

WSB 11200



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 the Airflex[®] WCSB Tensioner/Brake



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 Airflex replacement parts could result in substandard product performance, and may void your Eaton warranty. For optimum performance, contact Airflex:

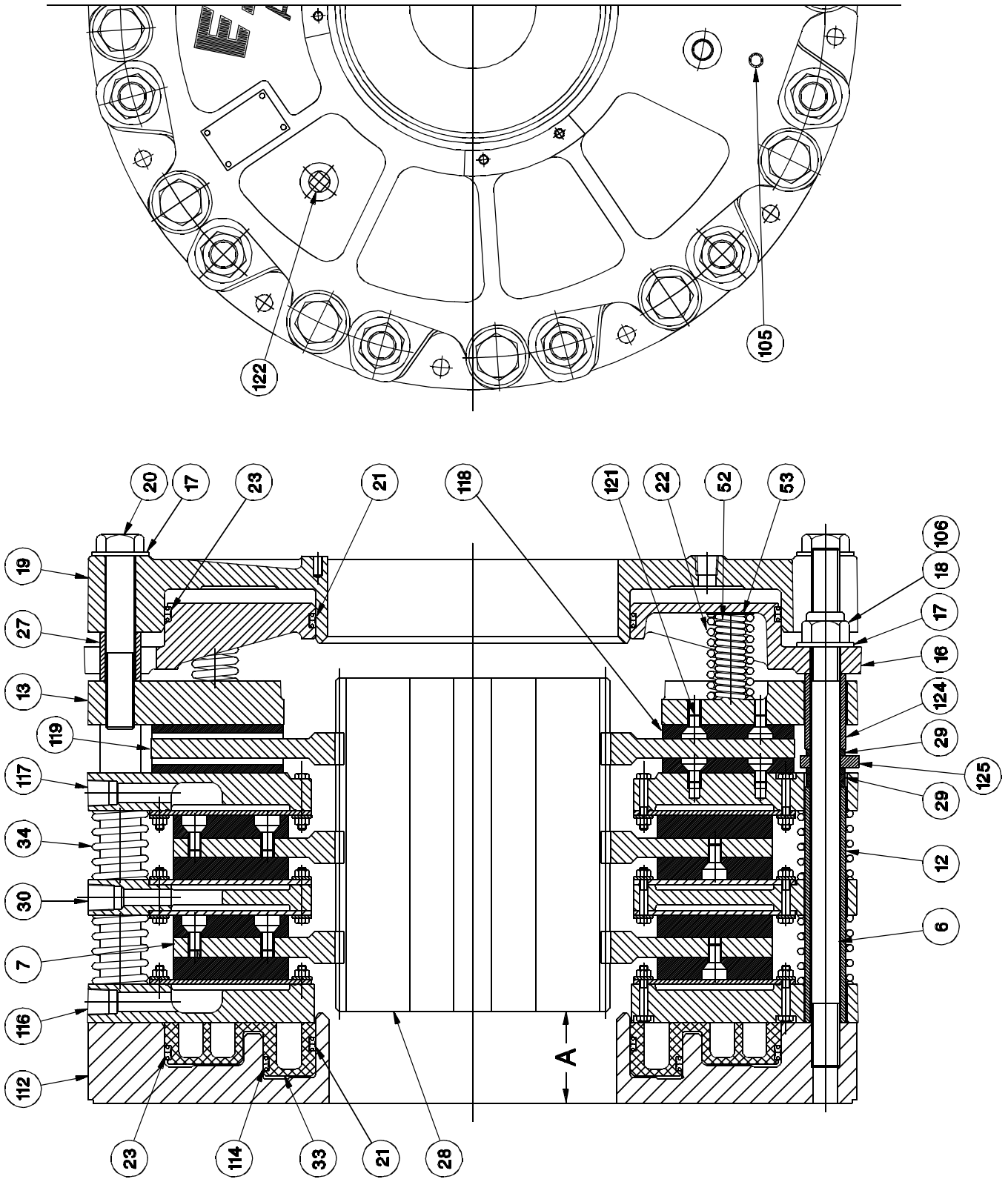
In the U.S.A. and Canada: **(800) 233-5926**
Outside the U.S.A. and Canada: **(216) 281-2211**
Internet: **www.airflex.com**

February, 2000
(Revised: December, 2006)

204170

© Copyright Eaton Corp., 2006. All rights reserved.






Item	Description	Item	Description	Item	Description
6	Stud	23	Seal	112	Mounting Flange / Cylinder
7*	Friction Disc Assembly	27	Spacer Tube	114	Seal
12	Clamp Tube	28	Gear	116*	Pressure Plate Sub-Assy
13	Pressure Plate Sub-Assy	29	Wear Spacer	117*	End Plate Sub-Assy
16	Spring Housing	30*	Reaction Plate Sub-Assy	118	Friction Disc
17	Flat Washer	33	Dual Piston	119	Disc
18	Self Locking Nut	34	Reaction Spring	121	Flat Head Screw
19	Cylinder	52	Inner Spring	122	Pipe Plug
20	Hex Head Screw	53	Spring Retainer	124	Clamp Tube
21	Seal	105	Pipe Plug	125	Stop Plate
22	Outer Spring	106	Sleeve Nut		

* See Section 6.2 for sub-assembly illustrated part lists and component descriptions.

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 .



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






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



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 WCSB water-cooled tensioner is designed for constant tension applications. It is exceptionally well suited for high inertia stopping and rapid heat dissipation. The WCSB incorporates both an air applied watercooled tensioner and an air cooled spring set brake into one relatively compact unit. The watercooled section is used for high energy, constant slip tensioning, while the spring set brake serves as an emergency stopping or parking brake. The design of the WCSB tensioner permits mid-shaft or end-shaft mounting. The rugged construction ensures long, trouble free service.

1.1.2 WCSB tensioners are available in various sizes and quantities of friction discs. The model number identifies the number of discs and the nominal disc diameter. For example, 324WCSB indicates three 24" diameter discs. Note that the air-cooled disc is typically larger in diameter by 2" when compared to the water-cooled disc, therefore, the model number will refer to the diameter of the watercooled discs only. Additional notations are made in describing the model number to indicate the number of watercooled (WC) disc assemblies and number of air cooled (AC) discs. For example, a 436WCSB (3WC/1AC) would indicate three watercooled discs and one air cooled disc, whereas a 436WCSB (2WC/2AC) would indicate two watercooled and two air-cooled discs.

- 1.1.3 When size, such as 36WCSB, is referred to in this manual, it means that the information given applies to all models using the 36" diameter watercooled disc assembly; i.e., 236WCSB, 336WCSB, etc.
- 1.1.4 The air applied pistons in the tensioner are available in either single or dual piston designs. The dual piston feature allows for more finite torque modulation of the tensioner when used with suitable valves and control systems.
- 1.1.5 Tensioners can be used with either closed loop or open loop water systems.
- 1.1.6 This manual includes metric equivalents usually shown in () following the U.S. measurement system value. Be sure to use the correct value.

1.2 How It Works

- 1.2.1 Referring to Figure 1, the gear (28) is mounted on the shaft which is to be stopped and the tensioner assembly is attached to the machine frame or a reaction bracket.

Air pressure is first applied through the ports in the mounting flange/cylinder (112) causing the piston (33) to apply force to the pressure plate assembly (116). As air pressure is applied through the ports in the cylinder (19) on the spring set section of the unit, the cylinder and pressure plate (13), which are attached to each other with screws (20), flat washers (17) and spacer tubes (27), move away from the mounting flange (112), which is connected to the machine frame or reaction bracket. The pressure plate compresses the springs (22) and (53) against the stationary spring housing (16). As the pressure plate moves, the end plate subassembly (117) also moves away from the mounting flange/cylinder until it rests against the stop plates (125) which are axially fixed. The pressure plate (13) then continues to move away from the end plate subassembly and the clamp force is removed from the disc (119) that rides on the gear.

As the end plate subassembly (117) moves towards the stop plates, the piston (33) and friction disc subassemblies (7) also move by means of the air pressure initially applied. Relieving the air pressure within the mounting flange/cylinder reduces the clamp force applied to the friction discs, allowing the shaft to

be free to rotate. Modulation of the air pressure then controls applied torque of tensioner.

As air pressure is exhausted from both the mounting flange/cylinder (112) and the cylinder (19), the springs force the pressure plate (13) toward the mounting flange, clamping the disc (119) between the pressure plate and the end plate subassembly (117). As the piston (33) retracts, the endplate subassembly continues to move towards the mounting flange/cylinder, pressing against the friction disc assemblies (7), reaction plate (30) and pressure plate subassembly (116). As the pressure plate (116) comes to rest against the mounting flange, the spring force clamps all discs between adjacent surfaces, applying stopping torque to the shaft.

High heat dissipation within the tensioner section in the WCSB is accomplished by passing water through a special cavity behind copper alloy wear plates (3).

2.0 INSTALLATION



Warning:

Only qualified maintenance personnel should install, adjust or repair these units. Faulty workmanship will result in unreasonable exposure to hazardous conditions or personal injury.



Caution:

Read these instructions thoroughly and review until you fully understand the installation sequence before proceeding with the work described in this section. Failure to follow these instructions will result in unreasonable exposure to hazardous conditions or personal injury.



Caution:

Do not paint the clamp tubes (12), (124), wear spacers(29), or the springs (34), as this may hinder the engagement or disengagement of the tensioner.

2.1 Preparation

- 2.1.1 Refer to the appropriate assembly drawing (available upon request) for appropriate envelope dimensions, mounting register diameters, mounting bolt circles and positions, and stud support bracket recommendations for each specific tensioner.
- 2.1.2 The tensioner reaction member should have a machined register to allow for mounting and alignment control of the tensioner and allow for full support of the face of the mounting flange/cylinder (112).
- 2.1.3 For proper operation and service life, the tensioner reaction member must be aligned to the shaft within the limits shown in Table 1.

TABLE 1 Alignment Requirements		
Size	Concentricity (Parallel, TIR) of Shaft and Tensioner (Inches (mm))	Perpendicularity (Angular, TIR) of Mounting Flange to Shaft * (Inches (mm))
18WCSB	0.010 (0.25)	0.010 (0.25)
24WCSB	0.010 (0.25)	0.012 (0.30)
36WCSB	0.010 (0.25)	0.019 (0.48)
48WCSB	0.010 (0.25)	0.025 (0.64)

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



Caution:

Proper alignment is necessary to ensure that the friction discs track properly. Improper alignment will result in excessive wear to the friction material and mating surfaces, plus the gear and splined bore of the friction disc assemblies. See Figure 2.

- 2.1.4 Refer to the appropriate assembly drawing for the setup dimension between the tensioner mounting surface and the end of the gear (dimension "A" on Figure 1). Gears should be positioned to ensure that - when the tensioner is mounted - the disc splines will not overhang the end of the gear when components are in both new and worn conditions. The gear is typically bored and keyed for a resulting Class FN2S interference fit for inch shafting and ISO System S7h6 for metric shafting. Contact Airflex Application Engineering for specific recommendations.

2.2 Mounting

- 2.2.1 The WCSB must be mounted to a clean, rigid surface with hardened flat washers and screws of the grade, quantity, and size as listed in Table 2. Mounting to a properly aligned, rigid surface *that fully supports the face of the mounting flange* minimizes any deflection during operation and helps to ensure that the friction discs will track properly on the copper wear plates.



Danger:

Use only the proper number and grade fasteners shown in Table 2. Use of commercial grade (Grade 2) fasteners where Grade 8 fasteners are specified may result in failure of the fasteners and a sudden and drastic reduction in brake torque.



Caution:

Water inlets and outlets must be located as close as possible to the 6 o'clock and 12 o'clock positions, respectively. This will prevent air pockets in the water cavity, which would allow the tensioner to overheat.

