Refer to **REMOTE KEYLESS ENTRY AND ALARM** for schematic and connector information.

**Normal Operation**

The hood switch is a normally closed switch with the hood in the closed position. The Smart Junction Box (SJB) receives the hood switch status through circuit CPL25 "(hood switch sense)". The hood switch ground is through circuit GD120. When the hood is opened, the hood switch opens, removing the ground to the **SJB** .

- DTC B1520 (Hood Switch Circuit Open) - an on-demand DTC that sets when there is an open in the circuit between the hood switch and the **SJB** , an open in the ground circuit to the hood switch, or the hood switch is stuck open.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Hood switch
- Door ajar switch(es)
- Liftgate ajar switch
- Liftgate glass ajar switch
- **SJB**

**PINPOINT TEST B: THE ALARM SYSTEM DOES NOT OPERATE CORRECTLY - ALARM DOES NOT ACTIVATE WITH HOOD, DOOR(S), LIFTGATE OR LIFTGATE GLASS AJAR/OPEN**

**NOTE: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

**NOTE: Failure to disconnect the battery will result in false resistance readings. Refer to Battery Disconnect .**

**B1 CHECK THE AJAR SWITCHES INTEGRITY**

- Observe the interior lamps while opening and closing all of the doors, liftgate and the liftgate glass.

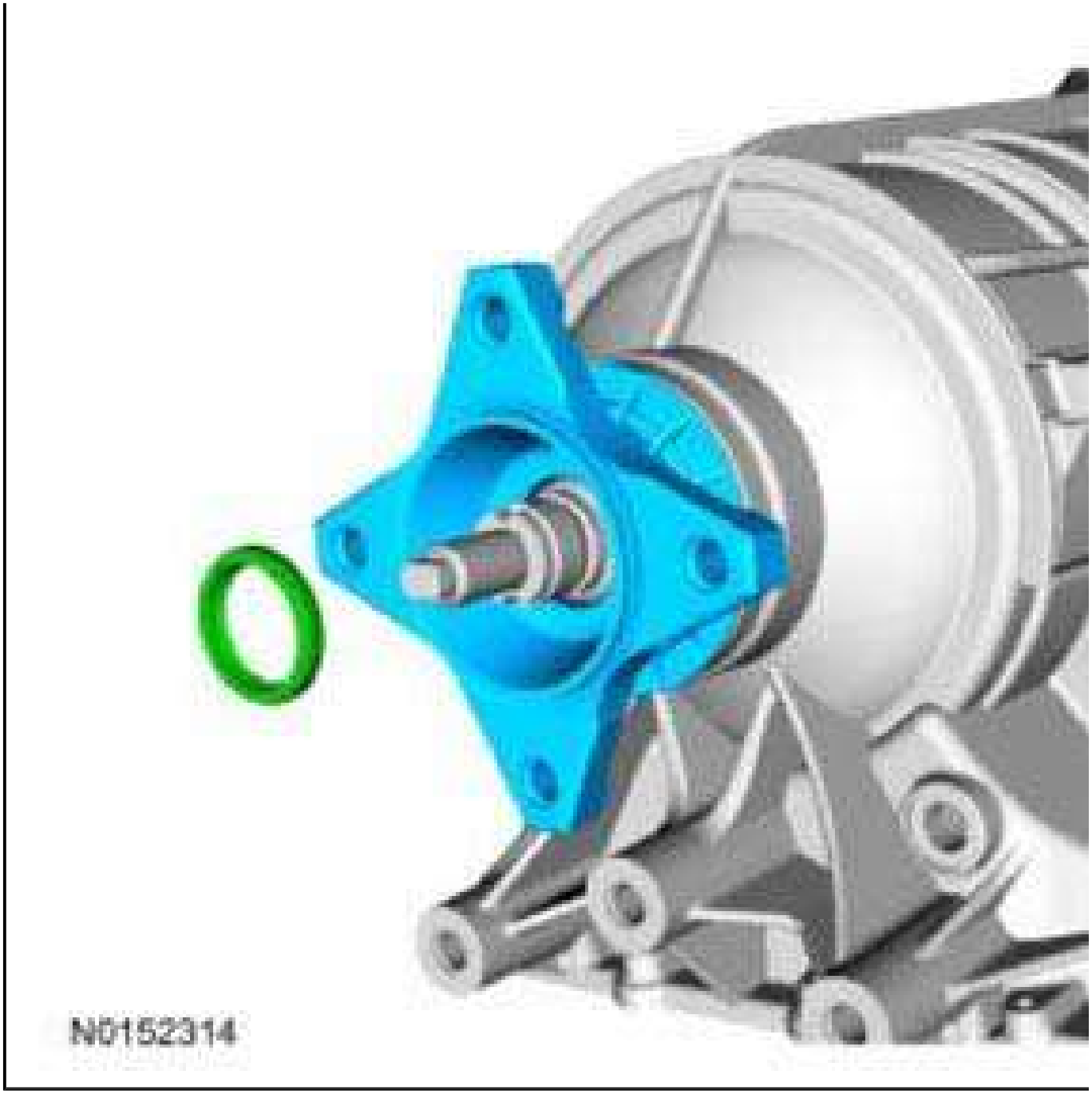
**Do the interior lamps operate correctly?**

