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SERVICE MANUAL

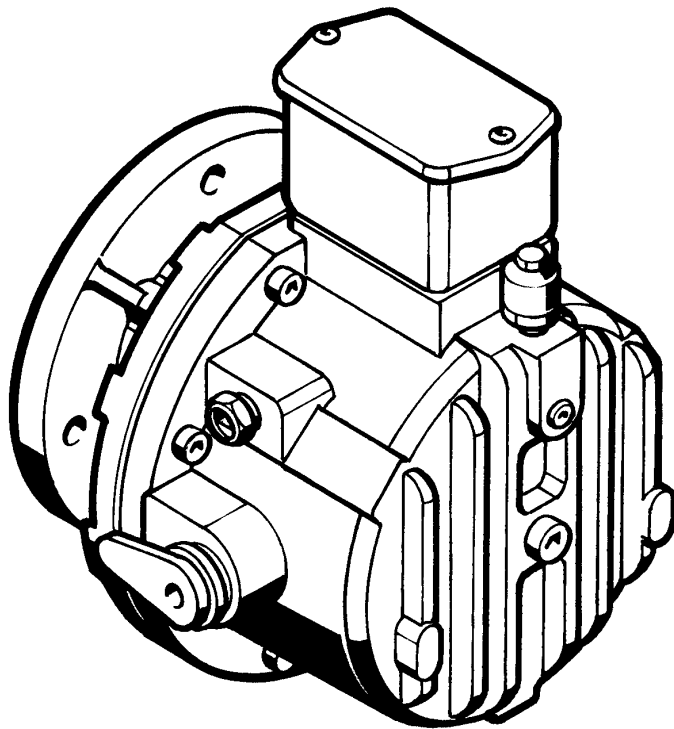
FOR

MSB3 MSB4 MSB6 MSB8

MagnaShear™

FULLY ELECTRIC

OIL SHEAR MOTOR 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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Section 1

DESCRIPTION and OPERATION

1-1 UNIT DESCRIPTION

MagnaShear Fully Electric Motor Brakes with Oil Shear dependability are available in four sizes which have NEMA standard mounting flanges from 4-1/2" FAK to 12-1/2" FAK. Spring set torque ratings range from 4 Ft. Lbs to 200 Ft. Lbs.

A spring set brake stack is released when 120 VAC power is supplied to the Brake Coil. Control logic is made simple by use of the motor starter auxiliary contactors. Back EMF effect from the motor windings is eliminated.

The units are ideal for a wide variety of applications including indexing tables, lifts, transfer conveyors, tap heads and other start/stop devices. Applications requiring the brake to be released on an average of more than 50% of the time or for long durations must be reviewed and approved by our engineering department.

1-2 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. The **MagnaShear Motor Brake** is an *Oil Shear* Brake, with the friction surfaces operating in a constantly replenished film of oil. The oil molecules tend to cling to each other and to the friction surfaces. As moving and stationary elements are brought together, a thin but positive film of oil is maintained between them which is controlled by the clamping pressure and carefully designed grooves in the friction discs. Torque is transmitted from one element to the other through the viscous shear of the oil film. As long as there is relative motion between the elements, they are protected by the oil, thus greatly reducing wear. The replenished oil film also effectively transmits heat away from the friction elements.

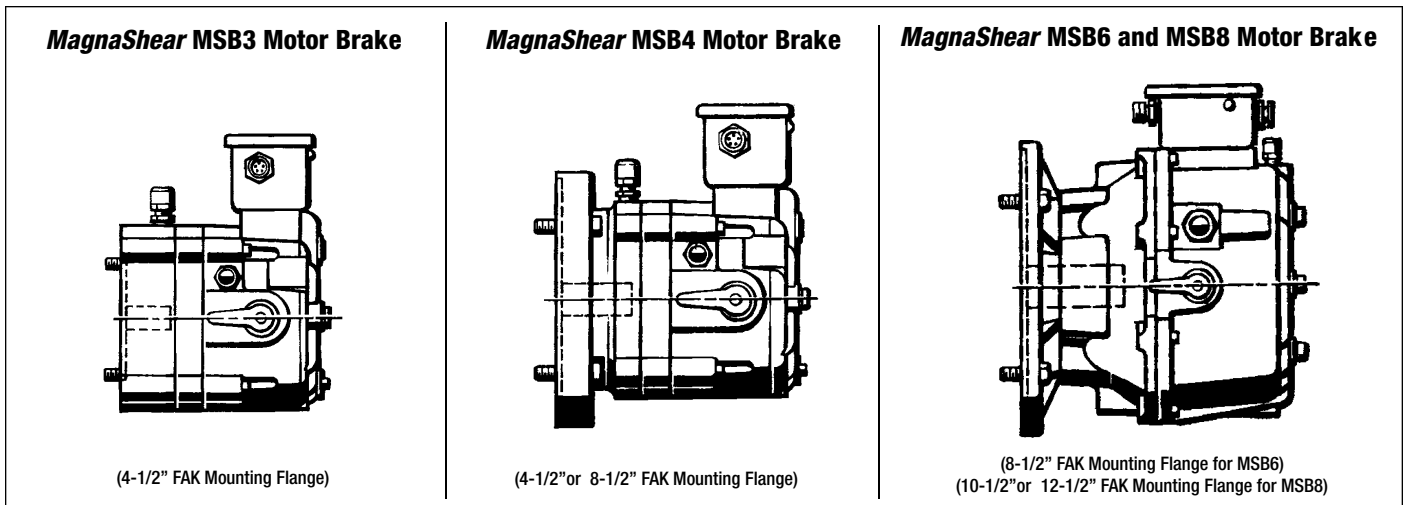
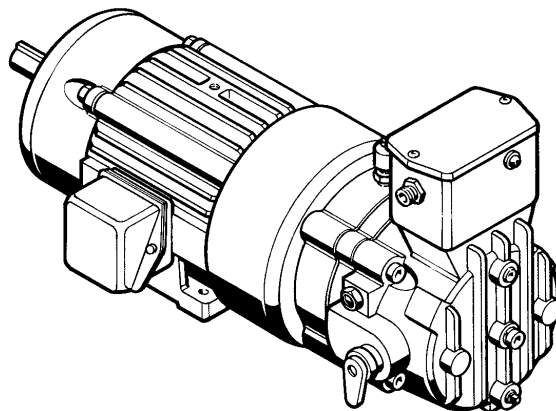


Figure 1.1 - MagnaShear Motor Brakes with C-Face Mounting



The **MagnaShear Motor Brake** is also available as an **Assembled Brake Motor (ABM)** in a wide variety of sizes ranging from 56 Frame to 326U or 326T Frames.

1-3 OPERATION

The cross section in *Figure 1.2* shows the **MagnaShear Motor Brake** in the Stopped position with the brake stack engaged. The **MagnaShear Motor Brake** will default to this position when all power is lost.

The Optional Manual Brake Release Mechanism is shown in the small section.

To run the Drive Motor the Brake Coil is energized, pulling the Armature Plate Assembly away from the Brake Stack which allows the splined hub and drive motor to rotate independently from the motor brake.

To stop the Drive Motor the Brake Coil is de-energized. This allows the brake springs to push the Armature Plate Assembly against the Brake Stack, clamping it and stopping the splined hub and drive motor.

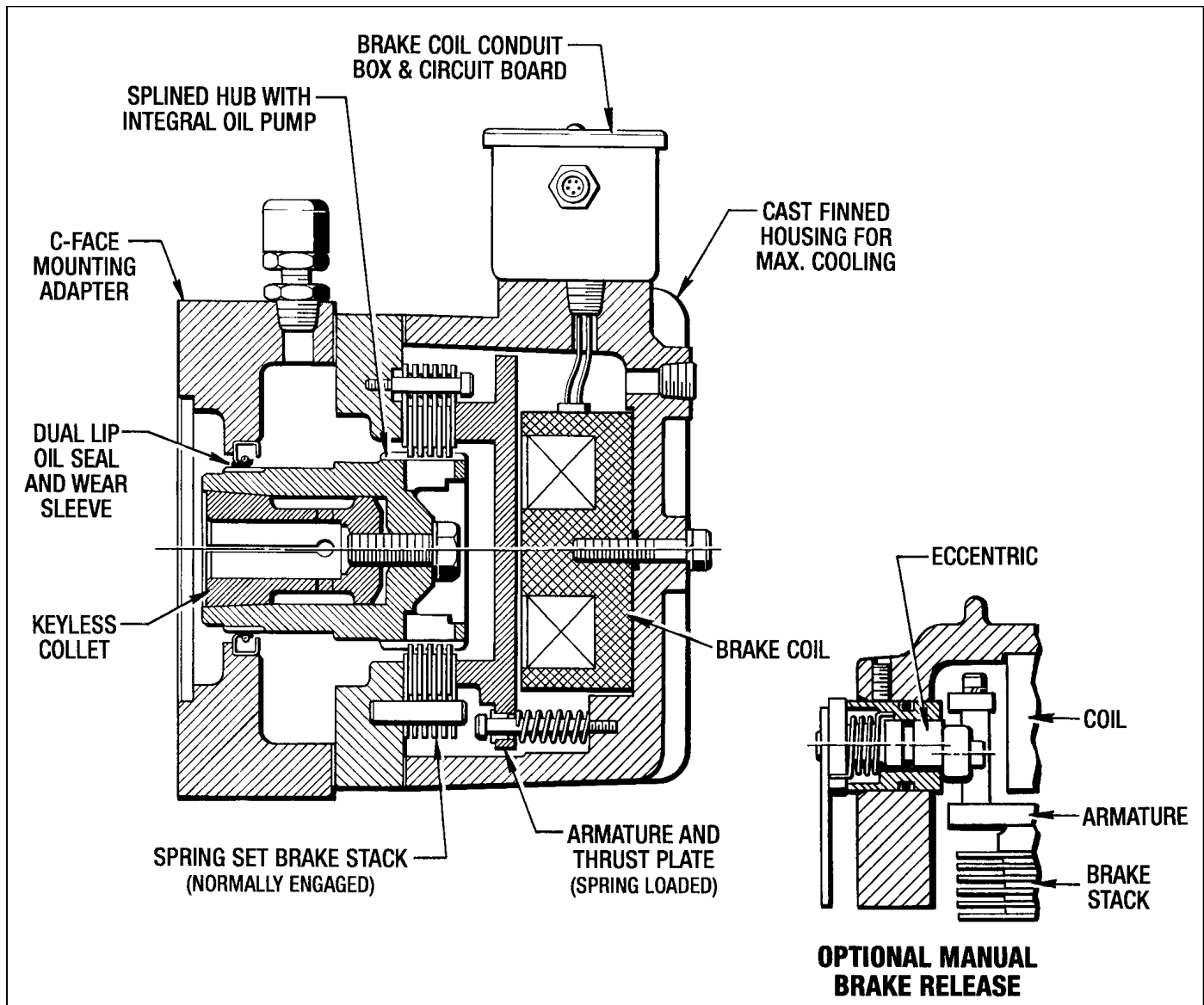


Figure 1.2 - MagnaShear Motor Brake Cross Section

Section 2 SPECIFICATIONS

Technical Specifications (With External Heat Sink)

BRAKE SIZE	AVAILABLE		No. OF SPRINGS	STATIC TORQUE (Lb. Ft.)	DYNAMIC TORQUE (Lb. Ft.)	MAX. KE per ENGMT. (Ft. Lbs.)	INERTIA (Lb. Ft. ²)	OIL CAP. (Fl. Oz.)	INPUT VOLTAGE (VAC)	CURRENT (Amps)	MAX. DUTY CYCLE	COIL RESISTANCE @ 20° C.
	PILOT DIA. (Inches)	COLLET BORE (Inches)										
MSB3	4.50	.625	3	3	2	7,975	0.013	36	115	1.3	50%	95
	8.50	.875	4	8	7							
		1.125	6	14	12							
MSB4	4.50	.875	2	9	8	22,000	0.024	40	115	1.3	50%	95
	8.50	1.125	4	21	18							
			6	33	28							
MSB6	8.50	.875	4	42	36	26,500	0.058	50	115	5.0	50%	23
		1.125	6	63	54							
		1.375	8	84	72							
MSB8	10.50 12.50	1.375	4	100	86	41,500	0.267	180	115	2.2	25%	53
		1.625	6	150	129							
		1.875	8	200	172							
			6	228	193							

Max. Duty Cycle is percentage of time brake is released. (Coil is Energized.)

Technical Specifications (With Pulse Width Modulation "PWM")

BRAKE SIZE	AVAILABLE		No. OF SPRINGS	STATIC TORQUE (Lb. Ft.)	DYNAMIC TORQUE (Lb. Ft.)	MAX. KE per ENGMT. (Ft. Lbs.)	INERTIA (Lb. Ft. ²)	OIL CAP. (Fl. Oz.)	INPUT VOLTAGE (VAC)	INRUSH CURRENT .4 Sec. (Amps)	HOLDING CURRENT (Amps)	MAX. DUTY CYCLE	COIL RESISTANCE @ 20° C. (Ohms)
	PILOT DIA. (Inches)	COLLET BORE (Inches)											
MSB3	4.50	.625	3	3	2	7,975	0.013	36	115 230	2.5 1.3	.3 .2	75%	47 188
	8.50	.875	4	8	7								
		1.125	6	14	12								
MSB4	4.50	.875	3	9	8	22,000	0.024	40	115 230	2.5 1.3	.3 .2	75%	47 188
	8.50	1.125	4	21	18								
			6	33	28								
MSB6	8.50	.875	4	42	36	26,500	0.058	50	115 230	5.5 2.8	.6 .3	75%	23 92
		1.125	6	63	54								
		1.375	8	84	72								
MSB8	10.50 12.50	1.375	4	100	86	41,500	0.267	180	115 230	6 3	.6 .3	50%	21.5 86
		1.625	6	150	129								
		1.875	8	200	172								
			6	228	193								

Thermal Horsepower Rating (With Pulse Width Modulation "PWM")

MagnaShear MSB4 Motor Brake						MagnaShear MSB6 Motor Brake						MagnaShear MSB8 Motor Brake					
% DUTY	CYCLE RATE (CPM)	AMBIENT TEMP.				% DUTY	CYCLE RATE (CPM)	AMBIENT TEMP.				% DUTY	CYCLE RATE (CPM)	AMBIENT TEMP.			
		TEFC Motor		TENV Motor				TEFC Motor		TENV Motor				TEFC Motor		TENV Motor	
		25° C	40° C	25° C	40° C			25° C	40° C	25° C	40° C			25° C	40° C	25° C	40° C
25%	2	0.26	0.19	0.20	0.14	25%	2	0.18	0.12	0.14	0.09	25%	2	0.43	0.28	0.41	0.27
	5	0.25	0.18	0.19	0.14		5	0.16	0.11	0.13	0.08		5	0.41	0.27	0.40	0.26
	10	0.24	0.17	0.18	0.13		10	0.14	0.08	0.11	0.06		10	0.39	0.25	0.38	0.24
50%	2	0.24	0.16	0.13	0.07	50%	2	0.12	0.06	0.05	NR	50%	2	0.18	NR	0.15	NR
	5	0.24	0.15	0.12	0.06		5	0.11	0.12	0.14	0.09		5	0.17	NR	0.14	NR
	10	0.23	0.14	0.11	0.05		10	0.09	NR	NR	NR		10	0.15	NR	0.12	NR
75%	2	0.23	0.13	0.05	NR	75%	2	0.07	NR	NR	NR	75%	2	NR	NR	NR	NR
	5	0.22	0.13	NR	NR		5	0.06	NR	NR	NR		5	NR	NR	NR	NR
	10	0.21	0.12	NR	NR		10	NR	NR	NR	NR		10	NR	NR	NR	NR

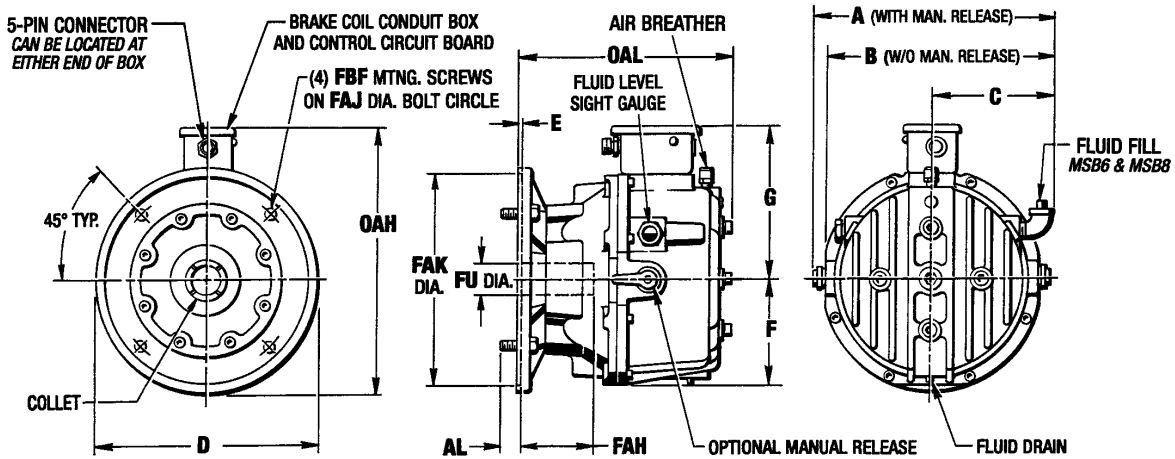
NOTES: Above ratings are based on 96° C maximum oil temperature and 1800 RPM motor.

NR - Not Recommended. Max. Duty Cycle is percentage of time brake is released. (Coil is Energized.)

