

Electronic Locking Differential (ELD)

Diagnostic Trouble Code (DTC) Chart

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

Diagnostic Trouble Code Chart

Module	DTC	Description	Action <i>New: hover over Pinpoint Test links to show title</i>
TCCM	P185A:00	Differential Lock-Up Input Switch Circuit High: No Sub Type Information	GO to Pinpoint Test A
TCCM	P185D:00	Differential Lock-Up Control Circuit Performance: No Sub Type Information	GO to Pinpoint Test D
TCCM	P187C:00	Differential Lock-Up Control Circuit/Open: No Sub Type Information	GO to Pinpoint Test B
TCCM	P187D:00	Differential Lock-Up Control Circuit Low: No Sub Type Information	GO to Pinpoint Test B
TCCM	P187E:00	Differential Lock-Up Control Circuit High: No Sub Type Information	GO to Pinpoint Test C

Principles of Operation

The ELD system allows the operator to lock the rear differential side gears. When the ELD is engaged both rear wheels turn at the same speed, providing added traction on slippery and/or off road surfaces. The operator can engage the ELD per the charts below:

ELD engagement/disengagement Speeds â€” 4WD Vehicles

Switch Position	Engage	Disengage	Re-engage
2H/4H	32 km/h (20 mph) ^a	41 km/h (25 mph)	32 km/h (20 mph) ^a
4L	90 km/h (56 mph) ^a	100 km/h (62 mph)	90 km/h (56 mph) ^a

^a The ELD system engages/re-engages at or below the speed noted.

ELD engagement/disengagement Speeds â€” 2WD Vehicles

Switch Position	Engage	Disengage	Re-engage
Off	N/A	N/A	N/A
On	32 km/h (20 mph) ^a	41 km/h (25 mph)	32 km/h (20 mph) ^a

a The ELD system engages/re-engages at or below the speed noted.

When the operator activates the ELD, the ELD icon displays in the IPC message center. If the vehicle is driven above the disengage speed, the IPC message center no longer displays the ELD icon, alerting the operator that the ELD is disengaged. Once the vehicle speed drops below the re-engage speed, the IPC message center displays the ELD icon again. If there is a malfunction with the ELD system, a CHECK LOCKING DIFFERENTIAL message is displayed in the IPC message center, letting the operator know the ELD is not engaged.

Under certain conditions the ELD system has the ability to modulate powertrain torque output as well as system engagement/disengagement to protect internal ELD hardware.

The ELD feature allows the ABS to override the engage state during special events. When this condition occurs the ELD icon flashes on and off rapidly.

The differential locks when a PWM controlled magnetic field coil located inside the differential energizes. This locks the differential side gears and creates the locked differential.

The ELD system also informs the customer when there is too much wheel slip to safely engage the ELD by displaying TO ENGAGE LOCKING DIFFERENTIAL RELEASE ACCELERATOR PEDAL message in IPC message center. When the ELD is engaged, the TCCM sends PWM voltage to the ELD field coil located in the differential. This voltage is initially 98% duty cycle, and then tapers off after 30 seconds. In order for the TCCM to activate the ELD, certain conditions must be met.

- ELD MSS set to On.
- Wheel speed information via HS-CAN communication from ABS module)
- Operating range (voltage 11.5-16 volts)
- DTC setting range (voltage 10-15 volts)
- Ignition in the ON position
- TP

Inspection and Verification

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

Visual Inspection Chart

Mechanical	Electrical
• Rear axle assembly • Matching tire sizes	• BJB Fuses ▪ fuse 13 (25A) ▪ fuse 11 (25A) ▪ fuse 39 (10A) ▪ fuse 52 (10A) • Wiring, terminals or connectors • MSS • ELD field coil • TCCM

Symptom Chart Electronic Locking Differential (ELD) System

Symptom	Possible Sources	Action
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• A module does not respond to the scan tool	• Wiring terminals or connectors • Scan tool • DLC • TCCM	• CHECK the module communications network, module does not respond to the scan tool. REFER to: Communications Network (418-00 Module Communications Network, Diagnosis and Testing).
• Rear wheels binding when turning corners with the ELD MSS in 2WD or OFF	• Wiring terminals or connectors • ELD field coil • Rear differential • TCCM	• GO to Pinpoint Test C

Pinpoint Tests

PINPOINT TEST A : DTC P185A:00

NOTE: Make sure the battery is fully charged before carrying out this pinpoint test.

