

TRANSMISSION/TRANSAXLE

Transmission Control System (Smoother)

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Specifications

Temperature vs Resistance

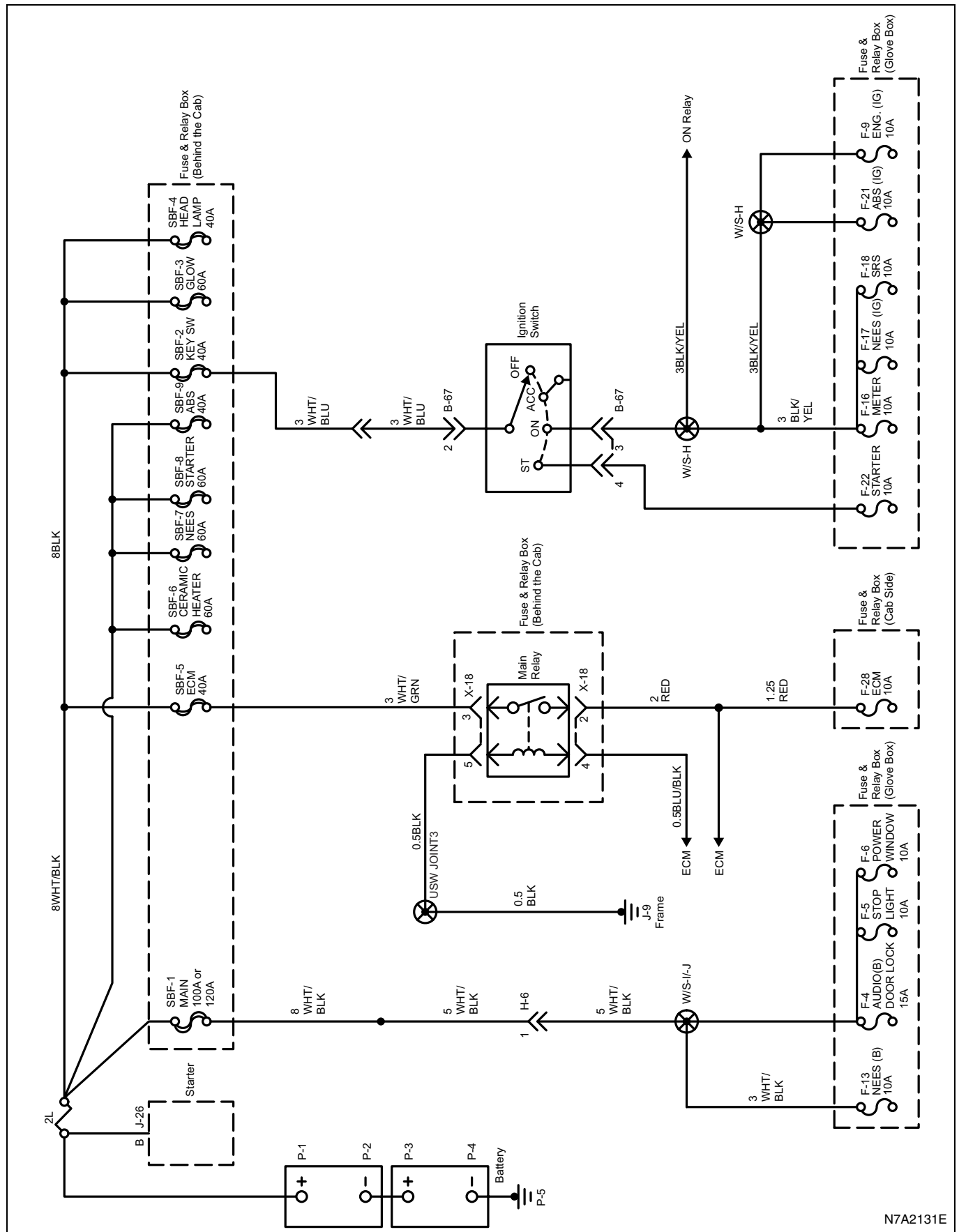
Transmission Fluid Temperature Sensor vs.
Resistance

°C	°F	Ω
Temperature vs. Resistance Value (Approximately)		
150	302	60
140	284	80
130	266	90
120	248	120
110	230	150
100	212	190
90	194	250
80	176	320
70	158	430
60	140	590
50	122	820
40	104	1160
30	86	1680
20	68	2500
10	50	3820
0	32	6030
-10	14	9840
-20	-4	16700
-30	-22	29610

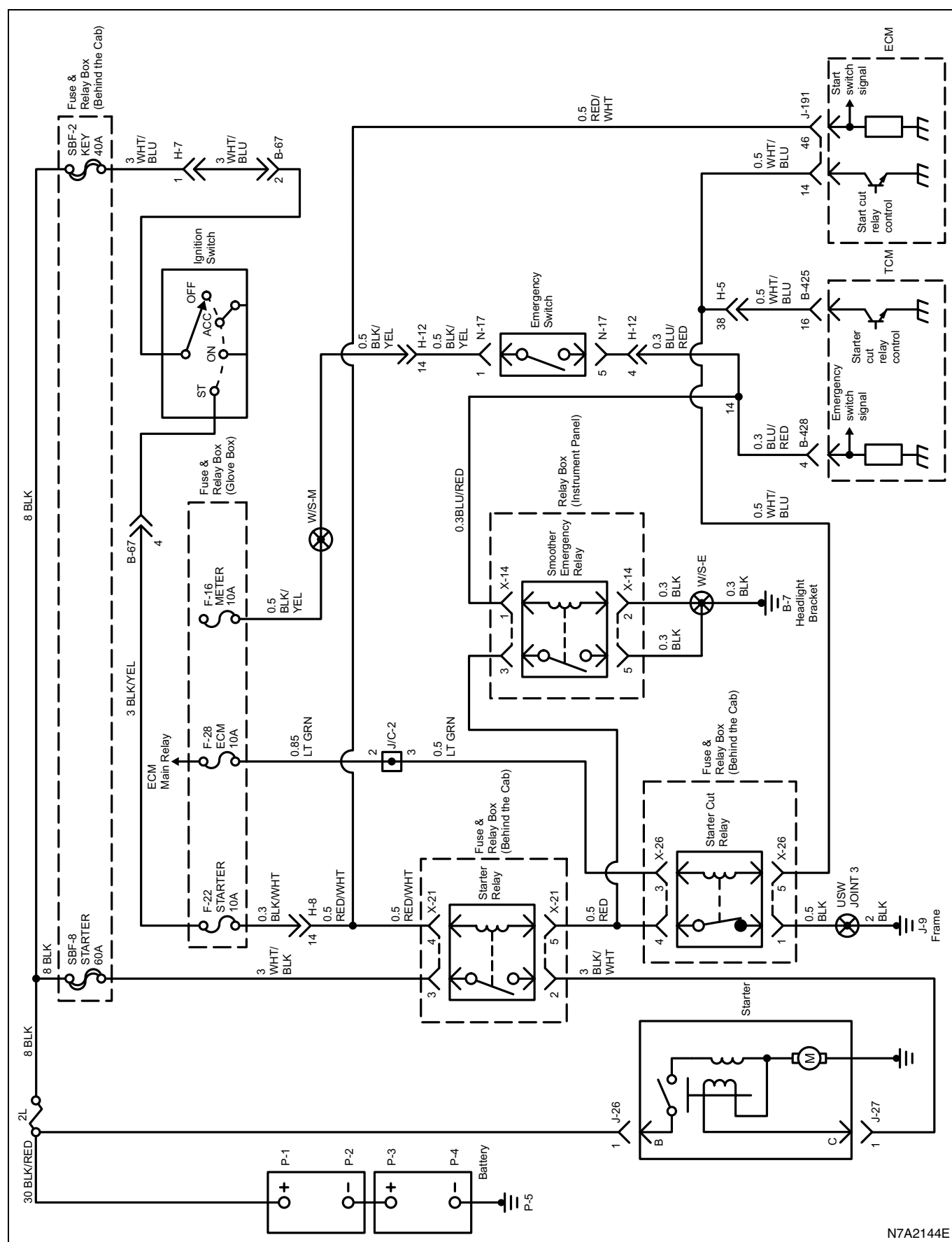
Schematic and Routing Diagrams

Transmission Controls Schematics

Power Distribution

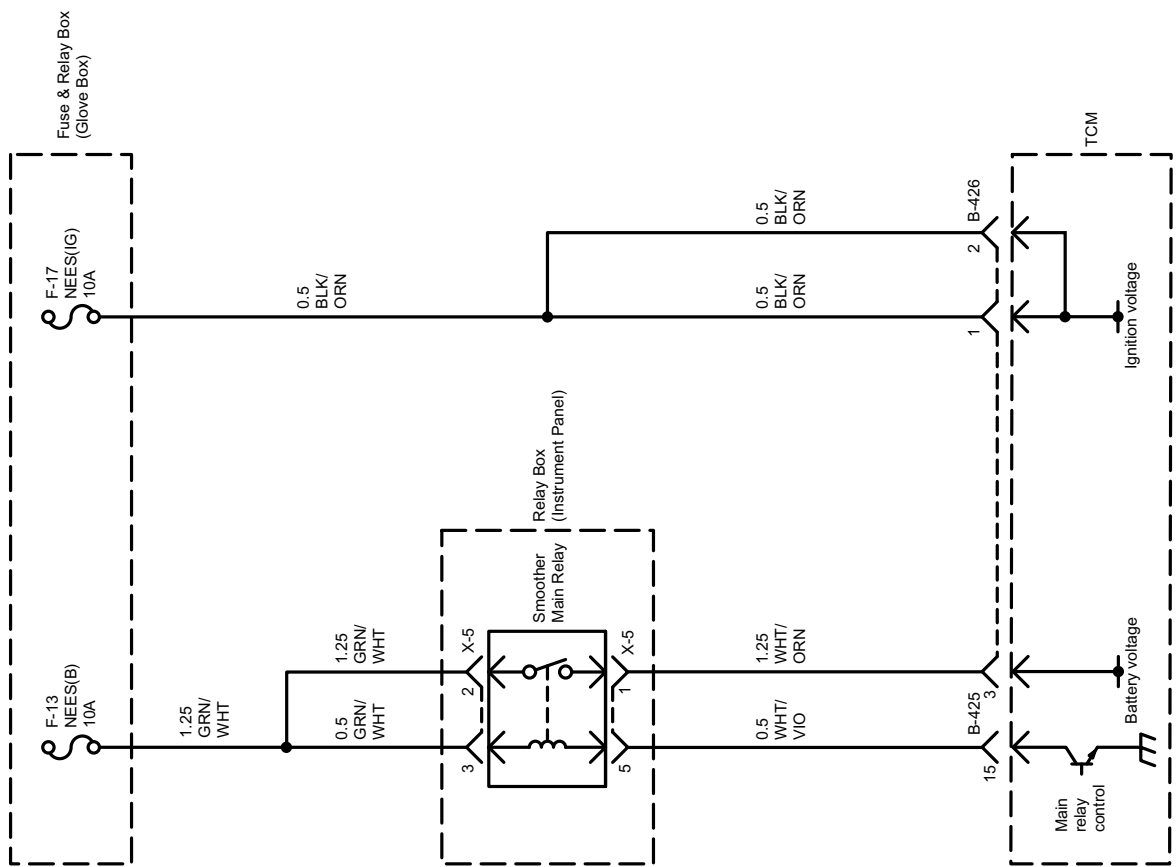


Starting System



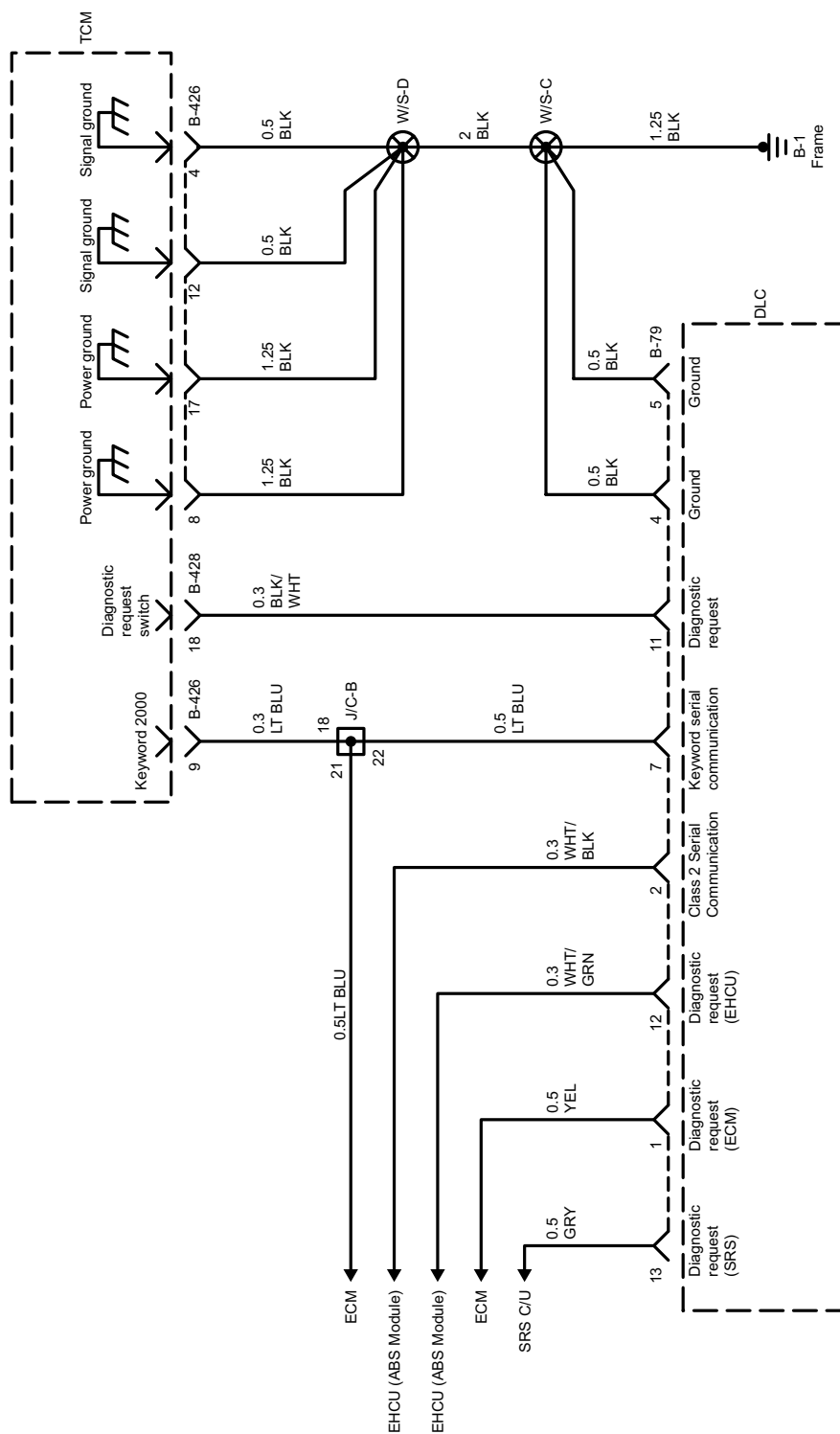
N7A2144E

ECM and TCM Power

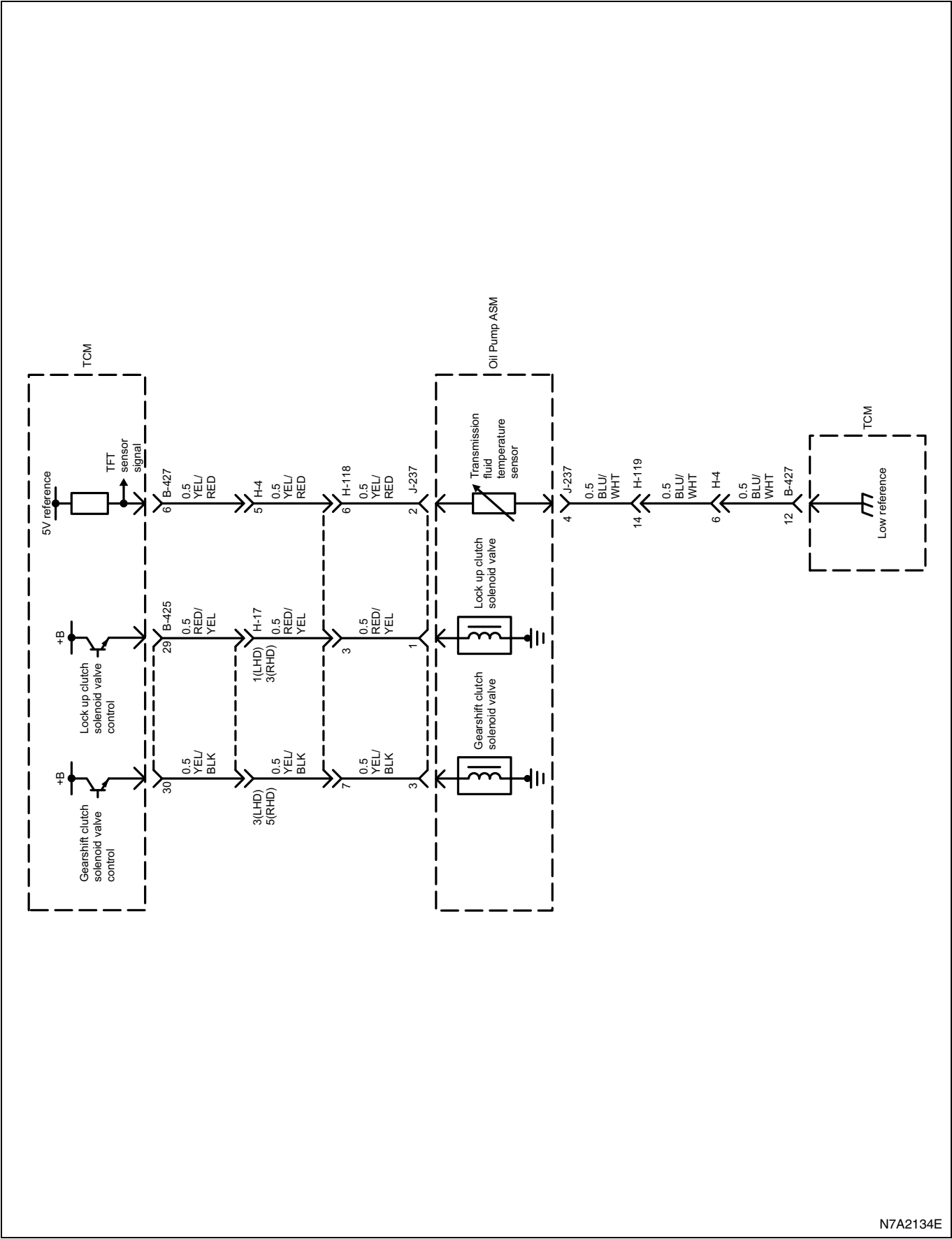


7A-6 Transmission Control System (Smoother)

TCM Ground and DLC

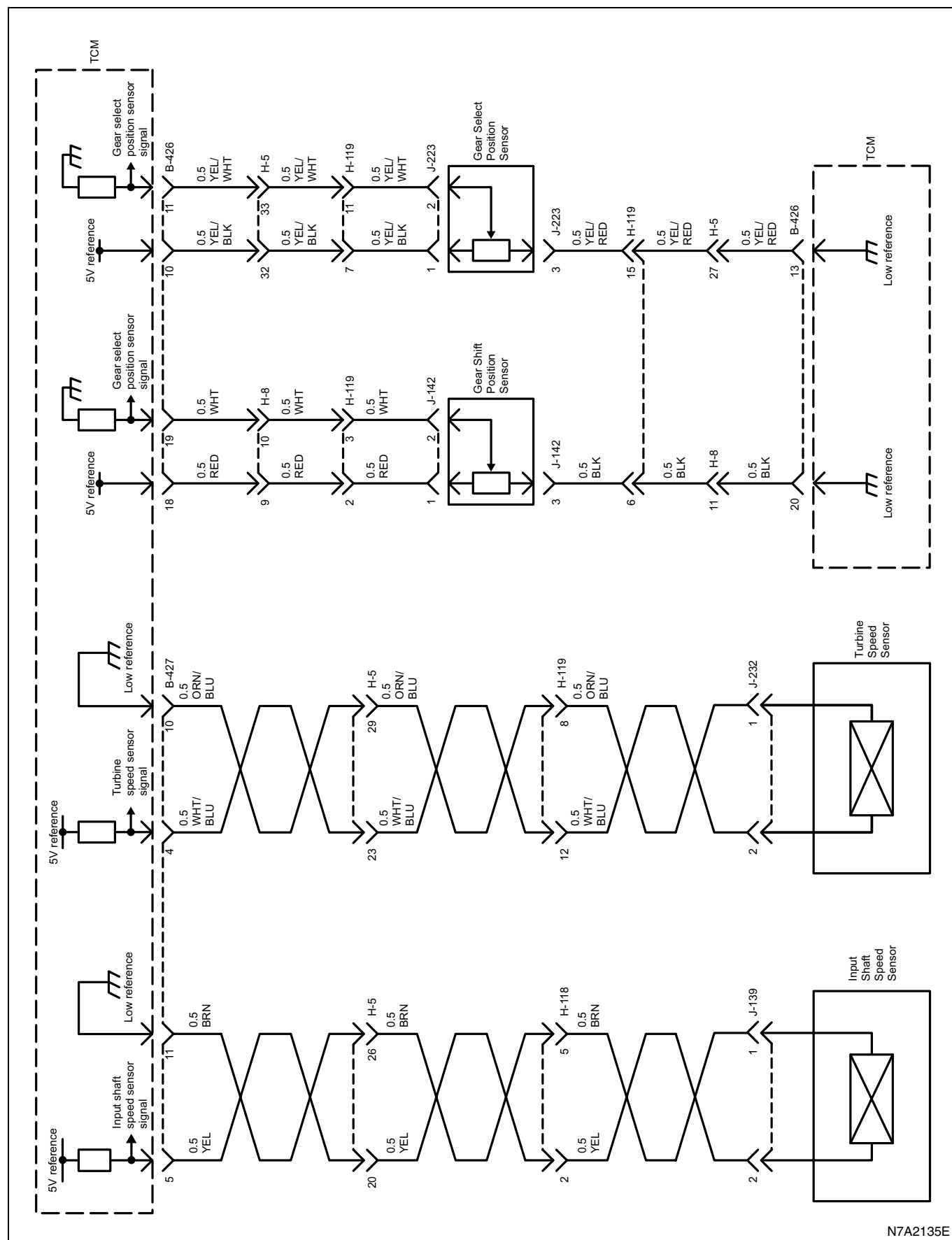


Clutch Control

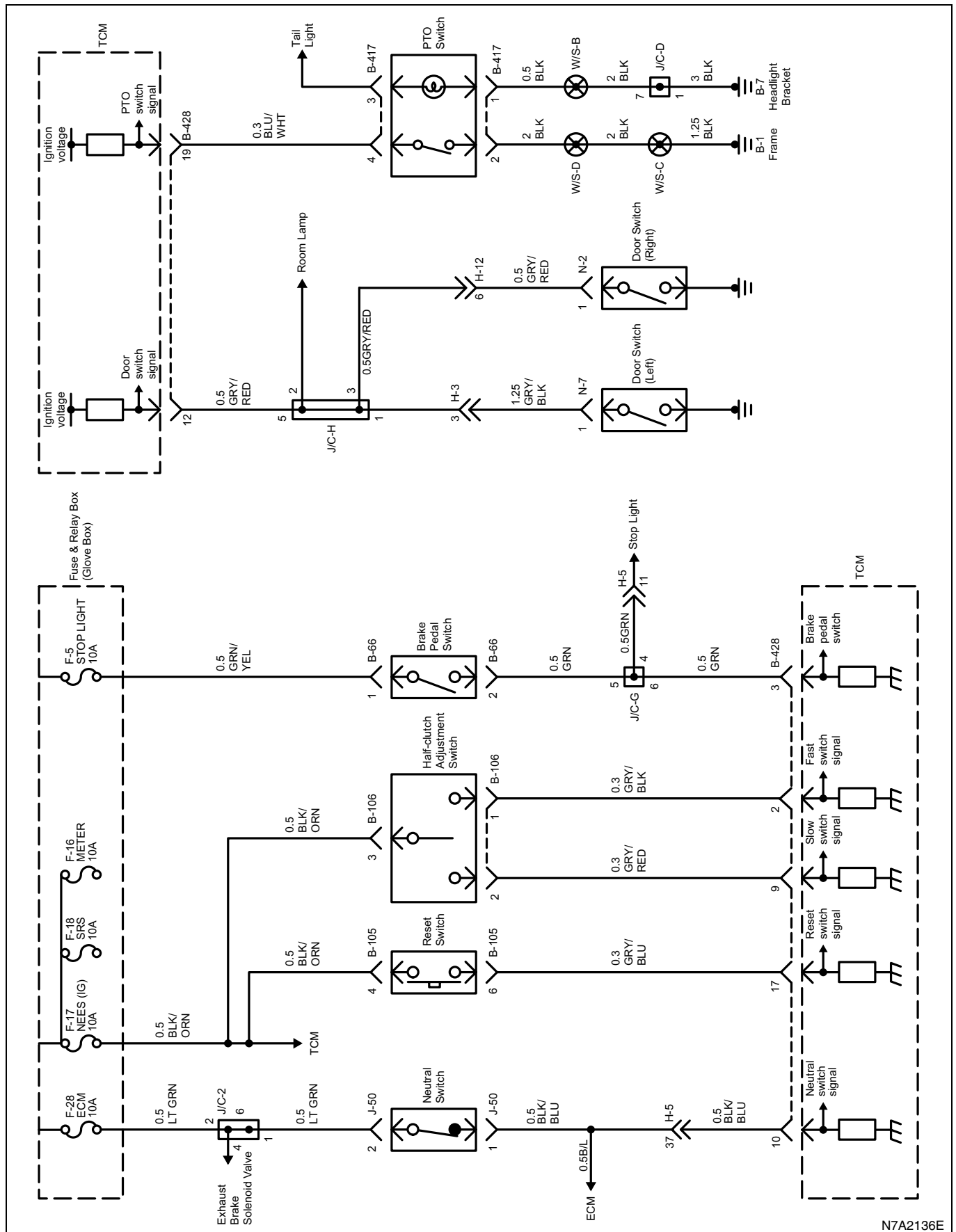


7A-8 Transmission Control System (Smoother)

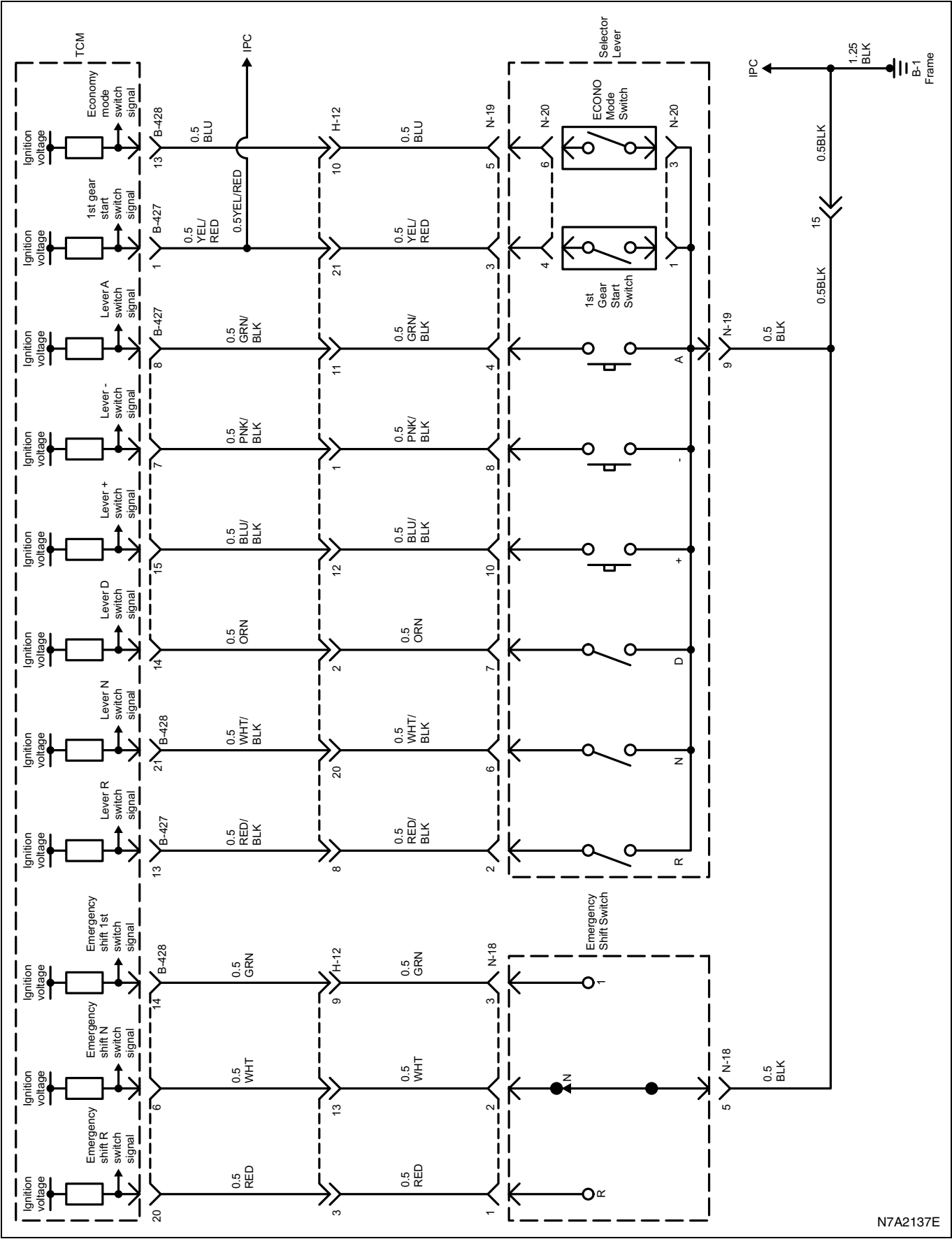
Input Shaft Speed Sensor, Turbine Sensor, Gearshift Position Sensor and Gear Select Position Sensor



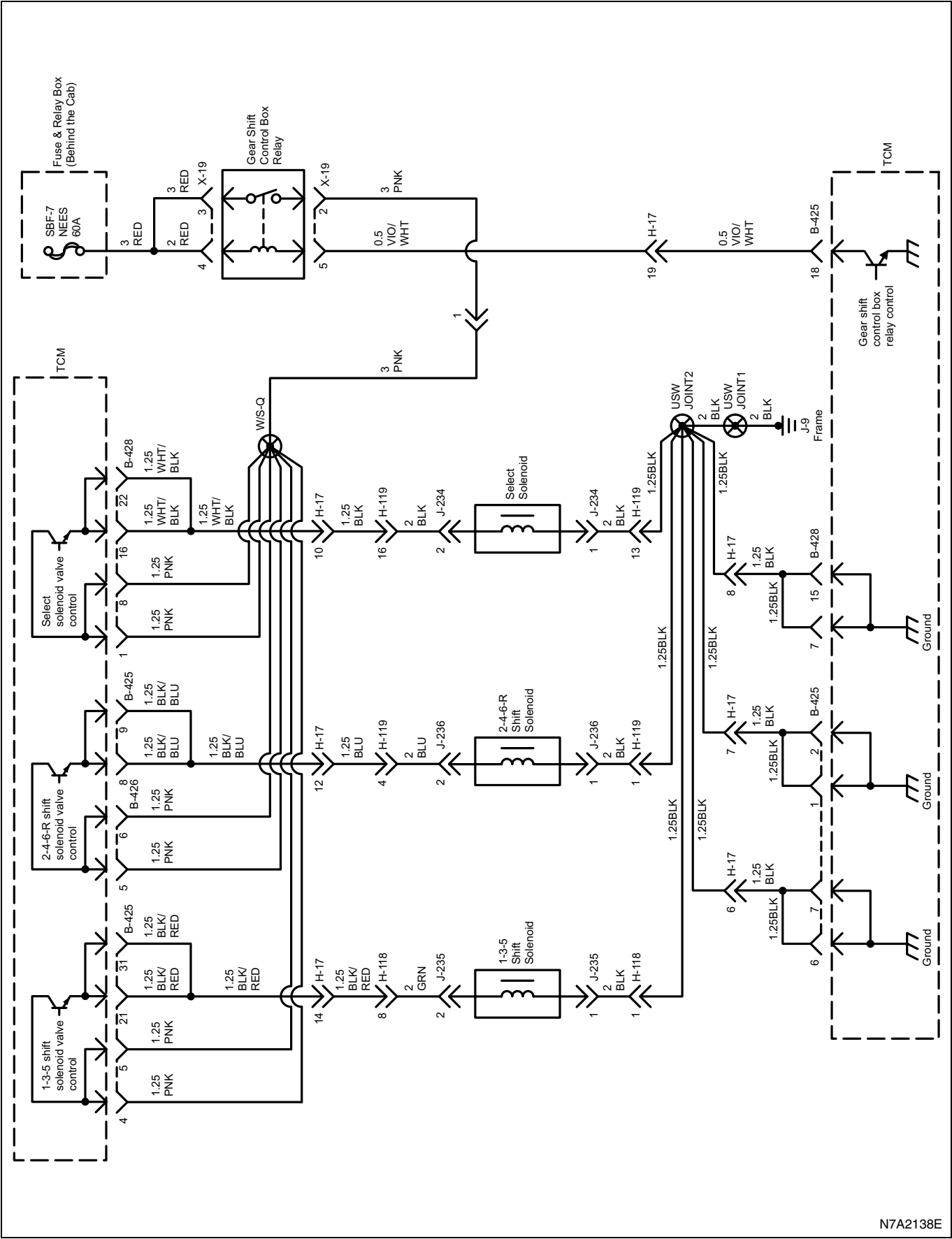
Neutral Switch, Reset Switch, Half-clutch adjustment Switch, Brake Pedal Switch, Door Switch, PTO Switch



Change Lever Switch

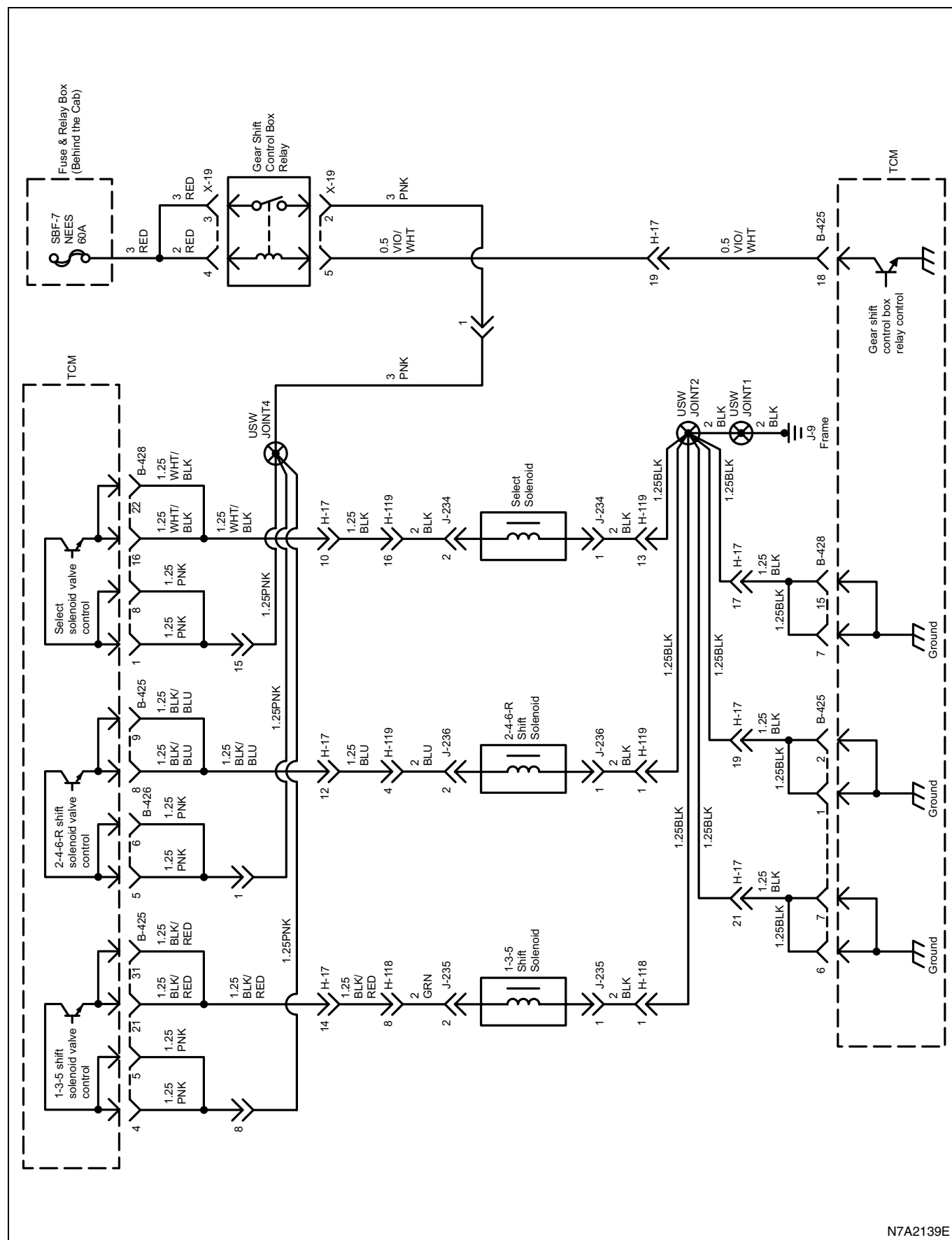


Shift System (LHD)



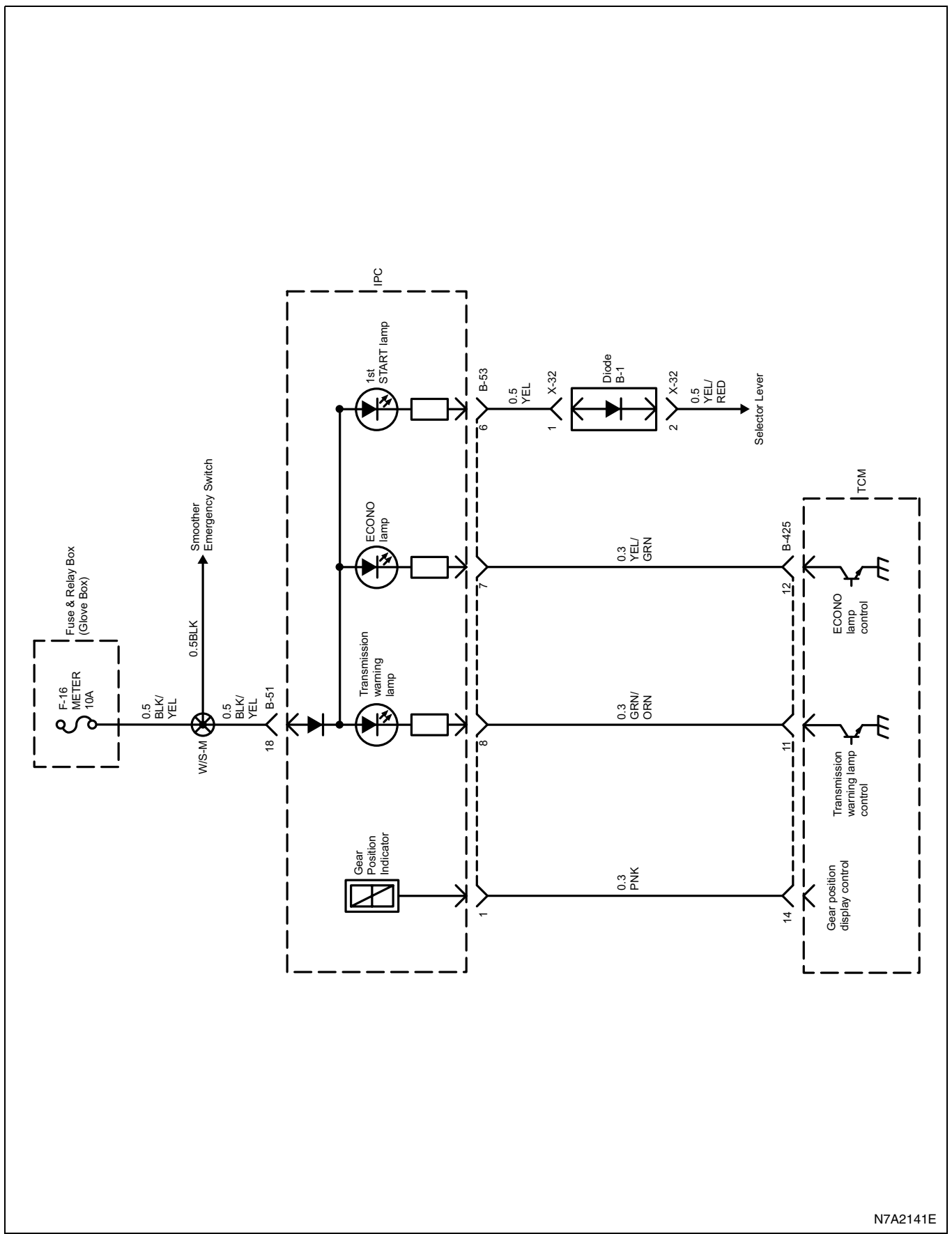
7A-12 Transmission Control System (Smoother)

Shift System (RHD)



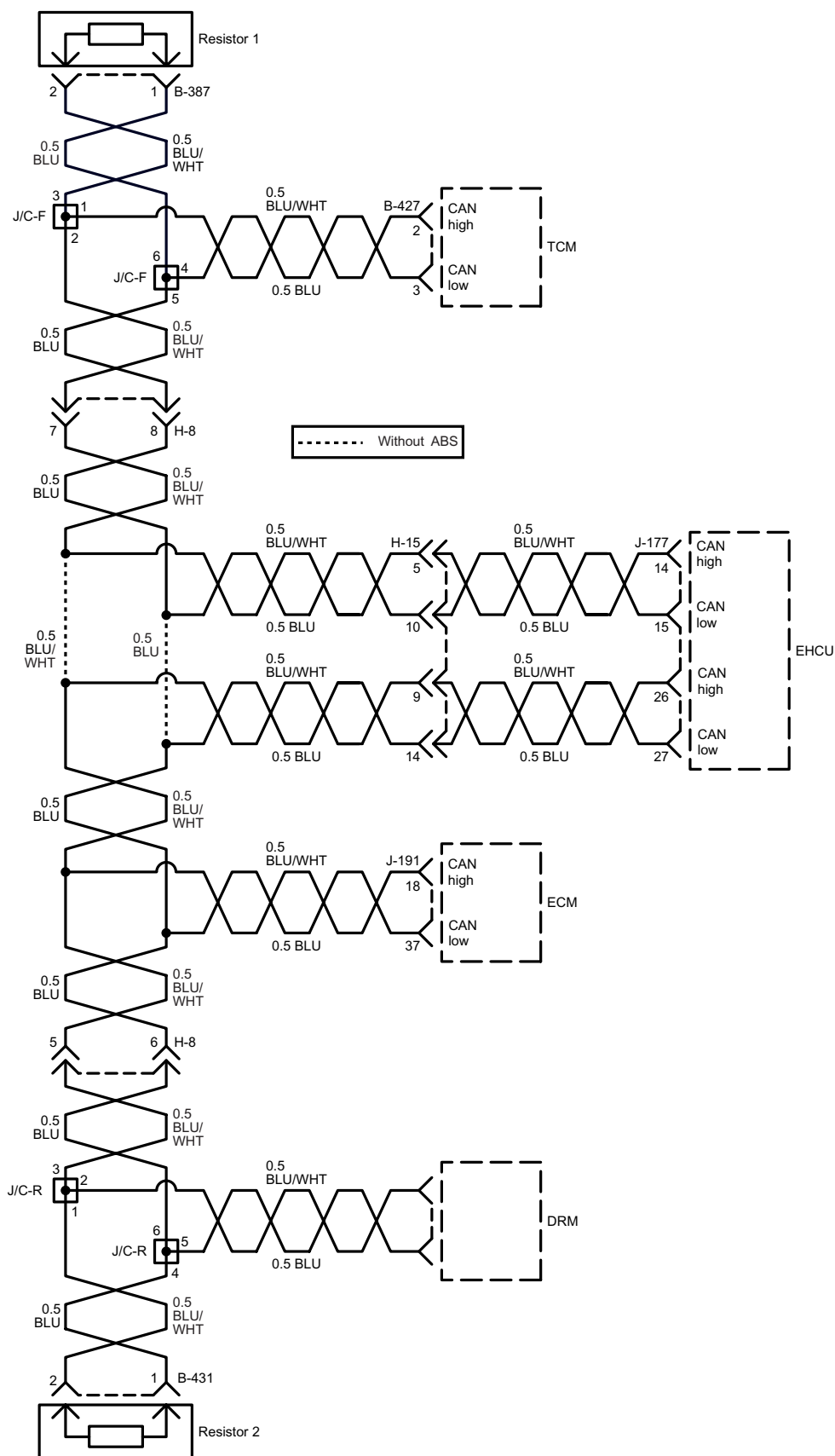
N7A2139E

Indicator Lamp

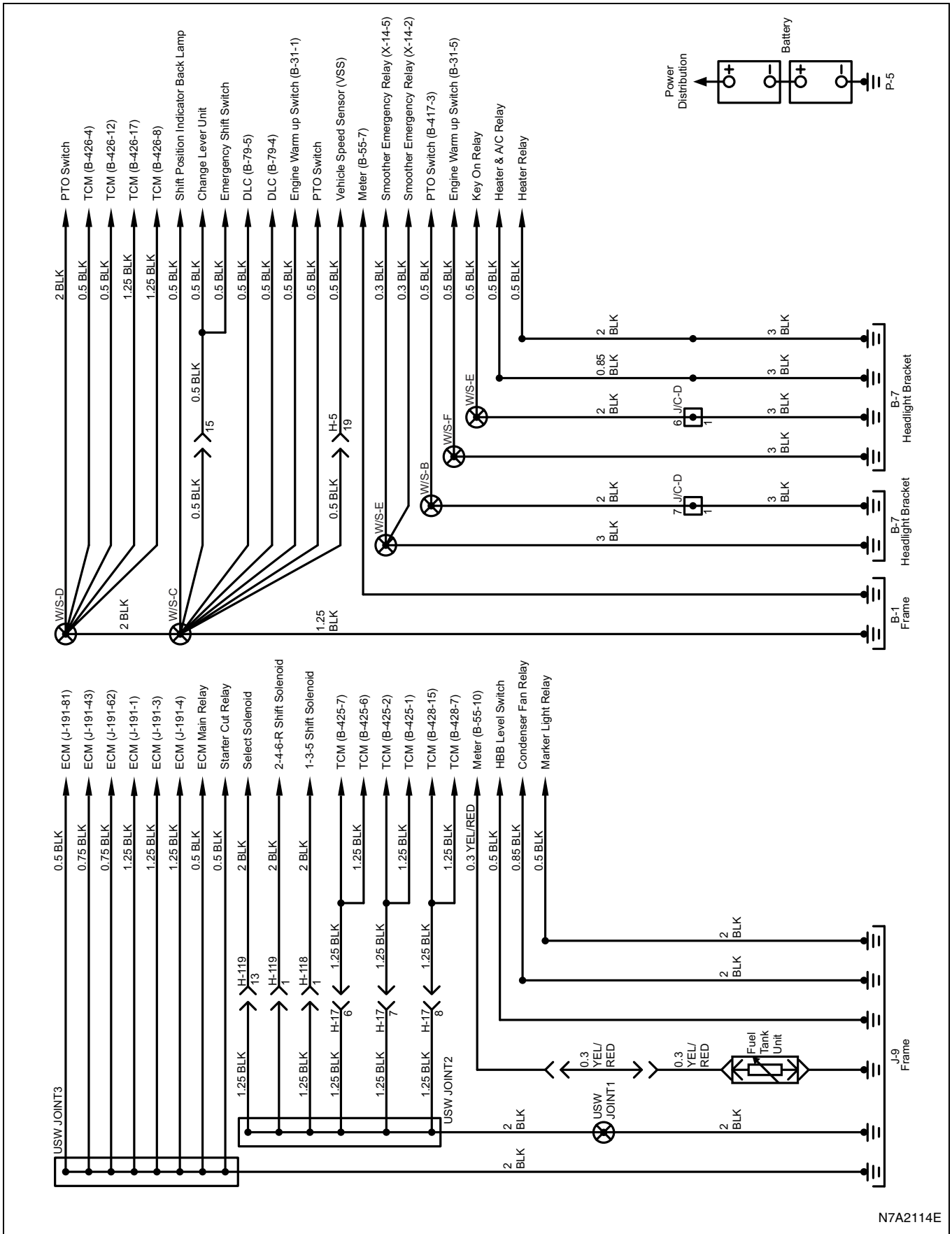


7A-14 Transmission Control System (Smoother)

Can System



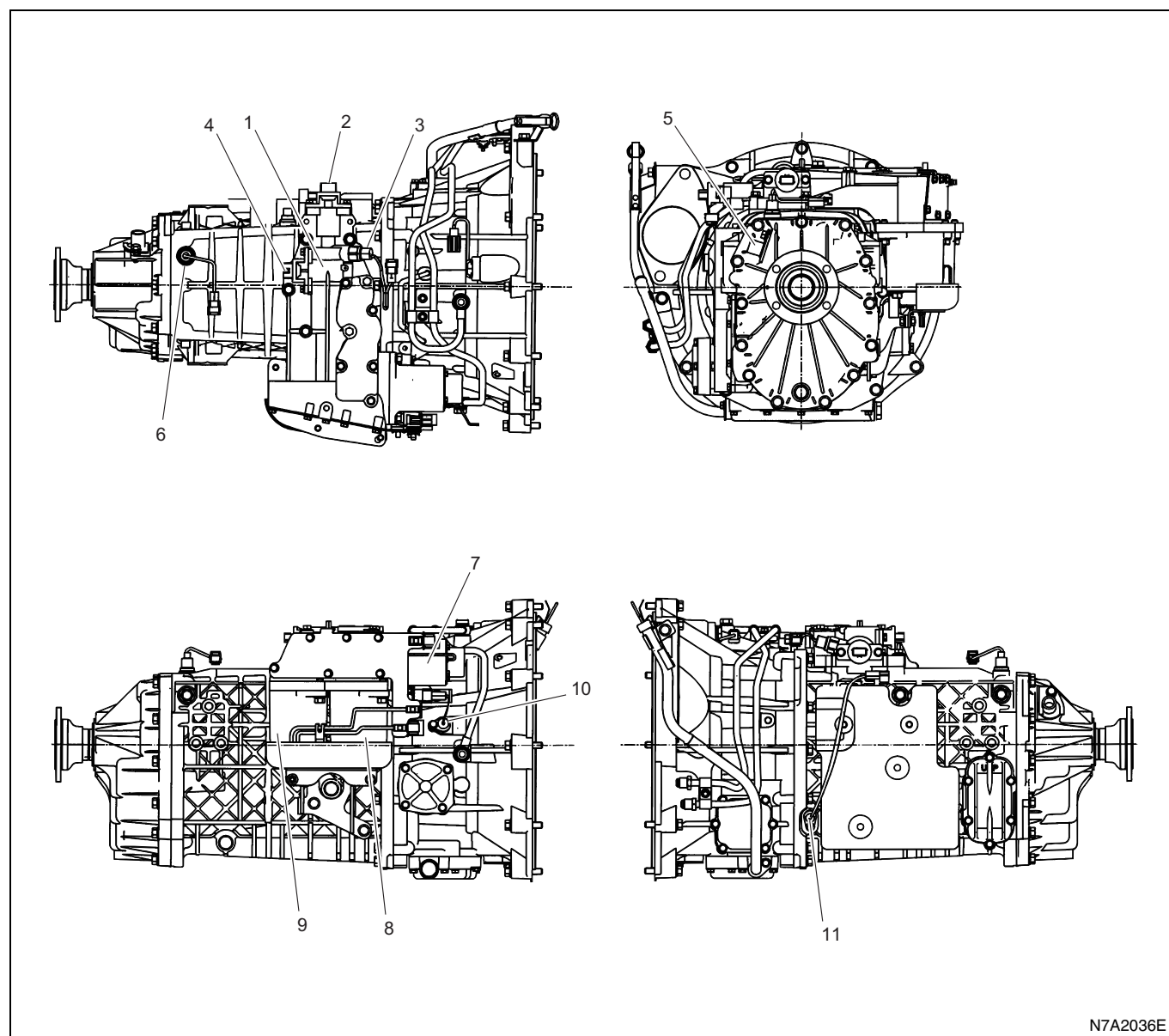
Ground Distributions



Component Locator

Transmission Controls Component Views

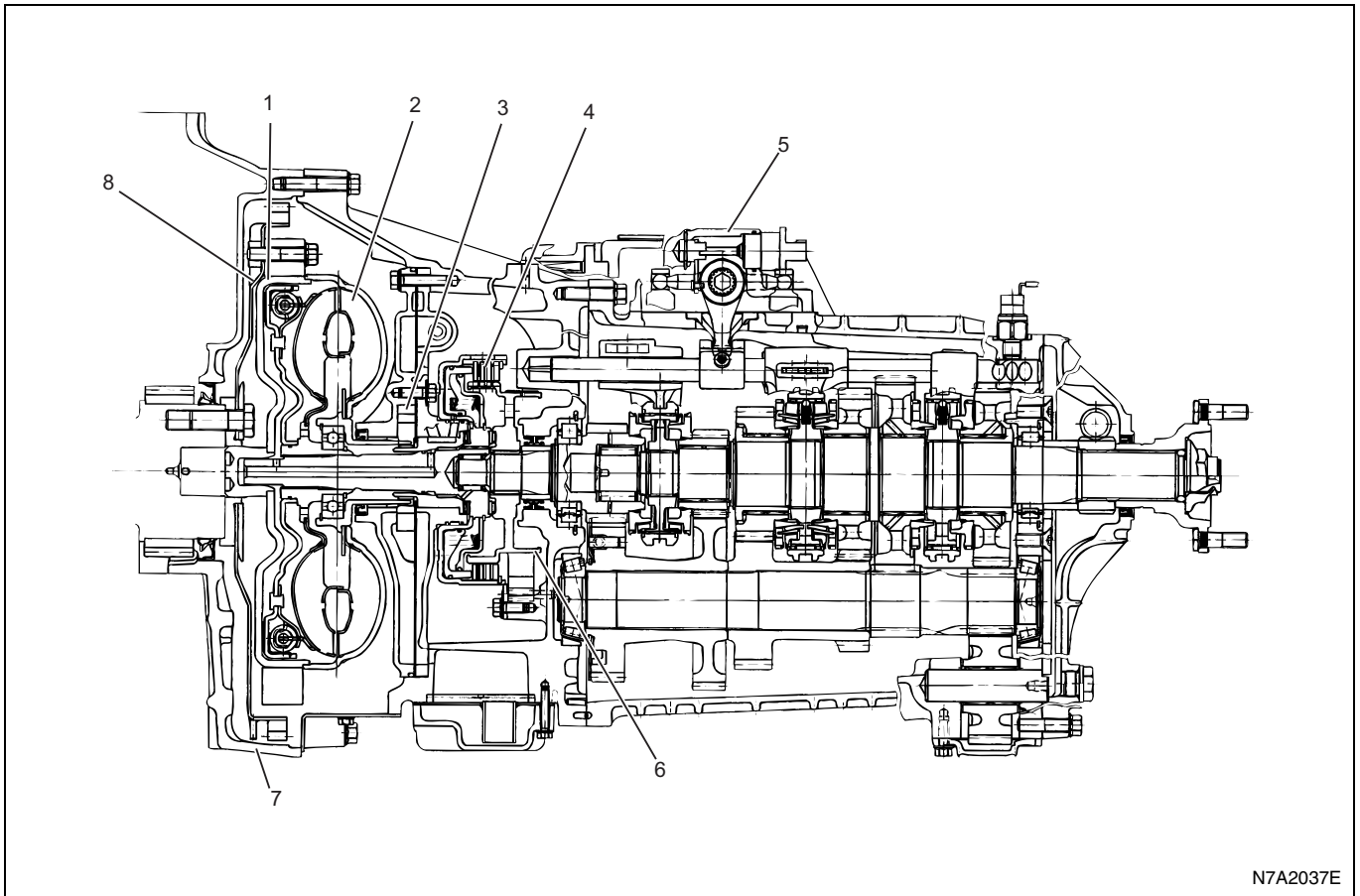
Transmission



Legend

- | | |
|--------------------------------|---------------------------------|
| 1. Gearshift Control Box | 7. Select Solenoid Valve |
| 2. Gear Shift Position Sensor | 8. 1-3-5 Shift Solenoid Valve |
| 3. Neutral Switch | 9. 2-4-6-R Shift Solenoid Valve |
| 4. Gear Select Position Sensor | 10. Turbine Speed Sensor |
| 5. Vehicle Speed Sensor | 11. Input Shaft Speed Sensor |
| 6. Reverse Switch | |