**Minimum Collet Bore
For a Given Static Torque**

BRAKE SIZE	GIVEN STATIC TORQUE (Lb. Ft.)	MINIMUM COLLET BORE (Inches)
MSB3	8	.625
	14	.875
MSB4	33	.875
MSB6	84	.875
MSB8	200	1.375

Dimensional Specifications (Inches)



Dimensions are subject to change without notice. Certified Installation Drawings are available upon request

BRAKE SIZE	MOTOR FRAME	COLLET BORE		PILOT DIMENSIONS			MOUNTING SCREWS		OVERALL DIMENSIONS																								
		FU*	FAH		FAK**	D	E	FBF	FAJ	AL	A	B	C	F	G	OAL	OAH																
			MIN	MAX																													
MSB3 MSB4	182U 184U	.875	1.37	2.42	4.500	7.31	.25	3/8-16	5.875	.56	9.26	8.24	4.63	3.39	6.78	8.75	11.25																
	182T 184T	.875																															
	213U 215U	1.125	1.84	2.89	8.500	8.92	.19	1/2-13	7.250																								
	213T 215T	1.125																															
	MSB6	213U 215U	.875	2.75	3.75	8.500	8.81	.19	1/2-13									7.250	.75	10.97	10.47	5.45	5.00	7.55	9.56	12.50							
		213T 215T	1.125																														
254U 256U		1.125																															
254T 256T		1.375																															
MSB8		284U 286U	1.375							4.62	5.00	10.500	11.06	.19	1/2-13	9.000	.75										14.32	13.75	7.38	5.53	8.94	13.00	14.47
		284T 286T	1.625																														15.50
	324U 326U	1.625																															
	324T 326T	1.875																															

* Standard Motor Shaft Diameter Tolerances: .875", 1.125" & 1.375" (+.0000" - .0005")
1.625" & 1.875" (+.000" - .001)

** Standard Motor Register Tolerances: 4.500", 8.500", 10.500" (+.000" - .003")
12.500" (+.000" - .005")

Section 3 INSTALLATION

IMPORTANT SAFETY PRECAUTIONS

The *MagnaShear* Motor Brake units described in this manual must not be installed in any manner except as specified and must not be operated at speeds, horsepower loads or temperatures other than those specified in this manual.

Failure to limit the operation of the drive to the conditions specified could damage the unit or damage interconnected equipment and void the Warranty.

WARNING

BEFORE INSTALLATION OR ATTEMPTING ANY REPAIRS TO THE MOTOR BRAKE, OPEN THE DISCONNECTS TO THE DRIVE MOTOR. LOCK IT OUT TO AVOID THE POSSIBILITY OF PERSONAL INJURY.

3-1 RECEIVING THE *MagnaShear* MOTOR BRAKE

Check the brake for shortage or damage immediately after arrival. Prompt reporting to the carrier's agent, with notations made on the freight bill, will expedite satisfactory adjustment by the carrier.

A. Assembled Brake Motor (ABM)

If your *MagnaShear* Motor Brake is shipped pre-assembled to a drive motor, it is filled with oil and ready to run except for installing the Air Breather (#45) and electrical wiring. (See *Figure 3.5* and *Figure 3.6* for Electrical Wiring Diagram.)

NOTE:

Before shipment, the Air Breather (#45) is removed and a pipe plug put in its place. This is done to prevent oil spillage during shipment. In most cases this will be a red plastic plug. This plug must be removed and the Breather (#45) installed to prevent damage to the brake. The breather is taped to the motor shaft for shipment. Always check the oil level though, to see if the oil level is in the center of the Sight Gauge (#46). (See Section 4 LUBRICATION)

B. *MagnaShear* Motor Brake

The standard *MagnaShear* Motor Brake has been partially assembled at the factory for ease of shipment. The Motor Brake is completely assembled except for the Hub and Collet Sub-assembly, which is packaged separately and also the motor mounting bolts and washers. Partial disassembly will be necessary to mount the brake to the drive motor.

During Installation refer to Section 8 and *Figures 8.1, 8.2, 8.3, 8.4 & 8.5* for a visual reference to parts.

MSB3 Motor Brake*Figure 8.1*
 MSB4 Motor Brake*Figure 8.1*
 MSB6 Motor Brake*Figure 8.2*
 MSB8 Motor Brake*Figure 8.3*
 Electric Box & Circuit Board*Figure 8.4*
 Vertical Installation.....*Figure 8.5*

3-2 VERIFYING MOTOR SPECIFICATIONS

The Motor Manufacturer's Specifications must be verified first to ensure the Motor Brake Oil Seal Reliability. (1) Motor Shaft Runout, (2) Mounting Face Runout and (3) Motor Shaft to Pilot Diameter Eccentricity need to be checked with a Dial Indicator as shown in *Figure 3.1*.

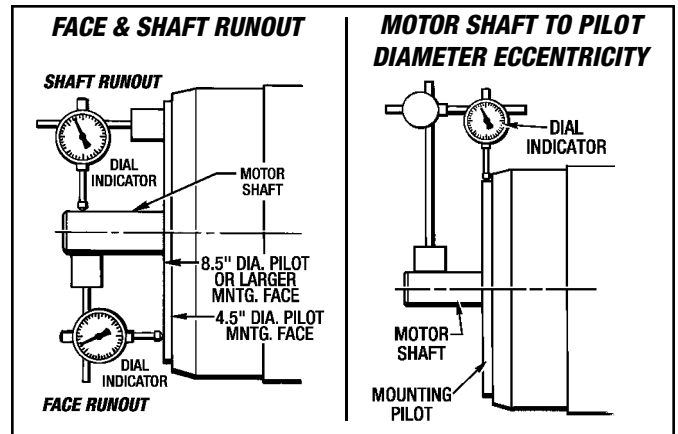


Figure 3.1 - Verifying Motor Specifications

MAXIMUM ALLOWABLE T.I.R. (Inches) (As Per NEMA MG 1 Standard)

Pilot Dia. Dimensions	Tolerance On Pilot Dia.		Maximum Allowable Shaft Runout	Maximum Allowable Face Runout	Maximum Allowable Eccentricity
	Plus	Minus			
Less than 12"	.000	.003	.002	.004	.004
12" & Larger	.000	.005	.003	.007	.007

CAUTION - T.I.R. in excess of this maximum will result in a potential leak condition.

3-3 MOUNTING THE *MagnaShear* MOTOR BRAKE TO THE DRIVE MOTOR

First check the motor shaft and pilot diameter for any nicks, scratches or burrs. Clean-up and de-burr if necessary.

(MSB3 and MSB4)

1. Remove the (4) Screws (#72) and (4) Lockwashers (#127) from the End Housing (#9). (Loosen evenly

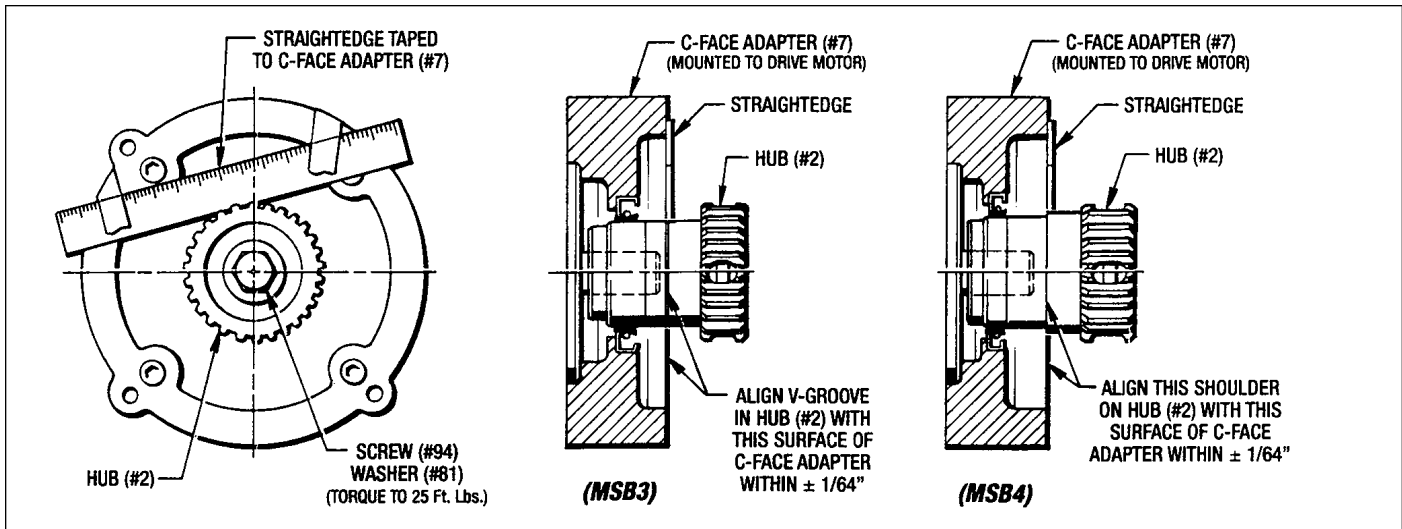


Figure 3.2 - Hub Alignment - Sizes MSB3 and MSB4

because the housing is under spring pressure.) Pull the End Housing (#9) and Gasket (#121) away from the Housing (#8).

2. Remove the Brake Stack from Housing (#8) by unscrewing the (4) Shoulder Bolts in the Drive Plates.
3. Separate the Housing (#8) from the C-Face Adapter (#7). Also remove the Gasket (#122).
4. Attach the C-Face Adapter (#7) to the motor mounting face with the (4) Screws (#149) and (4) Lockwashers (#128) **Torque to 25 Ft. Lbs.**

Be careful not to damage the lip of the Oil Seal (#31) which is located in the C-Face Adapter (#7).

5. Remove the Screw (#94) and Washer (#81) in the Hub (#2). Coat the threads with Loctite Threadlocker #271 or equivalent.

Reinstall the Screw and Washer back into the Hub (#2), but **do not tighten. The Collet (#110) must be loose in the Hub (#2) bore.**

6. Apply a light coat of vaseline or equivalent to the Wear Sleeve (#32) located on the Hub (#2) and the lip of the Oil Seal (#31) located in the C-Face Adapter (#7).
7. Slide the Hub and Collet onto the motor shaft, being careful not to damage the lip of the Oil Seal (#31).

IMPORTANT: Do not lubricate the motor shaft or the collet bore.

8. Tape a steel straight edge to the face of the C-Face Adapter (#7) as shown in Figure 3.2.
9. Tap the Hub (#2) lightly to position it. The **MSB3** has a V-groove machined in the hub. The **MSB4** uses the shoulder on the Hub. Align with the adapter face

(back edge of the straight edge). This alignment should be within plus or minus 1/64". (See Figure 3.2)

10. Tighten Screw (#94) after the Hub (#2) has been properly positioned. **Use Blue Loctite #242. Torque to 25 Ft. Lbs.**

NOTE: The Hub (#2) will move approx. 1/32" further on to the shaft as the screw is tightened.

11. Re-check alignment. If it is within the $\pm 1/64$ " tolerance, remove the straightedge.
12. Place the Gasket (#122) and the Housing (#8) on the C-Face Adapter (#7).
13. Place the Brake Stack (#41) on the hub spline and attach to the Housing (#8) with the (4) Shoulder Bolts in the Brake Stack.
14. Place the Gasket (#121) on to the Housing (#8), and attach the End Housing (#9) with the (4) Lockwashers (#127) and (4) Screws (#72). **Torque to 14 Ft. Lbs.**

(MSB6 and MSB8)

1. Remove the (8) Screws (#72) and (8) Lockwashers (#127) from the End Housing (#9). Pull the End Housing (#9) and Gasket (#122) away from the Housing (#8).
2. Remove the Brake Stack from Housing (#8) by unscrewing the (4) Shoulder Bolts in the Drive Plates.
3. Attach the C-Face Adapter (#7) and Housing (#8) to the motor mounting face with the (4) Screws (#150) and (4) Lockwashers (#126) **Torque to 60 Ft. Lbs. for MSB6 & 120 Ft. Lbs. for MSB8.**

Be careful not to damage the lip of the Oil Seal (#31) which is located in the C-Face Adapter (#7).

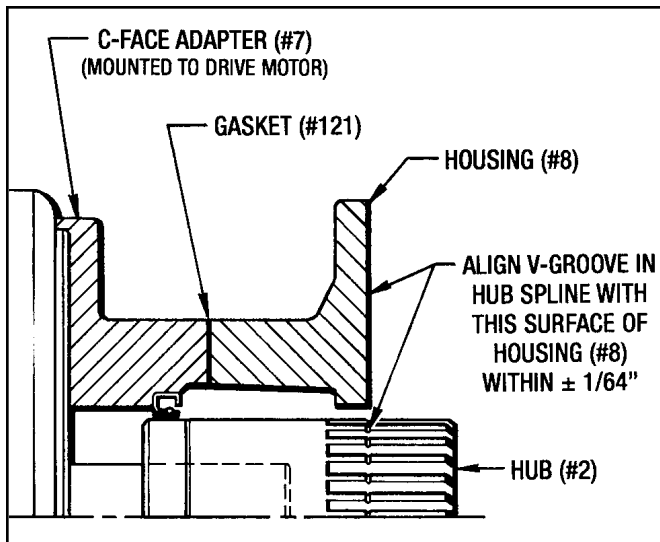


Figure 3.3 - Hub Alignment - Size MSB6

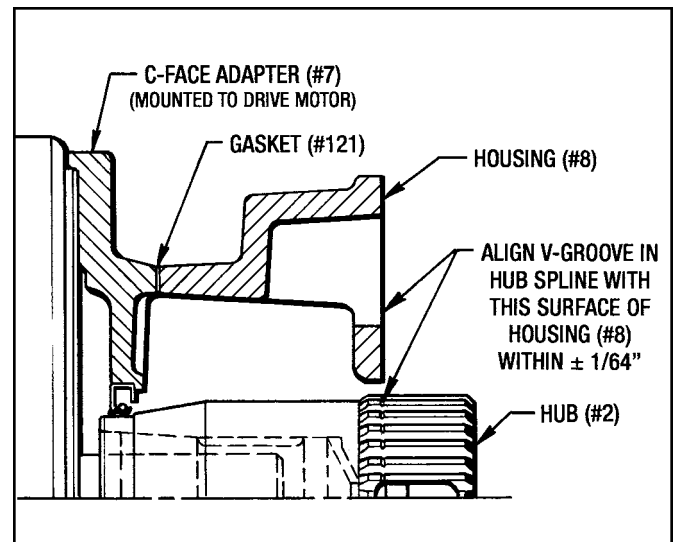


Figure 3.4 - Hub Alignment - Size MSB8

- Remove the Screw (#94) and Washer (#81) in the Hub (#2). Coat the threads with Loctite Threadlocker #271 or equivalent.

Reinstall the Screw and Washer back into the Hub (#2), but **do not tighten**. The Collet (#110) must be **loose in the Hub (#2) bore**.

- Apply a light coat of vaseline or equivalent to the Wear Sleeve (#32) located on the Hub (#2) and the lip of the Oil Seal (#31) located in the C-Face Adapter (#7).
- Slide the Hub and Collet onto the motor shaft, being careful not to damage the lip of the Oil Seal (#31).

IMPORTANT: Do not lubricate the motor shaft or the collet bore.

- Tap the Hub (#2) lightly to align the V-groove, which is machined in the hub spline, with the housing face. This alignment should be within plus or minus 1/64".

(See Figure 3.3 for MSB6 and Figure 3.4 for MSB8)

- Tighten Screw (#94) after the Hub (#2) has been properly positioned. **Use Blue Loctite #242. Torque to 60 Ft. Lbs. for MSB6; 180 Ft. Lbs. for MSB8.**

NOTE: This Hub will move approximately 1/32" onto the shaft as the screw is tightened.

- Re-check alignment and adjust if necessary.
- Place the Brake Stack (#41) on the hub spline and attach to the Housing (#8) with the (4) Shoulder Bolts in the Brake Stack.
- Place the Gasket (#122) on to the Housing (#8). and attach the End Housing (#9) with the (8) Lockwashers (#127) and (8) Screws (#72). **Torque to 25 Ft. Lbs.**

3-4 WIRING SPECIFICATIONS

(See Figure 3.5 below and 3.6 on next page.)

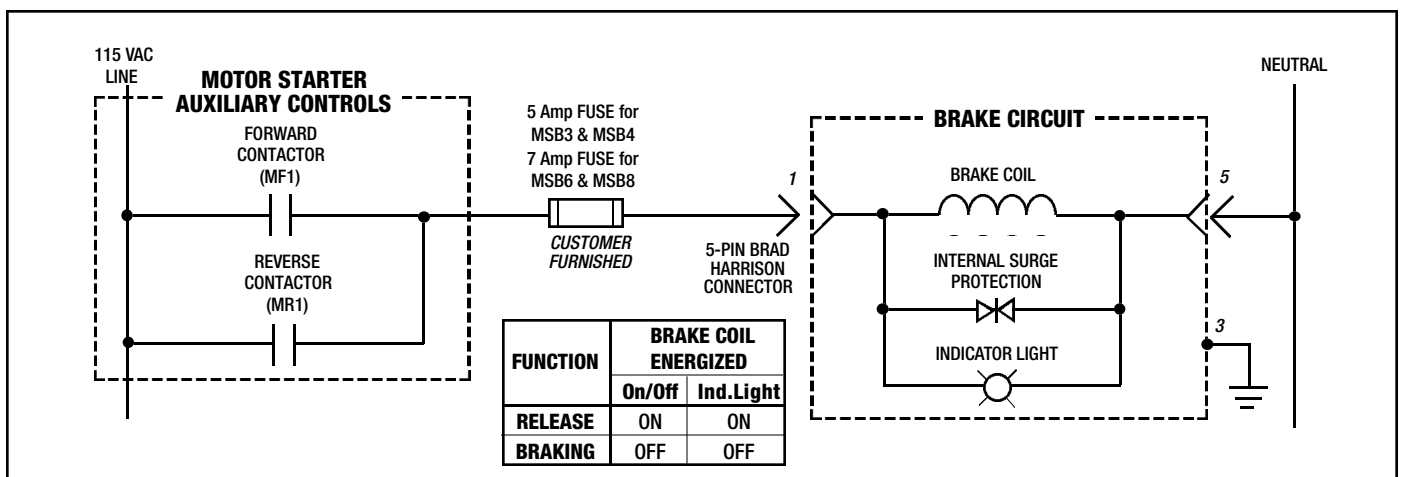


Figure 3.5 - Electrical Schematic

NOTES:

- 1. Coils may be driven independently.
- 2. Circuit Breaker Requirements:

MSB3 & MSB4 - 120 VAC Type #10 AC high in-rush current (Motor Starter) 5 Amp.

