

Four Wheel Drive (4WD) Systems

SPECIFICATIONS

MATERIAL SPECIFICATION

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Item	Specification	Fill Capacity
Motorcraft Transfer Case Fluid XL-12	ESP-M2C166-H	1.2L (2.5 pt)
Ultra Silicone Sealant TA-29	-	-

TORQUE SPECIFICATION

TORQUE SPECIFICATION

Description	Nm	lb-in
Transfer case shift motor bolts	10	89

DESCRIPTION AND OPERATION

FOUR WHEEL DRIVE (4WD) SYSTEMS

The electronic shift Four-Wheel Drive (4WD) system consists of the following components:

- Transfer case
- 4X4 control module
- Mode Select Switch (MSS)
- Transfer case shift motor
- Instrument Cluster (IC) indicators

The transfer case is connected to the transmission output shaft and is responsible for transmitting power through the rear drive shaft to the rear axle, and through the front drive shaft to the front axle. The electronic shift is the only type of transfer case used.

The system has a 2-Wheel Drive (2WD) mode, 4X4 HIGH mode and a 4X4 LOW range mode. When the **MSS** on the instrument panel is turned, the 4X4 control module powers the transfer case shift motor. When the shift motor reaches the desired position, as determined by the contact plate position inputs to the 4X4 control module, power to the shift motor will be removed.

DIAGNOSIS AND TESTING

FOUR WHEEL DRIVE (4WD) SYSTEMS - ELECTRONIC SHIFT

Special Tool(s)

SPECIAL TOOL SPECIFICATION

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ST2574-A

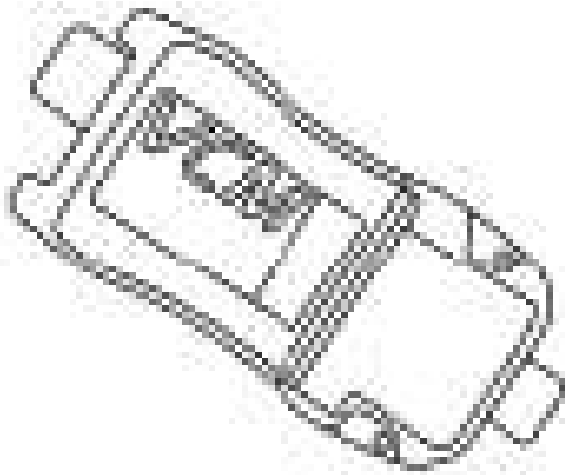
Flex Probe Kit 105-R025D



ST3093-A

Fluke 77-IV Digital Multimeter FLU77-4 or equivalent

Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software



ST2834-A

with appropriate hardware, or equivalent scan tool

Principles of Operation

The Electronic Shift-On-The-Fly (ESOF) system is an electronic shift system that allows the operator to choose between 2 different Four-Wheel Drive (4WD) modes as well as 2-Wheel Drive (2WD). The operator can switch between **2WD** and 4X4 HIGH mode at speeds up to 88 km/h (55 mph). To engage or disengage 4X4 LOW range, the vehicle speed must be less than 5 km/h (3 mph) and the transmission must be in NEUTRAL (or the clutch pedal pressed in manual transmission vehicles).

When the Mode Select Switch (MSS) on the instrument panel is turned, the 4X4 control module powers the transfer case shift motor. When the shift motor reaches the desired position, as determined by the contact plate position inputs to the 4X4 control module, power to the shift motor will be removed.

Transfer Case Shift Motor

The externally mounted transfer case shift motor, located at the rear of the transfer case, turns the shift cam assembly. As the shift cam assembly turns, it positions the reduction shift fork for desired transfer case operation. An integral position sensor in the shift motor provides shift motor position information to the 4X4 control module.

Mode Select Switch (MSS)

The rotary **MSS**, mounted on the instrument panel, allows the operator to select the **2WD**, 4X4 HIGH and 4X4 LOW transfer case operating modes.

Digital Transmission Range (TR) Sensor

The digital Transmission Range (TR) sensor completes the start circuit in PARK and NEUTRAL, the backup lamp circuit in REVERSE and the neutral sense circuit in NEUTRAL. The digital **TR** sensor also sends a digital output signal to the PCM indicating the manual lever position.

Feature Inputs

- **MSS**
- Wheel speeds via Controller Area Network (CAN) communication
- Contact plate position inputs A, B, C, D (grounded when closed, open circuit when open)
- Digital **TR** sensor

Feature Outputs

- Transfer case shift motor
- IC indicators via **CAN** communication
- **4WD** mode via **CAN** communication

Neutral Tow

The neutral tow feature is a program embedded in the 4X4 control module, which must be activated by a dealer technician. The neutral tow feature disengages the wheels from the powertrain by shifting the transfer case to the NEUTRAL position. This allows the vehicle to be towed with all 4 wheels on the ground. To activate the neutral tow feature, the dealer technician must access the 4X4 control module through the scan tool and Data Link Connector (DLC). Once communication is achieved, the technician can request the neutral tow feature be enabled. The technician must also install the neutral tow indicator lamp in order for the feature to be activated.

Feature inputs:

- **MSS**
- Contact plate position inputs A, B, C, D
- Vehicle Speed Sensor (VSS)
- Door ajar switch (battery voltage when door is closed, grounded circuit otherwise)
- Digital **TR** sensor

Feature outputs:

- **4WD** shift motor outputs
- Neutral tow indicator lamp

Inspection and Verification

1. Verify the customer concern.
2. Visually inspect the following for obvious signs of mechanical and electrical damage.

Visual Inspection Chart

VISUAL INSPECTION CHART

Mechanical	Electrical
<ul style="list-style-type: none"> • Halfshafts • Shift motor 	<ul style="list-style-type: none"> • Battery Junction Box (BJB) fuse 27 (20A) • Smart Junction Box (SJB) fuses: <ul style="list-style-type: none"> • 10 (10A) • 28 (15A)

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

- 33 (5A)
- Wiring harness
- 4X4 control module
- Mode Select Switch (MSS)
- Transfer case shift motor
- Circuitry

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. **NOTE: Make sure to use the latest scan tool software release.**

If the cause is not visually evident, connect the scan tool to the **DLC** .

5. **NOTE: The Vehicle Communication Module (VCM) LED prove out confirms power and ground from the DLC are provided to the VCM .**

If the scan tool does not communicate with the **VCM** :

- check the **VCM** connection to the vehicle.
- check the scan tool connection to the **VCM** .
- refer to **MODULE COMMUNICATIONS NETWORK** , No Power To The Scan Tool to diagnose no power to the scan tool.

6. If the scan tool does not communicate with the vehicle:

- verify the ignition key is in the ON position.
- refer to **MODULE COMMUNICATIONS NETWORK** to diagnose no response from the PCM.

7. Carry out the network test.

- If the scan tool responds with no communication for one or more modules, refer to **MODULE COMMUNICATIONS NETWORK** .
- If the network test passes, retrieve and record Continuous Memory Diagnostic Trouble Codes (CMDTCs).

8. Clear the **CMDTCs** and carry out the self-test diagnostics for the 4X4 control module.

9. **NOTE: Before carrying out the on-demand self test, make sure that:**

- the ignition is in RUN.
- all doors are closed.
- the brake pedal is not pressed.
- the transmission is not in NEUTRAL (automatic transmissions).
- the clutch is not pressed (manual transmissions).

If the DTCs retrieved are related to the concern, go to **4X4 CONTROL MODULE DTC CHART**. For all other DTCs, refer to **MULTIFUNCTION ELECTRONIC MODULES** .

10. If no DTCs related to the concern are retrieved, GO to or GO to **SYMPTOM CHART - NVH**.

4X4 Control Module DTC Chart

NOTE: Before carrying out the on-demand self test, switch the Mode Select Switch (MSS) into the suspect Four-Wheel Drive (4WD) mode (4X4 HIGH or 4X4 LOW) to verify the customer's concern.

CONTROL MODULE DTC CHART

DTC	Description	Source	Action
B1317	Battery Voltage High	4X4 control module	GO to <u>PINPOINT TEST B.</u>
B1318	Battery Voltage Low	4X4 control module	GO to <u>PINPOINT TEST B.</u>
B1319	Driver Door Ajar Circuit Failure	4X4 control module	GO to <u>PINPOINT TEST I.</u>
B1322	Driver Door Ajar Circuit Short to Ground	4X4 control module	GO to <u>PINPOINT TEST I.</u>
B1342	ECU is Defective	4X4 control module	CLEAR the DTCs. REPEAT the 4X4 control module self-test. If DTC B1342 is retrieved, INSTALL a new 4X4 control module. REFER to <u>4X4 CONTROL MODULE.</u> CLEAR the DTCs. REPEAT the self-test.
B1483	Brake Pedal Input Circuit Failure	4X4 control module	GO to <u>PINPOINT TEST I.</u>
B1485	Brake Pedal Input Short to Battery	4X4 control module	GO to <u>PINPOINT TEST I.</u>
B1555	Ignition Run/Start Circuit Failure	4X4 control module	GO to <u>PINPOINT TEST A.</u>
C1728	Transfer Case Unable to Transition Between 2H and 4H	4X4 control module	GO to <u>PINPOINT TEST C.</u>
C1729	Transfer Case Unable to Transition Between 4H and 4L	4X4 control module	GO to <u>PINPOINT TEST D.</u>
P1707	Transfer Case Neutral Indicator Circuit Failure	4X4 control module	GO to <u>PINPOINT TEST I.</u>
P1812	4WD Mode Select Circuit Failure	4X4 control module	GO to <u>PINPOINT TEST C.</u>
P1815	4WD Mode Select Short Circuit to Ground	4X4 control module	GO to <u>PINPOINT TEST C.</u>
	Transmission Neutral	4X4	

P1816	Safety Switch Circuit Failure	control module	GO to <u>PINPOINT TEST D.</u>
P1819	Transmission Neutral Safety Switch Short Circuit to Ground	4X4 control module	GO to <u>PINPOINT TEST D.</u>
P1849	Transfer Case Contact Plate A Short Circuit to Ground	4X4 control module	GO to <u>PINPOINT TEST C.</u>
P1853	Transfer Case Contact Plate B Short Circuit to Ground	4X4 control module	GO to <u>PINPOINT TEST C.</u>
P1857	Transfer Case Contact Plate C Short Circuit to Ground	4X4 control module	GO to <u>PINPOINT TEST C.</u>
P1861	Transfer Case Contact Plate D Short Circuit to Ground	4X4 control module	GO to <u>PINPOINT TEST C.</u>
P1867	Transfer Case Contact Plate General Circuit Failure	4X4 control module	GO to <u>PINPOINT TEST C.</u>
P1891	Transfer Case Contact Plate Ground Return Open Circuit	4X4 control module	GO to <u>PINPOINT TEST C.</u>
U0100	CAN Communication Bus Fault - Received Error From PCM	4X4 control module	DIAGNOSE the module communication network. REFER to <u>MODULE COMMUNICATIONS NETWORK .</u>
U2050	Application Not Present	4X4 control module	Method 3 programming fault. REFER to <u>MODULE CONFIGURATION</u> for 4X4 control module programming information.

