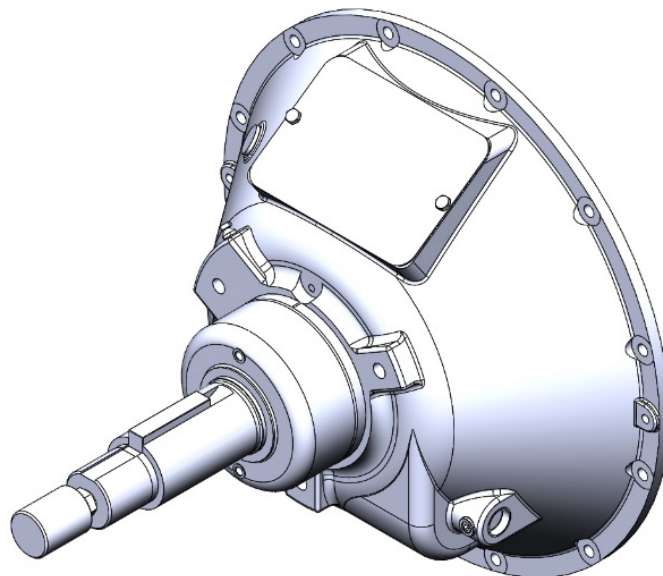




## HYDRO-MECHANICAL POWER TAKE OFF

### INSTALLATION AND MAINTENANCE MANUAL



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# 1. INTRODUCTION


- 1.1. The WPT Power Corporation Power Take Off is the most rugged PTO available on the market today. Follow the procedures detailed in this Installation Maintenance Manual for years of service.
- 1.2. When ordering parts, use the Part Number from the Bill of Materials supplied with this unit. Also, please include the Assembly Number and the Serial Number from the unit itself. These will be found on and under the Metal Hand Hole Cover on the Bellhousing. Your WPT Distributor can provide a copy of the Bill of Materials if the one provided should become lost.
- 1.3. When performing installation and maintenance functions, refer to the drawings as indicated throughout this manual. The references on the drawing in this manual DO NOT correspond to the references on the assembly drawing and Bill of Materials. Do not use the item numbers from the drawing in this manual for ordering parts.
- 1.4. It is the responsibility of the personnel involved in the installation, operation and maintenance of this equipment, on which this PTO is mounted, that they must fully understand the warnings and dangers that are listed in this manual and are aware of what the correct procedures must be to safety install, operate and maintain this equipment.

## DANGER:

To avoid damage or personal injury, insure that adequate lifting devices and hand tools are available.

## DANGER:

Read these instructions thoroughly and review until you fully understand all warning and hazards before proceeding with the work described in this manual. Failure to follow these instructions in this manual can result in unreasonable exposure to hazardous conditions and/or personal injury and/or death.

Throughout there are a number of HAZARD WARNINGS that must be read and adhered to in order to prevent possible loss of equipment and/or personal injury and /or loss of life. The three warning words are “DANGER”, “WARNING” and “CAUTION”. They are used to indicate the severity of the hazard and are preceded by a safety alert symbol. 

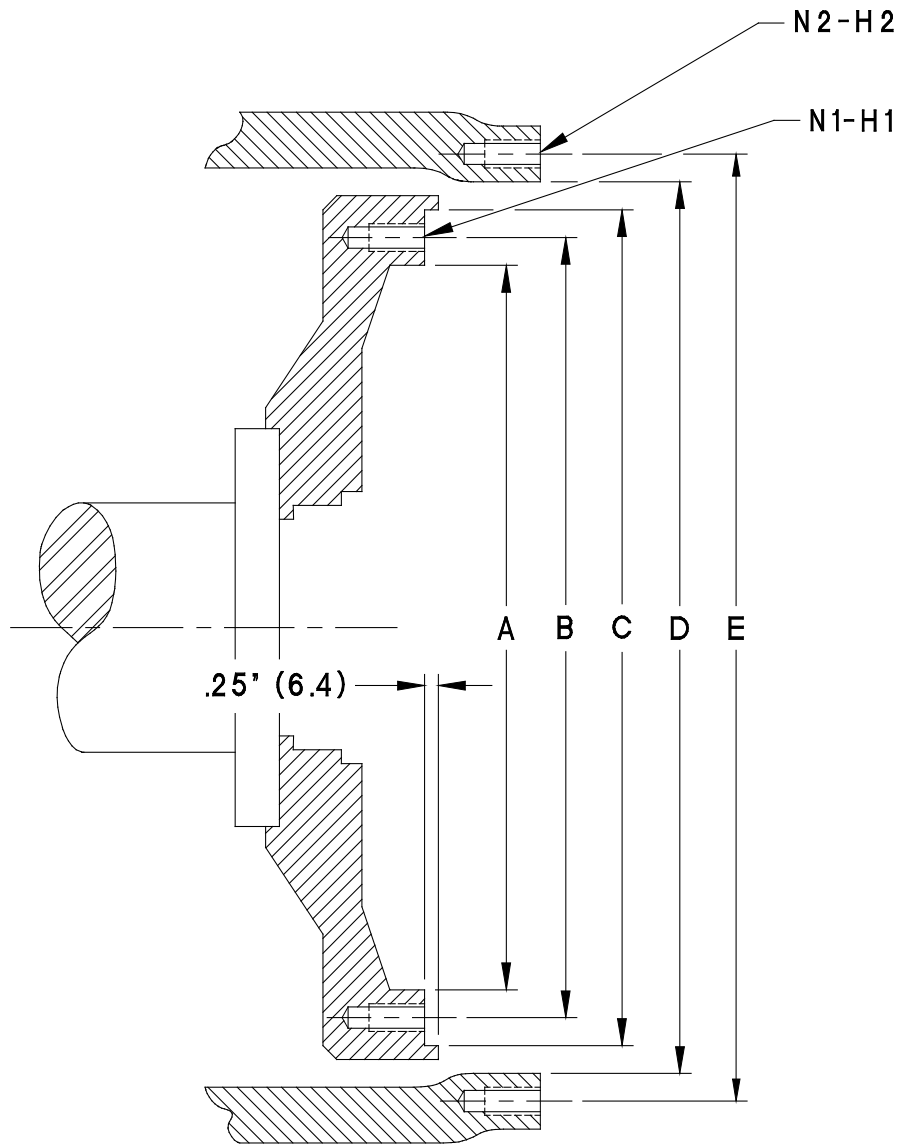
“**DANGER**” – Denotes the most serious injury hazard and is used when serious injury or death **WILL** result from misuse or failure to follow the specific instructions set forth in this manual.

