



502-MB-210-494-01

SERVICE MANUAL AND REPAIR PARTS

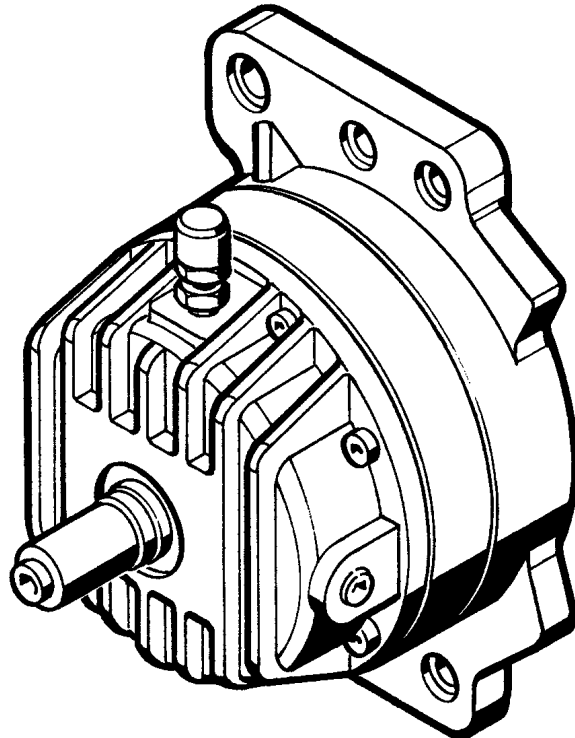
FOR

Posistop[®] Motor Brakes

MB-210-494 (Horizontal Brake)

MB-210-496 (Vertical Down Brake)

MB-210-497 (Vertical Up Brake)



WARNING - Read this manual before any installation, maintenance or operation.



FORCE CONTROL INDUSTRIES, INC.

**MANUFACTURERS OF MECHANICAL AND
ELECTRICAL POWER TRANSMISSION EQUIPMENT**

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SPECIAL 24 MONTH WARRANTY

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Table of Contents

Posistop MB-210-494, MB-210-496 and MB-210-497 Brakes

Section 1 - DESCRIPTION AND OPERATION

| | |
|---|---|
| 1-1 The Oil Shear Principle | 1 |
| 1-2 Description and Typical Application | 1 |
| 1-3 Motor Brake Features | 2 |
| 1-3 Motor Brake Operation | 2 |

Section 2 - SPECIFICATIONS

| | |
|--------------------------------|---|
| 2-1 Dimensional Specifications | 3 |
| 2-2 Operating Specifications | 4 |

Section 3 - INSTALLATION

| | |
|----------------------------|---|
| 3-1 Installation Procedure | 4 |
|----------------------------|---|

Section 4 - LUBRICATION

| | |
|-------------------------------------|---|
| 4-1 Checking the Oil Level | 6 |
| 4-2 Changing the Oil | 6 |
| A. Horizontal Brake (MB-210-494) | 6 |
| B. Vertical Down Brake (MB-210-496) | 6 |
| C. Vertical Up Brake (MB-210-497) | 7 |
| 4-3 Type of Oil | 7 |

Section 5 - OPERATIONAL CHECKS

| | |
|------------------------|---|
| 5-1 Operational Checks | 7 |
|------------------------|---|

Section 6 - TROUBLE SHOOTING

| | |
|----------------------------|---|
| 6-1 Trouble Shooting Chart | 8 |
|----------------------------|---|

Section 7 - DISASSEMBLY

| | |
|---|----|
| 7-1 Removing Brake from Lift and Transfer Machine | 9 |
| 7-2 Removing End Housing for Access to the Brake Stack | 10 |
| 7-3 Hub (#2) Disassembly | 10 |
| A. Removing Wear Sleeves (#32) and (#86) | 11 |
| B. Removing Bearing (#20) | 11 |
| 7-4 Removing Piston Housing (#10) and Piston (#3) to Replace Piston Seals | 11 |
| 7-5 Removing Oil Seals | 11 |
| A. From End Housing (#9) | 11 |
| B. From Housing (#8) | 11 |

Section 8 - CLEANING AND INSPECTION

| | |
|-----------------------------|----|
| 8-1 Cleaning and Inspection | 12 |
| 8-2 Repair and Replacement | 12 |

Section 9 - REASSEMBLY

| | |
|--|----|
| 9-1 General Reassembly Instructions | 12 |
| 9-2 Installing Oil Seals | 13 |
| 9-3 Hub Reassembly | 13 |
| A. Installing Ball Bearing (#20) | 13 |
| B. Installing Wear Sleeve (#86) | 13 |
| C. Installing Wear Sleeve (#32) | 14 |
| D. Installing Collet (#110) Into Hub (#2) | 14 |
| 9-4 Installing Hub (#2) Into Housing (#8) | 14 |
| 9-5 Piston Housing and Piston Reassembly | 15 |
| 9-6 Installing Piston Housing (#10) and Piston (#3) Sub-Assembly to Housing (#8) | 16 |
| 9-7 Installing Brake Stack | 16 |
| A. Horizontal Brake (MB-210-494) | 16 |
| B. Vertical Down Brake (MB-210-496) and Vertical Up Brake (MB-210-497) | 16 |
| 9-8 Installing End Housing (#9) | 16 |
| 9-9 Final Reassembly | 17 |

Section 10 - ORDERING REPLACEMENT PARTS

| | |
|---|----|
| 10-1 General Information | 17 |
| 10-2 Factory Rebuild Service | 17 |
| 10-3 Name Plate Information | 17 |
| Parts List for Figures 10.1 & 10.2 | 18 |
| Figure 10.1 - Pneumatic Control Valve Mntg. Kit | 18 |
| Figure 10.2 - Posistop (Horizontal) Brake (Model MB-210-494) | 19 |
| Parts List for Figure 10.3 | 20 |
| Figure 10.3 - Posistop (Vertical Down) Brake (Model MB-210-496) | 21 |
| Parts List for Figure 10.4 | 22 |
| Figure 10.4 - Posistop (Vertical Up) Brake (Model MB-210-497) | 23 |

Section 1

DESCRIPTION AND OPERATION

1-1 THE OIL SHEAR PRINCIPLE

Conventional clutches and brakes depend on the friction between solid surfaces operating in air to transmit torque. Friction does the job, but produces a great amount of Heat and Wear, causing an increase in replacement parts, breakdown and maintenance time.

OIL SHEAR TECHNOLOGY was pioneered by **Force Control Industries, Inc.** in 1959 and resulted in one of the most energy efficient Clutch/Brake or Variable Drive Systems available today.

In 1970 **Force Control** introduced an **integral oil pump**, which requires no additional parts. This oil pump forces a positive oil feed from the center of the brake disc stack to “**Float**” the friction surfaces in a continuously circulating bath of oil.

The oil molecules tend to cling to each other and also to the friction surfaces. As moving and stationary parts are brought together, a thin but positive film of oil is maintained

between them and is controlled by the clamping pressure and grooves machined into the braking surfaces.

Torque is transmitted from one surface to the other through the viscous shear of the oil film. The braking surfaces are protected by this oil film, which reduces wear and effectively transmits heat away from the braking surfaces.

...thus brake wear is greatly reduced along with all routine maintenance common to conventional dry friction motor brakes.

AN OIL CHANGE EVERY 6 MONTHS IS ALL THAT IS REQUIRED FOR NORMAL MAINTENANCE.

1-2 DESCRIPTION AND TYPICAL APPLICATION

(See Figure 1.1)

The **Posistop Brake Models: MB-210-494 (Horizontal), MB-210-496 (Vertical Down) and MB-210-497 (Vertical Up)** are all multiple surface, spring-set and pneumatic release motor brakes. All three models are thru-shaft configuration.

These brakes were designed specifically to be used on a **Lift and Transfer Machine** as shown in Figure 1.1. The part is picked up off the Unload Transfer Rails of Stamping Press #1 and carried over to and set down on the Load Transfer Rails of Stamping Press #2.

The oil shear principle of the **Posistop Brake** also allows for a soft lay-down of the part reducing part damage.

These Thru-Shaft Posistop Brakes can be used for many varied Lift and Transfer Applications.

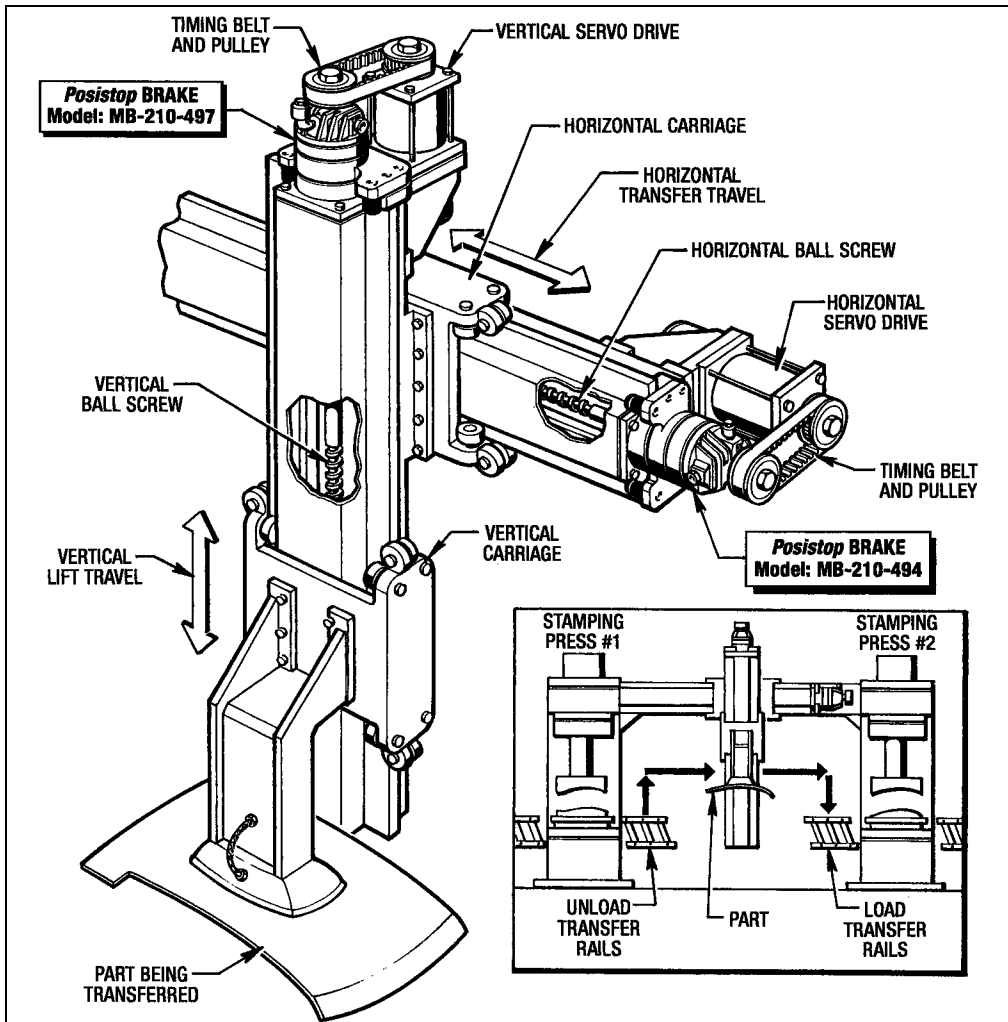


Figure 1.1 - Part Lift and Transfer Mechanism (Typical Application)

1-3 MOTOR BRAKE FEATURES

The most important Feature is the fact that it will reduce maintenance time and provide a very long service life.

- Easy retro-fit on existing machinery.
- Keyless Collet is a positive self-locking element with high torque transmitting capabilities.
- Totally enclosed design prevents contamination and corrosion.
- Heavy-duty housings combined with precision machined parts guarantee performance and long service life..
- Long-life Teflon Piston Seals.
- Self adjusting and reduced maintenance time.
- Internal integral oil pump maintains the **Oil Shear Principle** without external pumping devices.
- Multiple surface brake stack distributes the braking torque along the whole hub rather than on a single braking surface, reducing the heat and wear on each braking surface.

- 60 Ft. Lbs. and 75 Ft. Lbs. braking torque.
(Contact Force Control for other torque requirements.)
- Vertical and horizontal mounting.
- Automatic braking if electrical or pneumatic power is interrupted.

1-4 MOTOR BRAKE OPERATION

The Cross Section in *Figure 1.2* shows the brake in the normally spring-set braked position.

To run - The Control Valve Solenoid is energized which directs compressed air into the piston chamber which moves the piston to disengage the brake stack, allowing the drive motor to rotate the ball screw freely.

To Stop - The Control Valve Solenoid is de-energized which exhausts the air from the piston chamber. The Piston, which is spring loaded, returns to the braking position and stops the machine.