Symptom Chart - Four-Wheel Drive (4WD)

SYMPTOM CHART - FOUR-WHEEL DRIVE (4WD)

Condition	Possible Sources	Action
<ul style="list-style-type: none"> No communication with the 4X4 control module 	<ul style="list-style-type: none"> Scan tool Data Link Connector (DLC) 4X4 control module Circuitry 	<ul style="list-style-type: none"> REFER to <u>MODULE COMMUNICATIONS NETWORK .</u>
<ul style="list-style-type: none"> The Four-Wheel Drive (4WD) indicators do not operate correctly/do not operate 	<ul style="list-style-type: none"> Instrument Cluster (IC) Circuitry 4X4 control module Ignition switch 	<ul style="list-style-type: none"> GO to <u>PINPOINT TEST H.</u>
<ul style="list-style-type: none"> The vehicle does 	<ul style="list-style-type: none"> Mode Select 	<ul style="list-style-type: none"> GO to <u>PINPOINT TEST C.</u>

<p>not shift between 2-Wheel Drive (2WD) and 4WD modes correctly</p>	<p>Switch (MSS)</p> <ul style="list-style-type: none"> • Transfer case • 4X4 control module • Circuitry • Ignition switch 	
<ul style="list-style-type: none"> • The vehicle does not shift between 4WD HIGH and 4WD LOW correctly 	<ul style="list-style-type: none"> • Transfer case • MSS • 4X4 control module • Circuitry • Transmission drag torque • Ignition switch 	<ul style="list-style-type: none"> • GO to <u>PINPOINT TEST D.</u>
<ul style="list-style-type: none"> • The 4WD system jumps out of gear 	<ul style="list-style-type: none"> • Transfer case • MSS 	<ul style="list-style-type: none"> • GO to <u>PINPOINT TEST E.</u>
<ul style="list-style-type: none"> • Straight line driveline wind-up 	<ul style="list-style-type: none"> • Tire inflation pressure • Tire and wheel size • Tire wear • Axle ratio 	<ul style="list-style-type: none"> • GO to <u>PINPOINT TEST F.</u>
<ul style="list-style-type: none"> • Flashing 4X4 HIGH and 4X4 LOW indicators 3 times every 2 minutes 	<ul style="list-style-type: none"> • Loss of Controller Area Network (CAN) communication between 4X4 control module and IC • No communication with the 4X4 control module • Ignition switch 	<ul style="list-style-type: none"> • CHECK the IC for faults. REFER to <u>INSTRUMENTATION AND WARNING CHIMES .</u> • CHECK 4X4 control module communication. REFER to <u>MODULE COMMUNICATIONS NETWORK .</u>
<ul style="list-style-type: none"> • The transfer case makes noise 	<ul style="list-style-type: none"> • Tire inflation pressure • Tire and wheel size • Tire tread wear • Internal components 	<ul style="list-style-type: none"> • 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 0.15 mm (0.06 in) 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

	<ul style="list-style-type: none"> • Fluid level 	<p>transmission. REFER to <u>AUTOMATIC TRANSAXLE/TRANSMISSION - 5R44E AND 5R55E</u> . If there is noise in all gears, DISASSEMBLE the transfer case. REFER to <u>TRANSFER CASE</u> . CHECK the planetary gears, the bearings, the upper and lower drive sprockets and drive chain for damage. INSTALL new parts as necessary.</p> <ul style="list-style-type: none"> • FILL with transfer case fluid. REFER to <u>TRANSFER CASE</u> .
<ul style="list-style-type: none"> • The neutral tow does not operate 	<ul style="list-style-type: none"> • Smart Junction Box (SJB) fuse 33 (5A) • 4X4 control module • Neutral tow system indicator • Digital Transmission Range (TR) sensor • Door ajar switch • Circuitry • Ignition switch 	<ul style="list-style-type: none"> • CARRY OUT the Neutral Tow Functional Test. GO to <u>PINPOINT TEST I.</u>
<ul style="list-style-type: none"> • Unable to duplicate customer concern 	<ul style="list-style-type: none"> • 4WD system and/or related components 	<ul style="list-style-type: none"> • CARRY OUT the Electronic Shift-On-The-Fly (ESOF) Functional Test. GO to <u>PINPOINT TEST G.</u>

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 **NOISE, VIBRATION AND HARSHNESS** . 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. If this is not the causal system for the symptom, refer back to **NOISE, VIBRATION AND HARSHNESS** for the next likely system and continue diagnosis.

SYMPTOM CHART - NVH

Condition	Possible Sources	Action
<ul style="list-style-type: none"> • Transfer case whine - noise at all ranges 	<ul style="list-style-type: none"> • Incorrect fluid level or fluid quality • Worn oil pump • Under-inflated or oversized tires 	<ul style="list-style-type: none"> • CHECK that the transfer case is filled to the correct level and with the specified fluid. REFER to <u>TRANSFER CASE</u> . • DISASSEMBLE the transfer

		<p>case. CHECK the oil pump for wear or damage. REPAIR as necessary. REFER to <u>TRANSFER CASE</u> .</p> <ul style="list-style-type: none"> CONFIRM that the tires and wheels are correct for the vehicle. CHECK that the tire inflation pressures are correct.
<ul style="list-style-type: none"> Transfer case growl/rumble - noise at all ranges 	<ul style="list-style-type: none"> Damaged or worn bearings or planetary gear 	<ul style="list-style-type: none"> DISASSEMBLE the transfer case. CHECK the bearings or planetary gear for wear or damage. REPAIR as necessary. REFER to <u>TRANSFER CASE</u> .
<ul style="list-style-type: none"> Transfer case scraping/grating - noise at all ranges 	<ul style="list-style-type: none"> Excessively stretched drive chain hitting the case 	<ul style="list-style-type: none"> DISASSEMBLE the transfer case. CHECK the drive chain for wear or damage. REPAIR as necessary. REFER to <u>TRANSFER CASE</u> .
<ul style="list-style-type: none"> Transfer case howl/hum - noise at all ranges or 4X4 only 	<ul style="list-style-type: none"> Worn or damaged sun (input) gear, clutch pack (intermediate) gear or output shaft gear 	<ul style="list-style-type: none"> DISASSEMBLE the transfer case. CHECK the gears for wear or damage. REPAIR as necessary. REFER to <u>TRANSFER CASE</u> .

Pinpoint Tests

Pinpoint Test A: DTC B1555

Refer to **SYSTEM WIRING DIAGRAMS** for schematic and connector information.

Normal Operation

The 4X4 control module receives ignition switch position status from the hardwired run/start input to 4X4 control module pin 8 and the ignition switch position status message communicated by the Instrument Cluster (IC) over the High Speed Controller Area Network (HS-CAN). The ignition switch position status message originates from the Smart Junction Box (SJB) which communicates the ignition switch position status over the Medium Speed Controller Area Network (MS-CAN) to the IC which acts as a gateway module, transferring the ignition switch status message from **MS-CAN** to **HS-CAN** . For information regarding network messaging, refer to **MODULE COMMUNICATIONS NETWORK** .

- DTC B1555 Ignition Run/Start Circuit Failure - If the ignition switch is not in RUN for the self-test, this code will set.

This pinpoint test is intended to diagnose the following:

- Fuse

- Wiring, terminals or connectors
- Ignition switch and/or circuitry
- HS-CAN

PINPOINT TEST A: DTC B1555

A1 CARRY OUT NETWORK TEST

- Ignition ON.
- Connect the scan tool.
- Carry out a network test.
- **Did the network test pass?**

Yes: GO to A2 .

No: REFER to MODULE COMMUNICATIONS NETWORK to diagnose the network concern.

A2 CHECK 4X4 INDICATOR PROVE-OUT

- Carry out the 4X4 control module self-test.
- **Are any 4X4 control module DTCs present?**

Yes: For DTC B1555, GO to A3 . For all other DTCs, refer to the 4X4 CONTROL MODULE DTC CHART.

No: The system is functioning correctly.

A3 CHECK THE 4X4 CONTROL MODULE IGNITION SWITCH STATUS PIDs

- Enter the following diagnostic mode on the scan tool: DataLogger - 4X4 Control Module.
- Monitor the following ignition switch PIDs:
 - Ignition Switch - Off/Unlock Position (IGN_O/U)
 - ACC Position (IGN_A)
 - Start Position 3 (IGN_S)
 - Ignition Switch - Run/Start Position (IGN_R/S)
 - Ignition Switch - Run Position (IGN_R)
- **Do the ignition switch PIDs match the ignition switch positions?**

Yes: The system is functioning correctly.

No: If the IGN_R/S PID did not match, CHECK SJB fuse 10 (10A). If the fuse is OK, REPAIR circuit CBP10 (YE/OG). CLEAR the DTCs. REPEAT the self-test.

If the IGN_O/U, IGN_A, IGN_S or IGN_R PIDs did not match, REFER to STEERING COLUMN SWITCHES to diagnose the ignition switch concern.

Pinpoint Test B: DTC B1317/B1318

Refer to SYSTEM WIRING DIAGRAMS for schematic and connector information.

Normal Operation

If the 4X4 control module observes an overpower or under power voltage condition, DTCs are set and the 4X4 control module may not allow Four-Wheel Drive (4WD) operation.

- DTC B1317 Battery Voltage High - When the 4X4 control module detects battery voltage greater than 16 volts for at least 10 seconds, this DTC is set.
- DTC B1318 Battery Voltage Low - When the 4X4 control module detects battery voltage less than 9 volts for at least 10 seconds, with the engine running at 1,500 rpm or greater, this DTC is set.

This pinpoint test is intended to diagnose the following:

- Fuses
- Wiring, terminals or connectors
- 4X4 control module

PINPOINT TEST B: DTCs B1317/B1318

NOTE: DTCs B1317/B1318 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.

NOTE: Carry out a thorough inspection and verification before proceeding with the pinpoint test. Refer to **INSPECTION AND VERIFICATION**.

B1 RETRIEVE ALL CMDTCs IN ALL MODULES

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: Self Test - All CMDTCs.
- **Is B1317/B1318 present in one or more modules AND P0563, P0620, P0625, P0626 or P065B present in the PCM?**
Yes: REFER to **CHARGING SYSTEM** for diagnosis of the battery and charging system.
No: GO to **B2** .

B2 CHECK BATTERY CONDITION

- Ignition OFF.
- Refer to **BATTERY, MOUNTING AND CABLES** and carry out the Battery - Condition Test.
- **Does the battery pass the condition test?**
Yes: If the battery passed the condition test but required a recharge, REFER to **CHARGING SYSTEM** to diagnose the charging system. CLEAR all Continuous Memory Diagnostic Trouble Codes (CMDTCs). TEST the system for normal operation.

If the battery passed the condition test and did not require a recharge, GO to **B3** .

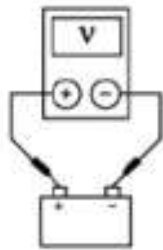
No: INSTALL a new battery. REFER to **BATTERY, MOUNTING AND CABLES** . CLEAR all CMDTCs. TEST the system for normal operation.

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 gone above

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 B1317, turn off all accessories and run the engine at 1,500 rpm for a minimum of 2 minutes.
 - For DTC B1318, turn on headlights and HVAC fan on high and run engine at 1,500 rpm for a minimum of 2 minutes.



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Fig. 1: Measuring Voltage Of Battery
Courtesy of FORD MOTOR CO.

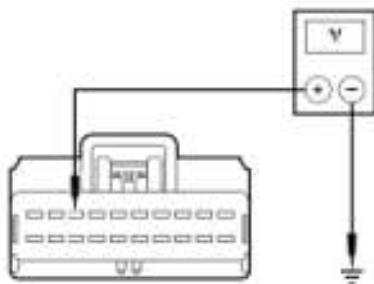
- **Is the battery voltage between 13-15.2 volts?**
Yes: For DTC B1318, GO to **B4** .

For DTC B1317, INSTALL a new 4X4 control module. REFER to **4X4 CONTROL MODULE**. CLEAR all CMDTCs. REPEAT the self-test.

No: REFER to **CHARGING SYSTEM** to diagnose the charging system. CLEAR all CMDTCs. TEST the system for normal operation.

B4 CHECK POWER TO 4X4 CONTROL MODULE

- Ignition OFF.
- Disconnect: 4X4 Control Module C281a and C281b.
- Ignition ON.
- Measure the voltage between 4X4 control module C281a-8, circuit CBP10 (YE/OG), harness side and ground.

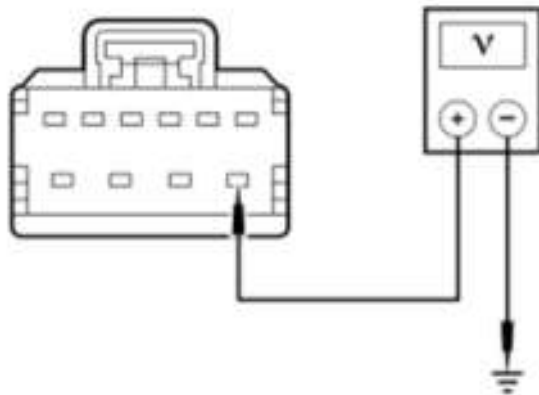


N0089778

Fig. 2: Measuring Voltage Between 4X4 Control Module C281A-8, Circuit CBP10

(YE/OG), Harness Side And Ground
Courtesy of FORD MOTOR CO.

- Measure the voltage between 4X4 control module C281b-7, circuit SBB28 (GN/RD), harness side and ground.



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Fig. 3: Measuring Voltage Between 4X4 Control Module C281B-7, Circuit SBB28 (GN/RD), Harness Side And Ground
Courtesy of FORD MOTOR CO.

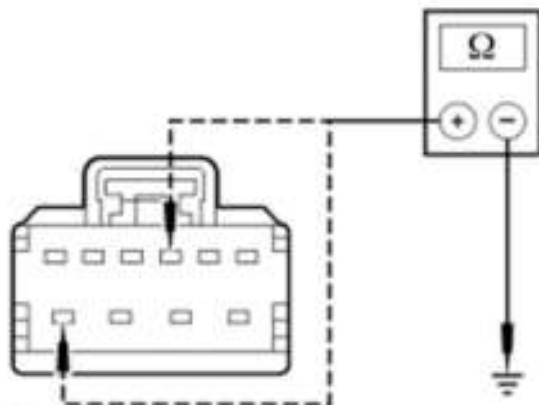
- **Is the voltage greater than 10 volts?**

Yes: GO to B5 .