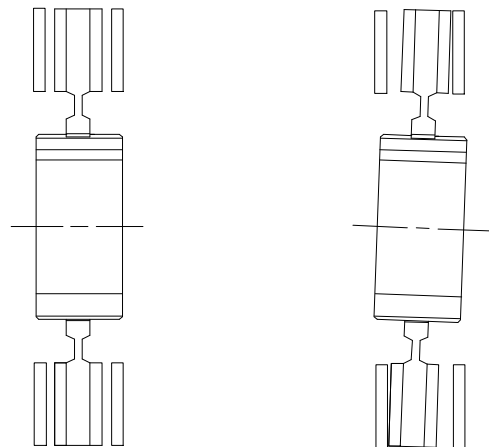


Fig. 2

TABLE 2 Fastener Description and Assembly Torque - ft.-lb. (Nm)					
Item # Description	Specification	18WCSB	24WCSB	36WCSB	48 WCSB
4 / 5 Wear Plate Screws	Size	5/16-18 NC Gr. 8	5/16-18 NC Gr. 8	3/8-16-NC2 Gr.8	3/8-16-NC2 Gr.8
	Torque, Dry	21 (28)	21 (28)	40 (54)	40 (54)
18 / 106 Locknut	Size	3/4-10 NC-3 Gr. 8	1 1/8-7 NC Gr. 8	1 3/8-6 NC Gr. 8	1 3/8-6 NC Gr. 8
	Torque, Lubed	150 (203)	500 (677)	750 (1016)	750 (1016)
20 Hex Head Screw	Size	3/4-10NC-2 Gr. 8	1 1/8-7NC Gr. 8	1 3/8-6NC Gr. 8	1 3/8-6NC Gr. 8
	Torque, Lubed	150 (203)	500 (677)	750 (1016)	750 (1016)
57 WC Friction Disc screw	Loctite	#242	#262	#262	#262
	Torque, Lubed	75 in.-lb.	15 ft.-lb.	15 ft.-lb.	15 ft.-lb.
121 Dry Friction Disc Screw	Loctite	#262	#262	#262	#262
	Torque, Lubed	20 ft.-lb.	20 ft.-lb.	20 ft.-lb.	20 ft.-lb.
Mounting Screw	Size	5/8-11NC-2 Gr. 8	5/8-11NC-2 Gr. 8	1-8 NC Gr. 8	1 3/8-6NC Gr. 5
	Quantity	10	10	14	14
	Torque, Lubed	150 (203)	150 (203)	660 (895)	1100 (1490)

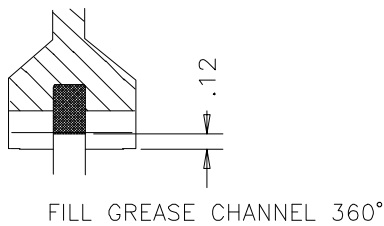


Fig. 3

2.2.2 Ensure that the shaft is free of nicks or burrs and the key fits properly in the shaft and gear.

2.2.3 Apply a light coat of anti-seizing compound to the shaft and key. Tap the key into the shaft keyway.

Note: Before installing the gear (28) onto the shaft, slide it into the brake assembly to align the splines in the friction disc assemblies. Air pressure must be applied to the brake cylinder (19) to release the friction disc assemblies for alignment. Once the gear passes through all friction disc assemblies, exhaust the air to clamp them into position and remove the gear.

2.2.4 Heat the gear uniformly to 250°F (121°C) to expand the bore and ease assembly. Press

the gear onto the shaft, making sure that the dimension between the gear and the tensioner mounting surface ("A") is maintained. See Figure 1. Allow the gear to cool.

2.2.5 Apply a thin coat of MOLUB-ALLOY® OG Heavy - or equivalent - grease to the splines of the gear.



Caution:

Excessive lubricant may contaminate friction material, resulting in erratic response or loss of torque.



Caution:

The use of anti-seize or bearing greases on the gear splines may result in premature gear and disc spline wear.

2.2.6 Pre-fill the grease channel in the friction disc splines (if applicable) with MOLUB-ALLOY® OG Heavy - or equivalent - grease, as shown on Figure 3.

2.2.7 Rig the WCSB into position and slide it over the gear. Avoid placing lifting straps or cables directly on the release springs (34).

TABLE 3 Actuation Port Sizes			
Size	Cylinder (3 ports)	Mounting Flange (Small Piston)	Mounting Flange (Large Piston)
18WCSB	1/2"-14 NPT	1/4"-18 NPT	1/2"-14 NPT
24WCSB	1/2"-14 NPT	1/4"-18 NPT	1/2"-14 NPT
36WCSB	3/4"-14 NPT	3/8"-18 NPT	3/4"-14 NPT
48WCSB	1"-11.5 NPT	1/2"-14 NPT	1"-11.5 NPT

2.2.8 While supporting the WCSB, connect an air supply to the cylinder (19) and apply adequate pressure to release the brake. Attach the mounting flange (2) to the mounting surface using the appropriate fasteners. Tighten the fasteners to the specified torque value. See Table 2. Exhaust the air from the cylinder after tightening the fasteners.



Caution:

Maximum allowable air pressure in the cylinder (19) is 150psi (10.2 bar).

2.2.9 Some brakes (typically 3 and 4 disc assemblies) require an additional support bracket to minimize torsional deflection during operation. Refer to the appropriate assembly drawing for bracket recommendations. The bracket, when required, will fit over the sleeve nuts (106) located on the studs (6) closest to the 6 o'clock position. Secure the bracket onto the sleeve nuts with flat washers (17) and locknuts (18). Tighten the locknuts to the value listed in Table 2. Shim the base of the support bracket as required. Install and tighten fasteners as required to secure the bracket into position.



Warning:

Ensure that the support bracket does not interfere with or bind on the cylinder (19). Interferences could prevent the brake from properly engaging or releasing.

2.2.10 WCSB tensioners should be covered to protect the unit from dirt, rain, overspray, and other sources of external contamination. In extreme environments the use of a sealed enclosure with internal strip heater is recommended to prevent moisture from collecting on the unit.

2.3 Air System



Warning:

Operation of the WCSB at pressures exceeding those specified in Section 3.2 may result in damage to components.



Caution:

Minimum releasing pressure for the spring set brake should be observed. Operation at pressures below minimum will result in brake drag, excessive heat and wear, and damage to brake components.



Caution:

When applying operating pressure to only one of two ports on units with dual pressure pistons (33), the second piston pressure port must be open and vented to atmosphere. Porting should be filtered to avoid contamination of the piston/cylinder during single piston actuation.

2.3.1 Maximum allowable pressure is 150psi (10.2 bar) in the spring set brake cylinder (19), and 150psi (10.2bar) in the air applied mounting flange / cylinder (112). See Section 3.2 for other limitations.

2.3.2 Use only clean, filtered air (a 50 micron filter or better is recommended) which is free of excess moisture. Exhaust porting in dual pressure piston/cylinders should also be filtered to avoid contamination when open to atmosphere during single port actuation.

- 2.3.3 Air inlet sizes are shown in Table 3. Air inlets for the spring set brake are on the face of the cylinder (19). Air inlets for the air applied tensioner (radially located in the mounting flange) should be located at or near the 6 o'clock position to facilitate purging of moisture that may accumulate in the air system.
- 2.3.4 All pipes should be free of metal chips, cutting compound and any other foreign matter. Pipe ends should be reamed after cutting to eliminate possible restrictions. For optimum air system response, a minimum number of bends and elbows should be used.
- 2.3.5 The final connection to the brake inlet ports on the cylinder (19) must be made with flexible hose. If using only one inlet, connect the hose to the lowest position.
- 2.3.6 The WCSB tensioner does not require lubricated air; however associated control valves may. Consult the valve manufacturer for appropriate recommendations.

2.4 Coolant System



Caution:

Make sure that the water inlets and outlets are as close as possible to the 6 o'clock and 12 o'clock positions, respectively. This will help to minimize the formation of air pockets in the water cavity during operation, which could contribute to overheating of the tensioner.

- 2.4.1 Maximum allowable coolant pressure is 40psi for size 36 and 48 WCSB units and 45psi for all other sizes. The use of an accumulator or pressure relief valve may be desirable to reduce the effect of pressure spikes in the coolant system during operation.



Warning:

Maximum allowable water pressure is dependent upon tensioner size. Applied pressure or surges exceeding maximum allowable may result in damage to the tensioner.

- 2.4.2 The coolant supply and discharge hose, pipe and fitting sizes, along with minimum flow rates for the tensioner rated horsepower, are listed in Table 4.
- 2.4.3 Coolant supply connections to the tensioner should provide a parallel flow through each section of the tensioner. Series flow is not recommended, as it can lead to overheating of the tensioner.
- 2.4.4 Inlet and outlet coolant manifolds must be provided. Manifolds should be constructed to allow for even flow through all ports.

Note: Reaction plates (30) typically have two inlet and two outlet ports to provide for balanced flow to each cooling chamber. In the event that an older style reaction plate with only one inlet and one outlet port is used, water flow should be restricted at the inlets to the pressure plate (116) and end plate (117) to allow for equally proportional heat dissipation at each cooling cavity. Contact the factory for information on water flow balancing when using single ported reaction plates.

- 2.4.5 Use flexible connecting hose to each tensioner coolant section to allow axial travel of the pressure plate, reaction plate, and end plate during tensioner operation. Hose lengths running between the manifold and the inlet or outlet ports should be equal in length, if possible. Reductions in the recommended line diameter should be avoided to prevent excessive line pressures.
- 2.4.6 Avoid the use of sharp bends and elbows that will restrict water flow. Loops and bends in the lines may create air pockets, which substantially reduce the flow of coolant and can contribute to overheating.
- 2.4.7 Coolant and coolant supply lines should be free of foreign material (a 500 micron water filter is recommended). In the event that contaminated water is used as a coolant (not generally recommended), use of a multi-stage filter / strainer may be desirable to avoid the need for frequent cleaning of fine mesh filters.
- 2.4.8 Figure 4 illustrates a typical closed loop liquid to liquid coolant system. The heat exchanger and temperature control would be replaced with a radiator, fan and motor in a liquid to air system.

TABLE 4
Coolant Supply Data

Qty of Water-cooled Discs / Disc Size		Thermal Rating ¹ HP (kW)	Water Inlet and Outlet Pipe Size (Minimum piping I.D.)	Min. Flow Rate ² GPM (dm ³ /min) 100% Water	Min. Flow Rate ² GPM (dm ³ /min) 70% Water, 30% Ethylene Glycol by Vol.	Min. Flow Rate ² GPM (dm ³ /min) 60% Water, 40% Ethylene Glycol by Vol.	Min. Flow Rate ² GPM (dm ³ /min) 50% Water, 50% Ethylene Glycol by Vol.
1	18"	120 (89.4)	1/2"-14 NPT	12 (45.4)	14 (53.6)	15.6 (58.8)	18 (67.9)
2		240 (179)		24 (91)	28 (106)	31(117)	36 (136)
3		360 (268)	(1/2")	36 (136)	42 (162)	47 (177)	54 (204)
1	24"	270 (201)	3/4"-14 NPT	27 (102)	32 (121)	35 (132)	40 (151)
2		540 (402)		54 (204)	64 (242)	70 (265)	80 (303)
3		810 (603)	(3/4")	81(305)	96 (361)	105 (395)	120 (451)
4		1080 (805)		108 (406)	128 (481)	140 (526)	160 (602)
1	36"	650 (485)	1 1/4"-11 NPT	65 (246)	76 (288)	84 (318)	98 (371)
2		1300 (969)		130 (489)	152 (572)	168 (632)	196 (737)
3		1950 (1454)	(1")	195 (738)	228 (863)	253 (958)	294 (1113)
4		2600 (1937)		260 (978)	304 (1143)	336 (1263)	392 (1474)
1	48"	1300 (969)	1 1/4"-11 NPT	130 (489)	152 (572)	168 (632)	196 (737)
2		2600 (1937)		260 (978)	304 (1143)	336 (1263)	392 (1474)
3		3900 (2906)	(1 1/4")	390 (1467)	456 (1715)	504 (1895)	588 (2211)
4		5200 (3874)		520 (1956)	608 (2286)	672 (2526)	784 (2948)
1 - Thermal rating based on a 70°F (21°C) water inlet temperature and a 50°F (28°C) temperature rise between inlet and outlet.							
2 - Flow rate is based on requirement of 1 U.S. GPM per 10 HP (1.97 kW per dm ³ /min) thermal dissipation.							

2.4.9 The coolant supply temperature at the inlet should be 100°F (38°C) or lower. The coolant outlet temperature should not exceed the values given in Table 5. However, *in no event* should there be more than a 50°F (28°C) temperature rise between inlet and outlet. See Table 5 for maximum allowable outlet coolant temperature with various water/ethylene glycol mixtures and other cooling media.

2.4.10 Open Loop Systems

For efficient operation of the WCSB, an adequate supply of filtered fresh water is required. (See 2.4.1-2.4.2). Excessive water hardness promotes the formation of scale deposits, which, in time, will affect the service life of the WCSB unit. Water of high acidity or high in

corrosive salts may cause electrolytic corrosion between the dissimilar metals used in the water cavities. Water treatment should be considered if the properties of the water exceed the following:

Equivalent calcium carbonate content hardness): Maximum 100 p.p.m.

pH value: 7.0 to 9.0.