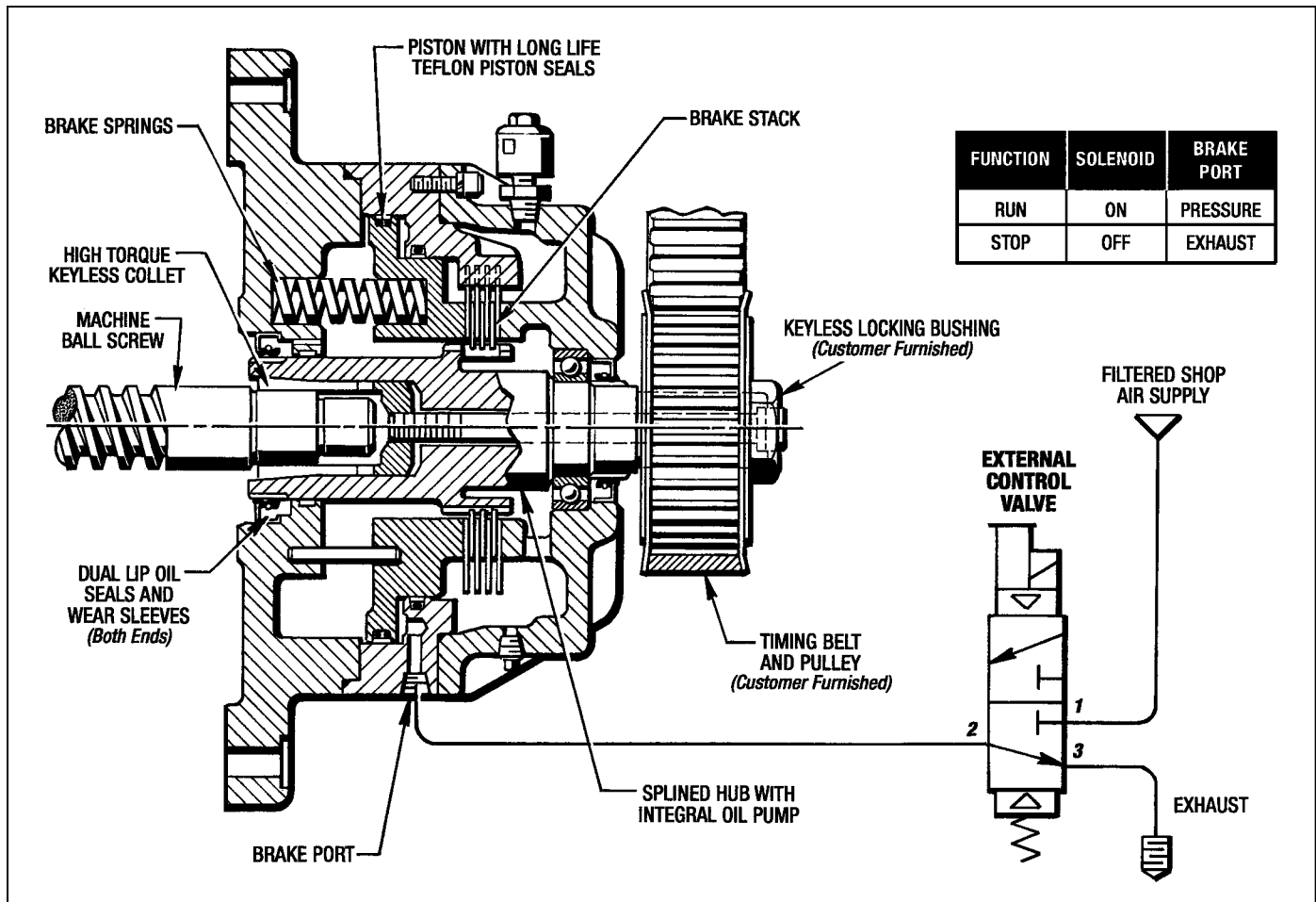
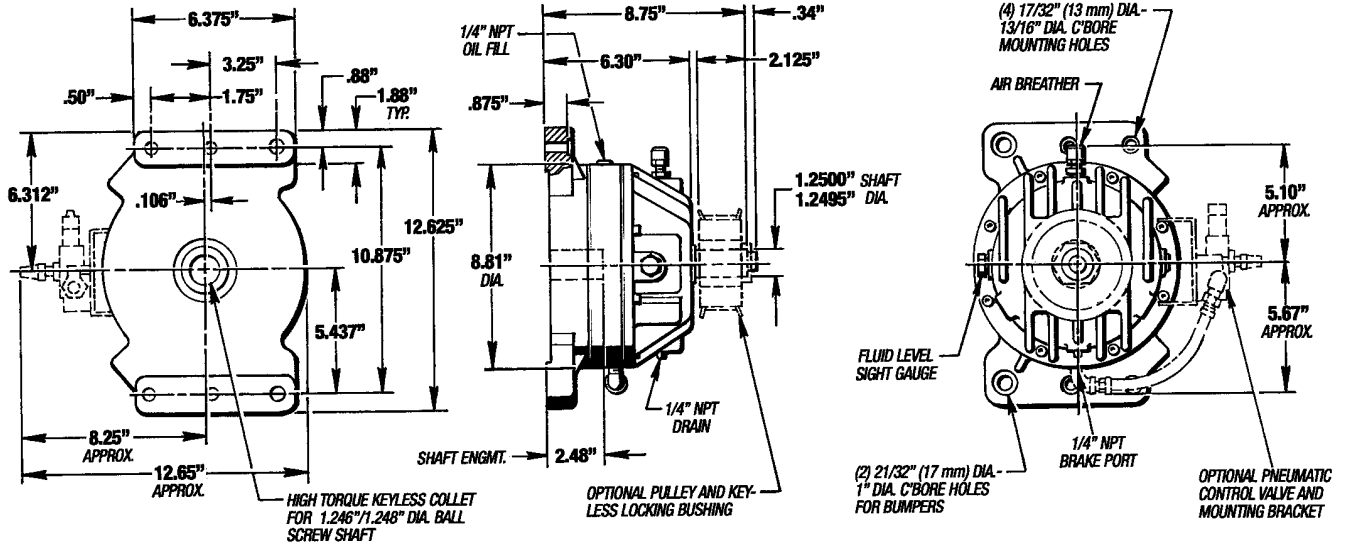


Figure 1.2 - Posistop Brake, Models: MB-210-494 and MB-210-496 Cross Section

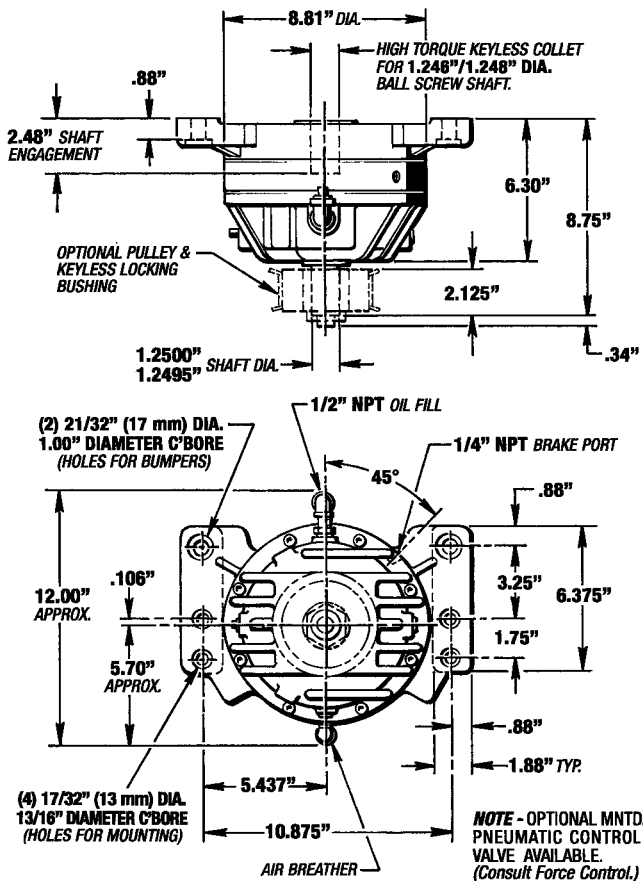
Section 2 SPECIFICATIONS

2-1 DIMENSIONAL SPECIFICATIONS

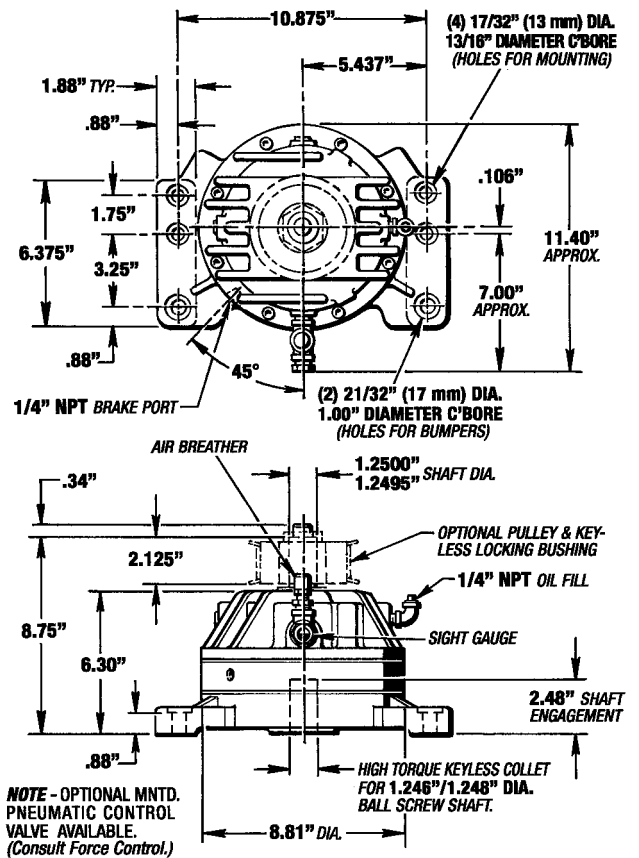
(Horizontal Installation) Model MB-210-494



(Vertical Down Installation) Model MB-210-496



(Vertical Up Installation) Model MB-210-497



2-2 OPERATING SPECIFICATIONS

| Posistop BRAKE MODEL | TYPE OF INSTALLATION | NOMINAL STATIC TORQUE <i>(Ft. Lbs.)</i> | NOMINAL DYNAMIC TORQUE <i>(Ft. Lbs.)</i> | RELEASE AIR PRESSURE <i>(PSI)</i> | | CYCLIC WK ² <i>(Lb. Ft.²)</i> | THERMAL RATING <i>(HP Sec/Min)</i> | MAX. KE per ENGMT. <i>(Ft. Lbs.)</i> |
|----------------------------|-------------------------|--|---|---|------|---|--|---|
| | | | | Min. | Max. | | | |
| MB-210-494 | Horizontal | 75 | 65 | 55 | 80 | .034 | 25 | 6425 |
| MB-210-496 | Vertical Down | 60 | 52 | 35 | 80 | | | |
| MB-210-497 | Vertical Up | 60 | 52 | 35 | 80 | | | |

Max. Operating Speed - *(Horizontal)* 3600 RPM; *(Vertical)* 1800 RPM

Approx. Fluid Capacity:

(MB-210-494) - 1 Quart ; *(MB-210-496)* - 3/4 Quart ; *(MB-210-497)* - 1-1/2 Quarts

Piston Volume - 3 Cu. In.

Section 3 INSTALLATION

IMPORTANT SAFETY PRECAUTIONS

The brake units described in this manual must not be installed in any manner except as specified herein and must not be operated at speeds, torque loads or temperatures other than what is specified in this manual. Failure to limit the operation of the brakes to the conditions specified could damage the brake units and may cause mal-function or damage to inter-connecting equipment

WARNING

The following precautions must be taken if the installation is to be a retrofit for an existing application. Before attempting installation, open the motor disconnects, shut off the control electrical supply and shut off the air supply. Lock them out to avoid the possibility of any personal injury.

The *Posistop* MB-210-494, MB-210-496 and MB-210-497 are shipped completely pre-assembled and ready for installation. They are also shipped dry so after they are installed the transmission fluid will have to be added. See **Section 4 -Lubrication** for the procedure.

3-1 INSTALLATION PROCEDURE

Pneumatic Control Valve - See *Figure 10.1*

Horizontal Brake (MB-210-494) - See *Figure 10.2*

Vertical Down Brake (MB-210-496) - See *Figure 10.3*

Vertical Up Brake (MB-210-497) - See *Figure 10.4*

The following **Installation Procedure** applies to all three brakes. (See *Figure 3.1*)

1. First make sure that the Ball Screw Shaft is cleaned thoroughly and is free of any foreign material before attaching the brake unit. Also check for nicks and burrs. Deburr as necessary.

IMPORTANT - Do not use any molybdenum disulfide "Molykote" or any other similar lubricant on the Ball Screw Shaft. The Collet (#110) is keyless and depends on friction to transmit torque from the brake to the ball screw.

2. Install **(2) Temporary Guide Pins** into the Transfer Slide Frame as shown in *Figure 3.1*.
3. Insert the Ball Screw Shaft into the Collet (#110) and the Brake Assembly over the **(2) Temporary Guide Pins**. Attach the Brake with the **(2) Screws (#150)** and **(2) Lockwashers (#126)**. **Only finger tighten these (2) screws at this time.**
4. Remove the **(2) Temporary Guide Pins** and install the other **(2) Screws (#150)** and **(2) Lockwashers(#126)**.

- Also only finger tighten these (2) screws at this time.**
5. Manually grab the Hub Shaft (#2) and pull it back as far as it will go. This is to properly seat the Hub (#2) into the internal Bearing (#20).
 6. Tighten the Hub Locking Screw (#156). **Torque to 60 Ft. Lbs.**
 7. Go back and tighten the (4) Mounting Screws (#150). **Torque to 60 Ft. Lbs.**
 8. Install the (2) Bumpers into the (2) appropriate holes as shown in *Figure 3.1*.
 9. Hook-up shop air and electrical service to the Pneumatic Control Valve.
 10. Slide the customer furnished Pulley and Keyless Bushing on to the Hub (#2). Install according to Manufacturers Specifications.
 11. Install the Timing Belt and adjust the belt tension with the machine jack screws.
 12. Install all necessary belt guards.
 13. Fill with oil as directed in **Section 4 - Lubrication**.

