Subsidiary of Federal Signal Corporation

SERVICE BULLETIN
Repair Instructions

SUBJECT: Brake Repair Instructions for Pelican NP, NR and NS Sweepers

DATE: 3/19/2010

NUMBER: SB-0066

TO: All Dealer Principals, Service Managers, Parts Managers and Regional Managers

ALWAYS REFER TO THE OPERATOR MANUAL FOR SAFETY INSTRUCTIONS BEFORE STARTING WORK.

PURPOSE:

Improved brake rotors have been released to enhance brake wear performance of NP, NS, and NR sweepers. Some sweepers may experience rotor wear that does not meet your customers' expectations. If this condition exists, the rotor should be replaced during a routine brake repair job.

UNITS TO SERVICE:

All Pelican NP, NR, and NS sweepers prior to NP/NS/NR2000.

WARRANTY COVERAGE:

If the NP, NS, or NR sweeper is less than 2 years old from the date of first use, and has less than 1600 operating hours, and has discs (rotors) thinner than 17mm (.669"), Elgin will cover the cost of parts and labor, on a case by case basis, as a goodwill gesture to your customer. Contact your Regional Service and Parts Manager for goodwill consideration if you have a customer that is eligible. Claims will not be approved without RSPM authorization prior to beginning the repair.

TOOLS:

Qty.	Description
1	Hub Service Kit (7970350)
1	Floor Jack
1	Overhead Hoist
1	3' Pry Bar
1	1-5/16" Socket Wrench
1	12mm Hex Wrench
1	14mm Hex Wrench

Qty.	Description
1	Open-end Wrenches (metric and Standard
2	SAE #4 ORFS Plugs
1	Torque Wrench (290 lb-ft min.)
1	Impact Wrench
1	1/2" Drill and Bits
1	Die Grinder

Qty.	Description
1	Loctite (blue/removable)
	Usual Mechanic Hand Tools
1	Brake Bleeder Hose
1	Slide Hammer w/Cap Adapter

Parts List

Parts required for brake pad and disc replacement for two (2) Wheel Drives

Part No.	Qty.	Description
1099451	2	Brake Disc (1 disc/whl)
7175717	6	Brake Pad Kit (3 calipers/whl)
7175689	2	Spindle Ring Nut (1 nut/whl)
7175715	2	Seal and O-ring Kit (Complete Hub) *

* Contains park brake piston and ring gear seals not required for service brake replacement.

Part No.	Qty.	Description
7175719	6	Brake Caliper Seal Kit (3 calipers/whl) **
1098610	1	Hydraulic Reservoir Cap ***

** Caliper Seal Kit is required as part of brake wear improvement that removes the piston assist springs. .*** Hydraulic Reservoir Cap (2psi) is required as part of brake wear improvement that replaces the original 7psi cap.

Additional Parts

Dealer stock of these parts should be available in case of damage or wear.

Part No.	Qty.	Description
7175707	A/R	Snap-ring (Cap retainer) (may be damaged during removal)
7175602	A/R	Disengage Pin

Part No.	Qty.	Description
7175501	A/R	Disconnect Cap
7175720	A/R	Caliper Pin Kit
7175687	A/R	Wheel Stud

Brake Pad and Disc Replacement

Periodically inspect the Pelican disc brakes for wear (500 hours or more often).

BRAKE PADS (FIGURE 1-1)

- Pad backing plates must not contact the disc. If any backing plate is within .050” of the disc, the pads must be replaced and the disc thickness measured.
- Pads with less than 2mm of friction material remaining must be discarded and replaced with new pads.

BRAKE DISCS (FIGURE 1-1)

- New disc is 18.1mm (.712”) thick.
- Minimum operational thickness of the disc is 17mm (.669”). Discard and replace any discs that are or will be thinner than 17mm (.669”) after resurfacing.

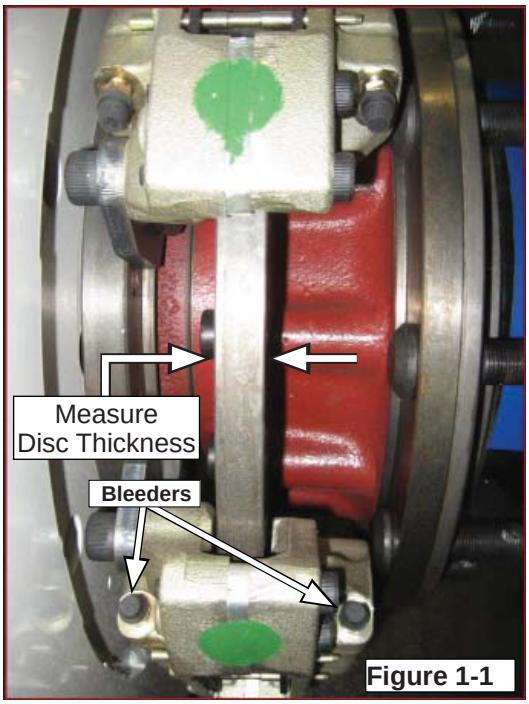


Figure 1-1

Remove Calipers

1. Securely raise and block the sweeper so that the drive wheels can be removed (FIGURE 1-2).


Figure 1-2

2. Remove the drive wheels and place tow-pins in the “tow” position (FIGURE 1-3).


Figure 1-3

PROCEDURE: (Continued)

3. Remove the calipers as instructed in the service manual. Calipers may be removed by accessing the 12mm socket head capscrews through the holes in the chassis (FIGURE 1-4 and 1-5). Either the brake caliper lines must be plugged to prevent hydraulic oil from leaking out or the brake supply line must be disconnected and plugged with a #4 ORFS male plug.