No: VERIFY the Smart Junction Box (SJB) fuse (s) 10 (10A) and 28 (10A) are OK. If fuse(s) are OK, REPAIR the circuit in question. If SJB fuse(s) are not OK, REFER to the **SYSTEM WIRING DIAGRAMS** to identify possible causes of the circuit short. CLEAR all CMDTCs. REPEAT the self-test.

B5 CHECK GROUND CIRCUITS FOR OPEN

- Ignition OFF.
- Measure the resistance between 4X4 control module C281b-3, circuit GD174 (BK/WH), harness side and ground; and between 4X4 control module C281b-10, circuit GD161 (BK/YE), harness side and ground
 - Repeat this measurement while wiggling the harness.



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Fig. 4: Measuring Resistance Between 4X4 Control Module C281B-3, Circuit GD174

(BK/WH), Harness Side And Ground
Courtesy of FORD MOTOR CO.

- **Is the resistance less than 5 ohms?**

Yes: GO to **B6** .

No: REPAIR the circuit. CLEAR all CMDTCs. REPEAT the self-test.

B6 CHECK FOR CORRECT 4X4 CONTROL MODULE OPERATION

- Ignition OFF.
- Check the harness and component side connectors for:
 - corrosion.
 - pushed-out/bent pins.
- Connect the 4X4 control module and make sure it seats correctly.
- Operate the system and determine if the concern is still present.
- **Is the concern still present?**

Yes: INSTALL a new 4X4 control module. REFER to **4X4 CONTROL MODULE**. CLEAR all CMDTCs. REPEAT the self-test.

No: The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR all CMDTCs. REPEAT the self-test.

Pinpoint Test C: The Vehicle Does Not Shift Between 2-Wheel Drive (2WD) and Four-Wheel Drive (4WD) Modes Correctly

Refer to **SYSTEM WIRING DIAGRAMS** for schematic and connector information.

Normal Operation

The Mode Select Switch (MSS) communicates the operator's choice to the 4X4 control module. The 4X4 control module then controls the transfer case clutch and transfer case shift motor as necessary. If the vehicle is not responding to the operator's intentions, systematically check the necessary inputs and outputs of the 4X4 control module, components of the transfer case and halfshafts. Check all circuits for opens and shorts to power or ground.

FAULT TRIGGER CONDITIONS CHART

DTC Description	Fault Trigger Conditions
• P1812 - 4-Wheel Drive Mode Select Circuit Failure	Open circuit or short to battery sensed by 4X4 control module or correct mode not selected for self-test.
• P1815 - 4-Wheel Drive Mode Select Short Circuit to Ground	Short to ground sensed by 4X4 control module.
• P1849 - Transfer Case Contact Plate 'A' Short Circuit to Ground	Motor encoder POS1 short to ground sensed at 4X4 control module, checked when new 4WD mode is selected.
• P1853 - Transfer Case Contact Plate 'B' Short Circuit to Ground	Motor encoder POS2 short to ground sensed at 4X4 control module, checked when new 4WD mode is selected.
• P1857 - Transfer Case Contact Plate 'C' Short Circuit to Ground	Motor encoder POS3 short to ground sensed at 4X4 control module, checked when new 4WD mode is selected.
• P1861 - Transfer Case Contact Plate 'D' Short Circuit to Ground	Motor encoder POS4 short to ground sensed at 4X4 control module, checked when new 4WD mode is selected.

<ul style="list-style-type: none"> • P1867 - Transfer Case Contact Plate General Circuit Failure 	<p>General motor encoder fault, invalid motor position detected when new 4WD mode is selected or during a motor movement.</p>
<ul style="list-style-type: none"> • P1891 - Transfer Case Contact Plate Ground Return Open Circuit 	<p>Open circuit on motor encoder position return line.</p>

This pinpoint test is intended to diagnose the following:

- Transfer case
- 4X4 control module
- Front axle assembly
- **MSS**
- Wiring, terminals or connectors

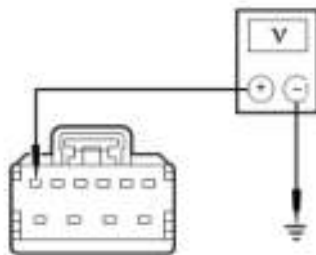
PINPOINT TEST C: THE VEHICLE DOES NOT SHIFT BETWEEN 2-WHEEL DRIVE (2WD) AND FOUR-WHEEL DRIVE (4WD) MODES CORRECTLY

C1 CHECK FOR DTCs

- Connect the scan tool.
- Carry out the 4X4 control module on-demand self test.
- **Are DTCs retrieved?**
Yes: If DTC P1812, GO to C8. If DTC P1815, GO to C11. DTC P1867 or P1891, GO to C19. If DTC P1849, P1853, P1857 or P1861, GO to C21.
No: GO to **C2** .

C2 CHECK FOR VOLTAGE INPUT TO THE 4X4 CONTROL MODULE

- Disconnect: 4X4 Control Module C281b.
- Measure the voltage between C281b-6, circuit SBB27 (BU/RD) and ground.



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Fig. 5: Measuring Voltage Between C281B-6, Circuit SBB27 (BU/RD) And Ground
 Courtesy of FORD MOTOR CO.

- **Is the voltage greater than 9 volts?**
Yes: GO to C6.
No: GO to **C3** .

C3 CHECK THE HOT AT ALL TIMES-2 BJB FUSE 27 (20A)

- Check Battery Junction Box (BJB) fuse 27 (20A).

- **Is the fuse OK?**

Yes: GO to C4 .

No: CHECK circuit SBB27 (BU/RD) for a short to ground or open. REPAIR as necessary. REPEAT the self-test.

C4 CHECK FOR BATTERY VOLTAGE FROM THE BJB

- Ignition ON.
- Measure the voltage between BJB input side fuse cavity 27 and ground.

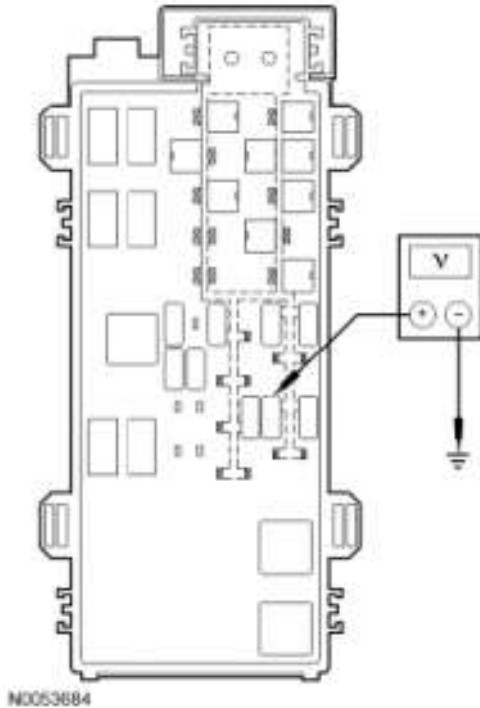


Fig. 6: Measuring Voltage Between BJB Input Side Fuse Cavity 27 And Ground
 Courtesy of FORD MOTOR CO.

- **Is the voltage greater than 9 volts?**

Yes: REPAIR or INSTALL new components as necessary. REPEAT the self-test.

No: GO to C5 .

C5 CHECK THE BATTERY VOLTAGE WITH THE ENGINE RUNNING

- Start the engine.
- Measure the battery voltage at the positive battery terminal.
- **Is the voltage greater than 9 volts?**

Yes: REPAIR circuit SBB27 (BU/RD) at the Battery Junction Box (BJB). REPEAT the self-test.

No: CHECK the charging system. REFER to **CHARGING SYSTEM** .

C6 CHECK GROUND TO 4X4 CONTROL MODULE FOR AN OPEN

- Disconnect the battery ground cable. Refer to **BATTERY, MOUNTING AND CABLES** .
- Disconnect: 4X4 Control Module C281b.
- Measure the resistance between 4X4 control module C281b-10 circuit GD161 (BK/YE), harness side and harness ground point.

Refer to **SYSTEM WIRING DIAGRAMS** for schematic and connector information.

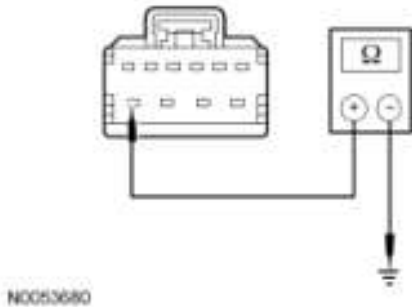


Fig. 7: Measuring Resistance Between 4X4 Control Module C281B-10 Circuit GD161 (BK/YE), Harness Side And Harness Ground Point
Courtesy of FORD MOTOR CO.

• **Is the resistance less than 5 ohms?**

Yes: Disconnect all 4X4 control module connectors. CHECK for corrosion and/or pushed-out pins. The condition may have been caused by a loose or corroded connector. REPAIR or CLEAN as necessary. GO to C7 .

If not, INSTALL a new 4X4 control module.

REFER to **4X4 CONTROL MODULE**. REPEAT the self-test.

No: REPAIR the affected circuit(s). REPEAT the self-test.

C7 CHECK THE IGNITION SWITCH STATUS PID

- Connect the battery ground cable. Refer to **BATTERY, MOUNTING AND CABLES** .
- Ignition ON.
- Monitor the following ignition switch PIDs:
 - Ignition Switch - Off/Unlock Position (IGN_O/U)
 - ACC Position (IGN_A)
 - Start Position 3 (IGN_S)
 - Ignition Switch - Run/Start Position (IGN_R/S)
 - Ignition Switch - Run Position (IGN_R)

• **Do the ignition switch PIDs match the ignition switch positions?**

Yes: GO to C8 .

No: If the IGN_R/S PID did not match, CHECK SJB fuse 10 (10A). If the fuse is OK, REPAIR circuit CBP10 (YE/OG). CLEAR the DTCs. REPEAT the self-test.

If the IGN_O/U, IGN_A, IGN_S or IGN_R PIDs did not match, REFER to **STEERING COLUMN SWITCHES** to diagnose the ignition switch concern.

C8 CHECK THE 4WD SWITCH STATUS (4WD_SW) POSITION PIDs

- Ignition OFF.
- Connect the scan tool.
- Ignition ON.

- Monitor the 4WD_SW PID while cycling through each MSS position.
- **Does the 4WD_SW PID always agree with the switch position?**
Yes: GO to C13.
No: GO to C9 .

C9 CHECK CIRCUITS CCF13 (WH/BU) AND RCF13 (WH/BN) FOR AN OPEN

- Disconnect: 4X4 Control Module C281a.
- Disconnect: MSS C284.
- Measure the resistance between MSS C284-2, harness side and 4X4 control module C281a-11, harness side, circuit CCF13 (WH/BU).

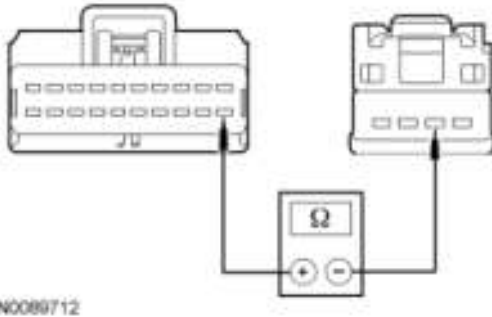


Fig. 8: Measuring Resistance Between MSS C284-2, And 4X4 Control Module C281A-11, Circuit CCF13 (WH/BU)
Courtesy of FORD MOTOR CO.

- Measure the resistance between MSS C284-3, harness side and 4X4 control module C281a-20, harness side, circuit RCF13 (WH/BN).

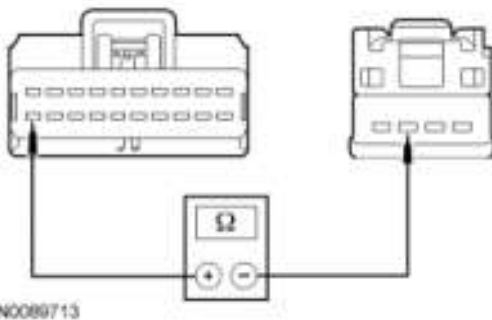
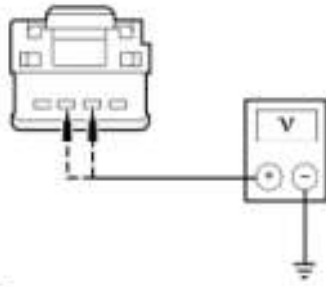


Fig. 9: Measuring Resistance Between MSS C284-3 And 4X4 Control Module C281A-20 Circuit RCF13 (WH/BN)
Courtesy of FORD MOTOR CO.

- **Is the resistance less than 5 ohms?**
Yes: GO to C10 .
No: REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.

