

Boston Gear®

HOR Series

Mechanical Overload Release Clutches

P-3028-BG

Installation and Maintenance

HOR Series
Model H1600



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Torque transmission between the balls and the housing is the key to the disengagement of the clutch. The balls are forced into the pockets of the housing 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 pockets and freewheel much as a ball thrust bearing. This rolling action increases the efficiency in which the clutch operates and reduces any fluctuation of torque setting due to frictional changes. Refer to Figure 2.

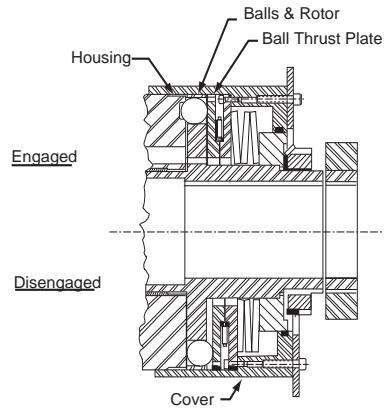


Figure 2

I. Operating Principle

The HOR Series Model H1600 is an automatic reset, mechanical ball detent style overload release clutch. It has been designed to provide accurate and dependable torque disconnect protection for mechanical power transmission equipment. Torque is transmitted through the clutch in one of two paths. Refer to Figure 1.

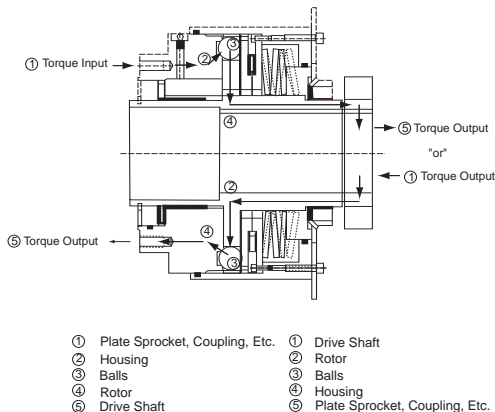


Figure 1

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 the overload determined and cleared. The drive can then be restarted. The automatic reset feature of the clutch will allow it to reengage without manual assistance and the clutch will once again be ready to provide accurate and dependable torque disconnect protection for your equipment.

II. Mounting Adapters and Sprockets or Sheaves to Clutch

A. Mounting to housing of basic clutch

1. Inspect mating pilots on clutch and adapter for nicks or burrs and remove as required.

2. Position adapter on clutch housing and align holes.
3. Attach adapter to housing with mounting bolts and a high collar lock washer. Refer to Table 1 for recommended seating torques.

Note: Large sprockets or sheaves should be supported on the rotor of the clutch with an auxiliary bearing, i.e. sleeve, needle roller, radial ball. Refer to Figure 4.

Table 1 - Mounting Screws

Type B			
Size	Screw Size	Qty.	Seating Torque
02	#8-32	6	49 in-lb
04	#10-24	6	64 in-lb
05	5/16-18	6	305 in-lb
06	3/8-16	6	545 in-lb
09	7/16-14	6	70 ft-lb
11	5/8-11	6	210 ft-lb

Type T			
Size	Screw Size	Qty.	Seating Torque
02	#8-32	6	49 in-lb
04	#8-32	3	49 in-lb
05	1/4-20	3	150 in-lb
06	1/4-20	3	150 in-lb
09	3/8-16	3	545 in-lb
11	3/8-16	3	545 in-lb

B. Mounting to "T" adapter

1. Inspect mating pilots on adapter and sprocket or sheave for nicks or burrs and remove as required.
2. Position sprocket or sheave on adapter and align dowel pin holes.
3. Attach sprocket or sheave to adapter with mounting bolts and a high collar lock washer. Refer to Table 1 for recommended seating torques.

4. Finish ream sprocket or sheave and adapter for dowel pins. These holes should be .0005 inches under the nominal pin diameter. Refer to Table 3 for pin sizes.
5. Install dowels to a point where they bottom in adapter.

