Brake System

Special Tool(s)

 ST2834-A	Vehicle Communication Module (VCM) and Integrated Diagnostic System (IDS) software with appropriate hardware, or equivalent scan tool
 ST1137-A	73III Automotive Meter 105-R0057 or equivalent
 ST2574-A	Flex Probe Kit 105-R025B or equivalent

Material

Item	Specification
High Performance DOT 3 Motor Vehicle Brake Fluid PM-1 or PM-1-C (US); CPM-1 or CPM-1-C (Canada)	ESA-M6C25-A or WSS-M6C62-A
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Metal Brake Parts Cleaner PM-4-A or PM-4-B (US); CPM-4 (Canada)	—

Inspection and Verification

WARNING: Use of any brake fluid other than the approved DOT 3 will cause permanent damage to brake components and will render the brakes inoperative. Failure to follow these instructions may result in personal injury.

WARNING: Carefully read cautionary information on product label. For EMERGENCY MEDICAL INFORMATION seek medical advice. In the USA or Canada on Ford/Motorcraft products call: 1-800-959-3673. For additional information, consult the product Material Safety Data Sheet (MSDS) if available. Failure to follow these instructions may result in personal injury.

NOTICE: Brake fluid is harmful to painted and plastic surfaces. If brake fluid is spilled onto a painted or plastic surface, immediately wash it with water.

NOTE: *Always check the fluid level in the brake master cylinder reservoir before carrying out the test procedures. If the fluid level is below the MIN level mark, clean the reservoir cap before removing, then add clean, specified brake fluid.*

NOTE: *Prior to carrying out any diagnosis, make sure the red brake warning indicator is functional. Refer to Section 413-01.*

The first indication that something may be wrong in the brake system is a change in the feeling through the brake pedal. The brake warning indicator in the instrument cluster and the brake fluid level in the brake master cylinder reservoir are also indicators of system concerns.

If a wheel is locked and the vehicle must be moved, open a bleeder screw at the locked wheel to let out enough fluid to relieve the pressure. Close the bleeder screw. This bleeding operation may release the brakes but does not correct the concern. If this does not relieve the locked wheel condition, repair the locked components before proceeding.

Inspect all hoses and connections. All unused vacuum connectors should be capped. Make sure hoses and their connections are correctly secured and in good condition with no holes, soft or collapsed areas.

Road Test

The technician should have a thorough knowledge of the brake system operation and accepted general braking guidelines in order to detect any problems.

Select a road that is reasonably smooth and level. Gravel or bumpy roads are not suitable because the surface does not allow the tires to grip the road equally. Avoid crowned roads.

A key factor in evaluating brake concerns is the deceleration rate. This varies from vehicle to vehicle and with changes in operating conditions. It is evident how well the brakes are working after just a few applications.

For low or spongy brake pedal concerns:

- bleed the brake system and retest the brake pedal feel.
- if the brake pedal is still low or feels spongy, check the brake pedal mounting for looseness and correct installation. Check the brake booster and the brake master cylinder for loose mounting. Correct as necessary and retest the system for normal operation.
- check the fluid level. The fluid level must be at or above the minimum mark. If the fluid level is below the minimum mark, check the system for leaks.

For a slow or incomplete brake pedal return concern:

- inspect for binding, damage, correct installation or interference at the brake pedal.
- check the brake booster for binding, damage and correct installation.

Brake Pads

NOTE: *New brake pads are not required if friction material properties are within guidelines. New brake pads are not required when the brake discs are machined.*

- Remove the brake pads. Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
- Inspect and measure the thickness of the brake pad friction material.
  - Install new brake pads if the thickness of the friction material is less than 3.0 mm (0.118 inch). Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
  - Compare all 4 front or rear pads for uneven wear. Install new brake pads if the thickness of the friction material varies from pad to pad by more than 2.0 mm (0.079 inch). Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
  - Install new brake pads if there are missing chunks or cracks in the lining through to the backing plate. Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
  - If the friction material shows taper wear and the thickness varies by more than (3.0 mm [0.118 inch] in any direction), or if the pads show uneven wear (2.0 mm [0.079 inch] difference between the inboard and the outboard pad), verify the caliper guide pins are functioning correctly. Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.

Brake Discs

NOTICE: Using an impact tool without a torque socket leads to unevenly tightened wheel nuts. This causes brake disc on-vehicle lateral runout and brake roughness.

