

Roadranger®

Dana® Spicer® Brakes

Brake Systems



EATON

One Great Drivetrain from Two Great Companies

Troubleshooting Guide BRIP-0300 November 1994



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Foreword

Purpose

This Eaton manual is intended as a diagnostics guide for technicians involved in the servicing of Eaton EB and ES Model Brakes.

How to Use this Manual

This manual outlines the steps necessary to pinpoint the source of problems and concerns related to braking systems. It does not describe service procedures, but instead refers the technician to service manual sections whenever possible. Therefore, this manual should be used as a "checklist" in conjunction with Eaton service manuals and other procedural guides.

To isolate the source of a problem or concern, follow the steps below:

1. Identify the symptom(s) exhibited by the braking system. Locate the related section in this manual. (For example, if the brakes are making unusual sounds, turn to the page labeled "Noise".)

2. Use the left-hand column as a checklist. Check each item on the list. If an item is found to be defective, perform the corresponding action prescribed in the right-hand column. (For example, noise may be caused by a bent brake spider. The recommended action is to replace the spider.)
3. Refer to the appropriate service manual section for information on specific procedures. Related service manual sections are shown in parenthesis, whenever possible. (Service Manual BRSM-0033)

Note: Included in the General Information section are assembly diagrams to assist in troubleshooting.

⚠ Work through all potential conditions or causes related to the symptom encountered before making a final conclusion. It is possible that several problems exist, each with the same symptom. Therefore, checking each item on the list will help to ensure that all problem sources are eliminated or corrected.

⚠ Replace only those parts that have been identified as definite problems. Doing so will save unnecessary time and expense.

BRAKE SYSTEMS DIAGNOSTIC GUIDE	
POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Dragging brakes	See DRAGGING BRAKES
Insufficient lining-to-drum contact: • Bell-mouthed drum condition • Poor surface condition of drum • Bent brake spider • Bent or stretched brake shoe • Loose wheel bearing • Worn or damaged camshaft • Improper lining grind	▶ Replace drum (3,6) ▶ Rebore or replace drum (3,6) ▶ Replace spider (3,6) ▶ Replace shoe (3,6) ▶ Torque spindle nuts and check end play (6) ▶ Replace camshaft (3,6) ▶ Grind linings to fit drum radius
Linings tapered across width: • Bell-mouthed drum condition • Poor surface condition of drum • Bent brake spider • Loose wheel bearing	▶ Replace drum (3,6) ▶ Rebore or replace drum (3,6) ▶ Replace spider (3,6) ▶ Torque spindle nuts and check end play (6)
Unequal shoe wear on same brake: • Mismatched lining friction codes • Worn camshaft or bushings	▶ Correct as required with proper lining (5) ▶ Replace camshaft or bushings (3,6)
Glazed linings: • Unbalanced brake system • Incorrect lining for vehicle type and service • Dragging spring brake chamber	▶ Inspect brake system (2) ▶ Install proper lining (6) ▶ Inspect valves and chamber for leaks. Replace air chamber (4,6)
Scored or grooved linings and drum: • Improperly machined drum • Abrasive material between lining and drum	▶ Replace or machine drum (3,6) ▶ Remove dirt and debris. Clean drum and remachine if required (3)
Loose lining: • Improper rivet size • Improper crimping of rivets • Enlarged rivet holes in shoe • Incorrect lining hole size or counterbore depth	▶ Replace rivets (5) ▶ Replace rivets (5) ▶ Replace shoe (3,6) ▶ Replace lining (5)
Cracked lining at rivet holes: • Dirt or rust on shoe table • Incorrect counterbore lining size • Loose rivets	▶ Remove dirt and debris. Clean and repaint shoe (3) ▶ Replace linings (5) ▶ Replace linings and check rivet process (5)