Caution:

Open loop systems should be thoroughly flushed with clean fresh water after operation to reduce the corrosive effects of contaminants on internal components.

TABLE 5 Maximum Mixture Outlet Coolant Temperature	
Water/Ethylene Glycol Mixture % by Volume	Maximum Outlet Coolant Temperature °F (°C)
100/0	150 (66)
70/30	165 (74)
60/40	165 (74)
50/50	170 (77)

2.4.11 Closed Loop Systems

For efficient operation of the WCSB in a closed loop system, ethylene glycol coolant conforming to SAE Standard J1034 should be used. For preparation of the proper concentration of a water/ethylene glycol mixture, use make-up water which is low in corrosive ions such as chlorides and sulfates.

Recommended pH value of the water/ethylene glycol mixture: 7.5. to 10.5.

3.0 OPERATION

3.1 Conditions of Operation

The following Hazard Warnings are to be followed for proper WCSB functioning:

Warning:

Friction lining must be worn in to achieve product torque rating. Verify proper operation before putting the product into service. See Section 3.3 for additional burnishing procedures.

Warning:

Protective means must be used to prevent oil, grease, dirt or coolant from coming into contact with the surfaces of the friction discs (8), (118), disc (119) or the wear plates (3). Oil or grease on these parts will significantly reduce the torque capacity of the unit. Dirt or coolant will produce erratic torque. Do not risk personal injury or damage to the equipment!

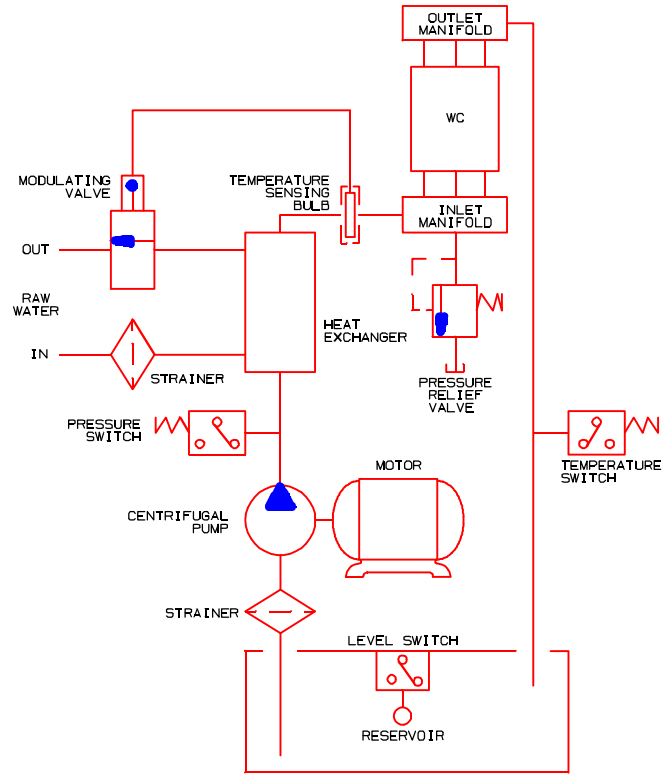


Fig. 4

Warning:

Maximum free wheeling speed must not exceed the speeds listed in Table 6. Exposure to speeds in excess of these values may cause the friction discs (8) to burst and result in extensive damage to the tensioner and/or cause personal injury.

Caution:

For proper cooling of the WCSB tensioner, it is required that the coolant inlet be located as close as possible to the 6 o'clock position and the outlet be located near the 12 o'clock position. This will help to assure that all coolant cavities are water-filled to help avoid overheating.



Caution:

For operation in subfreezing temperatures, ethylene glycol antifreeze must be added to the water. The antifreeze content of the mixture is critical and should not exceed 50% by volume. Excessive amounts of antifreeze will reduce cooling capacity and can cause coolant leakage due to overheating. Refer to Table 5.



Caution:

Maximum ambient temperature is 110°F (43°C). Minimum ambient temperature for closed loop systems using ethylene glycol antifreeze is 0°F (-18°C). For open loop systems using water, the minimum temperature is 45°F (7°C).

3.2 Pressure and Speed Limits

3.2.1 Maximum allowable coolant pressure is 40psi for size 36 and 48 WCSB units and 45psi for all other sizes. The use of an accumulator or pressure relief valve may be desirable to reduce the effect of pressure spikes in the coolant system during operation.



Warning:

Maximum allowable water pressure is dependent upon tensioner size. Applied pressure or surges exceeding maximum allowable may result in damage to the tensioner.

3.2.2 Maximum slip speeds and free wheeling disc speeds are shown in Table 6.



Caution:

Excessive slip speeds will result in rapid friction material wear. For good life, the values in Table 9 should not be exceeded.

3.2.3 Maximum allowable pressure is 150 psig (10.2 bar) in the spring set brake cylinder (19). Refer to the assembly drawing (available on request) for minimum pressure required for full release of the spring set brake. Release pressure is dependent upon the quantity of springs (22) (52) used in the specific brake.

3.2.4 Maximum allowable pressure within the air applied tensioner mounting flange/cylinder (112) is 150psi (10.2bar). Maximum operating pressure is specified on the assembly drawing mentioned in 3.2.3.

3.3 Wear-in Procedures

3.3.1 In order to improve initial operation and brake torque, it is suggested that the non-asbestos friction material used in WCSB brakes be worn-in prior to normal operation to improve contact of the mating friction surfaces.



Caution:

Machine operation should be monitored closely until the friction couple wears in.

3.3.2 The shaft on which the brake discs are mounted should be free to rotate to allow for run-in. On drawworks applications, disconnect the wire rope from the drawworks drum to allow operation as described in the following paragraphs.

3.3.3 Ensure that the coolant system is operating prior to dynamic operation of the WCSB tensioner. Verify that coolant temperature, pressure and flow values are within required settings or limits during operation.



Caution:

Dynamic operation of the WCSB - including while in the fully released condition - is not recommended without proper coolant flow in the tensioner. Heat generated during operation could result in damage to brake components.

TABLE 6 Maximum Disc Speeds		
Size	Max. Slip Speed RPM	Max. Free Wheeling Speed RPM
18WCSB	955	1600
24WCSB	715	1200
36WCSB	475	790
48WCSB	360	600

- 3.3.4 Release the brake by applying full release pressure through the ports in the cylinder (19) to allow the brake to freely rotate. Apply no pressure to the tensioner pressure ports in the mounting flange / cylinder (112).
- 3.3.5 Run the motor to achieve a brake disc speed listed in Table 6A. Exhaust the air pressure in the brake rapidly to 90psi. Slip the brake for the time specified in Table 6A, but **DO NOT ALLOW THE BRAKE TO SLIP FOR MORE THAN THE TIME SPECIFIED.**



Caution:

Slipping the brake at increased time intervals, speeds or pressures other than specified will result in damage to brake components.

- 3.3.6 After the brake has engaged / slipped for up to the maximum slip time specified in Table 6A, quickly apply full air pressure to completely release the brake. Smoke rising from the brake should be expected. Freewheel the brake discs at the speed listed in Table 6A, allowing the the brake disc (119) to cool to a temperature below 120°F. The use of fans or clean, dry compressed air can be used to accelerate the cooling process.



Caution:

Use proper safety precautions when using forced ventilation.

- 3.3.7 Monitor the brake disc (119) temperature after slipping and cooling. Do not allow the brake disc temperature to exceed 180°F.
- 3.3.8 Repeat steps 3.3.4 thru 3.3.7 for the number of cycles shown in Table 6A to allow for adequate wear-in of the air-cooled brake.

quate wear-in of the air-cooled brake. Allow the brake disc to completely cool to ambient temperature prior to testing the torque capacity of the brake or returning it to service.

3.4 Operational Sequence

- 3.4.1 Ensure that the coolant system is operating prior to dynamic operation of the WCSB tensioner. Verify that coolant temperature, pressure and flow values are within required settings or limits during operation.



Caution:

Dynamic operation of the WCSB - including while in the fully released condition - is not recommended without proper coolant flow in the tensioner. Heat generated during operation could result in damage to brake components.

- 3.4.2 Air pressure is first applied through the ports in the mounting flange/cylinder (112) to apply force to the piston (33) in the tensioner. Adequate pressure should be applied to support the load the tensioner is controlling. Air pressure is then applied through the ports in the cylinder (19) on the spring set section of the unit, until it is fully released.



Caution:

Observe all pressure and speed limits while operating the WCSB tensioner. See Section 3.2.

- 3.4.3 After release of the spring set brake, slowly relieve the air pressure within the mounting flange/cylinder (112) to reduce the clamp force applied to the friction disc assemblies (7), allowing the shaft to rotate. Modulation of the air pressure will vary the applied torque of the tensioner. Modulation control is dependent upon the specific pneumatic control system used. Refer to the manufacturers information for operation of control valves or feedback systems.
- 3.4.4 WCSB tensioners with dual pressure pistons (33) provide a more finite range of control. Each chamber within the dual pressure piston can be pressurized independently or simultaneously.

TABLE 6A Wear-in Parameters			
Size	Operating Speed (RPM)	Slip Time (Seconds)	Wear-in Cycles Required
24 WCSB	120	16	30
36WCSB	60	20	30
48WCSB	30	20	30



Caution:

When applying or exhausting operating pressure to only one of two ports on units with dual pressure pistons (33), the second piston pressure port must be open/vented to atmosphere. Open ports should be filtered to avoid contamination of the piston and cylinder during piston operation.

- 3.4.5 Exhausting air pressure from the cylinder (19) of the spring set brake allows it to engage. Air pressure within the mounting flange/cylinder (112) can be exhausted simultaneously with that in the cylinder (19). For more rapid brake response, exhaust the air pressure in the mounting flange/cylinder (112) after engaging the spring set brake.

Note: The spring set brake is intended for parking or emergency braking only.



Warning:

Dynamic braking with the air cooled, spring set brake is not recommended except for emergency stopping situations or during initial wear-in. High heat generated during dynamic braking can result in damage or failure of the brake components.



Caution:

Rapid engagement of a fully released tensioner/brake could result in pressure spikes within the coolant cavities and subsequent leakage.

3.5 Periodic Maintenance

- 3.5.1 As the friction material wears, adjustment of the brake may be required to keep pistons and cylinders within the proper stroke range. See the MAINTENANCE section for wear adjustment procedures and component wear limits.
- 3.5.2 Periodically check for external air leakage in the area of the piston seals (21) (23), and internal leakage across the dual pressure piston seals (114). For replacement, refer to procedures in Section 4.0, Maintenance.
- 3.5.3 Moisture that may accumulate in the brake cylinder can be purged on size 36WCSB and 48WCSB units. With air pressure exhausted

from the cylinder, remove the pipe plug (105) at the 6 o'clock position on the cylinder, and apply low air pressure to assist in expelling any excess moisture. After draining the cylinder, reinstall the pipe plug, applying a pipe thread sealant on the threads prior to installation.



Caution:

Applied air pressure greater than 10psi should not be used when draining the cylinder. Use adequate shielding to avoid contact with direct spray from moisture being purged from the cylinder.

- 3.5.4 Periodically observe the discs while the brake or tensioner is fully released. Dragging discs may be caused by wear or contamination of the gear or disc splines, disc imbalance, warped discs, or misalignment. Correct as required.
- 3.5.5 Pneumatic and electrical control interlocks should be periodically checked for proper settings and operation.
- 3.5.6 If leakage or blockage of any watercooled chamber is suspected, a static or dynamic test may be performed as follows:
 - 3.5.6.1 **Static Pressure Test:**

- a) Release the spring set brake by applying the proper air pressure,



Warning:

Ensure that the machinery will remain in a safe position prior to releasing the brake.

- b) Bleed all air from within the coolant cavity. Air bleeding must be accomplished by running coolant through the cavity with the tensioner secured in its proper operating position.

Note: Avoid contaminating the friction material with coolant or water.



Warning:

Contamination of the friction material could result in erratic or loss of torque.

- c) After the air has been removed, install a pipe plug(s) in the outlet(s) and apply maximum allowable coolant pressure measured at the inlet to the water cavity. Maximum allowable is 40 PSIG (2.7 bar) for size 36" and 48" units, and 45 PSIG (3.0 bar) for all other sizes. Maintain this pressure for 30 minutes. Check for leakage at O.D. and I.D. sealing areas.

 **Caution:**

Be sure to apply and retain air pressure to the cylinder (19) of the tensioner to release the spring pressure on the tensioner/brake during static coolant pressure testing. Engagement of the brake during testing could develop surge pressures exceeding the maximum allowable within the coolant cavities resulting in possible damage to the seals.