NOTE: *It is generally not required to install new brake discs to address noise issues.*

- Remove the brake disc. Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
- Inspect the brake discs and measure the brake disc thickness in a minimum of 4 places around the circumference of the brake disc. Record the measurements.
  - Install new brake discs if any thickness measurement is less than the minimum specification. Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
  - Install new brake discs if cracked. Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
  - Machine the brake discs if the diagnosis has revealed vibration in the steering wheel, seat or pedal while braking. Heavily scored brake discs, similar to that caused by pads worn down to the backing plate, should also be machined. In order to machine, discs must be above the minimum thickness specification. Refer to Specifications and Brake Disc Machining in this section.

Brake Caliper

Inspect the brake calipers for the following:

- Brake fluid leaks.
- Boots and seals for tears or cracks.
- Caliper piston for binding and corrosion.
- Guide pins for correct operation. Refer to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.

Brake Caliper Guide Pins

NOTICE: Do not use power tools for caliper guide pin bore cleaning.

NOTE: *Guide pin kits are not available.*

The guide pins should slide with a reasonable amount of hand force. If the brake pads show taper wear or the guide pins are difficult to move, install a new caliper assembly. For additional information, refer to Section 206-03 or Section 206-04.

Brake Hoses and Tubes

NOTICE: Never use copper tubing. It is subject to fatigue, cracking and corrosion, which could result in brake tube failure.

- Double-wall steel tubing is used throughout the brake hydraulic system. All brake tube fittings must be correctly flared to provide strong, leakproof connections. When bending tubing to fit the underbody or rear axle contours, be careful not to kink or crack the tube.
- If a section of the brake tube is damaged, the entire section must be installed new with a tube of the same type, size, shape and length.
- When installing the hydraulic brake tubing, hoses, or connectors, tighten all connections to specifications. After installation, bleed the brake system. Refer to Brake System Bleeding in this section.
- The wet appearance on the outer cover of rubber brake hoses is called sweating. This is a normal condition for neoprene rayon-braided hose and is not a sign of leakage or cause to install a new hose.

Install a new flexible brake hose if the hose shows signs of softening, cracking or other damage.

When installing a new brake hose, position the hose to avoid contact with other vehicle components.

Non-Pressure Leaks

The only part of the brake system that could have a brake fluid loss that does not appear when the system is under pressure is the brake master cylinder reservoir under the following conditions:

- Missing or poorly-fitted brake master cylinder filler cap.
- Punctured or otherwise damaged brake master cylinder reservoir.
- Missing or damaged brake master cylinder filler cap gasket.

- Missing, damaged or poorly-fitted sealing grommets between the brake master cylinder and the brake master cylinder reservoir.

The brake master cylinder reservoir grommets are not repairable and must be installed new as part of a new brake master cylinder reservoir.

Brake Master Cylinder — Normal Conditions

The following conditions are considered normal and are not indications that the brake master cylinder is in need of service.

Condition 1: During normal operation of the brake master cylinder, the fluid level in the brake master cylinder reservoir rises during brake application and falls during release. The net fluid level (such as after brake application and release) remains unchanged.

Condition 2: A trace of brake fluid exists on the booster shell below the master cylinder mounting flange. This results from the normal lubricating action of the master cylinder bore and seal.

Condition 3: Fluid level decreases with pad wear.

Brake Master Cylinder — Abnormal Conditions

Changes in brake pedal feel or travel are indicators that something could be wrong in the brake system. GO to Symptom Chart for abnormal condition diagnosis.

Brake Booster

Inspect the brake booster for the following:

- Excessive corrosion or damage.
- Vacuum connections for leakage.
- Vacuum hoses for kinks or leakage.
- Brake booster check valve for correct operation.

Changes in the brake pedal feel or travel are indicators that something could be wrong in the brake system. GO to Symptom Chart for abnormal condition diagnosis.

Parking Brake

Check the operation of the parking brake system with the vehicle on a hoist and the parking brake control fully released. Check for any damaged cables and install new components as necessary. Check the rear brake adjustment or carry out the brake system diagnosis. Refer to Section 206-05.

Symptom Chart

Symptom Chart

Condition	Possible Causes	Action
• The red brake warning indicator is always on	• Brake fluid level • Brake fluid leak	• If the fluid level is below the minimum level, CHECK the system for leaks. REPAIR as necessary.
	• Parking brake switch • Brake fluid level switch • Circuitry • Instrument cluster • Smart junction box (SJB)	• GO to Pinpoint Test A.
• The red brake warning indicator is inoperative	• Circuitry • Instrument cluster	• REFER to Section 413-01.
• The brakes pull or drift	• Tire air pressure	• CHECK the tires for uneven or excessive wear and CORRECT the inflation.

