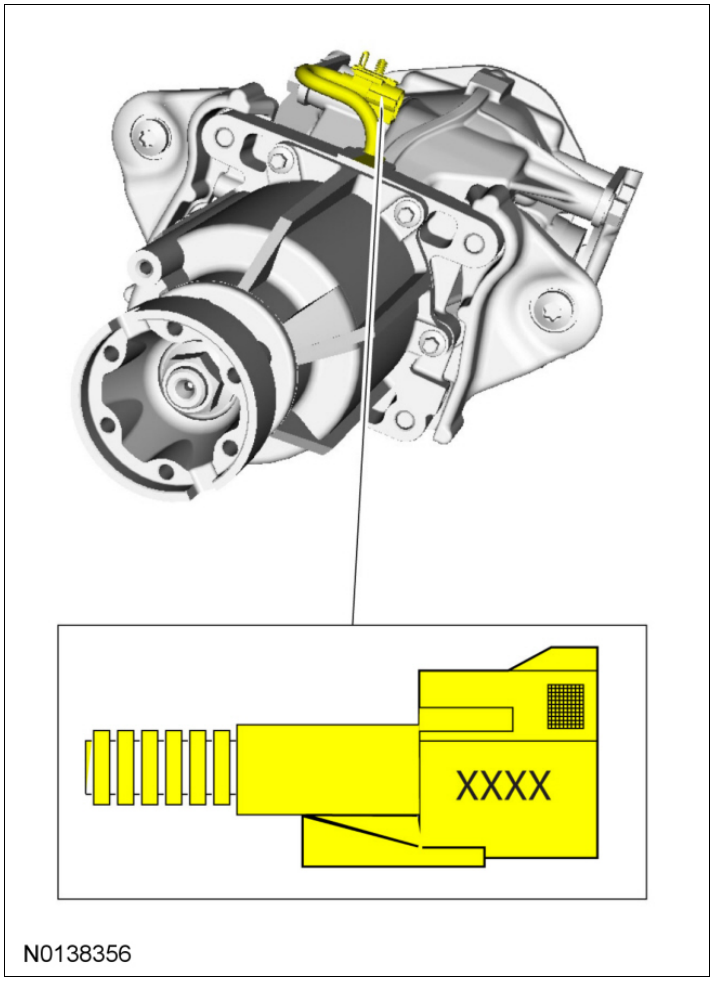
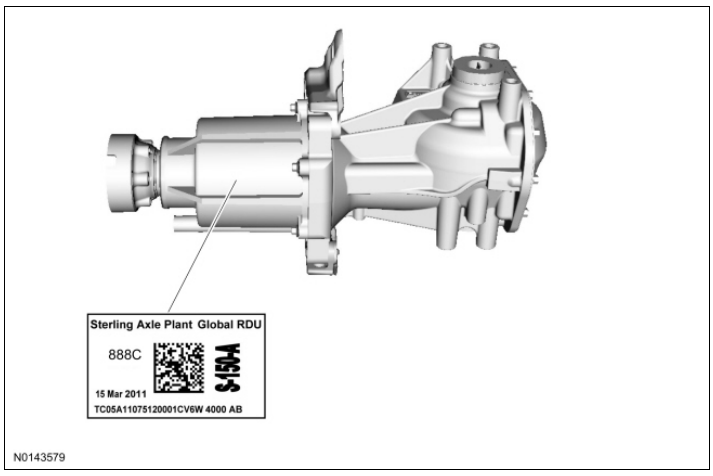


Aluminum Cover RDU



AWD Drive Cycle

Carry out the AWD drive cycle after downloading the ATC solenoid bar code information to the PCM.

NOTE: Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

1. Carry out 3 accelerations from 0-48 km/h (0-30 mph) in a straight line.
    - Perform this procedure at low, medium and full accelerator pedal position.
    - Verify that there is no perceived front wheel slip.

2. On dry pavement, drive the vehicle at 8 km/h (5 mph) in a fully locked turn.
    - Verify that there is no driveline binding.