3.5.6.2 **Dynamic Flow Test:**

- a) Dynamic flow testing of the tensioner should be conducted at the required flow rate for the rated HP dissipation and coolant quality, as given in Table 4. Inlet pressure for the appropriate tensioner size is not to be exceeded.
- b) There should be no restrictions on the outlet side of the brake to cause any backpressure to the unit. Coolant inlet and outlet sizes are listed in Table 4. Full size hoses and piping should be used. Check for low flow and/or leakage at the O.D. and I.D. seal areas.

4.0 MAINTENANCE

 **Warning:**

Before doing any maintenance work on the WCSB tensioner/brake, make sure that the machinery will remain in a safe position. Failure to do so could result in serious injury or possibly death.

 **Warning:**

Only qualified maintenance personnel should install, adjust or repair these WCSB units. Faulty workmanship will result in unreasonable exposure to hazardous conditions or personal injury.

 **Caution:**

Read these instructions thoroughly and review until you fully understand the parts replacement steps before proceeding with the work described in this section. Failure to follow these instructions can result in unreasonable exposure to hazardous conditions or personal injury.

4.1 Wear Limits

 **Warning:**

Periodically examine the tensioner for wear of friction linings, discs and wear plates. Failure to perform this examination will result in excessive wear, a significant reduction in torque, and may result in personal injury and/or damage to the machinery.

- 4.1.1 Wear limits for the WCSB components are shown in Table 7. If any wear limit has been reached or exceeded, that component must be repaired or replaced.

TABLE 7			
Wear Limits for WCSB Components (Ref. Fig. 1 and Section 6.2)			
Item	Description	Wear Limit	Remarks
#3 Wear Plate	Friction Wear Surface	Maximum wear is: 18 WCSB - 0.030" 24 WCSB - 0.045" 36 WCSB - 0.050" 48WCSB - 0.060"	Wear will be in form of even wear or circular grooves in the copper surface.
#8 Friction Disc	Friction Material	Fully worn at bottom of dust groove, or step on O.D. for size 48". See Figure 5. Friction material must also be replaced if contaminated with oil or grease.	Brakes have adjustment provision. See Section 4.2.
#9, #28, #119 Friction Disc Core, Gear, and Disc	Gear Backlash	Maximum total backlash is 0.060" (1.5 mm).	If step is worn in gear, gear must be replaced.
#12 Clamp Tube	Reaction Area	Maximum wear is 0.015" (0.38 mm).	Wear will be in the form of a notch or step on the side of the tube.
#13, #30, #54, #116, #117	Reaction Holes	Maximum wear is 0.031" (0.80 mm).	Wear will be in the form of elongation of the holes. Original hole diameters are shown on the table below.
#19 Cylinder	Seal Area	Maximum radial wear is 0.005" (0.13 mm).	Wear will be in the form of grooves where the seals contact the cylinder wall.
#34, #22, #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.
#119 Disc	Friction Wear Surfaces	Maximum wear is .045" (1,12mm) per surface. (0.090" (2,24mm) total).	Original thickness is 1.00" (25,4) for sizes 18 and 24, and 1.25" (31,7) for sizes 36 and 48.

Item	Description	Tensioner Size			
		18 WCSB	24 WCSB	36 WCSB	48 WCSB
#13, #30, #54, #116, #117	Original Reaction Hole Diameters in the Pressure Plate and Reaction Plate	1.312 (33,33)	1.688 (42,88)	2.065 (52,45)	2.375 (60,33)
34	Original Free Height		4.00 (101,60)	4.00 (101,60)	5.00 (127,00)
	Minimum Free Height		3.88 (98,55)	3.88 (98,55)	4.85 (123,19)
22	Original Free Height		5.18 (131,57)	6.65 (168,91)	9.00 (228,60)
	Minimum Free Height		4.90 (124,46)	6.37 (939,8)	8.75 (222,25)
52	Original Free Height	-----	5.23 (132,84)	6.78 (172,21)	-----
	Minimum Free Height	-----	4.95 (125,73)	6.50 (165,10)	-----

4.2 Wear Adjustment

Wear adjustment is periodically required as the friction material and mating surfaces wear. Wear adjustment reduces the running clearances between these surfaces to help maintain the holding force of the brake (for the spring applied feature), and to maintain the responsiveness of the brake by limiting the travel of components. Mechanical limits within the brake design require that the brake be adjusted when the adjustment points listed in Table 8 have been reached.



Warning:

Failure to perform adjustments when required may result in loss of adequate brake torque and potential injury to personnel or damage to equipment. Be certain to inspect the brake periodically to evaluate for wear, and adjust as necessary.

4.2.1 Brake Inspection and Evaluation

To determine when brake adjustment is required, the brake should be evaluated as follows:

4.2.1.1 Visually inspect for friction material wear.

The friction material is fully worn when the wear has reached the bottom of the wear groove as shown in Figure 5b.

Note: Friction blocks for the air cooled brake in size 48" brakes have a step on the outer edge of the friction material rather than a wear groove. The material is fully worn when wear has reached the step on the outer edge of the friction material. See Figure 5a.

- If fully worn – replace the material and evaluate the condition of the mating wear surface.

- If the wear limits of any of the friction discs or blocks have not been reached, determine if brake adjustment is required by proceeding to the next steps.

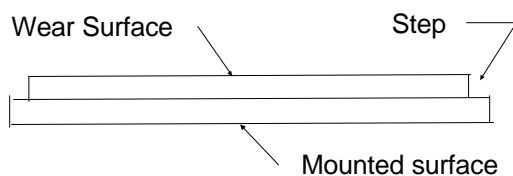


Fig 5a

4.2.1.2 Measure for brake wear:

- a) Ensure that the load that the brake supports will be properly secured from possibility of movement when no pressure is being applied to the brake(s) being inspected.
- b) Exhaust all air pressure from the pressure chambers on both ends of the WCSB brake being evaluated. Pressurized areas are located in the:
 - Cylinder (item 19) and
 - Mounting Flange (item 112).

If more than one WCSB brake is used in the driveline, exhaust all air pressure from those brakes also.

Note: Follow the recommendations of the control system manufacturer to ensure that no air pressure is trapped in the brake or control system, and that the control system has been safely isolated from the brake while performing inspections.

- c) Verify that the air pressure has been fully exhausted from these chambers by checking any in-line gauges (they should read zero pressure), and also by inspecting specific gaps between components as noted below. Refer to Figures 6 and 6a for the corresponding gap locations.

Pressure in the cylinder (item 19) has been exhausted if the measured gap Z is greater than zero, and there is no clearance between each side of the disc (item 119) and the corresponding friction material.

Pressure in the mounting flange (item 112) has been exhausted if gap Z-2, located between the mounting flange and the pressure plate (item 116) is closed and gap W is greater than zero.

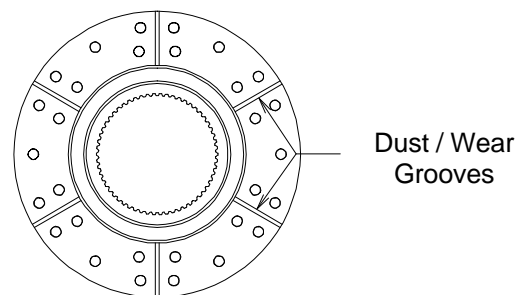


Fig 5b

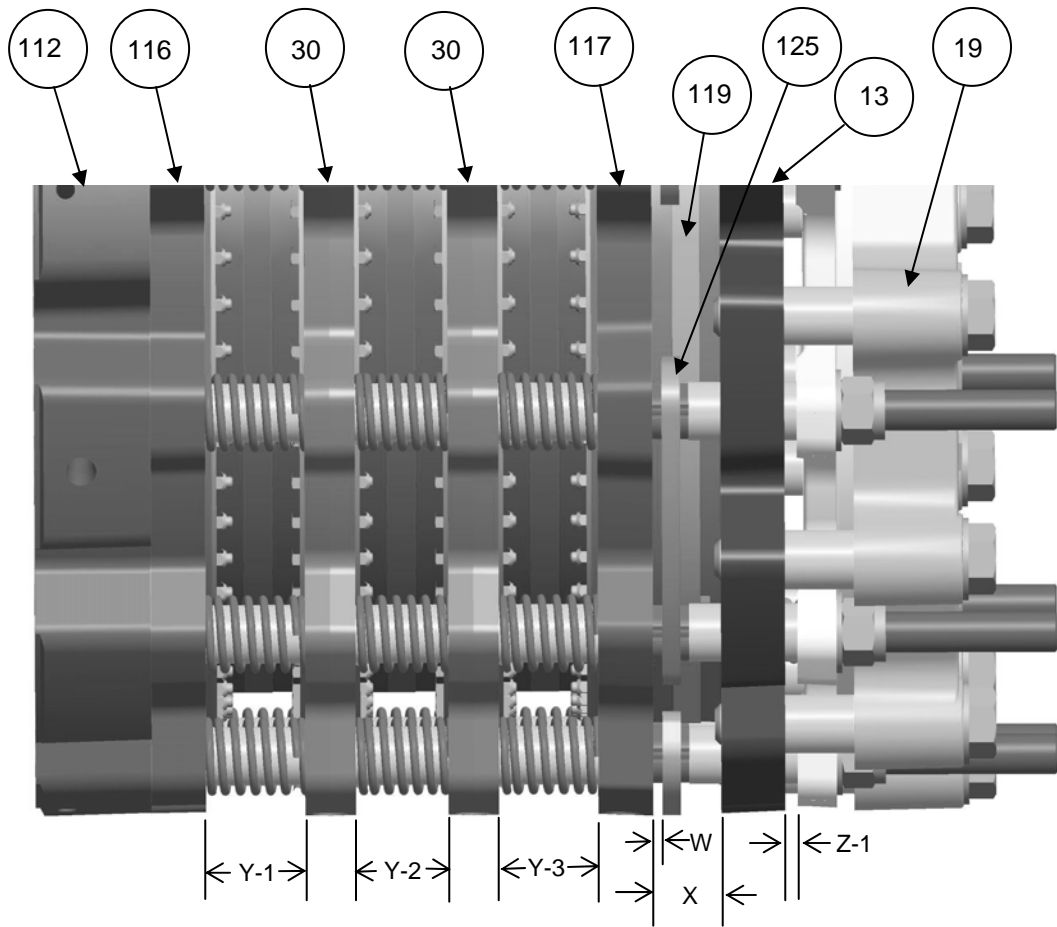


Fig. 6

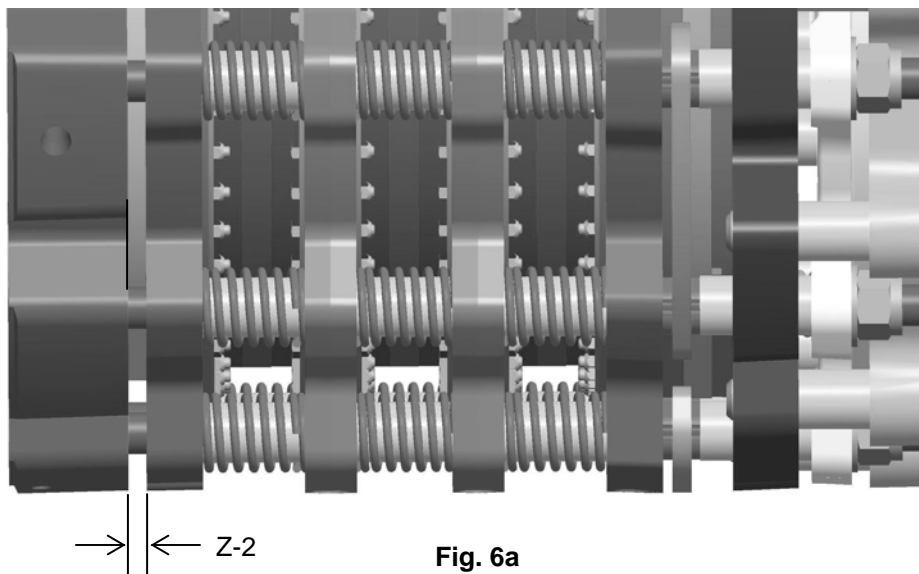


Fig. 6a

- d) Measure gaps between the components at positions W, X, Y-1, and if applicable, Y-2, and Y-3. See Figures 6, and 6a for the location of those gap positions.

For reference:

The W-gap is the measurement between the end plate (item 117) and the stop plates (item 125) and is used to determine when adjustment of the water-cooled section of the brake is required. This gap will increase as the brake wears.

The X-gap is the measurement between the end plate (item 117) and the pressure plate sub-assembly (item 13) and is used to determine when adjustment of the air-cooled section of the brake is required. This gap will decrease as the brake wears.

