

Boston Gear®

WOR Series

Mechanical Overload Release Clutches
for the Water and Wastewater Industry

P-3032-BG

Installation and Operation

WOR Series
Model H1900



a division of **Altra Industrial Motion**

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I. Introduction

A. Operating Principle

The WOR Series Model H1900 is a mechanical, ball detent style, overload release clutch. It has been designed to provide accurate and dependable torque disconnect protection for mechanical wastewater treatment equipment. The torque is transmitted through the clutch in one of two paths as shown in Figure 1.

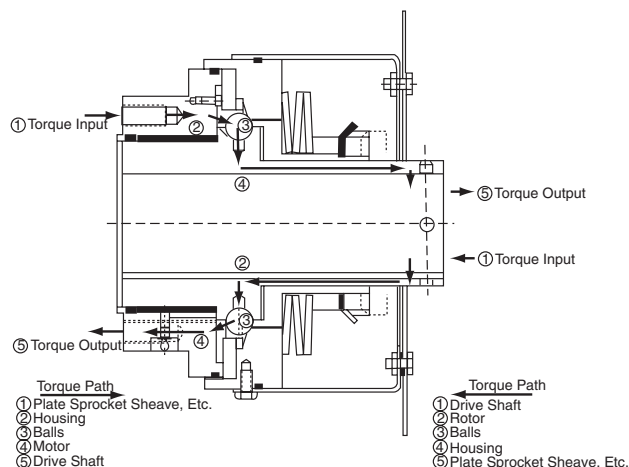


Figure 1

Torque transmission between the balls and the detents of the rotor is the key to the disengagement of the clutch as shown in Figure 2. The balls are forced into the detents of the rotor by an axial load generated by compressing a spring pack. This axial load is what determines the torque capacity of the clutch. Increasing or decreasing the spring compression or changing spring packs provides a means for multiple torque adjustments. When a torque overload condition occurs, the balls roll out of the rotor detents. This rolling action increases the efficiency in which the clutch operates and reduces any fluctuation of torque setting due to frictional changes.

The movement of the cover during disengagement of the balls can be used to trip a limit switch and signal a torque overload condition. The drive should be shut down immediately and the source of overload determined and cleared. The drive can then be restarted.

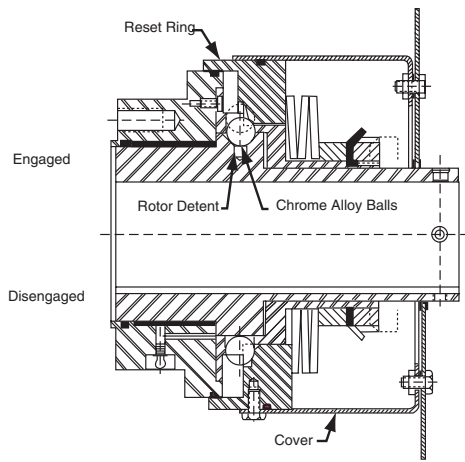


Figure 2

II. Mounting Sprockets and Jaw Clutches to Clutch

A. Mounting Sprockets to Housing

1. Inspect mating pilots on clutch and sprocket for nicks or burrs and remove as required.
2. Position sprocket on clutch housing and align mounting holes.
3. Attach sprocket to housing using stainless steel hexagon head capscrews, high collar lock washers and flat washers. See Figure 3 for mounting patterns, screw sizes, screw quantities and recommended screw seating torques. See Figures 4 and 5 for standard Type B NH-78 sprocket mounts.

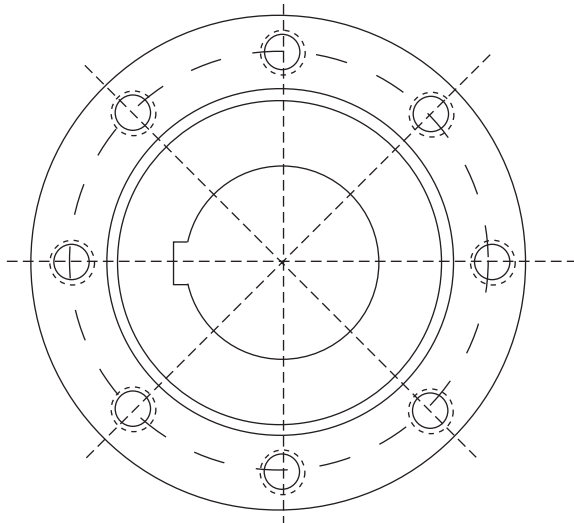


Figure 3 – Standard Mounting Hole Patterns

Size	Capscrews			Thread Depth	Bold Circle	+.000 -.002 Pilot
	Qty.	Thread	Seating Torque			
05 Styles A/B, M/N	6	5/16-18	170 in-lb	.75	4.000	3.123
06 Styles A/B, M/N	8	1/2-13	750 in-lb	1.12	4.875	4.000
09 Style A/B	8	1/2-13	750 in-lb	1.25	4.875	4.000
09 Style M/N	8	1/2-13	750 in-lb	1.25	6.500	5.500
11 Styles A/B, M/N	8	1/2-13	750 in-lb	1.25	6.500	5.500

Note: Capscrews should be minimum 80,000 PSI tensile, Rb 80-84

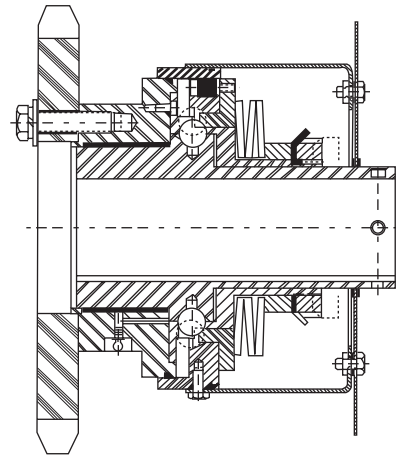


Figure 4
Type B, Through Bore – Standard NH-78
Sprocket Mounting

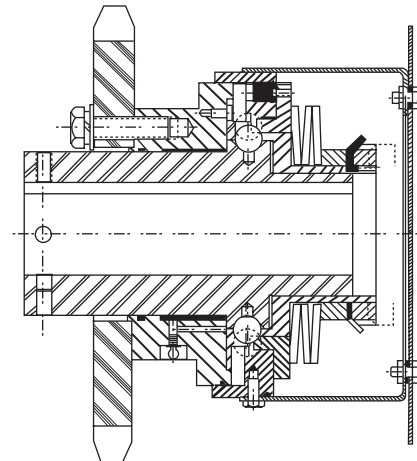


Figure 5
Type B, End Shaft – Standard NH-78 Sprocket
Mounting

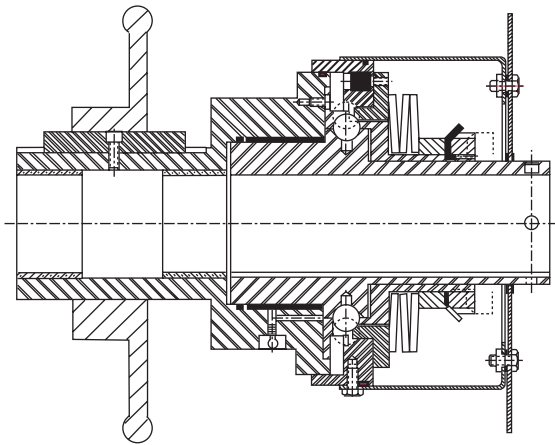


Figure 6

Type J with Handwheel Half of Jaw Clutch

B. Mounting Jaw Clutch to Type J Housing

1. Inspect hub and key of Type J housing for any nicks or burrs and remove as required.
2. Slide handwheel half of jaw clutch on Type J housing. The handwheel should be free to float along the hub of the J housing. See Figure 6 for possible jaw clutch mounting.