Inspection and Verification

1. Verify the customer concern.

2. Inspect for obvious signs of mechanical or electrical damage.

Visual Inspection Chart

Mechanical	Electrical
• ATC solenoid (part of rear axle) • PTU • RDU • Halfshafts and CV joints • Driveshaft and U-joints • Fluid leaks • Wheel/tire size and brand • Matching tire size and brand • Tire pressure	• BJB fuse 70 (15A) • AWD relay module • Wiring harness • Connector(s) • Circuitry • PCM

3. Clear the DTCs and carry out the self-test.

4. If the DTCs retrieved are related to the concern, go to the DTC Chart. For all other DTCs, refer to Section 419-10 .

5. If no DTCs related to the concern are retrieved, GO to Symptom Chart .

DTC Chart

DTC Chart

DTC	Description	Action
P164D	AWD ID Block Corrupted, Not Programmed	CLEAR the DTC. REPEAT the self-test. If DTC returns, enter the ID located on the RDU and program into the PCM.
P181F	Clutch Control System Performance	This an internal AWD relay module fault. INSTALL a new AWD relay module. REFER to All Wheel Drive (AWD) Relay Module .
P187B	Tire Size Out of Acceptable Range - AWD Disabled	GO to Pinpoint Test B .
P188B	AWD Clutch Control Circuit	GO to Pinpoint Test C .
P188C	AWD Relay Module Communication Circuit	CLEAR the DTCs. REPEAT the self-test. If DTC returns, GO to Pinpoint Test D .

P188D	AWD Relay Module Feedback Circuit	CLEAR the DTCs. REPEAT the self-test. If DTC returns, GO to Pinpoint Test D .

Symptom Chart

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices.

In most circumstances, the PCM sets DTCs to help guide with diagnostics. Refer to the DTC Chart before using the symptom chart. The Condition column lists the vehicle condition. The Source column lists a detailed vehicle condition. The Action column lists the action to be performed to determine the cause of the condition. Each action lists the components that can caused the system and the individual components in that system. The components are listed in order of disassembly. Use the list of components and the required action to focus on disassembly inspections for the root cause of the concern.

Symptom Chart

Pinpoint Tests

Pinpoint Test A: AWD System Functional Test

Diagnostic Overview

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for more information. This pinpoint test is intended to diagnosis the AWD system concern without on-demand or continuous DTCs

Refer to Wiring Diagrams Cell 34 , All Wheel Drive (AWD) for schematic and connector information.

Normal Operation and Fault Conditions

The AWD system is an active system, which means it not only responds to wheel slip between the front and rear axles but also has the ability to anticipate wheel slip and transfer torque to the rear wheels before the slip occurs. The AWD system is active all the time and requires no input from the operator. The AWD system continuously monitors vehicle conditions and automatically adjusts the torque distribution between the front and rear wheels. During normal operation, most of the torque is delivered to the front wheels. If wheel slip between the front and rear wheels is detected, if the vehicle is under heavy acceleration or if the vehicle is in an aggressive handling event, the AWD system increases torque to the rear wheels to prevent or control wheel slip. When the AWD system is functioning properly, there should be no perceived speed difference between the front and rear axles when launching or driving the vehicle on any uniform surface. Traction should be similar to a part time 4WD system in 4H (4X4 HIGH), but have no binding in turns.

PINPOINT TEST A: AWD SYSTEM FUNCTIONAL TEST

⚠ 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.

