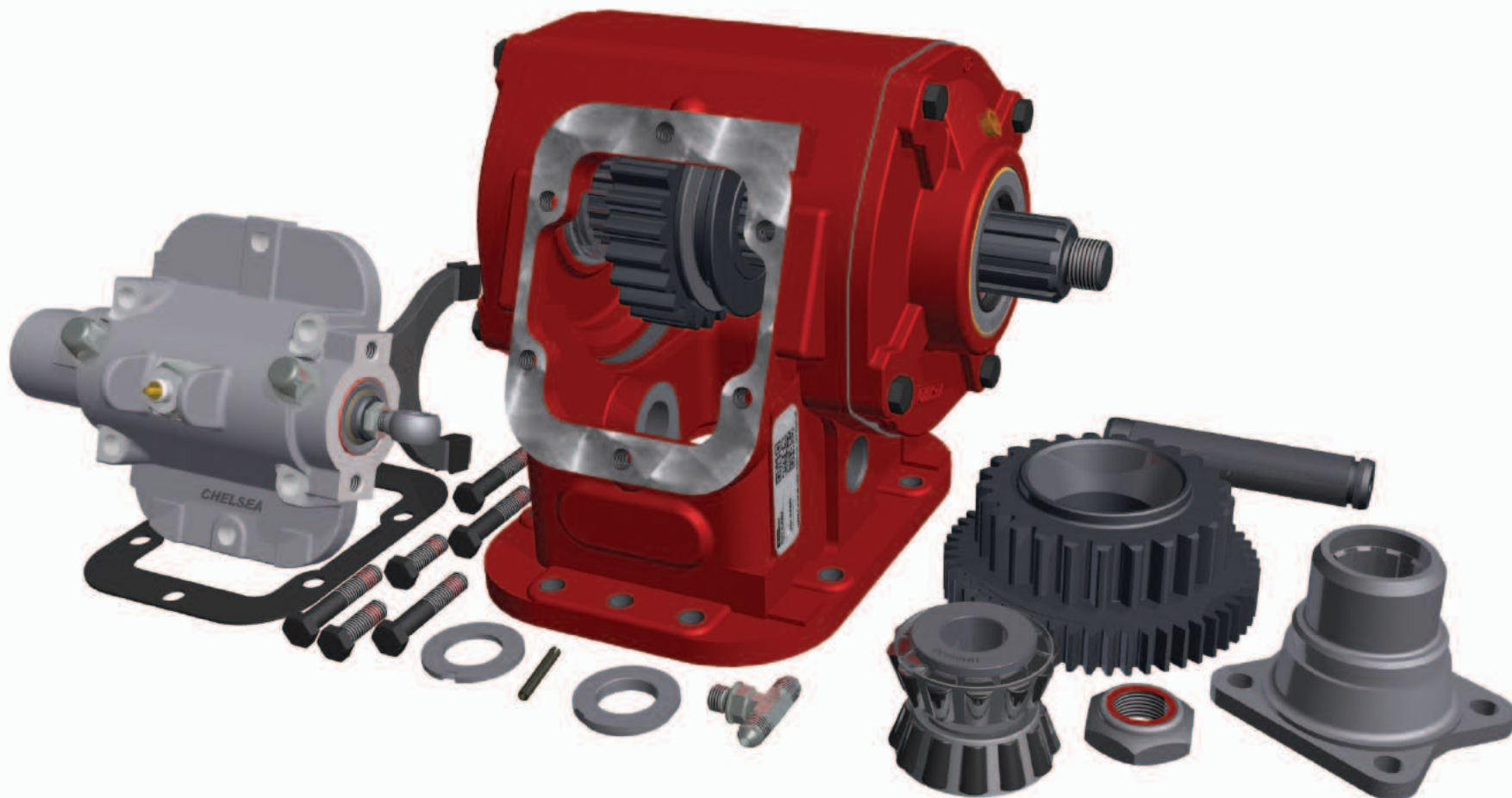




Chelsea® Power Take-Off

880 Series Service Manual

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



ENGINEERING YOUR SUCCESS.



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".

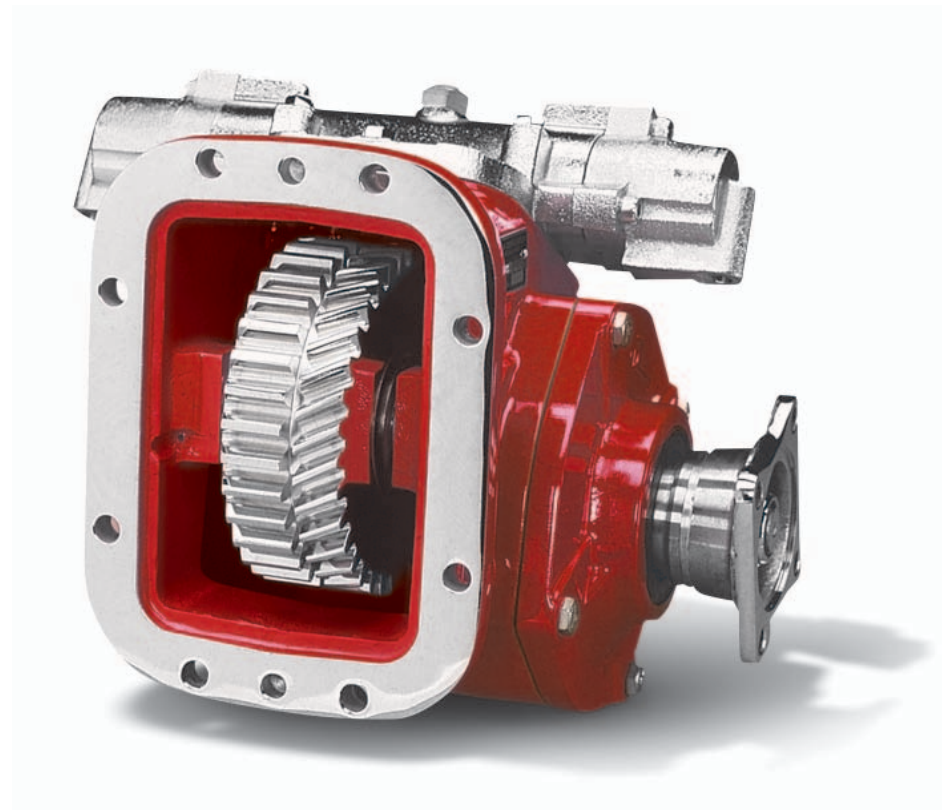
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NOTES

1	Visually inspect parts before assembly for flaws.
2	The item numbers identifying parts are the same item numbers used on the engineering drawings.
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 bearings, always place the bearings rounded end into the part.
7	Use Parker O-Lube or equal to lubricate O-Rings and seals before assembly.
8	When assembling O-Rings, do not roll it into their grooves. Use a O-Ring tool for assembly. O-Rings are not to be twisted or damaged.
9	Always reference the current Chelsea Parts List for part numbers and assemblies. 880 Series is HY25-2880-M1/US



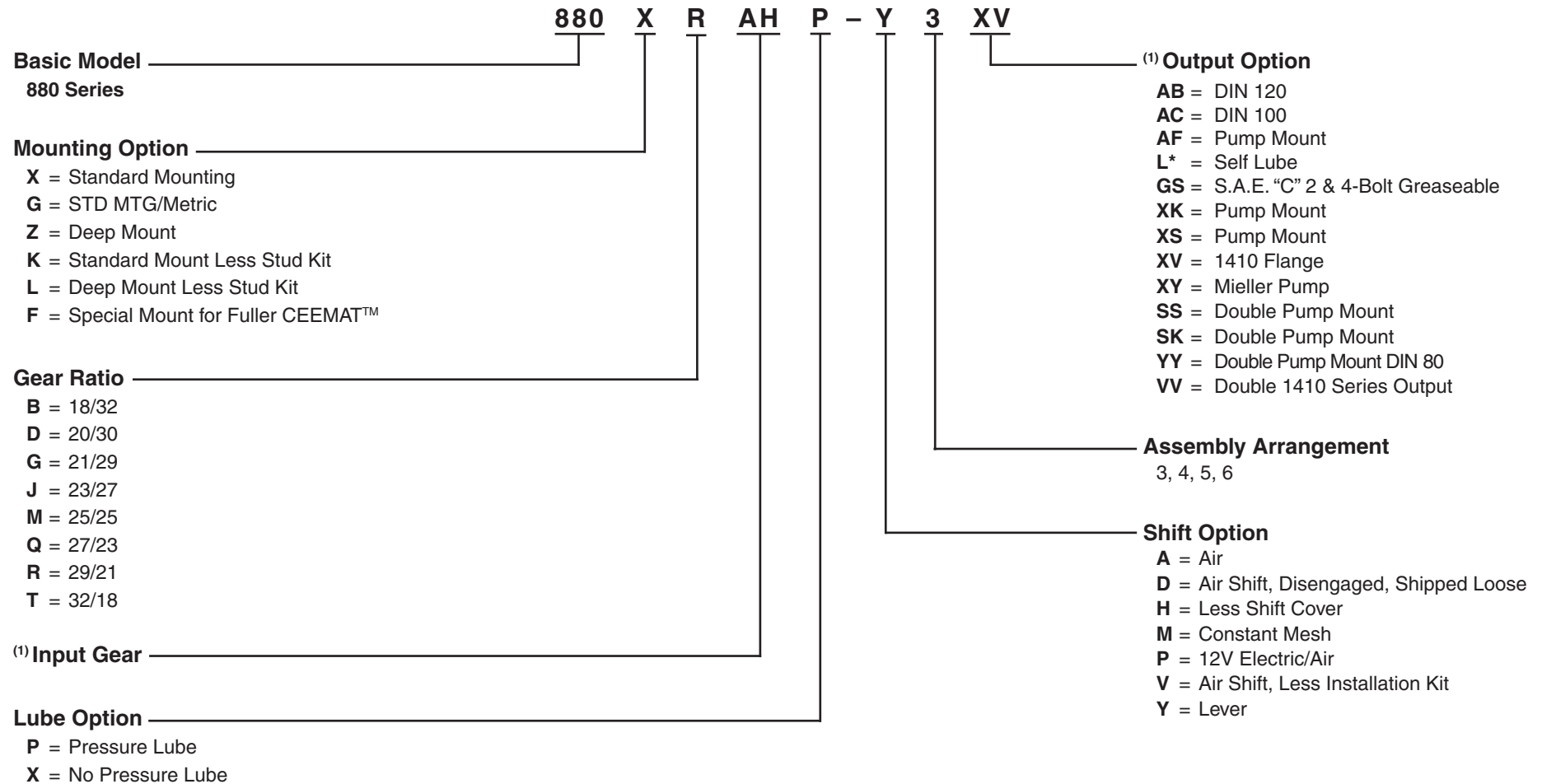
Suggested Tools

Safety Glasses	Shop Press	Pliers	Gasket Scraper Tool
3/4" Socket	5/32" Hex Bit Driver	Hammer/Mallet	

