# Chelsea® Power Take-Off

## 541 Series Service Manual

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

Parker Chelsea

ENGINEERING YOUR SUCCESS.

CHELSEA®

**⚠ WARNING**

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

## Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated in the “Offer of Sale”.

**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

# SECTION 1



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## NOTES

| | |
|---|---|
| **1** | Be sure selected parts are those called out on the Parts List. |
| **2** | Visually inspect parts before assembly for flaws. |
| **3** | Ensure tools and fixtures are current and have the required inspection and calibration labels and/or tags. |
| **4** | The terms **OUTPUT** and **DRIVE** are used interchangeably. |
| **5** | Lubricate most bearings before assembly. Use MELCOMOL “Y”, EP-2 or equal. |
| **6** | When assembling seals, the seal side is opposite the flat side which is identified by a stamped part number. The seal side must be in the direction of the oil/air pressure assembly is started. |

## Suggested Tools

| | | | |
|---|---|---|---|
| Snap Ring Pliers | Torque Wrench | Hammer | Socket |
| Socket driver | Bearing puller | Seal Slide | Loc Tite - 515 |
| Chelsea Snap Ring Guide Tool – PT 002778 | Chelsea Seal Driver Tool -1028 | Chelsea Bearing Tool-CT 11384-10 | |



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

**541 - L - BJ - Y - XV**

**Basic Model**
**541** = Two Gear Heavy Duty

**Gear Ratio**
**L** = .97:1
**M** = 1.25:1
**N** = 1.42:1

**Input Option**
**AT** = Fuller RT - 11609 A
Fuller RTO - 11609 A & B
Fuller RT - 12609 A
Fuller RTO - 12609 A & B
**AU** = Fuller RT - 14609 A
Fuller RTO- 14609 A & B
**BD** = Fuller RT - 11715
Fuller RTO - 11715
Fuller RTO - 11708LL
Fuller RT - 14715
Fuller RTO - 14715
Fuller RTO - 114708LL
Fuller RT - 15715
Fuller RTO - 15715
**BJ** = Fuller RTO - 14210C
Fuller RTO - 15210C
Fuller RTO - 16210C

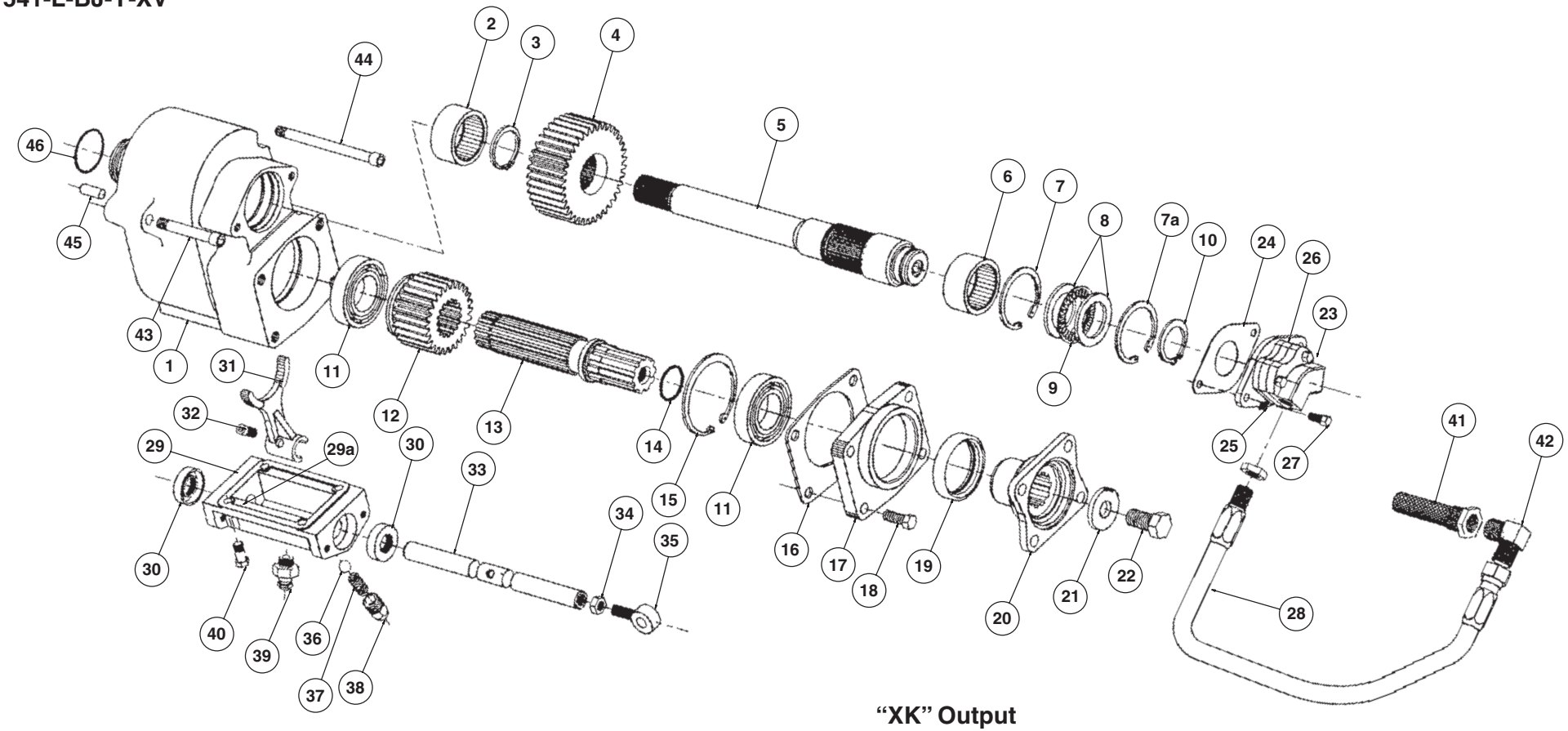
**Output Option**
**XK** = SAE “B” 2 or 4-Bolt
**XV** = Spicer 1410 Flange