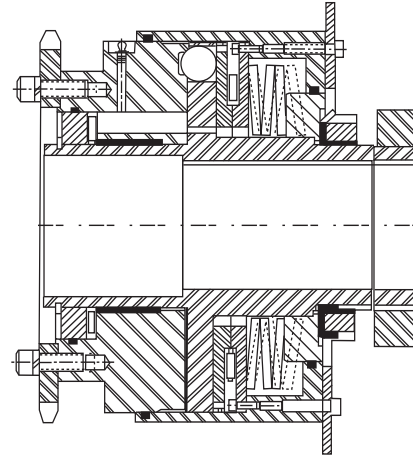


Figure 3 - Type B - Style F, Standard Sprocket Mounting

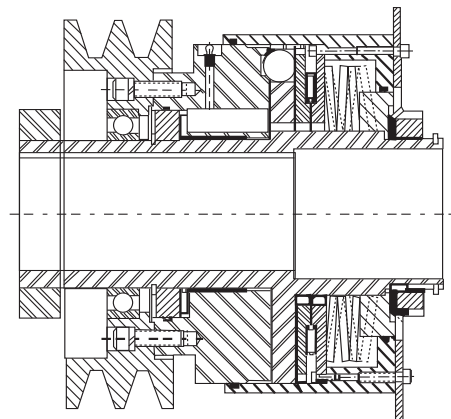


Figure 4 - Type B - Style L, Standard Sheave Mounting

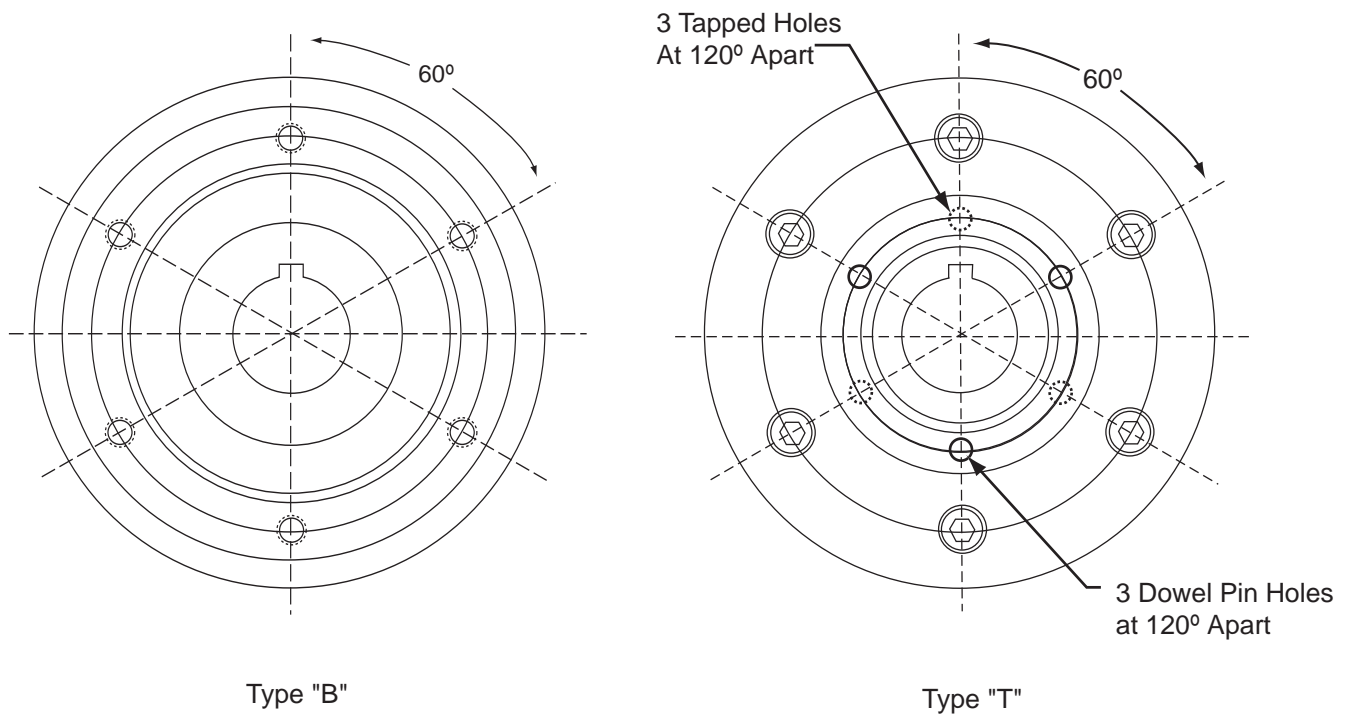


Figure 5 - Standard Mounting Hole Patterns

Table 2 - Minimum Acceptable Plate Sprocket Mounts

Size	Type	Number of Teeth Per Pitch Size							Type	Number of Teeth Per Pitch Size						
		#25 1/4 Pitch	#35 3/8 Pitch	#40 1/2 Pitch	#50 5/8 Pitch	#60 3/4 Pitch	#80 1 Pitch	#100 1-1/4 Pitch		#25 1/4 Pitch	#35 3/8 Pitch	#40 1/2 Pitch	#50 5/8 Pitch	#60 3/4 Pitch	#80 1 Pitch	#100 1-1/4 Pitch
02	B	39	27	22	---	---	---	---	T	27	19	15	---	---	---	---
04	B	51	35	28	23	---	---	---	T	37	26	20	17	---	---	---
05	B	69	47	36	30	26	---	---	T	50	35	27	23	19	---	---
06	B	76	52	40	33	28	---	---	T	54	37	29	24	20	16	14
09	B	101	68	52	43	36	28	24	T	79	54	41	34	29	23	19
11	B	119	80	61	50	43	33	27	T	90	61	47	38	32	25	21

Note: Consult the factory for sprocket mounting requirements which are below the minimum sprocket values shown above.

Table 3 - Standard Mounting Hole Patterns

Size	Type	Capscrews		Depth Thread	Bolt Circle	+.000 -.002 Pilot	Type	Capscrews		Dowel Pins		Depth Thrd./Pin	Bolt	+.000 -.002 Pilot
		Qty.	Thread					Qty.	Thread	Qty.	Diameter			
02	B	6	#8-32	0.38	2.125	1.781	T	6	#8-32	---	---	0.38	1.422	1.094
04	B	6	#10-24	0.50	3.062	2.688	T	3	#8-32	3	3/16	0.38	2.250	1.922
05	B	6	5/16-18	0.75	4.250	3.625	T	3	1/4-20	3	1/4	0.50	3.219	2.750
06	B	6	3/8-16	0.81	4.750	4.000	T	3	1/4-20	3	1/4	0.50	3.406	2.938
09	B	6	1/16-14	0.88	6.625	5.750	T	3	3/8-16	3	3/8	0.75	5.094	4.344
11	B	6	5/8-11	1.00	7.750	6.500	T	3	3/8-16	3	1/2	0.75	5.938	5.188

- Notes:
1. Mounting bolts must be minimum 160,000 PSI tensile, Rc 36-43.
 2. Dowel pins must be minimum 150,000 PSI Shear, Rc 50-58 core hardness.
 3. All mounting holes are equally spaced.

III. Locating and Mounting Clutch and Couplings to Shaft

A. Location

The clutch should always be located as close as possible to the source of an overload condition. Figures 6 through 9 indicate both preferred and not preferred locations for mounting a Series HOR mechanical overload release clutch.

Note: Clutch mounted sprockets, etc. and couplings should be positioned as close to a supporting bearing as possible to minimize overhung loads. A minimum shaft engagement of 1-1/2 times the shaft diameter is recommended for clutch and coupling flange installation.

1. Direct Drives

- a. Figure 6 shows the **preferred** location for mounting in a direct drive application. The clutch is mounted on the low speed side of the reducer, and transmits power from its housing, through its rotor to the driven shaft.
- b. Locating the clutch as shown in Figure 7 is **not preferred**. Here, the clutch is mounted on the high-speed side of the reducer. Generally, mounting in this manner requires the clutch to be hypersensitive to perform satisfactorily.

2. Indirect Drives

- a. Either location of the clutch shown in Figure 8 is **preferred** in indirect drive applications.
- b. The mounting location in Figure 9 is **not preferred** for the same reasons as those for Figure 7. Always consult the factory when a mounting of this type seems necessary.

B. Mounting Basic Clutch

1. Inspect shaft and key for any nicks or burrs and remove as required.
2. Loosen clamp collar on clutch.
3. Position shaft key and slide clutch onto shaft.

4. Align sprocket or sheave mounted to clutch with mating sprocket or sheave in drive train. Refer to installation and alignment instructions furnished with sprocket or sheave.
5. Secure clutch to drive shaft by tightening clamp collar. Refer to Table 4 for recommended seating torque for clamp collar screw.

Table 4 - Clamp Collar Screws

Clutch Size	Screw Size	Seating Torque
02	1/4-28	190 in-lb
04	1/4-28	190 in-lb
05	5/6-24	435 in-lb
06	3/8-24	63 ft-lb
09	1/2-20	140 ft-lb
11	1/2-20	140 ft-lb