	• Brake pads • Brake components	• CHECK the brake pads for uneven taper or excessive wear. REPAIR as necessary.
	• Suspension components • Wheel alignment	• CHECK the suspension components and the wheel alignment. REFER to Section 204-00.
• The brake pedal goes down fast	• Brake fluid level	• INSPECT the system for leaks, REPAIR as necessary. FILL the brake master cylinder reservoir. BLEED the system. REFER to Brake System Bleeding in this section.
	• Air in the system	• INSPECT the system for leaks, REPAIR as necessary. BLEED the system. REFER to Brake System Bleeding in this section.
	• Brake master cylinder	• CARRY OUT the brake master cylinder component test in this section.
• The brake pedal eases down slowly	• Air in the system	• INSPECT the system for leaks, REPAIR as necessary. BLEED the system. REFER to Brake System Bleeding in this section.
	• Brake master cylinder	• CARRY OUT the brake master cylinder component test in this section.
• Brake lockup under light brake pedal force	• Brake pads	• CHECK the brake pads for uneven taper or excessive wear. REPAIR as necessary.
	• Brake component	• CHECK the brake components for correct operation. REPAIR as necessary.
	• Parking brake component	• REPAIR or INSTALL new components as necessary. REFER to Section 206-05.
	• Anti-lock brake control system	• CHECK the anti-lock brake control system. REFER to Section 206-09.
• Excessive/erratic brake pedal travel	• Leak in the hydraulic system • Air in the system • Brake caliper	• INSPECT the system for leaks, REPAIR as necessary. BLEED the system. REFER to Brake System Bleeding in this section.
	• Brake master cylinder	• CARRY OUT the brake master cylinder component test in this section.
	• Brake pads	• CHECK the brake pads for excessive wear. REPAIR as necessary.
	• Brake pedal	• CHECK the brake pedal for binding or obstructions. REPAIR as necessary.
• Brakes drag	• Parking brake component	• REPAIR or INSTALL new components as necessary. REFER to Section 206-05.
	• Brake caliper guide pins	• REPAIR or INSTALL new brake calipers as necessary. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
	• Brake caliper	• REPAIR or INSTALL new brake calipers as necessary. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
	• Brake switches	• REMOVE and REINSTALL the stoplamp switch and the speed deactivation switch. REFER to Section 310-03.
	• Brake booster	• CARRY OUT the brake booster component test in this section.
	• Brake master cylinder	• CARRY OUT the brake master cylinder component test in this section.
• Excessive brake pedal effort	• Brake booster	• CARRY OUT the brake booster component test in this section.
	• Brake booster check valve	• CARRY OUT the check valve component test in this section.

	• Brake booster manifold vacuum hose	• REROUTE, REPAIR or INSTALL new components as necessary.
• Rattling noise	• Caliper mounting bolts loose	• CHECK the caliper bolts. TIGHTEN to specifications. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
	• Damaged or worn caliper guide pins or retainers	• CHECK the caliper guide pins and retainers for lubrication and correct operation. LUBRICATE or INSTALL new components as necessary. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
	• Missing or damaged anti-rattle clips or springs	• CHECK the brake pads for missing clips or broken springs. INSTALL new components as necessary. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
	• Loose brake disc shield	• TIGHTEN the brake disc shield bolts to specification. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes
• Clicking noise — with brakes applied with anti-lock brake system (ABS)	• ABS hydraulic control unit (HCU)	• Acceptable condition.
• Squealing noise — occurs on first brake application	• Brake pads	• Acceptable condition. Caused by humidity and low brake pad temperature.
• Squealing noise — a continuous squeal	• Brake pads or linings worn below minimum thickness	• INSPECT the brake pads for excessive wear, taper wear or uneven wear. VERIFY the brake pads are within minimum specifications. REFER to Brake Pads in this section.
• Squealing noise — an intermittent squeal brought on by cold, heat, water, mud or snow	• Brake pads	• Acceptable condition.
• Groaning noise — occurs at low speeds with brake lightly applied (creeping)	• Brake pads	• Acceptable condition.
• Grinding noise — continuous	• Brake pads or linings worn below minimum thickness	• INSPECT the brake pads, brake discs and attaching hardware for damage. VERIFY brake pads are within minimum specifications. REFER to Brake Pads in this section.
• Moaning noise	• Brake linings contaminated with grease or oil	• INSPECT the brake pads for contamination. REPAIR or INSTALL new components as necessary. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
• Vibration when the brakes are applied	• Uneven brake pad wear • Brake disc pad transfer • Brake disc • Suspension components	• COMPLETE the brake system inspection described in Inspection and Verification in this section. • GO to Pinpoint Test B.
• Brake vibration/shudder — occurs when the brake pedal is released	• Brake caliper guide pins	• INSPECT the brake caliper guide pins for correct operation. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.
	• Brake drag	• INSPECT the brake pads for premature wear. REPAIR or INSTALL a new caliper as necessary. REFER to Section 206-03 for front disc brakes or Section 206-04 for rear disc brakes.