III. Mounting Clutch to Shaft

A. Mounting Basic Clutch

1. Inspect shaft and key for any nicks or burrs and remove as required.
2. Loosen the setscrews on the rotor to make sure that the tips of the screws clear the bore and keyway.
3. Position shaft key and slide clutch onto shaft. On some bore sizes, a setscrew will not be over the key. It may be necessary to stake the key to the shaft.

Note: A minimum shaft engagement of 1-1/2 times the shaft diameter is recommended for clutch installation.

4. Align sprocket or jaw clutch mounted to overload clutch with mating sprocket in drivetrain. Refer to installation and alignment instructions furnished with sprocket and/or jaw clutch.

Clutch Size	Screw Size	Seating Torque
05	1/4-20	70 in-lb
06	3/8-16	230 in-lb
09	1/2-13	500 in-lb
11	1/2-13	500 in-lb

5. Secure clutch to shaft by tightening the rotor setscrews. Refer to the following table for setscrew seating torques.

IV. Resetting Instructions

A. Manual Reset

1. Before resetting the clutch, the overload condition must first be corrected.
2. After the clutch has disengaged, it can be reset in multiple positions. There are four tapped holes on the O.D. of the rotor and two lube fittings on the O.D. of the housing as shown in Figure 7.

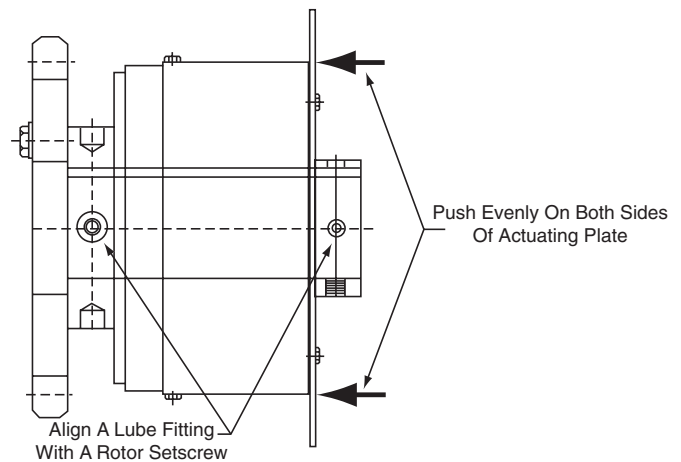


Figure 7

3. Rotate the drive until a lube fitting on the housing lines up with a tapped hole on the rotor. The rotor keyway should also be lined up with a lube fitting on the housing.
4. After the proper position has been established, push/pull evenly on both sides of the limit switch actuating plate as shown in Figure 7. When the clutch is properly reset, the steel balls will move back into their pockets and the cover and reset plate will return to their original positions. An audible sound will be detected when the clutch re-engages.

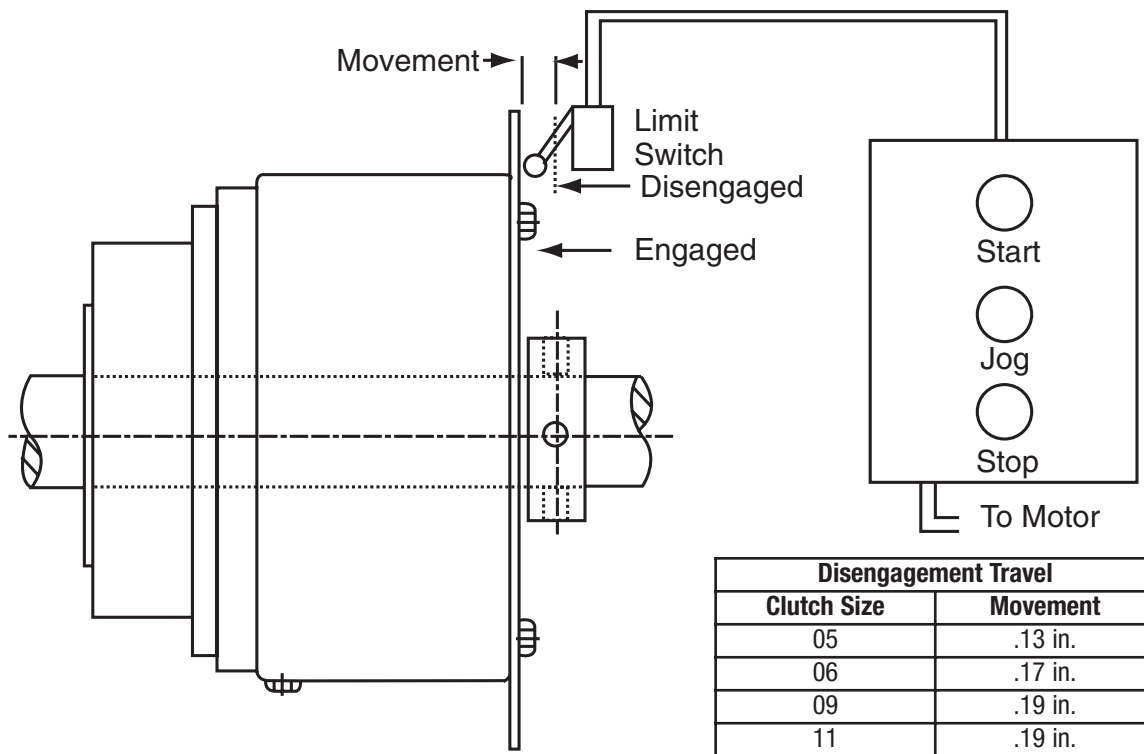


Figure 8

B. Automatic Reset

The automatic reset version of the clutch will re-engage without manual assistance. The steel balls will move back into their pockets every 1/4 of a revolution (1/8 of a revolution on a size 11). After the overload condition has been cleared, jog the drive until the steel balls move back into their pockets and the cover and reset plate return to their original positions. An audible sound will be detected when the clutch re-engages.

V. Limit Switch

The WOR Clutch Series is offered in an automatic reset design. Because of this feature, it is important that the drive be shut down immediately upon a torque overload condition. Figure 8 utilizes a single limit switch to detect an overload. The switch should be able to operate within the disengagement travel of the clutch. Upon an overload, an oversized stainless steel plate attached to the cover will move to actuate the limit switch and shut down the drive.