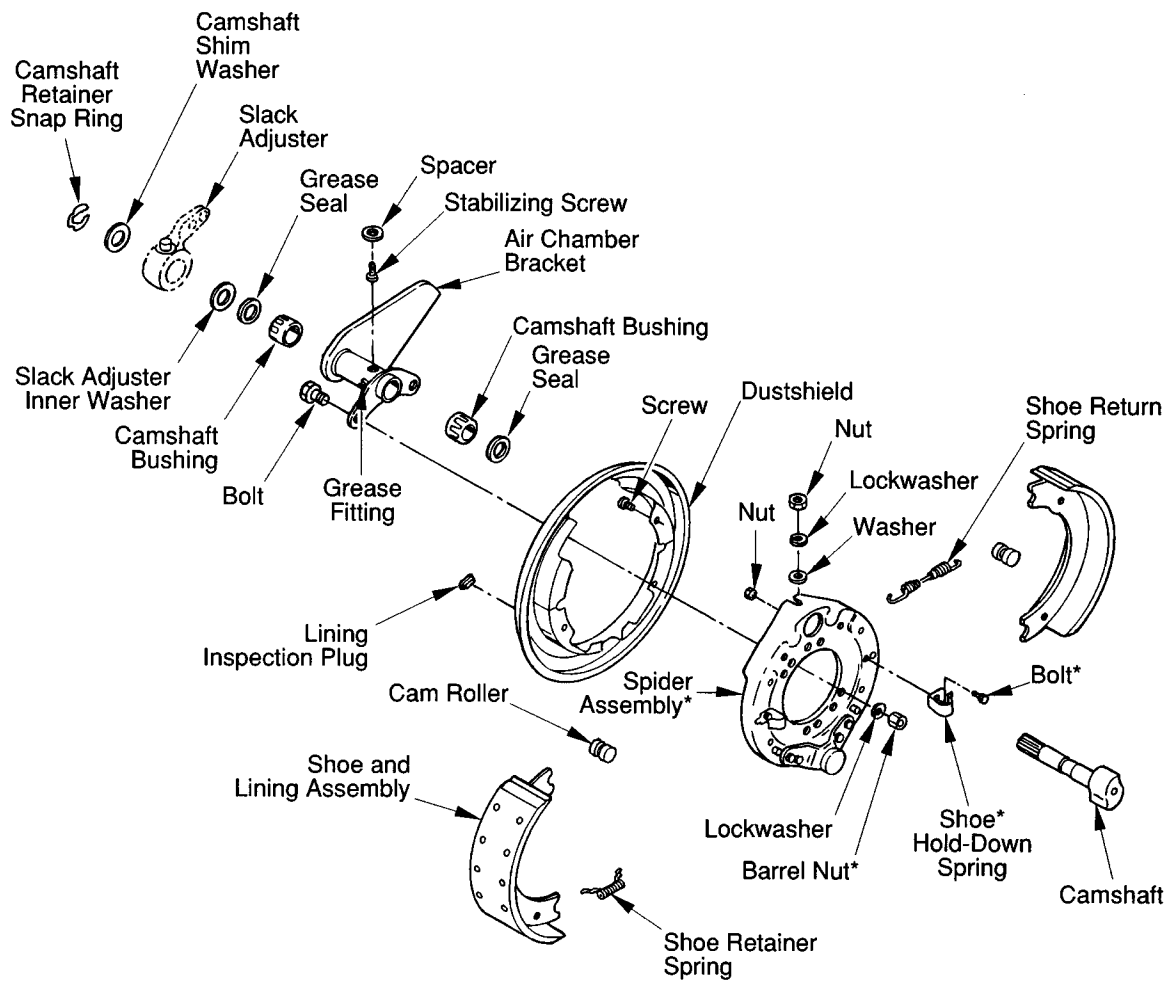
**AVOID CREATING DUST
POSSIBLE CANCER AND LUNG DISEASE HAZARD**

While Eaton does not offer asbestos brake linings, the long-term effects of some non-asbestos fibers have not been determined. Current OSHA Regulations cover exposure levels to some components of non-asbestos linings but not all. The following precautions must be used when handling these materials.

1. AVOID CREATING DUST. Compressed air or dry brushing must never be used for cleaning brake assemblies or the work area.
2. EATON RECOMMENDS THAT WORKERS DOING BRAKE WORK MUST TAKE STEPS TO MINIMIZE EXPOSURE TO AIRBORNE BRAKE LINING PARTICLES. Proper procedures to reduce exposure include working in a well ventilated area, segregation of areas where brake work is done, use of local filtered ventilation systems or use of enclosed cells with filtered vacuums. Respirators approved by the Mine Safety and Health Administration (MSHA) or National Institute for Occupational Safety and Health (NIOSH) should be worn at all times during brake servicing.
3. Workers must wash before eating, drinking or smoking; shower after working, and should not wear work clothes home. Work clothes should be vacuumed and laundered separately without shaking.
4. OSHA regulations regarding testing, disposal of waste and methods of reducing exposure for asbestos are set forth in 29 Code of Federal Regulations § 1910.001. These regulations provide valuable information which can be utilized to reduce exposure to airborne particles.
5. Material safety data sheets on this product, as required by OSHA, are available from Eaton.