**Yes** : GO to **B2** .

**No** : REFER to **Interior Lighting** .

**B2 CHECK THE HOOD SWITCH CIRCUITRY**

- Ignition OFF.
- Disconnect: **SJB C2280F** .
- With the hood closed, measure the resistance between the **SJB C2280F-10** , circuit CPL25 (BU/OG), harness side and ground.




9. Remove and discard the output shaft seal.


12. **NOTE: Note the color, size and location while removing for correct assembly.**

Remove and discard the 3 center support feed tube seals.

1. Center support feed tube seal (7G199 Black)
2. Center support feed tube seal (7G087 Green)
3. Center support feed tube seal (7G084 Blue)

| | | |
|---|---|---|
| 84 | 7B220 | Center support keys (2 required) |
| 85 | 7G199 | Center support feed tube seal (black) |
| 86 | 7G087 | Center support feed tube seal (green) |
| 87 | 7G084 | Center support feed tube seal (blue) |
| 88 | 7G033 | Center support assembly |
| 89 | 7D404 | Low/reverse clutch piston center seal |
| 90 | 7D403 | Low/reverse clutch piston outer seal |
| 91 | 7A262 | Low/reverse clutch piston |
| 92 | 7B070 | Low/reverse clutch piston return spring |
| 93 | 7H318 | Low/reverse clutch piston retainer |
| 94 | 7D483 | Retainer transmission-snap ring |
| 95 | 7E085 | Clutch disc cushion plate |
| 96 | 7B442 | Low/reverse clutch steel plates (externally splined) |
| 97 | 7B164 | Low/reverse clutch friction plates (internally splined) |
| 98 | 7B066 | Low/reverse clutch pressure plate (select fit) |
| 99 | 7A089 | OWC |
| 100 | 7F405 | Thrust gear shim (select fit) |
| 101 | 7C041 | Thrust bearing (T7) |
| 102 | 7D063 | Sun gear No. 2 |
| 103 | 7D235 | Thrust bearing outer race |
| 104 | 7D234 | Roller bearing (T8) |
| 105 | 7D063 | Sun gear No. 3 |
| 106 | 7D234 | Roller bearing (T9) |
| 107 | - | Roller bearing race (T9) |
| 108 | 7D006 | Rear planetary carrier assembly |
| 109 | - | Fluid collar rear planetary plate (part of 7D006) |
| 110 | 7A153 | Output shaft ring gear assembly |
| 111 | 7G178 | Thrust Bearing (T10) |
| 112 | 7060 | Output shaft park gear assembly |
| 113 | 7N194 | Output shaft retaining ring |
| 114 | 7B368 | Bearing (T11) |
| 115 | 7005 | Transmission case assembly (model dependent) |
| 116 | 7A010 | Transmission case fluid fill plug assembly |
| 117 | 7H398 | Transmission case fluid fill plug |
| 118 | 7A010 | Transmission case fluid fill seal |
| 119 | 7A010 | Transmission oil level indicator |
| 120 | 7034 | Transmission case vent assembly (model dependent) |
| 121 | 7A415 | Output shaft bearing assembly (**RWD** ) |
| 122 | 7A415 | Output shaft bearing assembly (4WD) |
| 123 | 7A433 | Washer (**RWD** ) |
| 124 | 7B368 | Thrust bearing (T12) (**RWD** ) |
| | | |

**NOTE:** **Clutch plate quantity is model dependent based on engine displacement. Refer to CLUTCH PLATE QUANTITY CHART in the Specifications portion of this article.**