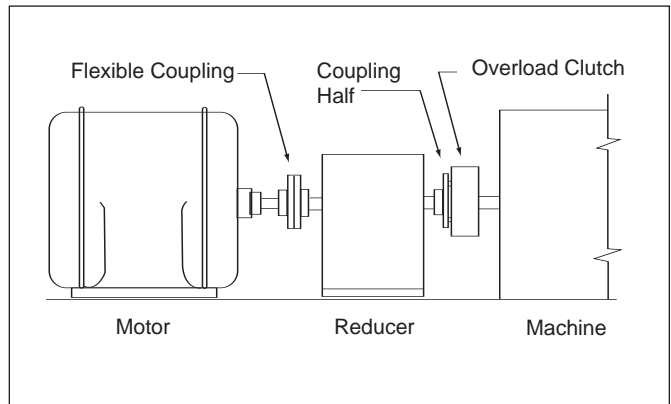


Figure 6

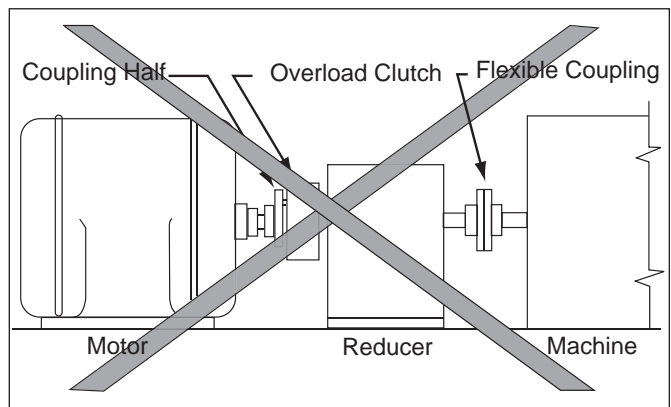


Figure 7

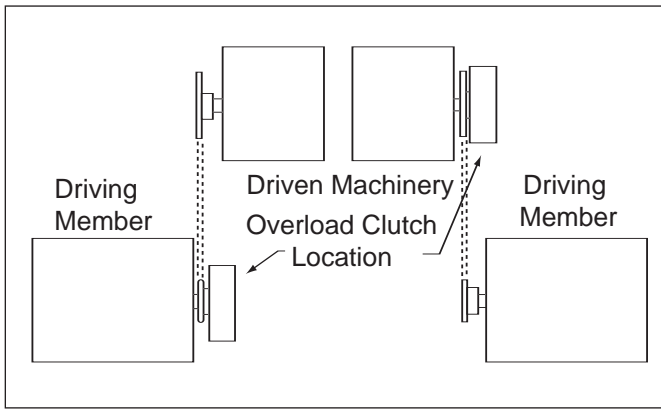


Figure 8

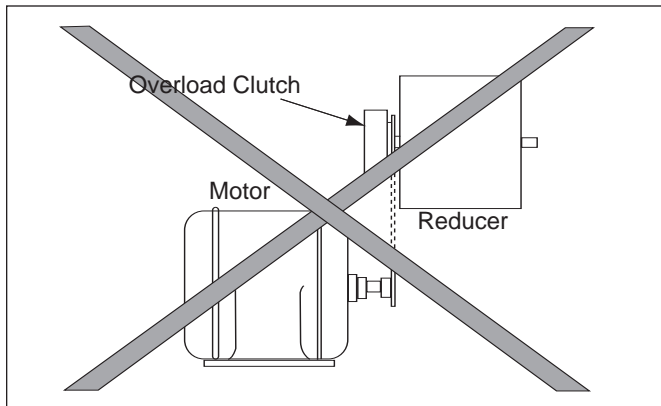


Figure 9

C. Mounting Clutch with Type "C" Flexible Coupling

1. Inspect shafts and keys for any nicks or burrs and remove as required.
2. Loosen clamp collar on clutch.
3. Position shaft keys and slide clutch and coupling flange onto appropriate shafts.
4. Slide coupling flange onto coupling studs. The coupling flange and adapter should be separated by a gap of 1/8".
5. Secure clutch to drive shaft by tightening clamp collar. Refer to Table 4 for recommended seating torque for clamp collar screw.
6. Secure coupling flange to drive shaft by tightening the two setscrews located in the hub of the flange. Refer to Table 5 for recommended setscrew seating torques.

Table 5 - Setscrews

Screw Size	Seating Torque	Screw Size	Seating Torque
#10-32	36 in-lb	1/2-13	52 ft-lb
1/4-28	87 in-lb	9/16-12	52 ft-lb
5/16-24	165 in-lb	5/8-11	110 ft-lb
3/8-24	290 in-lb	3/4-10	200 ft-lb
7/16-20	430 in-lb	7/8-9	300 ft-lb

Note: Retaining compound is furnished for screws 1/2" diameter and larger. Smaller screws are furnished with a self-locking patch.

7. Check the parallel alignment.
 - a. Place a straightedge across the coupling flange and adapter as shown in Figure 10.
 - b. Measure the offset around the periphery of these two components **without rotating** the shafts.
 - c. If the difference in offset from any two points 180 degrees apart exceeds the maximum value shown in Table 6, the shafts must be realigned.

Table 6 - "C" Couplings

Size	Maximum Allowable Misalignment	
	Parallel - in	Angular - in.
02	0.012	0.055
04	0.016	0.074
05	0.027	0.101
06	0.045	0.117
09	0.045	0.174
11	0.045	0.226

8. Check angular alignment with a micrometer or caliper.
 - a. Measure from the outside of the coupling flange to the outside of the adapter around the periphery of these two components **without rotating** the shafts. Refer to Figure 11.
 - b. If the difference between any two points 180 degrees apart exceeds the maximum angular misalignment value shown in Table 6, the shafts must be realigned.
 - c. If a correction is required to satisfy angular alignment requirements, then recheck the parallel alignment.

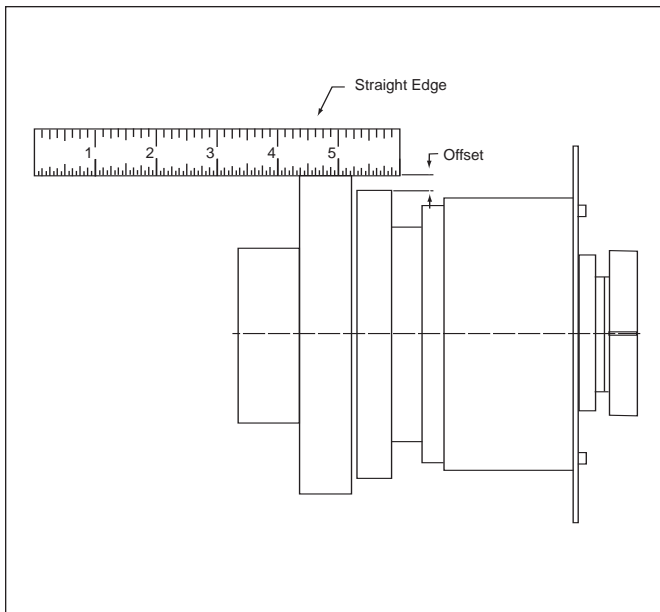


Figure 10 – Parallel “C” Coupling Alignment

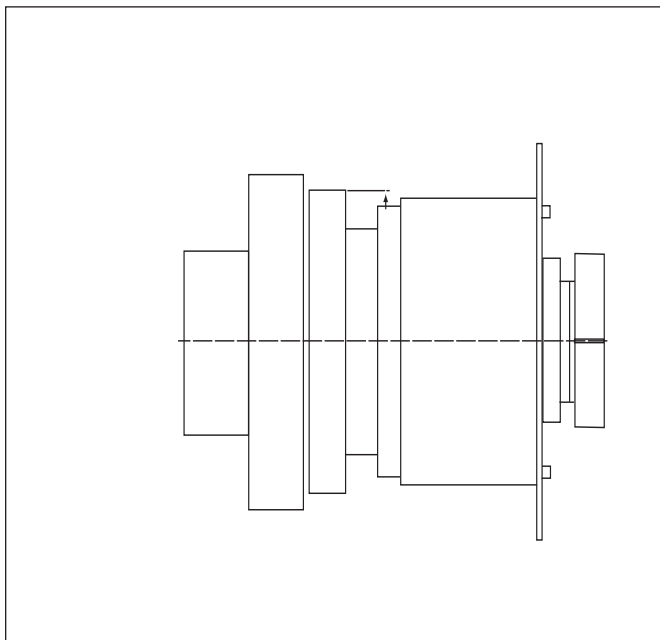


Figure 11 - Angular “C” Coupling Alignment

D. Mounting Clutch with Type “R” Rigid Coupling

1. Inspect mating pilots of clutch and coupling flange for nicks or burrs and remove as required.
2. Inspect shafts and keys for any nicks or burrs and remove as required.