MSB6 & MSB8 - 120 VAC Type #10 AC high in-rush current (Motor Starter) 7 Amp.

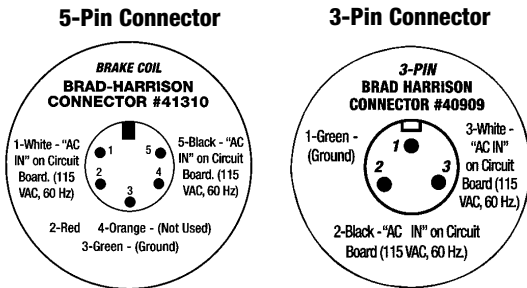


Figure 3.6 - Brad Harrison Connectors

3-5 START-UP

Verify that the Brake Coil is connected correctly. Check to see if the Drive Motor is wired correctly, fuses are in place and the motor disconnect is turned on. Set-up preliminary settings on positioning switches to insure the brake will stop.

“Bump” the Drive Motor to check for correct rotation. If the rotation is incorrect change two of the phase wires and recheck rotation. Verify that the Brake Coil Indicator Light on the Conduit Box is ON while the drive motor is running.

Next, complete a cycle to insure that there are no interference problems within the system.

Set-up Position Switches as required.

**Section 4
LUBRICATION**

4-1 CHECKING THE OIL LEVEL

When the brake is installed and weekly thereafter, or until experience dictates otherwise, check the oil level. Always check the oil level with the brake at room temperature and while it is not running.

A. Horizontal Mounting

The **MagnaShear Motor Brake** has an Oil Sight Gauge (#46) located on the side of the End Housing. (See Figure 4.1). The oil level is to be at the center of the sight gauge with the motor turned off.

B. Vertical Mounting-Brake Up

The **MagnaShear Motor Brake** has an Oil Sight Gauge (#46) located on the side of the End Housing. (See Figure 4.2). The oil level is to be at the center of the sight gauge with the motor turned off.

C. Vertical Mounting-Brake Down

Remove the Pipe Cap (#67) to check the oil level. (See Figure 4.2). The oil level is to be at the top of the Pipe Nipple (#69) with the motor turned off.

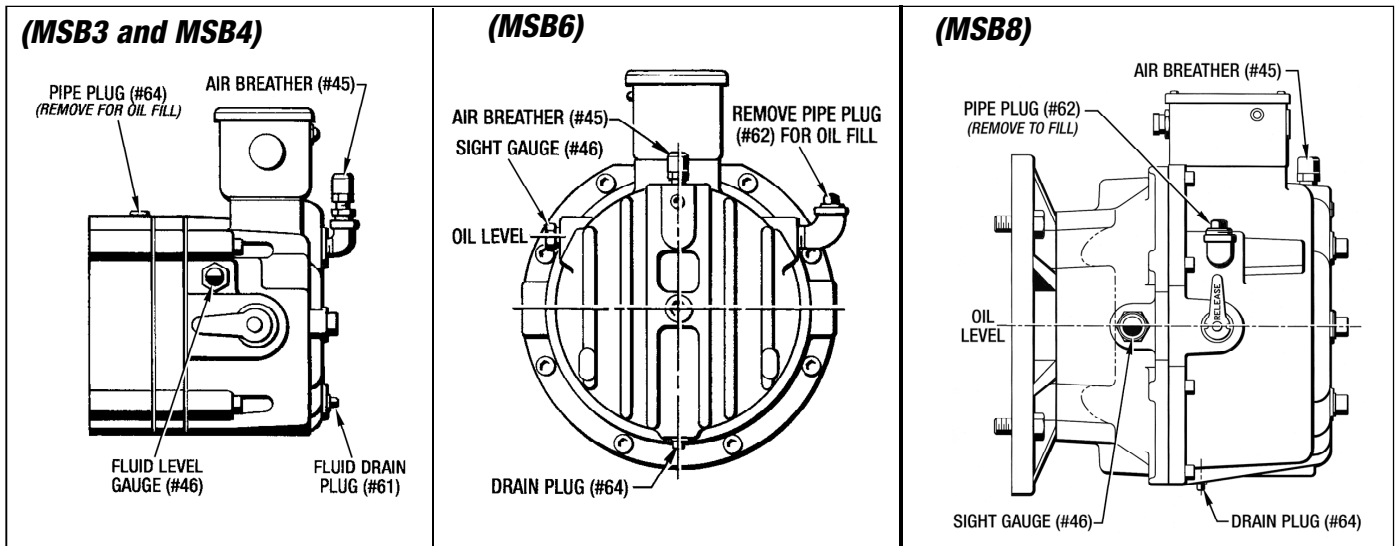


Figure 4.1 - Lubrication - Horizontal Mounting

4-2 OPERATING TEMPERATURES

A. Ambient Temperature

The standard oil used in the **MagnaShear** Brake was designed to operate between 40° F and 125°F. If the ambient temperature will fall outside of this range please contact Force Control Industries, Inc. for specific recommendations on proper lubricant and oil seals.

B. Oil Sump Temperature

The maximum recommended oil sump temperature is 200° F.

4-3 CHANGING THE OIL

IMPORTANT

Always open the disconnects to the drive motor before changing the oil.

Every three months completely drain the oil from the brake by removing Drain Plugs (#61) or (#64). If the Sight Gauge (#46) is dirty, it should also be removed and cleaned.-

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

Replace the Drain Plugs and Sight Gauge if they were removed.

A. Horizontal Mounting - MSB3 and MSB4

Remove Pipe Plug (#64). Fill with oil to the center of Sight Gauge (#46). (See Page 3 for Oil Capacity.)

Replace Pipe Plug (#64).

B. Horizontal Mounting - MSB6 and MSB8

Remove Pipe Plug (#62) from Elbow (#61) and fill with oil to the center of Sight Gauge (#46). (See Page 3 for Oil Capacity.) Replace Pipe Plug (#62).

C. Vertical Mounting-Brake Up

Remove Sq. Hd. Pipe Plug (#62) from the Elbow (#358). (See Figure 4.2 below.) Fill with oil to the center of Sight Gauge (#46). (See Page 3 for Oil Capacity.)

Replace Pipe Plug (#62).

D. Vertical Mounting-Brake Down

(MSB6)

Remove the Pipe Cap (#67). (See Figure 4.2 below.) Fill with oil to the top of the Pipe Nipple (#69). (See Page 3 for Oil Capacity.)

Replace Pipe Cap (#67).

(MSB8)

Remove the Pipe Plug (#62). (See Figure 4.2 below.) Fill with oil to the center of the Sight Gauge (#46). (See Page 3 for Oil Capacity.)

Replace Pipe Plug (#62).

CAUTION

Do not overfill the brake unit. Excess oil will cause the brake to over heat.

4-4 TYPE OF OIL

Use only Mobil Automatic Transmission Fluid ATF-210 (Type "F") or Mobil Multi-Purpose Automatic Transmission Fluid for most drives.

Other fluids may be specified for special applications.

Always use the type of oil specified on the Name Plate.

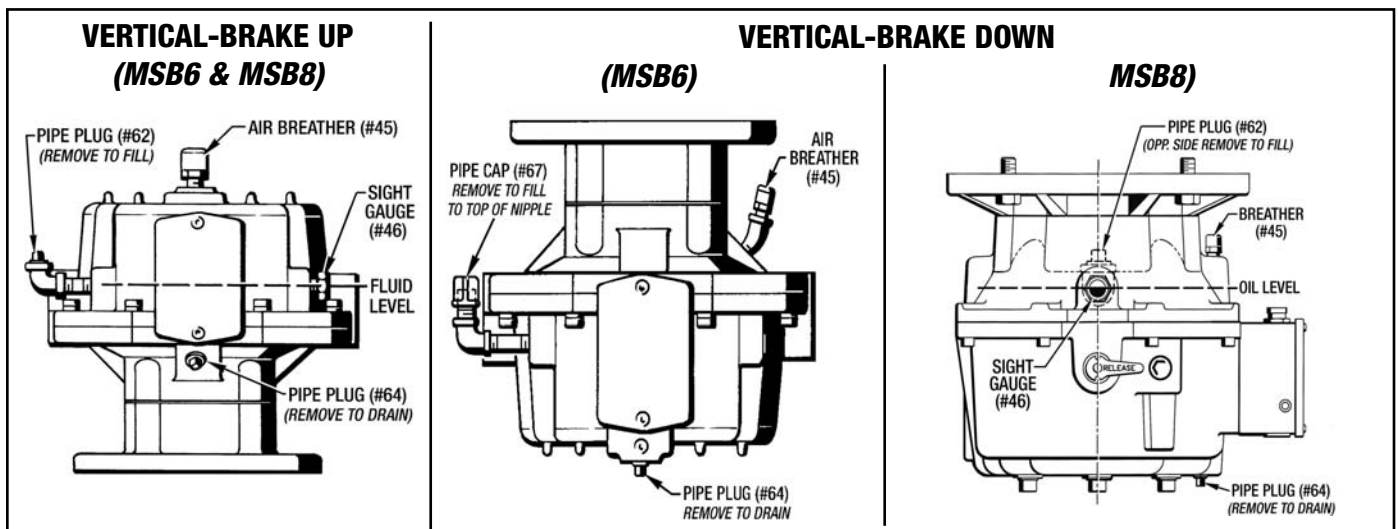


Figure 4.2 - Lubrication - Vertical Mounting

Section 5 OPERATIONAL CHECKS

Make these Operational Checks with the **MagnaShear Motor Brake** shut down and completely assembled with the drive motor attached.

Provisions for manual operation checks must be made if the drive unit has been removed for service and repair. 120 VAC, 60 Hz. electrical service is required to energize the coils. (See *Figure 5.1* below for the Test Set-Up)

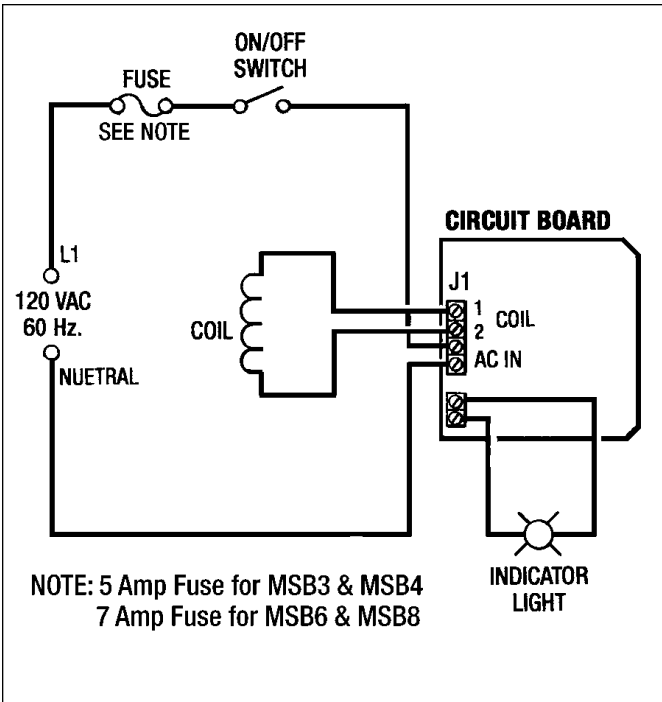


Figure 5.1 - Test Set-Up Electrical Schematic

5-1 CHECKING THE BRAKE OPERATION

To check the Brake Operation electrical power is not

required to energize the coil since the **Magna Shear Motor Brake** has a normally spring loaded brake when the coil is de-energized.

Disconnect the load to the motor. Install a torque wrench on the motor shaft and apply torque. The brake should slip at approximately the static torque of the brake. (Refer to page 3 for torque ratings.)

5-2 CHECKING THE BRAKE COIL OPERATION

1. Remove the cover from the Conduit Box (#405).
2. Disconnect the black and white power leads from the Brad-Harrison Cable Connector (# 416) to "AC In" on Terminal Strip J1. located on the Circuit Board (#400).
3. Connect the test power leads to "AC In" on J1. Turn the On/Off Switch to ON. The Power Indicator Light should come on.

CAUTION

Do not exceed the "Max. On Time" given in Section 2 SPECIFICATIONS on page 3. Exceeding this time could burn out the coil.

4. Manually turn the Drive Motor Output Shaft. If the shaft turns then the Brake Coil and Control Circuit is operating properly.

If it is not able to be turned, then the Brake Coil or Circuit Board is not functioning properly. (See Section 6 Trouble Shooting.)

CAUTION

Physical damage or mal-function in the motor or brake stack can also prohibit shaft rotation.

Section 6 TROUBLESHOOTING

6-1 TROUBLESHOOTING CHART

PROBLEM	POSSIBLE CAUSE	REMEDY
1. Brake fails to engage properly.	Electrical control circuit. Faulty <i>Magna Shear</i> circuit board. Worn friction surfaces.	Check control circuit. Replace circuit board. Check disc stack for wear and replace if necessary.
2. Brake fails to release properly.	Electrical control circuit. Faulty <i>Magna Shear</i> circuit board. Faulty coil. Low voltage at coil.	Check control circuit. Replace circuit board. Replace coil. Check wire size and voltage.
3. Brake torque too high.	Excessive spring force. Low oil level.	Contact Force Control. Check oil level and add oil.
4. Brake torque too low	Inadequate spring force.	Contact Force Control.
5. Noise and vibration	Motor mounted on poor foundation.	Improve installation. Tighten mounting bolts
6. Drive overheats (200° F max.)	Brake fails to engage or disengage properly. Improper oil level.	See #1 and #2 above. Check oil level. Add/Drain as req'd.
7. Oil leakage.	Bad oil seal Gaskets. Poor ventilation.	Disassemble and replace. Tighten all external screws. Remove breather and clean.
8. Brake does not repeat.	Electrical control circuit. Faulty <i>Magna Shear</i> circuit board. * Oil temperature change. Machine resistance changed.	Check control circuit. Replace circuit board. Check temperature. Lubricate bearings.

* For installations requiring precise starting and stopping, operating temperatures are important. Operating temperatures between 115° F and 165° F are recommended.

6-2 TROUBLESHOOTING COILS

(CIRCUIT BOARD WITH EXTERNAL HEAT SINK)

A. Coil Resistance Test

Remove the cover from the Junction Box (#405) and disconnect the (2) Coil Leads from both terminals on the Terminal Strip J1 located on the Circuit Board (#400).

Hook-Up a Meg-Ohmmeter to both coil leads as shown in *Figure 6.1*. Set the Meg-Ohmmeter to "Ohm" range and test Resistance at 500 VDC.

The Resistance should read as follows:

MSB3-Coil Resistance.....95 Ohms ± 10%

MSB4-Coil Resistance.....95 Ohms ± 10%

MSB6-Coil Resistance.....23 Ohms ± 10%

MSB8-Coil Resistance.....53 Ohms ± 10%

A reading outside of this range would indicate that the Coil is bad and needs to be replaced. See **Section 7 for Coil Replacement**.

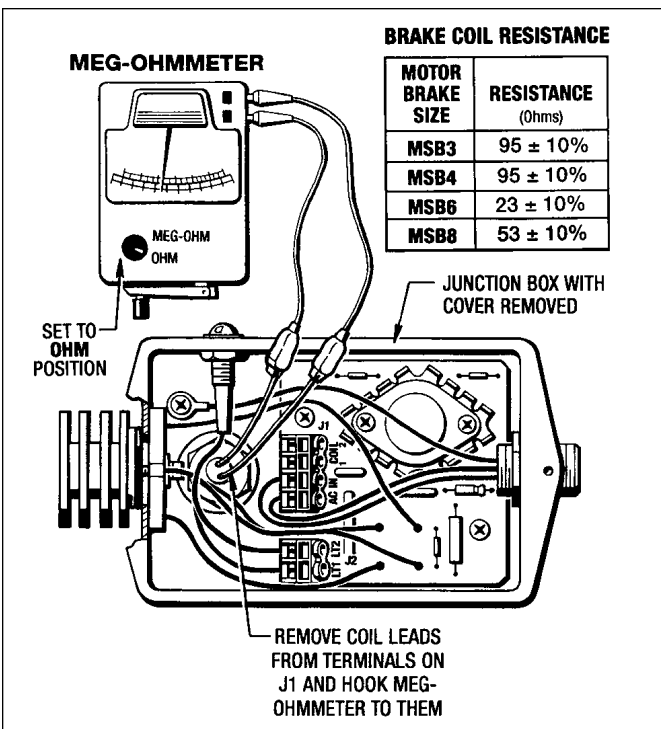


Figure 6.1 - Coil Resistance Testing

NOTE:

A Hi-Pot Tester can be used for this test but do not exceed 1250 VDC.

