
(2) Take a reading of the diagnostic trouble codes from the flashing of the oil temperature warning lamp.
(3) Repair the malfunction location while referring to the Chart Classified by Diagnostic Trouble Codes.
(4) Erase the diagnostic trouble codes by the following procedure.
   ① Turn the ignition switch to OFF.
   ② After disconnecting the battery cable from the negative battery terminal for 10 seconds or more, re-connect the cable.
   ③ Turn the ignition switch to ON, take a reading of the diagnostic code output and check that a normal code is output.
   ④ After the engine has warmed up, run it at idle for about 10 minutes.

UNDERSTANDING DIAGNOSIS RESULT BY THE OIL TEMPERATURE WARNING LAMP FLASHING

Example of flashing when a diagnostic trouble code is output	Flashing when normal
For diagnostic trouble code No. 24  6FU2060	 6FU2061

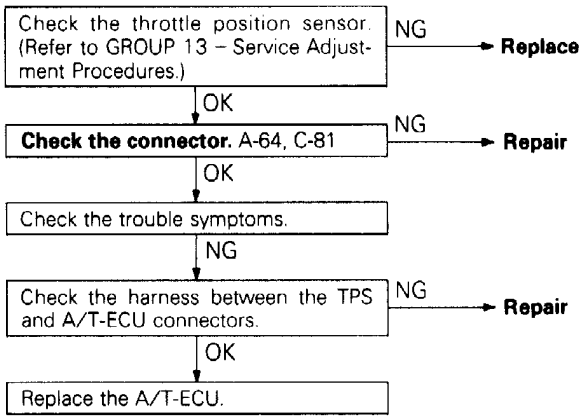
NOTE
Other diagnostic trouble codes also are output by the flashing of the check warning lamp corresponding to the same code numbers as when using the MUT-II.

INSPECTION CHART CLASSIFIED BY DIAGNOSTIC TROUBLE CODES

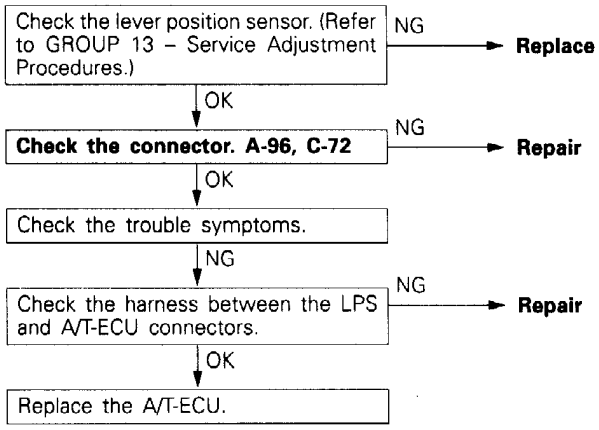
Code	Diagnostic item		Reference page
11	Throttle position sensor system <Petrol engine> Lever position sensor system <Diesel engine>	Malfunction of sensor Open circuit, short circuit	P.23-35-11
22	Wide open throttle switch system	Short circuit	P.23-35-12
32	A/T speed sensor system	Open circuit	P.23-35-13
38	Vehicle speed sensor system	Open circuit	P.23-35-14
41	Shift control solenoid valve No. 1 system	Open circuit	P.23-35-14
42	Shift control solenoid valve No. 1 system	Short circuit	P.23-35-14
43	Shift control solenoid valve No. 2 system	Open circuit	P.23-35-15
44	Shift control solenoid valve No. 2 system	Short circuit	P.23-35-15
47	Lock-up solenoid system	Open circuit	P.23-35-15
48	Lock-up solenoid system	Short circuit	P.23-35-15

INSPECTION PROCEDURES FOR EACH DIAGNOSTIC TROUBLE CODE

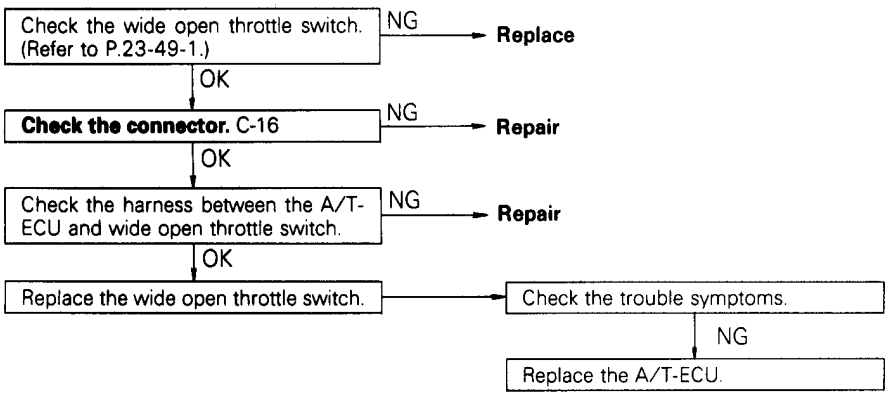
Code No. 11	Throttle position sensor system	Probable cause
[Comment]	If the TPS output becomes 4.95 V or more, TPS output is excessive, and if the TPS output becomes 0.09 V or less, TPS output is insufficient. In both cases, diagnostic trouble code No. 11 is output.	• Malfunction of throttle position sensor • Malfunction of connector • Malfunction of A/T-ECU



Code No. 11	Lever position sensor system	Probable cause
[Comment]	If the LPS output becomes 4.95 V or more, LPS output is excessive, and if the LPS output becomes 0.09 V or less, LPS output is insufficient. In both cases, diagnostic trouble code No. 11 is output.	• Malfunction of lever position sensor • Malfunction of connector • Malfunction of A/T-ECU

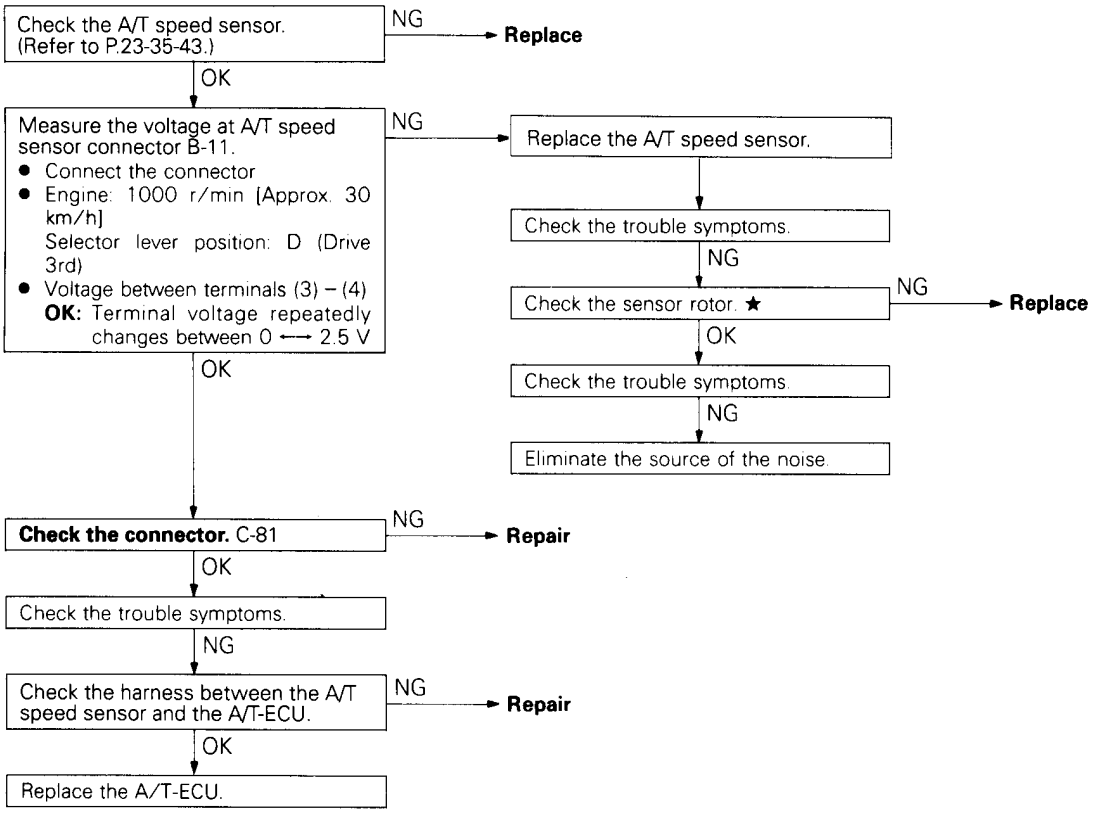


Code No. 22	Wide open throttle switch system	Probable cause
[Comment]	When the wide open throttle switch is ON despite less than 85% opening of the throttle, Code No. 22 is output.	• Malfunction of wide open throttle switch • Malfunction of connector • Malfunction of A/T-ECU

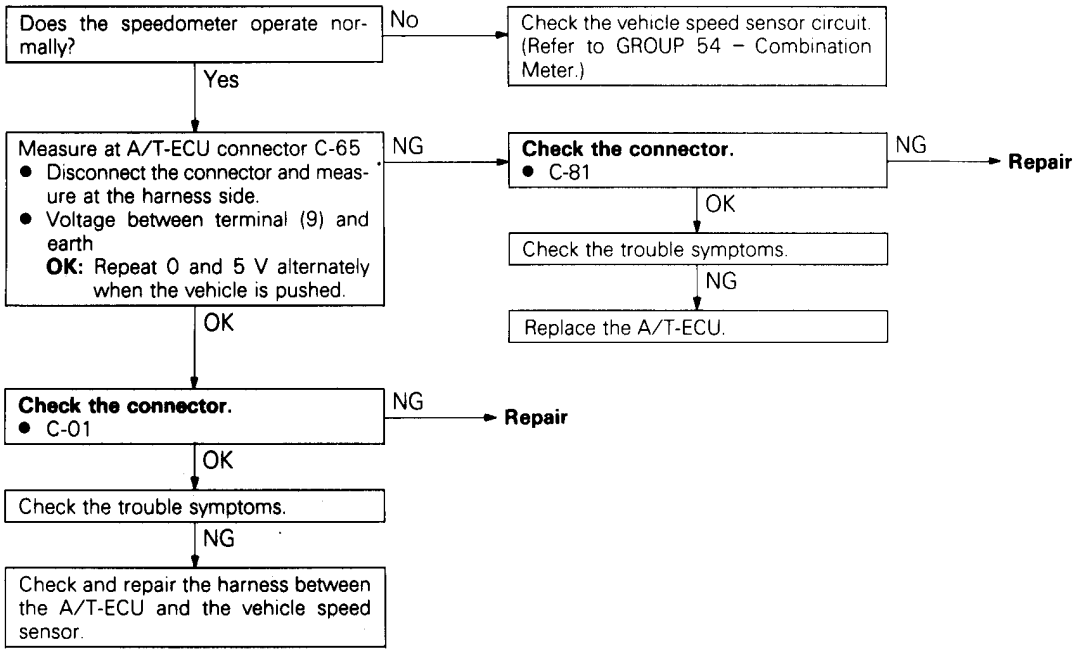


Code No. 32	A/T speed sensor system	Probable cause
[Comment]	If the vehicle moves 800 m or more while there is no output from the A/T speed sensor during the time that four pulses are input from the vehicle speed sensor, then there is judged to be an open circuit in the A/T speed sensor, and diagnostic trouble code No. 32 is output.	● Malfunction of A/T speed sensor ● Malfunction of connector ● Malfunction of sensor rotor ● Malfunction of A/T-ECU ● Noise generated

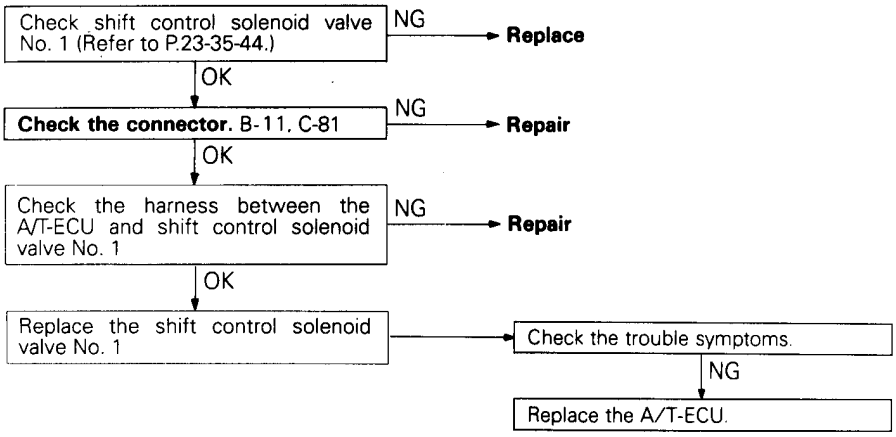
★ : Refer to the Transmission Workshop Manual.



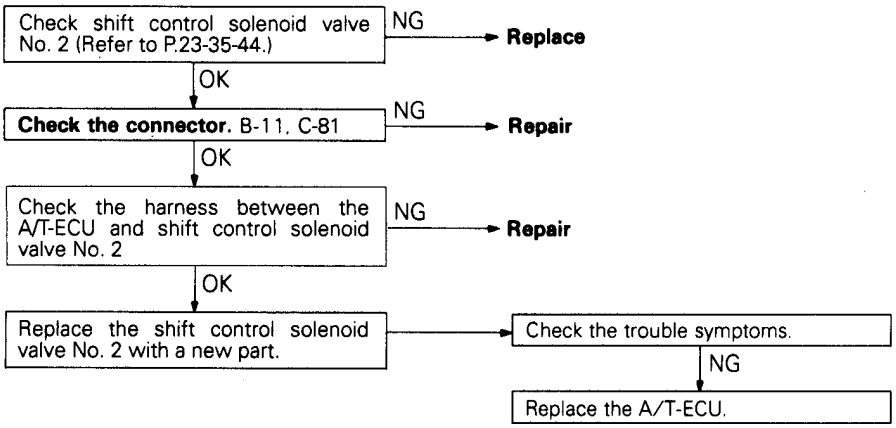
Code No. 38	Vehicle speed sensor system	Probable cause
[Comment]	If the vehicle moves 800 m or more while there is no output from the vehicle speed sensor during the time that 13 pulses (when the transfer control lever is at HIGH) or 25 pulses (when the transfer control lever is at LOW) are input from the A/T speed sensor, then there is judged to be an open circuit in the vehicle speed sensor, and diagnostic trouble code No. 38 is output.	• Malfunction of vehicle speed sensor • Malfunction of connector • Malfunction of A/T-ECU



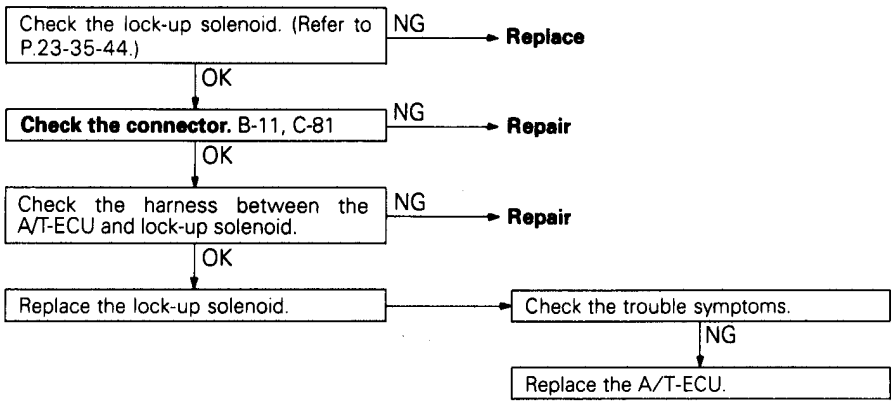
Code No. 41, 42	Shift control solenoid valve No. 1 system	Probable cause
[Comment]	If the resistance value of shift control solenoid valve No. 1 is large, there is an open circuit in shift control solenoid valve No. 1 and diagnostic trouble code No. 41 is output. If the resistance value is small, there is a short circuit in shift control solenoid valve No. 1 and diagnostic trouble code No. 42 is output.	• Malfunction of shift solenoid No. 1 • Malfunction of connector • Malfunction of A/T-ECU



Code No. 43, 44	Shift control solenoid valve No. 2 system	Probable cause
[Comment]	If the resistance value of shift control solenoid valve No. 2 is large, there is an open circuit in shift solenoid No. 2 and diagnostic trouble code No. 43 is output. If the resistance value is small, there is a short circuit in shift control solenoid valve No. 2 and diagnostic trouble code No. 44 is output.	• Malfunction of shift control solenoid valve No. 2 • Malfunction of connector • Malfunction of A/T-ECU



Code No. 47, 48	Lock-up solenoid system	Probable cause
[Comment]	If the resistance value of the lock-up solenoid is large, there is an open circuit in the lock-up solenoid and diagnostic trouble code No. 47 is output. If the resistance value is small, there is a short circuit in the lock-up solenoid and diagnostic trouble code No. 48 is output.	• Malfunction of lock-up solenoid • Malfunction of connector • Malfunction of A/T-ECU



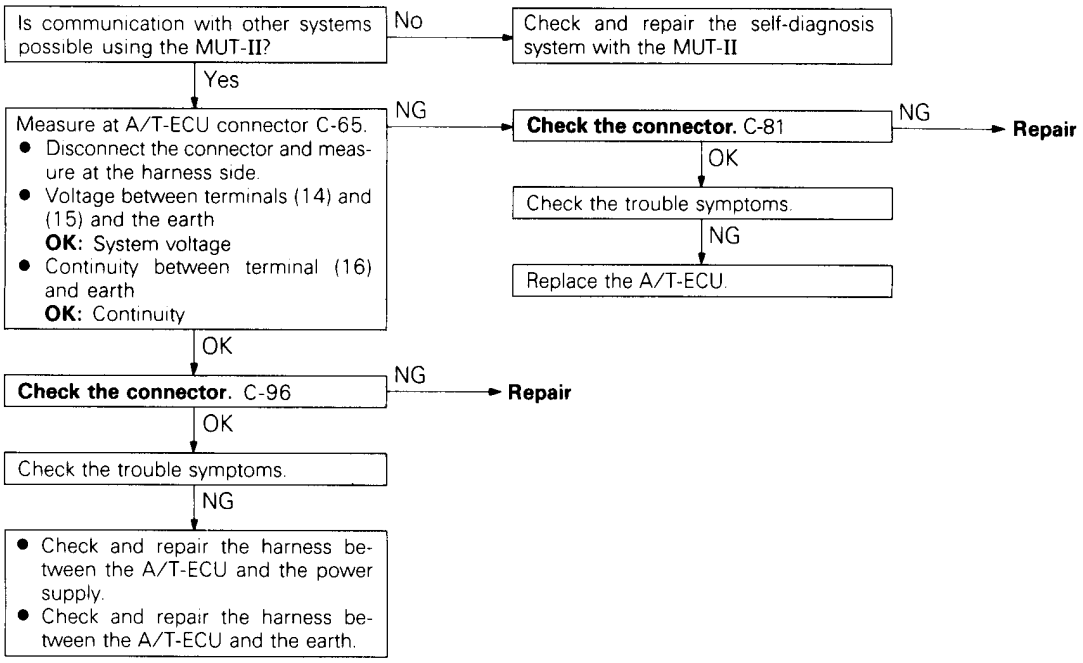
INSPECTION CHART CLASSIFIED BY TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with the MUT-II is not possible		1	P.23-35-17
Does not move	Does not move forward or reverse	2	P.23-35-18
	Does not move forward only	3	P.23-35-19
	Does not reverse only	4	P.23-35-19
Malfunction when shifting	Upshifting does not occur	5	P.23-35-20
	Downshifting does not occur	6	P.23-35-21
	Shifting point abnormality	7	P.23-35-22
	Upshifting occurs spontaneously	8	P.23-35-22
	Incorrect drive gear position	9	P.23-35-23
Large shocks		10	P.23-35-24
Slippage (vibration)		11	P.23-35-25
Lockup malfunction		12	P.23-35-26
Abnormal engine braking		13	P.23-35-26
Electronic circuit systems	Inhibitor switch system	14	P.23-35-27
	Pattern select switch system	15	P.23-35-28
	Overdrive switch system	16	P.23-35-29
	Stop lamp switch system	17	P.23-35-29
	Engine coolant temperature switch system	18	P.23-35-30
	Oil temperature sensor system	19	P.23-35-31

INSPECTION PROCEDURES FOR EACH TROUBLE SYMPTOM

INSPECTION PROCEDURE 1

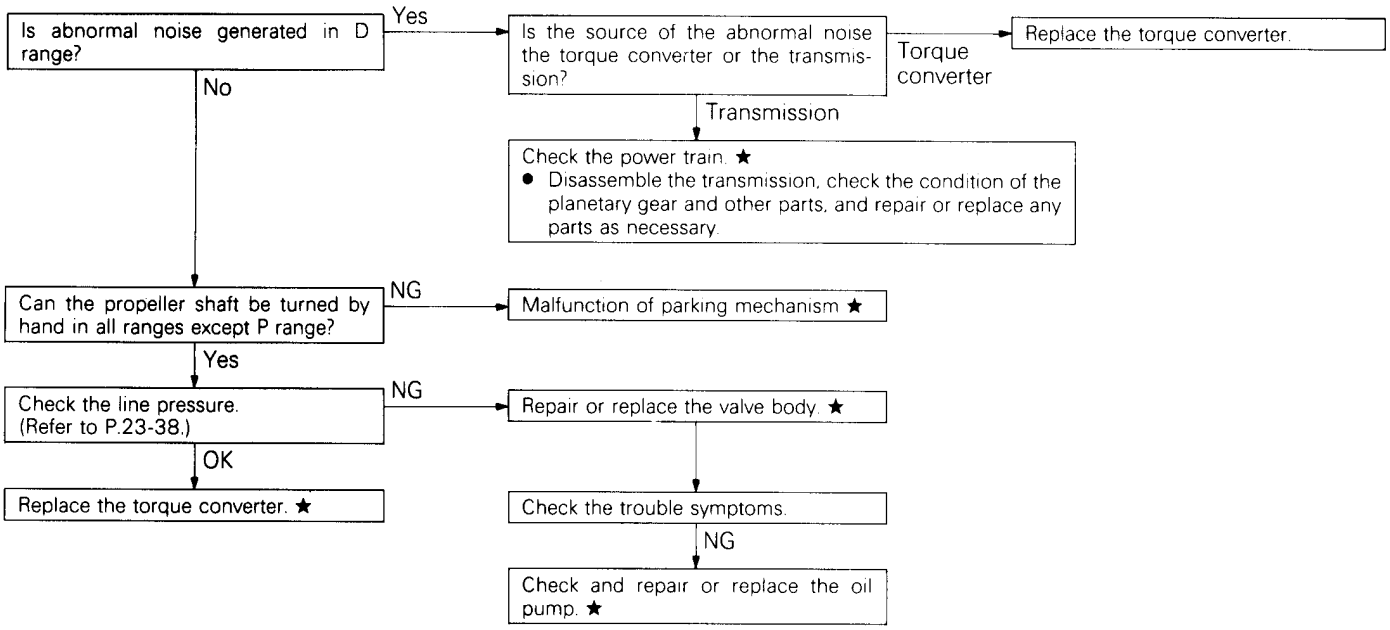
● Communication with the MUT-II is not possible	Probable cause
[Comment] If communication with the MUT-II is not possible, the cause is probably a malfunction in the self-diagnosis system or the A/T-ECU is not functioning.	● Malfunction of self-diagnosis system ● Malfunction of A/T-ECU power circuit ● Malfunction of A/T-ECU earth circuit ● Malfunction of A/T-ECU



INSPECTION PROCEDURE 2

● Does not move forward or reverse	Probable cause
[Comment] When the engine is idling, the vehicle does not move forward or back even if the selector lever is shifted from N to D, 2, L or R range. In such cases, the cause is probably abnormal line pressure, or a malfunction of the torque converter, oil pump, parking mechanism or the power train.	● Abnormal line pressure ● Malfunction of power train ● Malfunction of oil pump ● Malfunction of valve body ● Malfunction of parking mechanism ● Malfunction of torque converter

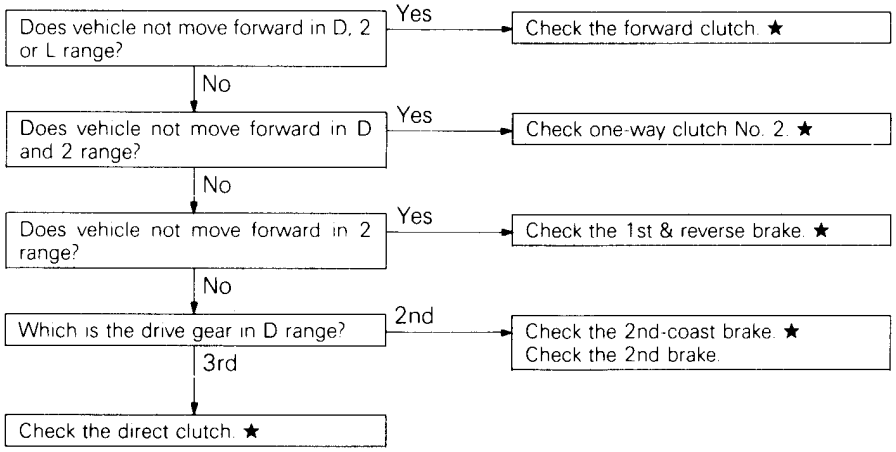
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 3

● Does not move forward only	Probable cause
[Comment] When the engine is idling, the vehicle does not move forward even if the selector lever is shifted from N to D, 2 or L range. In such cases, the cause is probably a malfunction of the clutch or brake.	● Malfunction of forward clutch ● Malfunction of direct clutch ● Malfunction of one-way clutch No. 2 ● Malfunction of 2nd-coast brake ● Malfunction of 2nd brake ● Malfunction of 1st & reverse brake

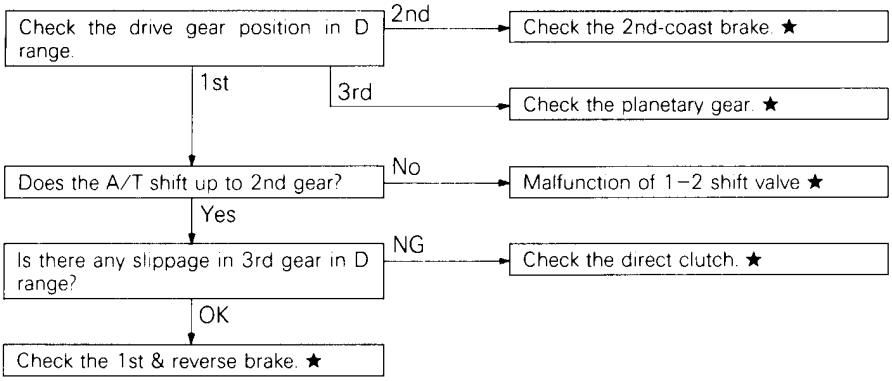
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 4