3. Loosen clamp collar on clutch.
4. Position shaft keys and slide clutch and coupling flange onto appropriate shafts.
5. Slide coupling flange and clutch together until they contact and align mounting holes.
6. Secure clutch to drive shaft by tightening clamp collar. Refer to Table 4 for recommended seating torque for clamp collar screw.
7. Secure coupling flange to drive shaft by tightening the two setscrews located in the hub of the flange. Refer to Table 5 for recommended setscrew seating torques.

8. Check the parallel alignment.
 - a. Place a straightedge across the coupling flange and clutch as shown in Figure 12.
 - b. Measure the offset around the periphery of these two components **without rotating** the shafts.
 - c. The shafts must be aligned until no offset exists or is equal at all points around the periphery.
9. Check angular alignment.
 - a. Measure the gap around the periphery between the coupling flange and clutch **without rotating** the shafts. Refer to Figure 13.
 - b. The shafts must be aligned until no gap exists or is equal at all points around the periphery.
 - c. If a correction is required to satisfy angular alignment requirements, then recheck the parallel alignment.

Note: The “R” coupling connection is rigid and does not allow for forgiveness of parallel or angular misalignment. To eliminate unnecessary bearing loads, both shafts must be in near perfect alignment.

10. Loosen clamp collar of clutch. Attach coupling flange to clutch with mounting bolts and a high collar lock washer. Refer to Table 1 for recommended seating torques. Tighten clamp collar to secure clutch to drive shaft.

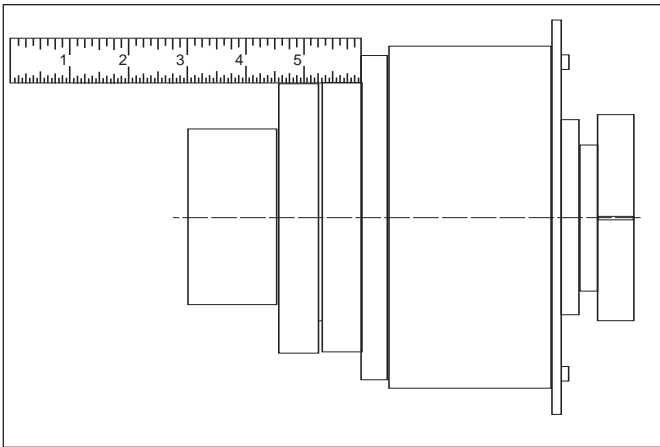


Figure 12 – Parallel “R” Coupling Alignment

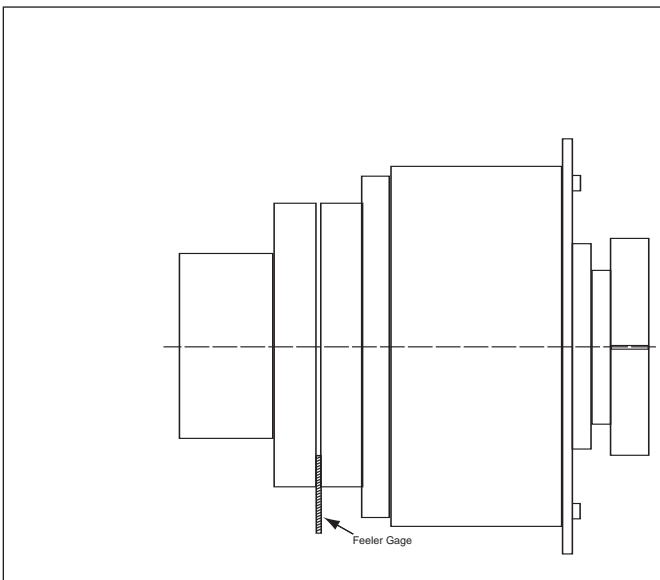


Figure 13 – Angular “R” Coupling Alignment

IV. Limit Switches

The HOR Series clutch is an automatic reset device. Because of this feature it is important that the drive be shut down immediately upon a torque overload condition. Figure 14 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, the cover of the clutch will move to actuate the limit switch and shut down the drive.

An oversized metallic plate provides a means for sensing movement from both ends of the clutch and the utilization of precision proximity switches. This plate may be removed in situations where space is restricted. Simply loosen the capscrews securing the plate to the cover, remove the plate, and reinstall the capscrews into the cover. Recommended cover screw seating torques are shown in Table 7.

Table 7 - Cover Screws

Clutch Size	Screw Size	Qty.	Seating Torque
02	#3-48 x 1/4	8	10 in-lb
04	#5-40 x 1/2	8	20 in-lb
05	#6-23 x 5/8	8	28 in-lb
06	#10-24 x 3/4	8	64 in-lb
09	#10-24 x 3/4	8	64 in-lb
11	1/4-20 x 1	8	150 in-lb

