

MSM Hydraulically Applied Shoe Brakes

Mondel MSM Hydraulically Applied Shoe Brakes Instruction Manual



MAGNETEK
MATERIAL HANDLING

Mondel

Part Number: 560011-R1
January 2006

© Copyright 2006 Magnetek Material Handling



MAGNETEK
MATERIAL HANDLING

Mondel

Installation and Maintenance Instructions

MSM Hydraulically Applied Shoe Brakes

SUPPLEMENTS FORMING PART OF THIS MANUAL:

DATE OF MANUFACTURE:

APPLICABLE DIMENSION PRINT:

EXPLODED VIEW:

PARTS LIST:

Table of Contents

Chapter 1.0: MSM Hydraulically Applied Shoe Brakes Warnings and Cautions 4
Chapter 2.0: General Description 6
Chapter 3.0: Application 8
Chapter 4.0: Description of Operation 9
Chapter 5.0: Installation 11
Chapter 6.0: Adjustment 13
Chapter 7.0: Operational Test 17
Chapter 8.0: Maintenance and Repair 19
Chapter 9.0: Replacement Parts 22
Chapter 10.0: Long Term Storage 23

Chapter 1.0: MSM Hydraulically Applied Shoe Brakes Warnings and Cautions

Read and Understand All Warnings And Cautions Printed In This Manual Before Commencing Installation, Adjustment Or Repair

Chapter 5: INSTALLATION – Warnings and Cautions

Anyone involved in the installation or service of this brake must have:

- **Received specific training.**
- **Had experience on similar equipment.**
- **Knowledge of the equipment on which the brake is installed.**
- **The ability to understand the terminology.**
- **The ability to understand the diagrams.**

Do not proceed unless technically qualified for the work involved.

Never lift the brake assembly by the brake rod. The weight of the brake can irreversibly damage the rod leading to fracture and total loss of braking effect.

The integrity of the brake may be compromised or a replacement part may not fit if alterations are made to the brake to achieve required alignment.

If the alterations to the brake supporting structure are required, they must be done under the direction of a competent authority.

On a hoist, chock the drum to prevent any rotation, due to the effect of gravity on the hook block etc.

Failure to install the brake wheel correctly may result in total loss of braking. Do not operate the brake unless the wheel is secured to the shaft.

On the travel motion subject to the effect of wind or camber gradient, apply the wind anchors or otherwise secure the equipment against inadvertent movement when the brake is being worked on or is removed entirely.

Failure to properly center the brake and obtain uniform lining contact results in localized heating and, ultimately, reduced torque, which can cause injury or death.

Chapter 6: ADJUSTMENT – Warnings and Cautions

Protect against the possibility of movement due to the effects of gravity, wind or other source of energy, which has the potential to create a hazard when the brake is being worked on or is removed entirely.

Chapter 7: OPERATIONAL TEST – Warnings and Cautions

Always perform an operational test of the brake after any replacement, adjustment, or repair. Read and understand the intent of the warnings published in this document – if in doubt, ask.

In a hoist application, post observers to monitor the position of the hook if it travels out of sight of the operator.

Before conducting an operational test, remove all tools, chocks and other equipment, which may create a hazard when the machine is operated.

Following any repair or adjustment, and before conducting an operational test, verify that all brake adjustments are complete in accordance with Chapter 6.

Before attempting to operate any motion in any application, advise and account for the location and security of all personnel involved.

Chapter 8: MAINTENANCE AND REPAIR – Warnings and Cautions

Unexpected movement or hazardous voltage can cause injury or death. Disconnect, lock out, and tag out the power source that feeds this device to prevent power from being applied while inspection and repairs are being performed. Before beginning repairs, try the operational controls to verify that the intended power source is disconnected.

When replacing a brake wheel or associated drive line components on an existing installation, verify that the brake is centered with uniform lining contact as described under the topic “Brake Installation”. Incorrect repair or replacement can result in death or injury to personnel.