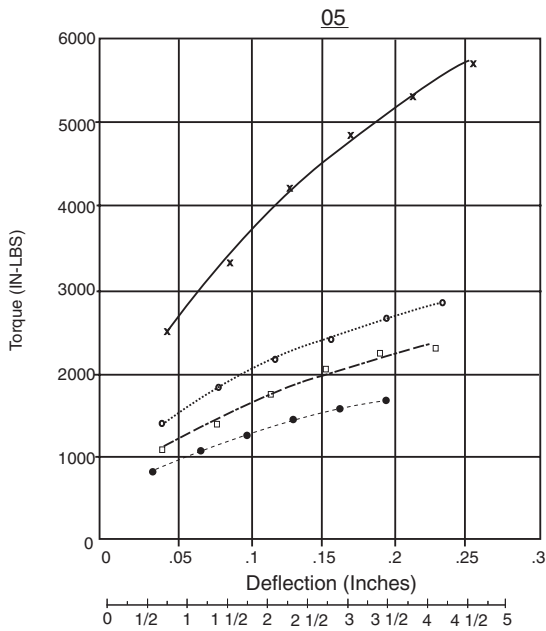
VI. Torque Adjustment

The spring curves on page 6 can be used to approximate the adjustment of the bearing nut required to yield a desired torque setting.

A. Estimated adjustment from spring curves

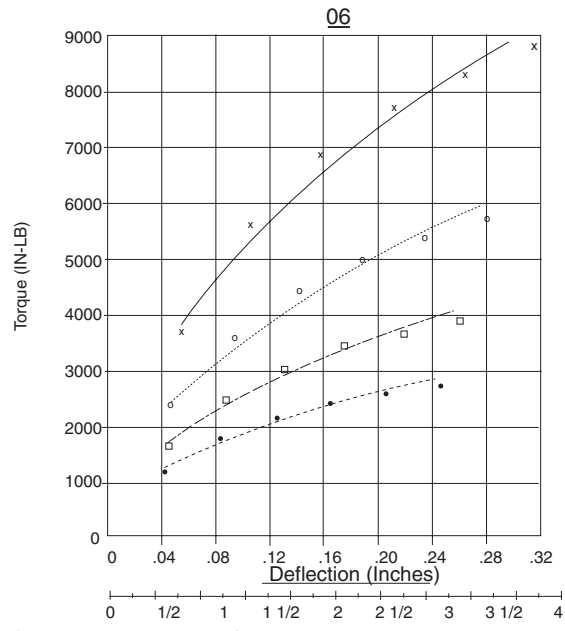
1. Determine what size overload release clutch and disc springs are being used.
2. Find the appropriate spring chart and curve for your situation.
3. Draw a line horizontally from a point on the torque scale, equal to the torque setting, to intersect with the spring curve.
4. Draw a line vertically down from this point of intersection to the deflection scale. This will be the amount of adjustment required on the bearing nut.

- B. The exponential curve equations found on each spring chart could also be used to determine the amount of adjustment required to approximate any desired torque setting.



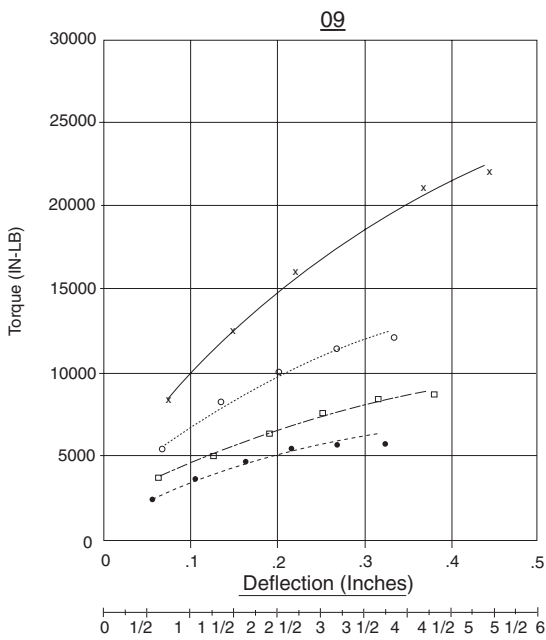
Corresponding Number Of Nut Revolutions For Desired Setting

- x = W Deflection = $(\text{Torque}/10970)^2$
- o = H Deflection = $(\text{Torque}/6500)^2$
- = M Deflection = $(\text{Torque}/5000)^2$
- = L Deflection = $(\text{Torque}/4400)^2$



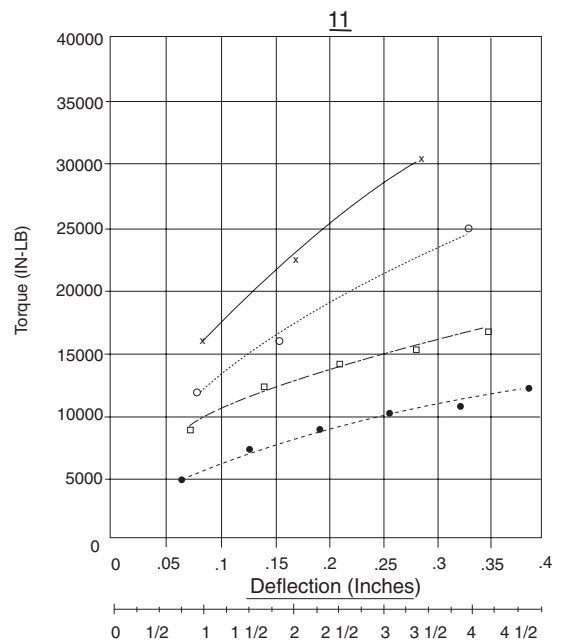
Corresponding Number Of Nut Revolutions For Desired Torque Setting

- x = W Deflection = $(\text{Torque}/16177)^2$
- o = H Deflection = $(\text{Torque}/11208)^2$
- = M Deflection = $(\text{Torque}/7844)^2$
- = L Deflection = $(\text{Torque}/6000)^2$



Corresponding Number Of Nut Revolutions For Desired Deflection

- x = W Deflection = $(\text{Torque}/34000)^2$
- o = H Deflection = $(\text{Torque}/22255)^2$
- = M Deflection = $(\text{Torque}/14700)^2$
- = L Deflection = $(\text{Torque}/11200)^2$



Corresponding Number Of Nut Revolutions For Desired Torque Setting

- x = W Deflection = $(\text{Torque}/57000)^2$
- o = H Deflection = $(\text{Torque}/43000)^2$
- = M Deflection = $(\text{Torque}/30000)^2$
- = L Deflection = $(\text{Torque}/20000)^2$

Spring Curves

Example:

Clutch Size -05
 Torque Range – 2,500 - 5,000 in.-lb. (W)
 Torque Setting - 5,000 in-lb
 Deflection by Curve- .19 in.
 Deflection by Equation- .20 in.
 Approximately 3-1/2 turns of nut

Size	Thread Pitch	Adjustment Per Turn				
		1/8	1/4	3/8	1/2	1
05	18	.007	.014	.021	.028	.056
06	12	.010	.021	.031	.042	.083
09	12	.010	.021	.031	.042	.083
11	12	.010	.021	.031	.042	.083

Size	Spring Pack No.	Color Code	Torque Range (In-Lb)		
			Minimum	Maximum	Code
05	711989-002	White	2,500	5,000	W
	711989-003	Blue	1,400	2,800	H
	711989-004	Yellow	1,100	2,200	M
	711989-005	Black	850	1,700	L
06	711990-002	White	4,000	8,000	W
	711990-003	Blue	2,500	5,500	H
	711990-004	Yellow	1,800	3,750	M
	711990-005	Black	1,250	2,500	L
09	711991-002	White	8,500	20,000	W
	711991-003	Blue	5,500	12,000	H
	711991-004	Yellow	3,750	8,500	M
	711991-005	Black	2,250	5,750	L
11	711992-002	White	16,000	30,000	W
	711992-003	Blue	12,000	25,000	H
	711992-004	Yellow	9,000	16,500	M
	711992-005	Black	5,000	12,000	L

Note: Each spring pack consists of three disc springs and a spacer.