Cross Section

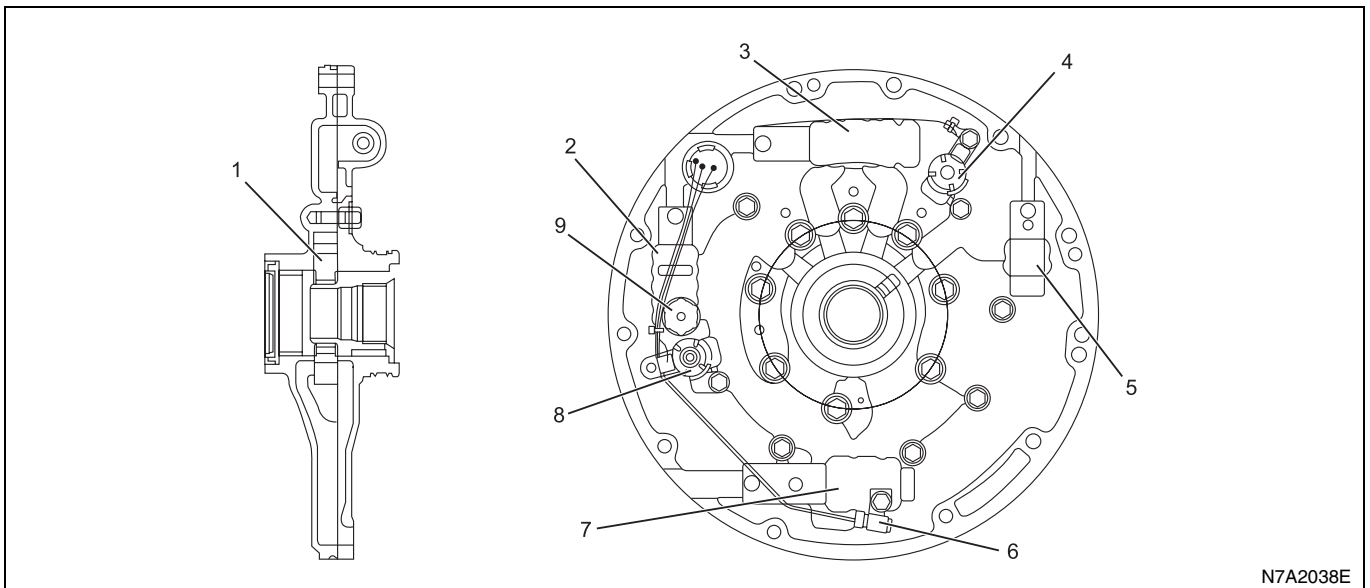


N7A2037E

Legend

- | | |
|---------------------|--------------------------|
| 1. Lock Up Clutch | 5. Gearshift Control Box |
| 2. Fluid Coupling | 6. Brake Band |
| 3. Oil Pump | 7. Flywheel Housing |
| 4. Gearshift Clutch | 8. Flexible Plate |

Oil Pump Assembly



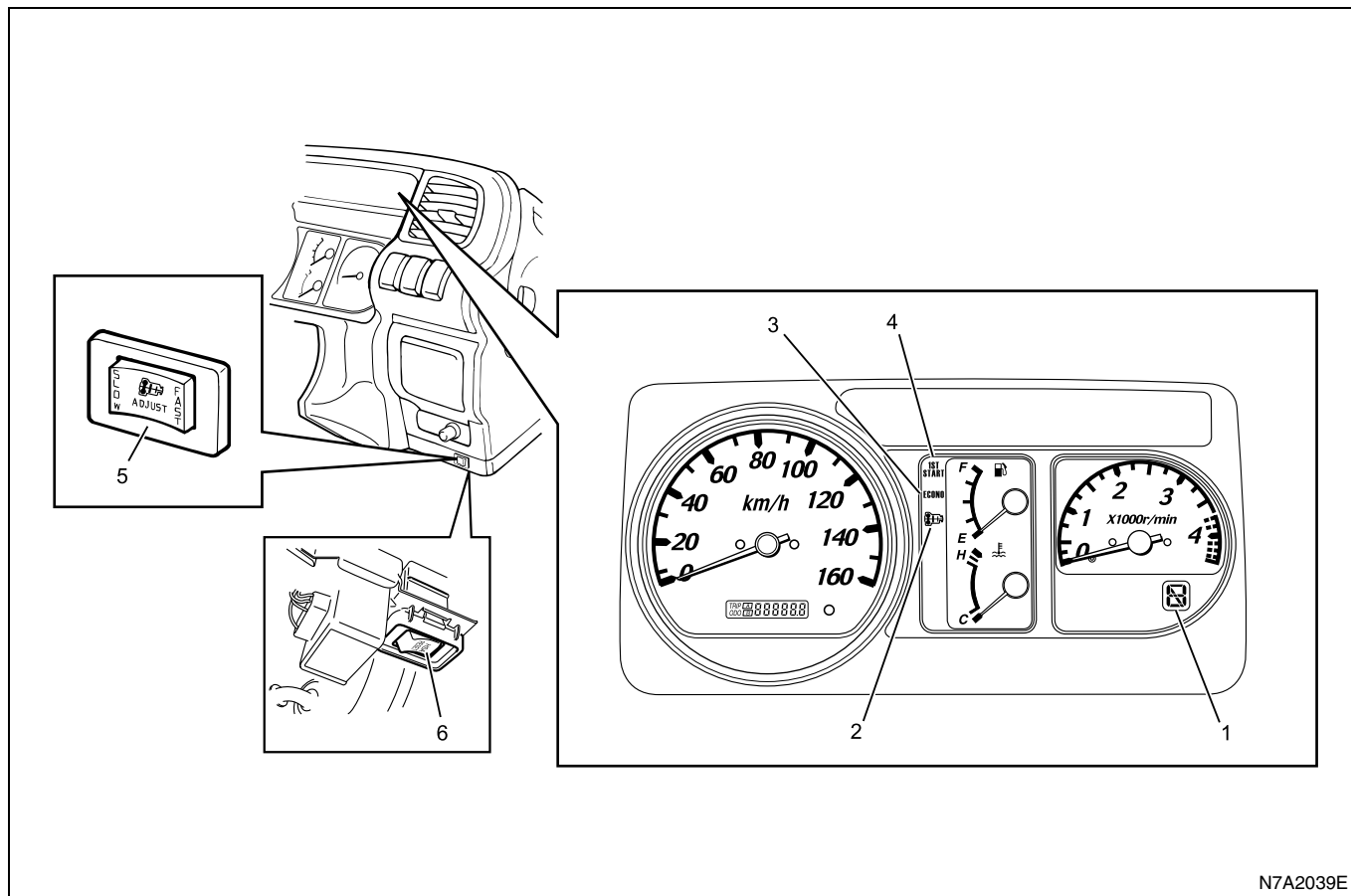
N7A2038E

7A-18 Transmission Control System (Smoother)

Legend

- | | |
|----------------------------------|--|
| 1. Oil Pump | 6. Transmission Fluid Temperature (TFT) Sensor |
| 2. Gearshift Clutch Spool Valve | 7. Relief Valve |
| 3. Lockup Clutch Spool Valve | 8. Gearshift Clutch Solenoid Valve |
| 4. Lock Up Clutch Solenoid Valve | 9. Accumulator |
| 5. Bypass Valve | |

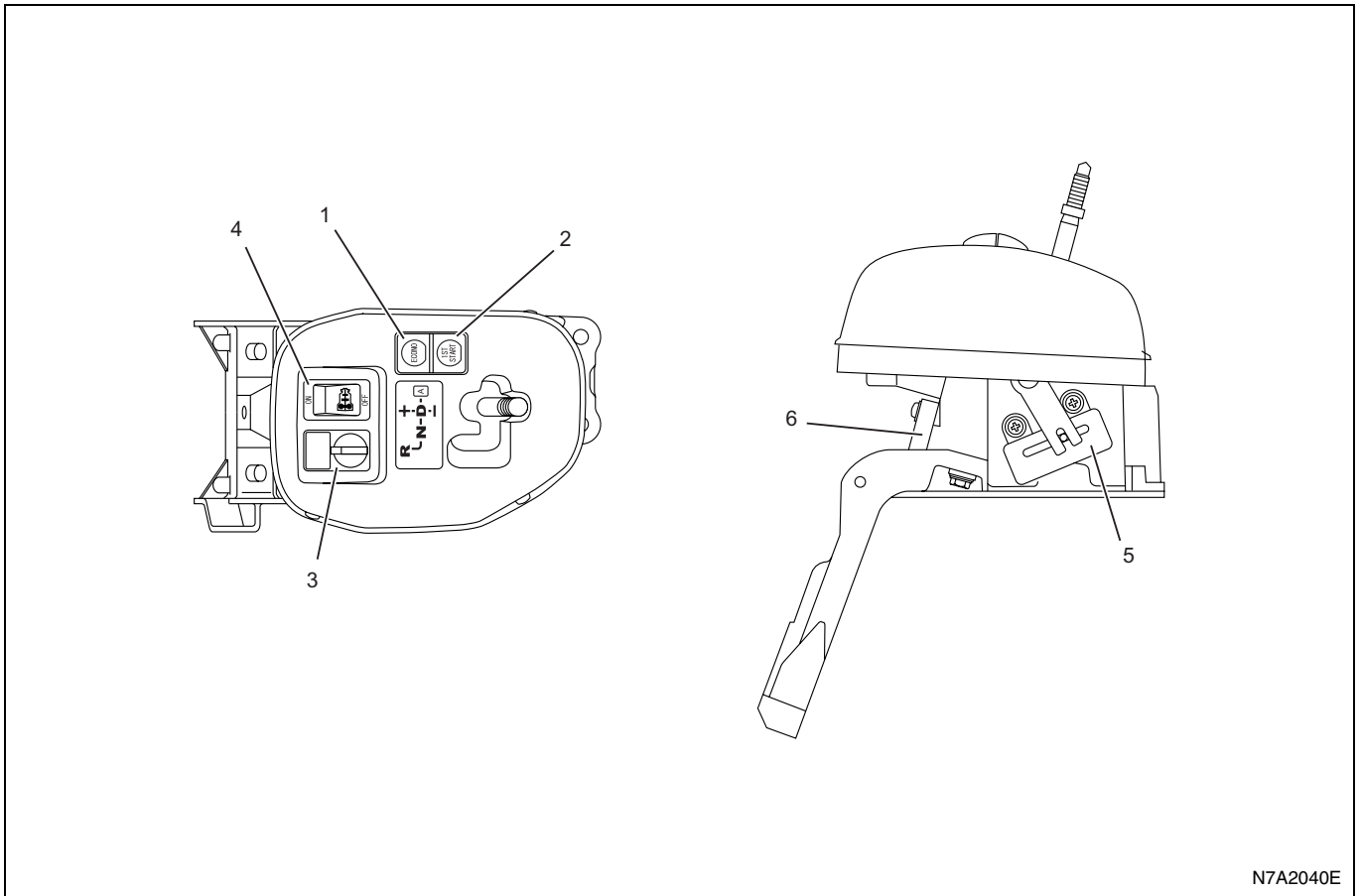
Cab



Legend

- | | |
|--------------------------------|----------------------------------|
| 1. Gear Position Indicator | 4. 1st Gear Start Indicator Lamp |
| 2. Transmission Warning Lamp | 5. Half-Clutch Adjustment Switch |
| 3. Economy Mode Indicator Lamp | 6. Reset Switch |

Selector Lever

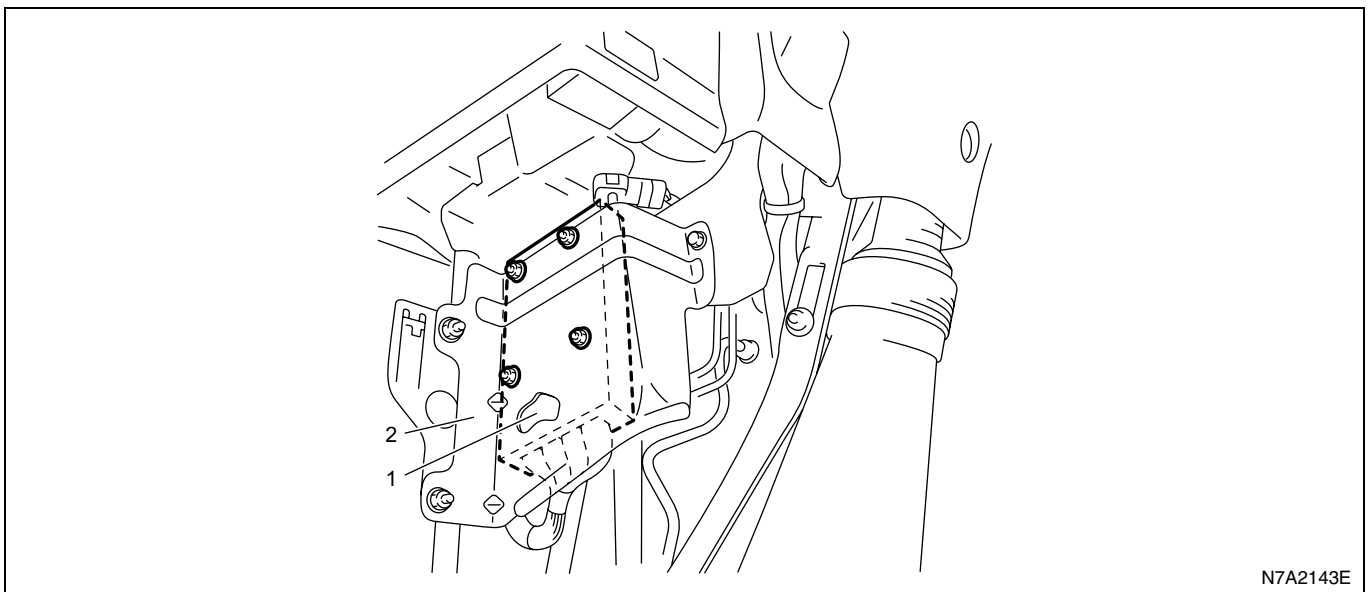


N7A2040E

Legend

- | | |
|---------------------------|--|
| 1. Economy Mode Switch | 4. Emergency Switch |
| 2. 1st Gear Start Switch | 5. Selector Lever Switch (Shift Side) |
| 3. Emergency Shift Switch | 6. Selector Lever Switch (Select Side) |

Transmission Control Module (TCM)



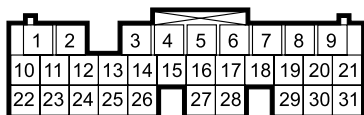
N7A2143E

Legend

- | | |
|--------------------------------------|--------------|
| 1. Transmission Control Module (TCM) | 2. TCM Cover |
|--------------------------------------|--------------|

7A-20 Transmission Control System (Smoother)

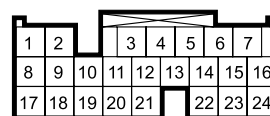
Transmission Control Module (TCM) Connector End Views



N7A2099E

Connector No.		B-425
Connector Color		White
Test Adapter No.		J-35616-64A
Pin	Wire Color	Pin Function
1	BLK	2-4-6-R Shift Solenoid Valve Ground
2	BLK	2-4-6-R Shift Solenoid Valve Ground
3	—	Not Used
4	PNK	1-3-5 Shift Solenoid Valve Voltage Feed
5	PNK	1-3-5 Shift Solenoid Valve Voltage Feed
6	BLK	1-3-5 Shift Solenoid Valve Ground
7	BLK	1-3-5 Shift Solenoid Valve Ground
8	BLK/BLU	2-4-6-R Shift Solenoid Valve Control
9	BLK/BLU	2-4-6-R Shift Solenoid Valve Control
10	—	Not Used
11	GRN/ORN	Transmission Warning Lamp Control
12	YEL/GRN	Economy Mode Lamp Control
13	—	Not Used
14	PNK	Gear Position Display Control
15	WHT/IO	Main Relay Control
16	WHT/BLU	Starter Cut Relay Control
17	—	Not Used
18	VIO/WHT	Gearshift Control Box Relay Control
19	—	Not Used
20	—	Not Used
21	BLK/RED	1-3-5 Shift Solenoid Valve Control

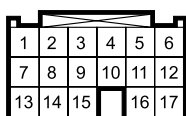
22	—	Not Used
23	—	Not Used
24	—	Not Used
25	—	Not Used
26	—	Not Used
27	—	Not Used
28	—	Not Used
29	RED/YEL	Lock Up Clutch Solenoid Valve Control
30	YEL/BLK	Gearshift Clutch Solenoid Valve Control
31	BLK/RED	1-3-5 Shift Solenoid Valve Control



N7A2100E

Connector No.		B-426
Connector Color		White
Test Adapter No.		J-35616-64A
Pin	Wire Color	Pin Function
1	BLK/ORN	Ignition Voltage Feed
2	BLK/ORN	Ignition Voltage Feed
3	WHT/ORN	Main Relay Voltage
4	BLK	TCM Signal Ground
5	PNK	2-4-6-R Shift Solenoid Valve Voltage Feed
6	PNK	2-4-6-R Shift Solenoid Valve Voltage Feed
7	—	Not Used
8	BLK	TCM Power Ground
9	LT BLU	Keyword 2000 Serial Data
10	YEL/BLK	Gear Select Position Sensor 5 Volts Reference
11	YEL/WHT	Gear Select Position Sensor Signal

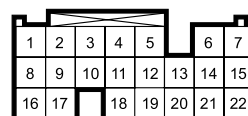
12	BLK	TCM Signal Ground
13	YEL/RED	Gear Select Position Sensor Low Reference
14	—	Not Used
15	—	Not Used
16	—	Not Used
17	BLK	TCM Power Ground
18	RED	Gear Shift Position Sensor 5 Volts Reference
19	WHT	Gear Shift Position Sensor Signal
20	BLK	Gear Shift Position Sensor Low Reference
21	—	Not Used
22	—	Not Used
23	—	Not Used
24	—	Not Used



N7A2101E

Connector No.		B-427
Connector Color		White
Test Adapter No.		J-35616-64A
Pin	Wire Color	Pin Function
1	YEL/RED	1st Gear Start Switch Input Signal
2	BLU/WHT	CAN High Signal
3	BLU	CAN Low Signal
4	WHT/BLU	Turbine Speed Sensor Signal
5	YEL	Input Shaft Speed Sensor Signal
6	YEL/RED	Transmission Fluid Temperature Sensor Signal
7	PNK/BLK	Selector Lever “–” Position Switch Input Signal
8	GRN/BLK	Selector Lever “A” Position Switch Input Signal

9	—	Not Used
10	ORN/BLU	Turbine Speed Sensor Low Reference
11	BRN	Input Shaft Speed Sensor Low Reference
12	BLU/WHT	Transmission Fluid Temperature Sensor Low Reference
13	RED/BLK	Selector Lever “R” Position Switch Input Signal
14	ORN	Selector Lever “D” Position Switch Input Signal
15	BLU/BLK	Selector Lever “+” Position Switch Input Signal
16	—	Not Used
17	—	Not Used



N7A2102E

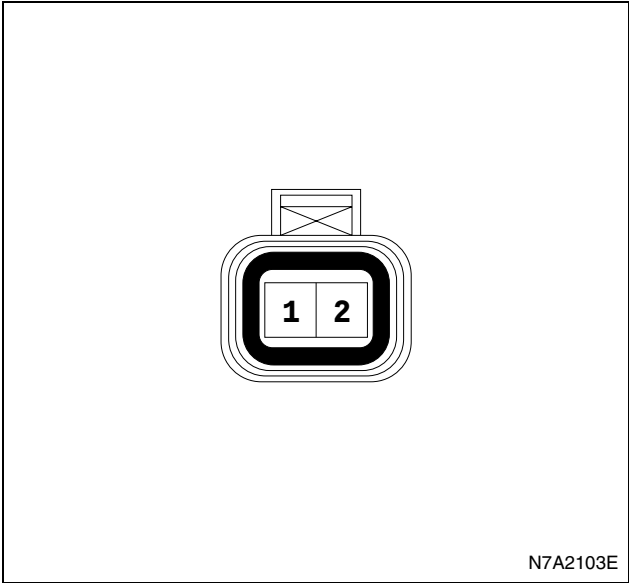
Connector No.		B-428
Connector Color		White
Test Adapter No.		J-35616-64A
Pin	Wire Color	Pin Function
1	PNK	Select Solenoid Valve Voltage Feed
2	GRY/BLK	Clutch Adjustment Fast Switch Input Signal
3	GRN	Brake Pedal Switch Input Signal
4	BLU/RED	Emergency Switch Input Signal
5	—	Not Used
6	WHT	Emergency Shift Switch “N” Position Input Signal
7	BLK	Select Solenoid Valve Ground
8	PNK	Select Solenoid Valve Voltage Feed
9	GRY/RED	Clutch Adjustment Slow Switch Input Signal
10	BLK/BLU	Neutral Switch Input Signal

7A-22 Transmission Control System (Smoother)

11	—	Not Used
12	GRY/RED	Door Switch Input Signal
13	BLU	Economy Mode Switch Input Signal
14	BLU/WHT	Emergency Shift Switch “1” Position Input Signal
15	BLK	Select Solenoid Valve Ground
16	WHT/BLK	Select Solenoid Valve Control
17	GRY/BLU	Reset Switch Input Signal
18	BLK/WHT	Diagnostic Request Switch
19	BLU/WHT	PTO Switch Input Signal
20	RED	Emergency Shift Switch “R” Position Input Signal
21	WHT/BLK	Selector Lever “N” Position Switch Input Signal
22	WHT/BLK	Select Solenoid Valve Control

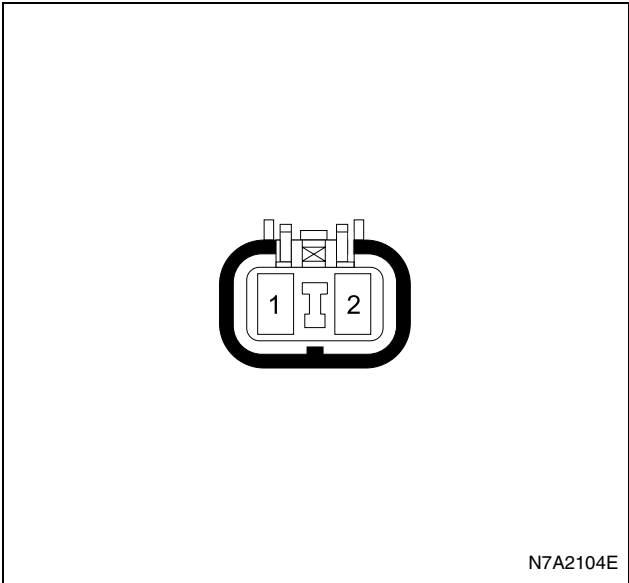
Transmission Controls Connector End Views

1-3-5 Shift Solenoid



Connector No.		J-235
Connector Color		Gray
Test Adapter No.		J-35616-42
Pin	Wire Color	Pin Function
1	BLK	1-3-5 Shift Solenoid Valve Ground
2	GRN	1-3-5 Shift Solenoid Valve Control

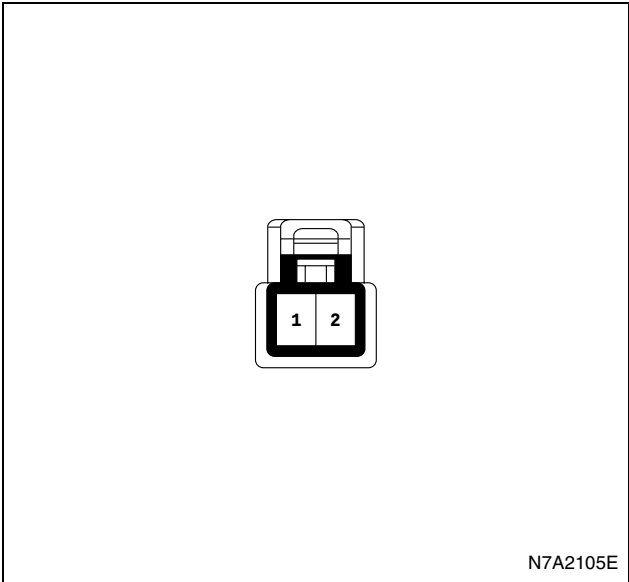
2-4-6-R Shift Solenoid



Connector No.		J-236
Connector Color		Black
Test Adapter No.		J-35616-42

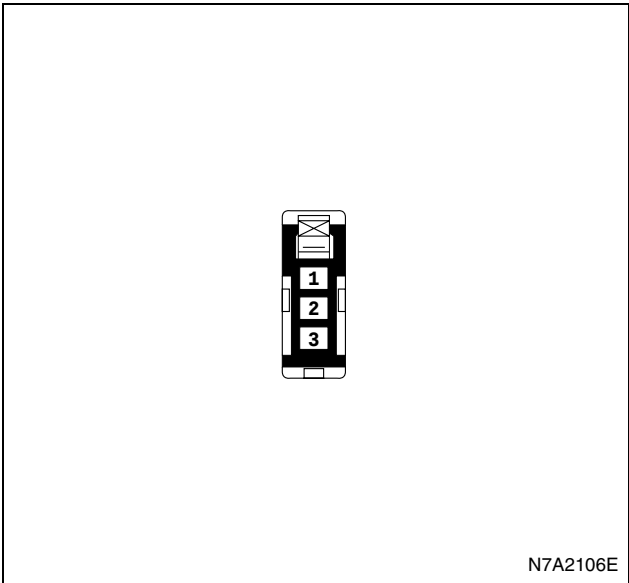
Pin	Wire Color	Pin Function
1	BLK	2-4-6-R Shift Solenoid Valve Ground
2	BLU	2-4-6-R Shift Solenoid Valve Control

Brake Pedal Switch



Connector No.		B-66
Connector Color		Black
Test Adapter No.		J-35616-42
Pin	Wire Color	Pin Function
1	GRN/YEL	Brake Pedal Switch Voltage Feed
2	GRN	Brake Pedal Switch Signal

Half-clutch Adjustment Switch

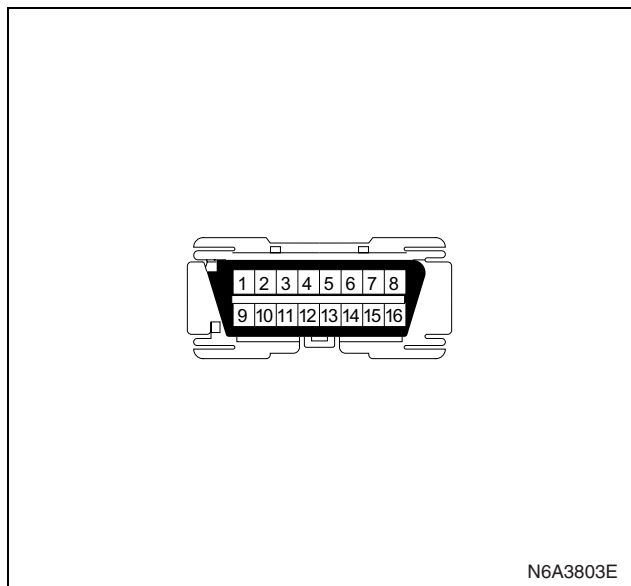


Connector No.		B-106
Connector Color		White

7A-24 Transmission Control System (Smoother)

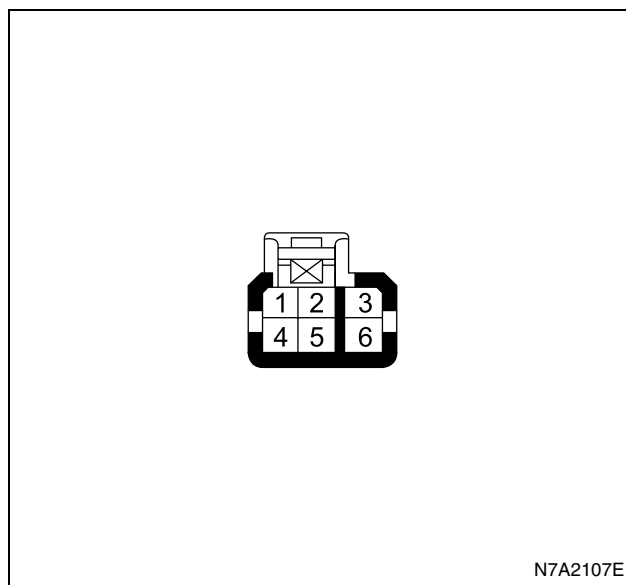
Test Adapter No.		J-35616-4A
Pin	Wire Color	Pin Function
1	GRY/BLK	Clutch Adjustment Fast Switch Signal
2	GRY/RED	Clutch Adjustment Slow Switch Signal
3	BLK/ORN	Clutch Adjustment Switch Voltage Feed

Data Link Connector (DLC)



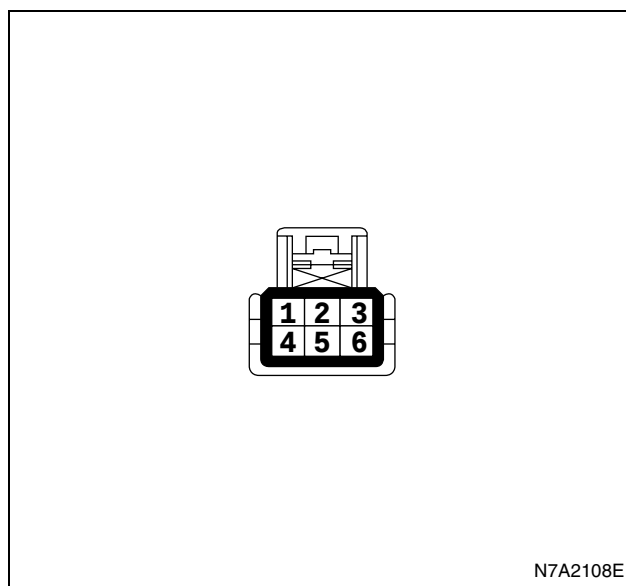
Connector No.		B-79
Connector Color		Black
Test Adapter No.		J-35616-2A
Pin	Wire Color	Pin Function
1	YEL	Diagnostic Request (ECM)
2	WHT/BLK	Class 2 Serial Communication (EHCU)
3	—	Not Used
4	BLK	Ground
5	BLK	Ground
6	—	Not Used
7	LT BLU	Keyword Serial Communication (ECM, TCM & SRS)
8	—	Not Used
9	—	Not Used
10	—	Not Used
11	BLK/WHT	Diagnostic Request (TCM)
12	WHT/GRN	Diagnostic Request (EHCU)
13	GRY	Diagnostic Request (SRS)
14	—	Not Used
15	—	Not Used
16	—	Not Used

Economy Mode Switch & 1st Gear Start Switch



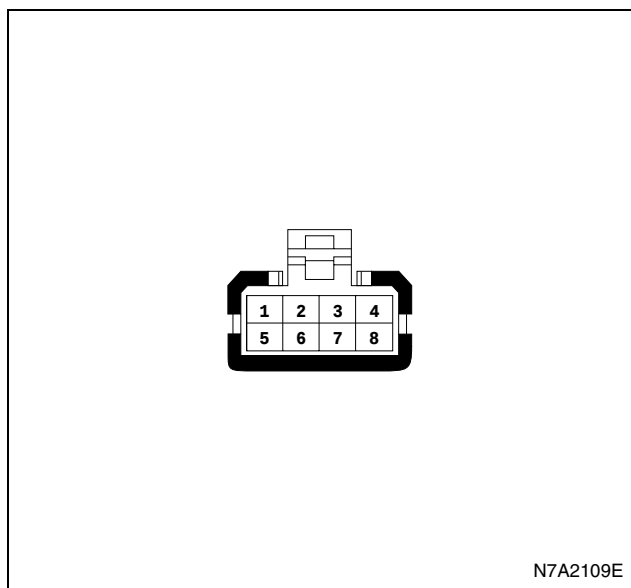
Connector No.		N-20
Connector Color		Blue
Test Adapter No.		J-35616-4A
Pin	Wire Color	Pin Function
1	ORN	1st Gear Start Switch Ground
2	—	Not Used
3	ORN	Economy Mode Switch Ground
4	VIO	1st Gear Start Switch Signal
5	—	Not Used
6	GRN/ORN	Economy Mode Switch Signal

Emergency Shift Switch

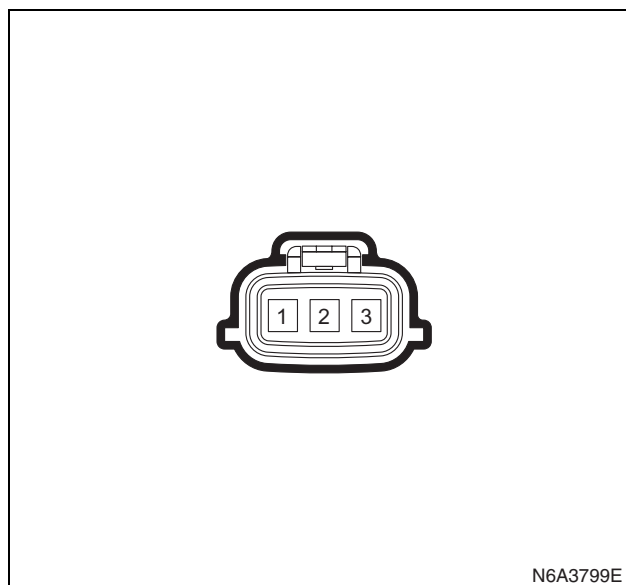


Connector No.		N-18
Connector Color		White
Test Adapter No.		J-35616-4A

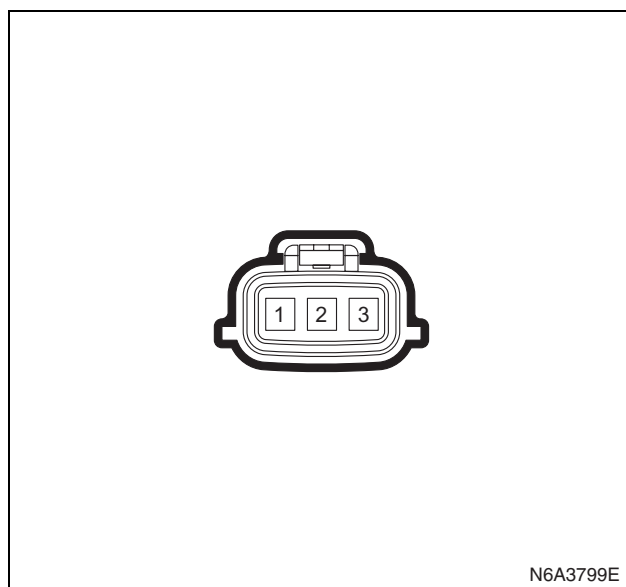
Pin	Wire Color	Pin Function
1	RED	Emergency Shift Switch "R" Position Signal
2	WHT	Emergency Shift Switch "N" Position Signal
3	GRN	Emergency Shift Switch "1" Position Signal
4	—	Not Used
5	BLK	Emergency Shift Switch Ground
6	—	Not Used

Emergency Switch

Connector No.		N-17
Connector Color		White
Test Adapter No.		J-35616-4A
Pin	Wire Color	Pin Function
1	BLK/YEL	Emergency Switch Voltage Feed
2	—	Not Used
3	—	Not Used
4	—	Not Used
5	BLU/RED	Emergency Switch Signal
6	—	Not Used
7	—	Not Used
8	—	Not Used

Gear Select Position Sensor

Connector No.		J-223
Connector Color		Brown
Test Adapter No.		J-35616-33
Pin	Wire Color	Pin Function
1	YEL/BLK	Gear Select Position Sensor 5 Volts Reference
2	YEL/WHT	Gear Select Position Sensor Signal
3	YEL/RED	Gear Select Position Sensor Low Reference

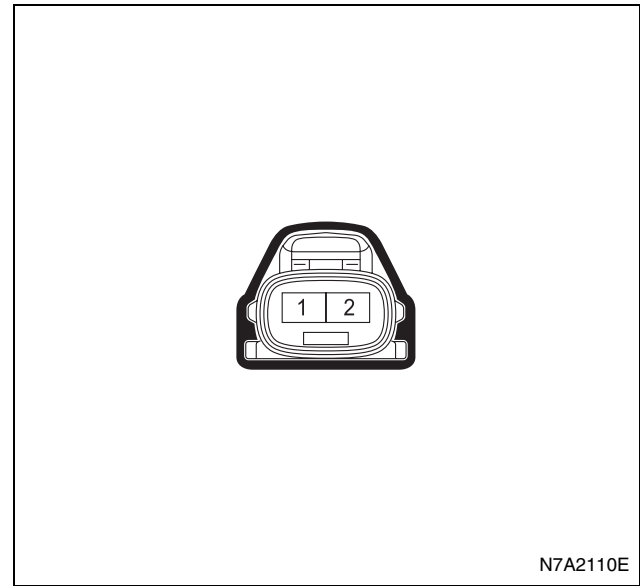
Gear Shift Position Sensor

Connector No.		J-142
Connector Color		Brown
Test Adapter No.		J-35616-33

7A-26 Transmission Control System (Smoother)

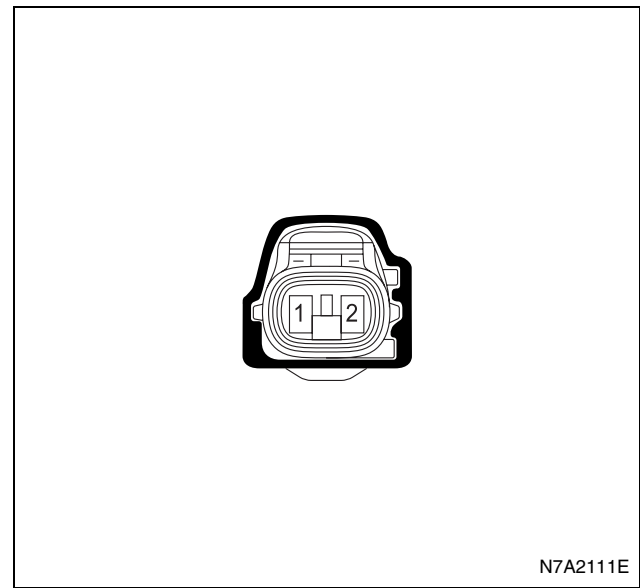
Pin	Wire Color	Pin Function
1	RED	Gear Shift Position Sensor 5 Volts Reference
2	WHT	Gear Shift Position Sensor Signal
3	BLK	Gear Shift Position Sensor Low Reference

Input Speed Sensor



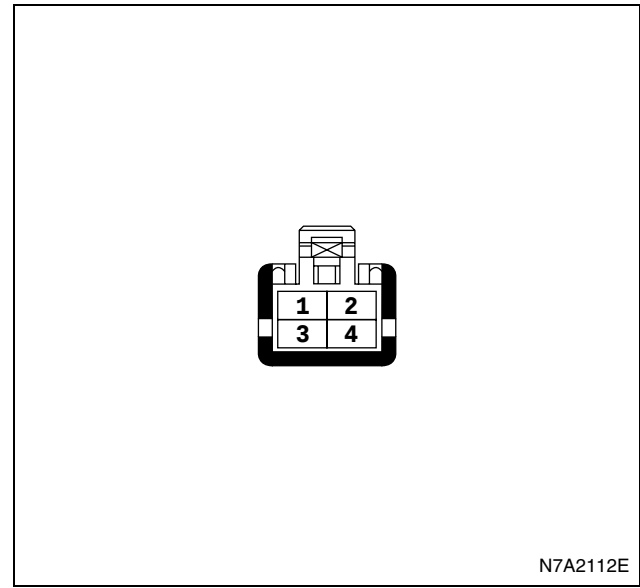
Connector No.		J-139
Connector Color		Gray
Test Adapter No.		J-35616-33
Pin	Wire Color	Pin Function
1	BRN	Input Shaft Speed Sensor Low Reference
2	YEL	Input Shaft Speed Sensor Signal

Neutral Switch

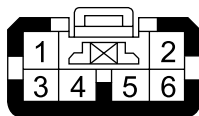


Connector No.		J-50
Connector Color		Black
Test Adapter No.		J-35616-33
Pin	Wire Color	Pin Function
1	BLK/BLU	Neutral Switch Signal
2	LT GRN	Neutral Switch Voltage Feed

PTO Switch

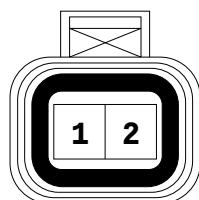


Connector No.		B-417
Connector Color		White
Test Adapter No.		J-35616-42
Pin	Wire Color	Pin Function
1	LT GRN/ RED	Illumination Lamp Voltage Feed
2	BLK	PTO Switch Ground
3	BLK	Illumination Lamp Ground
4	BLU/WHT	PTO Switch Signal

Reset Switch

N7A2113E

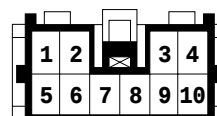
Connector No.		B-105
Connector Color		Black
Test Adapter No.		J-35616-4A
Pin	Wire Color	Pin Function
1	—	Not Used
2	—	Not Used
3	—	Not Used
4	BLK/ORN	Reset Switch Voltage Feed
5	—	Not Used
6	GRY/BLU	Reset Switch Signal

Select Solenoid

N7A2103E

Connector No.		J-234
Connector Color		Green
Test Adapter No.		J-35616-42

Pin	Wire Color	Pin Function
1	BLK	Select Solenoid Valve Ground
2	WHT/BLK	Select Solenoid Valve Control

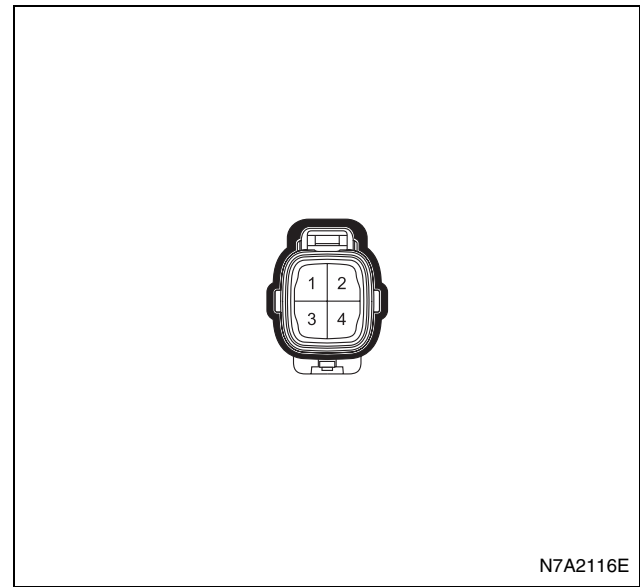
Selector Lever

N7A2115E

Connector No.		N-19
Connector Color		White
Test Adapter No.		J-35616-33
Pin	Wire Color	Pin Function
1	LT GRN/ RED	Illumination Lamp Voltage Feed
2	RED/BLK	Selector Lever "R" Position Switch Signal
3	YEL/RED	1st Gear Start Switch Signal
4	GRN/BLK	Selector Lever "A" Position Switch Signal
5	BLU	Economy Mode Switch Signal
6	WHT/BLK	Selector Lever "N" Position Switch Signal
7	ORN	Selector Lever "D" Position Switch Signal
8	PNK/BLK	Selector Lever "—" Position Switch Signal
9	BLK	Selector Lever Ground
10	BLU/BLK	Selector Lever "+" Position Switch Signal

7A-28 Transmission Control System (Smoother)

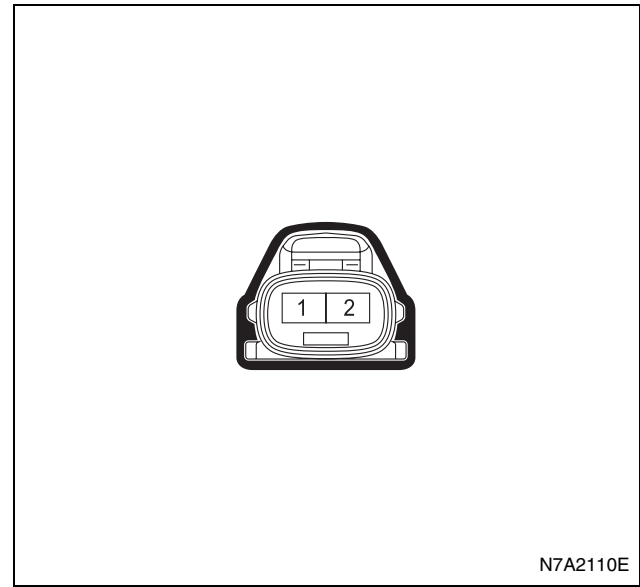
Solenoid Valves & Transmission Fluid Temperature
Sensor In-line Harness Connector



Connector No.		J-232
Connector Color		Gray
Test Adapter No.		J-35616-33
Pin	Wire Color	Pin Function
1	ORN/BLU	Turbine Speed Sensor Low Reference
2	WHT/BLU	Turbine Speed Sensor Signal

Connector No.		J-237
Connector Color		Gray
Test Adapter No.		J-35616-33
Pin	Wire Color	Pin Function
1	RED/YEL	Lock Up Clutch Solenoid Valve Control
2	YEL/RED	Transmission Fluid Temperature Sensor Signal
3	YEL/BLK	Gearshift Clutch Solenoid Valve Control
4	BLU/WHT	Transmission Fluid Temperature Sensor Low Reference

Turbine Speed Sensor



Diagnostic Information and Procedures

General Service Information

Non-OEM Parts

All of the on-board diagnostic (OBD) has been calibrated to run with original equipment manufacturer (OEM) parts. Accordingly, if commercially sold sensor or switch is installed, it makes a wrong diagnosis and turn on the transmission warning lamp. Aftermarket electronics, such as cellular phones, stereos, and anti-theft devices, may indicate electromagnetic interference (EMI) into the control system if they are improperly installed. This may cause a false sensor reading and turn on the transmission warning lamp.

Poor Vehicle Maintenance

The sensitivity of OBD will cause the transmission warning lamp turn on if the vehicle is not maintained properly. Restricted oil filters, fuel filters, and crankcase deposits due to lack of oil changes or improper oil viscosity can trigger actual vehicle faults that were not previously monitored prior to OBD. Poor vehicle maintenance cannot be classified as a "non-vehicle fault", but with the sensitivity of OBD diagnostics, vehicle maintenance schedules must be more closely followed.

Visual/Physical Transmission Compartment Inspection

Perform a careful visual and physical transmission compartment inspection when performing any diagnostic procedure or diagnosing the cause of an emission test failure. This can often lead to repairing a problem without further steps. Use the following guidelines when performing a visual/physical inspection:

- Inspect all vacuum hoses for punches, cuts, disconnects, and correct routing.
- Inspect hoses that are difficult to see behind other components.
- Inspect all wires in the transmission compartment for proper connections, burned or chafed spots, pinched wires, contact with sharp edges or contact with hot exhaust manifolds or pipes.

Basic Knowledge of Tools Required

Lack of basic knowledge of this powertrain when performing diagnostic procedures could result in an incorrect diagnosis or damage to powertrain components. Do not attempt to diagnose a powertrain problem without this basic knowledge. A basic understanding of hand tools is necessary to effectively use this section of the service manual.

Transmission Warning Lamp

Basically, the transmission warning lamp is turned on when the transmission control module (TCM) detects a DTC that will impact the vehicle performance. When the transmission warning lamp remains "ON" while the engine is running, or when a malfunction is suspected due to a driveability problem, a Diagnostic System Check must be performed. The procedures for these checks are given in Diagnostic System Check - Transmission Controls.

Reading Flash Diagnostic Trouble Codes (DTC)

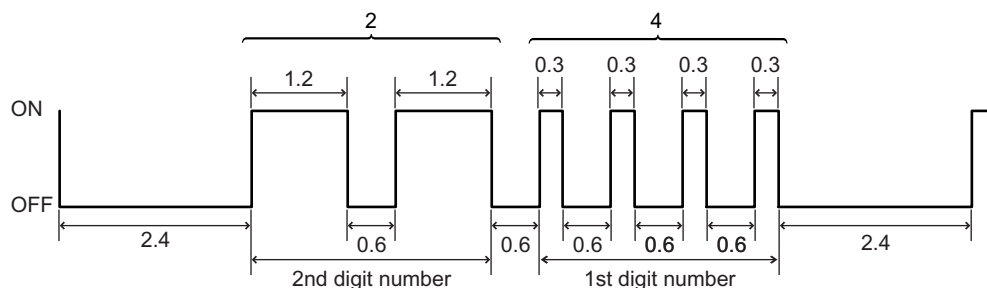
The provision for communicating with the TCM is the Data Link Connector (DLC). The DTCs stored in the TCM memory can be read either through a hand-held diagnostic scanner such as Tech 2 plugged into the DLC or by counting the number of flashes of the transmission warning lamp when the diagnostic test terminal of the DLC is grounded. The DLC terminal "11" (diagnostic request) is pulled "Low" (grounded) by jumped to DLC terminal "4", which is a ground wire. Once terminals "11" and "4" have been connected, the ignition switch must be moved to the "ON" position, with the engine not running. The transmission warning lamp will indicate a DTC three times is a DTC is present and history. If more than one DTC has been stored in the TCM's memory, the DTCs will be output numerical order with each DTC being displayed three times. The flash DTC display will continue as long as the DLC is shorted.

Notice:

- If DTC is present, buzzer also sounds with a lamp illumination.
- When present DTC and history DTC are mixed, present DTC is always output first, regardless of number of DTC.

Example: DTC 24 stored

Unit: second



N7A2118E

Reading Diagnostic Trouble Codes (DTCs) with The Tech 2

The procedure for reading DTC(s) is used a diagnostic Tech 2. To read DTCs, use the Tech 2 "Read DTC Info As Stored By ECU".

Clearing Diagnostic Trouble Codes (DTCs) with The Tech 2 or without Tech2

Do not clear DTCs unless directed to do so by the service information provided for each diagnostic procedure. To clear DTCs, use with the Tech 2 "Clear DTC Information". If there is no Tech 2, clear with reset switch operation.

DTC Clear Method with Reset Switch Operation

1. Turn ON the ignition, with the engine OFF.
2. Use a jumper wire and the DLC terminal "11" (diagnostic request) is pulled "Low" (grounded) by jumped to DLC terminal "4".
3. Press reset switch for at least 1 second and release it within 6 seconds.
4. If completed, buzzer will sound with a short beep.

Notice:

If the buzzer does not sound, restart clear procedure from step 1.

Tech 2 Scan Tool

Isuzu recommend using Tech 2. Refer to the Tech 2 Users Guide for proper start up procedures.

Operating Procedure

1. Press Enter at start screen.
2. Select Diagnostic > appropriate vehicle identification > Transmission > Smoother.
3. The following table shows, which functions are used the available equipment versions.

F0:	Diagnostic Trouble Codes
F0:	Read DTC Info As Stored By ECU
F1:	Clear DTC Information
F1:	Data Display
F2:	Snapshot
F3:	Programming
F0:	Program Vehicle Type
F1:	PTO Requested Engine Speed
F2:	Program Speedometer Driven Gear

N7A2119E

F0: Diagnostic Trouble Codes

The purpose of this mode is to display stored trouble code in the TCM. When "Clear DTC Information" is selected, "Clear DTC Information", warning screen appears. This screen informs you that by cleaning DTCs "all stored DTC information in the TCM will be erased".

F1: Data Display

The purpose of this mode is to continuously monitor data parameters. The current actual values of all important sensors and signals, solenoid commands in the system are display through this mode. Refer to the "Tech 2 Data List" in this section.

F2: Snapshot

"Snapshot" allow you to focus on making the condition occur, rather than trying to view all of the data in anticipation of the fault. The snapshot will collect parameter information around a trigger point that you select.

Refer to the Tech 2 user instructions for more information.

F3: Programming

The purpose of this mode is to program the vehicle information into the TCM if the vehicle specification or TCM is to be replaced.