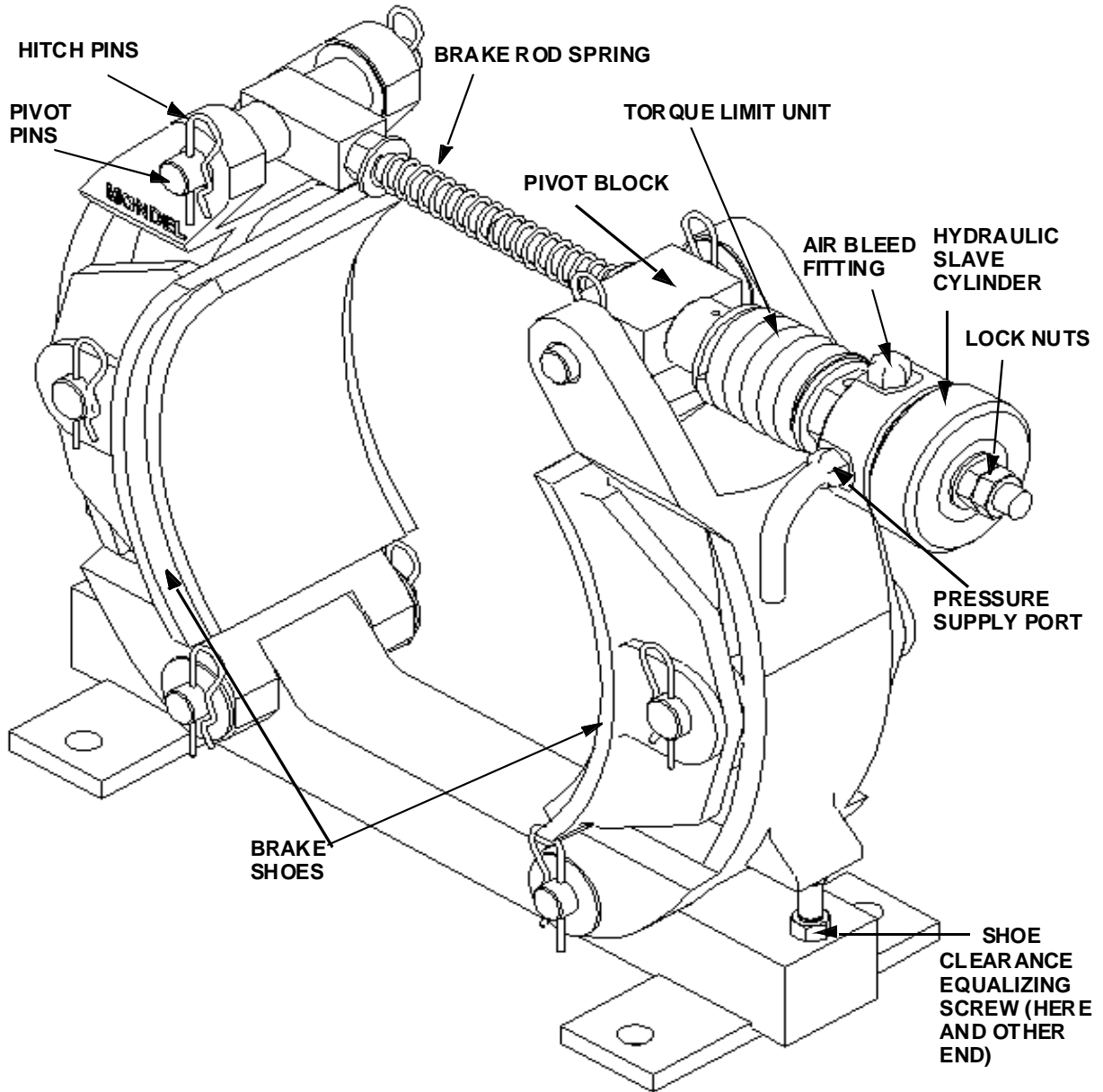
Chapter 2.0: General Description

- 2.1: Mondel type MSM pedal-operated braking systems are designed to provide the equipment operator with a sensitive pressure/torque braking system for smooth, controlled slowing, stopping and spotting of the load.
- 2.2: For more demanding environments, special hardware, enclosures, paint and surface treatments are available.

IF YOU HAVE AN UNUSUAL APPLICATION, OR REQUIRE A RECOMMENDATION FOR A BRAKE SIZE AND TYPE CONTACT MAGNETEK.

Figure 1

General Arrangement
MSM Hydraulically Applied Electric Shoe Brake



Chapter 3.0: Application

- 3.1: The brake covered by this manual is type MSM and is generally used for medium duty crane service.
- 3.2: For a given wheel diameter the Association of Iron and Steel Engineers (AISE) determines the prescribed torque, when applied to 30 and 60 minute rated motors in steel mill applications.
- 3.3: When applied to four quadrant drives or other applications where wheel heating can be accurately predicted, type MSM brakes can be provided with torque values in excess of the AISE recommendations.
- 3.4: When the load cycle requires a larger than normal wheel size, as is frequently the case on crane bridge drives, MSM brakes can be provided with torques lower than AISE for a given wheel size.
- 3.5: For applications where larger than normal running clearance is required, a longer stroke slave cylinder can be applied to a given brake. Typical would be severe applications where wheel expansion can be considerable or where excessive wheel run-out can be expected.