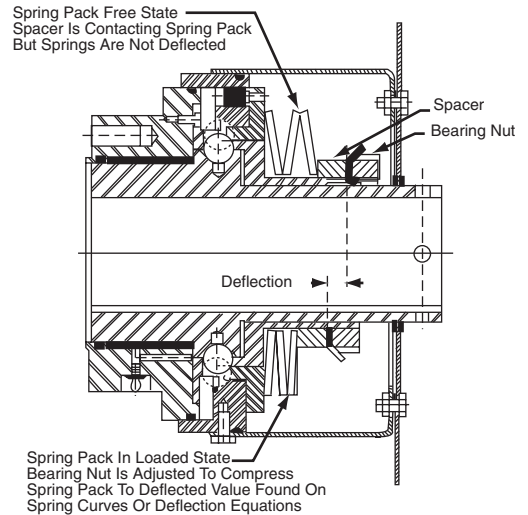
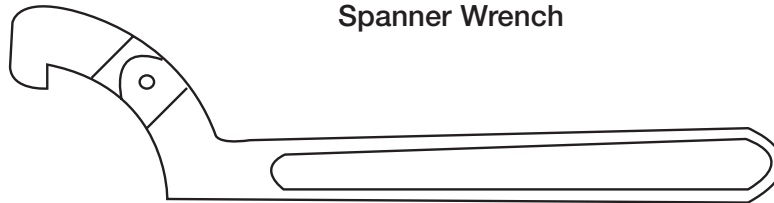


Figure 10

- C. The amount of adjustment required (spring deflection) can be estimated by counting the turns of the bearing nut or can be measured as shown in Figure 10.
1. Remove eight screws from face of trip plate.
 2. Remove eight screws from the O.D. of the cover.
 3. Slide the trip plate and seal off the end of the rotor.

Figure 9
Spanner Wrench



Clutch Size	Wrench Part No.			Specifications (inches/millimeters)			
	Armstrong Tool Co.	McMaster-Carr Supply Co	Snap-On Tool Co	Diameter Range	Hook Thickness	Hook Depth	Length
05, 06	34-307	5471A13	AHS304	2.00 to 4.75	.47	.19	11.38
				50.8 to 120.7	11.9	4.8	289.1
09	34-310	5471A14	AHS307	4.50 to 6.25	.47	.25	12.13
				114.3 to 158.6	11.9	6.4	308.1
11	34-313	5471A23	-----	6.12 to 8.75	.47	.31	13.75
				155.5 to 222.3	11.9	7.9	349.3

4. Slide the cover toward the housing until the bearing nut and lock washer are exposed.
5. Lift tab of lock washer securing the adjustment nut in position.
6. Use a spanner wrench to adjust nut to desired torque setting.
7. Once the torque is set, fold one of the lock washer tabs over one slot on the adjusting nut. Coat bearing nut and washer with a lithium-base, water-resistant, NLGI grade 2 grease.
8. Reinstall the trip plate and seal on the rotor and attach the trip plate to the cover with the trip plate screws. Tighten the trip plate screws to a torque of 100 in-lb.
9. Slide the cover back into its original position making sure that the O.D. holes line up with the tapped holes in the reset ring. Attach the cover to the reset ring with the cover screws and tighten the screws to a torque of 100 in-lb.

D. Standard bearing nuts are used to adjust the spring load which controls the release torque of the clutch. These nuts are slotted and can easily be turned using a common, commercially available hook-style spanner wrench. Refer to Figure 9 for wrenches which are compatible with our torque overload release clutch.

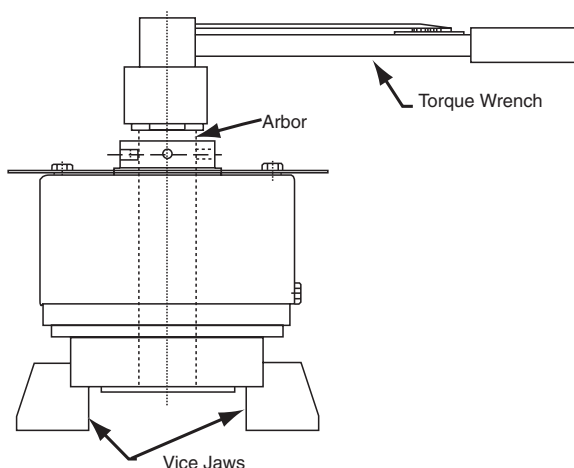


Figure 11

- E. For applications requiring a precise torque, the release torque setting of the clutch should be tested as shown in Figure 11. Verification of the release torque several times in both clockwise and counterclockwise directions is recommended. This service is available at the factory.

VII. Removal and Installation of Spring Pack

A. Removal of old spring pack

1. Remove the eight screws from the trip plate.
2. Slide the trip plate away from the cover just to the end of the rotor.
3. Remove the eight screws from the O.D. of the cover.
4. Slide the cover toward the housing just enough to expose the bearing nut and lock washer.
5. Lift the tab of the lock washer securing the bearing nut.
6. Turning counterclockwise, loosen nut with a spanner wrench.
7. Loosen rotor setscrews and remove clutch from shaft, if applicable.
8. Remove nut, lock washer, disc springs and spacer.

B. Installation of new spring pack

1. Lubricate disc springs with a lithium base, water-resistant, NLGI grade 2 grease.
2. Stack springs on thrust plate and rotor as shown in Figure 12.
3. Place spacer provided with the spring pack in position on clutch as shown in Figure 12.
4. Lubricate lock washer and threads of nut with a graphite-based lubricant like "Never-Seez."
5. Install lock washer and nut onto clutch.

6. Adjust nut to desired release torque as outlined in Section VI.
7. Coat bearing nut and washer with a lithium-base, water-resistant, NLGI grade 2 grease.

