



Chelsea CAT-D / CAT- H Series PTO Owner's Manual

Pro Gear Chelsea CAT-D / CAT-H Series PTO Owner's Manual to assist in identifying the parts for your Chelsea Power Take Off unit.

If you need any assistance identifying the correct Power Take Off unit for your truck and equipment, contact your Chelsea replacement part specialists at Pro Gear and Transmission.

Pro Gear stocks every part for your Parker Chelsea PTO including: PTO housings, mounts, driveshafts, gears, bearings, gaskets, cable shift cover assembly, post and plate assembly, brackets, stud kits, seal kits, lever control assembly, air shift cover assembly, direct mount pump conversion kits, stud kits including English and metric references, CAT D&H parts and much more.

Pro Gear Transmission has same day shipping and 1000's of products in stock and ready to ship internationally for your next project.

For parts or service contact the Chelsea specialists at Pro Gear & Transmission, Inc.

1 (877) 776-4600
(407) 872-1901
parts@eprogear.com



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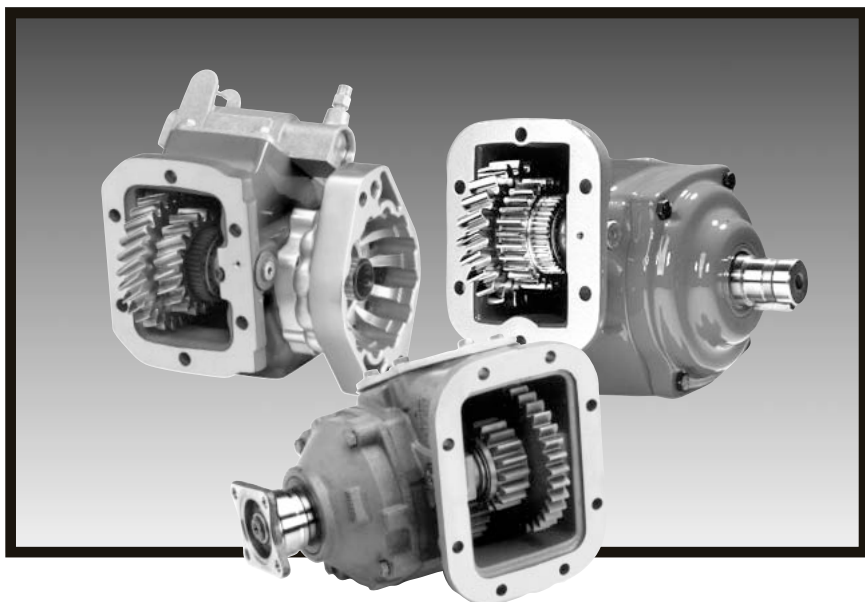
CHELSEA[®]

Bulletin HY25-1569-M1/US

Owner's Manual Power Take-Offs

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January 2007





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".

Patent Information

The Chelsea® Power Take-Off or its components shipped with this owner's manual may be manufactured under one or more of the following U.S. patents:

4610175 5228355 4597301 5645363 6151975 6142274 6260682 7159701 B2
Other patents pending.

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Safety Information

These instructions are for your safety and the safety of the end user. Read them carefully until you understand them.

General Safety Information

To prevent injury to yourself and/or damage to the equipment:

- Read carefully all owner's manuals, service manuals, and/or other instructions.
- Always follow proper procedures, and use proper tools and safety equipment.
- Be sure to receive proper training.
- Never work alone while under a vehicle or while repairing or maintaining equipment.
- Always use proper components in applications for which they are approved.
- Be sure to assemble components properly.
- Never use wornout or damaged components.
- Always block any raised or moving device that may injure a person working on or under a vehicle.
- Never operate the controls of the Power Take-Off or other driven equipment from any position that could result in getting caught in the moving machinery.

Proper Matching of P.T.O.



WARNING: A Power Take-Off must be properly matched to the vehicle transmission and to the auxiliary equipment being powered. An improperly matched Power Take-Off could cause severe damage to the vehicle transmission, the auxiliary driveshaft, and/or to the auxiliary equipment being powered. **Damaged components or equipment could malfunction causing serious personal injury to the vehicle operator or to others nearby.**

To avoid personal injury and/or equipment damage:

- Always refer to Chelsea catalogs, literature, and owner's manuals. Follow Chelsea recommendations when selecting, installing, repairing, or operating a Power Take-Off.
- Never attempt to use a Power Take-Off not specifically recommended by Chelsea for the vehicle transmission.
- Always match the Power Take-Off's specified output capabilities to the requirements of the equipment to be powered.
- Never use a Power Take-Off whose range of speed could exceed the maximum.



This symbol warns of possible personal injury.

Safety Information (Continued)

Cold Weather Operation of Powershift P.T.O.



WARNING: During extreme cold weather operation [32°F (0°C) and lower], a disengaged Powershift Power Take-Off can momentarily transmit high torque that will cause unexpected output shaft rotation. This is caused by the high viscosity of the transmission oil when it is extremely cold. As slippage occurs between the Power Take-Off clutch plates, the oil will rapidly heat up and the viscous drag will quickly decrease.

The Power Take-Off output shaft rotation could cause unexpected movement of the driven equipment resulting in serious personal injury, death, or equipment damage.

To avoid personal injury or equipment damage:

- Driven equipment must have separate controls.
- The driven equipment must be left in the disengaged position when not in operation.
- Do not operate the driven equipment until the vehicle is allowed to warm up.