Pinpoint Tests

Pinpoint Test A: The Red Brake Warning Indicator is Always On

Refer to Wiring Diagrams Cell 60 , Instrument Cluster for schematic and connector information.

Normal Operation

The red brake warning indicator is located in the instrument cluster and illuminates when the brake fluid in the brake master cylinder reservoir is below a specific level or when the parking brake is engaged. When the parking brake is applied, the instrument cluster receives a ground input on circuit 1309 (RD/YE) through the parking brake switch and circuit 1205 (BK), turning on the brake warning indicator. The smart junction box (SJB) provides a voltage to the brake fluid level switch through circuit 547 (LG/YE) and back through the SJB return circuit 512 (TN/LG). When the brake fluid level is low, the brake fluid level switch closes and connects circuit 547 (LG/YE) to circuit 512 (TN/LG). The voltage reference signal the SJB is sending to the brake fluid level switch drops to zero, then the SJB sends a message over the medium speed communication area network (MS-CAN) to the instrument cluster to turn on the brake warning indicator.

Possible Causes

- Circuit shorted
- Low brake fluid level
- Brake fluid level switch
- Parking brake engaged
- Parking brake switch
- Instrument cluster
- SJB

PINPOINT TEST A : THE RED BRAKE WARNING INDICATOR IS ALWAYS ON

NOTICE: Use the Flex Probe Kit for all test connections to prevent damage to the wiring terminals. Do not use standard multi-meter probes.

A1 CHECK THE PARKING BRAKE SWITCH

- Verify the parking brake is fully released.
- Ignition OFF.
- Disconnect: Parking Brake Switch C306 .
- Ignition ON.

Is the red brake warning indicator illuminated?

Yes	GO to A2.
No	INSTALL a new parking brake switch. CLEAR the DTCs. REPEAT the self-test.

A2 CHECK THE BRAKE FLUID LEVEL SWITCH

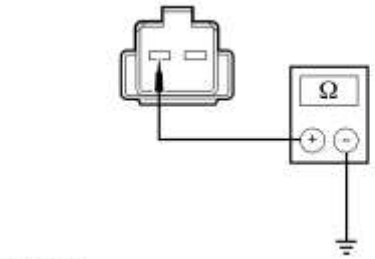
- Disconnect: Brake Fluid Level Switch C124 .

Is the red brake warning indicator illuminated?

Yes	GO to A3.
No	INSTALL a new brake fluid level switch. REFER to Brake Master Cylinder Exploded View in Section 206-06. CLEAR the DTCs. REPEAT the self-test.

A3 CHECK CIRCUIT 1309 (RD/YE) FOR A SHORT TO GROUND

- Ignition OFF.
- Disconnect: SJB C2280c .
- Measure the resistance between parking brake switch C306 Pin 1, circuit 1309 (RD/YE), harness side and ground.



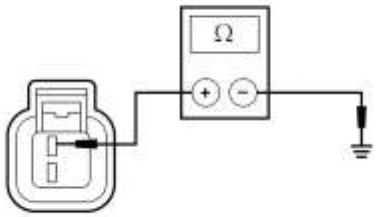
N0039145

Is the resistance less than 5 ohms?

Yes	REPAIR circuit 1309 (RD/YE). CLEAR the DTCs. REPEAT the self-test.
No	GO to A4.

A4 CHECK CIRCUIT 547 (LG/YE) FOR A SHORT TO GROUND

- Measure the resistance between brake fluid level switch C124 Pin 1, circuit 547 (LG/YE), harness side and ground.



