



## **TYPE 2 PTO**

# **INSTALLATION AND MAINTENANCE MANUAL**

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## **1.0 Introduction**

- 1.1 The WPT® Power Transmission PTO
- 1.2 Product Identification Numbers
- 1.3 Using This Manual

## **2.0 Specifications**

- 2.1 Flywheel Dimensions
- 2.2 Bell Housing Dimensions
- 2.3 Allowable Side Pull
- 2.4 Maximum RPM
- 2.5 Flywheel and Housing Alignment Tolerances

## **3.0 Installation**

- 3.1 Flywheel and Flywheel Housing Alignment Checks
- 3.2 Lubrication Prior to Installation
- 3.3 Mounting the PTO onto the Engine
- 3.4 Air Connection

## **4.0 Operation**

- 4.1 Clutch Engagement Procedure

## **5.0 Lubrication**

- 5.1 Grease Specification
- 5.2 Grease Specification for Cold Conditions
- 5.3 Lubrication Intervals
- 5.4 Bearing Operating Temperature

## **6.0 Maintenance**

- 6.1 Inspecting and Adjusting the Clutch
- 6.2 Adjusting the Clutch on the Engine
- 6.3 Adjusting the Clutch Removed from the Engine

## **7.0 Disassembly**

- 7.1 Removing the PTO from the Engine
- 7.2 Removing the Bell Housing
- 7.3 Removing the Clutch from the PTO
- 7.4 Removing the Shaft from the Bearing Housing

## **8.0 Assembly**

- 8.1 Preparing the Shaft
- 8.2 Assemble the Clutch
- 8.3 Assemble the PTO

## **9.0 Warranty**

## 1.0 Introduction

- 1.1 The WPT® Power Transmission PTO is the most rugged PTO available on the market today. Follow the procedures detailed in this Installation and 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 part 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.
- 1.3 When performing installation and maintenance functions, refer to the drawing at the back of 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.

## 2.0 Specifications

- 2.1 See Chart 3 for Flywheel Dimensions
- 2.2 See Chart 3 for Bell Housing Dimensions
- 2.3 See Chart 4 for the Allowable Side Pull of your PTO
- 2.4 The Maximum RPM is listed in Chart 4 for your PTO size.

## 3.0 Installation

### 3.1 Flywheel and Flywheel Housing Alignment Checks

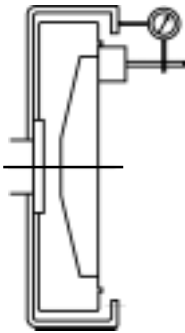
#### 3.1.1

##### Flywheel to housing face runout check

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° while holding pressure against the crankshaft thrust bearing.

The total indicator reading should not exceed:

# 1	SAE Housing	0.012" [.30mm]
#1/2	SAE Housing:	0.014" [.36mm]
# 0	SAE Housing:	0.016" [.41mm]
#00	SAE Housing:	0.019" [.48mm]



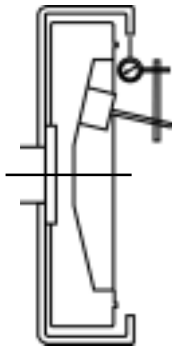
#### 3.1.2

##### Check flywheel housing bore runout

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

The total indicator reading should not exceed:

Same as above



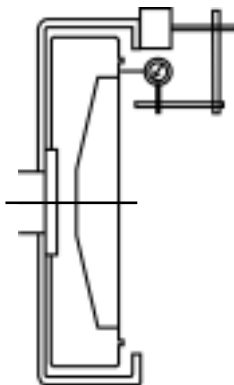
#### 3.1.3

##### 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° while holding pressure against the crankshaft thrust bearing.

The total indicator reading should not exceed:

14" Clutch	.009" [.23mm]
18" Clutch	.011" [.28mm]
21" Clutch	.013" [.37mm]



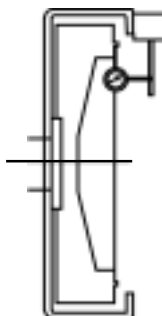
#### 3.1.4

##### Check flywheel pilot bore 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. Rotate the flywheel through 360°.

The total indicator reading should not exceed:

For all flywheels .005" [.13mm]



## 3.2 Lubrication Prior to Installation

- 3.2.1 The WPT® PTO is lubricated at the factory with Lubriplate® 1200-2 lithium-based grease and should require no further lubrication prior to being placed in service. See **Section 6** for lubricating instructions.

