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2011 FORD Ranger Double Cab OEM Service and Repair Workshop Manual

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In (4L):

- The ATCM (all terrain control module) sends a 4WD (four-wheel drive) (4L) mode status to the TCCM (transfer case control module) via GWM (gateway module A) .
- The IWE (integrated wheel end) are engaged.
- The TCCM (transfer case control module) outputs a 0% duty cycle to the synchronization clutch field coil (4WD_CLTCH_OUT # = 0.00%).
- The shift motor rotates to the full CW position. Refer to TRANSFER CASE SHIFT MOTOR STATUS in this section for further information.
- 4WD (four-wheel drive) (4L) is displayed in the message center.

ESOF Transfer Case Shift Motor

Vehicles equipped with the Electronic Shift on the Fly (ESOF) system use a shift motor to enter and exit 2WD (two-wheel drive) (2H), 4WD (four-wheel drive) (4H), and 4WD (four-wheel drive) (4L) modes.

The electric shift motor is mounted externally to the transfer case. It drives a rotary cam which moves the mode and range forks within the transfer case. The shift motor moves during shifts between 2WD (two-wheel drive) (2H), 4WD (four-wheel drive) (4H), and 4WD (four-wheel drive) (4L). The TCCM (transfer case control module) directly controls the electric shift motor and can reverse motor polarity to reverse rotary cam/shift fork direction. The message center may display “Shift in Progress” while the shift motor is operating. The shift motor sense plate, an integral part of the shift motor assembly, informs the TCCM (transfer case control module) of the transfer case position. The sense plates are a set of 4 contacts that are opened and closed to represent each valid transfer case shift motor position. The mode and range forks are spring loaded so the motor can move to position regardless of the time it takes it takes for the transfer case internal shaft and hub splines to align and engage.

ESOF Transfer Case Shift Motor Status

Position	PLATE_A	PLATE_B	PLATE_C	PLATE_D
(2H)	Closed	Open	Closed	Closed
(4H)	Open	Closed	Closed	Open
(4L)	Open	Closed	Open	Closed
Neutral	Closed	Closed	Open	Open

Synchronization Clutch

all four wheels, as required, for increased traction. 4WD (four-wheel drive) AUTO (4A) is appropriate for all on-road driving conditions, such as dry road surfaces, wet pavement, light snow or gravel.

4WD (four-wheel drive) (4H) provides electronically locked four-wheel drive power to both the front and rear wheels for use in off-road or winter conditions such as deep snow, sand or mud. This mode is not for use on dry pavement.

Shifts from 2WD (two-wheel drive) (2H) to 4WD (four-wheel drive) AUTO (4A)/(4H) can be made at any speed. When performing this shift, release the accelerator pedal prior to the shift and wait until the Shift in Progress message disappears in the IPC (instrument panel cluster) before accelerating, this improves the shift performance as the IWE (integrated wheel end) engage. In 4WD (four-wheel drive) AUTO (4A):

- The ATCM (all terrain control module) sends an AUTO (4A) 4WD (four-wheel drive) mode status to the TCCM (transfer case control module) via GWM (gateway module A) .
- The IWE (integrated wheel end) are engaged.
- The TCCM (transfer case control module) outputs a 0% to 97% duty cycle to the clutch field coil (4WD_CLTCH_OUT # = x.xx%).
- In 4WD (four-wheel drive) (4H), the TCCM (transfer case control module) outputs a constant 97% duty cycle to the clutch field coil.
- The shift motor is in the full CCW position. Refer to TRANSFER CASE SHIFT MOTOR STATUS in this section for further information.
- 4A or 4H is displayed in the message center.

In 4WD (four-wheel drive) AUTO (4A), the TCCM (transfer case control module) continuously monitors conditions and driver input to send torque automatically to the front driveline by controlling the transfer case clutch, providing 4WD (four-wheel drive) capability. The TCCM (transfer case control module) sends a duty cycle command to the transfer case clutch coil as a torque request based on combination of preemptive and wheel slip response algorithm. Preemptive response is based on steering wheel angle, vehicle speed, throttle positions and available powertrain torque. Wheel slip response is based on monitoring the average front and rear wheel speeds.

When 4WD (four-wheel drive) is no longer needed (during cruising or steady state driving) system defaults back to RWD (rear wheel drive) mode by setting the duty cycle output to 0. The IWE (integrated wheel end) remain engaged to allow seamless torque transfer to the front driveline when necessary.

TCCM (transfer case control module) increases the duty cycle to prevent or control slip under any of the following conditions:

- Slip is detected.
- Heavy acceleration (throttle position).

range is not within parameters, the message center will indicate the necessary action needed to complete the shift.