Test Step	Result / Action to Take
A1 CHECK FOR ATC SOLENOID LOCK	
• Drive the vehicle on a dry, hard surface in turns while applying the accelerator pedal. • **Is driveline wind-up present in turns?**	**Yes** Keep the engine OFF for at least 10 minutes then repeat the test. CHECK again for wind-up. If no wind-up is found, GO to A3 . If still present, GO to Pinpoint Test e . **No** GO to A2 .
A2 CHECK THE ACCELERATOR PEDAL FUNCTION	
• Connect the scan tool. • Ignition ON. • Monitor the APP PID while pressing the accelerator pedal. • **Does the accelerator pedal position match the APP PID percent value?**	**Yes** GO to A3 . **No** REFER to the Powertrain Control/Emissions Diagnosis (PC/ED) manual to diagnose the accelerator pedal position sensor concern.
A3 CHECK ABS WHEEL SPEED SENSOR PIDS	
• Connect the scan tool. • Ignition ON. • While driving the vehicle at 48 km/h (30 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) • **Are all 4 wheel speeds within 2 km/h (1.2 mph) of each other?**	**Yes** GO to A4 . **No** REFER to Section 206-09 .
A4 CHECK VEHICLE ACCELERATION IN A STRAIGHT LINE	
• Perform 3 accelerations from 0-48 km/h (0-30 mph) in a straight line (1 each with low, medium and full accelerator pedal application). • **Does the vehicle pulsate or shudder while accelerating?**	**Yes** GO to Pinpoint Test D . **No** GO to A5 .
A5 CHECK VEHICLE TURNING ABILITY	
• Drive the vehicle in a fully locked turn, on dry pavement, at 8 km/h (5 mph).	**Yes** GO to Pinpoint Test D . **No**

• **Does the vehicle bind in the turn or resist turning?**	GO to A6 .
A6 CHECK TORQUE AT THE REAR WHEELS	
• Using the scan tool, energize the ATC solenoid to a constant 100% applied. • On dry pavement, drive the vehicle in a fully locked turn at 8 km/h (5 mph). • **Does the vehicle bind in the turn or resist turning?**	**Yes** END the active command. End of System Functional Test. **No** CHECK the PTU . REFER to Section 308-07B .

Pinpoint Test B: P187B

Diagnostic Overview

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices. This pinpoint test is intended to diagnosis the wheels and tires, wheel speed sensors ABS module and PCM.

Refer to Wiring Diagrams Cell 34 , All Wheel Drive (AWD) for schematic and connector information.

Normal Operation and Fault Conditions

The AWD system uses input data from the ABS module wheel speed sensor inputs to the PCM. A dissimilar spare tire size (other than the spare tire provided) or major dissimilar tire sizes or improperly inflated tires between the front and rear axles could cause the AWD system to stop functioning correctly.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P187B	Tire Size Out of Acceptable Range - AWD Disabled	When the PCM detects an inappropriate size wheels/tires (greater than 7% difference in size across the front and rear axle or greater than 14% difference in size at one wheel on either the front or rear axle) installed.

PINPOINT TEST B: P187B

⚠ 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.

Test Step	Result / Action to Take
B1 CHECK FOR RECENT TIRE USAGE	
• Check with customer about recent tire usage or installation.	**Yes** Tire size should not exceed OEM recommendations and that all 4 tires should be the same size and brand. REPEAT the

• **Was a tire recently installed on the vehicle that was not originally supplied with the vehicle or has the mini spare been used?**	self-test. **No** GO to B2 .
B2 CHECK TIRE SIZE AND BRAND	
• Check the tire size and brand. • **Are all 4 tires the same size and brand?**	**Yes** GO to B3 . **No** Tire size should not exceed OEM recommendations and that all 4 tires should be the same size and brand. INSTALL new tire(s) as necessary. ROAD TEST the vehicle.
B3 CHECK TIRE AIR PRESSURES	
• Check the air pressure in all 4 tires. • **Are all 4 tires at the recommended air pressure?**	**Yes** GO to B4 . **No** ADJUST tire air pressures. ROAD TEST the vehicle.
B4 CHECK ABS MODULE WHEEL SPEED SENSORS	
• Connect the scan tool. • Drive the vehicle at 48 km/h (30 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) • **Are all 4 wheel speeds within 2 km/h (1.2 mph) of each other?**	**Yes** GO to B5 . **No** The ABS module is sending invalid wheel speed data to the PCM, REFER to Section 206-09 .
B5 CHECK FOR CORRECT PCM OPERATION	
• Disconnect: PCM C175B (3.7L Ti-VCT). • Inspect the connector for damaged or pushed-out terminals, corrosion, loose wires and missing or damaged seals. • Disconnect: PCM C1381B (3.5L GTDI). • Inspect the connectors for damaged or pushed-out terminals, corrosion, loose wires	**Yes** INSTALL a new PCM, REFER to Section 303-14 . PROGRAM the PCM with the latest calibration. PERFORM the Solenoid Body Strategy Data Download procedure and PERFORM the Solenoid Body Strategy Drive Cycle, REFER to Section 307-01A . PROGRAM the PCM with the ATC bar code, REFER to Automatic Torque Coupling (ATC) Configuration . PERFORM the AWD Drive Cycle. **No** The system is operating correctly at this time. ROAD TEST the vehicle and PERFORM the AWD Drive Cycle.

