

WORKSHOP MANUAL

TF SERIES

AUTOMATIC TRANSMISSION 4L30-E

SECTION 7A1

ISUZU

NOTICE

Before using this Workshop Manual to assist you in performing vehicle service and maintenance operations, it is recommended that you carefully read and thoroughly understand the information contained in Section 0A under the headings "GENERAL INFORMATION".

All material contained in this Manual is based on the latest product information available at the time of publication.

All rights are reserved to make changes at any time without prior notice.

THIS MANUAL INCLUDES THE FOLLOWING SECTIONS:

SECTION	CONTENTS
00	Service Information
7A1	Automatic Transmission (4L30-E)

SECTION 00

SERVICE INFORMATION

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MAIN DATA AND SPECIFICATIONS

AUTOMATIC TRANSMISSION

				Remarks	
Model			4L30-E		
Engine			V6 3.2L 6VD1	DOHC	
Type			Automatic four speed overdrive in 4th gear lock-up clutch torque converter		
Control systems	Shift control		Hydraulic		
	Shift pattern		Electronic		
	Shift quality		Electronic		
	Lock-up clutch		Electronic		
Gear ratio	1st		2.856		
	2nd		1.618		
	3rd		1.000		
	4th (O/D)		0.723		
	Reverse		2.000		
Gear set			Noiseless, high torque capability		
Oil used	Name		ATF DEXRON®-III		
	Q'ty lit (Imp qt / US qt)		8.6 (7.6 / 9.1)		
Torque converter			2200 ± 150	Stall speed (rpm)	
	Reverse clutch		RC	4	Number of discs
	Second clutch		C2	6	
	Third clutch		C3	6	
	Brake band		Double wrap		
	Fourth clutch		C4	2	Number of discs
	Overrun clutch		OC	1	
	Overdrive		OFW	10	Number of rollers
	Principal		PFW	26	Number of sprags
	Ravigneaux	Input sun gear		30	Number of teeth
		Pinion gear		19	
		Long pinion		23	
		Ring gear		90	
		Long pinion		19	
		Output sun gear		46	
	Overdrive	Sun gear		31	
		Pinion gear		24	
		Ring gear		81	

SERVICE STANDARD

AUTOMATIC TRANSMISSION

ITEMS	SERVICE STANDARD	SERVICE LIMIT
PLANETARY CARRIER Planetary Carrier Pinion End Play mm (in)	0.13 – 0.89 (0.005 – 0.035)	–
SECOND CLUTCH Second Clutch End Play mm (in)	0.36 – 0.79 (0.014 – 0.031)	–
OVERDRIVE CLUTCH Overdrive Clutch End Play mm (in)	0.1 – 0.8 (0.004 – 0.031)	–
MAIN CASE Main Case End Play mm (in)	0.36 – 0.80 (0.014 – 0.031)	–
OVERDRIVE CARRIER Overdrive Carrier Pinion End Play mm (in)	0.24 – 0.64 (0.0094 – 0.025)	–

SERVICING

AUTOMATIC TRANSMISSION

CHECKING TRANSMISSION FLUID LEVEL AND CONDITION

Checking fluid level and condition (color and odor) at regular intervals will provide early diagnosis information about the transmission. This information may be used to correct a condition that, if not detected early, could result in major transmission repairs.

IMPORTANT:

When new, automatic transmission fluid is red in color. As the vehicle is driven, the transmission fluid will begin to look darker in color. The color may eventually appear light brown.

A DARK brown color with burnt odor may indicate excessive fluid deterioration and signal a need for fluid change.

FLUID LEVEL

When adding or changing fluid, use only DEXRON®-III.

Refer to the Maintenance and Lubrication (Section 0) for maintenance information and servicing interval.



CAUTION: Do not overfill.

Overfilling will cause foaming, loss of fluid, abnormal shifting and possible damage to the transmission.

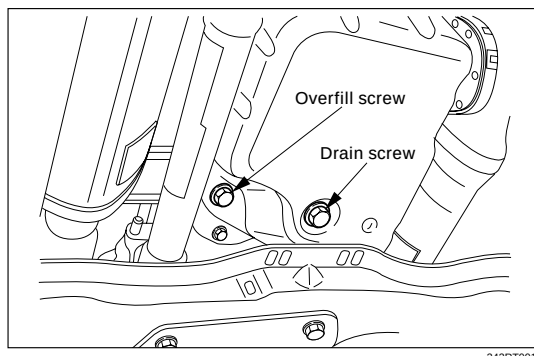


CAUTION:

DO NOT CHECK FLUID LEVEL UNDER THESE CONDITIONS:

- Immediately after driving at sustained highway speeds.
- In heavy city traffic during hot weather.
- If vehicle is towing a trailer.

If the vehicle has been operated under these conditions, shut the engine off and allow the vehicle to “cool” for thirty (30) minutes. After the cool-down period, restart the vehicle and continue from step 2 above.



1. Parking the vehicle on level ground and apply the parking brake firmly.
2. Check fluid level with engine running at idle.

NOTE:

Be sure that transmission fluid temperature is below 30°C (86°F).

3. Move through all gear ranges the selector lever.
4. Move the selector lever to "Park".
5. Let engine idle for 3 minutes and open the overfill screw.
6. Let engine idle until a fluid temperature between 32°C (90°F) and 57°C (135°F) is reached.
7. Add transmission fluid until it flows out over the overfill screw-opening, then close the overfill screw.

Overfill Screw Torque	N·m(kg·m/lb·ft)
	38 (3.9 / 28)



NOTE:

Transmission fluid temperature to be check with service tool.

Minimum fluid level → 57°C (135°F)

Maximum fluid level → 32°C (90°F)



CAUTION:

Do not open overfill screw with engine stopped.

00 – 6 SERVICE INFORMATION

FLUID CONDITION

	FLUID CONDITION			
	NORMAL*		CONTAMINATED	
COLOR	RED OR LIGHT BROWN	BROWN	NON-TRANSPARENT /PINK	BROWN
DRAIN REQUIRED?	NO	YES	YES	YES
CONTAMI- NATION	NONE	Very small amount of foreign material in bottom of pan	Contamination by coolant or other source	Large pieces of metal or other foreign material in bottom of pan
CORRECT LEVEL & CONDITION	1. LOW LEVEL: A. Add fluid to obtain proper level & check for external leaks. B. Correct cause of leak. 2. HIGH LEVEL: – Remove excess fluid	– Remove both pans – Change filter – Flush cooler – Add new fluid – Check level	– Repair/replace radiator cooler – Transmission overhaul required – Check for: • Damaged plates and seals • Contaminated solenoids – Flush cooler – Add new fluid – Check level	– Transmission overhaul required – Flush cooler and cooler lines – Add new fluid – Check level

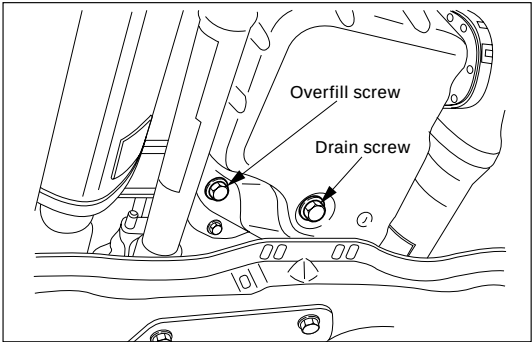
* Fluid should be changed according to maintenance schedule.

CHANGING TRANSMISSION FLUID

There is no need to change the transmission fluid unless the transmission is used under one or more of the following heavy duty conditions.

- A: Repeated short trips
- B: Driving on rough roads
- C: Driving on dusty roads
- D: Towing a trailer

If the vehicle is used under these conditions, change the fluid every 27,000 miles (45,000 km.)



1. Place a large drain pan under the oil pan.
2. Remove the transmission oil drain screw and drain fluid.
3. Tighten drain screw.



Drain Screw Torque	N·m(kg·m/lb·ft)
38 (3.9 / 28)	

4. Remove the transmission overfill screw and fill transmission through overfill screw opening, using DEXRON®-III ATF.
5. Let engine idle until a fluid temperature between 32°C (90°F) and 57°C (135°F) is reached, then close the overfill screw.



Overfill Screw Torque	N·m(kg·m/lb·ft)
38 (3.9 / 28)	

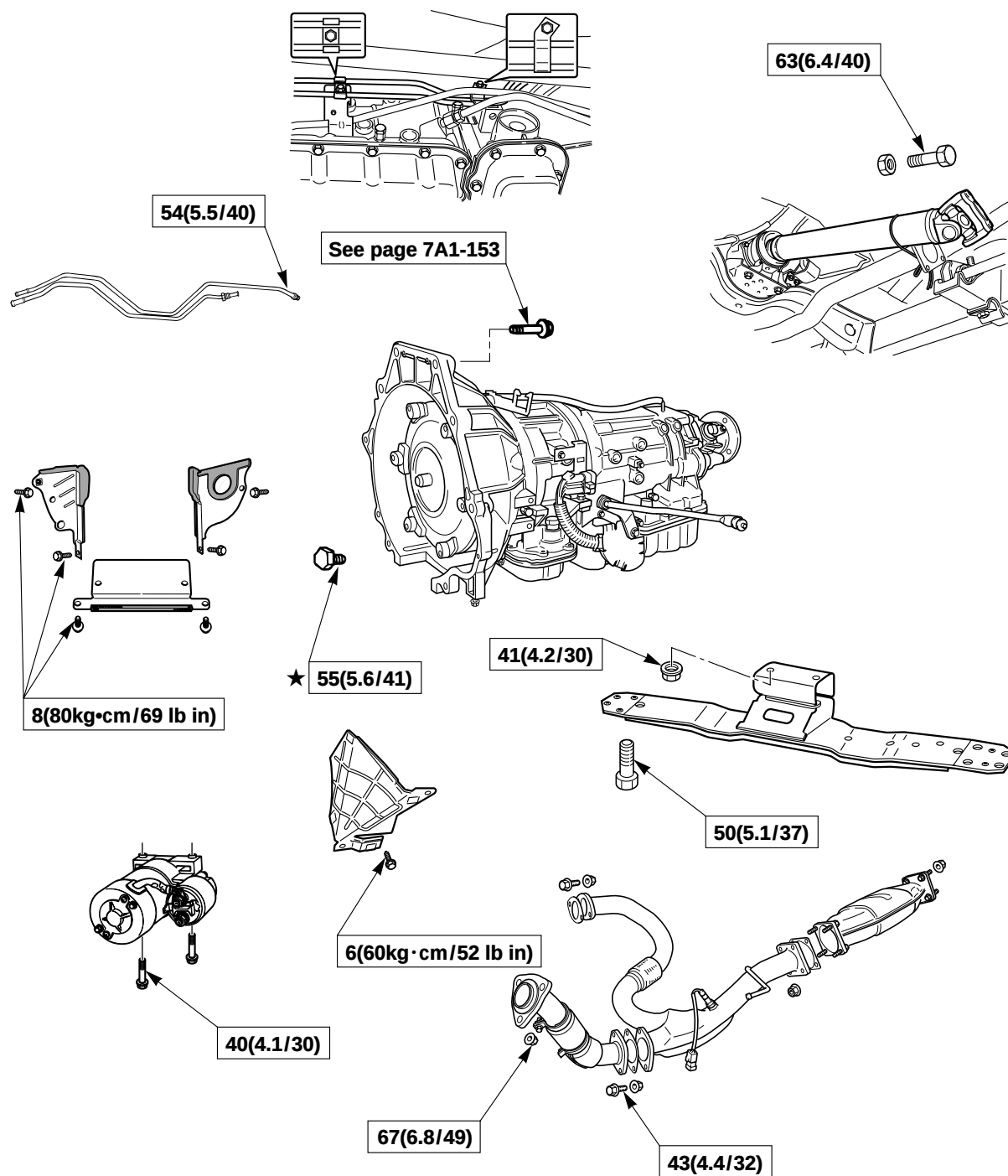
6. Add transmission fluid until it flows out over the overfill screw opening.

NOTE:
Transmission fluid temperature to be check with service tool.

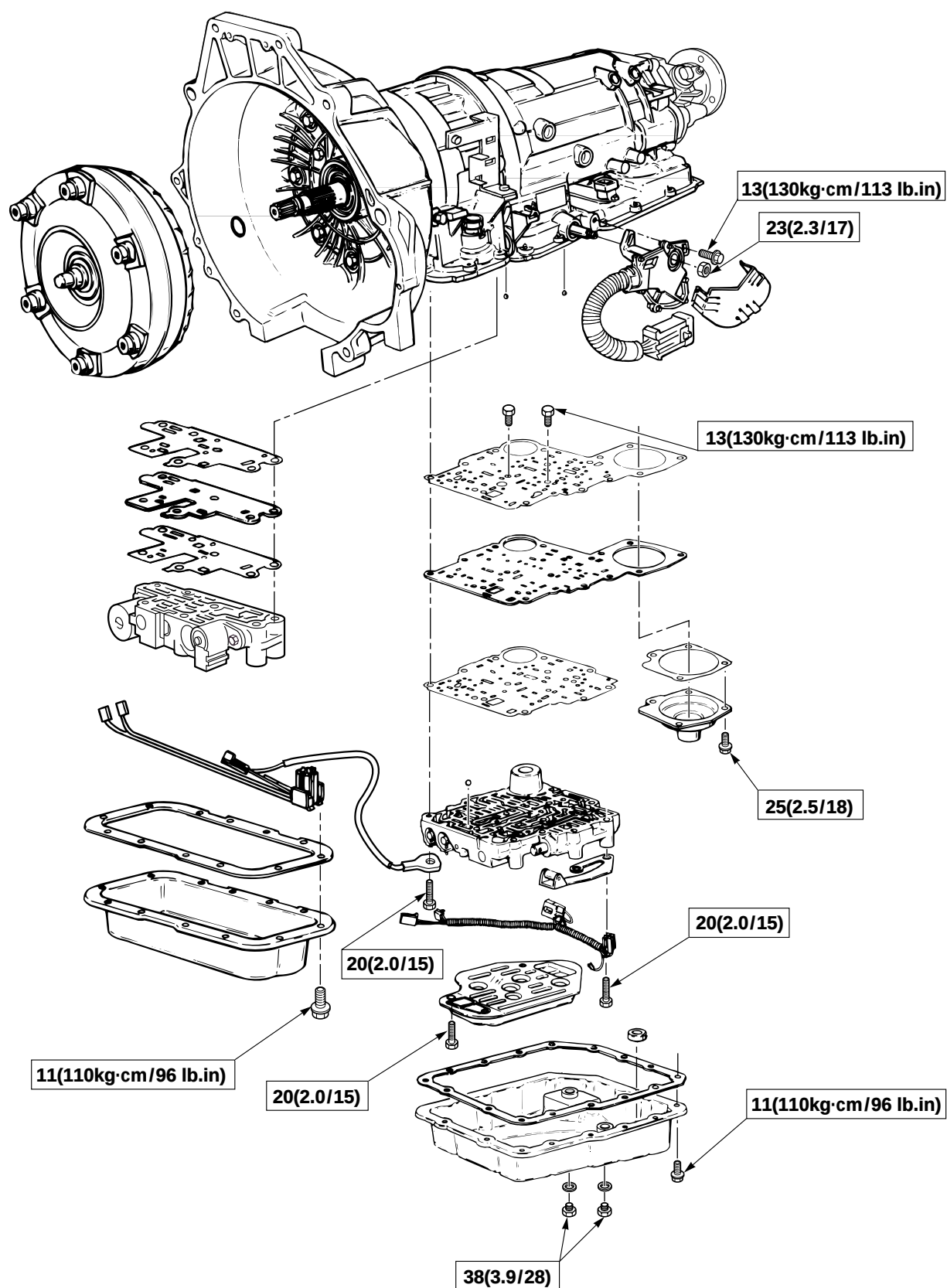
FIXING TORQUE

AUTOMATIC TRANSMISSION

N·m (kg·m / lb·ft)



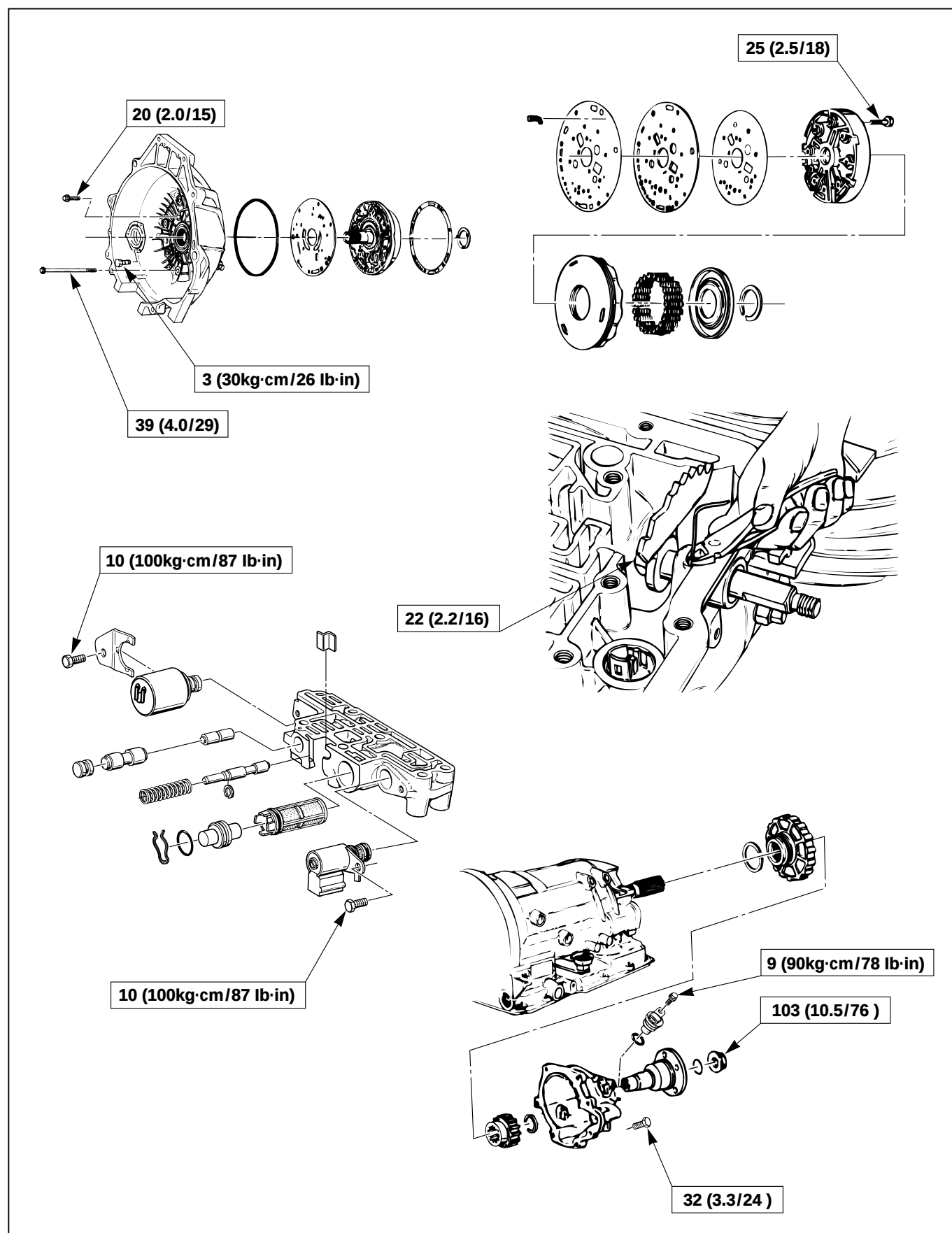
★ Non-reusable part

FIXING TORQUE (CONT.)**AUTOMATIC TRANSMISSION****N·m (kg·m / lb·ft)**

FIXING TORQUE (CONT.)

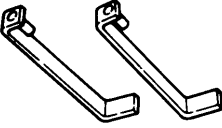
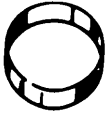
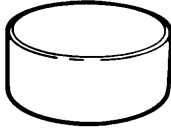
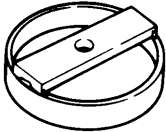
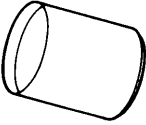
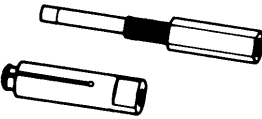
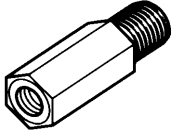
AUTOMATIC TRANSMISSION

N·m (kg·m / lb·ft)

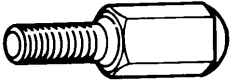
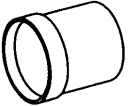
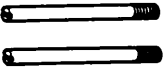
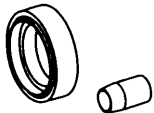
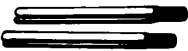
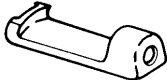
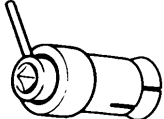


SPECIAL TOOLS

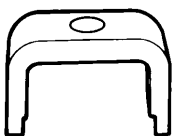
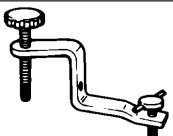
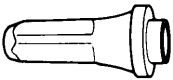
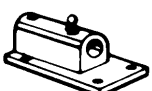
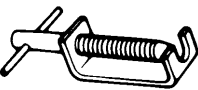
AUTOMATIC TRANSMISSION

ILLUSTRATION	PARTS NO.	PARTS NAME
	5-8840-0501-0 (J-23075)	Spring compressor (For servo piston)
	5-8840-2258-0 (J-38450)	Third clutch retaining ring compressor
	5-8840-2259-0 (J-23075-12)	Third clutch spring compressor adapter (Use with 5-8840-0501-0 (J-23075))
	5-8840-2260-0 (J-23084)	Third clutch piston installer
	5-8840-0195-0 (J-23327)	Spring compressor
	5-8840-2261-0 (J-23080-A)	Second clutch piston installer
	5-8840-2262-0 (J-23085-A)	Selective washer gaging tool
	5-8840-2263-0 (J-23327-90)	Fourth clutch spring compressor (Use with 5-8840-0195-0 (J-23327))
	5-8840-2264-0 (J-38553)	3/4 Accumulator piston fitter
	5-8840-2265-0 ('94) (J-38552)	Cover remover (Use with 5-8840-2266-0 (J-38584))
	5-8840-2403-0 ('96) (J-41096)	Cover remover (Use with 5-8840-2266-0 (J-38584))

SPECIAL TOOLS (CONT.)**AUTOMATIC TRANSMISSION**

ILLUSTRATION	PARTS NO.	PARTS NAME
	5-8840-2266-0 (J-38584)	Slide hammer adapter (Use with 5-8840-0019-0 (J-23907))
	5-8840-2267-0 (J-38554)	Fourth clutch piston fitter
	5-8840-2268-0 (J-38588)	Guide pins: adapter case to main case
	5-8840-2269-0 (J-38555)	Overrun clutch piston seal installer set
	5-8840-2270-0 (J-3387-2)	Guide pins: gasket and transfer plate to valve body
	5-8840-2271-0 (J-25022)	Turbine shaft puller (Use with 5-8840-0618-0 (J-24773-1))
	5-8840-0196-0 (J-23129)	Oil seal remover (Use with 5-8840-0019-0 (J-23907) and 5-8840-2266-0 (J-38584))
	5-8840-2272-0 (J-38557)	Oil pump centering tool
	5-8840-2273-0 (J-23082-01)	Oil pump rotation tool
	5-8840-0022-0 (J-25025-B)	Guide pins: valve body to main case
	5-8840-0019-0 & 5-8840-2000-0 (J-23907)	Slide hammer

SPECIAL TOOLS (CONT.)**AUTOMATIC TRANSMISSION**

ILLUSTRATION	PARTS NO.	PARTS NAME
	5-8840-2274-0 (J-38428)	Servo piston fitter
	5-8840-2275-0 (J-23327-91)	Overrun clutch spring compressor
	5-8840-2277-1 (J-38559-A)	3/4 Accumulator piston cover compressor
	5-8840-2278-0 (J-8763-02)	Holding fixture
	5-8840-2282-0 (J-36797)	A/T extension housing oil seal installer (Inside)
	5-8840-0003-0 (J-3289-20)	Holding fixture base
	5-8840-0004-0 (J-21867)	Pressure gauge
	5-8840-0618-0 (J-24773-1)	End play fixture (Use with 5-8840-2271-0(J-25022))

MEMO

A series of horizontal dotted lines for writing.

SECTION 7A1

AUTOMATIC TRANSMISSION (4L30-E)

⚠ CAUTION

When fasteners are removed, always reinstall them at the same location from which they were removed. If a fastener needs to be replaced, use the correct part number fastener for that application. If the correct part number fastener is not available, a fastener of equal size and strength (or stronger) may be used.

Fasteners that are not reused, and those requiring thread locking compound, will be called out. The correct torque values must be used when installing fasteners that require torque. If the above conditions are not followed, parts or system damage could result.

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GENERAL DESCRIPTION

The 4L30-E is a 4-speed fully-automatic transmission. It uses a microcomputer as a control unit to judge running conditions including throttle opening rate and vehicle speed, then it sets the shifting point in the optimum timing so that best driving performance can be achieved.

In addition, the built-in shift mode select function can select two shift modes according to the driver's preference.

- Normal mode –Normal shift pattern.
- Power mode has a delayed upshift for when more powerful acceleration is required.

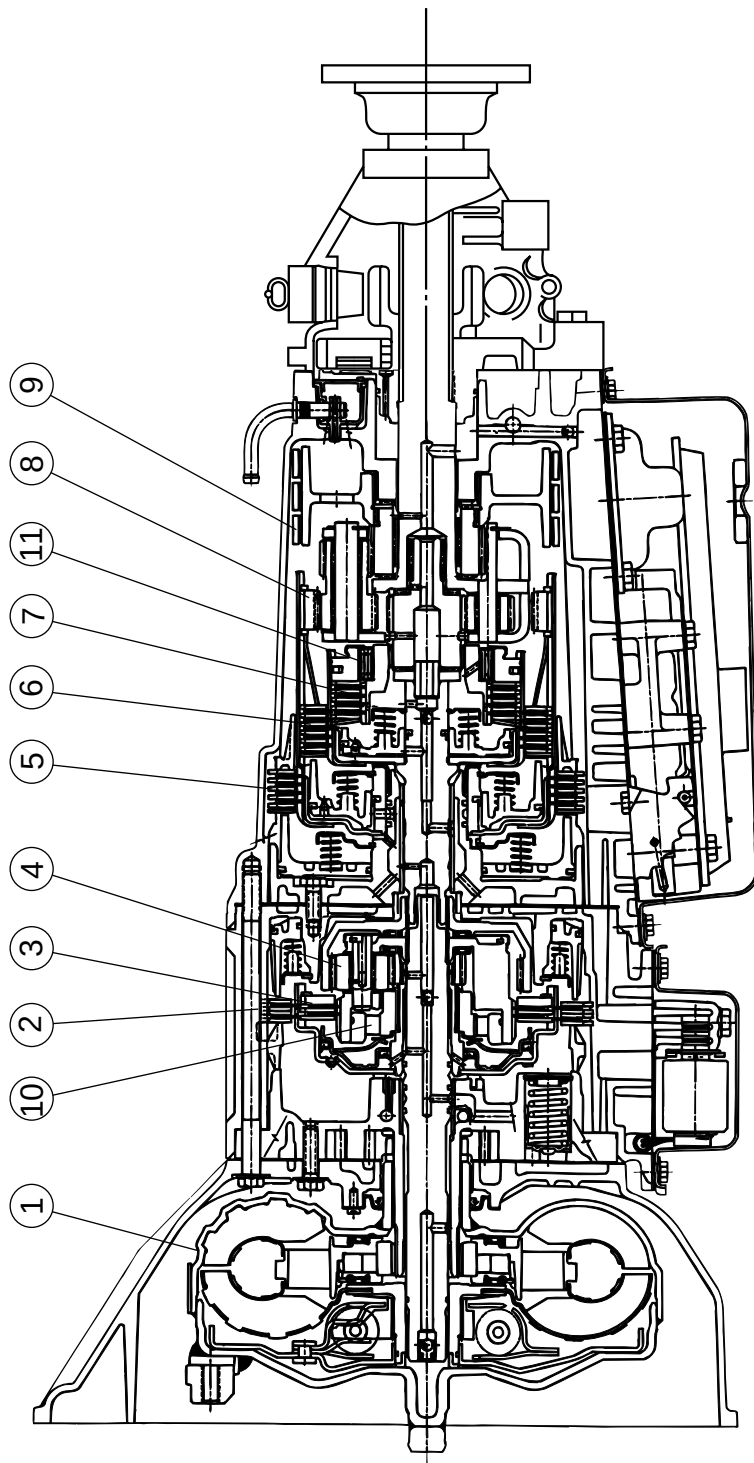
Also, the built-in fail-safe function ("backup mode") assures driving performance even if the vehicle speed sensor, throttle signal or any solenoid fails. Further, the self-diagnostic function conducts diagnosis in a short time when the control system fails, thus improving serviceability.

The major features of 4L30-E are as follows:

- A compact structure consisting of 2 sets of planetary gears and flat torque converter.
- Electronic control selects the optimum shift mode according to the driving conditions.
- Electronic control maintains the optimum hydraulic pressure for clutch, band brake as well as transmission so that shift feeling is improved.
- Two sets of planetary gears reduce friction of power train.
Also, a lock-up mechanism in the torque converter reduces fuel consumption.
- Wide gear ratio and high torque rate of torque converter provide excellent starting performance.

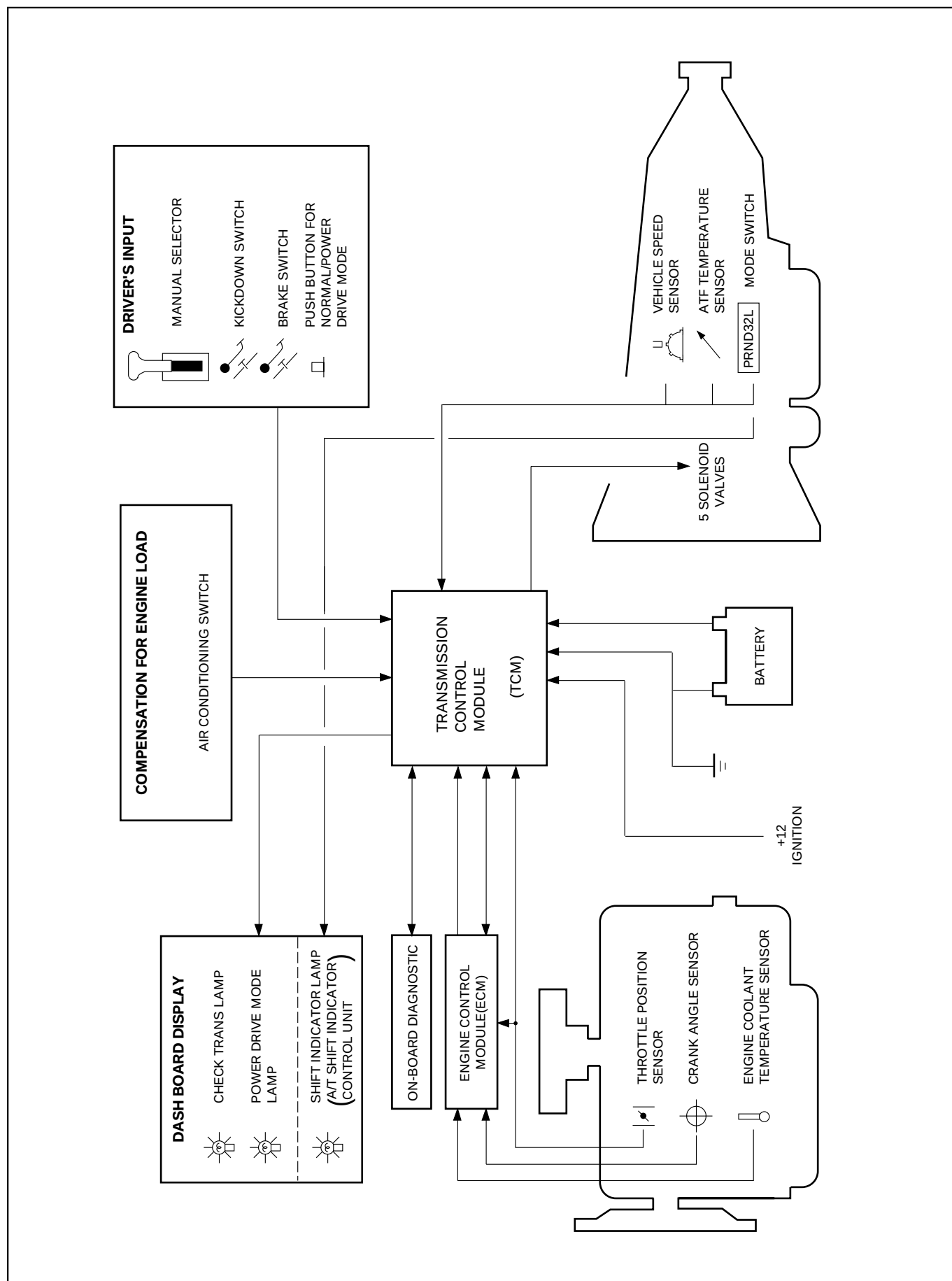
CONSTRUCTION

CROSS SECTION

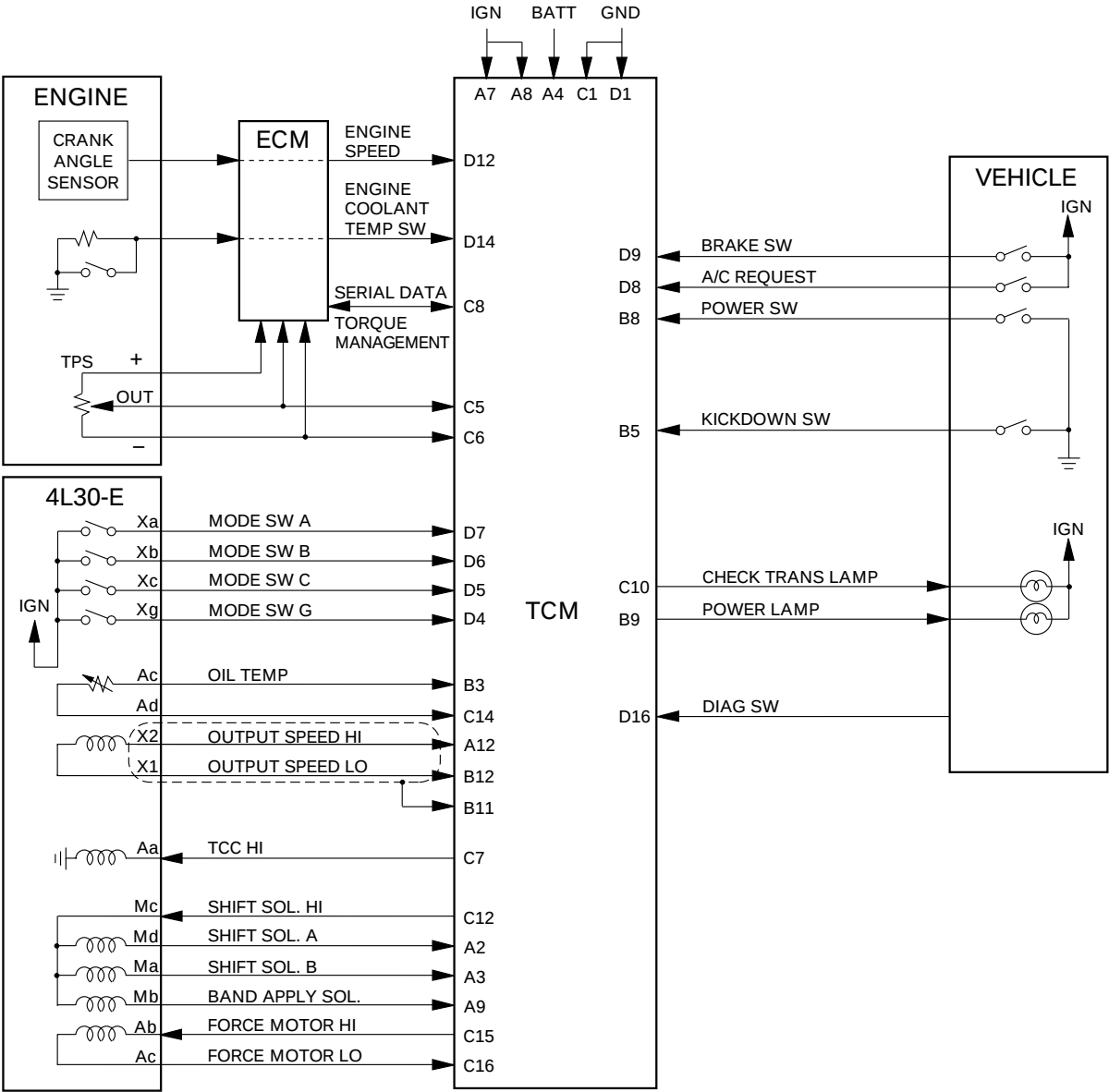


- | | | |
|----------------------------------|---------------------------------|--|
| 1. TORQUE CONVERTER-CLUTCH (TCC) | 5. REVERSE CLUTCH (RC) | 9. BRAKE BAND (B) |
| 2. FOURTH CLUTCH (C4) | 6. SECOND CLUTCH (C2) | 10. OVERDRIVE FREE WHEEL
(ONE WAY CLUTCH) (OFW) |
| 3. OVERRUN CLUTCH (OC) | 7. THIRD CLUTCH (C3) | 11. SPRAG FREE WHEEL
(ONE WAY CLUTCH) (PFW) |
| 4. OVERDRIVE UNIT | 8. RAVIGNEAUX PLANETARY GEARSET | |

ELECTRONIC CONTROL DIAGRAM

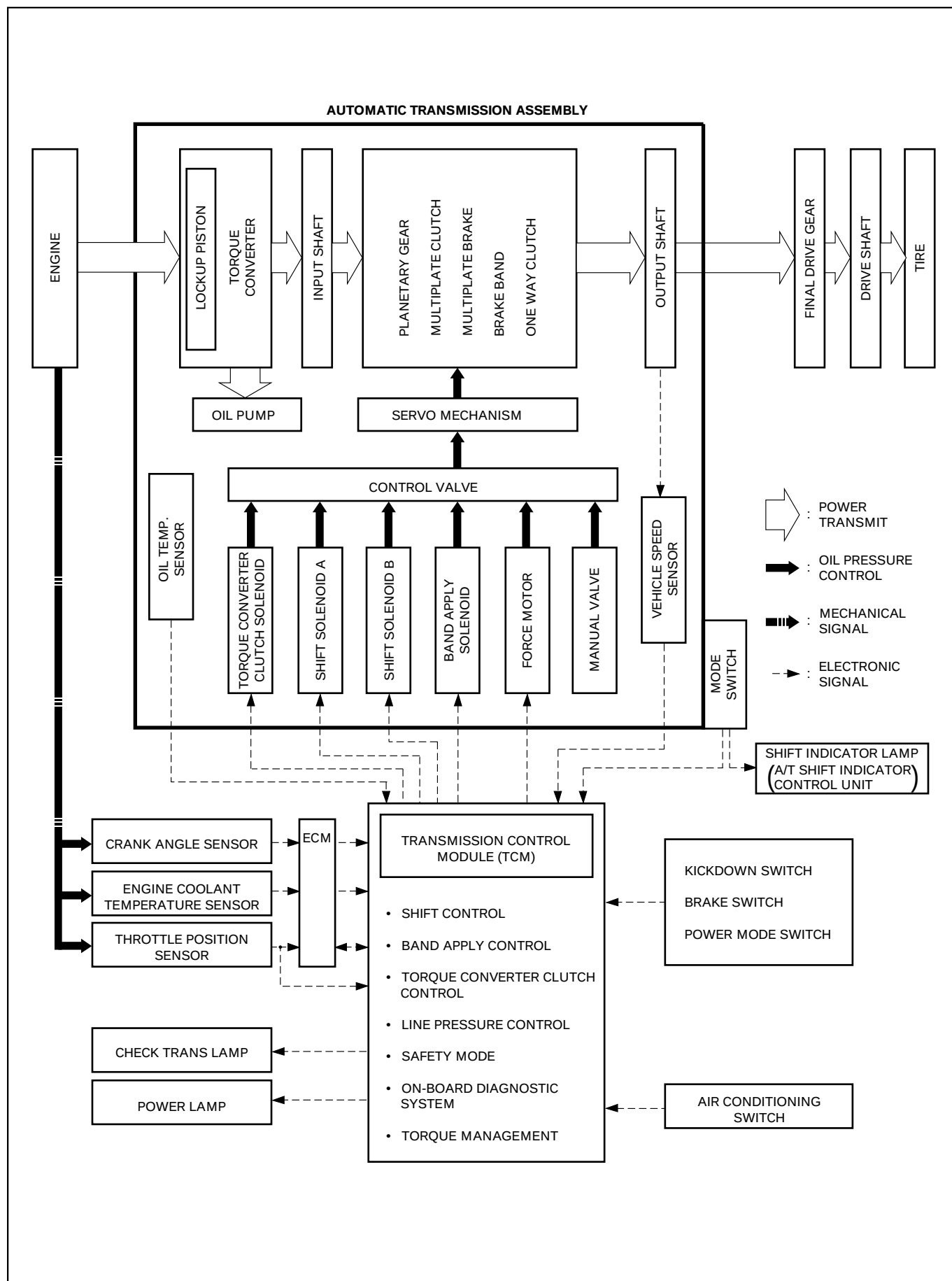


TRANSMISSION CONTROL MODULE (TCM)



ECM: Engine Control Module
TPS: Throttle Position Sensor
TCC: Torque Converter Clutch

CONTROL SYSTEM DIAGRAM



1. SHIFT CONTROL

The transmission gear is shifted according to the shift pattern selected by the driver.

In shifting gears, the gear ratio is controlled by the ON/OFF signal using the shift solenoid A and the shift solenoid B.

2. BAND APPLY CONTROL

The band apply is controlled when in the 3-2 downshift (engine overrun prevention) and the garage shift (shock control).

The band apply solenoid is controlled by the signal from the Pulse Width Modulation (PWM) to regulate the flow of the oil.

3. TORQUE CONVERTER CLUTCH CONTROL

The clutch ON/OFF is controlled by moving the converter clutch valve through shifting Torque Converter Clutch (TCC) solenoid using the ON/OFF signal.

4. LINE PRESSURE CONTROL

The throttle signal allows the current signal to be sent to the force motor. After receiving the current signal, the force motor activates the pressure regulator valve to regulate the line pressure.

5. ON-BOARD DIAGNOSTIC SYSTEM

Several malfunction displays can be stored in the Transmission Control Module (TCM) memory, and read out of it afterward.

The serial data lines, which are required for the testing of the final assembly and the coupling to other electronic modules, can be regulated by this function.

6. FAIL-SAFE MECHANISM

If there is a problem in the transmission system, the TCM will go into a "backup" mode. The vehicle can still be driven, but the drive must use the gear lever to shift gears.

7. TORQUE MANAGEMENT CONTROL

The TCM sends the absolute spark advance signal to the Engine Control Module (ECM) while the transmission is being shifted, to control the engine spark timing in compliance with the vehicle running condition to reduce the shocks caused by the change of speed.

SHIFT MODE CONTROL

① Mode type

Mode type	Select lever position
Normal drive mode (NOR)	Entire range (excluding "R")
Power drive mode (PWR)	Entire range (excluding "R")

② Mode selection

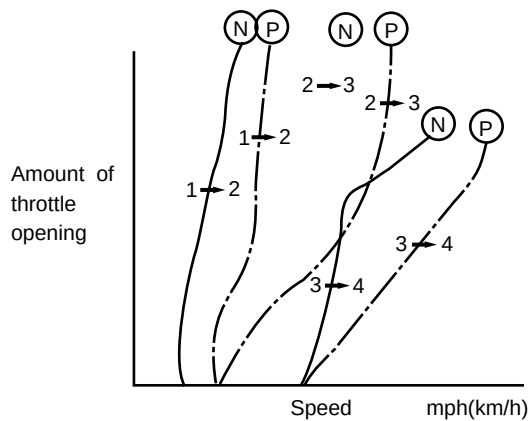
	SWITCH (SW)	LAMP
Mode type	PWR/NOR. SW	POWER DRIVE LAMP
Normal drive mode (NOR)	OFF	OFF
Power drive mode (PWR)	ON	ON

③ Comparison of mode

- (1) The normal drive mode is set at the normal shift points.
- (2) The shift points of the power drive mode are shifted to the higher speed side, compared to the normal drive mode.

Shift diagram

N: Normal drive mode
P: Power drive mode



GEAR SHIFT CONTROL

① Shift pattern

SELECT LEVER RANGE	SHIFT PATTERN
D (Drive)	1 ⇄ 2TCC ⇄ 3TCC ⇄ 4TCC
3 (Third)	1 ⇄ 2TCC ⇄ 3TCC ← 4TCC
2 (Second)	1 ⇄ 2TCC ← 3TCC
L (First)	1 ← 2

TCC = Torque Converter Clutch

② Gear position

The gear is selected by ON/OFF of two solenoids.

GEAR \ SOL	A	B
4 (Fourth)	X	X
3 (Third)	○	X
2 (Second)	○	○
1 (First)	X	○
P (Park)		
R (Reverse)	X	○
N (Neutral)		

○ = ON

X = OFF

SOLENOID A
(Normally closed)

SOLENOID B
(Normally open)

ON → PRESSURE TO
SHIFT VALVE

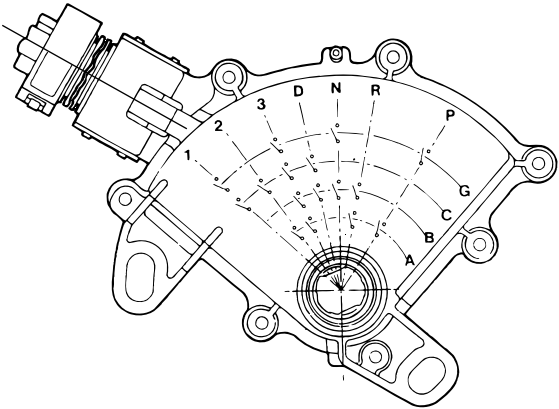
OFF → PRESSURE TO
SHIFT VALVE

③ Selecting gear position

Seven types of positions can be selected according to 5 signals from the mode switch as shown below.

SELECT LEVER RANGE	MODE SW TERMINALS				
	5(D)	8(A)	7(B)	6(C)	3(G)
P (Park)	●	●			●
R (Reverse)	●	●	●		
N (Neutral)	●		●		●
D (Drive)	●		●	●	
3 (Third)	●	●	●	●	●
2 (Second)	●	●		●	
L (First)	●			●	●

● = Continuity



BACKUP MODE

If a major system failure occurs which could affect safety or damage the transmission under normal vehicle operation, the diagnostic system detects the fault and overrides the TCM.

The "CHECK TRANS" light flashes to alert the driver, and the transmission must be manually shifted as follows:

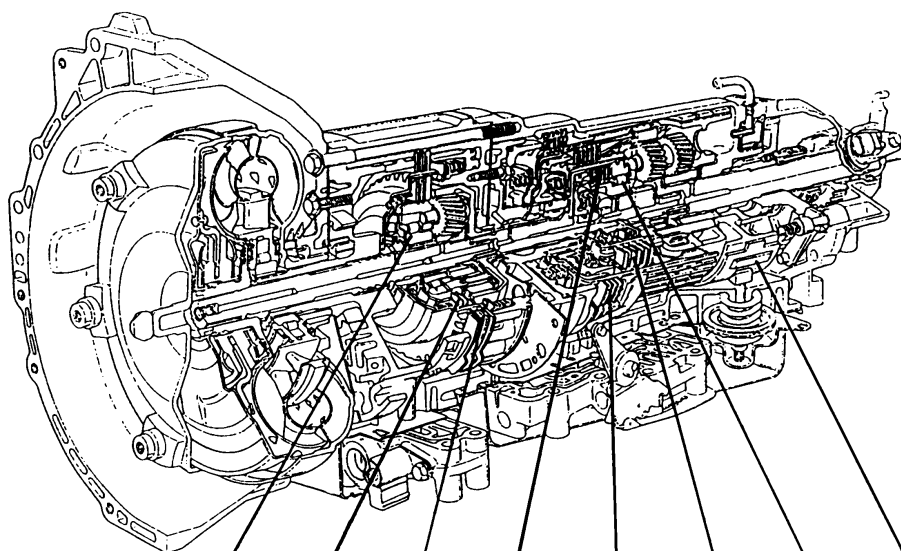
Select lever position	Gear Ratio Selected
D	4 (Fourth)
Manual 3	4 (Fourth)
Manual 2	3 (Third)
Manual L	1 (First)
R	Reverse

Shifts are firmer to prevent clutch slip and consequent wear. The fault should be corrected as soon as possible.

FUNCTIONS OF INPUT/OUTPUT COMPONENTS

	Components		Function
INPUT SIGNAL	Speed sensor (fixed to transmission T/M)		Senses rotation of output shaft and feeds the data to Transmission Control Module (TCM)
	Throttle position sensor (TPS) (fixed to engine)		Senses the extent of throttle valve opening and the speed of the throttle valve lever motion to open the valve and feeds the data to TCM (fed to Engine Control Module (ECM) also)
	Brake Switch (SW) (fixed to brake pedal)		Senses whether the driver has pressed the brake pedal or not and feeds the information to TCM
	Kick-down SW (fixed to accelerator pedal)		Senses whether the driver has pushed the accelerator pedal fully or not and feeds the information to TCM
	Mode SW (fixed to T/M)		Senses the select lever position and feeds the information to TCM
	Power drive SW (fixed to front console)		Senses whether the driver has selected the power mode and feeds the information to TCM
	T/M oil temp. sensor		Senses the T/M oil temperature and feeds the data to TCM
	Engine coolant temperature SW		Senses the engine cooling water temperature and feeds the data to TCM (feeds the signal from ECM)
	Engine speed signal		Feeds the signals monitoring engine speed to TCM from crank angle sensor (feeds the signal from ECM)
	Air conditioning information		Senses whether the air conditioner has been switched on or not and feeds the information to TCM
	On-board diagnostic input		By monitoring the Ground (GND), the location of failure is shown on the T/M monitor lamp (“CHECK TRANS”) by flashing the diagnostic trouble code
OUTPUT SIGNAL	SOLENOID	Shift solenoid A, B	Selects shift point and gear position suited to the vehicle running condition on the basis of TCM output
		Band apply solenoid	Controls oil flow suited to the vehicle running condition on the basis of TCM output
		Torque Converter Clutch solenoid	Controls clutch engagement/disengagement suited to the vehicle running condition on the basis of TCM output
		Force motor (Pressure regulator valve)	Adjusts the oil pump delivery pressure to line pressure suited to the vehicle running condition on the basis TCM output
	Power drive mode lamp		Informs the driver whether the vehicle is in power mode or not
	T/M monitor lamp (“CHECK TRANS”)		Informs the driver of failure in the system. It also displays the self diagnosis code.
	Data Link Connector (DLC)		When connected with TECH2 or tester, can communicate the data for function check, etc. (fed to ECM also). When TECH2 is not connected, can communicate the signal for torque management with ECM. When short-circuited with the bipolar connector, the T/M monitor lamp displays a failure by code.

RANGE REFERENCE CHART



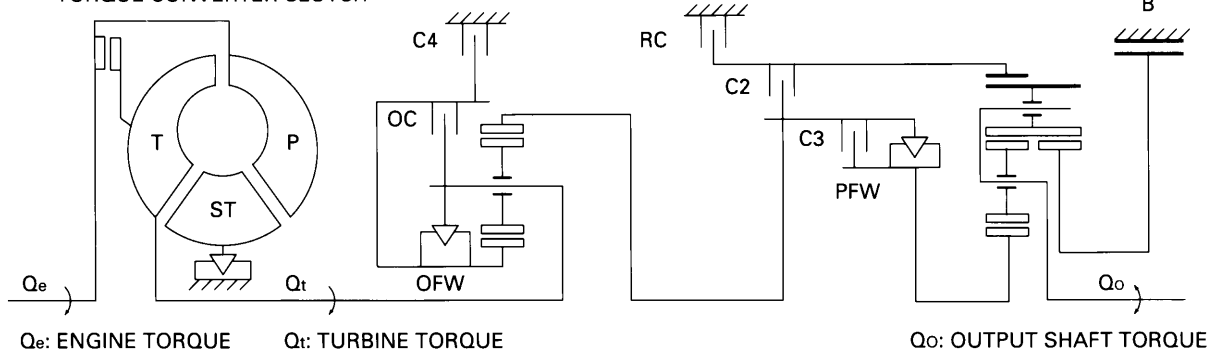
RANGE	GEAR	1-2/3-4 SOL N.C.	2-3 SOL N.O.	O/DRIVE ROLLER CLUTCH (OFW)	OVERRUN CLUTCH (OC)	FOURTH CLUTCH (C4)	THIRD CLUTCH (C3)	REVERSE CLUTCH (RC)	SECOND CLUTCH (C2)	PRINCIPLE SPRAG ASSEMBLY (PFW)	BAND ASSEMBLY (B)	ENGINE BRAKING
P-N		OFF	ON		APPLIED							NO
R	REVERSE	OFF	ON	LD	APPLIED			APPLIED		LD		NO
D	1ST	OFF	ON	LD	APPLIED					LD	APPLIED	NO
	2ND	ON	ON	LD	APPLIED				APPLIED	FW	APPLIED	YES
	3RD	ON	OFF	LD	APPLIED		APPLIED		APPLIED	NE		YES
	4TH	OFF	OFF	FW		APPLIED	APPLIED		APPLIED	NE		YES
3	1ST	OFF	ON	LD	APPLIED					LD	APPLIED	NO
	2ND	ON	ON	LD	APPLIED				APPLIED	FW	APPLIED	YES
	3RD	ON	OFF	LD	APPLIED		APPLIED		APPLIED	NE		YES
2	1ST	OFF	ON	LD	APPLIED		APPLIED			LD	APPLIED	YES
	2ND	ON	ON	LD	APPLIED				APPLIED	FW	APPLIED	YES
L	1ST	OFF	ON	LD	APPLIED		APPLIED			LD	APPLIED	YES

LD : LOCKED IN DRIVE

FW : FREEWHEELING

NE : NOT EFFECTIVE

TORQUE CONVERTER CLUTCH



NORMAL OPERATION OF 4L30-E TRANSMISSION

1. TORQUE CONVERTER CLUTCH (TCC) APPLICATION CONDITIONS:

The TCC is normally applied in 2nd, 3rd and 4th gears only when all of the following conditions exist:

- The engine coolant temperature is above 70°C (158°F).
- The brake pedal is released.
- The shift pattern requests TCC apply.

Moreover, TCC is always applied in 2nd, 3rd and 4th gears when the transmission oil temperature is above 135°C (275°F).

This mode should be canceled at 125°C (257°F).

2. SPECIAL SHIFT PATTERN WHEN THE ENGINE IS COLD:

A special shift pattern is activated when the engine coolant temperature is below 70°C (158°F). (3-4 shifts for example are delayed for small throttle openings and will occur a few MPH higher)

MEMO

[illegible]

DIAGNOSIS

INTRODUCTION

The systematic trouble shooting information covered by this Section offers a practical and systematic approach to diagnosing 4L30-E transmission, using information that can be obtained from road tests, electrical diagnosis, oil pressure checks or noise evaluation.

The key to correcting a complaint is to make use of all of the available symptoms and logically letting them direct you to the cause.

When dealing with automatic transmission complaints, it is best to gather as many symptoms as possible before making the decision to remove the transmission from the vehicle.

Frequently, the correction of the cause of the complaint does not require removal of the transmission from the vehicle.

7A1-18 AUTOMATIC TRANSMISSION (4L30-E)**DRIVER INFORMATION**

To analyze the problem fill a complete description of the owner's complaint.

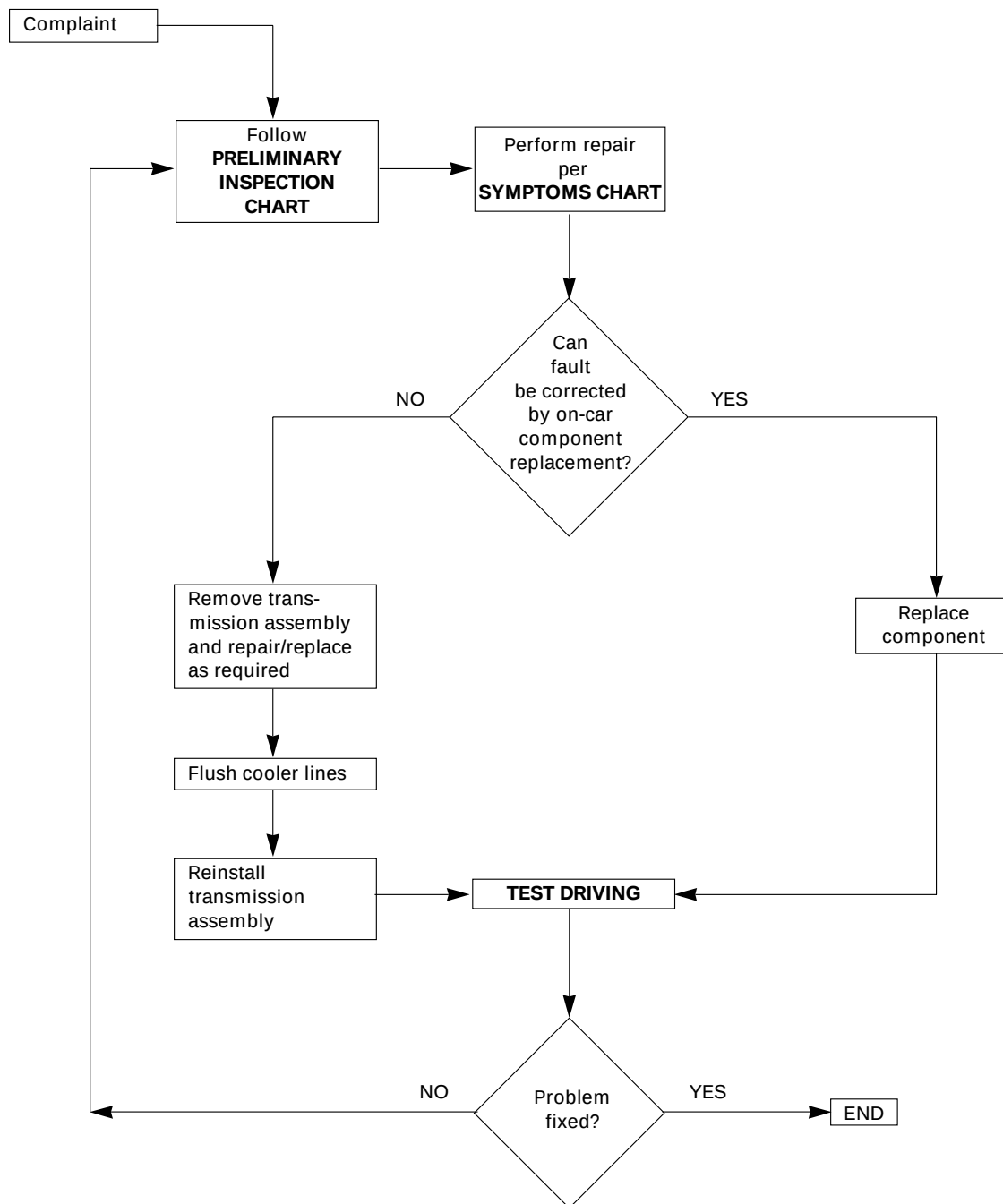
Please draw a circle around the right information and complete the following form. (Find next page an example of form completed). You can draw a circle around many numbers if you are not sure.

A - Today's date :	Month :	Day :	Year :
B - End User Name, Address :			
C - Date of Problem :	Month :	Day :	Year :
D - Mileage : Miles / Km	E - With Ignition ON is CHECK TRANS Indicator : 1- Flashing 2- Not Flashing	F - Car load when problem occurred : 1 - Towing a trailer 2- people OR Kg	
G - Weather conditions when problem : 1- Clear 2- Cloudy 3- Rain 4- Snow 5- Unstable 6- Any	H - Weather Temperature when problem: 1- Hot 2- Warm 3- Cool 4- Cold 5- Unstable 6- Any	I - Road Conditions when problem : 1- Any 2- Inter City 3- Outside City 4- Highway 5 - Uphill 6- Downhill 7- Unpaved 8- Snow 9 - Others :	J - Frequency of the Problem : 1- Always 2- Occasional : times/day, ... times/month 3- Only Once 4- Others :
K - Engine Condition : 1- Always 2- At Cold 3- During Warming up 4- After Warming or Hot 5- Others	L - Engine Speed when the problem occurred : 1- Idling 2- Starting 3- Stalling 4- High RPM 5- Low RPM	M - Transmission Condition when it occurred : 1- Any 2- Idling 3- Starting 4- Driving 5- Accelerating 6- Coasting 7- In corner 8- Shifting	
N - If there is a Transmission driveability problem BEFORE THE CHECK TRANS INDICATOR WAS FLASHING : 1- No Power in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 2- No shift in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 3- Shift Shock in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 4- Shift Slip in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 5- Shift Delayed in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 6- Shift Point too high in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 7- Shift Point too low in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 8- TCC Shudder in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 9- Noise in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1 Noise type : 1- Buzz 2- Whine 3- Clunk 4- Rattle 5- Whistle // 6- light 7- medium 8- heavy 10- Other : in Range : All - P - R - N - D - 3 - 2 - L during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1			
O - Other customer concern and comments			
P - Isuzu Vehicle Code :		Q - VIN Number	
R - Date of Vehicle Registration	Month :	Day :	Year :
S - Trans. model :		T - A/T Serial Number :	
U - Your name :			
V - Dealer Name, Address, Phone			

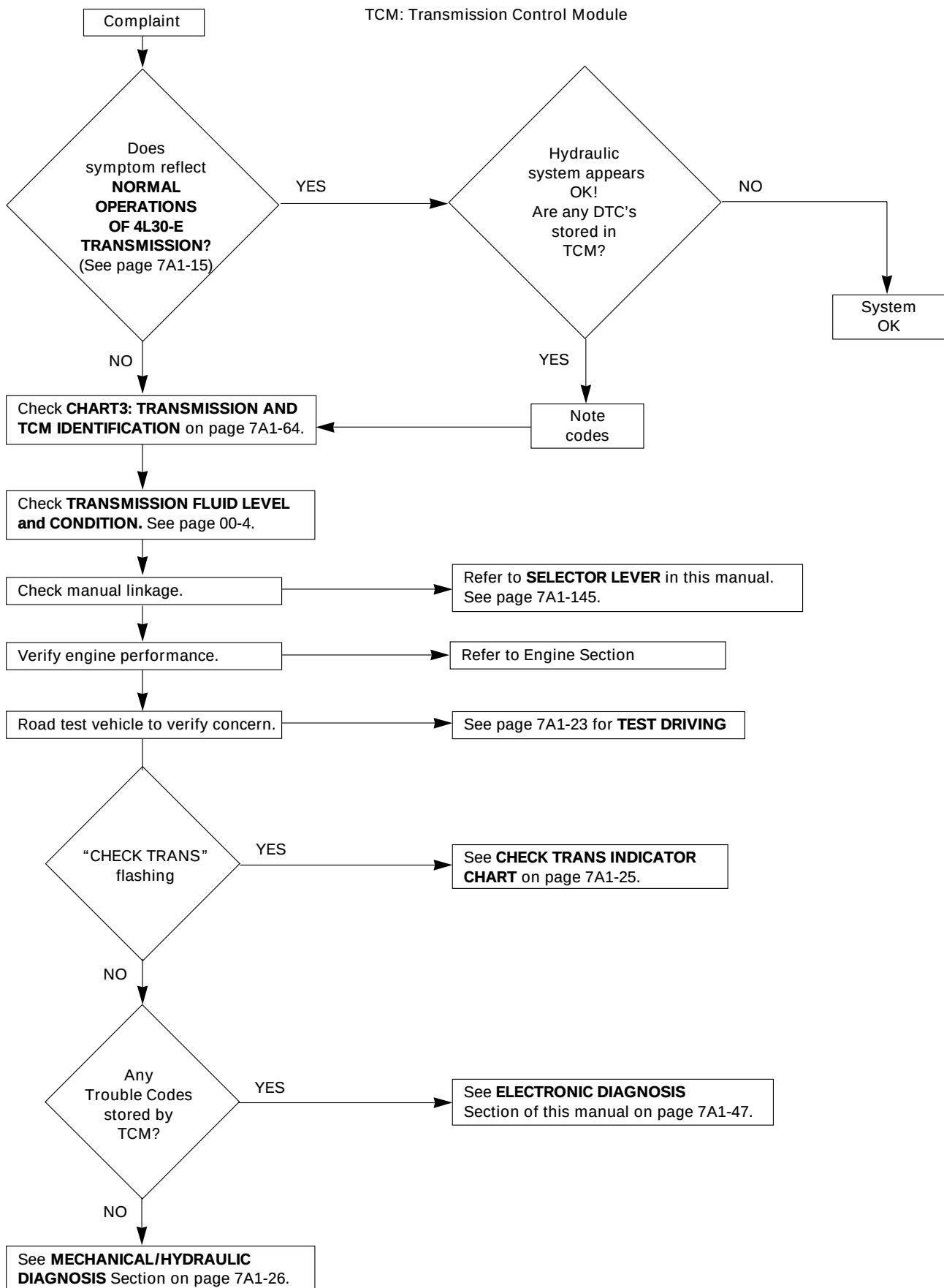
Example of form completed.

A - Today's date :	Month : April.....	Day : 13.....	Year : 1994.....																																												
B - End User Name, Address :	Dave Smith 6584, Arlington road Plymouth MI 48170 USA																																														
C - Date of Problem :	Month : April.....	Day : 8.....	Year : 1994.....																																												
D - Mileage : 12230 Miles / Km	E - With Ignition ON is CHECK TRANS Indicator : 1- Flashing 2- Not Flashing																																														
		F - Car load when problem occurred : 1 - Towing a trailer 2- ..2..... people OR Kg																																													
G - Weather conditions when problem : 1- Clear 2- Cloudy 3- Rain 4- Snow 5- Unstable 6- Any	H - Weather Temperature when problem: 1- Hot 2- Warm 3- Cool 4- Cold 5- Unstable 6- Any		I - Road Conditions when problem : 1- Any 2- Inter City 3- Outside City 4- Highway 5- Uphill 6- Downhill 7- Unpaved 8- Snow 9- Others																																												
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N - If there is a Transmission drivability problem BEFORE THE CHECK TRANS INDICATOR WAS FLASHING : <table style="width:100%; border: none;"> <tr> <td style="width:20%;">1- No Power</td> <td style="width:20%;">in Range : All - P - R - N - D - 3 - 2 - L</td> <td style="width:20%;">during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td style="width:20%;"></td> </tr> <tr> <td>2- No shift</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> <tr> <td>3- Shift Shock</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> <tr> <td>4- Shift Slip</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> <tr> <td>5- Shift Delayed</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> <tr> <td>6- Shift Point too high</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> <tr> <td>7- Shift Point too low</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> <tr> <td>8- TCC Shudder</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> <tr> <td>9- Noise</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> <tr> <td>Noise type : 1- Buzz 2- Whine 3- Clunk 4- Rattle 5- Whistle 6- light 7- medium 8- heavy</td> <td></td> <td></td> <td></td> </tr> <tr> <td>10- Other :</td> <td>in Range : All - P - R - N - D - 3 - 2 - L</td> <td>during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1</td> <td></td> </tr> </table>				1- No Power	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		2- No shift	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		3- Shift Shock	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		4- Shift Slip	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		5- Shift Delayed	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		6- Shift Point too high	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		7- Shift Point too low	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		8- TCC Shudder	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		9- Noise	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1		Noise type : 1- Buzz 2- Whine 3- Clunk 4- Rattle 5- Whistle 6- light 7- medium 8- heavy				10- Other :	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1	
1- No Power	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
2- No shift	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
3- Shift Shock	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
4- Shift Slip	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
5- Shift Delayed	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
6- Shift Point too high	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
7- Shift Point too low	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
8- TCC Shudder	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
9- Noise	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
Noise type : 1- Buzz 2- Whine 3- Clunk 4- Rattle 5- Whistle 6- light 7- medium 8- heavy																																															
10- Other :	in Range : All - P - R - N - D - 3 - 2 - L	during a : upshift : 1-2 / 2-3 / 3-4 or downshift : 4-3 / 3-2 / 2-1																																													
O - Other customer concern and comments : (This is just an example). Shift shock very harsh overall during a downshift. Not sure if it's the 4-3 or 3-2.																																															
P - Isuzu Vehicle Code :	94 UCR	Q - VIN Number	4S2CV58ZXM4324047																																												
R - Date of Vehicle Registration	Month : November.	Day : 18.....	Year : 1993.....																																												
S - Trans. model :	4L30-E	T - A/T Serial Number :	96 358 654																																												
U - Your name :	Joe Spring																																														
V - Dealer Name, Address, Phone Kent Helfrich Home-town ISUZU 900 - 999 - 9999																																															

GENERAL DIAGNOSIS PROCEDURE



PRELIMINARY INSPECTION CHART



**CHECKING TRANSMISSION FLUID LEVEL
AND CONDITION**

Refer to “SERVICING” of the SERVICE INFORMATION
(Section 00).

TEST DRIVING

Some 4L30-E automatic transmission complaints vehicles will require a test drive as a part of the diagnostic procedure. Some codes will not set unless the vehicle is moving. The purpose of the test drive is to duplicate the customer's complaint condition and set a current Transmission Control Module (TCM) trouble code. Perform this procedure before each 4L30-E automatic transmission repair, and again after repairs are made.

IMPORTANT:

- Duplicate the condition under which the customer's complaint was observed.
- Depending on the complaint, line pressure gauge and the scan tool may be required during the test drive.
- During the test drive, it is important to record all necessary data from the areas being monitored, for use in diagnosis. Also listen for and note any unusual noises.

The following procedure should be used to test drive 4L30-E automatic transmission complaint vehicles:

1. Turn the ignition ON without starting the engine. Check that the "CHECK TRANS" lamp comes on for approximately 2 to 3 seconds and then goes out and remains out.
 - If the lamp is flashing, GOTO CHECK TRANS INDICATOR.
 - If no serial data is present, see Chart 1: DIAGNOSTIC CONNECTOR AND VOLTAGE SUPPLY TEST.
 - If the lamp stays ON or stays OFF, GOTO "CHECK TRANS" CHECK.

2. Drive the vehicle. During the test drive be sure that the transmission achieves normal operating temperature (approx. 20 minutes). Allow the transmission to go through all of its gear ranges, checking shift timing and firmness. Duplicate the owner's complaint condition as closely as possible during the test drive.
3. If, during the test drive, the "CHECK TRANS" lamp comes on, use the scan tool to check for trouble codes.
4. If, during the test drive, a problem is felt, but the "CHECK TRANS" lamp does not come on and no trouble codes are present, drive the vehicle with the TCM disconnected (manually shifting the vehicle).
 - In Manual L, the vehicle operates in first gear.
 - In Manual 2, the vehicle operates in third gear.
 - In Manual 3 or "D", the vehicle operates in fourth gear.If the problem still exists with the TCM disconnected, refer to the MECHANICAL/HYDRAULIC DIAGNOSIS in this Section.
5. If no problem has been found at this point, check all underhood connections that supply power to the TCM and ignition fuses. Physically and visually inspect all the TCM harness connectors for loose or corroded terminals. Inspect the TCM ground points.

MEMO

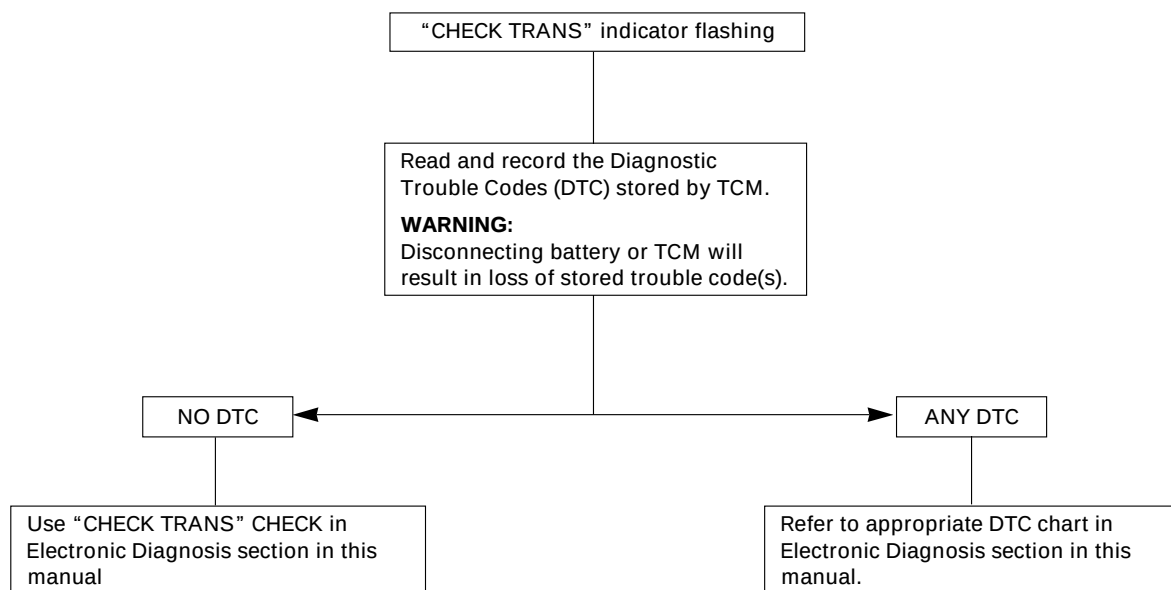
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MECHANICAL/HYDRAULIC DIAGNOSIS**CHECK TRANS INDICATOR CHART****PERFORM PRELIMINARY INSPECTION FIRST!**

When the "CHECK TRANS" indicator is flashing, it indicates that a problem related to the transmission, the Transmission Control Module (TCM), or the vehicle harness has occurred:

If the initial problem is intermittent or seldom, switching OFF/ON the engine might allow normal operation again until the problem re-occurs.

The system is now operating in a "BACKUP MODE" where the risk of further damaging the transmission has been reduced. The vehicle may be shifted manually.

**BACKUP MODE PATTERN:**

- No automatic shifting
- Manual shifting only
- "CHECK TRANS" Flashing

**SHIFT LEVER
POSITION**

P
R
N
D
3
2
L

**GEAR
SELECTED**

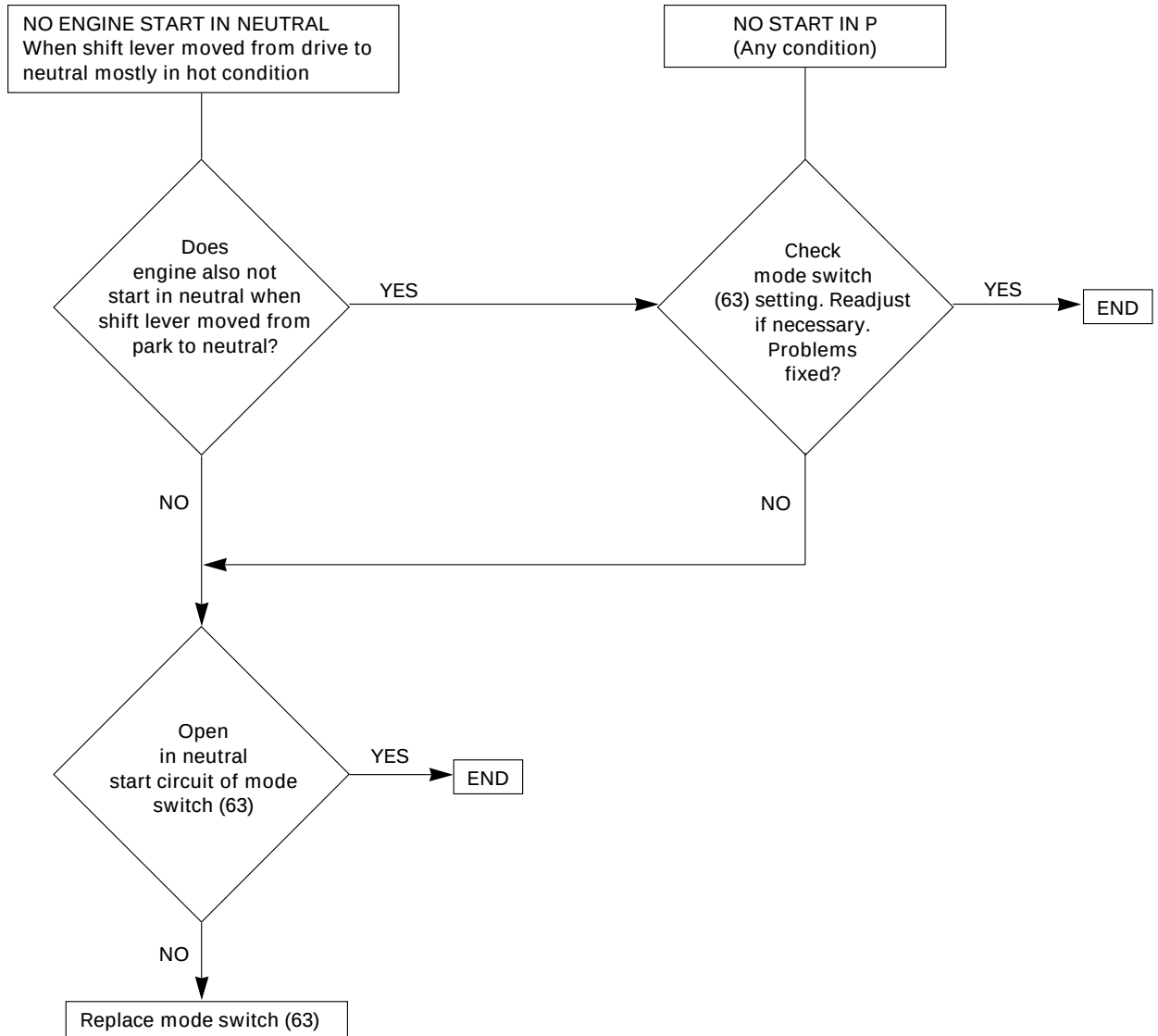
P
R
N
4
4
3
1

MECHANICAL/HYDRAULIC DIAGNOSIS SYMPTOMS INDEX**PERFORM PRELIMINARY INSPECTION FIRST!**

CHART	SYMPTOMS	PAGE
1	NO ENGINE START IN NEUTRAL OR PARK	7A1-27
2	NO FORWARD GEARS IN ANY RANGE/NO REVERSE	7A1-28
3	NO ENGINE BRAKE IN ANY RANGE	7A1-29
4	POOR SHIFTING IN ALL GEARS (ALL HARSH OR ALL SOFT)	7A1-30
5a	DELAYS IN DRIVE AND REVERSE	7A1-31
5b	DELAYS IN REVERSE ONLY	
6	DIAGNOSTIC TROUBLE CODE (DTC) 61	7A1-32
7	HARSH 1-2 SHIFT	7A1-33
8	HARSH 3-4 SHIFT	
9a	3-2 DOWNSHIFT COMPLAINT	7A1-34
9b	HARSH SHIFT WHEN SHIFTING INTO "D" OR ACCELERATING FROM STOP	
9c	COASTDOWN HARSH SHIFT OR CLUNK AT 3-2 DOWNSHIFT	
10	INTERMITTENT 4TH TO 2ND GEAR DOWNSHIFT AT STEADY SPEED	7A1-35
11	ENGINE FLARE AT SHIFTING DURING TURNING ONLY	7A1-36
12	ENGINE FLARE DURING 1-2 OR 2-3 SHIFT	
13	SHUDDER ONLY DURING TORQUE CONVERTER CLUTCH (TCC) APPLYING	7A1-37
14	POSSIBLE CAUSES OF TRANSMISSION NOISE	7A1-38
15a	POSSIBLE CAUSES OF LOW LINE PRESSURE	7A1-39
15b	POSSIBLE CAUSES OF HIGH LINE PRESSURE	7A1-40
16	POSSIBLE CAUSES OF TRANSMISSION FLUID LEAKS	7A1-41

NOTE:

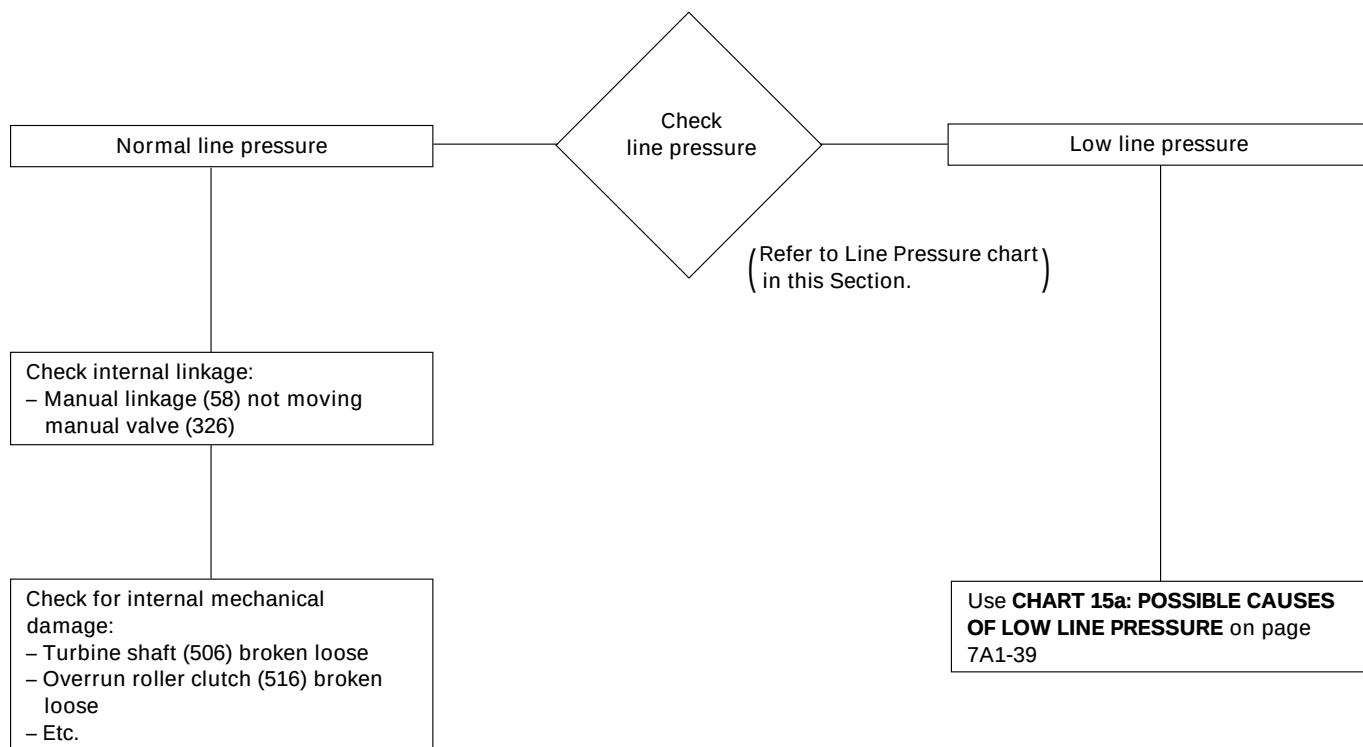
Numbers with parenthesis on the following charts refer to Parts List at end of this Section.

