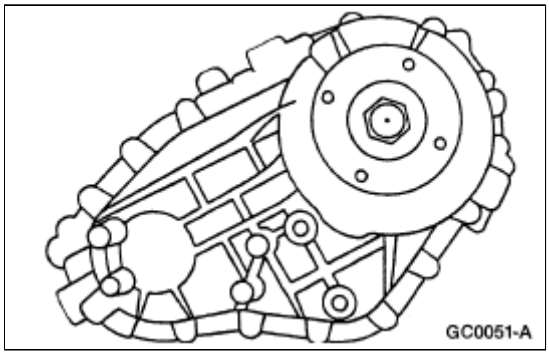
Transfer Case —All-Wheel Drive (AWD)

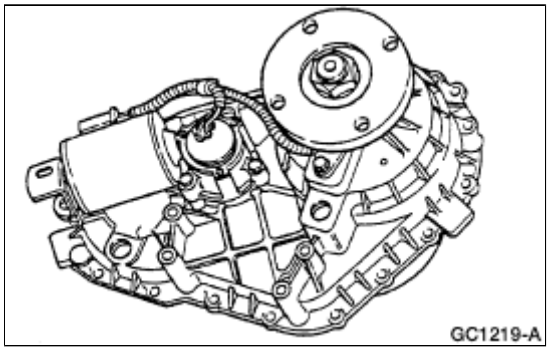


The all-wheel drive transfer case is a two-piece aluminum, chain driven, viscous clutch type unit. This produces a system in which all-wheel drive is always activated. The all-wheel drive transfer case is automatic and has no external controls.

The viscous clutch is a torque distribution device. It is non-repairable. The internal construction of the viscous clutch consists of alternating plates that are connected to the front and rear outputs of the transfer case. The viscous clutch is filled with a high viscosity fluid which flows through slots in the plates. The resistance to shear causes the plates to transmit torque at the needed ratio. The ratio that torque is transmitted at is approximately 35% front and 65% rear.

Torque is transmitted through the input shaft to the planet carrier assembly. Torque flow continues through the gear ring to the rear output shaft. Torque also flows from the planet carrier assembly to the sun gear shaft, which is splined to the drive sprocket. The drive gear is connected to the driven sprocket by the drive chain. Torque continues through the driven sprocket to the front output shaft flange. The viscous clutch provides the connection between the gear ring and the sun gear shaft.

Transfer Case —Automatic Four Wheel Drive (A4WD)



The A4WD system is an electronic shift 4x4 system that allows the operator to choose between three different 4x4 modes. The operator can switch between A4WD and 4WD HIGH modes at any speed. To engage or disengage LOW range, the vehicle speed must be less than 5 km/h, the brake depressed, and the transmission must be in NEUTRAL.

The front/rear driveshaft speed sensors (Hall effect) are mounted to the transfer case and detect the speed of the front and rear driveshafts. This input is used by the generic electronic module (GEM) primarily to control A4WD operation.

The throttle position output signal is provided to the GEM from the powertrain control module (PCM). This signal is used by the GEM in controlling the A4WD clutch.

The shift motor sense plate, an integral part of the electric shift motor, informs the GEM to the position of the transfer case.

The digital TR sensors are located on the LH side of the transmission; these sensors inform the GEM when the transmission is in the neutral position.

The electric shift motor is mounted externally at the rear of the transfer case. It drives a rotary cam which moves the mode fork and range fork within the transfer case between the HIGH range (A4WD, 4HIGH) and LOW range positions.

The 4x4 shift motor uses a module containing two relays which, under the control of the GEM, shifts the transfer case shift motor between HIGH range (A4WD, 4HIGH), and 4LOW modes.

The solid state clutch relay is used to activate the A4WD clutch within the transfer case.

System Function

Hall effect sensor monitors input and output shaft speed.

In the A4WD (C-Trac) system, the GEM varies the torque sent to the front driveline by controlling the transfer case clutch. At rest and under cruising conditions, the GEM activates the transfer case clutch a minimum duty cycle (percentage of time the clutch is turned on), which allows for the slight difference between the front and rear driveshafts which normally occurs when negotiating a corner on dry pavement. Under any of the following conditions, the GEM will increase the duty cycle in order to prevent or control slip:

- Slip is detected (by using the Hall Effect Sensors)
- Heavy acceleration (throttle position).

Feature inputs:

- Brake ON/OFF switch.
- 4WD mode switch.
- Digital transmission range sensor.
- Clutch switch (manual transmission vehicles only).
- Vehicle speed signal (transmitted from the ABS module).
- Front/rear driveshaft speed sensors.
- Throttle position information from the PCM.
- Contact plate position inputs A, B, C, D.

Feature outputs:

- Solid state clutch relay (pulse width modulated signal: grounded when relay is on, battery potential when relay is off).
- A4WD indicator (ground when activated, open circuit when deactivated).
- 4x4 shift motor relay outputs.

Shifts between A4WD and 4x4 HIGH can be made at any speed. Listed below are the inputs and outputs needed by the GEM to execute a change between any of these modes.

Feature inputs:

- Front/rear driveshaft speed sensor.
- Vehicle speed signal.
- Throttle position information.
- 4WD mode switch.

Feature outputs:

- Solid state clutch relay (pulse width modulated signal; grounded when relay is on, battery potential when relay is off).
- 4x4 HIGH cluster indicator (ground when activated, open circuit when deactivated).

When shifting into or out of LOW range, the GEM requires that the vehicle speed is less than 5 km/h (3 mph), the brake is applied, and the transmission is in NEUTRAL.

Feature inputs:

- Throttle position information.
- 4WD mode switch.
- Contact plate position inputs A, B, C, D.
- Vehicle speed signal (transmitted from ABS module).
- Brake ON/OFF switch input (battery voltage when brake is depressed, open circuit when not activated).
- Digital transmission range sensor (ground when transmission is in NEUTRAL, open circuit otherwise).
- Start/clutch depressed input (manual transmission only).

Feature outputs:

- 4x4 shift motor relay outputs.
- 4LOW cluster indicators (ground when activated, open circuit when deactivated).
- Solid state clutch relay (pulse width modulated signal; grounded when relay is on, battery potential when relay is off).

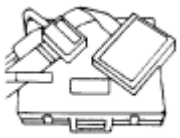
Transfer Case

Refer to Wiring Diagrams Cell 34 , Electric Shift Control for schematic and connector information.

Refer to Wiring Diagrams Cell 59 , Generic Electronic Module for schematic and connector information.

Refer to Wiring Diagrams Cell 62 , Instrument Cluster for schematic and connector information.

Special Tool(s)

 ST1137-A	73 Digital Multimeter 418-F082 (105-R00051) or equivalent
 ST1391-A	EEC-V 104-Pin Breakout Box 418-049 (014-00950) or equivalent
 ST2332-A	Worldwide Diagnostic System (WDS) 418-F224, New Generation STAR (NGS) Tester 418-F052, or equivalent scan tool

Inspection and Verification — AWD

NOTE: If the area of concern is indicated to be other than the transfer case, refer to the specific section or sections of the appropriate shop manual.

1. **NOTE:** Owner driving habits as well as road and weather conditions should be noted.

   Road test the vehicle to verify the concern, noting the road speed, engine speed, and speed range where the vehicle problem is evident.

2. Raise the vehicle on the hoist and position suitable safety floor stands under the vehicle.

3. Run the vehicle at the road speed where the concern exists. Verify concern area:
   - Engine.
   - Transmission.
   - Front/rear driveline components.
   - Front/rear drive axles.

- Front/rear brake systems.
- Front/rear wheels and/or tires.
- Transfer case.

4. Refer to the appropriate owner guide for operating data, if the concern is verified to be driveline or torsional windup, before repairing the transfer case.

5. Check tires and vehicle load if the problem is clearly driveline windup and not broken parts.

6. If the concern is not visually evident, refer to Symptom Chart — AWD.

Symptom Chart — AWD

Symptom Chart

Condition	Possible Sources	Action
• Transfer Case Makes Noise	• Tire inflation pressure. • Tire and wheel size.	• ENSURE that all tires and wheels are the same size and that inflation pressures are correct.
	• Tire tread wear.	• 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.
	• Internal components.	• OPERATE vehicle in all transmission gears. If there in noise in transmission in Neutral gear or in some gears and not in others, REMOVE and REPAIR transmission. REFER to Section 307-01A . If there is noise in all gears, DISASSEMBLE transfer case. REFER to Section 308-07C . CHECK input gear and intermediate and front output shaft gear for damage. REPLACE as required. REFER to Section 307-01A .
	• Lubricant level.	• FILL with MERCON V® Multi-Purpose Automatic Transmission Fluid XT-5QM or equivalent MERCON approved fluid.
• Wheel/Tire Bounce, Vehicle Skip	• Internal components.	• OPERATE vehicle in all transmission gears. If there in noise in transmission in Neutral gear, or in some gears and not in others, REMOVE and REPAIR transmission. REFER to Section 307-01A . If there is noise in all gears, DISASSEMBLE transfer case. REFER to Section 308-07C . CHECK input gear and intermediate and front output shaft gear for damage. REPLACE as required. REFER to Section 307-01A .
	• Tire tread wear.	• MAKE SURE that all tires and wheels are the same size and that inflation pressures are correct.
• Leaking (ATF) From Vent	• Transfer case.	• DRAIN lubricant to proper level.

	• Vent tube.	• REPAIR or REPLACE the vent tube. REFER to Section 308-07C .
• Leaking (ATF) From Transfer Case Housing	• Transfer case housing bolts.	• TIGHTEN bolts to specification. REFER to Section 308-07C .
	• Sealant.	• REBUILD with Black Non-Acid Cure Silicone Rubber E7TZ-19562-A or equivalent.
	• Lubricant.	• DRAIN lubricant and FILL with MERCON V® Multi-Purpose Automatic Transmission Fluid XT-5QM or equivalent MERCON approved fluid.
	• Transfer case gasket.	• REPLACE transfer case gasket. REFER to Section 308-07C .
• Leaking (ATF) Output Shaft Seals	• Vent is plugged.	• REPAIR plugged vent. REFER to Section 308-07C .
	• Output shaft seals.	• REPLACE leaking output shaft seal. REFER to Section 308-07C .

Inspection and Verification — A4WD

1. Verify the customer concern by operating the A4WD.

2. Visually inspect for obvious signs of mechanical and electrical damage; refer to the following chart:

Visual Inspection Chart

Mechanical	Electrical
• Switch(es)	• Fuse(s) • Damaged wiring harness • Loose or corroded connector(s) • Lamp(s) • Circuitry

3. If the concern remains after the inspection, connect the scan tool to the data link connector (DLC) located beneath the instrument panel and select the vehicle to be tested from the scan tool menu. If the scan tool does not communicate with the vehicle:
   - check that the program card is properly installed.
   2. check battery voltage.
   - check the connections to the vehicle.
   - check the ignition switch position.

4. If the scan tool still does not communicate with the vehicle, refer to the scan tool manual.

5. Perform the DATA LINK DIAGNOSTIC TEST. If the scan tool responds with:
   - CKT914, CKT915 or CKT70 = ALL ECUS NO RESP/NOT EQUIP, refer to Section 418-00 .
   - NO RESP/NOT EQUIP for generic electronic module (GEM), go to Pinpoint Test D.

- SYSTEM PASSED, retrieve and record the continuous diagnostic trouble codes (DTCs), erase the continuous DTCs and perform self-test diagnostics for the GEM.

6. If the DTCs retrieved are related to the concern, go to the GEM/CTM Diagnostic Trouble Code (DTC) Index to continue diagnostics.

7. If no DTCs related to the concern are retrieved, proceed to Symptom Chart — A4WD to continue diagnostics.

GEM/CTM Diagnostic Trouble Code (DTC) Index

GEM/CTM Diagnostic Trouble Code (DTC) Index

DTC	Description	Source	Action
B1302	Accessory Delay Relay Coil Circuit Failure	GEM	REFER to Section 501-11 .
B1304	Accessory Delay Relay Coil Circuit Short to Battery	GEM	REFER to Section 501-11 .
B1313	Battery Saver Relay Coil Circuit Failure	GEM/CTM	REFER to Section 417-02 .
B1315	Battery Saver Relay Coil Circuit Short to Battery	GEM/CTM	REFER to Section 417-02 .
B1317	Battery Voltage HIGH	GEM/CTM	REFER to Section 414-00 .
B1318	Battery Voltage LOW	GEM/CTM	REFER to Section 414-00 .
B1322	Door Ajar LF Circuit Short to Ground	GEM/CTM	REFER to Section 417-02 .
B1323	Door Ajar Lamp Circuit Failure	GEM/CTM	REFER to Section 413-01 .
B1325	Door Ajar Lamp Circuit Short to Battery	GEM/CTM	REFER to Section 413-01 .
B1330	Door Ajar RF Circuit Short to Ground	GEM/CTM	REFER to Section 417-02 .
B1334	Deck Lid Switch Circuit Short to Ground	GEM/CTM	REFER to Section 417-02 .
B1338	RR Door Ajar Circuit Short to Ground	GEM/CTM	REFER to Section 417-02 .
B1340	Chime Input Request Circuit Short to Ground	GEM/CTM	REFER to Section 413-09 .
B1342	GEM/CTM is Defective	GEM/CTM	CLEAR the DTCs. RETRIEVE the DTCs. If DTC B1342 is retrieved, REPLACE the GEM/CTM; REFER to Section 419-10 .
B1345	Heated Backlite Input Circuit Short to Ground	GEM	REFER to Section 501-11 .
B1347	Heated Backlite Relay Circuit Failure	GEM	REFER to Section 501-11 .
B1349	Heated Backlite Relay Circuit Short to Battery	GEM	REFER to Section 501-11 .

B1352	Ignition Key-In — Circuit Failure	GEM/CTM	REFER to Section 413-09 .
B1355	Ignition RUN Circuit Failure	GEM/CTM	REFER to Section 211-05 .
B1359	Ignition RUN/ACC Circuit Failure	GEM/CTM	REFER to Section 211-05 .
B1371	Illuminated Entry Relay Circuit Failure	GEM/CTM	REFER to Section 417-02 .
B1373	Interior Lamp Relay Coil Circuit Short to Battery	GEM/CTM	REFER to Section 417-02 .
B1398	Power Window LF One-Touch Window Relay Circuit Failure	GEM	REFER to Section 501-11 .
B1400	Power Window LF One-Touch Window Relay Coil Circuit Short to Battery	GEM	REFER to Section 501-11 .
B1404	Power Window LF Down Circuit Failure	GEM	REFER to Section 501-11 .
B1405	Power Window LF Down Short Circuit to Battery	GEM	REFER to Section 501-11 .
B1410	Power Window LF Motor Circuit Failure	GEM	REFER to Section 501-11 .
B1426	Seat Belt Lamp Circuit Short to Battery	GEM/CTM	REFER to Section 413-01 .
B1428	Seat Belt Lamp Circuit Failure	GEM/CTM	REFER to Section 413-01 .
B1431	Wiper Brake/Run Relay Circuit Failure	GEM/CTM	REFER to Section 501-16 .
B1432	Wiper Brake/Run Relay Short to Battery	GEM/CTM	REFER to Section 501-16 .
B1434	Wiper Hi/Lo Speed Relay Coil Circuit Failure	GEM/CTM	REFER to Section 501-16 .
B1436	Wiper Hi/Lo Speed Relay Circuit Short to Battery	GEM/CTM	REFER to Section 501-16 .
B1438	Wiper Mode Select Switch Circuit Failure	GEM/CTM	REFER to Section 501-16 .
B1441	Wiper Mode Select Switch Input Short to Ground	GEM/CTM	REFER to Section 501-16 .
B1446	Wiper Park Sense Circuit Failure	GEM/CTM	REFER to Section 501-16 .
B1450	Wiper/Wash Interval Delay Switch Input Circuit Failure	GEM/CTM	REFER to Section 501-16 .
B1453	Wiper/Wash Interval Delay Switch Input Short to Ground	GEM/CTM	REFER to Section 501-16 .
B1458	Wiper/Washer Pump Motor Relay Circuit Failure	GEM/CTM	REFER to Section 501-16 .
B1460	Wiper/Washer Pump Motor Relay Coil Short to Battery	GEM/CTM	REFER to Section 501-16 .
B1462	Seat Belt Switch Circuit Failure	GEM/CTM	REFER to Section 413-09 .

B1466	Wiper Hi/Lo Speed Not Switching	GEM/CTM	REFER to Section 501-16 .
B1467	Wiper Hi/Lo Speed Circuit Motor Short to Battery	GEM/CTM	REFER to Section 501-16 .
B1473	Wiper Low Speed Circuit Motor Failure	GEM/CTM	REFER to Section 501-16 .
B1475	Accessory Delay Relay Contacts Short to Battery	GEM/CTM	REFER to Section 501-11 .
B1476	Wiper High Speed Circuit Motor Failure	GEM/CTM	REFER to Section 501-16 .
B1483	Brake Pedal Input Circuit Failure	GEM	GO to Pinpoint Test B .
B1485	Brake Pedal Input Short Circuit to Battery	GEM	GO to Pinpoint Test B .
B1574	LR Door Ajar Circuit Short to Ground	GEM/CTM	REFER to Section 417-02 .
B1577	Lamp Park Input Short Circuit to Battery	GEM/CTM	REFER to Section 413-09 .
B1610	Illuminated Entry Input (From RAP Module) Circuit Short to Ground	GEM	REFER to Section 417-02 .
B1611	Wiper Rear Mode Select Switch Circuit Failure	GEM	REFER to Section 501-16 .
B1614	Wiper Rear Mode Select Switch Circuit Short to Ground	GEM/CTM	REFER to Section 501-16 .
B1814	Wiper Rear Motor Down Relay Coil Circuit Failure	GEM	REFER to Section 501-16 .
B1816	Wiper Rear Motor Down Relay Coil Circuit Short to Battery	GEM	REFER to Section 501-16 .
B1818	Wiper Rear Motor Up Relay Coil Circuit Failure	GEM	REFER to Section 501-16 .
B1820	Wiper Rear Motor Up Relay Circuit Short to Battery	GEM	REFER to Section 501-16 .
B1833	Door Unlock Switch Circuit Short to Ground	GEM	REFER to Section 501-14B .
B1834	Door Unlock Disarm Output Circuit Failure	GEM	REFER to Section 501-14B .
B1836	Door Unlock Disarm Output Circuit Short to Battery	GEM	REFER to Section 501-14B .
B1839	Wiper Rear Motor Circuit Failure	GEM	REFER to Section 501-16 .
B1840	Wiper Front Power Circuit Failure	GEM	REFER to Section 501-16 .
B1894	Wiper Rear Motor Speed Sense Circuit Failure	GEM	REFER to Section 501-16 .
B2141	NVM Configuration Failure	GEM/CTM	Vehicle speed calibration data is not programmed into

			the GEM/CTM. REFER to the scan tool help screen on the configuration card to program the tire size and axle ratio. TEST the system for normal operation. If DTC B2141 is still present, REPLACE the GEM/CTM. REFER to Section 419-10 . TEST the system for normal operation.
B2105	Throttle Position Input Out of Range Low	GEM	GO to Pinpoint Test A .
B2106	Throttle Position Input Out of Range High	GEM	GO to Pinpoint Test A .
P0500	Vehicle Speed Signal Circuit Failure	GEM	GO to Pinpoint Test B .
P1763	Transmission Neutral In Tow Indicator Circuit Short to Battery	GEM	REFER to Section 413-09 .
P1764	Transmission Neutral In Tow Indicator Circuit Fault	GEM	REFER to Section 413-09 .
P1804	4WD High Indicator Circuit Failure	GEM	GO to Pinpoint Test C .
P1806	4WD High Indicator Short to Battery	GEM	GO to Pinpoint Test C .
P1808	4WD Low Indicator Circuit Failure	GEM	GO to Pinpoint Test C .
P1810	4WD Low Indicator Short Circuit to Battery	GEM	GO to Pinpoint Test C .
P1812	4WD Mode Select Circuit Failure	GEM	GO to Symptom Chart.
P1815	4WD Mode Select Short Circuit to Ground	GEM	GO to Symptom Chart.
P1820	Transfer Case CW Shift Relay Coil Circuit Open or Short to Ground	GEM	GO to Pinpoint Test B .
P1822	Transfer Case CW Shift Relay Coil Short to Battery	GEM	GO to Pinpoint Test B .
P1824	4WD Electric Clutch Relay Circuit Failure	GEM	GO to Pinpoint Test A .
P1826	4WD Electric Clutch Relay Short to Battery	GEM	GO to Pinpoint Test A .
P1828	Transfer Case CCW Shift Relay Circuit Failure	GEM	GO to Pinpoint Test B .
P1830	Transfer Case CCW Shift Relay Coil Short to Battery	GEM	GO to Pinpoint Test B .
P1836	Transfer Case Front Shaft Speed Sensor Circuit Failure	GEM	GO to Symptom Chart.
P1837	Transfer Case Rear Shaft Speed Sensor Circuit Failure	GEM	GO to Symptom Chart.
P1838	Transfer Case Shift Motor Circuit Failure	GEM	GO to Pinpoint Test B .

P1846	Transfer Case CONTACT PLATE "A" Circuit Failure	GEM	GO to Pinpoint Test B .
P1850	Transfer Case CONTACT PLATE "B" Circuit Failure	GEM	GO to Pinpoint Test B .
P1854	Transfer Case CONTACT PLATE "C" Circuit Failure (GEM Only)	GEM	GO to Pinpoint Test B .
P1858	Transfer Case CONTACT PLATE "D" Circuit Failure (GEM Only)	GEM	GO to Pinpoint Test B .
P1866	Transfer Case Maintenance Required (GEM Only) (4-wheel drive operation can be restored by clearing the DTC and cycling the ignition.)	GEM	GO to Pinpoint Test B .
P1867	Transfer Case Contact Plate General Circuit Failure (GEM Only)	GEM	GO to Pinpoint Test B .
P1874	Automatic Hall Effect Sensor Power Circuit Failure	GEM	GO to Symptom Chart.
P1875	Automatic Hall Effect Sensor Power Circuit Short to Battery (GEM Only)	GEM	GO to Symptom Chart.
P1891	Transfer Case Contact Plate Ground Return Open Circuit	GEM	GO to Pinpoint Test B .

GEM/CTM Parameter Identification (PID) Index

NOTE: Depending on the level of scan tool software, the VSS_GEM PID could show units in MPH, but the actual value is in KPH. If the PID is off by a factor of 1.6, the PID is giving speed in KPH. This concern is normal.

GEM/CTM Parameter Identification (PID) Index

PID	Description	Expected Values
VSS_GEM	Vehicle Speed Input	0 - 255 MPH
PARK_SW	External Access Ajar Switch Status	OFF, ON
D_DR_SW	Left Front Door Ajar Switch Status	CLOSED, AJAR
DR_DSRM	Door Disarm Switch Status	L_Door, R_Door, LIFT_G, OFF
DR_UNLK	All Doors Unlock Output State	ON---, OFF---, ON-B-, OFFO-G
P_DR_SW	Right Passenger Door Ajar Switch Status	CLOSED, AJAR
IGN_KEY	Key-In-Ignition Status	IN, OUT
IGN_GEM	Ignition Switch Status	START, RUN, OFF, ACCY
BATSAV	Battery Saver Relay Circuit	ON---, OFF---, ON-B-, OFFO-G

VBATGEM	Battery Voltage	0.0 VDC - 16.0 VDC
LGATESW	Liftgate Ajar Switch Status	CLOSED - AJAR
LRDR_SW	Left Rear Door Ajar Switch Status	CLOSED - AJAR
RRDR_SW	Right Rear Door Ajar Switch Status	CLOSED - AJAR
INTLMP	Illuminated Entry Relay Circuit	ON---, OFF---, ON-B-, OFFO-G
CLTCHSW	Transmission Clutch Interlock Switch (GEM Only)	ENGAGED, NOT ENGAGED
NTRL_SW	Neutral Safety Switch Input (GEM Only)	NTRL, not NTRL
MTR_CCW	Transmission Transfer CCW Motor Output (GEM Only)	ON---, OFF---, OFFO-G, ON-B-
MTR_CW	CW Shift Relay Coil Status (GEM Only)	OFF---, ON---, OFFO-G, ON-B-
4WD_SW	4WD Switch Status (GEM Only)	AUTO, 4WDLOW, 4WDHIGH
4WDELCL	4WD Electric Clutch	ON---, OFF---, ON-B-, OFFO-G
TRANSGR	Transmission Gear Status	REV, notREV
TPI	Throttle Position Input (TPI) Status	0-250 Counts
4WDCLCH	4WD Electronic Clutch Output Status (GEM Only)	0-38%
4WDLOW	4WD Low Indicator Status (GEM Only)	ON---, OFF---, ON-B-, OFFO-G
4WDHIGH	4WD High Indicator Status (GEM Only)	ON---, OFF---, ON-B-, OFFO-G
PLATE_A	Transfer Case Contact Plate Switch A (GEM Only)	OPEN, CLOSED
PLATE_B	Transfer Case Contact Plate Switch B (GEM Only)	OPEN, CLOSED
PLATE_C	Transfer Case Contact Plate Switch C (GEM Only)	OPEN, CLOSED
PLATE_D	Transfer Case Contact Plate Switch D (GEM Only)	OPEN, CLOSED
BOO_GEM	Brake Pedal Position (BPP) Switch Input (GEM Only)	ON, OFF
HALLPWR	Hall Effect Speed Sensor Power (GEM Only)	ON---, OFF---, ON-B-, OFFO-G
4WDCLST	4WD Clutch PWM Output Status (GEM Only)	ON---, OFF---, ON-B-, OFFO-G
TRA_RSP	Rear Shaft Speed (GEM Only)	0-255 MPH
TRA_FSP	Front Shaft Speed (GEM Only)	0-255 MPH
PLATEPW	Contact Plate Ground Output (GEM Only)	ON---, OFF---, ON-B-, OFFO-G
PWR_RLY	ABS Active Input	ON, OFF
NTF	Neutral Tow Function (GEM Only)	ON, OFF
NTF_LMP	Neutral Tow Light (GEM Only)	ON, OFF
D_SBELT	Driver Seat Belt Status	OUT, IN
IPCHIME	External Chime Request	ON, OFF
SBLTMP	Seat Belt Indicator Status	OFF, ON, OFFO-G, ON-B-
DRAJR_L	Door Ajar Warning Lamp Circuit	OFF, ON
D_PWRLY	One Touch Down Relay Coil Circuit Status (GEM Only)	ON---, OFF---, ON-B-, OFFO-G
D_ PWAMP	LF Power Window Regulator Electric Drive Current (GEM Only)	0.25 amp increments (0-63.75 AMPS)
D_PWPK	LF Power Window Regulator Electric Drive Peak	0.25 amp increments (0-63.75 AMPS)

	Current (GEM Only)	
ACCDLY	Accessory Delay Relay Coil Circuit (GEM Only)	ON---, OFF---, ON-B-, OFFO-G
RDEF_ SW	Rear Defrost Control Switch Status	ON, OFF
RDEFRLY	Rear Window Defrost Relay Coil Circuit	ON---, OFF---, ON-B-, OFFO-G
WASHRLY	Washer Relay Status	ON---, OFF---, ON-B-, OFFO-G
WPPK_PK	Wiper Park-to-Park Time	0 - 65 Seconds
WPMODE	Wiper Control Mode Status	WASH, OPEN, INVLD, OFF, INTVL 1-7, LOW, HIGH
WPPRKSW	Wiper Motor Status	PARKED, notPRK
WPRUN	Wiper Mode Run Relay	ON---, OFF---, ON-B-, OFFO-G
WPHISP	Windshield Wiper HI/LO Relay Status	ON---, OFF---, ON-B-, OFFO-G
WASH_SW	Washer Pump Relay Switch Status	OFF, ON, ON-B-, OFFO-G
R_WP_UP	Rear Wiper Up Relay Status (GEM Only)	ON---, OFF---, OFFO-G, ON-B-
R_WP_DN	Rear Wiper Down Relay Status (GEM Only)	ON---, OFF---, OFFO-G, ON-B-
R_WP_SW	Rear Wiper Input Switch Status (GEM Only)	WPLOW, OFF, WPHIGH
R_WP_MD	Rear Wiper Mode Switch Status (GEM Only)	OFF, INTVL 1-2, LOW WASH
R_WP_PK	Rear Wiper Park Status (GEM Only)	PARKED, notPRK

GEM/CTM Active Command Index

GEM/CTM Active Command Index

Active Command	Display	Action
PID LATCH	PID LATCH	ON, OFF
FRONT WIPER	WIPER RLY	ON, OFF
FRONT WIPER	SPEED RLY	ON, OFF
FRONT WIPER	WASH RLY	ON, OFF
WARNING LAMPS AND CHIME	SBLT LAMP	ON, OFF
WARNING LAMPS AND CHIME	CHIME	ON, OFF
WARNING LAMPS AND CHIME	AJAR LAMP	ON, OFF
BATTERY SAVER	BATT SAVR	ON, OFF
INTERIOR COURTESY LAMPS	INT LAMPS	ON, OFF
ONE TOUCH DOWN AND ACCY DELAY (GEM only)	ACCY RLY	ON, OFF
ONE TOUCH DOWN AND ACCY DELAY (GEM only)	ONE TOUCH	ON, OFF
4-WHEEL ELECTRONIC SHIFT (GEM only)	CW/CCW	ON, OFF
4-WHEEL ELECTRONIC SHIFT (GEM only)	HIGH LAMP	ON, OFF
4-WHEEL ELECTRONIC SHIFT (GEM only)	LOW LAMP	ON, OFF
4-WHEEL ELECTRONIC SHIFT (GEM only)	PLATE PWR	ON, OFF

4-WHEEL ELECTRONIC SHIFT (GEM only)	SHFT CLCH	ON, OFF
SHIFT CLUTCH CONTROL	CLUTCH SOL	ANALOG %
NEUTRAL IN TOW LAMP	NTFLAMP	ON, OFF
REAR WIPER (GEM only)	UP RELAY	ON, OFF
REAR WIPER (GEM only)	DWN RELAY	ON, OFF
HEATED BACKLIGHT	RLY CNTRL	ON, OFF
DOOR LOCK CONTROL	DD UNLOCK	ON, OFF

Symptom Chart — A4WD

Symptom Chart

Condition	Possible Sources	Action
• The Vehicle Does Not Operate Properly in AUTO and 4WD HIGH Modes	• Circuitry. • Mode switch. • Speed sensors. • Transfer case electric clutch. • Transfer case mechanism. • GEM. • PCM. • DTC B2105. • DTC B2106. • DTC P1812. • DTC P1815. • DTC P1824. • DTC P1826. • DTC P1836. • DTC P1837. • DTC P1874. • DTC P1875. • DTC P0500.	• GO to Pinpoint Test A .
• The Vehicle Does Not Shift Between A4WD/4WD HIGH and 4WD LOW Modes Properly but Operates Properly in Auto Mode	• Circuitry. • Mode switch. • Contact plate sensors A, B, C and/or D. • Transfer case shift motor. • Transfer case shift relay. • Transfer case mechanism. • GEM. • Digital TR sensor. • Neutral safety switch. • Speed sensors. • Brake pedal position (BPP) switch.	• GO to Pinpoint Test B .

	• 4WABS control module. • DTC B1483. • DTC B1485. • DTC P1812. • DTC P1815. • DTC P1820. • DTC P1822. • DTC P1828. • DTC P1830. • DTC P1836. • DTC P1837. • DTC P1838. • DTC P1846. • DTC P1850. • DTC P1854. • DTC P1858. • DTC P1866. • DTC P1867. • DTC P1874. • DTC P1875. • DTC P1891 • DTC P0500.	
• The 4x4 or 4x4 LOW Range Indicator Does Not Operate Properly	• Circuitry. • Lamp. • Instrument Cluster. • GEM. • DTC P1804. • DTC P1806. • DTC P1808. • DTC P1810.	• GO to Pinpoint Test C .
• No Communication With the Module — Generic Electronic Module	• Circuitry. • Fuses. • GEM. • GEM connectors.	• GO to Pinpoint Test D .

Pinpoint Tests

CAUTION: Before removing and installing the GEM or its connectors, disconnect the battery. Failure to follow this caution will result in GEM storing many erroneous DTCs and it may exhibit erratic operation after installation.

CAUTION: Be careful when probing the fuse junction panel, power distribution box or any connectors. Damage will result to the connector receptacle if the probe or terminal being used is too large.

CAUTION: Electronic modules are sensitive to electrostatic charges. If exposed to these charges, damage may result.

NOTE: If continuous DTCs are recorded and the symptom is not present when performing the pinpoint tests, and intermittent concern may be the cause. Always check for loose connections and corroded terminals.

NOTE: Complete the entire pinpoint test related to the symptom before replacing the GEM.

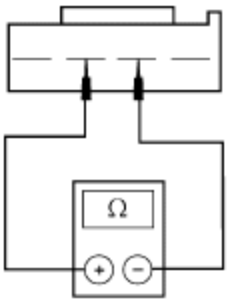
PINPOINT TEST A: THE VEHICLE DOES NOT OPERATE PROPERLY IN AUTO AND 4WD HIGH MODES

CONDITIONS	DETAILS/RESULTS/ACTIONS
A1 CHECK THE IGNITION STATES — MONITOR THE GEM PID IGN_GEM	
1  2  Scan Tool 3 	3 **NOTE:** If the vehicle is equipped with a manual transmission, depress the clutch pedal when turning the ignition switch to START. Monitor the GEM PID IGN_GEM while turning the ignition switch through the START, RUN, OFF, and ACC positions. • **Do the PID values agree with the ignition switch positions?** → **Yes** GO to A2 . → **No** REFER to Section 417-02 .
A2 RETRIEVE THE DIAGNOSTIC TROUBLE CODES	
1  2  Clear Continuous DTCs 3	1 Retrieve and document continuous DTCs.

 GEM On-Demand Self-Test	• **Are any DTCs recorded?** → **Yes** If DTC B1398 is retrieved with P1824, REFER to Section 501-11 . REPAIR DTC B1398 first, then TEST the system for normal operation. If DTC B1371, B1302, B1398, B1814, or B1818, REFER to the GEM/CTM Diagnostic Trouble Code (DTC) Index to diagnose first. If DTC B1342, REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. If DTC B2105, GO to A41 . If DTC B2106, GO to A41 . If DTC P1812, GO to A5 . If DTC P1815, GO to A5 . If DTC P1824, GO to A19 . If DTC P1826, GO to A19 . If DTC P1836, GO to A31 . If DTC P1837, GO to A31 . If DTC P1874, GO to A31 . If DTC P1875, GO to A31 . If DTC P0500, GO to A31 . → **No** GO to A3 .
A3 CHECK THE 4X4 HIGH LAMP INDICATOR — TRIGGER THE GEM ACTIVE COMMAND HIGH LAMP	
1 	1 Trigger the GEM active command HIGH LAMP ON then OFF. • **Does the 4x4 HIGH indicator illuminate then go off?**

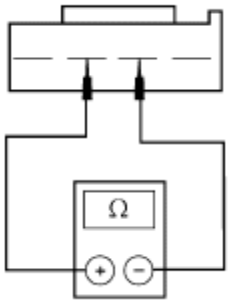
	→ **Yes** GO to A4 . → **No** GO to Pinpoint Test C .
A4 CHECK THE 4X4 LOW LAMP INDICATOR — TRIGGER THE GEM ACTIVE COMMAND LOW LAMP	
1 	1 Trigger the GEM active command LOW LAMP ON then OFF. • **Does the 4x4 LOW indicator illuminate then go off?** → **Yes** GO to A5 . → **No** GO to Pinpoint Test C .
A5 CHECK THE 4WD MODE SWITCH IN THE AUTO POSITION — MONITOR THE GEM PID 4WD_SW	
1  2  GC1174-A	1 Monitor the GEM PID 4WD_SW. 2 Place the 4WD mode switch in the AUTO position. • **Does the GEM PID 4WD_SW indicate AUTO?** → **Yes** GO to A6 . → **No** GO to A8 .
A6 CHECK THE 4WD MODE SWITCH IN THE 4WD HIGH POSITION — MONITOR THE GEM PID 4WD_SW	

1  2  GC1175-A	1 Monitor the GEM PID 4WD_SW. 2 Place the 4WD mode switch in the 4WD HIGH position. • **Does the GEM PID 4WD_SW indicate 4WD HIGH?** → **Yes** GO to A7 . → **No** GO to A8 .
A7 CHECK THE 4WD MODE SWITCH IN THE 4WD LOW POSITION — MONITOR THE GEM PID 4WD_SW	
1  2  GC1176-A	1 Monitor the GEM PID 4WD_SW. 2 Place the 4WD mode switch in the 4WD LOW position. • **Does the GEM PID 4WD_SW indicate 4WD LOW?** → **Yes** GO to A17 . → **No**

	GO to A8 .
A8 CHECK THE 4WD MODE SWITCH IN THE AUTO POSITION	
1  2  4WD Mode Switch C279 3  GC1174-A 4  GC1123-A	3 Place the 4WD mode switch in the AUTO position. 4 Measure the resistance between 4WD mode switch terminals 2 and 3. • **Is the resistance between 3700 and 4100 ohms?** → **Yes** GO to A9 . → **No** REPLACE the 4WD mode switch. CLEAR the DTCs. TEST the system for normal operation.
A9 CHECK THE 4WD MODE SWITCH IN THE 4WD HIGH POSITION	
1	1 Place the 4WD mode switch in the 4WD HIGH position.

GC1175-A

2



GC1123-A

2 Measure the resistance between 4WD mode switch terminals 2 and 3.

- **Is the resistance between 1050 and 1150 ohms?**

→ **Yes**
GO to A10 .

→ **No**
REPLACE the 4WD mode switch. CLEAR the DTCs. TEST the system for normal operation.

A10 CHECK THE 4WD MODE SWITCH IN THE 4WD LOW POSITION

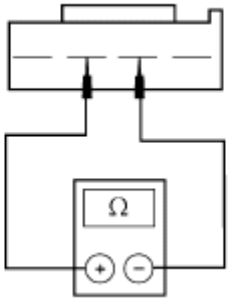
1

GC1176-A

1 Place the 4WD mode switch in the 4WD LOW position.

2

2 Measure the resistance between 4WD mode switch terminals 2 and 3.



- **Is the resistance between 340 and 380 ohms?**

→ **Yes**
GO to A11 .

→ **No**
REPLACE the 4WD mode switch. CLEAR the DTCs. TEST the system for normal operation.

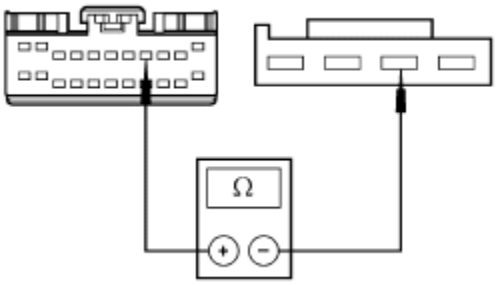
A11 CHECK CIRCUIT 465 (W/LB) FOR OPEN

1

2

GEM C282

3

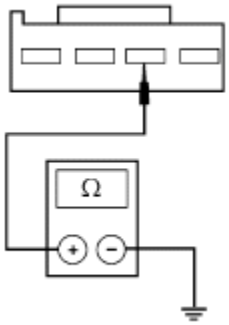
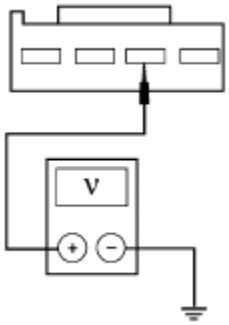


3 Measure the resistance between 4WD mode switch C279-3, circuit 465 (W/LB), and GEM C282-8, circuit 465 (W/LB).

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

→ **Yes**
GO to A12 .