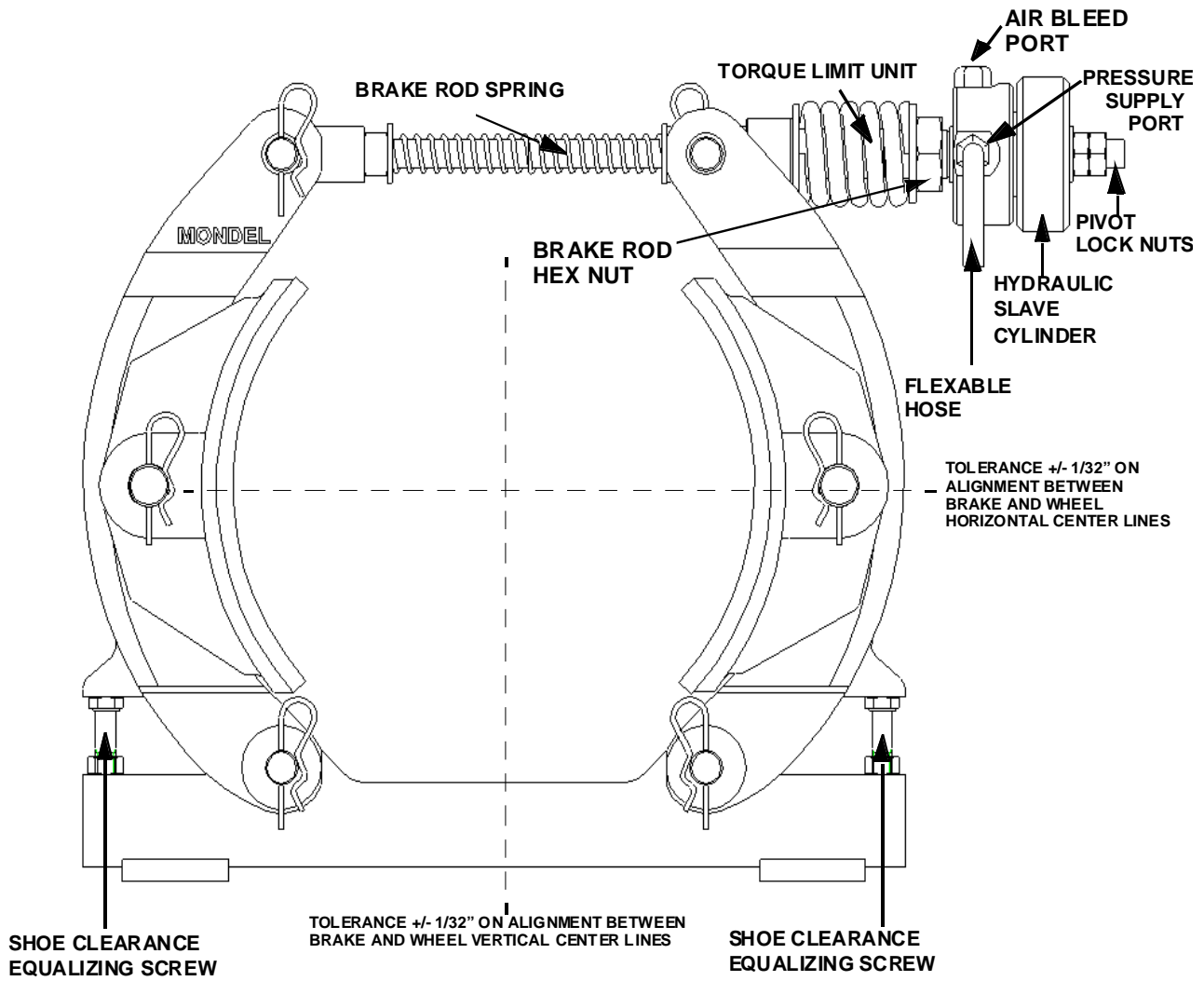
Chapter 4.0: Description of Operation

- 4.1: The type MSM brake has a direct-operating hydraulic slave cylinder mounted on the brake rod. Hydraulic pressure developed by the pedal-operated master cylinder is transmitted, via the connecting lines, to the slave cylinder. This applies the shoes to the wheel, developing a braking torque proportional to the force on the remote pedal. The master cylinder provides sensitive control between zero and maximum torque/force. A "torque limiting unit" controls the maximum torque available.
- 4.2: The brake remains applied as long as there is sufficient pressure available to the hydraulic slave cylinder port. When hydraulic pressure falls below a minimum level and brake rod spring force exceeds the hydraulic slave cylinder piston force, the brake will begin to release.
- 4.3: Brake application and release must not be prolonged as braking energy imposed on the wheel could exceed its thermal capacity. Excessive slippage will eventually over-heat the linings with consequent loss of braking torque.
- 4.4: Subject to the effect of brake geometry, braking torque depends upon three major factors:
- 4.4.(a):** The diameter of the wheel.
 - 4.4.(b):** The coefficient of friction of the lining material.
 - 4.4.(c):** The force with which the linings are applied to the wheel.
 - 4.4.(d):** The force with which the linings are applied to the wheel, depends on the force applied to the remote pedal control.

NEMA states: "The torque ratings apply at a worn lining condition defined as the point where re-adjustment is required as recommended by the manufacturer".

- 4.5: As the brake releases, a light spring, mounted on the brake rod between the link arms, moves the shoes apart.
- 4.6: Manually set shoe clearance equalizing bolts to ensure equal clearance between each shoe and the wheel.
- 4.7: Each time the brake is released, the shoes move apart to provide running clearance from the wheel. The slave cylinder's working stroke establishes the total clearance available for both shoes. The clearance allocated to each shoe is determined by the setting of the "shoe clearance equalizing bolts". See Fig. 2 and Chapter 6: "Shoe Clearance Adjustment".
- 4.8: This series of brakes is equipped with self-aligning, parallel clearance shoes which are designed to allow greater tolerance of wheel run-out and similar problems.
- 4.9: Various optional features are available. If the brake covered by this manual has any optional features, they will be listed on the front page of this manual and covered by supplementary instructions.

Figure 2



Chapter 5.0: Installation

- 5.1: After unpacking, visually inspect the brake assembly to ensure that damage has not occurred during shipment and that there are no loose or missing parts.
- 5.2: Prepare the brake support structure and install the brake assembly subject to the following:
- 5.2.(a):** Allow adequate clearance to adjacent obstructions. This will ensure the minimum practical access for adjustments and maintenance.
 - 5.2.(b):** Whether mounting a brake in a new or existing installation, mounting bolts need a reasonable clearance in the base mounting holes to allow the brake to be aligned for full contact between the brake linings and the wheel.
 - 5.2.(c):** Circumstances may determine the best order of installation for the brake and the wheel. This may be due to the available space or handling facilities on site; generally the wheel is installed first.
 - 5.2.(d):** Center the brake shoes across the width of the brake wheel. This avoids ridge formation and the possible creation of a dangerous situation as the linings wear.
- 5.3: Alternatively, it may be necessary to introduce the brake to the brake wheel from one side of the wheel. In this case partial dismantling of the brake may be required, depending on the circumstances. Refer to the general arrangement drawing in this manual to evaluate the options.
- 5.3.(a):** Once the brake is in position with mounting bolts loosely installed, turn adjusting nut clockwise until the shoes grip the wheel and the Torque Limit Unit just starts to compress.
 - 5.3.(b):** This will apply the brake at approximately rated torque and – bolt hole clearance permitting – square the brake to the wheel for maximum shoe contact area.
 - 5.3.(c):** When the brake assembly is correctly aligned and clamped to the wheel, loosen each of the securing bolts in turn and verify clearance in the base mounting holes. This will ensure tolerance to allow minor adjustments to the brake alignment to accommodate future relined shoes.
 - 5.3.(d):** Magnetek does not recommend “Dowelling” or “Keeper Plates” to maintain alignment.
- 5.4: Type MSM brakes are generally installed with the base and brake wheel shaft horizontal.
- 5.5: Type MSM brakes can also be wall mounted, with the brake wheel shaft horizontal or vertical.
- 5.6: For any other mounting arrangements consult factory.
- 5.7: The brake assembly must always be square and aligned to the brake wheel within a maximum of $\pm 1/32$ inch, in three axes (horizontal, vertical, and longitudinal), (Fig. 2).
- 5.7.(a):** Adjust the brake support bracket to achieve the specified horizontal and longitudinal alignment. For best performance, the brake base should be flat and parallel to the wheel rim or motor shaft. It may be necessary to release and re-apply the brake pressure several times to achieve optimum alignment. Shim under the brake base for the vertical alignment.
 - 5.7.(b):** Be sure that the brake shoes are still aligned parallel to the face of the brake and that each brake shoe is fully secured to its link arm.