CHART 1: NO ENGINE START IN NEUTRAL OR PARK**PERFORM PRELIMINARY INSPECTION FIRST!**

() Refer to Parts List at the end of this Section.

CHART 2: NO FORWARD GEARS IN ANY RANGE/NO REVERSE

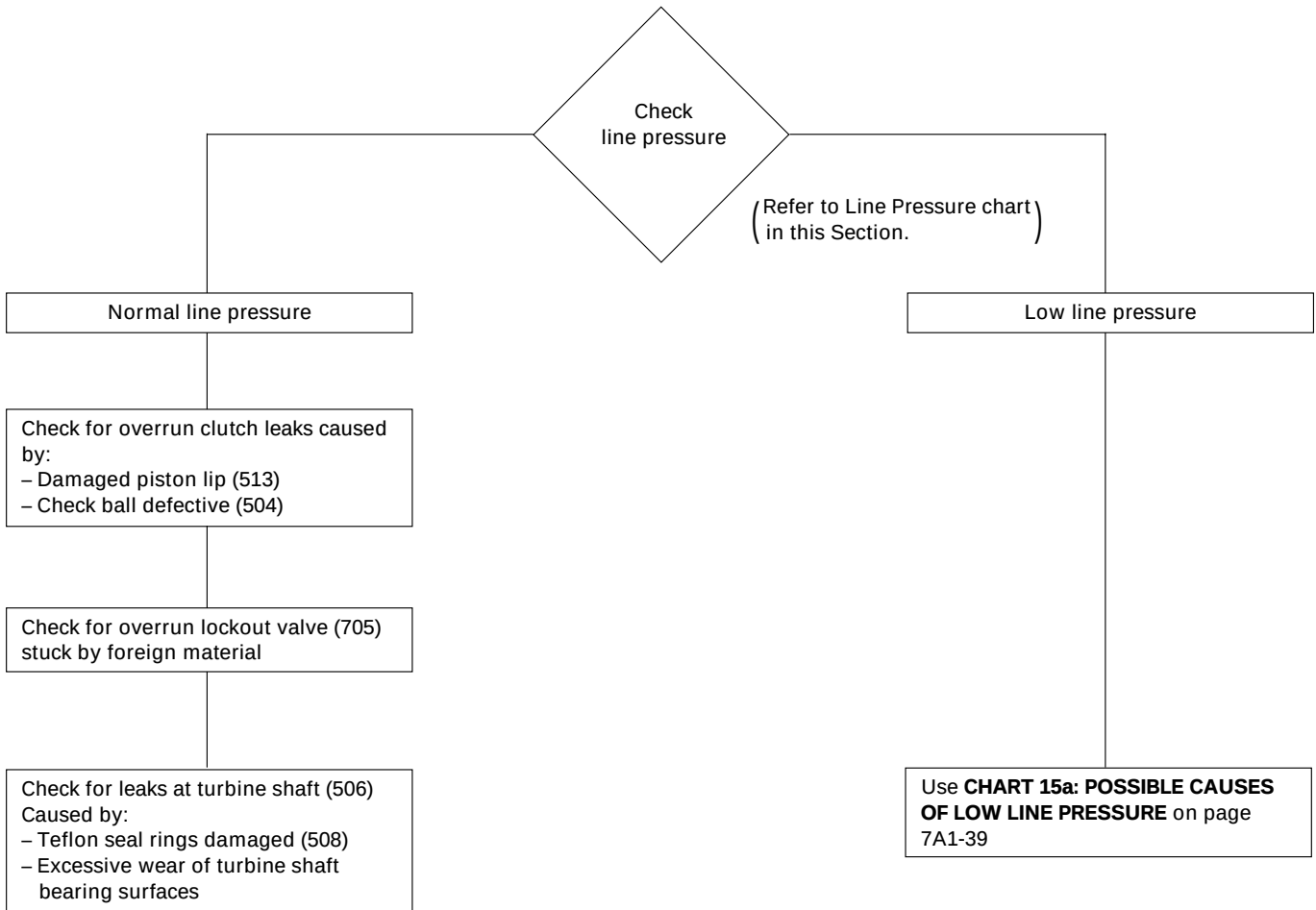
PERFORM PRELIMINARY INSPECTION FIRST!



() Refer to Parts List at the end of this Section.

CHART 3: NO ENGINE BRAKE IN ANY RANGE

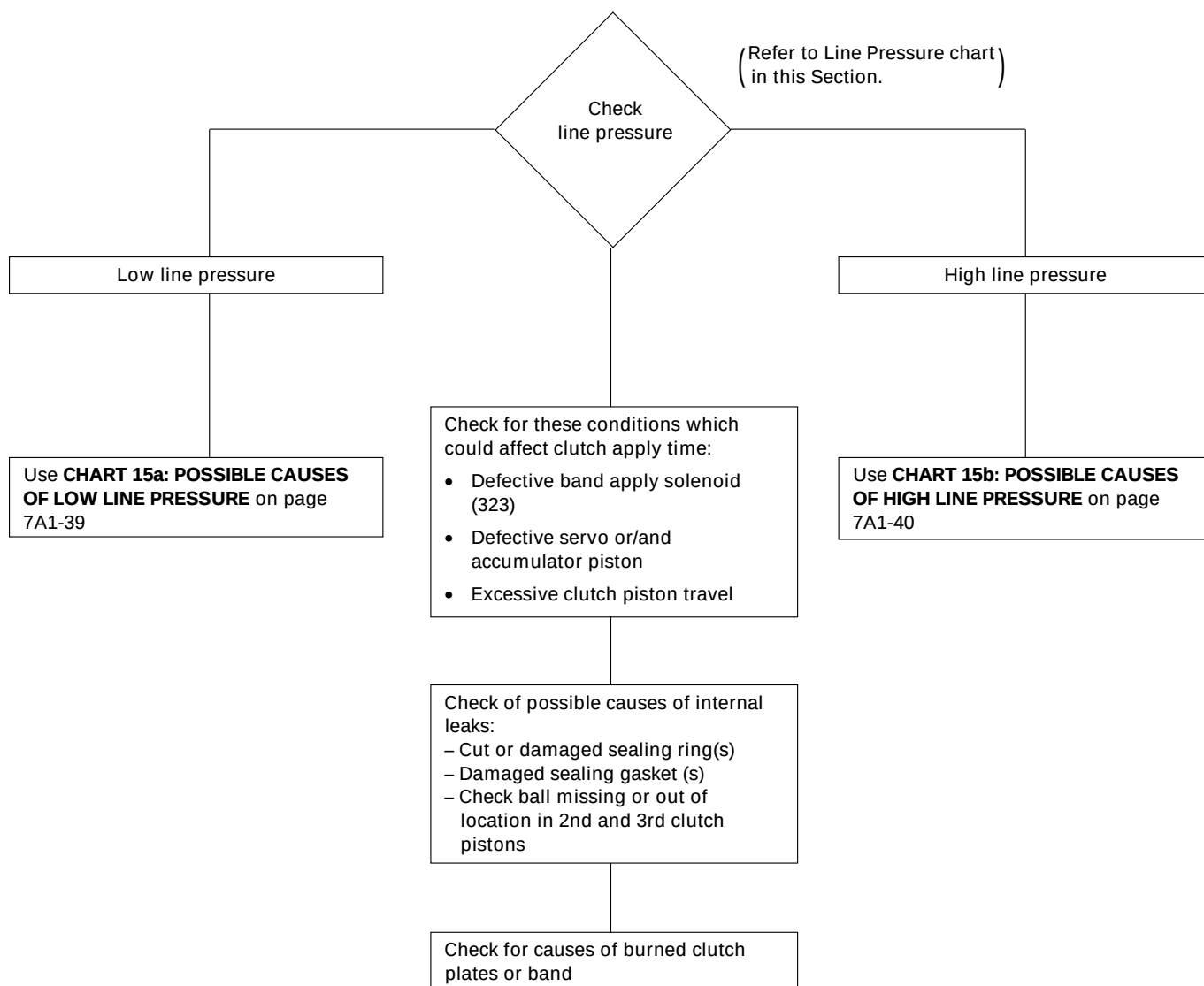
PERFORM PRELIMINARY INSPECTION FIRST!



() Refer to Parts List at the end of this Section.

CHART 4: POOR SHIFTING IN ALL GEARS (ALL HARSH OR ALL SOFT)

PERFORM PRELIMINARY INSPECTION FIRST!



() Refer to Parts List at the end of this Section.

CHART 5a: DELAYS IN DRIVE AND REVERSE

PERFORM PRELIMINARY INSPECTION FIRST!

NOTE: A short delay (less than 3 seconds) when first engaging drive or reverse after allowing vehicle to sit overnight is normal.

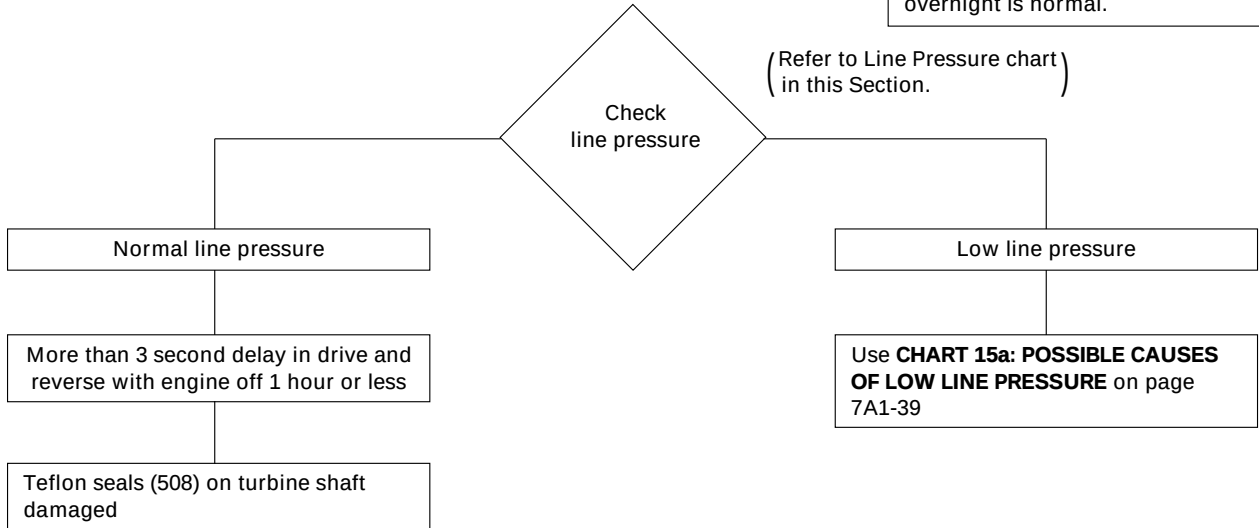


CHART 5b: DELAYS IN REVERSE ONLY

PERFORM PRELIMINARY INSPECTION FIRST!

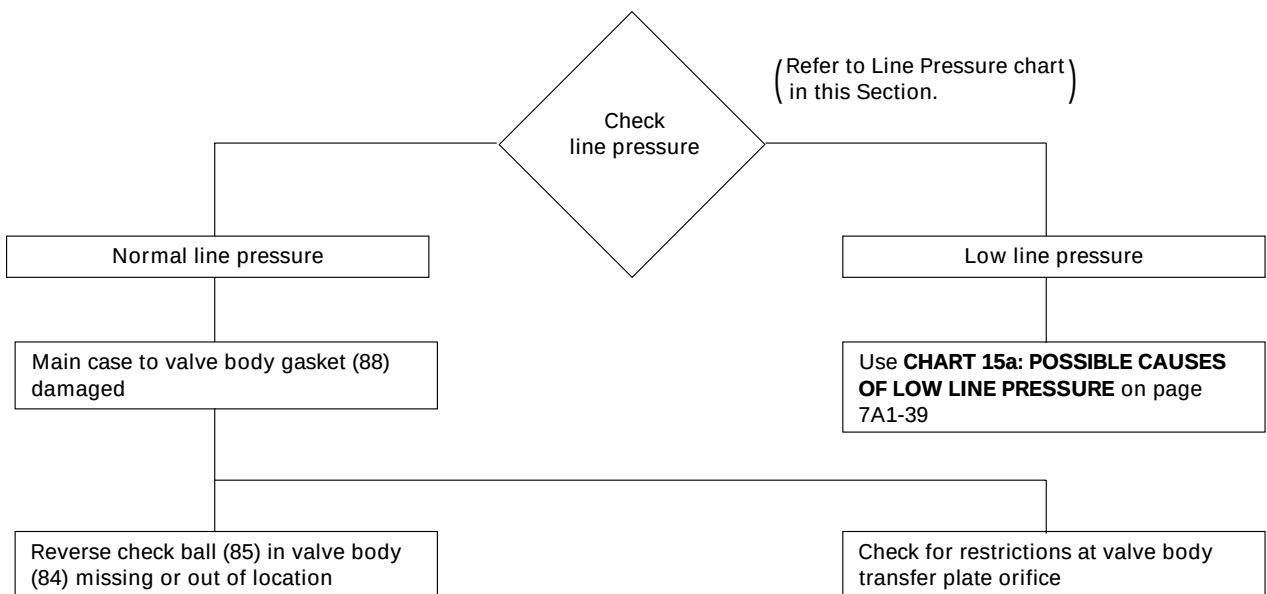
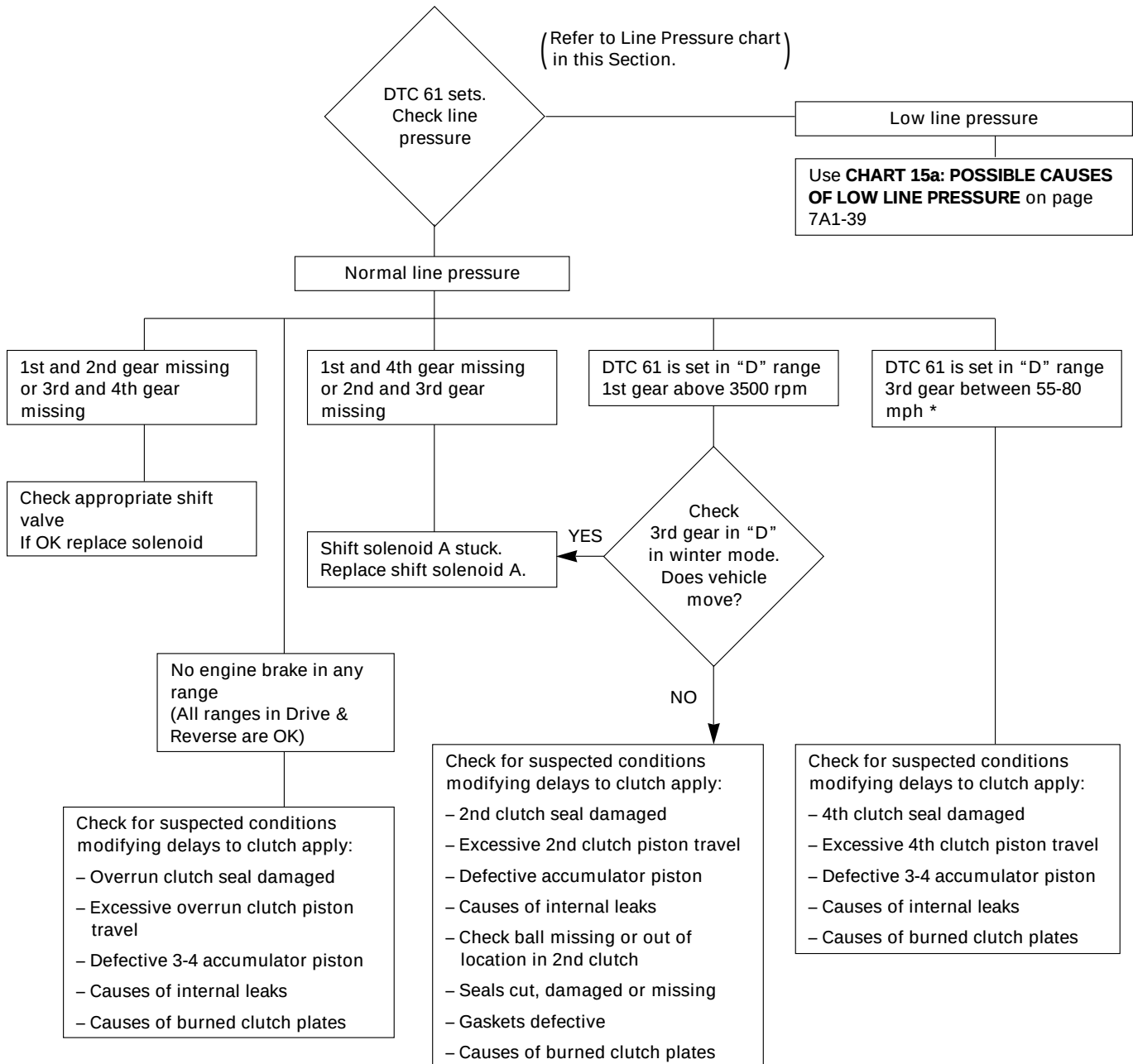


CHART 6: DIAGNOSTIC TROUBLE CODE (DTC) 61

PERFORM PRELIMINARY INSPECTION FIRST!



* Perform this test within safe and legal limits.

CHART 7: HARSH 1-2 SHIFT

PERFORM PRELIMINARY INSPECTION FIRST!

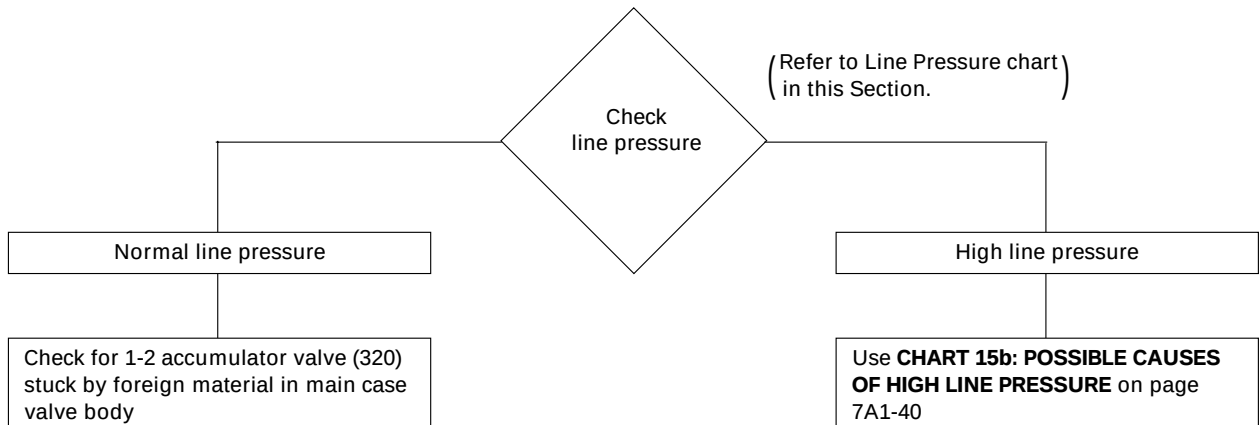
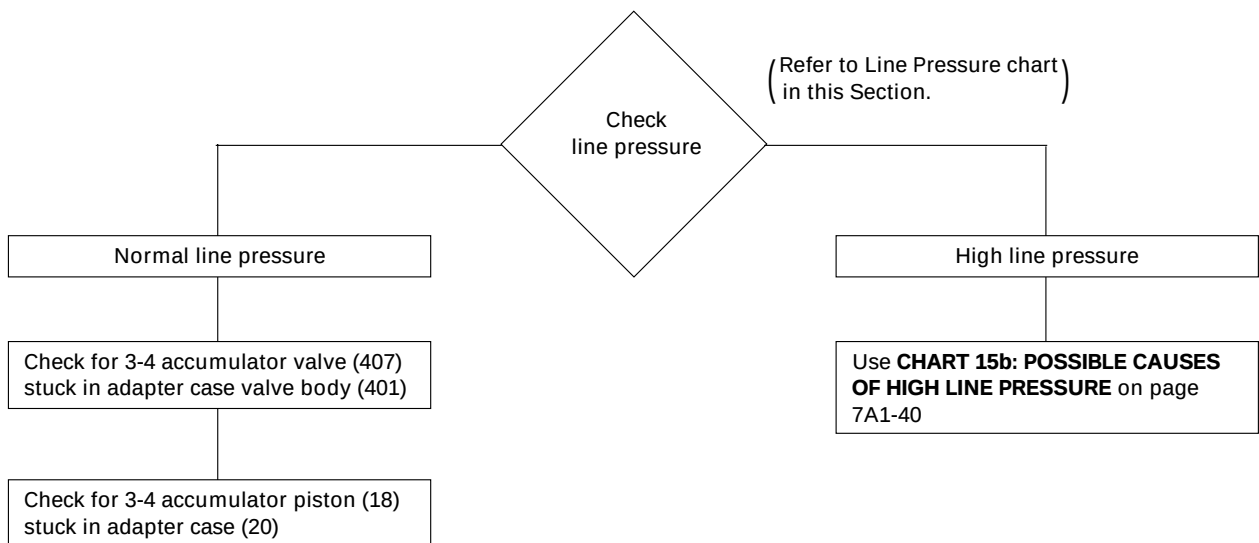


CHART 8: HARSH 3-4 SHIFT

PERFORM PRELIMINARY INSPECTION FIRST!



() Refer to Parts List at the end of this Section.

CHART 9a: 3-2 DOWNSHIFT COMPLAINT

PERFORM PRELIMINARY INSPECTION FIRST!

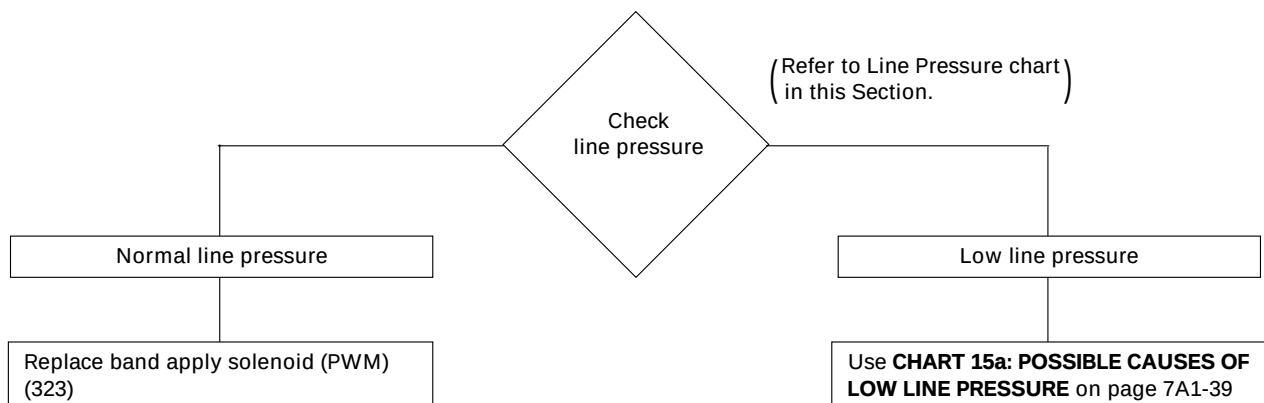


CHART 9b: HARSH SHIFT WHEN SHIFTING INTO "D" OR ACCELERATING FROM STOP

PERFORM PRELIMINARY INSPECTION FIRST!

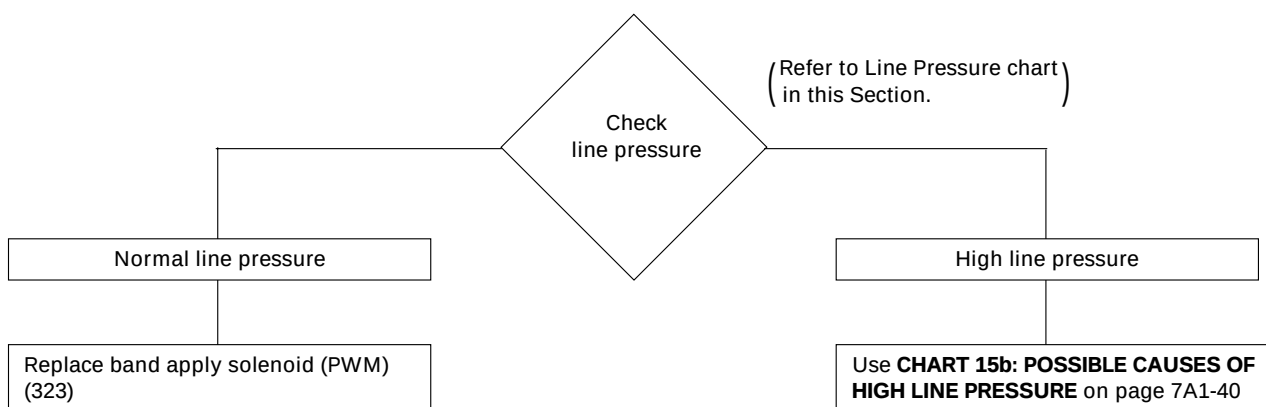
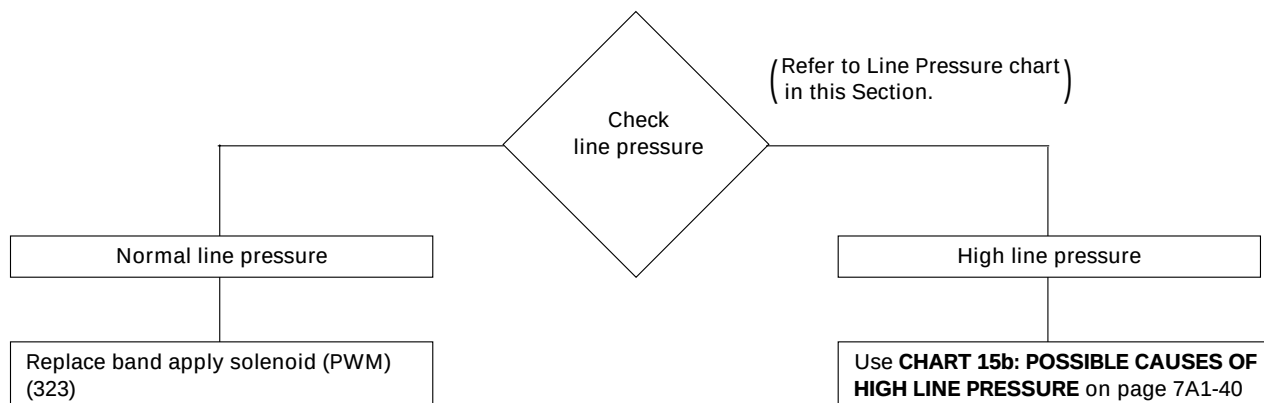


CHART 9c: COASTDOWN HARSH SHIFT OR CLUNK AT 3-2 DOWNSHIFT

PERFORM PRELIMINARY INSPECTION FIRST!



() Refer to Parts List at the end of this Section.

CHART 10: INTERMITTENT 4TH TO 2ND GEAR DOWNSHIFT AT STEADY SPEED

PERFORM PRELIMINARY INSPECTION FIRST!

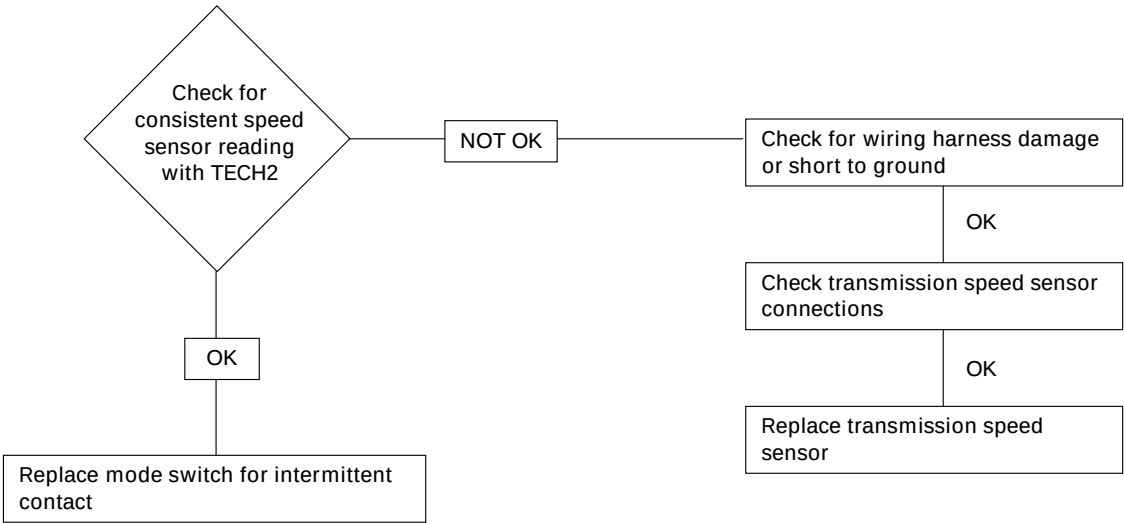


**CHART 11: ENGINE FLARE AT SHIFTING DURING TURNING ONLY
(USUALLY WITH WARM ENGINE)**

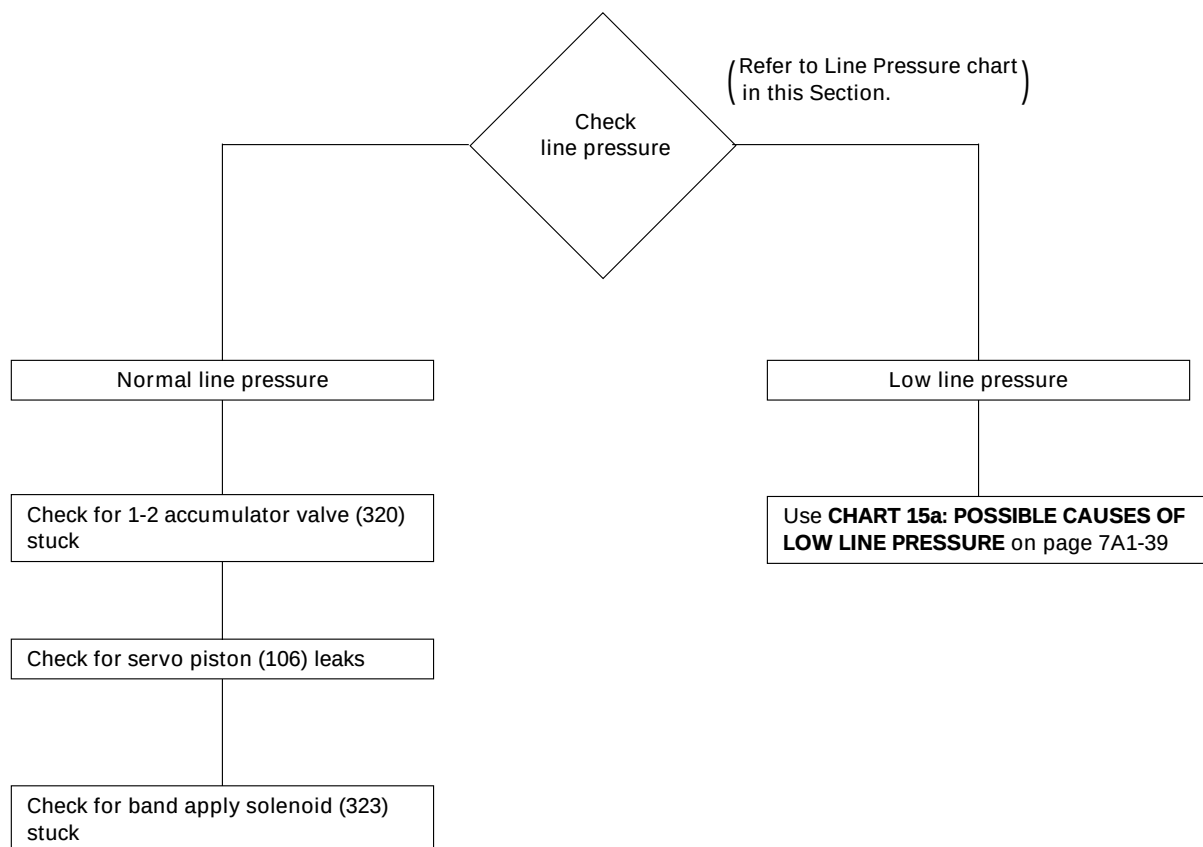
PERFORM PRELIMINARY INSPECTION FIRST!

Leak at transmission oil filter, gasket,
or wrong filter type

Replace transmission oil filter and
gasket

CHART 12: ENGINE FLARE DURING 1-2 OR 2-3 SHIFT

PERFORM PRELIMINARY INSPECTION FIRST!



() Refer to Parts List at the end of this Section.

CHART 13: SHUDDER ONLY DURING TORQUE CONVERTER CLUTCH (TCC) APPLYING

PERFORM PRELIMINARY INSPECTION FIRST!

TCC shudder is one of the most commonly misdiagnosed conditions in an automatic transmission. The key to diagnosing TCC shudder is to note when it happens and under what conditions. Once the TCC has been fully applied, it is nearly impossible to make it shudder. TCC shudder (short burst of noise normally less than 1 second) will only occur during clutch applying. It is not a steady state condition.

Drive until whole drivetrain is at normal operating temperature.
– Shudder is a SHORT BURST OF NOISE NORMALLY LESS THAN 1 SECOND IN DURATION, and can be induced by the following maneuver:

From coast condition at 50 mph in “D” range (Normal mode), depress the throttle to 1/4-1/3 throttle.
If present, shudder (short burst of noise normally less than 1 sec.) will occur within 5 seconds together with TCC applying.
(TECH2 may be used to determine the exact time of TCC applying)

NO

Perform mechanical inspection of other drivetrain components.

YES

Replace transmission fluid and filter (remove both pans) and flush cooler lines.
Replace converter assembly and O-ring on turbine shaft.

CHART 14: POSSIBLE CAUSES OF TRANSMISSION NOISE

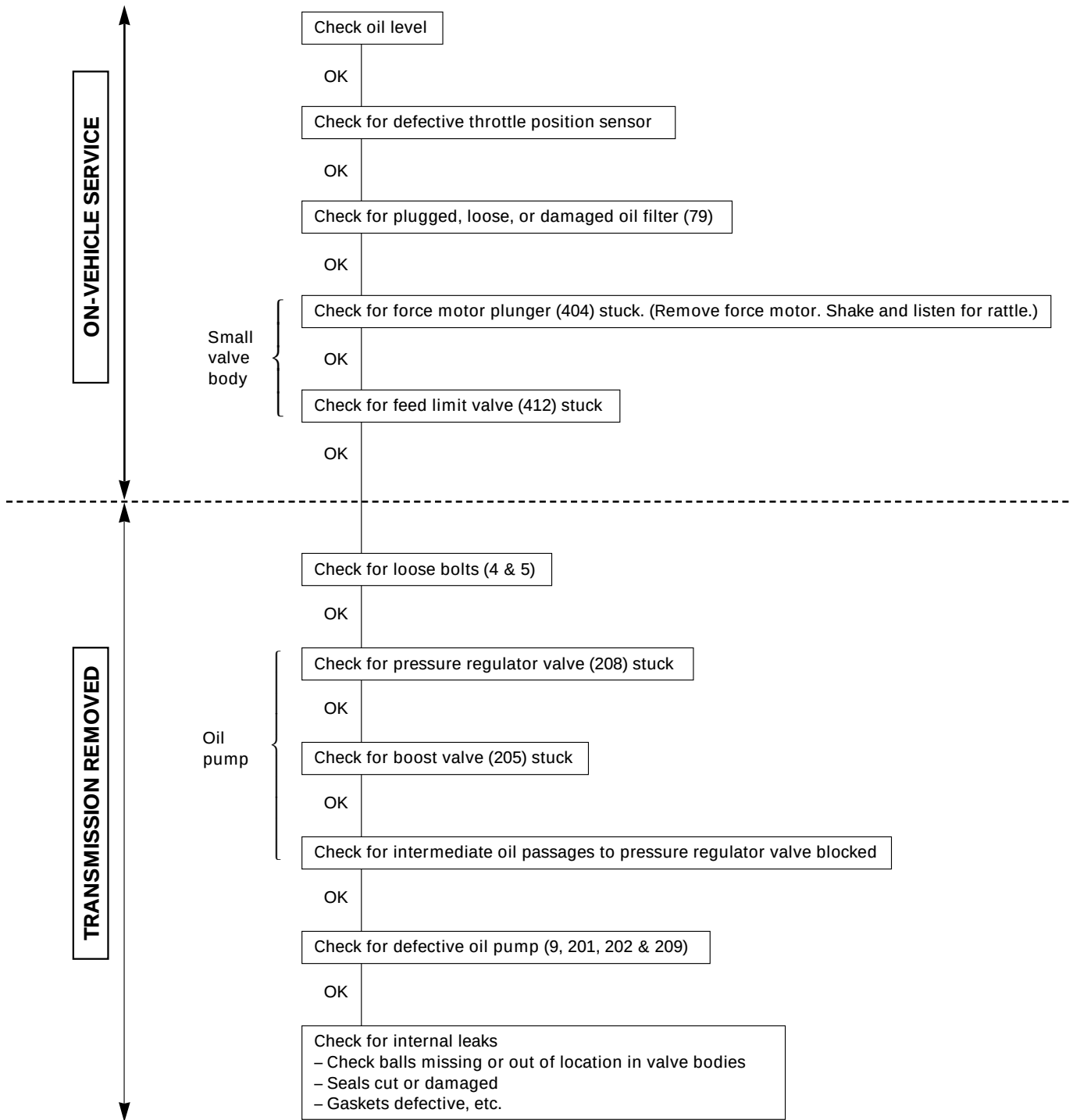
PERFORM PRELIMINARY INSPECTION FIRST!



CAUTION:

Before checking transmission for what is believed to be transmission noise, ensure presence and positioning of insulating plugs, pads etc. Also make sure that noise does not come from other drivetrain components.

1. WHINE OR BUZZ:
 - Oil level low
 - Plugged or restricted oil filter
 - Damaged oil filter gasket
2. KNOCKING NOISE FROM FRONT OF TRANSMISSION:
 - Loose bolts (Converter to flex plate)
 - Cracked or broken flex plate
 - Converter damaged
3. KNOCKING NOISE WHILE DRIVING - MOSTLY ON ACCELERATION:
 - Transmission mount loose or broken
 - Cooler line mounts loose or broken
 - Cooler lines touching body or frame
4. KNOCKING NOISE WHEN VEHICLE IS STATIONARY:
 - Loose flex plate mounting bolts
 - Cracked or broken flex plate
 - Damaged converter

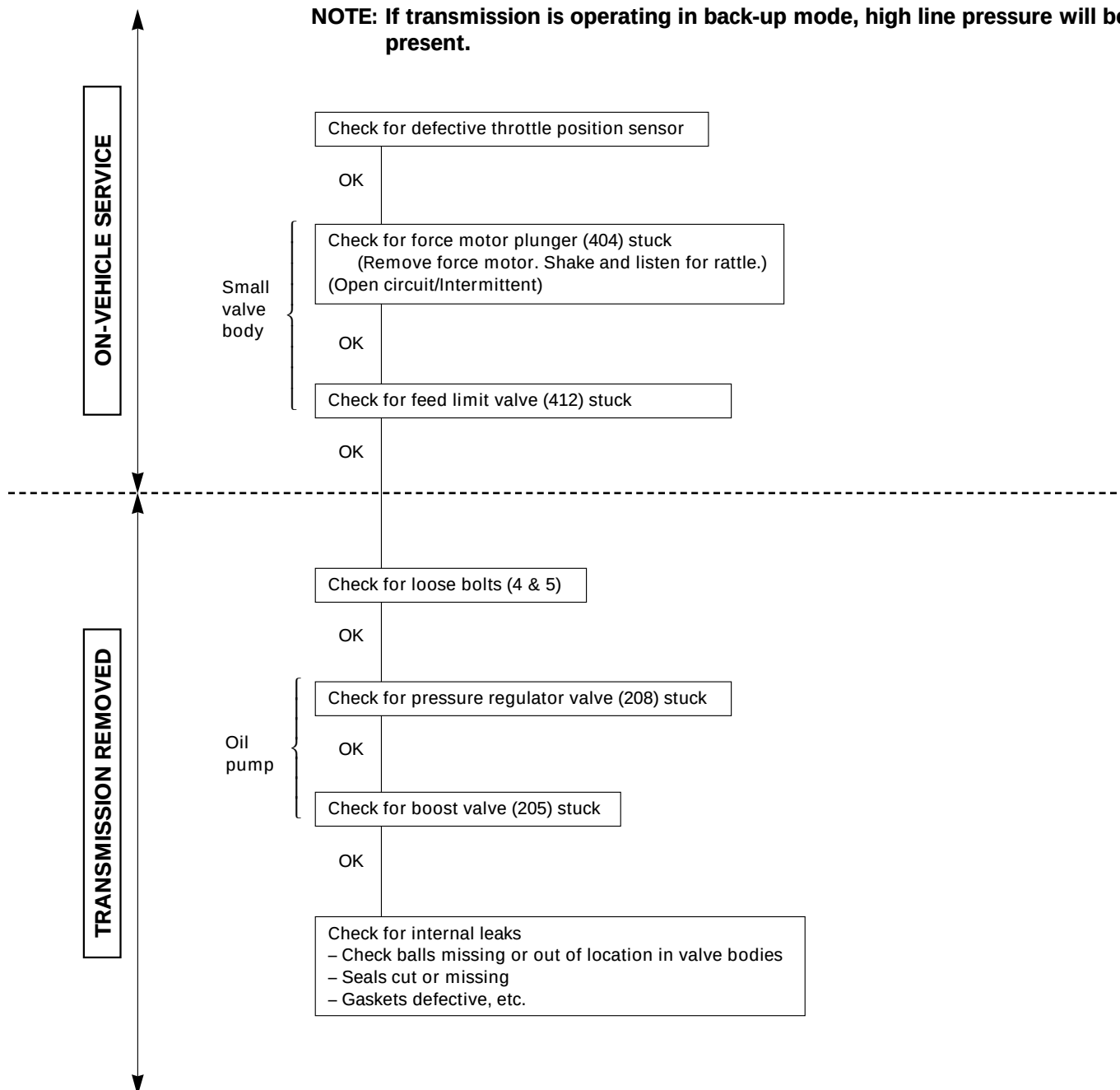
CHART 15a: POSSIBLE CAUSES OF LOW LINE PRESSURE

() Refer to Parts List at the end of this Section.

CHART 15b: POSSIBLE CAUSES OF HIGH LINE PRESSURE

PERFORM PRELIMINARY INSPECTION FIRST!

NOTE: If transmission is operating in back-up mode, high line pressure will be present.



() Refer to Parts List at the end of this Section.

CHART 16: POSSIBLE CAUSES OF TRANSMISSION FLUID LEAKS

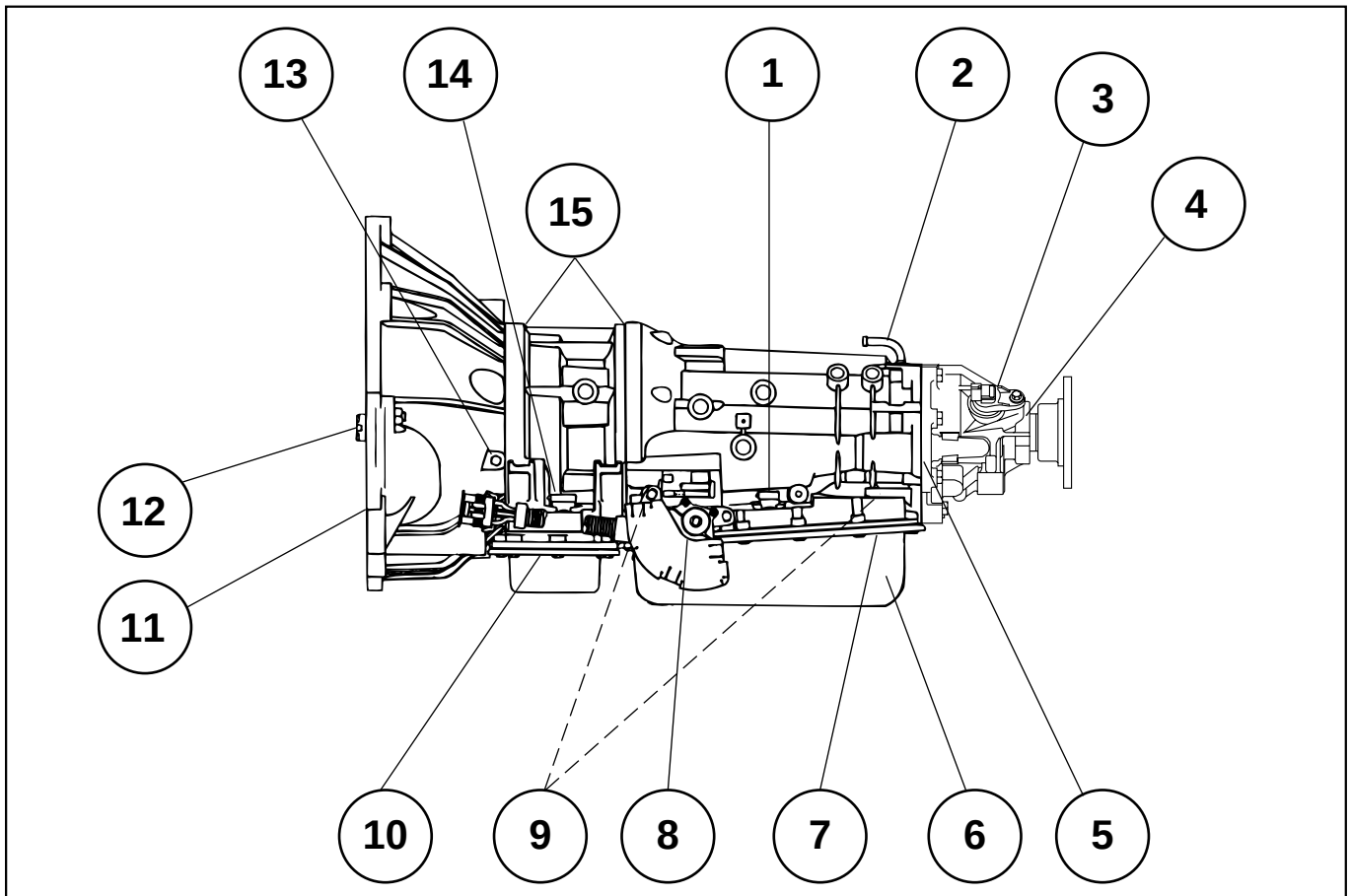
Before attempting to correct an oil leak, the actual source of the leak must be determined. In many cases, the source of the leak may be difficult to determine due to “wind flow” around the engine and transmission.

The suspected area should be wiped clean of all oil before inspecting for the source of the leak.

Oil leaks around the engine and transmission are generally carried toward the rear of the car by the air stream. In determining the source of an leak, the following two checks should be made:

1. With the engine running, check for external line pressure leaks.
2. With the engine off, check for oil leaks due to the raised oil level caused by drainback of converter oil into the transmission.

POSSIBLE CAUSES OF FLUID LEAKS DUE TO SEALING MALFUNCTION



240LW004

- 1) Electrical connector (Main case) seal
- 2) Transmission vent (Breather)
- 3) Speed sensor O-ring
- 4) Extension (Adapter) lip seal
- 5) Extension (Adapter) to main case gasket
- 6) Oil drain plug gasket
- 7) Oil pan gasket (Main case)
- 8) Selector shaft seal
- 9) Oil cooler connectors (2)
- 10) Oil pan gasket (Adapter case)
- 11) Converter housing attaching bolts not correctly torqued
- 12) Converter housing lip seal
- 13) Line pressure tap plug
- 14) Electrical connector (Adapter case) seal
- 15) Adapter case seal rings (2)

STALL TEST

The stall test allows you to check the transmission for internal abrasion and the oneway clutch for slippage. Torque converter performance can also be evaluated. The stall test results together with the road test results will identify transmission components requiring servicing or adjustment.

Stall Test Procedure:

1. Check the level of the engine coolant, the engine oil, and the automatic transmission fluid.
Replenish if necessary.
2. Block the wheels and set the parking brake.
3. Connect a tachometer to the engine.
4. Start the engine and allow it to idle until the engine coolant temperature reaches 70 - 80°C (158 - 176°F).
5. Hold the brake pedal down as far as it will go.
6. Place the selector in the "D" range.
7. Gradually push the accelerator pedal to the floor. The throttle valve will be fully open.
Note the engine speed at which the tachometer needle stabilizes.

Stall Speed

Standard
2200 ± 150 rpm

NOTE:

Do not continuously run this test longer than 5 seconds.

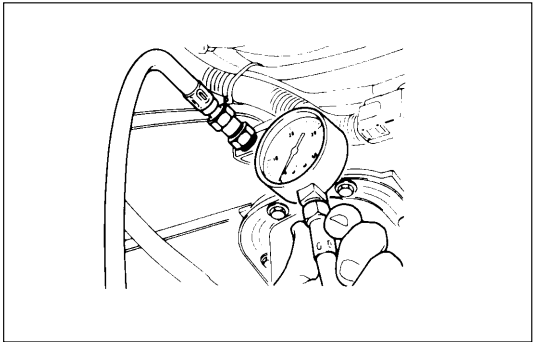
8. Release the accelerator pedal.
9. Place the selector in the "N" range.
10. Run the engine at 1,200 rpm for one minute.
This will cool the transmission fluid.
11. Repeat Steps 7-10 for the "3", "2", "L" and "R" ranges.

LINE PRESSURE TEST

The line pressure test checks oil pump and control valve pressure regulator valve function. It will also detect oil leakage.

Line Pressure Test Procedure:

1. Check the level of the engine coolant, the engine oil, and the automatic transmission fluid.
Replenish if required.
2. Block the wheels and set the parking brake.
3. Remove the pressure detection plug at the left side of the transmission case.
Set pressure gauge, adapter to the pressure detection plug hole.
Gauge and adapter: 5-8840-0004-0 (J-21867)



4. Start the engine and allow it to idle until the engine coolant temperature reaches 70 - 80°C (158- 176°F).
5. Hold the brake pedal down as far as it will go.
6. Place the selector in the "D" range.
7. Note the pressure gauge reading with the engine idling.
8. Gradually push the accelerator pedal to the floor. The throttle valve will be fully open.
Note the pressure gauge reading with the accelerator pedal fully depressed.

NOTE:

Do not continuously run this test longer than 5 seconds.

9. Release the accelerator pedal.
10. Place the selector in the "N" range.
11. Run the engine at 1,200 rpm for one minute.
This will cool the transmission fluid.
12. Repeat Steps 7 - 11 for the "3", "2", "L", and "R" ranges.
13. Install a pressure detection plug to the transmission case, applying recommended thread locking agent (LOCTITE 242) or its equivalent to thread of plug.
Make sure that thread is cleaned before applying locking agents.
14. Tighten the pressure detection plug to the specified torque.

Pressure Detection Plug Torque N·m (kg·m / lb·ft)

9 – 14 (0.9 – 1.4 / 7 – 10)



Line Pressure and Force Motor Current

KPa (kg/cm² / PSI)

MODE	LEVER POSITION	ENGINE SPEED	LINE PRESSURE	FORCE MOTOR CURRENT
NORMAL/POWER	D, 3, 2, L	IDLE	312 – 363 (3.2 – 3.7 / 45.2 – 52.6)	VARIABLE
NORMAL/POWER	REVERSE	IDLE	419 – 486 (4.3 – 5.0 / 60.7 – 70.5)	0.9 – 1.0A
NORMAL/POWER	D, 3, 2, L	STALL SPEED	1236 – 1320 (12.6 – 13.5 / 179.3 – 191.4)	0.1 – 0.2A
NORMAL/POWER	REVERSE	STALL SPEED	1634 – 1743 (16.7 – 17.8 / 236.9 – 252.8)	0.1 – 0.2A

SHIFT SPEED CHART

**(Transfer gear ratio: High: 1.000)
(Rear axle ratio: 4.555)**

“Normal mode”

Upshift

Km/h (mph)

Range	Throttle opening	1 → 2 (First Gear) (Second Gear)	2 → 3 (Second Gear) (Third Gear)	3 → 4 (Third Gear) (Fourth Gear)
D (Drive)	Fully opened	41 ~ 47 (25 ~ 29)	84 ~ 90 (52 ~ 56)	127 ~ 133 (79 ~ 83)
	Half throttle	33 ~ 39 (20 ~ 24)	60 ~ 66 (37 ~ 41)	117 ~ 123 (73 ~ 76)
3 (Third)	Fully opened	49 ~ 55 (30 ~ 34)	99 ~ 105 (62 ~ 66)	–
	Half throttle	32 ~ 38 (20 ~ 24)	58 ~ 64 (36 ~ 40)	–
2 (Second)	Fully opened	49 ~ 55 (30 ~ 34)	–	–
	Half throttle	32 ~ 38 (20 ~ 24)	–	–

Downshift

Km/h (mph)

Range	Throttle opening	1 ← 2 (First Gear) (Second Gear)	2 ← 3 (Second Gear) (Third Gear)	3 ← 4 (Third Gear) (Fourth Gear)
D (Drive)	Fully opened	16 ~ 22 (10 ~ 14)	62 ~ 68 (39 ~ 42)	104 ~ 110 (65 ~ 68)
	Half throttle	15 ~ 21 (9 ~ 13)	34 ~ 40 (21 ~ 25)	67 ~ 73 (42 ~ 46)
	Fully closed	14 ~ 20 (9 ~ 12)	21 ~ 27 (13 ~ 17)	29 ~ 35 (18 ~ 22)
3 (Third)	Fully opened	39 ~ 45 (24 ~ 28)	87 ~ 93 (54 ~ 58)	–
	Half throttle	15 ~ 21 (9 ~ 13)	34 ~ 40 (21 ~ 25)	–
	Fully closed	13 ~ 19 (8 ~ 12)	15 ~ 21 (9 ~ 13)	–
2 (Second)	Fully opened	40 ~ 46 (25 ~ 29)	94 ~ 100 (59 ~ 63)	–
	Half throttle	15 ~ 21 (9 ~ 13)	94 ~ 100 (59 ~ 63)	–
	Fully closed	13 ~ 19 (8 ~ 12)	82 ~ 88 (51 ~ 55)	–
L (First)	–	50 ~ 56 (31 ~ 35)	–	–

7A1-46 AUTOMATIC TRANSMISSION (4L30-E)

“Power mode”

Upshift

Km/h (mph)

Range	Throttle opening	1 → 2 (First Gear) (Second Gear)	2 → 3 (Second Gear) (Third Gear)	3 → 4 (Third Gear) (Fourth Gear)
D (Drive)	Fully opened	49 ~ 55 (30 ~ 34)	99 ~ 105 (62 ~ 66)	169 ~ 175 (105 ~ 109)
	Half throttle	37 ~ 43 (23 ~ 27)	74 ~ 80 (46 ~ 50)	124 ~ 130 (77 ~ 81)
3 (Thire)	Fully opened	49 ~ 55 (30 ~ 34)	99 ~ 105 (62 ~ 66)	–
	Half throttle	37 ~ 43 (23 ~ 27)	74 ~ 80 (46 ~ 50)	–
2 (Second)	Fully opened	49 ~ 55 (30 ~ 34)	–	–
	Half throttle	37 ~ 43 (23 ~ 27)	–	–

Downshift

Km/h (mph)

Range	Throttle opening	1 ← 2 (First Gear) (Second Gear)	2 ← 3 (Second Gear) (Third Gear)	3 ← 4 (Third Gear) (Fourth Gear)
D (Drive)	Fully opened	40 ~ 46 (25 ~ 29)	90 ~ 96 (56 ~ 60)	160 ~ 166 (100 ~ 104)
	Half throttle	21 ~ 27 (13 ~ 17)	53 ~ 59 (33 ~ 37)	98 ~ 104 (61 ~ 65)
	Fully closed	13 ~ 19 (8 ~ 12)	24 ~ 30 (15 ~ 19)	46 ~ 52 (29 ~ 32)
3 (Third)	Fully opened	40 ~ 46 (25 ~ 29)	90 ~ 96 (56 ~ 60)	–
	Half throttle	21 ~ 27 (13 ~ 17)	53 ~ 59 (33 ~ 37)	–
	Fully closed	13 ~ 19 (8 ~ 12)	24 ~ 30 (15 ~ 19)	–
2 (Second)	Fully opened	40 ~ 46 (25 ~ 29)	94 ~ 100 (59 ~ 63)	–
	Half throttle	21 ~ 27 (13 ~ 17)	94 ~ 100 (59 ~ 63)	–
	Fully closed	13 ~ 19 (8 ~ 12)	82 ~ 88 (51 ~ 55)	–
L (First)	–	50 ~ 56 (31 ~ 35)	–	–

LOCK-UP SPEED CHART

(Transfer gear ratio: High: 1.000)
(Rear axle ratio: 4.555)

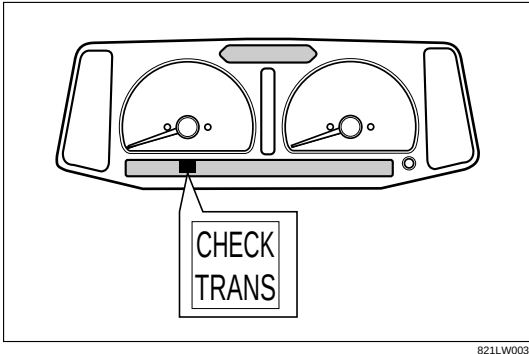
Km/h (mph)

D range Throttle opening 9%	Mode	Lock-Up ON			Lock-Up OFF		
		2nd	3rd	4th	2nd	3rd	4th
	Normal	75 ~ 81 (47 ~ 50)	55 ~ 61 (34 ~ 38)	67 ~ 73 (42 ~ 45)	70 ~ 76 (43 ~ 47)	47 ~ 53 (29 ~ 33)	62 ~ 68 (39 ~ 42)
	Power	72 ~ 78 (45 ~ 48)	77 ~ 83 (48 ~ 52)	77 ~ 83 (48 ~ 52)	67 ~ 73 (42 ~ 45)	68 ~ 74 (42 ~ 46)	72 ~ 78 (45 ~ 48)

ELECTRONIC DIAGNOSIS

HOW TO DIAGNOSE THE PROBLEM

1. To avoid incorrect diagnostics: this book needs to be followed accurately. Unless stated: do not jump directly to a section that could contain the solution: some important information may be missed.
2. The sections in CAPITALS and bold are the main sections that can be found in the contents.
3. The GOTO "**SECTION**" means to continue to check going to the "section".
4. The GOTHROUGH "**SECTION**" means to go through the "section" and then to go back to the place the GOTHROUGH was written.
5. BASIC ELECTRIC CIRCUITS:
You should understand the basic theory of electricity. This will include the meaning of voltage, amps, ohms, and what happens in a circuit with an open or shorted wire. You should also be able to read and understand wiring diagrams.
6. IGNITION CYCLE:
When the car is driven a malfunction can occur due to a car wiring harness problem, in this case the driver can reset the system (as on a personal computer). To reset the computer he must:
 - (1) Stop the car and the engine.
 - (2) Turn the key ignition OFF.
 - (3) Turn the key ignition ON.



CHECK TRANS INDICATOR

Find CHECK TRANS indicator and verify if it is:

- A. Flashing: GOTO **DIAGNOSTIC CHECK**.
- B. Staying on: GOTHROUGH **CHECK TRANS CHECK**.
- C. Is never ON when the ignition key is turned on: GOTHROUGH **CHECK TRANS CHECK**
- D. Is ON during 2 to 3 seconds at ignition but OFF after: Normal operation. No DTC or malfunction.

DIAGNOSTIC CHECK

This test determines if the transmission itself or its inputs or outputs connections or sensors are failing.

IF you have a scan tool TECH2:

NO: Use the CHECK TRANS Indicator diagnostic codes GOTO **FLASHING CODES**.

YES:

1. Connect the TECH2: GOTHROUGH **TECH2 CONNECTION**.
2. Turn on the ignition but not the engine.
3. Push "F2" on TECH2 to see the Diagnostic Trouble Code (DTC):
4. IF you have DTC?

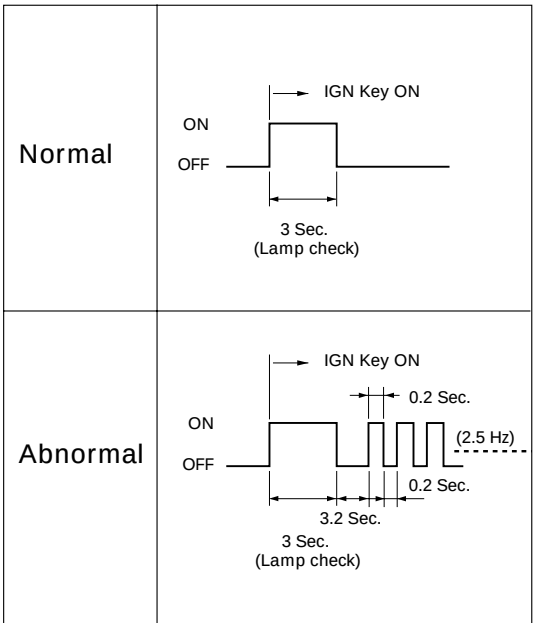
YES: write down all code numbers and do the **DTC CHECK**

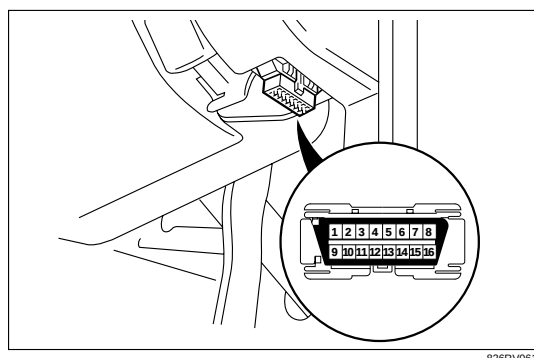
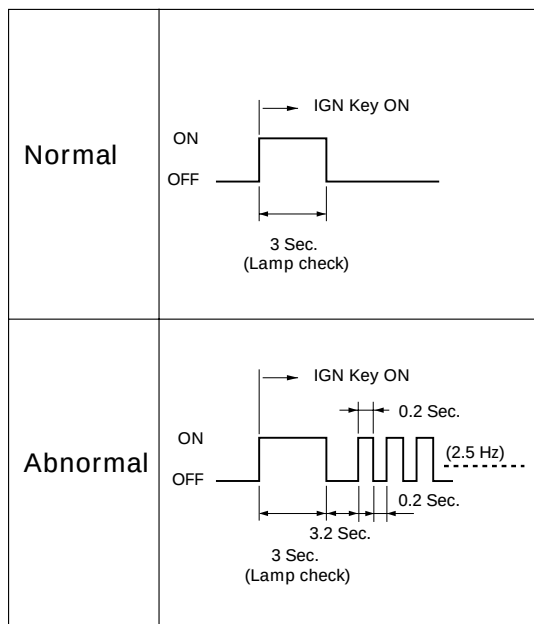
NO: the DTC can not help you finding the problem.

(1) GOTHROUGH **"CHECK TRANS" CHECK**

(2) IF it is flashing and the flash is 0.2 seconds ON and 0.2 seconds OFF, this means that you should have a DTC stored. Please recheck GOTO **DIAGNOSTIC CHECK** and if you find the same problem GOTO **TCM MEM-CAL REPLACEMENT**.

(3) IF the CHECK TRANS indicator is not flashing GOTO **WITHOUT DTC SET**.

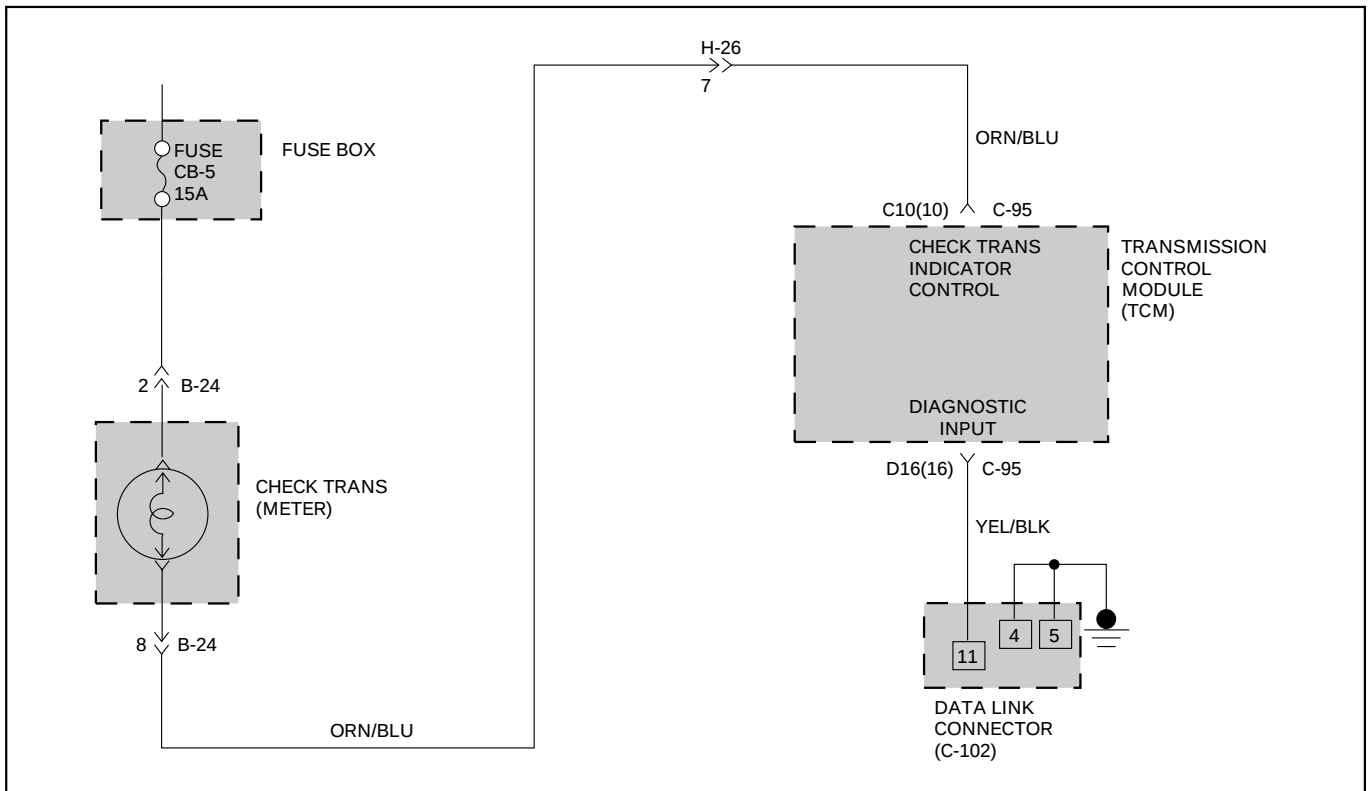


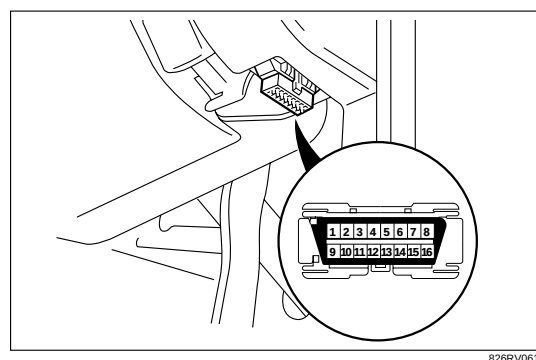
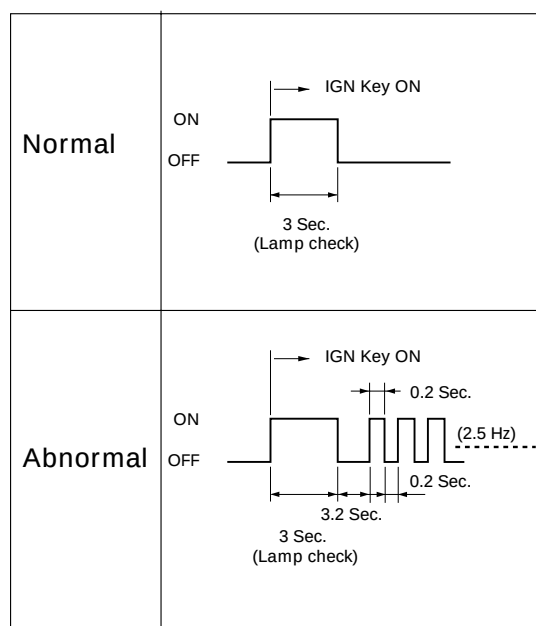


“CHECK TRANS” CHECK

1. **CASE** it is ON during 2 to 3 seconds at ignition (or when the engine is cranked) but it is OFF after. The indicator is working normally GOTO **DIAGNOSTIC CHECK**.
2. **CASE** it is flashing and the flash is 0.2 seconds ON and 0.2 seconds OFF always when ignition is on (engine cranked or not). This means that there is a malfunction. GOTO **DIAGNOSTIC CHECK**.
3. **CASE** the CHECK TRANS indicator is flashing always and the flash is 0.4 seconds ON and 0.4 second OFF.
 - (1) This means that the Transmission Control Module (TCM) is in flashing code mode. This mode is only used for service. This mode is set when the terminal 11 of data link connector C-102 is set to ground. To go out of this mode.
 - (2) Check if terminal 11 of data link connector C-102 is shorted to ground. (Voltage is about 0 volts when there is a short to ground instead of 5 volts).
 - (3) Check if TCM terminal D16 has the same problem.
 - (4) Remove the short circuit to ground due to wiring problems.
 - (5) IF problem solved: GOTO **CHECK TRANS INDICATOR**.
NO: GOTO **TCM MEM-CAL REPLACEMENT**.

4. **CASE** it is staying ON always when Ignition is ON.
 - (1) This means that connection between the Lamp and the TCM is shorted to ground.
 - (2) Verify if instrument panel terminal 8 of connector B-24 is shorted to ground.
 - (3) Verify if the TCM connector C-95 terminal C10 is shorted to ground.
 - (4) Verify that the instrument panel terminal 2 of connector B-24 is connected to battery.
 - (5) IF problem solved: GOTO **CHECK TRANS INDICATOR.**
NO: GOTO **TCM MEM-CAL REPLACEMENT.**
5. **CASE** it is staying OFF with the ignition ON (engine OFF).
 - (1) This means that connection between the lamp and the TCM is shorted to battery or opened.
 - (2) Verify if instrument panel terminal 8 of connector B-24 is shorted to battery or open.
 - (3) Verify if the TCM connector C-95 terminal C10 is shorted to battery or open.
 - (4) Verify that the instrument panel terminal 2 of connector B-24 is connected to battery. If not check the fuses and the connections voltage.
 - (5) IF problem solved: GOTO **CHECK TRANS INDICATOR.**
NO: GOTO **TCM MEM-CAL REPLACEMENT.**





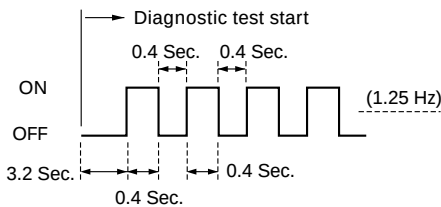
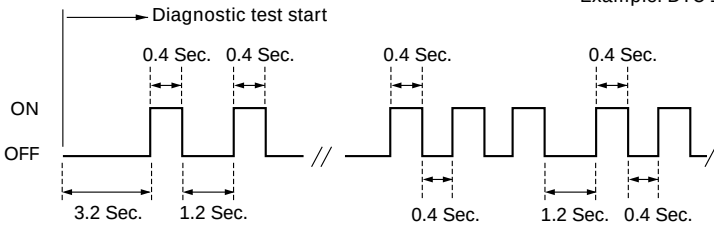
826RV061

FLASHING CODES

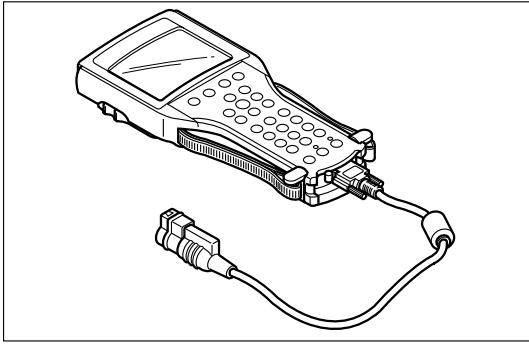
1. ON BOARD DIAGNOSIS (SELF-DIAGNOSIS)
 - (1) The Transmission Control Module (TCM) conducts a self-test of most of the wiring and components in the system each time the key is turned ON. If a fault is detected the TCM will store a Diagnostic Trouble Code (DTC) in memory. It's a number that corresponds to a specific problem.
 - (2) When the problem detected is important: the CHECK TRANS indicator is flashing (turned ON 0.2 seconds and OFF 0.2 seconds) until the fault is repaired and the TCM memory is cleared.

2. DIAGNOSTIC TROUBLE CODES (DTC)
 - (1) DTC can be displayed by the Transmission Control Module (TCM) by shorting together terminals 11 and 4 or 5 (ground) of the TCM Diagnosis Connector (C-102) located driver compartment.
(This grounds the TCM pin D16).

