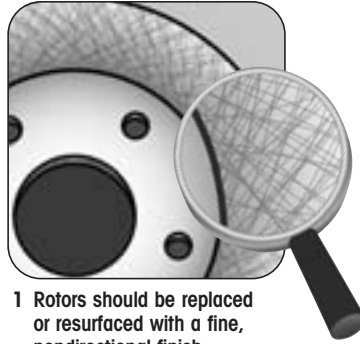


Quick Tips for installing brake pads

Your customer expects quiet, clean, dependable, and safe brakes. The following reminders will help get the best results and minimize comebacks.



1 Rotors should be replaced or resurfaced with a fine, nondirectional finish.



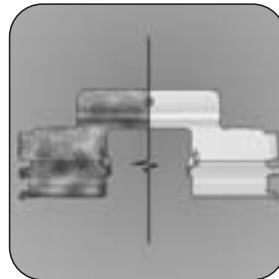
2 Wash rotor with non-detergent (clear) liquid cleanser and warm water.



3 Do not touch, or contaminate friction material.



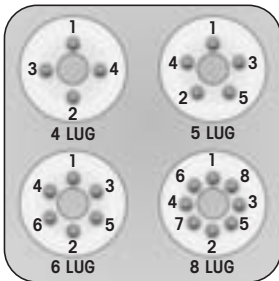
4 Lubricate sliding surfaces and back of pad with brake lubricant.



5 Inspect all components. Replace worn hardware, including pad installation clips.



6 Open bleeder and then compress piston. Do not hammer to set pads into place.



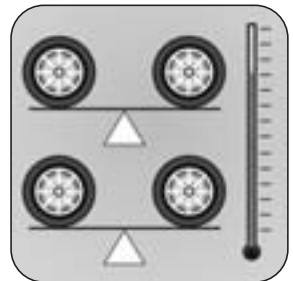
7 Torque lug nuts using star pattern.



8 High-speed break in is NOT required or recommended. Follow manufacturer's recommendation.



9 Check temperature of all four brakes to ensure balanced braking effort.



**Quick Tips for installing
brake shoes**



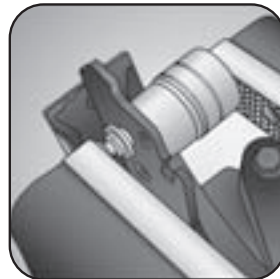
1 Inspect the Drum for out-of-round and "bell-mouth" conditions. Drum may be replaced or remove wear lip by refinishing.



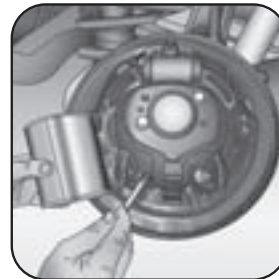
2 Wash Drum with non-detergent (clear) liquid cleanser and warm water.



3 Do not touch, or contaminate friction material.



4 Press pivot pins in with vise. Do not use hammer to install pins!



5 Clean, inspect and lubricate backing plate.



6 Inspect and clean or replace hardware, springs and adjuster.



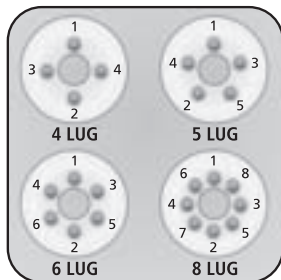
7 Inspect for frozen or leaking wheel cylinders. Inspect for leaking axle seals.



8 Adjust shoes to drum.



9 Inspect parking brake operation.



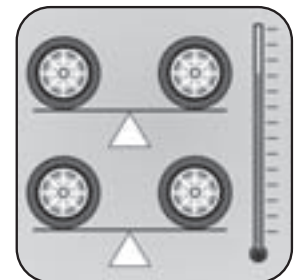
10 Torque lug nuts using star pattern.



11 High-speed break-in is NOT required or recommended! Follow manufacturer's recommendation.



12 Check temperature of all four brakes to ensure balanced braking effort.



FLEET VEHICLES/
LIGHT TRUCKS

MEDIUM/HEAVY
DUTY TRUCKS

NUMERICAL
LISTING

FMSI TO MONROE
INTERCHANGE

INSTALLATION TIPS

TECHNICAL
INFORMATION

Start with a thorough inspection of the entire braking system and then follow the installation recommendations:

Remember brake pads are part of a system.

- Inspect operating temperatures at all four corners with a digital pyrometer to ensure that braking forces are equally balanced.
- Inspect brake fluid (test strips are recommended), replace if necessary with proper fluid.
- Inspect hydraulics for binding caliper pistons or wheel cylinders.
- Inspect metering valve to insure rear brakes are applying prior to front under light pedal.
- Inspect compensating ports in master cylinder for blockage.
- Inspect rubber hoses for internal and external damage.