Rotating Auxiliary Driveshafts



WARNING:



- Rotating auxiliary driveshafts are dangerous. You can snag clothes, skin, hair, hands, etc. This can cause serious injury or death.
- Do not go under the vehicle when the engine is running.
- Do not work on or near an exposed shaft when the engine is running.
- Shut off the engine before working on the Power Take-Off or driven equipment.
- Exposed rotating driveshafts must be guarded.

Guarding Auxiliary Driveshafts



WARNING: We strongly recommend that a Power Take-Off and a directly mounted pump be used to eliminate the auxiliary driveshaft whenever possible. If an auxiliary driveshaft is used and remains exposed after installation, it is the responsibility of the vehicle designer and P.T.O. installer to install a guard.



This symbol warns of possible personal injury.

Safety Information (Continued)

Using Set Screws



WARNING: Auxiliary driveshafts may be installed with either recessed or protruding set screws. If you choose a square head set screw, you should be aware that it will protrude above the hub of the yoke and may be a point where clothes, skin, hair, hands, etc. could be snagged. A socket head set screw, which may not protrude above the hub of the yoke, does not permit the same amount of torquing as does a square head set screw. Also, a square head set screw, if used with a lock wire, will prevent loosening of the screw caused by vibration. Regardless of the choice made with respect to a set screw, an exposed rotating auxiliary driveshaft must be guarded.

Important: Safety Information and Owner's Manual

Chelsea Power Take-Offs are packaged with safety information decals, instructions, and an owner's manual. These items are located in the envelope with the P.T.O. mounting gaskets. Also, safety information and installation instructions are packaged with some individual parts and kits. **Be sure to read the owner's manual before installing or operating the P.T.O.** Always install the safety information decals according to the instructions provided. Place the owner's manual in the vehicle glove compartment.



WARNING: Operating the P.T.O. with the Vehicle in Motion

Some Power Take-Offs may be operated when the vehicle is in motion. To do so, the P.T.O. must have been properly selected to operate at highway speeds and correctly matched to the vehicle transmission and the requirements of the driven equipment.

If in doubt about the P.T.O. specifications and capabilities, avoid operating the P.T.O. when the vehicle is in motion. Improper application and/or operation can cause serious personal injury or premature failure of the vehicle, the driven equipment, and/or the P.T.O.

Always remember to disengage the P.T.O. when the driven equipment is not in operation.



This symbol warns of possible personal injury.

Caterpillar CX31/35 Series Transmissions Maximum Direct Mount Pump Limits

Maximum Allowable Bending Moment is 80 N·m (60 Lbs-ft) combined.

From the rear P.T.O. mounting face: maximum bending moment includes PTO, direct mount pump, and unsupported hydraulic lines. Support brackets designed to reduce the bending moment on the rear P.T.O. must insure that the 80 N·m (60 Lbs-ft or 720 Lbs-in.) limit cannot be exceeded. See drawing on page 5 for bracket support locations.

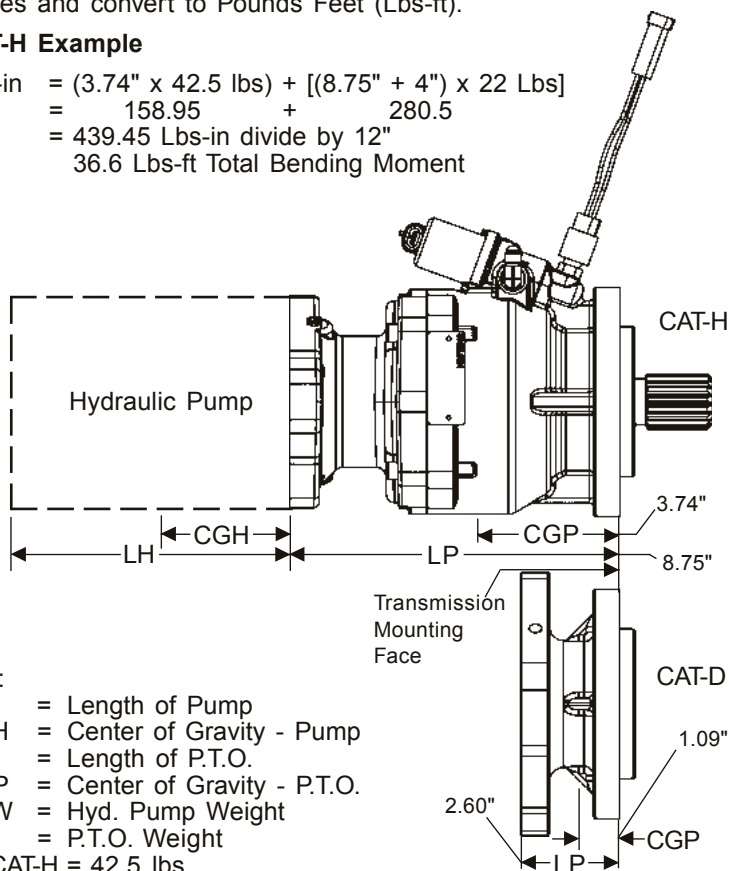
Calculating bending moment:

$$\text{Lbs-in} = (\text{CGP} \times \text{PW}) + [(\text{LP} + \text{CGH}) \times \text{HPW}]$$

Most measurements will be in inches (in) so we will do the calculation in inches and convert to Pounds Feet (Lbs-ft).