C10 CHECK CIRCUITS CCF13 (WH/BU) AND RCF13 (WH/BN) FOR A SHORT TO VOLTAGE

- Measure the voltage between MSS C284-2, circuit CCF13 (WH/BU) harness side and ground.



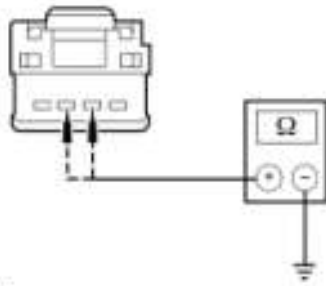
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Fig. 10: Measuring Voltage Between MSS C284-2, Circuit CCF13 (WH/BU) And Ground
 Courtesy of FORD MOTOR CO.

- Measure the voltage between MSS C284-3, circuit RCF13 (WH/BN) harness side and ground.
- **Is any voltage present?**
Yes: REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.
No: GO to C11 .

C11 CHECK CIRCUITS CCF13 (WH/BU) AND RCF13 (WH/BN) FOR A SHORT TO GROUND

- Disconnect: MSS C284.
- Measure the resistance between MSS C284-2, circuit CCF13 (WH/BU) harness side and ground.



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Fig. 11: Measuring Resistance Between MSS C284-2, Circuit CCF13 (WH/BU) And Ground
 Courtesy of FORD MOTOR CO.

- Measure the resistance between MSS C284-3, circuit RCF13 (WH/BN) harness side and ground.
- **Is the resistance greater than 10,000 ohms?**
Yes: GO to C12 .
No: REPAIR the affected circuit(s). CLEAR the DTCs. REPEAT the self-test.

C12 CHECK THE MSS

- Ignition OFF.
- Measure the resistance between MSS terminals 2 and 3 component side, while rotating the switch through all positions. Refer to the following chart.

RESISTANCE SPECIFICATION

MSS	Resistance
-----	------------

4L	130 ohms
4H	270 ohms
2H	620 ohms

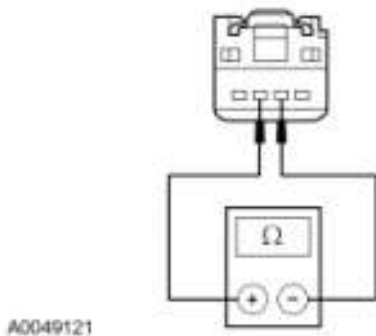


Fig. 12: Measuring Resistance Between MSS Terminals 2 And 3 Component Side
Courtesy of FORD MOTOR CO.

- **Are the resistance values within specification?**

Yes: GO to C27.

No: INSTALL a new MSS . REFER to **MODE SELECT SWITCH (MSS)**. CLEAR the DTCs. REPEAT the self-test.

C13 CHECK FOR 4X4 HIGH WIND-UP

- Switch the MSS to 4H.
- Drive the vehicle on a dry, hard surface in turns.
- **Is wind-up present in turns?**

Yes: GO to C15.

No: GO to C14 .

C14 CHECK FOR TRANSFER CASE ENGAGEMENT

- With the vehicle in NEUTRAL, position it on a hoist. Refer to **JACKING AND LIFTING** .
- Rotate the rear driveshaft.
- Observe the front driveshaft.
- **Did the front driveshaft rotate?**

Yes: CHECK that all driveline fasteners are present and tightened to specification. REFER to **DRIVELINE SYSTEM - GENERAL INFORMATION** for further diagnosis of the front axle.

No: GO to C17.

C15 CHECK THE TRANSFER CASE SHIFT TO 2H

- Ignition OFF.
- Connect the scan tool.
- Ignition ON.
- Using the active command contact plate power (PLATE_PWR) to energize the transfer case motor contact plate position return circuit.
- Monitor the 4X4 control module transfer case contact plate switch A (PLATE_A), B (PLATE_B), C (PLATE_C) and D (PLATE_D) PIDs for the contact plate position while switching the MSS to 2H.

CONTACT PLATE POSITION

MSS Position	Contact Plate Position			
	1 (A)	2 (B)	3 (C)	4 (D)
2H	CLOSED	OPEN	CLOSED	CLOSED
4H	OPEN	CLOSED	CLOSED	OPEN
4L	OPEN	CLOSED	OPEN	CLOSED

- Does the 4X4 control module PID and Instrument Cluster (IC) indicator lamp indicate that the vehicle shifted into 2WD?

Yes: GO to C16 .

No: GO to C19.

C16 CHECK FOR TRANSFER CASE DISENGAGEMENT

- With the vehicle in NEUTRAL, position it on a hoist. Refer to JACKING AND LIFTING .
- Rotate the rear driveshaft while observing the front driveshaft.
- Does the front driveshaft rotate?

Yes: The system is functioning correctly.

No: GO to C17 .

C17 CHECK THE TRANSFER CASE CONTACT PLATE POSITION PIDs

- Connect the scan tool.

NOTE: Once the contact plate power (PLATE_PWR) active command is activated, it is necessary to re-enter DataLogger and deselect then reselect the PLATE_PWR active command when the MSS is placed in a different position.

- Using the active command contact plate power (PLATE_PWR) to energize the transfer case motor contact plate position return circuit.
- Monitor the 4X4 control module Transfer Case Contact Plate Switch A (PLATE_A), B (PLATE_B), C (PLATE_C) and D (PLATE_D) PIDs.
- Switch the MSS from 2H to 4H.

CONTACT PLATE POSITION

MSS Position	Contact Plate Position			
	1 (A)	2 (B)	3 (C)	4 (D)
2H	CLOSED	OPEN	CLOSED	CLOSED
4H	OPEN	CLOSED	CLOSED	OPEN
4L	OPEN	CLOSED	OPEN	CLOSED

- Does the transfer case contact plate PID indicate 4H?

Yes: GO to C28.

No: GO to C18 .

C18 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 2WD position to the 4X4 HIGH position?

Yes: GO to C28.

No: GO to C19 .

C19 CHECK CIRCUITS CCF14 (GN/OG), CCF15 (BN/YE), CCF16 (VT/GN), CCF17 (WH/OG) AND RCF09 (BN/WH) FOR AN OPEN

- Ignition OFF.
- Disconnect: Transfer Case C350.
- Disconnect: 4X4 Control Module C281a.
- Measure the resistance of the following circuits between transfer case C350 harness side and 4X4 control module C281a harness side:

RESISTANCE SPECIFICATION

Transfer Case	Circuit	4X4 Control Module
C350-5	CCF14 (GN/OG)	281A-1
C350-1	CCF15 (BN/YE)	281A-2
C350-2	CCF16 (VT/GN)	281A-3
C350-3	CCF17 (WH/OG)	281A-4
C350-6	RCF09 (BN/WH)	281A-16

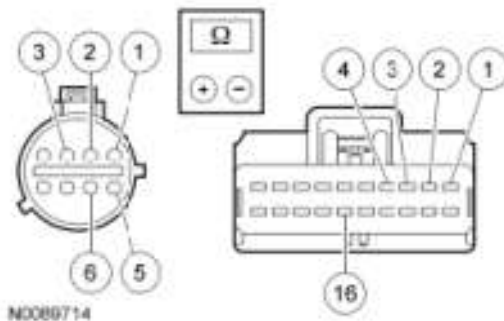


Fig. 13: Measuring Resistance Between Transfer Case C350 And 4X4 Control Module C281A

Courtesy of FORD MOTOR CO.

- Are the resistances less than 5 ohms?

Yes: GO to C20 .

No: REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

C20 CHECK CIRCUITS CCF14 (GN/OG), CCF15 (BN/YE), CCF16 (VT/GN), CCF17 (WH/OG) AND RCF09 (BN/WH) FOR A SHORT TO VOLTAGE

- Measure the voltage between the following circuits at transfer case C350, harness side and ground:

VOLTAGE SPECIFICATION

Circuit	Pin
CCF14 (GN/OG)	5
CCF15 (BN/YE)	1

CCF16 (VT/GN)	2
CCF17 (WH/OG)	3
RCF09 (BN/WH)	6

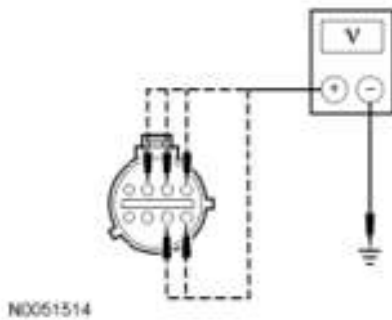


Fig. 14: Measuring Voltage Between Transfer Case C350 And Ground
 Courtesy of FORD MOTOR CO.

- **Is any voltage present?**

Yes: REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

No: GO to C21 .

C21 CHECK CIRCUITS CCF14 (GN/OG), CCF15 (BN/YE), CCF16 (VT/GN), CCF17 (WH/OG) AND RCF09 (BN/WH) FOR A SHORT TO GROUND

- Measure the resistance between the following circuits at transfer case C350, harness side and ground:

RESISTANCE SPECIFICATION

Circuit	Pin
CCF14 (GN/OG)	5
CCF15 (BN/YE)	1
CCF16 (VT/GN)	2
CCF17 (WH/OG)	3
RCF09 (BN/WH)	6

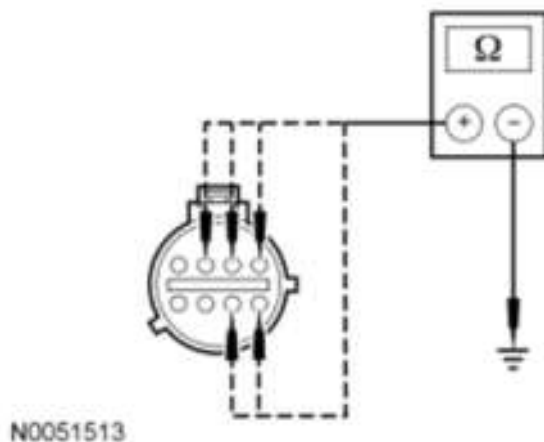


Fig. 15: Measuring Resistance Between Transfer Case C350 And Ground
 Courtesy of FORD MOTOR CO.

- Are the resistances greater than 10,000 ohms?

Yes: GO to C22 .

No: REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

C22 CHECK THE SHIFT MOTOR FOR AN INTERNAL SHORT TO GROUND

- Measure the resistance between shift motor pins 1, 2, 3, 5 and 6, component side and ground.

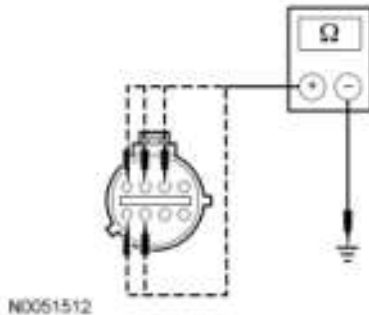


Fig. 16: Measuring Resistance Between Shift Motor Pins Component Side And Ground
Courtesy of FORD MOTOR CO.

- Is the resistance greater than 10,000 ohms?

Yes: GO to C23 .

No: INSTALL a new transfer case shift motor. REFER to **TRANSFER CASE SHIFT MOTOR**. CLEAR the DTCs. REPEAT the self-test. GO to C27.

C23 CHECK CIRCUITS CCF08 (GY/OG) AND CCF07 (BN/GN) FOR POWER USING THE CLOCKWISE RELAY CONTROL (CW_RELAY) AND COUNTERCLOCKWISE RELAY CONTROL (CCW_RELAY) ACTIVE COMMANDS

- Connect: 4X4 Control Module C281A.
- Enter the following diagnostic mode on the scan tool: DataLogger - 4X4 Control Module.
- Command the CW_RELAY active command ON and OFF and measure the voltage between transfer case C350-4, circuit CCF07 (BN/GN), harness side and ground. Command the CCW_RELAY active command ON and OFF and measure the voltage between transfer case C350-7, circuit CCF08 (GY/OG), harness side and ground.

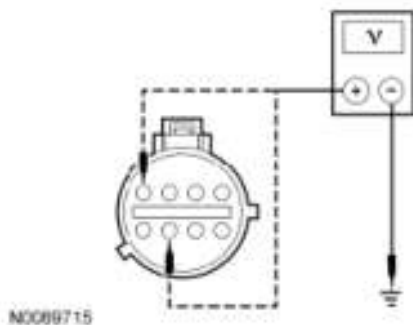


Fig. 17: Measuring Voltage Between Transfer Case C350-7, Circuit CCF08 (GY/OG), Harness Side And Ground
Courtesy of FORD MOTOR CO.