**Shift Option**
**A** = Air
**Y** = Lever

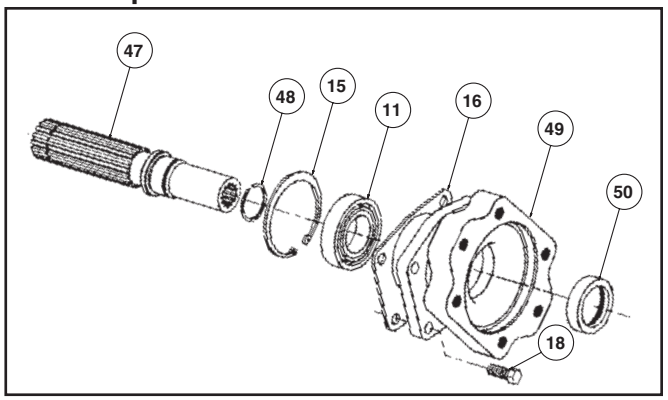


**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## 541-L-BJ-Y-XV




### "XK" Output






**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## 541-L-BJ-Y-XV

| Item | Part Number | Description | Qty. |
|---|---|---|---|
| 1 | **1-P-442** | Housing | 1 |
| 2 | **560959** | Needle Bearing | 1 |
| 3 | **379746** | Lock Ring | 1 |
| 4 | **5-P-718** | 541-L Input Gear, (31 Teeth Spur) | 1 or |
| | **5-P-717** | 541-M Input Gear, (35 Teeth Spur) | 1 or |
| | **5-P-716** | 541-N IInput Gear, (37 Teeth Spur) | 1 |
| 5 | **3-P-808** | Input Drive Shaft, for 541-*AU & BJ Only | 1 or |
| | **3-P-809** | Input Drive Shaft, for 541-*AT Only | 1 or |
| | **3-P-838** | Input Drive Shaft, for 541-*BD Only | 1 or |
| | **3-P-1000** | Input Drive Shaft, for 541-*LH Only | 1 or |
| | **3-P-1001** | Input Drive Shaft, for 541-*LG Only | 1 |
| 6 | **560967** | Needle Bearing | 1 |
| 7 | **379270** | Lock Ring | 1 |
| 7a | **379270** | Lock Ring | 1 |
| 8 | **31-P-55** | Thrust Bearing Race | 2 |
| 9 | **378769** | Thrust Bearing | 1 |
| 10 | **378576** | Lock Ring | 1 |
| 11 | **550010** | Ball Bearing | 2 |
| 12 | **2-P-628** | 541-L Output Gear, (32 Teeth) | 1 or |
| | **2-P-627** | 541-M Output Gear, (28 Teeth) | 1 or |
| | **2-P-626** | 541-N Output Gear, (26 Teeth) | 1 |
| 13 | **3-P-805** | Output Shaft “XV”, (for 1410 Series Flange) | 1 |
| 14 | **28-P-249** | O-Ring | 1 |
| 15 | **378895** | Lock Ring | 1 |
| 16 | **22-P-64** | Gasket, Bearing Cap | 1 |
| 17 | **21-P-356** | Bearing Cap | 1 |
| 18 | **378431-10** | Screw, Hex Head (.375" - 16 x 1.00") | 4 |
| 19 | **28-P-77** | Oil Seal | 1 |
| 20 | **380081** | Flange, 1410 Series | 1 |
| 21 | **4-P-130** | Washer, Retainer | 1 |
| 22 | **378435-7** | Screw, Hex Head (.625" - 11 x 1.250") | 1 |
| 23 | **328991-1X** | Lube Pump Gerotor | 1 |
| 24 | **22-P-82** | Gasket, Pump Adapter | 1 |
| 25 | **22-P-73** | Gasket, Pump | 1 |
| 26 | **379302** | Pump Adapter | 1 |
| 27 | **378429-6** | Screw, Hex Head (.250" - 20 x .625") | 2 |
| 28 | **379181** | Hose Assembly | 1 |
| | | | |
| | **328943X** | **LEVER SHIFT COVER ASSEMBLY** (Contains Items 29-39) | 1 |
| 29 | **28-P-82** | Cover, Shift | 1 |
| 29a | **35-P-8** | Gasket Shifter Cover | 1 |
| 30 | **28-P-207** | Oil Seal | 2 |
| 31 | **32-P-160** | Shifter Fork | 1 |
| 32 | **378447-4** | Screw, Socket Head (.312" - 18 x .625") | 1 |
| 33 | **11-P-144** | Shifter Shaft | 1 |
| 34 | **500381-3** | Nut, Jam (.375" - 24) | 1 |
| 35 | **36-P-1** | Eye Bolt | 1 |
| 36 | **378002** | Shifter Ball | 1 |
| 37 | **37-P-41** | Shifter Spring | 1 |
| 38 | **378554** | Poppet Cap | 1 |
| 39 | **379652** | Indicator Switch, (Norm. ON) | 1 |
| 40 | **378430-8** | Screw, Hex Head (.312" - 18 x .750") | 4 |
| | | | |
| N.S. | **328751-1X** | Indicator Light Kit | 1 |

N.S. — Not Shown

Continued on Next Page

See Page 22 for Kits Bill of Materials



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## 541-L-BJ-Y-XV

| Item | Part Number | Description | Qty. |
|---|---|---|---|
| | **328794-50X** | **MOUNTING KIT** (Contains Items 41-44) | 1 |
| 41 | **379304** | Strainer, Oil | 1 |
| 42 | **379273** | Elbow, 90° | 2 |
| N.S. | **379140-6** | Lockwasher | 1 |
| 43 | **379740-14** | Screw, Socket Head (M10 - 1.5 x 70mm) | 2 |
| 44 | **379740-19** | Screw, Socket Head (M10 - 1.5 x 120mm) | 1 |
| 45 | **378054** | Dowel Pin | 1 |
| | **328952-16X** | Gasket & Installation Instructions (includes item 46) | 1 |
| 46 | **28-P-174** | O-Ring | 1 |
| | | **OPTIONAL OUTPUT** | |
| | | **"XK" PUMP FLANGE OUTPUT** | |
| 47 | **3-P-806** | Pump Shaft | 1 |
| 48 | **378748** | Snap Ring | 1 |
| 49 | **21-P-364** | Bearing Cap, Pump Flange | 1 |
| 50 | **28-P-216** | Oil Seal | 1 |

N.S. — Not Shown

See Page 22 for Kits Bill of Materials



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

# SECTION 2



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

Before disassembling any Chelsea PTO inspect it for clues to the failure. Do this now so you don't lose valuable evidence during disassembly.

Check the case for wear or damage. Gears should spin freely, with no side-to-side movement. The output shaft should turn with no radial movement.

## Overview

1. Before and during disassembling of the Power Take-Off Unit, make note of the position of Output Flange, Shifter Cover, Shifter Fork, and Output Gear. Also check for condition of Seals/Gaskets, O-Rings, Shaft Splines, and Bearings.
2. Drain as much of the transmission oil from Housing before disassembling unit. Remove the Lube Hose (**28**) from unit.
3. Place unit on work bench.

## Disassembly

1. Shift Section disassembly from PTO Housing.
   - 1.1. Remove Shifter from Housing by unscrewing the four Hex Head Capscrew (**40**).
   - 1.2. Remove Gasket (**29**).

2. Output Shaft Section ("XV" Output) disassembly from PTO Housing.
   - 2.1. Remove Companion Flange from Output Shaft (**13**) by unscrewing Flange Bolt (**22**) and removing Washer (**21**). Slide Flange (**20**) off Shaft.
   - 2.2. For Companion Flange Output Options remove the Bearing Cap (**17**) by unscrewing the four Hex Head Capscrews (**18**).
   - 2.3. **NOTE**: The two Output Shaft Ball Bearings (**11**) are press fit onto the Output Shaft and a tight fit to the Housing. A puller may be required to help remove the Shaft and Bearings from the PTO.
   - 2.4. Pull on Output Shaft until Shaft will not travel any further out of opening.
   - 2.5. Next remove Output Shaft closed end Ball Bearing (**11**) from housing by use of a puller. Continue to pull on shaft until closed end bearing slides off the Output Shaft.
   - 2.6. The Closed End Bearing (**11**) and Output Gear (**12**) can be removed from the Housing (**1**) through the Shifter opening in the Housing.
   - 2.7. Pull Output Shaft (**13**) out of Housing.
   - 2.8. Remove Snap Ring from Housing (**15**)
   - 2.9. If Open End Bearing needs to be replaced, using Bearing Puller to remove from Shaft.

3. Output Shaft Section ("XK" Output) disassembly from PTO Housing.
   - 3.1. Remove Pump Flange (**49**) from Housing Assembly (**1**) by unscrewing four Hex Head Capscrews (**18**).
   - 3.2 **NOTE**: The two Output Shaft Ball Bearings (**11**) are press fit onto the Output Shaft and a tight fit to the Housing. A puller may be required to help remove the Shaft and Bearings from the PTO.
   - 3.3. Pull on output shaft until Shaft will not travel any further out of opening.
   - 3.4. Next remove Output Shaft Closed End Ball Bearing (**11**) from Housing buy use of a puller. Continue to pull on Shaft until Closed End Bearing slides off the Output Shaft.
   - 3.5. The Closed End Bearing (**11**) and Output Gear (**12**) can be removed from the Housing (**1**) through the Shifter opening in the Housing.
   - 3.6. Pull Output Shaft (**13**) out of Housing.
   - 3.7. Remove Snap Ring from Housing (**15**)
   - 3.8. If Open End Bearing needs to be replaced, using Bearing Puller to remove from Shaft.