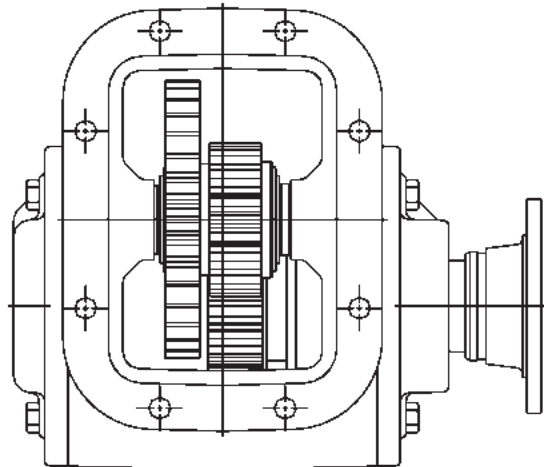
Suggested Service Kits

Part Number	Description
328356-51X	Gasket & Seal Kit, Standard Output
328356-52X	Gasket & Seal Kit, Pump Output
328356-72X	Gasket & Seal Kit, Air Shift
329183X	Overhaul Kit

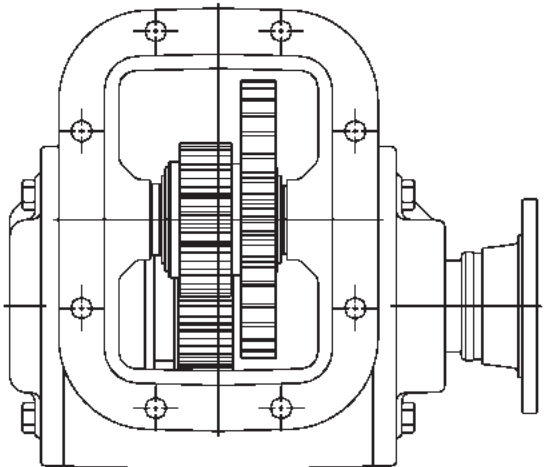
See [page 28](#) for Kits Bill of Materials



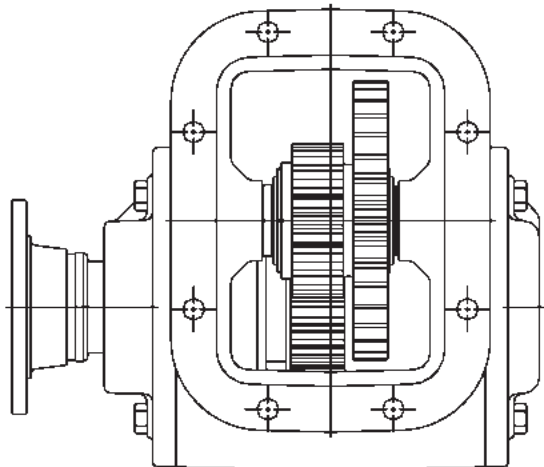
⁽¹⁾ Reference Chelsea Applications Catalog HY25-3000/US for Complete Discriptions.



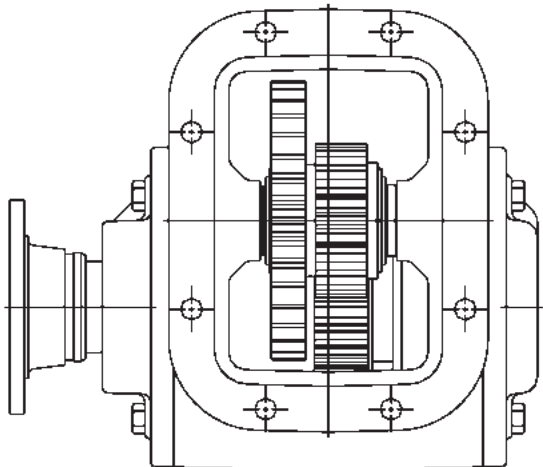
Assembly 3



Assembly 4

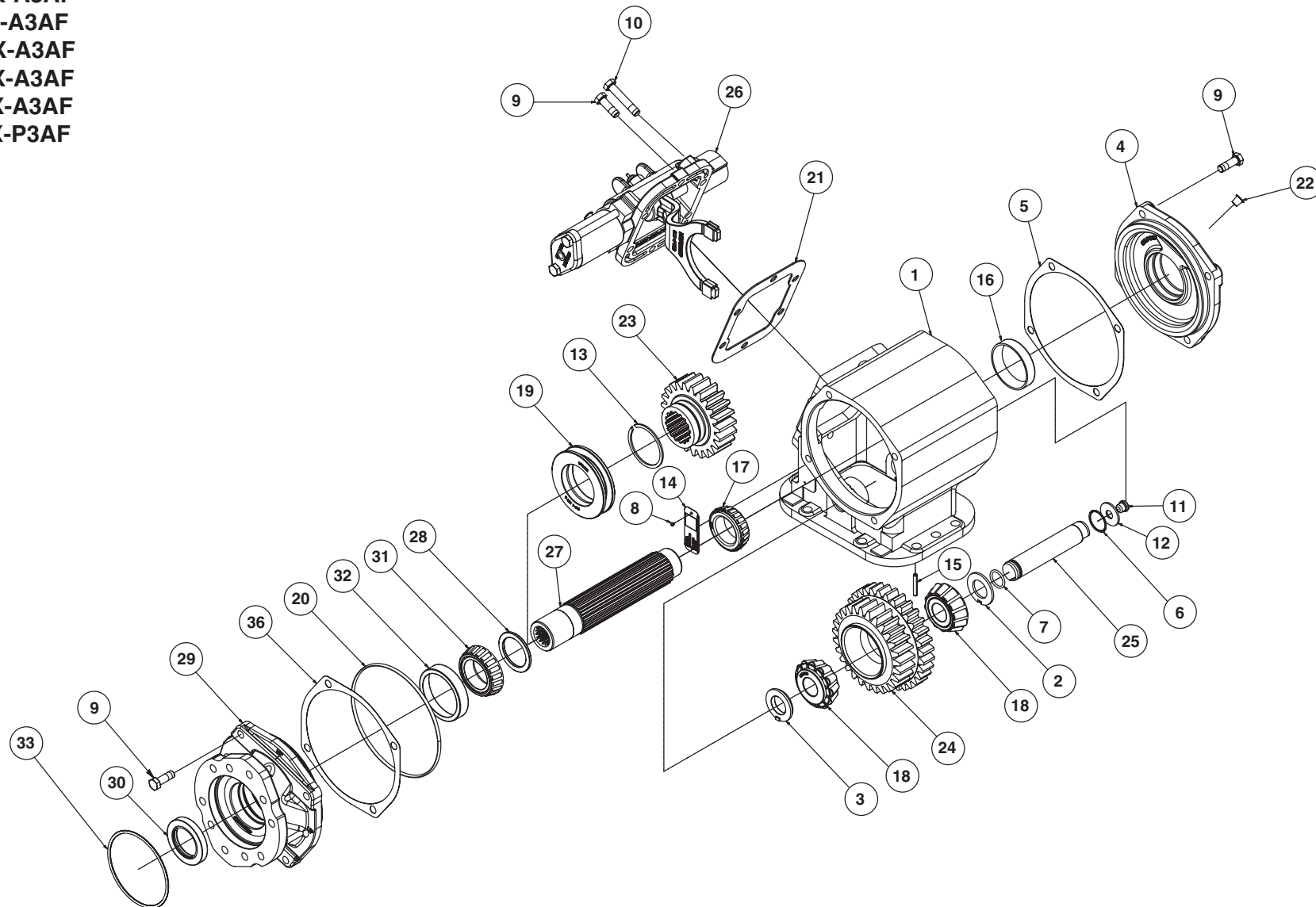


Assembly 5



Assembly 6

880XGAHX-A3AF
880XJAHX-A3AF
880XMAHX-A3AF
880XQAHX-A3AF
880XRAHX-A3AF
880XRDAX-P3AF



Bill of Materials**Service Manual
880 Series****“AF” Output Option**

Item	Part Number	Description	Qty.
1	1-P-507	Housing.....	1
2	14-P-80-1	Bearing Adjustment Spacer 1.014" x 1.750" x .110".....	1 or
	14-P-80-2	Bearing Adjustment Spacer 1.014" x 1.750" x .115".....	1 or
	14-P-80-3	Bearing Adjustment Spacer 1.014" x 1.750" x .120".....	1 or
	14-P-80-4	Bearing Adjustment Spacer 1.014" x 1.750" x .125".....	1
3	14-P-81	Input Bearing Spacer 1.014" x 1.750" x .255".....	1
4	21-P-546	Bearing Cap.....	1
5	22-P-98	Bearing Cap Gasket	1
6	28-P-42	O-Ring (-023).....	1
7	28-P-198	O-Ring (-117).....	1
8	378422	Drive Screw.....	2
9	378431-11	Hex Head Capscrew .375" - 16 x 1.125"	8
10	378431-18	Hex Head Capscrew .375" - 16 x 2.000"	4
11	379484	Straight Threaded Connector.....	1
12	379505	O-Ring Retainer.....	1
13	379592	Lockring	1
14	68-P-51	Name Plate	1
15	500597-16	Slotted Roll Pin .188" x 1.250".....	1
16	560982	Tapered Bearing Cup 2.5635" x .550"	2
17	560986	Tapered Bearing Cone.....	2
18	560987	Tapered Bearing Cone 1.0005" x .96"	1
19	61-P-1	Shifter Hub.....	1
20	28-P-196	O-Ring (-258).....	1
21	35-P-59	Gasket.....	1
22	500897-5	Shipping Plug.....	2
23	2-P-732	Output Gear (“G” Ratio)	1 or
	2-P-733	Output Gear (“J” Ratio)	1 or
	2-P-734	Output Gear (“M” Ratio)	1 or
	2-P-818	Output Gear (“Q” Ratio)	1 or
	2-P-736	Output Gear (“R” Ratio)	1

Item	Part Number	Description	Qty.
24	5-P-1135	Input Gear (GAH).....	1 or
	5-P-1102	Input Gear (JAH).....	1 or
	5-P-1103	Input Gear (MAH)	1 or
	5-P-1385	Input Gear (QAH).....	1 or
	5-P-1104	Input Gear (RAH).....	1 or
	5-P-1122	Input Gear (RDA).....	1
25	9-P-79	Idler Shaft	1
26	329772X	Air Shifter Cover Assembly	1
27	3-P-940	Output Shaft 1-1/4" - 15T.....	1
28	4-P-162	Spacer 1.633" x 2.188" x .125"	1
29	21-P-539	Flange.....	1
30	28-P-219	Oil Seal 2.506" x 1.625 x .375"	1
31	560976	Bearing Tape 1.6255" x .778"	1
32	560977	Bearing Tape 2.892" x .580"	1
33	28-P-259	O-Ring 3.984" x .139"	1
36	55-P-20-1	Shim, Bearing Cover (.003" Green)	1 or
	55-P-20-2	Shim, Bearing Cover (.010" Brown).....	1 or
	55-P-20-3	Shim, Bearing Cover (.020" Yellow)	1
N.S.	328170-179X	Stud Kit, Standard (“X” Mounting Option)	1
	328170-201X	Stud Kit, Metric (“G” Mounting Option).....	1