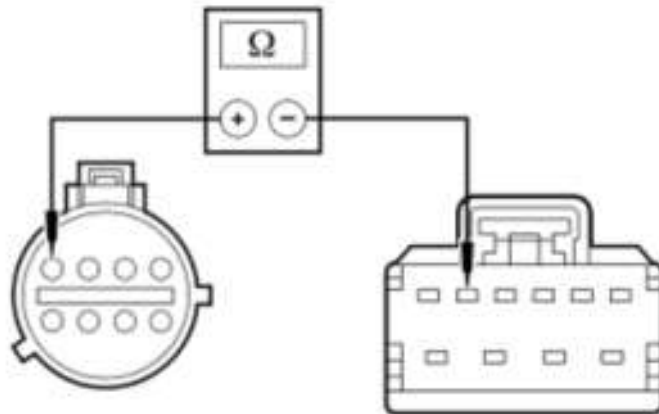
- Are the voltages 9 volts or greater on the circuit being commanded?

Yes: INSTALL a new transfer case shift motor. REFER to **TRANSFER CASE SHIFT MOTOR**. CLEAR the DTCs. REPEAT the self-test. GO to C27.

No: GO to C24 .

C24 CHECK CIRCUITS CCF07 (BN/GN) AND CCF08 (GY/OG) FOR AN OPEN

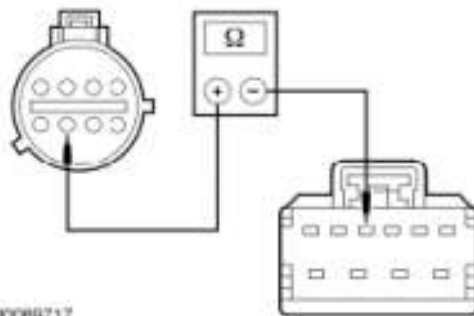
- Ignition OFF.
- Disconnect: 4X4 Control Module C281b.
- Measure the resistance between transfer case C350-4, harness side and 4X4 control module C281b-5, harness side circuit CCF07 (BN/GN).



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Fig. 18: Measuring Resistance Between Transfer Case C350-4, Harness Side And 4X4 Control Module C281B-5, Harness Side Circuit CCF07 (BN/GN)
Courtesy of FORD MOTOR CO.

- Measure the resistance between transfer case C350-7, harness side and 4X4 control module C281b-4, harness side circuit CCF08 (GY/OG).



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Fig. 19: Measuring Resistance Between Transfer Case C350-7, Harness Side And 4X4 Control Module C281B-4, Harness Side Circuit CCF08 (GY/OG)
Courtesy of FORD MOTOR CO.

- **Are the resistances less than 5 ohms?**
Yes: Connect 4X4 control module C281b. GO to C25 .
No: REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

C25 CHECK CIRCUITS CCF07 (BN/GN) AND CCF08 (GY/OG) FOR A SHORT TO POWER

- Ignition ON.
- Measure the voltage between transfer case C350-4, circuit CCF07 (BN/GN), harness side and ground; and between transfer case C350- 7, circuit CCF08 (GY/OG), harness side and ground.

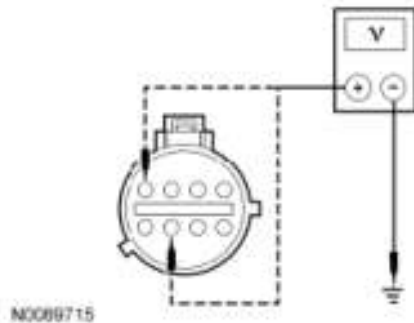


Fig. 20: Measuring Voltage Between Transfer Case C350-4, Circuit CCF07 (BN/GN) And Ground
 Courtesy of FORD MOTOR CO.

- Measure the voltage between transfer case C350-7, circuit CCF08 (GY/OG), harness side and ground.
- **Is any voltage present?**
Yes: REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.
No: GO to C26 .

C26 CHECK CIRCUITS CCF07 (BN/GN) AND CCF08 (GY/OG) FOR A SHORT TO GROUND

- Ignition OFF.
- Measure the resistance between transfer case C350-4, circuit CCF07 (BN/GN), harness side and ground.

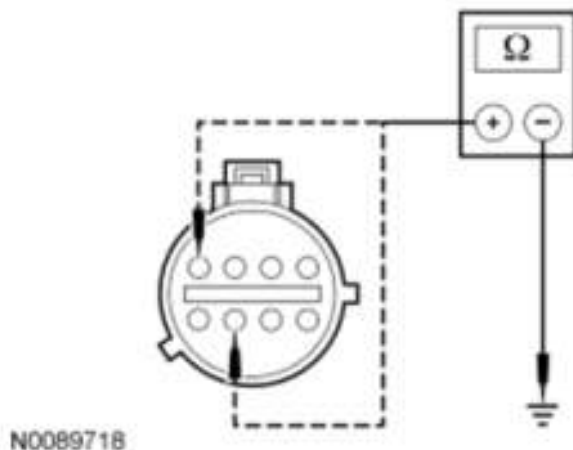


Fig. 21: Measuring Resistance Between Transfer Case C350-4, Circuit CCF07 (BN/GN), Harness Side And Ground
 Courtesy of FORD MOTOR CO.

- Measure the resistance between transfer case C350-7, circuit CCF08 (GY/OG), harness side and ground.

- **Are the resistances greater than 10,000 ohms?**

Yes: GO to C27 .

No: REPAIR the circuit. CLEAR the DTCs. REPEAT the self-test.

C27 ATTEMPT TO DUPLICATE THE CONCERN

- Inspect and, if necessary, clean the 4X4 control module and connectors.
- Drive the vehicle and attempt to duplicate the concern.

- **Is the concern still present?**

Yes: INSTALL a new 4X4 control module. REFER to **4X4 CONTROL MODULE**. REPEAT the self-test.

No: CLEAR the DTCs. REPEAT the self-test.

C28 SHIFT THE TRANSFER CASE TO 4X4 HIGH MANUALLY

- Remove the transfer case shift motor from the transfer case.
- Using a suitable wrench, rotate the shift cam to the 4X4 HIGH position.
- Rotate the rear driveshaft and watch the front driveshaft.
- **Does the transfer case shift to 4X4 HIGH and the front driveshaft rotate?**

Yes: GO to C29 .

No: REPAIR the transfer case. REFER to **TRANSFER CASE** .

C29 CHECK THE TORQUE REQUIRED TO SHIFT THE TRANSFER CASE

- Rotate the shift cam by hand through 4X4 LOW, N and 4X4 HIGH positions.
- Measure the torque required to carry out the shift.
- **Is the torque required to shift 45 Nm (33 lb-ft) or less?**

Yes: GO to C30 .

No: REPAIR the transfer case. REFER to **TRANSFER CASE** .

C30 SHIFT THE TRANSFER CASE TO 2WD MANUALLY

- Rotate the shift cam to the 2WD position.
- Rotate the rear driveshaft and watch the front driveshaft.
- **Does the transfer case shift to 2WD and the front driveshaft not rotate?**

Yes: GO to C31 .

No: REPAIR the transfer case. REFER to **TRANSFER CASE** .

C31 SHIFT THE TRANSFER CASE TO 4X4 LOW MANUALLY

- Rotate the shift cam by hand to the 4X4 LOW position.
- Rotate the rear driveshaft and watch the front driveshaft.
- **Does the transfer case shift to 4X4 LOW and the front driveshaft rotate?**

Yes: INSTALL a new transfer case shift motor. REFER to **TRANSFER CASE SHIFT MOTOR**.

No: REPAIR the transfer case. REFER to **TRANSFER CASE** .

Pinpoint Test D: The Vehicle Does Not Shift Between Four-Wheel Drive (4WD) High and Four-Wheel Drive (4WD) Low Correctly

Refer to **SYSTEM WIRING DIAGRAMS** 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 transmission range selection must be met before this shift can occur. Systematically check the necessary inputs and outputs of the 4X4 control module, components of the transfer case and halfshafts.

This pinpoint test is intended to diagnose the following:

- Transmission neutral switch
- ABS wheel speed inputs
- Controller Area Network (CAN) communication network

PINPOINT TEST D: THE VEHICLE DOES NOT SHIFT BETWEEN FOUR-WHEEL DRIVE (4WD) HIGH AND FOUR-WHEEL DRIVE (4WD) LOW CORRECTLY

D1 CHECK THE 2WD TO 4WD SHIFT

- Drive the vehicle and shift the Mode Select Switch (MSS) from 2H to 4H.
- **Does the vehicle shift between 2-Wheel Drive (2WD) and Four-Wheel Drive (4WD) correctly?**

Yes: GO to **D2** .

No: GO to **PINPOINT TEST C**.

D2 CHECK THE 4X4 HIGH TO 4X4 LOW SHIFT

- Drive the vehicle and shift the MSS from 4H to 4L with:
 - vehicle speed less than 5 km/h (3 mph).
 - transmission in NEUTRAL (or clutch pedal applied).
- **Does the transfer case shift from 4X4 HIGH to 4X4 LOW correctly and is the concern related to a clunk noise during the shift?**

Yes: Transmission neutral drag is excessive. REFER to **AUTOMATIC TRANSAXLE/TRANSMISSION - 5R44E AND 5R55E** for transmission diagnosis.

No: GO to **D3** .

D3 CHECK THE NEUTRAL SAFETY SWITCH (NTRL_SW) AND ABS MODULE WHEEL SPEED PIDs

- Enter the following diagnostic mode on the scan tool: DataLogger - 4X4 Control Module.
 - Vehicles equipped with automatic transmissions:** Monitor the NTRL_SW PID while shifting the transmission through gear ranges.
 - Vehicles equipped with manual transmissions:** Monitor the NTRL_SW PID while applying the clutch pedal.
- Enter the following diagnostic mode on the scan tool: DataLogger - ABS Module.
- Monitor the ABS module wheel speed PIDs.
 - Left Front Wheel Speed Sensor (LF_WSPD)
 - Left Rear Wheel Speed Sensor (LR_WSPD)
 - Rear Differential Wheel Speed (R_DIF_SPD)
- **A. Vehicles equipped with automatic transmissions: Does the 4 NTRL_SW indicate NEUTRAL when the transmission is shifted to NEUTRAL?**

B. Vehicles equipped with manual transmissions: Does the NTRL_SW PID indicate on when the clutch pedal is applied?

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

Yes: If all 4 PIDs are accurate, GO to **PINPOINT TEST C.**

No: A . REFER to **AUTOMATIC TRANSAXLE/TRANSMISSION - 5R44E AND 5R55E** for further diagnosis of the Transmission Range (TR) sensor and the CAN communication network.

B . REFER to **CRUISE CONTROL** for further diagnosis of the Clutch Pedal Position (CPP) switch.

C . REFER to **VEHICLE DYNAMIC SYSTEMS** for further diagnosis of the ABS system and the CAN communication network.

Pinpoint Test E: The Four-Wheel Drive (4WD) System Jumps Out of Gear

Refer to **SYSTEM WIRING DIAGRAMS** for schematic and connector information.

Normal Operation

Once the Four-Wheel Drive (4WD) system engages the user selected mode, that mode should be maintained. If the 4WD system does not stay in the selected position systematically check the 4WD system components.

This pinpoint test is intended to diagnose the following:

- Mode Select Switch (MSS)
- Transfer case

PINPOINT TEST E: THE 4WD SYSTEM JUMPS OUT OF GEAR

E1 VERIFY THE CONCERN

- Drive the vehicle and attempt to duplicate the concern.
- **Is the concern an uncommanded range shift (in or out of LOW range)?**

Yes: GO to E4.

No: GO to **E2** .

E2 CHECK THE 4WD SWITCH STATUS (4WD_SW) PID

- Ignition OFF.
- Connect the scan tool.
- Ignition ON.
- Drive the vehicle.
- Monitor the 4WD_SW PID while driving the vehicle in each shift position.
- **Does the 4WD_SW PID always agree with the switch position?**

Yes: GO to **E3** .

No: GO to **PINPOINT TEST C.**

E3 CHECK FOR DTCs

- Carry out the on-demand self test.
- **Are DTCs present?**

Yes: REFER to the **4X4 CONTROL MODULE DTC CHART**.

No: GO to **PINPOINT TEST G**.

E4 CHECK THE 4WD INDICATORS

- Stop the vehicle.
- Transmission in NEUTRAL.
- Observe the 4WD indicators in the Instrument Cluster (IC) while cycling through each MSS position.
- **Do the 4WD indicators match MSS switch positions?**

Yes: GO to E2.

No: GO to E5 .

E5 CHECK FOR DTCs

- Transmission in PARK.
- Carry out the on-demand self test.
- **Are DTCs present?**

Yes: REFER to the **4X4 CONTROL MODULE DTC CHART**.

No: CHECK the transfer case fluid level. REFER to **TRANSFER CASE** . If the fluid level is OK, CHECK for internal transfer case faults. REFER to **TRANSFER CASE** .

Pinpoint Test F: Straightline Driveline Wind-up

Refer to **SYSTEM WIRING DIAGRAMS** for schematic and connector information.

Normal Operation

In order for the Four-Wheel Drive (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.