“**WARNING**” – Denotes when serious injury or death **MAY** result from misuse or failure to follow the specific instructions set forth in this manual.

“**CAUTION**” – Denotes when injury, product or equipment damage may result from the misuse or failure to follow the specific instructions set forth in this manual.

## 2. SPECIFICATIONS

### 2.1. Engine Housing and Flywheel Dimensions



<b>FLYWHEEL DIMENSIONS</b>					
<b>Clutch size</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>N1</b>	<b>H1</b>
6"	7.25 (184.2)	8.500 (215.90)	7.875 (200.02)	6	5/16 – 18 NC
7"	8.12 (206.2)	8.750 (222.25)	9.500 (241.30)	8	5/16 – 18 NC
8"	8.88 (225.6)	9.625 (244.48)	10.375 (263.52)	6	3/8 – 16 NC
10"	10.88 (276.4)	11.625 (295.28)	12.375 (314.32)	8	3/8 – 16 NC
11"	12.38 (314.5)	13.125 (333.38)	13.875 (352.42)	8	3/8 – 16 NC
14"	16.12 (409.4)	17.250 (438.15)	18.375 (466.72)	8	1/2 - 13 NC
18"	19.62 (498.3)	21.375 (542.93)	22.500 (571.50)	6	5/8 – 11 NC
<b>FLYWHEEL HOUSING DIMENSIONS</b>					
<b>Housing size</b>	<b>D</b>	<b>E</b>	<b>N2</b>	<b>H2</b>	
6	10.500 (266.70)	11.250 (285.75)	8	3/8 – 16 NC	
5	12.375 (314.33)	13.125 (333.38)	8	3/8 – 16 NC	
4	14.250 (361.95)	15.000 (381.00)	12	3/8 – 16 NC	
3	16.125 (409.58)	16.875 (428.63)	12	3/8 – 16 NC	
2	17.625 (447.68)	18.375 (466.73)	12	3/8 – 16 NC	
1	20.125 (511.18)	20.875 (530.22)	12	7/16 - 14 NC	
1/2	23.000 (584.20)	24.375 (619.12)	12	1/2 - 13 NC	
0	25.500 (647.70)	26.750 (679.45)	16	1/2 - 13 NC	
00	31.000 (787.40)	33.500 (850.90)	16	1/2 – 13 NC	

2.2. The general specifications for your PTO are listed below. For detailed and application specific WPT Product specifications, please contact WPT Applications.