Monroe recommended disc brake replacement procedures.... Do it right.

- Follow appropriate safety precautions when working on vehicles. Do not inhale brake dust.
- Open brake bleeder, before removing caliper and pads. (See service manual for recommended bleeding procedure.)
- Compress caliper piston back to its "full open" position prior to removal.
- Close bleeder, remove caliper and/or pads.
- Inspect /clean WSS (Wheel Speed Sensors)
- Inspect the rotor
 - Check parallelism by measuring thickness in 4-8 different locations around the rotor
 - Check thickness and determine if replacement is necessary based on past wear
 - Check for rotor run-out with a dial indicator
 - Check for discolored hard spots and heat cracking. Replace if visible signs exists.
- Resurface or replace rotor if necessary. A fine non-directional finish of 10-50 mu is required.
- Wash rotor with non-detergent (clear) liquid cleanser and warm water.
- DO NOT apply solvent cleaners after washing rotor.
- Inspect wheel bearing for looseness, repack or replace as necessary.
- Do not touch friction material, or contaminate with solvent type cleaning solutions.
- Lubricate all sliding surfaces including steel backing plate, caliper pins, pad to caliper contact areas and back of brake pad.
- Install new Monroe brake pads. Follow OEM installation procedures.
- Inspect/replace worn hardware. Replace anti-rattle clips with new parts supplied.
- Crimp locking tabs with c-clamp, if applicable.
- Reassemble caliper - Torque mounting hardware.
- Secure bolts with locking compound.
- Bleed hydraulic system... Do not reverse bleed modern systems.
- Torque lug nuts using star pattern.
- No high speed friction break-in. Burnishing is not required or recommended.

Go to www.monroebrakes.com for additional installation tips and technical training.

ABS

When diagnosing a problem with the ABS, Monroe® recommends first inspecting and repairing the brake system as if it were non-ABS controlled. Electrical problems are then diagnosed using the vehicle's on-board diagnostics. Refer to the O.E. service manual. (Also see Speed Sensors)

ABS- Speed Sensors (Electronic Wheel and Vehicle)

Proper brake replacement should include cleaning of the wheel and vehicle speed sensors. Once this is done, the sensors and modules can be tested for accurate operation. Sensor issues account for approximately 80% of all ABS issues. Some of these issues may not cause an ABS warning light to activate.

Bleeding Procedure

Gravity, pressure, and vacuum methods are approved by Monroe®. Reverse bleeding is not recommended on vehicles with modern brake systems. A complete understanding of these procedures is required before executing. Follow the recommended bleeding sequence from the manufacturer, to insure proper removal of trapped air and contaminants.

Breaking-In New Monroe® Premium Brake Pads

High speed burnishing of the pads is not required or recommended! Proper initial break-in is one of the most important factors in determining brake pad performance. Proper break in during the final test drive seats the pads for optimum performance. Monroe® recommends 15 to 20 gentle stops from 20 mph. Advise customer to continue the non-aggressive break-in process during the first week of driving.

Combination Valves

Combination valves normally consist of a metering valve, a proportioning valve, and a pressure differential switch. The metering valve typically is designed to activate the rear brakes prior to the front brakes. This reduces brake dive and promotes even friction material wear (front to rear). The proportioning valve balances the braking forces front to rear, this helps prevent premature wheel lock up and balanced braking in corners. The pressure differential switch senses a leak in the front or rear hydraulic systems and then completes an electric circuit which turns on the brake warning light on the instrument panel. The combination valve should be tested for proper operation of all three functions.

Communicating Repairs

Monroe® endorses adherence to the Motorist Assurance Program (MAP) Standards of Service. These Standards of Service require that an inspection of the vehicle (problem) systems be made and the results communicated to the customer according to industry standards. Monroe® recommends participating shops utilize these Uniform Inspection & Communication Standards as part of the inspection process and for communicating their findings to their customers.

Complete Repair/Hydraulic System

Monroe® recommends performing a complete brake job. An inspection should be performed of all hydraulic system components including the:

- Master cylinder
- Combination valve
- Height Sensing Proportioning valve
- ABS system
- Disc calipers
- Wheel cylinders
- Brake lines and hoses

Performance testing for internal pressure bypass, and external hydraulic leaks fall under the Vehicle Safety Act.