Refer to Wiring Diagrams Cell [34](#) for schematic and connector information.

Normal Operation and Fault Conditions

When the ELD MSS is engaged to lock the rear differential, the ELD MSS opens allowing the voltage being monitored by the TCCM to go high. When the TCCM senses the voltage is high it activates the ELD. The TCCM sends a message to the IPC via the HS-CAN requesting the IPC illuminate the ELD message center indicator.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
TCCM P185A:00	Differential Lock-Up Input Switch Circuit High: No Sub Type Information	If the ELD is functioning normally, the differential immediately locks when the ELD MSS is activated and the ELD operating conditions are qualified. This DTC only displays during the self-test function.

Possible Sources

- Wiring terminals or connectors
- TCCM
- MSS

A1 CHECK FOR TCCM DTCS

NOTE: Failure to place the ELD MSS in OFF position prior to carrying out a self-test of the TCCM results in the false setting of DTC P185A:00.

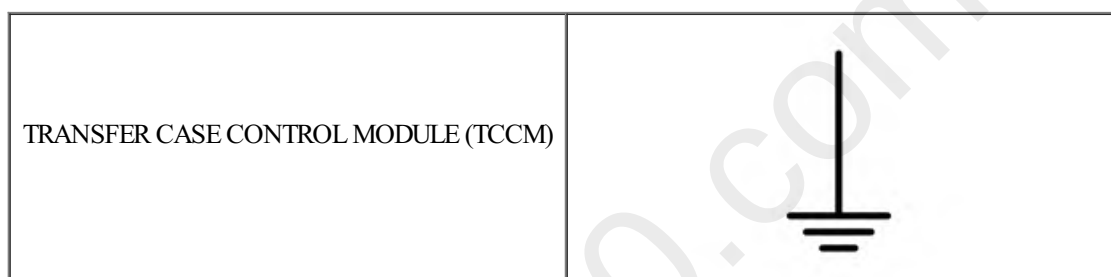
- Ignition ON.
- Set the ELD MSS to OFF.
- Enter the following diagnostic mode: TCCM Self-Test .

Are any DTCs present?

Yes	If only DTC P185A:00 is retrieved, GO to A2 For any other DTCs, REFER to the DTC Chart.
No	IDENTIFY the customer concern and GO to Symptom Chart: ELD.

A2 CHECK THE LOCKER MODE SWITCH CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect TCCM [C2371A](#) .
- Measure:



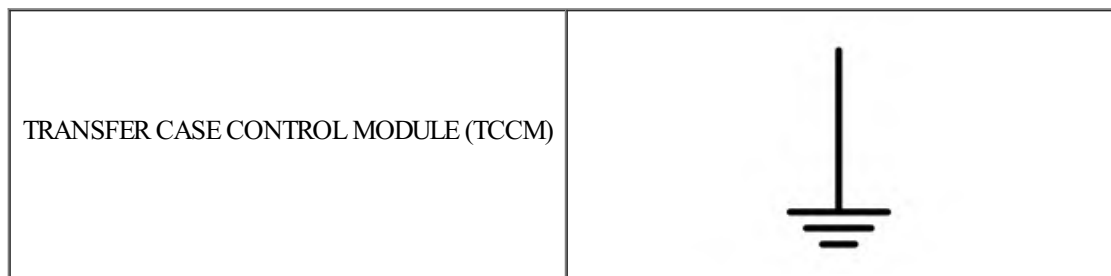
Positive Lead	Measurement / Action	Negative Lead
C2371A-15		Ground

Is any voltage present?

Yes	GO to A3
No	GO to A4

A3 CHECK THE LOCKER MODE SWITCH CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect MSS [C284](#) .
- Ignition ON.
- Measure:



Positive Lead	Measurement / Action	Negative Lead
C2371A-15		Ground

Is any voltage present?