● Does not reverse only	Probable cause
[Comment] When the engine is idling, the vehicle does not reverse even if the selector lever is shifted from N to R range. In such cases, the cause is probably a malfunction of a clutch, brake or the valve body.	● Malfunction of 2nd-coast brake ● Malfunction of direct clutch ● Malfunction of 1st & reverse brake ● Malfunction of valve body ● Malfunction of planetary gear

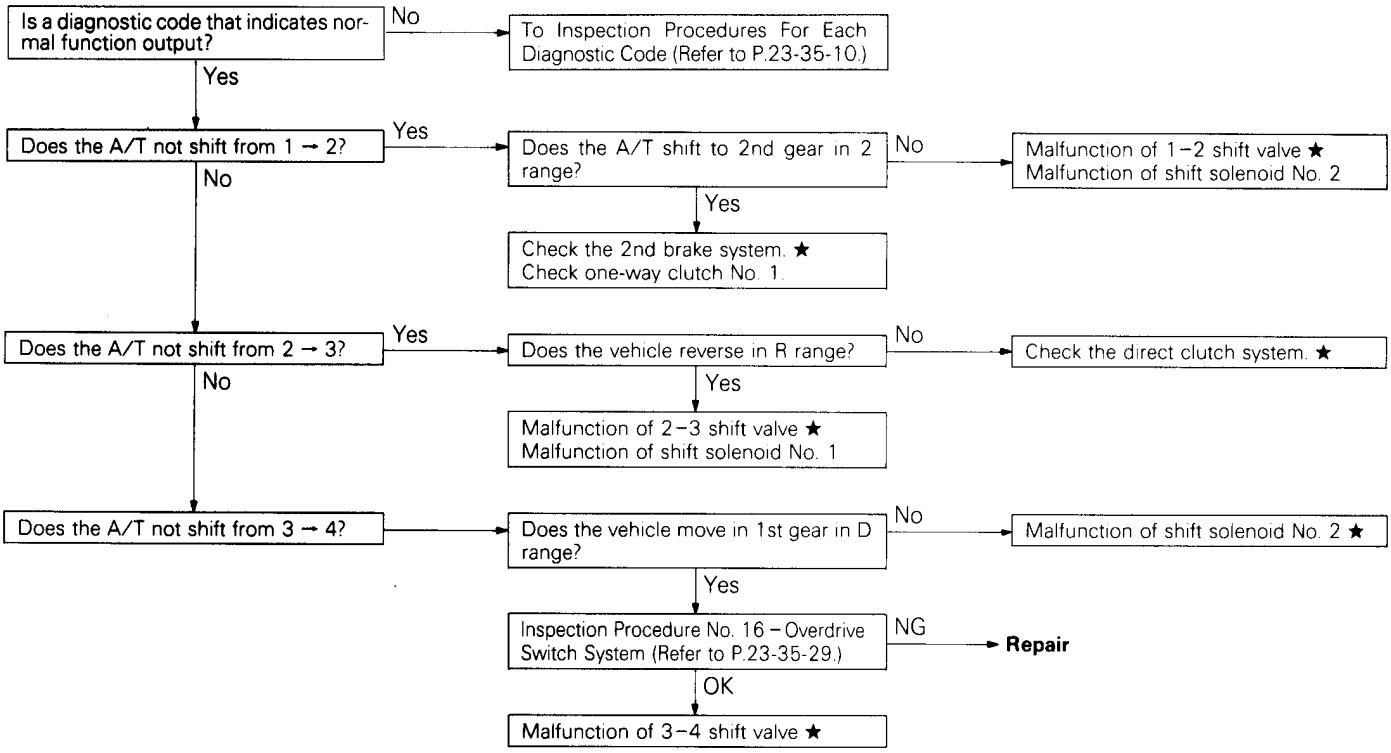
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 5

● Upshifting does not occur	Probable cause
[Comment] Upshifting does not occur under conditions when upshifting should occur. Check shifting from 1 → 2, 2 → 3 and 3 → 4 respectively.	● Shift solenoid ● A/T-ECU ● Power train internal parts

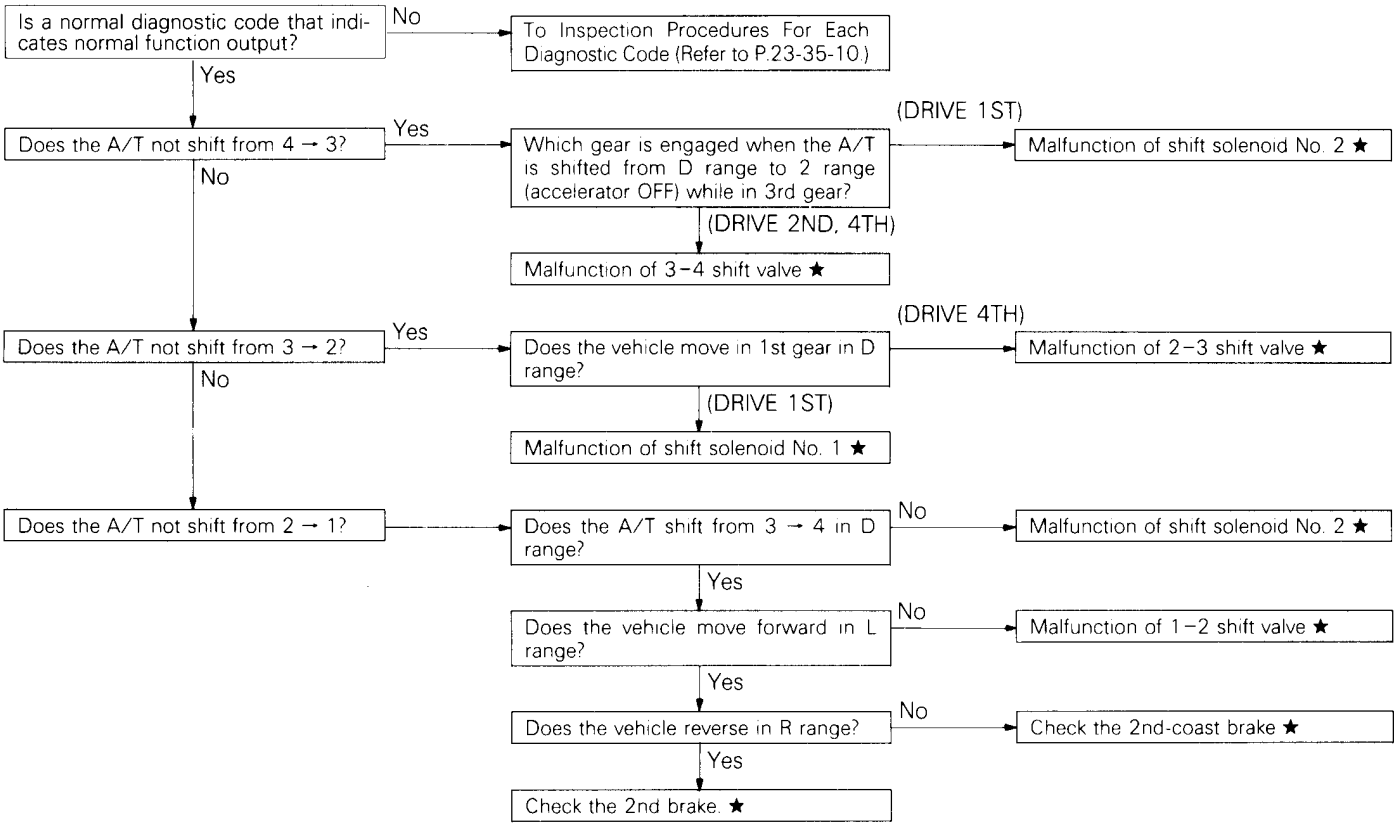
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 6

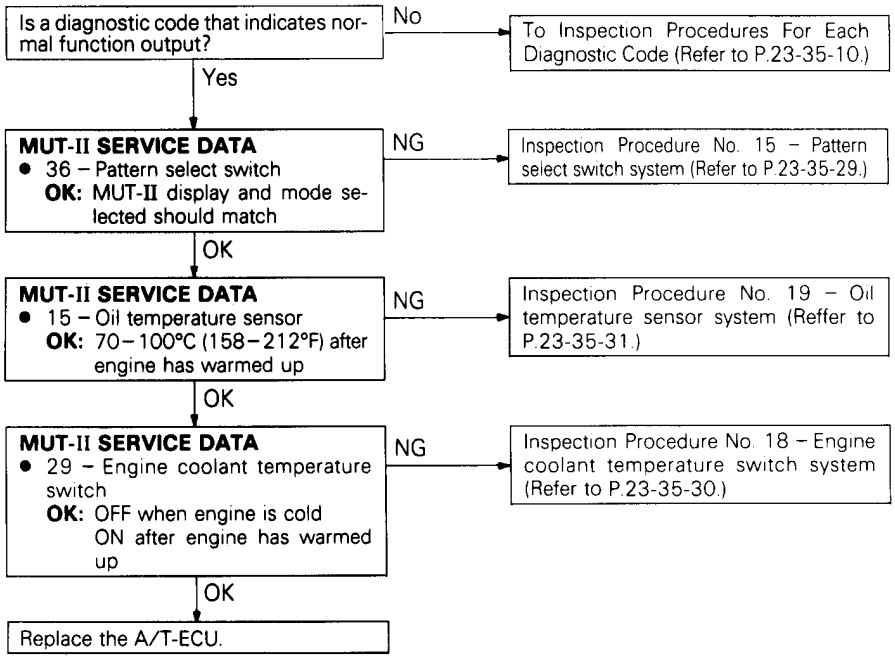
● Downshifting does not occur	Probable cause
[Comment] Downshifting does not occur under conditions when downshifting should occur. Check shifting from 2 → 1, 3 → 2 and 4 → 3 respectively.	● Shift solenoid ● A/T-ECU ● Power train internal parts

★ : Refer to the Transmission Workshop Manual.



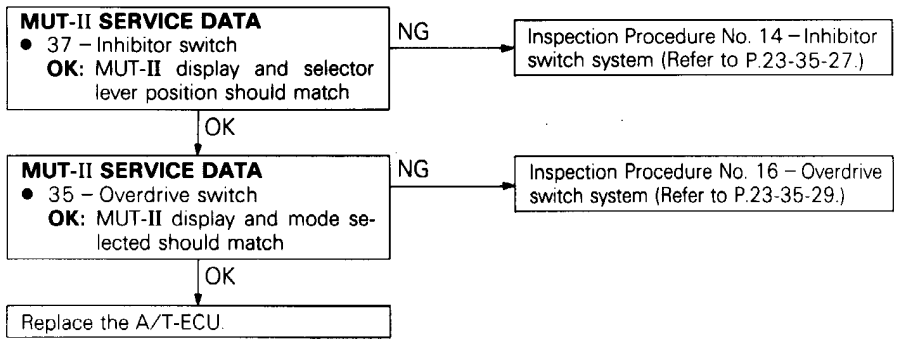
INSPECTION PROCEDURE 7

● Shifting point abnormality	Probable cause
[Comment] Shifting occurs at points which are different from the shift pattern. Note that the shift pattern will vary in different modes and at high oil temperatures.	● Throttle (lever) position sensor ● A/T speed sensor ● Oil temperature sensor ● Pattern selector switch ● Engine coolant temperature switch ● A/T-ECU



INSPECTION PROCEDURE 8

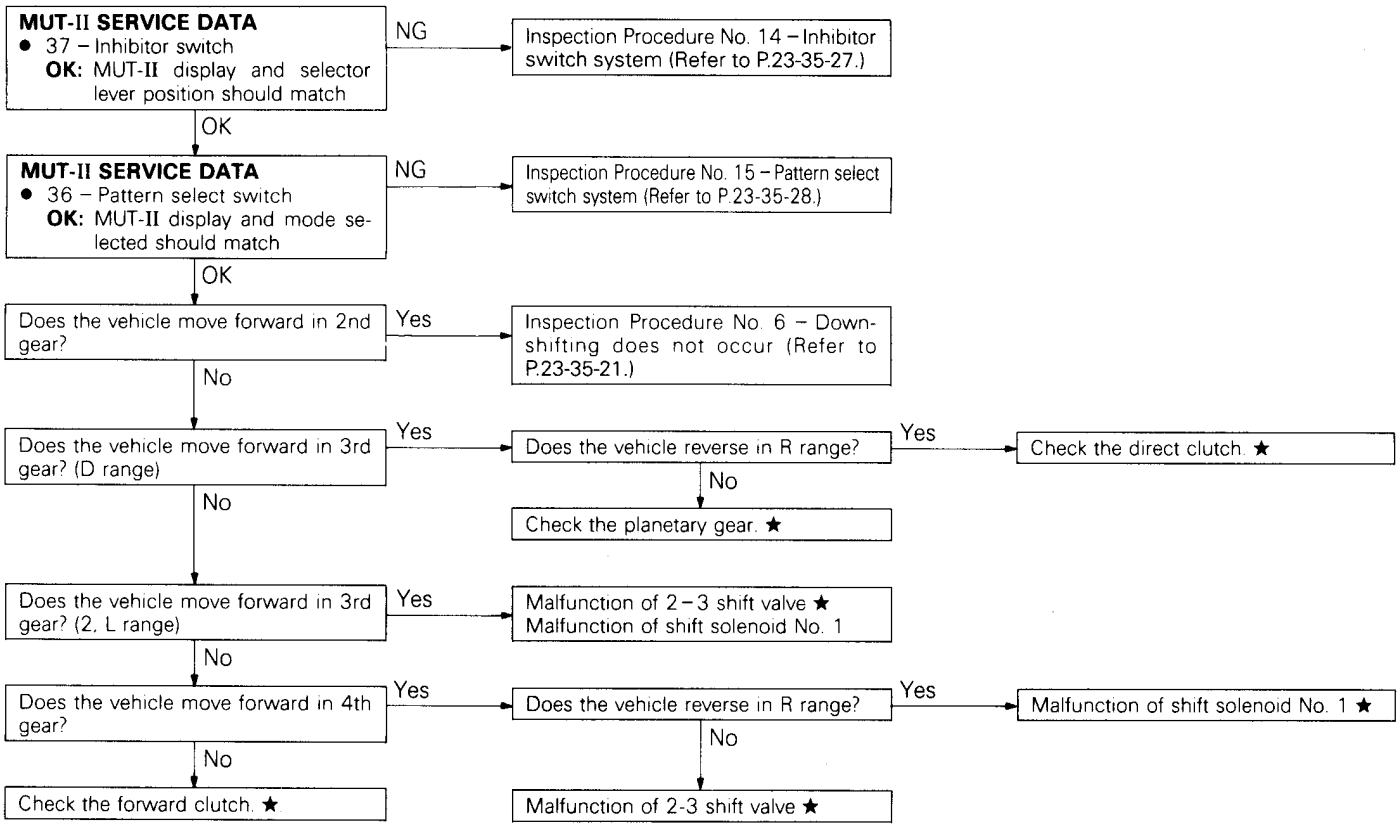
● Upshifting occurs spontaneously	Probable cause
[Comment] Upshifting occurs in ranges where upshifting should not occur when in 2nd gear in L range, 3rd gear in 2 range or 4th gear in D range when OD switch is OFF.	● Inhibitor switch ● Overdrive switch ● A/T-ECU



INSPECTION PROCEDURE 9

● Incorrect drive gear position	Probable cause
[Comment] Vehicle starts off in 2nd, 3rd or 4th gear when in D range. Often occurs when starting off is not smooth.	● Inhibitor switch ● Pattern select switch ● Direct clutch ● Planetary gear ● Valve body

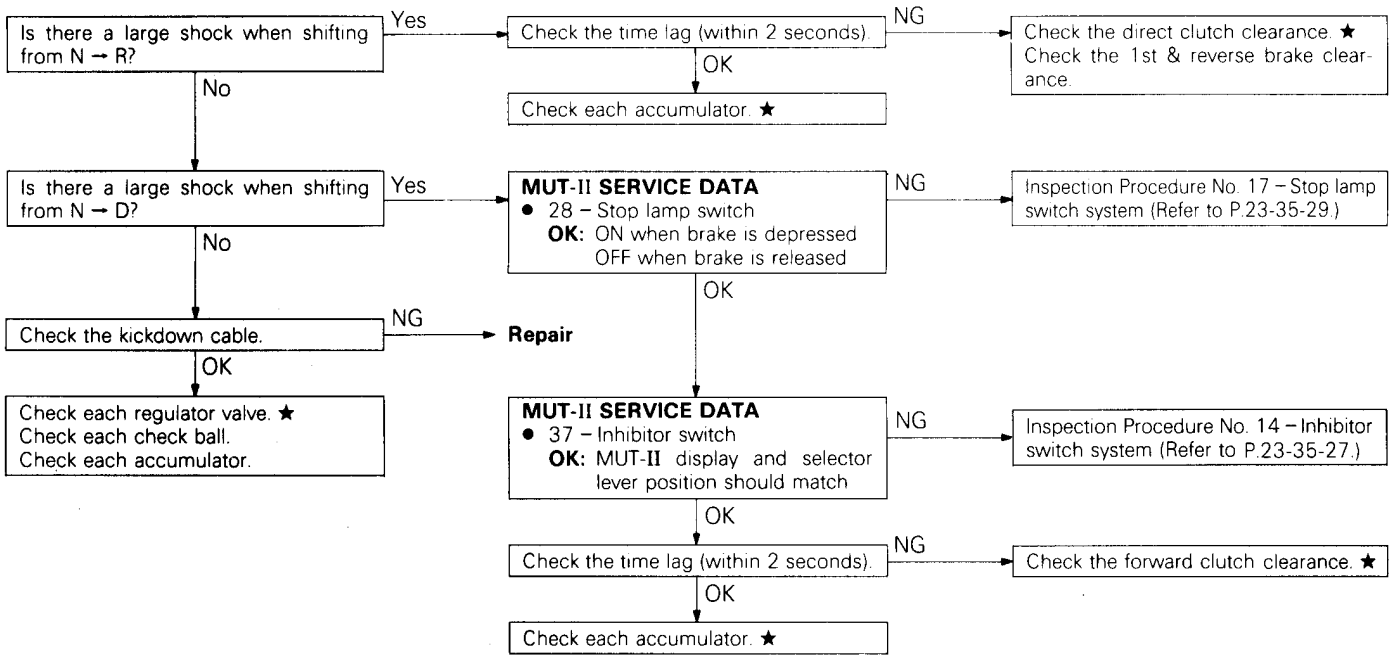
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 10

● Large shocks	Probable cause
[Comment] Shocks accompany shifting from N → D, N → R and during each upshift and downshift.	● Direct clutch ● 1st & Rev brake ● Stop lamp switch ● Inhibitor switch ● Forward clutch ● Valve body

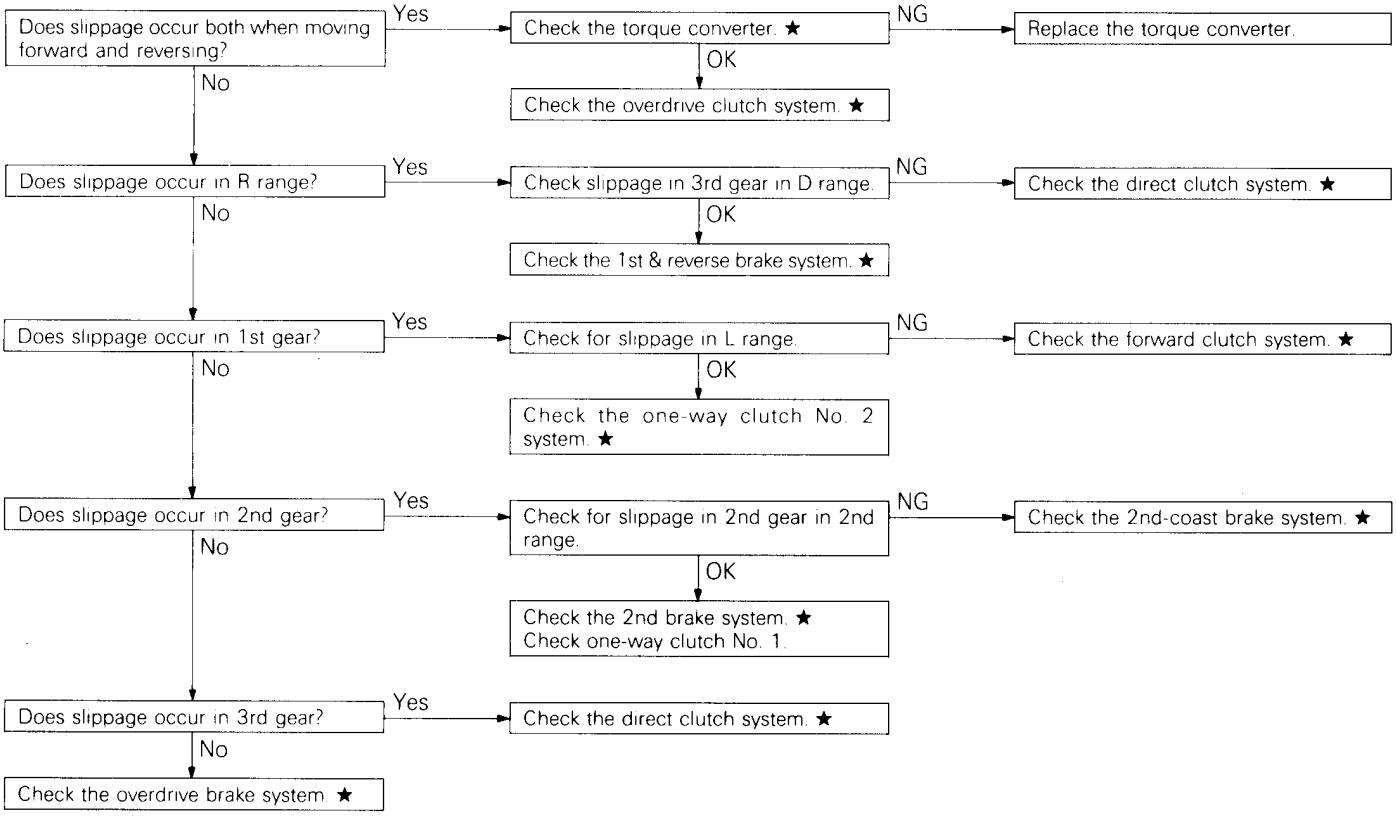
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 11

● Slippage (vibration)	Probable cause
[Comment] Occurs when a clutch or brake does not fully engage due to low hydraulic pressure or a worn facing. Appears as vibration when the problem is slight.	● Torque converter ● Direct clutch ● Forward clutch ● 2nd-coast brake ● 2nd brake ● Overdrive brake

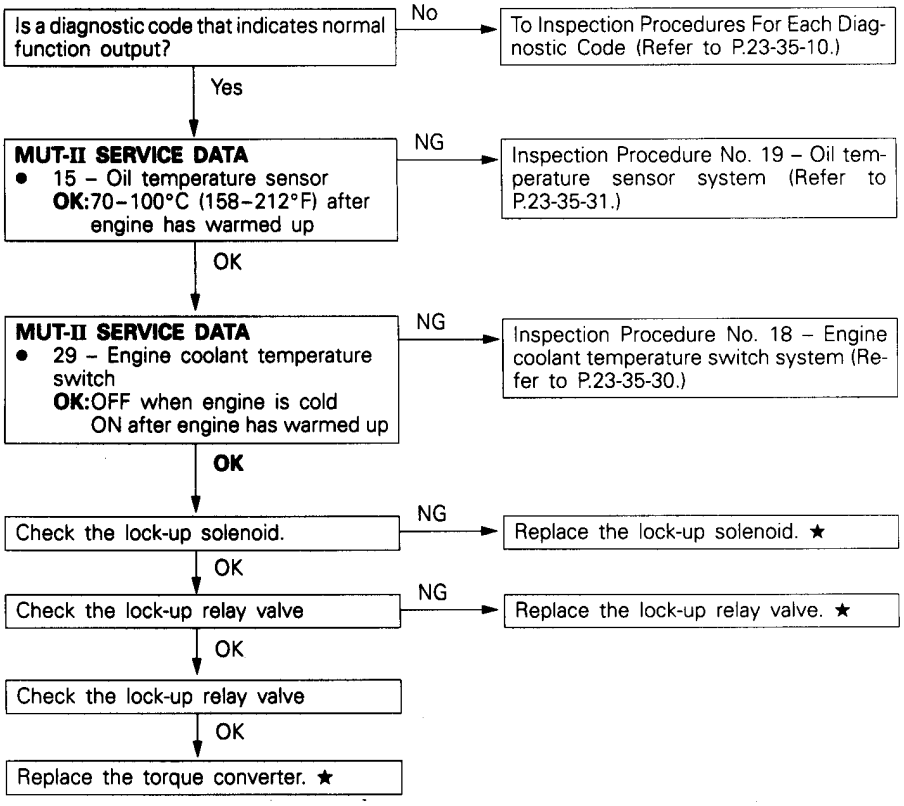
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 12

● Lockup abnormality	Probable cause
[Comment] When lock-up does not operate even though in the lock-up range, and also when lock-up is operating and the engine is idling but then stalls.	● Torque converter ● Valve body ● Oil temperature sensor ● Engine coolant temperature switch

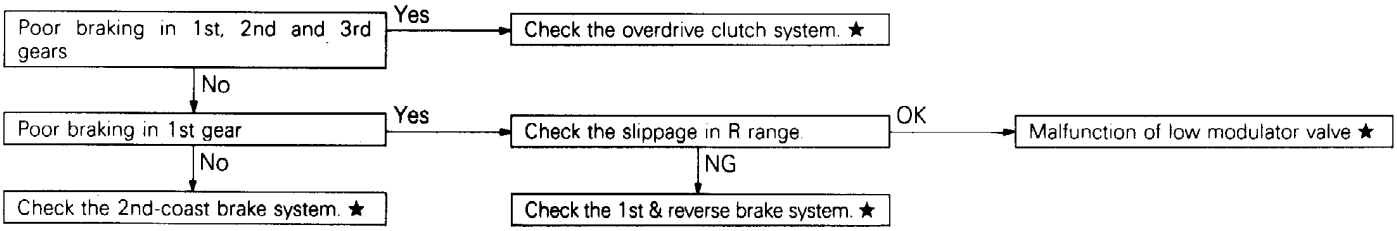
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 13

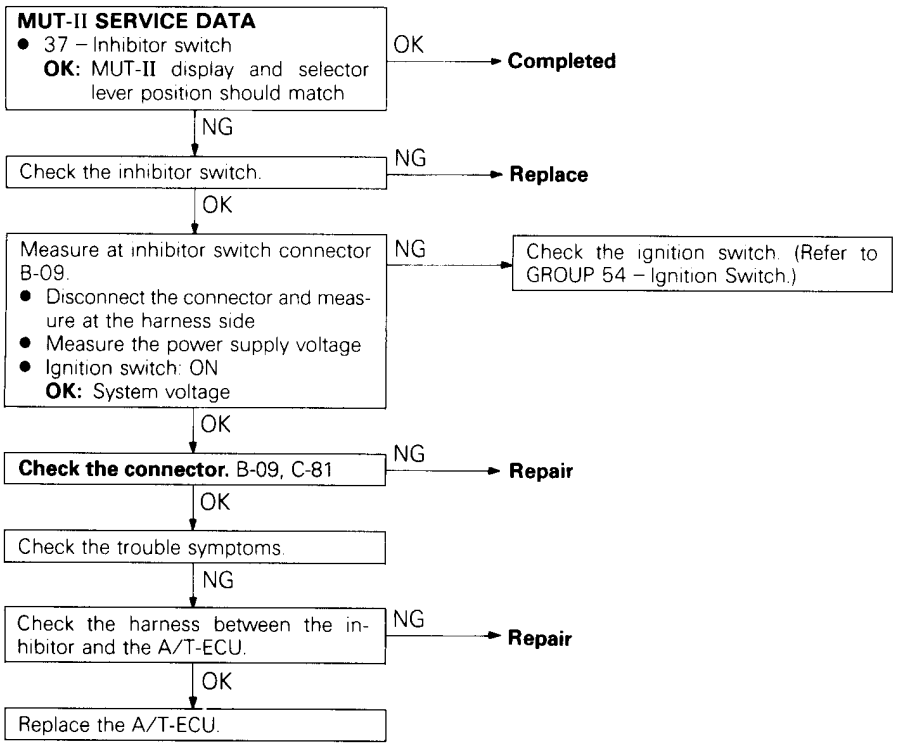
● Abnormal engine braking	Probable cause
[Comment] Engine braking effectiveness is poor after downshifting has occurred.	● Overdrive clutch ● 1st & Rev brake ● 2nd-coast brake ● Valve body

★ : Refer to the Transmission Workshop Manual.



