

**Section 5**  
**J72 Auto/Apply Park Brake System Service**

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## J72 PARK BRAKE SYSTEM SERVICE

The J72 park brake system is made up of two major separate components or systems, the actuator and the brake assembly. Each of the components is serviced as an assembly.

### SYSTEM OVERVIEW

The J72 system incorporates a unique full-circle parking brake. The automatic electric/hydraulic parking system controls the transmission/propeller shaft mounted parking brake. This system consists of a pump motor relay, vehicle ignition relay, electric/hydraulic pump, reservoir, proportional relief solenoid valve, pressure transducer, and an electronic control module (ECM). The ECM monitors seven inputs from the vehicle and controls the pump motor relay, auto-park light, park brake warning light, buzzer, proportional valve, and pressure transducer.

The park brake is released by pushing the park brake switch pull-button in and moving the shift lever on the steering column from the park position or select “D”, “N” or “R” on the push button shift control.

**Notice: Both situations must occur for the brake to release.**

Once the ECM receives the signals from the transmission and button contacts, the ECM closes the solenoid valve and closes the pump/motor relay allowing current to flow to the motor. The pump/motor then supplies fluid to the brake assembly. The brake assembly includes a friction disc clamped by a piston through force of an internal spring. The fluid pressure acts on the piston overcoming the spring tension that clamps the friction disc, releasing the brake. The pump motor will shut off when the transducer reads the fluid pressure of approximately 1400 psi. The solenoid valve holds pressure in the system while the brake is in a released state. The ECM monitors system pressure from the pressure transducer and energizes the pump motor when system pressure drops below approximately 1200 psi.

Putting the shift lever back to park, selecting “P” on the push button shift control, turning off the ignition, or pulling the push/pull switch prompts the ECM to de-energize the solenoid valve dumping fluid back into the reservoir. As the pressure decreases, the spring force clamps the piston back against the friction disc and applies the park brake.

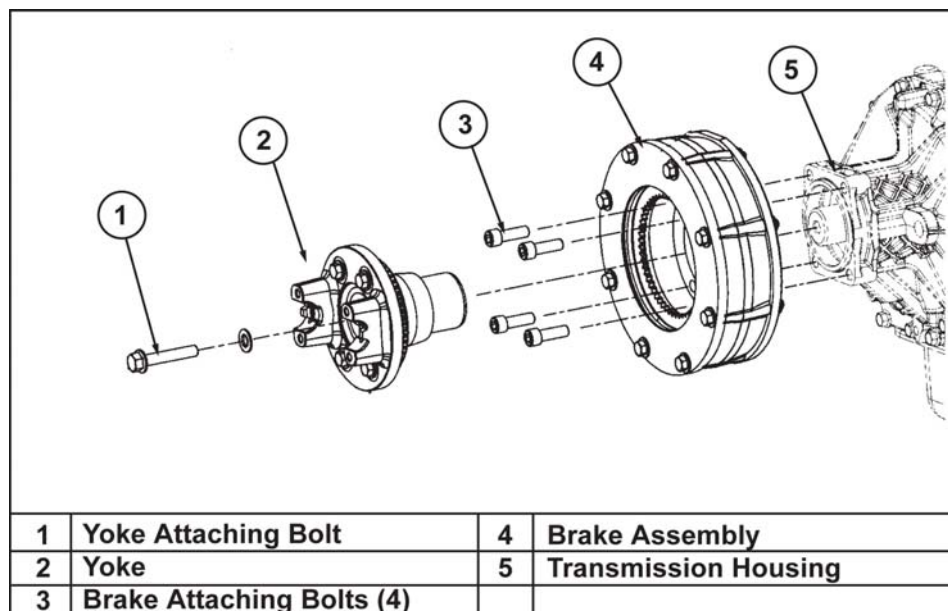


Figure 5-1. J72 Auto Apply Park Brake – Transmission Mounted Brake Assembly

### **Auto-Apply Warning Lamp**

The auto-apply warning lamp turns on when the system pressure falls below than 900 psi and the ECM receives the signal from the transmission.

### **Park Brake Warning Lamp**

The park brake warning lamp illuminates when system pressure falls below 900 PSI or when the parking brake pull-button is pulled out.

### **Park Brake Pull Switch**

The park brake pull switch is mounted on the instrument panel. This is a manual activation switch for the park brake. This switch is normally closed, pushed in. The body manufacturer determines final location of this switch.