Tech 2 Data List

Tech 2 data display items	Units	Typical Value (Key Switch ON)
Ignition Voltage	V	18V — 32V
Engine Speed	rpm	0 rpm
Turbine Speed	rpm	0 rpm
Input Shaft Speed	rpm	0 rpm
Engine and Input Shaft Speed Difference	rpm	0 rpm
Output Shaft Speed	rpm	0 rpm
Vehicle Speed	km/h / MPH	0 km/h
Accelerator Position Sensor Signal	%	0% *4
Transmission Fluid Temperature Sensor	V	Varies depending on conditions.
Transmission Fluid Temperature	°C / °F	–40 — 165 °C
Gearshift Clutch Solenoid Command	%	Varies depending on conditions.
Gearshift Clutch Output Signal	Engaged/Disengaged	Varies depending on conditions.
Lock up Clutch Solenoid Command	ON/OFF	Lockup solenoid valve active: ON
Lock up Clutch Solenoid Feedback	ON/OFF	Lockup solenoid valve active: ON
Desired Gear Select Position	V	Varies depending on conditions.
Gear Select Position Sensor	V	Varies depending on conditions.
Desired Gear Shift Position	V	Varies depending on conditions.
Gear Shift Position Sensor	V	Varies depending on conditions.
Select Solenoid Command	%	Varies depending on conditions.
1-3-5 Shift Solenoid Command	%	Varies depending on conditions.
2-4-6-R Shift Solenoid Command	%	Varies depending on conditions.
Neutral Switch	Neutral/In Gear	Neutral: Neutral
Selector Position	R/N/D/+/-/ --- /A/Don't know/Key Off/Emergency Control	Matches change lever operation (N)
Desired Gear Position	N1/N2/N3/N4/1st/2nd/3rd/4th/5th/6th	Varies depending on conditions.
Desired Gate Position	N1/N2/N3/N4/1st/2nd/3rd/4th/5th/6th	Varies depending on conditions.
Current Gear	During N1/N2/N3/N4/1st/2nd/3rd/4th/5th/6th/R shifting	Varies depending on conditions.
Control Phase	*1	Varies depending on conditions.
Gearshift Clutch Control Mode	*2	Varies depending on conditions.
Buzzer Mode	*3	Varies depending on conditions.
Main Relay Command	ON/OFF	ON
Main Relay Voltage Feed Circuit	ON/OFF	Battery voltage supplied to TCM: ON
Gearshift Control Box Relay Command	ON/OFF	ON
Starter Cut Relay Command	ON/OFF	Engine start prohibited: ON
Brake Pedal Switch	Applied/Released	Brake pedal depressed: Applied

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Tech 2 data display items	Units	Typical Value (Key Switch ON)
Selector N Switch	ON/OFF	ON in accordance with the selector lever position.
Selector D Switch	ON/OFF	ON in accordance with the selector lever position.
Selector A Switch	ON/OFF	ON in accordance with the selector lever position.
Selector + Switch	ON/OFF	ON in accordance with the selector lever position.
Selector – Switch	ON/OFF	ON in accordance with the selector lever position.
Selector R Switch	ON/OFF	ON in accordance with the selector lever position.
Emergency Switch	ON/OFF	Emergency switch pressed: ON
Emergency N Switch	ON/OFF	Emergency shift switch position N: ON
Emergency 1st Switch	ON/OFF	Emergency switch position 1st: ON
Emergency R Switch	ON/OFF	Emergency shift switch position R: ON
1st Gear Start Switch	ON/OFF	1st gear start switch pressed: ON
Economy Switch	ON/OFF	Economy mode switch pressed: ON
Economy Lamp Command	ON/OFF	Economy mode is enabled: ON
Warning Lamp Command	ON/OFF	Key is ON, trouble is detected, etc.: ON
Buzzer Command	ON/OFF	Buzzer sounding: ON
Fast Switch	ON/OFF	FAST side of Half-clutch adjustment switch pressed: ON
Slow Switch	ON/OFF	SLOW side of Half-clutch adjustment switch pressed: ON
Reset Switch	ON/OFF	Reset switch pressed: ON
Door Switch	Open /Closed	Door open: Open
PTO Switch	ON/OFF	PTO switch pressed: ON
PTO Mode Start	Yes/No	Varies depending on conditions.
PTO Solenoid	—	—
PTO Request Engine Speed	rpm	Varies depending on conditions.
Aerial Platform Vehicle	Yes/No	Depends on vehicle condition.
Neutral Learned Shift Position	V	Varies depending on conditions.
1st Gear Learned Shift Position	V	Varies depending on conditions.
2nd Gear Learned Shift Position	V	Varies depending on conditions.
3rd Gear Learned Shift Position	V	Varies depending on conditions.
4th Gear Learned Shift Position	V	Varies depending on conditions.
5th Gear Learned Shift Position	V	Varies depending on conditions.
6th Gear Learned Shift Position	V	Varies depending on conditions.
Reverse Gear R Learned Shift Position	V	Varies depending on conditions.
N1 Learned Select Position	V	Varies depending on conditions.
N2 Learned Select Position	V	Varies depending on conditions.
N3 Learned Select Position	V	Varies depending on conditions.
N4 Learned Select Position	V	Varies depending on conditions.
N1 Learned Duty Ratio	%	Varies depending on conditions.
N2 Learned Duty Ratio	%	Varies depending on conditions.

Tech 2 data display items	Units	Typical Value (Key Switch ON)
N3 Learned Duty Ratio	%	Varies depending on conditions.
N4 Learned Duty Ratio	%	Varies depending on conditions.
Torque Learned Duty Ratio	%	Varies depending on conditions.
Half-Clutch Adjustment Duty Ratio	%	Varies depending on conditions.
Engine Type	Example: 4HK1	Varies depending on vehicle.
Engine Type Learning Status	Learned/Not Learned	Learned after learning is complete.
Transmission Type	Example: MYY	Varies depending on vehicle.
Transmission Type Learning Status	Learned/Not Learned	Learned after learning is complete.
Speedometer Driven Gear Teeth	—	10 — 17
Speedometer Driven Gear Learning Status	Learned/Not Learned	Learned
Gear Position Learning Status	Learned/Not Learned	Learned
Torque Learning Status	Learned/Not Learned	Learned

*1

Non-control	Not control being performed.
Immediate clutch disengage	Clutch immediate disengage control
Clutch slow disengage	Clutch slow disengage control
Clutch fully disengaged	Clutch fully disengaged
Full clutch engage	Clutch immediate engage control
Clutch slow engage	Clutch slow engage control
Clutch slow engage complete	Slow clutch engage control complete
Clutch full engage	Clutch fully engaged
Shift start	Shift control started.
Neutral gear	Neutral gear select control
Neutral select transition	Neutral select position transition control
Neutral select N1 transition	Neutral selection position transition to initial position
Gear in	Gear in control started.
Control stopped	Smoother system control stopped
Engine start, clutch disengaged	Clutch disengaged immediately after engine start.
Engine start, clutch engaged	Clutch engaged immediately after engine start.
PTO mode	PTO control mode
Initial learning mode	Initial learning mode
Manual learning mode	Manual learning mode
Key off	Key switch is OFF.
Torque learning clutch full disengage	Clutch is fully disengaged when torque learning.
Torque learning N2 shift	Neutral clutch position is N2 when torque learning.
Torque learning 2nd shift	Shifted to 2nd when torque learning.
Torque learning standby	Clutch engage control when torque learning
Torque learning clutch immediate disengage	Clutch immediately engaged when torque learning.
Torque learning clutch loose disengage	Clutch slowly engaged when torque learning.
Torque learning stop	Torque learning complete
N2 shift after torque learning	Neutral clutch position is N2 after torque learning.
N1 shift after torque learning	Neutral clutch position is initial position after torque learning.
Torque learning neutral shift	Gear is shifted to neutral when torque learning.

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Gear learning full disengage	Clutch is fully disengaged when gear learning.
Gear learning TM learning	Gear learning (transmission type learning) performed.
Gear learning N1 learning	Gear learning (gear position) performed.
Gear learning N2 learning	Gear learning (gear position) performed.
Gear learning N3 learning	Gear learning (gear position) performed.
Gear learning N4 learning	Gear learning (gear position) performed.
Gear learning N1 standby	Standby in neutral select (N1) when gear learning.
Gear learning N2 standby	Standby in neutral select (N2) when gear learning.
Gear learning N3 standby	Standby in neutral select (N3) when gear learning.
Gear learning N4 standby	Standby in neutral select (N4) when gear learning.
Gear learning REV learning	Gear learning (gear position Rev learning) performed.
Gear learning 1st learning	Gear learning (gear position 1st learning) performed.
Gear learning 2nd learning	Gear learning (gear position 2nd learning) performed.
Gear learning 3rd learning	Gear learning (gear position 3rd learning) performed.
Gear learning 4th learning	Gear learning (gear position 4th learning) performed.
Gear learning 5th learning	Gear learning (gear position 5th learning) performed.
Gear learning 6th learning	Gear learning (gear position 6th learning) performed.
Gear learning complete	Gear position learning is complete.
Emergency control, non-control	System control stopped during non-control.
Non-control, N shift	Shift to neutral during non-control.
Non-control, 1st shift	Shift to 1st during non-control.
Non-control, Rev shift	Shift to Rev during non-control.

*2

Garage	Half-clutch control on a stopped vehicle
Engine plus	Half clutch control when engine speed is high due to input shaft speed, as when up-shifting is performed
Input shaft plus	Half clutch control when input shaft speed is high due to engine speed, as when down-shifting is performed
Syncho	Half-clutch control while running, when the engine speed and input shaft speed differential is very small.
Idle up-shift	Half-clutch control on a stopped vehicle, while idling

*3

Reset start	When the key switch is ON
Voltage drop	When battery voltage (system voltage) is low
Buzzer check	Buzzer check mode
Memory clear	When memory is cleared
Learning complete	When learning control is complete
Learning	When learning control is being performed
Self-diagnosis code output	When there is a short between DLC pins, and DTC is detected
Continuous buzzer trouble	When trouble that causes the buzzer to sound continuously is detected
Intermittent buzzer trouble	When trouble that causes the buzzer to sound on intermittently is detected
Gear in door open	When the door is open while the vehicle is in gear
Unlearned alarm	When learning is not being performed

Slip alarm	When the accelerator pedal is pressed while the parking brake is ON and the vehicle is in gear
Inclined stop alarm	When the vehicle is stopped on an incline, even though the accelerator pedal is depressed
Clutch pedal point adjustment	When torque learning (adjustment) is being performed
High-gear very low speed running	When vehicle speed is low while the gear position is very high
Overrun alarm	When the engine is over-running
Parking brake reminder	When the vehicle is running with the parking brake applied
Long-term gear in	When the vehicle is left in gear for a long time while stopped
Overrun shift prohibit	When there is an attempt to down-shift while the engine is over-running.
Underrun shift prohibit	When there is an attempt to up-shift while the engine is under-running.
N lock alarm	When the change lever position is change from N to D without pressing the brake
PTO idle up adjustment	When the idle speed is being adjusted while the PTO is active
PTO mode On	When the PTO mode is on
PTO mode Off	When the PTO mode is off
Buzzer OFF	When buzzer operation is prohibited

*4: The accelerator opening angle does not always match the operational feel of the pedal. Some difference between the two is not abnormal.

Tech 2 Data Definitions

A list of each message displayed on the Tech 2 will be explained in Transmission Controls. This information will assist in driveability problems. The displays can be viewed while the vehicle is being driven. Always perform the Diagnosis System Check - Transmission Controls first. The Diagnostic System Check will confirm proper system operation.

Ignition Voltage

This parameter displays the ignition voltage measured at the ignition feed circuit of the TCM. Voltage is applied to the TCM when the ignition switch is ON position.

Engine Speed

This parameter displays the rotational speed of the crankshaft as calculated by the engine control module (ECM) based on inputs from the crankshaft position (CKP) sensor or camshaft position (CMP) sensor. This data is sent over the CAN serial data link from the ECM to the TCM. The Tech 2 will display the engine speed in revolution per minute (RPM).

Turbine Speed

This parameter displays the rotational speed of the gearshift multi-plate clutch as calculated by the TCM based on an input from the turbine speed sensor. The Tech 2 will display the turbine speed in revolution per minute (RPM).

Input Shaft Speed

This parameter displays the rotational speed of the transmission counter shaft as calculated by the TCM based on an input from the input shaft speed sensor. The Tech 2 will display the turbine speed in revolution per minute (RPM).

Engine Speed and Input Shaft Speed Difference

This parameter display the difference of engine speed and input shaft speed (engine speed - input shaft speed) as calculated by the TCM using the signal from the input shaft speed sensor and crankshaft rotational speed that is sent over the CAN serial data link from the engine control module (ECM) to the TCM. The Tech 2 will display a low value when the gearshift clutch is engaged, and a high value when the gearshift clutch is disengaged.

Output Shaft Speed

This parameter displays the transmission output shaft speed calculated by the engine control module (ECM) using the signal from the output shaft speed sensor that is called vehicle speed sensor (VSS). This data is sent over the CAN serial data link from the ECM to the TCM. The Tech 2 will display the engine speed in revolution per minute (RPM).

Vehicle Speed

This parameter displays the vehicle speed calculated by the engine control module (ECM) using the signal from the vehicle speed sensor (VSS). This data is sent over the CAN serial data link from the ECM to the TCM. The Tech 2 will display a low value at lower vehicle speeds, and a high value at higher vehicle speeds.

Accelerator Pedal Position Sensor Signal

This parameter displays the angle of the accelerator pedal as calculated by the engine control module (ECM) using the signals from the accelerator pedal position (APP) sensors. This data is sent over the CAN serial data link from the ECM to the TCM. The APP sensor signal is a range of values indicating a low percentage when the accelerator pedal is not depressed to a high percentage when the accelerator pedal is fully depressed.

Transmission Fluid Temperature Sensor

This parameter displays the voltage signal sent to the TCM from the transmission fluid temperature (TFT) sensor. TFT sensor is a range of value indicating a low voltage when the temperature is high and a high voltage when the temperature is low.

Transmission Fluid Temperature

This parameter displays the temperature of the transmission fluid temperature (TFT) as calculated by the TCM using the signal from the TFT sensor. The Tech 2 will display a low temperature when the TFT sensor signal voltage is high, and a high temperature when the TFT sensor signal voltage is low.

Gearshift Clutch Solenoid Command

This parameter displays the gearshift clutch solenoid valve control duty ratio commanded by the TCM. The Tech 2 will display 0% when the gearshift clutch is controlled to engage. The Tech 2 will display a high percentage or 100% when the gearshift clutch is controlled to disengage.

Gearshift Clutch Output Signal

This parameter displays the state of the gearshift clutch output signal to the engine control module (ECM) from the TCM. The Tech 2 will display engage or disengage.

Lock Up Clutch Solenoid Command

This parameter displays the lock up clutch solenoid valve control signal commanded by the TCM. The Tech 2 will display On when the lock up clutch is controlled to engage. The Tech 2 will display Off when the lock up clutch is controlled to disengage.

Lock Up Clutch Solenoid Feedback

This parameter displays the feedback state of the lock up clutch solenoid valve control circuit. The Tech 2 will display On when the lock up clutch solenoid valve control circuit is a high voltage (commanded ON). The Tech 2 will display Off when the lock up clutch solenoid valve is a low voltage (commanded OFF).

Desired Gear Select Position

This parameter displays gear select side lever position desired by the TCM based on desired gear position.

Gear Select Position Sensor

This parameter displays the voltage signal sent to the TCM from the gear select position sensor. Gear select position sensor is a range of values indicating a low voltage when the select side lever is positioned near the N1 to a high voltage when the select side lever is positioned near the N3 or N4.

Desired Gear Shift Position

This parameter displays gear shift side lever position desired by the TCM based on desired gear position.

Gear Shift Position Sensor

This parameter displays the voltage signal sent to the TCM from the gear shift position sensor. Gear shift position sensor is a range of values indicating a low voltage when the shift side lever is positioned near the 2nd, 4th, 6th or reverse gear to a high voltage when the shift side lever is positioned near the 1st, 3rd or 5th gear.

It indicates a middle voltage when the shift side lever is positioned near the neutral.

Select Solenoid Command

This parameter displays the select solenoid valve control duty ratio commanded by the TCM. The Tech 2 will display 0% when the select solenoid valve is not controlled. The Tech 2 will display any percentage when the select solenoid valve is commanded to move the select side lever.

1-3-5 Shift Solenoid Command

This parameter displays the 1-3-5 shift solenoid valve control duty ratio commanded by the TCM. The Tech 2 will display 0% when the 1-3-5 shift solenoid valve is not controlled. The Tech 2 will display any percentage when the 1-3-5 shift solenoid valve is commanded to move the shift side lever. (When engaging to 1st, 3rd and 5th gear or when disengaging from 2nd, 4th, 6th and reverse gear.)

2-4-6-R Shift Solenoid Command

This parameter displays the 2-4-6-R shift solenoid valve control duty ratio commanded by the TCM. The Tech 2 will display 0% when the 2-4-6-R shift solenoid valve is not controlled. The Tech 2 will display any percentage when the 2-4-6-R shift solenoid valve is commanded to move the shift side lever. (When engaging to 2nd, 4th, 6th and reverse gear or when disengaging from 1st, 3rd and 5th gear.)

Neutral Switch

This parameter displays the input state of the neutral switch to the TCM. The Tech 2 will display Neutral or In Gear. Neutral indicates the neutral switch is closed position (actual neutral position). In gear indicates the neutral switch is opened position (other than neutral).

Selector Position

This parameter displays the selector lever position based on the selector lever switch inputs to the TCM.

Desired Gear Position

This parameter displays the gear position commanded by the TCM based on engine speed, vehicle speed, selector lever position and other inputs.

Desired Gate Position

This parameter displays the controlled gear position is set by the TCM for shifting to the desired gear position.

Current Gear

This parameter displays the current gear position based on the gear select position sensor and gear shift position sensor inputs. N1 indicates the shift position is neutral between 1st and reverse gear. N2 indicates the shift position is neutral between 2nd and 3rd gear. N3 indicates the shift position is neutral between 4th and 5th gear. N4 indicates the shift position is neutral at 6th gear gate.

Control Phase

This parameter displays the control state of the transmission. The Tech 2 will display various control status for transmission control.

Gearshift Clutch Control Mode

This parameter displays the control state of the gearshift clutch. The Tech 2 will display various control status for gearshift clutch control.

Buzzer Mode

This parameter displays the control state of the buzzer. The Tech 2 will display various control status for buzzer control.

Main Relay Command

This parameter displays the commanded state of the main relay control circuit. On indicates the main relay control circuit is being grounded by the TCM, allowing the main relay to supply battery voltage to the TCM. Off indicates the main relay is not being commanded On by the TCM.

Main Relay Voltage Feed Circuit

This parameter displays the input state of the main relay voltage supply to the TCM. On indicates the main relay is closed and battery voltage is being supplied through the main relay.

Gearshift Control Box Relay Command

This parameter displays the commanded state of the gearshift control box relay control circuit. On indicates the gearshift control box relay control circuit is being grounded by the TCM, allowing the gearshift control box relay to supply voltage to the select and shift solenoid valves through the TCM. Off indicates the gearshift control box relay is not being commanded On by the TCM.

Starter Cut Relay Command

This parameter displays the commanded state of the starter cut relay control circuit. On indicates the starter cut relay control circuit is being grounded by the TCM, inhibiting the starter relay control circuit to connect to ground and the engine will not crank. Off indicates the starter cut relay is not being commanded On by the TCM, allowing the starter relay control circuit to connect to ground and the engine is possible to crank.

Brake Pedal Switch

This parameter displays the state of the brake pedal as determined by the TCM based on an input from the stop lamp pedal switch. This switch turns on the stop lamps when the brake pedal is depressed. The Tech 2 will display Applied when the brake pedal is depressed.

Selector N Switch

This parameter displays the state of the selector lever as determined by the TCM based on input from the selector lever switches. The Tech 2 will display On when the selector lever is positioned to N.

Selector D Switch

This parameter displays the state of the selector lever as determined by the TCM based on input from the selector lever switches. The Tech 2 will display On when the selector lever is positioned to D, A + or –.

Selector A Switch

This parameter displays the state of the selector lever as determined by the TCM based on input from the selector

lever switches. The Tech 2 will display On when the selector lever is positioned to A.

Selector + Switch

This parameter displays the state of the selector lever as determined by the TCM based on input from the selector lever switches. The Tech 2 will display On when the selector lever is positioned to +.

Selector – Switch

This parameter displays the state of the selector lever as determined by the TCM based on input from the selector lever switches. The Tech 2 will display On when the selector lever is positioned to –.

Selector R Switch

This parameter displays the state of the selector lever as determined by the TCM based on input from the selector lever switches. The Tech 2 will display On when the selector lever is positioned to R.

Emergency Switch

This parameter displays the state of the emergency switch as determined by the TCM based on an input from the emergency switch. The Tech 2 will display On when the emergency switch is On, allowing the emergency mode to start.

Emergency N Switch

This parameter displays the state of the emergency shift switch as determined by the TCM based on an input from the emergency shift switch. The Tech 2 will display On when the emergency shift switch is positioned to N.

Emergency 1st Switch

This parameter displays the state of the emergency shift switch as determined by the TCM based on an input from the emergency shift switch. The Tech 2 will display On when the emergency shift switch is positioned to 1, allowing the emergency shifting to 1st gear when emergency switch is ON.

Emergency R Switch

This parameter displays the state of the emergency shift switch as determined by the TCM based on an input from the emergency shift switch. The Tech 2 will display On when the emergency shift switch is positioned to R, allowing the emergency shifting to reverse gear when emergency switch is ON.

1st Gear Start Switch

This parameter displays the state of the 1st gear start switch as determined by the TCM based on an input from the 1st gear start switch. The Tech 2 will display On when the 1st gear start switch is On.

Economy Switch

This parameter displays the state of the economy switch as determined by the TCM based on an input from the economy switch. The Tech 2 will display On when the economy switch is On, allowing the gearshift schedule to change at auto shift mode.

Economy Lamp Command

This parameter displays the commanded state of the economy indicator lamp control circuit. The ECONO indicator lamp should be On when the Tech 2 indicates the Economy Lamp Command is On. The ECONO

indicator lamp should be Off when the Tech 2 indicates the Economy Lamp Command is Off. The TCM will command the ECONO indicator lamp On approximately 3 seconds when the ignition is On with the engine Off in order to perform a bulb check.

Warning Lamp Command

This parameter displays the commanded state of the transmission warning lamp control circuit. The transmission warning lamp should be On when the Tech 2 indicates the Warning Lamp Command is On. The transmission warning lamp should be Off when the Tech 2 indicates the Warning Lamp Command is Off. The TCM will command the transmission warning lamp On approximately 3 seconds when the ignition is On with the engine Off in order to perform a bulb check.

Buzzer Command

This parameter displays the commanded state of the buzzer control circuit in the TCM. The buzzer should be sound when the Tech 2 indicates the Buzzer Command is On. The buzzer should be Off when the Tech 2 indicates the Buzzer Command is Off.

Fast Switch

This parameter displays the state of the half-clutch adjustment switch as determined by the TCM based on an input from the half-clutch adjustment switch. The Tech 2 will display On when the FAST side switch is depressed.

Slow Switch

This parameter displays the state of the half-clutch adjustment switch as determined by the TCM based on an input from the half-clutch adjustment switch. The Tech 2 will display On when the SLOW side switch is depressed.

Reset Switch

This parameter displays the state of the reset switch as determined by the TCM based on an input from the reset switch. The Tech 2 will display On when the reset switch is depressed.

Door Switch

This parameter displays the state of the door switch as determined by the TCM based on inputs from the door switches. The Tech 2 will display Open when the either of door open.

4L Switch

This parameter is not used.

PTO Switch

This parameter displays the state of the PTO switch as determined by the TCM based on an input from the PTO switch. The Tech 2 will display On when the PTO switch is depressed.

PTO Mode Start

This parameter displays the control state of the PTO mode. The Tech 2 will display Yes when the PTO mode is started.

PTO Solenoid

This parameter is not used.

PTO Request Engine Speed

This parameter displays the programmed PTO request engine speed when PTO mode is enabled. The PTO request engine speed can change by user request or PTO applications.

Aerial Platform Vehicle

This parameter is not used.

Neutral Learned Shift Position

This parameter displays the learned position at the neutral using the signal from the gear shift position sensor.

1st Gear Learned Shift Position

This parameter displays the learned position at the 1st gear using the signal from the gear shift position sensor.

2nd Gear Learned Shift Position

This parameter displays the learned position at the 2nd gear using the signal from the gear shift position sensor.

3rd Gear Learned Shift Position

This parameter displays the learned position at the 3rd gear using the signal from the gear shift position sensor.

4th Gear Learned Shift Position

This parameter displays the learned position at the 4th gear using the signal from the gear shift position sensor.

5th Gear Learned Shift Position

This parameter displays the learned position at the 5th gear using the signal from the gear shift position sensor.

6th Gear Learned Shift Position

This parameter displays the learned position at the 6th gear using the signal from the gear shift position sensor.

Reverse Gear Learned Shift Position

This parameter displays the learned position at the reverse gear using the signal from the gear shift position sensor.

N1 Learned Select Position

This parameter displays the learned position at the N1 using the signal from the gear select position sensor.

N2 Learned Select Position

This parameter displays the learned position at the N2 using the signal from the gear select position sensor.

N3 Learned Select Position

This parameter displays the learned position at the N3 using the signal from the gear select position sensor.

N4 Learned Select Position

This parameter displays the learned position at the N4 using the signal from the gear select position sensor.

N1 Learned Duty Ratio

This parameter displays the learned select solenoid valve control duty ratio at the N1.

N2 Learned Duty Ratio

This parameter displays the learned select solenoid valve control duty ratio at the N2.

N3 Learned Duty Ratio

This parameter displays the learned select solenoid valve control duty ratio at the N3.

N4 Learned Duty Ratio

This parameter displays the learned select solenoid valve control duty ratio at the N4.

Torque Learned Duty Ratio

This parameter displays the learned gearshift clutch solenoid valve control duty ratio when the half-clutch position is learned.

Half-Clutch Adjustment Duty Ratio

This parameter displays the adjustment value of the gearshift clutch solenoid valve control duty ratio when the gearshift clutch is engaged. The half-clutch adjustment switch is used to adjust the clutch engagement timing.

Engine Type

This parameter displays the programmed engine type.

Engine Type Learning Status

This parameter displays the learning state of the engine type. Not Learned indicates initialed state that is replaced to a new TCM. Learned indicates learning process is completed state.

Transmission Type

This parameter displays the programmed engine type.

Transmission Type Learning Status

This parameter displays the learning state of the transmission type. Not Learned indicates initialed state that is replaced to a new TCM. Learned indicates learning process is completed state.

Speedometer Driven Gear Teeth

This parameter displays the programmed speedometer driven gear teeth.

Speedometer Driven Gear Learning Status

This parameter displays the learning state of the speedometer driven gear teeth. Not Learned indicates initialed state that is replaced to a new TCM. Learned indicates learning process is completed state.

Gear Position Learning Status

This parameter displays the learning state of the half-clutch position. Not Learned indicates initialed state that is replaced to a new TCM. Learned indicates learning process is completed state.

Torque Learning Status

This parameter displays the learning state of the transmission gear select and shift position. Not Learned indicates initialed state that is replaced to a new TCM. Learned indicates learning process is completed state.

Transmission Control System Check Sheet

Check list for Smoother control system Specific example Inspector's name

Customer's name		Model type and model year	
Driver's name		Vehicle No.	
Date vehicle brought in		Transmission type	
Registration No.		Transmission No.	
		Engine model	
		Odometer reading	_____ km

Trouble symptom	☐ Engine does not start	☐ Engine does not crank ☐ At gear-in ☐ At neutral ☐ When emergency switch is ON
	☐ When gear is engaged while vehicle is stopped, engine stalls	☐ Idle speed is incorrect ☐ Abnormal idling ☐ High (rpm) ☐ Low (rpm) ☐ Others _____
	☐ Drivability is low	☐ Engagement/disengagement is felt at shift-up ☐ Body vibration ☐ Engine vibration ☐ Noise ☐ Large shock at gearshift ☐ Large shock at starting to move ☐ Others _____
	☐ Running not possible	☐ Immediately after starting to move ☐ When accelerator pedal is released ☐ When A/C is operated ☐ Immediately after replacing engine oil ☐ Immediately after replacing transmission oil ☐ When gear is shifted up ☐ Others _____
	☐ Gearshift	☐ Gear is shifted ☐ Gear is not shifted
	☐ Noise	☐ Gear clash ☐ Others _____
	☐ Accelerator pedal	☐ Blow up ☐ Slow response ☐ Rough
	☐ Engine stall	☐ Brake lamp does not come on ☐ Others _____

Trouble occurrence data		
Frequency of trouble		☐ Always ☐ Sometimes (How many times: per date/month) ☐ Once ☐ Others _____
Trouble condition	Weather	☐ Fine ☐ Cloudy ☐ Rain ☐ Snow ☐ Various/others _____
	Ambient temperature	☐ 30 °C or more ☐ Around 20–30 °C ☐ Around 10–15 °C ☐ 0°C or less (°C)
	Location	☐ Expressway ☐ Suburb ☐ Urban area ☐ Uphill ☐ Downhill ☐ Rough road ☐ Others _____
	Engine/transmission temperature	☐ Cold ☐ Warming-up ☐ After warmed-up ☐ Engine coolant temperature °C
	Operating condition	☐ When starting ☐ Immediately after starting (minutes) ☐ Idling ☐ Racing ☐ During operation ☐ At a constant speed ☐ At acceleration ☐ At deceleration ☐ A/C SW, other SW ON/OFF ☐ Others _____

Smoother warning lamp		☐ ON ☐ Sometimes comes on ☐ Not come on ☐ Not sure
D T C	Present	☐ _____ ☐ _____ ☐ _____
* When was the transmission oil replaced last time? Were genuine transmission oil, filter, etc. used?		☐ _____ ☐ _____ When was the engine oil replaced last time? ☐ _____
Buzzer	☐ Beeped ☐ Not beep ☐ Not sure	
Lamp indication fault	☐ Economy mode ☐ Indicator display ☐ Others ☐ Not sure ☐ 1st gear start	
Past trouble history	☐ (Year Month/Date) _____ ☐ (Year Month/Date) _____	
About learning	Torque learning _____ Torque learning value _____ % Gear learning _____ Adjustment learning value _____ %	
Trouble occurrence data	Phase _____ Shift mode _____ Target gear _____ Buzzer mode _____	

Diagnostic Starting Point - Transmission Controls

Begin the system diagnosis with Diagnostic System Check Transmission Controls. The Diagnostic System Check Transmission Controls will provide the following information:

- The identification of the control modules which command the system.
- The ability of the control modules to communicate through the serial data circuit.
- The identification of any stored diagnostic trouble codes (DTCs) and the their statuses.

The use of the Diagnostic System Check - Transmission Controls will identify the correct procedure for diagnosing the system and where the procedure is located.

Important:

Transmission Control System Check Sheet must be used to verify the customer complaint, you need to know the correct (normal) operating behavior of the system and verify that the customer complaint is a valid failure of the system.

Diagnostic System Check - Transmission Controls

Description

The Diagnostic System Check Transmission Controls is an organized approach to identifying a condition that is created by a malfunction in the electronic transmission control system. The Diagnostic System Check must be the starting point for any driveability concern. The Diagnostic System Check directs the service technician to the next logical step in order to diagnose the concern. Understanding and correctly using the diagnostic table reduces diagnostic time, and prevents the replacement of good parts.

Test Description

The numbers below refer to the step numbers on the diagnostic table.

1. Lack of communication may be because of a partial or a total malfunction of the Keyword 2000 serial data circuit. The specified procedure determines the particular condition.

5. The presence of DTCs which begin with U, indicate that some other module is not communicating.

11. If there are other modules with DTCs set, refer to the DTC list. The DTC list directs you to the appropriate diagnostic procedure. If the control module stores multiple DTCs, diagnose the DTCs in the following order.

- Component level DTCs, such as sensor DTCs, solenoid DTCs, actuator DTCs, and relay DTCs. Diagnose the multiple DTCs within this category in numerical order. Begin with the lowest numbered DTC, unless the diagnostic table directs you otherwise.

Important:

- DO NOT perform this diagnostic if there is not a driveability concern, unless another procedure directs you to this diagnostic.
- Before you proceed with diagnosis, search for applicable service bulletins.
- Unless a diagnostic procedure instructs you, DO NOT clear the DTCs.
- Ensure the battery has a full charge.
- Ensure the battery cables (+) (-) are clean and tight.
- Ensure the TCM grounds are clean, tight, and in the correct location.
- Ensure the TCM harness connectors are clean and correctly connected.
- Ensure the TCM terminals are clean and correctly mating.
- Ensure the vehicle maintenance has been done enough.
- Ensure the vehicle information data is correctly programmed and transmission gear select & shift position and half-clutch position is correctly learned.
- If there are DTC's P0718, P0726, P0909, P0915 or P0919, diagnose sensor DTCs, solenoid DTCs, actuator DTCs and relay DTCs FIRST.

Step	Action	Value(s)	Yes	No
1	1. Install the Tech 2. 2. Turn ON the ignition, with the engine OFF. 3. Attempt to establish communication with the listed control modules. • Engine control module (ECM) • Transmission control module (TCM) • Supplemental restraint system (SRS) control module (If so equipped) Does the Tech 2 communicate with all the listed control modules?	—	Go to Step 2	Go to Tech 2 Does Not Communicate with Keyword Device

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Step	Action	Value(s)	Yes	No
2	1. Turn OFF the ignition for 30 seconds. 2. Turn OFF the emergency switch. 3. Turn ON the ignition, with the engine OFF. Does the transmission warning lamp illuminate?	—	Go to Step 3	Go to Transmission Warning Lamp Inoperative
3	Attempt to crank the engine. Does the engine crank?	—	Go to Step 4	Go to Engine Does Not Crank
4	Attempt to start the engine. Does the engine start and idle?	—	Go to Step 5	Go to Engine Cranks But Does Not Run in Engine Control Section
5	Select the DTC display function for the following control modules: • ECM • TCM • SRS control module (If so equipped) Does the Tech 2 display any DTCs?	—	Go to Step 6	Go to Step 13
6	Does the Tech 2 display DTCs which begin with a U or other control module communication fault DTCs?	—	Go to Applicable DTC	Go to Step 7
7	Does the Tech 2 display TCM DTCs P0602, P0605 or P0613?	—	Go to Applicable DTC	Go to Step 8
8	Does the Tech 2 display TCM DTCs P0885 or P0889?	—	Go to Applicable DTC	Go to Step 9
9	Does the Tech 2 display TCM DTCs P0715, P0717, P0721, P0904 or P0914?	—	Go to Applicable DTC	Go to Step 10
10	Does the Tech 2 display TCM DTCs P0740, P0742, P0902 or P0903?	—	Go to Applicable DTC	Go to Step 11
11	Does the Tech 2 display TCM DTCs P0851, P0852, P0906 or P0907?	—	Go to Applicable DTC	Go to Step 12
12	Is there any other code in any controller that has not been diagnosed?	—	Go to Applicable DTC	Go to Step 13
13	Is the customer's concern with the engine?	—	Go to Diagnostic System Check - Engine Control	Go to Step 14
14	Is the customer's concern with the SRS airbag system?	—	Go to Diagnostic System Check SRS Control	Go to Step 15
15	Drive vehicle and verify if any engine or transmission related driveability concern exist. Perform Gearshift Control System Check as necessary. Refer to Gearshift Control System Check in this section. Does an engine or transmission driveability concern exist?	—	Go to Symptoms - Engine Controls in Engine Control Section or Diagnosis based on vehicle condition for Transmission	System OK

Tech 2 Does Not Communicate with Keyword Device

Circuit Description

The engine control module (ECM), transmission control module (TCM) and supplemental restraint system (SRS) control module communicates with the Tech 2 over the Keyword 2000 serial data link. However, the ECM, TCM, electric hydraulic control module (EHC) (ABS module) and the data recording module (DRM) communicate with each other over the controller area network (CAN) link. The CAN link is not used for communication with the Tech 2 and is shared only among each module.

Diagnostic Aids

The following conditions will cause a loss of Keyword serial data communication between the ECM, TCM and SRS control module or between the Tech 2 and any control module:

- A Keyword serial data circuit open.
- A Keyword serial data circuit shorted to ground.
- A Keyword serial data circuit shorted to voltage.
- An internal condition within a module or connector on the Keyword serial data circuit, that causes a short to voltage or ground to the Keyword serial data circuit.

Tech 2 Does Not Communicate with Keyword Device

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn ON the ignition, with the engine OFF. 3. Attempt to communicate with the listed control modules. • Engine control module (ECM) • Transmission control module (TCM) • Supplemental restraint system (SRS) control module (If so equipped) Does the Tech 2 communicate with all the listed control modules?	—	Go to Step 3	Go to Step 7
3	Does the Tech 2 communicate with the ECM?	—	Go to Step 4	Go to Diagnostic System Check - Engine Control
4	Does the Tech 2 communicate with the TCM?	—	Go to Step 5	Go to Lost Communication with The TCM
5	Does the Tech 2 communicate with the SRS control module?	—	Go to Step 6	Go to Diagnostic System Check -SRS Control
6	Test the Keyword serial data circuit for an intermittently short to ground or intermittently short to voltage. Then, test the Keyword serial data circuit for an intermittently open (based on which control module did not communicate) at the connection in the circuit. Did you find and correct the condition?	—	Go to Step 14	System OK
7	1. Turn OFF the ignition. 2. Disconnect the ECM E-111 and J-191 harness connectors. 3. Turn ON the ignition, with the engine OFF. 4. Attempt to communicate with the TCM and SRS control module. Does the Tech 2 communicate with the TCM and SRS control module?	—	Go to Step 11	Go to Step 8

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Step	Action	Value(s)	Yes	No
8	1. Turn OFF the ignition. 2. Reconnect the ECM E-111 and J-191 harness connectors. 3. Disconnect the TCM B-425, B-426, B-427 and B-428 harness connectors. 4. Turn ON the ignition, with the engine OFF. 5. Attempt to communicate with the ECM and SRS control module. Does the Tech 2 communicate with the ECM and SRS control module?	—	Go to Step 12	Go to Step 9
9	1. Turn OFF the ignition. 2. Reconnect the TCM B-425, B-426, B-427 and B-428 harness connectors. 3. Disconnect the SRS B-243 control module harness connector. 4. Turn ON the ignition leaving the engine OFF. 5. Attempt to communicate with the ECM and TCM. Does the Tech 2 communicate with the ECM and TCM?	—	Go to Step 13	Go to Step 10
10	Repair the short to ground or short to voltage on the Keyword serial data circuit between the DLC and ECM, TCM and SRS control module. Did you complete the repair?	—	Go to Step 14	—
11	Important: Replacement ECM must be programmed. Replace the ECM. Refer to Engine Control Module (ECM) Replacement /Restore Fuel Injector ID Code Data in engine control section. Did you complete the replacement?	—	Go to Step 14	—
12	Important: Replacement TCM must be programmed. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 14	—
13	Replace the SRS control module. Refer to Supplemental Restraint System (SRS) control module Replacement in the restraint system section. Did you complete the replacement?	—	Go to Step 14	—
14	Attempt to communicate with the ECM, TCM and SRS control module. Does the Tech 2 communicate with the ECM, TCM and SRS control module?	—	System OK	Go to Step 2

Lost Communication with The Transmission Control Module (TCM)**Circuit Description**

The engine control module (ECM), transmission control module (TCM) and supplemental restraint system (SRS) control module communicates with the Tech 2 over the Keyword 2000 serial data link. However, the ECM, TCM, electric hydraulic control module (EHCU) (ABS module) and the data recording module (DRM) communicate with each other over the controller area network (CAN) link. The CAN link is not used for communication with the Tech 2 and is shared only among each module.

Lost Communication with The Transmission Control Module (TCM)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	Attempt to establish transmission control module (TCM) communications with the Tech 2. Does the TCM communicate with the Tech 2?	—	Go to Intermittent Conditions	Go to Step 3
3	Check the TCM B-425, B-426, B-427 and B-428 connectors for poor connections. Did you find and correct the condition?	—	Go to Step 9	Go to Step 4
4	1. Turn ON the ignition, with the engine OFF. 2. Check the NEES (IG) (10A) fuse (F-17) in the glove box fuse block. Replace and retest if open. If any fuse continues to open, check for a short to ground on each circuit fed by that fuse. 3. Turn OFF the ignition. 4. Disconnect the TCM B-426 harness connector. 5. Turn ON the ignition, with the engine OFF. 6. Connect a test lamp to ground and check for voltage at the ignition voltage supply circuit at the ECM (pins 1 and 2 of B-426 connector). Does the test lamp illuminate?	—	Go to Step 5	Go to Step 7
5	1. Turn OFF the ignition. 2. Connect a DMM between the Keyword serial data circuit at the TCM (pin 9 of B-426 connector) and the data link connector (DLC) (pin 7 of B-79 connector). 3. Test the circuits for an open circuit or high resistance. 4. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 9	Go to Step 6
6	Important: An open in a ground circuit at the TCM will not cause a loss of communication. 1. Check TCM ground for corrosion and tightness. 2. Clean or tighten grounds as necessary. Did you find and correct the condition?	—	Go to Step 9	Go to Step 8

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Step	Action	Value(s)	Yes	No
7	Repair the open in the ignition voltage circuit to the TCM. Did you complete the repair?	—	Go to Step 9	—
8	Important: Replacement TCM must be programmed. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 9	—
9	1. Turn OFF the ignition. 2. Reconnect all previously disconnected fuse or harness connector(s). 3. Turn the ignition ON with the engine OFF. 4. Attempt to establish Tech 2 communications with the ECM. Does the Tech 2 communicate with the TCM?	—	System OK	Go to Step 3

Engine Does Not Crank

Description

The Engine Does Not Crank diagnostic table is an organized approach to identifying a condition that causes an engine not crank. The diagnostic table directs the service technician to the appropriate system diagnosis. The diagnostic table assumes the following conditions are met:

- The battery is completely charged and terminals are cleaned and tight.
- Fuse and slow blow fuse are normal.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

Test Description

The numbers below refers to the step number on the diagnostic table.

7. This step checks whether the starter cut relay command signal from TCM is canceled by the brake pedal signal.

8. This step checks whether the starter cut relay command signal from the TCM is canceled by the parking brake signal from the ECM.

9. This step checks whether the starter cut relay command signal from the TCM is canceled by the emergency switch signal.

10. If the vehicle parked in gear, the starter cut relay command is canceled by either of brake pedal, parking brake or emergency switch input. This step retests with the gear in neutral after engine is once started.

Engine Does Not Crank

Schematic Reference: Engine Controls Schematics and Transmission Controls Schematics

Connector End View Reference: Engine Controls Connector End Views, Engine Control Module (ECM) Connector End Views, Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Chart 1 of 3

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC P0602, P0605, P0613, P0851, P0852, P0906, P0907 or P0914 set?	—	Go to Applicable DTC	Go to Step 3
3	Operate the selector lever while observe the Selector Position parameter with the Tech 2. Does the Selector Position parameter indicate correct position?	—	Go to Step 4	Refer to DTC P0906 and P0907
4	1. Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Release the parking brake • Emergency switch OFF 2. Attempt to start the engine. Does the engine crank?	—	Go to Step 5	Go to Step 6
5	Does the engine start and idle?	—	System OK	Go to Engine Cranks But Does Not Run in Engine Control Section
6	1. Turn ON the ignition, with the engine OFF. 2. Observe the Starter Cut Relay Command parameter with the Tech 2. Does the Starter Cut Relay Command parameter indicate OFF?	—	Go to Chart 3 of 3 Step 1	Go to Step 7

7A-48 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
7	Put the vehicle with the following conditions: • Selector lever N position • Apply the brake pedal • Release the parking brake • Emergency switch OFF Does the Starter Cut Relay Command parameter indicate OFF?	—	Go to Step 8	Go to Chart 2 of 3 Step 1
8	Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Apply the parking brake • Emergency switch OFF Does the Starter Cut Relay Command parameter indicate OFF?	—	Go to Step 9	Go to Chart 2 of 3 Step 11
9	Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Release the parking brake • Emergency switch ON Does the Starter Cut Relay Command parameter indicate OFF?	—	Go to Step 10	Go to Chart 2 of 3 Step 16
10	1. Put the vehicle with the following conditions: • Selector lever N position • Apply the brake pedal or parking brake • Emergency switch OFF 2. Start the engine. If the engine cranks but does not start, go to Engine Cranks But Does Not Run in the engine control section. 3. Set the gear position in neutral. 4. Stop the engine. 5. Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Release the park brake • Emergency switch OFF 6. Attempt to start the engine. Does the engine crank?	—	Go to Step 5	Go to Step 11

Step	Action	Value(s)	Yes	No
11	1. Visually inspect the gear shift position sensor for the following conditions: • Physical damage • Loose or improper installation 2. Inspect the gear shift position sensor output voltage. Notice: The gear shift position sensor voltage shifted to a lower or a higher voltage will cause no engine crank without DTC. 3. Remove the gear shift position sensor. Refer to Gear Shift Position Sensor Replacement in this section. 4. Visually inspect the gear shift position sensor for the following conditions: • Physical damage • Loose or improper installation • Shift lever damage that connects to the gear shift position sensor shaft. Did you find and correct the condition?	—	Go to Step 14	Go to Step 12
12	1. Turn OFF the ignition. 2. Disconnect the gear shift position sensor harness connector. 3. Inspect for an intermittent, for poor connections and corrosion at the harness connector of the gear shift position sensor (pins 1, 2 and 3 of J-142 connector). 4. Disconnect the TCM harness connector. 5. Inspect for an intermittent, for poor connections and corrosion on each gear shift position sensor circuit at the harness connector of the TCM (pins 18, 19 and 20 of B-426 connector). 6. Test for high resistance on each gearshift position sensor circuit. 7. Repair the connection(s) or circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 14	Go to Step 13
13	Important: Replacement gear shift position sensor must be relearned. Replace the gear shift position sensor. Refer to Gear Shift Position Sensor Replacement in this section. Did you complete the replacement?	—	Go to Step 14	—

7A-50 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
14	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2 if stored. Important: Transmission Gear Select & Shift Position Learning must be done if the gear shift position sensor or transmission gearshift control box is replaced, removed or repaired. 3. Turn OFF the ignition for 30 seconds. 4. Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Release the parking brake • Emergency switch OFF 5. Attempt to start the engine. Does the engine crank?	—	Go to Step 5	Go to Step 2

Chart 2 of 3

Step	Action	Value(s)	Yes	No
1	1. Check to ensure the brake pedal switch is adjusted correctly. The plunger should be all the way in when the pedal is released, yet should not impede with the brake pedal full upward travel. 2. Adjust the brake pedal switch as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 2
2	1. Turn OFF the ignition. 2. Inspect the Stop Light (10A) fuse (F-5) in the glove box fuse block. Is the Stop Light (10A) fuse (F-5) open?	—	Go to Step 3	Go to Step 4
3	Replace the Stop Light (10A) fuse (F-5). If the fuse continues to open, repair the short to ground on one of the circuits that is fed by the Stop Light (10A) fuse (F-5) or replace the shorted attached component fed by the Stop Light (10A) fuse (F-5). Did you complete the repair?	—	Go to Step 25	—
4	1. Turn OFF the ignition. 2. Disconnect the brake pedal switch harness connector. 3. Connect a test lamp between the voltage feed circuit of the brake pedal switch harness (pin 1 of B-66 connector) and a known good ground. Does the test lamp illuminate?	—	Go to Step 5	Go to Step 6
5	1. Turn ON the ignition, with the engine OFF. 2. Observe the Brake Pedal Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the brake pedal switch harness connector between pins 1 and 2 of the B-66 connector. Does the Tech 2 indicate Applied when the circuit is jumpered and Released when the circuit is not jumpered?	—	Go to Step 8	Go to Step 7

Step	Action	Value(s)	Yes	No
6	Repair the open circuit or high resistance on the voltage feed circuit between the Stop Light (10A) fuse (F-5) and the brake pedal switch (pin 1 of B-66 connector). Did you complete the repair?	—	Go to Step 25	—
7	1. Test the brake pedal switch signal circuit between the transmission control module (TCM) (pin 3 of B-428 connector) and the brake pedal switch (pin 2 of B-66 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 9
8	1. Turn OFF the ignition. 2. Disconnect the brake pedal switch harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the brake pedal switch (pins 1 and 2 of B-66 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 10
9	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the brake switch circuit at the harness connector of the TCM (pin 3 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 24
10	Replace brake pedal switch. Did you complete the replacement?	—	Go to Step 25	—
11	1. Turn OFF the ignition. 2. Disconnect the parking brake switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Parking Brake Switch parameter with the Tech 2 in the engine system menu while momentarily jumping 3-amp fused jumper wire between the parking brake pedal switch harness (pin 2 of N-6 connector) and a known good ground. Does the Tech 2 indicate Applied when the circuit is jumpered and Released when the circuit is not jumpered?	—	Go to Step 13	Go to Step 12
12	1. Test the parking brake switch signal circuit between the engine control module (ECM) (pin 48 of J-191 connector) and the parking brake switch (pin 2 of N-6 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 14

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Step	Action	Value(s)	Yes	No
13	1. Turn OFF the ignition. 2. Disconnect the parking brake switch harness connector. 3. Inspect for an intermittent and for a poor connection at the harness connector of the parking brake switch (pin 2 of N-6 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 15
14	1. Turn OFF the ignition. 2. Disconnect the ECM harness connector. 3. Inspect for an intermittent and for a poor connection on the parking brake switch circuit at the harness connector of the ECM (pin 48 of J-191 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 23
15	Replace parking brake switch. Did you complete the replacement?	—	Go to Step 25	—
16	1. Turn OFF the ignition. 2. Disconnect the emergency switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp between the voltage feed circuit of the emergency switch harness (pin 1 of N-17 connector) and a known good ground. Does the test lamp illuminate?	—	Go to Step 17	Go to Step 18
17	1. Turn ON the ignition, with the engine OFF. 2. Observe the Emergency Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the emergency switch harness connector between pins 1 and 5 of the N-17 connector. Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 20	Go to Step 19
18	Repair the open circuit or high resistance on the voltage feed circuit between the Meter (10A) fuse (F-16) in the glove box fuse block and the emergency switch (pin 1 of N-17 connector). Did you complete the repair?	—	Go to Step 25	—
19	1. Test the emergency switch signal circuit between the TCM (pin 4 of B-428 connector) and the emergency switch (pin 5 of N-17 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 21

Step	Action	Value(s)	Yes	No
20	1. Turn OFF the ignition. 2. Disconnect the emergency switch harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the emergency switch (pins 1 and 5 of N-17 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 22
21	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the emergency switch circuit at the harness connector of the TCM (pin 4 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 25	Go to Step 24
22	Replace emergency switch. Did you complete the replacement?	—	Go to Step 25	—
23	Important: Replacement ECM must be programmed. Replace the ECM. Refer to Engine Control Module (ECM) Replacement /Restore Fuel Injector ID Code Data in engine control section. Did you complete the replacement?	—	Go to Step 25	—
24	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 25	—
25	1. Reconnect all previously disconnected fuse or harness connector(s). 2. Clear the DTCs with the Tech 2 if stored. 3. Turn OFF the ignition for 30 seconds. 4. Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Release the parking brake • Emergency switch OFF 5. Attempt to start the engine. Does the engine crank?	—	Go to Chart 1 of 3 Step 5	Go to Chart 1 of 3 Step 6

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Chart 3 of 3

Step	Action	Value(s)	Yes	No
1	- Put the vehicle with the following conditions: - Selector lever N position - Release the brake pedal - Release the parking brake - Emergency switch ON - Attempt to start the engine. Does the engine crank?	—	Go to Step 3	Go to Step 2
2	- Turn ON the ignition, with the engine OFF. - Observe the Emergency Switch parameter with the Tech 2. Does the Tech 2 indicate ON when the switch is ON and OFF when the switch is OFF?	—	Go to Step 13	Go to Step Chart 2 of 3 Step 16
3	- Turn OFF the ignition. - Replace the starter cut relay with the marker lamp relay or replace with a known good relay. - Put the vehicle with the following conditions: - Selector lever N position - Release the brake pedal - Release the parking brake - Emergency switch OFF - Attempt to start the engine. Does the engine crank?	—	Go to Step 12	Go to Step 4
4	- Turn OFF the ignition. - Remove the starter cut relay. - Inspect for an intermittent, for poor connections and corrosion at the harness connector of the starter cut relay (pins 1 and 4 of X-26 connector). Did you find and correct the condition?	—	Go to Step 33	Go to Step 5
5	- Turn OFF the ignition. - Remove the starter cut relay. - Probe the ground circuit of the starter cut relay switch side (pin 1 of X-26 connector) with a test lamp that is connected to battery voltage. Does the test lamp illuminate?	—	Go to Step 6	Go to Step 9
6	- Probe the starter relay control circuit to the starter cut relay switch side (pin 4 of X-26 connector) with a DMM that is connected to a known good ground. - Make sure the emergency switch is OFF. - Turn Start the ignition while observing the DMM. Does the DMM voltage more than the specified value?	18.0 volts	Go to Step 7	Go to Step 10
7	- Probe the control circuit of the starter cut relay (pin 5 of X-26 connector) with a test lamp that is connected to battery voltage. - Turn OFF the ignition for 30 seconds. - Disconnect the TCM harness connector (B-425 connector). - Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 8	Go to Step 32

Step	Action	Value(s)	Yes	No
8	1. Turn OFF the ignition for 30 seconds. 2. Keep the test lamp with connected. 3. Disconnect the ECM harness connector (J-191 connector). 4. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 11	Go to Step 31
9	Repair the open circuit or high resistance on the ground circuit of the starter cut relay switch side between the starter cut relay (pin 1 of X-26 connector) and the chassis ground (J-9). Did you complete the repair?	—	Go to Step 33	—
10	Repair the open circuit or high resistance on the starter relay control circuit to the starter cut relay switch side between the starter relay (pin 5 of X-21 connector) and the starter cut relay (pin 4 of X-26 connector). Did you complete the repair?	—	Go to Step 33	—
11	Repair the short to ground on the starter cut relay control circuit between the TCM (pin 16 of B-425 connector) or ECM (pin 14 of J-191 connector) and the starter cut relay (pin 5 of X-26 connector). Did you complete the repair?	—	Go to Step 33	—
12	Replace the starter cut relay. Did you compete the replacement?	—	Go to Step 33	—
13	1. Turn OFF the ignition. 2. Replace the starter relay with the glow relay or replace with a known good relay. 3. Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Release the parking brake • Emergency switch OFF 4. Attempt to start the engine. Does the engine crank?	—	Go to Step 29	Go to Step 14
14	1. Turn OFF the ignition. 2. Remove the starter relay. 3. Inspect for an intermittent, for poor connections and corrosion at the harness connector of the starter relay (pins 1, 2, 4 and 5 of X-21 connector). Did you find and correct the condition?	—	Go to Step 33	Go to Step 15
15	Probe the starter relay battery voltage feed circuit (pin 2 of X-21 connector) with a test lamp that is connected to a known good ground. Does the test lamp illuminate?	—	Go to Step 16	Go to Step 23
16	1. Probe the starter relay ignition voltage feed circuit (pin 4 of X-21 connector) with a test lamp that is connected to a known ground. 2. Turn Start the ignition while observing the test lamp. Does the test lamp illuminate?	—	Go to Step 17	Go to Step 24

7A-56 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
17	1. Test the starter C terminal circuit between the starter relay (pin 1 of X-21 connector) and the starter C terminal for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 33	Go to Step 18
18	1. Turn OFF the ignition. 2. Reinstall the starter relay. 3. Replace the emergency relay with the dimmer relay or replace with a known good relay. 4. Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Release the parking brake • Emergency switch OFF 5. Attempt to start the engine. Does the engine crank?		Go to Step 30	Go to Step 19
19	1. Turn OFF the ignition. 2. Remove the emergency relay. 3. Inspect for an intermittent, for poor connections and corrosion at the harness connector of the emergency relay (pins 1, 2, 3 and 5 of X-14 connector). Did you find and correct the condition?	—	Go to Step 33	Go to Step 20
20	Probe the emergency relay ground circuits (pins 2 and 5 of X-14 connector) with a test lamp that is connected to battery voltage. Does the test lamp illuminate?	—	Go to Step 21	Go to Step 25
21	1. Probe the emergency relay voltage feed circuit (pin 3 of X-21 connector) with a test lamp that is connected to a known ground. 2. Turn ON the ignition, with the engine OFF. 3. Turn ON the emergency switch. Does the test lamp illuminate?	—	Go to Step 22	Go to Step 26
22	1. Probe the starter relay control circuit to the emergency relay switch side (pin 1 of X-14 connector) with a DMM that is connected to a known good ground. 2. Turn OFF the emergency switch. 3. Turn Start the ignition while observing the DMM. Does the DMM voltage more than the specified value?	18.0 volts	Go to Step 28	Go to Step 27
23	Repair the open circuit or high resistance on the battery voltage feed circuit between the starter relay (pin 2 of X-21 connector) and the battery terminal. Check the Starter (60A) slow blow fuse (SBF-8) is first. Did you complete the repair?	—	Go to Step 33	—

Step	Action	Value(s)	Yes	No
24	Repair the open circuit or high resistance on the ignition voltage feed circuit between the starter relay (pin 4 of X-21 connector) and the starter switch (pin 4 of B-67 connector). Check the Starter (10A) fuse (F-22) is first. Did you complete the repair?	—	Go to Step 33	—
25	Repair the open circuit or high resistance on the ground circuits of the emergency relay between the emergency relay (pins 2 and 5 of X-14 connector) and the ground (B-7). Did you complete the repair?	—	Go to Step 33	—
26	Repair the open circuit or high resistance on the emergency switch voltage feed circuit between the emergency relay (pin 3 of X-14 connector) and the emergency switch (pin 5 of N-17 connector). Did you complete the repair?	—	Go to Step 33	—
27	Repair the open circuit or high resistance on the starter relay control circuit to the emergency relay switch side between the starter relay (pin 5 of X-21 connector) and the emergency relay (pin 1 of X-14 connector). Did you complete the repair?	—	Go to Step 33	—
28	Repair or replace the starter motor. Refer to starting and charging system in the engine section. Did you complete the repair?	—	Go to Step 33	—
29	Replace the starter relay. Did you complete the replacement?	—	Go to Step 33	—
30	Replace the emergency relay. Did you complete the replacement?	—	Go to Step 33	—
31	Important: Replacement ECM must be programmed. Replace the ECM. Refer to Engine Control Module (ECM) Replacement /Restore Fuel Injector ID Code Data in engine control section. Did you complete the replacement?	—	Go to Step 33	—
32	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 33	—

7A-58 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
33	1. Reconnect all previously disconnected fuse, relay or harness connector(s). 2. Clear the DTCs with the Tech 2 if stored. 3. Turn OFF the ignition for 30 seconds. 4. Put the vehicle with the following conditions: • Selector lever N position • Release the brake pedal • Release the parking brake • Emergency switch OFF 5. Attempt to start the engine. Does the engine crank?	—	Go to Chart 1 of 3 Step 5	Go to Chart 1 of 3 Step 6

Diagnostic Trouble Code (DTC) List

DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P0602	—	Blinks	Intermittently ON	Control Module Not Programmed	—	Vehicle information is not programmed.	Vehicle information is not programmed and learned.
P0605	33	ON	Continuity ON	Control Module Internal Performance	—	Either of following condition is met: - The TCM detects a malfunction in its internal Random Access Memory (RAM). - The TCM detects a calculated checksum does not agree with the TCM internal registered checksum.	Faulty TCM.
P0613	33	ON	Continuity ON	Control Module EEPROM Error	—	The TCM detects a faulty learning data in the Electronically Erasable Programmable Read Only Memory (EEPROM).	Faulty TCM.
P0710	21	ON	OFF	Transmission Fluid Temperature Sensor Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the TFT sensor signal voltage is less than 0.1 volts (more than 165°C [329°F]) or more than 4.9 volts (less than –50°C [–58°F]).	- Sensor signal circuit is short to battery or ignition voltage or short to any 5V reference circuit, short to ground, short to the low reference circuit, open circuit or high resistance. - Sensor low reference circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty sensor. - Faulty TCM.
P0715	3	ON	OFF	Turbine Speed Sensor Circuit	- DTCs P0721, P0726, U0400 and U0406 are not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The engine is running. - The lock up clutch is commanded engage.	The TCM detects that the turbine speed sensor pulses are not generated during lock up control.	- Faulty sensor installation condition. - Faulty sensor wheel (gearshift clutch case). - Sensor signal circuit is short to battery or ignition voltage, short to any 5V reference circuit, short to ground, open circuit or high resistance. - Sensor low circuit is open circuit or high resistance. - Sensor circuits short to each other. - Poor harness connector connection. - Faulty sensor. - Faulty TCM. - Electromagnetic interference and electrical noise.