and missing or damaged seals. • Connect: PCM C175B (3.7L Ti-VCT). • Connect: PCM C1381B (3.5L GTDI). • Ignition ON. • ROAD TEST the vehicle. • Operate the system and determine if the concern is still present. • **Is the concern still present?**	

Pinpoint Test C: P188B

Diagnostic Overview

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices. This pinpoint test is intended to diagnosis the wiring, terminals, connectors, AWD relay and PCM.

NOTE: Fuse 70 (15A) is HOT at all times and protects multiple components. Check related systems that may be inoperative.

Refer to Wiring Diagrams Cell 34 , All Wheel Drive (AWD) for schematic and connector information.

Normal Operation and Fault Conditions

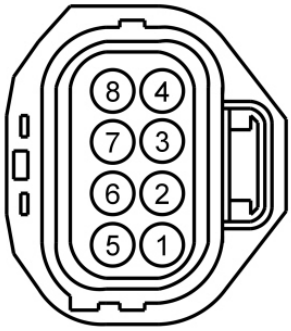
The AWD system uses data from other systems as inputs to the PCM. The PCM uses the inputs to determine the appropriate time to send a signal and have the AWD relay energize the ATC solenoid.

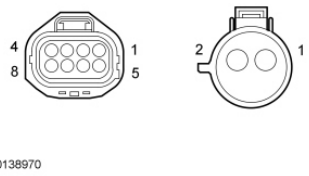
DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P188B	AWD Clutch Control Circuit	When the PCM detects an open, a short to ground or voltage on the active torque control coupling solenoid voltage supply and or return circuit.

PINPOINT TEST C: P188B

Test Step	Result / Action to Take
C1 CHECK THE ATC SOLENOID CIRCUITS	

• Disconnect: AWD Relay C281. • Inspect the connectors for damaged or pushed-out terminals, corrosion, loose wires and missing or damaged seals. • Measure the **resistance** between. Positive Lead: Pin C281-5, Circuit CCF21 (VT/WH) Negative Lead: Pin C281-8, Circuit RCF21 (WH/VT)  • **Is the resistance less than 10 ohms?**	**Yes** INSTALL a new AWD relay module. REFER to All Wheel Drive (AWD) Relay Module . **No** GO to C2 .
C2 CHECK THE ATC SOLENOID CIRCUITS FOR AN OPEN	
• Disconnect: ATC Solenoid C3347. • Inspect the connector for damaged or pushed-out terminals, corrosion, loose wires and missing or damaged seals. • Measure the **resistance** between. Positive Lead: Pin C281-5, Circuit CCF21 (VT/WH) Positive Lead: Pin C281-8, Circuit RCF21 (WH/VT) Negative Lead: Pin C3347-1, Circuit CCF21 (VT/WH) Negative Lead: Pin C3347-2, Circuit RCF21 (WH/VT)	**Yes** GO to C3 . **No** REPAIR the circuit.



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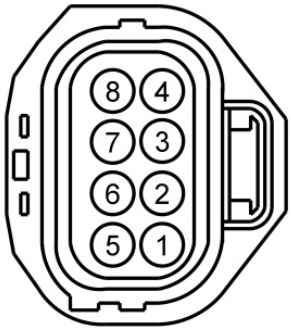
- **Is the resistance less than 5 ohms?**

C3 CHECK THE ATC SOLENOID CIRCUITS FOR A SHORT TO GROUND

- Measure the **resistance** between.