**All vehicles**

1. Install the park detent spring and the 2 bolts.
    - Tighten to 12 Nm (106 lb-in).


2. Position the park pawl and spring into the case and install the park pawl pin.
    1. Park pawl
    2. Park pawl return spring
    3. Park pawl pin

| | | | | |
|---|---|---|---|---|
| Mild Steel, Bake Hardened, Solid Solution Strengthened | Low | Fully annealed/dead soft | Body panels (closures, floor pan, dash panel) | - |
| High-Strength Low Alloy (HSLA) | Low | Fully annealed/dead soft | Rails, structural members | Strengthened with fine particles and small grain size |
| Dual Phase | Medium (Manganese Silicon, Molybdenum Chromium) | Fully annealed/partially hardened | Rails, structural members | 15-50% of structure is hard martensite |
| Ultra High Strength Steel (UHSS) (Martensitic, Boron) | Low | Fully hardened | Rocker reinforcements, door beams, bumper beams | 100% of structure is hard martensite |
| Transformation Induced Plasticity Steel | High (Manganese, Phosphorous, Silicon, Aluminum) | Fully annealed/partially hardened | To be determined | Complex microstructure for high strength and ductility |

**FORD RECOMMENDED STEEL REPAIRABILITY MATRIX**

| Grade | Trade Descriptions | Welding Method | | | Cold Repairs | Use of Heat for Repair | Temperature Range | Maximum Heat |
|---|---|---|---|---|---|---|---|---|
| | | Metal Inert Gas (MIG) | Squeeze-Type Resistance Spot Welding (STRW) | MIG Braze | | | | |
| Mild Steel | Mild | Yes | Yes | NA | Yes(1) | Yes | Up to 650°C (1, 200°F) | 90 sec. x 2 |
| Laminate Steel | Quiet Steel | No | Yes | No | Yes(1) | NA | NA | NA |
| Bake Hardened | BH 180, BH210, BH 250, BH 280 | Yes | Yes | Yes(2) | Yes(1) | Yes | Up to 650°C (1, 200°F) | 90 sec. x 2 |
| Solid Solution Strengthened | - | Yes | Yes | Yes(2) | Yes(1) | Yes | Up to 650°C (1, 200°F) | 90 sec. x 2 |
| High-Strength Low Alloy (HSLA) | HSLA 250, HSLA 350, HSLA 550 | Yes | Yes | Yes(2) | Yes(1) | Yes | Up to 650°C (1, 200°F) | 90 sec. x 2 |
| Dual Phase = 600 MPa Ultimate Tensile Strength | DP 500, DP 600 | Yes | Yes | Yes(2) | Yes(1) | No | NA | NA |
| | | | | | | | | |

- Ignition ON, engine OFF.
- Access the PCM and monitor the IAT2 (VOLT) PID.
- Observe the PID while disconnecting the IAT2 sensor.

**Is the voltage greater than 4.2 V?**

| Yes | No |
|---|---|
| GO to **DU9** . | GO to DU10. |

**DU9 SIMULATE THE LOW IAT2 SIGNAL TO THE PCM**

- Ignition OFF.
- IAT2 Sensor connector disconnected.
- Connect a 5 amp fused jumper wire between the following:

| Point A IAT2 Sensor Connector, Harness Side | Point B IAT2 Sensor Connector, Harness Side |
|---|---|
| IAT2 - Pin 1 | SIGRTN - Pin 2 |

- Ignition ON, engine OFF.
- Access the PCM and monitor the IAT2 (VOLT) PID.

**Is the voltage less than 0.2 V?**

| Yes | No |
|---|---|
| CONNECT the sensor and GO to **TYPICAL DIAGNOSTIC REFERENCE VALUES (SECTION 6)** . COMPARE the IAT2 PID to reference values under different road test conditions. If the sensor is not in range, INSTALL a new IAT2 sensor. REFER to the appropriate Electronic Engine Controls article.<br>Clear the PCM DTCs. REPEAT the self-test. | GO to **DU10** . |

**DU10 CHECK FOR CORRECT PCM OPERATION**

- Disconnect all the PCM connectors.
- Visually inspect for:
  - pushed out pins
  - corrosion
- Connect all the PCM connectors and make sure they seat correctly.
- Carry out the PCM self-test.
- Verify the concern is still present.