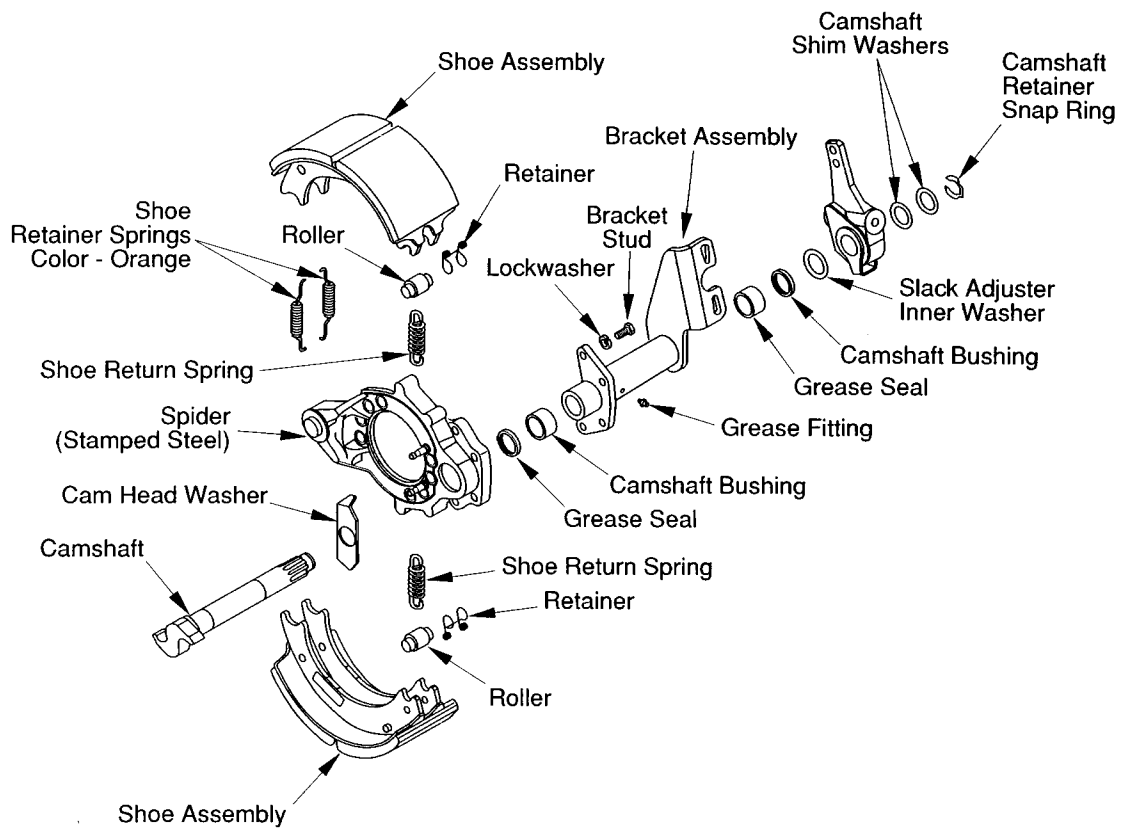
BRAKE SYSTEMS DIAGNOSTIC GUIDE

ES/EB-150-4L



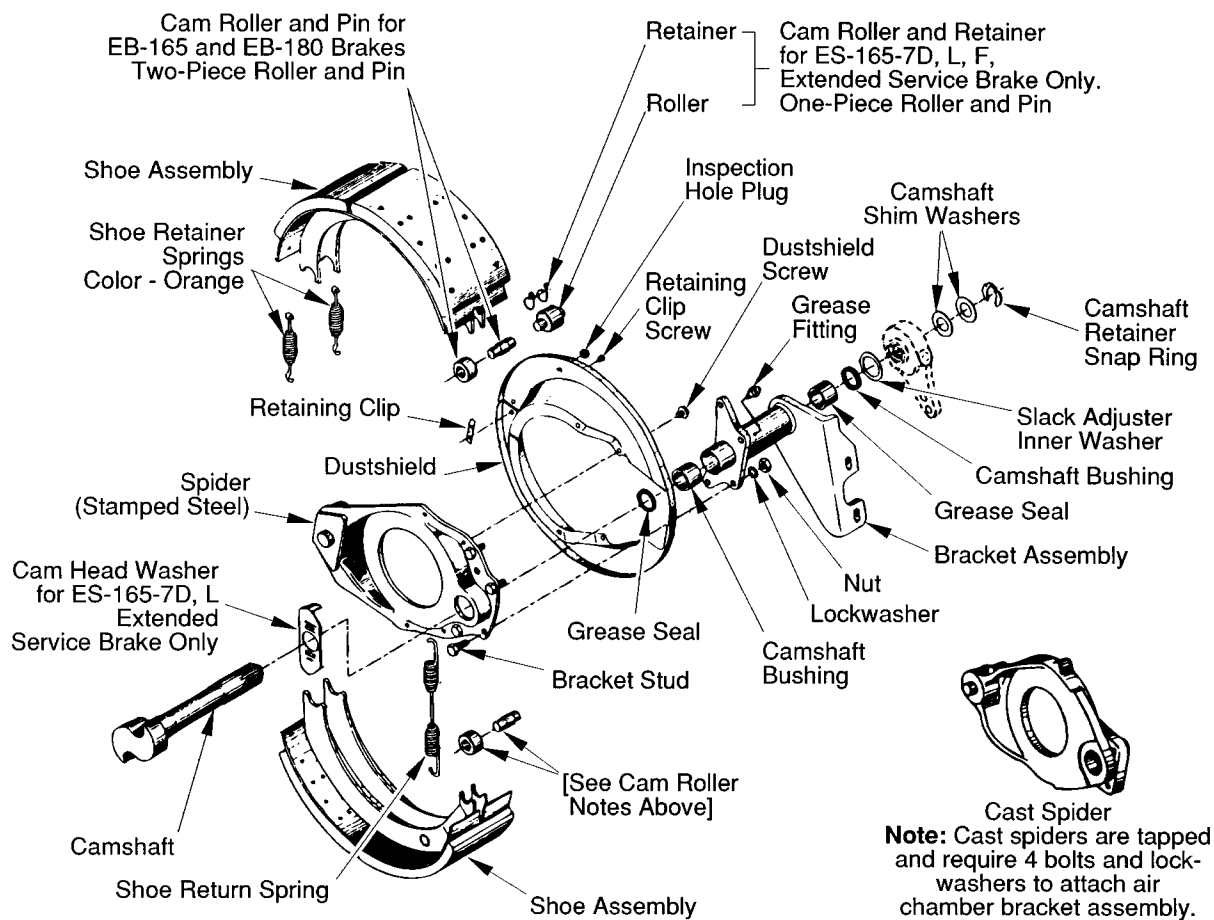
BRAKE SYSTEMS DIAGNOSTIC GUIDE

ES-150-8D, F



BRAKE SYSTEMS DIAGNOSTIC GUIDE

EB/ES-165-7L,D

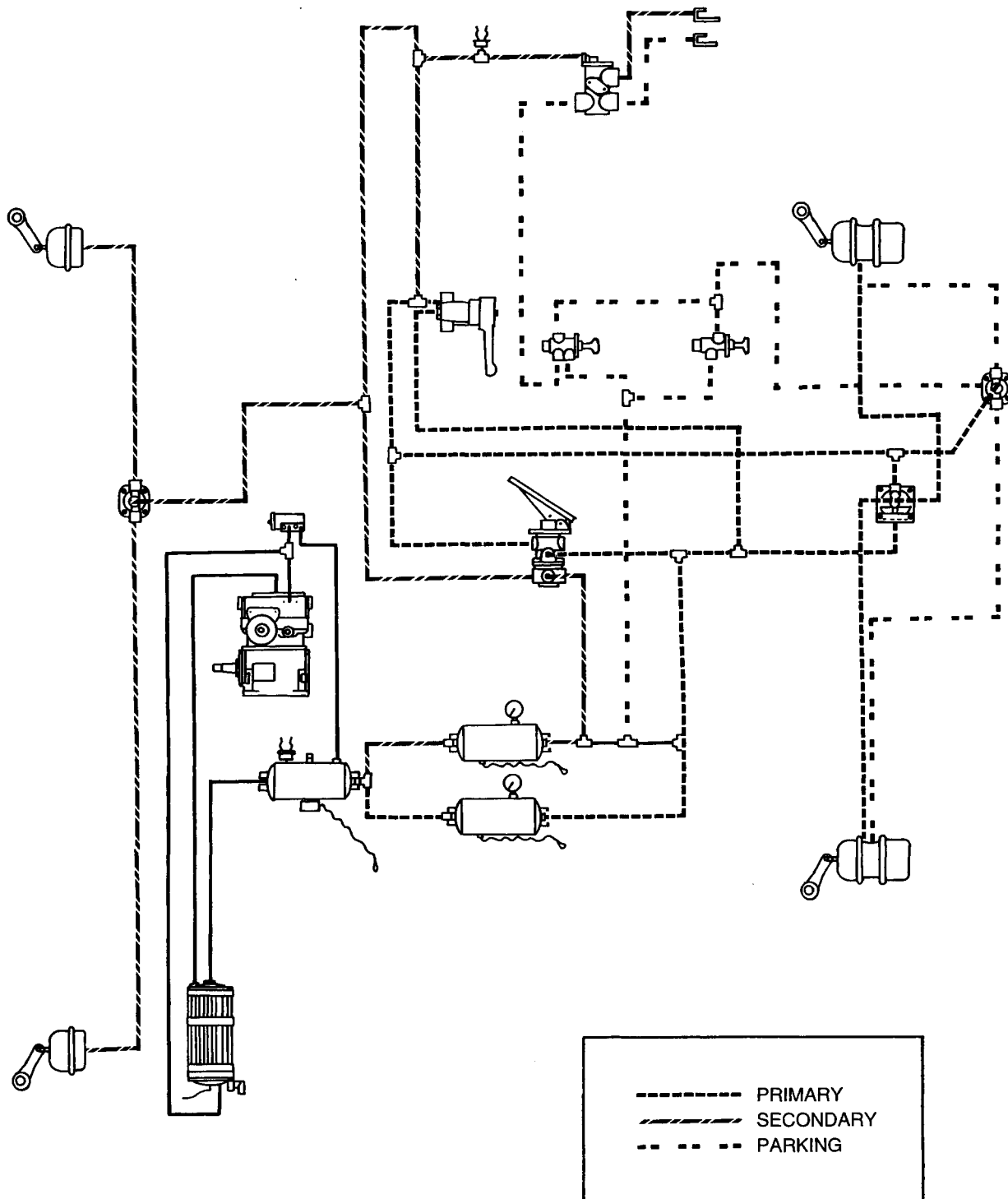


BRAKE SYSTEMS DIAGNOSTIC GUIDE

POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Dragging brakes	See DRAGGING BRAKES
Insufficient lining-to-drum contact: • Bell-mouthed drum condition • Poor surface condition of drum • Bent brake spider • Bent or stretched brake shoe • Loose wheel bearing • Worn or damaged camshaft • Improper lining grind	• Replace drum (3,6) • Rebore or replace drum (3,6) • Replace spider (3,6) • Replace shoe (3,6) • Torque spindle nuts and check end play (6) • Replace camshaft (3,6) • Grind linings to fit drum radius
Linings tapered across width: • Bell-mouthed drum condition • Poor surface condition of drum • Bent brake spider • Loose wheel bearing	• Replace drum (3,6) • Rebore or replace drum (3,6) • Replace spider (3,6) • Torque spindle nuts and check end play (6)
Unequal shoe wear on same brake: • Mismatched lining friction codes • Worn camshaft or bushings	• Correct as required with proper lining (5) • Replace camshaft or bushings (3,6)
Glazed linings: • Unbalanced brake system • Incorrect lining for vehicle type and service • Dragging spring brake chamber	• Inspect brake system (2) • Install proper lining (6) • Inspect valves and chamber for leaks. Replace air chamber (4,6)
Scored or grooved linings and drum: • Improperly machined drum • Abrasive material between lining and drum	• Replace or machine drum (3,6) • Remove dirt and debris. Clean drum and remachine if required (3)
Loose lining: • Improper rivet size • Improper crimping of rivets • Enlarged rivet holes in shoe • Incorrect lining hole size or counterbore depth	• Replace rivets (5) • Replace rivets (5) • Replace shoe (3,6) • Replace lining (5)
