DBB 8112

⚠ Warning

Forward this manual to the person responsible for Installation, Operation and Maintenance of the product described herein. Without access to this information, faulty Installation, Operation or Maintenance may result in personal injury or equipment damage.

Installation, Operation and, Maintenance of Airflex® DBBS Brake Assemblies with the Plate Style Disc Centering Option

(Horizontal Motor Shaft Mounting)

⚠ Caution:

Use Only Genuine Airflex® Replacement Parts

The Airflex Division of Eaton Corporation recommends the use of genuine Airflex replacement parts. The use of non-genuine Air-flex replacement parts could result in substandard product performance, and may void your Eaton warranty. For optimum performance, contact Airflex:

In the U.S.A. and Canada: (800) **233-5890**
Outside the U.S.A. and Canada: (216) 281-2211

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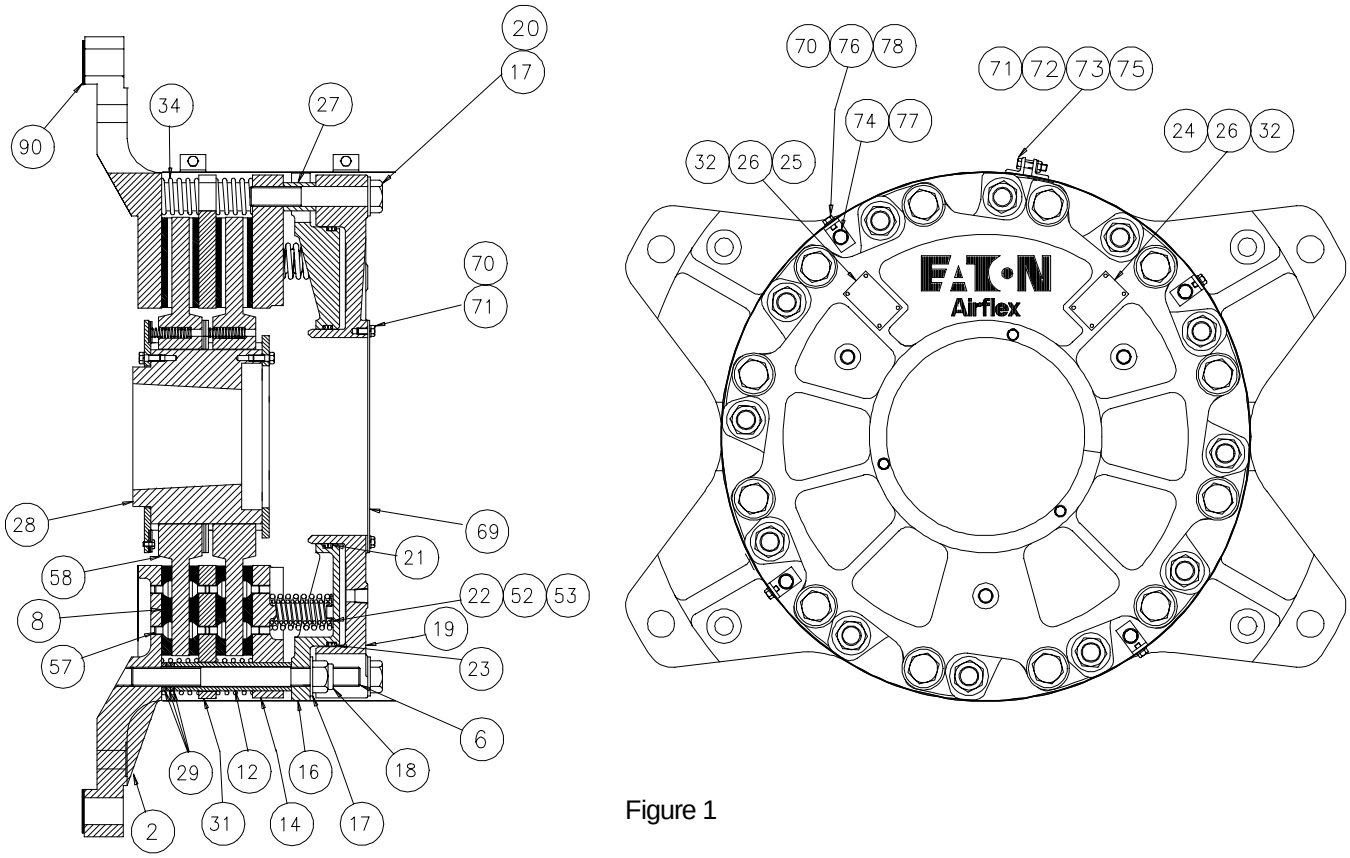
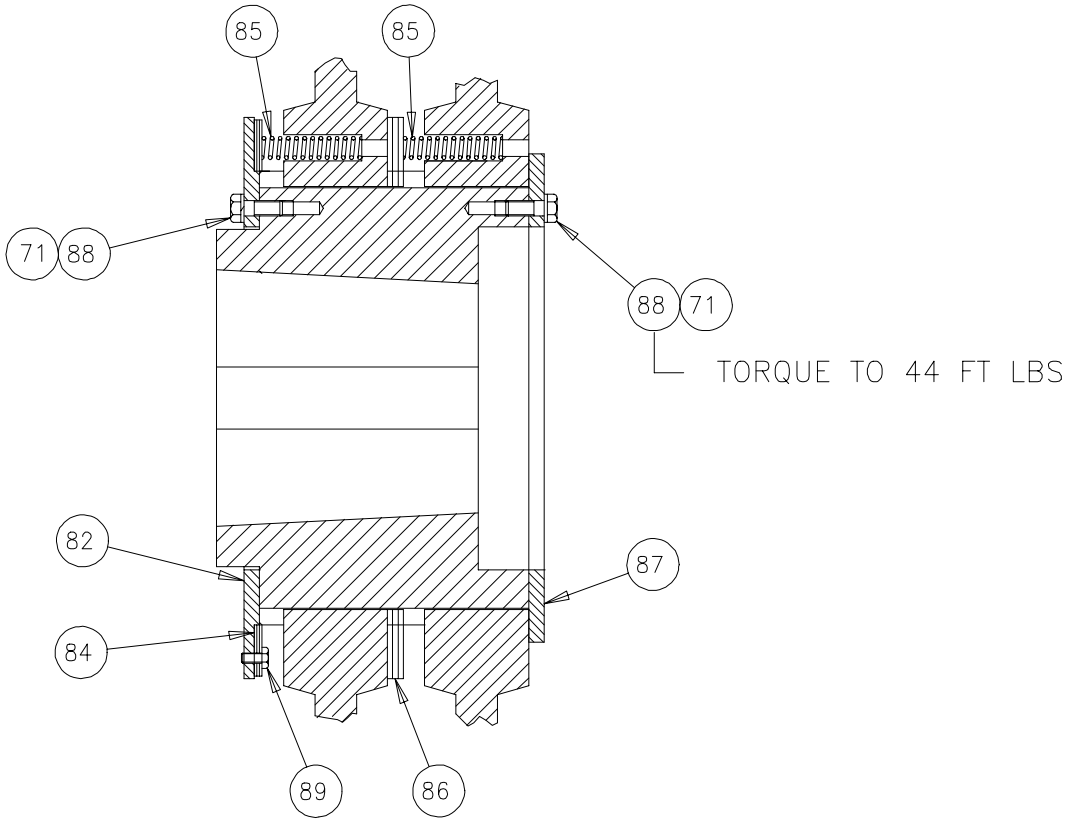