4. Input Drive Shaft Section disassembly from PTO Housing.
   - 4.1. Remove Gerotor Pump (**23**), Pump Gasket (**25**), Pump Adapter (**26**), and Pump Adapter Gasket (**24**) from the Closed End of the Housing (**1**).
   - 4.2. Remove Lock Ring (**7a**) from Housing opening.
   - 4.3. Remove Lock Ring (**10**) from Input Drive Shaft (**5**). Be careful not to damage the Seal.
   - 4.4. Next remove Thrust Bearing race (**8**) and Thrust Bearing (**9**).
   - 4.5. Remove Lock Ring (**7**) and Needle Bearing (**6**) from opening.
   - 4.6. Push Input Drive Shaft (**5**) towards the closed end of the Housing working through the shifter cover opening next remove the Input Gear (**4**) by removing the Lock Ring (**3**) from the end of the Shaft.
   - 4.7. Remove Lock Ring (**7**) and Needle Bearing (**6**) from opening.

5. Shifter disassembly (Lever Shift).
   - 5.1. Remove Indicator Switch (**39**).
   - 5.2. Remove Poppet Cap (**38**), Shifter Spring (**37**) and Shifter Ball (**36**).
   - 5.3. Remove Shifter Fork (**31**) by unscrewing Sockethead Screw (**32**).
   - 5.4. Slide Shifter Shaft out of Shifter Housing (**29**).
   - 5.5. Remove Oil Seals (**30**) from Shifter Housing (**29**).
   - 5.6. Inspect all components and replace as needed.
   - 5.7. Clean all reusable components.

1. Be sure selected parts are those called out on the Parts List.
2. Visually inspect parts before assembly for flaws.
3. Ensure tools and fixtures are current and have the required inspection and calibration labels and/or tags.
4. The terms OUTPUT and DRIVE are used interchangeably.
5. Lubricate most bearings before assembly. Use MELCOMOL “Y”, EP-2 or equal.
6. When assembling Seals, the Seal side is opposite the flat side which is identified by a stamped part number. The Seal side must be in the direction of the oil/air pressure assembly is started.
7. Lubricate all O-Rings with Parker-O-Lube before installation.

## Assembly

1. Shifter Assembly (Lever)
   - 1.1. If necessary install new Oil Seals (**30**) on both ends of Shifter Housing (**29**).
   - 1.2. Slide Shifter Shaft (**33**) through Housing. Check Shaft for any nicks or burrs that have damage Oil Seals before installing.
   - 1.3. Install Shifter Fork (**31**) using Sockethead Capscrew (**32**). Torque to 16-20 Lbs. ft. [20-27 Nm].
   - 1.4. Install Shifter Ball (**36**), Shifter Spring (**37**) and Poppet Cap (**38**). Torque Poppet Cap to 20-30 Lbs. ft. [27-41 Nm].
   - 1.5. Install Indicator Switch (**39**). Torque to 10-15 Lbs. ft. [13.5-20 Nm].
   - 1.6. Check functionality by sliding Shaft back and forth.
   - 1.7. Do not install onto PTO Assembly at this time.

2. Input Drive Shaft Section
   - 2.1. Place Housing (**1**) on table. The bores should be facing up and the Shifter opening facing the assembler.
   - 2.2. **NOTE**: Chelsea Bearing Tool CT 11384-10 will be required if replacing Needle Bearings (**2**) and (**6**).
   - 2.3. Place Needle Bearings (**2** & **6**) onto Bearing Tool.
   - 2.4. Install Needle Bearings (**2** & **6**) to Housing Assembly using Hammer, Bearing Tool and Seal Driver.
   - 2.5. Install Lock Ring (**7**) to Housing.
   - 2.6. At this time also attach Lock Ring (**15**) to Housing.
   - 2.7. Insert Input Gear (**4**) into Housing. Move Gear to the top bore of the Housing
   - 2.8. Insert Shaft into Housing Assembly. Rotate Shaft to get it to mesh with the internal spline of the Gear.
   - 2.9. Use Snap Ring pliers to insert Snap Ring (**3**) onto Shaft (**5**).
   - 2.10. Place Thrust Bearing Races (**8**) and Thrust Bearing (**9**) into Housing (**1**).
   - 2.11. Attach Snap Ring (**7a**) to Housing (**1**) using Snap Ring Pliers.

3. Output Drive Shaft Section (“XV” Output)
   - 3.1. Insert Roller Bearing (**11**) into Closed End Housing (**1**) side.
   - 3.2. Insert Output Gear (**12**) into Housing (**1**)
   - 3.3. Insert Output Shaft (**13**) into Output Gear (**12**). Rotate Shaft to get it to mesh with the internal spline of the Output Gear.
   - 3.4. Install Roller Bearing (**11**) on to Output Shaft (**13**) using a seal tool and hammer.
   - 3.5. Place Gasket (**16**) on Flange or Bearing Cap (**17**). Apply loctite 515 on gasket of flange/bearing cap.
   - 3.6. Attach Flange/Bearing Cap (**17**) to PTO Housing using four Capscrews (**18**). Torque to 30-35 Lbs. ft. [41-47 Nm].
   - 3.7. Gerotor Pump Assembly Installation
     - 3.7.1. Place Gasket (**24**) onto the Gerotor Pump Assembly (**23, 25** & **26**).
     - 3.7.2. Apply loctite 515 to inside Gasket (**24**) of the Gerotor Pump Assembly.
     - 3.7.3. Attach Gerotor Pump Assembly to PTO Housing Assembly using two Capscrews (**27**). Torque to 9-11 Lbs. ft. [12-15 Nm].

4. Shift Cover Installation
   - 4.1. If pin (**45**) has been removed or replaced, insert pin into housing using a hammer.
   - 4.2. Check that O-Ring (**45**) is attached to PTO Housing Assembly and in good condition. Replace if necessary.
   - 4.3. Shifter Cover Installation
     - 4.3.1. Attach Gasket (**29a**) and shifter to Housing Assembly (**1**) using four Capscrews (**40**) and torque to 192-240 in. Lbs. [22-27 Nm].

5. PTO is now ready for installation refer to page 13-14 or Chelsea Owner’s Installation Manual HY25-1396-M1/US for complete installation instructions.



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

# SECTION 3



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

| Location | Torque (English) | Torque (Metric) |
|---|---|---|
| Output Bearing Cap Hex Head Capscrew | 30 - 35 Lbs. ft. | 41 - 47 Nm |
| Companion Flange Hex Head Capscrew | 75 - 85 Lbs. ft. | 102 - 115 Nm |
| Gerotor Pump Adapter Hex Head Capscrew | 9 - 11 Lbs. ft. | 12 - 15 Nm |
| Mounting Socket Head Capscrews | 30 - 35 Lbs. ft. | 41 - 47 Nm |
| Indicator Switch | 10 - 15 Lbs. ft. | 13.5 - 20 Nm |
| Shifter Fork Socket Head Capscrew | 16 - 20 Lbs. ft. | 20 - 27 Nm |
| Shifter Housing Capscrews | 16 - 20 Lbs. ft. | 20 - 27 Nm |
| Poppet Cap | 20 - 30 Lbs. ft. | 27 - 41 Nm |
| Lever Shift Jam Nut | 20 - 24 Lbs. ft. | 27 - 33 Nm |