→ **No**
REPAIR circuit 465 (W/LB). CLEAR the DTCs.

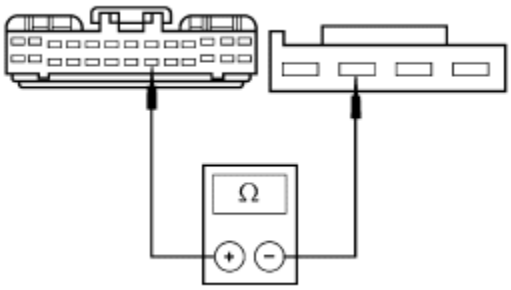
	TEST the system for normal operation.
A12 CHECK CIRCUIT 465 (W/LB) FOR SHORT TO GROUND	
1  GC1098-A	1 Measure the resistance between 4WD mode switch C279-3, circuit 465 (W/LB), and ground. • **Is the resistance greater than 10,000 ohms?** → **Yes** GO to A13 . → **No** REPAIR circuit 465 (W/LB). CLEAR the DTCs. TEST system for normal operation.
A13 CHECK CIRCUIT 465 (W/LB) FOR SHORT TO POWER	
1  2  GC1099-A	2 Measure the voltage between 4WD mode switch C279-3, circuit 465 (W/LB), and ground. • **Is any voltage indicated?** → **Yes** REPAIR circuit 465 (W/LB). CLEAR the DTCs. TEST the system for normal operation. → **No** GO to A14 .
A14 CHECK CIRCUIT 359 (GY/R) FOR OPEN	

1

2

GEM C280

3



GC1632-A

3 Measure the resistance between 4WD mode switch C279-2, circuit 359 (GY/R), and GEM C280-21, circuit 359 (GY/R).

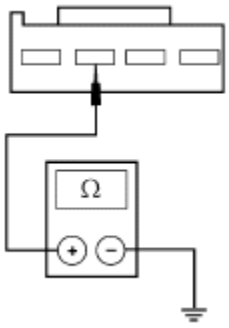
- **Is the resistance less than 5 ohms?**

→ **Yes**
GO to A15 .

→ **No**
REPAIR circuit 359 (GY/R). CLEAR the DTCs. TEST the system for normal operation.

A15 CHECK CIRCUIT 359 (GY/R) FOR SHORT TO GROUND

1



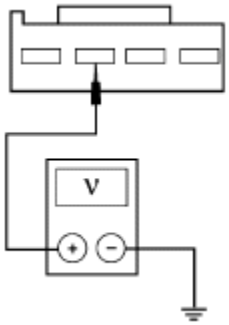
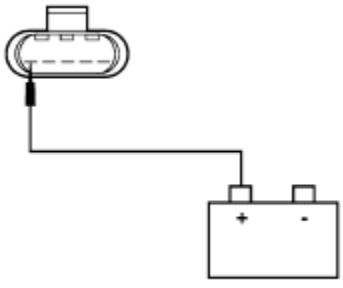
GC1102-A

1 Measure the resistance between 4WD mode switch C279-2, circuit 359 (GY/R), and ground.

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

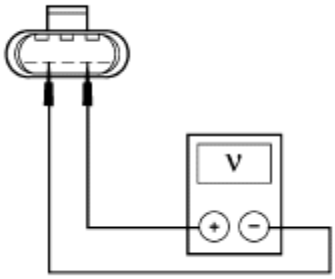
→ **Yes**
GO to A16 .

→ **No**

	REPAIR circuit 359 (GY/R). CLEAR the DTCs. TEST system for normal operation.
A16 CHECK CIRCUIT 359 (GY/R) FOR SHORT TO POWER	
1 	
2  GC1101-A	2 Measure the voltage between 4WD mode switch C279-2, circuit 359 (GY/R), and ground. • **Is any voltage indicated?** → **Yes** REPAIR circuit 359 (GY/R). CLEAR the DTCs. TEST the system for normal operation. → **No** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.
A17 CHECK THE SOLID STATE CLUTCH RELAY	
1  Solid State Clutch Relay C274	
2  GC1874-A	2 Connect a jumper wire between battery positive terminal and solid state clutch relay terminal 1.
3	3 Connect a jumper wire between solid state clutch relay terminal 2 and ground.

GC1559-A

4



GC1560-A

4 Measure the voltage between solid state clutch relay terminals 4 and 2.

- **Is the voltage 0 volts?**

→ **Yes**
GO to A18 .

→ **No**
REPLACE the solid state clutch relay. CLEAR the DTCs. TEST the system for normal operation.

A18 CHECK THE SOLID STATE CLUTCH RELAY SWITCH MODE

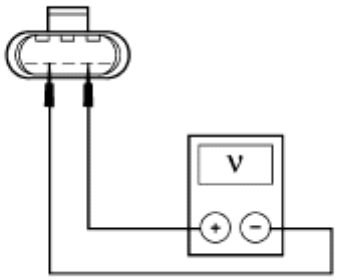
1

GC1561-A

2

1 Connect a jumper wire between solid state clutch relay terminal 3 and ground.

2 Measure the voltage between solid state clutch relay terminals 2 and 4.



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

→ **Yes**
RECONNECT the solid state clutch relay, GO to A19 .

→ **No**
REPLACE the solid state clutch relay. CLEAR the DTCs. TEST the system for normal operation.

A19 CHECK THE SOLID STATE CLUTCH RELAY COIL CIRCUIT — MONITOR THE GEM PID 4WDCLST

1

2

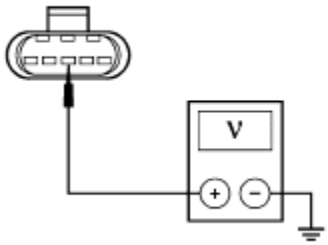
3

1 Place the 4WD mode switch in the 4WD HIGH position.

3 Monitor the GEM PID 4WDCLST.

- **Does the GEM PID 4WDCLST indicate ON---, OFF---?**

→ **Yes**
GO to A24 .

	→ **No** If the GEM PID 4WDCLST indicates ON-B-, GO to A20 . If the GEM PID 4WDCLST indicates OFFO-G, GO to A21 .
A20 CHECK CIRCUIT 275 (Y) FOR SHORT TO POWER	
1  2  Solid State Clutch Relay C274 3  GEM C282 4  5  GC1562-A	5 Measure the voltage between solid state clutch relay C274-3, circuit 275 (Y), and ground.
	• **Is any voltage indicated?** → **Yes** REPAIR circuit 275 (Y). CLEAR the DTCs. TEST the system for normal operation. → **No** RECONNECT system. RETRIEVE DTCs. TEST the system for normal operation. If the system is still inoperative, REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

A21 CHECK CIRCUIT 400 (LB/BK) FOR VOLTAGE

1

2

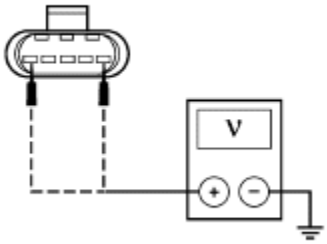
Solid State Clutch Relay C274

3

4

4 Trigger the GEM active command ACCY RLY to ON.

5



GC1563-A

5 Measure the voltage between solid state clutch relay C274-1, circuit 400 (LB/BK), and ground; and between solid state clutch relay C274-5, circuit 400 (LB/BK), and ground.

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

→ **Yes**
GO to A22 .

→ **No**
REPAIR circuit 400 (LB/BK). CLEAR the DTCs. TEST the system for normal operation.

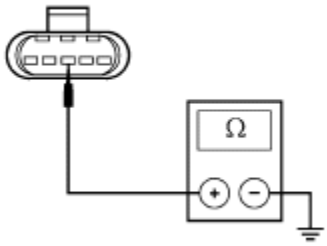
A22 CHECK CIRCUIT 275 (Y) FOR SHORT TO GROUND

1

2

GEM C282

3



GC1564-A

3 Measure the resistance between solid state clutch relay C274-3, circuit 275 (Y), and ground.

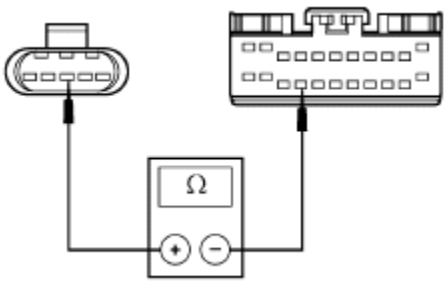
- **Is the resistance greater than 10,000 ohms?**

→ **Yes**
GO to A23 .

→ **No**
REPAIR circuit 275 (Y). CLEAR the DTCs. TEST the system for normal operation.

A23 CHECK CIRCUIT 275 (Y) FOR OPEN

1



GC1565-A

1 Measure the resistance between solid state clutch relay C274-3, circuit 275 (Y), and GEM C282-15, circuit 275 (Y).

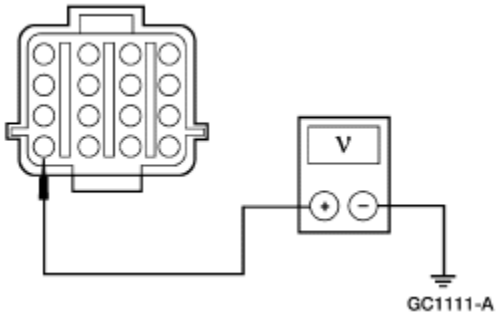
- **Is the resistance less than 5 ohms?**

→ **Yes**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPAIR circuit 275 (Y). CLEAR the DTCs. TEST the system for normal operation.

A24 CHECK THE ELECTRIC CLUTCH — ENERGIZED

1  2  4  GC1175-A 5 	3 Raise and support the vehicle; refer to Section 100-02 . 4 Place the 4WD mode switch in the 4WD HIGH position. 5 Trigger the GEM active command ACCY RLY to ON. 6 Rotate the front drive shaft. • **Does the front drive shaft lock to the rear?** → **Yes** GO to A25 . → **No** GO to A26 .
A25 CHECK THE ELECTRIC CLUTCH — NOT ENERGIZED	
1 	1 Trigger the GEM active command ACCY RLY to OFF. 2 Rotate the front drive shaft. • **Does the front drive shaft lock to the rear?** → **Yes**

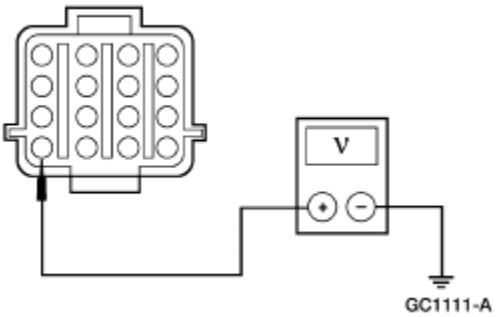
	GO to A27 . → **No** GO to A31 .
A26 CHECK THE VOLTAGE TO THE ELECTRIC CLUTCH — GEM ACTIVE COMMAND ACCY RLY ON	
1  2  Transfer Case Assembly C201 3  4  5  GC1111-A	4 Trigger the GEM active command ACCY RLY to ON. 5 Measure the voltage between transfer case assembly C201-16, circuit 779 (BR), and ground. • **Is the voltage greater than 10 volts?** → **Yes** REPLACE the electric clutch. CLEAR the DTCs. TEST the system for normal operation. → **No** GO to A29 .
A27 CHECK THE VOLTAGE TO THE ELECTRIC CLUTCH — GEM ACTIVE COMMAND ACCY RLY OFF	
1	

2

Transfer Case Assembly C201

3

4



4 Measure the voltage between transfer case assembly C201-16, circuit 779 (BR), and ground.

- **Is the voltage zero volts?**

→ **Yes**
REPLACE the electric clutch. CLEAR the DTCs. TEST the system for normal operation.

→ **No**
GO to A28 .

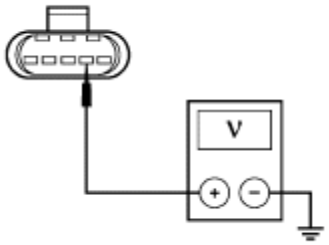
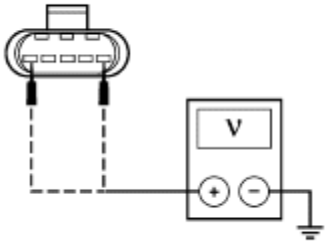
A28 CHECK CIRCUIT 779 (BR) FOR SHORT TO POWER

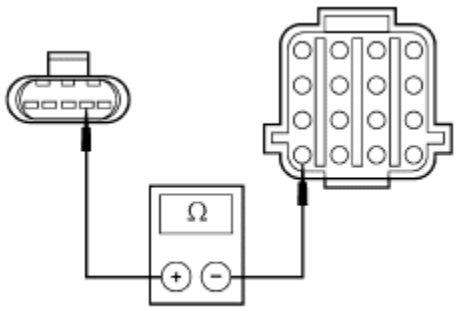
1

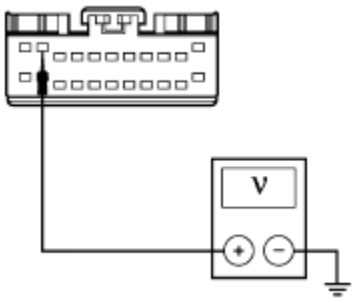
2

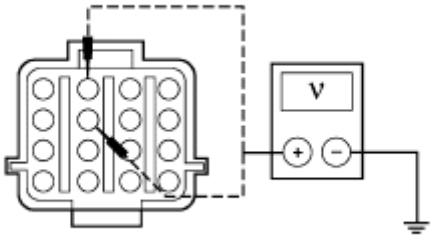
Solid State Clutch Relay C274

3

4  GC1566-A	4 Measure the voltage between solid state clutch relay C274-2, circuit 779 (BR), and ground. • **Is any voltage indicated?** → **Yes** REPAIR circuit 779 (BR). CLEAR the DTCs. TEST the system for normal operation. → **No** REPLACE the solid state clutch relay. CLEAR the DTCs. TEST the system for normal operation.
A29 CHECK THE VOLTAGE TO THE SOLID STATE CLUTCH RELAY — CIRCUIT 400 (LB/BK)	
1  2  Solid State Clutch Relay C274 3  4  GC1563-A	3 Trigger the GEM active command ACCY RLY to ON. 4 Measure the voltage between solid state clutch relay C274-1 and C274-5, circuit 400 (LB/BK), and ground. • **Is the voltage greater than 10 volts?**

	→ **Yes** GO to A30 . → **No** REPAIR circuit 400 (LB/BK). CLEAR the DTCs. TEST the system for normal operation.
A30 CHECK CIRCUIT 779 (BR) FOR OPEN	
1  GC1592-A	1 Measure the resistance between transfer case assembly C201-16, circuit 779 (BR), and solid state clutch relay C274-2, circuit 779 (BR). • **Is the resistance less than 5 ohms?** → **Yes** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** REPAIR circuit 779 (BR). CLEAR the DTCs. TEST the system for normal operation.
A31 CHECK THE FRONT AND REAR DRIVE SHAFT SPEED SENSORS	
1 	1 Monitor the GEM PIDs TRA_FSP and TRA_RSP while driving the vehicle 0 to 88.5 km/h (55 mph). • **Do the PID values agree with the speedometer?** → **Yes** GO to A39 . → **No** GO to A32 .
A32 CHECK CIRCUIT 539 (PK/LB) FOR SHORT TO POWER	
1 	

2  GEM C282 3  4  GC1567-A	4 Measure the voltage between GEM C282-2, circuit 539 (PK/LB), and ground. • **Is any voltage indicated?** → **Yes** REPAIR circuit 539 (PK/LB). CLEAR the DTCs. TEST the system for normal operation. → **No** RECONNECT GEM C282. GO to A33 .
A33 CHECK THE VOLTAGE TO THE FRONT AND REAR SHAFT SPEED SENSORS — CIRCUIT 774 (LG)	
1  2  Transfer Case Assembly C201 3  4	4 Measure the voltage between transfer case assembly C201-3, circuit 774 (LG), C201-7, circuit 774 (LG), and ground.



GC1115-A

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

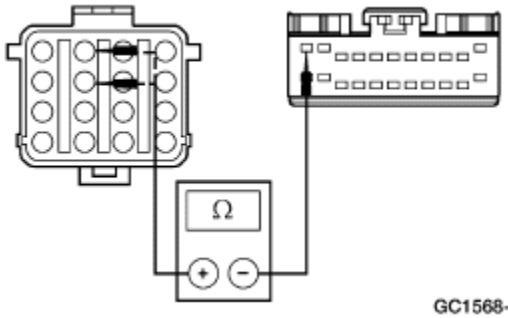
→ **Yes**
GO to A36 .

→ **No**
GO to A34 .

A34 CHECK CIRCUIT 774 (LG) FOR OPEN

1

2



GC1568-A

2 Measure the resistance between transfer case assembly C201-3, circuit 774 (LG), C201-7, circuit 774 (LG), and GEM C282-1, circuit 774 (LG).

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

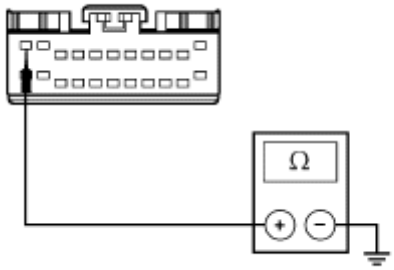
→ **Yes**
GO to A35 .

→ **No**
REPAIR circuit 774 (LG). CLEAR the DTCs. TEST the system for normal operation.

A35 CHECK CIRCUIT 774 (LG) FOR SHORT TO GROUND

1

1 Measure the resistance between GEM C282-1, circuit 774 (LG), and ground.



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

→ **Yes**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

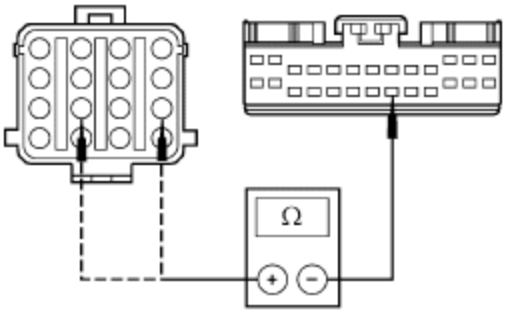
→ **No**
REPAIR circuit 774 (LG). CLEAR the DTCs. TEST the system for normal operation.

A36 CHECK CIRCUIT 359 (GY/R) FOR OPEN

1

GEM C280

2



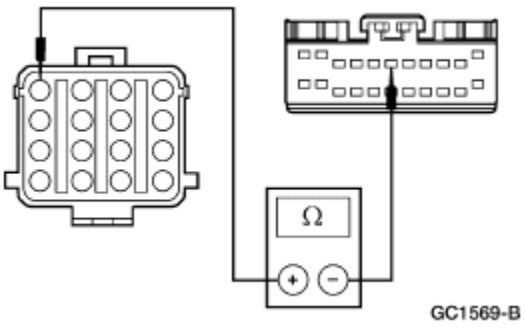
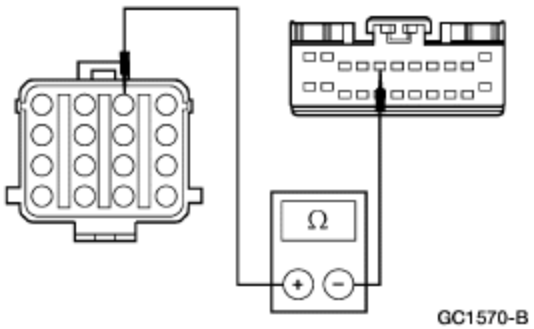
2 Measure the resistance between transfer case assembly C201-6, circuit 359 (GY/R), C201-8, circuit 359 (GY/R), and GEM C280-21, circuit 359 (GY/R).

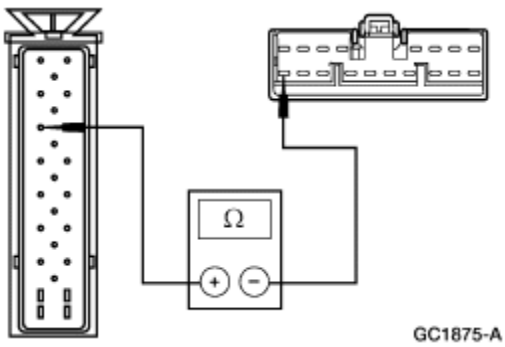
- **Is the resistance less than 5 ohms?**

→ **Yes**
If DTC P1836 was retrieved in **A2** , GO to A37 .

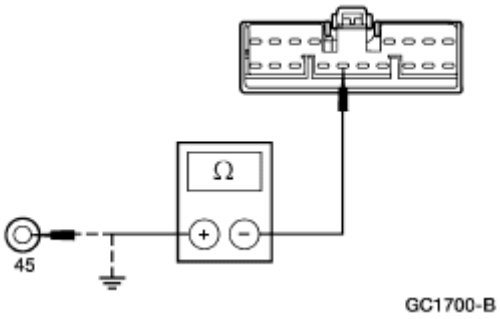
If DTC P1837 was retrieved in **A2** , GO to A38 .

If DTCs P1836 and P1837 were not retrieved, REPLACE the GEM; REFER to Section 419-

	10 . CLEAR the DTCs. TEST the system for normal operation. → **No** REPAIR circuit 359 (GY/R). CLEAR the DTCs. TEST the system for normal operation.
A37 CHECK THE FRONT SHAFT SPEED SENSOR CIRCUIT 236 (BK/LG) FOR OPEN	
1  	1 Measure the resistance between transfer case assembly C201-4, circuit 236 (BK/LG), and GEM C282-6, circuit 236 (BK/LG). • **Is the resistance less than 5 ohms?** → **Yes** REPLACE the front shaft speed sensor. CLEAR the DTCs. TEST the system for normal operation. → **No** REPAIR circuit 236 (BK/LG). CLEAR the DTCs. TEST the system for normal operation.
A38 CHECK THE REAR SHAFT SPEED SENSOR CIRCUIT 772 (LB) FOR OPEN	
1  	1 Measure the resistance between transfer case assembly C201-2, circuit 772 (LB), and GEM C282-5, circuit 772 (LB). • **Is the resistance less than 5 ohms?** → **Yes** REPLACE the rear shaft speed sensor. CLEAR the DTCs. TEST the system for normal operation. → **No**

	REPAIR circuit 236 (BK/LG). CLEAR the DTCs. TEST the system for normal operation.
A39 CHECK THE VEHICLE SPEED SIGNAL — MONITOR THE GEM PID VSS_GEM	
1 	1 Monitor the GEM PID VSS_GEM while driving the vehicle 0 to 88.5 kph (55 mph). • **Does the GEM PID VSS_GEM agree with the speedometer?** → **Yes** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** GO to A40 .
A40 CHECK CIRCUIT 679 (GY/BK) FOR OPEN	
1  2  4WABS Control Module C186 3  GEM C283 4  GC1875-A	4 Measure the resistance between GEM C283-9, circuit 679 (GY/BK), and 4WABS control module C186-19, circuit 679 (GY/BK). • **Is the resistance less than 5 ohms?** → **Yes**

	REFER to Section 206-09 . → **No** REPAIR circuit 679 (GY/BK). CLEAR the DTCs. TEST the system for normal operation.
A41 CHECK THE THROTTLE POSITION INPUT—MONITOR THE GEM PID TPI	
1  2 	2 Monitor the GEM PID TPI while pressing and releasing the accelerator. • **Does the GEM PID TPI decrease when the accelerator is pressed and increase when the accelerator is released?** → **Yes** DISCONNECT GEM C283 and PCM C202 and INSPECT circuit 357 (Y/W) for signs of corrosion or damage. If OK, RECONNECT the connectors, CLEAR the DTCs. TEST the system for normal operation. If the DTCs reappear, REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** GO to A42 .
A42 CHECK CIRCUIT 357 (Y/W) FOR OPEN AND SHORT TO GROUND	
1  2  PCM C202 3  GEM C283 5	4 Connect the EEC-V 104-Pin Breakout Box.



5 Measure the resistance between EEC-V 104-Pin Breakout Box pin 45, circuit 357 (Y/W), and GEM C283-13, circuit 357 (Y/W); and between GEM C357, circuit 357 (Y/W), and ground.

- **Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between the GEM connector and ground?**

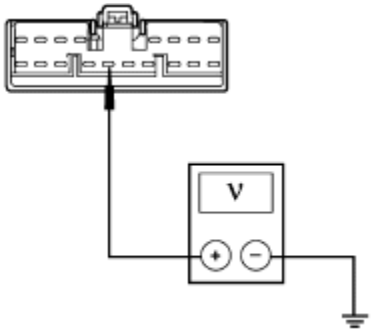
→ **Yes**
GO to A43 .

→ **No**
REPAIR circuit 357 (Y/W). CLEAR the DTCs. TEST the system for normal operation.

A43 CHECK CIRCUIT 357 (Y/W) FOR SHORT TO POWER

1

2



2 Measure the voltage between GEM C283-13, circuit 357 (Y/W), and ground.

- **Is any voltage indicated?**

→ **Yes**
REPAIR circuit 357 (Y/W). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REFER to Section 3A in the Powertrain Control/Emissions Diagnosis (PC/ED) manual for diagnosis and testing of the PCM.

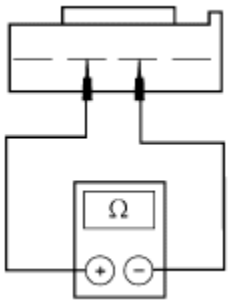
PINPOINT TEST B: THE VEHICLE DOES NOT SHIFT BETWEEN A4WD/4WD HIGH AND 4WD LOW MODES PROPERLY BUT OPERATES PROPERLY IN AUTO MODE

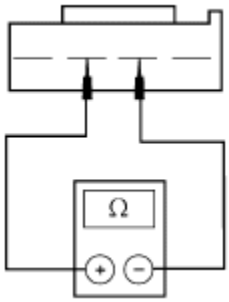
CONDITIONS	DETAILS/RESULTS/ACTIONS
B1 CHECK THE IGNITION STATES — MONITOR THE GEM PID IGN_GEM	
1  2  Scan Tool 3 	3 **NOTE:** If the vehicle is equipped with a manual transmission, depress the clutch pedal when turning the ignition switch to START. Monitor the GEM PID IGN_GEM while turning the ignition switch through the START, RUN, OFF, and ACC positions. • **Do the PID values agree with the ignition switch positions?** → **Yes** GO to B2 . → **No** REFER to Section 417-02 , Pinpoint Test D .
B2 RETRIEVE THE DIAGNOSTIC TROUBLE CODES (DTCs)	
1  2  Clear Continuous DTCs 3  GEM On-Demand Self-Test	1 Retrieve and document continuous DTCs.

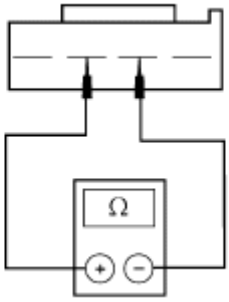
	• **Are any DTCs recorded?** → **Yes** If DTC B1371, B1302, B1398, B1814, or B1818, REFER to the GEM/CTM Diagnostic Trouble Code (DTC) Index to diagnose first. If DTC P0500, GO to B73 . If DTC P1342, REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. If DTC B1483, GO to B17 . If DTC B1485, GO to B17 . If DTC P1812, GO to B3 . If DTC P1815, GO to B3 . If DTC P1820, GO to B55 . If DTC P1822, GO to B55 . If DTC P1828, GO to B55 . If DTC P1830, GO to B55 . If DTC P1836, GO to B31 . If DTC P1837, GO to B31 . If DTC P1838, GO to B55 . If DTC P1846, GO to B40 . If DTC P1850, GO to B40 . If DTC P1854, GO to B40 . If DTC P1858, GO to B40 . If DTC P1866, GO to B40 . If DTC P1867, GO to B40 . If DTC P1874, GO to B31 . If DTC P1875, GO to B31 . If DTC P1891, GO to B31 . → **No** GO to B3 .
B3 CHECK THE 4X4 HIGH LAMP INDICATOR — TRIGGER THE GEM ACTIVE COMMAND HIGH LAMP	

1 	1 Trigger the GEM active command HIGH LAMP ON then OFF. • **Does the 4x4 HIGH indicator illuminate then go off?** → **Yes** GO to B4 . → **No** GO to Pinpoint Test C .
B4 CHECK THE 4X4 LOW LAMP INDICATOR — TRIGGER THE GEM ACTIVE COMMAND LOW LAMP	
1 	1 Trigger the GEM active command LOW LAMP ON then OFF. • **Does the 4x4 LOW indicator illuminate then go off?** → **Yes** GO to B5 . → **No** GO to Pinpoint Test C .
B5 CHECK THE 4WD MODE SWITCH IN THE AUTO POSITION — MONITOR THE GEM PID 4WD_SW	
1  2  GC1174-A	1 Monitor the GEM PID 4WD_SW. 2 Place the 4WD mode switch in the AUTO position. • **Does the GEM PID 4WD_SW indicate AUTO?**

	→ **Yes** GO to B6 . → **No** GO to B8 .
B6 CHECK THE 4WD MODE SWITCH IN THE 4WD HIGH POSITION — MONITOR THE GEM PID 4WD_SW	
1  2  GC1175-A	1 Monitor the GEM PID 4WD_SW. 2 Place the 4WD mode switch in the 4WD HIGH position. • **Does the GEM PID 4WD_SW indicate 4WD HIGH?** → **Yes** GO to B7 . → **No** GO to B8 .
B7 CHECK THE 4WD MODE SWITCH IN THE 4WD LOW POSITION — MONITOR THE GEM PID 4WD_SW	
1  2  GC1176-A	1 Monitor the GEM PID 4WD_SW. 2 Place the 4WD mode switch in the 4WD LOW position.

	• **Does the GEM PID 4WD_SW indicate 4WD LOW?** → **Yes** GO to B17 . → **No** GO to B8 .
B8 CHECK THE 4WD MODE SWITCH IN THE AUTO POSITION	
1  2  4WD Mode Switch C279 3  GC1174-A 4  GC1123-A	3 Place the 4WD mode switch in the AUTO position. 4 Measure the resistance between 4WD mode switch terminals 2 and 3. • **Is the resistance between 3700 and 4100 ohms?** → **Yes** GO to B9 . → **No**

	REPLACE the 4WD mode switch. CLEAR the DTCs. TEST the system for normal operation.
B9 CHECK THE 4WD MODE SWITCH IN THE 4WD HIGH POSITION	
1  GC1175-A	1 Place the 4WD mode switch in the 4WD HIGH position.
2  GC1123-A	2 Measure the resistance between 4WD mode switch terminals 2 and 3. • **Is the resistance between 1050 and 1150 ohms?** → **Yes** GO to B10 . → **No** REPLACE the 4WD mode switch. CLEAR the DTCs. TEST the system for normal operation.
B10 CHECK THE 4WD MODE SWITCH IN THE 4WD LOW POSITION	
1  GC1176-A	1 Place the 4WD mode switch in the 4WD LOW position.
2	2 Measure the resistance between 4WD mode switch terminals 2 and 3.



GC1123-A

- **Is the resistance between 340 and 380 ohms?**

→ **Yes**
GO to B11 .

→ **No**
REPLACE the 4WD mode switch. CLEAR the DTCs. TEST the system for normal operation.

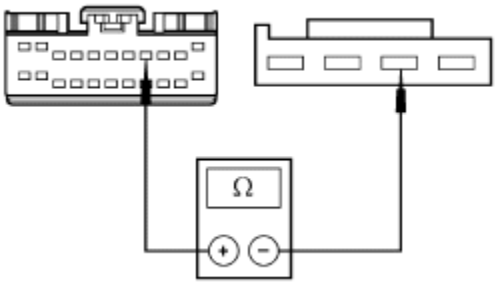
B11 CHECK CIRCUIT 465 (W/LB) FOR OPEN

1

2

GEM C282

3



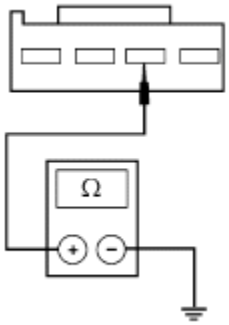
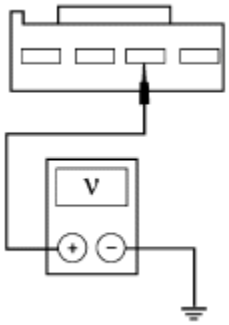
GC1556-A

3 Measure the resistance between 4WD mode switch C279-3, circuit 465 (W/LB), and GEM C282-8, circuit 465 (W/LB).

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

→ **Yes**
GO to B12 .

→ **No**
REPAIR circuit 465 (W/LB). CLEAR the DTCs.

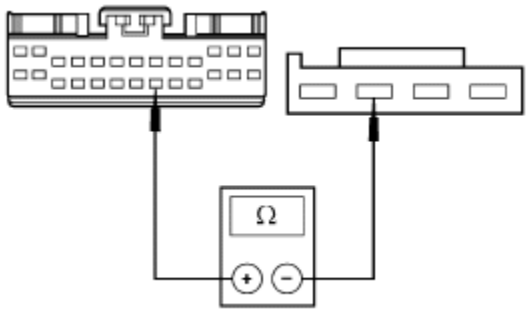
	TEST the system for normal operation.
B12 CHECK CIRCUIT 465 (W/LB) FOR SHORT TO GROUND	
1  GC1098-A	1 Measure the resistance between 4WD mode switch C279-3, circuit 465 (W/LB), and ground. • **Is the resistance greater than 10,000 ohms?** → **Yes** GO to B13 . → **No** REPAIR circuit 465 (W/LB). CLEAR the DTCs. TEST system for normal operation.
B13 CHECK CIRCUIT 465 (W/LB) FOR SHORT TO POWER	
1  2  GC1099-A	2 Measure the voltage between 4WD mode switch C279-3, circuit 465 (W/LB), and ground. • **Is any voltage indicated?** → **Yes** REPAIR circuit 465 (W/LB). CLEAR the DTCs. TEST the system for normal operation. → **No** GO to B14 .
B14 CHECK CIRCUIT 359 (GY/R) FOR OPEN	

1

2

GEM C280

3



GC1783-B

3 Measure the resistance between 4WD mode switch C279-2, circuit 359 (GY/R), and GEM C280-21, circuit 359 (GY/R).

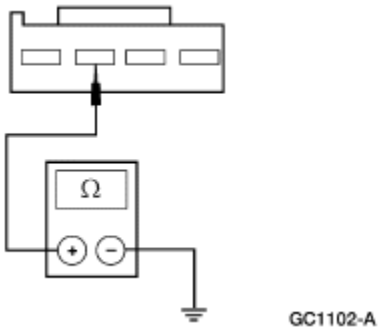
- **Is the resistance less than 5 ohms?**

→ **Yes**
GO to B15 .

→ **No**
REPAIR circuit 359 (GY/R). CLEAR the DTCs. TEST the system for normal operation.

B15 CHECK CIRCUIT 359 (GY/R) FOR SHORT TO GROUND

1



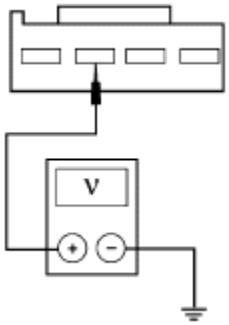
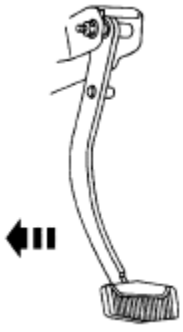
GC1102-A

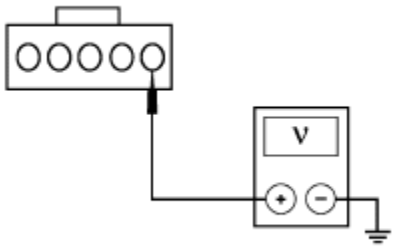
1 Measure the resistance between 4WD mode switch C279-2, circuit 359 (GY/R), and ground.

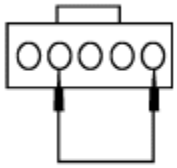
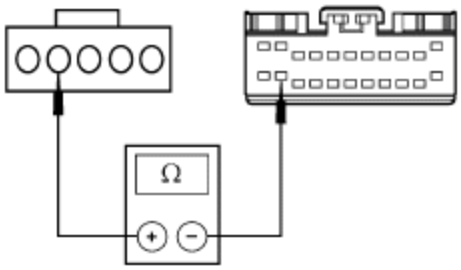
- **Is the resistance greater than 10,000 ohms?**

→ **Yes**
GO to B16 .

→ **No**

	REPAIR circuit 359 (GY/R). CLEAR the DTCs. TEST system for normal operation.
B16 CHECK CIRCUIT 359 (GY/R) FOR SHORT TO POWER	
1  2  GC1101-A	2 Measure the voltage between 4WD mode switch C279-2, circuit 359 (GY/R), and ground. • **Is any voltage indicated?** → **Yes** REPAIR circuit 359 (GY/R). CLEAR the DTCs. TEST the system for normal operation. → **No** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.
B17 CHECK THE BRAKE PEDAL POSITION (BPP) SWITCH — MONITOR THE GEM PID BOO_GEM	
1  2  GC1124-A	1 Monitor the GEM PID BOO_GEM. 2 Depress the brake pedal. • **Does the GEM PID BOO_GEM indicate ON?**

	→ **Yes** GO to B22 . → **No** GO to B18 .
B18 CHECK FUSE JUNCTION PANEL FUSE 13 (20A)	
1  2  Fuse 13 (20A)	• **Is the fuse OK?** → **Yes** GO to B19 . → **No** REPLACE the fuse. CLEAR the DTCs. TEST the system for normal operation. If the fuse fails again, CHECK for a short to ground, REPAIR as necessary.
B19 CHECK THE VOLTAGE TO THE PEDAL POSITION (BPP) SWITCH — CIRCUIT 10 (LG/R)	
1  BPP Switch C224 2  GC1571-A	2 Measure the voltage between BPP switch C224-5, circuit 10 (LG/R), and ground. • **Is the voltage greater than 10 volts?** → **Yes** GO to B20 .

	→ **No** REPAIR circuit 10 (LG/R). CLEAR the DTCs. TEST the system for normal operation.
B20 CHECK THE BPP SWITCH — MONITOR THE GEM PID BOO_GEM	
1  2  GC1572-A	1 Monitor the GEM PID BOO_GEM. 2 Connect a jumper wire between BPP switch C224-5, circuit 10 (LG/R), and C224-2, circuit 810 (R/LG). • **Does the GEM PID BOO_GEM indicate ON?** → **Yes** REPLACE the BPP switch; REFER to Section 417-01 . CLEAR the DTCs. TEST the system for normal operation. → **No** GO to B21 .
B21 CHECK CIRCUIT 810 (R/LG) FOR OPEN	
1  GEM C282 2  GC1573-A	2 Measure the resistance between GEM C282-13, circuit 810 (R/LG), and BPP switch C224-2, circuit 810 (R/LG).