This pinpoint test is intended to diagnose the following:

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

PINPOINT TEST F: STRAIGHTLINE DRIVELINE WIND-UP

NOTE: **4X4 HIGH/4X4 LOW is not intended for driving on hard/dry surfaces.**

F1 VERIFY THE CONCERN

- Drive the vehicle and shift from 2H to 4H. There should be minimal wind-up in 4X4 HIGH mode during straight line maneuvers, (wind-up in turns is normal; 4X4 HIGH/4X4 LOW is not intended for driving on hard/dry surfaces).

- **Is excessive wind-up present?**

Yes: GO to F2 .

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

F2 CHECK FOR MATCHING WHEEL AND TIRE SIZES

- Check the wheel and tire sizes.
- **Do the 4 wheel and tire sizes match?**

Yes: GO to F3 .

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

F3 CHECK TIRE WEAR

- Check each of the 4 tires for wear.
- **Are the 4 tires worn evenly?**

Yes: GO to F4 .

No: ADVISE the customer that 4WD systems require 4 matched, correctly inflated, correctly rotated tires to operate correctly.

F4 CHECK TIRE INFLATION PRESSURE

- Check the inflation pressure in each tire. Refer to the **VEHICLE CERTIFICATION (VC) LABEL** .
- **Are the tire inflation pressures correct?**

Yes: GO to F5 .

No: ADJUST the tire pressure as necessary. TEST the vehicle for normal operation. ADVISE the customer that 4WD systems require 4 matched, correctly inflated, correctly maintained tires to operate correctly.

F5 CHECK THE FRONT AND REAR AXLE RATIOS

- Check that front and rear axle ratios match. Refer to **FRONT DRIVE AXLE/DIFFERENTIAL - DANA 35** .
- **Do the front and rear axle ratios match?**

Yes: RETURN the vehicle to the customer and ADVISE about correct 4WD usage and normal vehicle behavior.

No: CHECK the Vehicle Identification Label (VIL). INSTALL the correct axle(s). REFER to **DRIVELINE SYSTEM - GENERAL INFORMATION** .

Pinpoint Test G: Electronic Shift-On-The-Fly (ESOF) Functional Test

Refer to **SYSTEM WIRING DIAGRAMS** for schematic and connector information.

Normal Operation

When operating in Four-Wheel Drive (4WD), the transfer case is locked. When in 4X4 LOW, the transfer case low range gear set provides an additional 2.64 gear reduction. When operating in 2-Wheel Drive (2WD), the transfer case is unlocked.

This pinpoint test is intended to diagnose the following:

- Transfer case and related components

- Wheel/tire assemblies

PINPOINT TEST G: ELECTRONIC SHIFT-ON-THE-FLY (ESOF) FUNCTIONAL TEST

NOTE: **4X4 HIGH/4X4 LOW is not intended for driving on hard/dry surfaces.**

G1 CHECK FOR 4WD INDICATOR PROVE OUT

- Ignition OFF.
- Ignition ON.
- **Do the 4WD indicators illuminate at prove out?**

Yes: GO to **G2** .

No: CHECK the Instrument Cluster (IC) for faults. REFER to **INSTRUMENTATION AND WARNING CHIMES** .

G2 CHECK 2WD OPERATION

- Stop the vehicle.
- Transmission in NEUTRAL.
- Switch the Mode Select Switch (MSS) to 2H.
- **Do the 4WD indicators turn off?**

Yes: GO to G5.

No: GO to **G3** .

G3 CHECK FOR DTCs

- Transmission in PARK.
- Connect the scan tool.
- Carry out the on-demand self test.
- **Are DTCs retrieved?**

Yes: REFER to the **4X4 CONTROL MODULE DTC CHART** for diagnosis.

No: GO to **G4** .

G4 CHECK FOR WIND-UP IN 2WD

- Drive the vehicle on a dry, hard surface while executing turns.
- **Is wind-up present in turns?**

Yes: REPAIR the transfer case. REFER to **TRANSFER CASE** .

No: GO to **G5** .

G5 CHECK 4X4 HIGH OPERATION

- Switch the MSS to 4H.
- **Does the 4X4 HIGH indicator illuminate correctly?**

Yes: GO to G8.

No: GO to **G6** .

G6 CHECK FOR DTCs

- Transmission in PARK.
- Connect the scan tool.
- Carry out the on-demand self test.
- **Are DTCs retrieved?**

Yes: REFER to the 4X4 CONTROL MODULE DTC CHART for diagnosis.

No: GO to G7 .

G7 CHECK FOR WIND-UP IN 4X4 HIGH

- Drive the vehicle on a dry, hard surface while executing turns.
- **Is wind-up present in turns?**

Yes: GO to PINPOINT TEST H.

No: GO to PINPOINT TEST C.

G8 CHECK FOR WIND-UP IN 4X4 HIGH

- Drive the vehicle on a dry, hard surface.
- **Is straightline wind-up present?**

Yes: GO to PINPOINT TEST F.

No: GO to G9 .

G9 CHECK FOR 4X4 HIGH WIND-UP IN TURNS

- Drive the vehicle in 4X4 HIGH while turning.
- **Is wind-up present in turns?**

Yes: GO to G10 .

No: GO to PINPOINT TEST C.

G10 CHECK 4X4 LOW OPERATION

- Bring the vehicle to a stop, transmission in NEUTRAL, switch the MSS to 4L.
- **Does the 4X4 LOW indicator illuminate correctly?**

Yes: GO to G13.

No: GO to G11 .

G11 CHECK FOR DTCs

- Transmission in PARK.
- Release the brake pedal.
- Connect the scan tool.
- Carry out the on-demand self test.
- **Are DTCs retrieved?**

Yes: REFER to the 4X4 CONTROL MODULE DTC CHART for diagnosis.

No: GO to G12 .

G12 CHECK FOR WIND-UP IN 4X4 LOW

- Drive the vehicle on a dry, hard surface while executing turns.
- **Is wind-up present in turns?**

Yes: GO to PINPOINT TEST H.

No: GO to PINPOINT TEST D.

G13 CHECK FOR 4X4 LOW WIND-UP IN TURNS

- Drive the vehicle on a dry, hard surface while executing turns.
- **Is wind-up present and 4X4 LOW functioning?**

Yes: GO to G14 .

No: CHECK for 4X4 control module DTCs. REFER to the INSPECTION AND VERIFICATION procedure. If no DTCs are present, GO to PINPOINT TEST D.

G14 CHECK 4X4 LOW TO 2WD SHIFT

- With the vehicle at a stop and the transmission in NEUTRAL, switch the MSS from 4L to 2H.
- **Do the 4WD indicators turn off?**
Yes: GO to G17.
No: GO to G15 .

G15 CHECK FOR DTCs

- Transmission in PARK.
- Release the brake pedal.
- Connect the scan tool.
- Carry out the on-demand self test.
- **Are DTCs retrieved?**
Yes: REFER to the 4X4 CONTROL MODULE DTC CHART for diagnosis.
No: GO to G16 .

G16 CHECK FOR WIND-UP IN 2WD

- Switch the MSS to 2H.
- Drive the vehicle on a dry, hard surface while executing turns.
- **Is wind-up present in turns?**
Yes: GO to PINPOINT TEST D.
No: GO to PINPOINT TEST H.

G17 CHECK FOR TRANSFER CASE DISENGAGEMENT

- With the vehicle in NEUTRAL, position it on a hoist. Refer to JACKING AND LIFTING .
- Rotate the rear driveshaft while observing the front driveshaft.
- **Does the front driveshaft rotate?**
Yes: REFER to TRANSFER CASE .
No: GO to G18 .

G18 CHECK 2WD TO 4X4 HIGH SHIFT AT SPEED ABOVE 32 KM/H (20 MPH)

- Switch the MSS to 2H.
- Drive the vehicle on the road and shift from 2WD to 4X4 HIGH while driving above 32 km/h (20 mph).
- **Does the transfer case shift to 4X4 HIGH satisfactorily?**
Yes: The 4WD system is functioning correctly.
No: GO to PINPOINT TEST F.

Pinpoint Test H: Four-Wheel Drive (4WD) Indicators Do Not Operate Correctly/Do Not Operate

Refer to SYSTEM WIRING DIAGRAMS for schematic and connector information.

Normal Operation

The 4X4 LOW and 4X4 indicator status is transmitted to the Instrument Cluster (IC) from the 4X4 control module through the Controller Area Network (CAN), circuits VDB04 (WH/BU) and VDB05 (WH). A steady indicator displays whether the vehicle is in 4X4 LOW or 4X4 HIGH mode, according to the driver selection. Flashing 4X4 and 4X4 LOW indicators are an indication that the IC has lost communication with

the 4X4 control module. For information about CAN , refer to **MODULE COMMUNICATIONS NETWORK** .

This pinpoint test is intended to diagnose the following:

- Four-Wheel Drive (4WD) system fault
- CAN circuits
- 4X4 control module
- IC

PINPOINT TEST H: THE FOUR-WHEEL DRIVE (4WD) INDICATORS DO NOT OPERATE CORRECTLY/DO NOT OPERATE

H1 CHECK THE 4WD INDICATOR PROVE-OUT

- Ignition OFF.
- Ignition ON.
- **Do the 4WD indicators prove out correctly?**

Yes: GO to H2 .

No: CHECK the IC for faults. REFER to **INSTRUMENT CLUSTER AND PANEL ILLUMINATION** .

H2 CHECK FOR DTCs

- Connect the scan tool.
- Carry out the on-demand self test.
- **Are DTCs present?**

Yes: REFER to the **4X4 CONTROL MODULE DTC CHART** for diagnosis.

No: GO to H3 .

H3 CHECK THE 4X4 INDICATORS IN 2H

- Switch the Mode Select Switch (MSS) to 2H.
- **Do any of the 4WD indicator(s) illuminate?**

Yes: GO to H5.

No: GO to H4 .

H4 CHECK THE 4X4 HIGH INDICATORS IN 4H

- Switch the MSS to 4H.
- Monitor the 4X4 IC indicator.
- **Does only the 4X4 IC indicator illuminate?**

Yes: GO to H6.

No: GO to H7.

H5 CHECK THE TRANSFER CASE CONTACT PLATE POSITION PIDs IN 2H

- Using the active command contact plate power (PLATE_PWR) to energize the transfer case motor contact plate position return circuit.
- Monitor the 4X4 control module Transfer Case Contact Plate Switch A (PLATE_A), B (PLATE_B), C (PLATE_C) and D (PLATE_D) PIDs in 2H.

CONTACT PLATE POSITION



MSS Position	Contact Plate Position			
	1 (A)	2 (B)	3 (C)	4 (D)
2H	CLOSED	OPEN	CLOSED	CLOSED
4H	OPEN	CLOSED	CLOSED	OPEN
4L	OPEN	CLOSED	OPEN	CLOSED

- Do the PIDs indicate that the motor is in the 2WD position?

Yes: CHECK the IC for faults. REFER to INSTRUMENTATION AND WARNING CHIMES .

No: GO to PINPOINT TEST C.

H6 CHECK THE INDICATORS IN 4L

- With the vehicle at a stop and the transmission in NEUTRAL, switch the MSS to 4L.
- Monitor the 4X4 LOW IC indicator.
- Does only the 4X4 LOW IC indicator illuminate?

Yes: The 4WD indicators are operating correctly. CARRY OUT the Electronic Shift-On-The-Fly (ESOF) Functional Test. GO to PINPOINT TEST G.

No: GO to H8.

H7 CHECK THE TRANSFER CASE CONTACT PLATE POSITION PIDs IN 4H

- Switch the MSS to 4H.
- Using the active command contact plate power (PLATE_PWR) to energize the transfer case motor contact plate position return circuit.
- Monitor the 4X4 control module Transfer Case Contact Plate Switch A (PLATE_A), B (PLATE_B), C (PLATE_C) and D (PLATE_D) PIDs in 4H.

CONTACT PLATE POSITION

MSS Position	Contact Plate Position			
	1 (A)	2 (B)	3 (C)	4 (D)
2H	CLOSED	OPEN	CLOSED	CLOSED
4H	OPEN	CLOSED	CLOSED	OPEN
4L	OPEN	CLOSED	OPEN	CLOSED

- Do the PIDs indicate that the motor is in the 4X4 HIGH position?

Yes: CHECK the IC for faults. REFER to INSTRUMENT CLUSTER AND PANEL ILLUMINATION .

No: GO to PINPOINT TEST C.

H8 CHECK THE TRANSFER CASE CONTACT PLATE POSITION PIDs IN 4L

- Using the active command contact plate power (PLATE_PWR) to energize the transfer case motor contact plate position return circuit.
- Monitor the 4X4 control module Transfer Case Contact Plate Switch A (PLATE_A), B (PLATE_B), C (PLATE_C) and D (PLATE_D) PIDs in 4L.