Disc Caliper

Monroe® recommends caliper inspection during each brake job, to determine if repair/replacements are necessary. You are not required to replace or rebuild calipers in axle sets. However, when replacing or rebuilding a caliper due to existing conditions, you may suggest servicing, rebuilding, or replacement of the other caliper (on the same axle) for improved performance and preventive maintenance (an example would be, a part is close to the end of its useful life, replacing the caliper may extend pad life, or contribute to more balanced braking).

Disc Caliper Hardware

Monroe® recommends replacing hardware with every service. Proper fastening torque, and the use of thread locking compound is recommended with threaded mounting hardware.

Disc Pads

Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses. It is required that friction material be matched in axle sets for consistent braking characteristics.

Disc Rotor Replacement or Reconditioning (Machining)

Never machine a new rotor. Monroe® recommends a non-directional (swirl) finish that creates a surface roughness (Ra) that meets the O.E. standard. This finish can normally be obtained through orbital machining or manual block sanding. Block sanding is defined as using 120-150 grit sand paper with moderate to heavy force for 60 seconds per side. Always wash rotors before installing, if new or after servicing (See drum and disc rotor washing).

Friction material replacement does not require rotor replacement or reconditioning (machining) unless other justifications exist. Monroe® recommends rotor replacement or reconditioning (machining) if they exceed factory specifications in 1) lateral runout 2) thickness variations 3) have a groove in excess of .060 inch. It is not necessary to replace rotors in axle sets. However, when replacing or reconditioning a rotor due to the existing conditions, you may suggest replacing or reconditioning of the other rotor on the same axle to eliminate uneven braking behavior. Monroe® suggests indicating and servicing brake lathes, as per the manufacturer's recommendation.

Always use a torque wrench or torque sticks to install the wheel. Torque lug nuts to manufacturer's recommended specification.

Disc Rotor Lateral Runout

Disc rotor lateral runout is defined as the measurement of deviation of a surface from its plane. This measurement needs to be taken with a dial indicator in the appropriate manner. Excessive runout needs to be corrected; however, it may not always be necessary to correct through rotor reconditioning. Disc rotor lateral runout should be checked during the inspection process and confirmed once the rotor is replaced on the vehicle.

Drums

Monroe® recommends a non-directional (swirl) finish that creates a surface roughness (Ra) that meets the O.E. standard. This finish can normally be obtained through manual sanding. Sanding is defined as using 120-150 grit sand paper with moderate to heavy force for 60 seconds per drum. Friction material replacement does not require drum reconditioning unless other justifications exist. Determine the need to recondition based upon individual drum conditions. Drums should be inspected for hard spots, out of round, bell mouth, balance, and wear (maximum inside diameter). It is not necessary to replace drums in axle sets. However when replacing or reconditioning a drum, you may suggest reconditioning of the other drum on the same axle to eliminate uneven braking behavior. Always wash drums with warm soapy water and a clean cloth after servicing or before installing.

Drum and Disc Rotor Washing

Drums and rotors require removal of dust, metal particles, residues and/or coatings. New rotors come with a clear coating to prevent rust during shipping & storage. Remove this coating prior to installation. Use a distillate to cut through the coating, completely removing the protective coating from both sides of the rotor surface. Then wash the rotor.

Residual contaminants may also be present from reconditioning or shipping. Monroe® recommends removing contaminants with a non-detergent (clear) liquid cleanser and warm water. After washing, dry rotor or drum with a clean cloth. CAUTION: Shop towels are chemically treated and may leave a residue that will result in glazing. Compressed air contains traces of oil which will contaminate the rotor surface. Washing the rotor removes surface magnetism and fine steel particles left in the rotor grooves which can cause noise issues. Never apply any type of foreign substance to the rotor or disc pad friction surface.

Fluid

Brake bleeder screws should be opened when compressing caliper pistons to prevent contaminated fluid from backing up into the master cylinder, combination valve, or into sensitive ABS units. The master cylinder should be filled with the appropriate type fluid, from a sealed container. Correct fluid type (DOT3, DOT4 or DOT5) is stamped on the master cylinder cover. DOT3 or DOT4 type fluid should not be mixed with DOT5 type fluid. Most manufacturers prohibit the use of DOT5 brake fluid in a system equipped with ABS. Monroe® recommends using dip strips to detect copper sulfide levels. If testing indicates high levels of copper sulfides, system should be bleed of contaminated fluid, along with trapped air. System contaminated with petroleum based fluid must be bleed, cleansed and, all effected rubber seals replaced.

Lines & Hoses

Metal lines should be inspected for corrosion or damage, and only replaced with the same style and diameter line. Compression fittings should not be used in hydraulic brake systems. Rubber hoses should be inspected for internal and external damage, and should flow the same in both directions. Replace as required. Monroe® recommends using an O.E. approved brake line locking device, if required.