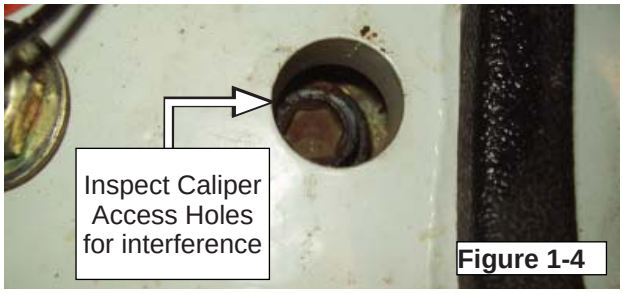


Figure 1-4

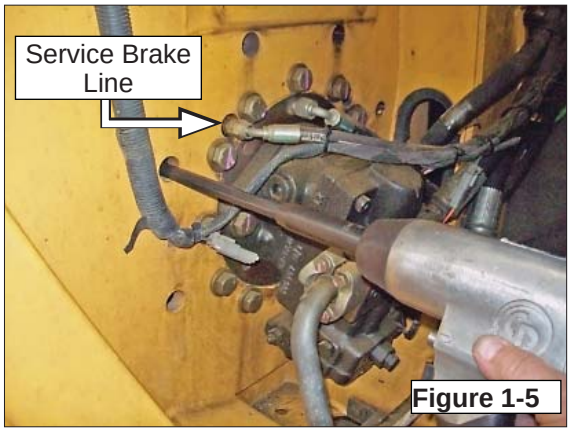


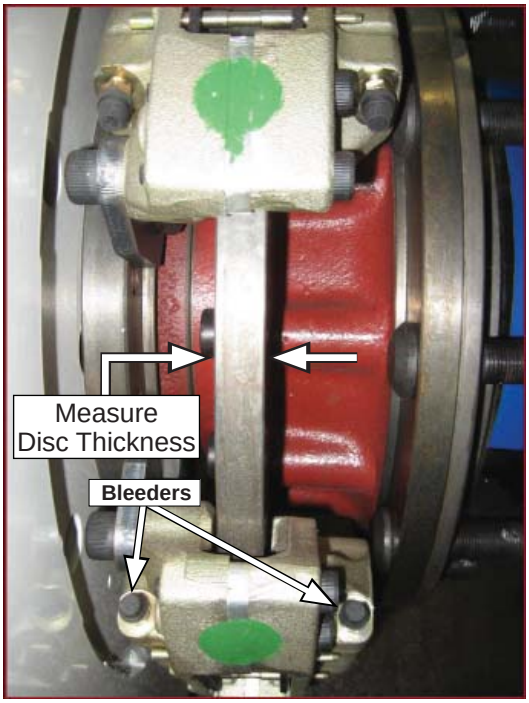
Figure 1-5

IMPORTANT: It is not normally necessary to remove the complete hub assembly from the chassis to service the brake system. Inspect the caliper bolt access holes in the chassis. If the holes do not provide enough clearance for the caliper bolts to be removed, the holes must be enlarged using a die grinder (FIGURE 1-5). If more than four (4) holes are misaligned (each wheel drive hub) or the caliper bolts cannot be made accessible, it may be advisable to remove the hub from the sweeper for brake replacement.

4. Place the calipers on a work surface for pad replacement (FIGURE 1-6).


Figure 1-6

5. Inspect the brake disc (rotor) wear surface. Discard and replace discs that have grooves deeper than 17mm or are thinner than 17mm (.669 in) after re-surfacing. If rotor replacement or reconditioning is not required, proceed to “Caliper (Pad) Installation”.



PROCEDURE: (Continued)

Hub and Rotor (Disc) Removal

6. Drain the hub lubricant (FIGURE 1-7).
7. Remove the hub cap using the heavy duty snap ring tool (Hi-Tec 87 Extra Large Snap-ring Pliers or equivalent). Scrape the paint from the hub and snap-ring, lube with penetrating oil, and loosen the snap-ring in the groove before attempting to remove the ring (FIGURE 1-8).

IMPORTANT: The snap-ring may be corroded into the hub and can be difficult to remove. In some cases, the snap ring may need to be destroyed in order to remove it. (**Refer to the Snap-ring Removal section in this bulletin**)

8. Remove the drive shaft and gear sets and then put them to the side.
9. Remove the spindle nut. The spindle nut is staked deeply in four places and is impossible to "un-stake" for removal with a wrench. The nut must be destroyed to remove it. Always replace the Ring Nut with a new one when assembling the hub/spindle. To remove the nut, mark and drill the rim of the nut in two places 180 degrees apart (at one of four keyway slots). Use a chisel to split the nut through the drilled area. Spread the nut using a pry-bar and remove the nut. Thoroughly clean out any remaining chips before re-assembly (FIGURE 1-9).

NOTE: Protect the hub components from drilling chips. Chips may be removed with either a magnet or vacuum. Do not blow the chips with compressed air. If the inner bearing is contaminated by chips, disassemble the hub, clean the bearing thoroughly, and then replace the wheel seal.