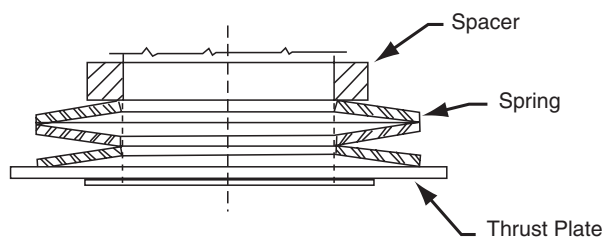


Figure 12

VIII. Automatic-Manual Conversion

- A. Remove the eight screws from the O.D. of the cover.
- B. Remove the cover and trip plate from the clutch assembly.
- C. Lift the tab of the lock washer securing the bearing nut.
- D. Turning counterclockwise, loosen the nut with a spanner wrench.
- E. Remove nut, lock washer, disc springs and spacer.
- F. Lift off automatic reset ring assembly from the housing and shoulder plate of the clutch.
- G. Apply a coating of grease to the entire inside surface of the new reset ring and thrust plate.
- H. Place the reset ring over the rotor with the chamfered side facing the housing. Press down on the reset ring until it is firmly seated.
- I. Insert an o-ring into the groove on the O.D. of the new reset ring.
- J. Lubricate the disc springs and stack the springs against the reset ring or thrust plate.
- K. Line up the I.D. tab of lock washer with the slot of the shoulder plate and slip the lock washer over the threads of the shoulder plate.
- L. Lubricate the lock washer and threads of nut with a graphite-based lubricant such as “Never-Seez” and tighten nut onto shoulder plate. See Section VI for torque adjustment.

IX. General Maintenance

A. Lubrication

The WOR Series clutch is prelubricated at the factory and is also equipped with lube fittings for scheduled lubrication. The clutch should be lubricated with a lithium base, water-resistant, grade 2 grease. The lubrication schedule should be in accordance with good operating practices for the equipment on which the clutch is mounted.

⚠ WARNING Do Not Over Lubricate.

On a clutch with a Type J adapter, it is also important to periodically lubricate the internal bronze bushings. This is accomplished by sliding the handwheel half of the jaw clutch, exposing the capscrew holding the key on the J housing. Remove the capscrew and inject a liberal amount of grease into the cavity between the two bronze bushings. Reinsert the capscrew and tighten, then slide the handwheel back into position.

B. Annual Inspection

The WOR SERIES overload release clutch is constructed of heavy-duty materials. Under reasonable conditions the unit will operate with a minimum of maintenance. A scheduled annual inspection of seals, bearings and other internal components is suggested. However, the actual frequency should be in accordance with good operating practices for the equipment on which the clutch is installed.

X. General Disassembly

A. Cover and miscellaneous internal components

1. Remove the eight capscrews from the trip plate.
2. Slide the trip plate and trip plate seal over the end of the rotor.
3. Remove the eight capscrews from the O.D. of the cover.
4. Remove cover by sliding the cover toward the end of the rotor.

5. Lift tab of lock washer securing the bearing nut into position.
6. Remove bearing nut by turning nut counterclockwise with a spanner wrench.
7. Remove lock washer and spring pack.
8. Lift off reset ring. For manual reset, the thrust plate, springs and shoulder screws will be attached to reset ring.
9. Remove o-ring seal from the O.D. of the reset ring.
10. Use a magnet to remove steel balls from the shoulder plate pockets.

B. Housing and miscellaneous internal components

1. Remove any adapters or sprockets from the housing.
2. Remove the capscrews attaching the shoulder plate to the housing.
3. Remove the shoulder plate from the housing by sliding the shoulder plate off the rotor.
4. Remove the bearing strip from the I.D. of the shoulder plate.
5. Remove the rotor from the housing by pulling the rotor away from the housing.
6. For sizes 05 and 06, remove the quad ring seal from the O.D. of the housing. For sizes 09 and 11, remove the quad ring seal from the I.D. of the reset ring. For all sizes, remove the o-ring seal from the I.D. of the housing.

XI. General Assembly

A. Housing and miscellaneous internal components

1. Grease pack o-ring groove in I.D. of housing and insert o-ring seal.

2. Insert the rotor into the I.D. of the housing until the rotor flange is against the housing. For a through bore style, the shorter end of the rotor is inserted into the housing and for an end shaft style, the longer end of the rotor is inserted. Apply a coating of grease to the pocket area of the rotor.
3. Insert the bearing strip into the I.D. groove of the shoulder plate and lightly coat the bearing strip with grease.
4. With the flange side of the shoulder plate facing the housing, slide the shoulder plate onto the rotor until the shoulder plate flange meets the mounting surface of the housing.
5. Rotate the shoulder plate until the counterbored holes line up with the tapped holes in the housing and the dowel pin holes of the shoulder plate line up with the dowel pins in the housing.
6. Thoroughly clean and dry threads of low head capscrews.
7. Apply some thread-locking compound like "Loctite #271 " to the threads of the low head capscrews and insert the low head capscrews into the counterbored holes and tighten to the torques in the following chart.
8. Rotate the rotor until the rotor pockets line up with the holes in the shoulder plate.
9. Apply a coating of grease to each hole in the shoulder plate.
10. Insert a steel ball into each hole in the shoulder plate until the ball sits firmly in the rotor pocket.
11. Grease pack the quad ring groove on the O.D. of the housing or on the I.D. of the reset ring and install the quad seal.
12. Coat the entire inside surface of the reset ring assembly and the outside surface of the housing with grease and place the reset ring over the rotor with the chamfered side facing the housing. Press down on the reset ring assembly until it is firmly seated.

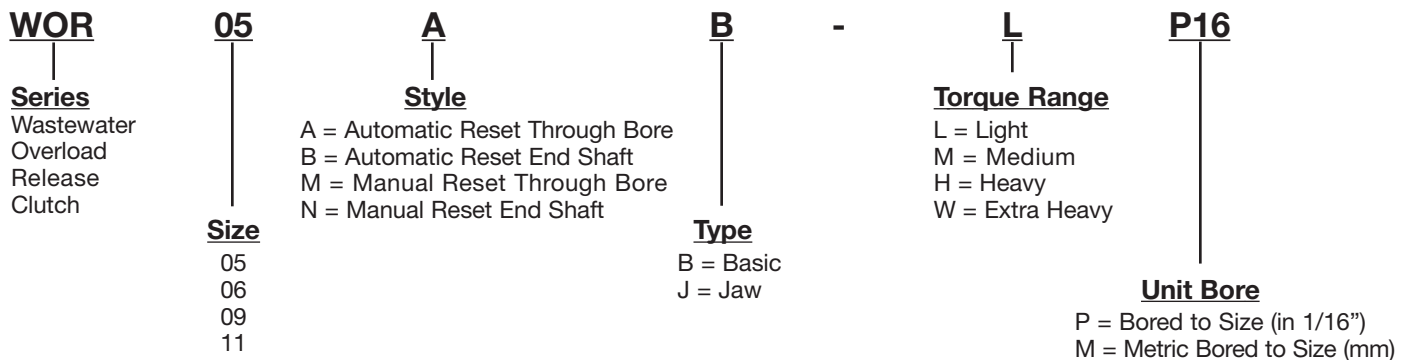
Size	Screw Size	Qty.	Seating Torque
05	1/4-20 UNC	8	80 in-lb
06	1/4-20 UNC	8	80 in-lb
09	3/8-16 UNC	8	273 in-lb
11	3/8-16 UNC	8	273 in-lb

⚠ WARNING Retaining compound must cure at 70°F for a 24-hour period before clutch is placed into service.

