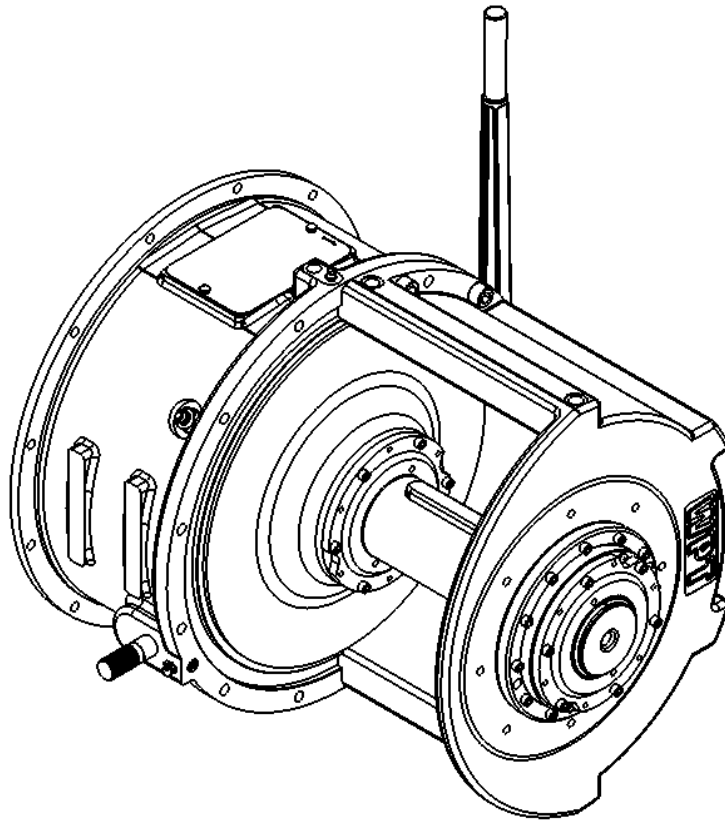




MECHANICAL POWER TAKE OFF

TYPE 1 (GEN II) POWER TAKE OFF

Installation & Maintenance Manual




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Table of Contents

1.0	INTRODUCTION.....	3
1.1	Product Description	3
2.0	TYPE 1 GEN II, 3 PLATE PTO EXPLODED VIEW.....	4
3.0	INSPECTION	7
4.0	INSTALLATION.....	9
4.1	Lubrication prior to installation.....	9
4.2	Support Mounting Bracket (Required, supplied by customer).....	9
4.3	Installing operating handle	9
4.4	Vertical mount installation.....	9
4.5	Installation of driving ring.....	9
4.6	Mounting the sheave	10
5.0	OPERATION.....	12
6.0	LUBRICATION.....	12
6.1	Grease specification	12
6.2	Grease specification for cold conditions	12
6.3	Bearing Lubrication intervals.....	12
6.4	Clutch Lubrication	13
6.5	Bearing operating temperature.	13
7.0	MAINTENANCE	13
7.1	Inspecting and adjusting the clutch.....	13
7.2	PTO Adjustment	13
7.3	Clutch Adjustment Frequency	14
8.0	DISASSEMBLY	15
8.1	Removing the PTO from the engine	15
8.2	Removing the Sheave Housing and Belts	15
8.3	Removing the outboard bearing	15
8.4	Removing the bell housing.....	16
8.5	Removing the clutch from the PTO.....	16
8.6	Removing the inboard bearing	16
9.0	ASSEMBLY	16
9.1	Preparing the shaft	16
9.3	Install clutch pack	18
9.4	Assembling the PTO	18
9.5	Installing the sheave housing	19
10.0	BOLT TORQUE VALUES	20
11.0	SPECIFICATIONS	21
12.0	GENERAL REQUIREMENTS	22
13.0	SIDELOAD DATA.....	22
14.0	OEM Clutch Pack Installation and Maintenance Instructions.....	23
15.0	Storage Guidelines	24
16.0	TROUBLE SHOOTING GUIDE	25

1.0 INTRODUCTION

Throughout this manual there are 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.

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 safely install, operate and maintain this equipment.

- The WPT Power Corporation PTO is the most rugged PTO available on the market today. Follow the procedures detailed in this Installation Maintenance Manual for years of service.
- 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 a metal tag riveted to the bell housing. Your WPT Distributor can provide a copy of the Bill of Materials if the one provided should become lost.
- When performing installation and maintenance functions, refer to the drawings in 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.

DANGER:

To avoid damage or personal injury, ensure 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.