<b>Model/ Size</b>	<b>Maximum Input Torque lbf-ft (N·m)</b>	<b>Maximum Speed rpm</b>	<b>Approx. Net Weight lb (kg)</b>
<b>C106</b>	171 (232)	3500	60 (27)
<b>C107</b>	191 (259)	3200	72 (32)
<b>C108</b>	248 (336)	3100	83 (37)
<b>C110</b>	354 (481)	2800	117 (53)
<b>SP111</b>	487 (660)	2500	143 (64)
<b>SP211</b>	974 (1321)	2500	157 (71)
<b>SP311</b>	1746 (2367)	2300	223 (101)
<b>SP114</b>	862 (1169)	2300	263 (119)
<b>SP214</b>	1724 (2337)	2300	332 (150)
<b>SP314</b>	2586 (3506)	2300	413 (187)
<b>IBF314</b>	2586 (3506)	2300	595 (270)
<b>SP318</b>	6465 (8765)	2100	897 (407)

### 3. LUBRICATION

- 3.1. This PTO requires lubrication with NLGI #2 lithium based grease. Prior to installation, grease the main shaft bearings. Apply grease to each fitting until grease just appears at the respective seal surfaces. Although the PTO is normally lubricated at the factory, this step will insure that all moving parts are properly lubricated for initial use.
- 3.2. Also lubricate the main bearings (located on the clutch shaft) per maintenance schedule applying one grease gun shot per 50 machine hours.
- 3.3. Amount and frequency of lubrication are only a recommendation. Actual requirements will vary, due to load and operating conditions. New units should be monitored for heat and wear for a period of time, to determine actual needs.
- 3.4. Pilot Bearing is "sealed for life" and does not require lubrication.

## 4. INSPECTION

### 4.1. General

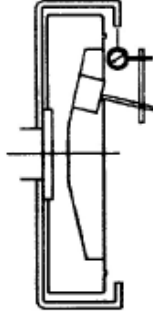
- 4.1.1. Upon receipt of your WPT product, inspect for and report any evidence of damage. To avoid damage or personal injury, insure that adequate lifting devices and hand tools are available. Compare the flywheel, flywheel housing, and Pilot Bearing bore to the bellhousing, Drive Ring, and Pilot Bearing, respectively to insure that you have the correct size unit.
- 4.1.2. For all measurements, it is important to verify the dial indicator returns to the original value where the measurement began. This simple step provides verification of measurement quality.

### 4.2. Flywheel and Flywheel Housing Alignment Inspection

It is strongly recommended that dial indicator checks be made prior to installation of the PTO, especially on new engines or when a previous PTO failure might indicate an alignment problem.

#### 4.3. Flywheel to Flywheel Housing Pilot

Mount the indicator base on the face of the flywheel and position the dial indicator tip perpendicular to the flywheel housing mounting face. Rotate the flywheel 360 degrees while holding pressure against the crankshaft thrust bearing. The Total Indicated Runout (T.I.R.) should not exceed the values listed in the table shown below.



The total indicator reading should not exceed:

SAE Housing Runout Limitations		
SAE Housing Size	in	mm
00	0.019	[0.483]
0	0.016	[0.406]
1	0.012	[0.305]
2	0.011	[0.279]
3	0.010	[0.254]
4	0.009	[0.229]
5	0.008	[0.203]
6	0.007	[0.178]

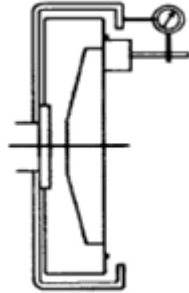
Reference: SAE J617 table 1A



#### 4.4. Flywheel to Flywheel Housing Face

Mount the indicator base on the face of the flywheel and position the dial indicator tip so its movement is perpendicular to the pilot bore of the flywheel housing. Rotate the flywheel through 360 degrees.

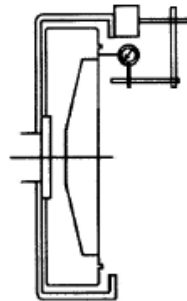
The total indicator reading should not exceed 0.0005 inches [0.013 mm] per inch of measured diameter.



#### 4.5. Flywheel Housing to Flywheel Face

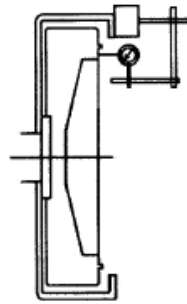
Mount the indicator base on the flywheel housing and position the dial indicator tip so that its movement is perpendicular to the face of the flywheel. Position the indicator tip near the Drive Ring mounting bolt circle diameter. Rotate the flywheel 360 degrees while holding pressure against the crankshaft thrust bearing.

The total indicator reading should not exceed 0.0005 inches [0.013 mm] per inch of measured diameter.



#### 4.6. Flywheel Housing to Flywheel (Crankshaft) Endplay

Measure and document the engine's crankshaft endplay before installing PTO. Mount the indicator base on the flywheel housing and position the dial indicator tip so that its



movement is perpendicular to the face of the flywheel. Move the crankshaft back against the rear main bearing and then move the crankshaft to the front of the engine. Record the total movement as shown by the dial indicator.