B. Coil Current Leakage Test

Remove the cover from the Junction Box (#405) and disconnect the (2) Coil Leads from both terminals on the Terminal Strip J1 located on the Circuit Board (#400).

Connect (1) alligator clip to both Coil Leads and the other one to Chassis Ground Screw (#426). (See *Figure 6.2*)

A reading of **10 Meg-Ohms or greater** indicates that the Coil is fine and does not need to be replaced. Anything much less would indicate that there is a short to ground and the Coil would need to be replaced. See **Section 7 for Coil Replacement**.

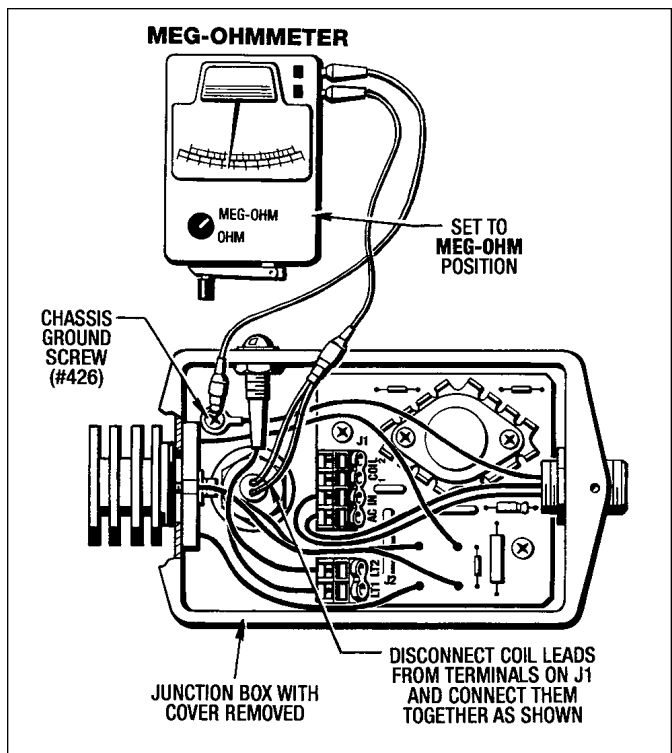


Figure 6.2 - Coil Current Leakage Testing

NOTE:

A Hi-Pot Tester can be used for this test but do not exceed 1250 VDC.

(PULSE WIDTH MODULATION CIRCUIT BOARD)

A. Coil Resistance Test

Remove the cover from the Junction Box (#405) and disconnect the (2) Coil Leads from both terminals on the Terminal Strip J1 located on the Circuit Board (#400).

Hook-Up a Meg-Ohmmeter to both coil leads as shown in Figure 6.3. Set the Meg-Ohmmeter to "Ohm" range and test Resistance at 500 VDC.

The Resistance should read as follows:

MSB3-Coil Resistance.....47 Ohms ± 10%

MSB4-Coil Resistance.....47 Ohms ± 10%

MSB6-Coil Resistance.....23 Ohms ± 10%

MSB8-Coil Resistance.....21.5 Ohms ± 10%

A reading outside of this range would indicate that the Coil is bad and needs to be replaced. See Section 7 for Coil Replacement.

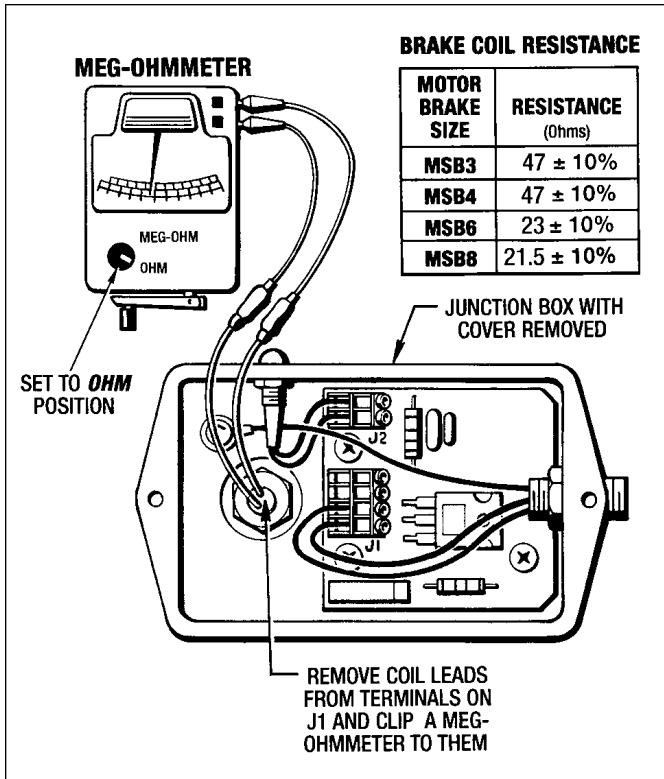


Figure 6.3 - Coil Resistance Testing

NOTE:

A Hi-Pot Tester can be used for this test but do not exceed 1250 VDC.

B. Coil Current Leakage Test

Remove the cover from the Junction Box (#405) and disconnect the (2) Coil Leads from both terminals on the Terminal Strip J1 located on the Circuit Board (#400).

Connect (1) alligator clip to both Coil Leads and the other one to Chassis Ground Screw (#426). (See Figure 6.4)

A reading of **10 Meg-Ohms or greater** indicates that the Coil is fine and does not need to be replaced. Anything much less would indicate that there is a short to ground and the Coil would need to be replaced. See Section 7 for Coil Replacement.

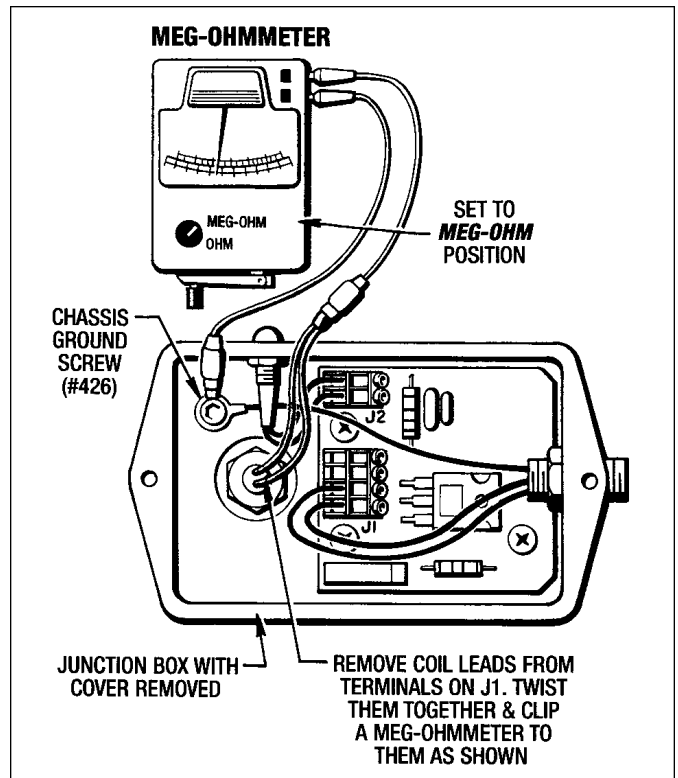


Figure 6.4 - Coil Current Leakage Testing

NOTE:

A Hi-Pot Tester can be used for this test but do not exceed 1250 VDC.

Section 7

REPAIR and REPLACEMENT

WARNING
SHUT-OFF AND LOCK-OUT ALL ELECTRICAL POWER BEFORE ATTEMPTING TO MAKE ANY REPAIRS TO THE BRAKE UNIT.

7-1 GENERAL INFORMATION

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

An overhead crane and soft sling is recommended to be used to remove any heavy parts.

7-2 CLEANING AND INSPECTION

Clean metal parts in a suitable solvent and dry with low pressure compressed air. After cleaning inspect parts for cracks, distortion, scoring, nicks, burrs or any other damage that would affect the operation of the brake.

Pay particular attention to the Wear Sleeve (#32) on the Hub (#2) and the Oil Seal (#31) located in the C-Face Adapter (#7). Check for nicks, scratches or any damage that would cause leakage.

7-3 REPAIR OR REPLACEMENT

A fine stone or crocus cloth may be used to remove minor surface defects from parts if the operation or seal-

ing action of the part is not affected. The use of coarser abrasives or other machining methods should not be attempted and damaged parts should be replaced.

Replacement is recommended for the following parts when needed:

1. Replace all Gaskets, O-Rings, Oil Seals and Wear Sleeves removed at disassembly.
2. Replace Brake Stack as a complete Assembly.
3. The Circuit Board (#400) and Holding Coil (#284) are also common replacement parts.

7-4 MEASURING STACK HEIGHT

The Stack Height must be measured to determine whether or not the Brake Stack needs to be replaced. If it measures under the Minimum Worn Stack Height then the Brake Stack needs to be replaced. (See Figure 7.1) Section 8 shows exploded view drawings for each size of *MagnaShear Motor Brake*. Refer to these illustrations for all disassembly and reassembly procedures.

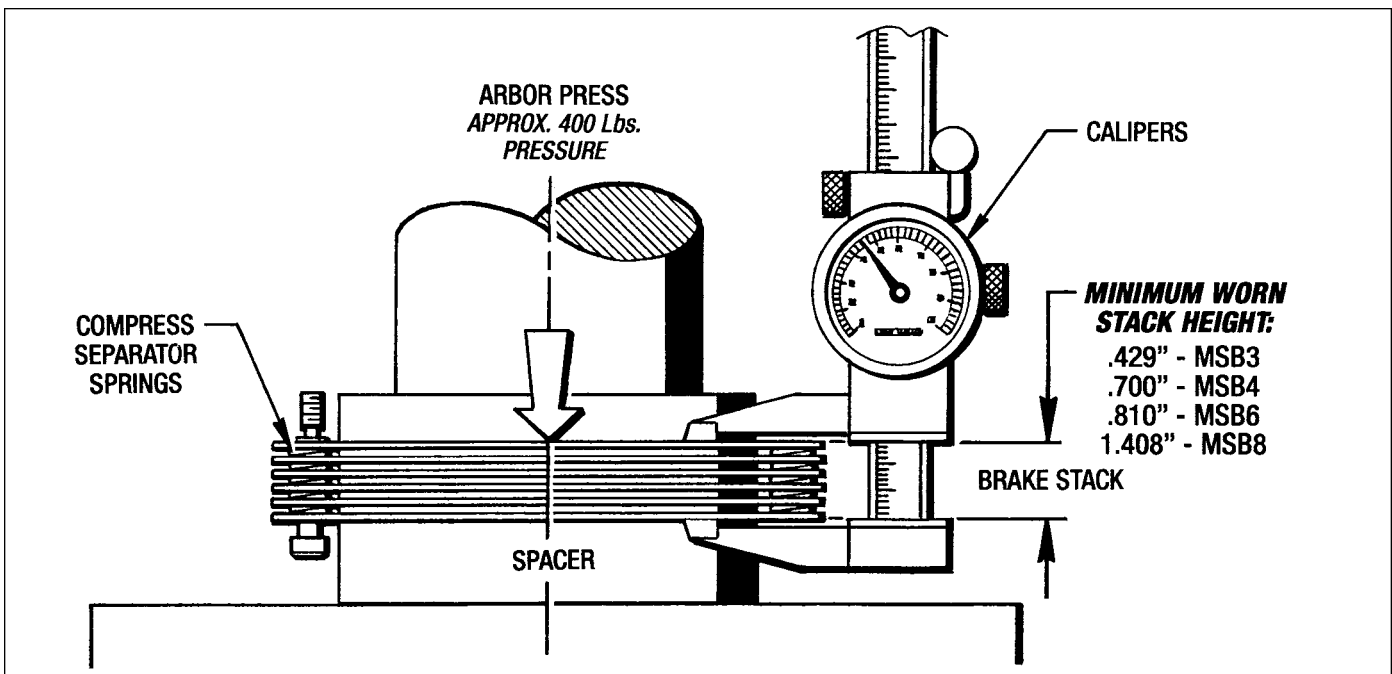


Figure 7.1 - Measuring Stack Height

Figure 8.1 - MSB3 and MSB4 Motor Brakes

Figure 8.2 - MSB6 Motor Brake

Figure 8.3 - MSB8 Motor Brake

Figure 8.4 - Conduit Box and Circuit Board

Figure 8.5 - Vertical Installation

7-5 REPLACING BRAKE STACK

1. First drain all the oil from the unit into a suitable container. **See Section 4 LUBRICATION** for location of drain plugs. Save or discard as condition warrants.
2. Also disconnect the 5-Pin Brad Harrison Cable from the Conduit Box (#405).
3. Remove the Screws (#72) and Lockwashers (#127) from the End Housing (#9). *There are (4) Screws and Lockwashers on the MSB3 and MSB4 Brakes. The MSB6 and MSB8 Brakes has (8) Screws and Lockwashers.*
4. Take the End Housing (#9) and Gasket (#121) or (#122) off. *The Gasket is (#121) for MSB3 and MSB4. For MSB6 and MSB8 the number is (#122).* Discard the Gasket.
5. The Brake Stack (#41) can now be removed by unscrewing the (4) shoulder bolts that attaches the drive plates to Housing (#8). Pull the Stack off the

Hub (#2) spline and the (4) Pins (#176). (See Figure 7.2)

6. Place the Brake Stack (#41) in an arbor press and measure the Stack Height to determine whether or not the Brake Stack (#41) needs replaced. (**See Section 7-4 and Figure 7.1**)
7. If the Brake Stack needs replaced then install a new stack onto the Hub (#2) and the (4) Pins (#176). Push it on as far as it will go and tighten the (4) shoulder bolts in the stack

NOTE: Make sure the teeth in the friction discs are aligned with each other so the Brake Stack (#41) will slide on to the Hub (#2) spline.

8. If the Brake Stack is the only part that needs replaced then reassemble the End Housing Assembly back over the Brake Stack with a new Gasket (#121) or (#122). **Do not use any gasket sealant on this gasket.**

Tighten Screws (#72) to the following Torque:

MSB3 and MSB4 - 14 Ft. Lbs.

MSB6 and MSB8 - 25 Ft. Lbs.

9. Replace drain plugs and refill with fresh oil as specified in **Section 4 LUBRICATION**.

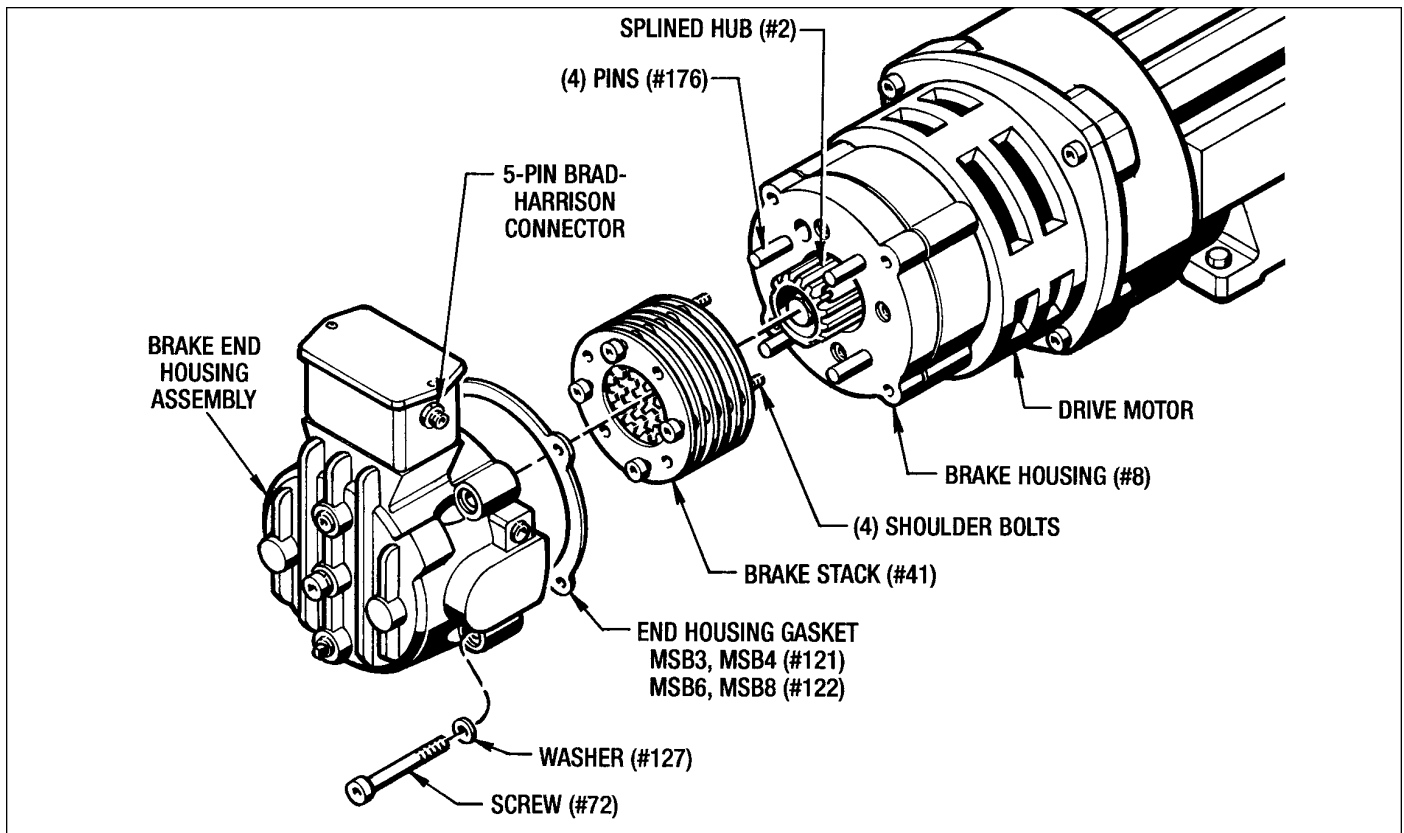


Figure 7.2 - Replacing the Brake Stack

7-6 REPLACING CIRCUIT BOARD (#400)

A. Circuit Board With External Heat Sink

(See Figure 7.3)

1. Take the cover off the Conduit Box (#405).
2. Disconnect all the wires from the (2) Terminal Strips J1 and J2 on the Circuit Board (#400).
3. Remove the Screw (#427), Lockwasher (#433) and Flat Washer (#434) which holds the Bridge Rectifier and External Heat Sink (#420) to the Conduit Box (#405). Remove the External Heat Sink (#420) and O-Ring (#437) and store for reassembly.
4. Remove the (3) Screws (#428) and (3) Nylon Washers (#431).
5. Take the old Circuit Board (#400) off and replace it with a new one.
6. Re-attach with (3) Screws (#428) and (3) Nylon Washers (#431). Re-connect the wires to J1 and J2 Terminal Strips.
7. Place the O-Ring (#437) back on the External Heat Sink (#420) and re-attach it with the Bridge Rectifier back onto the Conduit Box (#405) with Screw (#427), Lockwasher (#433) and Flat Washer (#434). Replace conduit box cover.