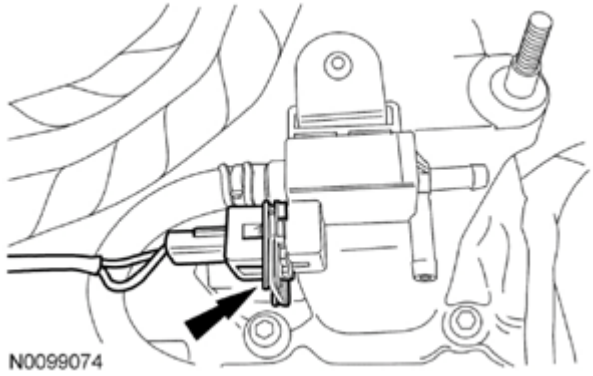



**Fig. 95: Locating Turbocharger Wastegate Regulating Valve Electrical Connector**
**Courtesy of FORD MOTOR CO.**

11. Connect the MAP/IAT2 sensor electrical connector.

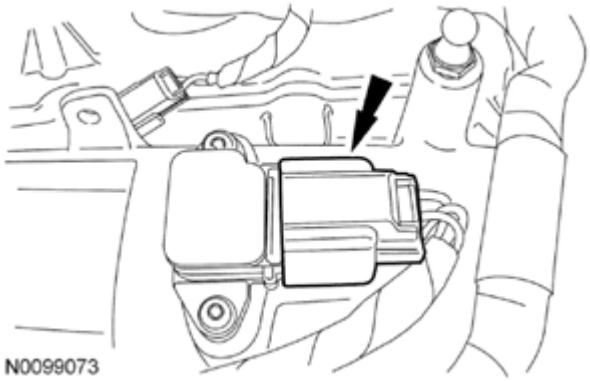



**Fig. 96: Locating Manifold Absolute Pressure (MAP)/Intake Air Temperature 2 (IAT2) Sensor Electrical Connector**
**Courtesy of FORD MOTOR CO.**