Lubrication

Monroe® includes a high quality silicone based lubricant with our premium brake pads. You should apply this lubricant to the metal backing plate, or the back of the brake pad shim. Monroe® also recommends lubricating all metal-to-metal contact areas, including caliper sliding surfaces, to reduce noise. Any lubrication contacting rubber boots should be done with a silicone based lubricant.

Parking Brake Systems

The parking brake is an integral part of the brake system. It is important that the parking brake function properly when brake service is performed. By law, the parking brake must sustain a vehicle from moving on the equivalency of a 6% grade. Monroe® recommends servicing, cleaning and adjusting all parking brakes including rear drum, rear disc with shoe or actuating caliper piston, front disc and hydro-electric parking brakes. Parking brake must operate to specifications set by manufacturer.

Shoes

Original Equipment Manufacturer (OEM) specifications designate replacement at different thicknesses. It is required that friction material be matched in axle sets for consistent braking characteristics.

Shoe Hardware

Self-Adjusting Systems: Lubricate star adjusters and replace hardware with every friction service.

Stop Lights

As part of a proper brake inspection, the brake light circuits/bulbs should be tested and repaired or replaced as required. This includes testing for proper activation of the brake pedal switch, or brake pedal position sensor.

Wheel Attachment Hardware

Check the condition of wheel studs. Replace broken or stretched studs as required. CAUTION: Proper lug nut torque is essential. Follow manufacturer torque specifications and tightening sequences. Monroe® recommends the use of a “click” type torque wrench or torque stick. DO NOT lubricate threads unless specified by the vehicle manufacturer.

Wheel Bearings, Races and Seals

Wheel bearings should be inspected for wear or damage and replaced as necessary. When replacing or repacking wheel bearings, grease seal replacement is required. You are not required to replace these components in axle sets. Determine the need to replace based upon each component’s individual condition.

Wheel Cylinders

You are not required to replace or rebuild wheel cylinders in axle sets. However, when rebuilding or replacing a wheel cylinder, you may suggest rebuilding or replacement of the other wheel cylinder (on the same axle) for preventive maintenance reasons; as an example, the part is close to the end of its useful life. Determine the need to rebuild or replace based upon the individual wheel cylinder conditions. The wheel cylinder should be inspected for external leakage, internal bypassing, binding, internal corrosion, and wear.

Some states may have specifications that differ from OEM. Check your local/state regulations. Where state or local laws are stricter, they take precedence over these guidelines.

DOUBLE-DISC GROUND BRAKE ROTORS

Many of the brake rotors supplied by various aftermarket and manufacturers have a double disc ground finish. This finish is easily identified by the non-directional or “swirled” friction surface.

Double disc grinding is the only procedure that ensures perfect parallelism and virtually eliminates runout and taper of the rotor surface. This finishing procedure, required by OE manufacturers, is accomplished by using specialized CNC precision grinding equipment costing nearly \$750,000. Tolerances are held to +/- .001 of an inch.

Many automotive technicians make it a practice to check runout on a new rotor before installation. This procedure is usually done using a brake lathe and dial indicator. However, brake lathes are incapable of matching the tolerances used in rotor finishing for these reasons:

1. The lathe arbor is only supported on one side.
2. The arbor has runout at the unsupported end.
3. The ends of the spacers and double taper adapters are not machined perfectly square. When a rotor is mounted on the lathe and the arbor nut is tightened, the spacers and adapters may shift, causing the rotor to shift on its axis. This actually introduces runout and will give the illusion that a perfect rotor is warped.

THIS CAN BE DEMONSTRATED ON ANY BRAKE LATHE BY THE FOLLOWING PROCEDURE.

1. Mount a rotor (a double-disc-ground rotor is preferable) with appropriate adapters and/or spacers and tighten the arbor nut. Note the torque used on the arbor nut.
2. Mount a dial indicator solidly to read runout near the outer edge of the friction surface.
3. Locate and mark the low and high spots on the rotor by rotating the rotor 360 degrees. Also, mark the location of the arbor in the relation to the marks on the rotor.
4. Loosen the arbor nut and, without moving any of the spacers, adapters or arbor, rotate the rotor 180 degrees and re-torque the arbor nut.
5. Repeat step 3. If the low and high spots are in the same locations in relation to the mark on the arbor then arbor and/or spacers and adapters are causing the rotor to exhibit runout. The low and high spots will appear to be reversed on the rotor.
6. To determine the cause of the runout, check the unsupported end of the arbor with a dial indicator. A couple of thousandths of an inch here will translate to several thousandths on a mounted rotor.