5.7.(c): With the brake fully applied, verify that the shoes are centered on the wheel face and that lining contact is within adequate bedding range.

5.7.(d): When the brake is correctly aligned in all three axes, tighten the brake mounting bolts and re-check the alignment.

5.7.(e): Connect brake slave and pedal master cylinders, and hydraulic fluid reservoir. Design responsibility for the sizing and logic of the hydraulic control circuit is by "others"; the following is provided only as a guide. Typical hydraulic system layouts are available from Magnetek.

5.8: The hydraulic fluid reservoir must be at the highest point of the system. Horizontal pipe runs must be level without "humps" to trap air. Install additional bleed points if necessary.

5.9: Hydraulic slave cylinder connections must be flexible to allow the cylinder to move when the brake is operated.

5.10: Hydraulic supply lines and hoses must be suitable for the environment and rated for ambient temperature and working pressure.

5.11: Avoid system contamination; keep all hose ends, tube ends, fittings and cylinder ports plugged until ready to connect.

5.12: Route hoses and connectors to allow the brake to work as intended.

5.13: Fill with hydraulic brake fluid. Use DOT 4 or equivalent fluid. Other fluids may be incompatible with seals used in the system and cause rapid deterioration of critical components.

5.14: Bleed the system as follows:

Note: Keep the fluid supply tank full and topped-up during these procedures.

5.14.(a): Ensure that fluid reaches the master cylinder and that its piston retracts fully.

5.14.(b): Attach a bleeder tube to the slave cylinder bleeder screw head. Keep free end of tube immersed in a small amount of the fluid in a clean container and open the bleeder screw one turn.

5.14.(c): Operate the pedal lever several times, until fluid without air bubbles, flows through the system and out of the tube. Close the screw.

5.14.(d): Repeat with any additional slave cylinders in the system.

5.14.(e): When all slave cylinders have been bled, the system should be working positively. Operation of the pedal lever must apply torque to the brakewheel.

5.14.(f): If the system does not work positively, there may still be air in the system. Repeat the above steps.

Chapter 6.0: Adjustment

- 6.1: Following any adjustment or repair of the brake, test operation of the brake as described under "Operational test", Chapter 7.
- 6.2: Complete adjustment is required following any rework where any settings were disturbed.

Table 1

BRAKE WHEEL SIZES (Inches)	TYPICAL RUNNING CLEARANCE BETWEEN LINING AND BRAKE WHEEL (Inches)	MAXIMUM FULL SPEED BRAKE WHEEL run-out (Inches)
6	0.014	0.006
8	0.016	0.008
10	0.020	0.010
13	0.026	0.013
16	0.032	0.016
19	0.038	0.019

Notes:

1. Refer to "Brake Installation" and "Replacing the Brake Shoes" for adjustment instructions.
2. Evaluate brake wheel run-out at full speed. It must not exceed value shown in this table.

6.3: Manual Operation

6.3.(a): Brake installation and shoe replacement described elsewhere, require the brake to be released and reapplied by hand. Proceed as follows:

6.3.(b): To manually release the brake: Adjust the brake rod hex-nuts, – to increase the brake rod length – until there is sufficient lining to brake wheel clearance.

6.3.(c): To manually apply the brake: Adjust the brake rod hex-nuts, – to decrease the brake rod length – until the linings contact the brake wheel. Continue until the Torque Limit Unit just begins to compress, then proceed to "Slave Cylinder Adjustment".

6.4: Slave Cylinder Adjustment

After the brake and wheel are correctly installed and aligned, adjust each slave cylinder as follows:

6.4.(a): Do not operate the pedal control.

6.4.(b): Loosen the equalizing screw lock-nuts, then turn both equalizing screws in, to allow the link arms and shoes to move apart.

6.4.(c): Loosen the pivot block nuts, sufficiently letting the shoes open to clear the wheel.