12. Connect and attach the 2 fuel injector wiring harness electrical connectors.

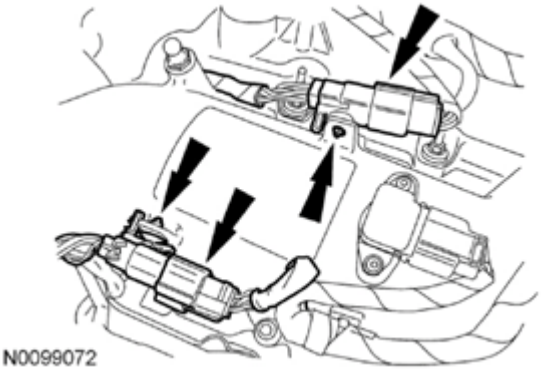
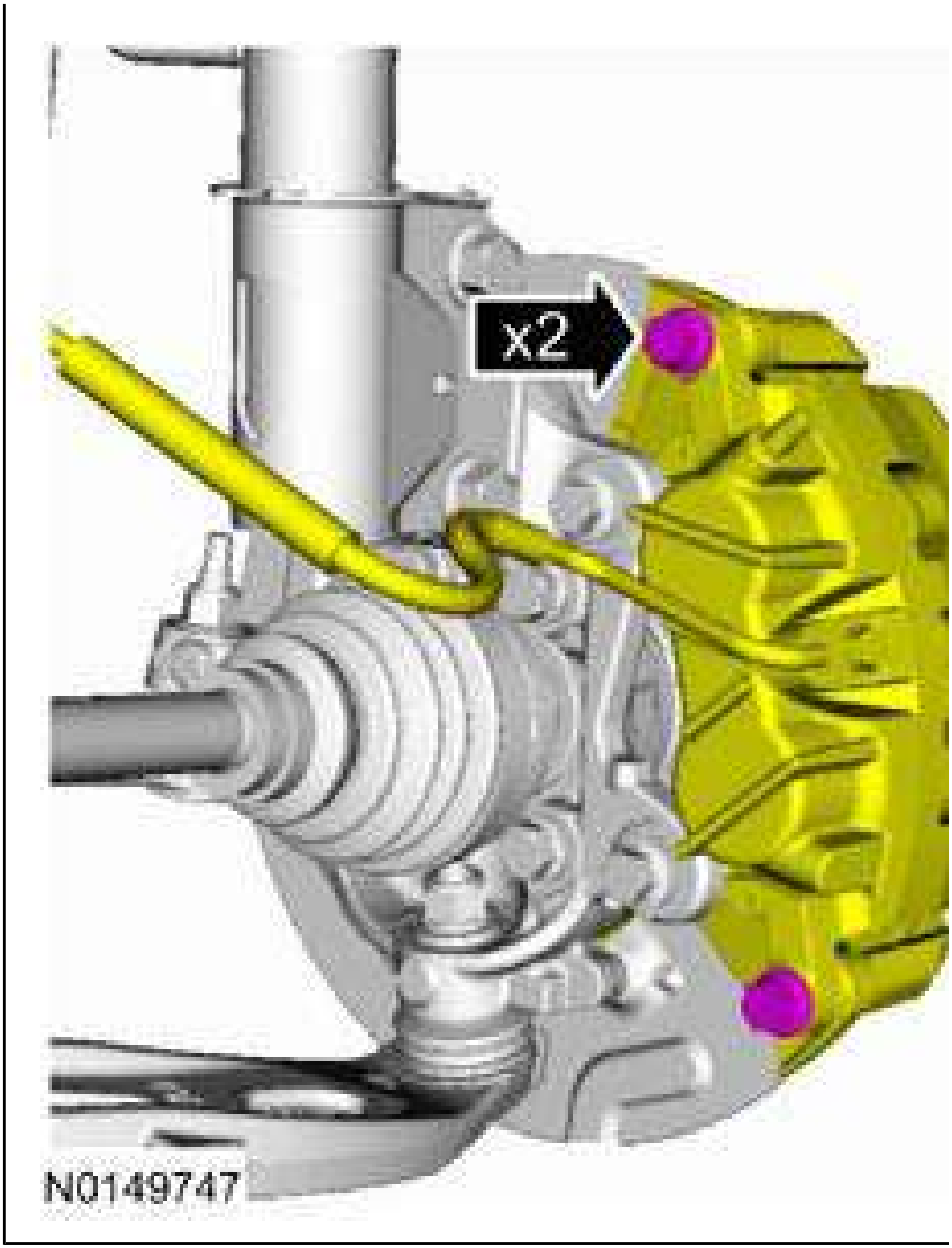
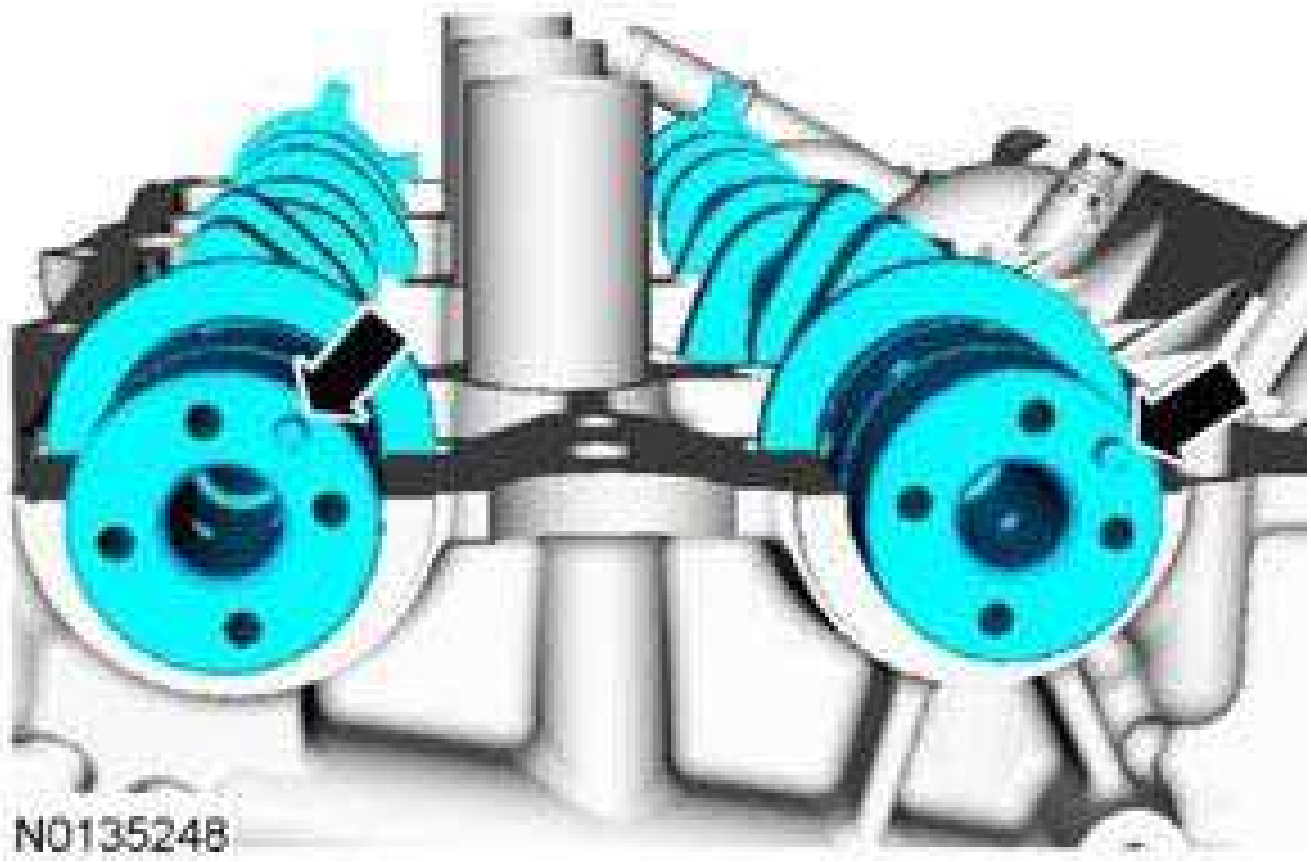