In 4WD (four-wheel drive) (4L):

- The ATCM (all terrain control module) sends a 4WD (four-wheel drive) (4L) mode status to the TCCM (transfer case control module) via GWM (gateway module A) .
- The IWE (integrated wheel end) are engaged.
- The TCCM (transfer case control module) outputs a 0% to 97% duty cycle to the clutch field coil (4WD_CLTCH_OUT # = x.xx%).
- The shift motor is in the full CW position. Refer to TRANSFER CASE SHIFT MOTOR STATUS in this section for further information.
- (4L) is displayed in the message center.

POWERTRAIN TORQUE PROTECTION: If the system is in 4WD (four-wheel drive) 4L and TCCM (transfer case control module) detects excessive stress or high energy going through the clutch (clutch is slipping excessively while the system is commanding max clutch torque), clutch output will be turned off and message center indicates 4x4 TEMPORARILY DISABLED. When the system had the ability to cool off, 4x4 operation will be automatically restored.

2 Speed Torque On Demand Transfer Case Shift Motor

Vehicles equipped with the 2-speed torque-on-demand system use a shift motor to enter and exit 4WD (four-wheel drive) (4L) mode.

The electric shift motor is mounted externally to the transfer case. It drives a rotary cam which moves the range fork within the transfer case. The shift motor moves during shifts to and from 4WD (four-wheel drive) (4L), and to Neutral. It does not move during the shift between 2WD (two-wheel drive) (2H) and 4WD (four-wheel drive) AUTO (4A) or 4H. TCCM (transfer case control module) directly controls the electric shift motor and can reverse motor polarity to reverse rotary cam/shift fork direction. The message center may display “Shift in Progress” while the shift motor is operating. The shift motor sense plate, an integral part of the shift motor assembly, informs the TCCM (transfer case control module) of the transfer case position. The sense plates are a set of 4 contacts that are opened and closed to represent each valid transfer case shift motor position.

2 Speed Torque On Demand Transfer Case Shift Motor Status

Position	PLATE_A	PLATE_B	PLATE_C	PLATE_D
(2H)	Closed	Open	Closed	Closed
AUTO (4A)	Closed	Open	Closed	Closed

Rear Drive Axle and Differential

205-02A Rear Drive Axle/Differential - Vehicles With: Ford 8.8 Inch Ring Gear	***2022 F-150***
Description and Operation	***Procedure revision date: 08/18/2016***

Rear Drive Axle and Differential

The 8.8-inch ring gear rear differential axle has 3.31, 3.55, and 3.73 gear ratio versions.

Rear Drive Axle and Differential

The rear axle assembly consists of the following:

- Integral-type housing hypoid gear design (center of the pinion set below the centerline of the ring gear)
- Hypoid differential ring gear and pinion consisting of a 8.8-inch ring gear and an overhung drive pinion that is supported by 2 opposed tapered roller bearings
- Pinion bearing preload that is maintained by a drive pinion collapsible spacer on the differential pinion shaft and adjusted by the pinion nut
- Cast center section with a stamped steel differential housing cover
- Differential housing cover using silicone rubber based sealant as a gasket
- Differential pinion shaft that is retained by a threaded differential pinion shaft lock bolt attached to the differential case
- Differential case that is mounted in the rear axle housing between 2 opposing differential bearings that are retained in the rear axle housing by 2 removable bearing caps
- Differential bearing preload and ring gear backlash which are adjusted by differential bearing shims that are located between the differential bearing cups and the rear axle housing

Electronic Locking Differential (ELD)

205-02A Rear Drive Axle/Differential - Vehicles With: Ford 8.8 Inch Ring Gear	***2022 F-150***
Diagnosis and Testing	***Procedure revision date: 12/18/2020***

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 (diagnostic trouble code)	Description	Action
TCCM (transfer case control module)	P0562:00	System Voltage Low: No Sub Type Information	GO to Pinpoint Test A
TCCM (transfer case control module)	P0563:00	System Voltage High: No Sub Type Information	GO to Pinpoint Test A
TCCM (transfer case control module)	P185D:00	Differential Lock-Up Control Circuit Performance: No Sub Type Information	GO to Pinpoint Test B