Figure 1

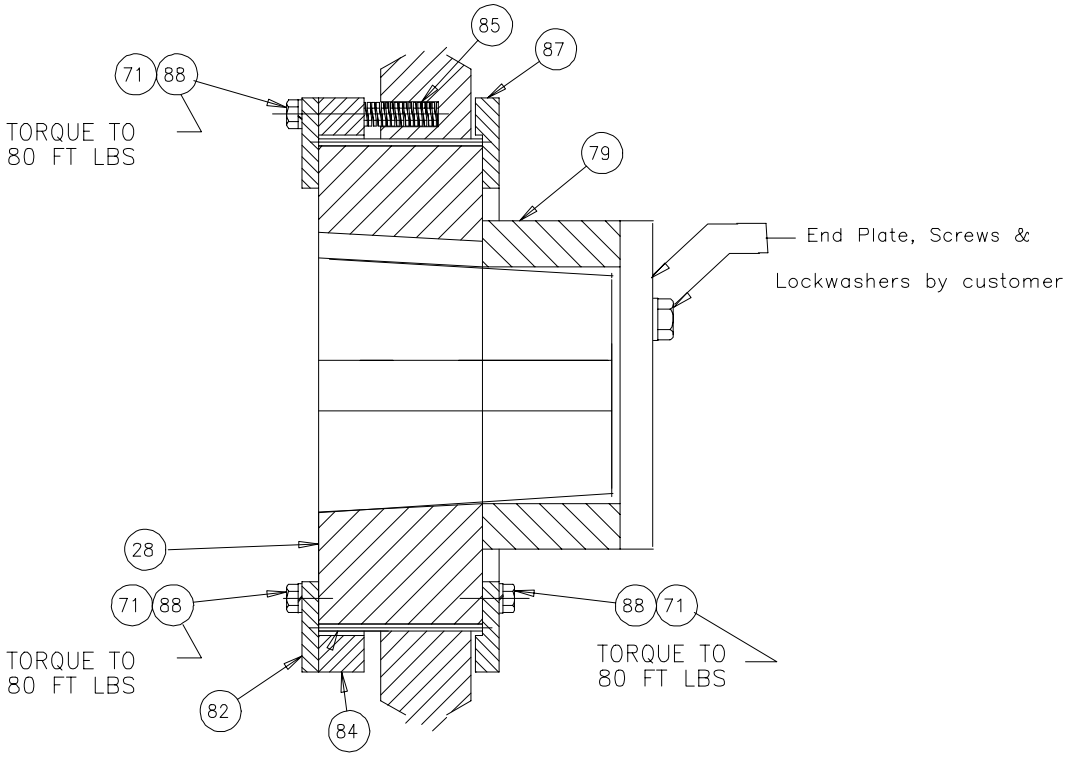
Table 1

Item	Description	Item	Description
2	Mounting Flange	53	Spring Retainer
6	Stud	57	Flat Head Screw
8	Friction Disc	58	Disc
12	Clamp Tube	69	Guard
14	Pressure Plate	70	Hex Head Screw
16	Spring Housing	71	Lockwasher
17	Flat Washer	72	Shield
18	Lock Nut	73	Hex Head Screw
19	Cylinder	74	Lockwasher
20	Hex Head Screw	75	Hex Nut
21	Polypak Seal	76	Bracket
22	Outer Spring	77	Hex Head Screw
23	Polypak Seal	78	Washer
24	Warning Decal	79	Gear Spacer
25	Name Plate	82	Front Plate
26	Drive Screw	84	Spacer
27	Spacer Tube	85	Spring
28	Gear [1]	86	Spacer
29	Wear Spacer	87	End Plate
31	Reaction Plate	88	Hex Head Screw
32	Decal Plate	89	Hex Head Screw
34	Release Spring	90	Shim
52	Inner Spring		

1 -Not included with brake assembly. Order separately.

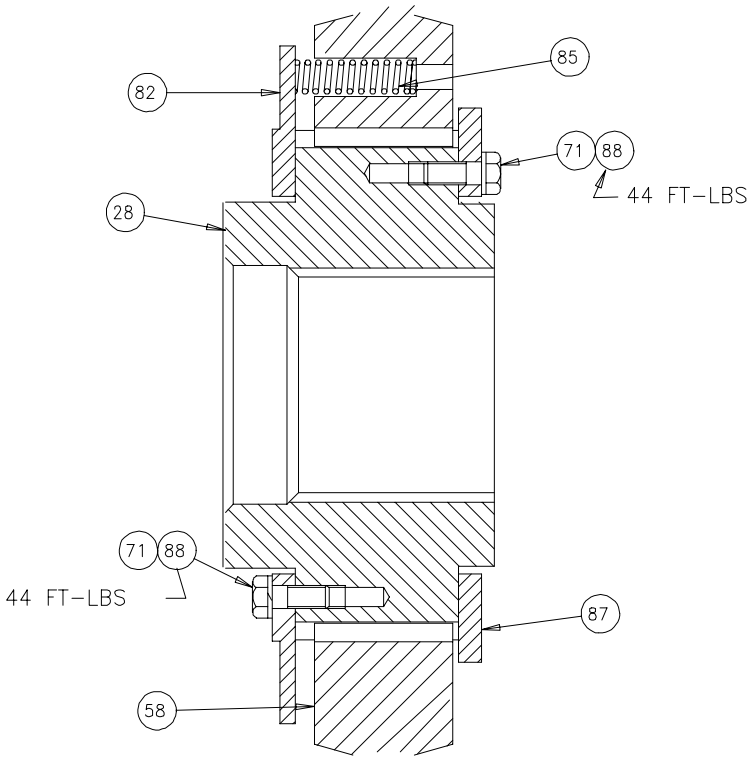


Dual Disc brake with taper bored gear.

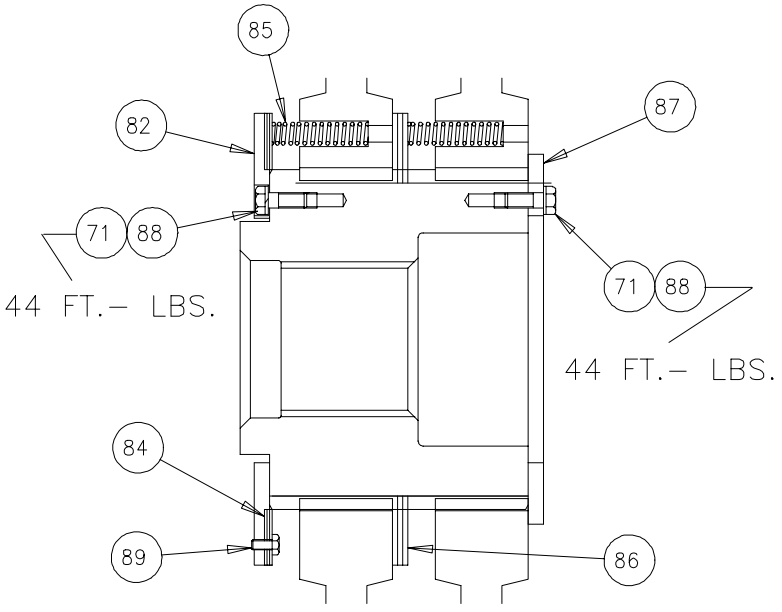


Taper bored gear for 138 DBBS

Figure 2



Single Disc brake with internal spline gear.



Dual Disc brake with internal spline gear

Figure 3

1.0 INTRODUCTION

Throughout this manual there are a number of **HAZARD WARNINGS** that must be read and adhered to in order to prevent possible personal injury and/or damage to the equipment. Three signal words "**DANGER**", "**WARNING**", and "**CAUTION**" are used to indicate the severity of the hazard, and are preceded by the safety alert symbol ⚠.

⚠ Danger:

Denotes the most serious injury hazard, and is used when serious injury or death WILL result from misuse or failure to follow specific instructions.

⚠ Warning:

Used when serious injury or death MAY result from misuse or failure to follow specific instructions.

⚠ Caution:

Used when injury or product/equipment damage may result from misuse or failure to follow specific instructions.

It is the responsibility and the duty of all personnel involved in the installation, operation and maintenance of the equipment on which this device is used to fully understand the ⚠ Danger: , ⚠ Warning: and ⚠ Caution: procedures by which hazards are to be avoided.

1.1 Description

1.1.1 The Airflex DBBS brake is designed to provide braking in heavy-duty industrial applications. The brake is spring applied and air released, thus, stopping the machinery if a loss of air supply occurs.

1.1.2 The brakes described in this manual have been modified specifically for use on shovel and dragline applications, for installation on horizontally mounted drives.

1.1.3 Included with these brakes is the Airflex® Disc Centering Device. The disc centering components have been designed specifically to work with Airflex DBBS brakes. Disc centering helps to minimize wear of the friction surfaces caused by the brake discs dragging against the friction material while the brake is in the fully released position. Although a certain amount of disc dragging is acceptable, high cable payout speeds can generate excessive heat at the disc surfaces and accelerate friction material wear.

1.1.4 The design of the Plate Style disc centering option allows for wear adjustment of the DBBS brake by simply rearranging spacer components.

1.1.5 Use of these procedures to initialy install DBBS brakes which are not in as-new condition (full friction disc (8) and disc (58) thickness) may result in improper assembly or setup.

⚠ Warning:

Improper installation procedures will result in inferior performance and possible brake failure.

1.2 How it Works

1.2.1 Referring to Figure 1, the gear (28) is mounted to the shaft which is to be stopped and the brake assembly is attached to the motor frame.

1.2.2 Air pressure is applied through the ports in the cylinder (19) into the cylinder cavity. As the air pressure increases, the cylinder and pressure plate (14), which are attached to each other with screws (20) and flat washers (17), move away from the mounting flange (2). The pressure plate compresses the springs (22)(52) against the stationary spring housing (16) and the clamp force is removed from the discs (58) which ride on the gear. The discs are then free to rotate. As the pressure plate continues to move away from the mounting flange, the reaction plate (31) and discs are relocated by means of spacers and springs.

1.2.3 As air pressure is exhausted from the brake, the springs (22)(52) force the pressure plate toward the mounting flange. The spring forces within the brake overcome the spring forces positioning the discs and reaction plate allowing the discs to slide axially towards the mounting flange and become clamped between the friction discs.

2.0 INSTALLATION

⚠ Danger:

Prior to installation of the DBBS Brake, make sure that the machinery will remain in a secured position. Failure to do so could result in serious personal injury or possibly death.

2.1 Gear Installation

2.1.1 Install the front plate (82) to the motor side of the gear with screws (88) and lockwashers (71) shown in Figure 2 and torque to the value in Table 2.

2.1.2 Taper bore Gear Installation

2.1.2.1 It may be desirable to verify armature endplay prior to installing the gear onto the motor shaft, in the event that repairs may be required. Refer to 2.3.1 and 2.3.2.

⚠ Warning:

Armature endplay in excess of manufacturer's maximum specification may result in premature wear or damage to the brake components.

2.1.2.2 Ensure that the motor shaft is clean and free of nicks or burrs and that the key fits properly in the shaft and gear. Tap the key into the shaft keyway and position the gear (28) on the shaft to check for binding of the key. Correct if necessary.