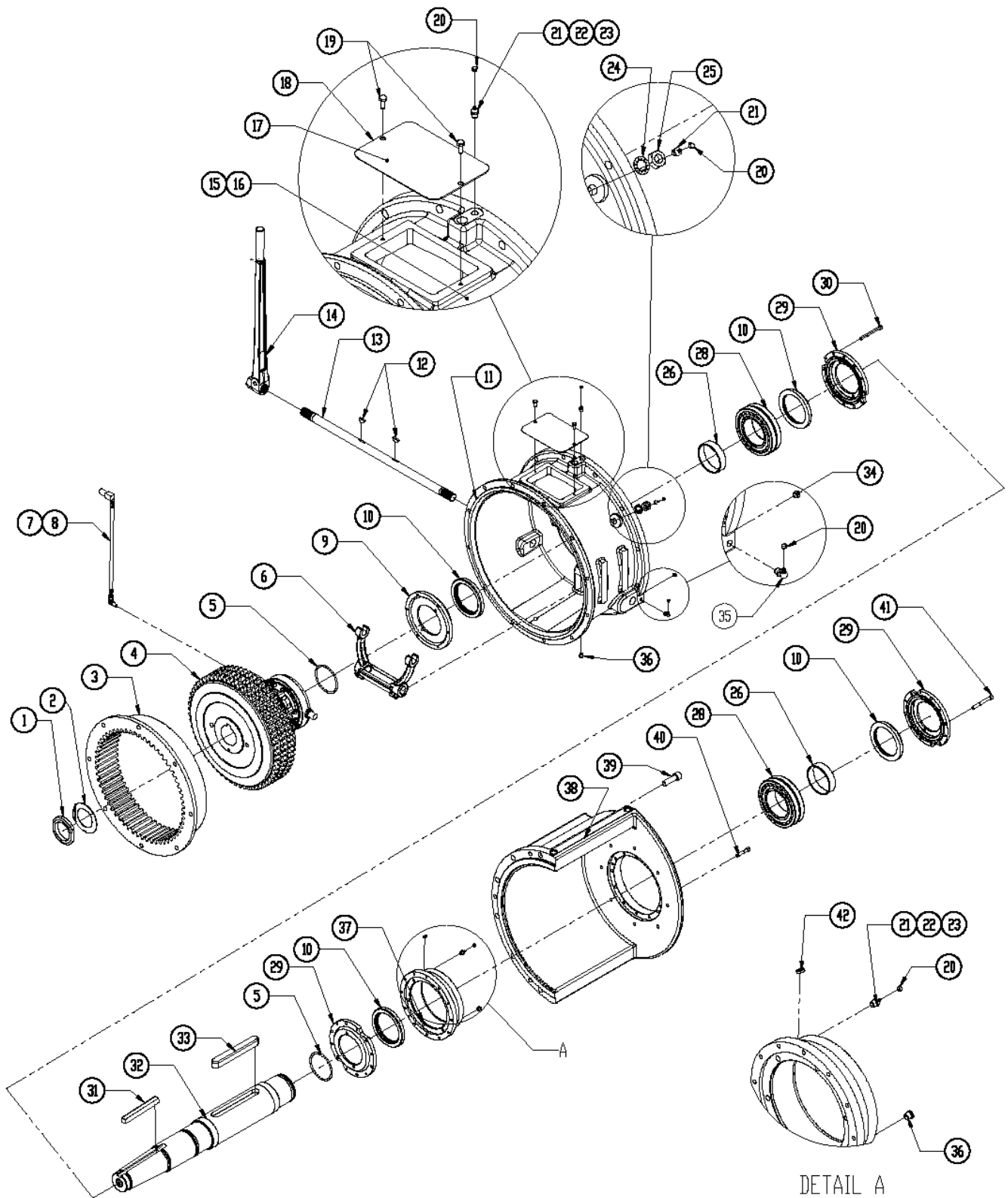
1.1 Product Description

The WPT mechanical Power Take-Off consists of a lever-actuated clutch with a shaft and bearings mounted in a rigid housing. The WPT TYPE 1 GEN II PTO is designed for heavy duty sideload applications on all internal combustion engines with standard SAE industrial flywheel / flywheel housing dimensions.

These PTO'S are designed to fit a standard SAE housing size #1. Two main bearings are used to distribute the applied load. The mechanical unit utilizes a maintenance free “ball bearing” sliding sleeve assembly.

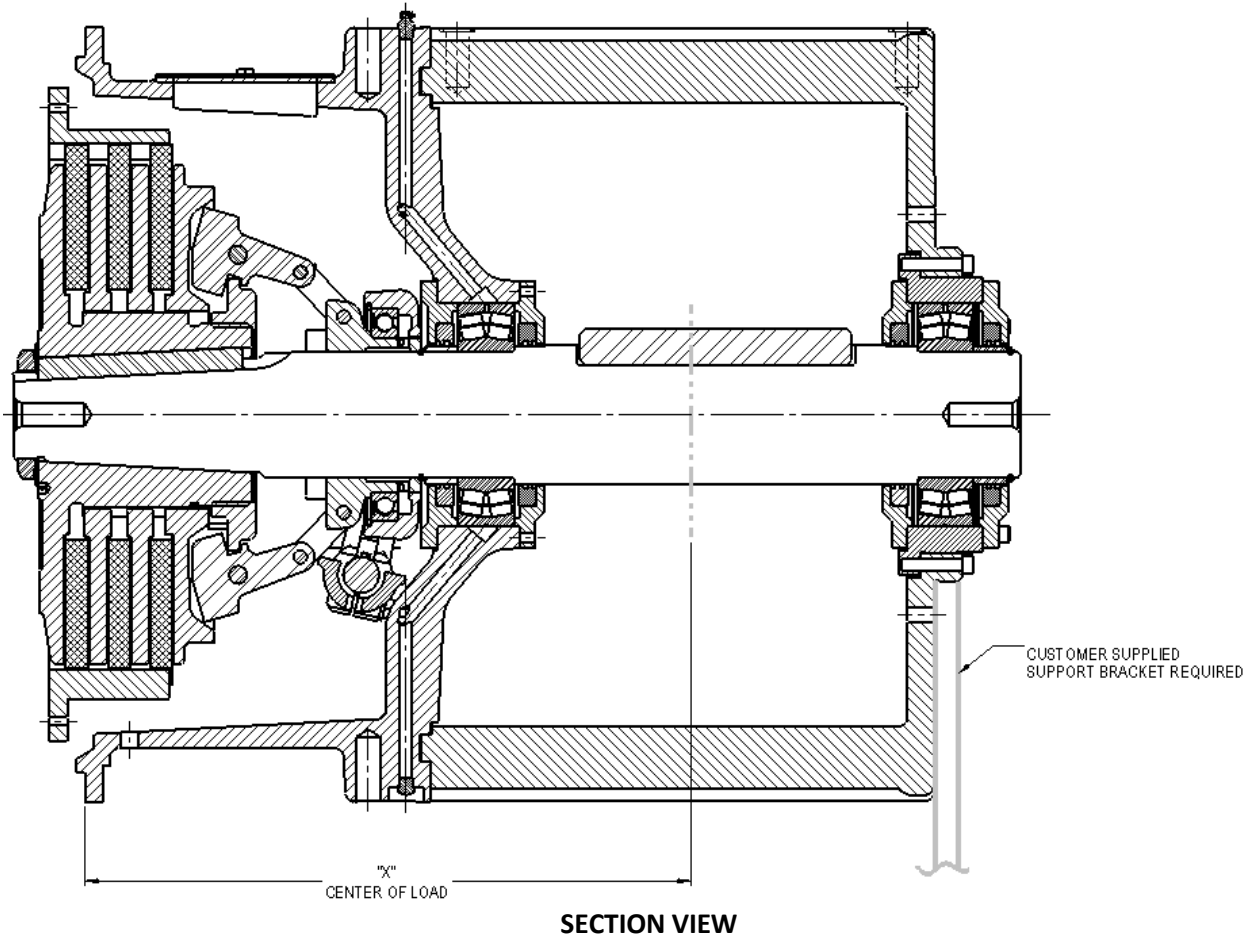
WPT mechanical PTO's nomenclatures are interpreted as such, “314 Mechanical PTO” indicates that there are three 14” diameter Center Plates.