## 3.3 Mounting the PTO onto the Engine

*Alternate methods are described to align the friction discs.*

- Method 1*
- 3.3.1 *(Requires air supply)* Use the **drive ring (2)** 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 outside diameter of the clutch body. Engage the clutch with 100 psi compressed air. Be sure there is adequate hose length to reach the back of the engine.
- 3.3.2 Remove the drive ring
- Method 2*
- 3.3.3 *(No air required)* Use a long handled screwdriver or other tool to align the friction disc teeth with the teeth of the drive ring. Use caution to avoid damaging the teeth of the friction discs.
- 3.3.4 Install the drive ring on the engine flywheel, making sure that the ring is seated in the locating bore. Use SAE Grade 5 bolts or equivalent with lockwashers, and torque to the specifications in Chart 1 or to the engine manufacturer's torque recommendation. Use the engine manufacturer's torque recommendation if different from that in Chart 1.
- 3.3.5 Slowly draw the PTO toward the engine. This can be done by installing 3 or 4 equally spaced lengths of all-thread with nuts into the flywheel housing and tightening these while supporting the weight of the PTO with a hoist or cribbing.
- 3.3.6 When the PTO is fully in place, remove the studs, if used, and replace with SAE Grade 5 bolts or equivalent with lockwashers and torque to the value in Chart 1. Use the engine manufacturer's torque recommendation if different from that in Chart 1.
- 3.3.7 Install belts and adjust belt tension.

## 3.4 Air Connection

- 3.4.1 A hose must be used to connect air to the rotary coupling. Insure that there are no side loads placed on the bearings in the rotary coupling.  
**See Figure 2.**

**I** Check and adjust belt tension after the first several hours of operation.

## 4.0 Operation

### 4.1 Clutch engagement procedure

- 4.1.1 Insure that hose or pipe sizes are adequate to supply the air to the clutch. Hose or pipe size of 1/2" should be a minimum for short runs. Use 3/4" size if runs are longer than fifteen feet.
- 4.1.2 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 build up in the friction discs. With extremely high loads, the engine may have to be operated at higher speeds while engaging the clutch. See Figure 2 for a suggested valve arrangement to engage the clutch gradually.
- 4.1.3 Once the load is turning with the clutch fully engaged, the engine RPM may be increased.

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**Note: UNDER NO CIRCUMSTANCES should the clutch be slipped for more than a second or two without either fully engaging the clutch or completely disengaging the clutch to allow it to cool.**

**Any excessive vibrations in the PTO should be cause for investigation. All rotating parts of the WPT® PTO are balanced at the factory.**

## 5.0 Lubrication

### 5.1 Grease Specification

The WPT® PTO is lubricated at the factory with Lubriplate® 1200-2, lithium base grease with an 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).

### 5.2 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.

### 5.3 Lubrication Intervals

*There are only two places on the WPT® PTO that require lubrication. Each is connected to the 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.*

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

- 5.3.1 Every 75 hours of operation, add enough grease to expel a small amount from the relief valves.
- 5.3.2 Every 300 hours of operation, flush each bearing with approximately 7.5 oz. (1/2 tube).
- 5.3.3 **Clutch:** No lubrication is required.
- 5.3.4 **Roto-Coupling (50):** Normally, no lubrication is required. If equipped with grease fittings or oil cups, any good bearing oil or grease can be used, but care should be taken not to over lubricate.

### 5.4 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).



**Note:** Do not rely on checking bearing temperature with the hand. Acceptable bearing temperatures are normally hotter than the hand can stand for more than a second. A contact type thermometer should be used to take accurate temperature measurements.

## 6.0 Maintenance

The WPT® PTO uses an air operated clutch which does not need frequent adjustment. It does, however, require periodic inspection to determine if friction discs and/or drive plates have worn, increasing clutch clearance. The clutch should be adjusted if the movement of the pressure plate is more than the value for that clutch found in Chart 2.