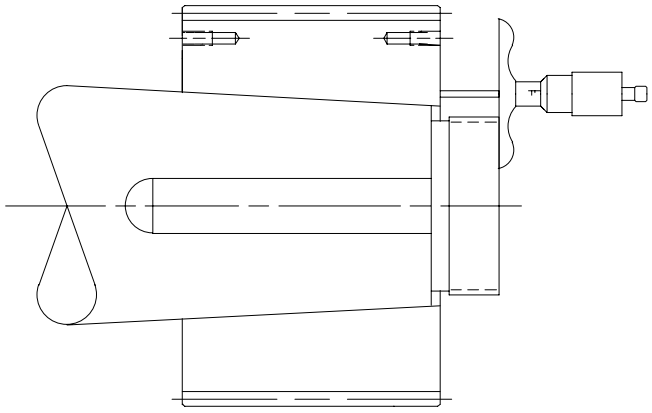


Figure 4

2.1.2.3 Mount the gear cold by placing it on the shaft and snapping it in position by hand. Measure the cold position of the gear, using a micrometer depth gauge, as on Figure 4. Mark the position of the depth gauge, so that measurements can be taken from the same position after the gear has been mounted.

2.1.2.4 Remove the gear from the shaft and heat it in an oven to a temperature approximately 110^{o}F above that of the temperature of the shaft. For example if the shaft temperature is 70^{o}F, heat the gear to a stable temperature of approximately 180^{o}F for mounting.

Note: This temperature difference is estimated only and can be adjusted to maintain the advance specified in the following procedures.

2.1.2.5 After making sure the bore is clean, mount the heated gear on the shaft. When the gear is nearly engaged with the taper fit, snap it forcibly in place with a quick push.

2.1.2.6 After allowing the gear to cool, check the position of the gear on the shaft with the micrometer depth gauge. Subtract the reading obtained in 2.1.2.3 from this dimension. The difference between the two readings should be .040" +/- .010". If the advance is not within .030" to .050", the gear should be pulled and remounted.

Table 2

Model	Item #	Size	Torque
20 &25 DBBS	88	3\8-16, Gr. 8	44 ft. lbs
38 DBBS	88	1\2-13, Gr. 8	80 ft. lbs.

2.1.2.7 **Dual disc brakes with tapered bore gear:**
Secure the gear to the shaft with the nut and lockwasher provided with the motor, tightening the nut firmly. Bend the lock-washer against one flat of the nut.

138 DBBS brakes:
Install the gear spacer (79) onto the shaft. Using a micrometer measure the distance from the face of the gear spacer to the shaft end. Shim the gap between the end plate and the shaft end to 0.000"/ -0.001". Install screws and lockwashers and torque to equipment manufacturers recommendations. See Figure 2.

Warning:

Failure to shim end plate may result in screw breakage.

Note: Allow gear to cool before installing brake.

2.1.3 Internal splined gear installation

2.1.3.1 Apply a light coat of Molub-Alloy® O. G. Heavy grease to the gearbox shaft spline prior to gear installation. Install gear onto shaft.

2.1.3.2 Measure the distance from the contact surface of the end plate to the end of the shaft. Shim this distance to 0.000"/-0.001" to prevent screw breakage.

2.1.3.3 Install end plate, screws and lockwashers and torque to equipment manufacturers specification.

Warning:

Failure to shim end plate may result in screw breakage.

Table 3

Model	Approximate Weight
120DBBS	450 lbs.
220DBBS	525 lbs.
125DBBS	N/A
225DBBS	1,110 lbs.
129DBBS	N/A
229DBBS	N/A
138DBBS	2,225 lbs.
238DBBS	N/A

Table 4

Model	Socket Size
120 DBBS	1- 1/16" x 2" Deep
220 DBBS	1- 1/16" x 3" Deep
125 DBBS	N/A
225 DBBS	1-5/8" x 3" Deep
129 DBBS	N/A
229 DBBS	N/A
138 DBBS	2" x 3" Deep
238 DBBS	N/A

2.2 Brake Preparation

Partial disassembly is required prior to installing the brake.

2.2.1 Lay the brake on a clean , flat surface, with the mounting flange (2) facing down. Refer to Table 3 for assembly weight minus gear.

2.2.2 Loosen the locknuts (18) ONE TURN AT A TIME in an alternating sequence until all spring force is relieved. See Table 4 for socket size information.

Caution:

The locknuts must be loosened gradually to prevent damage to the brake components

2.2.3 Remove the locknuts and washers (17) and slide the cylinder (19), spring housing (16) and pressure plate (14) off of the studs as an assembly, setting it aside on a clean dry surface.

Note: If a stud (6) should happen to come loose, remove it completely and clean the threads in the mounting flange. Apply Loctite® Loc-Quic® Primer Grade "T" to the stud threads. Apply Loctite® #271 and install the stud until it is flush or slightly recessed in the threaded hole in the mounting flange.

Caution:

Loctite® #271 must be shaken prior to application.

Caution:

Loctite® #271 may irritate sensitive skin. Refer to the product label for proper safety precautions.

2.2.4 Remove the disc (58) . On dual disc brakes remove release springs (34), reaction plate (23) and second disc from the mounting flange (2) sub-assembly, setting them aside on a clean dry surface.

2.3 Mounting and Assembly

The following procedures require that the thickness of all discs (4) and friction discs (15) are in as-new condition. Prior to installation and shimming of the brakes, replace worn components, as required.

Warning:

Improper installation will result in inferior performance and possible brake failure.

2.3.1 Mount a magnetic base dial indicator on the gear, positioning the tip of the indicator on the mounting surface.

2.3.2 Determine the total shaft endplay by thrusting the shaft axially to the mechanical limits. Leave the shaft thrust out (towards the brake end) and record the total thrust clearance. This value will be used later in the set-up procedures.

Warning:

Shaft free end play in excess of 11/64" may result in premature wear or damage to the brake components.

Caution:

Excessive jacking or prying when checking endplay may result in damage to bearings, bearing cartridges, or related components.

TABLE 5
Alignment Requirements, inches (mm)

Size	Concentricity (Parallel, TIR) of Shaft and Element	Perpendicularly (Angular, TIR) of Mounting Flange to Shaft *
20DBBS	0.010 (0,25)	0.010 (0,25)
25DBBS	0.010 (0,25)	0.012 (0,30)
29DBBS	0.010 (0,25)	0.015 (0.38)
38DBBS	0.010 (0,25)	0.019 (0,48)

* Perpendicularly measured near the O.D. of the mounting flange.

2.3.3 Assemble the mounting flange (2) to the mounting surface with Grade 8 hex head or socket head screws, lockwashers and/or locknuts (customer provided). If necessary, shim the mounting flange to correct for soft foot or perpendicularly (angular alignment) between the mounting flange and the motor shaft.

2.3.4 For proper operation and service life, the DBBS brake must be mounted concentrically and at right angles to the shaft. See Table 5.

Caution:

Proper alignment is necessary to assure that the discs will track properly. Improper alignment will result in excessive wear to the friction discs (8), discs (58) and gear (28). See Figure 5.

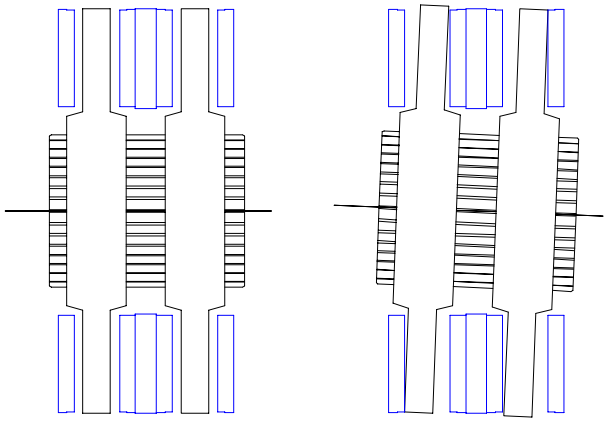


Figure 5

2.3.5 **220 & 225 DBBS:**
Position the three spacer plates (84) on the front plate (82). Apply Loctite® #242 (blue), or equivalent, to the threads of the hex head screws (89). Install and torque the screws to 75 lb.-in. Tighten the screws (99) attaching the front plate to the gear to 44 ft.-lb., dry. See Figure 2 and 3.

38 DBBS:
Position the spacer plate (84) on the front plate (82). Install screws (88) and lockwashers (71) and torque to 80 ft. lb.dry.

2.3.6 Lubricate the gear teeth with a *LIGHT* coat of Molub-Alloy OG Heavy, or equivalent grease.

⚠ Warning:

Excessive grease application on the driving gear (28) may result in contamination of the friction material. Grease on the discs or the friction discs will significantly reduce the torque capacity of the brake and decrease its ability to hold the machinery in a safe position.

On **dual** disc brakes install three wear spacers (29) on each stud. Wear spacers should be located next to the mounting flange and under the clamp tubes.

2.3.7 Slide one of the discs (58) onto the gear, with the spring pocket counterbores facing the mounting surface. Locate the disc approximately 45 degrees from the hex head screws (89) retaining the spacer plates (84) where applicable.

2.3.8 Insert one spring (85) into each of the four spring pockets in the disc. Slide the disc towards the motor until the springs contact the spacer plate.

2.3.9 For single disc brakes proceed to Section 2.4 On dual disc brakes, if not already installed, place a release spring (34) over every other clamp tube (every 4th clamp tube on 220 DBBS brakes) and slide the reaction plate (31) over the clamp tubes. Place the remaining reaction springs over the clamp tubes, positioned in-line with the reaction springs previously installed.

⚠ Caution:

Reaction plate springs (34) are to be assembled over every other stud (6). The springs on either side of the reaction plate must be assembled on the same stud. Improper assembly will result in cocking of the reaction plate and uneven brake release.

2.3.10 Install the two internally splined spacers (86) onto the gear and against the disc.

2.3.11 Noting the orientation of the spring pockets in the disc, see Figures 2 and 3, insert the remaining four springs (85) in the remaining disc (58) and slide the disc onto the gear.