## 5. INSTALLATION

### **DANGER:**

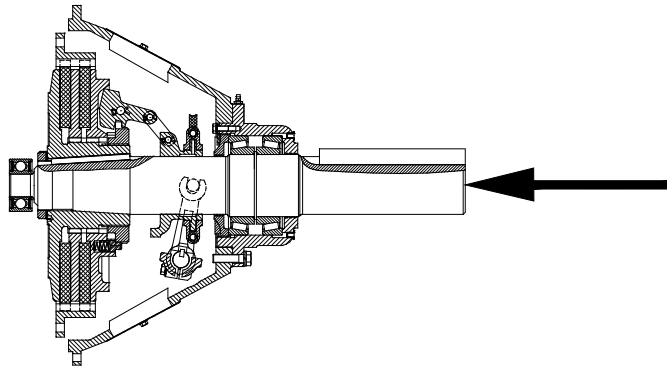
The PTO is heavy. Use approved lifting eyes and procedures to prevent accident or injury.

### **WARNING:**

Use care when removing the PTO from the engine to avoid damage to grease fittings, friction disc teeth, and other components.

- 5.1. Use the Drive Ring provided with the PTO or remove the Drive Ring from the engine flywheel to use as an alignment tool. Place the Drive Ring over the Friction Discs. Center the Drive Ring relative to the O.D. of the clutch body.
- 5.2. Engage the clutch by operating the actuator. Remove the Drive Ring. Do not disengage clutch until installation is complete.
- 5.3. Mount the Drive Ring to the engine flywheel making sure that it is seated in the locating bore. Use SAE Grade 5 bolts (better or equivalent) with lock washers and torque to the specifications in shown in appendices or to the engine manufacturers torque recommendation. Use the engine manufacturer's torque recommendation if different from that in WPT's recommendation.
- 5.4. Pilot Bearing
  - 5.4.1. Install Pilot Bearing onto clutch end of PTO shaft, stopping before the bearing is flush with the shaft. Let the bearing overhang the shaft by 1/8" (3.2). Only apply force on the inner race of the bearing. If Pilot Bearing is designed to be a free sliding fit on the shaft, skip this step and proceed to the next step.
  - 5.4.2. Install Pilot Bearing into flywheel bore. Apply force to the outer race as needed when pressing into the bore.
- 5.5. Remove inspection cover nameplate from the PTO Bellhousing and slowly draw the PTO toward the engine; this can be done by installing 3 or 4 equally spaced lengths of all-thread into the flywheel housing. Install nuts and tighten these while supporting the weight of the PTO with a hoist or cribbing.
- 5.6. As the PTO is drawn toward the engine, insure that the Pilot Bearing engages the crankshaft, and the Friction Discs engage the teeth on the Drive Ring without binding or interference.
- 5.7. When the PTO is fully in place, remove the studs if used and replace with SAE Grade 5 bolts (or equivalent) with lock washers and torque as shown in the torque chart in the back of this manual. Use the engine manufacturer's torque recommendation if different from that specified by this manual.

- 5.8. Strike the output end of clutch shaft with a soft face hammer to relieve bearing preloading caused by installation, see sketch below.



- 5.9. Verify shaft has axial clearance with a dial indicator, using the Assembly Drawing as a reference for the proper specification. Use the threaded hole in the end of the shaft to push/pull.
- 5.10. Re-check crankshaft endplay. If not the same as recorded in 4.6, STOP and determine the cause. Crankshaft and clutch shaft must have the proper amount of endplay or bearings may fail.
- 5.11. Connecting the Rotating Union to the PTO.
- 5.11.1. The Rotating Union is purposely shipped separately to prevent damage during shipping and assembly. Read the following steps to make sure this is properly installed. Every effort should be made to protect the Rotating Union's bearings from damage during assembly.
- 5.11.2. Prepare the hose that will connect to the Rotary Union. In general, the hose should be made to not restrict movement or apply any type of tension. It is recommended to limit the number of fittings and hose size where possible to reduce the weight applied to the Rotary Union bearings. Do not use steel or similar line to connect directly to the Rotary Union, there must be something flexible.
- 5.11.3. Connect Rotating Union, if equipped, to the supply hose. Lightly clamp the rotating union's bearing housing in a vise or similar, be careful not to damage internal bearings. Tighten hose.
- 5.11.4. Connect Rotating Union to shaft. Do not apply force to the rotating union's bearing housing when tightening.

 **WARNING:**

The WPT mechanical PTO is capable of side load and inline power transmission applications. Special care should be exercised when installing the PTO in an inline application. Due to engine movement and other factors that may cause misalignment, WPT recommends that a flexible coupling or drive shaft be used to join the PTO and driven shaft. If a coupling is used, insure that it has sufficient horsepower capacity and that shafts are in line within the limits specified by the coupling manufacturer. If you are unsure about the procedure to align these shafts, consult the coupling manufacturer or WPT Power Corp.



## 6. OPERATION

6.1. Engage the PTO at the engines Low Idle speed.

6.2. Loading, during an engagement falls into two criteria: High Inertia, Low Inertia.

### 6.2.1. High Inertia

These are loads that would typically stall the engine during an engagement. Depending on the degree of difficulty, there are different possible solutions.