Yes	REPAIR circuit. CLEAR the DTCs.
No	INSTALL a new MSS

A4 CHECK THE LOCKER MODE SWITCH CIRCUIT FOR AN OPEN

- Ignition OFF.
- Measure:

MODE SELECT SWITCH (MSS)	TRANSFER CASE CONTROL MODULE (TCCM)
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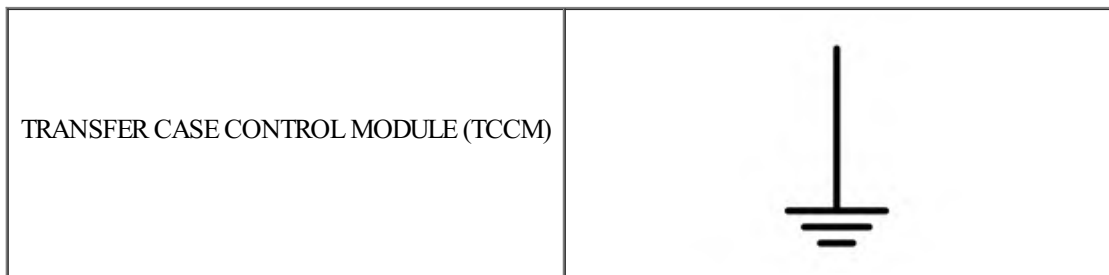
Positive Lead	Measurement / Action	Negative Lead
C284-5	Ω	C2371A-15

Is the resistance less than 3 ohms?

Yes	GO to A5
No	REPAIR the circuit.

A5 CHECK THE MSS

- Connect MSS Switch [C284](#) .
- Measure:



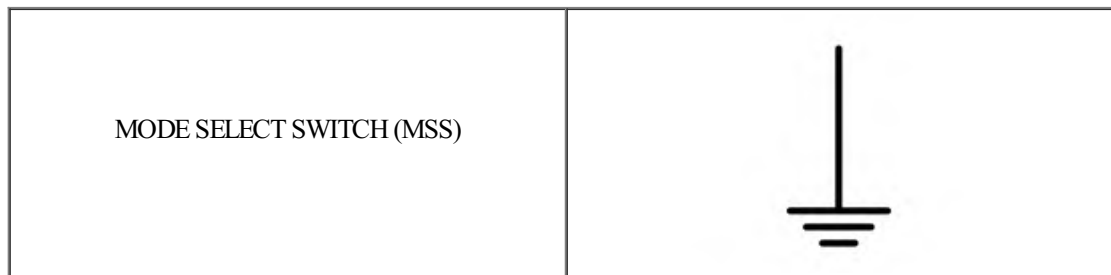
Positive Lead	Measurement / Action	Negative Lead
C2371A-15	Ω	Ground

Is the resistance between 24 - 24.5 ohms with the ELD MSS de-activated and greater than 10,000 ohms with the ELD MSS activated?

Yes	GO to A6
No	INSTALL a new MSS. REFER to: Mode Select Switch (MSS) (308-07A Four-Wheel Drive Systems, Removal and Installation).

A6 CHECK THE LOCKER MODE SWITCH GROUND CIRCUIT FOR AN OPEN

- Ignition OFF.
- Measure:



Positive Lead	Measurement / Action	Negative Lead
C284-1	Ω	Ground

Is the resistance less than 3 ohms?

Yes	GO to A7
No	REPAIR the circuit.

A7 CHECK FOR CORRECT TCCM OPERATION

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

Is the concern still present?

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

PINPOINT TEST B : DTC P187C:00 AND P187D:00

Refer to Wiring Diagrams Cell [34](#) for schematic and connector information.

Normal Operation and Fault Conditions

When the ELD MSS is engaged to lock the rear differential, the TCCM sends a PWM signal to the ELD field coil through the differential lock control circuit. This PWM signal is initially 98% duty cycle to lock the differential and then tapers off to a lower duty cycle once the differential is locked. If the differential lock control circuit is open or shorted to ground, the TCCM senses a signal is not reaching the differential and sets a DTC.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
TCCM P187C:00	Differential Lock-Up Control Circuit/Open: No Sub Type Information	This DTC sets when the TCCM senses the differential lock control circuit is open. The ELD differential is not engaged.
TCCM P187D:00	Differential Lock-Up Control Circuit Low: No Sub Type Information	This DTC sets when the TCCM senses the differential lock control circuit is shorted to ground. The ELD differential is not engaged.