### 6.1 Clutch Inspection Procedure

- 6.1.1 Remove power (stop the engine) and tag any remote start devices.
- 6.1.2 Remove hand hole covers.
- 6.1.3 With a flashlight and short scale, measure the movement of the pressure plate as the clutch is engaged and disengaged. Compare this measurement to that shown in Chart 2.
- 6.1.4 To adjust the clutch without removing the PTO from the engine, proceed to step 6.2. To remove the PTO and rebuild the clutch, proceed to step 7.1

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.

### 6.2 Clutch Adjustment on the Engine

- 6.2.1 Remove the **air hoses (23)** connecting the shaft to the air tube.
- 6.2.2 Remove the **hose adapters (22)**.
- 6.2.3 Remove the 4 **socket head cap screws (19)** in the **airtube holding plate (17)**.
- 6.2.4 Slide the **airtube holding plate (17)** and **airtube (16)** back to expose the **shims (18)**.
- 6.2.5 With snips or saw, cut the necessary number of shims and remove them.
- 6.2.6 Replace the airtube and airtube holding plate. Torque the four socket head cap screws to the value from Chart 1.
- 6.2.7 Replace fittings and hoses.
- 6.2.8 Check clutch clearance per 6.1.3 above.
- 6.2.9 Replace hand hole covers and remove tags from remote starting devices.



## 6.3 Clutch Adjustment with PTO Removed from the Engine.

### 6.3.1 See Section 8.2.9

Whenever the PTO is removed from the engine, it is recommended that the hub and drive ring teeth be checked for wear. To do this, lay a straight edge along the side of the teeth. Any groove worn .015" (.38mm) should indicate replacement of that part.

Examine the friction surfaces of the **center plates (12)** and **floating plate (13)** for heat checking and surface flatness. Flatness should be within .005" (.13mm) and the two sides of the centerplates should be parallel within the same amount.

Most damage to the WPT clutches is the result of misalignment or low operating pressure. Misalignment will cause premature wear of teeth (friction disc, center plates, hub, and drive ring), and, if extreme, may cause breakage of these parts. Low air pressure may cause the clutch to slip. Low air pressure or low air volume may cause the clutch to engage slowly. Slippage generates heat, which, if excessive, will shorten the life of friction discs, insulator plate, and airtube. A clutch that is suspected of slipping should be removed from service for examination or repair.

## 7.0 Disassembly

*Refer to PTO illustration at the back of this manual.*

### 7.1 Remove the Power Take-Off from the Engine.

7.1.1 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 approximately 500 lbs. (227 Kg.). Use approved lifting equipment and procedures to prevent accident or injury.*

7.1.2 Remove air hoses and other connections to the PTO.

7.1.3 Remove **roto-coupling (43)** to prevent damaging it.

7.1.4 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.

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

### 7.2 Remove the Bell Housing

7.2.1 Place the PTO on the floor, clutch down, supported by wood blocks. Use adequate support to keep the PTO from tipping.

7.2.2 Remove **socket head cap screws (30)** and remove any support bracket.

7.2.3 Remove 12 **socket head cap screws (30)** and lift the bell housing off the **bearing carrier (39)**. 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.

### 7.3 Remove the Clutch from the PTO

7.3.1 Position the shaft with the clutch at the top and resting on the **bearing housing (39)**.

7.3.2 Bend the tab out of the slot on the **bearing lock nut (7)** and remove the nut and the washer.

7.3.3 Remove the **hoses (24)** and **hose adapters (22)**.

7.3.4 Remove the 4 **hex head cap screws (10)** holding the **backplate (3)** and remove the backplate.

- 7.3.5 Remove the **friction discs (2)**, **center plates (12)**, **springs (4)**, **insulator plate (26)**, and **airtube (27)**.
- 7.3.6 Use a puller in the threaded holes in the **hub (5)** to pull the hub. The shaft has a 1-14 UNS tapped hole in the end.
- 7.3.7 Remove the **set screw (18)** in the **clutch spacer (44)** if equipped.
- 7.3.8 Remove the **clutch spacer (44)**.