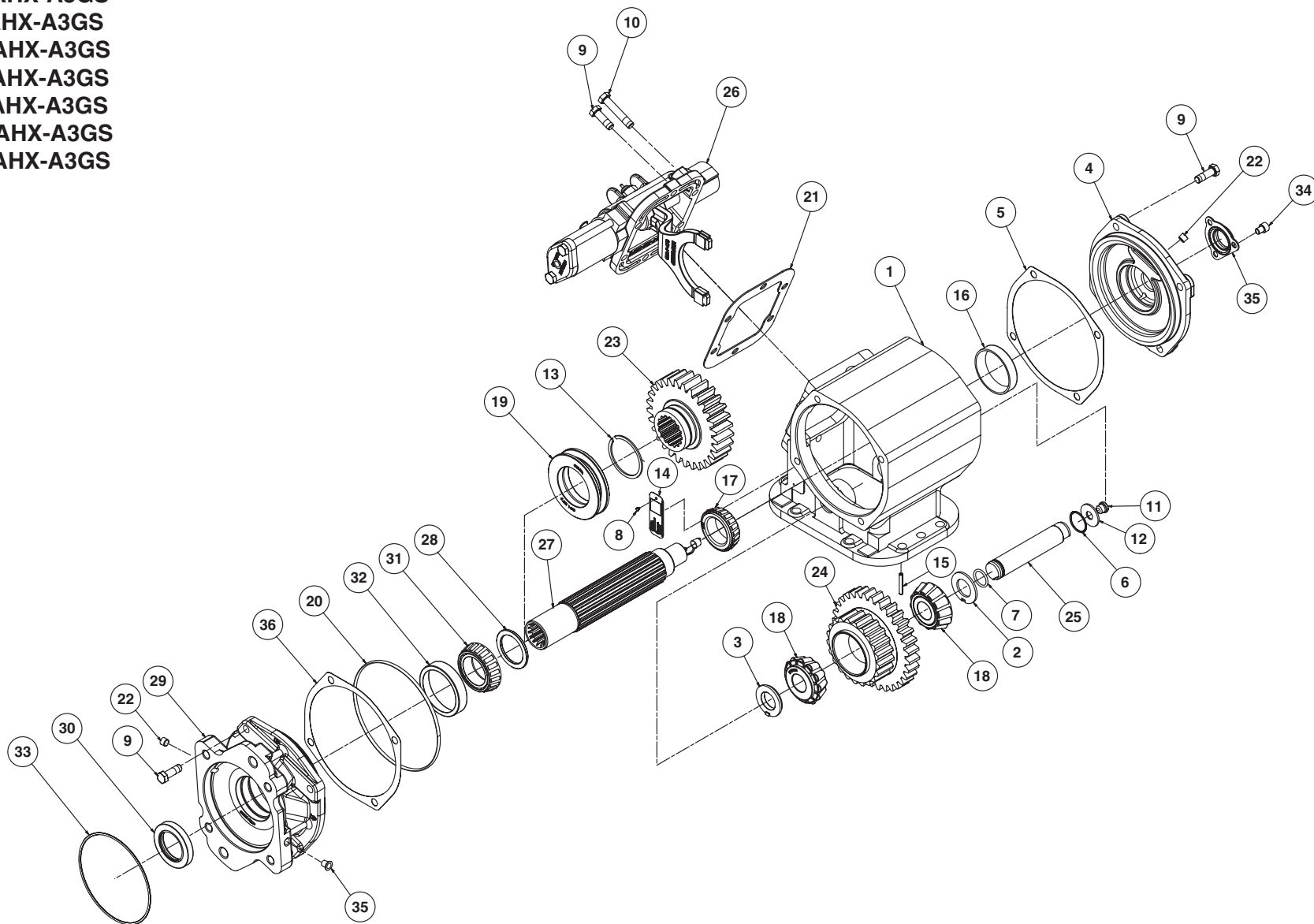
N.S. – Not Shown

Service Kits

Part Number	Description
328356-51X	Gasket & Seal Kit, Standard Output
328356-52X	Gasket & Seal Kit, Pump Output
329183X	Overhaul Kit

See [page 28](#) for Kits Bill of Materials

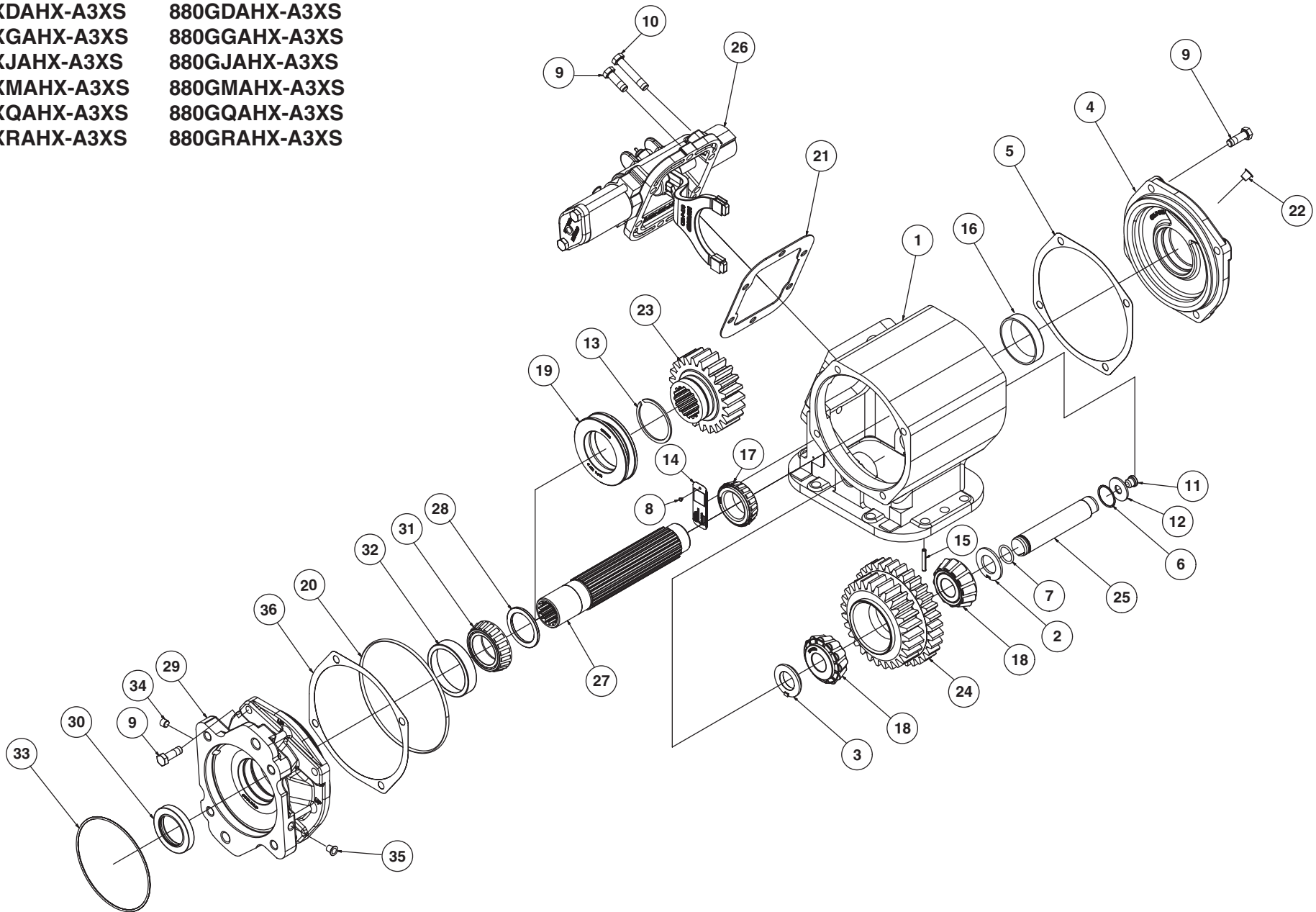
880XGAHX-A3GS
880XJAHX-A3GS
880XMAHX-A3GS
880XQAHX-A3GS
880XRAHX-A3GS
880GMAHX-A3GS
880GRAHX-A3GS



Bill of Materials**Service Manual
880 Series****“GS” Output Option**

Item	Part Number	Description	Qty.	Item	Part Number	Description	Qty.								
1	1-P-507	Housing.....	1	24	5-P-1135	Input Gear (GAH).....	1 or								
2	14-P-80-1	Bearing Adjustment Spacer 1.014" x 1.750" x .110".....	1 or		5-P-1102	Input Gear (JAH).....	1 or								
	14-P-80-2	Bearing Adjustment Spacer 1.014" x 1.750" x .115".....	1 or		5-P-1103	Input Gear (MAH)	1 or								
	14-P-80-3	Bearing Adjustment Spacer 1.014" x 1.750" x .120".....	1 or		5-P-1385	Input Gear (QAH).....	1 or								
	14-P-80-4	Bearing Adjustment Spacer 1.014" x 1.750" x .125".....	1		5-P-1104	Input Gear (RAH).....	1								
3	14-P-81	Input Bearing Spacer 1.014" x 1.750" x .255".....	1	25	9-P-79	Idler Shaft	1								
4	21-P-653	Bearing Cap.....	1	26	329772X	Air Shifter Cover Assembly	1								
5	22-P-98	Bearing Cap Gasket	1	27	3-P-949X	Greasable Shaft Assembly	1								
6	28-P-42	O-Ring (-023).....	1	28	4-P-162	Spacer 1.633" x 2.188" x .125".....	1								
7	28-P-198	O-Ring (-117).....	1	29	21-P-515	Output Cap Bearing	1								
8	378422	Drive Screw.....	2	30	28-P-219	Oil Seal 2.506" x 1.625 x .375".....	1								
9	378431-11	Hex Head Capscrew .375" - 16 x 1.125"	8	31	560976	Tapered Bearing Cone 1.6255" x .778"	1								
10	378431-18	Hex Head Capscrew .375" - 16 x 2.000"	4	32	560977	Tapered Bearing Cup 2.892" x .580"	1								
11	379484	Straight Threaded Connector.....	1	33	28-P-245	O-Ring 5.017" x .103"	1								
12	379505	O-Ring Retainer.....	1	34	379432-1	Cap Screw Socket Head .312" - 18 x .375"	3								
13	379592	Lockring	1	35	28-P-226	Bearing Cap with Molded Dual Lip Seal	1								
14	68-P-51	Name Plate	1	36	55-P-20-1	Shim, Bearing Cover (.003" Green)	1 or								
15	500597-16	Slotted Roll Pin .188" x 1.250"	1		55-P-20-2	Shim, Bearing Cover (.010" Brown).....	1 or								
16	560982	Tapered Bearing Cup 2.5635" x .550"	2		55-P-20-3	Shim, Bearing Cover (.020" Yellow)	1								
17	560986	Tapered Bearing Cone.....	2	N.S.	328170-179X	Stud Kit, Standard ("X" Mounting Option)	1								
18	560987	Tapered Bearing Cone 1.0005" x .96"	2		328170-201X	Stud Kit, Metric ("G" Mounting Option).....	1								
19	61-P-1	Shifter Collar.....	1	N.S. – Not Shown											
20	28-P-196	O-Ring (-258).....	1	Service Kits <table><tr><th>Part Number</th><th>Description</th></tr><tr><td>328356-51X</td><td>Gasket & Seal Kit, Standard Output</td></tr><tr><td>328356-52X</td><td>Gasket & Seal Kit, Pump Output</td></tr><tr><td>329183X</td><td>Overhaul Kit</td></tr></table>				Part Number	Description	328356-51X	Gasket & Seal Kit, Standard Output	328356-52X	Gasket & Seal Kit, Pump Output	329183X	Overhaul Kit
Part Number	Description														
328356-51X	Gasket & Seal Kit, Standard Output														
328356-52X	Gasket & Seal Kit, Pump Output														
329183X	Overhaul Kit														
21	35-P-59	Gasket.....	1												
22	379231	Pipe Plug .125" - 27	1												
23	2-P-732	Output Gear ("G" Ratio)	1 or												
	2-P-733	Output Gear ("J" Ratio)	1 or												
	2-P-734	Output Gear ("M" Ratio).....	1 or												
	2-P-818	Output Gear ("Q" Ratio)	1 or												
	2-P-736	Output Gear ("R" Ratio)	1												