CONTACT PLATE POSITION

MSS Position	Contact Plate Position			
	1 (A)	2 (B)	3 (C)	4 (D)

2H	CLOSED	OPEN	CLOSED	CLOSED
4H	OPEN	CLOSED	CLOSED	OPEN
4L	OPEN	CLOSED	OPEN	CLOSED

- **Do the PIDs indicate that the motor is in the 4X4 LOW position?**

Yes: CHECK the IC for faults. REFER to **INSTRUMENT CLUSTER AND PANEL ILLUMINATION** .

No: GO to **PINPOINT TEST D**.

Pinpoint Test I: Neutral Tow Functional Test

Refer to **SYSTEM WIRING DIAGRAMS** for schematic and connector information.

Normal Operation

Neutral tow is a dealer installed option that allows the vehicle to be towed without damaging the transmission. Neutral tow operates by disengaging the transmission from the rear differential.

This pinpoint test is intended to diagnose the following:

- Neutral tow indicator
- Controller Area Network (CAN) circuits
- Smart Junction Box (SJB)
- Transmission Range (TR) sensor
- Door ajar switch
- Ignition switch/circuitry

PINPOINT TEST I: NEUTRAL TOW FUNCTIONAL TEST

I1 CHECK THE NEUTRAL TOW INDICATOR PROVE OUT

- Ignition ON.
- Ignition OFF.
- **Does the neutral tow indicator prove-out?**

Yes: GO to I2 .

No: GO to I7.

I2 CHECK NEUTRAL TOW ACTIVATION

- Activate neutral tow:
 - make sure that the Four-Wheel Drive (4WD) system is in 2-Wheel Drive (2WD) mode.
 - press and hold the brake pedal.
 - transmission in N (NEUTRAL).
 - key in OFF position.
 - wait 5 seconds.
- **Does neutral tow activate?**

Yes: GO to I3 .

No: GO to I9.

I3 CHECK FOR NEUTRAL TOW TIME-OUT

- Close the driver door.
- Monitor the neutral tow indicator.
- **Does the indicator turn off after 20 seconds?**

Yes: GO to I4 .

No: CHECK the door ajar switch/SJB for faults. REFER to **INTERIOR LIGHTING** .

I4 CHECK NEUTRAL TOW INDICATION

- Open the driver door.
- Monitor the neutral tow indicator.
- **Does the neutral tow indicator illuminate?**

Yes: GO to I5 .

No: CHECK the door ajar switch/SJB for faults. REFER to **INTERIOR LIGHTING** .

I5 CHECK NEUTRAL DEACTIVATION BY THE IGNITION SWITCH

- Ignition ON.
- **Does neutral tow deactivate?**

Yes: GO to I6 .

No: GO to I9.

I6 CHECK NEUTRAL TOW REACTIVATION

- Reactivate neutral tow:
 - make sure that the 4WD system is in **2WD** mode.
 - press and hold the brake pedal.
 - transmission in N (NEUTRAL).
 - key in OFF position.
 - wait 5 seconds.
- Deactivate neutral tow by shifting the transmission out of NEUTRAL.
- **Does neutral tow reactivate then deactivate?**

Yes: The neutral tow system is functional.

No: GO to I10.

I7 CHECK NEUTRAL TOW SYSTEM INSTALLATION

- Verify that all neutral tow system components are installed correctly.
- **Are all neutral tow system components installed correctly?**

Yes: GO to I8 .

No: INSTALL the neutral tow system components as necessary. REPEAT the functional test.

I8 CHECK THE NEUTRAL TOW INDICATOR OPERATION

- Connect: DataLogger - 4X4 Control Module.
- Follow the scan tool directions to activate the neutral tow system.
- Monitor the neutral tow indicator.
- Key ON, then key OFF.
- **Does the neutral tow indicator prove-out correctly?**

Yes: GO to I2.

No: CHECK and REPAIR the neutral tow system wiring as necessary. REPEAT the functional test.

I9 CHECK THE TRANSFER CASE SHIFT MOTOR OPERATION BY ACTIVATING 4X4 LOW

- Ignition ON.
- Monitor the Instrument Cluster (IC) 4X4 LOW indicator:
 - vehicle stationary.
 - shift the transmission to N (Neutral).
 - select 4L.
 - wait for the 4X4 LOW indicator to illuminate in the IC indicating that the shift is complete.
- **Does the 4X4 LOW indicator illuminate?**
 - Yes:** GO to I10 .
 - No:** GO to **PINPOINT TEST D.**

I10 CHECK THE NEUTRAL SAFETY SWITCH (NTRL_SW) AND IGNITION STATE PIDs

- Connect the scan tool.
- Ignition OFF.
- Enter the following diagnostic mode on the scan tool: DataLogger - 4X4 Control Module.
- A. Monitor the NTRL_SW status PID while shifting the transmission through gear ranges.
- B. Monitor the ignition state PID.
 - Ignition Switch - Off/Unlock Position (IGN_O/U)
 - ACC Position (IGN_A)
 - Start Position 3 (IGN_S)
 - Ignition Switch - Run/Start Position (IGN_R/S)
 - Ignition Switch - Run Position (IGN_R)
- A. Does the NTRL_SW PID indicate NEUTRAL when the transmission is shifted to NEUTRAL?
 - B. Does the ignition state PID indicate OFF?

Yes: If both PIDs are accurate, INSTALL a new 4X4 control module. REFER to **4X4 CONTROL MODULE.** REPEAT the functional test.

No: A . REFER to **AUTOMATIC TRANSAXLE/TRANSMISSION - 5R44E AND 5R55E** for further diagnosis of the neutral safety switch.

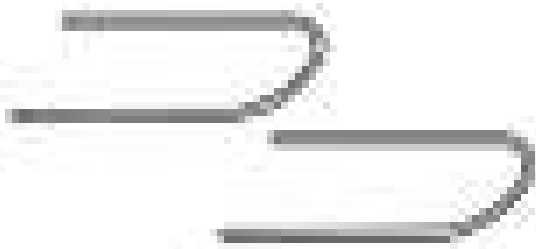
B . REFER to **STEERING COLUMN SWITCHES** for further diagnosis of the ignition switch.

REMOVAL AND INSTALLATION

MODE SELECT SWITCH (MSS)

Special Tool(s)

SPECIAL TOOL SPECIFICATION



Audio Unit Removing Tool 415-001 (T87P-19061-A)

ST1445-A

Mode Select Switch, Audio Unit And Antenna Cable Exploded View

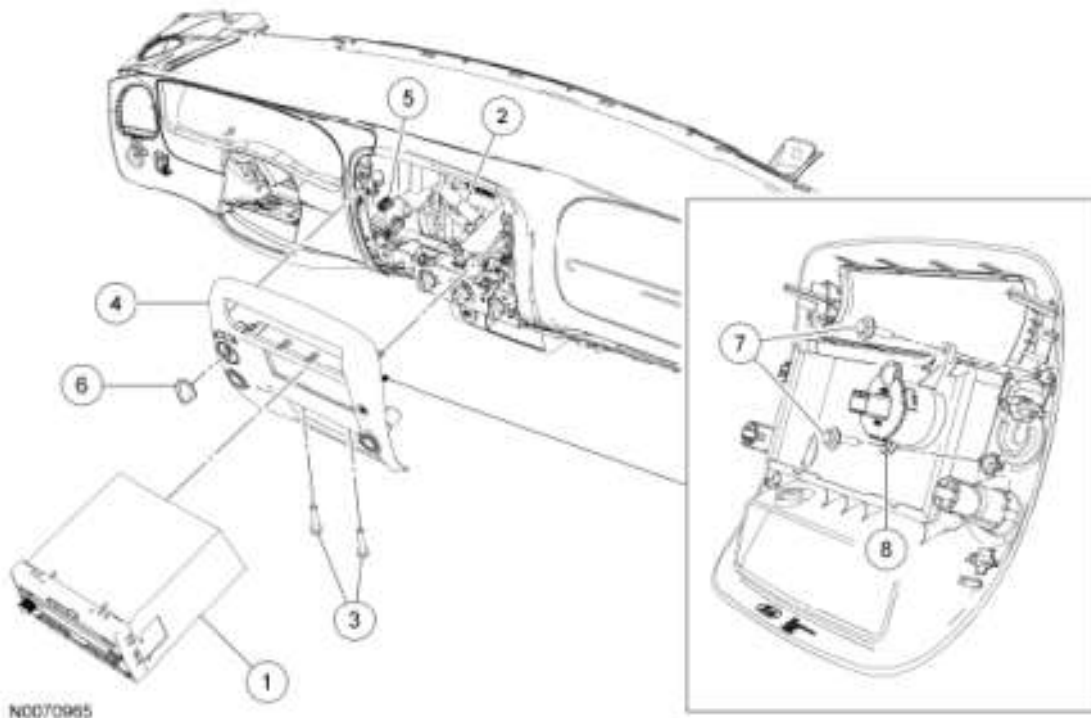


Fig. 22: Mode Select Switch, Audio Unit And Antenna Cable Exploded View
 Courtesy of FORD MOTOR CO.

PART NUMBER REFERENCE

Item	Part Number	Description
1	18C869	Audio unit
2	-	Audio unit electrical connectors and antenna cable
3	N807122	Screws (2 required)

4	04302	Instrument panel finish panel
5	-	Mode Select Switch (MSS) electrical connector
6	11666A	MSS knob
7	-	MSS screws (2 required)
8	14B166	MSS

Removal and Installation

NOTE: Before removing the audio unit, it must be placed in shipment mode. Failure to follow this instruction may result in damage to the audio unit.

1.

Put the audio unit in shipment mode. For additional information, refer to **INFORMATION AND ENTERTAINMENT SYSTEMS** .

2. Insert the Audio Unit Removing Tool, then remove and support the audio unit.

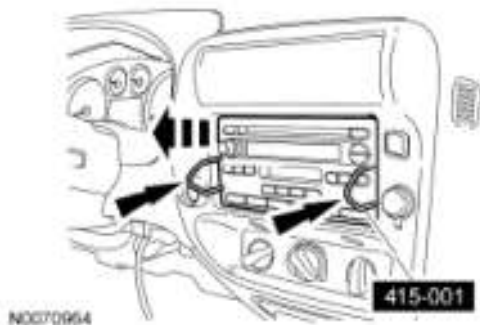


Fig. 23: Removing Audio Unit
Courtesy of FORD MOTOR CO.

3. Disconnect the audio unit electrical connector(s) and antenna cable.

4. Remove the 2 instrument panel finish panel screws. Disengage the spring clips at the top. Remove the instrument panel finish panel.



Fig. 24: Locating Instrument Panel Finish Panel Screws
Courtesy of FORD MOTOR CO.

5. Disconnect the finish panel electrical connectors.

6. Remove the Mode Select Switch (MSS) knob.

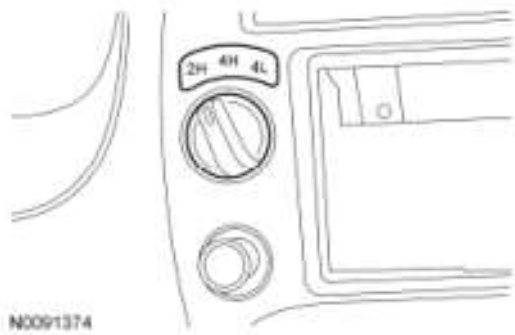


Fig. 25: Identifying Mode Select Switch Knob
 Courtesy of FORD MOTOR CO.

7. Turn the instrument panel finish panel over. Remove the 2 MSS screws.

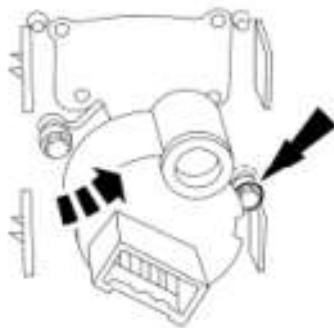


Fig. 26: Locating Instrument Panel Finish Panel Over Screws
 Courtesy of FORD MOTOR CO.