3. Remove the (3) Screws (#428) and (3) Nylon Washers (#431).
4. Take the old Circuit Board (#400) off and replace it with a new one.
5. Reattach the Circuit Board (#400) with the (3) Screws (#428) and (3) Nylon Washers (#431).
6. Reconnect the wires to J1 and J2 Terminal Strips.
7. Replace the cover on the Conduit Box (#405).

7-7 REPLACING HOLDING COIL (#284)

First drain all the oil from the unit into a suitable container. See Section 4 LUBRICATION for location of drain plugs. Save or discard oil as condition warrants.

A. Disassembly

1. Disconnect the 5-Pin Brad Harrison Cable from the Conduit Box (#405).
2. Remove the Screws (#72) and Lockwashers (#127) from the End Housing (#9). There are (4) Screws and Lockwashers on the MSB3 and MSB4 Brakes. The MSB6 and MSB8 Brakes has (8) Screws and Lockwashers.
3. Take the End Housing (#9) and Gasket (#121) or (#122) off. The Gasket is (#121) for MSB3 and MSB4. For MSB6 and MSB8 the number is (#122). Discard the Gasket.

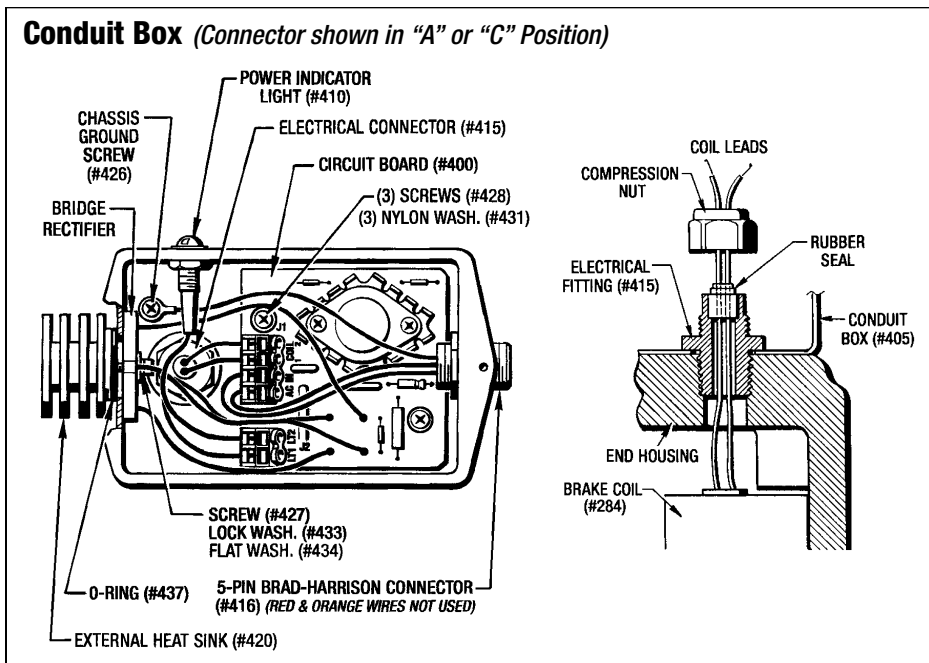


Figure 7.3 - Conduit Box with Cover Removed

B. Pulse Width Modulation Circuit Board

(See Figure 7.4)

1. Take the cover off the Conduit Box (#405).
2. Disconnect all the wires from the (2) Terminal Strips J1 and J2 on the Circuit Board (#400).

4. Take the cover off of the Conduit Box (#405) and dis-connect the coil leads from J1 terminal strip located on the Circuit Board (#400). Also remove the compression nut from the Electrical Fitting (#415) and pry the rubber seal out of the fitting and off of the coil leads. (See Figure 7.3)
5. Turn the End Housing (#9) over with the Armature Plate (#56) and Armature Ring (#58) in an Up position.

5. Turn the End Housing (#9) over with the Armature Plate (#56) and Armature Ring (#58) in an Up position.

6. This step only applies to units with Manual Release. Loosen the (2) Set Screws (#303) and pull both Manual Release Mechanisms out of the end housing. Check and replace O-Rings (#318) and (#319) if necessary.

7. Loosen and remove the Shoulder Bolts (#114) or (#138) that holds the Armature Plate (#56) in place. Lift the Armature Plate (#56) and Armature Ring (#38) out of the end housing.

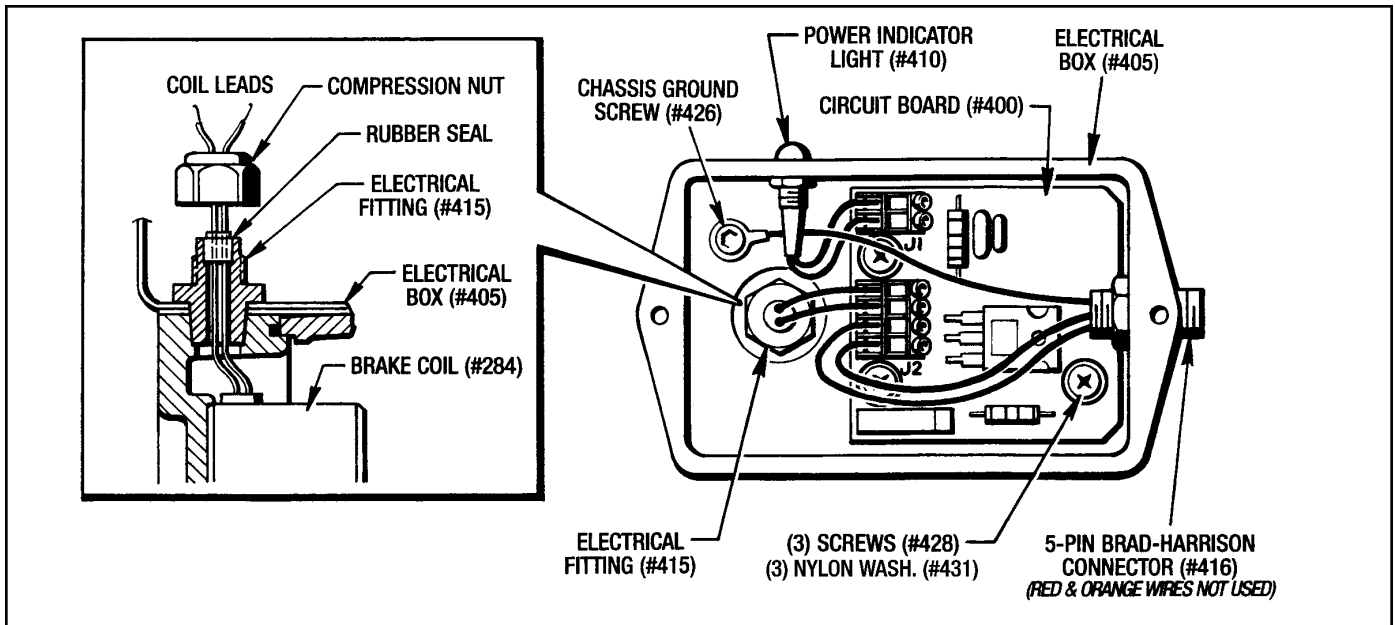


Figure 7.4 - Conduit Box with Cover Removed (Pulse Width Modulation Circuit Board)

CAUTION:

This Armature Plate (#56) is under spring pressure so loosen the (4) Shoulder Bolts evenly and very carefully to release the spring pressure and to avoid physical injury.

- Note the quantity and position of Springs (#36). Make a sketch of their location to help you at reassembly.

(MSB3 and MSB4)

- Remove Screw (#153) and Lockwasher (#275). Lift the Holding Coil (#284) out of the end housing.
Remove and discard O-Ring (#103).

(MSB6)

- Remove Screw (#153) and Lockwasher (#128). Lift the Holding Coil (#284) out of the end housing.
Remove and discard O-Ring (#130).

(MSB8)

- Remove (4) Screws (#153) and (4) Dyna-Seal Washers (#130). Lift the Holding Coil (#284) out of the end housing.
Discard the (4) Dyna-Seal Washers (#130).

B. Reassembly

(MSB3 and MSB4)

- Lubricate a new O-Ring (#103) with vaseline and install it into the End Housing (#9) counterbore.
- Place a new Holding Coil (#284) into the End Housing (#9), pushing the coil leads up through the

Electrical Fitting (#415). Make sure the Anti-Rotational Pin (#178) fits into the hole in the back face of the Coil.

- Attach the Coil (#284) with (1) Lockwasher (#275) and (1) Screw (#153). **Torque to 60 Ft. Lbs.**
- Set the End Housing (#9) so the Coil (#284) is facing upright. According to the sketch made at disassembly place the correct number of Springs (#36) into the End Housing.
- Set the Armature Plate (#56) and Armature Ring (#58) in position on the springs. (See Figure 7.5). Insert the (2) Shoulder Bolts (#114) and tighten down evenly to compress the Springs (#36).

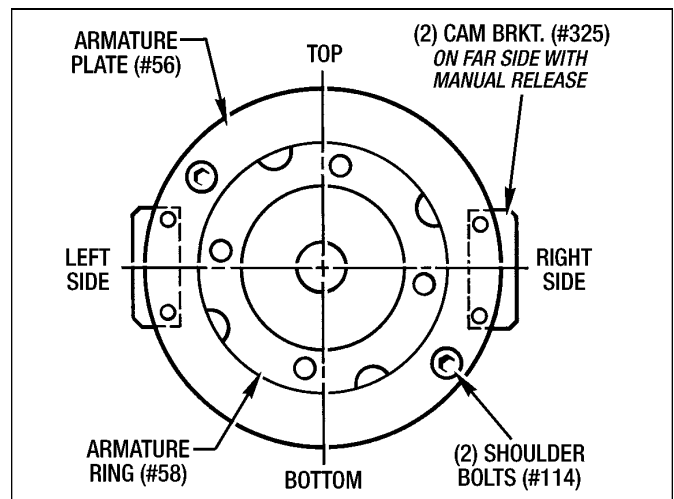


Figure 7.5 - Armature Plate Position - MSB3 and MSB4

- If your brake has Manual Release, insert the Bushing and Eccentric Pin Assembly into each side of the end housing. Tighten both Set Screws (#303).

(MSB6)

1. Lubricate a new O-Ring (#130) with vaseline and install it into the End Housing (#9) counterbore.
2. Place a new Holding Coil (#284) into the End Housing (#9), pushing the coil leads up through the Electrical Fitting (#415). Make sure the Anti-Rotational Pin (#178) fits into the hole in the back face of the Coil.
3. Attach the Coil (#284) with (1) Lockwasher (#128) and (1) Screw (#153). **Torque to 120 Ft. Lbs.**
4. Set the End Housing (#9) so the Coil (#284) is facing upright. According to the sketch made at disassembly place the correct number of Springs (#36) into the End Housing.
5. Set the Armature Plate (#56) and Armature Ring (#58) in position on the springs. Insert the (4) Shoulder Bolts (#138) and tighten down evenly to compress the Springs (#36).
6. If your brake has Manual Release, insert the Bushing and Eccentric Pin Assembly into each side of the end housing. Tighten both Set Screws (#303).

(MSB8)

1. Place a new Holding Coil (#284) into the End Housing (#9), pushing the coil leads up through the Electrical Fitting (#415).
2. Assemble (4) Dyna-Seal Washers (#130) and (4) Screws (#153). Apply Blue Loctite to the threads.
3. Attach the Coil (#284) with (4) Dyna-Seal Washers (#130) and (4) Screws (#153). **Torque to 120 Ft. Lbs.**

CAUTION - Do not over tighten these screws. The Dyna-Seal Washers (#130) could be damaged.

4. Set the End Housing (#9) so the Coil (#284) is facing upright. According to the sketch made at disassembly place the correct number of Springs (#36) into the End Housing.
5. Set the Armature Plate (#56) and Armature Ring (#58) in position on the springs. Insert the (4) Shoulder Bolts (#138) and tighten down evenly to compress the Springs (#36).
6. If your brake has Manual Release, insert the Bushing and Eccentric Pin Assembly into each side of the end housing. Tighten both Set Screws (#303).

(All Sizes)

7. Place the rubber seal on the coil leads and pull the wires through, taking up all the slack in the wires. Seat the rubber seal into the threaded part of the Electrical Fitting (#415). Tighten down the compression nut. (See Figure 7.3 or 7.4)

8. Attach the coil leads to Terminal Strip J1 on the Circuit Board (#400) and replace the Conduit Box cover. (See Figure 7.3 or 7.4).

(MSB3 and MSB4)

9. Position a new Gasket (#121) on Housing (#8) mounting face. **Do not use any gasket sealant on this gasket.**
10. Attach the End Housing Assembly with (4) Screws (#72) and (4) Lockwashers (#127). **Torque to 14 Ft. Lbs.**
11. Replace Drain Plug (#61) in bottom of End Housing (#9). Remove Air Breather (#45) and Reducer Bushing (#76) from C-Face Adapter (#7) and fill with fresh oil to center of Sight Gauge (#46). Replace Reducer Bushing and Air Breather. **See Section 4 - LUBRICATION.**

(MSB6 and MSB8)

9. Position a new Gasket (#122) on Housing (#8) mounting face. **Do not use any gasket sealant on this gasket.**
10. Attach the End Housing Assembly with (8) Screws (#72) and (8) Lockwashers (#127). **Torque to 25 Ft. Lbs.**
11. Replace Drain Plug (#64) in bottom of End Housing (#9). Remove the Pipe Plug (#62) from the Elbow (#61) and fill with fresh oil to center of Sight Gauge (#46). Replace the Pipe Plug (#62). **See Section 4 - LUBRICATION.**

7-8 REPLACING WEAR SLEEVE (#32)

Using the same procedure as described in **Section 7-5 - Replacing Brake Stack** remove the End Housing Assembly and the Brake Stack. (**Steps 1 thru Step 5**).

(MSB3 and MSB4)

If the Housing (#8) and Gasket (#122) is still in place remove them from the C-Face Adapter (#7). Discard the Gasket (#122).

(All Sizes)

1. Insert a large screw driver into the Hub (#2) pump opening to keep the Hub from turning. With a socket wrench remove the Hex Hd. Screw (#94) and the Copper Washer (#81) from the Hub (#2). Discard the Copper Washer (#81).
3/8" Socket for MSB3
1/2" Socket for MSB4 and MSB6
5/8" Socket for MSB8
2. Screw a Hex Hd. Bolt into the Hub (#2) until it contacts the Collet (#110). Holding the Hub (#2) with the screw driver continue turning the bolt until the Hub is forced off the Collet. (See Figure 7.6)

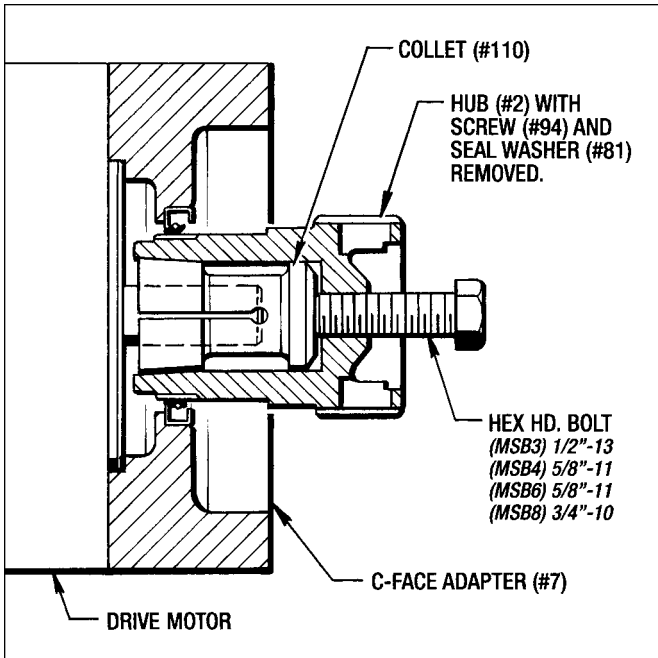


Figure 7.6 - Removing Hub (#2) and Collet (#110)

A. Removing Wear Sleeve (#32)

1. With a chisel the same width as the Wear Sleeve (#32) make about 5 or 6 notches as shown in Figure 7.7. The Wear Sleeve (#32) can now be removed by hand from the Hub (#2).