2.0 TYPE 1 GEN II, 3 PLATE PTO EXPLODED VIEW

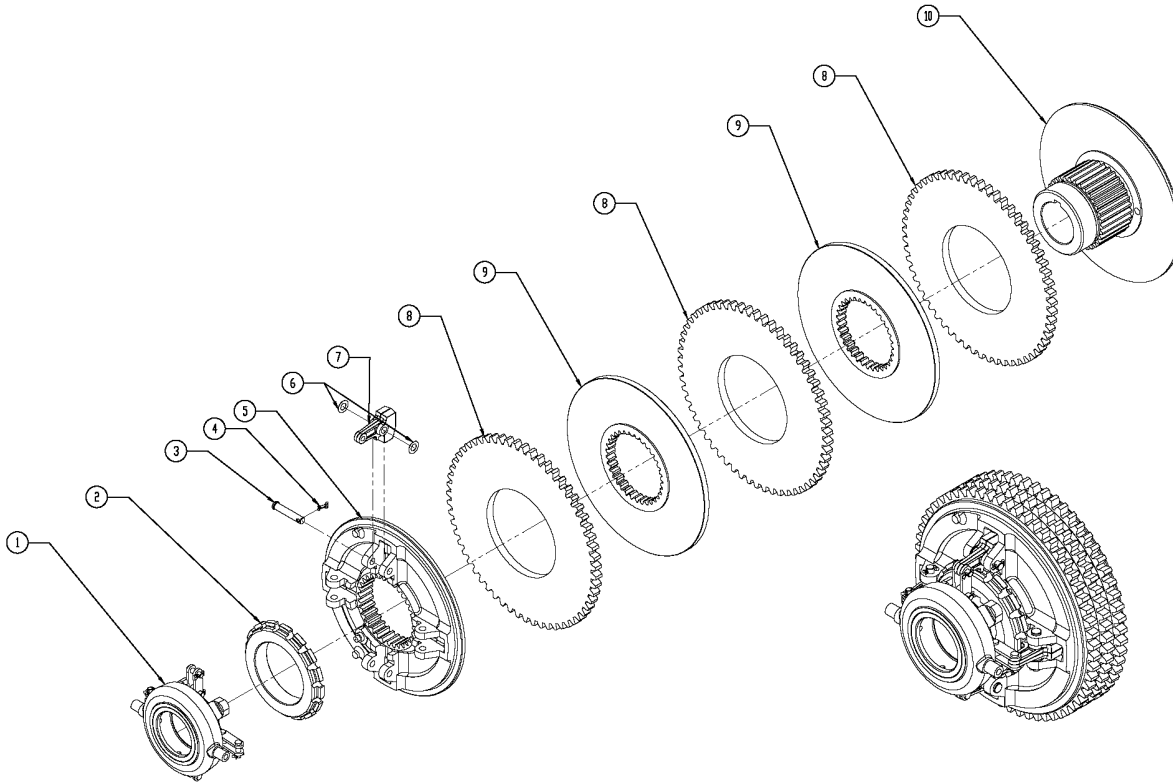


Item	Description	Qty	Item	Description	Qty
1	Nut	1	22	Lube Label	2
2	Washer, lock	1	23	Label	2
3	Driving Ring	1	24	Lock Washer	1
4	Clutch Pack	1	25	Nut	1
5	Retaining Ring	2	26	Spacer	2
6	Yoke Assembly	1	28	Bearing	2
7	Hose Assembly	1	29	Endcap	3
8	Grease Zerk	1	30	SHCS	6
9	Endcap	1	31	Key, Clutch	1
10	Seal Labyrinth	4	32	Shaft	1
11	Bellhousing	1	33	Key	1
12	Key, Woodruff	2	34	Plug	2
13	Operating Shaft	1	35	Grease Zerk	2
14	Lever Assembly	1	36	Valve, Relief	2
15	Name plate, Serial Number	1	37	Bearing Carrier	1
16	Drive Screw	4	38	Sheave Housing	1
17	Lube Label	1	39	SHCS	6
18	Nameplate	1	40	SHCS	12
19	HHCS	2	41	SHCS	6
20	Grease Cap	5	42	Plug, Freeze	2
21	Grease Zerk	3			

See page 4 for drawing with item numbers.

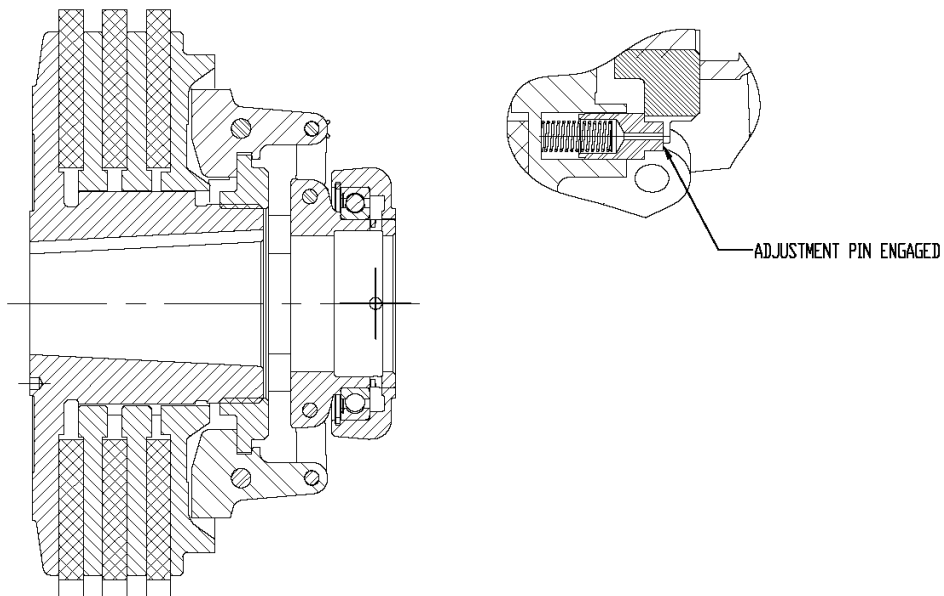


CLUTCH PACK 3 PLATE EXPLODED VIEW AND PARTS LIST



Item	Description	Qty	Item	Description	Qty
1	Sliding Sleeve Assembly ***	1	6	Spring Washer	8
2	Adjusting Ring	1	7	Lever	4
3	Clevis Pin	4	8	Friction Disc	3
4	Cotter Pin	4	9	Center Plate	2
5	Floating Plate Assembly	1	10	Hub and Backplate	1

*** Sliding Sleeve Assembly has a "Ball Bearing Collar"

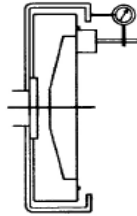


3 Plate clutch pack section view

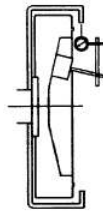
3.0 INSPECTION

REQUIREMENTS FOR PROPER OPERATION AND SERVICE LIFE

- 3.1 Preparation.** Upon receipt of your WPT product, inspect for and report any evidence of damage. To avoid damage or personal injury, ensure that adequate lifting devices and hand tools are available. Compare the flywheel, flywheel housing, and pilot bearing bore to the bell housing, drive ring, and pilot bearing, respectively to ensure that you have the correct size unit.
- 3.2 Check flywheel and flywheel housing alignment.** 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.
- 3.3 Flywheel to housing face run out inspection.** 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 applying force to the crankshaft thrust bearing. The total indicator reading should not exceed 0.012 inches (0.305mm).