7A-60 Transmission Control System (Smoother)

DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P0717	2	ON	OFF	Input Speed Sensor Circuit	- DTCs P0715, P0718, P0721, P0726, U0400 and U0406 are not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The engine is running. - The turbine speed is more than 500 RPM. - The vehicle speed is more than 10 km/h (6 MPH). - The gearshift clutch is commanded engage.	The TCM detects that the input shaft speed sensor pulses are not generated during vehicle running.	- Faulty sensor installation condition. - Faulty sensor wheel (counter shaft). - Sensor signal circuit is short to battery or ignition voltage, short to any 5V reference circuit, short to ground, open circuit or high resistance. - Sensor low circuit is open circuit or high resistance. - Sensor circuits short to each other. - Poor harness connector connection. - Faulty sensor. - Faulty TCM. - Electromagnetic interference and electrical noise.
P0718	17	ON	OFF	Gearshift Clutch Slip Error	- DTCs P0715 and P0717 are not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the input shaft speed is less than the turbine speed 300 RPM or more when the gearshift clutch is commanded engage.	- Faulty ATF amount. - Faulty line pressure (low). - Faulty oil pump. - Faulty gearshift clutch. - Faulty gearshift clutch solenoid valve. - Faulty gearshift clutch oil pressure circuits. - Faulty band brake. - Faulty input shaft speed sensor.
P0721	26	ON	OFF	Output Speed Sensor Performance	- DTCs P0717, P0904, P0914 and U0100 are not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The input shaft speed is more than 1500 RPM. - The current gear is other than neutral.	The TCM detects that the output shaft speed is less than 30 RPM during the vehicle running.	- Faulty sensor installation. - Sensor voltage feed circuit is open circuit or high resistance. - Sensor signal circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - Sensor low reference circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty sensor. - Faulty ECM. - Faulty TCM. - Electromagnetic interference and electrical noise.

DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P0726	16	ON	OFF	Lock Up Clutch Slip Error	- DTCs P0715, P0740, P0742 and U0400 are not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the turbine speed is less than the engine speed 300 RPM or more when the lock up clutch is commanded engage.	- Faulty ATF amount. - Faulty line pressure (low). - Faulty oil pump. - Faulty fluid coupling. - Faulty lock up clutch solenoid valve. - Faulty lock up clutch oil pressure circuits. - Faulty turbine speed sensor.
P0740	67	ON	OFF	Lock Up Clutch Solenoid Circuit High Voltage	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The smoother main relay is commanded ON.	The TCM detects a high voltage condition on the lock up clutch solenoid valve control circuit when the solenoid valve is commanded OFF.	- Solenoid valve control circuit is short to battery or ignition voltage, open circuit or high resistance. - Poor harness connector connection. - Faulty solenoid valve. - Faulty TCM.
P0742	67	ON	OFF	Lock Up Clutch Solenoid Circuit Low Voltage	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The smoother main relay is commanded ON.	The TCM detects a low voltage condition on the lock up clutch solenoid valve control circuit when the solenoid valve is commanded ON.	- Solenoid valve control circuit is short ground. - Poor harness connector connection. - Faulty solenoid valve. - Faulty TCM.
P0851	6	OFF	OFF	Neutral Switch Circuit Low Voltage	- DTC P0914 is not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the neutral switch signal is continuously OFF (other than neutral) when the current gear is neutral.	- Switch voltage feed circuit is open circuit or high resistance. - Switch signal circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty switch installation. - Faulty gearshift control box internal lever. - Faulty switch - Faulty gear shift position sensor. - Faulty 1-3-5 shift solenoid. - Faulty 2-4-6-R shift solenoid. - Faulty TCM.

7A-62 Transmission Control System (Smoother)

DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P0852	7	OFF	OFF	Neutral Switch Circuit High Voltage	- DTC P0914 is not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the neutral switch signal is continuously ON (neutral) when the current gear is other than neutral.	- Switch signal circuit is short to battery or ignition voltage. - Poor harness connector connection. - Faulty switch installation. - Faulty gearshift control box internal lever. - Faulty switch - Faulty gear shift position sensor. - Faulty 1-3-5 shift solenoid. - Faulty 2-4-6-R shift solenoid. - Faulty TCM.
P0885	38	ON	Continuity ON (Open Stuck DTC)/OFF (Close Stuck DTC)	TCM Power Relay Control Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	Open stuck DTC - The TCM detects a low voltage condition on the smoother main relay voltage feed circuit when the relay is commanded ON. Close stuck DTC - The TCM detects a high voltage condition on the smoother main relay voltage feed circuit when the relay is commanded OFF.	- Relay power feed circuit is open circuit or high resistance. - Relay control circuit is short to ground, open circuit or high resistance. - Relay voltage feed circuit is short to battery, open circuit or high resistance. - Poor harness connector connection. - Faulty relay. - Faulty TCM.
P0889	39	ON	Continuity ON (Open Stuck DTC)/OFF (Close Stuck DTC)	Gearshift Relay Control Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	Open stuck DTC - The TCM detects a low voltage condition on the 1-3-5 shift solenoid, 2-4-6-R shift solenoid and select solenoid voltage feed circuit when the gearshift control box relay is commanded ON. Close stuck DTC - The TCM detects a high voltage condition on the 1-3-5 shift solenoid, 2-4-6-R shift solenoid and select solenoid voltage feed circuit when the gearshift control box relay is commanded OFF.	- Relay power feed circuit is open circuit or high resistance. - Relay control circuit is short to ground, open circuit or high resistance. - Relay voltage feed circuit is short to battery, open circuit or high resistance. - Poor harness connector connection. - Faulty relay. - Faulty TCM.
P0902	65	ON	Intermittently ON	Clutch Actuator Circuit Low Voltage	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The smoother main relay is commanded ON.	The TCM detects a low voltage condition on the gearshift clutch solenoid valve control circuit when the solenoid valve is commanded ON.	- Solenoid valve control circuit is short ground. - Poor harness connector connection. - Faulty solenoid valve. - Faulty TCM.

DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P0903	65	ON	Intermittently ON	Clutch Actuator Circuit High Voltage	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The smoother main relay is commanded ON.	The TCM detects a high voltage condition on the gearshift clutch solenoid valve control circuit when the solenoid valve is commanded OFF.	- Solenoid valve control circuit is short to battery or ignition voltage, open circuit or high resistance. - Poor harness connector connection. - Faulty solenoid valve. - Faulty TCM.
P0904	58	ON	OFF	Gate Select Position Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the gear select position sensor signal voltage is less than 0.5 volts or more than 4.5 volts.	- Sensor 5V reference circuit is short to battery or ignition voltage, short to ground, short to the low reference circuit, open circuit or high resistance. - Sensor signal circuit is short to battery or ignition voltage, short to any 5V reference circuit, short to ground, short to the low reference circuit, open circuit or high resistance. - Sensor low reference circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty sensor installation condition. - Faulty sensor. - Faulty TCM.
P0906	52	ON	OFF	Selector Lever Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	Either of following condition is met: - The TCM detects two or more selector lever N, D and R switch signal is ON (pulled to ground). - The TCM detects two or more selector lever A, + and – switch signal is ON (pulled to ground) when the selector lever N, D or R switch signal is ON (pulled to ground).	- Switch signal circuit is short to ground or short each other. - Faulty switch installation condition. - Faulty switch. - Faulty selector lever. - Faulty TCM.
P0907	51	OFF	OFF	Selector Lever Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the selector lever N, D and R switch signals are OFF (open circuit) at the same time.	- Switch signal circuit is open circuit or high resistance. - Switch ground circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty switch installation condition. - Faulty switch. - Faulty selector lever. - Faulty TCM.

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DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P0909	76	ON	OFF	Gate Select Control Error	- DTCs P0718, P0889, P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 and P0977 are not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON. - The selector lever is other than N position.	The TCM detects the gear select side lever position does not reach to a desired select position continuously when shifting to desired gear.	- Faulty gear select position sensor. - Faulty gear select position sensor installation condition. - Faulty select solenoid valve. - Faulty select solenoid valve installation condition. - Faulty gear select lever shaft. - Faulty gearshift control box. - Select lever stuck. - Incorrect vehicle information programming (transmission type).
P0912	75	ON	Intermittently ON	Select Solenoid Valve Circuit High Voltage	- DTC P0889 is not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON.	The TCM detects a high voltage condition on the select solenoid valve monitor circuit when the solenoid valve is commanded OFF.	- Solenoid valve voltage feed circuit is open circuit or high resistance. - Solenoid valve control circuit is short to battery or ignition voltage, open circuit or high resistance. - Solenoid valve ground circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty solenoid valve. - Faulty TCM.
P0913	75	ON	Intermittently ON	Select Solenoid Valve Circuit Low Voltage	- DTC P0889 is not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON.	The TCM detects a low voltage condition on the select solenoid valve monitor circuit when the solenoid valve is commanded ON.	- Solenoid valve control circuit is short to ground. - Faulty solenoid valve. - Faulty TCM.

DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P0914	57	ON	OFF	Gear Shift Position Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the gear shift position sensor signal voltage is less than 0.5 volts or more than 4.5 volts.	- Sensor 5V reference circuit is short to battery or ignition voltage, short to ground, short to the low reference circuit, open circuit or high resistance. - Sensor signal circuit is short to battery or ignition voltage, short to any 5V reference circuit, short to ground, short to the low reference circuit, open circuit or high resistance. - Sensor low reference circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty sensor installation condition. - Faulty sensor. - Faulty TCM.
P0915	74	ON	OFF	Gear Shift Position Control Disengage Error	- DTCs P0718, P0889, P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 and P0977 are not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON. - The selector lever is other than N position.	The TCM detects the gear shift side lever position does not reach to a desired shift position and it keeping a previously engaged gear position continuously when shifting to desired gear. This indicates that the TCM detects gear stuck at an engaged position.	- Faulty gear shift position sensor. - Faulty gear shift position sensor installation condition. - Faulty 1-3-5 or 2-4-6-R shift solenoid valve. - Faulty 1-3-5- or 2-4-6-R shift solenoid valve installation condition. - Faulty gear shift lever shaft. - Faulty gearshift control box. - Shift lever stuck. - Faulty gearshift clutch (stuck engage). - Transmission stuck.
P0919	72	ON	OFF	Gear Shift Position Engage Error	- DTCs P0718, P0889, P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 and P0977 are not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON. - The selector lever is other than N position.	The TCM detects the gear shift side lever position does not reach to a desired shift position continuously when shifting to desired gear.	- Faulty gear shift position sensor. - Faulty gear shift position sensor installation condition. - Faulty 1-3-5 or 2-4-6-R shift solenoid valve. - Faulty 1-3-5- or 2-4-6-R shift solenoid valve installation condition. - Faulty gear shift lever shaft. - Faulty gearshift control box. - Shift lever stuck. - Faulty gearshift clutch (stuck engage). - Transmission stuck.

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DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P0973	71	ON	Intermittently ON	2-4-6-R Shift Solenoid Valve Circuit High Voltage	- DTC P0889 is not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON.	The TCM detects a high voltage condition on the 2-4-6-R shift solenoid valve monitor circuit when the solenoid valve is commanded OFF.	- Solenoid valve voltage feed circuit is open circuit or high resistance. - Solenoid valve control circuit is open circuit or high resistance. - Solenoid valve ground circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty solenoid valve. - Faulty TCM.
P0974	71	ON	Intermittently ON	2-4-6-R Shift Solenoid Valve Circuit Low Voltage	- DTC P0889 is not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON.	The TCM detects a low voltage condition on the 2-4-6-R shift solenoid valve monitor circuit when the solenoid valve is commanded ON.	- Solenoid valve control circuit is short to ground. - Faulty solenoid valve. - Faulty TCM.
P0976	73	ON	Intermittently ON	1-3-5 Shift Solenoid Valve Circuit High Voltage	- DTC P0889 is not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON.	The TCM detects a high voltage condition on the 1-3-5 shift solenoid valve monitor circuit when the solenoid valve is commanded OFF.	- Solenoid valve voltage feed circuit is open circuit or high resistance. - Solenoid valve control circuit is short to battery or ignition voltage, open circuit or high resistance. - Solenoid valve ground circuit is open circuit or high resistance. - Poor harness connector connection. - Faulty solenoid valve. - Faulty TCM.
P0977	73	ON	Intermittently ON	1-3-5 Shift Solenoid Valve Circuit Low Voltage	- DTC P0889 is not set. - The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The gearshift control box relay is commanded ON.	The TCM detects a low voltage condition on the 1-3-5 shift solenoid valve monitor circuit when the solenoid valve is commanded ON.	- Solenoid valve control circuit is short to ground. - Faulty solenoid valve. - Faulty TCM.

DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
P1901	19	OFF	OFF	Clutch Adjustment Switch (Fast) Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The vehicle speed is more than 5 km/h (3 MPH).	The TCM detects that the half-clutch adjustment fast switch signal is stuck at the ON position (high voltage).	- Switch signal circuit is short to battery or ignition voltage. - Faulty switch. - Faulty TCM.
P1902	19	OFF	OFF	Clutch Adjustment Switch (Slow) Circuit	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF. - The vehicle speed is more than 5 km/h (3 MPH).	The TCM detects that the half-clutch adjustment slow switch signal is stuck at the ON position (high voltage).	- Switch signal circuit is short to battery or ignition voltage. - Faulty switch. - Faulty TCM.
U0100	42	ON	OFF	CAN-BUS Error	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the CAN Bus messages are not being received.	- CAN Low circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - CAN High circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - Faulty resistor 1. - Faulty resistor 2. - Faulty ECM. - Faulty DRM. - Faulty TCM. - Faulty EHCUC. - Electromagnetic interference and electrical noise.
U0121	68	OFF	OFF	ABS Signal Line Error	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the CAN Bus messages from the EHCUC are not being received.	- CAN Low circuit to the EHCUC is open circuit. - CAN High circuit to the EHCUC is open circuit. - Faulty resistor 1. - Faulty resistor 2. - Faulty ECM. - Faulty EHCUC. - Electromagnetic interference and electrical noise.

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DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
U0400	23	ON	OFF	Engine Speed Signal Error	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the engine speed CAN Bus messages from the ECM are not being received.	- Faulty crankshaft position sensor circuits. - Faulty camshaft position sensor circuits. - CAN Low circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - CAN High circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - Faulty resistor 1. - Faulty resistor 2. - Faulty ECM. - Faulty DRM. - Faulty TCM. - Faulty EHCUC. - Electromagnetic interference and electrical noise.
U0401	24	ON	OFF	Accelerator Sensor Signal Malfunction	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the accelerator pedal position CAN Bus messages from the ECM are not being received.	- Faulty accelerator pedal position sensor circuits. - CAN Low circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - CAN High circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - Faulty resistor 1. - Faulty resistor 2. - Faulty ECM. - Faulty DRM. - Faulty TCM. - Faulty EHCUC. - Electromagnetic interference and electrical noise.

DTC	Flash Code	W/L Status	Buzzer Status	DTC Name	Condition for Running the DTC	Condition for Setting the DTC	Possible Cause
U0406	25	ON	OFF	Vehicle Speed Signal Error	- The ignition switch is ON. - The ignition voltage is more than 20 volts. - The emergency switch is OFF.	The TCM detects that the vehicle speed CAN Bus messages from the ECM are not being received.	- Faulty vehicle speed sensor circuits. - CAN Low circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - CAN High circuit is short to battery or ignition voltage, short to ground, open circuit or high resistance. - Faulty resistor 1. - Faulty resistor 2. - Faulty ECM. - Faulty DRM. - Faulty TCM. - Faulty EHCUC. - Electromagnetic interference and electrical noise.

P0602**Description**

The transmission control module (TCM) has the ability to set a diagnostic trouble code (DTC) if it detects that there is no vehicle information programmed.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM inhibits gearshift control under certain conditions.

Condition for Clearing the DTC

- The TCM blinks the transmission warning lamp when the diagnostic runs and does not fail, and turns OFF the transmission warning lamp when the initial learning is completed.

- The TCM stops the buzzer when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids**Notice:**

- Production and service TCM does not require software programming when it is replaced except calibration software update. This DTC indicates that a production or service TCM did not program vehicle information and learn.

DTC P0602

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Step 4
3	Program and learn the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the programming?	—	Go to Step 4	—
4	1. Clear the DTCs with the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 5
5	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0605 (Flash Code 33)**Description**

This diagnostic applies to internal microprocessor integrity conditions within the transmission control module (TCM).

Condition for Setting the DTC

Either of following condition is met:

- The TCM detects a malfunction in its internal Random Access Memory (RAM).
- The TCM detects a calculated checksum does not agree with the TCM internal registered checksum.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM continuously sounds buzzer when the diagnostic runs and fails.
- The TCM inhibits transmission control.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- The TCM stops the buzzer when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

DTC P0605 (Flash Code 33)

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Step 4
3	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 4	—
4	1. Clear the DTCs with the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 5
5	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0613 (Flash Code 33)**Description**

This diagnostic applies to internal microprocessor integrity conditions within the transmission control module (TCM).

Condition for Setting the DTC

- The TCM detects a faulty learning data in the Electronically Erasable Programmable Read Only Memory (EEPROM).

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM continuously sounds buzzer when the diagnostic runs and fails.

- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- The TCM stops the buzzer when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

DTC P0613 (Flash Code 33)

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Step 4
3	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 4	—
4	1. Clear the DTCs with the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 5
5	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0710 (Flash Code 21)**Circuit Description**

The transmission fluid temperature (TFT) sensor is located on the oil pump assembly and soaked in the transmission fluid. The TFT sensor is a variable resistor. The TFT sensor has a signal circuit and a low reference circuit. The transmission control module (TCM) supplies 5 volts to the TFT sensor signal circuit and a ground for the TFT sensor low reference circuit. When the TFT is cold, the sensor resistance is high. When the TFT increases, the sensor resistance decreases. With high sensor resistance, the TCM detects a high voltage on the TFT sensor signal circuit. With lower sensor resistance, the TCM detects a lower voltage on the TFT sensor signal circuit. If the TCM detects an excessively low or high TFT signal voltage, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the TFT sensor signal voltage is less than 0.1 volts (more than 165°C [329°F]) or more than 4.9 volts (less than -50°C [-58°F]).

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM uses a TFT substitution of 50°C (122°F) for transmission control.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Use the Temperature vs. Resistance table to test the TFT sensor at various temperature levels to evaluate the possibility of a skewed sensor. A skewed sensor could result in poor driveability concerns.
- If this DTC is present, harsh garage shift appears when shifted from N to D or N to R.

DTC P0710 (Flash Code 21)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Transmission Fluid Temperature (TFT) Sensor parameter with the Tech 2. Notice: If the TFT sensor signal voltage is more than 4.9 volts, the TFT Sensor parameter on the Tech 2 indicates a default value when the ignition has been turned ON for longer than 5 seconds. Does the TFT Sensor parameter ever exceed the specified value within 5 seconds after the ignition switch is ON?	4.9 volts	Go to Step 4	Go to Step 3
3	Notice: If the TFT sensor signal is less than 0.1 volts, the TFT Sensor parameter on the Tech 2 indicates a default value when the ignition has been turned ON for longer than 5 seconds. Does the TFT Sensor parameter ever fall below the specified value within 5 seconds after the ignition switch is ON?	0.1 volts	Go to Step 14	Go to Diagnostic Aids

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Step	Action	Value(s)	Yes	No
4	1. Turn OFF the ignition. 2. Disconnect the in-line harness connector (J-237) near the starter motor. 3. Connect a DMM between the signal circuit of the TFT sensor harness (pin 2 of J-237 female connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	5.5 volts	Go to Step 5	Go to Step 6
5	Important: The TFT sensor may be damaged if the sensor signal circuit is shorted to a voltage source. 1. Test the signal circuit between the transmission control module (TCM) (pin 6 of B-427 connector) and the in-line connector (pin 2 of J-237 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18
6	1. Turn OFF the ignition. 2. Connect a test lamp between the signal circuit of the TFT sensor harness (pin 2 of J-237 female connector) and a known good ground. 3. Connect a DMM between the probe of the test lamp and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 10	Go to Step 7
7	1. Turn OFF the ignition. 2. Connect a DMM across the signal circuit and low reference circuit of the TFT sensor harness (pins 2 and 4 of J-237 female connector). 3. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 11	Go to Step 8
8	1. Test the signal circuit between the TCM (pin 6 of B-427 connector) and the in-line harness connector (pin 2 of J-237 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 9
9	1. Test the low reference circuit between the TCM (pin 12 of J-237 connector) and the in-line harness connector (pin 4 of J-237 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 12
10	1. Test the signal circuit between the TCM (pin 6 of B-427 connector) and the in-line harness connector (pin 2 of J-237 connector) for a short to any 5 volts reference circuit. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18

Step	Action	Value(s)	Yes	No
11	1. Turn OFF the ignition. 2. Inspect for an intermittent and for poor connections at the in-line harness connector (pins 2 and 4 of J-237 connector). 3. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 13
12	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for poor connections on the TFT sensor circuits at the harness connector of the TCM (pins 6 and 12 of B-427 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18
13	1. Remove the harness assembly from the oil pump. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Test the signal circuit between the TFT sensor and the in-line harness connector (pin 2 of J-237 connector) for the following conditions: • An open circuit • A short to the solenoid valve circuit • High resistance 3. Test the low reference circuit between the TFT sensor and the in-line harness connector (pin 4 of J-237 connector) for an open circuit or high resistance. 4. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 17
14	1. Turn OFF the ignition. 2. Disconnect the in-line harness connector (J-237) near the starter motor. 3. Connect a DMM between the signal circuit of the TFT sensor harness (pin 2 of J-237 female connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 16	Go to Step 15
15	1. Test the signal circuit between the TCM (pin 6 of B-427 connector) and the in-line harness connector (pin 2 of J-237 connector) for a short to ground or short to the low reference circuit. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18
16	1. Test the signal circuit between the TFT sensor and the in-line harness connector (pin 2 of J-237 connector) for a short to ground or short to the low reference circuit. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 17
17	Replace the TFT sensor. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. (TFT sensor is part of the harness assembly) Did you complete the replacement?	—	Go to Step 19	—

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Step	Action	Value(s)	Yes	No
18	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 19	—
19	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 20
20	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0715 (Flash Code 3)**Circuit Description**

The turbine speed sensor is located on right-hand side of the fluid coupling housing. The turbine speed sensor is a magnetic coil type sensor, which generates an AC signal voltage based on the gearshift multi-plate clutch rotational speed that is part of the sub-hub assembly attached to the fluid coupling turbine by spline. (30 pulses per a rotation of the gearshift multi-plate clutch) If the transmission control module (TCM) detects no turbine speed sensor signal during the lock up clutch is engaged, this DTC will set.

Condition for Running the DTC

- DTCs P0721, P0726, U0400 and U0406 are not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The engine is running.
- The lock up clutch is commanded engage.

Condition for Setting the DTC

- The TCM detects that the turbine speed sensor pulses are not generated during lock up control.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Electrical or magnetic interference may affect intermittent condition.
- Ensure the sensor is tight and the gearshift multi-plate clutch case is not damaged.
- If this DTC is present, harsh garage shift appears when shifted from N to D or N to R.

DTC P0715 (Flash Code 3)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Place the transmission in neutral and set the parking brake. 4. Start the engine. 5. Observe the Turbine Speed parameter with the Tech 2 while accelerating the engine between idle and W.O.T. (accelerator pedal full travel). Does the Turbine Speed parameter increase in accordance with an engine speed increase?	—	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the turbine speed sensor harness connector. 3. Connect a DMM across the turbine speed sensor terminals. 4. Measure the resistance across the turbine speed sensor. Does the turbine speed sensor resistance measure within the specified range?	1.0 - 2.5k Ω	Go to Step 4	Go to Step 16

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Step	Action	Value(s)	Yes	No
4	1. Connect a DMM across the turbine speed sensor terminals (measure sensor output voltage). 2. Place the DMM on the AC volt scale. 3. Start the engine. 4. Monitor the DMM while accelerating the engine between idle and W.O.T. (accelerator pedal full travel). Does the DMM indicate an AC voltage increase in accordance with an engine speed increase?	—	Go to Step 5	Go to Step 15
5	1. Connect a DMM between the signal circuit of the turbine speed sensor harness (pin 2 of J-232 connector) and a known good ground. 2. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	5.5 volts	Go to Step 9	Go to Step 6
6	Is the DMM voltage more than the specified value at Step 5?	4.5 volts	Go to Step 7	Go to Step 11
7	1. Connect a test lamp between the signal circuit of the turbine speed sensor harness (pin 2 of J-232 connector) and a known good ground. 2. Connect a DMM between the probe of the test lamp and a known good ground. 3. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 10	Go to Step 8
8	1. Connect a DMM across the signal circuit and the low reference circuit of the turbine speed sensor harness (pins 1 and 2 of J-232 connector). 2. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 13	Go to Step 12
9	Important: The turbine speed sensor may be damaged if the sensor signal circuit is shorted to a voltage source. 1. Test the signal circuit between the transmission control module (TCM) (pin 4 of B-427 connector) and the turbine speed sensor connector (pin 2 of J-232 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 17
10	1. Test the signal circuit between the TCM (pin 4 of B-427 connector) and the turbine speed sensor harness connector (pin 2 of J-232 connector) for a short to any 5 volts reference circuit. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 17

Step	Action	Value(s)	Yes	No
11	- Test the signal circuit between the TCM (pin 4 of B-427 connector) and the turbine speed sensor harness connector (pin 2 of J-232 connector) for the following conditions: - An open circuit - A short to ground - A short to the low reference - High resistance - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 14
12	- Test the low reference circuit between the TCM (pin 10 of B-427 connector) and the turbine speed sensor harness connector (pin 1 of J-232 connector) for an open circuit or high resistance. - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 14
13	- Turn OFF the ignition. - Inspect for an intermittent and for poor connections at the harness connector of the turbine speed sensor (pins 1 and 2 of J-232 connector). - Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 15
14	- Turn OFF the ignition. - Disconnect the TCM harness connector. - Inspect for an intermittent and for poor connections on the turbine speed sensor circuits at the harness connector of the TCM (pins 4 and 10 of B-427 connector). - Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 17
15	- Remove the turbine speed sensor. Refer to Turbine Speed Sensor Replacement in this section. - Visually inspect the turbine speed sensor for the following conditions: - Physical damage - Loose or improper installation - The following conditions may cause this DTC to set: - Excessive air gap between the turbine speed sensor and the gearshift multi-plate clutch case - Electromagnetic interference in the turbine speed sensor circuits - Foreign material passing between the turbine speed sensor and the gearshift multi-plate clutch case Did you find and correct the condition?	—	Go to Step 18	Go to Step 16
16	Replace the turbine speed sensor. Refer to Turbine Speed Sensor Replacement in this section. Did you complete the replacement?	—	Go to Step 18	—

7A-80 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
17	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 18	—
18	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 19
19	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0717 (Flash Code 2)**Circuit Description**

The input shaft speed sensor is located on left-hand side of the transmission housing. The input shaft speed sensor is a magnetic coil type sensor, which generates an AC signal voltage based on the counter shaft rotational speed. If the transmission control module (TCM) detects no input shaft speed sensor signal during the vehicle running, this DTC will set.

Condition for Running the DTC

- DTCs P0715, P0718, P0721, P0726, U0400 and U0406 are not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The engine is running.
- The turbine speed is more than 500 RPM.
- The vehicle speed is more than 10 km/h (6 MPH).
- The gearshift clutch is commanded engage.

Condition for Setting the DTC

- The TCM detects that the input shaft speed sensor pulses are not generated during vehicle running.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Electrical or magnetic interference may affect intermittent condition.
- Ensure the sensor is tight and the counter shaft is not damaged.
- If this DTC is present, poor shift quality (feel) will appear.

Notice:

- If this DTC is present, the Input Shaft Speed parameter on the Tech 2 will indicate estimated value based on other inputs.

DTC P0717 (Flash Code 2)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run within the Conditions for Running the DTC. 5. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the input shaft speed sensor harness connector. 3. Connect a DMM across the input shaft speed sensor terminals. 4. Measure the resistance across the turbine speed sensor. Does the input shaft speed sensor resistance measure within the specified range?	1.5 - 3.5kΩ	Go to Step 4	Go to Step 16

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Step	Action	Value(s)	Yes	No
4	1. Connect a DMM across the input shaft speed sensor terminals (measure sensor output voltage). 2. Place the DMM on the AC volt scale. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run with a fixed gear. 5. Monitor the DMM while accelerating the engine. Does the DMM indicate an AC voltage increase in accordance with an engine speed increase?	—	Go to Step 5	Go to Step 15
5	1. Connect a DMM between the signal circuit of the input shaft speed sensor harness (pin 2 of J-139 connector) and a known good ground. 2. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	5.5 volts	Go to Step 9	Go to Step 6
6	Is the DMM voltage more than the specified value at Step 5?	4.5 volts	Go to Step 7	Go to Step 11
7	1. Connect a test lamp between the signal circuit of the input shaft speed sensor harness (pin 2 of J-139 connector) and a known good ground. 2. Connect a DMM between the probe of the test lamp and a known good ground. 3. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 10	Go to Step 8
8	1. Connect a DMM across the signal circuit and the low reference circuit of the input shaft speed sensor harness (pins 1 and 2 of J-139 connector). 2. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 13	Go to Step 12
9	Important: The input shaft speed sensor may be damaged if the sensor signal circuit is shorted to a voltage source. 1. Test the signal circuit between the transmission control module (TCM) (pin 5 of B-427 connector) and the input shaft speed sensor connector (pin 2 of J-139 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 17
10	1. Test the signal circuit between the TCM (pin 5 of B-427 connector) and the input shaft speed sensor harness connector (pin 2 of J-139 connector) for a short to any 5 volts reference circuit. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 17

Step	Action	Value(s)	Yes	No
11	- Test the signal circuit between the TCM (pin 5 of B-427 connector) and the input shaft speed sensor harness connector (pin 2 of J-139 connector) for the following conditions: - An open circuit - A short to ground - A short to the low reference - High resistance - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 14
12	- Test the low reference circuit between the TCM (pin 11 of B-427 connector) and the input shaft speed sensor harness connector (pin 1 of J-139 connector) for an open circuit or high resistance. - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 14
13	- Turn OFF the ignition. - Inspect for an intermittent and for poor connections at the harness connector of the input shaft speed sensor (pins 1 and 2 of J-139 connector). - Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 15
14	- Turn OFF the ignition. - Disconnect the TCM harness connector. - Inspect for an intermittent and for poor connections on the input shaft speed sensor circuits at the harness connector of the TCM (pins 5 and 11 of B-427 connector). - Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 17
15	- Remove the input shaft speed sensor. Refer to Input Shaft Speed Sensor Replacement in this section. - Visually inspect the input shaft speed sensor for the following conditions: - Physical damage - Loose or improper installation - The following conditions may cause this DTC to set: - Excessive air gap between the input shaft speed sensor and the counter shaft - Electromagnetic interference in the input shaft speed sensor circuits - Foreign material passing between the input shaft speed sensor and the counter shaft Did you find and correct the condition?	—	Go to Step 18	Go to Step 16
16	Replace the input shaft speed sensor. Refer to Input Shaft Speed Sensor Replacement in this section. Did you complete the replacement?	—	Go to Step 18	—

7A-84 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
17	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 18	—
18	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run within the Conditions for Running the DTC. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 19
19	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0718 (Flash Code 17)**Circuit Description**

The gearshift clutch pulse width modulation (PWM) solenoid valve is located on the oil pump assembly. It controls the transmission fluid supply to the gearshift clutch control spool valve. The transmission control module (TCM) controls the gearshift clutch solenoid valve by duty cycle signal based on vehicle running condition. Since normally open type solenoid valve is used, the gearshift clutch control spool valve moves by the applied fluid pressure when the TCM turns OFF the gearshift clutch solenoid valve under the certain condition. Then the gearshift multi-plate clutch engagement pressure circuit connects with the line pressure circuit. At the same time, the gearshift multi-plate clutch is engaged. The TCM detects the actual state of the gearshift clutch solenoid valve by the slip speed of the gearshift clutch based on the turbine speed sensor signal and input shaft speed sensor signal inputs. If the TCM detects an excessively low input shaft speed in comparison to turbine speed, this DTC will set.

Condition for Running the DTC

- DTCs P0715 and P0717 are not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the input shaft speed is less than the turbine speed 300 RPM or more when the gearshift clutch is commanded engage.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Ensure the input shaft speed sensor is tight and the counter shaft is not damaged.
- If this DTC is present, gearshift clutch slipping feel will appear.

DTC P0718 (Flash Code 17)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Inspect for correct ATF level. Refer to ATF inspection in this section. 2. Inspect for external leakage. Did you find and correct the condition?	—	Go to Step 10	Go to Step 3
3	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run within the Conditions for Running the DTC. 5. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC P0715, P0717, P0902 or P0903 set?	—	Go to Applicable DTC	Go to Step 4
4	Let the vehicle run while observing the Turbine Speed and Input Shaft Speed parameter with the Tech 2. Is the Input Shaft Speed parameter less than the Turbine Speed 300 RPM or more?	—	Go to Step 5	Go to Diagnostic Aids
5	Test the line pressure. Refer to line pressure test in this section. Does the line pressure within the specified value?	—	Go to Step 7	Go to Step 6

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Step	Action	Value(s)	Yes	No
6	1. Inspect oil strainer for clogging. Repair Instructions (Overhaul) - Oil Filter in this section. 2. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 8
7	1. Remove the input shaft speed sensor. Refer to Input Shaft Speed Sensor Replacement in this section. 2. Visually inspect the input shaft speed sensor for the following conditions: • Physical damage • Loose or improper installation 3. The following conditions may cause this DTC to set: • Excessive air gap between the input shaft speed sensor and the counter shaft • Electromagnetic interference in the input shaft speed sensor circuits • Foreign material passing between the input shaft speed sensor and the counter shaft 4. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 8
8	1. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Inspect the oil pump and gearshift clutch for the following conditions: • The oil pump for damage • The gearshift clutch solenoid valve for mechanically stuck or leaking • The clutch spool valve mechanically stuck or leaking • The gasket or seal leaking or worn • The band brake mechanically stuck 3. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 9
9	Important: Replacement gearshift clutch assembly must be learned. Replace the gearshift clutch assembly. Refer to Repair Instructions (Overhaul) - Gearshift Clutch Replacement in this section. Did you complete the replacement?	—	Go to Step 10	—
10	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run while observing the Turbine Speed and Input Shaft Speed parameter with the Tech 2. Is the Input Shaft Speed parameter less than the Turbine Speed 300 RPM or more?	—	Go to Step 2	Go to Step 11

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Step	Action	Value(s)	Yes	No
11	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0721 (Flash Code 26)**Circuit Description**

The output shaft speed sensor that is called vehicle speed sensor (VSS) is located on the transmission rear housing and is used by the engine control module (ECM), transmission control module (TCM) and speedometer, which generates a speed signal from the transmission output shaft. The output shaft speed sensor uses a hall effect element. It interacts with the magnetic field created by the rotating magnet and outputs square wave pulse signal. The ECM calculates the vehicle speed by the output shaft speed sensor and calculated vehicle speed sent to the TCM via a controller area network (CAN) communication bus. If the TCM detects no output shaft speed sensor signal from the ECM during the vehicle running, this DTC will set.

Condition for Running the DTC

- DTCs P0717, P0904, P0914 and U0100 are not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The input shaft speed is more than 1500 RPM.
- The current gear is other than neutral.

Condition for Setting the DTC

- The TCM detects that the output shaft speed is less than 30 RPM during the vehicle running.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM inhibits auto shift control.
- The TCM selects highest gear when shifted from N to D.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Electrical or magnetic interference may affect intermittent condition.

Notice:

- If this DTC is present, the Output Shaft Speed and Vehicle Speed parameters on the Tech 2 will indicate estimated value based on other inputs.

DTC P0721 (Flash Code 26)

Schematic Reference: Engine Controls Schematics and Transmission Controls Schematics

Connector End View Reference: Engine Controls Connector End Views, Engine Control Module (ECM) Connector End Views, Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC U0100, U0121 or U0406 set?	—	Go to Applicable DTC	Go to Step 3
3	1. Select the "4HK1" in the system selection menu. 2. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is the engine control module (ECM) DTC P0500 or P0501 set?	—	Go to Applicable DTC in Engine Control Section	Go to Step 4
4	1. Drive the vehicle. 2. Select the data display function of ECM. 3. Observe the Vehicle Speed parameter with the Tech 2. Does the Vehicle Speed parameter indicate correct vehicle speed?	—	Go to Diagnostic Aids	Go to Step 5

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Inspect the Meter (10A) fuse (F-16) in the glove box fuse block. Is the Meter (10A) fuse (F-16) open?	—	Go to Step 6	Go to Step 7
6	Replace the Meter (10A) fuse (F-16). If the fuse continues to open, repair the short to ground on one of the circuits that fed by the Meter (10A) fuse (F-16) or replace the shorted attached component fed by the Meter (10A) fuse (F-16). Did you complete the repair?	—	Go to Step 18	—
7	1. Remove the output shaft speed sensor. Refer to Output Shaft Speed Sensor replacement in the section. 2. Visually inspect the output shaft speed sensor for the following conditions: • Physical damage • Being loose • Improper installation • For transmission output shaft teeth damage 3. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 8
8	1. Turn OFF the ignition. 2. Disconnect the output shaft speed sensor harness connector. 3. Connect a test lamp between the ignition voltage feed circuit of the output shaft speed sensor harness (pin 1 of J-32 connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 9	Go to Step 11
9	1. Keep the ignition switch ON. 2. Connect a test lamp between the low reference circuit of the output shaft speed sensor harness (pins 2 of J-32 connector) and battery voltage. Does the test lamp illuminate?	—	Go to Step 10	Go to Step 12
10	1. Turn ON the ignition, with the engine OFF. 2. Intermittently jump the signal circuit of the output shaft speed sensor (pin 3 of J-32 connector) with a test lamp that is connected to 12 volts (apply from a battery) while monitoring the Vehicle Speed parameter with the Tech 2. Does the Tech 2 indicate any vehicle speed when the circuit is intermittently pulled to 12 volts?	—	Go to Step 14	Go to Step 13
11	Repair the open circuit or high resistance on the output shaft speed sensor ignition voltage feed circuit between the output shaft speed sensor (pin 1 of J-32 connector) and the Meter (10A) fuse (F-16). Did you complete the repair?	—	Go to Step 18	—

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Step	Action	Value(s)	Yes	No
12	Repair the open or high resistance in the output shaft speed sensor low reference circuit between the output shaft speed sensor (pin 2 of J-32 connector) and ground terminal. Did you complete the repair?	—	Go to Step 18	—
13	1. Test the output shaft speed sensor signal circuit between the engine control module (ECM) (pin 19 of J-191 connector) and the output shaft speed sensor (pin 3 of J-32 connector), then between the instrument panel cluster (IPC) (pin 17 of B-52 connector) and the output shaft speed sensor (pin 3 of J-32 connector) for the following conditions: • An open circuit • A short to ground • A short to battery or ignition voltage • High resistance 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 15
14	1. Turn OFF the ignition. 2. Disconnect the output shaft speed sensor harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the output shaft speed sensor (pin 1, 2 and 3 of J-32 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 16
15	1. Turn OFF the ignition. 2. Disconnect the ECM J-191 harness connector. 3. Inspect for an intermittent and for a poor connection on the output shaft speed sensor signal circuit at the harness connector of the ECM (pin 19 of J-191 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 18	Go to Step 17
16	Replace the output shaft speed sensor. Refer to Output Shaft Speed Sensor Replacement in this section. Did you complete the replacement?	—	Go to Step 18	—
17	Important: Replacement ECM must be programmed. Replace the ECM. Refer to Engine Control Module (ECM) Replacement /Restore Fuel Injector ID Code Data in engine control section. Did you complete the replacement?	—	Go to Step 18	—

Step	Action	Value(s)	Yes	No
18	1. Reconnect all previously disconnected fuse or harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Drive the vehicle. 5. Select the data display function of ECM. 6. Observe the Vehicle Speed parameter with the Tech 2. Does the Vehicle Speed parameter indicate correct vehicle speed?	—	Go to Step 19	Go to Step 5
19	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0726 (Flash Code 16)**Circuit Description**

The lock up clutch (ON/OFF) solenoid valve is located on the oil pump assembly. It controls the transmission fluid supply to the lock up clutch control spool valve. The transmission control module (TCM) controls the lock up solenoid valve by ON/OFF signal based on vehicle running condition. The TCM turns ON the lock up solenoid valve when the certain condition has been met. Then the lock up clutch control spool valve moves by the applied fluid pressure. The lock up engagement pressure circuit connects with the line pressure circuit, and the lock up clutch disengage pressure circuit connects to the drain circuit. The lock up clutch engagement pressure is nearly equal with the line pressure. At the same time, the lock up clutch is pressed to the fluid coupling front cover and then the fluid coupling is locked. The TCM detects the actual state of the lock up clutch solenoid valve by the slip speed of the lock up clutch based on the engine speed and turbine speed sensor signal inputs. If the TCM detects an excessively low turbine speed in comparison to engine speed, this DTC will set.

Condition for Running the DTC

- DTCs P0715, P0740, P0742 and U0400 are not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the turbine speed is less than the engine speed 300 RPM or more when the lock up clutch is commanded engage.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Ensure the turbine speed sensor is tight and the gearshift multi-plate clutch case is not damaged.
- If this DTC is present, lock up clutch slipping feel will appear.

DTC P0726 (Flash Code 16)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Inspect for correct ATF level. Refer to ATF inspection in this section. 2. Inspect for external leakage. Did you find and correct the condition?	—	Go to Step 10	Go to Step 3
3	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run within the Conditions for Running the DTC. 5. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC P0715, P0740, P0742 or U0400 set?	—	Go to Applicable DTC	Go to Step 4
4	1. Let the vehicle run so that lock up may operate enough. 2. Observe the Engine Speed and Turbine Speed parameter with the Tech 2. Is the Turbine Speed parameter less than the Engine Speed 300 RPM or more?	—	Go to Step 5	Go to Diagnostic Aids

Step	Action	Value(s)	Yes	No
5	Test the line pressure. Refer to line pressure test in this section. Does the line pressure within the specified value?	—	Go to Step 7	Go to Step 6
6	1. Inspect oil strainer for clogging. Repair Instructions (Overhaul) - Oil Filter in this section. 2. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 8
7	1. Remove the turbine speed sensor. Refer to Turbine Speed Sensor Replacement in this section. 2. Visually inspect the turbine speed sensor for the following conditions: • Physical damage • Loose or improper installation 3. The following conditions may cause this DTC to set: • Excessive air gap between the turbine speed sensor and the gearshift multi-plate clutch case • Electromagnetic interference in the turbine speed sensor circuits • Foreign material passing between the turbine speed sensor and the gearshift multi-plate clutch case 4. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 8
8	1. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Inspect the oil pump and gearshift clutch for the following conditions: • The oil pump for damage • The lock up clutch solenoid valve for mechanically stuck or leaking • The lock up clutch spool valve mechanically stuck or leaking • The gasket or seal leaking or worn • The gearshift multi-plate clutch for damage 3. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 9
9	Replace the fluid coupling assembly. Refer to Repair Instructions (Overhaul) - Fluid Coupling Replacement in this section. Did you complete the replacement?	—	Go to Step 10	—

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Step	Action	Value(s)	Yes	No
10	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run so that lock up may operate enough. 6. Observe the Engine Speed and Turbine Speed parameter with the Tech 2. Is the Turbine Speed parameter less than the Engine Speed 300 RPM or more?	—	Go to Step 2	Go to Step 11
11	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0740 (Flash Code 67)**Circuit Description**

The lock up clutch (ON/OFF) solenoid valve is located on the oil pump assembly. It controls the transmission fluid supply to the lock up clutch control spool valve. The transmission control module (TCM) controls the lock up solenoid valve by ON/OFF signal based on vehicle running condition. The TCM turns ON the lock up solenoid valve when the certain condition has been met. Then the lock up clutch control spool valve moves by the applied fluid pressure. The lock up engagement pressure circuit connects with the line pressure circuit, and the lock up clutch disengage pressure circuit connects to the drain circuit. The lock up clutch engagement pressure is nearly equal with the line pressure. At the same time, the lock up clutch is pressed to the fluid coupling front cover and then the fluid coupling is locked. The TCM monitors the lock up clutch solenoid valve operating status through the feedback circuit. If the TCM detects a high voltage condition on the lock up clutch solenoid valve control circuit when the solenoid valve is commanded OFF, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The smoother main relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a high voltage condition on the lock up clutch solenoid valve control circuit when the solenoid valve is commanded OFF.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- If this DTC is present, deteriorated vehicle starting feel will appear.

DTC P0740 (Flash Code 67)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the in-line harness connector (J-237) near the starter motor. 3. Connect a DMM between the control circuit of the lock up clutch solenoid valve harness (pin 1 of J-237 female connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	18.0 volts	Go to Step 4	Go to Step 5
4	1. Connect a test lamp between the control circuit of the lock up clutch solenoid valve harness (pin 1 of J-237 female connector) and a known good ground. 2. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 6	Go to Step 7

7A-96 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
5	1. Test the control circuit of the lock up clutch solenoid valve between the transmission control module (TCM) (pin 29 of B-425 connector) and the in-line harness connector (pin 1 of J-237 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 8
6	1. Test the control circuit of the lock up clutch solenoid valve between the TCM (pin 29 of B-425 connector) and the in-line harness connector (pin 1 of J-237 connector) for the following conditions: • A short to battery or ignition voltage • A short to the gearshift clutch solenoid valve control circuit 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 11
7	1. Turn OFF the ignition. 2. Inspect for an intermittent and for a poor connection at the in-line harness connector (pin 1 of J-237 connector). 3. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 9
8	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the lock up clutch solenoid valve circuit at the harness connector of the TCM (pin 29 of B-425 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 11
9	1. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Inspect for an intermittent and for a poor connection at the harness connector of the lock up clutch solenoid valve. 3. Inspect the lock up clutch solenoid valve for loose bolt. 4. Test the control circuit of the lock up clutch solenoid valve between the lock up clutch solenoid valve and the in-line harness connector (pin 1 of J-237 connector) for the following conditions: • An open circuit • A short to the gearshift clutch solenoid valve control circuit • High resistance 5. Repair the circuit(s), connection(s) or tightness as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 10
10	Replace the lock up clutch solenoid valve. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. Did you complete the replacement?	—	Go to Step 12	—

Step	Action	Value(s)	Yes	No
11	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 12	—
12	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Step 13
13	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0742 (Flash Code 67)**Circuit Description**

The lock up clutch (ON/OFF) solenoid valve is located on the oil pump assembly. It controls the transmission fluid supply to the lock up clutch control spool valve. The transmission control module (TCM) controls the lock up solenoid valve by ON/OFF signal based on vehicle running condition. The TCM turns ON the lock up solenoid valve when the certain condition has been met. Then the lock up clutch control spool valve moves by the applied fluid pressure. The lock up engagement pressure circuit connects with the line pressure circuit, and the lock up clutch disengage pressure circuit connects to the drain circuit. The lock up clutch engagement pressure is nearly equal with the line pressure. At the same time, the lock up clutch is pressed to the fluid coupling front cover and then the fluid coupling is locked. The TCM monitors the lock up clutch solenoid valve operating status through the feedback circuit. If the TCM detects a low voltage condition on the lock up clutch solenoid valve control circuit when the solenoid valve is commanded ON, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The smoother main relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a low voltage condition on the lock up clutch solenoid valve control circuit when the solenoid valve is commanded ON.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM commands OFF the lock up clutch solenoid valve.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- If this DTC is present, lock up clutch does not engage and excessive slip feel will appear.

DTC P0742 (Flash Code 67)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run so that lock up may operate enough. 5. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the in-line harness connector (J-237) near the starter motor. 3. Connect a DMM between the control circuit of the lock up clutch solenoid valve harness (pin 1 of J-237 female connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	18.0 volts	Go to Step 5	Go to Step 4

Step	Action	Value(s)	Yes	No
4	1. Test the control circuit of the lock up clutch solenoid valve between the transmission control module (TCM) (pin 29 of B-425 connector) and the in-line harness connector (pin 1 of J-237 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 7
5	1. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Test the control circuit of the lock up clutch solenoid valve between the lock up clutch solenoid valve and the in-line harness connector (pin 2 of J-237 connector) for the following conditions: • A short to ground • A short to the transmission fluid temperature (TFT) sensor low reference circuit 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 6
6	Replace the lock up clutch solenoid valve. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. Did you complete the replacement?	—	Go to Step 8	—
7	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 8	—
8	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run so that lock up may operate enough. 6. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Step 9
9	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0851 (Flash Code 6)**Circuit Description**

The neutral switch is installed on the transmission gearshift control box. When the gear position is neutral, the switch is closed and the switch signal is provided to the transmission control module (TCM). If the TCM detects the neutral switch signal is stuck OFF (open) when the current gear is neutral based on the gear shift position sensor input.

Condition for Running the DTC

- DTC P0914 is not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the neutral switch signal is continuously OFF (other than neutral) when the current gear is neutral.

Action Taken When the DTC Sets

- The TCM does not illuminate the transmission warning lamp when the diagnostic runs and fails.

- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Ensure the gear shift position sensor is tight and the sensor shaft is not damaged.

Notice:

- If this DTC is present, engine will not crank except applying the brake pedal or parking brake.