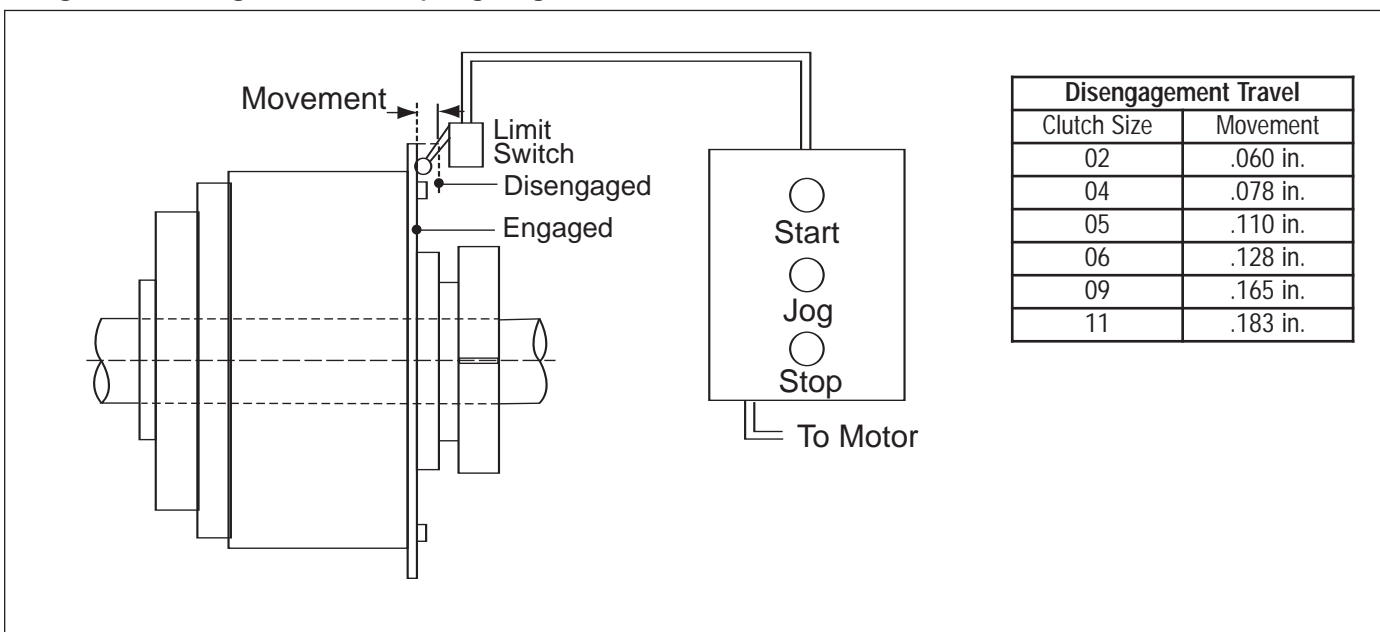


Figure 14 – Limit Switch Layout

Spring Pack Identification

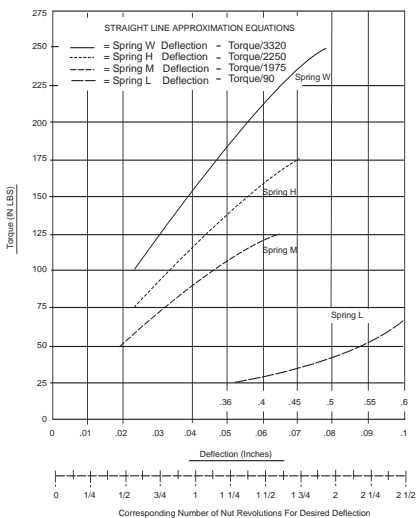
Size	Spring Pack No.	Color Code	Torque Range (in.-lb)			
			Minimum	MRT	Maximum	Code
02	712049-001	Red	100	200	250	W
	712049-002	White	75	125	175	H
	712049-003	Blue	50	100	125	M
	712049-004	Black	25	45	60	L
04	712050-001	Red	600	1,400	2,000	W
	712050-002	White	350	850	1,300	H
	712050-003	Blue	250	600	850	M
	712050-004	Yellow	175	400	550	L
05	712051-001	Red	1,650	4,000	6,000	Y
	712051-002	White	1,000	2,750	4,000	W
	712051-003	Blue	750	1,800	2,600	H
	712051-004	Yellow	500	1,300	1,800	M
	712051-005	Black	350	900	1,200	L
06	712052-001	Red	2,800	7,000	10,000	Y
	712052-002	White	1,500	3,900	5,600	W
	712052-003	Blue	1,000	2,600	3,800	H
	712052-004	Yellow	750	1,900	2,700	M
	712052-005	Black	600	1,400	1,900	L
09	712053-001	Red	6,250	15,000	22,500	W
	712053-002	White	4,250	10,000	15,000	H
	712053-003	Blue	3,000	7,500	10,500	M
	712053-004	Yellow	2,250	5,500	7,500	L
11	712054-001	Red	12,000	30,000	50,000	H
	712054-002	White	9,000	20,000	32,000	M
	712054-003	Blue	6,000	15,000	22,000	L

Notes:

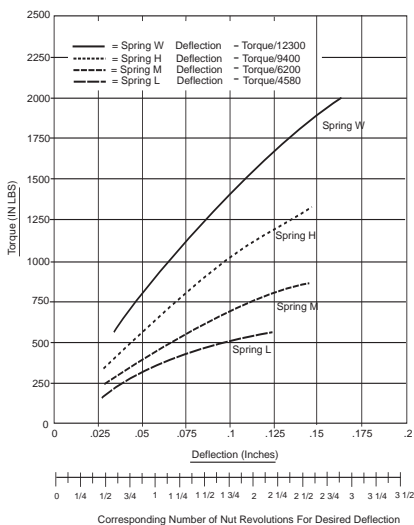
1. MRT is the minimum recommended torque setting for those applications which require a minimal degree of backlash.
2. Each spring pack consists of three disc springs, spacer and thrust plate mounting screws, (712049-004 consists of a wave spring, spacer and thrust plate mounting screws.)

Spring Curves

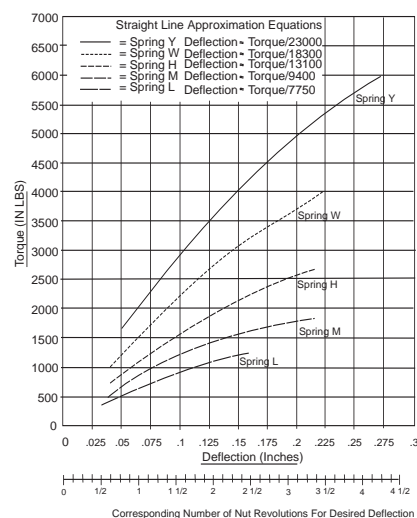
Size 02 Disc Springs



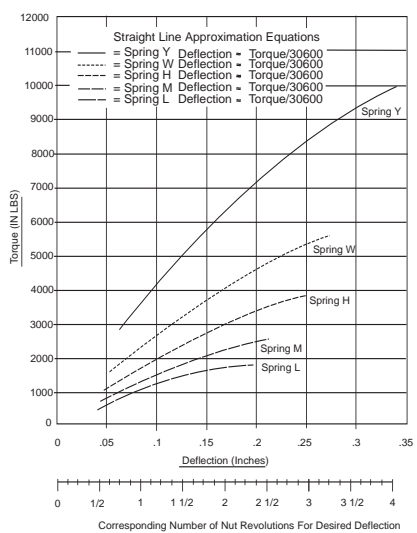
Size 04 Disc Springs



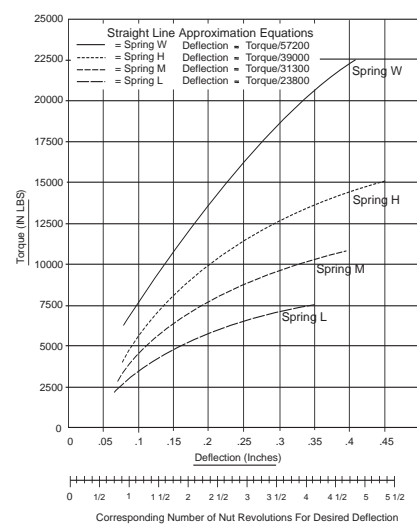
Size 05 Disc Springs



Size 06 Disc Springs



Size 09 Disc Springs



Size 11 Disc Springs

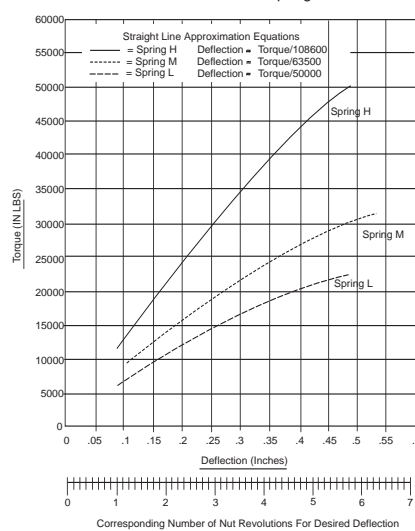
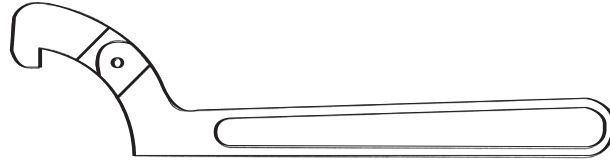