	• **Is the resistance less than 5 ohms?** → **Yes** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** REPAIR circuit 810 (R/LG). CLEAR the DTCs. TEST the system for normal operation.
B22 CHECK THE CLUTCH INTERLOCK — MONITOR THE GEM PID CLTCHSW	
1 	
2 	2 Monitor the GEM PID CLTCHSW.
3 	3 For A/T equipped vehicles, place the PRNDL in the park position.
	4 Verify the GEM PID CLTCHSW indicates ENGAGED.
5 	5 For vehicles equipped with M/T, depress the clutch.
6 	6 Verify the GEM PID CLTCHSW indicates ENGAGED.
	• **Does the GEM PID CLTCHSW indicate ENGAGED when in neutral (A/T) or the clutch is depressed (M/T) and indicate NOT_ENGAGED when in any position other than PARK or NEUTRAL (A/T) or clutch not depressed (M/T)?** → **Yes** If A/T, GO to B26 . If M/T, GO to B29 . → **No** GO to B23 .

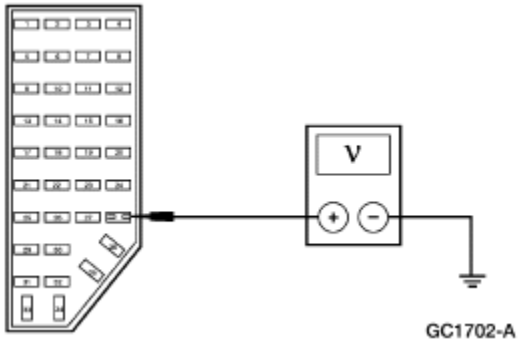
B23 CHECK FOR VOLTAGE AT FUSE JUNCTION PANEL FUSE 28 (7.5A)

1

Fuse 28 (7.5A)

2

3



3 Measure the voltage between fuse junction panel fuse 28 (7.5A), pin 2, and ground.

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

→ **Yes**
GO to B24 .

→ **No**
DIAGNOSE the starting system; REFER to Section 303-06 .

If OK, REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

B24 CHECK CIRCUIT 1000 (R/LG) FOR OPEN AND SHORT TO GROUND

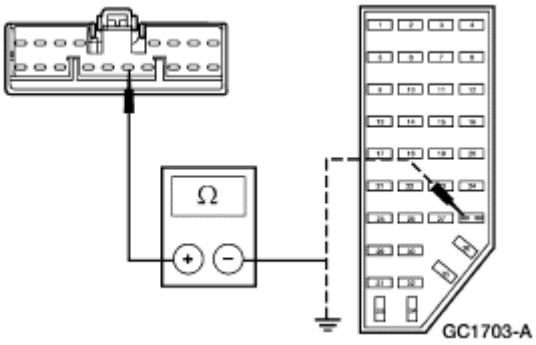
1

2

GEM C283

3

3 Measure the resistance between GEM C283-14, circuit 1000 (R/LG), and fuse junction panel fuse 28 (7.5A), pin 1; and between GEM C283-14, circuit 1000 (R/LG), and



ground.

- **Is the resistance less than 5 ohms between the two connectors and greater than 10,000 ohms between the GEM connector and ground?**

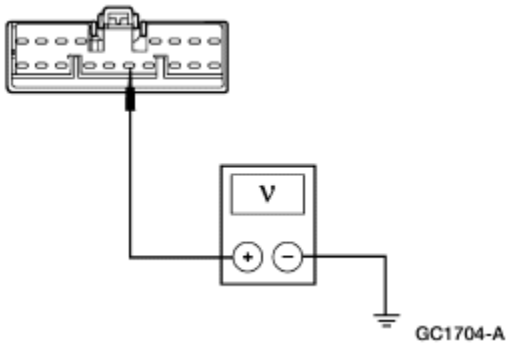
→ **Yes**
GO to B25 .

→ **No**
REPAIR circuit 1000 (R/LG). CLEAR the DTCs. TEST the system for normal operation.

B25 CHECK CIRCUIT 1000 (R/LG) FOR SHORT TO POWER

1

2



2 Measure the voltage between GEM C283-14, circuit 1000 (R/LG), and ground.

- **Is any voltage indicated?**

→ **Yes**
REPAIR circuit 1000 (R/LG). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

B26 CHECK THE TRANSMISSION RANGE SENSOR — MONITOR THE GEM PID NTRL_SW

1

2

3

4

1 Monitor the GEM PID NTRL_SW.

3 Verify the GEM PID NTRL_SW indicates NTRL.

4 Verify the GEM PID NTRL_SW indicates notNTRL when the transmission is in any position other than NEUTRAL.

- **Does the GEM PID NTRL_SW indicate correctly?**

→ **Yes**
GO to B31 .

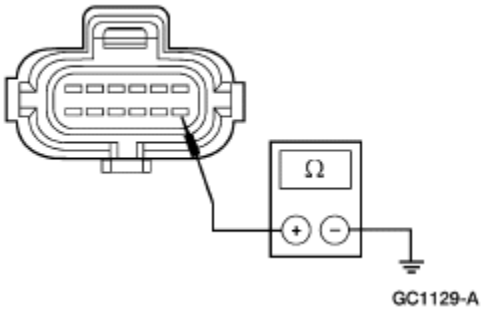
→ **No**
GO to B27 .

B27 CHECK THE GROUND TO THE DIGITAL TR SENSOR — CIRCUIT 57 (BK)

1

Digital TR Sensor C112

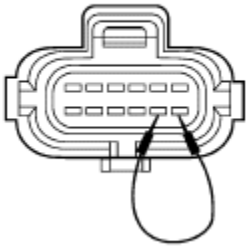
2



2 Measure the resistance between digital TR sensor C112-7, circuit 57 (BK), and ground.

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

→ **Yes**
GO to B28 .

	→ **No** REPAIR circuit 57 (BK). CLEAR the DTCs. TEST the system for normal operation.
B28 CHECK THE DIGITAL TR SENSOR — MONITOR THE GEM PID NTRL_SW	
1 	1 Monitor the GEM PID NTRL_SW.
2  GC1130-A	2 Connect a jumper wire between digital TR sensor C112-7, circuit 57 (BK) and C112-8, circuit 463 (R/W).
3 	
4 	4 Verify the GEM PID NTRL_SW indicates NTRL. 5 Remove the jumper wire. 6 Monitor the GEM PID NTRL_SW.
6 	7 Verify the GEM PID NTRL_SW indicates notNTRL. • **Does the GEM PID NTRL_SW indicate correctly?** → **Yes** REPLACE the digital TR sensor; REFER to Section 307-01A (4R70W) or Section 307-01B (5R55E). CLEAR the DTCs. TEST the system for normal operation. → **No** GO to B29 .

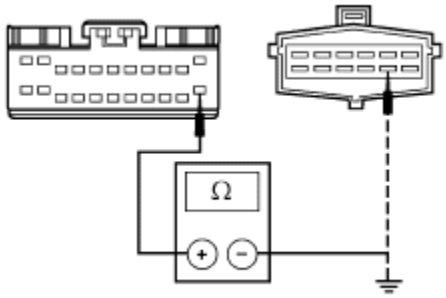
B29 CHECK CIRCUIT 463 (R/W) FOR OPEN

1

2

GEM C282

3



3 Measure the resistance between GEM C282-22, circuit 463 (R/W), and digital TR sensor C112-8, circuit 463 (R/W) (A/T); or between GEM C282-22, circuit 463 (R/W), and ground (M/T).

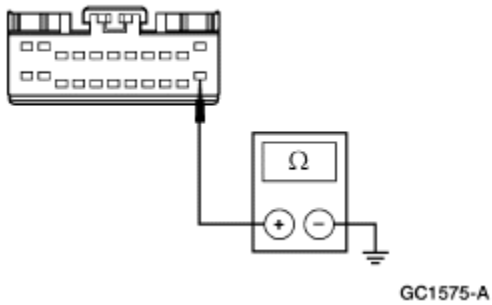
- **Is the resistance less than 5 ohms?**

→ **Yes**
GO to B30 .

→ **No**
REPAIR circuit 463 (R/W). CLEAR the DTCs. TEST the system for normal operation.

B30 CHECK CIRCUIT 463 (R/W) FOR SHORT TO GROUND

1

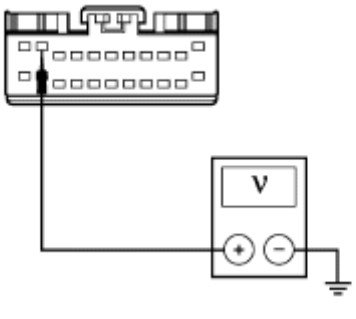


1 Measure the resistance between GEM C282-22, circuit 463 (R/W), and ground.

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

→ **Yes**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for

	normal operation. → **No** REPAIR circuit 463 (R/W). CLEAR the DTCs. TEST the system for normal operation.
B31 CHECK THE FRONT AND REAR SHAFT SPEED SENSORS — MONITOR THE GEM PIDS TRA_FSP AND TRA_RSP	
1  2  GC1175-A	1 Monitor the GEM PIDs TRA_FSP and TRA_RSP 2 Place the 4WD mode switch in the 4WD HIGH position. 3 Drive the vehicle 0 to 88.5 km/h (55mph). • **Do the PID values agree with the speedometer?** → **Yes** GO to B39 . → **No** GO to B32 .
B32 CHECK CIRCUIT 539 (PK/LB) FOR SHORT TO POWER	
1  2  GEM C282 3  4	4 Measure the voltage between GEM C282-2,



circuit 539 (PK/LB), and ground.

- **Is any voltage indicated?**

→ **Yes**
REPAIR circuit 539 (PK/LB). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
RECONNECT GEM C282, GO to B33 .

B33 CHECK THE VOLTAGE TO THE FRONT AND REAR SHAFT SPEED SENSORS — CIRCUIT 774 (LG)

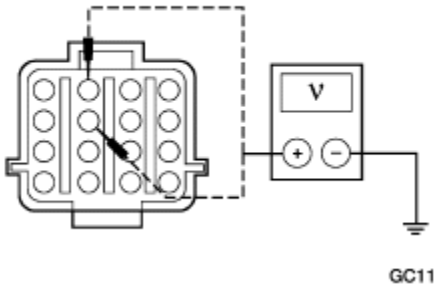
1

2

Transfer Case Assembly C201

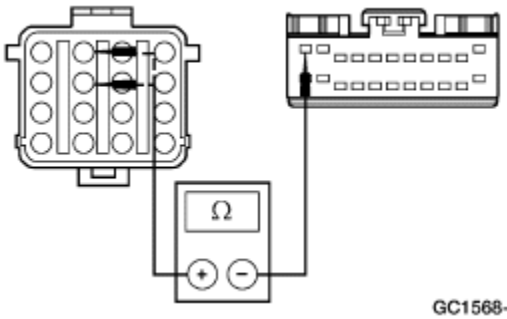
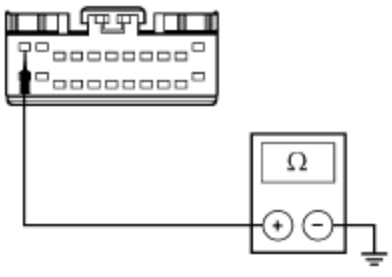
3

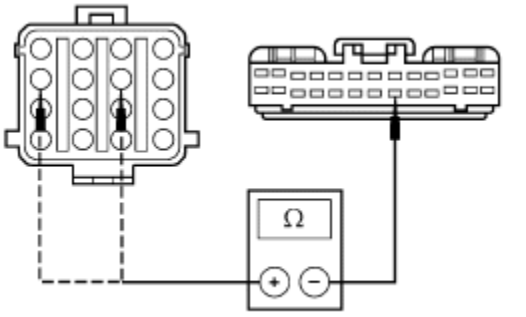
4

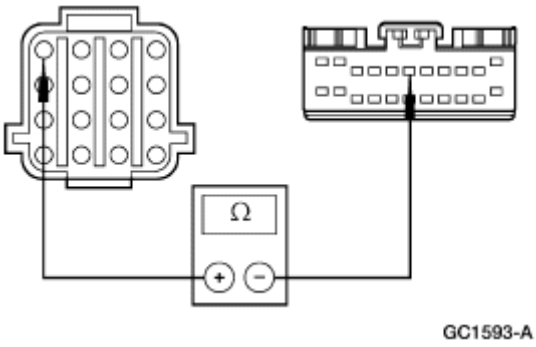


4 Measure the voltage between transfer case assembly C201-3, circuit 774 (LG), C201-7, circuit 774 (LG), and ground.

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

	→ **Yes** GO to B36 . → **No** GO to B34 .
B34 CHECK CIRCUIT 774 (LG) FOR OPEN	
1  2  GEM C282 3  GC1568-A	3 Measure the resistance between transfer case assembly C201-3, circuit 774 (LG), C201-7, circuit 774 (LG), and GEM C282-1, circuit 774 (LG). • **Is the resistance less than 5 ohms?** → **Yes** GO to B35 . → **No** REPAIR circuit 774 (LG). CLEAR the DTCs. TEST the system for normal operation.
B35 CHECK CIRCUIT 774 (LG) FOR SHORT TO GROUND	
1  GC1576-A	1 Measure the resistance between GEM C282-1, circuit 774 (LG) and ground.

	• **Is the resistance greater than 10,000 ohms?** → **Yes** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** REPAIR circuit 774 (LG). CLEAR the DTCs. TEST the system for normal operation.
B36 CHECK CIRCUIT 359 (GY/R) FOR OPEN	
1  GEM C280 2  GC1577-C	2 Measure the resistance between transfer case assembly C201-6, circuit 359 (GY/R), C201-8, circuit 359 (GY/R), and GEM C280-21, circuit 359 (GY/R). • **Is the resistance less than 5 ohms?** → **Yes** If DTC P1836 was retrieved in **B2** , GO to B37 . If DTC P1837 was retrieved in **B2** , GO to B38 . If DTC P1836 and P1837 were not retrieved, REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** REPAIR circuit 359 (GY/R). CLEAR the DTCs. TEST the system for normal operation.
B37 CHECK THE FRONT SHAFT SPEED SENSOR CIRCUIT 236 (BK/LG) FOR OPEN	
1	1 Measure the resistance between transfer case assembly C201-4, circuit 236 (BK/LG), and GEM C282-6, circuit 236 (BK/LG).



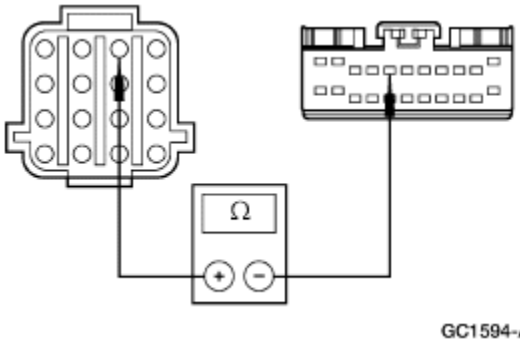
- **Is the resistance less than 5 ohms?**

→ **Yes**
REPLACE the front output shaft sensor; REFER to Section 308-07B . CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPAIR circuit 236 (BK/LG). CLEAR the DTCs. TEST the system for normal operation.

B38 CHECK THE REAR SHAFT SPEED SENSOR CIRCUIT 772 (LB) FOR OPEN

1



1 Measure the resistance between transfer case assembly C201-2, circuit 772 (LB), and GEM C282-5, circuit 772 (LB).

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

→ **Yes**
REPLACE the rear output shaft sensor; REFER to Section 308-07B . CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPAIR circuit 236 (BK/LG). CLEAR the DTCs. TEST the system for normal operation.

B39 CHECK THE VEHICLE SPEED SIGNAL — MONITOR THE GEM PID VSS_GEM

1

1 Monitor the GEM PID VSS_GEM while driving the vehicle 0 to 88.5 km/h (55 mph).

	• **Does the GEM PID VSS_GEM agree with the speedometer?** → **Yes** GO to B40 . → **No** GO to B73 .
B40 CHECK THE CONTACT PLATE SWITCHES	
1  2  3  GC1175-A 4  GC1176-A	1 Monitor the GEM PIDs PLATE_A, PLATE_B, PLATE_C, and PLATE_D. 3 Depress the brake pedal and shift the transmission into neutral or depress the clutch, while placing the 4WD mode switch in the 4WD HIGH position and record the PIDs. 4 Depress the brake pedal and shift the transmission into neutral or depress the clutch, while placing the 4WD mode switch in the 4WD LOW position and record the PIDs. 5 Compare the PIDs with the following tables: **Scan Tool Software 11.0 and Prior Versions** **AUTO/4WD HIGH** PLATE_A: CLOSED PLATE_B: CLOSED PLATE_C: OPEN **4WD LOW** PLATE_A: CLOSED PLATE_B: OPEN PLATE_C: CLOSED

PLATE_D	CLOSED	OPEN

Scan Tool Software 12.0 and Higher Versions

	AUTO/4WD HIGH	4WD LOW
PLATE_A	CLOSED	OPEN
PLATE_B	OPEN	CLOSED
PLATE_C	CLOSED	OPEN
PLATE_D	CLOSED	CLOSED

- **Do the PIDs agree with the table?**

→ **Yes**
REPAIR the transfer case; REFER to Section 308-07B . CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation.

→ **No**
GO to B41 .

B41 CHECK CIRCUIT 771 (P/Y) TO THE CONTACT PLATE SWITCH A — MONITOR THE GEM PID PLATE_A

1

2

Transfer Case Assembly C201

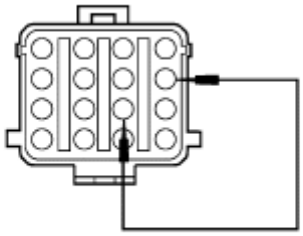
3

4

5

4 Monitor the GEM PID PLATE_A. Verify the GEM PID PLATE_A indicates OPEN.

5 Connect a jumper wire between transfer case assembly C201-10, circuit 762 (Y/W), and C201-5, circuit 771 (P/Y).



GC1578-B

6

6 Verify the GEM PID PLATE_A indicates CLOSED.

- **Does the GEM PID PLATE_A agree with the expected results?**

→ **Yes**
GO to B46 .

→ **No**
GO to B42 .

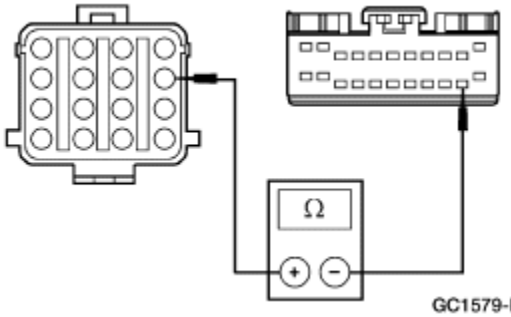
B42 CHECK CIRCUIT 771 (P/Y) FOR OPEN

1

2

GEM C282

3

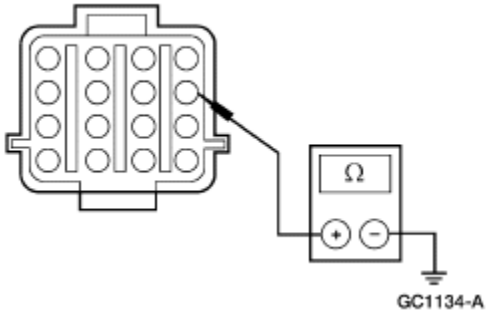
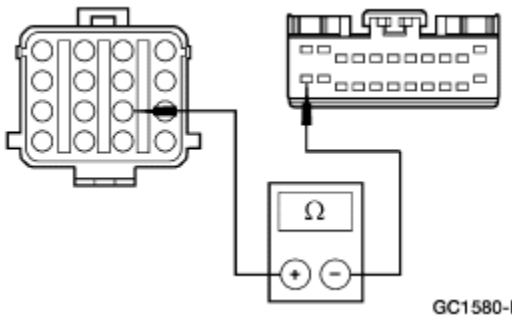


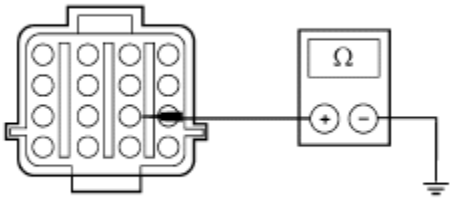
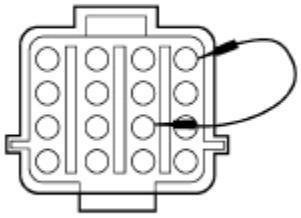
GC1579-B

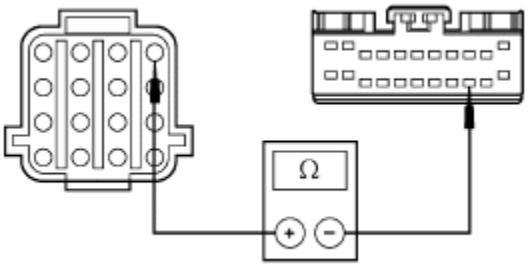
3 Measure the resistance between transfer case assembly C201-5, circuit 771 (P/Y), and GEM C282-21, circuit 771 (P/Y).

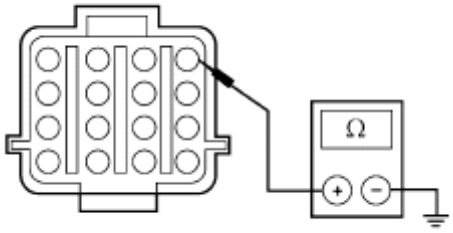
- **Is the resistance less than 5 ohms?**

→ **Yes**

	GO to B43 . → **No** REPAIR circuit 771 (P/Y). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation. If concern still exists, GO to B44 .
B43 CHECK CIRCUIT 771 (P/Y) FOR SHORT TO GROUND	
1  	1 Measure the resistance between transfer case assembly C201-5, circuit 771 (P/Y), and ground. • **Is the resistance greater than 10,000 ohms?** → **Yes** GO to B44 . → **No** REPAIR circuit 771 (P/Y). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation.
B44 CHECK CIRCUIT 762 (Y/W) FOR OPEN	
1  	1 Measure the resistance between transfer case assembly C201-10, circuit 762 (Y/W), and GEM C282-12, circuit 762 (Y/W). • **Is the resistance less than 5 ohms?** → **Yes** GO to B45 . → **No** REPAIR circuit 762 (Y/W). CLEAR the DTCs

	and CYCLE the ignition. TEST the system for normal operation.
B45 CHECK CIRCUIT 762 (Y/W) FOR SHORT TO GROUND	
1  GC1136-A	1 Measure the resistance between transfer case assembly C201-10, circuit 762 (Y/W), and ground. • **Is the resistance greater than 10,000 ohms?** → **Yes** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** REPAIR circuit 762 (Y/W). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation.
B46 CHECK THE CIRCUIT 770 (W) TO THE CONTACT PLATE SWITCH B — MONITOR THE GEM PID PLATE_B	
1 	
2 	2 Monitor the GEM PID PLATE_B. Verify the GEM PID PLATE_B indicates OPEN.
3  GC1141-A	3 Connect a jumper wire between transfer case assembly C201-10, circuit 762 (Y/W), and C201-1, circuit 770 (W).
4	4 Verify the GEM PID PLATE_B indicates

	CLOSED. • **Does the GEM PID PLATE_B agree with the expected results?** → **Yes** GO to B49 . → **No** GO to B47 .
B47 CHECK CIRCUIT 770 (W) FOR OPEN	
1  2  GEM C282 3  GC1581-A	3 Measure the resistance between transfer case assembly C201-1, circuit 770 (W), and GEM C282-20, circuit 770 (W). • **Is the resistance less than 5 ohms?** → **Yes** GO to B48 . → **No** REPAIR circuit 770 (W). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation. If concern still exists, RECONNECT GEM C282, GO to B49 .
B48 CHECK CIRCUIT 770 (W) FOR SHORT TO GROUND	
1	1 Measure the resistance between transfer case assembly C201-1, circuit 770 (W), and ground.



GC1143-A

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

→ **Yes**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPAIR circuit 770 (W). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation.

B49 CHECK THE CIRCUIT 764 (BR/W) TO THE CONTACT PLATE SWITCH C — MONITOR THE GEM PID PLATE _C

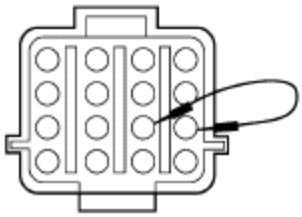
1

2

2 Monitor the GEM PID PLATE_C. Verify the GEM PID PLATE_C indicates OPEN.

3

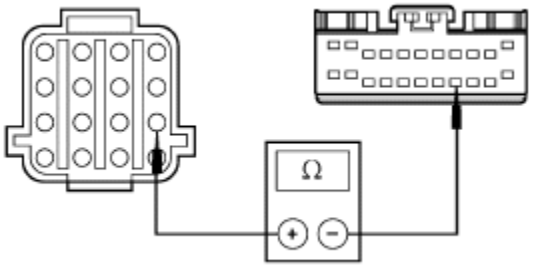
3 Connect a jumper wire between transfer case assembly C201-10, circuit 762 (Y/W), and C201-9, circuit 764 (BR/W).

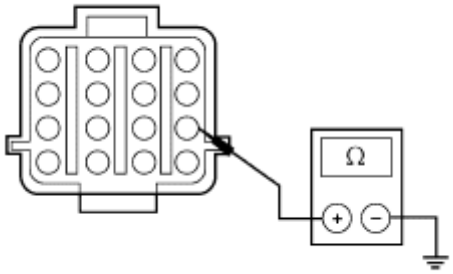


GC1144-A

4

4 Verify the GEM PID PLATE_C indicates CLOSED.

	• **Does the GEM PID PLATE_C agree with the expected results?** → **Yes** GO to B52 . → **No** GO to B50 .
B50 CHECK CIRCUIT 764 (BR/W) FOR OPEN	
1  2  GEM C282 3  GC1582-A	3 Measure the resistance between transfer case assembly C201-9, circuit 764 (BR/W), and GEM C282-19, circuit 764 (BR/W). • **Is the resistance less than 5 ohms?** → **Yes** GO to B51 . → **No** REPAIR circuit 764 (BR/W). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation. If the concern still exists, RECONNECT GEM C282, GO to B52 .
B51 CHECK CIRCUIT 764 (BR/W) FOR SHORT TO GROUND	
1	1 Measure the resistance between transfer case assembly C201-9, circuit 764 (BR/W), and ground.



GC1146-A

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

→ **Yes**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPAIR circuit 764 (BR/W). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation.

B52 CHECK THE CIRCUIT 763 (O/W) TO THE CONTACT PLATE SWITCH D — MONITOR THE GEM PID PLATE_D

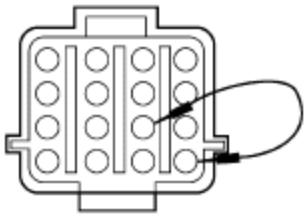
1

2

2 Monitor the GEM PID PLATE_D. Verify the GEM PID PLATE_D indicates OPEN.

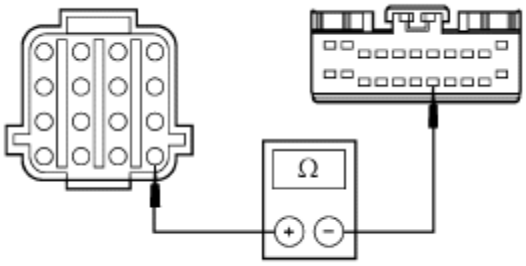
3

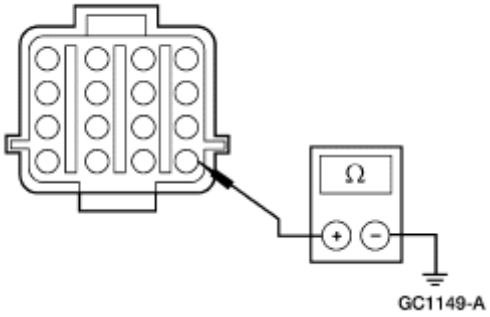
3 Connect a jumper wire between transfer case assembly C201-10, circuit 762 (Y/W), and C201-13, circuit 763 (O/W).


GC1147-A

4

4 Verify the GEM PID PLATE_D indicates CLOSED.

	• **Does the GEM PID PLATE_D agree with the expected results?** → **Yes** REPLACE the transfer case electric shift motor; REFER to Section 308-07B . CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation. → **No** GO to B53 .
B53 CHECK CIRCUIT 763 (O/W) FOR OPEN	
1  2  GEM C282 3  GC1882-A	3 Measure the resistance between transfer case assembly C201-13, circuit 763 (O/W), and GEM C282-18, circuit 763 (O/W). • **Is the resistance less than 5 ohms?** → **Yes** GO to B54 . → **No** REPAIR circuit 763 (O/W). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation.
B54 CHECK CIRCUIT 763 (O/W) FOR SHORT TO GROUND	
1	1 Measure the resistance between transfer case assembly C201-13, circuit 763 (O/W), and ground.



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

→ **Yes**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation.

→ **No**
REPAIR circuit 763 (O/W). CLEAR the DTCs and CYCLE the ignition. TEST the system for normal operation.

B55 CHECK THE TRANSFER CASE SHIFT RELAYS — MONITOR THE GEM PIDS MTR_CCW AND MTR_CW

1

2

2 Monitor the GEM PIDs MTR_CCW and MTR_CW while triggering the GEM active command CW/CCW ON and OFF.

- **DO the GEM PIDs MTR_CCW and MTR_CW indicate ON---, OFF---?**

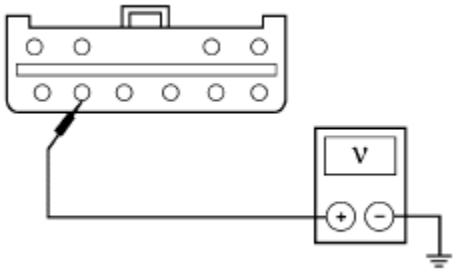
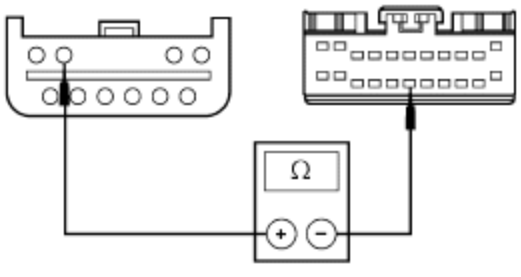
→ **Yes**
GO to B64 .

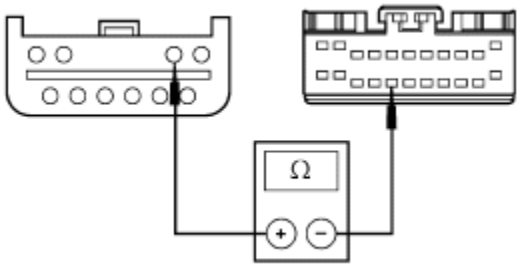
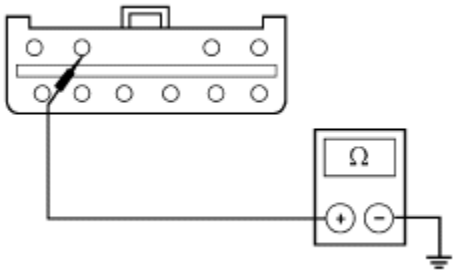
→ **No**
If the PIDs displayed ON-B-, GO to B61 .

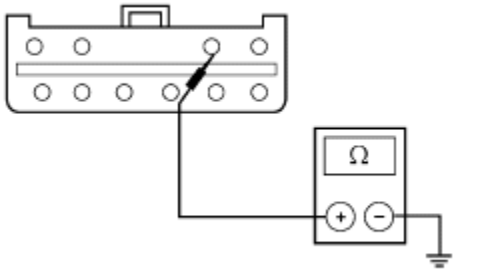
If the PIDs displayed OFFO-G, GO to B56 .

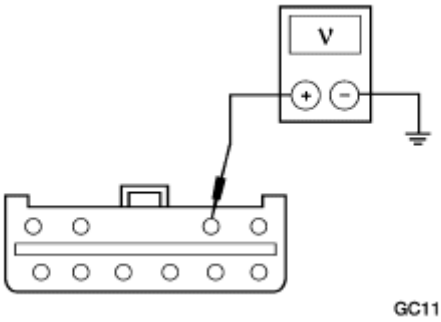
B56 CHECK THE VOLTAGE TO THE TRANSFER CASE SHIFT RELAY COIL — CIRCUIT 705 (LG/O)

1

 2  Transfer Case Shift Relay C278 3  GC1150-A	3 Measure the voltage between transfer case shift relay C278-5, circuit 705 (LG/O), and ground. • **Is the voltage greater than 10 volts?** → **Yes** GO to B57 . → **No** REPAIR circuit 705 (LG/O). CLEAR the DTCs. TEST the system for normal operation.
B57 CHECK CIRCUIT 513 (BR/PK) FOR OPEN	
1  GEM C282 2  GC1584-A	2 Measure the resistance between transfer case shift relay C278-9, circuit 513 (BR/PK), and GEM C282-17, circuit 513 (BR/PK). • **Is the resistance less than 5 ohms?**

	→ **Yes** GO to B58 . → **No** REPAIR circuit 513 (BR/PK). CLEAR the DTCs. TEST the system for normal operation.
B58 CHECK CIRCUIT 339 (GY) FOR OPEN	
1  GC1585-A	1 Measure the resistance between transfer case shift relay C278-8, circuit 339 (GY), and GEM C282-16, circuit 339 (GY). • **Is the resistance less than 5 ohms?** → **Yes** GO to B59 . → **No** REPAIR circuit 339 (GY). CLEAR the DTCs. TEST the system for normal operation.
B59 CHECK CIRCUIT 513 (BR/PK) FOR SHORT TO GROUND	
1  GC1153-A	1 Measure the resistance between transfer case shift relay C278-9, circuit 513 (BR/PK), and ground. • **Is the resistance greater than 10,000 ohms?** → **Yes** GO to B60 . → **No** REPAIR circuit 513 (BR/PK). CLEAR the DTCs. TEST the system for normal operation.
B60 CHECK CIRCUIT 339 (GY) FOR SHORT TO GROUND	

1  GC1154-A	1 Measure the resistance between transfer case shift relay C278-8, circuit 339 (GY), and ground. • **Is the resistance greater than 10,000 ohms?** → **Yes** GO to B63 . → **No** REPAIR circuit 339 (GY). CLEAR the DTCs. TEST the system for normal operation.
B61 CHECK CIRCUIT 339 (GY) FOR SHORT TO POWER	
1  2  GEM C282 3  Transfer Case Shift Relay C278 4  5	5 Measure the voltage between transfer case shift relay C278-8, circuit 339 (GY), and ground.



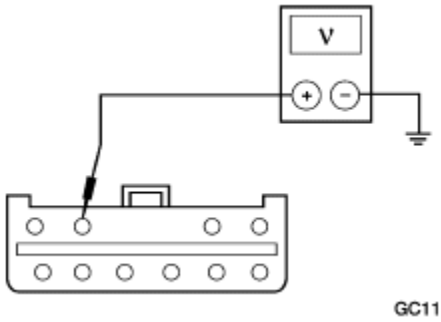
- **Is any voltage indicated?**

→ **Yes**
REPAIR circuit 339 (GY). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
GO to B62 .

B62 CHECK CIRCUIT 513 (BR/PK) FOR SHORT TO POWER

1



1 Measure the voltage between transfer case shift relay C278-9, circuit 513 (BR/PK), and ground.

- **Is any voltage indicated?**

→ **Yes**
REPAIR circuit 513 (BR/PK). CLEAR the DTCs. TEST the system for normal operation.

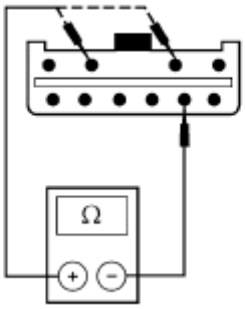
→ **No**
GO to B63 .

B63 CHECK THE TRANSFER CASE SHIFT RELAY COILS

1

2

2 Measure the resistance between transfer case shift relay terminals 8, 9 and terminal 5.



GC1157-A

- **Are the resistances between 60 and 100 ohms?**

→ **Yes**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPLACE the transfer case shift motor relay. CLEAR the DTCs. TEST the system for normal operation.

B64 CHECK THE VOLTAGE TO THE TRANSFER CASE SHIFT MOTOR — GEM ACTIVE COMMAND CW/CCW ON

1

2

Transfer Case Assembly C201

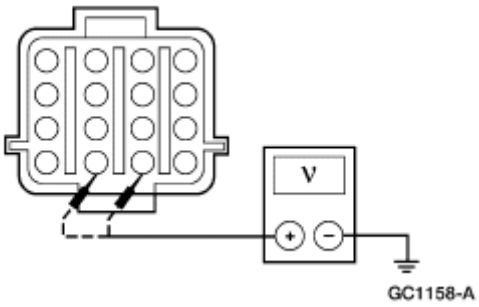
3

4

4 Trigger the GEM active command CW/CCW to ON.

5

5 Measure the voltage between transfer case assembly C201-14, circuit 778 (O), C201-15, circuit 777 (Y), and ground.



- **Are the voltages greater than 10 volts?**

→ **Yes**
GO to B66 .

→ **No**
GO to B65 .

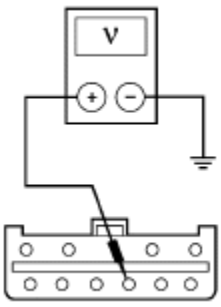
B65 CHECK THE VOLTAGE TO THE TRANSFER CASE SHIFT RELAY — SWITCH SIDE

1

2

Transfer Case Shift Relays C278

3



3 Measure the voltage between transfer case shift relay C278-3, circuit 704 (DG/LG), and ground.

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

→ **Yes**
GO to B70 .

→ **No**
REPAIR circuit 704 (DG/LG). CLEAR the DTCs. TEST the system for normal operation.

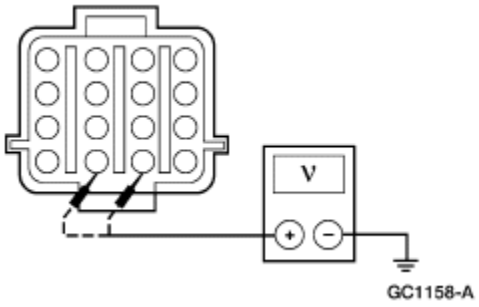
B66 CHECK THE VOLTAGE TO THE TRANSFER CASE SHIFT MOTOR — GEM ACTIVE COMMAND CW/CCW OFF

1

2

2 Trigger the GEM active command CW/CCW to OFF.

3



3 Measure the voltage between transfer case assembly C201-14, circuit 778 (O), C201-15, circuit 777 (Y), and ground.

- **Are the voltages greater than 10 volts?**

→ **Yes**
GO to B67 .

→ **No**
GO to B69 .

B67 CHECK CIRCUITS 777 (Y) FOR SHORT TO POWER

1

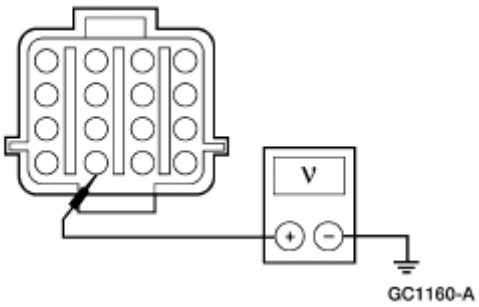
2

Transfer Case Shift Relay C278

3

4

4 Measure the voltage between transfer case assembly C201-15, circuit 777 (Y), and ground.



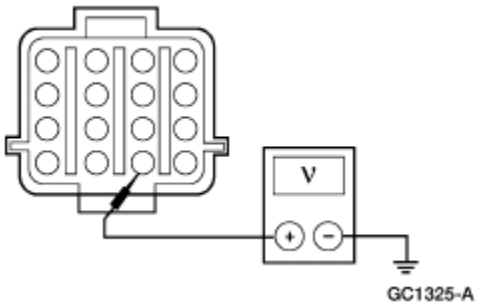
- **Is any voltage indicated?**

→ **Yes**
REPAIR circuit 777 (Y). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
GO to B68 .