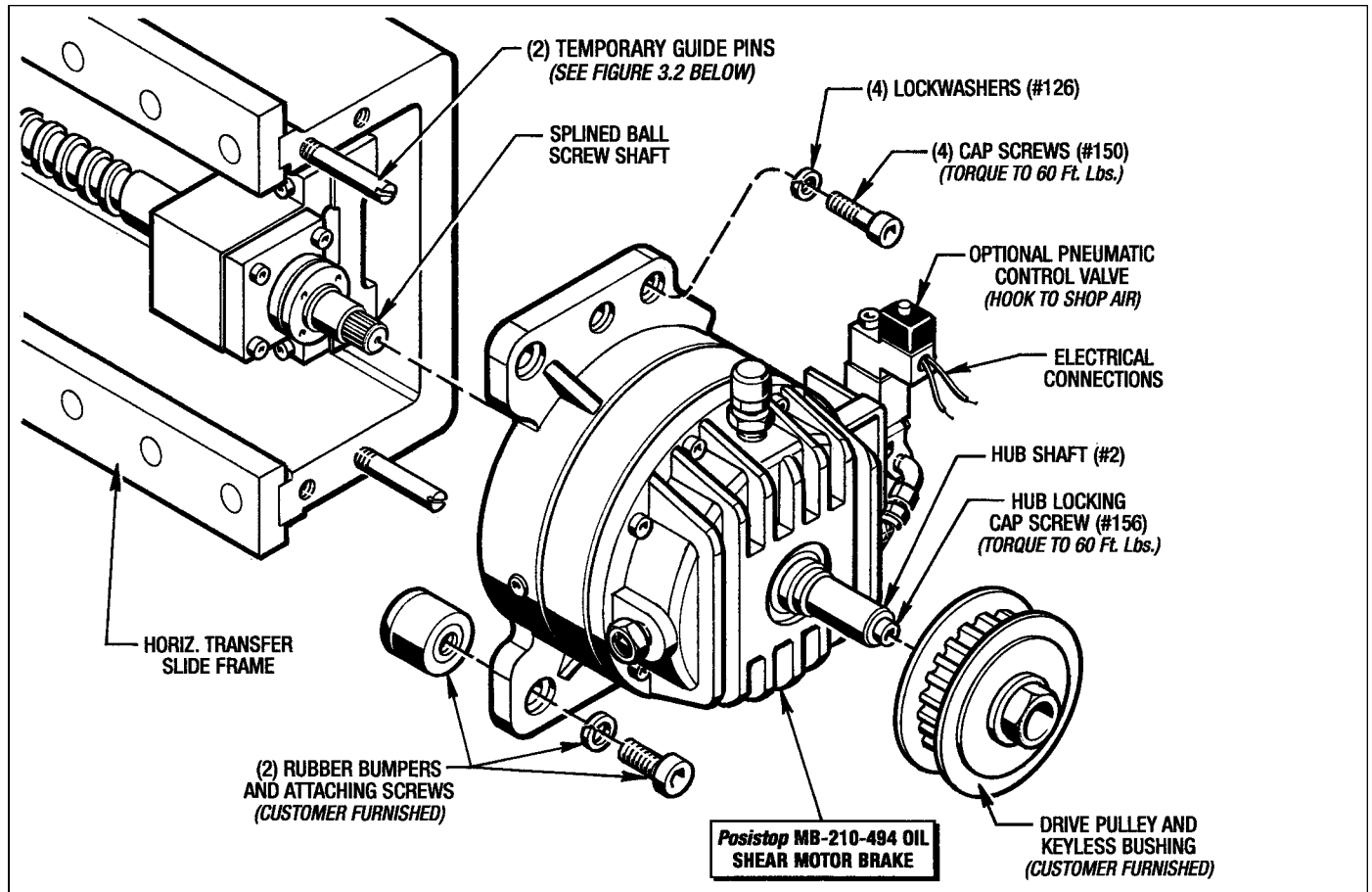


Figure 3.1 - Installation (Horizontal MB-210-494 Brake Shown)

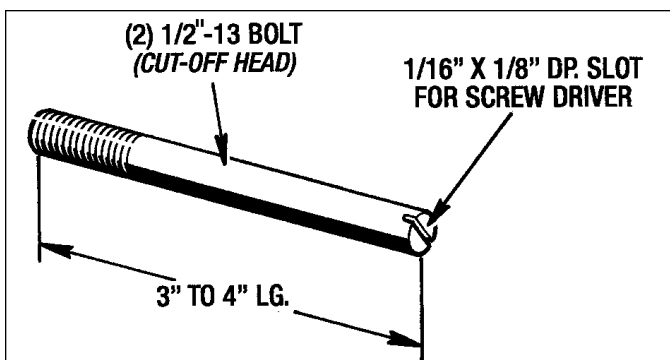


Figure 3.2 - Temporary Guide Pins

NOTE - The Installation Drawing shown above in Figure 3.1 is also applicable for the MB-210-496 (Vertical Brake Down) and the MB-210-497 (Vertical Brake Up) Motor Brakes.

Section 4 LUBRICATION

4-1 CHECKING THE OIL LEVEL

Check the oil level when the brake is initially installed and weekly thereafter or until experience dictates otherwise. Always check the oil with the brake stationary. (Not Running). The oil level is as shown in the following Figures:

1. Horizontal Brake (MB-210-494) - *Figure 4.1*
2. Vertical Down Brake (MB-210-496) - *Figure 4.2*
3. Vertical Up Brake (MB-210-497) - *Figure 4.3*

4-2 CHANGING THE OIL

IMPORTANT - Always open the disconnects to the drive motor and lock them out before changing the oil.

Change the oil in your brake every 6 months or until the oil darkens in color.

CAUTION - Do not overfill the brake. Excess oil will cause the brake to overheat.

NOTE: The oil should be changed more frequently when used in harsh environments or high cyclic applications.

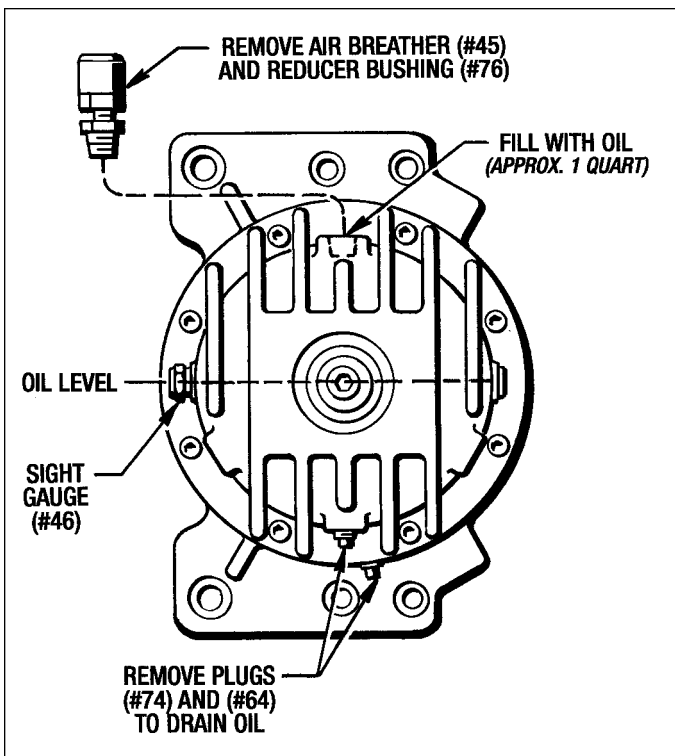


Figure 4.1 - Lubrication - Horizontal Brake (MB-210-494)

A. Horizontal Brake (MB-210-494)

(See *Figure 4.1*)

1. Remove the Pipe Plug (#74) from the End Housing (#9) and the Pipe Plug (#64) from the Housing (#8) to drain the oil from the brake. Save or discard as condition warrants. Replace the drain plugs.
2. Remove the Air Breather (#45) and the Reducer Bushing (#76) and fill the brake with fresh oil to the correct level as shown in *Figure 4.1*. Fluid capacity is approx. 1 Quart.

NOTE - The Sight Gauge (#46) and Air Breather (#45) should always be removed and cleaned when the oil is changed.

B. Vertical Down Brake (MB-210-496)

(See *Figure 4.2*)

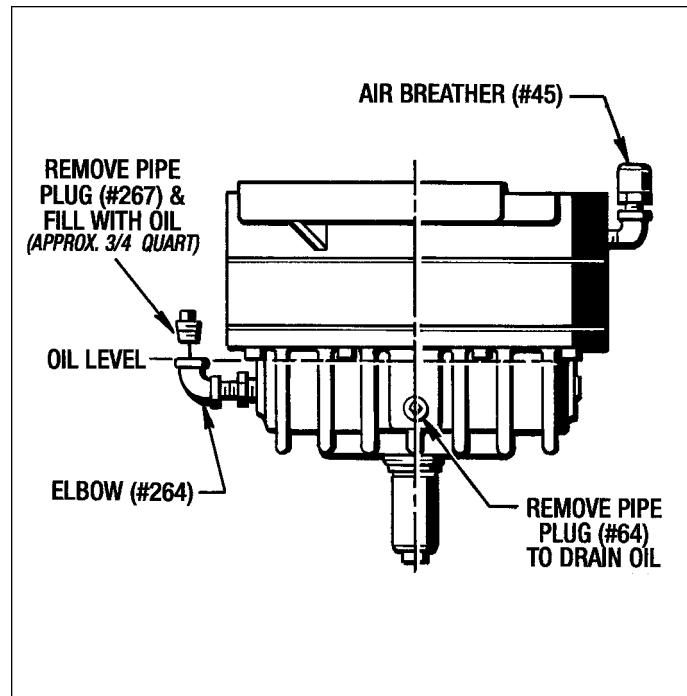


Figure 4.2 - Lubrication - Vertical Down Brake (MB-210-496)

1. Remove the Pipe Plug (#64) from the End Housing (#8) to drain the oil. Save or discard as condition warrants. Reinstall the plug after draining the oil.
2. Remove the Pipe Plug (#267) from the Elbow (#264) to fill the brake with fresh oil. Fill until the oil is at the top of the Elbow (#264) as shown in *Figure 4.2*. Oil capacity is approx. 3/4 Quart. Replace the plug after filling.

NOTE - The Air Breather (#45) should also be removed and cleaned when the oil is changed.

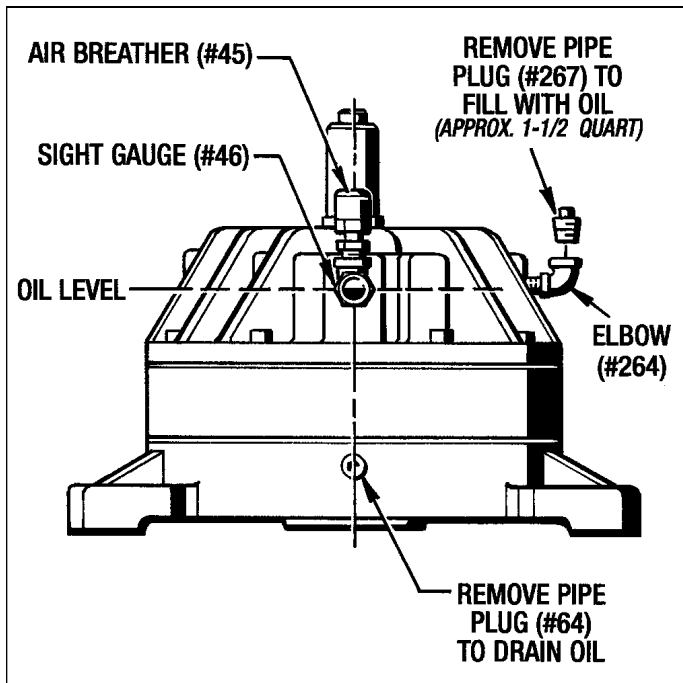


Figure 4.3 - Lubrication - Vertical Up Brake (MB-210-497)

C. Vertical Up Brake (MB-210-497)

(See Figure 4.3)

1. Remove the Pipe Plug (#64) from the End Housing (#8) to drain the oil. Save or discard as condition warrants. Reinstall the plug after draining the oil.
2. Remove the Pipe Plug (#267) from the Elbow (#264) to fill the brake with fresh oil to the center of the Sight Gauge (#46) as shown in Figure 4.3. Oil capacity is approx. 2 Quarts.

4-3 TYPE OF OIL

Use only **Mobil Automatic Transmission Fluid ATF-210 Type "F"** or **Mobil Multi-purpose Automatic Transmission Fluid**.

Other fluids may be used for special applications. **Always use the type of fluid specified on the name plate.** If the name plate is missing or if there is any doubt about the correct fluid to use contact Force Control Industries, Inc.

Section 5 OPERATIONAL CHECKS

WARNING

Make these Operational Checks only when the brake unit is not in operation. Open the motor disconnect and lock it out to avoid any personal injury.

5-1 OPERATIONAL CHECKS

1. Make provisions for manual operation, if automatic controls are used. (See Figure 5.1)
2. Remove Air Breather (#45) and Reducer Bushing (#76) from the End Housing (#9). **Do not remove while motor is operating.**
3. Apply 60 PSI air pressure to the brake and observe the action of the piston through the air breather port. If the piston action is irregular, or if it tends to stick or bind, internal damage may be indicated.
4. Listen and look for air bubbles in the oil which would indicate piston leakage.
5. If the piston moves slowly and leaks are evident, the piston seals may be damaged and will need replacement.
6. Exhaust the air pressure and observe that the piston returns quickly and smoothly back to the normal braking position.

7. Reinstall the Reducer Bushing (#76) and the Air Breather (#45) back into the End Housing (#9).

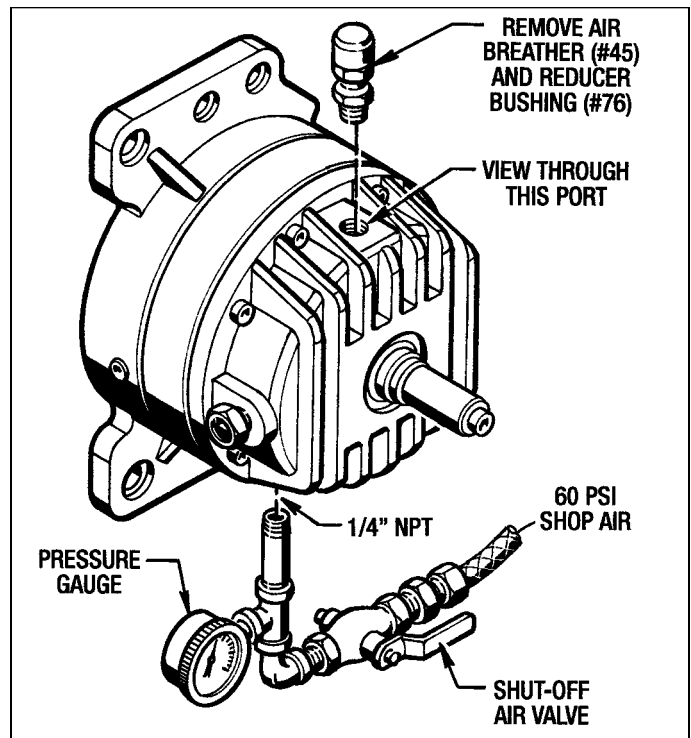


Figure 5.1 - Set-Up for Operational Checks

Section 6 TROUBLESHOOTING

6-1 TROUBLESHOOTING CHART

| TROUBLE | POSSIBLE CAUSE | REMEDY |
|---------------------------------------|---|---|
| A. Brake fails to engage properly. | Pistons sticking or binding. Worn Friction Discs. Weak or broken springs. Air pressure not exhausting or slow in exhausting. | Disassemble to the extent necessary and inspect for damaged parts. Replace brake stack. Replace as needed. Check control valve or muffler and clean or replace as necessary. |
| B. Brake engages too quickly. | Low oil level. | Check oil level and correct. |
| C. Noise and vibration. | Improper or loose mounting on motor. | Check mounting bolts and alignment. If partial disassembly is required refer to Section 3 - Installation. |
| D. Brake fails to disengage properly. | Low air pressure. Piston sticking or binding Control valve not functioning properly. | Increase air pressure. (See Section 2) Disassemble to the extent necessary and inspect for damaged parts. Check valve operation and replace if necessary. |
| E. Brake overheats (Over 225° F.) | Brake not engaging or disengaging properly causing excessive slippage. Improper oil level. | Refer to troubles A and D. Check oil level and correct. |
| F. Oil leakage. | Oil seal lip or wear sleeve damaged. Bad alignment. External bolts not tight. O-Rings damaged. | Check for oil leaking around shaft. Replace if necessary. Check and correct alignment. Tighten all external bolts. Check and replace if necessary. |
| G. Oil leakage at breather. | Oil level too high. | Drain excess oil. |
| H. Brake does not repeat. | Air pressure changed. *Oil temperature changed. Inconsistent stopping signal. | Check and adjust air pressure. Check temperature. Check control circuit. |

* - **NOTE:** For installations requiring precise starting and stopping, operating temperatures are very important. Operating temperatures between 116° F. and 165° F. are recommended.