Table 9



Torque Adjustment Wrench

Clutch Size	Wrench Part No.				Specifications (in. / mm)			
	Armstrong Tool Co.	McMaster-Carr Supply Co.	Metric & Multi Standard	Snap-On Tool Co.	Diameter Range	Hook Thickness	Hook Depth	Length
02	----	6975A15	1810H34-36	----	1.34 To 1.42	.24	.16	6.69
04	----	6975A19	1810H58-62	----	2.28 To 2.44	.26	.18	9.45
05, 06	34-307	5471A13	----	AHS304	2.00 To 4.75	.47	.19	11.38
09, 11	34-310	5471A14	----	AHS307	4.50 To 6.25	.47	.25	12.13
11	34-313	5471A23	----	----	6.12 To 8.75	.47	.31	13.75

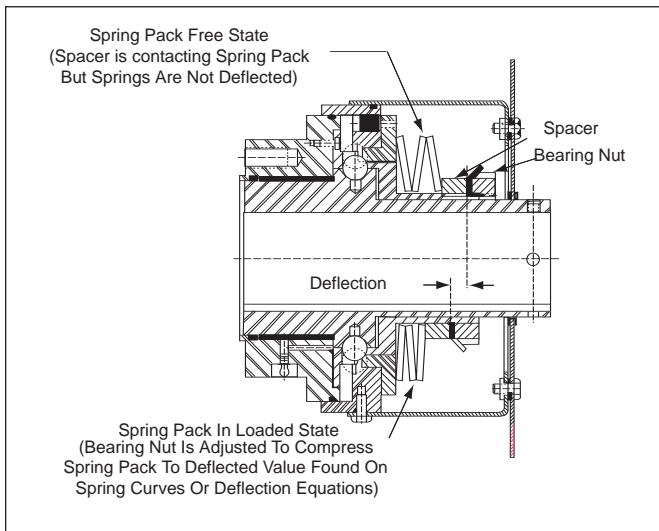


Figure 15

Table 8. Nut Adjustment

Size	Thread Pitch	Adjustment Per Turn				
		1/8	1/4	3/8	1/2	1
02	25.4	.005	.010	.015	.020	.040
04	18	.007	.014	.021	.028	.056
05	16	.008	.016	.024	.032	.064
06	12	.010	.020	.030	.040	.080
09	12	.010	.020	.030	.040	.080
11	12	.010	.020	.030	.040	.080

V. Torque Adjustment

The spring curves on page 10 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 straight line equations found on each spring chart could also be used to determine the amount of adjustment required to approximate any desired torque setting.

Example:

Clutch Size - 05
 Torque Range - 1,650 - 6,000 in.-lb (Y)
 Torque Setting - 5000 in.-lb.
 Deflection by curve - .20 in.
 Deflection by equation - .21 in.
 Approximately 3-1/4 turns of nut

- 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 15.

1. Lift tab of lockwasher securing the adjustment nut in position.
 2. Use a spanner wrench to adjust nut to desired torque setting.
 3. Once the torque is set, fold one of the lockwasher tabs over one slot on the adjusting nut.
- 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 Table 9 for wrenches which are compatible with our torque overload release clutch.
- E. For applications requiring a precise release torque, the release torque setting of the clutch should be tested as shown in Figure 16. Verification of the release torque several times in both clockwise and counterclockwise directions is recommended. This service is available at the factory.

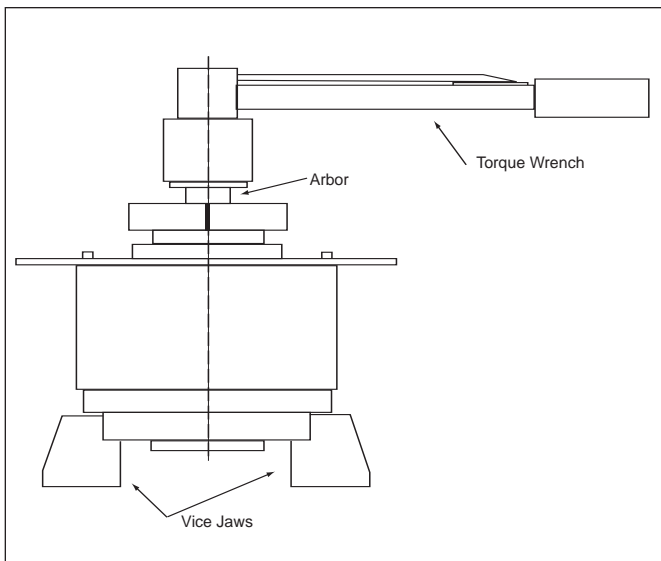


Figure 16 - Torque verification

VI. Removal and Installation of Spring Pack

A. Removal of old spring pack

1. Lift tab of lockwasher securing nut in position.
2. Turning counterclockwise, loosen nut with a spanner wrench.

3. Loosen clamp collar and remove clutch from shaft if applicable.
4. Remove clamp collar, nut and lockwasher from clutch.
5. Lift cover off clutch. **DO NOT USE ACTUATING PLATE TO LIFT COVER!**
6. Remove capscrews holding thrust plate to cover.
7. Remove thrust plate, disc springs and spacer.

B. Installation of new spring pack

1. Thoroughly clean and dry inside mounting holes of cover.
2. Place several drops of retaining compound in holes.
3. Lubricate disc springs, used in clutch sizes 04 through 11 with a Bentone type, NLGI grade 0 grease. Springs used in the 02 size clutch should be lubricated with a light oil.
4. Stack springs in cover as shown in Figure 17.
5. Set thrust plate in cover as shown in Figure 17.
6. Thoroughly clean and dry threads of capscrews.
7. Apply several drops of retaining compound to capscrew threads and attach thrust plate to cover. Recommended thrust plate screw seating torques are shown in Table 10.

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

8. Lubricate seals and slide cover onto clutch.
9. Place spacer provided with the spring pack in position on clutch as shown in Figure 17.
10. Lubricate lockwasher and threads of nut with a graphite base material.

11. Assemble lockwasher, nut and clamp collar on clutch.
12. Adjust nut to desired release torque as outlined in Section V.

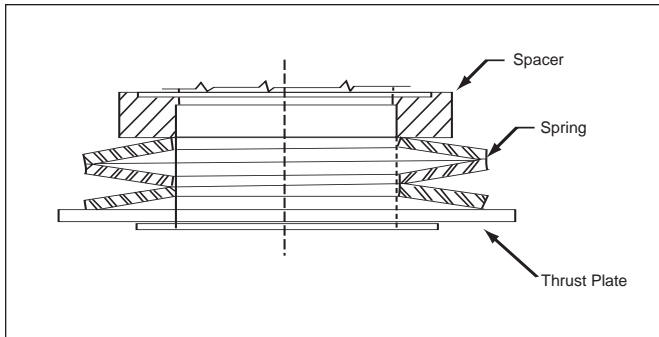


Figure 17 – Spring Pack Assembly

Table 10 - Thrust Plate Screws

Size	Screw Size	Qty.	Seating Torque in-lb
02	#3-48 x 1/4	4	10 in-lb
04	#5-40 x 3/8	4	20 in-lb
05	#6-32 x 1/2	4	28 in-lb
06	#10-24 x 1/2	4	64 in-lb
09	#10-24 x 1/2	8	64 in-lb
11	1/4-20 x 5/8	8	150 in-lb

VII. General Maintenance

A. Lubrication

HOR Series clutch is pre-lubricated at the factory and is also equipped with lube fittings for scheduled lubrication. The size 02 is lubricated with a light oil and sizes 04 through 11 with a Bentone type, NLGI grade 0 grease. The lubrication schedule should be in accordance with good operating practices for the equipment on which the clutch is mounted.

