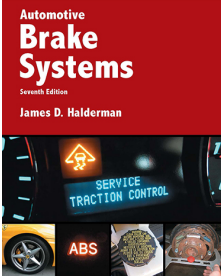


# Automotive Brake Systems



## CHAPTER 15

### Machining Brake Drums and Rotors

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## OBJECTIVES

- Explain the factors that cause rotor damage.
- Discuss brake drum distortion.
- Discuss disc brake rotors and causes of rotor distortion.

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## OBJECTIVES

- Explain the procedure for machining a brake drum and disc brake rotor.
- Explain how to machine a brake drum and when a brake drum should be discarded.

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## BRAKE DRUM AND ROTOR DAMAGE

- Scoring
  - Scoring is an extreme form of wear including scratches, deep grooves, and a generally rough finish on the friction surface
  - A scored drum or rotor will cause very rapid lining wear, often accompanied by a growling or grinding noise

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## BRAKE DRUM AND ROTOR DAMAGE

- Scoring can be machined out of a drum or rotor so long as the amount of metal removed is within the allowable limits
- Cracking
  - Cracks in a brake drum or rotor are caused by the stress of severe braking or an impact during an accident
  - Drums and rotors that have been previously machined are more susceptible to cracking than new parts

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## BRAKE DRUM AND ROTOR DAMAGE

- Cracks on drums are most often found near the bolt circle on the web, or at the open edge of the friction surface
- Rotors usually crack first at the edge of their friction surfaces

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## BRAKE DRUM AND ROTOR DAMAGE

- Heat Checking
  - Heat checking consists of many small, interlaced cracks on the friction surface that penetrate only a few thousandths of an inch into the metal and seldom pass through the structure of the drum or rotor

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## BRAKE DRUM AND ROTOR DAMAGE

- Heat checking is usually caused by a driver who leaves one foot on the brake pedal while applying the accelerator with the other or by repeated heavy braking or numerous panic stops made in rapid succession
- Light heat checking can often be machined away, but in more severe cases the drum or rotor must be replaced

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## BRAKE DRUM AND ROTOR DAMAGE

- Hard and Hot Spots
  - Hard spots, also called hot spots, occur when localized impurities in the metal are burned away
  - Hard spots are roughly circular, bluish gold, glassy-appearing areas on the friction surface
  - Most vehicle manufacturers recommend replacement of the drum or rotor if hard spots are found

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## BRAKEA DRUM DISTORTION

- Distortion
  - Distortion is normal during brake operation, but brakes usually return to their original shape once the brakes are released
  - When the friction surface does not return to its proper shape, is no longer parallel to the axle, or does not rotate in a precise circle around the axle, the drum is distorted

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## "MACHINE TO" VERSUS "DISCARD"

- Brake drums can usually be machined a maximum of 0.060 in. (1.5 mm) oversize unless otherwise stamped on the drum
- Most brake experts recommend that both drums on the same axle be within 0.010 in. (0.25 mm) of each other

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## "MACHINE TO" VERSUS "DISCARD"

- The maximum specified inside diameter (ID) means the maximum wear inside diameter
- Always leave at least 0.015 in. (0.4 mm) after machining (resurfacing) for wear
- Many manufacturers recommend that 0.030 in. (0.8 mm) be left

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## MACHINING BRAKE DRUMS

- Machining a Drum Procedure
  - Typical drum brake machining steps include the following:
    - STEP 1: Mount the drum on the lathe and install the silencer band.
    - STEP 2: Turn the drum by hand before turning on the lathe to be sure everything is properly mounted. Advance the tool bit manually until it just contacts the drum. This is called a scratch cut.

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## MACHINING BRAKE DRUMS

- Machining a Drum Procedure
  - Typical drum brake machining steps include the following:
    - STEP 3: Stop the lathe and back off the tool bit. Loosen the arbor nut, rotate the drum one-half turn (180°) on the arbor, and retighten the arbor nut. Turn the lathe on and make a second scratch cut.
      - a. If the scratch cuts are side-by-side, the lathe is okay and machining can begin.

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## MACHINING BRAKE DRUMS

- Machining a Drum Procedure
  - Typical drum brake machining steps include the following:
    - STEP 3: Stop the lathe and back off the tool bit. Loosen the arbor nut, rotate the drum one-half turn (180°) on the arbor, and retighten the arbor nut. Turn the lathe on and make a second scratch cut.
      - b. If the scratch cuts are opposite, remove the drum and check for nicks, burrs, or chips on the mounting surfaces.

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## MACHINING BRAKE DRUMS

- Machining a Drum Procedure
  - Typical drum brake machining steps include the following:
    - STEP 4: Start the lathe and set the depth of the cut.

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## MACHINING BRAKE DRUMS

- Machining a Drum Procedure
  - The maximum rough cut depends on the lathe type
  - The minimum cut is usually specified as no less than 0.002 in. (0.05 mm)

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## DISC BRAKE ROTORS

- Disc brake rotors use cast gray iron at the area that contacts the friction pad
- Rotors, also called discs or disks, have mass (weight) that absorbs heat

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## DISC BRAKE ROTORS

- The heavier the rotor, the more heat can be absorbed
- As the weight of the rotor decreases, the less heat the rotor can “store” or absorb, resulting in the rotor getting hotter

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## DISC BRAKE ROTORS

- As the rotor gets hotter, it expands and “grows” larger where it is the hottest
- If allowed to cool gradually, the rotor simply returns to its original shape
- If exposed to water, the rotor may cool rapidly, causing distortion

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## DISC BRAKE ROTOR DISTORTION

- Causes of Rotor Distortion
  - Distortion can occur during braking if there is a problem with the friction assembly, such as a frozen caliper piston that creates unequal application force on the two sides of the rotor

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## DISC BRAKE ROTOR DISTORTION

- Causes of Rotor Distortion
  - Friction surface distortion is much more significant in a disc brake rotor than in a brake drum

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## WHEN THE ROTORS SHOULD BE MACHINED

- A worn rotor has a very smooth friction surface that is ideal for replacement (new) disc brake pads
- Often when rotors are machined, the surface finish is not as smooth as specified

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## WHEN THE ROTORS SHOULD BE MACHINED

- A rotor should be machined only if one of the following conditions exists:
  - Grooves deeper than 0.060 in. (1.5 mm).
  - Thickness variation exceeding specifications and a brake pedal pulsation complaint.
  - Heavy rust that has corroded the friction surface of the rotor.

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## SUMMARY

- Scoring is an extreme form of wear including scratches, deep grooves, and a generally rough finish on the friction surface
- Cracks in a brake drum or rotor are caused by the stress of severe braking or an impact during an accident
- Disc brake rotors use cast gray iron at the area that contacts the friction pad

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