

Four-Wheel Drive Systems - Vehicles With: 2-Speed Torque On Demand Transfer Case

Principles of Operation

The TCCM has a thermal hardware protection strategy which monitors the amount of energy going through the clutch. This strategy has 2 levels of protection:

- **NOTE:** *In this scenario the indicators in the instrument cluster switch between 4H and 4A, While the physical MSS remains in 4A.*

AUTOLOCK - If the system is in 4A and TCCM detects driving conditions that require greater 4X4 performance, the TCCM temporarily turns on 4H and informs the customer via the message center indicating 4x4 Temporarily Locked. The 4x4 system automatically returns to 4A after the system no longer detects these driving conditions and informs the customer via the message center indicating 4x4 Restored.

- **NOTE:** *The 4x4 Temporarily Disabled message can be dismissed by the customer however it's advisable to let the TCCM clear the message itself, which indicates that the 4x4 system has resumed normal operation.*

POWERTRAIN TORQUE PROTECTION - If the system is in 4H or 4L and TCCM detects excessive stress or high energy going through the clutch (clutch is slipping excessively while the system is commanding max clutch torque), clutch output will be turned off and the message center indicates 4x4 Temporarily Disabled. When the system has the ability to cool off, the 4x4 operation is automatically restored.

The 2-speed torque-on-demand system allows the operator to choose between 2H (4x2) and 3 different 4WD modes of operation: 4A (4X4 AUTO), 4H (4X4 HIGH) and 4L (4x4 LOW). When 4WD modes are selected the TCCM sends a duty cycle command to the transfer case coil which activates the clutch within the transfer case and transfers torque to the front driveline. When the 2H mode is selected, the TCCM duty cycle command is turned OFF and the IWEs located at each front wheel are disengaged to reduce additional drag from the front driveline.

Engagement and disengagement of the front wheels is done by the IWEs. The IWEs are normally engaged (no vacuum). Vacuum is supplied to the IWEs by actuation of the IWE solenoid commanded by the TCCM. When actuated, the IWE solenoid allows vacuum to pass through to each IWE. The IWEs disengage and allow the front wheel hubs to be turned freely from the front axle. Note: When shifting to 2H mode in order for the IWEs to completely disengage the vehicle steering wheel must be less than 90 deg and 5 seconds have elapsed since the shift to 2H has been initiated.

The electric shift motor is mounted externally to the transfer case. It drives a rotary cam which moves the range fork within the transfer case between the HIGH range (2H, 4A and 4H) and LOW range (4L) positions. The electric shift motor only moves during a shift to and from 4L and Neutral, it does not move during any other mode shift. TCCM directly controls the electric shift motor and can reverse motor polarity to reverse rotary cam/shift fork direction. The shift motor sense plate, an integral part of the shift motor assembly, informs the TCCM of the transfer case position.

This transfer case is equipped with an electronically controlled clutch which is located inside the case. This clutch is used to synchronize the speed of the front driveline with the rear driveline as well as transfer torque in either of the 3 different 4WD modes. When the MSS is switched between 2H and 4A or 4H modes, the TCCM first energizes the clutch. When the transfer case front and rear output shafts are synchronized, the front axle IWEs are engaged.

When the front and rear drivelines are synchronized the TCCM sends a duty cycle command to the transfer case clutch coil as a torque request based on combination of

preemptive and wheel slip response algorithm. Preemptive response is based on steering wheel angle, vehicle speed, throttle positions and available powertrain torque. Wheel slip response is based on monitoring the average front and rear wheel speeds.

The TCCM has a cold strategy which is used to warm up the front axle in cold temperatures to improve driveline synchronization. When ambient temperature is below 32 F (0 C), the IWEs engage after the initial key cycle and a driven gear is selected. The hubs stay engaged regardless of 4x4 mode change for approximately 2 miles (3km). Once distance traveled has been achieved IWEs disengage if vehicle is in 2H. Distance traveled resets only if the temperature is below calibrated threshold and another key cycle has occurred or customer shifted to park and back to a driven gear within the same key cycle.

In 4A, the TCCM continuously monitors conditions and driver input to send torque automatically to the front driveline by controlling the transfer case clutch, providing 4WD capability. When 4WD is no longer needed (during cruising or steady state driving) system defaults back to RWD mode by setting the duty cycle output to 0. In situations where it is necessary to negotiate tight turns, clutch duty cycle output is reduced allowing slight difference between the front and rear driveshafts. However, the system is always on alert and when necessary, torque is sent automatically.

In 4H and 4L, the TCCM output behaves similarly to 4A mode but with increased duty cycle for greater 4WD performance.

TCCM increases the duty cycle to prevent or control slip under any of the following conditions:

- Slip is detected
- Heavy acceleration (throttle position)
- Straight-ahead steering wheel angle

Shifts from 2H mode to 4A or 4H mode can be made at any speed. When performing this shift, release the accelerator pedal prior to the shift and wait until the Shift in Progress message disappears in the IPC before accelerating, this improves the shift performance. The following are the inputs and outputs needed by the TCCM to execute a change between these modes and deliver the needed function:

Feature inputs

- MSS
- Steering wheel angle (from the ABS module)
- Transmission output torque (from the PCM/TCM)
- Wheel speed signal (transmitted from the ABS module)
- APP (from the PCM)
- Transfer case shift motor contact plate position inputs A, B, C, D

Feature outputs:

- PWM signal to the transfer case clutch
- 4WD message center indicators
- IWE solenoid command output

Shifts between 4X4 AUTO (4A) and 4X4 (4H) modes can be made at any speed. Listed below are the inputs and outputs needed by the TCCM to execute a change between any of these modes.

Feature inputs:

- MSS

Feature outputs:

- PWM signal to the transfer case clutch
- 4WD message center indicators

When shifting into or out of 4L (4x4 LOW) mode, the vehicle speed must be less than 5 km/h (3 mph) and the transmission must be in neutral. The following are the inputs and outputs needed by the TCCM to execute a change to this mode and deliver the needed function.

Feature inputs:

- Steering wheel angle (from the ABS module)
- APP (from the PCM)
- MSS
- Transfer case shift motor encoder contact plate position inputs A, B, C, D
- Wheel speed signal (transmitted from ABS module)
- TR position (from the PCM)
- Transmission output torque (from the PCM/ TCM)
- Steering wheel angle (from the ABS module)

Feature outputs:

- 4WD message center indicators
- PWM signal to the transfer case clutch
- IWE solenoid command output

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect for obvious signs of mechanical or electrical damage.
3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident, verify the symptom and refer to Symptom Chart: Four-Wheel Drive Systems.

Visual Inspection Chart

Mechanical	Electrical

- Halfshafts
- IWEs
- Driveshaft and U-joints
- Vacuum leaks
- Fluid leaks
- Matching tire sizes
- Transfer case

- BJB
 - fuse 63 (25A)
 - fuse 71 (25A)
 - fuse 13 (10A)
 - fuse 29 (10A)
- Wiring, terminals or connectors
- MSS
- Transfer case clutch
- IWE solenoid
- Transfer case shift motor

DTC Chart: TCCM

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.
REFER to: [Diagnostic Methods](#) (100-00 General Information, Description and Operation).

DTC	Description	Action
C1979:00	IWE Solenoid Circuit Failure: No Sub Type Information	GO to Pinpoint Test C
C1979:11	IWE Solenoid Circuit Failure: Circuit Short To Ground	GO to Pinpoint Test C
C1979:12	IWE Solenoid Circuit Failure: Circuit Short To Battery	GO to Pinpoint Test C
C1979:13	IWE Solenoid Circuit Failure: Circuit Open	GO to Pinpoint Test C
P0562:00	System Voltage Low: No Sub Type Information	GO to Pinpoint Test B
P0563:00	System Voltage High: No Sub Type Information	GO to Pinpoint Test B
P1812:00	4-Wheel Drive Mode Select Circuit Failure: No Sub Type Information	GO to Pinpoint Test L
P1815:00	4-Wheel Drive Mode Select Short Circuit To Ground: No Sub Type Information	GO to Pinpoint Test L
P06B8:00	Internal Control Module Non-Volatile Random Access Memory (NVRAM) Error: No Sub Type Information	CLEAR the DTC. REPEAT the self-test. If the DTC still sets, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
P1825:00	4-Wheel Drive Clutch Relay Open Circuit: No Sub Type Information	GO to Pinpoint Test F
P1826:00	4-Wheel Drive Low Clutch Relay Circuit To Battery: No Sub Type Information	GO to Pinpoint Test F
P1827:00	4-Wheel Drive Low Clutch Relay Circuit To Ground: No Sub Type Information	GO to Pinpoint Test F
P1839:00	Transfer Case Shift Motor Open Circuit: No Sub Type Information	GO to Pinpoint Test E

P1840:00	Transfer Case Shift Motor Short Circuit To Battery: No Sub Type Information	GO to Pinpoint Test E
P1841:00	Transfer Case Shift Motor Short Circuit To Ground: No Sub Type Information	GO to Pinpoint Test E
P1849:00	Transfer Case Contact Plate 'A' Short Circuit To Ground: No Sub Type Information	GO to Pinpoint Test E
P184B:00	Transfer Case Unable To Transition Between 4X4 High and 4X4 Low Range: No Sub Type Information	GO to Pinpoint Test E
P1853:00	Transfer Case Contact Plate 'B' Short Circuit To Ground: No Sub Type Information	GO to Pinpoint Test E
P1857:00	Transfer Case Contact Plate 'C' Short Circuit To Ground: No Sub Type Information	GO to Pinpoint Test E
P185A:00	Differential Lock-Up Input Switch Circuit High: No Sub Type Information	REFER to: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/ Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing).
P185B:00	Differential Lock-Up Indicator Circuit Low: No Sub Type Information	REFER to: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/ Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing).
P185C:00	Differential Lock-Up Indicator Circuit High: No Sub Type Information	REFER to: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/ Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing).
P185D:00	Differential Lock-Up Control Circuit Performance: No Sub Type Information	REFER to: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/ Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing).
P1861:00	Transfer Case Contact Plate 'D' Short Circuit To Ground: No Sub Type Information	GO to Pinpoint Test E
P1867:00	Transfer Case Contact Plate General Circuit Failure: No Sub Type Information	GO to Pinpoint Test E
P187A:00	Transfer Case Control Module System Voltage Low - Rear Locking Differential Disabled	REFER to: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/ Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing).
P187C:00	Differential Lock-Up Control Circuit/Open: No Sub Type Information	REFER to: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/ Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing).

P187D:00	Differential Lock-Up Control Circuit Low: No Sub Type Information	REFER to: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/ Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing).
P187E:00	Differential Lock-Up Control Circuit High: No Sub Type Information	REFER to: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/ Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing).
P1886:00	4X4 Initialization Failure: No Sub Type Information	CLEAR the DTC. REPEAT the self-test. If the DTC still sets, CONFIRM the TCCM part number is correct for the vehicle.
P1891:00	Transfer Case Contact Plate Ground Return Open Circuit: No Sub Type Information	GO to Pinpoint Test E
U0100:00	Lost Communication With ECM/PCM "A": No Sub Type Information	GO to Pinpoint Test M
U0101:00	Lost Communication With TCM "A": No Sub Type Information	GO to Pinpoint Test P
U0121:00	Lost Communication With Anti-Lock Brake System (ABS) Control Module: No Sub Type Information	GO to Pinpoint Test N
U0140:00	Lost Communication With Body Control Module (BCM): No Sub Type Information	GO to Pinpoint Test O
U0418:00	Invalid Data Received From Brake System Control Module: No Sub Type Information	To diagnose the wheel speed sensor concern, REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) .
U2300:54	Central Configuration: Missing Calibration	This DTC sets if one or more expected configuration data identifications is missing (gearbox type, tire circumference) from the BCM. CARRY OUT a self-test of the BCM. If DTCs are present, REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules) . If no DTCs are present, CARRY OUT a self-test. If U2300:54 returns, INSTALL a new TCCM.
U2300:55	Central Configuration: Not Configured	This DTC sets upon power up only until all expected configuration data parameters (gearbox type, axle ratio, tire circumference) are received from the BCM. CARRY OUT a self-test of the BCM. If DTCs are present, REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules) . If no DTCs are present, CLEAR the DTCs. CARRY OUT self-test. If U2300:55 returns, INSTALL a new Terrain Management Module.

U2300:56	Central Configuration: Invalid / Incompatible Configuration	This DTC sets if a expected configuration data parameter is out of range (gearbox type, axle ratio, tire circumference) from the BCM. CARRY OUT a self-test of the BCM. If DTCs are present, REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules) . If no DTCs are present, CARRY OUT a self-test. If U2300:56 returns, INSTALL a new Terrain Management Module.
U2300:64	Central Configuration: Signal Plausibility Failure	This DTC sets if the expected axle ratio or tire circumference is out of range from the BCM. CARRY OUT a self-test of the BCM. If DTCs are present, REFER to: Body Control Module (BCM) (419-10 Multifunction Electronic Modules) . If no DTCs are present, CARRY OUT a self-test. If U2300:64 returns, INSTALL a new Terrain Management Module.
U3000:04	Control Module: System Internal Failure	CLEAR the DTC. REPEAT the self-test. If DTC U3000:04 is retrieved again, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
U3000:41	Control Module: General Checksum Failure	CLEAR the DTC. REPEAT the self-test. If DTC U3000:41 is retrieved again, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
U3000:46	Control Module: Calibration / Parameter Memory Failure	CLEAR the DTC. REPEAT the self-test. If DTC U3000:46 is retrieved again, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
U3000:49	Control Module: Internal Electronic Failure	CLEAR the DTC. REPEAT the self-test. If DTC U3000:49 is retrieved again, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
U300D:11	Ignition Input On/Start: Circuit Short To Ground	GO to Pinpoint Test A

Symptom Chart: Four-Wheel Drive Systems

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.
REFER to: [Diagnostic Methods](#) (100-00 General Information, Description and Operation).