Section 7 DISASSEMBLY

WARNING

Before attempting to disassemble the Posistop Brake, open the motor disconnect, shut-off the control electrical supply and shut-off the air supply. Lock them out to avoid any personal injury.

Support and block all loads on Vertical Units before removing or disassembling brake.

Unless the brake is to be completely overhauled, it should only be disassembled to the extent necessary to gain access to the worn or damaged parts.

See Section 10 and the following Figures for a visual reference to all parts.

1. *Figure 10.1* - Pneumatic Control Valve, Mounting Bracket and Pre-Plumbed Piping.
2. *Figure 10.2* - Horizontal Brake (MB-210-494)
3. *Figure 10.3* - Vertical Down Brake (MB-210-496)
4. *Figure 10.4* - Vertical Up Brake (MB-210-497)

7-1 REMOVING BRAKE FROM LIFT AND TRANSFER MACHINE

1. Remove the Belt Guard and release the belt tension. Remove the Timing Belt from the Pulley.
2. Take the Pulley and Keyless Bushing off the Hub (#2) according to the manufacturer's instructions.
3. Disconnect the pneumatic air lines connected to the Control Valve (#270).
4. Remove the Drain Plug and drain all the oil out of the brake unit. as shown in **Section 4 - Lubrication**. Save or discard as condition warrants.
5. Loosen the (4) Screws (#150) and (4) Lockwashers (#126) from the Housing (#8). **Do not remove them at this time.**
6. Remove the Hub Locking Screw (#156) and the Lock Washer (#129) from the end of the Hub (#2).

NOTE:

A special Threaded Rod and Jack Bolt must be used to disengage the Collet (#110) from the Hub (#2) bore. Dimensions and specifications are given in *Figure 7.1*

7. Insert the Threaded Rod into the end of the Hub (#2) and thread it into the Collet (#110) with a flat head screw driver. Leave about 3/4" exposed thread inside the Hub extension (#2) as shown in *Figure 7.2*.

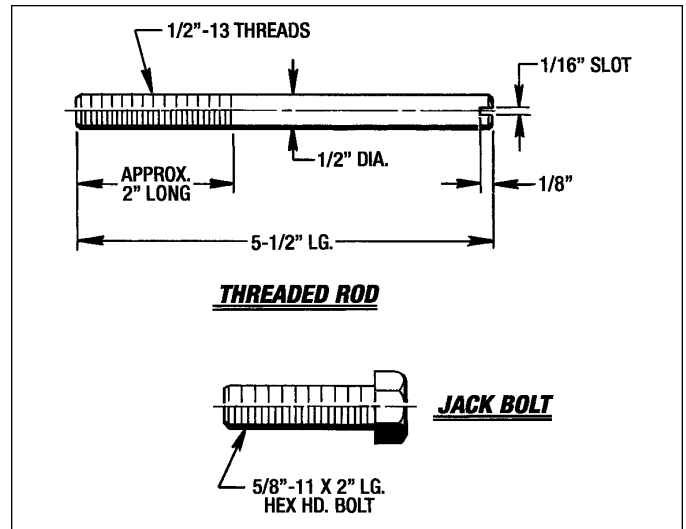


Figure 7.1 - Disassembly Tools

8. Screw the Jack Bolt into the Hub (#2) and tighten to release the Collet (#110) from the Hub (#2) bore. (See *Figure 7.2*)
9. Remove the Jack Bolt and Threaded Rod after the Collet (#110) is released from the Hub (#2) bore.
10. Remove the (4) Screws (#150) and the (4) Lockwashers (#126)
11. Pry the **Posistop Brake Assembly** away from the Lift and Transfer Machine with a large flat head screw driver. Pull the Brake Assembly straight back off the ball screw shaft.

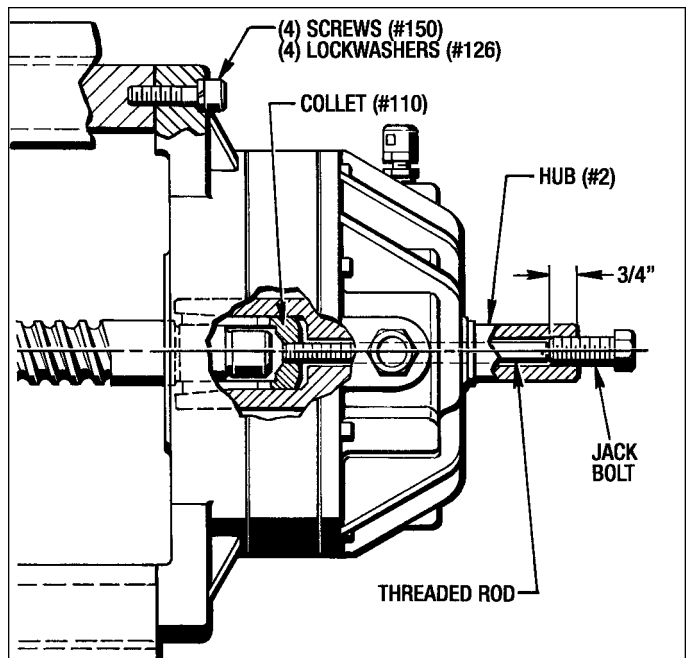


Figure 7.2 - Loosening Collet (#110) from Hub (#2)

7-2 REMOVING END HOUSING FOR ACCESS TO THE BRAKE STACK

1. Set the Brake Assembly on a work bench with the End Housing (#9) facing upwards.
2. Remove the (6) Screws (#72) and (6) Lockwashers (#128) from the End Housing (#9).

NOTE - If you have a Control Valve (#270) mounted to the brake, then there will also be (2) Screws (#273) and (2) Lockwashers (#275) holding the Valve Mounting Bracket (#271) to the housing.

3. Remove the Valve Mounting Bracket (#271). Control Valve (#270), Air Hose (#276) and any related fittings.
4. Pry the End Housing (#9) loose from the Piston Housing (#10) and lift it straight up.

CAUTION - Be careful not to damage the lip of the Oil Seal (#35) when removing this End Housing (#9).

5. Remove the O-Ring (#30) from the Piston Housing (#10) and discard it.
6. The Brake Stack can just be lifted off the Hub (#2) spline and Piston Housing (#10) lugs.

NOTES:

(1) **Horizontal Brake (MB-210-494)** - There will be (4) Drive Plates (#12) and (3) Friction Discs (#13).

(2) **Vertical Down Brake (MB-201-496) and Vertical Up Brake (MB-210-497)** - There will be (1) Drive Plate (#12), (3) Drive Plates (#18), (12) Separator Springs (#17) and (3) Friction Discs (#13).

(3) **Vertical Down Brake (MB-201-496)** - There will also be (2) Soc. Set Screws (#154) located in the Piston Housing Lugs (#10) to hold the Brake Stack in place. These (2) Set Screws (#154) will have to be loosened up to get the Brake Stack off. (See Figure 7.3)

7. If the Brake Stack is the only repair then jump ahead to **Section 9 - Reassembly**.

7-3 HUB (#2) DISASSEMBLY

1. Carefully pull the Hub (#2) straight up and out of the remaining brake assembly.

CAUTION - Be careful not to damage the lip of the Oil Seal (#31) located in the Housing (#8).

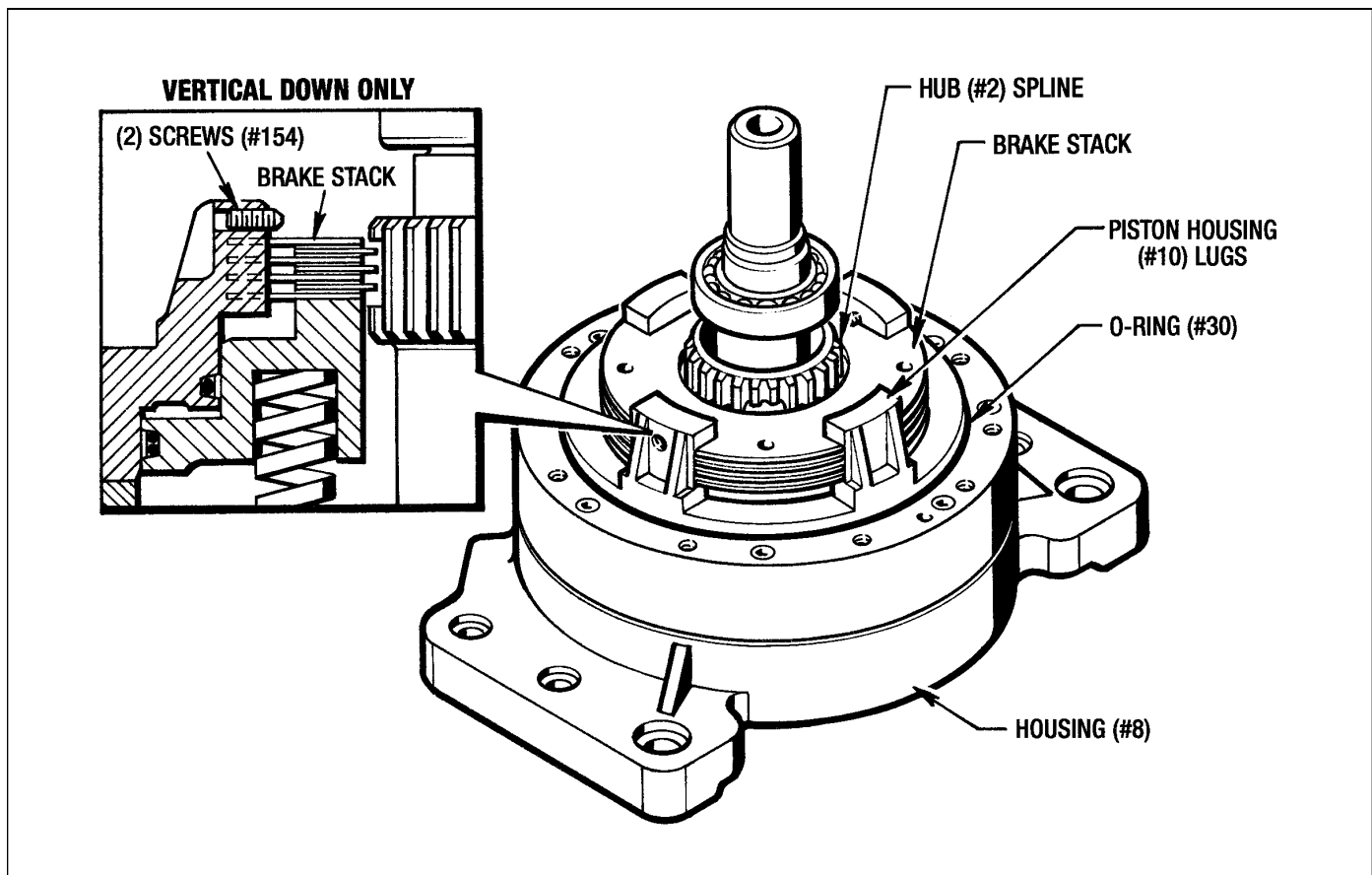


Figure 7.3 - Removing Brake Stack

- If the Collet (#110) stayed in the Hub (#2) remove it at this time.

A. Removing Wear Sleeves (#32) and (#86)

- Set the Hub into an appropriate V-Block Support as shown in *Figure 7.4*. Using a mallet and chisel the same width as the Wear Sleeve, make 6 to 8 notches in the Wear Sleeve. The Wear Sleeves (#32) and (#86) can be removed from the Hub (#2) by hand.

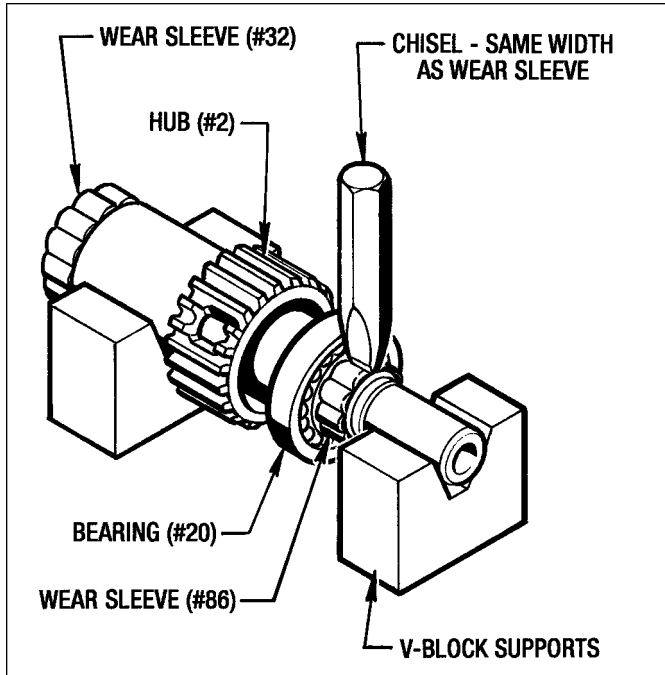


Figure 7.4 - Removing Wear Sleeves

B. Removing Bearing (#20)

NOTE - The Wear Sleeve (#86) has to be removed first before this Bearing (#20) can be removed.

- Use a standard Bearing Puller to take the Bearing (#20) off of the Hub (#2).

7-4 REMOVING PISTON HOUSING (#10) AND PISTON (#3) TO REPLACE THE PISTON SEALS

(See *Figure 7.5*)

- Remove the (6) Screws (#153) and (6) Lockwashers (#127) from the Piston Housing (#10).
- Lift the Piston Housing (#10) and Piston (#3) Sub-Assembly off the Housing (#8).

- Remove and discard the O-Ring (#104).
- Manually push the Piston (#3) out of the Piston Housing (#10).