- (2) After this, the CHECK TRANS Indicator will be OFF for 3.2 second and then will flash each DTC 3 times.
- ① When there are more than 9 flashes this means that the indicator is constantly flashing, OFF for 0.4 seconds, ON for 0.4 seconds. In this case there is no DTC stored in memory.
 - To find the problem without a scan tool and without DTC GOTO **WITHOUT DTC SET.**
 - ② When there are less than 9 flashes you will see DTC of 2 digits repeated 3 times each and when all codes have been displayed they are displayed again beginning from the first one.
 - ③ Do not care about the DTC order : if “21” is before “22” it does not matter.
 - ④ Write down all codes numbers and GOTO **DTC CHECK.**
- (3) IF CHECK TRANS indicator is not flashing GOTO **“CHECK TRANS” CHECK.**

Normal	
Abnormal	The trouble code(s) will flash 3 times. Example: DTC 11 x 3 (times), DTC 32 x 3 (times) 

7A1-54 AUTOMATIC TRANSMISSION (4L30-E)

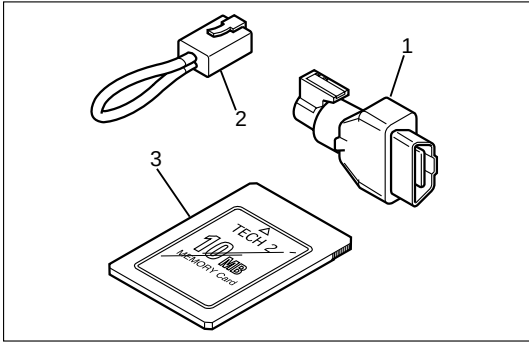


901RW176

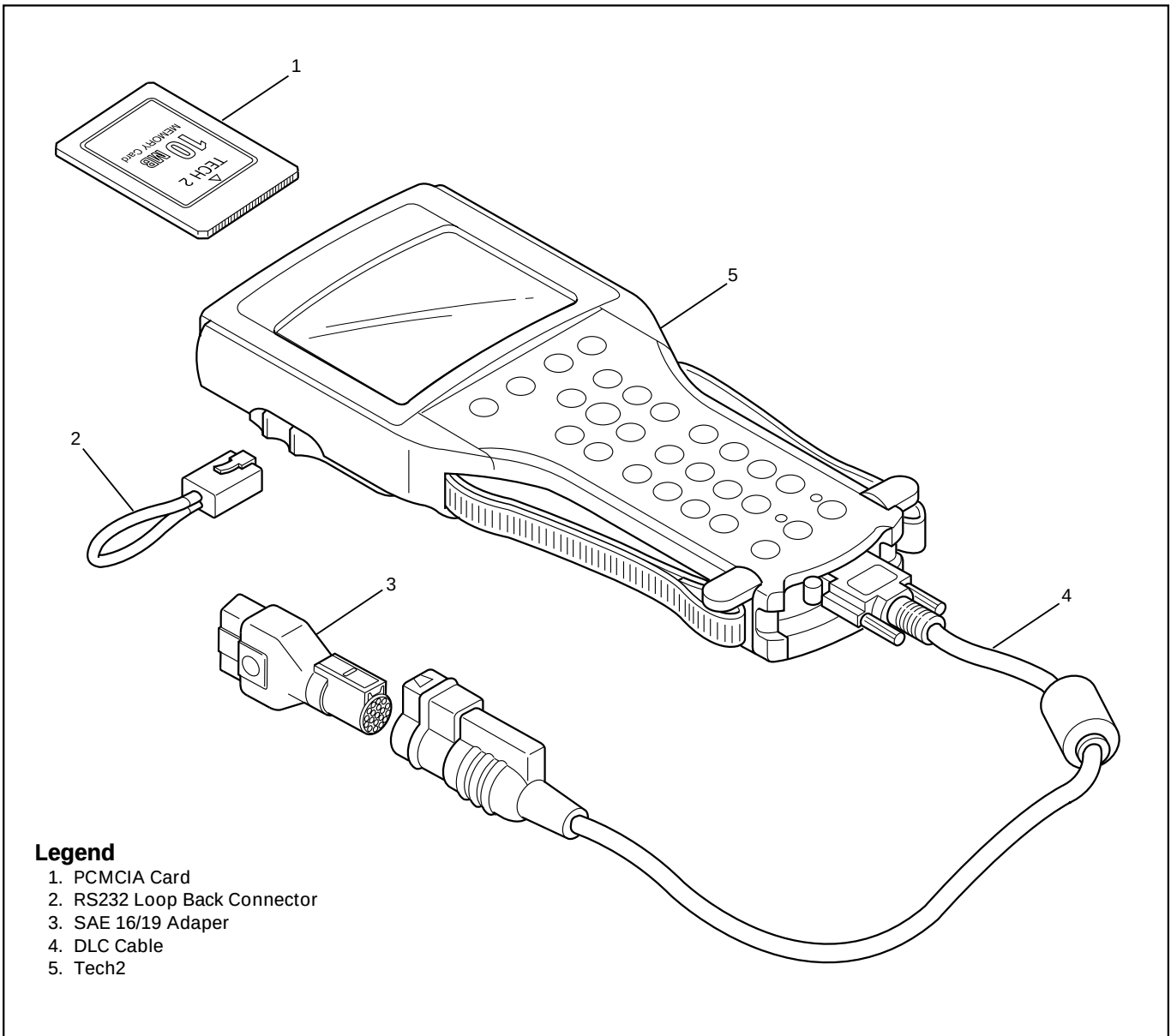
TECH2 CONNECTION

In order to access Transmission Control Module (TCM) data, use of the TECH2 scan tool is required.

1. The electronic diagnosis equipment is composed of:
 - (1) TECH2 (3000094) hand-held scan tool, and DLC cable (3000095).
 - (2) SAE 16/19 adapter (3000098) (1), RS 232 loop back connector (3000112) (2), and PCMCIA card (3000117) (3).



F07RW033



901RW180

Legend

1. PCMCIA Card
2. RS232 Loop Back Connector
3. SAE 16/19 Adapter
4. DLC Cable
5. Tech2

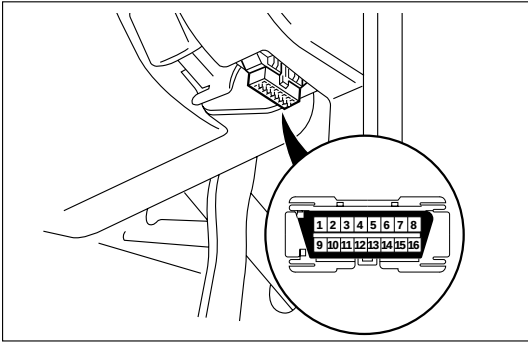
2. Connecting the TECH2

NOTE:

Always observe instructions in the TECH2 and Isuzu System PCMCIA card.

Before operating the Isuzu PCMCIA card with the TECH2, the following steps must be performed:

1. The Isuzu98 System PCMCIA card (1) inserts into the TECH2 (5).
2. Connect the SAE 16/19 adapter (3) to the DLC cable(4).
3. Connect the DLC cable to the TECH2 (5).
4. Make sure the vehicle ignition is off.



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5. Connect the TECH2 SAE 16/19 adaptor to the vehicle DLC.



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6. The vehicle ignition turns on.
7. Verify the TECH2 power up display.

NOTE:

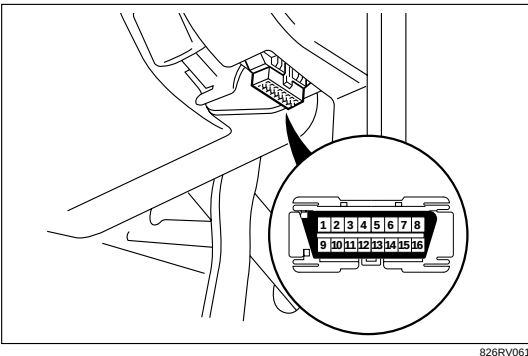
The RS232 Loop back connector is only to use for diagnosis of TECH2 and refer to user guide of the TECH2.

CLEAR DTC

Remark: If you clear the DTC (Diagnosis Trouble Codes) you will not be able to read any codes recorded during the last Trouble.

Remark: To be able to use the DTC again to identify a problem you will need to reproduce the fault or the problem. This may require a new test drive or just turning the ignition on (this depends on the nature of the fault).

1. IF you have a TECH2:
 - (1) Connect the TECH2 if it is still not connected
GOTHTROUGH TECH2 CONNECTION.
 - (2) Push "F4" and answer "Yes" to the question "Do you really want to clear the codes?"
 - ① When a malfunction remains as it is the TECH2 displays "4L30E CODES NOT CLEARED". This means that the problem is still there or that the recovery was not done please **GOTO DTC CHECK.**
 - ② When a malfunction has been repaired and the recovery is done the TECH2 displays "4L30E CODES CLEARED".
2. IF you have no TECH2:
 - (1) Short the Data Link Connector C-102 terminal 11 to terminal 4 or 5 (ground).
 - ① IF it is flashing and the flash is 0.4 seconds ON and 0.4 second OFF without interruption, this means that there is no DTC. The DTCs are already cleared.
 - (2) IF a code is flashed, wait until the lamp is flashing.
 - (3) Push POWER SWITCH (do this within 3 second).
 - ① If you continue to have malfunctions: This means that the problem is still there or that the recovery was not done please see **DTC CHECK.**
 - (4) IF you can not clear the DTC:
 - ① **GOTHTROUGH TCM PRECAUTIONS.**
 - ② Disconnect the TCM.
 - ③ Reconnect the TCM.
 - ④ IF the DTC is not cleared: **GOTO TCM MEM-CAL REPLACEMENT.**



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DTC CHECK

1. Diagnosis Trouble Codes (DTC) have been identified by TECH2 or FLASHING CODES.
2. You have written the list of the DTC. The order of the malfunctions has no meanings for this TCM. Usually only one or two malfunctions should be set for a given problem.
3. Check directly the DTCs you identified. The DTC are sorted by number. See Chart 2:
DIAGNOSTIC TROUBLE CODES (Page 7A1-63).

F0: DATA LIST QUICK CHECK

TECH2 DISPLAY	CONDITONS	CORRECT VALUE	FOR DIAGNOSIS SEE*1
BATTERY VOLTAGE	Ignition ON	9 V ≤ voltage ≤ 15.5 V (V)	DTC 25 or 26
FORCE MOTOR CUR.	Engine at idle speed Parking brake on Selector lever position "D"	approx. 0.9 A	DTC 35
CALCULAT. PRESS.		approx. 4.0 bar	
SOLENOID A	Vehicle traveling at a speed of: approx. 50 km/h (32 mph) with selector lever in position "2" or approx. 70 km/h (44 mph) with selector lever in position "3"	ACTIVE	DTC 31 or 41
SOLENOID B	Vehicle traveling at a speed of: approx. 10 km/h (6 mph) with selector lever in position "L" or approx. 30 km/h (18 mph) with selector lever in position "2"	ACTIVE	DTC 32 or 42
BAND APPLY SOL.	Engine at idle speed Selector lever position "L"	approx. 99% DC	DTC 34 or 44
TCC SOLENOID	Vehicle traveling at a speed of approx. 80 km/h (50 mph) Selector lever position "D"	ON	DTC 33 or 43
TCC SLIP RPM	Constant engine speed Selector lever position "D" TCC on	0±10 RPM	DTC 33 or 43
BRAKE SWITCH	Ignition ON Brake pedal pressed	ACTIVE	DTC 55 or 56
AT INPUT SPEED	Engine speed ≤ 200 rpm Output speed > 1024 rpm Selector lever position "D", "3", "2", "L"	Engine speed: (RPM)	DTC 13 or 62
AT OUTPUT SPEED	Output speed ≤ 0 rpm Engine speed > 3000 rpm Selector lever position "D", "3", "2", "L"	Output speed: (RPM)	DTC 11 or 13
BAROMETER SENSOR	Engine at idle speed	0.9 ~ 1.0 bar approx. 0.02 V	–
SELECTOR POS.	Ignition ON Shift through all selector lever positions	Dependent on selector lever position P, R, N, D, 3, 2, L	DTC 53 or 54
ACTUAL GEAR	Vehicle traveling at a speed of approx. 100 km/h (62 mph) Selector lever position "D"	- 4 -	DTC 61

NOTE: (*1) FOR DIAGNOSIS OF A DTC SEE CHART 2: DIAGNOSTIC TROUBLE CODES (DTC)
(PAGE 63)

F0: DATA LIST QUICK CHECK (continued)

TECH2 DISPLAY	CONDITONS	CORRECT VALUE	FOR DIAGNOSIS SEE*1
SELECTOR PIN A	Ignition ON Selector lever position: "P", "R", "3" or "2"	ACTIVE	DTC 53 or 54
SELECTOR PIN B	Ignition ON Selector lever position: "R", "N", "D" or "3"	ACTIVE	DTC 53 or 54
SELECTOR PIN C	Ignition ON Selector lever position: "D", "3", "2" or "L"	ACTIVE	DTC 53 or 54
SELECTOR PIN P	Ignition ON Selector lever position: "P", "N", "3" or "L"	ACTIVE	DTC 53 or 54
TPS SIGNAL	Ignition ON Throttle body in idle speed position Throttle body in full load position	0.1 V to 0.96 V (0%) 4.9 V or less (99%)	DTC 21 or 22
KICK DOWN SWITCH	Ignition ON Depress accelerator pedal to stop	ACTIVE	DTC 52
A/C REQUEST	Engine running. Air conditioning ON. Compressor engaged.	ACTIVE	CHECK WIRE FROM TCM CONNECTOR C-91 TERMINAL D8 FOR OPEN CIRCUIT.
TRANSM. OIL TEMP.	Engine running	70 - 120°C/158 - 248°F approx. 1.00 ~ 3.10 V	DTC 15 or 16
COOLANT TEMP SW.	Ignition ON: Engine warm	COLD ($\leq 63^{\circ}\text{C}$) WARM ($> 70^{\circ}\text{C}$)	DTC 51
POWER SWITCH	Ignition ON Press "POWER" switch	ACTIVE	TRANSMIS- SION OPERATING MODE TEST SEE PAGE 133
POWER LAMP	Engine running Press "POWER" switch	ON	

- IF ALL VALUES ARE CORRECT, CONTINUE DIAGNOSIS WITH F5: ACTUATOR TEST QUICK CHECK.

NOTE: (*1) FOR DIAGNOSIS OF A DTC SEE CHART 2: DIAGNOSTIC TROUBLE CODES (DTC)
(PAGE 63)

CHART 1

DIAGNOSIS CONNECTOR AND VOLTAGE SUPPLY TEST

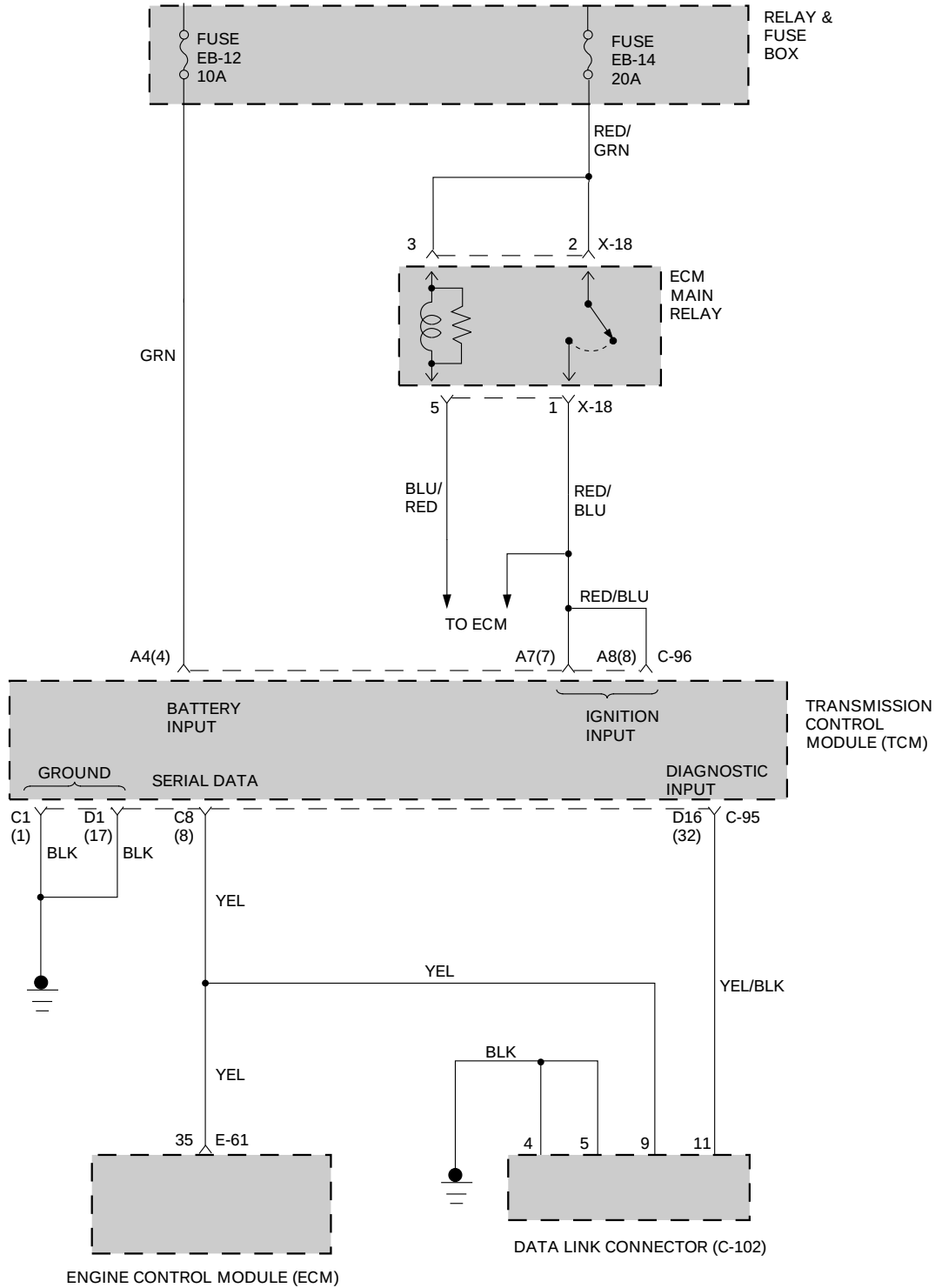


CHART 1

DIAGNOSIS CONNECTOR AND VOLTAGE SUPPLY TEST

TECH2 REFERS TO CHART 1 WHEN THE EQUIPMENT IS CORRECTLY CONNECTED, BUT NO DATA (WITH IGNITION ON) IS RECEIVED FROM TECH2.

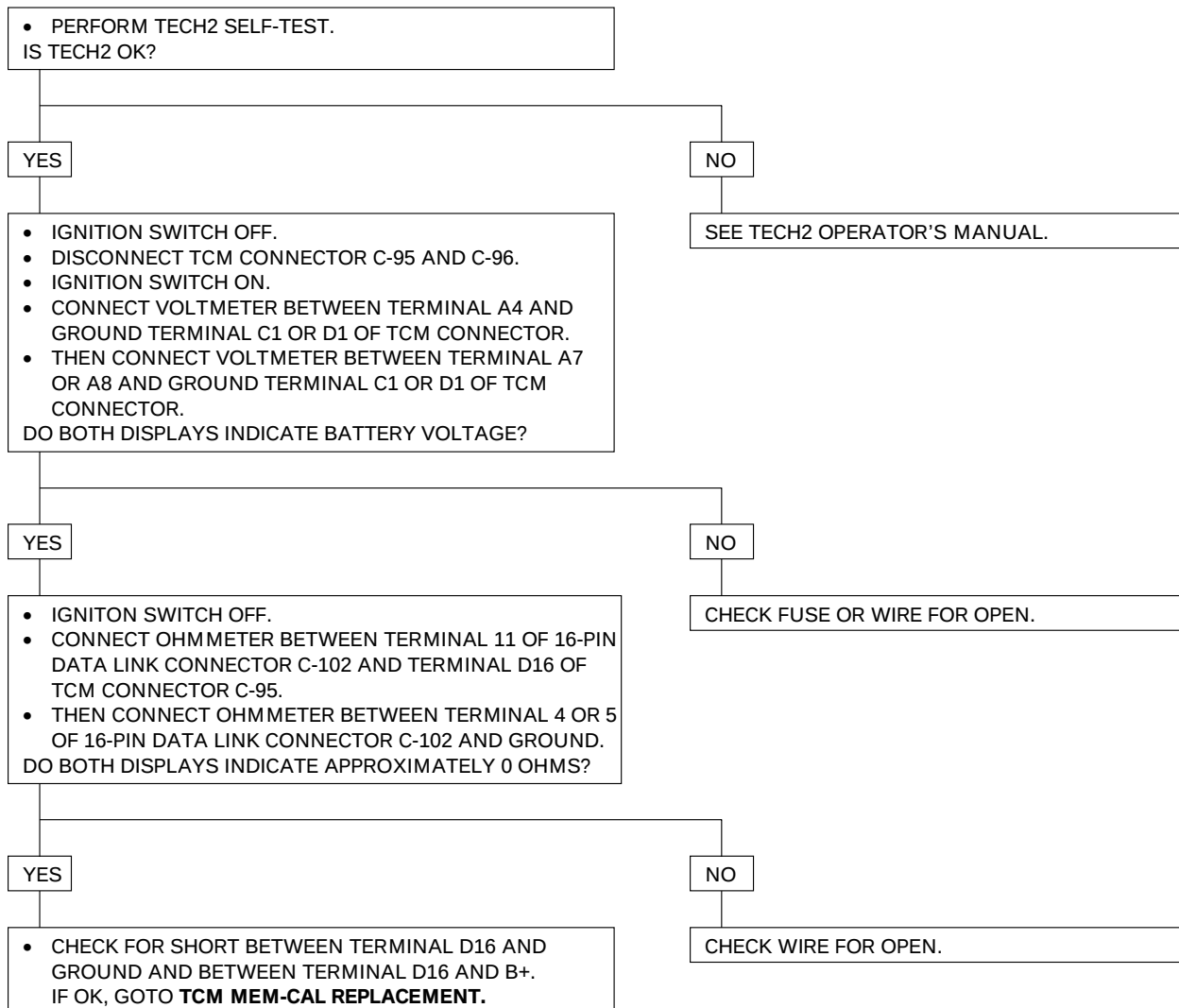


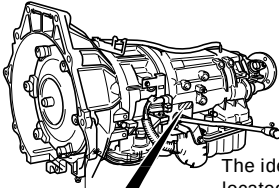
CHART 2: DIAGNOSTIC TROUBLE CODE (DTC)

DTC	MALFUNCTION	FOR DIAGNOSIS SEE PAGE
11	OUTPUT SPEED FAILURE	7A1 - 66
13	ENGINE SPEED FAILURE	7A1 - 70
15	TRANSMISSION OIL TEMPERATURE SHORT TO PLUS OR OPEN	7A1 - 72
16	TRANSMISSION OIL TEMPERATURE SHORT TO GROUND	7A1 - 74
21	THROTTLE POSITION SENSOR SHORT TO PLUS	7A1 - 76
22	THROTTLE POSITION SENSOR SHORT TO GROUND OR OPEN	7A1 - 78
23	THROTTLE POSITION SENSOR CONNECTOR OPEN	7A1 - 80
25	SUPPLY VOLTAGE TOO LOW	7A1 - 82
26	SUPPLY VOLTAGE TOO HIGH	7A1 - 84
31	SOLENOID A SHORT TO GROUND OR OPEN	7A1 - 86
32	SOLENOID B SHORT TO GROUND OR OPEN	7A1 - 88
33	TCC HIGH SHORT TO PLUS OR OPEN	7A1 - 90
34	BAND APPLY SOLENOID SHORT TO GROUND OR OPEN	7A1 - 94
35	FORCE MOTOR OPEN OR SHORT TO PLUS OR GROUND	7A1 - 96
36	SHIFT HIGH SHORT TO GROUND OR OPEN	7A1 - 98
37	TORQUE MANAGEMENT SERIAL LINE FAULTY	7A1 - 100
41	SOLENOID A SHORT TO PLUS	7A1 - 102
42	SOLENOID B SHORT TO PLUS	7A1 - 104
43	TCC HIGH SHORT TO GROUND	7A1 - 106
44	BAND APPLY SOLENOID SHORT TO PLUS	7A1 - 108
46	SHIFT HIGH SHORT TO PLUS	7A1 - 110
51	ENGINE COOLANT SWITCH SHORT TO GROUND, PLUS OR OPEN	7A1 - 112
52	KICK DOWN ALWAYS ON OR SHORT TO GROUND	7A1 - 114
53	MODE SWITCH IN P OR N OR R BAD POSITION	7A1 - 116
54	MODE SWITCH ILLEGAL POSITION	7A1 - 118
55	BRAKE SWITCH SHORT TO GROUND OR OPEN	7A1 - 120
56	BRAKE SWITCH SHORT TO PLUS	7A1 - 122
61	GEAR ERROR	7A1 - 124
62	DOWNSHIFT PROTECTION	7A1 - 126
63	EPROM CSUM FAILURE	7A1 - 129
82	SHIFT OR BAND APPLY SOLENOIDS FAULTY DURING DRIVING	7A1 - 130

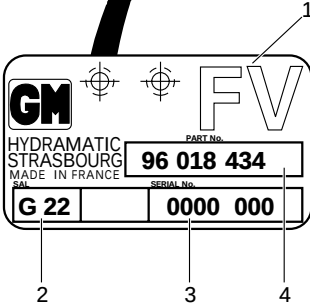
CHART 3: TRANSMISSION AND TCM IDENTIFICATION

Chart 3 contains a list of all important information concerning rear axle ratio, Transmission Control Module (TCM), and transmission identification.

VEHICLE		Rr axle Ratio	TCM	TRANSMISSION		
Type	Engine		ISUZU Parts No.	Calibration Code	Isuzu Part No.	Model Code
Isuzu/TFR	3.2L V6	4.555	8-09350-909-0	G22	8-96018-434-0	FV (4X2)

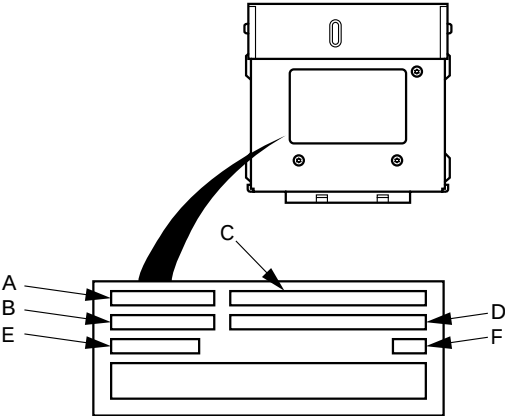


The idenifation plate is located on the left-hand side of the transmission above the mode switch.



AT Transmission identification on vehicle identification plate :

- Model code
- Calibration code
- Production serial number
- Production part number



TCM IDENTIFICATION:

- ISUZU part number
- Model of car
- DELCO part number
- Application
- Service TCM number
- Broadcast code

CHART 5: F5: ACTUATOR TEST QUICK CHECK

Before carrying out the Actuator Test, the selector lever should be placed in selector position "N".
The ignition should be switched ON, engine not running.

TECH2 DISPLAY	NOTES	CORRECT RESULT	FOR DIAGNOSIS SEE ¹
SOLENOID A	Press arrow up (ON) Press arrow down (OFF)	"Click" heard from transmission	DTC 31 or 41
SOLENOID B	Press arrow up (ON) Press arrow down (OFF)	"Click" heard from transmission	DTC 32 or 42
SHIFT SOLENOID	Press arrow up (ON) Press arrow down (OFF)	"Click" heard from transmission	DTC 82
TCC SOLENOID	Not used	—	—
TCC HIGH (D)	Press arrow up (ON) Press arrow down (OFF)	"Click" heard from transmission	DTC 33 or 43
POWER LAMP	Press arrow up (ON) Press arrow down (OFF)	POWER lamp ON	TRANSMISSION OPERATING MODE TEST (PAGE 133)
CHK. TRN. LAMP	Press arrow up (ON) Press arrow down (OFF)	CHECK TRANS lamp ON	CHECK TRANS CHECK (PAGE 50)

¹ FOR DIAGNOSIS OF A DTC SEE CHART 2: DIAGNOSTIC TROUBLE CODES (DTC) (PAGE 63)

DIAGNOSTIC TROUBLE CODE (DTC) 11

OUTPUT SPEED FAILURE

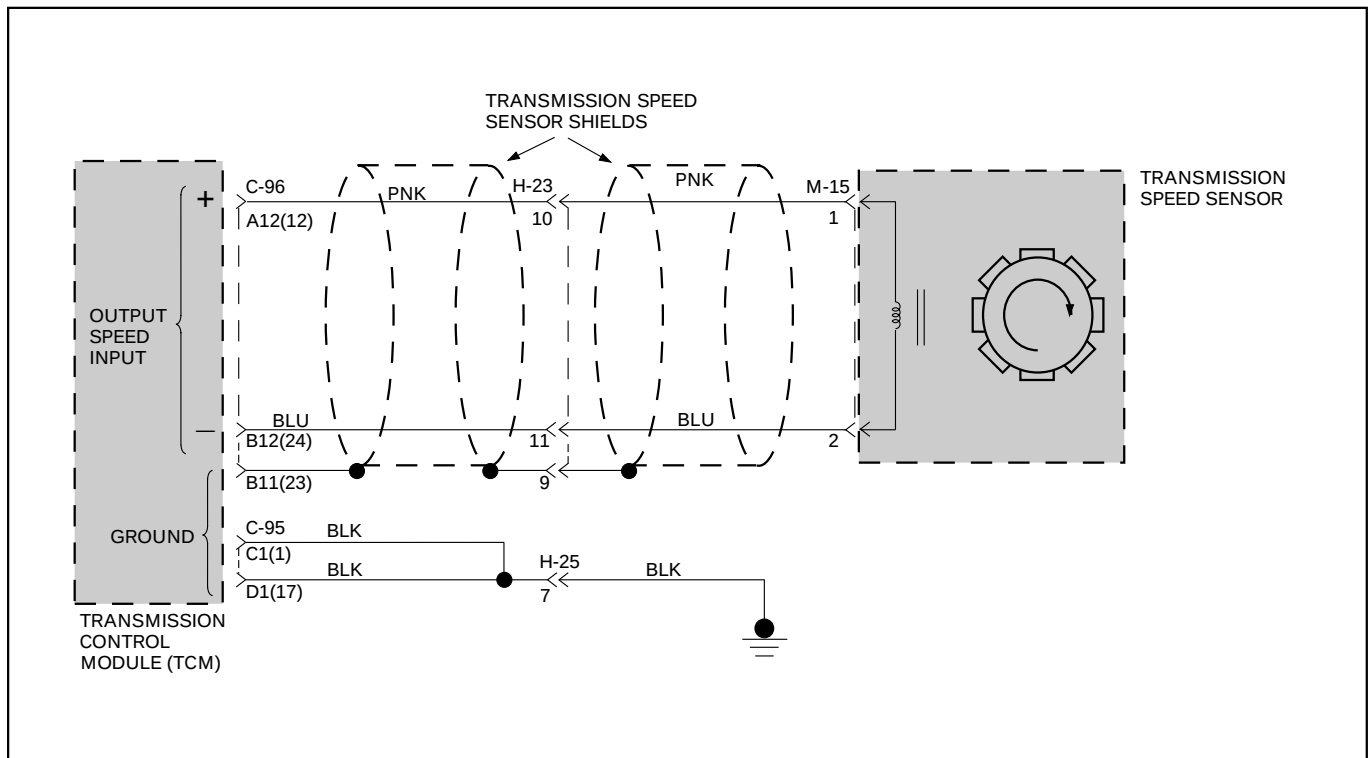
This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

The transmission output speed sensor provides information on vehicle speed to the Transmission Control Module (TCM). The speed sensor circuit consists of a magnetic induction type sensor. The sensor is mounted above a target wheel pressed on the output shaft in the transmission extension. As the output shaft turns, the target wheel teeth induce a variable voltage in the magnetic pickup. This alternating current (AC) signal is provided to the TCM. The voltage increases with the speed of the wheel but this is not used to define the speed of the vehicle. As the vehicle moves faster, the signal alternates faster between positive and negative voltages. The Output speed information is proportional to the frequency of the signal.

Diagnostic Aids:

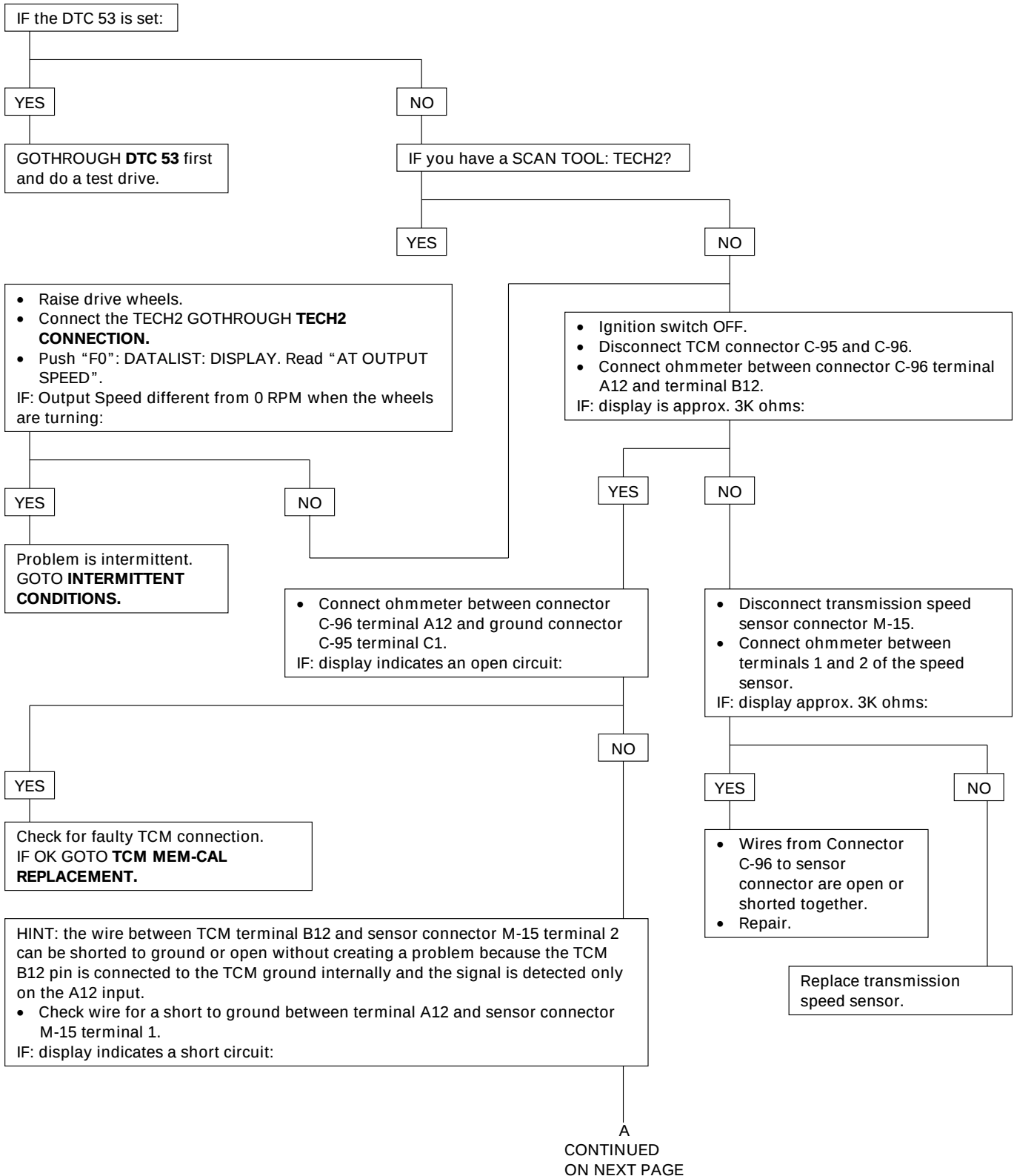
- This diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions:
 - ① Output Speed < or = 0 RPM.
 - ② Engine Speed > 3000 RPM.
 - ③ No Malfunction: Engine Speed DTC 13. Mode Switch DTC54.
 - ④ Selector lever not in Park, Reverse, or Neutral.
 - ⑤ The conditions need to be present for at least 5 seconds.
- Action after the detection time:
 - ① CHECK TRANS Indicator is turned ON.
 - ② TCM in BACKUP MODE
- Recovery conditions : To recover do an IGNITION CYCLE.

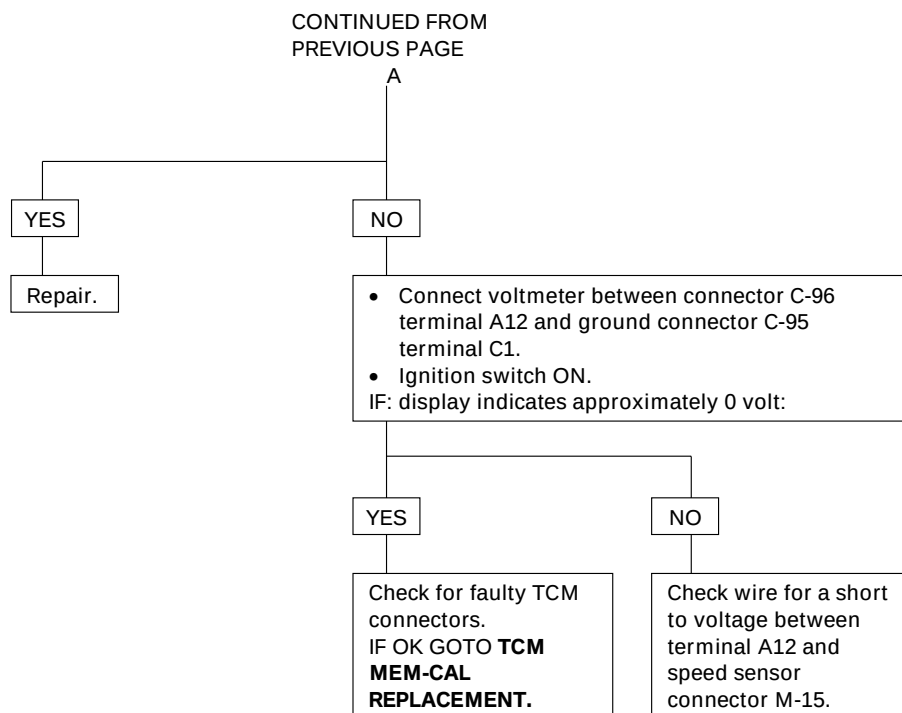


DIAGNOSTIC TROUBLE CODE (DTC) 11

OUTPUT SPEED FAILURE

⚠ CAUTION: If wire to connector C-96 terminal B12 is short to voltage, Transmission Control Module (TCM) will be damaged.





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[illegible]

DIAGNOSTIC TROUBLE CODE (DTC) 13

ENGINE SPEED FAILURE

This DTC flashes the CHECK TRANS indicator and set the BACKUP MODE.

Circuit Description:

The Engine Control Module (ECM) sends a signal to the Transmission Control Module (TCM) that indicates engine speed in RPM. When the vehicle is in neutral gear and the engine is at idle, the engine speed should be approximately 800 RPM.

Diagnostic Aids:

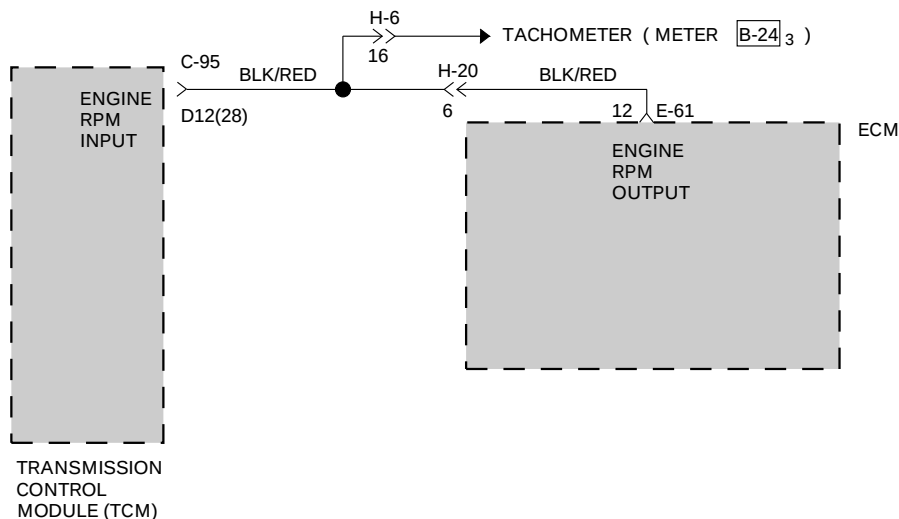
- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").

Detection conditions:

- ① Engine speed < or = 200 RPM.
- ② Output Speed > 1024 RPM.
- ③ Acceleration > 2 Km/h/s.
- ④ No DTC: Output Speed DTC11, Downshift Protection DTC62 or Mode Switch Illegal Position DTC54.
- ⑤ Selector Lever not in Park or Neutral.
- ⑥ The conditions need to be present for at least 0.5 second.

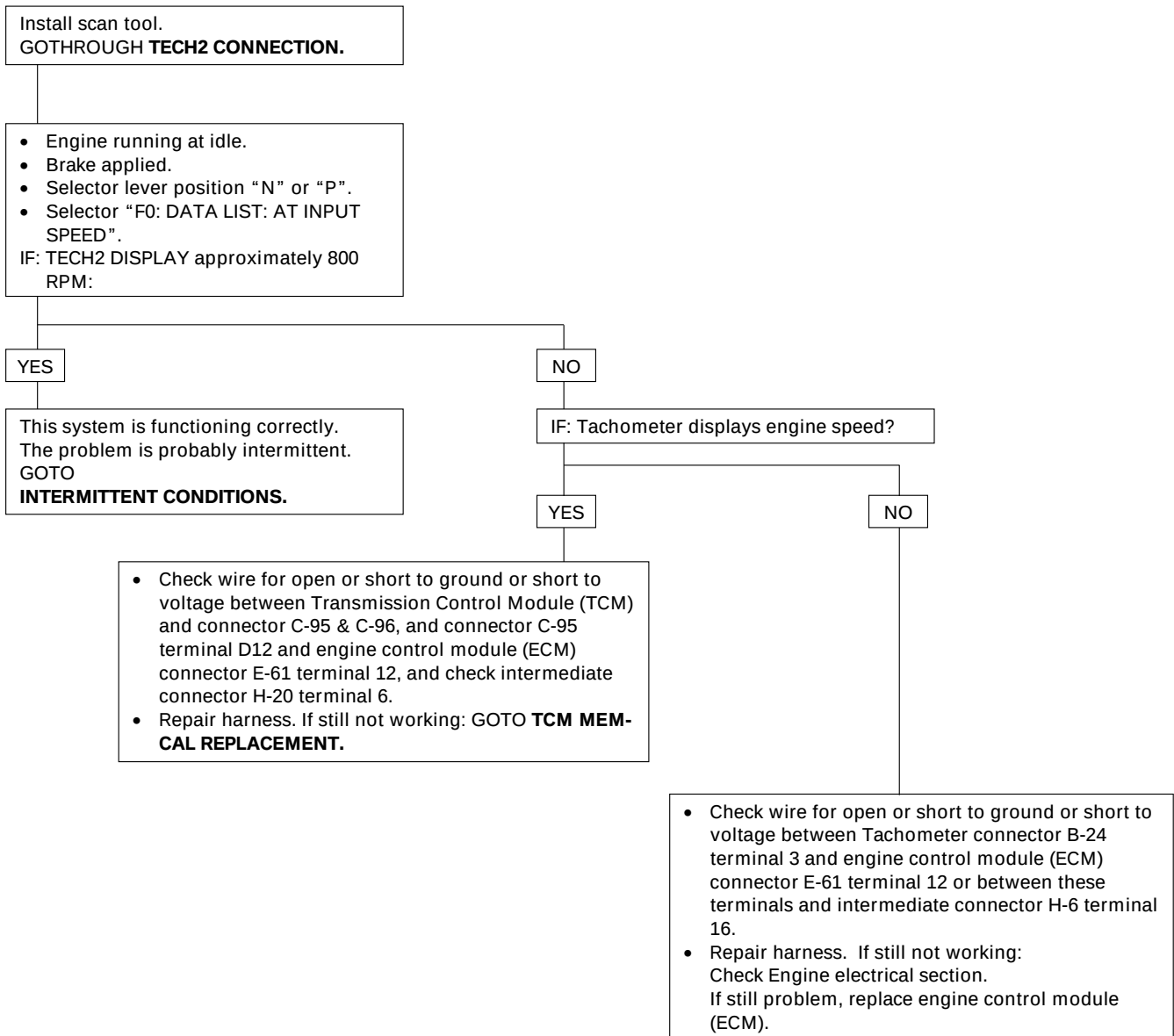
Action after the detection time: BACKUP MODE

- Recovery conditions: To recover do an IGNITION CYCLE



DIAGNOSTIC TROUBLE CODE (DTC) 13

ENGINE SPEED FAILURE



DIAGNOSTIC TROUBLE CODE (DTC) 15

TRANSMISSION OIL TEMPERATURE SHORT TO PLUS OR OPEN

This DTC does NOT flash the CHECK TRANS indicator and does NOT set the BACKUP MODE.

Circuit Description:

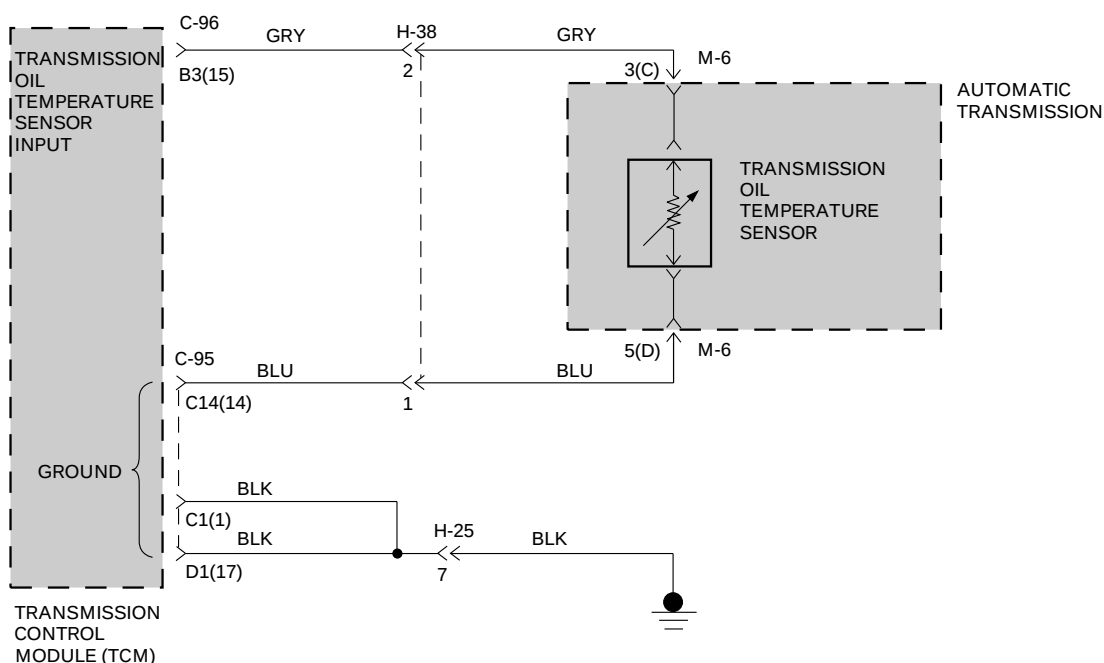
- The transmission oil temperature sensor is a thermistor within the internal wiring harness of the transmission in the adaptor case oil pan. The Transmission Control Module (TCM) applies 5 volts to the sensor connector M-6 terminal 3(C). The other side of the sensor is connected to ground through the TCM terminal C14.
- When the transmission oil is cold, the sensor resistance is high and the TCM will sense high signal voltage.
- As the transmission oil temperature warms to normal transmission operating temperature of 80°C (176°F), the sensor resistance becomes less and the voltage decreases at about 3.5 volts. Note, for more accuracy the measurement is done differently for low temperature (less than 45°C) and high temperature (more than 50°C).
- When DTC15 is set, the transmission will use a warm value for operation, but the scan tool will display the actual oil temperature.
- Table shows thermistor resistance at different temperatures.

Table:

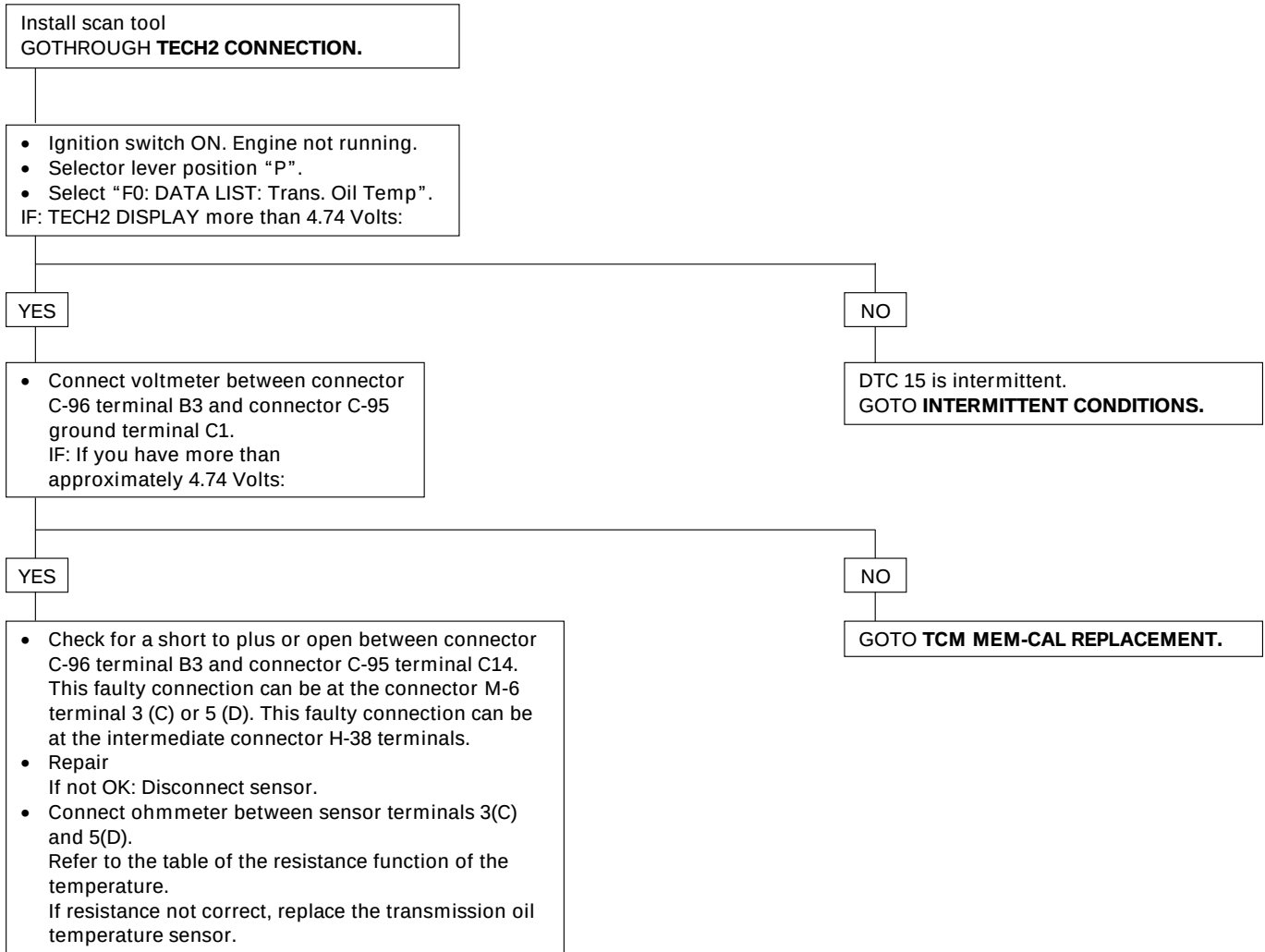
°C	°F	Resistance (kΩ)
-40	-40	672
0	32	65
20	68	25
80	176	2.5
120	248	0.78
150	304	0.37

Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① Voltage between terminals B3 and C14 > 4.74 volts.
 - ② The condition needs to be present for at least 20 seconds. Note: during the detection time the TCM reads the high voltage that defines a -40°C temperature.
- Action after the detection time: Default Transmission Oil Temperature is set to 100°C.
- Recovery conditions: To recover when voltage < or = to 4.74 volts after detection time.



DIAGNOSTIC TROUBLE CODE (DTC) 15
TRANSMISSION OIL TEMPERATURE SHORT TO PLUS OR OPEN



DIAGNOSTIC TROUBLE CODE (DTC) 16

TRANSMISSION OIL TEMPERATURE SHORT TO GROUND

This DTC does NOT flash the CHECK TRANS indicator and does NOT set the BACKUP MODE.

Circuit Description:

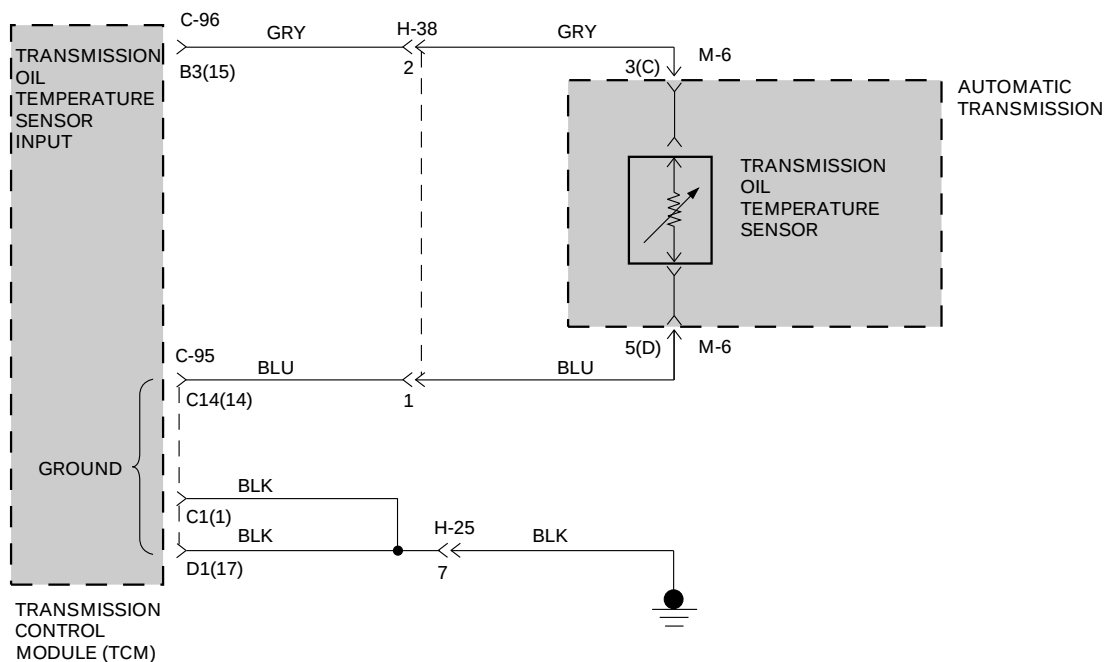
- The transmission oil temperature sensor is a thermistor within the internal wiring harness of the transmission in the adaptor case oil pan. The Transmission Control Module (TCM) applies 5 volts to the sensor connector M-6 terminal 3(C). The other side of the sensor is connected to ground through the TCM terminal C14. When the transmission oil is cold, the sensor resistance is high and the TCM will sense high signal voltage.
- As the transmission oil temperature warms to normal transmission operating temperature of 80°C (176°F), the sensor resistance becomes less and the voltage decreases at about 3.5 volts. Note, for more accuracy the measurement is done differently for low temperature (less than 45°C) and high temperature (more than 50°C).
- When DTC16 is set, the transmission will use a

warm value for operation, but the scan tool will display the actual oil temperature.

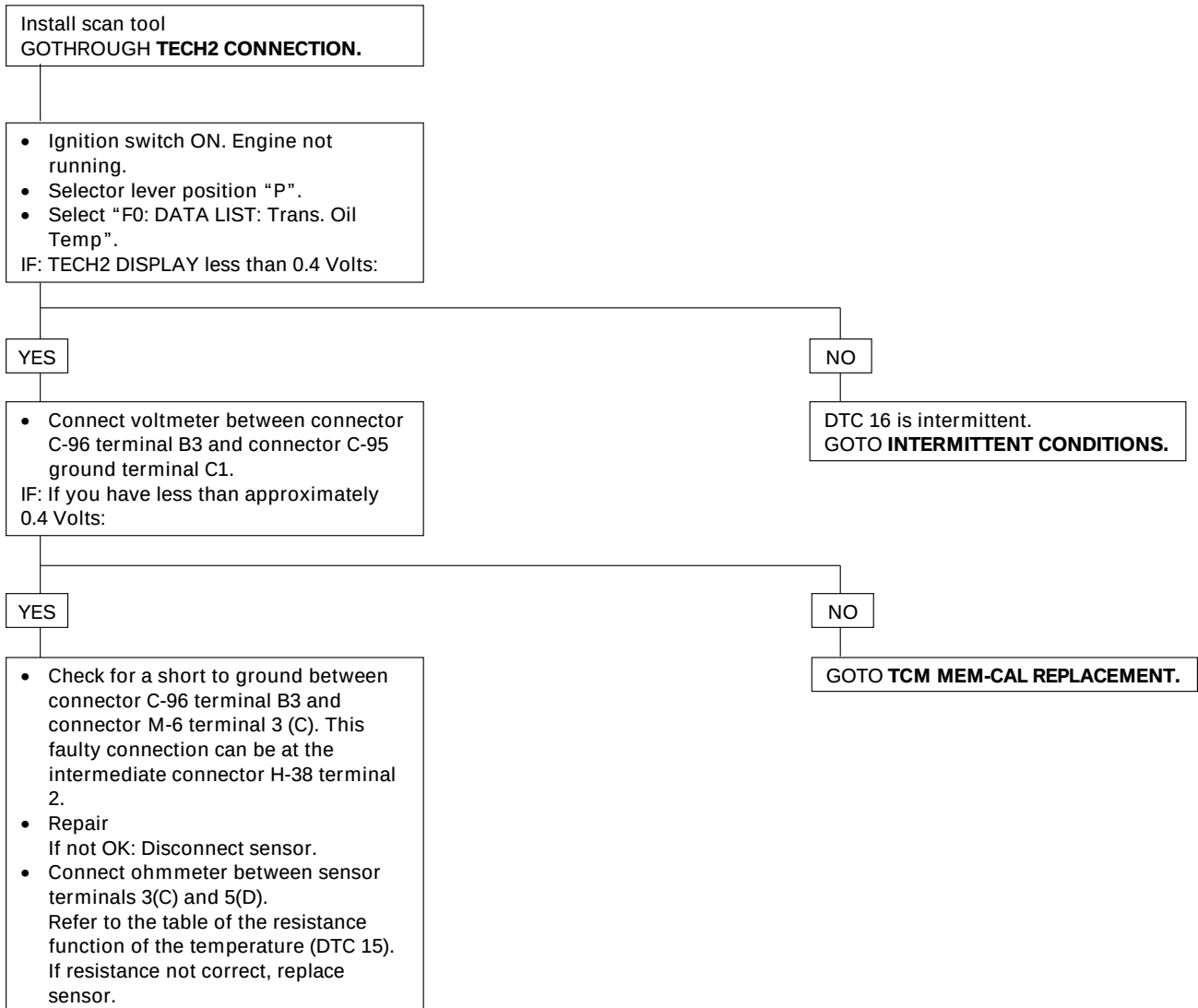
- Table shows thermistor resistance at different temperatures.

Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① Voltage between terminals B3 and C14 < 0.4 volts.
 - ② The condition needs to be present for at least 20 seconds. Note: during the detection time the TCM reads the low voltage that defines a 170°C temperature.
- Action after the detection time: Default Transmission Oil Temperature is set to 100°C.
- Recovery conditions: To recover when voltage > or = to 0.4 volts after detection time.



DIAGNOSTIC TROUBLE CODE (DTC) 16
TRANSMISSION OIL TEMPERATURE SHORT TO GROUND



DIAGNOSTIC TROUBLE CODE (DTC) 21

THROTTLE POSITION SENSOR SHORT TO PLUS

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

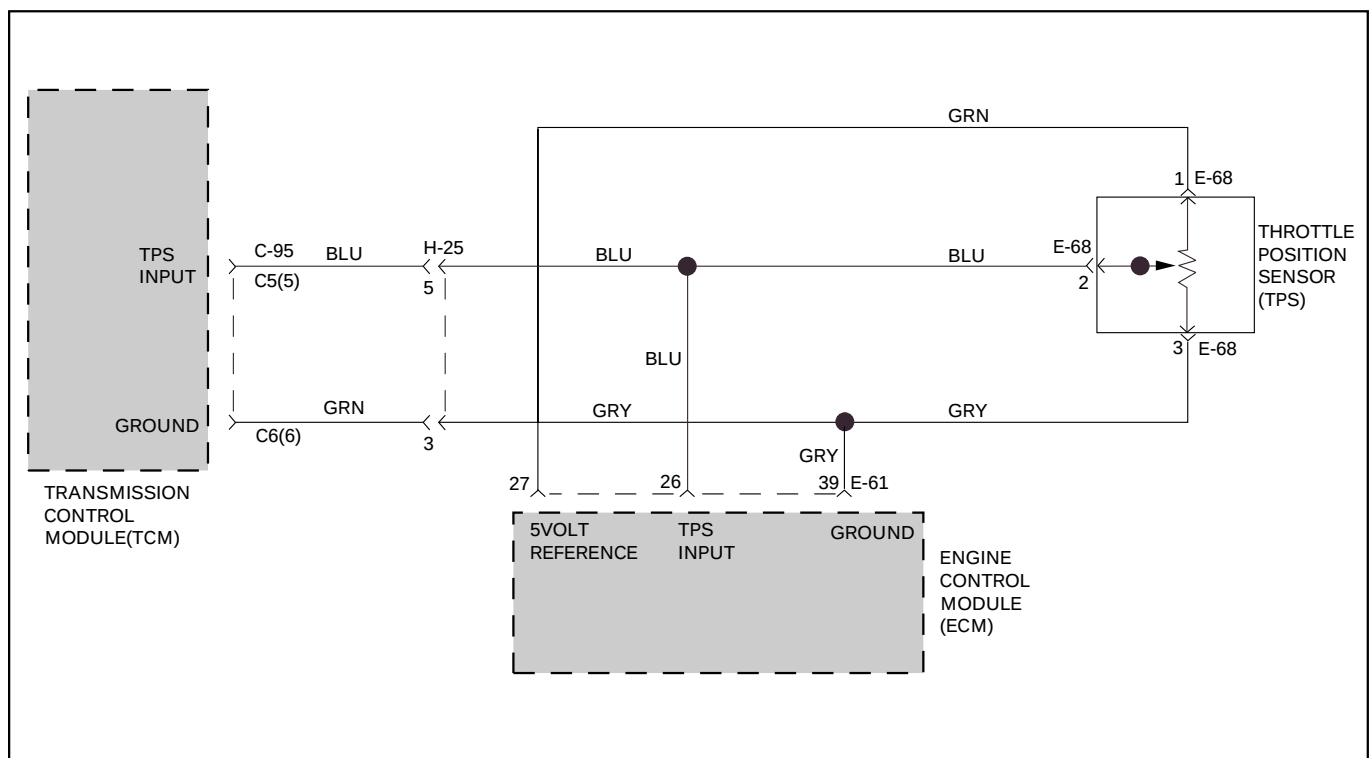
Circuit Description:

- The Throttle Position Sensor (TPS) provides a voltage signal that changes relative to the throttle plate position. Signal voltage between connector C-95 terminals C5 and C6 will vary from about 0.4 at idle to about 4.6 volts at wide open throttle.
- The Engine Control Module (ECM) also receives this signal. This TPS is a variable resistance with one side (connector E-68 terminal 1) connected only to the ECM connector to have the 5 volts supply voltage. The other side (connector E-68 terminal 3) is connected to the Transmission Control Module (TCM) (floating ground) and the ECM (ground). The "middle" (the wiper) (connector E-68 terminal 2) is connected to the TCM and the ECM.
- The ECM monitors output voltage from the TPS and determines fuel delivery based on throttle valve angle (driver demand).

- This TPS is an electrical component and must not be soaked in any liquid cleaner or solvent, as damage may result.

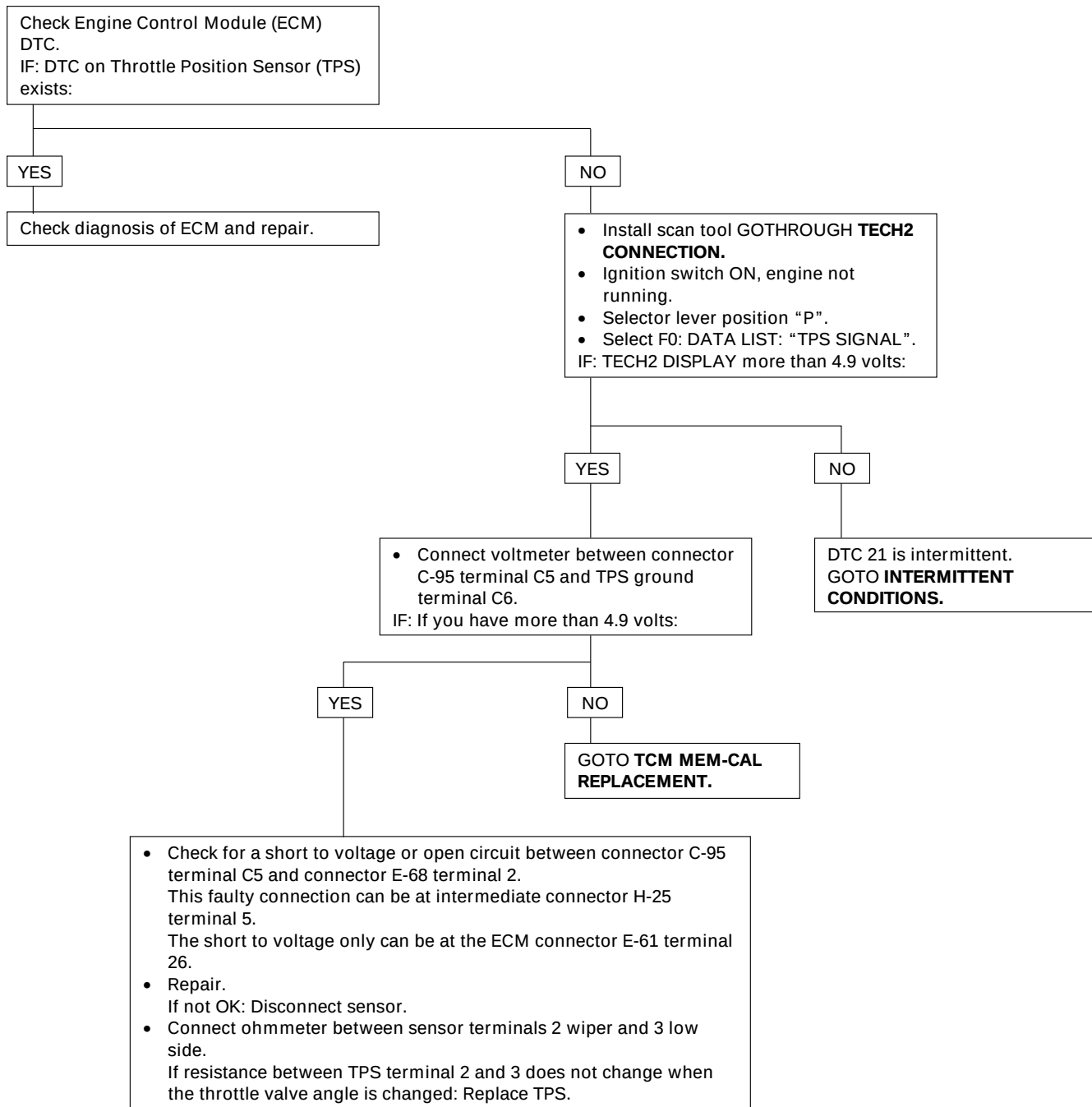
Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① Voltage between connector C-95 terminals C5 and C6 > 4.9 volts. This detection occurs when: The wiper is short to voltage (engine can stall).
 - ② The condition needs to be present for at least 0.5 seconds. Note: during the detection time the TCM reads "100% (wide open throttle)".
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover when voltage < or = to 4.9 volts and do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 21

THROTTLE POSITION SENSOR SHORT TO PLUS



DIAGNOSTIC TROUBLE CODE (DTC) 22

THROTTLE POSITION SENSOR SHORT TO GROUND OR OPEN

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

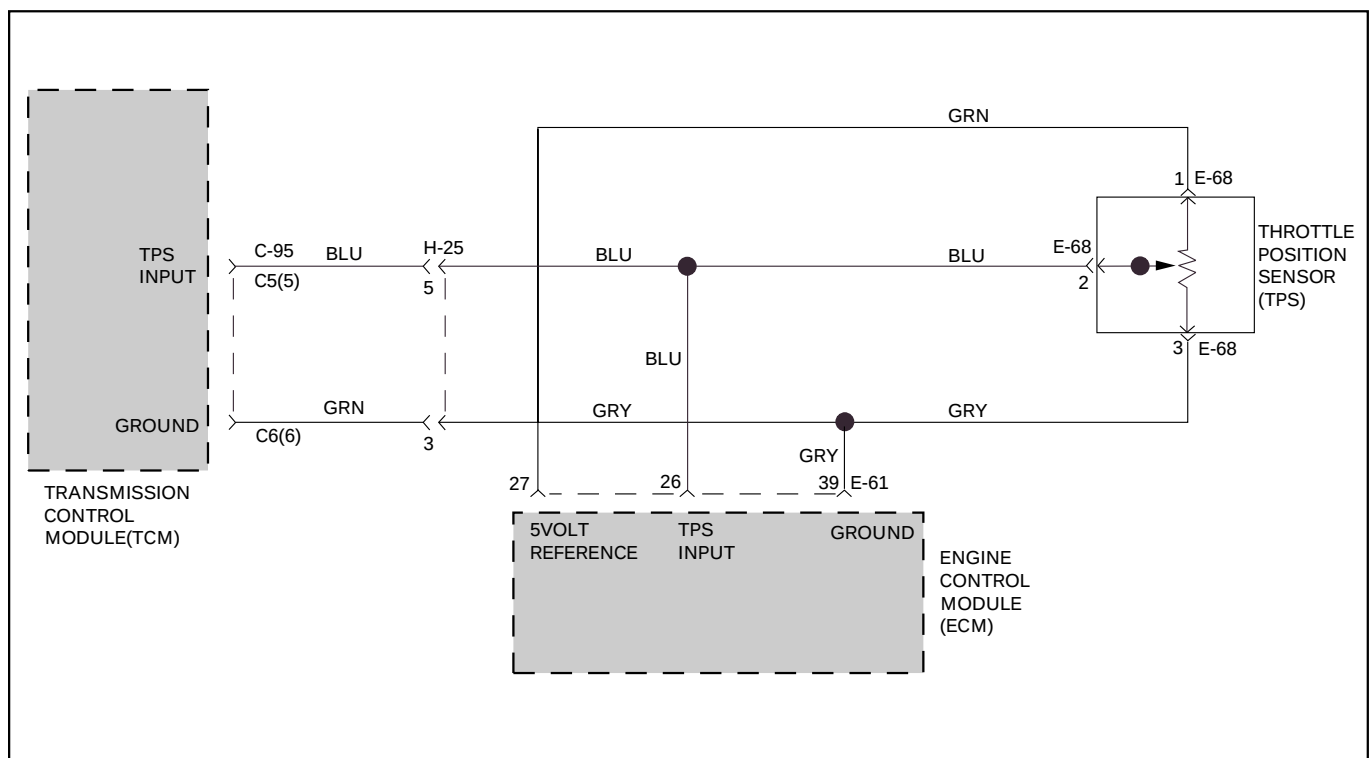
Circuit Description:

- The Throttle Position Sensor (TPS) provides a voltage signal that changes relative to the throttle plate position. Signal voltage between connector C-95 terminals C5 and C6 will vary from about 0.4 at idle to about 4.6 volts at wide open throttle.
- The Engine Control Module (ECM) also receives this signal. This TPS is a variable resistance with one side (connector E-68 terminal 1) connected only to the ECM connector to have the 5 volts supply voltage. The other side (connector E-68 terminal 3) is connected to the Transmission Control Module (TCM) (floating ground) and the ECM (ground). The "middle" (the wiper) (connector E-68 terminal 2) is connected to the TCM and the ECM.
- The ECM monitors output voltage from the TPS and determines fuel delivery based on throttle valve angle (driver demand)

- This TPS is an electrical component and must not be soaked in any liquid cleaner or solvent, as damage may result.

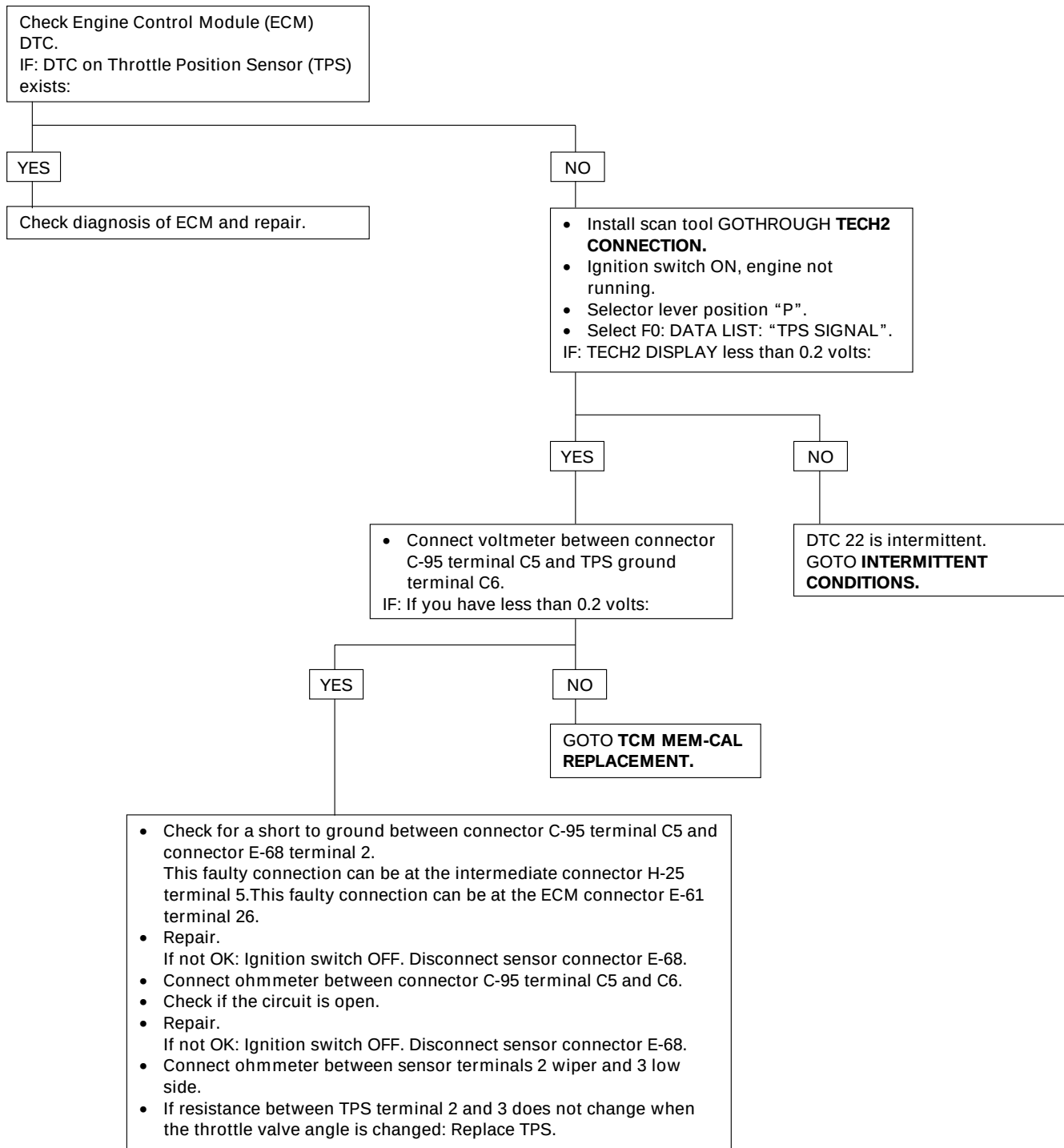
Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - This detects a TPS wiper short to TCM ground (except certain conditions) or open and wiper short to TPS low. This also detects a TPS low open.
 - Voltage between connector C-95 terminals C5 and C6 < 0.2 volts.
 - The condition needs to be present for at least 0.5 seconds. Note: during the detection time the TCM reads "0% (idle)".
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover when voltage $>$ or $=$ to 0.2 volts and do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 22

THROTTLE POSITION SENSOR SHORT TO GROUND OR OPEN



DIAGNOSTIC TROUBLE CODE (DTC) 23

THROTTLE POSITION SENSOR CONNECTOR OPEN

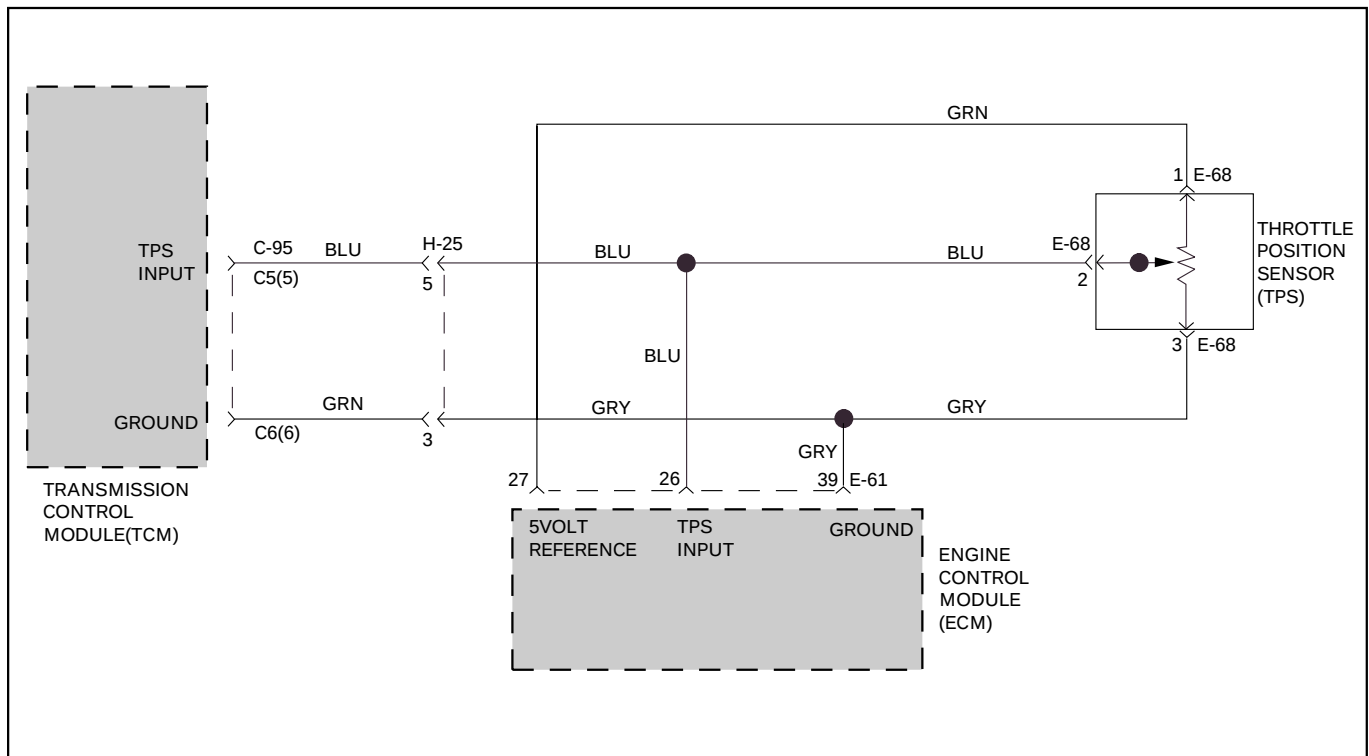
This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

- The Throttle Position Sensor (TPS) provides a voltage signal that changes relative to the throttle plate position. Signal voltage between connector C-95 terminals C5 and C6 will vary from about 0.4 at idle to about 4.6 volts at wide open throttle.
- The Engine Control Module (ECM) also receives this signal. This TPS is a variable resistance with one side (connector E-68 terminal 1) connected only to the ECM connector to have the 5 volts supply voltage. The other side (connector E-68 terminal 3) is connected to the Transmission Control Module (TCM) (floating ground) and the ECM (ground). The "middle" (the wiper) (connector E-68 terminal 2) is connected to the TCM and the ECM.
- The ECM monitors output voltage from the TPS and determines fuel delivery based on throttle valve angle (driver demand).
- This TPS is an electrical component and must not be soaked in any liquid cleaner or solvent, as damage may result.