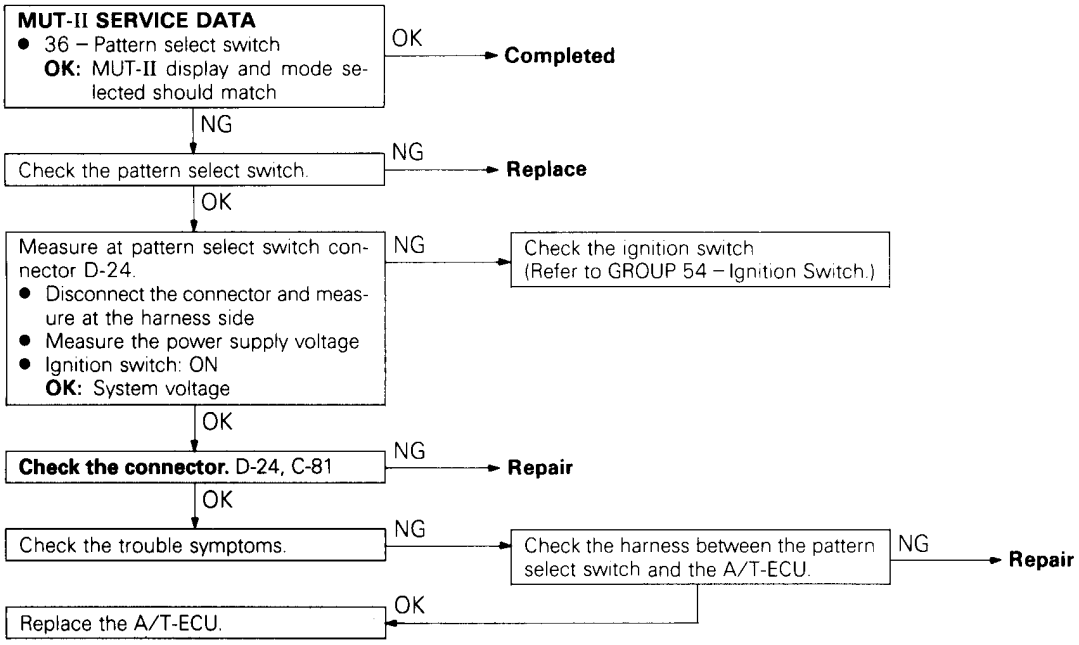
INSPECTION PROCEDURE 14

● Inhibitor switch system	Probable cause
[Comment] If the engine does not start in P or N range, the cause is probably a problem in the inhibitor switch system.	● Malfunction of inhibitor switch ● Malfunction of connector ● Malfunction of A/T-ECU



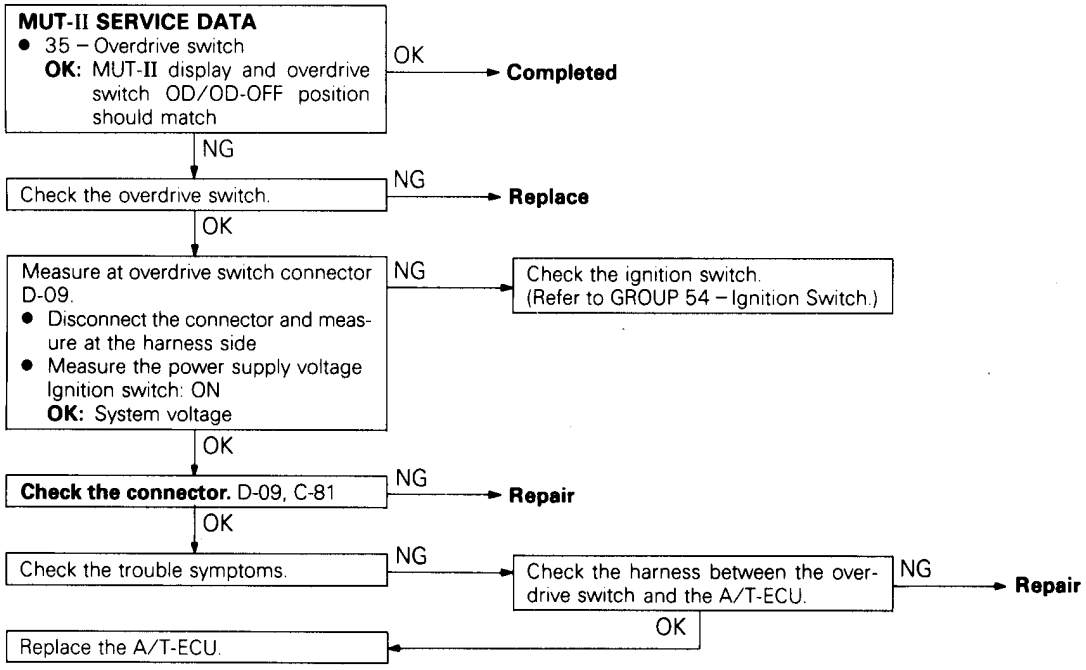
INSPECTION PROCEDURE 15

● Pattern select switch system	Probable cause
[Comment] If the shift pattern does not change when the pattern select switch is operated, the cause is probably a malfunction of the pattern select switch.	● Malfunction of pattern select switch ● Malfunction of connector ● Malfunction of A/T-ECU



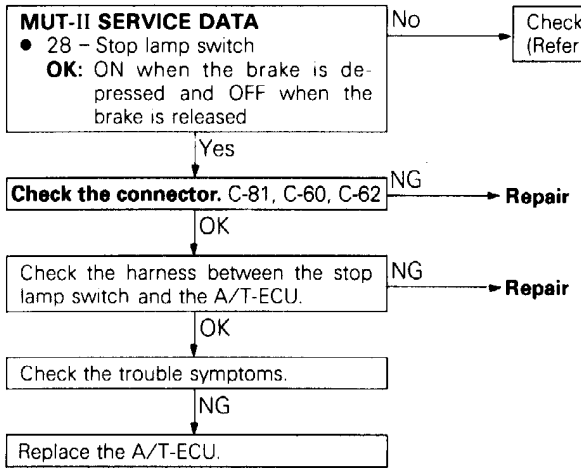
INSPECTION PROCEDURE 16

• Overdrive switch system	Probable cause
[Comment] If downshifting does not occur when overdrive is turned off while driving in 4th gear, or if shifting to 4th gear is not possible, the cause is probably a problem in the overdrive switch system.	• Malfunction of overdrive switch • Malfunction of connector • Malfunction of A/T-ECU



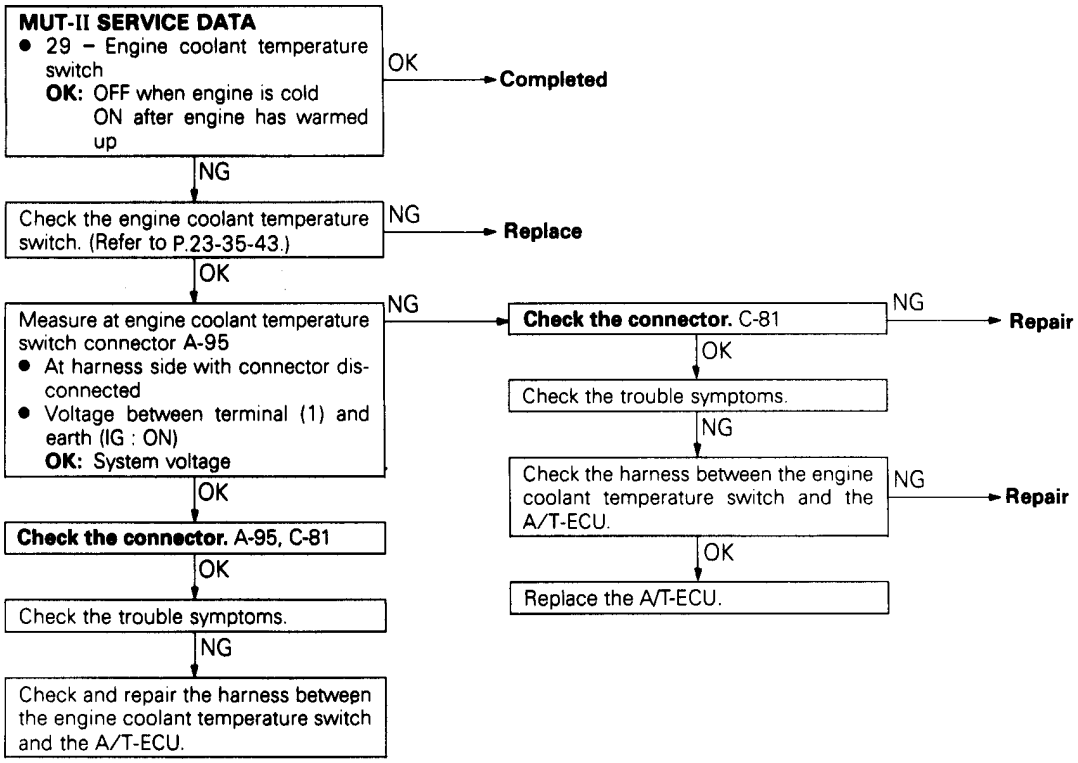
INSPECTION PROCEDURE 17

• Stop lamp switch system	Probable cause
[Comment] If large shocks occur during squat control, the cause is probably a problem with the stop lamp switch.	• Malfunction of stop lamp switch • Malfunction of connector • Malfunction of A/T-ECU



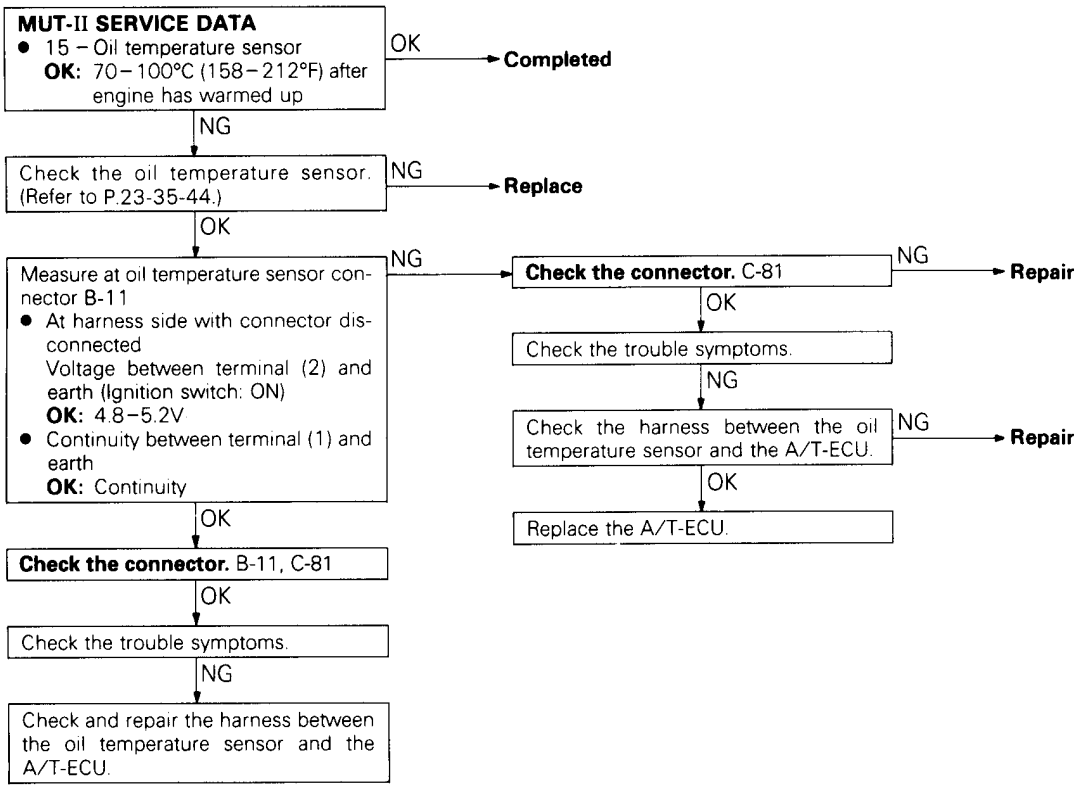
INSPECTION PROCEDURE 18

• Engine coolant temperature switch system	Probable cause
[Comment] The cause is probably a malfunction of the engine coolant tempearture switch: • When upshifting to the 4th gear does not occur in D range. (OD switch: ON) • When lock-up does not operate even though in the lock-up range. • When there is insufficient output while the engine is cold.	• Malfunction of engine coolant temperature switch • Malfunction of connector • Malfunction of A/T-ECU



INSPECTION PROCEDURE 19

● Oil temperature sensor system	Probable cause
[Comment] If the oil temperature warning lamp remains illuminated, the cause is probably a problem with the oil temperature sensor.	● Malfunction of oil temperature sensor ● Malfunction of connector ● Malfunction of A/T-ECU



SERVICE DATA REFERENCE TABLE

Item No.	Inspection item	Inspection conditions		Normal value
11	Throttle position sensor <Petrol powered vehicles>	Accelerator pedal position Engine: Idle Selector lever position: N	Fully closed	0 – 5%
			Depressed	Gradually rises from the above value
			Fully open (up to 2 seconds)	85 – 100%
	Lever position sensor <Diesel powered vehicles>	Accelerator pedal position Engine: Idle Selector lever position: N	Fully closed	0 – 20%
			Depressed	Gradually rises from the above value
			Fully open (up to 2 seconds)	90 – 100%
15	Oil temperature sensor	Warming up	Drive for 15 minutes or more so that the ATF temperature becomes 70 – 90°C (158 – 194°F)	Gradually rises to 70 – 90°C (158 – 194°F)
21	Wide open throttle switch	Accelerator pedal position Ignition switch: ON Engine: Stopped	Fully closed	OFF
			Fully open	ON
27	Shift position signal	Accelerator pedal position Engine: Idle (Vehicle stopped) Selector lever position: D Mode selection: Normal	Fully closed	1st
			N → D shift	1st → 3rd → 1st
		Selector lever position: L Mode selection: Normal	Idle (Vehicle stopped)	1st
		Selector lever position: 2 Mode selection: Normal	Idle (Vehicle stopped)	1st
			Driving at 40 km/h (20 seconds or more)	2
		Selector lever position: D Mode selection: Normal Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	3rd
		Selector lever position: D Mode selection: Normal Overdrive: ON	Driving at constant speed of 50 km/h (20 seconds or more)	4th
28	Stop lamp switch	Brake pedal position Ignition switch: ON Engine: Stopped	Depressed	ON
			Released	OFF

Item No.	Inspection item	Inspection conditions		Normal value
29	Engine coolant temperature switch	When engine changes from cold to warm	While engine is cold	OFF
			After engine has warmed up	ON
32	A/T speed sensor*	Selector lever position: D Mode selection: Normal Overdrive: ON	Driving at 30 km/h	25 – 35 km/h
			Driving at 50 km/h	42 – 58 km/h
35	Overdrive switch	Ignition switch: ON Engine: Stopped	Overdrive switch: ON	OD
			Overdrive: OFF	OD – OFF
36	Pattern select switch	Ignition switch: ON Engine: Stopped	Pattern select switch Power mode	Power
			Pattern select switch Hold mode	Hold
			Pattern select switch Normal mode	Normal
37	Inhibitor switch	Ignition switch: ON Engine: Stopped	Selector lever position: P Selector lever position: R Selector lever position: N Selector lever position: D Selector lever position: 2 Selector lever position: L	P, R, D P, R, D N P, R, D 2 L
39	Cruise control-ECU	Selector lever position: D Mode selection: Normal	Auto-cruise control OFF	OFF
			Auto-cruise control ON (climbing at 50 km/h)	ON
41	Shift solenoid No. 1	Selector lever position: D Mode selection: Normal	Driving at 10 km/h (Drive 1st)	ON
			Driving at 50 km/h (Drive 4th)	OFF
43	Shift solenoid No. 2	Selector lever position: D Mode selection: Normal Overdrive: OFF	Driving at 10 km/h (Drive 1st)	OFF
			Driving at 50 km/h (Drive 3rd)	ON
47	Lock-up solenoid	Selector lever position: D Mode selection: Normal Overdrive: ON	Driving at 10 km/h (Drive 1st)	OFF
			Driving at 50 km/h (Drive 4th)	ON

NOTE
*: Transfer lever position: 4H Range

REFERENCE FOR FAIL-SAFE/BACKUP FUNCTIONS

When malfunctions of the main sensors or actuators are detected by the self-diagnosis system, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

<table>
<tr><th>Malfunctioning item</th><th>Control contents during malfunction</th></tr>
<tr><td>A/T speed sensor</td><td>When there is an open circuit in the A/T speed sensor, vehicle speed detection is switched to the output from the vehicle speed sensor in the speedometer to maintain vehicle control.</td></tr>
<tr><td>Inhibitor switch</td><td>If there is an open circuit in the N, 2 or L signal line, driving is possible in the case of 2 and L (same as D range) so that control can be performed as if the range is D range, and driving is not possible in N range.
If more than one of the 2, L or N signals are input, the order of priority for control is L → 2 → N.</td></tr>
<tr><td>Throttle position sensor</td><td>If the output is 0.09 V or less or 4.95 V or more, the throttle is fully closed and gear shifting control is carried out.</td></tr>
<tr><td>Lock-up solenoid</td><td>If a problem is detected, lock-up is stopped over the whole range and the solenoid is turned OFF to prevent the engine from stalling during idling.</td></tr>
<tr><td>Shift control solenoid valve No. 1, No. 2</td><td>If a problem is detected, each solenoid stops operating and is turned OFF.
The gear shifting logic when a problem is detected is given in the table below.
<table>
<tr><th rowspan="2">Selector lever position</th><th colspan="3">Normal</th><th colspan="3">When the solenoid No.1 has broken</th><th colspan="3">When the solenoid No.2 has broken</th><th colspan="3">When the solenoids No.1 and No.2 have broken</th></tr>
<tr><th>Gear</th><th>S1</th><th>S2</th><th>Gear</th><th>S1</th><th>S2</th><th>Gear</th><th>S1</th><th>S2</th><th>Gear</th><th>S1</th><th>S2</th></tr>
<tr><td rowspan="4">D</td><td>1</td><td>O</td><td>X</td><td rowspan="3">3</td><td></td><td>X→O</td><td>1</td><td>O</td><td></td><td rowspan="4">O/D</td><td></td><td></td></tr>
<tr><td>2</td><td>O</td><td>O</td><td></td><td>O</td><td rowspan="2">O/D</td><td>O→X</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>X</td><td>O</td><td></td><td>O</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td>O/D</td><td>X</td><td>X</td><td>O/D</td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">2</td><td>1</td><td>O</td><td>X</td><td rowspan="3">3</td><td></td><td>X→O</td><td>1</td><td>O</td><td></td><td rowspan="3">3</td><td></td><td></td></tr>
<tr><td>2</td><td>O</td><td>O</td><td></td><td>O</td><td rowspan="2">3</td><td>O→X</td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>X</td><td>O</td><td></td><td>O</td><td>X</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">L</td><td>1</td><td>O</td><td>X</td><td>1</td><td></td><td>X</td><td rowspan="2">1</td><td>O</td><td></td><td rowspan="2">1</td><td></td><td></td></tr>
<tr><td>2</td><td>O</td><td>O</td><td>2</td><td></td><td>O</td><td>O</td><td></td><td></td><td></td><td></td></tr>
</table>
O : Energized (ON)
X : Not energized (OFF)
S1 : Solenoid valve No. 1
S2 : Solenoid valve No. 2</td></tr>
</table>

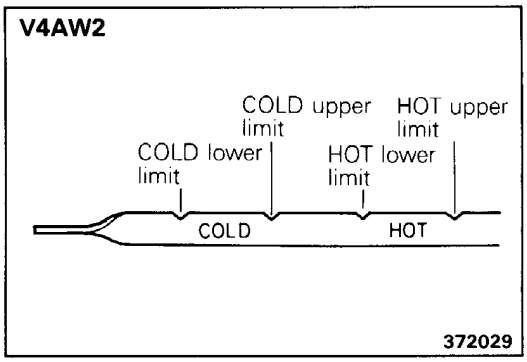
A/T-ECU TERMINAL VOLTAGE REFERENCE CHART

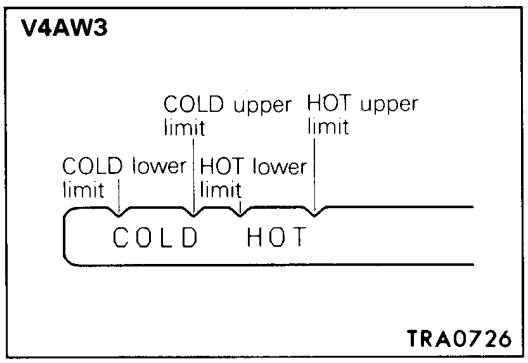
Terminal No.	Inspection item	Inspection conditions	Standard value
1	Shift control solenoid valve No. 1	When in 1st or 2nd gear	System voltage
		When in 3rd or 4th gear	0 V
2	Shift control solenoid valve No. 2	When in 2nd or 3rd gear	System voltage
		When in 1st or 4th gear	0 V
3	Lock-up solenoid	When lock-up clutch is operating	System voltage
		When lock-up clutch is not operating	0 V
4	A/T speed sensor Earth side	Ignition switch: OFF	0V
		Ignition switch: ON	2.5 V
5	Inhibitor switch (N)	Selector lever position: N	System voltage
		Selector lever position: Other than N	0 V
6	Diagnostic output terminal	When MUT-II is not connected	System voltage
7	HOLD mode signal	When HOLD mode is selected	System voltage
		When mode other than HOLD mode is selected	0 V
8	Overdrive switch	Overdrive switch: ON (OD)	0 V
		Overdrive switch: OFF (OD – OFF)	System voltage
9	Vehicle speed sensor	Vehicle: Slowly moving forward	Alternates between 0 ⟷ approx. 5 V
10	A/T speed sensor output side	Vehicle: Stopped	Approx. 2.5 V
		Vehicle: Driving	Other than 2.5 V
11	Cruise control signal	When cruise control is requested	0 V
		When cruise control is not requested	System voltage
12	Oil temperature sensor	ATF temperature: 120°C (248°F)	Approx. 1.9 V
		ATF temperature: 150°C (302°F)	Approx. 1.1 V
13	Self-diagnosis control terminal	—	—
14	Power supply	Ignition switch: ON	System voltage
		Ignition switch: OFF	0 V
15	Backup power supply	Ignition switch: OFF	System voltage
16	Earth	Engine: Idling	0 V
17	Stop lamp switch	When brake pedal is depressed	0 V
		When brake pedal is released	System voltage
18	Inhibitor switch (2)	Selector lever position: 2	System voltage
		Selector lever position: Other than 2	0 V

Terminal No.	Inspection item	Inspection conditions	Standard value
19	Inhibitor switch (L)	Selector lever position: L	System voltage
		Selector lever position: Other than L	0 V
20	Oil temperature warning lamp	When normal	0 V
		Ignition switch: For 5 seconds after turning ON	System voltage
21	Power mode signal	When POWER mode is selected	System voltage
		When mode other than POWER mode is selected	0 V
22	—	—	—
23	—	—	—
24	Engine coolant temperature signal	When engine coolant temperature is 30°C (86°F)	System voltage
		When engine coolant temperature is 80°C (176°F)	0 V
25	Wide open throttle switch	Accelerator pedal: Fully closed	System voltage
		Accelerator pedal: Fully open	0 V
26	Throttle position sensor <Petrol powered vehicles>	Accelerator pedal: Fully closed	0.3–1.0 V
		Accelerator pedal: Fully open	4.4–5.0 V
	Lever position sensor <Diesel powered vehicles>	Accelerator pedal: Fully closed	0.6–1.3 V
		Accelerator pedal: Fully open	4.3–5.0 V

SERVICE ADJUSTMENT PROCEDURES

AUTOMATIC TRANSMISSION FLUID INSPECTION





(1) Place the vehicle on a level surface.
(2) Before removing the dipstick, wipe all dirt form area around the dipstick.
(3) With the selector lever in the "P" position and the parking brake applied, start the engine.
(4) The engine should be running at idle and the transmission should be warmed up sufficiently. [fluid temperature 70–80°C (158–176°F)]
(5) Move the selector lever through all positions to fill the torque converter and hydraulic circuit with fluid. Then place the lever in the "N" position.
(6) Check that fluid level is at oil level gauge "HOT". If fluid level is low, add fluid to "HOT" level.