Cracked lining at rivet holes: • Dirt or rust on shoe table • Incorrect counterbore lining size • Loose rivets	• Remove dirt and debris. Clean and repaint shoe (3) • Replace linings (5) • Replace linings and check rivet process (5)

NOISE

BRAKE SYSTEMS DIAGNOSTIC GUIDE

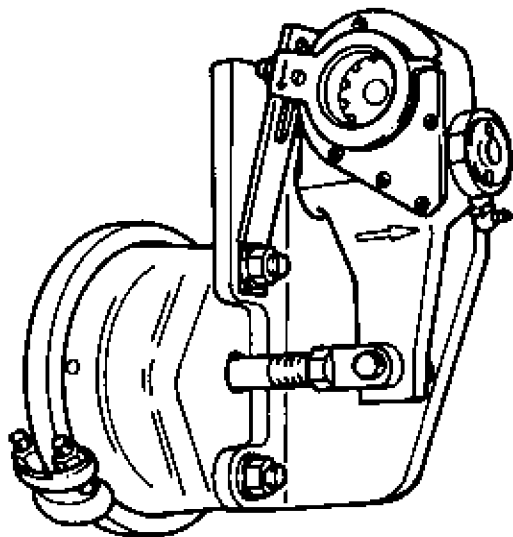


BRAKE SYSTEMS DIAGNOSTIC GUIDE

POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Inadequate air supply to chamber: • Old or broken lines • Pinhole leaks in air chamber line • Loose or damaged fittings • Air line inner lining separation	✦ Replace chamber air lines (3) ✦ Replace chamber air lines (3) ✦ Tighten or replace fittings (3) ✦ Replace chamber air lines (3)
Separation: • Plugged lines • Contamination	✦ Remove blockage ✦ Remove contamination
Valve problems: • Worn valves • Internal component failures • Seals/O-rings damaged • External vents blocked	✦ Repair or replace ✦ Repair or replace ✦ Replace seals/O-rings ✦ Remove blockage
Governor failure: • Incorrect set point • Contamination • Damaged valve	✦ Correct set point ✦ Remove contamination ✦ Repair or replace
Compressor failure: • Worn or leaking compressor • Slipping/broken belts/drives	✦ Repair or replace compressor ✦ Repair or replace belts or drives
Contamination: • No air dryer • Faulty air dryer • Dirty/damaged filter • Desiccant debris • Incompatible oils	✦ Install air dryer ✦ Repair or replace air dryer ✦ Replace air filter ✦ Remove debris ✦ Drain and refill oil
Leaking air tanks	✦ Repair or replace
Improperly set air chamber: • Too much rod free-travel	✦ Adjust brakes (2)
Slack adjuster improperly set: • Incorrect installation of slack adjuster • Incorrect in-service adjustment • Incorrect setup of external reference control arms (Eaton-Haldex) • Worn clevis pin	✦ Install slack adjuster properly (3,6) ✦ Adjust brakes using correct procedure (2,6) ✦ Perform correct setup procedure (3,6) ✦ Replace clevis pin (3,6)