B68 CHECK CIRCUITS 778 (O) FOR SHORT TO POWER

1



1 Measure the voltage between transfer case assembly C201-14, circuit 778 (O), and ground.

- **Is any voltage indicated?**

→ **Yes**
REPAIR circuit 778 (O). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPLACE the transfer case shift relay. CLEAR the DTCs. TEST the system for normal operation.

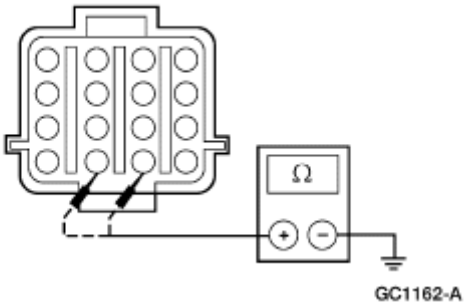
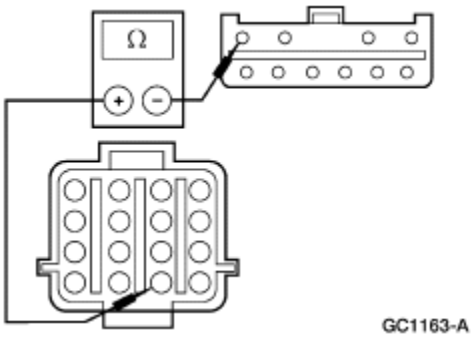
B69 CHECK CIRCUITS 777 (Y) AND 778 (O) FOR AN OPEN THROUGH THE TRANSFER CASE RELAY

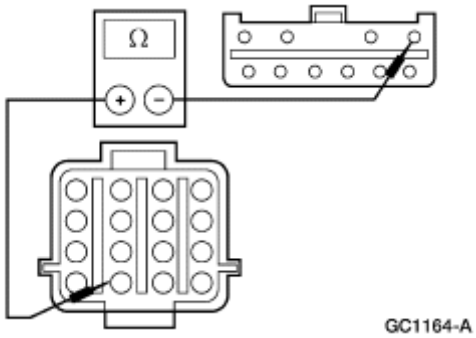
1

2

1 Trigger the GEM active command CW/CCW to OFF.

2 Measure the resistance between transfer case

	assembly C201-14, circuit 778 (O), C201-15, circuit 777 (Y), and ground. • **Are the resistances less than 5 ohms?** → **Yes** RECONNECT the transfer case assembly C201, GO to B40 . → **No** GO to B72 .
B70 CHECK CIRCUITS 778 (O) FOR OPEN	
1 	1 Measure the resistance between transfer case assembly C201-14, circuit 778 (O), and transfer case shift relay C278-10, circuit 778 (O). • **Is the resistances less than 5 ohms?** → **Yes** GO to B71 . → **No** REPAIR circuit 778 (O). CLEAR the DTCs. TEST the system for normal operation.
B71 CHECK CIRCUIT 777 (Y) FOR OPEN	
1	1 Measure the resistance between transfer case shift relay C278-7, circuit 777 (Y), and transfer case assembly C201-15, circuit 777 (Y).



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

→ **Yes**
REPLACE the transfer case shift relay. CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPAIR circuit 777 (Y). CLEAR the DTCs. TEST the system for normal operation.

B72 CHECK THE GROUND TO THE TRANSFER CASE SHIFT RELAY — CIRCUIT 57 (BK)

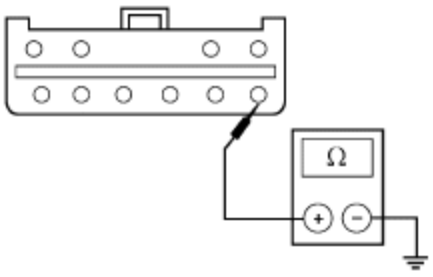
1

2

Transfer Case Shift Relay C278

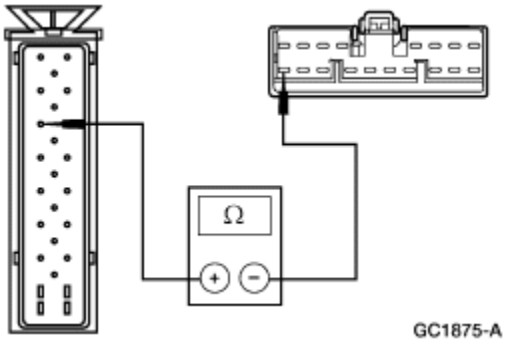
3

3 Measure the resistance between transfer case shift relay C278-1, circuit 57 (BK), and ground.



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

→ **Yes**
REPLACE the transfer case shift relay. CLEAR the DTCs. TEST the system for normal operation.

	→ **No** REPAIR circuit 57 (BK). CLEAR the DTCs. TEST the system for normal operation.
B73 CHECK CIRCUIT 679 (GY/BK) FOR OPEN	
1  2  4WABS Control Module C186 3  GEM C282 4  	4 Measure the resistance between 4WABS control module C186-19, circuit 679 (GY/BK), and GEM C283-9, circuit 679 (GY/BK). • **Is the resistance less than 5 ohms?** → **Yes** DIAGNOSE the 4WABS system; REFER to Section 206-09 . → **No** REPAIR circuit 679 (GY/BK). CLEAR the DTCs. TEST the system for normal operation.

PINPOINT TEST C: THE 4X4 HIGH AND/OR 4X4 LOW INDICATOR(S) DO/DOES NOT OPERATE PROPERLY

CONDITIONS	DETAILS/RESULTS/ACTIONS
C1 CHECK THE IGNITION STATES — MONITOR THE GEM PID IGN_GEM	
1	

2

Scan Tool

3

3 **NOTE:** If the vehicle is equipped with a manual transmission, depress the clutch pedal when turning the ignition switch to START.

Monitor the GEM PID IGN_GEM while turning the ignition switch through the START, RUN, OFF, and ACC positions.

- **Do the PID values agree with the ignition switch positions?**

→ **Yes**
GO to C2 .

→ **No**
REFER to Section 417-02 .

C2 RETRIEVE THE DIAGNOSTIC TROUBLE CODES (DTCS)

1

2

Clear Continuous DTCs

3

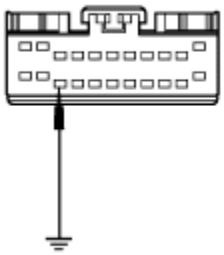
GEM On-Demand Self-Test

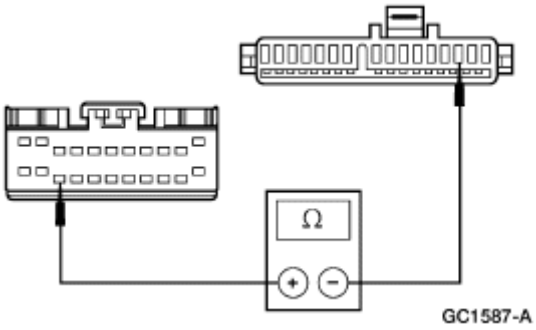
1 Retrieve and document continuous DTCs.

- **Are any DTCs recorded?**

→ **Yes**
If DTC B1342, REPLACE GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.

	If DTC P1804, GO to C3. If DTC P1806, GO to C3. If DTC P1808, GO to C3. If DTC P1810, GO to C3. → **No** GO to C3.
C3 VERIFY THE INOPERATIVE INDICATOR LAMP	
	1 Verify the inoperative indicator lamp. • **Is the 4x4 HIGH indicator inoperative?** → **Yes** GO to C4. → **No** If the 4x4 LOW indicator is inoperative, GO to C9. If both the 4x4 HIGH and 4x4 LOW indicators are inoperative; REFER to Section 413-01.
C4 CHECK THE 4X4 HIGH INDICATOR — MONITOR THE GEM PID 4WDHIGH	
1  2 	2 Monitor the GEM PID 4WDHIGH while triggering the GEM active command HIGH LAMP to ON then OFF. The 4X4 HIGH indicator should illuminate, then go off. • **Does the indicator operate correctly?** → **Yes** Indicator is operating correctly, GO to Pinpoint Test A. → **No** If the GEM PID 4WDHIGH displays ON-B-, GO to C7. If the GEM PID 4WDHIGH displays OFFO-G, GO to C5.
C5 CHECK THE GEM	
1	

2  GEM C282 3  GC1586-A 4 	3 Connect a jumper wire between GEM C282-14, circuit 783 (GY), and ground. • **Does the 4x4 HIGH indicator illuminate?** → **Yes** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** GO to C6 .
C6 CHECK CIRCUIT 783 (GY) FOR OPEN	
1  2  Instrument Cluster C286 3	3 Measure the resistance between GEM C282-14, circuit 783 (GY), and instrument cluster C286-3, circuit 783 (GY).



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

→ **Yes**
REPLACE the instrument cluster printed circuit; REFER to Section 413-01 . CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPAIR circuit 783 (GY). CLEAR the DTCs. TEST the system for normal operation.

C7 CHECK THE INSTRUMENT CLUSTER FOR SHORT TO POWER — MONITOR THE GEM PID 4WDHIGH

1

2

Instrument Cluster C286

3

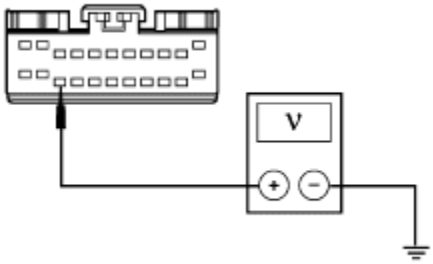
4

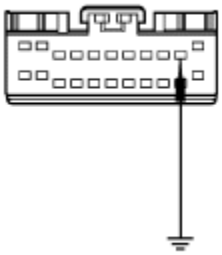
4 Monitor the GEM PID 4WDHIGH while triggering the GEM active command HIGH LAMP to ON then OFF.

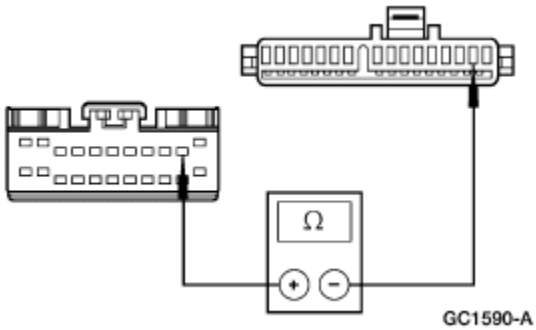
- **Does the GEM PID 4WDHIGH display ON-B-?**

→ **Yes**
GO to C8 .

→ **No**

	REPLACE the instrument cluster printed circuit; REFER to Section 413-01 . CLEAR the DTCs. TEST the system for normal operation.
C8 CHECK CIRCUIT 783 (GY) FOR SHORT TO POWER	
1  2  GEM C282 3  GC1588-A	3 Measure the voltage between GEM C282-14, circuit 783 (GY), and ground. • **Is any voltage indicated?** → **Yes** REPAIR circuit 783 (GY). CLEAR the DTCs. TEST the system for normal operation. → **No** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation.
C9 CHECK THE 4X4 LOW INDICATOR — MONITOR THE GEM PID 4WDLOW	
1  2 	2 Monitor the GEM PID 4WDLOW while triggering the GEM active command LOW LAMP to ON then OFF. The 4x4 LOW indicator should illuminate, then go off. • **Does the indicator operate correctly?** → **Yes**

	Indicator is operating correctly, GO to Pinpoint Test A . → **No** If the GEM PID 4WDLOW displays ON-B-, GO to C12 . If the GEM PID 4WDLOW displays OFFO-G, GO to C10 .
C10 CHECK THE GEM	
1  2  GEM C282 3  GC1589-A 4 	3 Connect a jumper wire between GEM C282-10, circuit 784 (LB/BK), and ground. • **Does the 4X4 LOW indicator illuminate?** → **Yes** REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for normal operation. → **No** GO to C11 .
C11 CHECK CIRCUIT 784 (LB/BK) FOR OPEN	
1	

2  Instrument Cluster C286 3  GC1590-A	3 Measure the resistance between GEM C282-10, circuit 784 (LB/BK), and instrument cluster C286-2, circuit 784 (LB/BK). • **Is resistance less than 5 ohms?** → **Yes** REPLACE the instrument cluster printed circuit; REFER to Section 413-01 . CLEAR the DTCs. TEST the system for normal operation. → **No** REPAIR circuit 784 (LB/BK). CLEAR the DTCs. TEST the system for normal operation.

C12 CHECK THE INSTRUMENT CLUSTER FOR SHORT TO POWER — MONITOR THE GEM PID 4WDLOW

1  2  Instrument Cluster C286 3  4	4 Monitor the GEM PID 4WDLOW while triggering the GEM active command LOW LAMP to ON, then OFF.

- **Does the GEM PID 4WDLOW display ON-B-?**

→ **Yes**
GO to C13 .

→ **No**
REPLACE the instrument cluster printed circuit; REFER to Section 413-01 . CLEAR the DTCs. TEST the system for normal operation.

C13 CHECK CIRCUIT 784 (LB/BK) FOR SHORT TO POWER

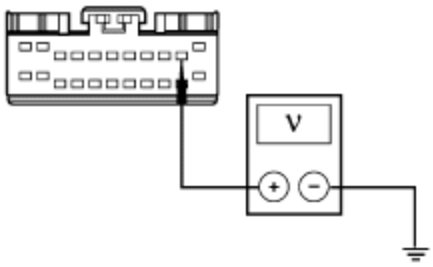
1

2

GEM C282

3

4



GC1591-A

4 Measure the voltage between GEM C282-10, circuit 784 (LB/BK) and ground.

- **Is any voltage indicated?**

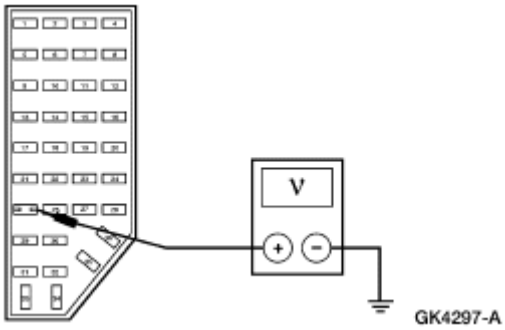
→ **Yes**
REPAIR circuit 784 (LB/BK). CLEAR the DTCs. TEST the system for normal operation.

→ **No**
REPLACE the GEM; REFER to Section 419-10 . CLEAR the DTCs. TEST the system for

	normal operation.

PINPOINT TEST D: NO COMMUNICATION WITH MODULE — GENERIC ELECTRONIC MODULE

CONDITIONS	DETAILS/RESULTS/ACTIONS
D1 CHECK POWER DISTRIBUTION BOX MAXI-FUSE 1 (60A)	
1  Fuse 1 (60A)	• **Is the fuse OK?** → **Yes** GO to D2 . → **No** REPLACE the fuse. CLEAR the DTCs. TEST the system for normal operation. If the fuse fails again CHECK circuit 1052 (T/BK) for a short to ground. REPAIR as necessary.
D2 CHECK FUSE JUNCTION PANEL FUSE 25 (7.5A)	
1  Fuse 25 (7.5A)	• **Is the fuse OK?** → **Yes** GO to D3 . → **No** REPLACE the fuse. CLEAR the DTCs. TEST the system for normal operation. If the fuse fails again CHECK circuit 1001 (W/Y) for a short to ground. REPAIR as necessary.
D3 CHECK CIRCUIT 1052 (T/BK) FOR VOLTAGE	
1	1 Measure the voltage between fuse junction panel fuse 25 (7.5A) pin 2, circuit 1052 (T/BK), and ground.



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

→ **Yes**
GO to D4 .

→ **No**
REPAIR circuit 1052 (T/BK). CLEAR the DTCs. TEST the system for normal operation.

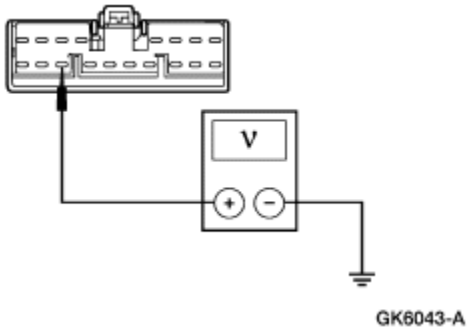
D4 CHECK THE VOLTAGE TO THE GEM — CIRCUIT 1001 (W/Y)

1

2

GEM C283

3



3 Measure the voltage between GEM C283-11, circuit 1001 (W/Y), and ground.

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

→ **Yes**
GO to D5 .

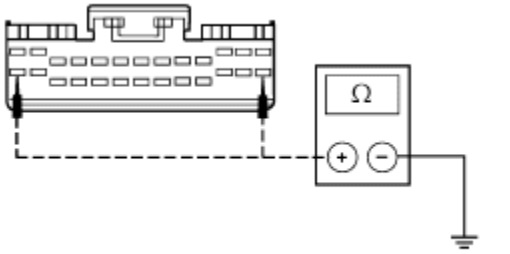
→ **No**
REPAIR circuit 1001 (W/Y). CLEAR the DTCs. TEST the system for normal operation.

D5 CHECK CIRCUIT 570 (BK/W) FOR OPEN

1

GEM C280

2



GC1770-A

2 Measure the resistance between GEM C280-14, circuit 570 (BK/W), and ground; and between GEM C280-26 circuit 570 (BK/W), and ground.

- **Are the resistances less than 5 ohms?**

→ **Yes**
REFER to Section 418-00 .

→ **No**
REPAIR circuit 570 (BK/W). CLEAR the DTCs. TEST the system for normal operation.

General Specifications

Item	Specification	Capacity
Motorcraft MERCON® Automatic Transmission Fluid XT-2-DDX or -QDX	—	1.42 Liters (3.0 Pints)
Motorcraft Black Non-Acid Cure Silicone Rubber E7TZ-19562-A	ESL-M4G273-A	—

Torque Specifications

Description	Nm	lb-ft	lb-in
Breather barb	8-14	6-10	—
Transfer case bolts	25	18	—
Damper bolts	41	30	—
Drain plug	15	11	—
Transfer case to transmission bolts	41	30	—
Fill plug	15	11	—
Rear output flange nut	355	262	—
Transfer case shift motor bolts	10	—	89
Clutch coil assembly nuts	10	—	89
Output shaft speed sensor bolt	5	—	44
Skid plate bolts	24	18	—

Transfer Case

Motor, Electric Shift

The externally mounted transfer case shift motor (7G360), located at the rear of the transfer case (7A195), turns the shift cam assembly. As the shift cam assembly turns, it positions the reduction shift fork (7289) for desired transfer case operation. An integral position sensor in the shift motor provides motor position information to the generic electronic module (GEM).

Switch, Rotary 4x4 Mode

The rotary 4x4 mode switch, mounted on the instrument panel, allows the operator to select the 4WD Auto, 4WD High, and 4WD Low transfer case operating modes. The indicator light, above the rotary switch dial, will illuminate when the 4WD High or 4WD Low position has engaged.

Switch, Brake Pedal Position (BPP)

The brake pedal position (BPP) switch is located on the brake pedal. The switch signals the GEM when the operator activates the brake pedal.

Switch, Clutch Pedal Position (CPP)

The clutch pedal position (CPP) switch is located on the clutch pedal bracket. On vehicles equipped with a manual transmission (7003) and an electronic shift transfer case, the clutch pedal must be fully depressed and vehicle stopped in order to make a range shift from HIGH to LOW, or from LOW to HIGH.

Sensor, Digital Transmission Range (DTR)

The DTR sensor is located on the outside of the transmission near the transmission shift cable attachment. The DTR sensor completes the start circuit in PARK and NEUTRAL, the back-up lamp circuit in REVERSE and the neutral sense circuit (4WD) in NEUTRAL. The DTR sensor also sends a digital output signal to the powertrain control module (PCM) (12A650) indicating the manual lever position (P, R, N, D, 2, 1).

Sensor, Throttle Position (TP)

The TP sensor is located on the throttle body. The sensor provides throttle position information to the PCM. The PCM converts the throttle position signal to a pulse width modulated (PWM) signal, and sends it to the GEM to control and adjust the transfer case clutch duty cycle.

Sensor, Front and Rear Output Shaft Speed (OSS)

The externally mounted OSS sensors are located at the rear of the transfer case. The sensors provide the GEM with front and rear driveshaft speeds to control and adjust the transfer case clutch duty cycle.

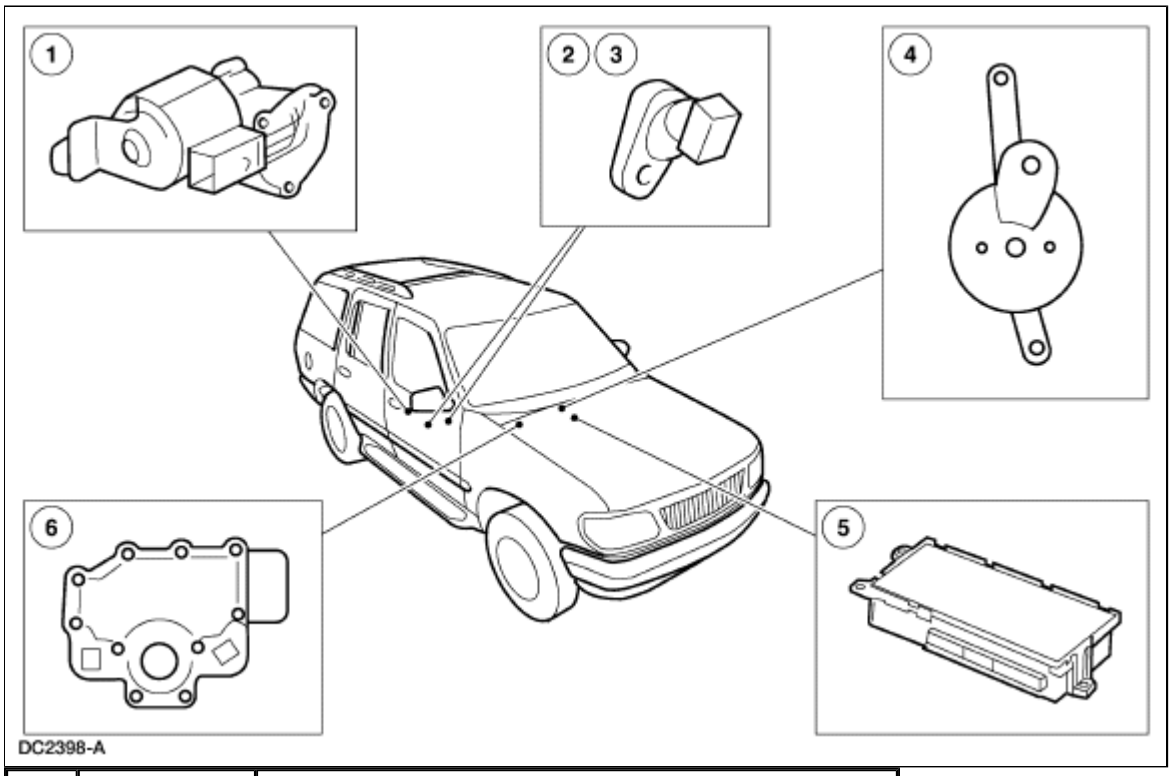
Sensor, Vehicle Speed Sensor (VSS)

The Anti-Lock Brake System (ABS) provides the GEM with vehicle speed information to control and adjust the transfer case clutch duty cycle.

Generic Electrical Module (GEM)

The GEM controls the operation of the transfer case in response to inputs from the electric shift motor, 4x4 mode switch, CPP switch, BPP switch, DTR sensor, throttle position output from the PCM, front and rear OSS sensors, and the VSS.

Electronic Shift Control System Components



Item	Part Number	Description
1	7G360	Transfer case shift motor
2	7F293	Front output shaft speed sensor
3	7F293	Rear output shaft speed sensor
4	—	Shift range selector switch
5	14B205	Generic electronic module (GEM) (electric shift only)
6	—	Digital transmission range (DTR) sensor

Mechanical Operation

The Borg-Warner 44-05 transfer case is available in the Explorer (A4WD) vehicle. The transfer case transfers power from the transmission to the rear axle, and also to the front axle when electronically activated.

In the Auto mode, torque from the transmission is transferred to the input shaft (7017) which, in turn, drives

the rear output shaft (7061) that drives the rear axle assembly (4006). The electromechanical ball ramp clutch assembly drives the drive sprocket (7177) after the GEM activates the clutch coil. The drive sprocket turns the drive chain (7A029) that rotates the front output shaft and the front driveshaft (4602). In the 4x4 High mode, the operation is the same as in the Auto mode, except that the GEM consistently activates the electromechanical ball ramp clutch assembly.

The high-low shift occurs when the reduction shift fork moves the high-low collar (7100) to lock the planetary gear set to the output shaft. Then, torque, transmitted through the sun gear, from the input shaft, turns the front planetary gear set assembly (7A398). The front planetary gear set assembly, which is now engaged, provides transfer case speed reduction.

Transfer Case Functions

There are three transfer case modes, Auto, 4WD Low, and 4WD High. Neutral is only available as a dealer installed option.

Control-Trac Function

The Control-Trac transfer case uses an electromechanical clutch assembly to control torque to the front wheels. In the Auto mode, while at rest and under cruising conditions, the GEM activates the transfer case clutch at a minimum level. This allows for the slight difference between the front and rear driveshafts which occurs normally when negotiating a corner on dry pavement. Under any of the following conditions, the GEM will increase the torque sent through the clutch to the front wheels in order to prevent or control slip.

- Slip is detected (by monitoring the front and rear OSS sensors in the transfer case)
- Throttle position (by using the throttle position signal from the EEC)

Range Function

NOTE: At zero throttle, the duty cycle remains low. At very light to heavy acceleration, the duty cycle jumps to the maximum.

In the 4WD Low Range, with throttle input, the transfer case electromechanical clutch locks the front and rear driveshafts for maximum 4WD traction. The transfer case shift motor rotates the shift cam to move the reduction shift fork to the 4WD low range position. This low range shift, accomplished through a planetary gear set, changes the torque to the driveshaft from 1:1 to 2.48:1 ratio.

In the 4WD High Range, with throttle input, the GEM signals the transfer case electromechanical clutch to lock the front and the rear driveshafts for maximum 4WD traction. Never use the 4WD High range when driving on dry or merely wet pavement. Use the 4WD High range only for driving off-road or in severe winter weather.

Transfer Case

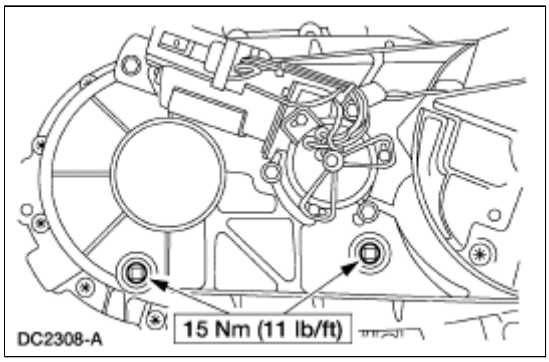
Refer to Section 308-07A .

Transfer Case Draining and Filling

1. **CAUTION: Transfer case failure can result if the correct fill procedures are not followed.**

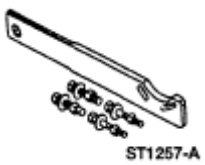
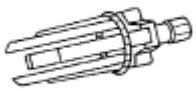
   NOTE: The fluid level must be just below the fill plug.

   Remove the fill plug and check the fluid level.
   - If the fluid is below the proper level, fill the transfer case with Motorcraft MERCON® Automatic Transmission Fluid XT-2-QDX or -DDX or MERCON® equivalent.



Seal —Rear

Special Tool(s)

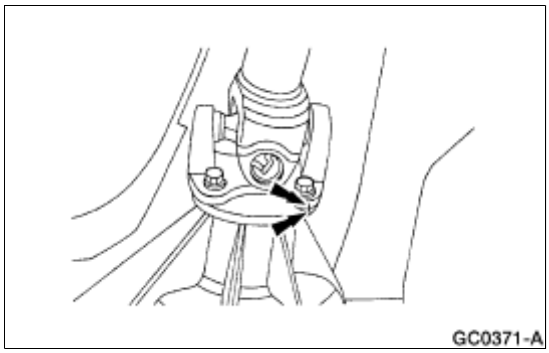
 ST1257-A	Companion Flange Holding Tool 205-126 (T78P-4851-A)
 ST1185-A	Impact Slide Hammer 100-001 (T50T-100-A)
 ST2305-A	Input Shaft Seal Installer 308-186 (T90T-7127-B)
 ST1213-A	Puller 307-001 (TOOL-1175-AC) or Equivalent

Removal

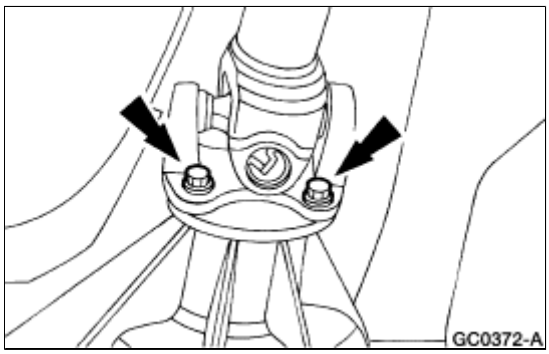
WARNING: The electrical power supply to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch located in the rear jack storage area. Failure to do so can result in unexpected inflation or deflation of the air springs which can result in shifting of the vehicle during these operations.

1. With the transmission in neutral, raise and support the vehicle. For additional information, refer to Section 100-02 .

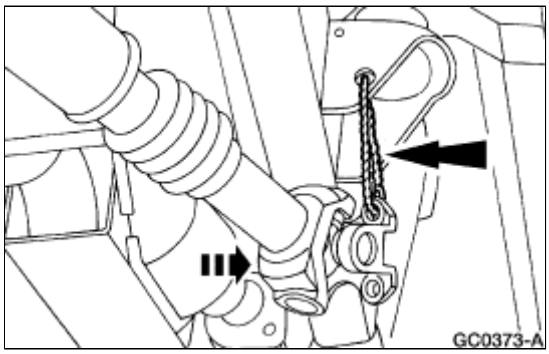
2. Index-mark the rear output flange (7B214) and the driveshaft yoke.



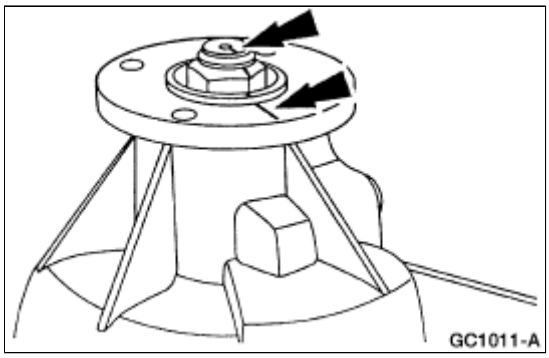
3. Remove the four bolts.



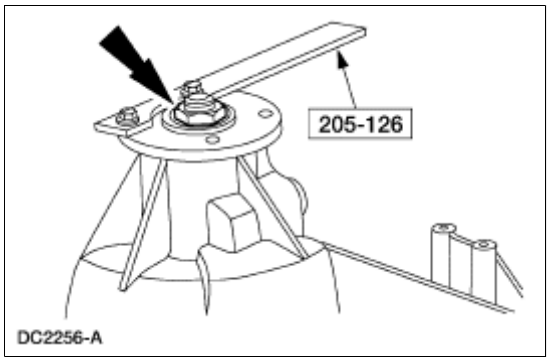
4. Separate the driveshaft from the output flange, and position the driveshaft aside.



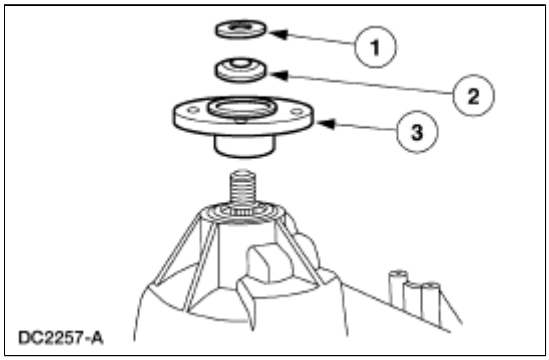
5. Index-mark the rear output flange to the rear output shaft (7061).



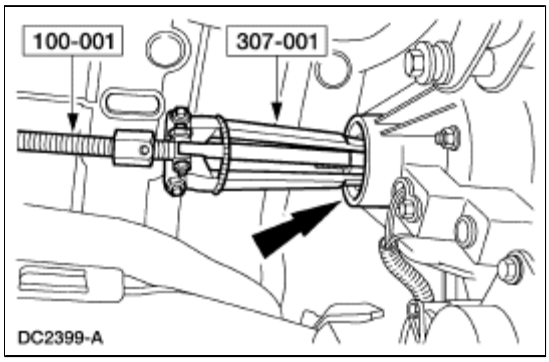
6. Use the special tool to hold the rear output flange while removing the nut.



7. Remove the rear output flange.
    1. Remove the output shaft yoke washer (7B368).
    2. Remove the oil seal (7052).
    3. Remove the rear output flange.

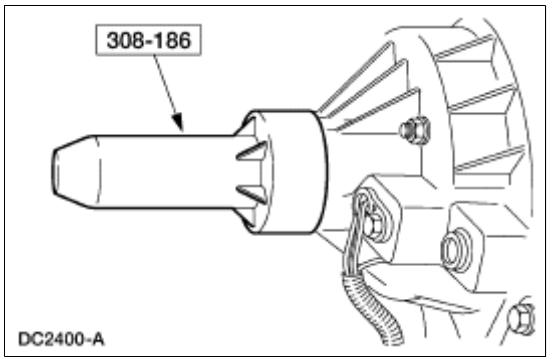


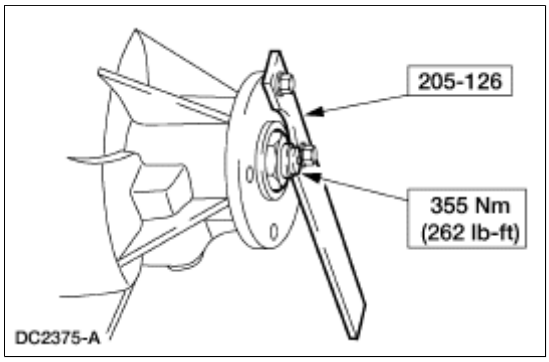
8. Using the special tools, remove the oil seal.



Installation

1. To install, reverse the removal procedure.
    - Use the special tool to install the oil seal.
    - Refer to Section 205-01 for driveshaft fastener tightening specifications.
    - Check, and if necessary, fill the transfer case to the specified level with the specified fluid. For additional information, refer to Transfer Case Draining and Filling in the General Procedures portion of this section.

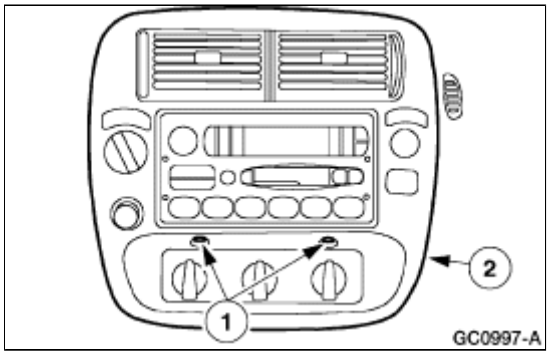

308-186
DC2400-A


205-126
355 Nm
(262 lb-ft)
DC2375-A

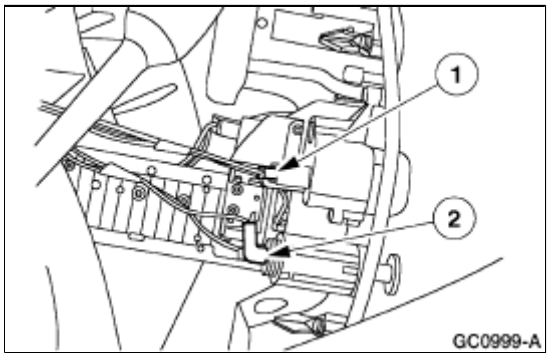
Shift Switch

Removal

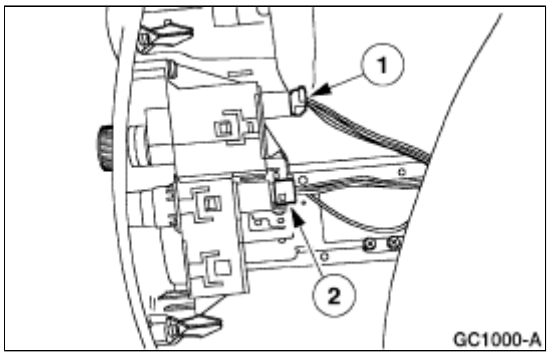
1. Remove and reposition the center instrument panel finish panel (044D70).
    1. Remove the screws.
    2. Remove and reposition the instrument panel finish panel.



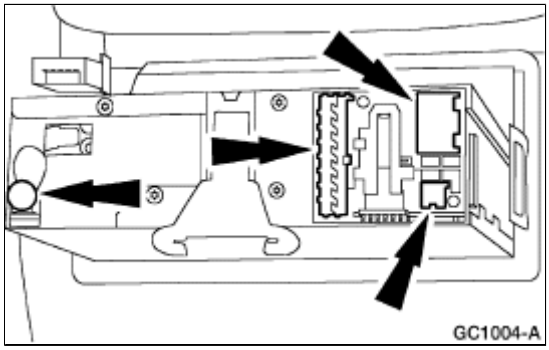
2. Disconnect the electrical connectors.
    1. Disconnect the shift range selector switch electrical connector.
    2. Disconnect the cigar lighter electrical connectors.



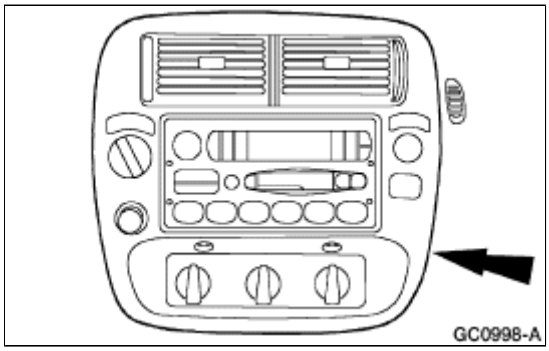
3. Disconnect the electrical connectors.
    1. Disconnect the rear heated back light switch electrical connector.
    2. Disconnect the rear wiper switch electrical connector (if so equipped).



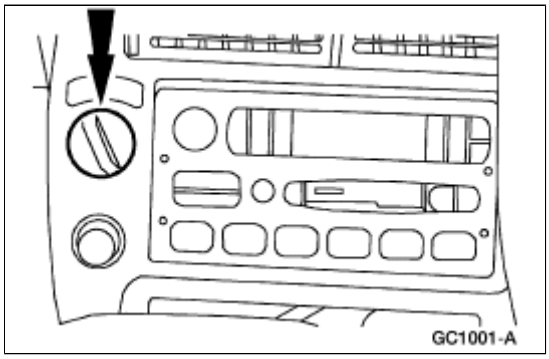
4. Disconnect the radio electrical connector.