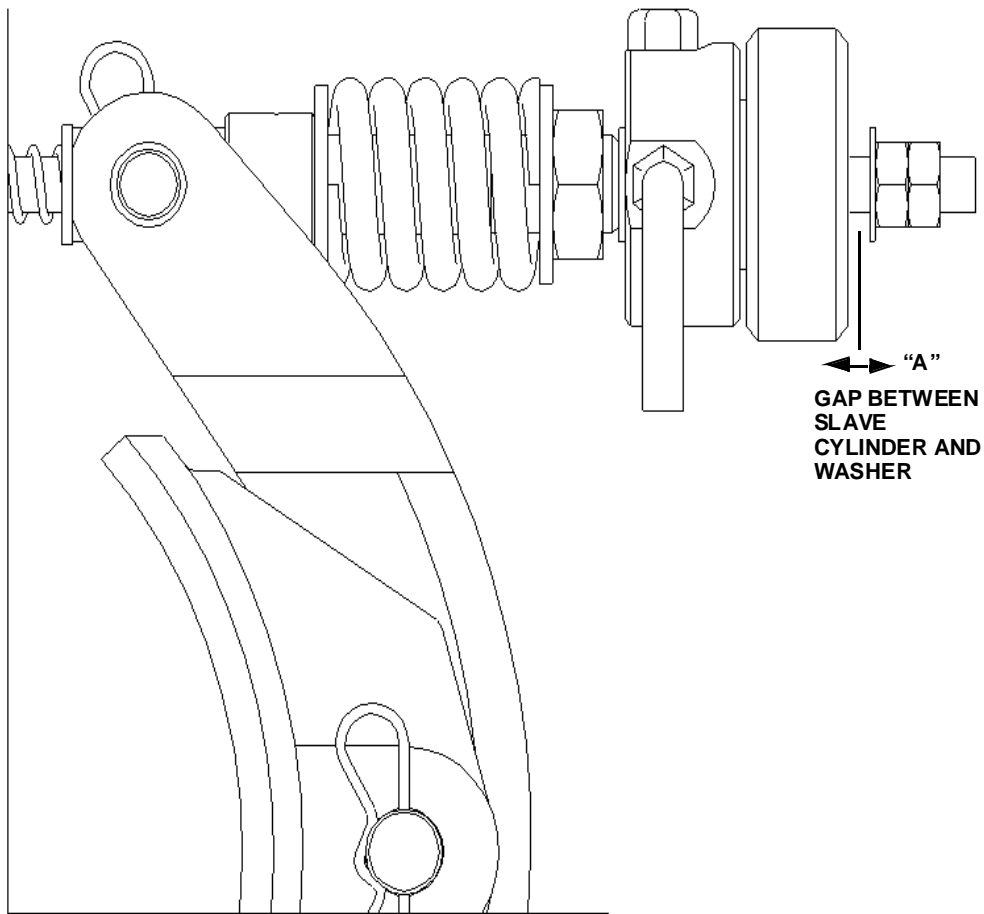
6.4.(d): Re-tighten pivot block lock nuts forcing the slave cylinder piston to retract and the shoes to just contact the wheel. (If necessary, open the bleed fitting to vent the cylinder allowing 100% piston retractor. Re-close the bleed fitting).

6.4.(e): Hold both shoes in contact with the wheel and back-off the pivot block lock nuts to set the gap between the outer face of the slave cylinder and the washer under the pivot block lock nuts. See Fig. 3.

6.4.(f): Tighten pivot block lock-nuts without altering slave cylinder gap.

Figure 3

Slave Cylinder Adjustment



BRAKE	6"	8"	10"	13"	16"	19"
"A" (INCH)	0.06	0.10	0.12	0.15	0.19	0.21

6.5: Torque Adjustment

6.5.(a): The rated torque, as shown on the nameplate, will be developed when the following conditions are met:

6.5.(a).(i): The brake is applied and aligned properly.

6.5.(a).(ii): The cylinder is adjusted correctly.

6.5.(a).(iii): The correct linings are fitted.

6.5.(a).(iv): The linings are in good condition and bedding is completed.

6.5.(a).(v): The brake wheel is aligned and in good condition.

6.6: Shoe Clearance Adjustment

6.6.(a): The total available shoe clearance is determined by the active stroke of the hydraulic slave cylinder. Distribution of the resulting clearance is determined by the setting of the active shoe clearance equalizing screw (Fig. 2).

6.6.(b): Generally only one of the two equalizing screws will be effective depending on the brake being installed horizontally or vertically.

6.6.(c): The “active” equalizing bolt will be evident after applying and releasing the brake.

6.6.(d): To equalize the brake shoe running clearance:

6.6.(d).(i): Back-off both equalizing screws allowing the shoes to move away from the wheel.

6.6.(d).(ii): Adjust the active side equalizing screw to limit the travel of that shoe; this moves the other shoe away from the wheel. Continue adjustment until wheel clearance is equal for both shoes.

6.6.(d).(iii): Set the non-active side equalizing screw so that shoe travel is not restricted; lock both equalizing screws with jam-nuts.

6.7: Parallel Shoe Gap Adjustment

6.7.(a): For optimum lining wear distribution, brake shoes have controlled freedom to align with the wheel contour as the linings wear.

6.7.(b): Each brake shoe holder pivots on its link arm. Its freedom to rotate under gravity is controlled by a shoe holder friction mechanism.

6.7.(c): Spring loaded pins in each link arm, see Fig. 4, bear against the inside of the shoe and provide enough tension to keep the shoes from rotating when the brake is released. The tension is not adjustable. When a shoe is replaced, make sure that both shoe alignment tension mechanisms are re-installed.