- 3.4 Check flywheel housing bore runout.** 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:

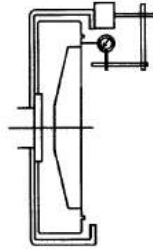
SAE "1" Housing: 0.012 inches (0.305 mm)

(Reference: SAE J617 table 1A)

3.5 Check flywheel face runout.

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 applying force to the crankshaft thrust bearing.

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

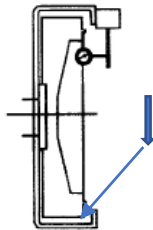


3.6 Check engine crankshaft endplay.

Measure and document the engine's crankshaft endplay before installing PTO. Using dial indicator as shown in 3.5 force the crankshaft back against the rear main bearing and then force the crankshaft to the front of the engine. Record the total movement as shown by the dial indicator.

3.7 Check engine radial play.

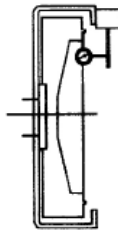
Apply upward radial force by using a prybar to check the radial play in flywheel. Consult engine manufactures specifications to ensure correct tolerance.



3.8 Check flywheel pilot bore runout.

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

The total indicator reading should not exceed 0.005 inches (0.127 mm).



4.0 INSTALLATION

4.1 Lubrication prior to installation

The WPT mechanical PTO requires lubrication with Lubriplate®1200-2 or equivalent. Prior to installation, grease the main shaft bearings, sliding sleeve assembly, and operating shaft. 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 ensure that all moving parts are properly lubricated for initial use. See Section 6 for lubrication instructions

4.2 Support Mounting Bracket (Required, supplied by customer)

When installing a support bracket, ensure the PTO maintains proper alignment throughout the flywheel, bellhousing & shaft. A dial indicator may be used to verify the PTO is not moving or deflecting during the installation process (see section 3). Shim and adjust the support as needed.

NOTE: the outboard support should complement the position of the PTO, not change it.

CAUTION:

Operating handle must be mounted in the vertical position, just over center, to eliminate excessive wear in the sliding sleeve collar.

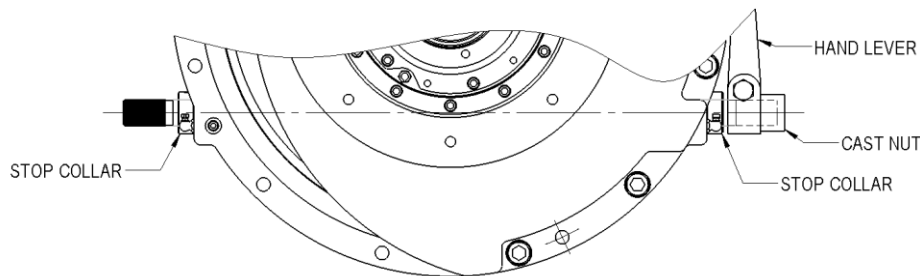


Figure 1

4.3 Installing operating handle

The operating handle (hand lever) may be installed on either side of the PTO engagement shaft, depending upon space requirements and convenience to the operator. Install lever with the cast hex facing away from the PTO. Engage clutch, remove handle and reinstall, align the splines so the handle position is over center, while engaged. See illustration.

4.4 Vertical mount installation

When installing PTO with operating shaft vertical, a stop collar should be added to the shaft on the topside for support. Failure to add stop collar will cause premature failure to the sliding sleeve collar assembly.

4.5 Installation of driving ring

- 4.5.1 Use the drive ring provided with the PTO or remove the drive ring from the engine flywheel to use as an alignment gauge. Place the drive ring over the friction discs. Center the drive ring relative to the O.D. of the clutch body
- 4.5.2 Engage the clutch by operating the hand lever. Remove the drive ring. Do not disengage clutch until installation is complete.

- 4.5.3 Mount driving ring (see sections 3 for proper alignment) on the engine flywheel, making sure it is seated properly.
- 4.5.4 Use SAE Grade 5 bolts (or equivalent) with lock washers and torque to the value in Table 2.

NOTE: Use the engine manufacturer's torque recommendation if different from that in Table 2.

4.6 Mounting the sheave

- 4.6.1 Removing the sheave housing
 - 4.6.1.1 If a sheave has not been mounted, mark the shaft in the center of the distance between the bearing end caps (29)
 - 4.6.1.2 Remove the 6 socket head bolts (41) and 12 socket head bolts (40) holding the sheave housing to the bearing housing and bell housing.
 - 4.6.1.3 Attach approved lifting eyes in the 3/4-10 holes in the ribs on the side of the housing if the PTO is in a horizontal position.
 - 4.6.1.4 Attach a pattern of lifting eyes in the 3/4-10 holes in the sheave housing if the PTO is in a vertical position.
 - 4.6.1.5 If the housing does not separate easily, insert (2) 5/16-18 jack bolts in the end of the bell housing and tighten these evenly to move the bell housing off the bearing housing boss.
- 4.6.2 Removing the outboard bearing
 - 4.6.2.1 Remove the 6 socket head cap screws(41) joining the bearing end caps(9) & (29) to the bearing carrier(37).
 - 4.6.2.2 Slide the bearing carrier off the bearing.
 - 4.6.2.3 Remove the outboard seal spacer (26).
 - 4.6.2.4 Take precautions to keep the bearing clean. If the bearing does not slide easily off the shaft, install a bearing puller with splitter plates behind the bearing and remove it from the shaft. Do not pull on the bearing end cap (29). The shaft has a 3/4-10 thread at the bottom of the rotary coupling pocket.
 - 4.6.2.5 Remove the seal spacer (26).
- 4.6.3 Installing the sheave
 - 4.6.3.1 If the key (33) is not in the shaft, install it now. Be sure it seats in the bottom of the slot.
 - 4.6.3.2 Measure the distance from the top of the key to the opposite side of the shaft.
 - 4.6.3.3 Compare this measurement to the mating dimension in the sheave or bushing and adjust the key height if necessary.
 - 4.6.3.4 Slide the sheave onto the shaft and lock in the approximate center determined in Section 3 above.

4.6.4 Replacing the outboard bearing

- 4.6.4.1 Slide the seal spacer (26) onto the shaft until it seats against the shoulder.
- 4.6.4.2 Install the outboard bearing (28) with its carrier (37), seal housings (9 & 29), and seals (10) onto the shaft. Use a light coating of grease on the seal ring and be careful to not damage the seal.
- 4.6.4.3 Slide the remaining seal spacer (26) onto the shaft. Use a light coating of grease on the seal ring and be careful to not damage the seal.