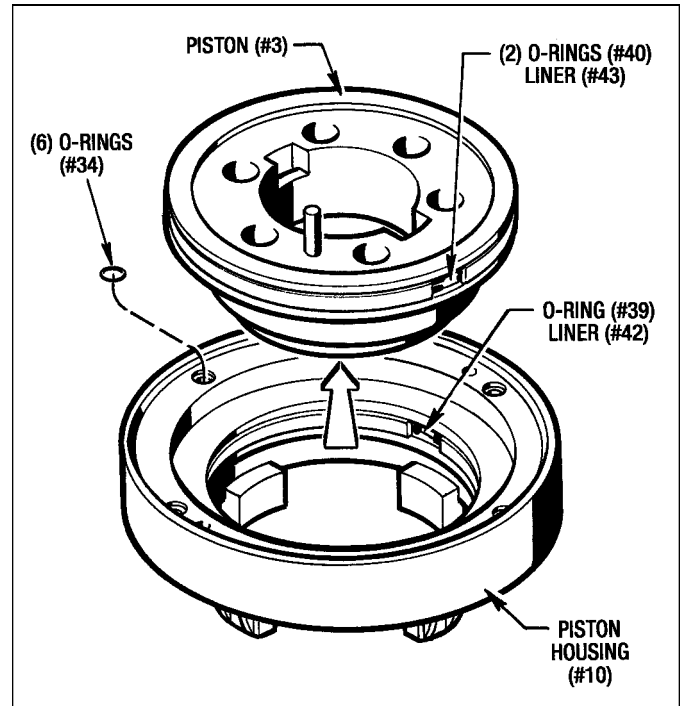


Figure 7.5 - Removing Piston Seals

- Remove the Liner (#42) and O-Ring (#39) from the Piston Housing (#10). The Liner (#43) and (2) O-Rings (#40) can also be removed from the Piston (#3).
- There are (6) small O-Rings (#34) in the Piston Housing (#10) used to seal the (6) attaching Screws (#153). Check them and remove them if they need replaced.

7-5 REMOVING OIL SEALS

A. From End Housing (#9)

- An arbor press will have to be used if the Oil Seal (#35) has to be removed from the End Housing (#9).

B. From Housing (#8)

- Use a flat head screw driver to pry the Bearing Sleeve (#204) out of the Housing (#8) if it needs replaced.
- If the Oil Seal (#31) needs replaced, then it will have to be knocked or pried out of the bore.

The Disassembly Procedure is now complete.

Section 8 CLEANING AND INSPECTION

8-1 CLEANING AND INSPECTION

Clean metal parts in a suitable solvent and dry in a stream of low pressure compressed air. The Brake Drive Plates (#12) or (#18) can be cleaned in a solvent, but **DO NOT clean the Brake Friction Discs (#13) in solvent.** Use only a clean, dry and lint-free rag to clean these Friction Discs. (Solvent will damage the resilient paper-based friction material used on the Friction Discs. Keep the Drive Plates and Friction Discs in the same order as they were removed. After cleaning, inspect parts for cracks, distortion, scoring, nicks, burrs or other damage would affect serviceability. Pay particular attention to the following:

1. Check the friction disc wear surfaces for scoring, galling or evidence of uneven wear.
2. Check the brake drive plates for scoring or galling. Make sure they are flat. If a perceptible ridge is worn in any of the drive plates, replace all of the drive plates and friction discs as a complete set.
3. Carefully check the piston and bore surfaces for nicks, scratches, scoring or other damage which would affect operation or cause leakage.
4. Carefully check the Piston Liners (#42) and (#43) and the O-Rings (#39) and (#40) for wear or any condition that would cause leakage.
5. Pay particular attention to the (2) Wear Sleeves (#32) and (#86) located on the Hub (#2) and the (2) Oil Seals (#31) and (#35). Check for nicks or scratches which would cause leakage. Replace any damaged parts.
6. It is not necessary to remove the Ball Bearing (#20) to check the operation. Slowly rotate the free race of the bearing by hand checking to see if it turns freely without any rough or flat spots.

8-2 REPAIR AND REPLACEMENT

A fine stone or crocus cloth may be used to remove minor surface defects from parts so long as the operating or sealing action of the part is not affected. The use of coarser abrasives or other machining methods should not be attempted. Otherwise, damaged parts should be replaced.

Replacement is recommended also for the following, as applicable:

1. Replace all O-Rings, Liners, Gaskets and Oil Seals removed during the course of disassembly.
2. Replace Brake Friction Discs and Drive Plates in complete sets only.

Section 9 REASSEMBLY

9-1 GENERAL REASSEMBLY INSTRUCTIONS

See Section 10 and the following Figures for a visual reference to all parts being reassembled.

1. *Figure 10.1* - Pneumatic Control Valve, Mounting Bracket and Pre-Plumbed Piping.
2. *Figure 10.2* - Horizontal Brake (MB-210-494)
3. *Figure 10.3* - Vertical Down Brake (MB-210-496)
4. *Figure 10.4* - Vertical Up Brake (MB-210-497)

Note the following general reassembly instructions as applicable:

1. Lubricate O-Rings, Liners and Oil Seal lips with “**Mobilith**” **SHC-PM Synthetic Grease**, or equivalent, immediately before reassembly or the installation of mating parts. This will be referred to as **White Grease** hereafter in the Reassembly Instructions.
2. The Ball Bearing (#20) can be installed on the Hub (#2) either of two ways. It can be heated up to 200° F. and just dropped on the shaft or it can be pressed on with an arbor press.
3. Use **Red Loctite #262** when installing the (2) Wear Sleeves (#32) and (#86) on the Hub (#2).
4. Use Removable **Blue Loctite #272** on the (2) Set Screws (#154) located in the (2) brake lugs on a Vertical Down Brake.
5. Use **Permatex #3D Sealant** on the O.D. of both Oil Seals (#31) and (#35) when installing them.
6. Any Cap Screws that have Lockwashers does not require any thread adhesive to be applied to the threads.

9-2 INSTALLING OIL SEALS

1. First thoroughly clean the bores in both Housings (#8) and (#9). Make sure they are clean and free of any foreign material.
2. Coat the oil seal bores with a thin coat of **Permatex #3D Sealant**.
3. Press the Oil Seal (#35) into the End Housing (#9) with an arbor press as shown in *Figure 9.1A*. It should be $3/32"$ (.09") from the outside surface of the End Housing (#9).
4. Press the Oil Seal (#31) into the Housing (#8) until it bottoms out in the bore as shown in *Figure 9.1B*.

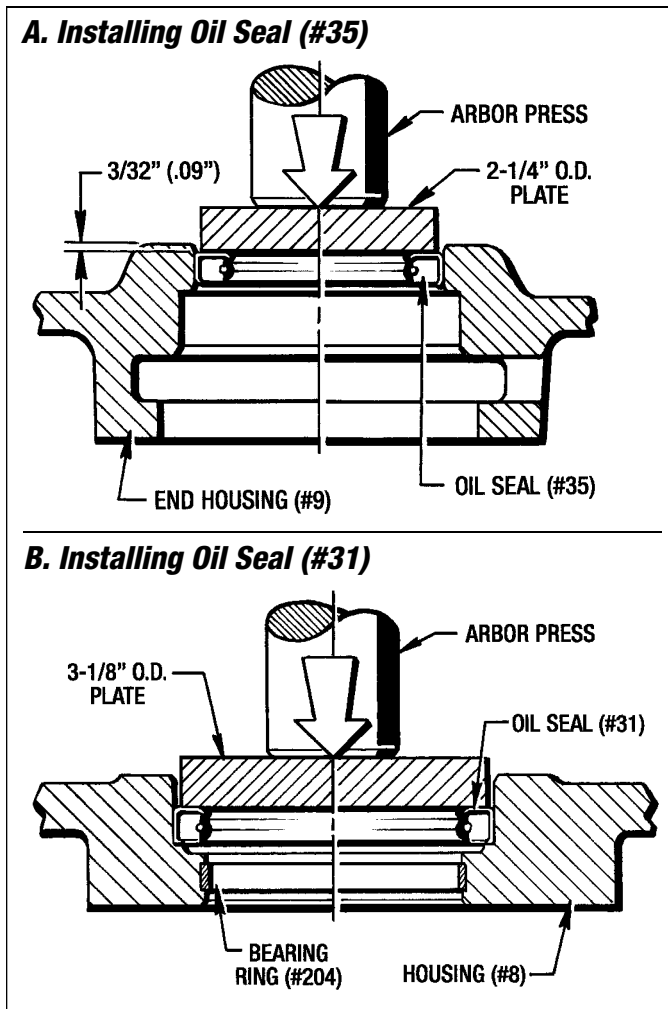


Figure 9.1 - Installing Oil Seals

5. Clean off any excess Sealant.
6. Lubricate the Bearing Ring (#204) with **White Grease** and install it into the Housing (#8).

9-3 HUB REASSEMBLY

A. Installing Ball Bearing (#20)

1. Heat up the Bearing (#20) and drop it on to the Hub (#2) or press it on with an arbor press until it seats itself against the shoulder as shown in *Figure 9.2*.

CAUTION - Be sure to wear suitable work gloves when handling heated parts.

This Bearing (#20) must be installed on the Hub (#2) before the Wear Sleeve (#86).

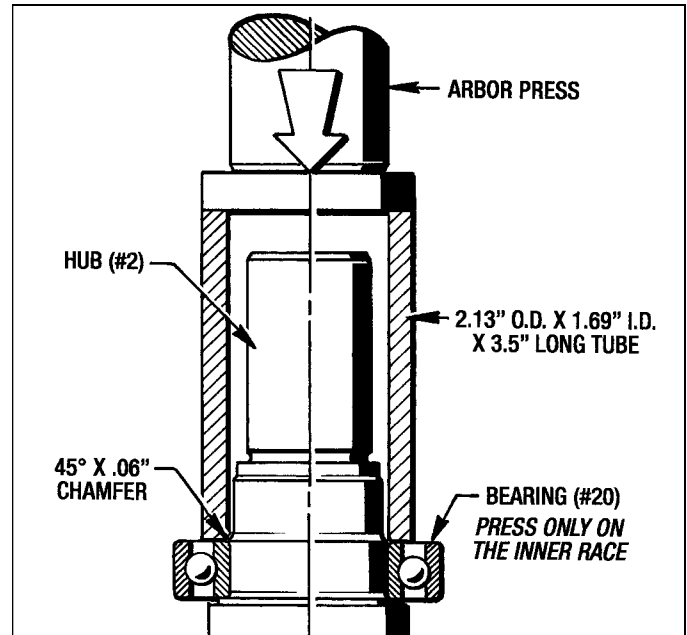


Figure 9.2 - Installing Bearing (#20) on to Hub (#2)

B. Installing Wear Sleeve (#86)

A Special Assembly Tool has to be used to press both Wear Sleeves (#86) and (#32) on to the Hub (#2). Dimensions and Specifications are given in *Figure 9.3* if you prefer to make your own. Use Part Number #601-13-043 to order it from Force Control Industries, Inc.

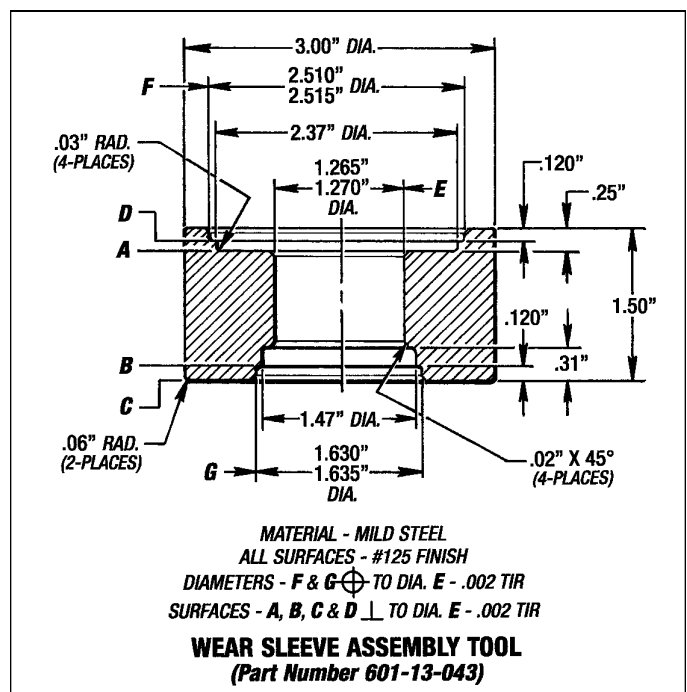


Figure 9.3 Wear Sleeve Assembly Tool #601-13-043

1. Apply **Red Loctite #262** to the Hub (#2) diameter. Press the Wear Sleeve (#86) with **Surface "A"** of the **Assembly Tool** on to the Hub (#2) as far as it will go as shown in **Step 1** of Figure 9.4.
2. Turn the **Assembly Tool** over and with **Surface "B"** finish seating the Wear Sleeve (#86) until it bottoms out on the hub shoulder. (See **Step 2** of Figure 9.4.)
3. Clean off any excess **Loctite**.

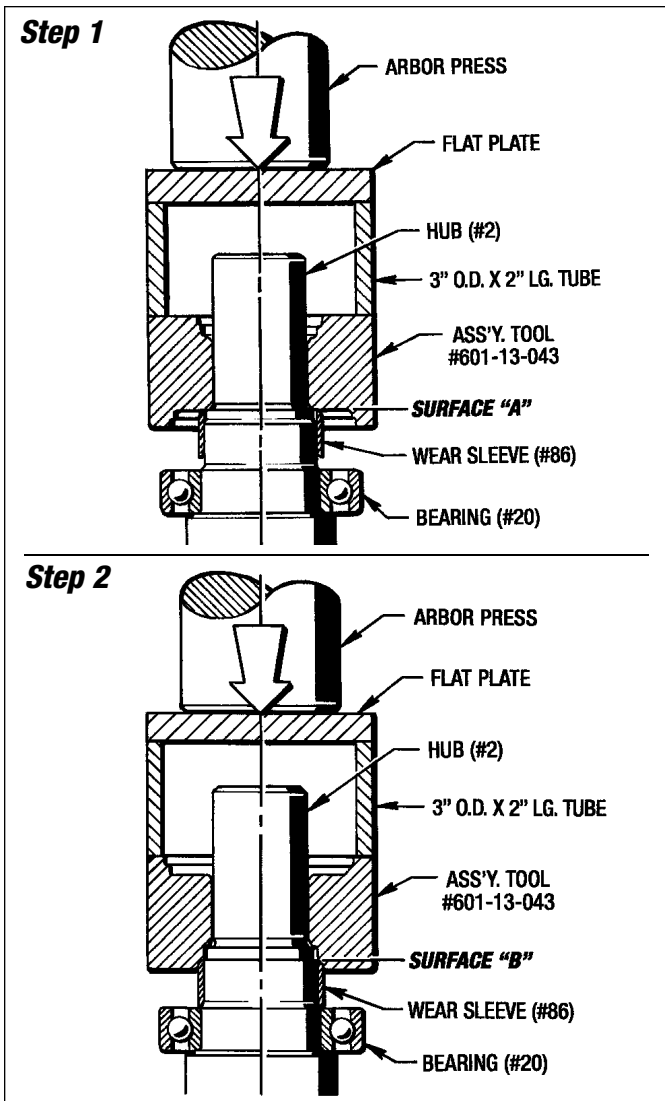


Figure 9.4 - Installing Wear Sleeve (#86)

C. Installing Wear Sleeve (#32)

The same **Assembly Tool (#601-13-043)** is also used to install this **Wear Sleeve (#32)** on to the other end of the **Hub (#2)**

1. Apply **Red Loctite #262** to the **Hub (#2)** diameter. Press the **Wear Sleeve (#32)** with **Surface "C"** of the **Assembly Tool** on to the **Hub (#2)** as far as it will go as shown in **Step 1** of Figure 9.5.