880XDAH-A3XS	880GDAH-A3XS
880XGAH-A3XS	880GGAH-A3XS
880XJAH-A3XS	880GJAH-A3XS
880XMAH-A3XS	880GMAH-A3XS
880XQAH-A3XS	880GQAH-A3XS
880XRAH-A3XS	880GRAH-A3XS



Bill of Materials**Service Manual
880 Series****“XS” Output Option**

Item	Part Number	Description	Qty.	Item	Part Number	Description	Qty.
1	1-P-507	Housing.....	1		2-P-818	Output Gear (“Q” Ratio)	1 or
2	14-P-80-1	Bearing Adjustment Spacer 1.014" x 1.750" x .110".....	1 or		2-P-736	Output Gear (“R” Ratio)	1
	14-P-80-2	Bearing Adjustment Spacer 1.014" x 1.750" x .115".....	1 or	24	5-P-1101	Input Gear (DAH)	1 or
	14-P-80-3	Bearing Adjustment Spacer 1.014" x 1.750" x .120".....	1 or		5-P-1135	Input Gear (GAH).....	1 or
	14-P-80-4	Bearing Adjustment Spacer 1.014" x 1.750" x .125".....	1		5-P-1102	Input Gear (JAH).....	1 or
3	14-P-81	Input Bearing Spacer 1.014" x 1.750" x .255".....	1		5-P-1103	Input Gear (MAH)	1 or
4	21-P-546	Bearing Cap	1		5-P-1385	Input Gear (QAH).....	1 or
5	22-P-98	Bearing Cap Gasket	1		5-P-1104	Input Gear (RAH).....	1
6	28-P-42	O-Ring (-023).....	1	25	9-P-79	Idler Shaft	1
7	28-P-198	O-Ring (-117).....	1	26	329772X	Air Shifter Cover Assembly	1
8	378422	Drive Screw.....	2	27	3-P-873	Output Shaft 1-1/4" - 15T.....	1
9	378431-11	Hex Head Capscrew .375" - 16 x 1.125"	8	28	4-P-162	Spacer 1.633" x 2.188" x .125"	1
10	378431-18	Hex Head Capscrew .375" - 16 x 2.000"	4	29	21-P-515	Output Bearing Cap	1
11	379484	Straight Threaded Connector.....	1	30	28-P-219	Oil Seal 2.506" x 1.625" x .375"	1
12	379505	O-Ring Retainer.....	1	31	560976	Bearing Tape.....	1
13	379592	Lockring	1	32	560977	Bearing Tape.....	1
14	68-P-51	Name Plate	1	33	28-P-245	O-Ring 5.017" x .103"	1
15	500597-16	Slotted Roll Pin .188" x 1.250".....	1	34	379231	Pipe Plug 125" - 27	1
16	560982	Tapered Bearing Cup 2.5635" x .550"	2	35	500897-3	Shipping Plug.....	1
17	560986	Tapered Bearing Cone	2	36	55-P-20-1	Shim, Bearing Cover (.003" Green)	1 or
18	560987	Tapered Bearing Cone 1.0005" x .96"	2		55-P-20-2	Shim, Bearing Cover (.010" Brown).....	1 or
19	61-P-1	Shifter Collar	1		55-P-20-3	Shim, Bearing Cover (.020" Yellow)	1
20	28-P-196	O-Ring (-258).....	1	N.S.	328170-179X	Stud Kit, Standard (“X” Mounting Option)	1
21	35-P-59	Gasket.....	1		328170-201X	Stud Kit, Metric (“G” Mounting Option).....	1
22	500897-5	Shipping Plug .125" - 27	1	N.S. – Not Shown			
23	2-P-731	Output Gear (“D” Ratio)	1 or	Service Kits			
	2-P-732	Output Gear (“G” Ratio)	1 or	Part Number		Description	
	2-P-733	Output Gear (“J” Ratio)	1 or	328356-51X		Gasket & Seal Kit, Standard Output	
	2-P-734	Output Gear (“M” Ratio).....	1 or	328356-52X		Gasket & Seal Kit, Pump Output	

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With the P.T.O. on the work bench and the shifter cover in the “UP” position, make **NOTE** of the following before disassembling the Power Take-Off.

1. The position of the P.T.O. Input Gear and the Output Shaft.
2. The position of the Bearing Adjustment Spacer & Input Bearing Spacer
3. The position of the Shift Cover
4. On the Output and Input Bearing Caps **NOTE** the position of the Lube Port marked “UP”

Disassembly

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Remove the Shifter Cover Assembly (26) from the P.T.O. Housing by removing the 6 Cap Screws from the Cover. NOTE position of Shifter and Shifter Fork. <ol style="list-style-type: none"> 1.1. Remove the Shifter Cover Gasket (21) inspect for any damage. 1.2. Set components aside. 2. Remove the Input Gear section next. <ol style="list-style-type: none"> 2.1. To remove the Input Gear Idler Shaft (25), remove the Hex Socket Straight Thread Connector (11), O-Ring Retainer (12) and O-Ring (6). 2.2. Press the Input Idler Shaft (25) out of the Housing (1). 2.3. As the Idler Shaft (25) slides out, the Bearing Adjustment Spacer (18), Spacer Input Bearing (3) and the Input Gear (24) will drop out of the P.T.O. Housing. 2.4. Set components aside. | <ol style="list-style-type: none"> 3. Remove the Closed End Bearing Cap (4) and Gasket Shim (5) by removing the four Cap Screws (9) that attach the cap to the Housing (1). 4. Remove the Open End Bearing Cap (29), Gasket Shims (34) and O-Ring (20) by removing the four Cap Screws (9) that attached the cap to the Housing. 5. Remove the Output Shaft (27) and Gear (23) from Housing. NOTE position of Shifter Collar (19) on Output Gear. 6. Remove the Output Bearings (31) by use of a Bearing Puller. 7. Remove the Output Gear (23) from the Output Shaft (27). |
|--|---|

Inspect all parts for excessive wear or other damage. Replace as necessary. All Gaskets and Seals should be discarded and all milled surfaces on the Housing should be cleaned of any excess Gasket material

NOTE: Any bearings that are replaced requires that the bearing race be replaced at the same time.

Assembly

1. Assemble Output Side Bearing Cap Assembly
 - 1.1. Place Bearing Cap (29) on table.
2. Assemble Output Gear Assembly
 - 2.1. Place Output Gear (23) on table with the small Shifter Collar (19) facing up.
 - 2.2. Position Tapered Bearing Cone (17) over the Shaft end (non-output end).
 - 2.3. Use the Arbor Press and a Bearing Driver tool to seat the Bearing.
 - 2.4. Remove the Assembly from the Arbor Press.
 - 2.5. Place it on the table with Drive end up.
 - 2.6. Slide Output Gear Assembly (23) onto Output Shaft (27)
 - 2.7. Place it into the Arbor Press.
 - 2.8. Position Spacer (28) and Tapered Bearing Cone (31) over Shaft end.
 - 2.9. Use the Arbor Press and a Bearing Driver Tool to seat the Bearing.

NOTE: Output Gear direction may change depending on assembly option ordered.

 - 2.10. Tools Required
 - 2.10.1 Arbor Press
 - 2.10.2 Lock Ring Slide
 - 2.10.3 Driver
3. Assemble Input Gear and Bearing Assembly into Housing
 - 3.1. Visually inspect Housing (1) internally and externally for dirt, burrs, chips, cracks, casting flaws, scratches or any condition affecting fit, condition or appearance. Clean if necessary.

NOTE: Slotted Roll Pin slot must face the back of the Housing to prevent leaking.