Symptom	Possible Sources	Action

No communication with the TCCM	- Scan tool - DLC - TCCM - Wiring, terminals or connectors	REFER to: Communications Network (418-00 Module Communications Network) .
The 4X4 mode indicators do not operate correctly/do not operate	- IPC 4WD system fault - HS-CAN - TCCM	To diagnose the 4X4 mode indicators do not operate correctly/do not operate, REFER to: Instrumentation, Message Center and Warning Chimes (413-01 Instrumentation, Message Center and Warning Chimes) .
The vehicle does not shift between 2H (2WD) and 4X4 modes correctly	- Wiring, terminals or connectors - MSS - IWE - IWE solenoid - Transfer case - Vacuum leaks - Front axle assembly - TCCM	GO to Pinpoint Test L
The vehicle does not shift between 4A (4X4 AUTO) and 4H (4X4) modes correctly	- Wiring, terminals or connectors - IWE - IWE solenoid - Transfer case - Vacuum leaks - Front axle assembly	GO to Pinpoint Test D

	• TCCM • MSS	
• Vehicle has no torque or inadequate torque at front wheels in 4A (4X4 AUTO) mode	• Transfer case and related components • IWE and related components • Wheel/tire assemblies	• GO to Pinpoint Test J
• The vehicle does not shift between 4H (4X4) and 4L (4X4 LOW) modes correctly	• Wiring, terminals or connectors • TR sensor • ABS wheel speed inputs • IWE • TCCM • Transmission drag torque	• GO to Pinpoint Test E
• 4WD does not engage at speed correctly	• Transfer case clutch • Transfer case • TCCM • Front axle assembly • Wiring, terminals or connectors	• GO to Pinpoint Test F

• The front axle does not engage/disengage correctly	• Wiring, terminals or connectors • Fuses • MSS • IWE • IWE solenoid • Transfer case • Vacuum leaks • Front axle assembly • TCCM	• GO to Pinpoint Test C
• The 4WD system jumps out of gear	• IWE vent line(s) • Transfer case • MSS	• GO to Pinpoint Test G
• Unable to achieve flat tow (neutral tow) mode	• Wiring, terminals or connectors • HS-CAN • IPC • TCCM • Door ajar switch • Ignition switch	• REFER to: Neutral Flat Tow Activation and Deactivation (308-07A Four-Wheel Drive Systems, General Procedures).
• Grinding noise from front axle when engaging 4x4 at speed.	• Torque on demand (TOD) clutch did not bring driveline up to speed. • Poor vacuum to IWE.	• GO to Pinpoint Test F • GO to Pinpoint Test F

• Unable to duplicate customer concern	• 4WD system and/or related components	• GO to Pinpoint Test J
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Symptom Chart — NVH

NOTE: NVH symptoms should be identified using the diagnostic tools that are available. For a list of these tools, an explanation of their uses and a glossary of common terms, refer to Section 100-04. Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system.

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.
 REFER to: [Diagnostic Methods](#) (100-00 General Information, Description and Operation).

Symptom	Possible Sources	Action
• Grinding noise during 4WD system engagement, especially at high speeds	• Front halfshaft speeds not turning at the same speed • Transfer case clutch	• GO to Pinpoint Test C
• Vehicle Pulsates or Shudders in a Straight Line (Straightline Driveline Wind-up)	• Unequal tire inflation pressures • Unmatched tire and wheel size • Unequal amounts of tire wear • Unmatched front and rear axle ratios	• GO to Pinpoint Test H
• The front axle makes noise in 2H mode only and generally under heavy throttle	• Vacuum leaks • Vacuum check valve • Vacuum reservoir • IWE solenoid • IWEs	• GO to Pinpoint Test I

• The transfer case makes noise	• Tire inflation pressure • Tire and wheel size • Tire tread wear • Internal components • Fluid level	• MAKE SURE that all tires and wheels are the same size and that the inflation pressures are correct. • CHECK tire tread wear to see if there is more than 1.6 mm (0.062 in) or 2/32 inch difference in tread wear between front and rear. INTERCHANGE one front wheel and one rear wheel. ROAD TEST again. • OPERATE the vehicle in all transmission gears. If there is noise in the transmission in NEUTRAL, or in some gears and not in others, REMOVE and REPAIR the transmission. REFER to: Diagnosis By Symptom (307-01A Automatic Transmission - 6-Speed Automatic Transmission - 6R80, Diagnosis and Testing). If there is noise in all gears, DISASSEMBLE the transfer case. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing). CHECK the planetary gears, the bearings, the upper and lower drive sprockets and drive chain for damage. INSTALL new parts as necessary • FILL with automatic transmission fluid.
• Transfer case whine — noise at all ranges	• Incorrect fluid level or fluid quality • Worn oil pump • Under-inflated or oversized tires	• CHECK that the transfer case is filled to the correct level and with the specified fluid. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing). • DISASSEMBLE the transfer case. CHECK the oil pump for wear or damage. REPAIR as necessary. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing). • CONFIRM that the tires and wheels are correct for the vehicle. CHECK that the tire inflation pressures are correct.

Transfer case growl/rumble — noise at all ranges	Damaged or worn bearings or planetary gear	DISASSEMBLE the transfer case. CHECK the bearings or planetary gear for wear or damage. REPAIR as necessary. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).
Transfer case scraping/grating — noise at all ranges	Excessively stretched drive chain hitting the case	DISASSEMBLE the transfer case. CHECK the drive chain for wear or damage. REPAIR as necessary. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).
Transfer case howl/hum — noise at all ranges or 4H only	Worn or damaged sun (input) gear, clutch pack (intermediate) gear or output shaft gear	DISASSEMBLE the transfer case. CHECK the gears for wear or damage. REPAIR as necessary. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).
Vehicle binds in a turn/resists turning/pulsates in a straightline in 4WD mode	- Unmatched tire sizes - Unequal amounts of tire wear - Unequal tire inflation pressures - Throttle position failure - Transfer case - TCCM	GO to Pinpoint Test K

Pinpoint Tests

DTC U300D:11

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation and Fault Conditions

The TCCM receives ignition switch position status from the hardwired run/start input circuit and the ignition switch position status message communicated by the BCM over the HS-CAN.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
U300D:11	Ignition Input On/Start: Circuit Short To Ground	This DTC sets when a short to ground is detected by the TCCM, or if the ignition switch is not in RUN for the self-test.

Possible Sources

- Fuse
- Wiring, terminals or connectors
- Ignition switch
- HS-CAN

PINPOINT TEST A : DTC U300D:11

A1 CHECK THE TCCM IGNITION POSITION (KEY_POS_4X4) AND IGNITION STATUS (KEY_STATUS_4X4) PIDS

- Using a diagnostic scan tool, monitor the PIDs KEY_POS_4X4 and KEY_STATUS_4X4.
- Cycle the ignition switch between the OFF and ON positions.

Do the ignition PIDs match the ignition switch positions?

Yes	The system is functioning correctly at this time. CLEAR the DTCs.
No	If the KEY_STATUS_4X4 PID did not match, CHECK BJB fuse 13 (10A). If the fuse is OK, REPAIR the open circuit. If the fuse is not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. After the fault is repaired, CLEAR the DTCs. If the KEY_POS_4X4 PID did not match, DIAGNOSE the ignition switch, REFER to: Steering Wheel and Column Electrical Components (211-05 Steering Wheel and Column Electrical Components) . After the fault is repaired, CLEAR the DTCs.

DTCS P0562:00, P0563:00

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation and Fault Conditions

If the TCCM observes an overpower or underpower voltage condition, a DTC is set and all TCCM outputs are turned off (IWE engaged).

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P0562:00	System Voltage Low: No Sub Type Information	This DTC sets when the TCCM detects battery voltage less than 9 volts for 5 seconds or more at the TCCM.
P0563:00	System Voltage High: No Sub Type Information	This DTC sets when the TCCM detects battery voltage greater than 16 volts for 5 seconds or more at the TCCM.

Possible Sources

- Fuse
- Wiring, terminals or connectors
- TCCM

PINPOINT TEST B : DTCS P0562:00, P0563:00

B1 RETRIEVE ALL CMDTCS IN ALL MODULES

NOTE: DTC P0562:00 or P0563:00 can be set if the vehicle has been recently jump started, the battery has been recently charged or the battery has been discharged. The battery may become discharged due to excessive load(s) on the charging system from aftermarket accessories or if the battery has been left unattended with the accessories on.

- Ignition ON.
- Enter the following diagnostic mode: Retrieve all CMDTCs.

Is DTC P0562:00 or P0563:00 present in one or more modules and P0563, P0620, P0625, P0626 or P065B present in the PCM?

Yes	For diagnosis of the battery and charging system, REFER to: Charging System - 2.7L EcoBoost (238kW/324PS) (414-00 Charging System - General Information) . REFER to: Charging System - 3.5L Duratec (209kW/284PS)/3.5L EcoBoost (272kW/370PS)/5.0L 32V Ti-VCT (414-00 Charging System - General Information) .
No	GO to B2

B2 CHECK BATTERY CONDITION

- Ignition OFF.
- Carry out the Battery Condition Test,
REFER to: [Battery](#) (414-01 Battery, Mounting and Cables, Diagnosis and Testing).

Does the battery pass the condition test?

Yes	GO to B3
No	CHARGE or INSTALL a new battery. REFER to: Battery (414-01 Battery, Mounting and Cables, Diagnosis and Testing).

B3 CHECK THE CHARGING SYSTEM VOLTAGE

- **NOTE:** Do not allow the engine rpm to increase above 2,000 rpm while performing this step or the generator may self-excite and result in default charging system output voltage. If engine rpm has exceeded 2,000 rpm, shut the vehicle off and restart the engine before performing this step.

Start the engine

- Measure the voltage of the battery:
 - For DTC P0562:00, turn on the headlights and the HVAC fan on high and run the engine at 1,500 rpm for a minimum of 2 minutes.
 - For DTC P0563:00, turn off all accessories and run the engine at 1,500 rpm for a minimum of 2 minutes.

Is the battery voltage between 13-15.2 volts?

Yes	For DTC P0562:00, GO to B4 For DTC P0563:00, GO to B6
No	To diagnose the charging system, REFER to: Charging System - 2.7L EcoBoost (238kW/324PS) (414-00 Charging System - General Information) . REFER to: Charging System - 3.5L Duratec (209kW/284PS)/3.5L EcoBoost (272kW/370PS)/5.0L 32V Ti-VCT (414-00 Charging System - General Information) . CLEAR all CMDTCs.

B4 CHECK VOLTAGE AND GROUND TO THE TCCM

- Ignition OFF.
- Disconnect TCCM C2371B.
- Ignition ON.

Is the voltage greater than 11 volts?

Yes	GO to B6
No	GO to B5

B5 CHECK VOLTAGE TO THE TCCM

Is the voltage greater than 11 volts?

Yes	REPAIR the ground circuit. CLEAR all CMDTCs.
No	VERIFY BJB fuse 71 (25A) is OK. If OK, REPAIR the open circuit. If not OK, REFER to the Wiring Diagrams manual to identify possible causes of the circuit short. CLEAR all CMDTCs.

B6 CHECK FOR CORRECT TCCM OPERATION

- Ignition OFF.
- Disconnect and inspect all TCCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Connect all TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
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No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of the connector or pin issues.
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The Front Axle Does Not Engage/Disengage Correctly

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation and Fault Conditions

Engagement and disengagement of the front wheels is done by the IWEs. The IWEs are normally engaged (no vacuum). Vacuum is supplied to the IWEs by actuation of the IWE solenoid commanded by the TCCM. When actuated, the IWE solenoid allows vacuum to pass through to each IWE. The IWEs disengage and allow the front wheel hubs to be turned freely from the front axle. When shifting to 2H mode in order for the IWEs to completely disengage the vehicle steering wheel must be less than 90 deg and 5 seconds have elapsed since the shift to 2H has been initiated. If the TCCM observes an overpower or underpower voltage condition, a DTC is set and all TCCM outputs are turned off (IWEs engaged).

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
C1979:00	IWE Solenoid Circuit Failure: No Sub Type Information	This DTC sets when the TCCM detects there is a possible mechanical fault present with the IWE system based on wheel speed message data. When the DTC is present IWE solenoid output shall continue to operate normally.
C1979:11	IWE Solenoid Circuit Failure: Circuit Short To Ground	This DTC sets when the TCCM detects a short to ground in the IWE solenoid circuit. The fault results in IWE disengaged all the time.
C1979:12	IWE Solenoid Circuit Failure: Circuit Short To Battery	This DTC sets when the TCCM detects a short to voltage in the IWE solenoid circuit. The fault results in IWE engaged all the time.
C1979:13	IWE Solenoid Circuit Failure: Circuit Open	This DTC sets when the TCCM detects an open circuit in the IWE solenoid circuit. The fault results in IWE engaged all the time.

Possible Sources

- Fuse
- Wiring, terminals or connectors
- TCCM
- IWE
- IWE solenoid
- Transfer case
- Vacuum leaks

- MSS

PINPOINT TEST C : THE FRONT AXLE DOES NOT ENGAGE/DISENGAGE CORRECTLY

C1 CHECK FOR TCCM DTCS

- Enter the following diagnostic mode: TCCM Self-Test.

Are any DTCs present?

Yes	For DTC C1979:11, GO to C17 For DTC C1979:12, GO to C16 For DTC C1979:13, GO to C18 For all other DTCs, REFER to the DTC chart: TCCM.
No	GO to C2

C2 CHECK FOR GRINDING NOISES AT HIGH SPEEDS

- With the vehicle at operating temperature and the MSS in 2H mode, drive the vehicle at sustained Wide Open Throttle (WOT) for 5 seconds.

Is there a grinding noise from the axle system during Wide Open Throttle (WOT)?

Yes	GO to Pinpoint Test I
No	GO to C3

C3 CHECK TCCM OPERATION

- Ignition ON.
- Monitor the 4X4 indicator on the IPC while moving the MSS between 2H and 4H modes.

Does the 4X4 indicator illuminate when the MSS is in the 4H position and turn off when the MSS is in the 2H position?

Yes	GO to C4
No	GO to Pinpoint Test L

C4 CHECK THE IWE DISENGAGEMENT

- **NOTE:** *The engine must be idling during the following steps to supply the vacuum required for the IWEs to disengage.*

With the vehicle in NEUTRAL, position it on a hoist.

REFER to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).

- Place the MSS in 2H.
- Start the engine.
- Rotate the LH front tire one revolution forward and one revolution backward while observing the LH front halfshaft.
- Rotate the RH front tire one revolution forward and one revolution backward while observing the RH front halfshaft.

Did either front halfshaft rotate?

Yes	GO to C7
No	GO to C5

C5 CHECK THE IWE ENGAGEMENT

- With the vehicle in NEUTRAL, position it on a hoist.
REFER to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
- Place the MSS in 4H.
- Start the engine.
- Rotate the LH front tire one revolution forward and one revolution backward while observing the LH front halfshaft.
- Rotate the RH front tire one revolution forward and one revolution backward while observing the RH front halfshaft.