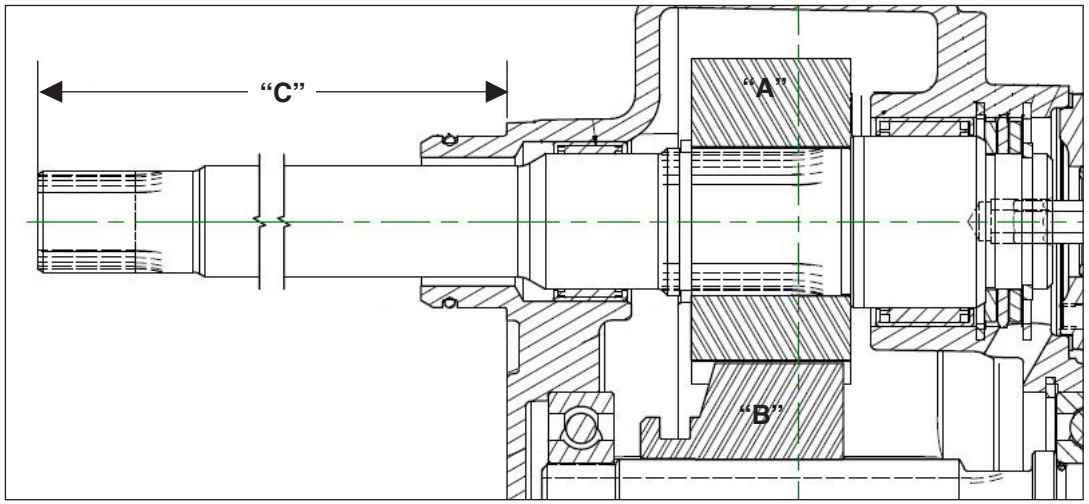
**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## Ratio Gears

| Model Number | Part Number Input Gear (4) | Helix Angle | Number of Teeth "A" | Part Number Output Gears (12) | Number of Teeth "B" |
|---|---|---|---|---|---|
| 541-L** | 5-P-718 | Spur | 31 | 2-P-628 | 32 |
| 541-M** | 5-P-717 | Spur | 35 | 2-P-627 | 28 |
| 541-N** | 5-P-716 | Spur | 37 | 2-P-626 | 26 |

## Input Designator

| Input Designator | Shaft Part | Dimension "C" |
|---|---|---|
| AT | 3-P-809 | 6.457" |
| AU | 3-P-808 | 7.457" |
| BD | 3-P-838 | 10.478" |
| BJ | 3-P-808 | 7.457" |
| LG | 3-P-1001 | 10.721" |
| LH | 3-P-1000 | 13.841" |





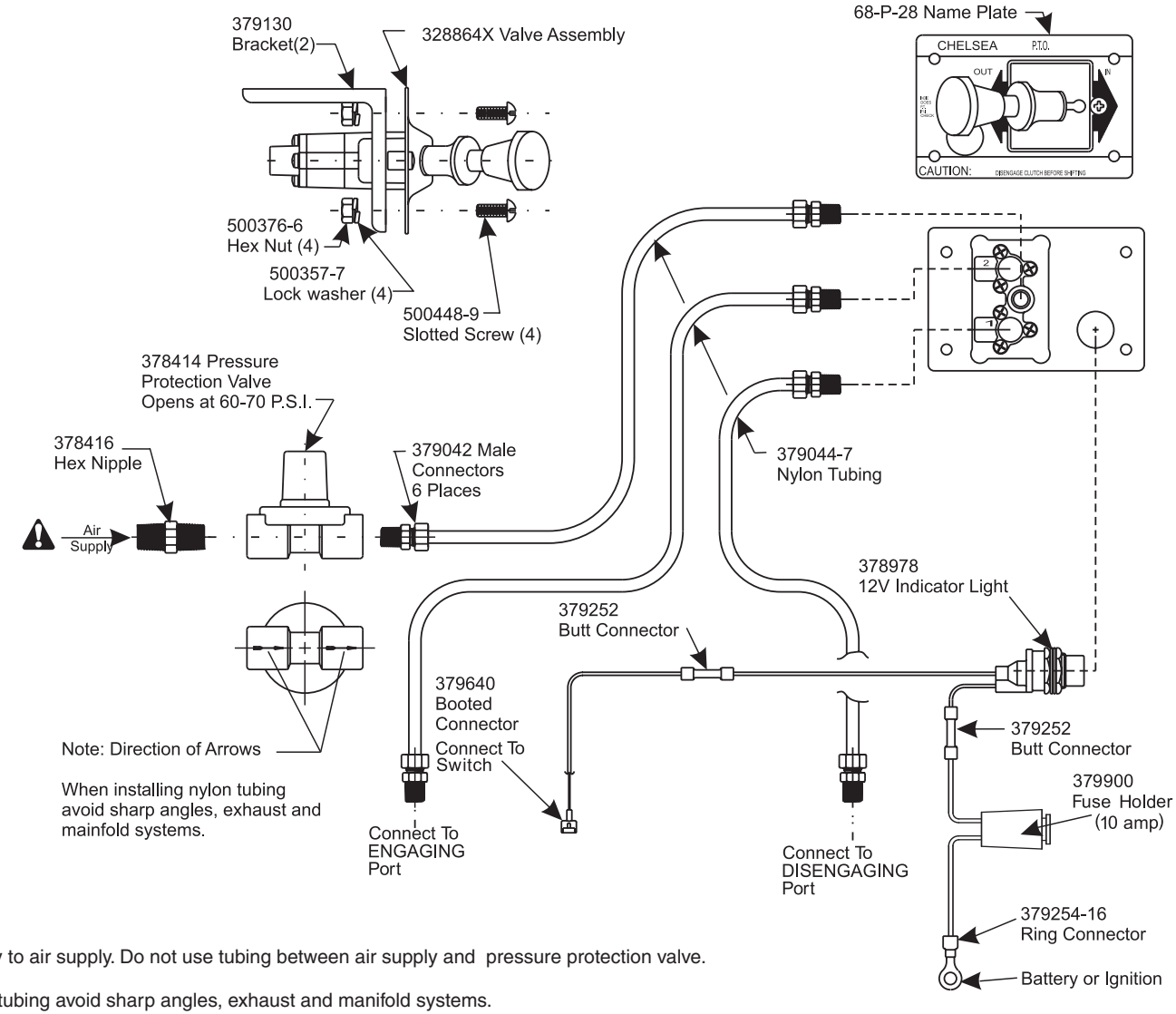

**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

# SECTION 4



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## Air Shift Installation Circuits SK-276 (Rev H)




**WARNING:** Connect directly to air supply. Do not use tubing between air supply and pressure protection valve.

**CAUTION:** When installing nylon tubing avoid sharp angles, exhaust and manifold systems.

**IMPORTANT:** When this installation is used on vehicles with automatic transmissions, the PTO drive gear must be stopped before shifting.

**NOTE:** Tube nut is reusable as long as nylon tubing is not removed from the tube nut.



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## 541 Thrushaft for Fuller

Always refer to current owner's/installation manual for current installation (HY25-1396-M1/US)

### Preparations

Drain the transmission oil, by removing the drain plug in the transmission rear cover. **CAUTION**: THE OIL MAY BE HOT.

1. Remove the Welsh Plug from the PTO drive access hole. (Fig. 1).

2. Lubricate the O-Ring supplied, with Parker-O-Lube.

3. Install the O-Ring in the groove in the PTO case. (**Fig. 2**).

### 541 Series PTO to the Transmission

4. Insert the PTO input shaft into the PTO drive access hole, lining up the PTO dowel pin with the alignment hole in the transmission rear cover. (**Fig. 3**).