### **Park Brake Pump Motor Relay**

The park brake pump motor relay is located in the underhood fuse box on the front driver's side of the radiator core support. It receives ground from the ECM and acts as the automatic control circuit for the high voltage current required to run the pump motor. When the ECM supplies ground to the relay switch, the contacts close to complete the feed circuit to the pump motor.

### **Ignition Relay**

The ignition relay is also located in the underhood fuse box on the front driver's side of the radiator core support. It monitors the vehicle's ignition switch to turn on/off the supply of the fifteen and forty-five amp fused-lines that the ECM and electric motor use. If the relay was not present, the ECM would be continually powered since it would be directly connected to the batteries.

## **ACTUATOR ASSEMBLY**

The actuator assembly controls the pressure in the park brake system to either set or release the park brake. The actuator consists of a mounting bracket and the following components:

### **Electronic Control Module**

The electronic control module (ECM) is an analog logic device that monitors the various vehicle conditions then controls the actuator accordingly. It is the "black box" mounted underneath the actuator mounting bracket. It connects to the vehicle via a fourteen pin connector, to the proportional solenoid valve via a two pin connector, and a pressure transducer via a three pin connector. The ECM is powered by two different sources.

First, it receives power primarily through a fifteen amp fuse. Secondly, the ECM receives power off of the forty-five amp fused-line that the pump motor relay also uses.

### **Pump/Motor Assembly**

The pump/motor assembly consists of an electric motor, geared pump, aluminum port block, and a semi-transparent fluid reservoir. The port block holds the proportional solenoid valve and pressure transducer. The pump provides fluid pressure for the system. A pressure relief valve in the port block limits system pressure to around 1700 psi.

**Proportional Solenoid Valve**

The proportional solenoid valve controls when fluid can return to the pump reservoir. When the parking brake is released, the valve is closed to hold pressure in the system. When the parking brake is applied, the valve opens to allow fluid to return to the pump reservoir. If the vehicle is at a speed greater than five miles per hour (5mph) and the pull button is pulled, the valve will remain open for a few moments and then release the pressure slowly for a gradual apply of the brake.

**CAUTION:** *The park brake is NOT designed for dynamic stops; if a dynamic stop occurs the park brake assembly must be inspected immediately for any internal damage.*

**Pressure Transducer**

The pressure transducer monitors the pressure of the system and relays that information back to the ECM. The critical pressure values are the cut-in and out for the motor which are 1200 psi and 1400 psi, respectively.

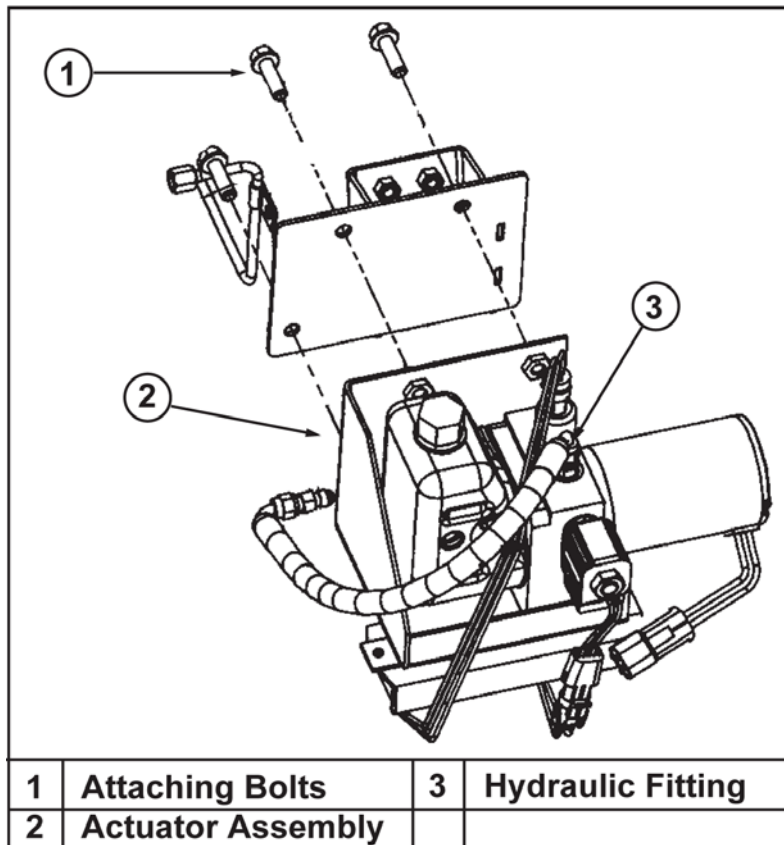


Figure 5-2. J72 Auto Apply Park Brake Actuator Assembly

## DIAGNOSIS

### PARK BRAKE SYSTEM DIAGNOSIS

Park brake operational concerns fall into two different areas.