Transmission fluid: DIA QUEEN ATF-SP or equivalent

NOTE
Low fluid level can allow the oil pump to take in air together with fluid, leading to various troubles. Air trapped in hydraulic circuit forms bubbles which make the fluid spongy. This lowers pressure and shows down pressure buildup. If the transmission has too much fluid, gears churn up foam and cause same conditions as when the fluid level is low, resulting in premature deterioration of ATF. In either case, air bubbles can cause overheating and fluid oxidation and varnishing, which can interfere with normal valve, clutch and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a fluid leak.

(7) Check fluid condition.

NOTE
When fluid smells burned, it is contaminated with metal bushing or friction material particles and hence a complete overhaul of the transmission is needed. Be sure to examine fluid on the dipstick closely.

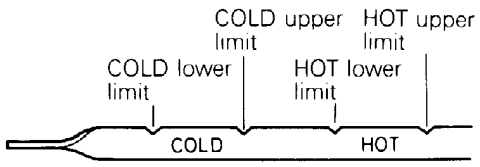
(8) After fluid has been checked, insert the dipstick until it is seated fully to seal out water and dirt.

AUTOMATIC TRANSMISSION FLUID CHANGE

Caution
If ATF change is required due to damage to the transmission, be sure to clean the cooler system.

(1) Raise the vehicle on hoist. Place a drain container with large opening under the drain plug (located in bottom of the oil pan).
(2) Remove the drain plug to let ATF drain.
(3) Install the drain plug and new gasket and tighten to 21 Nm (2.1 kgm, 15 ft.lbs.).]

V4AW2



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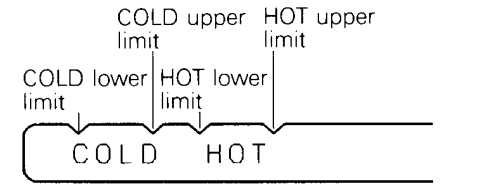
(4) Refill ATF through the oil level gauge hole until its level reached at COLD lower limit of the level gauge.
(5) Start the engine and allow to idle for at least two minutes. Then, with the parking brake and service brake applied, move the selector lever through all positions and finally place in the "N" or "P" position.
(6) After the transmission is warmed up to the normal operating temperature, recheck the fluid level, which must be between the HOT upper limit and HOT lower limit marks.
(7) Insert the dipstick fully to prevent dirt from entering the transmission.

V4AW3



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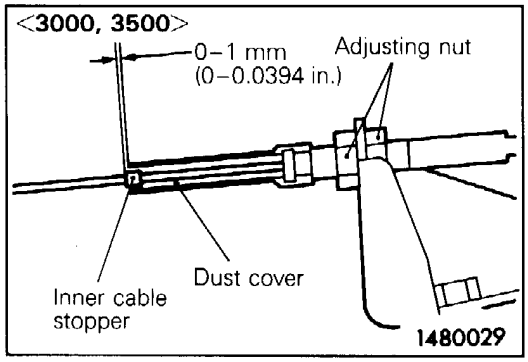
TRANSFER OIL INSPECTION AND CHANGE

Refer to GROUP 22 – Service Adjustment Procedures.

<3000, 3500>



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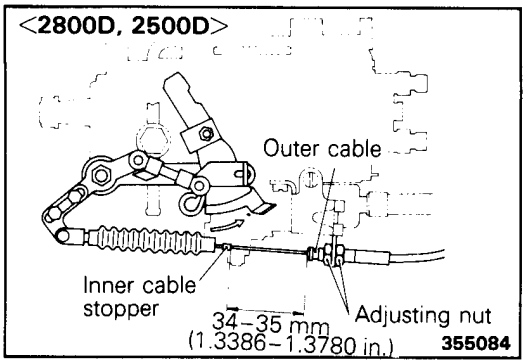
THROTTLE CABLE CHECK AND ADJUSTMENT

<3000, 3500>

(1) Check for defective or bent throttle lever or throttle cable bracket.
(2) With the accelerator depressed, check to be sure that the distance between the inner cable stopper and dust cover surface is within the standard value.
Standard value: 0–1 mm (0–0.0394 in.)
(3) If outside the standard value, adjust with adjusting nut.



<2500D, 2800D>

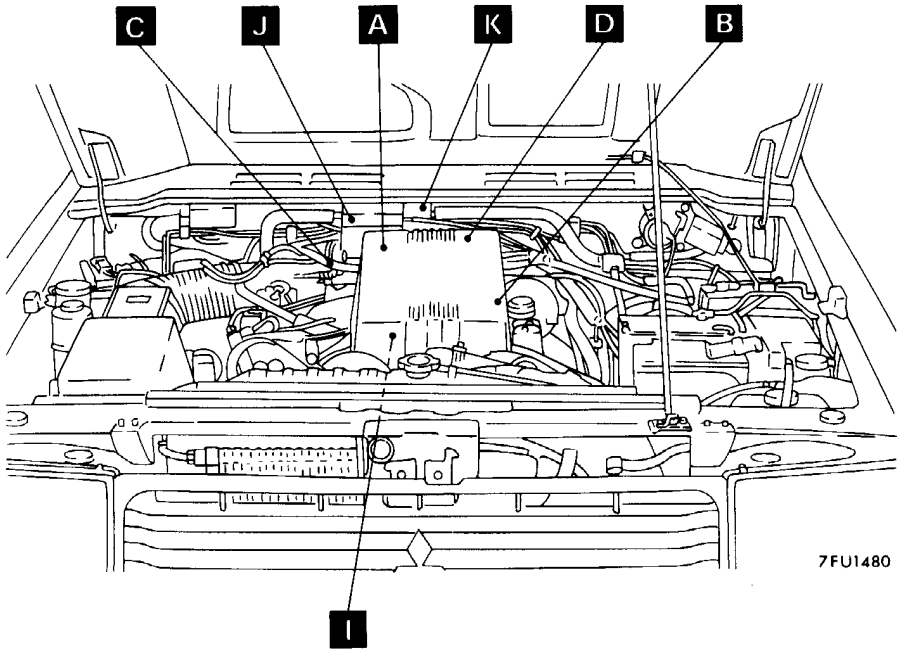
(1) Check for defective or bent throttle lever or throttle cable bracket.
(2) Remove outer cable side of boot to expose inner cable stopper.
(3) Pull throttle lever to fully open throttle valve and check that the distance between the inner cable stopper and outer cable ends is within the standard value.

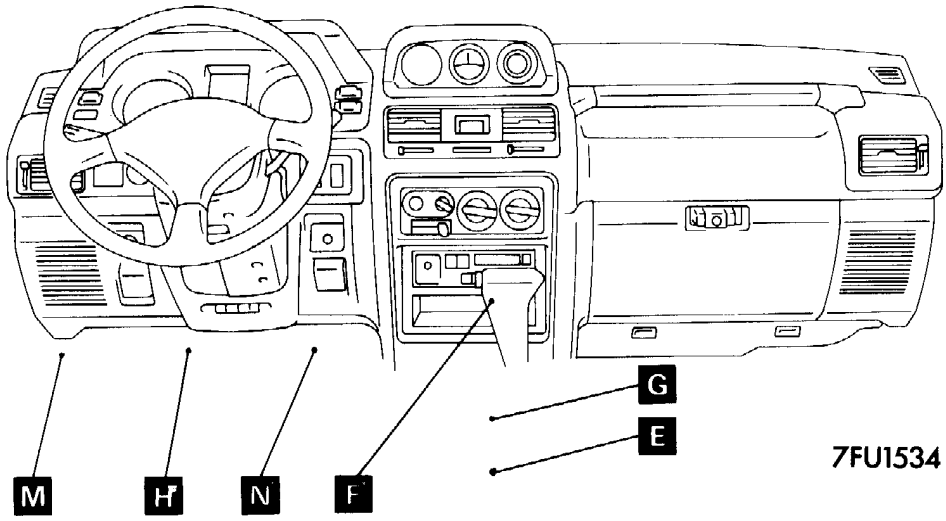
Standard value: 34 – 35 mm (1.3386 – 1.3780 in.)

(4) If outside the standard value, adjust with adjusting nut.

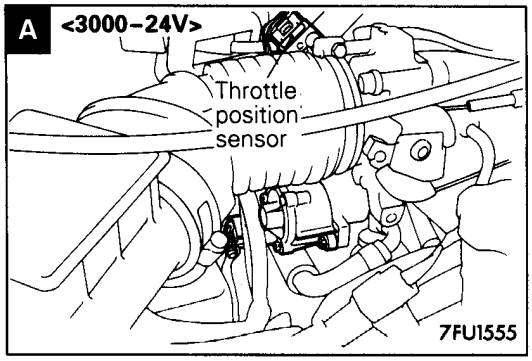
ELC-4A/T CONTROL COMPONENT LOCATION <V4AW3>

Name	Symbol	Name	Symbol
Throttle position sensor <3000–24V, 3500>	A	Stop lamp switch	H
Lever position sensor <2800D>	B	Engine coolant temperature switch	I
Inhibitor switch	C	Oil temperature sensor	J
A/T-speed sensor	D	Solenoid valves	K
Vehicle-speed sensor	E	A/T-ECU	L
Overdrive switch	F	Diagnosis connector	M
Pattern select switch	G	Wide open throttle switch	N

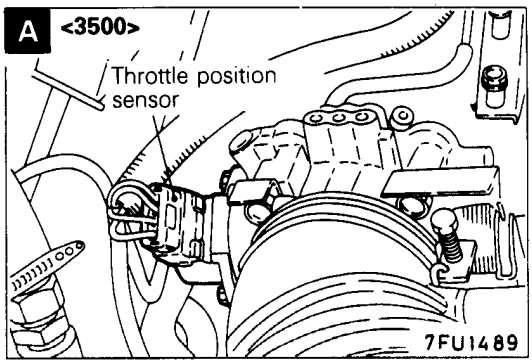




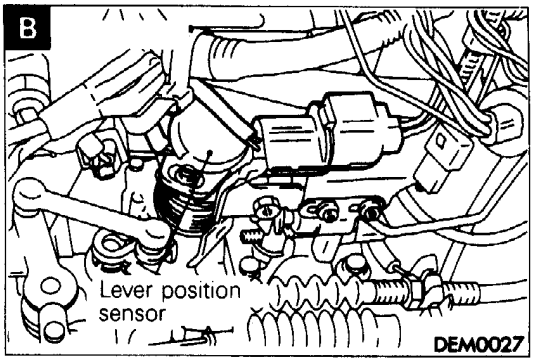
A <3000–24V>



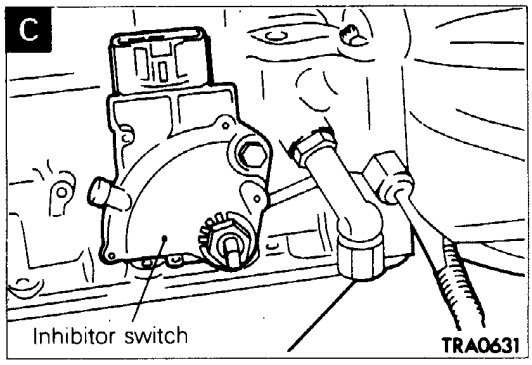
A <3500>



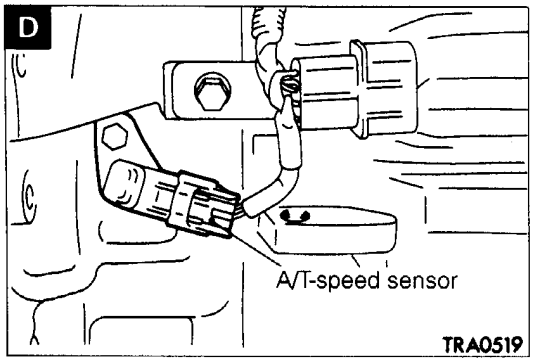
B



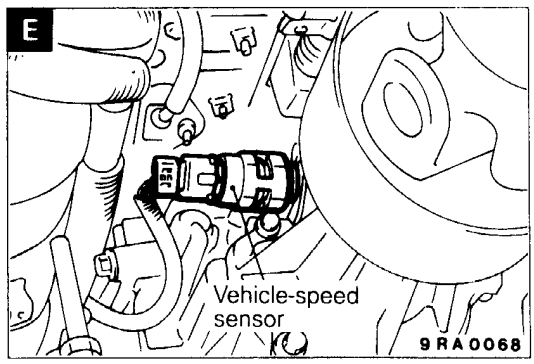
C



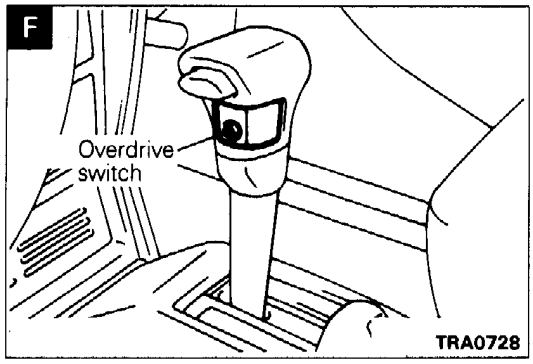
D



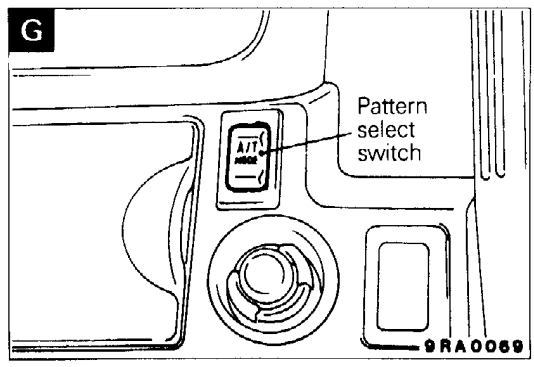
E



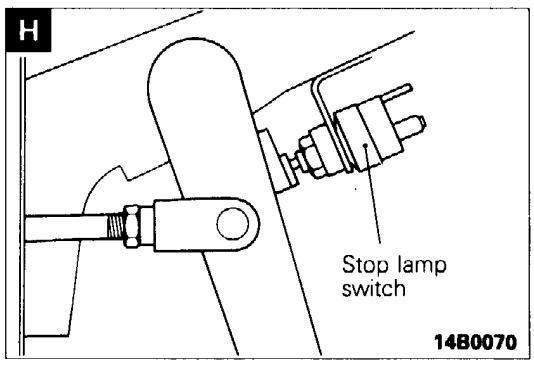
F



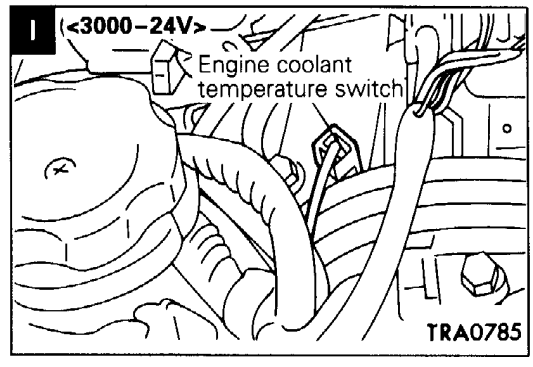
G



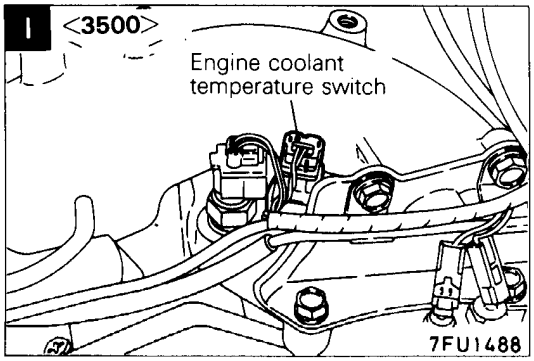
H



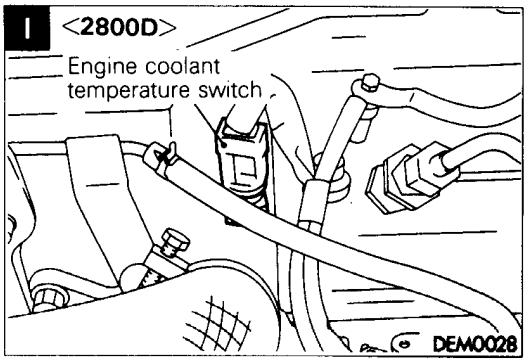
I <3000–24V>



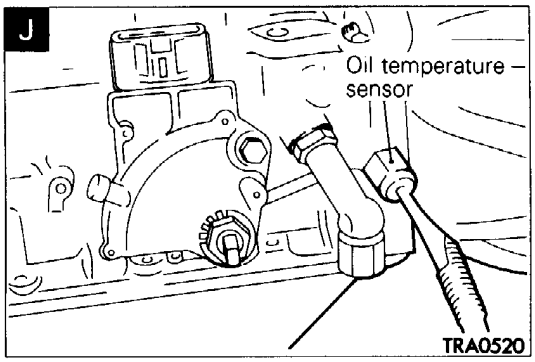
I <3500>



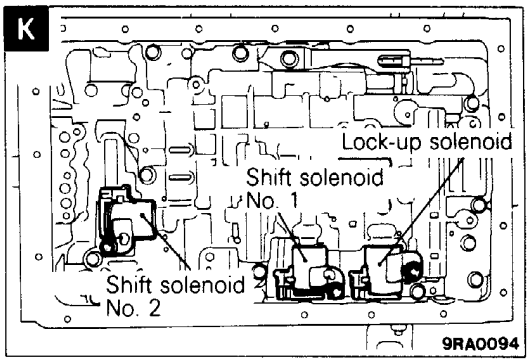
I <2800D>



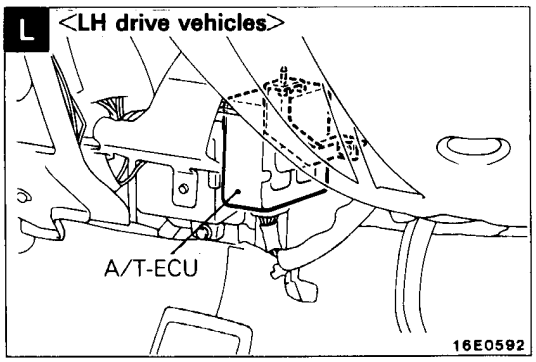
J



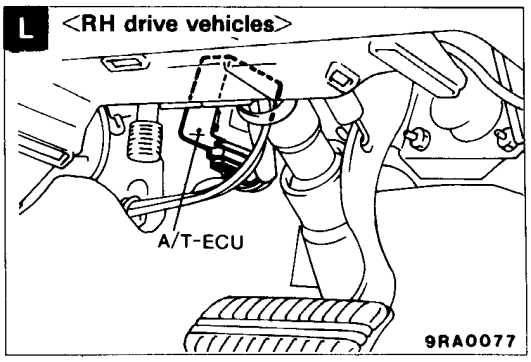
K



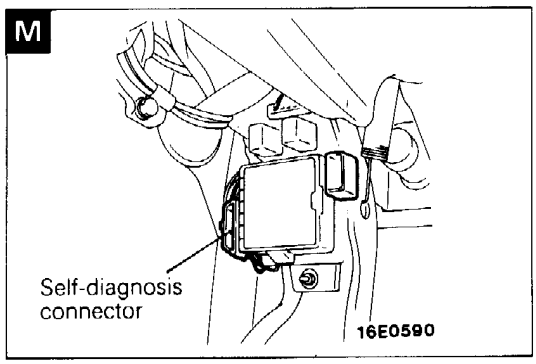
L <LH drive vehicles>



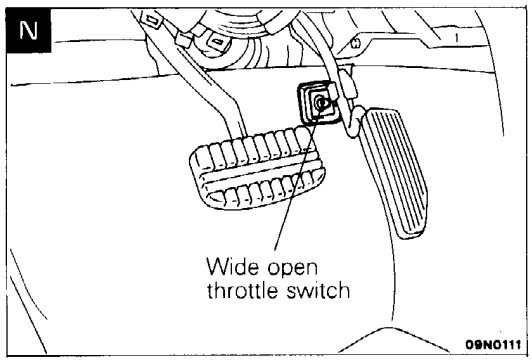
L <RH drive vehicles>



M



N



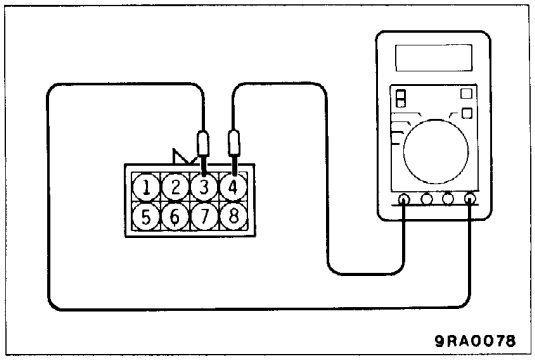
V4AW3 CONTROL COMPONENT INSPECTION

THROTTLE POSITION SENSOR <3000–24V, 3500>

Refer to GROUP 13 – Service Adjustment Procedures.

LEVER POSITION SENSOR <2800D>

Refer to GROUP 13 – Service Adjustment Procedures.



A/T-SPEED SENSOR

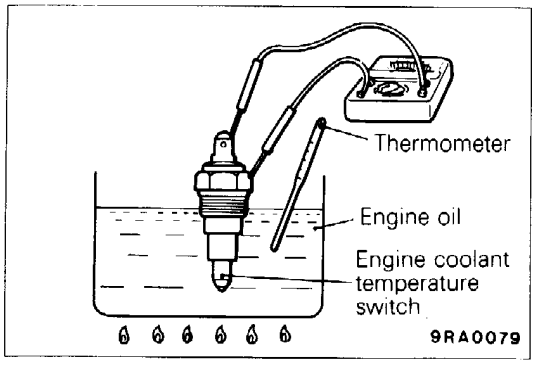
(1) Disconnect the sensor connector.
(2) Measure resistance value between terminal ③ and ④.
Standard value: 620 ± 60 Ω [at 20°C (68°F)]
(3) If outside the standard value, replace the sensor.

VEHICLE-SPEED SENSOR

Refer to GROUP 54 – Service Adjustment Procedures.

STOP LAMP SWITCH

Refer to GROUP 35 – Service Adjustment Procedures.

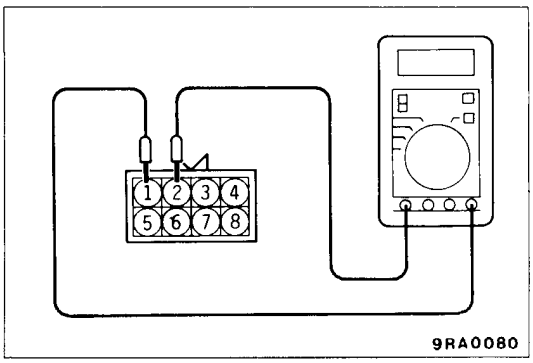


ENGINE COOLANT TEMPERATURE SWITCH

(1) Disconnect the switch connector.
(2) Check continuity between the terminal and the thread part.
Standard value:

Oil temperature	Continuity
30°C (86°F)	No continuity
60°C (140°F)	Continuity

(3) If outside the standard value, replace the switch.



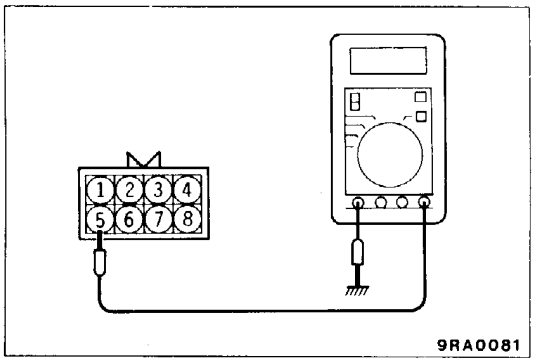
OIL TEMPERATURE SENSOR

(1) Disconnect the sensor connector.
(2) Measure resistance value between terminal ① and ②.

Standard value:

Oil temperature	Resistance value
25°C (77°F)	10 kΩ
120°C (248°F)	615 Ω

(3) If outside the standard value, replace the sensor.

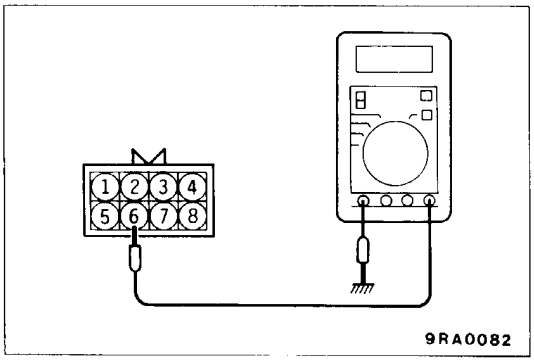


SHIFT CONTROL SOLENOID VALVE NO. 1

(1) Disconnect the solenoid connector.
(2) Measure resistance value between the terminal ⑤ and earth.

Standard value: 13 ± 2 Ω [at 25°C (77°F)]

(3) If outside the standard value, replace the solenoid assembly.

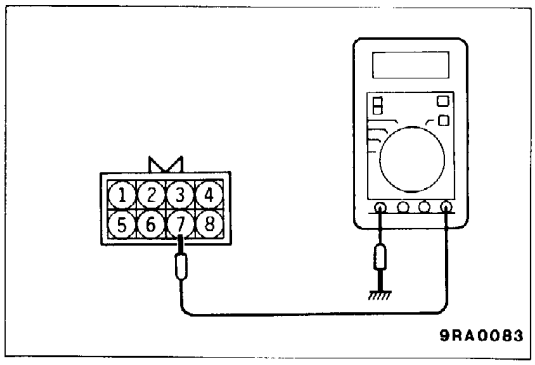


SHIFT CONTROL SOLENOID VALVE NO. 2

(1) Disconnect the solenoid connector.
(2) Measure resistance value between the terminal ⑥ and earth.

Standard value: 13 ± 2 Ω [at 25°C (77°F)]

(3) If outside the standard value, replace the solenoid assembly.



LOCK-UP SOLENOID

(1) Disconnect the solenoid connector.
(2) Measure resistance value between the terminal ⑦ and earth.

Standard value: 13 ± 2 Ω [at 25°C (77°F)]

(3) If outside the standard value, replace the solenoid assembly.

CONVERTER STALL TEST

In this test, the engine maximum speed when the torque converter stalls with the shift lever in the "D" or "R" range is measured to check operation of the torque converter, starter and one-way clutch and check hlding performance of the transmission clutch (including brake).

Caution
Do not stand in front or at rear of the vehicle during this test.