The Y gaps are measurements between the various wear plate sub-assemblies and are used to help evaluate the wear of the water-cooled friction discs and wear plates. These gaps will decrease as the brake wears. The wear limit for each of the Y gaps is the same for Y-1, Y-2 or Y-3.

Y-1 is the measurement between the mounting flange (item 116) and the reaction plate (item 30).

Y-2 is the measurement between the reaction plate (item 30) and the adjacent reaction plate (item 30). The Y-2 gap is found only on brakes that have three or more 'water-cooled' discs.

Y-3 is the measurement between the reaction plate (item 30) and the end plate (item 117).

- e) Record the W, X, Y-1, Y-2, and Y-3 values measured for each of the gaps, and compare them against the values listed in Table 8.
- f) If the value measured for any Y gap (Y-1, Y-2, Y3) is equal to or less than the Ymin value, the brake should be removed from service and repaired with new wear components.
- g) If the value measured for all Y gaps (Y-1, Y-2 or Y-3) is greater than the Ymin value, proceed to evaluate the measurement for gap W as follows:
- h) If the measurement for gap W is equal to or greater than the W_{adjust} value shown on

Table 8, wear adjustment is required. Adjust the brake per the procedures listed in section 4.2.2. If it is found that no wear spacers (item 29) exist between the clamp tube (item 12) and stop plate (item 125) before adjustment is attempted, all wear adjustments have been previously performed in the water-cooled section of the brake, and brake overhaul is required.

- h) If the gap measured for gap X is equal to or less than the X_{adjust} value, wear adjustment is required. Adjust the brake per the procedures listed in section 4.2.2. If it is found that no wear spacers (item 29) exist between the clamp tube (item 124) and stop plate (item 125), all wear adjustments have been previously performed in the air-cooled section of the brake and replacement of the friction discs (item 118) and disc (item 119) may be required. Remove the brake from service and evaluate the condition of those components, using Table 8 as a reference.

4.2.2 Adjustment Procedure

Wear adjustment can be conducted without full disassembly of the WCSB tensioner.



Warning:

Before performing any maintenance work on the WCSB unit, make sure that the machinery will remain in a safe position. Failure to do so could result in serious injury or possibly death.

- 4.2.2.1 Wear spacers should be removed in complete sets only (one from each stud location). Mark the spacers to be removed to avoid confusion during removal.

Note: For wear adjustment of the spring set brake (gap X), remove spacers closest to the short clamp tubes (124). For adjustment of the watercooled tensioner (gap W), remove spacers closest to the long clamp tubes (12).



Warning:

Removal of spacers in quantities other than complete sets (layers) will result in severe damage to WCSB components during re-assembly, and could cause the brake to not function properly.

TABLE 8
W, X, Y and Z Gaps - Inches (mm)

Disc Size	Qty of WC Discs	W _{new}	W _{adjust}	X _{new}	X _{adjust}	X _{min}	Y _{min}	Z-1 _{new}
18	1	Available at later date						
	2							
	3							
24	1	.070/.110 (1,78/2,79)	.340 (8,64)	2.142 (54,40)	1.892 (48,06)	1.642 (41,71)	2.37 (60,20)	.140/.220 (3,56/5,59)
	2	.140/.220 (3,56/5,59)	.430 (10,92)				2.19 (55,63)	.210/.330 (5,38/8,38)
	3	.210/.330 (5,33/8,38)	.520 (13,20)				2.19* (55,63)	.280/.440 (7,11/11,18)
36	1	.100/.140 (2,54/3,56)	.370 (9,40)	2.392 (60,75)	2.142 (54,40)	1.892 (48,06)	2.25 (57,15)	.200/.280 (5,08/7,11)
	2	.200/.280 (5,08/7,11)	.490 (12,45)					.300/.420 (7,62/10,67)
	3	.300/.420 (7,62/10,67)	.610 (15,50)					.400/.560 (10,16/14,22)
48	1	.136/.176 (3,45/4,47)	.406 (10,31)	2.392 (60,76)	2.142 (54,40)	1.892 (48,06)	2.86 (72,62)	.272/.352 (6,91/8,94)
	2	.272/.352 (6,91/8,94)	.562 (14,27)					.408/.528 (10,36/13,41)
	3	.408/.528 (10,36/13,41)	.718 (18,24)					.544/.704 (13,82/17,88)

* Min. gap between reaction plates is 2.03" (51,56)

Record of Wear Measurements

Gap:	W	X	Y-1	Y-2	Y-3	Z-1	Z-2
Date:							
Date:							
Date:							
Date:							
Date:							
Date:							
If recorded value is	Equal or greater than W _{adjust}	Equal or less than X _{adjust}	Greater than Y _{min}			Greater than Zero	Equal to Zero
Then	Adjust	Adjust	Inspect friction disc condition Note: If measured value is less than Y _{min} , rebuild the brake.			Check Z-2	OK to check for wear

- 4.2.2.2 If so equipped, remove the support bracket from the cylinder (19) end of the unit.
- 4.2.2.3 Loosen the locknuts (18) - and sleeve nuts (106) if applicable - ONE TURN AT A TIME and in an alternating (cross wise) pattern. Loosen each locknut only two or three turns.



Caution:

The locknuts (18) must not be loosened unless the hex head screws (20) are in place.

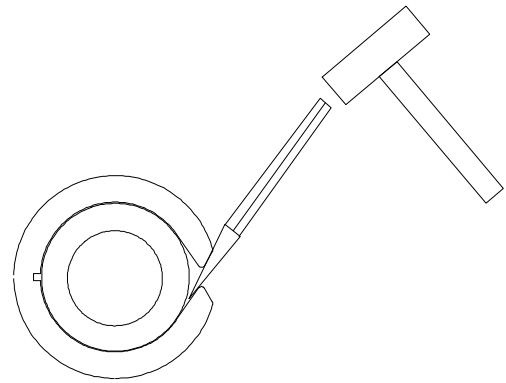


Fig. 7

- 4.2.2.4 Wear spacers are slotted to allow for in-place removal. Using a narrow chisel wedged between the stud and the spacer, as shown in Figure 7, wedge / pry the wear spacer until it fractures and is clear to be removed from the stud. Repeat for the remaining spacers in the set that is to be removed.



Warning:

Be sure to collect all wear spacers when removed. Spacers lodging in between tensioner components could prevent the tensioner from properly engaging or releasing.



Warning:

Ensure that the support bracket does not interfere with or bind on the cylinder (19). Interferences could prevent the brake from properly engaging or releasing.

- 4.2.2.5 While supporting the weight of the cylinder/spring housing/pressure plate assembly, tighten the locknuts (18) - and sleeve nuts (106) if applicable - ONE TURN AT A TIME and in a crosswise pattern, until the spring housing is seated tightly against the clamp tubes. Torque the locknuts and sleeve nuts to the appropriate value. See Table 2.



Caution:

The locknuts (18) and sleeve nuts (106) must be tightened gradually and evenly to prevent damage to the brake components.

- 4.2.2.6 Reinstall the support bracket if required. Secure the bracket onto the sleeve nuts using flat washers (17) and locknuts (18). Tighten the locknuts to the value listed in Table 2. Shim the base of the support bracket as required. Install and tighten fasteners as required to secure the bracket into position.

- 4.2.2.7 Restore any piping or covers removed prior to operating the tensioner.

4.3 Disassembly Procedures



Warning:

Ensure that the machinery is and will remain in a safe position prior to loosening fasteners or removing the tensioner.

- 4.3.1 Disconnect the air supply lines and water lines from the tensioner.
- 4.3.2 Remove the fasteners that secure the brake and support bracket to the mounting structure.
- 4.3.3 Using soft slings, rig the tensioner and slide the WCSB off of the gear. Avoid placing slings or straps directly on the release springs (34).
- 4.3.4 Transport the tensioner to a clean working area and position the unit on a flat surface with the mounting flange (112) facing down.

- 4.3.5 If the gear (28) requires replacement, remove it from the shaft with a portable jack, using the threaded holes in the end of the gear for puller holes. Heating may be required to ease removal. Replace the gear and install per Section 2.2.
- 4.3.6 Match-mark the mounting flange (112), pressure plate (116), reaction plates (30), end plate (117), pressure plate (13), spring housing (16), and cylinder (19) to one another prior to disassembly to adequately show the proper orientation of components to one another.
- 4.3.7 Loosen the locknuts (18) - or sleeve nuts (106) - ONE TURN AT A TIME and in sequence until the release spring force is relieved.



Caution:

The locknuts (18) must not be loosened unless the screws (20) are in place retaining brake spring tension.

- 4.3.8 Lift the cylinder, spring housing, and pressure plate off of the studs as an assembly. Set the assembly aside on a clean, level area, making sure to avoid damaging the friction material surface.
- 4.3.9 Continue removing the remaining components if required.
- 4.3.10 Inspect all components using the wear limits in Table 7 as a reference.
- 4.3.11 For friction lining replacement refer to Section 4.4.
- 4.3.12 For wear plate replacement refer to Section 4.5.
- 4.3.13 Refer to Section 4.6 to replace seals.
- 4.3.14 For spring replacement refer to Section 4.7.
- 4.3.15 Assemble the tensioner per Section 4.9.

4.4 Friction Material Replacement

Note: When replacing friction material, it is recommended that the mating wear surface be replaced or machined flat to ensure good contact between the mating surfaces. See Table 7 for wear limits.

- 4.4.1 Refer to Section 6.0 for the appropriate friction disc replacement part numbers .



Caution:

Use only genuine Airflex friction material. Use of material not of Airflex origin may result in unpredictable performance.

- 4.4.2 Disassemble the tensioner per Section 4.3.
- 4.4.3 Remove old screws and remove and discard the old friction material.

Note: Use of a pinpoint torch to heat the screws and soften the Loctite[®] will ease removal of the screws.

- 4.4.4 Clean all burrs, corrosion etc. from the friction disc core or mounting surface.
- 4.4.5 Position the friction material to align the screw holes. Apply Loctite[®] #262 to the screw threads and tighten the screws to the proper torque value. For watercooled disc assemblies, tighten screws to 15 ft.-lb. (75 in.-lb. for size 18). Screws securing the air cooled brake friction discs (118) or blocks mounted on the pressure plate (13) and end plate subassembly (117) should be tightened to 20 ft.-lb after application of Loctite[®] #262 to the screw threads. Install the screws in an even, cross-wise pattern. Screws in friction blocks should be installed from the centermost position in the block, then progressing towards the outer edges of the block. One at a time, install and torque each screw immediately after application of Loctite[®], then proceed to the next screw.



Warning:

Loctite[®] may cure prior to properly tightening the screw if not tightened to the proper torque value immediately after installation.



Caution:

Use only Airflex-supplied screws.



Caution:

Loctite[®] #262 must be shaken prior to application.



Caution:

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

- 4.4.6 Tensioner friction disc assemblies (7) of size 36" and larger require that the friction material be machined flat after assembly, to allow for even contact and minimize wear-in. Machine the friction surface perpendicular to the bore within .003", and parallel to the opposite face within .010".



Warning:

Use appropriate safety equipment and dust collection systems when machining friction material.

- 4.4.7 After replacement of friction material, re-assemble the tensioner per Section 4.9. Observe wear-in procedures during start-up per Section 3.0, Operation.

4.5 WC Wear Plate Replacement

Note: When replacing wear surfaces, it is recommended that the mating friction material be replaced or machined flat to ensure good contact between the mating surfaces. See Table 7 for wear limits.

- 4.5.1 Disassemble tensioner per Section 4.3.
- 4.5.2 Remove the screws and locknuts holding the wear plates and remove the wear plates. If the wear plates cannot be easily lifted off, gently tap the O.D. to break the gasket seal.



Caution:

Do not attempt to break the gasket seal by prying between the wear plate and housing. Damage to the sealing surfaces may occur.

- 4.5.3 Inspect the water passages and, if necessary, use a wire brush to clean them. If repainting is necessary, sand blast the water passages and paint the surfaces with Glid Gard® Epoxy 5256/5257 or equivalent. Dry film thickness should be 0.007" (0.18 mm). Be careful not to allow the paint to get into the seal grooves or onto the face of the nubs.