- Brake Does Not Hold
- Brake Will Not Release

#### Park Brake Does Not Hold

To test the park brake function, conduct the following steps.

1. Choose a LEVEL location away from people, pets, and buildings.
2. Ensure the vehicle is in PARK.
3. Apply the service brake (foot brake) and start the engine.
4. Place the transmission in DRIVE.
5. Apply the park brake by pulling the park brake button out to the applied position.
6. Slowly release the service brake (foot brake).

**CAUTION:** *If the vehicle moves, reapply the foot brake and place the transmission back in PARK. Service the park brake before repeating the test.*

7. If the vehicle does not move, GRADUALLY increase the throttle opening to approximately 1,500 RPM for five seconds, then release the throttle and apply the service brake (foot brake).
  - a. Test results:
    - i. If the brake holds, no further action is required. Note the results of the test on the Repair Order for future reference.
    - ii. If the brake does not hold, the park brake assembly must be replaced.
8. Apply the service brake (foot brake), then release the park brake.
9. Release and reapply the service brake (foot brake) to relieve any strain in the drivetrain.
10. Place the transmission in PARK. The auto-apply park brake should set.
11. Turn the ignition OFF and remove the key.
12. If the brake did not hold in step 7, chock the wheels and proceed to the repair instructions.

#### Park Brake Will Not Release

If the J72 park brake will not release, chock the wheels and check the following items.

1. Check the fluid level in the reservoir. Add fluid if the level is below the MIN line.
2. Check the ALT/START fuse.
3. Check the function of the Auto Park Brake Motor Relay by substituting a known good relay of the same type.
4. Check the function of the Auto Park IGN relay by substituting a known good relay of the same type.
5. Check the function of the Park Brake Pull Button relay by substituting a known good relay of the same type.
6. Check for leaks in the hydraulic lines. Correct any leaks found.
7. Check for power to the motor. If power is not present, check for continuity on the power feed circuit. If power is present, check for continuity on the ground circuit.

8. Check for motor function by providing battery voltage to pin A of the motor connector and ground to pin B of the motor connector. If the motor does not function, replace it.
9. Perform Park Brake ECM Connector Pin Out Diagnostic Tests:
  - Pin 1 – Check for battery voltage on ECM Pin 1. If no voltage is present check the fuse and the circuit.
  - Pin 2 – Disconnect the harness from the ECM. Connect a test lead from Cavity 2 and ground. The pump motor should operate. If not check the relay and motor circuit.
  - Pin 3 – Backprobe cavity 3 and apply the park brake. Power should be present when the brake is applied and the ignition is in the ON position.
  - Pin 4 – Backprobe cavity 4 with the brake applied. Ground should be present when the brake is applied.
  - Pin 5 – Backprobe Cavity 5 with the brake applied. Ground should be present.
  - Pin 6 through Pin 8 – Not used.
  - Pin 9 – Backprobe Cavity 9 with the brake applied. Ground should be present.
  - Pin 10 – Check for battery voltage on ECM Pin 10. If no voltage is present check the fuse and the circuit.
  - Pin 11 – Pin 11 provides the speed signal from the ABS module.
  - Pin 12 – Check for battery voltage on ECM Pin 10 with the vehicle in PARK. If no voltage is present check the fuse and the circuit to the PNP switch.
  - Pin 13 – Backprobe Cavity 9 with the brake applied. Ground should be present.
  - Pin 14 – Pin 14 supplies the ECM with chassis ground. Backprobe Cavity 14 and check for ground.