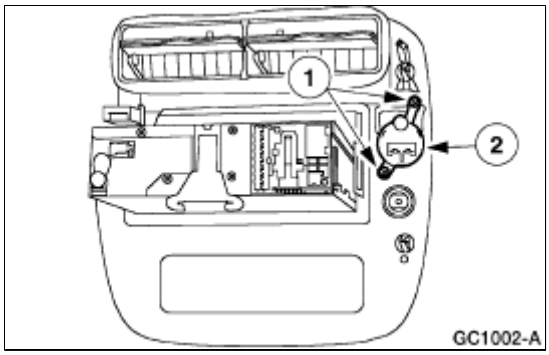
5. Remove the instrument panel finish panel.



6. Remove the shift range selector switch knob.



7. Remove the shift range selector.
    1. Remove the screws.
    2. Remove the switch.



Installation

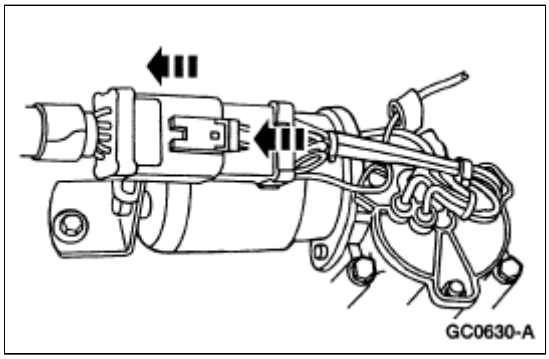
1. Follow the removal procedure in reverse order.

Transfer Case Shift Motor

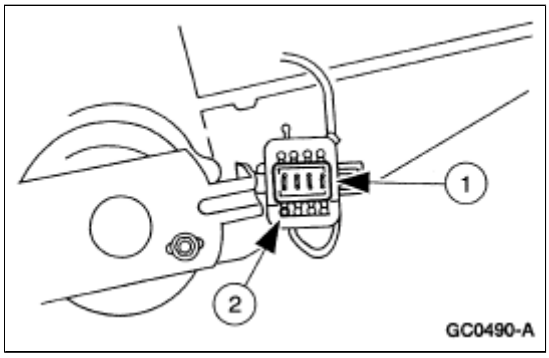
Removal

WARNING: The electrical power supply to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch located in the rear jack storage area. Failure to do so can result in unexpected inflation or deflation of the air springs which can result in shifting of the vehicle during these operations.

1. Raise and support the vehicle. For additional information, refer to Section 100-02 .
2. Disconnect the electrical connector.

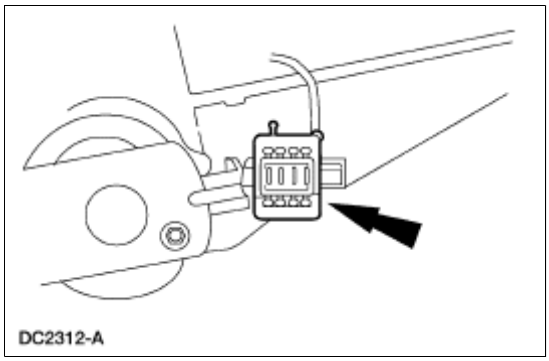


3. Remove the coil wire from the electrical connector.
    1. Remove the connector interlock.
    2. Remove the coil wire pin.
    - Use the proper electrical connector pin remover.

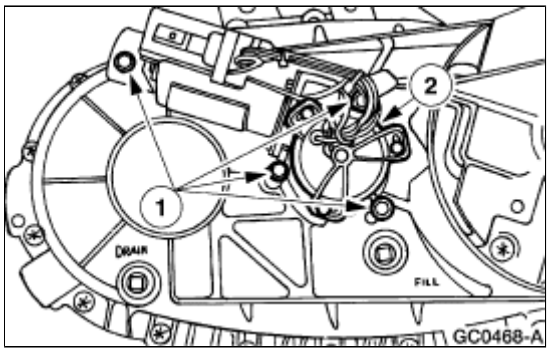


4. **CAUTION: Note each sensor wire pin location for correct installation.**

    Remove the front and rear output shaft speed sensor wire pins from the electrical connector.
    - Use the proper electrical connector pin remover.



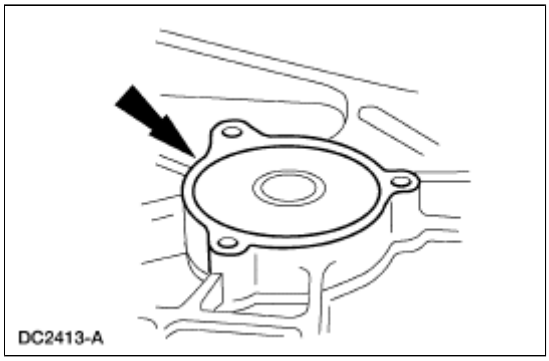
5. Remove the transfer case shift motor (7G360).
    1. Remove the four bolts.
    2. Remove the transfer case shift motor.



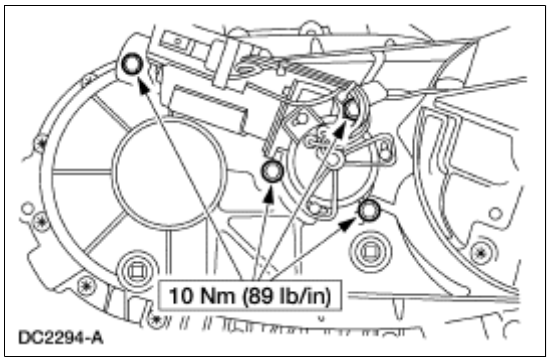
Installation

1. **NOTE:** Make sure the motor mounting surfaces are clean.

    Apply a 3-mm (1/8-inch) bead of sealant to the motor mounting surface on the case.
    - Use Black Non-Acid Cure Silicone Rubber E7TZ-19562-A or equivalent meeting Ford specification ESL-M4G273-A.



2. To install, reverse the removal procedure.

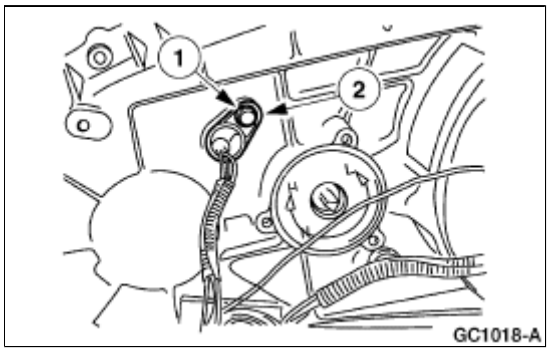

10 Nm (89 lb/in)
DC2294-A

Output Shaft Speed Sensor —Front

Removal

1. Remove the transfer case shift motor (7G360). For additional information, refer to Transfer Case Shift Motor in this section.

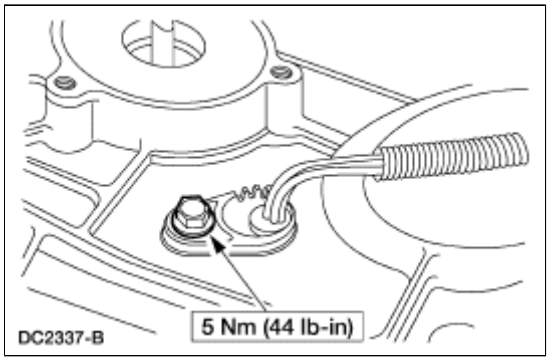
2. Remove the front output shaft speed sensor.
   1. Remove the bolt.
   2. Remove the front output shaft speed sensor.



Installation

1. **CAUTION: Make sure the sensor seats flat against the boss.**

   To install, reverse the removal procedure.

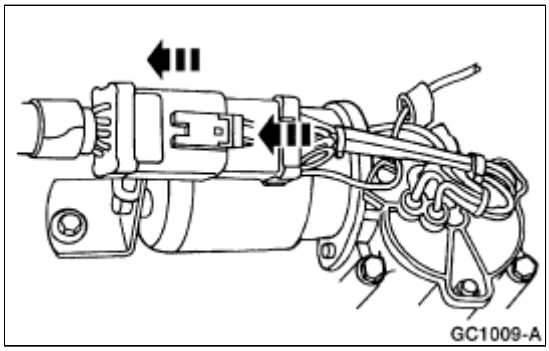


Output Shaft Speed Sensor —Rear

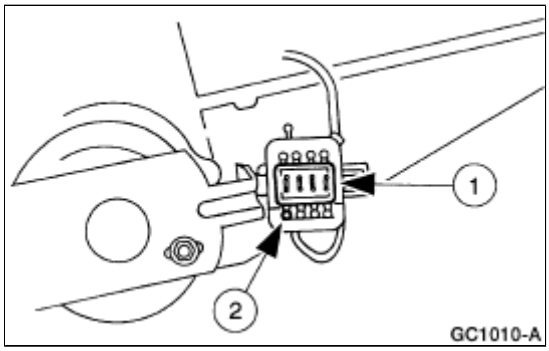
Removal

WARNING: The electrical power supply to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch located in the rear jack storage area. Failure to do so can result in unexpected inflation or deflation of the air springs which can result in shifting of the vehicle during these operations.

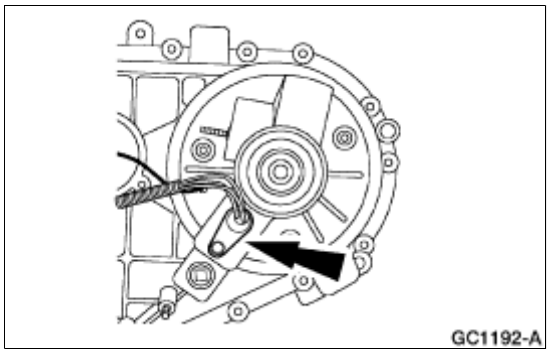
1. Raise and support vehicle. For additional information, refer to Section 100-02 .
2. Disconnect the electrical connector.



3. Remove the rear output shaft speed sensor wires from the electrical shift motor connector.
    1. Remove the connector interlock.
    2. Remove the wires.
        - Use the proper electrical connector pin remover.



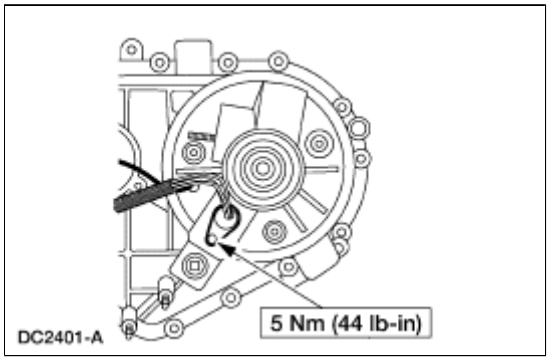
4. Remove the bolt and the sensor.



Installation

1. **CAUTION: Make sure the sensor seats flat against the boss.**

   To install, reverse the removal procedure.



Transfer Case

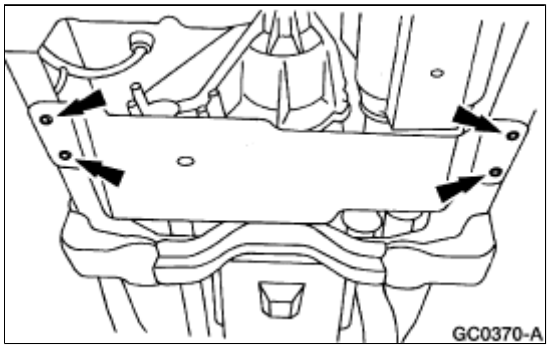
Removal

1. Disconnect the battery ground cable (14301). For additional information, refer to Section 414-01 .

2. **WARNING: The electrical power supply to the air suspension system must be shut off prior to hoisting, jacking or towing an air suspension vehicle. This can be accomplished by turning off the air suspension switch located in the rear jack storage area. Failure to do so can result in unexpected inflation or deflation of the air springs which can result in shifting of the vehicle during these operations.**

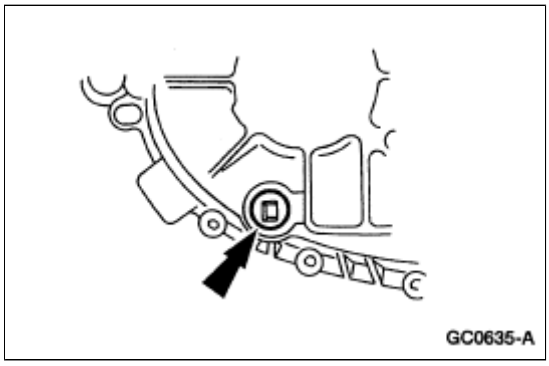
   With the transmission in neutral, raise and support the vehicle. For additional information, refer to Section 100-02 .

3. Remove the skid plate.

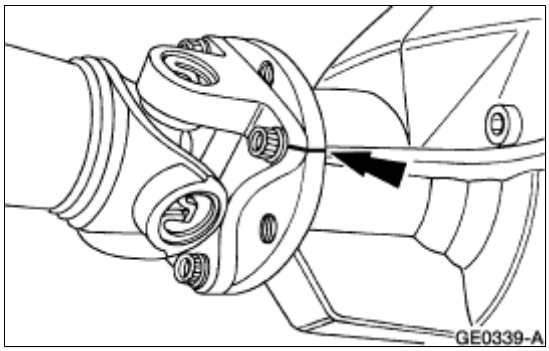


4. **NOTE:** Drain the transfer case (7A195) if disassembly is necessary.

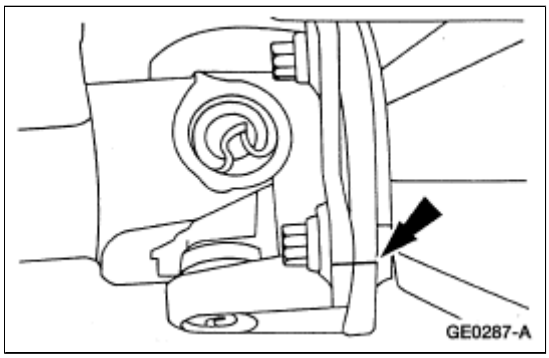
   Drain the transfer case.
   - Install the drain plug when finished draining.



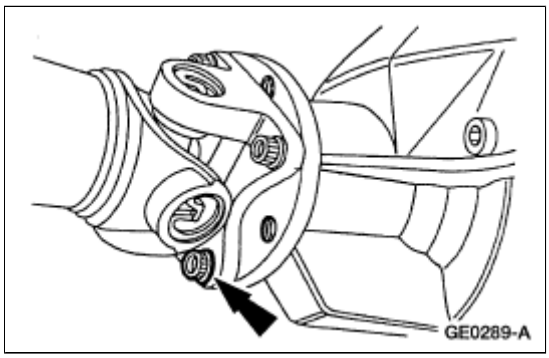
5. Index-mark the rear driveshaft yoke and pinion flange.



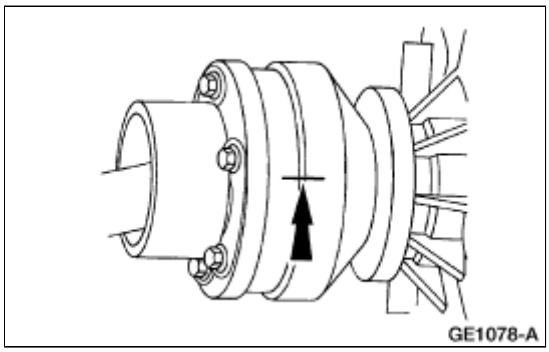
6. Index-mark the rear driveshaft yoke and rear output flange (7B214).



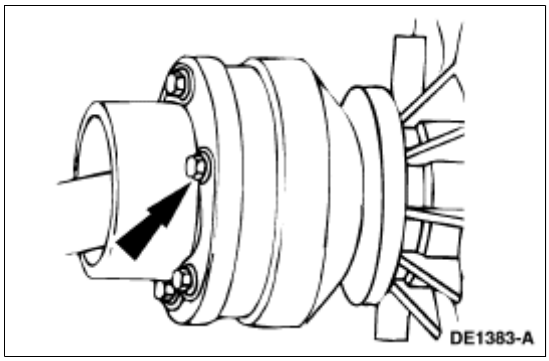
7. Remove the rear driveshaft. For additional information, refer to Section 205-01 .



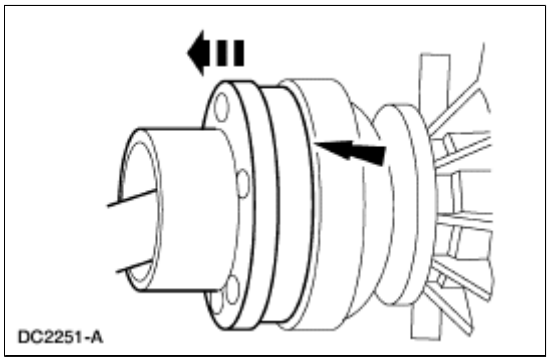
8. Index-mark the front output shaft and flange (7061) and the front driveshaft.



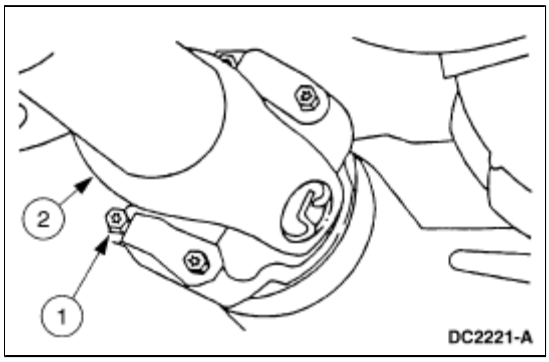
9. Remove and discard the bolts and straps.



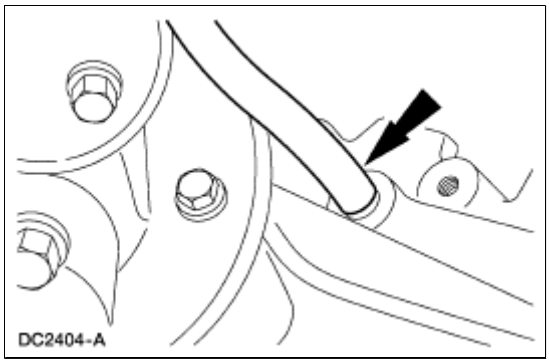
10. Separate the front driveshaft from the front output shaft and flange.



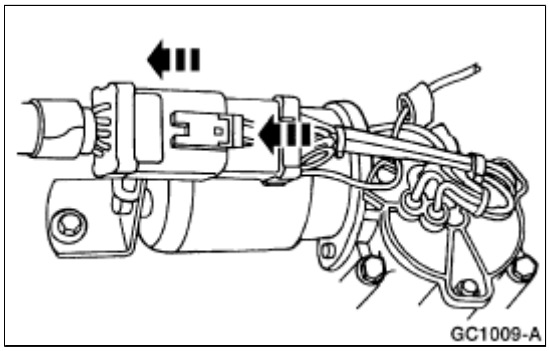
11. Remove the front driveshaft.
    1. Remove the four bolts.
    2. Disconnect the driveshaft.
    3. Carefully remove the front driveshaft.



12. Disconnect the vent tube.



13. Disconnect the shift motor electrical connector.

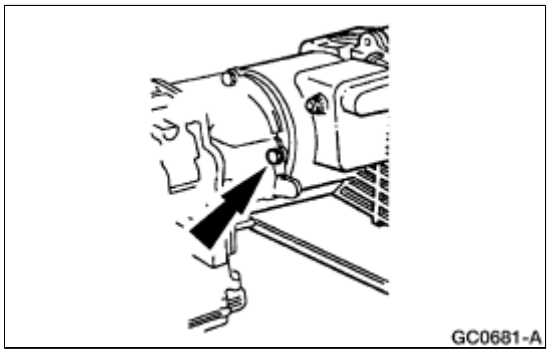


14. **CAUTION: Secure the transfer case to the jack with a safety strap.**

    Support the transfer case with a suitable hi-lift jack.

15. **CAUTION: Position a suitable drain pan below the extension housing.**

    Remove the five bolts.



16. Separate the transfer case from the extension housing.

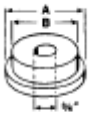
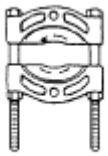
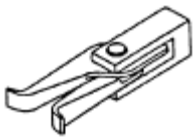
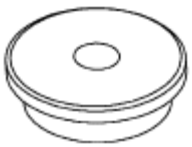
17. **CAUTION: Watch for obstructions.**

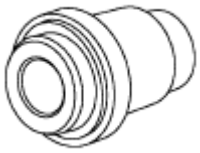
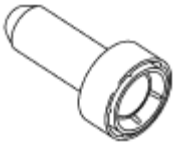
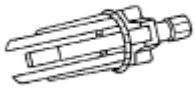
    Lower the jack and the transfer case.

18. Remove and discard the transfer case-to-extension housing gasket. Clean the gasket surfaces.

Transfer Case

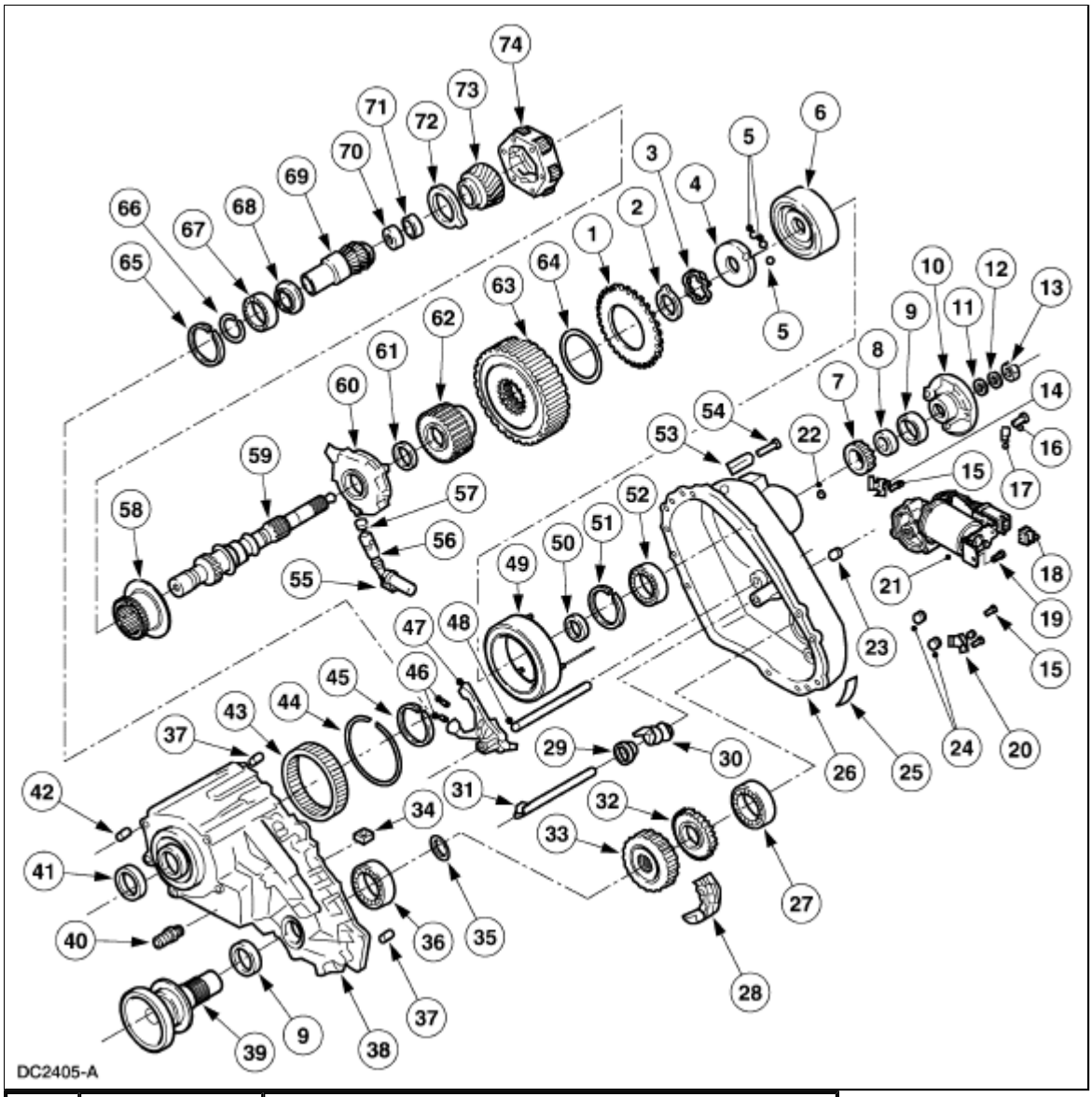
Special Tool(s)

 ST1200-A	Bearing Cup Remover 308-047 (T77F-1102-A)
 ST1471-A	Bearing Cup Replacer 204-020 (T73T-1202-A)
 ST1368-A	Bearing Pulling 205-D064 (D84L-1123-A) or Equivalent
 ST1362-A	Bearing Remover 307-318 (T94P-77001-KH)
 ST1257-A	Companion Flange Holding Tool 205-126 (T78P-4851-A)
 ST1783-A	Differential Bearing Cup Replacer 308-163 (T88C-77000-FH)
 ST1255-A	Handle 205-153 (T80T-4000-W)

 ST1186-A	Holding Fixture 307-003 (T57L-500-B)
 ST1185-A	Impact Slide Hammer 100-001 (T50T-100-A)
 ST1789-A	Input Shaft Bearing Replacer 308-085 (T83T-7025-C)
 ST2305-A	Input Shaft Seal Installer 308-186 (T90T-7127-B)
 ST1213-A	Puller 307-001 (TOOL-1175-AC) or Equivalent
 ST1385-A	Seal Remover 303-409 (T92C-6700-CH)
 ST1466-A	Valve Stem Seal Replacer 303-367 (T90P-6510-AH)

Disassembly

Disassembled View



Item	Part Number	Description
1	7H150	Armature
2	7917	Snap ring
3	7E085	Wave spring
4	7R428	Apply cam
5	7A534	Ball
6	7G362	Cam and coil housing assy
7	7G450	Tone wheel (upper)
8	7072	Spacer
9	7B215	Oil seal
10	7B214	Rear output flange
11	7052	Oil seal
12	7B368	Output shaft yoke washer

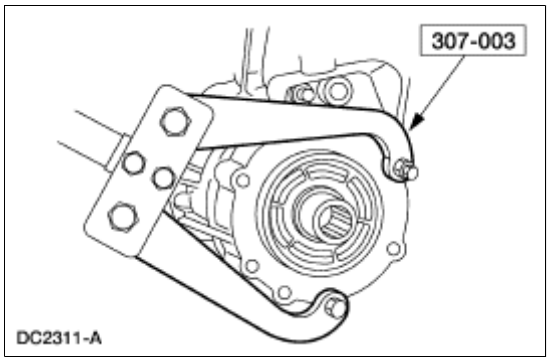
13	7045	Shaft nut
14	7F293	Speed sensor (rear output shaft)
15	7A443	Bolt
16	N800670	Bolt (3 req'd)
17	7K470	J-clip
18	—	Connector interlock (part of 7G360)
19	N802503	Bolt (hex-head)
20	7F293	Speed sensor (front output shaft)
21	7G360	Transfer case shift motor
22	N620480	Hex nut (3 req'd)
23	7288	Shifter shaft seal
24	7A010	Drain/fill plug
25	—	Identification decal (part of 7005)
26	7005	Cover
27	7025	Bearing (front output shaft rear)
28	7A029	Drive chain
29	7W074	Torsion spring
30	7F063	Electric shift cam assy
31	7N095	Shift shaft
32	7G450	Tone wheel (lower)
33	7177	Driven sprocket (30T)
34	7L027	Oil pan magnet
35	7064	Snap ring
36	7025	Bearing
37	—	Dowel pins (2 req'd) (part of 7003)
38	7005	Case assy
39	7061	Output shaft and flange (front)
40	383976	Breather barb
41	7B215	Input seal
42	—	Spiral pin (part of 7005)
43	7A153	Ring gear
44	7064	Snap ring
45	7917	Snap ring
46	7C430	Shift fork facing (2 req'd)
47	7289	Reduction shift fork
48	7240	Shift rail
49	7G361	Clutch coil assy

50	7D221	Thrust bearing
51	7917	Snap ring
52	7025	Bearing (rear output shaft support)
53	—	Identification tag (part of 7A195)
54	7A443	Bolt— hex-head (M10 x 1.5 x 30.0) (17 req'd)
55	7A098	Oil strainer
56	7A210	Pump hose
57	382846	Hose clamp
58	7100	High-low collar
59	7061	Rear output shaft
60	7A149	Pump assy
61	7Z111	Thrust washer
62	7177	Drive sprocket (30T)
63	7C108	Clutch pack assy
64	7Z104	Insulator washer
65	7064	Snap ring
66	7917	Snap ring
67	7025	Bearing (planetary gear carrier support)
68	7A385	Carrier thrust washer
69	7017	Input shaft
70	7025	Bearing
71	—	Output shaft bushing (part of 7017)
72	7B066	Thrust plate
73	7D063	Sun gear
74	7A398	Front planetary gear set assy

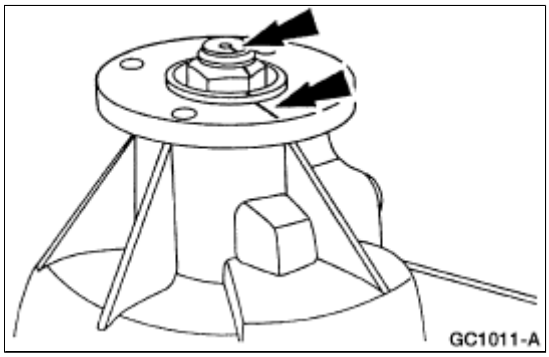
1. Remove the transfer case (7A195). For additional information, refer to Transfer Case in this section.

2. **WARNING: Make sure the Holding Fixture lock pin is secure.**

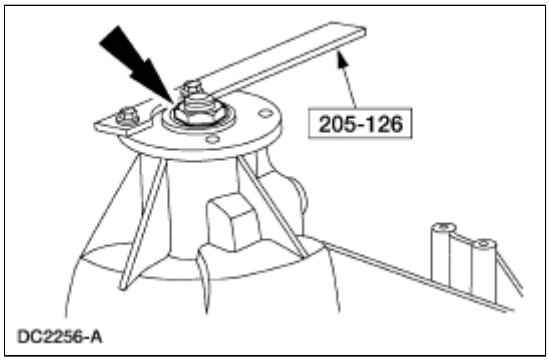
   Using the special tool, secure the transfer case to a bench.



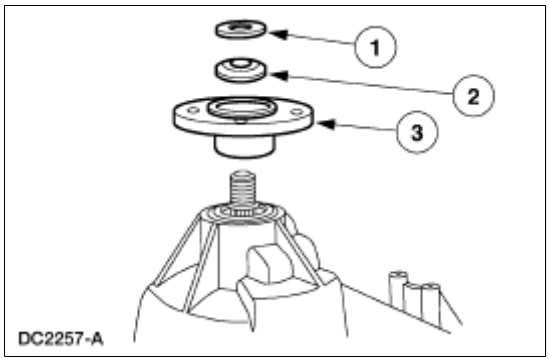
3. Index-mark the rear output flange and the rear output shaft (7061).



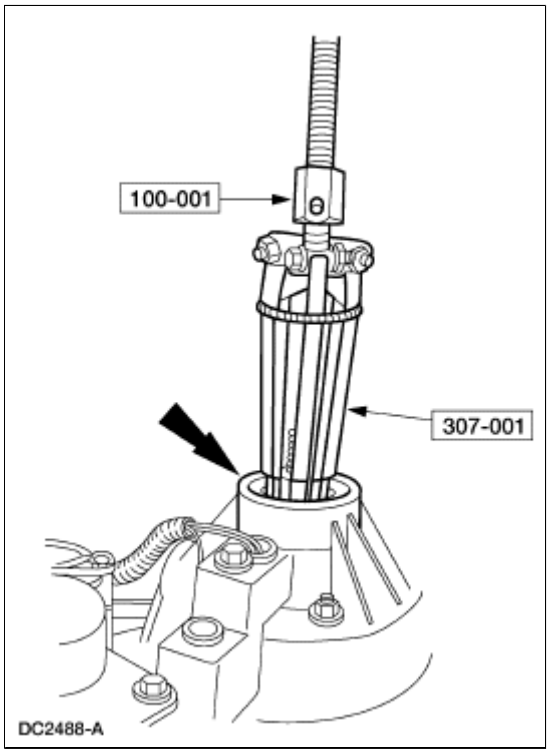
4. Use the special tool to hold the rear output flange (7B214) while removing the nut.



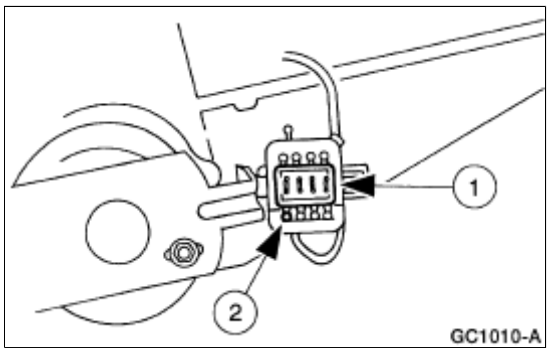
5. Remove the rear output flange.
    1. Remove the output shaft yoke washer (7B368).
    2. Remove the oil seal (7052).
    3. Remove the rear output flange.



6. Using the special tools, remove the oil seal.

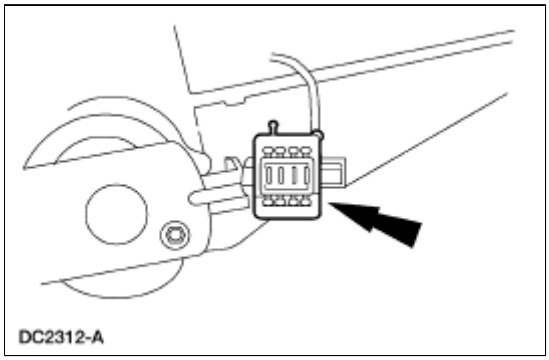


7. Remove the coil wire pin from the electrical connector.
    1. Remove the connector interlock.
    2. Remove the coil wire pin.
        - Use electrical connector pin extractor tool.

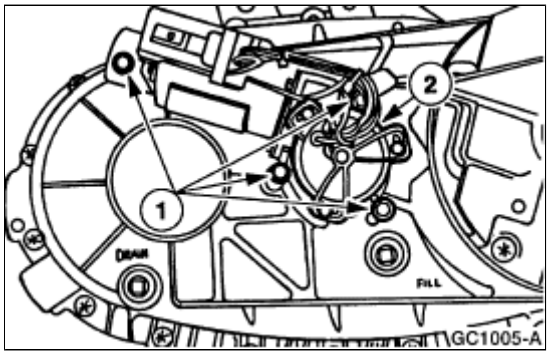


8. **CAUTION: Note each sensor wire pin location for correct installation.**

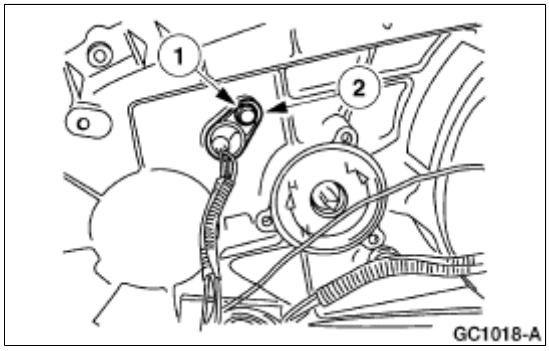
   Remove the front and rear output shaft speed sensor wire pins from the electrical connector.
   - Use an electrical connector pin extractor tool.



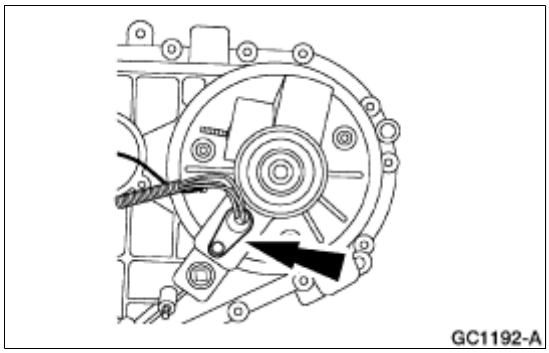
9. Remove the transfer case shift motor (7G360).
   1. Remove the bolts.
   2. Remove the transfer case shift motor.



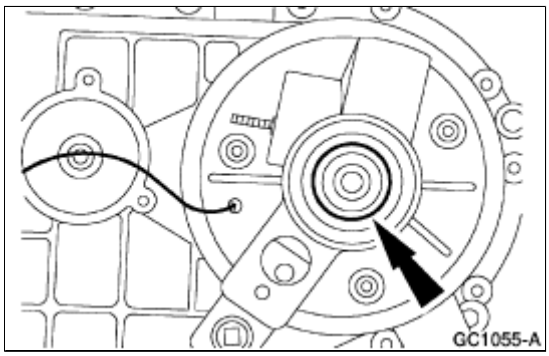
10. Remove the front output shaft speed sensor (7F293).
    1. Remove the bolt.
    2. Remove the front output shaft speed sensor.



11. Remove the bolt and the rear output shaft speed sensor (7F293).



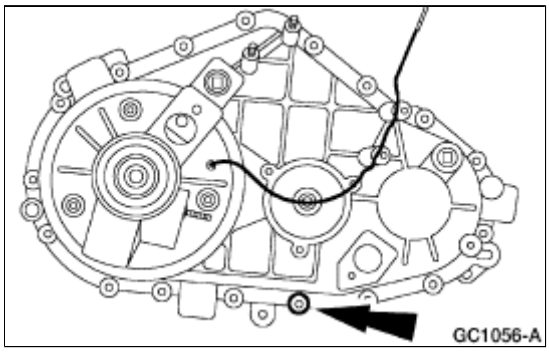
12. Remove the spacer.



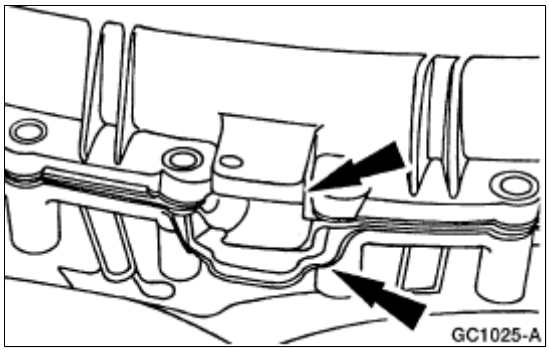
13. **NOTE:** Inspect the tone wheel teeth for damage.

    If necessary, remove and discard the tone wheel (7G450).