2. Turn the **Assembly Tool** over and with **Surface "D"** finish seating the **Wear Sleeve (#32)** until it bottoms out on the hub shoulder. (See **Step 2** of Figure 9.5.)
3. Clean off any excess **Loctite**.

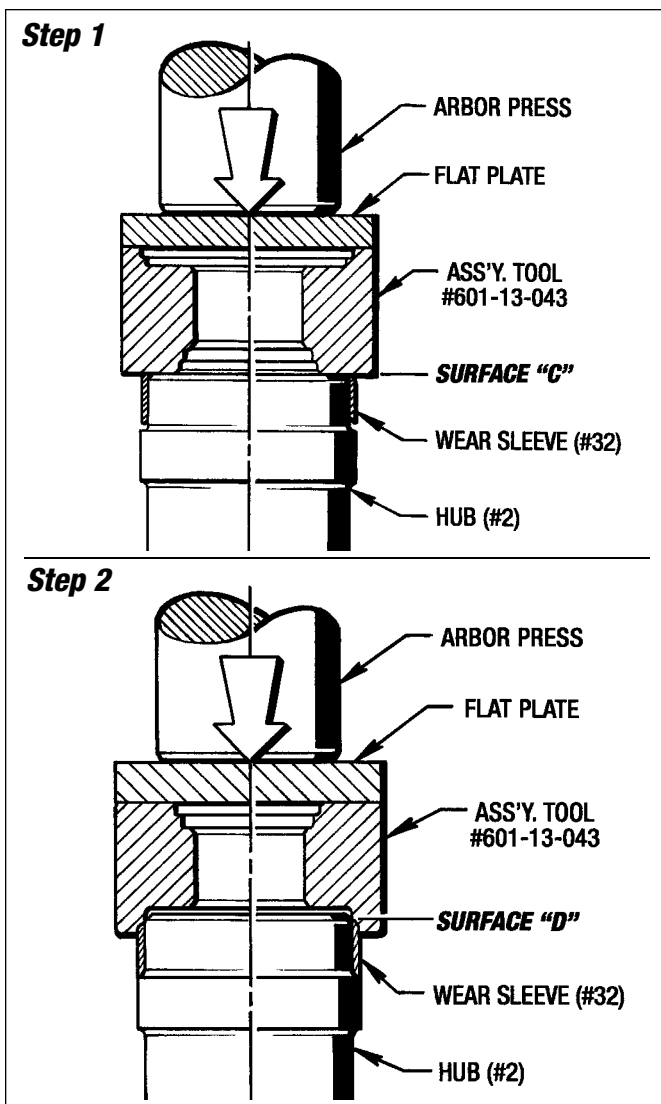


Figure 9.5 - Installing Wear Sleeve (#32)

D. Installing Collet (#110) Into Hub (#2)

1. Insert the **Collet (#110)** into the **Hub (#2)** bore. Install the **Soc. Hd. Cap Screw (#156)** and **Lockwasher (#129)** into the **Hub** to hold the **Collet** in place. Do not tighten this screw at this time. The **Collet (#110)** needs to be loose in the **Hub** to attach the **Brake** to your machine.

9-4 INSTALLING HUB (#2) INTO HOUSING (#8)

(See Figure 9.6)

To properly position the **Hub (#2)** when installing it into the **Housing (#8)** a simple spacer can be used. Make the **Hub Positioning Spacer 3-3/16" (3.188") Dia. x 21/64" (.328") Thick**. (See Figure 9.6)

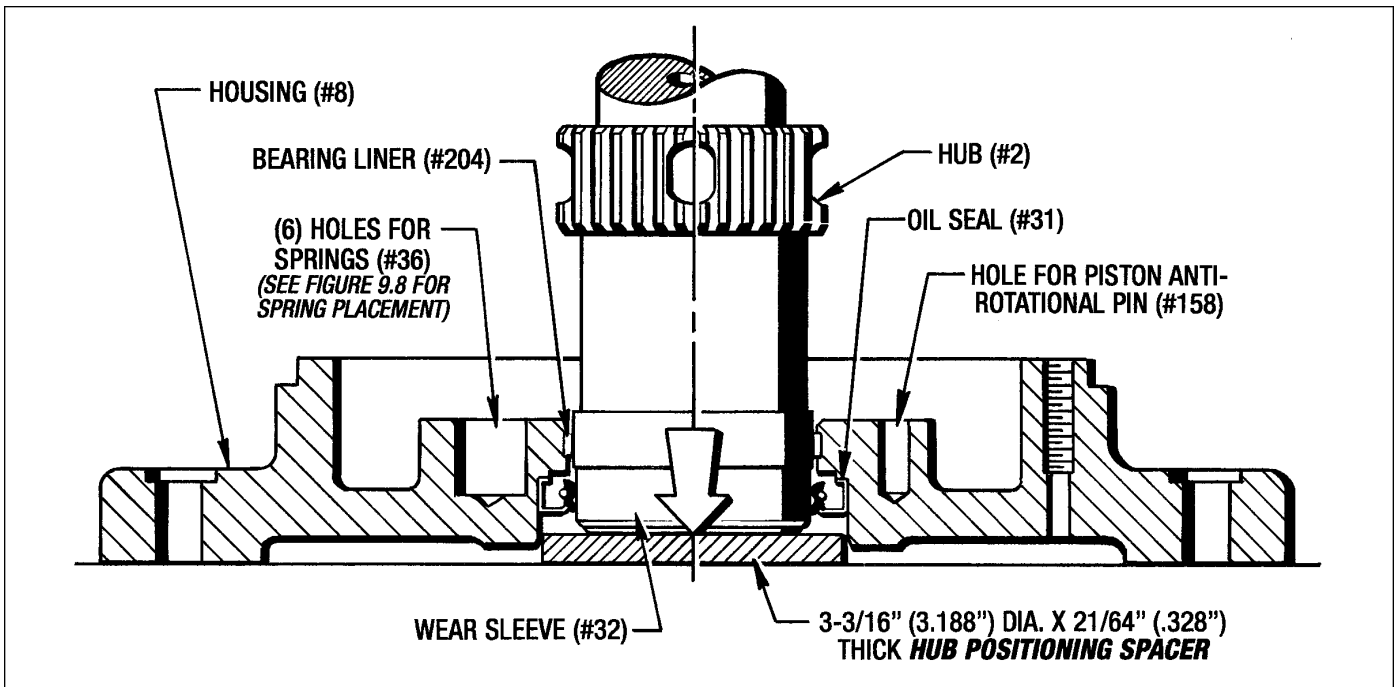


Figure 9.6 - Installing Hub (#2) into Housing (#8)

These dimensions are not very critical and does not require close machining tolerances. Accurate hub positioning and alignment will be done when the brake is installed on your machine.

1. Place the **Hub Positioning Spacer** on the work bench. Lay the Housing (#8) down over the Spacer as shown in Figure 9.6.
2. Lubricate the Wear Sleeve (#32), Oil Seal (#31) and the Bearing Liner (#204) with a light coat of **White Grease**.
3. Insert the Hub (#2) into the Housing (#8) until it rests on the **Hub Positioning Spacer** as shown in Figure 9.6.

CAUTION - Be very careful not to damage the sealing lip of the Oil Seal (#31).

9-5 PISTON HOUSING AND PISTON REASSEMBLY

(See Figure 9.7)

1. Lubricate the (2) O-Rings (#40) and the Liner (#43) with a light coat of **White Grease** and install them into the Piston (#3).
2. Lubricate the O-Ring (#39) and the Liner (#42) with a light coat of **White Grease** and install them into the Piston Housing (#10).

Also make sure that the (6) O-Rings (#34) are lubricated and installed into the Piston Housing (#10).

3. Set the Piston Housing (#10) on the work bench with the lugs down.

4. Insert the Piston (#3) into the Piston Housing (#10). **Make sure that both Piston Liners are well lubricated and be very careful not to damage them when inserting the Piston into the Piston Housing.**
5. Also make sure the Dowel Pin (#158) is installed in the Piston (#3) and that it is positioned so it will align with the proper hole in the Housing (#8).

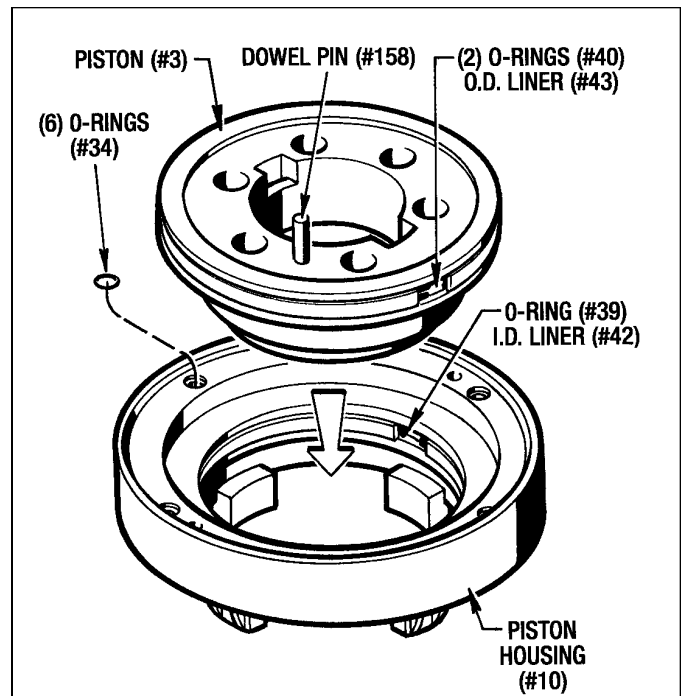


Figure 9.7 - Piston Housing and Piston Reassembly

9-6 INSTALLING PISTON HOUSING (#10) AND PISTON (#3) SUB-ASSEMBLY TO HOUSING (#8)

(See Figure 9.8)

1. Place the proper number of Springs (#36) into the spring pockets in the Housing (#8). (See Figure 9.8.)

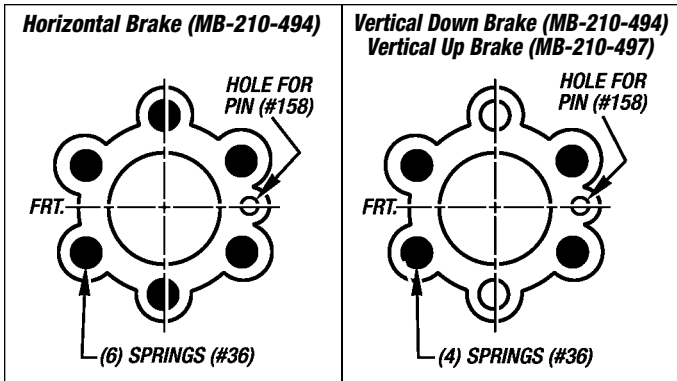


Figure 9.8 - Spring Placement

2. Lubricate the O-Ring (#104) and install it on the Housing (#8).
3. Place the Piston Housing (#10) and Piston (#3) Sub-Assembly down over the Hub (#2) and on to the Housing (#8). Align the Dowel Pin (#158) with the proper hole in the Housing (#8). (See Figure 9.8)

Attach with (6) Screws (#153) and (6) Lockwashers (#127). Tighten these screws down in an even manner to properly compress the Springs (#36). **Torque to 14 Ft. Lbs.**

9-7 INSTALLING BRAKE STACK

A. Horizontal Brake (MB-210-494)

First install a Drive Plate (#12) then a Friction Disc (#13). There will be a total of (4) Drive Plates (#12) and (3) Friction Discs (#13). You will end up with a Drive Plate (#12). (See Figure 9.9)

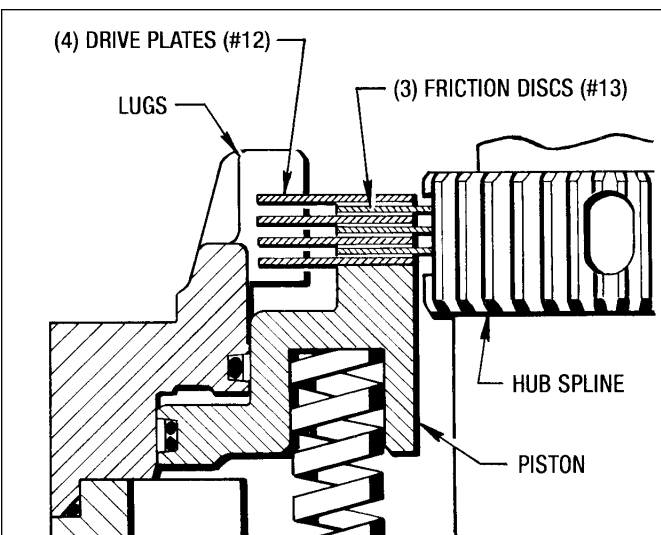


Figure 9.9 - Brake Stack - Horizontal Brake

B. Vertical Down Brake (MB-210-496) and Vertical Up Brake (MB-210-497)

First install a Drive Plate (#12), then a Friction Disc (#13), then a Drive Plate (#18) with (4) Separator Springs (#17) on it pointed downward. There will be a total of (3) Drive Plates (#18) with (4) Separator Springs (#17) each, (3) Friction Discs (#13) and (1) Drive Plate (#12). (See Figure 9.10)