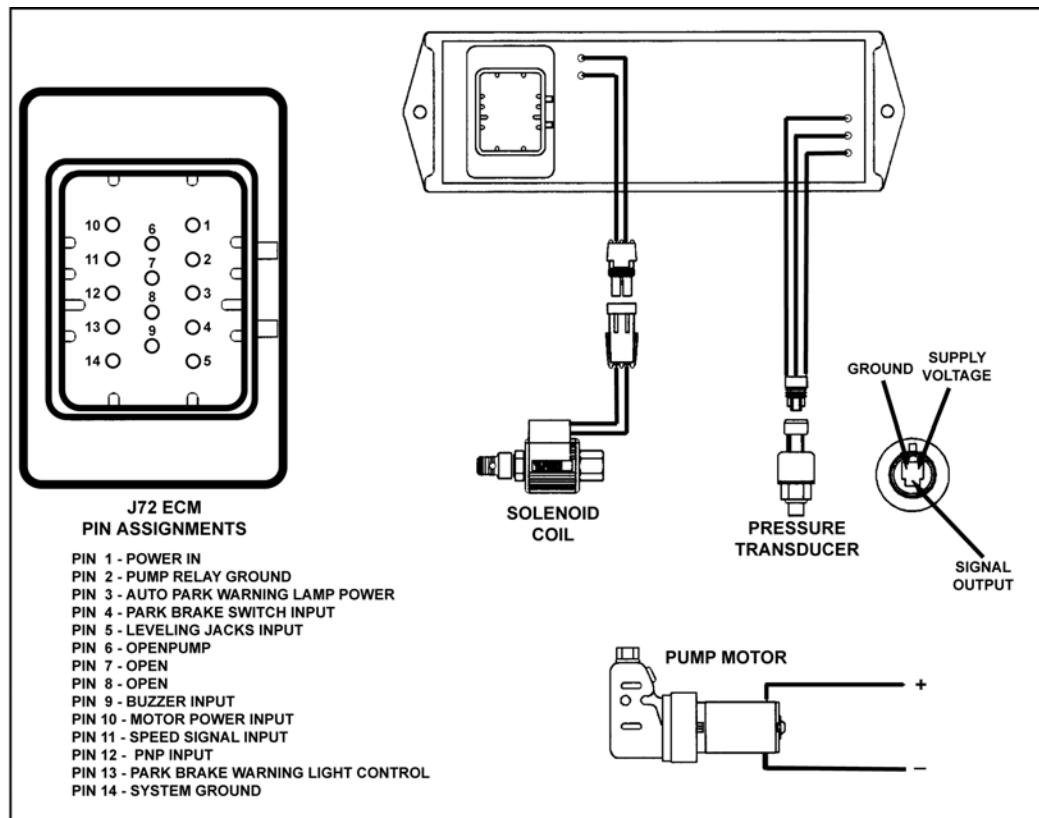


Figure 5-3. J72 Park Brake ECU Pinout Guide

## COMPONENT REPLACEMENT

### PARK BRAKE ASSEMBLY REPLACEMENT

**CAUTION:** Block the vehicle wheels to prevent movement before servicing the park brake assembly.

#### Removal Procedure

1. Raise the vehicle and support the vehicle with safety stands. Refer to Lifting and Jacking the Vehicle in General Information.

**Important:** Ensure the park brake is applied.

2. Remove the propeller shaft. Refer to Two-Piece Propeller Shaft Replacement or Three-Piece Propeller Shaft Replacement.
3. Disconnect the hydraulic line from the brake assembly. Install a suitable plug in the hydraulic line and cap the brake assembly fitting to minimize fluid loss.
4. Remove the center bolt retaining the yoke to the transmission output shaft. Remove the yoke.