Possible Sources

- Wiring terminals or connectors
- TCCM

NOTE: Make sure the battery is fully charged before carrying out this pinpoint test.

B1 CHECK FOR TCCM DTCS

- Ignition ON.
- Set the ELD MSS to OFF.
- Enter the following diagnostic mode: TCCM Self-Test .

Are any DTCs present?

Yes	For DTC P187C:00, GO to B4 . For DTC P187D:00, GO to B2 For all other DTCs, REFER to the DTC Chart: TCCM.
No	VERIFY the customer concern and GO to the Symptom Chart.

B2 CHECK FOR TCCM DTCS WITH THE ELD FIELD COIL DISCONNECTED

- Ignition OFF.
- Disconnect ELD Field Coil [C4359](#) .
- Ignition ON.
- Set the ELD MSS to OFF.
- Enter the following diagnostic mode: TCCM Self-Test .

CLEAR the DTCs. REPEAT the self-test. Does DTC P187D:00 return?

Yes	GO to B3
No	INSTALL a new ELD field coil. REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/Differential - Vehicles With: Dana M275, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02D Rear Drive Axle/Differential - Vehicles With: Ford 10.5 Inch Ring Gear, Disassembly and Assembly). CLEAR the DTCs.

B3 CHECK THE ELD DIFFERENTIAL LOCK CONTROL CIRCUIT FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect TCCM [C2371B](#).
- Measure:

TRANSFER CASE CONTROL MODULE (TCCM)



Positive Lead	Measurement / Action	Negative Lead
C2371B-9	Ω	Ground

Is the resistance greater than 10,000 ohms?

Yes	GO to B4
No	REPAIR the circuit.

B4 CHECK THE ELD DIFFERENTIAL LOCK CONTROL CIRCUIT FOR AN OPEN

- Ignition OFF.
- Disconnect TCCM [C2371B](#) .
- Disconnect ELD Field Coil [C4359](#) .
- Measure:

TRANSFER CASE CONTROL MODULE (TCCM)	ELECTRONIC LOCKING DIFFERENTIAL (ELD) FIELD COIL
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Positive Lead	Measurement / Action	Negative Lead
C2371B-9	Ω	C4359-1

Is the resistance less than 3 ohms?

Yes	GO to B5
No	REPAIR the circuit.

B5 CHECK FIELD COIL GROUND CIRCUIT

- Measure:

ELECTRONIC LOCKING DIFFERENTIAL (ELD) FIELD COIL	
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Positive Lead	Measurement / Action	Negative Lead
C4359-2	Ω	Ground

Is the resistance less than 3 ohms?

Yes	GO to B6
No	REPAIR the circuit.

B6 CHECK FOR CORRECT TCCM OPERATION

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

Is the concern still present?

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

PINPOINT TEST C : REAR WHEELS BINDING WHEN TURNING CORNERS WITH THE ELD MSS SET TO OFF

Refer to Wiring Diagrams Cell [34](#) for schematic and connector information.

Normal Operation and Fault Conditions

When the ELD MSS is engaged to lock the rear differential, the TCCM sends a PWM signal to the ELD field coil through the differential lock control circuit. This PWM signal is initially 98% duty cycle to lock the differential and then tapers off to a lower duty cycle once the differential is locked. If the differential does not lock, the TCCM continues to send the signal for a set amount of time. Once the differential is locked, the indicator illuminates steadily.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
TCCM P187E:00	Differential Lock-Up Control Circuit High: No Sub Type Information	This DTC sets when the TCCM senses the differential lock control circuit is shorted to battery voltage. The differential is constantly engaged.

Possible Sources

- Wiring, terminals or connectors
- ELD field coil
- TCCM (4WD only)

NOTE: Make sure the battery is fully charged before carrying out this pinpoint test.