CAT-H Example

$$\begin{aligned} \text{Lbs-in} &= (3.74" \times 42.5 \text{ lbs}) + [(8.75" + 4") \times 22 \text{ Lbs}] \\ &= 158.95 + 280.5 \\ &= 439.45 \text{ Lbs-in divide by } 12" \\ &= 36.6 \text{ Lbs-ft Total Bending Moment} \end{aligned}$$



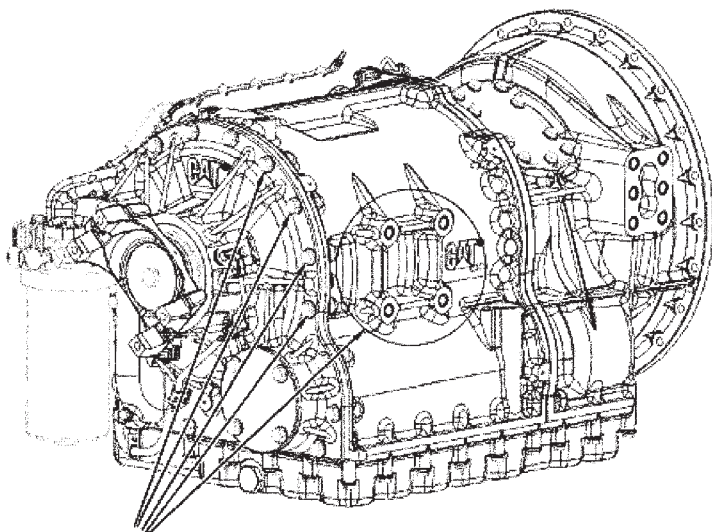
Key:

- LH = Length of Pump
- CGH = Center of Gravity - Pump
- LP = Length of P.T.O.
- CGP = Center of Gravity - P.T.O.
- HPW = Hyd. Pump Weight
- PW = P.T.O. Weight
- CAT-H = 42.5 lbs
- CAT-D = 8.2 lbs

NOTE: If pump center of gravity is not known divide LH by 2

Support Bracket Locations

If bolts are removed from the CX31 transmission to add mounting brackets, etc. they must be replaced with longer bolts so that thread engagement is maintained. The replacement bolts must be of the same grade and torqued to the required specifications. Thread engagement length and bolt torques are critical on the Aluminum Case and Cover of the CX Transmissions. The bolts selected must have a thread Engagement length of twice the bolt diameter. Standard Torques on short bolts will strip the threads. The bolts must not be too long because the bolts will bottom out and damage the case.



Bracket Attaching Locations

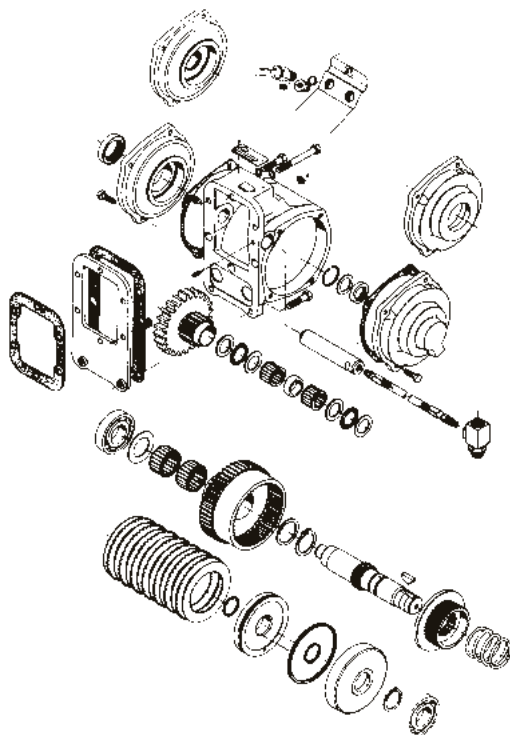
Foreword

Since our major objective is to show you how to get additional and more profitable miles from truck, tractor and trailer components, we want to provide you with information on the installation of Chelsea Power Take-Offs.

We all realize that an inadequate transmission will overwork any Power Take-Off in a very short period of time. In addition, a mismatched transmission/ P.T.O. combination can result in unsatisfactory performance of the equipment right from the start.

Before you order new trucks, be sure you're getting the right transmission/ P.T.O. combination. It is of vital importance for efficient performance to have adequate power. To help you select the proper type, size and design of P.T.O. it is advisable to discuss your specific requirements with Chelsea P.T.O. specialists. They know their products and have easy access to manufacturers of equipment, transmissions and Power Take-Offs. They can inform you about everything you need to know about power, at the right time, before you specify components.

Exploded View of a Typical Powershift P.T.O.