DTC P0851 (Flash Code 6)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. Notice: If the engine does not crank, apply the brake pedal or parking brake. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run so that all gear may engage enough. 6. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC P0914, P0915 or P0919 also set?	—	Go to Applicable DTC	Go to Step 3
3	Observe the Neutral Switch parameter with the Tech 2 while changing the gear between neutral and other positions. Does the Tech 2 indicate Neutral when the current gear is neutral and In Gear when other than the neutral?	—	Go to Diagnostic Aids	Go to Step 4

Step	Action	Value(s)	Yes	No
4	1. Turn OFF the ignition. 2. Disconnect the neutral switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Neutral Switch parameter with the Tech 2 while momentarily jumping across the neutral switch harness connectors between pins 1 and 2 of J-50 connector. Does the Tech 2 indicate Neutral when the circuit is jumped and In Gear when the circuit is not jumped?	—	Go to Step 8	Go to Step 5
5	1. Connect a test lamp between the ignition voltage feed circuit of the neutral switch harness (pin 2 of J-50 connector) and a known good ground. 2. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 7	Go to Step 6
6	Repair the open circuit or high resistance on the voltage feed circuit between the ENG (IG) (10A) fuse (F-9) (in the glove box fuse block) and the neutral switch (pin 2 of J-50 connector). Check the ENG (IG) (10A) fuse (F-9) first. Did you complete the repair?	—	Go to Step 13	—
7	1. Test the neutral switch signal circuit between the transmission control module (TCM) (pin 10 of B-428 connector) and the neutral switch (pin 1 of J-50 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 9
8	1. Turn OFF the ignition. 2. Inspect for an intermittent and for poor connections at the harness connectors of the neutral switch (pins 1 and 2 of J-50 connector). 3. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 10
9	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the neutral switch circuit at the harness connector of the TCM (pin 10 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12

7A-102 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
10	1. Remove the neutral switch. Refer to Neutral Switch Replacement in this section. 2. Visually inspect the neutral switch for the following conditions: • Physical damage • Loose or improper installation 3. Remove the gear shift position sensor. Refer to Gear Shift Position Sensor Replacement in this section. 4. Visually inspect the gear shift position sensor for the following conditions: • Physical damage • Loose or improper installation 5. Visually inspect the shift lever shaft to the gear shift position sensor shaft for damage. 6. Remove the transmission gearshift control box assembly from the transmission main unit. Refer to Repair Instructions (Overhaul) - Control Box in this section. 7. Visually inspect the neutral position detection lever for damage that contacts to the neutral switch. Did you find and correct the condition?	—	Go to Step 13	Go to Step 11
11	Replace the neutral switch. Refer to Neutral Switch Replacement in this section. Did you complete the replacement?	—	Go to Step 13	—
12	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 13	—
13	1. Reconnect all previously disconnected fuse or harness connector(s). 2. Clear the DTCs with the Tech 2. Important: Transmission Gear Select & Shift Position Learning must be done if the gear shift position sensor or transmission gearshift control box is replaced, removed or repaired. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Observe the Neutral Switch parameter with the Tech 2 while changing gear between neutral and other positions. Does the Tech 2 indicate Neutral when the current gear is neutral and In Gear when other than the neutral?	—	Go to Step 14	Go to Step 2
14	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0852 (Flash Code 7)**Circuit Description**

The neutral switch is installed on the transmission gearshift control box. When the gear position is neutral, the switch is closed and the switch signal is provided to the transmission control module (TCM). If the TCM detects the neutral switch signal is stuck ON (closed) condition when the current gear is other than neutral based on the gear shift position sensor input.

Condition for Running the DTC

- DTC P0914 is not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the neutral switch signal is continuously ON (neutral) when the current gear is other than neutral.

Action Taken When the DTC Sets

- The TCM does not illuminate the transmission warning lamp when the diagnostic runs and fails.

- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Ensure the gear shift position sensor is tight and the sensor shaft is not damaged.

Notice:

- If this DTC is present, engine may not crank except applying the brake pedal or parking brake.

DTC P0852 (Flash Code 7)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. Notice: If the engine does not crank, apply the brake pedal or parking brake. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run so that all gear may engage enough. 6. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC P0914, P0915 or P0919 also set?	—	Go to Applicable DTC	Go to Step 3
3	Observe the Neutral Switch parameter with the Tech 2 while changing the gear between neutral and other positions. Does the Tech 2 indicate Neutral when the current gear is neutral and In Gear when other than the neutral?	—	Go to Diagnostic Aids	Go to Step 4
4	1. Turn OFF the ignition. 2. Disconnect the neutral switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Neutral Switch parameter with the Tech 2. Does the Tech 2 indicate In Gear?	—	Go to Step 6	Go to Step 5

7A-104 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
5	1. Test the neutral switch input signal circuit between the transmission control module (TCM) (pin 10 of B-428 connector) and the neutral switch (pin 1 of J-50 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 9	Go to Step 8
6	1. Remove the neutral switch. Refer to Neutral Switch Replacement in this section. 2. Visually inspect the neutral switch for the following conditions: • Physical damage • Loose or improper installation 3. Remove the gear shift position sensor. Refer to Gear Shift Position Sensor Replacement in this section. 4. Visually inspect the gear shift position sensor for the following conditions: • Physical damage • Loose or improper installation 5. Visually inspect the shift lever shaft to the gear shift position sensor shaft for damage. 6. Remove the transmission gearshift control box assembly from the transmission main unit. Refer to Repair Instructions (Overhaul) - Control Box in this section. 7. Visually inspect the neutral position detection lever for damage that contacts to the neutral switch. Did you find and correct the condition?	—	Go to Step 9	Go to Step 7
7	Replace the neutral switch. Refer to Neutral Switch Replacement in this section. Did you complete the replacement?	—	Go to Step 9	—
8	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 9	—
9	1. Reconnect all previously disconnected fuse or harness connector(s). 2. Clear the DTCs with the Tech 2. Important: Transmission Gear Select & Shift Position Learning must be done if the gear shift position sensor or transmission gearshift control box is replaced, removed or repaired. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Observe the Neutral Switch parameter with the Tech 2 while changing gear between neutral and other positions. Does the Tech 2 indicate Neutral when the current gear is neutral and In Gear when other than the neutral?	—	Go to Step 10	Go to Step 2

Step	Action	Value(s)	Yes	No
10	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0885 (Flash Code 38)**Circuit Description**

The smoother main relay is energized to feed the battery voltage to the TCM through the relay switch side when the TCM receives an ignition voltage switch ON signal. When the ignition switch is OFF, the smoother main relay is de-energized after a certain length of time passed.

If the TCM detects the smoother main relay is turned OFF when the relay is commanded ON, this DTC will set. (Open stuck DTC)

If the TCM detects the TCM has been ON when the relay is commanded OFF, this DTC will also set. (Close stuck DTC)

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC**Open stuck DTC**

- The TCM detects a low voltage condition on the smoother main relay voltage feed circuit when the relay is commanded ON.

Close stuck DTC

- The TCM detects a high voltage condition on the smoother main relay voltage feed circuit when the relay is commanded OFF.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM continuously sounds buzzer when the diagnostic runs and fails. (Open stuck DTC)
- The TCM inhibits gearshift control. (Open stuck DTC)
- The TCM holds gear position.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- The TCM stops the buzzer when the diagnostic runs and does not fail. (Open stuck DTC)
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Faulty or sticking smoother main relay will set this DTC.

DTC P0885 (Flash Code 38)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition for 30 seconds. 2. Replace the smoother main relay with the dimmer relay or replace with a known good relay. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 4	Go to Step 11
4	1. Turn ON the ignition, with the engine OFF. 2. Observe the Main Relay Voltage Feed Circuit parameter with the Tech 2. Does the Main Relay Voltage Feed Circuit parameter indicate ON?	—	Go to Step 8	Go to Step 5

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Remove the smoother main relay. 3. Probe the battery voltage feed circuit of the smoother main relay (pins 2 and 3 of X-5 connector) with a test lamp that is connected to a known good ground. Does the test lamp illuminate?	—	Go to Step 6	Go to Step 7
6	1. Turn OFF the ignition. 2. Inspect for an intermittent, for poor connections and corrosion at the harness connector of the smoother main relay (pins 1, 2, 3 and 5 of X-5 connector). 3. Disconnect the transmission control module (TCM) harness connector. 4. Inspect for an intermittent, for poor connections and corrosion on the smoother main relay control and voltage feed circuit at the harness connector of the TCM (pin 15 of B-425 and 3 of B-426 connector). 5. Test for high resistance on each smoother main relay circuit. 6. Repair the connection(s) or circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12
7	Repair the open circuit or high resistance on the battery voltage feed circuit between the NEES (B) (10A) fuse (F-13) in the glove box fuse block and the smoother main relay (pins 2 and 3 of X-5 connector) (which ever test lamp did not illuminate at Step 5). Check the NEES (B) (10 A) fuse (F-13) first. Did you complete the repair?	—	Go to Step 13	—
8	1. Turn OFF the ignition. Remove the smoother main relay. 2. Turn ON the ignition, with the engine OFF. 3. Observe the Main Relay Voltage Feed Circuit parameter with the Tech 2. Does the Main Relay Voltage Feed Circuit parameter indicate ON?	—	Go to Step 10	Go to Step 9
9	1. Test the control circuit of the smoother main relay between the TCM (pin 15 of B-425 connector) and the smoother main relay (pin 5 of X-5 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12
10	1. Test the voltage feed circuit between the TCM (pin 3 of B-426 connector) and the smoother main relay (pin 1 of X-5 connector) for a short to battery. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12
11	Replace the smoother main relay. Did you complete the replacement?	—	Go to Step 13	—

7A-108 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
12	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 13	—
13	1. Reconnect all previously disconnected fuse or harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Turn ON the ignition, with the engine OFF. 5. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 14
14	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0889 (Flash Code 39)**Circuit Description**

The gearshift control box relay is energized to feed a drive voltage of the each solenoid valve (1-3-5 shift solenoid, 2-4-6-R shift solenoid and select solenoid) when the transmission control module (TCM) commands ON.

If the TCM detects the gearshift control box relay is turned OFF when the relay is commanded ON, this DTC will set. (Open stuck DTC)

If the TCM detects the TCM has been ON when the relay is commanded OFF, this DTC will also set. (Close stuck DTC)

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC**Open stuck DTC**

- The TCM detects a low voltage condition on the 1-3-5 shift solenoid, 2-4-6-R shift solenoid and select solenoid voltage feed circuit when the gearshift control box relay is commanded ON.

Close stuck DTC

- The TCM detects a high voltage condition on the 1-3-5 shift solenoid, 2-4-6-R shift solenoid and select solenoid voltage feed circuit when the gearshift control box relay is commanded OFF.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM continuously sounds buzzer when the diagnostic runs and fails. (Open stuck DTC)
- The TCM inhibits gearshift control. (Open stuck DTC)
- The TCM holds gear position.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- The TCM stops the buzzer when the diagnostic runs and does not fail. (Open stuck DTC)
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

Notice:

- If this DTC is present, P0912, P0973 and P0976 may also set.
- Faulty or sticking gearshift control box relay will set this DTC.

DTC P0889 (Flash Code 39)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Replace the gearshift control box relay with the glow relay or replace with a known good relay. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 4	Go to Step 11
4	Does the buzzer continuously sound?	—	Go to Step 5	Go to Step 8

7A-110 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
5	1. Turn OFF the ignition. 2. Remove the gearshift control box relay. 3. Probe the battery voltage feed circuit of the gearshift control box relay (pins 3 and 4 of X-19 connector) with a test lamp that is connected to a known good ground. Does the test lamp illuminate?	—	Go to Step 6	Go to Step 7
6	1. Turn OFF the ignition. 2. Inspect for an intermittent, for poor connections and corrosion at the harness connector of the gearshift control box relay (pins 2, 3, 4 and 5 of X-19 connector). 3. Disconnect the transmission control module (TCM) harness connector. 4. Inspect for an intermittent, for a poor connection and corrosion on gearshift control box relay control circuit at the harness connector of the TCM (pin 18 of B-425 connector). 5. Test the gearshift control box relay control circuit for an open circuit or high resistance. 6. Test the each solenoid valve voltage feed circuit between the gearshift control box relay and the TCM (pins 4 and 5 of B-425, pins 5 and 6 of B-426 and pins 1 and 8 of B-418 connector) for an open circuit or high resistance. 7. Repair the connection(s) or circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12
7	Repair the open circuit or high resistance on the battery voltage feed circuit between the NEES (60A) slow blow fuse (SBF-7) and the gearshift control box relay (pins 3 and 4 of X-19 connector) (which ever test lamp did not illuminate at Step 5). Check the NEES (60 A) slow blow fuse (SBF-7) first. Did you complete the repair?	—	Go to Step 13	—
8	1. Turn OFF the ignition. 2. Remove the gearshift control box relay. 3. Turn ON the ignition, with the engine OFF. Does the buzzer continuously sound?	—	Go to Step 9	Go to Step 10
9	1. Test the control circuit of the gearshift control box relay between the TCM (pin 18 of B-425 connector) and the gearshift control box relay (pin 5 of X-19 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12
10	1. Test the voltage feed circuit between the TCM (pins 4 and 5 of B-425, pins 5 and 6 of B-426 and pins 1 and 8 of B-418 connector) and the gearshift control box relay (pin 2 of X-19 connector) for a short to battery. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12

Step	Action	Value(s)	Yes	No
11	Replace the gearshift control relay. Did you complete the replacement?	—	Go to Step 13	—
12	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 13	—
13	1. Reconnect all previously disconnected fuse or harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Turn ON the ignition, with the engine OFF. 5. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 14
14	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0902 (Flash Code 65)**Circuit Description**

The gearshift clutch pulse width modulation (PWM) solenoid valve is located on the oil pump assembly. It controls the transmission fluid supply to the gearshift clutch control spool valve. The transmission control module (TCM) controls the gearshift clutch solenoid valve by duty cycle signal based on vehicle running condition. Since normally open type solenoid valve is used, the gearshift clutch control spool valve moves by the applied fluid pressure when the TCM turns OFF the gearshift clutch solenoid valve under the certain condition. Then the gearshift multi-plate clutch engagement pressure circuit connects with the line pressure circuit. At the same time, the gearshift multi-plate clutch is engaged. The TCM monitors the gearshift clutch solenoid valve operating status through the feedback circuit. If the TCM detects a low voltage condition on the gearshift clutch solenoid valve control circuit when the solenoid valve is commanded ON, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The smoother main relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a low voltage condition on the gearshift clutch solenoid valve control circuit when the solenoid valve is commanded ON.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM inhibits gearshift control.
- The TCM inhibits emergency gearshift control.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- The TCM stops the buzzer when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0902 (Flash Code 65)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Place the transmission in neutral and set the parking brake. 4. Start the engine. 5. Operate the selector lever from N to D and D to N. 6. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the in-line harness connector (J-237) near the starter motor. 3. Connect a DMM between the control circuit of the gearshift clutch solenoid valve harness (pin 3 of J-237 female connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	18.0 volts	Go to Step 5	Go to Step 4

Step	Action	Value(s)	Yes	No
4	1. Test the control circuit of the gearshift clutch solenoid valve between the transmission control module (TCM) (pin 30 of B-425 connector) and the in-line harness connector (pin 3 of J-237 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 7
5	1. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Test the control circuit of the gearshift clutch solenoid valve between the gearshift clutch solenoid valve and the in-line harness connector (pin 3 of J-237 connector) for the following conditions: • A short to ground • A short to the transmission fluid temperature (TFT) sensor low reference circuit 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 6
6	Important: Replacement gearshift clutch solenoid valve must be learned. Replace the gearshift clutch solenoid valve. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. Did you complete the replacement?	—	Go to Step 8	—
7	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 8	—
8	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Place the transmission in neutral and set the parking brake. 5. Start the engine. 6. Operate the selector lever from N to D and D to N. 7. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Step 9
9	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0903 (Flash Code 65)**Circuit Description**

The gearshift clutch pulse width modulation (PWM) solenoid valve is located on the oil pump assembly. It controls the transmission fluid supply to the gearshift clutch control spool valve. The transmission control module (TCM) controls the gearshift clutch solenoid valve by duty cycle signal based on vehicle running condition. Since normally open type solenoid valve is used, the gearshift clutch control spool valve moves by the applied fluid pressure when the TCM turns OFF the gearshift clutch solenoid valve under the certain condition. Then the gearshift multi-plate clutch engagement pressure circuit connects with the line pressure circuit. At the same time, the gearshift multi-plate clutch is engaged. The TCM monitors the gearshift clutch solenoid valve operating status through the feedback circuit. If the TCM detects a high voltage condition on the gearshift clutch solenoid valve control circuit when the solenoid valve is commanded OFF, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The smoother main relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a high voltage condition on the gearshift clutch solenoid valve control circuit when the solenoid valve is commanded OFF.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM inhibits gearshift control and holds gear position when the diagnostic runs and fails.
- The TCM inhibits emergency gearshift control.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- The TCM stops the buzzer when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0903 (Flash Code 65)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Place the transmission in neutral and set the parking brake. 4. Start the engine. 5. Operate the selector lever from N to D and D to N. 6. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition. 2. Disconnect the in-line harness connector (J-237) near the starter motor. 3. Connect a test lamp between the control circuit of the gearshift clutch solenoid valve harness (pin 3 of J-237 female connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 4	Go to Step 5

Step	Action	Value(s)	Yes	No
4	1. Keep the test lamp with connected. 2. Turn OFF the ignition for 30 second. 3. Start the engine while observing the test lamp. Does the test lamp blink after the engine start (note that the test lamp will blink then continuously illuminate normally)?	—	Go to Step 7	Go to Step 6
5	1. Test the control circuit of the gearshift clutch solenoid valve between the transmission control module (TCM) (pin 30 of B-425 connector) and the in-line harness connector (pin 3 of J-237 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 8
6	1. Test the control circuit of the gearshift clutch solenoid valve between the TCM (pin 30 of B-425 connector) and the in-line harness connector (pin 3 of J-237 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 11
7	1. Turn OFF the ignition. 2. Inspect for an intermittent and for a poor connection at the in-line harness connector (pin 3 of J-237 connector). 3. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 9
8	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the gearshift clutch solenoid valve circuit at the harness connector of the TCM (pin 30 of B-425 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 11
9	1. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Inspect for an intermittent and for a poor connection at the harness connector of the gearshift clutch solenoid valve. 3. Inspect the gearshift clutch solenoid valve for loose bolt. 4. Test the control circuit of the gearshift clutch solenoid valve between the gearshift clutch solenoid valve and the in-line harness connector (pin 3 of J-237 connector) for the following conditions: • An open circuit • A short to the lock up clutch solenoid valve control circuit • High resistance 5. Repair the circuit(s), connection(s) or tightness as necessary. Did you find and correct the condition?	—	Go to Step 12	Go to Step 10

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Step	Action	Value(s)	Yes	No
10	Important: Replacement gearshift clutch solenoid valve must be learned. Replace the gearshift clutch solenoid valve. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. Did you complete the replacement?	—	Go to Step 12	—
11	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 12	—
12	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Place the transmission in neutral and set the parking brake. 5. Start the engine. 6. Operate the selector lever from N to D and D to N. 7. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Step 13
13	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0904 (Flash Code 58)**Circuit Description**

The gear select position sensor is used to detect the select side lever position feedback for the select solenoid valve on the transmission gearshift control box and it is installed to the transmission gearshift control box assembly. The transmission control module (TCM) uses the gear select position sensor to determine the current gear position with a combination of the gear shift position sensor. The gear select position sensor has following circuits.

- 5 volts reference circuit
- Low reference circuit
- Gear select position sensor signal circuit

The TCM supplies 5 volts to the gear select position sensor on the 5 volts reference circuit. The TCM also provides a ground on the low reference circuit. The gear select position sensor provides a signal to the TCM on the gear select position sensor signal circuit, which is relative to the position changes of the select side. The TCM monitors the gear select position sensor signal for voltages outside the normal range of the gear select position sensor. If the ECM detects an excessively low or high gear select position sensor voltage, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the gear select position sensor signal voltage is less than 0.5 volts or more than 4.5 volts.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits auto shift control.
- The TCM permits shifting to neutral, 1st or reverse gear.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Ensure the sensor is tight, the sensor shaft and sensor lever are not damaged.

Notice:

- If this DTC is present, the Gear Select Position Sensor parameters on the Tech 2 will indicate desired value.

DTC P0904 (Flash Code 58)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. Notice: If the gear select position sensor signal voltage is more than 4.5 volts, the Gear Select Position Sensor parameter on the Tech 2 indicates a desired value when the ignition has been turned ON for longer than 5 seconds. Does the Gear Select Position Sensor parameter ever exceed the specified value within 5 seconds after the ignition switch is ON?	4.5 volts	Go to Step 4	Go to Step 3

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Step	Action	Value(s)	Yes	No
3	Notice: If the gear select position sensor signal is less than 0.5 volts, the Gear Select Position Sensor parameter on the Tech 2 indicates a desired value when the ignition has been turned ON for longer than 5 seconds. Does the Gear Select Position Sensor parameter ever fall below the specified value within 5 seconds after the ignition switch is ON?	0.5 volts	Go to Step 7	Go to Diagnostic Aids
4	1. Turn OFF the ignition. 2. Disconnect the gear select position sensor harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Gear Select Position Sensor parameter with the Tech 2. Is the Gear Select Position Sensor parameter less than the specified value within 5 seconds after the ignition switch is ON?	0.5 volts	Go to Step 5	Go to Step 9
5	1. Turn OFF the ignition. 2. Connect a DMM between the 5 volts reference circuit of the gear select position sensor harness (pin 1 of J-223 connector) and a known good ground. 3. Turn ON the ignition, with the engine OFF. Is the DMM voltage less than the specified value?	5.5 volts	Go to Step 6	Go to Step 10
6	1. Turn OFF the ignition. 2. Connect a test lamp between the low reference circuit of the gear select position sensor harness (pin 3 of J-223 connector) and battery voltage. 3. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 14	Go to Step 11
7	1. Turn OFF the ignition. 2. Disconnect the gear select position sensor harness connector. 3. Connect a DMM between the 5 volts reference circuit of the gear select position sensor harness (pin 1 of J-223 connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 8	Go to Step 12
8	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5 volts reference circuit and the signal circuit of the gear select position sensor harness (pin 1 and 2 of J-223 connector). 3. Turn ON the ignition, with the engine OFF. 4. Observe the Gear Select Position Sensor parameter with the Tech 2. Is the Gear Select Position Sensor parameter more than the specified value within 5 seconds after the ignition switch is ON?	4.5 volts	Go to Step 14	Go to Step 13

Step	Action	Value(s)	Yes	No
9	Important: The gear select position sensor may be damaged if the sensor signal circuit is shorted to a voltage source. - Test the signal circuit between the transmission control module (TCM) (pin 11 of B-426 connector) and the gear select position sensor (pin 2 of J-223 connector) for the following conditions: - A short to battery or ignition voltage - A short to any 5 volts reference - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18
10	- Test the 5 volts reference circuit between the TCM (pin 10 of B-426 connector) and the gear select position sensor (pin 1 of J-223 connector) for a short to battery or ignition voltage. - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18
11	- Test the low reference circuit between the TCM (pin 13 of B-426 connector) and the gear select position sensor (pin 3 of J-223 connector) for an open circuit or high resistance. - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 15
12	- Test the 5 volts reference circuit between the TCM (pin 10 of B-426 connector) and the gear select position sensor (pin 1 of J-223 connector) for the following conditions: - An open circuit - A short to ground - A short to the low reference circuit - High resistance - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 15
13	- Test the signal circuit between the TCM (pin 11 of B-426 connector) and the gear select position sensor (pin 2 of J-223 connector) for the following conditions: - An open circuit - A short to ground - A short to the low reference circuit - High resistance - Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 15

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Step	Action	Value(s)	Yes	No
14	1. Turn OFF the ignition. 2. Disconnect the gear select position sensor harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the gear select position sensor (pins 1, 2 and 3 of J-223 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 16
15	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for poor connections on the gear select position sensor circuits at the harness connector of the TCM (pins 10, 11 and 13 of B-426 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18
16	1. Remove the gear select position sensor. Refer to Gear Select Position Sensor Replacement in this section. 2. Visually inspect the gear select position sensor for the following conditions: • Physical damage • Loose or improper installation 3. Remove the transmission gearshift control box assembly from the transmission main unit. Refer to Repair Instructions (Overhaul) - Control Box in this section. 4. Visually inspect the lever for damage that connects to the gear select position sensor shaft. Did you find and correct the condition?	—	Go to Step 19	Go to Step 17
17	Important: Replacement gear select position sensor must be learned. Replace the gear select position sensor. Refer to Gear Select Position Sensor Replacement in this section. Did you complete the replacement?	—	Go to Step 19	—
18	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 19	—
19	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 20

Step	Action	Value(s)	Yes	No
20	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0906 (Flash Code 52)**Circuit Description**

The selector lever switches are installed to the selector lever bracket and there are two switches. The forward and backward direction switch detects the selector lever forward and backward movement. The horizontal direction switch detects the selector lever horizontal movement. When the selector lever is positioned N, D or R, each selector lever switch is closed and the switch signal from the transmission control module (TCM) is pulled to ground. When the selector lever is positioned A, + or –, each selector lever switch and D switch are also closed and the switch signal from the TCM is pulled to ground. If the TCM detects the selector lever switch input signal is out of correlation, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

Either of following condition is met:

- The TCM detects two or more selector lever N, D and R switch signal is ON (pulled to ground).
- The TCM detects two or more selector lever A, + and – switch signal is ON (pulled to ground) when the selector lever N, D or R switch signal is ON (pulled to ground).

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits selector lever switch signal.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Ensure each selector lever switch is tight and not damaged.

DTC P0906 (Flash Code 52)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn ON the ignition, with the engine OFF. 3. Operate the selector lever while observing the Selector N, R, D, A, + and – Switch parameter with the Tech 2. Notice: The Selector D Switch parameter indicates ON when the selector lever is A, + or –. Does each selector lever switch parameter display ON when it moved to its position and display OFF when it moved to other positions?	—	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Remove the selector lever cover. 3. Disconnect the selector lever switch harness connector. 4. Turn ON the ignition, with the engine OFF. Does all selector position switch parameter display OFF?	—	Go to Step 5	Go to Step 4

Step	Action	Value(s)	Yes	No
4	1. Test the signal circuit between the transmission control module (TCM) (pins 7, 8, 13, 14 & 15 of B-427 and pin 21 of B-428 connector) and the selector lever switch (pin 2, 4, 6, 7, 8 and 10 of N-19 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 7
5	1. Test the signal circuit on the selector lever switch (pin 2, 4, 6, 7, 8 and 10 of N-19 connector) and ground (pin 9 of N-19 connector) for a short each other. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 6
6	Repair or replace the selector lever. Refer to Selector Lever Replacement in this section. Did you complete the replacement?	—	Go to Step 8	—
7	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 8	—
8	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Turn ON the ignition, with the engine OFF. 5. Operate the selector lever while observing the Selector N, R, D, A, + and – Switch parameter with the Tech 2. Notice: The Selector D Switch parameter indicates ON when the selector lever is A, + or –. Does each selector lever switch parameter display ON when it moved to its position and display OFF when it moved to other positions?	—	Go to Step 9	Go to Step 3
9	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0907 (Flash Code 51)**Circuit Description**

The selector lever switches are installed to the selector lever bracket and there are two switches. The forward and backward direction switch detects the selector lever forward and backward movement. The horizontal direction switch detects the selector lever horizontal movement. When the selector lever is positioned N, D or R, each selector lever switch is closed and the switch signal from the transmission control module (TCM) is pulled to ground. When the selector lever is positioned A, + or –, each selector lever switch and D switch are also closed and the switch signal from the TCM is pulled to ground. If the TCM detects the selector lever N, D and R switch input signals are OFF (open circuit) at the same time, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the selector lever N, D and R switch signals are OFF (open circuit) at the same time.

Action Taken When the DTC Sets

- The TCM does not illuminate the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Ensure each selector lever switch is tight and not damaged.

Notice:

- Engine will not crank if the selector lever N switch signal is OFF (open circuit).

DTC P0907 (Flash Code 51)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn ON the ignition, with the engine OFF. 3. Operate the selector lever while observing the Selector N, R, D, A, + and – Switch parameter with the Tech 2. Notice: The Selector D Switch parameter indicates ON when the selector lever is A, + or –. Does each selector lever switch parameter display ON when it moved to its position and display OFF when it moved to other positions?	—	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Remove the selector lever cover. 3. Disconnect the selector lever switch harness connector. 4. Connect a DMM between the signal circuit (pins 2, 6 and 7 of N-19 connector which ever parameter reading did not display ON at Step 2) and a known good ground. 5. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	18.0 volts	Go to Step 5	Go to Step 4

Step	Action	Value(s)	Yes	No
4	1. Test the signal circuit between the transmission control module (TCM) (pin 13 & 14 of B-427 and pin 21 of B-428 connector) and the selector lever switch (pin 2, 6 and 7 of N-19 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 8
5	1. Turn OFF the ignition. 2. Disconnect the selector lever switch harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the selector lever (pins 2, 6, 7 and 9 of N-19 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 6
6	1. Test the ground circuit between the selector lever switch (pin 9 of N-19 connector) and the chassis ground (B-1) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 7
7	Repair or replace the selector lever. Refer to Selector Lever Replacement in this section. Did you complete the replacement?	—	Go to Step 10	—
8	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for poor connections on the selector lever switch circuits at the harness connector of the TCM (pins 13 & 14 of B-427 and pin 21 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 10	Go to Step 9
9	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 10	—

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Step	Action	Value(s)	Yes	No
10	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Turn ON the ignition, with the engine OFF. 5. Operate the selector lever while observing the Selector N, R, D, A, + and – Switch parameter with the Tech 2. Notice: The Selector D Switch parameter indicates ON when the selector lever is A, + or –. Does each selector lever switch parameter display ON when it moved to its position and display OFF when it moved to other positions?	—	Go to Step 11	Go to Step 3
11	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0909 (Flash Code 76)**Circuit Description**

The pulse width modulation (PWM) select solenoid valve is located on the gearshift control box. The transmission control module (TCM) controls the select solenoid valve by duty cycle signal based on commanded gear position. The select solenoid is only commanded ON when up-shifting. When downshifting, the force created by the return springs moves the internal select lever, but the select solenoid limits the amount of movement by generating force as required in the up-shift direction. The gear select position sensor is used to detect the select side lever position feedback for the select solenoid valve movement. The TCM uses the gear select position sensor to determine the current gear position with a combination of the gear shift position sensor. If the TCM detects the gear select side lever position does not reach to a desired select position when shifting to desired gear, this DTC will set.

Condition for Running the DTC

- DTCs P0718, P0889, P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 and P0977 are not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.
- The selector lever is other than N position.

Condition for Setting the DTC

- The TCM detects the gear select side lever position does not reach to a desired select position continuously when shifting to desired gear.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gearshift control.
- The TCM commands OFF the gearshift clutch solenoid valve.
- The TCM commands OFF the lock up clutch solenoid valve.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0909 (Flash Code 76)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run so that all gear may engage enough. 5. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 or P0977 also set?	—	Go to Applicable DTC	Go to Step 3
3	Visually inspect the gear select position sensor and the select solenoid valve for the following conditions: • Physical damage • Loose or improper installation Did you find and correct the condition?	—	Go to Step 8	Go to Step 4

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Step	Action	Value(s)	Yes	No
4	1. Lift the driving wheels or drive the vehicle. 2. Let the vehicle run so that all gear may engage enough. 3. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 5	Go to Diagnostic Aids
5	If the DTC fail only when shifting from 5th to 6th with the 5th speed transmission, programmed transmission type is incorrect. Reprogram correct vehicle information and retest. Refer to Transmission Control Module (TCM) Replacement Procedure Description in this section. Did you find and correct the condition?	—	Go to Step 8	Go to Step 6
6	1. Remove the gear select position sensor. Refer to Gear Select Position Sensor Replacement in this section. 2. Visually inspect the gear select position sensor for the following conditions: • Physical damage • Loose or improper installation 3. Inspect the gear select position sensor output voltage in order to check an open circuit, short circuit and high resistance somewhere in the operating range. 4. Remove the transmission gearshift control box assembly from the transmission main unit. Refer to Repair Instructions (Overhaul) - Control Box in this section. 5. Visually inspect the select side lever for the following conditions: • Select lever damage that connects to the gear select position sensor shaft. • Select lever damage that connects to the interlock plate and shift rods. • Select relay lever damage that connects to the select solenoid valve. • Other damage that the select lever possible stuck. 6. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 7
7	Important: Replacement select solenoid valve must be learned. Replace the select solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 8	—

Step	Action	Value(s)	Yes	No
8	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. Important: Transmission Gear Select & Shift Position Learning must be done if the gear select position sensor, select solenoid valve or transmission gearshift control box is replaced, removed or repaired. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run so that all gear may engage enough. 6. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 9
9	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0912 (Flash Code 75)**Circuit Description**

The pulse width modulation (PWM) select solenoid valve is located on the gearshift control box. The transmission control module (TCM) controls the select solenoid valve by duty cycle signal based on commanded gear position. The select solenoid is only commanded ON when up-shifting. When downshifting, the force created by the return springs moves the internal select lever, but the select solenoid limits the amount of movement by generating force as required in the up-shift direction. The gear select position sensor is used to detect the select side lever position feedback for the select solenoid valve movement. The TCM uses the gear select position sensor to determine the current gear position with a combination of the gear shift position sensor. If the TCM detects a high voltage condition on the select solenoid valve monitor circuit when the solenoid valve is commanded OFF, this DTC will set.

Condition for Running the DTC

- DTC P0889 is not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a high voltage condition on the select solenoid valve monitor circuit when the solenoid valve is commanded OFF.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM commands OFF gearshift control box relay.
- The TCM inhibits gearshift control and holds gear position when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail at next ignition cycle
- The TCM stops the buzzer when the diagnostic runs and does not fail at next ignition cycle.
- A current DTC clears when the diagnostic runs and does not fail at next ignition cycle.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0912 (Flash Code 75)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC P0889 also set?	—	Go to DTC P0889	Go to Step 3
3	1. Turn OFF the ignition for 30 seconds. 2. Disconnect the select solenoid valve harness connector. 3. Connect a DMM between the control circuit of the select solenoid valve harness (pin 2 of J-234 connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value until this DTC fails?	18.0 volts	Go to Step 4	Go to Step 6
4	Is the DMM voltage more than the specified value after this DTC fails?	18.0 volts	Go to Step 7	Go to Step 5

Step	Action	Value(s)	Yes	No
5	1. Connect a test lamp between the ground circuit of the select solenoid valve harness (pin 1 of J-234 connector) and battery voltage. 2. Turn ON the ignition. Does the test lamp illuminate?	—	Go to Step 9	Go to Step 8
6	1. Test the voltage feed circuit between the transmission control module (TCM) (pins 1 and 8 of B-428 connector) and the gearshift control box relay (pin 2 of X-19 connector) for an open circuit or high resistance. 2. Test the control circuit between the TCM (pins 16 and 22 of B-428 connector) and the select solenoid (pin 2 of J-234 connector) for an open circuit or high resistance. 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 10
7	Important: The select solenoid valve may be damaged if the solenoid valve control circuit is shorted to a voltage source. 1. Test the control circuit between the TCM (pins 16 and 22 of B-428 connector) and the select solenoid (pin 2 of J-234 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12
8	1. Test the ground circuit between the select solenoid (pin 1 of J-234 connector) and chassis ground (J-9) for an open circuit or high resistance. 2. Test the ground circuit between the TCM (pins 7 and 15 of B-428 connector) and chassis ground (J-9) for an open circuit or high resistance. 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 10
9	1. Turn OFF the ignition. 2. Disconnect the select solenoid valve harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the select solenoid valve (pins 1 and 2 of J-234 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 11
10	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for poor connections on the select solenoid valve circuits at the harness connector of the TCM (pins 1, 7, 8, 15 16 and 22 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12

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Step	Action	Value(s)	Yes	No
11	Important: Replacement select solenoid valve must be learned. Replace the select solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 13	—
12	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 13	—
13	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 14
14	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0913 (Flash Code 75)**Circuit Description**

The pulse width modulation (PWM) select solenoid valve is located on the gearshift control box. The transmission control module (TCM) controls the select solenoid valve by duty cycle signal based on commanded gear position. The select solenoid is only commanded ON when up-shifting. When downshifting, the force created by the return springs moves the internal select lever, but the select solenoid limits the amount of movement by generating force as required in the up-shift direction. The gear select position sensor is used to detect the select side lever position feedback for the select solenoid valve movement. The TCM uses the gear select position sensor to determine the current gear position with a combination of the gear shift position sensor. If the TCM detects a low voltage condition on the select solenoid valve monitor circuit when the solenoid valve is commanded ON, this DTC will set.

Condition for Running the DTC

- DTC P0889 is not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a low voltage condition on the select solenoid valve monitor circuit when the solenoid valve is commanded ON.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM commands OFF gearshift control box relay.
- The TCM inhibits gearshift control and holds gear position when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail at next ignition cycle
- The TCM stops the buzzer when the diagnostic runs and does not fail at next ignition cycle.
- A current DTC clears when the diagnostic runs and does not fail at next ignition cycle.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0913 (Flash Code 75)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Place the transmission in neutral and set the parking brake. 4. Start the engine. 5. Operate the selector lever from N to D in order to shift to 2nd or higher gear. 6. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition for 30 seconds. 2. Disconnect the select solenoid valve harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the DTC Information with the Tech 2. Is DTC P0912 set?	—	Go to Step 5	Go to Step 4

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Step	Action	Value(s)	Yes	No
4	1. Test the control circuit between the transmission control module (TCM) (pins 16 and 22 of B-428 connector) and the select solenoid valve (pin 2 of J-234 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 7	Go to Step 6
5	Important: Replacement select solenoid valve must be learned. Replace the select solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 7	—
6	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 7	—
7	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Place the transmission in neutral and set the parking brake. 5. Start the engine. 6. Operate the selector lever from N to D in order to shift to 2nd or higher gear. 7. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Step 8
8	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0914 (Flash Code 57)**Circuit Description**

The gear shift position sensor is used to detect the shift side lever position feedback for the shift solenoid valves on the transmission gearshift control box and it is installed to the transmission gearshift control box assembly. The transmission control module (TCM) uses the gear shift position sensor to determine the current gear position with a combination of the gear select position sensor. The gear shift position sensor has following circuits.

- 5 volts reference circuit
- Low reference circuit
- Gear shift position sensor signal circuit

The TCM supplies 5 volts to the gear shift position sensor on the 5 volts reference circuit. The TCM also provides a ground on the low reference circuit. The gear shift position sensor provides a signal to the TCM on the gear shift position sensor signal circuit, which is relative to the position changes of the select side. The TCM monitors the gear shift position sensor signal for voltages outside the normal range of the gear shift position sensor. If the ECM detects an excessively low or high gear shift position sensor voltage, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the gear shift position sensor signal voltage is less than 0.5 volts or more than 4.5 volts.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gearshift control and holds gear position when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- Ensure the sensor is tight and the sensor shaft are not damaged.

Notice:

- If this DTC is present, engine will not crank except applying the brake pedal or parking brake.

DTC P0914 (Flash Code 57)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run while observing the Gear Shift Position Sensor parameter with the Tech 2. Is the Gear Shift Position Sensor parameter within the specified value?	0.6 - 4.4 volts	Go to Diagnostic Aids	Go to Step 3
3	Is the Gear Shift Position Sensor parameter less than the specified value at Step 2?	0.5 volts	Go to Step 7	Go to Step 4

7A-136 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
4	1. Turn OFF the ignition. 2. Disconnect the gear shift position sensor harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Gear Shift Position Sensor parameter with the Tech 2. Is the Gear Shift Position Sensor parameter less than the specified value?	0.5 volts	Go to Step 5	Go to Step 9
5	1. Turn OFF the ignition. 2. Connect a DMM between the 5 volts reference circuit of the gear shift position sensor harness (pin 1 of J-142 connector) and a known good ground. 3. Turn ON the ignition, with the engine OFF. Is the DMM voltage less than the specified value?	5.5 volts	Go to Step 6	Go to Step 10
6	1. Turn OFF the ignition. 2. Connect a test lamp between the low reference circuit of the gear shift position sensor harness (pin 3 of J-142 connector) and battery voltage. 3. Turn ON the ignition, with the engine OFF. Does the test lamp illuminate?	—	Go to Step 14	Go to Step 11
7	1. Turn OFF the ignition. 2. Disconnect the gear shift position sensor harness connector. 3. Connect a DMM between the 5 volts reference circuit of the gear select position sensor harness (pin 1 of J-142 connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value?	4.5 volts	Go to Step 8	Go to Step 12
8	1. Turn OFF the ignition. 2. Connect a 3-amp fused jumper wire between the 5 volts reference circuit and the signal circuit of the gear shift position sensor harness (pin 1 and 2 of J-142 connector). 3. Turn ON the ignition, with the engine OFF. 4. Observe the Gear Shift Position Sensor parameter with the Tech 2. Is the Gear Shift Position Sensor parameter more than the specified value?	4.5 volts	Go to Step 14	Go to Step 13
9	Important: The gear shift position sensor may be damaged if the sensor signal circuit is shorted to a voltage source. 1. Test the signal circuit between the transmission control module (TCM) (pin 19 of B-426 connector) and the gear shift position sensor (pin 2 of J-142 connector) for the following conditions: • A short to battery or ignition voltage • A short to any 5 volts reference 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18

Step	Action	Value(s)	Yes	No
10	1. Test the 5 volts reference circuit between the TCM (pin 18 of B-426 connector) and the gear shift position sensor (pin 1 of J-142 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18
11	1. Test the low reference circuit between the TCM (pin 20 of B-426 connector) and the gear shift position sensor (pin 3 of J-142 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 15
12	1. Test the 5 volts reference circuit between the TCM (pin 18 of B-426 connector) and the gear shift position sensor (pin 1 of J-142 connector) for the following conditions: • An open circuit • A short to ground • A short to the low reference circuit • High resistance 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 15
13	1. Test the signal circuit between the TCM (pin 19 of B-426 connector) and the gear shift position sensor (pin 2 of J-142 connector) for the following conditions: • An open circuit • A short to ground • A short to the low reference circuit • High resistance 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 15
14	1. Turn OFF the ignition. 2. Disconnect the gear shift position sensor harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the gear shift position sensor (pins 1, 2 and 3 of J-142 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 16
15	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for poor connections on the gear shift position sensor circuits at the harness connector of the TCM (pins 18, 19 and 20 of B-426 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 19	Go to Step 18

7A-138 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
16	1. Remove the gear shift position sensor. Refer to Gear Shift Position Sensor Replacement in this section. 2. Visually inspect the gear shift position sensor for the following conditions: • Physical damage • Loose or improper installation 3. Visually inspect the lever shaft for damage that connects to the gear select position sensor shaft. Did you find and correct the condition?	—	Go to Step 19	Go to Step 17
17	Important: Replacement gear shift position sensor must be relearned. Replace the gear shift position sensor. Refer to Gear Shift Position Sensor Replacement in this section. Did you complete the replacement?	—	Go to Step 19	—
18	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 19	—
19	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run. 6. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 20
20	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0915 (Flash Code 74)**Circuit Description**

The pulse width modulation (PWM) 1-3-5 and 2-4-6-R shift solenoid valves are located on the gearshift control box. The transmission control module (TCM) controls each shift solenoid valves by duty cycle signal based on commanded gear position. The 1-3-5 shift solenoid is commanded ON when the commanded gear is set to 1st, 3rd and 5th gear. When disengaging from 2nd, 4th, 6th and reverse gear, the 1-3-5 shift solenoid is also commanded ON. The 2-4-6-R shift solenoid is commanded ON when the commanded gear is set to 2nd, 4th, 6th and reverse gear. When disengaging from 1st, 3rd and 5th gear, the 2-4-6-R shift solenoid is also commanded ON. The gear shift position sensor is used to detect the shift side lever position feedback for the shift solenoid valves movement. The TCM uses the gear shift position sensor to determine the current gear position with a combination of the gear select position sensor. If the TCM detects the gear shift side lever position does not reach to a desired shift position and it keeping a previous gear position when shifting to desired gear, this DTC will set.

Condition for Running the DTC

- DTCs P0718, P0889, P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 and P0977 are not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.
- The selector lever is other than N position.

Condition for Setting the DTC

- The TCM detects the gear shift side lever position does not reach to a desired shift position and it keeping a previously engaged gear position continuously when shifting to desired gear. This indicates that the TCM detects gear stuck at an engaged position.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gearshift control.
- The TCM commands OFF the gearshift clutch solenoid valve.
- The TCM commands OFF the lock up clutch solenoid valve.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0915 (Flash Code 74)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run so that all gear may engage enough. 5. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 or P0977 also set?	—	Go to Applicable DTC	Go to Step 3
3	Visually inspect the gear shift position sensor, 1-3-5 and 2-4-6-R shift solenoid valves for the following conditions: • Physical damage • Loose or improper installation Did you find and correct the condition?	—	Go to Step 8	Go to Step 4

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Step	Action	Value(s)	Yes	No
4	1. Lift the driving wheels or drive the vehicle. 2. Let the vehicle run so that all gear may engage enough. 3. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 5	Go to Diagnostic Aids
5	1. Remove the gear shift position sensor. Refer to Gear Shift Position Sensor Replacement in this section. 2. Visually inspect the gear shift position sensor for the following conditions: • Physical damage • Loose or improper installation 3. Inspect the gear shift position sensor output voltage in order to check an open circuit, short circuit and high resistance somewhere in the operating range. 4. Remove the transmission gearshift control box assembly from the transmission main unit. Refer to Repair Instructions (Overhaul) - Control Box in this section. 5. Visually inspect the shift side lever for the following conditions: • Shift lever damage that connects to the gear shift position sensor shaft. • Shift lever damage that connects to the shift solenoid valves. • Shift lever damage that connects to the interlock plate and shift rods. • Other damage that the shift lever possible stuck. 6. Inspect the transmission main unit as necessary. Refer to Repair Instructions (Overhaul) in this section. 7. Repair or replace as necessary. 8. Did you find and correct the condition?	—	Go to Step 8	Go to Step 6
6	1. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Inspect the oil pump and gearshift clutch for the following conditions: • The gearshift clutch solenoid valve for mechanically stuck • The clutch spool valve mechanically stuck • The gearshift clutch mechanically stuck 3. Repair or replace as necessary. Did you find and correct the condition?		Go to Step 8	Go to Step 7
7	Important: Replacement 1-3-5 or 2-4-6-R shift solenoid valve must be relearned. Replace the 1-3-5 or 2-4-6-R shift solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 8	—

Step	Action	Value(s)	Yes	No
8	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. Important: Transmission Gear Select & Shift Position Learning must be done if the gear shift position sensor, 1-3-5 shift solenoid valve, 2-4-6-R shift solenoid valve or transmission gearshift control box is replaced, removed or repaired. Important: Half-clutch Position Learning must be done if the gearshift clutch is replaced, removed or repaired. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run so that all gear may engage enough. 6. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 9
9	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0919 (Flash Code 72)**Circuit Description**

The pulse width modulation (PWM) 1-3-5 and 2-4-6-R shift solenoid valves are located on the gearshift control box. The transmission control module (TCM) controls each shift solenoid valves by duty cycle signal based on commanded gear position. The 1-3-5 shift solenoid is commanded ON when the commanded gear is set to 1st, 3rd and 5th gear. When disengaging from 2nd, 4th, 6th and reverse gear, the 1-3-5 shift solenoid is also commanded ON. The 2-4-6-R shift solenoid is commanded ON when the commanded gear is set to 2nd, 4th, 6th and reverse gear. When disengaging from 1st, 3rd and 5th gear, the 2-4-6-R shift solenoid is also commanded ON. The gear shift position sensor is used to detect the shift side lever position feedback for the shift solenoid valves movement. The TCM uses the gear shift position sensor to determine the current gear position with a combination of the gear select position sensor. If the TCM detects the gear shift side lever position does not reach to a desired shift position when shifting to desired gear, this DTC will set.

Condition for Running the DTC

- DTCs P0718, P0889, P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 and P0977 are not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.
- The selector lever is other than N position.

Condition for Setting the DTC

- The TCM detects the gear shift side lever position does not reach to a desired shift position continuously when shifting to desired gear.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gearshift control.
- The TCM commands OFF the gearshift clutch solenoid valve.
- The TCM commands OFF the lock up clutch solenoid valve.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0919 (Flash Code 72)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Lift the driving wheels or drive the vehicle. 4. Let the vehicle run so that all gear may engage enough. 5. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is P0902, P0903, P0904, P0912, P0913, P0914, P0973, P0974, P0976 or P0977 also set?	—	Go to Applicable DTC	Go to Step 3
3	Visually inspect the gear shift position sensor, 1-3-5 and 2-4-6-R shift solenoid valves for the following conditions: • Physical damage • Loose or improper installation Did you find and correct the condition?	—	Go to Step 8	Go to Step 4

Step	Action	Value(s)	Yes	No
4	1. Lift the driving wheels or drive the vehicle. 2. Let the vehicle run so that all gear may engage enough. 3. Monitor the DTC Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 5	Go to Diagnostic Aids
5	1. Remove the gear shift position sensor. Refer to Gear Shift Position Sensor Replacement in this section. 2. Visually inspect the gear shift position sensor for the following conditions: • Physical damage • Loose or improper installation 3. Inspect the gear shift position sensor output voltage in order to check an open circuit, short circuit and high resistance somewhere in the operating range. 4. Remove the transmission gearshift control box assembly from the transmission main unit. Refer to Repair Instructions (Overhaul) - Control Box in this section. 5. Visually inspect the shift side lever for the following conditions: • Shift lever damage that connects to the gear shift position sensor shaft. • Shift lever damage that connects to the shift solenoid valves. • Shift lever damage that connects to the interlock plate and shift rods. • Other damage that the shift lever possible stuck. 6. Inspect the transmission main unit as necessary. Refer to Repair Instructions (Overhaul) in this section. 7. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 8	Go to Step 6
6	1. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 2. Inspect the oil pump and gearshift clutch for the following conditions: • The gearshift clutch solenoid valve for mechanically stuck • The clutch spool valve mechanically stuck • The gearshift clutch mechanically stuck 3. Repair or replace as necessary. Did you find and correct the condition?		Go to Step 8	Go to Step 7
7	Important: Replacement 1-3-5 or 2-4-6-R shift solenoid valve must be releamed. Replace the 1-3-5 or 2-4-6-R shift solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 8	—

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Step	Action	Value(s)	Yes	No
8	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. Important: Transmission Gear Select & Shift Position Learning must be done if the gear shift position sensor, 1-3-5 shift solenoid valve, 2-4-6-R shift solenoid valve or transmission gearshift control box is replaced, removed or repaired. Important: Half-clutch Position Learning must be done if the gearshift clutch is replaced, removed or repaired. 3. Turn OFF the ignition for 30 seconds. 4. Lift the driving wheels or drive the vehicle. 5. Let the vehicle run so that all gear may engage enough. 6. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 9
9	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0973 (Flash Code 71)**Circuit Description**

The pulse width modulation (PWM) 2-4-6-R shift solenoid valve is located on the gearshift control box. The transmission control module (TCM) controls the 2-4-6-R shift solenoid valve by duty cycle signal based on commanded gear position. The 2-4-6-R shift solenoid is commanded ON when the commanded gear is set to 2nd, 4th, 6th and reverse gear. When disengaging from 1st, 3rd and 5th gear, the 2-4-6-R shift solenoid is also commanded ON. The gear shift position sensor is used to detect the shift side lever position feedback for the shift solenoid valves movement. The TCM uses the gear shift position sensor to determine the current gear position with a combination of the gear select position sensor. If the TCM detects a high voltage condition on the 2-4-6-R shift solenoid valve monitor circuit when the solenoid valve is commanded OFF, this DTC will set.

Condition for Running the DTC

- DTC P0889 is not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a high voltage condition on the 2-4-6-R shift solenoid valve monitor circuit when the solenoid valve is commanded OFF.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM commands OFF gearshift control box relay.
- The TCM inhibits gearshift control and holds gear position when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail at next ignition cycle
- The TCM stops the buzzer when the diagnostic runs and does not fail at next ignition cycle.
- A current DTC clears when the diagnostic runs and does not fail at next ignition cycle.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0973 (Flash Code 71)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC P0889 also set?	—	Go to DTC P0889	Go to Step 3
3	1. Turn OFF the ignition for 30 seconds. 2. Disconnect the 2-4-6-R shift solenoid valve harness connector. 3. Connect a DMM between the control circuit of the 2-4-6-R shift solenoid valve harness (pin 2 of J-236 connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value until this DTC fails?	18.0 volts	Go to Step 4	Go to Step 6
4	Is the DMM voltage more than the specified value after this DTC fails?	18.0 volts	Go to Step 7	Go to Step 5

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Step	Action	Value(s)	Yes	No
5	1. Connect a test lamp between the ground circuit of the 2-4-6-R shift solenoid valve harness (pin 1 of J-236 connector) and battery voltage. 2. Turn ON the ignition. Does the test lamp illuminate?	—	Go to Step 9	Go to Step 8
6	1. Test the voltage feed circuit between the transmission control module (TCM) (pins 5 and 6 of B-426 connector) and the gearshift control box relay (pin 2 of X-19 connector) for an open circuit or high resistance. 2. Test the control circuit between the TCM (pins 8 and 9 of B-425 connector) and the 2-4-6-R shift solenoid (pin 2 of J-236 connector) for an open circuit or high resistance. 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 10
7	Important: The 2-4-6-R shift solenoid valve may be damaged if the solenoid valve control circuit is shorted to a voltage source. 1. Test the control circuit between the TCM (pins 8 and 9 of B-425 connector) and the 2-4-6-R shift solenoid (pin 2 of J-236 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12
8	1. Test the ground circuit between 2-4-6-R shift solenoid (pin 1 of J-236 connector) and chassis ground (J-9) for an open circuit or high resistance. 2. Test the ground circuit between the TCM (pins 1 and 2 of B-425 connector) and chassis ground (J-9) for an open circuit or high resistance. 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 10
9	1. Turn OFF the ignition. 2. Disconnect the 2-4-6-R shift solenoid valve harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the 2-4-6-R shift solenoid valve (pins 1 and 2 of J-236 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 11
10	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for poor connections on the 2-4-6-R shift solenoid circuits at the harness connector of the TCM (pins 1, 2, 8 and 9 of B-425 and pins 5 and 6 of B-426 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12

Step	Action	Value(s)	Yes	No
11	Important: Replacement 2-4-6-R shift solenoid valve must be relearned. Replace the 2-4-6-R shift solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 13	—
12	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 13	—
13	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 14
14	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0974 (Flash Code 71)**Circuit Description**

The pulse width modulation (PWM) 2-4-6-R shift solenoid valve is located on the gearshift control box. The transmission control module (TCM) controls the 2-4-6-R shift solenoid valve by duty cycle signal based on commanded gear position. The 2-4-6-R shift solenoid is commanded ON when the commanded gear is set to 2nd, 4th, 6th and reverse gear. When disengaging from 1st, 3rd and 5th gear, the 2-4-6-R shift solenoid is also commanded ON. The gear shift position sensor is used to detect the shift side lever position feedback for the shift solenoid valves movement. The TCM uses the gear shift position sensor to determine the current gear position with a combination of the gear select position sensor. If the TCM detects a low voltage condition on the 2-4-6-R shift solenoid valve monitor circuit when the solenoid valve is commanded ON, this DTC will set.