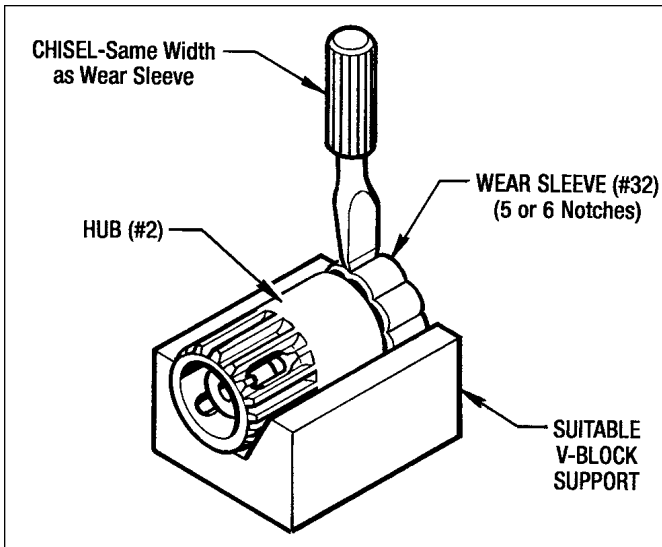


Figure 7.7 - Removing Wear Sleeve (#32)

B. Installing Wear Sleeve (#32)

(MSB3 and MSB4)

For the MSB3 and MSB4 Brakes a special Assembly Tool must be used. Machining dimensions are given in Figure 7.8 if you prefer to make your own.. They can also be ordered from Force Control with the following part numbers:

Part Number 601-06-012 for MSB3

Part Number 601-09-001 for MSB4

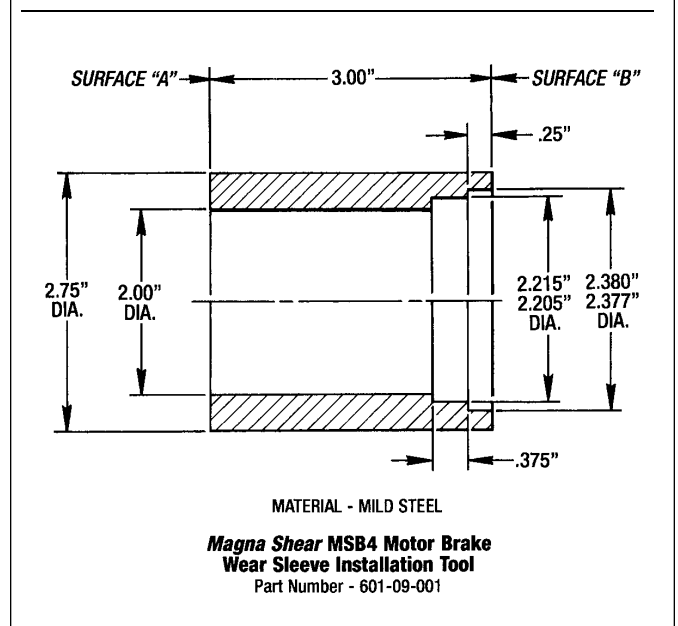
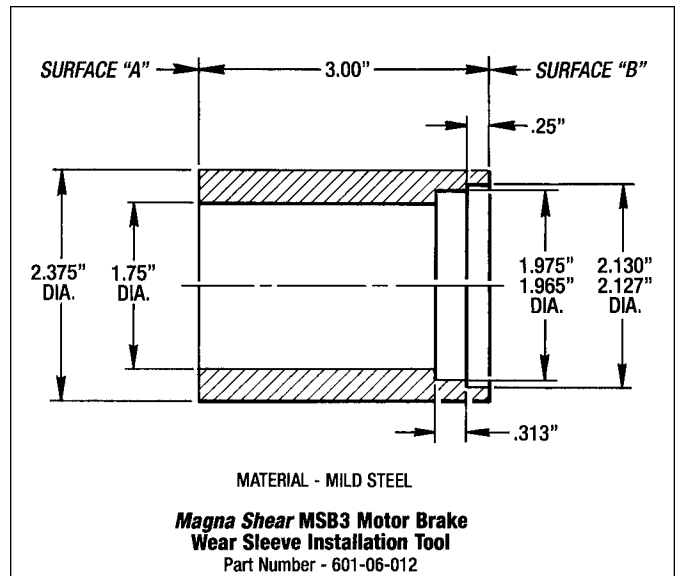


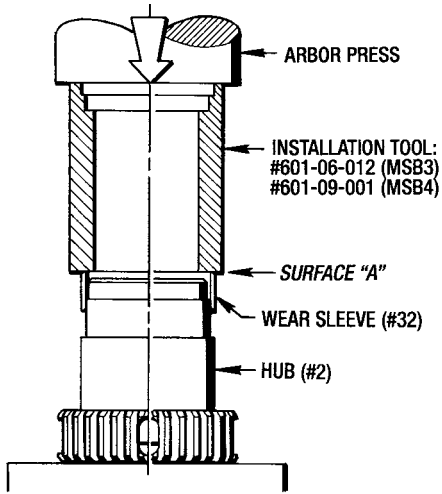
Figure 7.8 - Wear Sleeve Installation Tool

1. Place the Hub (#2) into an Arbor Press and with **Surface "A"** of the Installation Tool press the Wear Sleeve (#32) on as far as it will go. Turn the Installation Tool over and with **Surface "B"** continue pressing the Wear Sleeve until it bottoms out on the hub shoulder. (See Figure 7.9 on next page.)

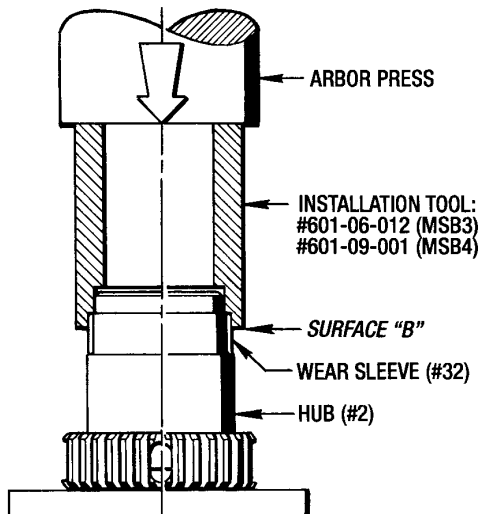
(MSB6 and MSB8)

1. Place the Hub (#2) into an Arbor Press and with a flat plate press the Wear Sleeve (#32) on until it bottoms out on the hub shoulder. (See Figure 7.9 on next page.)

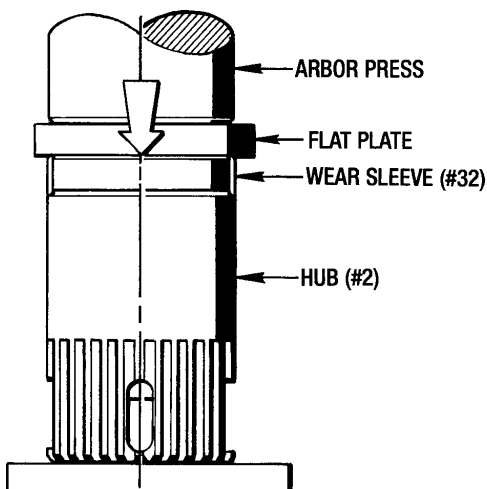
(MSB3 and MSB4) Step 1



(MSB3 and MSB4) Step 2



(MSB6 and MSB8)



7-9 REPLACING OIL SEAL (#31)

(MSB3 and MSB4)

1. Remove (4) Screws (#149) and (4) Lockwashers (#128). Pull the C-Face Adapter (#7) off of the motor face.
2. Press the Oil Seal (#31) out of the Adapter (#7).
3. Clean out the oil seal bore in the Adapter (#7) and lightly coat the bore with Permatex #30 Sealant. Press the new Oil Seal (#31) into the bore with an arbor press.

(MSB6)

1. Remove (4) Screws (#149) and (4) Lockwashers (#274). Pull the Housing (#8) off of the C-Face Adapter (#7)
2. Remove Gasket (#121) and discard.
3. Remove (4) Screws (#150) and (4) Lockwashers (#126). Pull the C-Face Adapter (#7) away from the motor face.
4. Press the Oil Seal (#31) out of the Adapter (#7).
5. Clean out the oil seal bore in the Adapter (#7) and lightly coat the bore with Permatex #30 Sealant. Press the new Oil Seal (#31) into the bore with an arbor press.

(MSB8)

1. Remove (4) Screws (#150) and (4) Lockwashers (#128). Pull the C-Face Adapter (#7) off of the motor face.
2. Remove (4) Screws (#149) and (4) Lockwashers (#274). Pull the Housing (#8) off of the C-Face Adapter (#7)
3. Remove Gasket (#121) and discard.
4. Press the Oil Seal (#31) out of the Adapter (#7).
5. Clean out the oil seal bore in the Adapter (#7) and lightly coat the bore with Permatex #30 Sealant. Press the new Oil Seal (#31) into the bore with an arbor press.

7-10 BRAKE REASSEMBLY PROCEDURE

(MSB3 and MSB4)

1. Re-attach the C-Face Adapter (#7) to the motor face with (4) Screws (#149) and (4) Lockwashers (#128).
2. Assemble, install and align the Hub (#2) and Collet (#110) on the motor shaft according to the procedure given in **Section 3 - INSTALLATION**.
3. Place a new Gasket (122) and Housing (#8) onto the C-Face Adapter (#7). **Do not use any gasket sealant on this gasket.**

Figure 7.9 - Installing Wear Sleeve (#32)

-
-
4. Place the Brake Stack (#41) onto the Hub (#2) and Pins (#176). Make sure the teeth in the friction discs are aligned with each other so they will slide onto the hub spline.

Attach the Brake Stack with the (4) Shoulder Bolts in the drive plates.

5. Place a new Gasket (#121) on Housing (#8). **Do not use any gasket sealant on this gasket.**
6. Attach the End Housing (#9) with (4) Screws (#72) and (4) Lockwashers (#127). **Torque to 14 Ft. Lbs.**

(MSB6)

1. Re-attach the C-Face Adapter (#7) to the motor face with (4) Screws (#150) and (4) Lockwashers (#126).
2. Place a new Gasket (121) and Housing (#8) onto the C-Face Adapter (#7). **Do not use any gasket sealant on this gasket.** Attach with (4) Screws (#149) and (4) Lockwashers (#274). **Torque to 25 Ft. Lbs.**
3. Assemble, install and align the Hub (#2) and Collet (#110) on the motor shaft according to the procedure given in **Section 3 - INSTALLATION.**
4. Place the Brake Stack (#41) onto the Hub (#2) and Pins (#176). Make sure the teeth in the friction discs are aligned with each other so they will slide onto the hub spline.

Attach the Brake Stack with the (4) Shoulder Bolts in the drive plates.

5. Place a new Gasket (#122) on Housing (#8). **Do not use any gasket sealant on this gasket.**

6. Attach the End Housing (#9) with (8) Screws (#72) and (8) Lockwashers (#127). **Torque to 25 Ft. Lbs.**

(MSB8)

1. Assemble the C-Face Adapter (#7) and Housing (#8) with a Gasket (#121) in between. Use (8) Screws (#149) and (8) Lockwashers (#274). **Do not use any gasket sealant on this gasket.**
2. Attach the C-Face Adapter (#7) to the motor face with (4) Screws (#150) and (4) Lockwashers (#128).
3. Assemble, install and align the Hub (#2) and Collet (#110) on the motor shaft according to the procedure given in **Section 3 - INSTALLATION.**
4. Place the Brake Stack (#41) onto the Hub (#2) and Pins (#176). Make sure the teeth in the friction discs are aligned with each other so they will slide onto the hub spline.

Attach the Brake Stack with the (4) Shoulder Bolts in the drive plates.

5. Place a new Gasket (#122) on Housing (#8). **Do not use any gasket sealant on this gasket.**
6. Attach the End Housing (#9) with (8) Screws (#72) and (8) Lockwashers (#127). **Torque to 25 Ft. Lbs.**

(All Sizes)

Make sure Air Breather, Sight Gauge and all pipe plugs are installed. Fill with fresh oil to level of the Sight Gauge. **See Section 4 - LUBRICATION.**

Section 8

ILLUSTRATED PARTS LIST

8-1 GENERAL INFORMATION

This section illustrates, lists and describes all parts for the **MagnaShear Motor Brakes**. 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.

8-2 DRIVE MOTORS

The Drive Motors used with these **MagnaShear Motor Brakes** are standard motors and may be repaired or replaced by any qualified Motor Re-build Facility or Supplier.

8-3 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 drives. Always protect mounting feet by attaching to a skid. Shipment-damaged drives 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

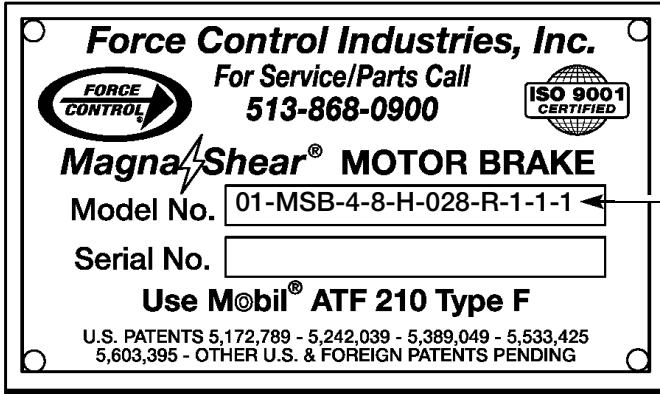
Phone: (513) 868-0900
Fax: (513) 868-2105
E-Mail: info@forcecontrol.com
Web: www.forcecontrol.com

8-4 ORDERING REPLACEMENT PARTS

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

1. Brake Model Number (On the Name Plate.)
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.

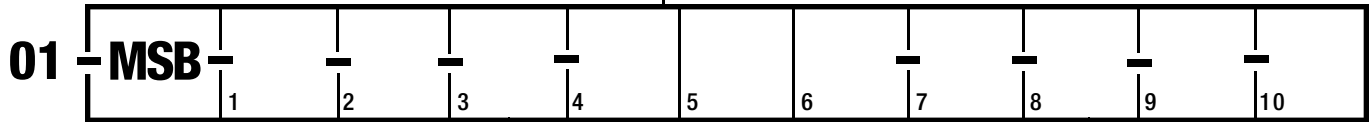
Failure to include information for items 1 through 6 will only delay your parts order. Unless another method is specified for item 6, parts weighing less than 150 Lbs. will be shipped United Parcel Service. Parts weighing more than 150 Lbs. will be shipped Motor Freight. Air freight and other transportation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



8-5 NAME PLATE AND MODEL NUMBER

The Name Plate shown is located on the Brake End Housing.

The Example shown is a size MSB4, 8-1/2" Pilot Dia., Horizontal Mounting, 28 Ft. Lbs. Torque, with Manual Release, 1-1/8" Collet Bore Dia., 115 VAC and Engineering Revision 1.



Size (1)

- 3** = MSB3
- 4** = MSB4
- 6** = MSB6
- 8** = MSB8

Pilot Diameter (FAK) (2)

NEMA	SEW IEC
4 = 4.500"	A = 71/80
8 = 8.500"	B = 90/100
0 = 10.500"	C = 112M/132S
2 = 12.500"	D = 132M/160M
	E = 160L/225

Mounting Position (3)

- H** = Horizontal
- U** = Brake Up
- D** = Brake Down

Manual Release (7)

- S** = Standard, None
- R** = With Manual Release

Collet Bore (Motor Shaft) Dia. (8)

- A** = .625"
- 0** = .875"
- 1** = 1.125"
- 2** = 1.250"
- 3** = 1.375"
- 5** = 1.625"
- 7** = 1.875"
- M** = Eurodrive Motors
- S** = Special

Revision (10) (By Force Control)

Voltage (9)

- 1** = 115 VAC
- 2** = 230 VAC

Torque (4, 5, 6)

- 0 0 3** = 3 Ft. Lbs.
- 0 0 8** = 8 Ft. Lbs.
- 0 0 9** = 9 Ft. Lbs.
- 0 1 4** = 14 Ft. Lbs.
- 0 2 1** = 21 Ft. Lbs.
- 0 3 3** = 33 Ft. Lbs.
- 0 4 2** = 42 Ft. Lbs.
- 0 6 3** = 63 Ft. Lbs.
- 0 8 4** = 84 Ft. Lbs.
- 1 0 0** = 100 Ft. Lbs.
- 1 5 0** = 150 Ft. Lbs.
- 2 0 0** = 200 Ft. Lbs.