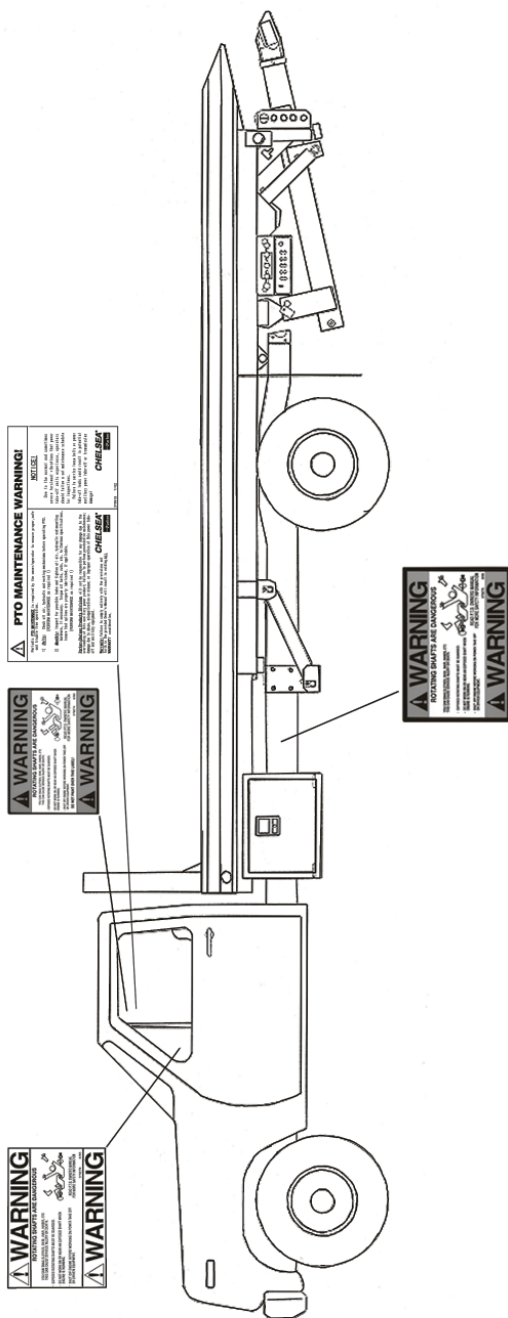


Chelsea P.T.O. Safety Label Instructions

1. The two black and orange on white 5" x 7" pressure sensitive vinyl labels, part number 379274; must be placed on the vehicle frame rails (one (1) on each side), in a position that would be **HIGHLY** visible to anyone that would go under the truck near the P.T.O. rotating shaft. If the vehicle is to be painted after these labels are installed, cover them with two (2) blank masking covers. Remove the masking covers after painting.
2. Place the one (1) black and orange on white 3.5" x 5" pressure sensitive vinyl label, part number 379275, on the visor nearest the operator of the vehicle, this must be placed near the P.T.O. visor label.
3. Place the one (1) red and white with black lettering 3.5" x 7.5" sensitive vinyl label, part number 379915, on the opposite side of the visor from the above label # 379275.
4. Place the one (1) white and black heavy duty card, part number 379276, in the vehicle glove box. Again in a position highly visible to the operator, for example: try to place this card on top of whatever may be in the glove box.

If you require labels, please order part number 328946X at no charge from your local Chelsea Warehouse or send request direct to:

**Parker Hannifin Corporation
Chelsea Products Division
8225 Hacks Cross Road
Olive Branch, MS 38654
Customer Service: (662) 895-1011**



Function of Auxiliary Power Shafts

An auxiliary power shaft transmits torque from the power source to the driven accessory. The shaft must be capable of transmitting the maximum torque and R.P.M. required of the accessory, plus any shock loads that develop.

An auxiliary power shaft operates through constantly relative angles between the power source and the driven accessory, therefore, the length of the auxiliary power shaft must be capable of changing while transmitting torque. This length change, commonly called "slip movement", is caused by movement of the power train due to torque reactions and chassis deflections.

Joint operating angles are very important in an auxiliary power joint application. In many cases, the longevity of a joint is dependent on the operating angles. (See chart below)

This information is limited to 1000 through 1310 series applications. For applications requiring a series larger than 1310, contact your local Chelsea distributor.

Determining Shaft Type

- 1) Solid or tubular?
 - a) In applications requiring more than 1000 R.P.M. or where the application necessitates a highly balanced auxiliary power shaft, a tubular shaft should be used.
 - b) Spicer's solid shafting auxiliary power joints are designed for 1000 or less R.P.M. intermittent service such as:
 - Driving small hydraulic pumps
 - Driving winches
 - Driving low speed product pumps
- 2) Joint Series should be determined using the chart on the following page.

Spicer® Universal Joint Operating Angles			
Prop. Shaft R.P.M.	Max. Normal Operating Angle	Prop. Shaft R.P.M.	Max. Normal Operating Angle
3000	5° 50'	1500	11° 30'
2500	7° 00'	1000	11° 30'
2000	8° 40'	500	11° 30'

Above based on angular acceleration of 100 RAD/SEC²

Spicer® Universal Joint Engineering Data

JOINT SERIES	1000	1100	1280	1310	
TORQUE RATING Automotive (Gas or Diesel Engine) lbs. ft. Continuous	50	54	95	130	
TUBING Diameter Wall Thickness W = WELDED S = SEAMLESS	1.750 .065 W	1.250 .095 S	2.500 .083 W	3.00 .083 W	
FLANGE DIAMETER (Swing Diameter) Rectangular Type	3.500	3.500	3.875	3.875	
BOLT HOLES - Flange Yoke Circle Diameter Number Male Pilot Dia.	2.750 .312 4 2.250	2.750 .312 4 2.250	3.125 .375 4 2.375	3.125 .375 4 2.375	
DISTANCE ACROSS LUGS Snap Ring Construction	2.188	2.656	3.469	3.469	
BEARING DIAMETER	.938	.938	1.062	1.062	
MAXIMUM OPERATING SPEED * BY TUBE SIZE, SOLID SHAFT SIZE, AND LENGTH *(For speed below 500 R.P.M. or over 2500 R.P.M., contact your Chelsea Distributor)					
Tubing Dia. & Wall Thickness Joint & Shaft (W=Welded S=Seamless)	MAX. INSTALLED LENGTH IN INCHES FOR GIVEN R.P.M. Centerline to Centerline of Joints For a Two Joint Assembly or Centerline of Joint to Centerline of Center Bearing for a Joint & Shaft R.P.M. - Revolutions per Minute				
	500	1000	1500	2000	2500
1.750" X .065" W	117"	82"	67"	58"	52"
1.250" X .095" S	91"	64"	52"	45"	40"
2.500" X .083" W	122"	87"	70"	62"	55"
3.000" X .083" W	-	-	-	85"	76"
SOLID SHAFT Diameter					
.750"	60"	42"	35"	30"	27"
.812"	62"	44"	36"	31"	28"
.875"	65"	46"	37"	32"	29"
1.000"	69"	49"	40"	35"	31"
1.250"	77"	55"	45"	39"	35"