#### **7.4 Remove the Shaft from the Bearing Housing**

- 7.4.1 Remove the sheave if still on the shaft.
- 7.4.2 Remove the 6 **flat head bolts (21)** from the **outboard seal housing (17)**.
- 7.4.3 The **shaft (40)** may now be drawn out of the **housing (39)**.
- 7.4.4 Remove the 6 **flat head bolts (21)** from the **inboard seal housing (17)** and remove it.
- 7.4.5 Slide the **seal spacers (19)**, **bearings (37)**, and **bearing spacer (29)** off of the shaft.

## 8.0 Assembly

### 8.1 Preparing the Shaft

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

### 8.2 Assemble the Clutch

- 8.2.1 Place the hub on a workbench with the back plate end up. Attach the backplate with **hex head cap screws (10)**.
- 8.2.2 Invert the hub and backplate so the backplate is on the workbench.
- 8.2.3 Attach the **insulator plate (15)** to the **floating plate (13)** with **roll pins (14)** if it is not already done.
- 8.2.4 Place the centerplates, friction discs, and floating plate with insulator plate attached to the hub as shown in the diagram. Be sure the **release springs (11)** are properly seated in their counterbores.
- 8.2.5 Place the **shims (18)** on the hub.
- 8.2.6 Insert the **airtube (16)** in the **airtube holding plate (17)** and set this assembly on the hub. Be careful not to damage the airtube or brass spuds.
- 8.2.7 Attach the airtube holding plate using 4 **socket head cap screws (19)**.
- 8.2.8 Plug all but one spud and install fittings to connect this spud to a supply of compressed air (60 PSI minimum).
- 8.2.9 Using compressed air, engage and disengage the clutch while measuring movement of the **insulator plate (15)**. Compare this value with that in Chart 2 and adjust the number of **shims (18)** accordingly.
- 8.2.10 Invert the clutch so the airtube holding plate is on the workbench.
- 8.2.11 Remove the backplate, friction discs, center and floating plates and airtube.
- 8.2.12 The hub, with attached shims and airtube holding plate, will be installed on the shaft as an assembly.

### 8.3 Assemble the PTO

- 8.3.1 Install the **seals(20)** in the **bearing end caps (17)**, and set these aside.
- 8.3.2 Support the shaft vertically with the clutch end up.
- 8.3.3 Slide an **end cap (17)** with seal over the shaft with the seal facing up.
- 8.3.4 Slide a **seal spacer (19)** on the shaft until it stops against the raised diameter.
- 8.3.5 Heat the **outboard bearing (34)** using an appropriate heat source and slide it on the shaft until it seats against the seal spacer.
- 8.3.6 Slide the **bearing spacer (29)** over the shaft and install the second bearing as done in 8.3.5. Install remaining **seal spacer (19)**.
- 8.3.7 Coat the **seal spacers (19)** with a light film of grease.
- 8.3.8 Support the **bearing housing (39)** with the clutch end down.
- 8.3.9 Invert the shaft and slide this assembly into the bearing housing being careful to avoid damaging the **seals (20)**.
- 8.3.10 Install **6 flat head bolts (21)** in the **outboard bearing end cap (17)** using thread locking compound. Torque to the value from Chart 1.
- 8.3.11 Invert the shaft/bearing housing assembly so the clutch end is once more at the top.
- 8.3.12 Install the **inboard bearing end cap (17)** with **seal (20)** using **flat head bolts (21)** and thread locking compound. Torque to the value from Chart 1.
- 8.3.13 Slide the **clutch spacers (44)** over the shaft until it seats against the seal spacer. Rotate this to expose the ports in the shaft and install the **hose adapters (22)** and **set screw (18)** if equipped.
- 8.3.14 Install the **hub key (9)** in its slot and measure the distance from the top of the key to the opposite side of the shaft. Compare this measurement to the corresponding measurement in the hub and adjust the key height if necessary.
- 8.3.15 Heat the hub with the airtube holding plate attached using an appropriate heat source and install on the shaft. Use an anti-sieze compound and have equipment available to push the hub on the shaft if necessary.