6.2.1.1. Engage the clutch for short periods, disengage quickly just before an engine stall, subsequently re-engaging as the engine speed recovers.

6.2.1.2. Purchase a WPT Monotonic Remote Start, which is designed to handle these types of loads.

### 6.2.2. Low Inertia

These are loads that would not cause the engine to stall. The engine will have no problem accelerating the load.

6.2.2.1. Fully engage the PTO between 1 and 3 seconds. Engaging too quickly may force misalignment on the engine and PTO, if this is noticed, decrease the engagement rate.

6.3. Once the load is turning with the clutch fully engaged, the engine RPM may be increased.



### **CAUTION:**

UNDER NO CIRCUMSTANCES should the clutch be slipped for more than four seconds maximum without either fully engaging the clutch or completely disengaging the clutch to allow it to cool. Any excessive vibration in the PTO should be cause for investigation. All rotating parts of the WPT PTO are balanced at the factory.

## 7. DISASSEMBLY

### DANGER:

The PTO is heavy. Use approved lifting eyes and procedures to prevent accident or injury.

- 7.1. Use a hoist or other suitable lifting equipment to support the weight of the PTO. Attach lifting devices at several places or use cribbing to support the PTO in a horizontal position during removal and disassembly process.
- 7.2. Remove the PTO from the Engine.
  - 7.2.1. Remove the Rotating Union from the PTO Shaft.
  - 7.2.2. Disconnect the Hose from the Rotating Union. DO NOT remove the hose connections to the Rotating Union without removing the Rotating Union from the Shaft. Place the bearing housing of the Rotating Union in a vise or similar, do not overtighten.
  - 7.2.3. Remove drive shaft or drive belts from PTO output shaft.
  - 7.2.4. Remove the mounting bolts attaching PTO to flywheel housing, removing those located near the top last. The PTO should separate from the flywheel housing. If the PTO does not separate easily, gently pry the flanges apart until the PTO is removed from the engine, or use the provided jack screw holes on either side of the PTO housing.
- 7.3. Remove the Clutch from the PTO.
  - 7.3.1. Remove the Pilot Bearing from PTO shaft using a bearing puller.
  - 7.3.2. Bend Hub Lock Washer tab away from Hub Locknut.
  - 7.3.3. Remove Hub Locknut.
  - 7.3.4. Remove Hub Lock Washer.
  - 7.3.5. Remove the Clutch Assembly using a gear puller and the tapped holes that are provided in the Hub & Backplate.

Use care while removing the clutch assembly to prevent damage to the Piston O-rings that seal against the Shaft. Make sure the O-rings DO NOT strike the edge of the keyway in the Shaft, as this will permanently damage the O-rings
  - 7.3.6. Remove Inertia Locking Plate and associated hardware.
  - 7.3.7. Remove the Spring Release Plate and associated hardware. Alternate loosening bolts, by turning each bolt only one revolution. Repeating as necessary until spring force is removed.
  - 7.3.8. Remove the Springs
  - 7.3.9. Unscrew Piston and Cylinder from the Hub. See next steps for assistance with removal.

- 7.3.9.1. The Piston and mating Hub threads were degreased and coated with a thread locker when assembling. The following steps will provide helpful tips in loosening this joint.
- 7.3.9.2. Place the square end of the Piston in a soft jaw vise, do not scratch or mar the squared area.
- 7.3.9.3. Using the tapped holes in the Backplate, install grade 8 bolts or stronger.
- 7.3.9.4. Use the new installed bolts and a long pry bar. Use the bar to loosen the connection, just enough to break the thread locker, then stop.
- 7.3.9.5. Place the Clutch Pack on a table with the Piston end facing up.
- 7.3.9.6. Remove the O-rings from the inner diameter of the Piston.
- 7.3.9.7. Spray brake cleaner on the threads that mate the Piston and the Hub. Apply more brake cleaner every 5 minutes, and proceed to the next step after 30 minutes from applying the first brake cleaner. The brake cleaner will aid in dissolving the thread locker.
- 7.3.9.8. Re-install the Piston in the vice, and continue loosening threads as before, but do not remove completely.
- 7.3.9.9. Place the Clutch Pack on a table with the Piston end facing up.
- 7.3.9.10. The Piston and Cylinder should now be able to be removed by hand.
- 7.3.10. The remaining Friction Discs and Center Plates may be lifted from the Hub by hand.
- 7.3.11. The Piston and Cylinder may be separated if needed. These parts are easily separated by hand by pressing firmly down on the internally threaded end of the Piston.
- 7.3.12. Remove Bearings and the shaft from the Bellhousing.
  - 7.3.12.1. Remove Bolt and Bearing Retainer Lock from the Bellhousing.
  - 7.3.12.2. Unscrew and remove Bearing Retainer from the Bellhousing.
  - 7.3.12.3. Drive out Shaft, using a soft faced hammer or use a suitable bearing press, to remove Shaft and Bearings from the Bellhousing.
  - 7.3.12.4. Remove inner cup and Shaft with Bearings from the Bellhousing.
  - 7.3.12.5. Drive outer cup from PTO housing by placing a punch through (2) access holes provided in rear of the housing (does not apply to 18").
  - 7.3.12.6. Using a suitable bearing press, remove bearings from shaft.