C1

- Ignition OFF.
- Disconnect ELD Field Coil [C4359](#) .
- Ignition ON.
- Set the ELD MSS to OFF.
- Measure:

ELECTRONIC LOCKING DIFFERENTIAL (ELD) FIELD COIL	
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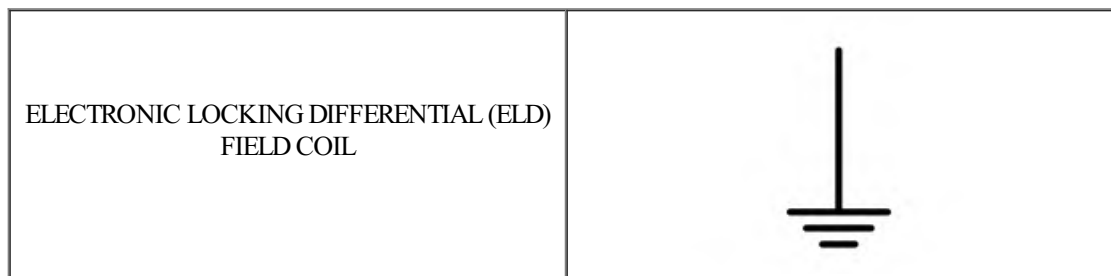
Positive Lead	Measurement / Action	Negative Lead
C4359-1		Ground

Is any voltage present?

Yes	GO to C2
No	To repair the rear differential, REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/Differential - Vehicles With: Dana M275, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02D Rear Drive Axle/Differential - Vehicles With: Ford 10.5 Inch Ring Gear, Disassembly and Assembly).

C2 CHECK THE ELD FIELD COIL CIRCUIT FOR A SHORT TO VOLTAGE

- Ignition OFF.
- Disconnect TCCM [C2371B](#) .
- Ignition ON.
- Measure:



Positive Lead	Measurement / Action	Negative Lead
C4359-1		Ground

Is any voltage present?

Yes	REPAIR the circuit.
No	GO to C3

C3 CHECK THE TCCM REAR LOCKING DIFFERENTIAL PWM OUTPUT CONTROL (DIFF_PWM_OS) PID

- Ignition OFF.
- Connect PWM Field Coil [C4359](#) .
- Connect TCCM [C2371B](#) .
- Ignition ON.
- Enter the following diagnostic mode: TCCM DataLogger .
- MSS to OFF monitor the DIFF_PWM_OS PID.

Does the DIFF_PWM_OS PID read OFF?

Yes	GO to C4
No	GO to Pinpoint Test A

C4 CHECK FOR CORRECT TCCM OPERATION

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

Is the concern still present?

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

PINPOINT TEST D : DTC P185D:00

Refer to Wiring Diagrams Cell [34](#) for schematic and connector information.

Normal Operation and Fault Conditions

When the ELD is fully locked, the indicator illuminates steadily. When the ELD MSS is engaged to lock the rear differential, a PWM signal is sent to the ELD field coil by the TCCM through the differential lock control circuit. This PWM signal is initially 98% duty cycle to lock the differential and then tapers off to a lower duty cycle once the differential is locked. If the differential does not lock, the TCCM module continues to send the signal for a set amount of time. Once the ELD is locked, the indicator illuminates steadily.

DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Condition
TCCM P185D:00	Differential Lock-Up Control Circuit Performance: No Sub Type Information	This DTC sets if the locker is not able to engage after a calibratable number of retries or a delta rear wheel condition persists while commanding the ELD ON. Fault clear if locker successfully engages. CLEAR the DTCs if the locker engages successfully

Possible Sources

- Wiring, terminals or connectors
- ELD field coil

NOTE: Make sure the battery is fully charged before carrying out this pinpoint test.

NOTE:

Clean and inspect the internal connector from coil to external ELD connector for damage.