B. Cover and miscellaneous internal components

- Grease pack the groove on the O.D. of the reset ring and insert the o-ring seal.
- Lubricate disc springs and stack the springs against the thrust plate as shown in Figure 12.
- Stack spacer on top of disc springs as shown in Figure 12.
- Line up I.D. tab of lock washer with the slot of the shoulder plate and slip the lock washer over the threads of the shoulder plate.
- Lubricate lock washer and threads of nut with a graphite-based lubricant such as “Never-Seez” and tighten nut onto the shoulder plate. See Section VI for torque adjustment.
- Lubricate the I.D. of the cover and slide the cover onto the reset ring making sure that the thru holes on the O.D. of the cover line up with the tapped holes on the O.D. of the reset ring.
- Install the trip plate U-channel seal into the I.D. of the trip plate. The end shaft style does not have a trip plate seal.
- For a through shaft style only, lubricate the trip plate seal and slide the trip plate over the rotor until the trip plate meets the cover.
- Make sure that the gasket is still attached to the trip plate. Line up the trip plate holes with the holes in the cover and insert the eight trip plate screws into these holes and tighten to a torque of 100 in-lb.
- Insert the eight capscrews into the O.D. holes of the cover and tighten to a torque of 100 in-lb.

WOR Series Part Numbering System



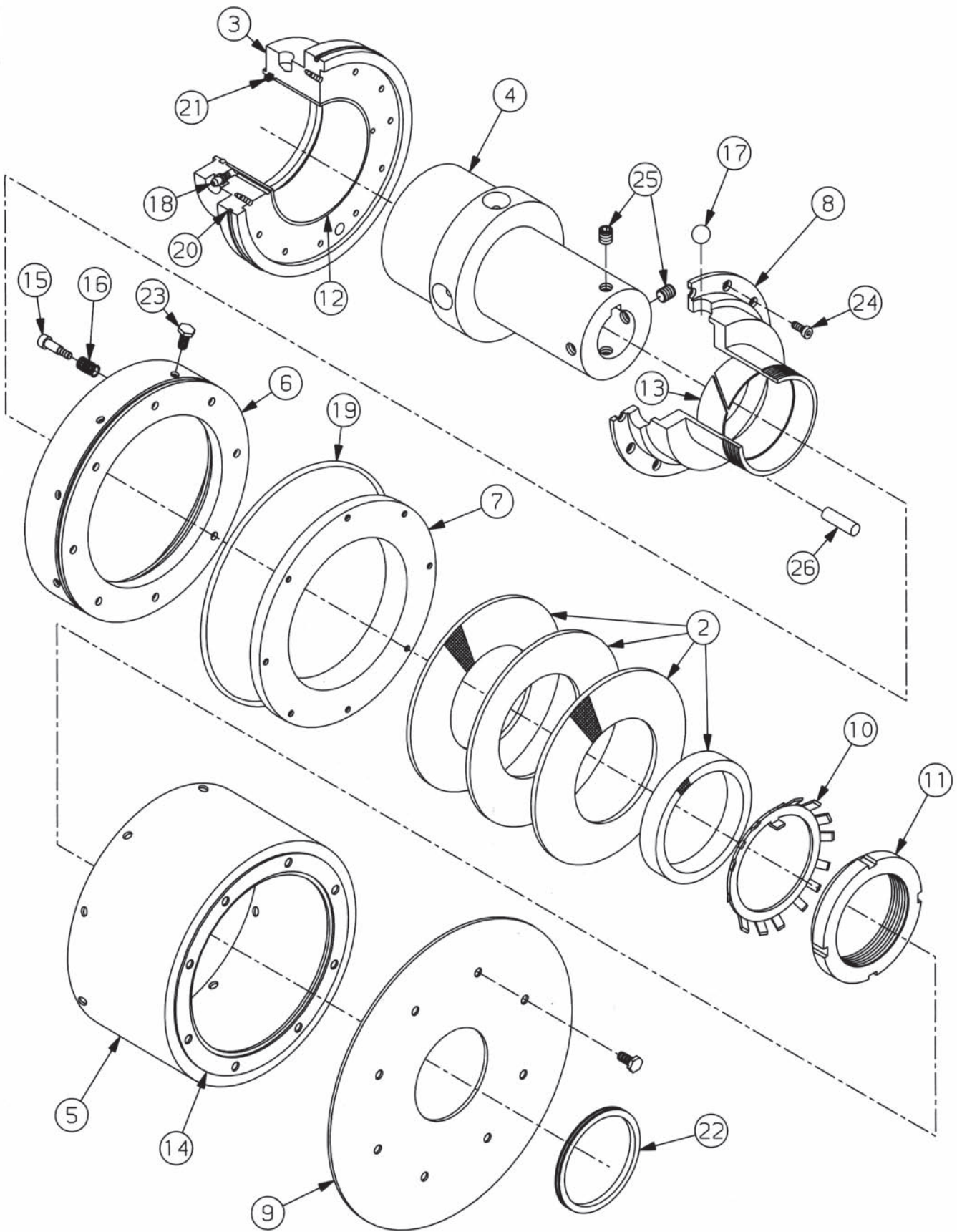


Figure 13 - Type B, Through Shaft Style

Part Identification For Type B, Through Shaft Style, Basic Unit

Item No.	Name	Qty.	05	06	09	11
1	Assembly - Automatic	-	711944-911	711947-921	711950-931	711953-941
	Assembly - Manual	-	711944-912	711947-922	711950-932	711953-942
2	Spring Pack	1	711989-XXX	711990-XXX	711991-XXX	711992-XXX
3	Housing	1	731764-001	731795-001	731704-001	731707-001
4	Rotor (Through Shaft)	1	731774-001	731805-001	731696-001	731781-001
5	Cover	1	731765-001	731796-001	731699-001	731791-001
6	Manual Reset Ring	1	731767-001	731798-001	731701-001	731701-001
	Automatic Reset Ring	1	731772-001	731803-001	731702-001	731702-001
**7	Thrust Plate	1	731768-001	731799-001	731698-001	731698-001
8	Shoulder Plate	1	731766-001	731797-001	731697-001	731786-001
9	Trip Plate	1	731770-001	731801-001	731700-001	731790-001
10	Lock Washer	1	065419-017	065419-018	065419-019	065419-020
11	Bearing Nut	1	075264-013	075264-014	075264-015	075264-022
12	Housing Bearing	1	730137-042	730137-041	730137-043	730137-006
13	Bearing Strip	1	731779-001	731779-002	731779-003	731779-004
14	Gasket	1	731771-001	731802-001	731703-001	731703-001
**15	Shoulder Screw	8	731710-001	731710-001	731710-002	731710-002
**16	Spring	8	034124-088	034124-088	034124-089	034124-089
*17	Ball	4	070071-008	070071-001	070071-009	070071-009
18	Lube Fitting	2	034186-030	034186-030	034186-030	034186-030
19	Cover Seal	1	023750-007	023750-303	023750-164	023750-164
20	Housing Seal	1	063628-111	063628-116	063628-198	063628-198
21	Rotor Seal	1	023750-176	023750-140	023750-140	023750-072
22	Trip Plate Seal	1	731780-001	731780-002	731780-003	731780-004
23	Cover Screw	16	074118-045	074118-045	074118-045	074118-045
24	Low Head Capscrew	8	075519-006	075519-006	075519-018	075519-018
25	Setscrew	2	731639-024	731639-038	731639-043	731639-043
26	Dowel Pin	2	023921-056	023921-054	023921-006	023921-006

* Size 11 uses eight balls.