2.3.12 Attach the end plate (87) to the gear using screws (88) and lockwashers (71) and torque to value shown in Table 2. See Figures 2 & 3.

2.3.13 Lubricate the exposed threads on the ends of the studs with 30 wt. oil or Never-Seez®.

⚠ Warning:

Improper assembly may result in faulty operation of the brake assembly.

2.3.14 Noting the position of the air inlets, hoist the end plate, spring housing and pressure plate assembly into position and slide it over the clamp tubes.

2.3.15 Assemble the washers (17) and locknuts (18) onto the studs. While supporting the weight of the pressure plate, spring housing and end plate assembly, tighten the locknuts ONE TURN AT A TIME in sequence until the spring housing is seated against the clamp tubes. Torque the locknuts, in a crosswise pattern, until fully tightened to the value in Table 6.

Table 6

Model	Item #	Torque
20 DBBS	18 Locknut	150 ft. lbs.
25 DBBS		500 ft. lbs.
29 DBBS		500 ft. lbs.
38 DBBS		750 ft.lbs.

Caution:

Failure to properly support the weight of the pressure plate sub-assembly while tightening the locknuts may result in binding of the reaction plate when the brake is disengaged, due to deflection of the studs.

Caution:

The locknuts must be tightened gradually to prevent damage to the brake components.

2.3.16 Prior to putting the brake into service, disc centering set-up is required. Adjust the brake per Section 2.4 after installation of the air supply.

Warning:

Failure to adjust the brake properly may cause premature wear of the brake components. Excessive heat may be generated from improper adjustment, resulting in damage to the brake and possible loss of torque.

2.3.17 Install air supply lines utilizing all ports.

2.4 Brake Shimming Procedure

The following shimming procedures are required after initial installation of new brakes, per section 2.3.

Warning:

Improper installation will result in inferior performance and possible brake failure.

The procedures described in this section should be strictly adhered to for proper adjustment of the running clearances between the discs (4) and friction discs (5).

Caution:

Failure to properly shim the brake after installation may result in premature brake wear.

Table 7
Gap Calculation

Description	Result
Outer nominal clearance = "X" "X" = 120 DBBS = 0.180" 220 DBBS = 0.180 125 DBBS = N/A 225 DBBS = 0.250" 129 DBBS = 0.250" 229 DBBS = 0.250" 138 DBBS = 0.250" 238 DBBS = N/A	"X"
Total shaft endplay from 2.3.2	
Subtract total endplay from "X"	

2.4.1 Ensure that angular alignment, as described in 2.3 has been checked and corrected, as necessary.

2.4.2 Calculate the *desired* gap value (outer disc to outer friction disc) by using Table 7.

2.4.3 Apply 100psi air pressure to fully release the brake.

2.4.4 Using a prying tool, adjust the position of the outer disc (58) to ensure that it is resting against the end plate (87) on the gear. Note: It may be necessary to add an equal number of shims (90) at each of the brake mounting points to create a gap between the outer disc and the outer friction disc. See Figure 7.

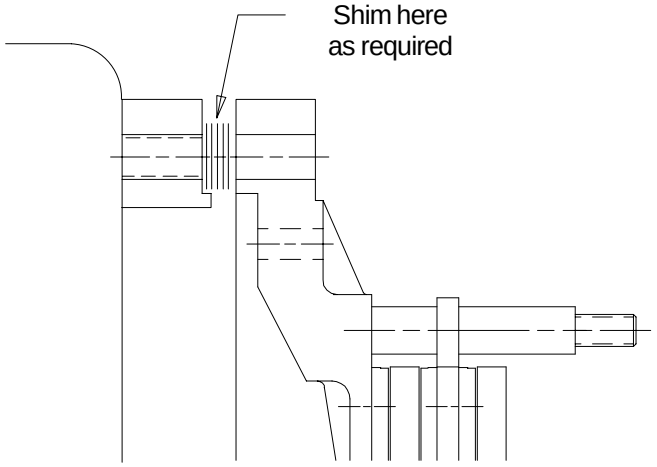


Figure 6

2.4.5 Measure the gap between the outer disc and friction disc which is mounted on the pressure plate. See Figure 7. The shaft should be thrust out (towards the brake end) to its axial limit when determining this dimension.

⚠ Caution:

Improper shaft location will result in improper shimming of the brake, and subsequent brake damage.

2.4.6 Compare the gap measured in 2.4.5 to that calculated in Table 7. If necessary, add or remove an equal number of shims (90) at each of the four mounting points to adjust the gap to within +/-.010 of the value determined in Table 6.

2.4.7 Thrust the shaft axially to the mechanical limits while the brake is released. Observe the outer gaps between the discs (4) and adjoining friction disc (5) as the shaft reaches each limit. *There should be clearance at all times.* Leave the shaft thrust out (towards the brake end of the motor) and recheck the gap as in 2.4.5. Adjust per 2.4.6 if necessary.

Note: Lack of clearance between discs and friction discs indicates improper assembly, or excessively worn bearings or related components. Identify and correct prior to operating the machinery.

2.4.8 If necessary, shift the position of the brake to adjust the concentricity between the discs and friction discs.

2.4.9 Torque the Grade 8 mounting fasteners to the value in Table 8.

Table 8
Mounting Flange Fastener Torque

Model	Screw Size	Torque
120 DBBS	5/8"-11, Gr. 8	150 ft. lbs.
220DBBS	3/4"-10, Gr. 8	200 ft. lbs.
25 DBBS	1 1/2"-6 , Gr. 8	750ft. lbs.
25 DBBS / with internal splined gear	3/4"- 10 Socket head cap screws	250 ft. lbs
29 DBBS	1 1/2"-6 , Gr. 8	750ft. lbs.
38 DBBS	1"-8 NC Gr. 8	500 ft. lbs.

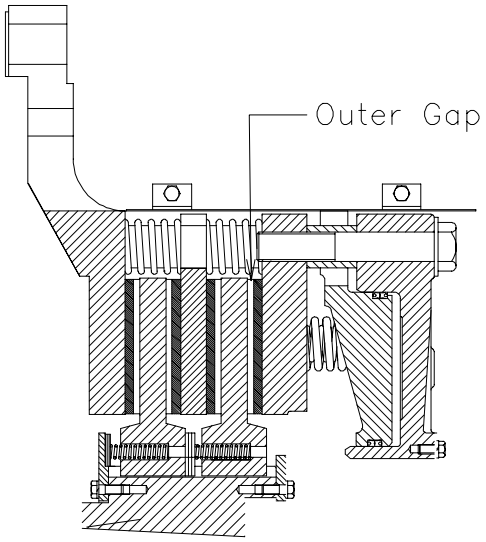


Figure 7

2.4.10 Exhaust the air pressure from the brake.

Note: During initial start up, monitor the axial travel of the discs between the mounting flange and the pressure plate. Due to various influences including gearing, couplings, or alignment of the motor to the pinion, the shaft may drift axially. If the discs remain in constant contact with the friction material, shim adjustment of the brake or motor bearing repair may be required. The discs should rotate freely, with no contact to the friction material while the brakes are fully disengaged.

⚠ Caution:

Shaft endplay in excess of motor manufacturers maximum specification of 11/64" may result in premature wear or damage to the brake components.

⚠ Warning:

Failure to shim the brake properly may cause premature wear of the brake components. Excessive heat may be generated from improper shimming, resulting in damage to the brake and possible loss of torque.

2.5 Air Supply and Control System

Warning:

Maximum allowable air pressure is 120 psig (8.2 bar). Operation of the DBBS at pressures exceeding 120psig may result in damage to the brake components.

Caution:

Minimum releasing pressure is 100psig (6.8 bar). Operation at pressures below minimum will result in brake drag and excessive heat and wear.

Brake response is dependent upon a good air system arrangement. Following are some general guidelines for installing the air control components.

2.5.1 It is recommended that all air inlet ports be used, connected with air bridge piping.

2.5.2 Use full size piping consistent with the air inlets. Pneumatic piping should be free of foreign material such as pipe thread sealer, metal chips, etc.

2.5.3 Pipe length should be kept to a minimum. Excessive piping, pipe elbows, and other restrictions will slow down the response time of the brake.

2.5.4 The final connection to the brake air bridge piping must be made with a flexible hose.

2.5.5 Use poppet type solenoid valves and locate as close as possible to the brake. Spool type valves are not recommended.

2.5.6 The DBBS brake does not require lubricated air; however the solenoid valve may. Consult the valve manufacturer.

2.5.7 Use of an in-line air filter is recommended to help prevent excessive moisture and contamination from entering the solenoid valve and brake.

2.5.8 Filters and regulators should be located prior to the solenoid valve, to ensure proper brake response.

Warning:

Locating filters or regulators between the brake and solenoid valve may result in inadequate brake response.

2.5.9 A pressure switch should be located in the air supply line to the brake and interlocked with the equipment electrical controls. Locate the pressure switch on or as close as possible to the brake. Adjust the switch to 80psi, falling.

Caution:

Pressure switches located too far from the brake may not detect air leakage near or within the brake assembly.

2.5.10 Installation of limit switches or proximity sensors may be desired to detect full mechanical release of the brake prior to operation of the machinery.

3.0 OPERATION

3.1 Pressure and Speed Limits

3.1.1 Maximum applied pressure is 120 psig (8.2 bar). Minimum releasing pressure is 80 psig (5.4 bar).

Warning:

Maximum applied pressure is 120 psig (8.2 bar). Operation at pressures exceeding maximum may result in damage to the DBBS components.

3.1.2 Maximum freewheeling disc speeds are shown on Table 9.

Warning:

Operation at disc speeds exceeding the maximum allowable, as shown on Table 9, may result in exposure to personal injury or product/equipment damage.