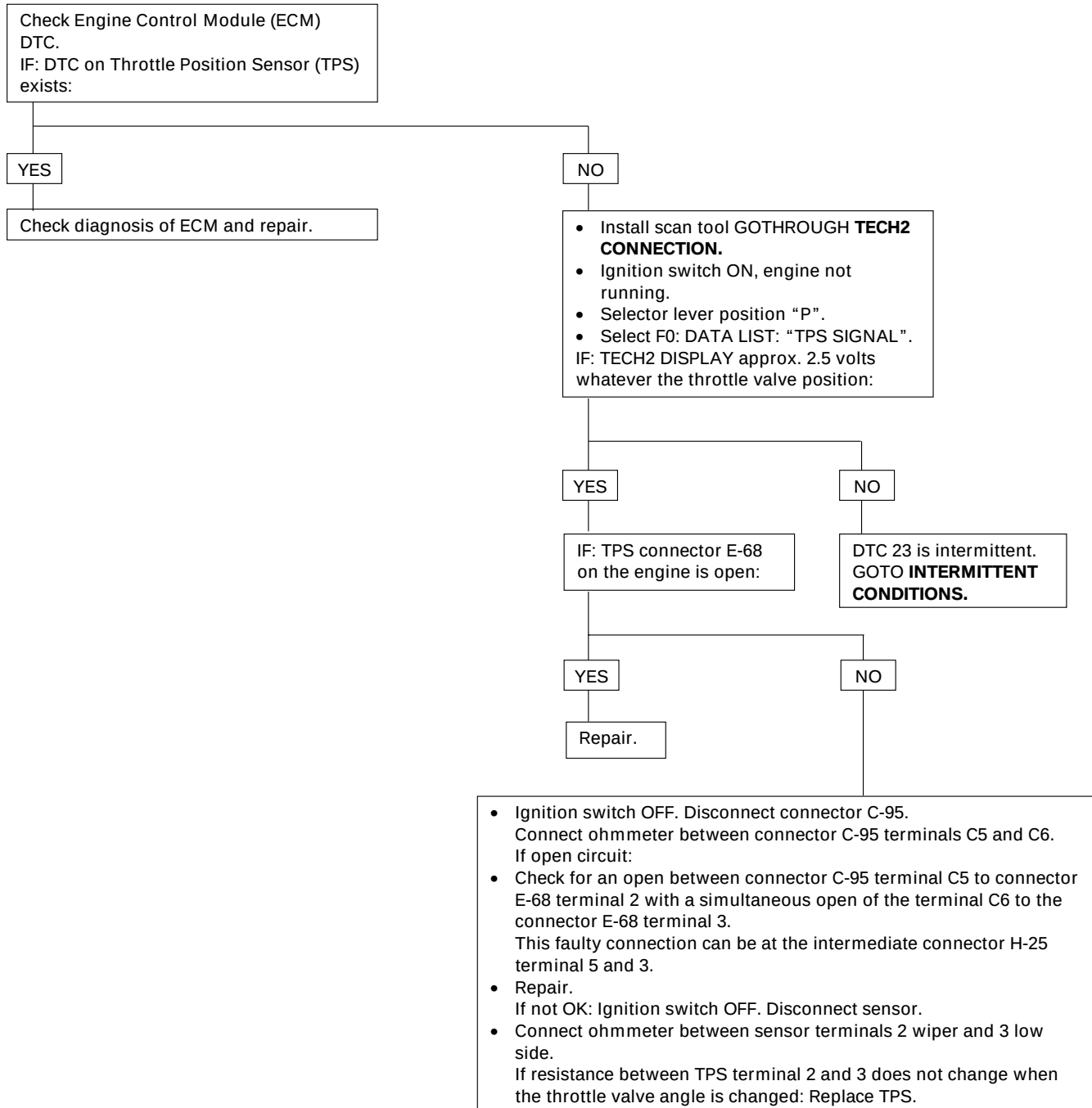
Diagnostic Aids:

- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions:
 - ① This detects the terminals C5 and C6 open or the connector E-68 open.
 - ② Throttle value opening > 42%.
 - ③ Engine Speed < 2200 RPM.
 - ④ Vehicle Speed < 3 Km/h.
 - ⑤ No DTC: Engine Speed DTC13, Output Speed DTC11. Downshift Protection DTC62.
 - ⑥ Only with Selector Lever in Park or Neutral.
 - ⑦ The detection is authorized only during 6 seconds after ignition switch ON.
 - ⑧ The conditions need to be present for at least 3 seconds.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 23

THROTTLE POSITION SENSOR CONNECTOR OPEN



DIAGNOSTIC TROUBLE CODE (DTC) 25

SUPPLY VOLTAGE TOO LOW

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

The ignition voltage of Transmission Control Module (TCM) terminals A7 and A8 is monitored by the TCM and when the voltage is too low (approx. 9 volts) the DTC25 is stored and the BACKUP MODE is set.

Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① Ignition voltage measured between TCM terminal A7 or A8 and ground C1 is lower than specification.

Specification decreases with the transmission oil temperature:

$-40^{\circ}\text{C} (-40^{\circ}\text{F}) = 8.7 \text{ volts}$

90°C (194°F) = 9.0 volts

150°C (304°F) = 9.2 volts

- ② The condition needs to be present for at least 1 second

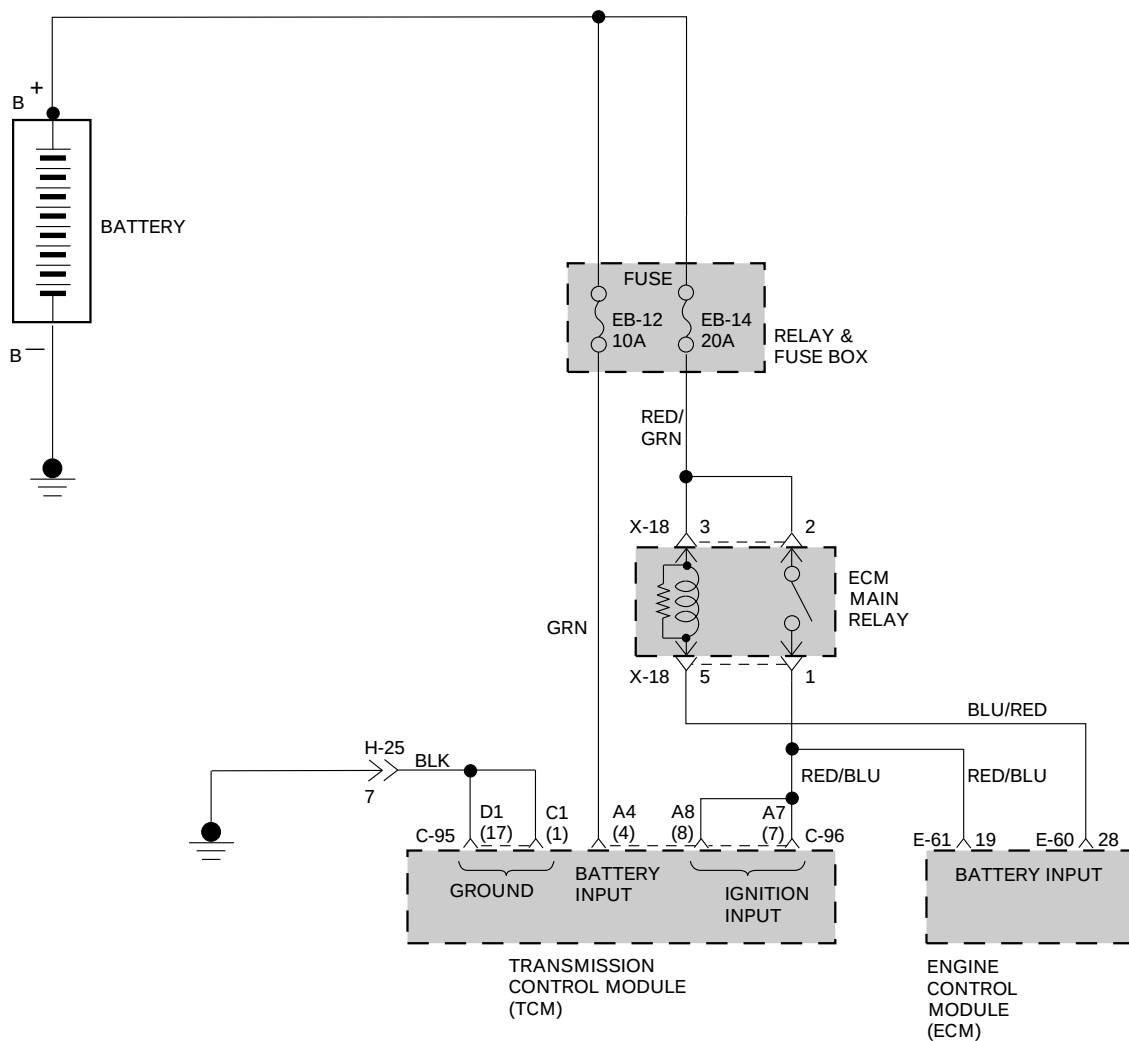
- Action after the detection time: BACKUP MODE
- Recovery conditions: To recover, the ignition voltage must be higher than specification.

Specification decreases with the transmission oil temperature:

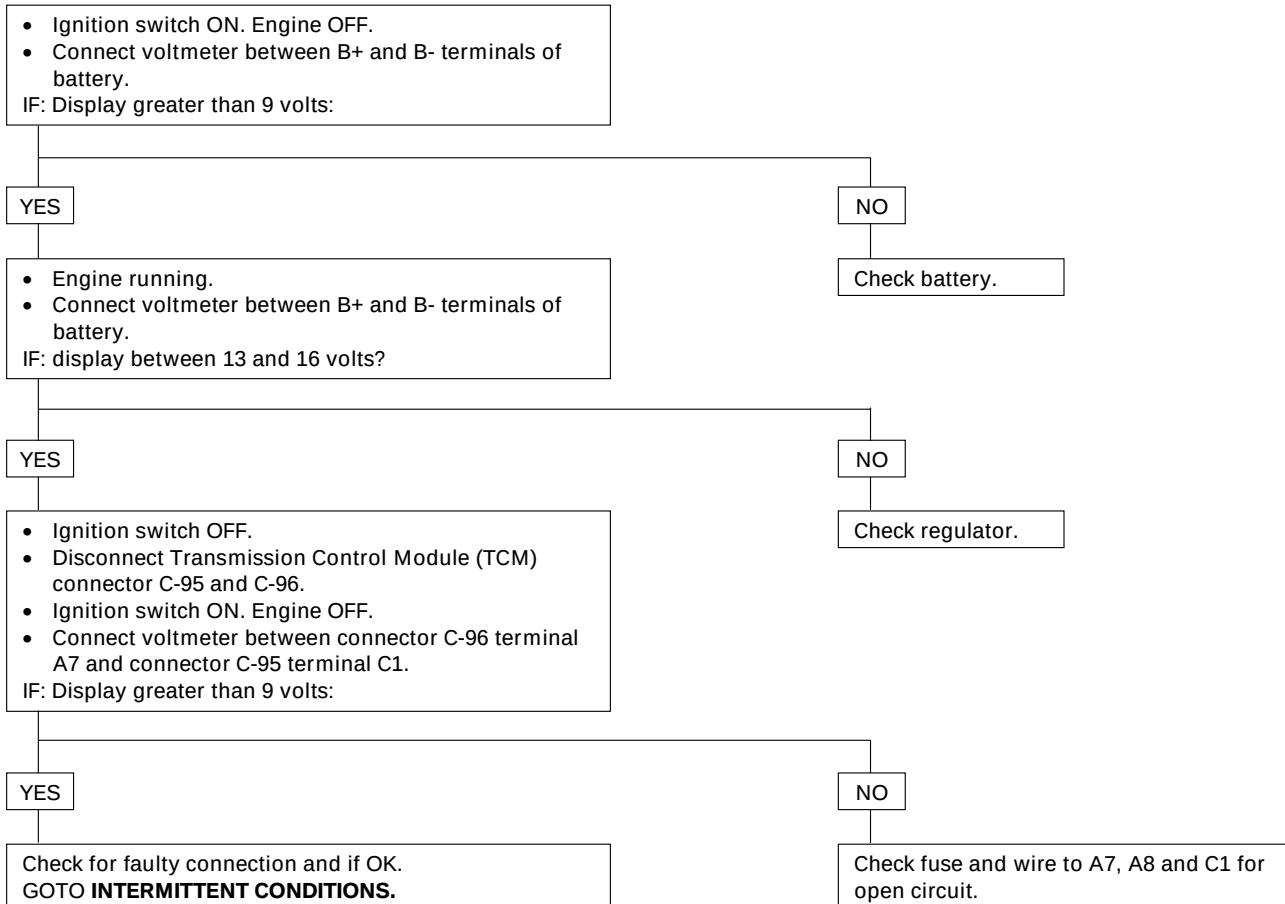
$-40^{\circ}\text{C} (-40^{\circ}\text{F}) = 9.2 \text{ volts}$

90°C (194°F) = 9.5 volts

150°C (304°F) = 9.6 volts



DIAGNOSTIC TROUBLE CODE (DTC) 25
SUPPLY VOLTAGE TOO LOW



DIAGNOSTIC TROUBLE CODE (DTC) 26

SUPPLY VOLTAGE TOO HIGH

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

The ignition voltage of Transmission Control Module (TCM) terminals A7 and A8 is monitored by the TCM and when the voltage is too high (approx. 16 volts) the DTC26 is stored and the BACKUP MODE is set.

Diagnostic Aids:

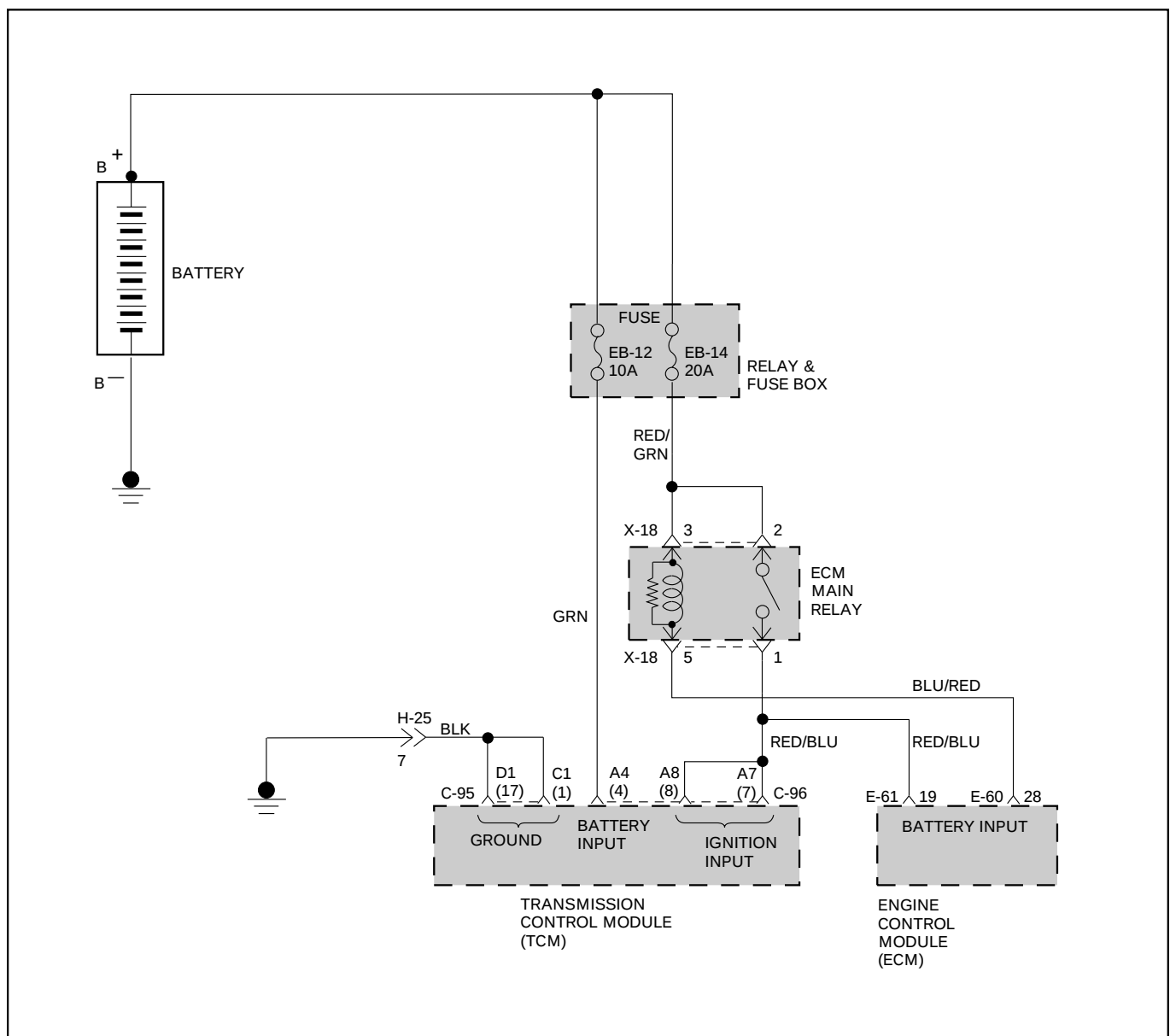
- This Diagnostic is an electrical test done by the TCM.

- Detection conditions:

- ① Ignition voltage measured between TCM terminal A7 or A8 and ground C1 is higher than 15.5 volts.
- ② The condition needs to be present for at least 1 second.

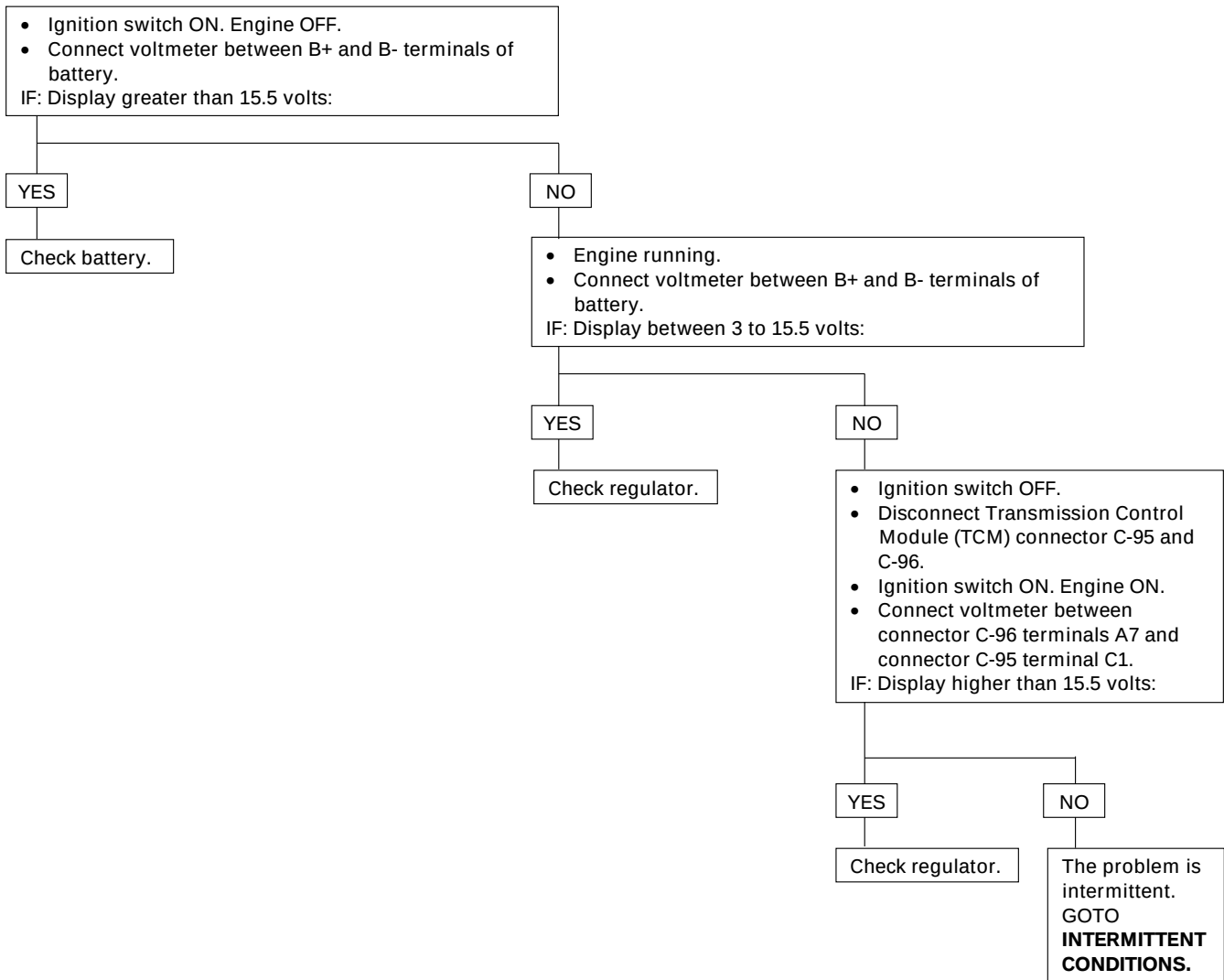
- Action after the detection time : BACKUP MODE

- Recovery conditions: To recover, ignition voltage ≤ 15.5 volts.



DIAGNOSTIC TROUBLE CODE (DTC) 26

SUPPLY VOLTAGE TOO HIGH



DIAGNOSTIC TROUBLE CODE (DTC) 31

SOLENOID A SHORT TO GROUND OR OPEN

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

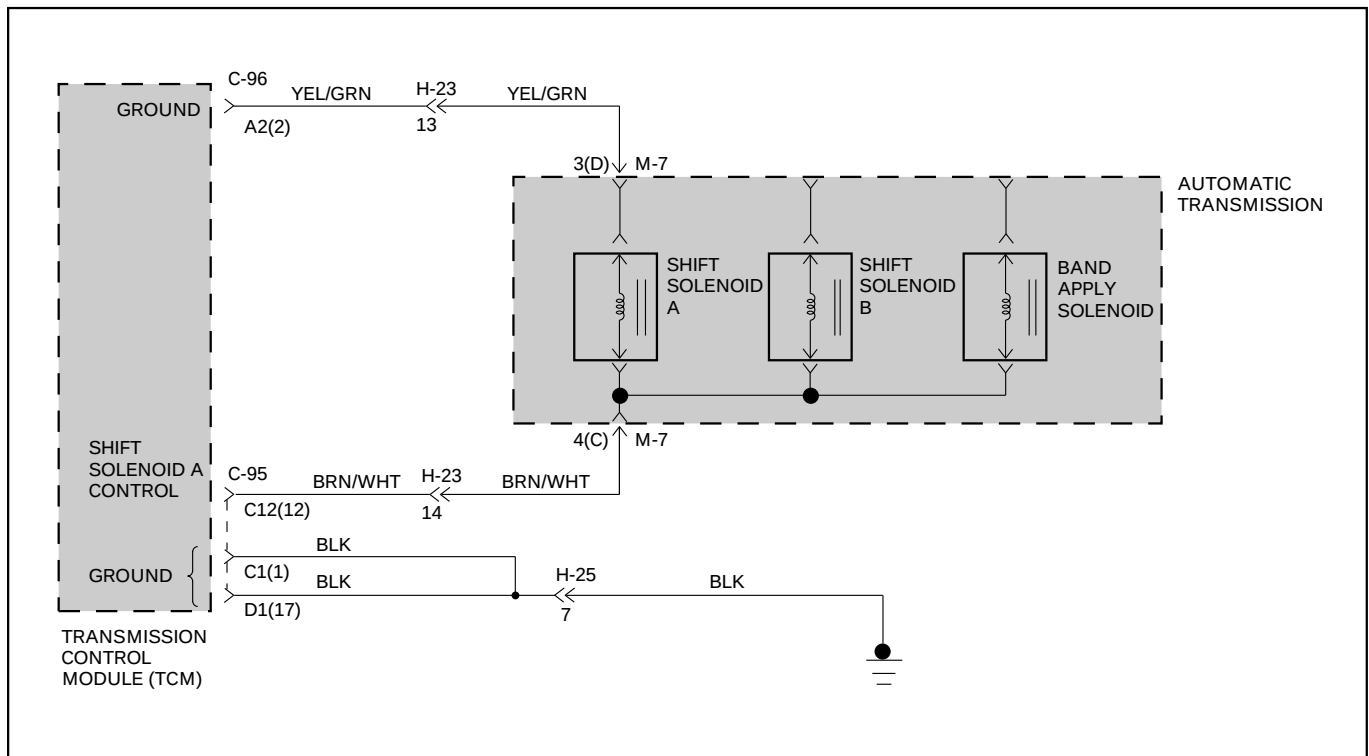
Circuit Description:

- The solenoid A is a simple ON/OFF solenoid located in the main case valve body. The solenoid is the normally closed-type. In second or third gear the Transmission Control Module (TCM) energizes the solenoid to open a fluid inlet port. When the port is open, fluid pressure actuates the shift valve.
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when ignition is OFF the HSD is turned OFF.
- The TCM continually monitors the solenoid connection to its Low Side Driver (LSD) for either low or high voltage. The LSD is a circuit of the TCM that acts as a switch between the solenoid and ground. When the solenoid is commanded ON the TCM is switching the solenoid to ground.

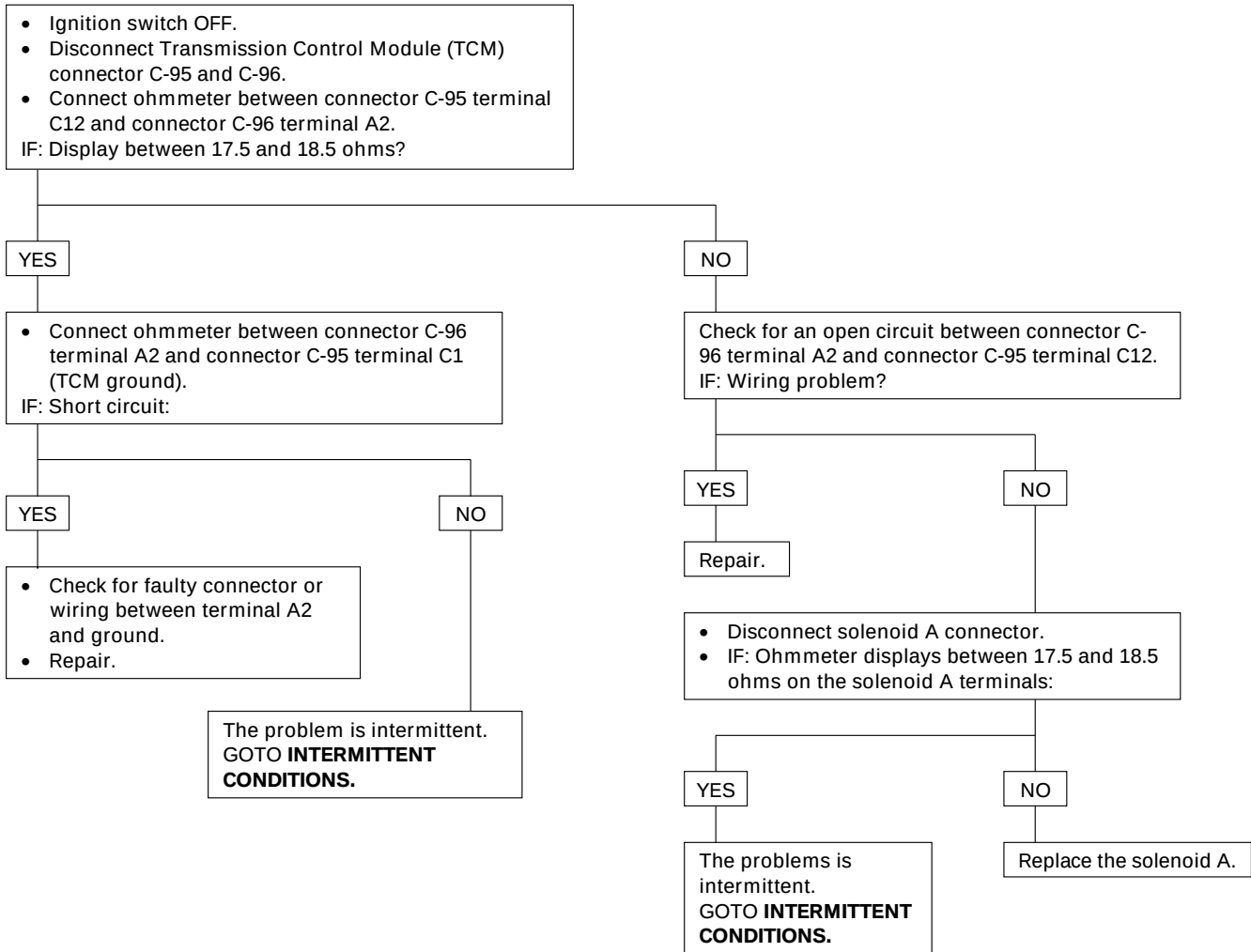
- There are two tests of the LSD: When the engine is cranked (DTC82) and when the ignition is turned ON (DTC31).
- When the ignition is turned ON, and before the engine is cranked, the TCM activates the shift solenoids (A, B and Band) to check for short circuits or open circuits. To do so the gear is set to 4th, 3rd, 1st, 1st with band apply, 4th with no HSD. Each one of the 5 tests requires 0.15 second. If the engine is cranked before the end of all tests, the remaining tests are not done.

Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - The solenoid low side connected to TCM terminal A2 is shorted to ground or open.
 - The test is only done when ignition is ON.
 - Engine Speed < 480 RPM (not cranked) and Output Speed = 0 RPM.
 - The conditions need to be present for 0.15 to 1.03 second after ignition switch ON.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



**DIAGNOSTIC TROUBLE CODE (DTC) 31
SOLENOID A SHORT TO GROUND OR OPEN**



DIAGNOSTIC TROUBLE CODE (DTC) 32

SOLENOID B SHORT TO GROUND OR OPEN

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

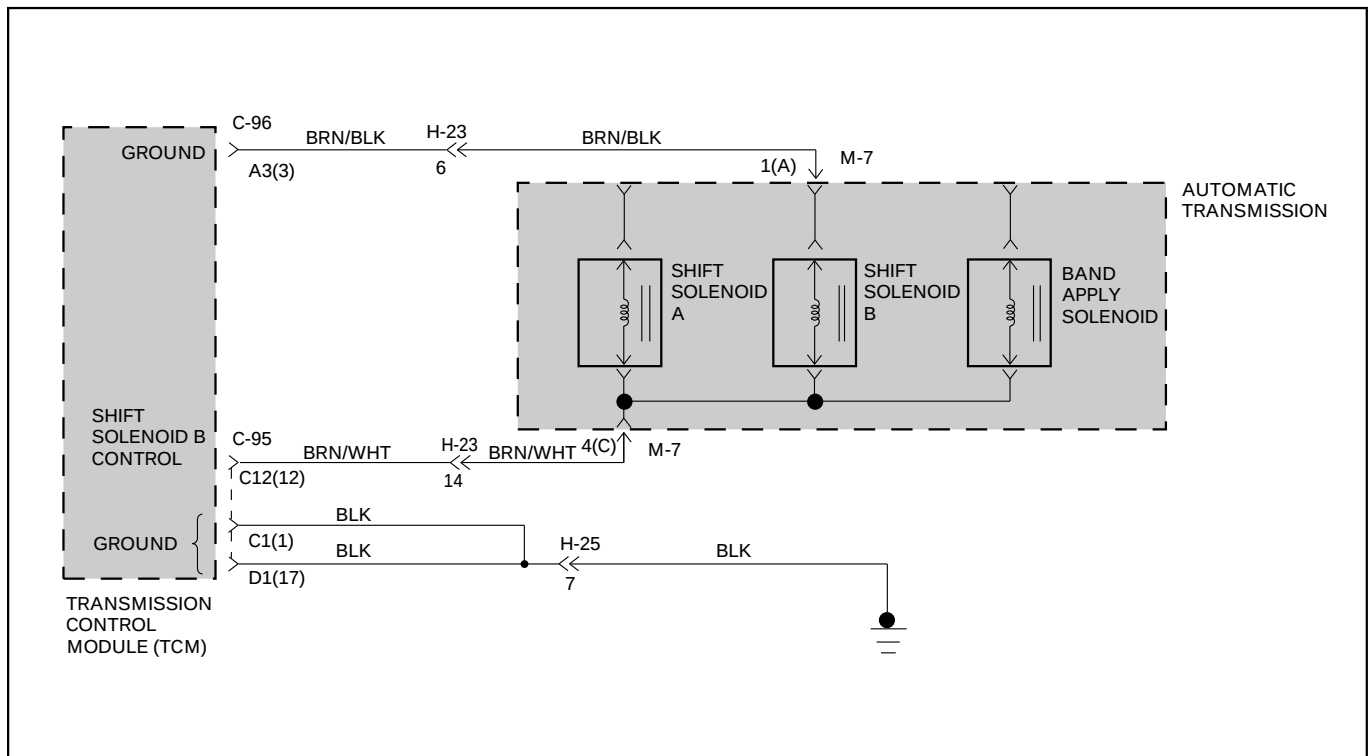
Circuit Description:

- The solenoid B is a simple ON/OFF solenoid located in the main case valve body. The solenoid is the normally open-type. When the port is open, fluid pressure actuates the shift valve. In first or second gear the Transmission Control Module (TCM) energizes the solenoid to close a fluid inlet port.
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when ignition is OFF the HSD is turned OFF.
- The TCM continually monitors the solenoid connection to its Low Side Driver (LSD) for either low or high voltage. The LSD is a circuit of the TCM that acts as a switch between the solenoid and ground. When the solenoid is commanded ON the TCM is switching the solenoid to ground.

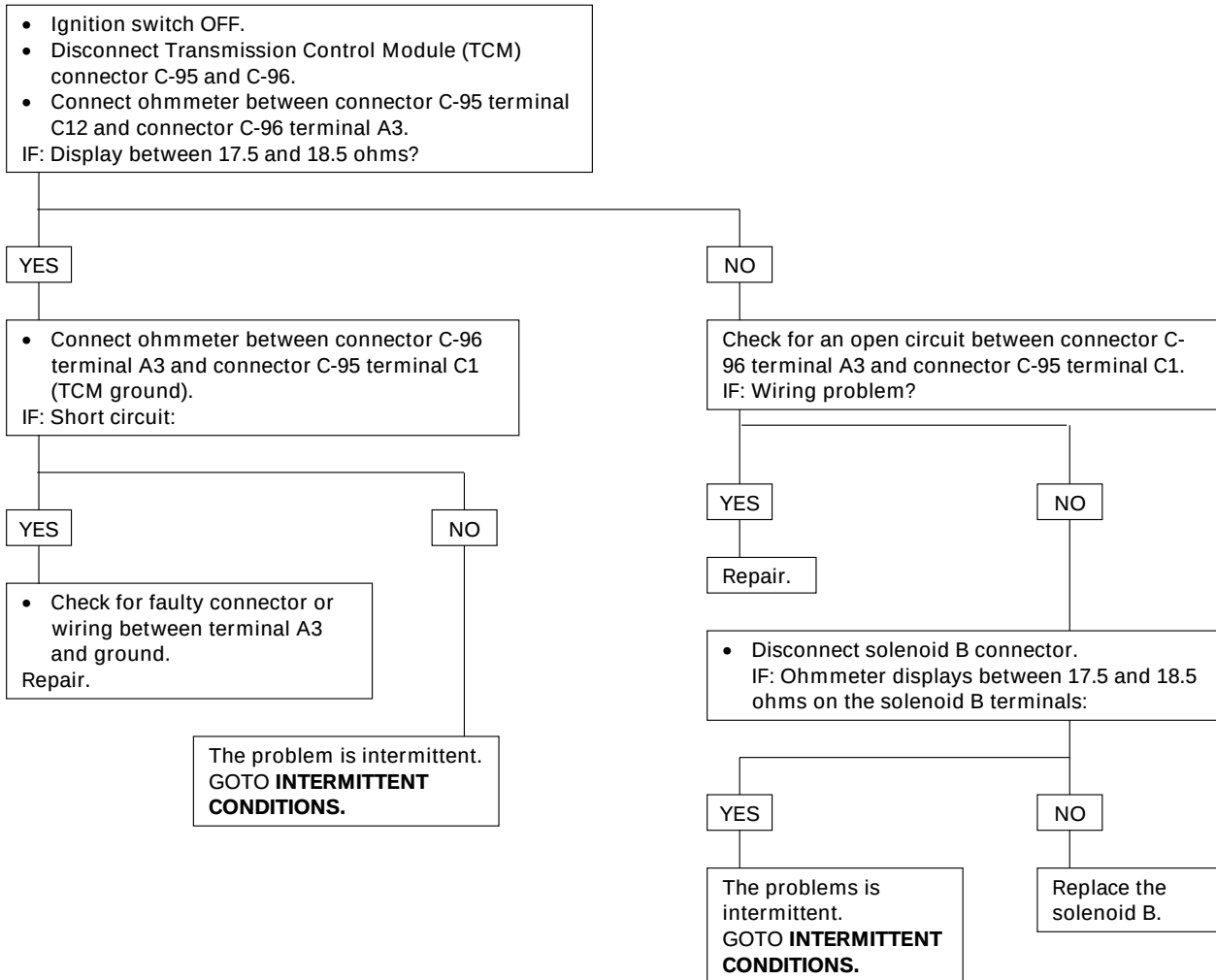
- There are two tests of the LSD: When the engine is cranked (DTC82) and when the ignition is turned ON (DTC32).
- When the ignition is turned ON, and before the engine is cranked, the TCM activates the shift solenoids (A, B and Band) to check for short circuits or open circuits. To do so the gear is set to 4th, 3rd, 1st, 1st with band apply, 4th with no HSD. Each one of the 5 tests requires 0.15 second. If the engine is cranked before the end of all tests, the remaining tests are not done.

Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - The solenoid low side connected to TCM terminal A3 is shorted to ground or open.
 - The test is only done when ignition is ON.
 - Engine Speed < 480 RPM (not cranked) and Output Speed = 0 RPM.
 - The conditions need to be present for 0.15 to 0.88 second after ignition switch ON.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



**DIAGNOSTIC TROUBLE CODE (DTC) 32
SOLENOID B SHORT TO GROUND OR OPEN**



DIAGNOSTIC TROUBLE CODE (DTC) 33

TCC HIGH SHORT TO PLUS OR OPEN

This DTC flashes the CHECK TRANS indicator and does NOT set the BACKUP MODE.

Circuit Description:

- The Torque Converter Clutch (TCC) solenoid is a simple ON/OFF solenoid connected to the adapter case valve body. When the solenoid is energized by the Transmission Control Module (TCM), it opens a fluid port. When the port is open, line pressure actuates the converter clutch control valve which engages the torque converter clutch by exhausting the fluid. The TCM engages the torque converter clutch only when all of the following conditions exist:
 - ① The transmission is at operating temperature.
 - ② The brake pedal is released.
 - ③ The transmission is operating in second, third or fourth gear.
 - ④ The engine is warm (more than 70°C).
 - ⑤ The shift pattern requests TCC apply.
 - ⑥ Shift finished.
 - ⑦ No malfunction which will disable the TCC: DTC43, DTC55 (only short to ground).
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoid and the supply voltage. The High side of the TCC solenoid is used to turn the TCC ON or OFF because the Low side is permanently connected

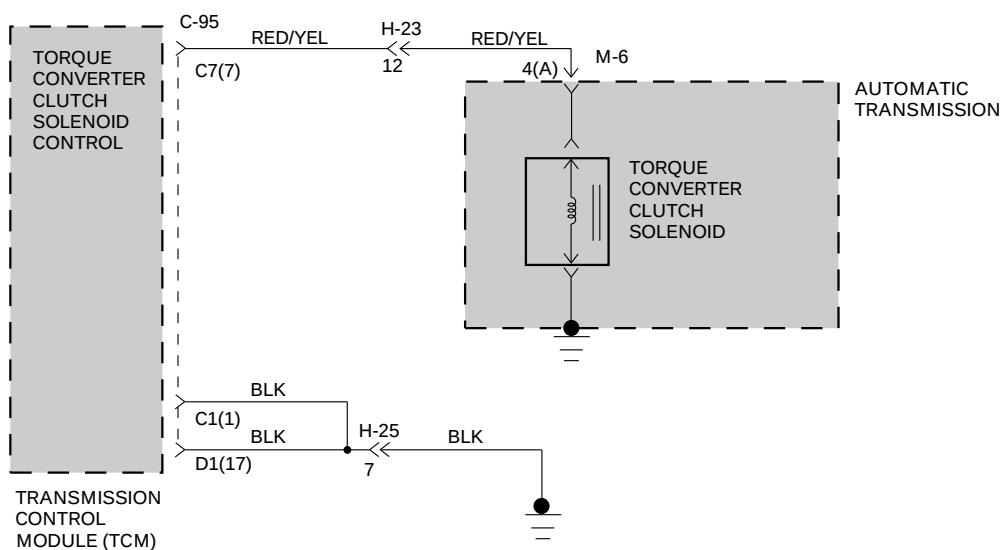
to the ground of the transmission. In BACKUP MODE or when ignition is turned OFF the TCC High Side is turned OFF.

- The TCM continually monitors the solenoid connection to its High Side Driver for either low or high voltage.
- There is only one test of the HSD for TCC: when the engine is cranked and the TCC is turned ON.
- If this circuit is shorted to plus, the TCC solenoid is constantly commanded ON (shifts can be firm). In 1st gear the TCC is hydraulically OFF, whatever the TCC solenoid position. This means that the car can be driven even with the TCC shorted to voltage. The engine could stall when the driver is braking strongly, if the car is stopped when the transmission is still in second gear with TCC applied.

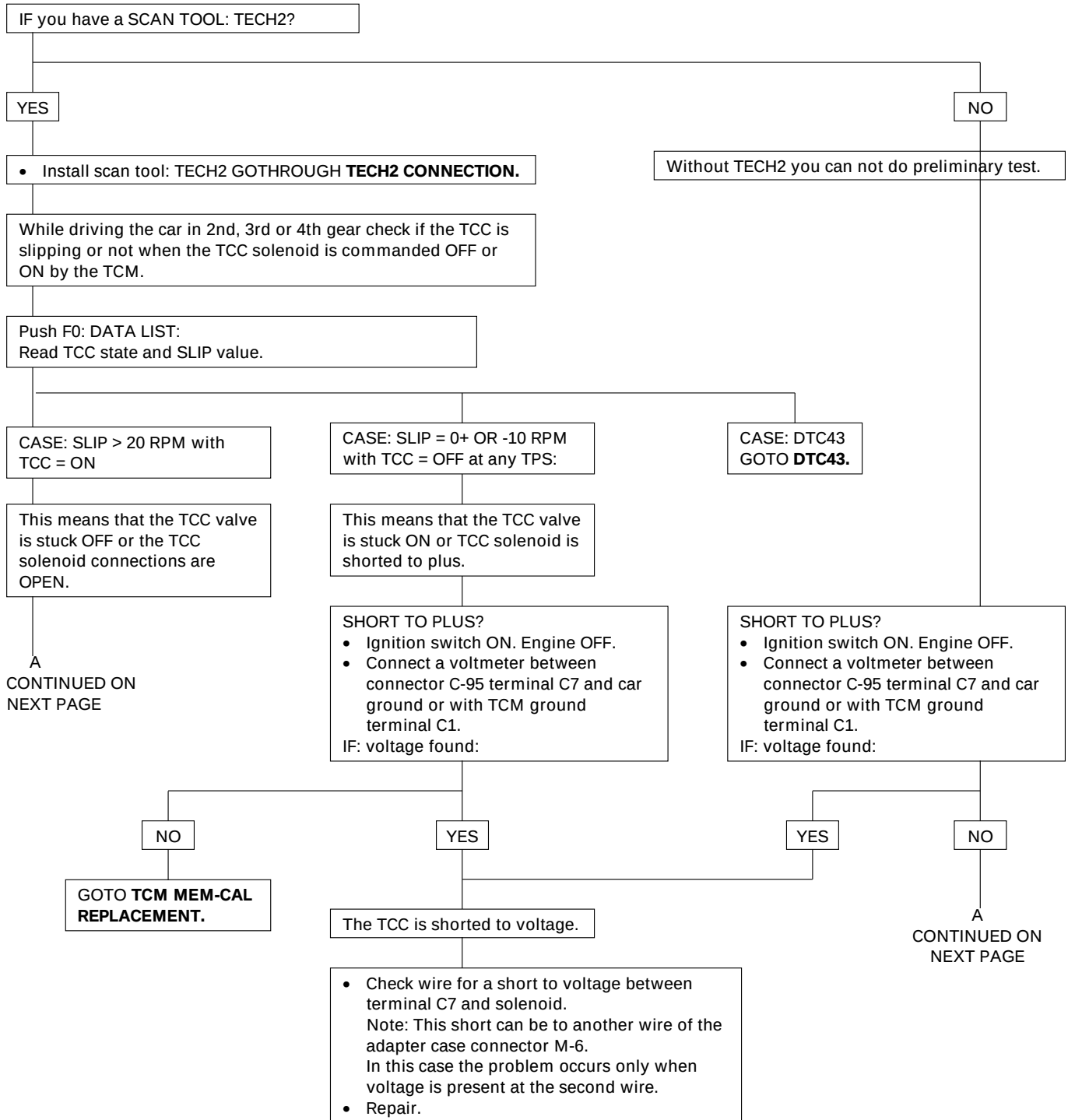
Note: The 3-2 shifts are very firm.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① The solenoid high side connected to TCM terminal C7 is shorted to voltage or open.
 - ② The condition needs to be present for 0.13 second.
- Action after the detection time:
 - ① TCC is turned OFF.
 - ② CHECK TRANS indicator turned ON.
- Recovery conditions: To recover, do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 33
TCC HIGH SHORT TO PLUS OR OPEN

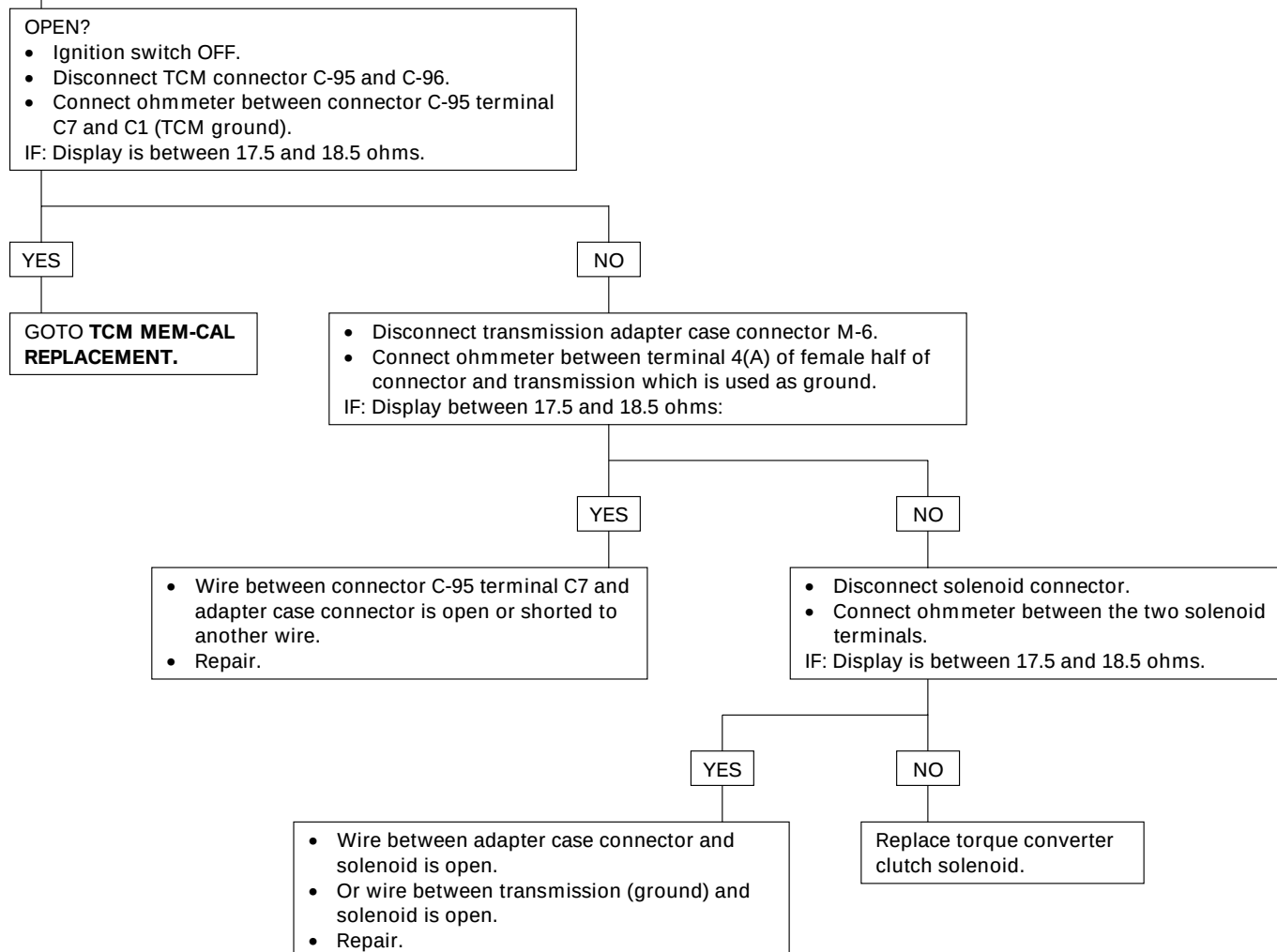


TCC: Torque Converter Clutch
 TCM: Transmission Control Module

DIAGNOSTIC TROUBLE CODE (DTC) 33
TCC HIGH SHORT TO PLUS OR OPEN
(CONTINUED)

CONTINUED FROM
PREVIOUS PAGE

A



TCC: Torque Converter Clutch
TCM: Transmission Control Module

[illegible]

DIAGNOSTIC TROUBLE CODE (DTC) 34

BAND APPLY SOLENOID SHORT TO GROUND OR OPEN

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

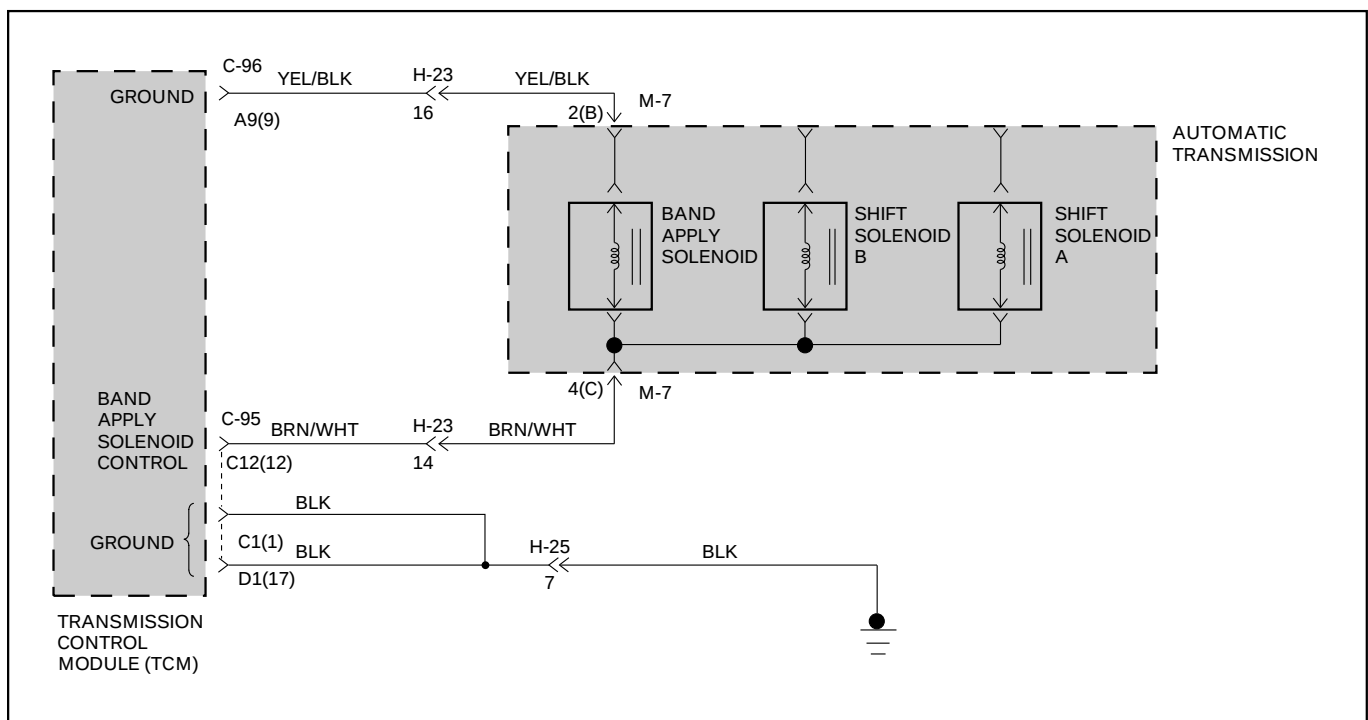
- The band apply solenoid is a normally open solenoid which controls the flow of fluid for brake band application. The Transmission Control Module (TCM) uses Pulse Width Modulation (PWM) and changes the duty cycle to control the solenoid. The TCM turns the solenoid ON (energized) and OFF (de-energized) at a constant frequency. The length of time the solenoid is energized during each ON/OFF cycle is called the pulse width. By varying or "modulating" the pulse width, the solenoid output pressure is changed. Since the solenoid is normally closed, increasing the pulse width increases the duty cycle and decreases the output pressure. PWM control provides smooth band application without an accumulator. The band is only applied in first and second gears.
- In the event of an electrical failure (open), the solenoid regulates at the maximum oil flow (0% duty cycle).
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when Ignition is OFF the HSD

is turned OFF.

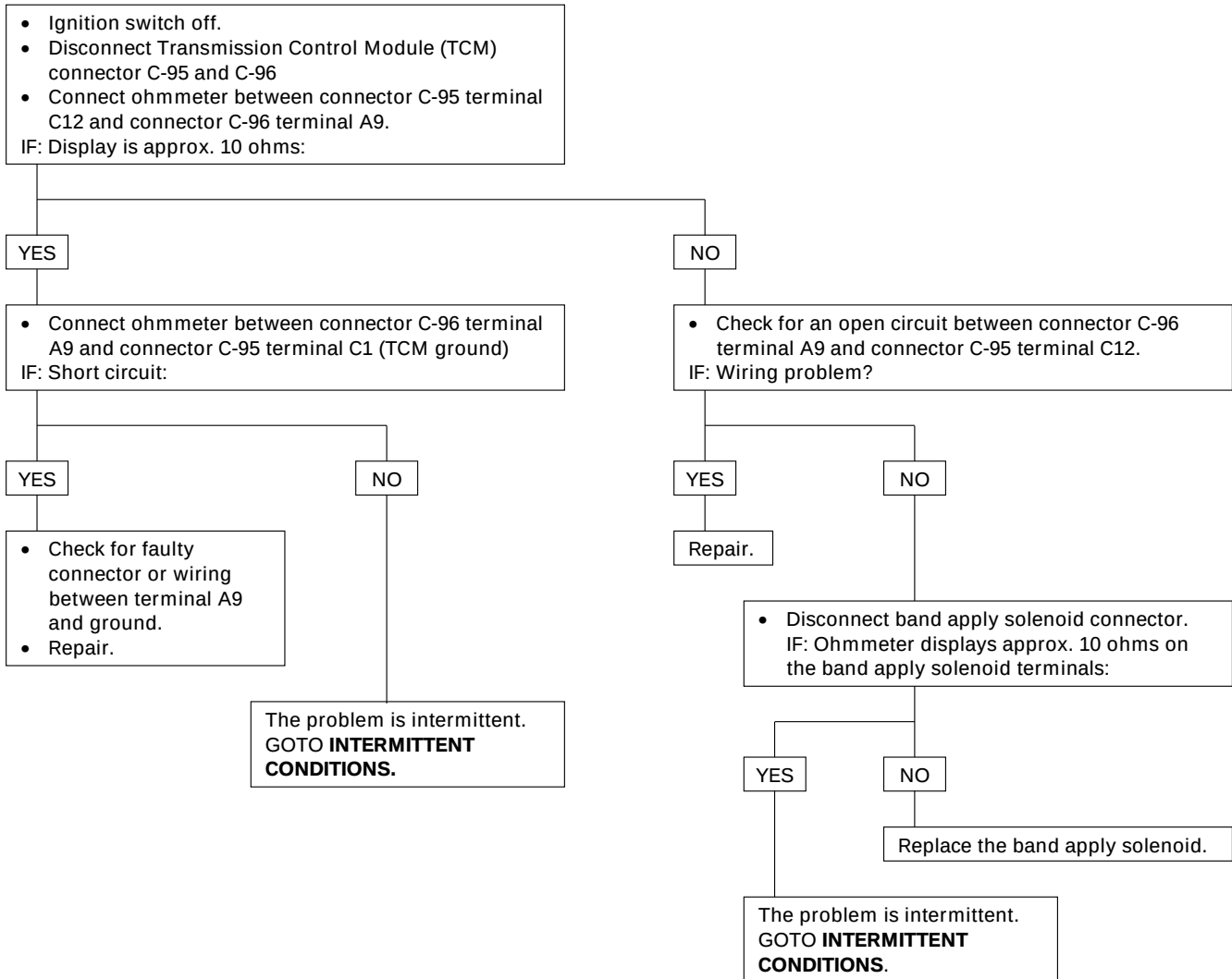
- The TCM continually monitors the splenoid connection to its Low Side Driver (LSD) for either low or high voltage. The LSD is a circuit of the TCM that acts as a switch between the solenoid and ground. When the solenoid is commanded ON the TCM is switching the solenoid to ground.
- There are two tests of the LSD: when the engine is cranked (DTC82) and when the ignition is turned ON (DTC34).
- When the ignition is turned ON, and before the engine is cranked, the TCM activates the shift solenoids (A, B and Band) to check for short circuits or open circuits. To do so the gear is set to 4th, 3rd, 1st, 1st with band apply, 4th with no HSD. Each one of the 5 tests requires 0.15 second. If the engine is cranked before the end of all tests, the remaining tests are not done.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① The solenoid Low side connected to TCM terminal A9 is shorted to ground or open.
 - ② The test is only done when ignition is ON.
 - ③ Engine Speed <480 RPM (not cranked) and Output Speed = 0 RPM.
 - ④ The condition needs to be present for 0.15 to 0.75 second after ignition switch ON.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



**DIAGNOSTIC TROUBLE CODE (DTC) 34
BAND APPLY SOLENOID SHORT TO GROUND OR OPEN**



DIAGNOSTIC TROUBLE CODE (DTC) 35

FORCE MOTOR OPEN OR SHORT TO PLUS OR GROUND

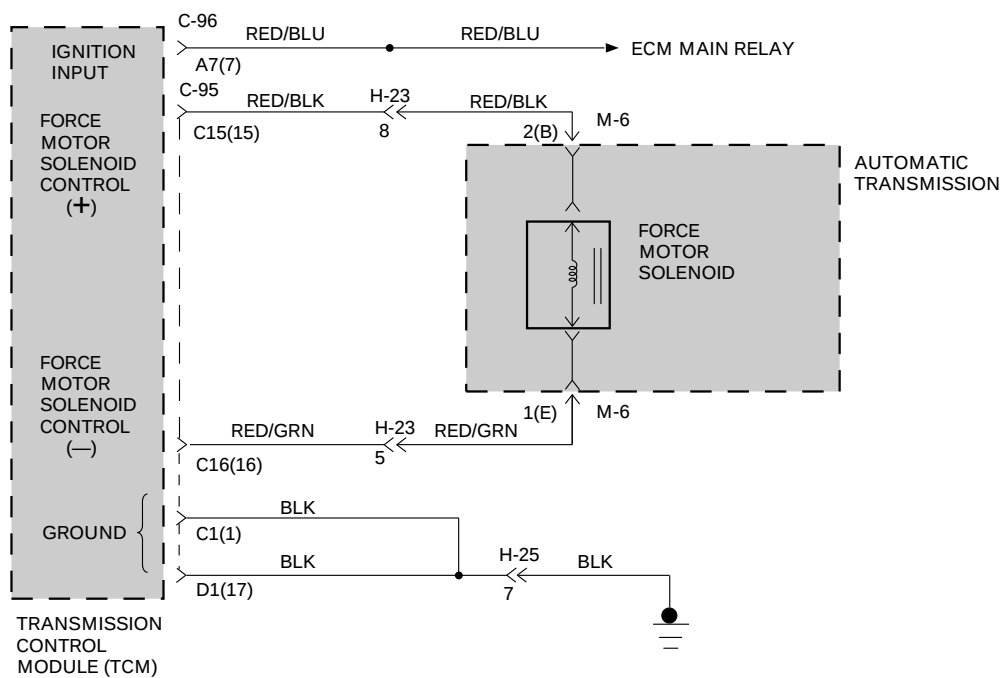
This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

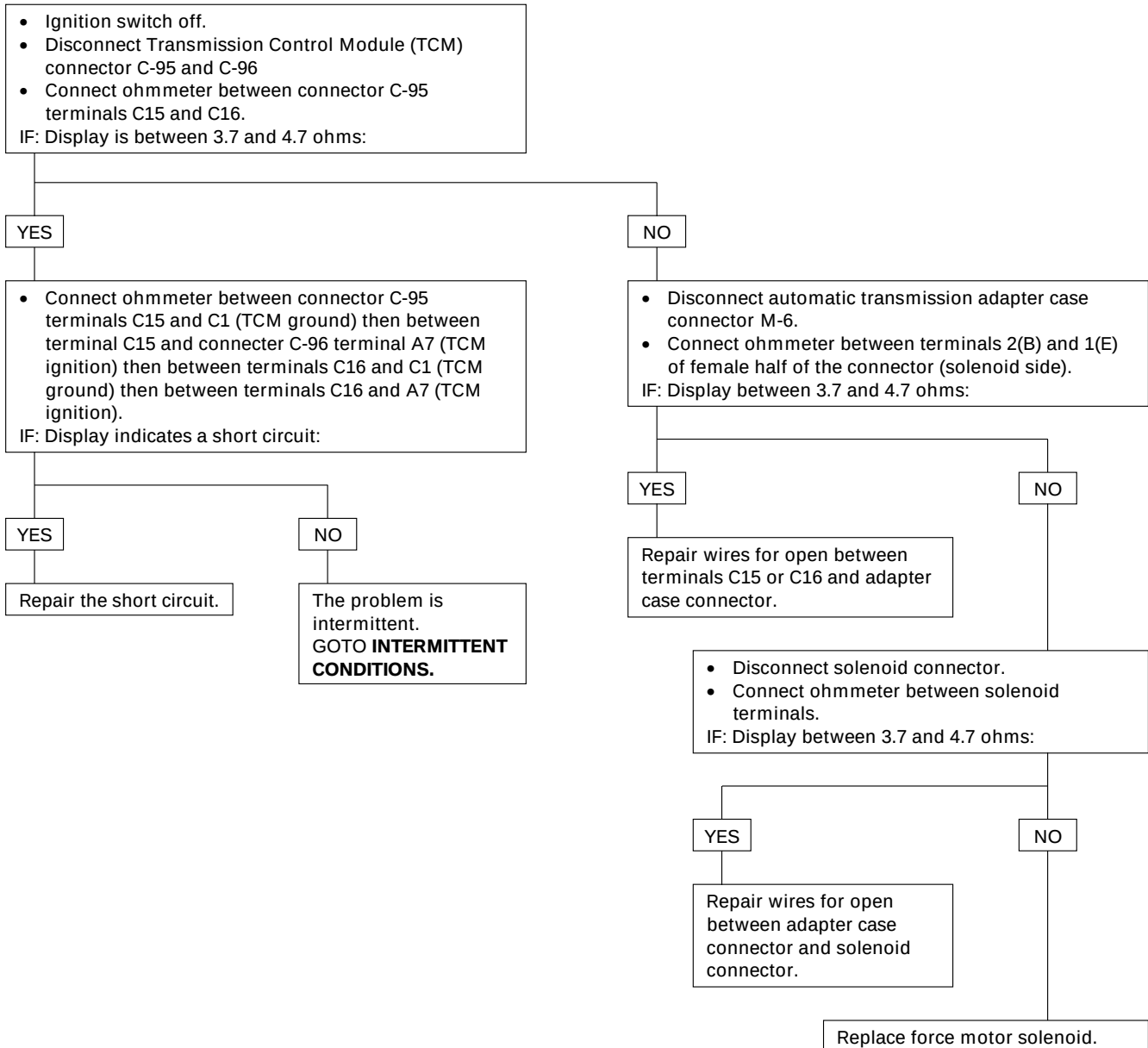
- The force motor solenoid is a device used to regulate transmission line pressure. The TCM uses TPS information and vehicle speed information to determine the line pressure appropriate for a given load. The TCM will regulate the pressure by applying a varying amperage to the force motor solenoid. The applied amperage can vary from 0.1 to 1.1 amp. The TCM then monitors the amperage at the return line. If the return amperage is more than 0.2 amp from the commanded amperage, the DTC is stored.
- The line pressure can vary from less than 50psi to more than 200 psi. The line pressure varies inversely to the amount of current. High current causes low pressure and low current causes high pressure.

Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
- The TCM monitors the amperage at the return line. When the return amperage is more than 0.2 amp from the commanded amperage, DTC is stored.
- Action after the detection time: BACKUP MODE
- Recovery conditions: To recover, do an IGNITION CYCLE.



**DIAGNOSTIC TROUBLE CODE (DTC) 35
FORCE MOTOR OPEN OR SHORT TO PLUS OR GROUND**



DIAGNOSTIC TROUBLE CODE (DTC) 36

SHIFT HIGH SHORT TO GROUND OR OPEN

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

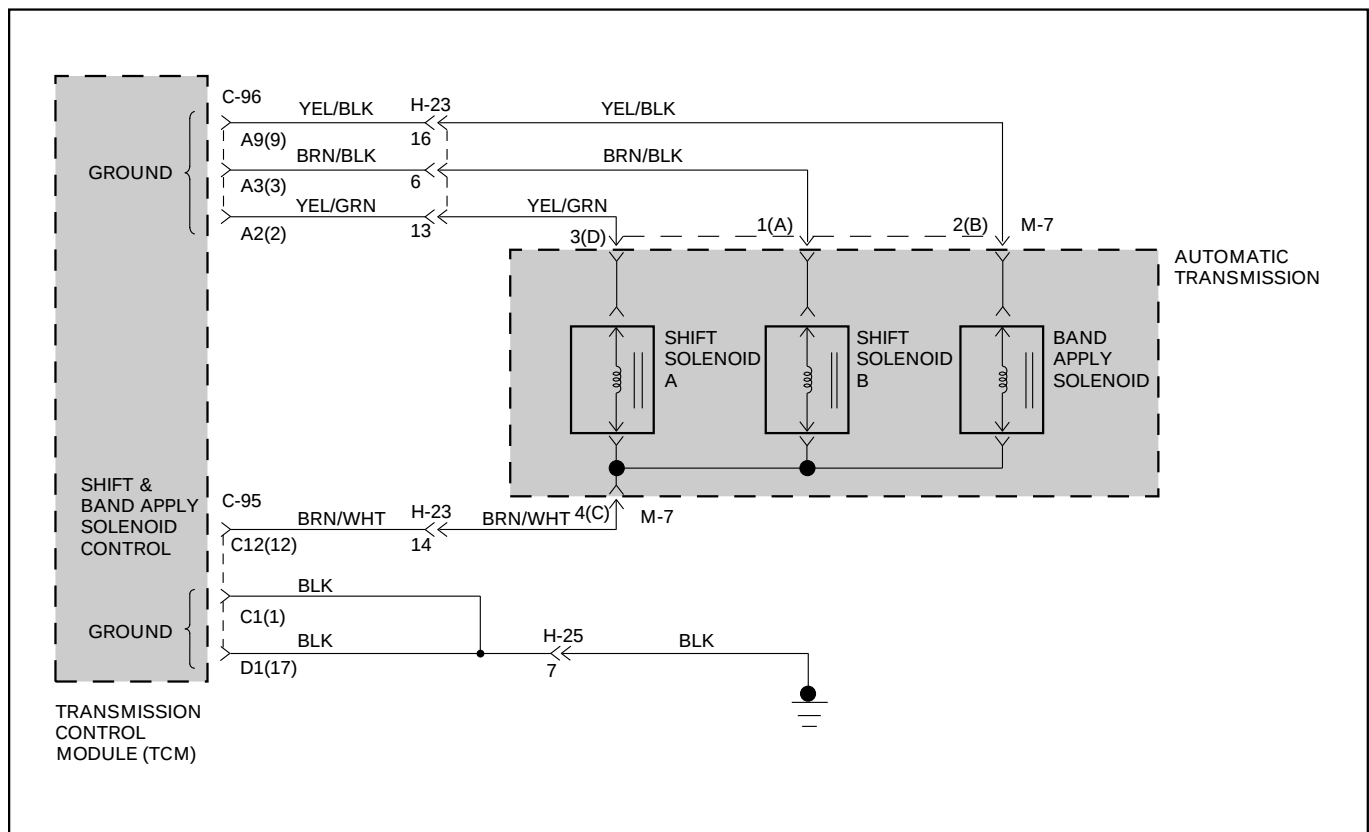
Circuit Description:

- The solenoids are activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the Transmission Control Module (TCM) that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when Ignition is OFF the High Side Driver is turned OFF.
- The TCM continually monitors the solenoid connection to its High Side Driver for either low or high voltage.
- There are two tests of the HSD: when the engine is cranked (DTC82) and when the ignition is turned ON (DTC36).
- When the ignition is turned ON, and before the engine is cranked, the TCM activates the shift

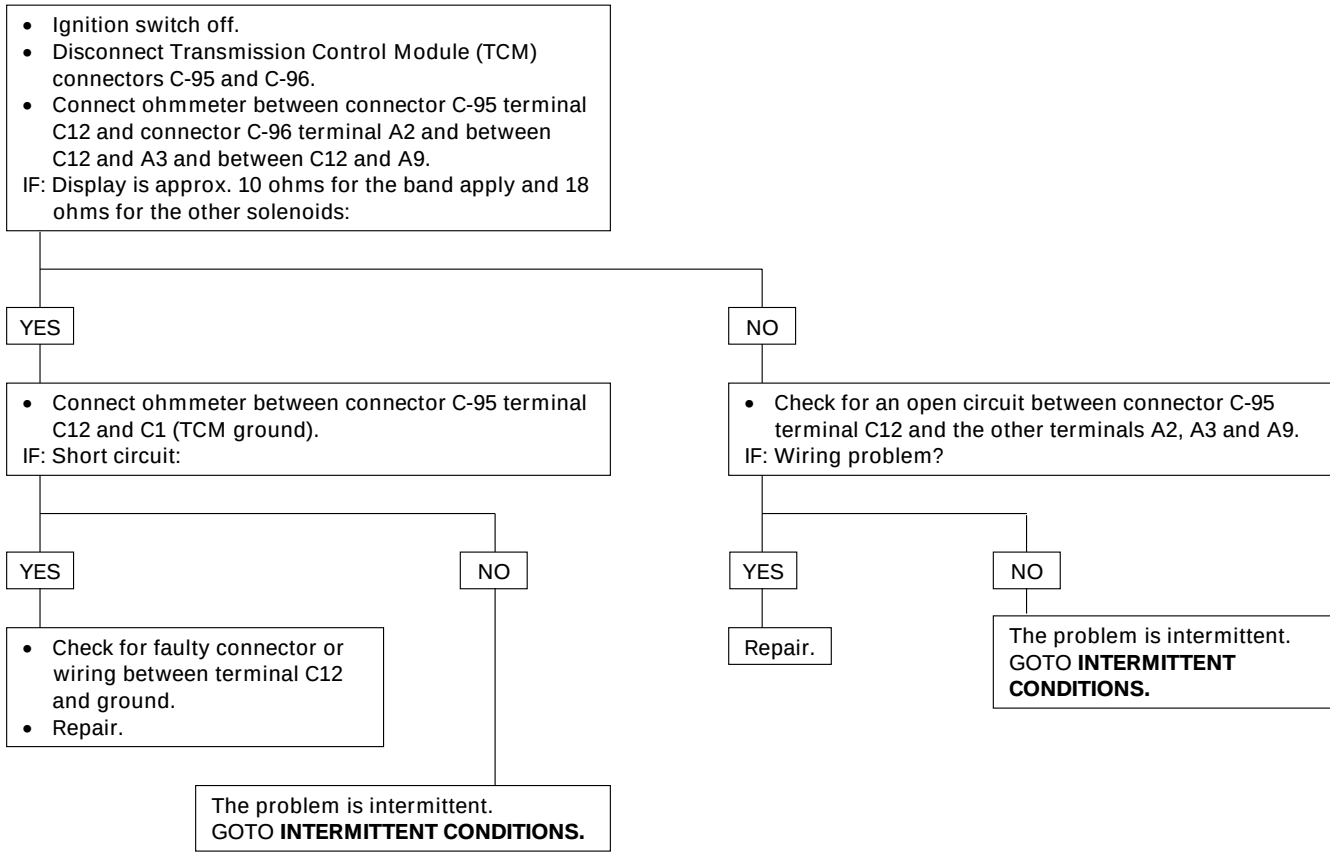
solenoids (A, B and Band) to check for short circuits or open circuits. To do so the gear is set to 4th, 3rd, 1st, 1st with band apply, 4th with no HSD. Each one of the 5 tests requires 0.15 seconds. If the engine is cranked before the end of all tests, the remaining tests are not done.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① The solenoid High side connected to TCM terminal C12 is shorted to ground or open.
 - ② The test is only done when ignition is ON.
 - ③ Engine Speed < 480 RPM (not cranked) and Output Speed = 0 RPM
 - ④ The condition needs to be present for 0.15 to 0.75 second after ignition switch ON.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



**DIAGNOSTIC TROUBLE CODE (DTC) 36
SHIFT HIGH SHORT TO GROUND OR OPEN**



DIAGNOSTIC TROUBLE CODE (DTC) 37 TORQUE MANAGEMENT SERIAL LINE FAULTY

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

- Torque Management is a function that decreases the engine torque during transmission shifts. To do so the Transmission Control Module (TCM) exchanges information on a wire with the Engine Control Module (ECM) that governs the Engine. This wire is the Data Link Connector which is also used by the Scan tool to communicate with the TCM and the ECM.

Diagnostic Aids:

- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions:
 - Torque control failure detected
 - Each time a shift occurs with the Torque Management active, the TCM sends a message to the ECM. If the ECM does not acknowledge this message, the DTC is stored.

- Action after the detection time: BACKUP MODE
- Recovery conditions: To recover, do an IGNITION CYCLE.

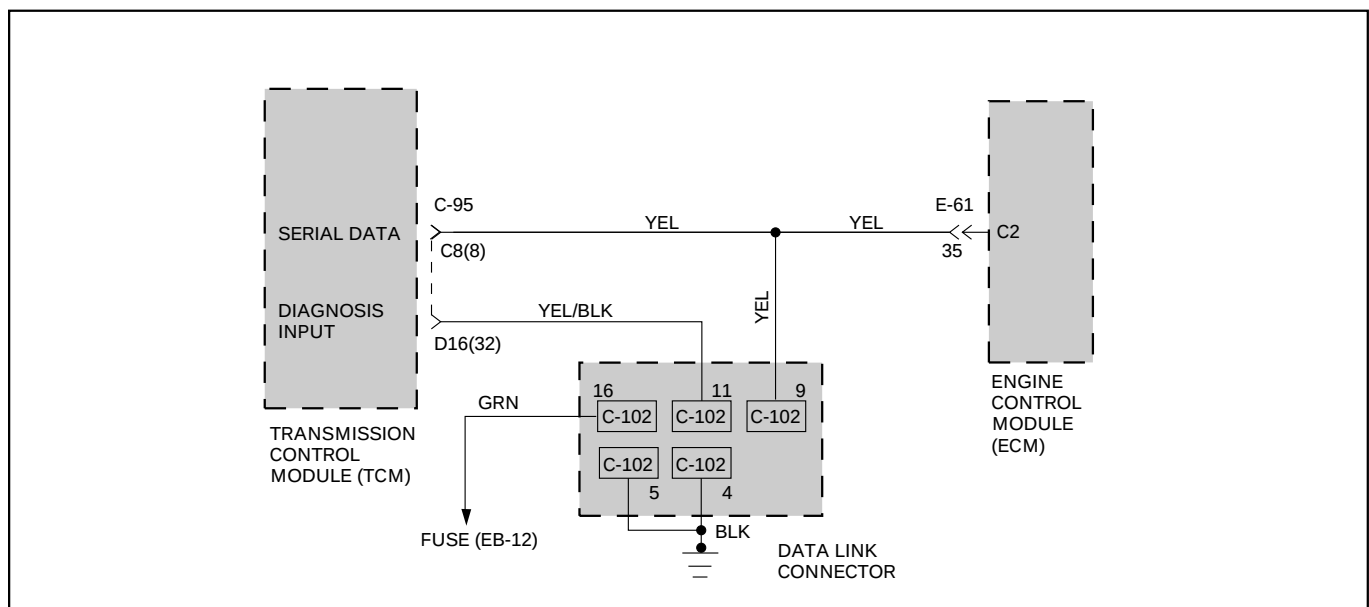
NOTE:

- When connecting the TECH2 to the data link connector, be sure to turn off the ignition switch.
- Since the torque management exchanges information between the TCM and the ECM at all times, the DTC37 is sometimes detects in the following condition.