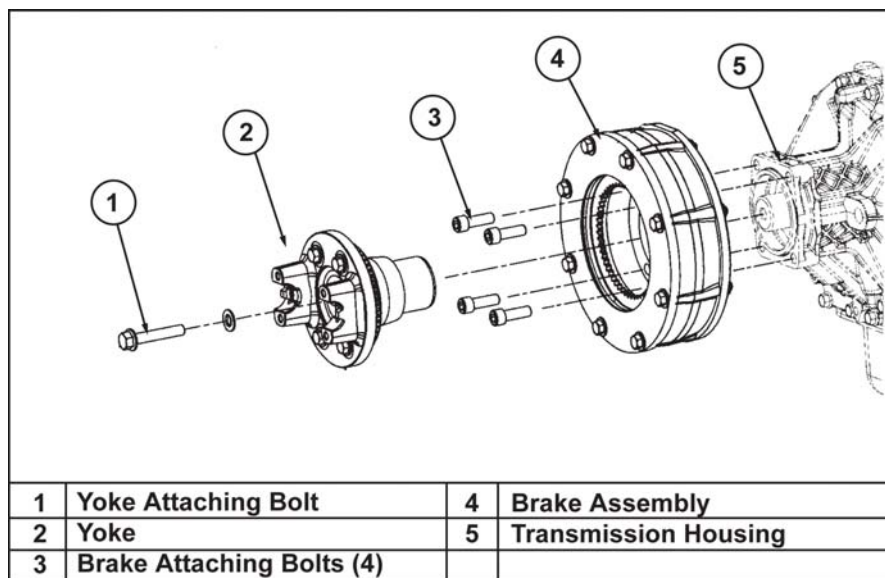


Figure 5-4. Removing the Park Brake Assembly

**Important:** Cap the end of the transmission in order to minimize fluid loss.

5. Inspect the yoke ears for damage and the splines for the following damage:
  - Wear
  - Burrs
  - Twisting

**CAUTION:** The park brake assembly weighs approximately 45lbs (20 kg). Use a suitable jack to support the brake before removing the attaching bolts. Failure to do so may result in personal injury.

6. Remove the four bolts attaching the brake assembly to the transmission housing.
7. Remove the brake assembly.



## Installation Procedure

**Notice:** Refer to *Fastener Notice* in **Cautions and Notices**.

1. Raise the brake assembly into position and align with the mounting holes in the transmission housing.
2. Install the bolts and washers attaching the brake assembly to the transmission housing. Tighten the bolts and washers to 89 lb ft (121 Nm).
3. Install the yoke and attaching bolt. Tighten the bolt to 89 lb ft (121 Nm).
4. Connect the hydraulic line to the brake assembly.
5. Fill the brake actuator reservoir with the specified fluid.

**Notice:** 2004-2005 models use Dexron III in the park brake system. 2006 models are filled with Dexron VI.

6. Install the propeller shaft. Refer to Two-Piece Propeller Shaft Replacement or Three-Piece Propeller Shaft Replacement.
7. Bleed the park brake hydraulic system. See bleeding the park brake in this section.
8. Lower the vehicle.
9. Test the operation of the park brake.

**CAUTION:** Always test the park brake before proper operation before returning the vehicle to the customer.

## PARK BRAKE ACTUATOR ASSEMBLY REPLACEMENT

### Removal Procedure

**CAUTION:** Ensure the park brake is applied before removing the actuator. The park brake hydraulic system operates at high pressure. Always relieve pressure by applying the park brake before disconnecting any hydraulic fittings.

1. Disconnect the electrical connectors from the actuator assembly.
2. Disconnect the Hydraulic line from the actuator assembly. Cap the actuator fitting and plug the line to prevent fluid loss.
3. Remove the bolts attaching the actuator assembly to the bulkhead.

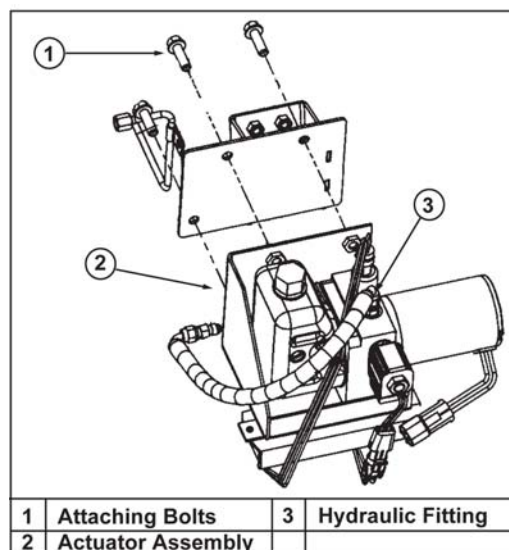


Figure 5-5. Replacing the Actuator Assembly

## Installation Procedure

**Notice:** Refer to *Fastener Notice* in *Cautions and Notices*.

1. Ensure that the hydraulic fitting is properly tightened in the actuator housing before installing the hydraulic line. Tighten the fitting to 108 lb in (12 Nm).
2. Install the new actuator assembly and tighten the bolts. Tighten the bolts to 28 lb ft (38 Nm).
3. Connect the hydraulic line to the actuator assembly. Tighten the fitting to 108 lb in (12 Nm).
4. Connect the electrical connection to the actuator assembly.
5. Fill the fluid reservoir with the appropriate fluid.

**Notice:** 2004-2005 models use Dexron III in the park brake hydraulic system. 2006+ models use Dexron VI in the hydraulic system.

6. Bleed the park brake system. See bleeding the park brake in this section.

**CAUTION:** Always test the park brake before proper operation before returning the vehicle to the customer.