5. Install the three cap screws (one long and two short) and torque them to 30-35 Ft. Lbs. (**Fig. 4**).

### Lubrication

6. Install the oil strainer and the 90° elbow in the transmission rear cover drain hole. (**Fig. 5 & 6**).

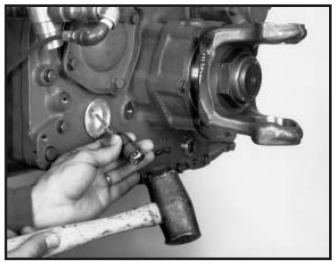


Fig. 1


Fig. 2

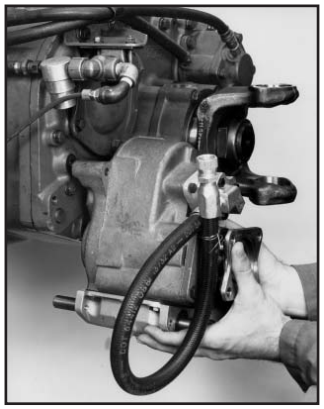


Fig. 3

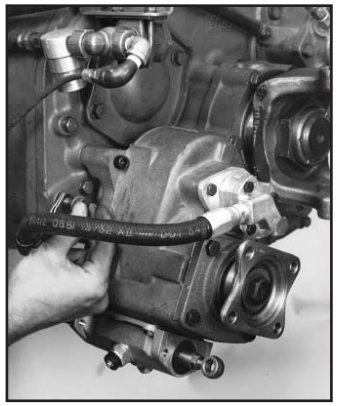


Fig. 4


Fig. 5


Fig. 6



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## 541 Thrushaft for Fuller

7. Connect the PTO lube hose to the 90° elbow. Connect the other end of the hose to the PTO oil pump. (**Fig. 7**).

8. Secure the PTO lube hose to the transmission rear cover, using the clamp supplied and the capscrew in the transmission rear cover. (**Fig. 8**).

9. Remove the pipe plug in PTO case and fill the PTO with transmission oil up to the pipe plug. (**Fig 9**) Be sure to replace the pipe plug after filling the PTO.

   Replace the transmission oil and check the oil level at the oil level plug.

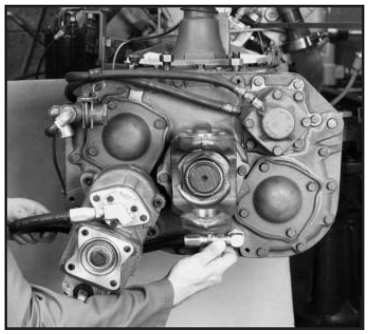


Fig. 7

Fig. 8

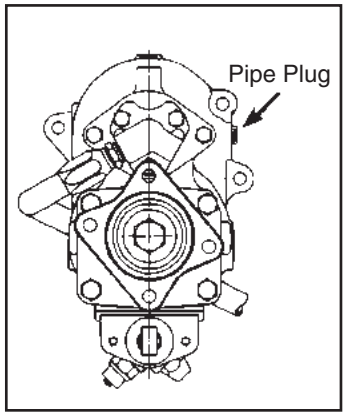



Fig. 9

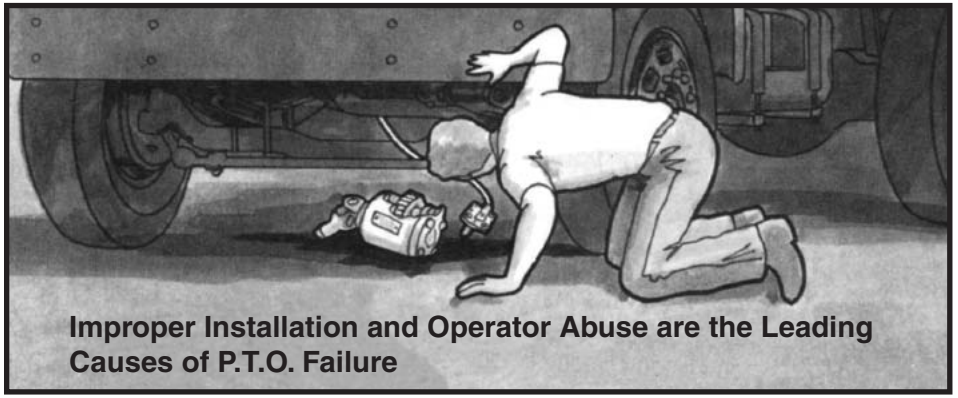


**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

# SECTION 5



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA



**Improper Installation and Operator Abuse are the Leading Causes of P.T.O. Failure**

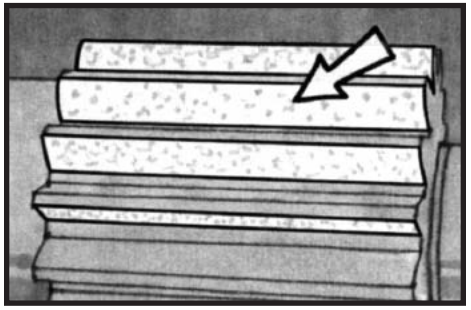
The Chelsea PTO is designed and built to meet the rugged demands of the Mobile Equipment Industry. With proper use and maintenance, the Chelsea PTO will provide a long service life, both on-highway and off. Yet, if a problem does arise, it is important to diagnose its causes and correct it at once.

The first place to look when troubleshooting a PTO failure is in the application itself. Repeated or premature failure may be a sign of an incorrect application. This can be discovered by using the Chelsea HY25-3001/US General Information Catalog or HY25-3000/US Applications Catalog. Check to see if the proper PTO was specified for the transmission, then find out if the torque handling capabilities of the PTO are satisfactory for the job being done. A PTO works best when it is properly specified for the transmission and job requirement.

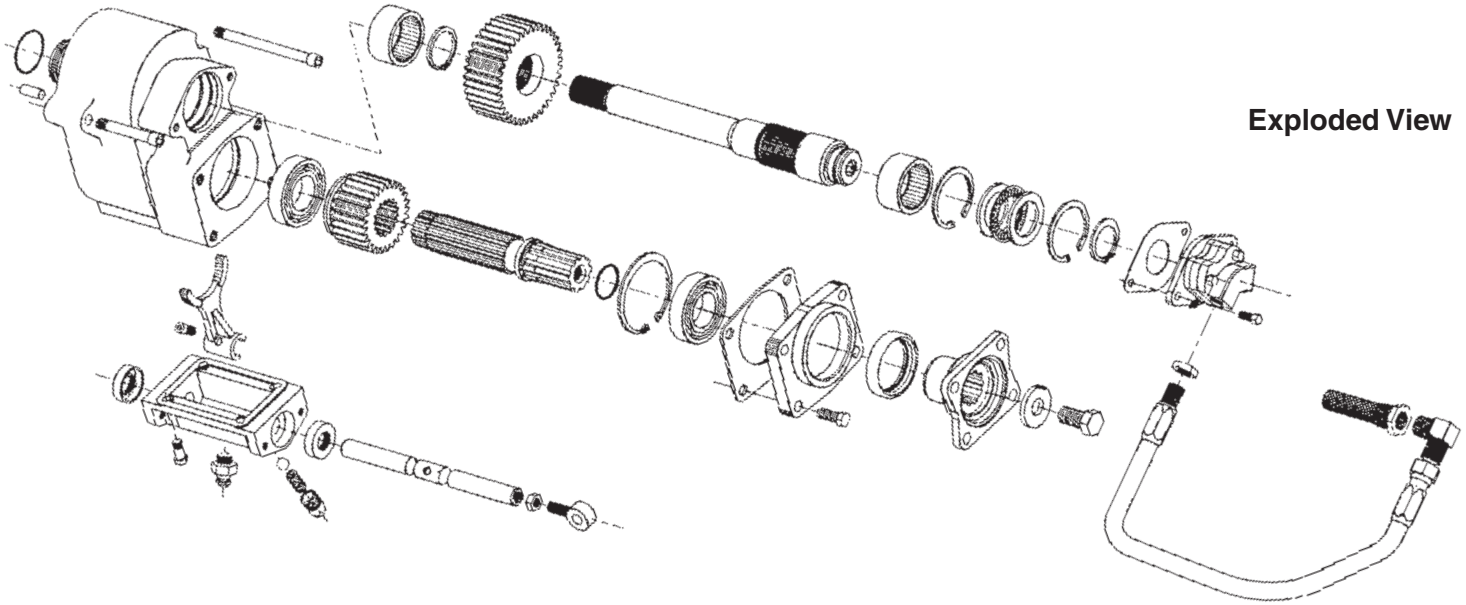
If the PTO was correctly specified and then failed prematurely, there are two likely causes: improper installation and/or operator misuse. These are tough problems because they involve people as well as product. An improperly installed PTO can normally be identified immediately by the sound it makes. It will “whine” if installed to tightly, or “clatter” if it is installed to loosely. Sometimes, the vehicle itself may contribute enough noise to mask the sound of the PTO and one may not notice the problem.