10. Pry and rotate slightly to loosen the hub inner seal from the spindle. Remove the hub and rotor assembly. (It is possible to remove the assembly by hand, but it may be easier to use the hub lifting fixture shown in Appendices 1 and 2 at the end of this section.) If possible, keep the hub tilted slightly outward so that any remaining chip debris can be washed out using brake cleaner or solvent. Do not allow chips to contaminate the inner wheel bearing and oil seal.
11. Inspect the wheel studs and replace any that are damaged.
12. Place the hub on a work surface and remove the brake disc (rotor) using a 14mm hex (allen head) wrench (FIGURE 1-10).


Figure 1-7

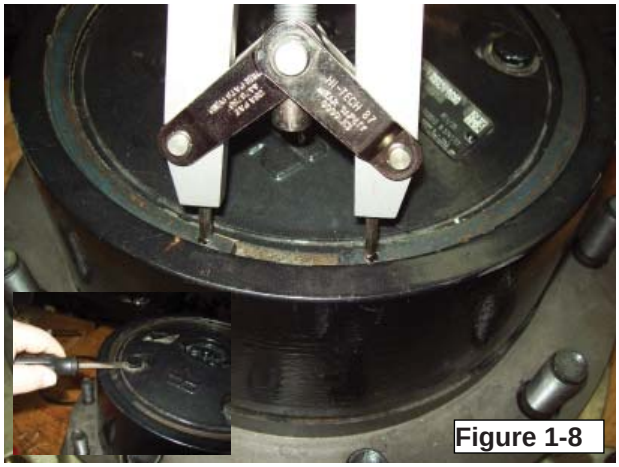


Figure 1-8

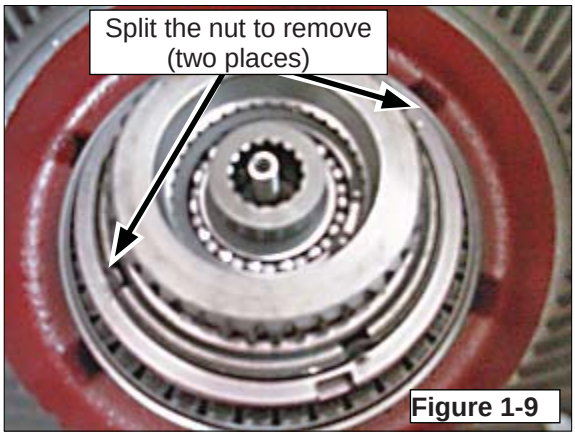


Figure 1-9

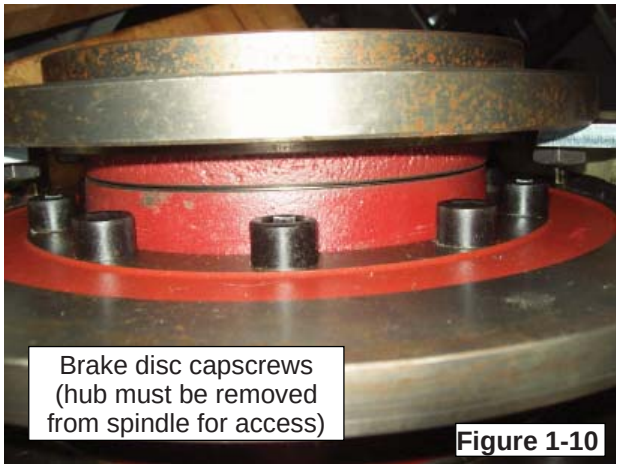


Figure 1-10

PROCEDURE: (Continued)

13. Install the new disc. Use Blue Loctite on the capscrew threads and tighten the disc capscrews to a torque of 255 lb·ft. (34,6 kNm).

Hub and Rotor (Disc) Installation

14. Drive or pry the seal from the hub (FIGURE 1-11).
15. Remove the bearing. Clean the bearing and hub thoroughly with solvent.
16. Install the bearing in the hub and drive or press the new seal in place using a suitable driver (FIGURE 1-12). Ensure that the bearing cones are assembled to mate with their original cups.
17. Lightly lubricate the seal surface and install the hub/bearing assembly on the spindle and install the outer bearing. Ensure that the bearings are clean and free from any remaining drilling debris before installation. Thread the replacement nut on the spindle.

NOTICE: Make sure that the bearing races (cones) are completely seated before setting the preload.

18. Seat the bearing cups by tightening the nut to 289 lb·ft. (39 Kg·M). Allow the hub to complete a number of revolutions. Loosen the nut and re-tighten to a torque of 79 +/- 4 lb-ft. Rolling torque should be between 6 and 10 lb-ft. (0.8 – 1.5 Kg·M) (FIGURE 1-12).
19. Using a drift punch and hammer, stake the ring nut into a stub axle slot to prevent ring nut movement.
20. Ensure that the gear components are very clean before reassembly. Place the inner gear set to engage the housing over the spindle splines (FIGURE 1-13).