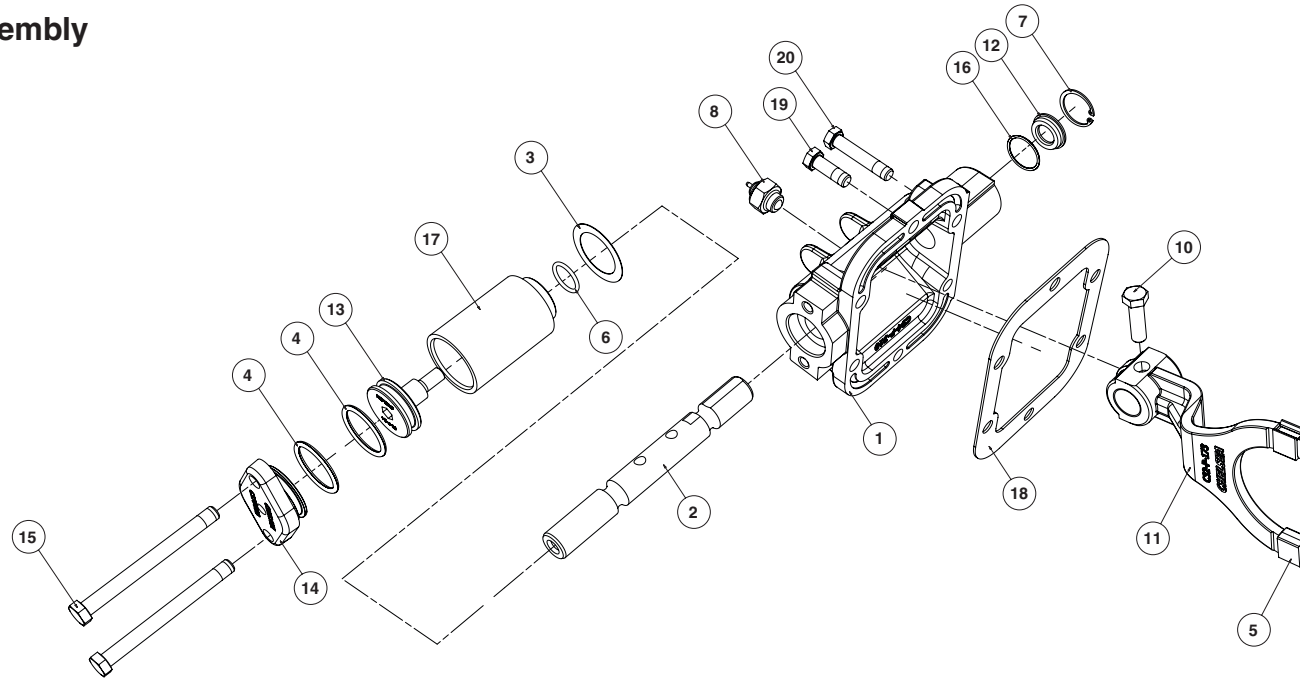
 - 3.2. Identify the required assembly arrangement and turn the housing over on it's side with the output side up.
 - 3.3. Assemble one non-lubricated Tapered Bearing Cone (18) into the large Gear side of Input Gear (24) and the other non-lubricated Tapered Bearing Cone (18) into the Input Gear's small Gear side.
 - 3.4. Put the Input Gear (24) and Bearings sub-assembly into the Housing cavity.
 - 3.5. Select and put Adjusting Bearing Spacer(s) (2) into the Housing cavity next to the Input Gear's large Gear side and the Input Bearing Spacer (3) next to the Input Gear's small Gear side.
 - 3.6. As an initial end play test, start with the largest spacer first (14-P-80-4). While spinning the gear attempt to install the spacers. If they don't install change one spacer out to the next smaller (14-P-80-3). If they still don't install change the other spacer to the next smaller. Continue this test until both spacers fit and the gear still turns.
 - 3.7. Slide the Guide Rod through the Housing Boss, input Bearing Spacer, Input Gear and Bearings and adjusting Bearing Spacer(s) diameters for parts alignment. By hand, assemble the lubricated O-Ring (7) to Idler Shaft (20). Be sure the O-Ring seats correctly and is not twisted.

- 3.8. Insert the Idler Shaft (25) into the Housing Boss. Push it carefully through diameters of the Boss, Spacers, and the Bearings in the Input Gear. At the same time as the Idler Shaft is being inserted, slowly remove the Guide Rod until the Idler Shaft replaces it.
- 3.9. By hand, assemble the lubricated O-Ring (6), then the O-Ring Retainer (12) and Straight Threaded Connector (11) to Idler Shaft (25). Be sure the O-Ring is not twisted and seats correctly.
- 3.10. Tighten and torque Straight Threaded Connector (11) to 120 - 156 in-lb.
- 3.11. By hand, rotate the Input Gear for freedom of movement without binding. Then, check and adjust end play. Input gear should turn freely and no side to side movement of the gear.
- 3.12. Tools Required:
 - 3.12.1. Feeler Gage
 - 3.12.2. Guide Rod
 - 3.12.3. Torque Wrench
4. Assemble Drive Shaft, Output Gear, Shifter Collar & Bearing Cone Assembly to Input Gear Assembly
 - 4.1. Assemble Bearing Cap Gasket (5), Rear Side Bearing Cap (16) and Bearing Assembly (4) with the four Capscrews (9).
 - 4.2. Torque the Capscrews to 30 - 37 Lbs. ft.
 - 4.3. Lubricate the Bearing Cone and Cup. Vertically insert the Bearing Cone End of the Drive Shaft and Output Gear Assemblies into the Housing cavity.
 - 4.4. Assemble the Bearing Cone into the Bearing Cup located in the rear Bearing Cap while meshing the Output Gear with the Input Gear.
 - 4.5. Check gear rotation to ensure that gears rotate freely, and without binding.
5. Assemble Output Side Bearing Cap
 - 5.1. Assemble lubricated O-Ring (20) to the required Bearing Cap (29) by hand.
 - 5.2. Align the set of shim(s) (36) that were removed/replaced over the housing threaded holes.
 - 5.3. Attach the bearing cap sub-assembly(29) to the housing with four Hex Capscrews (9).
 - 5.4. Torque the Capscrews to 30 - 37 ft-lbs.
 - 5.5. Rotate shaft for free movement without binding.
 - 5.6. Check end play.
6. Shifter Housing Installation - **NOTE:** This should be done after P.T.O. is installed back on Transmission and Backlash has been checked.
 - 6.1. Align Gasket (21) with the housing with its ridge facing the cover.
 - 6.2. Align and assemble Cover (26) to the Housing with six Capscrews (9 & 10).
 - 6.3. Sequence tighten the Capscrews in a crossing pattern. Torque to 30 - 37 Lbs. ft.
 - 6.4. Check Shaft rotation to be sure the Shaft rotates freely without binding.
 - 6.5. Assembly is complete.

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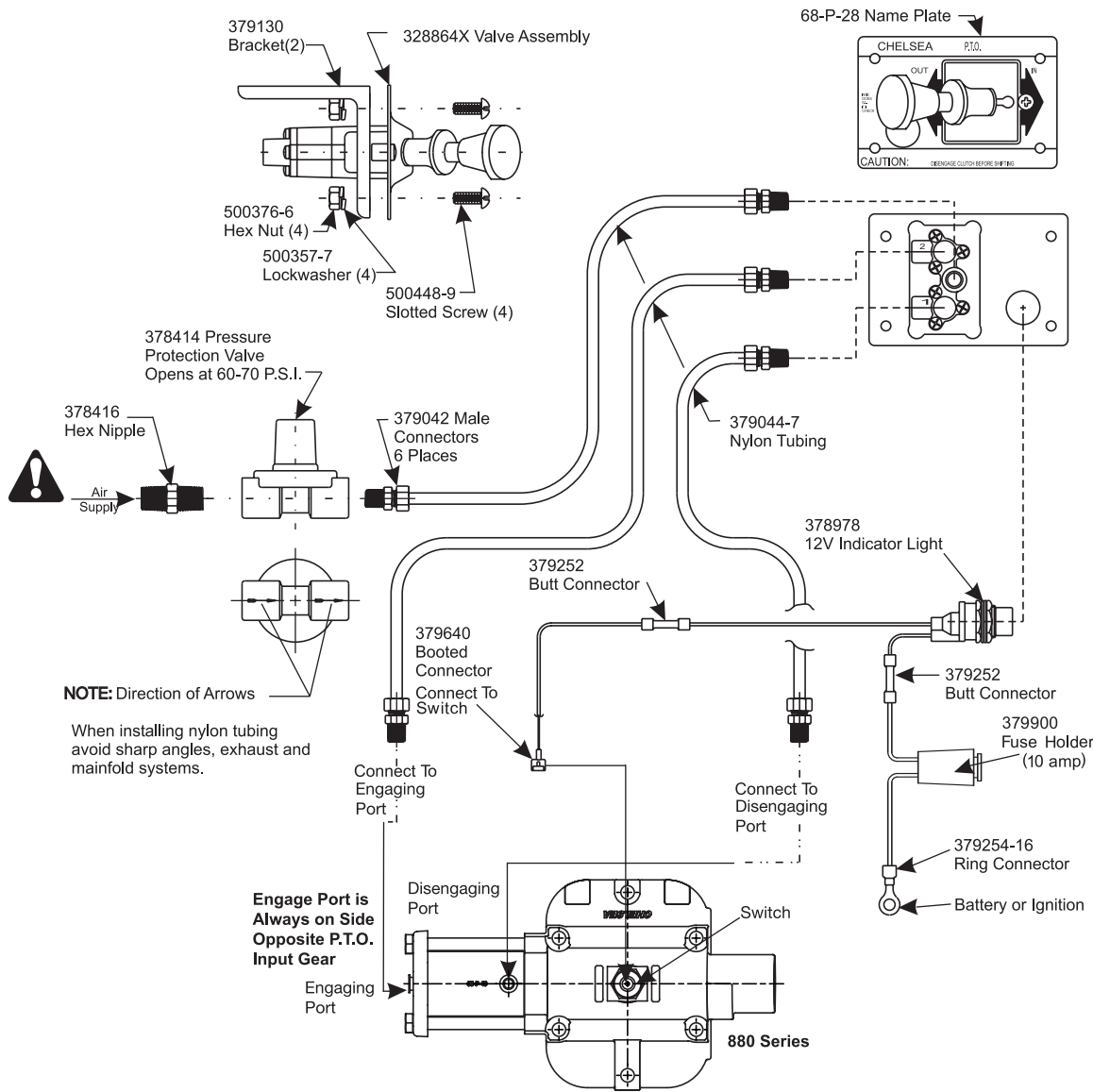
Air Shift Cover Assembly



Item	Part Number	Description	Qty.
	329772X	AIR SHIFT COVER ASSEMBLY (Includes items 1 thru 17)	
1	34-P-311	Cover Shifter.....	1
2	11-P-165	Shaft Shifter.....	1
3	22-P-113	Gasket .823".....	1
4	28-P-61	O-Ring 1.359" x .139".....	2
5	64-P-9	Clip Shifter Fork.....	1
6	28-P-198	O-Ring .798" x .103".....	1
7	378316	Lockring Internal.....	1
8	379639	Switch Indicator.....	1
N.S.	500897-5	Plug Shipping.....	1
10	378431-12	Capscrew HH .375" - 16 x 1.250".....	2
11	32-P-172	Fork Shifter.....	8
12	378315	Plug Cover.....	4
13	66-P-24	Piston Shifter.....	1

Item	Part Number	Description	Qty.
14	379027	Cap Cylinder.....	1
15	378431-30	Capscrew HH .375" - 16 x 4.00".....	1
16	28-P-42	O-Ring 1.051" x .070".....	1
17	65-P-43	Cylinder Air Shift.....	1
18	35-P-59	Gasket.....	2
19	378431-11	Capscrew Hex Head, (.375" - 16 x 1.125").....	2
20	378431-18	Capscrew Hex Head, (.375" - 16 x 2.000").....	2
	329216-3X	Shifter Kit Air (Includes items 1-20 & 328388-38X Installation Kit).....	1
N.S. — Not Shown			
Service Kit			
Part Number		Description	
328356-72X		Gasket & Seal Kit, Air Shift	
See page 28 for Kits Bill of Materials			

Air Shifter Installation Sketch for 880 Series Using: Valve (SK-276 Rev K) "A" Shift Option