REPAIR PARTS LIST
MSB3 and MSB4 *MagnaShear* MOTOR BRAKE
(Figure 8.1)

Ref. No.	Part Name	Qty.	Ref. No.	Part Name	Qty.
2	Hub	1	116	Guide Bushing	2
7	Housing, Motor Adapter	1	**121	Gasket	1
8	Housing, Thrust Face	1	*122	Gasket	1
9	End Housing	1	127	Lockwasher, 5/16"	4
*31	Oil Seal	1	128	Lockwasher, 3/8"	4
*32	Wear Sleeve	1	129	Lockwasher, 1/4"	4
*36	Spring		149	Soc. Hd. Cap Screw, 3/8"-16 x 2-1/4"	4
	MSB3; 4 Ft. Lbs. Torque	2	152	Soc. Hd. Cap Screw, 1/4"-20 x 5/8"	4
	MSB3; 9 Ft. Lbs. Torque	4	153	Low. Hd. Cap Screw, 1/2"-13 x 1-3/4"	1
	MSB3; 13 Ft. Lbs. Torque	6	176	Dowel Pin 1/2" x 1'	4
	MSB4; 9 Ft. Lbs. Torque	2	177	Roll Pin, 1/4" x 1"	4
	MSB4; 19 Ft. Lbs. Torque	4	178	Roll Pin, 3/16" x 5/16"	4
	MSB4; 28 Ft. Lbs. Torque	6	179	Roll Pin, 5/16" x 3/4"	4
**41	Stack Assembly	1	183	Spacer Tubing	4
*45	Air Breather	1	192	But. Hd. Screw, #10-24 x 1/4"	2
*46	Sight Gauge	1	272	Soc. Hd. Cap Screw, #10-24 x 1-1/2"	4
53	Threaded Insert	4	274	Lockwasher, #10	4
55	Brass Shim	1	275	Lockwasher, 1/2"	1
56	Armature Plate	1	284	Holding Coil	1
58	Armature Ring	1	301	Eccentric Pin	2
61	Pipe Plug, Mag. Sq. Hd., 1/4" NPT	1	303	Set Screw	2
64	Pipe Plug, 3/8" NPT	2	306	Release Arm	2
66	Street Elbow, 3/8" NPT	1	310	Roll Pin, 1/8" x 1/2"	4
72	Soc. Hd. Cap Screw, 5/16" x 3" Lg.	4	*318	O-Ring	2
76	Reducer Bushing, 3/8 x 1/4	1	*319	O-Ring	2
81	Copper Washer Gasket	1	320	Spring, Torsional	2
94	Hex Hd. Screw	1	322	Roller	2
*103	O-Ring	1	324	Sleeve	2
110	Collet	1	325	Bracket, Cam	2
114	Shoulder Bolt	2	326	Shoulder Bolt	2

NOTES:

- * - Indicates parts in Overhaul Kit.
- ** - Indicates parts in Stack Replacement Kit.

MSB3 and MSB4 MagnaShear MOTOR BRAKE

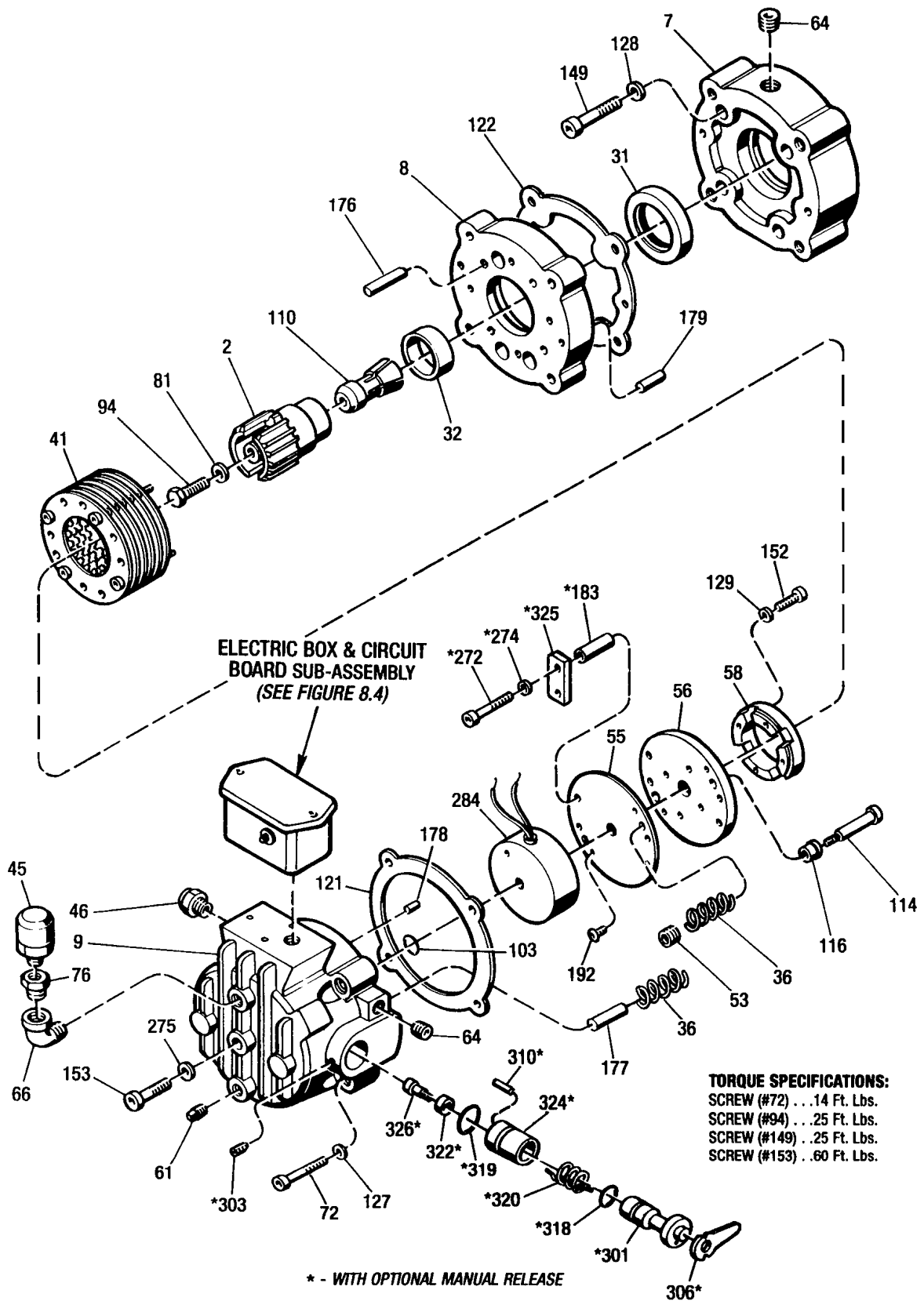


Figure 8.1 - Repair Parts - MSB3 and MSB4 MagnaShear Motor Brake

REPAIR PARTS LIST
MSB6 MagnaShear MOTOR BRAKE
(Figure 8.2)

Ref. No.	Part Name	Qty.	Ref. No.	Part Name	Qty.
2	Hub	1	**122	Gasket	1
7	Housing, Motor Adapter	1	126	Lockwasher, 1/2"	4
8	Housing, Thrust Face	1	127	Lockwasher, 3/8"	8
9	End Housing	1	128	Lockwasher, 5/8"	1
*31	Oil Seal	1	129	Lockwasher, 1/4"	4
*32	Wear Sleeve	1	*130	O-Ring	1
*36	Spring		138	Shoulder Bolt	4
	21 Ft. Lbs. Torque	2	149	Soc. Hd. Cap Screw, 3/8"-16 x 2-3/4"	4
	42 Ft. Lbs. Torque	4	150	Hex Hd. Cap Screw	4
	63 Ft. Lbs. Torque	6	152	Soc. Hd. Cap Screw, 1/4"-20 x 3/4"	4
	84 Ft. Lbs. Torque	8	153	Soc. Hd. Cap Screw, 5/8" -18 x 1-3/4"	1
**41	Stack Assembly	1	176	Dowel Pin 3/8" x 1-3/4'	4
*45	Air Breather	1	177	Roll Pin, 1/4" x 1-1/4"	4
*46	Sight Gauge	1	178	Roll Pin, 1/4" x 3/4"	4
49	Pipe Plug, 1/8"	1	192	But. Hd. Screw, #10-24 x 1/4"	2
52	Threaded Insert	4	274	Lockwasher, 3/8"	4
55	Brass Shim	1	284	Holding Coil	1
56	Armature Plate	1	301	Eccentric Pin	2
58	Armature Ring	1	303	Set Screw	2
61	90° Street Elbow, 3/8" NPT	1	306	Release Arm	2
62	Pipe Plug, 3/8" NPT	1	308	Roll Pin, 5/16" x 3/4"	2
64	Pipe Plug, 1/4" NPT	2	310	Roll Pin, 1/8" x 1/2"	4
72	Soc. Hd. Cap Screw, 3/8"-16 x 1-1/4" Lg.	8	*318	O-Ring	2
76	Reducer Bushing, 3/8 x 1/4	1	*319	O-Ring	2
81	Copper Washer Gasket	1	320	Spring, Torsional	2
94	Hex Hd. Screw, 1/2"-13 x 1-1/4"	1	322	Roller	2
110	Collet	1	324	Sleeve	2
116	Guide Bushing	4	326	Shoulder Bolt	2
*121	Gasket	1			

NOTES:

* - Indicates parts in Overhaul Kit.

** - Indicates parts in Stack Replacement Kit.

MSB6 MagnaShear MOTOR BRAKE

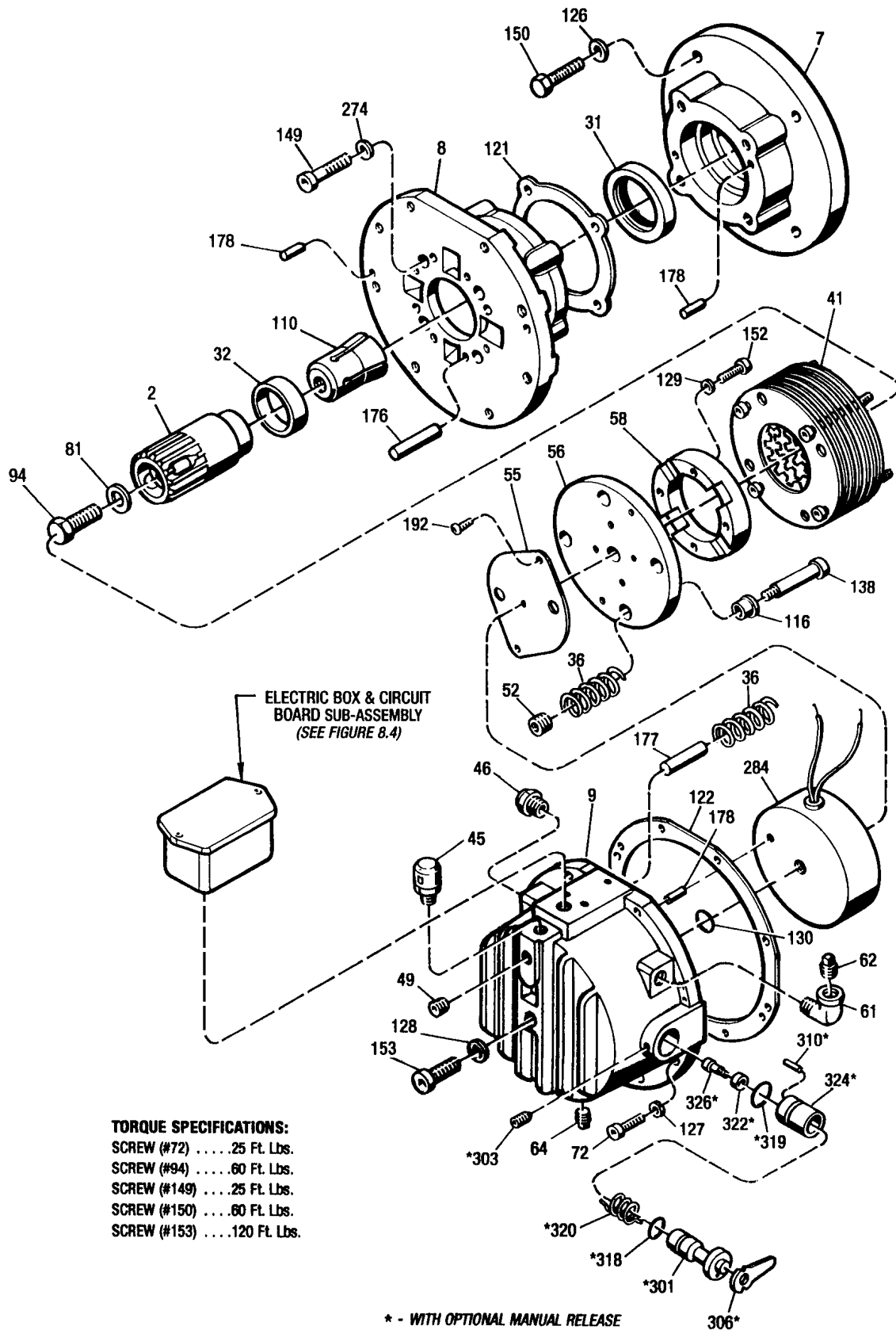


Figure 8.2 Repair Parts - MSB6 MagnaShear Motor Brake

REPAIR PARTS LIST
MSB8 MagnaShear MOTOR BRAKE
(Figure 8.3)

Ref. No.	Part Name	Qty.	Ref. No.	Part Name	Qty.
2	Hub	1	116	Guide Bushing	4
7	Housing, Motor Adapter	1	*121	Gasket	1
8	Housing, Thrust Face	1	**122	Gasket	1
9	End Housing	1	127	Lockwasher, 3/8"	8
*31	Oil Seal	1	128	Lockwasher, 5/8"	4
*32	Wear Sleeve	1	129	Lockwasher, 1/4"	4
*36	Spring		*130	Dyna-Seal	4
	50 Ft. Lbs. Torque	2	138	Shoulder Bolt	4
	100 Ft. Lbs. Torque	4	149	Soc. Hd. Cap Screw, 3/8"-16 x 1-3/4"	8
	150 Ft. Lbs. Torque	6	150	Hex Hd. Cap Screw, 5/8"-11 x 1-1/2"	4
	200 Ft. Lbs. Torque	8	152	Soc. Hd. Cap Screw, 1/4"-20 x 3/4"	4
**41	Stack Assembly	1	153	Soc. Hd. Cap Screw, 1/2"-20 x 2"	4
*45	Air Breather	1	176	Dowel Pin 1/2" x 3"	4
*46	Sight Gauge	1	177	Roll Pin, 3/8" x 2"	4
49	Pipe Plug, 3/8" NPT	1	178	Roll Pin, 5/16" x 3/4"	4
50	Pipe Plug, 1" NPT	1	192	But. Hd. Screw, #10-24 x 1/4"	2
52	Threaded Insert	4	274	Lockwasher, 3/8"	8
55	Brass Shim	1	284	Holding Coil	1
56	Armature Plate	1	301	Eccentric Pin	2
58	Armature Ring	1	303	Set Screw	2
61	90° Elbow, 3/4" NPT	1	306	Release Arm	2
62	Pipe Plug, 3/4" NPT	1	308	Roll Pin, 5/16" x 3/4"	2
64	Pipe Plug, 3/8" NPT	2	310	Roll Pin, 1/8" x 1/2"	4
69	Pipe Nipple, 3/4" NPT	1	*318	O-Ring	2
72	Soc. Hd. Cap Screw, 3/8"-16 x 1-1/4" Lg.	8	*319	O-Ring	2
73	Pipe Plug, 3/4" NPT	2	320	Spring, Torsional	2
76	Reducer Bushing, 3/8 x 1/4	1	322	Roller	2
81	Copper Washer Gasket	1	324	Sleeve	2
94	Hex Hd. Screw	1	326	Shoulder Bolt	2
110	Collet	1			

NOTES:

* - Indicates parts in Overhaul Kit.