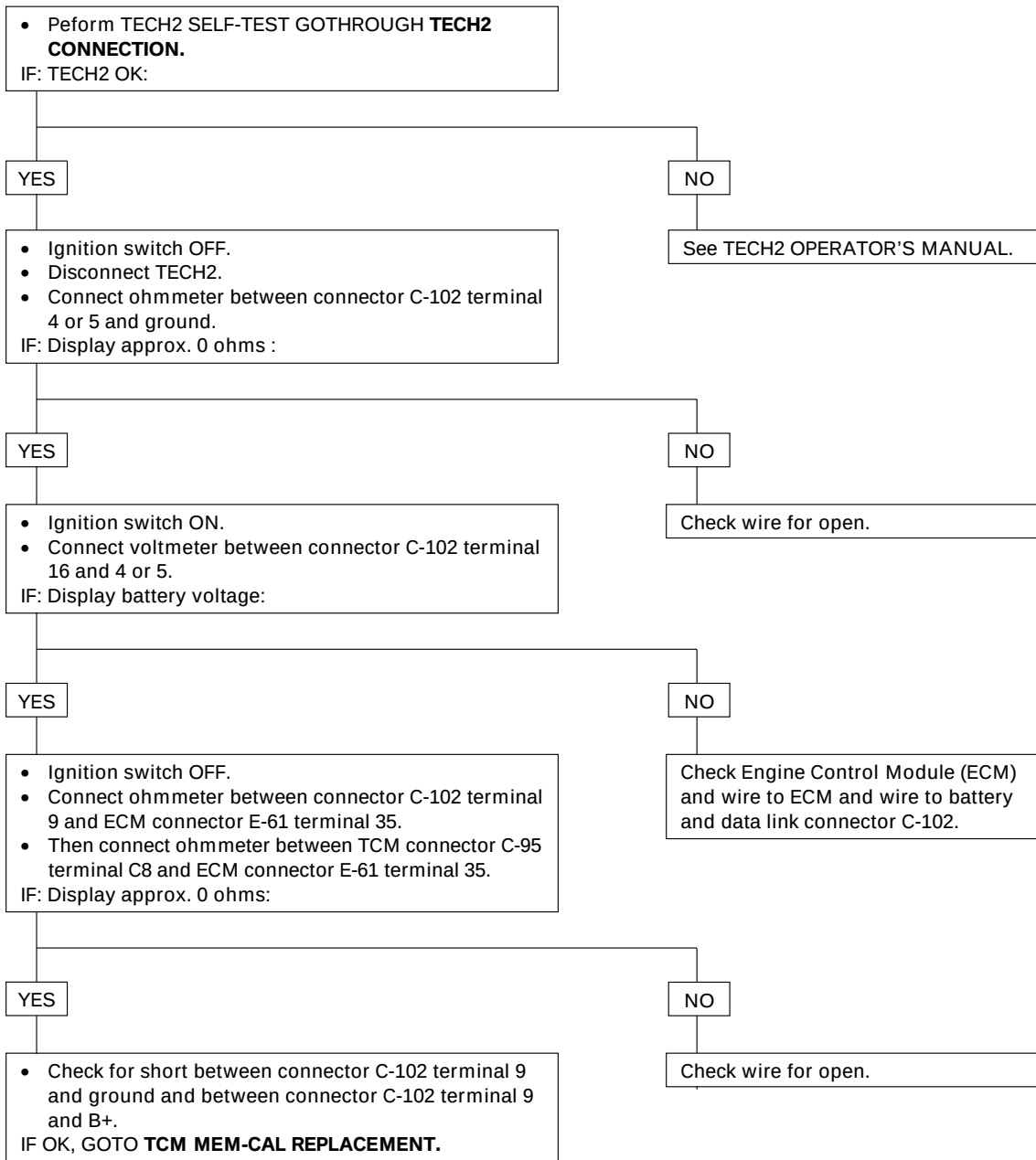
However, this is not an abnormal condition.

- When the engine stops while driving and then it is restarted.
- When the battery voltage goes down excessively and the engine does not start again.

When DTC37 is detected in the above conditions, turn off the ignition switch, correct the abnormal condition and erase the trouble code.



DIAGNOSTIC TROUBLE CODE (DTC) 37
TORQUE MANAGEMENT SERIAL LINE FAULTY



DIAGNOSTIC TROUBLE CODE (DTC) 41

SOLENOID A SHORT TO PLUS

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

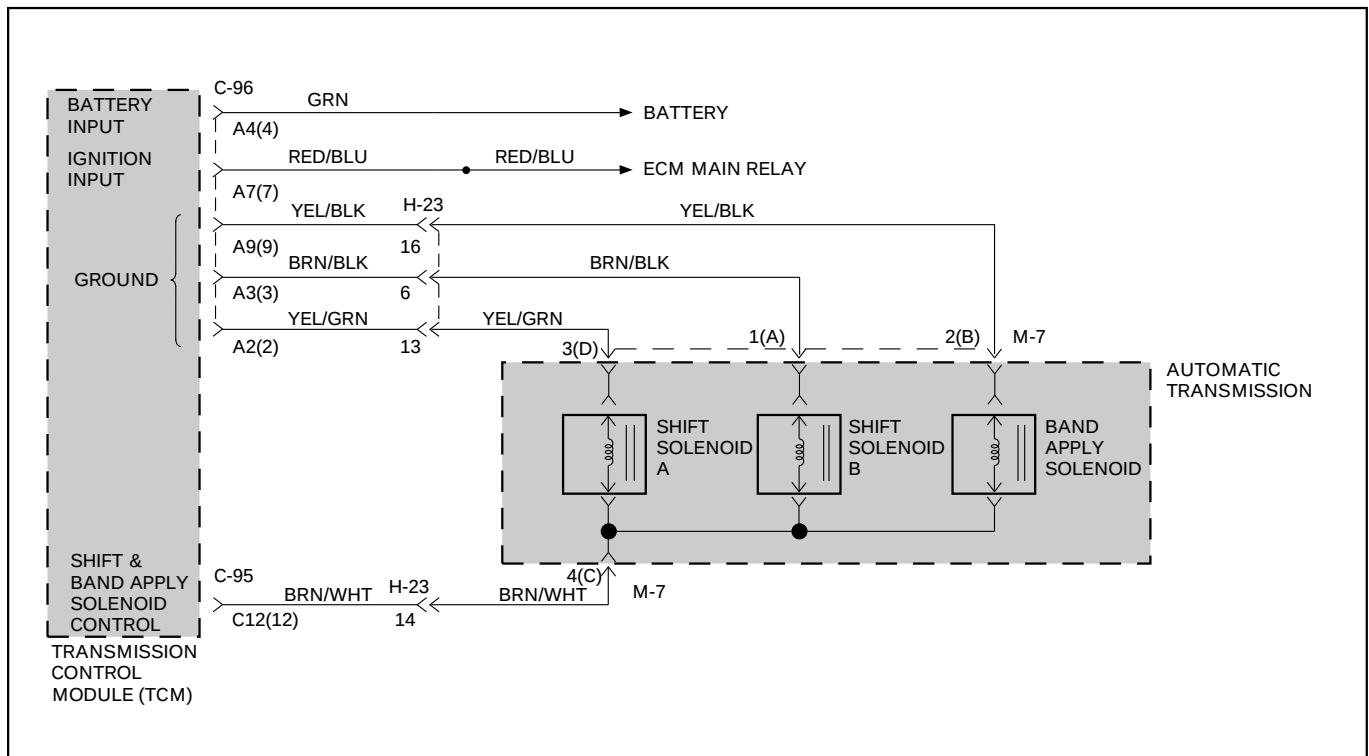
Circuit Description:

- The solenoid A is a simple ON/OFF solenoid located in the main case valve body. The solenoid is the normally closed-type. In second or third gear the Transmission Control Module (TCM) energizes the solenoid to open a fluid inlet port. When the port is open, fluid pressure actuates the shift valve.
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when ignition is OFF the HSD is turned OFF.
- The TCM continually monitors the solenoid connection to its Low Side Driver (LSD) for either low or high voltage. The LSD is a circuit of the TCM that acts as a switch between the solenoid and ground. When the solenoid is commanded ON the TCM is switching the solenoid to ground.

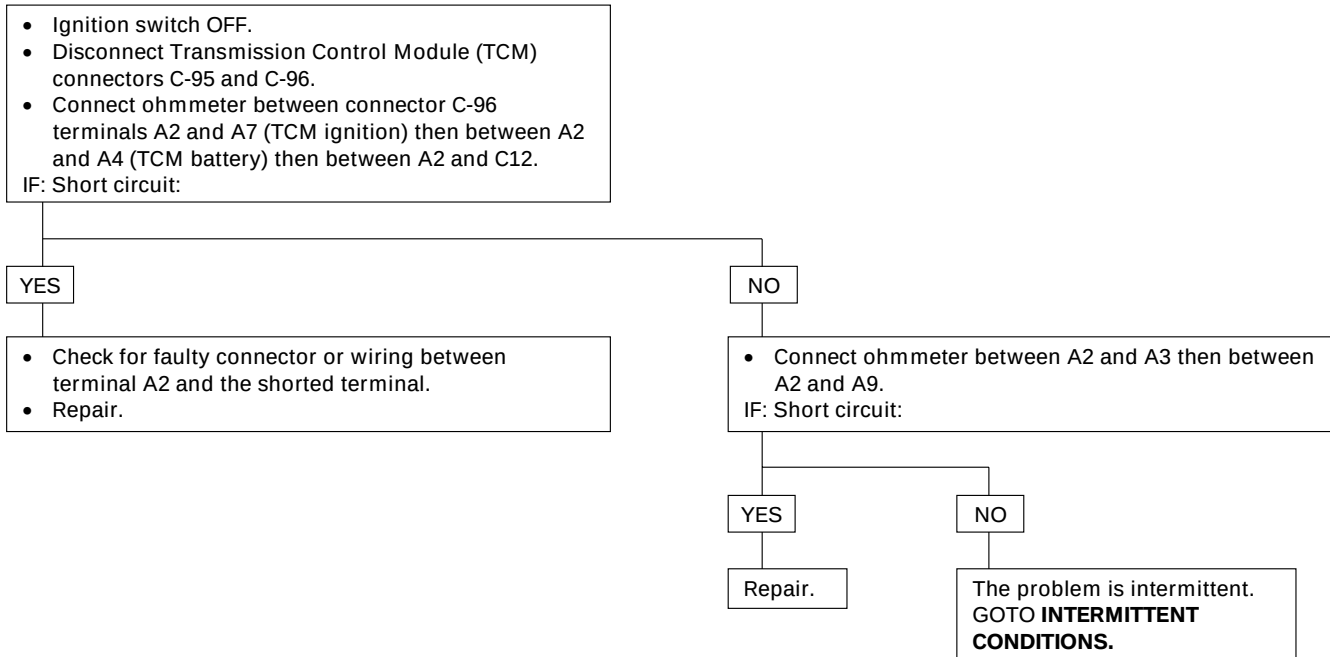
- There are two tests of the LSD: when the engine is cranked (DTC82) and when the ignition is turned ON (DTC41).
- When the ignition is turned ON, and before the engine is cranked, the TCM activates the shift solenoids (A, B and Band) to check for short circuits or open circuits. To do so the gear is set to 4th, 3rd, 1st, 1st with band apply, 4th with no HSD. Each one of the 5 tests requires 0.15 second. If the engine is cranked before the end of all tests, the remaining tests are not done.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - The solenoid Low side connected to TCM terminal A2 is shorted to plus.
 - The test is only done when ignition is ON.
 - Engine Speed < 480 RPM (not cranked) and Output Speed = 0 RPM.
 - The condition needs to be present for 0.15 to 0.88 second after ignition switch ON.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



**DIAGNOSTIC TROUBLE CODE (DTC) 41
SOLENOID A SHORT TO PLUS**



DIAGNOSTIC TROUBLE CODE (DTC) 42

SOLENOID B SHORT TO PLUS

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

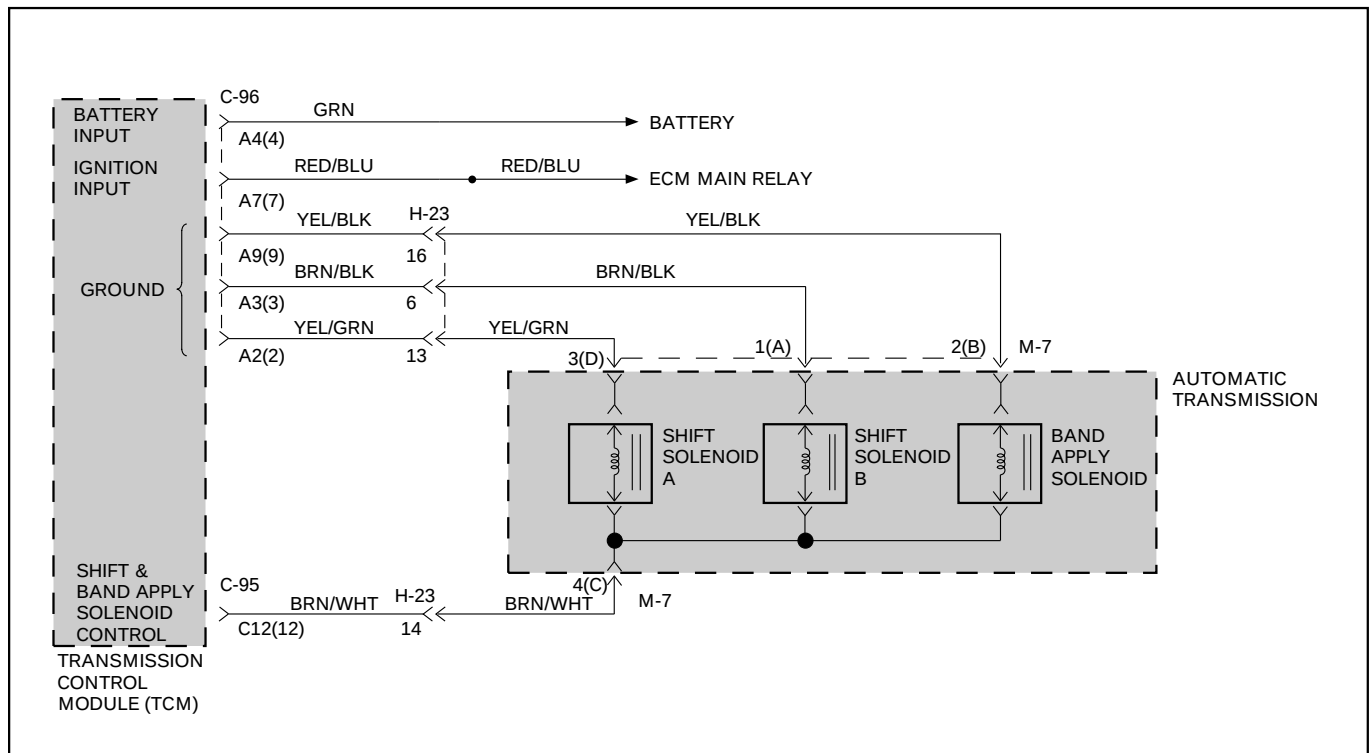
Circuit Description:

- The solenoid B is a simple ON/OFF solenoid located in the main case valve body. The solenoid is the normally open-type. When the port is open, fluid pressure actuates the shift valve. In first or second gear the Transmission Control Module (TCM) energizes the solenoid to close a fluid inlet port.
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when ignition is OFF the HSD is turned OFF.
- The TCM continually monitors the solenoid connection to its Low Side Driver (LSD) for either low or high voltage. The LSD is a circuit of the TCM that acts as a switch between the solenoid and ground. When the solenoid is commanded ON the TCM is switching the solenoid to ground.

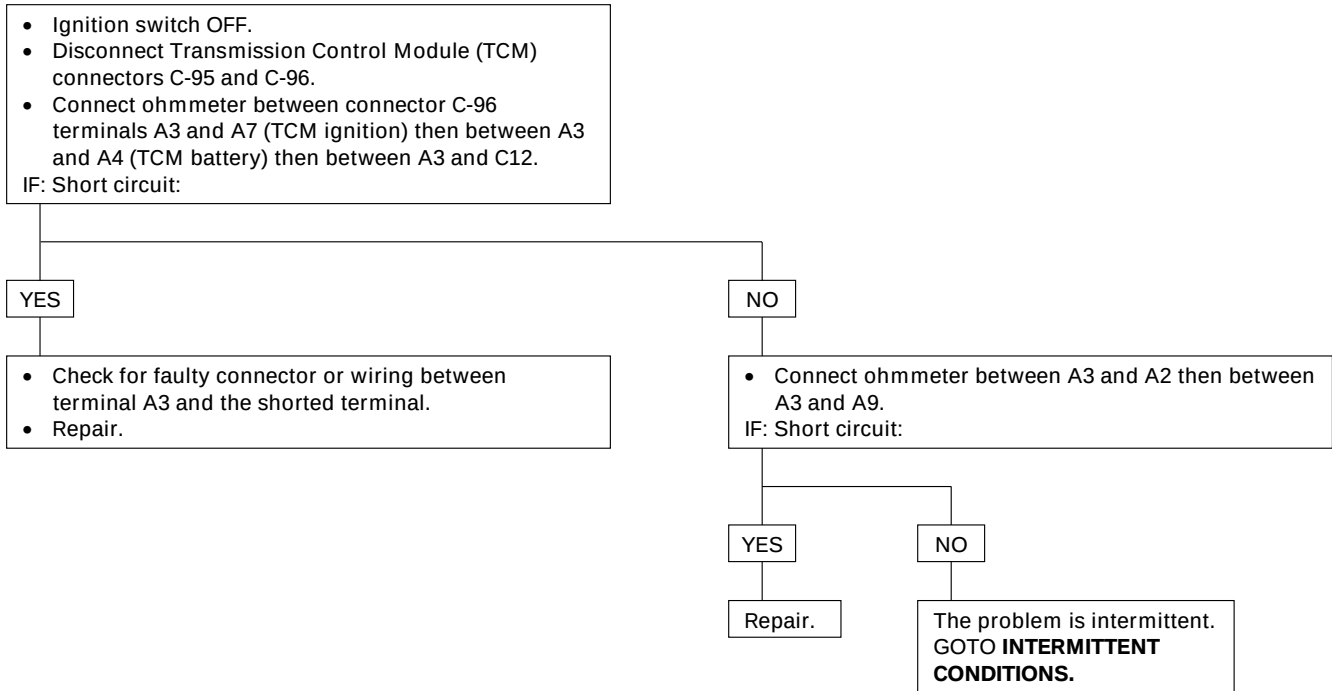
- There are two tests of the LSD: when the engine is cranked (DTC82) and when the ignition is turned ON (DTC42).
- When the ignition is turned ON, and before the engine is cranked, the TCM activates the shift solenoids (A, B and Band) to check for short circuits or open circuits. To do so the gear is set to 4th, 3rd, 1st, 1st with band apply, 4th with no HSD. Each one of the 5 tests requires 0.15 second. If the engine is cranked before the end of all tests, the remaining tests are not done.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - The solenoid Low side connected to TCM terminal A3 shorted to plus.
 - The test is only done when ignition is ON.
 - Engine Speed < 480 RPM (not cranked) and Output Speed = 0 RPM.
 - The condition needs to be present for 0.15 to 1.03 second after ignition switch ON.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 42
SOLENOID B SHORT TO PLUS



DIAGNOSTIC TROUBLE CODE (DTC) 43

TCC HIGH SHORT TO GROUND

This DTC does NOT flash the CHECK TRANS indicator and does NOT set the BACKUP MODE.

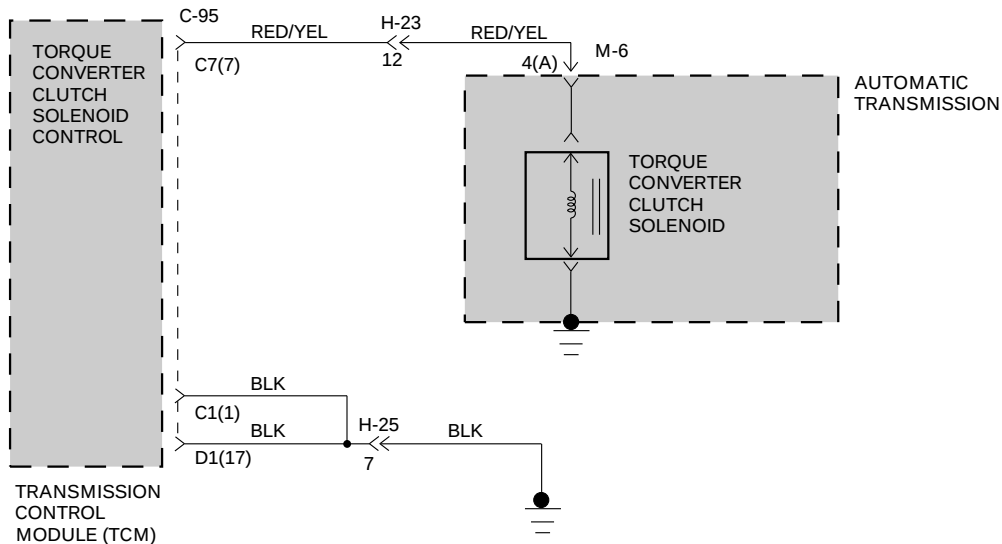
Circuit Description:

- The Torque Converter Clutch (TCC) solenoid is a simple ON/OFF solenoid connected to the adapter case valve body. When the solenoid is energized by the Transmission Control Module (TCM), it opens a fluid port. When the port is open, line pressure actuates the converter clutch control valve which engages the torque converter clutch by exhausting the fluid. The TCM engages the torque converter clutch only when all of the following conditions exist:
 - ① The transmission is at operating temperature.
 - ② The brake pedal is released.
 - ③ The transmission is operating in second, third or fourth gear.
 - ④ The engine is warm (more than 70°C).
 - ⑤ The shift pattern requests TCC apply.
 - ⑥ Shift finished.
 - ⑦ No malfunction which will disable the TCC: DTC33, DTC55 (only short to ground).
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).

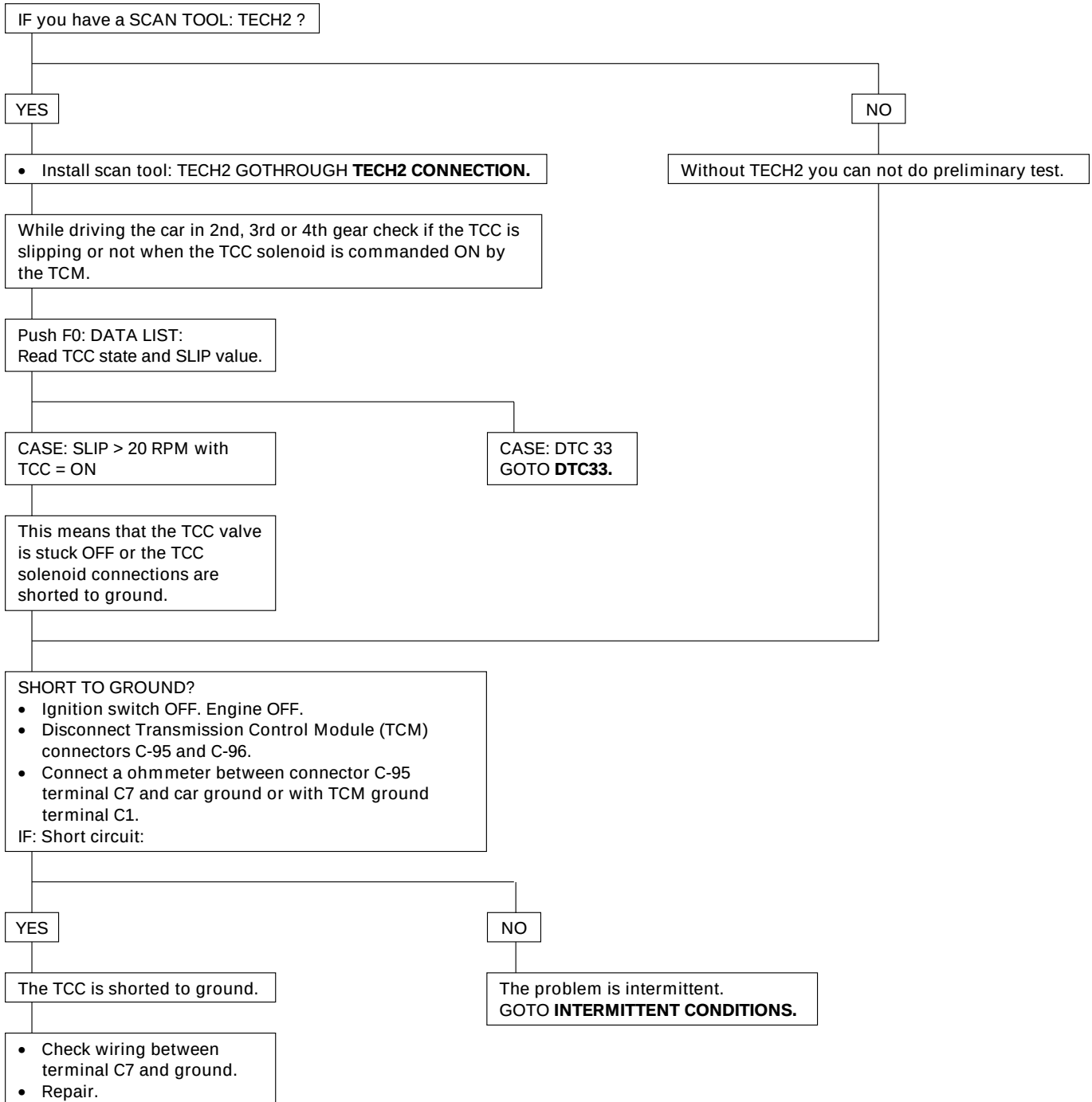
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoid and the supply voltage. The High side of the TCC solenoid is used to turn the TCC ON or OFF because the Low side is permanently connected to the ground of the transmission. In BACKUP MODE or when ignition OFF the TCC High Side is turned OFF.
- The TCM continually monitors the solenoid connection of to its High Side Driver for either low or high voltage.
- There is only one test of the HSD for TCC: when the engine is cranked and the TCC is turned ON.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① The solenoid High side connected to TCM terminal C7 is shorted to ground.
 - ② The condition needs to be present for 0.07 seconds after ignition switch ON.
- Action after the detection time: TCC is turned OFF.
- Recovery conditions: To recover, do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 43
TCC HIGH SHORT TO GROUND



TCC: Torque Converter Clutch
TCM: Transmission Control Module

DIAGNOSTIC TROUBLE CODE (DTC) 44

BAND APPLY SOLENOID SHORT TO PLUS

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

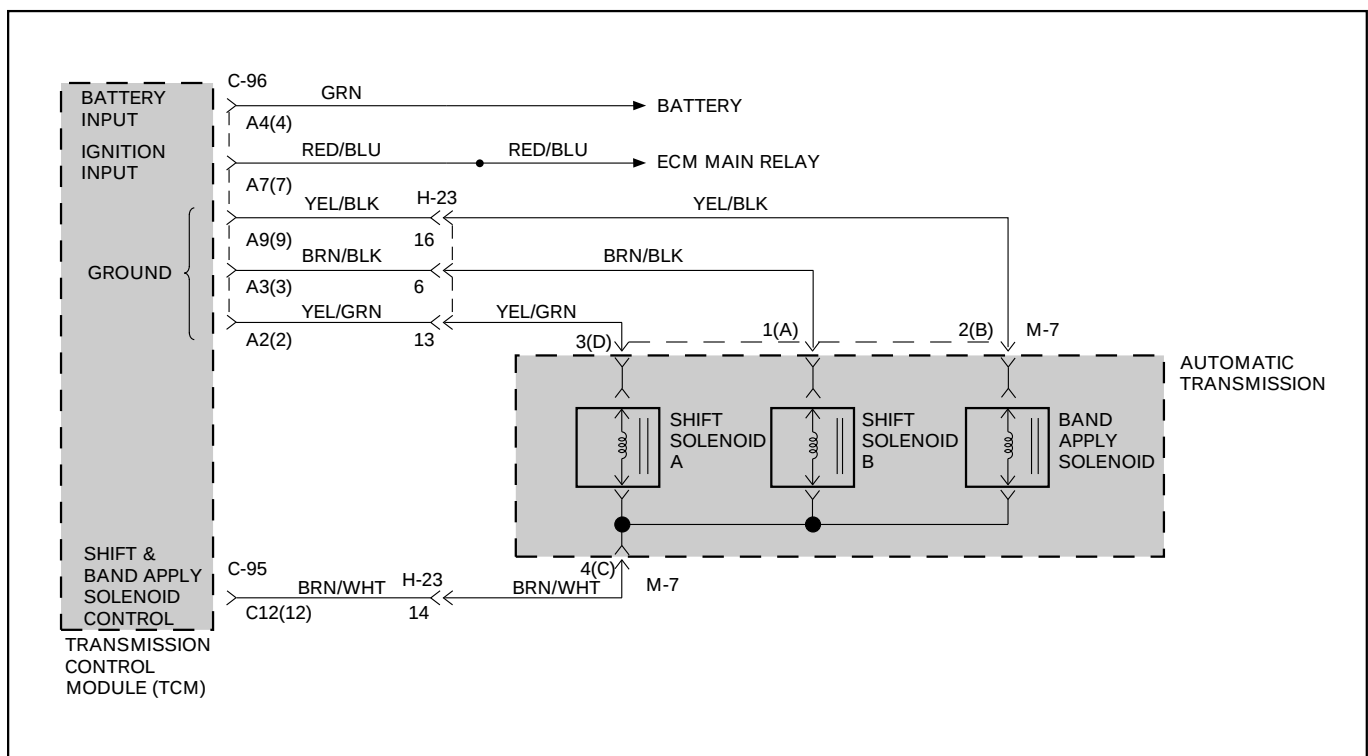
- The band apply solenoid is a normally open solenoid which controls the flow of fluid for brake band application. The Transmission Control Module (TCM) uses Pulse Width Modulation (PWM) and changes the duty cycle to control the solenoid. The TCM turns the solenoid ON (energized) and OFF (de-energized) at a constant frequency. The length of time the solenoid is energized during each ON/OFF cycle is called the pulse width. By varying or "modulating" the pulse width, the solenoid output pressure is changed. Since the solenoid is normally closed, increasing the pulse width increases the duty cycle and decreases the output pressure. PWM control provides smooth band application without an accumulator. The band is only applied in first and second gears.
- In the event of an electrical failure (open), the solenoid regulates at the maximum oil flow (0% duty cycle).
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when ignition is OFF the HSD

is turned OFF.

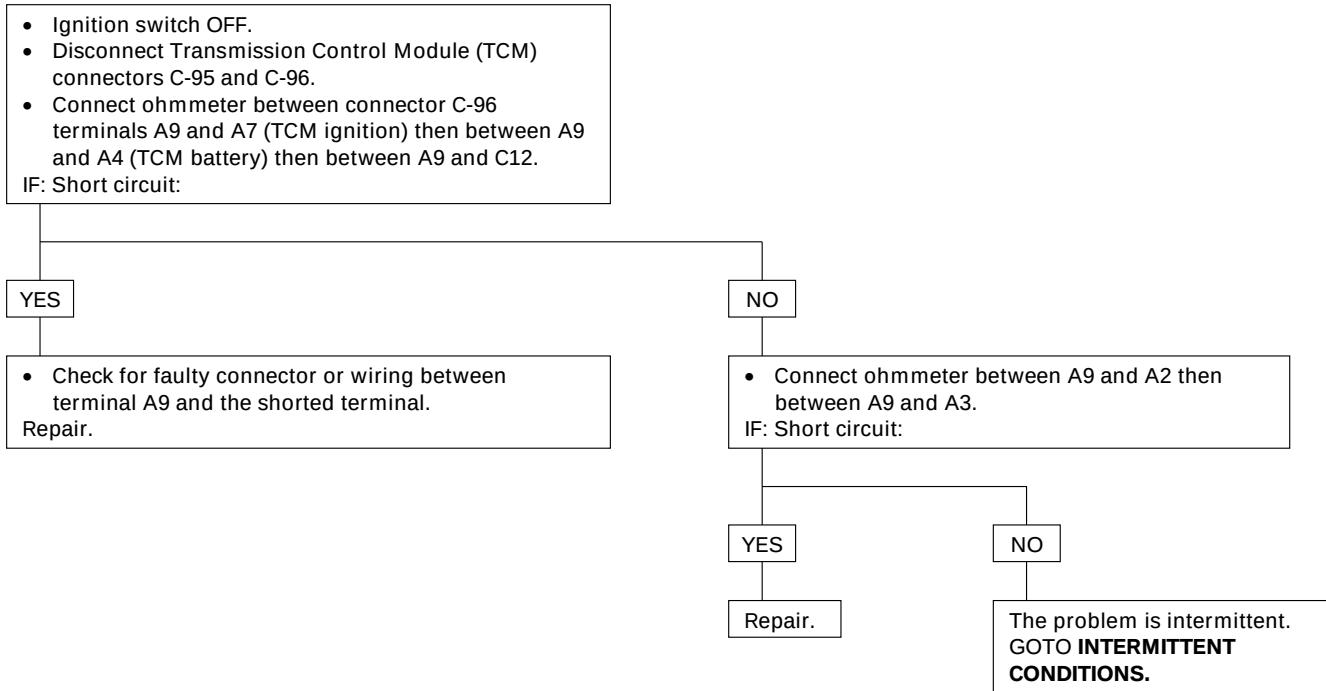
- The TCM continually monitors the solenoid connection to its Low Side Driver (LSD) for either low or high voltage. The LSD is a circuit of the TCM that acts as a switch between the solenoid and ground. When the solenoid is commanded ON the TCM is switching the solenoid to ground.
- There are two tests of the LSD: when the engine is cranked (DTC82) and when the ignition is turned ON (DTC44).
- When the ignition is turned ON, and before the engine is cranked, the TCM activates the shift solenoids (A, B and Band) to check for short circuits or open circuits. To do so the gear is set to 4th, 3rd, 1st, 1st with band apply, 4th with no HSD. Each one of the 5 tests requires 0.15 second. If the engine is cranked before the end of all tests, the remaining tests are not done.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - The solenoid Low side connected to TCM terminal A9 is shorted to voltage.
 - The test is only done when ignition is ON.
 - Engine Speed < 480 RPM (not cranked) and Output Speed = 0 RPM.
 - The condition needs to be present for 0.15 to 1.18 second after ignition switch ON.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



**DIAGNOSTIC TROUBLE CODE (DTC) 44
BAND APPLY SOLENOID SHORT TO PLUS**



DIAGNOSTIC TROUBLE CODE (DTC) 46 SHIFT HIGH SHORT TO PLUS

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

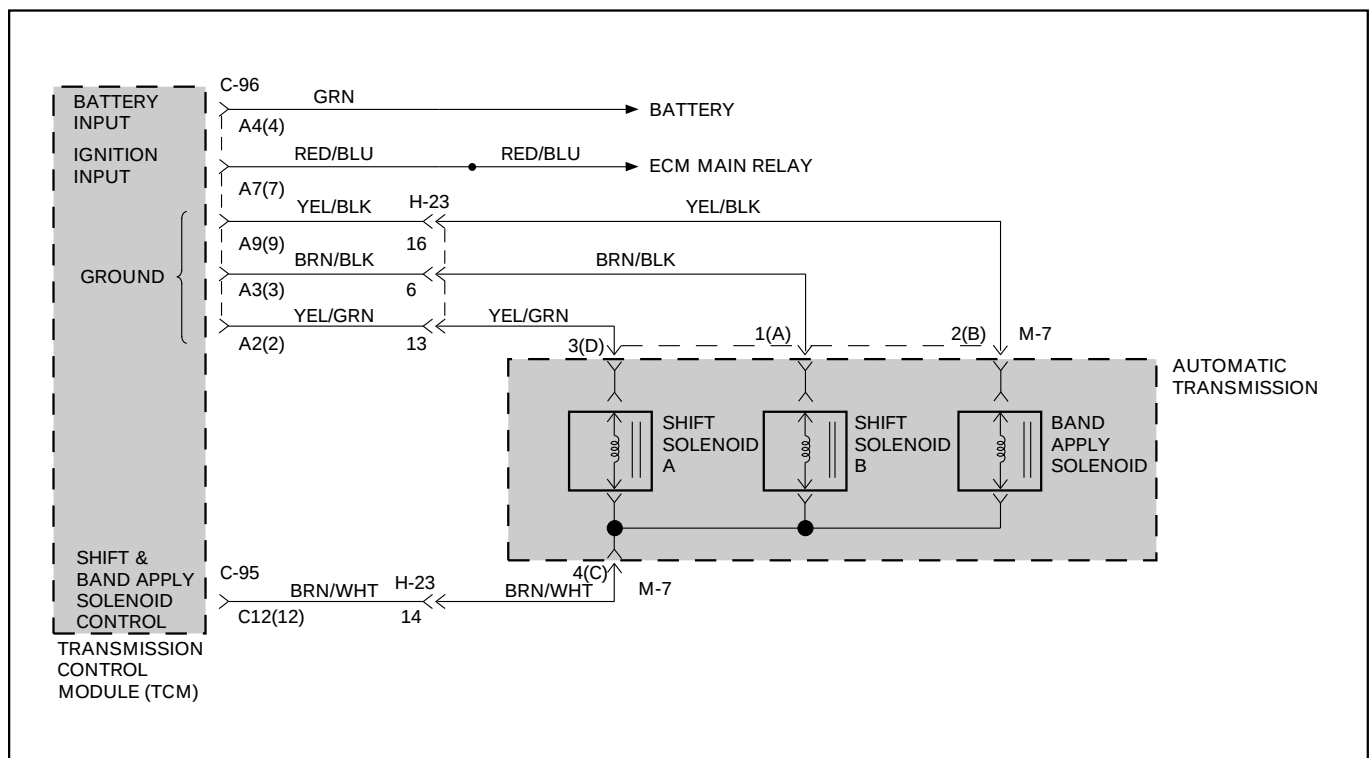
Circuit Description:

- The solenoids are activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the Transmission Control Module (TCM) that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when ignition is OFF the High Side Driver is turned OFF.
- The TCM continually monitors the solenoid connection to its High Side Driver for either low or high voltage.
- There are two tests of the HSD: when the engine is cranked (DTC82) and when the ignition is turned ON (DTC46).
- When the ignition is turned ON, and before the engine is cranked, the TCM activates the shift

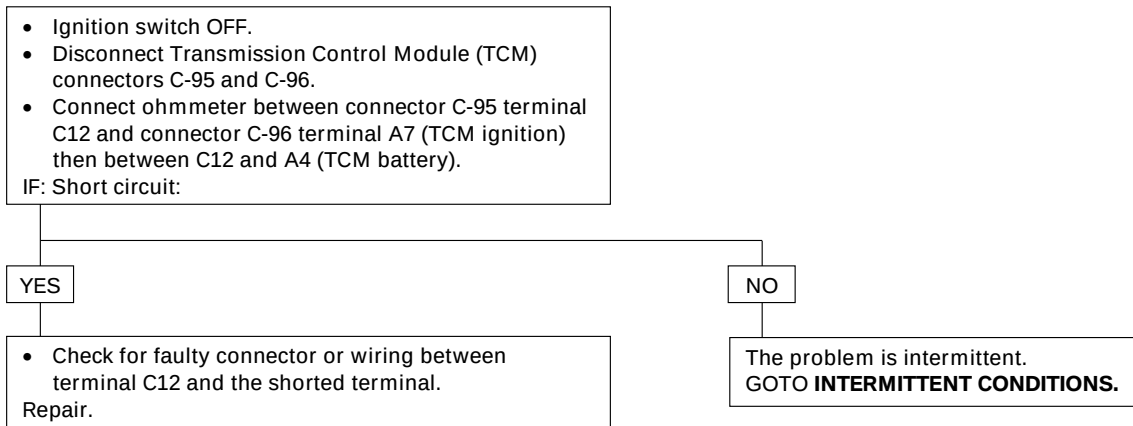
solenoids (A, B and Band) to check for short circuits or open circuits. To do so the gear is set to 4th, 3rd, 1st, 1st with band apply, 4th with no HSD. Each one of the 5 tests requires 0.15 second. If the engine is cranked before the end of all tests, the remaining tests are not done.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① The solenoid High side connected to TCM terminal C12 is shorted to voltage.
 - ② The test is only done when ignition is ON.
 - ③ Engine Speed < 480 RPM (not cranked) and Output Speed = 0 RPM.
 - ④ The condition needs to be present for 0.15 to 1.34 second after ignition switch ON.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 46
SHIFT HIGH SHORT TO PLUS



DIAGNOSTIC TROUBLE CODE (DTC) 51 ENGINE COOLANT SWITCH SHORT TO GROUND, PLUS OR OPEN

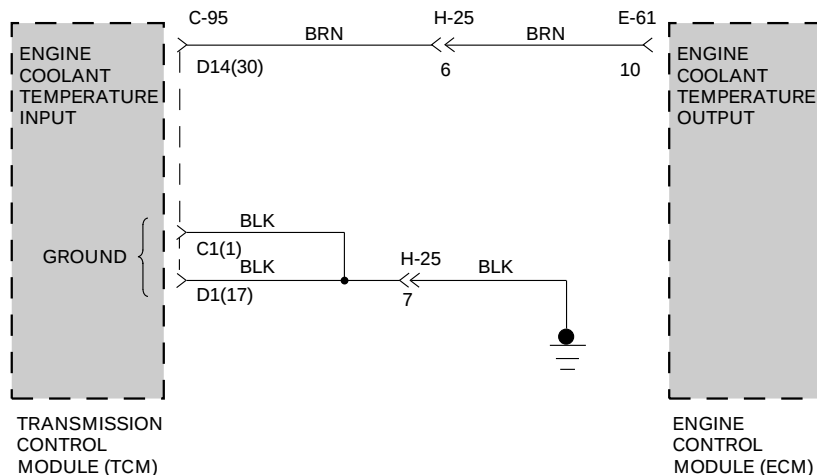
This DTC does NOT flash the CHECK TRANS indicator and does NOT set the BACKUP MODE.

Circuit Description:

- The Engine Coolant Temperature is measured by a sensor in the coolant system. This information is used by the Engine Control Module (ECM) for the engine. The ECM provides the information: Engine Warm to the Transmission Control Module (TCM) when the ECM measures a temperature higher than 70°C (158°F).
- The information is provided using a wire between the ECM terminal 10 and the TCM terminal D14. When the engine is warm the ECM connects its terminal 10 to ground using a Low Side Driver. When the engine is Cold the ECM lets this wire open and the TCM pulls it up to 5 volts.
- When Ignition is ON and Engine is OFF: the ECM always sends the information "engine cold" even if the engine is warm. The information is valid only when the engine is ON.

Diagnostic Aids:

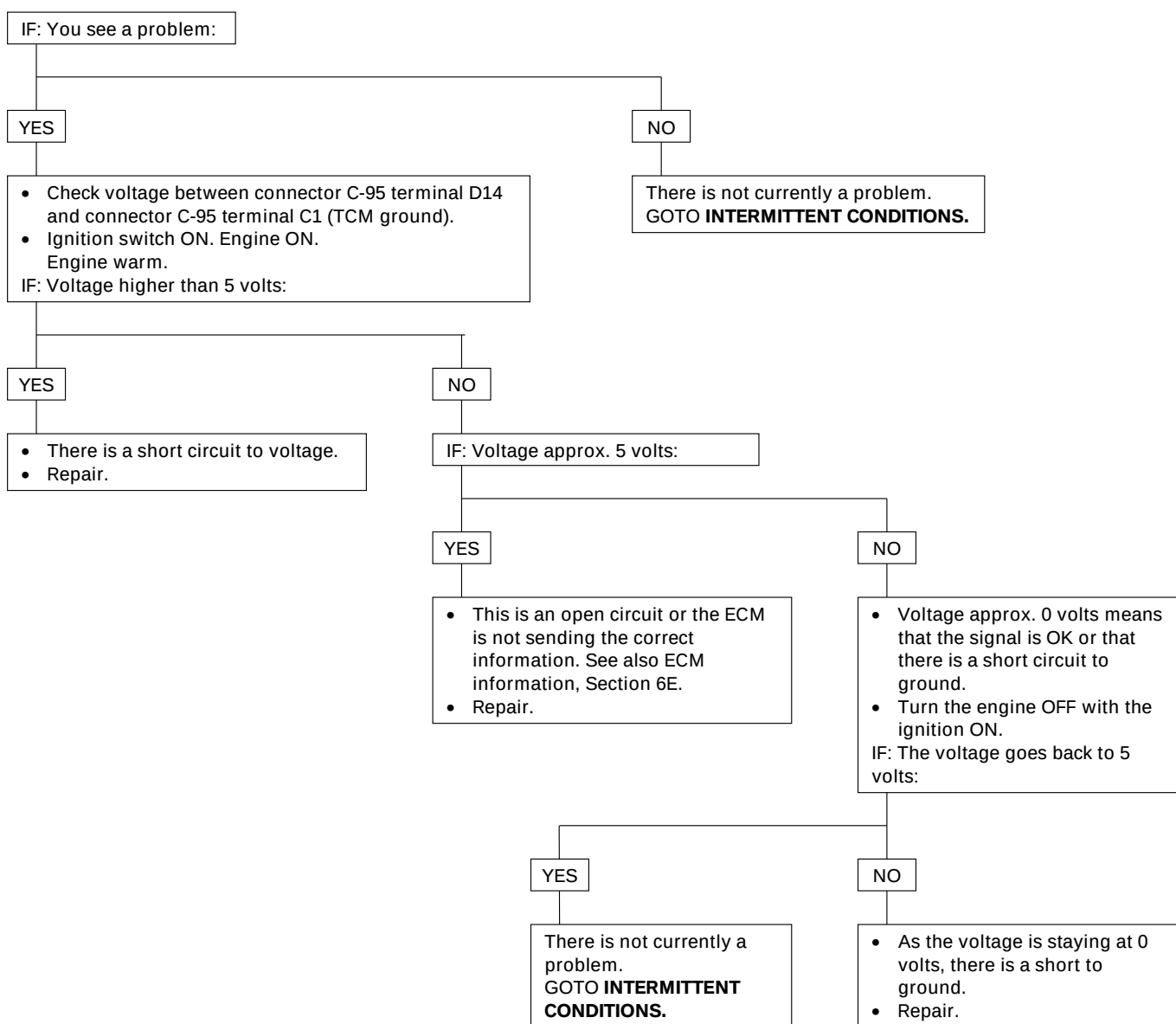
- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions of engine always cold:
 - ① Engine seen as cold: wire short to voltage or open.
 - ② Transmission Oil Temperature >150°C (302°F) or more than 20 minutes since last ignition cycle.
 - ③ Detection conditions need to be present for at least 25 seconds.
- Detection conditions of engine always warm:
 - ① Engine seen as warm: wire short to ground.
 - ② Transmission Oil Temperature < 0°C (32°F).
 - ③ Without problem on Transmission Temperature sensor then: voltage on A/T Oil Temperature sensor <4.74 V.
 - ④ Detection conditions need to be present for at least 6 seconds.
- Action after the detection time: No action.
- Recovery conditions: To recover, Engine Coolant Temperature change information need to be present for more than 6 seconds.



DIAGNOSTIC TROUBLE CODE (DTC) 51

ENGINE COOLANT SWITCH SHORT TO GROUND, PLUS OR OPEN

- This DTC can be set when there is no problem at all. This is due to the fact that when the engine stalls the ignition is still ON then Engine Control Module (ECM) provides a false information: engine cold. The Transmission Control Module (TCM), knowing that the last ignition cycle happened more than 20 minutes ago, then sets DTC51.
- Using the Scan Tool you can check with TECH2: F0: ENG. TEMP. SW information. When the engine is cold or when the engine is OFF the TECH2 should show: COLD. When the engine is warm the TECH2 should show WARM.
- This DTC is not very important. In the worst case it would not allow the Torque Converter Clutch (TCC) to be applied. This will cause low fuel economy.



DIAGNOSTIC TROUBLE CODE (DTC) 52 KICK DOWN ALWAYS ON OR SHORT TO GROUND

This DTC does NOT flash the CHECK TRANS indicator and does NOT set the BACKUP MODE.

Circuit Description:

- When the driver presses the accelerator pedal down fully, the kick down switch closes, sending a ground signal to the Transmission Control Module (TCM).
- This information is used to do shifts with a high Engine Speed RPM.
- When the kick down switch is closed the Throttle Position Sensor (TPS) is already at 100%.

Diagnostic Aids:

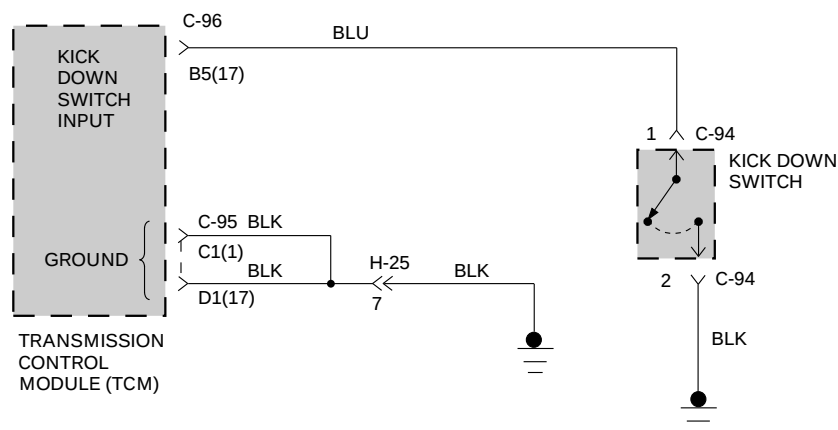
- This diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").

Detection conditions:

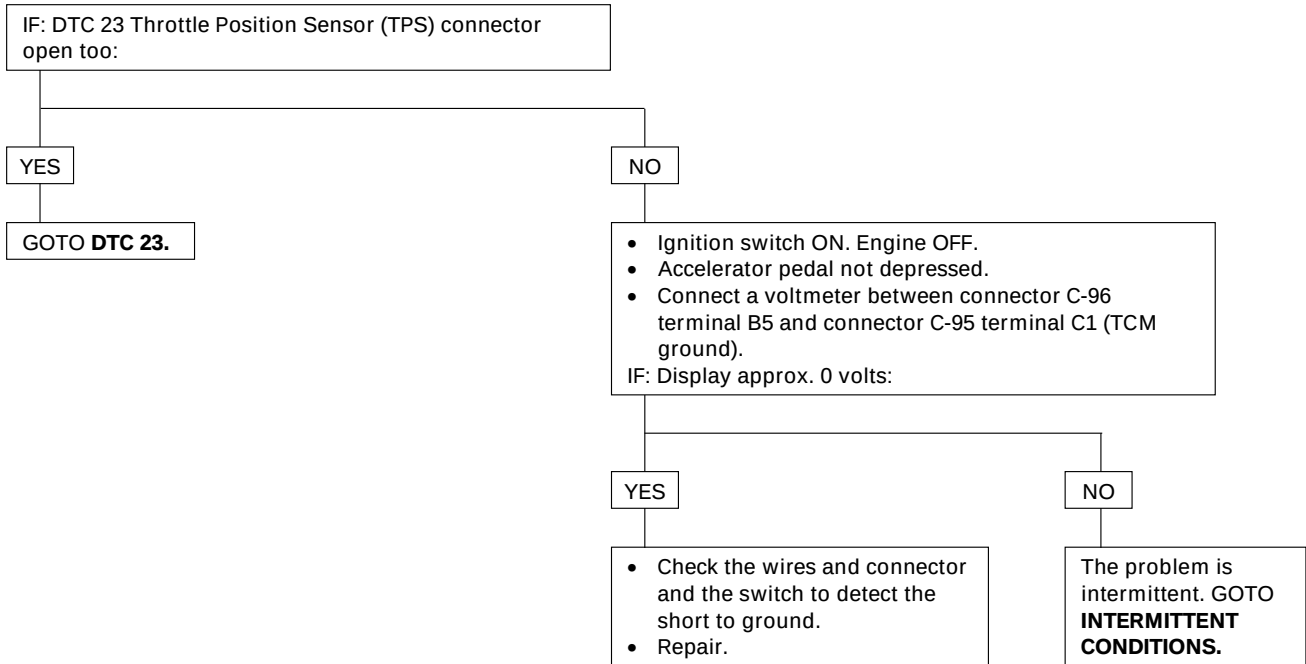
- ① Kick down switch ON (short to ground) and TPS <70%.
- ② No malfunction: TPS short to voltage or ground (DTC21 and DTC22).
- ③ The conditions need to be present for at least 1 second.

• Action after the detection time: Kick Down information not taken into account.

• Recovery conditions: To recover, Kick Down needs to be seen as OFF during detection time.



DIAGNOSTIC TROUBLE CODE (DTC) 52
KICK DOWN ALWAYS ON OR SHORT TO GROUND



DIAGNOSTIC TROUBLE CODE (DTC) 53

MODE SWITCH IN P OR N OR R BAD POSITION

This DTC does NOT flash the CHECK TRANS indicator and does NOT set the BACKUP MODE.

Circuit Description:

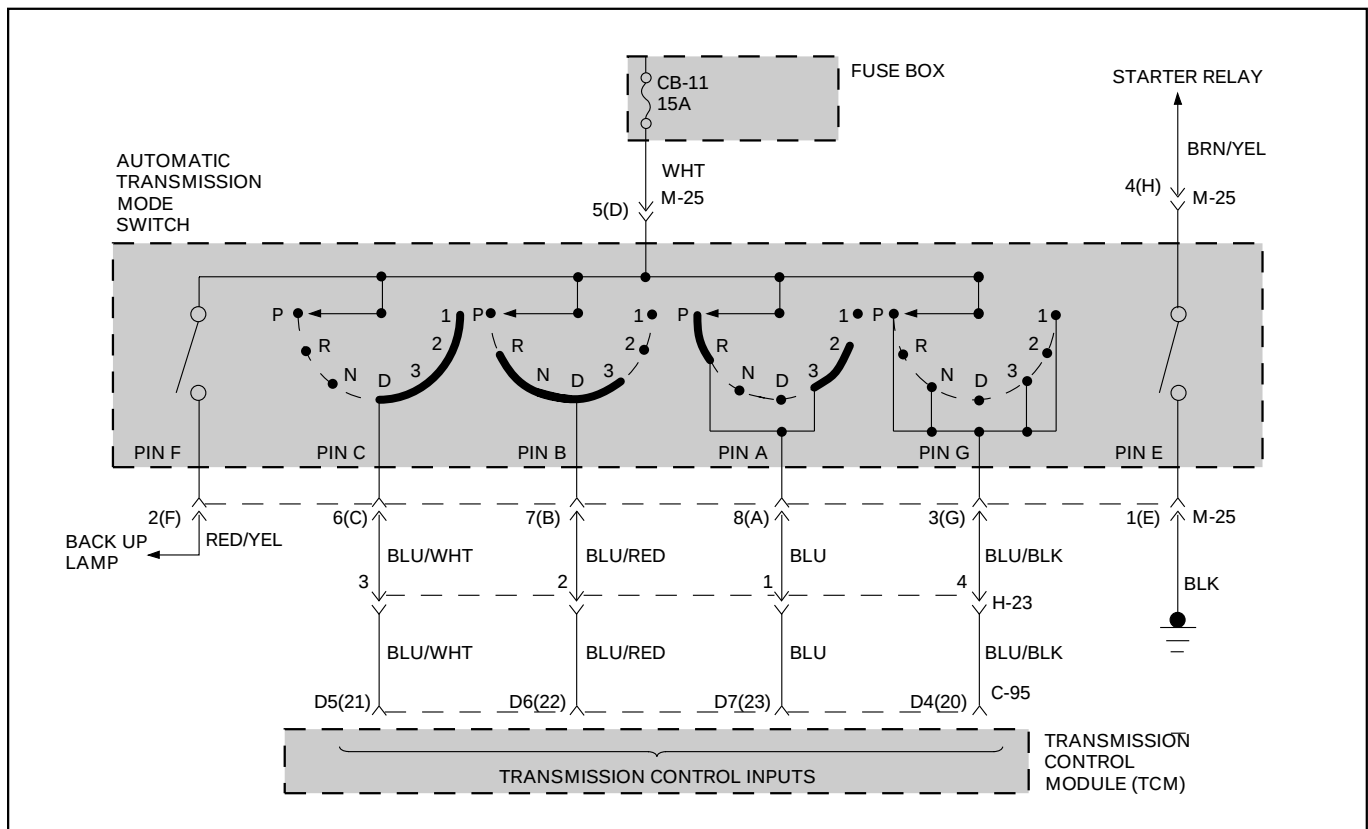
- The mode switch supplies the Transmission Control Module (TCM) with information regarding the selector lever position: P, R, N, D, 3, 2 or L. The selector lever position is indicated by the state of four ON/OFF contacts. The mode switch is located on one side of the transmission. It is on the transmission manual shaft and is fixed to the main case.
- The mode switch is also used to provide the information P or N to the engine crank wiring. The engine can be cranked only if connector M-25 terminal 4(H) is connected to terminal 1(E), which is connected to ground.
- The mode switch is also used to provide the back up lamp power in reverse. This is the reason why the mode switch is supplied through a 15A fuse (CB-11). This fuse can burn due to short circuit in the back up lamp.
- When this fuse is open, the mode switch does not work and DTC54 is set.
- The mode position is defined by the shift linkage which is a link between the shift lever and the mode switch. A bad adjustment of the shift linkage can create a mode switch problem (DTC53).

Diagnostic Aids:

- This Diagnostic is not an electrical test done by

the TCM but a test between different information ("logic test").

- Detection conditions of P or N bad position:
 - A/T Input Speed < 3000 RPM
 - TPS > 20%
 - Mode Switch = P or N
 - No malfunction: TPS short to voltage or ground (DTC 21, DTC22), Engine Speed (DTC13).
 - The conditions need to be present for at least 4 seconds.
- Action after the detection time: Default position assumed for pressure calculation and shift pattern = always in D.
- Recovery Conditions: To recover, have the engine speed higher than 3000 RPM with a TPS higher than 20% when the mode switch is not in P or N.
- Detection conditions of R bad position:
 - A/T Output Speed > 3200 RPM (approx. 100 KPH)
 - Mode Switch = R
 - No malfunction: Output speed (DTC11). Downshift Protection (DTC62).
 - The conditions need to be present for at least 4 seconds.
- Action after the detection time: Default position assumed for pressure calculation and shift pattern = always in D.
- Recovery conditions: To recover, have the output speed higher than 3200 RPM when the mode switch is not R.



**DIAGNOSTIC TROUBLE CODE (DTC) 53
MODE SWITCH IN P OR N OR R BAD POSITION**

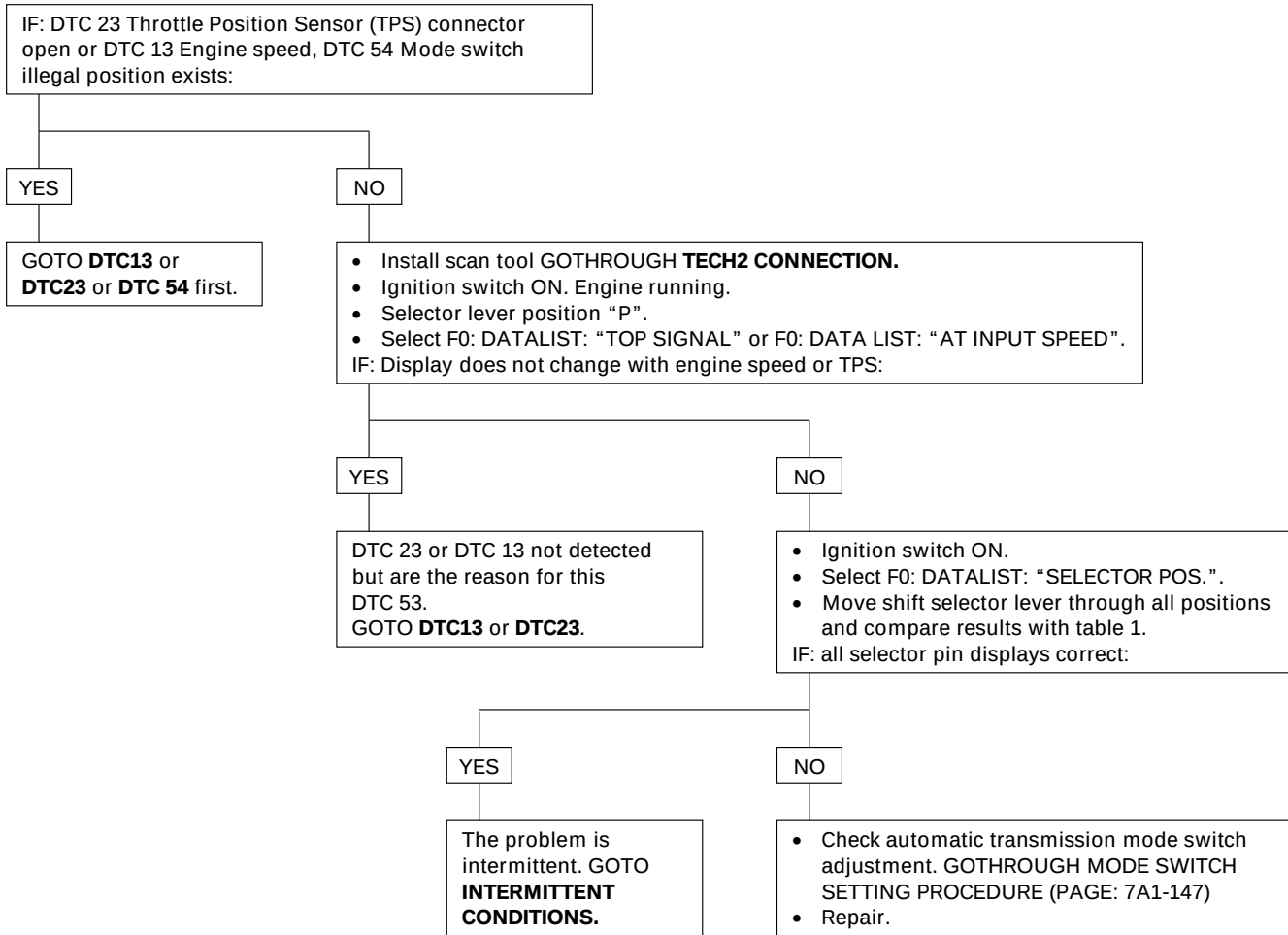


Table 1

	SHIFT SELECTOR POSITION						
TECH1 DISPLAY	P	R	N	D	3	2	L
SELECTOR PIN A	X	X			X	X	
SELECTOR PIN B		X	X	X	X		
SELECTOR PIN C				X	X	X	X
SELECTOR PIN P	X		X		X		X

Note: "X" indicates TECH2 displays "ACTIVE".

DIAGNOSTIC TROUBLE CODE (DTC) 54

MODE SWITCH ILLEGAL POSITION

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

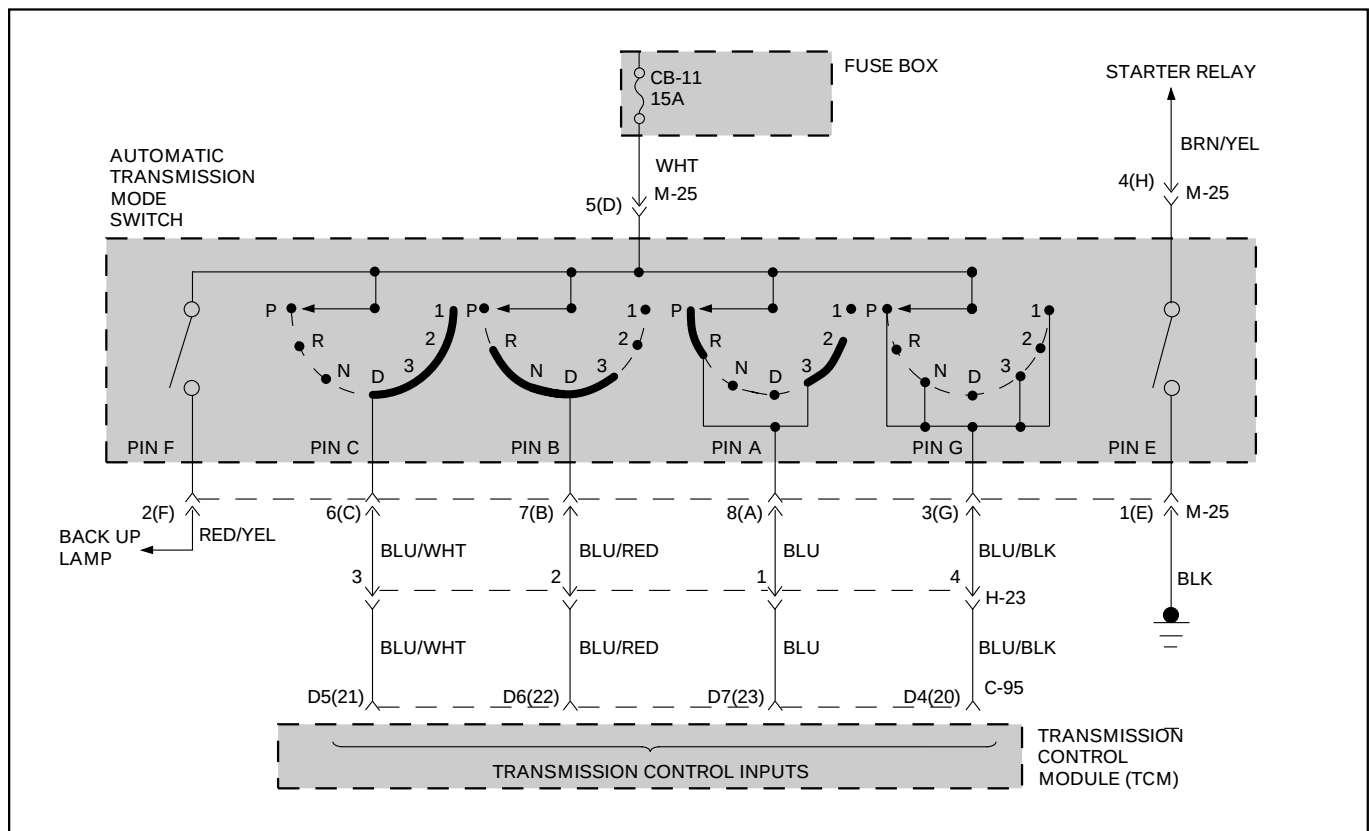
Circuit Description:

- The mode switch supplies the Transmission Control Module (TCM) with information regarding the selector lever position: P, R, N, D, 3, 2 or L. The selector lever position is indicated by the state of four ON/OFF contacts. The mode switch is located on one side of the transmission. It is on the transmission manual shaft and is fixed to the main case.
- The mode switch is also used to provide the information P or N to the engine crank wiring. The engine can be cranked only if connector M-25 terminal 4(H) is connected to terminal 1(E), which is connected to ground.
- The mode switch is also used to provide the back up lamp power in reverse. This is the reason why the mode switch is supplied through a 15A fuse (CB-11). This fuse can burn due to short circuit in the back up lamp.

- When this fuse is open, the mode switch does not work and DTC54 is set.
- The mode position is defined by the shift linkage which is a link between the shift lever and the mode switch. A bad adjustment of the shift linkage can create a mode switch problem (DTC53).

Diagnostic Aids:

- This Diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - Selector Pin A and Pin B and Pin C are not active: no position is identified then.
 - Based upon Table 1, in Park shift selector position the code is set when Pin A is open or shorted to ground.
 - The conditions need to be present for at least 5 seconds.
- Action after the detection time: BACKUP MODE
- Recovery conditions: To recover, do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 54

MODE SWITCH ILLEGAL POSITION

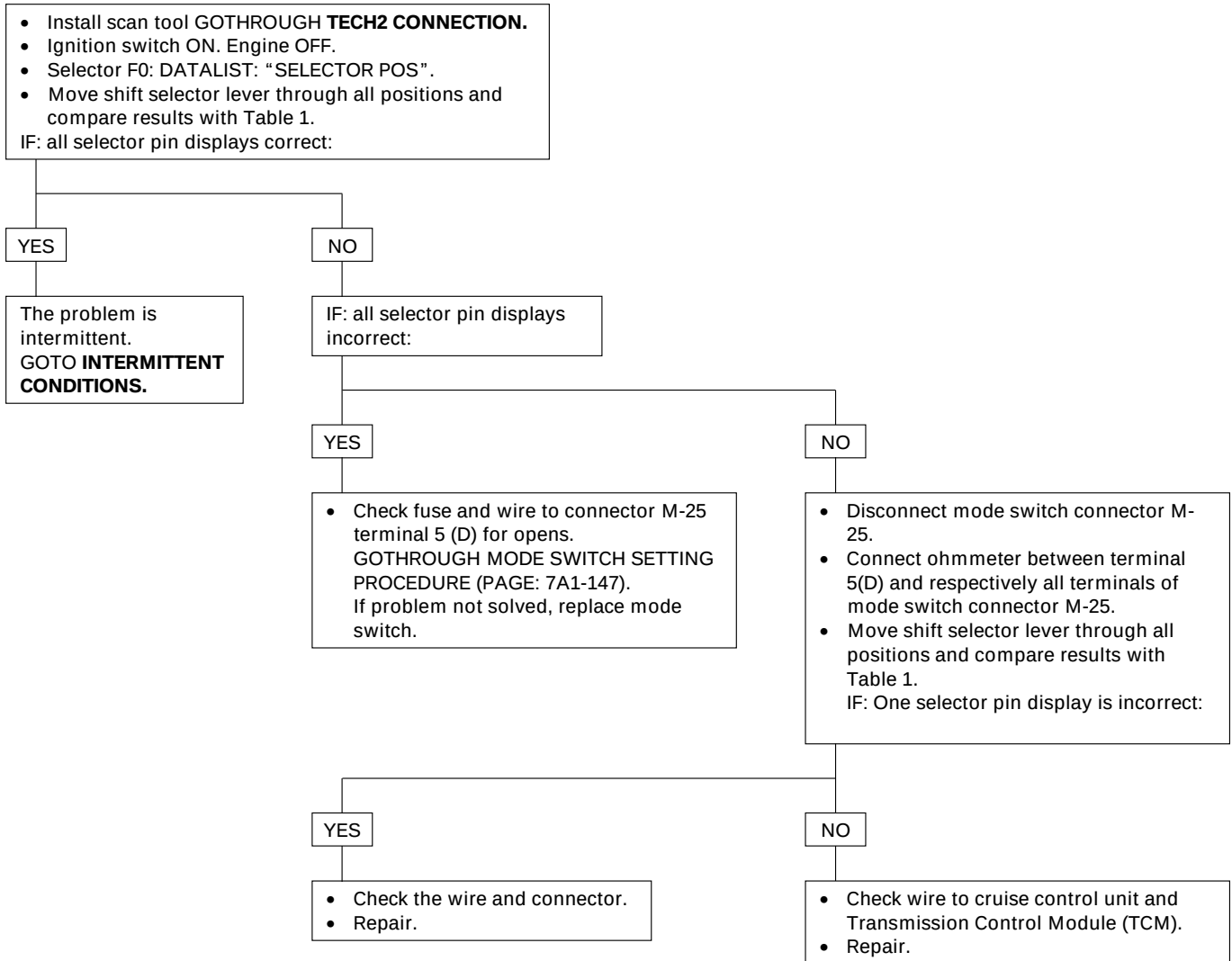


Table 1

TECH1 DISPLAY	SHIFT SELECTOR POSITION						
	P	R	N	D	3	2	L
SELECTOR PIN A	X	X			X	X	
SELECTOR PIN B		X	X	X	X		
SELECTOR PIN C				X	X	X	X
SELECTOR PIN P	X		X		X		X

Note: "X" indicates TECH2 displays "ACTIVE".

DIAGNOSTIC TROUBLE CODE (DTC) 55 BRAKE SWITCH SHORT TO GROUND OR OPEN

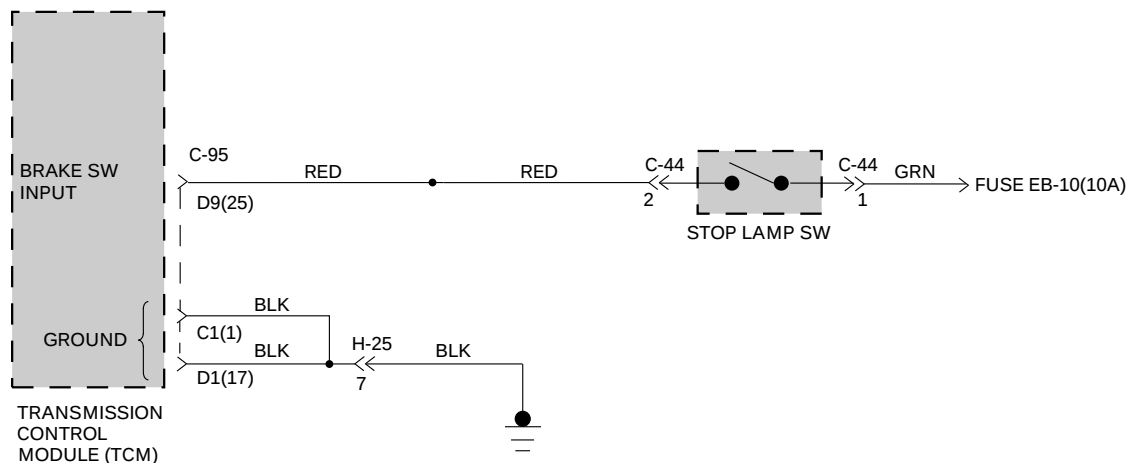
This DTC does NOT flash the CHECK TRANS indicator and does NOT set the BACKUP MODE.

Circuit Description:

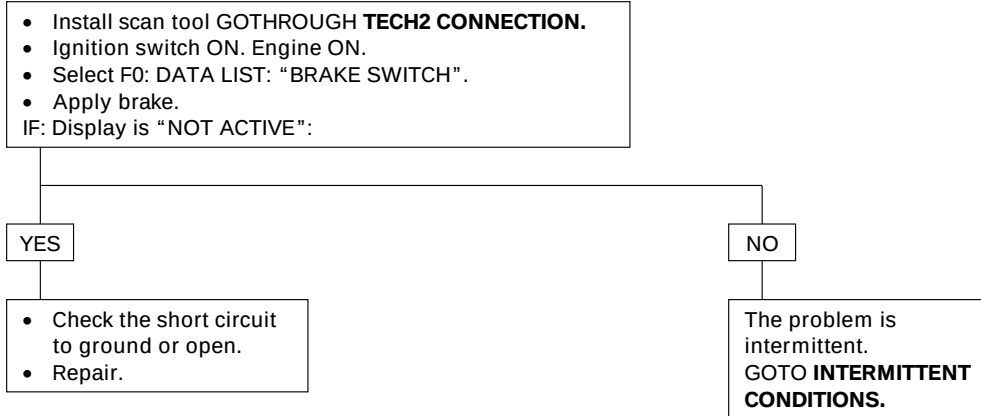
- The brake switch is a switch on the brake pedal that is used to provide the information: brakes are applied. This is used by different features: cruise control, stop light and Transmission Control Module (TCM).
- The TCM uses the information (brakes applied) mainly to release the Torque Converter Clutch (TCC).
- The brake switch input is constantly connected to battery when the pedal is pressed. TCM terminal D9 is connected to Voltage.
- The brake switch input is opened when the pedal is released. TCM terminal D9 is grounded.

Diagnostic Aids:

- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions:
 - ① Brake seen as applied during an acceleration from less than 10 Km/h to more than 60 Km/h within 6 seconds.
 - ② After this acceleration the vehicle speed was higher than 60 Km/h during at least 6 seconds.
 - ③ No Malfunction: Output Speed (DTC11). Downshift Protection (DTC62).
 - ④ The conditions need to be present for at least 5 times during an ignition cycle.
- Action after the detection time: No action but, as the brake is seen as applied, the TCC is never applied.
- Recovery conditions: To recover, brake has to be released.



DIAGNOSTIC TROUBLE CODE (DTC) 55
BRAKE SWITCH SHORT TO GROUND OR OPEN



DIAGNOSTIC TROUBLE CODE (DTC) 56 BRAKE SWITCH SHORT TO PLUS

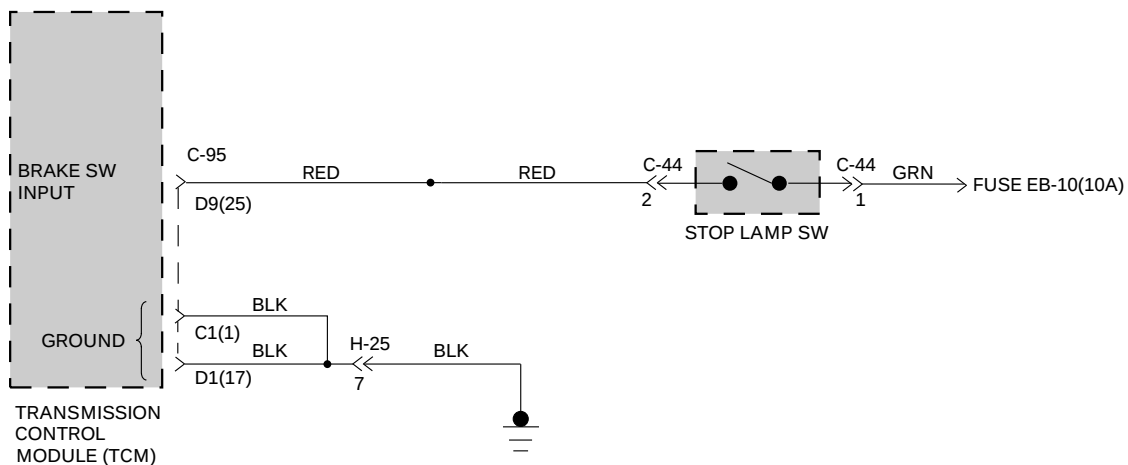
This DTC does NOT flash the CHECK TRANS indicator and does NOT set the BACKUP MODE.

Circuit Description:

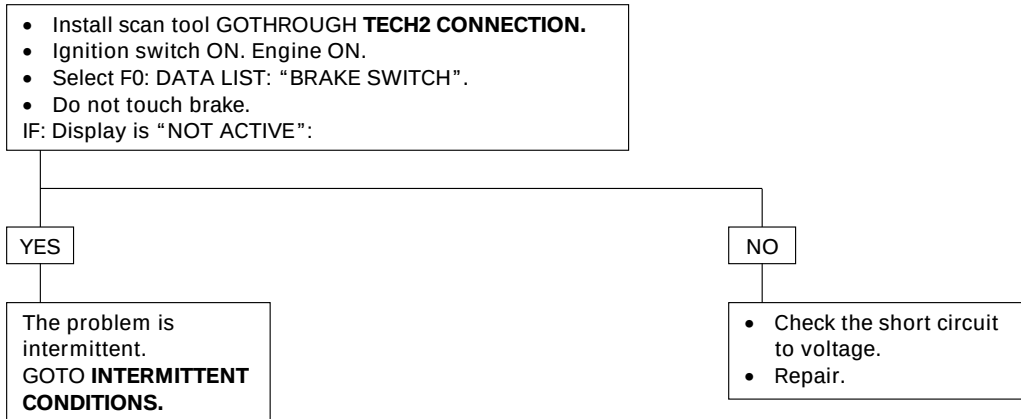
- The brake switch is a switch on the brake pedal that is used to provide the information: brakes are applied. This is used by different features: cruise control, stop light and Transmission Control Module (TCM).
- The TCM uses the information (brakes applied) mainly to release the Torque Converter Clutch (TCC).
- The brake switch input is constantly connected to battery when the pedal is pressed. TCM terminal D9 is connected to Voltage.
- The brake switch input is opened when the pedal is released. TCM terminal D9 is grounded.