21. Place outer gear set into the hub (FIGURE 1-14).

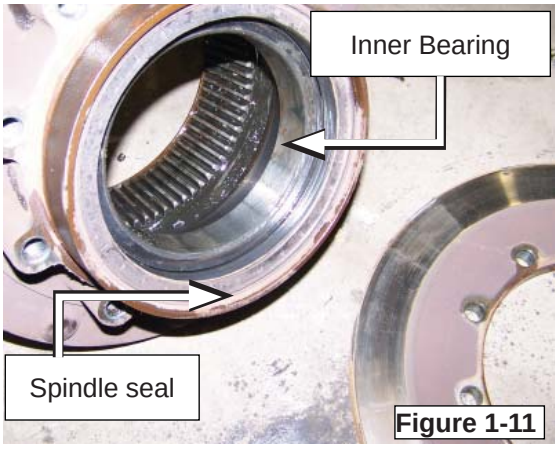


Figure 1-11

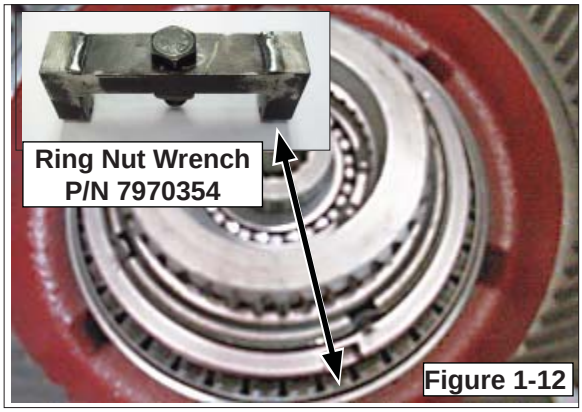


Figure 1-12

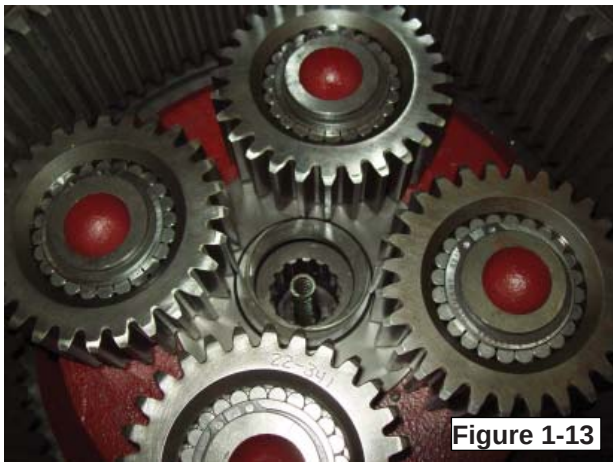


Figure 1-13

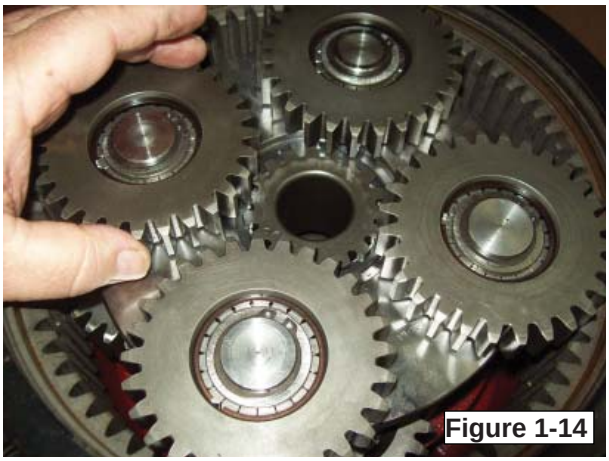


Figure 1-14

PROCEDURE: (Continued)

22. Place and align the drive shaft and outer gear. Ensure that the disconnect spring is properly seated in pockets (FIGURES 1-13 and 1-15).
23. Remove the Disengage Pin from the cap and clean the pin thoroughly. Remove the O-ring from the cam and replace with a new O-ring.
24. Lubricate the Disengagement Pin with grease and reinstall in the cap.

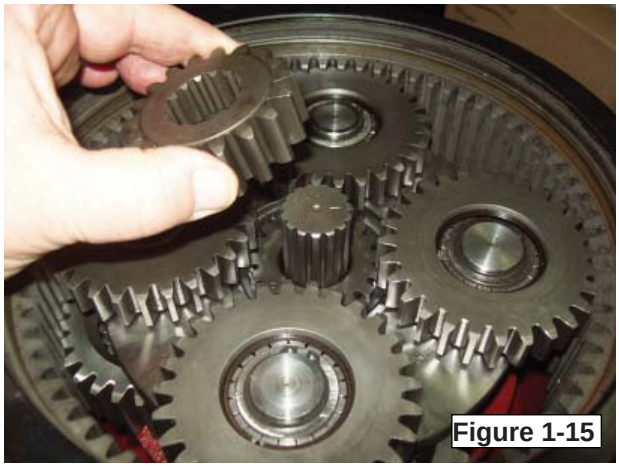


Figure 1-15

25. Remove the cap O-ring (FIGURE 1-16) and clean the cap thoroughly.
26. Install the replacement O-ring in the cap. Lightly lubricate the cap O-ring and place the cap in the hub. Tap the cap with a rubber mallet to seat and install the snap-ring (FIGURE 1-16).


Figure 1-16

Caliper (Pad) Installation

IMPORTANT:
At the first pad service interval, when calipers are removed for pad replacement, remove the caliper piston assist springs as instructed in "**Caliper Spring Removal**" section of this bulletin. Also, replace the Hydraulic Reservoir cap with P/N 1098610.

1. Remove the pad retaining pins and discard the old pads. (FIGURE 1-17)


Figure 1-17

2. Install new pads in the calipers using the original retaining pins (FIGURE 1-18). If the pins are badly corroded, damaged, or missing the snap-ring, replace with 7175720 Pin Kit.
3. Clean the calipers, rotors, and pads with brake cleaner to remove debris or oil from the friction surfaces.