4.6.5 Replacing the sheave housing

- 4.6.5.1 Refer to 8.2

4.7 Installing or replacing belts

To install/replace belts, the customer's support bracket and sheave housing must be removed.

- 4.7.1 Remove outboard support bracket
- 4.7.2 Remove the 6 socket head bolts (41) and 12 socket head bolts (40) holding the sheave housing to the bearing housing and bell housing.
- 4.7.3 Attach approved lifting eyes in the $\frac{3}{4}$ -10 holes in the ribs of the sheave housing.
- 4.7.4 If the housing does not separate easily, insert (two) 5/8-11 jack bolts in the end of the bell housing and tighten these evenly to move the bell housing off the bearing housing boss.
- 4.7.5 Install/replace belts.
- 4.7.6 Reposition the sheave housing on the bell housing (38) and outboard bearing carrier (37).
- 4.7.7 Align bolt holes and start socket head bolts (40). Supporting the sheave housing with cribbing or threaded rods screwed into the bell housing will aid assembly.
- 4.7.8 Evenly tighten socket head bolts (40) to the values from Table 2.
- 4.7.9 Remove threaded rods, if used, and install socket head bolts (40). Tighten to the values from Table 2.
- 4.7.10 Replace outboard support bracket and adjust belt tension.
Check and adjust belt tension after the first several hours of operation.

5.0 OPERATION

Clutch engagement procedure

5.1 Where high inertia loads must be started, engaging the clutch at idle speed may stall the engine. High inertia loads may be brought up to speed by engaging the clutch for short periods (1 second) at intervals long enough to prevent excessive heat buildup in the friction discs. With extremely high loads, the engine may have to be operated at higher speeds while engaging the clutch. However, with a combination of clutch control and careful use of engine speed, a much smoother transition can be achieved by allowing the clutch to slip. Variations in engine revs are not immediately translated into changes in drive shaft rotation speed, but rather the friction on the clutch plate allows the drive shaft to gradually equalize with the speed of the engine.

5.2 Do not engage clutch above 1100 RPM.

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

NOTE:

UNDER NO CIRCUMSTANCES should the clutch be slipped for more than several seconds 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.

6.0 LUBRICATION

Re-lube before placing in service

NOTE:

Follow unit's nameplate and labels for lubrication intervals.

6.1 Grease specification

The WPT PTO is lubricated at the factory with Lubriplate®1200-2 or equivalent, lithium base grease with an EP (extreme pressure) additive. This will serve under normal ambient conditions up to 2100 RPM at a maximum bearing temperature of 200° F. (93.3°C.)

6.2 Grease specification for cold conditions

For ambient temperatures below -25 ° F. (-32 ° C.), Lubriplate® MAG-1 may be substituted.



CAUTION:

Do not mix sodium or calcium-based greases with lithium-based grease.

6.3 Bearing Lubrication intervals.

There are only two places on the WPT PTO that require bearing lubrication. Each is connected to a main bearing cavity with the excess grease being forced out of a relief valve on the bottom of the unit. The small amount of grease expelled is an indication that enough grease is being provided.

6.3.1 Every 75 hours of operation add enough grease to expel a small amount from the relief valves.

6.3.2 Every 300 hours of operation flush the bearing with approximately 7.5 oz. (1/2 tube).

These lubrication intervals are suggested. The operator is responsible for establishing lubrication intervals according to the duty cycle and operating conditions in which the equipment is used.

6.4 Clutch Lubrication

During normal operation, apply one to three grease gun shots of grease to each of the three zerks (sliding sleeve assembly, operating handle left & operating handle right) every 20 hours of operation.

6.5 Bearing operating temperature.

Operating temperature range is normally between 170 ° F. and 200 ° F. (76.7 to 93.3° C.). Higher ambient temperatures will cause the bearings to run hotter. More frequent lubrication intervals and/or lubricant designed for higher operating temperatures will be required if the unit is to be used in this environment. Consult the factory for lubricant recommendations where ambient temperatures are consistently above 100 ° F. (38 ° C.)

CAUTION:

Do not check bearing temperature with the hand. Acceptable bearing temperatures are normally hotter than the hand can stand. A contact type thermometer should be used to take accurate temperature measurements.

7.0 MAINTENANCE

The WPT mechanical PTO uses an adjusting collar to adjust for clutch wear. If the engagement force reaches 2/3 of maximum specified torque, clutch slips, heats excessively, or operating lever fails to stay engaged, clutch adjustment is required. The clutch should be adjusted to maintain hand lever force found in Table 1.

7.1 Inspecting and adjusting the clutch

7.1.1 Remove power (stop the engine) and tag any remote start devices.

7.1.2 Check engagement force with a torque wrench using the cast hex on the lever or check hand lever engagement force using spring scale at hand lever length "A" shown in of Figure 4 & Table 1

It is good to periodically remove dirt and accumulated dust from the clutch. Wear a mask and eye protection while doing this. WPT friction material is asbestos free.

7.2 PTO Adjustment

Clutch Adjustment

The WPT mechanical PTO uses an adjusting collar to adjust for clutch wear. If the engagement force reaches 2/3 of maximum specified torque, clutch slips, heats excessively, or operating lever fails to stay engaged, clutch adjustment is required.

7.2.1 Remove inspection cover nameplate.

For "SP" style clutches, disengage locking pin by pushing pin in.

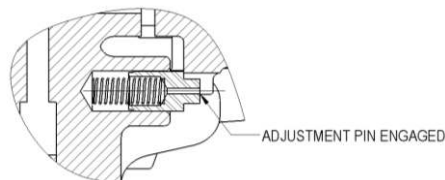


Figure 2

“SP” STYLE

7.2.2 Turn adjusting ring clockwise to increase clutch engagement force.

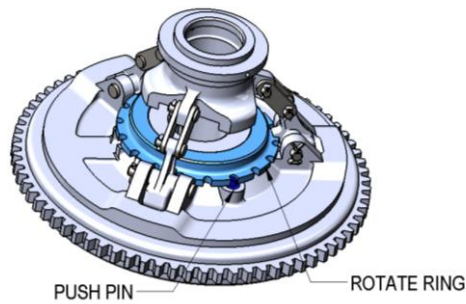


Figure 3 "SP" STYLE

- 7.2.3 Adjust clutch engagement force until the hand lever force required to engage the clutch is within the range specified on the inspection cover nameplate or Table 1 in this section.
- 7.2.4 Check engagement force with a torque wrench using the cast hex on the lever or check hand lever engagement force using spring scale at hand lever length "A" shown in of Figure 4 & Table 1