Table 9	
Model	Maximum freewheeling speed
20	2200 rpm
25	1700 rpm
29	N/A
38	950 rpm

3.2 Initial Operation

3.2.1 The non-asbestos friction material used on DBBS brakes may not develop rated torque as a short wear in period is required.

3.2.2 If the brake engagement appears harsh, a flow control valve may be installed in the brake air supply line. When using a flow control valve, install so free flow is to the brake and restricted flow is away from the brake.

Warning:

Excessive restriction of the brake exhaust air will result in long stopping times and inconsistent stopping position.

3.3 Periodic Inspection

3.3.1 As the friction material wears, the brake torque will be reduced somewhat and adjustment of the stopping position controls (flow control or limit switch) will be necessary. See the MAINTENANCE section for the friction material wear limit and replacement procedure.

3.3.2 Periodically check for air leakage in the area of the piston seals (21,23). For replacement, refer to the MAINTENANCE section.

3.3.3 Periodically observe the discs with the brake released. Causes of dragging discs may include wear or contamination of the gear or disc splines, disc imbalance, warped discs, or excessive shaft float.

3.3.4 Pneumatic and electrical control interlocks should be periodically checked for correct settings and operation.

4.0 MAINTENANCE

Warning:

Prior to performing any maintenance on the DBBS brake, make sure the equipment is in, and will remain in, a safe condition.

4.1 Wear Limits

4.1.1 Wear limits for the DBBS components are shown on Table 10. If any wear limit has been reached or exceeded, that component must be repaired or replaced.

4.2 Wear Adjustment

On single and dual disc units, the friction material must be replaced when worn to the bottom of the groove on the friction lining. See Figure 8. On dual disc brakes, however, a wear adjustment is required when the friction material is approximately one-fourth worn. To determine when adjustment is required, measure the gap between the spring housing (16) and the pressure plate (14) with the brake engaged, as shown on Figure 9. If the measured gap exceeds the limits shown on Table 11 AND none of the friction discs are worn to the bottom of the wear groove, adjust the brake per the following procedure.

Warning:

If a wear adjustment is not made, the brake torque may deteriorate to the point where the equipment will not stop properly.

4.2.1 Disconnect the air supply lines from the brake.

4.2.2 While supporting the cylinder, loosen the locknuts (18) ONE TURN AT A TIME and in an alternating (crosswise) pattern until the spring force is relieved.

Caution:

The locknuts (18) must be loosened gradually to prevent damage to the brake components.

TABLE 10 Wear Limits for DBBS Components			
Item	**Description**	**Wear Limit**	**Remarks**
#8 Friction Disc	**Friction Material**	Fully worn at bottom of dust groove. See Fig 4. Friction material must also be replaced when contaminated with oil or grease.	Dual disc brakes have adjustment provision. See section 4.2.
#14 Pressure Plate and #31 Reaction Plate	**Reaction Holes**	Maximum wear is .031 in. (.80 mm).	Wear will be in the form of elongation of the holes. Original hole diameters are shown on the table below.
#12 Clamp Tube	**Reaction Area**	Maximum wear is .015 in. (.38 mm).	Wear will be in the form of a notch or step on the side of the tube.
#19 Cylinder	**Seal Area**	Maximum wear is .005 in. (.13 mm).	Wear will be in the form of grooves where the seals contact.
#22, 34 & 52 Spring	**Spring Free Height**	Minimum free height shown on the table below.	Original free height shown on the table below. Springs must be replaced in complete sets.
#28 & 58 Gear and Disc	**Gear Backlash**	Maximum allowable total backlash is: .060 in (1,5 mm).	Backlash is measured at the pitch diameter. Replace the disc and gear together. If step is worn in gear, gear must be replaced.
#58 Disc	**Friction Wear Surfaces**	Maximum wear is .045 in (1,12mm) per surface .090 in (2,24mm) total.	Original thickness is 1.00" (25,4mm). Wear will be in the form of circular [1.25" for Size 38] grooves on the iron surface.

Table 10A

Item Reference	Description	Element Size			
		20 DBBS	**25 DBBS**	**29 DBBS**	**38 DBBS**
14 & 31	Original Reaction Hole Diameters in the Pressure Plate and Reaction Plate	1.343" (34.11mm)	1.688" (42.87mm)	N/A	2.063" (54.40mm)
34	Original Free Height	2.84" (72.11mm)	2.57" (65.3mm)		3.64" (92.4mm)
	Minimum Free Height	2.65" (67.3mm)	2.40" (65.3mm)		3.40" (86.4mm)
22	Original Free Height	4.56" (115.8mm)	5.18" (131.6mm		6.65" (168.9mm)
	Minimum Free Height	4.25" (108.0mm)	4.90" (124.5mm)		6.37" (161.8mm)
52	Original Free Height	------	5.23" (132.8mm)		6.78" (172.2mm)
	Minimum Free Height	------	4.95" (125.73mm)		6.50" (165.1mm)

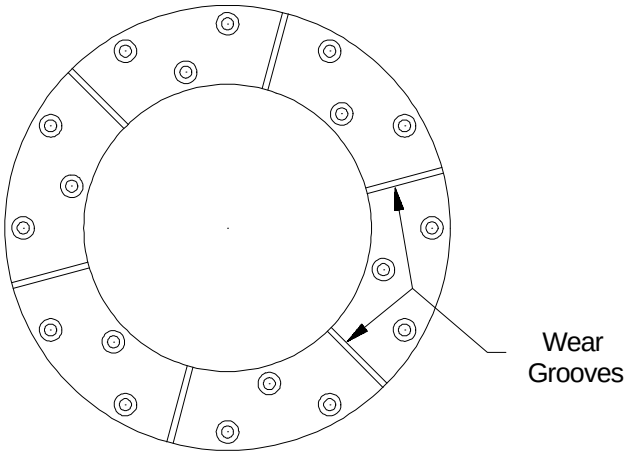


Figure 8

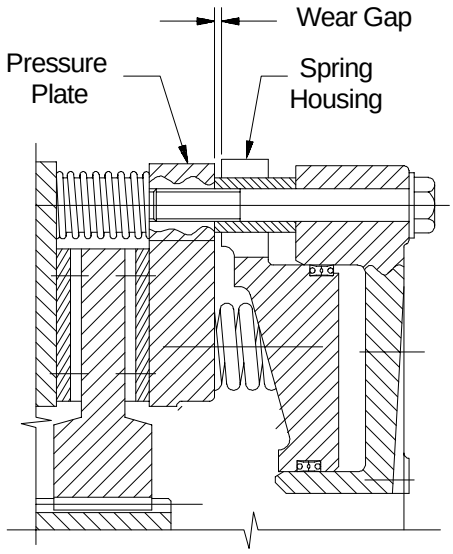


Figure 9

TABLE 11 Wear Gap Values, Inches (mm)				
Size	**220**	**225**	**229**	**238**
New Gap	.36	.50	N/A	N/A
Gap Required for Adjustment	.61	.75	N/A	N/A

UMBER =

4.2.3 Remove the locknuts and washers (17) and slide the cylinder, spring housing and pressure plate (14) off of the studs as an assembly. Set aside in a clean area making sure not to damage the friction material on the pressure plate.

Note: If a stud (6) should happen to come loose, remove it completely, clean the threads on the stud and the threads in the mounting flange. Apply Loctite® Loc-Quic® Primer Grade "T" to the stud threads. After the threads have dried, assemble to the mounting flange using Loctite® #262. The end of the stud must not extend past the mounting surface on the mounting flange.

Caution:

Loctite® #262 must be shaken prior to application.

Caution:

Loctite® #262 may irritate sensitive skin. Refer to the product label for safety precautions.

4.2.4 Remove the screws (88) and lockwashers (71) attaching the end plate (87) to the gear. Remove end plate.

4.2.5 Remove the discs (58), springs (85), reaction plate (31) , spacers (86) , screws (89), spacers (84) and the release springs (34) and set aside.

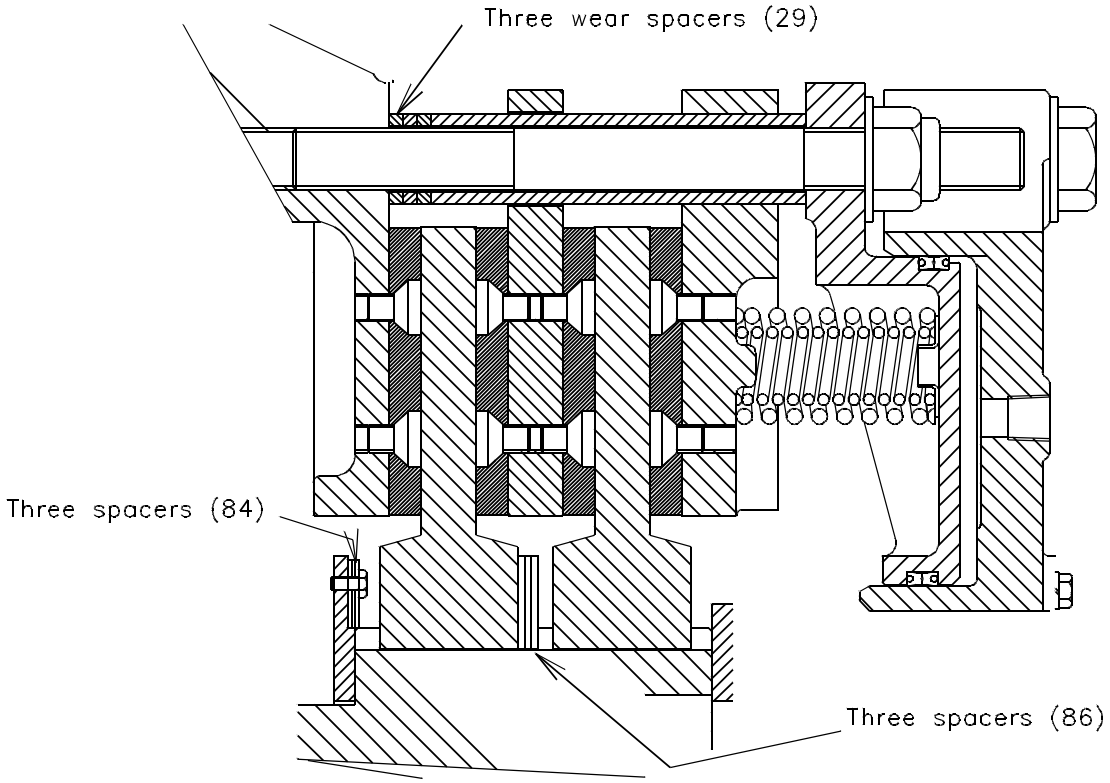
4.2.6 Slide the clamp tubes (12) off of the studs set aside. ONE each spacer (84)(86) from the gear and set aside. Remove ONE wear spacer (29) from each stud and set aside. Reinstall the clamp tubes.