(1) Check the transmission fluid level. The fluid temperature should be at the level after normal operation [70–80°C (158–176°F)]. The engine coolant temperature should also be at the level after normal operation [80–90°C (176–194°F)].
(2) Apply chocks to the rear wheels (right and left).
(3) Mount an engine tachometer.
(4) Apply fully the parking and service brakes.
(5) Start the engine.
(6) With the selector lever in the "D" range, fully depress the accelerator pedal and read off the engine maximum speed.

Standard value: 2,100–2,400 r/min. <V4AW2>
2,100–2,600 r/min. <V4AW3>

NOTE
When doing so, do not keep the engine running with throttle full open for more than necessary duration (5 seconds or more). If two or more stall tests are needed, place the selector lever in the "N" position and run the engine at about 1,000 r/min to allow the transmission fluid to cool before another stall test.

(7) Place the selector lever in the "R" range and perform the test as above.

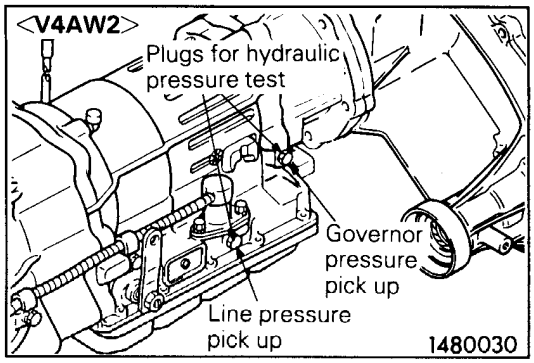
JUDGEMENT OF STALL TEST RESULTS

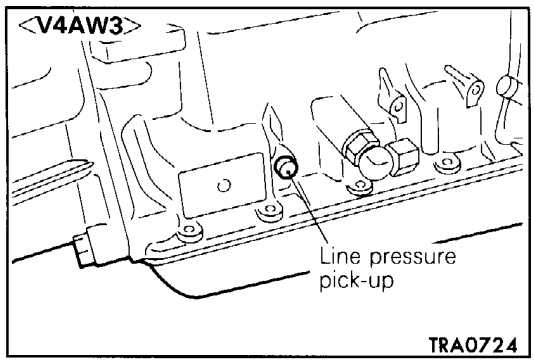
<V4AW2>

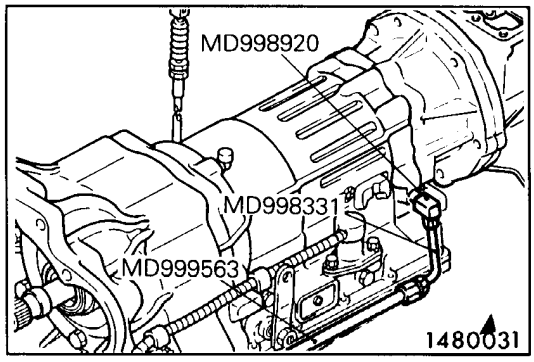
Stall speed in "D" and "R" range is equal to each other but lower than the nominal value.	(1) Engine output is low (2) Starter one-way clutch is faulty. (Faulty torque converter is suspected if it is lower than nominal by more than 600 r/min.)
Stall speed in "D" range is higher than nominal.	(1) O.D. clutch slipping. (2) O.D. one-way clutch faulty (3) Forward clutch slipping (4) One-way clutch No. 2 faulty (5) Low line pressure
Stall speed in "R" range is higher than nominal.	(1) O.D. clutch slipping. (2) O.D. one-way clutch faulty (3) Direct clutch slipping (4) Brake No. 3 slipping (5) Low line pressure

<V4AW3>

Stall speeds in each range are equal to each other but are lower than the standard value.	(1) Throttle valve is not fully open (2) Insufficient engine output (3) Malfunction of stator one-way clutch (Malfunction of torque converter could be the problem if the stall speed is lower than the standard value by 600 r/min or more)
Stall speeds in each range are equal to each other but are higher than the standard value.	(1) Low line pressure (2) Fluid level is not at standard level (insufficient fluid) (3) Malfunction of O.D. one-way clutch
Stall speed in D range is higher than the standard value	(1) Forward clutch slippage (2) Malfunction of O.D. one-way clutch (3) Malfunction of one-way clutch No. 2 (4) Low line pressure
Stall speed in R range is higher than the standard value	(1) Direct clutch slippage (2) 1st & reverse brake slippage (3) Low line pressure (4) Malfunction of O.D. one-way clutch







HYDRAULIC PRESSURE TEST

The hydraulic pressure tests (governor pressure and line pressure tests) are important in determining the causes of transmission failures. Before conducting these tests, fluid level and condition and throttle cable adjustment, etc. must be checked for defects or abnormalities. When conducting the tests, the engine and transmission should be at correct operating temperatures, [engine coolant 80–90°C (176–194°F), transmission fluid 70–80°C (158–176°F)].

GOVERNOR PRESSURE TEST <V4AW2 only>

(1) Place vehicle on a chassis dynamometer.
(2) Remove plug from governor pressure take off port.
(3) Install special tool as shown in figure and place the meter inside vehicles.
(4) Apply parking brake.
(5) Start engine.
(6) Release parking brakes.
(7) Shift to D and measure governor pressure at each output shaft r/min.

Standard value:

<V4AW2-3-Q>

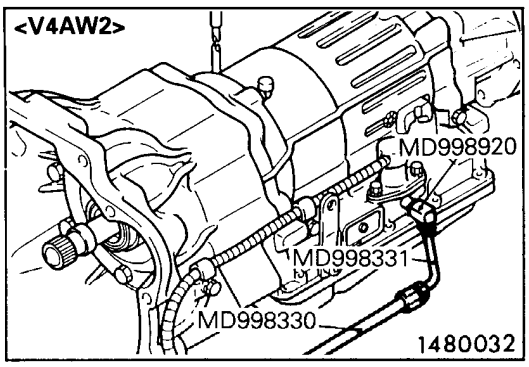
Output shaft speed (r/min)	Governor pressure kPa (kg/cm^2, psi)
1,000	110–140 (1.1–1.4, 15.6–19.9)
2,000	220–240 (2.2–2.4, 31.3–34.1)
3,200	410–470 (4.1–4.7, 58.3–66.8)

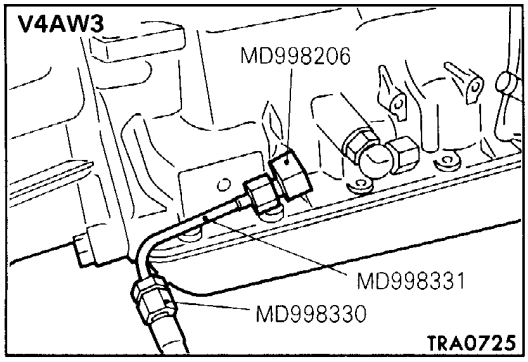
<V4AW2-3-L>

Output shaft speed (r/min)	Governor pressure kPa (kg/cm^2, psi)
1,000	140–170 (1.4–1.7, 19.9–24.2)
2,000	250–290 (2.5–2.9, 35.6–41.2)
3,200	410–470 (4.1–4.7, 58.3–66.8)

JUDGEMENT BY GOVERNOR PRESSURE

Governor pressure is not within the standard value	• Line pressure malfunction • Oil leak in governor circuit • Governor malfunction





LINE PRESSURE TEST

(1) Place the vehicle on a chassis dynamometer.
(2) Remove the plug from the line pressure take off port.
(3) Install special tool as shown in the figure and place the meter inside vehicle.
(4) Apply the parking brake.
(5) Start the engine.
(6) Place the selector lever in the "D" range.
(7) Depress the brake pedal firmly by the left foot and operates the accelerator pedal by the right foot to measure the line pressure at each engine rpm. If the measured pressure is not nominal, check adjustment of the throttle cable and readjust if necessary before conducting the test again.
(8) Place the selector lever in the "R" range and test as above. When measuring the hydraulic pressure for reverse, change the oil-pressure gauge to 3,000 kPa (30 kg/cm^2, 427 psi).

Standard value:

<V4AW2-2500D>

Items	Line pressure kPa (kg/cm^2, psi)	
	"D" range	"R" range
At idle	450–510 (4.5–5.1, 64–72.5)	620–700 (6.2–7.0, 88.2–99.5)
At stall	1,120–1,320 (1.12–13.2, 159.3–187.7)	1,500–1,900 (15–19, 213.3–270.2)

<V4AW2-3000-12V>

Items	Line pressure kPa (kg/cm^2, psi)	
	"D" range	"R" range
At idle	520–600 (5.2–6.0, 74–85)	790–910 (7.9–9.1, 112–129)
At stall	1,100–1,300 (11–13, 156–185)	1,600–2,000 (16–20, 228–284)

<V4AW3-3000-24V, 3500>

Items	Line pressure kPa (kg/cm^2, psi)	
	"D" range	"R" range
At idle	430–490 (4.3–4.9, 61–70)	520–620 (5.2–6.2, 74–88)
At stall	1,140–1,390 (11.4–13.9, 162–198)	1,400–1,750 (14.0–17.5, 199–249)

<V4AW3-2800D>

Items	Line pressure kPa (kg/cm^2, psi)	
	"D" range	"R" range
At idle	430–490 (4.3–4.9, 61–70)	530–630 (5.3–6.3, 75–90)
At stall	1,350–1,600 (13.5–16.0, 192–228)	1,670–2,020 (16.7–20.2, 238–287)

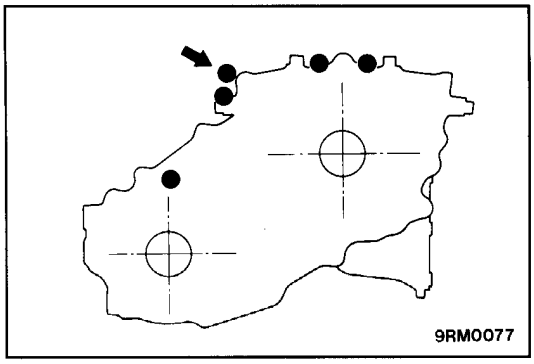
JUDGEMENT BY LINE PRESSURE

<V4AW2>

Hydraulic pressure higher than nominal in all ranges	(1) Regulator valve faulty (2) Throttle valve faulty (3) Throttle control cable incorrectly adjusted
Hydraulic pressure lower than nominal in all ranges	(1) Oil pump faulty (2) Rgulator valve faulty (3) Throttle valve faulty (4) Throttle control cable incorrectly adjusted (5) O.D. clutch faulty
Hydraulic pressure lower than nominal in "D" range	(1) Large fluid leaks in "D" range hydraulic circuit (2) Forward clutch faulty (3) O.D. clutch faulty
Hydraulic pressure lower than nominal in "R" range	(1) Large fluid leaks in "R" range hydraulic circuit (2) Brake No. 3 faulty (3) Direct clutch faulty (4) O.D. clutch faulty

<V4AW3>

Hydraulic pressure in all ranges is higher than the standard value	(1) Malfunction of regulator valve (2) Malfunction of throttle valve (3) Incorrect throttle cable adjustment
Hydraulic pressure in all ranges is lower than the standard value	(1) Malfunction of oil pump (2) Malfunction of regulator valve (3) Malfunction of throttle valve (4) Incorrect throttle cable adjustment (5) Malfunction of O.D. direct clutch
Hydraulic pressure in D range is lower than the standard value	(1) Large fluid leaks in D range hydraulic circuit (2) Malfunction of forward clutch (3) Malfunction of O.D. direct clutch
Hydraulic pressure in R range is lower than the standard value	(1) Large fluid leaks in R range hydraulic circuit (2) Malfunction of 1st & reverse brake (3) Malfunction of direct clutch (4) Malfunction of O.D. direct clutch

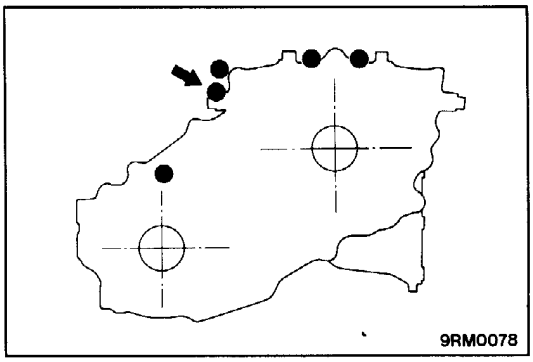


CENTRE DIFFERENTIAL LOCK DETECTION SWITCH CHECK

E22FFAA

Check the continuity between the brown connector terminal on the side of the transfer case and the transfer case.

Transfer control lever position	Continuity
4H	No continuity
4HLc	Continuity

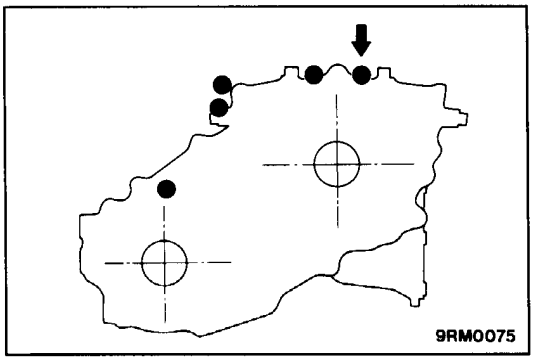


2WD/4WD DETECTION SWITCH CHECK

E22FGAA

Check the continuity between the black connector terminal on the side of the transfer case and the transfer case.

Transfer control lever position	Continuity
2H	Continuity
4H	No continuity

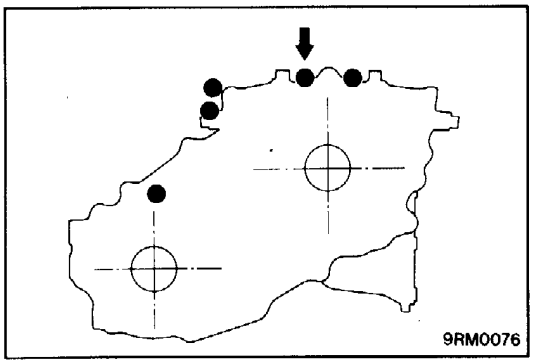


CENTRE DIFFERENTIAL LOCK OPERATION DETECTION SWITCH CHECK

E22FHAA

Check the continuity between the brown connector terminal on the top of the transfer case and the transfer case.

Transfer control lever position	Continuity
4H	No continuity
4HLc	Continuity

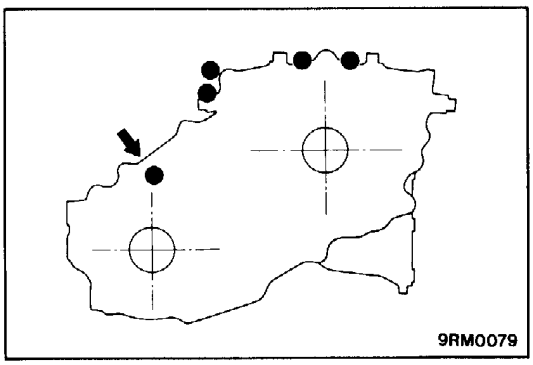


4WD OPERATION DETECTION SWITCH CHECK

E22FIAA

Check the continuity between the black connector terminal on the top of the transfer case and the transfer case.

Transfer control lever position	Continuity
2H	No continuity
4H	Continuity



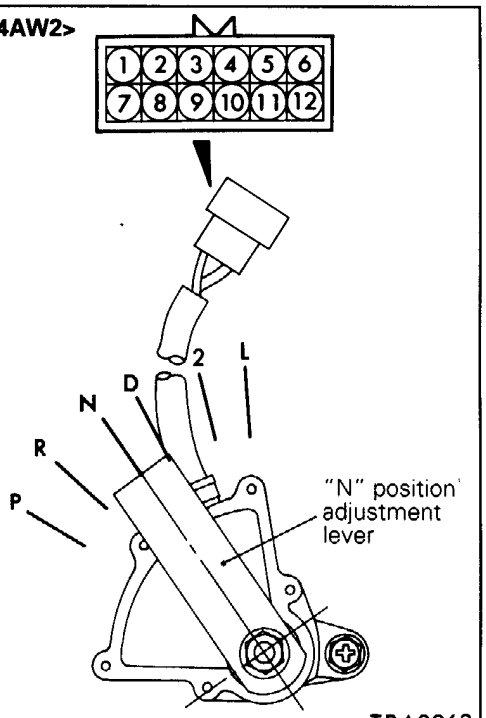
HI/LO DETECTION SWITCH CHECK

E22FJAA

Check the continuity between the white connector terminal on the side of the transfer case and the transfer case.

Transfer control lever position	Continuity
4HLc	Continuity
N (between 4HLc and 4LLc)	No continuity
4LLc	Continuity

<V4AW2>



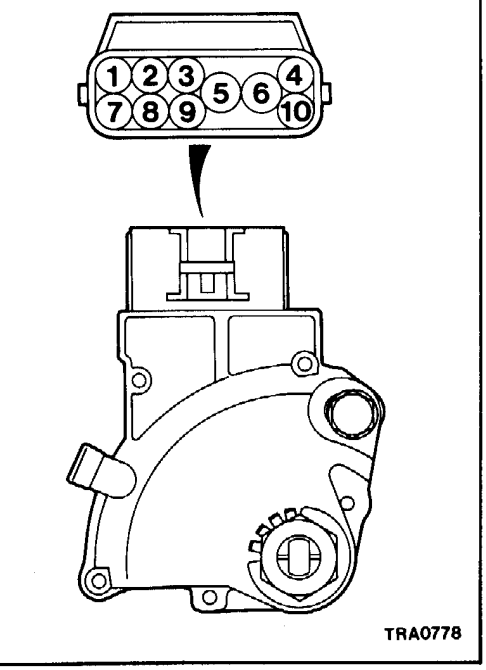
INHIBITOR SWITCH CHECK

E23FYAA

<V4AW2>

Item	Terminal No.								
	1	2	3	4	5	6	7	9	12
P						○	○	○	○
R					○			○	
N				○			○	○	○
D			○					○	
2	○							○	
L		○						○	

<V4AW3>

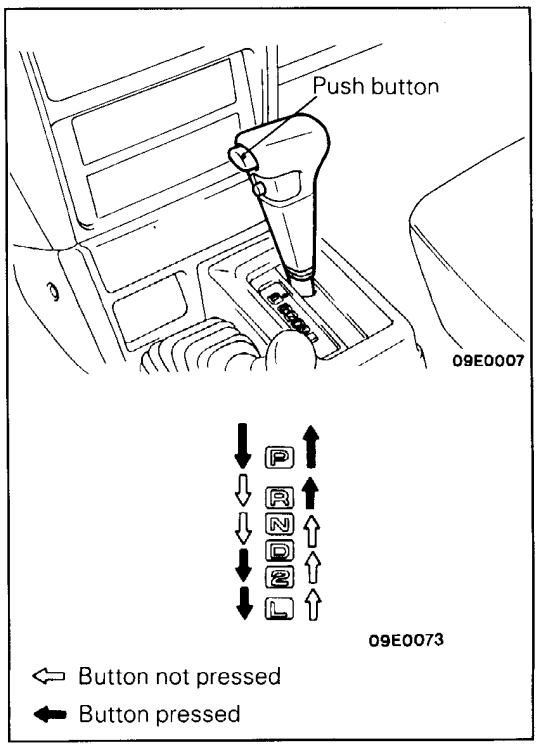


<V4AW3>

Item	Terminal No.								
	1	2	3	5	6	7	8	9	10
P	○			○	○				○
R	○							○	
N	○			○	○	○			
D	○						○		
2	○		○						
L	○	○							

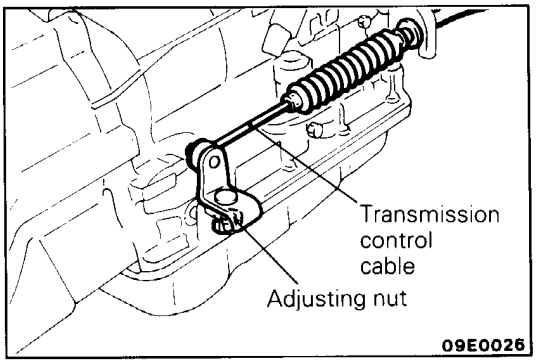
NOTE
○—○ indicate that there is a continuity between the terminals.

NOTES



SELECTOR LEVER OPERATION CHECK E23FOAB

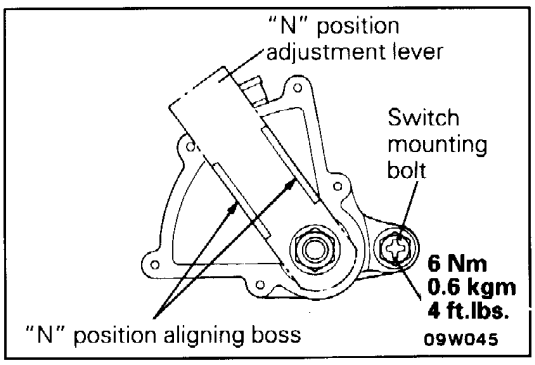
1. Shift selector lever to each range and check that lever moves smoothly and is controled. Check that position indicator is correct.
2. Check to be sure the selector lever can be shifted to each position (by button operation as shown in the illustration).
3. Start the engine and check if the vehicle moves forward when the selector lever is shifted from N to D, and moves backward when shifted to R.
4. When the shift lever malfunctions, adjust control cable and selector lever sleeve. Check for worn shift lever assembly sliding parts.



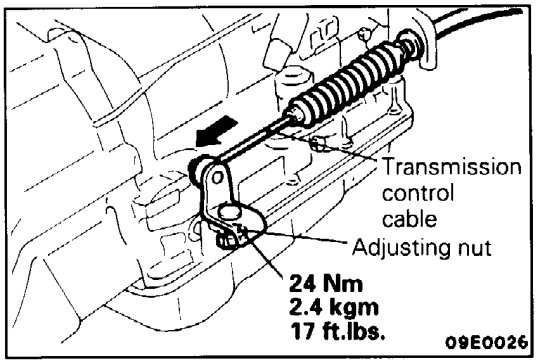
ADJUSTMENT OF INHIBITOR SWITCH AND CONTROL CABLE E23FOAH

INHIBITOR SWITCH

(1) Move the selector lever to the "N" position.
(2) Loosen the adjusting nut of the control cable.



(3) Loosen the inhibitor switch mounting bolt.
(4) Adjust by turning the inhibitor switch so that the bosses for aligning the "N" position on the inhibitor switch are aligned with the "N" position adjustment lever.
(5) Tighten the inhibitor switch mounting bolt to the specified torque.



(6) Gently pull the end of the transmission control cable in the direction of the arrow and tighten the adjusting nut to the specified torque.
(7) Check that the selector lever is in the "N" position.
(8) Check that each range on the transmission side operates and functions correctly for each position of the selector lever.

CONTROL CABLE

Whether control cable is properly adjusted can be confirmed by checking whether inhibitor switch is performing well.

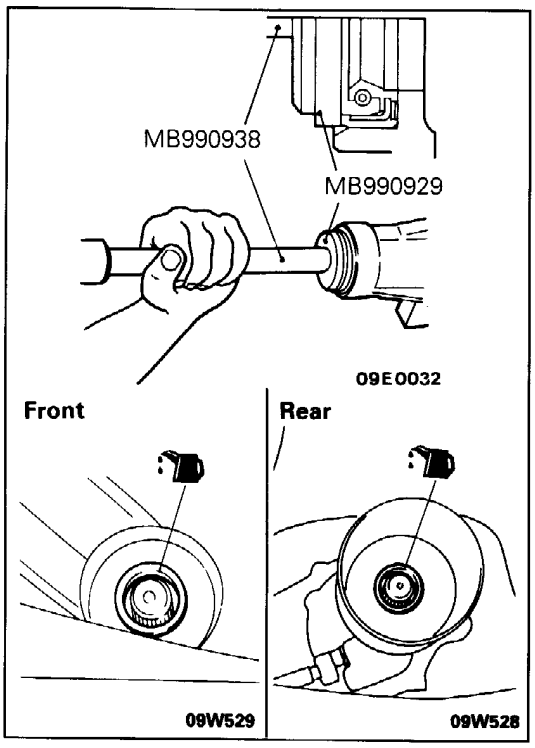
1. Apply parking brakes and service brakes securely.
2. Place selector lever to "R" range.
3. Set ignition key to "ST" position.
4. Slowly move the selector lever upward until it clicks as it fits in notch of "P" range. If starter motor operates when lever makes a click, "P" position is correct.
5. Then slowly move selector lever to "N" range by the same procedure as in foregoing paragraph. If starter motor operates when selector lever fits in "N", "N" position is correct.
6. Also check to be sure the vehicle doesn't begin to move and the lever doesn't stop between P-R-N-D.
7. The control cable is properly adjusted if, as described above, the starter motor starts at both the "P" range and the "N" range.

4WD INDICATOR CONTROL UNIT CHECK E23FKAA

Refer to GROUP 22–Service Adjustment Procedures.

SPEEDOMETER CABLE REPLACEMENT E23FPAD

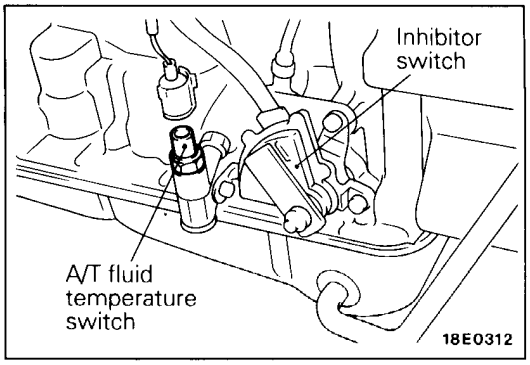
Refer to GROUP 22–Service Adjustment Procedures.



TRANSFER OIL SEALS REPLACEMENT E22FAAF

1. Disconnect the propeller shaft from the transfer. (Refer to GROUP 25–Propeller Shaft.)
2. Using a flat-tip (–) screwdriver, remove the oil seal.
3. Using the special tool, tap the transfer oil seal into the transfer. Note in illustration the direction of installation of transfer oil seal.
4. Apply a coating of the transmission oil to the lip of the oil seal.

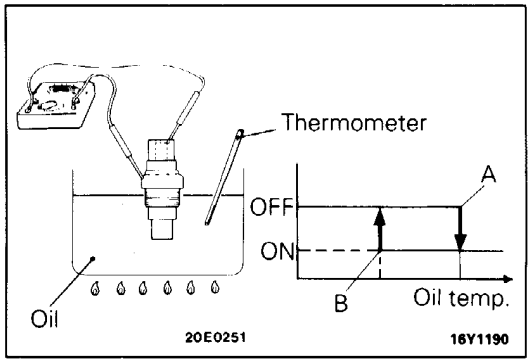
Transmission oil:
Hypoid gear oil API GL-4, SAE 75W-90 or 75W-85W



AUTOMATIC TRANSMISSION FLUID TEMPERATURE SWITCH CHECK

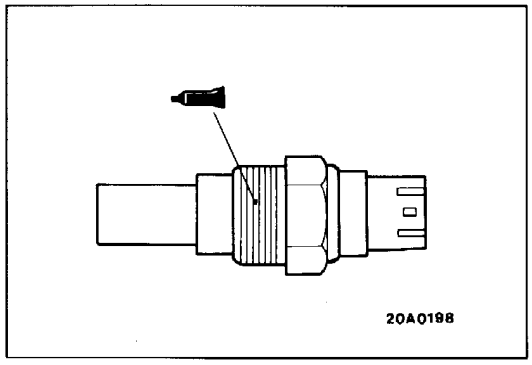
1. Remove the automatic transmission fluid temperature switch from the automatic transmission.