Did both front halfshafts rotate?

Yes	The front axle is operating properly at this time. CARRY OUT the 4WD Functional Test. GO to Pinpoint Test J
No	GO to C6

C6 CHECK THE IWE SOLENOID OUTPUT IN 4H

- Disconnect the output vacuum line at the IWE solenoid.
- With the engine running, measure the vacuum at the output port of the IWE solenoid.

Is the vacuum less than 25 mm-Hg (1 in-Hg)

Yes	The IWE is mechanically stuck in the disengaged position. INSTALL a new IWE on the halfshaft(s) that did not rotate. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	REPLACE the IWE Solenoid.

C7 CHECK THE IWE SOLENOID OUTPUT VACUUM IN 2H

- Disconnect the output vacuum line at the IWE solenoid.
- With the engine running and the MSS in 2H, measure the vacuum at the output port of the IWE solenoid.

Is the vacuum greater than 254 mm-Hg (10 in-Hg)

Yes	GO to C9
No	GO to C8

C8 CHECK THE IWE SOLENOID INPUT VACUUM IN 2H

- Disconnect the supply vacuum line at the IWE solenoid.
- With the engine running, measure the supply line vacuum to the IWE solenoid.

Is the vacuum greater than 254 mm-Hg (10 in-Hg)?

Yes	INSTALL a new IWE solenoid.
No	GO to Pinpoint Test I

C9 CHECK THE IWE VACUUM LINES FOR LEAKS

- Ignition OFF.
- Disconnect the output vacuum line at the IWE solenoid.
- Disconnect and plug the LH and RH IWE vacuum lines at the IWE.
- Connect a vacuum pump to the IWE output vacuum circuit at the IWE solenoid connection. Apply 508 mm-Hg (20 in-Hg) of vacuum and observe the vacuum reading.

Does the vacuum drop more than 25 mm-Hg (1 in-Hg) per minute?

Yes	The vacuum lines between the IWE solenoid and the RH or LH IWEs are leaking. INSTALL new vacuum lines as required.
No	GO to C10

C10 CHECK THE LH IWE VACUUM LINE FOR AN OBSTRUCTION

- Ignition OFF.
- Disconnect the output vacuum line from the IWE solenoid.
- Disconnect and plug the LH and RH IWE vacuum lines at the IWE.
- Connect a vacuum pump to the IWE output vacuum circuit at the IWE solenoid connection. Apply 508 mm-Hg (20 in-Hg) of vacuum.
- Remove the plug at the LH IWE vacuum line and observe the vacuum reading.

Does the vacuum drop more than 25 mm-Hg (1 in-Hg) per minute?

Yes	REINSTALL the plug at the LH IWE vacuum line. GO to C11
No	INSPECT vacuum lines from IWE solenoid to LH IWE for obstruction. INSTALL new lines as required.

C11 CHECK THE RH IWE VACUUM LINE FOR AN OBSTRUCTION

- Ignition OFF.
- Disconnect the output vacuum line from the IWE solenoid.
- Disconnect and plug the LH and RH IWE vacuum lines at the IWE.
- Connect a vacuum pump to the IWE output vacuum circuit at the IWE solenoid connection. Apply 508 mm-Hg (20 in-Hg) of vacuum and observe the vacuum reading.
- Remove the plug at the RH IWE vacuum line and observe the vacuum reading.

Does the vacuum drop more than 25 mm-Hg (1 in-Hg) per minute?

Yes	The vacuum lines are not leaking or obstructed. GO to C12
No	INSPECT vacuum lines from the vacuum line “T” to the RH IWE for obstruction. INSTALL new lines as required.

C12 CHECK THE RH IWE LEAK RATE

- Disconnect the vacuum line from the larger port at the RH IWE.
- Connect a hand vacuum pump to the RH IWE port. Apply 508 mm-Hg (20 in-Hg) of vacuum and observe vacuum reading.

Does the vacuum drop more than 25 mm-Hg (1 in-Hg) per minute?

Yes	INSTALL a new RH IWE. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	GO to C13

C13 CHECK THE RH IWE OPERATION

- Connect a vacuum pump with gauge to the larger port of the RH IWE.
- Observe the RH halfshaft while rotating the RH front tire. Apply between 152-203 mm-Hg (6-8 in-Hg) of vacuum and release the vacuum to manually disengage and engage the RH IWE.

Did the RH IWE disengage between 152-203 mm-Hg (6-8 in-Hg) and engage when the vacuum is released?

Yes	CONNECT the vacuum line to the RH IWE. GO to C14
------------	--

No	INSTALL a new RH IWE. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation).
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C14 CHECK THE LH IWE LEAK RATE

- Disconnect the vacuum line from the larger port at the LH IWE.
- Apply 508 mm-Hg (20 in-Hg) of vacuum to the LH IWE port and observe vacuum reading.

Does the vacuum drop more than 25 mm-Hg (1 in-Hg) per minute?

Yes	INSTALL a new LH IWE. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	GO to C15

C15 CHECK THE LH IWE OPERATION

- Connect a vacuum pump with gauge to the larger port of the LH IWE.
- Observe the LH halfshaft while rotating the LH front tire. Apply between 152-203 mm-Hg (6-8 in-Hg) of vacuum and release the vacuum to manually disengage and engage the LH IWE.

Did the LH IWE disengage between 152-203 mm-Hg (6-8 in-Hg) and engage when the vacuum is released?

Yes	CONNECT the vacuum line to the LH IWE. The front axle is operating properly at this time. CARRY OUT the 4WD Functional Test. GO to Pinpoint Test J
No	INSTALL a new LH IWE. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation).

C16 CHECK THE IWE SOLENOID CONTROL CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect IWE C1291.
- Disconnect TCCM C2371A.
- Ignition ON.

Is any voltage present?

Yes	REPAIR the circuit. CLEAR the DTCs.
No	GO to C17

C17 CHECK THE IWE SOLENOID CONTROL CIRCUIT FOR A SHORT TO GROUND

- Ignition OFF.

Is the resistance greater than 10,000 ohms?

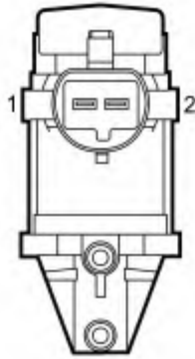
Yes	GO to C18
No	REPAIR the circuit.

C18 CHECK THE IWE SOLENOID RESISTANCE

NOTE: *If the temperatures (either ambient or in the engine compartment) are exceptionally high, a higher than normal resistance reading could result. A lower temperature could result in a lower resistance reading.*

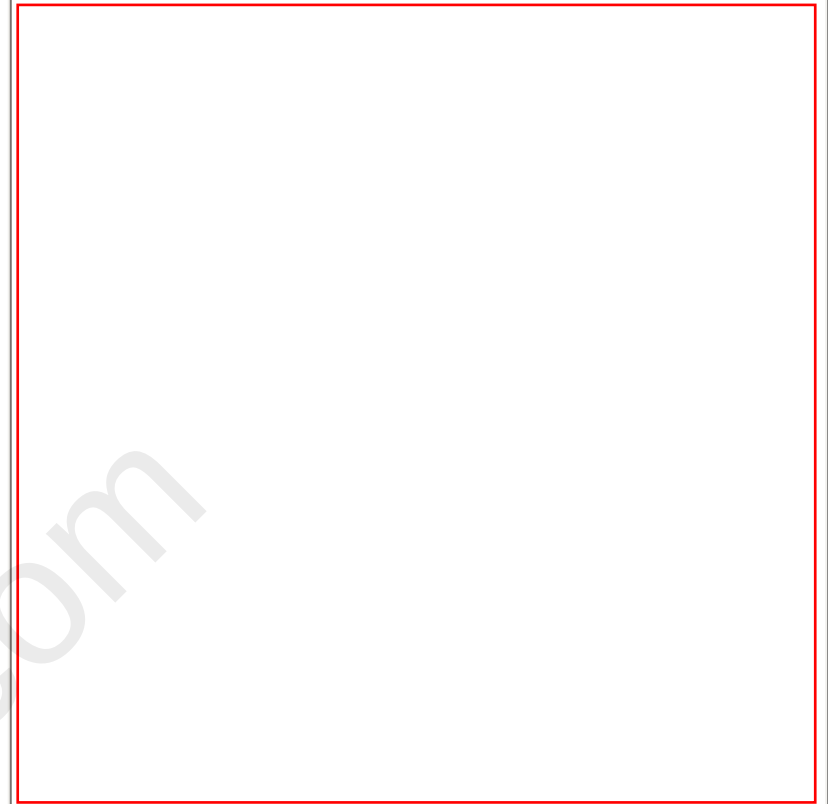
- Measure:

Positive Lead	Measurement / Action	Negative Lead



E191450

Pin 1, component side.



Pin 2, component side.

Is the resistance between 44 and 70 ohms?

Yes	GO to C19
No	INSTALL a new IWE. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation). CLEAR the DTCs.

C19 CHECK FOR VOLTAGE TO THE IWE SOLENOID

- Connect TCCM C2371A.
- Ignition ON.

Is the voltage greater than 11 volts?

Yes	GO to C20
No	CHECK BJB fuse 29 (10A). If OK, REPAIR the open circuit. If not OK, REFER to the Wiring Diagrams manual to identify possible causes of the circuit short. CLEAR the DTCs.

C20 CHECK THE IWE SOLENOID CONTROL CIRCUIT FOR AN OPEN

- Ignition OFF.
- Disconnect IWE solenoid C1291.
- Disconnect TCCM C2371A.
- Ignition ON.

Is the resistance less than 3 ohms?

Yes	GO to C21
No	REPAIR the circuit. CLEAR the DTCs.

C21 CHECK FOR CORRECT TCCM OPERATION

- Ignition OFF.
- Disconnect and inspect all TCCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Connect all TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of the connector or pin issues.

The Vehicle Does Not Shift Between 4A (4X4 AUTO) and 4H (4X4) Modes Correctly

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

For locator views of the vacuum lines and vacuum reservoir,

REFER to: [Four-Wheel Drive Systems - Overview](#) (308-07A Four-Wheel Drive Systems, Description and Operation).

Normal Operation

In 2H mode, the TCCM supplies a ground path to the IWE solenoid to apply vacuum to the IWEs (disengaging the front hubs from the front axle). In AUTO, 4H and 4L modes, the TCCM does not supply the ground path to the IWE solenoid, vacuum is not applied to the IWEs and an internal spring keeps the hubs engaged. Systematically check the necessary inputs and outputs at the TCCM, internal components of the transfer case, MSS , IWE components and drive axles.

Possible Sources

- Wiring, terminals or connectors
- TCCM
- IWE
- IWE solenoid
- Transfer case
- Vacuum leaks
- Front axle assembly
- MSS

PINPOINT TEST D : THE VEHICLE DOES NOT SHIFT BETWEEN 4A (4X4 AUTO) AND 4H (4X4) MODES CORRECTLY

D1 CHECK FOR TCCM DTCS

- Ignition ON.
- Using a diagnostic scan tool, carry out the TCCM Self-Test.

Are DTCs retrieved?

Yes	REFER to the DTC Chart: TCCM.
No	GO to D2

D2 CHECK THE 4H INDICATOR

- Select 4H mode and observe the IPC.

Does the IPC indicator lamp indicate 4H (4X4) mode?

Yes	GO to D8
No	GO to D3

D3 CHECK THE TCCM IGNITION POSITION (KEY_POS_4X4) PID

- Enter the following diagnostic mode on the scan tool: TCCM DataLogger
- Monitor the KEY_POS_4X4 PID while cycling through each position:

Does the ignition position PID match the ignition switch positions?

Yes	GO to D4
No	REFER to: Steering Wheel and Column Electrical Components (211-05 Steering Wheel and Column Electrical Components) .

D4 CHECK THE TCCM 4WD SWITCH STATUS (4X4_SW) PID

- Monitor 4X4_SW PID while cycling the MSS through each position.

MSS Position	PID Status
2H	2-W Drive
4A	A4WD
4H	4W Hi
4L	4W Low

Does each PID status agree with each MSS position?

Yes	GO to D7
No	GO to D5

D5 CHECK THE MSS RESISTANCE VALUES

- Ignition OFF.
- Disconnect MSS C284.
- Refer to table below, measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
MSS pin 2 component side.	Ω	MSS pin 3 component side.

MSS Position	Resistance ($\pm 1\%$)
2H	619 ohms
4A	270 ohms
4H	130 ohms
4L	62 ohms

Are the resistance values within specification?

Yes	GO to D6
No	INSTALL a new MSS. REFER to: Mode Select Switch (MSS) (308-07A Four-Wheel Drive Systems, Removal and Installation).

D6 CHECK THE MSS CONTROL AND RETURN CIRCUITS FOR AN OPEN

- Disconnect TCCM C2371A.

Are the resistances less than 3 ohms?

Yes	GO to D18
No	REPAIR the affected circuit(s). CLEAR the DTCs.

D7 CHECK THE TCCM 4WD PWM CLUTCH STATUS (4WD_CLTCH_OS) PID IN 4H

- Switch the MSS to 4H mode.
- Monitor the 4WD_CLTCH_OS PID.

Does the PID read 0 to 10% at closed throttle?

Yes	GO to D18
No	DIAGNOSE any HS-CAN or PCM DTCs first. REFER to: Communications Network (418-00 Module Communications Network) . Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

D8 CHECK FOR WIND-UP IN 4H MODE

- Switch the MSS to 4H mode.
- Drive the vehicle on a dry, hard surface in tight turns while applying 10-15% throttle.

Is wind-up present in turns?

Yes	GO to D12
No	GO to D9

D9 CHECK THE TCCM ABSOLUTE THROTTLE POSITION (TP_TCCM) PID

- **NOTE:** The TP_TCCM PID is APP as communicated by the PCM via HS-CAN .

Slowly move the accelerator pedal from closed throttle to WOT and observe the TP_TCCM PID.

Does the TP_TCCM PID vary between 0% at closed throttle and 100% at WOT ?