Diagnostic Aids:

- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions:
 - ① Brake seen as released during a deceleration from more than 60 Km/h to less than 10 Km/h within 6 seconds.
 - ② Before this deceleration the car vehicle speed was higher than 60 Km/h during at least 6 seconds.
 - ③ No Malfunction: Output Speed (DTC11). Downshift Protection (DTC62).
 - ④ The conditions need to be present for at least 5 times during an ignition cycle.
- Action after the detection time: No action but, as the brake is seen as released, the TCC is applied even when the brake is applied.
- Recovery conditions: To recover, brake has to be released.



DIAGNOSTIC TROUBLE CODE (DTC) 56
BRAKE SWITCH SHORT TO PLUS



DIAGNOSTIC TROUBLE CODE (DTC) 61

GEAR ERROR

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

- The Transmission Control Module (TCM) is calculating the slippage of the Converter and transmission based upon the Engine Speed, the Output Speed and the current gear ratio.
- The slippage of the converter at a high enough engine speed is low. Then the transmission should not slip more than a given value when there is no shift.

Diagnostic Aids:

- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions:
 - ① Engine Speed > 3500 RPM
 - ② Using the ratio of the current gear the Converter Slippage is calculated based upon the engine speed and the output speed. This slippage must be more than:
 - 528 RPM in 4th gear
 - 536 RPM in 3rd gear
 - 556 RPM in 2nd gear
 - 595 RPM in 1st gear

- ③ No malfunction: Engine Speed (DTC 13). Output Speed (DTC 11). Downshift Protection (DTC 62).
- ④ The last change of shift solenoid was more than 3 seconds ago.
- ⑤ The conditions need to be present for at least 5.5 seconds.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.

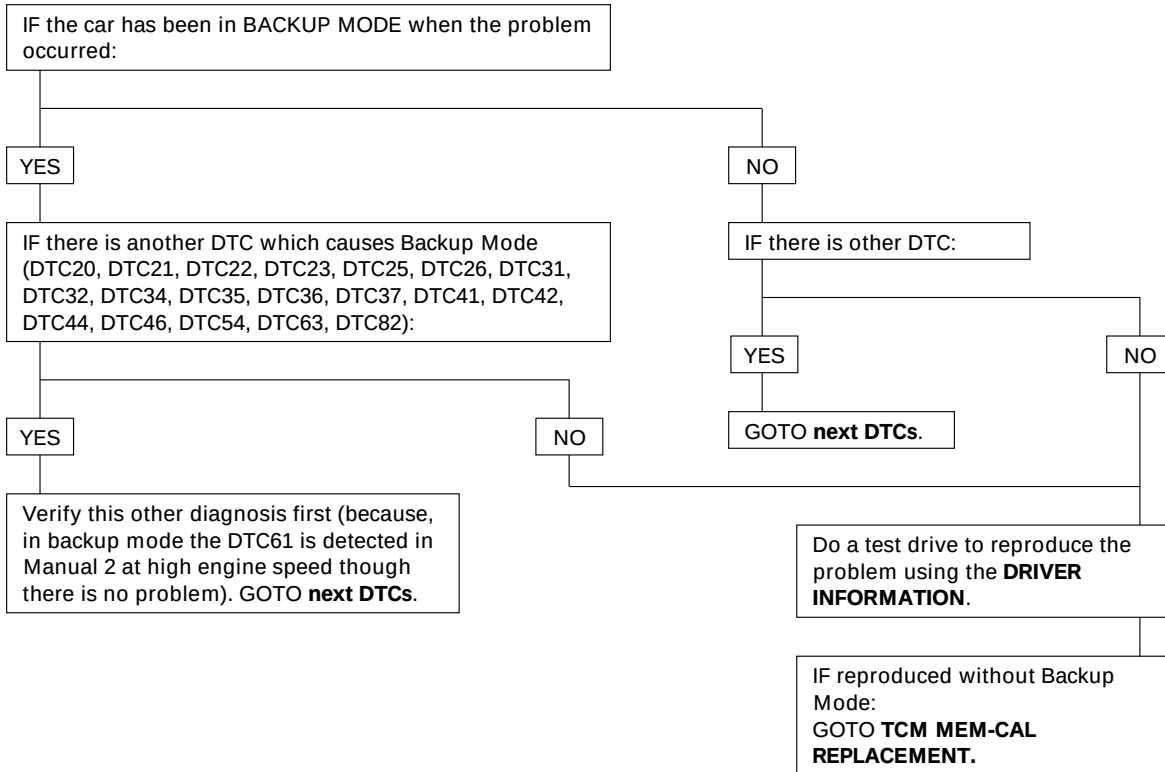
NOTE:

The TCC slip data is a calculated value, and not an accurate one.

This value should be used to see if the TCC is engaged or not.

DIAGNOSTIC TROUBLE CODE (DTC) 61

GEAR ERROR



DIAGNOSTIC TROUBLE CODE (DTC) 62

DOWNSHIFT PROTECTION

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

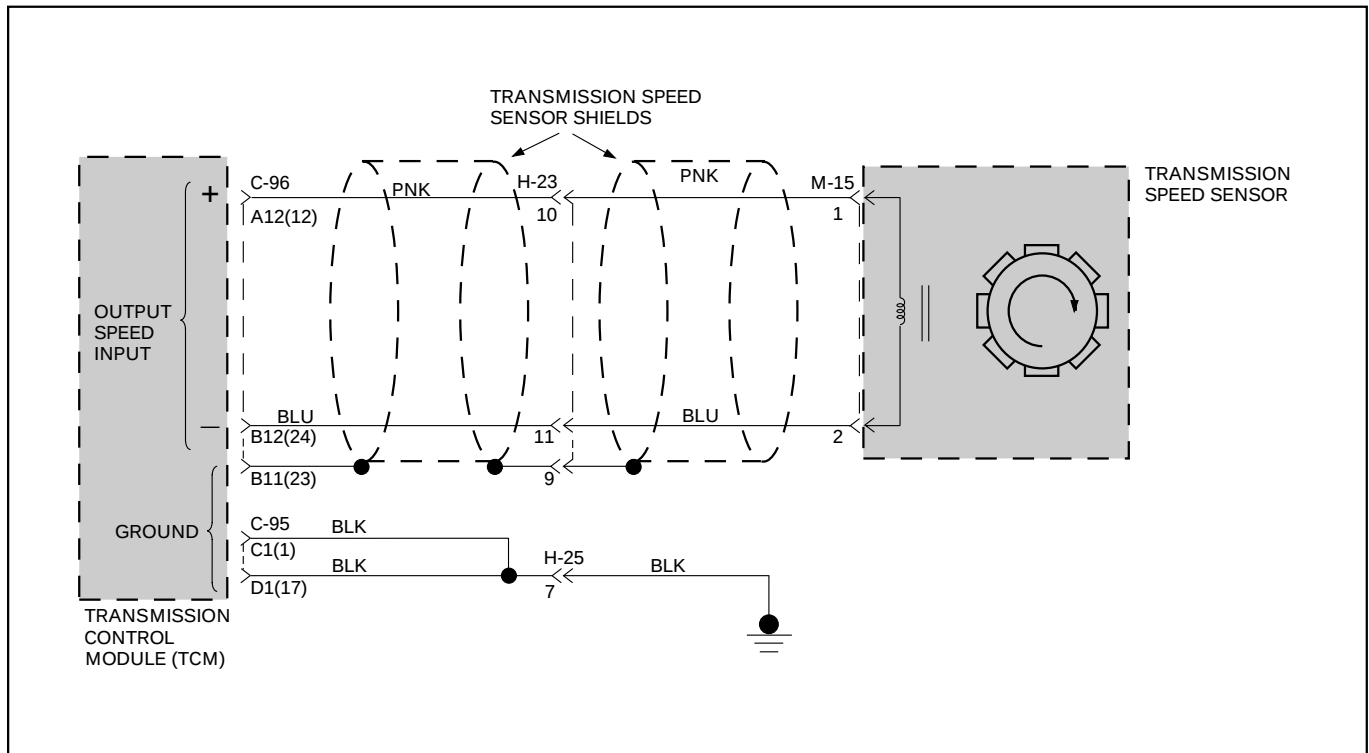
Circuit Description:

- The output speed information is used to determine if the transmission has to upshift or downshift.
- If this information suddenly changes due to an open circuit or some electrical interference the transmission would downshift.
- To avoid this the Transmission Control Module (TCM) is constantly checking the variations of the Output Speed. If this variation is too great (too much decrease or increase) DTC62 is set. This variation is taken into account only when the output speed is more than 2900 RPM (approx. 90 KPH).
- The transmission output speed sensor provides information on vehicle speed to the TCM. The speed sensor circuit consists of a magnetic induction type sensor. The sensor is mounted above a target wheel pressed on the output shaft in the transmission extension. As the output shaft turns, the target wheel teeth induce a variable

voltage in the magnetic pickup. This alternating current (AC) signal is provided to the TCM. The voltage increases with the speed of the wheel but this is not used to define the speed of the vehicle. As the vehicle moves faster, the signal alternates faster between positive and negative voltages. The Output speed information is proportional to the frequency of the signal.

Diagnostic Aids:

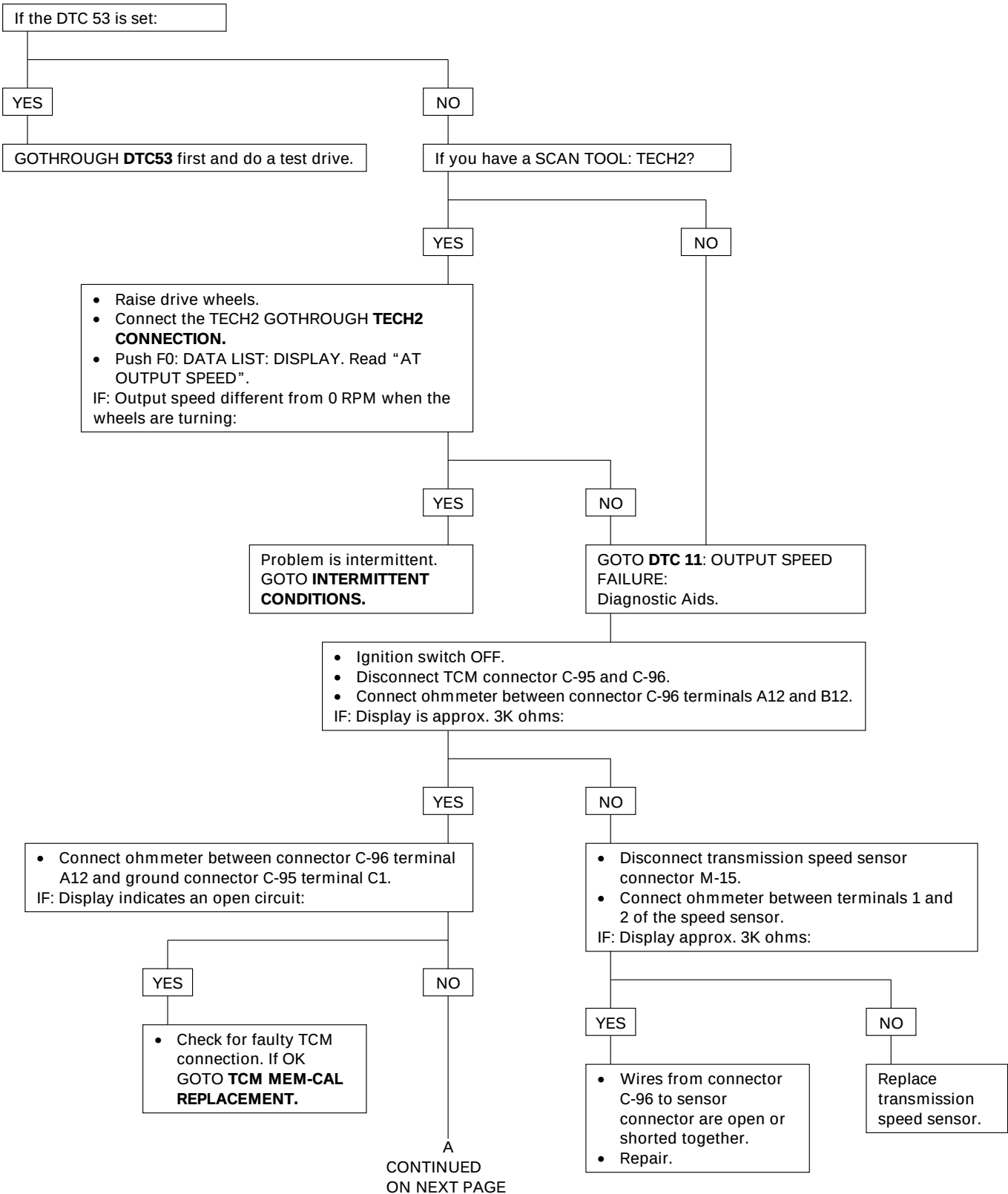
- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions:
 - ① Variation of Output Speed >512 RPM (approx. 16 KPH)/0.025s.
 - ② Ignition ON more than 5 seconds.
 - ③ Mode Switch not in P, N or R.
 - ④ Last Output Speed > 2900 RPM.
 - ⑤ The conditions need to be present for at least 0.1 second.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.



DIAGNOSTIC TROUBLE CODE (DTC) 62

DOWNSHIFT PROTECTION

CAUTION: If wire to connector C-96 terminal B12 is short to voltage, Transmission Control Module (TCM) will be damaged.



DIAGNOSTIC TROUBLE CODE (DTC) 62
DOWNSHIFT PROTECTION
(CONTINUED)

CONTINUED FROM
PREVIOUS PAGE

A

HINT:

- The wire between connector C-96 terminal B12 and speed sensor connector M-15 terminal 2 can be shorted to ground or open without creating a problem because the TCM B12 pin is connected to the TCM ground internally and the signal is detected only on the A12 input.
- Check wire for a short to ground between terminal A12 and sensor connector M-15 terminal 1.

IF: Display indicates a short circuit:

YES

Repair.

NO

- Connect voltmeter between connector C-96 terminal A12 and ground connector C-95 terminal C1.
- Ignition switch ON.

IF: Display indicates approximately 0 volt:

YES

- Check for faulty TCM connectors. If OK GOTO **TCM MEM-CAL REPLACEMENT.**

NO

- Check wire for a short to voltage between terminal A12 and speed sensor connector M-15.

DIAGNOSTIC TROUBLE CODE (DTC) 63

EPROM CSUM FAILURE

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

- The Erasable Programmable Read Only Memory (EPROM) is an electronic circuit that contains the commands that control the Transmission Control Module (TCM).
- The EPROM content is checked automatically approx. each second by the TCM. This is called Check Sum (CSUM) calculation. If this CSUM is false this means that one command is altered.
- This can be due to a circuit failure or a bad contact between the EPROM and the TCM and the DTC63 will be set.
- If all EPROM connections are bad, the TCM does not work. The CSUM can not be calculated and detected. Nothing works, not even the CHECK TRANS indicator.

Diagnostic Aids:

- This Diagnostic is not an electrical test done by the TCM but a test between different information ("logic test").
- Detection conditions:
 - ① Bad EPROM Check Sum.
 - ② The condition needs to be present for at least approx. 1 second.
- Action after the detection time: BACKUP MODE.
- Recovery conditions: To recover, do an IGNITION CYCLE.

To Solve the Problem

- Check the EPROM MEM-CAL connector.
- If condition still exists, replace MEM-CAL.

DIAGNOSTIC TROUBLE CODE (DTC) 82 SHIFT OR BAND APPLY SOLENOIDS FAULTY DURING DRIVING

This DTC flashes the CHECK TRANS indicator and sets the BACKUP MODE.

Circuit Description:

- The shift solenoids are simple ON/OFF solenoids located in the main case valve body. The solenoids are normally closed or open-type. Depending on gear the Transmission Control Module (TCM) controls the solenoids to open or close a fluid inlet port. When the port is open, fluid pressure actuates the shift valve.
- The solenoid is activated by a current. This current is produced by applying a voltage to one side (the High side) and a ground to the other side (Low side).
- The High Side Driver (HSD) is a circuit of the TCM that acts as a switch between the solenoids and the supply voltage. The High side of the solenoid is permanently supplied with voltage, except in BACKUP MODE or when Ignition is OFF the High Side Driver is turned OFF.
- The Low Side Driver (LSD) is a circuit of the TCM that acts as a switch between the solenoid and ground. When the solenoid is commanded ON the TCM is switching the solenoid to ground.

The TCM continually monitors each solenoid connection to its Low Side Driver and to its High Side Driver for either low or high voltage.

- DTC82 is activated when the Shift High Side Driver or one of the Shift Low Side Drivers senses a short circuit or open circuit when the engine is cranked, then when the car is driven. DTC82 can be set only when the TCM is activating the solenoids in with the problem circuit.
- To know where the fault comes from, do IGNITION CYCLE to use the TCM self-check of solenoids when Engine is not cranked but Ignition ON.

Diagnostic Aids:

- This diagnostic is an electrical test done by the TCM.
- Detection conditions:
 - ① HSD or LSD is improperly ON.
 - ② The condition needs to be present for at least 0.15 second.
- Action after the detection time: BACKUP MODE
- Recovery conditions: To recover, do after IGNITION CYCLE.

DIAGNOSTIC TROUBLE CODE (DTC) 82
SHIFT OR BAND APPLY SOLENOIDS FAULTY DURING DRIVING

This DTC is set when the car is driven (Engine ON) but the diagnostic is not specific.
To correctly identify the problem, do an IGNITION CYCLE.

If you have not already done an IGNITION CYCLE:

- Turn ignition switch OFF. Turn ignition switch ON and wait 3 seconds to have the specific diagnostic done.
- Then you can turn the engine ON or not.

Check on Scan Tool or Flashing Code what other DTC is provided. It should be one of the following:
DTC31 or DTC32 or DTC34 or DTC36 or DTC41 or DTC42 or DTC44 or DTC46.

GOTO this **DTC**.

WITHOUT DTC SET

1. If you have already checked the Diagnostic Trouble Code (DTC) and the scan tool TECH2 does not provide any DTC, and you have reproduced the problem and no DTC was stored:

This means that you have to check the problem by comparing the way it should work to the way it works now that the problem exists.

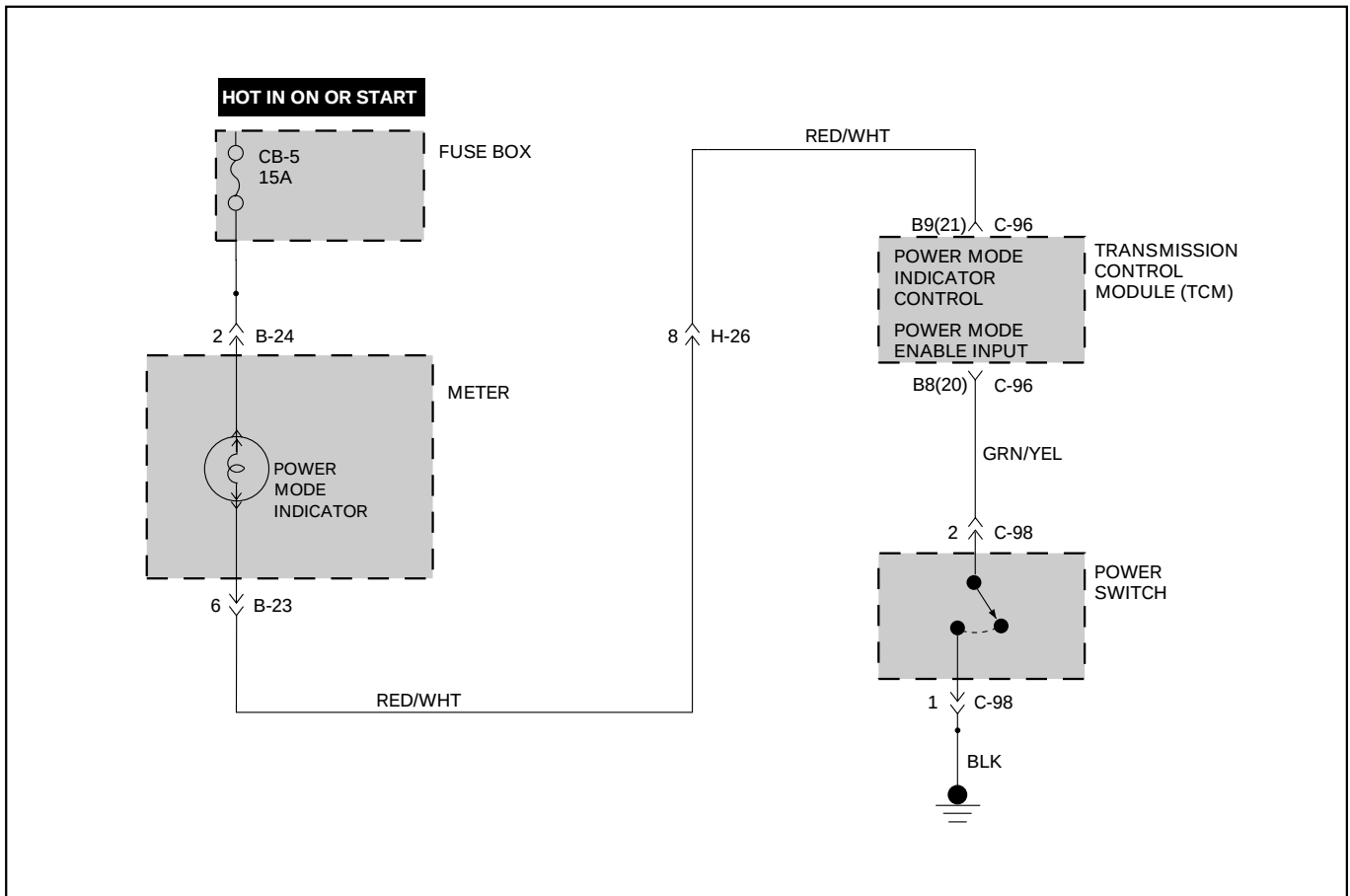
2. To find the problem, perform the following tests:
 - **Transmission Operating Mode Test**

TRANSMISSION OPERATING MODE TEST

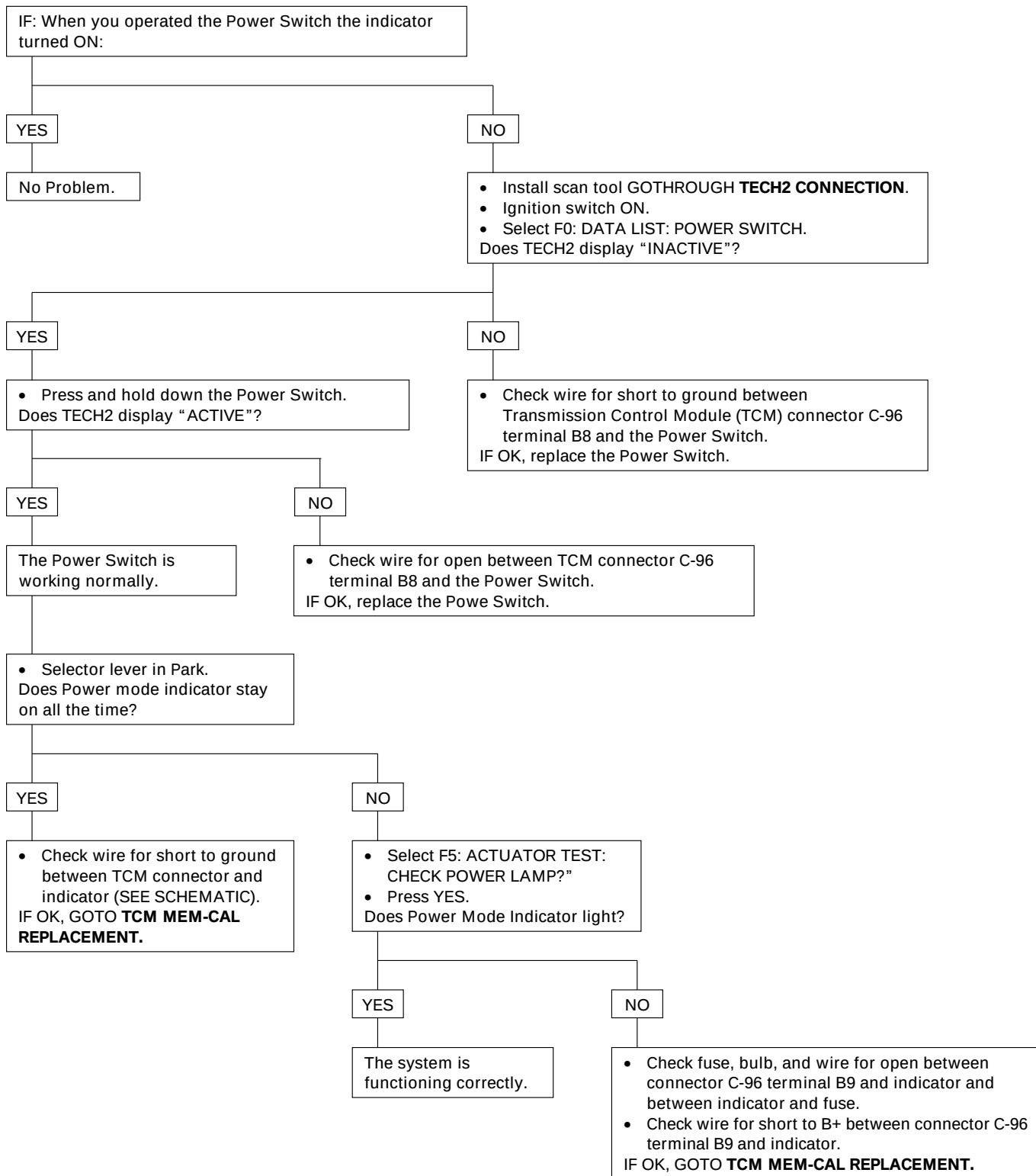
Circuit Description:

The Transmission Control Module (TCM) can controls 4L30-E operation in two modes: Power mode, and Normal mode. The driver determines the transmission operating mode through the Power/Normal mode switch.

The Power mode provides better part-throttle acceleration by providing earlier part-throttle upshifts.



TRANSMISSION OPERATING MODE TEST



TCM: Transmission Control Module

TCM PRECAUTIONS

The TCM can be damaged by:

- (1) The Electrostatic discharge
- (2) The short circuit of some terminals to voltage or to ground.

Electrostatic Discharge Damage Description:

- (1) Electronic components used to control systems are often designed to carry very low voltage, and are very susceptible to damage caused by electrostatic discharge. It is possible for less than 100 volts of static electricity to cause damage to some electronic components. By comparison, it takes as much as 4000 volts for a person to even feel the zap of a static discharge.
- (2) There are several ways for a person to become statically charged. The most common methods of charging are by friction and induction. An example of charging by friction is a person sliding across a car seat, in which a charge of as much as 25,000 volts can build up. Charging by induction occurs when a person with well insulated shoes stands near a highly charged object and momentarily touches ground. Charges for the same polarity are drained off, leaving the person highly charged with the opposite polarity. Static charges of either type can cause damage, therefore, it is important to use care when handling and testing electronic components.

NOTICE: To prevent possible Electrostatic Discharge damage:

- (1) Do not touch the TCM connector pins or soldered components on the TCM circuit board.
- (2) When handling a Mem-Cal (PROM), do not touch the component leads, and do not remove integrated circuit from carrier.
- (3) Be sure to follow the guidelines listed below if servicing any of these electronic components:
- (4) Do not open the replacement part package until it is time to install the part.
- (5) Avoid touching electrical terminals of the part.
- (6) Before removing the part from its package, ground the package to a known good ground on the vehicle.
- (7) Always touch a known good ground before handling the part. This step should be repeated before installing the part if the part has been handled while sliding across the seat, while sitting down from a standing position or while walking some distance.

INFORMATION ON TCM:

- (1) The Transmission Control Module (TCM) is located in the passenger compartment and is the control center of the electronic transmission control system.

- (2) The TCM must be maintained at a temperature below 185°F (85°C) at all times. This is most essential if the vehicle is put through a paint baking process. The TCM will become in-operative if its temperature exceeds 85°C (185°F). Therefore, it is recommended that the TCM be removed or that temporary insulation be placed around the TCM during the time the vehicle is in a paint oven or other high temperature process.
- (3) The TCM is designed to process the various inputs and then respond by sending the appropriate electrical signals to control transmission upshift, downshift, shift feel and torque converter clutch engagement.
- (4) The TCM constantly interprets information from the various sensors, and controls the systems that affect transmission and vehicle performance. By analyzing operational problems, the TCM is able to perform a diagnostic function by displaying DTC(s) and aid the technician in making repairs.

PROM/MEM-CAL:

- (1) Information for a specific engine and vehicle is programmed using an integrated circuit called a Programmable Read-Only Memory (PROM). It is also called a MEM-CAL (Memory Calibrator). This allows one model of controller to be used for many different vehicles. The PROM is located inside the TCM and has information on the engine, transmission, calibration., etc. While one TCM part number can be used by many vehicle lines, a PROM is more specific and must be used only with the right vehicles. For this reason, it is very important to check the latest parts book and Service Bulletin information for the correct part number when replacing a PROM.

INTERMITTENT CONDITIONS

If the TECH2 displays a diagnostic trouble code as intermittent, or if after a test drive a DTC does not reappear though the detection conditions for this DTC are present: the problem is most likely a faulty electrical connection or loose wiring. Terminals and grounds should always be the prime suspect. Intermittents rarely occur inside sophisticated electronic components such as the TCM.

Use the DTC information to understand which wires and sensors are involved.

When an intermittent problem is encountered, check suspect circuits for:

- (1) Poor terminal to wire connection.
- (2) Terminals not fully seated in the connector body (backed out).
- (3) Improperly formed or damaged terminals.
- (4) Loose, dirty, or corroded ground connections:
HINT: Any time you have an intermittent in more than one circuit, check whether the circuits share a common ground connection.
- (5) Pinched or damaged wires.
- (6) Electro-Magnetic Interference (EMI):
HINT: Check that all wires are properly routed away from spark plug wires, distributor wires, coil, and generator. Also check for improperly installed electrical options, such as lights, 2-way radios, etc.

Use the F3: SNAPSHOT mode of the TECH2 to help isolate the cause of an intermittent fault. The snapshot mode will record information before and after the problem occurs. Set the snapshot to "trigger" on the suspect DTC or, if you notice the reported symptom during test drive, trigger the snapshot manually.

- (1) NOTE: When TECH2 is plugged the shifts are always done at the maximum pressure. This means that if you do SNAPSHOT while driving you will notice firm shifts.

After the snapshot has been triggered, command the TECH2 to play back the flow of data recorded from each of the various sensors. Signs of an intermittent fault in a sensor circuit are sudden unexplainable jump in data values out of the normal range.

CASE: problem still not solved GOTO **TCM MEM-CAL REPLACEMENT**.

TCM MEM-CAL REPLACEMENT
(TCM: Transmission Control Module)**1. MEM-CAL (Memory and Calibration Unit)**

Information for specific transmission and vehicle is programmed using an integrated circuit called a MEM-CAL.

This allows one model of controller to be used for many different vehicles.

The MEM-CAL is located inside the TCM and has information on the transmission, shift map, etc. several others.

2. MEM-CAL Replacement

If the diagnostic procedures require MEM-CAL replacement, the MEM-CAL should be replaced using the following procedures.

NOTE:

The ignition must be "OFF", when disconnecting or reconnecting the TCM connector, to prevent internal damage to the TCM.

NOTE:

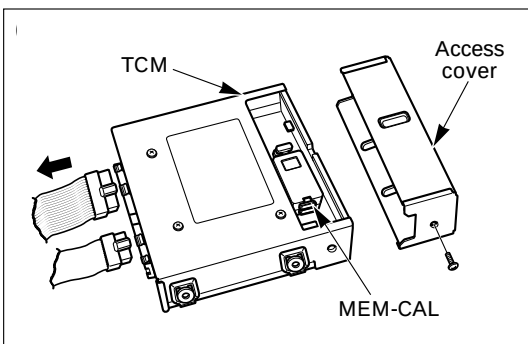
To prevent possible Electrostatic Discharge damage to the TCM, do not touch the connector pins or soldered components on the circuit board.

MEM-CAL Replacement Procedure:

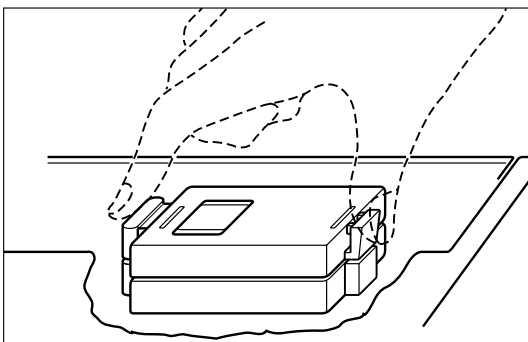
1. Remove TCM from passenger compartment:
 - (1) Disconnect negative (-) battery cable.
 - (2) Remove connectors from TCM.
 - (3) Remove TCM from passenger compartment.
 - (4) Remove MEM-CAL access cover.

NOTE:

Do not remove any of the other screws.



826RV010

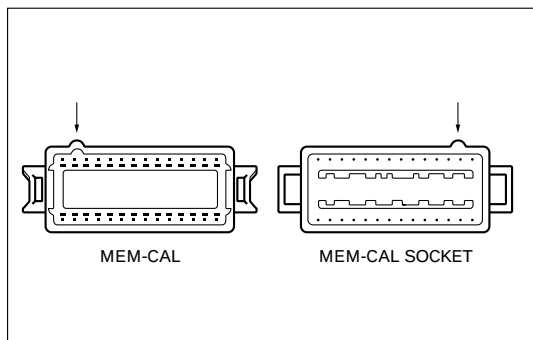


2. Remove MEM-CAL from TCM.
 - Using two fingers, pinch both retaining clips and remove MEM-CAL from the MEM-CAL socket.Using unapproved MEM-CAL removal methods may cause damage to the MEM-CAL or socket.

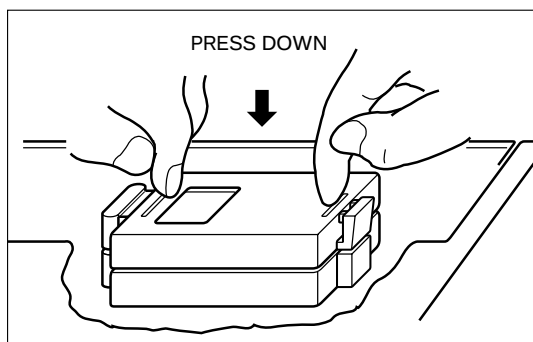
3. Check new MEM-CAL
 - Check the part number of the new MEM-CAL to make sure it is the correct replacement part.

4. Install new MEM-CAL

- (1) Small notches in the MEM-CAL must be aligned with small notches in the MEM-CAL socket.



- (2) Gently press down on the ends of the MEM-CAL until the clips are locked. Listen for the click.



5. Install TCM to passenger compartment:

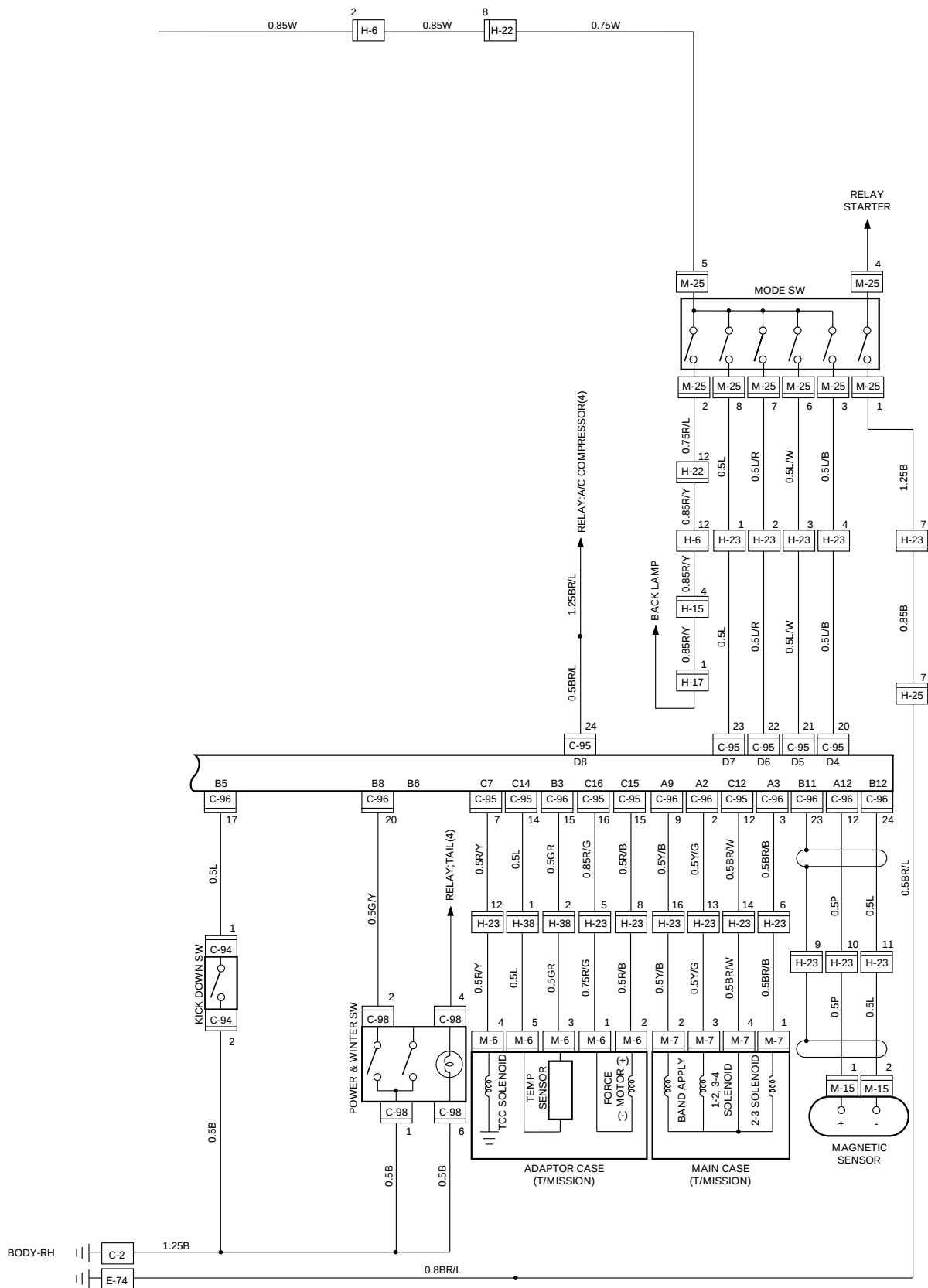
- (1) Install MEM-CAL access cover.
- (2) Install TCM to passenger compartment.
- (3) Connect TCM connectors.
- (4) Connect negative (-) battery cable.
- (5) Do an IGNITION CYCLE and verify correct CHECK TRANS indicator operation.

MEMO

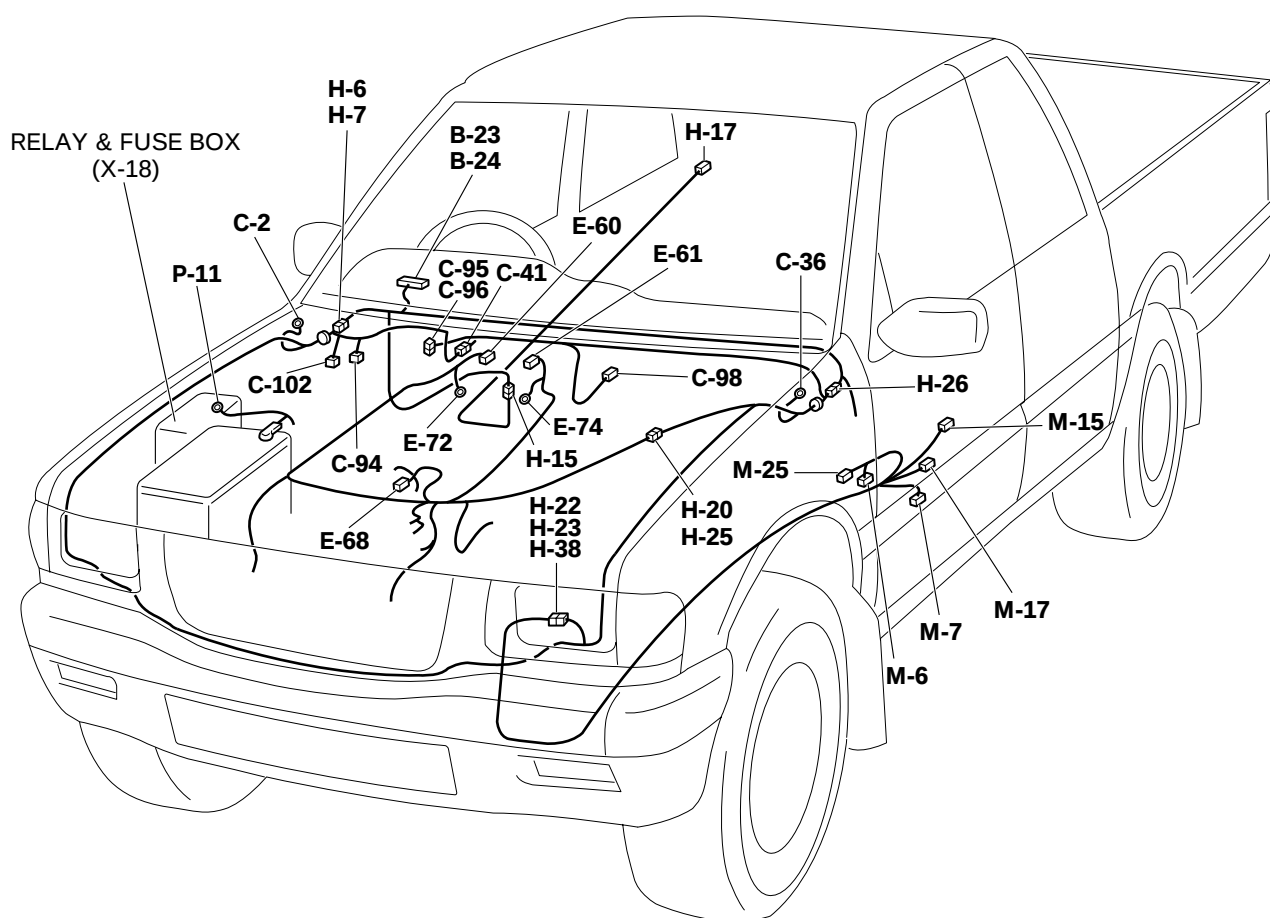
This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

WIRING DIAGRAM

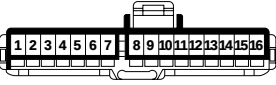
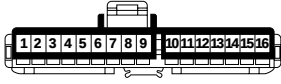
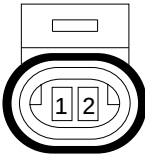
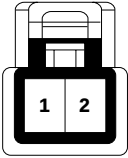
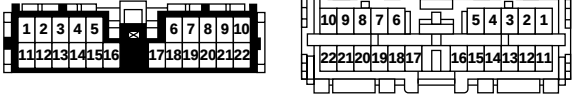
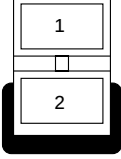
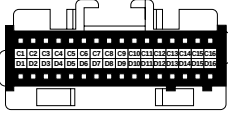
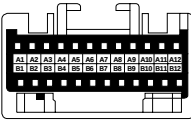
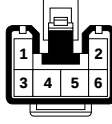
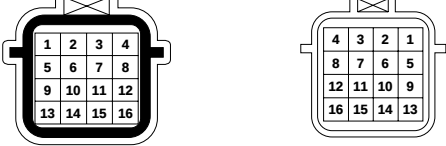
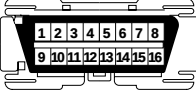




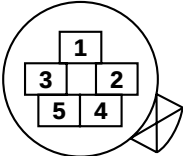
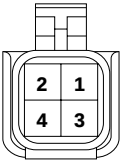
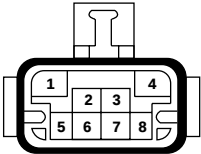
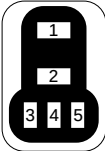
CONNECTOR LOCATION



CONNECTOR LIST

No.	Connector face	No.	Connector face
B-23		E-61	
B-24		C-68	
C-41		E-69	
C-44		H-6	
C-94		H-7	
C-95		H-20	
C-96		H-22	
C-98		H-23	
C-102		H-25	
E-60		H-26	

CONNECTOR LIST

No.	Connector face	No.	Connector face
H-38	 		
M-6			
M-7			
M-15			
M-25			
X-18			

ON-VEHICLE SERVICE

SELECTOR LEVER



INSPECTION

P ⇌ R ⇌ N ⇌ D ⇌ 3 ⇌ 2 ⇌ L

 Button must be pressed.

 Button need not be pressed.

- 1) Make sure that when the shifter control lever is shifted from "P" to "L", a "clicking" can be felt at each shift position. Make sure that the gear corresponds to that of the position plate indicator.
- 2) Check to see if the shifter lever can be shifted as shown.



REMOVAL

Preparation:

Disconnect negative (-) battery cable.

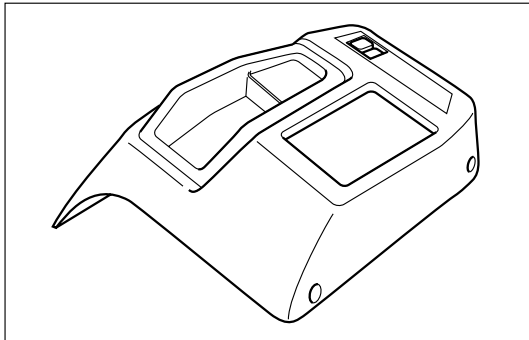
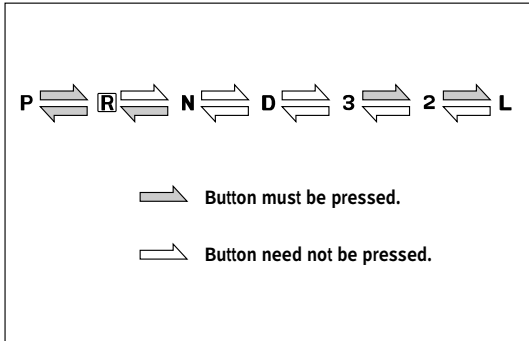
1. Front Console

Disconnect wiring harness connectors.

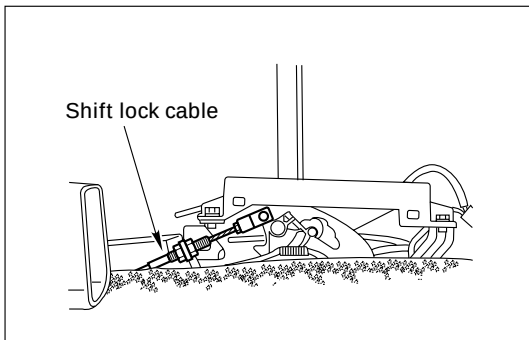
2. Selector Lever Assembly

- 1) Disconnect shift lock cable from the selector lever assembly side.
- 2) Disconnect wiring harness connectors.
- 3) Disconnect shift control rod from the selector lever assembly side.

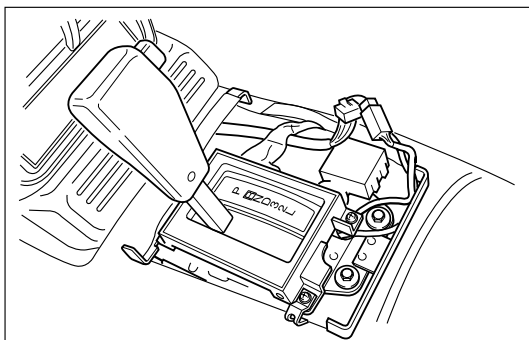
- 4) Remove selector lever assembly.



745LW001



256RV012



255LW007



INSTALLATION

To install, follow the removal steps in the reverse order, noting the following points;

Adjustment of select lever and control rod

- (1) Place the vehicle on a level surface.

NOTE:

If the vehicle is not on a level surface, the shift select cable set positions will vary with the movement of the engine. To prevent possible misadjustment of the cable, the vehicle must be placed on a level surface.

- (2) Install the shift control rod (1) to the transmission select lever (2), and then place the lever in the "N" position.
- (3) Set select lever in the "N" position.
- (4) Push select lever forward and secure it (using a rubber band (3), etc.) so that pin comes into contact with the wall of detent plate.
- (5) Install the shift control rod (1) to the selector lever arm (4).

Nut Torque

N·m (kg·m / lb·ft)



32 (3.3 / 24)

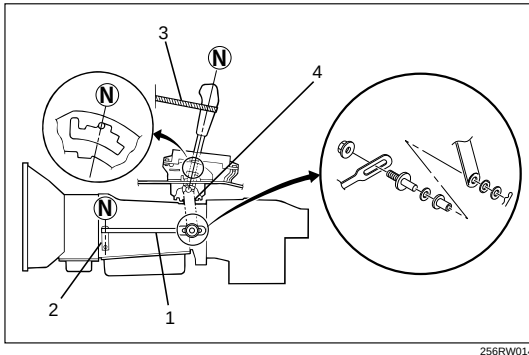
NOTE:

Do not apply to threaded portions.

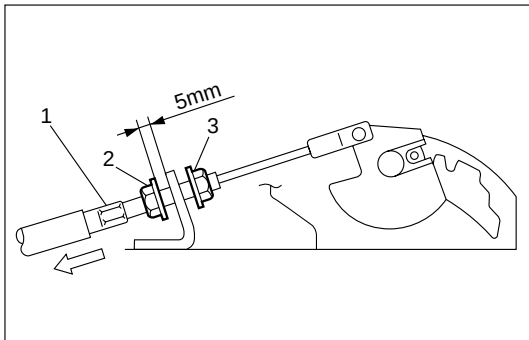
- (6) After adjustment, make sure that the selector lever operates normally, and that each selector position is properly indicated. (The red mark shows through the window.)

Adjustment of shift lock cable

- 1) Set IGN key in "LOCK" position and selector lever in "P" position.
- 2) Adjust cable screw cap on selector lever side to provide a gap (slack for cable) of 1 ~ 2mm between rod on steering lock side and stopper. Adjust cap as follows:
 - ① Pull screw cap in arrow direction to remove inner cable slack.



256RW014



256RW015

- ② With cable kept as ①, adjust gap between nut (1) and bracket to 5mm (0.2in).
- ③ Lock inner cable by turning nut (2) while holding nut (1) in place.



Lock Nut Torque	N·m (kg·cm / lb-in)
	4 (39 / 35)

NOTE:

Clean the rod threads and do not apply oil to them.

- 3) Check the shift lock operation:
 - ① Selector lever shall not move out of "P" position with ignition key in "Lock" position.
 - ② Selector lever can be moved out of "P" position with ignition key in "ON" position only when brake pedal is depressed.
 - ③ Ignition key can be turned to "LOCK" position only when selector lever is in "P" position (key can be pulled out).

If ① and ③ fail, readjust cable. If ② fails, readjust connector wiring and brake pedal switch.

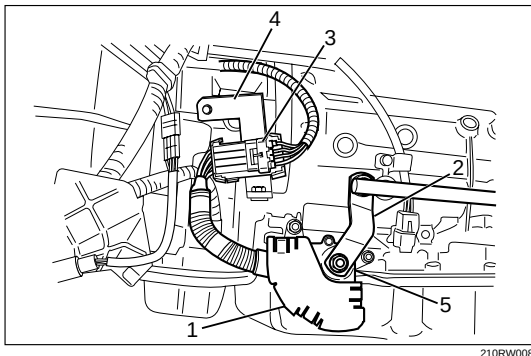
MODE SWITCH



REMOVAL

Preparation:

- Disconnect negative (-) battery cable.
1. Place selector lever in neutral.
 2. Disconnect battery ground cable.
 3. Remove mode switch cover (1).
 4. Disconnect selector lever (2) from the mode switch.
 5. Disconnect transmission harness from the mode switch connector (3).
 6. Remove bracket with mode switch connector from the transmission case.
 7. Remove mode switch connector (3) from the bracket (4).
 8. Remove two mode switch bolts and nut then remove mode switch(5).





INSTALLATION

To install, follow the removal steps in the reverse order, noting the following points;

1. Mode Switch Bolt Torque	N·m (kg·cm / lb·in)
	13 (130 / 113)



Selector Lever Nut Torque	N·m (kg·m / lb·ft)
	23 (2.3 / 17)



2. Mode switch setting procedure

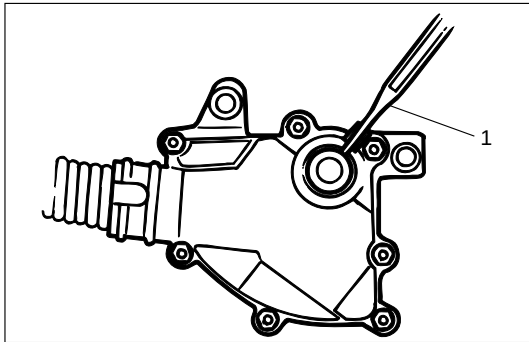
Perform either of the following adjustment procedures:

Procedure1

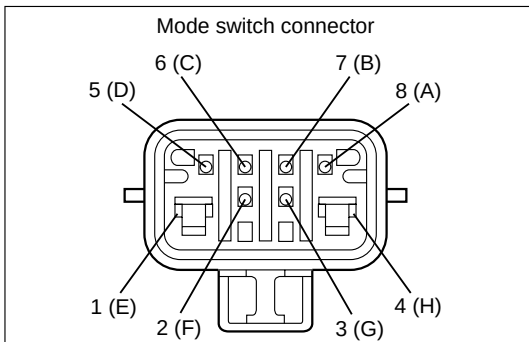
- Place selector lever in neutral.
- Remove selector lever from the mode switch.
- Remove the mode switch cover.
- Loosen the two 10 mm screws.
- Rotate the mode switch until the slot in the mode switch housing aligns with the selector shaft bushing, and insert a 3/32 in. (2.4 mm) drill bit or punch (1) into the slot.
- Tighten the screws to 13 N·m (113 lb·in).
- After completing adjustment, snap the mode switch cover into place.
- Reinstall the selector lever.

Procedure2

- Place selector lever in neutral.
- Disconnect transmission harness connector from mode switch connector.
- Remove mode switch connector with bracket from the transmission case.
- Connect multimeter (resistance mode) to terminals 1(E) and 4(H) on mode switch connector.
- Loosen two mounting screws.
- Rotate mode switch slightly in both directions to determine the range (approx. 5 degrees) of electrical contact.
- Position mode switch in middle of contact range.
- Tighten two mounting screws.
- Remove multimeter and install mode switch harness connector with bracket to the transmission case.
- Connect transmission harness connector to mode switch connector.

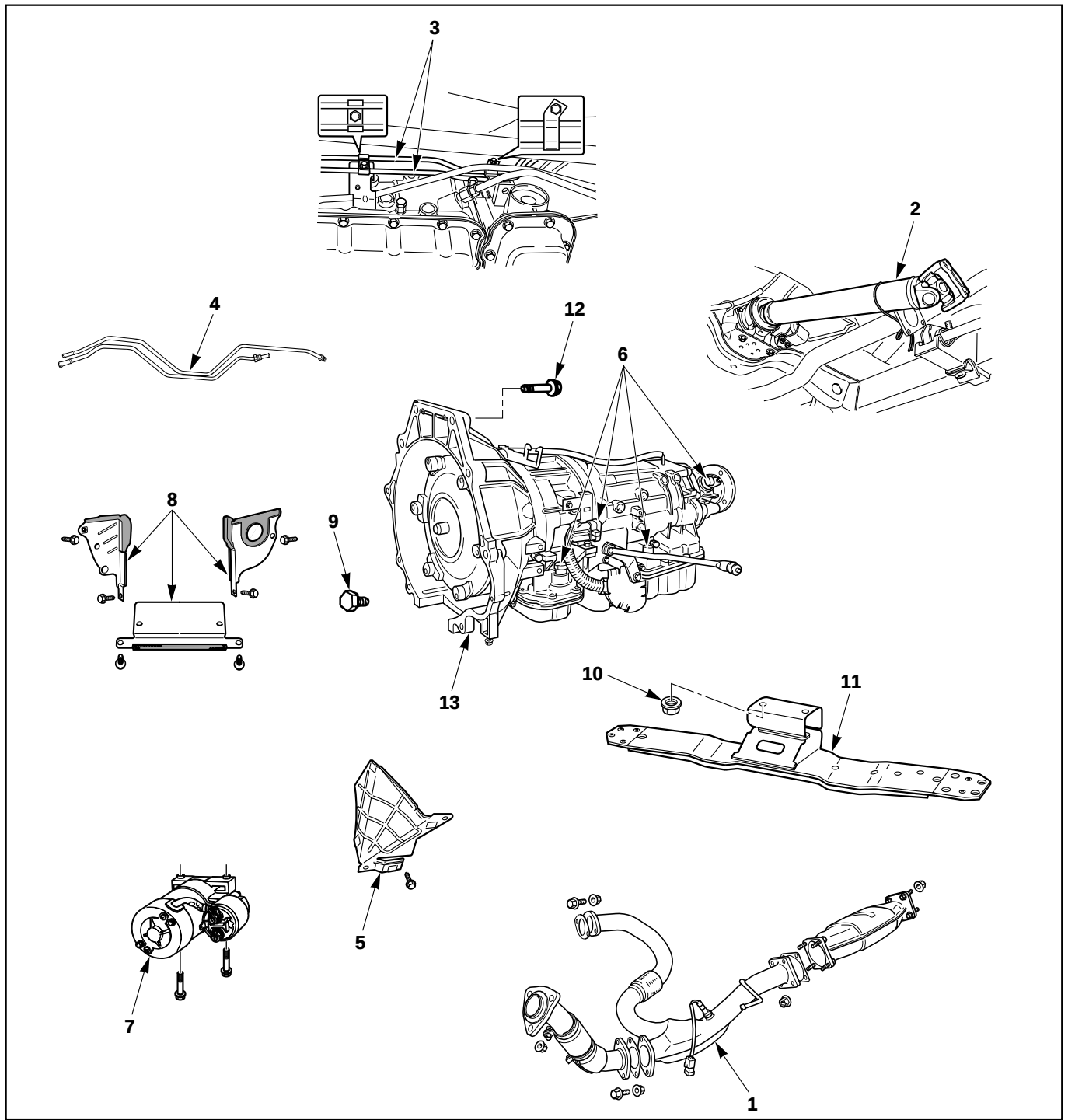


249RW001



F07RW003

TRANSMISSION



240LW002

Removal Steps

1. Exhaust pipe
2. Rear propeller shaft
3. Fuel pipe
4. ATF oil cooler pipe
5. Heat protector
6. Harness connector
7. Starter
8. Flywheel under cover
9. Flywheel-Torque converter bolt

10. Rear mount nut
11. 3rd crossmember
12. Engine-transmission bolt
13. Transmission assembly

Installation Steps

To install, follow the removal steps in the reverse order.



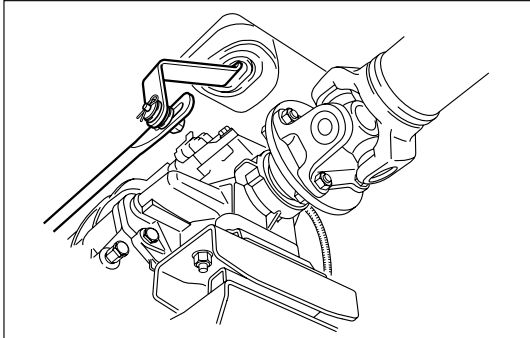
REMOVAL

Preparation:

- Remove engine hood.
- Disconnect negative (-) battery cable.

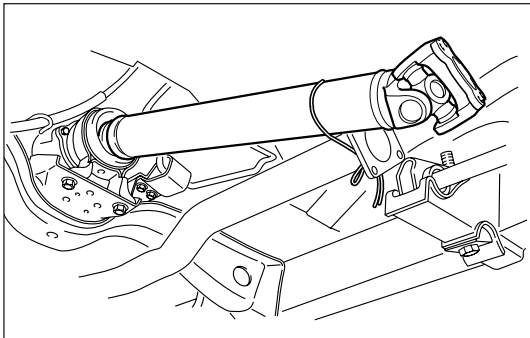
1. Exhaust Pipe

- 1) Remove catalytic converter, center pipe and left front pipe.
- 2) Disconnect O₂ sensor connector from the transmission harness connector.

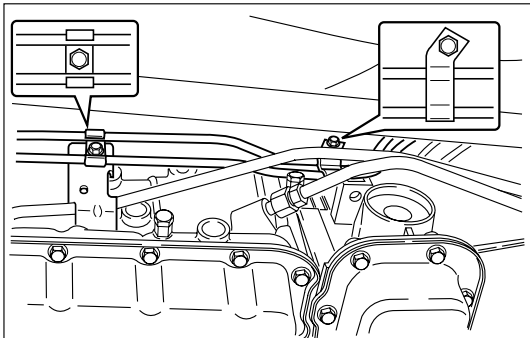


2. Rear Propeller Shaft

- 1) Disconnect shift control rod from the selector lever assembly side.

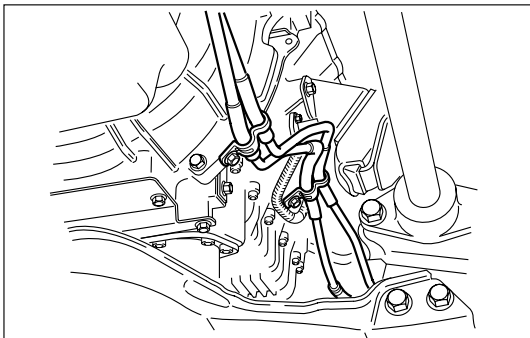


- 2) Disconnect rear propeller shaft transmission side.



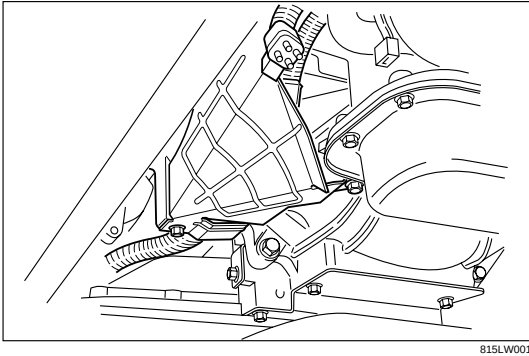
3. Fuel Pipe

Disconnect two fuel pipe clamp bracket from the transmission case eight side.



4. ATF Oil Cooler Pipe

- 1) Disconnect ATF oil cooler pipe from transmission side.
- 2) Remove oil pipe clamp bracket from torque converter case.
- 3) Loosen oil pipe clamp bolt at the engine mount side.

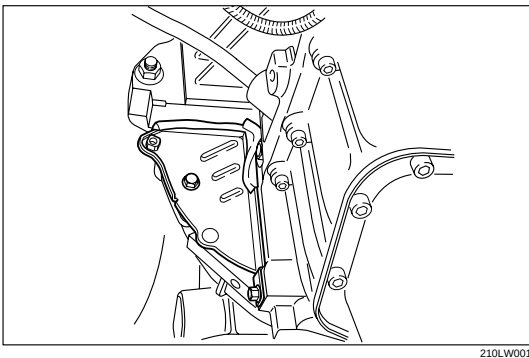


5. Heat Protector

6. Harness Connector

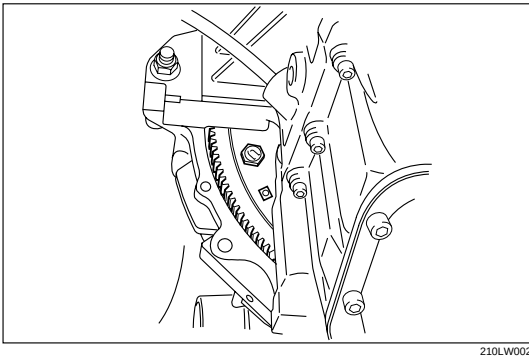
- 1) Disconnect transmission harness connectors from transmission side connectors.
- 2) Disconnect harness clamp from transmission case side.

7. Starter



8. Flywheel Under Cover

Remove flywheel under covers (3 pieces) from transmission case.



9. Flywheel - Torque Converter Bolt

Remove flywheel torque converter fixing bolts (6 pieces) by turning crankshaft.

10. Rear Mount Nut

- 1) Support transmission with a jack.
- 2) Remove two rear mount nuts from the rear mount.

11. 3rd Crossmember

Remove eight 3rd crossmember bolts.

12. Engine-Transmission Bolt

- 1) Hoist engine with a chain block.
- 2) Remove engine-transmission bolts

13. Transmission Assembly



INSTALLATION

To install, follow the removal steps in the reverse order, noting the following points;

13. Transmission Assembly

Slowly raise transmission jack until front of the transmission is aligned with rear of the engine.

12. Engine-Transmission Bolt

Tighten engine-transmission bolts, to the specified torque (see next page).

11. 3rd Crossmember

3rd Crossmember Bolt Torque	N·m (kg·m / lb·ft)
50 (5.1 / 37)	



10. Rear Mount Nut

Rear Mount Nut Torque	N·m (kg·m / lb·ft)
41 (4.2 / 30)	



9. Flywheel-Torque Converter Bolt

- 1) Align the flywheel-torque converter bolt boss with the starter portion of the converter housing by turning torque converter.
- 2) Install new flywheel-torque converter bolts (6 pieces) by turning crankshaft.

NOTE:
 Do not reuse the flywheel-torque converter bolt.

Flywheel-Torque Converter Bolt Torque	N·m (kg·m / lb·ft)
55 (5.6 / 41)	



8. Flywheel Under Cover

Flywheel Under Cover Bolt Torque	N·m (kg·cm / lb·in)
8 (80 / 69)	



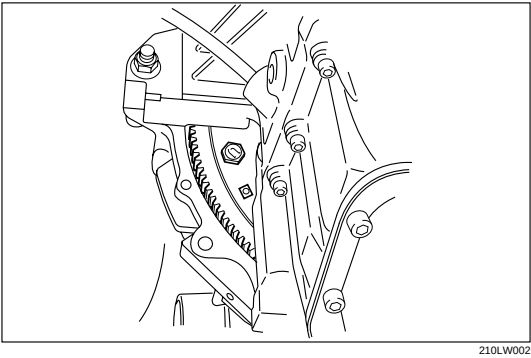
7. Starter

Starter Bolt Torque	N·m (kg·m / lb·ft)
40 (4.1 / 30)	

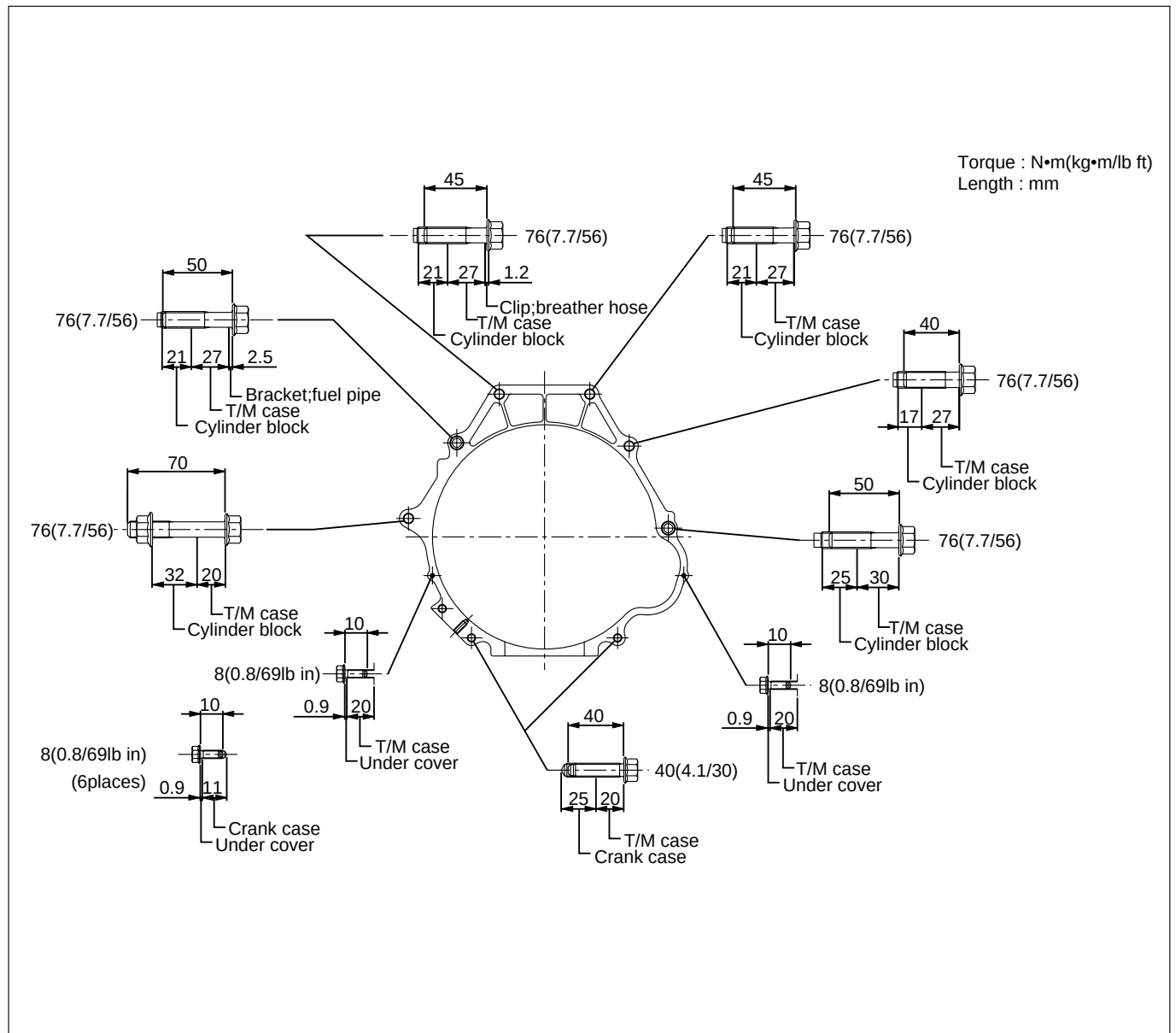


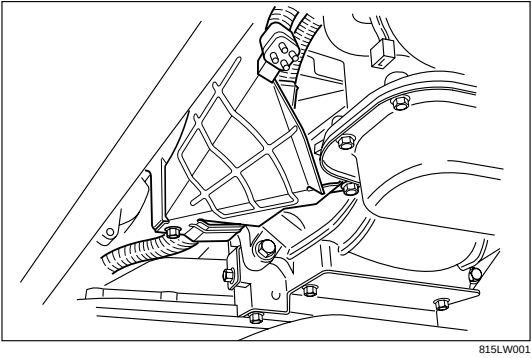
6. Harness Connector

- 1) Connect transmission harness connectors to transmission side.
- 2) Connect harness clamp to transmission harness clamp bracket.



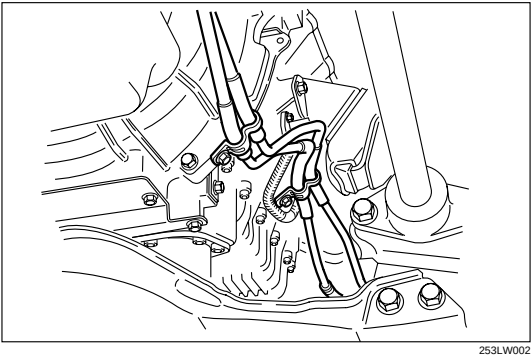
Engine-Transmission Bolt Torque





5. Heat Protector

Heater Protector Bolt Torque	N·m (kg·cm / lb·in)
6 (60 / 52)	



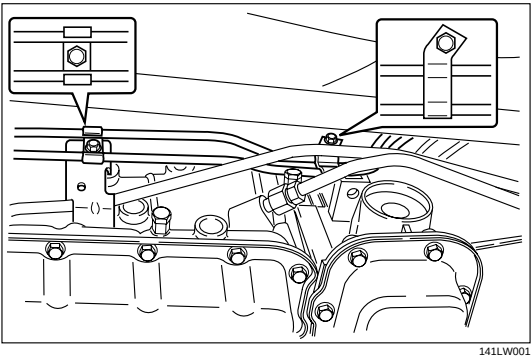
4. ATF Oil Cooler Pipe

1) Install ATF oil cooler pipe to transmission.

ATF Oil Cooler Pipe Nut Torque	N·m (kg·m / lb·ft)
54 (5.5 / 40)	



- 2) Install oil pipe clamp bracket to torque converter case.
- 3) Tighten oil pipe clamp bolt at engine mount side.



3. Fuel Pipe

Connect fuel pipe bracket to transmission side.

2. Rear Propeller Shaft

Connect shift control rod to the selector lever assembly.

Propeller Shaft Bolt Torque	N·m (kg·m / lb·ft)
63 (6.4 / 46)	



1. Exhaust Pipe

Exhaust Pipe Bolt Torque	N·m (kg·m / lb·ft)
Exh. pipe to exh. manifold	67 (6.8 / 49)
Exh. pipe flange bolt	43 (4.4 / 32)



Connect O₂ sensor connector to transmission harness connector.

SOLENOID VALVE (MAIN CASE VALVE BODY)



REMOVAL

Preparation:

- Disconnect negative (-) battery cable.
- Drain fluid.
Refer to "SERVICING" of the SERVICE INFORMATION (Section 00).
- Remove exhaust pipe and disconnect oxygen sensor connector.
- Support transmission case with a jack and remove third crossmember.

1. Main Case Oil Pan

Remove sixteen 10 mm screws, main case oil pan, magnet, and gasket.

2. Oil Filter

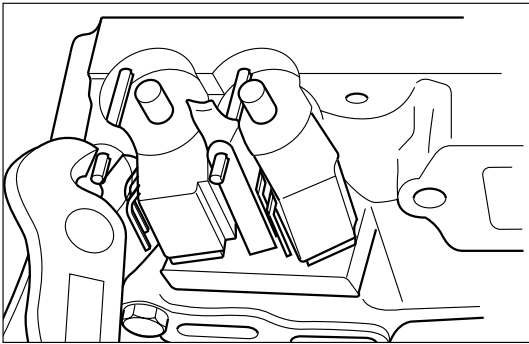
Remove three 13 mm screws, oil filter.

3. Wiring Harness

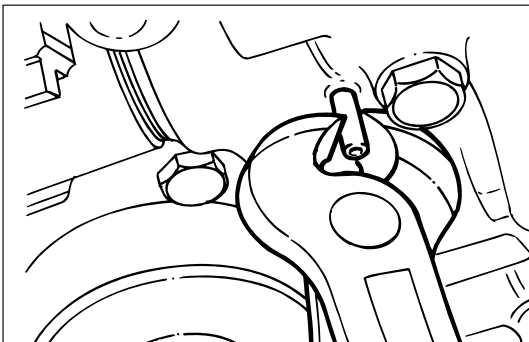
Disconnect wiring harness from band control solenoid, shift solenoids. Pull only on connectors, not on wiring harness.

4. Spring Pin

Remove spring pin for shift solenoid A, shift solenoid B, and band control solenoid respectively, using suitable pliers taking care not to damage solenoids.



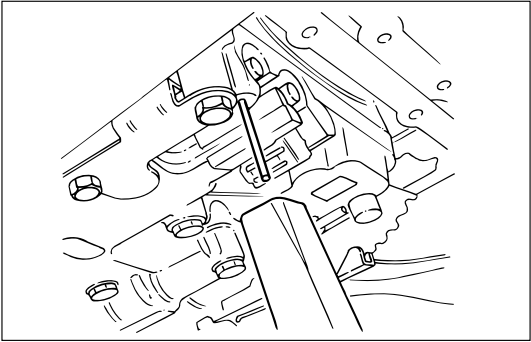
210RW010



244RW003

5. Solenoids

Remove shift solenoid A, shift solenoid B, band control solenoid, and gaskets from main case valve body. Do not pull on wiring harness. Remove solenoids by grasping the metal tip.



INSTALLATION

To install, follow the removal steps in the reverse order, noting the following points;

- Solenoids**
 Install 1shift solenoid A, shift solenoid B, band control solenoid with new gaskets to main case valve body respectively.
- Spring Pin**
 Carefully install spring pin with hammer to avoid damage to valve body etc.
- Wiring Harness**
 Connect wiring harness to solenoids.

- Oil Filter**
 Install oil filter with new gasket, three 13 mm screws.

Oil Filter Bolt Torque	N·m (kg·m / lb·ft)
20 (2.0 / 15)	



- Main Case Oil Pan**
 Install magnet, main case oil pan with new gasket, sixteen 10 mm screws

Main Case Oil Pan Bolt Torque	N·m (kg·cm / lb·in)
11 (110 / 96)	



- Install third crossmember and rear mount nuts.
- | | |
|-----------------------|--------------------|
| Rear Mount Nut Torque | N·m (kg·m / lb·ft) |
| 41 (4.2 / 30) | |



- | | |
|-------------------------------|--------------------|
| Third Crossmember Bolt Torque | N·m (kg·m / lb·ft) |
| 50 (5.1 / 37) | |

- Install exhaust pipe and connect oxygen sensor connector.



- | | |
|---------------------------------|--------------------|
| Exhaust Pipe Flange Bolt Torque | N·m (kg·m / lb·ft) |
| 43 (4.4 / 32) | |

- Refill the transmission with new ATF DEXRON®-III. Refer to “SERVICING” of the SERVICE INFORMATION (Section 00).
- Connect negative (–) battery cable.

SOLENOID VALVE (ADAPTER CASE VALVE BODY)



REMOVAL

Preparation:

- Disconnect negative (-) battery cable.
- Drain fluid.
Refer to "SERVICING" of the SERVICE INFORMATION (Section 00).
- Remove exhaust pipe and disconnect oxygen sensor connector.

1. Adapter Case Oil Pan

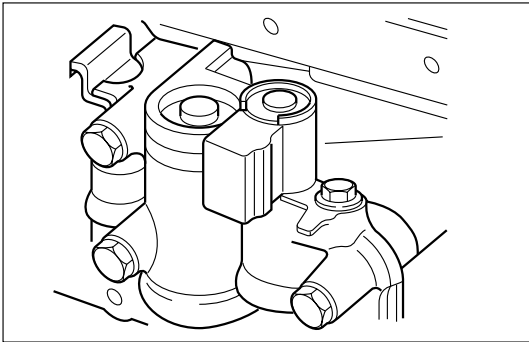
Remove twelve 10 mm screws, adapter case oil pan, and gasket.

2. Wiring Harness

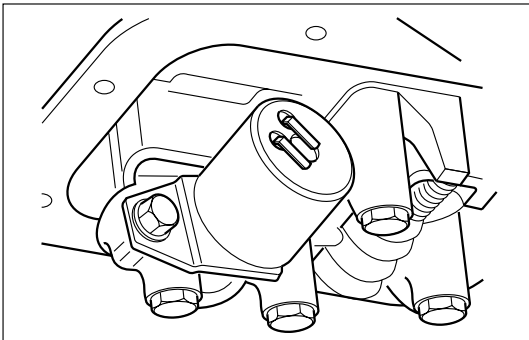
Disconnect wiring harness from force motor solenoid, converter clutch solenoid. Pull only on connectors, not on wiring harness.