D1 CHECK THE ABS MODULE WHEEL SPEED SENSOR PIDS

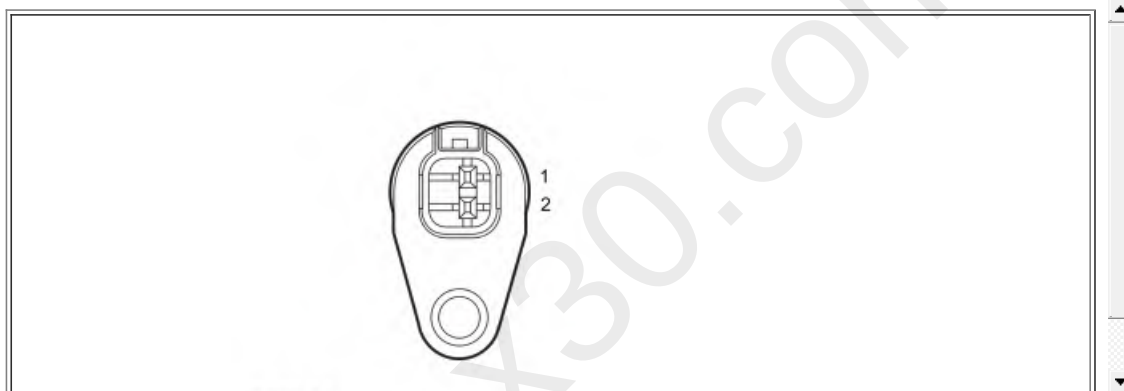
- Enter the following diagnostic mode: ABS Module Datalogger.
- While driving the vehicle at 30 km/h (18 mph), monitor the following wheel speed sensor PIDs:
 - Left Front Wheel Speed Sensor (LF_WSPD)
 - Left Rear Wheel Speed Sensor (LR_WSPD)
 - Right Front Wheel Speed Sensor (RF_WSPD)
 - Right Rear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

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

Yes	GO to D2
No	VERIFY that the 4 road wheels are the same size and have similar tread depth. CHECK the ABS for faults.

D2 CHECK RESISTANCE OF THE ELD FIELD COIL

- Ignition OFF.
- Disconnect ELD field coil.
- Measure:



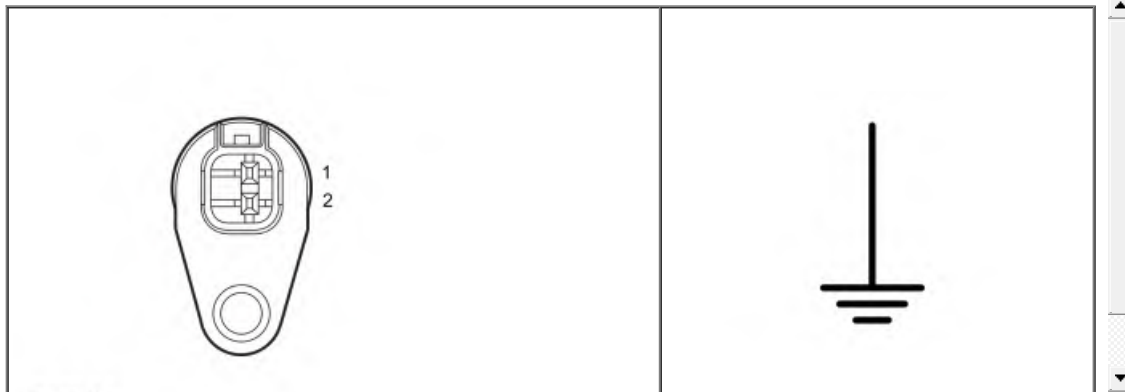
Positive Lead	Measurement / Action	Negative Lead
ELD field coil pin 1 component side	Ω	ELD field coil pin 2 component side

Is the resistance between 2-4 ohms?

Yes	GO to D3
No	INSTALL a new ELD field coil. REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/Differential - Vehicles With: Dana M275, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02D Rear Drive Axle/Differential - Vehicles With: Ford 10.5 Inch Ring Gear, Disassembly and Assembly).

D3 CHECK THE ELD FIELD COIL GROUND

- Measure:



Positive Lead	Measurement / Action	Negative Lead
ELD field coil pin 2 component side	Ω	Ground

Is the resistance less than 3 ohms?

Yes	To repair the rear differential REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02A Rear Drive Axle/Differential - Vehicles With: Dana M275, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02D Rear Drive Axle/Differential - Vehicles With: Ford 10.5 Inch Ring Gear, Disassembly and Assembly). . CLEAR the DTCs.
No	REPAIR the circuit.