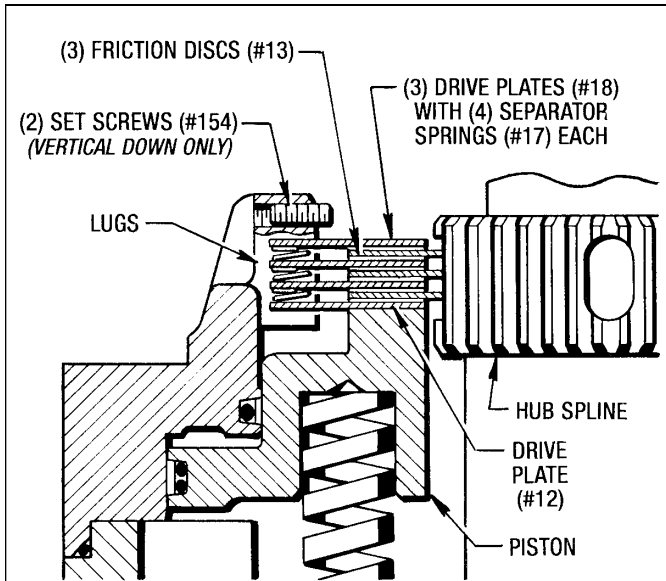


Figure 9.10 - Brake Stack - Vertical Brake

NOTES:

- (1) Align the teeth in the Friction Discs (#13) with the spline teeth of the Hub (#2) and the notches in the Drive Plates (#12) and (#18) with the (4) lugs on the Piston Housing (#10).
- (2) The **Vertical Down Brake (MB-210-496)** will also have (2) Set Screws (#154) in two of the brake lugs. After the Brake Stack is installed apply some **Blue Loctite #272** to the screws and tighten them up enough to retain the stack. (See Figure 9.10)

9-8 INSTALLING END HOUSING (#9)

1. Lubricate the O-Ring (#30) with White Grease and install it on the Piston Housing (#10).
2. Lubricate the Wear Sleeve (#86) located on the Hub (#2) and the sealing lip of the Oil Seal (#35) located in the End Housing (#9) with a light coat of **White Grease**.
3. Lower the End Housing (#9) down carefully over the Hub (#2) and attach it with (6) Screws (#72) and (6) Lockwashers (#128). **Torque to 14 Ft. Lbs.**

CAUTION - Be very careful not to damage the sealing lip of the Oil Seal (#35) when installing this End Housing (#9).

9-9 FINAL REASSEMBLY

1. Reinstall the Air Breather (#45), Sight Gauge (#46) and any other pipe plugs and fittings removed for disassembly.
2. Reattach the Pneumatic Control Valve (#270) and Mounting Bracket (#271) with the (2) Screws (#273) and (2) Lockwashers (#275). (See Figure 10.1)
3. Fill the Brake with fresh oil as specified in **Section 4 - Lubrication**.
4. Conduct an Operational Check as described in **Section 5 - Operational Checks**.

5. Mount the Brake to your machine as specified in **Section 3 - Installation**.
6. Hook-up shop air and electrical service to the control valve.
7. Reinstall the Pulley, Timing Belt and Belt Guards previously removed.

Your Posistop Motor Brake is now ready for service .

Section 10 ORDERING REPLACEMENT PARTS

10-1 GENERAL INFORMATION

This section illustrates, lists and describes all parts for the **Posistop Brake Models: MB-210-494, MB-210-496 and MB-210-497**. The **MB-210-494** is the Horizontal Brake, the **MB-210-496** is the Vertical Down Brake and the **MB-210-497** is the Vertical Up Brake.

Parts are identified on the exploded views with Part Reference Numbers. These Numbers correspond to the Part Reference Number given in the Parts Lists. The Part Name and Quantity Used is also given in the Parts List. This Part Reference Number, Part Name and Quantity should be used when ordering Replacement Parts.

10-2 FACTORY REBUILD SERVICE

Reconditioning Service is offered by Force Control Industries, Inc. at the factory. A complete factory rebuild will be 50% the cost of a new unit if the housings are reusable. If Housings need to be replaced, there will be an additional cost.

Contact **Force Control Industries, Inc.** for authorization and shipping instruction before returning a drive unit for this service. **Force Control** cannot be responsible for units returned to the factory without prior notice and authorization.

Care must be given to the packing of returned brakes. Always protect mounting surfaces by attaching to a skid. Shipment-damaged brakes always delays repairs. It is usually impossible to recover damage costs from the carrier. When possible, describe the problem experienced on your shipping papers.

Return to: **Force Control Industries, Inc.**
3660 Dixie Highway
Fairfield, Ohio 45014
Phone: (513) 868-0900
Fax: (513) 868-2105
E-Mail: info@forcecontrol.com

10-3 ORDERING REPLACEMENT PARTS


When ordering replacement parts, please specify all of the following information:

1. **Brake Model Number.** (On the Name Plate.)
(See below.)
2. **Brake Serial Number.** (On the Name Plate.)
3. **Part Reference Number.** (From the parts list or exploded view drawing.)
4. **Part Name.** (From the parts list.)
5. **Quantity.** (From the parts list.)
6. **Complete Shipping Information.**

Failure to include information for items 1 through 6 will only delay your parts order. Unless another method is specified for item 6, parts weighing less than 150 Lbs. will be shipped United Parcel Service. Parts weighing more than 150 Lbs. will be shipped Motor Freight. Air freight and other transportation services are available but only if specified on your order.

10-4 NAME PLATE INFORMATION

The Name Plate will be located on the Piston Housing (#10). (See below.)

| | | |
|---|---|----------------------|
|  | Force Control Industries, Inc. Fairfield, Ohio | |
| | For Service / Parts Call: 513-868-0900 | |
| | Posistop® Brake Model No. | <input type="text"/> |
| Use Mobil ATF-210 | Serial No. | <input type="text"/> |

Repair Parts List

Posistop (Horizontal) Brake - Model MB-210-494

| REF No. | PART NAME | QTY. | REF No. | PART NAME | QTY. |
|---------|---|------|---|--|------|
| 2 | Hub | 1 | 110 | Collet | 1 |
| 3 | Piston | 1 | 126 | Lockwasher, 1/2" | 4 |
| 8 | Housing | 1 | 127 | Lockwasher, 5/16" | 6 |
| 9 | End Housing | 1 | 128 | Lockwasher, 5/16" | 6 |
| 10 | Piston Housing | 1 | 129 | Lockwasher, 1/2" | 1 |
| *12 | Drive Plate (Without Rivet) | 4 | 131 | Pipe Plug, 1/4" NPT | 3 |
| *13 | Friction Disc | 3 | 150 | Soc. Hd. Cap Screw, 1/2"-13 x 1-3/4" | 4 |
| *20 | Ball Bearing | 1 | 153 | Soc. Hd. Cap Screw, 5/16"-18 x 2" | 6 |
| *30 | O-Ring | 1 | 156 | Soc. Hd. Cap Screw, 1/2"-13 x 6" | 1 |
| *31 | Oil Seal | 1 | 158 | Dowel Pin | 1 |
| *32 | Wear Sleeve | 1 | *204 | Bearing Liner | 1 |
| *34 | O-Ring | 6 | PNEUMATIC CONTROL VALVE MOUNTING KIT <i>(MB-210-494, MB-210-496 and MB-210-497)</i> | | |
| *35 | Oil Seal | 1 | 270 | Control Valve | 1 |
| *36 | Spring (75 Ft. Lbs. Braking Torque) | 6 | 271 | Mounting Bracket | 1 |
| *39 | O-Ring | 1 | 272 | Soc. Hd. Cap Screw, 1/4"-20 x 1-3/8" | 2 |
| *40 | O-Ring | 2 | 273 | Soc. Hd. Cap Screw, 5/16"-18 x 3" | 2 |
| *42 | Liner, I.D. Sealing | 1 | 274 | Lockwasher, 1/4" | 2 |
| *43 | Liner, O.D. Sealing | 1 | 275 | Lockwasher, 5/16" | 2 |
| **45 | Air Breather | 1 | 276 | Hose | 1 |
| **46 | Sight Gauge | 1 | 277 | Hose Fitting | 1 |
| 64 | Pipe Plug, Mag. Sq. Hd., 1/4" NPT | 1 | 278 | Hose Fitting | 1 |
| 72 | Soc. Hd. Cap Screw, 5/16"-18 x 7/8" | 6 | 280 | 90° Swivel Fitting | 1 |
| 74 | Pipe Plug, Mag. Sq. Hd., 1/4" NPT | 1 | 281 | Street Elbow, 1/8" NPT | 1 |
| 75 | Pipe Plug, 1/2" NPT | 1 | 282 | Bronze Muffler | 1 |
| 76 | Reducer Bushing, 1/2" x 1/4" | 1 | | | |
| *86 | Wear Sleeve | 1 | | | |
| *104 | O-Ring | 1 | | | |

*- Indicates parts in Minor Overhaul Kit.