3. Solenoid

- Remove 11 mm bolt and converter clutch solenoid with two O-rings.
- Remove 11 mm bolt, retainer, and force motor solenoid.



210RW011



210RW009



INSTALLATION

To install, follow the removal steps in the reverse order, noting the following points;

3. Solenoids

- 1) Install force motor solenoid, retainer, and 11 mm bolt to adapter case valve body.

Retainer Bolt Torque	N·m (kg·cm / lb·in)
	10 (100 / 87)



- 2) Install converter clutch solenoid with two O-rings.
- 3) Tighten 11 mm converter clutch solenoid bolt to adapter case valve body.

Converter Clutch Solenoid	
Bolt Torque	N·m (kg·cm / lb·in)
10 (100 / 87)	



2. **Wiring Harness**
Connect wiring harness assembly to solenoids.

1. **Adapter Case Oil Pan**
Install adapter case oil pan, new gasket, and twelve 10 mm screws.

Adapter Case Oil Pan	
Bolt Torque	N·m (kg·cm / lb·in)
11 (110 / 96)	



- Install exhaust pipe and connect oxygen sensor connector.

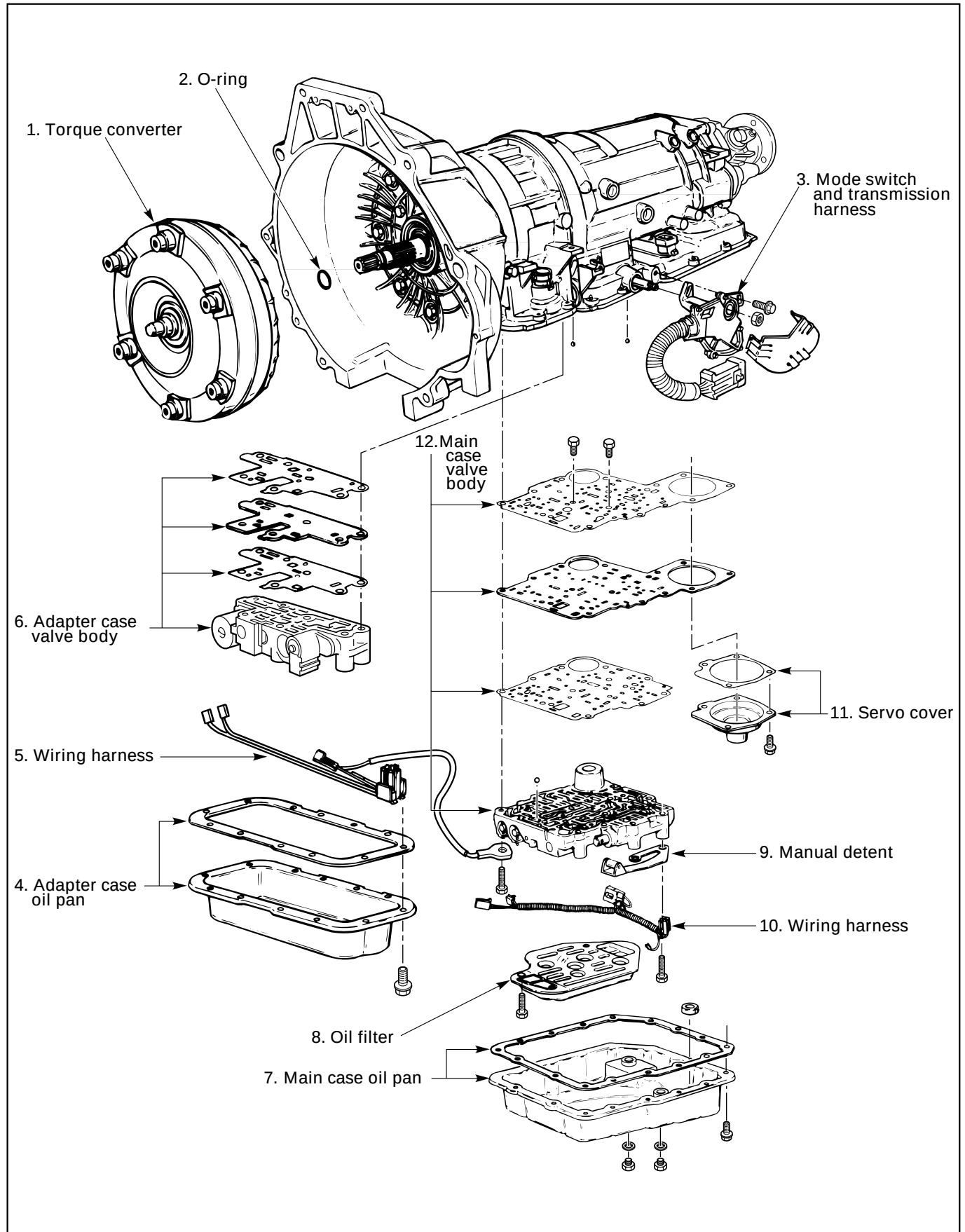
Exhaust Pipe Flange Bolt Torque	N·m (kg·m / lb·ft)
43 (4.4 / 32)	



- Refill the transmission with new ATF DEXRON®-III. Refer to “SERVICING” of the SERVICE INFORMATION (Section 00).
- Connect negative (–) battery cable.

UNIT REPAIR

TRANSMISSION (4L30-E)



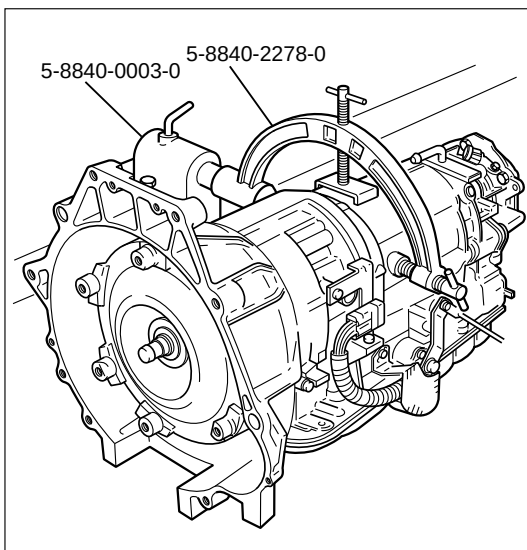


DISASSEMBLY

During the disassembly and reassembly of the following components, perform the following:

- Wash each part thoroughly and blow air through each oil passage and groove to eliminate blockage.
- Seal rings, roll pins and gaskets should be replaced with new parts.
- When assembling the components, apply DEXRON®-III Automatic transmission fluid to each seal, rotating part and sliding part.
- Do not dip those parts having a facing, such as drive plate for clutch or brake, in the cleaner when washing it with solvent.

Also, always wash it with new ATF two or three times after cleaning with solvent.



420RW019



1. Torque Converter

- 1) Drain fluid from torque converter.
- 2) Attach holding fixture to the transmission and set it on holding fixture base.

Holding fixture: 5-8840-2278-0 (J-8763-02)

Fixture base: 5-8840-0003-0 (J-3289-20)

NOTE:

Do not overtighten the tool, as case damage may result.

2. O-Ring

Remove O-ring from turbine shaft.

3. Mode Switch

- 1) Remove two 10mm screws, cover and mode switch.

4. Adapter Case Oil Pan

- 1) Remove twelve 10mm screws, adapter oil pan, and gasket.

5. Wiring Harness

- 1) Disconnect electrical connections from solenoids. Pull on connectors only, not on wiring harness.

6. Adapter Case Valve Body

- 1) Remove seven 13mm screws, adapter case valve body assembly, transfer plate and two gaskets.
- 2) Remove wiring harness and 5 pin connector.

7. Main Case Oil Pan

Remove sixteen 10mm screws, main oil pan, magnet, and gasket.

8. Oil Filter

Remove three 13mm screws, oil filter.

9. Manual Detent

Remove two 13mm screws, roller & spring and manual detent.

10. Wiring Harness

- 1) Disconnect harness assembly from band apply solenoid, shift solenoids and main case 4 pin connector.
- 2) Remove 4 pin connector.

11. Servo Cover

Remove four 13mm screws, servo cover and gasket.

12. Main Case Valve Body and Ground Wire

- 1) Remove seven 13mm valve body screws.
- 2) Remove ground wire from main case.
- 3) Remove main valve body assembly with manual valve link and transfer plate.

NOTE:

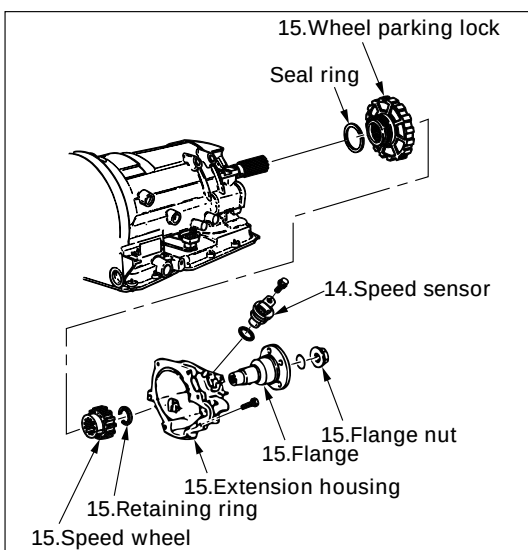
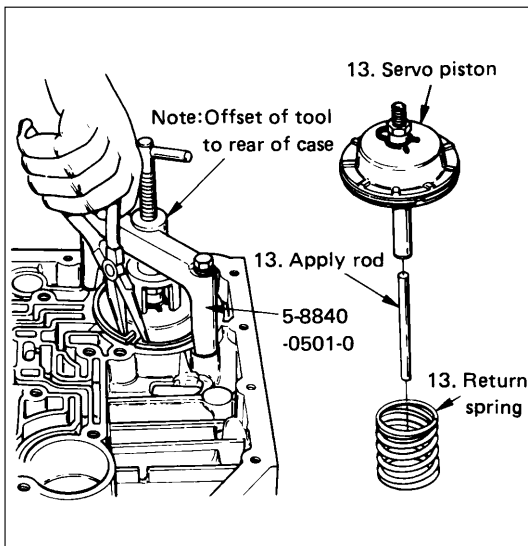
Note the position of link, with the long end into valve short end, into range selector lever.

- 3) Remove gasket transfer plate from main case.
- 4) Remove two check balls from main case.

13. Servo Piston

- 1) Turn transmission to vertical position to drain fluid. Return back to horizontal position when drained.
- 2) Install servo piston spring compressor with offset to the rear of case.
- 3) Compress servo piston assembly.
- 4) Remove servo piston retaining ring.
- 5) Slowly release servo piston assembly.
- 6) Remove tool.
- 7) Remove servo piston assembly, return spring, and servo apply rod.

Servo piston spring compressor: 5-8840-0501-0 (J-23075)



241LW001

14. Speed Sensor

- 1) Rotate transmission to horizontal position, pan side down.
- 2) Remove one 10mm screw, and speed sensor with O-ring.

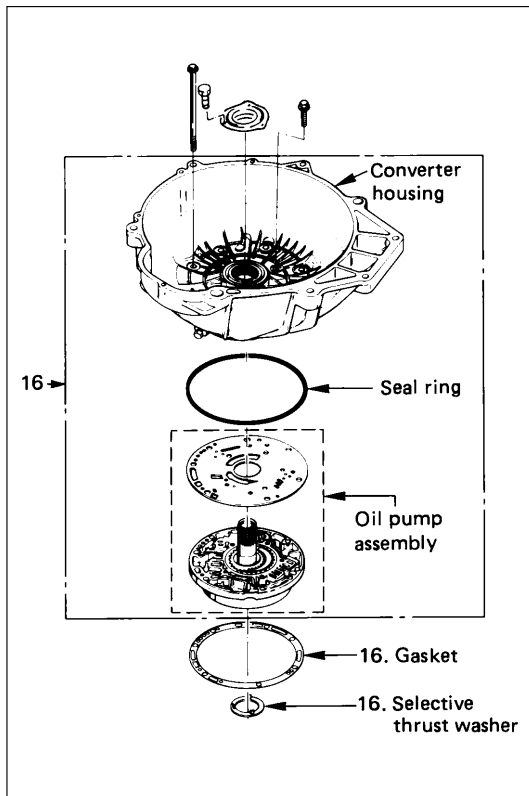
15. Extension Housing and Flange

- 1) Remove seven 8mm hexagon socket head screws, extension assembly, and gasket.
- 2) Remove retaining ring.

NOTE:

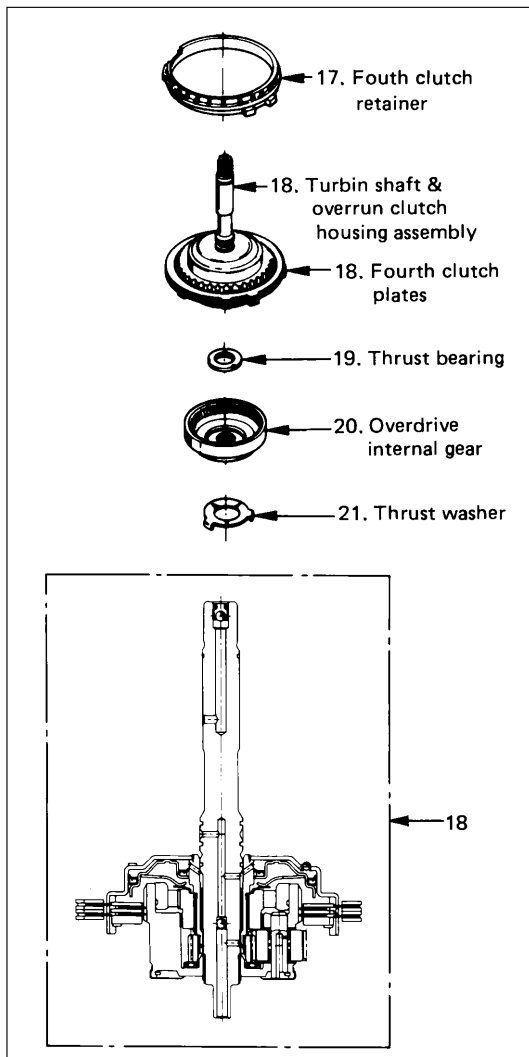
Use extra long nose pliers.

- 3) Remove flange nut.
- 4) Remove flange and O-ring.
- 5) Remove speed wheel.
- 6) Remove wheel parking lock (with seal ring).



16. Converter Housing and Oil Pump Assembly

- 1) Rotate transmission to vertical position, converter housing up.
- 2) Loosen, but not remove, five 13 mm inner screws if oil pump disassembly required.
- 3) Remove seven outer screws.
- 4) Remove converter housing and oil pump assembly.
- 5) Remove gasket.
- 6) Remove selective thrust washer.



17. Fourth Clutch Retainer

Remove fourth clutch retainer.

18. Turbine Shaft and Clutch Plates

Grasp turbine shaft and lift out the overrun clutch housing assembly and fourth clutch plates.

19. Thrust Bearing Assembly

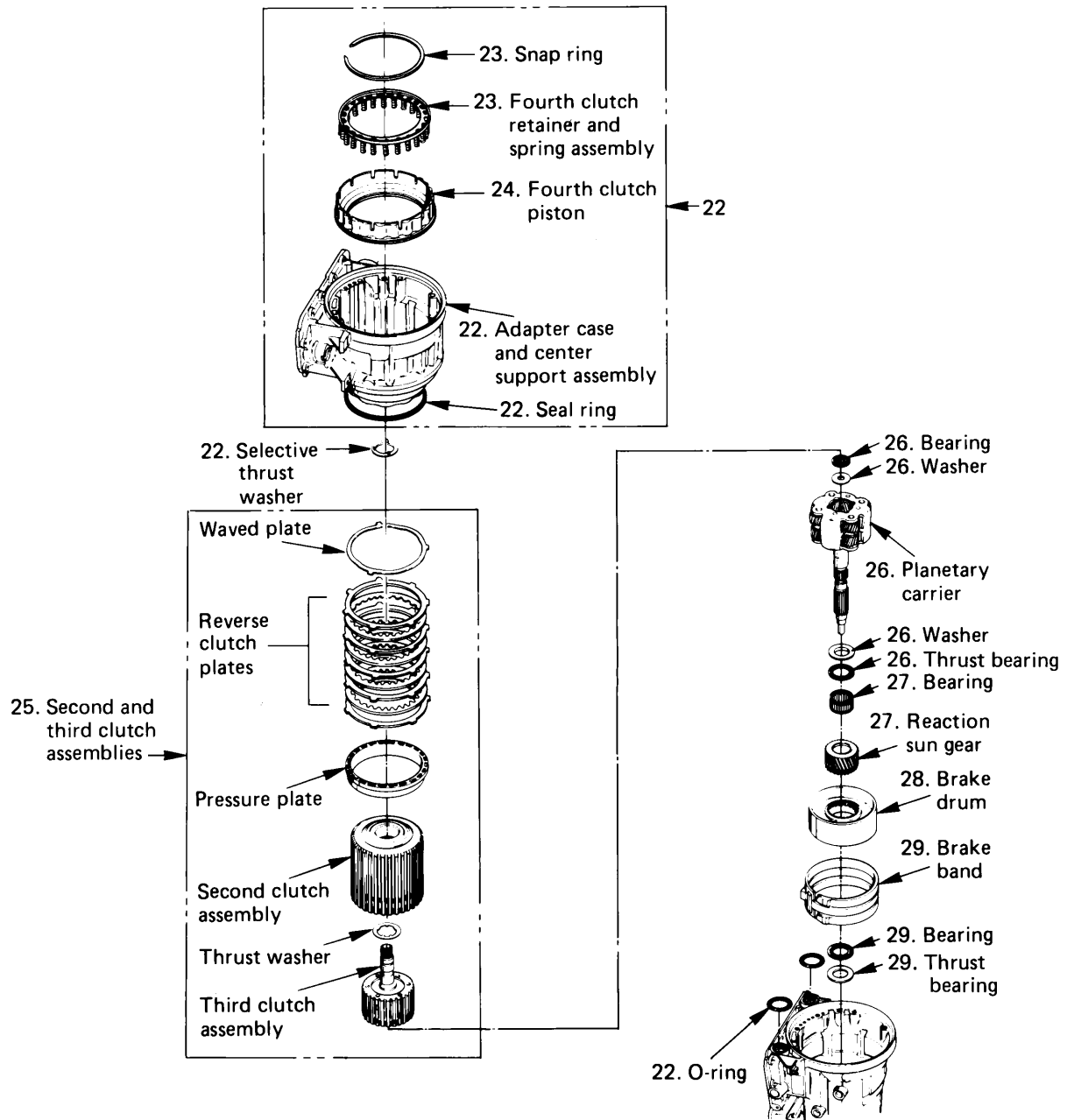
Remove thrust bearing assembly.

20. Overdrive Internal Gear

Remove overdrive internal gear.

21. Thrust Washer

Remove thrust washer.



22. Adapter Case and Center Support Assembly

- 1) Remove adapter case and center support assembly (with fourth clutch piston).
- 2) Remove seal ring.
- 3) Remove selective thrust washer and two O-ring seals from main case.

23. Fourth Clutch Spring Retainer



- 1) Compress the fourth clutch spring retainer and springs.
- 2) Release snap ring from groove.
- 3) Remove clutch compressor and snap ring.
- 4) Remove retainer and spring assembly.

Compressor: 5-8840-0195-0 (J-23327) and
5-8840-2263-0 (J-23327-90)

24. Fourth Clutch Piston

- 1) Insert two converter housing/main case screws to hold adapter case while pulling out fourth clutch piston.
- 2) Remove fourth clutch piston assembly.
- 3) Remove converter housing/main case screws.

25. Second and Third Clutch Assemblies

- 1) Grasp intermediate shaft, twist and pull out the second and third clutch drum assemblies with reverse clutch plates while holding onto output shaft.
- 2) Separate 2nd and 3rd clutch assemblies.
- 3) Remove thrust washer.
- 4) Remove reverse clutch plates and reverse clutch pressure plate.

26. Planetary Carrier Assembly

- 1) Remove bearing and washer.
- 2) Remove planetary carrier assembly.
- 3) Remove thrust bearing.

27. Reaction Sun Gear

- 1) Remove reaction sun gear
- 2) Remove needle bearing.

28. Brake Drum

Remove brake drum.

29. Brake Band

- 1) Remove brake band.
- 2) Remove thrust bearing.

30. Parking Lock and Selector Lever Assembly

- 1) Rotate case to horizontal position, valve body side facing up.
- 2) Remove spring pin, using cutting pliers.

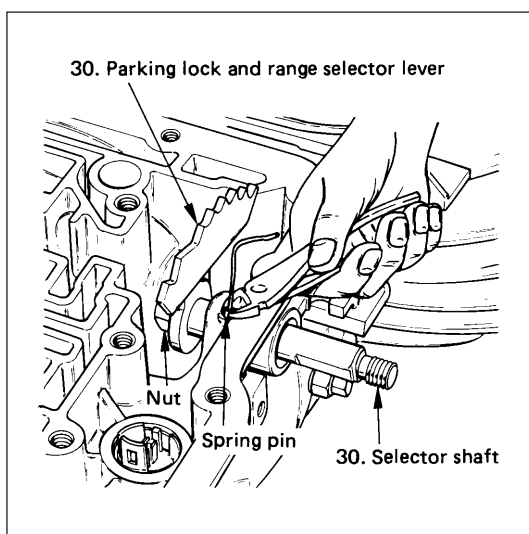
NOTE:

Insert wire in the center of the spring pin to prevent it from collapsing during removal. Be aware of pin height. Protect machined face of main case.

- 3) Remove parking lock and range selector lever 17 mm nut.
- 4) Remove parking lock and range selector lever and actuator assembly.
- 5) Remove selector shaft.

NOTE:

Inspect the shaft for burrs before removing to prevent damaging seal. If necessary, remove burrs by lightly sanding with an oilstone.





REASSEMBLY

30. Parking Lock and Selector Lever Assembly

- 1) Inspect selector shaft seal, replace if necessary.

NOTE:

Use a seal installer when replacing the seal.

- 2) Install selector shaft.

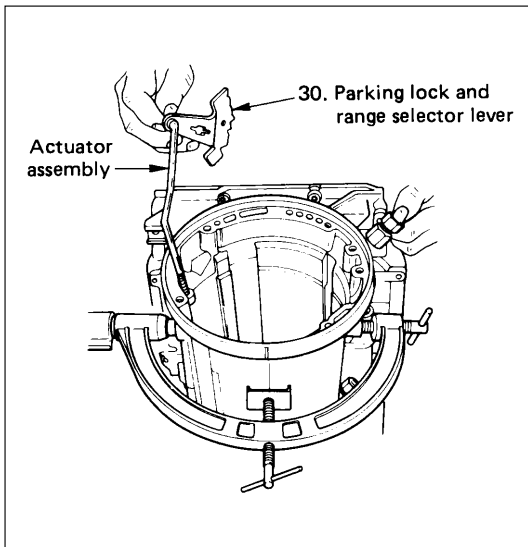
NOTE:

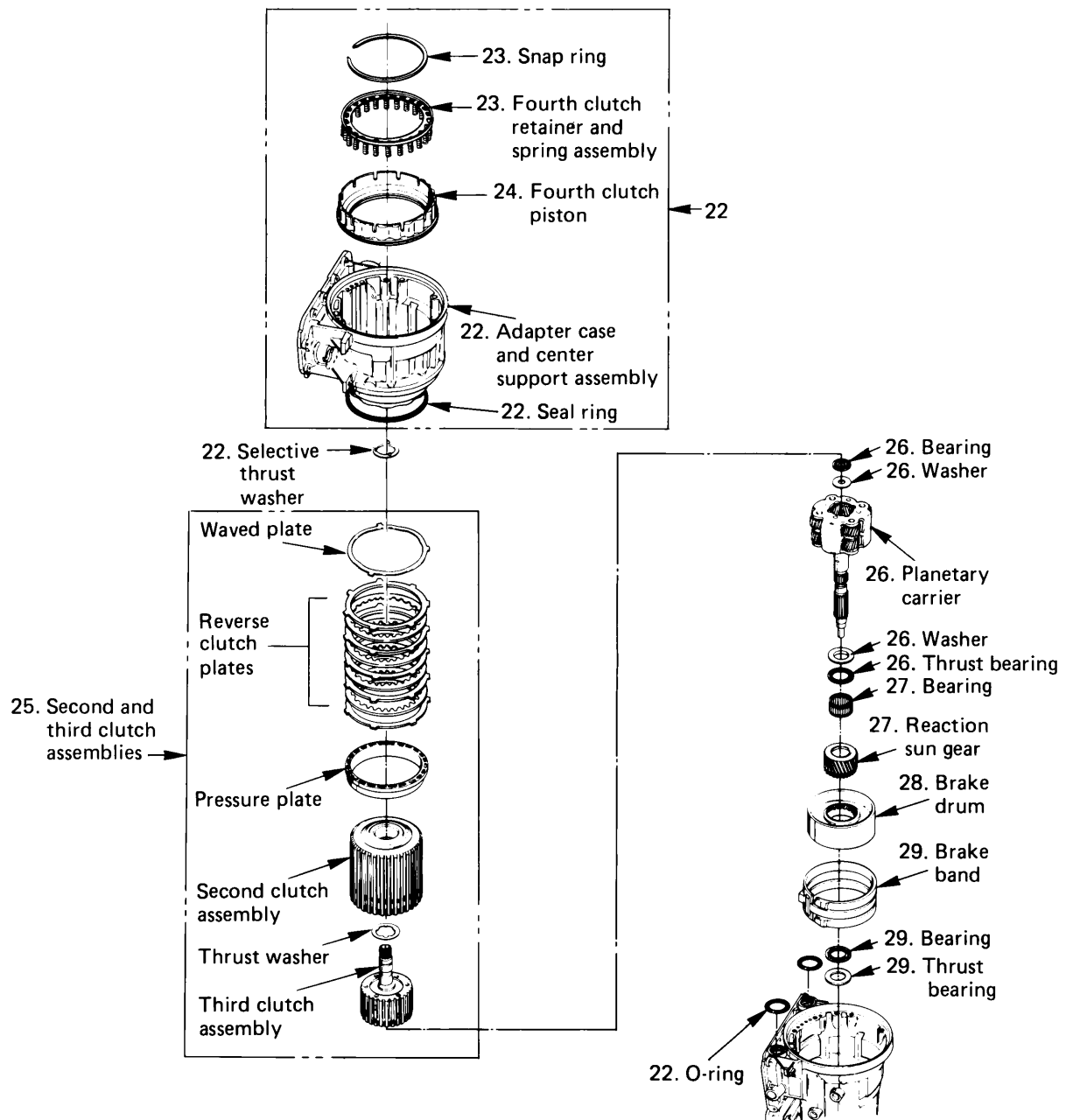
Spring pin groove must be positioned inside the case.

- 3) Install spring pin. Be sure the selector shaft can move freely.
Do not push the pin flush with the case surface.
Leave enough height for removal.
- 4) Install actuator assembly.
- 5) Install parking lock and range selector lever and new 17 mm nut.

Selector Lever Nut Torque	N·m (kg·m / lb·ft)
---------------------------	--------------------

22 (2.2 / 16)	
---------------	--





29. Brake Band



- 1) Rotate main case to vertical position, extension end facing down.
- 2) Install brake band assembly.

NOTE:

Be sure to align servo pin area with the servo hole.

- 3) Install thrust bearing.

NOTE:

The case bushing acts as a guide for the thrust bearing.

28. Brake Drum

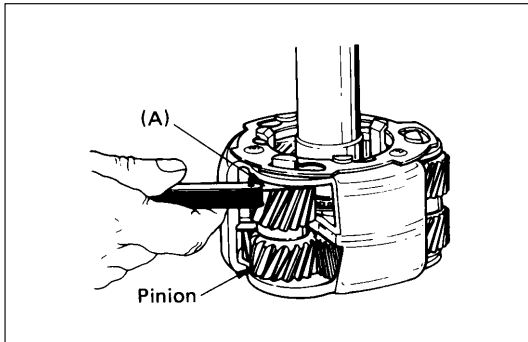
Install brake drum.

27. Reaction Sun Gear

- 1) Install reaction sun gear.
- 2) Install needle bearing.

26. Planetary Carrier Assembly

- 1) Inspect planetary carrier assembly for wear and damage, if necessary renew.
- 2) Measure pinion end play clearance (A) with a feeler gage.



Planetary Carrier Pinion End Play (A)		mm (in)
Standard		0.13 - 0.89 (0.005 - 0.035)

If clearance is outside specified valve, replace planetary carrier assembly.

- 3) Install the thrust bearing on the output shaft.

NOTE:

Use petroleum jelly to hold the thrust bearing in place.

- 4) Align planetary pinions. Each planetary pinion is marked with double points to indicate the master tooth space and exactly opposite with a single point to indicate the master tooth. The markings on the planetary carrier consist of double lines which are to be lined-up with the double points on two opposite pinions; the single lines are to be lined-up with the single points on the other two pinions.
- 5) After all four pinions are lined-up, slide on third clutch assembly. Rotate third clutch and check mark alignment. Considering that the ring gear tooth between the double points of one planetary pinion is tooth number 1, count the teeth to check that the single points on the two adjacent pinions are between teeth 23 and 24 of the ring gear, and that the ring gear tooth between the double points of the opposite pinion is tooth number 46. If it is not so, remove, realign and try again.
- 6) Install planetary carrier with third clutch.

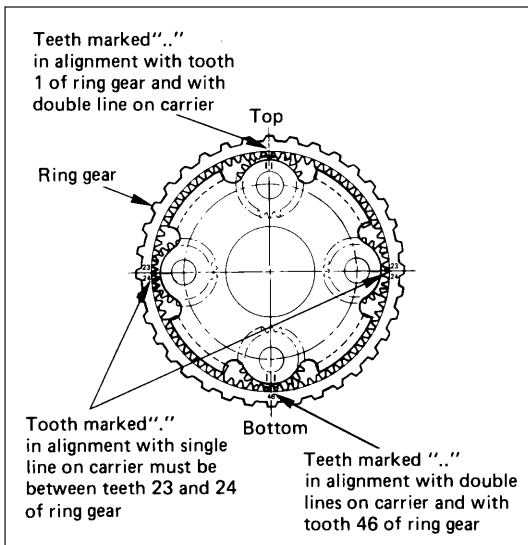
NOTE:

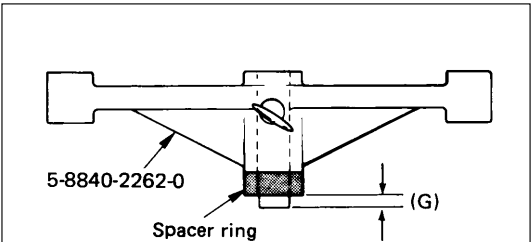
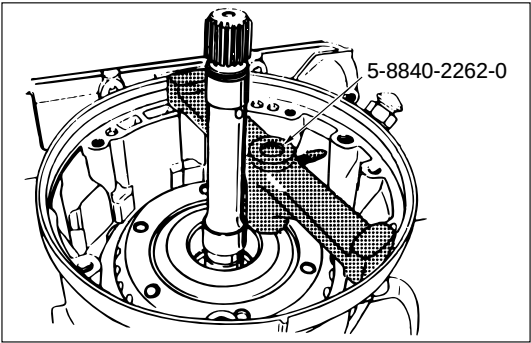
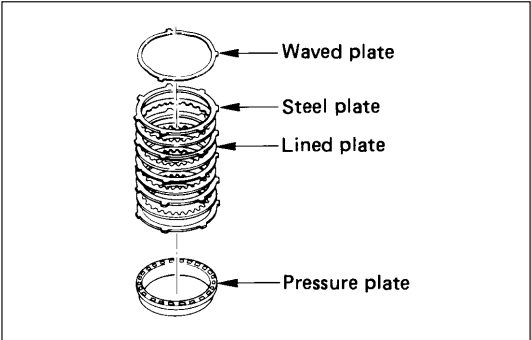
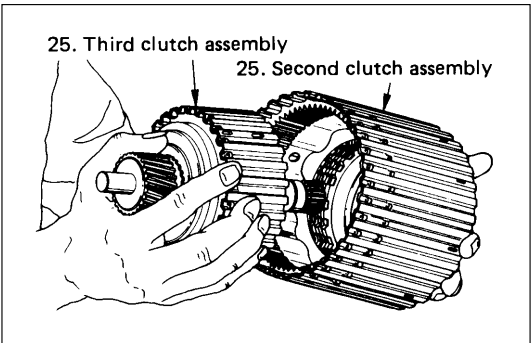
Do not force. When properly aligned, the parts will fit together easily.

- 7) Remove the third clutch.
- 8) Install bearing and washer.

NOTE:

Use petroleum jelly to hold the washer and bearing in place.





Selective Thrust Washer

DIM. "G" mm(in)	Color
1.53 - 1.63 (0.060 - 0.064)	YELLOW
1.72 - 1.82 (0.068 - 0.072)	RED
1.91 - 2.01 (0.075 - 0.079)	BLACK
2.10 - 2.20 (0.083 - 0.087)	NATURAL
2.29 - 2.39 (0.090 - 0.094)	GREEN
2.48 - 2.58 (0.098 - 0.102)	BLUE

FOLLOWING THE PROCEDURE SHOULD
 RESULT IN FINAL END-PLAY FROM
 0.36mm TO 0.79 mm (.014" TO .031")

25. Second and Third Clutch Assemblies

- Carefully align second clutch plates inner tangs.
- Install thrust washer, tangs pointing downward, locating tang positioned in slot on second clutch hub.

NOTE:

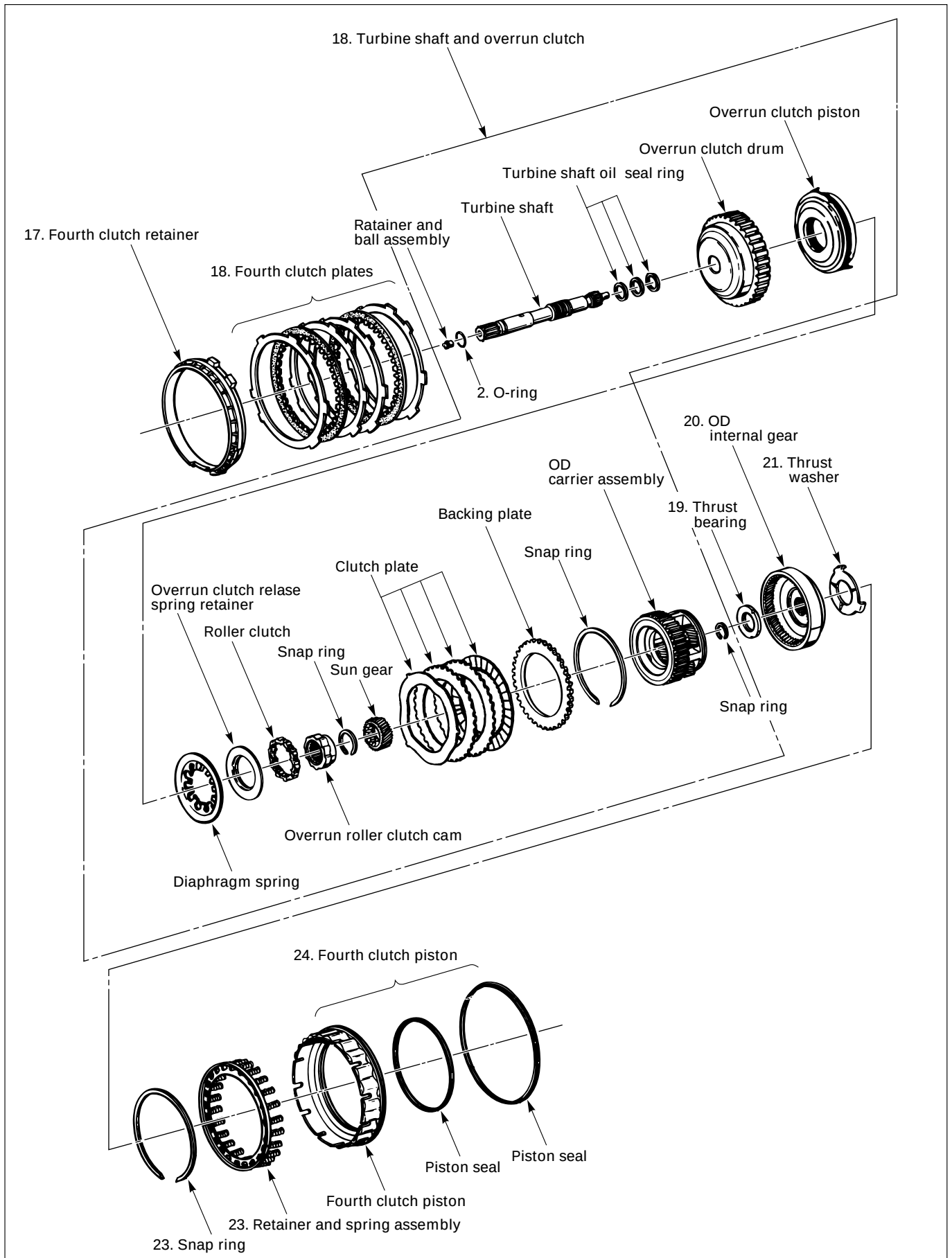
Use petroleum jelly to hold thrust washer in place.

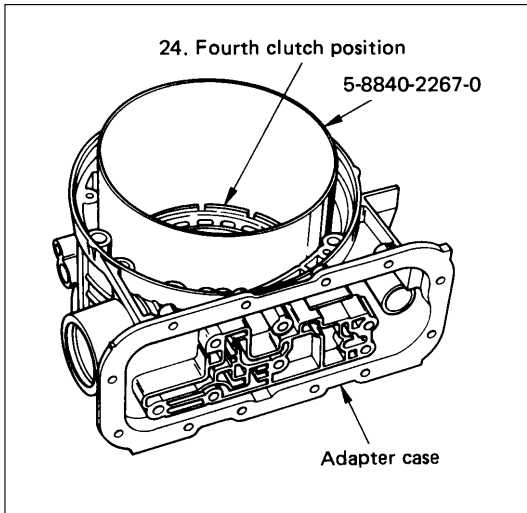
- Install third clutch and intermediate shaft assembly into the second clutch drum.
- Install second and third clutch assemblies into the main case. Twist output shaft and clutch assemblies to insure proper fit.
- Install pressure plate with lip side up, tang facing valve body face.
- Install reverse clutch plates. Start with a steel plate and alternate with lined plates.
- Install waved clutch plate, center tang facing valve body side.

Second clutch end play measurement

- Install the gaging tool on the case flange and against the intermediate shaft.
- Position the inner shaft of the gaging tool against the thrust surface of the second clutch hub.
- Tighten thumb screw. Remove the tool.
- Fit the spacer ring on the inner shaft of the tool.
- Measure gap ("G"). Select appropriate size washer as the chart specified.

Selective washer gaging tool: 5-8840-2262-0
 (J-23085-A)

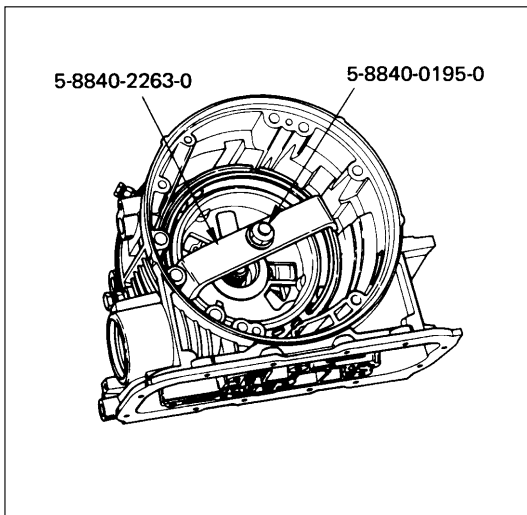




24. Fourth Clutch Piston

- 1) Inspect piston seals and replace if necessary.
- 2) Lubricate fitter and install on fourth clutch piston.
- 3) Install fourth clutch piston in adapter case.
- 4) Remove fitter.

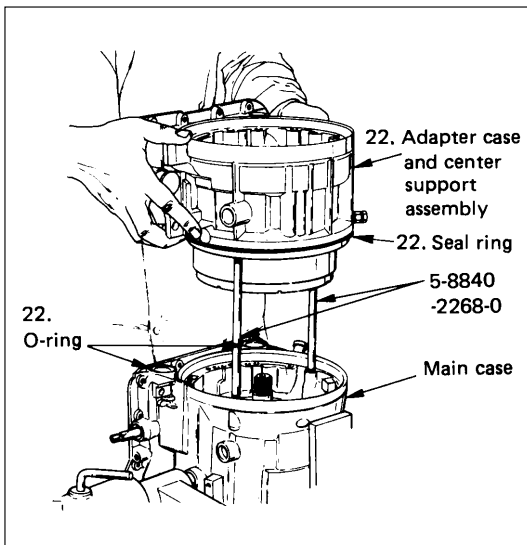
Fourth clutch piston fitter: 5-8840-2267-0 (J-38554)



23. Fourth Clutch Spring Retainer

- 1) Install retainer and spring assembly.
- 2) Install snap ring in adapter case.
- 3) Install compressor.
- 4) Compress retainer and spring assembly.
- 5) Seat snap ring in groove.
- 6) Remove compressor.

Fourth clutch spring compressor: 5-8840-0195-0 (J-23327) and 5-8840-2263-0 (J-23327-90)

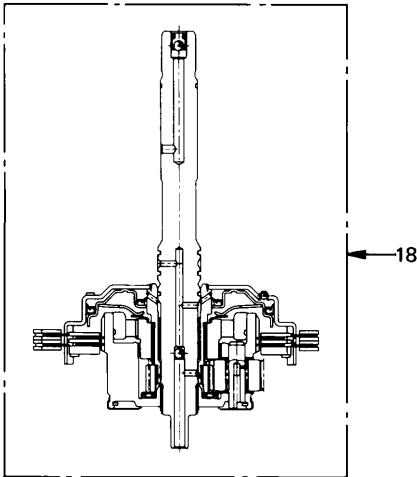
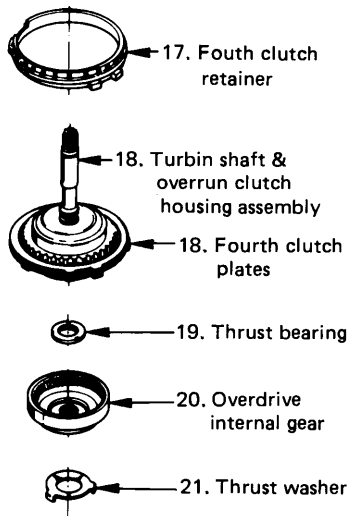


22. Adapter Case and Center Support Assembly

- 1) Install selective washer using petroleum jelly.
- 2) Install two O-ring seals in main case and adapter case/main case seal ring.
- 3) Install guide pins.
- 4) Install adapter case complete to main case.

Guide pin: 5-8840-2268-0 (J-38588)





21. Thrust Washer



Install thrust washer into adapter case, with tangs pointing downwards.

20. Overdrive Internal Gear

19. Thrust Bearing Assembly

18. Turbine Shaft and Fourth Clutch Plates

- 1) Preassemble overdrive internal gear and thrust bearing assembly onto the overrun clutch assembly complete.

NOTE

Install bearing assembly, black side up. Use petroleum jelly to keep assembly in place.

- 2) Complete overdrive carrier and internal gear assembly into adapter case.



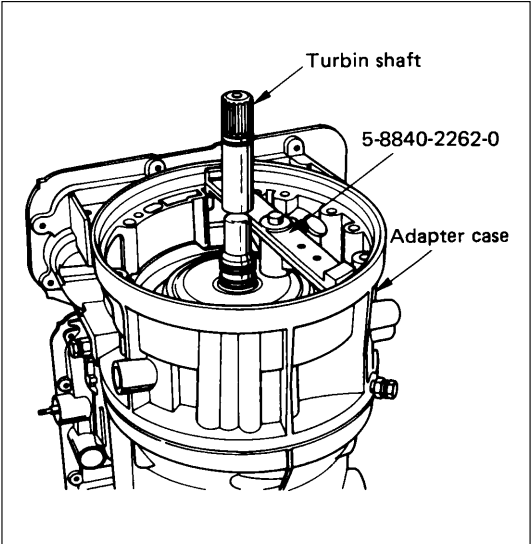
- 3) Install fourth clutch plates in the following order. Steel, Lined, Steel, Steel, Lined, Steel. Steel plates go in with short tang facing towards valve body surface.

17. Fourth Clutch Retainer



Install fourth clutch retainer.

Notch facing up and positioned towards valve body surface.

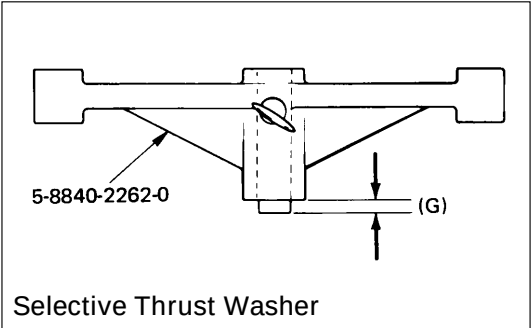


OD clutch end play measurement

- 1) Install the tool on the adapter case flange and against the input shaft.
- 2) Position the inner shaft of the tool against the thrust surface of the overrun clutch housing.
- 3) Tighten thumb screw. Remove the tool.
- 4) Measure gap "G". Select appropriate size washer as the chart specifies.
- 5) Set selective thrust washer aside.

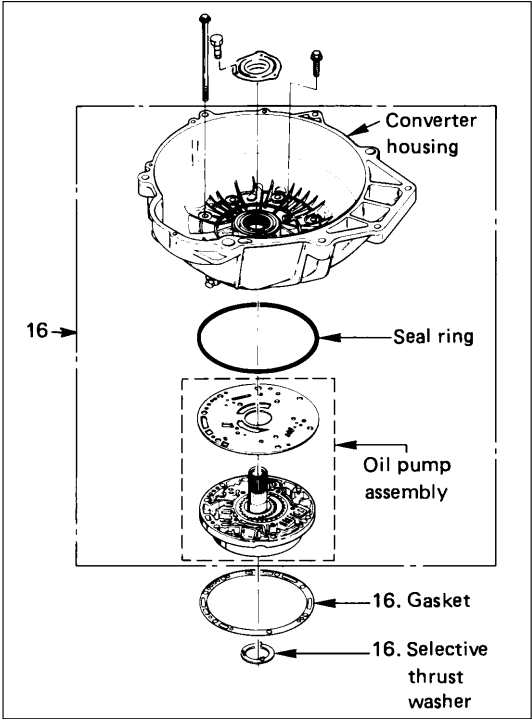


Selective washer gaging tool: 5-8840-2262-0
(J-23085-A)



Selective Thrust Washer

DIM. "G" mm(in)	Color
1.53 - 1.63 (0.060 - 0.064)	YELLOW
1.72 - 1.82 (0.068 - 0.072)	RED
1.91 - 2.01 (0.075 - 0.079)	BLACK
2.10 - 2.20 (0.083 - 0.087)	NATURAL
2.29 - 2.39 (0.090 - 0.094)	GREEN
2.48 - 2.58 (0.098 - 0.102)	BLUE
FOLLOWING THE PROCEDURE SHOULD RESULT IN FINAL END-PLAY FROM 0.1 mm TO 0.8 mm (0.004" TO 0.03")	



16. Converter Housing and Oil Pump Assembly

- 1) Install outer seal ring and gasket.
- 2) Install selective washer.

NOTE

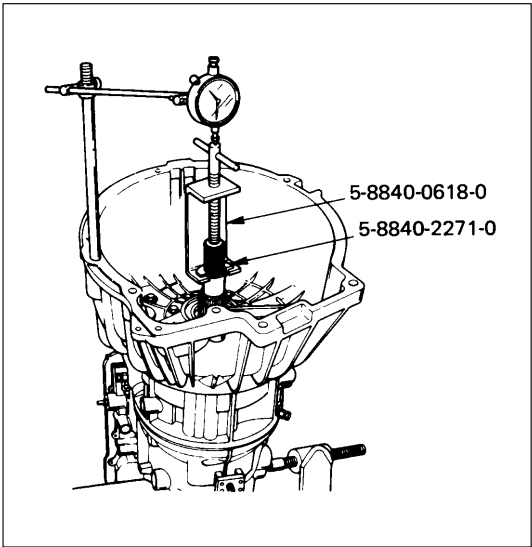
Use petroleum jelly to hold selective washer in place.

- 3) Install complete converter housing and oil pump assembly to adapter case.
- 4) Fit and tighten seven outer 13 mm screws.

Converter Housing Outer

Screw Torque	N·m (kg·m / lb·ft)
39 (4.0 / 29)	

- 5) Ensure free rotation of pump using rotation tool.
Pump rotation tool: 5-8840-2273-0 (J-23082-01)



Overdrive end play measurement

- 1) Fit puller on turbine shaft.
- 2) Position axial play checking tool on converter housing mating face.
- 3) Pull turbine shaft upwards with puller until first resistance is met.
(Due to weight of overdrive complete assembly) Maintain shaft in this position and set indicator to zero.
- 4) Pull turbine shaft further upwards with puller.
Read end play shown on indicator.

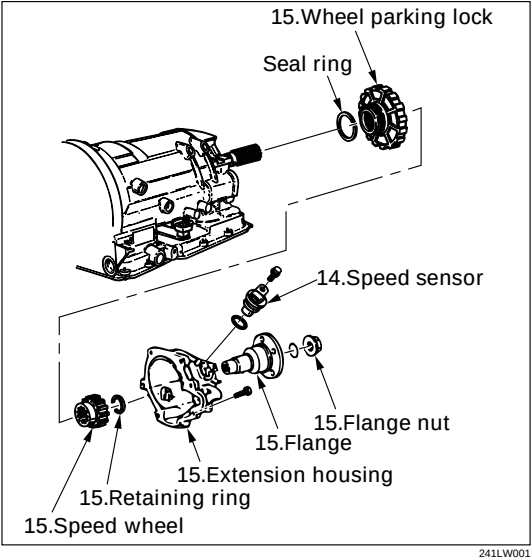
Overdrive End Play	mm (in)
Standard	
0.1 – 0.8 (0.004 – 0.031)	

- 5) Remove axial play checking tool and puller.

NOTE:

If end play is not correct, repeat selective washer selection.

Turbine shaft puller: 5-8840-2271-0 (J-25022) and
5-8840-0618-0 (J-24773-1)



15. Extension Housing and Flange

- 1) Inspect extension housing oil seal and bearing. Replace if necessary.
Extension housing oil seal installer: 5-8840-2282-0 (J-36797)
- 2) Rotate transmission to horizontal position, with valve body side down.
- 3) Inspect parking wheel seal ring. Replace if necessary.
- 4) Install wheel parking lock assembly.
- 5) Install speed wheel and snap ring.

NOTE:

Use extra long nose pliers.

- 6) Install gasket onto extension assembly, using a thin coating of oil.
- 7) Install extension housing assembly, and align parking pawl shaft.
- 8) Install actuator assembly into extension assembly.
- 9) Install seven 8 mm hexagon socket head screws.

Extension Housing Bolt Torque	N·m (kg·m / lb·ft)
32 (3.3 / 24)	

- 10) Install flange and O-ring.
- 11) Install flange nut.

Flange Nut Torque	N·m (kg·m / lb·ft)
103 (10.5 / 76)	

14. Speed Sensor

- 1) Inspect speed sensor O-ring. Replace if necessary.
- 2) Install speed sensor assembly and 10 mm screws.

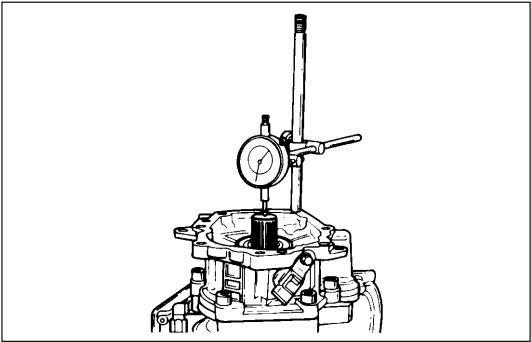
Speed Sensor Bolt Torque	N·m (kg·cm / lb·in)
9 (90 / 78)	

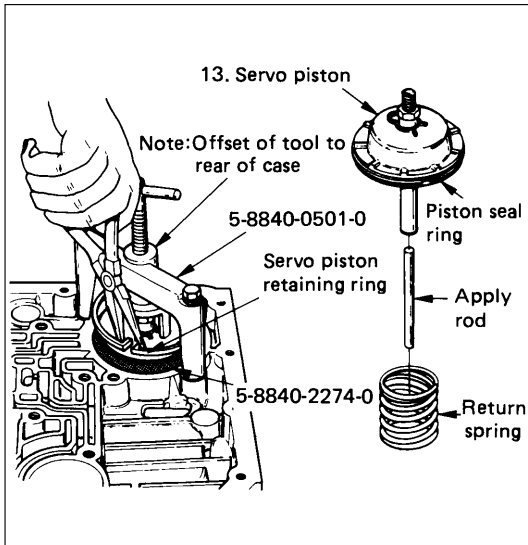
Main case end play measurement

- 1) Attach axial play checking tool on the extension housing and set indicator to zero on output shaft.
- 2) Manually push output shaft upwards.

Main Case End Play	mm (in)
Standard	
0.36 – 0.80 (0.014 – 0.031)	

- 3) Remove axial play checking tool.
- 4) If end play is not correct, repeat selective washer selection.





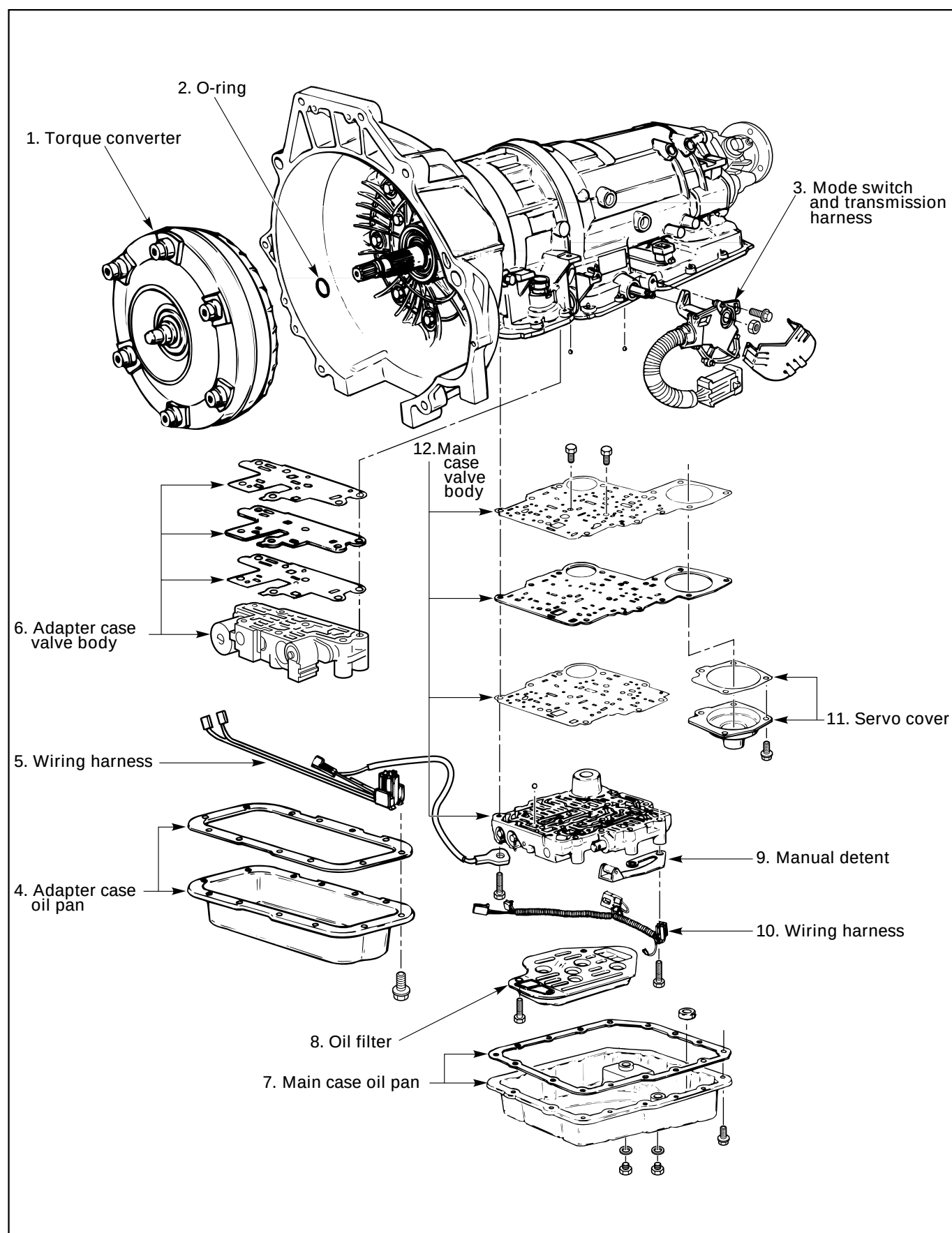
13. Servo Piston

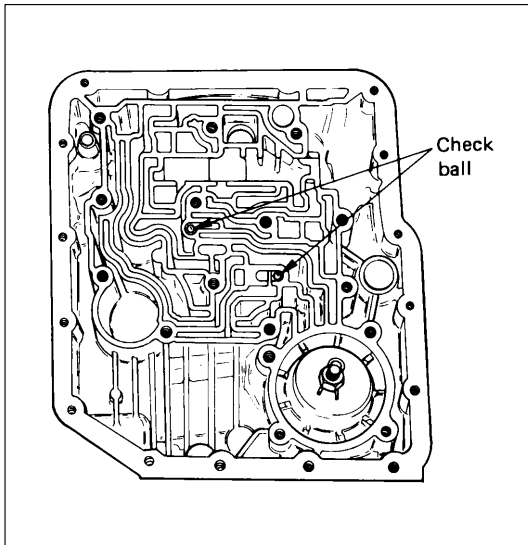
- 1) Inspect piston seal ring. Replace if necessary.
- 2) Ensure brake band is correctly positioned. Rotate output shaft if necessary.
- 3) Install servo piston fitter in servo bore.
- 4) Install apply rod, round end toward band, return spring and piston assembly.
- 5) Install the tool with offset to rear of case.
- 6) Compress servo piston seal ring, using fitter while tightening the tool screw.
- 7) Install servo piston retaining ring.
- 8) Remove tool.
- 9) Adjust the brake band by tightening the servo adjusting screw to 4.5 N·m (46 kg·cm / 40 lb·in) torque. Be certain the lock nut is loose, then back-off the screw five turns exactly. Hold piston sleeve with wrench and tighten lock nut to 18.5 N·m (1.9 kg·m / 14 lb·ft) torque. Be certain the adjusting screw does not turn.



Servo spring compressor: 5-8840-0501-0 (J-23075)
 Servo piston fitter: 5-8840-2274-0 (J-38428)

7A1 - 176 AUTOMATIC TRANSMISSION (4L30-E)





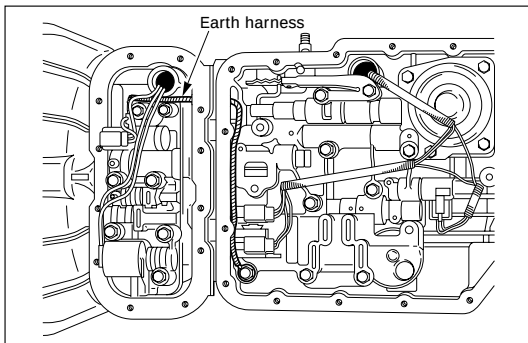
12. Main Case Valve Body and Ground Wire

- 1) Install two check balls.
- 2) Inspect electrical connector and seal, replace if necessary.
- 3) Install electrical 4 pin connector/main case and wiring harness.
- 4) Install two guide pins into main case.
Guide pin: 5-8840-0022-0 (J-25025-B)
- 5) Install valve body complete assembly and manual valve link.

NOTE:

Valve must be extended as the short end of manual valve link is connected to the range selector lever. Long end of link goes into valve.

- 6) Install seven 13 mm screws.
- 7) Pass ground wire of adapter case wiring harness assembly through the hole joining adapter fluid area and main case fluid area.
- 8) Assemble 8.5 mm connector of ground wire under the head of this valve body bolt and reinstall it.



Main Case Valve Body

Bolt Torque	N·m (kg·m / lb·ft)
20 (2.0 / 15)	

- 9) Remove two guide pins.

11. Servo Cover

Install servo cover gasket, cover and four 13 mm screws.

Servo Cover Bolt Torque	N·m (kg·m / lb·ft)
25 (2.5 / 18)	

10. Wiring Harness

Connect harness to band control and shift solenoids.

9. Manual Detent

Install roller and spring assembly with clip.
Install two 13 mm screws.

Manual Detent Screw Torque	N·m (kg·m / lb·ft)
20 (2.0 / 15)	

8. Oil Filter

Install oil filter, three 13 mm screws.

Oil Filter Bolt Torque	N·m (kg·m / lb·ft)
20 (2.0 / 15)	

7.
Main Case Oil Pan

Install oil pan gasket, magnet, oil pan, sixteen 10 mm screws.

Main Case Oil Pan Bolt Torque	N·m (kg·cm / lb·in)
	11 (110 / 96)



6.
Adapter Case Valve Body

- 1) Inspect electrical connector and seal. Replace if necessary.
Install electrical five pin connector and harness assembly in bottom of adapter case.
Install gasket, transfer plate, gasket.
- 2) Install adapter case valve body complete and seven 13 mm screws.

Adapter Case Valve Body Bolt Torque	N·m (kg·m / lb·ft)
	20 (2.0 / 15)



5.
Wiring Harness

- 1) Connect harness assembly to converter clutch solenoid, and force motor.

4.
Adapter Case Oil Pan

- 1) Install oil pan gasket, oil pan, twelve 10 mm screws.

Adapter Case Oil Pan Bolt Torque	N·m (kg·cm / lb·in)
	11 (110 / 96)



- 2) Rotate transmission, with bottom pan facing down.

3. Mode Switch

- 1) Install mode switch, shield and two 10 mm screws.
- 2) Adjust using setting tool.
Refer to "MODE SWITCH" in this section.

Selector Shaft Nut Torque	N·m (kg·m / lb·ft)
	23 (2.3 / 17)



Mode Switch Screw Torque	N·m (kg·cm / lb·in)
	13 (130 / 113)



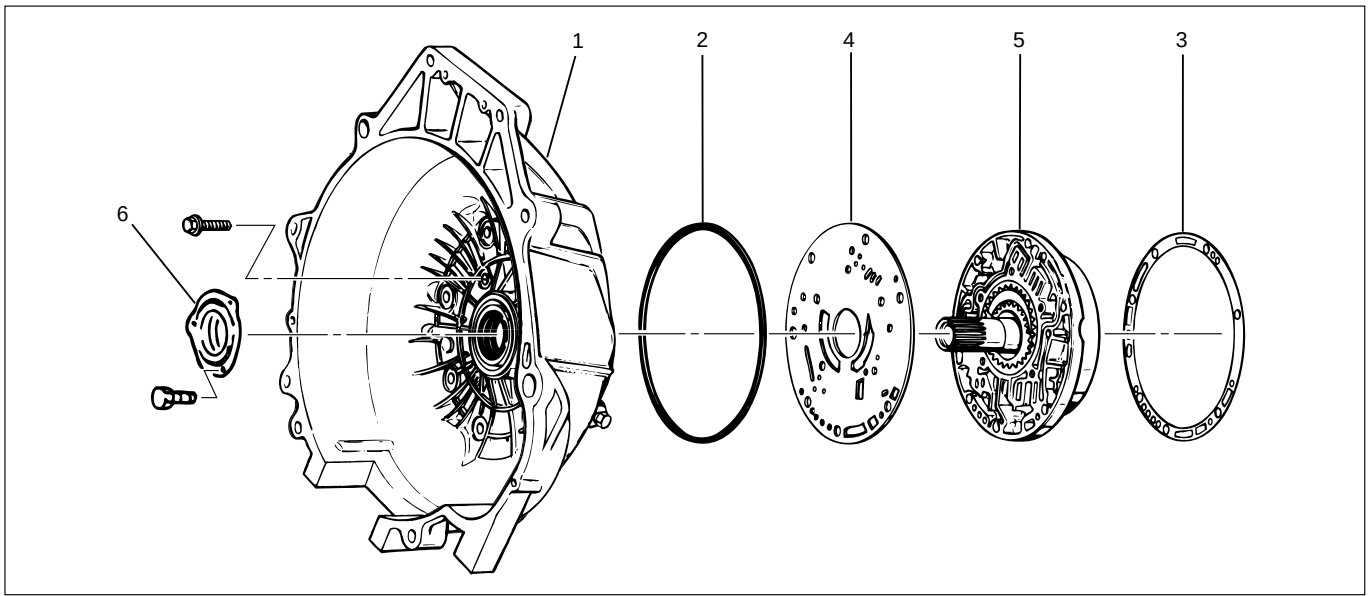
2. O-Ring

Install O-ring on turbine shaft.

1. Torque Converter

- 1) The converter assembly must be replaced under any of the following conditions:
 - a. Evidence of damage to the pump assembly
 - b. Metal particles are found after flushing the cooler lines
 - c. External leaks in hub weld area
 - d. Converter Pilot broken, damaged or poor fit into crankshaft
 - e. Converter hub scored or damaged
 - f. Internal failure in stator
 - g. Contamination from engine coolant
 - h. Excess end play
- 2) Install converter assembly.
Rotate transmission, bell housing up. Spin converter to insure proper fit.
- 3) Fill transmission through the overfill screw, using DEXRON®-III ATF.

CONVERTER HOUSING AND OIL PUMP ASSEMBLY



241RW003

Disassembly Steps

1. Converter housing
2. Outer seal ring
3. Gasket
4. Wear Plate
5. Oil pump assembly
6. Oil seal ring

Reassembly Steps

To reassemble, follow the disassembly steps in the reverse order.



DISASSEMBLY

1. **Converter Housing**
Remove five bolts from converter housing.
2. **Outer Seal Ring**
3. **Gasket**
4. **Wear Plate**
5. **Oil Pump Assembly**
6. **Oil Seal Ring**



INSPECTION AND REPAIR

Visual check

If any damage, deformation or local wear is found in a converter housing, outer seal ring, wear plate or oil seal ring, replace it.



REASSEMBLY

6. Oil Seal Ring

Install oil seal ring using installer.

Oil Seal Ring Bolt Torque N·m (kg·cm / lb·in)



3 (30 / 26)

5. Oil Pump Assembly

4. Wear Plate

Install wear plate onto oil pump assembly.

3. Gasket

2. Outer Seal Ring

1. Converter Housing

- 1) Install converter housing onto complete oil pump assembly. Align with two short guide pins on outer bolt holes.
- 2) Loosely install five 13mm bolts.
- 3) Center converter housing using centering tool.
- 4) Tighten five inner 13mm bolts in an alternating pattern.



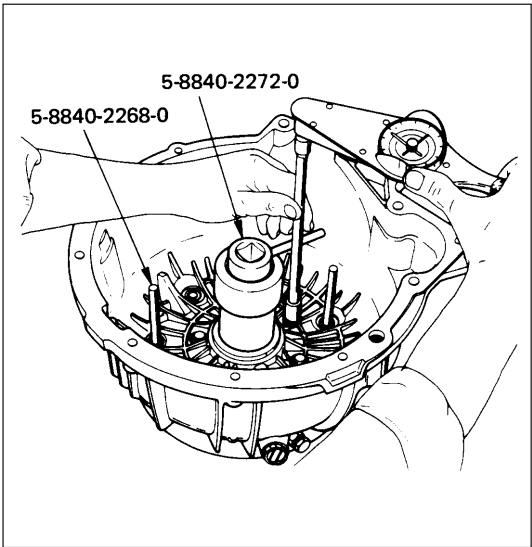
Converter Housing Bolt Torque N·m (kg·m / lb·ft)



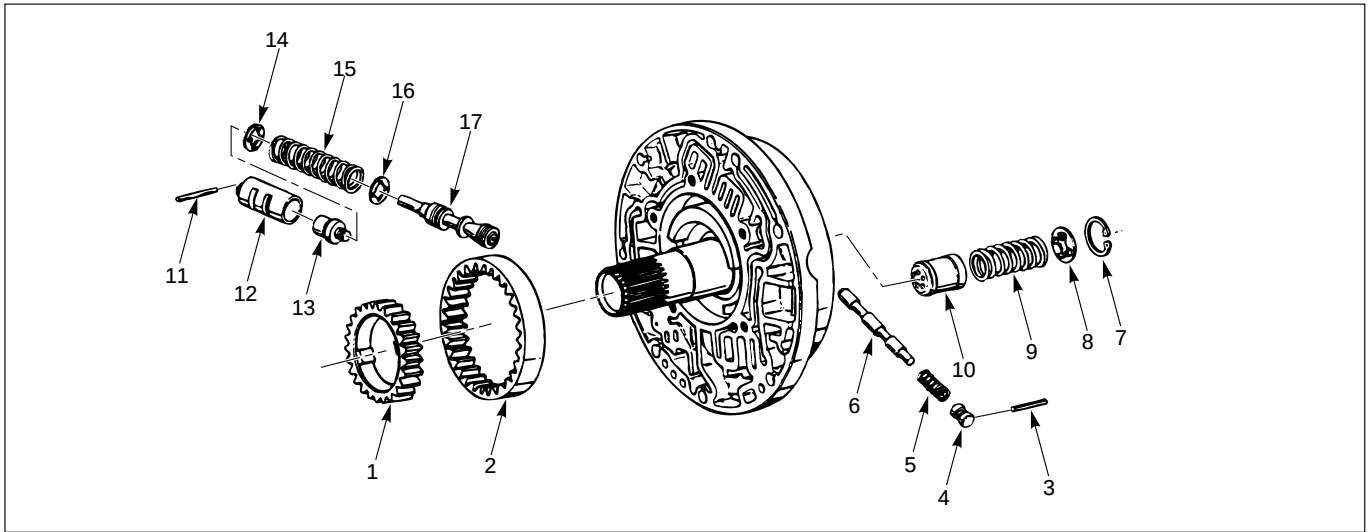
20 (2.0 / 15)

Guide pin: 5-8840-2268-0 (J-38588)

Centering tool: 5-8840-2272-0 (J-38557)



OIL PUMP



Disassembly Steps

1. Oil pump drive gear
2. Oil pump driven gear
3. Pin
4. Plug
5. Spring
6. Converter clutch control valve
7. Snap ring
8. Spring seat
9. Spring
10. Throttle signal accumulator piston

11. Sleeve pin
12. Sleeve
13. Boost valve
14. Spring seat
15. Valve spring
16. Spring seat
17. Pressure regulator valve

Reassembly Steps

To reassemble, follow the disassembly steps in the reverse order.



DISASSEMBLY

1. Oil Pump Drive Gear
2. Oil Pump Driven Gear
3. Pin
4. Plug
5. Spring
6. Converter Clutch Control Valve
7. Snap Ring
8. Spring Seat
9. Spring
10. Throttle Signal Accumulator Piston
11. Sleeve Pin
12. Sleeve
13. Boost Valve
14. Spring Seat
15. Valve Spring
16. Spring Seat
17. Pressure Regulator Valve



INSPECTION AND REPAIR

Visual check

If any damage, deformation or local wear is found in a snap ring, spring, spring retainer valve, gear or oil pump, replace it.



REASSEMBLY

17. Pressure Regulator Valve

16. Spring Seat



Lubricate and preinstall pressure regulator spring seat on valve, with the flat side against shoulder.



15. Valve Spring

14. Spring Seat

13. Boost Valve

12. Sleeve

11. Sleeve Pin

10. Throttle Signal Accumulator Piston

9. Spring

8. Spring Seat



Install throttle signal accumulator piston, spring, and spring seat, with the flat side away from the spring and snap ring.

7. Snap Ring

6. Converter Clutch Control Valve

5. Spring

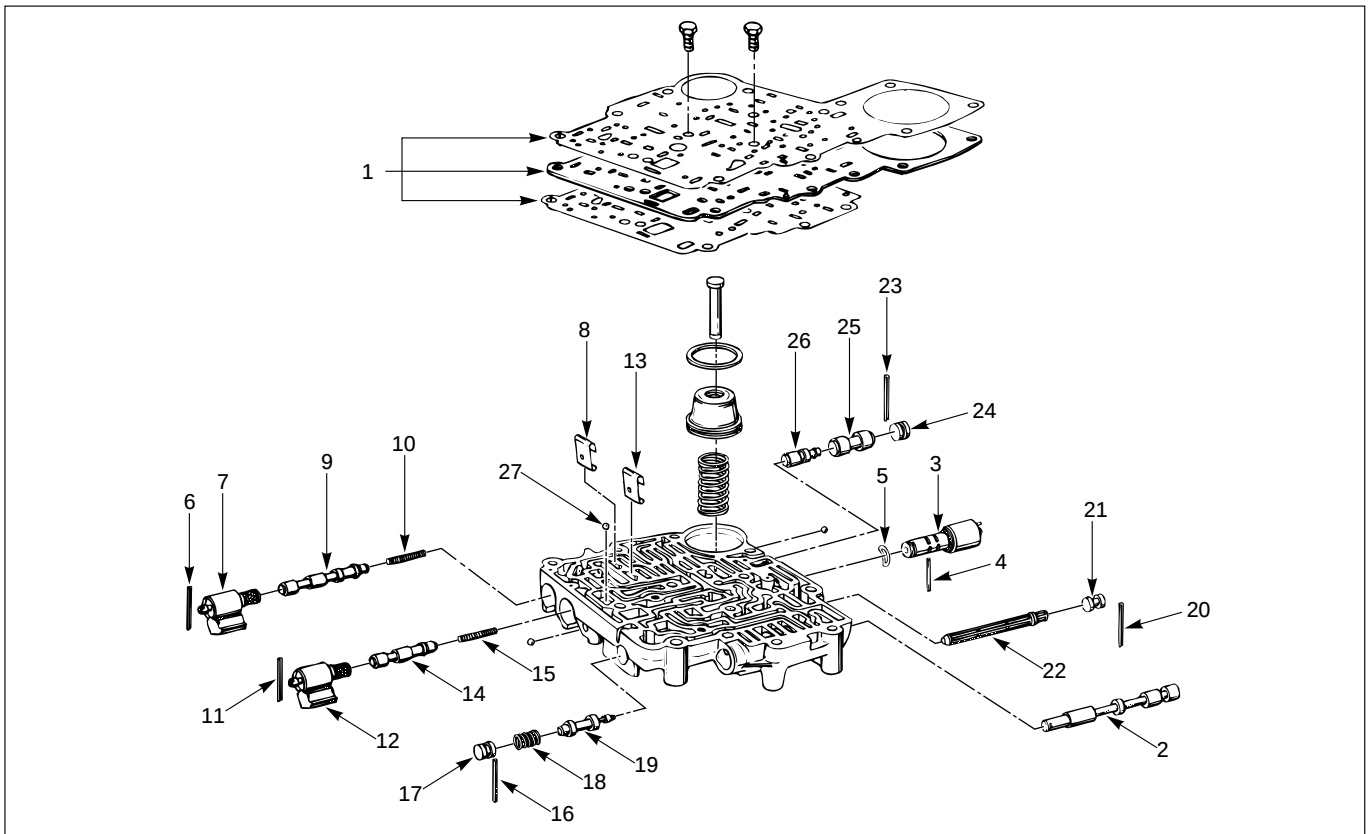
4. Plug

3. Pin

2. Oil Pump Driven Gear

1. Oil Pump Drive Gear

MAIN CASE VALVE BODY



Disassembly Steps

1. Gaskets and transfer plate
2. Manual valve
3. Band control solenoid
4. Pin
5. Waved washer
6. Spring pin
7. Solenoid A
8. Retainer
9. 1-2/3-4 shift valve
10. Spring
11. Spring pin
12. Solenoid B
13. Retainer
14. 2-3 shift valve
15. Spring
16. Spring pin
17. Plug
18. Spring
19. Low pressure control valve
20. Spring pin

21. Plug
22. Band control screen assembly
23. Spring pin
24. Plug
25. 1-2 accumulator valve
26. 1-2 accumulator control valve
27. Check ball

Reassembly Steps

To reassemble, follow the disassembly steps in the reverse order.



DISASSEMBLY

- 1. Gaskets and Transfer Plate**
Remove two 11mm bolts from valve body.
- 2. Manual Valve**
- 3. Band Control Solenoid**
- 4. Pin**
- 5. Waved Washer**
- 6. Spring Pin**
- 7. Solenoid A**
Remove solenoids by grasping the metal tip. Do not grasp the connector housing.
- 8. Retainer**
- 9. 1-2/3-4 Shift Valve**
- 10. Spring**
- 11. Spring Pin**
- 12. Solenoid B**
Remove solenoids by grasping the metal tip. Do not grasp the connector housing.
- 13. Retainer**
- 14. 2-3 Shift Valve**
- 15. Spring**
- 16. Spring Pin**
- 17. Plug**
- 18. Spring**
- 19. Low Pressure Control Valve**
- 20. Spring Pin**
- 21. Plug**
- 22. Band Control Screen Assembly**
- 23. Spring Pin**
- 24. Plug**
- 25. 1-2 Accumulator Valve**
- 26. 1-2 Accumulator Control Valve**
- 27. Check Ball**
Remove 1 check ball from valve body.



INSPECTION AND REPAIR

Inspect for the following and replace any damaged or worn parts:

- Damage or wear to each valve.
- Damage in oil passages.
- Cracks or damage to valve body.
- Valve operations.
- Spring fatigue.



REASSEMBLY

27. **Check Ball**
Install 1 check ball to valve body
26. **1-2 Accumulator Control Valve**
25. **1-2 Accumulator Valve**
24. **Plug**
23. **Spring Pin**
22. **Band Control Screen Assembly**
21. **Plug**
20. **Spring Pin**
19. **Low Pressure Control Valve**
18. **Spring**
17. **Plug**
16. **Spring Pin**
15. **Spring**
14. **2-3 Shift Valve**
13. **Retainer**
12. **Solenoid B**
11. **Spring Pin**
10. **Spring**
9. **1-2/3-4 Shift Valve**
8. **Retainer**
7. **Solenoid A**
6. **Spring Pin**
5. **Waved Washer**
4. **Pin**
3. **Band Control Solenoid**
2. **Manual Valve**
1. **Gaskets and Transfer Plate**

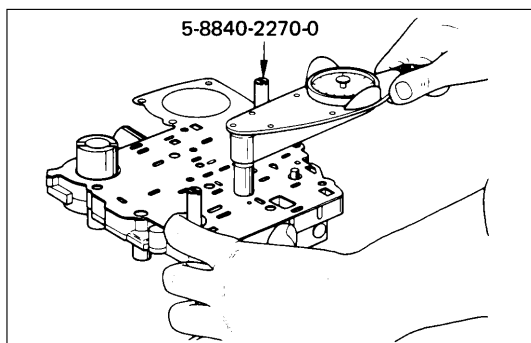


- 1) Install gasket (valve body/transfer plate) and transfer plate, using two guide pins.
- 2) Install two 11mm bolts.