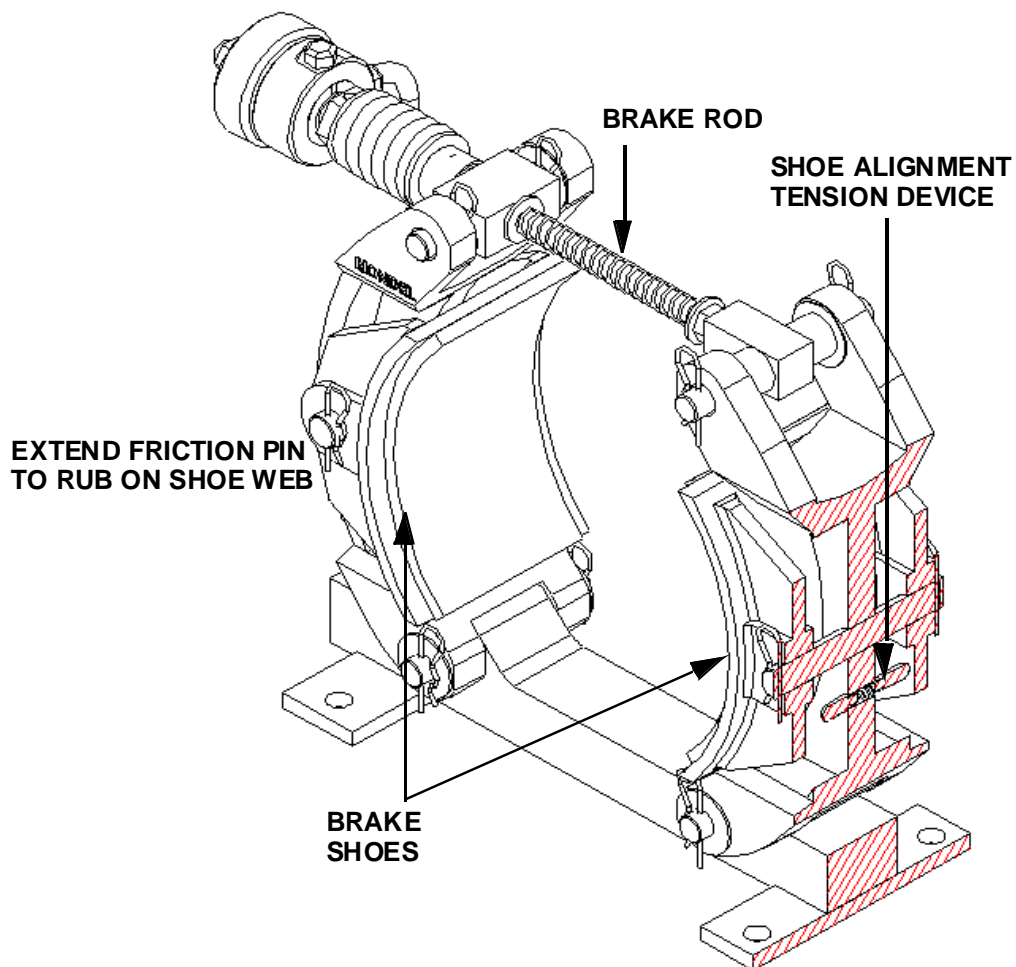
6.7.(d): To align shoes with the wheel, apply the brake at the rated torque and make the following initial adjustments:

6.7.(d).(i): Release the brake.

6.7.(d).(ii): With the brake released, use a soft-faced mallet to tap the upper edge of each brake shoe, in towards the wheel, in the direction it would rotate under gravity.

6.7.(d).(iii): Re-apply the brake, and the shoes will be forced to align with the wheel to optimize parallel clearance with the wheel.

Figure 4



Chapter 7.0: Operational Test

- 7.1: Heed all warnings and cautions in addition to the owners' safety procedures.
- 7.2: Follow all standards and local statutes.
- 7.3: Remove any drum chocks on a hoist application.
- 7.4: Initially, test the brake without load. Activate the equipment for one short jog and, using the remote pedal, apply the brake. If the brake fails to stop and hold the motion stationary, repair or re-adjust the brake as necessary. Visually inspect the brake during operation to ensure all adjustments are correct. If successful, continue with longer duration jogs until confident that the brake is operating satisfactorily.
- 7.5: A minimum of 60% contact between lining and wheel on each shoe is required before subjecting the brake to its rated capacity.
- 7.6: If re-lined shoes have been fitted, or the brake alignment has been altered or is otherwise suspect, you may have to realign the brake. This will minimize the bedding needed to obtain the necessary 60% of brake lining to wheel contact.
- 7.7: The required lining contact is seldom achieved without "bedding", but time spent to achieve satisfactory bedding will be rewarded with a considerably longer life for the lining.
- 7.8: Modern linings, although hard wearing, are difficult to "bed" when the area in contact with the wheel cannot support the heat energy transferred to the brake. As a result the linings will become "glazed" where in contact with the wheel. "Glazing" is the name applied to a condition where the lining has been heated beyond its working temperature range and is no longer capable of its designed coefficient of friction. "Glazing" will seldom be removed by further braking operations as any increase in area of lining contact will immediately be glazed.
- 7.9: "Glazing" can be prevented by ensuring a minimum of 60% contact area before placing the brake in service.
- 7.10: On hoists, well-spaced, short bursts of energy, such as an E.Stop at high speed with no load are best to achieve initial "bedding". This will limit the energy input while the wheel is monitored for temperature.
- 7.11: Care must be taken to achieve the minimum 60% contact between lining and wheel on each shoe without exceeding the maximum of 150°C.
- 7.12: Bedding is just as important when the brake is applied with a four-quadrant drive, and not subjected to dynamic loading, except under emergency conditions.
- 7.13: The following are the key steps to satisfactory "bedding" to extend lining life.
- 7.13.(a):** Use only genuine Mondel lined brake shoes. This will maintain specified brake performance and ensure that the braking torque is neither more nor less than the specified rating.
- 7.13.(a).(i):** Linings thicker than the original equipment may result in contact with the wheel only at the tips.
- 7.13.(a).(ii):** Linings thinner than the original equipment may result in contact with the wheel only across the middle and cause vibration during stops.
- 7.13.(b):** Do not use re-lined shoes where the castings are damaged, worn or distorted.

7.13.(c): Square the brake to the wheel for optimum contact between the linings and the wheel.

7.13.(d): Type MSM brakes utilize shoe clearance equalizing bolts to equalize brake shoe clearance; ensure that they are correctly adjusted in accordance with Chapter 6.

7.13.(e): Type MSM brakes incorporate a mechanism to keep brake shoe clearance parallel to the wheel; ensure that it is correctly adjusted in accordance with Chapter 6.

7.14: Wheel run-out must be within the allowable tolerance; see Table 1. Any unnecessary lining drag will result in excessive heat in the wheel and lining deterioration.