NOTE: Refer to Figure 10, which illustrates spacer locations after one adjustment. There are three adjustments to the dual disc brakes. Fully worn condition will have all wear spacers (29) under the locknuts (18) and all of the spacers (84)(86) next to the end plate (87).

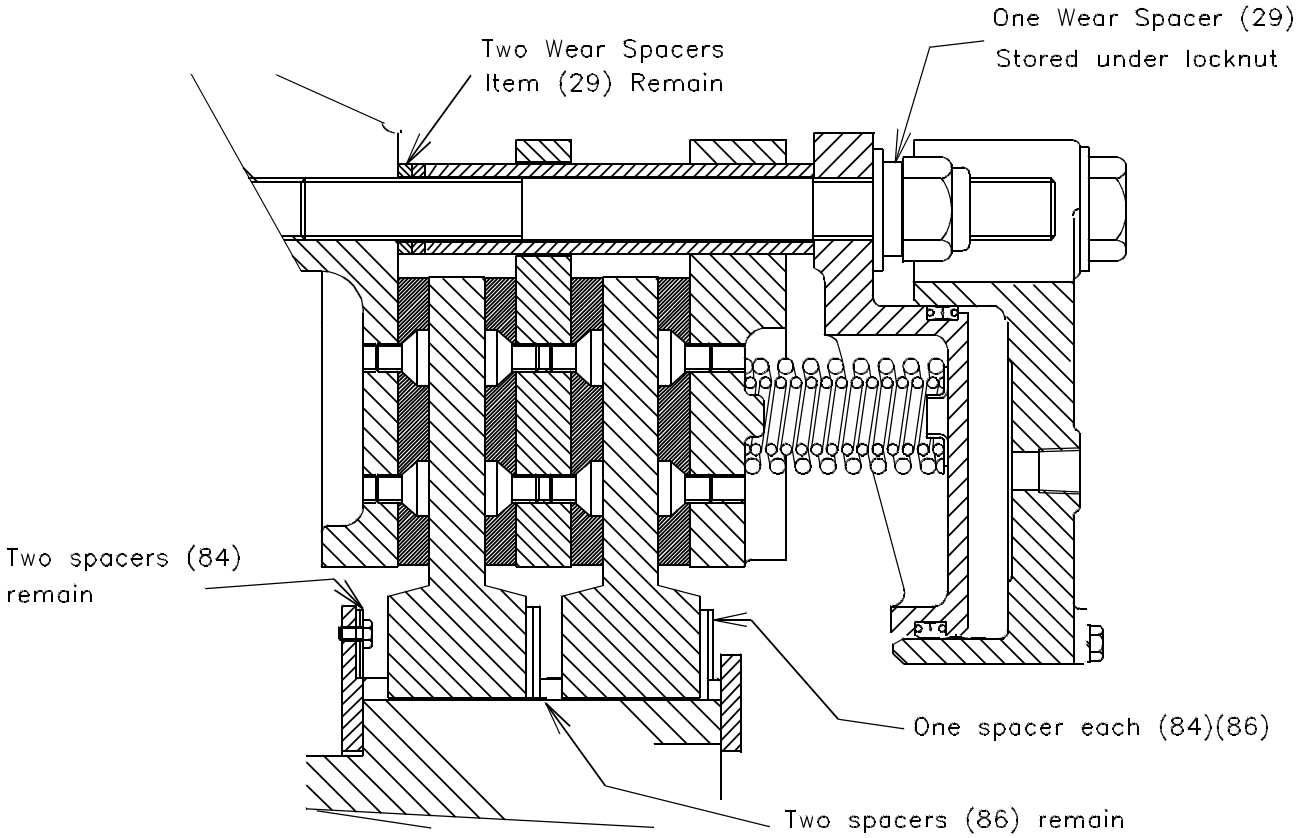
Warning:

Failure to properly install or move spacers and wear spacers will cause improper disc positioning resulting inuneven wear and high brake temperatures.

4.2.7 Slide the remaining spacer(s) (84) back onto the gear. Apply Loctite® #242 and install screws (89) to 75 in. lb..



Location of spacers in the "new" condition.



Location of spacers after one wear adjustment.

Figure 10

Caution:

Loctite® #262 may irritate sensitive skin. Refer to the product label for safety precautions.

4.2.8 Clean the gear, removing any contamination or old grease. Lubricate the gear teeth with a *LIGHT* coat of Molub-Alloy® OG Heavy, or equivalent grease.

Warning:

Excessive grease application on the driving gear may result in contamination of the friction material. Grease on the discs or the friction discs will significantly reduce the torque capacity of the brake and decrease its ability to hold the machinery in a safe position.

4.2.9 Noting the position from which it was removed, align the disc so that the spring pockets are not in line with the hex head screws (89) and slide the first disc onto the gear. Insert the springs (85) into the spring pockets in the disc and slide the disc towards the motor.

4.2.10 If not already installed, place a release spring (34) over every other clamp tube (or every fourth clamp tube on 220 dbbs brakes). Noting the orientation from which it was removed, slide the reaction plate over the clamp tubes, and against the disc. Install the remaining release springs over the clamp tubes, positioned in-line with the reaction springs previously installed.

Caution:

Release springs (34) are to be assembled over every other stud (2)(or every fourth clamp tube on 220 dbbs brakes). The springs on either side of the reaction plate must be assembled on the same stud. Improper assembly will result in cocking of the reaction plate and uneven brake release.

4.2.11 Install the spacer(s) (86) onto the gear and against the disc - if applicable. See bottom position of Figure 10. The number of spacer plates (97) installed at the location described here should be equal to the number of spacer plates (84) installed in 4.2.6 and wear spacers (29) installed in 4.2.5.

4.2.12 Install the springs into the spring pockets in the second disc and slide the disc onto the gear.

4.2.13 Install the remaining spacer plates (84,86) onto the gear. See Figure 10.

4.2.14 Attach the end plate to the gear using two 3/8-16NC2 x 1.75" (1/2-13 x 1.75" on 38DBBS) screws, evenly spaced. Draw the end plate towards the gear to compress the springs using the two screws until they bottom in the tapped holes of the gear. Do not tighten the screws after they have bottomed in the holes.

Warning:

Excessive tightening of these fasteners may damage the threaded holes in the gear.

4.2.15 Install two hex head screws (88) and lockwashers (71) in the remaining two holes in the end plate. Tighten these two screws one turn at a time, in an alternating sequence, until the end plate contacts the end of the gear.

4.2.16 Remove the two 3/8-16NC2 x 1.75" (1/2-13 x 1.75" on 38DBBS) screws, replacing them with hex head screws (88) and lockwashers (71). Tighten all four screws to the value in Table 2.

4.2.17 Lubricate the threads on the ends of the studs (6) with 30 wt. oil or Never-Seez®.

4.2.18 Slide the pressure plate/cylinder assembly onto the clamp tubes.

4.2.19 Lubricate the threads on the ends of the studs with 30 wt. oil or anti-seizing compound and install the locknuts (18), washers (17) and the wear spacers removed in 4.2.5. The wear spacers are "stored" under the locknuts for use after replacing friction discs. See Figure 11.

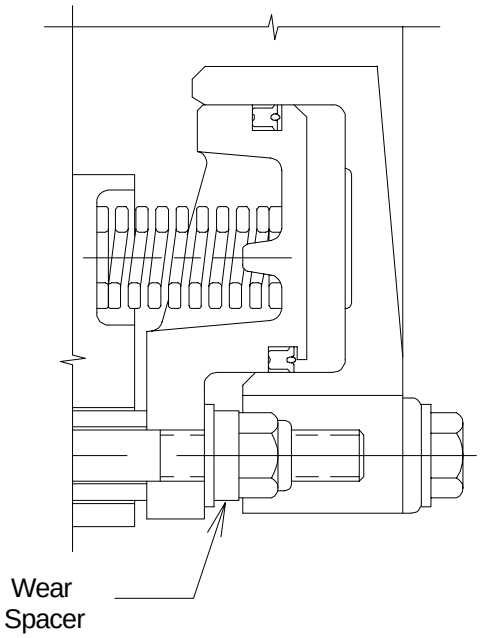


Figure 11

4.2.20 While supporting the weight of the cylinder/spring housing/pressure plate assembly, tighten the locknuts, ONE TURN AT A TIME and in a crosswise pattern, until the spring housing is seated against the clamp tubes. Torque the locknuts to the appropriate value. See Table 2.