Mounting the P.T.O. on the Transmission

When installing a P.T.O., always wear protective clothing and safety glasses.

WARNING: Oil may be hot. Use extreme caution to Assure that you do not accidentally come in contact with hot oil.

1. Drain transmission oil before removing the rear aperture plate. After draining transmission fluid reinstall plug. (**Fig. 1**)
2. Remove the P.T.O. rear aperture plate with an 18 mm socket. (**Fig. 1**)
3. Remove the O-Ring and clean the aperture surface. (**Fig. 2**)

NOTE: Do not reuse the O-Ring that comes with the transmission cover plate.

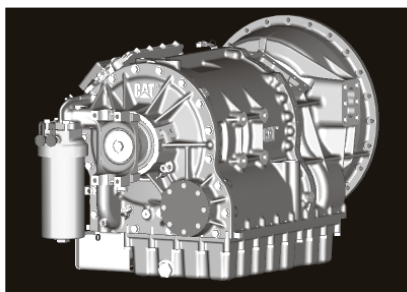


Fig. 1

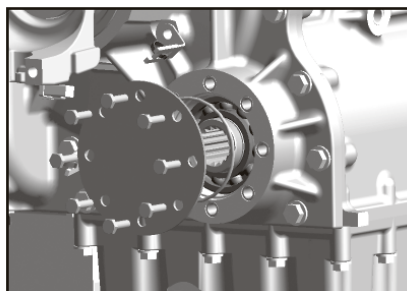


Fig. 2

“XV” Output

4. Mounting Constant Drive “XV” Output.
 - a. Install O-Ring, furnished with P.T.O., on transmission mounting surface (**Fig.3**). To prevent damage to O-Ring make sure it is installed in groove as shown.
 - b. Install studs as shown in **Fig. 4**.

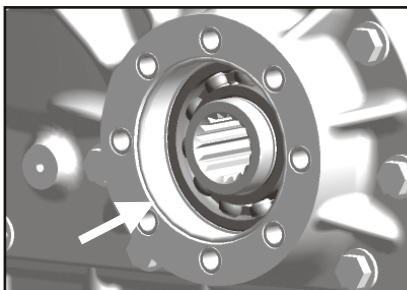


Fig. 3

Mounting the P.T.O. on the Transmission (continued)

c. DO NOT bottom studs in holes. Install until shoulder is approximately one to two threads from the Transmission mounting surface. To verify correct installation measure from end of stud to transmission mounting surface. Correct length should be between 1.31-1.25 in. [33.2 – 31.8 mm].

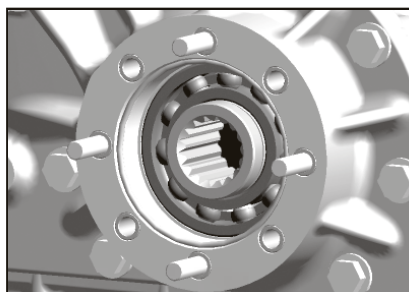


Fig. 4

d. Mount P.T.O. as shown in **Fig. 5** and install flange nuts.

NOTE: Do not use sealing compounds because they are generally incompatible with Automatic transmission fluid.

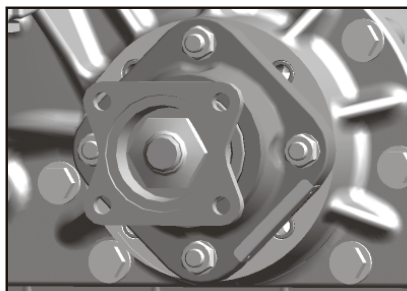


Fig. 5

e. Tighten and torque in pattern shown in Fig. 6. Torque to 55-60 Lbs.-ft. [75-81Nm]

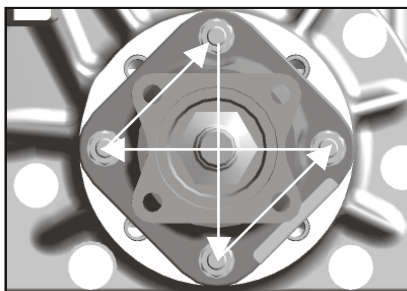


Fig. 6

Mounting the P.T.O. on the Transmission (continued)

CAUTION: Caterpillar transmissions have a different weight limit for rear mount PTO/Pump applications than Chelsea's recommended limits, see page 4 of this manual or contact Caterpillar for weight limits on rear mount applications.

Direct Pump Drive Outputs

5. Mounting Constant Drive Pump Shafts

- a. Install O-Ring as shown in **Fig. 7**.