B. Annual Inspection

The HOR Series overload release clutch is constructed of heavy-duty materials. Under reasonably clean 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.

VIII. General Disassembly

A. Cover and miscellaneous internal components.

1. Loosen capscrew in clamp collar and remove collar.
2. Remove bearing nut and lockwasher.
3. Lift cover off clutch. **DO NOT USE ACTUATING PLATE TO LIFT COVER!**
4. Push spacer out of cover.
5. Lift thrust bearings, washers and thrust plate from rotor.
6. Use a magnet to remove balls from rotor flange.

B. Housing and miscellaneous internal components.

1. Remove any adapters, sprockets or sheaves from housing.
2. Remove ring, retaining rear spacer to rotor. On clutch sizes 09 and 11 there are two capscrews which must be removed from rear spacer.
3. Insert capscrews in threaded holes of rotor flange. Use these screws to push rear spacer off rotor. Screws must be turned evenly and progressively to avoid binding.

Because of the extended length of the rotor on a Style L clutch, it will be necessary to press the rotor through the housing with an arbor. Support the clutch by the housing as shown in Figure 18 and push the rotor through the housing.

4. Remove thrust bearing and washers from housing.

Table 11 - Push Off Holes

Size	Qty.	Hole Size
02	3	#6-32
04	4	1/4-28
05	4	1/4-28
06	4	1/4-28
09	4	3/8-24
11	4	3/8-24

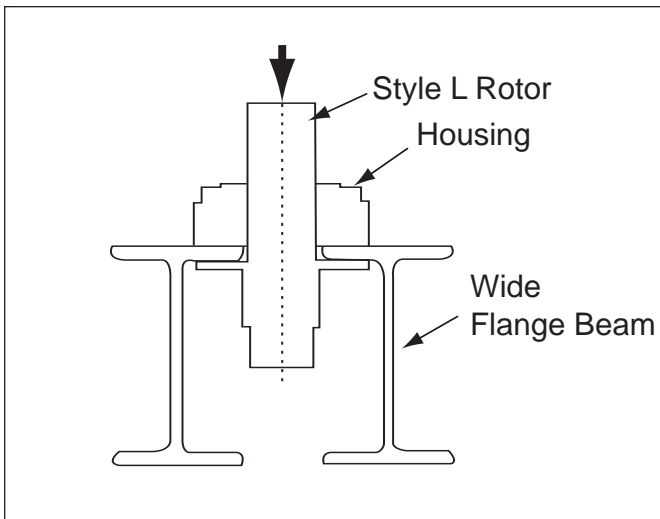


Figure 18

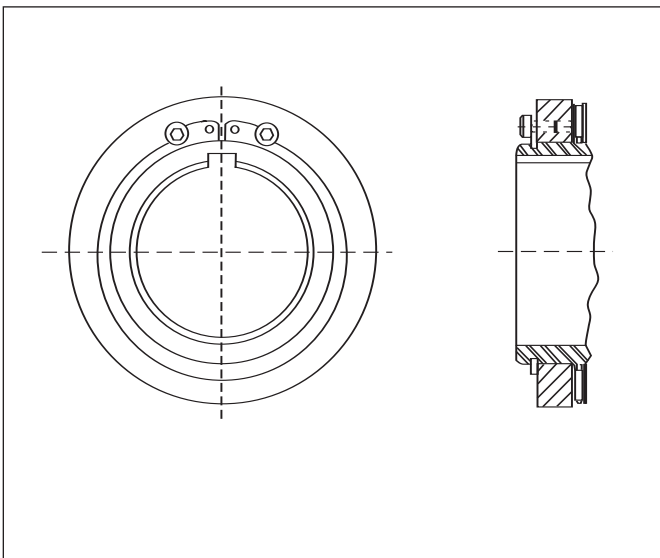


Figure 19

IX General Assembly

A. Housing and miscellaneous internal components

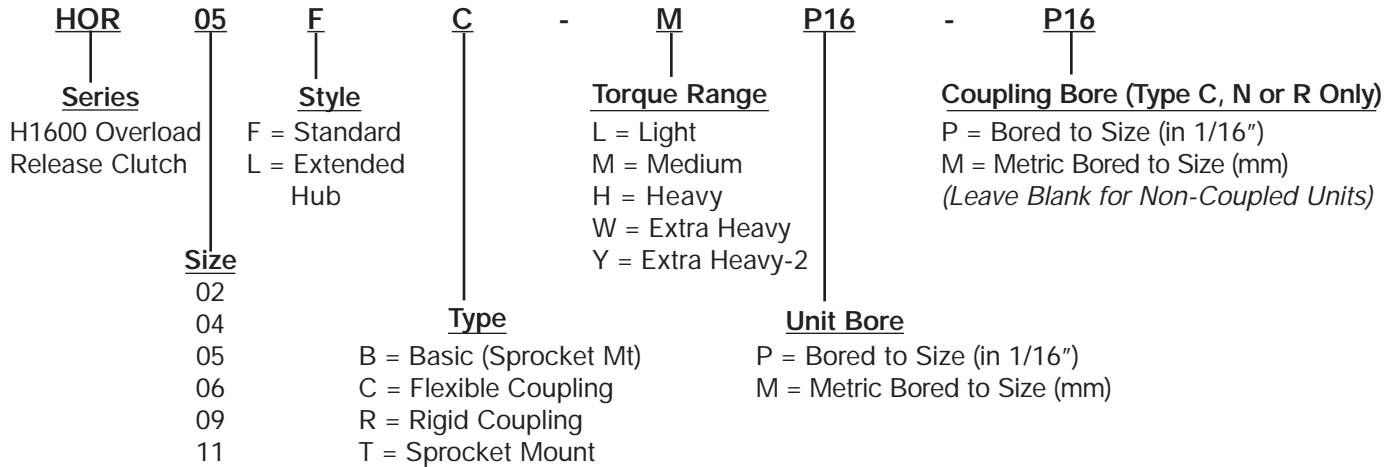
1. Grease pack o-ring groove in housing and insert o-ring seal.
2. Paint pocket side of housing with grease on all sizes except 02. The detent surface of the size 02 housing should be brushed with a light oil.
3. Slip housing onto rotor.

4. Grease coat thrust bearing and washers. Sandwich bearing between washers and slip into cavity of housing.
5. Press rear spacer onto rotor until the snap ring groove in rotor is cleared and install snap ring in groove.
6. On clutch sizes 09 and 11, the tabs of the snap ring must be oriented between the two tapped holes in rear spacer. Install spacer as shown in Figure 19.

B. Cover and miscellaneous internal components

1. Grease pack grooves in cover and insert quad seals.
2. Paint balls with grease on all clutch sizes except 02, these should be dipped in a light oil. Align ball holes of rotor flange with pockets in housing. Insert balls into holes of rotor flange.
3. Place one thrust plate on rotor.
4. Grease coat thrust bearing and washers. Sandwich bearing between washers and slip over pilot of thrust plate.
5. Slip cover assembly onto rotor. Care must be taken not to twist or damage seals.
6. Place spacer onto rotor and into opening in cover.
7. Lubricate lockwasher and threads of nut with a graphite based material.
8. Assemble lockwasher, nut and clamp collar on clutch.
9. Adjust nut to desired release torque as outlined in Section V.