14. Remove the 17 bolts.

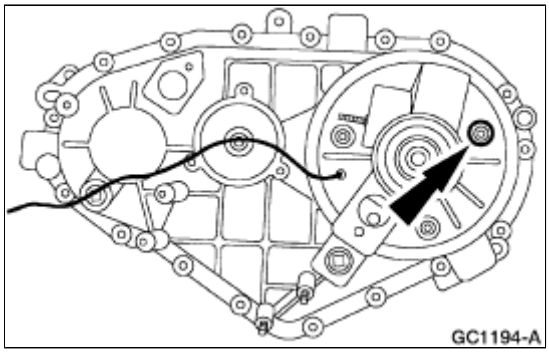


15. Separate the transfer case halves at the transfer case pry bosses.

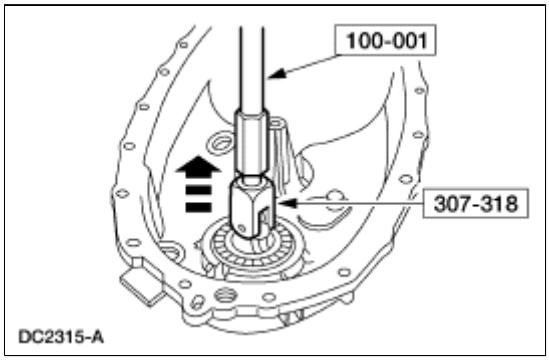


16. **CAUTION: Support the clutch coil assembly (7G361) while removing the nuts.**

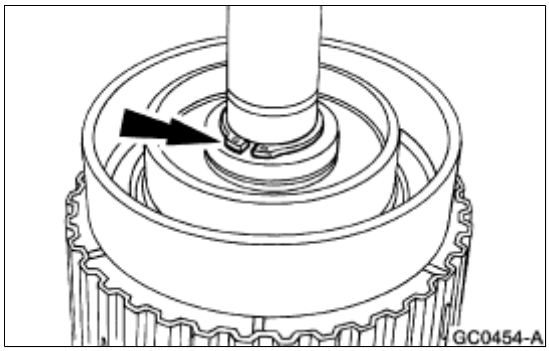
    Remove the nuts and the clutch coil assembly.



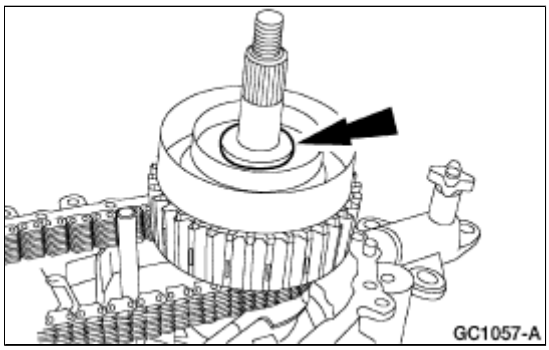
17. Using the special tools, remove the front output shaft rear bearing (7025), and remove the rear output shaft support bearing (7025).



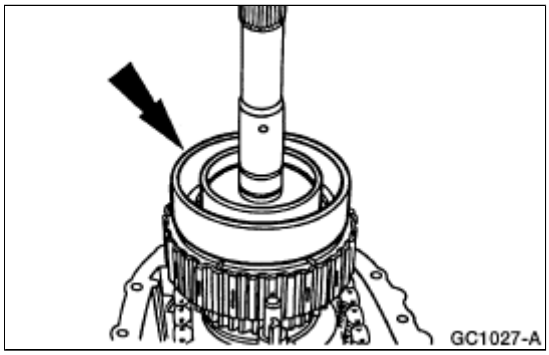
18. Remove the snap ring (7917).



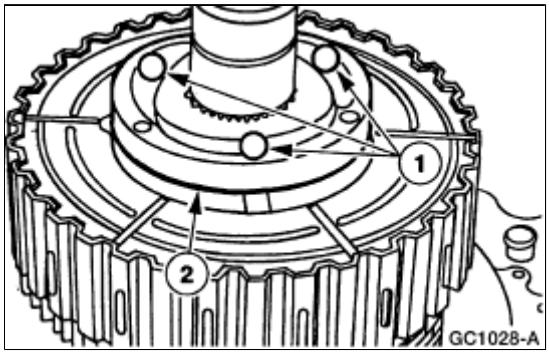
19. Remove the thrust bearing (7D221).



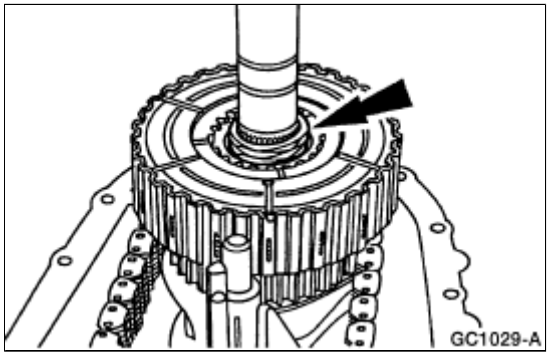
20. Remove the cam and coil housing assembly (7G362).



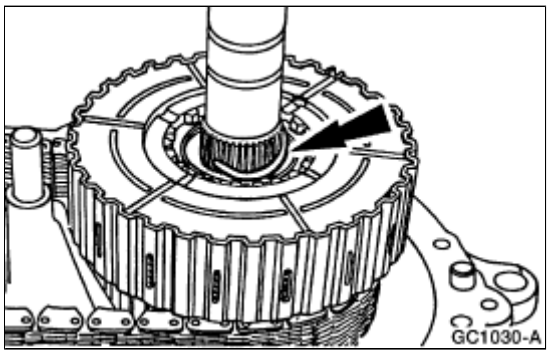
21. Remove the apply cam (7R428) and balls (7A534).
    1. Remove the steel balls.
    2. Remove the apply cam.



22. Remove the wave spring (7E085).

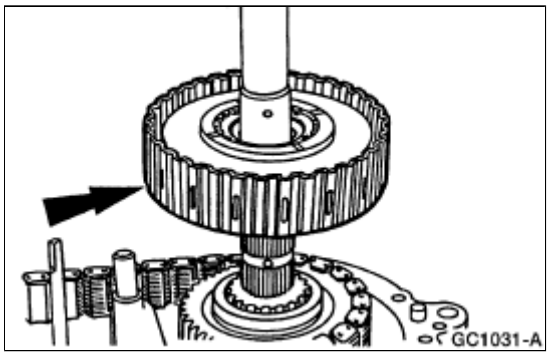


23. Remove the snap ring (7917).

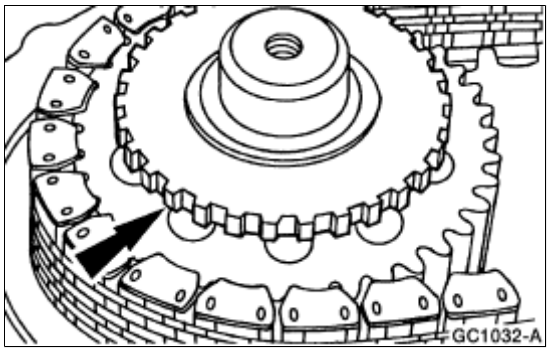


24. **CAUTION: When removing or installing the clutch pack assembly, do not separate the clutch pack assembly. Keep tension on the clutch pack upon removal. Set the clutch pack assembly on the bench in the same position as it was located in the transfer case. The thrust washer in the lower clutch pack uses tabs to hold it in place. If the thrust washer is not in place, a transfer case clearance problem can occur.**

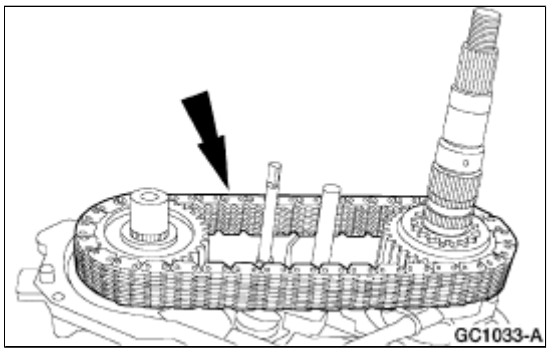
Remove the clutch pack assembly (7C108).



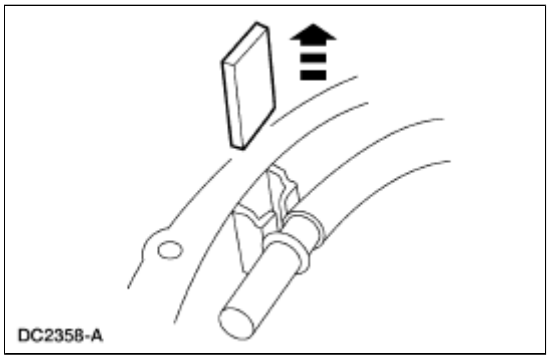
25. Remove the tone wheel (7G450).



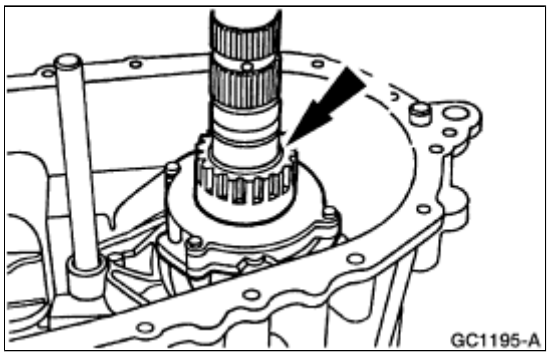
26. Remove the drive chain (7A029) and the sprockets as an assembly.



27. Remove and clean the oil pan magnet (7L027).

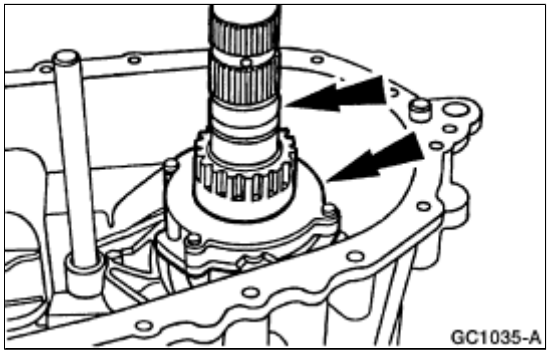


28. Remove the thrust washer (7Z111).



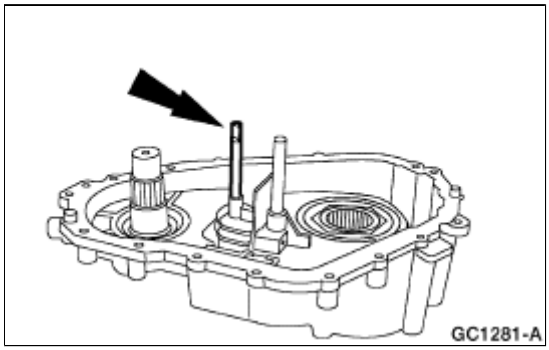
29. **CAUTION: Do not disassemble the pump assembly (7A149).**

Remove the pump assembly and the rear output shaft (7061) as an assembly.

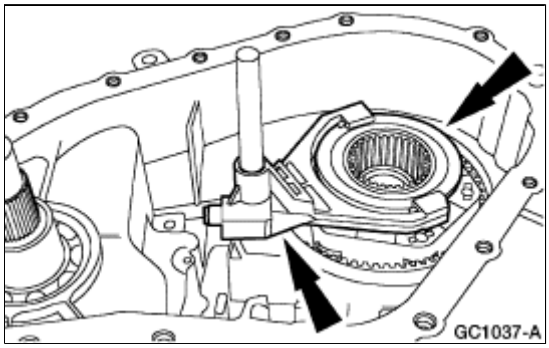


30. **CAUTION: Do not disassemble the electric shift cam assembly (7F063).**

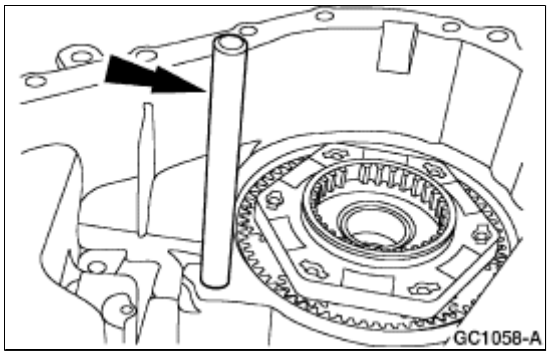
Remove the electric shift cam assembly.



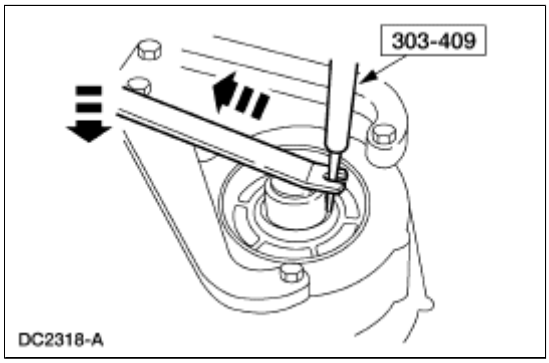
31. Remove the reduction shift fork (7289) and the high-low collar (7100) as an assembly.



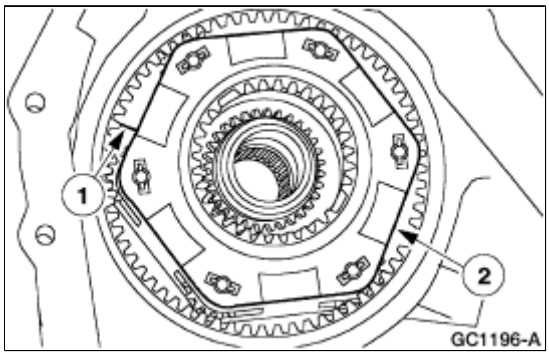
32. Remove the shift rail (7240).



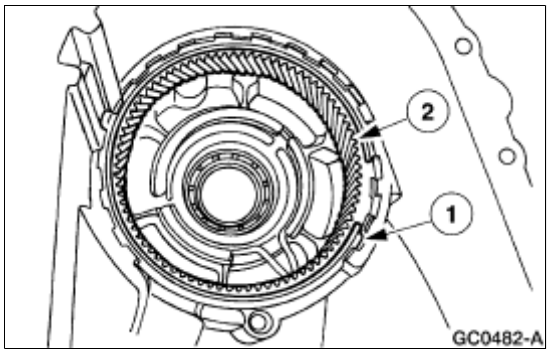
33. Using the special tool, remove the oil seal.



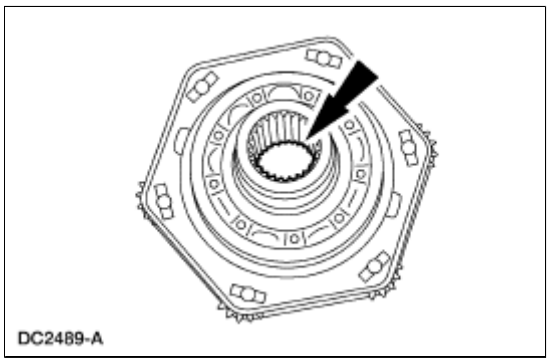
34. Remove the front planetary gear set assembly (7A398).
    1. Expand the snap ring (7064).
    2. Remove the front planetary gear set assembly.



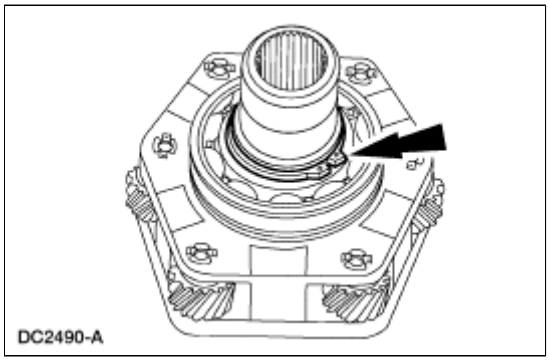
35. Remove the ring gear (7A153), if necessary.
    1. Remove the snap ring (7064).
    2. Remove the ring gear.



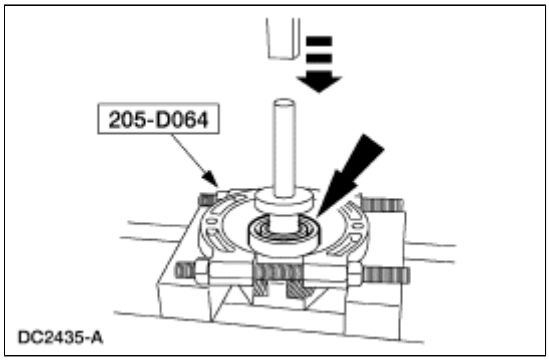
36. If necessary, using a drift and hammer, remove the output shaft bushing and bearing (7025).



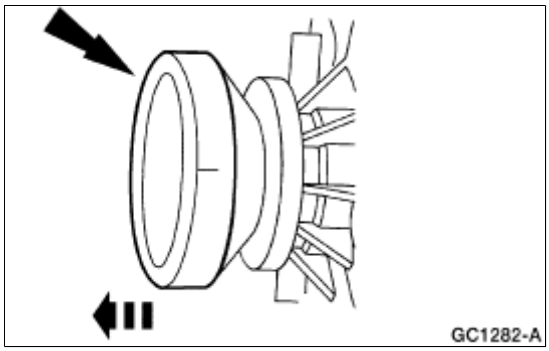
37. If planetary gear carrier support bearing (7025) removal is necessary, remove the snap ring.



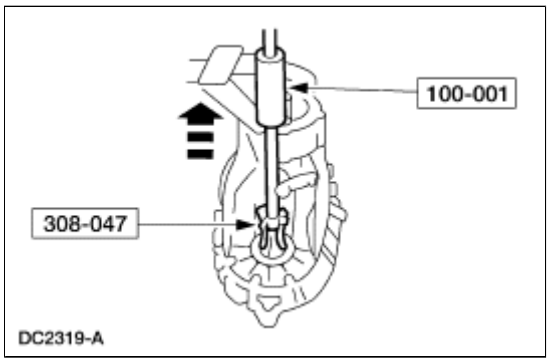
38. Using a suitable press and the special tool, remove the planetary gear carrier support bearing.



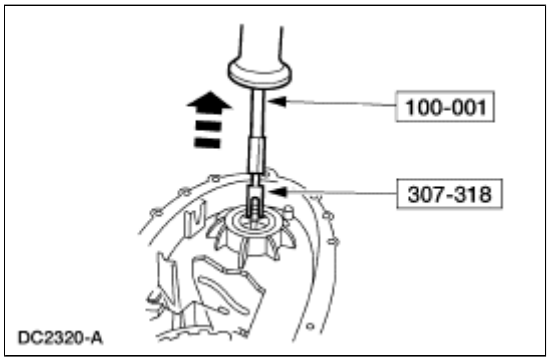
39. Remove the snap ring (7064) and the front output shaft and flange (7061).



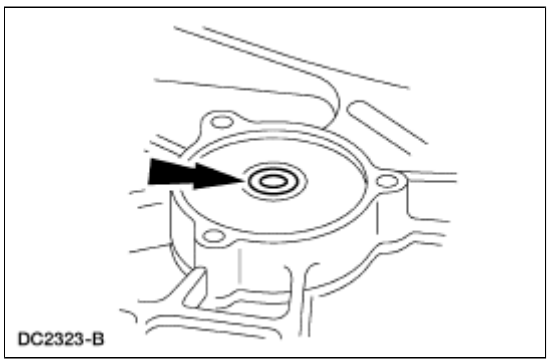
40. Using the special tools, remove the oil seal.



41. Using the special tools, remove the front output shaft support bearing (7025).



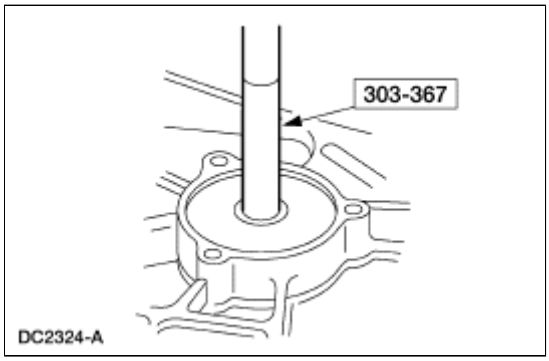
42. Using a suitable tool, remove the shifter shaft seal (7288).



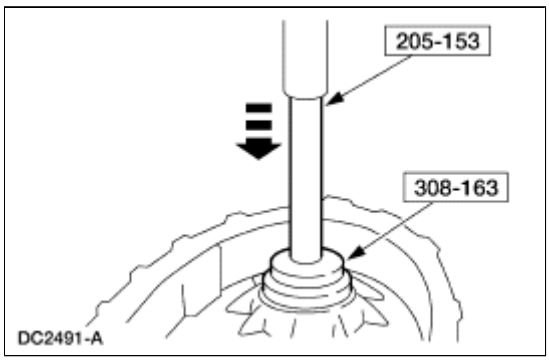
Assembly

1. **CAUTION: Do not crush the seal.**

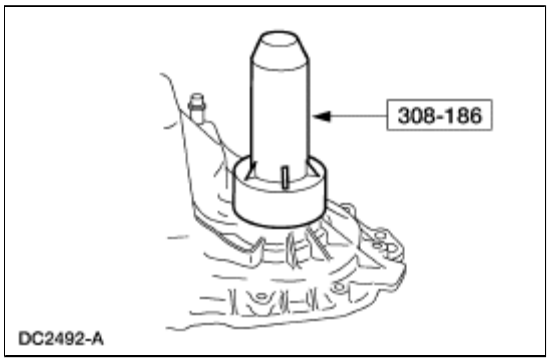
   Using the special tools, install the shifter shaft seal.



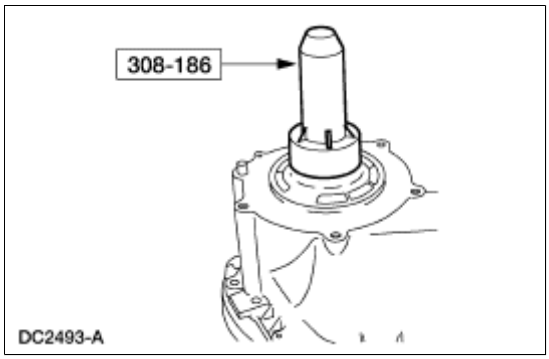
2. Using a suitable press and the special tools, install the front output shaft support bearing.



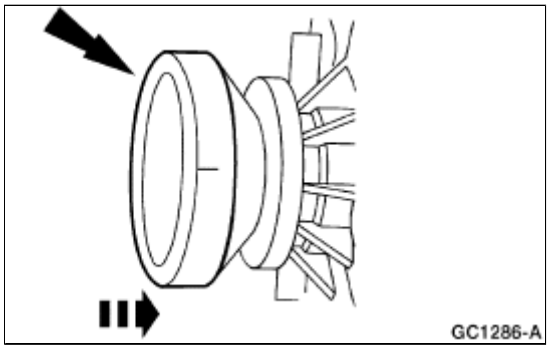
3. Using the special tool, install the oil seal.



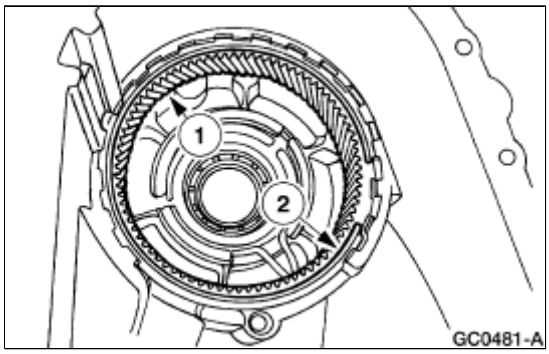
4. Using the special tool, install the oil seal.



5. Install the front output shaft and flange and snap ring.

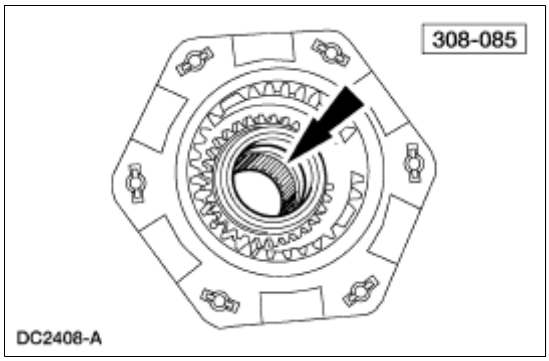


6. Install the ring gear, if removed.
    1. Position the ring gear.
    2. Install the snap ring.

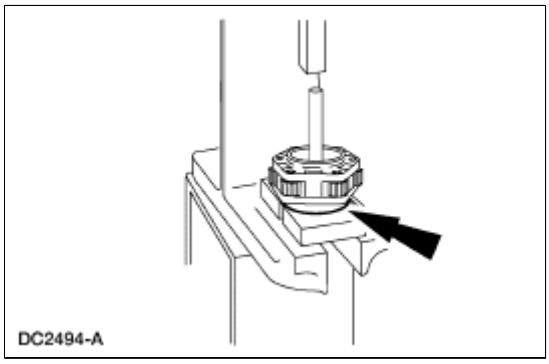


7. **CAUTION: Do not crush the bearing cage.**

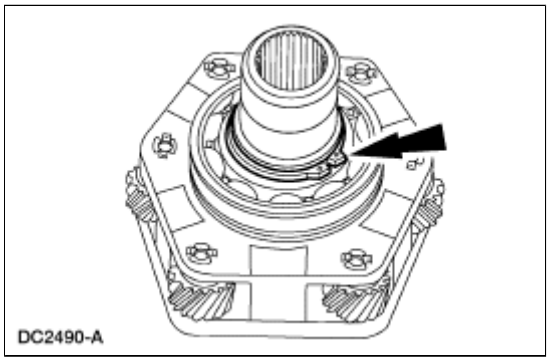
    If removed, using a suitable press and the special tool, install the bushing and the bearing.



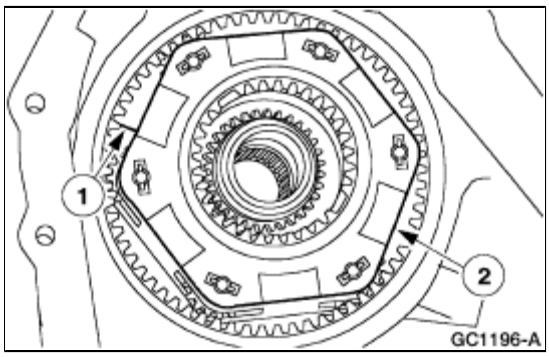
8. If removed, using a suitable press, install the planetary gear carrier support bearing.



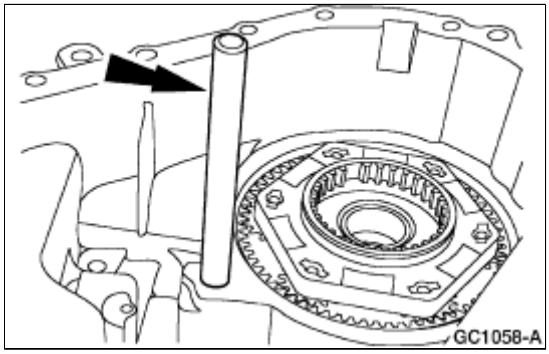
9. Install the snap ring.



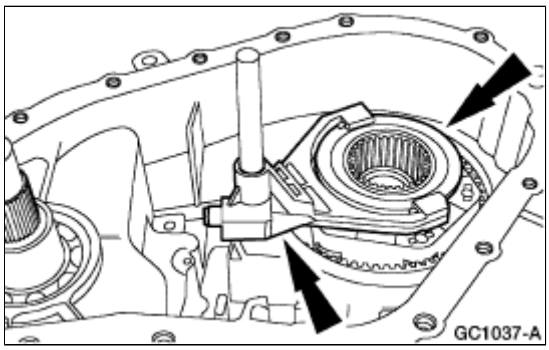
10. Install the front planetary gear set assembly.
    1. Expand the snap ring.
    2. Position the front planetary gear set assembly, and release the snap ring.



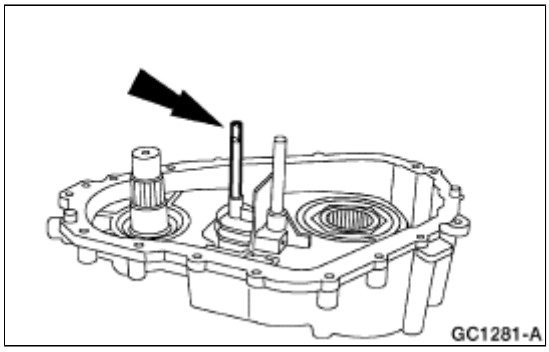
11. Install the shift rail.



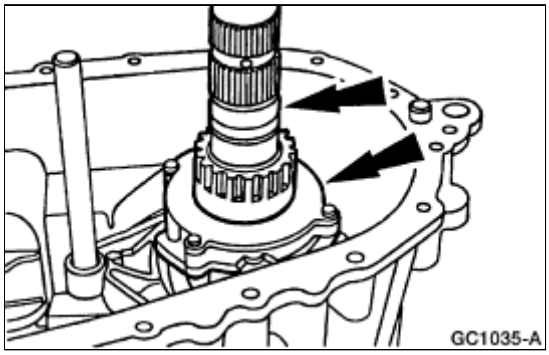
12. Install the reduction shift fork and the high-low collar as an assembly.



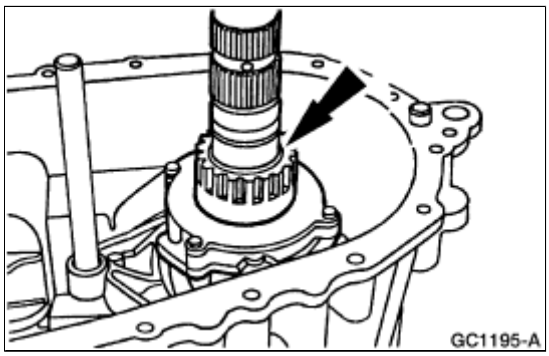
13. Install the electric shift cam assembly.



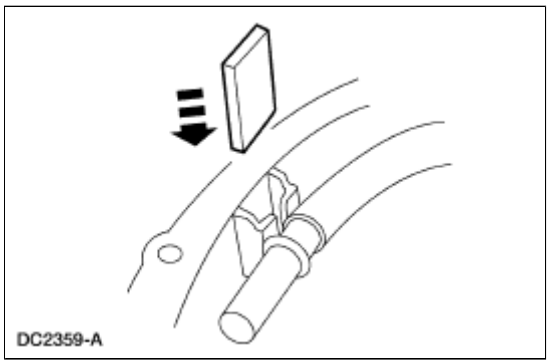
14. Install the pump assembly and the rear output shaft as an assembly.



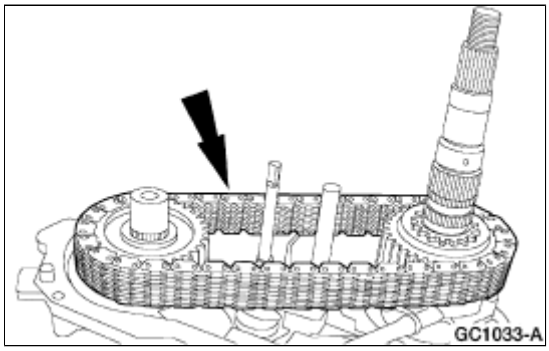
15. Install the thrust washer.



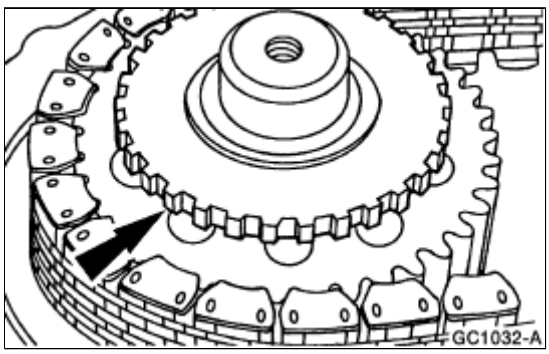
16. Install the oil pan magnet into its slot in the case.



17. Install the drive chain and sprockets as an assembly.

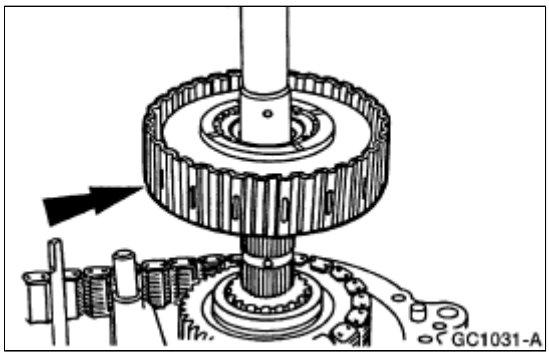


18. Install the tone wheel.



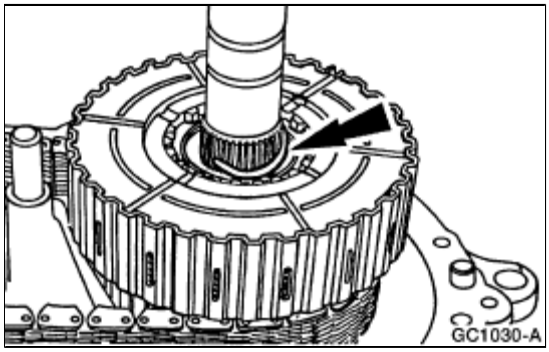
19. **CAUTION: When removing or installing the clutch pack assembly, do not separate the clutch pack assembly. Keep tension on the clutch pack upon removal. Set the clutch pack assembly on the bench in the same position as it was located in the transfer case. The thrust washer in the lower clutch pack uses tabs to hold it in place. If the thrust washer is not in place, a transfer case clearance problem can occur.**

    Install the clutch pack assembly.

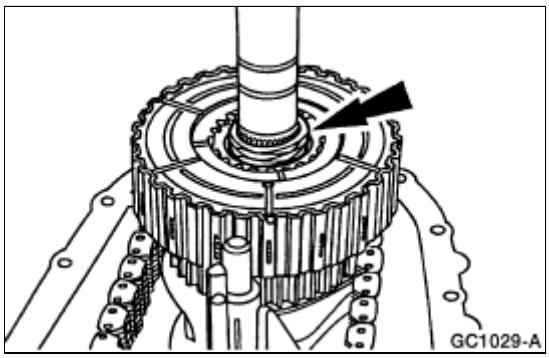


20. **CAUTION: Use a new snap ring.**

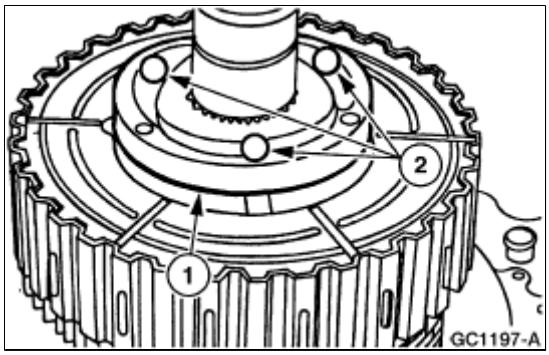
    Install a new snap ring.



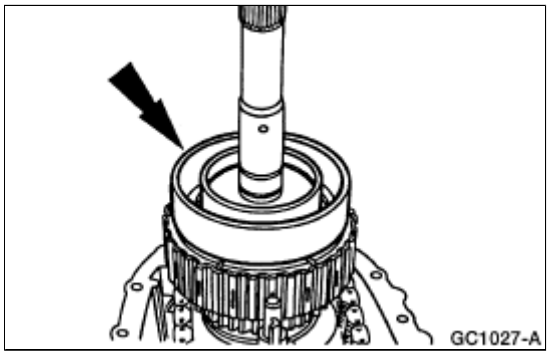
21. Install the wave spring.



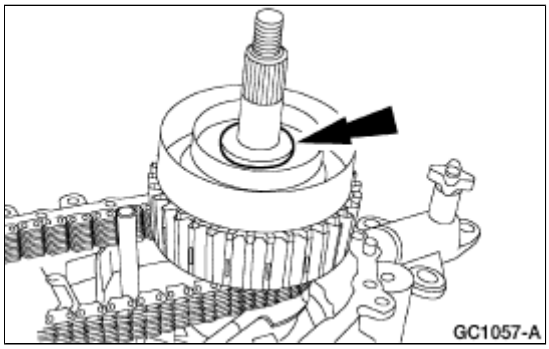
22. Install the apply cam and balls.
    1. Install the apply cam.
    2. Install the steel balls.



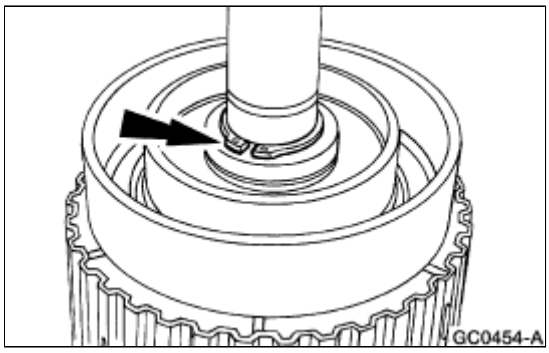
23. Install the cam and coil housing.



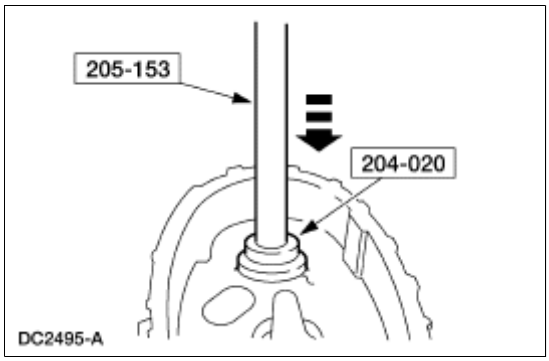
24. Install the thrust bearing.



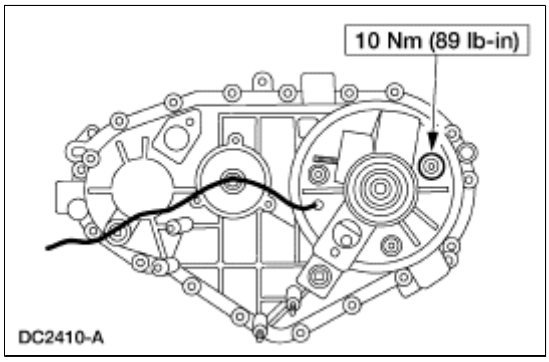
25. Install the snap ring.



26. Using a suitable press and the special tools, install the front output shaft rear bearing, and install the rear output shaft support bearing.



27. Position and support the clutch coil assembly, and install the nuts.



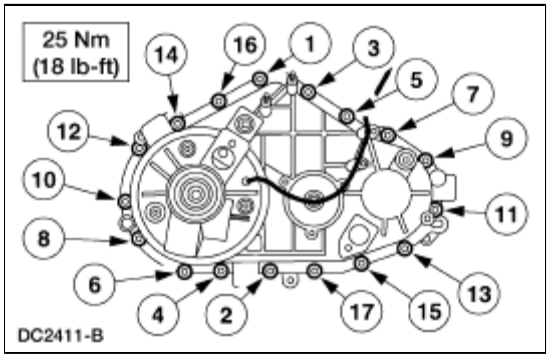
28. **CAUTION: Applying too much silicone sealant can plug the fluid filter and cause transfer case failure.**

    NOTE: Make sure the transfer case mating surfaces are clean.

    Apply a 3-mm (1/8-inch) bead of sealant to the transfer case mating surfaces.
    - U se Black Non-Acid Cure Silicone Rubber E7TZ-19562-A or equivalent meeting Ford specification ESL-M4G273-A.