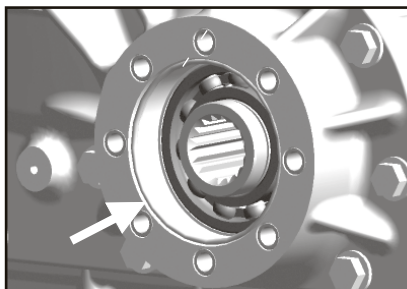


Fig. 7

- b. Install Studs as shown in **Fig. 8**
- c. DO NOT bottom studs in holes. Install until shoulder is approximately one to two threads from the Transmission mounting surface. To verify correct installation measure from end of stud to transmission mounting surface. Correct length should be between 1.31-1.25 in. [33.2 – 31.8 mm].

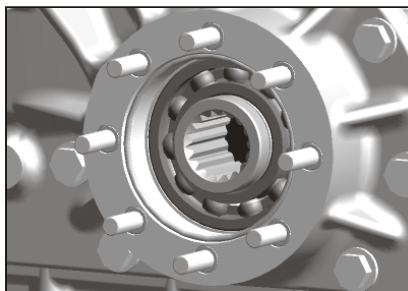


Fig. 8

- d. Install spring into pump shaft as shown in **Fig 9**.

NOTE: Verify that snap ring has been installed on shaft.

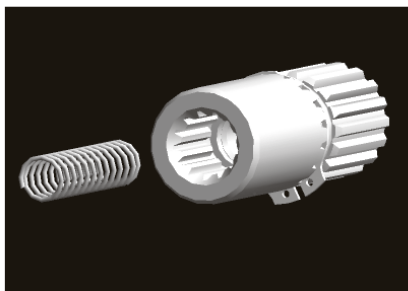


Fig. 9

Mounting the P.T.O. on the Transmission (continued)

- e. Install P.T.O. shaft into transmission counter shaft as shown in **Fig 10**.

NOTE: Verify that snap ring is installed on shaft before installing into transmission.

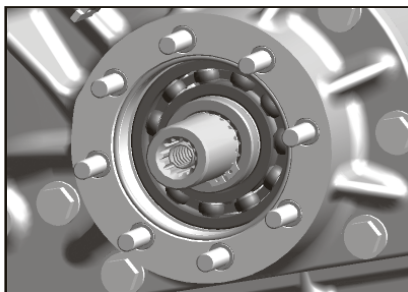


Fig. 10

- f. Mount P.T.O. housing to transmission as shown in **Fig 11**.
- g. Install flange nuts. Tighten and torque in a crossing pattern and Torque to 55-60 Lbs.-ft. [75-81 Nm].
- h. Refill transmission with fluid.

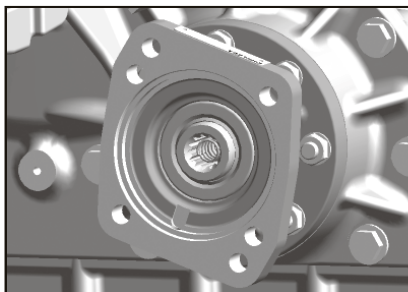


Fig. 11

6. Wet Spline Installation

- a. Wet spline installation will be the same as above (step a thru g of the pump mount installation (item 4 page 12))
- b. The P.T.O. housing will not have an oil seal and there will be a "plug" (1/8" NPT) in the housing (**Fig. 12**).
- c. Install O-Ring that is supplied with kit in flange as shown (**Fig 12**).
- d. Carefully mount pump so as not to damage O-Ring and torque as required.

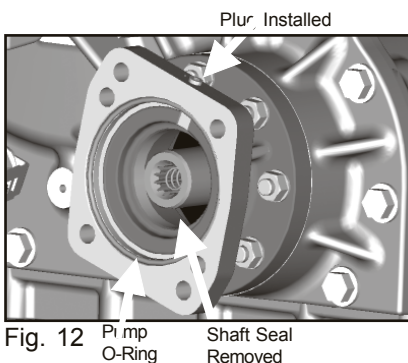


Fig. 12

CAUTION: Check Transmission Oil Level before running P.T.O. Assure that the transmission oil is at the proper level recommended by Caterpillar. Refer to Caterpillar for correct fluid types.

Mounting the P.T.O. on the Transmission

When installing a P.T.O., always wear protective clothing and safety glasses.

WARNING: Oil may be hot. Use extreme caution to Assure that you do not accidentally come in contact with hot oil.

1. Drain transmission oil before removing the rear aperture plate. After draining transmission fluid reinstall plug.
2. Remove the P.T.O. rear aperture plate with an 18 mm socket. (Fig. 1)
3. Remove the O-Ring and clean the aperture surface. (Fig. 2)

NOTE: Do not reuse the O-Ring that comes with the transmission cover plate.

4. Install O-Ring, furnished with P.T.O., (Fig.3). To prevent damage to O-Ring make sure it is installed in groove as shown.