TCCM (transfer case control module)	U2300:54	Central Configuration: Missing Calibration	GO to Pinpoint Test G
TCCM (transfer case control module)	U2300:55	Central Configuration: Not Configured	GO to Pinpoint Test H
TCCM (transfer case control module)	U2300:56	Central Configuration: Invalid/Incompatible Configuration	GO to Pinpoint Test I
TCCM (transfer case control module)	U2300:64	Central Configuration: Signal Plausibility Failure	GO to Pinpoint Test J
TCCM (transfer case control module)	U3000:04	Control Module: System Internal Failures	GO to Pinpoint Test L
TCCM (transfer case control module)	U3000:46	Control Module: Calibration/Parameter Memory Failure	GO to Pinpoint Test K
TCCM (transfer case control module)	U3000:47	Control Module: Watchdog/Safety µC Failure	GO to Pinpoint Test N
TCCM (transfer case control module)	U3000:49	Control Module: Internal Electronic Failure	GO to Pinpoint Test L
TCU (telematic control unit module)	U0418:00	Invalid Data Received from Brake System Control Module "A": No Sub Type Information	GO to Pinpoint Test F

Global Customer Symptom Code (GCSC) Chart

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices.

REFER to: Diagnostic Methods

Driver Aides & Information > Warning Indicators/Messages/Chimes > Anti-Lock Brake System > Inoperative	GO to Pinpoint Test B
Driver Aides & Information > Warning Indicators/Messages/Chimes > Anti-Lock Brake System > Inoperative	GO to Pinpoint Test E
Driver Aides & Information > Warning Indicators/Messages/Chimes > Anti-Lock Brake System > Inoperative	GO to Pinpoint Test F
Driver Aides & Information > Warning Indicators/Messages/Chimes > Transmission > Inoperative	GO to Pinpoint Test G
Driver Aides & Information > Warning Indicators/Messages/Chimes > Transmission > Inoperative	GO to Pinpoint Test H
Driver Aides & Information > Warning Indicators/Messages/Chimes > Transmission > Inoperative	GO to Pinpoint Test I
Driver Aides & Information > Warning Indicators/Messages/Chimes > Transmission > Inoperative	GO to Pinpoint Test J
Driver Aides & Information > Warning Indicators/Messages/Chimes > Transmission > Inoperative	GO to Pinpoint Test K
Driver Aides & Information > Instrumentation/Display > Electric Vehicle/Hybrid Charge Level > Inaccurate	GO to Pinpoint Test A
Driver Aides & Information > Instrumentation/Display > Compass > Inaccurate	GO to Pinpoint Test G
Driver Aides & Information > Instrumentation/Display > Compass > Inaccurate	GO to Pinpoint Test H
Driver Aides & Information > Instrumentation/Display > Compass > Inaccurate	GO to Pinpoint Test I
Driver Aides & Information > Instrumentation/Display > Compass > Inaccurate	GO to Pinpoint Test J
Driver Aides & Information > Instrumentation/Display > Compass > Inaccurate	GO to Pinpoint Test K

• A module does not respond to the scan tool	• Wiring, Terminals or Connectors • Scan tool • DLC (data link connector) • TCCM (transfer case control module)	• CHECK the module communications network, module does not respond to the scan tool. REFER to: Controller Area Network (CAN) Module Communications Network(418-00A Controller Area Network (CAN) Module Communications Network, Diagnosis and Testing).
• Rear wheels binding when turning corners with the ELD (electronic locking differential) MSS (mode select switch) in 2WD (two-wheel drive) or OFF	• Wiring, Terminals or Connectors • ELD (electronic locking differential) field coil • Rear differential • TCCM (transfer case control module)	• GO to Pinpoint Test D

Pinpoint Tests

PINPOINT TEST A : P0562:00 AND P0563:00

Refer to Wiring Diagrams Cell 34for schematic and connector information.
Normal Operation and Fault Conditions If the TCCM (transfer case control module) observes an overpower or underpower voltage condition, a DTC (diagnostic trouble code) is set and all TCCM (transfer case control module) outputs are turned off (IWE (integrated wheel end) engaged). **DTC Fault Trigger Conditions**

DTC (diagnostic trouble code)	Description	Fault Trigger Condition
TCCM (transfer case control module) P0562:00	System Voltage Low: No Sub Type Information	This DTC (diagnostic trouble code) sets when the TCCM (transfer case control module) detects battery voltage less

NOTE

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

- Ignition ON.
- Enter the following diagnostic mode: Retrieve all CMDTC (continuous memory diagnostic trouble code) s.

Is DTC (diagnostic trouble code) P0562:00 or P0563:00 present in one or more modules or P0563, P0620, P0625, P0626 or P065B present in the PCM (powertrain control module) ?

Yes	For diagnosis of the battery and charging system, REFER to: Charging System - 2.7L EcoBoost (238kW/324PS)/3.5L EcoBoost (BM) (414-00 Charging System - General Information, Diagnosis and Testing). REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing). REFER to: Charging System (414-00 Charging System - General Information, Diagnosis and Testing).

No	GO to A2

A2 CHECK BATTERY CONDITION