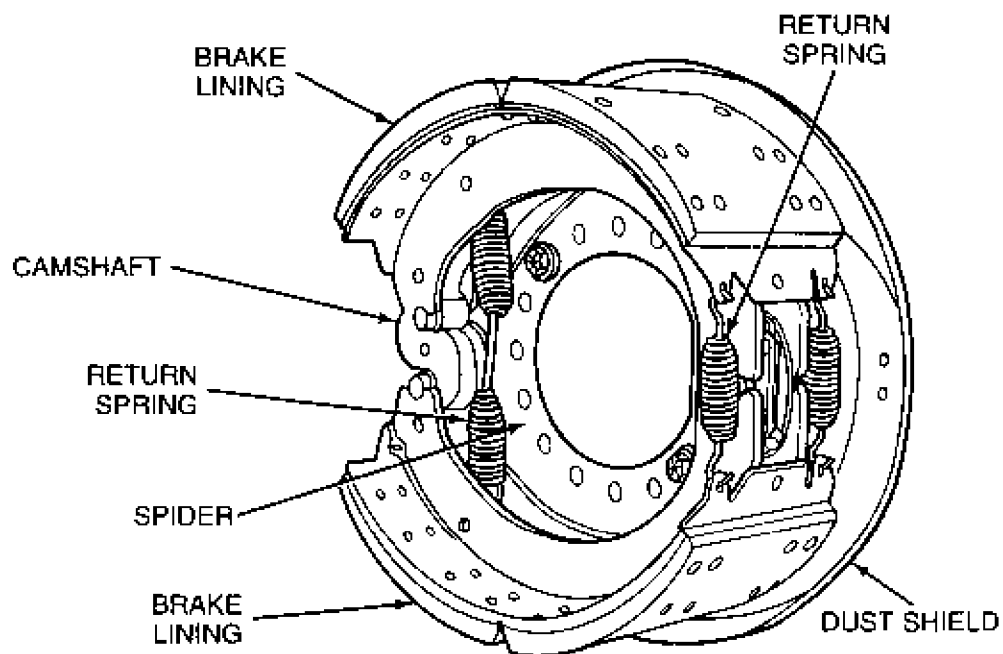
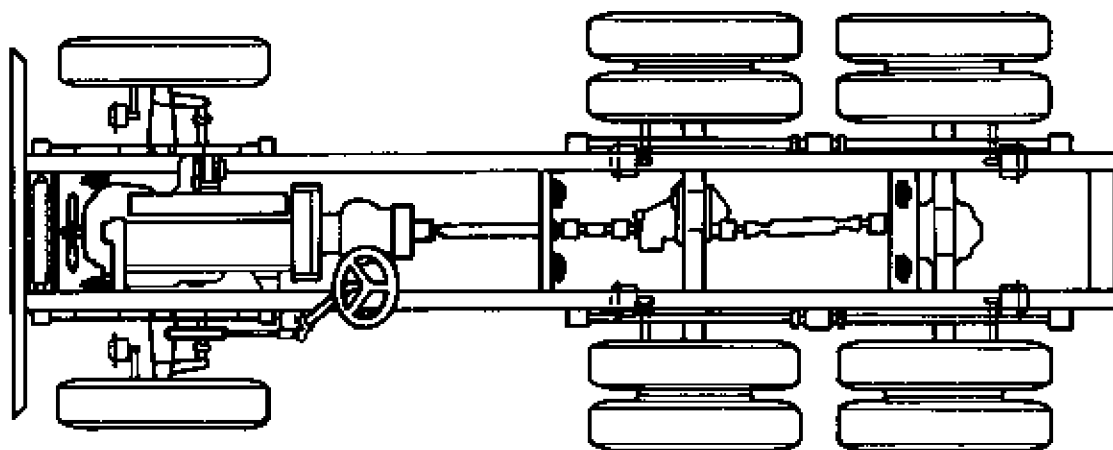
LONG STOPPING DISTANCES

BRAKE SYSTEMS DIAGNOSTIC GUIDE



POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Slack adjuster not functioning properly: • Bushing worn • Spline damaged • Worn or damaged internal parts • Incorrect slack window (auto slacks)	• Replace bushing (3,6) • Replace slack adjuster (3,6) • Replace slack adjuster (3,6) • Install correct window (3,6)
Overadjustment/underadjustment: • Contamination of internal parts (auto slacks) • False feedback to slack adjuster due to degraded foundation brake components (see below) • Severely glazed or worn linings	• Replace slack adjuster (3,6) • Replace bad foundation brake component • Replace linings (5)
Degraded foundation brake components: • Grease or oil on linings • Flat spots on cam or rollers	• Replace linings (5) • Replace cam or roller (3,6)
Camshaft bushings binding: • lacks lubricant • Stretched shoe • Other broken or bent parts • Performing downgrade braking using light drag	• Lubricate bushings • Replace shoe (3,6) • Replace damaged parts as required (3,6) • Use snub method on downgrades

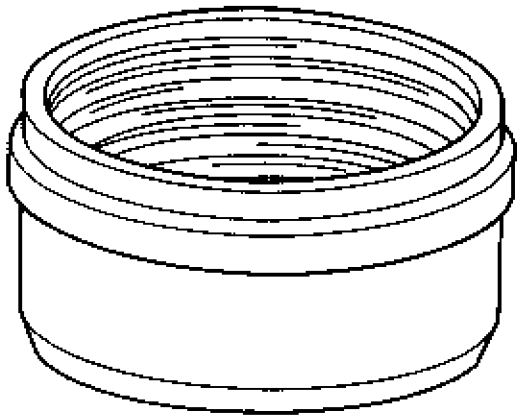
BRAKE SYSTEMS DIAGNOSTIC GUIDE



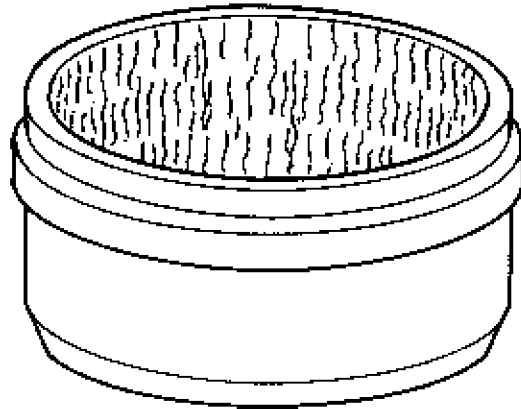
POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Dragging brakes	See DRAGGING BRAKES ♦ Check brake adjustment
Grabbing or pulling brakes: • Grease, oil or dirt on linings • Glazed linings • Cam bracket seal failure • Brake linings not a balanced set, different codes, or lining brand • Loose or broken linings • Brake drum out-of-round • Defective brake drum • Camshaft binding at one or more wheels • Defective slack adjuster • Uneven brake adjustment (side-to-side) • Broken or bent part(s) • Loose spider or drum mounting bolts • Different air chamber size or slack adjuster length (side-to-side)	♦ Replace linings (5) ♦ Deglaze linings or replace (5) ♦ Replace seals (5) ♦ Replace linings (5) ♦ Replace linings (5) ♦ Replace drum (3,6) ♦ Replace drum (3,6) ♦ Clean and lubricate (2,3) ♦ Replace slack adjuster (3,6) ♦ Adjust brakes (2) ♦ Replace part(s)(6) ♦ Retorque bolts (6) ♦ Use same size air chamber and slack adjuster length on all brakes