** - Indicates parts in Major Overhaul Kit. (This Major Overhaul Kit also includes all parts in the Minor Overhaul Kit.)

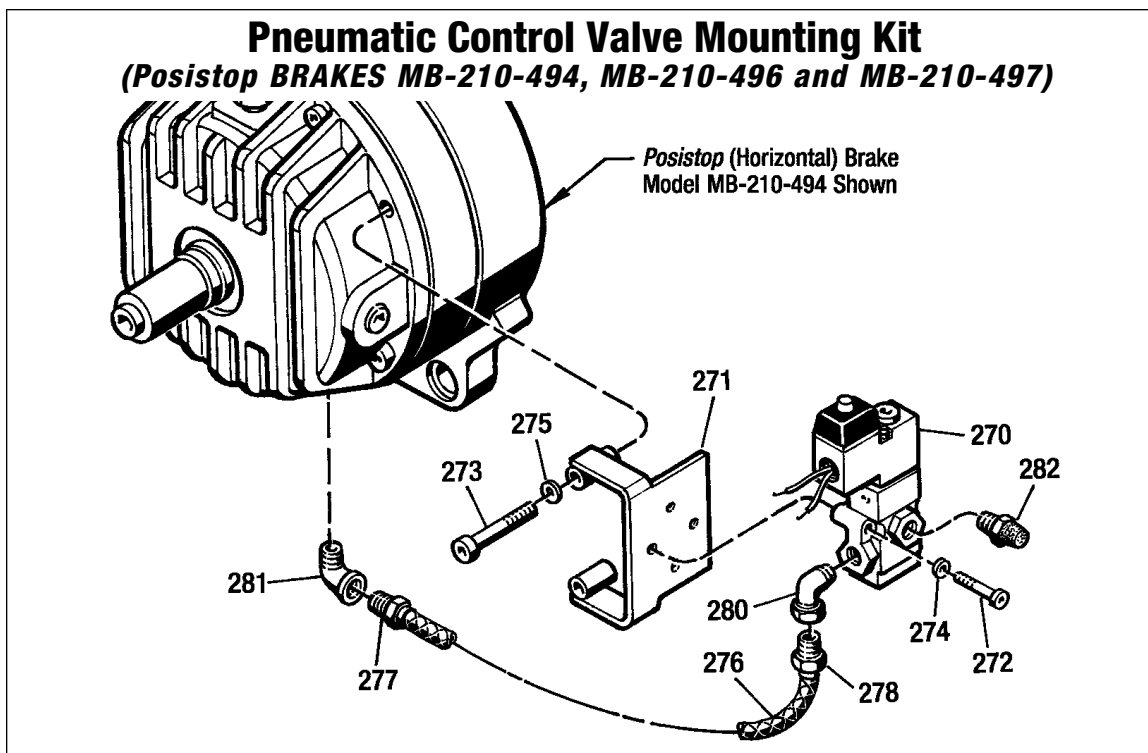


Figure 10.1 - Pneumatic Control Valve Mounting Kit

Posistop (Horizontal) Brake - Model MB-210-494

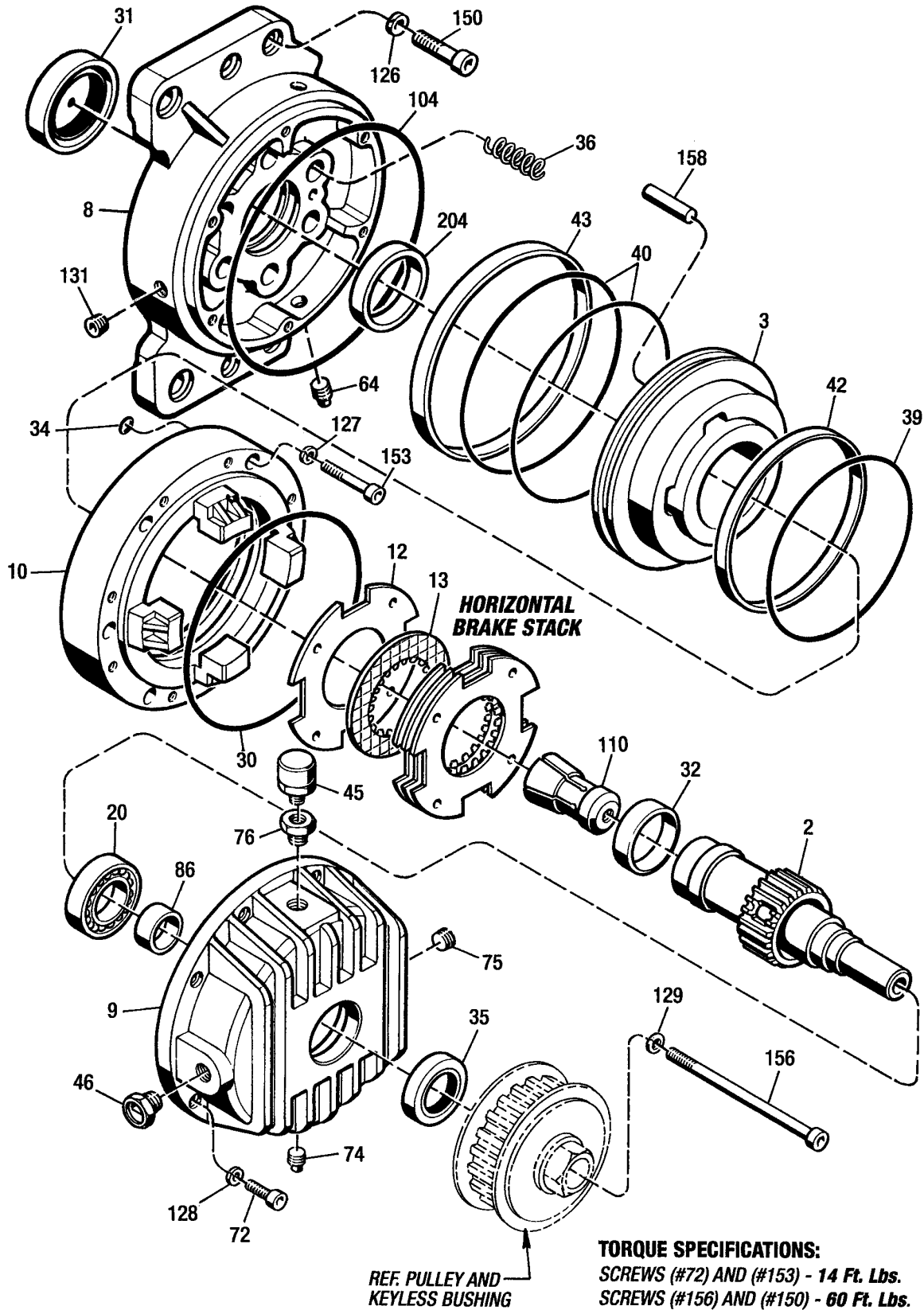


Figure 10.2 - Posistop (Horizontal) Brake Model MB-210-494

Repair Parts List
Posistop (Vertical Down) Brake - Model MB-210-496

| REF No. | PART NAME | QTY. | REF No. | PART NAME | QTY. |
|---------|---|------|---------|--|------|
| 2 | Hub | 1 | 72 | Soc. Hd. Cap Screw, 5/16"-18 x 7/8" | 6 |
| 3 | Piston | 1 | 75 | Pipe Plug, 1/2" NPT | 2 |
| 8 | Housing | 1 | 76 | Reducer Bushing, 1/2" x 1/4" | 1 |
| 9 | End Housing | 1 | *86 | Wear Sleeve | 1 |
| 10 | Piston Housing | 1 | *104 | O-Ring | 1 |
| *12 | Drive Plate (Without Rivet) | 1 | 110 | Collet | 1 |
| *13 | Friction Disc | 3 | 126 | Lockwasher, 1/2" | 4 |
| *17 | Separator Springs | 12 | 127 | Lockwasher, 5/16" | 6 |
| *18 | Drive Plate (With Rivets) | 3 | 128 | Lockwasher, 5/16" | 6 |
| *20 | Ball Bearing | 1 | 129 | Lockwasher, 1/2" | 1 |
| *30 | O-Ring | 1 | 131 | Pipe Plug, 1/4" NPT | 3 |
| *31 | Oil Seal | 1 | 150 | Soc. Hd. Cap Screw, 1/2"-13 x 1-3/4" | 4 |
| *32 | Wear Sleeve | 1 | 153 | Soc. Hd. Cap Screw, 5/16"-18 x 2" | 6 |
| *34 | O-Ring | 6 | 154 | Soc. Set Screw, #10-24 x 1/2" Lg | 2 |
| *35 | Oil Seal | 1 | 156 | Soc. Hd. Cap Screw, 1/2"-13 x 6" | 1 |
| *36 | Spring (60 Ft. Lbs. Braking Torque) | 4 | 158 | Dowel Pin | 1 |
| *39 | O-Ring | 1 | *204 | Bearing Liner | 1 |
| *40 | O-Ring | 2 | 263 | Pipe Nipple, 1/4" NPT x 1-1/2" Lg. | 1 |
| *42 | Liner, I.D. Sealing | 1 | 264 | Elbow, 1/4" NPT | 1 |
| *43 | Liner, O.D. Sealing | 1 | 265 | Street Elbow, 1/4" NPT | 1 |
| **45 | Air Breather | 1 | 267 | Pipe Plug, Sq. Hd., 1/4" NPT | 1 |
| 64 | Pipe Plug, Mag. Sq. Hd., 1/4" NPT | 1 | | | |

*- Indicates parts in Minor Overhaul Kit.

** - Indicates parts in Major Overhaul Kit. (This Major Overhaul Kit also includes all parts in the Minor Overhaul Kit.)

Posistop (Vertical Down) Brake - Model MB-210-496

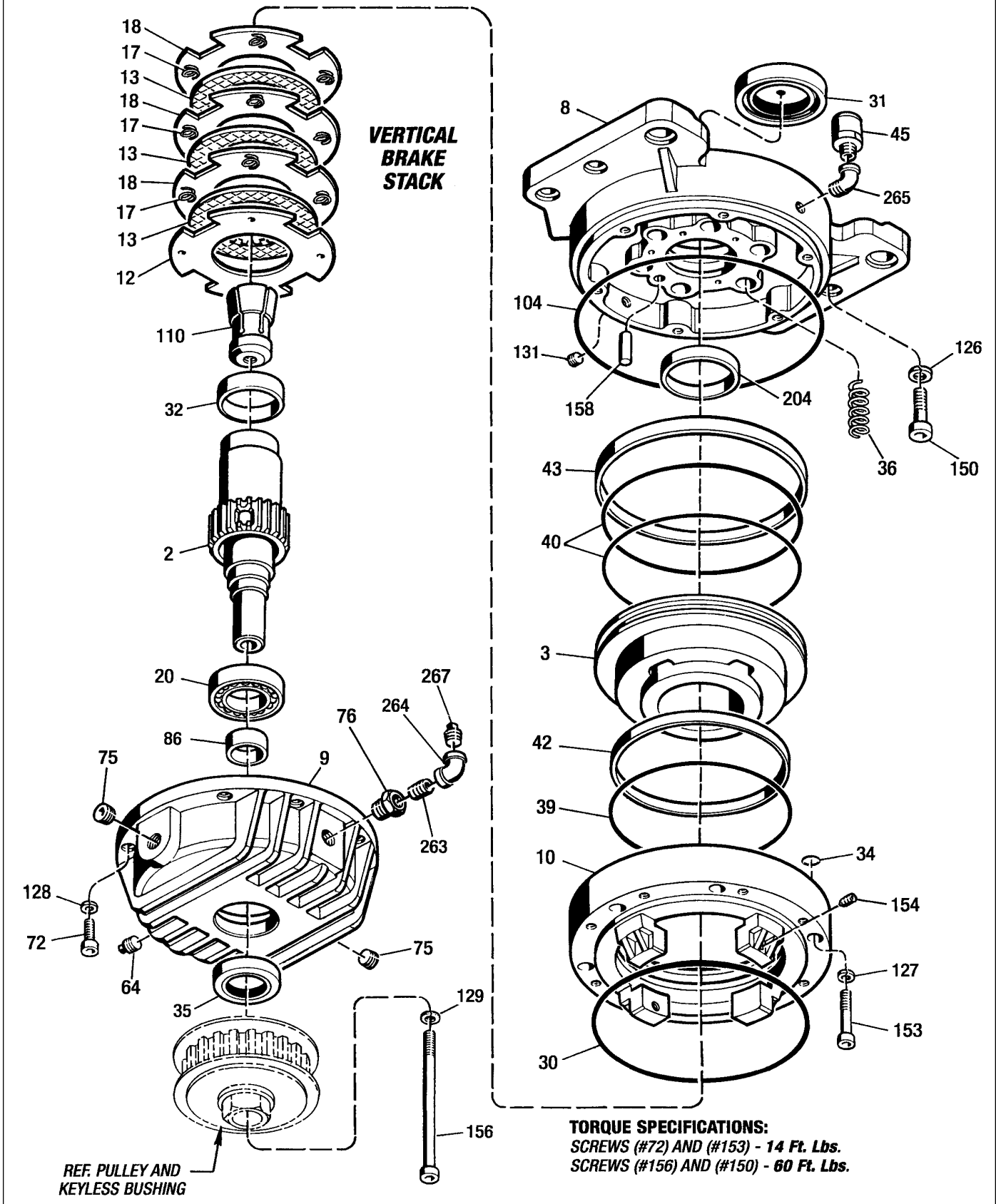


Figure 10.3 - Posistop (Vertical Down) Brake - Model MB-210-496

Repair Parts List
Posistop (Vertical Up) Brake - Model MB-210-497

| REF No. | PART NAME | QTY. | REF No. | PART NAME | QTY. |
|---------|---|------|---------|--|------|
| 2 | Hub | 1 | 64 | Pipe Plug, Mag. Sq. Hd., 1/4" NPT | 1 |
| 3 | Piston | 1 | 69 | Pipe Nipple, 1/4" NPT x 1-1/2" Lg. | 1 |
| 8 | Housing | 1 | 72 | Soc. Hd. Cap Screw, 5/16"-18 x 7/8" | 6 |
| 9 | End Housing | 1 | 74 | Pipe Plug, 1/4" NPT | 1 |
| 10 | Piston Housing | 1 | 75 | Pipe Plug, 1/2" NPT | 1 |
| *12 | Drive Plate (Without Rivet) | 1 | 76 | Reducer Bushing, 1/2" x 1/4" | 1 |
| *13 | Friction Disc | 3 | 77 | Pipe Nipple, 1/2" NPT x 1-1/2" Lg. | 1 |
| *17 | Separator Springs | 12 | *86 | Wear Sleeve | 1 |
| *18 | Drive Plate (With Rivets) | 3 | *104 | O-Ring | 1 |
| *20 | Ball Bearing | 1 | 110 | Collet | 1 |
| *30 | O-Ring | 1 | 126 | Lockwasher, 1/2" | 4 |
| *31 | Oil Seal | 1 | 127 | Lockwasher, 5/16" | 6 |
| *32 | Wear Sleeve | 1 | 128 | Lockwasher, 5/16" | 6 |
| *34 | O-Ring | 6 | 129 | Lockwasher, 1/2" | 1 |
| *35 | Oil Seal | 1 | 150 | Soc. Hd. Cap Screw, 1/2"-13 x 1-3/4" | 4 |
| *36 | Spring (60 Ft. Lbs. Braking Torque) | 4 | 153 | Soc. Hd. Cap Screw, 5/16"-18 x 2" | 6 |
| *39 | O-Ring | 1 | 156 | Soc. Hd. Cap Screw, 1/2"-13 x 6" | 1 |
| *40 | O-Ring | 2 | 158 | Dowel Pin | 1 |
| *42 | Liner, I.D. Sealing | 1 | *204 | Bearing Liner | 1 |
| *43 | Liner, O.D. Sealing | 1 | 247 | Pipe Tee, 1/2" NPT | 1 |
| **45 | Air Breather | 1 | 258 | Elbow, 1/4" NPT | 1 |
| **46 | Sight Gauge | 1 | 267 | Pipe Plug, 1/4" NPT, Sq. Hd. | 1 |
| 49 | Pipe Plug, 1/4" NPT | 3 | | | |

*- Indicates parts in Minor Overhaul Kit.

** - Indicates parts in Major Overhaul Kit. (This Major Overhaul Kit also includes all parts in the Minor Overhaul Kit.)

Posistop (Vertical Up) Brake - Model MB-210-497

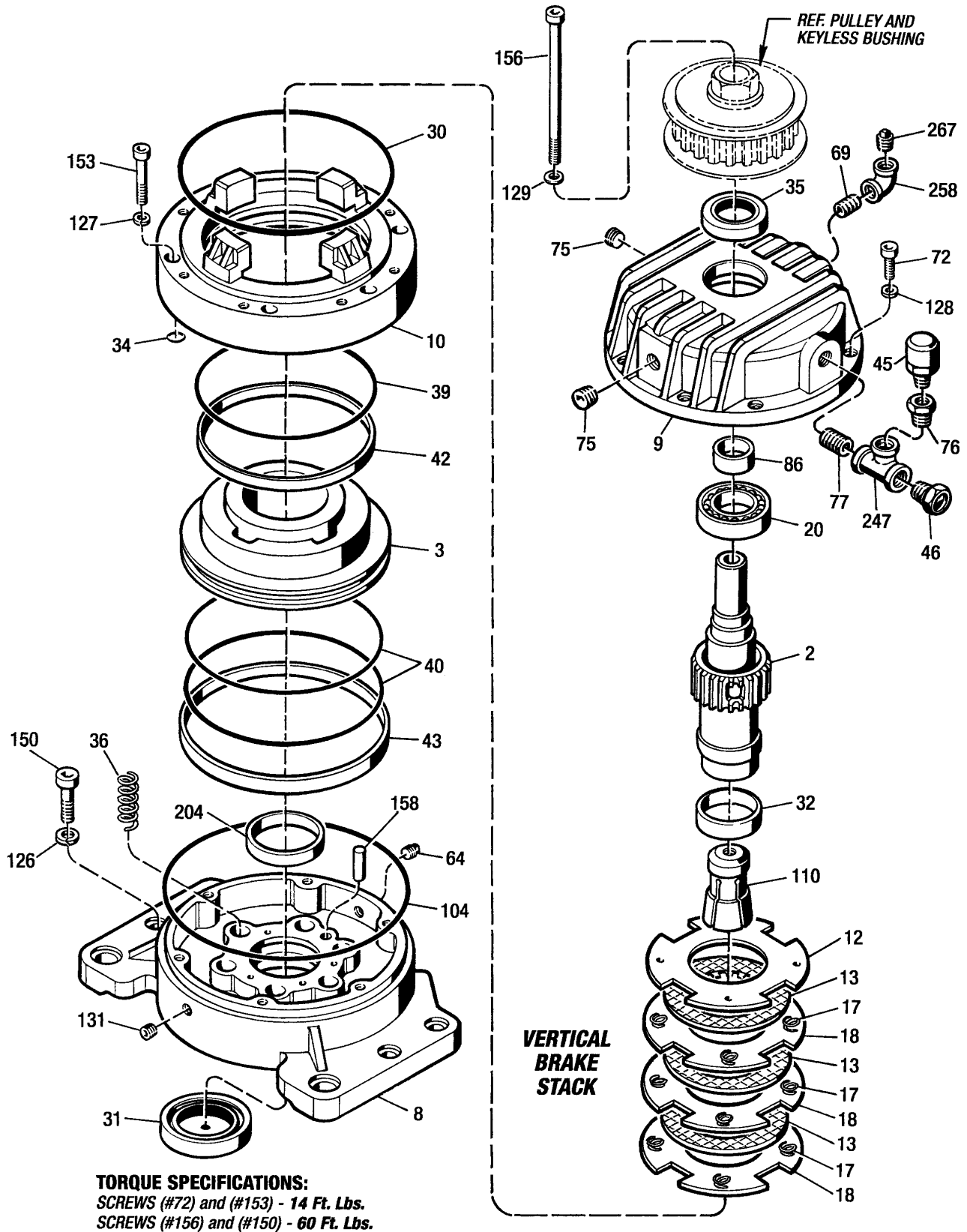


Figure 10.4 - Posistop (Vertical Up) Brake - MB-210-497

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