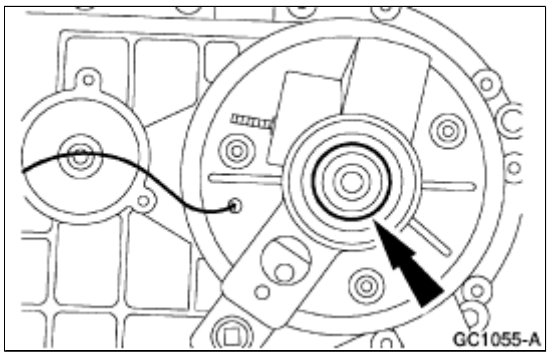
29. Position the transfer case halves together.

30. Install the bolts, and tighten them in the specified order.

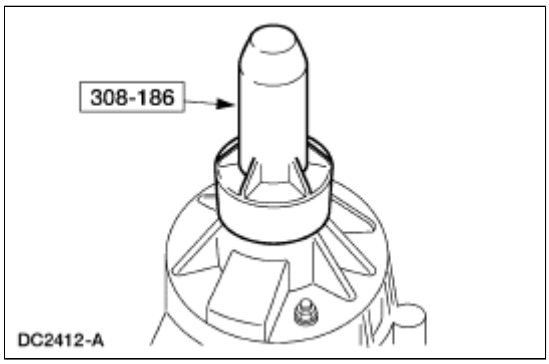


31. Install the tone wheel.

32. Install the spacer.

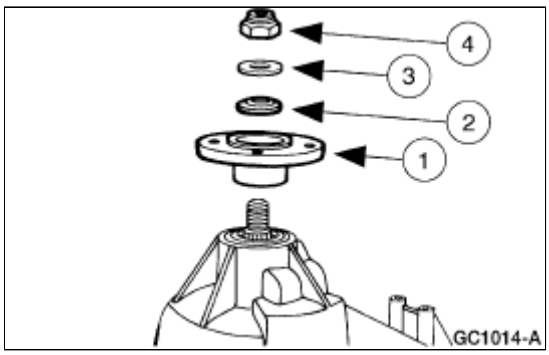


33. Install the oil seal.

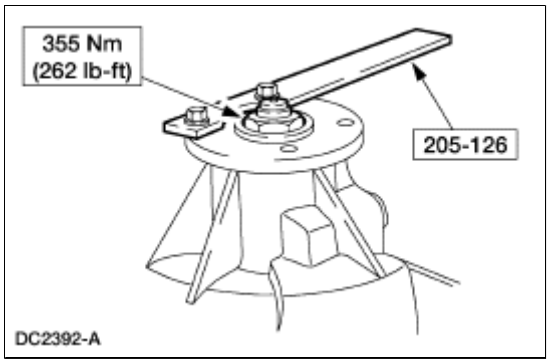


34. **NOTE:** Align the index-marks made during disassembly.

Install the rear output flange.
1. Position the flange.
2. Position the oil seal.
3. Position the output flange yoke washer.
4. Install the nut.

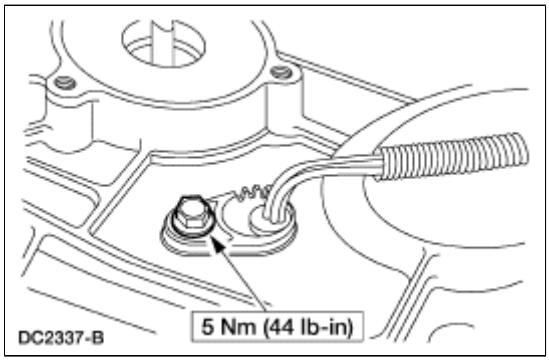


35. While holding the flange with the special tool, tighten the nut.



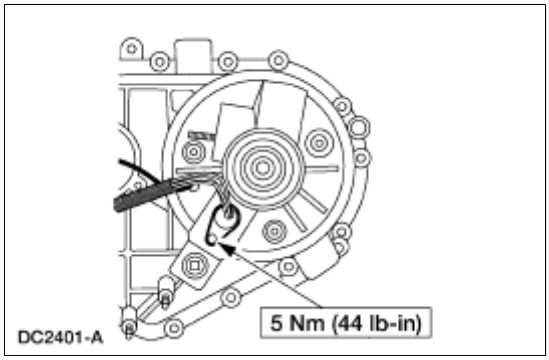
36. **CAUTION: Make sure the sensor seats flat against the boss.**

Install the front output shaft speed sensor.



37. **CAUTION: Make sure the sensor seats flat against the boss.**

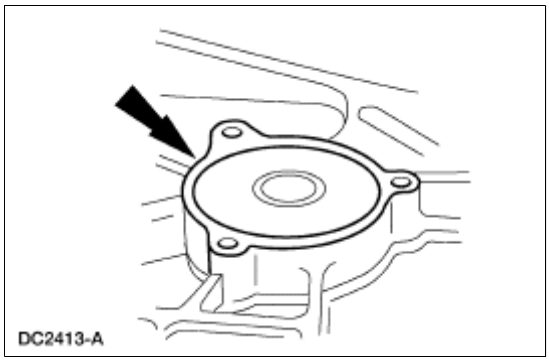
Install the rear output shaft speed sensor.



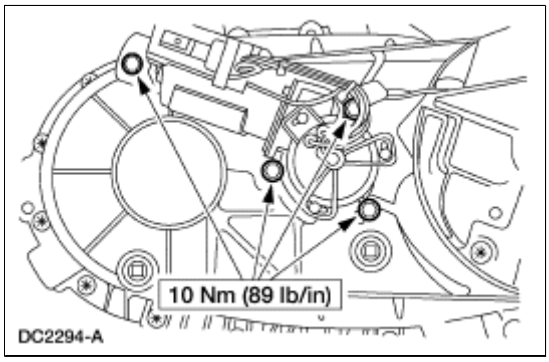
38. **NOTE:** Make sure the motor mounting surfaces are clean.

Apply a 3-mm (1/8-inch) bead of sealant to the motor mounting surface on the case.

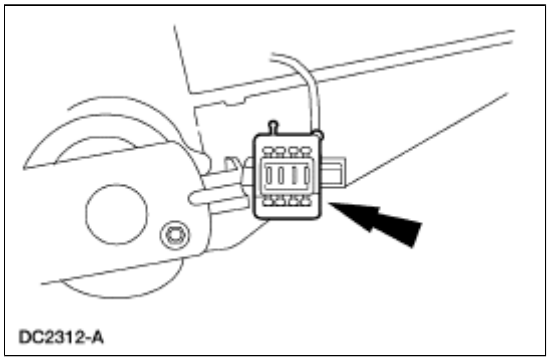
- Use Black Non-Acid Cure Silicone Rubber E7TZ-19562-A or equivalent meeting Ford specification ESL-M4G273-A.



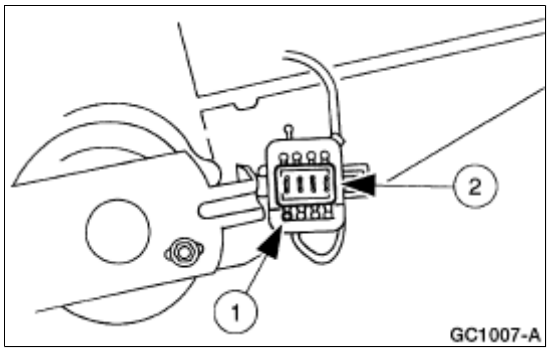
39. Install the transfer case shift motor.



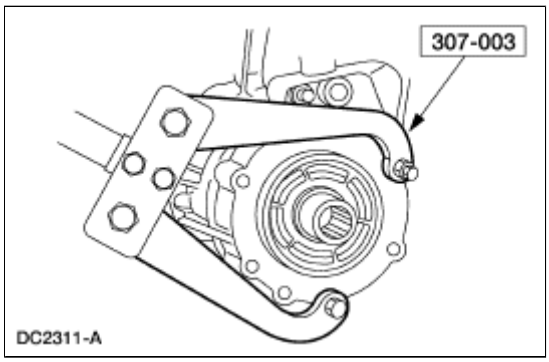
40. Install the front and rear output shaft speed sensor wire pins in the locations noted during their removal.



41. Install the coil wire pin in the electrical connector.
    1. Install the coil wire pin.
    2. Install the connector interlock.



42. Remove the transfer case from the special tool.

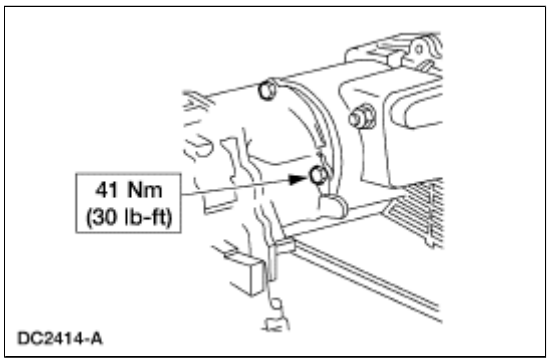


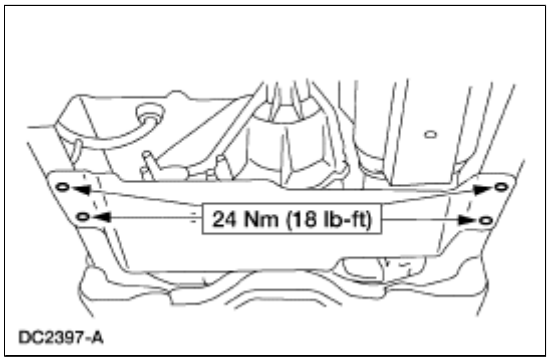
43. Install the transfer case in the vehicle. For additional information, refer to Transfer Case in this section.

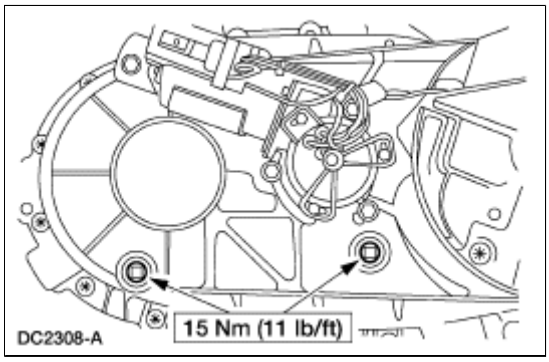
Transfer Case

Installation

1. To install, reverse the removal procedure.
    - Use a new transfer case to extension housing gasket.
    - Refer to Section 205-01 for driveshaft fastener tightening specifications.
    - Refer to Transfer Case Draining and Filling in the General Procedures portion of this section when refilling the transfer case.
    - Reactivate the air suspension system if so equipped.







Lubricant Capacity

Lubricant	Liters	U.S. Pints
Motorcraft MERCON® Multi-Purpose Automatic Transmission Fluid XT-2-QDX, XT-2-DDX or Equivalent	1.25	2.6

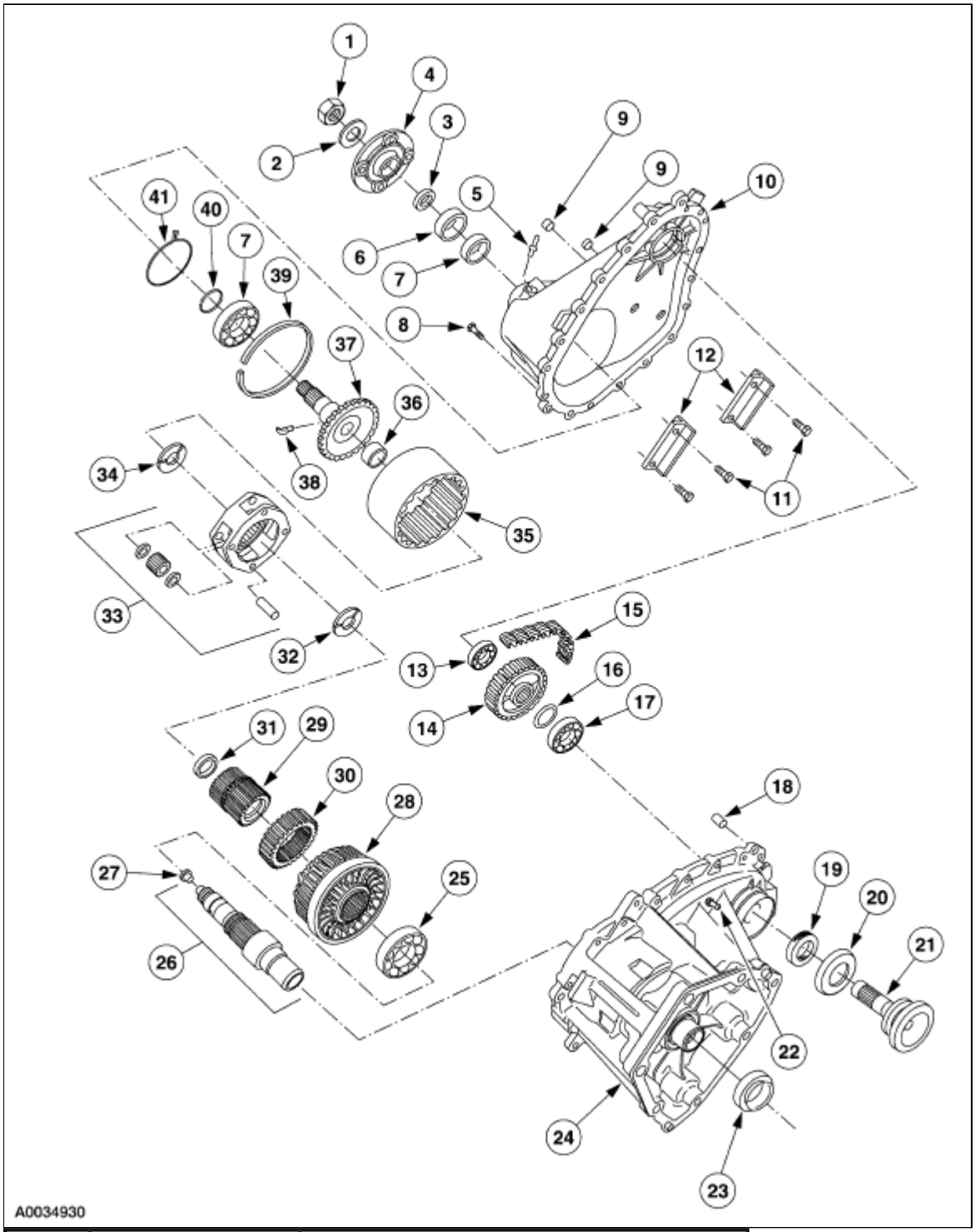
General Specifications

Item	Specification
Silicone Gasket and Sealant F7AZ-19554-EA	WSE-M4G323-A4

Torque Specifications

Description	Nm	lb-ft	lb-in
Transfer case-to-extension housing bolts	40	30	—
Skid plate bolts	40	30	—
Fill and drain plug	17	13	—
Case bolts	25	18	—
Damper snubber screws	7	—	62
Rear shaft nut	355	262	—
Transmission mount nuts	90	66	—
Transfer case heat shield bolts	25	18	—
Crossmember bolts	70	52	—
Transmission mount bolts	90	66	—

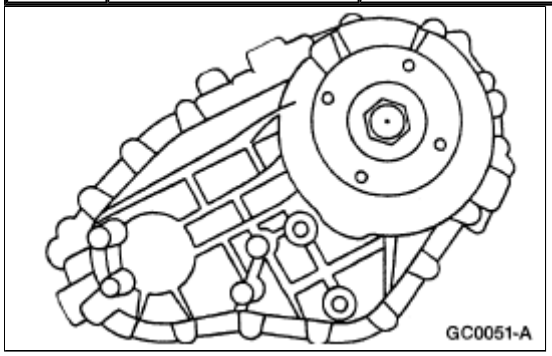
Transfer Case



Item	Part Number	Description
1	7045	Shaft nut

2	7B368	Output shaft yoke washer
3	7052	Oil seal
4	7B214	Output flange
5	7C207	Case stud
6	7B215	Yoke to flange seal
7	7025	Bearing
8	7A443	Bolt (17 req'd)
9	7A010	Drain/fill plug
10	7005	Case
11	7A771	Torx® head screw (4 req'd)
12	7F123	Damper snubber
13	7025	Bearing
14	7177	Lower drive sprocket
15	7A029	Drive chain
16	7917	Snap ring
17	7025	Bearing
18	7B362	Spring dowel bushing (2 req'd)
19	7B215	Yoke to flange seal
20	7C016	Dust deflector
21	7061	Output shaft
22	383976	Breather barb
23	7B215	Yoke to flange seal
24	7005	Case
25	7025	Bearing
26	7017	Input shaft assembly
27	7L276	Lubricating tube
28	7L499	Coupling (viscous)
29	7177	Lower drive sprocket
30	7D063	Overdrive sun gear
31	—	Bushing (part of 7D063)
32	7C341	Thrust washer
33	7A398	Front planetary gear assembly
34	7A385	Output shaft thrust washer
35	7A153	Ring gear
36	7120	Needle bearing
37	7061	Upper output shaft
38	7L290	Oil scoop
39	7C122	Snap ring

40	7R141	Snap ring
41	7917	Snap ring



The constantly activated, automatic, all-wheel drive transfer case has no external controls. A two-piece aluminum case houses the assembly. The unit is chain driven. A non-repairable viscous coupling provides torque distribution to the front and rear transfer case outputs. The viscous coupling contains slotted alternating plates through which a high viscosity fluid flows. The resistance of the fluid shear causes the plates to transmit torque at the approximate ratio of 35 percent to the front output and 65 percent to the rear output.

Operation

Torque flows through the input shaft to the front planetary gear assembly outward to the ring gear to the upper output shaft. Torque also flows through the front planetary gear assembly to the overdrive sun gear outward to the upper drive sprocket. The torque flow continues from the upper drive sprocket through the drive chain to the lower drive sprocket to the front output shaft. The viscous coupling provides the connection between the ring gear and the overdrive sun gear.

Transfer Case

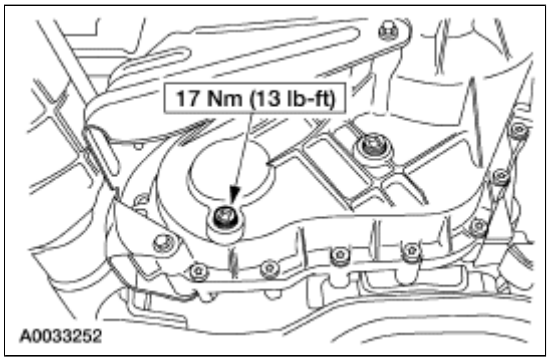
Refer to Section 308-07A .

Transfer Case Draining and Filling

Material

Item	Specification
Motorcraft MERCON® Multi-Purpose (ATF) Transmission Fluid XT-2-QDX	MERCON®

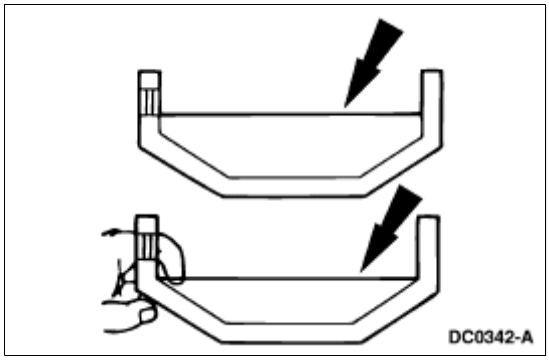
1. Remove the drain plug and drain the fluid.
   - Clean and install the drain plug after fluid is drained.



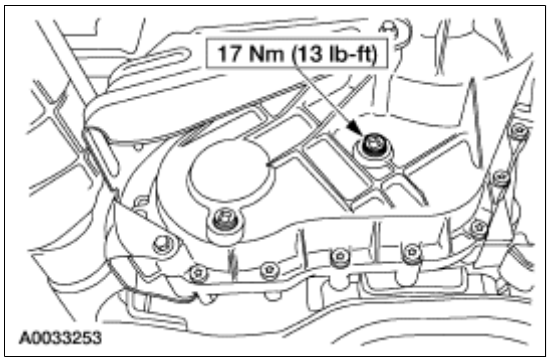
2. **CAUTION: Incorrect fluid fill can result in transfer case failure.**

   NOTE: Clean the area around the fill plug.

   Remove the fill plug, and fill the transfer case.
   - The fluid must be just below the fill plug hole. Because you can reach the fluid with a finger does not mean the fluid is at the correct level. Make sure the fluid is level with the filler opening for the correct fluid level.
   - The total transfer case fill capacity is 1.25 Liter (2.6 pints).

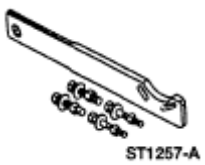
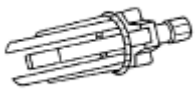


3. Install the fill plug.


17 Nm (13 lb-ft)
A0033253

Seal —Rear

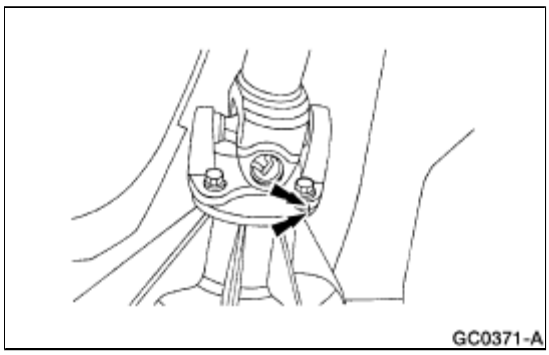
Special Tool(s)

 ST1257-A	Holding Fixture, Drive Pinion Flange 205-126 (T78P-4851-A)
 ST1185-A	Slide Hammer 100-001 (T50T-100-A)
 ST2305-A	Installer, Input Shaft Oil Seal 308-186 (T90T-7172-B)
 ST1213-A	Remover, Bushing 307-001 (TOOL-1175-AC) or Equivalent

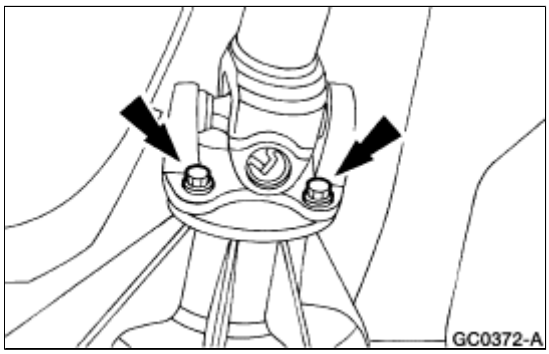
Removal

1. With the transmission in NEUTRAL, raise and support the vehicle. For additional information, refer to Section 100-02 .

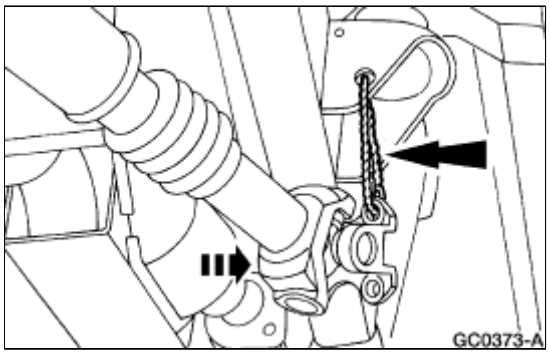
2. Index-mark the rear output flange and the driveshaft yoke.


GC0371-A

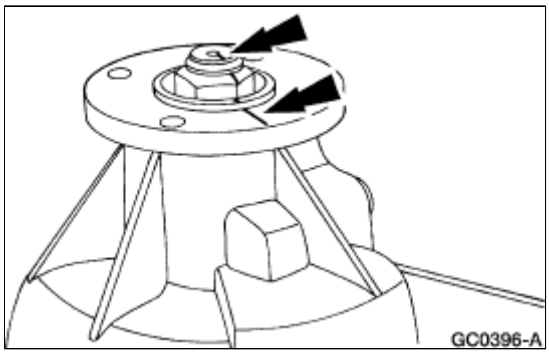
3. Remove the four bolts.



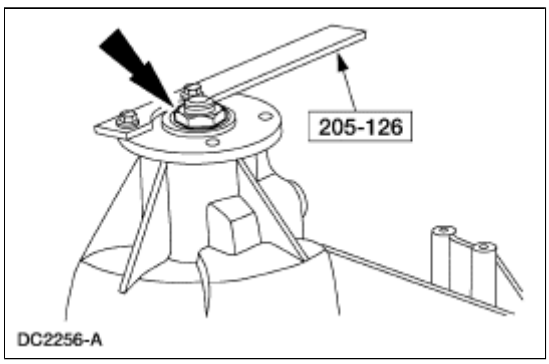
4. Separate the driveshaft from the output flange, and position the driveshaft aside.



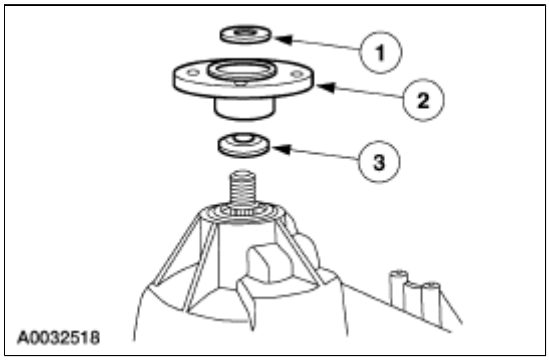
5. Index-mark the rear output flange and the upper output shaft.



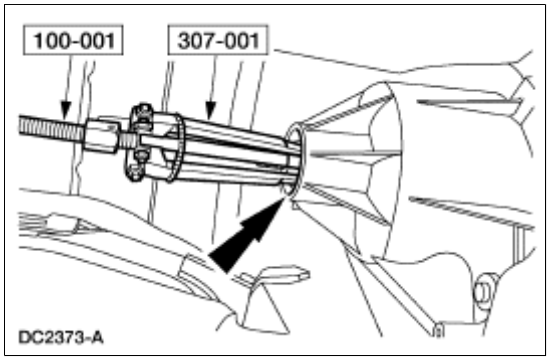
6. Use the special tool to hold the output flange while removing the nut.



7. Remove the rear output flange.
    1. Remove the output shaft yoke washer.
    2. Remove the rear output flange.
    3. Remove the oil seal.

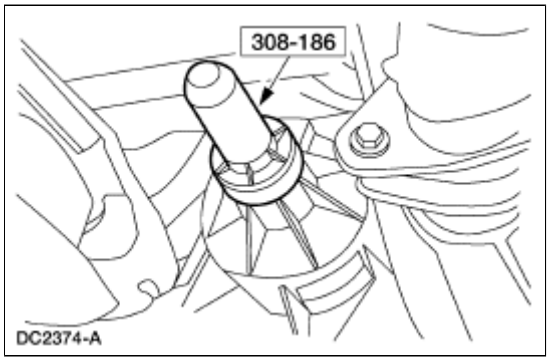


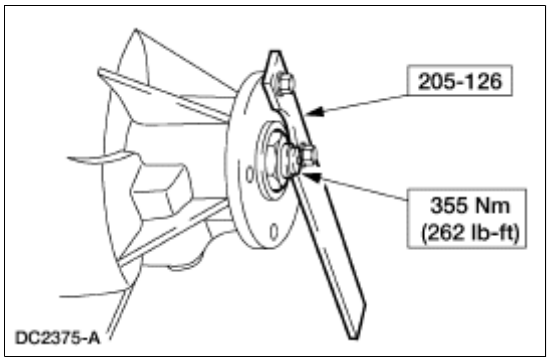
8. Using the special tools, remove the yoke to flange seal.



Installation

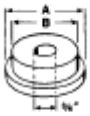
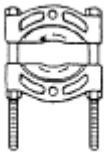
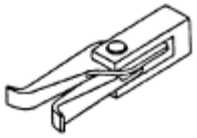
1. To install, reverse the removal procedure.
    - Use the special tool to install the yoke to flange seal.
    - Refer to Section 205-01 for driveshaft fastener tightening specifications.
    - Check, and if necessary, fill the transfer case to the specified level with the specified fluid. For additional information, refer to Transfer Case Draining and Filling in the General Procedures portion of this section.

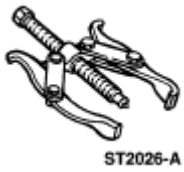



205-126
355 Nm
(262 lb-ft)
DC2375-A

Transfer Case

Special Tool(s)

 ST1200-A	Remover, Bearing Cup 308-047 (T77F-1102-A)
 ST1471-A	Installer, Wheel Hub Bearing Cup 204-020 (T73T-1202-A)
 ST1368-A	Puller, Bearing 205-D064 (D84L-1123-A)
 ST1362-A	Remover, Stator Bearing 307-318 (T94P-77001-KH)
 ST1257-A	Holding Fixture, Drive Pinion Flange 205-126 (T78P-4851-A)
 ST1255-A	Adapter for 303-224 (Handle) 205-153 (T80T-4000-W)
 ST1186-A	Holding Fixture, Transmission 307-003 (T57L-500-B)

 ST1351-A	Slide Hammer 100-001 (T50T-100-A)
 ST2026-A	2 Jaw Puller 205-D026 (D80L-1002-L) or equivalent
 ST2305-A	Installer, Input Shaft Oil Seal 308-186 (T90T-7127-B)

Material

Item	Specification
Silicone Gasket and Sealant F7AZ-19554-EA or equivalent	WSE-M4G323-A4
Multi-Purpose ATF XT2-QDX	Mercon®

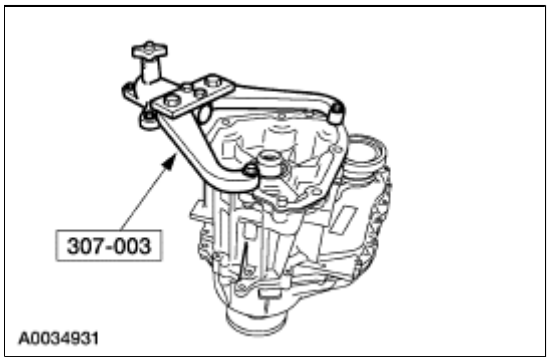
Disassembly

1. **CAUTION: Discard all seals after removing them.**

   Remove the transfer case from the vehicle. For additional information, refer to Transfer Case in this section.

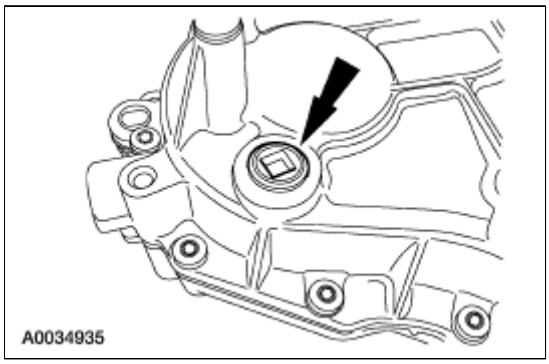
2. **WARNING: Make sure the Holding Fixture lock pin is secure.**

   Using the special tool, secure the transfer case to a bench.

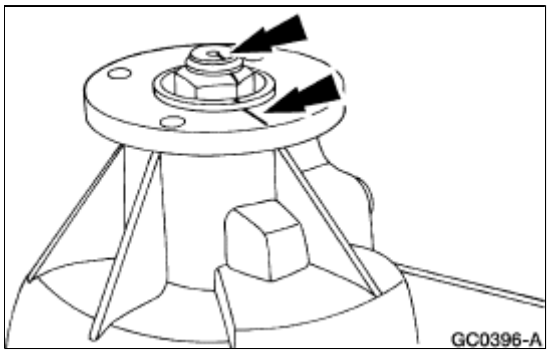


3. Remove the dampener.

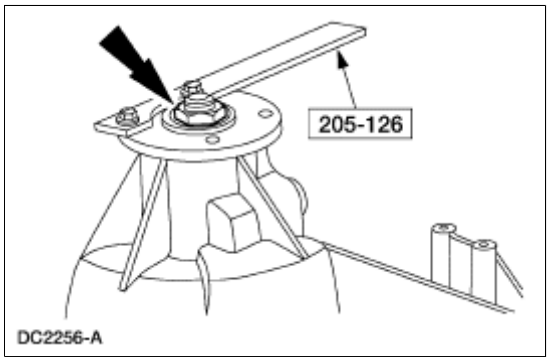
4. If not done previously, remove the drain plug and drain the fluid.
    - Install the drain plug when finished draining.



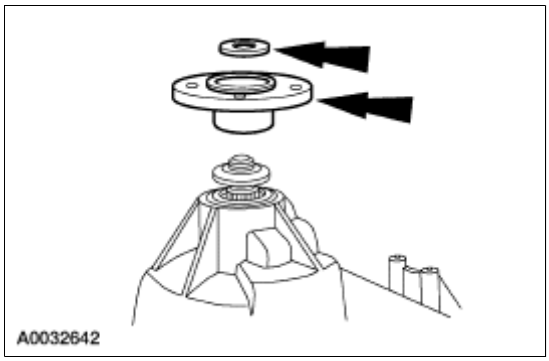
5. Index-mark the rear output flange and the upper output shaft.



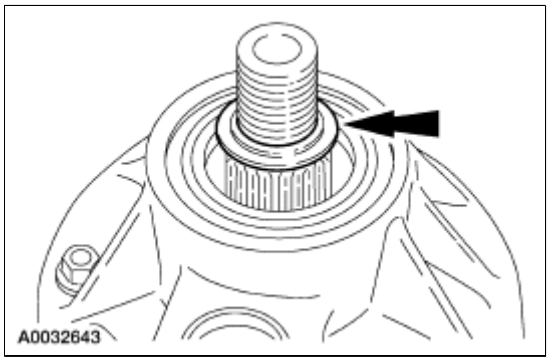
6. Using the special tool to hold the output flange, remove the nut.



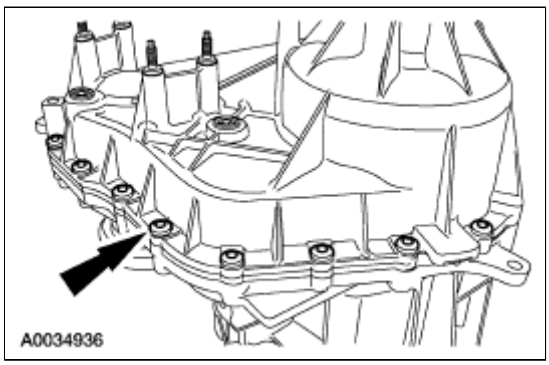
7. Remove the output flange and the output shaft yoke washer.



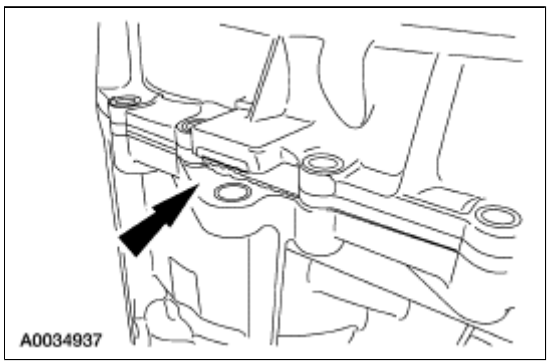
8. Remove the oil seal.

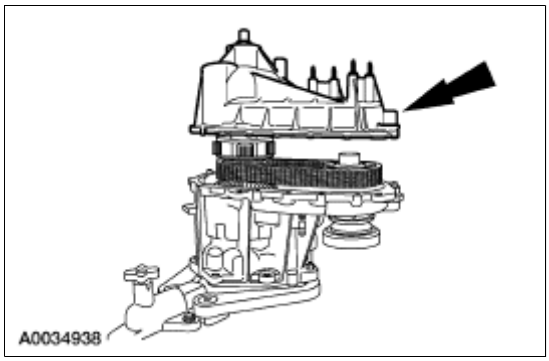


9. Remove the 17 bolts.



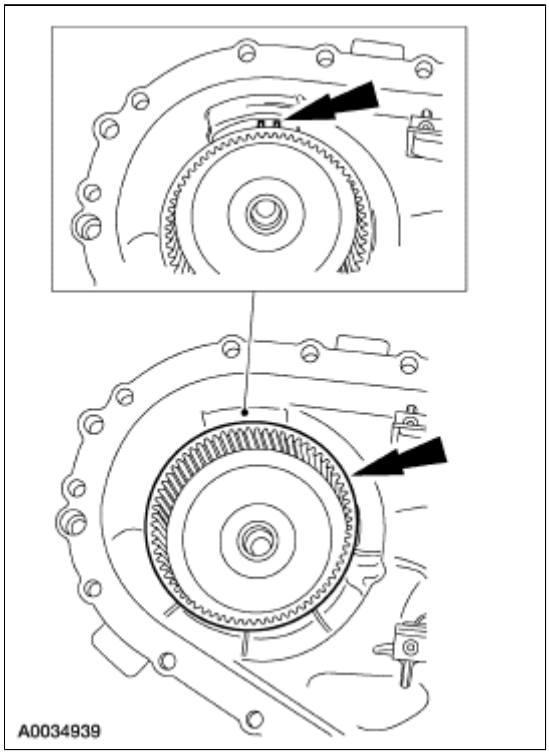
10. Using a pry bar, separate the rear case from the front case.
    - Pry only at the transfer case pry bosses.



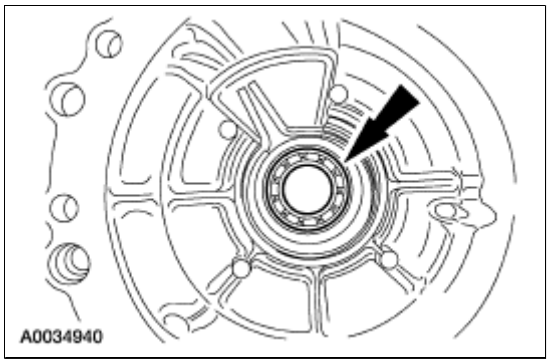


11. **CAUTION: Do not remove the needle bearing from the upper output shaft.**

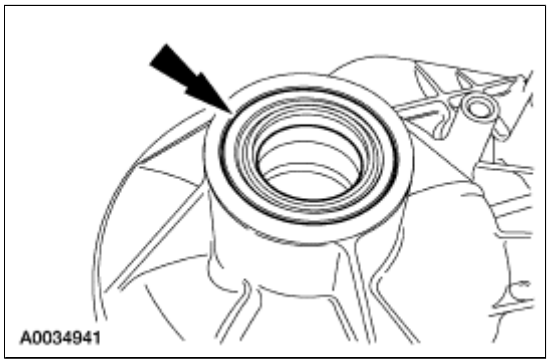
    Remove the upper output shaft and the ring gear.
    - Expand the snap ring.



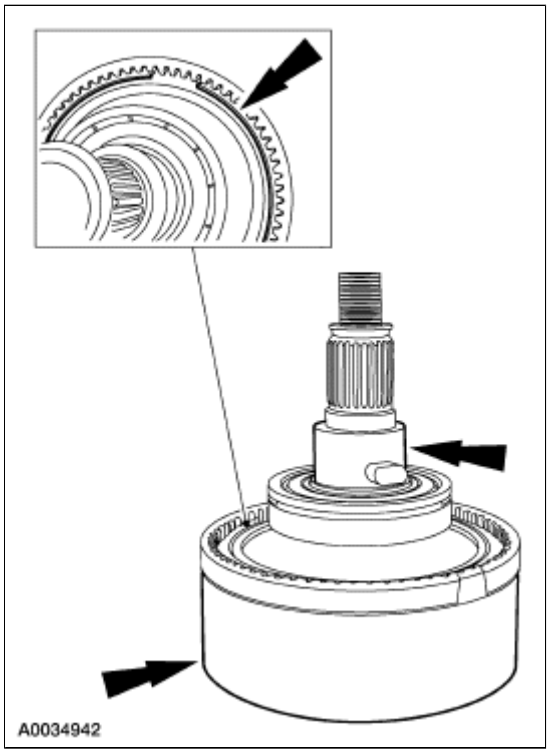
12. Remove the bearing.