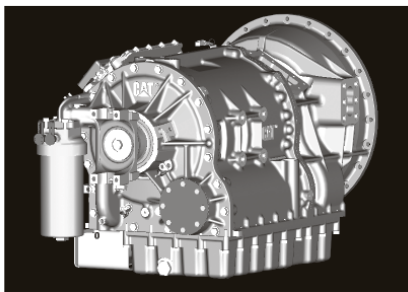


Fig. 1

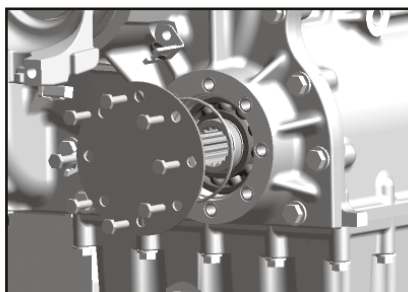


Fig. 2

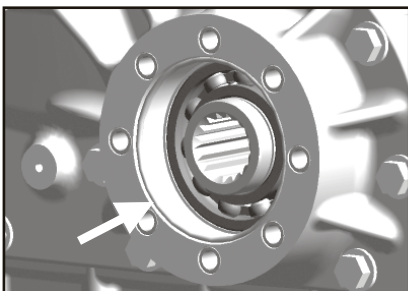


Fig. 3

Mounting the P.T.O. on the Transmission (continued)

CAUTION: Caterpillar transmissions have a different weight limit for rear mount PTO/Pump applications than Chelsea's recommended limits, see page 4 of this manual or contact Caterpillar for weight limits on rear mount applications.

5. Install Studs as shown in **Fig. 4**
DO NOT bottom studs in holes.
Install until shoulder is approximately one to two threads from the transmission mounting surface. To verify correct installation measure from end of stud to transmission mounting surface. Correct length should be between 1.31-1.25 in. [33.2 – 31.8 mm].

NOTE: Prior to mounting the P.T.O. install pressure switch into P.T.O. housing as shown in **Fig. 5**. Torque to 10-12 Lbs. ft. [13-16 N.m].

6. Mount P.T.O. to transmission as shown using the flange nuts provided with Power Take-Off.

NOTE: Position of P.T.O. solenoid between 12 o'clock and 2 o'clock position when viewed from rear. (**Fig.5**)

Tighten and Torque flange nuts in a crossing pattern to 50-60 Lbs.-ft. [75-81 N.m]

7. Install the 90° elbow in the transmission pressure port as shown. Connect hose to the transmission port as shown. Connect other end of hose to the P.T.O. 90° elbow located near the P.T.O. solenoid. (**Fig 6**)

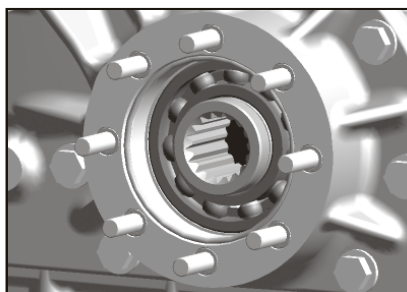


Fig. 4



Fig. 5

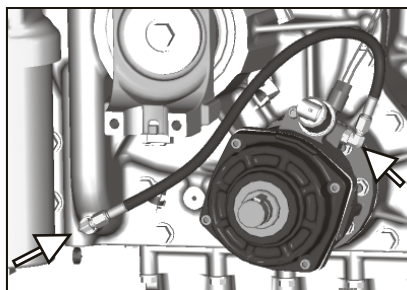


Fig. 6

Mounting the P.T.O. on the Transmission (continued)

8. Keep the bend radius of the hose as large as possible to avoid collapsing the hose and restriction of flow. Minimum bend radius is measured on the inside bend of the hose. To determine minimum bend, divide the total distance between ends (B length) by 2. For example, B = 6", minimum bend radius = 3"

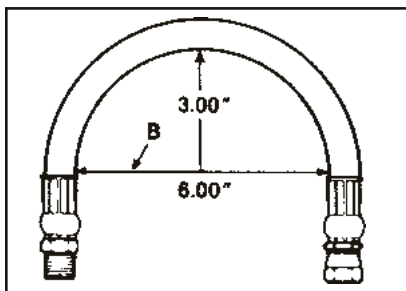


Fig.7

9. Route hose and secure to stay out of the path (swing diameter) of the transmission output yoke. (**Fig 7**)

NOTE: It is not recommended to route the hose under the P.T.O. due to the possibility of the hose being exposed to road hazards.