Figure 1-18

PROCEDURE: (Continued)

4. Insert a 3/4” spacer (fabricate from wood or steel stock) to hold the pistons in the retracted position and install the calipers in their original positions (FIGURE 1-19).

IMPORTANT: Ensure that caliper brake fitting threads are correctly engaged before final tightening. Calipers or lines may be damaged if threads are “cross-threaded”.


Figure 1-19

5. Apply Blue Loctite to the caliper capscrews and tighten to torque of 75 lb·ft. (FIGURE 1-20). If calipers are installed while the hub is mounted to the sweeper, two people will be required to align and start the caliper capscrews.
6. Re-connect the service brake line, if previously unplugged.
7. Bleed the service brakes as instructed in the Pelican Service Manual. Two people may be required for the brake bleeding procedure.


Figure 1-20

8. Fill the hub gear case with SHC629 lubricant until level with the check plug in the horizontal position (see the Operator Manual). Bleed the brake calipers using the procedure found in the Service Manual (FIGURES 1-21 and 1-22).


Figure 1-21


Figure 1-22

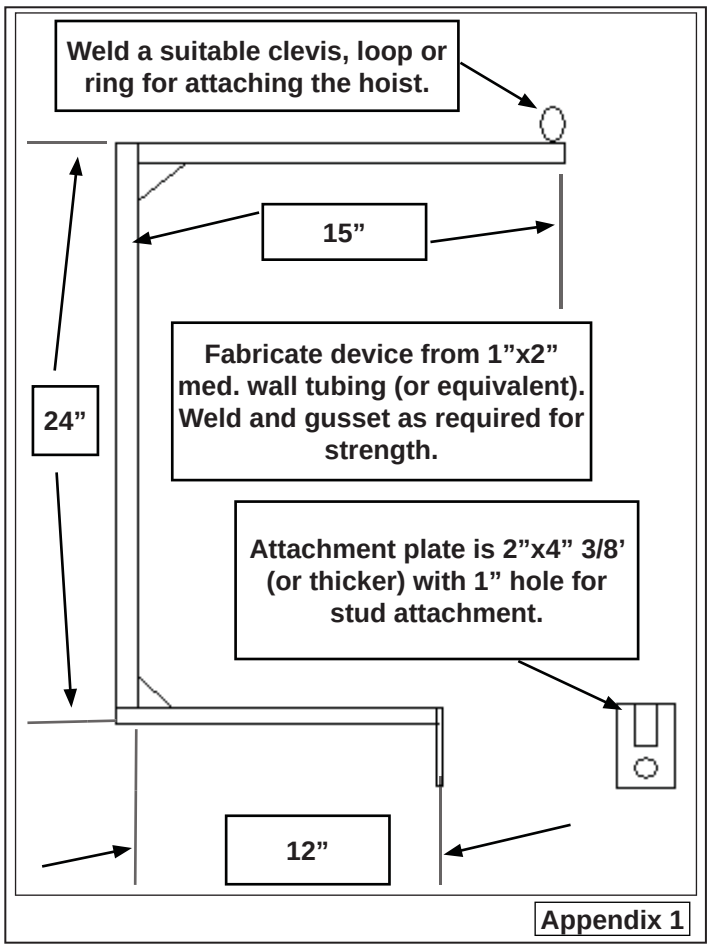
PROCEDURE: (Continued)

9. Install the wheel and tighten the wheel nuts to 290 lb·ft (FIGURE 1-23).

10. Remove the axle blocking, lower the hopper, and operate the sweeper to ensure proper operation and to check for leaks. Repair any leaks or failures that are discovered.

Figure 1-23

Appendix



Appendix 1

Appendix 2

Caliper Spring Removal and Hydraulic Cap Replacement

PURPOSE:

At the first brake pad service interval, remove the caliper springs from beneath the pistons and replace the hydraulic vent cap with 2psi cap (P/N 1098610). Replacement of the hydraulic cap, removal of the caliper springs, and use of replacement disc (rotor) will improve brake rotor life.

UNITS TO SERVICE:

NP/NS/NR with RR hub

TOOLS:

Qty.	Description
1	10mm Hex Wrench
1	O-ring Pick
1	Small Screwdriver
1	Scribe or Marking Paint
	Usual Mechanic Hand Tools

PARTS LIST

Part No.	Qty.	Description
7175719	6	Brake Caliper Seal Kit (3 calipers/whl)
1098610	1	Hydraulic Reservoir Cap

PROCEDURE:

Brake disc wear on Pelican NP, NS, and NR sweepers may be improved by performing several steps at the first brake service interval.

- Install Hydraulic Reservoir cap with 2psi rating to replace the original 7psi cap.
- Remove the piston assist springs from the caliper assemblies.
- Install new brake discs (rotors).

1. Caliper Service (Remove Springs)

a. Remove calipers as instructed in “Brake Disc and Pad Replacement” section of this bulletin. Remove the pad retaining pins and remove the brake pads (FIGURE 1-24).

b. Place the caliper in a vise and mark the caliper halves and separators for reassembly (FIGURE 1-24).

c. Remove the four caliper capscrews (FIGURE 1-24).

d. Separate the caliper assembly and note the position of the O-rings present in the brake separator plates. NOTE: Only the passages used for brake operation will have O-rings (FIGURE 1-25).

e. Force pistons outward by applying compressed air to the port. Pry the seals from the caliper body using a small screwdriver. Remove the dust seals from the pistons using a small screwdriver or other suitable tool (FIGURE 1-26).