Yes	GO to D10
No	DIAGNOSE any HS-CAN or PCM DTCs first. REFER to: Communications Network (418-00 Module Communications Network) . Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

D10 CHECK FOR TRANSFER CASE CLUTCH ENGAGEMENT WITH THE TCCM 4WD PWM CLUTCH STATUS COMMAND (4WD_CLTCH_OS) ACTIVE COMMAND PID

- Using the 4WD_CLTCH_OS active command, engage the transfer case clutch to 90%.
- Drive the vehicle on a dry, hard surface in tight turns while applying 10-15% throttle.

Is wind-up present in turns?

Yes	END the active command. GO to D11
No	END the active command. GO to Pinpoint Test F

D11 CHECK THE IPC INDICATOR IN AUTO MODE

- Select 4A mode and observe the IPC.

Does the message center indicate 4A (4X4 AUTO) mode?

Yes	GO to D12
No	CHECK key status PID, GO to Pinpoint Test A

D12 CHECK FOR WIND-UP IN AUTO MODE

- Drive the vehicle on a dry, hard surface in turns while applying the throttle.

Is wind-up present in turns?

Yes	GO to D13
No	The system is operating correctly.

D13 CHECK THE TCCM 4WD PWM CLUTCH STATUS (4WD_CLTCH_OS) PID AT CLOSED THROTTLE

- Monitor the 4WD_CLTCH_OS PID at closed throttle, KOEO.

Does the 4WD_CLTCH_OS PID indicate 0 to 10% clutch application at closed throttle?

Yes	GO to D14
No	GO to D16

D14 CHECK VOLTAGE ON THE CLUTCH CONTROL CIRCUIT USING THE TCCM 4WD PWM CLUTCH STATUS (4WD_CLTCH_OS) ACTIVE COMMAND

- Ignition ON.
- Using the 4WD_CLTCH_OS active command, command the transfer case clutch to 4%.

Is the voltage approximately 0.2 to 0.4 volt?

Yes	END the active command. CHECK the transfer case. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).
No	GO to D15

D15 CHECK THE CLUTCH CONTROL CIRCUIT FOR AN OPEN

- Ignition OFF.
- Disconnect Transfer Case C350.
- Disconnect TCCM C2371B.

Is the resistance less than 3 ohms?

Yes	GO to D16
No	REPAIR the circuit. CLEAR the DTCs.

D16 CHECK THE ABS MODULE WHEEL SPEED SENSOR PIDS

- Enter the following diagnostic mode on the scan tool: ABS Module DataLogger.
- While driving the vehicle at 30 km/h (18 mph), monitor the following wheel speed sensor PIDs:
 - Left Front Wheel Speed Sensor (LF_WSPD)
 - Left Rear Wheel Speed Sensor (LR_WSPD)
 - Right Front Wheel Speed Sensor (RF_WSPD)
 - Right Rear Wheel Speed Sensor (RR_WSPD)

Do the wheel speed sensor PIDs and speedometer speeds match within 1.5 km/h (1 mph)?

Yes	GO to D17
No	CHECK the ABS for faults. REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) .

D17 CHECK THE TCCM ABSOLUTE THROTTLE POSITION (TP_TCCM) PID

- **NOTE:** The TP_TCCM PID is APP as communicated by the PCM via HS-CAN.

Enter the following diagnostic mode on the scan tool: TCCM DataLogger.

- Slowly move the accelerator pedal from closed throttle to and observe the TP_TCCM PID.

Does the TP_TCCM PID vary between 0% at closed throttle and 100% at WOT?

Yes	GO to D18
No	DIAGNOSE any HS-CAN or PCM DTCs first. REFER to: Communications Network (418-00 Module Communications Network) . Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

D18 CHECK FOR CORRECT TCCM OPERATION

- Ignition OFF.
- Disconnect and inspect all TCCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Connect all TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of the connector or pin issues.

The Vehicle Does Not Shift Between 4H (4X4) and 4L (4X4 Low) Modes Correctly

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

The high-low shift occurs when the reduction shift fork moves the high-low collar to lock the planetary gear set to the output shaft. The torque transmitted through the sun gear from the input shaft turns the front planetary gear set assembly. The front planetary gear set assembly, now engaged, provides transfer case speed reduction. Certain criteria, such as vehicle speed and TR selection must be met before this shift can occur. Systematically check the necessary inputs and outputs of the TCCM, components of the transfer case, IWE components and halfshafts.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P1839:00	Transfer Case Shift Motor Open Circuit: No Sub Type Information	This DTC sets when the TCCM detects battery voltage less than 9 volts for 5 seconds or more at TCCM.
P1840:00	Transfer Case Shift Motor Short Circuit To Battery: No Sub Type Information	This DTC sets when TCCM detects a short to voltage. Shift motor moves are prevented when this DTC is set.
P1841:00	Transfer Case Shift Motor Short Circuit To Ground: No Sub Type Information	This DTC sets when TCCM detects a short to ground. Shift motor moves are prevented when this DTC is set.
P1849:00	Transfer Case Contact Plate 'A' Short Circuit To Ground: No Sub Type Information	This DTC sets when TCCM detects a short to ground. Shift motor moves are prevented when this DTC is set. The TCCM cannot complete mode change if a change in shift motor position is required.
P184B:00	Transfer Case Unable to Transition Between 4H and 4L: No Sub Type Information	This DTC sets when target shift motor position is not reached after the maximum number of allowed blocked shift retries for 4H to 4L. Requested shift motor position is not reached.
P1853:00	Transfer Case Contact Plate 'B' Short Circuit to Ground: No Sub Type Information	This DTC sets when TCCM detects a short to ground. Shift motor moves are prevented when this DTC is set. The TCCM cannot complete mode change if a change in shift motor position is required.
P1857:00	Transfer Case Contact Plate 'C' Short Circuit to Ground: No Sub Type Information	This DTC sets when TCCM detects a short to ground. Shift motor moves are prevented when this DTC is set. The TCCM cannot complete mode change if a change in shift motor position is required.
P1861:00	Transfer Case Contact Plate 'D' Short Circuit to Ground: No Sub Type Information	This DTC sets when TCCM detects a short to ground. Shift motor moves are prevented when this DTC is set. The TCCM cannot complete mode change if a change in shift motor position is required.
P1867:00	Transfer Case Contact Plate General Circuit Failure: No Sub Type Information	This DTC sets when an invalid shift motor position is detected during selection of a new 4WD mode or during a motor movement. If the shift motor is not moving, shift motor movement is prevented. If the shift motor is moving when this DTC sets, the shift motor moves to the high-side mechanical stop.

P1891:00	Transfer Case Contact Plate Ground Return Open Circuit: No Sub Type Information	This DTC sets when TCCM detects a short to ground, a short to voltage or open circuit. The TCCM cannot complete mode change if a change in shift motor position is required.
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Possible Sources

- Wiring, terminals or connectors
- TR
- ABS wheel speed inputs
- Transfer case
- TCCM
- Transmission drag torque

PINPOINT TEST E : THE VEHICLE DOES NOT SHIFT BETWEEN 4H (4X4) AND 4L (4X4 LOW) MODES CORRECTLY

E1 CHECK FOR TCCM DTCS	
 WARNING: When directed to drive the vehicle as part of this test, drive the vehicle on a hard surface in an area without traffic to prevent a crash. Failure to follow these instructions may result in personal injury.	
• Ignition ON. • Enter the following diagnostic mode on the scan tool: TCCM Self-Test.	
Are any DTCs present?	
Yes	For DTC P184B:00, GO to E18 For DTC P1839:00, GO to E13 For DTC P1840:00, GO to E16 For DTC P1841:00, GO to E17 For DTC P1849:00, P1853:00, P1857:00, P1861:00, P1867:00 GO to E8 For DTC P1891:00, GO to E10 For all other DTCs, the DTC Chart: TCCM.
No	GO to E2
E2 CHECK THE 4H TO 4L SHIFT	

- **NOTE:** When switching in or out of 4L, the transmission must be in NEUTRAL and the vehicle stopped or moving less than 5 km/h (3 mph).

Drive the vehicle and shift MSS from 4H to 4L.

Does the transfer case shift from 4H to 4L correctly and the complaint is related to a clunk noise during the shift?

Yes	Transmission neutral drag is excessive. REFER to: Diagnosis By Symptom (307-01A Automatic Transmission - 6-Speed Automatic Transmission - 6R80, Diagnosis and Testing).
No	GO to E3

E3 CHECK THE NEUTRAL INDICATOR (NEUTRAL) PID

- Enter the following diagnostic mode: TCCM Datalogger.
- Monitor the NEUTRAL TCCM PID while shifting the transmission through gear ranges.

Does the NEUTRAL PID indicate True when the transmission is shifted to NEUTRAL?

Yes	GO to E4
No	For further diagnosis of the TR sensor, REFER to: Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 2.7L EcoBoost (238kW/324PS) (307-01 Automatic Transmission - 6-Speed Automatic Transmission - 6R80) . REFER to: Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 3.5L Duratec (209kW/284PS) (307-01 Automatic Transmission - 6-Speed Automatic Transmission - 6R80) . REFER to: Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 3.5L EcoBoost (272kW/370PS) (307-01 Automatic Transmission - 6-Speed Automatic Transmission - 6R80) . REFER to: Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 5.0L 32V Ti-VCT (307-01 Automatic Transmission - 6-Speed Automatic Transmission - 6R80) .

E4 CHECK THE TCCM AVERAGE FRONT WHEEL SPEED (FRT_WHL_SPD) AND AVERAGE REAR WHEEL SPEED (REAR_WHL_SPD) PIDS

- Ignition OFF.
- Connect TCCM C2371A.
- Connect MSS.
- Ignition ON.
- Switch the MSS to 2H
- Enter the following diagnostic mode on the scan tool: TCCM DataLogger.
- Monitor the FRT_WHL_SPD and REAR_WHL_SPD PIDs with the vehicle stopped and while driving.

Do the FRT_WHL_SPD and REAR_WHL_SPD PIDs match with the vehicle stopped and at all speeds?

Yes	GO to E5
No	To diagnose the wheel speed concern. REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) . After the repair is complete, CLEAR the DTCs.

E5 CHECK THE ABS MODULE WHEEL SPEED PIDS

- Enter the following diagnostic mode on the scan tool:ABS DataLogger.
- Monitor the wheel speed PIDs:
 - Left Front Wheel Speed Sensor (LF_WSPD)
 - Left Rear Wheel Speed Sensor (LR_WSPD)
 - Right Front Wheel Speed Sensor (RF_WSPD)
 - Right Rear Wheel Speed Sensor (RR_WSPD)

Do the wheel speed PIDs indicate 0 km/h (0 mph)?

Yes	GO to E6
No	To DIAGNOSE the wheel speed concern, REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) . After the repair is complete, CLEAR the DTCs.

E6 CHECK THE TCCM 4WD MODES (4WD_MODES) PID WITH THE MSS IN 4H

- Start the engine.
- Switch the MSS to 4H
- Monitor the 4WD_MODES PID:

Does the 4WD_MODES PID indicate 4WD High?

Yes	GO to E7
No	GO to E8

E7 CHECK THE TCCM 4WD MODES (4WD_MODES) PID WITH THE MSS IN 4L

- Start the engine.
- Switch the MSS to 4L.
- Monitor the 4WD_MODES PID.

Does the 4WD_MODES PID indicate 4WD Low?

Yes	GO to E18
No	GO to E8

E8 CHECK TRANSFER PLATE CONTACT PLATE CIRCUITS FOR A SHORT TO VOLTAGE

- Disconnect Transfer Case C350.
- Disconnect TCCM C2371A.
- Ignition ON.

Is any voltage present?

Yes	REPAIR the affected circuit(s). CLEAR the DTCs.
No	GO to E9

E9 CHECK TRANSFER PLATE CONTACT PLATE CIRCUITS FOR A SHORT TO GROUND

- Ignition OFF.

Are the resistances greater than 10,000 ohms?

Yes	GO to E10
No	REPAIR the affected circuit(s). CLEAR the DTCs.

E10 CHECK THE TRANSFER PLATE CONTACT PLATE CIRCUITS FOR AN OPEN

- Start the engine.

Are the resistances less than 3 ohms?

Yes	GO to E11
No	REPAIR the affected circuit(s). CLEAR the DTCs.

E11 CHECK THE SHIFT MOTOR FOR AN INTERNAL SHORT TO GROUND

Are the resistances greater than 10,000 ohms?

Yes	GO to E12
No	INSTALL a new transfer case shift motor. CLEAR the DTCs. REPEAT the self-test. If the concern is still present, GO to E19

E12 CHECK THE SHIFT MOTOR CIRCUITS FOR POWER WHILE COMMANDING THE TCCM CW RELAY (CW_SMD_OS) AND CCW RELAY (CCW_SMD_OS) PIDS ON

- Connect TCCM C2371A.
- Ignition ON.
- Enter the following diagnostic mode: TCCM Datalogger.

Are the voltages 11 volts or greater on the circuits when commanding the PIDs ON?

Yes	END the active commands, GO to E16
No	END the active commands, GO to E13

E13 CHECK THE TCCM VOLTAGE CIRCUIT

- Ignition OFF.
- Disconnect TCCM C2371B.

Is the voltage greater than 11 volts?

Yes	GO to E14
No	VERIFY BJB fuse 63 (25A) is OK. If OK, REPAIR the circuit. If not OK, REFER to the Wiring Diagrams manual to identify possible causes of the circuit short. CLEAR the DTCs.

E14 CHECK THE TRANSFER CASE CONTROL MODULE GROUND

- Ignition OFF.

Is the resistance less than 3 ohms?

Yes	GO to E15
No	REPAIR the circuit.

E15 CHECK THE TRANSFER CASE SHIFT MOTOR CIRCUITS FOR AN OPEN

- Disconnect Transfer Case C350.
- Disconnect TCCM C2371B.

Are the resistances less than 3 ohms?

Yes	GO to E16
No	REPAIR the affected circuit(s). CLEAR the DTCs.

E16 CHECK THE TRANSFER CASE SHIFT MOTOR CIRCUITS FOR SHORT TO VOLTAGE

- Ignition ON.

Is any voltage present?

Yes	REPAIR the affected circuit(s). CLEAR the DTCs.
No	GO to E17

E17 CHECK THE TRANSFER CASE SHIFT MOTOR CIRCUITS FOR SHORT TO GROUND

- Ignition OFF.

Are the resistances greater than 10,000 ohms?

Yes	GO to E19
No	REPAIR the affected circuit(s). CLEAR the DTCs.