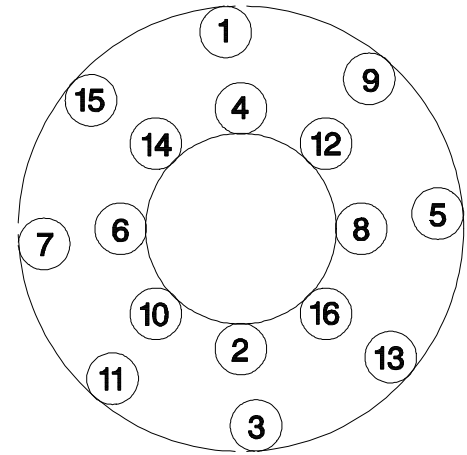


Figure 8



Caution:

If nubs are severely corroded, wear plates may not be properly supported. Replace pressure plate, reaction plate or end plate, if necessary.

- 4.5.4 Clean and completely dry the gasket surfaces on the pressure plate (14), reaction plate(s) (30) and end plate (117). These surfaces should be free of nicks and scratches to prevent leaks. Minor nicks and scratches may be filled with Loctite Superflex® #596 Sealant during assembly.
- 4.5.5 Apply a uniform bead of Loctite Superflex® #596 Sealant in the grooves of the pressure plate, reaction plate(s) and/or end plate. Recommended bead diameter is 0.060" - 0.090" (1.5 mm - 2.3 mm).



Caution:

Loctite Superflex® #596 Sealant will begin to set up and skin over in approximately 10 minutes. The wear plate must be fastened to the mating component within 10 minutes of applying the sealant.

- 4.5.6 Inspect the new wear plates and remove any scratches or raised edges with very fine sandpaper or steel wool. Position the smoothest side of the wear plate on the mating surface being careful to align the holes.

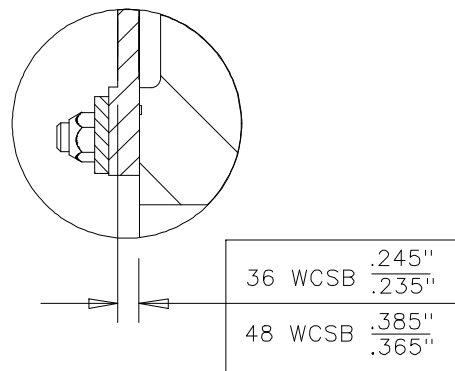
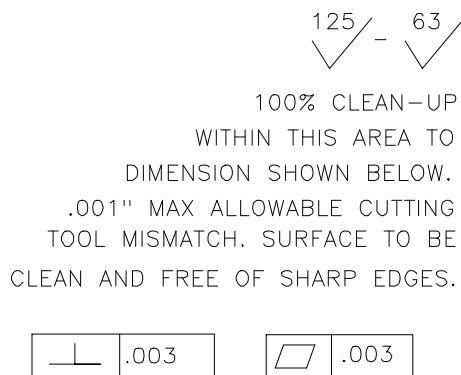


Fig. 9

4.5.7 Install new screws and locknuts provided with the wear plate replacement kit and secure finger tight.



Caution:

To prevent excessive warpage and to ensure a good seal, the following hardware tightening procedure must be followed.

4.5.8 For each wear plate being replaced, follow the tightening sequence shown in Figure 8 for the first 16 screws. The remaining screws may be tightened in any reasonable crosswise pattern. See section 6.2 for illustrated part lists and Table 2 for tightening torque values.

4.5.9 After completion of the assembly, each water cavity should be checked for leaks.

4.5.9.1 Using lifting straps, suspend each assembly with the water outlet port at the 12 o'clock position. Connect a water supply line to the inlet port (at 6 o'clock position). In reaction plates, plug the remaining inlet port. See Table 4 for water port size.

4.5.9.2 Slowly fill with water to purge all air from water cavities.

4.5.9.3 Install pipe plug(s) in the outlet port(s) and apply appropriate water pressure (40psi (2.7bar) for size 36 and 48 WCSB units and 45 PSIG (3.1 bar) for all other sizes) measured at the inlet. Maintain this pressure for a minimum of 30 minutes.

4.5.9.4 Check for leakage at O.D. and I.D. seal areas. **NO** leakage is allowed.

4.5.9.5 If the assembly leaks, check the torque on each screw and retest. If leaks still occur, the wear plate(s) may be damaged. Repeat the procedure from 4.5.2.

4.5.9.6 Follow steps in Section 4.9 to reassemble the tensioner.

4.5.10 Machining the wear surfaces is required for sizes 36" and larger after replacement of the wear plates or the adjoining friction material. See Figure 9 for machining specifications. Clean all wear surfaces after machining to remove any residual contaminates.



Warning:

Failure to machine wear plates flat could result in a reduction or erratic torque of the tensioner.

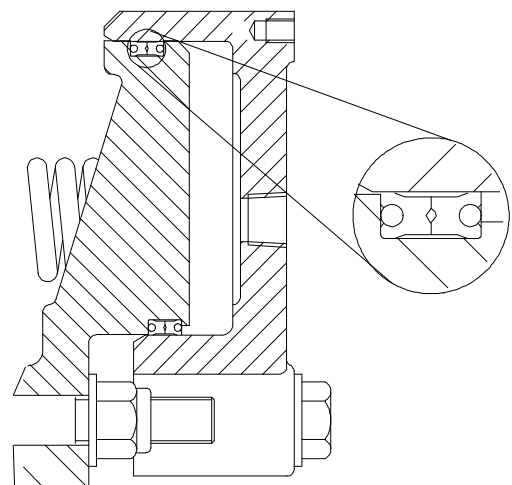


Figure 10

4.6 Cylinder Seal Replacement

Note: If seals in the mounting flange/cylinder (112) require replacement, full disassembly of the tensioner is required. See Section 4.3.

- 4.6.1 Disconnect the air supply lines and remove the screws (20), washers (17) and spacer tubes (27) attaching the cylinder (19) to the pressure plate (13).
- 4.6.2 Carefully slide the cylinder off of the spring housing (16) or piston (33) out of the mounting flange / cylinder (112).



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

- 4.6.3 Remove the cylinder seals from the spring housing (16) or piston (33) and thoroughly clean the seal grooves in the spring housing or spring housing.
- 4.6.4 Insert new seals into the grooves, noting the orientation of the seals per Figure 10.

Note: Older brakes might have used two seals back-to-back in the seal groove. The new, wider, one-piece dual lip seals are directly interchangeable with the older seals, providing the same functionality.

- 4.6.5 Carefully examine the seal surfaces in the cylinder or mounting flange / cylinder. If the surfaces have worn to point as indicated on Table 10, the cylinder must be replaced. Small nicks or scratches must be sanded smooth to prevent air leakage.

Note: If the tensioner was completely removed and disassembled to replace seals, refer to Section 4.9 to assemble.

- 4.6.6 Lubricate the seal surfaces in the cylinder with Dow Corning[®] 55 O-ring lubricant and carefully slide the cylinder onto the spring housing. Take special care to avoid damaging the seal lips.
- 4.6.7 Attach the cylinder to the pressure plate with the screws, washers and spacer tubes removed in 4.6.1. Use Loctite[®] Locquic[®] 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 Table 5.



Warning:
Loctite[®] Primer "T" contains harmful vapors. Refer to the product label for proper safety precautions.



Caution:
Loctite[®] #262 must be shaken prior to application.



Caution:
Loctite[®] #262 may irritate sensitive skin. Refer to the product label for proper safety precautions.

- 4.6.8 If mounting flange / cylinder seals have been replaced, re-assemble the tensioner / brake per Section 4.9.
- 4.6.9 Install air lines and air test the assembly for seal leakage per the following:

Apply 120psi to an open port in the cylinder (19) to disengage the spring-set brake and check for release cylinder leakage. Apply 120psi to the larger of the two ports in the mounting flange / cylinder (112) and check for large cylinder seal leakage. Allow the smaller port in the mounting flange / cylinder to remain open to check for potential leakage from the large cylinder to the small cylinder in the mounting flange / cylinder. Shut off the air supply and check for pressure drop from the cylinders. If air pressure does not drop below 100psi within 10 minutes, the seals have been properly installed.

Continue the test by releasing the air pressure in the larger port in the mounting flange cylinder, and applying 120psi to the smaller of the two ports in the mounting flange. The larger port should remain open to atmosphere. Apply 120psi to the cylinder (19) to disengage the spring set brake. Check for leakage from the small cylinder to the large cylinder in the mounting flange / cylinder. Shut off the air supply and check for pressure drop from the cylinders. If air pressure does not drop below 100psi within 10 minutes, the seals have been properly installed.

4.7 Spring Replacement

- 4.7.1 Remove the tensioner as an assembly, and disassemble per Section 4.3.
- 4.7.2 Match mark the cylinder (19), spring housing (16), and pressure plate subassembly (13) to one another, to ease reassembly.
- 4.7.3 With the cylinder (19) facing up, disassemble the cylinder/spring housing subassembly by loosening the hex head screws (20) ONE TURN AT A TIME, following a crosswise sequence, until the spring force is relieved. Remove the hex head screws and washers.



Caution:

Failure to loosen the screws (20) evenly and in small increments as described may cause the screws or cylinder to bind.

- 4.7.4 Lift and set aside the spring housing (16) and cylinder (19) as a subassembly to expose the springs. Note the locations of the springs and spring retainers (53) - if applicable - for reassembly purposes.
- 4.7.5 Inspect the springs for distortion and check the free height. If the free height of any spring is less than the value shown on Table 7, the entire set of springs must be replaced.
- 4.7.6 Reassemble the tensioner by following the procedures in Section 4.9., beginning with section 4.9.20.



Caution:

The cylinder, spring housing and end plate, should not be re-assembled as a separate subassembly. Improper assembly procedures may result in uneven contact of the friction material with the disc (119), resulting in low stopping torque.

4.8 Reaction Plate Bushing Replacement (size 36 only)

- 4.8.1 Disassemble per section 4.3.
- 4.8.2 Refer to Table 7 to determine if the reaction plate bushings (54) require replacement.
- 4.8.3 Heat up the area around each bushing to soften the Loctite[®]. Drive out the old bushings.

- 4.8.4 Clean the bores in the mating component, removing any residual Loctite[®].
- 4.8.5 Apply Loctite[®] #RC601, 635 or 680 to the bushing O.D. and mating hole in the reaction plate using a swab. Apply enough liquid to entirely fill the space between the parts. Install the bushings by twisting the bushing while pushing it down, until it is flush with the casting surface. Inspect to see that a ring of liquid adhesive is visible at the parting line. Reapply Loctite if required. Allow the Loctite to cure for 15 minutes before moving the sub assembly.
- 4.8.6 Assemble the tensioner per section 4.9, as required.

4.9 Assembly Procedures

- 4.9.1 Position the mounting flange / cylinder (112) on a flat, level surface, mounting face down. Note the location of the cylinder inlets in the mounting flange as the "6 o'clock" position.
- 4.9.2 Lubricate the seals (21)(23)(114) with Dow Corning 55M O-ring lubricant, and install them into the seal grooves on the piston (33). Note the orientation of the seal lips, per Figure 10. Lubricate the seal surfaces in the mounting flange / cylinder (112) and evenly insert the piston into the mounting flange / cylinder.
- 4.9.3 Install the studs (6) into the mounting flange (112). The stud end with the shorter length of threads is to be assembled into the mounting flange. Clean the stud end to be assembled by applying Loctite[®] Loc-Quic[®] Primer Grade "T" to the threads. After the threads have dried, apply Loctite[®] #271 to the threads and assemble the stud until it bottoms in the threaded hole in the mounting flange. Repeat for the remaining studs.



Warning:

Loctite[®] Primer "T" contains harmful vapors. Refer to the product label for proper safety precautions

- 4.9.4 Install a clamp tube (12) over each stud.
- 4.9.5 With the wear plate facing up, lower the pressure plate subassembly (116) over the clamp tubes, noting the position of the water inlet in relation to the ports in the mounting flange / cylinder. The inlet ports should be as close as possible to the "6 o'clock" position noted in 4.9.1.

TABLE 9 Tensioner Wear Spacers	
Size	Qty Required
324WCSB	3
336WCSB	3
436WCSB	4
348WCSB	3

4.9.6 Pre-fill the grease channel in the friction disc subassembly (7) splines with MOLUB-AL-LOY[®] 936SF grease, or equivalent, as shown on Figure 3.

4.9.7 Lower a friction disc subassembly (7) onto the pressure plate wear surface. Center the friction disc on the pressure plate (116).

4.9.8 Place a release spring (34) over every clamp tube. For single disc tensioners, proceed to section 4.9.12.

4.9.9 On multiple disc assemblies, lower a reaction plate subassembly (30) over the clamp tubes, noting the position of the water inlet in relation to the ports in the pressure plate (116).

4.9.10 Assemble a release spring (34) over every clamp tube, and lower a friction disc subassembly (7) onto the reaction plate. Align the disc splines with those in the previous disc assembled to ease installation after assembly.