** - Indicates parts in Stack Replacement Kit.

MSB8 MagnaShear MOTOR BRAKE

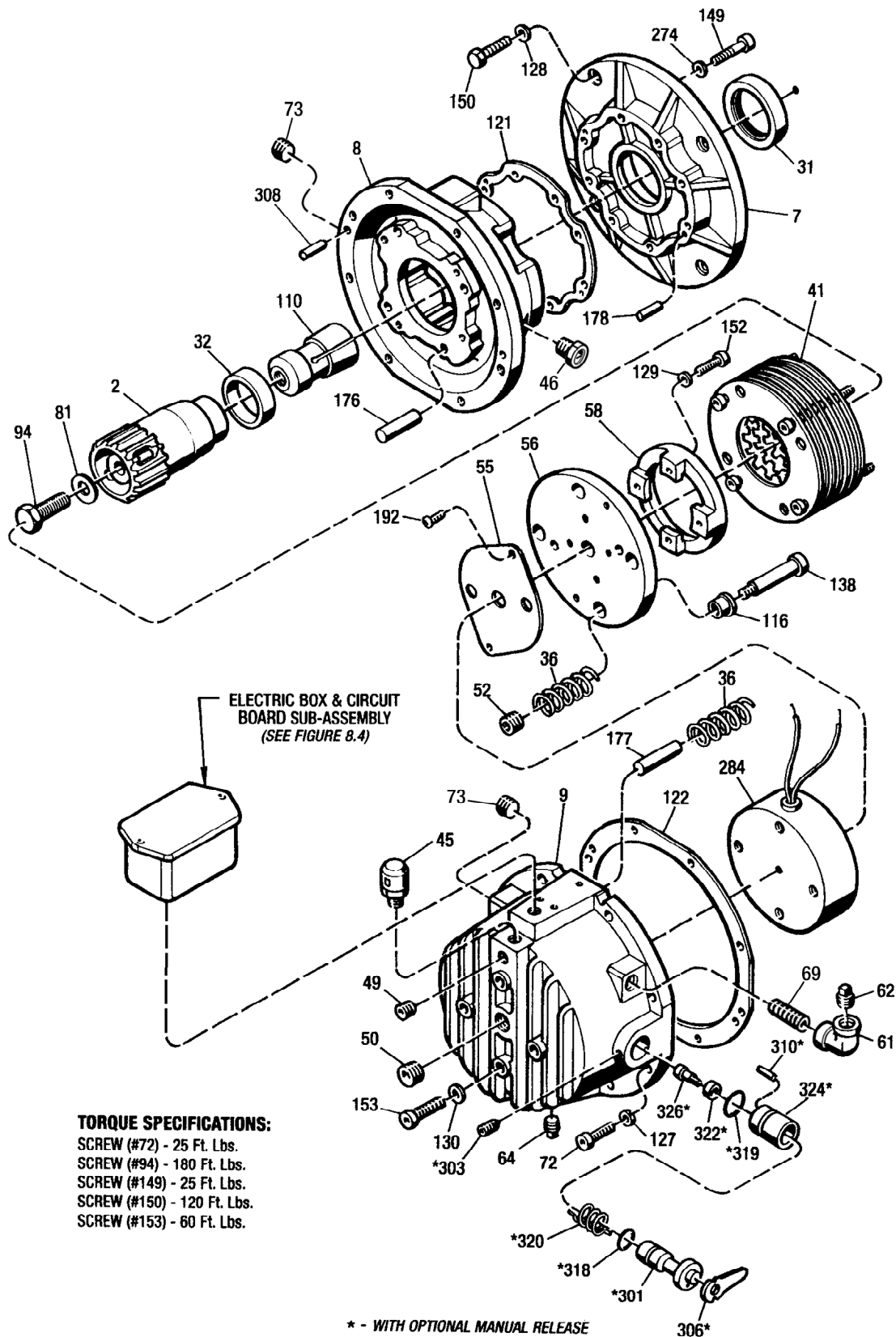


Figure 8.3 - Repair Parts - MSB8 MagnaShear Motor Brake

REPAIR PARTS LIST
ELECTRIC BOX & CIRCUIT BOARD
Circuit Board with External Heat Sink
(Figure 8.4)

Ref. No.	Part Name	Qty.	Ref. No.	Part Name	Qty.
400	Circuit Board	1	427	Soc. Hd. Screw, #10-24 x 3/4" Lg.	1
405	Electric Box	1	428	Pan Hd. Screw, #8-32 x 1/2" Lg.	3
410	Indicator Lamp	1	429	But. Hd. Screw, 1/4"-20 x 1/2" Lg.	3
415	Electrical Fitting	1	431	Nylon Washer	3
416	Receptical, 5-Pin	1	432	Lockwasher, 1/4"	3
417	Receptical Nut	1	433	Lockwasher, #10	1
418	Sealing Ring	1	434	Flat Washer, #10	1
420	External Heat Sink.....	1	435	Stand-off	3
*425	Gasket	1	*437	O-Ring	1
426	But. Hd. Screw, #10-24 x 1/4" Lg.	1			

NOTES:

* - Indicates parts in Overhaul Kit.

APPLIES TO *MagnaShear* BRAKES AS FOLLOWS:

MSB3 - With an Eng. Revision Number of 0 or 1.
MSB4 - With an Eng. Revision Number of 0, 1 or 2.
MSB6 - With an Eng. Revision Number of 0 or 1.
MSB8 - With an Eng. Revision Number of 0 or 1.

REPAIR PARTS LIST
ELECTRIC BOX & CIRCUIT BOARD
Pulse Width Modulation (PWM) Circuit Board
(Figure 8.4)

Ref. No.	Part Name	Qty.	Ref. No.	Part Name	Qty.
400	Circuit Board	1	*425	Gasket	1
405	Electric Box	1	426	But. Hd. Screw, #10-24 x 1/4" Lg.	1
410	Indicator Lamp	1	428	Pan Hd. Screw, #8-32 x 1/2" Lg.	3
415	Electrical Fitting	1	429	But. Hd. Screw, 1/4"-20 x 1/2" Lg.	2
416	Receptical, 5-Pin	1	431	Nylon Washer	3
417	Receptical Nut	1	432	Lockwasher, 1/4"	2
418	Sealing Ring	1	435	Stand-off	3

NOTES:

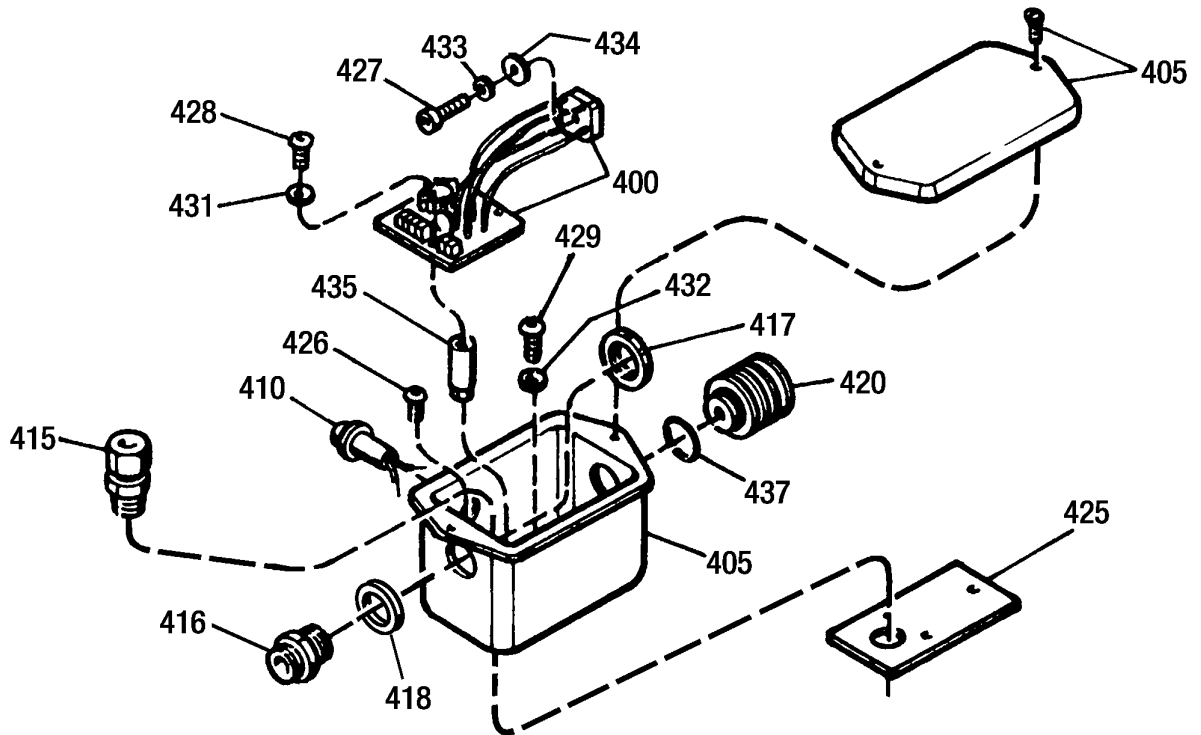
* - Indicates parts in Overhaul Kit.

APPLIES TO *MagnaShear* BRAKES AS FOLLOWS:

MSB3 - With an Eng. Revision Number of 2 or higher.
MSB4 - With an Eng. Revision Number of 3 or higher.
MSB6 - With an Eng. Revision Number of 2 or higher.
MSB8 - With an Eng. Revision Number of 2 or higher.

ELECTRIC BOX AND CIRCUIT BOARD

Circuit Board with External Heat Sink



Pulse Width Modulation (PWM) Circuit Board

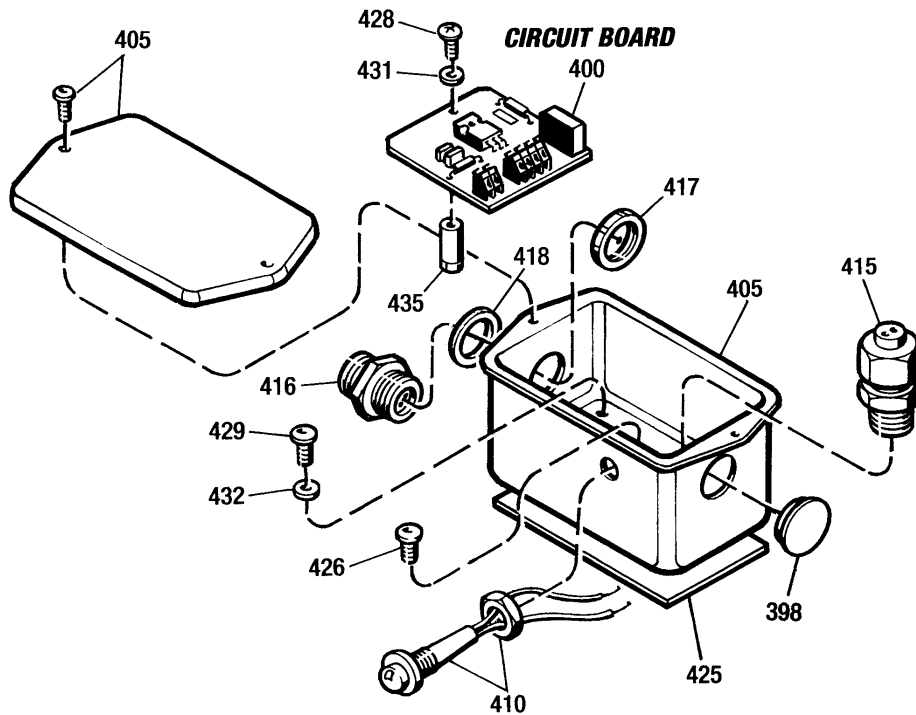


Figure 8.4 - Electric Box and Circuit Board

REPAIR PARTS LISTS *(Figure 8.5)*

MSB3 and MSB4 VERTICAL INSTALLATION

Brake UP

Ref. No.	Part Name	Qty.
*45	Air Breather	1
*46	Sight Gauge.....	1
62	Sq. Hd. Pipe Plug	1
64	Sq. Hd. Mag. Pipe Plug.....	1
218	Pipe Nipple	1
358	Female Elbow	1

Brake Down

Ref. No.	Part Name	Qty.
*45	Air Breather	1
49	Pipe Plug	1
64	Sq. Hd. Mag. Pipe Plug.....	1
66	90° Street Elbow	2
67	Pipe Cap	1
69	Pipe Nipple	1
76	Reducer Bushing.....	1

MSB6 VERTICAL INSTALLATION

Brake UP

Ref. No.	Part Name	Qty.
*45	Air Breather	1
*46	Sight Gauge.....	1
49	Pipe Plug	1
62	Sq. Hd. Pipe Plug	1
64	Sq. Hd. Mag. Pipe Plug.....	1
218	Pipe Nipple	1
358	Female Elbow	1

Brake Down

Ref. No.	Part Name	Qty.
*45	Air Breather	1
49	Pipe Plug	2
64	Sq. Hd. Mag. Pipe Plug.....	1
67	Pipe Cap	1
69	Pipe Nipple	1
218	Pipe Nipple	1
259	45° Street Elbow	1
268	Pipe Plug	1
358	90° Female Elbow	1

MSB8 VERTICAL INSTALLATION

Brake UP

Ref. No.	Part Name	Qty.
*45	Air Breather	1
*46	Sight Gauge.....	1
49	Pipe Plug	1
61	90° Female Elbow	1
62	Sq. Hd. Pipe Plug	1
64	Sq. Hd. Mag. Pipe Plug.....	1
69	Pipe Nipple	1

Brake Down

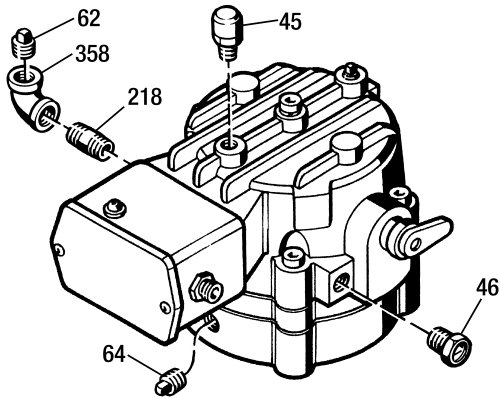
Ref. No.	Part Name	Qty.
*45	Air Breather	1
*46	Sight Gauge.....	1
49	Pipe Plug	2
61	90° Female Elbow	1
62	Sq. Hd. Pipe Plug	1
64	Sq. Hd. Mag. Pipe Plug.....	1
69	Pipe Nipple	1
268	Pipe Plug	2

NOTES:

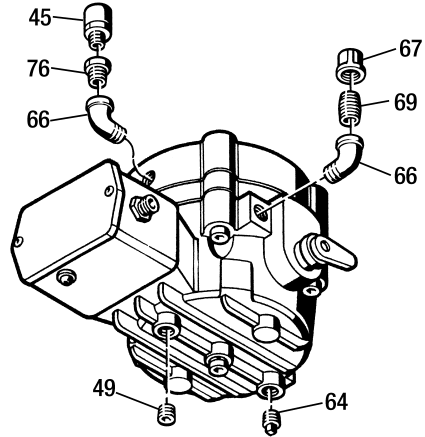
* - Indicates parts in Overhaul Kit.

VERTICAL INSTALLATION

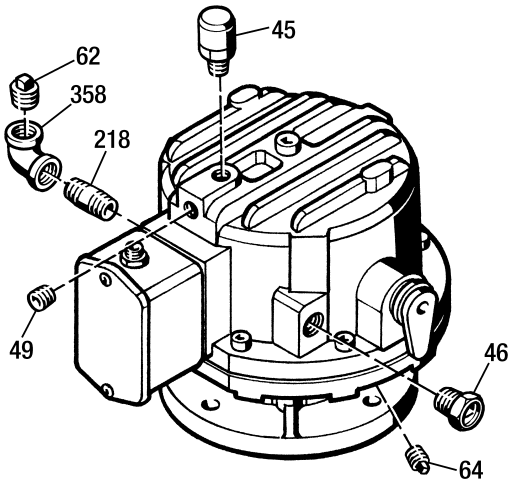
MSB3 & MSB4 - Brake Up



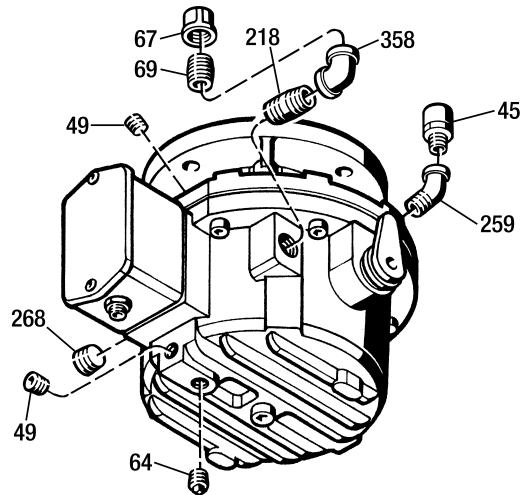
MSB3 & MSB4 - Brake Down



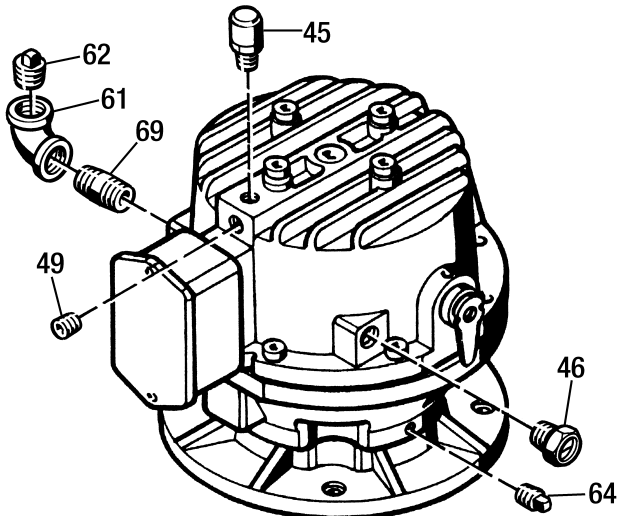
MSB6 - Brake Up



MSB6 - Brake Down



MSB8 - Brake Up



MSB8 - Brake Down

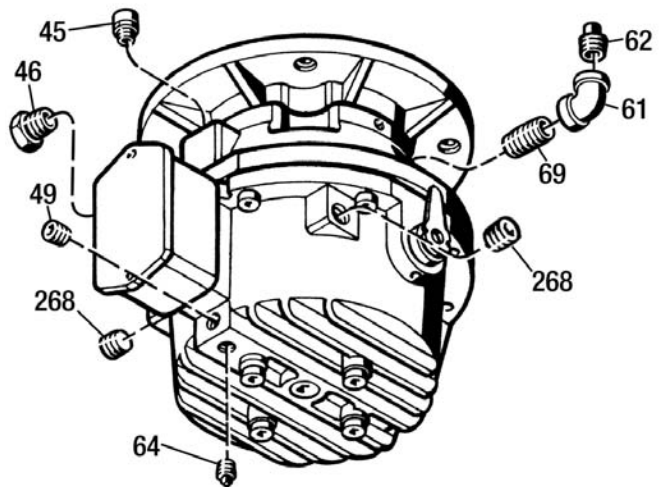


Figure 8.5 - Vertical Installation

Manual Revision History

MSB3, MSB4, MSB6 and MSB8 MagnaShear Motor Brake

REVISION NUMBER	REVISION DATE <i>(Month/Year)</i>	REVISION/ACTION DESCRIPTION	REVISION INITIATED BY: <i>(Name)</i>	REVISION MADE BY: <i>(Name)</i>
502-MSB-002-02	1/2004	Optimized digital size of document. Made new PDF document. Updated manual format. New cover and back. Added warranty information. Removed Detroit information. Added revision history.	Brooks	Brooks
502-MSB-002-03	5/2005	Changed location of MSB8 Sight Gauge.	Meinhardt	Brooks

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