E18 CHECK THE TRANSFER CASE SHIFT MOTOR OPERATION

- Remove the transfer case shift motor from the transfer case, leaving the wiring connector connected.
- Observe the transfer case shift motor while switching the MSS from 2H to 4H.

Does the transfer case shift motor rotate from the 2H position to the 4H position?

Yes	Disassemble transfer case. REFER to: Transfer Case - Vehicles With: 2-Speed Torque On Demand Transfer Case (308-07B Transfer Case, Disassembly and Assembly).
No	INSTALL a new transfer case shift motor. REFER to: Transfer Case Shift Motor (308-07A Four-Wheel Drive Systems, Removal and Installation).

E19 CHECK FOR CORRECT TCCM OPERATION

- Ignition OFF.
- Disconnect and inspect all TCCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Connect all TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of the connector or pin issues.

Four-Wheel Drive (4WD) Does Not Engage at Speed Correctly

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

When the operator selects a transfer case mode from 2H mode, the TCCM engages a clutch for approximately 5 seconds to synchronize the front and rear driveshafts allowing a mechanical engagement of the transfer case. The TCCM also removes the ground path from the IWE solenoid, which removes vacuum from the IWEs , allowing them to engage the front axle shaft. Systematically check the necessary inputs and outputs at the TCCM, internal components of the transfer case, IWE components and drive axles.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P1825:00	4-Wheel Drive Clutch Relay Open Circuit: No Sub Type Information	This DTC sets when TCCM detects an open circuit. The TCCM disables transfer case clutch operation.
P1826:00	4-Wheel Drive Low Clutch Relay Circuit To Battery: No Sub Type Information	This DTC sets when TCCM detects a short to voltage. Transfer case clutch operation, though disabled by the TCCM, is fully engaged when this DTC is present.
P1827:00	4-Wheel Drive Low Clutch Relay Circuit To Ground	This DTC sets when TCCM detects a short to ground. The TCCM disables transfer case clutch operation.

Possible Sources

- Fuse
- Wiring, terminals or connectors
- TCCM
- Transfer case
- Front axle assembly
- Transfer case clutch

PINPOINT TEST F : FOUR-WHEEL DRIVE (4WD) DOES NOT ENGAGE AT SPEED CORRECTLY

F1 CHECK FOR TCCM DTCS



WARNING: When directed to drive the vehicle as part of this test, drive the vehicle on a hard surface in an area without traffic to prevent a crash. Failure to follow these instructions may result in personal injury.

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: TCCM Self-Test.

Are any DTCs present?

Yes

For DTC P1825:00, GO to [F11](#) For DTC P1826:00, GO to [F12](#) For DTC P1827:00, GO to [F10](#) For all other DTCs, the DTC chart: TCCM.

No	GO to F2
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F2 CHECK 4X4 MODE ENGAGEMENT AT REST

- Switch the MSS from 4X2 mode to 4X4 mode.

Does 4X4 mode engage at rest correctly?

Yes	GO to F3
No	GO to Pinpoint Test C

F3 CHECK 4X2 MODE TO 4X4 MODE SHIFT AT SPEED

- Switch the MSS to 4X2 mode.
- Drive the vehicle and carry out a 4X2 mode to 4X4 mode shift while driving at approximately 16 km/h (10 mph).
- Stop the vehicle, shift to 4X2 mode, drive the vehicle and carry out a 4X2 mode to 4X4 mode shift while driving at approximately 64 km/h (40 mph).

Does 4X4 mode engage correctly at 16 km/h (10 mph) and at 64 km/h (40 mph)?

Yes	GO to Pinpoint Test J
No	GO to F4

F4 CHECK THE TCCM AVERAGE FRONT WHEEL SPEED (FRT_WHL_SPD) AND AVERAGE REAR WHEEL SPEED (REAR_WHL_SPD)

- Enter the following diagnostic mode: TCCM DataLogger.
- Monitor the FRT_WHL_SPD and REAR_WHL_SPD PIDs while driving in a straight line.

Do the FRT_WHL_SPD and REAR_WHL_SPD PIDs match?

Yes	GO to F5
No	REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) .

F5 CHECK THE TRANSFER CASE CLUTCH LOCKUP USING TCCM 4WD PWM CLUTCH STATUS (4WD CLTCH_OUT) PID ACTIVE COMMAND

- With the vehicle in NEUTRAL, position it on a hoist.
REFER to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
- Enter the following diagnostic mode: TCCM DataLogger.
- Switch the MSS to AUTO mode.
- Using the 4WD CLTCH_OUT active command, command the transfer case clutch to 98%.
- Rotate the rear driveshaft while observing the front driveshaft.

Does the front driveshaft rotate when the rear driveshaft is rotated?

Yes	GO to F6
No	GO to F9

F6 CHECK THE TRANSFER CASE CLUTCH RELEASE USING TCCM 4WD PWM CLUTCH STATUS (4WD_CLTCH_OS) ACTIVE COMMAND

- With the vehicle still in NEUTRAL and on a hoist, using the 4WD_CLTCH_OS active command, command the transfer case clutch to 0%.
- Rotate the rear driveshaft while observing the front driveshaft.

Does the front driveshaft rotate when the rear driveshaft is rotated?

Yes	GO to F12
No	End the active command. GO to F7

F7 CHECK THE TRANSFER CASE ENGAGEMENT (ON A HOIST)

- Start the engine, switch the MSS to 4X2 mode.
- Place the transmission in DRIVE and increase speed to between 5 km/h (3 mph) and 8 km/h (5 mph).
- While observing the front driveshaft, switch the MSS to 4X4 mode.

Did the front driveshaft start to spin?

Yes	GO to F8
No	GO to F13

F8 CHECK THE TRANSFER CASE DISENGAGEMENT

- Switch the MSS to 4X2 mode while observing the front driveshaft.

Does the front driveshaft rotate?

Yes	GO to F13
No	GO to Pinpoint Test C

F9 CHECK CLUTCH CONTROL CIRCUIT FOR VOLTAGE USING THE TCCM 4WD PWM CLUTCH STATUS (4WD_CLTCH_OS) ACTIVE COMMAND

- Ignition ON.
- Using the 4WD_CLTCH_OS active command, command the transfer case clutch to 98%.

Is the voltage greater than 9 volts?

Yes	END the active command. INSTALL a new transfer case clutch. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing). CLEAR the DTCs.
No	GO to F10

F10 CHECK CLUTCH CONTROL CIRCUIT FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect Transfer Case .
- Disconnect TCCM C2371B.

Is the resistance greater than 10,000 ohms?

Yes	GO to F11
No	REPAIR the circuit. CLEAR the DTCs.

F11 CHECK CLUTCH CONTROL CIRCUIT FOR AN OPEN

Is the resistance less than 3 ohms?

Yes	GO to F12
No	REPAIR the circuit. CLEAR the DTCs.

F12 CHECK CLUTCH CONTROL CIRCUIT FOR A SHORT TO VOLTAGE USING THE TCCM 4WD PWM CLUTCH STATUS (4WD_CLTCH_OS) ACTIVE COMMAND

- Connect Transfer Case C350.
- Connect TCCM C2371B.
- Ignition ON.
- Enter the following diagnostic mode: TCCM DataLogger .
- Using the 4WD_CLTCH_OS active command, command the transfer case clutch to 0%.

Is the voltage approximately 0.2 to 0.4 volt?

Yes	REPAIR the circuit. CLEAR the DTCs.
No	GO to F13

F13 CHECK FOR CORRECT TCCM OPERATION

- Ignition OFF.
- Disconnect and inspect all TCCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Connect all TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of the connector or pin issues.

The Four-Wheel Drive (4WD) System Jumps Out of Gear

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

When the 4WD system engages the user selected mode, that mode should be maintained. If the 4WD system does not stay in the selected mode, systematically check the 4WD system components.

Possible Sources

- IWE vent lines
- MSS
- Transfer case

PINPOINT TEST G : THE FOUR-WHEEL DRIVE (4WD) SYSTEM JUMPS OUT OF GEAR

G1 CHECK FOR OBSTRUCTED IWE VENT LINES

- With the vehicle in NEUTRAL, position it on a hoist.
REFER to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).

- **NOTE:** *The IWE vent port is the smaller of the 2 vacuum ports.*

Disconnect the LH IWE line from the vent port.

- Attach a hand vacuum pump to the IWE vent line.
- Attempt to draw and hold a vacuum.
- Connect the LH IWE line.
- Disconnect the RH IWE line from the vent port.
- Attempt to draw and hold a vacuum.

Can a vacuum be held on either IWE vent line?

Yes	INSTALL new IWE vent lines as necessary.
No	GO to G2

G2 CHECK THE TCCM 4WD SWITCH STATUS (4X4_SW) PID

- Ignition ON.
- Enter the following diagnostic mode: TCCM Datalogger.
- DRIVE the vehicle.
- Monitor the 4X4_SW PID while driving the vehicle in each MSS position.

MSS Position	Status
2H	2-W Drive
4A	A4WD
4H	4W Auto/Hi
4L	4W Low

Does the PID always agree with the MSS position?

Yes	GO to G3
No	GO to Pinpoint Test C

G3 CHECK THE 4WD INDICATORS

- Stop the vehicle.
- Shift the transmission into the NEUTRAL position.
- **NOTE:** 2H is indicated by the absence of 4X4 AUTO, 4H or 4L mode indicators in the IPC message center.

Observe the 4WD indicators in the IPC while cycling through each MSS position.

Do the 4WD indicators match MSS switch positions?

Yes	GO to Pinpoint Test C
No	GO to G4

G4 CHECK FOR TCCM DTCS

- Shift the transmission into the PARK position.
- Enter the following diagnostic mode: TCCM self-test.

Are DTCs present?

Yes	REFER to the DTC Chart: TCCM.
No	CHECK the transfer case fluid level. If the fluid level is OK, CHECK for internal transfer case faults. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).

Vehicle Pulsates or Shudders in a Straight Line (Straightline Driveline Wind-up)

Normal Operation

In order for the 4WD system to function correctly, tires and wheels must be the same size, be in good condition and the front and rear axle ratios must match.

Possible Sources

- Unmatched tire sizes
- Unequal amounts of tire wear
- Unequal tire inflation pressures
- Unmatched front and rear axle ratios

PINPOINT TEST H : VEHICLE PULSATES OR SHUDDERS IN A STRAIGHT LINE (STRAIGHTLINE DRIVELINE WIND-UP)

NOTE: 4X4 is not intended for driving on hard/dry surfaces; using 4X4 mode while driving on these surfaces may produce noises like intermittent clunking, but it does not damage driveline components.

H1 VERIFY THE CONCERN

- Drive the vehicle and shift from 2H mode to 4H mode. There should be minimal wind-up in 4H mode during straightline maneuvers (windup in turns is normal; 4H/4L is not intended for driving on hard/dry surfaces).

Is excessive wind-up present?

Yes	GO to H2
No	RETURN the vehicle to the customer. ADVISE about correct 4WD system operation and normal vehicle behavior.

H2 CHECK FOR MATCHING WHEEL AND TIRE SIZES

- Check the wheel and tire sizes.

Do the 4 wheels and tire sizes match?

Yes	GO to H3
No	ADVISE the customer that 4WD systems require 4 matched, correctly inflated, correctly maintained tires to operate correctly.

H3 CHECK TIRE WEAR

- Check each of the 4 tires for wear.

Are the 4 tires worn evenly?

Yes	GO to H4
No	ADVISE the customer that 4WD systems require 4 matched, correctly inflated, correctly maintained tires to operate correctly.

H4 CHECK TIRE INFLATION PRESSURE

- Check the inflation pressure in each tire. Refer to the Safety Certification Label on driver door or door pillar.

Are the tire inflation pressures correct?

Yes	GO to H5
No	ADJUST the tire pressure as necessary. ADVISE the customer that 4WD systems require 4 matched, correctly inflated, correctly maintained tires to operate correctly.

H5 CHECK THE FRONT AND REAR AXLE RATIOS

- Check that front and rear axle ratios match.
REFER to: [Rear Drive Axle and Differential](#) (205-02A Rear Drive Axle/Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Description and Operation).
REFER to: [Front Drive Axle](#) (205-03 Front Drive Axle/Differential, Diagnosis and Testing).

Do the front and rear axle ratios match?

Yes	RETURN the vehicle to the customer and ADVISE about correct 4WD system usage and normal vehicle behavior.
No	CHECK the VC label. INSTALL the correct axle(s). REFER to: Rear Drive Axle and Differential (205-02A Rear Drive Axle/Differential - Vehicles With: Ford 8.8 Inch Ring Gear, Diagnosis and Testing). REFER to: Front Drive Axle (205-03 Front Drive Axle/Differential, Diagnosis and Testing).

The Front Axle Makes Noise in 2H Mode Only and Generally Under Heavy Throttle

Locator views for the vacuum lines and vacuum reservoir are located in Description and Operation.
REFER to: Four-Wheel Drive Systems (308-07 Four-Wheel Drive Systems) .

Normal Operation

In 2H mode, the TCCM provides a ground path to the IWE solenoid to supply vacuum to each IWE (disengaging the front hubs from the front axle). During certain conditions such as WOT maneuvers, manifold vacuum is lower than desired. To maintain uninterrupted IWE function in 2H, stored engine vacuum is sourced from the vacuum reservoir. A one-way check valve is implemented between the vacuum reservoir and the IWE solenoid to prevent the stored vacuum from escaping into the manifold during low engine vacuum conditions. For noise-free IWE operation under all conditions, the check valve must be operating correctly.

Possible Sources

- Vacuum leaks
- TCCM
- Transfer case clutch
- Front axle assembly
- Transfer case
- IWE solenoid

PINPOINT TEST I : THE FRONT AXLE MAKES NOISE IN 2H MODE ONLY AND GENERALLY UNDER HEAVY THROTTLE

I1 CHECK FOR TCCM DTCS



WARNING: When directed to drive the vehicle as part of this test, drive the vehicle on a hard surface in an area without traffic to prevent a crash. Failure to follow these instructions may result in personal injury.

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: TCCM Self-Test.

Are any DTCs present?

Yes	REFER to the TCCM DTC chart.
No	GO to I2

I2 CHECK FOR GRINDING NOISES AT HIGH SPEEDS

- With the vehicle warm and the MSS in 2H mode, drive the vehicle at sustained WOT for 5 seconds.

Is there a grinding noise from the axle system during WOT?

Yes	GO to I3
No	IDENTIFY the customer concern and REFER to Symptom Chart: Four-Wheel Drive Systems.