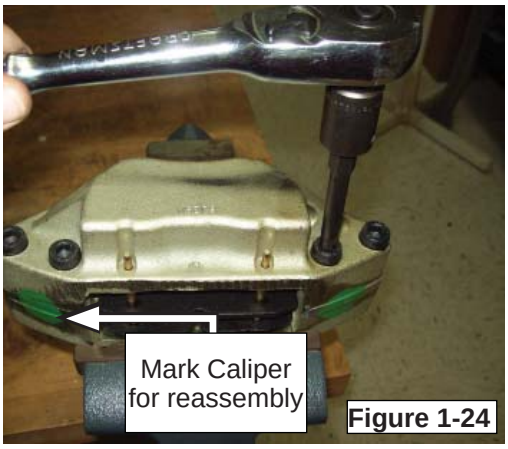


Figure 1-24

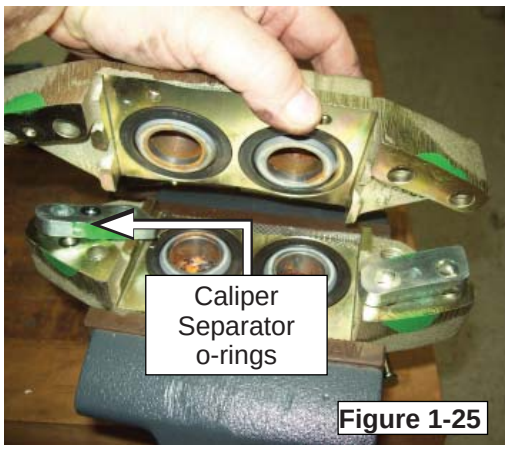


Figure 1-25

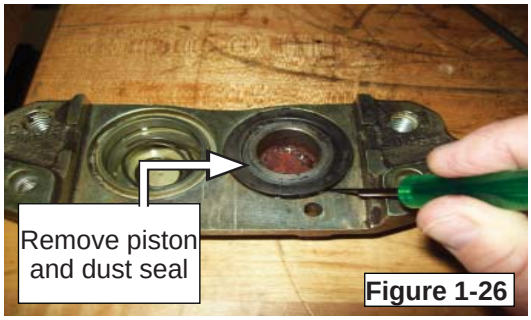


Figure 1-26

f. Withdraw the pistons and the spring located behind each piston. Discard the springs (FIGURE 1-27).
g. Withdraw the sealing O-rings from the bores.

2. Reassemble the Caliper

a. Clean the calipers and pistons thoroughly using brake cleaner or solvent. Install new sealing O-rings in the caliper bores.

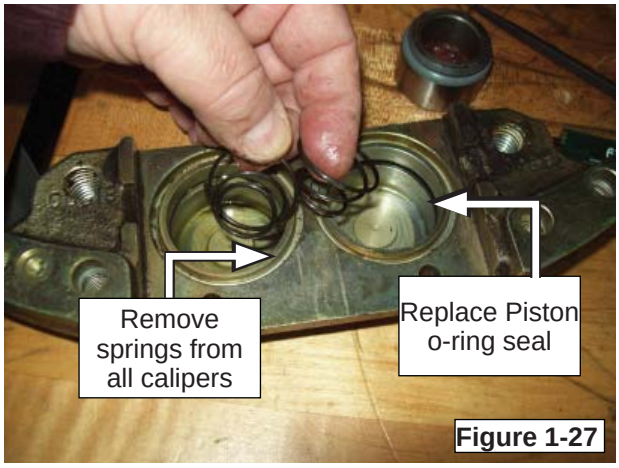


Figure 1-27

b. Install the new dust seals to the pistons. Ensure that seal garters are not twisted in the piston groove. Lubricate the pistons and O-rings with hydraulic oil or assembly lube and install the pistons (FIGURE 1-28).
c. Seat the dust seal bodies in the caliper bore and drive into place with a 2" OD driver. NOTE: Do not cut or damage the dust seal (FIGURE 1-28).


Figure 1-28

d. Note the previous assembly markings and assemble the caliper halves and separators as they were disassembled. NOTE: Ensure that new separator O-rings are installed in the correct position (FIGURE 1-29).

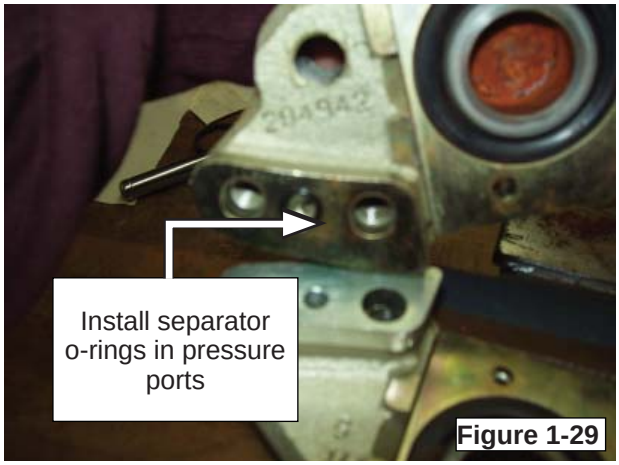


Figure 1-29

e. Tighten the caliper bolts to a torque of 50 lb·ft. (FIGURE 1-30).