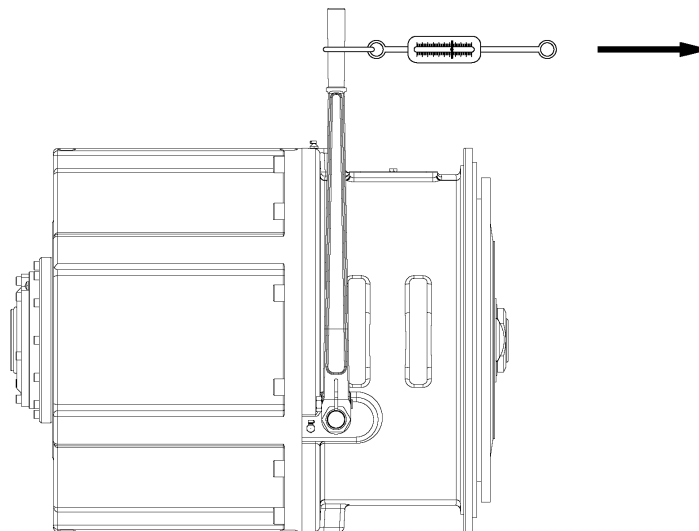


Figure 4

Model/ Size	Operating Shaft Torque lbf-ft (N-m)	Hand Lever Force lb (kg)	Hand Lever Length "A"	HEX NUTS SIZE ACROSS FLATS
14"	218/289 (295/391)	125/165 (57/75)	21" (533)	1.4375

Table 1

7.2.5 Make sure lock pin is proper engaged after completing adjustment.

7.2.6 Replace inspection cover nameplate.

NOTE: New friction discs require frequent adjustments during an initial break-in period.

7.2.7 Recheck clutch adjustment after the first 10 hours of operation.

7.3 Clutch Adjustment Frequency

7.3.1 As clutch wears, the hand lever force required to engage clutch will decrease.

- 7.3.2 The need to readjust the clutch is indicated when the handle force has decreased to 2/3 of the maximum force specified on the inspection cover plate OR anytime clutch slippage is detected.
- 7.3.3 Do not adjust clutch so tight that hand lever force exceeds the maximum as indicated on the inspection cover nameplate or Table 1.

 **CAUTION:**

Do not use any automated clutch engagement device which continues to apply pressure to the hand lever, after clutch is engaged. To prevent excessive wear to clutch sliding sleeve and other clutch parts, the hand lever should be allowed to rest in a vertical position with no external force applied to it once clutch is engaged.

8.0 DISASSEMBLY

(Refer to PTO Illustration at the front of this manual)

8.1 Removing the PTO from the engine

- 8.1.1 Use a hoist or other suitable lifting equipment to support the weight of the power take-off. Attach lifting devices at several places or use cribbing to support the PTO in a horizontal position during removal.

 **Caution:**

The PTO weighs in excess of 1000 lbs. (454 Kg.) Use approved lifting eyes and procedures to prevent accident or injury.

- 8.1.2 Remove air hoses and other connections to the PTO
- 8.1.3 Remove the mounting bolts between PTO and flywheel housing, removing those located near the top last. The PTO should separate from the flywheel housing. If the PTO doesn't separate, gently pry the flanges apart until the housing is removed from the engine flywheel housing pilot diameter.
- 8.1.4 Use care when removing the PTO from the engine to avoid damage to grease fittings, friction disc teeth, and other components.

8.2 Removing the Sheave Housing and Belts

- 8.2.1 Place the PTO on the floor, clutch down, supported by wood blocks under the bell housing. Use adequate support to keep the PTO from tipping.
- 8.2.2 Refer to section 2 of this manual.
- 8.2.3 Slide the belts off the pulley(s).
- 8.2.4 The sheave housing, if replaced at this time, will help balance the PTO.

8.3 Removing the outboard bearing

- 8.3.1 Remove cap screws (41) and slide the bearing end cap (29) off of the shaft.
- 8.3.2 Slide the seal spacer (26) off of the shaft.
- 8.3.3 Slide the bearing carrier (37) off the bearing and off of the shaft.
- 8.3.4 Slide the bearing off the shaft. If a puller is necessary, use splitter plates behind the bearing. Do not pull on the bearing end cap (29). The shaft is tapped $\frac{3}{4}$ -10 at the bottom of the rotary coupling pocket.
- 8.3.5 Remove the seal spacer (26).

8.4 Removing the bell housing

- 8.4.1 Remove 6 socket head cap screws (30) and lift the bell housing off the inboard bearing carrier (29). If the bell housing does not lift off easily, insert jack bolts in the threaded holes provided and tighten these evenly to separate the two.

8.5 Removing the clutch from the PTO

- 8.5.1 Position the shaft with the clutch at the top.
- 8.5.2 Remove jam nut (on outside of bellhousing) in order to free grease fitting.
- 8.5.3 Bend hub lock washer tab away from hub locknut.
- 8.5.4 Remove hub locknut.
- 8.5.5 Remove hub lock washer.
- 8.5.6 Remove the clutch/ hub assembly using a gear puller and the tapped holes that are provided in the hub & backplate.
- 8.5.7 Remove the grease hose and fittings from the clutch assembly.
- 8.5.8 Remove cotter pins, straight pins, and any washers from the clutch assembly, allowing the sliding sleeve and collar to separate from the clutch.
- 8.5.9 Remove (2) nuts and bolts securing the brass collar halves to the sliding sleeve.
- 8.5.10 Push or pull clutch adjusting lock and remove adjusting collar from clutch.

8.6 Removing the inboard bearing

- 8.6.1 Remove the grease hoses (7) from the bearing carrier (29).
- 8.6.2 Remove socket cap screws (30) and slide the bearing end cap (9) off of the shaft.
- 8.6.3 Slide the bearing carrier (29) off of the shaft.
- 8.6.4 Slide the seal spacer (26) off the shaft.
- 8.6.5 Slide the bearing off the shaft. If a puller is necessary, use splitter plates behind the bearing. Do not pull on the bearing end cap (29).
- 8.6.6 Slide the seal spacer (26) off the shaft.

9.0 ASSEMBLY

9.1 Preparing the shaft

- 9.1.1 Clean the shaft. Remove all dirt or corrosion.
- 9.1.2 Check the shaft to see that it is free of burrs.
- 9.1.3 Inspect threads to see that there is no damage.
- 9.1.4 Keyways should not be worn. Keys should be a snug fit in the slot.

9.2 Assembling the clutch

- 9.2.1 Put friction disc on backplate.
- 9.2.2 Place center plate on hub, being careful to align teeth with hub teeth.
- 9.2.3 Put 2nd friction disc on center plate.

- 9.2.4 Place 2nd center plate on hub.
- 9.2.5 Put 3rd friction disc on center plate.
- 9.2.6 For "SP" style install floating plate on hub and backplate assembly. Place spring & adjusting lock pin into floating plate, then screw adjusting ring on hub to secure floating plate.
- 9.2.7 Assemble finger levers to floating plate using spring washers, clevis pins and cotter pins. See Figure 5 & 6 for direction of clevis pins and positioning of cotter pins.