Caution
Use care to prevent foreign subject from entering the automatic transmission fluid temperature switch mounting hole.



2. Immerse the automatic transmission fluid temperature switch in fluid up to the threaded portion as shown in the illustration.
3. Use a circuit tester or the like to check continuity when oil temperature changes.
   The switch is judged good if the conditions are in the following ranges.

Item	Temperature °C (°F)
Continuity is present (temperature at point A)	143–151 (289–304)
No continuity is present (temperature at point B)	125 (257) or less



4. Apply recommended sealant sparingly to the thread of automatic transmission fluid temperature switch.
   (Models not equipped with O-ring in the sensor mounting hole)

   Specified sealant: 3M ATD Part No. 8660 or equivalent
5. Install the automatic transmission fluid temperature switch.

   Tightening torque: 30 Nm (3.0 kgm, 22 ft.lbs.)
6. Check automatic transmission fluid for quantity.

NOTES

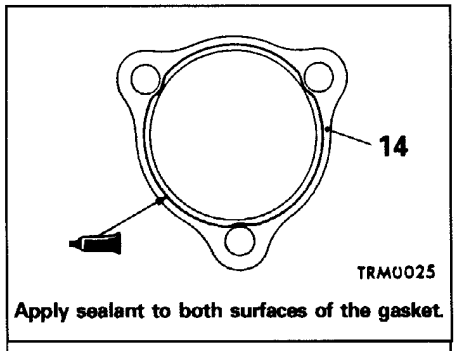
TRANSMISSION CONTROL

E23IA--

REMOVAL AND INSTALLATION

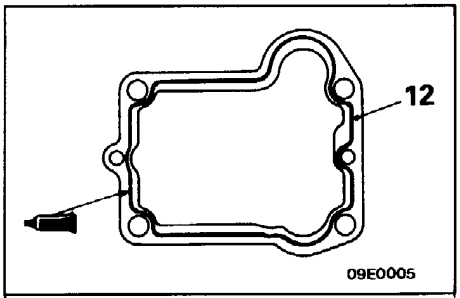
<L.H. drive vehicles>

Pre-removal and Post-installation Operation
- Removal and Installation of Front Console Assembly (Refer to GROUP 52–Floor Console.)

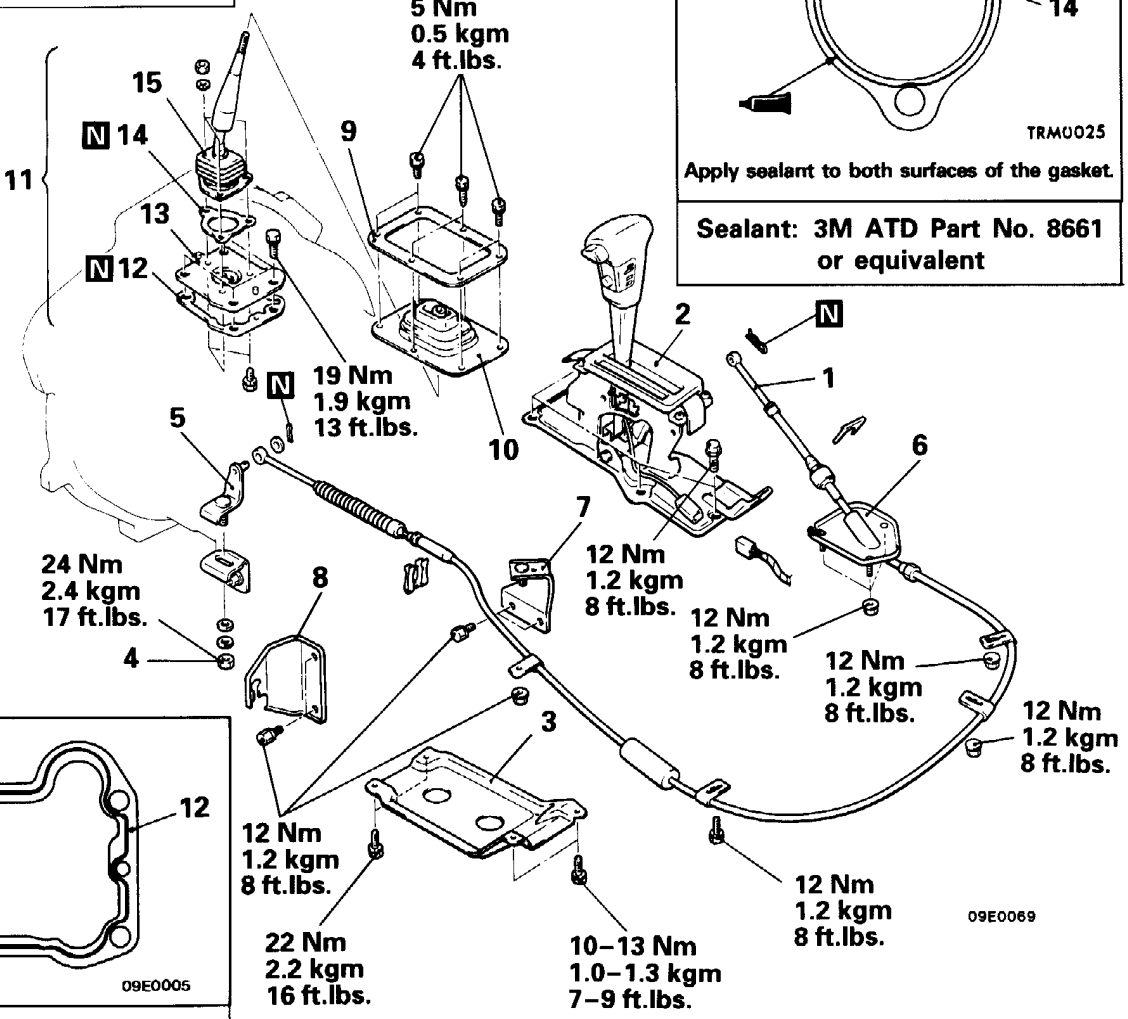


Apply sealant to both surfaces of the gasket.

Sealant: 3M ATD Part No. 8661 or equivalent



Sealant: 3M ATD Part No. 8661 or equivalent



Selector lever assembly removal steps

1. Connection for transmission control cable assembly (selector lever assembly side)
2. Selector lever assembly

Transmission control removal steps

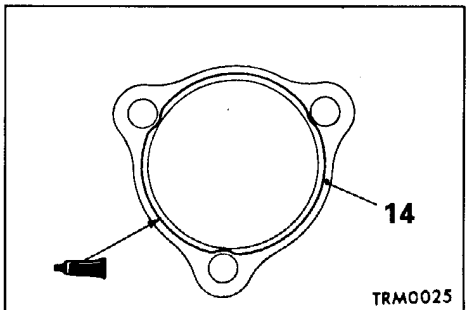
1. Connection for transmission control cable assembly (selector lever assembly side)
3. Transfer case protector
4. Connection for transmission control cable assembly (transmission side)
5. Upper lever
6. Transmission control cable assembly
7. Cable bracket
8. Cable end bracket

Transfer control lever assembly removal steps

9. Retainer
10. Control lever boot
11. Transfer control lever assembly
12. Gasket
13. Stopper plate
14. Gasket
15. Transfer control lever

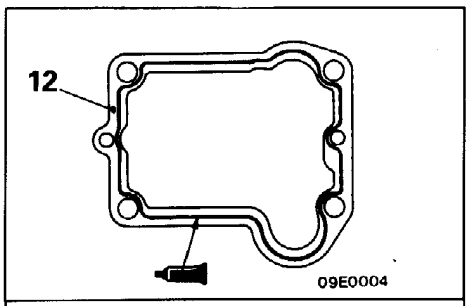
<R.H. drive vehicles>

Pre-removal and Post-installation Operation
- Removal and Installation of Front Console Assembly (Refer to GROUP 52–Floor Consle.)

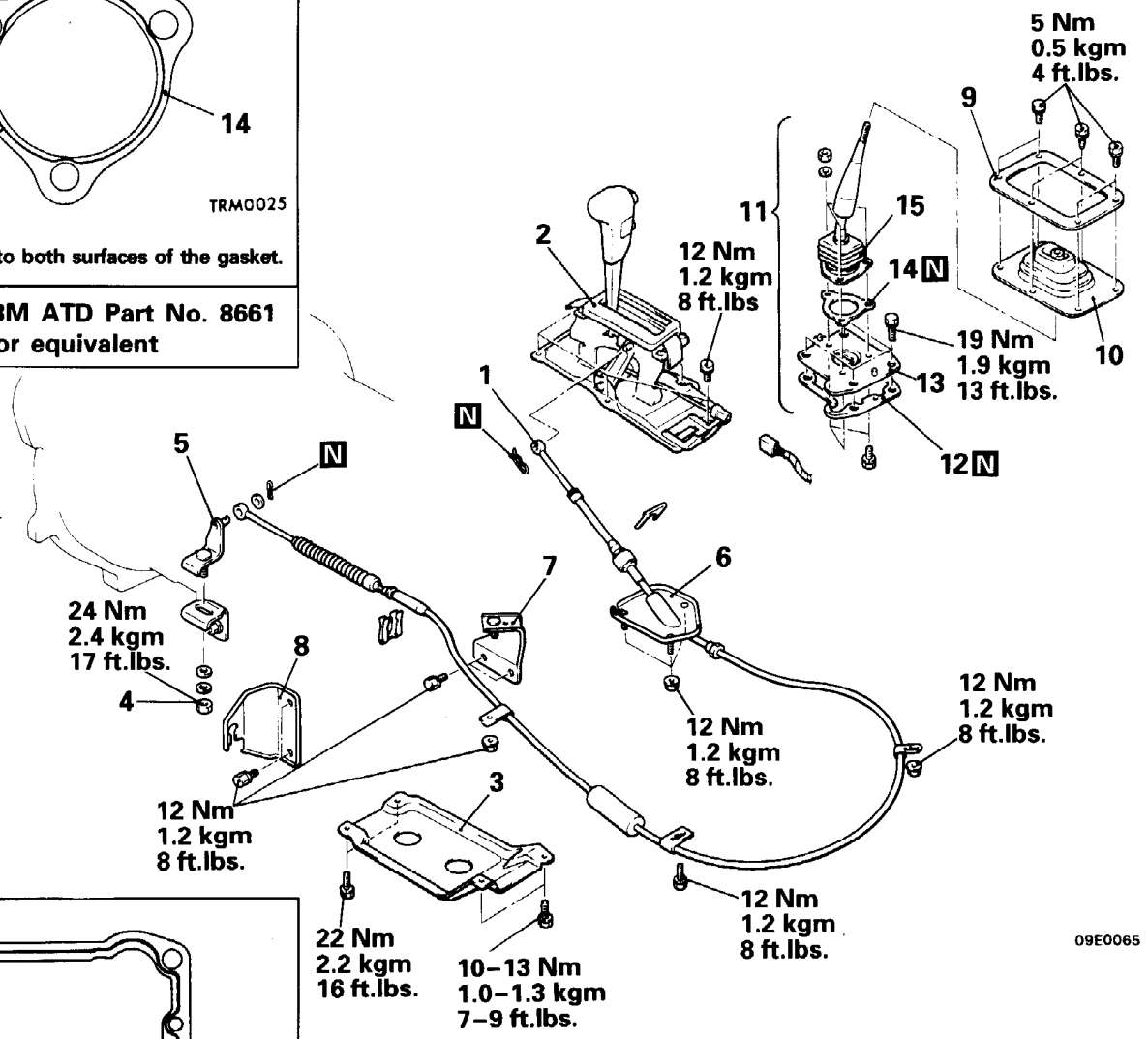


Apply sealant to both surfaces of the gasket.

Sealant: 3M ATD Part No. 8661 or equivalent



Sealant: 3M ATD Part No. 8661 or equivalent



Selector lever assembly removal steps

1. Connection for transmission control cable assembly (selector lever assembly side)
2. Selector lever assembly

Transmission control removal steps

1. Connection for transmission control cable assembly (selector lever assembly side)
3. Transfer case protector
4. Connection for transmission control cable assembly (transmission side)
5. Upper lever
6. Transmission control cable assembly
7. Cable bracket
8. Cable end bracket

Transfer control lever assembly removal steps

9. Retainer
10. Control lever boot
11. Transfer control lever assembly
12. Gasket
13. Stopper plate
14. Gasket
15. Transfer control lever

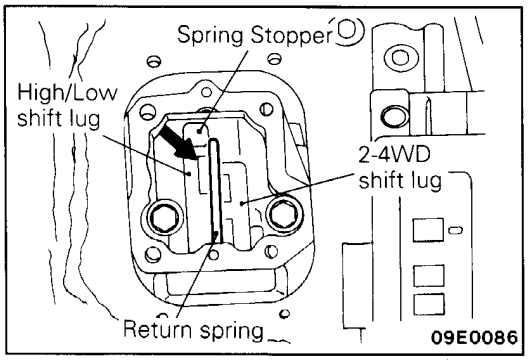
SERVICE POINTS OF REMOVAL E23IBAE

11. REMOVAL OF TRANSFER CONTROL LEVER ASSEMBLY

When removing the transfer control lever assembly, move the transfer control lever to the 2H (2 wheel drive-high range) position.

INSPECTION E23ICAJ

- Check the transmission control cable assembly for function and for damage.

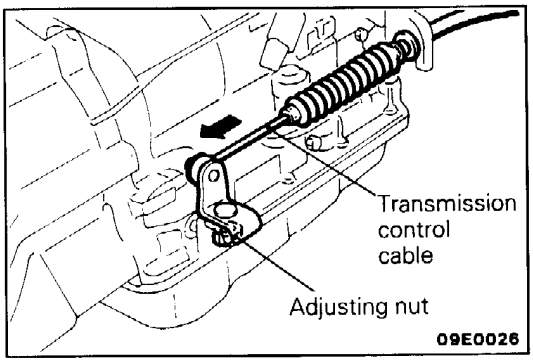


SERVICE POINTS OF INSTALLATION E23IDAK

11. INSTALLATION OF TRANSFER CONTROL LEVER ASSEMBLY

(1) Remove the adhesive sticking to the transfer control lever assembly mounting bolts.
(2) Use a tap (M8 × 1.25) to remove the adhesive sticking to the transfer control lever assembly installation holes.
(3) Check to be sure that the return spring is set to the spring stopper of the 2-4WD shift lug, and then install the control lever in the position shown by the arrow (⬅).
(4) Apply specified adhesive to the threads of the lever assembly mounting bolts, and then tighten the transfer control lever.

Specified adhesive: 3M Stud Locking No. 4710 or equivalent



1. INSTALLATION OF TRANSMISSION CONTROL CABLE ASSEMBLY (SELECTOR LEVER ASSEMBLY SIDE)

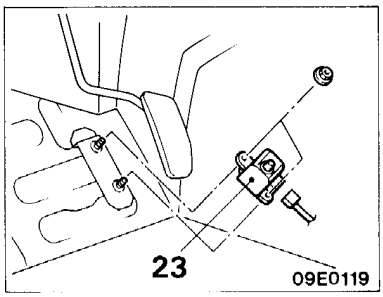
After installing the transmission control cable, adjust it by the following procedure.

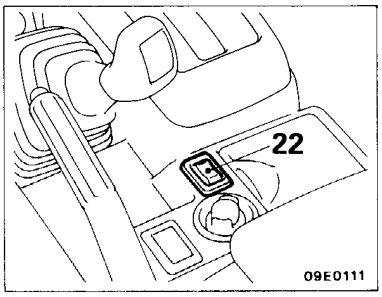
(1) Move the selector lever to the "N" position.
(2) Loosen the adjusting nut, gently pull the end of the transmission control cable in the direction of the arrow and then tighten the adjusting nut.

SELECTOR LEVER ASSEMBLY

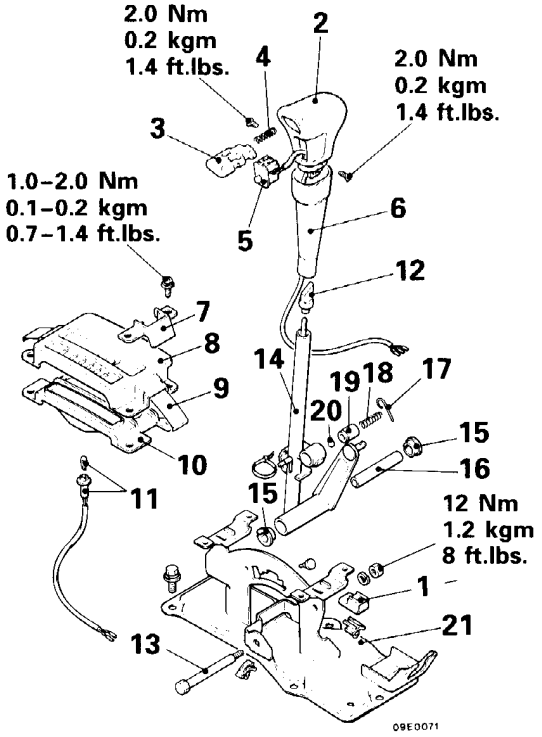
E23NA--

DISASSEMBLY AND REASSEMBLY

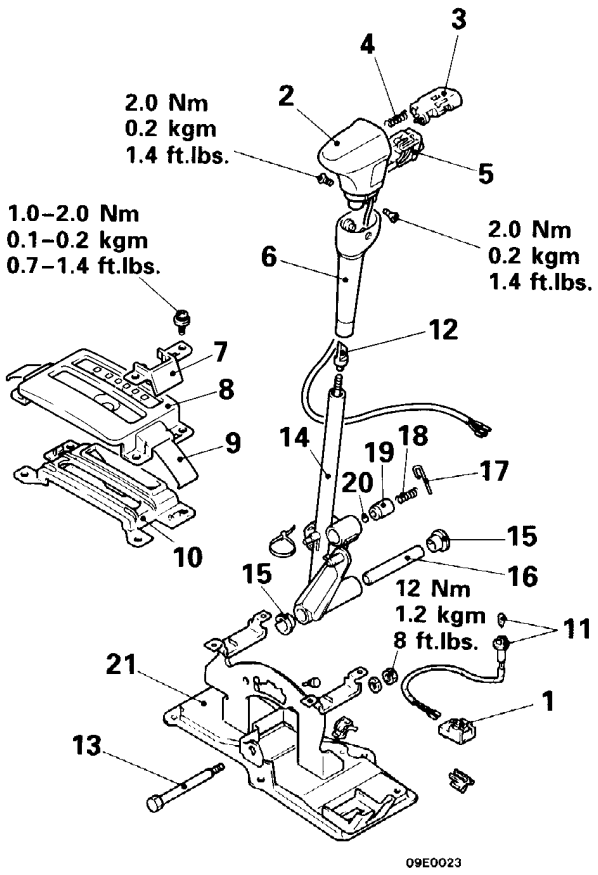




<L.H. drive vehicles>

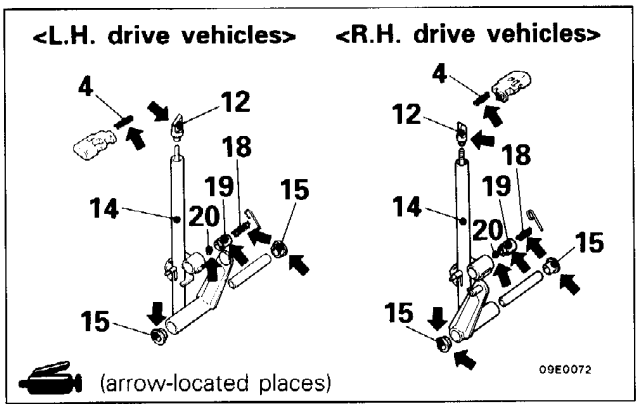


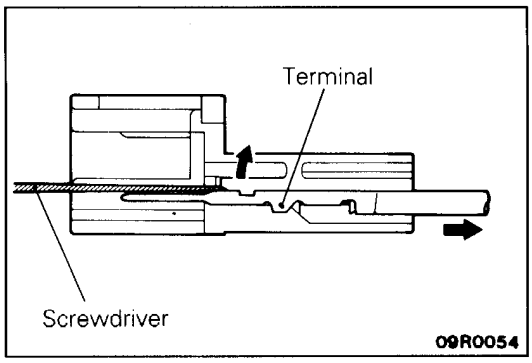
<R.H. drive vehicles>



Removal steps

- ◆◆ 1. Overdrive switch/position lamp switch connector case
- ◆◆ 2. Selector knob
- 3. Push button
- 4. Spring
- ◆◆ 5. Overdrive switch
- 6. Knob cover
- 7. Guide
- 8. Upper panel
- 9. Slider
- 10. Lower panel
- 11. Position indicator lamp assembly
- ◆◆ 12. Sleeve
- 13. Bolt
- 14. Selector lever assembly
- 15. Bushing
- 16. Pipe
- 17. Pin
- 18. Spring
- 19. Support
- 20. Steel ball
- 21. Bracket assembly
- 22. Pattern select switch } <V4AW3>
- 23. Wide open throttle switch }

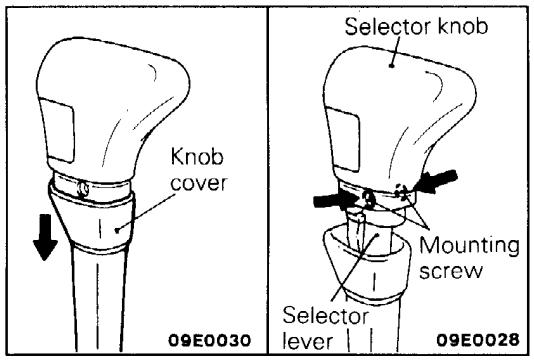




SERVICE POINTS OF DISASSEMBLY E23NBAB

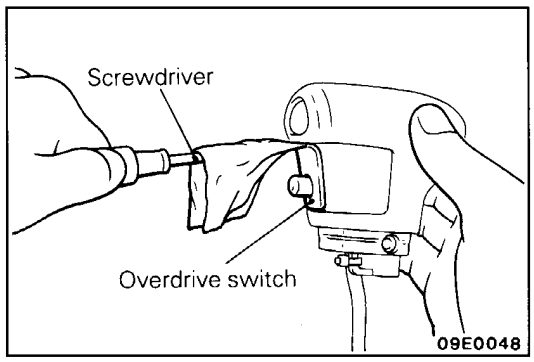
1. REMOVAL OF OVERDRIVE SWITCH/POSITION LAMP CONNECTOR CASE

Use a minus screwdriver or similar to remove the overdrive switch/position lamp connector case from the terminal.



2. REMOVAL OF SELECTOR KNOB

(1) Press the knob cover downwards.
(2) Remove the front and back mounting screws and remove the selector knob from the selector lever.



5. REMOVAL OF OVERDRIVE SWITCH

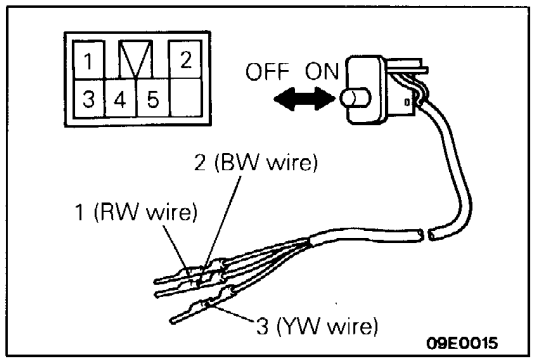
Use a minus screwdriver or similar to remove the overdrive switch.

INSPECTION E23NCAB

- Check the detent plate for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.

OVERDRIVE SWITCH

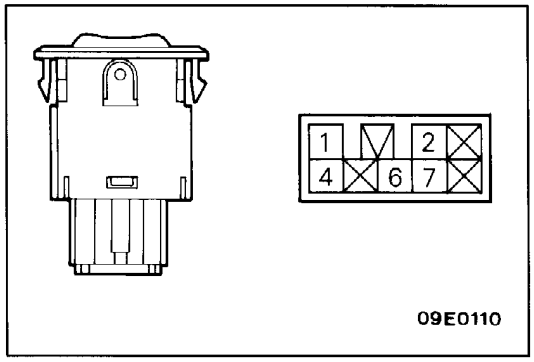
Check for continuity between terminals when the switch is OFF and when ON.



Switch position \ Terminal	3	4	5
OD ON	○		○
OD OFF	○	○	

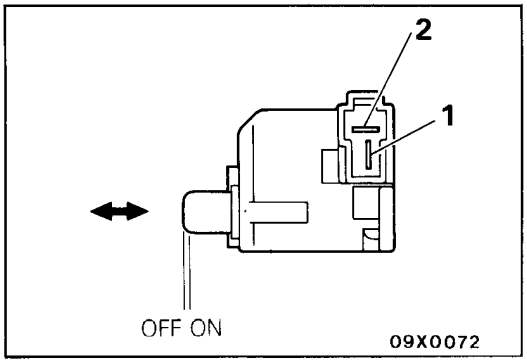
NOTE
○—○ Indicate that there is continuity between the terminals.

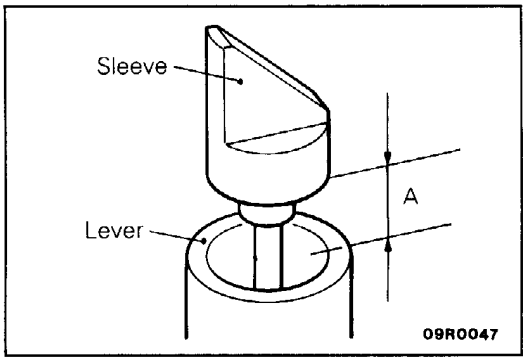
PATTERN SELECT SWITCH <V4AW3>



Switch position \ Terminal	1	2	6	4		7
HOLD	○	○				
POWER	○		○	○	ⓞ	○

NOTE
○—○ indicates that there is continuity between the terminals.





WIDE OPEN THROTTLE SWITCH

Check for continuity between terminals when the switch is off and when ON.

	1	2
ON	○———	———○
OFF		

NOTE
○–○ indicates that there is continuity between the terminals.