**Fig. 97: Locating Fuel Injector Wiring Harness Electrical Connectors**
**Courtesy of FORD MOTOR CO.**

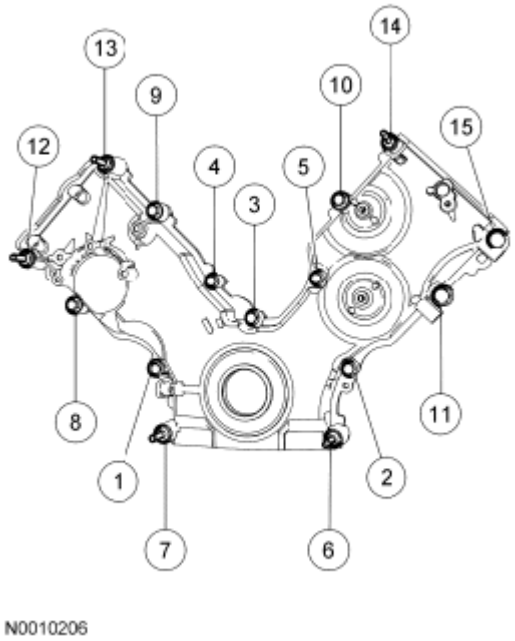

x2
N0149747




**NOTE:** **The crankshaft must remain in the freewheeling position (crankshaft dowel pin at 9 o'clock) until after the camshafts are installed and the valve clearance is checked/adjusted. Do not turn the crankshaft until instructed to do so. Failure to follow this process will result in severe engine damage.**

2. Rotate the crankshaft counterclockwise until the crankshaft dowel pin is in the 9 o'clock position.

| | | |
|---|---|---|
| 2 | N806177 | Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50 |
| 3 | N806177 | Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50 |
| 4 | N806177 | Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50 |
| 5 | N806177 | Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50 |
| 6 | N808529 | Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103 |
| 7 | N808529 | Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103 |
| 8 | N806177 | Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50 |
| 9 | N806177 | Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50 |
| 10 | N806177 | Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50 |
| 11 | N806177 | Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50 |
| 12 | W709573 | Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94 |
| 13 | W709573 | Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94 |
| 14 | W709573 | Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94 |
| 15 | W706605 | Bolt, Hex Head Pilot, M8 x 1.25 x 56 |




N0010206

**Fig. 67: Identifying Engine Front Cover Bolts Tightening Sequence**
**Courtesy of FORD MOTOR CO.**

4. Loosely install the 4 oil pan bolts, then tighten in 2 stages, in the sequence shown in the illustration.
    - Stage 1: Tighten to 20 Nm (177 lb-in).
    - Stage 2: Tighten an additional 60 degrees.