4.9.11 Repeat Sections 4.9.9 through 4.9.10 until all reaction plates, friction discs and reaction springs are installed.

4.9.12 Lower the end plate subassembly (117) over the clamp tubes, noting the orientation of the the water inlets.

4.9.13 Assemble the wear spacers (29) over the studs (6). Refer to Table 9 for the quantity required at this location (adjacent to clamp tubes (12)) on each stud.

4.9.14 Assemble the friction discs or blocks (118) to the end plate subassembly (117) and pressure plate (13) per the following:

Position the friction material to align the screw holes. Apply Loctite[®] #262 to the screw threads and tighten the screws (121) to 20 ft-lb. Install the screws in an even, cross-wise pattern. Screws in friction blocks should be installed from the centermost position in

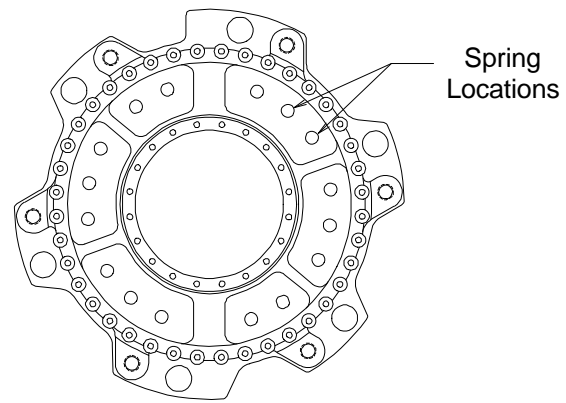


Fig. 11

the block, then progressing towards the outer edges of the block. One at a time, install and torque each screw immediately after application of Loctite[®], then proceed to the next screw.

! Warning:

Loctite[®] may cure prior to properly tightening the screw if not tightened to the proper torque value immediately after installation.

! Caution:

Use only Airflex-supplied screws.

! Caution:

Loctite[®] #262 must be shaken prior to application.

! Caution:

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

4.9.15 Lower the disc (119) onto the friction material on the end plate subassembly (117), centering it on the friction blocks or disc. Align the splines with those in the tensioner friction disc subassemblies (7).

4.9.16 Assemble the stop plates (125) over adjoining pairs of studs so that they rest against the end plate or wear spacers.

4.9.17 Install the remaining wear spacers (29) over the studs. One spacer should be placed over each stud. See Figure 1.

- 4.9.18 Slide the clamp tubes (124) over the studs.
- 4.9.19 Lower the pressure plate (13) over the clamp tubes (124), resting the friction material face against the disc (119).
- 4.9.20 Install the springs in a symmetrical pattern on the pressure plate subassembly (13), distributing them as evenly as possible. Locate the springs over bosses or in the spring pockets in the pressure plate, as shown in Figure 11. If applicable, position the spring retainers (53) on top of the springs to hold the springs into position.
- 4.9.21 Lower the spring housing and cylinder over the springs and spring retainers, if applicable, aligning the match marks made during disassembly. Be sure to not overlap spring retainers such that they interfere with the ribs in the spring housing (16) when assembled.



Caution:

Interference of the spring retainers with the casted ribs in the spring housing will damage the spring retainers and may prevent proper positioning of the springs.

- 4.9.22 Lubricate the ends of the studs (6) with 30 weight oil or an anti-seize compound, and assemble the locknuts (18) and flat washers (17) onto the studs. Tighten the nuts in an even crosswise pattern - one turn at a time - to evenly compress the springs. Tighten the nuts to the final tightening torque listed on Table 2.

Note: If sleeve nuts (106) are used to accommodate a support bracket, install the sleeve nuts onto the studs in place of the locknuts at or near the "6 O'clock" position, tightening them as required.



Caution:

The locknuts (18) and sleeve nuts (106) must be tightened gradually to prevent damage to the brake components.

- 4.9.23 Lubricate the seals (21)(23) with Dow Corning 55M O-ring lubricant, and install them into the seal grooves on the spring housing (16). Note the orientation of the seal lips, per Figure 10.

- 4.9.24 Lubricate the seal surfaces in the mounting cylinder (19) and lower the cylinder onto the spring housing. Orient the cylinder so that the Eaton logo is near the "12 O'clock" position, in-line with the water outlets.
- 4.9.25 Position the spacer tubes (27) in-line with the bolt holes in the cylinder, and install the hex head screws (20) and lockwashers (17). Tighten the screws in a crosswise pattern ONE TURN AT A TIME until the spacer tubes are clamped between the cylinder and pressure plate. Make sure the cylinder slides over the seals properly, to avoid damaging the seal lips.
- 4.9.26 Remove the screws (20) one at a time, apply Loctite #262 to the screw threads, and reinstall the screw, tightening to the value shown in Table 2. Repeat for the remaining screws.



Warning:

Loctite® may cure prior to properly tightening the screw if not tightened to the proper torque value immediately after installation.



Caution:

Loctite® #262 must be shaken prior to application.



Caution:

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

- 4.9.27 After assembly, check gaps "W" and "Z-1" to ensure that the brake will have adequate running clearances when released. Refer to Figure 6 and Table 8. Additional machining of friction discs or wear plates may be required to achieve proper running clearances if gaps W_{new} and Z_{new} are not found to be within the ranges shown on Table 8. Correct as required.
- 4.9.28 Prior to installation, air test the cylinder seals for leakage per section 4.6.9.
- 4.9.29 Install the WCSB tensioner per Section 2.0.

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 Rd.
Cleveland, Ohio 44144
Tel: (216) 281-2211
Fax: (216) 281-3890
Internet: www.airflex.com

Loctite, Locquic, and Superflex are registered trademarks of Henkle Corporation.

Glid Gard is a registered trademark of The Glidden Company.

MOLUB-ALLOY is a trademark of Castrol Industrial Lubricants.

6.0 Part Lists

6.1 Basic Assemblies

ITEM	DESCRIPTION	224WCSB (146452C)		324WCSB (146453C)		424WCSB (146454C)	
		Part No	Qty	Part No	Qty	Part No	Qty
6	Stud	245 x 0116	12	245 x 0113	12	245 x 0115	12
7	Friction Disc Assembly		1		2		3
12	Clamp Tube	308206-11	12	308206-06	12	308206-10	12
13	Pressure Plate	513335	1	513335	1	513335	1
16	Spring Housing	513268	1	513268	1	513268	1
17	Flat Washer	153 x 0641	24	153 x 0641	24	153 x 0641	24
18	Self Locking Nut	110 x 0073	12	110 x 0073	12	110 x 0073	12
19	Cylinder	513264	1	513264	1	513264	1
20	Hex Head Screw	197 x 1035	12	197 x 1035	12	197 x 1035	12
21	Seal	308462-05	2	308462-05	2	308462-05	2
22	Outer Spring	307970	24	307970	24	307970	24
23	Seal	308462-02	2	308462-02	2	308462-02	2
27	Spacer Tube	308206-09	12	308206-09	12	308206-09	12
28	Gear (Not Included)	410970-#####	---	412433-#####	---	413195-#####	---
29	Wear Spacer	308348	24	308348	48	308348	72
30	Reaction Plate Sub-Assy	---	---	513348-02	1	513348-02	2
33	Dual Piston	514545	1	514545	1	514545	1
34	Release Spring	416751-02	12	416751-02	24	416751-02	36
52	Inner Spring	307969	24	307969	24	307969	24
53	Spring Retainer	307971	12	307971	12	307971	12
57	Flat Hd Screw	294 x 0407	36	294 x 0407	72	294 x 0407	108
105	Pipe Plug	77 x 0021	1	77 x 0021	1	77 x 0021	1
106	Sleeve Nut	-----	---	-----	---	-----	---
112	Mounting Flange / Cylinder	514509	1	514509	1	514509	1
114	Seal	308462-04	1	308462-04	1	308462-04	1
116	Pressure Plate Sub-Assy	513348-03	1	513348-03	1	513348-03	1
117	End Plate Sub-Assy	514353-02	1	514353-02	1	514353-02	1
118	Friction Disc / Block	513307	2	513307	2	513307	2
119	Disc	514348	1	514348	1	514348	1
121	Flat Head Screw	294 x 0405	48	294 x 0405	48	294 x 0405	48
122	Pipe Plug	76 x 0006	3	76 x 0006	3	76 x 0006	3
124	Clamp Tube	308206-07	12	308206-07	12	308206-07	12
125	Stop Plate	308349	6	308349	6	308349	6

ITEM	DESCRIPTION	236WCSB (146436C)		336WCSB (146477C)		436WCSB (146402C)	
		Part No	Qty	Part No	Qty	Part No	Qty
6	Stud	307111-18	16	307111-17	16	307111-15	16
7	Friction Disc Assembly	514766	1	514766	2	514766	3
12	Clamp Tube	308246-12	16	308246-11	16	308246-05	16
13	Pressure Plate	514479-03	1	514479-03	1	514479-03	1
16	Spring Housing	514125	1	514125	1	514125	1
17	Flat Washer	67 x 0042	32	67 x 0042	32	67 x 0042	37
18	Self Locking Nut	110 x 0075	16	110 x 0075	16	110 x 0075	16
19	Cylinder	513988	1	513988	1	513988	1
20	Hex Head Screw	197 x 1342	16	197 x 1342	16	197 x 1342	16
21	Seal	308463-05	2	308463-05	2	308463-05	2
22	Outer Spring	308035	64	308035	64	308035	64
23	Seal	308463-02	2	308463-02	2	308463-02	2
27	Spacer Tube	308150-06	16	308150-06	16	308150-06	16
28	Gear (Not Included)	416821-####	---	416842-####	---	416676-####	---
29	Wear Spacer	308313	32	308313	64	308313	80
30	Reaction Plate Sub-Assy	---	---	513985-02	1	513985-02	2
33	Dual Piston	514521	1	514521	1	514521	1
34	Release Spring	416751-01	16	416751-01	32	416751-01	48
52	Inner Spring	308034	64	308034	64	308034	64
53	Spring Retainer	416504	16	416504	16	416504	16
105	Pipe Plug	77 x 0021	1	77 x 0021	1	77 x 0021	1
106	Sleeve Nut	---	---	---	---	308242	5
112	Mounting Flange / Cylinder	514507	1	514507	1	514507	1
114	Seal	308462-01	1	308462-01	1	308462-01	1
116	Pressure Plate Sub-Assy	514479-01	1	514479-01	1	514479-01	1
117	End Plate Sub-Assy	514479-02	1	514479-02	1	514479-02	1
118	Friction Disc / Block	513396	2	513396	2	513396	2
119	Disc	513395	1	513395	1	513395	1
121	Flat Head Screw	294 x 0405	72	294 x 0405	72	294 x 0405	72
122	Pipe Plug	76 x 0007	4	76 x 0007	4	76 x 0007	4
124	Clamp Tube	308246-06	16	308246-06	16	308246-06	16
125	Stop Plate	308312	8	308312	8	308312	8

ITEM	DESCRIPTION	248WCSB (146478C)		348WCSB (146400C)		448WCSB (146479C)	
		Part No	Qty	Part No	Qty	Part No	Qty
6	Stud	307111-12	16	307111-16	16	307111-19	16
7	Friction Disc Assembly	514767	1	514767	2	514767	3
12	Clamp Tube	308329-09	16	308329-01	16	308329-04	16
13	Pressure Plate	514330	1	514330	1	514330	1
16	Spring Housing	514506	1	514506	1	514506	1
17	Flat Washer	67 x 0042	32	67 x 0042	37	67 x 0042	37
18	Self Locking Nut	110 x 0075	16	110 x 0075	16	110 x 0075	16
19	Cylinder	514516	1	514516	1	514516	1
20	Hex Head Screw	197 x 1347	16	197 x 1347	16	197 x 1347	16
21	Seal	308463-04	2	308463-04	2	308463-04	2
22	Spring	416751-03	112	416751-03	112	416751-03	112
23	Seal	308463-01	2	308463-01	2	308463-01	2
27	Spacer Tube	308329-03	16	308329-03	16	308329-03	16
28	Gear (Not Included)	416795-####	---	416688-####	---	416797-####	---
29	Wear Spacer	308315	32	308315	64	308315	80
30	Reaction Plate Sub-Assy	---	---	514329-02	1	514329-02	2
33	Dual Piston	514484	1	514484	1	514484	1
34	Release Spring	416751-04	16	416751-04	32	416751-04	48
53	Spring Retainer	416674	16	416674	16	416674	16
105	Pipe Plug	77 x 0021	1	77 x 0021	1	77 x 0021	1
106	Sleeve Nut	---	---	308242	5	308242	5
112	Mounting Flange / Cylinder	514332	1	514332	1	514332	1
114	Seal	308463-03	1	308463-03	1	308463-03	1
116	Pressure Plate Sub-Assy	514329-01	1	514329-01	1	514329-01	1
117	End Plate Sub-Assy	514329-03	1	514329-03	1	514329-03	1
118	Friction Disc / Block	416691	18	416691	18	416691	18
119	Disc	514511	1	514511	1	514511	1
121	Flat Head Screw	294x 0405	90	294x 0405	90	294x 0405	90
122	Pipe Plug	76 x 0005	4	76 x 0005	4	76 x 0005	4
124	Clamp Tube	308329-02	16	308329-02	16	308329-02	16
125	Stop Plate	308314	8	308314	8	308314	8