I3 CHECK THE IWE SOLENOID OUTPUT VACUUM IN 2H

- Select 2H.
- **NOTE:** *The engine must be idling during the following steps to supply vacuum to the IWE solenoid.*

Start the engine.
- Disconnect the output vacuum line at the IWE solenoid while having the vacuum supply attached to the solenoid.
- With the engine running and the in 2H mode, measure the vacuum at the output port of the solenoid.

Is the vacuum greater than 254 mm (10 in) Hg?

Yes	GO to I8
No	GO to I4

I4 CHECK THE IWE SOLENOID INPUT VACUUM

- Disconnect the supply vacuum line at the IWE solenoid.
- With the engine still running, measure the supply line vacuum to the IWE solenoid.

Is the vacuum greater than 254 mm (10 in) Hg?

Yes	INSTALL a new IWE solenoid.
No	GO to I5

I5 CHECK SOURCE VACUUM TO THE VACUUM RESERVOIR

- Disconnect the source vacuum line from the vacuum reservoir.
- With the engine still running, measure the source vacuum being supplied to the vacuum reservoir.

Is the vacuum greater than 254 mm (10 in) Hg?

Yes	GO to I6
No	REPAIR or INSTALL a new source vacuum line.

I6 CHECK THE VACUUM RESERVOIR

- Ignition OFF.
- Disconnect the vacuum line from the vacuum reservoir.
- Connect a hand vacuum pump to the source vacuum port on the vacuum reservoir and apply 508 mm (20 in) Hg of vacuum.

Does the vacuum maintain or drop less than 25 mm (1 in) Hg per minute?

Yes	GO to I7
No	INSTALL a new vacuum reservoir.

I7 CHECK THE ONE-WAY VACUUM CHECK VALVE

- **NOTE:** *The check valve is between the IWE solenoid and the vacuum reservoir.*

Connect the vacuum lines to the IWE solenoid.

- Connect a hand vacuum pump to the IWE solenoid vacuum line at the vacuum reservoir and apply 508 mm (20 in) Hg of vacuum.

Does the vacuum maintain or drop less than 25 mm (1 in) Hg per minute?

Yes	Concern not present at this time. GO to Pinpoint Test J
No	REPAIR or INSTALL new vacuum lines or INSTALL a new one-way check valve.

I8 CHECK THE IWE VACUUM SYSTEM

- Ignition OFF.
- Disconnect both vacuum lines from the IWE solenoid.
- Using a hand vacuum pump, apply 508 mm (20 in) Hg of vacuum to the IWE system through the apply vacuum circuit.
- Observe the vacuum reading.

Does the vacuum maintain or drop less than 25 mm (1 in) Hg per minute?

Yes	CONNECT the vacuum lines to the solenoid. GO to I12
No	GO to I9

I9 CHECK THE RH IWE LEAK RATE

- With the vehicle in NEUTRAL, position it on a hoist.
REFER to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
- Disconnect the vacuum line from the larger port on the RH IWE.
- Apply 508 mm (20 in) Hg of vacuum to the RH port and observe vacuum reading.

Does the vacuum maintain or drop less than 25 mm (1 in) Hg per minute?

Yes	GO to I10
No	INSTALL a new RH IWE. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation).

I10 CHECK THE LH IWE LEAK RATE

- Disconnect the vacuum line from the larger port at the LH IWE.
- Apply 508 mm (20 in) Hg of vacuum to the LH port and observe vacuum reading.

Does the vacuum maintain or drop less than 25 mm (1 in) Hg per minute?

Yes	GO to I11
No	INSTALL a new LH IWE. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation).

I11 CHECK THE IWE VACUUM SUPPLY TUBE

- Disconnect both vacuum lines from the IWE solenoid.
- Plug both LH and RH IWE vacuum lines. Apply 508 mm (20 in) Hg of vacuum to the IWE apply vacuum circuit and observe the vacuum reading.

Does the vacuum maintain or drop less than 25 mm (1 in) Hg per minute?

Yes	CONNECT the vacuum lines to the solenoid. GO to I12
No	INSTALL new vacuum lines as necessary.

I12 CHECK THE IWE VACUUM SUPPLY AT EACH IWE IN 2H

- Connect a hand-held vacuum gauge to the LH vacuum supply tube.
- **NOTE:** *The engine must be idling during the following steps to supply the vacuum required for the IWE to disengage.*

Start the engine.

- While maintaining the steering wheel straight, switch to 2H mode and wait for approximately 5 seconds, observe the vacuum gauge.
- Repeat these steps for the RH IWE.

Are the vacuum readings greater than 254 mm (10 in) Hg after 5 seconds have elapsed?

Yes	GO to I13
No	INSTALL new vacuum lines as necessary.

I13 CHECK THE LH IWE VACUUM LINE FOR AN OBSTRUCTION

- Ignition OFF.
- Disconnect both vacuum lines from the IWE solenoid.
- With the vehicle in NEUTRAL, position it on a hoist.
- Disconnect the vacuum line at the LH IWE.
- Connect a hand vacuum pump to the LH IWE vacuum line and attempt to draw a vacuum on the line.

Did the hand vacuum pump draw a vacuum on the LH IWE vacuum line?

Yes	INSTALL a new vacuum line.
No	CONNECT the vacuum line to the LH IWE. GO to I14

I14 CHECK THE RH IWE VACUUM LINE FOR AN OBSTRUCTION

- Disconnect the larger vacuum line at the RH IWE.
- Connect a hand vacuum pump to the RH IWE vacuum line and attempt to draw a vacuum on the line.

Did the hand vacuum pump draw a vacuum on the RH IWE vacuum line?

Yes	INSTALL a new vacuum line.
No	CONNECT the vacuum line to the RH IWE. GO to I15

I15 CHECK THE LH IWE OPERATION

- Ignition OFF.
- Connect a hand vacuum pump with gauge to the larger port of the LH IWE.
- Observe the LH halfshaft while rotating the LH front tire. Apply between 152 and 203 mm (6 to 8 in) Hg of vacuum and release the vacuum to manually disengage and engage the LH IWE.

Did the LH IWE disengage between 152 and 203 mm (6 to 8 in) Hg and engage when the vacuum is released?

Yes	GO to I16
No	INSTALL a new LH IWE.

I16 CHECK THE RH IWE OPERATION

- Connect a hand vacuum pump with gauge to the larger port of the RH IWE.
- Observe the RH halfshaft while rotating the RH front tire. Apply between 152 and 203 mm (6 to 8 in) Hg of vacuum and release the vacuum to manually disengage and engage the RH IWE.

Yes	GO to Pinpoint Test J
No	INSTALL a new RH IWE. REFER to: Integrated Wheel End (IWE) (308-07A Four-Wheel Drive Systems, Removal and Installation).

Four-Wheel Drive (4WD) System Functional Test

Locator views for the vacuum lines and vacuum reservoir are located in Description and Operation.
REFER to: Four-Wheel Drive Systems (308-07 Four-Wheel Drive Systems) .

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

When operating in 4WD modes, the transfer case clutch is energized and both IWEs are locked. When in 4L mode, the transfer case low range gear set provides an additional 2.64 gear reduction. When operating in 2H mode, the transfer case clutch is de-energized and both IWEs are unlocked. The transfer case has certain amount of clutch drag which can cause the front driveshaft to spin even when in 2H mode.”

Possible Sources

- Transfer case and related components
- IWEs and related components
- Wheel/tire assemblies

PINPOINT TEST J : FOUR-WHEEL DRIVE (4WD) SYSTEM FUNCTIONAL TEST

NOTE: 4X4 High and 4X4 Low are not intended for driving on hard/dry surfaces; using these modes while driving on these surfaces may produce noises like intermittent clunking, but does not damage driveline components.

J1 CHECK 2H MODE OPERATION

- Shift the transmission into the NEUTRAL position.
- Switch the MSS to 2H mode.

Are there any 4WD mode indicators present in the IPC message center?

Yes	GO to J2
No	GO to J4

J2 CHECK FOR TCCM DTCS

- Shift the transmission into the PARK position.
- Ignition ON.
- Enter the following diagnostic mode: TCCM Self-test.

Are DTCs retrieved?

Yes	REFER to the DTC Chart: TCCM.
No	GO to J3

J3 CHECK FOR WIND-UP IN 2H MODE

- Drive the vehicle on a dry, hard surface while executing turns and applying 10-15% throttle.

Is wind-up present in turns?

Yes	GO to Pinpoint Test E
No	To diagnose the 4X4 mode indicators do not operate correctly/do not operate, REFER to: Instrumentation, Message Center and Warning Chimes (413-01 Instrumentation, Message Center and Warning Chimes) .

J4 CHECK AUTO MODE OPERATION

- Switch the MSS to 4A mode.

Is the 4X4 auto (4A) mode indicator on in the IPC message center?

Yes	GO to J7
No	GO to J5

J5 CHECK FOR TCCM DTCS

- Ignition ON.
- Enter the following diagnostic mode: TCCM Self-Test.

Are DTCs present?

Yes	REFER to the DTC Chart: TCCM.
No	GO to J6

J6 CHECK FOR WIND-UP IN 4A MODE

- Drive the vehicle on a dry, hard surface, executing turns while applying the throttle.

Is wind-up present in turns?

Yes	GO to J7
No	GO to J8

J7 CHECK THE TCCM 4WD PWM CLUTCH STATUS (4WD_CLTCH_OS) PID

- Enter the following diagnostic mode: TCCM DataLogger.
- Monitor the 4WD_CLTCH_OS PID.

Does the PID indicate 0% to 10% clutch application at closed throttle?

Yes	GO to J8
No	GO to J9

J8 CHECK FOR WIND-UP IN 4A MODE WITH 100% CLUTCH DUTY CYCLE

- Enter the following diagnostic mode: TCCM DataLogger.
- Command the 4WD_CLTCH_OS to 100%.
- Drive the vehicle on a dry, hard surface, executing turns.

Is wind-up present in turns?

Yes	GO to J9
No	CHECK the transfer case. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).

J9 CHECK THE TCCM AVERAGE FRONT WHEEL SPEED

- Enter the following diagnostic mode: TCCM DataLogger.
- Monitor the FRT_WHL_SPD and REAR_WHL_SPD PIDs.
- Drive the vehicle 30 km/h (18 mph).
- Record and compare the FRT_WHL_SPD and REAR_WHL_SPD PIDs.

Do the FRT_WHL_SPD and REAR_WHL_SPD PID values match within 1.5 km/h (1 mph)?

Yes	GO to J10
No	VERIFY all 4 tires are the same size and brand. INSTALL new tires as necessary. If the tires are OK, CHECK the ABS. and VERIFY that the 4 road tire sizes match. REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) .

J10 CHECK THE TCCM ABSOLUTE THROTTLE POSITION (TP_TCCM) PID

- Enter the following diagnostic mode: TCCM DataLogger.
- Monitor the TP_TCCM PID.
- **NOTE:** *The TP_TCCM PID is as communicated by the PCM via HS-CAN.*

Slowly move throttle from closed throttle to WOT and observe the TP_TCCM PID.

Does the TP_TCCM PID value vary between 0% at closed throttle and 100% at WOT?

Yes	GO to J11
No	CHECK the APP sensor and/or the PCM. Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

J11 CHECK 4H MODE OPERATION

- Switch the MSS to 4H mode.

Does the 4X4 (4H) indicator illuminate in the IPC message center correctly?

Yes	GO to J14
No	GO to J12

J12 CHECK FOR TCCM DTCS

- Shift the transmission into the PARK position.
- Enter the following diagnostic mode: TCCM Self-Test.

Are DTCs retrieved?

Yes	REFER to the DTC Chart: TCCM.
No	GO to J13

J13 CHECK FOR WIND-UP IN 4H MODE

- Drive the vehicle on a dry, hard surface while executing turns and applying 10-15% throttle.

Is wind-up present in turns?

Yes	GO to Pinpoint Test F
No	GO to Pinpoint Test D

J14 CHECK FOR STRAIGHTLINE WIND-UP IN 4H MODE

- Drive the vehicle on a dry, hard surface.

Is straightline wind-up present?

Yes	GO to Pinpoint Test H
No	GO to J15

J15 CHECK WIND-UP IN TURNS IN 4H MODE

- Drive the vehicle in 4H mode while turning and applying 10-15% throttle.

Is wind-up present in turns?

Yes	GO to J16
No	GO to Pinpoint Test D

J16 CHECK 4L MODE OPERATION

- Bring the vehicle to a stop with the transmission in NEUTRAL, switch the MSS to 4L mode.

Does the 4WD LOW (4L) indicator in the IPC message center illuminate correctly?

Yes	GO to J19
No	GO to J17

J17 CHECK FOR TCCM DTCS

- Select PARK.
- Enter the following diagnostic mode: TCCM Self-Test .

Are DTCs retrieved?

Yes	REFER to the DTC Chart: TCCM .
No	GO to J18

J18 CHECK FOR WIND-UP IN 4L MODE

- Drive the vehicle on a dry, hard surface while executing turns.

Is wind-up present in turns?

Yes	GO to Pinpoint Test K
No	GO to Pinpoint Test E

J19 CHECK FOR WIND-UP IN TURNS IN 4L MODE

- Drive the vehicle on a dry, hard surface while executing turns.

Is wind-up present and 4L mode functioning?

Yes	GO to J20
No	CHECK for DTCs. REFER to the Inspection and Verification procedure. If no DTCs are present, GO to Pinpoint Test E

J20 CHECK 4L MODE TO 2H MODE SHIFT

- With the vehicle at a stop and transmission in NEUTRAL, switch the MSS from 4L mode to 2H mode.

Are there any 4WD mode indicators present in the message center?

Yes	GO to J21
No	GO to J23

J21 CHECK FOR TCCM DTCS

- Select PARK.
- Release the brake pedal.
- Enter the following diagnostic mode: TCCM Self-Test.

Are DTCs retrieved?

Yes	REFER to the DTC Chart: TCCM.
No	GO to J22

J22 CHECK FOR WIND-UP IN 2H MODE

- Drive the vehicle on a dry, hard surface while executing turns.

Is wind-up present in turns?

Yes	GO to Pinpoint Test E
No	To diagnose the 4X4 mode indicators do not operate properly, REFER to: Instrumentation, Message Center and Warning Chimes (413-01 Instrumentation, Message Center and Warning Chimes) .