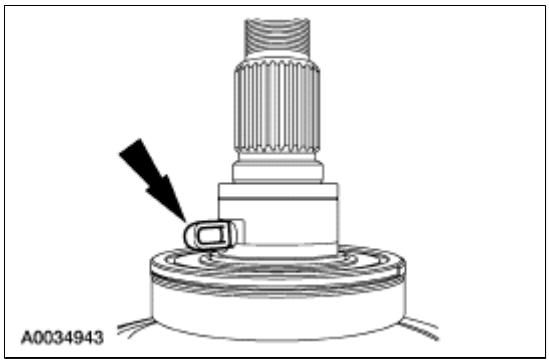
13. Remove the seal.



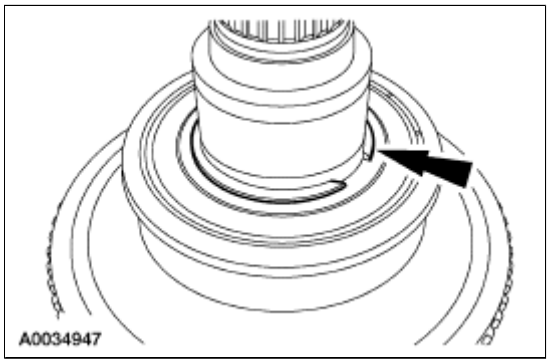
14. Remove the snap ring, then separate the upper output shaft from the ring gear.



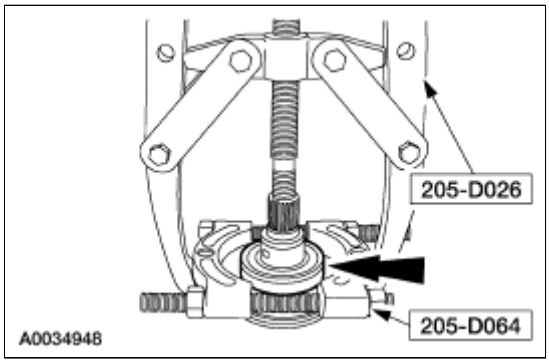
15. Remove the oil scoop.
    - Using a screwdriver, carefully pry the oil scoop out.



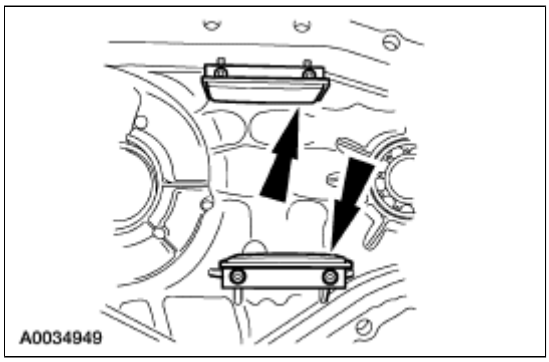
16. Remove the snap ring retaining the bearing on the upper output shaft.



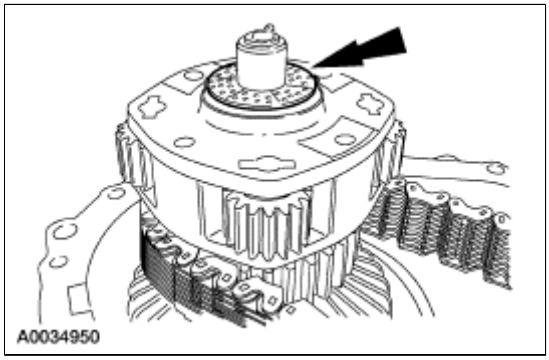
17. Using the special tools, remove the bearing.



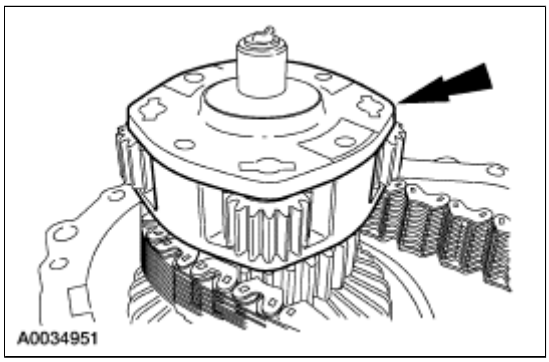
18. Remove the damper snubber.



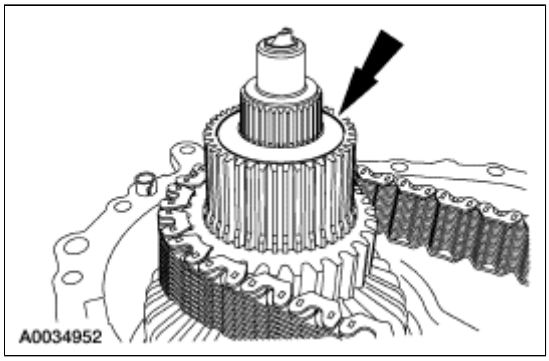
19. Remove the output shaft thrust washer.



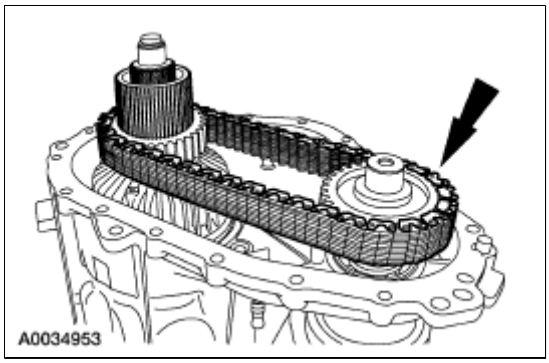
20. Remove the front planetary gear assembly.



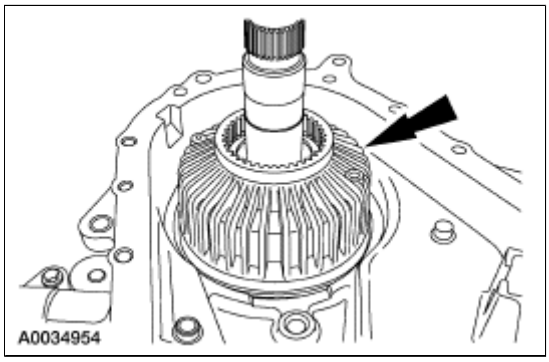
21. Remove the thrust washer.



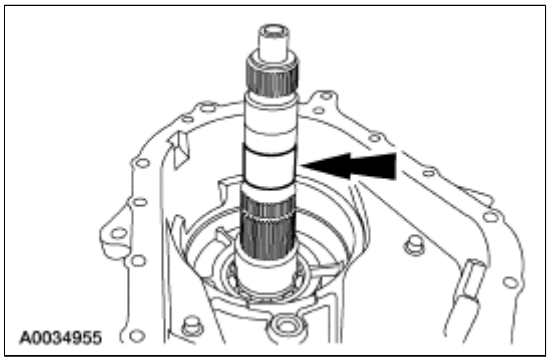
22. Remove the overdrive sun gear, the upper drive sprocket, the drive chain, and the lower drive sprocket.



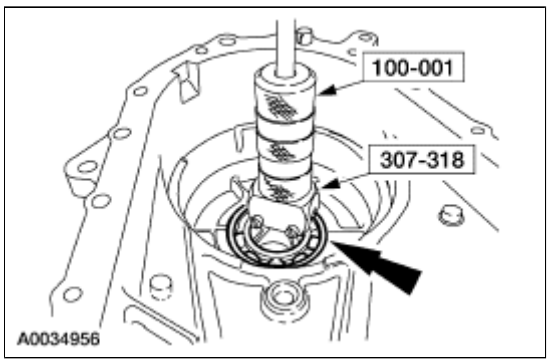
23. Remove the viscous coupling.



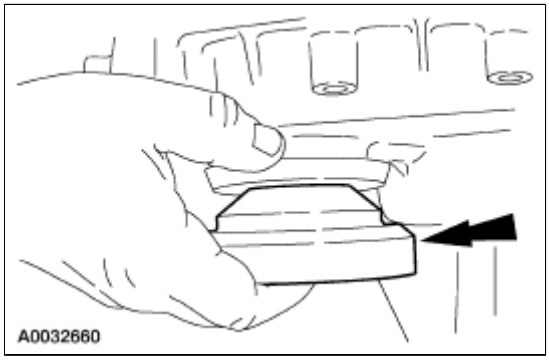
24. Remove the input shaft.

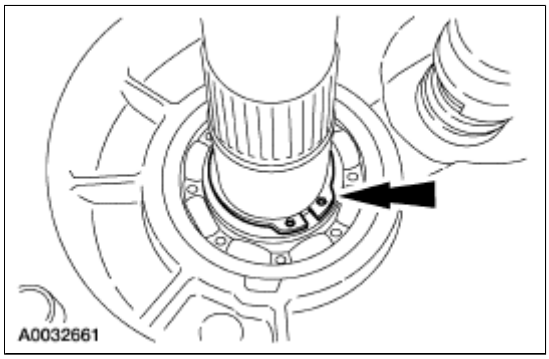


25. Using the special tools, remove the bearing.

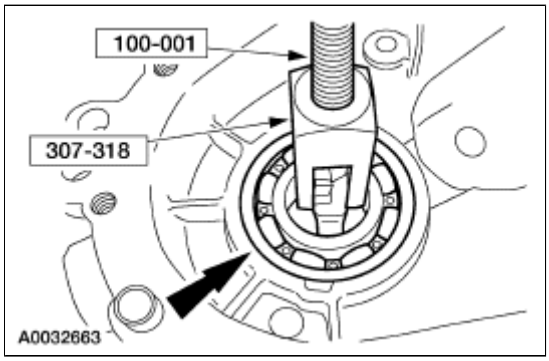


26. Holding the front output shaft, remove the snap ring and the front output shaft.



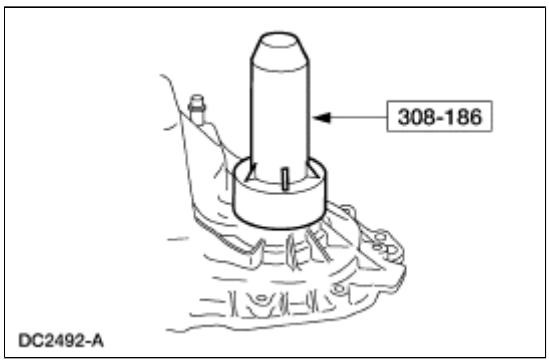


27. Using the special tools, remove the bearing, then remove the seal.

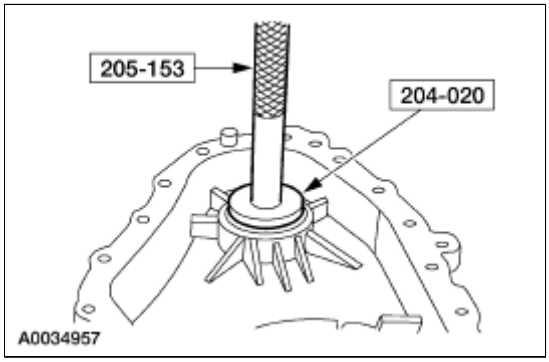


Assembly

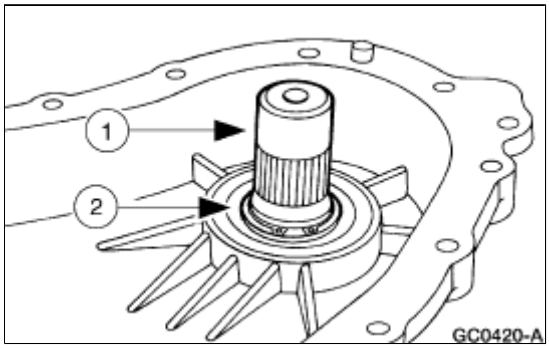
1. Using the special tool, install the seal.



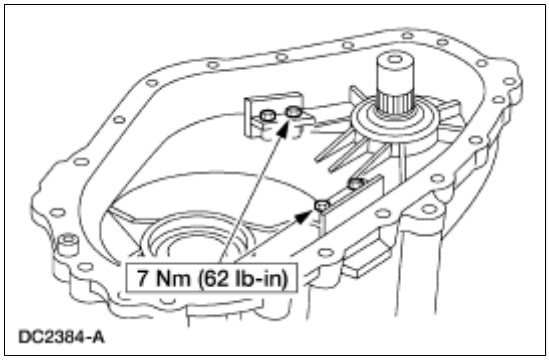
2. Using the special tools, install the bearing.



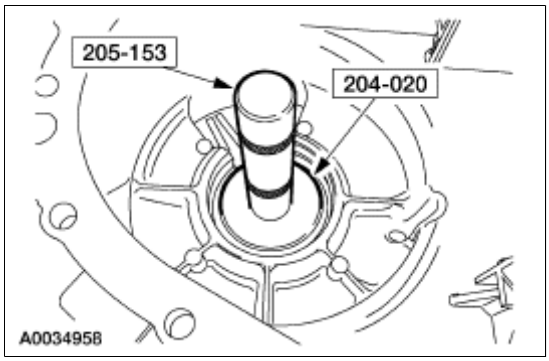
3. Install the front output shaft.
    1. Install the front output shaft.
    2. Install the snap ring.



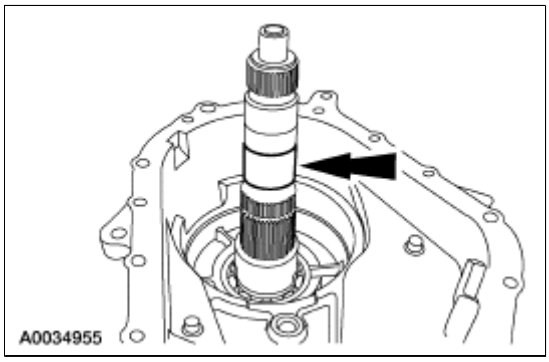
4. Install the damper snubbers.



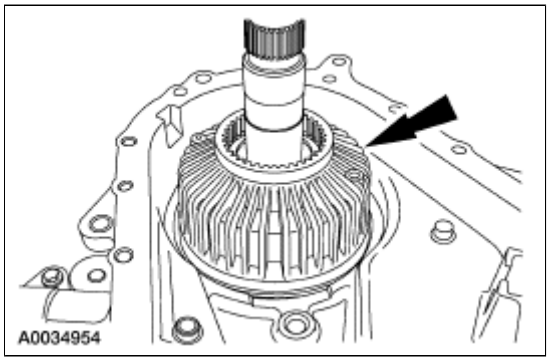
5. Using the special tools, install the bearing.



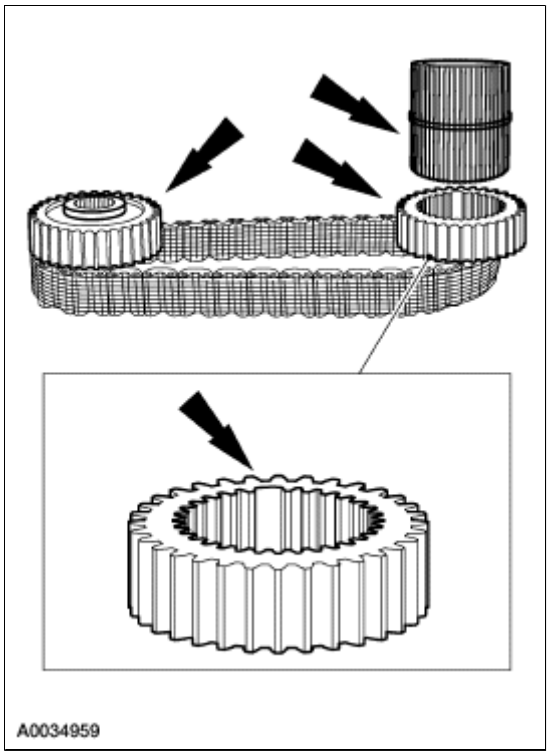
6. Install the input shaft.



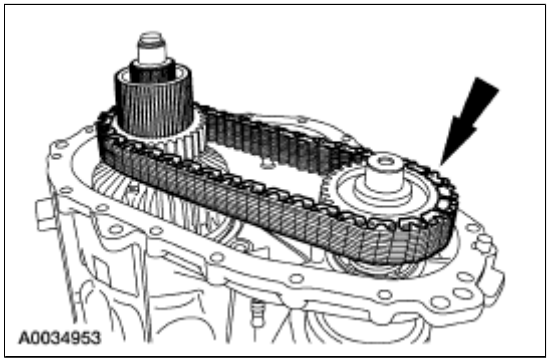
7. Install the viscous coupling.



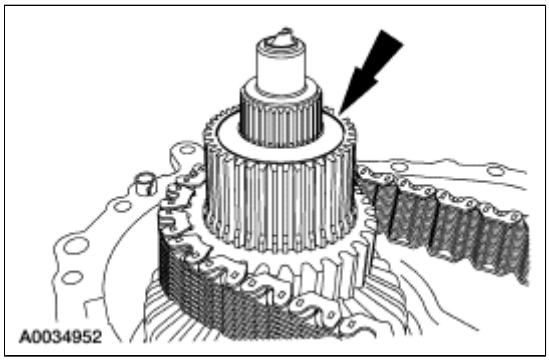
8. Assemble the overdrive sun gear, the upper drive sprocket, lower drive sprocket and the drive chain.
    - Align the blind spline on the lower drive sprocket with the narrow spline on the overdrive sun gear.



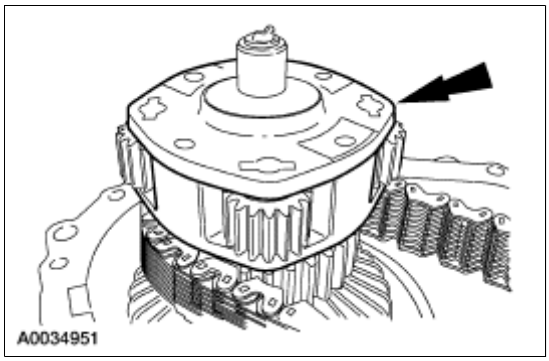
9. Install the overdrive sun gear, the upper and lower drive sprockets and the drive chain.



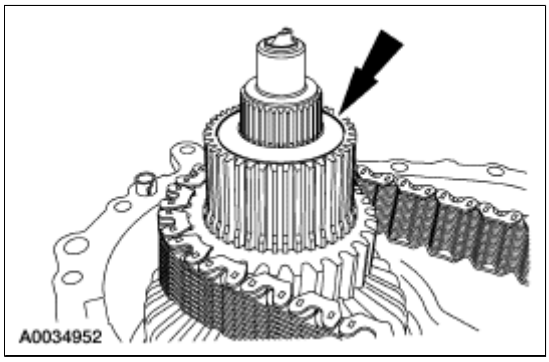
10. Install the thrust washer.



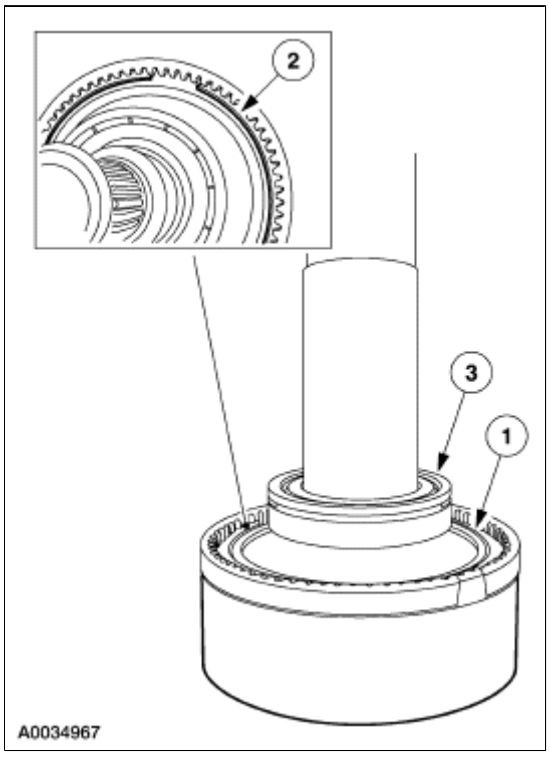
11. Install the front planetary gear assembly.



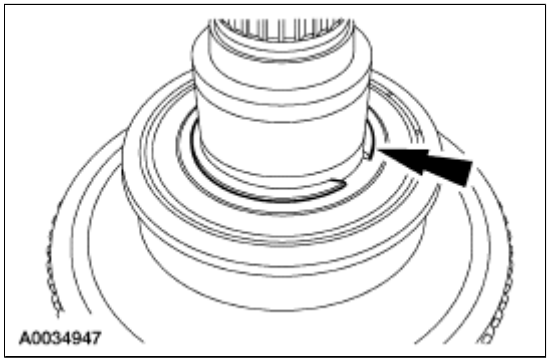
12. Install the thrust washer.



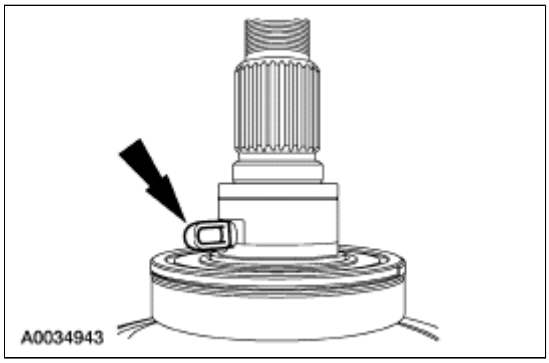
13. Assemble the upper output shaft and the ring gear.
    1. Install the output shaft.
    2. Install the snap ring.
    3. Press on the bearing.



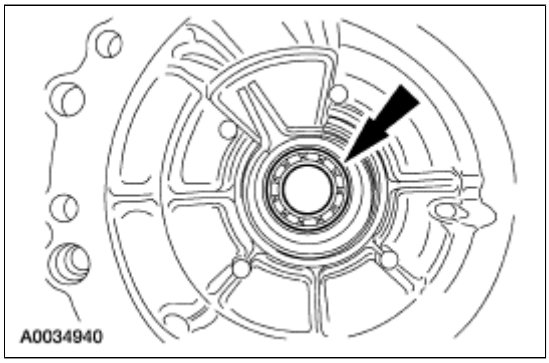
14. Install the snap ring.



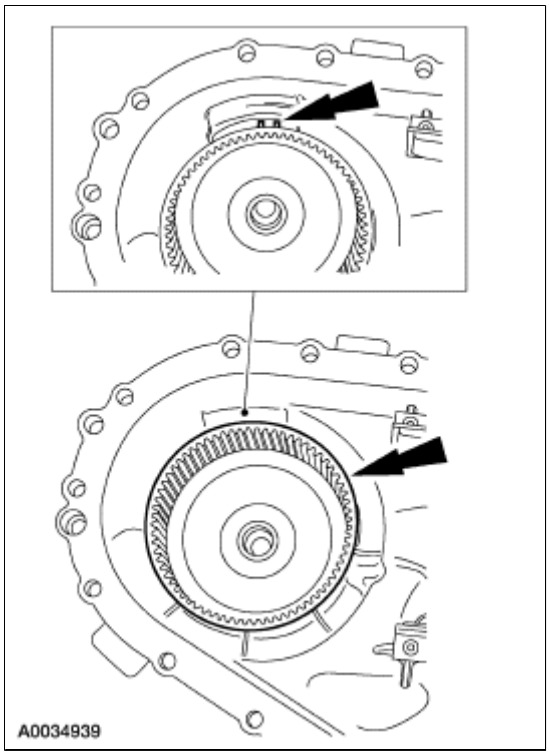
15. Install the oil scoop.



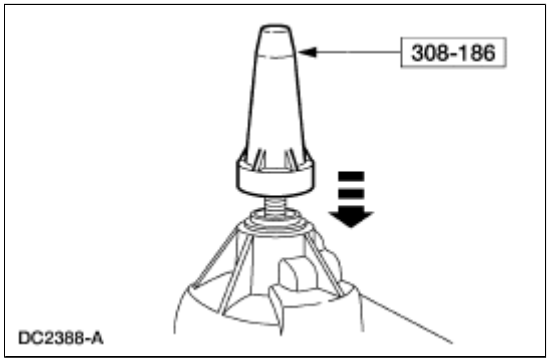
16. Install the bearing.



17. Install the upper output shaft and ring gear in the rear case half.
    - Expand the snap ring. Install the upper output shaft and the ring gear.
    - Release the snap ring.

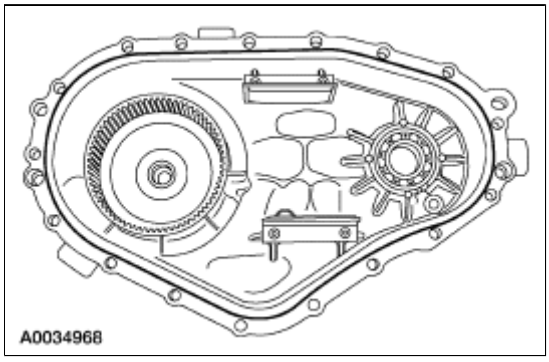


18. Using the special tool, install the yoke to flange seal.

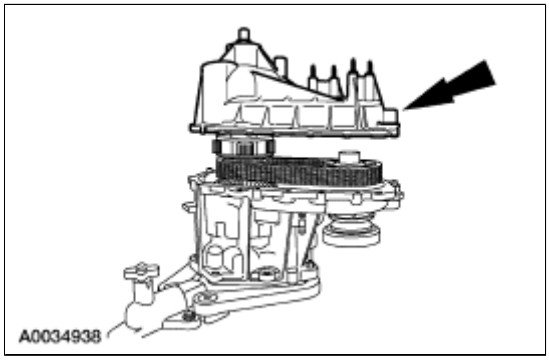


19. **CAUTION: Applying excess silicone rubber can damage the internal components.**

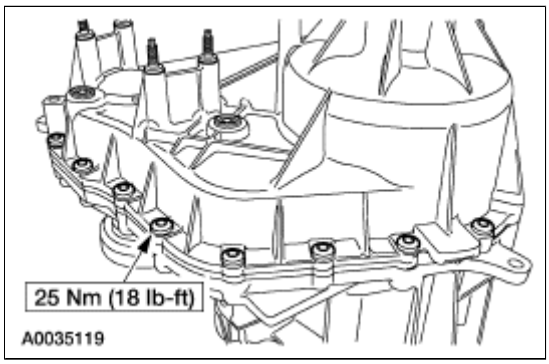
Apply a 3 mm (0.125 in) bead of silicone rubber on the rear case mating surface.



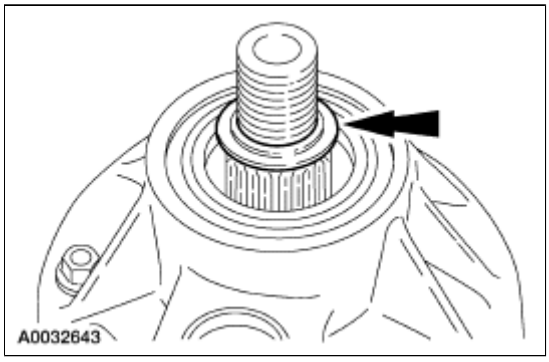
20. Assemble the front and rear case halves.



21. Install the 17 bolts.

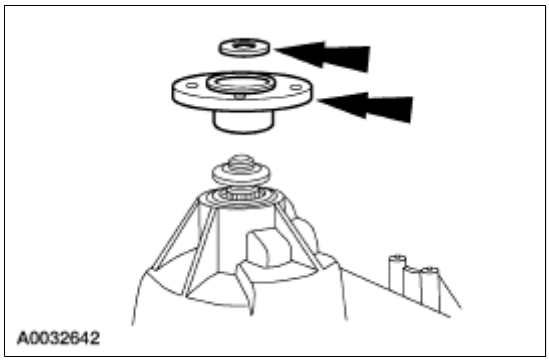


22. Install the oil seal.

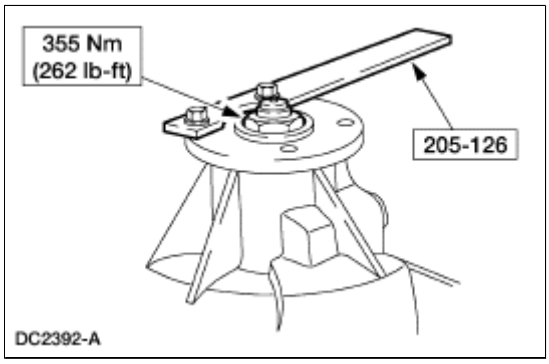


23. **NOTE:** Align the index marks made during disassembly.

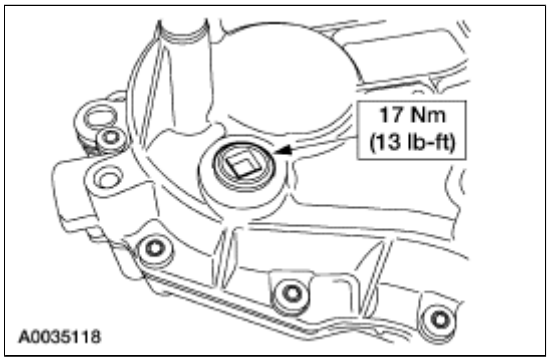
    Install the output flange and the output shaft yoke washer.



24. Install the nut. While holding the flange with the special tool, tighten the nut.

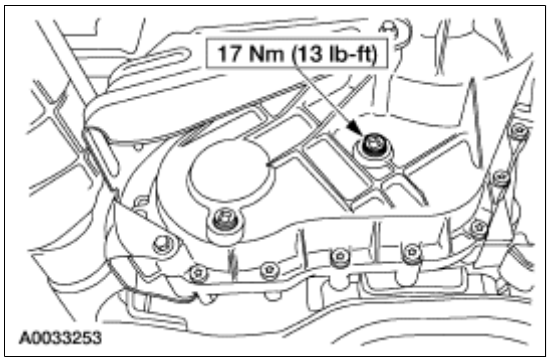


25. Tighten the drain plug.



26. Remove the fill plug, fill the transfer case with the specified fluid to the bottom of the fill hole.

27. Install the fill plug.



28. Install the damper.

Transfer Case

1. With the vehicle in NEUTRAL, raise and support the vehicle. For additional information, refer to Section 100-02 .

2. **CAUTION: Index-mark the front axle pinion flange and the front driveshaft, and the front output shaft and the front driveshaft constant velocity joint.**

   CAUTION: Always disconnect the front driveshaft from the transfer case first. Otherwise, the weight of the driveshaft can pinch the boot between the shaft and the boot can and cause the boot to tear.

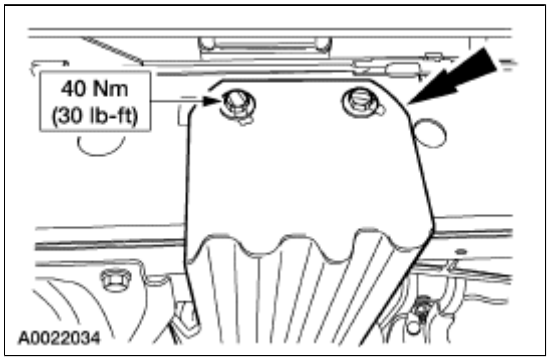
   CAUTION: Tape the bearing cups to prevent them from falling off the spider.

   Remove the front driveshaft. For additional information, refer to Section 205-01 .

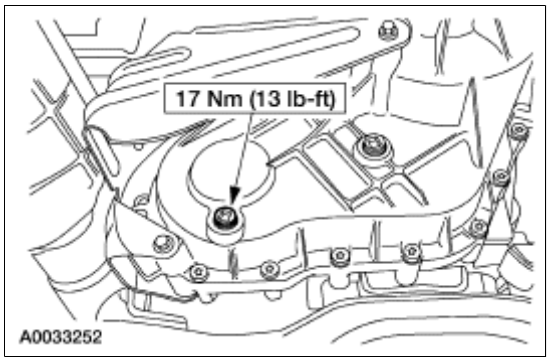
3. **CAUTION: Index-mark the front flange on the rear driveshaft and the flange on the transfer case, and the rear flange on the driveshaft and the rear axle pinion flange.**

   Remove the rear driveshaft. For additional information, refer to Section 205-01 .

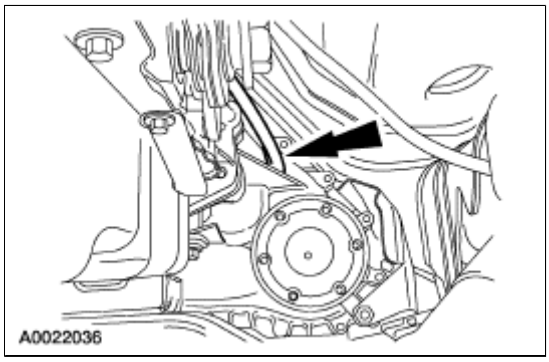
4. Remove the four bolts and the skid plate.



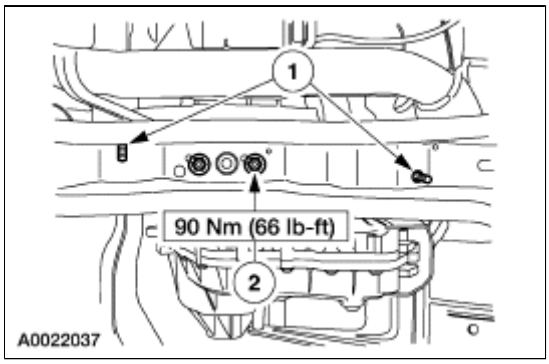
5. If transfer case disassembly is necessary, remove the drain plug and drain the fluid.
   - Install the drain plug when all of the fluid has drained.



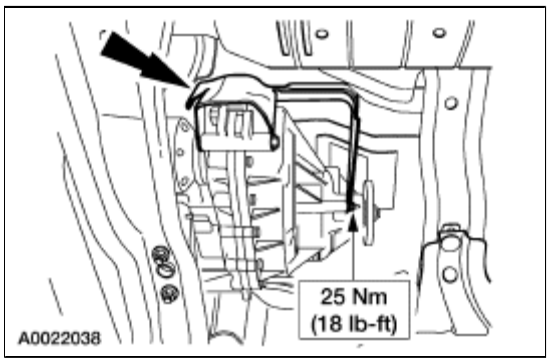
6. Disconnect the hose from the vent.



7. Carry out the following:
    1. Remove the two bolts retaining the heat shield to the crossmember.
    2. Loosen, but do not remove, the two nuts retaining the transmission mount to the crossmember.

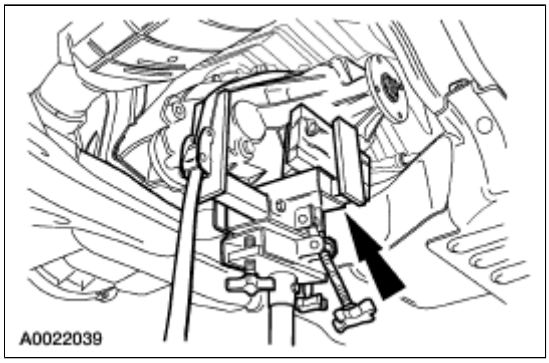


8. Remove the three bolts and the heat shield.

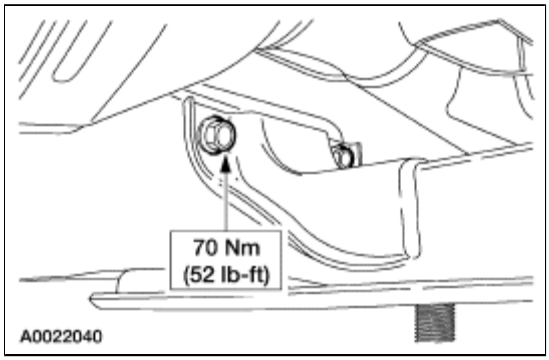


9. **WARNING: Secure the transfer case to the jack with a safety strap. Failure to follow these instructions may result in personal injury.**

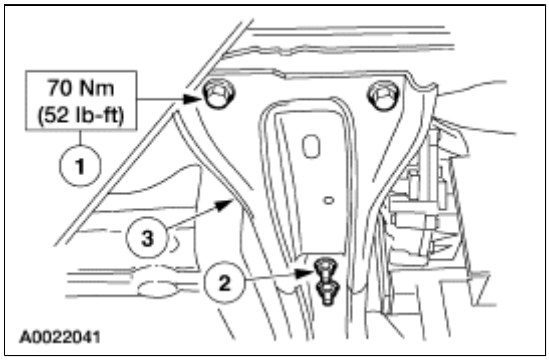
   Position a high lift jack under the transfer case.



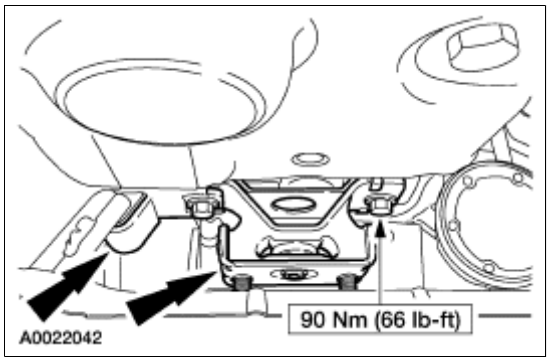
10. Remove the four upper nuts and bolts retaining the crossmember to the frame.



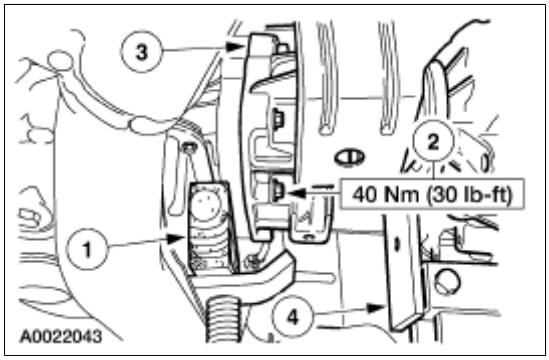
11. Carry out the following:
    1. Remove the two lower bolts retaining the crossmember to the frame.
    2. Remove the two nuts retaining the transmission mount to the crossmember.
    3. Remove the crossmember.



12. Remove the two bolts, the transmission mount, and the exhaust hanger.



13. Carry out the following:
    1. Support the transmission.
    2. Remove the seven bolts retaining the transfer case to the transmission.
    3. Separate the transfer case from the extension housing and the output shaft.
    4. Lower the transfer case from the vehicle.



14. Remove and discard the gasket, and clean the mating surfaces.

Transfer Case

Installation

1. To install, reverse the removal procedure.
    - Install a new gasket on the transfer case.
    - Watch for obstructions when installing the transfer case in the vehicle.
    - Install the original transfer case to transmission bolts. If new bolts are required, be sure to install only the specific Ford transfer case to transmission bolts.
    - Refer to Section 205-01 for driveshaft installation.
    - Fill the transfer case, as necessary, with the correct type and quantity of fluid. For additional information, refer to Transfer Case Draining and Filling in this section.