If a problem is allowed to continue, then damage to the PTO will result. A unit that has been mounted to loosely could result in broken gear teeth. A unit that is mounted too tightly could result in premature wear to the gear teeth. Also, when a PTO is installed without enough filler blocks, spacers, or gaskets between it and the transmission, a deep wear pattern will occur on the gear teeth. These patterns will lead to fatigue and early tooth failure. To help prevent this from occurring, always test the PTO for noise just after it is installed.

Whatever the reason for a PTO failure, there will be confusion over who, or what, is at fault. More than likely the product will be blamed. Although the PTO cannot defend itself, its failed parts will tell a story.
The first parts to inspect should be the gears. Check the surface of the gear teeth for signs



of pitting . . . pitting is a normal wear pattern in most cases. However, contaminants in the oil or an installation that is too tight will cause severe pitting.

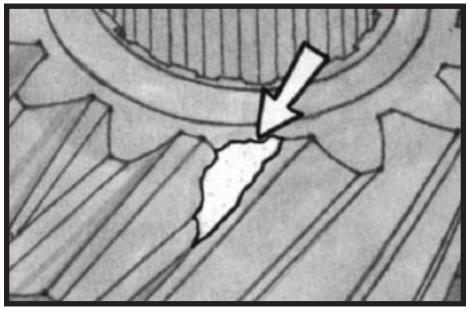


**Exploded View**



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

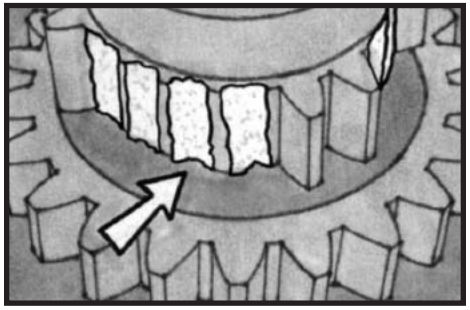
Once pitting of the gear surfaces has begun, there is nothing that can stop it. Severe pitting will eventually lead to gear tooth failure, therefore the damaged gear should be replaced when a PTO is repaired or rebuilt. Sometimes a gear will chip a tooth because of



mishandling or improper shifting. Even though a PTO may continue to run with a chipped tooth, the damaged gear should be replaced immediately. It will damage the other teeth it comes in contact with during operation, not to mention the possible damage which could result from the loose chip. If the problem is allowed to continue, then failure to other parts in the PTO or transmission could result.

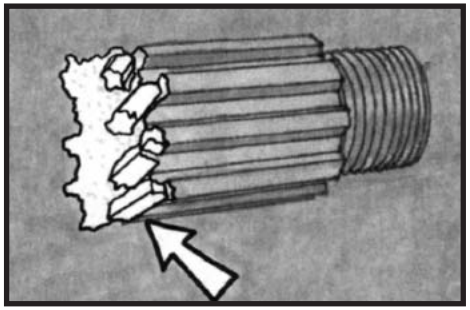
Another possible problem during vehicle operation is “shock load.” This occurs when the torque demands on a PTO are suddenly greater than it was designed to take. “Shock load” could be caused by torque overloads, improper shifting, equipment failure, or excessive loads over a short period of time. If this happens, the PTO is likely to fail immediately. The vehicle operator may not even be aware of the reason for the PTO failure.

Worn gears can easily be affected by “shock load.” If the worn gears are not replaced, they can eventually lead to broken gear teeth. This is the most severe form of PTO failure. Worn or damaged gears are likely to break because of their reduced load carrying capacity. To prevent the possibility of broken gear teeth, always inspect auxiliary equipment

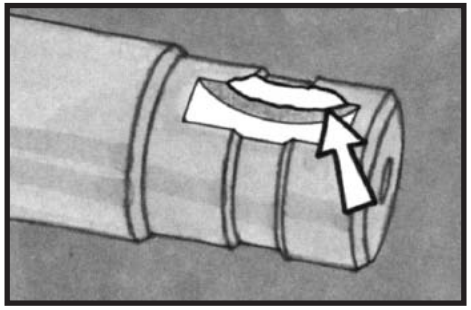


for possible freeze-up. Also, recheck PTO application, operating conditions and PTO installation.

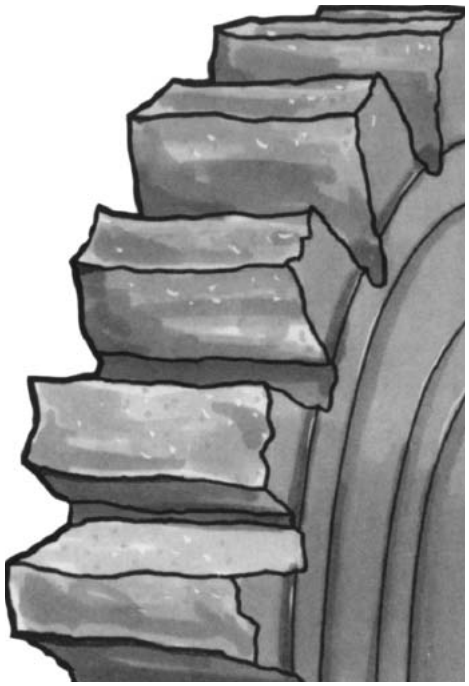
PTO shafts are also vulnerable to operating abuse. If the shaft break is irregular, this usually indicates a torsional overload. Bending fatigue failure usually shows up as a smooth, flat break. To correct a PTO shaft problem replace the failed shaft and check the speed and operating angle of the universal

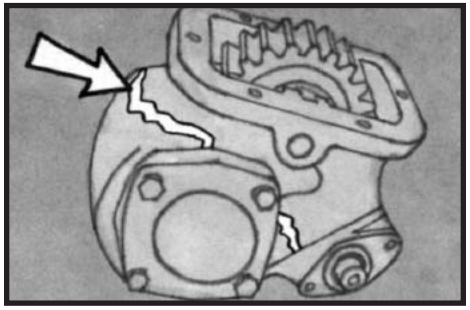


joint. Also, make sure the PTO driveshaft is properly phased, (yokes in-line with each other). If a driveline is improperly installed it will cause vibration, which may lead to PTO driveshaft or driven equipment problems. When inspecting a PTO output shaft, always inspect the keyway. Sometimes a PTO will fail because of a displaced keyway on the shaft caused by a loose fitting yoke or equipment freeze-up. Proper maintenance on auxiliary equipment and replacing a worn yoke and/or PTO driven shaft will prevent this problem.



One of the most serious problems a PTO can suffer is a cracked case. This condition can lead to oil loss and eventual transmission failure. Improper installation, poorly torqued bolts, or an unsupported direct mount pump can cause such a problem. A PTO case can also be damaged by foreign objects meshing between the gear teeth, severe shock load, or even hitting an obstacle in the road.





Prevention is the best cure for PTO case damage. Therefore, always torque the PTO flange bolts in sequence and the proper specifications. Also, be sure to check the weight of the direct mount pump and, if it is over forty pounds, make a support bracket for it.