### 8.3 Assemble the PTO (continued)

- 8.3.16 Allow the hub to cool and install the clutch components as shown in the diagram being sure the **release springs (4)** are properly seated in their counterbores.
- 8.3.17 Use thread locking compound on the 4 **hex head cap screws (10)** holding the **backplate (3)** and torque these per Chart 1.
- 8.3.18 Install **air hoses (24)** between shaft and airtube. Airtest these connections before continuing.
- 8.3.19 Install the **bearing lockwasher (6)** and **bearing nut (7)**.
- 8.3.20 Lock the bearing nut with one of the tabs of the lockwasher.
- 8.3.21 Invert the PTO so the sheave end is up. Be sure the shaft and clutch are adequately supported.
- 8.3.22 Slide the bell housing over the bearing housing and install 12 **socket head cap screws (30)**. Use Loctite® 242 or equivalent and torque to values from Chart 1.
- 8.3.23 Fit sheave key into keyslot and mount sheave if necessary.
- 8.3.24 Install the **rotary coupling (43)** in the end of the shaft with **seal ring (41)**.
- 8.3.25 Install **hand hole covers (25)**.

## 9.0 Warranty

*WPT® guarantees all products will leave the factory in good condition. The products are warranted against defects in workmanship and material for a period of 365 days (one year) after shipment. Adjustment under this warranty will be made only after completion of inspection of part or product in our factory. Liability under the warranty shall extend only to the replacement or correction of any defective part or product as determined by WPT®. All materials must be returned freight prepaid. This warranty shall not apply to any product that has been repaired or altered without the specific knowledge and consent of an authorized representative of the manufacturer; or operated or installed in a manner contrary to the manufacturer's instruction; or subjected to misuse or improper maintenance; or has been damaged by accident or negligence. This warranty is made in lieu of all other warranties, expressed or implied, including but not limited to warranties of merchantability or fitness for a particular purpose, and there are no other warranties that extend beyond this expressed warranty. WPT® reserves the right to discontinue models or to change specifications at any time without notice. No discontinuance or change will create any liability on the part of WPT® in respect to its products in the hands of customers or products on order not incorporating such changes even though delivered after any such change.*

**I** *Rotating equipment is potentially dangerous and should be properly guarded. The user should check for all applicable safety codes and provide suitable guarding.*

**Chart 1**

Bolt Size Inches	Torque Values for Socket Head and Hex Head Cap Screws								
	Socket Head Cap Screws			Hex Head Cap Screws - Gr. 8			Hex Head Cap Screws - Gr. 5		
	<i>lb. ft.</i>	<i>lb. in.</i>	<i>Nm</i>	<i>lb. ft.</i>	<i>lb. in.</i>	<i>Nm</i>	<i>lb. ft.</i>	<i>lb. in.</i>	<i>Nm</i>
1/4	13	150	17	8	100	11	6	71	8
5/16	23	305	34	17	200	23	12	142	16
3/8	45	545	62	30	360	41	22	260	29
7/16	70	840	95	48	570	64	34	410	46
1/2	108	1300	147	83	990	112	53	636	72
9/16	155	1860	210	107	1285	145	74	890	101
5/8	211	2530	286	143	1714	194	104	1250	141
3/4	367	4400	497	256	3070	347	183	2200	249
7/8	583	7000	791	417	5000	565	298	3570	403
1	867	10400	1175	625	7500	848	440	5280	597
1-1/8	1242	14900	1684	-	-	-	553	6640	750
1-1/4	1750	21000	2374	-	-	-	775	9300	1051
1-3/8	2317	27800	3142	-	-	-	1012	12140	1372
1-1/2	3042	36500	4125	-	-	-	1350	16200	1831
1-3/4	4950	59400	6714	-	-	-	-	-	-
2	7492	89900	10161	-	-	-	-	-	-

**Chart 2**

Clutch Size Inches	Minimum Clearances		Minimum Clearances		Total Maximum Clearance Allowed (w/o shims)	
	<b>2 Disc Units</b>		<b>3 Disc Units</b>			
	inches	mm	inches	mm	inches	mm
14 & 14H	3/32 - 5/32	2.38 - 3.97	1/8 - 5/32	3.18 - 3.97	7/16	11.11
18	1/8 - 5/32	3.18 - 3.97	5/32 - 3/16	3.97 - 4.76	7/16	11.11
21	5/32 - 3/16	3.97 - 4.76	3/16 - 7/32	4.76 - 5.56	1/2	12.70