BRAKE SYSTEMS DIAGNOSTIC GUIDE

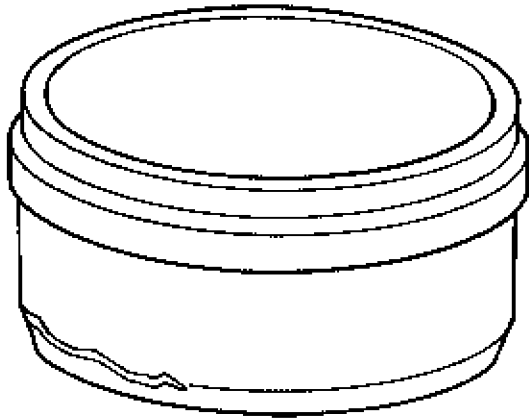
1.) Scoring



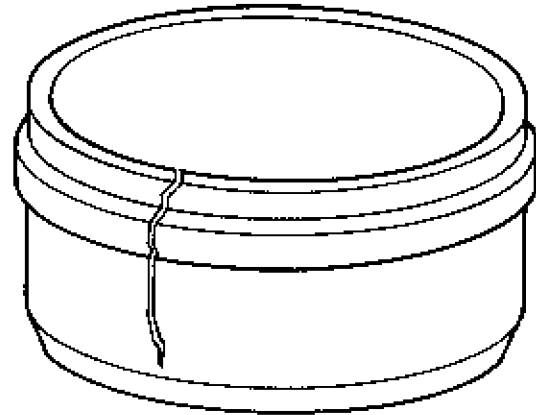
2.) Severe Heat Checking (Drum cannot be turned to eliminate heat cracks)



3.) Cracking Through Hat Section



4.) Cracking Through Side Wall



POTENTIAL CONDITION/CAUSE

Dragging brake

- Brake drum heat checked:
- Out-of-round brake drum
 - Eccentric mounting of drum
 - Loose wheel bearing
 - Glazed linings
 - Improper friction materials for vehicle type and vocation
 - Overworked brake
 - Driver abuse
 - Wrong drum type
 - Defective brake lining
 - Debris between lining and drum
 - Performing downgrade braking using light drag

Excessive scoring of drum:

- Soft drum

Excessive lining wear

ACTION (SERVICE MANUAL SECTION)

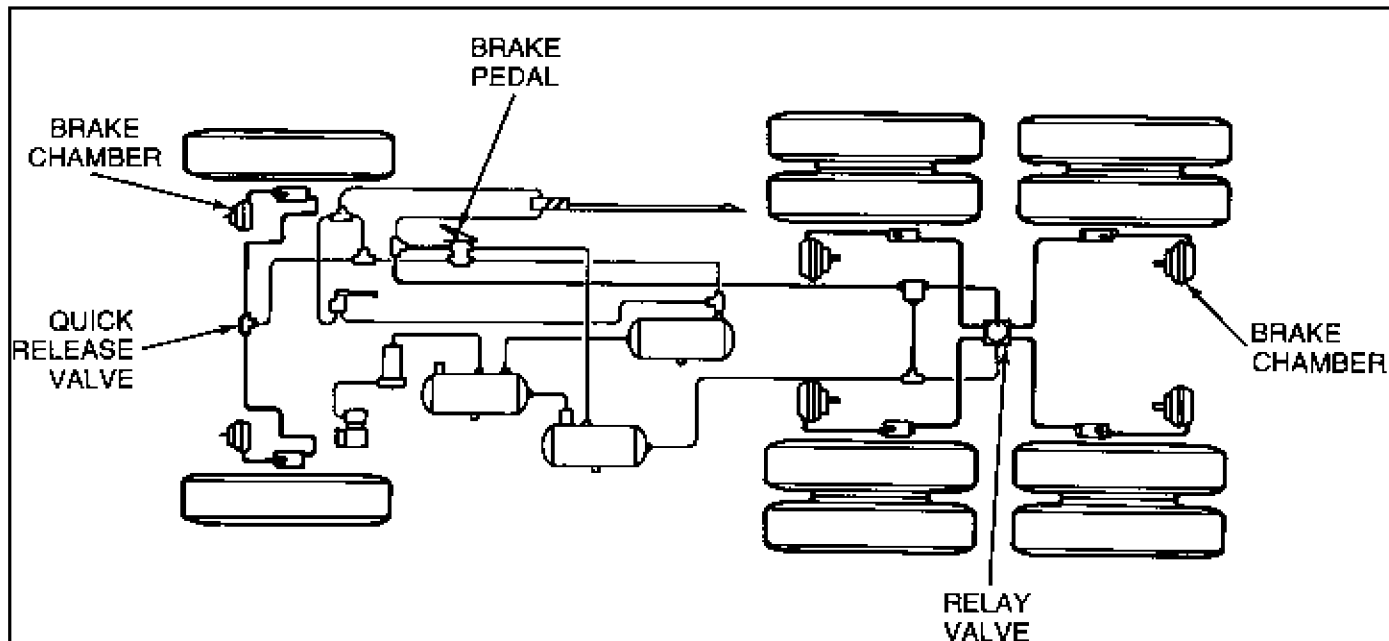
See DRAGGING BRAKES

- ◆ Replace drum (3)
- ◆ Correct as required (3)
- ◆ Correct as required
- ◆ Deglaze or replace linings (5)
- ◆ Consult dealer for proper friction levels
- ◆ Check brake balance (2)
- ◆ Correct as required
- ◆ Replace with correct drum type (3)
- ◆ Replace lining (5)
- ◆ Clean, remove dirt and debris (3)
- ◆ Use snub method on downgrades