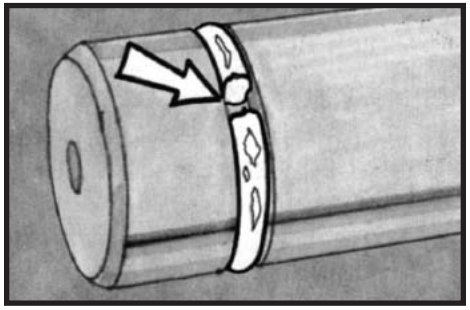
Shifting problems are sometimes a complaint an operator will have about his PTO. A PTO that is hard to shift may be caused by a tight bend in the shifter cable, poor leverage, a gear that is installed backwards, or too tight of an installation. Many of these problems can be solved by inspecting the PTO installation and making the proper adjustments regarding cable length, gear position, or shift lever.

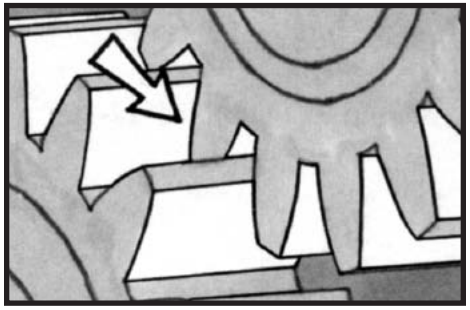
Remember, a lever-operated shift linkage should not be connected to a wire shift cover. The mechanical advantage of the lever is often too great for the wire shift cover and could severely damage it. Also inversely, don’t use a cable with a lever shift cover. The cable isn’t capable of transmitting the force necessary to shift a lever mechanism.

**Deep Mesh Pattern Caused by Improper Backlash Adjustment**



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA





Seals and O-Rings may cause special problems in PTO operations. Improper installation or heat build-up can cause O-Rings and seals to fail prematurely. Once seals or O-Rings fail, they should be replaced. The proper procedure for installing these parts is to lubricate them first so they will easily slide on the shaft.



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

# SECTION 6



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

| | | |
|---|---|---|
| **328991-1X** | Lube Pump Gerotor | 1 |
| 3-P-881 | Shift Output Hex. Drive | 1 |
| 28-P-249 | O-Ring 1.239" x .070" | 2 |
| 378429-13 | Cap Screw HH .250 - .20 x 1.375" | 3 |
| 379172 | Plate pump adapter Volvo R60 C/Shaft | 1 |
| 379173 | Plate pump Volvo R60 C/Shaft | 1 |
| 379174 | Cap Pump 540 6 and 8-Bolt | 1 |
| 379175 | Lock ring | 1 |
| 379176 | Pump gerotor 540 6 and 8-Bolt | 1 |
| 500037-7 | Dowel Pin .188 x .625 Lg | 2 |
| 500370-1 | Hex Nut .250" - 20 | 3 |
| 500566-3 | Drive Ball .125 | 1 |
| 22-P-73 | Gasket 540 | 1 |
| 500897-1.1 | Shipping Plug | 1 |

| | | |
|---|---|---|
| **328943X** | Lever Shift Cover Assembly | |
| 28-P-82 | Cover, Shift | 1 |
| 28-P-207 | Oil Seal | 2 |
| 32-P-160 | Shifter Fork | 1 |
| 378447-4 | Screw, Socket Head (.312" - 18 x .625") | 1 |
| 11-P-144 | Shifter Shaft | 1 |
| 500381-3 | Nut, Jam (.375" - 24) | 1 |
| 36-P-1 | Eye Bolt | 1 |
| 378002 | Shifter Ball | 1 |
| 37-P-41 | Shifter Spring | 1 |
| 378554 | Poppet Cap | 1 |
| 379652 | Indicator Switch, (Norm. ON) | 1 |

| | | |
|---|---|---|
| **328794-50X** | Installation Kit | |
| 379304 | Strainer, Oil | 1 |
| 379273 | Elbow, 90° | 1 |
| 379140-6 | Lockwasher | 3 |
| 379740-14 | Screw, Socket Head (M10 - 1.5 x 70mm) | 2 |
| 379740-19 | Screw, Socket Head (M10 - 1.5 x 120mm) | 1 |

| | | |
|---|---|---|
| **328953X** | Air Shift Cover Assembly | |
| 378430-9 | Screw, Hex Head (.312" - 18 x .875") | 4 |
| 34-P-81 | Cap, Cylinder | 1 |
| 28-P-61 | O-Ring, Piston | 1 |
| 66-P-19 | Piston | 1 |
| 28-P-250 | O-Ring, Cylinder Cap | 1 |
| 65-P-15 | Cylinder | 1 |
| 28-P-71 | O-Ring | 1 |
| 35-P-14 | Gasket, Cylinder Cap | 1 |
| 34-P-82 | Shifter Cover | 1 |
| 32-P-160 | Shifter Fork | 1 |
| 378447-4 | Screw, Socket Head (.312" - 18 x .625") | 1 |
| 28-P-207 | Oil Seal | 1 |
| 11-P-144 | Shifter Shaft | 1 |
| 378554 | Poppet Cap | 1 |
| 379652 | Indicator Switch, (Norm. ON) | 1 |

| | | |
|---|---|---|
| **328952-16X** | Gasket & Installation Instruction | |
| 28-P-174 | O-Ring | 1 |
| 379085 | Instructions Decal | 1 |
| 379281-15 | Envelope | 1 |
| 379300 | Installation Instructions | 1 |
| 328946X | Caution Label Kit | 1 |

| | | |
|---|---|---|
| **328751-1X** | Indicator Light Kit | |
| 378978 | Indicator Light 12 Volt | 1 |
| 379252 | Butt Connector | 2 |
| 68-P-18 | Name Plate | 1 |
| 379640 | Electrical Connector Booted | 1 |
| 379900 | Assembly Fuse Holder | 1 |

| | | |
|---|---|---|
| **328388-61X** | Air Shift Installation Kit | |
| 68-P-28 | Name Plate | 1 |
| 328388-49X | Air Shift Kit | 1 |
| 379044-6 | Nylon Tubing | 1 |
| 379130 | Support Bracket | 2 |
| 379252 | Butt Connector | 2 |
| 379640 | Electrical Connector Boot | 1 |
| 379254-16 | Ring Connector | 1 |
| 328864X | Shifter Valves | 1 |
| 378414 | Pressure Protection Valve | 1 |



**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

## Notes




**Parker Hannifin Corporation**
Chelsea Products Division
Olive Branch, MS 38654 USA

# Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods, services or work described will be referred to as "Products".

**1. Terms and Conditions.** Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is subject to these Terms and Conditions or any newer version of the terms and conditions found on-line at www.parker.com/saleterms/. Seller objects to any contrary or additional terms or conditions of Buyer's order or any other document issued by Buyer.

**2. Price Adjustments; Payments.** Prices stated on Seller's quote or other documentation offered by Seller are valid for 30 days, and do not include any sales, use, or other taxes unless specifically stated. Unless otherwise specified by Seller, all prices are F.C.A. Seller's facility (INCOTERMS 2010). Payment is subject to credit approval and is due 30 days from the date of invoice or such other term as required by Seller's Credit Department, after which Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

**3. Delivery Dates; Title and Risk; Shipment.** All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon placement of the products with the shipment carrier at Seller's facility. Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's acts or omissions.

**4. Warranty.** Seller warrants that all products sold, other than the 590 Series, conform to the applicable Parker Chelsea standard specification for the lesser period of 2 years (24 Months) from date of service or 2-1/2 years (30 Months) from date of build (as marked on the product name plate). Seller warrants that the 590 Series will conform to the applicable Seller standard specification for the lesser period of 2 years (24 Months) from date of service or 2000 hours of usage. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING DESIGN, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

**5. Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 30 days after delivery. Buyer shall notify Seller of any alleged breach of warranty within 30 days after the date the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for an amount due on any invoice) must be commenced within 12 months from the date of the breach without regard to the date breach is discovered.