ITEM	DESCRIPTION	248WCSB (146478C)	
		Part No	Qty
6	Stud	307111-12	16
7	Friction Disc Assembly	514767	1
12	Clamp Tube	308329-09	16
13	Pressure Plate	514330	1
16	Spring Housing	514506	1
17	Flat Washer	67 x 0042	32
18	Self Locking Nut	110 x 0075	16
19	Cylinder	514516	1
20	Hex Head Screw	197 x 1347	16
21	Seal	308463-04	2
22	Spring	416751-03	112
23	Seal	308463-01	2
27	Spacer Tube	308329-03	16
28	Gear (Not Included)	416795-####	---
29	Wear Spacer	308315	32
30	Reaction Plate Sub-Assy	---	---
33	Dual Piston	514484	1
34	Release Spring	416751-04	16
53	Spring Retainer	416674	16
105	Pipe Plug	77 x 0021	1
106	Sleeve Nut	---	---
112	Mounting Flange / Cylinder	514332	1
114	Seal	308463-03	1
116	Pressure Plate Sub-Assy	514329-01	1
117	End Plate Sub-Assy	514329-03	1
118	Friction Disc / Block	416691	18
119	Disc	514511	1
121	Flat Head Screw	294x 0405	90
122	Pipe Plug	76 x 0005	4
124	Clamp Tube	308329-02	16
125	Stop Plate	308314	8

6.2 Sub Assemblies (Standard)

Wear Plate Subassemblies (Ref Fig. 12)								
ITEMS	DESCRIPTION	24WCSB		36WCSB		48WCSB		
		Part Number	Qty	Part Number	Qty	Part Number	Qty	
30	Reaction Plate S/A	513342-02		513985-02		514329-02		
	3 Wear Plate	508459	2	416527	2	416690	2	
	4 Hex Head Screw	0000153 x 0685	90	000153 x 0843	108	000153 x 1224	120	
	5 Locknut	000153 x 0642	90	000153 x 0844	108	000153 x 0844	120	
	31 Reaction Plate	513343	1	513989	1	514514	1	
	50 Inner Support Ring	413107	6	414032-01	12	416618	10	
	51 Outer Support Ring	413108	10	414033-01	18	416673	20	
	54 Bushing	N/A	---	203863-03	16	N/A	---	
	126 Plug	000077 x 0023	2	000077 x 0019	2	000077 x 0019	2	
	O-ring - inner	N/A	---	N/A	---	000073 x 0410	2	
	O-ring - outer	N/A	---	N/A	---	000073 x 0411	2	
116	Pressure Plate S/A	513348-03		514479-01		514329-01		
	3 Wear Plate	508459	1	416527	1	416690	1	
	4 Hex Head Screw	0000153 x 0685	90	000153 x 0842	72	000153 x 1223	120	
	4a Hex Head Screw	Included with item 4		000153 x 1216	36	Included with item 4		
	5 Locknut	000153 x 0642	90	000153 x 0844	108	000153 x 0844	120	
	14 Pressure Plate	513345	1	514541	1	514513	1	
	50 Inner Support Ring	413107	3	414032-01	6	416618	5	
	51 Outer Support Ring	413108	5	414033-01	9	416673	10	
	54 Bushing	N/A	---	203863-01	16	N/A	---	
	O-ring - inner	N/A	---	N/A	---	000073 x 0410	1	
	O-ring - outer	N/A	---	N/A	---	000073 x 0411	1	
117	End Plate S/A	514353-02		514479-02		514329-03		
	3 Wear Plate	508459	1	416527	1	416690	1	
	4 Hex Head Screw	0000153 x 0685	90	000153 x 0842	72	000153 x 1225	80	
	4a Hex Head Screw	Included with item 4		000153 x 1216	36	000153 x 0842	40	
	5 Locknut	000153 x 0642	90	000153 x 0844	108	000153 x 0844	120	
	50 Inner Support Ring	413107	3	414032-01	6	416618	5	
	51 Outer Support Ring	413108	5	414033-01	9	426673	10	
	54 Bushing	N/A	---	203863-01	16	N/A	---	
	117a End Plate	514352	1	514475	1	514327	1	
	O-ring - inner	N/A	---	N/A	---	000073 x 0410	2	
	O-ring - outer	N/A	---	N/A	---	000073 x 0411	2	

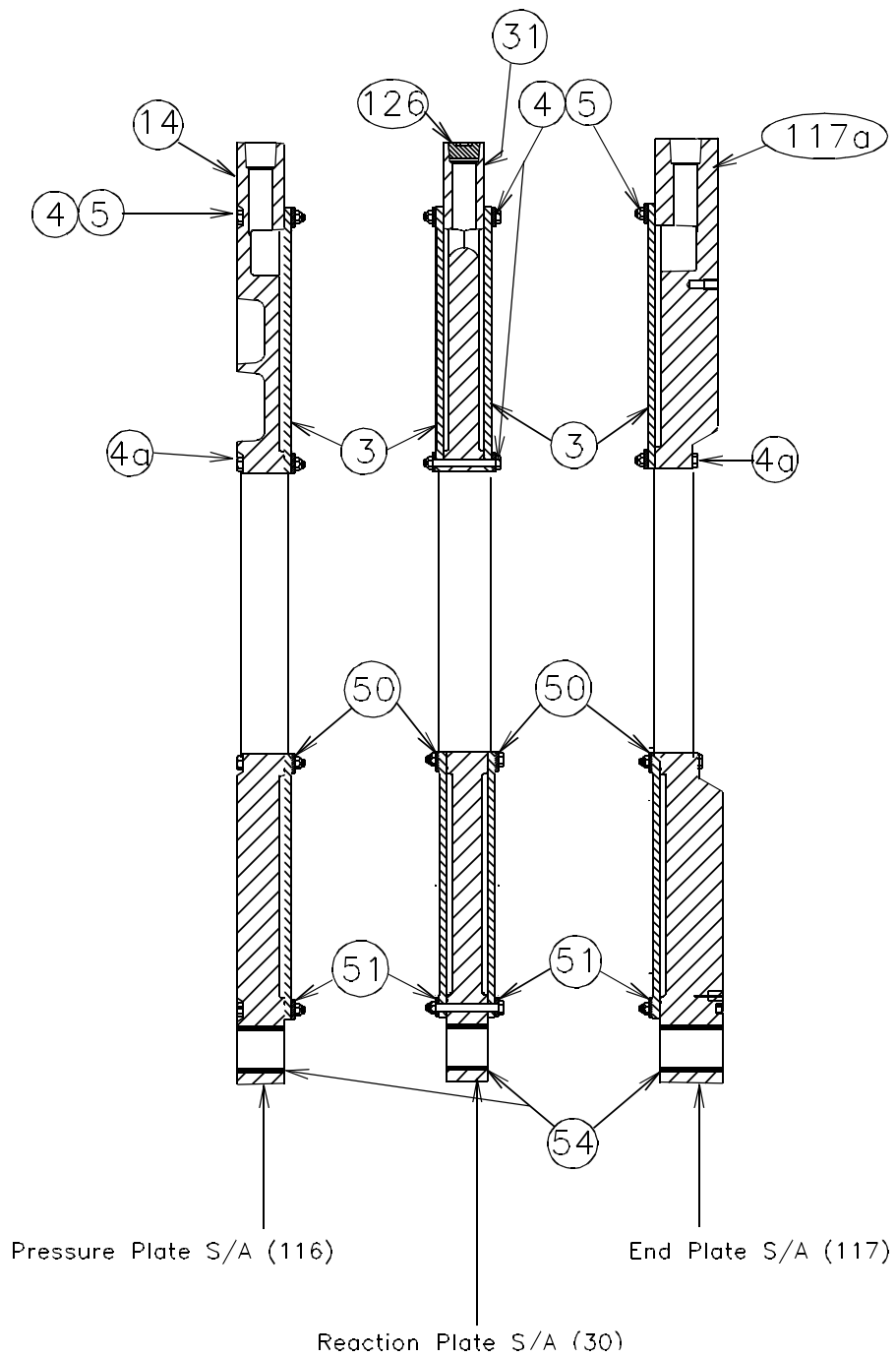


Fig. 12

Friction Disc Subassemblies (Ref Fig. 13)							
ITEMS	DESCRIPTION	24WCSB		36WCSB		48WCSB	
		Part Number	Qty	Part Number	Qty	Part Number	Qty
7	Friction Disc S/A			514766	*	514767	*
8	Friction Material	514711	2	514707	16	514708	16
9	Friction Disc core	510745	1	513667	1	514287	1
10	Flat Head Screw	000294 x 0407	36	000294x0407	144	000294x0407	224

* See specific part lists in Section 6.1 for quantities required.

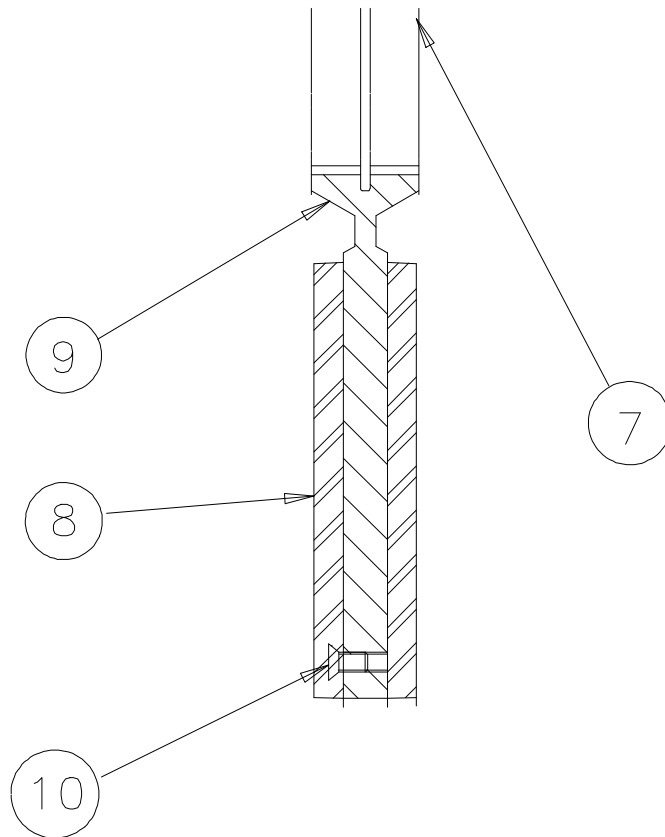


Fig. 13

EATON PRODUCT WARRANTY

Subject to the conditions stated herein, Eaton Corporation warrants to the Purchaser that each new Airflex Product manufactured by Eaton will be free from failures caused by defects in material and workmanship, and will deliver its rated capacity, for a period of twelve (12) months from the date of shipment to Purchaser, provided such Product is properly installed, properly maintained, operated under normal conditions and with competent supervision. Warranty claims shall be made in writing and the part or parts shall, if requested by Airflex Division, be returned prepaid to the Airflex Division for inspection. Upon a determination that a defect exists, Eaton shall thereupon correct any defect, at its option either by repairing any defective part or parts or by making available at Eaton's plant a repaired or replacement part. This warranty does not extend to normal wear parts or components of the Product, such as friction material and friction surfaces.

LIMITATION OF WARRANTY

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER WRITTEN, ORAL OR IMPLIED. ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE SPECIFICALLY EXCLUDED.

In no event shall Eaton be liable for special, incidental or consequential damages. Eaton's liability arising out of the supplying of such Product, or its use, whether in warranty, contract or otherwise, shall in no case exceed the cost of correcting defects in the Products as herein provided. Upon expiration of the twelve (12) month period, all such liability shall terminate. THE FOREGOING SHALL CONSTITUTE THE SOLE REMEDY OF PURCHASER AND THE SOLE LIABILITY OF EATON.