- ◆ Replace drum (3)

See PREMATURE LINING WEAR

BRAKE SYSTEMS DIAGNOSTIC GUIDE



**PARKING BRAKE WILL NOT HOLD/
DRAGGING BRAKES**

POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Blockage in air lines preventing air chamber from exhausting: • Air line inner lining separation • Plugged lines • Contamination • Damaged fittings	• Replace line • Remove blockage • Remove contamination • Replace fittings
Air valves sticking: • Seals/O-rings damaged • External vents blocked • Contamination • Worn valves/internal component failures	• Replace seals/O-rings • Remove blockage • Remove contamination • Repair or replace as required
Spring brake not functioning: • Power spring failure	• Replace spring brake chamber
Air chamber not set properly: • Too much rod free-travel • Air chamber in wrong position in bracket slot • Pushrod length too long	• Adjust brakes (2) • Reposition air chamber or bracket (3) • Adjust clevis or shorten pushrod (2)
Slack adjuster not set properly: • Incorrect installation of slack adjuster • Incorrect in-service adjustment • Incorrect setup of external reference control arms (Eaton-Haldex) • Broken or bent parts	• Install slack adjuster properly (3,6) • Check and correct adjustment procedure (2) • Perform correct setup procedure (2) • Replace damaged parts as required (3,6)
No force at shoes: • Grease, oil or dirt on linings	• Replace linings (5)
Lack of friction: • Glazed linings • Worn/damaged drums • New linings, not burnished	• Deglaze or replace linings (5) • Replace drums (3) • Burnish linings

BRAKE SYSTEMS DIAGNOSTIC GUIDE

PARKING BRAKE WILL NOT HOLD/
DRAGGING BRAKES

POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Incomplete release of air chamber after service application: • Incorrect clevis position • Incorrect bracket slot • Damaged pushrod • Air chamber return spring failure • Road debris damage • Blockage in other upstream air system parts	◆ Reposition clevis (6) ◆ Reposition on correct bracket slot (6) ◆ Replace air chamber (3,6) ◆ Replace air chamber (3,6) ◆ Repair damage (5) ◆ Remove blockage (5)
Incomplete release of parking brake after application of pressure to air chamber: • Internal cup/cone hang-up • Damaged pushrod • Diaphragm leak in parking chamber • Cocked power spring • Pushrod seal leak • Blockage in other upstream air system parts	◆ Repair or replace cup/cone ◆ Replace pushrod (3,6) ◆ Replace diaphragm or air chamber (3,6) ◆ Repair power spring ◆ Replace seal (5) ◆ Remove blockage
Air leaks in parking system: • Old or broken lines • Pinhole leaks in air line • Loose or damaged fittings • Damaged or contaminated valve	◆ Replace lines ◆ Replace line ◆ Tighten or replace fittings ◆ Repair or replace valve
Blockages in service system air lines: • Inner lining separation • Plugged lines • Contamination	◆ Replace chamber air lines ◆ Remove blockage ◆ Remove contamination
Air valves sticking: • Seals/O-rings damaged • External vents blocked • Low air pressure to valve (see below)	◆ Replace seals/O-rings ◆ Remove blockage ◆ Check for blockage ◆ Check compressor
Low air pressure supplied to system: • Governor failure - — Incorrect set point — Contamination — Damaged valve • Compressor Failure - — Worn or leaking components — Damaged components — Slipping or broken belts or drives	◆ Adjust set point ◆ Remove contamination ◆ Repair or replace valve ◆ Repair or replace ◆ Repair or replace ◆ Repair or replace

BRAKE SYSTEMS DIAGNOSTIC GUIDE

POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Contamination - —No air dryer —Faulty air dryer —Dirty or damaged filter —Desiccant debris —Incompatible oils —Leaking air tanks —Mis-adjusted brakes	◆ Install air dryer ◆ Repair or replace ◆ Replace filter ◆ Clean desiccant ◆ Drain and refill with proper oil ◆ Repair or replace tank ◆ Readjust brakes
Insufficient pushrod free travel: • Pushrod length too long • Incorrect installation of slack adjuster	◆ Shorten pushrod to proper length ◆ Perform correct installation procedure (6)
Overadjusted slack adjuster: • Incorrect in-service adjustment (manual) • Incorrect setup of external reference control arms (Eaton-Haldex) • Incorrect slack window (auto slacks) • Contamination of internal parts (auto) • False feedback to slack adjuster (review all foundation brake and wheel end problems) • Auto slack installed and/or adjusted with spring brake partially applied (low reservoir pressure) • Performing downgrade braking using light drag	◆ Readjust using proper procedure ◆ Perform correct setup procedure ◆ Replace with proper slack window (6) ◆ Replace slack adjuster (6) ◆ Check lining clearances and hub/drum run-out (4) ◆ Readjust with spring brake fully retracted ◆ Use snub method on downgrades
Cam flip over: • Worn linings/drums • Worn shoes/rollers • Worn cam	◆ Replace linings/drums (3,5,6) ◆ Replace as necessary (3,6) ◆ Replace cam (3,6)
Binding of camshaft in bushings: • Corrosion • Lack of lubricant • Damaged bushings/journals	◆ Replace bushings and lubricate (5) ◆ Lubricate with proper lubricant (2) ◆ Replace bushings/journals (5)
Drum out-of-round: • Worn-out drum • Overloading of vehicle • Over-aggressive linings • Driver abuse • Incorrect turning of drum • Performing downgrade braking using light drag	◆ Replace drum (3,6) ◆ Don't exceed legal weight rating of vehicle ◆ Change lining friction rating ◆ Correct as required ◆ Perform correct drum turning operation (2) ◆ Use snub method on downgrades