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

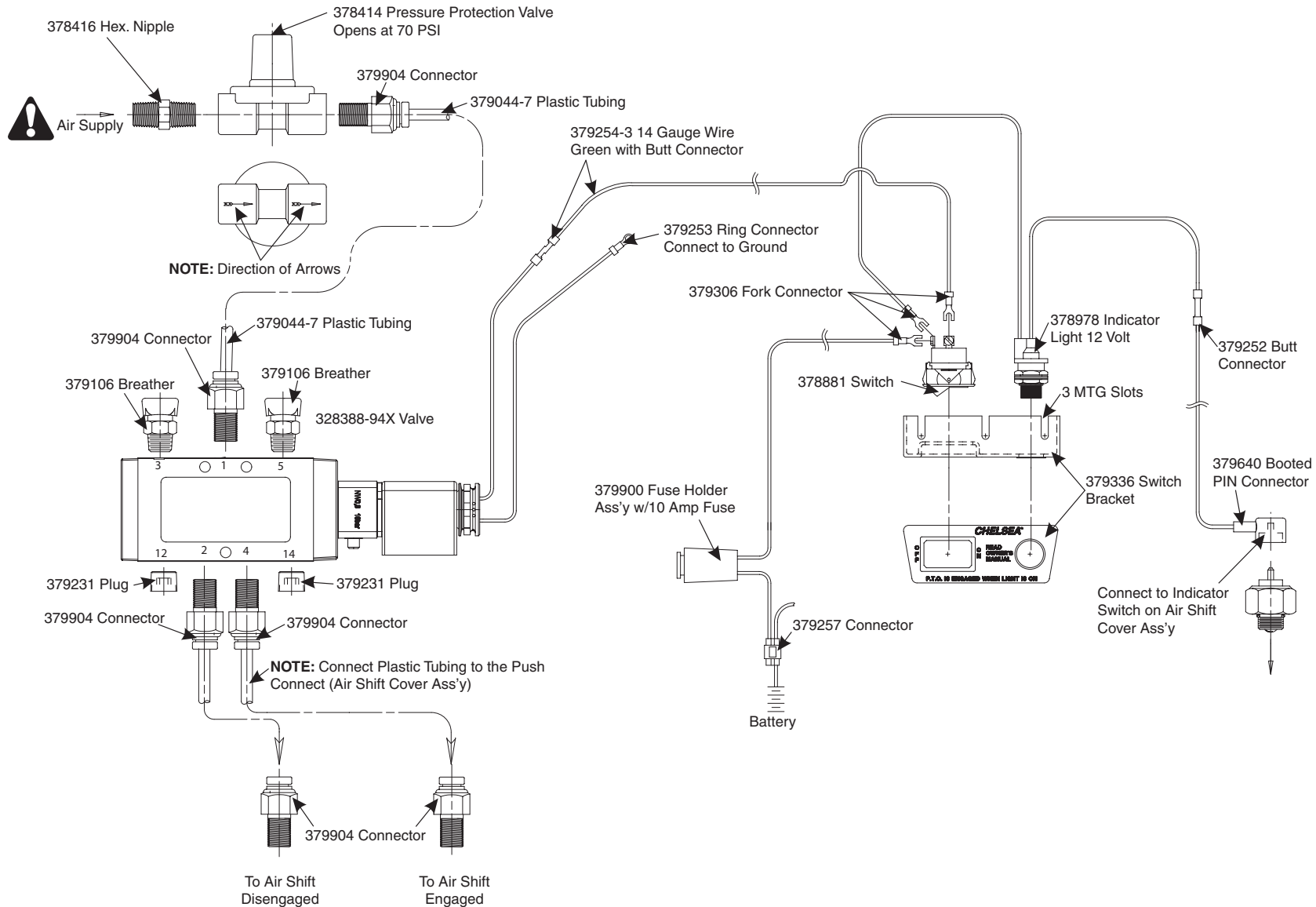
Caution: When installing nylon tubing avoid sharp angles, exhaust and manifold systems.

Important: When this installation is used on vehicles with automatic transmissions, the P.T.O. drive gear must be stopped before shifting.

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

NOTE: The template for the control plate (See HY25-1135-M1/US page 48).

Electric Air Shifter Installation Sketch for 880 Series (SK-447) "P" Shift Option



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

Torque Chart**Service Manual
880 Series**

Location	Torque (English)	Torque (Metric)
NWD Plug	120 - 156 In. Lbs.	14 - 18 N.m.
Bearing Cap Closed/Open	30 - 37 Lbs. ft.	41 - 50 N.m.
Shaft Nut (380486X)		
1410 Series Flange Outputs	120-130 Lbs. ft.	162-176 N.m.
Bearing Cap Closed	30 - 37 Lbs. ft.	41 - 50 N.m.
Shift Covers	30 - 37 Lbs. ft.	41 - 50 N.m.

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Mounting the P.T.O. on the Transmission

1. Place the correct number of gaskets over studs (Fig. 1). Do not use Permatex between gaskets because you may want to add or subtract gaskets to obtain proper backlash.
 - When mounting a P.T.O. use gaskets between all mounting surfaces.
 - Do not stack more than 3 gaskets together.
 - Usually one thick gasket .020 (.50mm) will be required.
 - Remember the lubricant in the transmission also lubricates the P.T.O. Therefore, at least one gasket must always be used on either side of filler blocks, adapter assemblies or adapter plates. More gaskets may be required when establishing proper backlash.
2. Secure P.T.O. to the transmission.
 - Use Self Locking nuts provided with P.T.O. (Fig. 2).

NOTE: Self Locking nuts do not require lockwashers.

3. Fasten the P.T.O. to the transmission (Fig. 3). Torque the set of locking nuts to their proper specifications.
 - 379745 7/16" - 20 for 8-Bolt applications 55 - 60 Lbs. ft. (7.59 - 8.28 kg meters)
 - Torque capscrews to their proper specifications.
 - 8-Bolt to 45 - 50 Lbs. ft. (6.22 - 6.91 kg meters)



Fig. 1

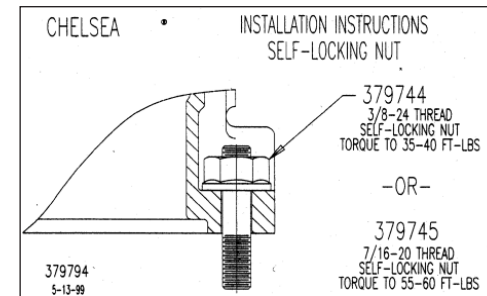


Fig. 2



Fig. 3

Checking Backlash

To check for proper backlash on P.T.O.s with shift cover

1. Remove the P.T.O. shift housing and/or inspection plate.
2. Mount the dial indicator so that it registers movement of the input gear (driven gear) of the P.T.O. (Fig. 4).

NOTE: See Figure 5 for proper location of dial indicator contact point. (Two common type dial indicators shown).

3. Hold the P.T.O. driver gear in transmission with a screwdriver or bar and rock the P.T.O. input gear (driven gear) back and forth with your hand. Note the total movement on the dial indicator.
4. Establish backlash at .006" - .012" [.15mm - .30mm] by adding or subtracting gaskets.
**General rule: A Chelsea .010" gasket will change backlash approx. .006".
A .020" gasket changes backlash approx. .012".**
5. Replace the shift housing and/or inspection plate and retorque capscrews to 30-37 Lbs. ft. (41-50 N.m.).

NOTE: Apply a drop of Loctite 290 on each capscrew before reinstalling. Capscrews that are furnished with a conversion kit and are being installed for the first time do not require the drop of Loctite.

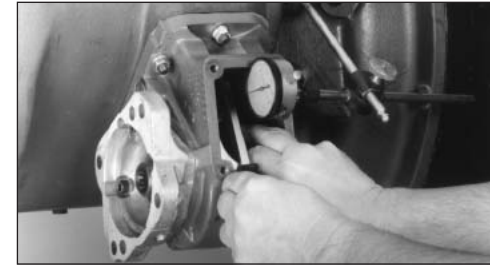


Fig. 4

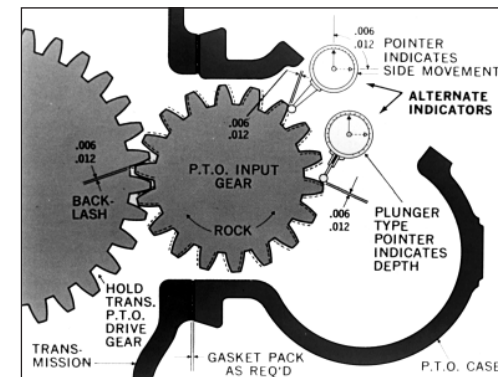


Fig. 5

Lubricant in Transmission/Inspect Installation

1. Remove the filler plug from the transmission and add recommended transmission lubricant to the level prescribed by the transmission or truck manufacturer (Fig. 6).

NOTE: If the P.T.O. is mounted below oil level, additional lubricant will be required.

2. Run the P.T.O. for 5-10 minutes and check for oil leaks and noise.
3. Should a quiet P.T.O. become noisy after the universal joint connection is made, check the P.T.O. driveline components for an out of phase condition, excessive or unequal joint angles or possibly worn parts in the driven accessory.
4. Re-torque all mounting bolts, nuts, cap screws and set up inspection routine of the P.T.O. driveline components and the driven auxiliary equipment.

NOTE: Anticipate slight increase in P.T.O. noise level as oil thins out at operating temperatures.

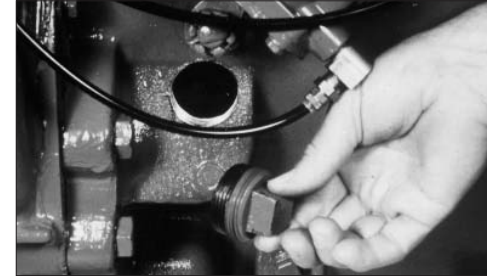


Fig. 6

Continuity Check 379639 and 379652 Indicator Switches

In order to ensure that the switch is functioning properly, the following procedure can be used with the unit on a bench, or installed.

1. Use a continuity checker, battery type, either meter or light. Attach one (1) probe to the screw on the 379639 or 379652 Indicator Switch.

NOTE: Make sure 379639 and 379652 Indicator Switches in the P.T.O. shifter or housing are torqued to 10 - 15 Lbs. ft. (1.38 - 2.07 kg meters).

2. With the other probe, make contact with the shifter cover or housing (Fig. 7).
3. Actuate shifting device and the meter or light* should be actuated when P.T.O. gear is engaged (Fig. 8).
4. Shift unit out of gear and the meter or light* should return to normal as shown.

This test procedure can be used to check Chelsea wire, lever, and air shifter covers, although an air source would be necessary for the latter.

* If a meter is not available the light in the 328751-1X can be used. A six volt battery is all that is necessary for a power source.

CAUTION: Indicator switches are capable of 0.5 amps maximum.