Caution:

The locknuts (18) must be tightened gradually to prevent damage to the brake components.

4.3 Friction Disc Replacement

Note: Friction disc may be replaced without complete removal of brake. Dis-assemble per-section 4.21 -4.2.5. Inspect and assemble the brake per section 4.37 - 4.3.17.

Warning:

Use only genuine, Airflex friction material. Use of material not of Airflex origin may result in unpredictable brake performance and/or excessive wear of the brake components.

Note: Friction disc replacement is required when worn to the bottom of the wear groove, as indicated in Figure 8, or if oil or grease have contaminated the surface.

4.3.1 Disconnect the air supply lines from the brake.

4.3.2 Remove the screws (88) and lockwashers (71) attaching the end plate (87) to the gear.

4.3.3 Remove the brake and place it on a level working surface, with the mounting flange facing down.

4.3.4 Loosen the locknuts (18) ONE TURN AT A TIME and in an alternating (crosswise) pattern until the spring force is relieved. Remove the locknuts, wear spacers (29) (on dual disc brakes) and washers (17).

Caution:

The locknuts (18) must be loosened gradually to prevent damage to the brake components.

4.3.5 Remove the locknuts and washers (17) and slide the cylinder, spring housing and pressure plate (14) off of the studs as an assembly. Set aside in a clean area making sure not to damage the friction material on the pressure plate.

Note: If a stud (6) should happen to come loose, remove it completely, clean the threads on the stud and the threads in the mounting flange. Apply Loctite® Loc-Quic® Primer Grade "T" to the stud threads. After the threads have dried, assemble to the mounting flange using Loctite® #262. The end of the stud must not extend past the mounting surface on the mounting flange.

Caution:

Loctite® #262 must be shaken prior to application.

Caution:

Loctite® #262 may irritate sensitive skin. Refer to the product label for safety precautions.

4.3.6 Remove the disc (58), springs (85), spacers (84) or (86) on duals and the release springs (34), if applicable, and set aside.

4.3.7 On dual disc brakes, remove the reaction plate (31), release springs (34), wear spacers, (29) spacers (86), clamp tubes (12), remaining disc (58), screws (89), spacers (84).

4.3.8 Inspect the brake components for wear or damage. Replace as required. For wear limits of components, see Table 10.

4.3.9 Remove the socket head screws and friction discs and discard.

Note: It may be necessary to use heat to soften the Loctite® to ease screw removal. Use a pinpoint torch, heating only the socket area of the screw.

4.3.10 Smooth the friction disc mounting surfaces of any burrs or raised areas with a course, flat polishing stone, and clean the tapped holes of any residual Loctite® or other contamination.

Caution:

Before installing screws, make sure that the screw threads and threaded holes are clean to ensure that the new screws will lock properly.

4.3.11 Position the new friction discs on the mounting surfaces. Apply Loctite® #262 to the threads of the screws (57), install and torque the screws to 20 ft.-lb.

4.3.12 Position a disc (58) on the mounting flange/friction disc assembly. Center the disc on the friction material.

4.3.13 On dual disc units, install ALL wear spacers (29), clamp tubes (12), release springs , the reaction plate, and remaining reaction springs over the studs. Center all of the spacers (86) onto the face of the first friction disc face. Position the remaining disc (58) on the reaction plate/friction disc assembly. Center the disc on the friction material and align the disc splines with those on the first disc. (See Figure 10, top illustration, location of spacers in the "NEW" condition.

Caution:

Release springs are to be assembled on every other stud. The springs on either side of the reaction plate must be assembled on the same stud, over the clamp tubes. Improper assembly will result in cocking of the reaction plate and uneven brake release.

4.3.14 Lubricate the threads on the ends of the studs with 30 wt. oil or Never Seez® anti-seizing compound..

4.3.15 Hoist the cylinder, spring housing and pressure plate assembly into position. Noting the position of the air inlets to the mounting flange, lower the assembly over the studs and clamp tubes.

4.3.16 Assemble the washers (17) and locknuts (18) onto the studs. Tighten the locknuts, ONE TURN AT A TIME and in a crosswise pattern, until the spring housing is seated against the clamp tubes. Torque the locknuts to the appropriate value. See Table 6.

Caution:

The locknuts (18) must be tightened gradually to prevent damage to the brake components.

4.3.17 Rig the brake assembly into position to slide on gear.

4.3.18 Apply 100 psi air pressure to fully release the brake.

4.3.19 Slide the brake assembly onto the gear.

4.3.20 Attach the end plate (87) to the gear using screws (88) and lockwashers (71) and torque to value shown in Table 2. See Figures 2 & 3.

4.3.21 Assemble the mounting flange (2) to the mounting surface with Grade 8 hex head or socket head screws, lockwashers and/or locknuts (customer provided). If necessary, shim the mounting flange to correct for soft foot or perpendicularly (angular alignment) between the mounting flange and the motor shaft.

Table 12			
Model	**Item**	**Size**	**Torque**
20 DBBS	20	3/4" - 10 Gr. 8	150 ft. lbs.
25 DBBS		1 1/8"-7, Gr.8	500 ft. lbs.
29 DBBS		N/A	N/A
38 DBBS		1 3/8"- 6, Gr. 8	750 ft. lbs.

4.3.22 For proper operation and service life, the DBBS brake must be mounted concentrically and at right angles to the shaft. See Table 5.

4.3.23 Install air lines

4.4 Cylinder Seal Replacement

4.4.1 Disconnect the air supply lines and remove the screws (20), washers (17) and spacer tubes (27) attaching the cylinder (19) to the pressure plate (14).

4.4.2 Carefully slide the cylinder off of the spring housing (16).

Caution:

Do not use compressed air to remove the cylinder from the spring housing.

4.4.3 Remove the cylinder seals (21,23) from the spring housing and thoroughly clean the seal grooves in the spring housing.

4.4.4 Insert new seals into the grooves, noting the orientation of the seals per Figure 7.

4.4.5 Carefully examine the seal surfaces in the cylinder. If the surfaces have worn to the point as indicated on Table 10, the cylinder must be replaced. Examine for corrosion.

4.4.6 Lubricate the seal surfaces in the cylinder with Parker O-Lube® and carefully slide the cylinder onto the spring housing. Take special care to avoid damaging the seal lips.

4.4.7 Attach the cylinder to the pressure plate with the screws, washers and spacer tubes removed in 4.4.1. Use Loctite® Loc-Quic® Primer Grade "T" to clean and prepare the screw threads and install with Loctite® #262. Using a crosswise pattern, torque the screws to the value shown on Table12.

4.5 Spring Replacement

4.5.1 Disconnect the air supply lines and loosen the locknuts (18), ONE TURN AT A TIME and in a crosswise pattern, until the spring force has been relieved.

4.5.2 Match mark the pressure plate and spring housing to one another.

Caution:

The locknuts (18) must be loosened gradually to prevent damage to the brake components.

4.5.3 Remove the locknuts (18) and washers (17) and carefully remove the cylinder/spring housing/pressure plate assembly. Transport to a clean work area.

4.5.4 Loosen the screws (20) gradually until the remaining spring force is relieved. Remove the screws and washers (17).

4.5.5 Carefully lift the cylinder and spring housing off of the pressure plate, exposing the springs (22).

Caution:

Before removing the old springs, make note of the number used and the position that they are in so that the new springs may be installed similarly for proper brake functioning.

4.5.6 Noting their orientation, remove the spring retainer plates (53), exposing the springs.

4.5.7 Remove the springs and check the free height. If the free height of any spring is less than the value shown on Table 10, or any springs are cracked or broken, the entire complement of springs must be replaced.

4.5.8 Re-install the springs into the pockets in the pressure plate in reverse order.

Caution:

No spring retainer plate (53) should cross over the ribs in the spring housing (16).

4.5.9 Arrange the spring retainer plates onto the springs in the reverse order removed.

4.5.10 Place a spacer tube (27) in position over each tapped hole in the pressure plate, align the match marks and carefully lower the spring housing/cylinder assembly onto the springs, making sure the springs engage the bosses in the pressure plate.

4.5.11 Clean and prepare the threads on the screws (20) with Loctite® Loc-Quic® Primer Grade "T" and install with Loctite® #262, making sure the washers (17) are in place. Using a crosswise pattern, tighten the screws one turn at a time until the spacer tubes are clamped between the cylinder and pressure plate. Torque the screws to the value shown on Table 2.

4.5.12 While supporting the weight of the cylinder/spring housing/pressure plate assembly, tighten the locknuts, ONE TURN AT A TIME and in a crosswise pattern, until the spring housing is seated against the clamp tubes. Torque the locknuts to the appropriate value. See Table 12.

Caution:

The locknuts (18) must be tightened gradually to prevent damage to the brake components.