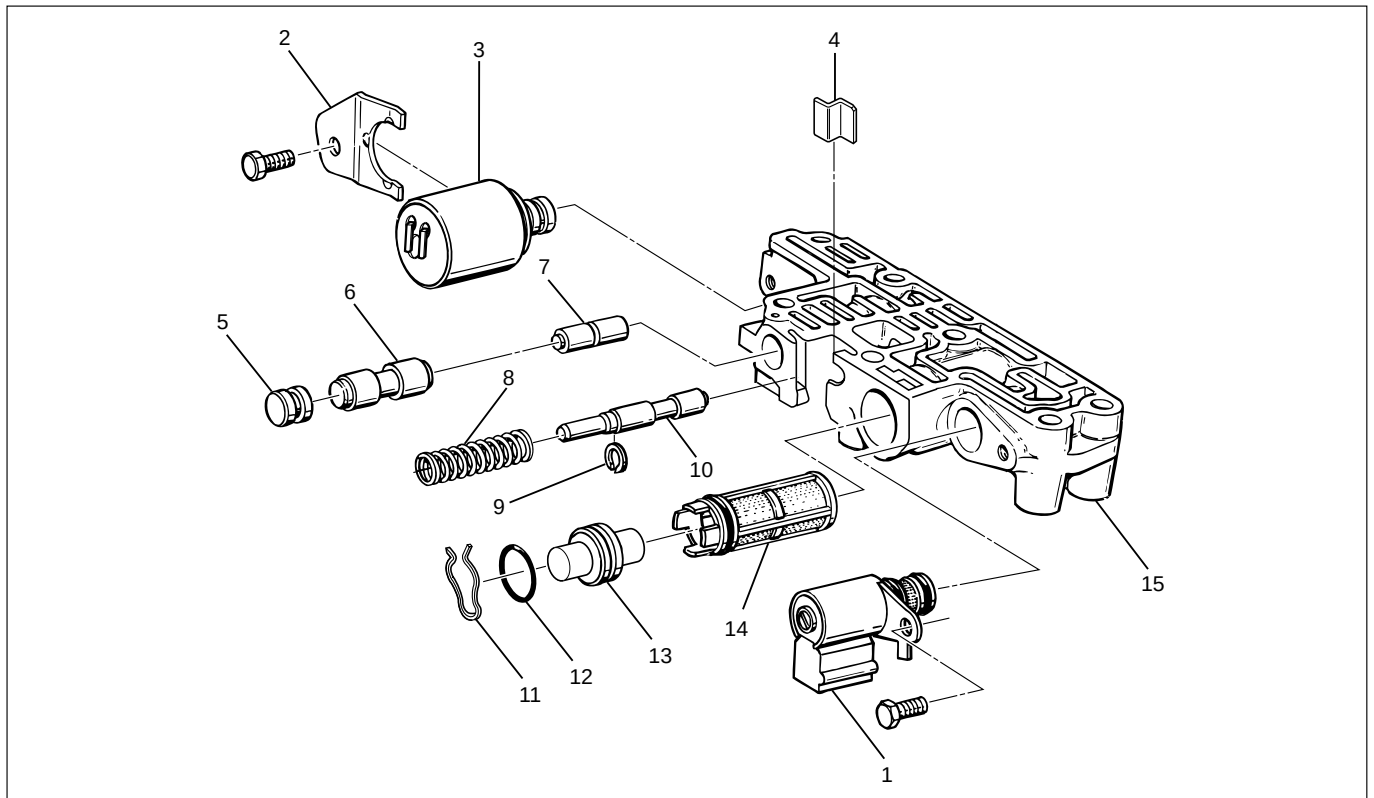
Valve Body Bolt Torque	N·m (kg·cm / lb·in)
13 (130 / 113)	



- 3) Install gasket (transfer plate/main case).
Guide pins: 5-8840-2270-0 (J-3387-2)



ADAPTER CASE VALVE BODY



243RW001

Disassembly Steps

1. Converter clutch solenoid
2. Retainer
3. Force motor solenoid
4. Retainer
5. Plug
6. 3/4 accumulator valve
7. 3/4 accumulator control valve
8. Spring
9. Retaining ring
10. Feed limit valve

11. Plug retainer
12. O-ring
13. Plug
14. Force motor screen assembly
15. Adapter case valve body

Reassembly Steps

To reassemble, follow the disassembly steps in the reverse order.



DISASSEMBLY

1. Converter Clutch Solenoid

- 1) Remove 11mm bolt from valve body.
- 2) Remove converter control solenoid assembly with two O-ring.

2. Retainer

Remove 11mm bolt and retainer from valve body.

3. Force Motor Solenoid

4. Retainer

5. Plug

6. 3/4 Accumulator Valve

7. 3/4 Accumulator Control Valve

8. Spring
9. Retaining Ring
10. Feed Limit Valve
11. Plug Retainer
12. O-ring
13. Plug
14. Force Motor Screen Assembly

Use 5mm bolt to pull plug.



INSPECTION AND REPAIR

- Inspect for the following and replace any damaged or worn parts:
- Damage or wear to each valve.
 - Damage in oil passages.
 - Cracks or damage to valve body.
 - Valve operations.
 - Spring fatigue



REASSEMBLY

14. Force Motor Screen Assembly
13. Plug
12. O-ring
11. Plug Retainer
10. Feed Limit Valve
9. Retaining Ring
8. Spring
7. 3/4 Accumulator Control Valve
6. 3/4 Accumulator Valve
5. Plug
4. Retainer
3. Force Motor Solenoid
2. Retainer



- 1) Place solenoid terminals pointing towards mating face.
- 2) Install retainer and bolt.

Retainer Bolt Torque	N·m (kg·cm / lb·in)
10 (100 / 87)	

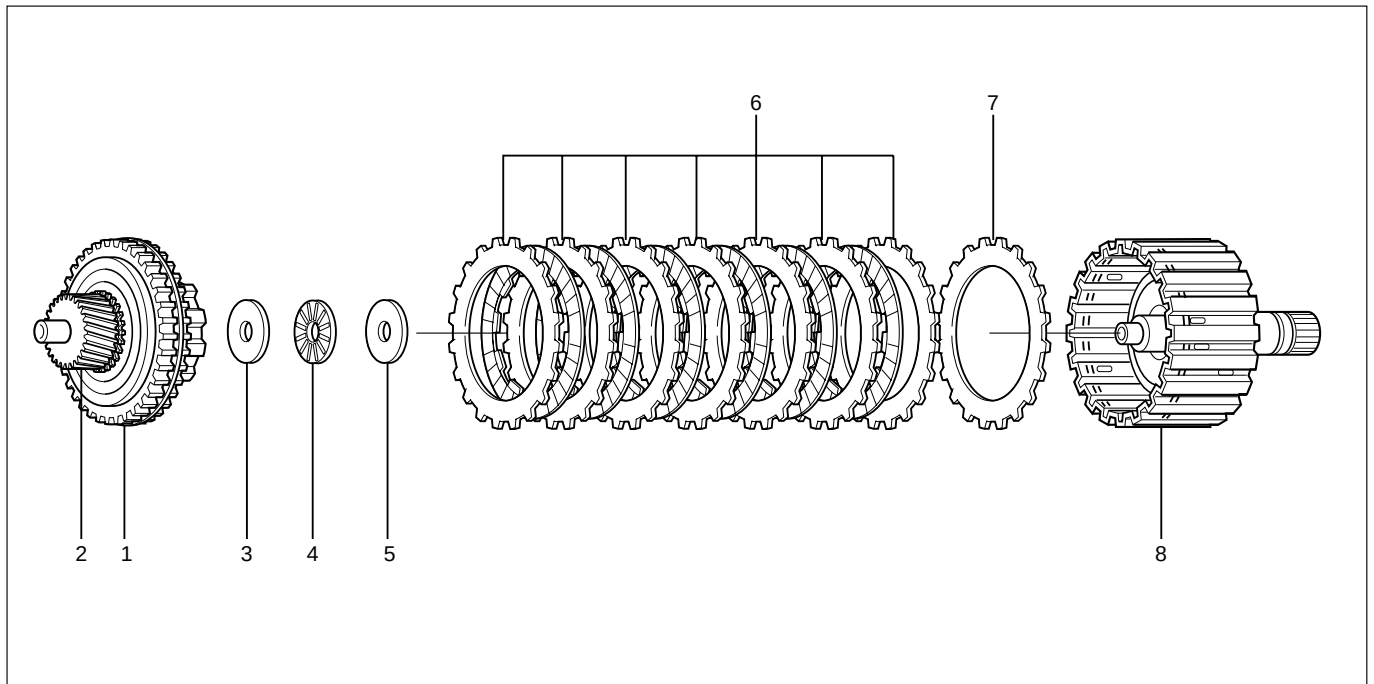


1. Converter Clutch Solenoid
 - 1) Install converter clutch solenoid assembly with two O-rings to valve body.
 - 2) Install bolt.

Bolt Torque	N·m (kg·cm / lb·in)
10 (100 / 87)	



THIRD CLUTCH AND SPRAG UNIT



248RW001

Disassembly Steps

1. Retaining ring
2. Input sun gear assembly
3. Retaining washer
4. Bearing
5. Thrust washer
6. Clutch plates
7. Third clutch drum

Reassembly Steps

To reassemble, follow the disassembly steps in the reverse order.

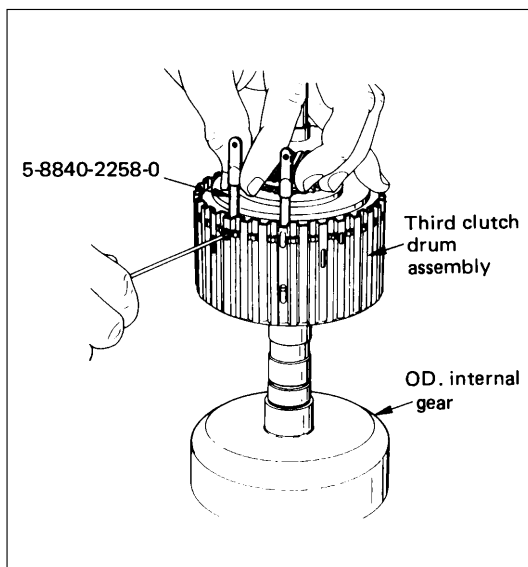


DISASSEMBLY

1. Retaining Ring

- 1) Place the third clutch housing and intermediate shaft assembly upright, using the overdrive internal gear as a support.
- 2) Locate the end of the sprag retaining ring. Compress near the end, using a screwdriver through the side slot and slide one tool blade between ring and housing to hold the ring clear of the groove.
- 3) Repeat with a second tool blade near the other end of the retaining ring.
- 4) Repeat with a third tool blade opposite the first two.
- 5) Repeat with two further blades equally spaced apart.

Third clutch retaining ring compressor: 5-8840-2258-0 (J-38450)



2. Input Sun Gear Assembly

Pull the input sun gear assembly unit until the sprag retaining ring clears the ring groove.

3. Retaining Washer

4. Bearing

5. Thrust Washer

6. Clutch Plates

7. Third Clutch Drum



INSPECTION AND REPAIR

Visual check

If any damage, deformation or local wear is found in a bearing, thrust washer, clutch plates or third clutch drum, replace it.



REASSEMBLY

7. Third Clutch Drum

6. Clutch Plates

- 1) Place third clutch housing and intermediate shaft assembly upright, using the overdrive internal gear as a support.
- 2) Install third clutch spring cushion plate, bevel face down.
- 3) Install third clutch plates into clutch housing. Start with the steel clutch plate and alternate with lined plates.



5. Thrust Washer

4. Bearing

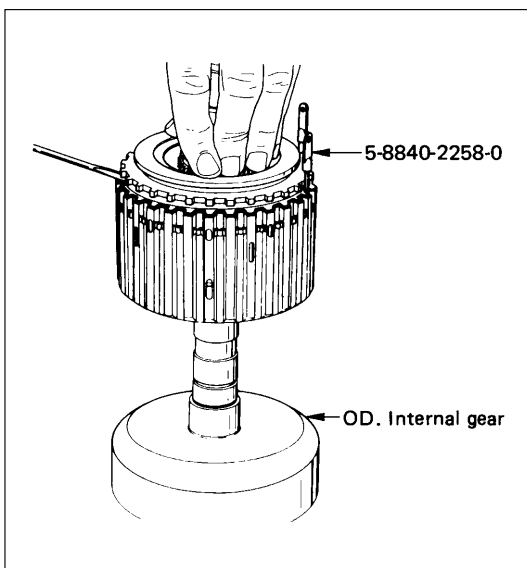
3. Retaining Washer

2. Input Sun Gear Assembly

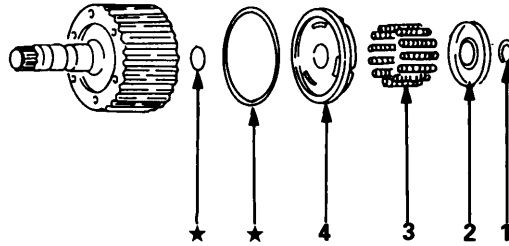
1. Retaining Ring

- 1) Fully engage the sprag assembly hub splines into the third clutch inner tangs. Simultaneously rotate the outer sprag race to engage into the third clutch housing.
- 2) Install a tool blade at each extremity of the retaining ring.
- 3) Compress the retaining ring with a screw-driver opposite the tool blades while pushing down on the outer sprag race.
- 4) Engage retaining ring into groove.
- 5) Remove tool blades.

Third clutch retaining ring compressor: 5-8840-2258-0 (J-38450)



THIRD CLUTCH



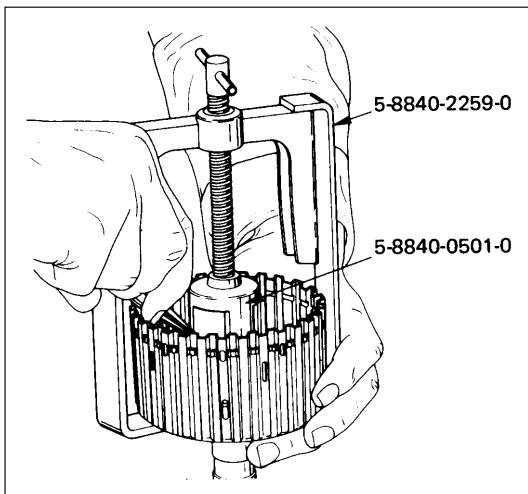
Disassembly Steps

1. Retaining ring
2. Spring seat
3. Springs
4. Piston

Reassembly Steps

To reassemble, follow the disassembly steps in the reverse order.

★; Repair kit



DISASSEMBLY

1. Retaining Ring

- 1) Compress spring seat using the tool.



NOTE:

Do not over-stress the springs and seat. This will cause damage to the spring seat.

- 2) Remove retaining ring.
- 3) Release the spring seat.

NOTE:

Do not let the spring seat catch in the ring groove.

Spring compressor: 5-8840-0501-0 (J-23075)

Adapter: 5-8840-2259-0 (J-23075-12)

2. Spring Seat

3. Springs

4. Piston



INSPECTION AND REPAIR

Visual check

If any damage, deformation or local wear is found in a retaining ring, return spring, piston seals or spring seat, replace it.

Operation check

Shake piston and listen for check ball movement. Replace piston if check ball is missing or falls out.



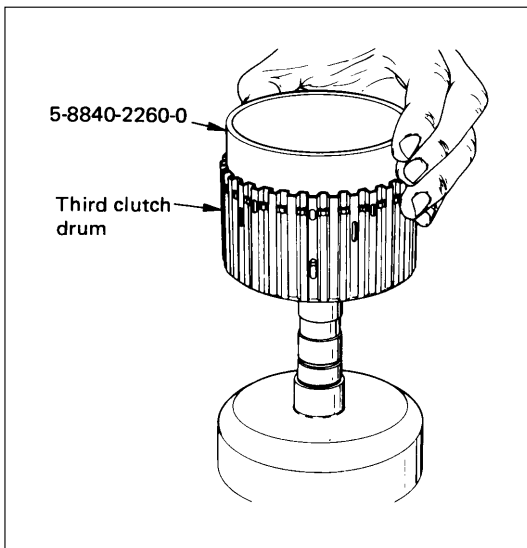
REASSEMBLY



4. Piston

- 1) The lip of the seals must point toward the front of the transmission. Lubricate the lip seal with transmission fluid.
- 2) Install piston assembly into the third clutch drum.

Third clutch piston installer: 5-8840-2260-0
(J-23084)



3. Springs

2. Spring Seat

1. Retaining Ring

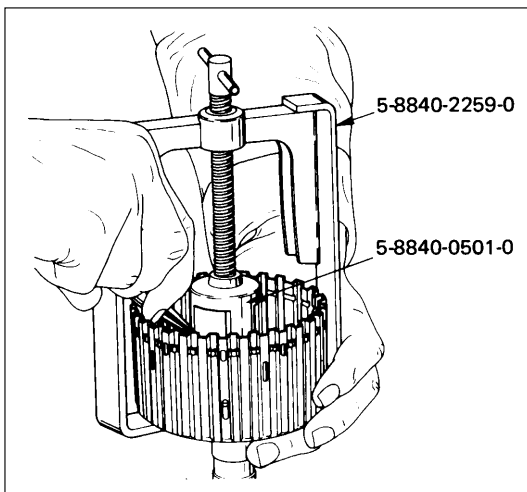
- 1) Place retaining ring onto spring seat.
- 2) Compress the piston springs, using the piston spring compressor.



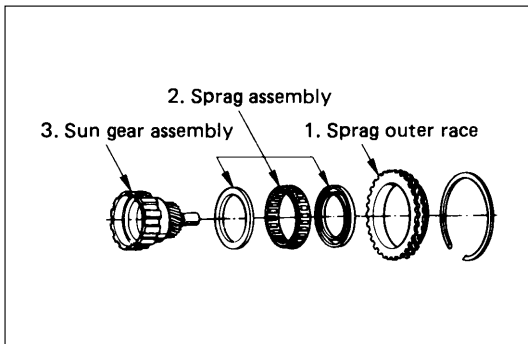
NOTE:

Do not over-stress the springs and seat. Do not let the spring seat catch in the ring groove. This may cause damage to the spring seat.

- 3) Install spring seat retaining ring.
- 4) Remove the piston spring compressor.
Spring compressor: 5-8840-0501-0 (J-23075)
Adapter: 5-8840-2259-0 (J-23075-12)



SPRAG UNIT



DISASSEMBLY

1. **Sprag Outer Race**
2. **Sprag Assembly**
Remove sprag outer race and sprag assembly from third clutch hub and sun gear assembly.
3. **Sun Gear Assembly**



INSPECTION AND REPAIR

Visual check

If any damage, deformation or local wear is found in a sun gear, sprag assembly or sprag outer race, replace it.



REASSEMBLY

3. **Sun Gear Assembly**
2. **Sprag Assembly**
Install sprag assembly onto the sun gear.

NOTE:

Flared shoulder of the sprag cage faces the sun gear. This procedure must be followed exactly to be sure that the sprag assembly is installed properly.

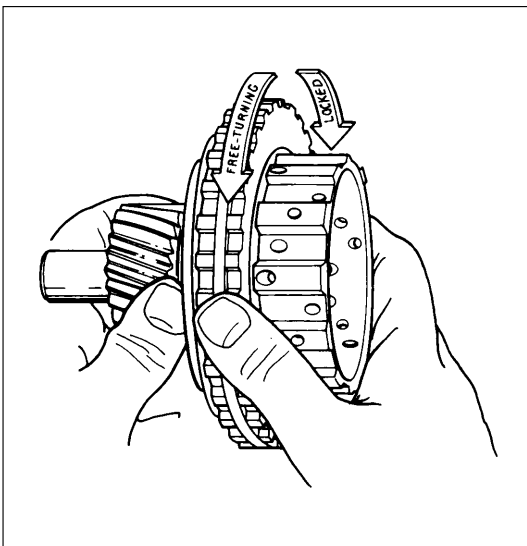
1. **Sprag Outer Race**

- 1) Install outer sprag race assembly over the sprag cage assembly.
- 2) Place third clutch hub and sun gear assembly on a flat surface, sun gear facing up. Place sprag outer race and sprag assembly over the sun gear assembly, push down and turn the input sun counterclockwise at the same time.

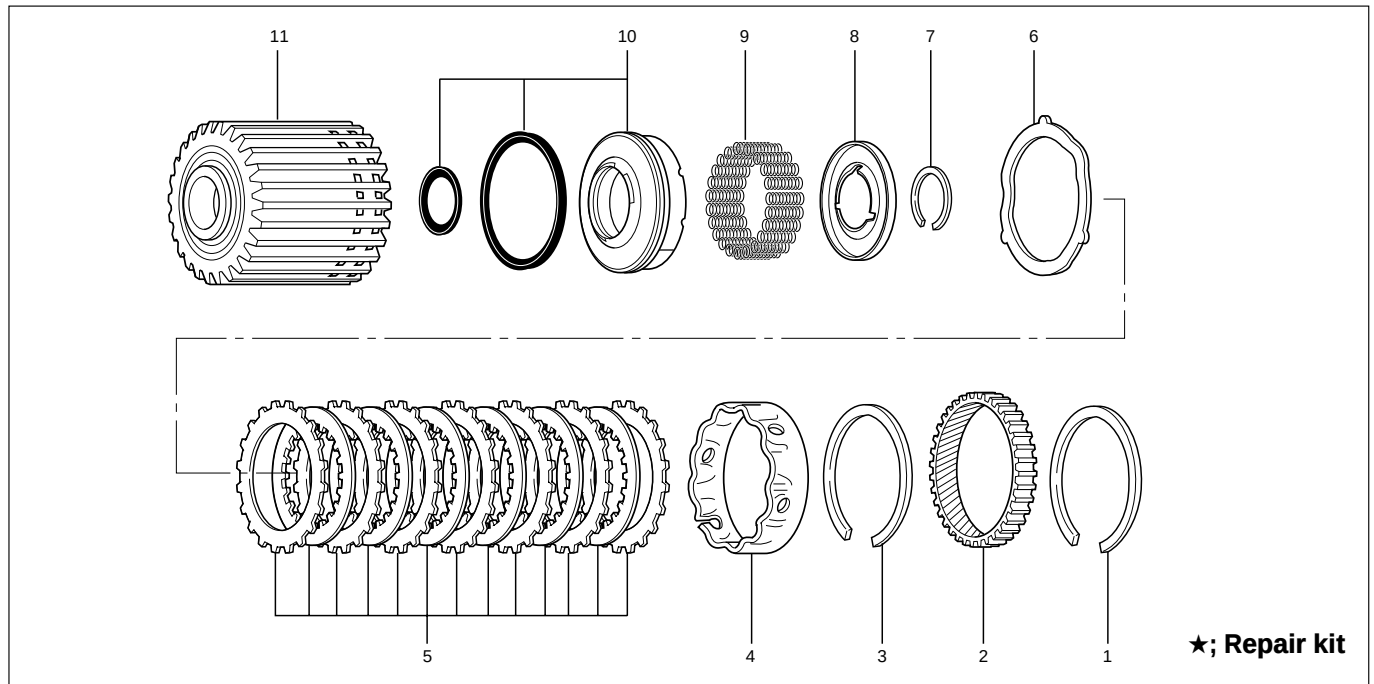


NOTE:

Check correct rotation by holding the sun gear in your left hand and turning the outer race. The outer sprag race should turn freely towards you and lock turning away from you.



SECOND CLUTCH



Disassembly Steps

1. Retaining ring
2. Ring gear
3. Retaining ring
4. Spacer
5. Clutch plates
6. Waved washer
7. Retaining ring
8. Spring seat

9. Springs

10. Piston

11. Second clutch drum

Removal Steps

To reassemble, follow the disassembly steps in the reverse order.



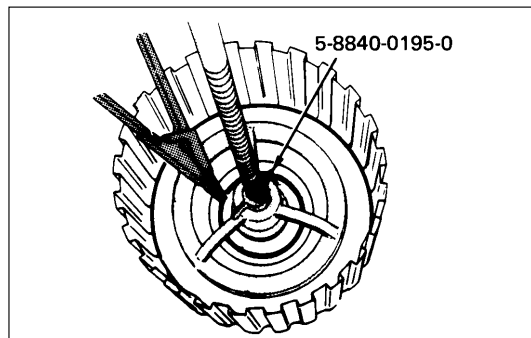
DISASSEMBLY

1. Retaining Ring
2. Ring Gear
3. Retaining Ring
4. Spacer
5. Clutch Plates
6. Waved Washer
7. Retaining Ring



Compress the spring seat.

Compressor: 5-8840-0195-0 (J-23327)



- 8. Spring Seat**
- 9. Springs**
- 10. Piston**
- 11. Second Clutch Drum**



INSPECTION AND REPAIR

Visual check

If any damage, deformation or local wear is found in a retaining ring, ring gear, spacer, clutch plates, piston seals, return spring or spring seat, replace it.

Operation check

Shake piston and listen for check ball movement.

Movement indicates proper check ball operation. Replace piston if check ball is missing or falls out.



REASSEMBLY

11. Second Clutch Drum

10. Piston



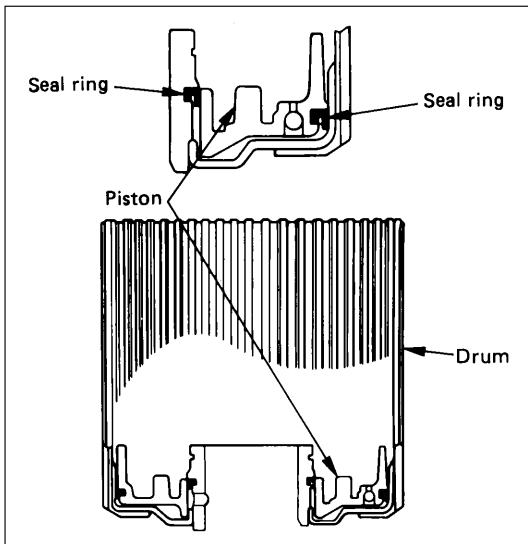
Install piston assembly into the second clutch drum. Lubricate the lip seal with liberal amounts of transmission fluid. Use the installer to protect the outer piston lip seal.



NOTE:

Lip of the seals point toward front of transmission.

Second clutch piston installer: 5-8840-2261-0
(J-23080-A)



9. Springs

8. Spring Seat

7. Retaining Ring

1) Install twenty-two piston springs and spring seat on the second clutch piston. Place retaining ring onto spring seat.



2) Use the compressor to compress the piston springs.

Compressor: 5-8840-0195-0 (J-23327)

NOTE:

Do not let spring seat catch in ring groove.

6. Waved Plate

5. Clutch Plates

Install clutch plates. Start with a steel plate and alternate with lined plates.

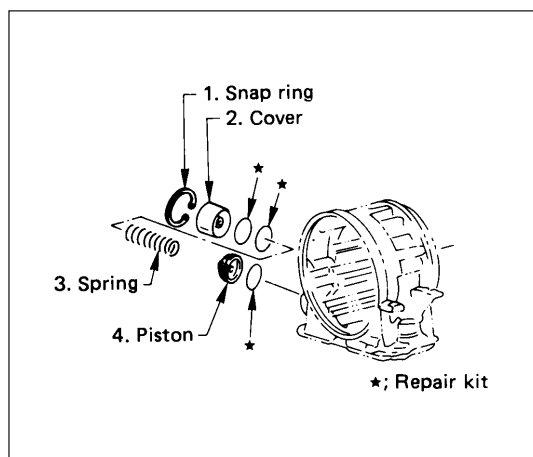


Align second clutch inner tangs.



4. **Spacer**
Install spacer, with the fluted end toward clutch plates.
3. **Retaining Ring**
2. **Ring gear**
1. **Retaining Ring**

3-4 ACCUMULATOR PISTON



DISASSEMBLY

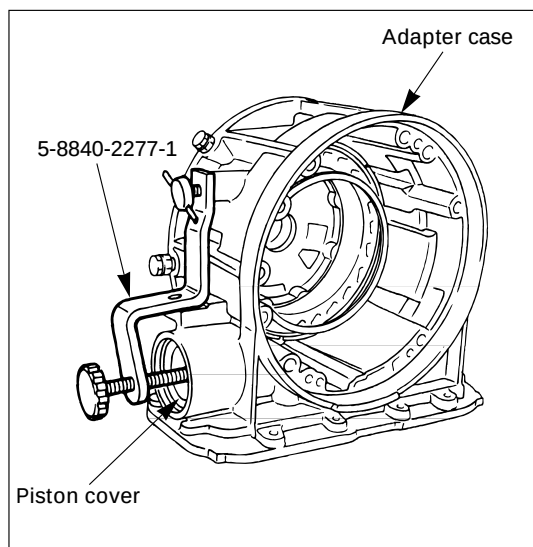
Disassembly steps

1. Snap ring
2. Cover
3. Spring
4. Piston

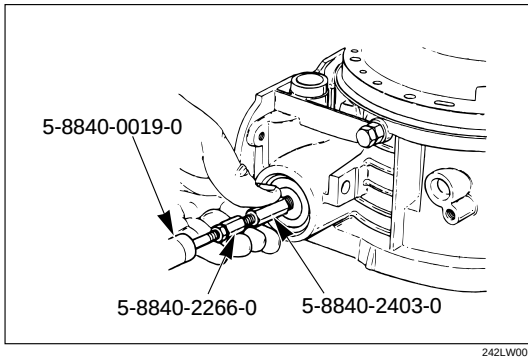
Reassembly steps

To reassemble, follow the disassembly steps in the reverse order.

★ Repair kit



1. **Snap Ring**
Install cover compressor on adapter case. Compress piston cover. Remove snap ring.
Compressor: 5-8840-2277-1 (J-38559-A)



2. Cover



Install cover remover to center hole of cover.
Use slide hammer to remove cover.

Cover remove: 5-8840-2403-0 (J-41096)

Adapter: 5-8840-2266-0 (J-38584)

Slide hammer: 5-8840-0019-0 (J-23907)

3. Spring

4. Piston



INSPECTION AND REPAIR

Visual Check

If any damage, deformation or wear is found in a return spring, piston or piston cover, replace it.



REASSEMBLY

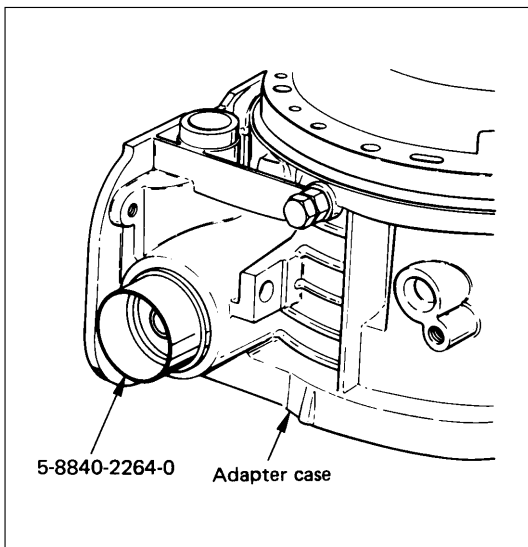
4. Piston

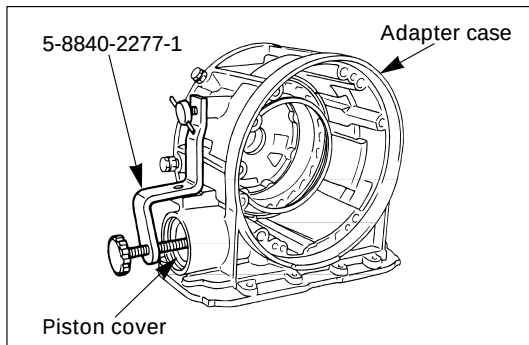


Place the fitter into adaptor case and push the piston into position, using suitable diameter tube.

Piston fitter: 5-8840-2264-0 (J-38553)

3. Spring





2. Cover

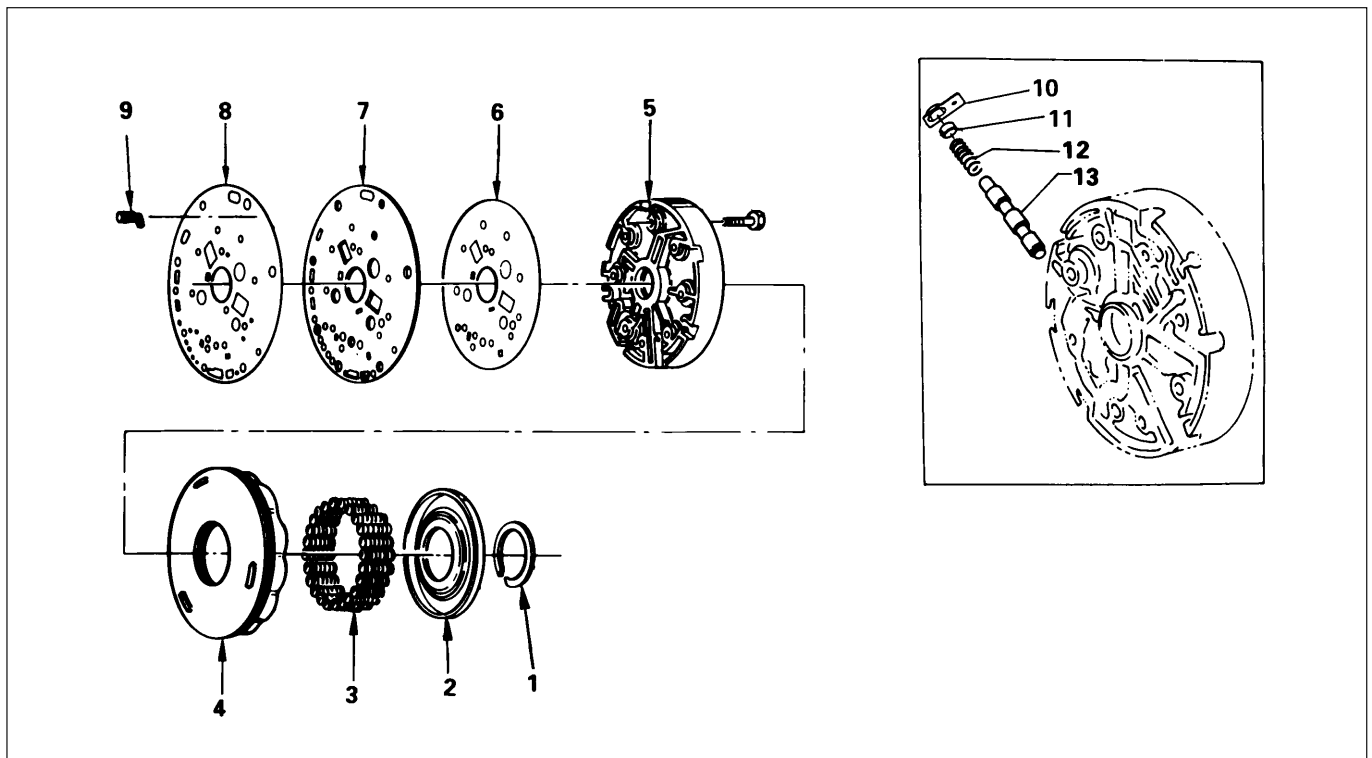
Install cover, using compressor tool.

Compressor: 5-8840-2277-1 (J-38559-A)

1. Snap ring

Install snap ring in groove.

REVERSE CLUTCH PISTON AND CENTER SUPPORT

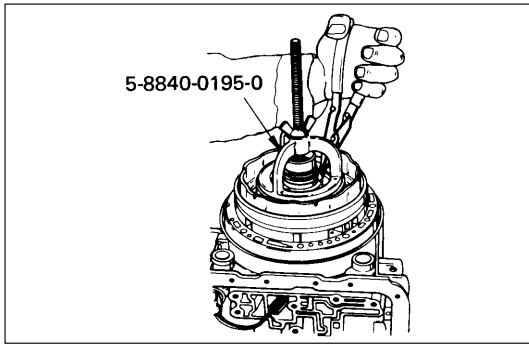


Disassembly Steps

1. Retaining ring
2. Spring seat
3. Springs
4. Piston
5. Center support
6. Gasket
7. Transfer plate
8. Gasket
9. Restrictor
10. Retainer plate
11. Plug
12. Spring
13. Overrun lock out valve

Reassembly Steps

To reassemble, follow the disassembly steps in the reverse order.



DISASSEMBLY

1. Retaining Ring

- 1) Install the tool on spring seat.
- 2) Compress the spring seat.
Compressor: 5-8840-0195-0 (J-23327)



NOTE:

Do not over-stress the springs and seat, as this will cause damage to the spring seat.

2. Spring Seat

3. Springs

4. Piston

5. Center Support

Remove 8 bolts from center support. Remove center support from adapter case.

6. Gasket

7. Transfer Plate

8. Gasket

9. Restrictor

10. Retainer Plate

11. Plug

12. Spring

13. Overrun Lock Out Valve



INSPECTION AND REPAIR

Visual check

If any damage, deformation or local wear is found in a retaining ring, return spring, spring retainer, piston or center support, replace it.



REASSEMBLY

13. Overrun Lock Out Valve

12. Spring

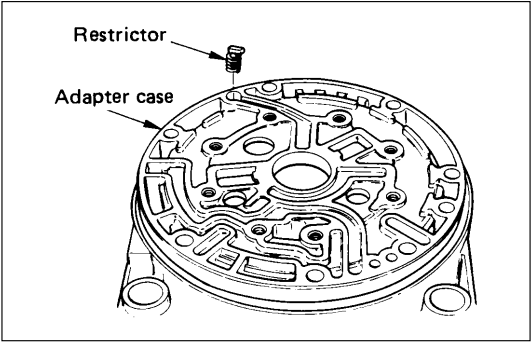
Install overrun lock out valve and spring.

NOTE:

Ensure correct assembly of valve. The spring should be located over the long small diameter end.

11. Plug

10. Retainer Plate



9. Restrictor

Place in the lube overdrive channel in the adapter case housing.

8. Gasket

7. Transfer Plate

6. Gasket

5. Center Support

Install center support with 8 bolts.

Center Support Bolt Torque	N·m (kg·m / lb·ft)
25 (2.5 / 18)	

4. Piston

3. Springs

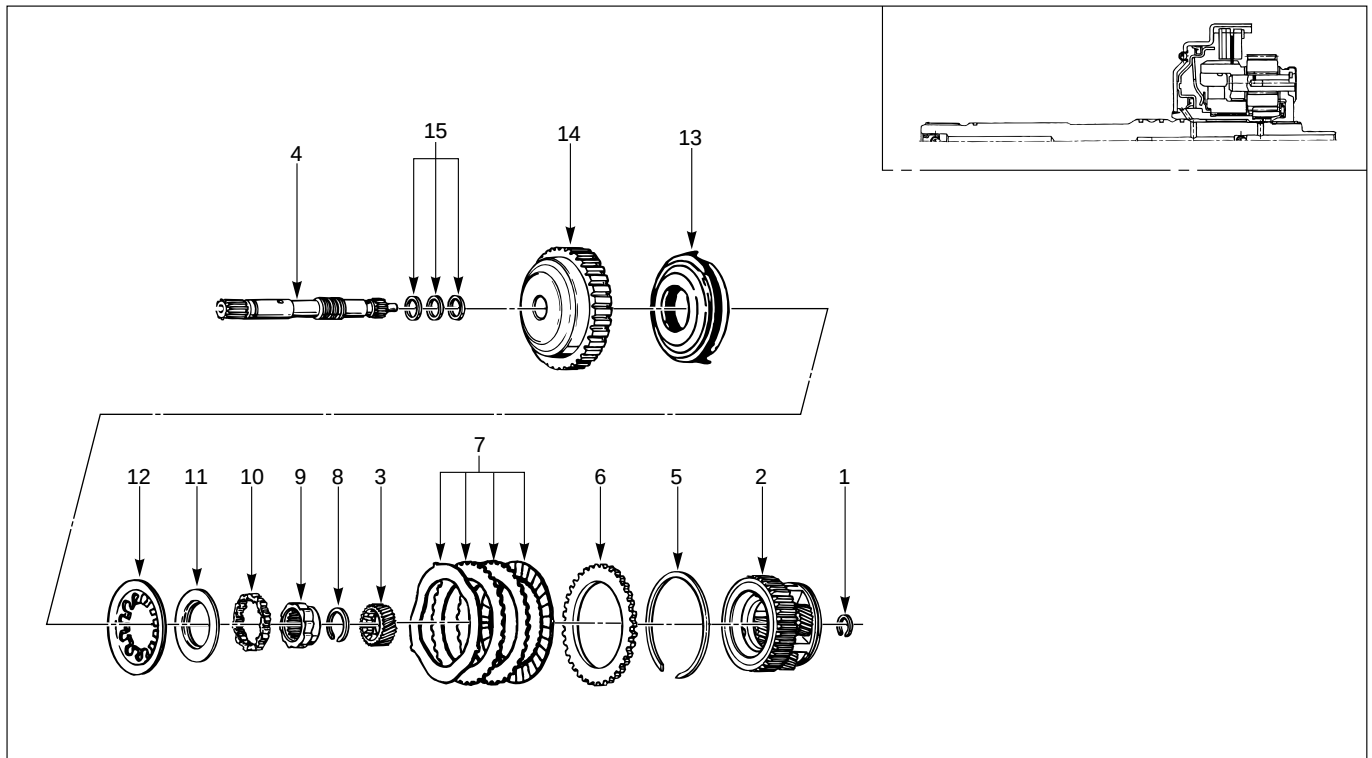
2. Spring Seat

1. Retaining Ring

- 1) Install twenty four springs, spring seat and retaining ring.
- 2) Install the tool.
- 3) Compress retaining ring and springs.
- 4) Seat snap ring in groove.

Compressor: 5-8840-0195-0 (J-23327)

OVERRUN CLUTCH AND TURBINE SHAFT



Disassembly Steps

1. Snap ring
2. Overdrive carrier assembly
3. Sun gear
4. Turbine shaft
5. Snap ring
6. Backing plate
7. Clutch plates
8. Snap ring
9. Overrun roller clutch cam
10. Roller clutch assembly
11. Overrun clutch release spring retainer
12. Diaphragm spring
13. Piston
14. Overrun clutch drum
15. Turbine shaft seal rings

Reassembly Steps

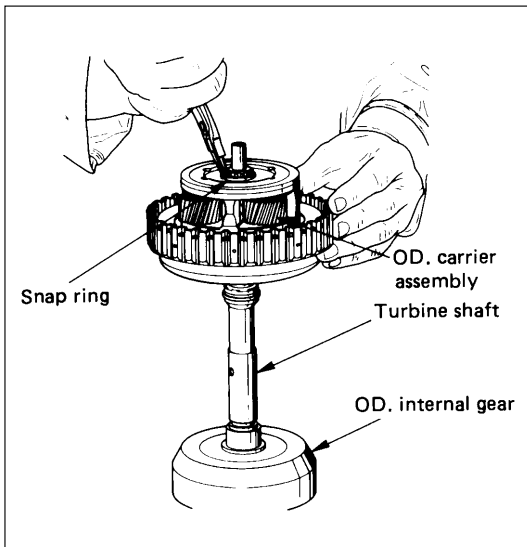
To reassemble, follow the disassembly steps in the reverse order.



DISASSEMBLY

1. Snap Ring

- 1) Position overrun clutch assembly upright, using the overdrive internal gear as a support.
- 2) Remove snap ring.



2. Overdrive Carrier Assembly

3. Sun Gear

4. Turbine Shaft

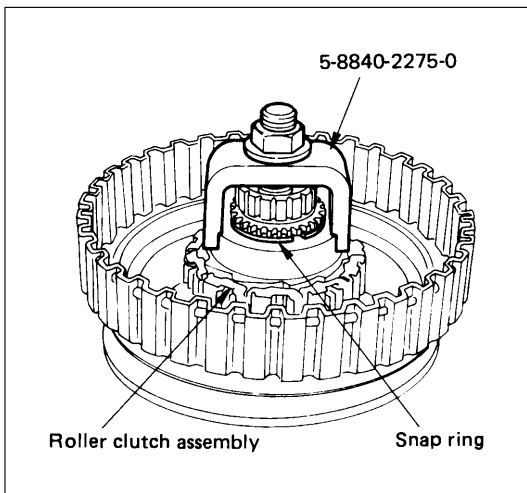
5. Snap Ring

6. Backing Plate

7. Clutch Plates

8. Snap Ring

Compress piston return spring with compressor.
Compressor: 5-8840-2275-0 (J-23327-91)



9. Overrun Roller Clutch Cam

10. Roller Clutch Assembly

11. Overrun Clutch Release Spring Retainer

12. Diaphragm Spring

13. Piston

14. Overrun Clutch Drum

15. Turbine Shaft Seal Rings



INSPECTION AND REPAIR

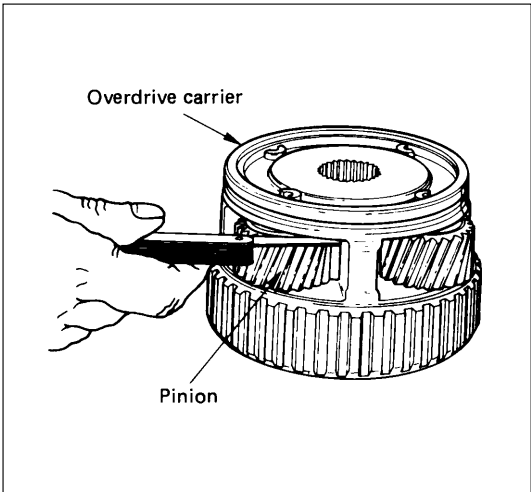
Overdrive carrier check



Check pinion end play with a feeler gage.

Overdrive Carrier Pinion End Play	mm (in)
Standard	
0.24 – 0.64 (0.0094 – 0.025)	

If clearance is outside specified value, replace overdrive carrier assembly



Visual check

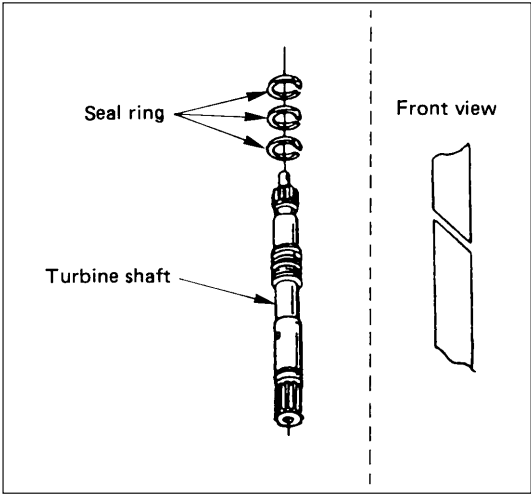
If any damage, deformation or local wear is found in a snap ring, diaphragm spring, or spring retainer, roller clutch assembly, turbine shaft, piston or clutch plates, replace it.



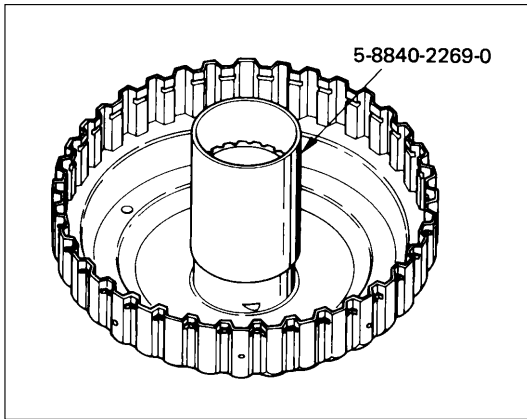
REASSEMBLY

15. Turbine Shaft Seal Rings

Install seals with grease (petroleum jelly).



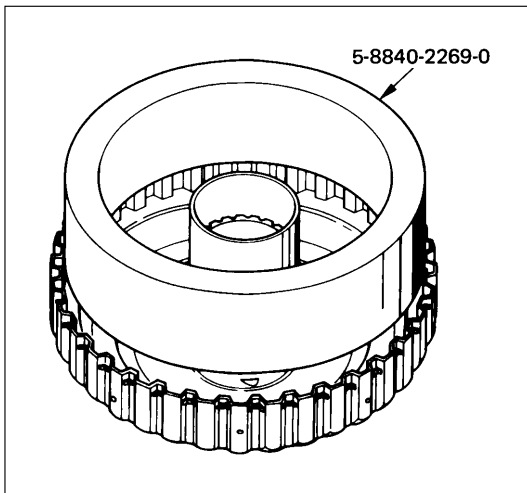
14. Overrun Clutch Drum



13. Piston



- 1) Install the inner installer on the drum.
 - 2) Pre-install piston into outer installer.
 - 3) Install overrun clutch piston assembly. Use the outer installer while pushing piston into drum.
- Installer: 5-8840-2269-0 (J-38555)



12. Diaphragm Spring

11. Overrun Clutch Release Spring Retainer

10. Roller Clutch Assembly

9. Overrun Roller Clutch Cam

8. Snap Ring



- 1) Place snap ring loosely on spring retainer.
- 2) Hold the compressor in a vise. Compress piston return spring with compressor.
- 3) Set snap ring in ring groove.

Compressor: 5-8840-2275-0 (J-23327-91)

7. Clutch Plates

Install clutch plates, start with steel plate and alternate with lined plates.

6. Backing Plate

5. Snap Ring

4. Turbine Shaft

3. Sun Gear



Overdrive sun gear, countersink pointing downwards.

2. Overdrive Carrier Assembly

Complete overdrive carrier assembly.

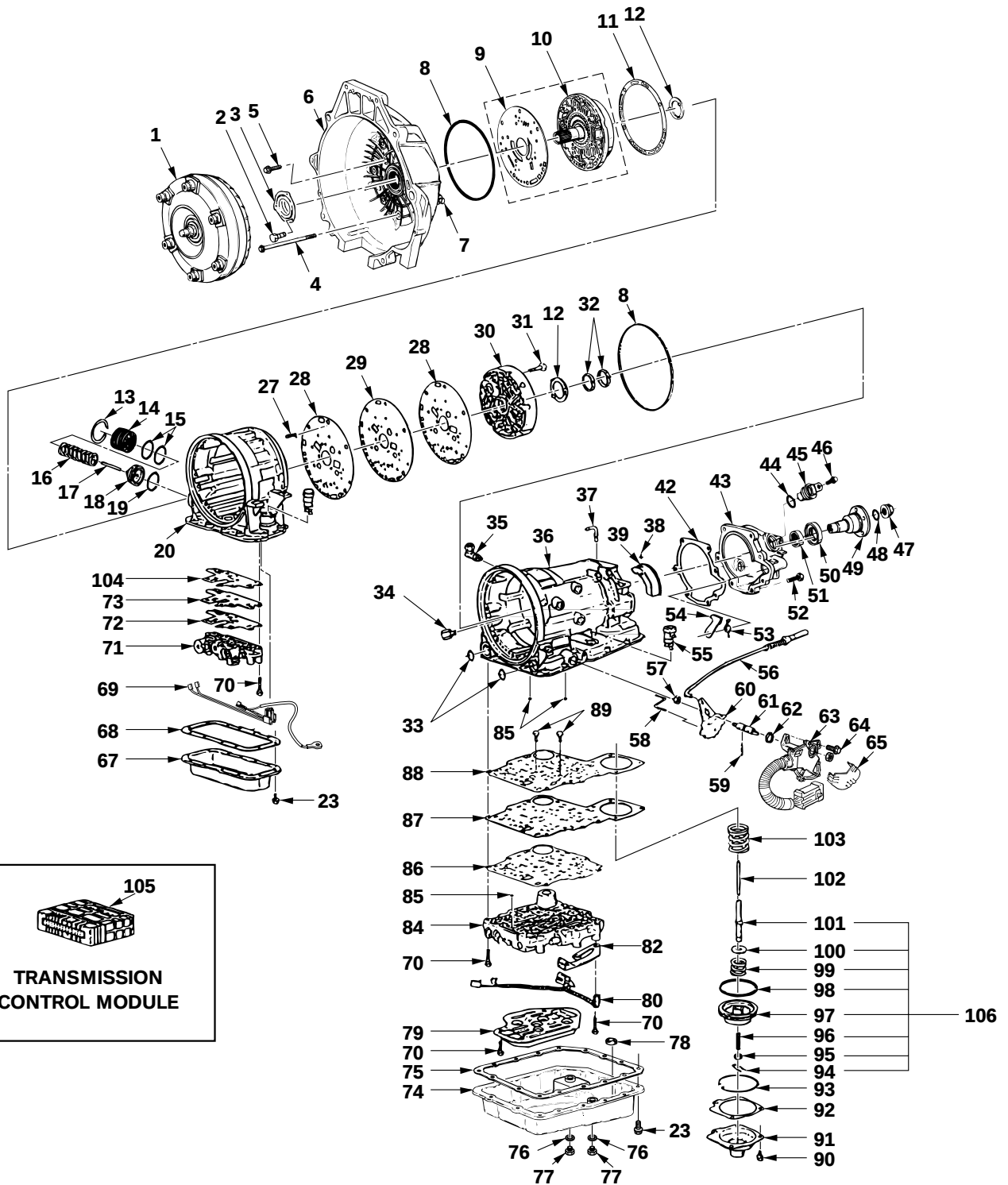
NOTE:

Turn the assembly in a counter-clockwise direction only until roller clutch enters the outer race. After assembly, rotate the assembly and listen for loose rollers.

1. Snap ring

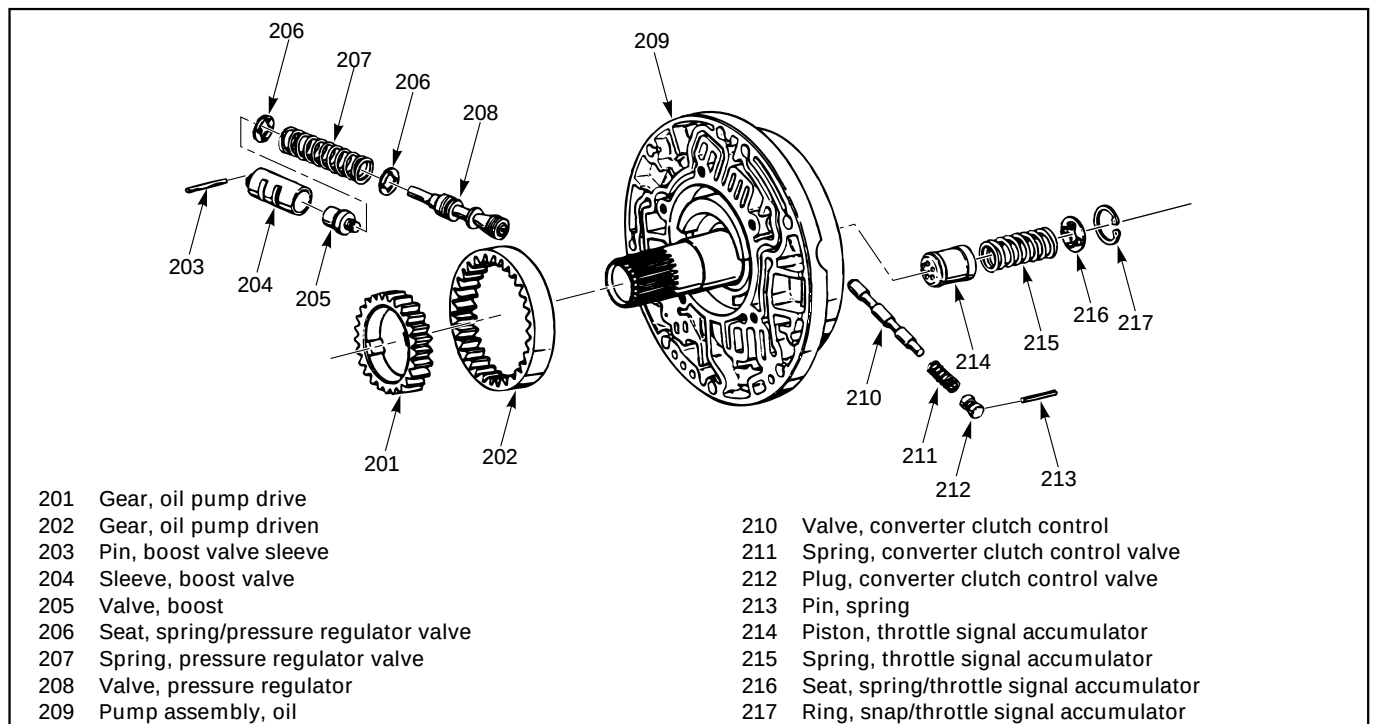
4L30-E PARTS LIST

CASE AND ASSOCIATED PARTS

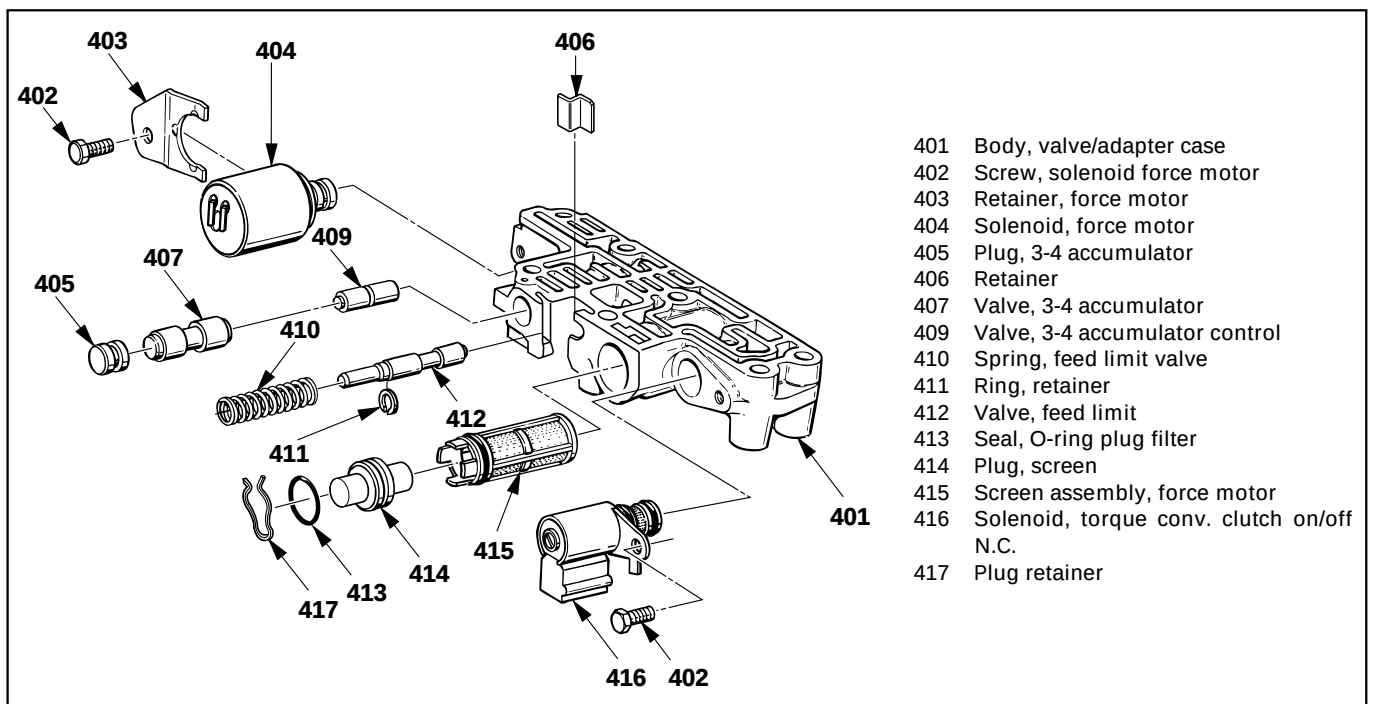
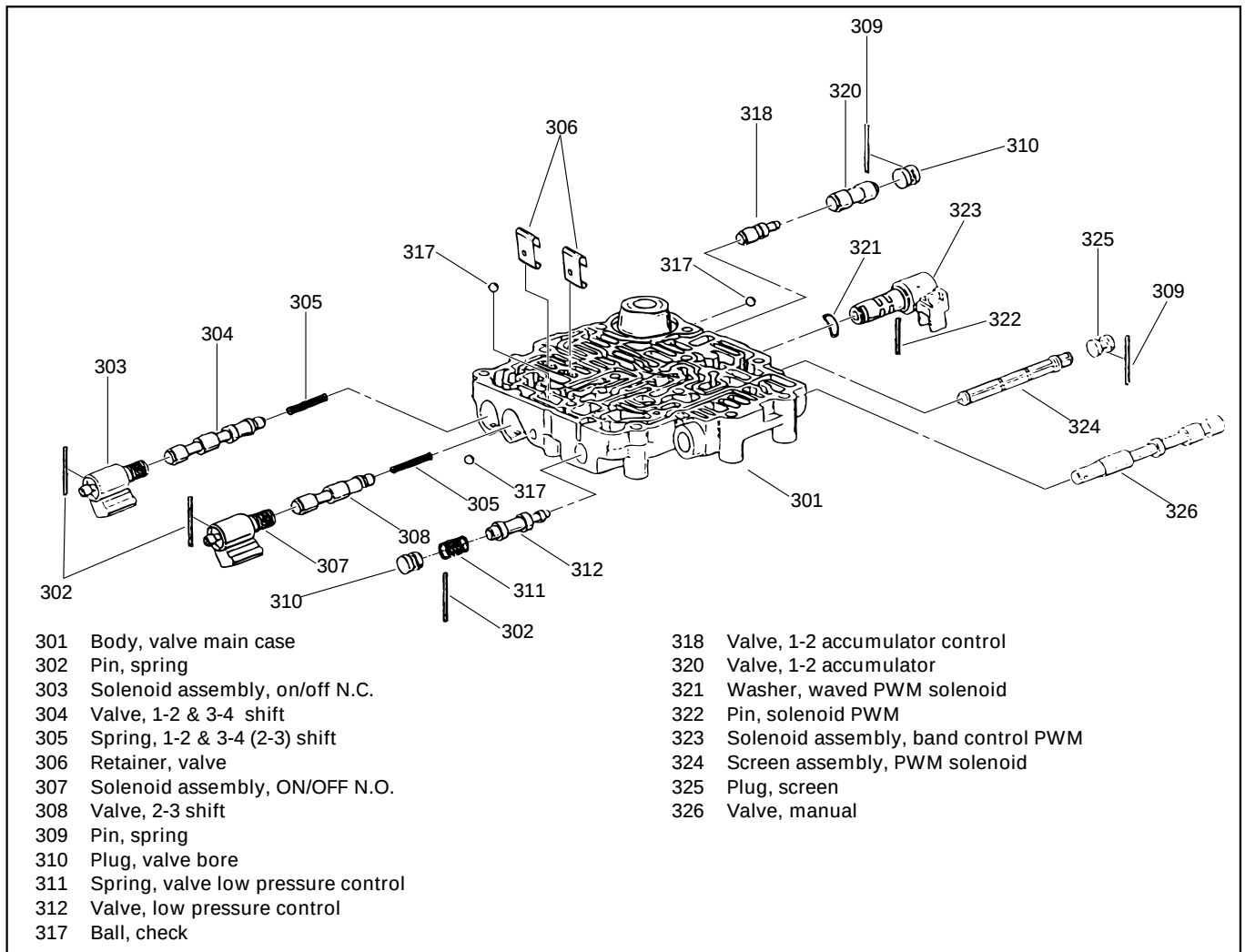


CASE AND ASSOCIATED PARTS

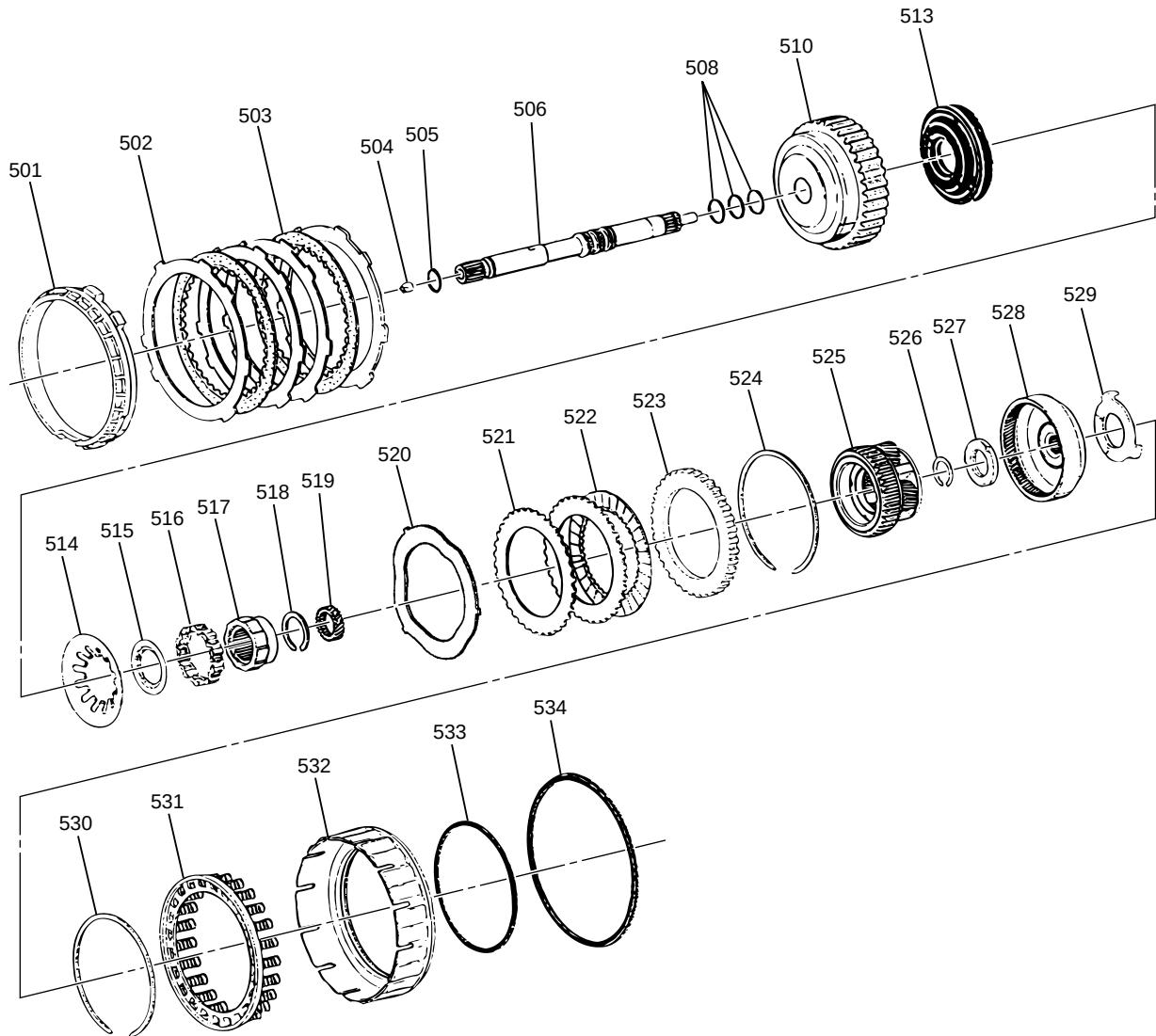
1	Torque converter	36	Case, main	72	Gasket, adapter valve body
2	Screw, seal ring assembly	37	Breather, pipe	73	Plate, adapter valve body/transfer
3	Seal ring assembly, converter housing	38	Seal, O-ring	74	Pan, bottom/main case
4	Screw, converter housing/main case	39	Reservoir	75	Gasket, bottom pan/main case
5	Screw, converter housing/oil pump	42	Gasket, extension case	76	Gasket, screw ('97)
6	Housing, converter	43	Extension assembly	77	Screw, oil drain or overfill ('97)
7	Plug, converter housing	44	Seal, O-ring/speed sensor	78	Magnet, chip collector
8	Seal, O-ring	45	Sensor assembly, speed	79	Filter oil
9	Wear plate, oil pump body	46	Screw, speed sensor	80	Harness assembly, main case
10	Pump assembly, oil	47	Nut, output shaft/drive flange	81	Earth harness ('97)
11	Gasket	48	Seal, O-ring/drive flange	82	Roller & spring assembly, manual detent
12	Washer, thrust selective	49	Flange, drive		
13	Ring, snap	50	Seal, extension assembly	84	Valve body assembly, main case
14	Cover, 3-4 accumulator piston	51	Bearing, needle/extension	85	Ball, check
15	Seal, O-ring, 3-4 accumulator	52	Screw, extension/main case	86	Gasket, main V.B./Transfer plate
16	Spring, 3-4 accumulator piston	53	Spring, parking pawl lock	87	Plate, main V.B./Transfer
17	Pin, 3-4 accumulator piston	54	Pawl, parking lock	88	Gasket, transfer/main case
18	Piston, 3-4 accumulator	55	Connector, electrical/main case	89	Screw, transfer plate on V.B.
19	Ring, 3-4, accumulator piston	56	Actuator assembly, parking lock	90	Screw, servo cover
20	Case, adapter	57	Nut, parking lock lever	91	Cover, servo piston
22	Connector, electrical/adapter case	58	Link, manual valve	92	Gasket, cover/servo piston
		59	Pin, spring	93	Ring, retaining servo piston
		60	Lever, parking lock & range selector	94	Clip, servo piston
		61	Shaft, selector	95	Nut, servo screw
27	Restrictor, oil	62	Seal, selector shaft	96	Screw, servo piston
28	Gasket, Transfer plate/adapter	63	Mode switch assembly	97	Piston, servo
29	Plate, transfer adapter/center support	64	Screw & conical washer assembly	98	Seal, ring/servo piston
30	Support assembly, center	65	Shield, mode switch	99	Spring, cushion/servo piston
31	Screw, center support			100	Seat, cushion spring
32	Ring, oil seal	67	Pan, Bottom/Adapter case	101	Sleeve, servo piston adjust
33	Seal, O-ring main case	68	Gasket, bottom pan/adapter case	102	Rod, apply/servo piston
34	Fitting, cooler	69	Harness assembly, adapter case	103	Spring, return/servo piston
35	Fitting assembly, cooler	70	Screw, valve body	104	Gasket, adapter case/transfer plate
		71	Valve body assembly, adapter case	105	Transmission control module
				106	Servo piston assembly

PUMP ASSEMBLY


VALVE BODY ASSEMBLIES

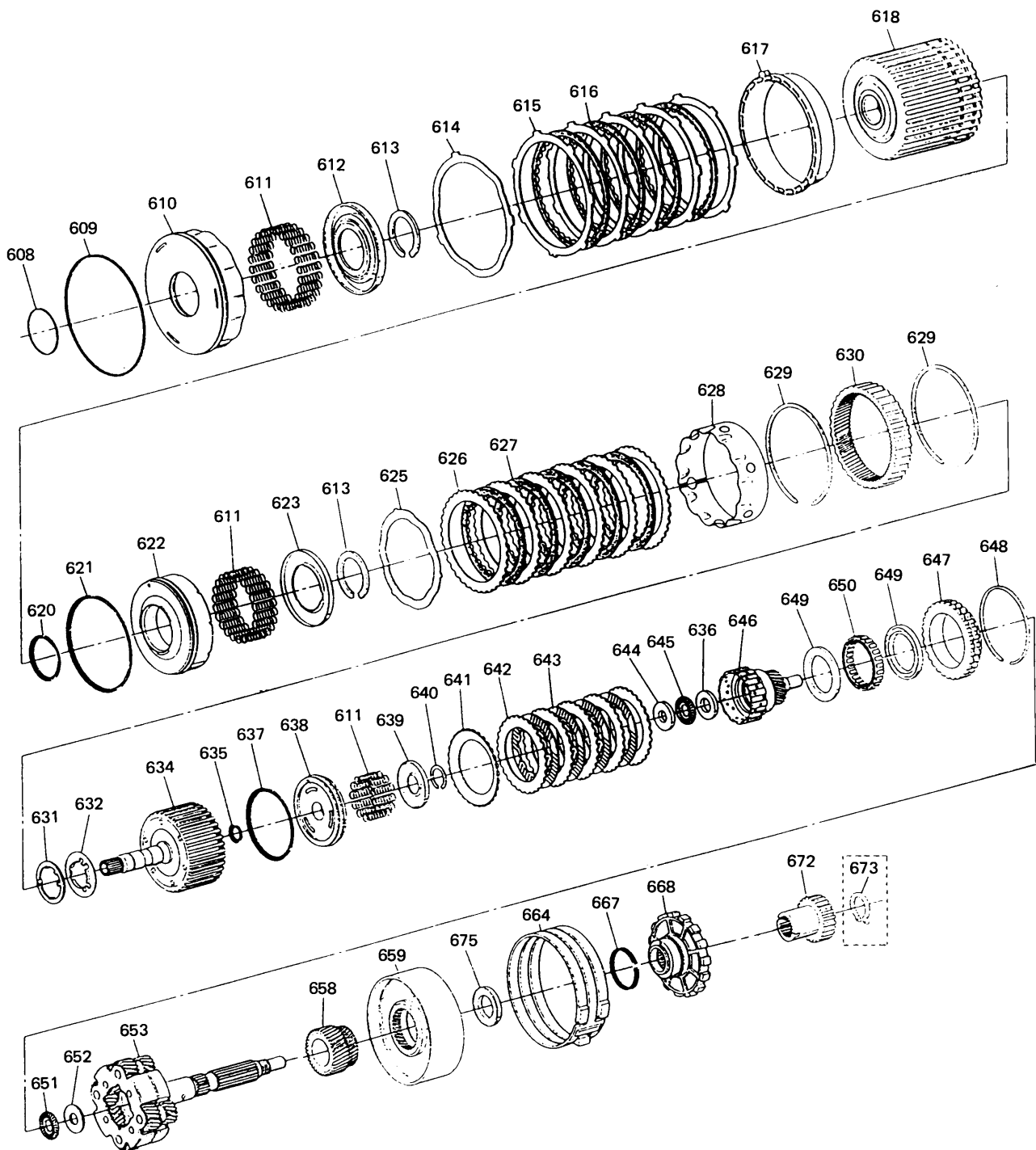


OVERDRIVE INTERNAL COMPONENTS



- | | |
|---|--|
| 501 Retainer, 4th clutch | 521 Plate, overrun clutch (steel) |
| 502 Plate, 4th clutch (steel) | 522 Plate assembly, overrun clutch (lined) |
| 503 Plate assembly, 4th clutch (lined) | 523 Plate, backing/overrun clutch |
| 504 Retainer & ball assembly, check valve | 524 Ring, snap/overrun clutch housing |
| 505 Seal, O-ring/turbine shaft | 525 Carrier assembly, overdrive complete |
| 506 Shaft, turbine | 526 Ring, snap/turbine shaft/carrier |
| 508 Ring, oil seal/turbine shaft | 527 Bearing assembly, thrust |
| 510 Housing, overrun clutch | 528 Gear, overdrive internal |
| 513 Piston, overrun clutch | 529 Washer, thrust/internal gear/support |
| 514 Spring, overrun clutch release | 530 Ring, snap/adaptor/4th clutch spring |
| 515 Retainer, release spring/overrun clutch | 531 Retainer & spring assembly, 4th clutch |
| 516 Roller assembly, overdrive clutch | 532 Piston, 4th clutch |
| 517 Cam, overdrive roller clutch | 533 Seal, 4th clutch piston (inner) |
| 518 Ring, snap/overrun clutch hub | 534 Seal, 4th clutch piston (outer) |
| 519 Gear, overdrive sun | |

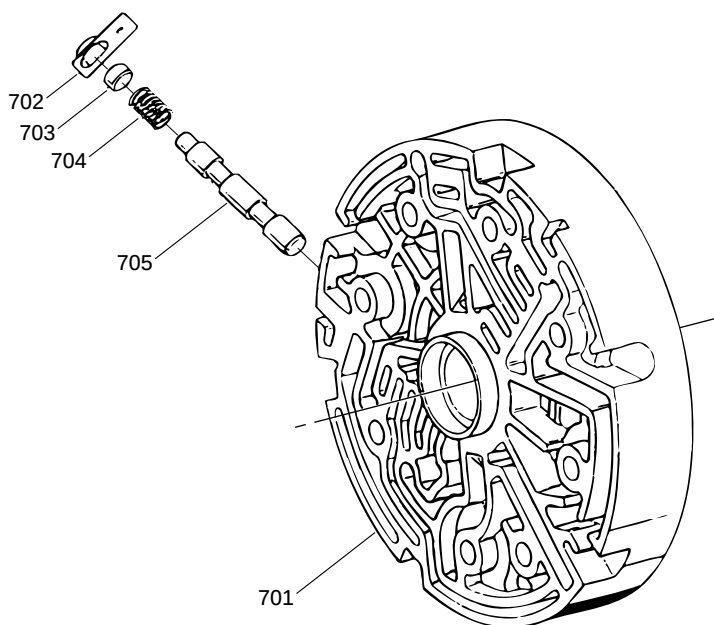
INTERNAL COMPONENTS



INTERNAL COMPONENTS

608	Seal, reverse clutch piston (inner)	638	Piston 3rd clutch
609	Seal, reverse clutch piston (outer)	639	Seat, spring/3rd clutch
610	Piston, reverse clutch	640	Ring, retaining
611	Spring, piston clutch	641	Plate, spring cushion/3rd clutch
612	Seat, spring/reverse clutch	642	Plate, 3rd clutch (Steel)
613	Ring, Retaining	643	Plate assembly, 3rd clutch (Lined)
614	Plate, waved/reverse clutch	644	Washer, thrust/input sun
615	Plate, reverse clutch (steel)	645	Bearing, input shaft/gear assembly
616	Plate assembly, reverse clutch (lined)	646	Gear assembly, input sun
617	Plate, reverse clutch pressure/selective	647	Race assembly, sprag
618	Drum assembly, 2nd clutch	648	Ring, retaining/sprag
620	Seal, 2nd clutch piston (Inner)	649	Ring, retaining
621	Seal, 2nd clutch piston (Outer)	650	Cage assembly, sprag
622	Piston, 2nd clutch	651	Bearing, output shaft/input sun
623	Seat, spring/2nd clutch	652	Washer, output shaft/input sun
625	Plate, waved/2nd clutch	653	Carrier assembly, planetary
626	Plate, 2nd clutch (Steel)	658	Gear, reaction sun
627	Plate assembly, 2nd clutch (Lined)	659	Drum, reaction sun
628	Spacer, 2nd clutch	664	Band assembly, brake
629	Ring, retaining	667	Seal, ring/wheel parking lock
630	Gear, ring	668	Wheel, parking lock
631	Washer, thrust/2nd clutch/3rd clutch		
632	Thrust washer, clutch hub	672	Wheel, speedo
634	Drum assembly, 3rd clutch	673	Ring, retaining
635	Seal, 3rd clutch piston (Inner)		
636	Washer, retaining	675	Bearing, thrust assembly
637	Seal, 3rd clutch piston (Outer)		

CENTER SUPPORT ASSEMBLY



- 701 Center support
- 702 Retainer plate
- 703 Plug, lockout
- 704 Spring, overrun lockout
- 705 Valve, overrun lockout

TF4L3-WE-889AR

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INTERNATIONAL SERVICE DEPARTMENT

Tokyo, Japan