## 8. ASSEMBLY

- 8.1. Press Install main Bearing(s) on Shaft.
- 8.2. Install Shaft and Bearings in PTO housing.
  - 8.2.1. Blow out grease ports to insure part is clean. Verify all ports are completely clean and air flows through all holes.
  - 8.2.2. Place Bellhousing into assembly stand and secure with clamps, Clutch end up.
  - 8.2.3. Apply thread sealant to grease passage plug and install in Bearing Carrier/Bellhousing
  - 8.2.4. Insert one Outer Bearing race into Bearing Carrier/Bellhousing.
  - 8.2.5. Lower Shaft assembly into Bellhousing.
  - 8.2.6. Install the second Outer Bearing Race into Bellhousing.
  - 8.2.7. Screw Bearing Retainer into Bellhousing until all clearance is removed from Bearings.
- 8.3. Adjust Main Bearing Clearance
  - 8.3.1. PTO main bearings should be adjusted to provide .007" - .009" axial clearance in main shaft for 106 thru 211 PTO's and .009" - .012" axial clearance in main shaft for 311 thru 314 PTO's (18" PTO's do not have an adjustment).
  - 8.3.2. Place PTO so the Bellhousing flange supports its weight.
  - 8.3.3. Mount dial indicator base on Bellhousing.
  - 8.3.4. Place dial indicator needle on end of shaft in a manner that will gauge Shaft's axial endplay.
  - 8.3.5. Apply 200 lbs [90 kg] of "upward" force on shaft using a suitable hoist and lift device to fit the tapped hole in the end of the shaft.
  - 8.3.6. Rotate shaft several revolutions.
  - 8.3.7. Zero dial indicator reading.
  - 8.3.8. Remove hoist from shaft and apply 200 lbs [90 kg] of "downward" force on Shaft.
  - 8.3.9. Rotate shaft several revolutions.
  - 8.3.10. Read axial endplay from dial indicator.
  - 8.3.11. Rotate Bearing Retainer until proper shaft axial endplay is obtained.

NOTE: When loosening nut, strike output end of shaft with a soft face hammer to set bearing cup (outer race) against Bearing Retainer while applying 200 lbs [90 kg] of force on the Shaft in the same direction.
  - 8.3.12. Adjust Bearing Retainer until nearest notch lines up with tab on Bearing Adjustment Lock.

8.3.13. Tighten Bearing Adjustment Lock.

8.4. Lubricate the main Bearings using the PTO's grease Zerk. Fill until grease begins to exit around the Shaft.

8.5. Install all plugs into Bellhousing.

8.6. Assemble Clutch

8.6.1. The threads that mate the Piston and Hub must have all oil residue removed, to allow the thread locker to harden properly, later in assembly. This residue may be removed using paint thinner, or industrial degreaser. Keep these threads clean until otherwise instructed.

8.6.2. Install Friction Disc then Center Plate, repeat until all Friction Discs and center plates have been installed.

8.6.3. Assemble Actuator

8.6.3.1. Test the fit of the Piston in the Cylinder without any seals installed. DO NOT scratch the parts!!!

8.6.3.2. Lubricate the O-rings and Seals for the Piston and Cylinder using clean hydraulic oil.

8.6.3.3. Install the O-rings in the Piston bores as shown on the assembly drawing.

8.6.3.4. Install the Seals in the Cylinder and Piston. The Seals should be installed in an orientation, such that, when the Piston and Cylinder are assembled, the O-ring sides face each other.

8.6.3.5. Lubricate the polished sealing surfaces on the Piston and Cylinder with clean hydraulic oil.

8.6.3.6. Set the Cylinder on a press, elevating the OD of the part about 2" high with blocks, to allow the Piston clearance during installation.

8.6.3.7. Set the Piston inside the Cylinder. Align a Spring Pocket in the Piston with a Tapped Hole in the Cylinder. Press slowly until the Seals are properly started, then press down to completion.

8.6.4. Clean the mating threads on the Piston and Hub with paint thinner, degreaser or similar. The objective is to remove all oil film from the mating threads. Allow to dry completely before proceeding.

8.6.5. Apply Loctite 242 or equal to the internal threads of the Piston. Be sure to saturate at least a 1/2" wide circumferential path of the threads with the Loctite.