*****IMPORTANT***ORIENT ALL CLEVIS PINS AS SHOWN**

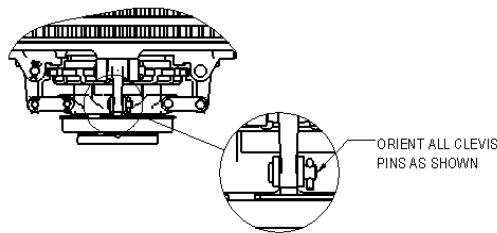
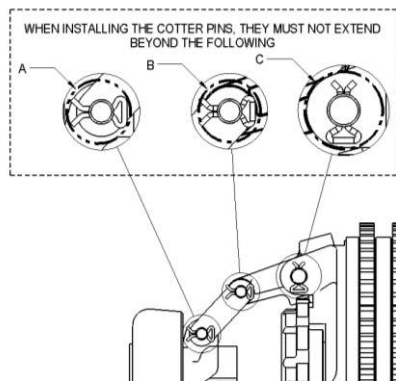


Figure 5

- 9.2.8 Assemble lever links, clevis pins and cotter pins to sliding sleeve. See Figure 5 & 6 for direction of clevis pins and positioning of cotter pins.

*****IMPORTANT***ALL COTTER PINS MUST NOT EXTEND BEYOND THE RADIUS**



Radius dimensions shown in A, B & C			
UNIT SIZE	COTTER PIN LOCATION		
	A	B	C
14"	0.47" [11.94]		0.59" [14.99]

Figure 6

- 9.2.9 Assemble sliding sleeve assembly to floating plate assembly using clevis pins and cotter pins. See Figure 5 & 6 for direction of clevis pins and positioning of cotter pins.
- 9.2.10 Attach elbow, grease hose, bushing and zerk to ball bearing assembly and tighten.
- 9.2.11 Brush anti-seize lubricant on shaft for easy assembly.

9.3 Install clutch pack

9.3.1 Align keyway with key in shaft.

*****IMPORTANT***TURN ENGAGEMENT SHAFT TO ALIGN FORKS WITH BALL BEARING COLLAR AS CLUTCH IS POSITIONED ONTO SHAFT SEE Figure 7**

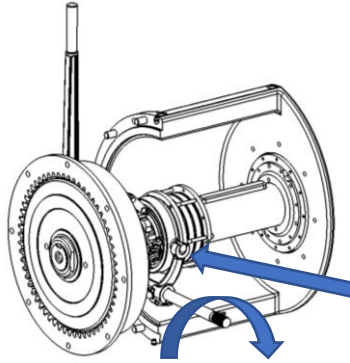


Figure 7

9.3.2 Place grease hose bushing thru bellhousing and secure with lock washer and nut.

9.3.3 Slide clutch pack onto shaft.

9.3.4 Install lock washer on shaft next to hub, make sure tab is located in hole.

9.3.5 Install lock nut on shaft making sure direction is as shown on drawing (See Section 2) and torque nut (See Section 12).

9.3.6 Bend lock washer onto one flat of clutch nut.

9.4 Assembling the PTO

9.4.1 Install the seals in the bearing end caps (9,10 & 29) and set these aside.

9.4.2 Fix the shaft vertically with the clutch end up.

9.4.3 Heat the inboard bearing (28) using an appropriate heat source and slide it on the shaft until it seats against the raised diameter of the shaft. Allow the bearing to cool.

9.4.4 Slide a seal spacer (26) on the shaft until it stops against the bearing.

9.4.5 Invert the PTO so the sheave end is up. Be sure the shaft and clutch are adequately supported

9.4.6 Slide the bell housing over the bearing (28).

9.4.7 Slide an inboard end cap (9) with seal over the shaft with the seal facing the bearing.

9.4.8 Install 6 socket head cap screws (30). Use thread locking compound and torque to values from Table 2.

9.4.9 Invert the PTO so the clutch end is up. Be sure the shaft and clutch are adequately supported

9.4.10 Install operating shaft (13) in bellhousing (11) with yoke (6) secured with woodruff keys (32) inside of bellhousing.

- 9.4.11 Tighten bolts on yoke assembly.
- 9.4.12 Install the clutch pack (4) and hub key (31) onto shaft (see Section 9.3).
- 9.4.13 Ensure yoke assembly (6) fork engage the ball bearing assembly of clutch pack (4).
- 9.4.14 Set proper hand lever force see section 6.2
- 9.4.15 Invert the PTO so the sheave end is up. Be sure the shaft and clutch are adequately supported
- 9.4.16 Fit sheave key into keyway and mount sheave if necessary.
- 9.4.17 Slide the other inboard bearing end cap (29) over the shaft with seal facing bearing.
- 9.4.18 Heat the outboard bearing (28) using an appropriate heat source and slide it on the shaft until it seats against the raised diameter of the shaft. Allow the bearing to cool.
- 9.4.19 Heat the outboard bearing carrier (37) and slide this onto the bearing.
- 9.4.20 Slide the seal spacer (26) onto the shaft until it seats against the bearing.
- 9.4.21 Slide the outboard bearing end cap into place and bolt both end caps to the bearing housing using flat head socket cap screws (41) and thread locking compound. Torque to the value listed in Table 2 for socket head bolts.
- 9.4.22 Install hand hole covers (18).

9.5 Installing the sheave housing

- 9.5.1 Using a hoist and approved lifting eyes, set the sheave housing over the outboard bearing housing. Align the mating holes and install several bolts to aid assembly. Check the desired orientation of the opening of the sheave housing with the bell housing.
- 9.5.2 Tighten the bolts (39) drawing the sheave housing onto the bearing carrier boss while aligning the sheave housing to bell housing bolt holes. Be sure the sheave housing counterbore is tight against the bell housing boss. This establishes alignment of the components. Install socket head cap screws (39) with thread locking compound and torque to the value shown in Table 2.