J23 CHECK FOR TRANSFER CASE DISENGAGEMENT

- With the vehicle in NEUTRAL, position it on a hoist.
REFER to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
- Rotate the rear driveshaft while observing the front driveshaft.

Does the front driveshaft rotate?

Yes	REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).
No	GO to J24

J24 CHECK FOR LH AND RH IWE (INTEGRATED WHEEL END) DISENGAGEMENT

- **NOTE:** *The engine must be at idle during the following steps to supply vacuum for IWE disengagement.*

Start the engine and allow to idle.

- Rotate the LH front tire one revolution forward and one revolution backward while observing the LF halfshaft and U-joint.
- Rotate the RH front tire one revolution forward and one revolution backward while observing the RF halfshaft and U-joint.

Does the LH or RH front halfshaft rotate?

Yes	GO to Pinpoint Test C
No	GO to J25

J25 CHECK FOR VACUUM LEAKS

- Ignition OFF.
- Disconnect both vacuum lines from the IWE solenoid.
- Using a hand vacuum pump, apply 508 mm (20 in) Hg of vacuum to the IWE apply vacuum circuit.
- Observe the vacuum reading.

Did the vacuum drop more than 25 mm (1 in) Hg per minute?

Yes	CHECK the IWE and related components for leaks.
No	GO to J26

J26 CHECK 2H MODE TO 4H MODE SHIFT AT SPEED ABOVE 32 KM/H (20 MPH)

- Switch the MSS to 2H mode.
- Drive the vehicle on the road and shift from 2H mode to 4H mode while driving above 32 km/h (20 mph).

Does the transfer case shift to 4H mode satisfactorily?

Yes	The 4WD system is functioning correctly.
No	GO to Pinpoint Test F

Vehicle Binds in a Turn/Resists Turning/Pulsates in a Straightline in 4WD Mode

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

When the vehicle is operating in 4WD modes, all 4 wheels receive the same amount of torque and rotate at the same speed. The amount of traction the vehicle can achieve depends on the amount of traction each tire can establish with the road surface. In order for the 4WD system to function correctly, each tire must be in good condition and the front and rear axle ratios must match.

Possible Sources

- IPC Unmatched tire sizes
- Unequal amounts of tire wear
- Unequal tire inflation pressures
- Throttle position failure
- Transfer case
- TCCM

PINPOINT TEST K : VEHICLE BINDS IN A TURN/RESISTS TURNING/PULSATES IN A STRAIGHTLINE IN 4WD MODE

K1 VERIFY THE CONCERN

- **NOTE:** 4x4 High and 4x4 Low modes are not intended for driving on hard/dry surfaces; using these modes while driving on these surfaces may produce noise like intermittent clunking, but does not damage driveline components.”

Test drive the vehicle on a straight stretch of road in various 4x4 modes.

- Drive the vehicle through turns and parking lot maneuvers.

Does the vehicle bind, pulsate or shudder?

Yes	If the problem occurs in 4A mode, GO to K2 If in 4H mode or 4L mode, binding is a normal condition.
No	GO to Pinpoint Test H

K2 CHECK THE 4H AND 4A INDICATORS

- Review the test drive notes.

4x4 Auto (4A), did the 4X4 (4H) or powertrain malfunction indicator (wrench light) illuminate in the IPC message center?

Yes	If the powertrain malfunction indicator (wrench light) illuminated, GO to K4 If the 4H mode indicator illuminated, GO to K3
No	GO to K5

K3 VERIFY THE FAULT

- Review the test drive notes.

Was 4H mode selected when the 4H indicator was illuminated in the IPC message center?

Yes	The system is functioning correctly.
No	The fault may have been caused by an intermittent, un-commanded or autolock shift. GO to Pinpoint Test H

K4 CHECK FOR TCCM DTCS

- Enter the following diagnostic mode: TCCM Self-Test.

Are DTCs retrieved?

Yes	REFER to the DTC Chart: TCCM .
No	GO to K5

K5 VERIFY THE CONCERN WITH TRANSFER CASE CONNECTOR DISCONNECTED

- Select 4A mode.
- Disconnect Transfer Case.
- **NOTE:** Since the Transfer Case is disconnected you may get some DTC's and Check 4x4 illuminated in the IPC message center.

Test drive the vehicle in 4A on a straight stretch of road and in turns.

Is the concern present?

Yes	INSPECT the driveline components for damage or wear. REFER to Inspection and Verification.
No	GO to K6

K6 CHECK THE TCCM 4WD PWM CLUTCH STATUS (4WD_CLTCH_OS) PID

- Connect Transfer Case.
- Using the scan tool, clear the DTCs.
- Enter the following diagnostic mode: TCCM Datalogger.
- Monitor the 4WD_CLTCH_OS PID at closed throttle, KOEO.
- Select 4A mode.

Does the PID indicate 0% to 10% clutch application at closed throttle?

Yes	GO to K7
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No	CHECK the transfer case. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).
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K7 CHECK THE ABS MODULE WHEEL SPEED SENSOR PIDS

- Enter the following diagnostic mode: ABS Module Datalogger.
- While driving the vehicle at 30 km/h (18 mph), monitor the following wheel speed sensor PIDs:
 - Left Front Wheel Speed Sensor (LF_WSPD)
 - Left Rear Wheel Speed Sensor (LR_WSPD)
 - Right Front Wheel Speed Sensor (RF_WSPD)
 - Right Rear Wheel Speed Sensor (RR_WSPD)
- Compare the speedometer reading to the wheel speed sensor PIDs.

Do the wheel speed sensor PIDs and speedometer speeds match within 1.5 km/h (1 mph)?

Yes	GO to K8
No	VERIFY that the 4 road wheels are the same size and have similar tread depth. CHECK the ABS for faults. REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) .

K8 CHECK THE TCCM ABSOLUTE THROTTLE POSITION (TP_TCCM) PID

- Enter the following diagnostic mode: TCCM Datalogger.
- **NOTE:** *The TP_TCCM PID is APP as communicated by the PCM via HS-CAN.*

Slowly move accelerator pedal from closed throttle to and observe the TP_TCCM PID.

Does the TP_TCCM PID value vary between 0% at closed throttle and 100% at WOT?

Yes	GO to K9
No	DIAGNOSE the PCM. Refer to Powertrain Control/Emissions Diagnosis (PC/ED) manual.

K9 CHECK THE TRANSFER CASE FRONT DRIVESHAFT OUTPUT

- With the vehicle in NEUTRAL, position it on a hoist.
REFER to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
- Rotate the front driveshaft by hand.

Does the front driveshaft rotate freely (does it require less than 45 Nm [33 lb-ft] to rotate)?

Yes	GO to K10
No	CHECK the transfer case. REFER to: Transfer Case (308-07B Transfer Case, Diagnosis and Testing).

K10 CHECK FOR CORRECT TCCM OPERATION

- Ignition OFF.
- Disconnect and inspect all TCCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Connect all TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of the connector or pin issues.

The Vehicle Does Not Shift Between 2H (2WD) and 4X4 Modes Correctly

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

The MSS communicates the operator's choice to the TCCM. The TCCM then controls the transfer case clutch, transfer case motor and IWEs as necessary. If the vehicle is not responding as intended, systematically check the necessary inputs and outputs of the TCCM, components of the transfer case, IWE components and halfshafts. Check all circuits for opens and shorts to power or ground.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P1812:00	4-Wheel Drive Mode Select Circuit Failure: No Sub Type Information	This DTC sets when the TCCM senses an open circuit. 4WD system mode cannot be changed.
P1815:00	4-Wheel Drive Mode Select Short To Ground: No Sub Type Information	This DTC sets when the TCCM detects a short to ground. 4WD system mode cannot be changed.

Possible Sources

- Wiring, terminals or connectors
- MSS
- Transfer case
- TCCM

 **WARNING:** When directed to drive the vehicle as part of this test, drive the vehicle on a hard surface in an area without traffic to prevent a crash. Failure to follow these instructions may result in personal injury.

PINPOINT TEST L : THE VEHICLE DOES NOT SHIFT BETWEEN 2H (2WD) AND 4X4 MODES CORRECTLY

L1 CHECK FOR TCCM DTCS	
• Ignition ON. • Enter the following diagnostic mode: TCCM Self-Test.	
Are any DTCs present?	
Yes	For DTC P1812:00, GO to L5 For DTC P1815:00, GO to L7 For all other DTCs, REFER to the DTC Chart: TCCM .
No	GO to L2
L2 CHECK THE TCCM IGNITION POSITION (KEY_POS_4X4) AND IGNITION STATUS (KEY_STATUS_4X4) PIDS	

- Enter the following diagnostic mode: TCCM Datalogger.
- Monitor the KEY_POS_4X4 and KEY_STATUS_4X4 PIDs while cycling through each position.

Do the ignition PIDs match the ignition switch positions?

Yes	GO to L3
No	If the KEY_STATUS_4X4 PID did not match, CHECK BJB fuse 13 (10A). If the fuse is OK, REPAIR the circuit for an open. If the fuse is not OK, REFER to the Wiring Diagrams manual to identify the possible causes of the circuit short. After the fault is repaired, CLEAR the DTCs.

L3 CHECK THE TCCM MODULE SUPPLY VOLTAGE (VBAT_4X4) PID

- Start the engine.
- Enter the following diagnostic mode: TCCM Datalogger.
- Monitor the VBAT_4X4 PID.

Is the VBAT_4X4 PID greater than 12 volts?

Yes	GO to L4
No	To DIAGNOSE the low battery voltage and/or charging system concern, REFER to: Charging System - 2.7L EcoBoost (238kW/324PS) (414-00 Charging System - General Information) . REFER to: Charging System - 3.5L Duratec (209kW/284PS)/3.5L EcoBoost (272kW/370PS)/5.0L 32V Ti-VCT (414-00 Charging System - General Information) .

L4 CHECK THE MSS POSITION MONITORING THE TCCM 4WD SWITCH STATUS (4X4_SW) PID

- Monitor the 4X4_SW PID while switching to each MSS position.

Does the PID match the MSS position?

Yes	GO to L10
No	GO to L5

L5 CHECK THE MSS RESISTANCE VALUES

- Ignition OFF.
- Disconnect MSS C284.
- Refer to tables below, measure:

Click to display connectors

Positive Lead	Measurement / Action	Negative Lead
MSS pin 2 component side.	Ω	MSS, pin 3 component side.

MSS Position	Resistance ($\pm 1\%$)
2H	619 ohms
4A	270 ohms
4H	130 ohms
4L	62 ohms

Are the resistance values within specification?

Yes	GO to L6
No	INSTALL a new MSS. REFER to: Mode Select Switch (MSS) (308-07A Four-Wheel Drive Systems, Removal and Installation).

L6 CHECK THE MSS CONTROL AND RETURN CIRCUITS FOR SHORT TO VOLTAGE

- Disconnect TCCM C2371A.
- Ignition ON.

Is any voltage present?

Yes	REPAIR the circuit.
No	GO to L7

L7 CHECK THE MSS CONTROL AND RETURN CIRCUITS FOR SHORT TO GROUND

- Ignition OFF.
- Disconnect TCCM C2371A.
- Disconnect MSS C284.

Is the resistance greater than 10,000 ohms?

Yes	GO to L8
No	REPAIR the affected circuit(s).

L8 CHECK THE MSS CONTROL AND RETURN CIRCUITS FOR AN OPEN

- Disconnect TCCM C2371A.

Are the resistances less than 3 ohms?

Yes	GO to L9
No	REPAIR the affected circuit(s).

L9 CHECK THE MSS CONTROL AND RETURN CIRCUITS FOR A SHORT TOGETHER

- Ignition OFF.

Is the resistance greater than 10,000 ohms?

Yes	GO to L10
No	REPAIR the affected circuit(s).

L10 CHECK FOR CORRECT TCCM OPERATION

- Ignition OFF.
- Disconnect and inspect all TCCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
 - Refer to Wiring Diagrams Cell 34 and verify module ground to vehicle ground connection.
- Connect all TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. Concern may have been caused by a loose or corroded connector. ADDRESS the root cause of the connector or pin issues.

DTC U0100

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

The TCCM sets DTC U0100 when it has not received messages from the PCM for more than 5 seconds with ignition in RUN and battery voltage in range. Other modules that require data from the PCM all set communication DTCs and may also exhibit system function concerns.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
U0100	Lost Communication With ECM/PCM "A": No Sub-Type Information	Sets in continuous memory in the TCCM if powertrain data messages received from the PCM over the HS-CAN are missing for longer than 5 seconds with ignition in RUN and battery voltage in range.

Possible Sources

- Communication concern
- Battery voltage concern
- PCM
- TCCM

PINPOINT TEST M : U0100

M1 VERIFY THE SCAN TOOL COMMUNICATES WITH THE PCM (POWERTRAIN CONTROL MODULE)

- Ignition ON.
- Connect a diagnostic scan tool.
- Check that a vehicle session can be established using a diagnostic scan tool.

Can a vehicle session be established?

Yes	GO to M2
No	REFER to: Communications Network (418-00 Module Communications Network) .

M2 CHECK THE TCCM (TRANSFER CASE CONTROL MODULE) CONTINUOUS MEMORY DTC (DIAGNOSTIC TROUBLE CODE) S

- Using a diagnostic scan tool, perform the TCCM self-test.
- Clear the DTCs.
- Wait 10 seconds.
- Repeat the TCCM self-test.

Is DTC U0100?

Yes	GO to M3
No	The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.

M3 RETRIEVE THE RECORDED DTC (DIAGNOSTIC TROUBLE CODE) S FROM THE PCM (POWERTRAIN CONTROL MODULE) KOEO (KEY ON, ENGINE OFF) SELF-TEST

- Using a diagnostic scan tool, perform the PCM KOEO self-test.

Are any DTCs recorded?

Yes	REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 2.7L EcoBoost (238kW/324PS)) . REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 3.5L EcoBoost (272kW/370PS)) . REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 3.5L Duratec (209kW/284PS)) . REFER to: Electronic Engine Controls (303-14 Electronic Engine Controls - 5.0L 32V Ti-VCT) .
No	GO to M4

M4 RETRIEVE THE RECORDED DTC (DIAGNOSTIC TROUBLE CODE) S FROM THE TCCM (TRANSFER CASE CONTROL MODULE) SELF-TEST

- Using a diagnostic scan tool, perform the TCCM self-test.

Is DTC P0562:00 or P0563:00 recorded?