\*\*\*DO NOT apply thread locker to the threads of the Hub, as the thread locker will find its way into the Piston/Cylinder or Center Plate Teeth. Either of these things could cause the PTO to seize.\*\*\*

8.6.6. Screw the Piston and Cylinder Assembly onto the Hub until firmly tight against the Teeth on the Hub.

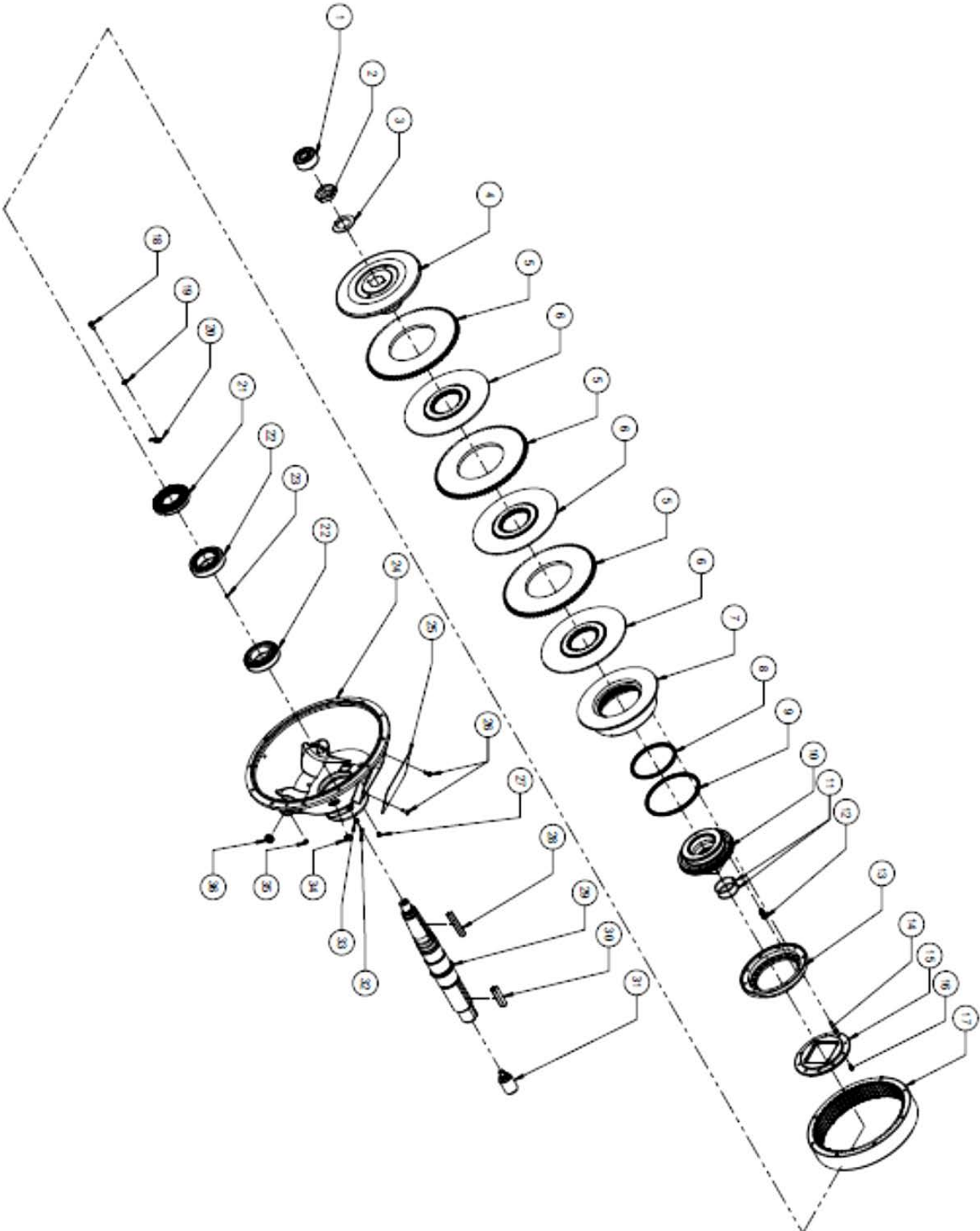
- 8.6.7. Align the Piston, Cylinder, Spring Release Plate, and Inertia Locking Plate.
  - 8.6.7.1. Loosely install 4 bolts that hold the Inertia Locking Plate and Spring Release Plate together. This will be a temporary assembly.
  - 8.6.7.2. Set the Spring Release Plate and Inertia Locking Plate temporary assembly onto the Piston/Cylinder. Twist the assembly until the Inertia Locking Plate can slide freely down the square area of the Piston and the tapped holes in the Cylinder align with the mating holes in the spring release plate.
  - 8.6.7.3. Match mark the parts from the previous step and disassemble the temporary assembly.
- 8.6.8. Place the Springs on the Piston.
- 8.6.9. Install the Spring Release Plate, verifying the Springs are properly seated in each Spring Pocket using the provided access holes in the Spring Release Plate, and by aligning timings marks. Failure to properly seat each Spring will cause failure of the PTO.
- 8.6.10. Apply Loctite 242 or equal to the bolts that hold the Spring Release Plate to the Cylinder. Apply torque.
- 8.6.11. Mount the Inertia Locking Plate. Apply Loctite 242 or equal to the Bolts, apply torque.
- 8.6.12. Insert the O-rings to the inner diameter of the Piston. Coat with a thin film of clean hydraulic oil prior to installing.
- 8.7. Mount Clutch Assembly on the Shaft
  - 8.7.1. Place PTO vertical, with Clutch end of Bellhousing facing up.
  - 8.7.2. Using threaded holes on Backplate of the Clutch Assembly, lift up aligning Bore with the Shaft.
  - 8.7.3. Apply thin film of clean hydraulic oil to Shaft face where the O-rings seat as shown.
  - 8.7.4. Keep O-rings away from keyways, threads and all sharp edges.
  - 8.7.5. Slide Clutch Assembly onto Shaft while installing key.
  - 8.7.6. Install Hub Lock Washer, align the tooth with slot in the Backplate.
  - 8.7.7. Install Hub Locknut and torque 90-110 lbf-ft [122-149 N-m].