4.5.13 Re-assemble per para. 2.3.14 -2.3.17.

5.0 ORDERING INFORMATION/ TECHNICAL ASSISTANCE

5.1 Equipment Reference

5.1.1 In any correspondence regarding Airflex Equipment, refer to the information on the product nameplate and call or write:

Eaton Corporation
Airflex Division
9919 Clinton Road
Cleveland, Ohio 44144
Tel.: (216) 281-2211
Fax: (216) 281-3890

6.0 PARTS

Item	Description	120 DBBS (146323AY)		220 DBBS (146322AU)		220 DBBS (146322BM)	
		Part Number	Qty	Part Number	Qty	Part Number	Qty
2	Mounting Flange	513787	1	513805	1	513805	1
6	Stud	000245x0066	12	000245x0063	12	000245x0063	12
8	Friction Disc	513326	2	513326	4	513326	4
12	Clamp Tube	306956-21	12	306956-23	12	306956-23	12
14	Pressure plate	513332	1	513332	1	513332	1
16	Spring Housing	512639	1	512639	1	512639	1
17	Flat Washer	000153x0727	24	000153x0727	24	000153x0727	24
18	Lock Nut	000110x0030	12	000110x0030	12	000110x0030	12
19	Cylinder	512693	1	512693	1	512693	1
20	Hex Head Screw	000197x0723	12	000197x0723	12	000197x0723	12
21	Polypak Seal	000402x0021	2	000402x0021	2	000402x0021	2
22	Spring	307947	18	307947	18	307947	18
23	Polypak Seal	000402x0022	2	000402x0022	2	000402x0022	2
24	Warning Decal	203627	1	203627	1	203627	1
25	Name Plate	307640	1	307640	1	307640	1
26	Drive Screw	000153x0644	8	000153x0644	8	000153x0644	8
27	Spacer Tube	308155-06	12	308155-06	12	308155-06	12
28	Gear	416453	1	513875-05	1	416493	11
29	Wear Spacer	-----	-	308155-03	36	308155-03	36
31	Reaction Plate	-----	-	513330	1	513330	1
32	Decal Plate	307753	1	307753	2	307753	2
34	Release Spring	-----	-	307629	6	307629	6
53	Spring Retainer	415823	6	415823	6	415823	6
57	Flat Head Screw	000294x0405	36	000294x0405	72	000294x0405	72
58	Disc	513328	1	513328	2	513328	2
69	Guard	416232	1	416232	1	416232	1
70	Hex Head Screw	000001x0203	3	000001x0203	3	000001x0203	3
71	Lockwasher	000068x0007	11	000068x0007	11	000068x0007	11
72	Shield	513807	1	513807	1	514206	1
73	Hex Head Screw	0000001x0107	2	000001x0107	2	000001x0107	2
74	Lockwasher	000068x0004	5	000068x0004	5	000068x0004	5
75	Hex Nut	000045x0005	2	000045x0005	2	000045x0005	2
76	Bracket	308082	3	308082	3	308082	3
77	Hex Head Screw	000001x0103	6	000001x0103	6	000001x0103	6
78	Flat Washer	000067x0002	3	000067x0002	3	000067x0002	3
82	Front Plate	416346	1	416346	1	416346	1
84	Spacer	-----	-	416347	3	416347	3
85	Spring	000071x0145	4	000071x0118	8	000071x0118	8
86	Spacer	-----	-	416348	3	416348	3
87	End Plate	416349	1	416349	1	416349	1
88	Hex Head Screw	000197x0207	8	000197x0207	8	000197x0207	8
89	Hex Head Screw	-----	-	000385x0003	2	000385x0003	2
90	Shim	000153x1156	108	000153x1156	144	000153x1156	144

Item	Description	225 DBBS (146330AT)		225 DBBS (146330BD)		225 DBBS (146330BP)	
		Part Number	Qty	Part Number	Qty	Part Number	Qty
2	Mounting Flange	513840	1	513908	1	514223	1
6	Stud	000245x0077	12	000245x0077	12	000245x0077	12
8	Friction Disc	513307	4	513307	4	513307	4
12	Clamp Tube	306542-14	12	306542-14	12	306542-14	12
14	Pressure plate	513335	1	513335	1	513335	1
16	Spring Housing	513268	1	513268	1	513268	1
17	Flat Washer	000153x0641	24	000153x0641	24	000153x0641	12
18	Lock Nut	000110x0073	12	000110x0073	12	000110x0073	12
19	Cylinder	513264	1	513264	1	514224	1
20	Hex Head Screw	000197x1035	12	000197x1035	12	000030x1022	12
21	Polypak Seal	000402x0023	2	000402x0023	2	000402x0023	2
22	Spring	307970	24	307970	24	307970	24
23	Polypak Seal	000402x0024	2	000402x0024	2	000402x0024	2
24	Warning Decal	203627	1	203627	1	203627	1
25	Name Plate	307640	1	307640	1	307640	1
26	Drive Screw	000153x0644	8	000153x0644	8	000153x0644	8
27	Spacer Tube	308170-02	12	308170-02	12	307972-01	12
28	Gear	416339	1	514117	1	514222	1
29	Wear Spacer	308170-03	36	308170-01	36	307989-02	36
31	Reaction Plate	513333	1	513333	1	513333	1
32	Decal Plate	307753	2	307753	2	307753	2
34	Release Spring	306909	12	306909	12	306909	12
52	Inner Spring	307969	24	307969	24	307969	24
53	Spring Retainer	307971	12	307971	12	307971	12
57	Flat Head Screw	000294x0405	96	000294x0405	96	000294x0405	96
58	Disc	513304	2	513304	2	513304	2
69	Guard	416274	1	416274	1	416274	1
70	Hex Head Screw	000001x0205	7	000001x0205	7	000001x0205	7
71	Lockwasher	000068x0007	13	000068x0007	13	000068x0007	13
72	Shield	513839	1	513839	1	513839	1
73	Hex Head Screw	000001x0209	2	000001x0209	2	000001x0209	2
74	Lockwasher	000068x0013	4	000068x0013	4	000068x0013	4
75	Hex Nut	000045x0008	2	000045x0008	2	000045x0008	2
76	Bracket	307999	4	307999	4	307999	4
77	Hex Head Screw	000001x0405	4	000001x0405	4	000001x0405	4
78	Flat Washer	000067x0003	4	000067x0003	4	000067x0003	4
82	Front Plate	415170	1	416419	1	416419	1
84	Spacer	415836	3	415836	3	415836	3
85	Spring	000071x0118	8	000071x0118	8	000071x0118	8
86	Spacer	415837	3	415837	3	415837	3
87	End Plate	415171	1	415171	1	415171	1
88	Hex Head Screw	000197x0207	8	000197x0207	8	000197x0207	8
89	Hex Head Screw	000385x0003	2	000385x0003	2	000385x0003	2
90	Shim	000153x1156	144	000153x1120	48	000153x1020	48

Item	Description	138 DBBS (146328BT)		138 DBBS (146328CB)		138 DBBS (146328CC)	
		Part Number	Qty	Part Number	Qty	Part Number	Qty
2	Mounting Flange	513391	1	513391	1	513391	1
6	Stud	000245x0073	16	000245x0073	16	000245x0073	16
8	Friction Disc	513396	2	513396	2	513396	2
12	Clamp Tube	307941-08	16	307941-08	16	307941-08	16
14	Pressure plate	513392	1	513392	1	513392	1
16	Spring Housing	512811	1	512811	1	512811	1
17	Flat Washer	000067x0042	32	000067x0042	32	000067x0042	32
18	Lock Nut	000110x0075	16	000110x0075	16	000110x0075	16
19	Cylinder	513988	1	513988	1	513988	1
20	Hex Head Screw	000197x1338	16	000197x1338	16	000197x1338	16
21	Polypak Seal	000402x0005	2	000402x0005	2	000402x0005	2
22	Spring	308035	48	308035	32	308035	18
23	Polypak Seal	000402x0006	2	000402x0006	2	000402x0006	2
24	Warning Decal	203627	1	203627	1	203627	1
25	Name Plate	307640	1	307640	1	307640	1
26	Drive Screw	000153x0644	8	000153x0644	8	000153x0644	8
27	Spacer Tube	308150-01	16	308150-01	16	308150-01	16
28	Gear	415991-03	1	415991-03	1	415991-03	1
29	Wear Spacer	-----	2-	-----	-	-----	-
31	Reaction Plate	-----	-	-----	-	-----	-
32	Decal Plate	307753	2	307753	2	307753	2
34	Release Spring	-----	-	-----	-	-----	-
52	Inner Spring	308034	48	308034	32	308034	18
53	Spring Retainer	415635	16	415635	16	415635	6
57	Flat Head Screw	000294x0405	72	000294x0405	72	000294x0405	72
58	Disc	513395	1	513395	1	513395	1
69	Guard	416014	1	416014	1	416014	1
70	Hex Head Screw	000001x0405	3	000001x0405	3	000001x0405	3
71	Lockwasher	000068x0013	15	000068x0013	15	000068x0013	15
72	Shield	513816	1	514376	1	514376	1
73	Hex Head Screw	000001x0209	2	000001x0209	2	000001x0209	2
74	Lockwasher	000068x0007	6	000068x0007	6	000068x0007	6
75	Hex Nut	000045x0008	2	000045x0008	2	000045x0008	2
76	Bracket	307999	4	307999	4	307999	4
77	Hex Head Screw	000001x0205	8	000001x0205	8	000001x0205	8
78	Flat Washer	000067x0003	4	000067x0003	4	000067x0003	4
79	Gear Spacer	416017	1	416017	1	416017	1
82	Front Plate	308183	1	308183	1	308183	1
84	Spacer	416438-03	1	416438-03	1	416438-03	1
85	Spring	000071x0144	4	000071x0144	4	000071x0144	4
86	Spacer	-----	-	-----	-	-----	-
87	End Plate	308256	1	308256	1	308256	1
88	Hex Head Screw	000197x0409	12	000197x0409	12	000197x0409	12
89	Hex Head Screw	-----	-	-----	-	-----	-
90	Shim	000153x1201	144	000153x1201	144	000153x1201	144

7.0 REVISIONS

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Eaton Corporation
Airflex Division
9919 Clinton Road
Cleveland, Ohio 44144

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