SERVICE POINTS OF REASSEMBLY E23NDAB

12. INSTALLATION OF SLEEVE

Move the selector lever to the "N" position and adjust the sleeve by turning it so that the distance A between the sleeve and the tip of the lever is at the standard value.

Standard value (A): 18.2–18.9 mm (0.717–0.744 in.)

NOTES

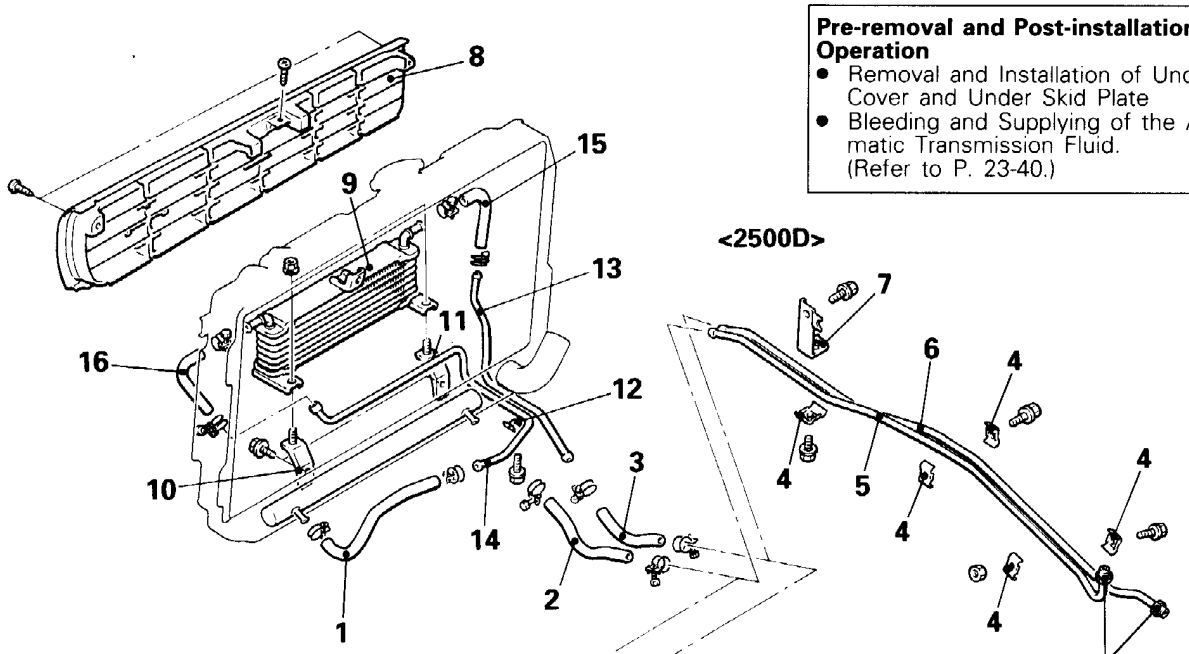
TRANSMISSION OIL COOLER, HOSES, PIPES

E23KA--

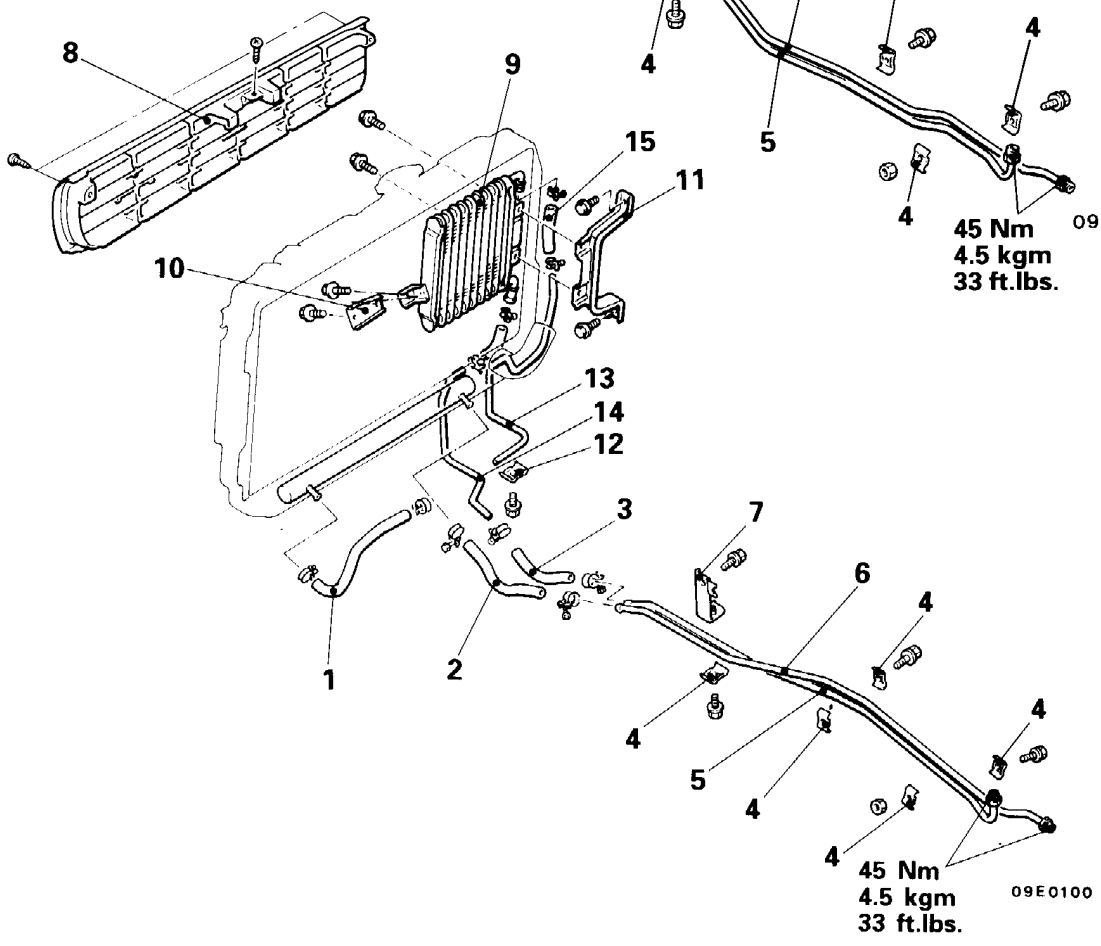
REMOVAL AND INSTALLATION

<3000, 3500, 2500D>

Pre-removal and Post-installation Operation
- Removal and Installation of Under Cover and Under Skid Plate
- Bleeding and Supplying of the Automatic Transmission Fluid. (Refer to P. 23-40.)



<2800D>



◆◆ 1. Hose A
◆◆ 2. Hose B
◆◆ 3. Hose C

Feed pipe A, Return pipe A removal steps

◆◆ 4. Clamp
◆◆ 5. Feed pipe A
◆◆ 6. Return pipe A
7. Pipe bracket

Oil cooler assembly removal steps

8. Radiator grill
9. Oil cooler assembly
10. Oil cooler bracket (L.H.)
11. Oil cooler bracket (R.H.)

Feed pipe B, Return pipe B removal steps

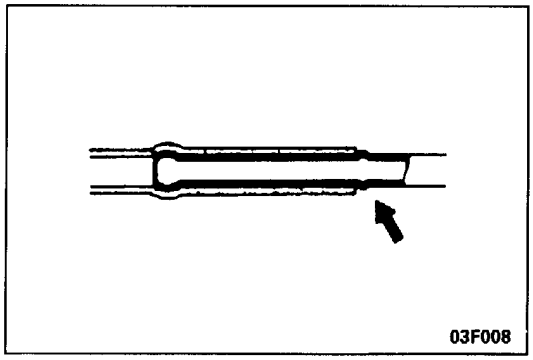
8. Radiator grill
12. Clamp
◆◆ 13. Feed pipe B
◆◆ 14. Return pipe B

Hose D, Hose E removal steps

8. Radiator grill
◆◆ 15. Hose D
◆◆ 16. Hose E

INSPECTION E23KCAD

- Check the hose and pipe for crack, damage and clog.
- Check for rusted or clogged radiator oil cooler.
- Check oil cooler fins for bend, damage, and clogged foreign matter.



SERVICE POINTS OF INSTALLATION E23KDAC

16. INSTALLATION OF HOSE E/15. HOSE D/14. RETURN PIPE B/13. FEED PIPE B

When connecting hoses to pipes with a stepped part, insert securely as far as the stepped part.

6. INSTALLATION OF RETURN PIPE A/5. FEED PIPE A/4. CLAMP

(1) Provisionally tighten the return pipe A and feed pipe A flare nuts to the transmission and transfer, and after clamping the pipes with each clamp, fully tighten the flare nuts.
Also, tighten all of the clamps, starting with those that are the closest to the transmission and transfer assembly.
(2) When connecting the pipes to the hoses, insert securely as far as the stepped part.

3. INSTALLATION OF HOSE C/2. HOSE B/1. HOSE A

When connecting hoses to pipes with a stepped part,insert securely as far as the stepped part.

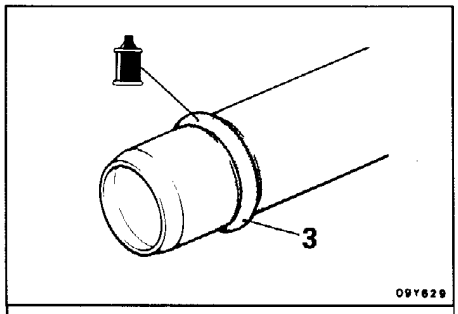
TRANSMISSION AND TRANSFER ASSEMBLY

E23LA--

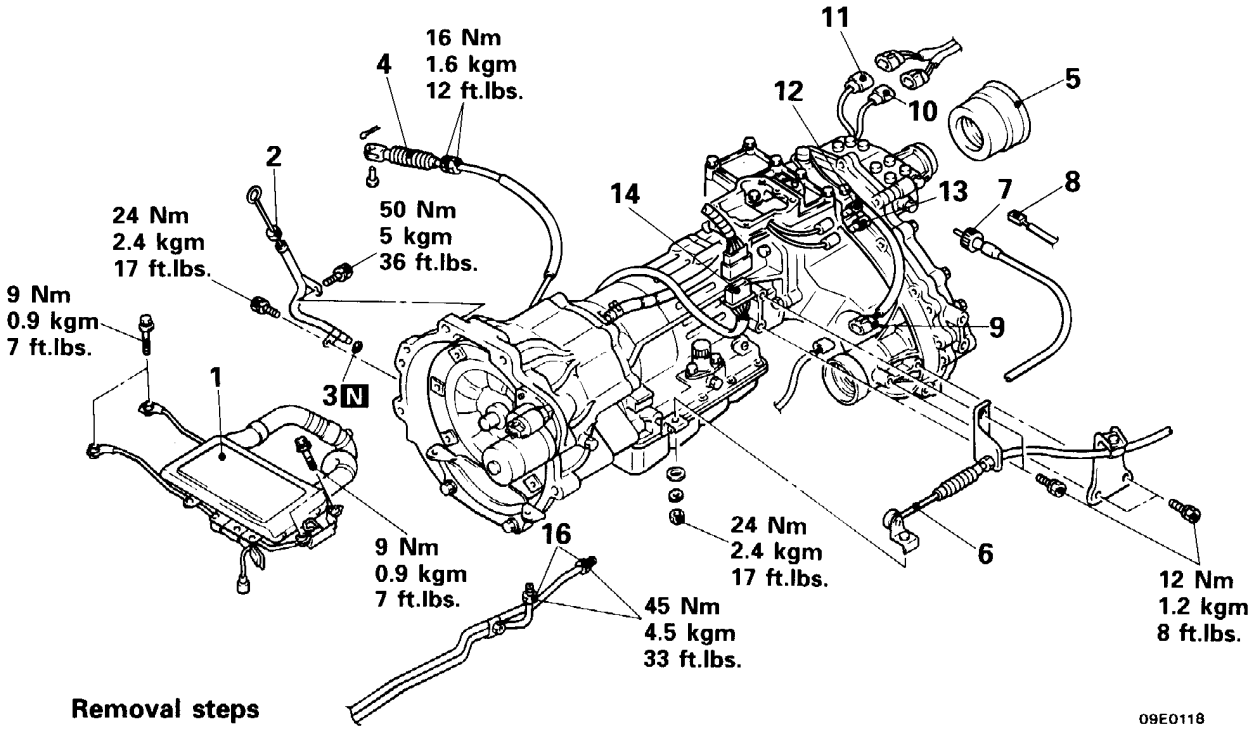
REMOVAL AND INSTALLATION

<2500D>

Pre-removal and Post-installation Operation
- Removal and Installation of Transfer Control Lever Assembly. (Refer to P. 23-45, 46.)
- Removal and Installation of Transfer Case Protector
- Removal and Installation of Front Exhaust Pipe
- Draining and Supplying of Automatic Transmission Fluid and Transfer Oil (Refer to P. 23-40 and GROUP 22–Service Adjustment Procedures.)
- Removal and Installation of Front and Rear Propeller Shaft (Refer to GROUP 25–Propeller Shaft.)

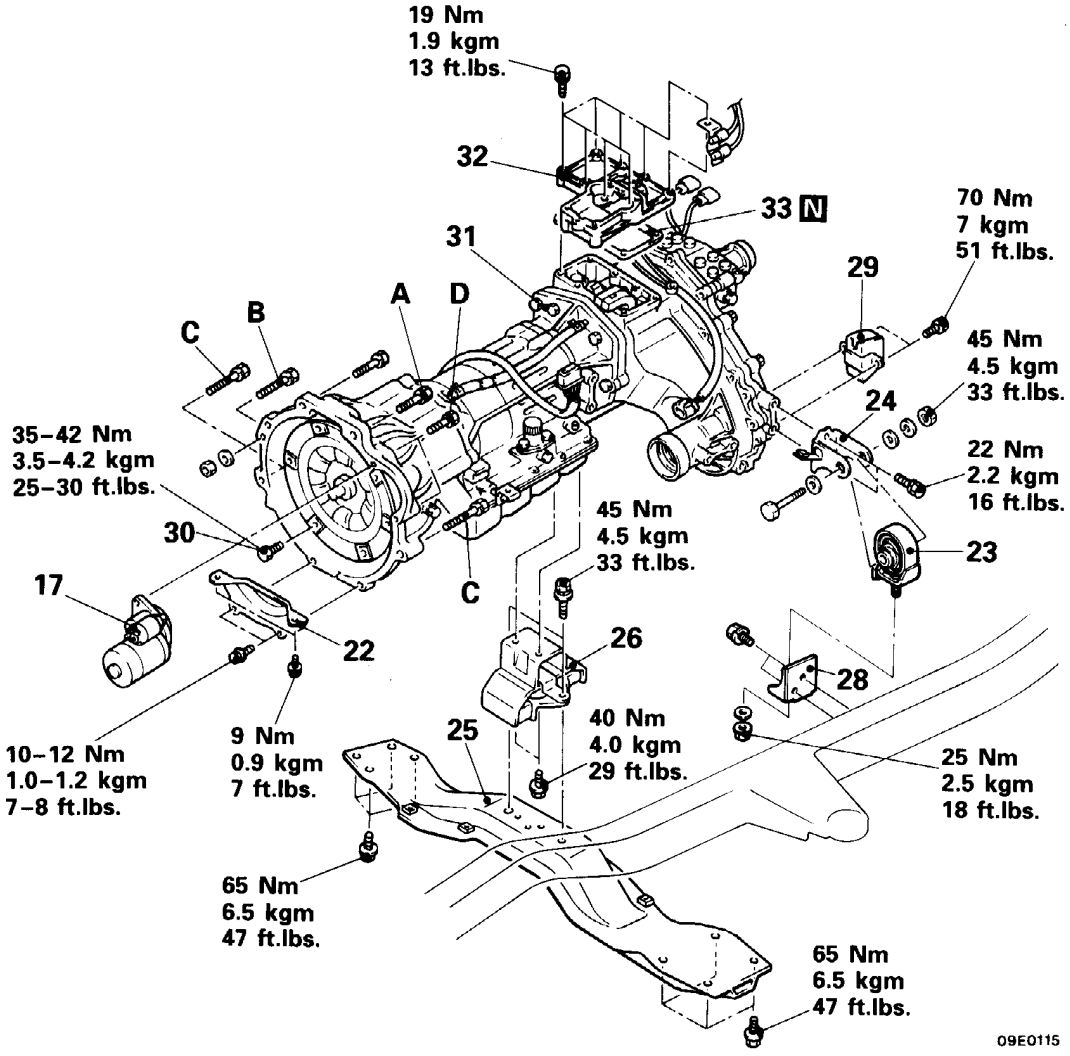


Fluid: Dia Queen ATF SP, ATF DEXRON II or equivalent

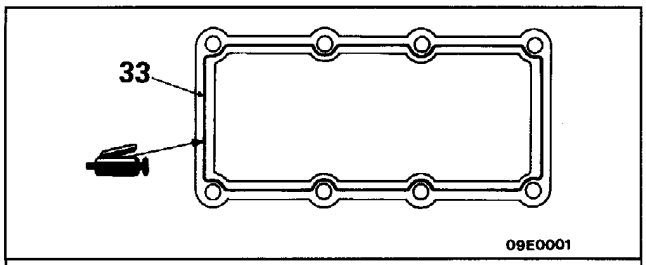


Removal steps

1. Intercooler
2. Oil filler pipe
3. O-ring
4. Connection for throttle control cable
5. Dust seal guard
6. Connection for transmission control cable
7. Connection for speedometer cable <Vehicles built up to October, 1993>
8. Speed sensor connector <Vehicles built from November, 1993>
9. HI/LO detection switch connector
10. 4WD operation detection switch connector
11. Center diffenential lock operation detection switch connector
12. Center differential lock detection switch connector
13. 2WD/4WD detection switch connector
14. Inhibitor switch connector
16. Connection for oil cooler pipe

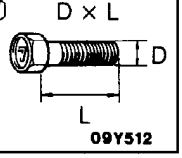


17. Starter motor
22. Bell housing cover
23. Transfer roll stopper
24. Transfer mounting bracket
25. No. 2 crossmember
26. Engine mount rear insulator
28. Transfer case protector bracket
29. Mass damper
30. Torque converter connecting bolt
31. Transmission and transfer assembly
32. Control housing
33. Gasket



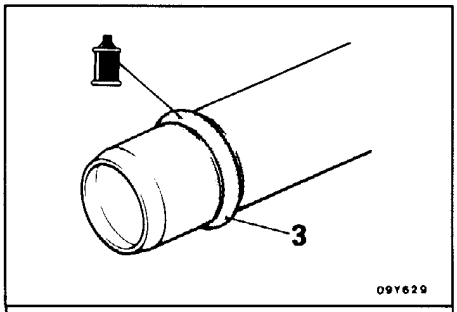
Sealant: 3M ATD Part No. 8661 or equivalent

	Nm	kgm	ft.lbs.	O.D. × Length mm (in.)	Bolt identification
A	50	5.0	36	10 × 40 (0.4 × 1.6)	D × L
B	24	2.4	17	8 × 25 (0.3 × 1.0)	
C	50	5.0	36	10 × 65 (0.4 × 2.6)	
D	31	3.1	22	10 × 60 (0.4 × 2.4)	

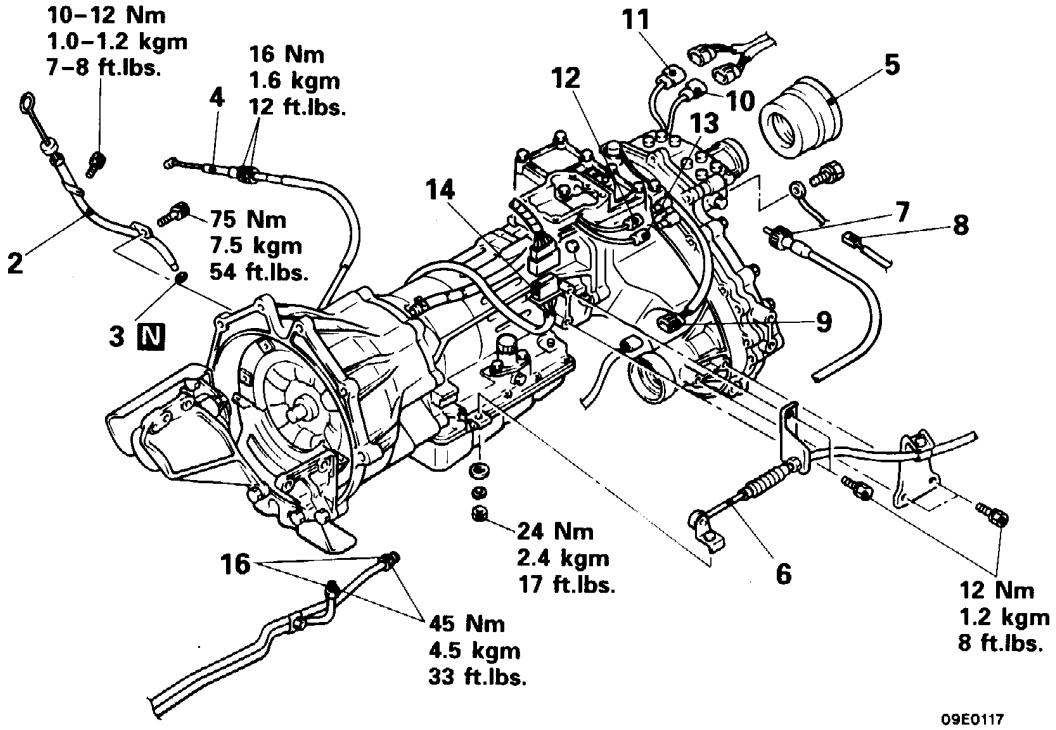


<3000–12 VALVE>

Pre-removal and Post-installation Operation
- Removal and Installation of Transfer Control Lever Assembly. (Refer to P. 23-45, 46.)
- Removal and Installation of Transfer Case Protector
- Removal and Installation of Front Exhaust Pipe
- Draining and Supplying of Automatic Transmission Fluid and Transfer Oil (Refer to P. 23-40 and GROUP 22–Service Adjustment Procedures.)
- Removal and Installation of Front and Rear Propeller Shaft (Refer to GROUP 25–Propeller Shaft.)

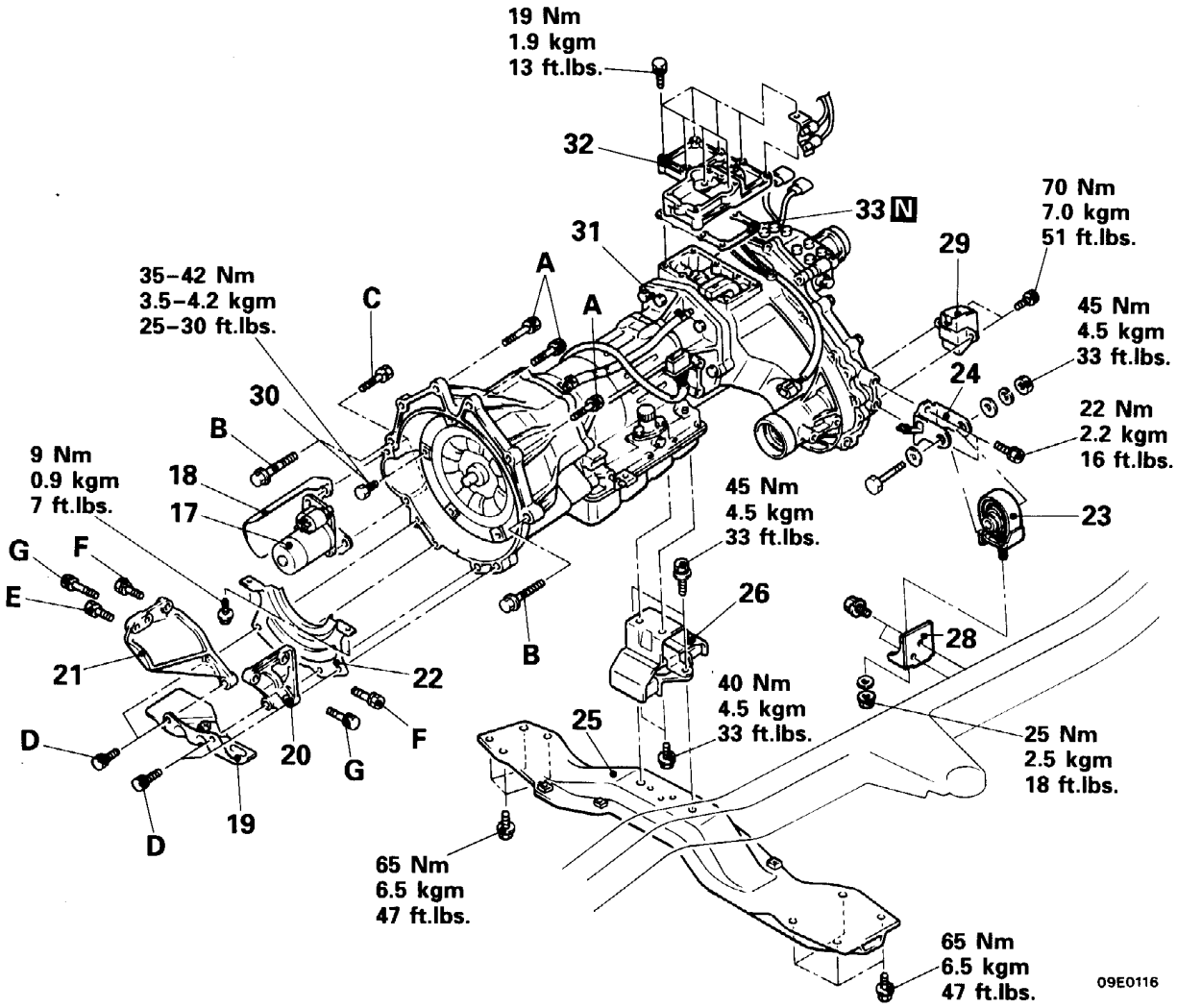


Fluid: Dia Queen ATF SP, ATF DEXRON II or equivalent

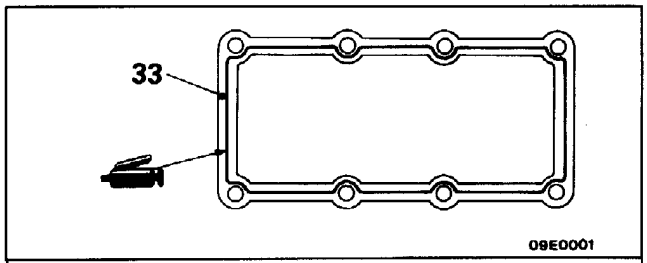


Removal steps

2. Oil filler pipe
3. O-ring
4. ◆◆ Connection for throttle control cable
5. Dust seat guard
6. ◆◆ Connection for transmission control cable
7. Connection for speedometer cable <Vehicles built up to October, 1993>
8. Speed sensor connector <Vehicles built from November, 1993>
9. HI/LO detection switch connector
10. 4WD operation detection switch connector
11. Center differential lock operation detection switch connector
12. Center differential lock detection switch connector
13. 2WD/4WD detection switch connector
14. Inhibitor switch connector
16. Connection for oil cooler pipe