# 9. Bolt Torque Chart

TORQUE VALUES FOR SOCKET HEAD AND HEX HEAD CAPSCREWS						
SOCKET HEAD CAP SCREWS						
BOLT SIZE INCHES	As Received			Lubricated**		
	lbf-ft	lbf-in	N-m	lbf-ft	lbf-in	N-m
1/4	13	150	17	10	120	13
5/16	23	305	34	18	244	27
3/8	45	545	62	36	436	49
7/16	70	840	95	56	672	76
1/2	108	1300	147	86	1040	117
9/16	155	1860	210	124	1488	168
5/8	211	2530	286	168	2024	228
3/4	367	4400	497	293	3520	397
7/8	583	7000	791	466	5600	632
1	867	10400	1175	693	8320	940
1 1/8	1242	14900	1684	993	11920	1347
1 1/4	1750	21000	2374	1400	16800	1899
1 3/8	2317	27800	3142	1853	22240	2513
1 1/2	3042	36500	4125	2433	29200	3300
1 3/4	4950	59400	6714	3960	47520	5371
2	7492	89900	10161	5993	71920	8128
HEX HEAD CAP SCREWS - Grade 8						
BOLT SIZE INCHES	As Received			Lubricated**		
	lbf-ft	lbf-in	N-m	lbf-ft	lbf-in	N-m
1/4	8	100	11	6	80	9
5/16	17	200	23	13	160	18
3/8	30	360	41	24	288	32
7/16	48	570	64	38	456	51
1/2	83	990	112	66	792	89
9/16	107	1285	145	85	1028	116
5/8	143	1714	194	114	1371	155
3/4	256	3070	347	204	2456	277
7/8	417	5000	565	333	4000	452
1	625	7500	848	500	6000	678
HEX HEAD CAP SCREWS - Grade 5						
BOLT SIZE INCHES	As Received			Lubricated**		
	lbf-ft	lbf-in	N-m	lbf-ft	lbf-in	N-m
1/4	6	71	8	5	56	6
5/16	12	142	16	9	113	12
3/8	22	260	29	17	208	23
7/16	34	410	46	27	328	36
1/2	53	636	72	42	508	57
9/16	74	890	101	59	712	80
5/8	104	1250	141	83	1000	112
3/4	183	2200	249	146	1760	199
7/8	298	3570	403	238	2856	322
1	440	5280	597	352	4224	477
1 1/8	553	6640	750	442	5312	600
1 1/4	775	9300	1051	620	7440	840
1 3/8	1012	12140	1372	809	9712	1097
1 1/2	1350	16200	1831	1080	12960	1464

\*\* NOTE: For Loctite use lubricated values

# 10. DRAWING & BOM



Item #	Description
1	Pilot Bearing
2	Hub Nut
3	Hub Lock Washer
4	Hub and Backplate
5	Friction Disc
6	Center Plate
7	Cylinder
8	Seal Inner
9	Seal Outer
10	Piston
11	O-Ring
12	Spring
13	Release Spring Plate
14	SHCS,.250-20 X 0.50"
15	Inertia Locking Plate
16	SHCS,.250-20 X 0.50"
17	Drive Ring
18	HHCS,.312-18 NC X .625",GR 5,PLATED
19	5/16" Lock Washer
20	Lock, Bearing Retainer
21	Bearing Retainer
22	Bearing
23	Set Screw
24	Bellhousing
25	Nameplate
26	HHCS,.250-20 NC X .625",GR 5,ZINC PLATING
27	Plug
28	Key Clutch
29	Shaft
30	Key Output
31	Rotating Union
32	Zerk Cap
33	Zerk
34	Plug
35	1/8" Pipe Plug
36	Freeze Plug
37	Product Label