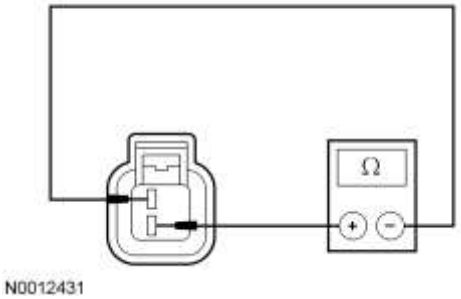
A0085325

Is the resistance less than 5 ohms?

Yes	REPAIR circuit 547 (LG/YE). CLEAR the DTCs. REPEAT the self-test.
No	GO to A5.

A5 CHECK FOR A SHORT BETWEEN CIRCUIT 512 (TN/LG) AND CIRCUIT 547 (LG/YE)

- Measure the resistance between brake fluid level switch C124 Pin 1, circuit 547 (LG/YE), harness side and between brake fluid level switch C124 Pin 2, circuit 512 (TN/LG), harness side.



N0012431

Is the resistance less than 5 ohms?

Yes	GO to A6.
No	INSTALL a new brake fluid level switch. REFER to Brake Master Cylinder Exploded View in Section 206-06. CLEAR the DTCs. REPEAT the self-test.

A6 CHECK THE SMART JUNCTION BOX (SJB) OUTPUT

- Connect: SJB C2280c .
- Disconnect: SJB C2280b .
- Observe the red brake warning indicator.

Is the red brake warning indicator illuminated?

Yes	GO to A7.
No	GO to A8.

A7 CHECK FOR CORRECT INSTRUMENT CLUSTER OPERATION

- Connect: SJB C2280b .
- Disconnect all the instrument cluster connectors.
- Check for:
  - corrosion.
  - pushed-out pins.
  - spread terminals.
- Connect all the instrument cluster connectors and make sure they seat correctly.
- Operate the system and verify if the concern is still present.

Is the concern still present?

Yes	INSTALL a new instrument cluster. REFER to Section 413-01. CLEAR the DTCs. REPEAT the self-test.

No	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

A8 CHECK FOR CORRECT SJB OPERATION

- Disconnect all the SJB connectors.
- Check for:
  - corrosion.
  - pushed-out pins.
  - spread terminals.
- Connect all the SJB connectors and make sure they seat correctly.
- Operate the system and verify if the concern is still present.

Is the concern still present?

Yes	INSTALL a new SJB. REFER to Section 419-10. CLEAR the DTCs. REPEAT the self-test.
No	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. CLEAR the DTCs. REPEAT the self-test.

Pinpoint Test B: Vibration When the Brakes are Applied

Possible Causes

- Uneven brake pad wear
- Brake disc pad transfer
- Brake disc
- Suspension components

PINPOINT TEST B : VIBRATION WHEN THE BRAKES ARE APPLIED

B1 CHECK OASIS AND FOR TSBS

- Check the On-Line Automotive Service Information System (OASIS) and Technical Service Bulletins (TSBs) for applicable brake concerns.

Is there applicable information available on OASIS or in a TSB?

Yes	REFER to OASIS or the TSB. CARRY OUT any necessary repairs that are indicated by OASIS or the TSB. If the concern is still present, GO to B2 .
No	GO to B2.

B2 ROAD TEST THE VEHICLE — LIGHT BRAKING

- Inspect the wheels and tires. Refer to Section 204-00.

- Road test the vehicle. Warm the brakes by slowing the vehicle from 80-32 km/h (50-20 mph) using light brake force. At highway speeds of 89-97 km/h (55-60 mph), apply the brake using light pedal force.

Is there a vibration/shudder felt in the steering wheel, seat or brake pedal?

Yes	GO to B5.
No	GO to B3.

B3 ROAD TEST THE VEHICLE — MODERATE TO HEAVY BRAKING

- Road test the vehicle. At highway speeds of 89-97 km/h (55-60 mph), apply the brake using a moderate to heavy pedal force.

Is there a vibration/shudder?

Yes	GO to B4.
No	The concern is not present at this time.

B4 NORMAL ACTUATION OF THE ANTI-LOCK BRAKE SYSTEM (ABS) SYSTEM DIAGNOSIS

- During moderate to heavy braking, noise from the hydraulic control unit (HCU) and pulsation in the brake pedal can be observed. Pedal pulsation coupled with noise during heavy braking or on loose gravel, bumps, wet or snowy surfaces is acceptable and indicates correct functioning of the ABS system. Pedal pulsation or steering wheel nibble (frequency is proportioned to the vehicle speed) indicates a concern with a brake or suspension component.