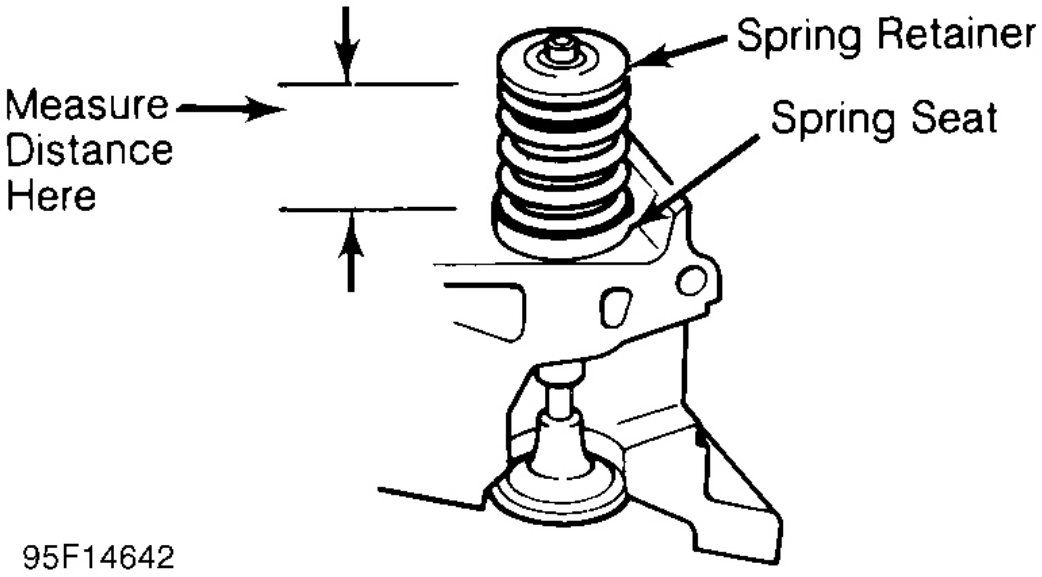



**Fig. 12: Measuring Valve Spring Installed Height**

**ROCKER ARMS & ASSEMBLIES**

**NOTE: Examples used in this article are general in nature and do not necessarily relate to a specific engine or system. Illustrations and procedures have been chosen to guide mechanic through engine overhaul process. Descriptions of processes of cleaning, inspection, assembly and machine shop practice are included.**

**Always refer to appropriate engine overhaul article, if available, in the ENGINES section for complete overhaul procedures and specifications for the vehicle being repaired.**

**Rocker Studs**

Rocker studs are either threaded or pressed in place. Threaded studs are removed by locking 2 nuts on the stud. Unscrew the stud by turning the jam nut. Coat new stud threads with Loctite and install. Tighten to specification.

Pressed-in stud can be removed using a stud puller. Ream stud bore to proper specification and press in a new oversize stud. Pressed-in studs are often replaced by cutting threads in the stud bore to accept a threaded stud.

**Rocker Arms & Shafts**

Mark rocker arms for location. Remove rocker arm retaining bolts. Remove rocker arms. Inspect rocker arms, shafts, bushings and pivot balls (if equipped) for excessive wear. Inspect rocker arms for wear in valve stem

includes other general powertrain system failures. For information about HS-CAN, refer to **MODULE COMMUNICATIONS NETWORK** .

**This pinpoint test is intended to diagnose the following:**

- IC
- 4WD system fault
- HS-CAN circuits
- TCCM

#### PINPOINT TEST V: THE 4X4 MODE INDICATORS DO NOT OPERATE CORRECTLY/DO NOT OPERATE

**V1 CHECK FOR TCCM DTCs**

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: Self-Test - TCCM.
- **Are DTCs present?**

  **Yes** : REFER to the **Transfer Case Control Module (TCCM) DTC Chart** in this service information for diagnosis.

  **No** : GO to V2.

**V2 CHECK FOR IC DTCs**

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: Self-Test - IC.
- **Are DTCs present?**

  **Yes** : REFER to **INSTRUMENTATION, MESSAGE CENTER, AND WARNING CHIMES** .

  **No** : GO to V3.

**V3 CHECK 4WD SYSTEM OPERATION**

- Test drive the vehicle and operate the 4WD system.
- **Does the 4WD system operate correctly?**

  **Yes** : REFER to **INSTRUMENTATION, MESSAGE CENTER, AND WARNING CHIMES** .

  **No** : GO to **SYMPTOM CHART - FOUR WHEEL DRIVE (4WD)**.

#### Pinpoint Test W: Vehicle Binds in a Turn/Resists Turning/Pulsates in a Straightline in 4WD Mode

##### Normal Operation

When the vehicle is operating in Four-Wheel Drive (4WD) (4H/4L modes), all 4 wheels receive the same amount of torque and rotate at the same speed. The amount of traction the vehicle can achieve depends on the amount of traction each tire can establish with the road surface. In order for the 4WD system to function correctly, each tire must be in good condition and the front and rear axle ratios must match.