Condition for Running the DTC

- DTC P0889 is not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a low voltage condition on the 2-4-6-R shift solenoid valve monitor circuit when the solenoid valve is commanded ON.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM commands OFF gearshift control box relay.
- The TCM inhibits gearshift control and holds gear position when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail at next ignition cycle
- The TCM stops the buzzer when the diagnostic runs and does not fail at next ignition cycle.
- A current DTC clears when the diagnostic runs and does not fail at next ignition cycle.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0974 (Flash Code 71)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Place the transmission in neutral and set the parking brake. 4. Start the engine. 5. Operate the selector lever from N to D in order to energize the 2-4-6-R shift solenoid valve. 6. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition for 30 seconds. 2. Disconnect the 2-4-6-R shift solenoid valve harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the DTC Information with the Tech 2. Is DTC P0973 set?	—	Go to Step 5	Go to Step 4

Step	Action	Value(s)	Yes	No
4	1. Test the control circuit between the transmission control module (TCM) (pins 8 and 9 of B-425 connector) and the 2-4-6-R shift solenoid (pin 2 of J-236 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 7	Go to Step 6
5	Important: Replacement 2-4-6-R shift solenoid valve must be learned. Replace the 2-4-6-R shift solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 7	—
6	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 7	—
7	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Place the transmission in neutral and set the parking brake. 5. Start the engine. 6. Operate the selector lever from N to D in order to energize the 2-4-6-R shift solenoid valve. 7. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 8
8	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0976 (Flash Code 73)**Circuit Description**

The pulse width modulation (PWM) 1-3-5 shift solenoid valve is located on the gearshift control box. The transmission control module (TCM) controls the 1-3-5 shift solenoid valve by duty cycle signal based on commanded gear position. The 1-3-5 shift solenoid is commanded ON when the commanded gear is set to 1st, 3rd and 5th gear. When disengaging from 2nd, 4th, 6th and reverse gear, the 1-3-5 shift solenoid is also commanded ON. The gear shift position sensor is used to detect the shift side lever position feedback for the shift solenoid valves movement. The TCM uses the gear shift position sensor to determine the current gear position with a combination of the gear select position sensor. If the TCM detects a high voltage condition on the 1-3-5 shift solenoid valve monitor circuit when the solenoid valve is commanded OFF, this DTC will set.

Condition for Running the DTC

- DTC P0889 is not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a high voltage condition on the 1-3-5 shift solenoid valve monitor circuit when the solenoid valve is commanded OFF.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM commands OFF gearshift control box relay.
- The TCM inhibits gearshift control and holds gear position when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail at next ignition cycle
- The TCM stops the buzzer when the diagnostic runs and does not fail at next ignition cycle.
- A current DTC clears when the diagnostic runs and does not fail at next ignition cycle.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0976 (Flash Code 73)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC P0889 also set?	—	Go to DTC P0889	Go to Step 3
3	1. Turn OFF the ignition for 30 seconds. 2. Disconnect the 1-3-5 shift solenoid valve harness connector. 3. Connect a DMM between the control circuit of the 1-3-5 shift solenoid valve harness (pin 2 of J-235 connector) and a known good ground. 4. Turn ON the ignition, with the engine OFF. Is the DMM voltage more than the specified value until this DTC fails?	18.0 volts	Go to Step 4	Go to Step 6
4	Is the DMM voltage more than the specified value after this DTC fails?	18.0 volts	Go to Step 7	Go to Step 5

Step	Action	Value(s)	Yes	No
5	1. Connect a test lamp between the ground circuit of the 1-3-5 shift solenoid valve harness (pin 1 of J-235 connector) and battery voltage. 2. Turn ON the ignition. Does the test lamp illuminate?	—	Go to Step 9	Go to Step 8
6	1. Test the voltage feed circuit between the transmission control module (TCM) (pins 4 and 5 of B-425 connector) and the gearshift control box relay (pin 2 of X-19 connector) for an open circuit or high resistance. 2. Test the control circuit between the TCM (pins 21 and 31 of B-425 connector) and the 1-3-5 shift solenoid (pin 2 of J-235 connector) for an open circuit or high resistance. 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 10
7	Important: The 1-3-5 shift solenoid valve may be damaged if the solenoid valve control circuit is shorted to a voltage source. 1. Test the control circuit between the TCM (pins 21 and 31 of B-425 connector) and the 1-3-5 shift solenoid (pin 2 of J-235 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12
8	1. Test the ground circuit between the 1-3-5 shift solenoid (pin 1 of J-235 connector) and chassis ground (J-9) for an open circuit or high resistance. 2. Test the ground circuit between the TCM (pins 6 and 7 of B-425 connector) and chassis ground (J-9) for an open circuit or high resistance. 3. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 10
9	1. Turn OFF the ignition. 2. Disconnect the 1-3-5 shift solenoid valve harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the 1-3-5 shift solenoid valve (pins 1 and 2 of J-235 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 11
10	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for poor connections on the 1-3-5 shift solenoid circuits at the harness connector of the TCM (pins 4, 5, 6, 7, 21 and 31 of B-425 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 13	Go to Step 12

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Step	Action	Value(s)	Yes	No
11	Important: Replacement 1-3-5 shift solenoid valve must be relearned. Replace the 1-3-5 shift solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 13	—
12	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 13	—
13	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. 5. Operate the vehicle within the Conditions for Running the DTC. Did the DTC fail this ignition?	—	Go to Step 2	Go to Step 14
14	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P0977 (Flash Code 73)**Circuit Description**

The pulse width modulation (PWM) 1-3-5 shift solenoid valve is located on the gearshift control box. The transmission control module (TCM) controls the 1-3-5 shift solenoid valve by duty cycle signal based on commanded gear position. The 1-3-5 shift solenoid is commanded ON when the commanded gear is set to 1st, 3rd and 5th gear. When disengaging from 2nd, 4th, 6th and reverse gear, the 1-3-5 shift solenoid is also commanded ON. The gear shift position sensor is used to detect the shift side lever position feedback for the shift solenoid valves movement. The TCM uses the gear shift position sensor to determine the current gear position with a combination of the gear select position sensor. If the TCM detects a low voltage condition on the 1-3-5 shift solenoid valve monitor circuit when the solenoid valve is commanded ON, this DTC will set.

Condition for Running the DTC

- DTC P0889 is not set.
- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The gearshift control box relay is commanded ON.

Condition for Setting the DTC

- The TCM detects a low voltage condition on the 1-3-5 shift solenoid valve monitor circuit when the solenoid valve is commanded ON.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.

- The TCM intermittently sounds buzzer when the diagnostic runs and fails.
- The TCM commands OFF gearshift control box relay.
- The TCM inhibits gearshift control and holds gear position when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail at next ignition cycle
- The TCM stops the buzzer when the diagnostic runs and does not fail at next ignition cycle.
- A current DTC clears when the diagnostic runs and does not fail at next ignition cycle.
- A history DTC clears with the Tech 2 or reset switch operation.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P0977 (Flash Code 73)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Place the transmission in neutral and set the parking brake. 4. Start the engine. 5. Operate the selector lever from N to D and from D to N in order to energize the 1-3-5 shift solenoid valve. 6. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	1. Turn OFF the ignition for 30 seconds. 2. Disconnect the 1-3-5 shift solenoid valve harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the DTC Information with the Tech 2. Is DTC P0976 set?	—	Go to Step 5	Go to Step 4

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Step	Action	Value(s)	Yes	No
4	1. Test the control circuit between the transmission control module (TCM) (pins 21 and 31 of B-425 connector) and the 1-3-5 shift solenoid (pin 2 of J-235 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 7	Go to Step 6
5	Important: Replacement 1-3-5 shift solenoid valve must be relearned. Replace the 1-3-5 shift solenoid valve. Refer to Repair Instructions (Overhaul) - Gearshift Control Box in this section. Did you complete the replacement?	—	Go to Step 7	—
6	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 7	—
7	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Place the transmission in neutral and set the parking brake. 5. Start the engine. 6. Operate the selector lever from N to D and from D to N in order to energize the 1-3-5 shift solenoid valve. 7. Monitor the DTC Information with the Tech 2. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 8
8	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P1901 (Flash Code 19)**Circuit Description**

The half-clutch adjustment switch is used to adjust the clutch engagement timing. The clutch engages too fast/slow when starting vehicle or the clutch engagement timing does not match with the driver preference when starting vehicle, the driver can select the timing by pressing either "FAST" or "SLOW" adjustment switch. If the TCM detects the half-clutch adjustment fast switch signal continuously "ON", this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The vehicle speed is more than 5 km/h (3 MPH)

Condition for Setting the DTC

- The TCM detects that the half-clutch adjustment fast switch signal is stuck at the ON position (high voltage).

Action Taken When the DTC Sets

- The TCM does not illuminate the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits half-clutch adjustment.

Condition for Clearing the DTC

- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P1901 (Flash Code 19)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn ON the ignition, with the engine OFF. 3. Observe the Fast Switch parameter with the Tech 2. Does the Fast Switch parameter indicate OFF?	—	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the half-clutch adjustment switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Fast Switch parameter with the Tech 2. Does the Fast Switch parameter indicate OFF?	—	Go to Step 5	Go to Step 4
4	1. Test the half-clutch adjustment switch circuit between the transmission control module (TCM) (pin 2 of B-428 connector) and the half-clutch adjustment switch (pin 1 of B-106 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 7	Go to Step 6
5	Replace the half-clutch adjustment switch. Did you complete the replacement?	—	Go to Step 7	—
6	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 7	—

7A-156 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
7	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Turn ON the ignition, with the engine OFF. 5. Observe the Fast Switch parameter with the Tech 2. Does the Fast Switch parameter indicate OFF?	—	Go to Step 8	Go to Step 3
8	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

P1902 (Flash Code 19)**Circuit Description**

The half-clutch adjustment switch is used to adjust the clutch engagement timing. The clutch engages too fast/slow when starting vehicle or the clutch engagement timing does not match with the driver preference when starting vehicle, the driver can select the timing by pressing either "FAST" or "SLOW" adjustment switch. If the TCM detects the half-clutch adjustment slow switch signal continuously "ON", this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.
- The vehicle speed is more than 5 km/h (3 MPH)

Condition for Setting the DTC

- The TCM detects that the half-clutch adjustment slow switch signal is stuck at the ON position (high voltage).

Action Taken When the DTC Sets

- The TCM does not illuminate the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits half-clutch adjustment.

Condition for Clearing the DTC

- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

DTC P1902 (Flash Code 19)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn ON the ignition, with the engine OFF. 3. Observe the Slow Switch parameter with the Tech 2. Does the Slow Switch parameter indicate OFF?	—	Go to Diagnostic Aids	Go to Step 3
3	1. Turn OFF the ignition. 2. Disconnect the half-clutch adjustment switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Slow Switch parameter with the Tech 2. Does the Slow Switch parameter indicate OFF?	—	Go to Step 5	Go to Step 4
4	1. Test the half-clutch adjustment switch circuit between the transmission control module (TCM) (pin 9 of B-428 connector) and the half-clutch adjustment switch (pin 2 of B-106 connector) for a short to battery or ignition voltage. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 7	Go to Step 6
5	Replace the half-clutch adjustment switch. Did you complete the replacement?	—	Go to Step 7	—
6	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 7	—

7A-158 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
7	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Turn ON the ignition, with the engine OFF. 5. Observe the Slow Switch parameter with the Tech 2. Does the Slow Switch parameter indicate OFF?	—	Go to Step 8	Go to Step 3
8	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

U0100, U0121 (Flash Code 42, 68)**Circuit Description**

The engine control module (ECM), the transmission control module (TCM), the electric hydraulic control module (EHCU) (ABS module) and the data recording module (DRM) communicate control and diagnostic information via a controller area network (CAN) communication bus. The TCM monitors CAN operational status by expecting a constant flow of messages from the ECM, EHCU and DRM. If the TCM fails to receive an expected message from the ECM, EHCU and DRM, DTC U0100 or U0121 will set depending on what communication is lost.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC**U0100**

- The TCM detects that the CAN Bus OFF Status.

U0121

- The TCM detects that the CAN Bus.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails. (U0100)
- The TCM does not illuminate the transmission warning lamp when the diagnostic runs and fails. (U0121)

- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail. (U0100)
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- If DTC U0100 is present, auto shift control is inhibited and poor shift quality (feel) will appear.
- If DTC U0121 is present, lock up clutch may engage/disengage during an ABS event.

Notice:

- Diagnostic charts are different depending on the specification of the vehicle.

DTC U0100, U0121 (Flash Code 42, 68)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Chart for without ABS

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the transmission control module (TCM) Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	Attempt to communicate with the engine control module (ECM) via the Engine Data table. Does the Tech 2 communicate with the ECM?	—	Go to Step 4	Go to Diagnostic System Check - Engine Controls
4	1. Turn OFF the ignition. 2. Measure the resistance across the controller area network (CAN) Low and High circuits by back probing the resistor 1 (pins 1 and 2 of B-387 connector) (resistor 1 is located near the driver's side dash panel. It is blue connector). Is the resistance within the specified value (parallel resistance of the 120Ω resistor 1 and the 120Ω resistor 2 should be 60Ω)?	50 - 70Ω	Go to Step 11	Go to Step 5

7A-160 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
5	Is the resistance less than the specified value at Step 4?	—	Go to Step 6	Go to Step 9
6	1. Keep the DMM with connected. 2. Disconnect the TCM harness connectors. Is the resistance within the specified value?	50 - 70Ω	Go to Step 29	Go to Step 7
7	1. Keep the DMM with connected. 2. Disconnect the engine control module (ECM) harness connectors. Is the resistance within the specified value?	50 - 70Ω	Go to Step 30	Go to Step 8
8	1. Keep the DMM with connected. 2. Disconnect the data recording module (DRM) harness connector (DRM is located behind the glove box). Is the resistance within the specified value?	50 - 70Ω	Go to Step 28	Go to Step 21
9	1. Disconnect the resistor 1 harness connector. 2. Measure the resistance of the resistor 1. Is the resistance within the specified value?	110 - 130Ω	Go to Step 10	Go to Step 26
10	1. Disconnect the resistor 2 harness connector (resistor 2 is located behind the radio and above the heater unit. It is blue connector). 2. Measure the resistance of the resistor 2. Is the resistance within the specified value?	110 - 130Ω	Go to Step 22	Go to Step 27
11	1. Disconnect the resistor 1 and resistor 2 harness connector. 2. Turn ON the ignition, with the engine OFF. 3. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 4. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 12	Go to Step 15
12	1. Turn OFF the ignition. 2. Disconnect the ECM harness connectors. 3. Disconnect the TCM harness connectors. 4. Turn ON the ignition, with the engine OFF. 5. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 6. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 13	Go to Step 18

Step	Action	Value(s)	Yes	No
13	1. Turn OFF the ignition. 2. Reconnect the TCM harness connectors. 3. Disconnect the DRM harness connectors. 4. Turn ON the ignition, with the engine OFF. 5. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 6. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 14	Go to Step 19
14	1. Turn OFF the ignition. 2. Reconnect the ECM harness connectors. 3. Disconnect the TCM harness connectors. 4. Turn ON the ignition, with the engine OFF. 5. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 6. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Diagnostic Aids	Go to Step 20
15	1. Turn OFF the ignition. 2. Disconnect the ECM harness connectors. 3. Disconnect the TCM harness connectors. 4. Disconnect the DRM harness connector. 5. Turn ON the ignition, with the engine OFF. 6. Test the CAN Low and CAN High circuits among the resistor 1, resistor 2, ECM, TCM and DRM for a short to ground and short to voltage. Did you find and correct the condition?	—	Go to Step 31	Go to Step 16
16	1. Turn OFF the ignition. 2. Reconnect the ECM harness connectors. 3. Turn ON the ignition, with the engine OFF. 4. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 5. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 17	Go to Step 30

7A-162 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
17	1. Turn OFF the ignition. 2. Reconnect the TCM harness connectors. 3. Turn ON the ignition, with the engine OFF. 4. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 5. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 28	Go to Step 29
18	1. Test for an open or high resistance in the CAN Low or High circuit (which ever voltage reading did not read between 1.3 — 3.7 volts in Step 12) between the DRM and joint connection. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 31	Go to Step 23
19	1. Test for an open or high resistance in the CAN Low or High circuit (which ever voltage reading did not read between 1.3 — 3.7 volts in Step 13) between the TCM and joint connection. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 31	Go to Step 24
20	1. Test for an open or high resistance in the CAN Low or High circuit (which ever voltage reading did not read between 1.3 — 3.7 volts in Step 14) between the ECM and joint connection. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 31	Go to Step 25
21	Repair the short circuit each other across the CAN Low and High circuits among the resistor 1, resistor 2, ECM, TCM and DRM. Did you complete the repair?	—	Go to Step 31	—
22	1. Repair the open circuit or high resistance on the CAN Low and High circuits between the resistor 1 (pins 1 and 2 of B-387 connector) and the resistor 2 (pins 1 and 2 of B-431 connector). 2. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the each resistor. Did you complete the repair?	—	Go to Step 31	—
23	1. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the DRM (pins 2 and 8 of B-429 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 31	Go to Step 28

Step	Action	Value(s)	Yes	No
24	1. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the TCM (pins 2 and 3 of B-427 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 31	Go to Step 29
25	1. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the ECM (pins 18 and 37 of J-191 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 31	Go to Step 30
26	Replace the resistor 1. Did you complete the replacement?	—	Go to Step 31	—
27	Replace the resistor 2. Did you complete the replacement?	—	Go to Step 31	—
28	Replace the DRM. Refer to Data Recording Module (DRM) Replacement. Did you complete the replacement?	—	Go to Step 31	—
29	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 31	—
30	Important: Replacement ECM must be programmed. Replace the ECM. Refer to Engine Control Module (ECM) Replacement /Restore Fuel Injector ID Code Data in engine control section. Did you complete the replacement?	—	Go to Step 31	—
31	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 32
32	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

Chart for with ABS

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls

7A-164 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Monitor the transmission control module (TCM) Diagnostic Trouble Code (DTC) Information with the Tech 2. Does the DTC fail this ignition?	—	Go to Step 3	Go to Diagnostic Aids
3	Attempt to communicate with the engine control module (ECM) via the Engine Data table. Does the Tech 2 communicate with the ECM?	—	Go to Step 4	Go to Diagnostic System Check - Engine Controls
4	Attempt to communicate with the electrical hydraulic control unit (EHCUC) (ABS module) via the ABS Data table. Does the Tech 2 communicate with the EHCUC?	—	Go to Step 5	Go to Diagnostic System Check - Anti-lock Brake System Controls
5	1. Turn OFF the ignition. 2. Measure the resistance across the controller area network (CAN) Low and High circuits by back probing the resistor 1 (pins 1 and 2 of B-387 connector) (resistor 1 is located near the driver's side dash panel. It is blue connector). Is the resistance within the specified value (parallel resistance of the 120Ω resistor 1 and the 120Ω resistor 2 should be 60Ω)?	50 - 70Ω	Go to Step 14	Go to Step 6
6	Is the resistance less than the specified value at Step 5?	—	Go to Step 7	Go to Step 12
7	1. Keep the DMM with connected. 2. Disconnect the EHCUC harness connector. Is the resistance within the specified value?	110 - 130Ω	Go to Step 9	Go to Step 8
8	1. Keep the DMM with connected. 2. Disconnect the TCM harness connectors. Is the resistance within the specified value?	110 - 130Ω	Go to Step 35	Go to Step 25
9	Measure the resistance across the CAN Low and High circuits by back probing the resistor 2 (pins 1 and 2 of B-431 connector) (resistor 2 is located behind the radio and above the heater unit. It is blue connector). Is the resistance within the specified value?	110 - 130Ω	Go to Step 36	Go to Step 10
10	1. Keep the DMM with connected. 2. Disconnect the engine control module (ECM) harness connectors. Is the resistance within the specified value?	110 - 130Ω	Go to Step 37	Go to Step 11
11	1. Keep the DMM with connected. 2. Disconnect the data recording module (DRM) harness connector (DRM is located behind the glove box). Is the resistance within the specified value?	110 - 130Ω	Go to Step 34	Go to Step 26
12	1. Disconnect the resistor 1 harness connector. 2. Measure the resistance of the resistor 1. Is the resistance within the specified value?	110 — 130Ω	Go to Step 13	Go to Step 32

Step	Action	Value(s)	Yes	No
13	1. Disconnect the resistor 2 harness connector (resistor 2 is located behind the radio and above the heater unit. It is blue connector). 2. Measure the resistance of the resistor 2. Is the resistance within the specified value?	110 - 130Ω	Go to Step 27	Go to Step 33
14	1. Disconnect the resistor 1 and resistor 2 harness connector. 2. Turn ON the ignition, with the engine OFF. 3. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 4. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 15	Go to Step 18
15	1. Turn OFF the ignition. 2. Disconnect the ECM harness connectors. 3. Disconnect the EHCU harness connectors. 4. Disconnect the DRM harness connector. 5. Turn ON the ignition, with the engine OFF. 6. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 7. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 16	Go to Step 23
16	1. Turn OFF the ignition. 2. Reconnect the DRM harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Connect a DMM between the CAN Low circuit (pin 1 of B-431 connector) and a known good ground at the resistor 2 harness connector. Record the voltage reading. 5. Connect a DMM between the CAN High circuit (pin 2 of B-431 connector) and a known good ground at the resistor 2 harness connector. Record the voltage reading. Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 17	Go to Step 22

7A-166 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
17	1. Turn OFF the ignition. 2. Reconnect the ECM harness connectors. 3. Disconnect the DRM harness connectors. 4. Turn ON the ignition, with the engine OFF. 5. Connect a DMM between the CAN Low circuit (pin 1 of B-431 connector) and a known good ground at the resistor 2 harness connector. Record the voltage reading. 6. Connect a DMM between the CAN High circuit (pin 2 of B-431 connector) and a known good ground at the resistor 2 harness connector. Record the voltage reading Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Diagnostic Aids	Go to Step 24
18	1. Turn OFF the ignition. 2. Disconnect the ECM harness connectors. 3. Disconnect the TCM harness connectors. 4. Disconnect the EHCU harness connector. 5. Disconnect the DRM harness connector. 6. Turn ON the ignition, with the engine OFF. 7. Test the CAN Low and CAN High circuits among the resistor 1, resistor 2, ECM, EHCU and DRM for a short to ground and short to voltage. Did you find and correct the condition?	—	Go to Step 38	Go to Step 19
19	1. Turn OFF the ignition. 2. Keep the ECM, TCM and DRM harness connectors with disconnect. 3. Reconnect the EHCU harness connector. 4. Turn ON the ignition, with the engine OFF. 5. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 6. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 20	Go to Step 36
20	1. Turn OFF the ignition. 2. Reconnect the TCM harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 5. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 21	Go to Step 35

Step	Action	Value(s)	Yes	No
21	1. Turn OFF the ignition. 2. Reconnect the ECM harness connectors. 3. Turn ON the ignition, with the engine OFF. 4. Connect a DMM between the CAN Low circuit (pin 1 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading. 5. Connect a DMM between the CAN High circuit (pin 2 of B-387 connector) and a known good ground at the resistor 1 harness connector. Record the voltage reading Are both voltage readings within the specified value?	1.3 - 3.7 volts	Go to Step 34	Go to Step 37
22	1. Test for an open or high resistance in the CAN Low or High circuit (which ever voltage reading did not read between 1.3 — 3.7 volts in Step 16) between the DRM and joint connection. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 38	Go to Step 28
23	1. Test for an open or high resistance in the CAN Low or High circuit (which ever voltage reading did not read between 1.3 — 3.7 volts in Step 15) between the TCM and joint connection. 2. Repair the circuit(s) as necessary. 3. Did you find and correct the condition?	—	Go to Step 38	Go to Step 29
24	1. Test for an open or high resistance in the CAN Low or High circuit (which ever voltage reading did not read between 1.3 — 3.7 volts in Step 17) between the ECM and joint connection. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 38	Go to Step 31
25	Repair the short circuit each other across the CAN Low and High circuits among the resistor 1, TCM and EHCU. Did you complete the repair?	—	Go to Step 38	—
26	Repair the short circuit each other across the CAN Low and High circuits among the resistor 2, ECM, DRM and EHCU. Did you complete the repair?	—	Go to Step 38	—
27	1. Test the CAN Low and High circuits between the resistor 1 (pins 1 and 2 of B-387 connector) and the EHCU (pins 14 and 15 of J-177 connector) for an open circuit or high resistance. 2. Test the CAN Low and High circuits between the resistor 2 (pins 1 and 2 of B-431 connector) and the EHCU (pins 26 and 27 of J-177 connector) for an open circuit or high resistance. 3. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the each resistor. 4. Repair the circuit(s) or connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 38	Go to Step 30

7A-168 Transmission Control System (Smoother)

Step	Action	Value(s)	Yes	No
28	1. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the DRM (pins 2 and 8 of B-429 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 38	Go to Step 34
29	1. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the TCM (pins 2 and 3 of B-427 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 38	Go to Step 35
30	1. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the EHCUC (pins 14, 15, 26 and 27 of J-177 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 38	Go to Step 36
31	1. Inspect for an intermittent, for poor connections and corrosion on the CAN Low and High circuits at the harness connector of the ECM (pins 18 and 37 of J-191 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 38	Go to Step 37
32	Replace the resistor 1. Did you complete the replacement?	—	Go to Step 38	—
33	Replace the resistor 2. Did you complete the replacement?	—	Go to Step 38	—
34	Replace the DRM. Refer to Data Recording Module (DRM) Replacement. Did you complete the replacement?	—	Go to Step 38	—
35	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 38	—
36	Replace the EHCUC. Refer to Electric Hydraulic Control Unit (EHCUC Replacement in the Anti-lock Brake section). Did you complete the replacement?	—	Go to Step 38	—
37	Important: Replacement ECM must be programmed. Replace the ECM. Refer to Engine Control Module (ECM) Replacement /Restore Fuel Injector ID Code Data in engine control section. Did you complete the replacement?	—	Go to Step 38	—

Step	Action	Value(s)	Yes	No
38	1. Reconnect all previously disconnected harness connector(s). 2. Clear the DTCs with the Tech 2. 3. Turn OFF the ignition for 30 seconds. 4. Start the engine. Did the DTC fail this ignition?	—	Go to Step 3	Go to Step 39
39	Observe the DTC Information with the Tech 2. Are there any DTCs that you have not diagnosed?	—	Go to Diagnostic Trouble Code (DTC) List	System OK

U0400 (Flash Code 23)**Circuit Description**

The engine speed signal to the transmission control module (TCM) is sent from the engine control module (ECM) via a controller area network (CAN) communication bus based on inputs from the crankshaft position (CKP) sensor and camshaft position (CMP) sensor. If the TCM detects no engine speed signal from the ECM during the engine running, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the engine speed CAN Bus messages from the ECM are not being received.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

Notice:

- If this DTC is present, the Engine Speed parameter on the Tech 2 will indicate the turbine speed when the current gear is neutral or lock up clutch is engaged. Other condition, it indicates a default value.

DTC U0400 (Flash Code 23)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC U0100 or U0121 set?	—	Go to Applicable DTC	Go to Step 3
3	1. Select the "4HK1" in the system selection menu. 2. Monitor the DTC Information with the Tech 2. Is the engine control module (ECM) DTC P0335, P0336, P0340, P0341 or P1345 set?	—	Go to Applicable DTC in Engine Control Section	Go to Diagnostic Aids

U0401 (Flash Code 24)**Circuit Description**

The accelerator pedal position (APP) signal to the transmission control module (TCM) is sent from the engine control module (ECM) via a controller area network (CAN) communication bus based on inputs from the APP sensor 1 and APP sensor 2. If the TCM detects no APP signal from the ECM, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the accelerator pedal position CAN Bus messages from the ECM are not being received.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits auto shift control.

- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.
- If this DTC is present, poor shift quality (feel) will appear.

DTC U0401 (Flash Code 24)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC U0100 or U0121 set?	—	Go to Applicable DTC	Go to Step 3
3	1. Select the "4HK1" in the system selection menu. 2. Monitor the DTC Information with the Tech 2. Is the engine control module (ECM) DTC P1271, P1277, P1278, P1282 or P1283 set?	—	Go to Applicable DTC in Engine Control Section	Go to Diagnostic Aids

U0406 (Flash Code 25)**Circuit Description**

The vehicle speed signal to the transmission control module (TCM) is sent from the engine control module (ECM) via a controller area network (CAN) communication bus based on input from the vehicle speed sensor (VSS). If the TCM detects no vehicle speed signal from the ECM, this DTC will set.

Condition for Running the DTC

- The ignition switch is ON.
- The ignition voltage is more than 20 volts.
- The emergency switch is OFF.

Condition for Setting the DTC

- The TCM detects that the vehicle speed CAN Bus messages from the ECM are not being received.

Action Taken When the DTC Sets

- The TCM illuminates the transmission warning lamp when the diagnostic runs and fails.
- The TCM inhibits auto shift control.
- The TCM selects highest gear when shifted from N to D.
- The TCM inhibits gear select & shift position learning and half-clutch learning.

Condition for Clearing the DTC

- The TCM turns OFF the transmission warning lamp when the diagnostic runs and does not fail.
- A current DTC clears when the diagnostic runs and does not fail.
- A history DTC clears when the diagnostic runs and does not fail.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

Notice:

- If this DTC is present, the Output Shaft Speed and Vehicle Speed parameter on the Tech 2 will indicate estimated value based on other inputs.

DTC U0406 (Flash Code 25)

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Start the engine. 4. Monitor the Diagnostic Trouble Code (DTC) Information with the Tech 2. Is DTC U0100 or U0121 set?	—	Go to Applicable DTC	Go to Step 3
3	1. Select the "4HK1" in the system selection menu. 2. Monitor the DTC Information with the Tech 2. Is the engine control module (ECM) DTC P0500 or P0501 set?	—	Go to Applicable DTC in Engine Control Section	Go to Diagnostic Aids

Transmission Warning Lamp Inoperative

Circuit Description

Ignition voltage is supplied to the transmission warning lamp via meter fuse. The transmission control module (TCM) turns the transmission warning lamp ON by grounding the lamp control circuit.

Transmission Warning Lamp Operation

The transmission warning lamp is located on the instrument panel cluster (IPC).

Transmission Warning Lamp Function

- The transmission warning lamp informs the driver that a malfunction has occurred and the vehicle should be taken in for service as soon as possible.
- The transmission warning lamp illuminates during a bulb test.

- A DTC will be stored if the transmission warning lamp is requested by the TCM.

Transmission Warning Lamp Illumination

- The transmission warning lamp illuminates for approximately 3 seconds when the ignition switch is turned ON, with the engine OFF.
- The transmission warning lamp remains illuminated if the transmission control module (TCM) detects a fault.

Transmission Warning Lamp Inoperative

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Verify whether the instrument panel cluster (IPC) is operational. 2. Turn OFF the ignition for 30 seconds. 3. Turn OFF the emergency switch. 4. Turn ON the ignition, with the engine OFF. Does the transmission warning lamp illuminate?	—	Go to Intermittent Conditions	Go to Step 3
3	Inspect the Meter (10 A) fuse (F-16) in the glove box fuse block that supplies ignition voltage to the transmission warning lamp. Is the fuse open?	—	Go to Step 10	Go to Step 4
4	1. Turn OFF the ignition. 2. Remove the Meter (10 A) fuse (F-16) that supplies voltage to the transmission warning lamp. 3. Disconnect the transmission control module (TCM) harness connector (B-425 connector). 4. Turn ON the ignition with the engine OFF. 5. Measure the voltage from the transmission warning lamp control circuit at the TCM (pin 11 of B-425 connector) to a known good ground. Is the voltage less than the specified value?	1 volt	Go to Step 5	Go to Step 11
5	1. Turn OFF the ignition. 2. Install the Meter (10 A) fuse (F-16) that supplies voltage to the transmission warning lamp. 3. Turn ON the ignition, with the engine OFF. 4. Connect a 3-amp fused jumper wire between the transmission warning lamp control circuit in the TCM harness connector and a known good ground. Is the transmission warning lamp illuminated?	—	Go to Step 9	Go to Step 6

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Step	Action	Value(s)	Yes	No
6	1. Turn ON the ignition. 2. Operate the 1st gear start switch while observing the 1st START indicator lamp in the IPC. Does the 1st START indicator lamp operate correctly?	—	Go to Step 7	Go to Step 12
7	1. Turn OFF the ignition. 2. Disconnect the IPC harness connector (B-53 connector). 3. Test the transmission warning lamp control circuit between the TCM (pin 11 of B-425 connector) and the IPC (pin 8 of B-53 connector) for an open or high resistance. 4. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 8
8	1. Test for an intermittent and for a poor connection at the IPC (pin 8 of B-53 connector). 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 13
9	1. Test for an intermittent and for a poor connection at the TCM harness connector (pin 11 of B-425 connector). 2. Repair the connector(s) as necessary. Did you find and correct the condition?	—	Go to Step 15	Go to Step 14
10	Replace the Meter (10 A) fuse (F-16). If the fuse continues to open, repair the short to ground on the ignition voltage circuit or check for a shorted component. Did you complete the repair?	—	Go to Step 15	—
11	Repair the short to voltage on the transmission warning lamp control circuit. Did you complete the repair?	—	Go to Step 15	—
12	Repair the open in the transmission warning lamp ignition voltage circuit. Did you complete the repair?	—	Go to Step 15	—
13	Replace the IPC. Refer to Instrument Panel Cluster (IPC) Replacement in the Cab and Chassis Electrical section. Did you complete the replacement?	—	Go to Step 15	—
14	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 15	—
15	1. Remove all test equipment. 2. Connect any disconnected components or any disconnected fuse. 3. Turn ON the ignition, with the engine OFF. Does the transmission warning lamp illuminate?	—	Go to Step 16	Go to Step 2

Step	Action	Value(s)	Yes	No
16	1. Turn OFF the ignition for 30 seconds. 2. Start the engine and operate the vehicle checking for acceptable performance and driveability. 3. Observe the transmission warning lamp, the vehicle performance and the driveability. Does the vehicle operate correctly, without any transmission warning lamp illumination and without any stored DTCs?	—	System OK	Go to Diagnostic Trouble Code (DTC) List or Symptom Charts

Transmission Warning Lamp Always On

Circuit Description

Ignition voltage is supplied to the transmission warning lamp via meter fuse. The transmission control module (TCM) turns the transmission warning lamp ON by grounding the lamp control circuit.

Transmission Warning Lamp Operation

The transmission warning lamp is located on the instrument panel cluster (IPC).

Transmission Warning Lamp Function

- The transmission warning lamp informs the driver that a malfunction has occurred and the vehicle should be taken in for service as soon as possible.
- The transmission warning lamp illuminates during a bulb test.

- A DTC will be stored if the transmission warning lamp is requested by the TCM.

Transmission Warning Lamp Illumination

- The transmission warning lamp illuminates for approximately 3 seconds when the ignition switch is turned ON, with the engine OFF.
- The transmission warning lamp remains illuminated if the transmission control module (TCM) detects a fault.

Transmission Warning Lamp Always On

Schematic Reference: Transmission Controls Schematics

Connector End View Reference: Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls
2	1. Turn OFF the ignition for 30 seconds. 2. Turn OFF the emergency switch. 3. Turn ON the ignition, with the engine OFF. Does the transmission warning lamp always remain ON after 3 seconds passed?	—	Go to Step 3	Check for DTCs and if none exist Go to Intermittent Conditions
3	1. Turn OFF the ignition. 2. Disconnect the transmission control module (TCM) harness connector (B-425 connector). 3. Turn ON the ignition, with the engine OFF. 4. Observe the transmission warning lamp. Is the transmission warning lamp illuminated?	—	Go to Step 4	Go to Step 6
4	1. Remove the instrument panel cluster (IPC). 2. Disconnect the IPC harness connector (B-53 connector). 3. Test the transmission warning lamp control circuit between the TCM (pin 11 of B-425 connector) and the IPC (pin 8 of B-53 connector) for a short to ground. 4. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 7	Go to Step 5
5	Replace the IPC. Refer to Instrument Panel Cluster (IPC) Replacement in the Cab and Chassis Electrical section. Did you complete the replacement?	—	Go to Step 7	—
6	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 7	—

Step	Action	Value(s)	Yes	No
7	1. Remove all test equipment. 2. Connect any disconnected components. 3. Turn ON the ignition, with the engine OFF. Does the transmission warning lamp always remain ON after 3 seconds passed?	—	Go to Step 2	Go to Step 8
8	1. Turn OFF the ignition for 30 seconds. 2. Start the engine and operate the vehicle checking for acceptable performance and driveability. 3. Observe the transmission warning lamp, the vehicle performance, and the driveability. Does the vehicle operate correctly, without any transmission warning lamp illumination and without any stored DTCs?	—	System OK	Go to Diagnostic Trouble Code (DTC) List or Symptom Charts

Gearshift Control System Check

Description

The pulse width modulation (PWM) select solenoid valve, 1-3-5 and 2-4-6-R shift solenoid valves are located on the gearshift control box. The transmission control module (TCM) controls each select and shift solenoid valves by duty cycle signal based on commanded gear position. The select solenoid is only commanded ON when up-shifting. When downshifting, the force created by the return springs moves the internal select lever, but the select solenoid limits the amount of movement by generating force as required in the up-shift direction. The 1-3-5 shift solenoid is commanded ON when the commanded gear is set to 1st, 3rd and 5th gear. When disengaging from 2nd, 4th, 6th and reverse gear, the 1-3-5 shift solenoid is also commanded ON. The 2-4-6-R shift solenoid is commanded ON when the commanded gear is set to 2nd, 4th, 6th and reverse gear. When disengaging from 1st, 3rd and 5th gear, the 2-4-6-R shift solenoid is also commanded ON. The gear select position sensor is used to detect the select side lever position feedback for the select solenoid valve movement. The gear shift position sensor is used to detect the shift side lever position feedback for the shift solenoid valves movement. The TCM uses the gear shift position sensor to determine the current gear position with a combination of the gear select position sensor.

When the selector lever is in the N position, the transmission is in neutral. Operating the lever to the R position puts the vehicle into reverse. Operating the lever to the D position puts the vehicle into drive, and into auto shift mode. Operating the lever to the + direction from D, shifts the up-shifting. Operating it to the – direction, shifts the downshifting. This operation also switches to the manual mode. Operating the lever from the D position to the A position while in the manual mode switches to the auto mode. When the selector lever is moved to any of the A, + or – positions from the D position, it will automatically return to the D position.

The economy mode switch can be pressed during the auto mode if you want gear changes to be performed with the priority on efficient fuel consumption. The 1st gear start switch is used to control vehicle starting so that 1st gear is normally used to start vehicle. This is because the transmission is controlled to start in 2nd gear if the 1st gear start switch is not ON.

The emergency switch, which is used when the TCM or related switches or sensors fail and normal control is not possible, and the emergency shift switch are located in front of the selector lever. As these switches are only used in an emergency, they are usually protected with a cover.

The diagnostic table assumes the following conditions are met:

- The battery is completely charged and terminals are cleaned and tight.
- Fuse and slow blow fuse are normal.
- The vehicle information data is correctly programmed and transmission gear select & shift position is correctly learned.

Diagnostic Aids

- If an intermittent condition is suspected, refer to Intermittent Conditions in this section.

Gearshift Control System Check

Schematic Reference: Engine Controls Schematics and Transmission Controls Schematics

Connector End View Reference: Engine Controls Connector End Views, Engine Control Module (ECM) Connector End Views, Transmission Controls Connector End Views or Transmission Control Module (TCM) Connector End Views

Chart 1 of 4

Step	Action	Value(s)	Yes	No
1	Did you perform the Diagnostic System Check - Transmission Controls?	—	Go to Step 2	Go to Diagnostic System Check - Transmission Controls

Step	Action	Value(s)	Yes	No
2	1. Install the Tech 2. 2. Turn OFF the ignition for 30 seconds. 3. Turn ON the ignition, with the engine OFF. 4. Observe the following transmission data with the Tech 2. Reprogram correct vehicle information if incorrect. Refer to Transmission Control Module (TCM) Replacement in this section. • Engine Type • Transmission Type • Speedometer Driven Gear Teeth 5. Observe the following transmission data with the Tech 2. Relearn if indicates Not Learned. Refer to Transmission Control Module (TCM) Replacement in this section. • Engine Type Learning Status • Transmission Type Learning Status • Speedometer Driven Gear Learning Status • Gear Position Learning Status • Torque Learning Status 6. Learning procedure must be done whenever any of the relating parts are replaced, removed or repaired. Refer to Programming & Learning Guideline in this section. Did you complete the action?	—	Go to Step 3	—
3	Operate the selector lever while observe the Selector Position parameter with the Tech 2. Does the Selector Position parameter indicate correct position?	—	Go to Step 4	Refer to DTC P0906 and P0907
4	1. Inspect for correct ATF level. Refer to ATF inspection in this section. 2. Inspect for external leakage. 3. Repair or add ATF as necessary. Did you complete the action?	—	Go to Step 5	—
5	1. Lift the driving wheels or drive the vehicle. 2. Start the engine. 3. Monitor the DTC Information with the Tech 2. Are any DTC(s) set?	—	Go to Applicable DTC	Go to Step 6
6	1. Start the engine if stopped. 2. Put the vehicle with the following conditions: • Selector lever N position • 1st gear start switch OFF • Economy mode switch OFF • Emergency switch OFF • Emergency shift switch N position • PTO switch(s) and/or lever OFF 3. Operate the selector lever from N to D while applying the brake pedal. Does the gear position display in the instrument panel cluster (IPC) indicate A?	—	Go to Step 7	Go to Step 20

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Step	Action	Value(s)	Yes	No
7	Does the transmission warning lamp OFF in the IPC?	—	Go to Step 8	If DTC is set, refer to applicable DTC. If no DTC, Go to Transmission Warning Lamp Always ON
8	Does the ECONO indicator lamp OFF in the IPC?	—	Go to Step 9	Go to Chart 2 of 4 Step 13
9	Does the 1st START indicator lamp OFF in the IPC?	—	Go to Step 10	Go to Chart 2 of 4 Step 28
10	Let the vehicle run while observing the Current Gear and Desired Gear Position parameter with the Tech 2. Does all forward gear automatically engage or disengage except 1st gear, and Current Gear parameter follow the Desired Gear Position parameter?	—	Go to Step 11	If DTC is set, refer to applicable DTC. If no DTC, Go to Step 19
11	1. Stop the vehicle. 2. Economy mode switch ON. 3. Let the vehicle run while observing the Current Gear and Desired Gear Position parameter with the Tech 2. Does all forward gear automatically engage or disengage except 1st gear, and the timing of up-shifting earlier than normal auto shifting?	—	Go to Step 12	Go to Chart 2 of 4 Step 1
12	1. Stop the vehicle. 2. Operate the selector lever to + and -. Slightly move the vehicle as necessary. Does the gear position display in the IPC indicate 1, 2 or 3 when the selector lever is operated?	—	Go to Step 13	If DTC is set, refer to applicable DTC. If no DTC, Go to Step 19
13	1. Stop the vehicle. 2. Operate the selector lever to A. 3. 1st gear start switch ON 4. Let the vehicle run while observing the Current Gear and Desired Gear Position parameter with the Tech 2. Does the 1st gear automatically engage whenever vehicle starting?	—	Go to Step 14	Go to Chart 2 of 4 Step 18
14	1. Stop the vehicle. 2. Operate the selector lever to R. Slightly move the vehicle as necessary. Does the reverse gear engage?	—	Go to Step 15	If DTC is set, refer to applicable DTC. If no DTC, Go to Step 19
15	1. Stop the vehicle. 2. Put the vehicle with the following conditions: • Selector lever N position • Emergency switch ON • Emergency shift switch N position Does the transmission warning lamp blink in the IPC?	—	Go to Step 16	Go to Chart 3 of 4 Step 1
16	1. Apply the brake pedal firmly. 2. Turn the emergency shift switch to 1. Does the 1st gear engage?	—	Go to Step 17	Go to Chart 3 of 4 Step 13

Step	Action	Value(s)	Yes	No
17	1. Stop the vehicle. 2. Apply the brake pedal firmly. 3. Turn the emergency shift switch to R. Does the reverse gear engage?	—	Go to Step 18	Go to Chart 3 of 4 Step 24
18	1. Stop the vehicle. 2. Put the vehicle with the following conditions: • Selector lever N position • Emergency switch OFF • Emergency shift switch N position 3. Turn OFF the ignition for 30 seconds. 4. Turn ON the ignition, with the engine OFF. Does the gear position display in the IPC indicate N?	—	System OK	If DTC is set, refer to applicable DTC. If no DTC, Go to Step 19
19	1. Perform following checks which ever gear position did not engage or disengage. Use Tech 2 transmission data list normal reading or a known good vehicle to determine nominal values. 2. Visually inspect the gear select position sensor, gear shift position sensor, select solenoid valve, 1-3-5 shift solenoid valve, 2-4-6-R shift solenoid valve for the following conditions: • Physical damage • Loose or improper installation 3. Remove the transmission gearshift control box. Refer to Repair Instructions (Overhaul) - Control Box in this section. 4. Visually inspect the gearshift control box for the following conditions: • Internal lever damage that connects to the each position sensor. • Internal lever damage that connects to the each solenoid valve. • Shift lever damage that connects to the interlock plate and shift rods • Other damage that the shift lever possible to stuck. 5. Inspect the transmission main unit as necessary. Refer to Repair Instructions (Overhaul) in this section. 6. Remove the oil pump assembly. Refer to Repair Instructions (Overhaul) - Oil Pump in this section. 7. Inspect the oil pump assembly and gearshift clutch for the following conditions: • The gearshift clutch solenoid valve or lock up clutch solenoid valve for mechanically stuck or damage. • Each spool valve for damage. • The oil pump for damage. • ATF Internal leaking • The gearshift clutch mechanically stuck or damage. 8. Repair or replace as necessary. Did you find and correct the condition?	—	Go to Step 2	—

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Step	Action	Value(s)	Yes	No
20	Does the gear position display in the IPC keep to indicate N?	—	Go to Step 21	Go to Step 22
21	Does the transmission warning lamp blink in the IPC?	—	Go to Chart 3 of 4 Step 9	Go to Step Chart 4 of 4 Step 1
22	Does the gear position display in the IPC indicate any gear?	—	If DTC is set, the TCM is not allowing auto shift control. Refer to applicable DTC. If no DTC, Go to Chart 4 of 4 Step 16	Go to Chart 4 of 4 Step 12

Chart 2 of 4

Step	Action	Value(s)	Yes	No
1	1. Turn ON the ignition switch, with the engine OFF. 2. Observe the Economy Switch parameter with the Tech 2. Does the Economy Switch parameter indicate ON when the switch is ON?	—	Go to Step 2	Go to Step 3
2	Does the ECONO indicator lamp illuminate at Step 1?	—	Go to Intermittent Conditions	Go to Step 9
3	1. Turn OFF the ignition. 2. Disconnect the economy mode and 1st gear start switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Economy Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire between the economy mode switch harness (pin 6 of N-20 connector) and a known good ground. Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 4	Go to Step 5
4	Observe the Economy Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the economy mode switch harness (pins 3 and 6 of N-20 connector). Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 7	Go to Step 6
5	1. Test the economy switch signal circuit between the transmission control module (TCM) (pin 13 of B-428 connector) and the economy mode switch (pin 6 of N-20 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 8
6	Repair the open circuit or high resistance on the ground circuit of the economy mode switch (pin 3 of N-20 connector) and the chassis ground (B-1). Did you complete the repair?	—	Go to Step 35	—

Step	Action	Value(s)	Yes	No
7	1. Turn OFF the ignition. Inspect for an intermittent and for poor connections at the harness connector of the economy mode switch (pins 3 and 6 of N-20 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 32
8	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the economy mode switch signal circuit at the harness connector of the TCM (pin 13 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 34
9	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector (B-425 connector). 3. Turn ON the ignition, with the engine OFF. 4. Connect a 3-amp fused jumper wire between the ECONO indicator lamp control circuit of the TCM harness connector (pin 12 of B-425 connector) and a known good ground. Does the ECONO indicator lamp illuminate?	—	Go to Step 12	Go to Step 10
10	1. Turn OFF the ignition. 2. Inspect for an intermittent and for a poor connection at the harness connector of the instrument panel cluster (IPC) (pin 7 of B-53 connector). 3. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 11
11	1. Test the ECONO indicator lamp control circuit between the TCM (pin 12 of B-425 connector) and the IPC (pin 7 of B-53 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 33
12	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the ECONO indicator lamp control circuit at the harness connector of the TCM (pin 12 of B-425 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 34
13	1. Turn ON the ignition switch, with the engine OFF. 2. Observe the Economy Switch parameter with the Tech 2. Does the Economy Switch parameter indicate OFF when the switch is OFF?	—	Go to Step 16	Go to Step 14

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Step	Action	Value(s)	Yes	No
14	1. Turn OFF the ignition. 2. Disconnect the economy mode and 1st gear start switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Economy Switch parameter with the Tech 2. Does the Economy Switch parameter indicate OFF?	—	Go to Step 32	Go to Step 15
15	1. Test the economy switch circuit between the TCM (pin 13 of B-428 connector) and the economy mode switch (pin 6 of N-20 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 34
16	1. Turn OFF the ignition. 2. Disconnect the IPC B-53 connector harness connector. 3. Connect a test lamp between the ECONO indicator lamp control circuit (pin 7 of B-53 connector) and battery voltage. 4. Turn ON the ignition, with the engine OFF. Does the test lamp continuously illuminate (test lamp blink then go out normally)?	—	Go to Step 17	Go to Step 33
17	1. Test the ECONO indicator lamp control circuit between the TCM (pin 12 of B-425 connector) and the IPC (pin 7 of B-53 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 34
18	1. Turn ON the ignition switch, with the engine OFF. 2. Observe the 1st gear start switch parameter with the Tech 2. Does the 1st gear start switch parameter indicate ON when the switch is ON?	—	Go to Step 19	Go to Step 20
19	Does the 1st START indicator lamp illuminate at Step 18?	—	Go to Intermittent Conditions	Go to Step 26
20	1. Turn OFF the ignition switch. 2. Disconnect the economy mode and 1st gear start switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the 1st Gear Start Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire between the economy switch harness (pin 4 of N-20 connector) and a known good ground. Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 21	Go to Step 22
21	Observe the 1st Gear Start Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the economy switch harness (pins 1 and 4 of N-20 connector). Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 24	Go to Step 23

Step	Action	Value(s)	Yes	No
22	1. Test the 1st gear start switch signal circuit between the TCM (pin 1 of B-427 connector) and the 1st gear start switch (pin 4 of N-20 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 25
23	Repair the open circuit or high resistance on the ground circuit of the 1st gear start switch (pin 1 of N-20 connector) and the chassis ground (B-1). Did you complete the repair?	—	Go to Step 35	—
24	1. Turn OFF the ignition. 2. Inspect for an intermittent and for poor connections at the harness connector of the 1st gear start switch (pins 1 and 4 of N-20 connector). 3. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 32
25	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the 1st gear start switch signal circuit at the harness connector of the TCM (pin 1 of B-427 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 34
26	1. Turn OFF the ignition. 2. Inspect for an intermittent and for a poor connection at the harness connector of the IPC (pin 6 of B-53 connector). 3. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 27
27	1. Test the 1st START indicator lamp circuit between the 1st gear start switch (pin 4 of N-20 connector) and the IPC (pin 6 of B-53 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 33
28	1. Turn ON the ignition switch, with the engine OFF. 2. Observe the 1st Gear Start Switch parameter with the Tech 2. Does the 1st Gear Start Switch parameter indicate OFF when the switch is OFF?	—	Go to Step 31	Go to Step 29
29	1. Turn OFF the ignition. 2. Disconnect the economy mode and 1st gear start switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the 1st Gear Start Switch parameter with the Tech 2. Does the 1st Gear Start Switch parameter indicate OFF?	—	Go to Step 32	Go to Step 30

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Step	Action	Value(s)	Yes	No
30	1. Test the 1st gear start switch circuit between the TCM (pin 1 of B-427 connector) and the 1st gear start switch (pin 4 of N-20 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 34
31	1. Test the 1st START indicator lamp circuit between the diode (pin 1 of X-32 connector) and the IPC (pin 6 of B-53 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 35	Go to Step 33
32	Replace the economy mode & 1st gear start switch. Did you complete the replacement?	—	Go to Step 35	—
33	Repair or replace the IPC. Refer to Instrument Panel Cluster (IPC) Replacement in the Cab and Chassis Electrical section. Did you complete the repair or replacement?	—	Go to Step 35	
34	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 35	—
35	Reconnect all previously disconnected fuse or harness connector(s). Is the action complete?	—	Go to Chart 1 of 4 Step 6	—

Chart 3 of 4

Step	Action	Value(s)	Yes	No
1	1. Turn ON the ignition switch, with the engine OFF. 2. Observe the Emergency Switch parameter with the Tech 2. Does the Emergency Switch parameter indicate ON when the switch is ON?	—	Go to Step 2	Go to Step 3
2	Does the transmission warning lamp blink at Step 1?	—	Go to Intermittent Conditions	Go to Transmission Warning Lamp Inoperative
3	1. Turn OFF the ignition. 2. Disconnect the emergency switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Connect a test lamp between the voltage feed circuit of the emergency switch harness (pin 1 of N-17 connector) and a known good ground. Does the test lamp illuminate?	—	Go to Step 4	Go to Step 5

Step	Action	Value(s)	Yes	No
4	1. Turn ON the ignition, with the engine OFF. 2. Observe the Emergency Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the emergency switch harness connector between pins 1 and 5 of the N-17 connector. Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 7	Go to Step 6
5	Repair the open circuit or high resistance on the voltage feed circuit between the Meter (10A) fuse (F-16) in the glove box fuse block and the emergency switch (pin 1 of N-17 connector). Did you complete the repair?	—	Go to Step 36	—
6	1. Test the emergency switch signal circuit between the TCM (pin 4 of B-428 connector) and the emergency switch (pin 5 of N-17 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 8
7	1. Turn OFF the ignition. 2. Disconnect the emergency switch harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the emergency switch (pins 1 and 5 of N-17 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 12
8	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the emergency switch circuit at the harness connector of the TCM (pin 4 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 35
9	1. Turn ON the ignition switch, with the engine OFF. 2. Observe the Emergency Switch parameter with the Tech 2. Does the Emergency Switch parameter indicate OFF when the switch is OFF?	—	Go to Intermittent Conditions	Go to Step 10
10	1. Turn OFF the ignition. 2. Disconnect the emergency switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Emergency Switch parameter with the Tech 2. Does the Emergency Switch parameter indicate OFF?	—	Go to Step 12	Go to Step 11