Yes	REFER to: Charging System - 2.7L EcoBoost (238kW/324PS) (414-00 Charging System - General Information) . REFER to: Charging System - 3.5L Duratec (209kW/284PS)/3.5L EcoBoost (272kW/370PS)/5.0L 32V Ti-VCT (414-00 Charging System - General Information) .
No	GO to M5

M5 CHECK FOR DTC (DIAGNOSTIC TROUBLE CODE) S U0100 SET IN OTHER MODULES

- Using a diagnostic scan tool, clear all DTCs.
- Ignition OFF.
- Ignition ON.
- Wait 10 seconds.
- Using a diagnostic scan tool, perform the continuous memory self-test.
- Retrieve the CMDTCs from all modules.

Is the DTC U0100 set in other modules on the network?

Yes	GO to M6
No	GO to M7

M6 CHECK FOR CORRECT PCM (POWERTRAIN CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all PCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Reconnect the PCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present

Is the concern still present?

Yes	CHECK OASIS for any applicable TSBs. If a TSB exists for this concern, DISCONTINUE this test and FOLLOW TSB instructions. If no TSBs address this concern, INSTALL a new PCM. REFER to: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 2.7L EcoBoost (238kW/324PS)) . REFER to: Powertrain Control Module (PCM) (303-14C Electronic Engine Controls - 3.5L EcoBoost (272kW/370PS), Removal and Installation). REFER to: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 3.5L Duratec (209kW/284PS)) . REFER to: Powertrain Control Module (PCM) (303-14 Electronic Engine Controls - 5.0L 32V Ti-VCT) . PROGRAM the PCM with the latest calibration level.
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

M7 CHECK FOR CORRECT TCCM (TRANSFER CASE CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect the TCCM connector.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Reconnect the TCCM connector. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present

Is the concern still present?

Yes	CHECK OASIS for any applicable TSBs. If a TSB exists for this concern, DISCONTINUE this test and FOLLOW TSB instructions. If no TSBs address this concern, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

U0121

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

The TCCM sets the DTC U0121 when key messages such as wheel speed, brake pressure or torque are not received for longer than 5 seconds. This loss of key messages degrades the 4x4 system performance and/or inability to change 4x4 modes. Other modules that require data from the ABS module all set communication DTCs and may also exhibit system function concerns.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
U0121	Lost Communication With Anti-Lock Brake System (ABS) Control Module	Sets in continuous memory in the TCCM if ABS data messages received from the ABS Module over the HS-CAN are missing for longer than 5 seconds.

Possible Sources

- Communication concern
- Battery voltage concern
- ABS module
- TCCM

PINPOINT TEST N : U0121

N1 VERIFY THE SCAN TOOL COMMUNICATES WITH THE ABS (ANTI-LOCK BRAKE SYSTEM)

- Ignition ON.
- Connect a diagnostic scan tool.
- Check that a vehicle session can be established using a diagnostic scan tool.

Can a vehicle session be established?

Yes	GO to N2
No	REFER to: Communications Network (418-00 Module Communications Network) .

N2 CHECK THE TCCM (TRANSFER CASE CONTROL MODULE) CMDTC (CONTINUOUS MEMORY DIAGNOSTIC TROUBLE CODE) S

- Using a diagnostic scan tool, perform the TCCM self-test.
- Clear the DTCs.
- Wait 10 seconds.
- Repeat the TCCM self-test.

Is DTC U0121 retrieved again?

Yes	GO to N3
No	The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.

N3 RETRIEVE THE RECORDED DTC (DIAGNOSTIC TROUBLE CODE) S FROM THE ABS (ANTI-LOCK BRAKE SYSTEM) MODULE SELF-TEST

- Using a diagnostic scan tool, perform the ABS module self-test.

Are any DTCs recorded?

Yes	REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) .
No	GO to N4

N4 RETRIEVE THE RECORDED DTC (DIAGNOSTIC TROUBLE CODE) S FROM THE PCM SELF-TEST

- Using a diagnostic scan tool, perform the PCM self-test.

Is DTC P0562:00 or P0563:00 recorded?

Yes	DIAGNOSE and REPAIR all charging or battery related DTCs first. REFER to: Charging System - 2.7L EcoBoost (238kW/324PS) (414-00 Charging System - General Information) . REFER to: Charging System - 3.5L Duratec (209kW/284PS)/3.5L EcoBoost (272kW/370PS)/5.0L 32V Ti-VCT (414-00 Charging System - General Information) .
No	GO to N5

N5 CHECK FOR DTC (DIAGNOSTIC TROUBLE CODE) U0121 SET IN OTHER MODULES

- Using a diagnostic scan tool, clear all DTCs.
- Ignition OFF.
- Ignition ON.
- Wait 10 seconds.
- Using a diagnostic scan tool, perform the continuous memory self-test.
- Retrieve the CMDTCs from all modules.

Is DTC U0121 set in other modules on the network?

Yes	GO to N6
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No	GO to N7
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N6 CHECK FOR CORRECT ABS (ANTI-LOCK BRAKE SYSTEM) MODULE OPERATION

- Ignition OFF.
- Disconnect and inspect the ABS module connector.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Reconnect the ABS module connector. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable TSBs. If a TSB exists for this concern, DISCONTINUE this test and FOLLOW TSB instructions. If no TSBs address this concern, INSTALL a new ABS module. REFER to: Anti-Lock Brake System (ABS) Module (206-09 Anti-Lock Brake System (ABS) and Stability Control, Removal and Installation).
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

N7 CHECK FOR CORRECT TCCM (TRANSFER CASE CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect the TCCM connector.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Reconnect the TCCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present

Is the concern still present?

Yes	CHECK OASIS for any applicable TSBs. If a TSB exists for this concern, DISCONTINUE this test and FOLLOW TSB instructions. If no TSBs address this concern, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

U0140

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

The TCCM sets the DTC U0140 when key messages such as wheel speed, brake pressure or torque are not received for longer than 5 seconds. This loss of key messages degrades the 4x4 system performance and/or inability to change 4x4 modes. Other modules that require data from the BCM all set communication DTCs and may also exhibit system function concerns.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
U0140	Lost Communication With Body Control Module (BCM): No Sub Type Information	Sets in continuous memory in the TCCM if BCM data messages received from the BCM over the HS-CAN are missing for longer than 5 seconds.

Possible Sources

- Communication concern
- Battery voltage concern
- BCM module
- TCCM

PINPOINT TEST O : U0140

O1 VERIFY THE SCAN TOOL COMMUNICATES WITH THE BCM (BODY CONTROL MODULE)

- Ignition ON.
- Connect a diagnostic scan tool.
- Check that a vehicle session can be established using a diagnostic scan tool.

Can a vehicle session be established?

Yes	GO to O2
No	REFER to: Communications Network (418-00 Module Communications Network) .

O2 CHECK THE TCCM (TRANSFER CASE CONTROL MODULE) CMDTC (CONTINUOUS MEMORY DIAGNOSTIC TROUBLE CODE) S

- Using a diagnostic scan tool, perform the TCCM self-test.
- Clear the DTCs.
- Wait 100 seconds.
- Repeat the TCCM self-test.

Is DTC U0140 retrieved again?

Yes	GO to O3
No	The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.

O3 RETRIEVE THE RECORDED DTC (DIAGNOSTIC TROUBLE CODE) S FROM THE ABS (ANTI-LOCK BRAKE SYSTEM) MODULE SELF-TEST

- Using a diagnostic scan tool, perform the ABS module self-test.

Are any DTCs recorded?

Yes	REFER to: Anti-Lock Brake System (ABS) and Stability Control (206-09 Anti-Lock Brake System (ABS) and Stability Control) .
No	GO to O4

O4 RETRIEVE THE RECORDED DTC (DIAGNOSTIC TROUBLE CODE) S FROM THE TCCM (TRANSFER CASE CONTROL MODULE) SELF-TEST

- Using a diagnostic scan tool, perform the TCCM self-test.

Is DTC P0562:00 or P0563:00 recorded?

Yes	GO to Pinpoint Test B
No	GO to O5

O5 CHECK FOR DTC (DIAGNOSTIC TROUBLE CODE) U0140 SET IN OTHER MODULES

- Using a diagnostic scan tool, clear all DTCs.
- Ignition OFF.
- Ignition ON.
- Wait 10 seconds.
- Using a diagnostic scan tool, perform the continuous memory self-test.
- Retrieve the CMDTCs from all modules.

Is DTC U0140 set in other modules on the network?

Yes	GO to O6
No	GO to O7

O6 CHECK FOR CORRECT BCM (BODY CONTROL MODULE) MODULE OPERATION

- Ignition OFF.
- Disconnect and inspect the BCM module connector.
- Repair:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Reconnect the BCM module connector. Make sure it seat and latches correctly.
- Operate the system and verify the concern is still present.

Is the concern still present?

Yes	CHECK OASIS for any applicable TSBs. If a TSB exists for this concern, DISCONTINUE this test and FOLLOW TSB instructions. If no TSBs address this concern,   Click here to access Guided Routine (BCM).
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

O7 CHECK FOR CORRECT TCCM (TRANSFER CASE CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect the TCCM connector.
- Repair:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Reconnect the TCCM connector. Make sure it seats and latches correctly.
- Operate the system and verify the concern is still present

Is the concern still present?

Yes	CHECK OASIS for any applicable TSBs. If a TSB exists for this concern, DISCONTINUE this test and FOLLOW TSB instructions. If no TSBs address this concern, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
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No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.
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DTC U0101

Refer to Wiring Diagrams Cell 34 for schematic and connector information.

Normal Operation

The TCCM sets DTC U0101 when it has not received messages from the TCM for more than 5 seconds with ignition in RUN and battery voltage in range. Other modules that require data from the TCM all set communication DTCs and may also exhibit system function concerns.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
U0101	Lost Communication With TCM "A": No Sub-Type Information	Sets in continuous memory in the TCCM if powertrain data messages received from the TCM over the HS-CAN are missing for longer than 5 seconds with ignition in RUN and battery voltage in range.

Possible Sources

- Communication concern
- Battery voltage concern
- TCM
- TCCM

PINPOINT TEST P : DTC U0101

P1 VERIFY THE SCAN TOOL COMMUNICATES WITH THE PCM (POWERTRAIN CONTROL MODULE)

- Ignition ON.
- Connect a diagnostic scan tool.
- Check that a vehicle session can be established using a diagnostic scan tool.

Can a vehicle session be established?

Yes	GO to P2
No	REFER to: Communications Network (418-00 Module Communications Network) .

P2 CHECK THE TCCM (TRANSFER CASE CONTROL MODULE) CONTINUOUS MEMORY DTC (DIAGNOSTIC TROUBLE CODE) S

- Using a diagnostic scan tool, perform the TCCM self-test.
- Clear the DTCs.
- Wait 10 seconds.
- Repeat the TCCM self-test.

Is DTC U0101?

Yes	GO to P3
No	The system is operating correctly at this time. The DTC may have been set due to high network traffic or an intermittent fault condition.

P3 RETRIEVE THE RECORDED DTC (DIAGNOSTIC TROUBLE CODE) S FROM THE TCM (TRANSMISSION CONTROL MODULE) KOEO (KEY ON, ENGINE OFF) SELF-TEST

- Using a diagnostic scan tool, perform the TCM KOEO self-test.

Are any DTCs recorded?

Yes	REFER to: Diagnostic Trouble Code (DTC) Charts and Pinpoint Tests - 3.5L EcoBoost (272kW/370PS) (307-01B Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Diagnosis and Testing).
No	GO to P4

P4 RETRIEVE THE RECORDED DTC (DIAGNOSTIC TROUBLE CODE) S FROM THE TCCM (TRANSFER CASE CONTROL MODULE) SELF-TEST

- Using a diagnostic scan tool, perform the TCCM self-test.

Is DTC P0562:00 or P0563:00 recorded?

Yes	REFER to: Charging System - 2.7L EcoBoost (238kW/324PS) (414-00 Charging System - General Information) . REFER to: Charging System - 3.5L Duratec (209kW/284PS)/3.5L EcoBoost (272kW/370PS)/5.0L 32V Ti-VCT (414-00 Charging System - General Information) .
No	GO to P5

P5 CHECK FOR DTC (DIAGNOSTIC TROUBLE CODE) S U0101 SET IN OTHER MODULES

- Using a diagnostic scan tool, clear all DTCs.
- Ignition OFF.
- Ignition ON.
- Wait 10 seconds.
- Using a diagnostic scan tool, perform the continuous memory self-test.
- Retrieve the CMDTCs from all modules.

Is the DTC U0101 set in other modules on the network?

Yes	GO to P6
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No

GO to [P7](#)

P6 CHECK FOR CORRECT TCM (TRANSMISSION CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect all TCM connectors.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Reconnect the TCM connectors. Make sure they seat and latch correctly.
- Operate the system and verify the concern is still present

Is the concern still present?

Yes	CHECK OASIS for any applicable TSBs. If a TSB exists for this concern, DISCONTINUE this test and FOLLOW TSB instructions. If no TSBs address this concern, INSTALL a new TCM, REFER to: Transmission Control Module (TCM) - 3.0L Power Stroke Diesel/3.5L EcoBoost (272kW/370PS) (307-01B Automatic Transmission - 10-Speed Automatic Transmission - 10R80, Removal and Installation). PROGRAM the TCM with the latest calibration level. PERFORM the Solenoid Body Strategy Data Download procedure. REFER to: Transmission Strategy Download (307-01A Automatic Transmission - 6-Speed Automatic Transmission - 6R80, General Procedures).
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.

P7 CHECK FOR CORRECT TCCM (TRANSFER CASE CONTROL MODULE) OPERATION

- Ignition OFF.
- Disconnect and inspect the TCCM connector.
- Check for the following:
 - corrosion (install new connector or terminals - clean module pins)
 - damaged or bent pins - install new terminals/pins
 - pushed-out pins - install new pins as necessary
- Reconnect the TCCM connector. Make sure they seat and latch correctly.

- Operate the system and verify the concern is still present

Is the concern still present?

Yes	CHECK OASIS for any applicable TSBs. If a TSB exists for this concern, DISCONTINUE this test and FOLLOW TSB instructions. If no TSBs address this concern, INSTALL a new TCCM. REFER to: Transfer Case Control Module (TCCM) (308-07A Four-Wheel Drive Systems, Removal and Installation).
No	The system is operating correctly at this time. The concern may have been caused by module connections. ADDRESS the root cause of any connector or pin issues.