** Not included in automatic design.

Note: Please include clutch catalog number when ordering any spare parts.

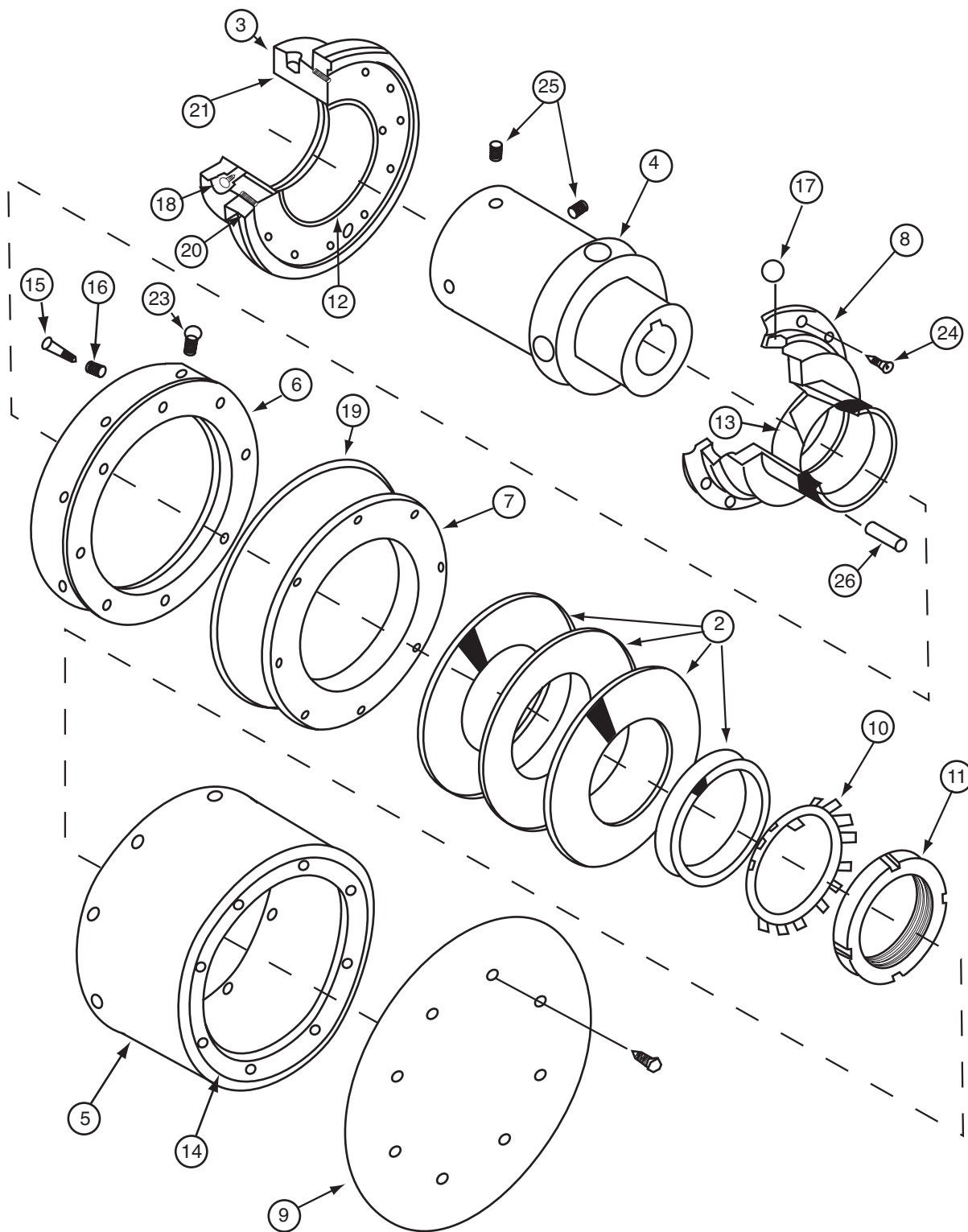


Figure 14 - Type B, End Shaft Style

Part Identification For Type B, End Shaft Style

Item No.	Name	Qty.	05	06	09	11
1	Assembly - Automatic	-	711945-913	711948-923	711951-933	711954-943
	Assembly - Manual	-	711945-914	711948-924	711951-934	711954-944
2	Spring Pack	1	711989-XXX	711990-XXX	711991-XXX	711992-XXX
3	Housing	1	731764-001	731795-001	731707-001	731707-001
4	Rotor (End Shaft)	1	731769-001	731800-001	731706-001	731782-001
5	Cover	1	731765-001	731796-001	731699-001	731791-001
6	Manual Reset Ring	1	731767-001	731798-001	731701-001	731701-001
	Automatic Reset Ring	1	731772-001	731803-001	731702-001	731702-001
**7	Thrust Plate	1	731768-001	731799-001	731698-001	731698-001
8	Shoulder Plate	1	731766-001	731797-001	731697-001	731786-001
9	Trip Plate	1	731770-002	731801-002	731700-002	731700-002
10	Lock Washer	1	065419-017	065419-018	065419-019	065419-020
11	Bearing Nut	1	075264-013	075264-014	075264-015	075264-022
12	Housing Bearing	1	730137-042	730137-041	730137-006	730137-006
13	Bearing Strip	1	731779-001	731779-002	731779-003	731779-004
14	Gasket	1	731771-001	731802-001	731703-001	731703-001
**15	Shoulder Screw	8	731710-001	731710-001	731710-002	731710-002
**16	Spring	8	034124-088	034124-088	034124-089	034124-089
*17	Ball	4	070071-008	070071-001	070071-009	070071-009
18	Lube Fitting	2	034186-030	034186-030	034186-030	034186-030
19	Cover Seal	1	023750-007	023750-303	023750-164	023750-164
20	Housing Seal	1	063628-111	063628-116	063628-198	063628-198
21	Rotor Seal	1	023750-176	023750-140	023750-072	023750-072
23	Cover Screw	16	074118-045	074118-045	074118-045	074118-045
24	Low Head Capscrew	8	075519-006	075519-006	075519-018	075519-018
25	Setscrew	2	731639-024	731639-038	731639-043	731639-043
26	Dowel Pin	2	023921-056	023921-054	023921-006	023921-006

* Size 11 uses eight balls.

** Not included in automatic design.

Note: Please include clutch catalog number when ordering any spare parts.