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Step	Action	Value(s)	Yes	No
11	1. Test the emergency switch circuit between the TCM (pin 4 of B-428 connector) and the emergency switch (pin 5 of N-17 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 35
12	Replace emergency switch. Did you complete the replacement?	—	Go to Step 36	—
13	1. Turn ON the ignition switch, with the engine OFF. 2. Observe the Emergency 1st Switch parameter with the Tech 2. Does the Emergency 1st Switch parameter indicate ON when the switch is 1?	—	Go to Step 14	Go to Step 16
14	Does the Emergency 1st Switch parameter indicate OFF when the switch is N?	—	Go to Step 15	Go to Step 19
15	Does the Emergency N Switch parameter indicate ON when the switch is N?	—	Go to Intermittent Conditions	Go to Step 21
16	1. Turn OFF the ignition switch. 2. Disconnect the emergency shift switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Emergency 1st Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire between the emergency shift switch harness (pin 3 of N-18 connector) and a known good ground. Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 17	Go to Step 18
17	Observe the Emergency 1st Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the emergency shift switch harness (pins 3 and 5 of N-18 connector). Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 29	Go to Step 33
18	1. Test the emergency 1st position switch signal circuit between the TCM (pin 14 of B-428 connector) and the emergency shift switch (pin 3 of N-18 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 30
19	1. Turn OFF the ignition. 2. Disconnect the switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Emergency 1st Switch parameter with the Tech 2. Does the Emergency 1st Switch parameter indicate OFF?	—	Go to Step 34	Go to Step 20

Step	Action	Value(s)	Yes	No
20	1. Test the emergency 1st position switch circuit between the TCM (pin 14 of B-429 connector) and the emergency shift switch (pin 3 of N-18 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 35
21	1. Turn OFF the ignition switch. 2. Disconnect the emergency shift switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Emergency N Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire between the emergency shift switch harness (pin 2 of N-18 connector) and a known good ground. Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 22	Go to Step 23
22	Observe the Emergency N Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the emergency shift switch harness (pins 2 and 5 of N-18 connector). Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 29	Go to Step 33
23	1. Test the emergency N position switch signal circuit between the TCM (pin 6 of B-428 connector) and the emergency shift switch (pin 2 of N-18 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 30
24	1. Turn ON the ignition switch, with the engine OFF. 2. Observe the Emergency R Switch parameter with the Tech 2. Does the Emergency R Switch parameter indicate ON when the switch is R?	—	Go to Step 25	Go to Step 26
25	Does the Emergency R Switch parameter indicate OFF when the switch is N?	—	Go to Intermittent Conditions	Go to Step 31
26	1. Turn OFF the ignition switch. 2. Disconnect the emergency shift switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Emergency R Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire between the emergency shift switch harness (pin 1 of N-18 connector) and a known good ground. Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 27	Go to Step 28

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Step	Action	Value(s)	Yes	No
27	Observe the Emergency R Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the emergency shift switch harness (pins 1 and 5 of N-18 connector). Does the Tech 2 indicate ON when the circuit is jumpered and OFF when the circuit is not jumpered?	—	Go to Step 29	Go to Step 33
28	1. Test the emergency R position switch signal circuit between the TCM (pin 20 of B-428 connector) and the emergency shift switch (pin 1 of N-18 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 30
29	1. Turn OFF the ignition. Inspect for an intermittent and for poor connections at the harness connector of the emergency shift switch (pins 1, 2, 3 and 5 of N-18 connector). 2. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 34
30	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for poor connections on the emergency shift switch signal circuit at the harness connector of the TCM (pin 6, 14 and 20 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 35
31	1. Turn OFF the ignition. 2. Disconnect the switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the Emergency R Switch parameter with the Tech 2. Does the Emergency R Switch parameter indicate OFF?	—	Go to Step 34	Go to Step 32
32	1. Test the emergency R position switch circuit between the TCM (pin 20 of B-428 connector) and the emergency shift switch (pin 1 of N-18 connector) for a short to ground. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 36	Go to Step 35
33	Repair the open circuit or high resistance on the ground circuit of the emergency shift switch (pin 5 of N-18 connector) and the chassis ground (B-1). Did you complete the repair?		Go to Step 36	—
34	Replace emergency shift switch. Did you complete the replacement?	—	Go to Step 36	—
35	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 36	—

Step	Action	Value(s)	Yes	No
36	Reconnect all previously disconnected fuse or harness connector(s). Is the action complete?	—	Go to Chart 1 of 4 Step 6	—

Chart 4 of 4

Step	Action	Value(s)	Yes	No
1	1. Turn ON the ignition, with the engine OFF. 2. Observe the Brake Pedal Switch parameter with the Tech 2. Does the Brake Pedal Switch parameter indicate Applied when the pedal is applied and Released when the pedal is released?	—	Go to Intermittent Conditions	Go to Step 2
2	1. Check to ensure the brake pedal switch is adjusted correctly. The plunger should be all the way in when the pedal is released, yet should not impede with the brake pedal full upward travel. 2. Adjust the brake pedal switch as necessary. Did you find and correct the condition?	—	Go to Step 22	Go to Step 3
3	1. Turn OFF the ignition. 2. Inspect the Stop Light (10A) fuse (F-5) in the glove box fuse block. Is the Stop Light (10A) fuse (F-5) open?	—	Go to Step 4	Go to Step 5
4	Replace the Stop Light (10A) fuse (F-5). If the fuse continues to open, repair the short to ground on one of the circuits that is fed by the Stop Light (10A) fuse (F-5) or replace the shorted attached component fed by the Stop Light (10A) fuse (F-5). Did you complete the repair?	—	Go to Step 22	—
5	1. Turn OFF the ignition. 2. Disconnect the brake pedal switch harness connector. 3. Connect a test lamp between the voltage feed circuit of the brake pedal switch harness (pin 1 of B-66 connector) and a known good ground. Does the test lamp illuminate?	—	Go to Step 6	Go to Step 7
6	1. Turn ON the ignition, with the engine OFF. 2. Observe the Brake Pedal Switch parameter with the Tech 2 while momentarily jumping 3-amp fused jumper wire across the brake pedal switch harness connector between pins 1 and 2 of the B-66 connector. Does the Tech 2 indicate Applied when the circuit is jumpered and Released when the circuit is not jumpered?	—	Go to Step 9	Go to Step 8
7	Repair the open circuit or high resistance on the voltage feed circuit between the Stop Light (10A) fuse (F-5) and the brake pedal switch (pin 1 of B-66 connector). Did you complete the repair?	—	Go to Step 22	—

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Step	Action	Value(s)	Yes	No
8	1. Test the brake pedal switch signal circuit between the transmission control module (TCM) (pin 3 of B-428 connector) and the brake pedal switch (pin 2 of B-66 connector) for an open circuit or high resistance. 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 22	Go to Step 10
9	1. Turn OFF the ignition. 2. Disconnect the brake pedal switch harness connector. 3. Inspect for an intermittent and for poor connections at the harness connector of the brake pedal switch (pins 1 and 2 of B-66 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 22	Go to Step 11
10	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the brake switch circuit at the harness connector of the TCM (pin 3 of B-428 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 22	Go to Step 21
11	Replace brake pedal switch. Did you complete the replacement?	—	Go to Step 22	—
12	1. Turn OFF the ignition. 2. Disconnect the instrument panel cluster (IPC) harness connector. 3. Inspect for an intermittent and for a poor connection at the harness connector of the IPC (pin 1 of B-53 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 22	Go to Step 13
13	1. Turn OFF the ignition. 2. Disconnect the TCM harness connector. 3. Inspect for an intermittent and for a poor connection on the gear position display control circuit at the harness connector of the TCM (pin 14 of B-425 connector). 4. Repair the connection(s) as necessary. Did you find and correct the condition?	—	Go to Step 22	Go to Step 14
14	1. Test the gear position display control circuit between the TCM (pin 14 of B-425 connector) and the IPC (pin 1 of B-53 connector) for the following conditions: • An open circuit • A short to ground • A short to battery or ignition voltage • High resistance 2. Repair the circuit(s) as necessary. Did you find and correct the condition?	—	Go to Step 22	Go to Step 15

Step	Action	Value(s)	Yes	No
15	Replace the IPC. Refer to Instrument Panel Cluster (IPC) Replacement in the Cab and Chassis Electrical section. Did you complete the replacement?	—	Go to Step 22	—
16	1. Turn ON the ignition, with the engine OFF. 2. Observe the PTO Switch parameter with the Tech 2 in the ENGINE system menu. Does the PTO Switch parameter OFF when the PTO switch or lever is released?	—	Go to Intermittent Conditions	Go to Step 17
17	1. Turn OFF the ignition. 2. Disconnect the PTO switch harness connector. 3. Turn ON the ignition, with the engine OFF. 4. Observe the PTO Switch parameter with the Tech 2. Does the PTO Switch parameter OFF?	—	Go to Step 19	Go to Step 18
18	1. Test the PTO switch circuit between the ECM (pin 44 of J-191 connector) and the PTO switch or lever (pin 1 of B-84 connector) for a short to ground. 2. Repair the circuit(s) as necessary. 3. Did you find and correct the condition?	—	Go to Step 22	Go to Step 20
19	Replace the PTO switch or lever. Did you complete the replacement?	—	Go to Step 22	—
20	Important: Replacement ECM must be programmed. Replace the ECM. Refer to Engine Control Module (ECM) Replacement /Restore Fuel Injector ID Code Data in engine control section. Did you complete the replacement?	—	Go to Step 22	—
21	Important: Replacement TCM must be programmed and learned. Replace the TCM. Refer to Transmission Control Module (TCM) Replacement in this section. Did you complete the replacement?	—	Go to Step 22	—
22	Reconnect all previously disconnected fuse or harness connector(s). Is the action complete?	—	Go to Chart 1 of 4 Step 6	—

Symptoms - Transmission Controls

Symptoms - Transmission Controls

Important Preliminary Inspections Before Starting

Perform Diagnostic System Check - Transmission Controls before using the symptom tables, and verify that all of the following are true:

- The transmission control module (TCM) and transmission warning lamp are operating correctly.
- There are no diagnostic trouble codes (DTCs) stored.
- The Tech 2 data is within the normal operating range. Refer to Tech 2 Data List in this section.
- Verify the customer concern and locate the correct symptom in the table of contents. Inspect the items indicated under that symptom.

Visual and Physical Inspection

Several of the symptom procedures ask for careful visual and physical inspection. This step is extremely important. The visual and physical inspection can lead to correcting a problem without further inspections, and can save valuable time. Ensure that:

- The TCM grounds are clean, tight, and in their proper location.
- The transmission harness wiring and terminals are properly connected and are not pinched or cut.

Intermittent

Important:

Inspect for improper installation of electrical components if an intermittent condition exists. Inspect for aftermarket add-on electrical equipment devices, lights, and cellular phones. Verify that no aftermarket equipment is connected to the keyword 2000 serial data circuit. If you cannot locate an intermittent condition, a cellular phone communication signal may cause the condition.

Important:

The problem may or may not turn ON the transmission warning lamp or store a DTC.

Faulty electrical connections or wiring cause most intermittent problems. Perform a careful visual and physical inspection of the suspect connectors for the following conditions:

- Improperly mated connector halves
- Terminals that are not seated
- Terminals that are damaged or improperly formed

Reform or replace connector terminals in the problem circuit in order to ensure proper contact tension. Remove the terminal from the connector body in order to inspect for poor terminal wire connection.

Road test the vehicle with the DMM connected to the suspected circuit. An abnormal reading that occurs when the malfunction occurs is a good indication that there is a malfunction in the circuit being monitored.

Use the Tech 2 in order to help detect intermittent conditions. Useful features of the Tech 2 include the following:

- Trigger the Snapshot feature in order to capture and store transmission parameters when the malfunction occurs. Review this stored information in order to see the specific running conditions that caused the malfunction.
- Use the Plot Function on the Tech 2 in order to plot selected data parameters. Review this stored information to aid in locating an intermittent problem. Refer to the Tech 2 Users Guide for more information.

Important:

If the intermittent condition exists as a start and then stall, test for DTCs relating to the vehicle theft deterrent system. Test for improper installation of electrical options such as lights, cellular phones, etc.

Any of the following may cause an intermittent transmission warning lamp with no stored DTC:

- The TCM grounds are loose or dirty. Refer to Transmission Controls Schematics.
- The transmission warning lamp circuit intermittently shorted to ground.
- Electrical system interference caused by a malfunctioning relay, TCM driven solenoid, or switch. The electrical component can cause a sharp electrical surge. Normally, the problem will occur when the malfunctioning component is operating.
- There are any open diodes.

Important:

The following symptom tables contain groups of possible causes for each symptom. The order of these procedures is not important. If the Tech 2 readings do not indicate the problems, then proceed in a logical order, easiest to check or most likely to cause first. In order to determine if a specific vehicle is using a particular system or component, refer to Transmission Controls Schematics for an application.

Use the following tables when diagnosing a symptom complaint:

Intermittent Conditions

Checks	Action
DEFINITION: The problem is not currently present but is indicated in DTC History. OR There is a customer complaint, but the symptom cannot currently be duplicated, if the problem is not DTC related.	
Preliminary Checks	• Refer to Symptoms - Transmission Controls before starting.
Harness/Connector	Many intermittent open or shorted circuits are affected by harness/connector movement that is caused by vibration, engine torque, bumps/rough pavement, etc. Test for this type of condition by performing the applicable procedure from the following list: • Move related connectors and wiring while monitoring the appropriate Tech 2 data. • Move related connectors and wiring with the component commanded ON, and OFF, with the Tech 2. Observe the component operation. • With the engine running, move related connectors and wiring while monitoring engine operation. If harness or connector movement affects the data displayed, component/system operation, or engine operation, inspect and repair the harness/connections as necessary. Refer to Electrical Connections or Wiring.
Electrical Connections or Wiring	Poor electrical connections, terminal tension or wiring problems cause most intermittent. To perform the following inspections: • Inspect for poor mating of the connector halves, or terminals improperly seated in the connector body. • Inspect for improperly formed or damaged terminals. Test for poor terminal tension. • Inspect for poor terminal to wire connections including terminals crimped over insulation. This requires removing the terminal from the connector body. • Inspect for corrosion/water intrusion. Pierced or damaged insulation can allow moisture to enter the wiring. The conductor can corrode inside the insulation, with little visible evidence. Look for swollen and stiff sections of wire in the suspect circuits. • Inspect for wires that are broken inside the insulation. • Inspect the harness for pinched, cut or rubbed through wiring. • Ensure that the wiring does not come in contact with hot exhaust components.
Control Module Power and Grounds Component Power and Grounds	Poor power or ground connections can cause widely varying symptoms. • Test all control module power supply circuits. Many vehicles have multiple circuits supplying power to the control module. Other components in the system may have separate power supply circuits that may also need to be tested. Inspect connections at the module/component connectors, fuses, and any intermediate connections between the power source and the module/component. A test lamp or a DMM may indicate that voltage is present, but neither tests the ability of the circuit to carry sufficient current. Ensure that the circuit can carry the current necessary to operate the component. • Test all control module ground and system ground circuits. The control module may have multiple ground circuits. Other components in the system may have separate grounds that may also need to be tested. Inspect grounds for clean and tight connections at the grounding point. Inspect the connections at the component and in splice packs, where applicable. Ensure that the circuit can carry the current necessary to operate the component.

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Checks	Action
Temperature Sensitivity	• An intermittent condition may occur when a component/connection reaches normal operating temperature. The condition may occur only when the component/connection is cold, or only when the component/connection is hot. • If the intermittent is related to heat, review the data for a relationship with the following: - High ambient temperatures - Underhood/engine generated heat - Circuit generated heat due to a poor connection, or high electrical load - Higher than normal load conditions, towing, etc. • If the intermittent is related to cold, review the data for the following: - Low ambient temperatures - In extremely low temperatures, ice may form in a connection or component. Test for water intrusion. - The condition only occurs on a cold start. - The condition goes away when the vehicle warms up. • Information from the customer may help to determine if the trouble follows a pattern that is temperature related.
Electromagnetic Interference (EMI) and Electrical Noise	Some electrical components/circuits are sensitive to EMI or other types of electrical noise. Inspect for the following conditions: • A misrouted harness that is too close to high voltage/high current devices such as injection components, motors, generator etc. These components may induce electrical noise on a circuit that could interfere with normal circuit operation. • Electrical system interference caused by a malfunctioning relay, or the transmission control module (TCM) driven solenoid or switch. These conditions can cause a sharp electrical surge. Normally, the problem will occur when the malfunctioning component is operating. • Improper installation of non-factory or aftermarket add on accessories such as lights, 2-way radios, amplifiers, electric motors, remote starters, alarm systems, cell phones, etc. These accessories may lead to an emission related failure while in use, but do not fail when the accessories are not in use. • Test for any open diodes. Some relays may contain a clamping diode. • Test the generator for a bad rectifier bridge that may be allowing AC noise into the electrical system.
Duplicating Failure Conditions	• If none of the previous tests are successful, attempt to duplicate and/or capture the failure conditions. • An alternate method is to drive the vehicle with the DMM connected to a suspected circuit. An abnormal reading on the DMM when the problem occurs, may help you locate the problem.
Tech 2 Snapshot	The Tech 2 can be set up to take a Snapshot of the parameters available via serial data. The Snapshot function records live data over a period of time. The recorded data can be played back and analyzed. The Tech 2 can also graph parameters singly or in combinations of parameters for comparison. The Snapshot can be triggered manually at the time the symptom is noticed, or set up in advance to trigger when a DTC sets. An abnormal value captured in the recorded data may point to a system or component that needs to be investigated further. Refer to the Tech 2 user instructions for more information on the Snapshot function.

Programming and Learning

Programming and Learning Guideline

Description

The vehicle information data must be programmed and the learning procedure must be done when the transmission control module (TCM) is replaced, sensors, actuators or internal parts are replaced or repaired. Programming with the wrong data or improper learning will cause a deterioration of the shift feeling, the poor vehicle performance and the diagnostic trouble code (DTC) to set.

Vehicle Information Programming and/or Initial Learning must be done whenever any of the following parts is replaced or specification changed. Refer to Transmission Control Module (TCM) Replacement - TCM Replacement Procedure Description in this section.

- TCM
- Transmission assembly
- Engine type
- Final gear and tire size change relating speedometer driven gear
- PTO request engine speed

Transmission Gear Select & Shift Position Learning must be done whenever any of the following parts are replaced, removed or repaired.

- 1-3-5 shift solenoid valve
- 2-4-6-R shift solenoid valve
- Select solenoid valve
- Gear shift position sensor
- Gear select position sensor
- Transmission gearshift control box
- Transmission unit internal

Half Clutch Position Learning must be done whenever any of the following parts are replaced, removed or repaired.

- Gearshift clutch assembly
- Gearshift clutch solenoid valve
- Oil pump assembly
- Clutch engagement point is shifted greatly (when difficult to adjust by the adjustment switch)

Transmission Gear Select & Shift Position Learning

1. Put the vehicle with the following conditions:
 - DTC is not present
 - Vehicle is stationary
 - Parking brake is pulled
 - Selector lever is Neutral
 - Emergency switch is OFF
 - Engine is idle speed

- Idle up control knob to the lowest position (Full counterclockwise direction)
- A/C switch is OFF
- Use the Tech 2 and make sure clutch fluid temperature is 40°C (104°F) or higher

2. Depress and hold the brake pedal.

Notice:

DO NOT release the brake pedal until the transmission gear select & shift position learning is completed.

3. Press Reset switch for at least 7 seconds and release it within 17 seconds. This will enter the learning mode, which is indicated by a buzzer pattern that consists of a series of two short beeps.

Notice:

If the buzzer does not sound, restart the learning procedure from step 1.

4. With the brake pedal firmly depressed, operate the selector lever in the following sequence: N - D - N (Neutral - Drive - Neutral)
This will change the buzzer pattern that consists of a series of two beeps, one short beep followed by one long beep. After the selector lever is operated, this buzzer pattern will continue for approximately 10 seconds and shift to each gear will be automatically performed.

Notice:

If the buzzer does not sound, operate the selector lever again.

5. Confirm that the buzzer stops.

Half Clutch Position Learning

1. Put the vehicle with the following conditions:
 - DTC is not present
 - Vehicle is stationary
 - Parking brake is pulled
 - Selector lever is Neutral
 - Emergency switch is OFF
 - Engine is warm upped
 - Engine is idle speed
 - Idle up control knob to the lowest position (Full counterclockwise direction)
 - A/C switch is OFF
 - Use the Tech 2 and make sure clutch fluid temperature is 40°C (104°F) or higher
2. Depress and hold the brake pedal.

Notice:

DO NOT release the brake pedal until the half clutch position learning is completed.

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3. Press Reset switch for at least 7 seconds and release it within 17 seconds. This will enter the learning mode, which is indicated by a buzzer pattern that consists of a series of two short beeps.

Notice:

If the buzzer does not sound, restart the learning procedure from step 1.

4. With the brake pedal firmly depressed, operate the selector lever in the following sequence: N - D (Neutral - Drive)

This will change the buzzer pattern that consists of a series of single short beeps. After the selector lever is operated, this buzzer pattern will continue for approximately 30 seconds and the clutch will be automatically engaged.

Notice:

If the buzzer does not sound, operate the selector lever again.

5. Confirm that the buzzer stops.

Repair Instructions

Transmission Control Module (TCM) Replacement

TCM Replacement Procedure Description

The following A-F steps provide an overview procedure to replace and reprogram a TCM. Each A-F step is explained further in this section.

- A. Record the vehicle type information manually from the old TCM. The vehicle type information can be obtained using the Tech 2 Data Display function.
- B. Replace the old TCM with the new TCM.
- C. Program the latest software and calibrations into the new TCM using the Service Programming System (SPS).
- D. Program the recorded vehicle information into the new TCM using the Tech 2 Programming function.
- E. Perform the transmission gear position learning, half clutch learning and number of speedometer driven gear teeth learning by initial learning procedure.
- F. Program the vehicle identification number (VIN). If the TCM from another vehicle is installed, VIN does not match with the vehicle. Use the SPS to change the original VIN.

A. Recording Vehicle Information

The following vehicle type information must be programmed into the TCM for correct vehicle performance.

- Engine Type
- Transmission Type
- Speedometer Driven Gear Teeth
- PTO Request Engine Speed (If so equipped)

Important:

If the communications cannot be established with the old TCM, the technician will need to follow the following ways.

- Find out the correct engine type and transmission type from the service ID plate.
- Physically find out the correct number of speedometer driven gear teeth.
- Ask the customer which of the PTO request engine speed was previously being used.

B. Removal and Installation

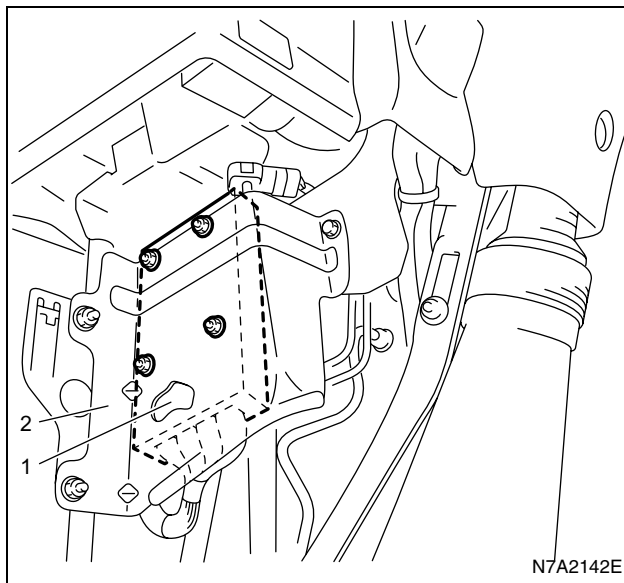
Removal Procedure

Important:

Take care not to give a strong impact to the TCM.

1. Turn OFF the ignition.
2. Disconnect the negative battery cable.
3. Disconnect the TCM connectors.
4. Remove the TCM fixing nuts.

5. Remove the TCM.



Legend

1. TCM
2. TCM Cover

Installation Procedure

Important:

Do not use a fallen TCM or the TCM that received a strong impact.

1. Install the TCM on the TCM bracket.
2. Tighten the TCM fixing nuts.
3. Connect the TCM connectors.
4. Connect the negative battery cable.

C. Programming Software and Calibrations

Program latest software/calibrations if released. Refer to Service Programming System (SPS) Description and Service Programming System (SPS) (Remote Procedure) or Service Programming System (SPS) (Pass-Thru Procedure) in this section.

D. Programming Vehicle Information

Use the Tech 2 to program the previously recorded vehicle information.

Notice:

If the removed TCM from another vehicle is installed with same specification, this programming is not necessary.

1. Install the Tech 2.
2. Turn ON the ignition, with the engine OFF.
3. Select Diagnostics > appropriate vehicle identification > Smoother > Programming.
4. Select Program Vehicle Type and press Change.
5. Select previously recorded correct combination of engine type and transmission type.

6. Select PTO Request Engine Speed and press Change. (If PTO is not installed, skip to step 8.)
7. Select previously recorded correct PTO request engine speed.
8. Select Program Speedometer Driven Gear and press Change.
9. Select previously recorded correct number of speedometer driven gear teeth.
10. Select Diagnostics > appropriate vehicle identification > Smoother > Data Display. At this point, all programmed data can be verified. Compare the vehicle information programmed into the TCM with the recorded value. If the programmed vehicle information is incorrect, go back to appropriate step.

E. Initial Learning

As for initial learning, transmission gear select & shift position learning, half clutch position learning and speedometer driven gear learning will be performed at the same time.

1. Put the vehicle with the following conditions:
 - DTC is not present
 - Vehicle is stationary
 - Parking brake is pulled
 - Selector lever is Neutral
 - Emergency switch is OFF
 - Engine is warm upped
 - Engine is idle speed
 - Idle up control knob to the lowest position (Full counterclockwise direction)
 - A/C switch is OFF
 - Use the Tech 2 and make sure clutch fluid temperature is 40°C (104°F) or higher
2. Use a jumper wire and the DLC terminal "11" (diagnostic request) is pulled "Low" (grounded) by jumped to DLC terminal "4". This will warning lamp blinks.
3. Depress and hold the brake pedal.

Notice:

DO NOT release the brake pedal until the transmission gear select & shift position learning and half clutch position learning is completed (until step 6).

4. Press Reset switch for at least 7 seconds and release it within 17 seconds. This will enter the learning mode, which is indicated by a buzzer pattern that consists of a series of two short beeps.

Notice:

If the buzzer does not sound, restart the learning procedure from step 1.

5. With the brake pedal firmly depressed, operate the selector lever in the following sequence: N - D - N (Neutral - Drive - Neutral)

This will change the buzzer pattern that consists of a series of two beeps, one short beep followed by one long beep. After the selector lever is operated, this buzzer pattern will continue for approximately 10 seconds and shift to each gear will be automatically performed. And then, change automatically to single short beeps. This buzzer pattern will continue for approximately 30 seconds and the clutch will be automatically engaged.

Notice:

If the buzzer does not sound, operate the selector lever again.

Notice:

If the buzzer stops on the way of this step, restart the learning procedure from step 3.

6. Confirm that the buzzer stops. Remove the jumper wire from the DLC.

Notice:

If the buzzer sounds after removing the jumper wire from the DLC, restart the learning procedure from step 1.

7. Confirm that the warning lamp. The warning lamp will blink if the number of speed meter driven gear teeth leaning is not completed.

Notice:

If the TCM from another vehicle is installed, the warning lamp does not blink.

8. With the parking brake applied, the engine speed is idle, and the brake pedal is depressed, move the selector lever to D (Drive) position. Confirm that the gear position indicator is 2nd. If the gear position is not 2nd, operate the selector lever "+" or "-" to change 2nd.
9. Run the vehicle in 2nd gear at fixed vehicle speed of approximately 20km/h (12MPH) for 10 seconds.
10. Confirm that the warning lamp goes out.

Notice:

If the warning lamp does not go out, restart the learning procedure from step 8.

F. Programming VIN

If the TCM from another vehicle is installed, VIN does not match with the vehicle. Use the SPS to change the original VIN. Refer to Service Programming System (SPS) Description and Service Programming System (SPS) (Remote Procedure) or Service Programming System (SPS) (Pass-Thru Procedure) in this section.

Notice:

If an updated software/calibrations is released, DO NOT program the VIN now. The VIN is programmed at previously described C. Programming Software and Calibrations SPS procedure.

Service Programming System (SPS) Description

The service programming system (SPS) allows a technician to program a control module through the data link connector (DLC). The information transfer circuit that is used at the DLC is the same serial data circuit used by the Tech 2 for retrieving diagnostic trouble codes (DTCs), displaying data, clearing DTCs etc. This procedure offers the ability to install software/calibrations matched to a particular vehicle.

Most control modules have two types of memory. The software/calibrations reside in the flash memory. The two types of memory are listed below:

- Electrically Erasable Programmable Read Only Memory (EEPROM).
This type of memory allows selected portions of memory to be programmed while other portions remain unchanged.
Certain learned values reside in the EEPROM, such as:
 - The vehicle identification number (VIN)
 - The vehicle type information
 - The gear position learning and half clutch learning
- Flash Read Only Memory-Flash Memory
Flash memory has increased memory storage capacity. During programming, all information within this type of memory is erased, and then replaced with entirely new information.

Service Programming Methods

The two methods of programming an transmission control module (TCM) are listed below:

- Remote Programming
- Pass Thru Programming

For information on programming a TCM using one of the methods listed above, refer to Service Programming System (SPS) (Remote Procedure) or Service Programming System (SPS) (Pass-Thru Procedure).

Before Programming a Control Module

Important:

DO NOT program an existing transmission control module (TCM) with the identical software/calibration package. This procedure is not a short cut to correct the driveability condition. This is an ineffective repair. A TCM should only be programmed when the following occurs:

- When a service procedure instructs you to replace the TCM. When the TCM from another vehicle is installed, VIN must be changed.
- An updated software/calibrations is released.

Ensure that the following conditions are met before programming a TCM:

- The Tech 2 PCMCIA card is programmed with the latest software.

- The TIS 2000 is installed with the latest software.
- The hardware key is plugged into the computer port.
- Vehicle system voltage:
 - There are no charging system concerns. All charging system concerns must be repaired before programming the TCM.
 - The battery voltage is greater than 24 volts but less than 30 volts. The battery must be fully charged before programming the TCM.
 - A battery charger is NOT connected to the vehicles battery. Incorrect system voltage or voltage fluctuations from a battery charger may cause programming failure or TCM damage.
 - Turn OFF or disable any system that may put a load on the vehicles battery. Turn OFF or disable systems such as:
 - Heating, ventilation, and air conditioning (HVAC) systems
 - Headlights
 - Room lights
 - Accessory equipment
- The ignition switch is in the proper position. The Tech 2 prompts you to turn ON the ignition, with the engine OFF. DO NOT change the position of the ignition switch during the programming procedure unless instructed to do so.
- All tool connections are secure:
 - The RS-232C cable
 - The connection at the DLC
 - The voltage supply circuits
- DO NOT disturb the tool harnesses while programming. If an interruption occurs during the programming procedure, programming failure or TCM damage may occur.
If you are performing the Pass-Thru programming procedure using a notebook computer without the power cord, ensure that the internal battery is fully charged.

Service Programming System (SPS) (Remote Procedure)

The Remote Service Programming System (SPS) method is a three-step process that involves the following procedures:

1. Connecting the Tech 2 to the vehicle and obtaining the information from the transmission control module (TCM).
2. Connecting the Tech 2 to the terminal and downloading a new calibration file from the terminal into the Tech 2 memory.
3. Reconnecting the Tech 2 to the vehicle and uploading the new calibration file into the TCM.

Performing the Remote Procedure

1. Connect the Tech 2 to the vehicle and obtain the transmission control module (TCM) information using the following procedure:

Important:

Ensure the TCM is installed in the vehicle and the battery is fully charged before programming.

- 1.1. Connect the Tech 2 to the vehicle data link connector (DLC), with the engine and the Tech 2 OFF.
- 1.2. Turn ON the Tech 2.
- 1.3. Press Enter at the title screen.
- 1.4. Turn ON the ignition, with the engine OFF.
- 1.5. Select Service Programming System at the Main Menu.
- 1.6. Select Request Info.
- 1.7. If there is already stored in the Tech 2, the existing data is displayed on the screen. The Tech 2 asks user to keep existing data Keep Data or Continue to request new vehicle information from the TCM. If there is no data in the Tech 2, it will immediately start vehicle identification.
- 1.8. Enter the vehicle description by following the on-screen instructions based on stamped VIN or affixed VIN plate on the vehicle.
- 1.9. During obtaining information, the Tech 2 is receiving information from any modules at the same time. But only engine control module (ECM) information is displayed on the screen if ECM is programmable.
- 1.10. Turn OFF all accessories and select Continue.
- 1.11. Verify that the correct VIN is entered on the Tech 2. If the VIN is incorrect, write down the correct VIN.
2. Turn OFF the Tech 2.
3. Disconnect the Tech 2 from the vehicle.
4. Turn OFF the ignition.
5. Transfer the data from the terminal to the Tech 2 using the following procedure:

Important:

The TIS supports service programming with the Tech 2 scan tool only.

- 5.1. Connect the Tech 2 to the terminal.
- 5.2. Launch the TIS application at the terminal.
- 5.3. Select the Service Programming System at the main screen.
- 5.4. Highlight the following information on the Select Diagnostic Tool and Programming Process screen:
 - Select Diagnostic Tool-Select Tech 2.

- Select Programming Process-Identify whether an existing TCM is being reprogrammed or a TCM is being replaced with a new one.
- Select TCM Location-Select Vehicle.

5.5. Select Next.

5.6. Verify the connections on the Preparing for Communication screen and select Next.

5.7. Verify the VIN on the Validate Vehicle Identification Number (VIN) screen and select Next.

Important:

If the TCM is replaced to new one, VIN does not displayed. Input correct VIN reading from stamped VIN or affixed VIN plate on the vehicle. If the TCM from another vehicle is installed, input correct VIN by same way.

5.8. Highlight Engine on the System Type screen and select Next, if requested.

5.9. Complete the following information based on the service ID plate on the Validate Vehicle Data screen until Next is highlighted:

- Model
- Model Year
- Engine
- System Type
- Model Designator

5.10. Select Next.

5.11. Verify your selection on the Summary screen.

Important:

Refer to Service Bulletins before service programming is performed if the bulletins are listed along with the calibration files.

Important:

Select Cancel if you receive a message stating that the calibration selected is already the current calibration in the TCM and reprogramming with the same download is not allowed.

5.12. Select Reprog.

5.13. The Transfer Data screen will appear until the progress bar reaches 100%.

6. Close the application and return to the TIS application selection screen after the download is complete.

7. Turn OFF the Tech 2.

8. Disconnect the Tech 2 from the terminal.

9. Transfer the data from the Tech 2 to the TCM using the following procedure:

9.1. Connect the Tech 2 to the vehicle DLC, with the engine and the Tech 2 OFF.

9.2. Turn ON the Tech 2.

9.3. Press Enter at the Title screen.

9.4. Turn ON the ignition, with the engine OFF.

- 9.5. Select Service Programming System.
- 9.6. Select the Program TCM on the Tech 2.
- 9.7. Follow the on-screen instructions and select Continue.
- 9.8. Programming in Process will appear until the progress bar reaches 100%.

Important:

Some warning lamp may turn ON or blink while programming the TCM since communication between the TCM and other modules are interrupted. Clear DTC in any module after programming.

- 9.9. Select Continue and exit the program after the Tech 2 displays Programming Was Successful.
10. Turn OFF the ignition.
11. Turn OFF the Tech 2.
12. Disconnect the Tech 2 from the vehicle.

Service Programming System (SPS) (Pass-Thru Procedure)

Pass-Thru programming allows the Tech 2 to remain connected to the terminal and to the vehicle throughout the programming process. The vehicle must be in close proximity to the terminal while using Pass-Thru.

Important:

The TIS supports service programming with the Tech 2 scan tool only.

1. Launch the TIS application at the terminal.
2. Select the Service Programming System at the main screen.
3. Highlight the following information on the Select Diagnostic Tool and Programming Process screen:
 - Select Diagnostic Tool-Select Pass-Thru
 - Select Programming Process-Identify whether as existing transmission control module (TCM) is being reprogrammed or a TCM is being replaced with a new one.
 - Select TCM Location-Select Vehicle.
4. Select Next.
5. Complete all vehicle data on the Preparing for Communication/Determine Vehicle screen until Next is highlighted.
6. Select Next.
7. Follow the instruction on the Preparing for Communication screen.

Important:

In order to reduce the potential for signal loss, the RS-232 cable should not be more than 25 feet long.

8. Select Next.
9. Verify the VIN on the Validate Vehicle Identification Number (VIN) screen and select Next.

Important:

If the TCM is replaced to new one, VIN does not displayed. Input correct VIN reading from stamped VIN or affixed VIN plate on the vehicle. If the TCM from another vehicle is installed, input correct VIN by same way.

10. Highlight Engine on the System Type screen and select Next, if requested.
11. Complete the following information based on the service ID plate on the Validate Vehicle Data screen until Next is highlighted:
 - Model
 - Model Year
 - Engine
 - System Type
 - Model Designator
12. Select Next.
13. Verify your selection on the Summary screen.

Important:

Refer to Service Bulletins before service programming is performed if the bulletins are listed along with the calibration files.

Important:

Select Cancel if you receive a message stating that the calibration selected is already the current calibration in the Tech 2 and reprogramming with the same download is not allowed.

14. Select Reprog.
15. The Transfer Data screen will appear until the progress bar reaches 100%.

Important:

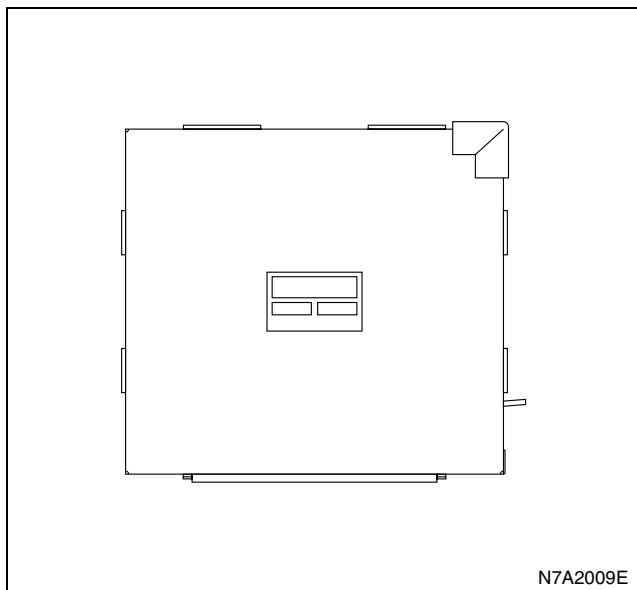
Some warning lamp may turn ON or blink while programming the TCM since communication between the TCM and other modules are interrupted. Clear DTC in any module after programming.

16. Select Close on the Programming Complete screen.
17. Turn OFF the Tech 2.
18. Disconnect the Tech 2 from the vehicle.

Description and Operation

Transmission Control Module (TCM) Description

The TCM constantly monitors the information sent from various sensors and controls the solenoid valves and other systems. The TCM controls the output circuits by controlling the ground or power supply circuit through a transistor and other devices. The TCM performs the diagnostic function of the system, detects operational problems of the system, warns the driver with a Smoother warning lamp and buzzer and memorizes DTC (diagnostic trouble codes). It also has a system backup function when trouble occurs.



TCM and Components

The TCM is designed to provide outstanding driveability and fuel efficiency. The TCM monitors the transmission and other vehicle functions using operational information it obtains via various speed sensors, switches, magnetic (solenoid) valves, etc.

TCM Voltage Description

The TCM impresses reference voltage to various switches and sensors. The TCM is able to impress voltage like this because the TCM resistance value is very high, and the voltage actually applied to the circuit is low. The test light may not light, even when it is connected to the circuit. The voltmeter usually used in a service shop may not indicate a correct reading because its input impedance is too low. A digital voltmeter whose input impedance is at least 10 MΩ (e.g. 5-8840-2691-0) should be used to obtain a correct voltage reading. The input/output devices of the TCM have an analog-digital converter, a signal buffer, a counter, a special driver, etc. The TCM uses an electrical switch to control most of the components.

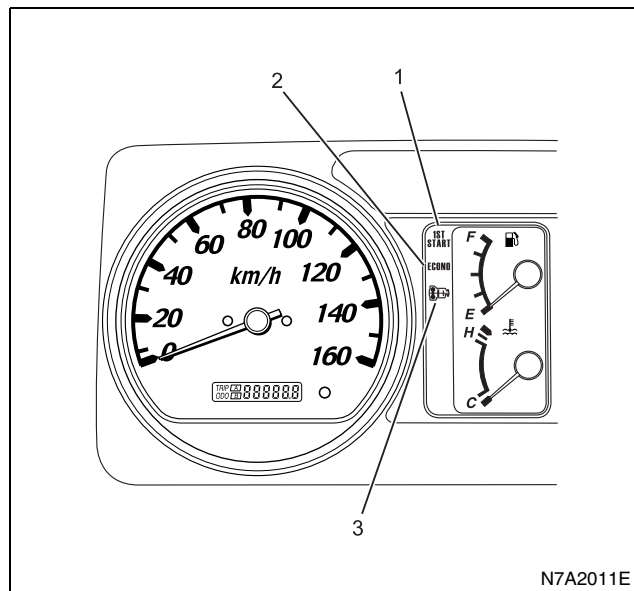
Important:

Replacement TCM must be programmed and learned.

Transmission Control Component Description

1st Gear Start Indicator Lamp

When the 1st gear start switch is "ON", the lamp lights.

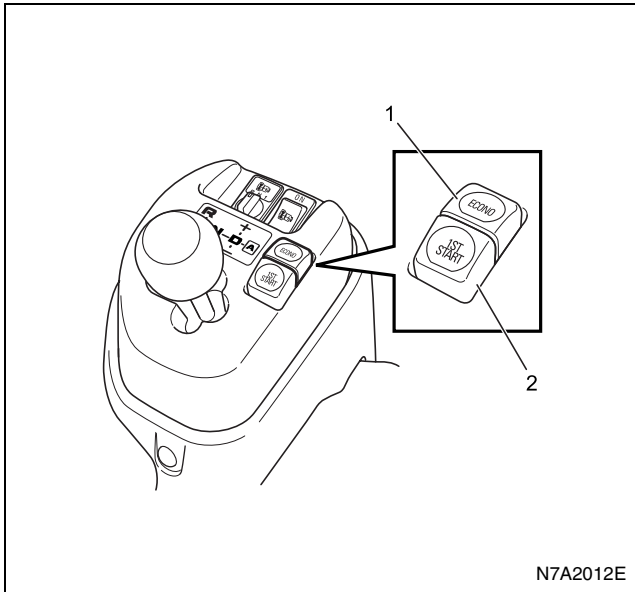


Legend

1. 1st Gear Start Indicator Lamp
2. Economy Mode Indicator Lamp
3. Transmission Warning Lamp

1st Gear Start Switch

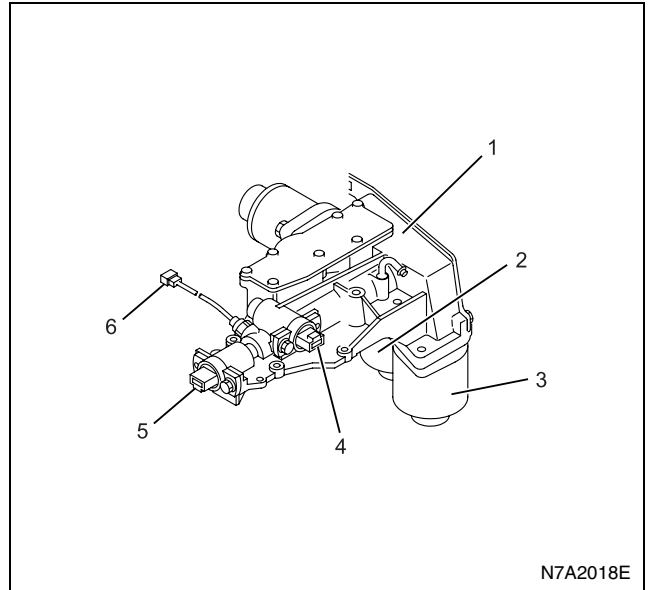
Turning on the 1st gear start switch causes the normal start gear (2nd) to change to 1st gear. This can be used when power is required due to payload and inclines.



N7A2012E

Legend

1. Economy Mode Switch
2. 1st Gear Start Switch



N7A2018E

Legend

1. Gearshift Control Box
2. 1-3-5 Shift Solenoid Valve
3. 2-4-6-R Shift Solenoid Valve
4. Gear Select Position Sensor
5. Gear Shift Position Sensor
6. Neutral Switch

1-3-5 Shift Solenoid Valve

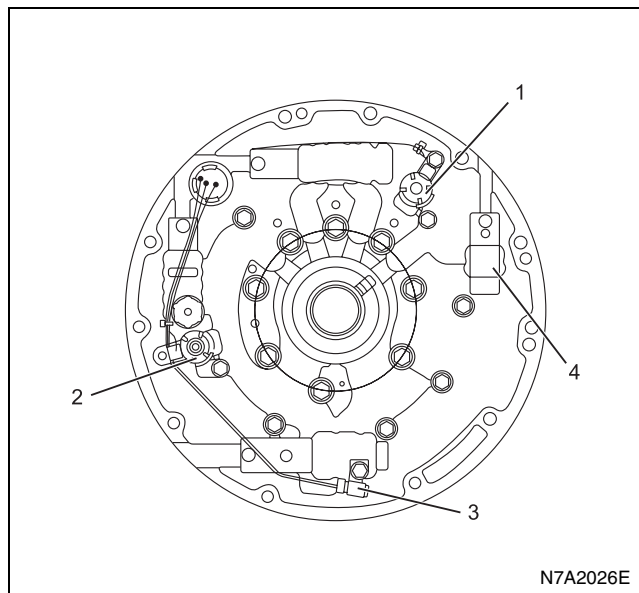
This shift solenoid valve is installed in the shift control box. The shaft inside the solenoid operates during shifting and the shift operation is performed.

2-4-6-R Shift Solenoid Valve

This shift solenoid valve is installed in the shift control box. The shaft inside the solenoid operates during shifting and the shift operation is performed.

Transmission Fluid Temperature (TFT) Sensor

The transmission fluid temperature (TFT) sensor is used to detect the clutch fluid temperature inside the transmission. Clutch fluid temperature is determined by detecting changes in thermistor resistance.

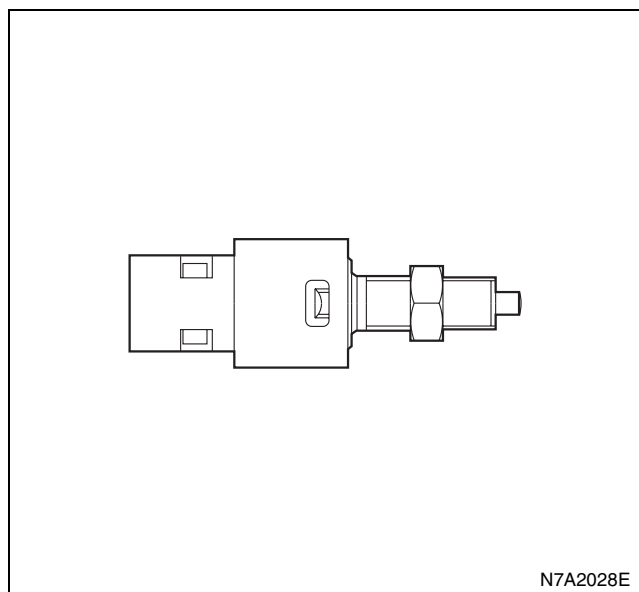


Legend

1. Lock Up Clutch Solenoid Valve
2. Gearshift Clutch Solenoid Valve
3. Transmission Fluid Temperature (TFT) Sensor
4. Bypass Valve

Brake Switch

The brake switch is used to detect brake pedal depression. The transmission control module (TCM) interprets the condition when the brake switch is on (contact closed) as the brake pedal being pressed.

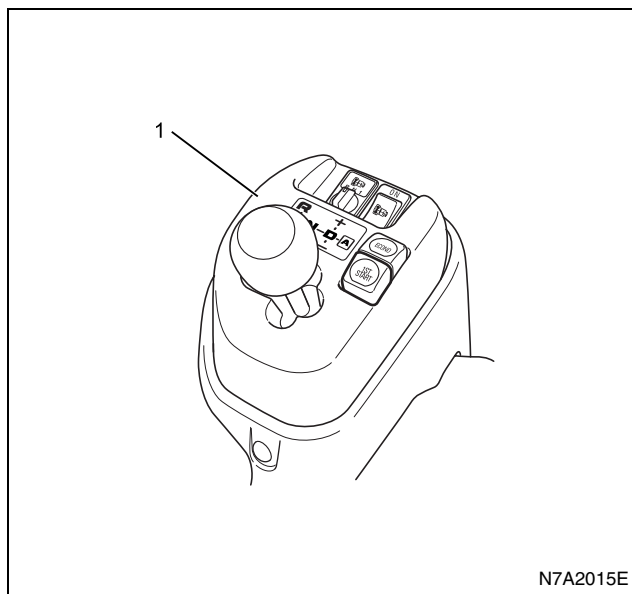


Buzzer

The buzzer sounds when trouble is detected in the Smoother system, when learning is being performed, when shift control is prohibited, etc.

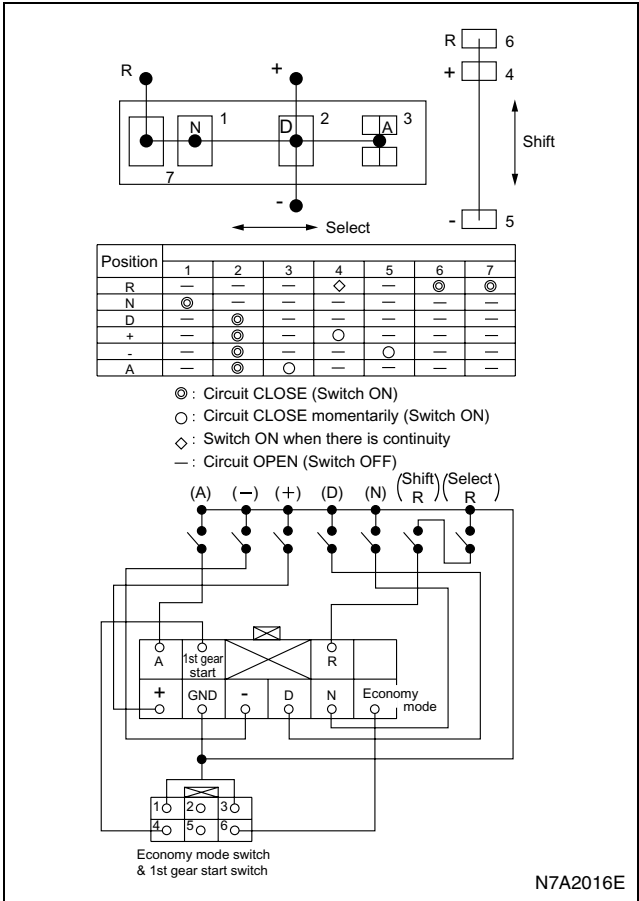
Selector Lever Unit

The selector lever unit is used during selector lever operation to communicate the lever position to the TCM, for shift control, etc. The change lever unit also has a position detection switch built in.



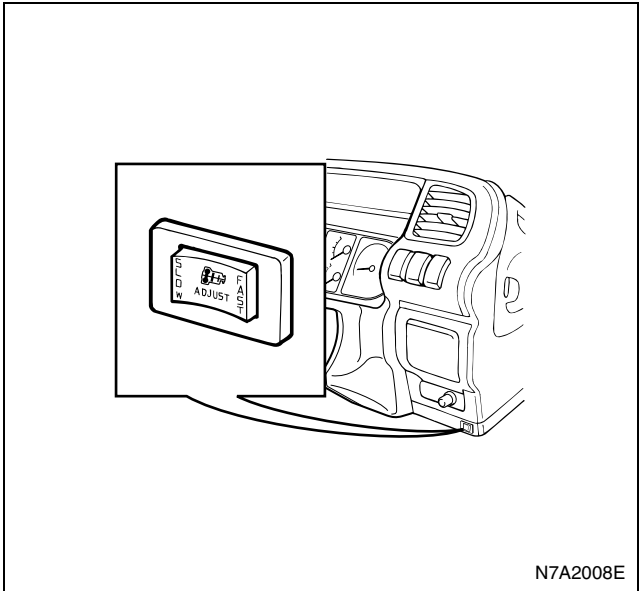
Legend

1. Selector Lever Unit



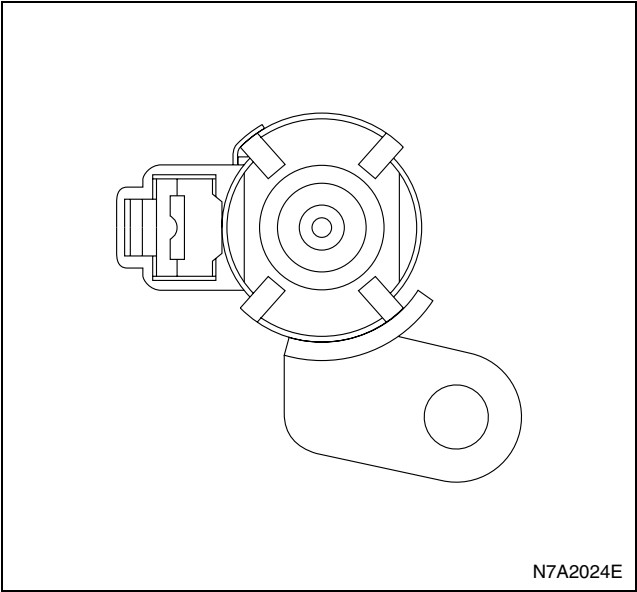
Half-clutch Adjustment Switch

The half-clutch adjustment switch is used to adjust the half-clutch point.