7.15: Every operational test should include verification of brake wheel run-out as follows:

7.15.(a): At all speeds, verify that the linings are clear of the wheel. Take steps to correct wheel run-out, imbalance or the effects of critical speed.

7.15.(b): If necessary, check low speed brake wheel run-out as follows:

7.15.(c): Using a run-out gauge, verify that radial run-out does not exceed 0.001” per inch of brake wheel diameter. Refer to Table 1 for brake wheel run-out allowance. Bearing play can also be checked by lifting the brake wheel with a suitable lever while observing the dial gauge.

Chapter 8.0: Maintenance and Repair

NEMA Standard ICS 9-1993, Part 1 recommends that brakes be fitted with new or re-lined shoes before the lining material is worn excessively. Refer to Table 4 for minimum thickness.

8.1: Replacing the Brake Shoes

8.1.(a): Remove and reinstall the brake shoes as follows:

8.1.(a).(i): On a hoist, lower the load to the floor and disconnect the load from the bottom block.

8.1.(a).(ii): Reset the bottom block on the floor, or on a suitable support. Chock drum to prevent rotation of the drum.

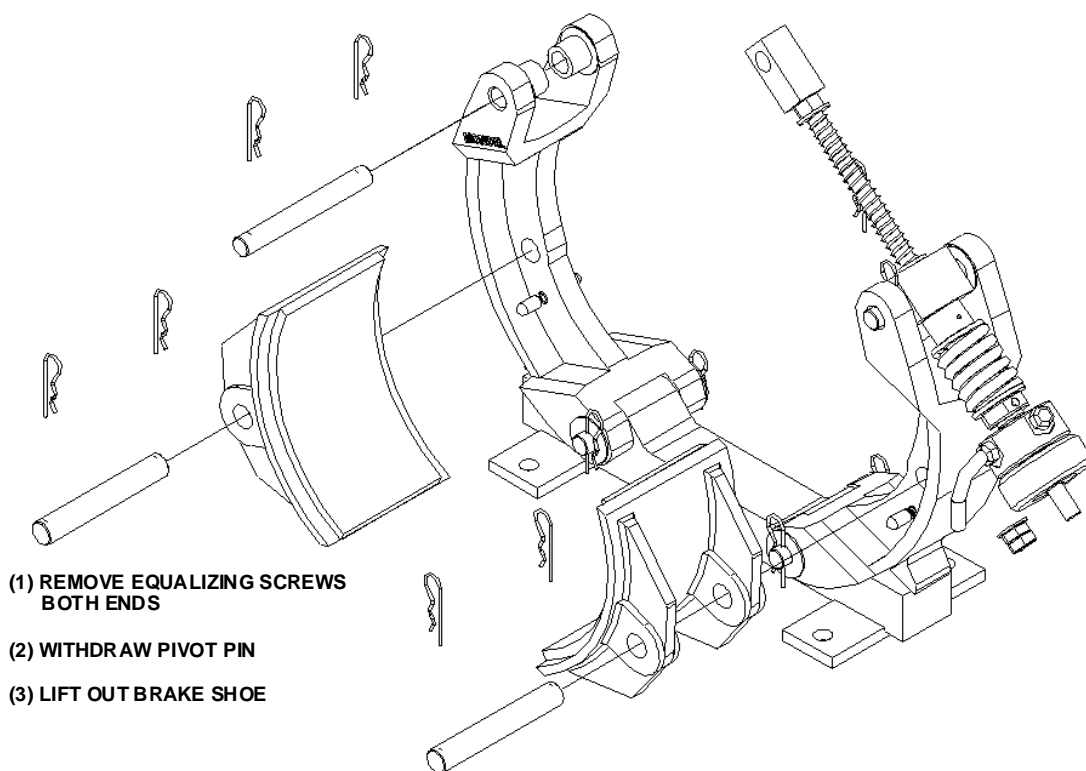
8.1.(a).(iii): Refer to Chapter 6 and manually release the brake to provide sufficient clearance between the brake linings and the brake wheel.

8.1.(a).(iv): Remove both shoe clearance equalizing bolts.

8.1.(a).(v): Loosen and disconnect the top rod to provide clearance between the brake linings and the brake wheel.

8.1.(a).(vi): Remove hitch pins and withdraw the shoe pivot pins connecting the brake rod to the link arm furthest from the hydraulic slave cylinder. Swing the brake rod assembly clear and remove the shoes from the wheel.

8.1.(a).(vii): Remove either shoe hitch pin and withdraw the shoe pivot pin. The brake shoe can now be removed. Remove the other shoe in similar fashion.



8.1.(a).(viii): Before starting shoe installation, check that the braking surface of the wheel is clean and free from oil and grease.

8.1.(a).(ix): Next, verify that the lining surface will be true to the wheel when the shoe is installed. Carefully check lining contact with the wheel. Remove any high spots with emery paper to ensure 60% contact between the lining and the wheel.

8.1.(b): Ensure adequate clearance will be available and install the replacement shoe assemblies in the reverse order.

8.1.(c): The braking surface of the wheel must be clean and free from any oil or grease contamination which may have occurred during servicing.

8.1.(d): Make all adjustments covered in Chapter 6.

NOTE: The brake can be damaged if the brake shoes are not accurately aligned. Do not operate the brake unless the brake shoes are in their correct position and all shoe holder pivot and hitch pins are correctly installed.

8.1.(e): Newly lined shoes seldom fit perfectly with the contour of an existing brake wheel, particularly if the wheel is worn or undersized. If the brake has been moved, realignment of the brake with the wheel may be necessary. Refer to the topic "Brake Installation" for the correct alignment and bedding procedure.

8.1.(f): Refer to Chapter 6 and adjust the slave cylinder as required.

8.1.(g): Refer to Chapter 6 and adjust the torque as required.