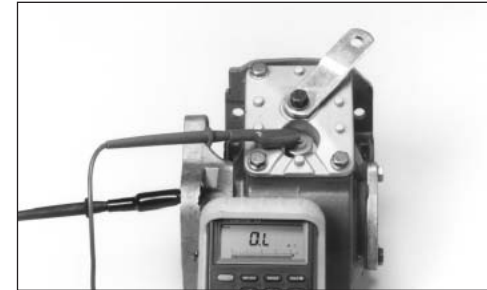


Fig. 7

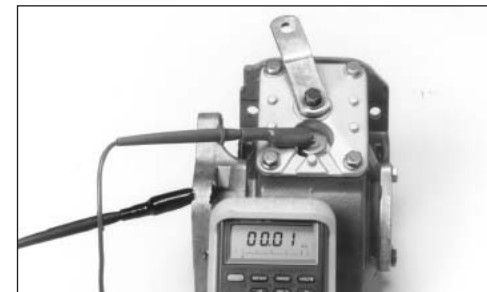
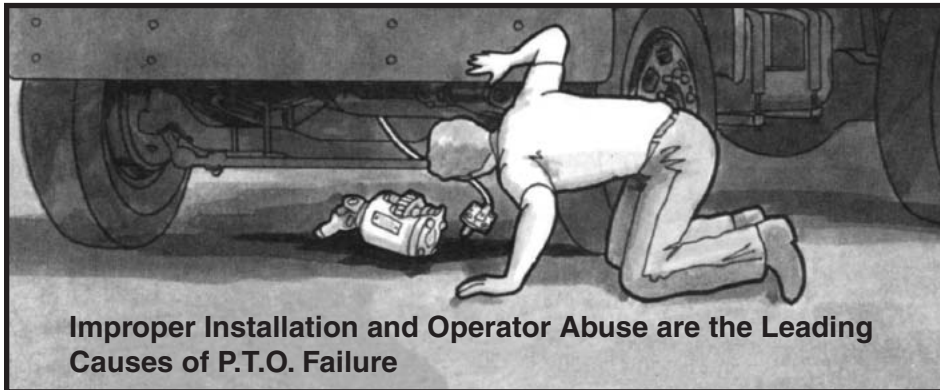


Fig. 8

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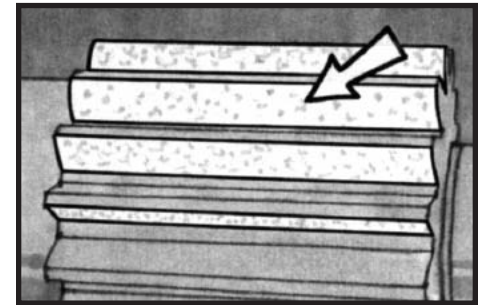
The Chelsea P.T.O. is designed and built to meet the rugged demands of the Mobile Equipment Industry. With proper use and maintenance, the Chelsea P.T.O. will provide a long service life, both on-highway and off. Yet, if a problem does arise, it is important to diagnose its causes and correct it at once.

The first place to look when troubleshooting a P.T.O. 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 P.T.O. was specified for the transmission, then find out if the torque handling capabilities of the P.T.O. are satisfactory for the job being done. A P.T.O. works best when it is properly specified for the transmission and job requirement.

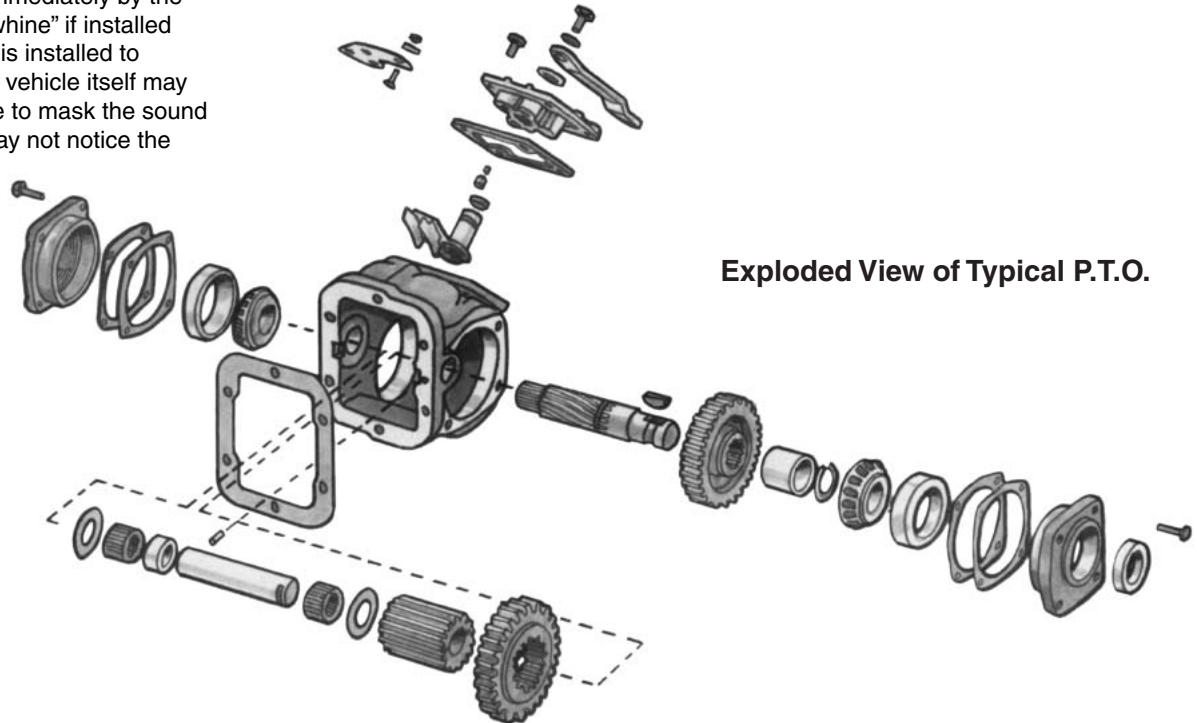
If the P.T.O. was correctly specified and then failed prematurely, there are two likely causes: improper installation and/or operator misuse. These are tough problems because they involve people as well as product. An improperly installed P.T.O. can normally be identified immediately by the sound it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

If a problem is allowed to continue, then damage to the P.T.O. will result. A unit that has been mounted too 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 P.T.O. 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 P.T.O. for noise just after it is installed.

Whatever the reason for a P.T.O. failure, there will be confusion over who, or what, is at fault. More than likely the product will be blamed. Although the P.T.O. cannot defend itself, its failed parts will tell a story.



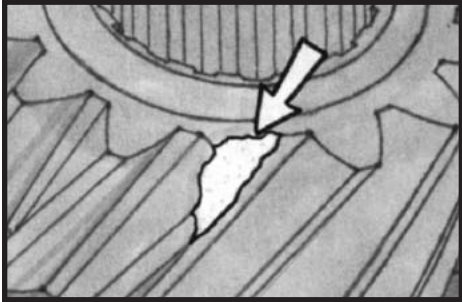
The first parts to inspect should be the gears. Check the surface of the gear teeth for signs of pitting . . . pitting is a normal wear pattern in most cases. However, contaminants in the oil or an installation that is too tight will cause severe pitting.



Troubleshooting

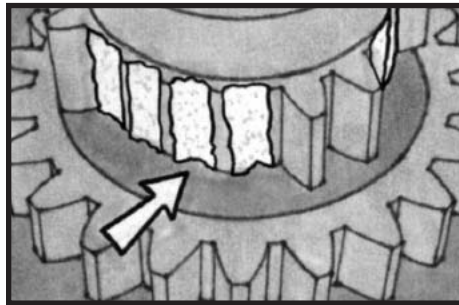
Service Manual 880 Series

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 P.T.O. is repaired or rebuilt.

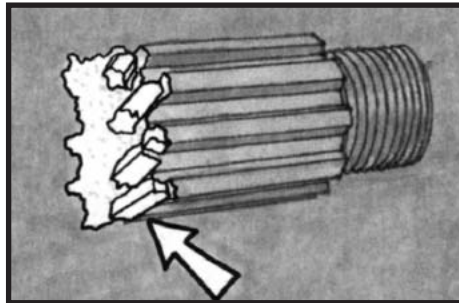


Sometimes a gear will chip a tooth because of mishandling or improper shifting. Even though a P.T.O. may continue to run with a chipped tooth, the damaged gear should be replaced immediately. It will damage the other teeth it comes in contact with during operation, not to mention the possible damage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

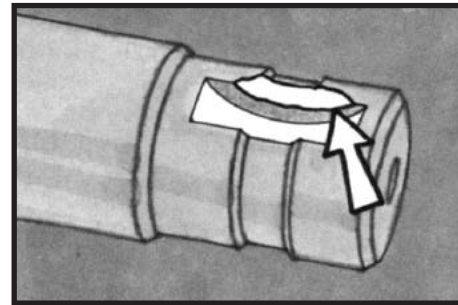
Another possible problem during vehicle operation is "shock load." This occurs when the torque demands on a P.T.O. are suddenly greater than it was designed to take. "Shock load" could be caused by torque overloads, improper shifting, equipment failure, or excessive loads over a short period of time.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



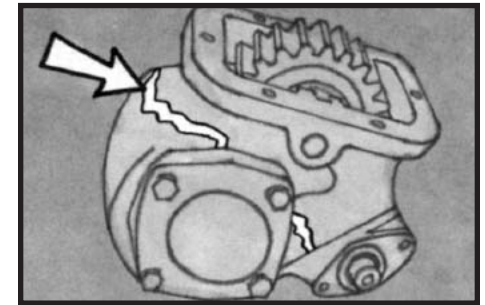
Worn gears can easily be affected by "shock load." If the worn gears are not replaced, they can eventually lead to broken gear teeth. This is the most severe form of P.T.O. failure. Worn or damaged gears are likely to break because of their reduced load carrying capacity. To prevent the possibility of broken gear teeth, always inspect auxiliary equipment for possible freeze-up. Also, recheck P.T.O. application, operating conditions and P.T.O. installation.



P.T.O. 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 P.T.O. shaft problem replace the failed shaft and check the speed and operating angle of the universal joint. Also, make sure the P.T.O. driveshaft is properly phased, (yokes in-line with each other). If a driveline is improperly installed it will cause vibration, which may lead to P.T.O. driveshaft or driven equipment problems.

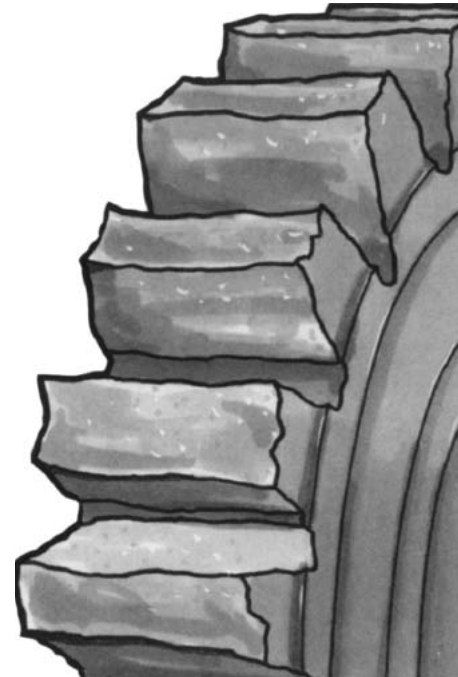


When inspecting a P.T.O. output shaft, always inspect the keyway. Sometimes a P.T.O. will fail because of a displaced keyway on the shaft caused by a loose fitting yoke or equipment freeze-up. Proper maintenance on auxiliary equipment and replacing a worn yoke and/or P.T.O. driven shaft will prevent this problem.