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
C281-5	CCF21 (VT/WH)	-	Ground
C281-8	RCF21 (WH/VT	-	Ground



- **Is the resistance greater than 10,000 ohms?**

Yes
GO to C4 .

No
REPAIR the circuit.

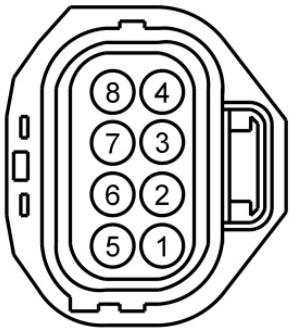
C4 CHECK THE ATC SOLENOID CIRCUITS FOR A SHORT TOGETHER

- Measure the **resistance** between.

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
C281-5	CCF21 (VT/WH)	C281-8	RC(WH/VT)

Yes
GO to C5 .

No
REPAIR the circuit.

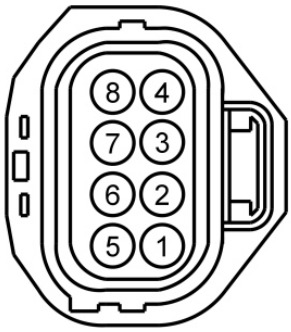


- **Is the resistance greater than 10,000 ohms?**

C5 CHECK THE ATC SOLENOID CIRCUITS FOR A SHORT TO POWER

- Ignition ON.
- Measure the **voltage** between.

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
C281-5	CCF21 (VT/WH)	-	Ground
C281-8	RCF21 (WH/VT)	-	Ground



- **Is any voltage present?**

Yes
REPAIR the circuit.

No
GO to C6 .

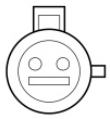
C6 CHECK THE ATC SOLENOID

- Measure the **component side resistance** between.

Positive Lead		Negative Lead	
Pin	Circuit	Pin	Circuit
C3347-1	-	C3347-2	-

Yes
INSTALL a new PCM. REFER to Section 303-14 . PROGRAM the PCM with the latest calibration. PERFORM the Solenoid Body Strategy Data Download procedure and PERFORM the Solenoid Body Strategy Drive Cycle, REFER to Section 307-01A . PROGRAM the PCM with the ATC solenoid bar code information, REFER to Automatic Torque Coupling (ATC) Configuration . PERFORM the AWD Drive Cycle.

No

 N0138971 • **Is the resistance less than 10 ohms?**	INSTALL a new rear axle. REFER to Section 205-02 . PROGRAM the PCM with the ATC solenoid bar code information, REFER to Automatic Torque Coupling (ATC) Configuration . PERFORM the AWD Drive Cycle.

Pinpoint Test D: P188C and P188D

Diagnostic Overview

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. Refer to Diagnostic Methods in Section 100-00 for information about these practices. This pinpoint test is intended to diagnosis the wiring, terminals, connectors, AWD relay and PCM.

NOTE: Fuse 70 (15A) is HOT at all times and protects multiple components. Check related systems that may be inoperative.

Refer to Wiring Diagrams Cell 34 , All Wheel Drive (AWD) for schematic and connector information.

Normal Operation and Fault Conditions

The AWD system uses data from other systems as inputs to the PCM. The PCM uses the inputs to determine the appropriate duty cycle to send to the AWD relay on the command circuit and returns AWD relay information on the feedback circuit.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
P188C	AWD Relay Module Communication Circuit	When the PCM detects an open, a short to ground or voltage on the command circuit.
P188D	AWD Relay Module Feedback Circuit	When the PCM detects an open, a short to ground or voltage on the feedback circuit.

PINPOINT TEST D: P188C AND P188D

Test Step	Result / Action to Take
D1 CHECK FOR AWD RELAY VOLTAGE	