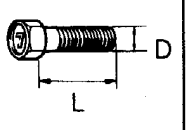


17. Starter motor
18. Starter cover
19. Heat protector
20. Transmission stay (L.H.)
21. Transmission stay (R.H.)
22. Bell housing cover
23. Transmission roll stopper
24. Transfer mounting bracket
25. No. 2 crossmember
26. Engine mount rear insulator
28. Transfer case protector bracket
29. Mass damper
30. Torque converter connecting bolt
31. Transmission and transfer assembly
32. Control housing
33. Gasket



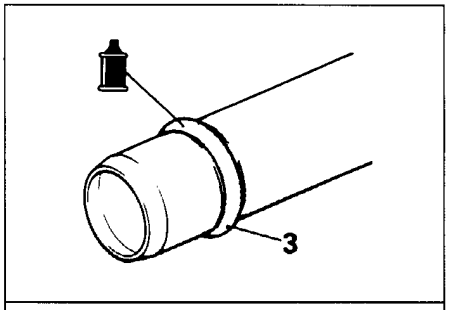
Sealant: 3M ATD Part No. 8661 or equivalent

	Nm	kgm	ft.lbs.	O.D. × Length mm (in.)	Bolt identification
A	75	7.5	54	12 × 40 (0.5 × 1.6)	
B	90	9.0	65	12 × 55 (0.5 × 2.2)	D × L
C	31	3.1	22	10 × 55 (0.4 × 2.2)	
D	36	3.6	26	10 × 40 (0.4 × 1.6)	
E	75	7.5	54	12 × 35 (0.5 × 1.4)	
F	42	4.2	31	10 × 30 (0.4 × 1.2)	
G	75	7.5	54	12 × 50 (0.5 × 2.0)	

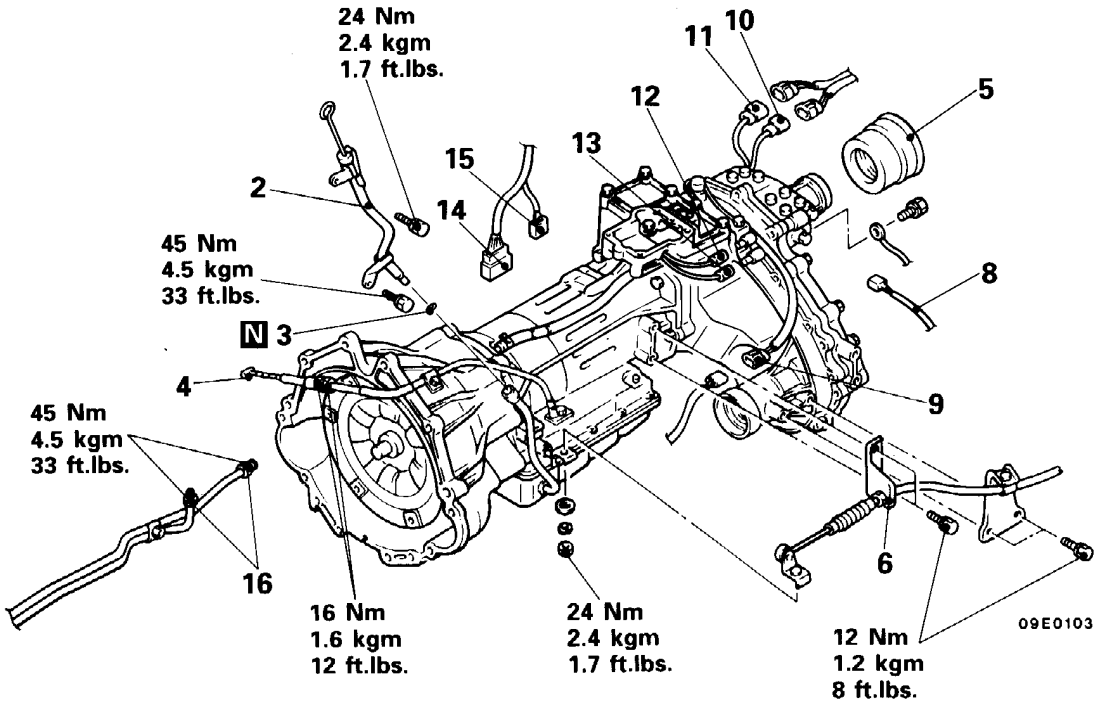


<3000–24 VALVE, 3500>

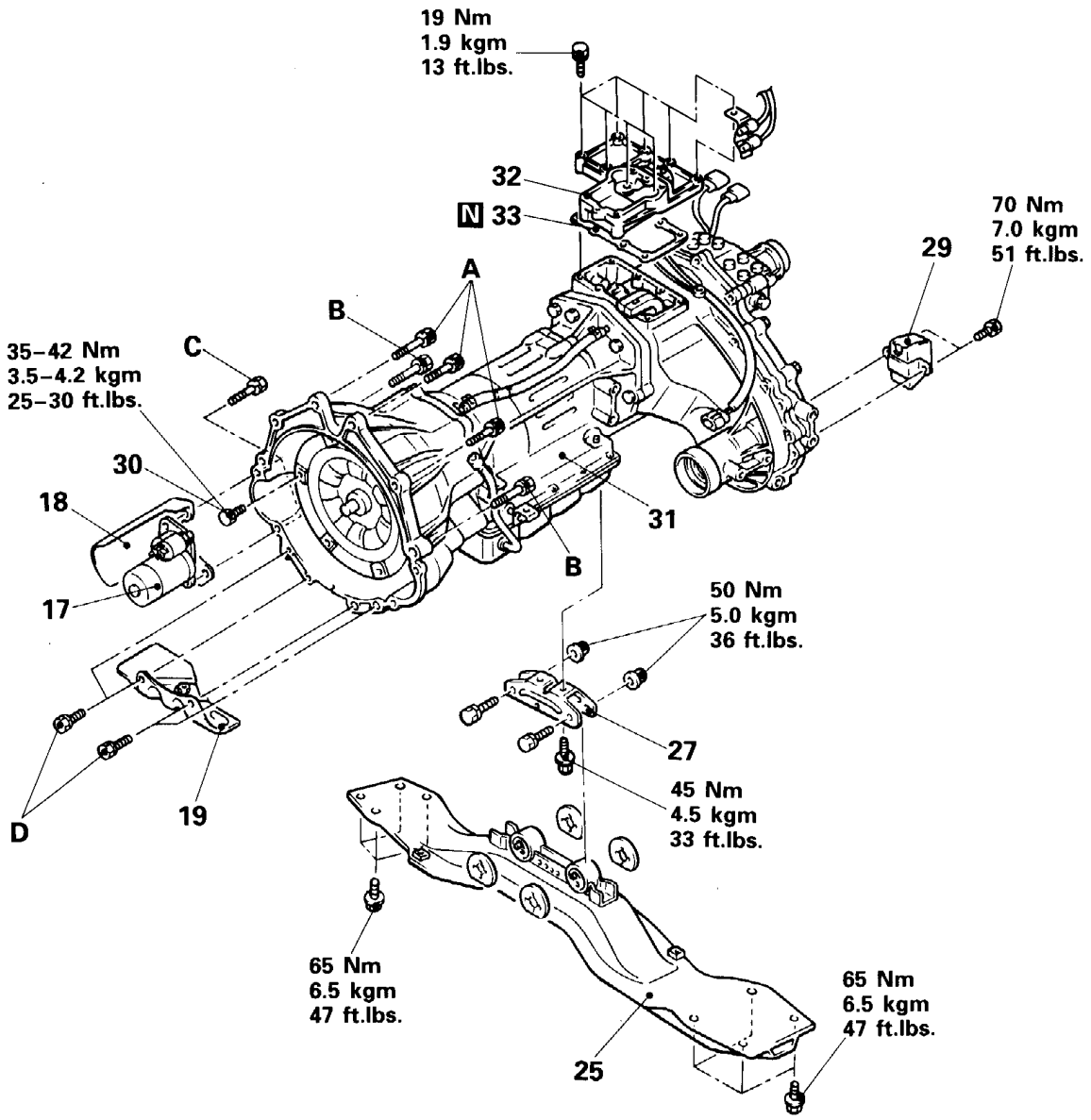
Pre-removal and Post-installation Operation
- Removal and Installation of Transfer Control Lever Assembly. (Refer to P. 23-45, 46.)
- Removal and Installation of Transfer Case Protector
- Removal and Installation of Front Exhaust Pipe
- Draining and Supplying of Automatic Transmission Fluid and Transfer Oil (Refer to P. 23-40 and GROUP 22–Service Adjustment Procedures.)
- Removal and Installation of Front and Rear Propeller Shaft (Refer to GROUP 25–Propeller Shaft.)

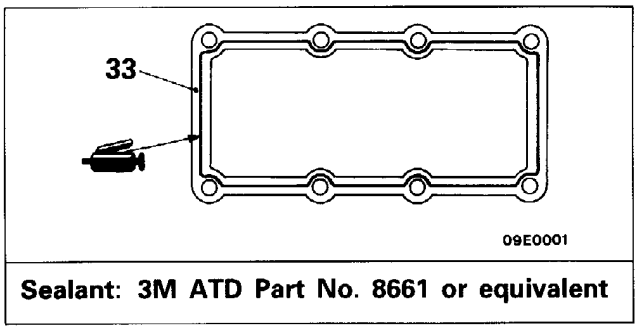


Fluid: Dia Queen ATF SP, ATF DEXRON II or equivalent



Removal steps
2. Oil filler pipe
3. O-ring
4. Connection for throttle control cable
5. Dust seal guard
6. Connection for transmission control cable
8. Speed sensor connector
9. HI/LO detection switch connector
10. 4WD operation detection switch connector
11. Center differential lock operation detection switch connector
12. Center differential lock detection switch connector
13. 2WD/4WD detection switch connector
14. Inhibitor switch connector
15. Solenoid valve connector
16. Connection for oil cooler pipe





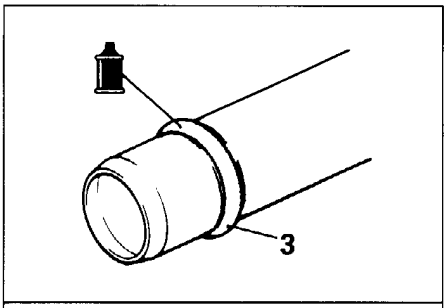
Sealant: 3M ATD Part No. 8661 or equivalent

17. Starter motor
18. Starter cover
19. Heat protector
25. No. 2 crossmember
27. Engine rear mount bracket
29. Mass damper
30. Torque converter connecting bolt
31. Transmission and transfer assembly
32. Control housing
33. Gasket

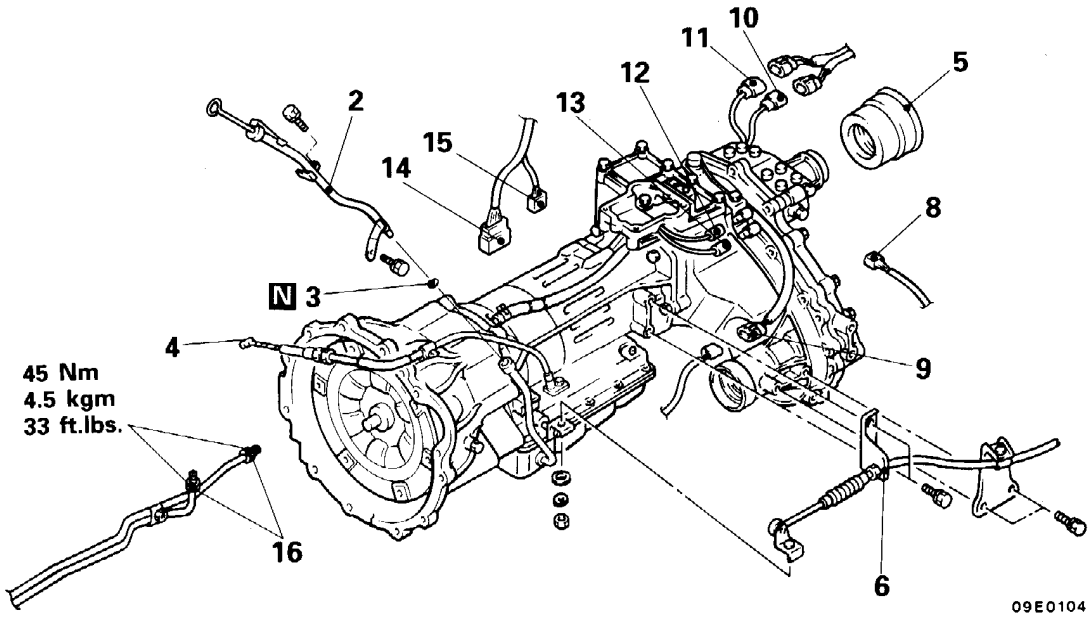
	Nm	kgm	ft.lbs.	O.D. × Length mm (in.)	Bolt identification
A	75	7.5	54	⑦ 12 × 40 (0.5 × 1.6)	⑦ D × L
B	90	9.0	65	⑦ 12 × 55 (0.5 × 2.2)	D, L
C	31	3.1	22	⑦ 10 × 55 (0.4 × 2.2)	
D	36	3.6	26	⑦ 10 × 40 (0.4 × 1.6)	09Y512

<2800D>

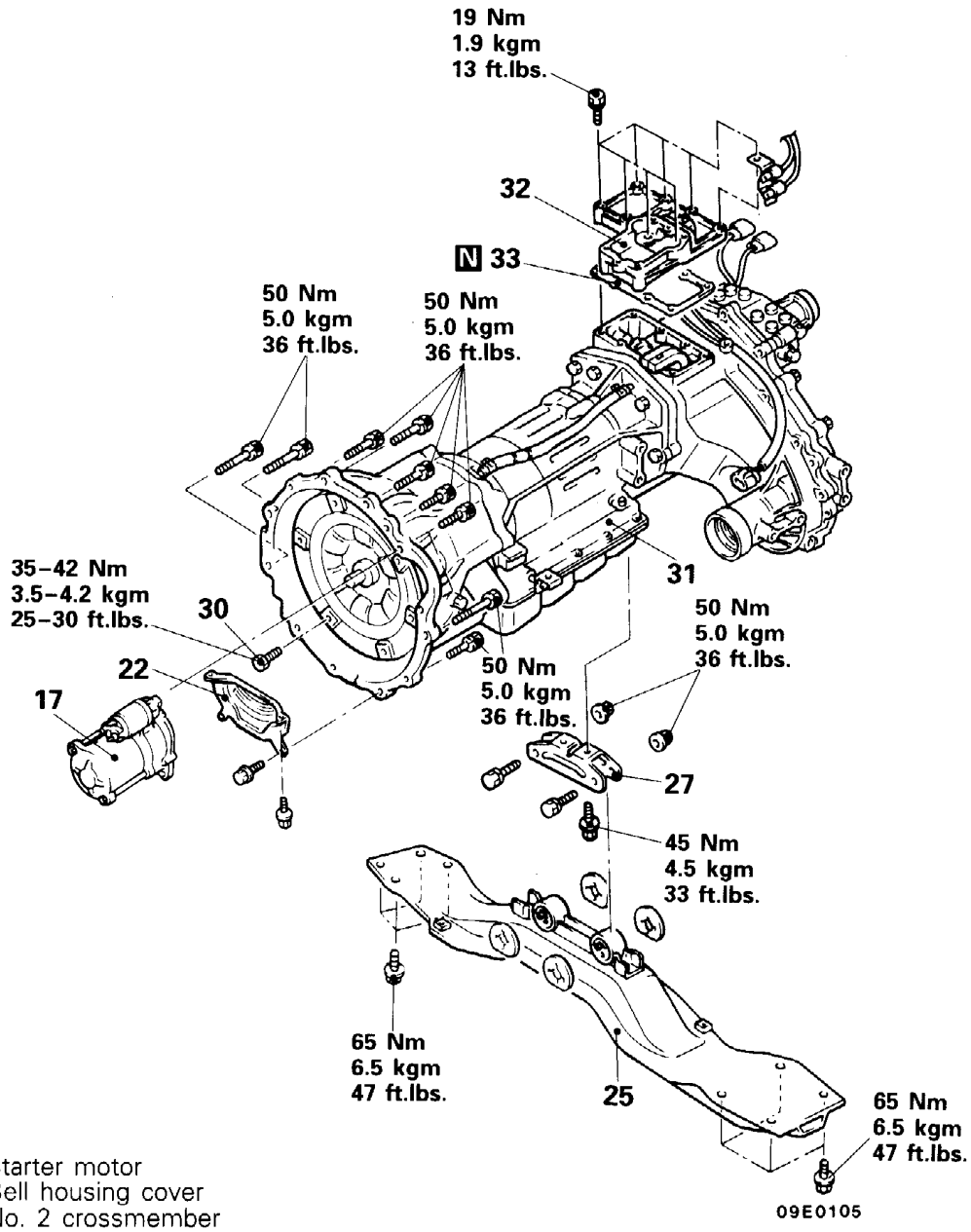
Pre-removal and Post-installation Operation
- Removal and Installation of Transfer Control Lever Assembly. (Refer to P. 23-45, 46.)
- Removal and Installation of Transfer Case Protector
- Removal and Installation of Front Exhaust Pipe
- Draining and Supplying of Automatic Transmission Fluid and Transfer Oil (Refer to P. 23-40 and GROUP 22–Service Adjustment Procedures.)
- Removal and Installation of Front and Rear Propeller Shaft (Refer to GROUP 25–Propeller Shaft.)
- Removal and Installation of Intercooler (Refer to GROUP 15–Intercooler.)



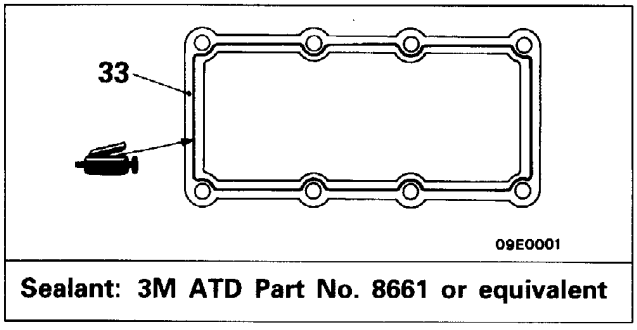
Fluid: Dia Queen ATF SP, ATF DEXRON II or equivalent



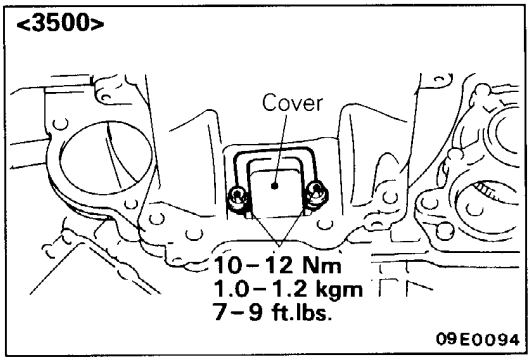
Removal steps
2. Oil filler pipe
3. O-ring
4. Connection for throttle control cable
5. Dust seat guard
6. Connection for transmission control cable
8. Speed sensor connector
9. HI/LO detection switch connector
10. 4WD operation detection switch connector
11. Center differential lock operation detection switch connector
12. Center differential lock detection switch connector
13. 2WD/4WD detection switch connector
14. Inhibitor switch connector
15. Solenoid valve connector
16. Connection for oil cooler pipe



17. Starter motor
22. Bell housing cover
25. No. 2 crossmember
27. Engine rear mount bracket
30. Torque converter connecting bolt
31. Transmission and transfer assembly
32. Control housing
33. Gasket



Sealant: 3M ATD Part No. 8661 or equivalent



SERVICE POINTS OF REMOVAL E23LBAK

23. REMOVAL OF TRANSFER ROLL STOPPER

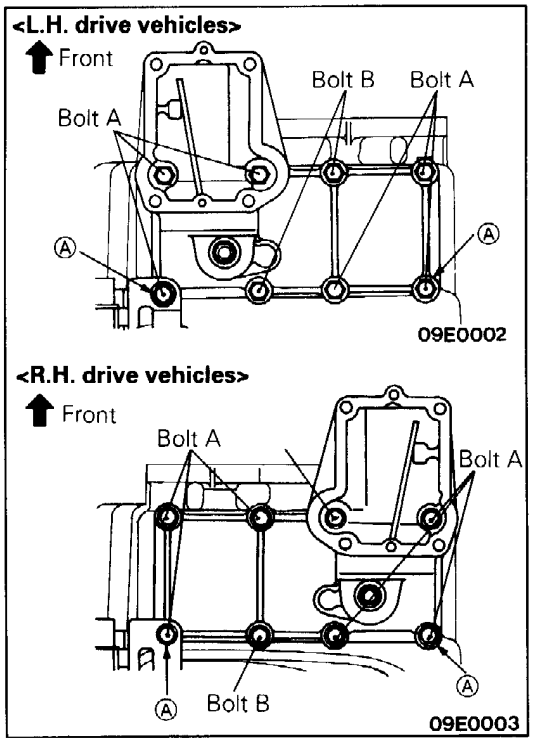
Before removing the transfer roll stopper, support the transmission and transfer assembly with a transmission jack.

30. REMOVAL OF TORQUE CONVERTER CONNECTING BOLT
31. TRANSMISSION AND TRANSFER ASSEMBLY

(1) Remove the cover from the oil pan upper. <3500>
(2) Remove the connecting bolts (6 places) while turning the crank shaft.
(3) Gently lower the rear section of the transmission and transfer assembly to remove the assembly from the engine.

Caution
When removing the transmission and transfer assembly, push the torque converter over to the transmission and transfer assembly side so it does not remain on the engine side.

(4) Next, tilt the front section of the transmission and transfer assembly downwards and gently lower it, being careful that the rear section of the transfer does not touch the No.4 crossmember.



SERVICE POINTS OF INSTALLATION E23LDAK

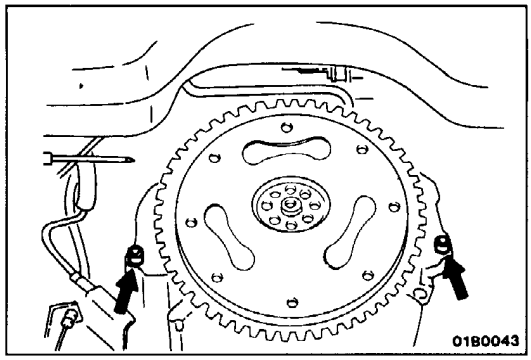
32. INSTALLATION OF CONTROL HOUSING

(1) Remove the adhesive sticking to the bolts attached to portion Ⓐ.
(2) Use a tap (M8 x 1.25) to remove the adhesive sticking to the screw holes (portion Ⓐ).
(3) Apply specified adhesive to the threads of the mounting bolts (portion Ⓐ).

Specified adhesive:
3M Stud Locking No. 4710 or equivalent

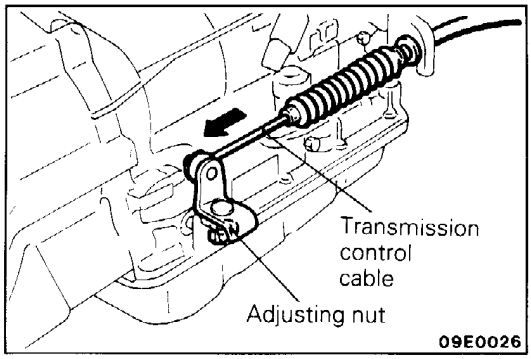
(4) The dimensions of the mounting bolts vary according to their mounting locations, so do not confuse them when installing.

Bolt to be used	O.D. × Length mm (in.)	Bolt identification
A	⑦ 8 × 25 (0.3 × 1.0)	⑦ D × L
B	⑦ 8 × 27 (0.3 × 1.1) Reame bolt	D, L 09Y512



31. INSTALLATION OF TRANSMISSION AND TRANSFER ASSEMBLY

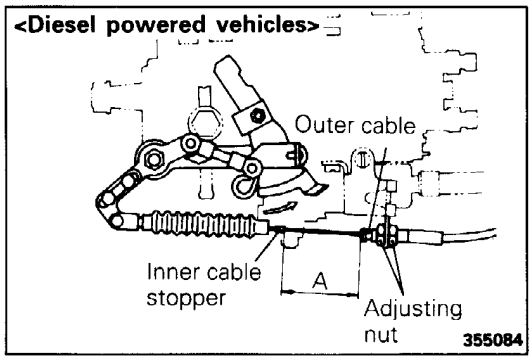
(1) Align the engine transmission mounting bolt holes with the transmission and transfer assembly as shown in the illustration, and connect the transmission and transfer assembly to the engine.



6. INSTALLATION OF TRANSMISSION CONTROL CABLE ASSEMBLY

After installing the transmission control cable, adjust it by the following procedure.

(1) Move the selector lever to the "N" position.
(2) Loosen the adjusting nut, gently pull the end of the transmission control cable in the direction of the arrow and then tighten the adjusting nut to the specified torque.



4. INSTALLATION OF THROTTLE CONTROL CABLE

After installing the throttle control cable, adjust it by the following procedure.

<Diesel powered vehicles>

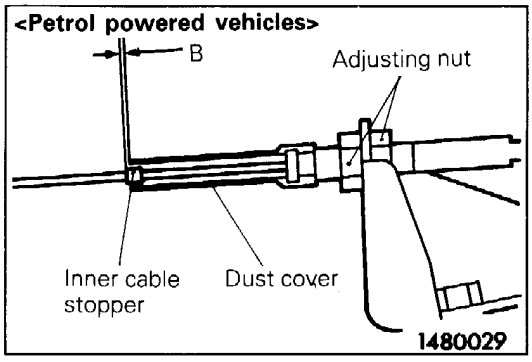
(1) Remove the cable from the boot outer cable side until the inner cable stopper can be seen.
(2) Open the throttle lever completely and adjust the cable with the adjusting nut so that the distance between the inner cable stopper and the outer cable end is at the standard value.

Standard value (A): 34–35 mm (1.34–1.38 in.)

<Petrol powered vehicles>

Open the throttle lever completely and adjust the cable with the adjusting nut so that the distance between the inner cable stopper and the dust cover end is at the standard value.

Standard value (B): 0–1 mm (0–0.04 in.)



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