**Chart 3**

Flywheel and Flywheel Housing Dimensions

Clutch Size						Housing Size				
	"A"	"B"	"C"	N1	H1		"D"	"E"	N2	H2
14"	16.12 [409.40]	17.250 [438.15]	18.375 [466.72]	8	1/2-13 NC	"1"	20.125 [511.17]	20.875 [530.22]	12	7/16-14 NC
18"	19.62 [498.30]	21.375 [542.92]	22.500 [571.50]	6	5/8-11 NC	"1/2"	23.000 [584.20]	24.375 [619.12]	12	1/2-13 NC
21"	23.00 [584.20]	23.000 [641.35]	26.500 [673.10]	12	5/8-11NC	"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

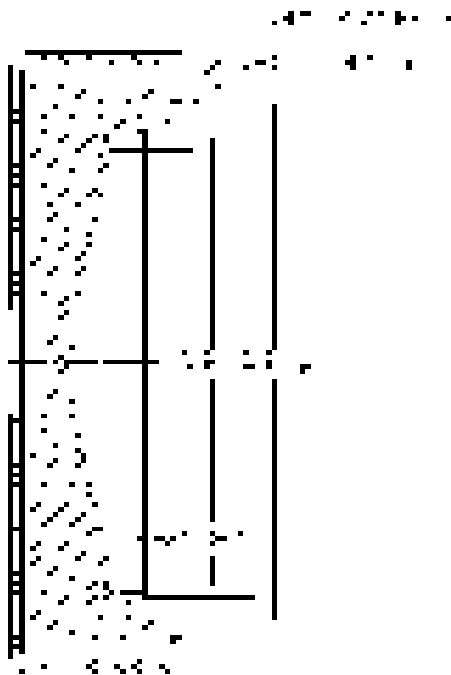


Figure 1.

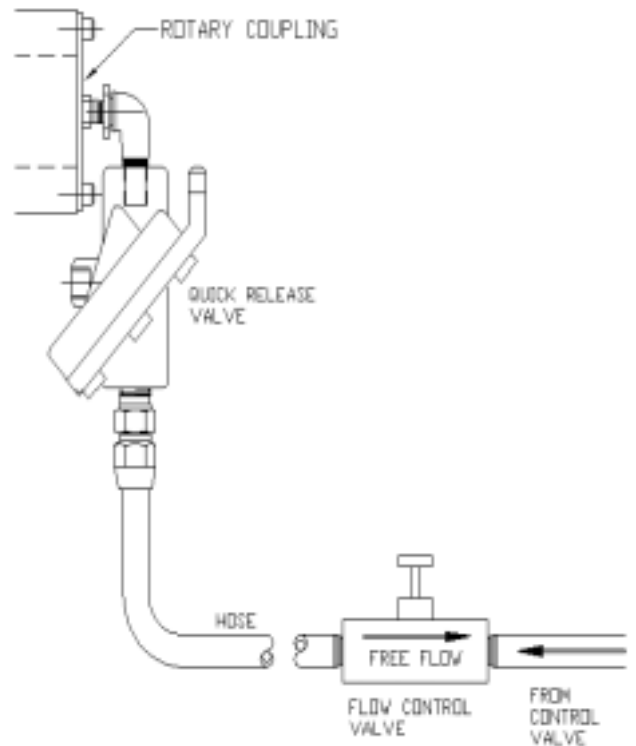


Figure 2.

**Chart 4****14" & 18" PTO**

**Allowable Side Pull Load (lbs.) for 5000 hrs. Bearing Life  
"X" Distance**

	4"	5"	6"	7"	8"	9"	10"	11"	12"
<b>Max Load @ 2100 RPM</b>	15300	16550	18000	19750	19050	17200	15700	16550	13300
<b>Max Load @ 1800 RPM</b>	16050	17350	18900	20700	20000	18050	15100	17350	14000
<b>Max Load @ 1200 RPM</b>	18300	19750	21500	23600	22750	20550	17200	19750	15900