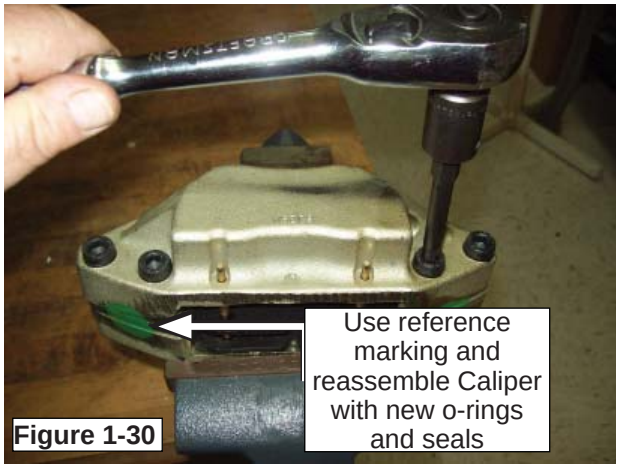


Figure 1-30

f. Install the pads and pad retaining pins (FIGURE 1-31).

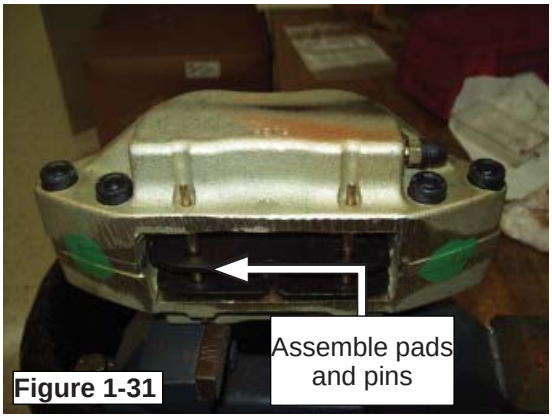


Figure 1-31

g. Apply Blue Loctite to the caliper capscrews and tighten to a torque of 75 lb·ft. If calipers are installed while the hub is mounted to the sweeper, two people will be required to align and start the caliper capscrews (FIGURE 1-32).

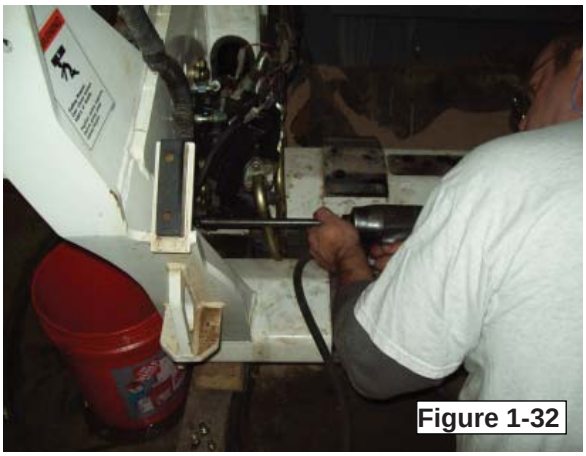


Figure 1-32

3. Install the replacement Hydraulic Reservoir Cap P/N 1098610.

a. Remove and discard the original reservoir cap and install 2 psi cap (P/N 1098610) that will reduce residual hydraulic pressure on the brake pistons (FIGURE 1-33).

Figure 1-33

Snap-ring Removal

IMPORTANT: The snap-ring may be corroded into the hub and can be difficult to remove. In some cases, the snap ring may need to be destroyed in order to remove it.

Remove the snap-ring using a suitable tool (FIGURE 1-34). If the snap-ring is corroded or stuck in the bore, there are a few possible techniques that may be used to loosen it.

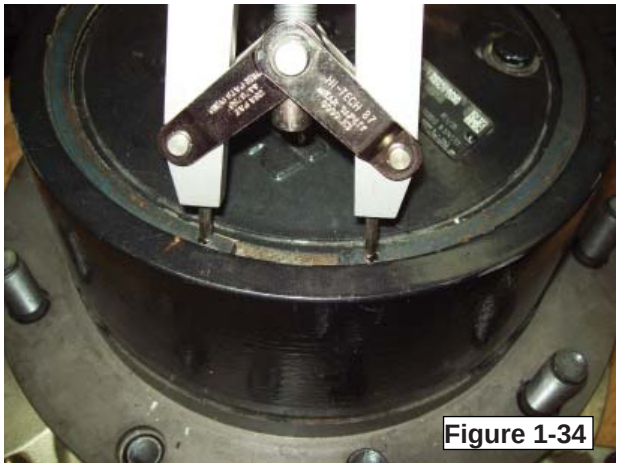


Figure 1-34

1A. Rust penetrant and vibration

a. Scrape the paint from the hub and snap-ring. Lubricate them with penetrating oil.
b. Use either a hammer and punch or an air hammer (if available) to apply a vibrating force all around the ring. Do not apply force to the ring-gear casting snap-ring groove or the ring-gear may be damaged (FIGURE 1-35).
c. Attempt to remove the snap-ring using the snap-ring tool.
d. If the snap-ring is still stuck; apply force with the snap-ring tool and repeat the application of penetrant and vibration. Heating the snap-ring with an acetylene torch may also help to loosen the snap-ring. IMPORTANT: If heat is applied to the snap-ring or the ring is bent during removal, the snap-ring must be replaced.