**6. LIMITATION OF LIABILITY. UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**

**7. User Responsibility.** The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

**8. Loss to Buyer's Property.** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, will be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer ordering the items manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

**9. Special Tooling.** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the Products, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

**10. Buyer's Obligation; Rights of Seller.** To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest.

**11. Improper use and Indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

**12. Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

**13. Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

**14. Force Majeure.** Seller does not assume the risk and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation: accidents, strikes or labor disputes, acts of any government or government agency, acts of nature, delays or failures in delivery from carriers or suppliers, shortages of materials, or any other cause beyond Seller's reasonable control.

**15. Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

**16. Termination.** Seller may terminate this agreement for any reason and at any time by giving Buyer thirty (30) days written notice of termination. Seller may immediately terminate this agreement, in writing, if Buyer: (a) commits a breach of any provision of this agreement (b) appointments a trustee, receiver or custodian for all or any part of Buyer's property (c) files a petition for relief in bankruptcy on its own behalf, or by a third party (d) makes an assignment for the benefit of creditors, or (e) dissolves or liquidates all or a majority of its assets.

**17. Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement.

**18. Indemnity for Infringement of Intellectual Property Rights.** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that a Product sold pursuant to this Agreement infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If a Product is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to Products delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

**19. Entire Agreement.** This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of sale. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

**20. Compliance with Law, U. K. Bribery Act and U.S. Foreign Corrupt Practices Act.** Buyer agrees to comply with all applicable laws and regulations, including both those of the United Kingdom and the United States of America, and of the country or countries of the Territory in which Buyer may operate, including without limitation the U. K. Bribery Act, the U.S. Foreign Corrupt Practices Act ("FCPA") and the U.S. Anti-Kickback Act (the "Anti-Kickback Act"), and agrees to indemnify and hold harmless Seller from the consequences of any violation of such provisions by Buyer, its employees or agents. Buyer acknowledges that they are familiar with the provisions of the U. K. Bribery Act, the FCPA and the Anti-Kickback Act, and certifies that Buyer will adhere to the requirements thereof. In particular, Buyer represents and agrees that Buyer shall not make any payment or give anything of value, directly or indirectly to any governmental official, any foreign political party or official thereof, any candidate for foreign political office, or any commercial entity or person, for the purpose of influencing such person to purchase products or otherwise benefit the business of Seller.

07/14

# Parker Worldwide

## Europe, Middle East, Africa

**AE – United Arab Emirates,** Dubai
Tel: +971 4 8127100
parker.me@parker.com

**AT – Austria,** Wiener Neustadt
Tel: +43 (0)2622 23501-0
parker.austria@parker.com

**AT – Eastern Europe,** Wiener Neustadt
Tel: +43 (0)2622 23501 900
parker.easteurope@parker.com

**AZ – Azerbaijan,** Baku
Tel: +994 50 22 33 458
parker.azerbaijan@parker.com

**BE/LU – Belgium,** Nivelles
Tel: +32 (0)67 280 900
parker.belgium@parker.com

**BG – Bulgaria,** Sofia
Tel: +359 2 980 1344
parker.bulgaria@parker.com

**BY – Belarus,** Minsk
Tel: +375 17 209 9399
parker.belarus@parker.com

**CH – Switzerland,** Etoy
Tel: +41 (0)21 821 87 00
parker.switzerland@parker.com

**CZ – Czech Republic,** Klecany
Tel: +420 284 083 111
parker.czechrepublic@parker.com

**DE – Germany,** Kaarst
Tel: +49 (0)2131 4016 0
parker.germany@parker.com

**DK – Denmark,** Ballerup
Tel: +45 43 56 04 00
parker.denmark@parker.com

**ES – Spain,** Madrid
Tel: +34 902 330 001
parker.spain@parker.com

**FI – Finland,** Vantaa
Tel: +358 (0)20 753 2500
parker.finland@parker.com

**FR – France,** Contamine s/Arve
Tel: +33 (0)4 50 25 80 25
parker.france@parker.com

**GR – Greece,** Athens
Tel: +30 210 933 6450
parker.greece@parker.com

**HU – Hungary,** Budaoers
Tel: +36 23 885 470
parker.hungary@parker.com

**IE – Ireland,** Dublin
Tel: +353 (0)1 466 6370
parker.ireland@parker.com

**IT – Italy,** Corisico (MI)
Tel: +39 02 45 19 21
parker.italy@parker.com

**KZ – Kazakhstan,** Almaty
Tel: +7 7273 561 000
parker.easteurope@parker.com

**NL – The Netherlands,** Oldenzaal
Tel: +31 (0)541 585 000
parker.nl@parker.com

**NO – Norway,** Asker
Tel: +47 66 75 34 00
parker.norway@parker.com

**PL – Poland,** Warsaw
Tel: +48 (0)22 573 24 00
parker.poland@parker.com

**PT – Portugal,** Leca de Palmeira
Tel: +351 22 999 7360
parker.portugal@parker.com

**RO – Romania,** Bucharest
Tel: +40 21 252 1382
parker.romania@parker.com

**RU – Russia,** Moscow
Tel: +7 495 645-2156
parker.russia@parker.com

**SE – Sweden,** Spånga
Tel: +46 (0)8 59 79 50 00
parker.sweden@parker.com

**SK – Slovakia,** Banská Bystrica
Tel: +421 484 162 252
parker.slovakia@parker.com

**SL – Slovenia,** Novo Mesto
Tel: +386 7 337 6650
parker.slovenia@parker.com

**TR – Turkey,** Istanbul
Tel: +90 216 4997081
parker.turkey@parker.com

**UA – Ukraine,** Kiev
Tel: +380 44 494 2731
parker.ukraine@parker.com

**UK – United Kingdom,** Warwick
Tel: +44 (0)1926 317 878
parker.uk@parker.com

**ZA – South Africa,** Kempton Park
Tel: +27 (0)11 961 0700
parker.southafrica@parker.com

## North America

**CA – Canada,** Milton, Ontario
Tel: +1 905 693 3000

**MX – Mexico,** Toluca
Tel: +52 72 2275 4200

## Asia Pacific

**AU – Australia,** Castle Hill
Tel: +61 (0)2-9634 7777

**CN – China,** Shanghai
Tel: +86 21 2899 5000

**HK – Hong Kong**
Tel: +852 2428 8008

**IN – India,** Mumbai
Tel: +91 22 6513 7081-85

**JP – Japan,** Fujisawa
Tel: +81 (0)4 6635 3050

**KR – South Korea,** Seoul
Tel: +82 2 559 0400

**MY – Malaysia,** Shah Alam
Tel: +60 3 7849 0800

**NZ – New Zealand,** Mt Wellington
Tel: +64 9 574 1744

**SG – Singapore**
Tel: +65 6887 6300

**TH – Thailand,** Bangkok
Tel: +662 717 8140

**TW – Taiwan,** New Taipei City
Tel: +886 2 2298 8987

## South America

**AR – Argentina,** Buenos Aires
Tel: +54 3327 44 4129

**BR – Brazil,** Cachoeirinha RS
Tel: +55 51 3470 9144

**CL – Chile,** Santiago
Tel: +56 2 623 1216

**Pan Am,** Miami
Tel: +1 305-470-8800



HY25-6541-M1/US April 2015

**Parker Hannifin Corporation**
Chelsea Products Division
8225 Hacks Cross Road
Olive Branch, Mississippi 38654 USA
Tel: (662) 895-1011
Fax: (662) 895-1069
www.parker.com/chelsea

Parker | Chelsea