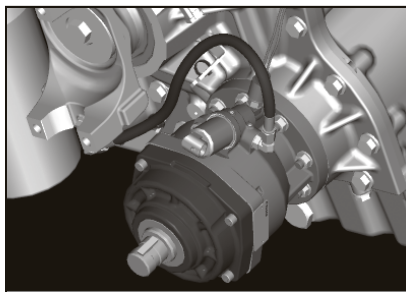
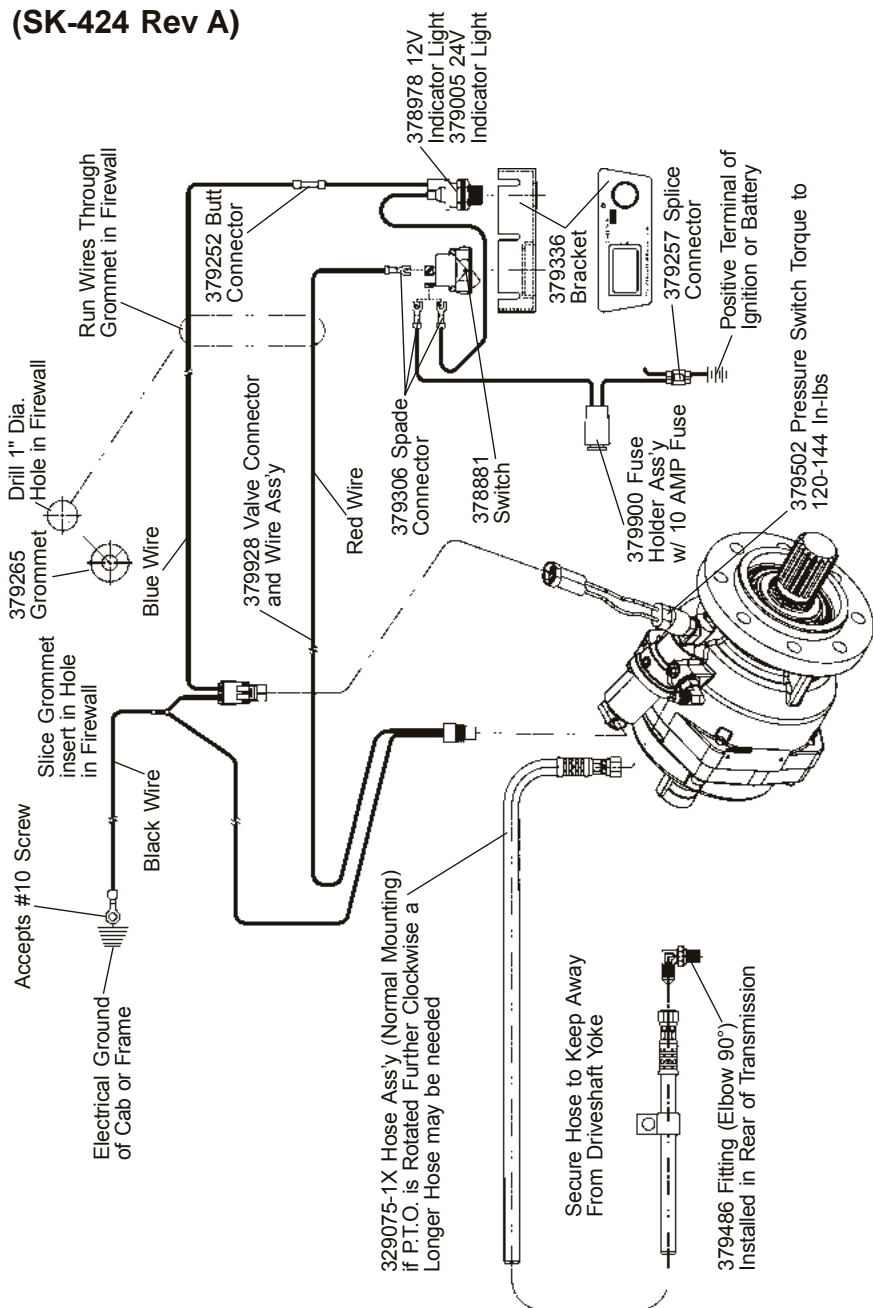


Fig. 8

10. See SK-424, pg. 18 for complete wiring & plumbing installation information.
11. Refill transmission with fluid.

CAUTION: Check Transmission Oil Level before running P.T.O. Assure that the transmission oil is at the proper level recommended by Caterpillar. Refer to Caterpillar for correct fluid types.

12v Electrical & Hydraulic Installation CAT-H (SK-424 Rev A)



Power Take-Off Maintenance

Due to the normal and sometime severe torsional vibrations that Power Take-Off units experience, operators should follow a set maintenance schedule for inspections. Failure to service loose bolts or Power Take-Off leaks could result in potential auxiliary Power Take-Off or transmission damage.

Periodic P.T.O. MAINTENANCE is required by the owner/operator to ensure proper, safe and trouble free operation.

Daily: Check all air, hydraulic and working mechanisms before operating P.T.O. Perform maintenance as required.

Monthly: Inspect for possible leaks and tighten all air, hydraulic and mounting hardware, if necessary. Torque all bolts, nuts, etc. to Chelsea specifications. Insure that splines are properly lubricated, if applicable. Perform maintenance as required.

With regards to the direct mounted pump splines, the P.T.O. requires the application of a specially formulated anti-fretting, high pressure, high temperature grease. The addition of the grease has been proven to reduce the effects of the torsional vibrations, which result in fretting corrosion on the P.T.O. internal splines as well as the pump external splines. Fretting corrosion appears as a "rusting and wearing" of the pump shaft splines. Severe duty applications, which require long P.T.O. running times and high torque may require more frequent regreasing. Applications such as Utility Trucks that run continuously and are lightly loaded also require frequent regreasing due to the sheer hours of running time. It is important to note that service intervals will vary for each and every application and is the responsibility of the end user of the product. Chelsea also recommends that you consult your pump owners manuals and technical services for their maintenance guidelines. Fretting corrosion is caused by many factors and without proper maintenance; the anti-fretting grease can only reduce its effects on components.

Chelsea offers the grease to our customers in two packages. The first is a 5/8 fluid ounce tube (379688), which is included with every applicable P.T.O., and the second is a 14-ounce grease cartridge (379831). Chelsea also offers greaseable shafts for most all output designators.

Warranty: Failure to comply entirely with the provisions set forth in the appropriate Owner's Manual will result in voiding of ALL Warranty consideration.

Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. 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 such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of:
(A) All Power Take-Off units one (1) year from date of installation.
(B) Except 267, 277, 278, 242, 244, 246, 250, 251 and 859 series two (2) years from date of installation.

THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED. NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. 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 items sold hereunder, 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.

8. 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, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are 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. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. 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 Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter '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 an item sold pursuant to this contract 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 an item sold hereunder 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 said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item 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 items 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 item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of 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, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.



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