Is the vibration/shudder vehicle speed sensitive?

Yes	GO to B5.
No	The concern is not present at this time.

B5 CHECK THE FRONT SUSPENSION

- Check the front suspension. Refer to Section 204-00.

Are all the suspension components in satisfactory condition?

Yes	GO to B6.
No	REPAIR or INSTALL new components as necessary. REFER to Section 204-01. TEST the system for normal operation.

B6 RESURFACE THE FRONT BRAKE DISCS

- **NOTICE: Do not use a bench lathe to machine the brake discs.**

  NOTE: *Follow the manufacturer's instructions to machine the brake discs. After machining, make sure the brake disc meets the thickness specification.*

Resurface the front brake discs. Refer to Brake Disc Machining in this section.
- Road test the vehicle.

Is the vibration/shudder present?

Yes	GO to B7.
No	The concern is not present at this time.

B7 CHECK THE REAR SUSPENSION

- Check the rear suspension. Refer to Section 204-00.

Are all the suspension components in satisfactory condition?

Yes	GO to B8.
No	REPAIR or INSTALL new components as necessary. REFER to Section 204-02. TEST the system for normal operation.

B8 RESURFACE THE REAR BRAKE DISC

- **NOTICE: Do not use a bench lathe to machine the brake discs.**

  NOTE: *Follow the manufacturer's instructions to machine the brake discs. After machining, make sure the brake disc meets the thickness specification.*

  Resurface the rear brake discs. Refer to Brake Disc Machining in this section.
- Road test the vehicle.

Is the vibration/shudder present?

Yes	REFER to Section 100-04 to continue diagnosis of the vibration.
No	The concern is not present at this time.

Component Tests

Brake Booster

1. Check the hydraulic brake system for leaks or insufficient fluid.
2. With the transmission in NEUTRAL, stop the engine and apply the parking brake control. Apply the brake pedal several times to exhaust all vacuum in the system.
3. Apply the brake pedal and hold it in the applied position. Start the engine. If the vacuum system is operating, the brake pedal tends to move downward under constant foot pressure. If no motion is felt, the brake booster system is not functioning. Continue with the following steps.
4. Remove the vacuum booster hose from the check valve connection. Manifold vacuum must be available at the check valve end of the vacuum booster hose with the engine at idle speed and the transmission in NEUTRAL. If the manifold vacuum is available to the brake booster, connect the vacuum booster hose to the brake booster

check valve and repeat Steps 2 and 3.

5. If no downward movement of the brake pedal is felt, install a new brake booster. For additional information, refer to Section 206-07.

6. Operate the engine a minimum of 10 seconds at fast idle. Stop the engine, and let the vehicle stand for 10 minutes. Then apply the brake pedal with approximately 89 N (20 lb) of force. The brake pedal feel should be the same as that noted with the engine operating. If the brake pedal feels hard (no power assist), install a new brake booster check valve and retest. If the brake pedal feels spongy, bleed the hydraulic system to remove air. Refer to Brake System Bleeding in this section.

Check Valve

The function of the brake booster check valve is to allow manifold vacuum to enter the brake booster and prevent the escape of vacuum in case manifold vacuum is lost during sustained full throttle operation.

To test the function of the brake booster check valve:

- start and run the engine for at least 10 seconds.
- operate the brake pedal to check for power assist.
- disconnect the vacuum booster hose from the brake booster check valve. Do not remove the brake booster check valve from the brake booster.
- there should be enough vacuum retained in the brake booster for at least one more power-assisted brake operation.

Brake Master Cylinder — Bypass Condition

1. Disconnect the brake tubes at the brake master cylinder.

2. Plug the outlet ports of the brake master cylinder.

3. Apply the brakes. If brake pedal height cannot be maintained, the brake master cylinder has an internal leak and a new brake master cylinder must be installed.

Brake Master Cylinder — Compensator Port Check

The purpose of the compensator ports in the brake master cylinder is to supply any additional brake fluid required by the system due to brake pad wear and to allow brake fluid returning from the brake hoses and tubes to the brake master cylinder to enter the brake master cylinder reservoir.

The returning brake fluid causes a slight turbulence in the brake master cylinder reservoir. Turbulence seen in the brake master cylinder reservoir upon application or release of the brake pedal is normal and shows that the compensating ports are not plugged.