Figure 1-35

1B. Cut the snap-ring in pieces to remove

a. If the snap-ring cannot be loosened and removed by non-destructive methods, it must be carefully cut into pieces with an acetylene torch (FIGURE 1-36).

   IMPORTANT: Only an experienced torch operator should attempt to cut the snap-ring. The ring-gear ring groove may easily be damaged by incorrect torch work.


Figure 1-36

b. Cut the snap-ring in 3 or 4 places and remove the individual pieces using a hammer and chisel. Do not damage the hub casting (FIGURE 1-37).

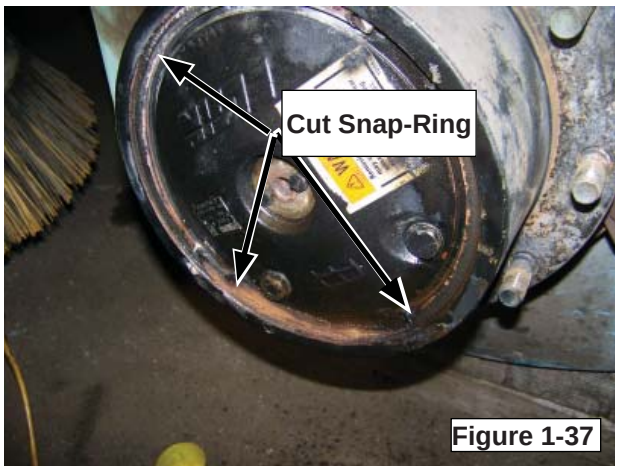


Figure 1-37

PROCEDURE: (Cont'd)

2. Remove cap

a. Remove the hub cap. A slide hammer with an adapter fabricated to fit the cap drain/fill holes may be used to assist in pulling the cap (FIGURE 1-38).

Figure 1-38

b. Clean the hub snap-ring groove, cap, and snap-ring thoroughly and replace the cap sealing O-ring (FIGURE 1-39).

Figure 1-39

c. Install a replacement snap-ring if the original was destroyed or damaged (FIGURE 1-40).

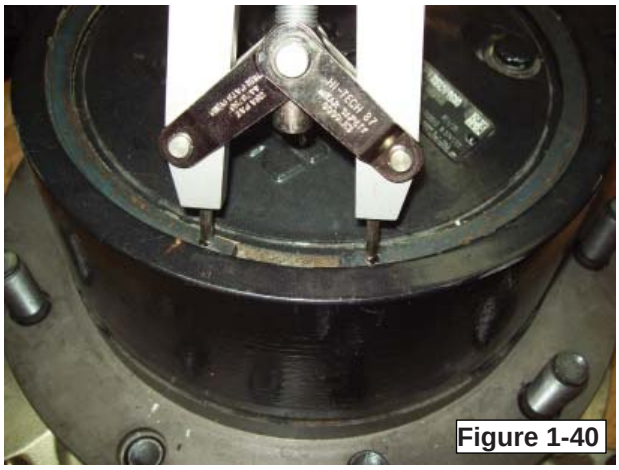


Figure 1-40

Flat Rate for Brake Replacement Operation	Flat Rate	Quantity
Remove and Replace Brake Pads and Disc (Rotor), includes seal replacement. Fault Code: Brakes-Hydraulic Brakes-Rotor Labor Code: Brakes-Hydraulic Brakes-Rotor-Replace (RH or LH side)	4hr 10min	1 - Wheel Drive

Additional Brake/Hub Replacement Operations (if required)	Flat Rate	Quantity
Remove Stuck/Rusted Snap-Ring Fault Code: Brakes-Hydraulic Brakes-Rotor Labor Code: Brakes-Hydraulic Brakes-Rotor-Remove Stuck Snap-ring	1hr (maximum)	1 - Wheel Drive
Grind Caliper Access Holes (die-grinder) Fault Code: Brakes-Hydraulic Brakes-Brake Calipers Labor Code: Brakes-Hydraulic Brakes-Brake Calipers-Enlarge Access Holes	10min./hole (60min. maximum)	1 - Wheel Drive
Replace Damaged Ring Gear and/or Ring Gear O-ring Seal Fault Code: Brakes-Hydraulic Brakes-Rotor Labor Code: Brakes-Hydraulic Brakes-Rotor-Replace damaged Ring Gear and Seal	30min	1 - Wheel Drive

Flat Rate for Caliper Spring Removal	Flat Rate	Quantity
Remove Caliper Springs and Re-assemble Caliper with new Seals Fault Code:Brakes-Hydraulic Brakes-Brake Calipers Labor Code: Brakes-Hydraulic Brakes-Brake Calipers-Remove Springs (6 Calipers)	1 hr and 30 min for 6 calipers	6 Calipers are used per sweeper
Remove and Replace The Hydraulic Cap with New Part Fault Code:Brakes-Hydraulic Brakes-Hydraulic Tank Labor Code: Brakes-Hydraulic Brakes-Replace Cap	10min	1 - Cap

Warranty Claim Submission Instructions

Use the following information when submitting a warranty claim:

CAUSAL PART: **1086400**

To create the FAULT CODE and LABOR CODE; See the labor chart above.

In the FAULT FOUND dropdown list, select **Design Upgrade**.

In the CAUSED BY dropdown list, select **Product Improvement**.