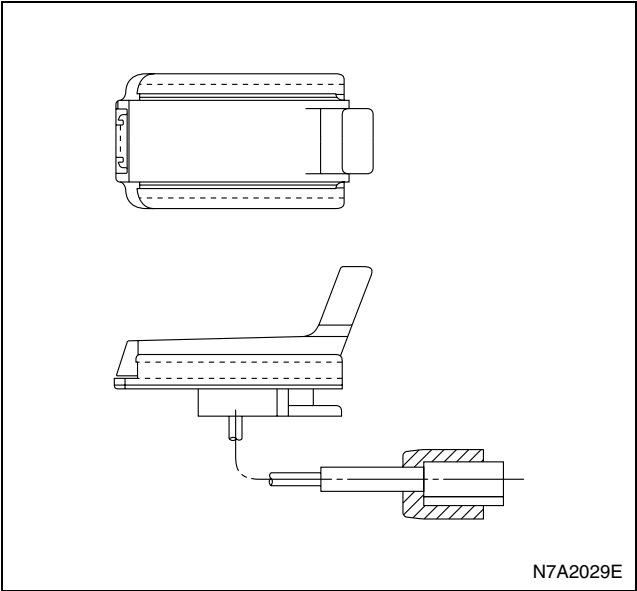
Geagshift clutch Solenoid Valve

The gearshift clutch solenoid valve is installed in the oil pump. It operates during shifting, and when the gearshift clutch is engaged or disengaged.



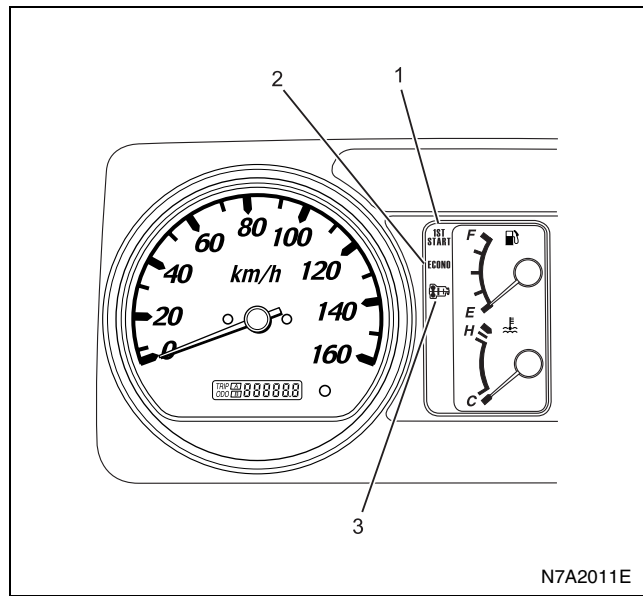
Door Switch

The door switch is used to detect the door open/closed condition. The transmission control module (TCM) interprets the condition when the door switch is on (contact closed) as door open.



Economy Mode Indicator Lamp

When the economy mode switch is "ON" during automatic shifting, the lamp lights. The lamp is out in the normal mode.

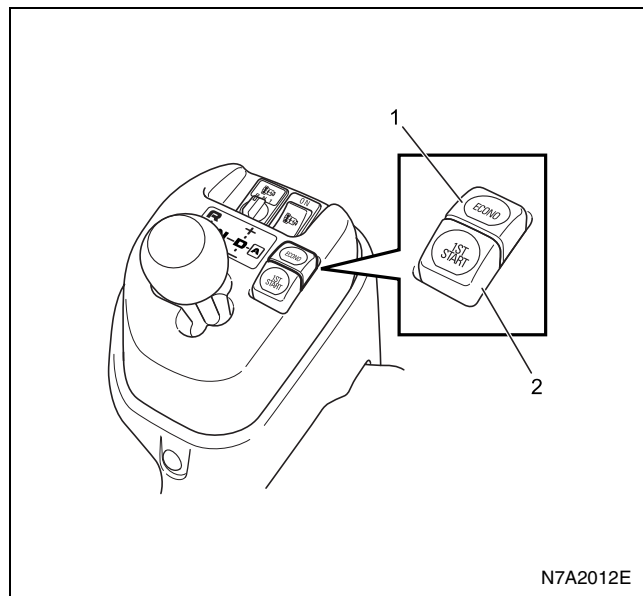


Legend

- 1. 1st Gear Start Indicator Lamp
- 2. Economy Mode Indicator Lamp
- 3. Transmission Warning Lamp

Economy Mode Switch

Automatic shift control characteristics are switched by the switch position. If you want to conserve fuel while running in the normal mode, press the switch to change to the economy mode. In the economy mode, the shift timing is earlier than in the normal mode.



Legend

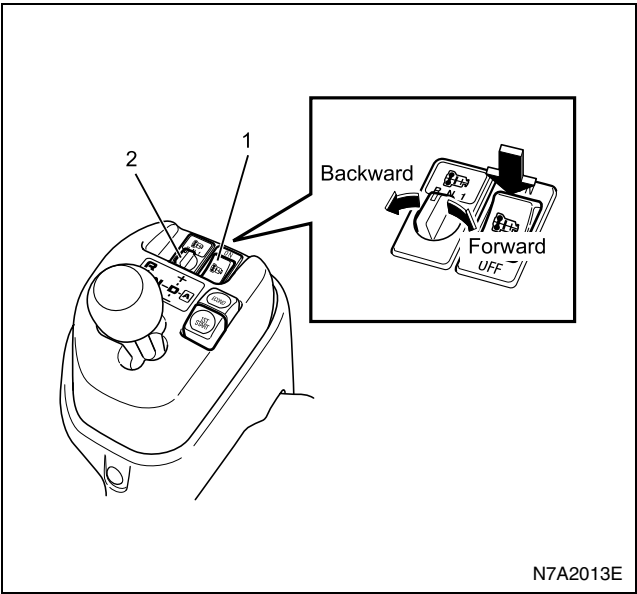
- 1. Economy Mode Switch
- 2. 1st Gear Start Switch

Emergency Shift Switch

The emergency switch is used when there is a problem with the Smoother system. When the emergency switch is ON, the emergency shift switch can be operated to shift gears to R, N, or 1.

Emergency Switch

The emergency switch is used when there is a problem with the Smoother system. Normally the emergency switch should be left in the OFF position. Turning on the emergency switch allows the engine to be started regardless of the transmission gear position, and enables the emergency shift switch.

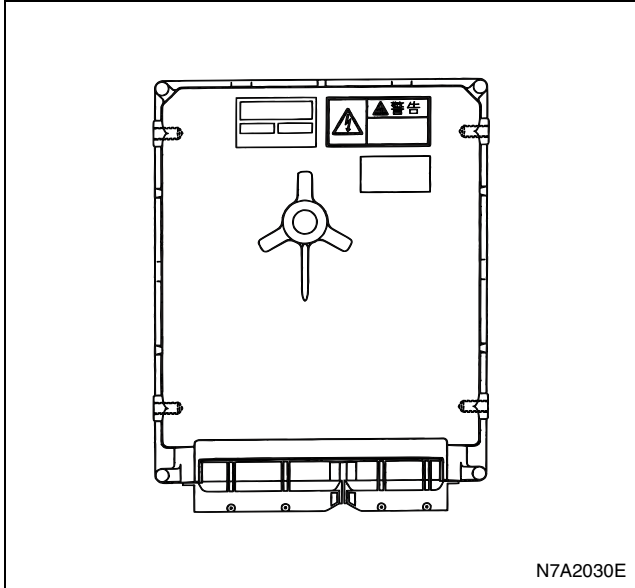


Legend

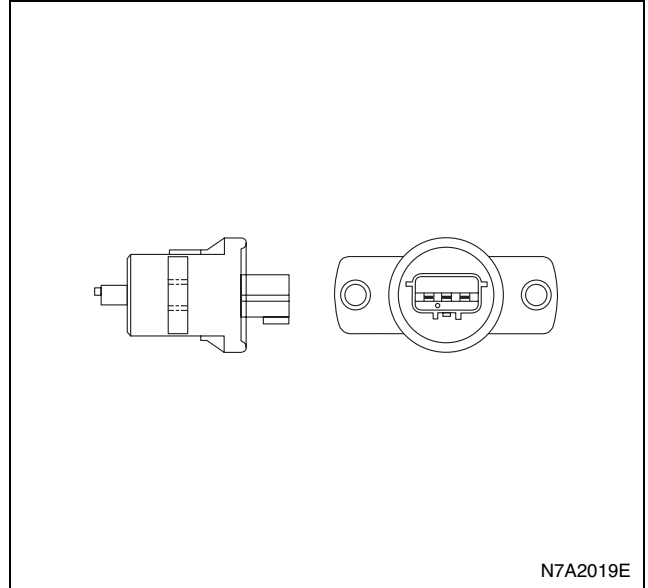
- 1. Emergency Switch
- 2. Emergency Shift Switch

Engine Control Module (ECM)

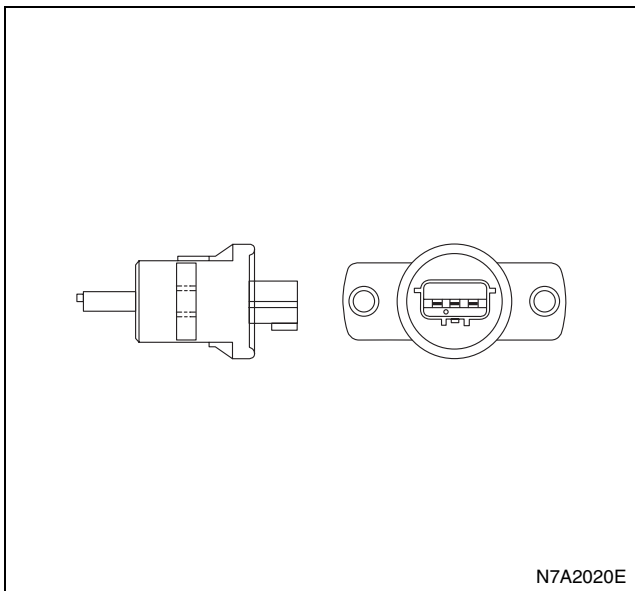
The engine control module (ECM) uses CAN communication to send and receive engine speed, accelerator opening angle, vehicle speed, and switch signals.

**Gear Shift Position Sensor**

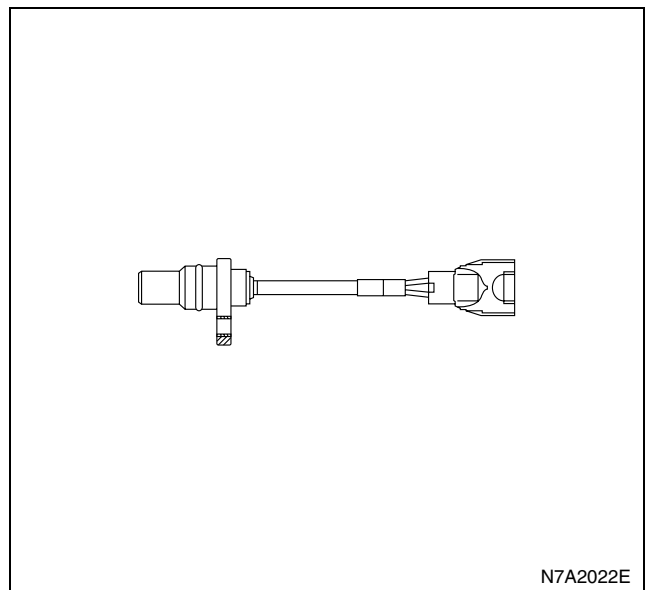
The gear shift position sensor is the hall IC type sensor and is installed to shift control box. It detects the shift stroke amount of T/M and outputs to transmission control module (TCM).

**Gear Select Position Sensor**

The gear select position sensor uses a hall IC type sensor to detect the shift stroke of the T/M installed in the shift control box, and outputs to the transmission control module (TCM).

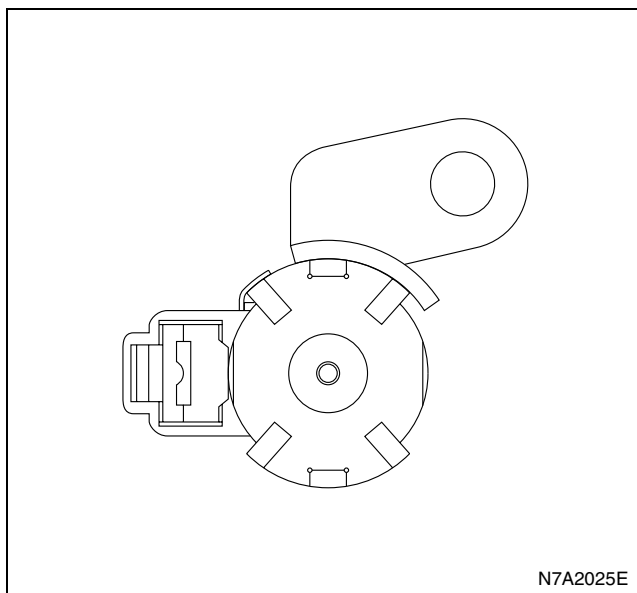
**Input Shaft Speed Sensor**

The input shaft speed sensor is a pickup type sensor installed in the transmission, which generates a signal when it is passed by the input shaft pulser. The input shaft speed sensor signal is used for gear shift control (lockup control, clutch control, etc.) based on signals input from the turbine speed sensor, vehicle speed sensor, etc.



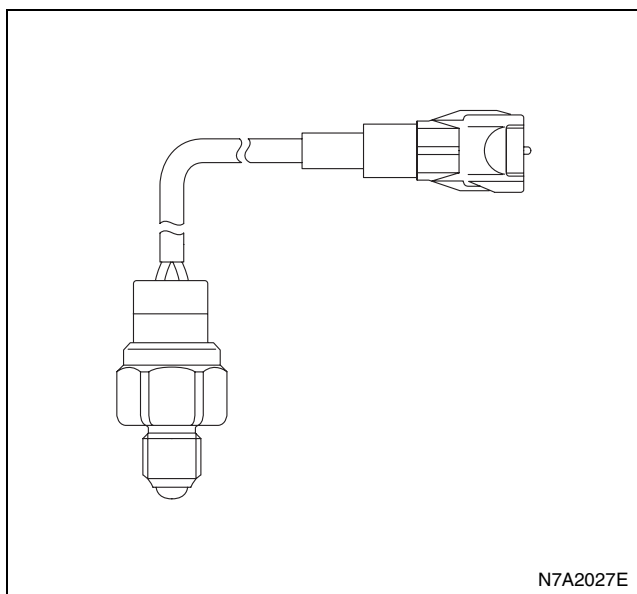
Lock up Clutch Solenoid Valve

The lock up clutch solenoid valve is installed in the oil pump. It operates in response to engine speed and fluid coupling operation.



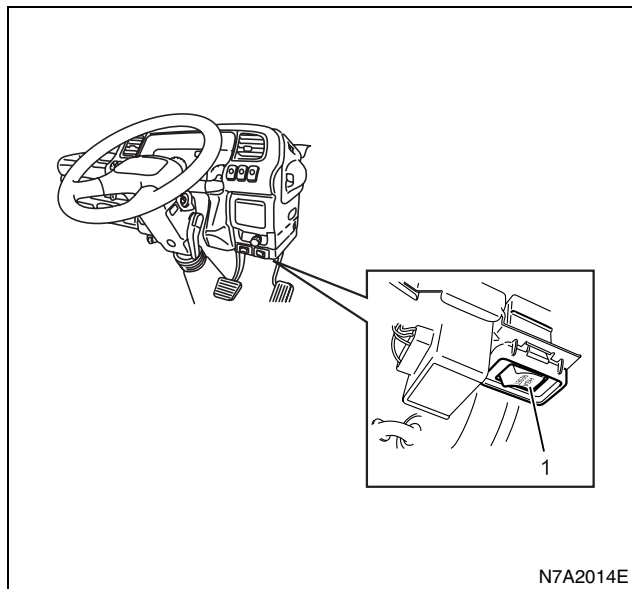
Neutral Switch

The neutral switch is installed in the gearshift control box, and it used to detect when the transmission is in neutral. The transmissin control module (TCM) interprets the condition when the neutral switch is on (contact closed) as neutral gear.



Reset Switch

The reset switch is used during transmission position learning and clutch position learning, or to clear DTC/ Smoother learning values.

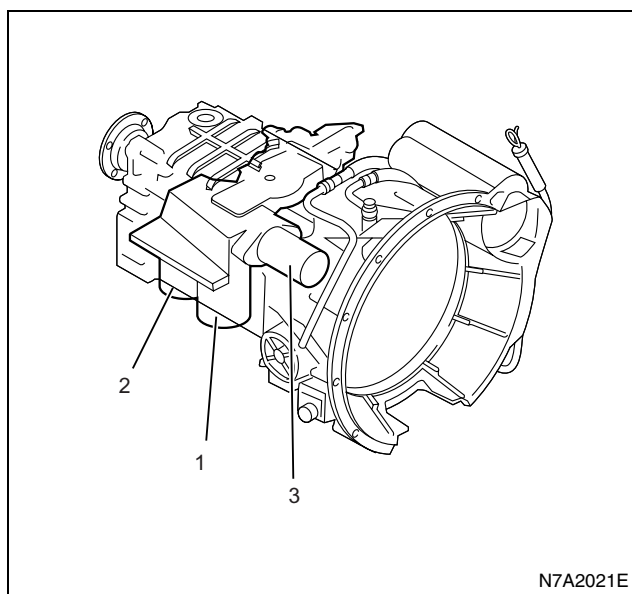


Legend

1. Reset Switch

Select Solenoid Valve

This select solenoid valve is installed in the gearshift control box. The shaft inside the solenoid operates during shifting and the select operation is performed.

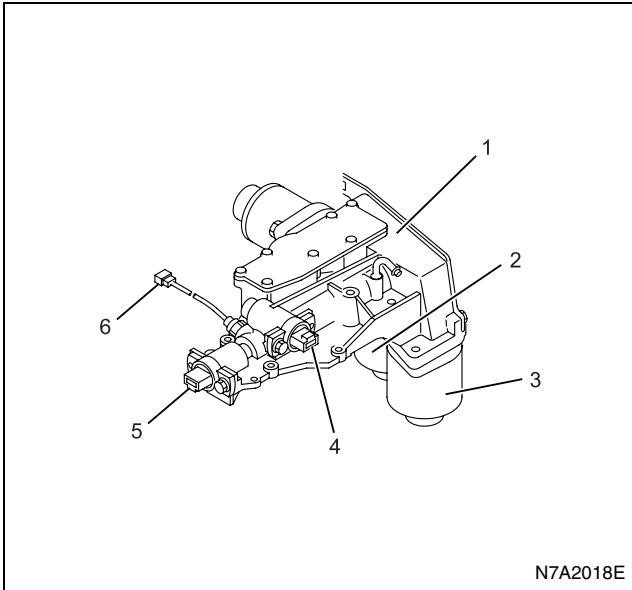


Legend

1. 1-3-5 Shift Solenoid Valve
2. 2-4-6-R Shift Solenoid Valve
3. Select Solenoid Valve

Gearshift Control Box

The gearshift control box has shift solenoids (two), a select solenoid (one), a gear shift position sensor, and a gear select position sensor, and performs shift operations (control) in accordance with signals from the transmission control module (TCM).



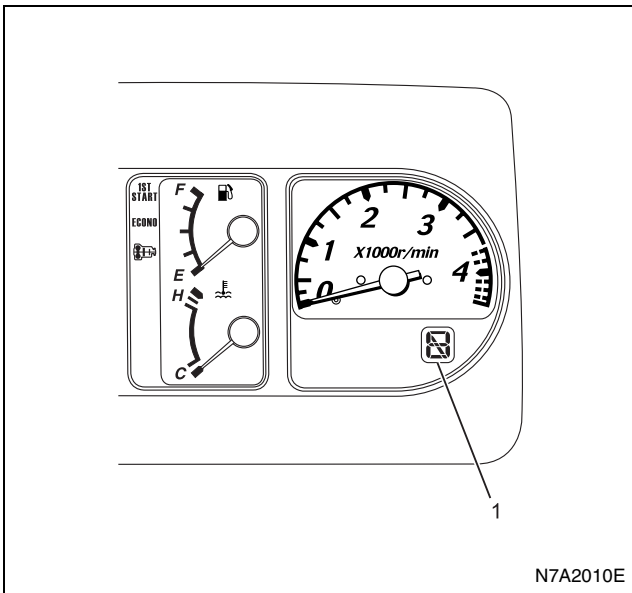
N7A2018E

Legend

1. Gearshift Control Box
2. 1-3-5 Shift Solenoid Valve
3. 2-4-6-R Shift Solenoid Valve
4. Gear Select Position Sensor
5. Gear Shift Position Sensor
6. Neutral Switch

Gear Position Indicator

The gear position indicator indicates the transmission gear position as detected by the TCM. The gear position indicator is installed within the instrument panel cluster (IPC).



N7A2010E

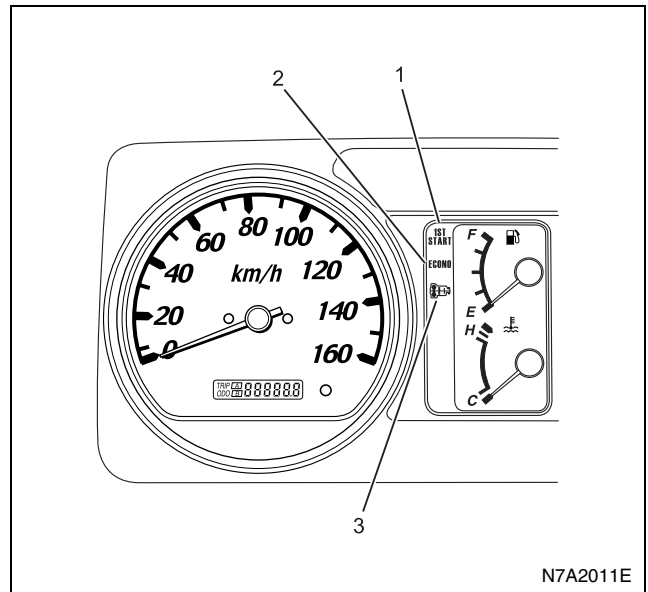
Legend

1. Gear Position Indicator

Transmission Warning Lamp

The transmission warning lamp lights or blinks when the following conditions occur.

- If trouble is detected by the system during normal running, the lamp lights or blinks.
- The warning lamp blinks when the emergency switch is on.
- If the Smoother system transmission fluid temperature rises to an abnormal level during normal running, the lamp blinks.
- The lamp blinks during learning.



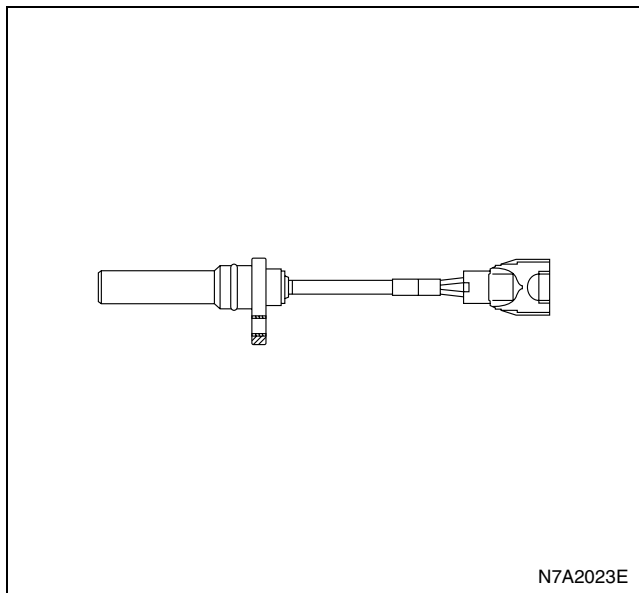
N7A2011E

Legend

1. 1st Gear Start Indicator Lamp
2. Economy Mode Indicator Lamp
3. Transmission Warning Lamp

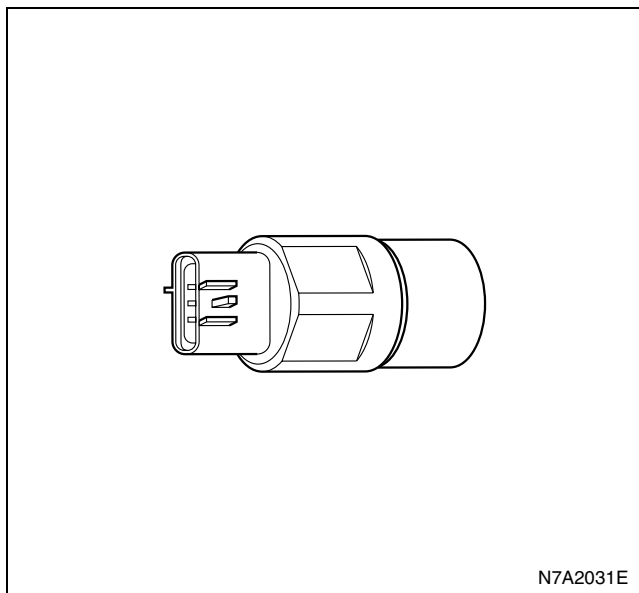
Turbine Speed Sensor

The turbine speed sensor is a pickup type sensor installed in the transmission, which generates a signal when it is passed by the turbine pulser. The turbine speed sensor signal is used for gear shift control (lockup control, clutch control, etc.) based on signals input from the input shaft speed sensor, vehicle speed sensor, etc.



Vehicle Speed Sensor

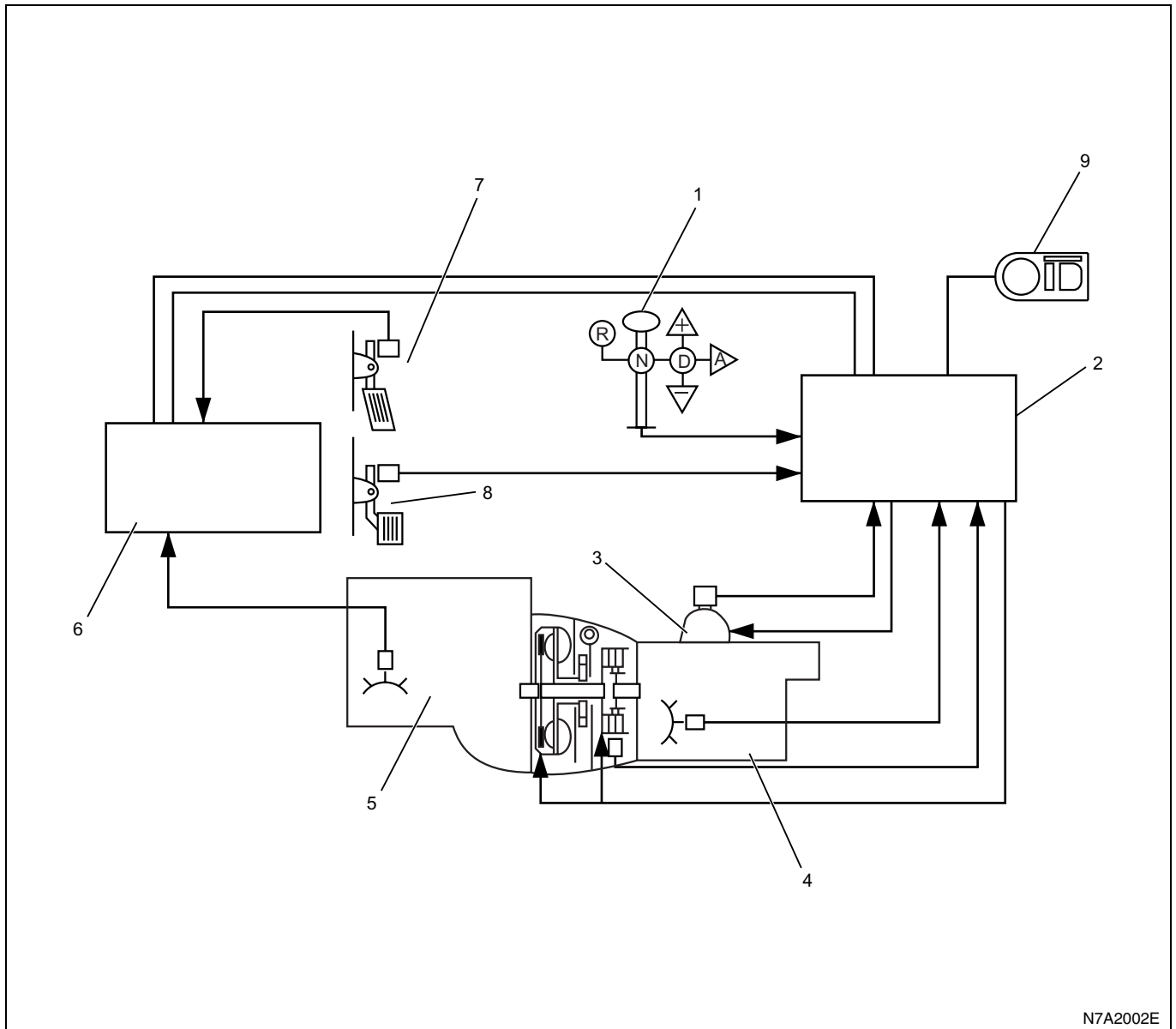
The vehicle speed sensor is installed in the transmission. The vehicle speed sensor signal is obtained from the ECM using CAN communication.



Smoother System Description

Smoother System Overview

“Smoother” is the name of a new-generation drive train that provides benefits in terms of both life cycle costs (low initial cost and maintenance cost, lower fuel consumption, etc.) and easy driving. Smoother is a system that adds an automatic transmission to the existing Smoother, for even better fuel consumption and easier driving. This is accomplished by installing a solenoid system gearshift control box on the Smoother, which combines a manual transmission with fluid coupling, so all shifting is performed automatically in accordance with signals from the transmission control module (TCM). When starting moving the vehicle, depressing the brake pedal and operating the change lever as on an automatic vehicle causes a selector lever position signal to be detected by the TCM. This actuates the gearshift control box solenoid and shifts the gear into the starting position or the reverse position, and then engages the shift change clutch (gearshift). (After the shift clutch engages, creep force is generated the same as on an AT vehicle.) Releasing the foot from the brake pedal and pressing the accelerator pedal starts the vehicle moving forward. If there is an up-shift or down-shift while running, the control unit determines the vehicle status based on vehicle speed, accelerator opening angle, and other factors, and shifts to the optimal gear automatically. If the driver moves the change lever in the “+” or “-” direction, a gear change is indicated, so sequential manual shifting is also possible. (Even during sequential manual shifting, the transmission shifts to the starting position when the vehicle is stopped.)



N7A2002E

Legend

- | | |
|--------------------------------------|---|
| 1. Selector Lever | 6. Engine Control Module (ECM) |
| 2. Transmission Control Module (TCM) | 7. Accelerator Opening Angle Signal |
| 3. Gearshift Control Box Assembly | 8. Brake Signal |
| 4. Transmission Main Unit | 9. Instrument Panel Cluster (Lamps, Indicators) |
| 5. Engine | |

About Control

The transmission control module (TCM) has the following functions, which perform various types of control.

- 1. Transmission shift control**
 Shift control is performed automatically as required by vehicle conditions, shift mode, 1st gear start, etc. Shift control is performed by controlling the change lever, shift control box assembly, etc. (Manual operation is also supported, and the driver's intentions are giving top priority.)
 - Shift up, shift down control
- 2. Running mode control**
 Shift control is change automatically in accordance with the selected mode, and switches between fuel economy mode and normal mode. There are two modes: NORMAL mode and ECONO mode.
 - Shift clutch control
 - Lockup clutch control
 - Engine speed control
 - 1st gear start control

7A-214 Transmission Control System (Smoother)

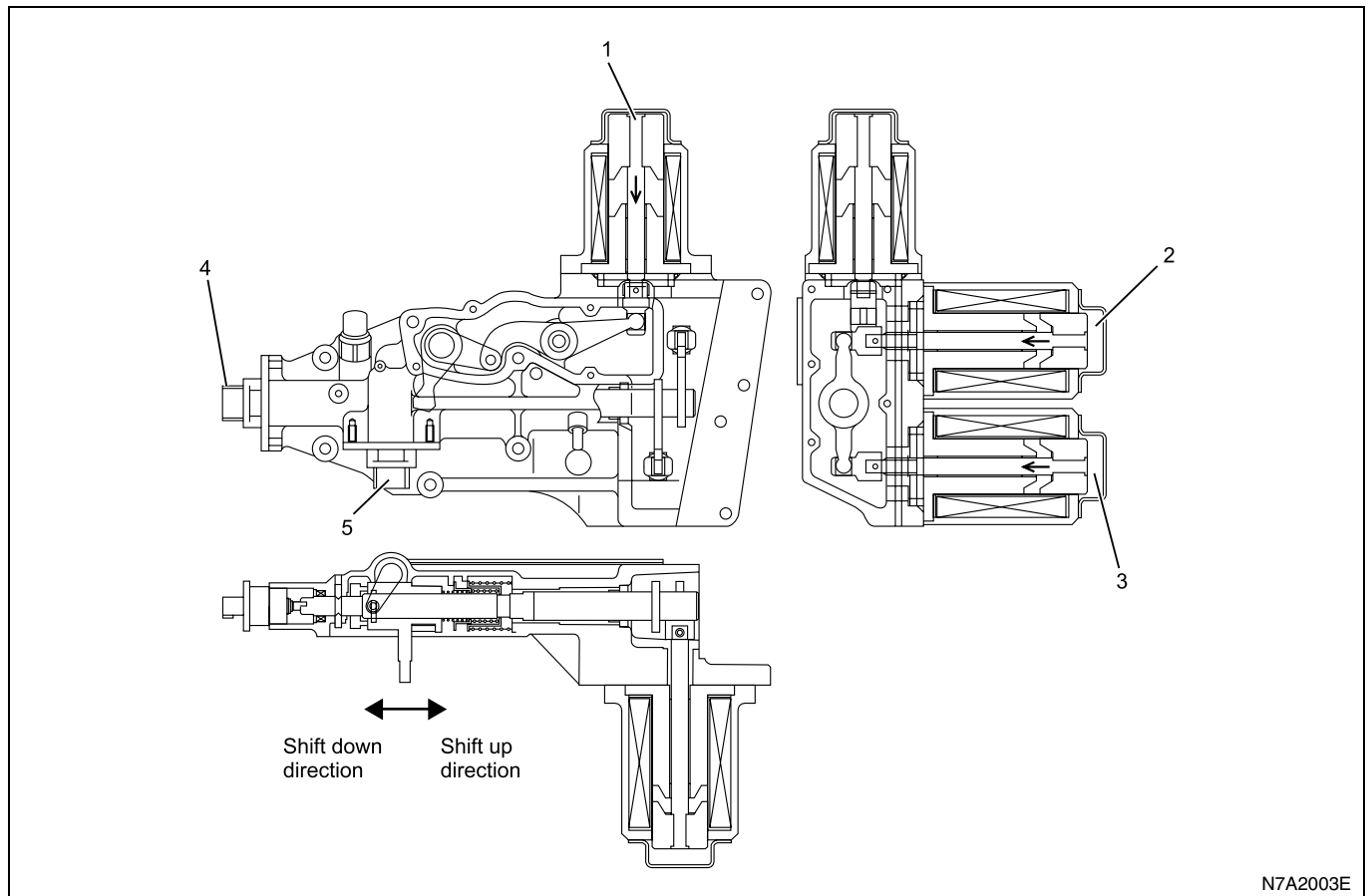
3. Starter inhibitor control
Neutral control and other control are performed when the engine is being started.
4. PTO control
Shift control is performed for PTO gear operation.
5. Emergency system control
Control is performed to enable engine start and vehicle movement when system trouble is detected.
6. Inter-TCM communication
Communication is performed with the engine control module (ECM) and other devices, and information transfer required for control is also performed.
7. Self-diagnosis function
DTC are used to perform various tests to identify the location of trouble and communication is

performed with scan tool, the DTC are confirmed, etc.

8. Information functions (indicator, lamp, buzzer control)
Gear position indicators show the current gear position of the transmission, information lamps indicate operation of each function, and a buzzer alerts the driver to function operations, etc.
9. Half-clutch adjustment function
The half-clutch position can be adjusted by operating a clutch adjustment switch.

Transmission Shift Control

Based on control signals from the selector lever unit, gearshift control box solenoids (shift, select) are controlled in accordance with engine speed, transmission turbine speed, input shaft speed, vehicle speed, accelerator opening angle, and other factors to perform the shift operation.



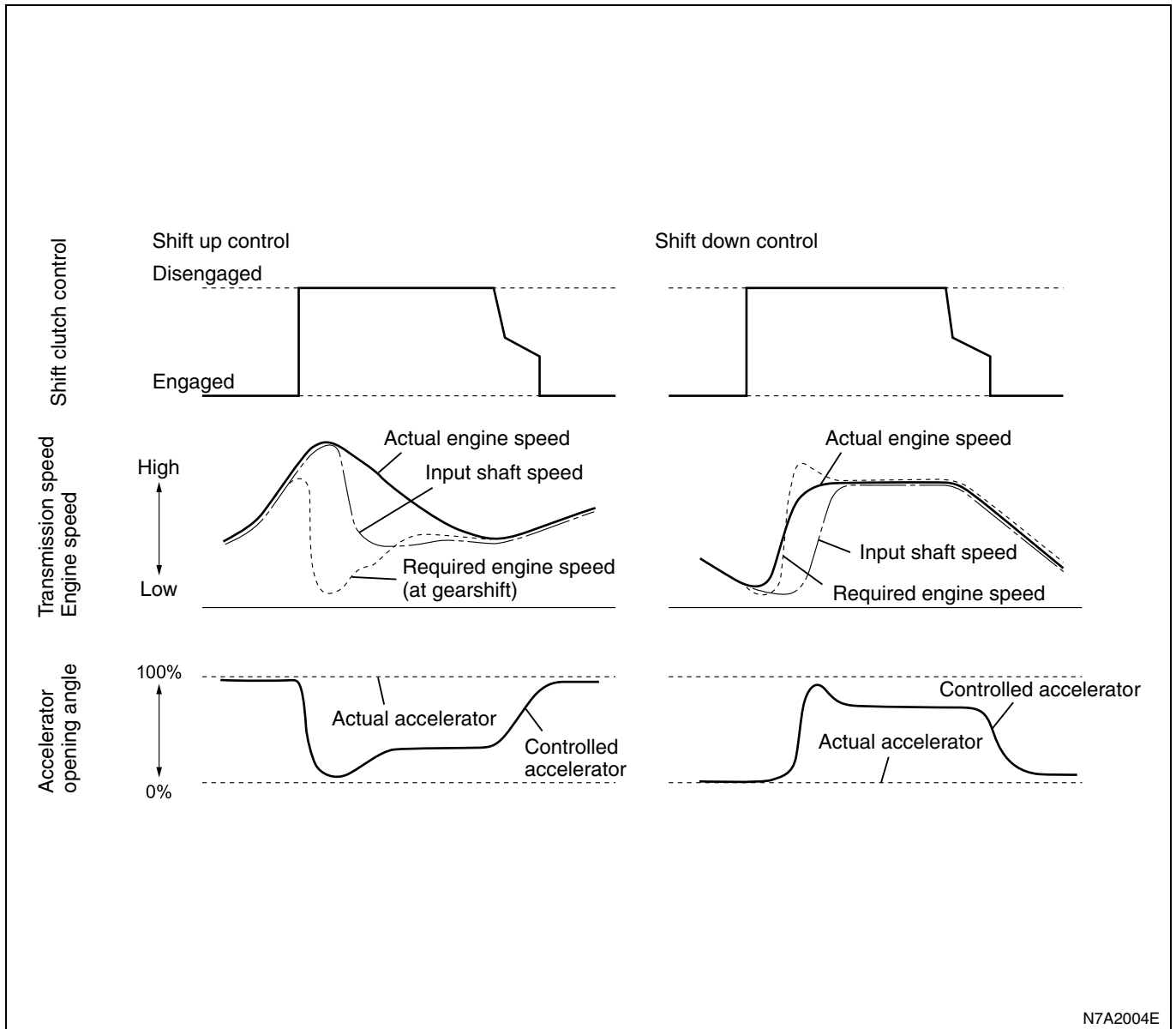
Legend

- | | |
|---------------------------------|--------------------------------|
| 1. Select Solenoid Valve | 4. Gear Shift Position Sensor |
| 2. 1-3-5 Shift Solenoid Valve | 5. Gear Select Position Sensor |
| 3. 2-4-6-R Shift Solenoid Valve | |

About Shift Up, Shift Down Control

Shift up/shift down is performed when the selector lever position (mode) is "D", and an automatic shift or selector lever operation is performed in the "+" direction or "-" direction. Basically, shift clutch control and shift control

are performed based on engine speed, input shaft speed, accelerator opening angle, etc.



About Shift Clutch Control

Clutch solenoid valves are controlled so fluid pressure operates the clutch assembly piston, which operates the gearshift clutch to disengage and engage the clutch. The clutch is disengaged while in neutral, and operates before shifting and after shift control is complete. When ATF temperature is low (up to 20°C [68°F]), the clutch engages in order to warm up the engine.

About Lockup Clutch Control

While running at or above a preset speed, the lockup clutch engages in order to perform control that eliminates engine power transmission loss.

- Lockup clutch engagement control
In 2nd and higher gears, the lockup clutch engages when the following conditions are satisfied: shift clutch is engaged, input shaft speed is 900 to 1500 rpm (vehicle speed depends on gear position), etc. In the case of Rev or 1st gear, the lockup clutch does not engage.

- Lockup clutch disengagement control

The lockup clutch disengages when the following conditions are satisfied: input shaft speed is 900 to 1500 rpm (input shaft speed depends on gear position), etc.

About Engine Speed Control

When the clutch is released (for shifting, etc.), a request for engine speed change is sent to the engine control module (ECM), and engine blowup and deterioration of feeling (shift shock etc.) are prevented.

1st Gear Start Control

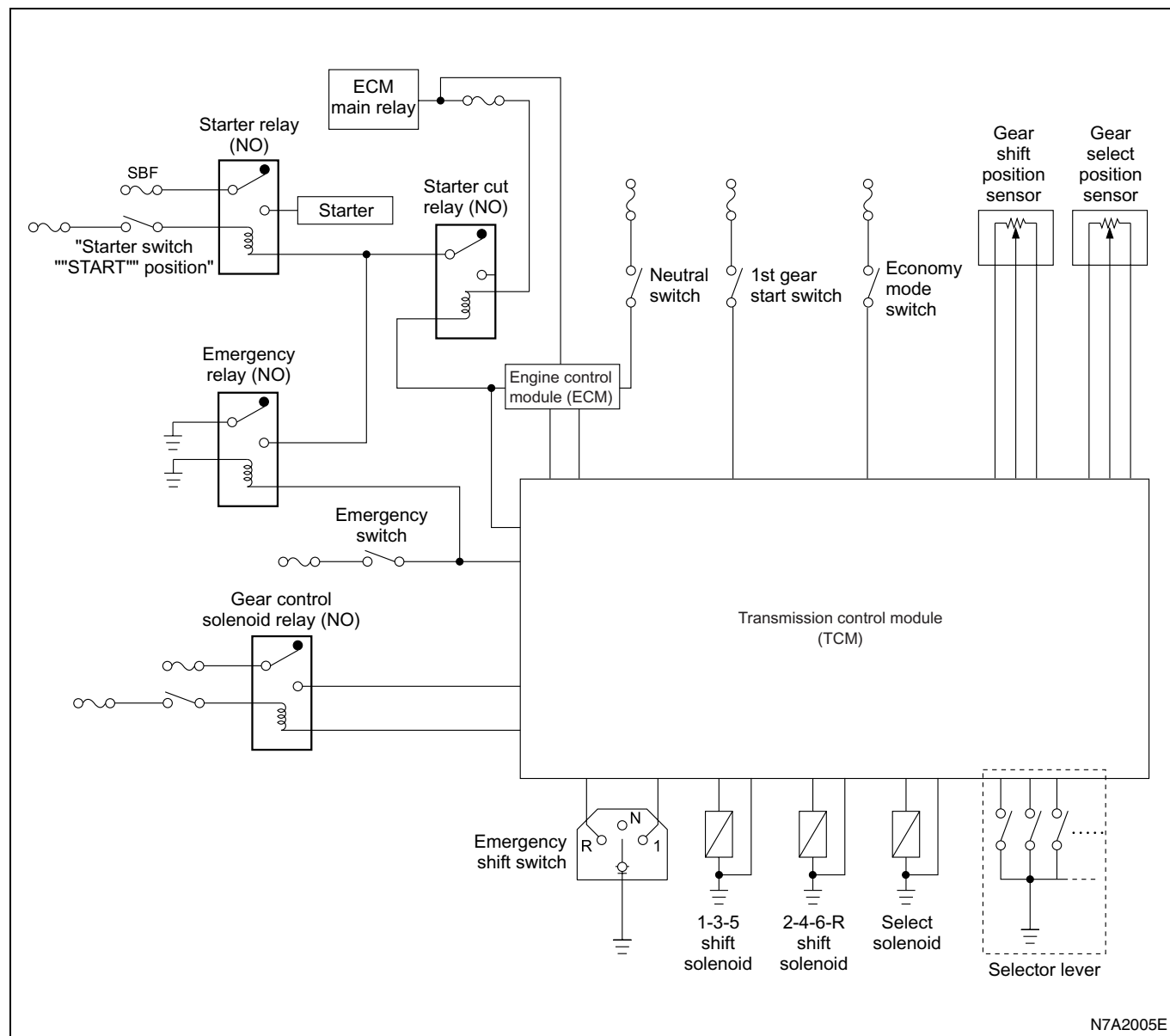
Turning on the 1st gear start switch causes the normal start gear (2nd) to change to 1st gear. This can be used when power is required due to payload and inclines.

Running Mode Control

Shift control is change automatically in accordance with the selected mode, and switches between fuel economy mode and normal mode. There are two modes: NORMAL mode and ECONO mode.

Starter Inhibitor Control

Starter inhibitor control makes it impossible to start the engine when the selector lever is in any position other than neutral.



N7A2005E

PTO Control

PTO mode ON/OFF control is performed in accordance with the PTO switch input gear position, parking brake switch, and other inputs.

Determination of PTO control is possible

- Gear: Neutral
- Vehicle speed: Stopped
- PTO switch: ON
- Engine speed: Running (idling)
- Accelerator opening angle: OFF (idling)
- Parking brake: ON

Determination of PTO control is possible

- PTO switch: OFF

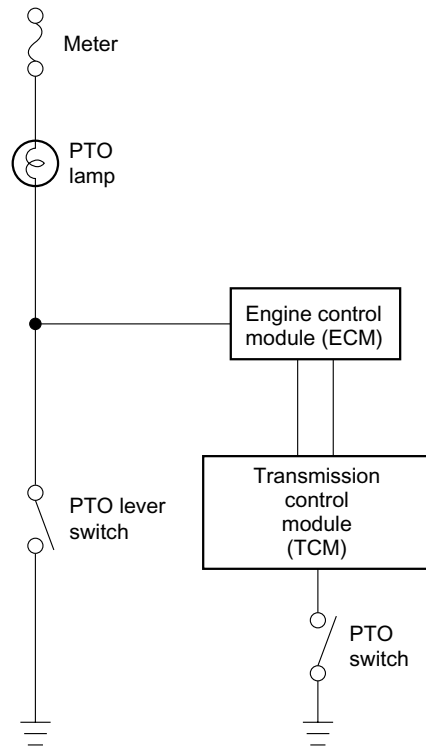
- Engine stopped
- Selector lever operation during PTO operation
- In neutral, vehicle speed is greater than 20 km/h (12 MPH)
- Emergency switch: ON

Shift Control Limit

Automatic shifting prohibited while vehicle is running.

About The Starting Gear

The starting gear can be selected from among 1, 2 and Rev, and shifting from the starting gear is not possible. (The starting gear is fixed. However, shifting to neutral is possible.)



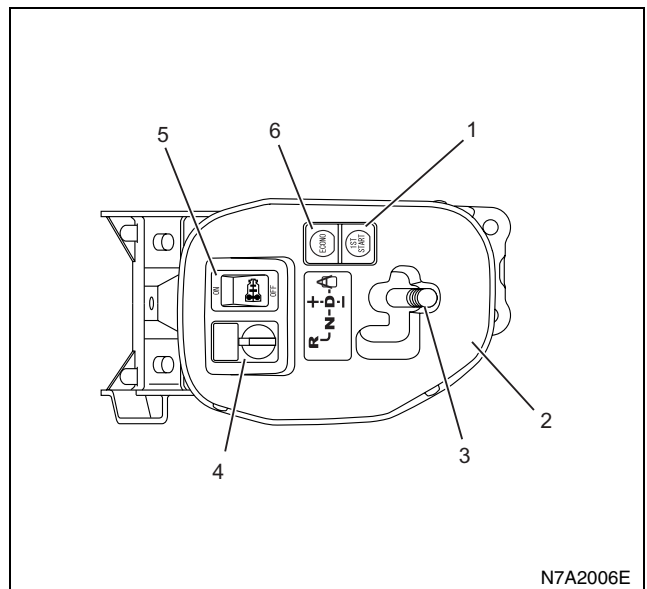
N7A2095E

Emergency System Control

Turning on the emergency switch operates the emergency relay and enables starter relay operation, which makes it possible to operate the starter. The emergency shift switch is also enabled, and switch operation can be used to shift to R, neutral, and 1st.

Notice:

Shifting with the selector lever is not possible when the emergency switch is turned on.



N7A2006E

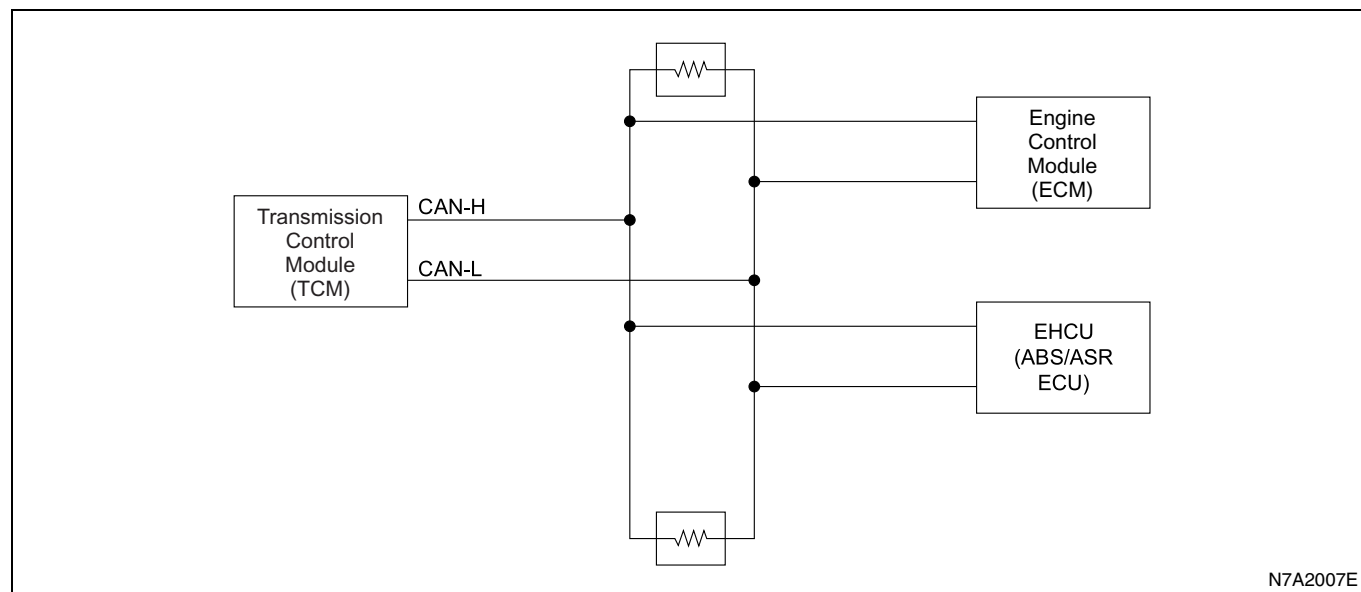
Legend

1. 1st Gear Start Switch
2. Selector Lever Unit
3. Selector Lever
4. Emergency Shift Switch
5. Emergency Switch
6. Economy Mode Switch

Inter-TCM Communication

The transmission control module (TCM) communicates with the engine control module (ECM), EHCU (ABS/ASR control unit), etc., and transfers engine speed,

vehicle speed, accelerator opening angle, ABS/ASR operation, and other signals. CAN communication is used for the communication system.



Half-Clutch Position Adjustment Function

The half-clutch point (gear engagement point) is adjusted by pressing the FAST side or SLOW side of the clutch adjustment switch. The procedure is: select the neutral gear, pull the parking brake, and then press "FAST" for fast clutch engagement or "SLOW" for slow engagement. Adjustment is possible to four levels on each side.

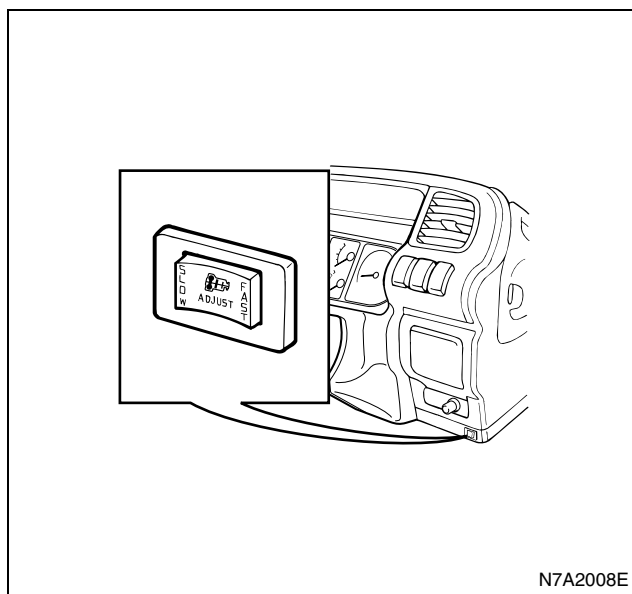
Important:

When ATF temperature is unstable, accurate learning is not possible for half-clutch position adjustment.

Perform the adjustment operation after warming up the engine sufficiently. If the half-clutch position does not feel right after adjustment, repeat half-clutch adjustment as required.

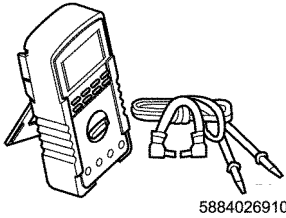
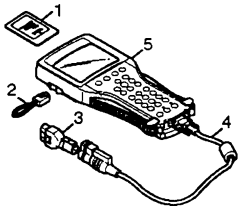
(In this case, it is not necessary to clear the current learned value. Half-clutch adjustment can be performed consecutively.)

It is easy to obtain a stable position at an ATF temperature of 40°C (104°F) or higher (directly after running), which can be checked using scan tool (Tech 2).



Special Tools and Equipment

Special Tools and Equipment

Illustration	Tool Number / Description / Remarks
 5884026910	5-8840-2691-0/ Digital multimeter
	Tech 2/ Scan tool