PARKING BRAKE WILL NOT HOLD/
DRAGGING BRAKES

ES-165-7H, M

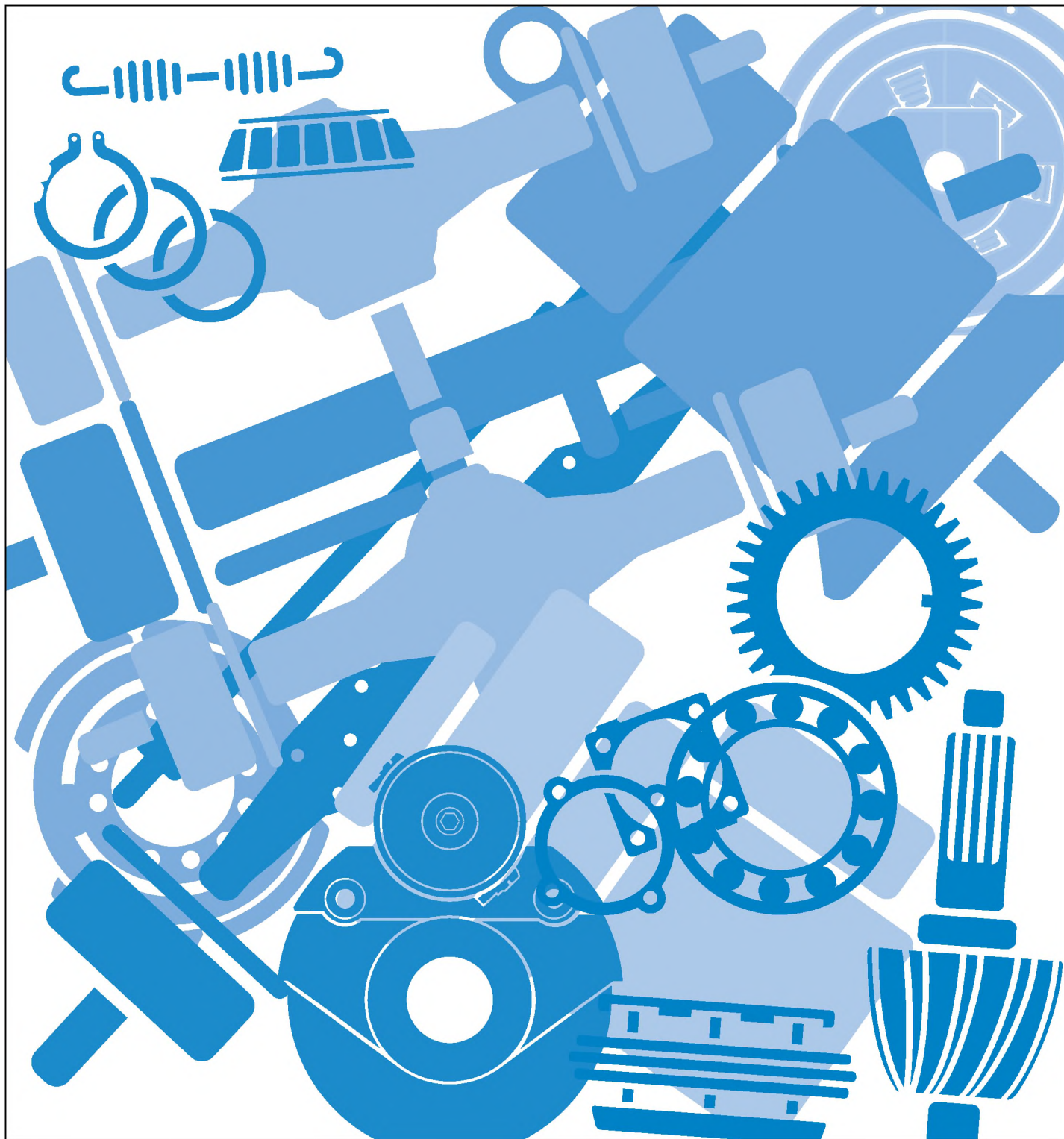


BRAKE SYSTEMS DIAGNOSTIC GUIDE

POTENTIAL CONDITION/CAUSE	ACTION (SERVICE MANUAL SECTION)
Dragging brakes	See DRAGGING BRAKES
Poor lining-to-drum contact. Linings are tapered across width: • Bell-mouthed drum • Bent brake spider • Bent or stretched brake shoe • Loose wheel bearing • Worn or damaged cam	• Replace drum (3) • Replace spider (3,6) • Replace shoe (3,6) • Torque spindle nuts and check end play (6) • Replace cam (3,6)
Shoe-to-shoe variation: • Mismatched lining friction codes • Stretched shoe	• Replace lining(s) with proper friction code (5) • Replace shoe (3,6)
Brake components: • Flat spots on cam or roller • Worn anchor pin • Worn camshaft or bushings	• Replace cam or roller (3,6) • Replace anchor pin (3,6) • Replace camshaft and bushings (5)
Unequal wear on side-to-side brakes for same axle: • Mismatched lining friction codes • Seized or binding camshaft • Brake drum surface in poor condition • Loose wheel bearing • Performing downgrade braking using light drag	• Replace lining(s) with proper friction code (5) • Clean and lubricate camshaft (2) • Replace drum (3) • Torque spindle nuts and check end play (6) • Use snub method on downgrades
Slack adjuster not set properly: • Incorrect installation of slack adjuster • Incorrect in-service adjustment • Incorrect setup of external reference control arms (Eaton-Haldex) • Broken or bent parts	• Install slack adjuster properly (3,6) • Check and correct adjustment procedure (2) • Perform correct setup procedure (2) • Replace damaged parts as required (3,6)
Wear on edge of lining: • Wrong lining width • Wrong drum • Loose bearing adjustment. Bearing spacer missing or too thin	• Replace lining (5) • Replace drum (3) • Replace spacer and torque spindle nuts. Check end play (6)

PREMATURE LINING WEAR

NOTES:



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National Institute for
**AUTOMOTIVE
SERVICE
EXCELLENCE**

Roadranger®

MORE TIME ON THE ROAD.

The Roadranger® System is an unbeatable combination of the best products from Eaton and Dana – partnering to provide you the most advanced, most trouble-free drivetrain in the industry. And it's backed by the Roadrangers – the most experienced, most expert, most accessible drivetrain consultants in the business.

For spec'ing or service assistance, call 1-800-826-HELP (4357) 24 hours a day, 7 days a week, (Mexico: 001-800-826-HELP (4357)) for more time on the road. Or visit our web site at www.roadranger.com.



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