BRAKE SYSTEM OPERATION and SERVICE Reverse Modulated

Wet Disc Brake System

General

The reverse modulated "wet disc" brake system is a spring applied, hydraulic release brake system incorporating the durability of an oil immersed enclosed brake with the positive stopping action achieved by spring applied force. Each brake is both a service brake and a parking brake. In the event of loss of hydraulic power, immediate application of braking action occurs. *Oil is required to release the brakes. It is not required to apply them.*

Operation

The system begins with the hydraulic tank oil flow to a dedicated pressure compensated pump. The pump sends oil to a high pressure filter and a relief valve. After the high pressure filter, oil is sent through a check valve to an accumulator. From there oil is supplied through the parking brake solenoid and brake pedal valve to the brakes.

A low pressure warning switch is located after the accumulator and will illuminate a warning light on the dashboard if the pressure falls below 1600 psi. To fully release the brakes 1500 psi is required, while initial release may occur around 1250 psi.

The parking brake solenoid will allow oil flow to the brake pedal valve when energized (parking brake released). From there oil will flow directly to the brakes, releasing them, if the brake pedal is not depressed. If the parking brake is set, or electrical power to the solenoid has failed, oil to the brake pedal valve will be shut off and the brakes will automatically apply. Electrical power to the solenoid must be restored to release them. Adequate oil and pressure is stored in the accumulator for some time in order to release the brakes after the engine is shut off or an oil supply failure has occurred. The brake pressure valve is a variable pressure reducing valve. Upon depression, supply oil to the brakes is shut off and oil pressure in the brakes is modulated down; applying the brakes and returning the brake oil back to the hydraulic tank. A check located in the valve will allow oil to flow out of the brakes (activating the brakes) if the oil to the supply valve is cut off.

The brake cooling circuit is separate from the actuation circuit. Hydraulic oil is supplied from the power beyond of the side tilt valve. This low pressure circuit sends cooling oil through the brakes or a 5 psi in-line check valve before being routed to a return filter in the hydraulic tank. The 5 psi check valve protects the brake seals from pressure surges.

WARNING

ALWAYS BLEED OFF THE ACCUMULATOR CHARGE PRESSURE BEFORE WORKING ON THE BRAKE SYSTEM.



WET DISC BRAKE SYSTEM SCHEMATIC







Lining Wear Check Procedure

Note: The machine must be shut down and power off before lining wear can be checked.

The brake must be applied to make the wear indicator check. This means all hydraulic pressure to the brake must be off as the brakes are applied with spring pressure.

 Thoroughly clean the area around the wear indicator.
Push the wear indicator pin against the reaction plate. It may be necessary to tap pin lightly to ensure it is against the reaction plate and not frozen in place.

3. When the wear indicator pin is flush with the indicator nut face, the friction and lining disc must be replaced (see illustration).



Disassembly and Reassembly

WARNING

DO NOT ATTEMPT TO MAKE ANY REPAIRS ON THE BRAKE UNTIL THIS TEXT IS COMPLETELY READ AND UNDERSTOOD, AND ALL SAFETY PRECAUTIONS ARE UNDERSTOOD.

1. Drain axle wheel end thoroughly.

2. Disassemble wheel end from spindle up to and including the removal of the wheel hub from the brake discs. Note: If the axle spindle or axle housing is to be replaced, remove brake as an assembly by removing brake to spindle stud nuts and washers. Remove brake assembly from spindle.

It is imperative a special disassembly and reassembly spring compression tool be fabricated before disassembling any part of this brake; a print of the tool is included in this text. (See Figure 1.)

3. Install spring compression tool cylinder portion over axle spindle, through brake discs and against the piston pressure ring.

4. Install the round portion with the bolts over the spindle. Back the bolts out far enough so they do not contact the cylinder face.

5. Install spindle nut and tighten securely against compression tool.

6. Tighten the four (4) compression tool bolts against compression tool cylinder. This will hold the springs in position while removing the brake cover and brake discs.

WARNING

OUTER BRAKE HOUSING COVER IS UNDER 72,000 LBS. COMPRESSED SPRING PRESSURE AND EXTREME CAUTION MUST BE TAKEN IN REMOVING THIS COVER. BRAKE COVER BOLTS MUST BE REMOVED CAUTIOUSLY AND EVENLY. DO NOT REMOVE BRAKE COVER BOLTS ONE (1) AT A TIME! 7. With the spring compression tool securely in place, remove the brake cover bolts evenly. *Do not remove bolts one at a time.*

8. Remove brake cover and piston from brake housing.

9. Remove the friction and reaction discs.

10. Cautiously and evenly turn out, **one (1) thread at** *a time,* the compression tool bolts. The compression springs will push the piston pressure ring out of the brake housing.

WARNING

BEFORE REMOVING THE COMPRESSION TOOL FROM SPINDLE, MAKE SURE ALL SPRING FORCE IS OFF OF PRESSURE RING AND RING MOVES FREELY IN BRAKE HOUSING.

11. Remove spindle nut and remove two piece compression tool.

12. Remove piston pressure ring.

Note: Inner and outer compression springs are matched and must remain together as a set. As each spring set is removed, wire the inner and outer spring together so they do not get mixed up with the other springs while cleaning and inspecting.