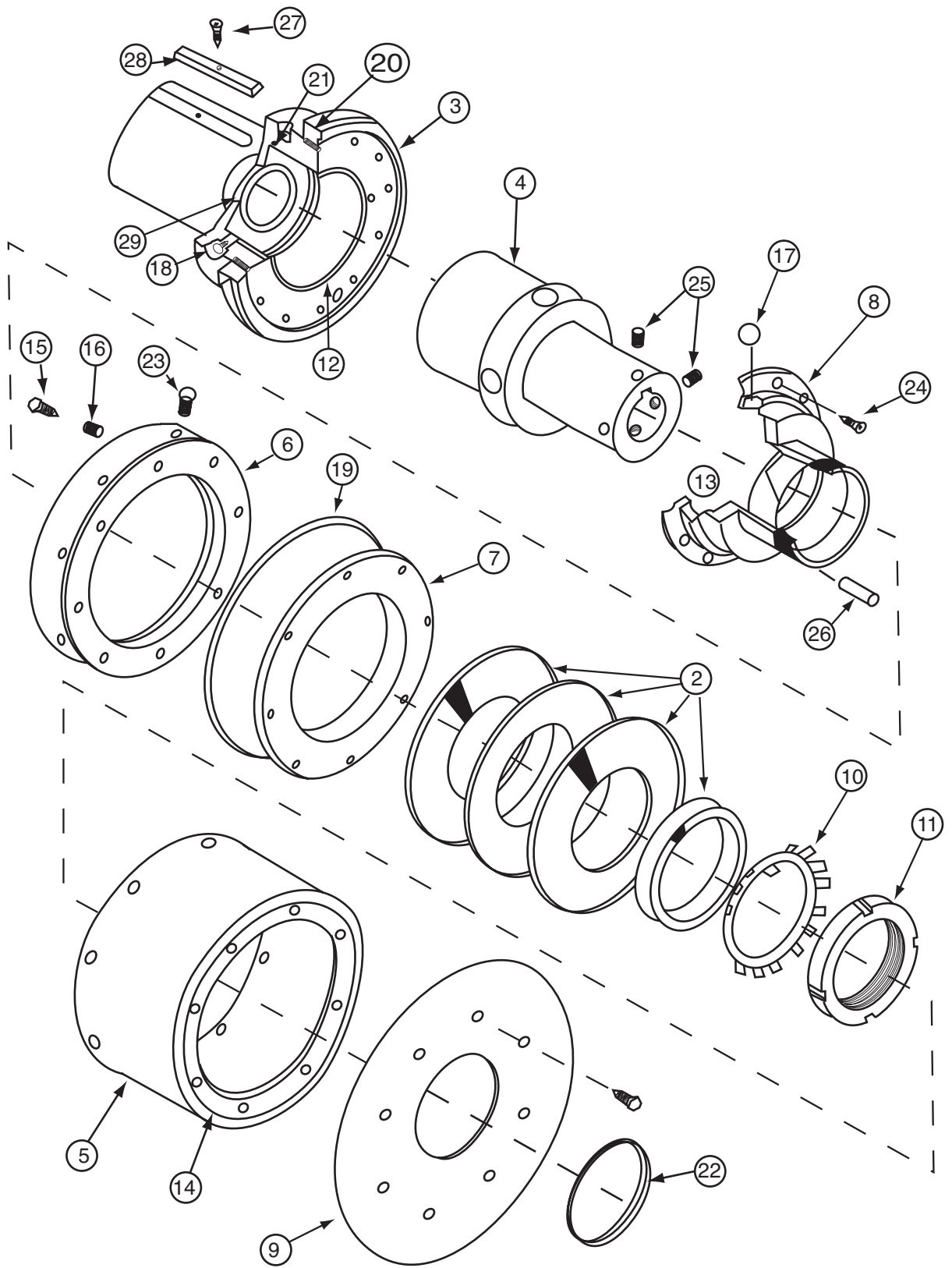


Figure 15 - Type J, Through Shaft Style

Part Identification For Type J, Through Shaft Style With Jaw Clutch Adapter

Item Number	Name	Qty.	05	06	09	11
1	Assembly - Automatic	-	711946-915	711949-925	711952-935	711955-945
	Assembly - Manual	-	711946-916	711949-926	711952-936	711955-946
2	Spring Pack	1	711989-XXX	711990-XXX	711991-XXX	711992-XXX
3	Housing	1	731773-001	731804-001	731763-001	731785-001
4	Rotor (Through Shaft)	1	731774-001	731805-001	731696-001	731781-001
5	Cover	1	731765-001	731796-001	731699-001	731791-001
6	Manual Reset Ring	1	731767-001	731798-001	731701-001	731701-001
	Automatic Reset Ring	1	731772-001	731803-001	731702-001	731702-001
**7	Thrust Plate	1	731768-001	731799-001	731698-001	731698-001
8	Shoulder Plate	1	731766-001	731797-001	731697-001	731786-001
9	Trip Plate	1	731770-001	731801-001	731700-001	731790-001
10	Lock Washer	1	065419-017	065419-018	065419-019	065419-020
11	Bearing Nut	1	075264-013	075264-014	075264-015	075264-022
12	Housing Bearing	1	730137-042	730137-041	730137-043	730137-006
13	Bearing Strip	1	731779-001	731779-002	731779-003	731779-004
14	Gasket	1	731771-001	731802-001	731703-001	731703-001
**15	Shoulder Screw	8	731710-001	731710-001	731710-002	731710-002
**16	Spring	8	034124-088	034124-088	034124-089	034124-089
*17	Ball	4	070071-008	070071-001	070071-009	070071-009
18	Lube Fitting	2	034186-030	034186-030	034186-030	034186-030
19	Cover Seal	1	023750-007	023750-303	023750-164	023750-164
20	Housing Seal	1	063628-111	063628-116	063628-198	063628-198
21	Rotor Seal	1	023750-176	023750-140	023750-140	023750-072
22	Trip Plate Seal	1	731780-001	731780-002	731780-003	731780-004
23	Cover Screw	16	074118-005	074118-045	074118-045	074118-045
24	Low Head Capscrew	8	075519-006	075519-006	075519-018	075519-018
25	Setscrew	2	731639-024	731639-038	731639-043	731639-043
26	Dowel Pin	2	023921-056	023921-054	023921-006	023921-006
27	Capscrew	1	731433-017	731433-017	731433-017	731433-017
28	Key	1	731793-001	731793-002	731793-003	731793-004
29	Bushing	2	731794-XXX	731794-XXX	731794-XXX	731794-XXX

* Size 11 uses eight balls.

** Not included in automatic design.

Note: Please include clutch catalog number when ordering any spare parts.

CAUTION Rotating equipment is potentially dangerous and could cause injury or damage if not properly protected. Follow all applicable codes and regulations. In accordance with our established policy to constantly improve our products, the specifications contained herein are subject to change without notice.

Warranty

Boston Gear warrants that products manufactured or sold by it shall be free from defects in material and workmanship. Any products which shall within one (1) year of delivery, be proved to the Company's satisfaction to have been defective at the time of delivery in these respects will be replaced or repaired by the Company at its option. Freight is the responsibility of the customer. The Company's liability under this limited warranty is limited to such replacement or repair and it shall not be held liable in any form of action for direct or consequential damages to property or person. The foregoing limited warranty is expressly made in lieu of all other warranties whatsoever, express, implied and statutory and including without limitation the implied warranties of merchantability and fitness.

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Boston Gear
14 Hayward Street ▪ Quincy, MA 02171
617-328-3300 ▪ Fax: 617-479-6238
www.bostongear.com
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