**This pinpoint test is intended to diagnose the following:**

switch is hardwired to the **SJB** through the brake fluid level signal circuit and return circuit. When the parking brake is applied, the parking brake switch closes to ground through the ground circuit, providing a ground to the **SJB** and pulling the parking brake input circuit low. When a low brake fluid level condition exists, the low brake fluid level switch closes to ground, pulling the brake fluid level circuit low. The **SJB** monitors the parking brake and low brake fluid level inputs and sends the **IC** a message to turn on the brake warning indicator when the parking brake is applied or the brake fluid is low. When the ABS module detects a base brake system concern or other ABS related concerns that affect the **EBD** function, the ABS module sends a message to the **IC** to illuminate both the ABS warning indicator and the brake warning indicator.

**This pinpoint test is intended to diagnose the following:**

- Wiring, terminals or connectors
- Brake fluid level switch (part of the master cylinder)
- Brake fluid level switch
- **SJB**
- **IC**

**PINPOINT TEST O: THE BRAKE WARNING INDICATOR IS NEVER ON**

**NOTE: Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may damage the connector.**

**NOTE: Failure to disconnect the battery when instructed will result in false resistance readings. Refer to BATTERY, MOUNTING AND CABLES .**

**O1 CARRY OUT THE IC INDICATOR LAMP CONTROL ACTIVE COMMAND USING THE SCAN TOOL**

- Ignition ON.
- Enter the following diagnostic mode on the scan tool: **IC** DataLogger.
- Select the **IC** brake warning indicator (BRK_LAMP) active command on. Observe the brake warning indicator.

**Does the brake warning indicator illuminate when commanded on** ?

**Yes** : GO to O2.

**No** : INSTALL a new **IC** . REFER to **Instrument Cluster (IC)** in this article. TEST the system for normal operation.

**O2 CHECK THE PARKING BRAKE SWITCH PID**

- Enter the following diagnostic mode on the scan tool: **SJB** DataLogger.
- Monitor the **SJB** (PRK_BRAKE) PID while applying the parking brake.

**Does the PID agree with the parking brake position?**

REPOWER the **SRS** . REFER to **Supplemental Restraint System (SRS) Depowering and Repowering** .

**No** : GO to **L29** .

**L29 CHECK THE HORIZONTAL MOTOR CIRCUITS FOR A SHORT TO VOLTAGE**

- Disconnect: **DSM** C341B.
- Ignition ON.
- Measure the voltage between:
  - **DSM C341B-9** , circuit CPS06 (GN/WH), harness side and ground.
  - **DSM C341B-12** , circuit CPS01 (GN/BU), harness side and ground.

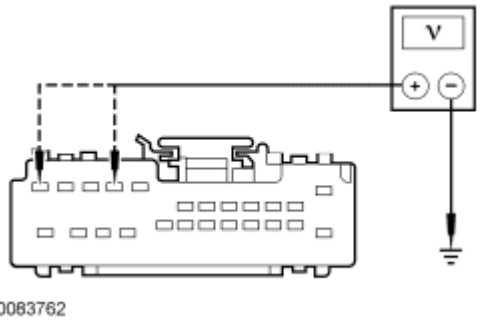



**Fig. 73: Measuring Voltage Between DSM C341B-9 And Ground**
**Courtesy of FORD MOTOR CO.**

**Is voltage present on either circuit?**

**Yes** : REPAIR the circuit(s). CLEAR the DTCs. REPEAT the self-test.

DISCONNECT the battery ground cable. CONNECT driver safety belt buckle pretensioner C3049.

CONNECT driver seat side air bag module C3051.

REPOWER the **SRS** . REFER to **Supplemental Restraint System (SRS) Depowering and Repowering** .

**No** : GO to **L30** .

**L30 CHECK THE HORIZONTAL MOTOR CIRCUITS FOR AN OPEN**

- Ignition OFF.
- Measure the resistance between:
  - **DSM C341B-9** , circuit CPS06 (GN/WH), harness side and horizontal motor **C362-3** , circuit CPS06 (GN/WH), harness side.
  - **DSM C341B-12** , circuit CPS01 (GN/BU), harness side and horizontal motor **C362-4** , circuit CPS01 (GN/BU), harness side.