10.0 BOLT TORQUE VALUES

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 Table 2

11.0 SPECIFICATIONS

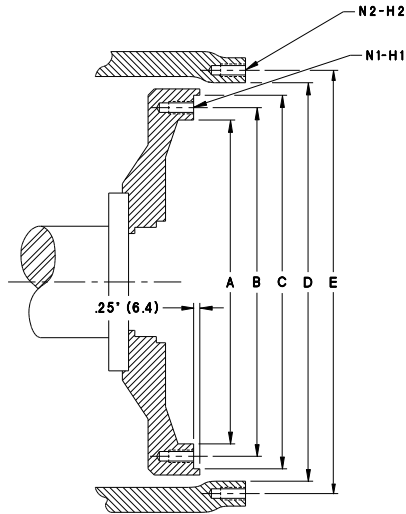


Figure 8 See Table 3

FLYWHEEL DIMENSIONS					
Clutch size	A	B	C	N1	H1
14"	16.12 (409.4)	17.250 (438.15)	18.375 (466.72)	8	1/2 - 13 NC
FLYWHEEL HOUSING DIMENSIONS					
Housing size	D	E	N2	H2	
1	20.125 (511.18)	20.875 (530.22)	12	7/16 - 14 NC	

Table 3

12.0 GENERAL REQUIREMENTS

GENERAL	
DESCRIPTION	REFERENCE
CLUTCH ADJUSTMENT	SECTION 7, PAGES 13-15
LUBRICATION	SECTION 6, PAGE 12-13
SIDELOAD RATINGS	SECTION 13, PAGE 22

HARDWARE TIGHTENING		
DESCRIPTION	THREADLOCKER	TORQUE SPECIFICATION OR REFERENCE
NAMEPLATE BOLTS	NONE	SECTION 10, PAGE 20
SHEAVE HOUSING BOLTS BEARING CARRIER BOLTS SEAL ENDCAP BOLTS	LOCTITE 242 OR EQUAL, OR NONE IF LOCKING WASHER IS USED	
HUB NUT	BEND LOCKING TAB OVER NUT FLAT AFTER TIGHTENING	
GREASE HOSE CONNECTIONS AND GREASE ELBOW CONNECTIONS	REMOVE OIL/GREASE RESIDUE FROM BOTH MATING THREADS. APPLY LOCTITE 242 OR EQUAL.	FINGER TIGHT, PLUS 1.5-2.5 TURNS FOR TAPERED NPT THREADS

13.0 SIDELOAD DATA

ALLOWABLE SIDELOAD – lbf (kgf)					
RPM	"X" DISTANCE				
	15" (381)	16" (406)	17" (432)	18" (457)	19" (483)
1800	11,500 (5200)	13,100 (5900)	15,100 (6900)	14,200 (6500)	12,400 (5600)
2100	11,000 (5000)	12,500 (5700)	14,400 (6600)	13,600 (6200)	11,800 (5400)
2300	10,700 (4900)	12,200 (5500)	14,100 (6400)	13,200 (6000)	11,500 (5200)

14.0 OEM CLUTCH PACK INSTALLATION AND MAINTENANCE INSTRUCTIONS

Refer to the specific WPT clutch pack drawing as needed.

Installing the Clutch Pack on the Shaft:

1. See section 8 in this manual and perform duties in section 9.3.
2. Torque specification for hub nut see page 22.

Aligning the Friction Discs and Assembling with the Engine:

1. See section 3.0 Installation in this manual.
2. Disengage the PTO after mounting to the Engine is complete.

Maintenance:

1. Maintenance section:
 - See section 7 in this manual.
2. Clutch Adjustment
 - See section 7.2 in this manual.
3. General Requirements:
 - See section 12 in this manual.

Clutch Operation:

- See section 4 in this manual.

General Storage Guidelines

Upon receipt of parts or assemblies, they should be inspected for corrosion or other related damage. If any problem is detected, contact WPT's warranty department.

It is the owner's primary responsibility to store and protect the WPT product.

Products should be stored in a manner that it is protected from the environment and outside sources, which may include but are not limited to the following:

- **Environmental storage requirements should be maintained as follows:**
 - **No exposure to rain water**
 - **Temperatures 32F° (0C°) to 110F° (43C°)**
 - **Below 50% average humidity**
 - **Average sunlight**

- **Hazards that require addition protection:**
 - **Dust and debris**
 - **Oil, water, salt water, acids, or other chemicals**
 - **Any other foreign items which may damage the product**
 - **Other measures include covering the product to prevent ingress of foreign matter**

- **Additional Protection Measures for Long-Term Storage (For storage exceeding 1 month):**
 - **Coating the studs, hub, springs, and exposed metal with Cosmoline RP-342 "HEAVY" Military-Grade Rust Preventive Aerosol Spray, or equal**
 - **Coating of painted surfaces is not required or recommended**
 - **Visually inspect the product for degradation once every three-months**

16.0 TROUBLE SHOOTING GUIDE

Problem	Possible Cause	Remedy
PTO Will Not Engage/Disengage	Improper engagement torque	Check engagement torque and adjust as necessary
	Worn or damaged friction discs	Inspect friction discs and replace as needed
	Debris in clutch pack	Inspect clutch pack and remove debris
Ringing or Knocking Sound While Disengaged	Normal operational sound	Engage PTO
Grinding/Scraping Sounds While Engaged or Disengaged	Worn pilot bearing	Inspect pilot bearing and replace as needed
	Worn PTO main bearings	Inspect main bearings and replace as needed
Clutch Slips, Burnt Smell, and/or Smoke from PTO	Improper engagement torque	Check engagement torque and adjust as necessary
	Worn or damaged friction discs	Inspect friction discs and replace as needed
	Sliding sleeve assembly contacting clutch shaft	Check for axial loading on operating shaft
Excessive Vibrations	Worn engine bearings	Inspect endplay and runout on engine flywheel, replace as needed
	Worn PTO main bearings	Inspect main bearings and replace as needed
	Worn PTO pilot bearing	Inspect pilot bearing and replace as needed
	Improper alignment	Check alignment, adjust as needed
Split Friction Disc or Broken Teeth	Worn drive ring	Inspect drive ring teeth and replace as needed
	Engagement speed is too high	Reduce to 1100 r/min
	Improper alignment	Check alignment, adjust as needed
	No support outboard support plate	Check if unit requires outboard support, install if needed
PTO Self Engages	High inertia or shock load starts	Contact WPT Power Applications Engineering for support
	Improper engagement torque	Check engagement torque and adjust as necessary
Frequent Adjustments Needed to Engagement Torque	Worn or damaged friction discs	Inspect friction discs and replace as needed
	Engagement speed is too high	Reduce engagement speed to below 1000 r/min
Pilot Bearing Will Not Fit in Bore	Excessive force on operating handle	Reduce operating force to spec
	Incorrect pilot bearing size	Measure pilot bearing bore and depth, replace as needed
Clutch Will Not Fully Seat on Bell Housing	Pilot bearing wrong size	Measure pilot bearing bore and depth, contact WPT Power Applications Engineering
	Flywheel bore depth too shallow	Measure bore depth, contact WPT Power Applications Engineering
Bearing Carrier Hot	Too much or too little grease	Remove/Add Grease
	Improper belt tension	Adjust belt tension per belt manufactures recommendations
	Worn PTO main bearings	Inspect main bearings and replace as needed
Excessive Grease Leaking	Over greased	Run at idle speed until grease outflow stops