HOR Series Part Numbering System



Part Identification For Type B - Style F & L, Basic Unit

Item No.	Name	Qty.	02	04	05	06	09	11	
1	Clutch Assembly	Style F	—	712001-613	712002-623	712003-633	712004-643	712005-653	712006-663
		Style L	—	712007-614	712008-624	712009-634	712010-644	712011-654	712012-664
2	Spring Pack*	1	712049-XXX	712050-XXX	712051-XXX	712052-XXX	712053-XXX	712054-XXX	
3	Cover Sub-Assembly	1	711035-602	711039-604	711043-605	711047-606	711051-609	711055-611	
4	Housing Sub-Assembly	1	711036-602	711040-604	711044-605	711048-606	711052-609	711056-611	
5	Seal Kit	1	711037-602	711041-604	711045-605	711049-606	711053-609	711057-611	
6	Thrust Bearing Kit	1	711038-602	711042-604	711046-605	711050-606	711054-609	711058-611	
7	Rotor	Style F	1	721201-001	731307-001	731321-001	731314-001	731328-001	731336-001
		Style L	1	731156-002	731157-002	731158-002	731159-001	731160-001	731161-001
8	Thrust Plate	2	731304-001	731310-001	731324-001	731217-001	731331-001	731339-001	
9	Snap Ring***	1	040682-048	040682-049	040682-050	040682-045	040682-046	040682-053	
10	Rear Spacer	1	731306-001	731312-001	731327-001	731320-001	731335-001	731343-001	
11	Clamp Collar	Style F	1	730094-019	730094-020	730094-021	730094-022	730094-025	730094-010
		Style L	1	730094-028	730094-029	730094-030	730094-022	730094-025	731244-001
12	Nut	1	075264-001	075264-002	075264-003	075264-004	075264-005	075264-006	
13	Lockwasher	1	731221-001	065419-006	065419-007	065419-008	065419-009	065419-010	
14	Ball	4**	070071-007	070071-003	070071-008	070071-001	070071-009	070071-010	
15	Snap Ring	1	040682-042	040682-064	040682-025	040682-045	040682-046	040682-047	
16	Cap Screw	2	N/A	N/A	N/A	N/A	075519-001	075519-001	

* Refer to Spring Pack Table on Page 9 for specific part number.

** Size 02 uses only 3 balls.

*** Not shown - Style 2 only.

Clutch catalog number required when ordering spare parts.

Part Identification For Adapters

Name	02	04	05	06	09	11
C Adapter Sub-Assembly	712037-602	712038-604	712039-605	712040-606	712041-609	712042-611
R Adapter Sub-Assembly	702043-602	712044-604	712045-605	712046-606	712047-609	712048-611
T Adapter Sub-Assembly	712031-602	712032-604	712033-605	712034-606	712035-609	712036-611

⚠ 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.

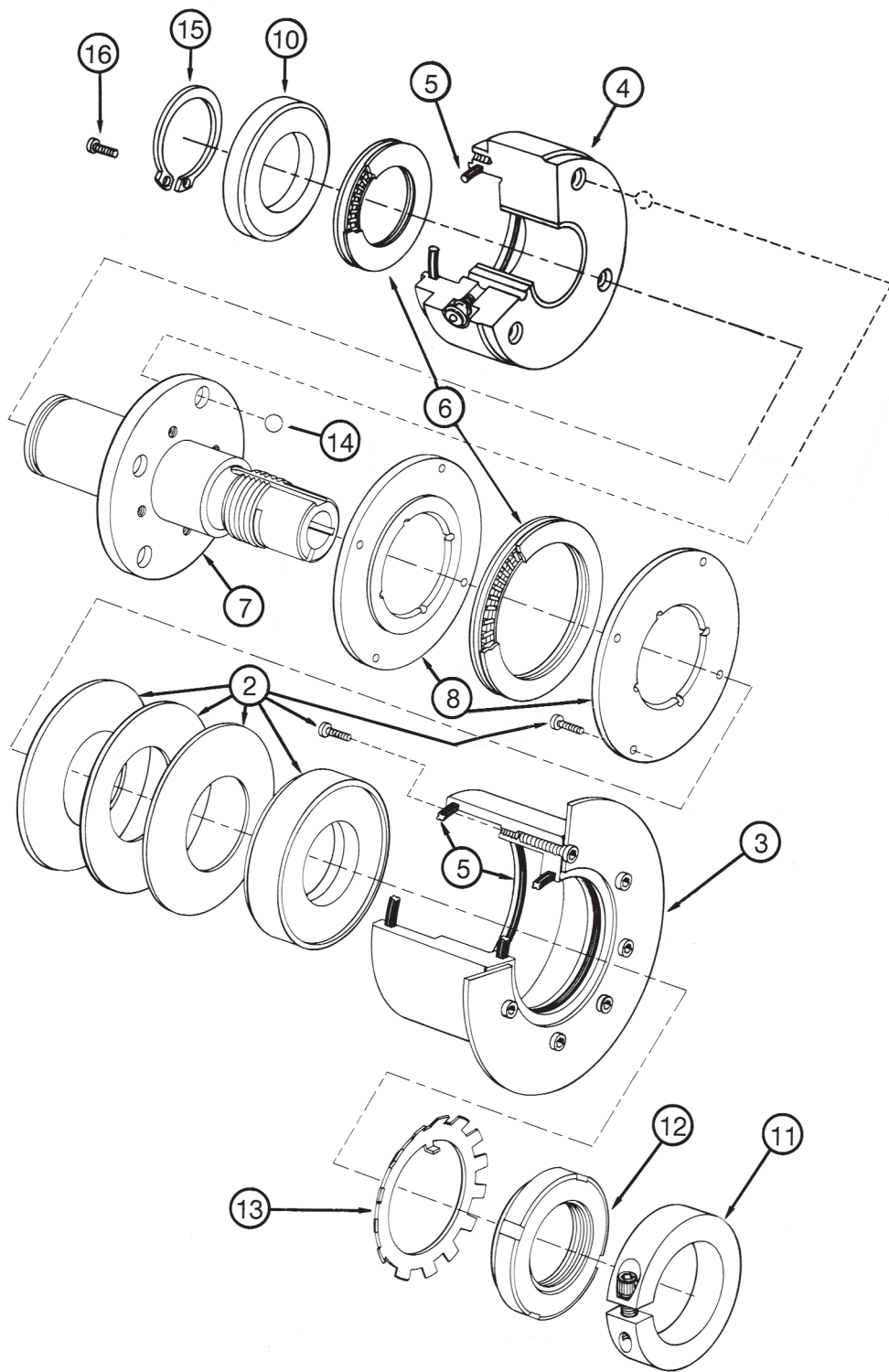


Figure 21 – Type B – Style F, Basic Unit

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.

No employee, agent, distributor, or other person is authorized to give additional warranties on behalf of Boston Gear, nor to assume for Boston Gear any other liability in connection with any of its products, except an officer of Boston Gear by a signed writing.



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