8.1.(h): Refer to Chapter 6 and adjust the brake shoe clearance as required.

8.1.(i): Refer to Chapter 8; bed and test the brake as described.

8.2: Re-lining The Brake Shoes

We do not recommend that shoes be re-lined in the field. New bonded shoe assemblies can be ordered as repair parts. Factory rebuilt shoes are also available from Magnetek. Under this program, credit will be allowed for old shoes in usable condition.

8.3: Removal and Installation of Motor and Brake Wheel as an Assembly

8.3.(a): Quick replacement of the drive motor and brake wheel, as an assembly, can be accomplished with minimum disturbance to the brake.

8.3.(b): Disconnect, lock out, and tag out the disconnect switch that feeds this equipment to prevent power from being applied while service is being performed.

8.3.(c): Remove both shoe assemblies as described under the topic, "Replacing the Brake Shoes". If the shoes will not be replaced as part of this work order, identify the shoes in order that they can be re-fitted without having to be re-bedded.

8.3.(d): Disconnect the brake rod from the link arm furthest from the hydraulic slave cylinder.

8.3.(e): Swing the entire brake rod assembly clear to permit unobstructed vertical withdrawal of the brake wheel without damage.

8.3.(f): Remove the motor and brake wheel by lifting straight up until the wheel clears the brake links.

8.3.(g): Install the motor and brake wheel by lowering it into place.

8.3.(h): Re-install the shoe assemblies as described under the topic "Replacing the Brake Shoes".

8.3.(i): Re-attach the brake rod to the link arm.

8.3.(j): Ensure that all shoe holder pivot and hitch pins are correctly installed.

8.3.(k): Test the operation of the brake as described under the topic "Operational Test".

8.3.(l): NOTE: A brake wheel is installed as described elsewhere.

8.3.(m): Verify the brake is still properly centered over the wheel. Make any adjustments as required. See Chapter 5, "Brake Installation".

8.3.(n): Maintenance and inspection periods depend on operating conditions. High duty cycle applications obviously require more frequent inspections, than brakes operating on low duty cycle applications. In either case, we recommend a general inspection every 100 operating hours or every month minimum.

8.4: Inspection

8.4.(a): Mechanical fasteners should be checked for tightness. Inspect the brake wheel to ensure that it is neither damaged nor loose. Inspect the brake mounting bolts for tightness, and that brake shoe clearance settings are within specifications.

8.4.(b): Inspect the brake wheel for unusual scoring, signs of over-heating, cracking or wear. Replace any damaged, cracked or excessively worn brake wheels.

8.4.(c): Inspect the condition of the bearings and bushings as well as the mechanical integrity of the complete braking system. Make any repairs or adjustments that may be required to ensure proper brake system operation.

8.4.(d): Check the brake wheel run-out at all speeds. See Chapter 7, "Operational Test".

8.5: Lubrication

8.5.(a): Periodic lubrication is not required on these brakes. Oil or any other lubricant applied to any part of the brake may trap airborne contaminants.

8.6: Brake Adjustments

8.6.(a): Wear will be more rapid when the linings are new, while the high spots are wearing down as the bedding process takes place. Adjustment will be required soon after the brake has been put into service.

Following any adjustment, maintenance or repair on the brake, fully test its operation as described under topic "Operational Test".

Chapter 9.0: Replacement Parts

9.1: Brake Lining Replacement

9.1.(a): As a general guide, Magnetek recommends that brake linings be replaced when the linings wear down to 1/16" minimum thickness. Table 4, taken from standard ICS 9-193, Part 1: Electromagnetic Brakes, shows NEMA's recommended range of minimum lining thickness for bonded and riveted linings on brake wheels from 8" to 19" diameter...

Table 4

Wheel Diameter (Inches)	Maximum RPM Ductile Iron	Minimum Wheel Dia. (Inches) (1)	Lining Thickness (Inches) (2)	
			Riveted (3)	Bonded
8	5000	7.94	0.010	0.016
10	4000	9.92	0.010	0.020
13	3300	12.90	0.010	0.026
16	2600	15.87	0.015	0.038
19	2300	18.87	0.015	0.038

(1) Minimum after re-machining.
(2) Minimum permissible prior to replacement.
(3) Above rivet head at maximum wear point.

9.2: Detailed procedures for brake shoe replacement and actuator removal and installation are covered earlier in this manual.

9.3: For other parts replacement or complete disassembly and rebuild, refer to the exploded view attached to this manual.

9.4: Before returning a brake to service after major repairs or overhaul, carry out all adjustments outlined in this manual followed by a complete operational test.

9.5: Ordering Parts

9.5.(a): For part number and identification, refer to the Exploded View and Bill of Material forming part of this manual.

9.5.(b): Always quote the Magnetek Serial Number when ordering parts.

9.5.(c): For optimum brake life and performance use only genuine Mondel parts.

Chapter 10.0: Long Term Storage

- 10.1: If a brake assembly will not be installed immediately, it can be stored indoors in a dry location indefinitely, or outdoors for a reasonable time if adequately protected from moisture and corrosive atmosphere. The brake assembly must always be protected from direct exposure to the elements, unless specifically treated at the factory for use in that environment. Covering with plastic sheeting is not acceptable unless provision is made to prevent condensation under the plastic.
- 10.2: During storage, rust may form on the surface of the brake wheel. This is not usually a problem with ductile iron wheels nor is it necessary to clean the wheel before placing the wheel in service. The first few brake applications will polish the wheel.
- 10.3: Steel wheels may form scale when corroded, and the braking surface may have to be re-machined to remove the scale. See Table 4 for machining limits. Dynamic balance may be affected.
- 10.4: Before painting a brake, protect all pivot points, brake-rod, brake wheel and linings, etc.
 - 10.4.(a):** Data plates and labels must not be removed or painted over.