13. Remove brake to spindle stud nuts and washers. Remove brake housing from studs.

Piston and Piston Seal Removal

A. A recommended procedure for removing the piston is to fabricate three (3) simple piston removal tools from channel iron. A print of this tool is included with this text. (See Figure 2.)

There are three (3) threaded holes approximately 120 degrees apart in the outer face of the piston. Using the proper size bolts, thread a nut on the bolt and add a washer under the nut. Position bolt, nut and washer through top of channel and thread into hole in piston in all three locations. Turn nuts a thread or two at a time and piston will come out of brake cover.

B. Remove the inner and outer two piece piston sealing ring. (See Cleaning and Inspection)

14. Position a new brake housing to axle spindle "o" ring on brake housing. Install brake housing on axle spindle studs with brake bleeder hole located at the top. Use caution as not to damage "o" ring. Position stud nut washers on studs and install stud nuts. Tighten stud nuts to specified torque.

15. Remove wire from one compound spring set (inner and outer) at a time and install in spring pocket in brake housing. Springs must stay as a matched set as they are weighed and matched at the factory.

16. Install all springs as explained in Step 15.

17. Position piston pressure ring in brake housing and against compound springs.

18. Install spring compression tool cylinder portion over axle spindle and centered in pressure ring.

19. Install the round portion with the bolts over the spindle. Back the bolts out far enough so they do not contact the cylinder face.

20. Install spindle nut and tighten securely against round compression tool.

21. Turn the four (4) compression tool bolts in against compression tool cylinder.

22. Cautiously and evenly in a crisscross manner, tighten compression tool bolts a thread or two at a time to compress spring sets and push pressure ring in brake housing. Springs are compressed far enough when the tangs on the pressure ring are approximately 1/8 of an inch from being flush with the face of the brake housing.

23. Install first steel reaction plate in pressure ring.

24. Install first friction disc and lining assembly in pressure plate and against first steel plate.

25. Install second steel reaction ring.

26. Install second friction disc, aligning the four (4) oil grooves in the second disc with the oil grooves in the first friction disc.

27. Alternate steel plates and friction discs until five (5) plates and five (5) discs are installed. First plate installed is steel and the last disc installed is friction.

Note: Always align friction disc oil grooves with previously installed friction disc oil grooves and careful alignment of friction disc teeth at this time will facilitate wheel hub spline alignment in discs at wheel hub assembly in brake.

28. Install a new square cut sealing ring in groove in brake housing.

Piston and Brake Cover Assembly:

A. Install new piston outer "o" ring and seal ring in outer ring groove in brake cover.

B. Install new piston inner "o" ring and seal ring in inner ring groove. Use caution as not to overstretch inner "o" ring and seal ring.

C. Make sure inner and outer seal rings are in full position in ring grooves. Lightly lubricate both inner and outer seals.

D. To facilitate installing the piston in the brake cover, a simple installation tool can be made. A print of the tool is included with this text. A quantity of three (3) of these tools is needed. (See Figure 2.)

E. The three steel blocks with a hole in them are used with the three brake cover bolts, washers and three 5/8-11 NC nuts. The bolts come up through the cover approximately 120 degrees apart. The piston is positioned in the piston groove with the chamfer edges down and the three threaded holes up. Position an installing steel block on each of the cover bolts. Install a washer and a nut on each bolt. Locate long portion of block over piston. Tighten nuts evenly on all three blocks to compress piston into piston groove. Use caution as not to damage piston inner and outer sealing rings. Push piston in groove until it is flush with the face of the cover. Remove nuts, washers installing blocks and cover bolts.

F. Position two new square cut sealing rings in ring grooves in cover. A light coat of oil will hold rings in position during cover installation. Mark the location of these holes on the edge of the cover for alignment with holes in brake housing.



Brake Cover Installation on Housing:

29. Mark edge of brake housing at the two fluid hole locations.

30. Position brake cover on brake housing, aligning fluid hole marks on cover with marks on brake housing. Install cover on housing using caution not to disrupt sealing rings at fluid openings.

Note: If brake bleeder screw is in brake housing, open brake bleeder screw to allow air to escape from behind piston during cover installation.

31. Install cover to housing bolts and washers. If there is a slight gap between cover and housing, carefully and evenly tighten bolts to specified torque.

32. When all cover bolts are tightened to specified torque, install the two warning tags and capscrews. Tighten capscrews to specified torque.

33. Carefully and evenly loosen bolts in compression tool. When bolts are away from compression cylinder, remove spindle nut. Remove compression tool and cylinder from spindle and brake.

Install and adjust wheel end assembly.

Note: Brake release pressure must be applied to turn wheel hub and adjust wheel bearings.

Cleaning and Inspection Cleaning

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid an moved up an down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

Inspection

The importance of careful and thorough inspection of all parts can not be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoid failures at a later date.

Housing, Covers, etc.

Inspect housing and covers to be certain that they are thoroughly cleaned and that mating surfaces are free of nicks and burrs. Check all parts thoroughly for evidence of cracks or a condition that could cause subsequent oil leaks or failures.

Piston and Housing Seals

Replacement of seals is more economical when unit is disassembled than premature overhaul to replace these parts at a future time. Further loss of lubricant through a worn seal may result in failure of more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting or scratching seriously impairs its efficiency.

Apply a film of lubricant to the brake piston and all sealing rings to facilitate reassembly.