8. Remove the MSS .
9. To install, reverse the removal procedure.

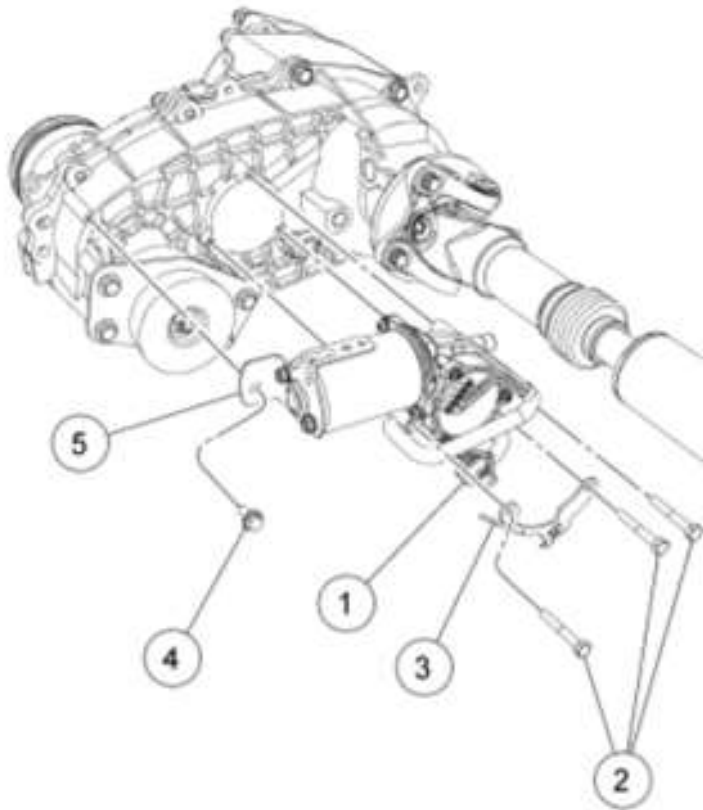
TRANSFER CASE SHIFT MOTOR

Material

MATERIAL SPECIFICATION

Item	Specification
Ultra Silicone Sealant TA-29	-

Transfer Case Shift Motor Exploded View



N0070962

Fig. 27: Transfer Case Shift Motor Exploded View
 Courtesy of FORD MOTOR CO.

PART NUMBER REFERENCE

Item	Part Number	Description
1	14A464	Transfer case shift motor electrical connector
2	N800670-S	Transfer case shift motor bolts (3 required)
3	7K470	J-clip
4	7A443	Transfer case shift motor bracket bolt
5	7G360	Transfer case shift motor

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING**.
2. Disconnect the transfer case shift motor electrical connector.

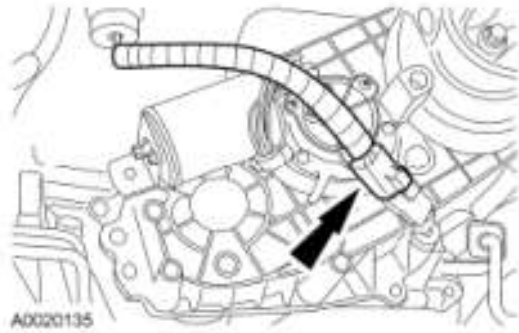


Fig. 28: Locating Transfer Case Shift Motor Electrical Connector
 Courtesy of FORD MOTOR CO.

3. Remove the coil wire from the shift motor electrical connector.
 1. Remove the inner retainer from the electrical connector.
 2. Lift up on the lock tab and remove the wire from the electrical connector.

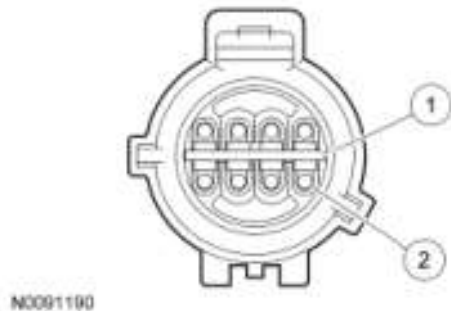


Fig. 29: Identifying Shift Motor Electrical Connector Terminal
 Courtesy of FORD MOTOR CO.

4. Remove the bracket bolt and the 3 transfer case shift motor bolts, remove the transfer case shift motor.
 - To install, tighten to 10 Nm (89 lb-in).

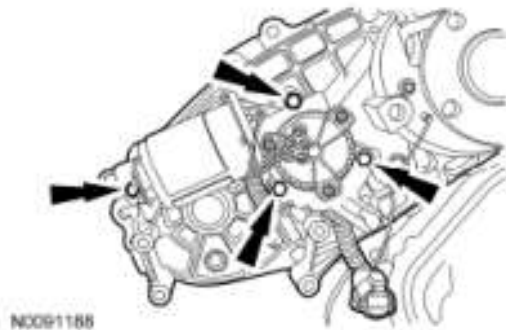


Fig. 30: Locating Transfer Case Shift Motor Bolts
 Courtesy of FORD MOTOR CO.

5. Remove the grease from the motor adapter and inspect for any nicks or burrs. If any damage is found, repair or install a new transfer case shift motor.

NOTE: It may be necessary to rotate the transfer case shift rod to match the shift motor position.

- 6.

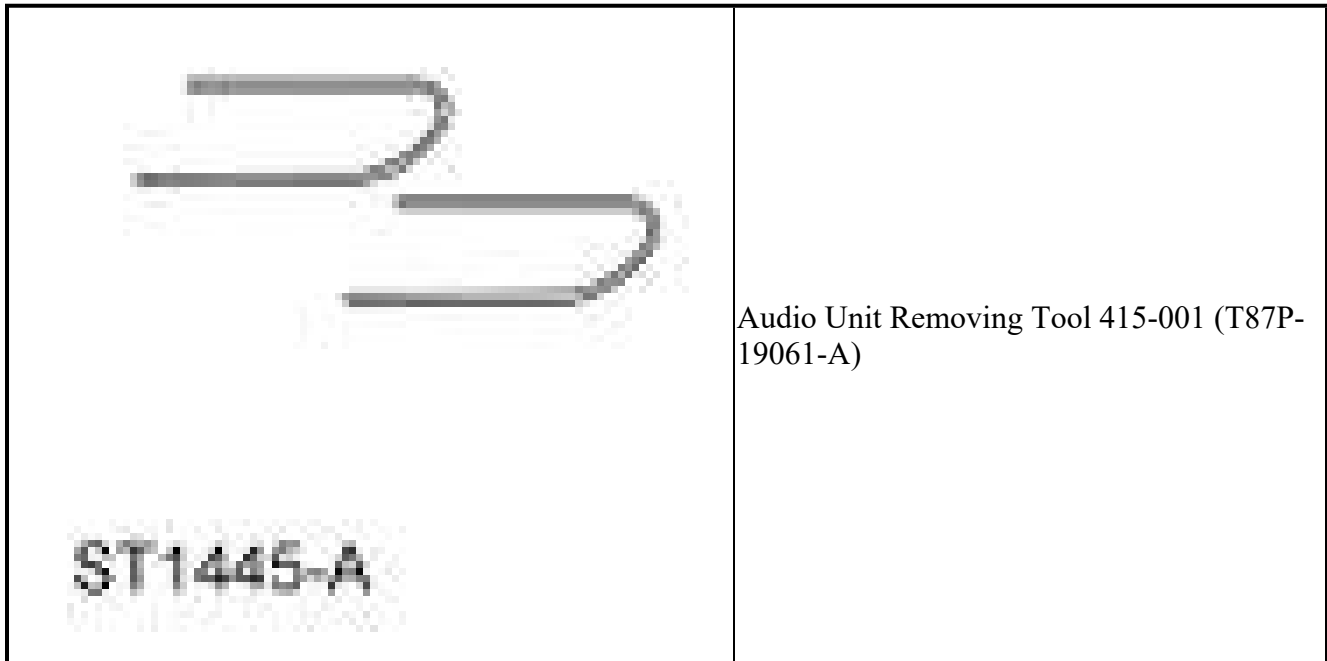
To install, reverse the removal procedure.

- Apply a thin coat of silicone sealant to the transfer case shift motor housing base.

4X4 CONTROL MODULE

Special Tool(s)

SPECIAL TOOL SPECIFICATION



4X4 Control Module And Audio Unit Exploded View

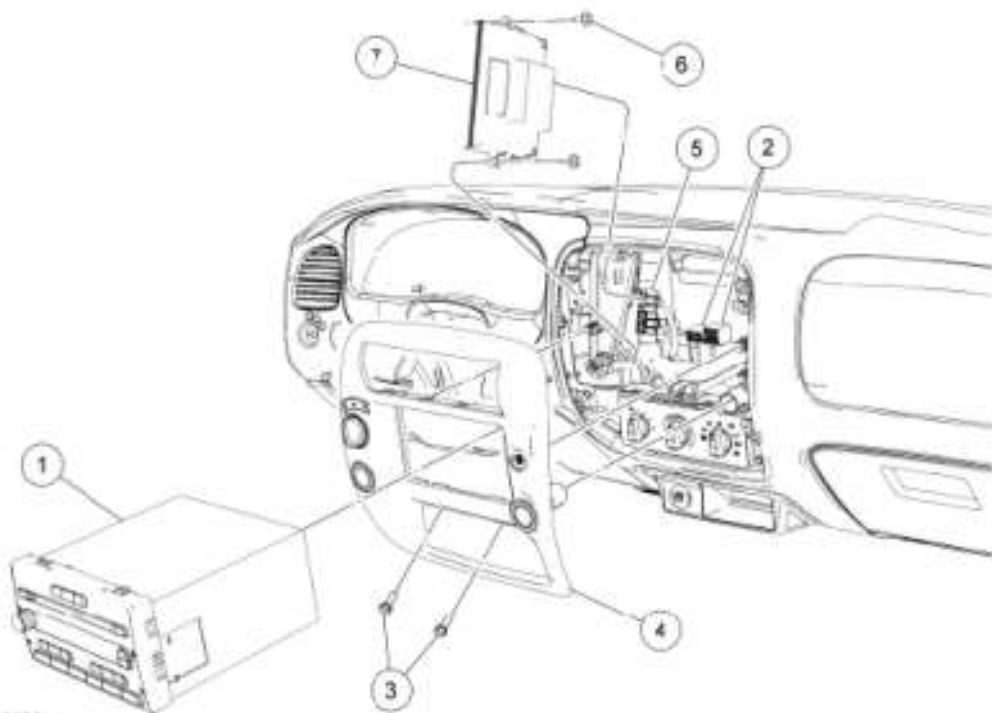


Fig. 31: 4X4 Control Module And Audio Unit Exploded View
 Courtesy of FORD MOTOR CO.

PART NUMBER REFERENCE

Item	Part Number	Description
1	18C869	Audio unit
2	-	Audio unit electrical connectors and antenna cable
3	N807122	Screws (2 required)
4	04302	Instrument panel finish panel
5	-	4X4 control module electrical connectors
6	-	4X4 control module screw (2 required)
7	7E453	4X4 control module

Removal and Installation

NOTE: Before removing the audio unit, it must be placed in shipment mode. Failure to follow this instruction may result in damage to the audio unit.

1.

Put the audio unit in shipment mode. For additional information, refer to **INFORMATION AND ENTERTAINMENT SYSTEMS** .

2. Insert the Audio Unit Removing Tool, then remove and support the audio unit.

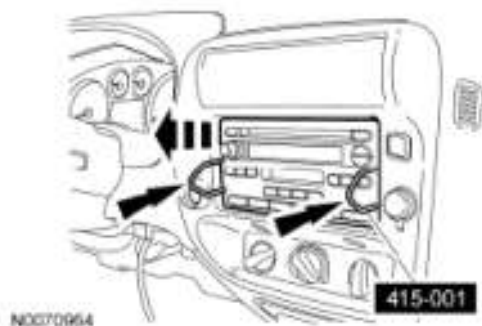


Fig. 32: Removing Audio Unit
 Courtesy of FORD MOTOR CO.

3. Disconnect the audio unit electrical connector(s) and antenna cable.
4. Remove the 2 instrument panel finish panel screws. Disengage the spring clips at the top. Remove the instrument panel finish panel.

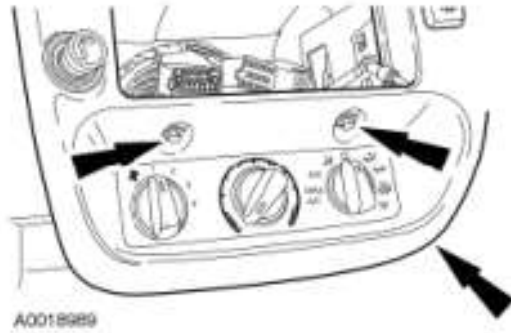


Fig. 33: Locating Instrument Panel Finish Panel Screws
Courtesy of FORD MOTOR CO.

5. Disconnect the finish panel electrical connectors.
6. Disengage the locking tangs and remove the 4X4 control module harness connectors.
7. Remove the two 4X4 control module screws.

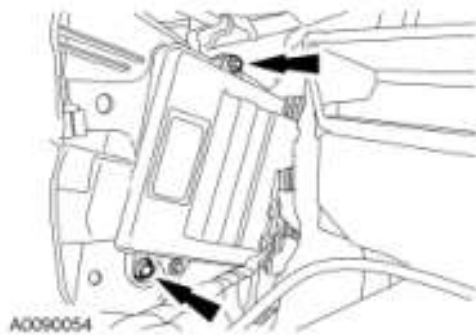


Fig. 34: Locating 4X4 Control Module Screws
Courtesy of FORD MOTOR CO.

8. Remove the 4X4 control module.
9. To install, reverse the removal procedure.