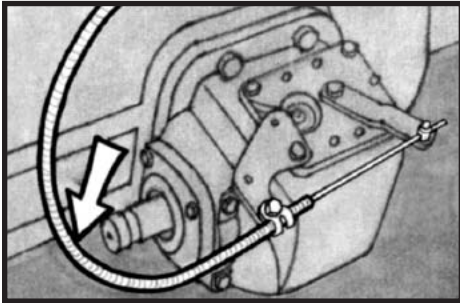


One of the most serious problems a P.T.O. can suffer is a cracked case. This condition can lead to oil loss and eventual transmission failure. Improper installation, poorly torqued bolts, or an unsupported direct mount pump can cause such a problem. A P.T.O. case can also be damaged by foreign objects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

Prevention is the best cure for P.T.O. case damage. Therefore, always torque the P.T.O. 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.

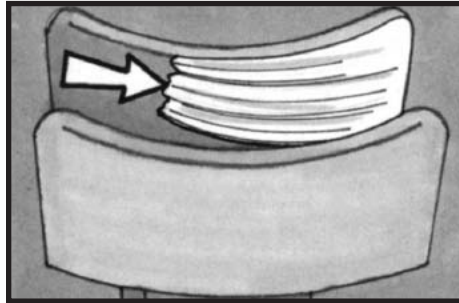


Deep Mesh Pattern Caused by Improper Backlash Adjustment

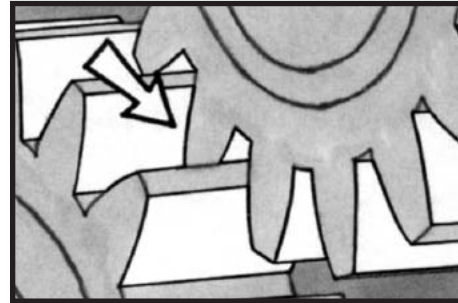


Shifting problems are sometimes a complaint an operator will have about his P.T.O. A P.T.O. that is hard to shift may be caused by a tight bend in the shifter cable, poor leverage, a gear that is installed backwards, or too tight of an installation. Many of these problems can be solved by inspecting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

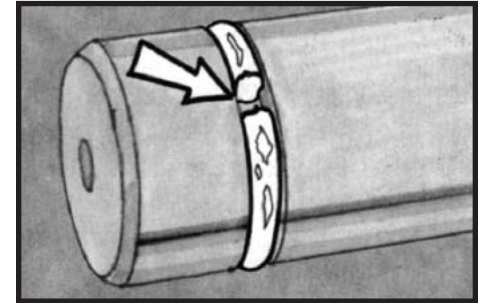
Remember, a lever-operated shift linkage should not be connected to a wire shift cover. The mechanical advantage of the lever is often too great for the wire shift cover and could severely damage it. Also inversely, don't use a cable with a lever shift cover. The cable isn't capable of transmitting the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



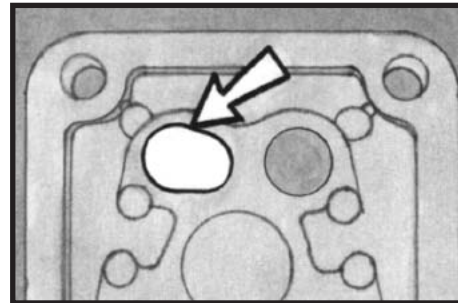
Most shifting complaints are caused by improper shifting procedure or incorrect linkage installation. Both of these situations will cause premature wear on the shift pad or fork and the shift rod or rail. To prevent this premature wear, avoid overshifting or undershifting the P.T.O. Overshifting causes the shifter fork to press against a P.T.O. gear during operation. This results in unnecessary friction and wear.



Undershifting allows incomplete gear tooth contact with the driver gear. This means only part of the tooth width is transmitting the torque and R.P.M. during P.T.O. operation. This situation can lead to gear failure or it could cause the P.T.O. to jump out of gear. These two problems can be overcome by checking linkage adjustments and proper operator training.



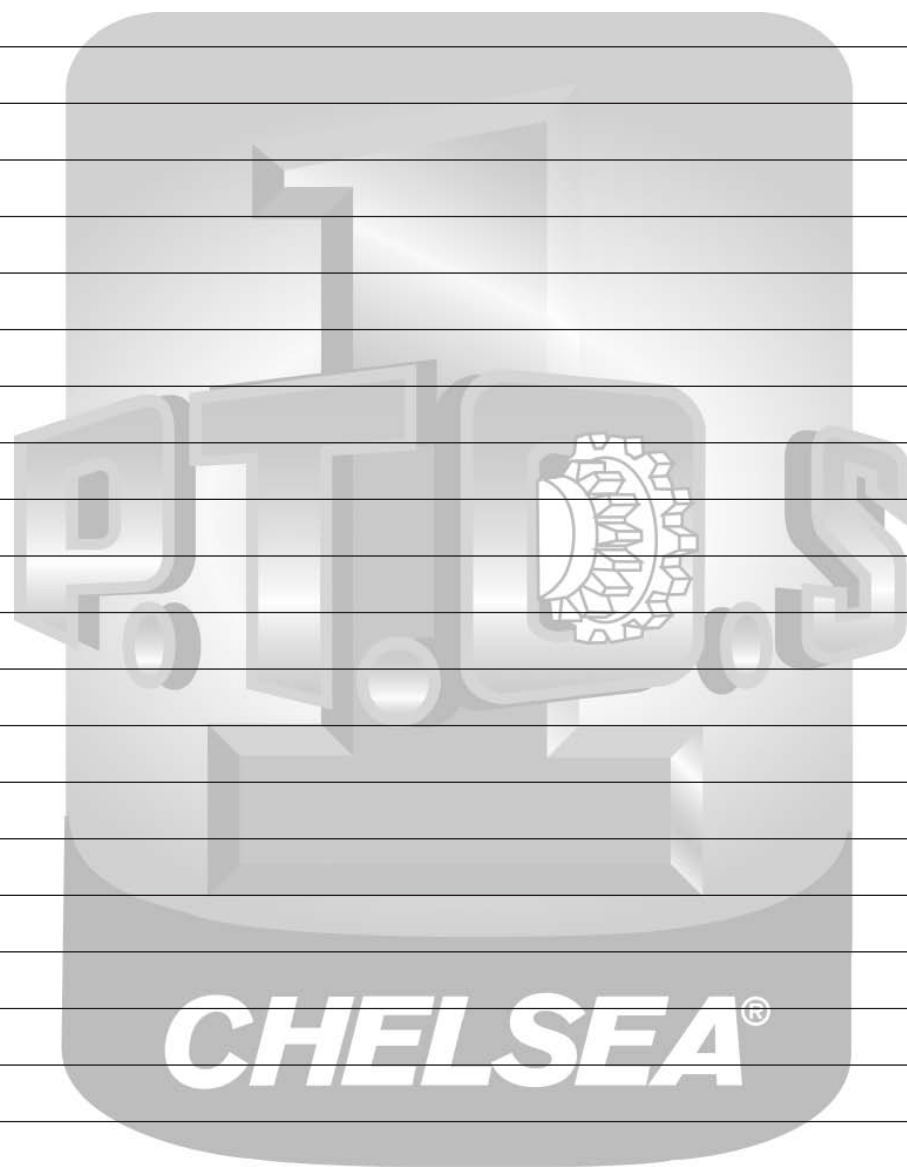
Seals and O-Rings may cause special problems in P.T.O. operations. Improper installation or heat build-up can cause O-Rings and seals to fail prematurely. Once seals or O-Rings fail, they should be replaced. The proper procedure for installing these parts is to lubricate them first so they will easily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



Shifting problems can also be caused by a worn or elongated shifter poppet hole. This causes the P.T.O. to jump out of gear and the parts in the shifter assembly to break or become loose. If this happens, replace those parts that are worn.

Kits Bill of Materials**Service Manual
880 Series**

329183X	Repair Kit/Overhaul		328356-52X	Gasket & Seal Kit, Pump Output	
14-P-66-1	Non Tabbed	2	22-P-98	Gasket	1
14-P-66-2	Non Tabbed	2	28-P-196	O-Ring	1
14-P-66-3	Non Tabbed	2	28-P-198	O-Ring	1
22-P-96	Gasket 880	2	28-P-219	Oil Seal	1
22-P-98	Gasket	1	28-P-42	O-Ring	1
28-P-196	O-Ring	1	35-P-15-1	Mounting Gasket	2
28-P-198	O-Ring	1	35-P-15-2	Mounting Gasket	2
28-P-211	Oil Seal	1	35-P-59	Gasket	1
28-P-218	Oil Seal	2	55-P-20-1	Shim, Bearing Cover Green	2
28-P-219	Oil Seal	1	55-P-20-2	Shim, Bearing Cover Brown	2
28-P-42	O-Ring	1	55-P-20-3	Shim, Bearing Cover Yellow	2
28-P-61	O-Ring	4			
35-P-15-1	Mounting Gasket	2	328356-72X	Gasket & Seal Kit, Air Shift	
35-P-15-2	Mounting Gasket	2	22-P-113	Gasket .823"	1
35-P-59	Gasket	1	28-P-61	O-Ring 1.359" x .139"	2
55-P-20-1	Shim, Bearing Cover Green	2	28-P-198	O-Ring .798" x .103"	1
55-P-20-2	Shim, Bearing Cover Brown	2	28-P-42	O-Ring 1.051" x .070"	1
55-P-20-3	Shim, Bearing Cover Yellow	2	35-P-59	Gasket	2
560976	Bearing Tape	1			
560977	Bearing Tape	1			
560978	Bearing Cone (Tapered)	2			
560982	Bearing Cup Tapered	2			
560986	Bearing Tape	2			
560987	Tapered Bearing Cone	2			
328356-51X	Gasket & Seal Kit				
22-P-98	Gasket	1			
28-P-196	O-Ring	1			
28-P-198	O-Ring	1			
28-P-211	Oil Seal	1			
28-P-42	O-Ring	1			
35-P-15-1	Mounting Gasket	2			
35-P-15-2	Mounting Gasket	2			
35-P-59	Gasket	1			
55-P-20-1	Shim, Bearing Cover Green	2			
55-P-20-2	Shim, Bearing Cover Brown	2			
55-P-20-3	Shim, Bearing Cover Yellow	2			







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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 Buyer's 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.

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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. Invalidity 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.

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